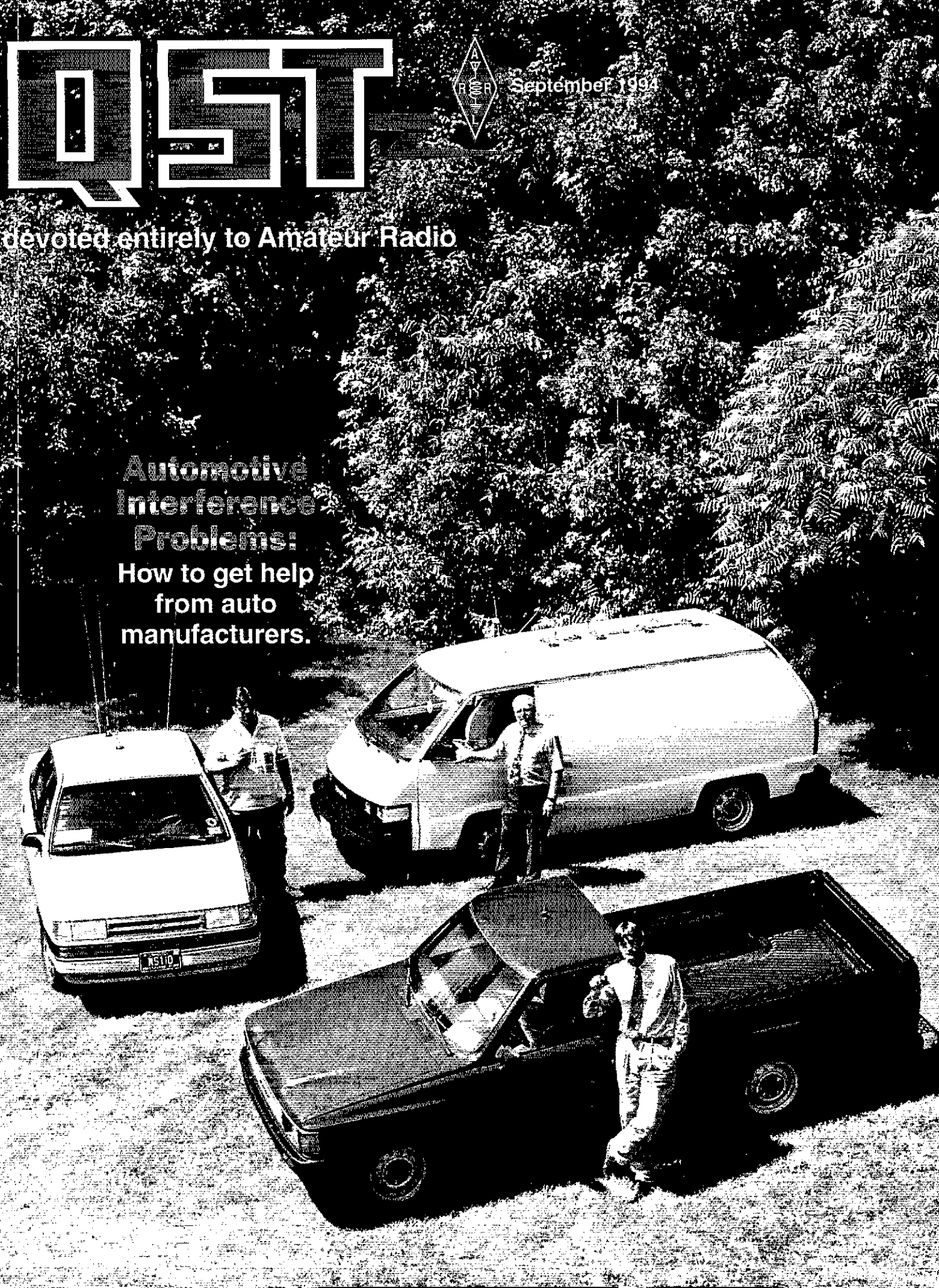
QST

September 1994

devoted entirely to Amateur Radio

Automotive Interference Problems:

How to get help from auto manufacturers.



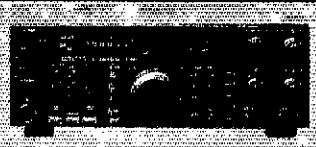
Explore the Kenwood Dimension

The finest selection of communications equipment for the Amateur Radio enthusiast

H F T R A N S C E I V E R S

TS-950SDX •160m to 10m amateur band operation, 100kHz to 30MHz general coverage receiver •Built-in DSP (Digital Signal Processor) •MOS-type FET final section •Dual frequency receive •Menu system

TS-850S •160m to 10m amateur band operation, 100kHz to 30MHz general coverage receiver •DDS (Direct Digital Synthesizer) & digital PLL system •AIP (Advanced Intercept Point) system •IF slope tuning •Electronic message keyer circuit with weighting control



TS-450S/690S •160m to 10m amateur band operation, 500kHz to 30MHz general coverage receiver •6m amateur band and 50–54MHz general coverage receive (TS-690S) •DDS (Direct Digital Synthesizer) & digital PLL system •AIP system •IF shift function tuning •AF notch filter

TS-140S •160m to 10m amateur band operation, 500kHz to 30MHz general coverage receive •IF shift circuit •31 memory channels with multi-scan functions •Dual-mode noise blanker •Speech processor with audio compression amplifier

A L L M O D E T R A N S C E I V E R S

TS-50S •Super-compact, 100-watt, 160m to 10m transceiver, 500kHz to 30MHz general coverage receiver •DDS (Direct Digital Synthesizer) with "fuzzy logic" control •AIP system •100-memory channels •CW reverse •Menu system

TS-790A •144/440MHz dual-band operation •1200MHz unit (option) •All-mode operation •Satellite communications with Doppler effect frequency correction •59 multi-function memory channels with lithium battery back-up

TS-60S •50MHz all-mode operation •Max. 90W RF output (SSB, CW & FM) •100 memory channels •DDS with "fuzzy logic" control •AIP, IF shift (SSB & CW) and optional 500Hz CW filter •Dual-menu system

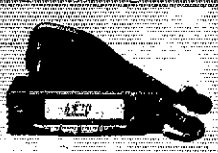
TM-255A/455A •All-mode operation (TM-255A: 144MHz; TM-455A: 430MHz) •101 memory channels •DDS with "fuzzy logic" control •TF-SET (TX frequency set) function •DTSS selective calling with page •1200/9600bps packet terminal

F M M O B I L E T R A N S C E I V E R S

TM-742A/642A/942A
•Multi-band operation (TM-742A: 144/440MHz; TM-642A: 144/220MHz; TM-942A: 144/440/1200MHz) •Optional FM band units for TM-742A/642A (TM-742A: 28/50/220/1200MHz; TM-642A: 28/50/440/1200MHz) •Dual/triple receive capability •101 memory channels per band •Detachable display & control panels (option)

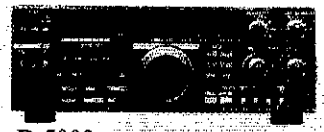
TM-733A •144MHz/440MHz dual-band operation •Dual receive on same band (VHF+VHF or UHF+UHF) •"6-in-1" programmable memory •72 memory channels •DTSS selective calling with page •1200/9600/19.2kbps packet terminal •AIP system •Cross-band repeater function

TM-241A/331A/441A/541A
•Single-band operation (TM-241A: 144MHz; TM-331A: 220MHz; TM-441A: 440MHz; TM-541A: 1200MHz) •20 multi-function memory channels plus call channel •Multi-scan capability •Selectable CTCSS tone encoder •Multi-function microphone supplied



TM-251A/451A •Single-band operation (TM-251A: 144MHz; TM-451A: 440MHz) •41 memory channels (optionally expandable to 200) •Dual-band receive •Digital recording system •DTSS selective calling with page •1200/9600bps packet terminal

C O M M U N I C A T I O N R E C E I V E R



R-5000 •100kHz to 30MHz in 30 bands, with optional 108–174MHz coverage •SSB, CW, AM, FM & FSK modes •Dual IF crystal filters •IF shift circuit •100 memory channels with multi-scan functions

H A N D H E L D T R A N S C E I V E R S

TH-79A •144MHz/440MHz dual-band operation •Compact, light design •Mos FET power Module •Dot-matrix LCD, Guide function & menu system for easy operation •Dual receive on same band •82 non-volatile memory channels in E²PROM •ID memory & DTMF memory •Built-in CTCSS encoder/decode •Cross-band repeater function

TH-28A/48A
•Single-band transmit and dual-band receive (TH-28A: TX 144MHz/RX 144/440MHz, TH-48A: TX 440MHz, RX 144/440MHz) •Alphanumeric memory •Alphanumeric message paging •40 multi-function memory channels (non-volatile) •Tone alert system with indicator

TH-22AT/42AT
•Single-band operation (TH-22A: 144MHz; TH-42A: 440MHz) •MOS FET power module •Built-in DTMF keypad •40 memory channels in E²PROM (plus 1 call channel) •Multiple scan functions •Dual scan stop modes (CO & TO) •Channel Display function

KENWOOD COMMUNICATIONS CORPORATION
AMATEUR RADIO PRODUCTS GROUP
P.O. BOX 22745, 2201 East Dominguez St., Long Beach, CA 90801-5745
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•Repair Locations/Parts (800) KENWOOD •Bulletin Board Service (BBS) (310) 761-8284
KENWOOD ELECTRONICS CANADA INC.
6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8

KENWOOD

94ARD-0971

BACK TO BASICS

TM-241A

FM MOBILE TRANSCEIVER

Pure and simple, the concept reads like this: "rock-solid performance with straightforward operation, at an affordable cost". And Kenwood's TM-241A (144MHz) FM mobile transceiver symbolizes this perfectly.

Great looks and rugged construction are just the beginning. The TM-241A's user-friendly controls make mobile QSOs a snap, and a powerful 50-watt amplifier lets you work simplex with confidence or hit those distant repeaters. Reception specs are equally impressive: intermod characteristics have been improved* to reduce interference from strong adjacent band signals. Plus, there are 20 multi-function memory channels for programming combinations of frequency, sub-audible tone, and repeater offset.

So, if you're looking for true mobile performance, go back to the basics and reach for Kenwood's TM-241A.

Features

- 144-148 MHz TX, 118-174 MHz RX
- 50 watts RF output
- 20 multi-function memory channels
- Large LCD display with illuminated keys
- Full band scan, programmable band scan, memory scan with channel lock-out
- Time-operated & carrier-operated scan modes
- Built-in selectable CTCSS tone encoder
- Auto repeater offset
- Tone alert with elapsed time indicator
- DTSS for selective calling and paging (with optional DTU-2)
- Time-out timer
- Auto power-off with warning beeper
- Meets U.S. military standards for shock and vibration (MIL-STD-810C/D/E)
- Modifiable for MARS/CAP use (permits required)

These specifications guaranteed for Amateur band only.
*Current K&K2 versions with serial number 5080000 or later.

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AMATEUR RADIO PRODUCTS GROUP
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•Customer Support Brochures (310) 639-5300
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KENWOOD ELECTRONICS CANADA INC.
(6070 Kestrel Road, Mississauga, Ontario, Canada L5T 1S8)

KENWOOD

94ARD-0981

This year's "All-Star" Line Up includes (L to R):
Top row: IC-2340H, IC-Δ100H, IC-2700H
Middle row: IC-2GXAT, IC-820H, IC-T21A, IC-281H
Bottom row: IC-737A, IC-736
(Not pictured: IC-T41A UHF handheld and IC-481H UHF mobile)*

Get Your Mitts on an ICOM "All-Star" this Season!

IC-2340H 144/440 MHz Mobile
- Independent Controls
- Auto Repeater Functions
- Large Display
- Built In Duplexer
- 110 Memories
- 2.4 W Audio
- CTCSS Encode
- True Dual Band

IC-Δ100H Triple Band Mobile
- Triple Band Flexibility
- Full Remote Cntrl. Mic.
- 642 Memories
- High Performance
- Detachable Panel
- Voice Synth. (opt.)
- 8 Selectable Band Combinations

IC-2700H 144/440 MHz Mobile
- Detachable Panel
- V/V, U/U or V/U
- Full Remote Ctrl. Mic.
- Auto Repeater Functions
- CTCSS Encode
- Pager/Code Squelch
- Infrared Wireless Mic. (opt.)

IC-2GXAT 144 MHz Handheld
- Tone Scan
- Auto Repeater Functions
- 350 mW Audio
- 700 mAh Battery
- Selectable DTMF Speed
- 7 W (opt.)

IC-820H 144/440 MHz All Mode Base Station
- Auto Satellite Features
- High Stability Crystal
- New DDS (1-Loop)
- 9600 bps Ready
- 116 Memories
- Compact Size

IC-T21A 2 M w/440 MHz Rx Handheld
- 114 Memories
- 800 mAh Battery
- Tone Scan
- Auto Repeater Functions
- Selectable DTMF Speed
- 6 W (opt.)

IC-281H 2 M Mobile w/440 MHz Rx
- 80 Memories
- Large Display
- 9600 bps Ready
- Auto Repeater Functions
- Plug & Play
- Tone Scan (opt.)

IC-737A 100 W HF Transceiver
- New DDS (1-Loop)
- 100% Duty Cycle
- Built In Tuner
- Built In Keyer
- Dual Ant. Connectors
- VOX

IC-736 100 W HF & 6 M Transceiver
- VOX, RF Gain
- Built In Power Supply
- New DDS (1-Loop)
- Built In Tuner (6 M too)
- Built In Keyer
- 4 Function Display

View a video demonstration of this product at your participating ICOM dealer today!

ICOM America, Inc.
Corporate Headquarters
2380-116th Ave. NE, Bellevue, WA 98004
Technical Support (206) 454-7619

*This device has not been approved by the Federal Communications Commission. This device is not, and may not be, offered for sale or lease, or sold or leased until the approval of the FCC has been obtained.

ICOM

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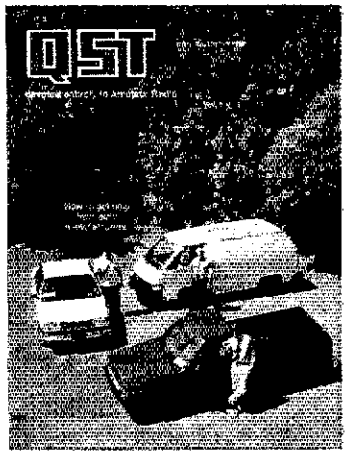


OUR COVER

Features Editor Brian Battles, WS1O (left); Field Services Manager Rick Palm, K1CE (bottom); and Managing Editor Al Brogdon, K3KMO (top) agree that mutual interference between automotive systems and ham rigs can be a royal pain! While they were on the side lawn at HQ discussing this important topic, ARRL Lab Supervisor Ed Hare, KA1CV, was inside the building, finishing his article on that same subject (page 51).

CONTENTS

September 1994
Volume LXXVIII Number 9

TECHNICAL

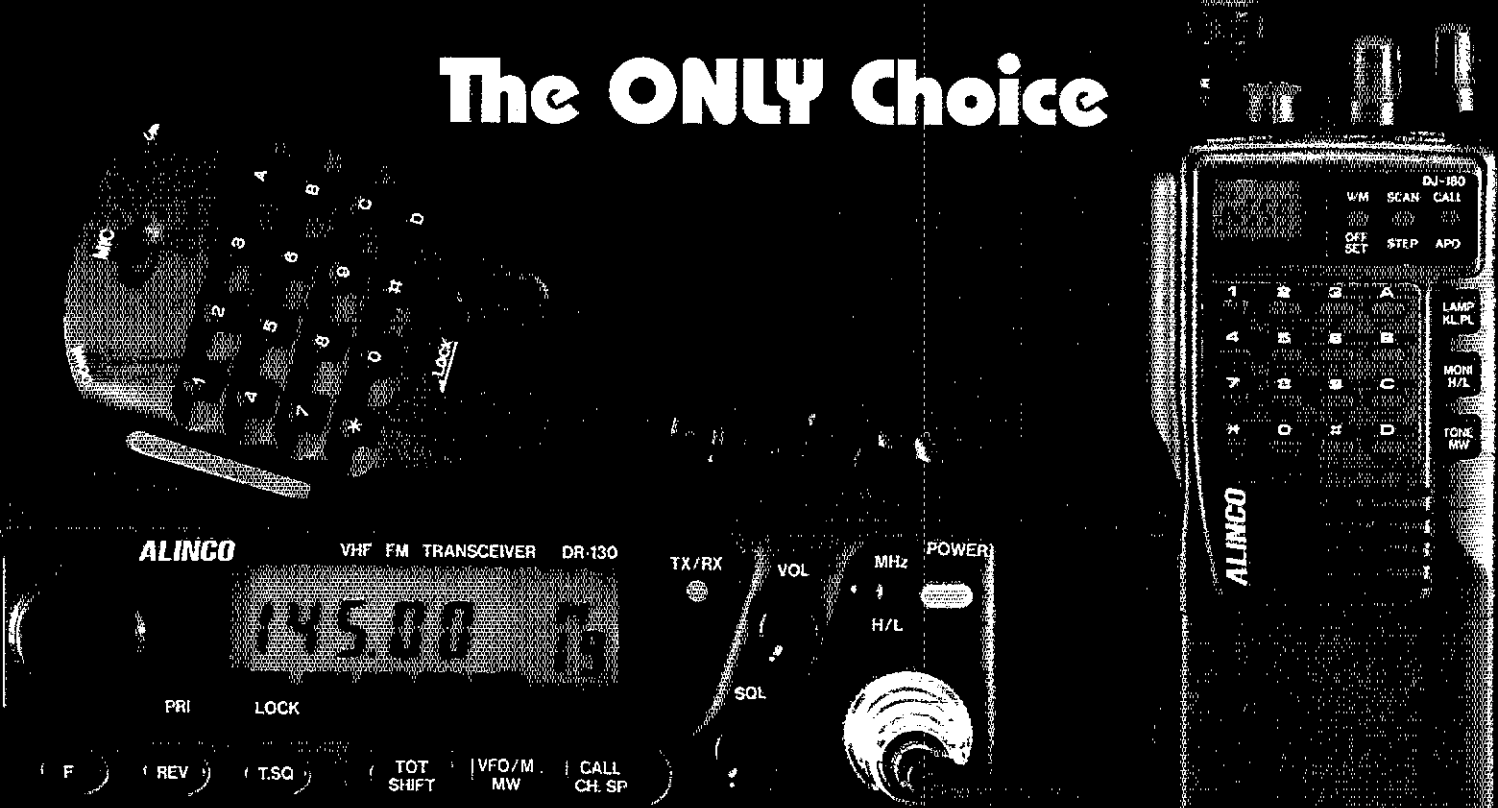
NEWS AND FEATURES

NEW HAM COMPANION

OPERATING

DEPARTMENTS

The ONLY Choice



DR-130/430T:
Power Play

The DR-130T packs a big punch. This compact radio delivers 50 Watts of cool running power, and offers the durability and reliability that Hams have come to expect from ALINCO. The DR-430T is a 70-cm version of the same radio, and can supply 35 watts of output power.

These rigs offer 12 additional CTCSS tones (50 total) for compatibility with any repeater system. 20 memory channels are included, but if more channels are needed, simply plug in the optional EJ-19U module, and 100 memory channels will be available. All memory channels can store 'odd split' frequencies, and also store CTCSS encode/decode status.

A 1750Hz tone burst feature is included, and the LCD display has two modes: 'Commercial Display' which shows only the channel number, and 'Amateur Display' which shows channel numbers and frequency. The simple layout of the front panel offers maximum operating efficiency with no confusion, and a built-in Time Out Timer (TOT) can be programmed from 30-450 seconds.

DJ-180T/TH:
Survival of the Fittest

The rugged DJ-180T features an ergonomics design that fits in your hand like a glove. Excellent sensitivity and great sound make this the radio of choice for demanding operators. The DJ-180TH (High power version) comes with a 12V battery and delivers 5 watts of solid output power.

Ten memory channels come standard, and the unit can be upgrade to 50, or even 200 memory channels with the optional plug-in chips. The DJ-180T comes standard with CTCSS encode and decode, and also has an Automatic Power Off (APO) feature that extends battery life.

Odd Splits! This radio can store repeater offsets from 0 to 15.995 MHz. A different offset can be stored in each memory channel, and most other functions can also be stored independently in each memory channel.

Check out the affordable technology of the 90's.
Check out Alinco.

ALINCO ELECTRONICS INC.

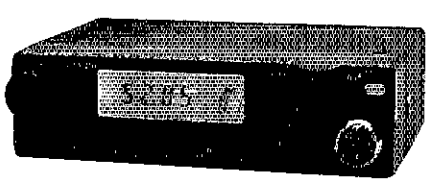
438 Amapola Ave., #130, Torrance, CA90501
Phone: (310) 618-8616 Fax: (310) 618-8758

BRAND NEW FROM ALINCO

The brand new **ALINCO DR-M06T 6-meter VHF FM mobile transceiver** lets you broaden your scope of communication and enjoy sporadic E propagation. Easy programming and compact size are only a few of the outstanding features that bring the excitement of the 6-meter band directly to you. (FCC approval pending)

Super compact size!

5-3/5" (W) x 1-3/5" (H) x 4-3/5" (D)
Operational at 50 MHz – 54 MHz
with 10 Watts output.



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

The "R" Factor

THOUSANDS OF HAMS EXPERIENCE IT EVERY DAY

Cushcraft R7 and R5 antennas are the most advanced verticals in the world. The difference is the "R" Factor! R means DXing and rag chewing are easier. R is louder signals. R also is easier assembly and installation. R is automatic band switching. R is a sleek appearance that looks good in the most demanding environment. R antennas eliminate the need for expensive towers and rotors. The R antennas do not use ground radials. R antennas have a proven track record. R antennas have gained the respect of the amateur community. Listen across the bands and you will hear R7 and R5 antennas perform better than any other antennas in their class. Hundreds of comments have been received recording their exceptional performance.

R antennas make selecting an antenna easy. If you want a small antenna that will give you clear, around the globe communications and quick installation, at a fair price, the R antenna is the right choice.

"I live in a congested suburban area. . .the R7 exceeds my expectations. Wyn H. McGee (ZL3DX)

"I guess I would be understating the obvious - The R7 is fantastic. Also, it was very easy to assemble.
Robert L. Rose (KA2JUQ)

"Antenna is fabulous - SWR on all bands better than expected - I did not have to tune antenna at all."
Martin P. Miller (NN2C)

"Nothing would replace it on my limited spaced rented apartment balcony." Yuri Dzyuba (VE2XLT)

MODEL	R5	R7
Frequency, MHz	28, 24, 21, 18, 14	28, 24, 21, 18, 14, 10, 7
Electrical Wavelength	Halfwave	Halfwave
SWR 2:1 Bandwidth	10 m-2 MHz	10 m-2 MHz
	12 m-100 KHz	12 m-100 KHz
	15 m-450 KHz	15 m-450 KHz
	17 m-100 KHz	17 m-100 KHz
	20 m-350 KHz	20 m-150 KHz
		30 m-50 KHz
		40 m-75 KHz
Power Rating, Watts PEP	1800	1800
Radiation Angle, Degrees	16	16
Frequency Selection	Automatic	Automatic
Horizontal Rad. Pattern Deg.	360	360
Height, ft (m)	17 (5.2)	22.5 (6.9)
Mast Size Range, in (cm)	1.5-1.75 (3.8-4.4)	1.5-1.75 (3.8-4.4)
Wind Load, ft2 (m2)	1.4 (.13)	2.25 (.21)
Weight, lb (kg)	8.7 (4)	12.3 (5.6)
49" Counterpoise Radials (Supplied)	4	7

AVAILABLE THROUGH DEALERS WORLDWIDE

cushcraft

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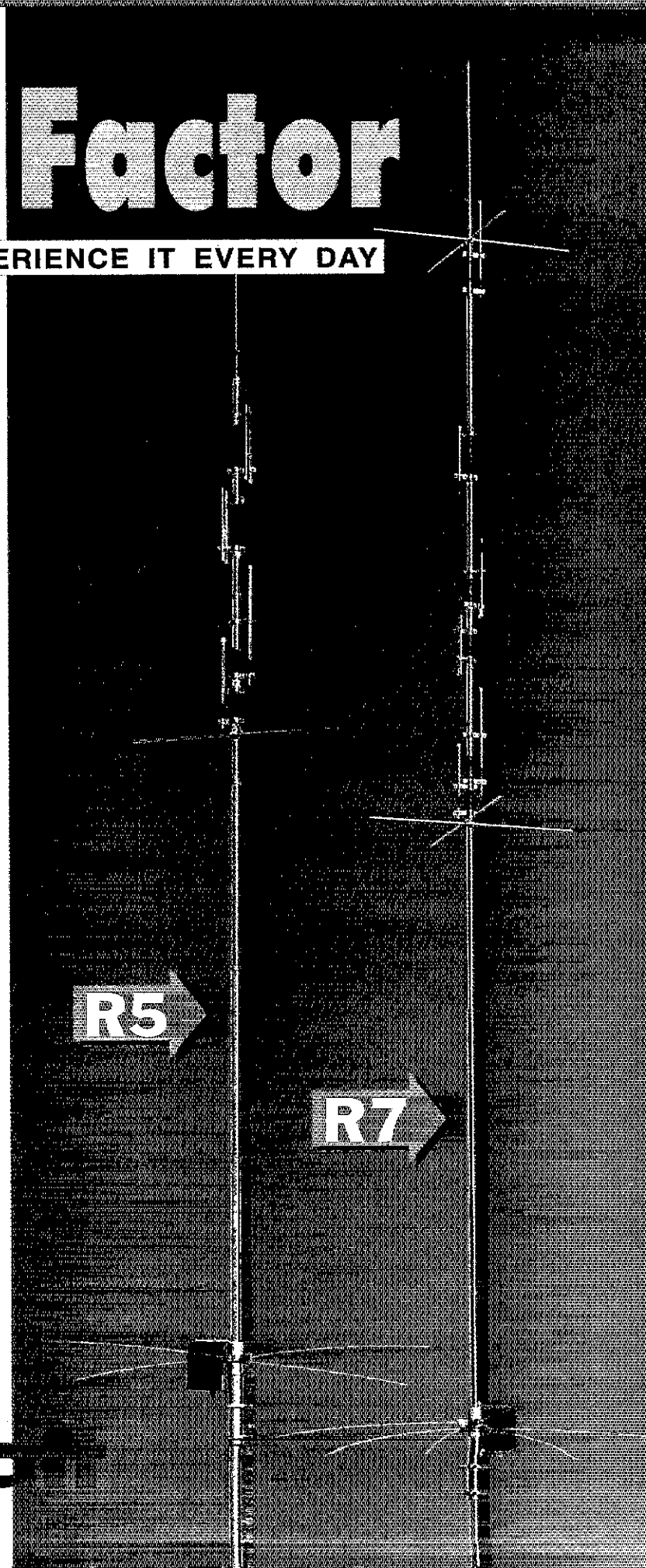


Key Bored?

Add some zip to your CW keying with the KK-1 Keyboard Keyer from AEA. The KK-1 turns any AT-compatible keyboard into an easy-to-use, feature-packed Morse machine. Using the provided cable, the KK-1 will even share a keyboard with your computer!

Unique features such as short-term memory, message repeat, and twelve nestable message buffers, make the KK-1 versatile and simple to use. Hone your skills with an extensive code practice mode or use the built-in iambic keyer with your paddles for a change of pace.

With more usable features for your money than any other Morse keyboard, the KK-1 continues AEA's tradition of top-notch keyers.

Take a break from tapping your paddles and call AEA's Literature Request Line at (800) 432-8873 for more information, or call us direct at (206) 774-5554. Contact your favorite ham radio equipment dealer for best pricing.

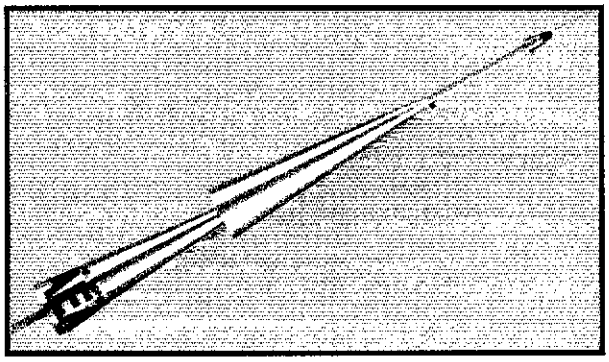
AEA

Con[illegible]h us

Go Far With an Antenna From AEA

IsoLoop

- A 35″ loop antenna with low-angle performance that is better than many full-size HF antennas.
- The ideal compact antenna for amateurs facing antenna restrictions or space limitations.
- Efficiency ranges from 72% on 20m, rising to 96% on 10m.
- High-Q design results in narrow bandwidth.
- Frequency range: 10-30 MHz, continuous.
- Omnidirectional, comes with manual tuner.
- Optional automatic tuner available.

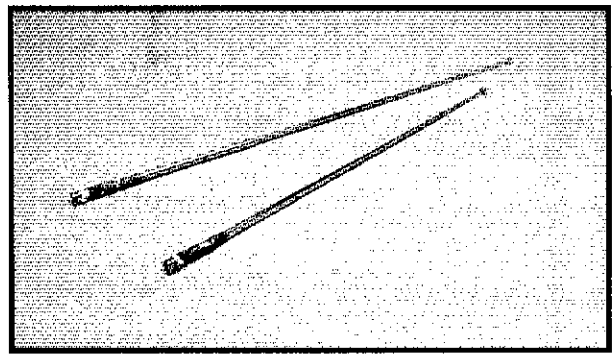


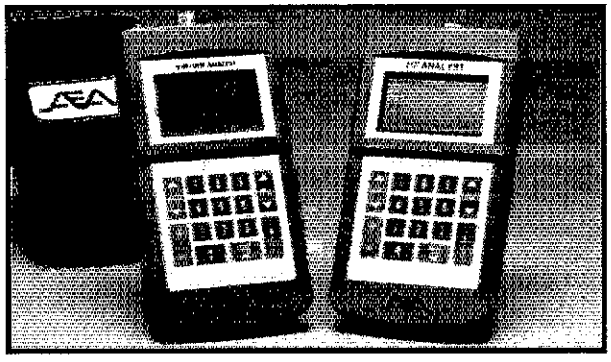
IsoPole

- Patented decoupling cones give you maximum gain possible on the horizon for the length.
- Unique conical shape means lowest feedline pick-up of computer hash noise of any competing antenna.
- Built to withstand the harshest weather.
- Allows broad frequency coverage with full power output over entire band.
- An impedance matching network designed for maximum legal power.
- Available in 144, 220, or 440 MHz versions.

Hot Rods

- High-performance, telescoping handheld half-wave antennas.
- Achieves higher gain than any 5/8 wave, two-meter telescopic antenna for handhelds.
- They can handle over 25 watts of power, making the Hot Rods ideal as a portable base or mobile antenna.
- Collapsed, they perform electrically like helical quarter-wave flexible antennas.
- Available in the HR-1 half-wave 2M and the HR-2 half-wave 220 MHz versions.





SWR-121 Antenna Analyzers

- Digital display of antenna's resonant frequency.
- Graphic display shows the antenna's SWR curve over an entire range, not just one frequency.
- Battery powered—designed for portability.
- Measure the return/loss in a length of coax.
- Digital SWR readout at center frequency.
- Optional software lets you view, save, and print plots to your PC-compatible computer.
- UHF/VHF version covers 120-175, 200-225, and 400-475 MHz.
- HF version covers 1.0-31.999 MHz.

Call (800) 432-8873 for a complete catalog or information on a specific product. Contact your favorite amateur radio equipment dealer for best pricing.

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*Executive Committee Member

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

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Delaware	Randall K. Carlson, WBØJJX, 121 Scarborough Park Dr, No 10, Wilmington 19804 (302-655-6179)
Eastern Pennsylvania	Bob Stanhope, KB3YS, 1359 Bon Bar Rd, York 17403 (717-843-0237)
Maryland-DC	William Howard, WB3V, 2304 Snowflake Dr, Odenton, MD 21113 (410-551-6775)
Southern New Jersey	Bruce Eichmann, KE2OP, 204 E Lake Blvd, Medford 08055 (609-983-0106)
Western New York	WilliamThompson, W2MTA, 5460 Rock Rd, Newark Valley 13811 (607-642-8930)
Western Pennsylvania	Bernie Fuller, N3EFN, RD 2, Box 122, Saegertown 16433 (814-763-1529)

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Indiana	Peggy Coulter, W9JUJ, 12330 SCR 200 E, Muncie 47302 (317-288-0481)
Wisconsin	Richard R. Regent, K9GDF, 5003 S 26th St, Milwaukee 53221 (414-282-0312)

Dakota Division

Minnesota	Randy "Max" Wendel, NØFKU, 8539 Bryant Ave S, Bloomington 55420-2147 (612-888-5953)
North Dakota	Roger "Bill" Kurtti, WCØM, Rural Route, Box 34, Rock Lake 58365 (701-266-5646)
South Dakota	Roland Cory, WØYMB, 1010 7th St W, Mobridge 57601(605-845-2400)

Delta Division

Arkansas	Bob Ideker, WB5VUH, 210 Alanbrook Ave, Sherwood 72116 (501-835-8497)
Louisiana	Lionel A. "Al" Oubre, K5DPG, 3011 Sugar Mill Rd, New Iberia 70560 (318-364-2857)
Mississippi	Richard Redd, KA5WRX, PO Box 9886, Jackson 39206 (601-856-6919)
Tennessee	O. D. Keaton, WA4GLS, 141 Medarais Dr, Old Hickory 37138 (615-758-2329)

Great Lakes Division

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Michigan	Dale Williams, WA8EFK, 291 Outer Dr, Dundee 48131 (313-529-3232)
Ohio	David Kersten, N8AUH, 2197 McKinley Ave, Lakewood 44107-5432 (216-221-6740)

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NYC-Long Island	Richard Ramhap, N2GQR, 31 Caroline St, Bethpage 11714-2905 (516-932-0911)
Northern New Jersey	Richard S. Moseson, NW2L, 19 Linden Ave, Bloomfield 07003 (201-680-1585)

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Kansas	Robert M. Summers, KØBXF, 3045 N 72nd, Kansas City 66109 (913-299-1128)
Missouri	Roger Volk, KØGOB, 4773 Oakbrier Dr, St Louis 63128 (314-487-4050)
Nebraska	Vern J. Wirka, WBØGQM, 3106 Vinton, Omaha 68105 (402-341-4572)

New England Division

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Eastern Massachusetts	David Crocker, W1TMO, 80 Spring Rd, Needham Heights 02194 (617-444-7724)
Maine	Michelle Mann, WM1C, PO Box 15, Rumford Ctr 04278 (207-364-2010)
New Hampshire	Alan Shuman, N1FIK, PO Box 145, Goffstown 03045 (603-487-3333)
Rhode Island	Rick Fairweather, K1KYI, 144 Parkview Dr, Pawtucket 02861 (401-725-0736)
Vermont	Justin Barton, WA1ITZ, 3 Crab Apple Ridge, Randolph 05060-9709 (802-728-4034)
Western Massachusetts	Daniel Senie, N1JEB, 324 Still River Rd, Bolton 01740 (508-779-0439)

Northwestern Division

Alaska	Larry Flanagan, NL7XG, PO Box 3167, Anderson 99744 (907-582-2240)
Eastern Washington	Kyle Pugh, KA7CSP, W 5006 Houston Ave, Spokane 99208 (509-327-5039)
Idaho	Don Clower, KA7T, 5103 W Cherry Ln, Meridian 83642 (208-888-7020)
Montana	Darrell Thomas, N7KOR, 743 33rd Ave NE, Great Falls 59404 (406-453-8574)
Oregon	Randy Stimson, KZ7T, 9890 SW Inglewood St, Portland 97225 (503-297-1175)
Western Washington	Harry Lewis, W7JWJ, 10352 Sand Point Way NE, Seattle 98125 (206-523-9117)

Pacific Division

East Bay	Bob Vallio, W6RGG, 18655 Sheffield Rd, Castro Valley, CA 94546 (510-537-6704)
Nevada	E. J. (Curly) Silva, K7HRW, 3780 Hummingbird, Reno 89506 (702-972-3933)
Pacific	Robert Schneider, AH6J, Box 131, Keaau, HI 96749 (808-966-8146)
Sacramento Valley	Jettie Hill, W6RFF, 306 St Charles Ct, Roseville, CA 95661 (916-783-0383)
San Francisco	John Wallack, W6TLK, PO Box 1115, Kenwood, CA 95452 (707-833-1873)
San Joaquin Valley	Mike Siegel, KI6PR, 1145 Julie Dr, Merced, CA 95348 (209-383-2166)
Santa Clara Valley	Scott Hensley, KB6UOO, 3734 Caravella Dr, San Jose, CA 95117 (408-249-7083)

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South Carolina	Michael Epstein, KD1DS, 108 Kanard Rd, Starr 29684 (803-296-8656)
Virginia	Edward Dingler, N4KSO, 211 Four Apple Ave, Chilhowie 24319 (703-646-5798)
West Virginia	O. N. (Ollie) Rinehart, WD8V, 1256 Ridge Dr, South Charleston, 25309-2434 (304-768-9534)

Rocky Mountain Division

Colorado	Tim Armagost, WBØTUB, 6337 S Lafayette Pl, Littleton 80121 (303-795-9683)
New Mexico	Joe Knight, W5PDY, 10408 Snow Heights Blvd NE, Albuquerque 87112 (505-299-4581)
Utah	Richard Fisher, NS7K, 1510 Celia Way, Layton 84041(801-544-1928)
Wyoming	Warren "Rev" Morton, WS7W, 1341 Trojan Dr, Casper 82609 (307-235-2799)

Southeastern Division

Alabama	Ken McGlaughn, KM4JD, 21 Country Lane, Rainbow City 35906 (205-262-9668)
Georgia	Jim Altman, N4UCK, 636 Grant St SE, Atlanta 30312 (404-589-8145)
Northern Florida	Rudy Hubbard, WA4PUP, PO Box 843, Milton 32572-0843 (904-626-0620)
Southern Florida	Richard D. Hill, WA4PFK, 12380 NW 30 St, Sunrise 33323 (305-572-3172)
Puerto Rico	Tele Figueroa, KP4P, PO Box 1651, Yabucoa 00767 (809-744-7539)
Virgin Islands	Ronald Hall Sr, KP2N, PO Box 3987, St Thomas 00803 (809-774-4740)

Southwestern Division

Arizona	Clifford Hauser, KD6XH, 8741 N Hollybrook Ave, Tucson 85741 (602-744-9095)
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Orange	Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (909-687-8394)
San Diego	Patrick Bunsold, WA6MHZ, 14291 Rios Canyon Rd, No 33, El Cajon, CA 92021 (619-561-0052)
Santa Barbara	Jennifer Roe, AA6MX, 2480 N Verde Ct, Simi Valley, CA 93065 (805-583-3805)

West Gulf Division

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Oklahoma	Joseph Lynch, N6CL, PO Box 73, Oklahoma City 73101 (405-528-6625)
South Texas	Alan Cross, WA5UZB, 4714 Coltwood Dr, Spring 77388 (713-350-0322)
West Texas	Amelia "Milly" Wise, W5OVH, 8516 Mt Scott, El Paso 79904 (915-751-4160)

"It Seems to Us..."

NTIA's Magic Act

If you're at all interested in the amateur microwave bands, you probably know that Congress has instructed the federal government to relinquish control of 200 MHz of the spectrum below 5 GHz, turning it over for new nongovernment (that means non-*federal*) uses. Provisions of the 1993 Omnibus Budget Reconciliation Act (OBRA) call for one-quarter of this spectrum (or 50 MHz) to be made available "immediately," with half of that (25 MHz) coming from government bands below 3 GHz. The agency that is responsible for the first steps in implementing the Act is the National Telecommunications and Information Administration (NTIA), which performs for federal agencies (including the military) a function that is somewhat similar to the regulatory function performed by the FCC for nonfederal users of the spectrum. The NTIA is in the Department of Commerce; its Administrator, Larry Irving, is also the Assistant Secretary of Commerce for Communications and Information.

You probably also know that below 3 GHz, the 25 MHz the NTIA wants to turn over immediately is 2390 to 2400 and 2402 to 2417 MHz, with 2300 to 2310 MHz to be relinquished later.

"Wait a minute," you may think. "Those frequencies are in the 13-cm ham band, and the higher segment is also available for amateur satellites. We *are* nongovernment users of the spectrum, and even if it's on a secondary basis we're already *using* these frequencies. How can they get off the hook with Congress by giving us something we already have?"

Indeed, what kind of magic trick (to put it politely) is the NTIA trying to pull off?

The OBRA allows the NTIA to meet its reallocation obligation by surrendering bands where government is primary and non-government is secondary, but several conditions must be met. Congress attached some of those conditions at the ARRL's request. The OBRA stipulates that excessive disruption of existing use of federal government frequencies by Amateur Radio licensees should be avoided, and that in evaluating the potential for productive uses and public benefits of spectrum, the extent to which, in general, commercial users could share the frequency with Amateur Radio licensees must be considered.

In its February 1994 *Preliminary Spectrum Reallocation Report* the NTIA notes that it is proposing to reallocate 35 MHz of the 70 MHz that is now available to amateurs between 2300 and 2450 MHz (in itself a reduction of 80 MHz from the original allocation, but that's another story) and says, "It is expected that the amateur community can satisfy the majority of their spectrum requirements in the 13-cm band in the remaining 35 MHz." But all of the 35 MHz that we would be left with is in what is called the "ISM band" of 2400 to 2500 MHz. Elsewhere the *Report* notes the presence of microwave ovens and similar RF generators in this band and says that "To counter the type of noise present at 2450 MHz, radiocommunications equipment designers would have to increase transmitter power by a factor of over 100 to achieve performance comparable to other bands." Those are the NTIA's words, not ours.

We share very successfully with the existing federal users, in part because there aren't very many of them—precisely the reason, of course, that the government wants to give up these bands instead of some others. Whether we could share equally well with new commercial or nonfederal government licensees is rather doubtful. Unlike the NTIA, which has done its best to skirt the issue, the FCC raised it in its Notice of Inquiry in ET Docket No. 94-32, which it had to initiate in parallel with the NTIA's proceeding in order to meet the timetable set by Congress. The Commission asked, among other questions, the following:

- Will the recommended reallocation avoid excessive disruption of existing use of federal government frequencies by amateurs?
- Is the 2-MHz segment from 2400 to 2402 MHz that the Department of Commerce excluded from consideration for reallocation sufficient to avoid disrupting existing amateur-satellite operations?
- Will new nonfederal services in these bands be able to share the spectrum with existing services, especially with amateur operations? If yes, what are the appropriate technical sharing criteria?

If anyone has evidence that the answer to any of these questions should be yes, their documentation somehow hasn't found its way into the FCC's public comment file.

We're not the only nonfederal users who now share the 2300-MHz band with the federal government. Nonlicensed Part 15 use of the ISM band is on the rise, fueled by encouragement the FCC gave to the use of spread-spectrum technology. Companies that invested heavily in this technology, and that are only now able to begin bringing products to market, are incensed that the rules might be changed at this late date.

In short, there's a growing consensus that the NTIA's justifications for its reallocation proposals around 2400 MHz simply aren't good enough. We are far from alone in these thoughts. The OBRA requires that bands be selected for reallocation "that are most likely to have the greatest potential for productive uses and public benefits under the 1934 [Communications] Act if allocated for nonfederal use." Spectrum that is subject to ISM interference hardly meets the criterion of *greatest* potential.

More important, no sleight of hand can change the simple fact that the NTIA is proposing to satisfy Congress by offering spectrum to which nonfederal users already enjoy considerable access. It's like having your buddy borrow ten bucks from you so he can pay you back the ten bucks he borrowed last week.

As they say down in 4-land, that dog won't hunt. — *David Sumner, K1ZZ*

FT-2500M/FT-7400H 2m/70cm Mobiles

Specifications

- **Frequency Coverage:**
  FT-2500M
  RX: 140-174 MHz
  TX: 144-148 MHz
  FT-7400H
  RX/TX: 430-450 MHz
- Rugged Military Spec Design
- Advanced Track Tuning (ATT)
- Selectable Alpha-Numeric Display
- Largest Display Available
- Power Output:
  FT-2500M 50/25/5 Watts
  FT-7400H 35/20/5 Watts
- Flip Up Front Control Panel Hides Seldom Used Buttons
- Backlit DTMF Mic
- 31 Memory Channels
- CTCSS Encode Built-in
- Automatic Power Off (APO)*
- Time-Out Timer (TOT)*
- Manual* or Automatic Backlighting Adjustment
- **Accessories:**

FTS-17A	CTCSS Decode Unit
FRC-6	DTMF Paging Unit
SP-4	External Speaker
FP-800	Power Supply

*FT-2500M

"No other mobile has a Military spec rating. This radio can really take it!"

"New Omni-Glow display and backlit DTMF Mic, too. Both Yaesu 'firsts'!"

Performance beyond the call of duty.

Just when you thought you had the most formidable mobile built, we made the FT-2500M – the next evolution of powerful, rugged mobile radios.

The FT-2500M takes the durable quality, features, and performance of the popular FT-2400H and goes one better! A new easy-to-operate front panel design with rubber coated knobs, new, large state of the art Omni-Glow display to provide enhanced viewing at all angles and light levels, and Yaesu's exclusive 3-Stage Advance Track Tuning feature that reduces intermodulation and front-end overload puts the FT-2500M as close as you can get to commercial grade performance in amateur frequencies.

The FT-2500M is the only mobile with a Military spec rating and the most often used controls on the front and those you "set and forget" neatly hidden. It's the first mobile radio with a backlit DTMF mic, too. With its extra large heat sink and one-piece die-cast chassis, the tough FT-2500M is unlike any other mobile in its class.

Test the mettle of your mobile. If it doesn't measure up to the endurance standards of the U.S. Military, get the FT-2500M. For flawless performance in rough and rugged situations, the FT-2500M is really formidable – just what you'd expect from Yaesu. See it at your dealer today!

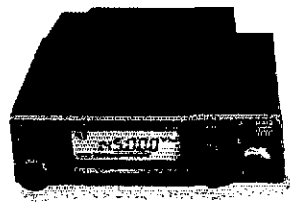
YAESU

Performance without compromise.℠

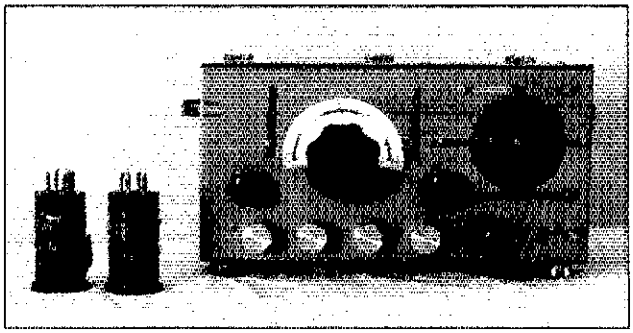
FT-2200/7200

Just 5.5"W x 1.6"H x 6.5"D, the FT-2200/7200 radios are designed to fit into today's more compact cars with ease.

SPECIFICATIONS • Frequency Coverage: FT-2200 RX: 110-180 MHz, TX: 144-148 MHz. FT-7200 RX/TX: 430-450 MHz. • Wide Receiver Coverage: 110-180 MHz • AM "Aircraft" Receive: 110-139 MHz • Built-in DTMF Paging/Coded Squelch • Selectable Channel Only Display • 10 Memory DTMF Auto Dialer • Backlit DTMF Mic • Power Output 50/25/5 Watts (FT-7200 35 Watts) • 50 Memory Channels • Remote Operation w/ Optional MW-2 • CTCSS Encode Built-in • Optional Digital Voice Storage System. Accessories: See your authorized Yaesu dealer.

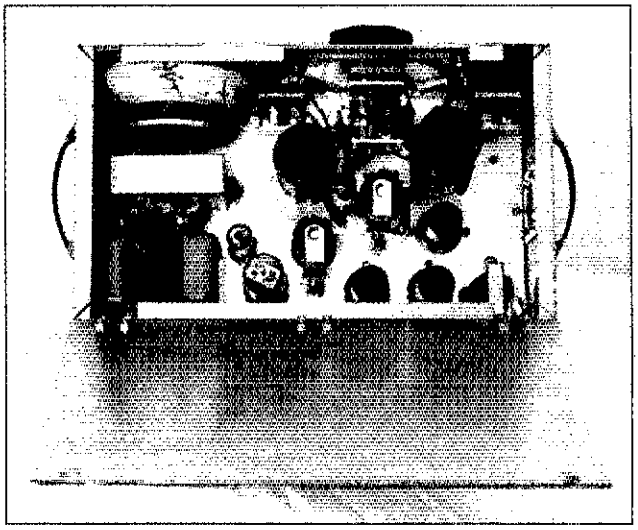


Specifications subject to change without notice. Specifications guaranteed only within amateur bands. Some accessories and/or options are standard in certain areas. Check with your local Yaesu dealer for specific details.



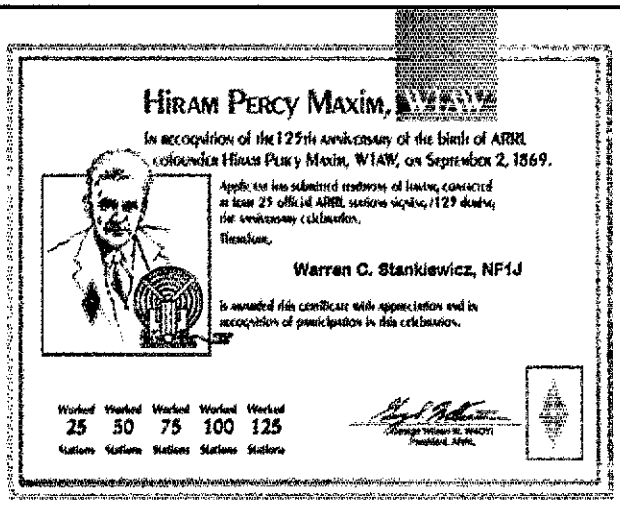
CHARLES ABELS, KJ6LC

Just like "the good old days": Using a regenerative, grid-leak detector preceded by two stages of RF and followed by two stages of audio, Charles Abels, KJ6LC, of San Diego, built this AM/SSB/CW receiver from scratch in the style of circuitry he used in 1940, as W2MXL, in Tenafly, New Jersey. It took a bit of digging, but he found some old Hammarlund plug-in coil forms and tube types 6SJ7, 6SK7, 6C5, 6F6 and so on. Two tubes are held by clamps and the back of the speaker is secured with felt strips from a blackboard eraser to help eliminate audio feedback from microphonic tubes. Charles says his next project will be a QRP transmitter in a matching cabinet.



BILL ROSS, KY9M

The big rig: Checking out the possibility of using an 18-wheeler to haul their excess purchases from this year's Dayton HamVention (l-r), Ted Southworth, KA9WFG, of Naperville, Illinois; Jay Whipple Jr, N9LFG, and Richard Steck, W9RS, of Lake Forest, Illinois; and Bill Ross, KY9M, of Winnetka, Illinois, couldn't think of a way to convince their wives that "all this stuff belongs to the other guys!"



HIRAM PERCY MAXIM, W1AW

In recognition of the 125th anniversary of the birth of ARRL cofounder Hiram Percy Maxim, W1AW, on September 2, 1869.

Application has submitted evidence of having contacted at least 25 official ARRL stations during the anniversary celebration.

Therefore,

Warren C. Stankiewicz, NF1J

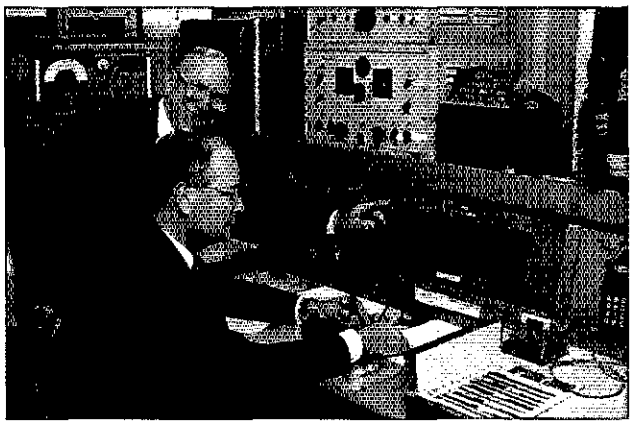
is awarded this certificate with appreciation and in recognition of participation in this celebration.

Worked 25 Stations | Worked 50 Stations | Worked 75 Stations | Worked 100 Stations | Worked 125 Stations

The Old Man himself would be proud: Here's a copy of the fine certificate available for working at least 25 hams signing "125" during the Hiram Percy Maxim Birthday Memorial Celebration, September 2 through 11. For details, see August *QST*, pages 46 and 47.

BILL RIGLEY

Sisters of Static: With HF conditions not spectacular, but young people's interest in ham radio at a peak, the "22 Crew" Radio Club of JHS 22 in New York City sponsored a girls softball team in a local league. With funding provided by the crew and a grant from the Radio Club of America, Joe Fairclough, WB2JKJ, helped the 7 to 10-year-old girls learn sportsmanship, teamwork and have a great time publicizing Amateur Radio in front of thousands of spectators all season.



KATE BRIGHTMAN K6OSC

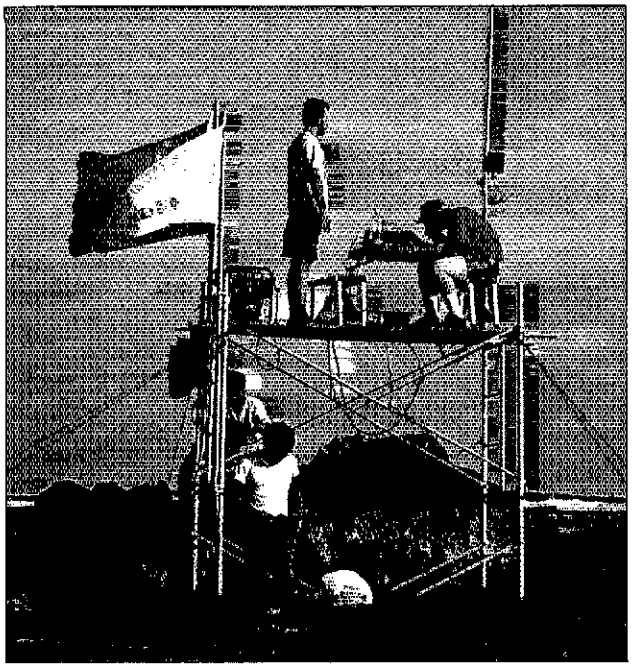
Celebrating 15 years of hamming on board: Thanks to Nate Brightman, K6OSC (standing), the Associated Radio Amateurs of Long Beach and hundreds of volunteers and guests, the radio shack of the legendary *Queen Mary*, in service from the 1930s to the '60s, has been active since 1979. Nate's guest is Joseph Prevratil, president of the RMS Foundation Inc, which has operated this popular tourist attraction since February of 1993. Hams from all over the US can visit and operate W6RO in the Wireless Room, high atop the ship, aft of the bridge and wheelhouse. The number of guest ops in the log will swell when next year's ARRL Southwestern Division Convention is held aboard the historic luxury liner September 1 through 3, 1995. Nate is chairman of the convention committee.

JAY CHAMBERLAIN KD4OOI

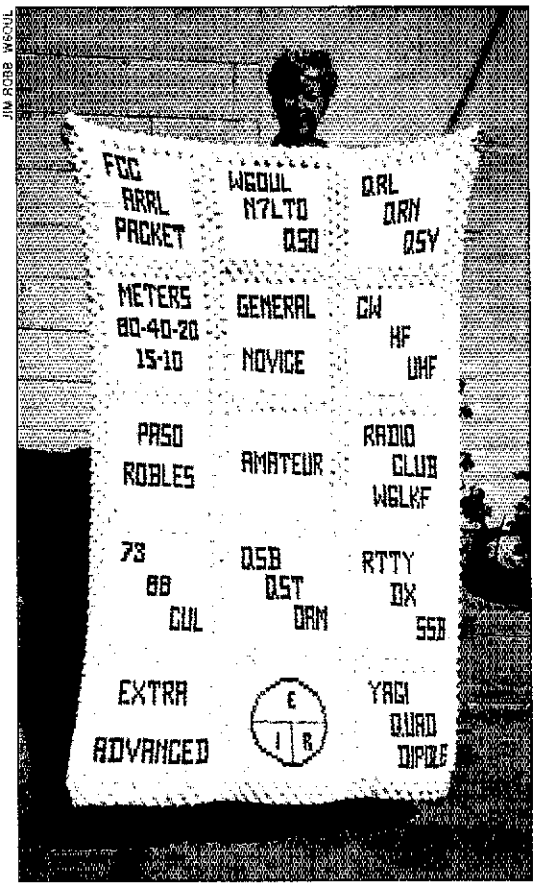
"A Scout gives goodwill": Every four years, the National Capitol Area Council of the Boy Scouts of America holds a display on the grounds of the Washington Monument. This May, 17,000 Scouts from DC, Virginia and Maryland took part. Troop 170 of Fredericksburg, Virginia, operated special-event station K2BSA/3, Field Day-style, with Assistant Scoutmaster Jay Chamberlain, KD4OOI, as part of the Scout Show on the Mall. Operating the HF SSB and CW station are (l-r) Jake Yoder, Josh Thompson (on 2 meters), Lane Zetty, Sam Chamberlain (standing) and Tim Brennan. The base of the Washington Monument can be seen in the background.

Multihop signals: Things were hopping in northern Texas when members of the Arlington ARC participated in the Summerfields Neighborhood Community Fair. Bicycle-mobile operator Herb Viegas, WJ5D, is joined by neighborhood children and AARC members (l) Scott Cashel, KJ5ME, and Tony West, N5OWU.

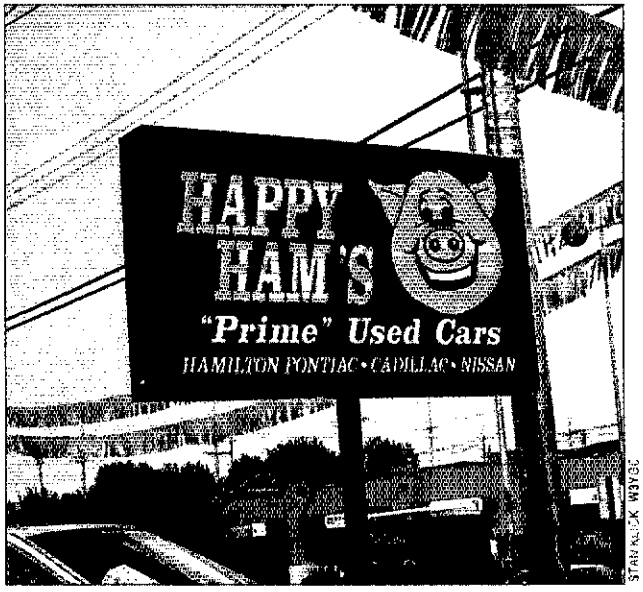
TOM ANDERSON JR WW5L CHAIRMAN ARRL PSAC



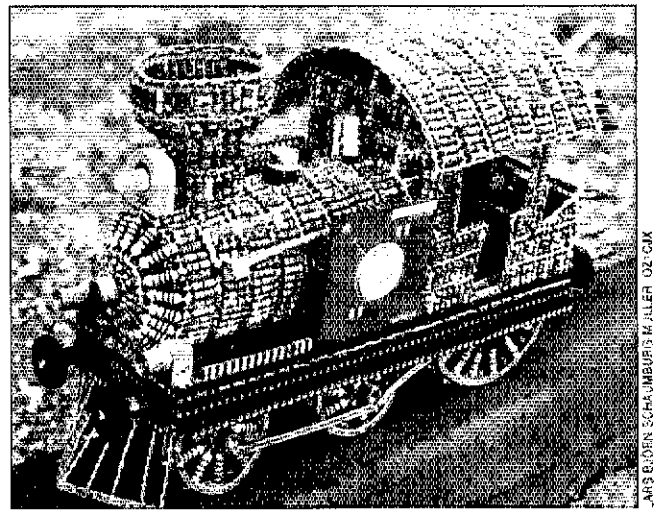
Hope it's high tide! In late June, the Chinese Radio Sports Association conducted its first DXpedition from Huangyan Dao, also known as Scarborough Reef, in the South China Sea. Operators were BZ1HAM, DL5VJ, DU1RAA, DU1IOG, JF1IST, KJ4VH, OH2BH and OH2MAK. Two thousand QSOs were made in 13 hours of operation. The operation was curtailed because of an approaching typhoon. A petition for new DXCC country status has been filed with the ARRL DX Advisory Committee by the Chinese Radio Sports Association.



QLT: Paso Robles ARC member Sherry Robb, N7LTO, of Lompoc, California, displays the ham radio quilt she won at the club's Christmas party. Sherry is also secretary of the California Central Coast DX club and a member of the ARRL DXCC. The quilt was handmade by Nathalie Klebs, KE6ECF.

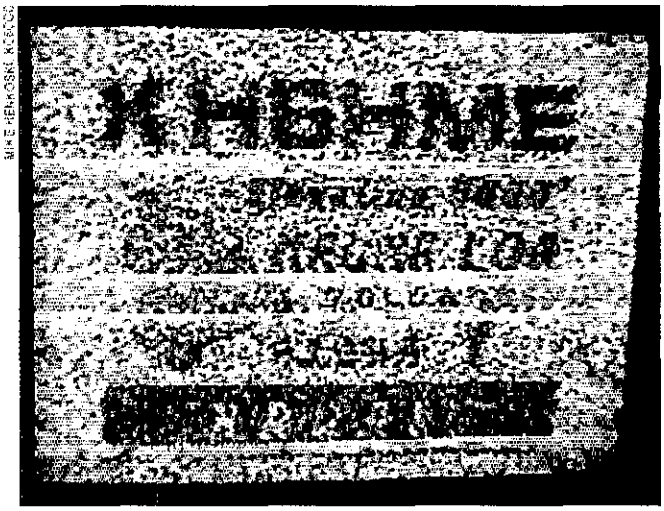


Would you buy a used car from this ham? Stan Klick, W3YGC, claims that Hagerstown, Maryland, has the happiest hams around, and sent in a photo of a sign that proves it.



Electron express: In her job inspecting printed circuit boards, Hennie Jensen, OZ1IDC, of Denmark, often finds defective components. Instead of discarding the rejected parts, however, Hennie decided to save some and solder them together to make this unique electronic sculpture.

GORDON WEST, WB6NOA



MIKE HENKOSKI, KC6CCC

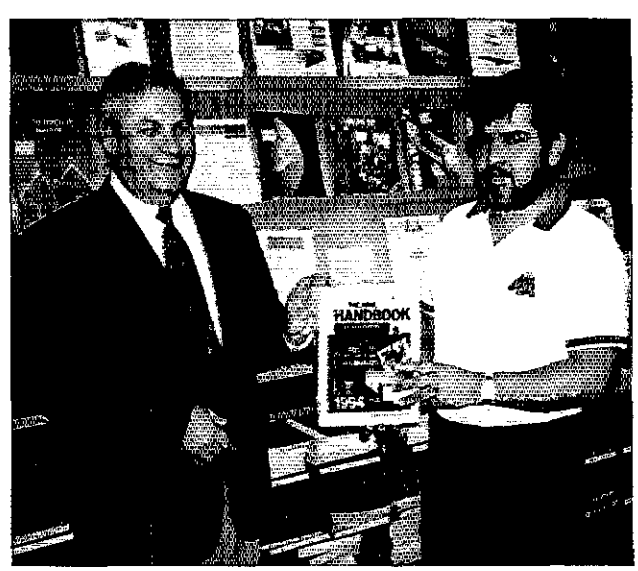
ATV DX record on 434 MHz! Conditions were just right, as summer tropo ducting allowed Gordon West, WB6NOA, of Costa Mesa, California (see photo at left), and Mike Henkoski, KC6CCC, of San Clemente (see photo at right), to pull in this fast-scan amateur television signal from Paul Lieb's portable station 5600 feet up on the Mauna Loa volcano. Paul has been working with Gordon to try a California-to-Hawaii ATV contact for more than two years. Finally, at about 2 PM on July 11, Gordon was able to copy the signal and called Tom O'Hara, W6ORG, who immediately alerted other local ATVers. Mike is a few miles further east, so apparently he can lay claim to the DX reception distance record, while Gordon can claim the first Hawaii-to-California reception.

When the VHF/UHF bands pop open, it doesn't take a super station to get amazing results. Paul was using a 10-W PC Electronics ATV transceiver driving a 100-W Mirage amplifier to span the 2509+ miles. Mike's 10-element KLM beam at his 830-foot elevation feeds his PC Electronics downconverter with 50 feet of 9913 coax.

PAUL RINALDO, W4RI

Life Member is a powerful advocate for the world's hams: League dignitaries presented a Life Member plaque to Dick Kirby, WØLCT, director of the International Telecommunication Union (ITU) Radio Communication Bureau and a strong supporter of Amateur Radio and the amateur satellite service. The ITU is the United Nations agency that oversees all telecommunication worldwide. Shown visiting Dick's office in Geneva are (l-r) ARRL Technical Relations Manager Paul Rinaldo, W4RI; Dick; ARRL President George Wilson III, W4OYI; and ARRL International Affairs Vice President Larry Price, W4RA. At their meeting in June, ITU officials announced to ARRL leaders that it would celebrate 1995 as the 100th anniversary of radio, and plans a special ceremony for May 17, 1995 (see last month's Amateur Radio World column).

Space is available for your colorful, interesting photographs of hams in action! Send photos to *QST*'s Features Editor, and include a daytime telephone number.



LARRY PRICE, W4RA

Make room on the "New Nonfiction" shelf: While in Geneva, ARRL President George Wilson III, W4OYI (l), presents a set of ARRL books to ITU librarian Antonio Pinto.

HOW TO CONTACT THE ARRL

ARRL HQ is open from 8 AM to 5 PM, Monday through Friday, except holidays.

To reach ARRL HQ by mail or courier, send to: ARRL, 225 Main St, Newington, CT 06111-1494. Our voice telephone number is 203-666-1541, and our fax number is 203-665-7531. You can reach us electronically via MCI Mail (2155052), The ARRL BBS (203-666-0578), Compuserve (70007,3373), America On Line (HQARRL), GEnie (ARRL), and Prodigy (PTYS02A).

MEMBERSHIP INFORMATION

ARRL membership, including a subscription to *QST*, is available to individuals at the following rates: $30 per year in the US and possessions, $42 elsewhere, payable in US funds. Age 65 and over, with proof of age, $24 US, $36 elsewhere. First Class and airmail rates are available upon request. Licensed radio amateurs age 21 and under may qualify for special rates; write for application. Address membership inquiries to the Circulation Department.

Publications Delivery—Direct changes of address and questions about delivery of *QST*, *QEX*, *NCJ* and *The ARRL Letter* to the Circulation Department.

Back Issues—Back issues of *QST* are available for $5 each, postpaid, from the Circulation Department.

QST EDITORIAL

Writing for *QST*—If you're interested in writing for *QST*, send a stamped, self-addressed envelope (SASE) along with a written request for our free author's guide. *QST* accepts unsolicited manuscripts; please include your name, call sign, address and daytime telephone number. Address inquiries and submissions to the *QST* Editor.

Press Releases and New Products/Books—Direct all general press releases to the *QST* Editor. Address New Product and New Book releases to the *QST* Features Editor.

Strays and Up Front in *QST*—Direct Strays and Up Front in *QST* submissions to the *QST* Features Editor. Be sure to include your name, address and daytime telephone number. Photos and other material cannot be returned unless accompanied by a written request and return postage/packaging.

Letters to the Editor—We welcome your comments and suggestions, and all letters are read by the *QST* editorial staff. We can publish only a fraction of the letters received because of space limitations and reserve the right to edit all submissions. Letters must include your name and address and should be sent to the *QST* Editor.

Contacting *QST* Columnists—*QST* columnists can be contacted at the addresses given at the top of each column. If no address is given, the columnist may be contacted through ARRL HQ.

Reprint Permission—For permission to quote or reprint material from *QST* or any ARRL publication, send a written request including the issue date (or book title), article, page numbers and a description of the text to be reprinted and its intended use. Send your request to the ARRL Publications Manager.

REGULATORY INFORMATION

Direct questions about FCC Rules and Regulations, antenna ordinances, third-party agreements, and reciprocal operating permission to the Regulatory Information Branch. An SASE will speed your reply.

VOLUNTEER EXAMINATIONS

Contact the Volunteer Examiner Department for information on the location of examination sessions in your area if you have an amateur license and want to upgrade; becoming a volunteer examiner; and examination accommodations and/or Morse code exemptions for the disabled.

EDUCATIONAL ACTIVITIES

Contact the Educational Activities Department (EAD) for general information on Amateur Radio. EAD can tell you how to become licensed and how to locate Amateur Radio clubs, instructors, licensing classes, and examiners in your area; recommend study materials; and help you promote Amateur Radio activities to the general public.

League Lines

Just as we went to press the Federal Communications Commission proposed to reorganize a number of its bureaus and offices. A new Wireless Telecommunications Bureau is to have as a co-deputy chief Ralph Haller, who currently is chief of the Private Radio Bureau and is well known to amateurs. Richard M. Smith, now head of the Field Operations Bureau, is to be chief of a new Office of Engineering and Technology. And Beverly Baker, who is now deputy chief of the Private Radio Bureau, will become chief of the Field Operations Bureau.

FCC Chairman Reed Hundt said, in announcing the proposed reorganization, that wireless and international matters were the areas calling for the "biggest changes."

The reorganization requires formal approval by the Commission, Congress, and the labor union that represents FCC employees.

The widow of Guglielmo Marconi, the Marchesa M. Cristina Bezzi Scali, died July 15, 1994, at age 94. The two were married in 1927 and Marconi died in 1937 at age 63. The couple had a daughter, Elettra, who, according to Pat Ciancarini, IØKHP, will continue the family's work in preparing for "1995, Year of Guglielmo Marconi," the centennial celebration of Marconi's first wireless telegraph.

The deadline for submissions to appear in the 1994 DXCC Annual List is September 30. Your timely submission will ensure you're on the list to receive the DXCC Yearbook in early 1995. Submissions must be made using 1994 forms only: MSD-505 (594) or MSD-505 (194).

Some power restrictions have been lifted in Great Britain. Holders of the amateur Class A license may now use 400 W output from 1.81 to 1.85 MHz. The power limit for 1.85 to 2.0 MHz remains at 30 W. Holders of the Class A and B licenses may now run up to 400 W between 50 and 51 MHz, and ERP and antenna height restrictions have been removed from the whole of the 50 to 52 MHz band.

In addition, all UK amateurs are now required to notify their local Radio Investigation Service office of unattended digital operation so that the RIS can if necessary turn the station off in an emergency.

Astronaut William F. Readdy is replacing Ken Cameron, KB5AWP, as NASA manager of operational activities at Star City in Russia. Cameron, who returns to Houston, has flown twice on the space shuttle, both times commanding Shuttle Amateur Radio Experiment (SAREX) operations, in 1991 and 1993. A NASA release said Cameron is expected to "command another shuttle mission in the near future."

The FCC has issued a Notice of Apparent Liability for $20,000 to Ace Communications of Fishers, Indiana, for marketing illegal scanner radios. Ace, the FCC said, advertised two different unauthorized scanners in magazines including *73 Amateur Radio Today*, *CQ*, and *Popular Electronics*. Both the models cover cellular telephone frequencies.

Ham Radio Horizons, *a video introduction to Amateur Radio* produced by CQ Communications, has won a bronze medal in the Association for Visual Communicators' 1994 Cindy awards competition, in the "public service and information" category. It was written, produced, and directed by Rich Moseson, NW2L, who is the ARRL Section Manager for Northern New Jersey, as well as a member of the ARRL's volunteer Public Relations Committee.

Weird Science: A story in June about wieners and health originated in the *Los Angeles Times* and was widely circulated via its news service. Not heard on TV recaps was a statement by the study's originator, University of Southern California epidemiologist John Peters, who said that the hot dog indictment was "part of a little side questionnaire to our study on electromagnetic fields. We were as surprised as anyone," Peters said, "by the hot dogs findings...it was the biggest risk for anything we saw in the study—about four times the risk for EMFs."

Questions about service from HQ? Contact the ARRL Ombudsman by telephone: 203-666-1541 (ext. 285); fax: 203-665-7531 (attn. Ombudsman); Internet: ombudsman@arrl.org; or by mail.

ARRL Educational Activities Department continuing education workshops are scheduled for the Pacific (October 21) and New England (September 30) ARRL division conventions. The Pacific will feature computer-aided design of HF antenna systems, while electromagnetic interference and the radio amateur will be discussed at the New England convention. Space is limited and pre-registration is encouraged. For details, contact the ARRL EAD.

New FCC Commissioner Susan Ness has named David Siddall, K3ZJ, as legal advisor. Siddall, 44, will concentrate on mass media and wireless matters. He has been with the FCC since 1985.

ICOM's IC-2GXAT . . . Powerful Versatility In A Rugged, User-Friendly Handheld.

Buy an IC-2GXAT and Save $20.00 Now through September 30, 1994!

The IC-2GXAT offers surprisingly simple operation with the features and performance amateurs have come to expect from Icom products. Whether you're a beginner or a seasoned veteran, you'll quickly fall in love with this 2 meter handheld.

IC-2GXAT
2 Meter
FM Transceiver

SIMPLE OPERATION

Channel Operation – display can be set to indicate memory channel numbers only. This keeps frequencies secret, restricts operating frequencies or simplifies operation for an unfamiliar user.

Auto Repeater Operation – automatically activates the correct duplex direction when the receiver frequency tuned is within the repeater output frequency range.

Tone Scan – scans for, detects and sets the subaudible tone frequency to enable communication with another station that is using subaudible tones.

DTMF Redial – for quick and easy access to autopatches.

User Friendly Keyboard – uncluttered, user-friendly design for ease of operation.

ADVANCED FEATURES

Power Saver – reduces the current drain to 35 mA (avg. Rx) for battery conservation and extended operating time.

Low Power Option – switch to 1 W output power to extend your operating time when high power isn't required.

40 Memory Channels – store **all** repeater information independently.

Memory Transfer – the contents of a memory channel are transferred into VFO, **and the VFO mode is automatically selected,** to assure quick and easy QSY'ing.

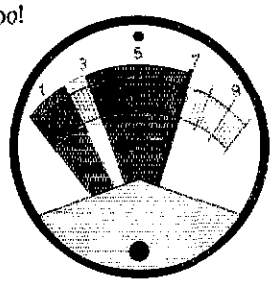
5 DTMF Auto Dial Memories – for quick and easy autopatching to frequently used telephone numbers.

Selectable DTMF Autodial Digit Duration – adjust your DTMF speed to the decode capabilities of the repeater.

Need more information? Call our brochure hotline: (206) 450-6088

MAXIMUM POWER

7 W Output Power – one of the highest powers available in a handheld (nominal with 13.5 V DC or the optional BP-132A battery pack). The BP-132A battery pack provides more than enough power to reach those fringe areas, and a long lasting 600 mAh too!



DURABLE CONSTRUCTION

Die-cast Aluminum Rear Case – will withstand the demands of rugged outdoor use.

Splash Resistant Body – maintains performance in harsh outdoor environments.

Rated JIS II for splash resistance, the IC-2GXAT is built to withstand rugged outdoor use.

OTHER GREAT FEATURES

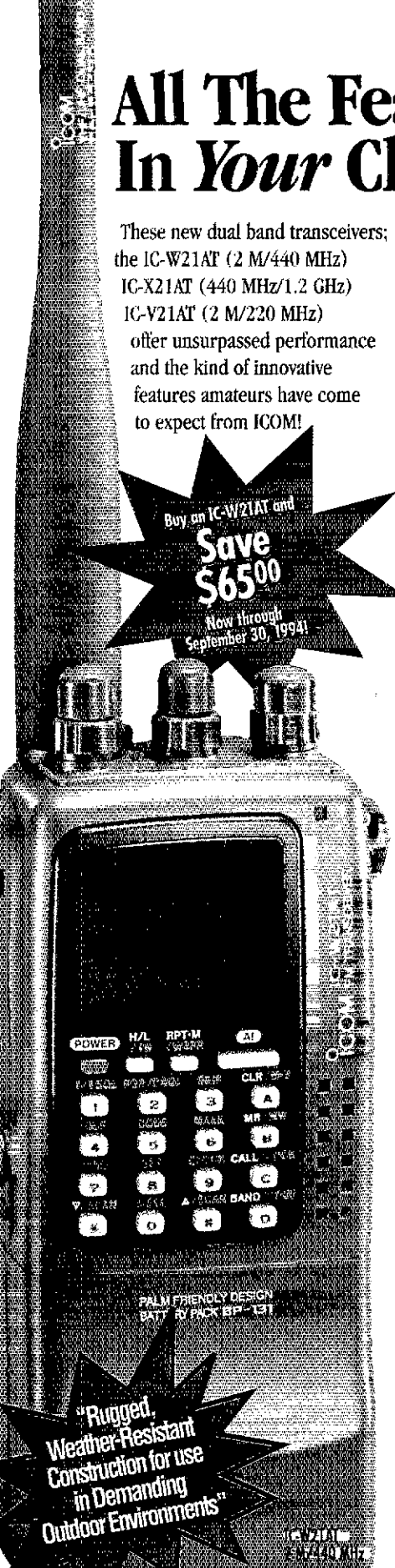
- High Sensitivity: 0.18 µV for 12 dB SINAD
- Multiple Scan Modes
- Monitor Function
- SET mode to customize transceiver operation
- Display lighting with 5 second timer
- Subaudible tone encoder, tone squelch and pocket beep
- Optional pager and code squelch
- BP-160 (3 W, 700 mAh) battery pack, wall charger, belt clip and hand strap come standard
- 8 tuning steps (5, 10, 12.5, 15, 20, 25, 30 or 50 kHz)
- Call Channel
- Icom compatible accessories

ICOM®

Communications Quality®

All The Features You Want In *Your* Choice Of Bands!

These new dual band transceivers;
the IC-W21AT (2 M/440 MHz)
IC-X21AT (440 MHz/1.2 GHz)
IC-V21AT (2 M/220 MHz)
offer unsurpassed performance and the kind of innovative features amateurs have come to expect from ICOM!



Buy an IC-W21AT and Save $6500 Now through September 30, 1994!

"Rugged, Weather-Resistant Construction for use in Demanding Outdoor Environments"

IC-V21AT
2 M/220 MHz

IC-X21AT
440 MHz/1.2 GHz

Buy an IC-V21AT and Save $5000 Now through September 30, 1994!

Repeater Quick Memory – The repeater quick memory stores the last-used repeater frequency and related information, providing speedy repeater access.

Optional Whisper Function for Telephone-Style Operation – This convenient function provides telephone-style communication through a microphone-equipped battery pack (the optional BP-131 or BP-132 is required). Enjoy portable telephone-style full duplex crossband operation.

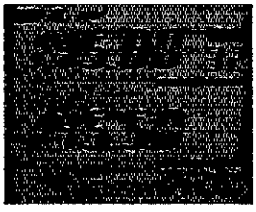
900 mAh Standard Battery – Combined with the many power-saver features and low current drain, the standard battery provides greatly extended operating time.

Auto-Output Power Selection – This useful feature automatically adjusts transceiver output power when communicating through a repeater.

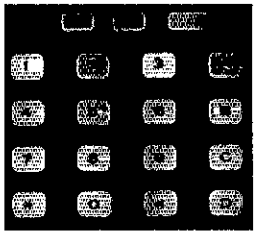
Five Levels of Output Power – With an external 13.8 V DC power supply, the IC-21 family outputs a powerful 5 W of high power. In addition, 3.5 W, 1.5 W (standard), 500 mW and miser output of 15 mW can be selected for low power.

Battery Capacity Indicator – Shows remaining battery capacity.

*Simultaneously receive two signals on the same band – U/U, V/V, V/U**



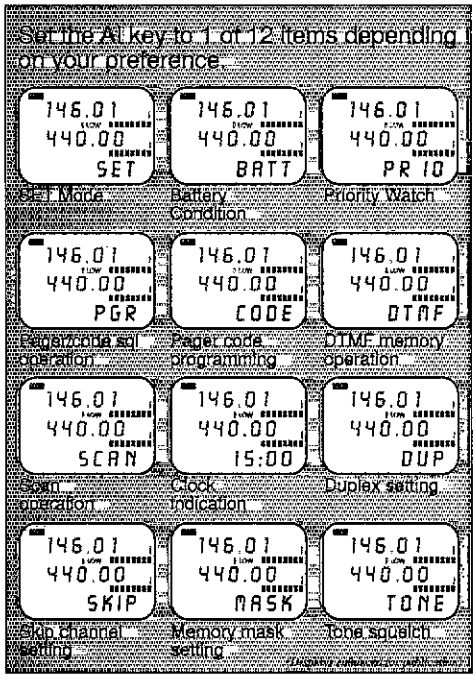
The IC-21AT dual band family of radios features easy-to-read multifunction displays showing a variety of information, including battery capacity, repeater settings, etc.



Multifunction keypad with backlighting. The well laid out keypad puts access to multiple functions – several scan types, pager functions, etc. – at your fingertips. Each well spaced key provides a positive feel when depressed. No mistaken input.

* Not available on IC-X21AT

AI Key – Day-to-day operation of a handheld often involves the repetitive use of one particular function or operation. Assign these most often used functions to the AI key for one-touch operation.



More Great Features!

- Separate Speaker Control
- Built-in Pager, Code Squelch, Pocket Beep & Tone Squelch
- Power On/Off Timers & Auto Power-Off Function
- 70 Memory Channels
- Numerous Hi-Speed Scan Functions
- 4 Priority Watch Functions
- 4 DTMF Memories
- Auto Low Output Power Selection
- 8 Tuning Steps
- And more . . .

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BUY SMART

SG-230 Smartuner®

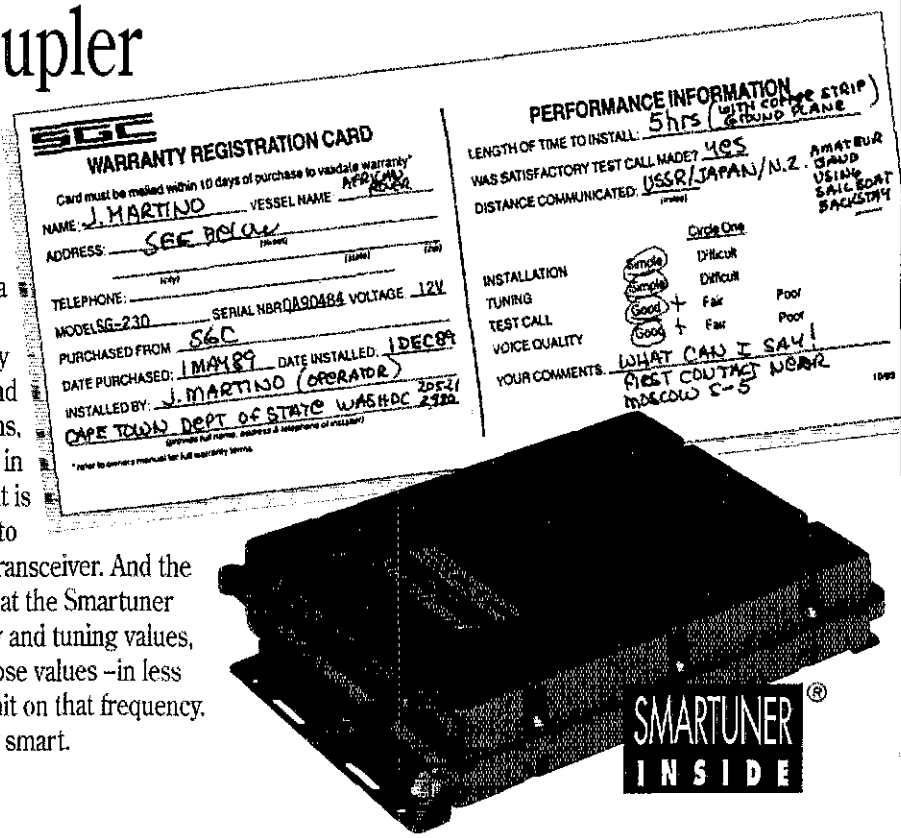
Antenna Coupler

SSB, AM, CW & DATA

You can't buy a smarter tuner than this. An automatic antenna coupler so intelligent it precisely tunes any length antenna –8 to 80 ft–in the HF band.

The Smartuner® automatically evaluates and switches 64 input and 32 output capacitance combinations, plus 256 inductance combinations in a "pi" network. The amazing result is over a half-million different ways to ensure a perfect match for your transceiver. And the most intelligent feature of all is that the Smartuner remembers the chosen frequency and tuning values, and will automatically reselect those values –in less than 10 ms, each time you transmit on that frequency.

The SG-230 Smartuner.® Buy smart.



MICROPROCESSOR CONTROLLED • NON-VOLATILE MEMORY • WATERPROOF • B.I.T.E. INDICATOR • 1.8 TO 30 MHZ RANGE
10 TO 150 WATTS INPUT POWER • 10mS RETUNING TIME • 8 to 80 ft. ANTENNA (all types)

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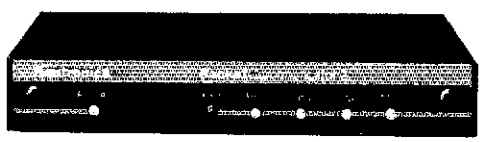
Imagine this much power unleashed by a 9-volt battery. That's the KPC-3.



Kantronics KPC-3

It's one of the smallest TNCs you can buy. One of the least expensive. It uses the least power. And it's extremely user-friendly. Yet it offers enough performance to satisfy even advanced users. The KPC-3 has more than 20K in personal mailbox space that is inexpensively expandable to 100K; it runs on a 9-volt battery, so it's portable; and it's very affordable. So if you've been wondering why packet beginners and veterans alike choose the KPC-3, now you know. Maybe you should catch the same wave.

Kantronics

For more information, contact your authorized Kantronics dealer or Kantronics at 1202 E. 23rd St., Lawrence, KS 66046-5006 913-842-7745 FAX 913-842-2021.

Ameritron *doubles* average SSB power . . .

NEW AL-80B kilowatt output desktop linear can double your average SSB power output with high-level RF processing . . . it also runs cooler because its Eimac 3-500Z tube completely turns off between words . . .

Ameritron's all NEW AL-80B kilowatt *output* desktop linear can *double* your average SSB power output with high-level RF processing using Ameritron's exclusive *Dynamic ALC™*.

You get cooler operation because the AL-80B's exclusive *Instantaneous RF Bias™* completely turns off the Eimac 3-500Z tube between words. It saves hundreds of watts wasted as heat.

You get a full kilowatt PEP *output* from a whisper quiet desktop linear. It's a compact 8½"H x14"D x15¼" W and plugs into your nearest 120 VAC wall outlet. Covers all bands 160-15 Meters, including WARC and MARS bands (user modified for 10/12 Meters with license).

You get 1000 watts *output* on SSB, 850 watts *output* on CW, 500 watts *output* on RTTY, an extra heavy duty power supply, genuine Eimac 3-500Z tube, nearly 70% efficiency, tuned input, Pi/Pi-L output, inrush current protection, multi-voltage transformer, dual Cross-Needle meters, QSK compatibility, Two-Year Warranty, Made in USA, plus much more for only $1195.

Dynamic ALC™ doubles average SSB power

The AL-80B's exclusive *Dynamic ALC™* gives you high-level low-distortion RF processing. When activated, it can more than double your *average* SSB power and produce up to 6 dB improvement in intelligibilty. It maximizes your talk power without distortion and splatter.

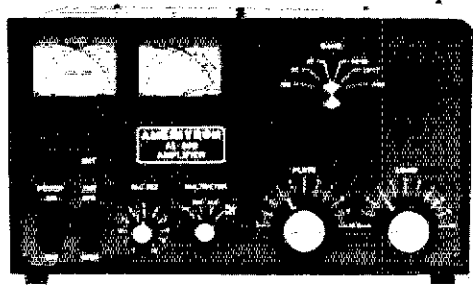
A convenient front panel control lets you adjust your output power level.

Instantaneous RF Bias™ eliminates heat

The AL-80B's exclusive *Instantaneous RF Bias™* completely turns off the Eimac 3-500Z tube (except filaments) between words and dots and dashes. It eliminates hundreds of watts wasted as heat to give you cooler operation and longer component life.

Gutsy Heavy-Duty Power Supply

The guts of the AL-80B is its heavy ***heavy*** duty power supply. A 26 pound transformer using a high silicone steel core, computer grade capacitors, heavy duty bleeders and ten 3 amp, 1000 V power rectifiers give you a stiff 2700 volts fully loaded. Many amplifiers using *two* 3-500Zs use such small power supplies they don't deliver much more power output than the AL-80B.



NEW! $1195 Ameritron AL-80B Suggested Retail

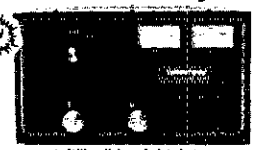
Genuine Eimac® 3-500Z Tube

The AL-80B uses a *genuine* Eimac® 3-500Z tube warranted by Eimac® -- not cheaper, less reliable 3-500Zs used by some competitors.

600 WATTS OUT . . . $649

A tough low cost linear with REAL transmitting tubes!

Ameritron's new AL-811 linear amplifier gives you plenty of power to bust thru QRM. You get a quiet desk top linear that's so compact it'll slide right into your operating position – you'll hardly know it's there . . . until QRM sets in. And you can conveniently plug it into your nearest 120 VAC outlet.



You get three tough vertically mounted 811A transmitting tubes, extra heavy duty power supply, all HF band coverage, pressurized ventilation, tuned input, dual illuminated meters, adjustable ALC, standby switch, transmit LED, UPS shippable and much more.

Select the 3 tube 600 watt out AL-811, $649 – or the new 4 tube 800 watt out AL-811H, $795.

70% efficiency

The AL-80B is built on a rugged steel chassis. It has a separate RF compartment that's fully shielded to keep RF from leaking out. This keeps RFI and TVI to a minimum.

Superb RF design and layout, Hi-Q tank circuit and commercially rated RF power components give you nearly 70% plate efficiency over the entire operating range. Your power goes into your antenna instead of heating up your amplifier.

A whisper quiet internal fan draws in cool air over power supply components and pressurizes the 3-500Z tube compartment to remove heat for longest life.

Tuned Input lets your rig deliver full output

A 50 ohm broadband Pi-Network *tuned input* is used.

Pi/Pi-L Output Network

A carefully designed Pi/Pi-L output network using the optimum Q for each band gives you exceptionally smooth tuning, extremely wide matching range, full band coverage and peak performance at all power levels.

Has ball bearing vernier reduction drives with logging scales on plate and load controls.

Step-Start Inrush Protection™

Step-Start Inrush Protection™ stops damaging inrush current with a start up sequence that's *easy* on your tube and power supply components.

Multi-Voltage Power Transformer

Ameritron's exclusive *Multi-Voltage Power Transformer* lets you optimize for different line voltage. You can select from 14 different *primary* voltages from 90 to 140 VAC and 205 to 250 VAC.

Dual Illuminated Cross-Needle Meters

Ameritron's dual illuminated cross-needle meters give you *four separate meters* to monitor your operating conditions – you can tell right away if something is wrong.

QSK Compatible

The fast *custom* T/R (transmit/receive) relay in the AL-80B switches nearly as fast as some vacuum relay QSK T/R switches.

For *lightning fast* QSK operation use the optional external Ameritron *electronic PIN diode* QSK-5 T/R switch or the internal QSK-5PC. Please contact Ameritron for details.

Plus more . . .

An *Standby* switch lets you run barefoot, but you can instantly switch to full power if you need it.

Has transmit LED; 12 VDC, 200 mA jack; 12 VDC keying relay for solid state and tube rigs; tough, nearly indestructible Lexan-over-aluminum front panel. Two year limited warranty.

AMERITRON offers the best selection of legal limit linears!

These 3 rugged linears all use a super heavy duty hypersil power supply capable of 2500 watts!

Ameritron's most powerful amplifier

AL-1500 **$2695.00** Suggested Retail

Ameritron super power amplifier uses the herculean Eimac® 8877 ceramic tube.

It's so powerful that 65 watts drive gives you full legal output—and it's just loafing because the power supply is capable of 2500 watts PEP.

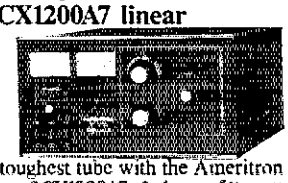
Ameritron's Dual 3-500Z linear

AL-82 **$2095.00** Suggested Retail

This linear gives you full legal output using a pair of Eimac® 3-500Zs. Some competing linears using dual 3-500Zs don't give you 1500 watts because their lightweight power supplies can't use the tubes to their full potential.

Ameritron's 3CX1200A7 linear

AL-1200 **$2195.00** Suggested Retail



Get ham radio's toughest tube with the Ameritron AL-1200—the Eimac 3CX1200A7. It has a 50 watt control grid dissipation—12 times tougher than the 4 watt rating of the 3CX800A7—yet you get the same full legal output as you get from a *pair* of 3CX800A7s.

AMERITRON brings you the finest high power accessories!

Legal limit antenna tuner

ATR-15 **$399** Suggested Retail

Ameritron — *the high power specialist* — brings you the ATR-15 antenna tuner that's designed for legal limit amplifiers. Heavy duty silver plated bandswitch virtually eliminates switch failure. High power transmitting capacitors. 1.8-30 MHz. Peak reading SWR/wattmeter. 6 position antenna switch. Selectable 1:1 or 4:1 balun. 5¼ x 13¼ x 13½ inches. Meter lamps uses 12 VDC.

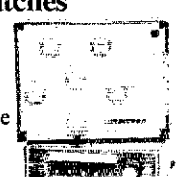
Legal Limit Dummy Load

ADL-1500X **$39.50** Suggested Retail

Oil cooled 50 ohm dummy load. Handle 1500 W for 5 min. SWR under 1.2 up to 30 MHz. Low SWR to 400 MHz. 7½" H x 6 5/8" D. **ADL-1500X** without oil, $39.95. **ADL-1500** with oil, $59.95.

Remote Coax Switches

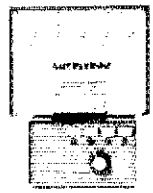
RCS-8V **$149** Suggested Retail



RCS-8V, DC-UHF 5 KW Coax Switch. Replace 5 coax feedlines with one with this Remote Coax switch. Weatherproof box mounts outdoors on your tower or mast. Attractive control unit sits on your operating desk. Low SWR to 250 MHz. Usable to 450 MHz. Low loss. Rated at 5 KW to 30 MHz, 1 KW at 150 MHz. **RCS-8VN, $159.00** with "N" connectors.

RCS-4, $134.00, 4 position HF switch. Similar to RCS-8V. No control cable needed. Handles 1500 watts continuous.

RCS-4 **$134.50** Suggested Retail



QSK-5 Pin Diode T/R Switch

$349 QSK-5 Suggested Retail

Self-contained, connects externally to most HF amplifiers. Handles 2.5 KW PEP, 2 KW CW. Six time faster then vacuum relay. 6x4x9½ inches.

Step-Start Inrush Current Protector

ICP120/240 **$79** Suggested Retail

Stops power up inrush current and absorbs momentary high voltage spikes to your amplifier. ICP-120 for 110-120V or ICP-240 for 220-240 VAC.

AMERITRON

. . . the high power specialist

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CASH Discount OR FREE $50 Value CMP115 Speaker-Microphone

☐ $30 Cash Discount or ☐ $50 Value Speaker-Mic

C158A • 2 Meters • *The Affordable HT*
• 5 watts at 12 VDC • 20 memories • 130 to 170MHz extended receive
• Unsurpassed 0.158 microvolts sensitivity • CTCSS encode *(and decode)*

☐ $50 Value Speaker-Mic

C168A • 2 Meters • *The Deluxe Small HT*
• 5W at 12 VDC • 40+ memories *(or optional 200+ memories)* • 115-174MHz extended receive *(including AM aircraft band)* • CTCSS encode *(and decode)*

☐ $50 Value Speaker-Mic

C178A • 2 Meters (+ *low power 440*) • *Deluxe Dual-Band HT*
• Single-Band Price • 5W *(2M)* at 12 VDC & 50mW *(440)* • 40+ memories *(opt 200+)*
• 110-174 & 320-474MHz extend. rx *(including AM air band)* • CTCSS encode *(& decode)*

☐ $50 Value Speaker-Mic

C188A • 2 Meters • *The Slim-Line HT*
• 5W at 12 VDC • 40+ memories *(or optional 200+ memories)* • 115-174MHz extended receive *(including AM aircraft band)* • CTCSS encode *(and decode)*

☐ $50 Value Speaker-Mic

C288A • 220MHz • *The Slim-Line HT*
• 5W at 12 VDC • 40+ memories *(or optional 200+ memories)* • 115-249MHz super extended receive *(including AM air band)* • CTCSS encode *(& decode)*

☐ $50 Value Speaker-Mic

C468A • 440MHz • *The Deluxe Small HT*
• 5W at 12 VDC • 40+ memories *(or optional 200+ memories)*
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☐ $20 Cash Discount or ☐ $50 Value Speaker-Mic

C528A • 2 M & 440MHz • *Deluxe Twin-Band HT*
• 5W *(2M and 440)* at 12 VDC • 40 memories *(20 + 20 "limited" memories)*
• 130-174 and 300-474MHz extended receive • CTCSS encode *(and decode)*

☐ $30 Cash Discount or ☐ $50 Value Speaker-Mic

C228A • 2 M & 220MHz • *Deluxe Twin-Band HT*
• 5W *(2M and 220)* at 12 VDC • 40 memories *(20 + 20 "limited" memories)*
• 130-174 and 200-244MHz extended receive • CTCSS encode *(and decode)*

☐ $20 Cash Discount or ☐ $50 Value Speaker-Mic

C558A • Deluxe 2 M & 440MHz • *Newest Twin-Band HT*
• 5W at 12 VDC • 40+ memories *(opt. 200+ memories)* • 115-174 & 340-474MHz extended receive *(including AM aircraft band)* • CTCSS encode *(& decode)*

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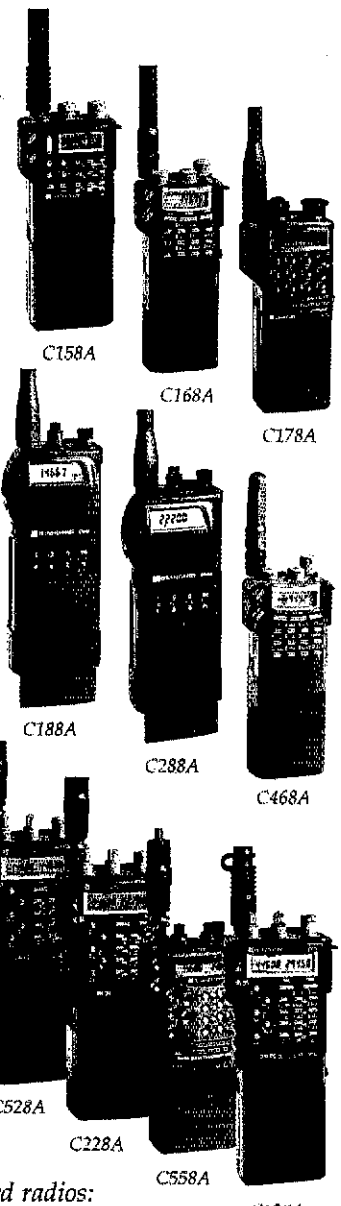
C628A • 440MHz & 1.2GHz • *Deluxe Twin-Band HT*
• 5W *(440)* and 1W *(1.2GHz)* at 12 VDC • 40 memories *(20 + 20 "limited")*
• 130-174 and 1220-1340MHz extended receive • CTCSS encode *(& decode)*



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Purchase Date: ____-____-____ Phone:_(_____)_____-_____

Name: _____ Address: _____

City:_____ State:_____ Zip:_____

Dealer Name/Location:_____Receipt#_____

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☐ *Or* CUSTOMER mails in coupon *(for free CMP-115 speaker microphone)*

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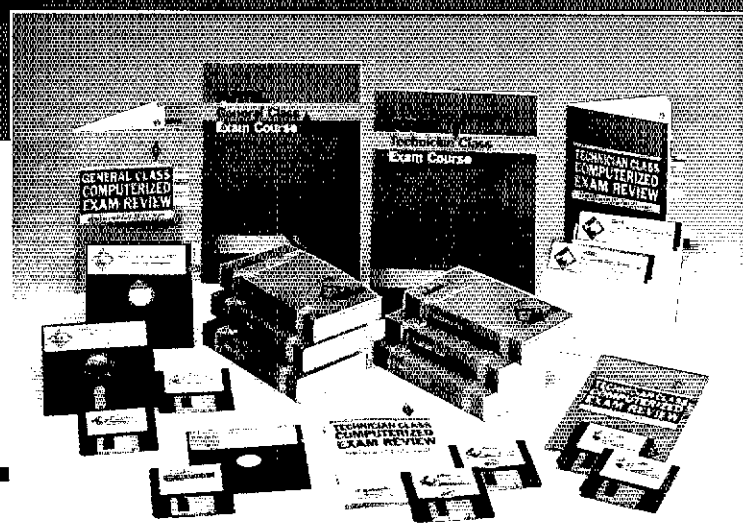

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So What's New in *The ARRL Antenna Book*?

The first edition of *The ARRL Antenna Book* came off the press in 1939. Since then, more than 800,000 copies of its various editions have provided amateurs with a wealth of practical information on antennas, transmission lines and propagation. The 17th edition appeared on bookstands last month. Along with much new written material, the book includes a disk full of great software.

By R. Dean Straw, N6BV
Senior Assistant Technical Editor

I have a long-standing passion for Amateur Radio. I've been known to operate contests with abandon, but my first love in Amateur Radio has always been antennas. As a kid back in Hawaii in the 1950s, I daydreamed a lot about *really big* antennas, fantasizing about how I would crack monster pileups with a single call. At the Saturday afternoon movies, while the other kids were wishing they could be like Superman, leaping effortlessly over tall buildings, I wanted to fly over tall steel towers—putting huge antennas on top of them!

You can imagine my delight when I came to work at League HQ and was handed the assignment of working on the next edition of *The ARRL Antenna Book*, known to all amateurs simply as "the Antenna Book." Along with many other amateurs, I have always held this venerable book in high esteem, almost in reverence.

The dog-eared first edition of the *Antenna Book* in the HQ library is tiny compared to today's jumbo model. That first book contained only 142 small-format pages, while there are more than 700 full-size pages in the 17th edition. Over the last 55 years there have been some monumental changes in radio, and in most everything else in the world too. Still, I find it comforting that many sentences are very familiar in that old book. After all, some things—such as fundamental principles—*shouldn't* change with time.

Of course, many things do benefit from modern analytical tools. I approached my new task with a mixture of excitement and awe. After all, some legendary engineers and writers had labored over the last half-century putting together the knowledge in the *Antenna Book*. People like George Grammer, Byron Goodman and Jerry Hall had laid a solid foundation. My task was to use modern computing power to further illuminate those areas that could benefit from such treatment.

So, you ask, what really is new in the *Antenna Book*? The main changes came in the chapters dealing with Yagis (both HF and VHF/UHF), HF propagation, and to a smaller extent, transmission lines. Throughout the new book there are additions and modifications, but only where computer analysis could provide additional insight or clarification. For example, modern software makes it especially easy to generate detailed azimuth and elevation polar plots, directly comparing one antenna with another. When it comes to gaining a visceral understanding of how antennas really work, the old adage "one picture is better than a thousand words" accurately describes the impact of a printed pattern plot.

However, there is another, modern adage: "One computer screen can be better than 10 printed plots." The reason is simple—you can interact with properly designed software to explore, in great detail and at your own pace, particular areas that interest you most about an antenna's performance.

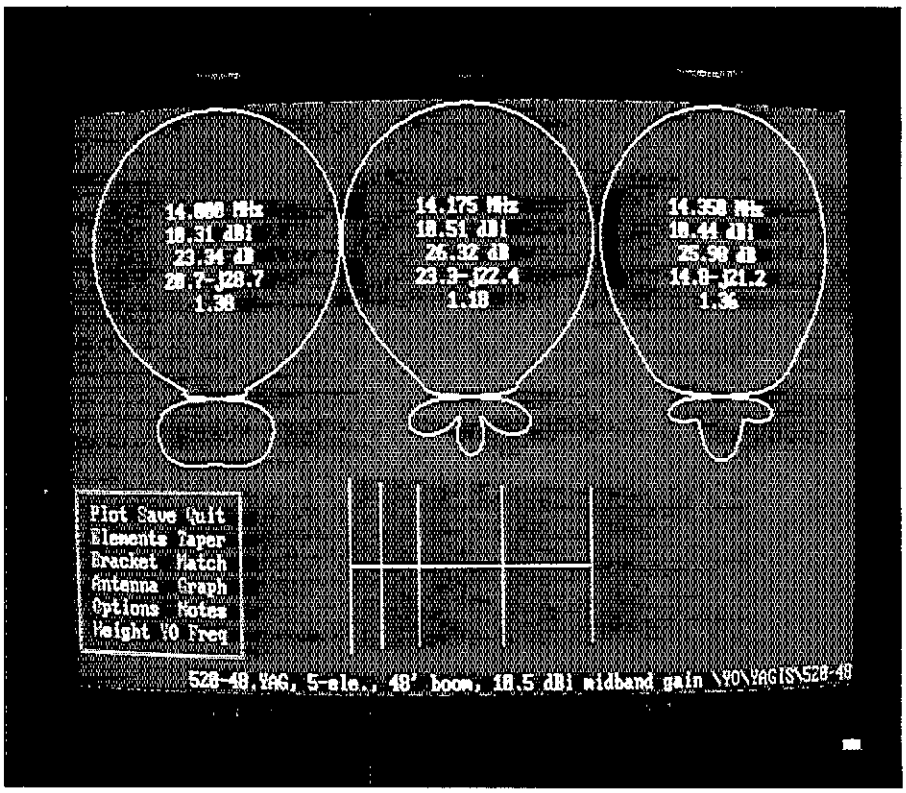


Figure 1—*YA* display for a 5-element 20-meter Yagi on a 48-foot boom in free space. *YA* shows all pertinent performance parameters for this antenna at the low end, middle frequency, and high end of the band.

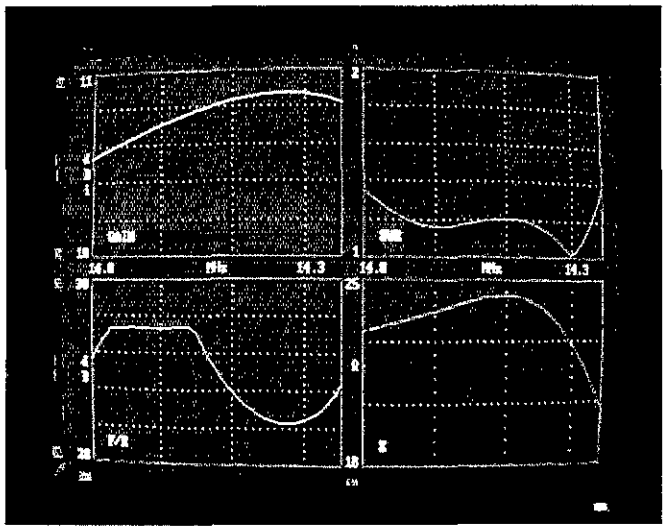


Figure 2—*YA* display across the 20-meter band for the antenna of Figure 1, showing forward gain, front-to-rear ratio, SWR, and feedpoint impedance. It is important to characterize an antenna across its entire useful frequency range to avoid severe peaks and valleys in its response.

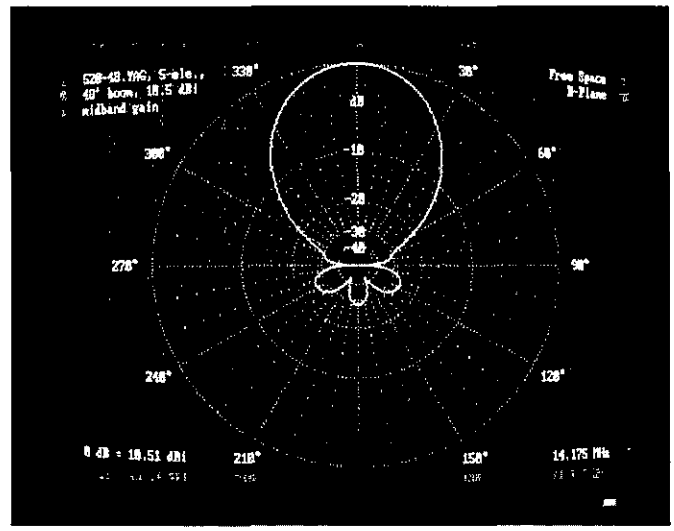


Figure 3—Detailed *YA* E-plane plot for the antenna of Figure 1. The worst-case rearward lobes are about 24 dB down at the mid-frequency point, and are at 135° and 225° in azimuth (with the main lobe at 0°).

Bundled Software in the *Antenna Book*

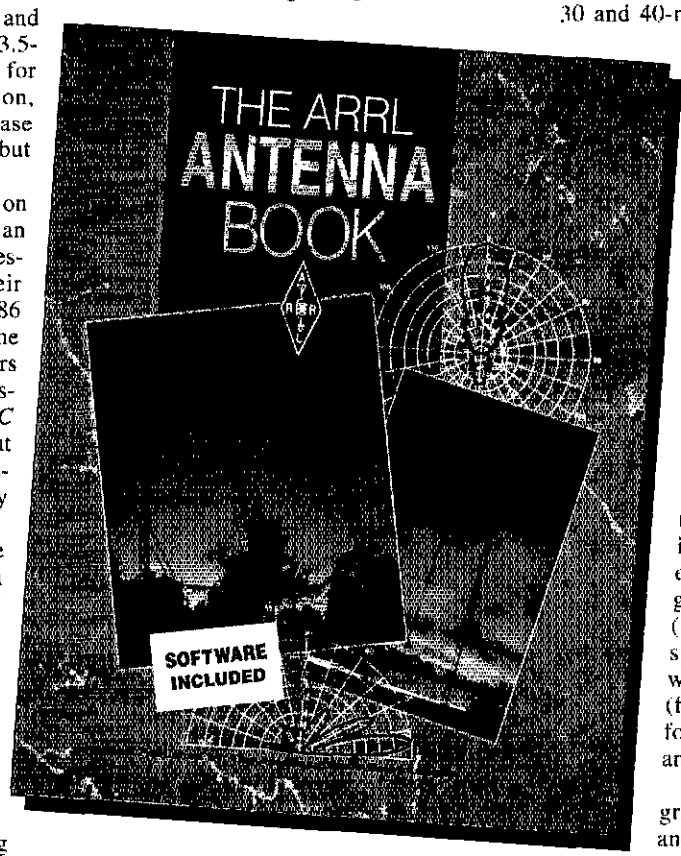
So, for the first time ever, the ARRL has bundled some really useful, interactive software in the back of the *Antenna Book*. This software is designed strictly for the IBM PC or fully compatible computer and comes on a 1.44-MB high-density 3.5-inch diskette. Included are programs for Yagi analysis, propagation prediction, and transmission-line analysis. Please note that this software is copyrighted, but not copy-protected.

The software programs will work on an older computer, such as one using an 80286 or even an (ancient) 8088 processor. However, they really strut their stuff on a more modern 80386, 80486 or Pentium-based computer. The graphics will work on older computers that have at least a CGA or Hercules display adapter (be sure to run *MS-HERC* in the \ELEVAT subdirectory first), but they look *much* better on a machine using a VGA display adapter, especially in color.

The programs will work anywhere from 10 to 20 times faster if a math coprocessor is in the system. 80486DX computers have the math coprocessor inside the main chip, as do Pentium systems. Neither the 80486SX nor the vast majority of 80286 or 80386 computers have the math coprocessor inside. Math coprocessors are pretty inexpensive nowadays and they are a *very* worthwhile investment if you intend to do any sort of serious modeling work. The quality and versatility of this ARRL-supplied software may well spur you to go ahead and upgrade your computer hardware to take full advantage!

Yagis

I mentioned that I am an HF contester—thus, almost by definition, I am interested in Yagis. Over the years Brian Beezley, K6STI, has done a commendable job creating innovative antenna-modeling software. The HF Yagi chapter in the 17th edition has a detailed discussion about the trade-offs that can be made between forward gain, peak front-to-rear ratio and SWR, all computed over a full amateur band. Much of this was derived from voluminous computations using Beezley's *YO* (Yagi Optimizer) program. *YO* was used to create a stable of more than 80 different Yagi designs, optimized to meet stringent performance criteria. There are seven large tables in the book, covering the 10, 12, 15, 17, 20, 30 and 40-meter bands, for boom lengths between 8 and 80 feet.



The data files for these 80 individual designs are located on the diskette too. Further, K6STI has provided a special program to analyze Yagis. This is called *YA*, for "Yagi Analyzer," a slick bit of programming!

Figure 1 shows the main screen for a 5-element 20-meter Yagi on a 48-foot boom in free space. The response at the low end, middle and high end of the 20-meter band is shown in the three on-screen patterns for this antenna. The second line (under the frequency for each pattern) is the forward gain, in dBi, referenced to isotropic, although gain may also be shown in dBd (referenced to a dipole in free space). The third line is the worst-case peak rearward lobe (front-to-rear ratio), in dB. The fourth line is the feedpoint impedance and the last line is the SWR.

YA can generate a set of four graphs showing the performance across the whole band. See Figure 2, created for the same 20-meter Yagi. For this particular design, the gain rises slightly over the whole frequency band, while the worst-case front-to-rear ratio (F/R) stays better than 20 dB over the whole band, rising to a peak level of 24.4 dB at about 14.150 MHz. The SWR

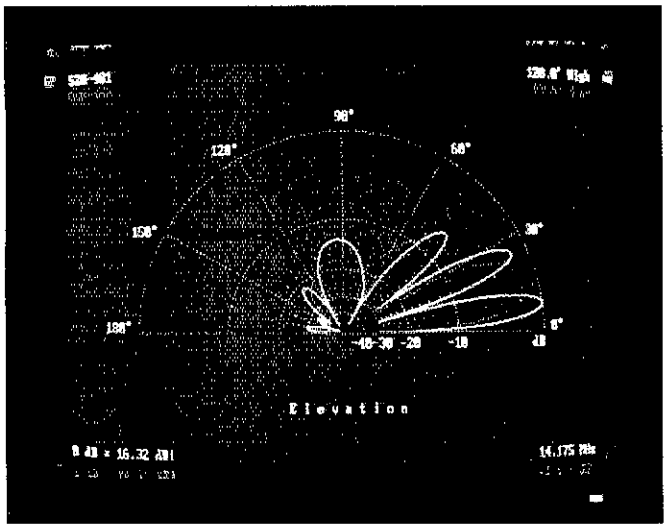


Figure 4—Polar elevation plot by *YA*, showing the effect of height on the pattern. If two antennas of the type illustrated in Figure 1 were placed on a tower 69 feet and 120 feet above flat ground, the null in the pattern of the higher antenna at 15° elevation will be covered nicely by the lower antenna, as would be expected.

W9-EUROP.PRN Rx QTH: Western and Eastern Europe

Elev	80m	40m	30m	20m	17m	15m	12m	10m
1	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0
2	0.0	0.0	0.9	4.8	7.1	5.1	8.3	8.9
3	0.0	5.7	1.9	5.8	13.4	12.8	21.7	17.8
4	0.0	4.7	5.6	7.7	11.8	10.3	11.7	15.6
5	0.0	1.0	12.1	8.3	10.2	6.4	6.7	2.2
6	0.0	0.0	6.0	5.9	3.9	5.1	3.3	15.6
7	0.0	3.1	7.0	4.3	6.3	3.8	8.3	11.1
8	0.0	1.0	12.1	18.8	17.3	16.7	10.0	11.1
9	0.0	2.1	12.6	28.0	17.3	14.1	15.0	8.9
10	0.0	3.6	10.2	9.7	9.4	16.7	6.7	8.9
11	0.0	11.9	4.2	6.8	3.1	6.4	6.7	0.0
12	0.0	16.1	5.6	0.5	0.0	1.3	1.7	0.0
13	0.0	10.9	9.3	0.0	0.0	1.3	0.0	0.0
14	3.7	10.9	9.8	1.4	0.0	0.0	0.0	0.0
15	21.5	8.8	2.3	1.0	0.0	0.0	0.0	0.0
16	11.2	4.1	0.5	0.5	0.0	0.0	0.0	0.0
17	21.5	4.7	0.0	0.0	0.0	0.0	0.0	0.0
18	13.1	7.3	0.0	0.0	0.0	0.0	0.0	0.0
19	6.5	4.1	0.0	0.0	0.0	0.0	0.0	0.0
20	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
22	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
24	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
27	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
32	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 5—A portion of the data file from the *Antenna Book* diskette that shows the percentages of time versus angle when each frequency band is open from the Chicago area to all of Europe. For example, on 20 meters the peak percentage is 28.7%, at a takeoff angle of 9°.

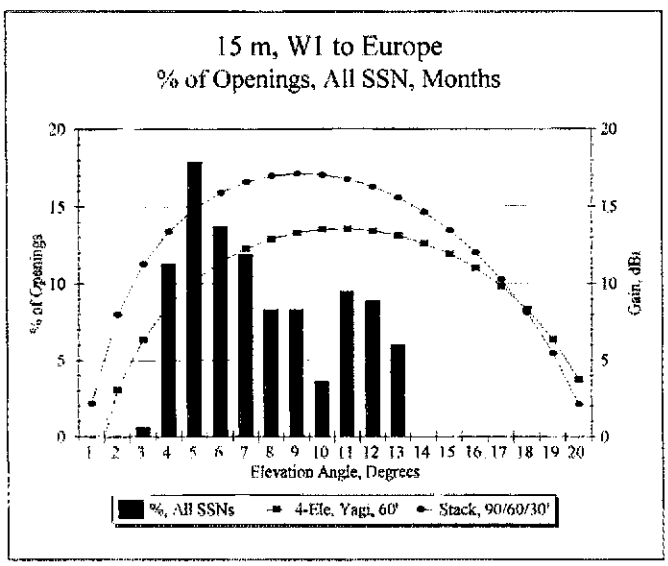


Figure 6—A graph from the *Antenna Book* that shows an overlay of computer-generated elevation patterns for two different antenna systems, compared to the statistical histogram of the percentage of all openings versus elevation angle for the 15-meter band from New England to Europe. One antenna is a 4-element Yagi 60 feet high, and the second is a stack of such Yagis at 30, 60 and 90 feet. The stack can be expected to outperform the single antenna by at least 5 dB at the peak statistical elevation angle of 5°.

UTC	MUFo MHz	1.8	3.5	7.0	10.1	14.0	18.1	21.0	24.9	28.0	[UTHRLS]
0	14.6	0	0	99	100	100	50	13			==========
1	13.8	0	14	99	100	90	39	7			northeast
2	13.0	0	46	99	100	80	25				(USA)->
3	12.3	0	83	99	100	70	11				western Eu
4	11.8	0	19	99	100	60					rope
5	11.5	0	0	98	100	51					(N PATH)
6	10.8	0	0	90	70	41					BRNG= 53
7	10.1	0	0	21	97	59					4266 mi
8	12.9	0	0	0	64	40					=256 km
9	10.0	0	0	0	4						MinEL= 0
10	14.1	0	0	0	11	15	5				Min F Hop=
11	14.6	0	0	0	8	13	17				28.6 deg
12	14.5	0	0	0	1	22	28				SSN= 46
13	14.4	0	0	0	0	29	38				NFN= 85
14	14.2	0	0	0	0	36	41				RX Noise=
15	14.1	0	0	0	0	39	39				KRS
16	14.1	0	0	0	0	42	40				ANP= V/V
17	14.2	0	0	0	1	46	43				BW= 3000
18	14.4	0	0	0	3	50	48	2			Kw= 1
19	14.7	0	0	0	9	53	53	6			SNR= 10
20	15.1	0	0	0	22	55	56	10			Hop= 7
21	15.4	0	0		87	99	97	15			==========
22	16.4	0	0	18	96	99	58	18			Screen 1/2
23	15.9	0	0	91	99	100	94	16			<2/C>

Figure 7—The total reliability screen from the *ION* propagation-prediction software. This is for the path from New England to Western Europe for the month of July, with a solar flux level of 85. The 30-meter band would be the most consistent performer on this path during the late afternoon and early evening.

stays below 2:1 over the whole band also, while the magnitude of the feedpoint impedance gradually falls as the frequency is raised.

The patterns may be seen in more detail in *YA* by invoking the "Plot" function. Figure 3 shows a detailed free-space E-plane plot of the 5-element Yagi we have been considering at 14.175 MHz. Figure 4 shows the pattern of this antenna at 69 feet, compared with its pattern at 120 feet. You can see that the two heights are complementary—where the high antenna has a null about 15°, the lower antenna has a peak.

Propagation

Another subject near and dear to the heart of the amateur operator is propagation. HF DXers and contesters are particularly attuned to the vagaries of the ionosphere. The elevation angles needed to launch signals toward distant QTHs has been for many years a subject of considerable interest, but there has been precious little hard data available for the amateur. In the mid 1980s in Northern California, I well remember struggling to find elevation angle information when I was designing the 80-meter quad arrays at the N6RO contest station. I resorted to extrapolating from the only source of information available to amateurs at that time—the single table labeled "Measured Vertical Angles of Arrival of Signals from England at Receiving Location in New Jersey," which had been in the *Antenna Book* since the early 1970s.

It turns out that the information in that table (which covered only 7 to 28 MHz) was derived from measurements taken by Bell Labs in 1934. That was a year, incidentally, when the sunspot cycle was at its very lowest. The likelihood that this information measured for England to New Jersey was also valid for a station about 3000 miles to the west was pretty slim. But as I said, it was the only information around!

So in preparing material for the *Antenna Book*, once again I turned to the computer. I used a very sophisticated ionospheric-modeling program called *IONCAP*. This program has been under almost continuous development over the last 30 years by various agencies of the US government. It is used here at HQ each month to generate the propagation graphs in *QST*'s How's DX column. I ran thousands of computations, creating huge databases from which statistically significant data could be extracted about elevation angles for locations in the US to important DX locations throughout the rest of the world.

The *Antenna Book* itself contains detailed summaries of all this data, customized for all 10 US geographic call areas, W1 through WØ, to six important areas of the world: Europe, the Far East, South America, Southern Africa, South Asia, and the South Pacific. On the disk, however, are 60 ASCII files, which show considerably more detail.

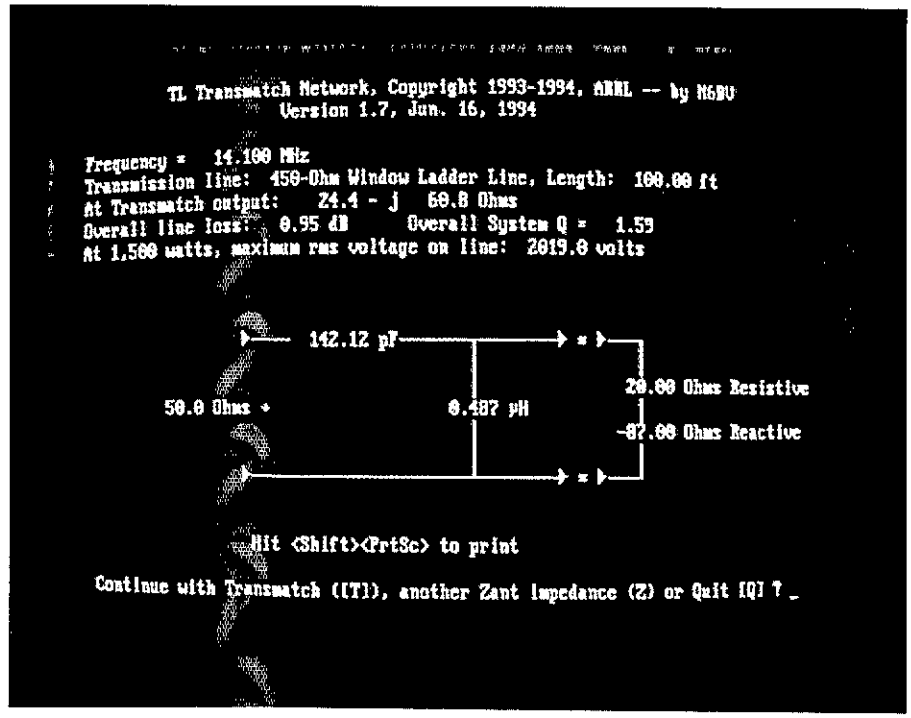


Figure 8—Computed matching network from *TL* (transmission line) analysis program for 100 feet of RG-8 or RG-213 coaxial cable at 14.1 MHz, with a load of 25 – *j* 40 Ω. *TL* computes a number of parameters for a variety of types of transmission lines at frequencies up to 5 GHz.

A sample from one of the 60 files, from Chicago to all of Europe, is shown in Figure 5. The file covers all levels of solar activity and all hours, months and years. For each amateur HF band and at each takeoff angle up to 35°, the percentage of all possible openings is shown. For example, on 40 meters, signals arrive (or depart) at a 12° elevation angle 16.1% of all the time the 40-meter band is open to Europe from Chicago. On 10 meters, the peak percentage occurs at 3° for 17.8% of all times this band is open. There is a second peak angle at 6° elevation, occurring 15.6% of the time.

Figure 6 shows a graph from the 17th edition. Statistical propagation data for New England to Europe has been overlaid with elevation pattern responses created by the *NEC* computer program. This shows the 15-meter percentages versus elevation angle, overlaid with the elevation response for a single 60-foot-high 4-element Yagi, and for a stack of three such Yagis at 90, 60 and 30 feet height over flat ground. Such information should help you plan the heights at which to place your antennas.

Besides the wealth of statistical elevation-angle data, the *Antenna Book* disk also includes a nifty propagation-prediction program by noted software author Jake Handwerker, W1FM. The software is called *ION_HDX*, or *ION* for short. With *ION*, you have the ability to make short-term forecasts of what the HF bands should be doing, for any given level of solar flux in any month and year. Radio station WWV broadcasts solar flux numbers regularly, and many amateur packet networks list them on request.

Figure 7 shows the total reliability predicted by *ION* from Boston to Western Europe for July 1994, with an assumed solar flux of 85. This prediction assumes Yagi antennas at each end of the circuit, 3000-Hz receiver bandwidth, 1-kW transmitter power, and a required signal-to-noise ratio (S/N) of 10 dB. For this relatively low level of solar activity in midsummer, the 15-meter band is not very likely to be open to Europe, even from the East Coast! There are corresponding screens for predicted signal level, angle of radiation, modes of propagation, and other parameters of interest. The *ION* program is very full-featured and useful, indeed.

Other Software

Another useful program on the diskette included with the *Antenna Book* is called *TL*, for "Transmission Line." *TL* can be thought of as a sort of Smith Chart without the chart. *TL* can analyze any length of any type of transmission line, terminated with any desired impedance, at any frequency up to 5 GHz. It computes not only the impedance at the input of a line, but also the overall loss, the SWR at input and output, and the maximum voltage on the line for 1.5 kW of power. It can generate an on-screen schematic of a network to match the impedance at the input of a line to 50 Ω.

See Figure 8 for an example, where 100 feet of RG-213 is operating at 14.1 MHz with a termination of 25 Ω in series with a capacitive reactance of 40 Ω. The overall loss in the transmission line at this frequency is 1.34 dB, and there is a maximum of 417.9 V on the line. *TL* is useful to analyze a variety of transmission-line problems.

Another useful program for working with Yagi antennas is called *SCALE*, which allows the operator to scale a *YA* Yagi design to another frequency, another taper schedule (for telescoping tubing), or for input to another program, such as *NEC2* or *MN*.

The Bottom Line

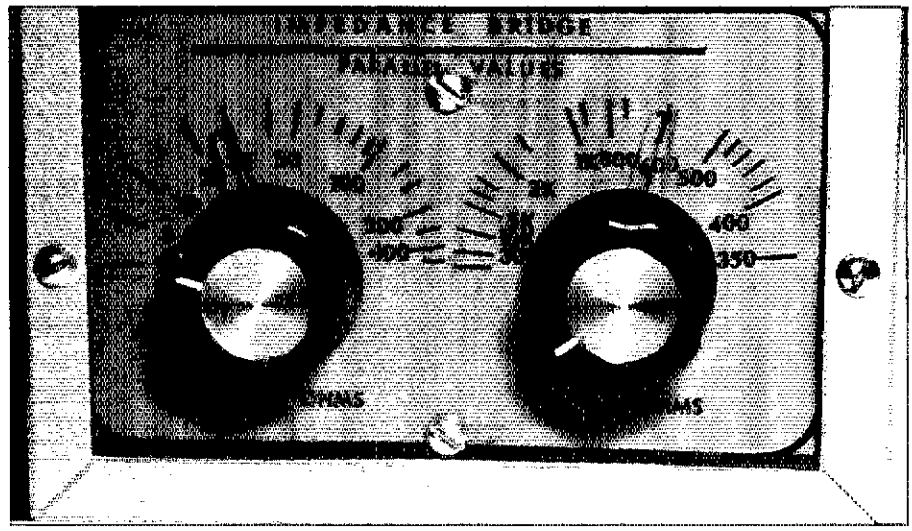
Many amateurs have told me how delighted they are with the software bundled with the 17th edition of *The ARRL Antenna Book*. Several have commented that they would gladly have paid the full price for just a single program like *YA* or *ION*. And they also get a 700-page book and a multitude of other useful programs! Other hams, who are not so deeply into computers, have told me that the printed book is still worth every penny it has been for almost 60 years now. I would love to hear further feedback, negative as well as positive, from readers.

[Software updates are available on HQ's Hiram BBS at 203-666-0578.—*Ed.*]

A Reevaluation of the Caron RF Impedance Bridge

When you encounter capacitive reactance with this bridge, a bit of fine tuning is required to obtain accurate results.

By Charles Camillo, W6TGK
6150 Locust Ln
La Grange, IL 60525



When making antenna impedance measurements at the end of a long transmission line (usually from within the shack) it's always necessary to translate the measured impedance back to the antenna feed point, either by the use of a Smith Chart, or any of a number of computer programs designed for this purpose.[1] Because the measured impedance at any point on the transmission line can be very different from the antenna impedance, we must be prepared to measure a wide range of resistance and reactance. This is especially true if the measurements are made over a range of frequencies above and below the resonance point of the antenna. We must also be able to accurately determine the cable's electrical length. My favorite method of measuring the electrical cable length is to measure its input impedance with a short at the antenna end, if it is easily accessible. Because many typical noise bridges[2] used for this work are poorly calibrated and are noisy at the low end of the resistance scale, one can be misled by substantial errors. With John Grebenkemper's noise bridge modifications,[3] it's possible to improve the low-resistance accuracy for most measurements. However, we're still left with the noisy resistor and the frustration of adjusting the dials for a good balance without going past the point of best balance because of the directly driven shafts.

After several years of working with my noise bridge, I felt I needed something better, yet cheaper than a laboratory bridge costing hundreds of dollars. *The ARRL Antenna Book*, 15th Edition, describes an RF impedance bridge[4] that can be used to read resistance values as low as several ohms and uses a capacitor to balance the unknown resistance (see Figure 1). This circuit caught my interest several years ago and I built one. In order to satisfy my desire for a smooth and easy adjustment of the resistance dial—and at the same time improve the resolution of the readings—I used a National Velvet Vernier drive and dial on that shaft.

Resistance calibration was done using 1%-tolerance metal-film resistors obtained from Radio Shack (part number 271-309). Using a digital multimeter, I selected values of 5.8, 10.5, 46.6, 100 and 470 Ω. I soldered the resistors into PL-259 connectors in much the same way as described by Grebenkemper.

I calibrated the reactance dial as detailed by Wilfred Caron in *The ARRL Antenna Book*, simply by calculating the reactance at 1 MHz for various values of capacitance, assuming a straight-line relationship be-

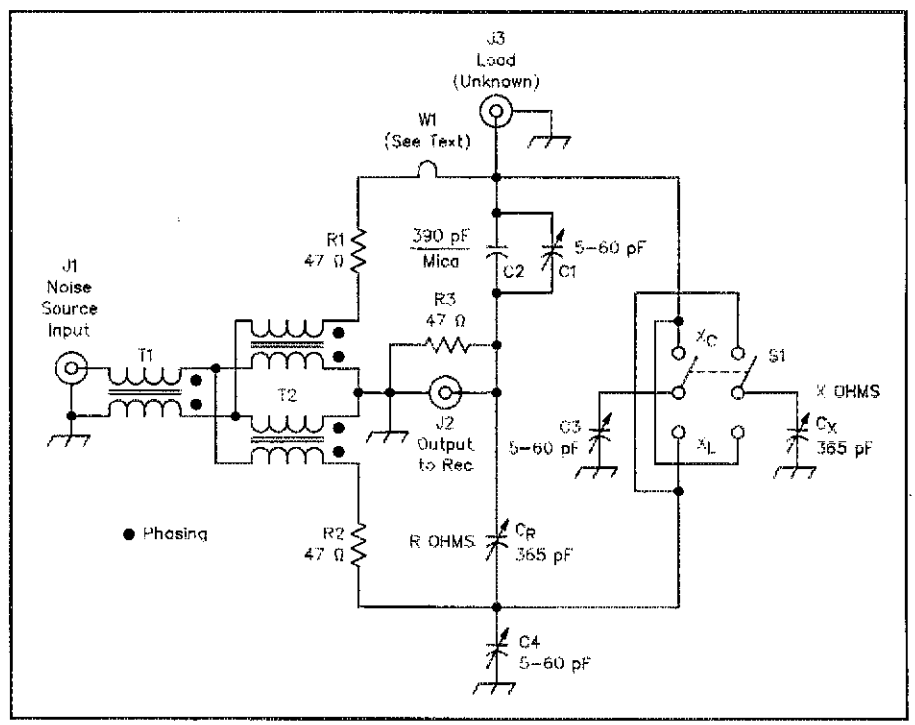


Figure 1—Schematic of the Caron Parallel Impedance Bridge described in *The ARRL Antenna Book*, 15th edition, pp 27-19 to 27-22. Refer to the original text for a complete explanation of the circuit.

[1]Notes appear on page 31.

tween capacitance and shaft rotation, using the maximum and minimum values of the capacitor to determine the graph line. Being a skeptic, I wanted to check the accuracy of the reactance dial calibrated this way.

To accomplish this, I made up more loads consisting of various parallel resistor-capacitor combinations using PL-259 connectors, mica capacitors and suitable resistors. These checks indicated the bridge was reading low by a factor of approximately 2 to 1—more in some cases—as shown in Table 1. Naturally, my first conclusion was I had made a wiring error or the parts arrangement was causing a substantial amount of stray capacitance to be added in parallel across C_X (see Figure 1). When I found no errors, I built a second, smaller unit, to keep wiring and wire lengths to a minimum.

This version gave the same results. Now I began to suspect the loads were at fault, either because the PL-259s were introducing excessive reactance, or the mica capacitors were not as good as expected, which wasn't very plausible. At this point, I dropped the project. I purchased a good laboratory standard bridge—a General Radio 916A RF Impedance Bridge[5]—and got caught up experimenting with it. My thoughts never returned to the parallel-impedance bridges until one day when a friend asked how they had worked out. I then decided to determine what the problem was.

Calibrating the Loads

The GR-916A RF impedance bridge is a classic four-arm Wheatstone bridge that measures the equivalent series impedance of the unknown. Calibrating the loads required measuring the equivalent series impedance and converting the results to parallel values using the equations:[6]

$$R_P = \left(X_S^2 + R_S^2\right) \div R_S \qquad \text{(Eq 1)}$$

$$X_P = \left(R_S^2 + X_S^2\right) \div X_S \qquad \text{(Eq 2)}$$

When I had made my original capacitor/resistor loads, I chose four values of capacitance and 33 or 47-Ω resistors for the combinations. (As you'll see later, the choice of low-value resistors was a serendipitous event.) The results of the measurements are shown in Table 2. There is close agreement in the resistance values obtained with all methods, but the reactance values—and thus the capacitance values—of the Caron bridge are substantially different from those obtained using the GR bridge and the multimeter. Because the multimeter and the GR bridge were in fairly close agreement, I was forced to assume a circuit or calibration error. Before going any further, I made another thorough check of the wiring, solder connections and grounds. Then, since some time had passed—and I assumed I wouldn't repeat any calibration errors of the past—I performed the calibration again—from scratch. A repeat of the data taken in Table 1 indicated no change. At this point, I decided it was necessary to review the operation and theory of the bridge. Then I might have a better chance of understanding the source of the errors.

The ARRL Antenna Book article shows the balance conditions in the simplified form using only C_R and a resistive load. There is no equation or mathematical relationship covering the case when the load is reactive and C_X is included in the circuit, only the statement that C_X tunes out the reactance. Although the rigorous mathematical analysis of circuits is not one of my strong points, I decided to see if I could develop the proper equations.

I began by deriving, from scratch, the balance equation for the simplified resistive load, to see if I could duplicate the results of *The ARRL Antenna Book*.

Purely Resistive Loads

The simplified schematic in Figure 4A shows the current paths for three complete circuits or meshes.[7] These current paths yield three circuit equations:

$$e = (I_1 + I_2)R + I_1 R_u \qquad \text{(Eq 3)}$$

$$e = (I_1 + I_2)R + I_2 X_1 + (I_2 - I_3)R_D \qquad \text{(Eq 4)}$$

$$e = I_3 R + I_3 X_R + (I_3 - I_2)R_D \qquad \text{(Eq 5)}$$

where R_u is the unknown resistance and $R_D = R$.

At balance, $I_3 = I_2$ to give a null in the detector R_D. To solve for R_u in terms of X_R, we equate Equations 3 and 5, combine terms and rearrange to get:

$$I_1 R + I_1 R_u = I_2 R \qquad \text{(Eq 6)}$$

Because the voltage drops across R_u and X_1 must be equal to null the current in R_D, then, $I_1 R_u = I_2 X_1$

$$I_1 R_u = I_2 X_1 \qquad \text{(Eq 7)}$$

and,

$$I_2 = \frac{R_u}{X_1} I_1 \qquad \text{(Eq 8)}$$

Substituting Equation 8 in Equation 6:

$$I_1 R + I_1 R_u = R_u \frac{X_R}{X_1} I_1 \qquad \text{(Eq 9)}$$

which simplifies to

$$R_u = \frac{R X_1}{X_R - 1} \qquad \text{(Eq 10)}$$

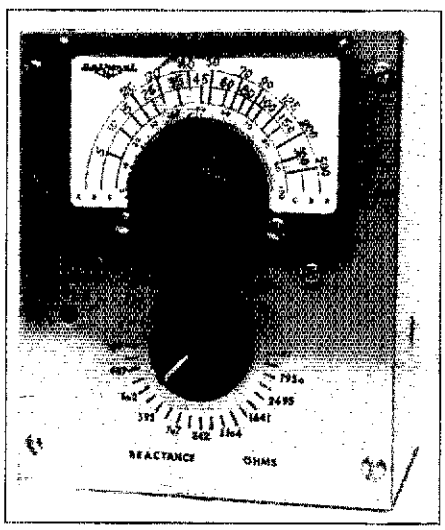


Figure 2—My first model of the Caron bridge uses a National vernier drive equipped with a logging scale. My second—more compact—version of Caron's bridge is shown in the title photo.

Table 1
Measurement Results of Calibration Loads Using the Caron Bridge at 3 MHz

Marked Values		*Caron Bridge*			
Resistance (ohms)	*Capacitance (pF)*	*Parallel Z_u*	*R_p (ohms)*	*C_p (pF)*	*Ratio C_p/C_{marked}*
33	47	34-*j*4800/3	34	33.2	0.45
35	320	35-*j*1050/3	35	151.7	0.47
47	470	49-*j*510/3	49	261.0	0.56
33	820	35-*j*430/3	35	370.3	0.45

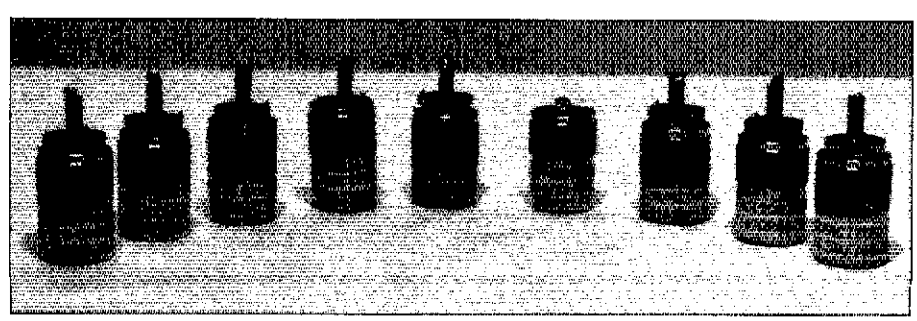


Figure 3—Various loads used to calibrate the bridge.

This converts to

$$R_u = \frac{R}{\frac{X_R}{X_1} - 1} \qquad \text{(Eq 11)}$$

Since Equation 11 is identical to the one in *The ARRL Antenna Book*, I proceeded to the next step, adding an unknown reactance and the capacitor, C_X.

Complex Impedance Load

Assuming the load is inductive, S1 places C_X directly across the load, which puts C_X and L_u in parallel with R_u. Working out the parallel combination of the three elements, we find that C_X cancels the unknown inductance, L_u. Thus, this case presents no problems.

In the capacitive case (Figure 4B), I have redrawn the bridge circuit in order to simplify the analysis. The addition of the one connecting wire from the junction of Z_u and C_X to the center tap of the matching transformer means we cannot assume the currents in Z_u and C_X are equal.

From the circuit, we can again write three mesh equations as:

$$(I_1 + I_3)R + I_1 Z_u = e \qquad \text{(Eq 12)}$$

$$(I_2 + I_3)R + I_2 X_x = e \qquad \text{(Eq 13)}$$

$$(I_1 + I_3)R + (I_2 + I_3)R + (X_1 + X_R)\, I_3 = 2e \qquad \text{(Eq 14)}$$

To solve for Z_u, we equate Equations 12 and 13:

Table 2
Data of R_p and C_p from Various Measurement Methods at 3 MHz

Marked Values		Multimeter		GR-916A Bridge		Caron Bridges: First Model		Caron Bridges: Second Model	
R (ohms)	C (pF)	R (ohms)	C (pF)	R_p (ohms)	C_p (pF)	R_p (ohms)	C_p (pF)	R_p (ohms)	C_p (pF)
33	47	32.8	46	32.5	41.4*	37	20.3	32	33.2
35	320	35.0	318	34.9	315	39	145	36	152
47	470	46.6	480	46.5	489	50	249	49	261
33	820	32.6	822	32.5	768	37	339	32	370

*Used the lead reactance correction methods described in the General Radio 916A Bridge manual as the reactance for this capacitor is almost at the zero point on the scale.

$$I_1 (R + Z_u) = I_2 (R + X_x) \qquad \text{(Eq 15)}$$

Also, at balance,

$$\frac{I_1 Z_u}{I_2 X_x} = \frac{I_3 X_1}{I_3 X_R};\ Z_u = \frac{X_x X_1 I_2}{X_R I_1} \qquad \text{(Eq 16)}$$

Solving Equation 15 for I_2/I_1 and substituting the answer into Equation 16, gives

$$Z_u = \frac{X_1 X_x (R + Z_u)}{X_R (R + X_x)} = \frac{X_1 X_x R}{R X_R + X_R X_x - X_1 X_x} \qquad \text{(Eq 17)}$$

Again, substituting the reactance equations

$$X_1 = \frac{1}{j\omega C_1};\ X_x = \frac{1}{j\omega C_x};\ X_R = \frac{1}{j\omega C_R} \qquad \text{(Eq 18)}$$

into Equation 17 gives

$$Z_u = \frac{R C_R}{(C_1 - C_R) - j\omega R C_1 C_x} \qquad \text{(Eq 19)}$$

Since Z_u is a parallel combination of resistance and capacitance, then Z_u can also be expressed as:

$$Z_u = \frac{R_u \left(\frac{1}{j\omega C_u}\right)}{R + \frac{1}{j\omega C_u}} = \frac{R_u}{1 + j\omega R_u C_u} \qquad \text{(Eq 20)}$$

Equating Equations 19 and 20, and simplifying, we get

$$R_u(C_1 - C_R) + j\omega R_u R C_1 C_x = R C_R + j\omega R_u R C_u C_R \qquad \text{(Eq 21)}$$

Separating real and imaginary parts on each side and equating them gives the two balance equations necessary to fully characterize the unknown impedance,

$$R_u = \frac{R C_R}{C_1 - C_R} \qquad \text{(Eq 22)}$$

$$C_u = \frac{C_1}{C_R} C_x \qquad \text{(Eq 23)}$$

As you can see, Equation 22 is identical to the original—resistance only—balance equation. This is a considerable encouragement to trust the validity of Equation 23, which says that the indicated value of the reactive component is reduced by the ratio of C_1 divided by C_R. Since the parallel combination of C_1 and C_2 is fixed at about 400 pF, a small value of C_R (which is determined by the load resistance) leads to a substantial reduction in the indicated reactive component. This is exactly what I got as a result of my choice of the small values of resistance for the loads. Had I used a 470-Ω resistor, I might never have seen the problem! The C_R capacitor would have been very nearly at its maximum value, giving a value of approximately 1 for the ratio of C_1 to C_R.

Recalibration and Checking the New Equation

The final step in this analysis was to test the new balance equation to determine the

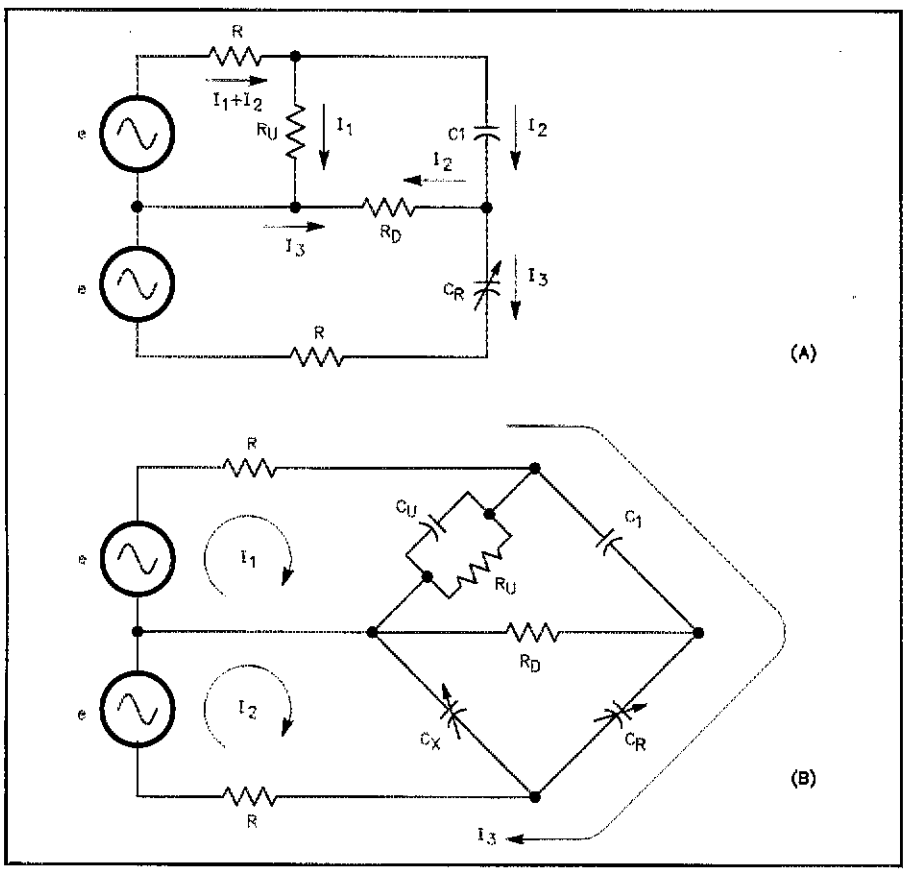


Figure 4—Simplified bridge circuits (see text).

Table 3
Data of Final Bridge Measurements with C_t/C_R Corrections Applied (at 3 MHz)

Load (ohms/pF)	R_P	X_X	LOG	C_R	C_t/C_R	C_X	C_P	STD	Devn %
33 47	37	7950/3	45.0	173	2.312	20.0	46.2	41.4	+11.7
35 320	40	1104/3	47.5	183	2.186	144.2	315.2	315.1	+0.03
47 470	50	651/3	53.5	208	1.923	244.6	470.4	489.0	−3.8
33 820	37	470/3	45.0	173	2.312	338.8	783.3	768.2	+2.0

proper reactance of the loads. But before I could do that, I needed a means of determining the value of C_R for any measured value of R_u on the bridge dial. I was fortunate that my first bridge model with the National vernier dial is equipped with a logging scale. I measured the capacitance versus the logging scale using a digital capacitance meter, after temporarily disconnecting the capacitor from the circuit. The short leads to the meter added no more than 1 pF to the measurements, so that was neglected.

Now, I could measure X_u and R_u and determine C_R from the logging scale and the graph. I remeasured all four loads and made a comparison chart, Table 3, which clearly confirms the validity of the correction to the reactance readings. These new values obtained for the unknown capacitance may be even more accurate than the General Radio bridge, the accuracy of which is diminished at the low end of the reactance dial. At least, this seems to be the case for the 47-pF capacitor where the Caron bridge value is closer to the digital capacitance meter than the GR bridge. Thus, the new equation seems to work well, as it gives the correct values for the loads.

Summary

This analysis shows that the Caron bridge can be used without corrections—as long as you're measuring a pure resistance or a complex load consisting of resistance and inductance. When you encounter a capacitive reactance, you *must* use the correction factor presented here to properly establish the reactance of the unknown load.

Although the new procedure is more cumbersome than simply taking two readings directly from the instrument scales, the parallel bridge should be evaluated in terms of its original purpose: to measure—with a higher degree of precision and accuracy—small values of impedance (both resistance and reactance are small). As stated at the outset, our measurements frequently require us to deal with these low values, and it seems appropriate to have another means of checking the accuracy of our measurements. The smoothness and lack of noise in the resistance dial is much preferred to the potentiometer in the typical series impedance reading noise bridges. With the addition of the reduction drives on both shafts, this instrument is a pleasure to use.

Finally, we're left with two choices in calibrating the R dial:

- Draw a graph of R and C_R versus an arbitrary logging scale and use the graph with only one reading taken from the C_R dial, or,
- Calibrate the C_R dial with two scales, one for R and a second for C_R.

Even though you have to take three readings for each point, it seems a small price to pay considering the advantages of using this device to measure network or antenna impedances.

Notes

[1]W. Hayward, *ARRL Microsmith*, V2.0 (available from the ARRL, 225 Main St, Newington, CT 06111-1494, tel 203-666-1541; 5.25-inch diskette, no. 4076; 3.5-inch diskette, no. 4084; price $39 plus shipping. Connecticut residents add 6% state sales tax; Canadians add 7% GST.)

[2]"A Noise Bridge For 1.8 Through 30 MHz," *The ARRL Antenna Book*, 17th edition, 1994, pp 27-23 to 27-26.

[3]J. Grebenkemper, "Improving And Using R-X Noise Bridges," *QST*, Aug 1989, pp 27-32.

[4]W. Caron, "An Accurate RF Impedance Bridge," *The ARRL Antenna Book*, 15th edition, 1988, pp 27-19 to 27-22.

[5]D. Sinclair, "A New R-F Bridge for Use at Frequencies up to 60 Mc," *General Radio Experimenter*, Vol. XVII, No. 3, Aug 1942.

[6]*The ARRL Antenna Book*, 15th edition, p 27-19.

[7]W. Hayt, J. Kemmerly, *Engineering Circuit Analysis*, (New York: McGraw-Hill Book Co, Inc. 1962).

Charles Camillo, W6TGK, was first licensed in 1949 as W9GZJ. He has also held the calls WIRBO and W9ISV. Charles received his degree in engineering physics from the University of Illinois in 1948. After graduation, he joined the Research Department of Amphenol. In 1956, Charles was one of the first to recognize the advantages of foamed polyethylene as a cable dielectric and developed the first cables using this material.

In 1962, Charles was appointed the US technical expert on RF connectors and cables for the International Electro-technical Commission meetings in Switzerland.

Charles became the General Manager of Amphenol's Cable and Wire Division in Chicago, where he remained until 1970.

From 1971 until his retirement, Charles was with the electronics group of Illinois Tool Works.

Currently, Charles is retired and enjoying experimenting with wire antenna configurations and measurements.

New Products

ATV SCAN CONVERTER, TNC

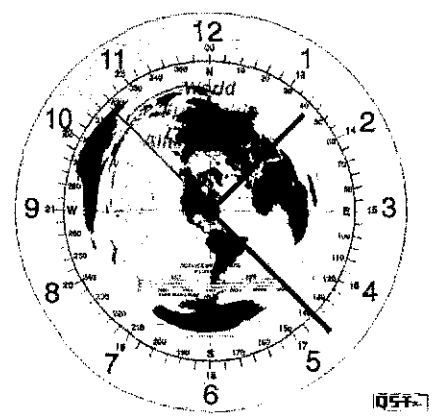
◊ The AOR TSC-100 Still Image Color Scan Converter uses advanced digital signal-processing (DSP) technology to operate amateur television (color SSTV) in a standalone configuration, with no computer necessary. It's fully compatible with Robot color 36- and 72-second, and Amiga AVT 90- and 94-second modes. Its compact size and 12-V dc (500 mA) power requirement make it practical for portable and mobile operation. It has standard NTSC outputs and connects to most image sources: camcorders, 8-mm video sources, Composer, VTR, laserdisk and more. The TSC-100 interfaces to almost any analog-grade voice radio or audio circuit, and has a built-in microphone relay and monitor speaker. The compact unit measures just 8½×5½×1½ inches and weighs 1½ pounds. Retail price is $749.95

The AR-210 is a compact (2½×1×1¼ inches), lightweight (3.3-ounce), TAPR TNC-2-compatible terminal node controller (TNC) for operating VHF packet radio. It features a built-in real-time clock with lithium battery back-up, an internal mailbox system, enhanced command set, diagnostic calibration, TCP/IP-capable KISS mode and runs at 1200 bauds (AFSK). The AR-210 runs on 10 to 13.8 V dc at just 200 mA, and can be equipped with an optional NiCd battery with quick charge circuit. The serial port is a standard RS-232C interface with a DB-9 connector, and the radio connections use its mini-phone jacks for handheld rigs or a DIN-type jack for other radios. Retail price is $229.95.

For information contact EDCO, 325 Mill St, Vienna, VA 22180; tel 703-938-8105, fax 703-938-4525.

RADIO AMATEUR WORLD CLOCK

◊ Tim Thirst, G4CTT, has introduced an attractive, colorful analog-dial quartz clock for radio amateurs that features a global map centered on your "home" and true compass bearings from the center to any point in the world. Order with your location specified and your clock is customized with the map face centered on your home. (Choices include Eastern, Central and Western North America, Eastern and western Europe, Australia, the Far East and more. The scale of miles/kilometers on the face helps to measure the distance from the center to a DX country. The clock is marked in 12- and 24-hour formats, with compass readings in 10° increments. The 3-color, 9-inch face is easy to read from across the shack. An AA battery provides at least a year of operation. Retail price £29.95 Sterling (about $46 US). Eastern Communications, Cavendish House, Happisburgh, Norfolk, England; tel 44-692-650-077, fax 44-692-650-925.



Thermoelectric Power for QRP Transmitters

By Arnold Sayre, W8WVM
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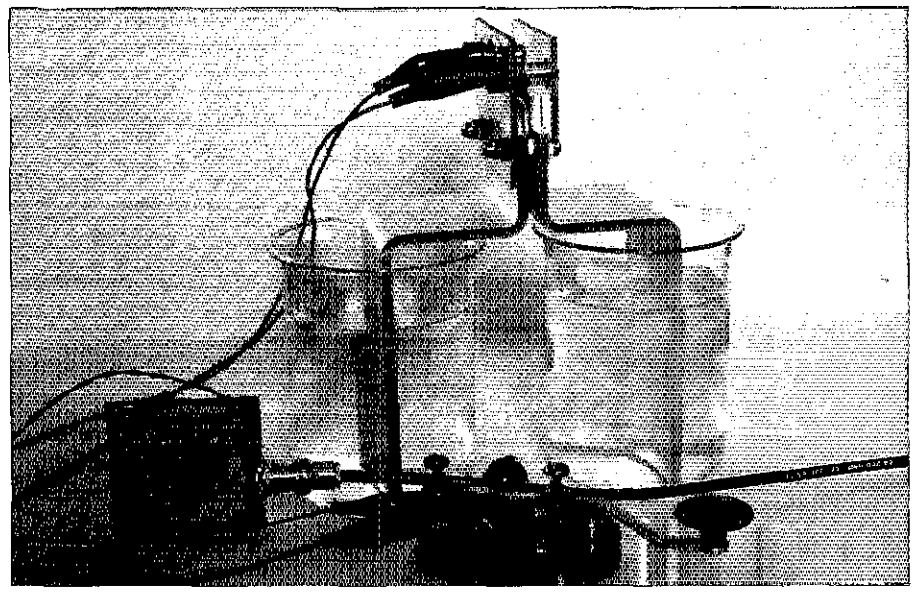
Buckhannon, WV 26201
(Photos by the author)



Peltier-device power provides plenty of potential to permit QRP operation.

Supplying Amateur Radio equipment with power generated by solar panels or wind-operated devices has become somewhat commonplace over the last few years. More recently, vegetables and fruit ("green machines?"—*Ed.*) have been uniquely tapped as power sources. Remember the lemon-powered QRP transmitter?[1] Now you can be the first kid on your block to power a transmitter with...hot and cold water!

Introduction

Solid-state heat pumps have been known since the discovery of the Peltier (Pel'-tyay) effect in 1834. The devices became practical only recently, however, with the development of semiconductor thermocouple materials. The modules I've used and describe here contain PN junctions made of bismuth telluride. The PN junctions are assembled between two flat, ceramic plates (see Figure 1). When current flows through the attached leads, one plate gets hot and the other gets cold. (In the majority of applications, the cold plate is used to cool something; the hot side, attached to a heat sink, dissipates the heat being pumped from the cold side.) In this application, the process is used in reverse: By heating one plate and cooling the other, we produce current to power a QRP transmitter.

Construction

The heart of this power supply is a Frigichip[2] thermoelectric module. You'll also need two $^1/_8$-inch-thick aluminum plates[3] that can be formed to the shape shown in Figures 2 and 3, with the aid of a shop vise. Be careful not to distort or scratch the surfaces to which the cooler module will be attached. Use a small amount of heat-sink compound between the aluminum and ceramic surfaces to ensure good thermal conductivity.

To maintain thermal isolation between the hot and cold plates, the two aluminum plates are held together by nylon bolts and nuts. *Use caution when tightening the bolts!* Plates must be drawn up evenly to prevent cracking the ceramic. Do not overtighten them! Be gentle with the leads—constant flexing will cause them to break off at the module end. Solder tip or banana jacks to the lead ends to make connections to your transmitter.

Operation

I used the transmitter employed in the "Lemonized QSO" (see Note 1), although you can use any similar design. To power the transmitter, immerse the two device legs in plastic cups—styrofoam is best (see Figure 4). Fill one cup with hot water and the other with crushed ice and water. Although either device leg can be placed in the hot or cold water, electric polarity depends on leg placement. For proper polarity, the red lead should be positive, the black lead negative. Before connecting the power supply to your transmitter, allow a few minutes for the aluminum plates to conduct the heat and cold to the Peltier module. Connect a voltmeter across the leads to monitor the voltage rise. I measured a maximum potential of 1 V, although the transmitter operated at 0.5 V or less. This power source and transmitter were

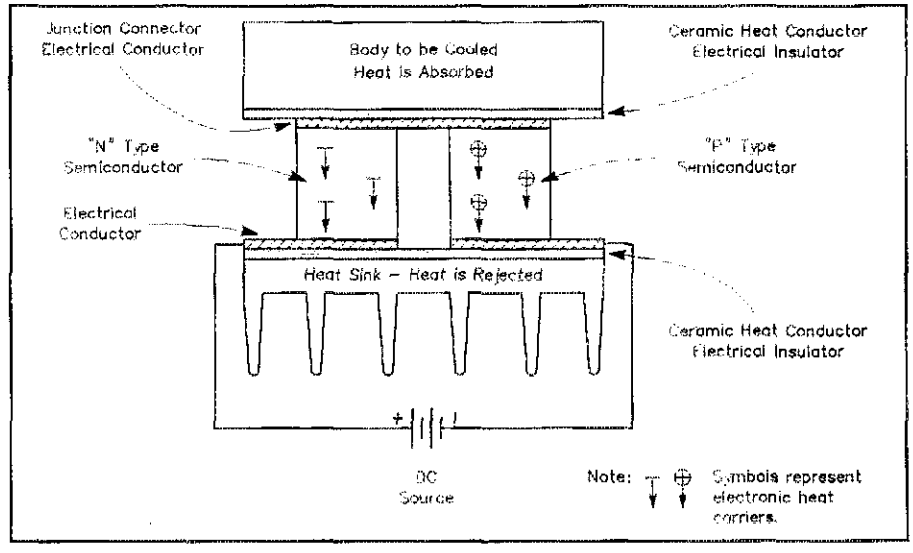


Figure 1—Cross section of a typical Peltier device being used as a cooling device. For the sake of clarity, only one junction is shown. The device used in this project has a total of 127 junctions.

[1]Notes appear on page 33.

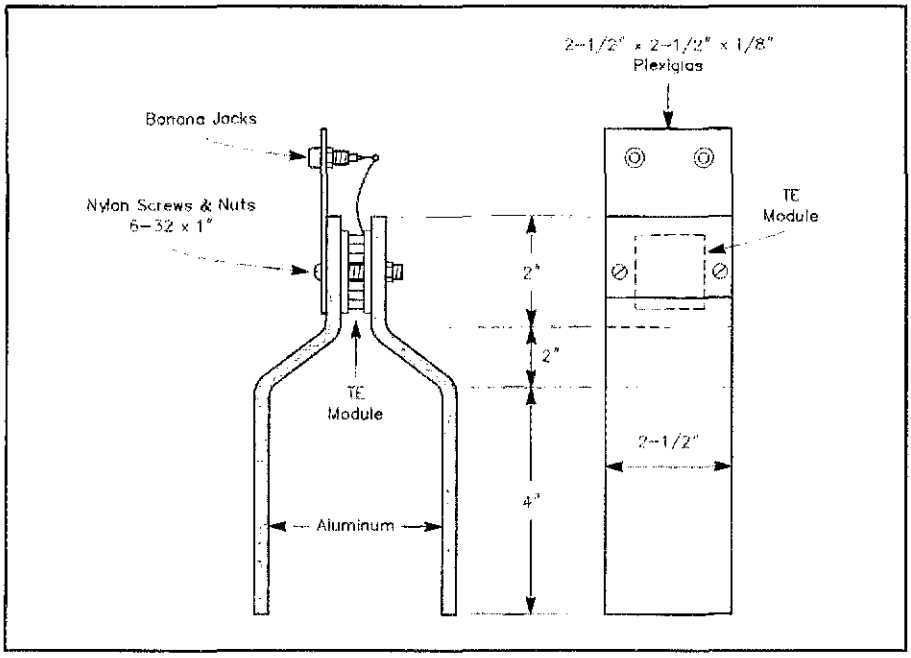


Figure 2—The mounting assembly for the Peltier device is made of aluminum and Plexiglas secured by nylon bolts and nuts . See Figure 3.

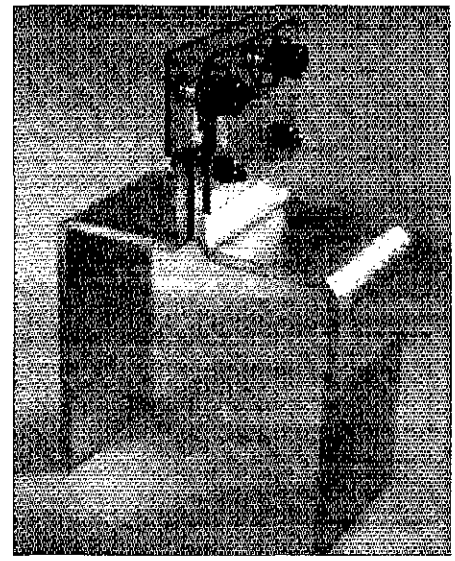


Figure 3—A Peltier device secure in its mountng assembly.

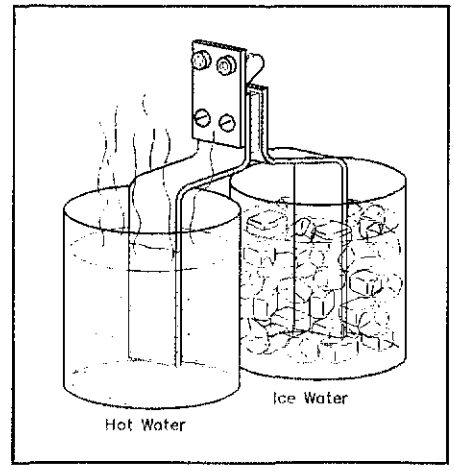


Figure 4—One leg of the Peltier device mounting assembly is placed in a container filled with hot water; the other leg is submerged in ice water. Although the title photo shows the use of glass beakers, styrofoam cups provide better thermal insulation and extend the operating period.

The Peltier Effect—Curiosity to Treasure

Jean Charles Athanase Peltier (1785-1845), was a French watchmaker turned physicist. He'd retired from watchmaking at the age of 30, and devoted the rest of his life to the study of physics. One of Peltier's discoveries was that when a current from an external source passes through a junction formed by two metals, it cools the junction. Further, when current is passed through the junction in one direction, it absorbs heat; when the current flow is in the opposite direction, the junction produces heat. We now know this as the Peltier Effect.

For many years a laboratory curiosity, Peltier devices have now become quite useful. This is due entirely to the development of new alloys for use in the junctions. The following list of current applications attest to the Peltier device usefulness:

- Consumer products: refrigerators for recreational vehicles (RVs) and mobile homes; aquarium coolers; picnic coolers.
- Scientific: coolers for transistors, ICs, diode lasers and infrared detectors.
- Aerospace and military: electronic equipment cooling and parametric amplifier coolers.
- Medical: Opthomological cornea freezers; tissue preparation and storage.
- Mobile refrigerators: medical supplies and food services.

The quality that sets this heat pump apart from all others is that it has absolutely no moving parts; its heat transferring process is completely electronic. (See Figure 1 in the article body.)—*Arnold Sayre, W8WVM*

used to complete a two-way QSO over a two-mile distance. The initial hot and cold water supplies lasted long enough to complete exchanging call signs, signal reports and brief comments.

Summary

Don't become overenthusiastic, throw away your NiCd cells and call your utility company to tell them you won't be needing their services any longer! It isn't likely that Peltier devices will replace other power sources in the immediate future. However, the Peltier device is experimentally interesting and practical. When used as described here, it is certainly an attention getter at club meetings and ham fests.

I present this article with two goals in mind. First, it's a novel demonstration of an alternative method of producing electric power. Secondly—and perhaps more importantly—this should give radio amateurs a chance to learn about a space-age device—albeit one that's 160 years old!

Peltier devices can be connected in series to increase the available voltage and in parallel to increase the current. Therefore, it is possible to thermally couple multiple devices to hot and cold tanks with, perhaps, hot water supplied by a solar heater and cold water piped from a nearby stream.

Right now, Peltier devices are more practical for cooling than for producing electricity. With mass production of the devices, perhaps their cost will drop and the use of Peltier-based thermoelectric generators will become commonplace.

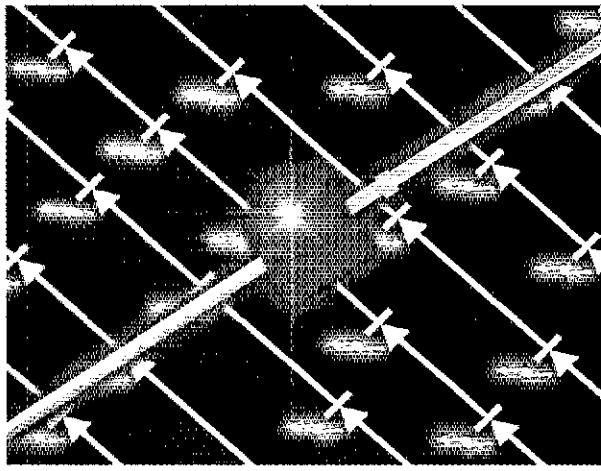
Notes

[1]B. Culter and W. Hayward, "Lemonized QSO," *QST*, Mar 1992, pp 18-19.

[2]Frigichips are manufactured and distributed by Materials Electronic Products Corp (MELCOR), 1040 Spruce St, Trenton, NJ 08648-4587, tel 609-393-4178, fax 609-393-9461. The preferred device size for this project is the No. CP 1.4-71-10L; price is $18.75 plus $10 shipping and handling. Similar units are available from All Electronics Corp, PO Box 567, Van Nuys, CA 91408-0567, tel: 800-826-5432, 818-997-1806; fax: 818-781-2653, and H&R Corp, PO Box 122, Bristol, PA 19007-0122, tel 800-848-8001, 215-788-5583, fax 215-788-9577. Check for availability and current prices before ordering.

[3]One source of aluminum sheet and nylon screws is Small Parts Inc, 13980 NW 58th Court, PO Box 4650, Miami Lakes, FL 33014-0650, tel 305-557-8222 (orders only), fax 800-423-9009, 305-557-7955.

Under the Hood: *Lamps, Indicators and Displays*



This sixth installment of Under the Hood illuminates the components that tell us what our rigs are doing.

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Our latest portable, dependable, and easy-to-use equipment places more emphasis on ergonomics and less on the inner workings of individual components. Communications equipment manufacturers focus on effective, useful and efficient controls, indicators and displays. Indicators for audio and RF level, frequency and mode, emergency conditions, power output, and signal levels give you real-time information about what's happening inside your equipment. Follow along for an introduction to the indicators—including LCDs, LEDs, neon, and incandescent bulbs—that you're likely to find in your communications and test equipment.

Display and Indicator Types

Analog Meters

No discussion of displays and indicators would be complete without mentioning the old standby—the once-ubiquitous analog meter (Figure 1). Even with the digital displays for frequency, mode, and channel used in most modern transceivers, there's something comforting about a mechanical, analog panel meter for monitoring rapidly changing signals, such as power output, SWR, and signal strength.

Analog panel meters generally rely on the magnetic interaction between a suspended coil of wire and the poles of a permanent magnet. Since the basic analog meters generally have a full-scale range of less than 1 mA, shunt resistors are required for measuring larger currents. Similarly, resistors can be added in series with the meter to create a voltmeter. Many analog meters have integral series or shunt resistors, with a faceplate calibrated according to the full-scale voltage or current indicated by the meter.

Despite their long-standing popularity, analog meters are becoming increasingly rare. Analog meters are generally bulkier; less accurate; less shock-, vibration-, and moisture-resistant; and, perhaps most significantly, much more expensive than the newer digital indicators and meters. You may find that a new panel meter doubles the cost of your project. Luckily, there are solid-state alternatives to the mechanical panel meter, such as liquid crystal displays, that are much more cost-effective.

Liquid Crystal Displays

Liquid crystal displays or LCDs are found in everything from digital watches and thermometers to hand-held digital multimeters and VHF transceivers. LCDs are popular because they're inexpensive, require very little power, don't flicker, produce minimal electromagnetic fields, have a fast response time and long life span, and provide a pleasing, high-contrast display that can be viewed in direct sunlight. If you have a modern mobile, portable, or handheld rig, it probably uses an LCD.

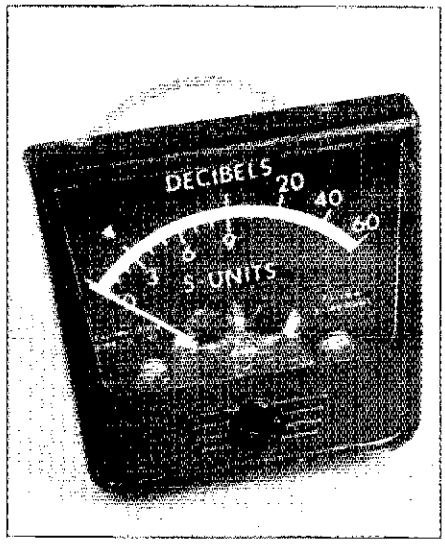

Figure 1—Analog panel meters are popular in ham gear, but their fragile construction has led to the adoption of solid-state substitutes.

LCDs take a variety of forms, from digital numeric panels to mock analog panel meters. Whatever the form, they are constructed of a thin film of viscous liquid crystal sandwiched between two glass plates with transparent etched electrodes. When opposing etched electrodes are energized, the optical properties of the liquid crystal matrix changes, rendering the area defined by the electrodes visible.

LCDs have come a long way in the past few years, in part because of pressure from the portable TV and laptop computer market. The main distinction in LCDs is between *passive matrix* displays and the more capable (and more expensive) *active matrix* displays.

Passive-matrix LCDs, like those found in inexpensive wristwatches, have poor contrast and limited viewing angles.

Active-matrix displays aren't commonly used in communications equipment (unless you consider a laptop computer part of your packet station), in part because of their great expense. You're much more likely to find this type of display in your laptop, at least until the technology matures. In active-matrix LCDs (AMLCD) designs, a thin-film transistor and capacitor are used at every pixel. In effect, the panel is a giant IC. Although they're expensive, AMLCDs provide full color, a wide viewing angle, good response time, and impressive contrast.

Electroluminescent Lamps

Electroluminescent (EL) lamps are used to backlight LCDs for many of the same reasons LCDs are so popular. EL lamps are

inexpensive, lightweight, require very little power, have long life spans, and generate little heat. Other key attributes of EL lamps is their uniformity of illumination and availability in a variety of colors, including white, red, green, blue-green, and yellow. If your mobile transceiver has an illuminated LCD, odds are it's illuminated by an EL lamp.

EL lamps are constructed with transparent conductive electrodes that are separated by a dielectric containing luminescent phosphor. Application of an ac voltage to opposing electrodes causes the dielectric between them to glow. Brightness can be easily controlled by varying the magnitude and/or frequency of the applied voltage.

Incandescent Lamps

When a wide viewing angle, great brightness, and a variety of colors are required, it's difficult to compete with the incandescent lamp (Figure 2). Incandescent lamps, which are brighter than either LCD or neon lamps (typical output for an incandescent lamp is on the order of 0.5 to 2.8 lumens), consist of a thin tungsten filament mounted between two electrodes in an evacuated glass bulb (a tungsten filament would fail within a few seconds if it were operated in the presence of oxygen). When current flows through the filament, the electrical energy is transformed to light. A small amount of inert gas may be added to improve efficiency and color; any color is possible with the use of filters.

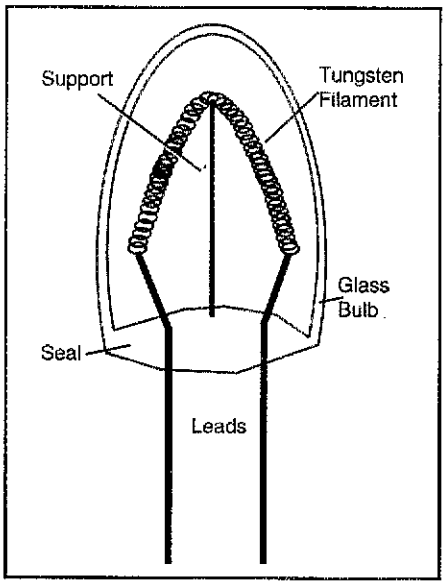

Figure 2—Incandescent bulbs are constructed with a thin tungsten filament, often stabilized by a molybdenum support, encased in an evacuated glass envelope. Operating life and light output can be increased by filling the envelope with argon, nitrogen, krypton, or other gas. Halogen bulbs use a quartz envelope that is filled with a halogen gas such as iodine or bromine.

Tungsten is a popular filament material because of its low rate of evaporation and high melting point. Due to the limited space inside the lamp envelope, the tungsten is coiled and mounted into various filament shapes, often supported by molybdenum posts.

Typical operating voltages (from 5 to 115 V) and currents (from a few mA to an ampere or more), are determined by the size, length, and composition of the filament. Lower-current lamps have a smaller diameter tungsten filament and therefore higher resistance. However, power requirements also influence an incandescent lamp's susceptibility to shock and vibration. Low-voltage, high-current lamps have thicker filaments and are therefore less fragile; eg, a 28-V, low-current lamp will be more fragile than a 5-V lamp operated at higher current.

In addition to their relatively fragile tungsten filaments, a major limitation of incandescent lamps is their relatively short life-spans. Even when operated away from the shock and vibration common in portable equipment, incandescent bulb life spans are commonly in the hundreds or, at best, thousands of hours. As a result, the incandescent lamps require the added cost of a socket that facilitates bulb replacement.

Incandescent lamp life span is usually rated at 60-Hz ac. Operating an incandescent lamp on dc decreases lamp life by approximately 50%. Dc alters the molecular structure of the tungsten, resulting in hot spots on the filament, which accelerates the rate of tungsten evaporation and embrittlement.

Neon Lamps

Neon glow lamps are popular in ac-power-supply circuitry, both as indicators and as light-duty surge suppressors, in part because they are line-voltage compatible, require very little power, and are relatively inexpensive (Figure 3). Neon lamps are less prone to shock and vibration failures than are incandescents; typical life spans are about 25,000 hours. Compared to LEDs, neon lamps have a much shorter life span. Unlike LEDs, though, neon lamps can be operated at higher temperatures (up to 150° C) and are not damaged by voltage transients or high-voltage static discharges.

Neon glow lamps are constructed with a pair of oxide-painted nickel electrodes mounted within an envelope containing neon gas under low pressure. When a high voltage is applied through a current-limiting resistor, the gas ionizes and produces the characteristic reddish-orange glow. A small amount of mercury can be added to produce a bluish tint; other colors are made possible by coating the inside surface of the envelope with phosphor.

An important concept in the operation of neon lamps is breakdown voltage—the voltage at which a lamp starts to glow steadily. Breakdown voltage is a function of the gasses use, electrode spacing and geometry, and the geometry of the tube. It is also influenced by ambient light (harder to fire in the dark), and the time since the last discharge (the longer the time, the harder to fire). In most neon lamp designs, the breakdown voltage is normally between 55 and 95 V ac. Dc breakdown voltage is roughly 50% greater than the ac breakdown voltage. Similarly, neon lamp ac breakdown voltage increases with increasing frequency, in part due to the capacitance of the lamp—about 0.5 pF.

Typical current for a neon lamp is between 0.5 and 3.0 mA. Since the internal resistance of a neon lamp is from about 3 to 30 kΩ, a series resistor (150 kΩ is typical) must be used to limit lamp current. Since life span increases considerably as operating current decreases, a small decrease in operating current results in a considerable increase in life span. Interestingly, light output is directly proportional to current, so a small decrease in operating current results in little output loss. Lamp life is decreased significantly (about 50%) by operating a lamp at dc versus the same rms ac voltage.

Unlike incandescent lamps and LEDs, neon lamps fail rather gracefully. As neon lamps age, the electrodes evaporate and condense on the inside of the glass envelope. The firing voltage increases until it reaches the value of the supply voltage. At this point, the lamp flickers and exhibits a slight decrease in brightness.

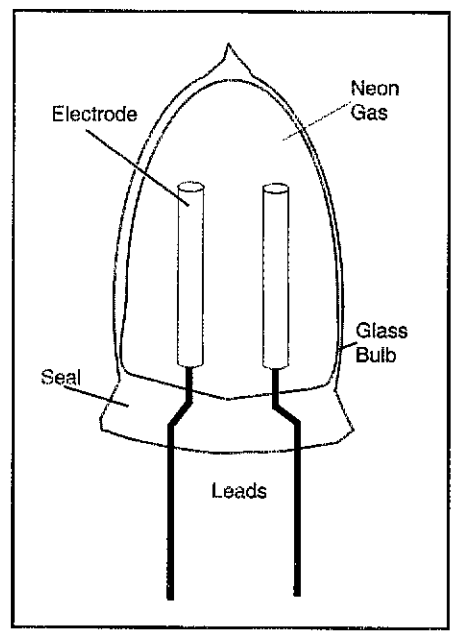

Figure 3—Neon glow lamps are constructed of two parallel electrodes encased in a glass envelope filled with neon gas under low pressure. When the voltage across the electrodes exceeds the breakdown voltage of neon, the ionized neon gas emits a characteristic reddish-orange glow.

Light-Emitting Diodes

Light-emitting diodes or LEDs are rapidly replacing both incandescent and neon lamps in communications equipment. The reasons are clear: LEDs consume less power, are smaller, have better than a 50-fold improvement in life expectancy over incandescent and neon lamps (typical life span is about 11 years), are resistant to shock, vibration, moisture, and temperature extremes, provide good visibility even in direct sunlight, and are available in virtually any conceivable configuration, from discrete lamps, 7, 14, and 16-segment digital displays, to high-output clusters, high-density surface-mount chips, bar graph, dot-matrix, and alphanumeric displays.

When LEDs were first introduced in the late 1960s, they were available in only low-output, single-color (red) configurations. Advances in technology gave us higher-intensity LEDs in a variety of colors, including warm whites, in bases that match those of the incandescent lamps LEDs will replace.

LEDs are simple PN junction semiconductor devices. When the LED is forward biased, electrons in the N region combine with holes near the PN junction, and light is generated (Figures 4 and 5). An LED may be forward biased from a battery or other steady dc source, or from a pulsed dc source up to about 100 MHz. The energy level associated with the recombination, and therefore the wavelength of the light produced, is a function of the semiconductor material used.

Like many semiconductor devices, when LEDs fail, they do so catastrophically. LEDs are rated in terms of maximum and typical forward current, typical forward voltage, maximum reverse voltage, viewing angle, output color, packaging, diffused or nondiffused, and intensity. A typical LED rating would be 30/20 mA max/typical forward current, 1.4-V forward voltage, and 5-V maximum reverse voltage. Output intensity is generally specified in millicandelas (mcd) at specified current; 3 mcd at 20 mA is typical, although high-intensity LEDs (eg, greater than 1000 mcd) are available.

LEDs, like neon lamps, are generally designed to be used with a series resistor that limits the forward current to a safe value (some LEDs designed for a specific supply voltage have built-in series resistors). The value of the series resistor can be determined by the formula: $R_s = (V_{in} - V_{LED})/I_{LED}$, where V_{in} is the supply voltage, V_{LED} is the LED voltage drop, and I_{LED} is the desired maximum current. V_{LED} varies from about 1.3 to 2.5 V, depending on the LED construction and output wavelength (green LEDs tend to have a greater V_{LED} than do red LEDs). For example, with a 6-V supply and a LED with a 1.7-V voltage drop, and a desired current of 20 mA, the optimal resistor would be about 220 Ω.

LED package configurations greatly influence light output and appropriateness for a given application. For example, there are cylindrical, inverted cone, arch, rectangle, and square package designs. An LED molded into the shape of a lens can produce roughly 10 times the light output of the same semiconductor LED housed in a

Light Output Terms and Factors

Look at any good electronics supply catalog and you'll see lamps described in terms of optimal operating voltage and current, estimated life span, and brightness. Operating current and voltage, specified in typical and maximum amperes and volts, respectively, are familiar concepts to all of us. Estimated lifespan, generally specified as average lamp life, is the time before half of an entire lot of lamps can be expected to fail. For example, a lamp rated at 500 hours would be expected to burn out in one half of all of its applications by the 500th hour. That is, a given lamp could fail after 5 or 5000 hours, but odds are it will fail at around 500 hours.

Unless you've worked with laser communications or other applications that deal with optics, the terminology associated with brightness or luminous intensity may seem a bit foreign at first. When quantifying the light output of a device, the candela is the standard unit of measurement, replacing the once popular candlepower. Whereas luminous intensity, measured in candelas, is a measure of the light output of a device, the lumen is a measure of the amount of energy in a beam of light shining on a surface. These units are tied together in the following relationship: a 1-candela light source produces a 1-lumen beam of light, which results in 1 foot-candle illumination on a 1-square-foot area located 1 foot from the source.

Large light sources, such as high-powered halogen lamps, are measured by total light output. In such cases, the usual unit of light output, the Mean Spherical Candlepower (MSCP) is a measurement of total visible light being emitted from the lamp. MSCP can be converted to a lumens equivalent by multiplying the MSCP value by 12.57. In contrast, the intensity of LEDs and other small light sources is measured in millicandela (mcd). The intensity of small, point sources, such as LEDs, are generally measured on-axis.

It can be helpful to think of light source as a small RF antenna. For example, the light intensity must double for the eye to detect a noticeable difference, eg, from 10 to 20 mcd or from 100 to 200 mcd. Similarly, light intensity is angular-dependent. That is, a 10-mcd device with a viewing angle of 35° may have the same total light output as a 200-mcd device with a viewing angle of 8°. Like adding elements to a beam antenna, the light intensity produced by a lamp can be effectively increased an order of magnitude by using lenses. Lenses, whether an integral part of the lamp or an external device, collect the light emitted from a naked lamp and project it into a useful direction.

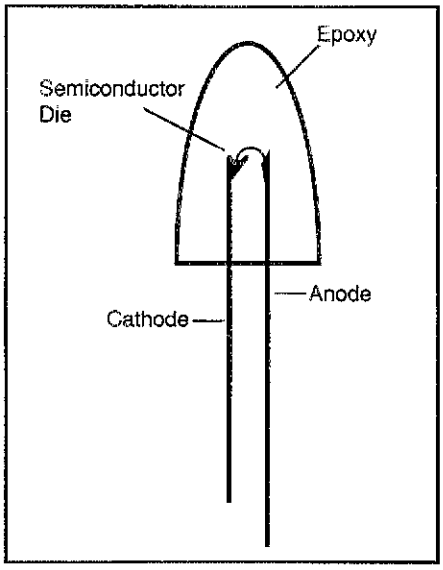

Figure 4—LED construction. Unlike incandescent and neon lamps, LEDs are polarized. The anode (+) lead is longer than the cathode (–) lead. In the design shown, the transparent epoxy dome acts as a lens to focus the light output. LEDs are current dependent, in that light output is directly proportional to the forward current.

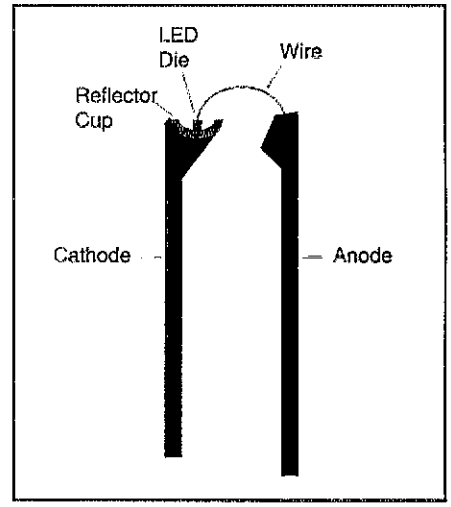

Figure 5—Close-up of LED construction. The semiconductor LED die sits atop a concave reflector that directs and concentrates the light output.

transparent rectangular epoxy mold; internal reflectors can raise the output even further.

One of the more interesting LED designs is the bicolor LED, which can be switched from one color to another (typically from red to green). Bicolor LEDs are formed by putting two LED chips on the same package as a single LED, connected in reverse parallel. When biased in one direction, one LED lights; when biased in the other, the other generates light. By varying the duty cycle of each color, a third state can be displayed; eg, a mixture of red and green produces amber. Some bicolor LEDs are made in three-LED packages, which simplifies the drive circuitry needed to display three states. Because of the three states available, bicolor LEDs can be used to pack a lot of information in a small space. Applications for bicolor LEDs range from dc polarity indicators to front-panel function indicators.

Miscellaneous Devices

In addition to the major indicators and displays described above, a number of miscellaneous display devices deserve mention. For example, the ubiquitous cathode-ray tube (CRT) is found in or around most communications stations. The ICOM IC-781 transceiver and R-9000 receiver, for example, use a CRT to display the frequency spectrum of received signals as well as operating frequency and mode information. Many ham stations feature modulation monitor scopes and even panoramic adaptors, that allow limited spectrum analysis when used with a receiver. Finally, CRTs are used in nearly all computer monitors.

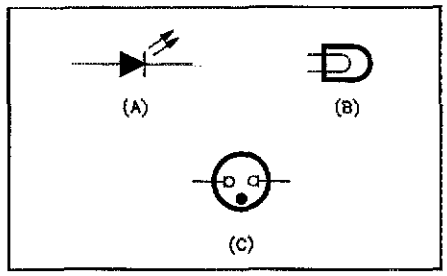

Figure 6—Schematic symbols of LEDs (A), incandescent lamps (B), and neon-glow lamps (C).

Incandescent digital readout tubes, which are bright, operate at a low current, and provide a wide viewing angle, are also found in some communications and test equipment. Numerical neon glow tubes, often used in test equipment, provide a pleasing display, albeit with a somewhat restricted viewing angle because of their multi-plane construction. Microprocessor-controlled vacuum-fluorescent display modules are used by a number of equipment manufacturers.

Summary

Display technology is undergoing rapid evolution. Economic forces are bringing to the market devices that are more compact, more cost effective, more reliable, and provide more functionality than their predecessors. LEDs, neon lamps, and other discrete display components can be expected to be with us for some time. There is, however, considerable movement toward virtual interfaces, in which your computer screen becomes a powerful and easily customized user interface to a "black box" communications unit. QST

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Reviewed By Jim Kearman, KR1S
QST *Assistant Technical Editor*

It's no secret that you can pass every Amateur license exam through Extra Class without having a clue about electronics. When you get down to it, the goal is to pass the exam by getting the right answers to the questions. Most of us promise to go back and really learn the theory, but simply studying the books can put you to sleep. This book by the prolific Joe Carr seems oriented toward those of us with ham licenses and guilty consciences. Starting with a refresher of the simple math you need to know to understand how radio stuff works, Joe follows with details on home construction techniques and simple test equipment. But the bulk of this hefty book consists of schematic diagrams and descriptions of practical RF circuits, from VLF through the microwaves. Even working fast, it would take you a lot of evenings and weekends to build every project.

Most of the circuits are oriented toward receivers. Because this book may fall into the hands of unlicensed students, that's probably a good idea. I couldn't find any power amplifier circuits, for example, even in the extensive index. Most receiver circuits, such as mixers, IF amplifiers and the switching of IF filters, are covered. Some coverage of automatic gain control (AGC) circuits would have been nice, though, and audio circuits are dealt with only in passing, with the 386 IC. Much better audio chips are available now and should have been included. A poorly conceived audio stage can make an otherwise excellent receiver sound like a piece of junk.

If I ever set out to write a book like this, I think I'd have the reader construct a series of modules that would eventually end up as a complete transceiver or separate receiver and transmitter. Although each circuit is described thoroughly and is interesting by itself, when you finish the book you're just going to have a pile of circuits. Nowadays, knowing how to integrate modules is as important as designing the modules themselves.

To excuse the lack of focus, you could say this book wasn't written exclusively for hams, although we'll probably be its biggest market. But if Joe intends the book to appeal to "professionals," why the heavy emphasis on direct-conversion receivers? An entire chapter is dedicated to them; nothing approaching equal coverage of superheterodyne receivers is to be found. It's obvious that Joe hopes to sell a lot of copies of this book to hams, but some of amateurs build superhets, too. So why not include some transmitter circuits? And although the title says the book covers "projects and experiments," I couldn't find any experiments.

Amateur Radio definitely needs a project-oriented text. The ARRL's *Solid State Design* is in many ways out of date. When I first saw *Mastering Radio Frequency Circuits*, I hoped it would be a fitting replacement for *Solid State Design*, but it's not. If you want to learn by doing about radio circuits and have some useful pieces of equipment when you're finished, *Solid State Design* is still the best value. *Mastering Radio Frequency Circuits* has value as a compendium of circuits, and the text contains valuable information. In fact, compared to other offerings on the market, this book seems underpriced. But I don't think you'll master RF by using it. QST

Nickel-Metal-Hydride Batteries in Amateur Radio Applications

Meet the newest power source for portable equipment: the NiMH battery

By Gary Kuusisto, N6TCF
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Apartment 2014
The Woodlands, TX 77381

Most hams are familiar with nickel-cadmium (NiCd) batteries, used in our hand-held transceivers. NiCd batteries offer the possibility of hundreds of charge-discharge cycles, and reasonable energy capacity. Nickel-metal-hydride (NiMH) batteries have voltage profiles and usable lifetimes similar to NiCd batteries, but offer 30 to 40% greater energy capacity. What's more, when a NiMH battery has reached the end of its career, you can dispose of it without risk of polluting the environment with cadmium, a toxic metal. Because the two battery types are so much alike, it is easy to substitute a NiMH battery where a NiCd is used now.

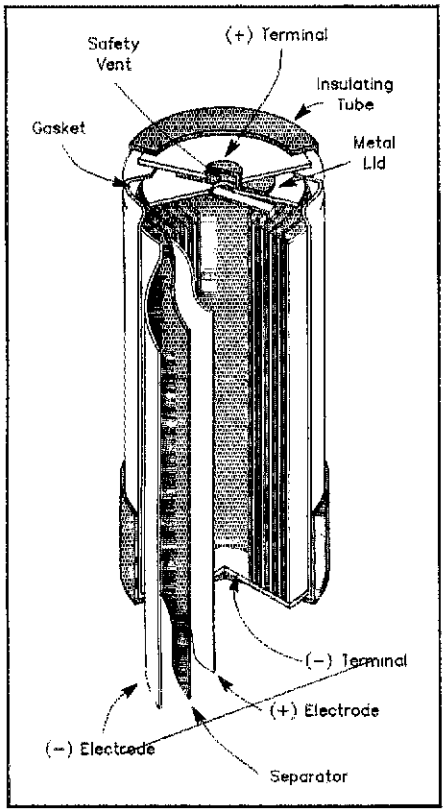

Figure 1—Cutaway drawing of a nickel-metal-hydride (NiMH) cell. Except for the cathode, which is made of hydrogen-storage metal instead of cadmium, construction is very similar to that of the nickel-cadmium (NiCd) cell. Hydrogen-storage metal is preferred because it is less toxic than cadmium, and gives the NiMH cell a greater energy storage capacity.

Similar Construction/Better Performance

NiMH cell construction is similar to that of NiCd cells. In fact, they use many of the same components. In either a NiCd or NiMH cell, the positive plate is made of nickel and the electrolyte is potassium hydroxide. The only difference lies in the choice of metal used for the negative plate (Figure 1). NiCD cells have cadmium negative plates, while hydrogen storage metal is used in NiMH cells. During a charging cycle, the hydrogen storage metal plate absorbs hydrogen, which it releases when the cell is discharged, allowing current to flow.

NiMH batteries operate over the same temperature range as NiCd batteries (–20° to 60°C (–4° to 140°F).

Hydrogen storage metal is a compound capable of storing a quantity of hydrogen gas hundreds of times its own volume, at less than atmospheric pressure. This feature gives NiMH batteries up to 40% more capacity than NiCD batteries of the same size.

Figure 2 demonstrates the higher energy density of NiMH batteries over NiCd and lead-acid batteries. Higher energy density is especially important for portable equipment like hand-held transceivers. NiMH batteries of equivalent capacity will weigh less than NiCd counterparts. Of perhaps more importance, you'll be able to operate for longer periods without discharging your batteries. Hams active in public-service communication will appreciate the longer discharge cycle.

Discharge Performance of NiMH Cells

Figure 3 graphs the voltage curves for NiMH and NiCD cells over a typical discharge cycle. At full charge, a single NiMH cell has a terminal voltage of 1.35 V, which quickly drops to a nominal 1.2 V. The recommended low-voltage cutoff for both cell types is 1.0 V. As you can see in Figure 3, the greatest difference between the two curves is that the NiMH cell has a much greater capacity.

One difference between NiCd and NiMH cells is their maximum discharge current. At high discharge rates (3 or more amperes), an AA NiMH cell has less ampere-hour capacity than its NiCD counterpart. The reason is the higher internal resistance of the NiMH cell. Fortunately, this characteristic isn't a problem for most devices, and the discharge voltage remains stable.

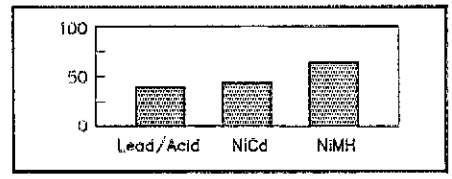

Figure 2—Energy density and specific energy of common rechargeable cells, in watt-hours/kg. Higher energy density means that, for a given battery weight, you get more hours of operation.

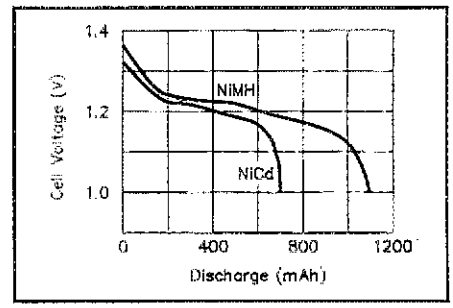

Figure 3—Discharge curves for NiCd and NiMH cells. Both cells behave similarly near the end of their discharge cycles, making NiMH cells compatible with low-voltage cutoff circuits in battery-powered equipment.

Charging NiMH Cells

NiMH cells are very sensitive to overcharging. Although this is also true for NiCd cells, a NiMH cell will have drastically reduced capacity after a couple of abusive charging cycles. A constant-current charger coupled with an end-of-charge controller will provide more than 500 charge/discharge cycles from a NiMH cell.

At full charge, the terminal voltages of both NiCd and NiMH cells drop slightly. This *negative delta V (voltage)* point is sensed by many advanced charge-control systems and used to terminate charging. At full charge, the state of charge of the cell no longer changes. The cell begins to act like a resistor and dissipates the charging current as heat. This rise in cell temperature causes a drop in both the cell's internal resistance and voltage.

The standard charging technique for NiMH batteries uses a constant current. If the battery is fully discharged, energy equal to 150% of its capacity is applied to fully charge it. For example, NiMH cell rated at 1100 mAH capacity is charged at 110 mA for 15 hours, for 1650 mAH of charge. The allowable temperature range during charging is 0° to 45°C (32° to 113°F). Charge control, which is essential for NiMH cells, can be accomplished either by sensing the cell voltage or temperature.

Storing NiMH Batteries

Allowable storage temperatures for NiMH batteries are from –20° to 35°C (–4° to 95°F). NiMH batteries return to service quickly when stored in a discharged state (terminal voltage less than 1.0 V per cell). After a couple of charge/discharge cycles they will deliver full capacity. What about when NiMH batteries are stored charged? In this type of service, NiMH batteries don't perform as well as NiCd batteries. When stored at room temperature, a fully charged NiMH battery will be completely discharged after 15 days. NiCd batteries, on the other hand, will retain their charge for 30 to 60 days. If you use and recharge your batteries frequently, this characteristic isn't a disadvantage.

Long-term overcharge and shallow discharge of NiMH batteries may lead to slightly lower terminal voltage over the life of the battery.

Conclusion

NiMH batteries offer higher energy density and an environmentally safer chemistry. On the other hand, NiMH batteries have poorer charge retention, higher internal resistance and more specialized charging needs than NiCds. Making the transition from NiCd to NiMH batteries requires users to accommodate slightly different charge, discharge and storage characteristics, but the two types are essentially interchangeable.

Acknowledgment

I referred to *NiMH Technical Notes* (Bethel, CT: Duracell, Inc) while preparing this article. QST

New Products

CT KEYBOARD TEMPLATES

◊ In the heat of a contest, who has time to concentrate on remembering all the commands in K1EA's *CT* logging software? When the QSOs are rolling in, it's no time to press Alt-H for a help screen or search through the manual. Contest Assistant is a set of precut templates for most standard 101-key keyboards (a set for Gateway AnyKey keyboards is also available). They show the commands available on all the keys programmed by *CT*, including all shifted (Shift, Alt, Ctrl) key combinations. They're made of heavy, plastic-laminated material (in a manila-envelope color to stand out on most keyboards), in a two-piece design for easy storage or uncut for custom use. Retail price is $7.50 for the ready to use version, $4.50 for the uncut kit (s/h $1.25). VCH Products, 7433 Popp Rd, Ft Wayne, IN 46845; tel 219-627-2604.

COMPUTERIZED ROTATOR CONTROLS

◊ When trying to focus a Yagi on a distant station, it can be slow and confusing to mentally convert a beam heading to a direction on the face of a rotator-control box. A new unit from Pro-Search provides digital conversion of beam headings (easy to note in your log) with a 360° readout in continuous 1° increments on a 1½-inch-wide, ½-inch-high display. It works with all 8-wire CDE rotators. Retail price is $59.95 plus s/h.

The shack of the '90s can be automated further with the PSE-1 series computerized rotator controllers, with automatic braking and programmable features. It even "talks" and scans directions. A 16-button control panel lets the operator directly enter the desired antenna azimuth or turn the antenna manually with directional control buttons. There are presets for five continents and users can assign favorite beam headings to memories. It's compatible with HAM-M, HAM-II, HAM-III, HAM-IV, Tailtwister, HDR-300 and other popular rotators with no modifications. Retail prices range from $189.95 to 469.95. Pro-Search Electronics, 1350 Baur Blvd, St Louis, MO 63132; tel 800-325-4016 or 314-994-7872

VHF/UHF ANTENNAS

◊ Extra range comes in handy when you try to punch your signal through the increasingly busy bands from 144 to 1300 MHz. A new family of rugged, optimized, high-performance Yagi antennas is available for FM, ATV and packet radio applications. The 2-meter antennas for FM and packet include the 4-element COY2M4EL for $59 and the 3-element COY2M3EL "Stealth" for $65. FM and packet antennas for 223 to 225 MHz include the 4-element COY2234EL for $65 and the COY2235EL for $59. The 70-cm antennas include the 3-element COY4393EL for packet and ATV on 427 to 441 MHz at $49, and two 7-element models: the COY4347EL for ATV, repeater links and SSB on 420 to 440 MHz for $65 and the COY4407EL for FM on 440 to 450 MHz for $65. The 16-element COY23CM16EL covers ATV, links and FM on 1240 to 1300 MHz at $110. The COY2M440 is a dual-band vertical folded monopole for 2 meters and 70 cm at $49. Swiech Communication Systems, 12218 Greentree Rd, Poway, CA 92064; tel 619-748-2286.

WATTMETER CONVERSIONS

◊ You can go crosseyed trying to follow some average-reading analog wattmeteers, such as those used on Collins 312B-4/5 consoles. C. J. Hawley, KE9UW, designed the PDC-1 as a simple peak-detector circuit to convert almost any averaging-type wattmeter to a peak-reading wattmeter with an adjustable needle hang time. At only 2×1½ inches, it's been installed inside Drake, MFJ, Daiwa, Ten-Tec, Heathkit, Nye Viking, Bird and other wattmeters. Retail price is $19.99 for the ready to assemble kit. Floyd Soo, KF8AT, Hi-Res Communications Inc, 18464 Ash Creek Dr, Macomb, MI 48044; voice or fax 810-228-1600.

CODE KEYS

◊ True-blue CW fans and collectors will be impressed with the fine craftsmanship and styling of a new series of imported German code keys, including the $149.95 mini, the $164.95 mobile key, the $169.95 Portable Warbler, the $199.95 Profi and the $209.95 mahogany base straight key. Schurr Morse Keys, Electronic Switch Co Inc, Suite E-6, 4343 Shallowford Rd, Marietta, GA 30062; tel 404-518-4634. QST

A Smart Charger For Nickel-Cadmium Batteries

Recharge your hand-held's battery pack FAST, with this easy weekend project.

By Steven Avritch, WB1EOB
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Forestville, CT 06011-9303

Wouldn't we all like to thank the people who invented NiCd rechargeable batteries? NiCd batteries save us from spending countless dollars on throw-away (and expensive) conventional (nonrechargable) alkalines. Everyone familiar with NiCds also wishes they were easier to charge. Trickle charging takes forever, but speeding up the process can damage batteries by overcharging. We all know that NiCds must be charged correctly or battery life is significantly reduced. Since Mother Nature isn't about to change the rules for charging NiCds, a Smart Charger is needed. This article describes a simple yet sophisticated NiCd battery "quick" charger. This Smart Charger is based on the MAX713 single-chip battery charger. The unit continuously monitors the battery during fast charge and automatically switches over to trickle charge when the battery is full—eliminating any possibility of overcharge.

MAX713 Single-Chip Battery Charger

The MAX713 single-chip charger can fast charge and trickle charge any NiCd battery pack containing from 1 to 16 cells (ie, battery pack voltages ranging from 1.2 to 19.2 V). The charger in this article, however, is limited to packs having a maximum of nine cells, because of the 12-V wall adapter power supply. Charge rates are programmable from 4C (20-minute charge) to C ÷ 3 (4-hour charge), where C is the capacity of the battery in milliampere-hours (mA-h). The trickle charge rate is fixed at C ÷ 16. The MAX713 uses three different techniques to determine when to end the fast charge and switch over to trickle. These techniques are:

- Voltage peak detection
- Battery temperature
- Time.

Voltage peak detection is the best method to determine when a NiCd battery is fully charged. As NiCd batteries charge, the voltage across the battery slowly increases. This voltage peaks when the battery is fully charged and then drops off slightly (see Figure 1). The MAX713 continuously samples the battery voltage and shuts down when the voltage peak is detected. Also, if the battery voltage does not peak within a preset timeout period, fast charge is terminated.

The MAX713 also has provision for thermally protecting the battery during the charge cycle. A high-temperature shutoff will terminate the charge cycle if the battery temperature exceeds a preset limit. Also, a low- (cold) temperature shutoff will not allow fast charging until the battery temperature reaches another preset limit. The temperature-detection features are optional and require the addition of three thermistors and a few other parts. One of the thermistors must be in contact with the battery, which is not practical with sealed battery packs. To simplify the project, the Smart Charger does not use temperature detection. Note that temperature detection *is* recommended if the charge rate selected is greater than 2C.

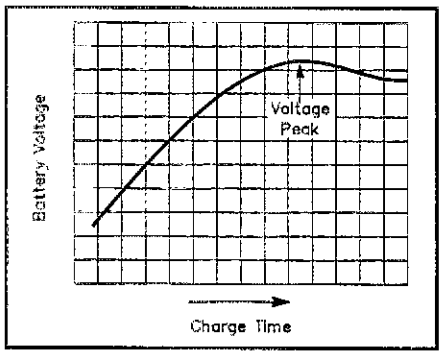


Figure 1—The terminal voltage of a NiCd cell increases as the cell is charged. Once the cell is fully charged, though, the terminal voltage drops slightly. The Smart Charger detects this drop and automatically switches to trickle charging.

Design Overview

This charger is capable of charging battery packs from one to nine cells (1.2 to 10.8 V). The number of cells in the pack to be charged must be programmed into the MAX713 by connecting the PGM pins of the 713 as defined in Table 1. This design assumes that the battery pack(s) to be charged will always have the same number of cells. If you wish to build a charger capable of charging battery packs with varying numbers of cells, switches must be added to change the PGM pin connections according to the battery to be charged.

The charging section is simply the MAX713 and a few external components (see Figure 2). The entire circuit is powered by an inexpensive 12-V dc wall adapter. The current capacity of the adapter should be at least 50 mA greater than the preprogrammed fast-charge rate current (ie, if the fast charge rate current is 250 mA, then the wall adapter should be rated for at least 300 mA).

Designing a Charger

A few decisions must be made before the design can begin:

- Wall adapter voltage (minimum)
- Number of cells in pack to be charged
- Fast charge rate
- Time-out period (maximum time in fast charge).

The following charger design is for a 7.2-V, 500-mAh battery pack, the kind that come with many hand-helds. The wall adapter voltage should be at least 1 V higher than the battery being charged. The number of cells in the pack is determined by dividing the pack voltage by 1.2; the 7.2-V pack contains 6 cells. The charge rate is selected

Table 1
Maxim MAX713 Programming for 1- to 16-Cell Packs

No. of Cells	*PGM1*	*PGM0*
1	V+	V+
2	OPEN	V+
3	REF	V+
4	BATT–	V+
5	V+	OPEN
6	OPEN	OPEN
7	REF	OPEN
8	BATT–	OPEN
9	V+	REF
10	OPEN	REF
11	REF	REF
12	BATT–	REF
13	V+	BATT–
14	OPEN	BATT–
15	REF	BATT–
16	BATT–	BATT–
OPEN	Not connected	
BATT–	Connect to pin 12	
REF	Connect to pin 16	
V+	Connect to pin 15	

to be C ÷ 2 (250 mA), which will result in a charge time of approximately 2.5 hours. The charge time is calculated by:

Charge time = C ÷ (charge rate × 0.8). (Eq 1)

The 0.8 accounts for the fact that the charging process is only about 80% efficient.

Therefore, for this design:

- Number of cells = 6
- Charge rate = C ÷ 2 (250 mA)
- Time-out = 2.5 hours (150 minutes)
- The wall adapter is 12 V dc, rated at 300 mA.

There are four steps in the charger design:

1. Calculate the power dissipation in Q1
2. Calculate the value of R1
3. Calculate the value of R_{SENSE}
4. Determine the PGM pin connections.

Step 1

Check to ensure that the power dissipated in the PNP transistor (Q1) does not exceed the maximum power rating of the transistor. The power dissipated by Q1 is calculated by:

Power (Q1) = (max adapter V – minimum battery V) × charge rate (A) (Eq 2)

The minimum battery voltage will be 1.0 × number of cells, or 6.0 V.

In our case, the power dissipated by Q1 is:

$Power_{Q1} = (12 - 6.7) \times 0.250 = 1.50$ W

Make sure that the power dissipation rating of Q1 exceeds 1.5 W.

Table 2
Maxim MAX713 Programming for Various Time-Out Periods

Time-Out Period (Minutes)	*PGM3*	*PGM2*
22	V+	REF
33	V+	BATT–
45	OPEN	REF
66	OPEN	BATT–
90	REF	REF
132	REF	BATT–
180	BATT–	REF
264	BATT–	BATT–

See Table 1 for explanation of programming pin connections.

Step 2

The value of R1 (refer to Figure 2) is calculated by:

R1 (kΩ) = (minimum adapter V – 5) + 5 (Eq 3)

In our case, R1 = (12 – 5) + 5 = 1.4 kΩ

Step 3

The value of R_{SENSE} (refer to Figure 2) is calculated via the following equation:

R_{SENSE} (Ω) = (0.25) ÷ charge rate (A) (Eq 4)

In our case,
R_{SENSE} = (0.25 ÷ 0.250) = 1 kΩ

Step 4

The last thing to do is determine how to connect the four PGM pins on the MAX713. PGM0 and PGM1 determine the number of cells in the pack (6 in our case) and should be connected according to Table 1.

PGM2 and PGM3 determine the max charge time, which should be connected according to Table 2 (150 minutes in our example; note that 150 minutes is not in the table, therefore we'll select the next greater

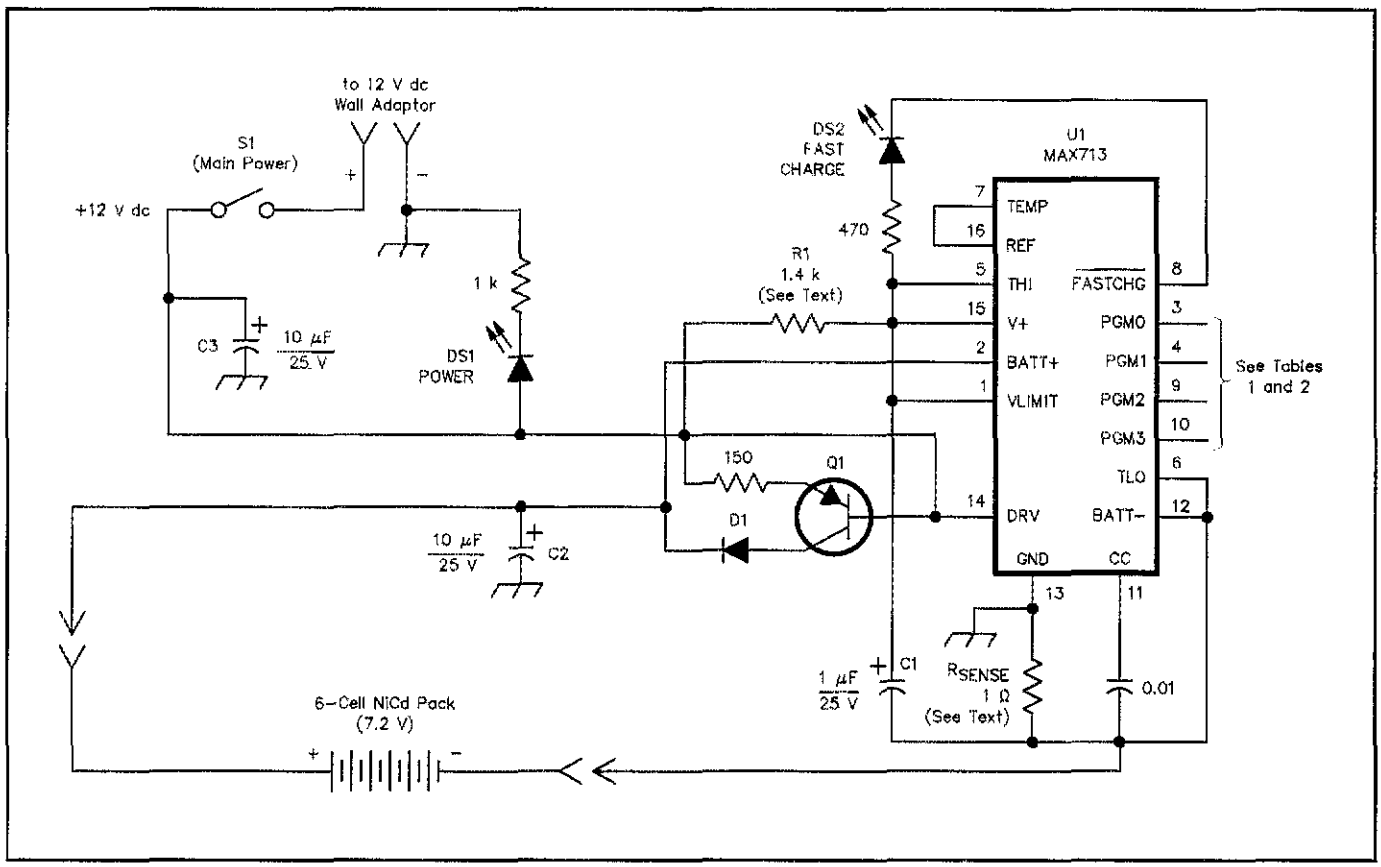


Figure 2—Schematic diagram of the Smart Charger, as set up to charge a 7.2-V pack. All parts except the Maxim MAX713 are available from Radio Shack stores. See text for details.

D1—1N4001 or eqivalent.
DS1—Green LED (Radio Shack 276-022).
DS2—Yellow LED (Radio Shack 276-021).
Q1—MJS2955 PNP power transistor (Radio Shack 276-2043 or equivalent; see text).
R1—1.4 kΩ (see text).
R_{SENSE}—1 Ω (see text).
S1—SPST switch (Radio Shack 275-612).
U1—Maxim MAX713CPE single-chip battery charger.
Misc—The wall-cube power supply used in this project is a Radio Shack 273-1652. The charger is housed in a plastic project box (Radio Shack 270-627).

value of 180 minutes).

The PGM pins for our design need to be connected as follows (6-cell pack with time-out at 180 minutes):

Pin	Connect To
PGM0	NO CONNECTION
PGM1	NO CONNECTION
PGM2	REF
PGM3	BATT–

When the Smart Charger is turned on, the MAX713 charger circuit is connected to the battery, and fast charge begins. When the voltage peaks or the time-out is reached the charger reverts to trickle charge.

Construction and Checkout

Simply wire the circuit according to the schematic.

Connect a milliammeter in line at the positive terminal of the battery. Also, connect a voltmeter across the positive and negative terminals of the battery. Place a half-charged battery in the charger and turn on the power; the **FAST CHARGE** indicator should light.

The voltage will slowly rise and the milliammeter should indicate the maximum charge rate as designed (250 mA in our example). After the battery voltage peaks or the fast charge time-out (2.5 hours) has passed, whichever comes first, the **FAST CHARGE** light should go out and the charge rate should decrease to approximately C ÷ 16 (approximately 500 ÷ 16, or 31 mA).

Getting the Parts

All parts except the MAX713 can be obtained from Radio Shack. The 1-Ω resistor is available from Radio Shack in a package with many resistors of different values. Some parts were selected only because they are standard Radio Shack stock. For example, the 100-W PNP transistor (Q1) is overkill; it could be replaced with a smaller device.

I used a 6-cell battery holder, which cannot be obtained at Radio Shack. Radio Shack sells a variety of cell holders, though. To charge six cells in series, use a 4-cell and a 2-cell holder. Like my 6-cell holder, these holders use a 9-V battery connector, also available from Radio Shack.

The MAX713 chip or a complete set of parts including the chip are available from the author.[1]

[1]The following parts are available from:

Simple Design Implementations, PO Box 9303, Forestville, CT 06011-9303 203-582-8526

1. Maxim MAX713CPE single chip battery charger: $10 + $1.50 shipping and handling.
2. Complete kit of parts, including perforated board, case, wall adaptor: $30 plus $3.00 shipping and handling.

QST

New Books

EMERGENCY RADIO!

By Norm Schrein, KA8PGJ

Published by Index Publishing Group Inc, 3368 Governor Dr, Suite 273F, San Diego, CA 92122; tel 800-546-6707 or 619-281-2957; fax 619-281-0547. First edition, 1994, paperback, 8½×5½ inches, 214 pp, B&W photographs. $14.95 plus $3 s/h.

Reviewed By Brian Battles, WS1O
QST *Features Editor*

"*It's a dessert topping...It's a floor wax...*" The old *Saturday Night Live* "Shimmer" ad-parody skit comes to mind when I try to think of how to describe this book. "*It's a frequency directory...It's a public service communication guide....*" Surprise! It's a little of both, but it doesn't cleanly fit either category. When I first saw it, I expected it to be another tourist guide to scanning police and fire radio, with lists of frequencies, monitoring tips, etc. I was wrong. It's not a typical scanner book in the traditional sense. Author Norm Schrein, KA8PGJ, takes us to the other side of the scanner hobbyist's world. He profiles law-enforcement and public safety officers in a sort of "you are there" style. The radio portion of the book is, in fact, sometimes underplayed.

The subtitle is *Scanning news as it happens*...and that's an appropriate description. This is the printed counterpart to real-life action TV shows like *Cops*, *Rescue 911* and so on. Norm rides with the police officers, firefighters, emergency medical technicians and volunteers as they patrol our communities and respond to calls. Each chapter focuses on one particular local agency, with titles that include Headshot in a Heartbeat—The Cincinnati SWAT Team, The Gangs of Ft Worth, Hams and the Miamisburg Disaster, EMS Indy Style, Women in Police Work, Saginaw Saturday Night, Working Side-By-Side, A Tampa Fire and Rescue Story, Ham Radio—Nothing Amateur About It, Hoover Dam—The "Dam Police," Security at Both Ends of Pennsylvania Avenue, and America's Front Line.

There's a fair amount of radio-related info and lists of interesting frequencies, but this is primarily a book about the work these people do. Radio communication is discussed mainly in terms of how it's used as a part of general operations of various agencies, not as the principal topic. Some topics are fascinating to read about. It's not all cops and robbers—although there's a fair share of them here—but Norm also brings you along on visits with traffic reporters for broadcast stations, US Border Patrol agents, Major League baseball teams, Las Vegas casinos, the US Postal Inspection Service, federal prison personnel, marine services and more. This is unusual and interesting stuff that you just don't often get to read about.

Any book has shortcomings, however, and this one has a few. First, packing 36 chapters into a 214-page book means that the chapters are all short—most only two or three pages—and you'll find yourself wishing some of them were longer and delved into more detail. There's also a distressing lack of an index—surprising in a book as thoughtfully researched as this. I'd have liked an appendix or two giving frequency listings and specific data on what to monitor. This information is sprinkled throughout the text, so you do get the info, it's just not all in one convenient place. Besides, there are dozens of "complete" (and redundant) scanner frequency guides available from other sources, so I guess the publisher felt that most scanner enthusiasts will go elsewhere if they want books chock-full of lists, directories and tables.

There's no doubt that the author is an established authority on the subject of monitoring emergency and public service communications. Billed as "Mr Scanner," Norm edits the *Betty Bearcat Frequency Directories* and the *Fox Scanner Radio Listings Directories*, and his credits include serving as president of the Bearcat RC, as a former police officer and as a firefighter. Even former US Senator Barry Goldwater, K7UGA, who's profiled in a chapter entitled A Radio Pioneer, provided a quote for the book's back cover: "An excellent job..."

Well, Senator, I do believe I agree.

QST

Exploring the Internet—*Part 1*

By Steve Ford, WB8IMY
Assistant Managing Editor
(Internet address: sford@arrl.org)

WELCOME TO CYBERSPACE

Someone once said that you can examine the most intricate details of the human brain and never find the mind. You can also disassemble every computer in the world and never find *cyberspace*.[1] Like the mind, cyberspace is more than simply the sum of its parts. It's a vast community with millions of inhabitants. Cyberspace is an alternate reality, a kind of global consciousness that our computer networking technology has created. It's intangible—just like the mind—but very real nonetheless.

The denizens of cyberspace are people like you and me. Their thoughts, feelings and knowledge enter cyberspace at their keyboards and are available to every other "cybernaut" in the world. You could be "jacked into" (more *cyberspeak*) a huge Cray mainframe or a Commodore 64—it doesn't matter. The computer type is unimportant as long as you can use it to access whatever network is available to you.

Information flows through cyberspace at up to 45 *million* bits per second. (Soon it will flow at rates exceeding 2 *billion* bits per second.) The never-ending data stream travels through an electronic nervous system composed of telephone lines, fiber-optic circuits, satellite links and so on. If cyberspace is the global mind, the physical network is the brain and body, better known as the *Internet*.

The Information Superhighway

When you hear politicians and media personalities speak of the Information Superhighway, they're often talking about the Internet. Thinking of the Internet as a highway isn't a bad idea. Imagine eight-lane freeways connecting large cities. From these large cities you find smaller freeways linking small towns.

The eight-lane highways comprise the Internet *backbone*. Connected to this are computers that transfer data at high speeds. Connected to the backbone are smaller networks serving particular geographic regions (exits off the highway). Feeding off these are even smaller networks or individual computers. The ARRL Headquarters local area network (LAN) is one of these.

There's no central computer at the core of the Internet. Instead, the Internet is a composite creature made of thousands of systems scattered throughout the world. How many computers and networks comprise Internet? No one knows. Some people say that there are as many as 5000 networks connecting nearly 2 million computers and more than 15 million people.

How Does it Work?

Data moves through the Internet using *packet-switching* techniques. That is, pieces of data are transported in packets of a specific size. The packets are handed off from one network and computer to another like batons in a relay race. Like amateur packet radio, Internet packets are occasionally retransmitted if the data is corrupted at any point along the way.

Every computer connected to the Internet has a unique address. This address is included in every data packet sent to a particular destination. By analyzing the address, the network "knows" how to route each packet efficiently. In addition, the flow of data between networks and computers is automatically managed according to how busy the system is at the moment, speeding up or slowing down as necessary. The system used to move data through the Internet in this fashion is known as Transmission Control Protocol/Internet Protocol, or *TCP/IP*.

By tapping into Internet, you open a world of amazing possibilities. You can:

✔ Exchange electronic mail (e-mail) with friends around the world. Internet e-mail moves at high speed and is relatively reliable. You can use Internet e-mail to contact anyone on the ARRL Headquarters staff. I'll tell you how next month in Part 2 of this series.

✔ Enter the USENET *newsgroups* and participate in discussions on almost any topic imaginable. There are several newsgroups devoted to Amateur Radio topics.

✔ Tap into thousands of information data bases and libraries worldwide. The ARRL maintains an *Infoserver* with a large inventory of valuable information. In Part 2 of this series I'll give you a step-by-step description of how to use this service via the Internet.

✔ Retrieve thousands of documents, journals, books, computer programs, images and sound files.

✔ Operate distant computers by remote control. One of the Internet's earliest capabilities was to allow researchers, students and scientists to run programs on powerful processors at distant computers to obtain results beyond the capabilities of their own local data-processing equipment. Clever applications have been developed that allow you to play games, retrieve call sign directory information and even determine a geographic location's latitude and longitude.

Amateur Radio TCP/IP

Packet operators who use TCP/IP are operating on a pseudo-Internet, although they may not know it. The group of programs hams call TCP/IP is actually an adaptation of Internet TCP/IP. If an Internet user saw an amateur TCP/IP system in

[1] *Cyberspace* is a word derived from the term *cybernetics* (which uses the prefix *cyber-*, Greek for *to steer* or *govern*), the science of augmenting living organisms with mechanical or automatic devices to perform specialized or enhanced control functions. Cyberspace is, therefore, a fanciful expression that describes humans operating in an "electronic universe" where they use electronic computers to communicate and control remote devices by transmitting data via digital links (over telephone wires, fiber-optic cables, RF circuits, etc).

operation, he or she would recognize it right away.

As a group, the amateur TCP/IP networks are known as *AMPRNET* (Amateur Packet Radio Network). Not all AMPRNET networks connect to the Internet, however. Many provide coverage throughout a state or region, but do not tap the vast global network.

On the other hand, some AMPRNET networks *do* connect to the Internet superhighway. For example, you might be able to connect to a packet station that's operating a *gateway* to Internet. Depending on how it is configured, you can use a gateway to send e-mail, transfer files or even enjoy live discussions with hams across the globe. Everything sent to and from the gateway is dispatched via the Internet backbone. The result is a tremendous increase in speed and coverage that would be impossible on normal packet-radio networks.

Getting started on amateur TCP/IP isn't difficult. If you own a VHF or UHF transceiver and a Terminal Node Controller (TNC), you're almost there. You only need TCP/IP software for your computer and an AMPRNET address. The software is available free from many sources and there's a coordinator in your state or region who issues addresses. The details of amateur TCP/IP go beyond the scope of this article, so I recommend you pick up a copy of *NOSIntro* by Ian Wade, G3NRW. It's available from your favorite dealer or directly from the ARRL. (See the *ARRL Publications Catalog* elsewhere in this issue.)

Amateur Radio TCP/IP is fun, but it's not the best way to access the Internet. Ham networks are slower, so transferring even moderate amounts of information can be a painful exercise. In addition, there are restrictions on how Internet gateways may operate according to FCC third-party traffic rules. If you want to experience the full benefits of the Internet, you need a more direct connection.

Merging onto the Information Superhighway

Your journey through cyberspace begins with your computer. Although you can use just about any computer to access the Internet, I recommend a modern machine with a large hard disk. You'll need the storage capacity for all the information you're going to grab off the network. An efficient, up-to-date computer makes the job much easier.

The next item you must consider is a *modem*. The modem is the interface between your computer and your telephone line. Speed is essential. I consider 2400 bit/s to be the *minimum* requirement. A 9600 bit/s modem is much better. If you can push the throttle to 14400 bit/s or 28800 bit/s, go for it. When you're connected, time often equals money! The faster your modem, the less time you'll need to spend on line.

The only software you'll need is a terminal program to communicate with your modem.

You can spend as little as a few dollars for a shareware program or hundreds of dollars for sophisticated software. (Some Internet access services require special software. The software is usually provided by the service.)

You'll find Internet connections at colleges and universities, corporations, government agencies, nonprofit organizations, military installations and elsewhere. The place where you work or go to school may have Internet access you can use right now. Talk to your computer department and see what's available.

There are public access sites that offer Internet services for a fee. See the sidebar, "Internet Public Access." If you can't tap a public access site, you can enjoy Internet activities through commercial on-line services. CompuServe, GEnie, Prodigy and MCI offer access to Internet e-mail only. America On-Line and Delphi provide full Internet access, allowing you to transfer files, chat "live" with other users and so on.

You can reach the Internet through BIX (the *Byte* Information Exchange). BIX offers access to the Internet as part of its basic service. For information, call 800-695-4775. PSI, based in Reston, Virginia, provides nationwide access to Internet services to owners of IBM-compatible computers. Special software is required, but it's available free from PSI. For information, call 800-82PSI82 or 703-620-6651.

Internet Public Access

The following sites provide public access to Internet (usually requiring a monthly or yearly charge). You may not need to live in or near the cities shown to use many of these services. Call the numbers shown for information

Alabama
Nuance, tel 205-533-4296

Alaska
Anchorage. University of Alaska Southeast, *Tundra Services*, tel 907-465-6453

Alberta
Edmonton, *PUCNet* Computer Connections, tel 403-448-1901

Arizona
Phoenix, *Internet Direct*, tel 602-324-0100
Tucson, *Data Basics*, tel 602-721-1988
Tucson, *Internet Direct*, tel 602-274-0100

British Columbia
Victoria Free-Net, tel 604-389-6026

California
Berkeley, *Holonet*, tel 510-704-0160
Cupertino, *Portal*, tel 408-973-9111
Irvine, *Dial N' CERF USA*, See San Diego
Los Angeles/Orange County, *Kaiwan Public Access Internet*, tel 714-638-2139
Palo Alto, *Institute for Global Communications* (local conferences on environmental/peace issues), tel 415-442-0220
San Diego, *Dial N' CERF USA*, tel 800-876-2373
San Diego, *CTS Network Services*, tel 619-637-3637
San Francisco, *Pathways*, tel 415-346-4188
San Jose, *Netcom* (Maintains archives of USENET postings), tel 408-554-UNIX
Sausalito, *The Whole Earth 'Lectronic Link (The WELL)*, tel 415-332-4335; recorded message about the system's current status, tel 800-326-8354 (continental US only)

Colorado
Colorado Springs/Denver, *CNS*, tel 719-592-1240
Colorado Springs, *Old Colorado City Communications*, tel 719-632-4848
Golden, *Colorado SuperNet* (available only to Colorado residents, Local dial-in numbers available in several Colorado cities), tel 303-273-3471

District of Columbia
The Meta Network, tel 703-243-6622
CapAccess, tel 202-994-4245

Florida
Tallahassee, *Tallahassee Free-Net*, tel 904-488-5056

Illinois
Champaign, *Prairienet Free-Net*, tel 217-244-1962
Chicago, *MCSNet*, tel 312-248-UNIX
Peoria, *Peoria Free-Net*, tel 309-677-2544

Maryland
Baltimore, *Express Access*, tel 800-969-9090
Baltimore, *Clarknet*, tel 410-730-9765

Massachusetts
Brookline, *The World* (large collection of MS-DOS files, "Online Book Initiative" collection of electronic books, poetry and other text files), tel 617-739-0202
Lynn, *North Shore Access*, tel 617-593-3110
Worcester, *NovaLink*, tel 800-274-2814

Michigan
Ann Arbor, *MSEN*, tel 313-998-4562
Ann Arbor, *Michnet*, tel 313-764-9430

New Hampshire
MV Communications Inc, tel 603-429-2223

New Jersey
New Brunswick, *Digital Express*, tel 800-969-9090

New York
New York, *Panix*, tel 212-877-4854
New York, *Echo*, tel 212-255-3839
New York, *MindVox*, tel 212-989-2418
New York, *Pipeline* (has graphical interface for Windows), tel 212-267-3636
New York, *Maestro*, tel 212-240-9600

North Carolina
Charlotte, *Vnet Internet Access*, tel 704-374-0779

Ohio
Cleveland, *Cleveland Free-Net*, tel 216-368-8737
Cleveland, *Wariat*, tel 216-481-9428
Dayton, *Freelance Systems Programming*, tel 513-254-7246
Lorain, *Lorain County Free-Net*, tel 216-366-4200

Ontario
Toronto, *UUNorth*, tel 416-225-8649
Toronto, *Internex Online*, tel 416-363-8676

Oregon
Portland, *teleport*, tel 503-223-4245

Pennsylvania
Pittsburgh, *telerama*, tel 412-481-3505

Quebec
Montreal, *Communications Accessibles Montreal*, tel 514-931-0749

Rhode Island
Providence/Seekonk, *Anomaly*, tel 401-273-4669

Texas
Austin, *RealTime Communications*, tel 512-451-0046
Dallas, *Texas Metronet*, tel 214-705-2900
Houston, *The Black Box*, tel 713-480-2684

Virginia
Norfolk/Peninsula, *Wyvern Technologies*, tel 804-622-4289

Washington
Seattle, *Halcyon*, tel 206-955-1050
Seattle, *Eskimo North*, tel 206-367-7457.

Next Month

In the next issue we'll get down to the nitty-gritty of how to contact the ARRL via the Internet and explore the services we have to offer. In Parts 3 and 4, Scott Ehrlich, WY1Z, will show you how to "ftp" (transfer) files, go digging with *gopher* and more. Until then, see you in **CYBERSPACE**.

Cyberspace Reading

B. Aboba, *The Online User's Encyclopedia: Bulletin Boards and Beyond*, (Reading, MA: Addison-Wesley, 1994).

D. P. Dern, *The Internet Guide for New Users*, (New York: McGraw-Hill, 1994).

A. Engst, *Internet Starter Kit for Macintosh*, (Indianapolis: Hayden Press, 1993).

P. Gilster, *The Internet Navigator*, (New York: John Wiley, 1993).

H. Hahn, and R. Stout, *The Internet Complete Reference* (Berkeley: Osborne McGraw-Hill, 1993).

E. Krol, *The Whole Internet: User's Guide & Catalog* (2nd ed. Sebastapol, CA: O'Reilly & Associates, 1994).

T. LaQuey, *The Internet Companion Plus: A Beginner's Start-Up Kit for Global Networking* (Reading, MA: Addison-Wesley, 1993).

R. Smith and M. Gibbs, *Navigating the Internet* (Carmel, Indiana: SAMS Publishing, 1993).

J. R. Levine and C. Baroudi, *The Internet for Dummies* (San Mateo, California: IDG Books Worldwide Inc).

QST

New Books

NATIONAL RADIO CLUB AM RADIO LOG, 14th EDITION

By Ken Chatterton

Published by National Radio Club, PO Box 164, Mannsville, NY 13661-0164; 350 pp, 8½x11 inches, looseleaf in a three-ring binder, $19.95.

Reviewed By Kirk Kleinschmidt, NTØZ
Assistant Managing Editor

As hams, it's fair to assume that we have a soft spot for good old AM broadcast radio. In fact, I'd bet that almost everyone who has a modern ham rig—with receive coverage of the AM and shortwave bands—has tuned the broadcast band a time or two in search of a favorite talk show or some far-away hometown station. Come on, you can admit it!

Like many youngsters in the '70s (and before, perhaps today, too) I got started in radio by trying to DX AM broadcasters. I'd stay up past my bedtime, tuning stations on my green Panasonic "round ball" radio, thrilled each time I'd come across a station I could identify (usually biggies such as WLS, KOA, KSL, WCCO, CKLW and occasionally, XEROK, the Mexican powerhouse on 800 kHz, a stone's throw across the border, running *big* power).

IDing the many stations, especially those on the upper end of the dial, where lots of low-power stations slug it out on the same frequencies, was difficult. A dog-eared copy of an older *White's Radio Log* (I think that's what it was called, anyway), helped, and provided QSLing addresses.

As a 12-year-old soon-to-be-ham, building a collection of broadcast-band QSL cards was fascinating. Every time I look at those cards today, I remember how exciting it was to tune a station, find it in the station listings, send away for a QSL card and run to the mailbox every day after school looking for cards.

So what's my point? NRA's *AM Radio Log* is a modern version of just such a book—only better! Its more than 350 pages (looseleaf in a plastic binder) list every AM broadcast station in North America, with frequencies, format, network affiliation, power levels, antenna patterns and day/night power levels and complete addresses for QSLing! There are 6000 listings sorted by city, state, frequency and call sign, so information on just about any station is easy to find.

In 1994, as in the '70s, DXing the broadcast band is a lot of fun. As the sunspot cycle slowly bottoms out, activity on the HF ham bands declines, while propagation "down under" improves.

So spin your VFO down to the broadcast band and check things out. One thing's for sure, *AM Radio Log* will dramatically improve your BCB listening efforts. The 14th edition also happens to celebrate the 60th anniversary of the National Radio Club.

QST

Strange Signals from the Land of the Midnight Sun

As a youngster, I had worked the Yukon and had read Jack London's novels of that wild and wondrous territory. I dreamed of operating my ham station from within the Arctic Circle...

By Larry R. Luchi, VY1WA/W7KZE
9001 Airport Rd
Everett, WA 98204
Photos by the author

The author operating his TS-50S from Whitehorse, Yukon Territory, with his VY1WA license proudly displayed in the picture frame (lower left).

The Yukon Territory is a place apart, a land where you can escape the confines of what we call civilization. It is magnificently untamed and rugged to this day, but it has become progressively more accessible as the highways leading to the far north have been improved. The Yukon is, to me, a land of simple magic and ongoing mystery. And, for years, it had been calling me to come visit—and to bring ham radio equipment, to operate north of the Arctic Circle.

In the summer of 1992 I visited the hams of the Prince George Zulu Contest Club, VE7ZZZ, in Prince George, British Columbia, and met some of the nicest and friendliest hams you could find. During my visit, I mentioned my desire to operate during the summer of 1993 from the Yukon Territory, and that I wanted to get a Yukon call sign for the operation. The club members helped me apply for a temporary license.

Then I started haunting my mail box, with the same feeling of anxiety that I had when I was watching for my Novice license 40 years earlier.

Finally, my license arrived! I had been given the call sign I requested, VY1WA, chosen to reflect the abbreviation for my home state of Washington. The license was valid from July 15 to August 15, 1993. I started making my preparations—packing equipment, camping gear and fishing tackle in my van, and buying a new Kenwood TS-50S and Spider four-band antenna for the trip.

And so, on July 15, we arrived outside the town of Watson Lake, Yukon Territory, and set up camp on the Upper Liard River. Within minutes I started exercising my new call sign, working KL7HAD, ES1SWW and K8VJW on 20 meters. Then I took a break from ham radio for the other important part of my trip—fishing. The Yukon is a fisherman's paradise, with the grayling almost jumping onto your hook!

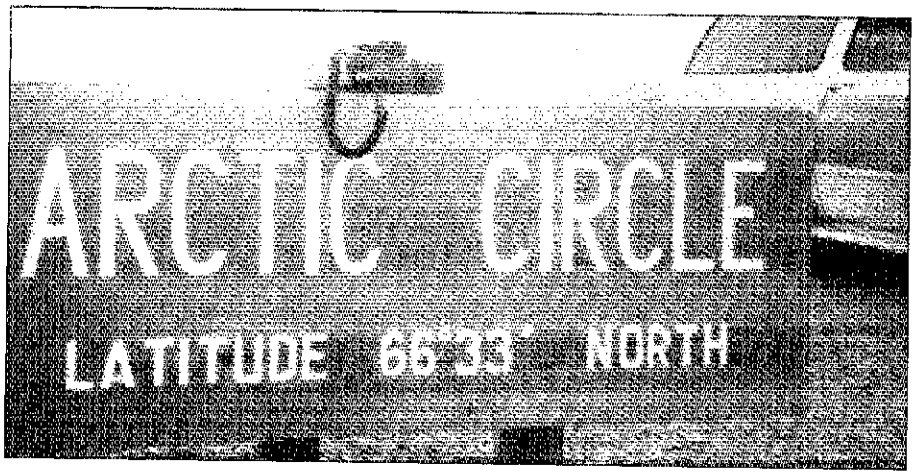
The other half of the "we" on this trip was my four-year-old son, Anthony, who was a good companion and was thrilled beyond words to catch fish that were longer than he was tall! Anthony learned a lot of new things on our trip to the Arctic.

After two days at our Upper Liard River camp site, with my time divided between fishing and hamming, I headed up the Alaska Highway for another 283 miles, to Whitehorse, the capital city of the Yukon. We spent a week in Whitehorse, over 2000 miles from home, camping in the MacKenzie Campground at Milepost 922.5 of the Alaska Highway. For this extended period of operating, I installed a portable ground system I had brought with me. Because the permafrost is only about four or five feet below the surface in much of the Yukon, I needed my portable ground system for best results. The system was made up of wire radials of various lengths, so as to be effective on all the bands I intended to operate, laid out in a somewhat regular pattern.

I had a schedule with one of my former students from my Amateur Radio class, Pat May, AA7XI, which was successful, and then shut down the rig to do some local sightseeing. I dropped by the Yukon Visitor Reception Centre and toured the historic sternwheel steamboat *Klondike*, which is now on dry land near the Visitor Centre. The *Klondike* was the largest sternwheeler to ply the rushing waters of the mighty Yukon River during the gold rush days and on into the 1930s.

My next stop was the Whitehorse Rapids Dam. Before the dam was built, an early trapper had visualized the rapids as the great white mane of a horse, so the town that eventually came into existence at the spot was named Whitehorse Rapids. Nowadays the rapids have been stilled by the building of the dam, but it is still a place of great beauty.

Another schedule with AA7XI was successful. Then W0BBT called me, and told me that VY1 was the last Canadian call area he needed to have worked them all! Then 20 meters opened to Asia, giving me contacts with UZ0WZ and JN1HOW. It



VY1WA's TS-50S sitting on the Arctic Circle!

Anthony enjoyed fishing in the Yukon: (l-r) a 6-lb northern pike, Anthony, and Daddy!

was obvious that the rare VY1 prefix was attracting attention!

I closed down the HF position and made a call on the 146.94 MHz repeater to get some important local information. David, VY1DM, came back to my call and was able to answer my question about where the good fishing was. David, as it turned out, was going to Kusawa Lake and he invited me to meet him there. We arrived just as he was "stuffing" his boat into the water, and we had a great time fishing together for grayling.

After my stay in Whitehorse, I drove on to Dawson City, a 330-mile trip on the Klondike Highway, a tar-and-chip surfaced road. Dawson City is only 159 miles from the Arctic Circle, so it has daylight most of the day in July, with the skylight bright enough to see quite well all through the night. Setting up camp late at night was quite easy; we didn't have to use our propane lantern and flashlights at all.

By this time I had freed myself from the normal fetters of time that usually control our day-to-day lives. That "holiday" attitude, plus the lack of the usual daylight indicators of time started causing me to miss schedules. It was easy to overlook a late-evening schedule when the sun was still above the horizon! I offer my apologies to those for whom I missed schedules because I was temporarily living in a different world.

At Dawson City, I again installed my portable ground system and fired up the TS-50S and Spider. It was still getting out very well, with my first contact from the new location being with KL7OH, 180 miles north of Nome. During our stay in Dawson City, we visited the places that the writers who fired my boyhood imagination had lived, worked, and visited. Our first stop was the Jack London Centre, where London spent his mad summer of 1889. Readings of his works and tales of his life are retold at his cabin every day throughout the summer.

Robert Service was one of the most popular poets of the early 1900s, telling stories of the Klondike Gold Rush characters to a world that was eager to listen. In Dawson City, Service's poetry is recited twice daily by Tom Byrne, and it's enough to stir the hairs on the back of your neck to hear those stories in verse told so vividly.

My childhood dream of operating an Amateur Radio Station from within the Arctic Circle was finally near at hand. From Dawson City, in the heart of the Klondike, we took the Dempster Highway and headed toward Inuvik, Northwest Territories, on the MacKenzie Delta just a short distance from the Arctic Ocean. The scenery was breathtaking and the wildlife along the highway was abundant, making the Dempster Highway drive an unequaled experience. The Arctic tundra is made up of many different kinds of plants, moss, wildflowers, and ground-hugging berry bushes, and it turns the roadside into a kaleidoscope of color!

After all those years of hoping, months of planning, and weeks on the road, I finally reached the end of my personal rainbow: the Arctic Circle, at 66°33'N. It was a moment to be savored—a time to think back on the years of hoping to arrive at the cap of the world! After leafing through all those old memories and thoughts, it was then time to get on 20 meters again. During the next 30 minutes, I made contacts with WD8NHN, KD4XM, WA7ZDU, WA6RTE, W7ACC, W7FQD, W2DFZ, W9HAO, W6RKP, K6ZAN, K2DTT, and LY2BN. It was as thrilling for me to be able to give out such rare contacts as it was for the operators back home to make them. But I felt a little sad that those operators could share the rugged beauty of the far north with me only via my descriptions over the air, rather than by experiencing it themselves.

After working those stations, a cloud moved in as a storm approached, the noise level went to S9, and the band dropped completely out. Propagation in the Arctic region is another thing that has to be experienced to understand just how weird it can be! Since the band was closed down, we drove on up the Dempster Highway to Inuvik, where I operated as W7KZE/VE8. We had traveled 460 miles on the Dempster Highway, which is a dirt and gravel road with quite a few large 18-wheel trucks on the route. The only vehicle problem I had on the trip was a few small rock chips in the windshield, from rocks thrown up by the trucks.

After a short stay in Inuvik, we headed back down the Dempster, and again stopped at the Arctic Circle to operate for a few hours, before continuing the return drive to our home in Washington. It had been a wonderful trip of 7000 miles, with beautiful scenery, great fishing, and 632 ham radio contacts in the log. After all those years of anticipation, the trip had exceeded my highest expectations and it has left me with some of the most wonderful memories of my lifetime. And Anthony was exposed to sights, experiences, and circumstances that he will never forget.

But don't think I'm going to just sit home and be content with the memories of my dream trip to the Arctic Circle; I've already started planning my next trip—to Herschel Island, a island that is the northernmost part of the Yukon, located in the Beaufort Sea. Or perhaps Banks Island. Keep your ears peeled for VY1WA's reappearance! QST

Hello, Zak—This Is Ray

N3CBY DE N1OUL BT HELLO ZAK BT WHAT A THRILL TO BE DOING CW WITH YOU...

So began an unforgettable first CW contact between two WW II shipmates who had lost track of each other for 45 years.

By Ray Rushing, N1OUL
61527 Miami Meadows Ct
South Bend, IN 46614

This story began in the closing days of World War II, when I was an 18-year-old sailor fresh out of the US Navy Electronics Technician Training School. I had just been posted to my first duty assignment on the heavy cruiser USS *Bremerton* (CA-130). Although the shooting had stopped, World War II was technically not over yet. Our home port was Long Beach, California, and we spent many long days on maneuvers and patrol duty up and down the West Coast from Mexico to Canada, with practice firing of the ship's guns against targets on islands, air targets towed by aircraft, and surface targets towed by ships.

I was assigned to the section that performed repair and maintenance of radars and related equipment on the ship. That section was headed by Warrant Officer Radio Electrician G. E. Zakotnik, known affectionately and respectfully as "Mr Zak" by his men and fellow crew members.

Mr Zak was a wonderful person to know. He encouraged my interest in electronics, which led me to a very satisfying career. And, of course, eventually into ham radio.

For the next several months, Mr Zak took me in tow and taught me a lot of practical things about electronics and the ship's equipment, to round out the theory I had learned in school. For example, I learned that you don't store vacuum tubes near the ship's big guns—we had stored tubes in a spare parts locker behind the aft battery of 8-inch guns and later discovered that most of the tubes' filaments had been broken when the guns were fired!

One day when the workload was low, Mr Zak showed me how he was modifying an obsolete short-wave receiver to copy CW, and showed me the miracle of translating those strange beeps into words on paper. I had not known before that Mr Zak was a ham, and had been one since he was 13 years old. That made quite an impression on me, and Mr Zak grew even larger in my esteem.

After the war, I was honorably discharged from the Navy and enrolled in Texas A&M University, where I earned a BS degree in electrical engineering. For the next 38 years, I followed a career in engineering and management, working for General Electric, Essex International, Automated Building Components and, finally, 12 years as Vice President for Manufacturing and Vice President and General Manager for Hubbell Inc. I retired a few years ago.

Many times during those years since WW II, I thought of Mr Zak and how he had helped nurture my interest in electronics, an interest that led to my career. When I would think of Mr Zak, I would often toy with the idea of becoming a ham. As a young boy, I had played with wire telegraph systems for sending messages to a friend, but I had never *memorized* the Morse code. The thought of having to learn the code always intimidated me, so that I never acted on my recurring impulse to get a ham license.

But then retirement brought new leisure time to me, to spend on the pursuit of hobby interests both old and new. I learned Morse code and studied for the written exam, and soon was issued the call sign N1OUL, while living in Connecticut.

Just as so many hams do, I visited ARRL Headquarters. My tour guide at HQ was David Newkirk, WJ1Z. Near the end of a very interesting tour, I asked Dave if it was possible to locate a ham operator by only his name. He smiled and said there might be a way, as I went off to visit W1AW in the adjacent building.

Before I left W1AW, Dave came in with an even bigger smile and a piece of paper with Mr Zak's call sign and address on it!

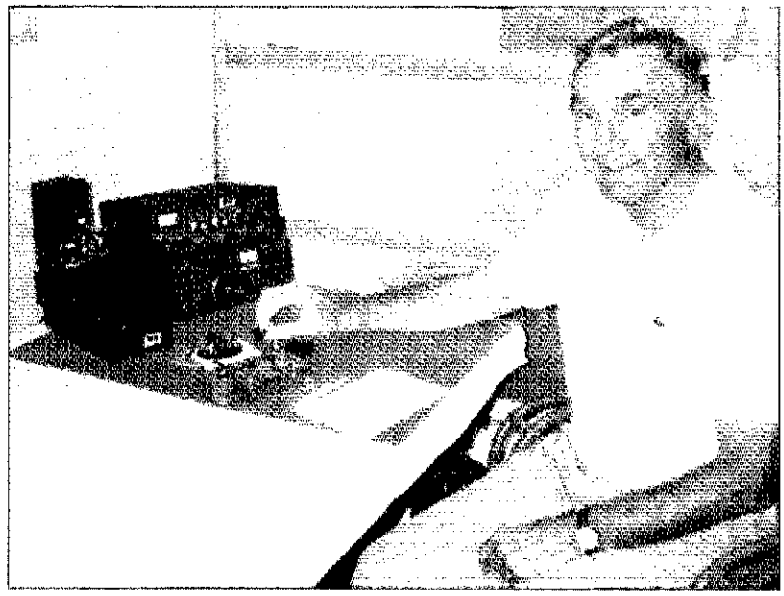
As I drove away from HQ, I started thinking of Mr Zak. Strong memories started flooding my brain. Would he remember me? What will he say when he learns that I became a ham?

That night I called Mr Zak at his Florida home, and he was surprised! He remembered my name and a lot of the things we did together on the *Bremerton*, but he wasn't sure that he recalled what I looked like. (Never mind; my looks changed just a little bit over those 45 years!) I learned that Mr Zak had retired from the Navy as a Chief

The author—Ray Rushing, N1OUL

Mr Zak—Longtime Ham

Mr Zak served in the US Navy from 1933, the year he was first licensed as a ham, until his retirement in 1958. One of his memorable early duty stations was Swan Island from May through November 1939, where he set up and maintained radio communication in support of early development work on atmospheric soundings by weather balloons and radiosondes. Mr Zak took his ham transmitter along and got on the air as W6QFJ/5 when he wasn't operating on the Navy circuits. [Swan Island is now a possession of Honduras, but earlier had been claimed by the US. Its DXCC status was as a separate country up until 1972. During Mr Zak's stay, its prefix was K5, the same as the Canal Zone; in later years, the prefix KS4 was used. Swan Island is located due south of the western end of Cuba, about 125 miles north of Honduras.—*Ed.*]



Mr Zak—G. E. "Zak" Zakotnik, N3CBY

World War II was declared in Europe in September 1939, during Mr Zak's stay on Swan Island, and he recalls that the Navy personnel regularly spotted silhouettes of surfaced German submarines in the wee hours of the morning, when the subs were surfaced to recharge their batteries with their diesel generators. A secondary duty of the Navy personnel then became reporting submarine activity.

Mr Zak also relates that radio communication on Swan Island began back in the early days of spark transmission, with its attendant short range. The United Fruit Company wanted to communicate between their headquarters in New Orleans and their Central and South American banana growers. Swan Island was at just the right location to be within range of both ends of the banana circuit, so, in 1904, United Fruit installed a high power spark station on Swan Island to serve as a relay station.

"Ray," recalls Mr Zak, "was active and intelligent. He also demonstrated leadership ability by sharing his knowledge with his shipmates and helping them learn to do their jobs better. Ray was very helpful to me during the demobilization activities that followed the end of the war."

One story Mr Zak tells illustrates Ray's resourcefulness, even as a young and relatively inexperienced electronics Navy technician: "We had an air surveillance radar on the *Bremerton* that was mounted on a gyroscopically stabilized platform. The heart of the system was what we called the 'stable element'—the roll, pitch, and yaw sensor in the bowels of the ship. A problem developed with the stable element so that the gyroscope would occasionally tumble, causing the antenna to go wild as it tried to follow the erratic commands from the stable element. Wouldn't you know it—the Admiral was on board one day and saw the antenna go spastic, and he observed that it would be a very good idea to get that antenna fixed—*right away*! I asked Ray to look into it. Even though the problem wasn't obvious, Ray dug through the entire system, checking every component, wire, and connection, and finally—way down in the stable element—he found an open wire in a cable bundle! The Admiral was happy, and anything that made the Admiral happy made me *very* happy!

"Ray is a very perceptive person, just as he was as a young seaman. His retention of information was always high—he never asked the same question twice. I now see that his decision to leave the Navy after WW II was a wise one; he gained a technical education that led him to a highly successful career in industry.

"Nowadays Ray and I are successful at almost every one of our weekly skeds. We are having a lot of fun retelling old stories and learning about each other's present life. I'm looking forward to his visit down here this fall."

Warrant Officer, and had then pursued a successful civilian electronics career with Melpar, Cooke Engineering, TMC Systems, Rixon and Bechtel. He, too, was now retired. Although he couldn't have an antenna where he lived, he had a small ham station set up at the home of a good friend, Nicholas Saleo, where he went for his operating. He was pleased to hear that I had my ticket, and we agreed that we would make a schedule after I finished my relocation to Indiana.

After I had installed my antenna at my new home, Mr Zak and I tried a schedule on 15-meter CW and made that thrilling first contact with each other! Since then, we have continued weekly schedules with good success. Now that I've upgraded to Advanced class, we meet on 20-meter CW. (I'm working now toward upgrading to Extra!)

Mr Zak has now been a ham for 65 years, and is a lifetime member of the Society of Wireless Pioneers. During our CW chats, he has told me many interesting radio stories from his experience and from the "good old days." I've asked him if he wants to try a schedule on phone, but he prefers CW—and he still has an excellent fist!

Finding and getting reacquainted with my old friend and mentor showed me what a wonderful vehicle Amateur Radio is for such a purpose. I'm thankful to be a part of such a wonderful hobby, and to have had the help of Dave Newkirk and the ARRL in making it possible for me to once again swap sea stories with Mr Zak—on the air! QST

A Letter to My Elmer

By Larry Guenther, W4UJT
2256 Thornbury Dr
Richmond, VA 23233

One of the more perceptive Volunteer Examiners (VEs) in my area recently observed that for many of the people coming to examination sessions, the first hams they've ever met are the members of the VE team. This may not come as a surprise to some who have watched with interest the profusion of highly focused self-study guides for all license classes, a proliferation of code-practice tapes, and interactive software packages for written-exam preparation. But it leaves me with a disquieting feeling to know that so many new licensees enter the ranks without the active encouragement and guidance of an Elmer. It is this person—often a veteran ham—who has traditionally been a role model for operating practices and technical assistance. Equally important, this key person was able to share the unique experiences in getting and staying on the air that keep so many of us addicted to this hobby.

"Who will teach me what's needed for a license?"

I began to muse over the impact my own Elmer had on my fumbling efforts to build equipment, raise antennas and chase DX. This letter of gratitude, coming four decades after he helped write a formula for my enchantment with ham radio, is directed not only to him, but to the Elmers before and since who made that personal investment.

To an impressionable preteenager, his shack was...well, *awesome*. A National NC-183 receiver was joined by state-of-the-art Collins gear, while the backyard contained a telephone pole-mounted Yagi and folded-dipole antennas. Running through a bushing in the wall was an innovation destined to change the manner of feeding most antennas, coaxial cable. Most striking of all were the confirmations (QSL cards) of contacts from around the world that wallpapered the room.

There were cable connections and power switches, spare-parts boxes, microphones, keys and radio publications—the usual paraphernalia of an active ham. I dared to ask, "Can I learn how all this works?" and "Who will teach me what's needed for a license?" He replied that I could, and to my astonishment, that he would. The rest is a blurred memory of code practice sessions, soldering lessons and memorized regulations, punctuated by occasional on-the-air examples of procedure.

His conception of the Elmer role didn't stop when I became licensed and attempted to put my home brew gear on 80 meters. The receiver wouldn't regenerate and the transmitter wouldn't oscillate. My landline call for help was familiar to him and inside 15 minutes, he had both working. I learned why my 6L6 rig failed the "smoke" test (the polarity of an electrolytic deserves respect). Later house calls responded to transformer meltdowns, antenna-resonance problems, fractured crystals and the usual casualties of doing ham radio. I didn't know then, but learned in later years, how many others he served in a similar fashion.

Nor has the pace of his involvement as an Elmer slackened as he enters the *eighth* decade of a ham career distinguished by technical and operating achievements. He was a proponent of nearly every technological advance, from HF mobile rigs at a time when a trunk and dashboard full of equipment were required, to early SSB, solid-state gear, and the digital modes. On the basis of his years in the hobby, a reputation as the consummate CW operator, and his participation in virtually every facet of the hobby, newcomers meeting him for the first time might expect a vision of the hobby dimmed by nostalgia. What they encounter instead is a ham for the '90s, delighted by the new wave of Technicians who will provide tomorrow's leadership, well-informed about satellite and digital communication technology, yet troubled by the aggressive competition for our spectrum.

He replied, to my astonishment, that *he would.*

There's another side to my Elmer. He has consistently and unselfishly used his operating skills and his station for public service and to further the progress of the hobby. Many of us could well take a page from his notebook on service work. He was instrumental in the founding and leadership of radio clubs in his community, and provided emergency communication in many times of disaster. Most recently, he was honored for organizing a new chapter of the Quarter Century Wireless Association.

Today's newcomers to ham radio aren't all that different from those of us who entered the ranks when my Elmer was there for me. They have a yen to communicate, they need encouragement and they assume it will come from established hams. Whether their path to communicating is the local repeater, packet, 40-meter CW or a satellite, they'll look to us to share our technical and operational knowledge. Their continued progress depends on *mentors* who can address their individual needs for assistance.

I've taken this opportunity—more a toast to Elmership than a letter, as it turns out—to recognize my mentor. I do so because his personal example was so powerfully influential upon me (and many others) and because he once suggested to me that the best form of gratitude would be to "pass it on."

When new hams enlist my help in getting *their* rigs to perk or in solving their antenna SWR problems, they often ask how they can repay me. I reply that it will soon be their turn to pass it on, but in the meantime, they can thank Forrest Pilgrim, W4JD, who lived and Elmered in Kingsport, Tennessee.

(To obtain an "Elmer Award" certificate to present to your Elmer, send a 9×12-inch SASE with 75 cents postage affixed to EAD at ARRL HQ.—*Ed.*) QST

We regret to report that, in the month's since this article was written, Forrest Pilgrim, W4JD, became a Silent Key. Forrest continues to live in the memories of the many hams he Elmered, including Forrest Jr, AB4H, known on the air as Fritz.—*K3KMO*

Automotive Interference Problems:

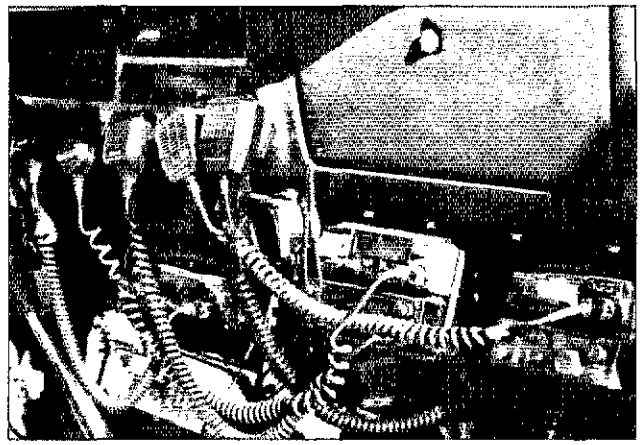
What the Manufacturers Say

Installing mobile radios in your new megabucks car can be a frightening proposition—especially if RF from your rig could damage your shiny new roadster, voiding the warranty! Want help? Read on!

By Ed Hare, KA1CV
ARRL Laboratory Supervisor

In the good old days, things were simple. If you wanted to install a mobile radio in your car, your primary considerations were mechanical: where to place the antenna, where to mount the radio and how to route the wires so they didn't interfere with the family use of the car.

There were some incompatibility problems to solve, such as electrical RF noise from the ignition system, but the proper application of cures (resistive wires and plugs, or, in extreme cases, a filter for the distributor and its wiring) almost always resulted in a successful installation.



The mobile setup of Randy Stimson, KZ7T, Oregon's Section Manager.

As automotive designs evolved, however, installing mobile radio systems became more complicated. Remember how computers used to be house-sized monoliths? In the early 1980s, microprocessors and their associated circuitry became small enough (and inexpensive enough) so car manufacturers (and many others) could use them to control many different functions.

In the early 1980s, electronic control modules (ECMs) became standard in most cars. There were sporadic reports of interference problems to and from these devices, but most hams were able to find a workaround. Soon it became possible to use microprocessors to accomplish additional automotive functions, ranging from engine control to anti-lock braking to air-bag deployment. Some manufacturers even use "slave" microprocessors to control things such as rear-end lights, running only one cable to the back instead of an entire wiring harness, using the "slave" microprocessor to execute proper tail-light sequence (brakes, signaling, etc).

Sure enough, these electronic marvels came with a price!

The more complex things become, the more likely it is that things will go wrong. Every microprocessor has a clock oscillator, and the circuitry uses digital signals for processing and control. These digital signals are square waves. They're perfect for digital circuits, but rich in harmonics.

FCC regulations (Part 15) specify the amount of interference that can be generated by these "unintentional radiators." The regulations are adequate to protect other radio services, such as TV reception in nearby homes, but they're not intended to protect against interference to radio receivers installed in the vehicles, broadcast band or otherwise.

In addition, the vehicle electronics can also be affected by strong electromagnetic fields (EMFs). These fields can be caused by nearby transmitters, transmitters installed in the vehicle, high-voltage power lines, and so on.

Most manufacturers created electromagnetic compatibility (EMC) departments to deal with testing and design issues, assuring compliance with federal regulations and compatibility with factory-installed equipment.

In addition, the industry has voluntarily developed standards that apply to many EMC technical issues (see the sidebar on the Society of Automotive Engineers). There is even a standard that applies to installed transceiver equipment. (The ARRL is a voting member of the SAE Committee working on these standards.)

So far, things look pretty good! New technology has made cars less expensive, more reliable and less polluting. Federal regulations control the amount of interference that cars can generate, automobile manufacturers have created departments to solve the problems and the entire industry has formed committees and developed standards to help make things right.

As automotive systems evolved, ham gear did, too. More and more ham transceivers were capable of operating from a 12 to 14-volt supply, so mobile operation became more popular than ever.

Unfortunately, this rosy picture was spoiled by an unexpected phenomenon; radio transmitting equipment, sensitive receivers and automotive electronics didn't always work well together.

As if this weren't bad enough, EMC problems usually take place on a two-way street (all puns intended). Just as vehicle electronics can interfere with installed radio equipment, even low-power transmitters can interfere with vehicle electronics.

Details are not forthcoming, but urban legends abound about vehicles that would stall or lock their brakes near high-power transmitters, or about hams who could stall nearby vehicles on the highway by keying up high-power transmitters. (The ARRL staff has amassed a fair collection of anecdotal reports, none of which describe this problem firsthand.)

The legends may or may not be true, but vehicle manufacturers know that fields of up to 300 V/meter can be found on our highways and byways; automobile elec-

Ron Hammel, KC6WLC, mountain-topping in the White Mountains of California and Nevada for the June 1993 VHF Contest.

tronics must continue to function when drivers whiz past Voice of America transmitter sites!

Car companies have worked to ensure that their vehicles do not interfere with factory-installed equipment and do not keel over near VOA-class transmitters, but it's clear that manufacturers do not always pay attention to compatibility with aftermarket equipment, including transmitters and receivers for various radio services.

When hams installed transceivers in their cars, things didn't always work as planned. As the number of automotive microprocessors grew, the potential for the umpteenth harmonic of the clock oscillator falling on a favorite repeater channel also grew. Add to this the possibility of noise from sophisticated ignition systems, motor noise from wiper-blade, electric cooling-fan or fuel-pump motors, and even the vehicle's factory-installed broadcast-band radio receivers and you have a potential for electromagnetic incompatibility.

What's worse, some vehicle electronics are susceptible to RF fields generated by mobile transceivers. This susceptibility ranges from the minor annoyance of having a dash light come on in step with the transmitter, to the major annoyance of having the vehicle's microprocessor lose its mind, resulting in a dead car.

The ARRL has not received any reports about interference to safety devices such as anti-lock brakes or air bags, but this type of interference is still possible, especially if good installation techniques are not used.

Wheels Start to Turn

In early 1992, John Harman, W8JBH, wrote an item for *QST*'s Correspondence column pointing out the problems he was experiencing in trying to get Toyota to help him with an interference problem he was having with his 1992 Camry.[1]

In Harman's case, his 2-meter transceiver had resulted in temporary damage to the car's ECM. John, as of that date, had been unable to get any concrete information from Toyota about the proper installation of transmitting equipment in his vehicle.

Since then, we've heard from other hams who experienced similar interference. The May 1992 issue included a few more tales of woe. In addition, the ARRL Technical Information Service and RFI Desk heard from a few dozen folks who had been having some sort of EMC problems with their cars, dealers or manufacturers.

This is, of course, just the tip of the iceberg; most hams simply do not report their interference problems: not to the FCC, the involved manufacturers or the ARRL.

The situation was confusing. After hearing tales of blown ECMs and voided warranties, hams were afraid to install mobile transceivers in their cars. As interference reports increased, the Lab decided to look into the matter.

ARRL Surveys Auto Manufacturers

As ARRL Senior Lab Engineer and all-around EMC guru, the task fell into my lap. "No problem!" I said. "We can ask car manufacturers to tell us all about their cars and policies." I drafted a letter asking the following questions:

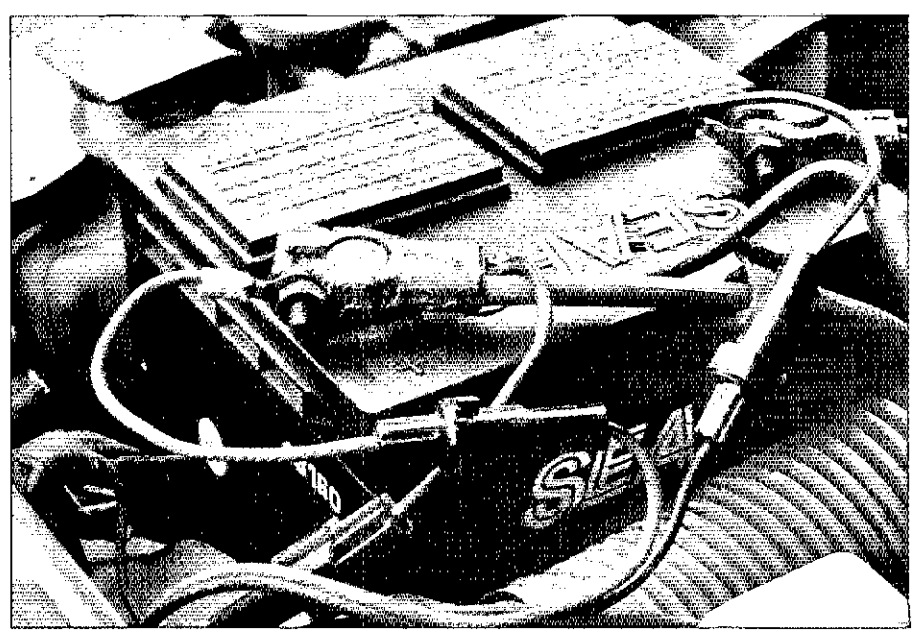
- "How does your company resolve electromagnetic compatibility (EMC) problems that result from installed (or nearby) transmitter operation, or when vehicle electronics cause interference to installed (or nearby) radio receivers?
- "Have you published any service bulletins that relate to radio transmission or reception, or electromagnetic interference (EMI)?
- "If customers have problems with EMC or EMI that cannot be resolved by the dealer, who should the dealer or customer contact for additional assistance? Have these contact people been specifically trained in EMC and EMI mitigation?
- "May we make the information you provide available to our members?"

We also outlined some typical Amateur Radio installations, citing power levels of 100 W on HF, 50 W on VHF and 10 W on UHF.

I sat back and waited for a flood of responses from a field of eager manufacturers. I knew that each would tell me that it was okay to put transmitters in their cars and that if hams had problems, dealers and customer service people would be glad to help them out.

The replies would lead to an article summarizing the responses that would clearly explain how to install a radio in each type of car and reap the praise from all of our grateful members. NOT! (Well, not exactly, anyway.)

After 60 days, we'd heard from only a handful of manufacturers. The first round



Make battery connections to your transceiver with both a negative lead and a positive lead, rather than using a single hot lead with ground return via the vehicle chassis. Placing fuses in both leads provides for greater safety.

of responses didn't look very useful, with the letters ranging from "We have never had a problem with radio installations," to "It's not our fault—ever!" The latter is paraphrased, but not too far off the mark.

Things weren't going to be as smooth as I had hoped. I waited impatiently another month and sent off a follow-up letter, asking what happened to the first letter, and pointing out how the manufacturer was going to look if it did not respond and were listed in a national magazine as having ignored two letters.

Over the next 90 days, the answers trickled in. In many of the letters I could clearly see the mark of the manufacturer's marketing, public-relations and legal departments. The caveats were rampant, and in most of the letters the disclaimer that if any aftermarket equipment, including radio transmitters, caused any damage to the vehicle it would *not* be covered under warranty.

One company said the answers to the questions I had asked were proprietary! Even worse, some companies didn't respond at all! In most cases, I finally got a response by calling the respective public relations departments.

To partially offset the number of companies that didn't respond, one company sent two answers—completely contradictory, of course.

The mix-up was ultimately resolved, but it demonstrates that a big part of the EMC problem may involve poor communication.

A company can have an excellent EMC facility, program and policy, but if its information isn't widely distributed to dealers and regional offices, it does little good.

If *QST* received contradictory responses from the same building within the same company, imagine how difficult it could be to get accurate information from corporate and engineering policy makers at the factory to dealers who have to actually solve the problems.

So far, the overall manufacturers' response hasn't been that good. It isn't all bad, however. I noticed several call signs in the signatures of the letters I received. Not surprisingly, these were among the more useful answers.

A few of the companies came quite close to my ideal, giving us solid information and telling us that their dealer-support network or factory specialists will help hams with compatibility problems!

Toyota, the company whose customer really started the ball rolling, did respond after much prompting (not unlike John Harman's experience). And after all was said and done, Toyota's response was actually positive. It took a bit of time, but for the 1994 models, the 10-W power output limitation mentioned in the 1992 Service Manual has been upped to 100 W.

According to Toyota's Customer Service Department, a few of the 1994 manuals were not updated, but the current limitation of 100 W applies across the board.

General Motors has long been proactive in the EMC field, maintaining a complete EMC facility (like many other automobile manufacturers), publishing a complete and useful installation guide and maintaining a high profile in the professional and amateur EMC press.

Even more encouraging is the fact that several companies told me privately that my letter and article have prompted them to develop their own EMC guidelines and to clarify company policies about EMC.

Unfortunately, there have been problems even with some of the companies that have clear policies and installation guidelines. In several cases, hams who have reported problems tell us that customer-service people or dealers made decisions that were different from the information that we received in writing from the manufacturer.

When I called the Customer Assistance Center at Pontiac, as a follow-up to a Member who called me, at first I was told the same thing as the Member—that they had no information about how to install radios in cars. Everyone I spoke with at the assistance center insisted that the dealer is the only source of information.

Remember, GM is one of the *good guys*! They have an active EMC department, published installation guidlelines and clear policies. Unfortunately, the process often breaks down.

All in all, the problems are not surprising. Many auto manufacturers are giants, and it must be difficult to maintain a clear policy in all areas across such a diverse and spread-out business structure. On the other hand, our original letters were sent directly to each company's customer-service contact address.

Of course, all of the policies could be swept away by the new model year! As each new model is designed and built, its EMI susceptibility presumably will be different than its predecessor. Because most manufacturers won't guarantee that a properly installed transceiver will not interfere with a vehicle's proper performance, we could never keep track of the changing policies and applications.

Clearly, manufacturers have a way to go before the policies and standards formulated by their hard-working EMC engineers and EMC committees can make a difference for the average ham. The ARRL will continue to work toward that goal—and you can help! If you've had interference problems with your automobiles, or good or bad experiences with your dealer in getting those problems resolved, report this to the manufacturer at the address we list at the end of the article. This will help manufacturers to stay on top of the types of problems their customers are experiencing.

Send a copy of your letter to ARRL Headquarters, RFI Desk, 225 Main St, Newington, CT 06111-1494. I will collect the letters, combine them with what we already have, and send them *en masse* to the key players at automobile manufacturers and their standards committees. Let's see how we can make a difference. If all else fails, contact me at HQ with your automotive EMC problems.

What the Manufacturers Say

Now, as promised, a description of each manufacturer's policy statement. The addresses and telephone numbers are the manufacturers' suggested contacts or are the addresses on the letterheads of the letters we received from manufacturers. All of this information is based on the statements made by the vehicle manufacturers. Manufacturers not listed were not contacted. If the manufacturer answered our question about who to contact to resolve problems, we have included that in their response. If not, contact your dealer or the manufacturer's customer-assistance network. Most manufacturers suggest that customers contact their dealers, who have access to the normal problem-resolution workers through zone or regional offices, which, in turn, contact the factory for support with difficult problems.

BMW of North America, Inc
Customer Relations
300 Chestnut Ridge Rd.
Woodcliff Lake, NJ 07675
201-307-4000

BMW does not test their cars for the installation of the types of radios we mentioned (ham HF, VHF and UHF transmitters). They cannot comment on the transmitters' compatibility with BMW products. However, the electronic systems in their vehicles are designed to be protected from EMI sources outside the vehicle. A specific repair would not be covered under warranty if it were determined that damage was caused by the installation or operation of any non-approved aftermarket accessory.

Chrysler Corporation
Customer Satisfaction and Vehicle Quality
26001 Lawrence Ave.
Centerline, MI 48015

Chrysler has an extensive EMC program, involving design, testing and active participation in the development of national and international standards on EMC for the automotive industry. They support the power levels described in SAE J551/12 (typically 100 W—see the sidebar). For 1992 through 1995 model years. On new-vehicle orders, specify the JLW sales code to obtain a vehicle with a suppressed ECM.

The owner's manual of a new Chrysler product contains a summary of their EMC policies. The design of the vehicle provides immunity to radio-frequency signals. Two-way radio equipment must be installed properly by trained personnel. Power connections must be made directly to the battery, fused as close to the battery as possible. Antennas should be mounted on the roof or rear of the vehicle. The antenna feed line must be shielded coaxial cable, as short

as practical and installed away from vehicle wiring. Ensure that the antenna system is in good order and is properly matched to the feedline.

Chrysler has published a comprehensive installation guideline, expanding on the guidelines in the owner's manual. Any Chrysler dealer can supply or order a copy (order no. TSB-08-31-94). The guideline describes in detail the mechanical, electrical and RF requirements that need to be considered for a successful radio installation.

All of this withstanding, Chrysler warranty does not cover any non-Chrysler parts or the costs of any repairs or adjustments that might be needed because of the use or installation of non-Chrysler parts. The owner's manual details the policy that should be followed to resolve any customer problems that can't be corrected by the dealer.

Chrysler had a booth at the 1994 Dayton HamVention, answering customer questions, passing out literature, and soliciting customer feedback.

Ferrari North America, Inc
Corporate Office
Director of Parts and Services
250 Sylvan Ave
Englewood Cliffs, NJ 07632
201-816-2650

Ferrari North America is a distributor for its parent company in Italy. It did not have much information available, but stated that any vehicle damage caused by the installation of any aftermarket equipment would not be covered under warranty. At press time, the New Jersey office was still awaiting information from engineers in Italy.

Fiat Auto R&D USA
39300 Country Club Dr
Farmington Hills, MI 48331-3473
810-488-5800

Fiat Auto R&D USA is also a distributor for its parent company in Italy. They did not have any information about the installation of transmitters in their vehicles or how to resolve any EMC problems. They suggested that we contact one of their engineers at their factory in Italy.

Ford Motor Company
Ford Parts and Service Division
Public Affairs
300 Schaefer Rd
PO Box 1902
Dearborn, MI 48121
313-446-8321

The electronic modules and entire vehicle are subjected to conducted/radiated immunity levels testing. These tests are designed to reflect the use of 100-W class transmitters installed in the vehicle and verify that their operation causes no damage to any system and that critical safety systems will not be functionally affected during exposure.

Tests are also done to minimize interference with radio reception.

However, Ford cannot guarantee freedom from interference from all possible installation configurations. The installation of such equipment does not necessarily void the warranty, but if the installation is determined to have caused damage, such damage would not be covered. (Ford engineers say they do test for the installation of on-board transmitters.)

Ford is not aware of any damage problems from Amateur Radio equipment. If problems are experienced, first contact the installer or supplier of the ham equipment to see if a different installation procedure will correct the situation. If that doesn't work, contact your dealer, who has access to Technical Service Bulletins (TSB) and technical support. There is a TSB (93-15-6) on the installation of a filter to reduce interference from the electric fuel pump (reports received at ARRL are mixed; for some hams it worked, for others it didn't). According to Ford, these TSBs are only recommendations and are not guaranteed to work.

In 1987, the Ford Electrical and Electronics Division wrote an installation guide (Tech Letter EED-6-031-N). This was not mentioned in Ford's 1992 letter to us, so it is probably obsolete.

General Motors

Each GM subsidiary has its own customer-service network and TSB numbers for installation guidelines. These guidelines represent the only official EMC policy of General Motors. The following is taken from GM installation guidelines:

"Certain radiotelephones or land mobile radios or the way in which they are installed may adversely affect vehicle operations, such as the performance of the engine and driver information, entertainment and electrical charging systems. Expenses incurred to protect the vehicle systems from any adverse effect of any such installation are not the responsibility of the General Motors

Society of Automotive Engineers EMR and EMI Standards Committee

The automotive industry is quite concerned with automotive EMC issues. The Society of Automotive Engineers formed the EMR and EMI Standards Committee to coordinate and supplement the EMC work being done by individual manufacturers. This committee is still in existence today, with representatives from automobile manufacturers, component suppliers and consumer groups. Ed Hare, KA1CV, represents the ARRL and Amateur Radio officially on this committee, but there are several hams on the committee who also understand the radio-communications aspects of the work and projects of the committee.

The committee is publishing a new set of EMC standards for automobiles. SAE J551, which pertains to complete vehicle EMC tests, was first published in 1957. The document established a test method and limits for broadband radiation from ignition systems. It has been revised several times over the years to keep pace with changing technology.

The latest version, now in printing, includes a new test to measure the amount of RF energy and noise picked up on an antenna mounted on the vehicle. It also includes tests methods for measuring the immunity of the vehicle to strong RF fields. Three immunity tests are included: off-vehicle radiation source, on-vehicle radiation source and a bulk-current injection test method. Of particular interest to amateurs is the on-board transmitter simulation test method. The amateur bands from 1.8 to 1300 MHz are included; power levels are typical of commercially available equipment for each band.

A second series of documents, SAE J1113, also in preparation, includes emissions and immunity tests for modules and components used in vehicles. Originally, this document only contained immunity tests, but the scope was expanded during development to include emissions as well.

A task force of the SAE EMR Standards Committee is developing test methods that will have a significant impact on the design of integrated circuits (ICs) used in vehicle electronics. Improvements in the layout of ICs have been defined that will reduce the RF energy that microprocessors and other digital ICs will emit. While the focus of this standard is on automotive needs, it can be applied to ICs for all applications.

The work of the SAE committees is international in scope. SAE delegates represent the United States on two international standards committees that are chartered by the UN. The Special International Committee on Radio Interference (CISPR, from the French version of the committee name) deals with interference to radio reception. A working group of the International Standards Organization deals with the immunity characteristics of automotive vehicles. The SAE standards and requirements are closely aligned with the international standards.

It has taken several years to complete the work that went into these standards. The needs of Amateur Radio and other on-board radio services have been seriously considered as these standards have been developed. As manufacturers' engineering teams use these standards to develop new automobile designs, many of the problems reported by hams will no longer be a major concern.—*Poul Andersen, K8JOF, SAE EMR and EMI Standards Committee Chairman.*

Corporation." The following are general guidelines for installing a radiotelephone or land mobile radio in General Motors vehicles. These guidelines are intended to supplement, but not to be used in place of, detailed instructions for such installations which are the sole responsibility of the manufacturer of the involved radiotelephone or land mobile radio.

"If any vehicle-radio interaction exists after following these guidelines, check current service bulletins for resolution of the customer problem. If there is no bulletin that covers the customer problem, call your technical assistance group." [This is apparently an instruction to the dealer.—*Ed.*]

Locate the transceiver for remote radios on the driver's side of the trunk. One-piece transceivers should be mounted under the dash or on the transmission hump. Don't mount any accessory in the deployment path of the air bag. Mount antennas in the center of the roof or center of the rear deck lid. Use a high-quality coaxial cable, located away from vehicle electronics. Tune the antenna for an SWR < 2:1. Obtain power directly from the battery itself, properly fused, for both positive and negative leads. Use connector kit 1846855 (GM and AC-DELCO) to connect to the battery terminals. Route all wires through grommeted holes in the front bulkhead.

As an editorial aside, General Motors and its various subsidiaries have long been active in the EMC field. They have had a booth at the annual Dayton HamVention to gather customer feedback and to issue information about their automobiles. They were one of the first companies to publish installation guidelines.

In general, hams should not experience problems with the installation of transmitters in General Motors vehicles. Their guidelines outline the approved methods to install transmitters in their cars. GM design engineers test the installation of on-board transmitters.

Honda, American Honda Motor Co, Inc
National Consumer Affairs
1919 Torrance Blvd
Torrance, CA 90501-2746
310-783-3260

According to Honda, the installation of amateur transceivers has not presented any problems. If a customer experiences a problem, Honda will refer the customer to the original installer or manufacturer of the installed equipment. The installation of an aftermarket transmitter would not necessarily void the warranty, but if the installation were not done properly or damage were caused by a defective aftermarket component, it would not be covered.

Hyundai Motor America
Consumer Affairs
10550 Talbert Ave
Fountain Valley, CA 92728-0850
800-633-5151

Hyundai has an extensive EMC test facility at its factory in Korea. They have not experienced many problems with properly installed, medium-power transmitters. Their customer-service engineers have been able to work successfully with their dealers to straighten out any problems that have been encountered. They do not have any published installation guidelines, but suggest that a proper installation would keep power and antenna cables well away from the ECM and its wiring, obtain power directly from the vehicle battery and ensure that the antenna were properly tuned and installed, well away from the ECM. The ECM is located just behind the kick panels on the left or right side of the vehicle. Customers who experience problems should first carefully evaluate the installation, then, if necessary, contact their dealer. Dealers have access to Regional Offices and the National Technical Services Department for assistance in resolving customer problems. This information was supplied in 1992. As of press time, they had not yet answered a request to verify the information as being applicable to the current model year.

Isuzu, American Isuzu Motors, Inc
Customer Relations Department
13181 Crossroads Parkway N
City of Industry, CA 91746-0480
800-255-6727

The installation of radio transmitters has not been tested by the parent company in Japan, so Isuzu does not have any information. Their policy letter is clear: "Any modification to your vehicle could affect its performance, safety or durability; void the warranty; or even violate government regulations." [Apparently this policy was intended to cover more than just ham radio transmitters.—*Ed.*]

In a conversation with ARRL, the Customer Relations Manager was quite clear; they deal with only unmodified Isuzu vehicles. Problems with the installation of transmitting equipment fall outside the scope of their customer service responsibilities.

Mazda Motors of America, Inc
Customer Relations Manager
PO Box 19374
Irvine, CA 92718
800-222-5500

No answer was received to two letters and three faxes sent to Mazda's "Customer Relations Manager." A letter to the Public Relations Office prompted a phone call from Mazda's Customer Service Coordinator, who promised an answer within "two weeks." As of press time (about two months later), the answer had not been received.

Mercedes-Benz of North America
Customer Assistance Center
One Mercedes Dr
PO Box 350
Montvale, NJ 07645-0350
800-FOR-MERCEDES

Mercedes-Benz says that it is generally acceptable to install moderate-power transmitters in their cars, provided the installation guidelines outlined in their Service Information MBNA 54/35 are followed. Customers having problems should first contact their dealer, who will then contact the nearest Regional Office. The Regional Offices have received training and information about how to resolve interference problems. Dealers or customers can also contact the Customer Assistance Center at the toll-free number listed above. Mercedes-Benz is committed to providing reasonable technical assistance to their customers. They have an extensive laboratory and field EMC testing program.

Mitsubishi Motor Sales of America, Inc
6400 Katella Ave
Cypress, CA 90630-5208
714-373-6000

The installation of aftermarket equipment does not necessarily void the warranty, but if the aftermarket equipment causes any damage to the vehicle, that damage will not be covered under warranty.

Nissan Motor Corporation in the USA
Consumer Affairs
PO Box 191
Gardena, CA 90247-7638

All requests about EMC problems should be directed to the above office. The staff is not specifically trained in EMC, but will direct inquiries to the correct departments.

Poor installations that do not follow the Nissan installation guidelines and high transmitter power can cause malfunctions and/or damage to electronic control systems of any vehicle. While the installation of a radio in and of itself will not void the warranty, any expenses incurred in protecting the vehicle's electronics from a radio installation are not the responsibility of Nissan Motor Corporation.

They did supply a copy of an installation guideline.

The guideline emphasized the following points:

No service bulletins have been published.

The radio equipment must be type accepted by the FCC. [Most amateur equipment doesn't require type acceptance, so this doesn't usually apply to hams.—*Ed.*]

The radio-equipment power connections should be run directly to the vehicle battery. The antenna and power connections should not be routed along with any vehicle wiring, and should cross vehicle wiring at right angles. If possible, route the antenna and power cables in contact with the vehicle body. Use quality coaxial cable (95% or better shielding) with proper antenna connections. The SWR must be below 1.5:1. The antenna should be connected directly to the vehicle's body, as far away as possible from all on-board vehicle electronics modules.

Moderate power levels may be used in

Nissan vehicles. Moderate power is defined as: <100 W below 500 MHz; 10 to 40 W between 500 and 1000 MHz; 1 to 10 W above 1000 MHz. In addition, they have a figure depicting the recommended antenna locations.

Peugeot Motors of America
One Peugeot Plaza
PO Box 607
Lyndhurst, NJ 07071
201-935-8400

Peugeot has ceased production of US models after the 1992 model year. They recommend against the installation of transmitters in their vehicles. Their ECMs are not shielded adequately to protect against the resultant amounts of EMI, which may interrupt or damage their operation. If damage to a Peugeot vehicle is determined to be caused by an outside influence, the damaged component would not be covered under warranty.

Porsche Cars North America, Inc
100 West Liberty St
PO Box 30911
Reno, NV 89520-3911
702-348-3000

Porsche "prohibits the installation of radio transceivers and any after-market electrical equipment in new Porsche vehicles." They "discourage the addition or use of non-Porsche supplied telephone equipment in the vehicle." If transmitters are operated within their cars, control or warning lamps may light up with no apparent reason, or malfunctions may occur in other electronic components.

Saab Cars, USA
Consumer Assistance Center
PO Box 9000
Norcross, GA 30091
800-955-9007

All Saab vehicle designs have been EMC tested. Individual questions about frequency and power can be answered by their Customer Assistance Center. All inquiries and problems are handled on an individual basis. They have no record of any EMC problems with Saab cars. The installation of aftermarket accessories will not void the vehicle warranty, but if the installed equipment causes any damage, that damage will not be covered under warranty.

Subaru of America
Owner Service Department
PO Box 6000
Cherry Hill, NJ 08034-6000
609-488-3278

According to Subaru, they have not experienced any problems with the installation of on-board transmitters. If any problems are experienced, the customer should contact the dealer. If the installation of any aftermarket component causes damage to the vehicle, that damage would not be covered under warranty. This information was supplied in 1992. Subaru Customer Service and Public Relations did not answer several faxed requests to verify the information.

Suzuki, American Suzuki Motor **Corporation**
3251 E Imperial Hwy
PO Box 1100
Brea, CA 92622-1100
714-996-7040

In 1992 the Suzuki Customer Relations Manager told us that the answers to our questions were "proprietary." This was clarified a bit by the additional statement that "American Suzuki Motor Corporation does not recommend any modifications or (non-Suzuki) parts or accessories." Two follow-up letters and two separate faxes for clarification went unanswered. Suzuki's Public Relations Department told us via telephone that "proprietary" was not a good choice of words. The intent of the original letter was to be clear that Suzuki will not support or endorse the installation of any after-market equipment and that any problems resulting from aftermarket equipment will not be covered under warranty and should be resolved by the aftermarket manufacturer.

Toyota
Toyota Motor Sales USA, Inc
Customer Assistance Center
19001 South Western Ave
PO Box 1991
Torrance, CA 90509-2991
800-331-4331

Toyota says that the ECMs in all modern vehicles are easily damaged by electromagnetic radiation from high-power radio transmitters. The resultant problems could affect the operation of vital vehicle functions. The proper and safe operation of the vehicle could be compromised if any of the following situations, and possibly others exist: the transceiver is not type accepted; the power or antenna cables radiate RF current; the routing of the power or antenna cables results in inductive or capacitive coupling; transmitter, feed line and/or antenna inefficiencies results in an unacceptable level of RF radiation exposure to the ECMs; the SWR is unacceptably high or the antenna ground plane is inadequate.

Toyota has prepared an installation guideline entitled "Two-Way Radios In Toyota Vehicles." In addition to the potential problems mentioned above, the guideline states that the maximum output power of the transmitter must be 100 W or less; all installations and operating instructions provided by Toyota and the transmitter manufacturer must be followed; the antenna must be installed as far away as possible from all ECMs or other on-board sensors; the antenna cabling must be routed no closer than 20 cm (7⅞ inches) from the ECM or sensors; all antenna and power cabling must not be routed alongside or near the vehicle's wiring harness, preferably crossing vehicle wiring at right angles; the antenna should be adjusted to obtain the lowest possible standing-wave ratio.

All of this notwithstanding, they did emphasize that any damage caused by *higher-power* mobile radio is specifically excluded from warranty coverage.

Owner's manuals from 1993 and earlier published a 10-W power limitation. This in being deleted from 1994 manuals and the limitations in the guideline take precedent over those few 1994 manuals that have not been updated.

Customers or dealers having a problem can contact the Customer Assistance Center to obtain help or a copy of the installation guidelines.

Volkswagen of America, Inc
Corporate Technical Services
3800 Hamlin Rd
Auburn Hills, MI 48326
313-340-4723

All Volkswagen designs are thoroughly tested for EMC at their test facility in Wolfsburg, Germany. In addition, the vehicles are extensively tested in the field for RF exposures to fields greater than 120 V/meter. At the present time, the minimum requirements for passing their tests is 120 V/meter for 3 to 30 MHz and 80 V/meter for 30 to 1000 MHz. Critical safety components are tested over a wider range of frequencies at higher field strength. They have no reports of problems from using radio equipment in their vehicles. Their Corporate Technical Services Department is confident that they can advise hams that encounter problems.

Volvo Cars of North America
Consumer Affairs Department
Rockleigh, NJ 07647
201-784-4525

Volvo builds and tests vehicles to several international EMC standards. They feel that their cars are generally safe regarding immunity against EMI from properly installed transmitters. Volvo tests their vehicles with transmitters with frequency range from 1.8 MHz to 1 GHz, using 10 different antenna locations. Volvo requirements are that the vehicle performance shall not be affected by transmitters in the 200-W range and that no system in the car shall be damaged by a field strength of up to 200 V/meter. This information was received in 1992. Several requests to verify the information for current model years were not answered.

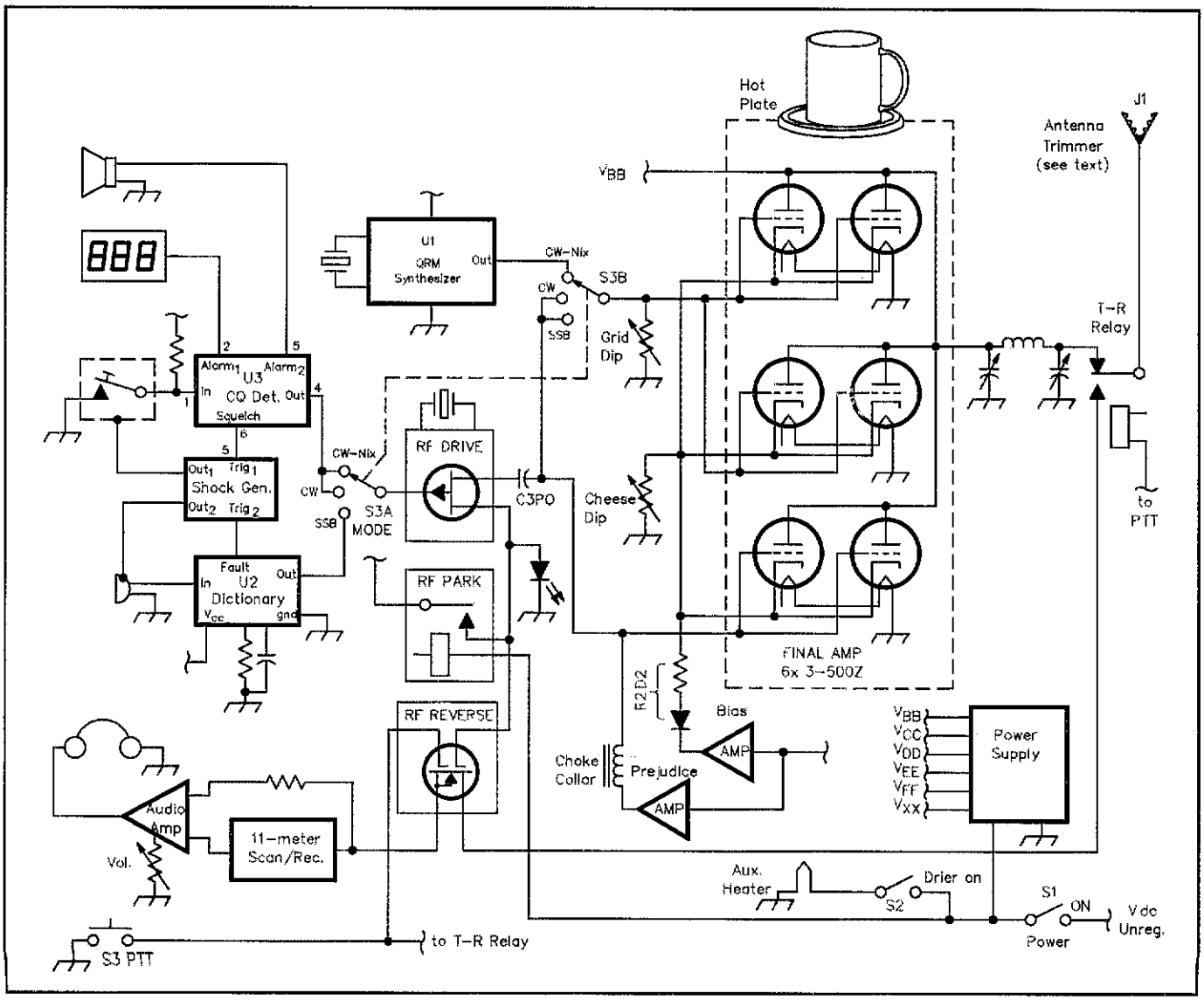
Modern Classic Test:

Yaecomwood T-Max All-Mode Transceiver

By Joseph E. Randazzo, NX1F
8 Woodside Dr
South Burlington, VT 05403

Every once in a while, a truly unique piece of equipment comes along, and the T-Max all-mode transceiver from Yaecomwood is unique to The Max. An example of international cooperation in the electronics industry, Yaecomwood was started in Tasmania in 1972 by a group of engineers who had split from their parent companies. They bought 1317 patents covering amateur and commercial communication equipment and antennas. It wasn't until 1988 that they recognized that these patents were inactive or discontinued by the original parent companies. They proceeded anyway, reworked the data, and are proud to announce the introduction of the T-Max superhomodyne transceiver, scheduled to appear in the winter of 1994, 1995 or 1996.

We managed to obtain our test set directly from the kind people at Yaecomwood, and we've since learned that it's just the third set to be wired. We could keep the unit for only two days' intensive testing.



Yaecomwood T-Max transceiver schematic diagram.

(The factory rep was concerned about heat build-up from the six 500Z finals so close to the sensitive solid-state boards, and wanted to redesign the hot plate. More about this later.)

We've tested many new units here and we're the first to admit that new technology often produces features that are highly specialized and not useful to everybody. Hams love bells and whistles whether they'll be used on the air or not. The T-Max, however, has a host of innovative features that will appeal to everyone from Novice to Extra Class.

The first feature to grab our attention is internally operated. When the **Mode** switch is set to **CW** and the operator pounds out more than four CQs, a high-pitched siren-like squealing comes through the speaker or headphones. If the operator continues to send CQs, after the eighth, a mild electric shock automatically zaps the keying hand. At the same time, the large LED display flashes the letters **LID**. This is a nice way to remind people not to clutter up the airwaves.

The second feature we like is that the T-Max all-mode transceiver floats. A 3-inch-thick layer of styrofoam is glued inside all six sides, making it impossible for the unit to sink. A special patented formula renders the flotation material impervious to heat. The manual has complete instructions for using the built-in heater (next to the power switch) for drying the unit if it becomes wet.

Although this adds bulk to the overall dimensions, people with steel or concrete benches shouldn't have a problem. Owners of 75-foot or larger yachts will enjoy peace of mind, knowing that if their boat sinks, their T-Max will be saved.

Because this reviewer loves CW, the next feature alone is worth the price of admission. On the **Mode** switch next to **CW** is **CWN**. This is the "CW Nix" setting. On this setting, only two of the six 500Z finals are used for the CW signal, putting out the usual 1500 W. The other four finals are used to produce two 1500-W signals on either side of the main frequency. These additional signals are variable, with separate **XITs**, and are obnoxious-sounding squawks that discourage other stations from getting too close. (The chip responsible for this breakthrough is also patented.) These sounds are synthesized from actual atmospheric noise so that the FCC will never know that you're generating all three signals.

The T-Max is compact in two of its three dimensions: 8×12×88 inches. Real hams have big rigs! The controls are easily accessible for anyone whose chair has casters. Switches are hefty (no plastics here) and glow in the dark. On the negative side, some of this iridescent material rubbed off on my finger and I have a tingling sensation under my tongue and a bit of a sunburn. Otherwise, no significant radiation was detected; the finals are fairly well shielded.

The Lab staff members agreed that their favorite feature is the built-in talking dictionary, available in four languages. (Four more of your choice can be placed on the memory tape.) These languages each contain 1635 of the most overlooked phrases in QSOs. All the operator has to do is select the desired language, speak the phrase in English, and the logic circuits will automatically translate and speak the phrase in the chosen tongue. The four supplied are Swiss, Canadian, Tasmanian and Rap. If you should accidentally speak a phrase not programmed into the computer, it will say "Okay, okay, you're 59, QSL?" seven times. A mild electric shock is then sent via the microphone to remind you not to use clichés.

As mentioned earlier, the heat build-up from the final tubes affected some of the circuits wired directly next to them. Occasionally, the signal jumped into the international shortwave band, but only when left in keydown mode for more than three minutes. On the plus side, a 4-inch hot plate is built into the cabinet directly above the tubes. For those of us ragchewers who like our coffee, a five- to seven-minute conversation will usually get up enough heat to boil water.

The rig has another unusual feature. Rather than the standard male/female connectors for your RG-58 coax, the T-Max provides a direct feed for the cable into the hole marked "antenna trimmer." You'll hear a whirring sound like a pencil sharpener as the coax is fed into the unit, and a perfect connection is made. The motor buzzes a bit before it's set, so don't forget to allow another 39 to 41 feet of cable inside the shack to take advantage of this feature.

A special 11-meter Citizen's Band scanner-recorder is built into the receiver section. With the power turned off, the three strongest stations are recorded on tape and held until the transceiver is turned on. Before the operator can get on the air, these three recorded chats are played back. When the finished tape shuts off, the transmitter section is automatically activated. The guys at Yaecomwood thought it would be a good idea for amateurs to listen in on the public bands to learn new techniques, expand their vocabulary and increase cultural awareness.

Access to the circuitry is excellent when using the cutting torches supplied in the generous tool kit. The rig is mailed in five cartons to comply with shipping requirements. Two Stillson wrenches and an arc welder are also furnished to combine the pieces. (Be sure to plug in the six 500Zs before welding the cabinet shut.)

Summary

The T-Max has a distinct advantage over other modern transceivers. Most manufacturers introduce new units every four years or so. It takes about that long to design and market new equipment, but it soon becomes outdated. The T-Max's circuitry is already outdated, so you know right away that you have a "modern classic." This transceiver brings a sense of adventure and discovery to our airwaves. It should also keep those FCC monitors busy. QST

New Books

HIDDEN HAM ANTENNAS

By Frank P. Hughes, VE3DQB

Tiare Publications, PO Box 493, Lake Geneva, WI 53147; tel 414-248-4845. Softcover, 8½×11 inches, B&W artwork, 48 pp, $12.95

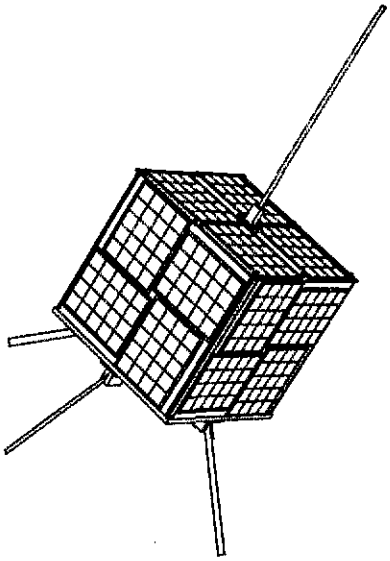
Reviewed By Jim Kearman, KR1S
QST *Assistant Technical Editor*

If you put a bunch of hams together in a room and got them talking about how to hide antennas, you'd probably come up with this book. If you live in a place where visible antennas aren't allowed and you can't think of a single means of hiding a piece of wire, this book may give you hope. Most of the ideas are pretty simple, though. As the author of a book about operating from an apartment, condominium or dormitory, I had more than passing interest in this book. In fact, I thought I might steal an idea or two for the next edition. What I found instead was mostly ideas I discarded when writing my book as being too obvious. One subject that might have been discussed, but isn't, is the possible biological effect of exposure to RF fields on people close to (or next to, in the case of an antenna shown hanging on the shack wall) transmitting antennas. For further discussion, see the ARRL's *Low Profile Amateur Radio*, *Antenna Book* or *Handbook for Radio Amateurs*. The author might as least warn you of possible danger.

Calling the 40 illustrations in this book amateurish is being kind. Still, they get the point across, even if the point is only that you can hide a small transmitting loop inside an arbor in your garden, or to illustrate how to lay out a counterpoise wire on the floor of your shack. But you could have figured that out for yourself, right? The drawing of a groundplane antenna on page 34 is even upside down.

Later (but not by much—this is a short book), the author gives a table of dimensions for 146, 222.5 and 435-MHz Yagis. This information almost seems like an afterthought.

If this little book sold for $5 or so, I wouldn't be so hard on it, even with the tacky drawings. Including shipping charges, though, this book will set you back almost $16, and that's outrageous. Thanks to Dean Straw, N6BV, for his comments on this book, some of which are included in this review. QST



NEW HAM COMPANION

This tiny wonder is DOVE-OSCAR 17, a member of the *Microsat* fleet. If you can set up even a minimal packet station, you can copy—and decode—DOVE's telemetry. Learn how on page 65.

This Month in *New Ham Companion*

2-Meter FM DXing

If you're tired of talking to the local folks, maybe you should expand your horizons a few hundred miles or so!

Steve Ford, WB8IMY

An Easy Dual-Band VHF/UHF Antenna

A simple 2-meter/70-cm antenna that packs a punch. Build it in less than 30 minutes!

Jim Reynante, KD6GLF

Design Your Own Photographic QSL Card

You don't have to be a master artist to create an award-winning QSL card. All you really need is your imagination and a camera.

Sumner Weisman, W1VIV

On the Wings of a DOVE

You may never travel into space, but you can get a sense of what it's like. Just set up your packet station and monitor DOVE-OSCAR 17.

Steve Ford, WB8IMY

Go Digital!

What the heck is *RTTY*—and why should you care about all those mysterious *TORs*? Isn't CLOVER that lush growth in the middle of your lawn? Sounds like it's time for a breezy pass through the HF digital modes. Once you've tried one, you may never reach for your microphone again.

Kirk Kleinschmidt, NTØZ

The Doctor is IN

Running excessive power, receiving ATV signals with VCRs, using 4:1 "remote" baluns, proper autopatch techniques and more.

Elsewhere in this issue

In addition to New Ham Companion, there are other articles in this issue that you might find interesting. Here's a quick rundown:

❑ Most hams have NiCd rechargeable batteries around their home. Steve Avritch, WB1EOB, describes how to build a simple and inexpensive **Smart NiCd Quick Charger**.

❑ Amaze your friends with a state-of-the-art toy! Build a Peltier device that generates small amounts of electricity using a cup of ice and a cup of hot water. See **Thermoelectric Power for QRP Transmitters**, by Arnold Sayre, W8WVM, to learn some nifty things; build the Peltier device he describes to learn even more!

❑ The Internet is the HOV lane of the "information superhighway" that everyone is talking about. Our own Steve Ford, WB8IMY, presents you with an **Introduction to the Internet—Part 1** to guide you onto the entrance ramp to this new communication freeway. Watch for more information to come in future articles.

❑ If you would like to make a gentle start in radio contesting, read about the **School Club Roundup, 1994**, by Lew Malchick, N2RQ. Then mark your calendar to take part in the ninth annual Roundup from February 14 to 17, 1995, either as an individual entrant, or by helping the kids in your neighborhood school get on the air for the event.

2-Meter FM FM FM FM DXing

VHF DX isn't just for CW and SSB operators. There's excitement to be found on FM, too.

By Steve Ford, WB8IMY
Assistant Technical Editor

To most VHFers, DXing means working stations hundreds or even thousands of miles away using SSB or CW. Why not FM? The reason has to do with signal strength and noise.

Due to the nature of FM reception, an FM signal must be fairly strong to be readable. This isn't true of SSB or CW. You can usually copy an SSB signal when it is quite weak, assuming that the frequency is free of interference. CW offers even better performance. Experienced CW operators can often decipher a signal that's barely audible above the noise. That's why CW is the preferred mode for moonbounce work.

The bottom line is that a CW or SSB signal will be readable at weaker levels and over greater distances than an FM signal. Does this mean that FM operators are frozen out of the DX game completely? Not at all. There's still plenty of DX to be worked on FM—if you know how to find it.

Waiting for *Tropo*

The DX activity you're likely to encounter on 2 meters is provided courtesy of Mother Nature in the form of *tropospheric propagation*, or just *tropo* for short. (No, the talking mouse on the Ed Sullivan Show was "Topo.")

The troposphere is the layer of the Earth's atmosphere where most of our weather takes place. Air masses at various temperatures and moisture densities have the potential to refract (bend) VHF signals so that communication is possible many miles—sometimes *hundreds* of miles—beyond your local horizon. A slow-moving high-pressure area, for example, is a prime candidate for tropo. Tropo can also occur when layers of cool air at the Earth's surface rest just below masses of warm air. (This type of tropo is known as *radiation inversion* and takes place primarily in the summer months.)

Violent weather can bring VHF DX, too. An advancing cold front may clash with a warm sector ahead of it. In addition to thunderstorms, it may create some fascinating tropo. Hurricanes and typhoons can also trigger tropo DX. In addition to stirring up the atmosphere over huge areas, these storms often block the movement of distant high-pressure zones. When a large dome of high pressure is lingering over your state, start checking your radio! Conditions may be right for a tropo opening.

Most tropo activity takes place in the summer and fall, although it can occur at other times of the year as well. A good tropo opening may last several hours, and sometimes several *days*. If you're hunting VHF DX, it pays to keep an eye on the weather reports. For more detailed information on weather-related DX conditions, see "The Weather That Brings VHF DX" by Emil Pocock, W3EP, in the May 1983 *QST*.

Hunting DX

If you suspect that the band is active, start prowling the repeater frequencies. Listen for bursts of activity from distant repeaters. They may offer your first clues that a band opening is at hand.

Generally speaking, it's best to avoid repeater DXing and concentrate on simplex contacts instead. When you hear a far-flung repeater, it's tempting to reach for your microphone. Yes, the repeater may indeed hear you—as may other repeaters operating on the same frequencies. Keep in mind that when a band opening is in progress, your signal is likely to travel much farther than you think. Sometimes you may hear several machines responding simultaneously to your transmissions. Often, however, you won't know that you're getting into more than one repeater. This gives you a unique opportunity to be a pain in the neck in several states at once!

Switch to 146.52 MHz or another simplex frequency instead. That's where you'll find the lion's share of 2-meter FM DX. If the frequency seems quiet, don't be shy. Go ahead and call a short CQ. You never know who will reply—or where they may be. If no one responds to your call, wait a few minutes and try again. You could also turn up your squelch control *just* to the point where the noise stops and busy yourself with another activity. If you hear voices or bursts of static, pay close attention. DX may be coming through!

Antennas for FM DX

Almost any kind of outdoor antenna will do the job for 2-meter FM DXing. Your best choice is a beam—the larger the better—mounted in the *vertically polarized* position. With a rotator to turn the antenna, you can maximize your transmitted and received signals for best effect.

Not everyone can afford a beam and a rotator, so an *omnidirectional* antenna is in order. Even a simple ground plane may work surprisingly well. I once contacted an FM station 200 miles away with a ground plane and about 30 W. Get your antenna as high above the ground as you can. If you're running low power (less than 10 W), you may want to consider adding an RF power amplifier.

But what if all you have is an H-T with a *rubber-duck* antenna? The solution is to get you—and your H-T—as high as possible. Tall buildings can be terrific locations for DXing, as can hilltops and mountains. If you have a friend who is a private pilot, see if he or she will take you aloft with your H-T. You'd be amazed at the DX you can work from about 5,000 feet. (Don't try to operate from a commercial airliner, however!)

Don't Take My Word for It

It's fine for me to extol the virtues of FM DXing, but I work at the ARRL. It's my business to promote all aspects of Amateur Radio. To gather some unbiased opinions I went to the CompuServe *Hamnet* forum and asked for input from anyone who had indulged in FM DXing. Here's a sample of the responses I received:

■ "Florida is the home of tropo. I have a 'pipeline' every morning from Clearwater Beach (30 km west of Tampa) to WB4BWS in Palm Harbor over by Cape Canaveral. My best FM DX on 2 meters is Gene, KD4NGB, in Warner Robins, Georgia. Not too shabby for a Yaesu 736R transceiver and a Comet vertical."—*Don Stoner, W6TNS/4*

■ "I was first licensed as G6NYY in the early 1980s. Back then I enjoyed a number of FM contacts with Dutch stations using 2.5 W and a 5-element Yagi. I was located in North Norfolk, England, so our conversations took place over a sea path of around 120 miles."—*Kevin Danks, GØDBL*

■ "This goes back more than 10 years, but on my first visit to Chicago, I took my 1-W Drake TR-22C transceiver to the top of the Sears Tower and worked a bunch of folks on 146.52 MHz across the lake in Michigan. I've also had good luck working FM simplex from the top of Cadillac Mountain in Bar Harbor, Maine." —*Rich Moseson, NW2L*

■ "I worked a station in North Carolina

(continued on page 64)

An Easy Dual-Band VHF/UHF Antenna

Why settle for the performance your rubber duck antenna offers?

Build this portable J-pole and boost your signal for next to nothing!

By Jim Reynante, KD6GLF
PO Box 27856
San Diego, CA 92198

You've just opened the box that contains your new H-T and you're eager to get on the air. But the *rubber duck* antenna that came with your radio is not working well. Sometimes you can't reach the local repeater. And even when you can, your buddies tell you that your signal is noisy.

If you have 20 minutes to spare, why not build a low-cost *J-pole* antenna that's guaranteed to outperform your rubber duck? My design is a dual-band J-pole. If you own a 2-meter/70-cm H-T, this antenna will improve your signal on *both* bands.

Hams throughout the world have built and used J-pole antennas for years. My design is simple, lends itself to experimentation and alternative construction techniques, and has the following features:

- ❑ A 1.7:1 SWR or better throughout most of the 2-meter band and less than 2:1 across the 70-cm band.
- ❑ Easy set up. You can put it on the air in a matter of seconds, or store it in a space no larger than a small paperback book.
- ❑ Simple construction. The entire antenna system can be built in less than 30 minutes using TV twin lead and coaxial cable.

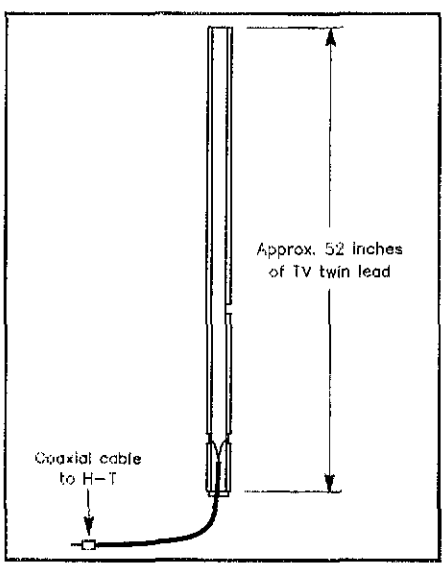


Figure 1—The J-pole antenna is approximately 52 inches long and may be hung from just about anywhere.

All of the SWR data in this article was measured at the transmitter end of the feed line. The reference impedance is 50 Ω, since most equipment is designed for this impedance.

J-Pole Antenna Theory

The J-pole is a vertically polarized antenna with two elements: the radiator and the matching stub. Although the antenna's radiator and stub are ¾ wavelength and ¼ wavelength, respectively, it operates as an end-fed half-wave antenna. Here's how you determine the lengths of the J-pole's two elements:

$$L_{3/4} = \frac{8856 \times V}{f}$$

$$L_{1/4} = \frac{2952 \times V}{f}$$

where:

$L_{3/4}$ = the length of the ¾-wavelength radiator in inches
$L_{1/4}$ = the length of the ¼-wavelength stub in inches
V = the velocity factor of the TV twin lead
f = the design frequency in MHz

These equations are more straightforward than they look. Just plug in the numbers and go. My design assumes that 146 MHz is the center frequency on the 2-meter band. You may, of course, substitute a center frequency of your choice. Even though the antenna is designed using a 2-meter center frequency, it also works well on 70 cm—as you'll see later.

Don't let the *velocity factor* throw you. The concept is easy to understand. Put simply, the time required for a signal to travel down a length of wire is *longer* than the time required for the same signal to travel the same distance in free space. This delay—the velocity factor—is expressed in

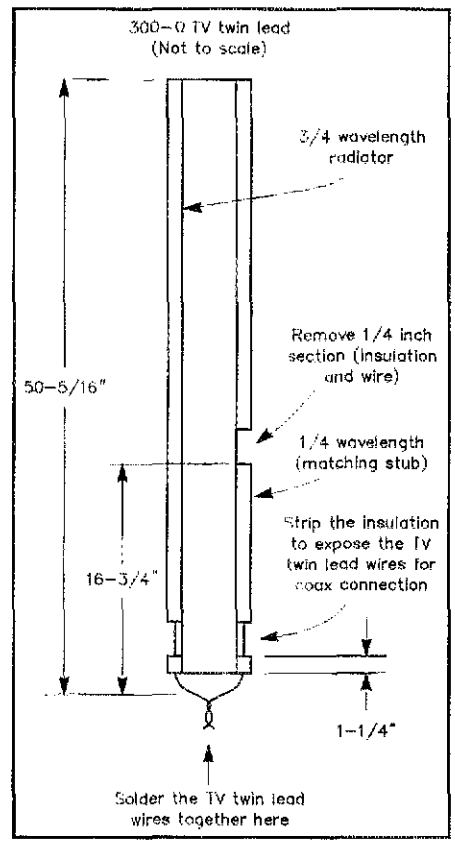


Figure 2—The basic J-pole layout. Note the areas where insulation and/or wire must be trimmed.

terms of the speed of light, either as a percentage or a decimal fraction. Knowing the velocity factor is important when you're building antennas and working with transmission lines. Because of the delay, 360° of a given signal wave exists in a physically *shorter* distance on a wire than in free space. This shorter distance is the *electrical* length, and that's the length we need to be concerned about.

Copper wire has a velocity factor of about 0.93, whereas TV twin lead has a velocity factor of 0.81 to 0.85 depending on who made it. If you're unsure about the twin lead you're using, just use 0.85 as its velocity factor. It's okay if it turns out to be too high. You'll be able to compensate by trimming the antenna. (It's better for the antenna to be too long than too short!) The TV twin lead I used had a velocity factor of 0.83. So, using the formulas, at 146 MHz the lengths would be approximately 50⁵/₁₆ inches for the ³/₄-wavelength radiator and 16³/₄ inches for the ¹/₄-wavelength stub.

Construction

Because of the few materials needed to construct this antenna, you'll find it surprisingly easy to build. Start with approximately five feet of 300-Ω TV twin lead and about six feet of 50-Ω coaxial cable (see Figure 1) with a suitable connector (most H-T's use a BNC connector). Use only flat 300-Ω TV twin lead, not foam core. RF can potentially short through the foam core.

Start by stripping off ¹/₂ inch of insulation at one end of the TV twin lead (see Figure 2). Solder the two exposed wires together. This is the bottom of the antenna. Next, measure up 1¹/₄ inches from the soldered wires and remove the insulation from the twin lead to expose ¹/₈ to ¹/₄ inch of wire on both sides. Be careful not to nick or break these wires. They are your connection points for the coaxial feed line.

Now you're ready to measure and cut the elements of the antenna. On one side of the twin lead, measure up 50⁵/₁₆ inches from the center of the exposed wire and trim off the twin lead entirely (both conductors). This side of the twin lead is the radiator of the J-pole antenna. On the opposite side of the twin lead, measure up 16³/₄ inches from the center of the exposed wire and carefully remove a ¹/₄-inch section of insulation *and* wire. This is the ¹/₄-wavelength matching stub.

Turn your attention to the coaxial cable and strip the end without the connector. Separate and expose the center conductor from the braided shield. Attach the coax to the twin lead by soldering the center conductor of the coax to the longer element of the J-pole and the shield to the shorter of the two elements. Do this at the point where you removed the twin lead insulation and exposed the wire on both sides (see Figure 3).

Apply a generous amount of weatherproof silicon sealant to the exposed coax to prevent moisture from seeping into the line. Now tape the coax to the twin lead to relieve strain on the soldered connection points. Heat shrink tubing also works well for this application.

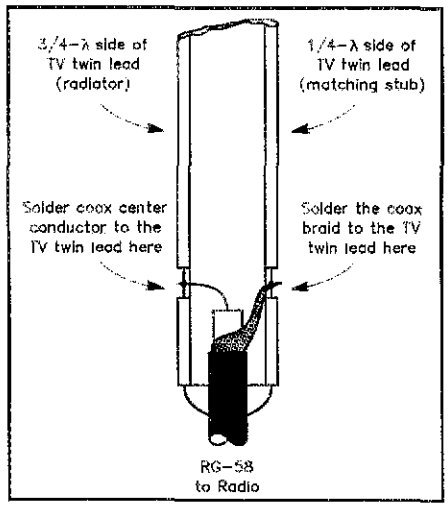


Figure 3—The coaxial feed line is connected directly at the antenna. Be careful to observe that the center conductor is soldered to the side of the TV twin lead with the longer conductor. The braid is connected to the side with the shorter conductor.

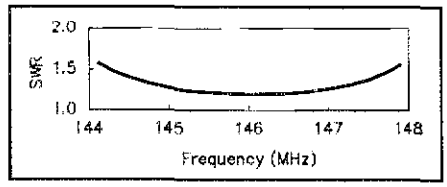


Figure 4—The SWR of the J-pole over the 2-meter band.

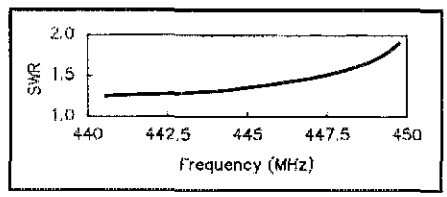


Figure 5—On the 70-cm band, the J-pole still presents a useable SWR.

Tuning

Hang your J-pole vertically by making a small hole at the top of the antenna and tying a length of twine or fishing line. Take care to keep the antenna away from metal objects that could detune it.

Tuning the J-pole is easy. Using a high-accuracy VHF/UHF SWR meter (borrow one if necessary), simply trim the length of the elements until you read a 1:1 SWR—or as close as you can get. Trim in *very* small increments: don't chop off an inch at a time! Remember to trim in a 3:1 ratio to maintain the ³/₄- to ¹/₄-wavelength proportions. For example, if you cut ¹/₈ inch from the ¹/₄-wavelength stub, you must cut ³/₈ inches from the ³/₄-wavelength radiator (¹/₈ × 3 = ³/₈).

I should mention that this design can cause RF coupling to the feed line. To avoid this, you can place ferrite beads on the coax at the feedpoint. An alternative is to use 3 to 5 turns of coax (1 to 2 inches in diameter) to create an RF choke at the feedpoint.

Results

Figure 4 shows my SWR measurements on 2 meters. As you can see, the antenna displayed a fairly flat SWR over most of the 2-meter band. At no point did it exceed 1.7:1. I achieved slightly higher, but useable, results on 70 cm (see Figure 5).

After hanging my J-pole from a tree limb and connecting my H-T, I switched to the frequency of a nearby repeater and gave it a try. I was able to talk with several local hams and they all said my signal sounded strong and clear. So far so good, but now came the true test. I switched to a repeater located about 17 miles north of my home, one that I couldn't use with my rubber duck antenna. I keyed the transceiver, announced my call sign, and was almost immediately greeted by a friendly voice. It worked! And not only that, it worked pretty well. The other ham said I was full-quieting into the repeater. Not bad for less than 30 minutes of work. Reception performance was also improved.

Summary

A J-pole antenna will never replace a beam or a full-size vertical mounted at 30 feet, but it offers relatively good performance for a minimum of materials, time and effort.

The applications of this antenna go beyond emergency or portable use. A permanent weatherproof enclosure can be built by mounting the J-pole inside a length of PVC tubing capped at the top. The PVC tube may then be placed at the top of a mast or similar structure. You can drill a small hole in the side of the PVC tube for the coax. Just make sure to seal it against the weather. The PVC will protect the antenna and can be painted to match the color of your house or apartment. If you live in an area where you can't put up outside antennas, hang the J-pole in your attic! If the antenna is located more than 10 feet from your radio, use a low-loss coaxial feed line such as RG-213 or equivalent.

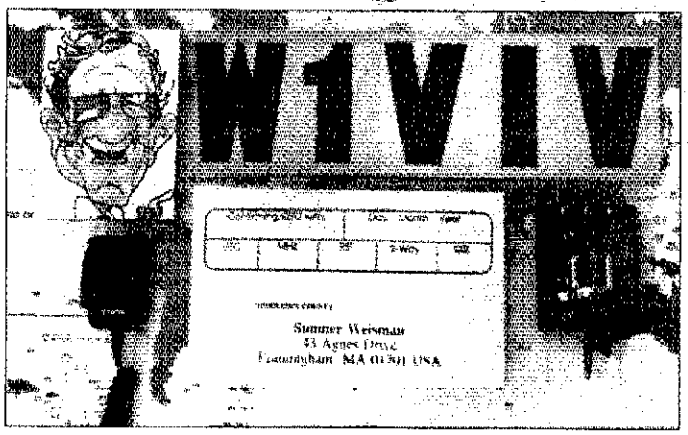
Because of the low cost, simple construction, compact size and improved performance, there's no reason not to build several of these antennas. Keep one rolled up in your backpack when hiking, or in the glove compartment of your car! QST

A good example of a "do-it-yourself" photographic QSL card. Clint took the photo himself using a tripod and a self-timer.

Design Your Own Photographic QSL Card

By Sumner Weisman, W1VIV
43 Agnes Drive
Framingham, MA 01701

Make an attention-getting QSL. All you need is a camera!



The author's final result. Experience has shown that having a unique, attention-getting QSL nets more replies.

When my old QSL cards ran out, I did what we all do; I requested samples from a number of the people who advertise in the back of this and other ham magazines. What I received varied widely in quality, originality and price. While some were excellent, I wanted something different. Therefore, I decided to create my own card *photographically*.

Why use the photographic approach? Unless you're a talented artist, making your own artwork isn't the easiest thing in the world. On the other hand, you can use a camera to photograph any scene you desire—your radio equipment, your antennas, your home or whatever. Once you have the "perfect" photo, a printer can use it to create colorful QSL cards. The QSL printers can also *strip in* your call sign and other information over the photograph for a nice effect.

Creating photo QSLs is not at all difficult. You can design your own cards fairly easily, and letting your creative juices flow can be quite satisfying. I enjoy sending my cards with the knowledge that nobody else has a card like mine.

You don't have to be an expert photographer and you don't need an expensive camera. The "point and shoot" variety, with either automatic or manual controls, are fine. The only real requirements for success are creativity, a steady hand (use a tripod if you can) and good lighting.

My Montage QSL

The easiest way to create your own card is to simply take a picture of yourself sitting in front of your rig. You can either have someone else take the photo or do it yourself using a tripod and a self-timer, as my old friend Clint Pierce, K6UEF, did (see his QSL card at the top of this page). The QSL card printer will add the rest. If you have a great-looking setup as Clint does, this is a good way to go. Unfortunately, my equipment is nowhere near as impressive, so I decided to create my card using a *montage* technique (above).

Although QSO information areas (where you write in the time, date, signal report and so on) are usually added at no charge by the printer, I chose to put mine *in the photograph*. I prefer it on the front rather than on the back so that it can be read

Taking the montage photo. Many different combinations of arrangement, lighting, and exposure were tried.

if the card is hung on the wall.

Using a copying machine, I enlarged the QSO information area from a friend's blank card. I added my name and address by using a word processor and a laser printer. Although QSL cards are coated on the photo side, writing the information on them with a ball-point pen is no problem. You may also wish to put in your county, 10-10 number, awards, or affiliations such as the ARRL. I experimented with the word processor and the copier until I had an information area that was approximately half of the size of my entire montage layout.

For an interesting background, I used a ham radio world map. The map I chose was printed by Yaesu, and may be obtained from their distributors. The letters and numerals of my call sign are printed on individual cards. You can get these at artist- or sign-supply shops.

To complete my montage I added a microphone, CW key and a caricature of myself that an artist had done at a party. I assembled everything onto a small tabletop, tilting the table slightly to provide the best position for the camera (see my photo set-up on the previous page).

My photographic equipment consisted of a Canon AE-1 single lens reflex, with 50mm *f*/1.8 lens. I used fine-grain Ektar film, ASA 100, made by Eastman Kodak. Only one photoflood lamp was used, and I experimented with the proper exposure by "bracketing." That is, I first shot the picture at the exposure called for by the light meter, and then shot two more at one *f*-stop higher and one *f*-stop lower. When I had the film developed, I ordered 4×6 inch jumbo prints. I selected the best and sent it to the printer. The printer simply cropped it down to QSL size and went to press! (When taking photos, allow an extra border because ¼ inch will be lost from each side.)

Use Your Imagination

Your card should tell the person who receives it something about you. Rather than a montage, I could have chosen a photograph of myself, a photo of my Yagi antenna, or something reflecting another hobby that I was involved in. For example, I've seen QSL cards showing animals, tropical fish, airplanes, boats, antique automobiles and exotic locations (see the HS5SEA card on this page). Use your imagination and create a card that's really *you*. QST

This card was issued by Radio Amateur Society of Thailand station HS5SEA, the official station of the 19th *Seanet* convention. The call sign and other information were stripped in by the printer over the original photograph.

FM DXing

(continued from page 60)

from the *attic* of my home in North Andover, Massachusetts on 146.52-MHz simplex with a Yaesu FT-208 transceiver. This was during a hurricane off the Atlantic Coast, and the weather pattern was fantastic for tropo. That fellow in North Carolina must have worked thousands of New England stations on FM!"—*Rich Richmand, KA5S*

The VHF QSO Party

A great opportunity to test your FM DXing skill is just around the corner. The September VHF QSO Party is one of the hottest VHF contests of the year. It is held the weekend of September 10-11, and complete rules appeared in August *QST*. During the contest period you can expect to find activity on all VHF and UHF bands, with 2 meters being the most popular. Much of the activity will be taking place on SSB and CW, but you can count on hearing operators on FM, too.

You can't use 146.52-MHz simplex to make contest contacts, but all the other nationally recognized FM simplex frequencies are fair game. If you make at least 25 contacts you'll be eligible for a handsome participation pin. See the complete rules in the August *QST* for details.

Remember: If you hear nothing, don't take "no" for an answer. Call "CQ contest" yourself! Other stations will be hunting for contacts, so you have to let them know you're on the air. Don't stay on one frequency after you've mined it for all it's worth. Jump to another frequency and try again. Depending on the activity in your area, you should bag 25 contacts in no time at all. And if tropo puts in an appearance, the sky's the limit! QST

W1FB'S HELP FOR NEW HAMS, 2ND EDITION

By Doug DeMaw, W1FB

W1FB's Help for New Hams has been an Amateur Radio staple ever since it was first published. The second edition has just been released and it contains a wealth of new information.

The author, Doug DeMaw, W1FB, is a veteran amateur. Aside from his extensive experience in circuit design (Doug's projects have been appearing in ham magazines and books for years), his specialty is helping new hams. The first edition of *W1FB's Help for New Hams* was released prior to the advent of the codeless Technician license, so its emphasis was on HF operating. The new second edition shifts the focus to include material on VHF and UHF activities.

Here are just a few of the highlights:

The book begins with an overview of the HF and VHF bands. You learn which frequencies and modes are available on each band, as well as the types of activity you'll encounter.

Chapter 2 gets you acquainted with your station equipment—everything from HF transceivers, to H-Ts, to antenna tuners. You'll learn how to use a speech processor, how to adjust an antenna tuner, the importance of proper microphone impedance, and so much more. Conquering the complexity of a new radio is intimidating for many hams. By reading *W1FB's Help for New Hams* before you reach for the **POWER** switch, you'll avoid unnecessary anxiety and get a head start on your hamming enjoyment!

Chapter 3 tackles the "mysteries" of antennas and feed lines. Doug walks you through the theories with simple, easy-to-understand language. There's plenty of practical information in this chapter, too. You'll find diagrams of HF and VHF antennas that you can build yourself.

Doug devotes an entire chapter to the discussion of station accessories. This chapter alone is worth the cost of the book. Which type of accessory is best? Should you buy an accessory, or build it yourself? Before you reach for your checkbook, read this chapter!

W1FB's Help for New Hams doesn't confine itself to hardware. The book looks at the human side, too. Like most veterans, Doug remembers what it was like to be on the air for the first time. He guides you through your first contacts, explains *net* operating, offers a detailed discussion of contesting, and so on.

W1FB's Help for New Hams is available from your favorite dealer, or directly from the ARRL. See the *ARRL Publications Catalog* elsewhere in this issue.—*WB8IMY*

On the Wings of a DOVE

Here's an incentive to get started in packet radio: DOVE-OSCAR 17. You can copy telemetry data from this Amateur Radio satellite without purchasing special equipment. Just a common packet setup is all you need.

By Steve Ford, WB8IMY
Assistant Technical Editor

DOVE-OSCAR 17 is known as a *Microsat*. If you could see the satellite you'd understand why. It's basically a small cube—about 9 inches on each side—that's covered with solar cells. Weighing in at only a few pounds, you could hold this tiny marvel in your lap!

DOVE was launched in 1991 along with several companion Microsats. They travel in polar orbits about the Earth, making one revolution every 100 minutes or so. These Amateur Radio satellites receive "OSCAR" designations as soon as they reach orbit. OSCAR stands for *O*rbiting *S*atellite *C*arrying *A*mateur *R*adio. Like its companions, DOVE is a digital *packet-radio* satellite. That is, it sends data to ground stations using packet-radio techniques. It is satellite number 17 of the OSCAR series. That's why we call it DOVE-OSCAR *17*.

By sending telemetry data, DOVE gives monitoring stations a glimpse of the harsh environment in near-Earth orbit. All it takes is a little imagination and it's almost like being in space yourself.

Strange as it may seem, DOVE also *speaks*! The DOVE controllers activated the satellite's speech function and tested it in early June. It will be used to send bulletins about DOVE and other Amateur Radio satellite activities.

Like all *LEO* (*L*ow *E*arth *O*rbiting) satellites, DOVE behaves like a tiny moon. It pops above your local horizon at a particular time and then sets about 15 minutes later. As DOVE completes each orbit, the Earth continues to turn beneath it. This means that DOVE is not available at exactly the same times each day. Fortunately, there are computer programs that predict when DOVE will be available in your area, and for how long.

DOVE's 145.825-MHz FM signal is very easy to receive. You don't need sophisticated antennas or receivers. In fact, you can hear DOVE on VHF scanners and other relatively inexpensive radios. With a computer, interface and software (see Figure 1), you can monitor DOVE's speech and telemetry as it passes overhead.

Assembling Your DOVE Station

Putting together a station for DOVE is little different than setting up for earthbound packet work. When you're not copying DOVE telemetry, you can use your station to enjoy live packet chats, packet bulletin boards and so on. Except for a special piece of software, your DOVE station is the same as an ordinary packet station.

❑ **Antenna**: A simple 2-meter antenna is all you need. An omnidirectional antenna such as a ground plane or J-pole is fine. Beams are definitely *not* required!

Install the antenna outdoors if possible. You may be able to receive DOVE indoors, but the results are likely to be poor. Even mounting the antenna on the edge of a window sill may be adequate. Use good-quality coaxial cable to link the antenna to your receiver. RG-213 cable (or better) is recommended.

❑ **TNC**: This device is the nerve center of any packet radio station. The letters TNC stand for *T*erminal *N*ode *C*ontroller. It sounds like a complicated device, but don't let the name scare you away. If you're familiar with computers, a TNC is very similar to a *modem*. Modems take computer data and translate it into audio tones that can be sent over telephone lines. They also take audio tones *from* the telephone lines and translate them back into data for the computer. TNCs do much the same thing except that radios are used rather than telephone lines.

❑ **Transceiver**: Just about any modern 2-meter FM transceiver—even an H-T—is more than adequate for DOVE monitoring and packet operating in general. Your TNC manual will describe how to connect the TNC to your radio.

❑ **Computer**: You need an IBM-PC or compatible computer to run the software that decodes DOVE's telemetry. The computer doesn't need to be powerful—any PC will do.

❑ **Software**: There are two types of software you'll need for your DOVE monitoring station:

(1) A *terminal* program. This is software that enables your computer to communicate with your TNC. There are literally dozens of terminal programs available. Some of the shareware versions sell for as little as $5. If your computer has Microsoft *Windows* installed, it may have a terminal program already.

(2) *TLMDCII*. This is the actual telemetry-decoding software. Among the DOVE decoders available, *TLMDCII* is my favorite. *TLMDCII* takes live DOVE telemetry, decodes the data and displays the results in a detailed table (see Figure 2). Each time new data is received, *TLMDCII* automatically updates the information in the table. This allows you to see the changing conditions aboard the satellite in real time! *TLMDCII* will operate on just about any IBM-PC or compatible computer.

TLMDCII is available from:
AMSAT
PO Box 27
Washington, DC 20044
tel 301-589-6062

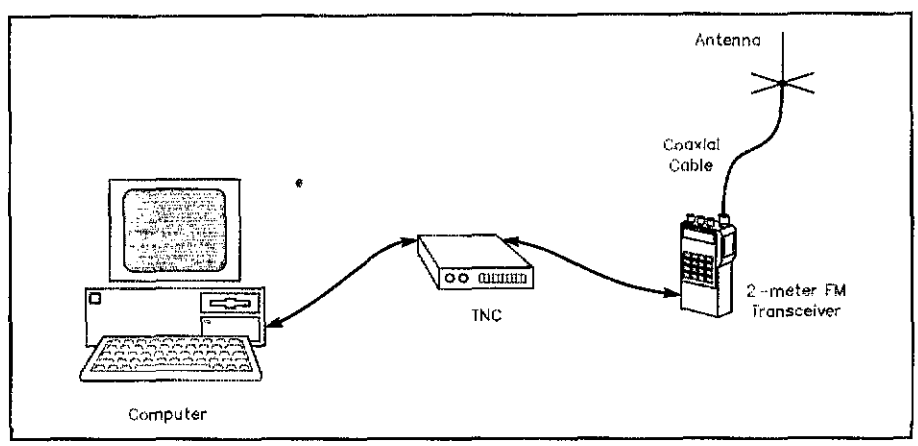


Figure 1—It doesn't take much to set up a DOVE monitoring station. All you need is a PC, a terminal node controller (TNC) and a radio.

Finding Dove

The easiest way to determine when DOVE will appear over your area is to use satellite-tracking software. There are a number of different satellite tracking programs available. One of the best is *InstantTrack*. Costing less than $100, *InstantTrack* is a full-featured software package. If you're using a computer with a color VGA monitor, *InstantTrack* will draw detailed maps showing DOVE's position above the Earth at any time—past, present or future. You can use *InstantTrack* to predict when DOVE will appear above your horizon. Not only that, you'll be able to determine how high DOVE will "rise" in the sky (the higher the better). Even if you lack a color monitor, *InstantTrack* can display this data in tabular form, too. *InstantTrack* and other satellite-tracking programs are available from AMSAT.

But let's say that you don't own satellite tracking software. Maybe you're new to satellite operating and you want to hear what DOVE sounds like before you invest in *TLMDCII*, a packet TNC, tracking software and so on. No problem! I've provided a list of the best DOVE passes in Table 1. The information in the table is good through the end of September. This should give you plenty of time to test your ability to receive DOVE. As you read through the table, don't forget to convert the times and dates from UTC to local.

Monitoring DOVE for the First Time

Let's see whether your TNC and computer can "understand" each other. With your TNC off, start your terminal software and make sure its *communication settings* match those expected by the TNC (data rate, number of bits and so on). Switch on your TNC. If all goes well, you should see some kind of sign-on message followed by the **cmd:** prompt.

If lines of gibberish appear on the computer screen, don't be alarmed. Your TNC is probably okay. The problem is that your computer and the TNC are not quite conversing! Check those communication settings and read the "getting started" section of your TNC manual one more time.

The TNC is working (we hope!), so it's time to place it in the *KISS* mode. KISS is an abbreviation for *K*eep *I*t *S*imple, *S*tupid. No, I'm not joking. Without plunging into the details, the KISS mode instructs the TNC to

(continued on page 69)

Table 1

Optimum DOVE-OSCAR 17 Pass Times—late August through September 1994

The times shown below indicate the approximate *starting times* of the two best DOVE passes each day at the centers of each geographic zone. A list of corresponding states is shown below.

Eastern zone: ME, NH, VT, MA, CT, RI, NY, NJ, DE, MD, PA, WV, VA, OH, IN, MI, KY, NC, SC, GA, FL

Central zone: ND, SD, MN, WI, IA, NE, IL, MO, TN, AL, MS, LA, AR, TX, OK, KS

Mountain zone: MT, ID, WY, UT, CO, AZ, NM

Pacific zone: CA, NV, OR, WA

If you live in the northern or southern areas of a zone, the starting times will vary as much as +/- 6 minutes from those shown below.

All dates and times are UTC

Date	*Eastern*	*Central*	*Mountain*	*Pacific*	*Alaska*	*Hawaii*	*Date*	*Eastern*	*Central*	*Mountain*	*Pacific*	*Alaska*	*Hawaii*
Aug 25	0346	0525	0525	0705	0713	0843	13	0429	0429	0610	0610	0757	0926
	1738	1738	1919	1919	2234	2106		1642	1823	1823	2004	2139	2150
26	0316	0455	0636	0636	0820	0952	14	0400	0540	0540	0721	0728	0858
	1708	1708	1849	2031	2205	2216		1614	1754	1934	1934	2249	2121
27	0426	0426	0607	0607	0754	0923	15	0331	0511	0652	0652	0839	1008
	1640	1820	1820	2002	2136	2147		1724	1724	1905	1905	2220	2232
28	0358	0538	0538	0717	0725	0855	16	0442	0442	0623	0623	0809	0939
	1611	1751	1931	1931	2246	2118		1655	1835	1835	2017	2152	2202
29	0328	0508	0649	0649	0835	1005	17	0412	0412	0553	0553	0740	0910
	1721	1721	1902	1902	2217	2228		1626	1806	1948	1948	2302	2134
30	0439	0439	0619	0619	0806	0936	18	0343	0523	0523	0704	0851	1021
	1652	1832	1832	2014	2148	2159		1736	1736	1919	1919	2234	2244
31	0409	0409	0550	0730	0737	0907	19	0315	0454	0635	0635	0822	0951
	1623	1803	1943	1943	2259	2130		1707	1707	1848	2029	2203	2215
Sept 1	0340	0520	0520	0700	0848	1018	20	0425	0425	0606	0606	0752	0922
	1733	1733	1914	1915	2229	2240		1638	1819	1819	2000	2134	2146
2	0312	0451	0632	0632	0818	0948	21	0356	0536	0536	0716	0724	0853
	1704	1704	1845	2026	2200	2211		1749	1749	1929	1929	2245	2117
3	0422	0422	0603	0603	0749	0919	22	0327	0506	0647	0647	0834	1003
	1635	1815	1815	1957	2131	2142		1719	1719	1900	1900	2216	2228
4	0352	0532	0532	0713	0720	0850	23	0437	0437	0618	0618	0805	0934
	1745	1745	1926	1926	2242	2114		1650	1831	1831	2012	2147	2158
5	0325	0503	0644	0644	0831	1000	24	0408	0408	0549	0728	0736	0905
	1716	1716	1857	1857	2213	2224		1621	1802	1942	1942	2257	2129
6	0434	0434	0615	0615	0802	0933	25	0339	0519	0519	0659	0846	1016
	1647	1828	1828	2009	2143	2155		1732	1732	1913	1913	2228	2240
7	0405	0545	0545	0725	0733	0902	26	0310	0449	0630	0630	0817	0946
	1618	1759	1939	1939	2254	2126		1702	1843	1843	2025	2159	2210
8	0336	0515	0515	0655	0843	1013	27	0420	0420	0603	0741	0748	0918
	1728	1728	1911	1911	2226	2236		1633	1814	1955	1955	2310	2141
9	0446	0446	0627	0627	0814	0943	28	0351	0531	0531	0711	0720	0849
	1659	1840	1840	2021	2156	2207		1744	1744	1925	1925	2240	2112
10	0417	0417	0558	0738	0745	0914	29	0322	0502	0643	0643	0829	0959
	1630	1811	1953	1953	2306	2138		1715	1715	1856	1856	2211	2222
11	0348	0528	0528	0708	0716	0846	30	0432	0432	0613	0613	0800	0929
	1741	1741	1922	1922	2237	2249		1646	1825	1825	2008	2142	2153
12	0319	0459	0640	0640	0826	0956							
	1712	1712	1853	2034	2208	2219							

Go Digital!

The HF digital modes are booming. There's no better time than now to join the fun.

By Kirk Kleinschmidt, NTØZ
Assistant Managing Editor

When most hams think of computers and Amateur Radio, packet comes to mind. And why not? During the last 10 years packet has become the most popular digital communication mode. More than 30,000 packeteers couldn't be wrong!

Packet is terrific for local networks on VHF and UHF, but it's not well suited for HF work. When it comes to HF digital hamming, the more suitable modes are RTTY, AMTOR, PacTOR, CLOVER and G-TOR. This collection looks like alphabet soup, doesn't it? Let's dispel some of the mystery by taking a brief look at the hardware and software required to get started in these fascinating modes, and what you can do with them on the air.

The Transceiver

You'll find that most modern HF transceivers easily accommodate the digital modes. If you're considering AMTOR, PacTOR, CLOVER or G-TOR, make sure your rig can switch from transmit to receive very rapidly. For example, AMTOR requires a transmit/receive turnaround time of 30 milliseconds or less for long-distance work. *QST* Product Reviews and some manufacturer's ads list these specs.

If you're interested in RTTY, you'll need a rig that can tolerate *high-duty-cycle* transmissions for extended periods of time. (CW and SSB are *low*-duty-cycle modes because they cause the transmitter to produce full output for only brief intervals.) Most modern rigs are rated for full output in high-duty-cycle use, but some must be operated at reduced output.

Older rigs are often less tolerant of high-speed switching and high-duty-cycle transmissions. AMTOR, PacTOR, CLOVER and G-TOR are impossible on many vintage radios. Most older SSB transmitters and transceivers should be RTTY compatible—although you'll have to be careful not to exceed their specifications for continuous output power!

If you don't know the switching speed of a particular rig, here's an easy rule of thumb for selecting an HF transceiver for digital applications: If you intend to operate any of the modes that require rapid transmit/receive switching, buy a rig that was manufactured within the last 5 to 10 years. Not only do they switch rapidly, most feature good frequency stability. If your only interest is RTTY, almost any good-quality radio made within the last 20 years will do the job.

The Computer

With all due respect to owners of Apple, Commodore, Atari and other computer brands, it's fair to say that IBM PC compatible computers have become the de facto standard in Amateur Radio. This doesn't mean that other models are unusable for digital communications, though. (The only exception is CLOVER, which *requires* an IBM-PC or compatible.) If you can get a terminal-emulation program for your computer, you're halfway there.

Virtually any personal computer is sufficient to get you off and running. There are a few factors to consider before making your choice, however:

- *I/O* (input/output): Does the computer have an RS-232C serial port? Most digital interfaces require one.
- *Software*: Is there a terminal-emulation program available for the computer?
- *Memory*: How much random-access memory (RAM) is available? When it comes to RAM, the more the merrier.
- *Data storage*: Does the computer offer some form of reliable data storage (preferably floppy disks or a hard disk)?
- *Interference*: Does the computer bombard your receiver with RF of its own making? How does it respond to *your* radio signals? Interference can be a major headache!
- *Support*: If your computer suddenly becomes demented, is there anyone on the planet who remembers how to fix it?

The computer that's best for you will ultimately depend on your budget and your goals. If you're a little unsure about digital communication, start small and work your way up.

The Analog/Digital Interface

Getting your computer to talk to your radio is the job of the interface, which must accept digital data from the computer and translate it into audio signals (or on/off keying) for the transceiver, and vice versa. Unless you're using a CLOVER card in an IBM-PC, you'll need an interface device. In this case you're really talking about modems—much like the ones used to link computers via telephone.

Multimode Communications Processors

As digital technology evolved, it wasn't long before someone said, "Why should I have to use one interface for packet and another for RTTY? Why can't they all be together in one box?"

Not only did manufacturers place packet and RTTY together in the same box, they added several other modes for good measure. The result was the *multimode communications processor* (or *MCP*)—probably one of the most popular pieces of equipment for the digital ham today.

Like packet TNCs, MCPs incorporate microprocessor design and internal memory. By issuing a single command from the computer keyboard, you can switch the MCP from packet (HF or VHF), to AMTOR, to RTTY or whatever. Some models also add fax, ASCII, NAVTEX and SSTV to their list of modes. MCPs have brought a smorgasbord of operating modes within the reach of average hams. Their sheer convenience is addictive!

Digital Signal Processing

Now that you've been introduced to MCPs, it's time to tell you about an exciting new technology called *digital signal processing* (or *DSP*)—an entirely digital approach to decoding and encoding signals for various modes. Its main advantage is its flexibility.

For example, you can add a new digital mode to a standard MCP by replacing an IC chip that has been programmed with new software. This is fine as long as the unit can support the new mode. But what if you want the processor to perform a task that's beyond the capability of its existing hardware?

With a DSP processor, you can add virtually *any* mode to the unit by simply add-

ing new software. Unlike standard communications processors, DSP units use software to directly encode and decode signals without depending on specialized hardware.

RTTY

Technically speaking, the term RTTY encompasses many forms of amateur digital communication, including AMTOR and ASCII. In common use, however, RTTY refers to the use of the 5-bit International Telegraph Alphabet Number 2 (ITA2), also known as Baudot (pronounced Bawdough). Although communications data rates for landline or radio modems are properly expressed in bits per second, you'll often see them referred to as so many "bauds." Telephone modems typically run at 2400 or 9600 bauds; most VHF packet runs at 1200 bauds; AMTOR chirps along at 100 bauds and most amateur RTTY warbles along at an easy-to-type pace of 45.45 bauds. Further discussion of the technical aspects of RTTY are beyond the scope of this article. For more technical information, check out *The ARRL Handbook* or the *ARRL Operating Manual*.

Unlike AMTOR, which we'll get to in a minute, making RTTY contacts is a lot like making Morse code QSOs. Because no error-correction schemes are used, signal strength and propagation are important. If a RTTY signal fades out for a second, your RTTY terminal "loses copy."

To make a contact, one station usually calls CQ by turning on his transmitter and typing "CQ CQ CQ DE NTØZ NTØZ NTØZ K K K," or something similar, usually repeated two or three times (computerized terminals and their programmable buffers make short work of this).

A station answering the CQ might reply with a three-by-three reply (sending the CQ'ers call sign three times followed by his call sign three times), which is sometimes preceded by a short string of "RYs." Because of their Baudot code patterns, an "endless" string of the letters R and Y produces an unmistakable sound. The RYs make it easy for the receiving station to exactly tune in the other station before information is exchanged—sort of like priming the pump. (Don't overdo the RYs, however...)

From then on, an RTTY QSO is a lot like a Morse code QSO. In fact, many of the same procedural signs are used.

If the hustle and bustle of everyday hamming is getting you down, RTTY may be the answer. RTTY ops are known for being extra friendly, and "hitting the keys" makes for an interesting, almost nostalgic, ragchew medium.

Ragchewing is a popular RTTY pastime, but there's something for everyone, from intense contest action, to traffic handling, to awards chasing and DXing. (With low-cost RTTY technology catching up to the rest of the world, the RTTY subbands are bursting with DX stations. Often, they're much easier to work than their SSB and CW counterparts.) One look at the DXing newsletters and you'll see that even DXpeditions to rare spots around the globe equip at least one RTTY station. If you've "worked 'em all" on SSB or CW, why not give RTTY a try? Regardless of your interests, even a fully computerized RTTY setup seems to take you back to a bygone era when mechanical teleprinters churned out copy on long rolls of gritty yellow paper. You can almost smell the oil and the machinery...

Table 1
Some Places to Look for HF Digital Activities (in kHz)

3605-3645
10,140-10,150
14,070-14099.5,
14,100.5-14,112
18,100-18,110
21,070-21,100
24,920-24,930
28,070-28,150

AMTOR

If RTTY is known for its nostalgic appeal, then AMTOR brings amateur HF digital communication into the computer age.

Instead of sending and receiving steady streams of data, an AMTOR station sends short data bursts back and forth, and will keep repeating the same burst until the receiving station has acknowledged receipt. This results in AMTOR's (and SITOR's) characteristic "chirp-chirp-chirp" sound, which is hard to miss on the bands.

If signals fade momentarily, the AMTOR stations chirp away until the data has been correctly sent and received. This eliminates some of the "nostalgic" feel, but ensures nearly 100% copy, which is important in traffic handling or transferring computer or text files.

All of the previously mentioned RTTY activities take place on AMTOR, but the newer mode is more suitable for certain types of "remote access" activities such as AMTOR "mailboxes," which work a lot like landline BBSs. You can leave mail for other AMTOR users, and when they "check in," their mail is waiting to be picked up. Text files and other data files are also available from the mailbox.

Probably the most popular AMTOR mailbox system is a global network of *APLink* stations. *APLink* stations can network with VHF packet networks, for seamless traffic handling and emergency communication. As an example of how effective AMTOR can be, during the Gulf War, hundreds of messages were clandestinely relayed from occupied Kuwait by one AMTOR/*APLink* operator hidden within the borders.

PacTOR

PacTOR made its debut in the early 1990s and it's been growing rapidly ever since. PacTOR has become so popular, it has almost replaced AMTOR as the most active HF digital communications mode.

Like AMTOR and packet, PacTOR sends error-free information by using a *handshaking* system. When the data is received intact, the receiving station sends an ACK signal (for *acknowledgment*). If the data contains errors, a NAK is sent (for nonacknowledgment). AMTOR and PacTOR sound similar when you hear them, but PacTOR is the mode with the extended chirps.

The key to PacTOR's magic is a feature known as *memory ARQ*. Each time your MCP receives an incomplete data burst (one with missing data), the bits of data that made it through intact are stored temporarily in memory. When the data burst is repeated, memory ARQ looks for the *missing* data and attempts to fill the gaps. In most cases, memory ARQ can assemble error-free information with only one or two repeat transmissions. The fewer the repeats, the faster your communication will be! (PacTOR is *much* faster than AMTOR under most conditions.)

PacTOR also adjusts itself *automatically* to the band conditions. If band conditions are good, PacTOR will run at 200 bits/s (bits per second). If the band starts to go, it adjusts itself down to 100 bit/s.

With memory ARQ and automatically adjustable data rates, PacTOR offers very good performance. PacTOR also supports the complete ASCII character set. This means that you can send every letter of the alphabet (in upper or lower case) as well as punctuation marks and special symbols. (AMTOR supports only a limited character set.) It's also possible to swap binary files on PacTOR.

Most *APLink* systems now include PacTOR. You can connect and pass traffic using either PacTOR or AMTOR as you prefer. There are also plenty of PacTOR BBSs on the air as well as hams eager to enjoy live keyboard-to-keyboard chats.

CLOVER

Of all the Amateur Radio HF digital communication modes, CLOVER offers the best overall performance. Using a complicated modulation scheme, automatic output power adjustment and other advanced

features, CLOVER is able to maintain communication under the worst conditions. CLOVER is also very efficient. In terms of throughput, CLOVER is the most efficient HF digital mode available to hams today.

Although CLOVER appeared at nearly the same time as PacTOR, it hasn't enjoyed PacTOR's success. This has been mainly due to hardware requirements and cost. This situation is changing, as you'll see in a moment.

To operate CLOVER you must purchase a PCI-4000 card from HAL Communications. This card installs in the expansion slots of an IBM-PC computer (286 or higher). The connections to your SSB transceiver are simple. One cable goes to your microphone jack and another connects to your external speaker jack or auxiliary audio output. Almost any modern SSB transceiver will work with CLOVER—if it is *very* stable.

Like AMTOR and PacTOR, CLOVER uses a handshaking system to exchange information. In the case of CLOVER, however, stations swap information about signal conditions and power output levels *in addition* to the files or other data they're attempting to send. The length of CLOVER bursts can vary, but they're usually longer than AMTOR or PacTOR.

When CLOVER cards were first available, the cost was about $1000 per card. A CLOVER card could operate *only* in CLOVER; no other modes were available. Prices of CLOVER cards have fallen to around $700 or $800 and they are now *multimode* units, offering RTTY, AMTOR and PacTOR in addition to CLOVER. With the reduced cost and multimode features, you may hear more CLOVER stations on the air soon. At the present time CLOVER is being used primarily as a means to transfer large amounts of data between bulletin board systems.

G-TOR

G-TOR is the newest Amateur Radio digital mode in active use. Pioneered by Kantronics Corporation, G-TOR was released early this year as a new feature of their popular *KAM Plus* MCP.

G-TOR is an acronym for Golay-coded Teleprinting Over Radio. Golay coding is the error-correction system created by M. J. E. Golay and used by the *Voyager* spacecraft. Sending billions of bytes of data across the Solar System required a scheme to ensure that the information could be recovered despite errors caused by interference, noise, and so on. It seemed like a perfect choice for overcoming some of the difficulties of digital communication on the HF bands.

Operating G-TOR is essentially the same as operating AMTOR or PacTOR. G-TOR signals sound almost identical to PacTOR when you hear them on the air. (If you listen carefully, the G-TOR bursts are longer than PacTOR bursts.) Like PacTOR, G-TOR supports the complete ASCII character set in addition to the ability to transfer binary files.

The main advantage of G-TOR over AMTOR and PacTOR is speed. G-TOR is capable of transferring data at rates nearly *triple* those of PacTOR—even under terrible band conditions. G-TOR even approaches the efficiency of CLOVER in certain situations.

When this article went to press, you needed a Kantronics KAM Plus (or an upgraded KAM) to operate G-TOR. Other MCP manufacturers have also expressed interest in adding G-TOR to their products. The popularity of G-TOR is on the rise, but it's too early to tell whether it will give PacTOR any serious competition. QST

DOVE

(continued from page 66)

send all the incoming data from the satellite directly to your computer. In normal packet radio operating, the TNC processes the data, then it displays the result on a computer. In this case, we want the *TLMDCII* program to do the processing.

Consult your manual for instructions on how to put your TNC into the KISS mode. For many TNCs, it works like this:

STEP 1: Enter **KISS ON**
STEP 2: Enter **RESTART** or **RESET**

With the TNC in the KISS mode, there is little left to do. Just switch on your radio and make sure it's set to 145.825 MHz. Turn the squelch control until you hear noise. As the satellite comes within range, you'll hear buzzing sounds separated by periods of silence or digitized speech. Now it's time to plug the audio input cable from the TNC into the external speaker or earphone jack on your radio. Turn up the volume until the **RCV** (or **DCD**) indicator on the TNC glows in response to packet bursts.

Exit your terminal program. You don't need it to talk to the TNC now. Start *TLMDCII* and press **L** to activate the live telemetry decoding function. The next thing you'll see is a blank screen. This is normal. The screen will remain blank until the software has decoded enough telemetry to create at least a partial display.

Now wait. Don't expect to see decoded telemetry right away. Depending on the sensitivity of your receiver and the quality of your antenna, you may have to wait several minutes before you get your first screen-full of data. But what a sight it is! If you've never received a transmission directly from a satellite before, it's sure to give you a tingle!

There are other spacecraft that you can hear with your DOVE equipment. The OSCAR 21 satellite transmits a powerful FM signal on 145.985 MHz. OSCAR 21 relays live conversations (much like a terrestrial repeater) as well as packet telemetry data. And don't forget the Russian *Mir* space station. The cosmonauts use their Amateur Radio station aboard *Mir* to converse with hams on Earth through packet radio and even voice. QST

uptime is 141/09:16:30. Time is Mon Mar 28 03:29:46 1994

DOVE

+10V Bus	11.147 V	BCR Set Point	20.213 C	BCR Load Cur	0.080 A
+8.5V Bus Cur	0.029 A	+5V Bus Cur	0.229 A	X Array Cur	0.011 A
+X Array Cur	0.013 A	Y Array Cur	0.010 A	+Y Array Cur	0.011 A
-Z Array Cur	0.017 A	+Z Array Cur	0.011 A	Est Power Cur	0.020 A
BCR Input Cur	0.188 A	BCR Output Cur	0.017 A	Bat 1 Temp	4.234 D
Bat 2 Temp	-24.206 D	Baseplt Temp	3.024 D	FM TX#1 RF OUT	0.026 W
FM TX#2 RF OUT	0.003 W	PSK TX HPA Tmp	-18.760 D	+Y Array Temp	-0.607 D
RC PSK HPA Tmp	-5.448 D	RC PSK BP Temp	-5.027D	+Z Array Temp	-10.288 D
Rx L/F AudioW	2.165 V	Rx L/F AudioN	2.165 V	Mixer Bias V	1.367 V
Osc. Bisd V	0.500 V	Rx A Audio (W)	2.165 V	Rx A Audio (N)	2.165 V
Rx A DISC	0.318 K	Rx A S meter	83.000 C	Rx L/F DISC	-1.080 k
Rx L/F S meter	112.000 C	+5 Volt Bus	4.880 V	+5V Rx Current	0.023 A
+2.5V VREF	2.506 V	8.5V BUS	8.367 V	IR Detector	0.000 C
LO Monitor I	0.001 A	+10V Bus	10.454 V	GASFET Bias I	0.004 A
Ground REF	0.000 V	+Z Array V	0.205 V	+X (RX) temp	-4.237 D
Rx Temp	6.654 D	Bat 1 V	1.289 V	Bat 2 V	1.289 V
Bat 3 V	1.290 V	Bat 4 V	1.289 V	Bat 5 V	1.289 V
Bat 6 V	1.319 V	Bat 7 V	1.298 V	Bat 8 V	1.303 V
Array V	9.941 V	+5V Bus	4.802 V	+8.5V Bus	8.344 V

Figure 2—This is DOVE telemetry decoded by the *TLMDCII* software during a pass in late March, 1994.

The Doctor is IN

Q Mark Orey, KF9TL, asks, "I heard a couple of hams talking on 20 meters the other day. They gave each other 30-dB over S9 signal reports and both mentioned that they were using amplifiers. Another ham broke in and suggested that they should reduce output if their signals were so strong. They refused and criticized him for interrupting. Was he correct in suggesting that they reduce their output?"

A That unfortunate fellow was correct. The FCC clearly states that hams must use the *minimum* amount of power required for communication. This doesn't mean you must pin the S meter on the other guy's radio. You should only use as much power as is necessary to make yourself understood. If band conditions are good and interference is minimal, a signal that barely moves your S meter may be perfectly readable.

Q Wallace Colvin, N8NAS, asks, "I often hear hams on local repeaters using the expression 'in the group.' What's the purpose of this phrase? Does it mean their conversation is closed to newcomers?"

A The expression "in the group" (or "*and* the group") is one of those *hamisms* that have crept into use along with "destinated," "the home QTH" and other words that set our teeth on edge. It's a clumsy way of acknowledging that other hams are participating in the conversation. As in so many hamisms, it states the obvious. You'll often hear it used as a kind of elaborate identification. ("WR1B this is W1XYZ *in the group*.")

Yes, it can be an intimidating thing to hear—especially if you're a new ham. It makes you wonder if they want others to join at all. In most cases, however, it's just babble without malicious intent. When someone says "in the group" they usually don't mind if you join the fray. Some hams use "in the group" as a way to *encourage* others to join. The idea is to communicate that a roundtable discussion is in progress so that others will check in. Plain English would be so much easier, though.

Q C. B. Hempel, K6BOF, asks, "What is the approximate insertion loss of a typical 1:1 or 4:1 balun? There must be some loss since they surely aren't 100% efficient."

A No balun is 100% efficient, but calculating the potential loss is more complicated than it seems. There are many factors involved. When used with a resonant antenna at a low SWR, for example, the loss in a 4:1 balun can be less than 0.2 dB. The same balun is also capable of functioning well at high SWR *if* it is well constructed and operated within its design parameters.

That's one of the reasons why there is so much controversy about baluns and how well various types work. It's more than a question of frequency and power. You have to consider the impedances involved, whether the currents are balanced properly and so on. You'll know when a balun is being pushed beyond its design limit when it begins to dissipate excessive heat. An arcing balun is another danger signal!

Q Walter Wysock, KA6HND, asks, "I own a transceiver with a DTMF (*TouchTone*) keypad. The buttons are labeled 0 through 9 along with #, * and A, B, C and D. Can I use the keypad to make telephone calls through a repeater?"

A Yes, you can. The only thing you need is a repeater with an *autopatch*. An autopatch acts as the interface between you, the repeater and the telephone system. Most repeaters require special DTMF code sequences to activate the autopatches and turn them off again. Your transceiver has what is known as a *16-button* pad. Most code sequences, however, only require the use of the * and/or # keys in addition to the numerical keys.

Here's a step-by-step outline for using a typical autopatch:

1. Identify and declare your intention to use the autopatch ("KA6HND to access patch").

2. Drop the carrier momentarily. If no one objects, key your transceiver again and send the access code. A code sequence might be something like #-7-9.

3. Drop your carrier again and listen. If you're successful, you should hear a dial tone.

4. Now send the telephone number you wish to call. When the other person answers, make sure to tell him or her that you're connected via Amateur Radio (this isn't a private conversation!) and that both of you must take turns talking.

5. Keep the conversation as short as possible. When you're finished, send the sequence to shut down the patch. Make sure the autopatch has deactivated and then identify again, saying that you're clear.

Every repeater system uses different access codes and procedures, so you'll have to contact the repeater operators to get them. In many cases, you must become a member of a club or other sponsoring group to obtain the codes.

Q Is it true that you can use a cable-ready TV or VCR to receive ATV signals?

A Well...maybe. It depends on the kind of equipment you own and the strength of the ATV signals you're trying to receive.

There are several cable channels that correspond to ham radio ATV frequencies. They are:

Channel 57 — 421.25 MHz
Channel 58 — 427.25 MHz
Channel 59 — 433.25 MHz
Channel 60 — 439.25 MHz

Most modern TVs and VCRs feature preprogrammed channels. This may present a problem because you can't adjust the frequencies for best reception. Older equipment may be better in this regard. Many include fine-tuning controls for each channel. Be careful, though. Old TVs and VCRs include UHF channels 57 through 60, but these are over-the-air *television* channels, not *cable* channels.

Contact ATV operators in your area and ask which frequencies are most active, and *when* they're active. With luck you'll be able to watch the fun!

Q I want to feed my antenna with open-wire feed line (ladder line). The problem is that my transceiver has a built-in antenna tuner and it only accepts coaxial cable. Any solutions?

A Yes, use an outboard (remote) 4:1 balun to make the transition from open-wire line to coaxial cable. The approach is similar to what actually goes on inside most antenna tuners.

The 4:1 balun "steps down" the feed line input impedance to a value that may be within the range of your rig's antenna tuner. In addition, it acts as a bridge between the *balanced* feed line and the *unbalanced* tuner circuitry. In most cases, one side of the balun enclosure has dual binding posts to accommodate open-wire line. On the other side you'll find an SO-239 coaxial connector. The enclosure may or may not be weatherproof—something to consider if you intend to install it outdoors.

You can make your own 4:1 remote balun, or buy one from manufacturers such as MFJ, Radio Works and others. When you install it, keep the coax between the balun and your radio as short as possible. This is very important. Some manufacturers recommend a maximum coax length of 15 feet or so. I suggest a *much* shorter length (a few feet).

When the SWR is high, your open-wire feed line will lose very little RF energy. That's one of its big advantages. The same cannot be said for the coax, however. The longer the coax between your rig and the remote balun, the more RF you may lose. If the cable is too long, its loss under high SWR conditions may be such that it effectively cancels the advantage of using open-wire line!

DO YOU HAVE A QUESTION OR A PROBLEM? ASK THE DOCTOR! SEND YOUR QUESTIONS (NO TELEPHONE CALLS, PLEASE) TO: "THE DOCTOR," ARRL, 225 MAIN ST, NEWINGTON, CT 06111.

Technical Correspondence

Conducted By Paul Pagel, N1FB
Associate Technical Editor

REVISITING "THE NEARLY PERFECT AMPLIFIER"

Publication of "The Nearly Perfect Amplifier" by Richard Measures, AG6K, in January 1994 *QST* sparked correspondence from a number of readers questioning the technical accuracy of several points made in the article. We asked ARRL Technical Advisor Fred Telewski, WA7TZY, to review the article and the correspondence received. Fred's comments are presented here, along with excerpts from some of the letters received from readers (see the Contributors sidebar).—*N1FB*

Fred Telewski: Many of the things Rich Measures describes (but not all of them) exist. The issue is to what degree they're relevant in the design of a practical amplifier. Measures tends to stress some aspects of amplifier design which do not significantly contribute to the performance of the final product.

Filament Voltage

Fred Telewski: I substantially agree with Measures' observations concerning filament life as a function of voltage. Where Measures and I depart regards his idea of using a regulated dc supply for filaments. Five volts dc at 5 to 30 A, although conceptually easy to generate, could prove uneconomical for most amateurs and manufacturers of amateur equipment. I suggest using a separate filament transformer with taps set at 5% intervals for easy setting of the filament voltage.

Filament Inrush Current

Fred Telewski: Although the "ideal" ratio for inrush to operating current is 1 to 1, the question is how significant is it to achieve this ratio in an amateur amplifier. I have perused both Eimac and RCA literature and find that for extremely high-power tubes (approximately 500 kW anode dissipation) that the inrush to operating current ratio is approximately 1.2 to 1. For tubes in the 250 kW dissipation class, this ratio is in the 2.5 to 1 range. I found one RCA 5 kW dissipation triode where the inrush to operating current ratio is specified as approximately 5 to 1. That Eimac does not discuss inrush current for tubes with less than 100 kW dissipation, leads me to conclude that this is not a major factor in the design of amateur transmitters.

While it is theoretically possible, as Measures points out, that a 15-A tube can draw 125 A, I must also agree with Tom Rauch's observations that this is extremely unlikely due to the impedance of filament chokes, transformers and wiring. I think the message to amateurs building their own amplifiers is to avoid oversizing the filament transformer. The right size filament transformer works best, and if available, use one designed to have high leakage reactance.

Measures also asserts that indirectly heated cathodes are not affected by inrush current. Here again, I must agree with Rauch's observations that truly excessive inrush current can be detrimental to indirectly and directly heated cathodes.

Tom Rauch: Inrush current to a tube's filament does have a deleterious effect on the filament. Inrush current can affect all types of tubes, although problems are very rare in the types of tubes used in amateur service. Contrary to the statements presented in the article the principal damage has been found to be thermal in nature and not magnetic.

Grid Protection

Fred Telewski: Here I have to agree with Eimac and Tom Rauch. The loss of load or plate voltage while drive is applied can be very detrimental to grids. Therefore, I favor electronic protection. I agree with Rauch that fuses and resistors afford poor protection for a grid under these fault conditions.

Reid Brandon: The suggestion that grid-protection circuits are unnecessary is ludicrous. Agreed, tubes such as the 3-500Z with rugged grids are not easily damaged, provided the operator keeps an eye on the grid-current indicator. Oxide cathode tubes using focus-cathode design are more easily damaged in a short time (such as milliseconds) under fault conditions. Newly developed circuits are quite effective in protecting tubes from excessive grid dissipation, which can result from loss of load due to failure in the feed line, balun, or antenna. To suggest that a grid can be protected by fuses is incorrect. Fuses are too slow to react to fault conditions; they may not operate at all in the case of brief overloads, and when they do operate, there is no feedback to shut off drive power or plate voltage or any other parameter. What Measures has proposed is to discard good engineering practice and adopt a dangerous situation for some tube applications.

We do not understand the reference to "sudden bursts of VHF or UHF grid current." If Measures meant to imply that this is something which is occurring in even one commercial HF linear amplifier manufactured for the amateur market today, it is an amplifier we have not yet seen. With no proof of this phenomenon, we have to assume this is a clever method of promoting "low-Q parasitic suppressors."

Tom Rauch: Measures states that VHF and UHF parasitics result in super-heated grid surfaces, magnetically bent grids and filaments, destruction of tank capacitors, damaged band switches and cathode to anode arcing. Although VHF and UHF parasitics are undesirable characteristics and must be avoided, there is no basis in amplifier tube theory or actual experience to support such conclusions. They are not supported by design theory or the experience of recognized experts in the RF amplifier community that include Eimac, Siemens, ETO, Henry, and Ameritron. In fact, it is impossible to perform a failure analysis of a tube and determine if the failure resulted from excessive VHF or UHF grid current. The article further states that its author has, "never found a tube damaged by excessive HF grid current." This statement is contrary to common sense and to the experience of manufacturers of power grid tubes. It is also contrary to the sad expe-

Contributors

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Tom Rauch, W8JI, 3455 Monica Ln, Conyers, GA 30208. Tom is an RF engineer, designer and consultant. Presently employed by Ameritron, he has designed many of their products including the AL-80A/80B/82/84/800/800H/1200/1500 and the RCS-4 and RCS-8. Tom also designed amplifiers (such as the SB-1000) for the Heath company. Tom's designs include amplifiers for private and government contractors.

riences of those hams who have inadvertently driven the fuse- or resistor-protected grid of a 3CX1500 or 3CX800 with as little as 100 W for only a moment.

In contrast, those who have attempted to overdrive carefully designed home-brew or commercial electronically protected amplifiers, have found that their tubes survive. To replace these fast-responding circuits with fuses or resistors would be foolish. Fuses are notorious for their slow response to overloads, and resistors are worse. Overloads to grid circuits must be controlled in milliseconds. Fuses and resistors cannot provide this speed.

Glitch Protection

Fred Telewski: Beyond the obvious approach of protecting meters by using diodes in parallel, protection becomes a matter of design choice. One needs to look at the entire amplifier design and the protection philosophy employed before making judgments here. Rich obviously has some amplifier designs in mind, but has not shared their schematics or the protection rationale of their designs with us. For example, judicious use of clearance around the dc high-voltage paths will successfully mitigate high voltage arcs caused by hairs, insects, etc.

Tom Rauch: Glitch protection must consider the equivalent series resistance (ESR) of the components in the high voltage circuit. Typical high-voltage electrolytic capacitors can exhibit more than 1 Ω of ESR per capacitor. When the RF choke and other component resistances are added to the capacitor's ESR, the total supply resistance generally exceeds 10 Ω. The addition of a 10-Ω resistor may only offer a negligible improvement in most circuits. It is alarming to note that the article recommends the use of a resistor rated at 500 V. Any device rated at 500 V is subject to catastrophic failure if subjected to the stress of several thousand volts. The manufacturer of such resistors absolutely do not endorse the use of this type of resistor in this application. The correct component would be an energy absorbing type of resistor such as the Carborundum SP type, or RCD Corporation's PCN type. The PCN series resistor for this application should be rated at 80 watts or more dissipation to safely handle the stored energy of a 25-µF capacitor charged to 3 kV.

Power Supplies

Transformers

Fred Telewski: Potting transformers seals the windings against moisture. It does not fill up the air spaces unless it is done under vacuum. Vacuum-potted transformers are more costly. The leakage reactance of the transformer determines what type of filter (choke or capacitor input) is most practical.

Filters

Fred Telewski: I agree that capacitor-filtered power supplies are the norm in Amateur Radio amplifiers. In order the achieve good regulation, these supplies should employ transformers with very low leakage reactances. I have seen capacitor-input supplies with regulations from quiescent current to peak current of approximately 4% using such transformers. It is also imperative that a step-start circuit be used with a low leakage reactance transformer to limit surge currents, which can run as high as 40 times the normal operating current.

I do not understand Measures' comments about choke filters, swinging chokes and transient loads. I have seen many fine commercial-grade transmitters produced with 10 to 12-H chokes and 12 to 20-µF capacitors for operation on single-phase 60-Hz mains. I might add that these commercial grade amplifiers have intermodulation distortion (IMD) specs which are far better than most amateur amplifiers (home-brew or manufactured) achieve. If one has a plate transformer of high leakage reactance design, the only practical choice for good regulation is to use a choke-input filter. Use of capacitive-input filters with high leakage reactance transformers will result in poor regulation (approximately 35%), even with very large capacitors (120 µF).

Rectifiers

Fred Telewski: I must agree with Steve Katz's fine letter on the selection and application of rectifier diodes. I also find that while there is some good advice about not mixing rectifiers, this section of Measures' article is somewhat confusing.

Steve Katz: Measures implies that rectifiers "of the same type" will be successfully used in series without the need for any type of equalization. This is misleading. "Of the same type" hardly qualifies P-N junction rectifiers as being equal, or even similar. The ubiquitous 1N4007, for example, has a PIV rating of 1 kV and an I_0 (forward current) rating of 1 A. Does this make it a 1-kW rectifier? Are they all the same?

In reality, most 1N4007s and similar commercial devices cannot possibly be operated at 1 kV (peak reverse) and 1 A of forward conducted current simultaneously, as they will go into thermal runaway due to the extreme rise in junction temperature created by this application. With a V_f (forward voltage drop) of 1.2 V at 1 A forward current, the device is called on to dissipate 1.2 W. Under these conditions, even if the ambient temperature could be maintained at 55°C (very cool for a large power supply environment), the device's junction temperature would be 94.6°C (derived from its thermal resistance rating). At this junction temperature, the device's reverse leakage current would normally be about 1 mA. At 1 mA leakage current times 1 kV peak reverse potential, the device would dissipate an additional 1 W from reverse losses. Add this 1 W to the original 1.2 W, and now we're up to 2.2 W of power dissipation in a subminiature device that can really only handle perhaps ½ W total. Thermal runaway can set in very quickly under these conditions.

The 1N4007 (and many similar devices) are neither uniform nor consistent from device to device, lot to lot, or manufacturer to manufacturer. More accurately stated, a 1N4007 can withstand either 1 kV reverse bias, or 1 A forward current, but never both (simultaneously). I purchased a reel of 10,000 1N4007s and evaluated 500 diodes at random, measuring breakdown voltage at 1 mA and leakage current at 1 kV dc. Within this single reel of diodes (obviously all from one source), the devices varied in leakage current from less than 1 µA up to more than 10 µA at 1 kV dc (25°C test temperature); and they varied in breakdown voltage from less than 770 V up to more than 1150 V (BV measured at 1 mA reverse current). Where's the lot consistency? (Remember, no consistency is guaranteed on these parts. They are supposed to meet the JEDEC specification for a 1N4007, however, and 76 samples out of 500 didn't even do that.)

As such, these would be extremely poor candidates for series-string operation in a high-voltage power supply. While Measures is correct in the assumption that the reverse current in a string of series-connected rectifiers will be equal in all devices (it will be the equivalent to whichever device has the lowest leakage), he doesn't address the fact that the devices, even if the same part number type, will often break down at varying voltages, placing the most stress (and dissipation) on the highest-voltage breakdown parts. This is the evil of using series-string P-N junction rectifiers without resistive equalization. Equalizing resistors can force all devices to break down at the same voltage.

High-voltage rectifier assemblies or modules manufactured specifically for applications such as Amateur Radio vacuum tube amplifiers are available, however. Rather than using equalizing resistors, which add more components that can potentially fail in the system, the manufacturers of such assemblies use carefully selected junction rectifiers that are well matched for reverse characteristics at high voltage and temperature. Usually the devices used in these assemblies are simple series-strings of junction rectifiers, but they are matched for breakdown within one or two percent prior to overall assembly and encapsulation, so they don't require any additional special equalizing or balancing.

Also, Measures says, "A better solution is to connect a metal-oxide varistor across each half-wave rectifier..." with respect to solving some of the problems detailed in this section. I guess he hadn't heard about all the problems MOVs have caused in the industry. MOVs are specifically credited for causing a number of industrial fires, as has been well documented in, for example, *Electronic Buyers' News*, April 13, 1992.

Metal-oxide varistors are pseudosemiconductors made of doped grains of zinc oxide. To achieve higher breakdown potential, many grains are used in series. Each grain contributes only about 3 V toward the total voltage rating of the device; thus, a "200-V" MOV would have about 67 grains in series. (Compare this with a silicon P-N junction, which can be fabricated to break down at more than 1 kV in a single junction.) Transient events or an isolated single transient event can degrade or destroy individual grains, incrementally and permanently reducing the MOVs nominal voltage. As the nominal voltage is reduced, the leakage current increases accordingly. The increase in leakage current causes a corresponding increase in joule heating effects on the devices. This heating, coupled with the negative temperature coefficient of an MOV (typically −0.01 to −0.05%

per °C) causes even further "self-induced voltage reduction" and eventual thermal runaway.

When the MOV's nominal voltage degrades to an extent that the working voltage can no longer be maintained, the circuit in which it is used ceases to function properly. Since the MOV device tends not to degrade abruptly or electrically short-circuit due to the many oxide grains in series, it effectively becomes a parasitic resistive load. Substantial parasitic heating currents will flow through the MOV in the peak cycles of ac potential applied and progressively worsen with the continuing MOV degradation. In a dc application, the effective heating energy is greater. While in this state, sufficient heat energy can develop to cause a fire either directly or indirectly via combustion of adjacent materials. A circuit with this type of device failure is difficult to fuse and may not adequately protect against a potential fire hazard.

Conclusion: MOVs are a poor choice for circuits which may be exposed to line transients, high temperatures, or a combination of the two. Do you really want MOVs in your amplifier?

Tom Rauch: Equalization of voltage through the power-supply rectifier string is important. However, the article incorrectly places emphasis on equalization of current. Low-cost diode rectifiers must be protected by equalization of the reverse voltage since they are not matched for capacitance or reverse leakage resistance. Manufacturers of these devices simply put them through a go/no-go acceptance test. The reverse voltage characteristics of individual diodes can vary considerably from device to device.

During a discussion with a Motorola power rectifier engineer to verify my understanding of their testing procedures, he made the following statement: "Diodes are not matched, only tested in a go/no-go test. There is no guarantee that like-marked diodes are from the same country, let alone the same manufacturing lot. Even if diodes were matched, they would have to be maintained at relatively close temperatures to one another to ensure they stay matched."

John C. Fakan: Measures seems to not understand that the use of resistor and capacitor arrays in parallel with series-connected diodes is to equalize the reverse voltage (not current, as stated in the article) across the individual diodes. During the nonconducting half of the cycle a bare, series-connected diode string will divide the impressed reverse voltage according to the individual capacitance of each diode junction. The diode with the least capacitance will see a proportionately higher voltage than the others. If that voltage exceeds the diode's reverse breakdown value it is likely to fail.

A properly designed resistor and capacitor array will establish the reverse-voltage distribution across each element regardless of differences in individual diode capacitances and leakage currents and thus prevent this failure mode.

Measures' statement that the currents in the elements of a series circuit are exactly equal is certainly correct. However, the flaw in his logic is to presume that equal currents in the component leads implies that the conduction mechanism within each component is the same. A diode experiencing a reverse bias below its break-down voltage is acting like a capacitor and thus storing energy in the dielectric of its junction. Above the breakdown voltage "actual" current (rather than "displacement" current) will be flowing through the high resistance of the reverse-biased junction, and the resulting ohmic heating may destroy the diode.

Electrolytic Capacitor Equalizing Resistors

Tom Rauch: The article is again in error where it recommends the use of a 'carte blanche' equalizing resistor for electrolytic filters. The leakage current range of an electrolytic capacitor is very important in determining the proper resistor value. Different types of capacitors require different values of resistance. Correct values should be selected from information supplied by the capacitor manufacturer. A good rule of thumb is to use the lowest value of resistance that can be tolerated in the application.

Biasing

Fred Telewski: The bias string with 0.7-V increments is not a bad idea. I have successfully used it myself. Where I disagree with Measures is in the area of electronic bias switching. Here again I must agree with Tom Rauch, but also point out that improperly designed bias switches can cause problems.

Tom Rauch: The commentary regarding electronic bias switches having a deleterious affect on amplifier performance is misleading. It is possible—with poor design and poor construction—to build an electronic bias switch which would result in excessive IMD in an amplifier. However, properly designed and constructed electronic bias switches, such as those used by reputable amplifier manufacturers or skilled amateurs, will not cause any deterioration in the IMD characteristics of an amplifier.

High-Speed Relays

Fred Telewski: Fast relays are essential for QSK operation and I applaud Rich's attempt to get them sequenced. I am not sure, however, that he's got it right from a systems point of view. There's also the obvious erroneous connection in Figure 3,[1] and I agree with Bill Clemow's comments concerning the switching voltage and current. This circuit would certainly not pass muster with the safety folks in my company.

Steve Katz suggests the use of high-power PIN diodes for RF output switching. Measures' counterpoint is that they might not be as robust as vacuum relays when it comes to lightning and other such hazards. I don't have experience in this area, other than to say that I myself use vacuum relays and consider them excellent.

Steve Katz: Measures addresses the "relay problem" relating to high-powered amateur amplifiers but doesn't really offer any solutions. This is ironic, since there is an obvious solution, albeit a recently introduced one: Don't use relays at all!

There is a new family of very high-power, high-voltage, long carrier-litetime PIN diode RF switches available which can solve a multitude of problems for amateurs. Although early PINs were mostly available only for lower-power or microwave work due to their low breakdown voltages and short carrier lifetimes, a new product family from Microsemi Corporation[2] is ideal for high-powered operation in the HF spectrum, down to below 1.8 MHz. This is the UM2100 product family. The device is characterized by the manufacturer to have ratings that are ideal for amateur applications.

Instead of the 15 to 25-ms switching speed of a conventional relay, or even the 2-ms switching speed of a vacuum relay with a "speed-up circuit" as referenced by Measures, the PIN diode switch, using only two diodes costing one-tenth as much as a vacuum relay, will switch in microseconds—not milliseconds—making it ideal for modern data modes. No moving parts, nothing to wear out, and performance equivalent to even the best coaxial relay.

The Ameritron model QSK-5 2.5 kW QSK TR Switch makes intelligent use of high-powered PIN diodes, and this accessory can be added to any MF/HF amplifier. It uses older-generation UM4001Bs, also made by Microsemi Corporation, but the newer-generation UM2100 family better lends itself to the application. Hopefully, the QSK-5 will be updated to use UM2110s.[3]

To prove that the new-generation PINs are as good as they look on paper, I replaced the vacuum relay in my Henry model 3K Premier amplifier with a set of UM2110 diodes, using two in parallel for the forward (conducting) switch, and a single diode for the shunt (isolating) switch. Using a 600-mA bias to switch the diodes, the amplifier still delivers full power, more than 40 dB isolation (comparable to the original relay) at 29 MHz, and the diodes get just perceptibly warm under full-output conditions, key down for 10 minutes. There is additional circuitry associated with using diode switches (two RF chokes and two dc blocking capacitors, which must be high quality), but my total investment in the circuitry was less than $40.

Do the diodes survive high SWR and local lightning transient conditions? No problems to date, using antennas with SWRs greater than 5:1 on some frequencies, and leaving the antennas connected during local thunderstorms. It's only been 10 months since the modification, so I cannot comment on overall operating life, but I'd anticipate the diodes will last at least as long as any relay possibly could, and they switch 100 times faster.

VHF Stability

Fred Telewski: The whole subject of VHF stability and parasitics is where Measures' material seems to be at its weakest. When he speaks of striking gongs and the magic of how spark-gap transmitters convert dc to RF, I become worried. Nowhere does he quantify the fault energies associated with these phenomena and whether or not they are in fact truly detrimental to tubes. We also find no laboratory substantiation or comparison between a fully functional output network with and without his parasitic suppressors. It would be useful to see an output network

swept on a network analyzer and attempt to draw some sound conclusions.

VHF stability and parasitics are a consequence of the gain around some loop (unintentional, perhaps) being equal to one, and the phase angle being equal to 0°. These conditions constitute the definition of oscillation. They come about when the tube in question has gain at frequencies beyond which we have adequately modeled and understood our input and output tank circuits, and are not given to moving in and out of our amplifiers as some of Measures' comments might suggest. I would also like to point out that I've seen a number of commercial-grade transmitters function properly without the aid of plate parasitic suppressors. Suppression in these instances was often achieved on the input side and through judicious layout and component choice in the plate-tank circuit. In this area, I think the comments made by Tom Rauch and Eimac bear serious consideration.

Tom Rauch: Measures' description of the causes, effects, and cures of parasitics is flawed, both in the theory and the practical applications described.

There is no evidence to support the article's claims that intermittent VHF parasitics bend grids and filaments, destroy switches, instigate arcing, or cause the plating to fall off the grids of tubes. There is no support for these claims in extensive tests, the field experience of reputable manufacturers of power grid tubes and RF amplifiers, and even basic science.

For example, the article states that replacing the copper or silver-plated copper wire in a parasitic suppressor will radically lower the VHF Q of the suppressor. This is not true. In a typical parasitic suppressor, the coil is in parallel with a low-value resistor. This combination is in series with the signal path, usually in the anode circuit between the tube and the plate tuning capacitor. The coil's reactance increases with frequency, and at VHF most of the signal path is through the resistor. It is plainly evident that the dominant component at VHF is the resistor, not the coil. Changing the coil has very little effect on VHF Q.

On the other hand, changing the resistance of the suppressor's coil radically affects the HF circuit Q. The tube's output capacitance almost always comprises the major part of the 10 and 15-m tank-circuit input capacitance. The majority of the HF signal travels through the parasitic suppressor's coil. Any additional series resistance in this path, such as resistance introduced with nichrome wire, places additional resistance in the portion of the HF tank circuit carrying very high circulating currents. The reduction of circuit Q, the increased loss, and the reduced harmonic suppression caused by this faulty modification peaks in the 10-m band.

The only practical application for nichrome wire in the anode circuit of an amplifier is if the component or layout creates a stability problem near the upper HF region. This would occur if old tubes with long, thin grid leads (ie, 811As or 572Bs) were used, if the RF layout was inadequate (long, thin leads or poor shielding), or if several tubes were connected in parallel. The best solution would be correcting the specific cause of the stability problem, but if a loss in HF performance is acceptable, nichrome might be a viable option.

The most misleading and erroneous statements in the article are those addressing VHF stability. As stated earlier, parasitic oscillations do not bend grids or filaments. Nor do they cause bandswitches and tuning capacitors to fail. The use of nichrome wire in the parasitic-suppressor coil does not significantly change the Q of the suppressor at VHF or UHF. Nichrome suppressor coils will lower the Q at HF. This is because the coil is the primary path for HF signals and the suppressor's resistor is the primary path for VHF and UHF signals. The experience of the technical community, including both manufacturers and knowledgeable amateurs, absolutely contradicts the conclusions of this section of the article.

Reid Brandon: Measures' inference that modern tubes used in linear amplifiers have inherent "VHF parasitic oscillations" is incorrect. Parasitic oscillations are a result of improper ampli-fier circuit design and/or component layout.

Measures states that "...much has been published about VHF parasitic oscillations," but unfortunately he does not indicate any references to these publications.

The proposed "low-Q VHF parasitic suppressor" appears to hold no proven advantages over conventional suppressors. With no scientific proof or technical references, the appearance of a new device called the "low-Q VHF parasitic suppressor" seems to be more of a commercial venture than a technological breakthrough.

Is More Gain Always Better?

Fred Telewski: Here is an area where Measures and I disagree. Measures takes an amplifier-only view of IMD, and I take a systems view. Most solid-state transceivers, particularly those operating on 12 V, have IM levels in excess of those produced by the tubes in the linear amplifiers in question (3-500Z, 3CX800-A7, 8877). This can clearly be seen by examining some of the fine product reviews done in *QST* for transceivers and amplifiers. One approach to reducing the total IMD of the transceiver/power amplifier system is to use a high-gain amplifier and reduce the drive required from the transceiver. This permits the transceiver to function at a power level where it produces less IMD. The result is lower overall IMD at the PA output than that achieved with Measures' approach.

The insertion of cathode negative feedback will reduce the gain of the PA, as Measures suggests, and improve the PA's IMD by itself. This is of no consequence unless one is using a commercial-grade exciter whose IMD is better than that of the open-loop performance of the triode in question. Cathode feedback will also increase the input impedance of the tube in question. Measures does not deal with the effects that this will have on the input network and matching of the amplifier to the transceiver. Measures' comments about ALC being generically flawed are inappropriate. I would suggest referring to the comprehensive discussion on the plusses and minuses of ALC in *Single Sideband Systems & Circuits.*[4]

The only merit I find in Measures' "gain argument" lies in the fact that some amateurs suffer from the "knobs at 5 o'clock" syndrome, and will overdrive anything they own.

Adjustable Tuned Inputs

Fred Telewski: Although I agree that it would be nice to have some adjustability on the input network (particularly if you've added a cathode feedback resistor) in order to be able to tune the amplifier input for minimum SWR, I agree with Rauch's comments concerning SWR. Measures' notion here is quite in error. Tom Rauch is correct.

Tom Rauch: The comments regarding adjustable tuned inputs are incorrect. The article implies that the reactance of the output network of a transceiver affects the input SWR of an amplifier. This finding is without basis in theory or practice. The output impedance of a source has nothing to do with the input impedance of a load.

Finally

Fred Telewski: A few words about transformer leakage reactance are in order. I haven't quantified leakage reactance as to what is considered high and low. I am not sure that this is a readily designable quantity for most transformers. I do know that certain transformer architectures provide very low leakage reactance, while others will provide comparatively high leakage reactance. Their geometries are as follows. The high leakage reactance type usually consists of a **C**-core pair with the primary wound on one leg and the secondary wound on the other leg (this looks like the typical **UI** lamination configuration). Many plate transformers intended for use with choke-input filters have been wound this way for reasons of economy. The lowest practical leakage reactance transformer I'm aware of for plate application usually consists of 2 **C**-core pairs with the primary and secondary windings split and interleaved on the adjoining legs (this looks like the typical **EI** lamination configuration).

Notes

[1]See R. Measures, "The Nearly Perfect Amplifier," *QST*, Jan 1994, p 33, Figure 3. The label "Negative High Voltage" (at the bottom left of the schematic) is erroneously shown on the positive side of the capacitor; it should be on the negative side of the capacitor near the junction of the resistors and diodes (Dgp). Bill Clemow adds: Note the Short to Transmit control line: There is 80 to 120 V at 80 mA on this line. This is a shock hazard.

[2]Microsemi Corporation, 580 Pleasant St, Watertown, MA 02172, tel 617-926-0404. For further information, request a free copy of their *RF Application Note MPD-101*, (April 15, 1994), which discusses "A Comparison of PIN Diodes and Rectifier Diodes."

[3]Contact Ameritron at 116 Willow Rd, Starkville, MS 39759, tel 601-323-8211.

[4]For a comprehensive discussion on the plusses and minuses of ALC, see W. Sabin and E. Schoenike, *Single Sideband Systems & Circuits* (New York: McGraw-Hill, 1987).

Exam Info

Conducted By Bart J. Jahnke, KB9NM
ARRL/VEC Manager

Special Circuits and Techniques Used to Administer Examinations

The ARRL/VEC is often asked to provide diagrams of circuits that can be used by Volunteer Examiners (VEs) to administer examinations. Some circuits are simple headphone-distribution systems or PC interfaces for Morse code audio output. There are other circuits VEs use at test sessions that the ARRL/VEC doesn't have access to, but would like to have to share them with others. In fact, when it comes to devices to accommodate handicapped people, we have *no* references on available circuits, so the best we can do is refer you to the Courage HANDI-Ham System (3915 Golden Valley Rd, Apple Valley MN 55422; tel 612-520-0520).

Although we want to refer people to the best source for services and support, we should be able to initially provide some information ourselves. Therefore, we're soliciting copies of schematics and/or diagrams of circuits you use for such instruction or to administer your examinations.

What kinds of circuits are we looking for?

- Headphone distribution networks (we have a few, but will gladly include more)
- Morse code audio interfacing devices for PCs
- Flashing-light circuits (one- or two-light systems) with appropriate Morse code keying interface
- Vibrating-surface (tactile pad) circuits and interfaces
- Any other circuits you've used in similar ways

Please provide your circuits/diagrams in a form clean and dark enough to duplicate (avoid pencil drawings because they're difficult to copy). We'll compile the submissions we receive into a special *VE Circuits* booklet. In return for your circuit contribution, we'll give you a free copy of the complete package we've compiled, postage paid.

If you haven't contributed a circuit, but would like a copy of the compiled booklet, send a large (9×12-inch) self-addressed, stamped envelope (SASE) with $2.90 postage (or send $2.90 in postage with a preaddressed return label and we'll provide the envelope).

We expect to have an initial mailing of booklets by December 10, 1994, to those who contributed or who expressed interest. Thank you in advance for your contribution.

Are You Interested in Becoming an ARRL VE?

If you're 18 or older and a General, Advanced or Extra Class licensee, and you're interested in becoming a VE, we'd like to hear from you. To get you started, a special VE Application Form is on pages 210 and 211 in this issue; or for information contact ARRL/VEC, 225 Main St, Newington, CT 06111; tel 203-666-1541, fax 203-665-7531.

July 1 was an Important Date

As widely publicized, effective July 1, a new General (Element 3B) question pool took effect. General class (Element 3B) written tests beginning July 1 must be based on the new question pool.

Next up is the Advanced (Element 4A) question pool, scheduled for July 1, 1995, implementation in exams.

Call for Public Input to the Extra Class Syllabus

Beginning July 1, 1994, the Question Pool Committee (QPC) of the National Conference of VECs seeks your input to the Extra Class (Element 4B) syllabus. Your input, directed to the QPC, is requested by October 31, 1994.

Beginning February 1, 1995, your input to the Extra Class pool questions will be sought.

Direct your QPC input to Chairman, Ray Adams, N4BAQ, 5833 Clinton Hwy, Suite 203, Knoxville, TN 37918-2500; with a copy to QPC Vice-Chairman Fred Maia, W5YI, PO Box 565101, Dallas, TX 75356-5101; and a copy to me at ARRL HQ.

QST

Strays

YO! GETCHA RED-HOT RADIO-ASTRONOMICAL DATA!

◊ The National Radio Astronomy Observatory (NRAO) has made available a vast, original, comprehensive data set, full of potential scientific surprises. Radio images of the sky produced by the Very Large Array (VLA) radiotelescope as part of a massive survey are now stored in an electronic repository available on the Internet.

Each map shows about 1000 radio-emitting objects, most of which have never been seen before. The maps are a product of the NRAO VLA Sky Survey (NVSS), which began observations in September 1993 and will cover 82% of the sky when completed by the end of 1996.

In addition to the NVSS, the VLA is making a more detailed survey of a smaller region of the sky. Faint Images of the Radio Sky at Twenty centimeters (FIRST), a project headed by Dr Robert Becker of the University of California at Davis and Lawrence Livermore National Laboratory, is expected to yield accurate positions of radio-emitting objects in the same area of the sky to be surveyed in visible light by the Sloan Digital Sky Survey.

The VLA, in west-central New Mexico, consists of 27 82-foot-diameter dish antennas arranged in a **Y**. The arms of the **Y** are each 13 miles long and the 230-ton antennas are moved along them to act as a "zoom lens" for the telescope.

For information, contact Dr J. J. Condon at Internet address jcondon@nrao.edu.—*thanks, Dave Finley, N1IRZ, NRAO Array Operations Center, Socorro, New Mexico*

EMERALD ISLE EVENT

◊ Ireland's largest and longest-running radio/electronics exhibition is Sunday, October 2. Sponsored by the Fingal RC, an IRTS-affiliated club, the show has been running since the late 1970s. It's held in the 7500-square-foot ballroom of Jury's Hotel in north Dublin, a location well-known to American visitors. The show is held twice a year, on the first Sunday in March or May and in October. There are usually about 800 attendees and about 100 commercial and private traders. Not a bad turnout, with only about 2500 licensees in EI-land and few traders in ham equipment. This is the biggest thing to hit Amateur Radio in EI in a long time.

The group tries to attract more new attendees from all over the UK, Europe and the US, and new vendors when possible from G-land. Admission is 2 Irish pounds, which comes out to about $3 US. The Fingal RC show committee, Brendan, EI4CYB; Charlie, EI2EM; and George, EI7EC, looks forward to seeing visitors from the US this October and in the future.—*Fingal RC show committee chairman Rod Walsh, EI7DF, IRTS, Maynooth, County Kildare, Ireland; Internet rwalsh@vax1.may.ie*

QST congratulates...

◊ Charles "Chip" Townsend, WA4DCN, supervising engineer, Department of Management Services (DMS), state of Florida, who was honored as outstanding DMS employee in a ceremony at the Governor's Mansion. Chip took his own equipment from Tallahassee, Florida, to Pensacola and eliminated stray broadcast signals from the Florida Labor Department's telephone lines. The local telephone company and the maintenance company had not been able to solve the problem. —*John Hills, KC4N, ARRL Southeastern Division Assistant Director*

QST Compares: 1200/9600 Bit/s Dual TNCs

Reviewed by Steve Ford, WB8IMY

1200/9600 Bit/s TNC Features

	PK-96	*TNC/NB-96*	*KPC-9612*
External level controls	Yes	No	No
Mailbox	Yes	Yes	Yes
Automatic mail handling	Yes	Yes	Yes
Radio cable provided	Yes	Yes	Yes
Serial cable provided	No	Yes	No
Software provided	No	No	Yes
Power supply provided	No	Yes	No
KISS mode	Yes	Yes	Yes
Host mode	Yes	Yes	Yes
Modem disconnect	Yes	Yes	No
Suggested List Price	**$229**	**$295**	**$219 (32 kbytes RAM)** **$249 (128 kbytes RAM)**

Except for some AX.25 backbone systems and TCP/IP, ROSE and TexNET networks, most packet activity still takes place at 1200 bits per second (bits/s). When packet exploded onto the amateur scene in the early 1980's, 1200 bits/s seemed adequate, even fast by the standards of the day. But now it's 1994 and amateur packet radio is still lumbering along at 1200 bits/s, long after most telephone modems have accelerated to 9600, 14400 and even 28800 bits/s.

Part of the reason so many hams remain at 1200 bits/s has to do with hardware. Twelve-hundred bits/s TNCs (terminal node controllers) are essentially plug-and-play devices. The TNC assembles and encodes the outgoing data, and it decodes incoming data. It's the link between you and your radio. You simply take the transmit audio and keying lines from the TNC and route them to the microphone jack of your FM transceiver. Receive audio is supplied by the transceiver's external speaker jack. Apply power, fire up your computer or data terminal and you're on the air.

Getting on the air at 9600 bits/s *isn't* plug and play. The TNCs are pretty much the same, but hooking up your radio often involves circuit surgery—an intimidating prospect for many hams these days. You must tap receive audio directly at the FM discriminator. Transmit audio must be injected in the modulator stage—preferably at or near the varactor. (And woe unto those whose rigs do not employ "true" FM. Sending a clean 9600 bit/s data signal with these radios can be a difficult prospect.)

After you've made the proper radio connections for 9600 bits/s, there is the matter of adjusting deviation. FM deviation at 9600 bits/s is *very* critical. It's not impossible to set by ear, but it's tough. (A 9600 bit/s data signal sounds like a burst of noise.)

There may be some light at the end of the proverbial tunnel, though. A number of major transceiver manufacturers are working toward a standard for implementing 9600 bit/s TNC ports. Rigs equipped with these ports are already on the market. Just glance at the transceiver ads in *QST* and look for "9600 Ready" in the list of features.

The new "data-ready" radios are not without their own problems. Some have IF filter and discriminator characteristics that leave little room for error. If you're off frequency by a small amount, you may not be able to pass data. In addition, the ceramic discriminator coils used in some transceivers have poor group delay, making it impossible to tune them for wider bandwidths. With this in mind, some amateurs prefer to make the leap to 9600 bits/s using *dedicated* data radios such as those manufactured by Tekk, Kantronics and others.

The Best of Both Worlds

Hams are a conservative bunch and getting them to move to 9600 bits/s isn't easy—even with 9600 bit/s-ready radios. Besides, the networks are still dominated by 1200 bit/s activity. The common lament among packeteers is, "Yes, I'd like to try 9600 bits/s, but all my buddies have 1200 bit/s TNCs. I don't want to own two TNCs, one for 1200 bits/s and another for 9600 bits/s."

Despite the clear advantages of 9600 bits/s on terrestrial packet networks, and the proliferation of 9600 bit/s packet satellites, hams are still holding back. What will it take to drag amateur packeteers into the 1990s? Perhaps the answer lies in the three TNCs presented here. Each product offers access to both packet worlds—1200 *and* 9600 bits/s—in compact, affordable packages. With these TNCs you can explore 9600 bits/s while still retaining the ability to communicate with your "slower" friends on the 1200 bit/s networks. Jumping from one data rate to another is often as simple as pushing a button or sending a software command.

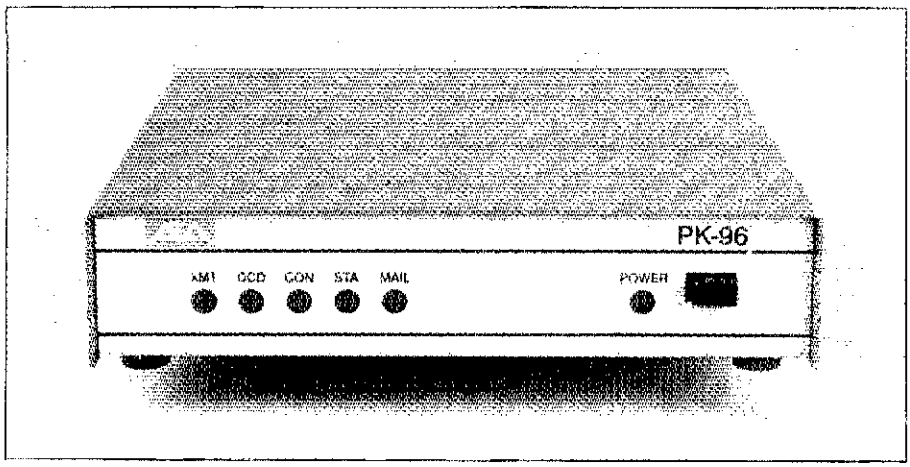
For this review I put each TNC to the test using 9600 bit/s packet satellites (KITSAT-OSCAR 23 in particular). Satellite packet signals at my station are subject to constant drifting and occasionally fading. I hoped that the demanding conditions of a PACSAT link would expose any weakness in these TNCs. To be thorough, I also tested the TNCs on a local 9600 bit/s TCP/IP network. That's where these TNCs will probably find their greatest use.

My 2-meter satellite transceiver was a Kenwood TS-700S modified to transmit 9600 bit/s data (it also served as my 1200 bit/s terrestrial packet rig). The receive setup consisted of an ICOM IC-745 HF transceiver with the optional FM board installed. I converted the 70-cm satellite downlink signals to 10 meters and used the IC-745 as my receiver, tapping the 9600 bit/s audio from the discriminator output. For terrestrial packet, I borrowed a modified Motorola Mitrek 70-cm transceiver from a friend.

AEA PK-96

The PK-96 TNC is about as straightforward as you can imagine. The TNC is built into a slender, lightweight enclosure. The front panel features the usual LED indicators for DCD, STA, power and so on. A 25-pin socket is provided on the back panel for the serial cable to your computer.

The connections to your transceiver are made through a 5-pin DIN socket. Although you can pass receive audio through this connection, the AEA engineers thoughtfully added a 1/8-inch miniature jack for auxiliary audio. They recognized that there might be configurations that require you to receive with one radio and transmit with another. Two potentiometers are included on the rear panel: one for 1200 bit/s output level adjustment and the other for 9600 bits/s. These proved to be very convenient!



AEA PK-96

Switching from 1200 to 9600 bits/s is performed through the **HBAUD** command. **HBAUD 1200** places the PK-96 in the 1200 bit/s mode. **HBAUD 9600** places the unit in the 9600 bit/s mode. I used the Microsoft *Windows* 3.1 terminal program to communicate with the PK-96. Operation may be easier with one of AEA's software products, such as *PC Pakratt*. The PK-96 will also function in the host or KISS modes for particular applications such as TCP/IP.

The manual provided with the PK-96 is a real winner—one of the best I've ever seen. It spends a great deal of time taking you through the steps necessary to interface common FM transceivers for 9600 bit/s operation. There are several pages of modification information for a variety of radios. The author doesn't sugarcoat the difficulties involved. You're warned, for example, about the critical nature of 9600 bit/s deviation settings.

The Importance of Deviation

When I fired up the PK-96 for the first time, I took the impatient approach and tried to set the 9600 bit/s deviation by ear. This gave me an immediate appreciation for deviation meters! I used an H-T to monitor my transmit signal. With some careful tweaking of the pot on the back of the PK-96, I adjusted the output to a level that I *thought* sounded correct. Of course, you're listening to little more than a rushing noise, so it's difficult to be certain.

KITSAT-OSCAR 23 passed over my area an hour later and I made my first attempt to get its attention. No luck! After several transmissions it was clear that something was wrong. The downlink was working perfectly. The PK-96's DCD indicator glowed brightly and all sorts of data went flying across my screen. But when I tried to request a file or a directory listing, the satellite was deaf to my pleas.

Before the bird was out of range, I grabbed my trusty alignment tool and reduced the transmit audio level a bit further. Now the 9600 bits/s signal sounded like a hiss just above the background noise. I gave OSCAR 23 another blast and it heard me! I must have stumbled onto the right level setting, or something close to it. It was impressive to watch the PK-96 and the satellite communicate. Within a minute I had the file I wanted.

A few days later I asked Mike Stemmler, N1LMP, to take a look at my signal from his station. Mike owns a service monitor that can measure the characteristics of a received signal. He watched my signal on the monitor, gauging the shape of the eye pattern and measuring my deviation. My data signal looked good, but my deviation was set a tad too low at 2.5 kHz. (Not bad, however, when you consider my adjustment method!) With his help I set it to 3 kHz exactly.

The next test took place a week later on the local 70-cm TCP/IP network. With the PK-96 recalibrated to match the Motorola transceiver, its operation was flawless. I transferred a number of files with ease.

Two-meter Operation and More

I disconnected the cables to the Mitrek and wired up my 2-meter rig. Checking into my home PBBS at 1200 bits/s was a painful experience after screaming along at 9600 bits/s. The PK-96 worked fine, but it was difficult to tolerate the slowness of the connection itself. You could compare it to the sensation you get when you exit a freeway and find yourself in stop-and-go traffic. As you're plodding along at 5 or 10 mph, you really miss 55 mph!

AEA has added some notable goodies to the PK-96. There is a personal mailbox with 18 kbytes of battery-backed memory capacity, upgradable to 100 kbytes. The PK-96 mailbox supports automatic reception of mail as well as reverse forwarding.

The PK-96 also includes a gateway function that's similar to the Kantronics KA-Node. Unlike a simple digipeater, the PK-96 gateway supports node-type operation without the need for end-to-end acknowledgments of every packet. The gateway operates simultaneously with other PK-96 functions. A friend could use your gateway to reach a distant PBBS, for example, while you communicate with another station.

If you want to add an external modem—to jump up to 19,200 bits/s, for example—the PK-96 provides a *modem disconnect header*. This connection point allows you to disable the PK-96 modem and substitute another. The header is internal, however, which makes it a little difficult to access. Still, it's a great feature for hams who wish to push the envelope a bit further.

The PK-96 is a solid little TNC with a lot to offer the 9600 bit/s packeteer. It's easy to set up (as easy as any 1200/9600 bit/s system could be) and simple to operate.

Manufacturer: Advanced Electronic Applications (AEA), PO Box C2160, 2006 196th St SW, Lynnwood, WA, 98036, tel 206-774-5554. Suggested list price: $229. 100 kbyte mailbox memory upgrade: $50.

KANTRONICS KPC-9612

Of the three TNCs tested for this review, the Kantronics KPC-9612 has one of the most interesting features: the ability to operate at 1200 and 9600 bits/s *simultaneously*. By using the proper software, you can do some remarkable things with the KPC-9612, as we'll discuss in a moment.

If you think the KPC-9612 bears a strong resemblance to the popular KPC-3 TNC, you're right. The KPC-9612 is based on the KPC-3 architecture and includes all of its features. For example, the KPC-9612 provides a personal packet *mailbox* with various enhancements for compatibility with existing packet bulletin board systems (PBBSs). If you buy the KPC-9612 with the 32 kbyte RAM option, you'll get a 20 kbyte mailbox. Spring for the 128 kbyte option and you'll enjoy nearly 100 kbytes of storage space. By making arrangements with your local PBBS SysOp, you can use the KPC-9612 to interact with the bulletin board automatically. It will forward messages to the PBBS and download any waiting mail.

Like the KPC-3, you can access your KPC-9612 from different locations. All you need is another packet system. With remote access, you can check mail and even modify your KPC-9612 parameters.

The KPC-9612 offers very low power consumption, allowing it to be powered from a 9-V battery. (You can use the **LEDS OFF** command to reduce the power drain even further.) This has great benefits for portable/mobile packet, high-altitude ballooning, remote site control, etc.

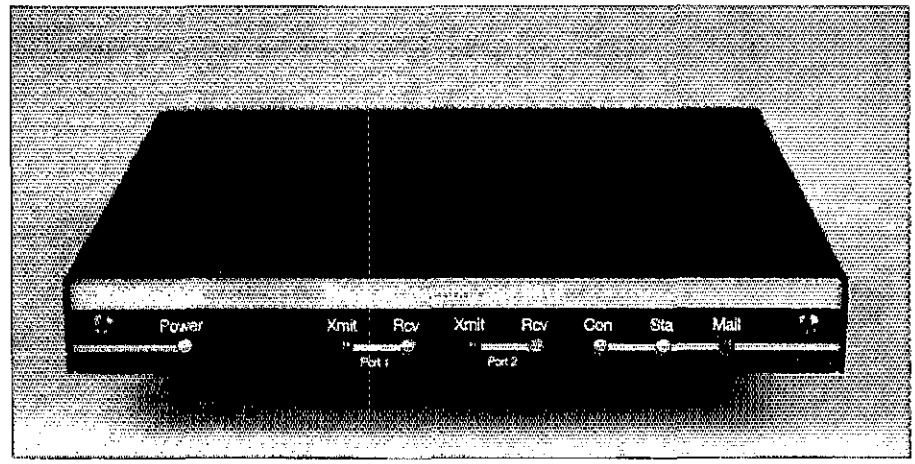
KA-Node, Gateway and WEFAX

Like all the Kantronics TNCs, the KPC-9612 includes the Kantronics *KA-Node*. When the KA-Node is active, the KPC-3 behaves like a *NET/ROM*-style node. Anyone can connect to the KA-Node and use it as a relay. Like a NET/ROM node, a KA-Node forwards packets without requiring end-to-end acknowledgments. Once a packet has been received by the KA-Node, it takes "responsibility" for passing it along to the next station. If the packet must be re-

peated, the KA-Node does so automatically without involving the originating station. Unlike NET/ROM nodes, however, KA-Nodes do not maintain node lists for automatic routing. To reach a destination, you must use KA-Nodes like traditional digipeaters, hopping from one to the other until you establish your desired connection.

Part of the KA-Node is the *gateway* function. The gateway allows cross-port digipeating, which has fascinating potential in the KPC-9612. With the proper software you could set up a system that would enable 1200 bits/s users to connect to your 9600 bit/s port. How about a satellite gateway that lets 1200 bit/s packeteers access OSCARs 22, 23 or 25 in real time? Or a gateway from a 1200 bit/s AX.25 network to 9600 bit/s TCP/IP?

The KPC-9612 has another neat trick up its sleeve. If you have only one data-ready transceiver, the KPC-9612 can use it to operate at 1200 *or* 9600 bit/s. How is this accomplished? The cables from the 9600 bit/s port attach to the data connector on the transceiver. The cables from the 1200 bit/s port attach to the microphone and external speaker jacks on the same radio. With the **ONERADIO** command **ON**, the KPC-9612 will inhibit transmission whenever 1200 or 9600 bit/s signals are detected. In this fashion the TNC avoids transmitting at 9600 bits/s while a 1200 bit/s signal is being received, and vice versa. This allows one radio to serve as both a 1200 *and* 9600 bit/s transceiver, depending on the data rates of the signals received. This feature is especially interesting for those who own dual-band (2 meter/70 cm) data-ready transceivers.



Kantronics KPC-9612

Software

To get the most out of the KPC-9612, you need the right software. Kantronics provides *PacTerm* terminal software on a 3½-inch diskette with the KPC-9612. This program will get you started, but you'll probably want to graduate to a more sophisticated package.

To switch ports on the KPC-9612, you use a method that may be familiar to experienced packeteers: *stream switching*. Think of the 1200 and 9600 bit/s ports as two streams flowing side by side. If you want to sail down the 1200 bit/s stream, you have to let the TNC know your intentions. In the KPC-9612 you do this by entering **!A** at the **cmd:** prompt. From that point onward, you're paddling down the 1200 bit/s stream. Everything you send—including commands to connect, disconnect and so on—will be sent through the 1200 bit/s port. To jump to the 9600 bit/s stream, you must enter **~A** at the **cmd:** prompt. If you have connections on both ports at the same time, this could get very confusing very quickly.

My solution was to use the *HostMaster* software that I purchased with my KAM Plus. Through the *HostMaster*'s HOSTSET program, I reconfigured the software for use with a dual-port VHF TNC. The KPC-9612 has a host mode that's compatible with *HostMaster*, so the rest was easy. *HostMaster* made it simple to flip from one stream to another. All I had to do was hit the **PAGE UP** or **PAGE DOWN** keys.

I didn't attempt to use my PACSAT software in a dual-port configuration, but I couldn't resist trying TCP/IP. One of the benefits of TCP/IP is that it supports connections to and from AX.25 users. By operating TCP/IP with the KPC-9612, I hoped to connect to my local PBBS on the 1200 bit/s port and the regional TCP/IP network on the 9600 bit/s port.

My first task was to reconfigure the AUTOEXEC.NET file in my TCP/IP (NOS) software to recognize two ports. By adding another **attach** command to the file, I configured AX1 as my 1200 bit/s port, effectively a *subport* of AX0 on COM 1. When I wanted to connect to my home PBBS (WINRG) at 1200 bits/s, all I'd need to do is communicate through AX1. Anything sent to AX0—such as a TCP/IP command to transfer a file—would wind up on the KPC-9612's 9600 bit/s port.

Unfortunately, you won't learn how to modify your AUTOEXEC.NET file by reading the KPC-9612 manual. You might expect to see this information in the KISS section (you must use the KISS mode with TCP/IP software), but the manual only mentions how to take the TNC in and out of KISS. I had to tap some of my more knowledgeable TCP/IP buddies to learn the secret. A call to Kantronics put the rest of the puzzle pieces together.

Installation

The KPC-9612 is compact enough to fit almost anywhere. The TNC measures only 0.8×6.2×6.1 inches and weighs just 13 ounces. In addition to the **CONNECT**, **STATUS** and **MAIL** indicators on the front panel, there are separate **TRANSMIT** and **RECEIVE** LEDs for each port. These LEDs are very convenient when you need to spot the active port at a glance.

The 1200 and 9600 bit/s audio levels are adjusted through *internal* potentiometers. I had to remove the cover (two screws hold it in place) and tweak the PC board pots while monitoring my deviation. This approach is a bit of a headache, but you shouldn't need to do it very often.

The serial cable from the computer or data terminal connects to a 25-pin socket on the rear of the KPC-9612. Nine- and 15-pin sockets connect to the radios. In my case, I connected the 1200 bit/s port to my 2-meter transceiver. The 9600 bit/s port was patched to the Mitrek rig on 70 cm.

On the Air

Using my modified NOS, I connected to WINRG on 144.97 MHz. Bingo! The connection was established!

Now the moment of truth. While still connected to WINRG on the 1200 bit/s port, I linked with a station two states away on the TCP/IP network (on 70 cm) and started transferring a large image file.

With the file transfer under way, I turned my attention back to WINRG. I requested a list of bulletins and sat back to watch the fun. The KPC-9612 seemed to jump from one port to another as data flowed in and out. If throughput suffered in the ensuing traffic jam, I wasn't aware of it. The bulletin list appeared on my screen in due time while the file transfer continued on the other channel. Within about 10 minutes I had surveyed the latest messages on my PBBS *and* transferred a file to another station!

The KPC-9612's performance on OSCAR 23 seemed almost anticlimactic after my dual-port test. Still, it's worth noting that its 9600 bit/s modem functioned well, considering the fluctuating signal from the satellite. I copied an average of 300 kbytes of data during each pass. Without a modem disconnect header in the KPC-9612, you're confined to working only the 9600 bit/s birds. (Through the **HBAUD** command, however, you can accelerate the KPC-9612 up to 19200 bits/s.) You can't add an external PSK modem for OSCARs 16, 19, 20 and 26.

Manufacturer: Kantronics, 1202 East 23rd St, Lawrence, KS 66046, tel 913-842-7745, fax 913-842-2021. Suggested list price: $219 (32 kbyte RAM); $249 (128 kbyte RAM).

PACCOMM TNC/NB-96

The TNC/NB-96 is a hybrid product. PacComm has taken its popular TINY-2 Mk 2 TNC and combined it with its NB-96 *DFM* 9600 bit/s modem. (*DFM* stands for *D*irect *FM*, a reference to the G3RUH direct FM modem design.) The result is a switchable 1200/9600 bit/s TNC with excellent versatility.

There are two rows of LEDs on the front panel. The top row indicate the status of the TINY-2 TNC (STA, DCD, PTT and so on). The bottom row indicates which modem is functioning and, if the NB-96 or another modem is selected, the status of the modem.

Choosing Modems

Selecting modems is simple. If you want to operate 1200 bit/s packet, press the front-panel button until the **AFSK** LED glows. To switch to 9600 bit/s packet, press the button again until the **DFM** LED lights up. One of the versatile aspects of the TNC/NB-96 is that you can use the same switch to select an *auxiliary* modem. In other words, the TNC/NB-96 can be your springboard to digital experimentation at speeds beyond 9600 bits/s. All you have to do is plug in the new modem and you're on your way!

You can interface a PSK modem to the TNC/NB-96 and select it from the front panel as well. Simply plug it into the DIN socket on the rear panel. You'll be ready to communicate with the 1200 bit/s PACSATs (OSCARs 16, 19, 20 and 26). You can even try your hand at terrestrial PSK work.

EPROM Switch

The TNC/NB-96 includes an EPROM-switching feature on the rear panel. There is a push-button switch labeled **OPTIONAL EPROM** and **NORMAL EPROM**. The TNC is shipped with the TINY-2 Mk 2 firmware in the "lower half" of the 64 kbyte 27C512 EPROM chip. The upper half is occupied by WA8DED version 2.6 code. Most users will leave the switch in the **NORMAL** position.

This EPROM switching feature is ideal for network nodes. You can load your desired network software in the upper half of an EPROM and standard TNC code in the lower half.

Mailbox

The TNC/NB-96 includes a mailbox known as a Personal Message System, or *PMS*. The PMS supports standard packet mailbox functions as well as forwarding to and from a full-fledged packet bulletin board. Automatic forwarding (initiated by the TNC itself) is *not* supported. Incoming messages are stored in 15 kbytes of RAM. When you have mail waiting, the **STA** LED on the front panel blinks on and off.

KISS, Host and GPS Modes

KISS is included among the list of operating modes. This is essential for TCP/IP and as well as the PB/PG packet-satellite software. The TINY-2 also supports a Host mode (Host software not provided) as well as an innovative *GPS* mode.

The GPS mode configures the TNC to interface with an NMEA 183-compatible Global Positioning System (GPS) receiver. Location data from the receiver is automatically incorporated into the TNC's beacon and connect-message fields. You can do many intriguing things with this capability. Automatic Packet Reporting (APR) systems come to mind. (See "Interfacing GPS or LORAN Devices to Packet Radio" by Bob Bruninga, WB4APR, in February 1994 *QEX*.)

The Manual

The only nagging problem with the TNC/NB-96 is the manual. Like the product itself, the manual is a hybrid. The first section is a TINY-2 manual. It's informative, providing a beginner-level discussion of the TINY-2 itself. The second section is a manual for the NB-96 modem and it is *not* a beginner-level discussion. Unless you have some familiarity with digital communication, the text may be bewildering.

The manual refers to the TINY-2 in several places, but you'll be hard pressed to find a detailed discussion of both units as they operate *together* in the TNC/NB-96. For example, I had to search for an explanation of the front-panel modem-select switch. What I finally found was a brief mention (a couple of sentences) of its existence and function.

To its credit, the manual includes a copy of the *9600 Baud Packet Handbook* by Mike Curtis, WD6EHR. This text is almost legendary in the high-speed packet world. It's an easy-to-understand explanation of the joys and pitfalls of 9600 bit/s packet. The *Handbook* also includes modification instructions for several radios.

Installing the TNC/NB-96

The TNC/NB-96 comes complete with a serial computer cable as well as cables for your transceiver. A dc power block is included, too. This greatly streamlines installation. The only hassle is the lack of external level controls for the 1200 and 9600 bit/s signals. You must disassemble the case and remove the circuit boards to reach the potentiometers.

I removed the boards and gingerly connected the cables to the radio, computer and power supply. While monitoring my transmissions I adjusted each potentiometer for the proper level. Most hams will perform this adjustment once and won't need to repeat it unless they connect a new transceiver. If you're going to be using the TNC/NB-96 with several rigs, however, the lack of external controls is a drawback.

While setting up the TNC I noticed that the 1200 bit/s audio was somewhat low. It would be sufficient to feed the microphone amplifier stages, but I was injecting the 1200 bit/s audio at the varactor. A quick call to PacComm solved the problem. The technician advised me to replace R11, a 22 kΩ resistor, with a 2.2 kΩ resistor. Sure enough, that provided enough audio drive to do the job.

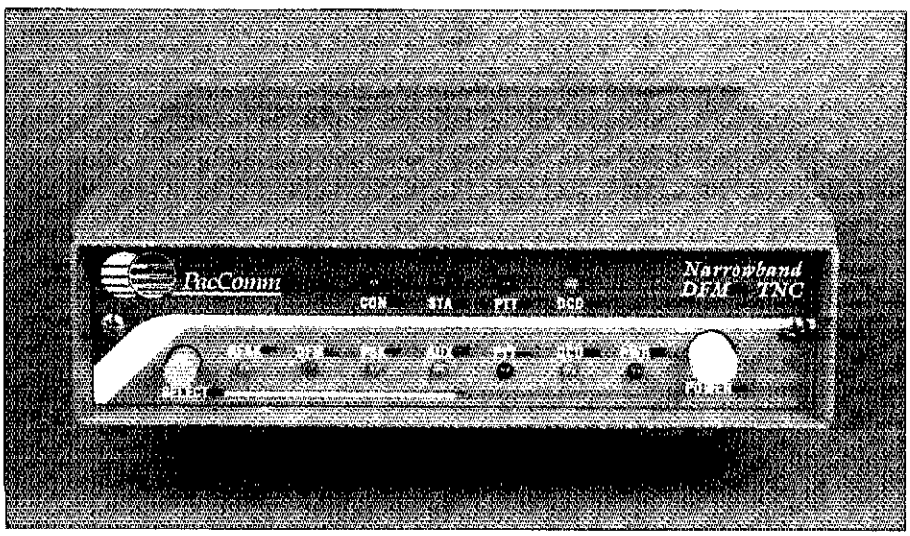
On the Air

The TNC/NB-96 performed very well during my terrestrial and satellite tests. The NB-96 modem appeared to be quite sensitive. On several KITSAT-OSCAR 23 passes, it managed to decode packets during slight signal fades. Its performance on the local 9600 bit/s TCP/IP network was as good as other TNCs I tested.

It was a pleasure to switch from 9600 to 1200 bits/s at the push of a button. When I finished one of my OSCAR 23 sessions, all I had to do was switch frequencies on my 2-meter transceiver and select the 1200 bit/s AFSK modem. Within 15 seconds I was connected to my home BBS on 144.97 MHz. Nice!

Other than the confusing manual, the TNC/NB-96 is a fine product. Not only do you gain access to 1200 and 9600 bit/s packet in the same box, you have the opportunity to go even farther!

Manufacturer: PacComm Packet Radio Systems, 4413 N Hesperides St, Tampa, FL 33614-7618, tel: 813-874-2980, fax: 813-872-8696. Suggested list price: $295.



PacComm TNC/NB-96

Kenwood TS-60S 6-Meter All-Mode Transceiver

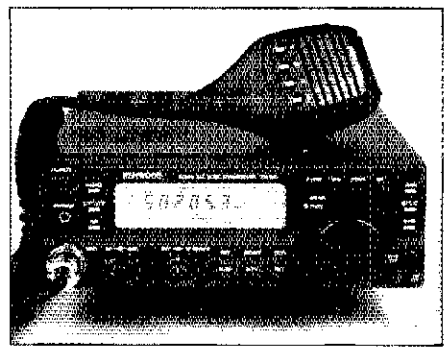
Reviewed by Mark Wilson, AA2Z

Last year, Kenwood introduced the TS-50S, a tiny, full-featured MF/HF transceiver that gained instant popularity. As an encore, Kenwood offers the TS-60S, a 6-meter multimode radio that looks virtually identical to the TS-50S and shares many of its features (see the TS-50S review in September 1993 *QST* for a detailed description). Although Kenwood and other manufacturers offer transceivers with 160 through 6 meter coverage, it's been a long time since anyone introduced a full-featured 6-meter-only box. Six meters is an exciting band that combines reliable local communication with exciting DX opportunities (see this month's The World Above 50 MHz for a sample). It's encouraging to see Kenwood take the plunge and bring us a new radio for this underappreciated band.

Features

The TS-60S offers SSB, CW, AM and FM operation from 50 to 54 MHz. The receiver covers 40 to 60 MHz, letting you spot band openings before they happen by monitoring out-of-band signals. Transmitter power is selectable in three fixed steps: 10, 50 and 90 W. The TS-60S's impressive list of features reads like that of a modern MF/HF transceiver: dual-VFO and split-frequency operation, QSK and semi-break-in CW, IF shift, multiple scanning modes, 100 memories, CTCSS, a 20-dB attenuator and AIP (Advanced Intercept Point), automatic power shutoff (if none of its key controls have been used for 3 hours). The rig also offers CW normal and reverse (that is, CW reception on your choice of upper or lower sideband), adjustable CW offset (from 400 Hz to 1 kHz in 50-Hz steps), various tuning-step sizes, display-backlight intensity, and a selectable RIT range (±1.1 or ±2.2 kHz). The rig's memories (and VFOs) store transmit and receive frequencies, mode, filter bandwidth, AIP, attenuator and AGC selections, and tone-encoder frequency (for FM CTCSS operation). The TS-60S is rugged and features a thermostatically controlled fan for cooling. Surprisingly, there's no provision for VOX operation.

The TS-60S's front panel shares the simple elegance of the TS-50S. This is possible because some 40 functions — including RF output power, AGC constants, CW offset, IF filter selection, CTCSS tones, and tuning steps — are software-controlled by menus that allow you to customize the radio to your operating style. You access these functions by pressing the **MENU** button, then making selections with the main tuning knob and



UP/DOWN buttons. You'll need to use the instruction manual for reference. To make it easier to access the features you use most often, you can program the four switches on the standard MC-47S microphone to operate any of the front-panel or menu-controlled functions. The TS-60S includes provisions for connection to an external amplifier (rear-panel phono jacks for ALC input and amplifier-control line), and for computer control with the optional IF-10D interface.

Where many small radios fall short is the main tuning knob. The tuning on the TS-60S is smooth, like a quality MF/HF rig. The smallest tuning step is 5 Hz, but the step increases to as much as 200 Hz when you spin the knob faster. A comfortable tuning speed yields about 2 kHz per knob revolution. In FM, the tuning-step range is 50 Hz to 2 kHz. Tuning over a wide range (say to tune across the beacons in the lower part of the band) is a bit slow. If you're a rabid 6-meter DXer, you'll probably want to use the scanning features (memory scan or continuous scan) to look for openings and activity in key parts of the band.

The versatile memories make FM and repeater operation easy. You can store the input and output frequencies of your favorite repeaters, along with any of the standard CTCSS tone frequencies.

Kenwood's instruction manual is clear and well illustrated. This is especially important for a radio like the TS-60S where many of the functions are not accessed by conventional front-panel controls. Extensive cross references help, too. Interspersed with the operating instructions are a number of helpful hints for successful on-the-air operation.

Performance

In the past, multimode VHF transceivers have fallen short on receiver performance. This is a shame, because strong-signal-handling capability is particularly important on 6 meters and the other VHF bands — you're often listening for very weak signals in the presence of very strong local signals. The TS-60S's receiver sensitivity and dynamic range compare favorably with MF/HF radios in the $1000 to $1500 price class, and its dynamic range is noticeably better than previous-generation 6-meter single-band radios. Even so, loud local stations can be annoying. The AIP feature helps you deal with very strong local signals, but it does reduce the sensitivity (which may hurt when you're listening for weak DX signals in the noise).

The optional CW filter is evidence that the TS-60S is intended for more demanding applications. Installation is identical to the TS-50S, requiring a bit of transceiver disassembly and soldering. It's not difficult to do, and the instructions are quite clear.

The peak-reading S meter deserves mention because it's particularly useful on 6 meters where rapid fading is common. The noise blanker is effective on power-line noise that plagues many operators. And, typical of Kenwood radios, the receiver audio sounds great.

At 90 W maximum, the TS-60S has sufficient power to work any propagation mode on 6 meters. Most of the time, when starting a QSO you'll probably run the TS-60S in the 50-W position. The difference between that power level and the full 90-W output can't be noticed under most conditions. When signals are good, you'll want to drop down to 10 W.

In Short

The TS-60S squeezes big-rig features into a tiny package that's easy to use. The radio is based on an MF/HF radio that's intended to see a lot of mobile use, and for serious home-station use, some 6-meter operators may wish for more convenient access to features like IF filter, AGC constant and power selection. But for most users, the TS-60S offers all the 6-meter radio you'll ever need in a box so small that you may have to keep reminding yourself that it's a real radio. But that won't be hard. All you'll have to do is turn it on!

Thanks to Emil Pocock, W3EP, and Dave Sumner, K1ZZ, for their contributions to this review.

Manufacturer's suggested retail prices: TS-60S, $1210; YK-107C 500-Hz CW filter, $110; PS-33 dc power supply, $240. Manufacturer: Kenwood Communications Corporation, Amateur Radio Products Group, PO Box 22745, Long Beach, CA 90801-5745, tel 310-639-5300.

Table 1

Kenwood TS-60S 6-Meter Multimode Transceiver, serial no. 50800781

Manufacturer's Claimed Specifications	*Measured in the ARRL Lab*
Frequency coverage: Transmitter: 50-54 MHz. Receiver: 40-60 MHz.	As specified.
Modes of operation: CW, LSB, USB, AM, FM.	As specified.
Power requirement: 13.5-V dc, ±15%; 2 A or less on receive, 20.5 A or less on transmit.	At 13.8-V dc: 0.9 A on receive (no signal); 16.3 A max on transmit.
Receiver	*Receiver Dynamic Testing*
SSB/CW receiver sensitivity (bandwidth not specified, 10 dB S+N/N): 0.16 μV (−123 dBm) or less.	Minimum discernible signal (noise floor) with 500-Hz IF filter: AIP on, −130 dBm; AIP off, −139 dBm
AM receiver sensitivity (bandwidth not specified, 10 dB S+N/N): 2 μV or less.	10 dB S+N/N (signal 30% modulated with a 1-kHz tone, 5-kHz filter): AIP on, 1.8 μV; AIP off, 0.6 μV
FM receiver sensitivity (bandwidth not specified, 12 dB SINAD): 0.25 μV or less.	12 dB SINAD with 12-kHz filter: AIP on, 0.7 μV; AIP off, 0.2 μV
Blocking dynamic range: Not specified.	Blocking dynamic range with 500-Hz IF filter:* AIP on, 115 dB; AIP off, 110 dB
Two-tone, third-order IMD dynamic range: Not specified.	Two-tone, third-order IMD dynamic range with 500-Hz IF filter:* AIP on, 94 dB; AIP off, 87 dB
Third-order input intercept: Not specified.	AIP on, +2 dBm; AIP off, +0.7 dBm
FM adjacent channel rejection: Not specified.	FM adjacent channel rejection at 20-kHz offset: AIP on, 68 dB; AIP off, 67 dB
FM two-tone, third-order IMD dynamic range: Not specified.	FM two-tone, third-order IMD dynamic range at 20-kHz offset: AIP on, 72 dB; AIP off, 68 dB
S-meter sensitivity: Not specified.	S9 signal at 50 MHz: AIP on, 123 μV; AIP off, 21 μV.
Squelch sensitivity: SSB/CW/AM, <2 μV; FM, <0.25 μV.	SSB: AIP on, 3.7 μV; AIP off, 0.7 μV. FM: AIP on, 0.18 μV; AIP off, 0.05 μV.
Receiver audio output: 2 W into 8 Ω with 10% THD.	2.6 W at 10% THD into 8 Ω.
IF/audio response: Not specified.	At −6 dB: CW-N, 621-1222 Hz (601 Hz); USB, 226-1832 Hz (1606 Hz); LSB, 242-2269 Hz (2027 Hz); AM, 120-1700 Hz (1580 Hz).
Image rejection: More than 80 dB.	SSB/CW: AIP on, 65 dB; AIP off, 93 dB; FM, 100 dB (AIP on and off).
Transmitter	*Transmitter Dynamic Testing*
Power output: SSB/CW/FM, adjustable in 3 steps: 10, 50 and 90 W; AM, 4-7, 10-20 and 15-30 W.	Maximum power output typically 98 W SSB/CW/FM and 23 W AM. Minimum power output typically 8 W SSB/CW/FM and 5 W AM.
Spurious-signal and harmonic suppression: >60 dB.	As specified. Meets FCC specifications for equipment in its power output class and frequency range.
Third-order intermodulation distortion products: Not specified.	See Figure 1.
CW keying characteristics: Not specified.	See Figure 2.
Transmit-receive turnaround time (PTT release to 50% audio output): Not specified.	S9 signal, 24 ms.
Composite transmitted noise: Not specified	See Figure 3.
Size (height, width, depth): 2.4×7×9.2 inches; weight, 6.4 lbs.	

*Dynamic-range measurements were made at the ARRL Lab standard signal spacing of 20 kHz. Blocking dynamic range measurements with AIP on were noise-limited at the value shown. AGC could not be disabled.

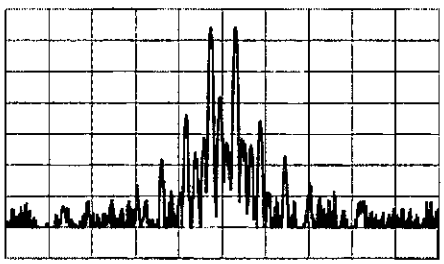


Figure 1—Worst-case spectral display of the Kenwood TS-60S transmitter during two-tone intermodulation distortion (IMD) testing. Worst-case third-order product is approximately 34 dB below PEP output, and the fifth-order product is approximately 47 dB down. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The transceiver was being operated at 90 W PEP output at 50 MHz.

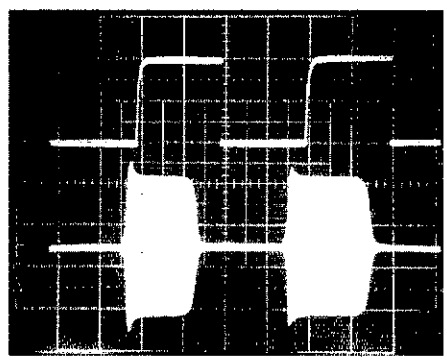


Figure 2—CW-keying waveform for the Kenwood TS-60S in the semi-break-in mode. The upper trace is the actual key closure; the lower trace is the RF envelope. Horizontal divisions are 10 ms. The transceiver was being operated at 90 W output at 50 MHz. There is only a slight shortening of the first dit.

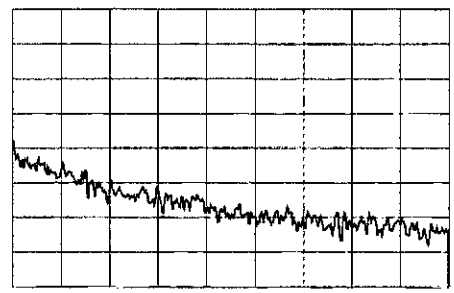


Figure 3—Spectral display of the Kenwood TS-60S transmitter output during composite-noise testing. Power output is 90 W at 50 MHz. Vertical divisions are 10 dB; horizontal divisions are 2 kHz. The log reference level (the top horizontal line on the scale) represents −60 dBc/Hz and the baseline is 140 dBc/Hz. The carrier, off the left edge of the plot, is not shown. This plot shows composite transmitted noise 2 to 20 kHz from the carrier. QST

Smooth Sailing at Rocky Hill

The ARRL Board of Directors met in Rocky Hill, Connecticut, July 15, 1994, to consider a diverse agenda. Here's your guide to your policymakers' actions.

By Rick Palm, K1CE
Field Services Manager
Photos by Rod Stafford, KB6ZV

An upbeat Board of Directors met this past July in the Hartford suburb of Rocky Hill, but the meeting's timbre was anything but rocky. In fact, it took the Board only one day to conclude its formal session, a record in the League's modern history. Although there was no one dominant theme, the Board acted on an eclectic array of issues.

On the eve of the 25th anniversary of the Apollo 11 moon mission, and with the STS-65 mission flying overhead, churning out QSOs even as the Board deliberated, the League's policymakers took the opportunity to praise the efforts of the Shuttle Amateur Radio Experiment (SAREX) Working Group. They noted SAREX's 10 years of successful missions, and its earning the highest priority among secondary payloads.

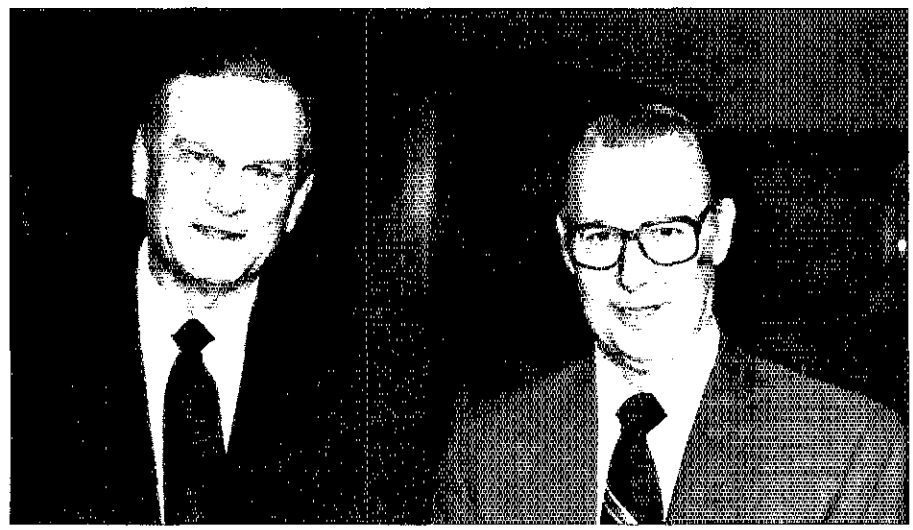
The SAREX Working Group was commended for its resourcefulness in bringing space communication into the classroom, and for making Amateur Radio communication a part of future space missions (see Minute 25).

RF Safety Committee Created

Consistent with its primary interest to promulgate standards of safe operating practices, the Board created the RF Safety Committee. The committee will advise the Board on related policy issues, and will advise the staff on the development of educational methods and materials related to RF safety. The committee will "monitor the technical, political and social environment for trends regarding RF safety, especially as they may potentially impact the Amateur Radio Service," (see Minute 33).

The Delta Division Duo, Vice Director Rick Roderick, K5UR, left, and Director Joel Harrison, WB5IGF, look over a draft motion.

Southeastern Division Director Frank Butler, W4RH, brought his years of experience as Section Manager, Vice Director and Director to the Board table.



The Great Lakes Division team, Director Al Severson, AB8P, left, and Vice Director George Race, WB8BGY. Al is a member of the Executive Committee. George is an important player on the League's Computer Committee.

Table 1
Summary of Major Board Actions

Minute	*Purpose*	*Disposition*
Operating		
15/43	Rover rules for ARRL VHF contests	Referred to Awards Committee
59	10-GHz contest expansion	CAC Study
63	Addition of club competition system to VHF and UHF contests	CAC Study
64	Summer Sprint series	CAC Study
Organizational		
17	Convention Rules	Amended
33	RF Safety Committee	Created
35	Professional Media Award	Created
50	Peoria, Illinois, site of 1996 National Convention	Adopted
51	Digital Communications Conference at Dallas/Ft Worth	Adopted
54	Incumbent mailing policy	Withdrawn
56	Three-year Director terms	Lost
Awards		
18	Jonathan M. LeBretton, N1MJM, Hiram Percy Maxim Award	Awarded
19	James Dalley, W0NAP, Herb S. Brier Instructor of the Year	Awarded
20	Sheila Perry, N0UOP, Professional Educator of the Year	Awarded
21	Rick Campbell, KK7B, Technical Excellence Award	Awarded
22	Len Winkler, KB7LPW, Philip J. McGan Silver Antenna Award	Awarded
International		
53	EVP directed to ensure continued ARRL participation in USTTI training program	Adopted
58	ARRL casts affirmative vote on admission of Union of Radio Amateurs of Russia to IARU	Adopted
60	Paul Rinaldo, W4RI, member of US delegation to ITU plenipotentiary conference noted, commended	Adopted
61	ARRL to abstain in vote of Iraqi RAC admission to IARU	Adopted
Spectrum Management		
57	Spectrum Committee study, 420 MHz to 300 GHz	Adopted
62	Spectrum Committee to give highest priority to bands subject to government reallocation plans in study commissioned at Minute 57	Adopted
Commendations		
9	Staff and others involved in 13-cm protection effort	Commended
25	SAREX Working Group	Commended
45	DXAC	Commended
65	Sam Sitton, KV5X	Commended

Table 2
Committee Reports Available

Copies of the reports of the Standing Committees of the Board, *Ad Hoc* Committees and Advisory Committees are available to Members for the cost of reproduction and mailing. Here's a list of these reports, as presented at the 1994 Second Meeting, with the number of pages and their respective cost. Please order by document number and include remittance with your order. Send orders to Secretary, ARRL.

Committee	*Document*	*Pages*	*Cost*
Membership Services	15	6	$1
Volunteer Resources	16	5	$1
Election	18	1	$1
SAREX	19	4	$1
Computer	21	9	$1
Amateur Auxiliary	22	1	$1
Amateur Auxiliary Oversight	22-A	1	$1
RFI	23	1	$1
Biological Effects	24	2	$1
Public Relations	25	3	$1
Long Range Planning	26	1	$1
Future Systems	28	1	$1
Industry Advisory Council	29	1	$1
Spectrum	30	6	$1
Contest	31	2	$1
DX	32	8	$1
Public Service	33	4	$1

Rick Campbell, KK7B, Technical Excellence Award Winner

The winning article: "High-Performance, Single-Signal, Direct-Conversion Receivers," *QST*, January 1993.

The Technical Excellence Award winner for 1993 is Rick Campbell, KK7B. This is Rick's second TEA, having won his first in 1991.

Rick says: "I have always been fascinated with receivers. I compressed the entire history of radio receivers into 20 years by building a razorblade detector crystal set in 1963, and a DSP IF system for microwaves in 1983.

"My favorite Amateur Radio activity is taking a project all the way from the first glimmer of an idea through the design and prototype stages to a reproducible circuit that works better than anything I can buy.

"I don't really mind transmitting, but every minute I spend transmitting is a minute I'm not listening.

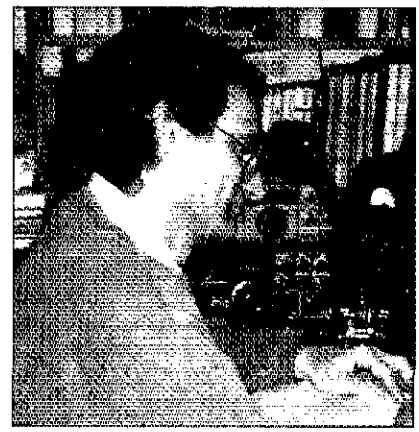
"Microwaves appeal to me because I can do things that nobody has ever tried before on the microwave bands.

"I always end up building QRP rigs because it's a lot of fun to build the receiver and kind of interesting to build the companion exciter—but that's about when I start working on the next project!

"I like to build SSB equipment because it's more of a challenge, but I'd rather operate CW, because *it's* more of a challenge."

Rick was first licensed as WN8VAZ at the age of 14. He began his professional career as a US Navy Radioman in 1971, then went on to receive a BS in Physics in 1975, an MSEE in 1981 and PhD in 1984. Rick earns his daily bread as an Associate Professor at Michigan Technological University.

Rick enjoys playing fiddle with the Bayside Boys at the Los Dos Amigos restaurant on Saturday nights, performance windsurfing on Lake Superior's big waves and in the big winds of the Columbia River Gorge, and "...all kinds of fun and crazy things with my wife and kids."



Sheila Perry, N0UOP, Jim Dalley, W0NAP, Instructors of the Year

Each year, the ARRL Instructor of the Year awards bring forth the finest educators to compete for a chance to be named ARRL Professional Educator, ARRL Herb S. Brier Instructor, or ARRL Professional Instructor of the Year. To quality for the ARRL Professional Educator of the Year award, one must use Amateur Radio as part of a school curriculum, or teach it in a public or private educational institution. ARRL Herb S. Brier nominees must teach Amateur Radio without being financially compensated for their service. Our newest award, ARRL Professional Instructor of the Year, solicits educators who teach Amateur Radio as a regular course or subject in a public or private educational institution, such as a community college or vocational education institute. Let's meet the winners for 1993.

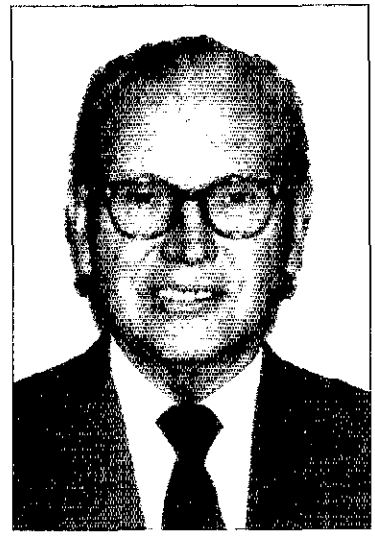
Sheila Perry, N0UOP, of Bloomfield, Missouri, was selected as the 1993 ARRL Professional Educator of the Year. Sheila, a Technician licensee, teaches third grade at Bloomfield Elementary School and has been using ham radio in her classroom for three years. Sheila uses the theme of space to involve her students in learning, and already has them learning the concepts of longitude and latitude by tracking satellites. Their geography skills have improved significantly, too. Says Sheila, "it never amazes me what new things I keep learning with my ham shack. I think of the many opportunities we can provide students, especially if we can set up all of the classrooms with ham teachers."

Sheila has a knack for writing grants, and has received a respectable amount of funding through her efforts, including a recent $50,000 grant chronicled in August 1994 *QST* League Lines. Robert Noyes, Superintendent of Bloomfield Reorganized School District No. 14 summarizes Sheila's success story best. "Mrs. Perry's creativeness is demonstrated by the fact that she has written for and received an incentive grant each year since the grant program was initiated. Most of these grants were written using the space theme and has brought a United States astronaut to our school. Another grant allowed our students to talk directly with the astronauts aboard the shuttle (STS-58, *Columbia*) by way of ham radio. The Planetarium (another grant) has been visited by students from other schools and by the district's public. She is the State of Missouri Christa McAuliffe grant recipient which she has pursued to further enhance the Bloomfield R-14 third grade program. She promotes Amateur Radio and four other teachers received their amateur license with her."

James (Jim) Dalley, W0NAP, of Centerville, Utah, was named 1993 ARRL Herb S. Brier Instructor of the Year. Jim holds an Extra license and began teaching Morse code 45 years ago while teaching at Weber State University in Ogden, Utah. First licensed at the age of 16, he trained radio mechanics to work at military installations during World War II, taught vocational electronics at the undergraduate and graduate levels, and has worked as an electronics technician and radio/TV repairman and as a research and development engineer at Bell Telephone Laboratories.

Jim holds true to the philosophy that the teaching work load should be shared so that more variety and enthusiasm is brought to the class. This prevents anyone from getting burned out. He feels that with the many varied aspects of Amateur Radio, there is usually someone in the club [Davis County Amateur Radio Club] who is more specialized in any given area. Perhaps Major Michael Gardner, KB2MWD, said it best: "Dr. Dalley was the most important influence in my recent successful upgrade to the General license and I heartily recommend him as one of America's best Amateur Radio instructors. Within just a few days after moving to Utah, I received a call from Jim inviting me to attend his upgrade training course and to become a member of the Davis County Amateur Radio club. His invitations were persuasive and enthusiastic, but the personal attention which he gave me impressed me the most. He not only called each week to remind me of the classes, but also went the extra mile by arranging transportation for both of us to attend the meetings."

Congratulations to Sheila and Jim and to the group of nominees who deserve honorable mention. The nominees for ARRL Professional Educator of the Year award include: Norm Dillman, N0JCC, Manhattan, Kansas; Michelle Hollenbeck, AA0OF, Augusta, Kansas; Terry Pemberton, KB7TRE, Prescott, Arizona; David Reeves, KF6PJ, Simi Valley, California; Alex Reyes, KC4UFM, Phoenix, Arizona; and Charles Ward, KJ4RV, Fayetteville, North Carolina. Those nominated for the ARRL Herb S. Brier Instructor of the Year award include: Milt Dexheimer, W2VCI, Tonawanda, New York; Russell (Rusty) Hack Jr, NM1K, Enfield, Connecticut; Ron Hambric, N5SBN, Bryan, Texas; Terry Murphy, AB4VJ, Durham, North Carolina; William Pope, W6TKE, Chico, California; Adrian Sebborn, N1JWO, Williamstown, Massachusetts; Bill Shimmin, W7GBC, Tacoma, Washington and Andy Treat, KF0MP, Shell Knob, Missouri.

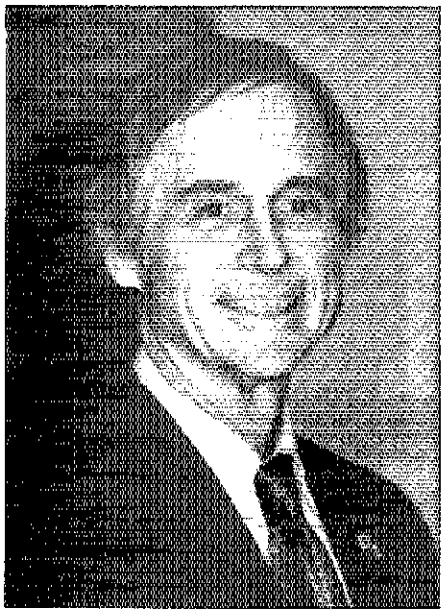


Professional Media Award Created

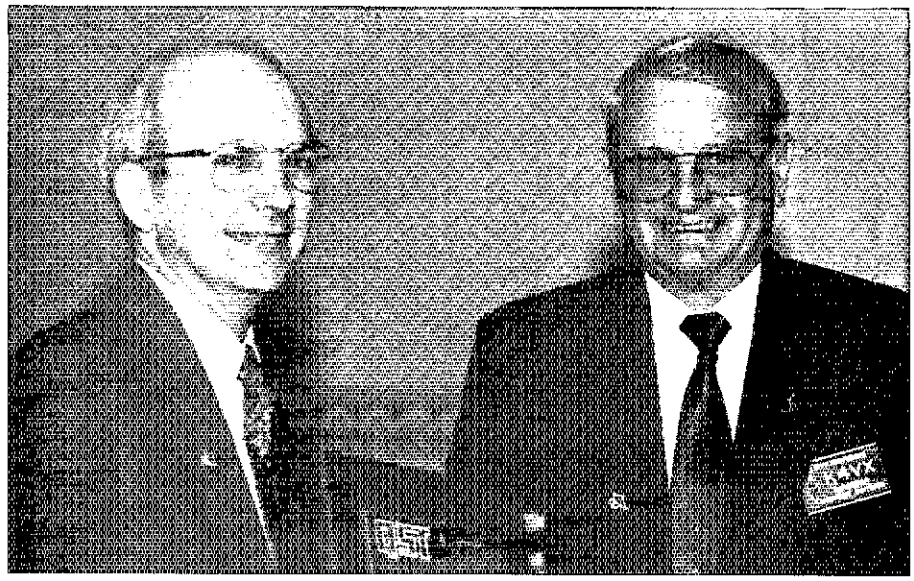
In response to a report and recommendation from its Public Relations Committee, the Board created the ARRL Professional Media Award to recognize distinguished contributions to the public image of Amateur Radio by news media professionals. The committee will act as a selection committee for this award (see Minute 35).

International Front

Staff was directed to take measures to insure the continued ARRL participation in the industry-sponsored United States Telecommunications Training Institute (USTTI) program aimed at providing timely training to foreign government telecommunications regulators and others concerning Amateur Radio administration. Special emphasis will be placed on recruiting students who are opinion leaders from target countries as identified by the IARU (see Minute 53). International Affairs Vice



Vice President Jay Holladay, W6EJJ, chairs the Long Range Planning Committee. Jay conducted a strategic planning session following the close of formal business of the Board.



Executive Vice President David Sumner, K1ZZ, as *QST* Publisher, presents Midwest Division Director Lew Gordon, K4VX, with the *QST* Cover Plaque award for August 1993 *QST* for his article, "The Effect of Continuous, Conductive Guy Wires on Antenna Performance."

President Larry E. Price, W4RA, had noted earlier the critical importance of gaining foreign support as a foundation for the protection and development of Amateur Radio interests at international conferences which are the headwaters for spectrum access.

The ARRL, as a member of the International Amateur Radio Union (IARU) will vote for the admission to membership in IARU of the Union of Radio Amateurs of Russia (see Minute 58), and will abstain with regard to the admission of the Iraqi Radio Amateur Club (see Minute 61).

The selection of ARRL Technical Relations Manager Paul Rinaldo, W4RI, as a member of the US delegation to the International Telecommunication Union (ITU) Plenipotentiary Conference in Kyoto, Japan, was noted. Paul was congratulated by the Board for his continued excellent job as an international representative of Amateur Radio (see Minute 60).

Spectrum Issues

The Board, noting that the National Telecommunications and Information Administration (NTIA) preliminary spectrum allocation plan, coupled with provisions of related FCC rulemaking proceedings, poses a major direct challenge to the existence and future development of the 13-cm band, commended the staff and others for ongoing defensive efforts, including the marshaling of the force of the membership in support (see Minute 9).

Looking for a more comprehensive understanding of present amateur activities and possible future activities in bands between 420 MHz to 300 GHz, the Spectrum Committee was charged with initiating a study of these bands to obtain rel-

Jonathan LeBretton, N1MJM, Maxim Award Winner

The Board selected Jonathan M. LeBretton, N1MJM, as the 1993 winner of the prestigious Hiram Percy Maxim Memorial Award. The award recognizes achievement in the leadership, technical, operating, public relations and recruitment/training arenas by a ham under the age of 21.

Jon is 16 years old and is a junior at Plymouth North High School in Plymouth, Massachusetts. He is president of the Mayflower Amateur Radio Club, an ARRL affiliated club in Plymouth. Jon holds a General license and is studying for his Advanced test. He is an Official Relay Station, and holds National Traffic System (NTS) certificates for participation in local, section, and region nets. He has achieved Worked All States, Worked All Continents, Rag Chewers Club, Code Proficiency at 15 wpm, and the National Traffic System Message Origination Award. Jon is currently working for his DXCC, with only 10 countries to go.

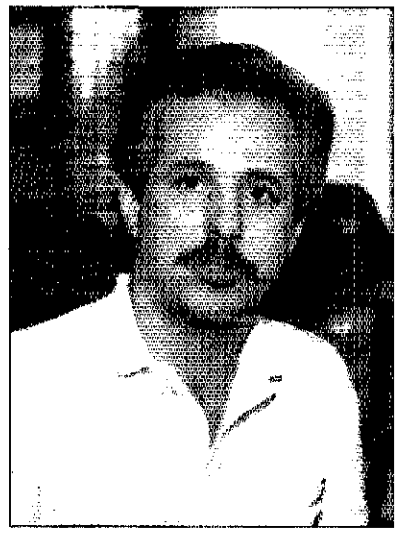
Jon placed first in Eastern Massachusetts in the 1993 Novice Roundup contest. He also placed first in the 1993 ARRL International DX Contest in Novice/Technician phone and also in 10 meter phone. He is active in traffic handling and has acted as Cape and Islands Traffic Net control, as well as liaison to the First Region Net.

As president of the Mayflower ARC, he is presented with many opportunities to deal with the public in various ways. Jon is the youngest president in club history. The club runs classes for the public to gain Amateur Radio licenses. He has helped teach the classes in the past. As a student , he encourages friends and classmates to join the fun of Amateur Radio. He is currently trying to get a school club started.

His favorite club activities are Field Day and the club-sponsored flea market. "These provide the most satisfaction for me because months of planning result in a smooth running event. These activities also allow me to interact with the public and get a feel for what they would like from the club."

Jon was nominated by Eastern Massachusetts Section Manager Dave Crocker, W1TMO, who said, "I am convinced that Jon is the kind of young person who holds the future of ham radio. He not only enjoys the benefits of being a ham, but also recognizes an obligation to contribute to his own growth and to that of others and to serve the public interest."

Len Winkler, KB7LPW, Wins McGan Silver Antenna Award



When Len Winkler of Phoenix, Arizona, earned his first ham license in 1990, he knew he wanted to make a difference in Amateur Radio. And he has. With an impressive record of public relations successes to his credit, Winkler has been named this year's Philip McGan Silver Antenna Award winner.

The New Hampshire Amateur Radio Association and the ARRL give the award annually to the ham who exemplifies volunteer public relations on behalf of Amateur Radio in the spirit of Philip J. McGan, WA2MBQ (SK). Winkler was nominated by Fried Heyn, WA6WZO. The winner is selected by the ARRL Public Relations Committee subject to the approval of the ARRL Board of Directors.

"Len's efforts have led to increased positive awareness of Amateur Radio in Arizona, and he has also spread the word nationally by way of his radio program on the Talk America National Network," says Heyn.

Winkler is the creator and host of "The Ham Radio & More Show," a weekly nationally syndicated talk show devoted to Amateur Radio. He donates his time and talent to the show. He also writes articles and speaks to school children and other groups about Amateur Radio. Winkler helped start a club at Carl Hayden High School, which now boasts about 50 licensed hams. Currently, he is assisting in starting a new club specializing in Elmering new hams.

"Winkler, in just four years, has dedicated countless hours and boundless energy to public relations activities," says Rich Moseson, NW2L, ARRL Public Relations Committee Chairman. "We were particularly impressed with his enthusiasm and creativity in bringing more families into the Amateur Radio community. The first Family Amateur Radio Event (FARE), which Len helped organize in 1993, was a smashing success, attracting almost 3,000 visitors.

"Picking a winner for this award is never an easy task," says Moseson. "Each year, we see more hams out there voluntarily working on public relations projects with a drive and creativity that exemplifies not only the spirit of Phil McGan, but of Amateur Radio."

Other nominees for this year's McGan Award were Joe Kasser, W3/G3ZCZ, of Silver Spring, MD; Earl Falk, N7GDR, of Bullhead City AZ; Margaret Bevan, N3BMB, of Crownsville MD; Mary Ann Foble, N8ODZ, of Great Cacapon, WV, and Jeff Reinhardt, KM6II, of Agoura Hills, CA.

In selecting Len Winkler, the ARRL Board of Directors also thanked all amateurs for their public relations efforts.— *Jennifer Hagy, ARRL Media Relations Assistant*

President George Wilson III, W4OYI, right, ponders a point of order with First Vice President Rod Stafford, KB6ZV.

evant data for Board guidance (see Minute 57). The committee will give the highest priority to those bands subject to spectrum reallocation contemplated by the US government (see Minute 62).

Contest Issues

The Contest Advisory Committee (CAC) will study expanding the 10-GHz Contest to include all bands above 10 GHz also, and report back to the Board at the 1995 Annual Meeting (see Minute 59). The CAC will also study addition of a club competition system to all VHF and UHF contests and sprints (see Minute 63). And finally, the committee will study creation of a Summer Sprint series to be held during July and August, taking advantage of prime VHF/UHF/SHF propagation. (see Minute 64).

Awards

The Board selected Jonathan M. LeBretton, N1MJM, as the recipient of the prestigious Hiram Percy Maxim Memorial Award for 1993 (see Minute 18). James Dalley, W0NAP, was picked as the recipient of the Herb S. Brier Instructor of the Year Award for 1993 (see Minute 19). Sheila Perry, N0UOP, won honors as the ARRL Professional Educator of the Year Award (see Minute 20). Rick Campbell, KK7B, was selected as the recipient of the Technical Excellence Award for his article, "High-Performance, Single-Signal, Direct-Conversion Receivers," appearing in January 1993 *QST* (see Minute 21). Len Winkler, KB7LPW, was tabbed as the recipient of the Philip J. McGan Silver Antenna Award for 1994. The Board thanked all amateurs for their public relations efforts throughout the year (see Minute 22). For profiles of this year's award winners, please see the sidebars.

Peoria Gets Nod for 1996 National

The Board voted that the ARRL National Convention be held at Peoria, Illinois, September 13 through 15, 1996, under the sponsorship of the Peoria Area Amateur Radio Club (see Minute 50).

Dallas/Ft Worth was selected as the site of the 14th ARRL Digital Communications Conference. The Tucson Amateur Packet Radio Corporation (TAPR) and the Texas Packet Radio Society will co-host the conference slated for September 1995 (see Minute 51).

The Following Pages...

...contain the official records, or "minutes" of the meeting. Check the summary of Board actions contained in the sidebar for issues of interest to you, noting the minute reference. Then, check the corresponding text in the following pages: It will give you the official position taken. You'll know exactly how the Board acted on your pet issue. Plus, you'll have the facts in your corner when discussing League policy matters with other amateurs! QST

Moved & Seconded

1994 SECOND MEETING OF THE ARRL BOARD OF DIRECTORS

JULY 15, 1994

Summary Agenda

1. Roll Call
2. Moment of Silence
3. Consideration of the Agenda for the meeting
4. Approval of the Minutes of the 1994 Annual Meeting
5. Reports by the Officers
6. Receive reports and consider recommendations of the committees
7. Directors' motions

1. Pursuant to due notice, the Board of Directors of the American Radio Relay League, Inc, met in second session at the Marriott Hotel in Rocky Hill, Connecticut, on Friday, July 15, 1994. The meeting was called to order at 8:30 AM EDT with President George S. Wilson III, W4OYI, in the Chair and the following Directors present:

Hugh A. Turnbull, W3ABC, Atlantic Division
Edmond A. Metzger, W9PRN, Central Division
Tod Olson, KØTO, Dakota Division
Joel M. Harrison, WB5IGF, Delta Division
Allan L. Severson, AB8P, Great Lakes Division
Stephen A. Mendelsohn, WA2DHF, Hudson Division
Lew Gordon, K4VX, Midwest Division
William Burden, WB1BRE, New England Division
Mary Lewis, W7QGP, Northwestern Division
Brad Wyatt, K6WR, Pacific Division
John C. Kanode, N4MM, Roanoke Division
Marshall Quiat, AGØX, Rocky Mountain Division
Frank M. Butler, W4RH, Southeastern Division
Fried Heyn , WA6WZO, Southwestern Division
Tom Comstock, N5TC, West Gulf Division

Also present as members of the Board without vote were Rodney J. Stafford, KB6ZV, First Vice President; Jay A. Holladay, W6EJJ, Vice President; Tom Frenaye, K1KI, Vice President; Larry E. Price, W4RA, International Affairs Vice President; David Sumner, K1ZZ, Executive Vice President; and James E. McCobb, K1LLU, Treasurer. Chief Financial Officer Barry J. Shelley was present in his capacity as an officer of the Corporation.

Also in attendance at the invitation of the Board as observers were the following Vice Directors: Kay C. Craigie, WT3P, Atlantic Division; Howard Huntington, K9KM, Central Division; Rick Roderick, K5UR, Delta Division; George E. Race, WB8BGY, Great Lakes Division; Bruce Frahm, KØBJ, Midwest Division; Warren Rothberg, WB1HBB, New England Division; Mary Lou Brown, NM7N, Northwestern Division; James A. Maxwell, W6CF, Pacific Division; C. Dennis Bodson, W4PWF, Roanoke Division; Bob Scupp, WB5YYX, Rocky Mountain Division; Evelyn Gauzens, W4WYR, Southeastern Division; Art Goddard, W6XD, Southwestern Division; and Sam Sitton, KV5X, West Gulf Division. Also present were J. Farrell Hopwood, VE7RD, President, Radio Amateurs of Canada Inc; General Counsel Christopher D. Imlay, N3AKD; Publications Manager Mark J. Wilson, AA2Z; Membership Services Manager Charles L. Hutchinson, K8CH; Field Services Manager Richard K. Palm, K1CE; Paul L. Rinaldo, W4RI, Technical Relations Manager; and Steve Mansfield, N1MZA, Manager, Legislative and Public Affairs.

2. The assembly observed a moment of silence in recollection of Radio Amateurs who have passed away since the previous Board meeting, especially Joanie Branson, KA6V; Paul M. Chamberlin, K4KTV; Dr. Karl William Edmark, W7IGJ; Dave Fraser, KH6BIH; Joe Hertzberg, N3EA; John Hultquist, W6QWM; Bettie Johnson, N3PNW; Bill Johnson, W6MUR; Stu Meyer, W2GHK; Dr. George H. Murphy, WA4GOG; Katashi Nose, KH6IJ; Anne Rinaldo; Tom Spencer, W5IGM; and Bill Walters, Sr., W6MKE.

3. On motion of Mr. Mendelsohn, seconded by Mr. Harrison, the agenda was ADOPTED as presented.

4. On motion of Mr. Mendelsohn, seconded by Mr. Harrison, the Minutes of the 1994 Annual Meeting were ADOPTED as printed, with the notation that Mr. Frahm had left the meeting at Minute 68 rather than at Minute 58.

5. At this point, the officers reported on their activities during the first half of 1994. President Wilson noted the regular reports he had made to the Board, and commended Messrs. Rothberg and Maxwell on their efforts with the DX Advisory Committee and Biological Effects Committee, respectively. First Vice President Stafford referred to his written report. He attended the Membership Services Committee meeting, a special meeting called by President Wilson to review FCC matters and strategic planning relating to those and other matters; an Executive Committee meeting; the ARRL Board Retreat in Savannah, Georgia; the Northwestern Division Convention at Seaside, Oregon; and the National Convention in Arlington, Texas, where he moderated the FCC Forum with John Johnston and Robert McNamara of the FCC staff. Vice President Holladay reported that his major involvement has been with strategic planning in connection with his position as Chairman of the Long Range Planning Committee. He indicated that he would have comments on long range planning and the 1996 National Convention during the course of the meeting. Vice President Frenaye emphasized the need to concentrate on identifying opportunities to gain new members from the pool of new licensees, and the need to tighten our policies with respect to the provision of services to members versus nonmembers. International Affairs Vice President Price called attention to the "one country, one vote" policy of the ITU and emphasized the importance of gaining foreign administrations' support for Amateur Radio. Mr. Price summarized his extensive travel over the course of the first half of the year, noting success at the first World Telecommunications Development Conference, where a resolution was adopted that recognizes Amateur Radio for its abilities in the mitigation of disasters. Mr. Price emphasized that our activity in telecommunications conferences, working groups and committees is critical to our ability to marshal foreign support for Amateur Radio. Mr. Price also reported on the activities of IARU President Richard L. Baldwin, W1RU, especially a training seminar for Asian-Pacific government officials in Tokyo, and IARU regional Executive Committee Meetings in South Africa, Amsterdam, and Jamaica. Treasurer McCobb presented his report which analyzed the performance of the League's portfolio and the market in general. Mr. McCobb noted that the financial condition of the League is good.

6. Executive Vice President Sumner conveyed the greetings of Honorary Vice President Robert York Chapman, W1QV, who had expressed his regrets at not being able to attend the meeting. Mr. Sumner then referred to his 19-page report, which addressed the inauguration of a newsstand edition of *QST*, two successful SAREX missions, DXCC growth, publication of *The DXCC Yearbook*, staff changes, Amateur Auxiliary program restructuring, VEC matters, work of the technical relations staff in spectrum reallocation challenges, ITU, WRC-95 preparation and other related matters, legislative relations including progress on H.J. Resolution 199/S.J. Resolution 90 and H.R. 2623, license-expiration notification program, and free *ARRL Letter* subscriptions for newsletter editors.

7. The report of Chief Financial Officer Shelley covered financial results for the first half of the year, including a shortfall in publication sales and a flattening of the membership growth rate. A new Local Area Network was installed at HQ, with corresponding desktop workstation upgrades and software standardization. Mr. Shelley's report also provided projections for the second half.

8. The report of General Counsel Imlay covered spectrum allocation matters, regulatory proceedings of the FCC, litigation, recent antenna and RFI matters, and legislation. Of special note were the NTIA's spectrum reallocation plan and the specific issue of the 2.3-GHz band; the 902 to 928 MHz band; the Commission's "vanity" call sign proposal; VEC operating guidelines codification; and preparations for the ITU WRC-95 and WRC-97 Conferences.

9. On motion of Mr. Wyatt, seconded by Mr. Heyn, the following resolution was ADOPTED:

WHEREAS, the NTIA preliminary spectrum allocation plan coupled with FCC Docket 94-32 provides a major direct challenge to the existence and future development of the 13-cm band, now therefore

BE IT RESOLVED: that this Board commends and thanks most highly, Messrs Imlay, Rinaldo, Sumner, Mansfield, their staffs and others, for:

1) Developing and implementing in a timely manner, skillful strategies and response to the NTIA plan, and

2) Providing these strategies and responding rapidly to members and their organizations to help them prepare their supportive comments in a timely manner.

10. Mr. Metzger, as President, presented the report of the ARRL Foundation, Inc. The Foundation enjoyed moderate growth during the past twelve months. Twenty scholarships were awarded and several grants were issued from the Victor C. Clark, W4KFC, Youth Incentive Program. Foundation scholarships and grants for the past 12 months total more than $26,000.

The Board was in recess from 10:12 to 10:27 AM.

11. Mr. Burden, as Chairman, presented the report of the Administration and Finance Committee. The committee has reviewed the current financial status of the League and reviewed and approved Terms of Reference for the Colvin Award. The committee investigated legal defense insurance as instructed at Minute 56 of the January meeting and determined that such insurance cannot be made available to League members at reasonable rates. The status of the computer upgrading initiative scheduled for 1994-95 was reviewed, and it was determined that the pace of implementation should be accelerated, with some steps originally scheduled for 1995 to be completed this year, instead. To address developing tax and accounting issues affecting nonprofit organizations, President Wilson was requested to appoint an ad hoc financial planning subcommittee to report to the Administration and Finance Committee.

Mr. Sitton joined the assembly at 10:37 AM.

12. On motion on Mr. Burden, seconded by Mr. Mendelsohn, it was VOTED that Mark J. Wilson and Charles L. Hutchinson be authorized as signatories on ARRL checking accounts at Shawmut Bank.

13. Mr. Hopwood, as President, extended greetings from the Radio Amateurs of Canada, and discussed the challenges posed by the Canadian government's proposal to delegate the responsibility for the administration of the Amateur Radio service in Canada to the RAC. Mr. Hopwood also discussed the upcoming inaugural RAC National Convention in Calgary, Alberta, and the planned presence of League and IARU officials.

14. Mr. Kanode, as Chairman, presented the report of the Membership Services Committee. The committee has held two meetings since January. In response to Minute 51 of the January meeting, the committee studied the 40-meter Novice band and recommends that no change be sought. Work on the Hiram Percy Maxim 125th anniversary operating event has been completed. The committee is continuing its consideration of a possible domestic QSL bureau.

15. It was moved by Mr. Quiat, seconded by Mr. Kanode, that the following be added to the rules for ARRL VHF contests:

Rule 1 (C) Rover: A rover consists of one or two operators of a single station that moves among two or more grid locators during the contest. A rover vehicle may transport only one station using a single call sign; thus a rover may not operate with multiple call signs under the family rule 7 (C). Rover vehicles must transport all the equipment, power supplies, and antennas used at each operating site. This rule is not intended to prevent an operator from using the same call sign to submit separate logs for single-operator (fixed station) and rover-class entries. Rovers add "rover" on phone and /R on CW after their call signs.

Rule 4 (D) Rovers only: The total rover score is the sum of the scores made from each grid locator. Submit separate logs for each grid where operating sites were established and score them individually, as explained in paragraphs (A) though (C) above. Then add the scores from each grid on the summary sheet for the total rover score. Rovers are listed in the published contest results under the division from which the highest aggregate score was made. [For the January VHF Sweepstakes only:] Rovers entering club competition must indicate the grid locators where operating sites were within 175 miles of the club's center. Only scores made from those grid locations count for club competition.

It was moved by Mr. Heyn, seconded by Mr. Burden, that the matter be referred to the Awards Committee. Following discussion, on motion of Mr. Price, seconded by Mr. Heyn, it was VOTED that the matter is POSTPONED.

16. Mr. Turnbull, as Chairman, presented the report of the Volunteer Resources Committee. The committee met on April 23 in St. Louis, and in Newington on July 14. The committee considered the Amateur Auxiliary logo, educational activities in the Field Organization, policy concerning changes in convention dates, section budgets, technical awards system, and possible Memorandums of Understanding with the National Disaster Medical System and REACT.

17. On motion of Mr. Turnbull, seconded by Mr. Harrison, it was VOTED that section 3 of the Rules and Regulations concerning ARRL Conventions be amended by adding the following: "A convention is sanctioned by the Executive Committee for the date(s) and location specified on the application. Following EC approval, should the event officials decide to change the date(s) and/or location of the event, the sanction is invalidated and new application must be made."

18. On motion of Mr. Burden, seconded by Mr. Kanode, it was VOTED that the ARRL Board of Directors selects Jonathan M. LeBreiton, N1MJM, as recipient of the Hiram Percy Maxim Memorial Award for 1993.

19. On motion of Mr. Quiat, seconded by Mrs. Lewis, it was VOTED that the ARRL Board of Directors selects James Dalley, W0NAP, as the recipient of the Herb S. Brier Instructor of the Year Award for 1993.

20. On motion of Mr. Gordon, seconded by Mr. Mendelsohn, it was VOTED that the ARRL Board of Directors selects Sheila Perry, N0UOP, as the recipient of the ARRL Professional Educator of the Year Award.

21. On motion of Mr. Severson, seconded by Mr. Harrison, it was VOTED that the ARRL Board of Directors selects Rick Campbell, KK7B, as the recipient of the Technical Excellence Award for his article, "High-Performance, Single-Signal, Direct-Conversion Receivers," that appeared in January 1993 *QST*.

22. On motion of Mr. Heyn, seconded by Mr. Mendelsohn, it was VOTED that the ARRL Board of Directors selects Len Winkler, KB7LPW, as the recipient of the Philip J. McGan Silver Antenna Award for 1994. The Board thanks all amateurs for their public relations efforts throughout the year.

23. On motion of Mr. Turnbull, seconded by Mr. Harrison, it was VOTED, at 11:10, that the Board sit as a Committee of the Whole for the consideration of the Election Committee report. On motion of Mr. Mendelsohn, seconded by Mr. Turnbull, it was VOTED, at 11:24, that the Committee of the Whole arise. On motion of Mr. Harrison, seconded by Mr. Heyn, it was VOTED to receive the report of the Committee of the Whole. On motion of Mr. Quiat, seconded by Mrs. Lewis, it was VOTED to amend the report to stipulate that no fault was found in connection with the subject Vermont Section Manager election.

24. Mr. Goddard assumed the seat of Mr. Heyn to present the report of the SAREX Working Group. Two successful missions have flown this year so far. STS-60 saw space history made when Sergei Krikalev, U5MIR, flew aboard the shuttle. The responsibility of SAREX oversight will be transferred from NASA's Educational Department to its Public Affairs Department. There is a preliminary, favorable indication from NASA's space station office for SAREX operation aboard the future space station.

25. On motion of Mr. Goddard, seconded by Mr. Comstock, the following resolution was ADOPTED:

WHEREAS, the Shuttle Amateur Radio Experiment (SAREX) has completed more than ten years of successful missions aboard Space Shuttle flights; and

WHEREAS, the SAREX payload has flown three times more than any other payload (primary or secondary) and has earned the highest priority among secondary payloads; and

WHEREAS, the SAREX mission has a proven record of high educational value and favorable public visibility of Amateur Radio; and

WHEREAS, the SAREX mission owes much of its success to the dedicated effort of the SAREX Working Group established by the ARRL; and

WHEREAS, the SAREX Working Group has assured the operational effectiveness of each SAREX mission through conference calls during each flight day to assess mission status and determine corrective actions; and

WHEREAS, the SAREX Working Group has demonstrated resourcefulness and innovation through means such as the worldwide telebridge links that bring SAREX communications into the classroom when orbital parameters and crew schedules do not permit direct, line-of-sight communication; and

WHEREAS, the SAREX Working Group is now charged with guiding the SAREX mission through significant changes at NASA and with setting the stage for Amateur Radio communications on future space platforms such as the Space Station; now therefore

BE IT RESOLVED: that the ARRL Board of Directors expresses its gratitude to the SAREX Working Group for providing the right stuff to assure the continued success of the SAREX mission, and commends the SAREX Working Group for its endeavor to make Amateur Radio communications a part of future space missions.

Atlantic Division Vice Director Kay Craigie, WT3P, serves as Board liaison to the Digital Committee.

At this point, Mr. Heyn returned to his seat.

26. Mr. Quiat, as Chairman, reported for the Ad Hoc Coordination Committee. The committee is considering the pursuit of the reinstitution of repeater call signs and a system of coordination/approval as a basis for the issuance of such call signs. The committee is also considering a "single point of contact" coordination procedure and a list of coordination criteria.

27. Mr. Brenave, as Chairman, presented the report of the Ad Hoc Computer Committee. The committee met by teleconference on March 15 and in person on June 4 and July 13. Tasks associated with upgrading of computer/workstation resources, especially the installation of a new Local Area Network at Headquarters, have been substantially accomplished, and KPMG Peat Marwick has been selected as consultant for the next phase of computer upgrading.

28. Mr. Turnbull, as Chairman, reported for the Amateur Auxiliary Committee. The mission of the committee has been completed with the release of the new training manual, detailing the program restructuring. President Wilson discharged the committee, and oversight for the new program's implementation will be handled by the Amateur Auxiliary Oversight Committee. Mr. Roderick was added to the latter committee's roster.

29. Mr. Turnbull, as Chairman, presented the report of the Amateur Auxiliary Oversight Committee. The committee met on July 14 in Newington, and reviewed problems involving improper referrals and lack of awareness of program changes on the part of FCC field offices. A few questions had surfaced from the field concerning insurance coverage.

30. Mr. Bodson, as liaison, reported for the RFI Task Group. The Group has been very active during the past six months. The Group will evaluate its scope and agenda during the next six months. A major effort involves work with the ANSI/IEEE C-63 Committee on immunity issues. An RFI survey has been developed and will be conducted shortly. Technical Information Service packages have been updated. A draft *QST* article has been completed on the subject of automotive RFI. Mr. Turnbull, as chairman, added that cooperation between industry and the standards committee on the matter of telephone interference is sought.

31. At this point, Mr. Sumner, as *QST* publisher, presented Mr. Gordon with the cover plaque award for August 1993 *QST* for his article, "The Effect of Continuous, Conductive Guy Wires on Antenna Performance." (applause)

32. Mr. Maxwell assumed the chair of Mr. Wyatt, and as liaison, reported for the Biological Effects Committee. The committee members have resigned, and progress is being made on identifying new candidates for committee membership.

33. It was moved by Mr. Mendelsohn, seconded unanimously, that the following resolution be ADOPTED:

WHEREAS, the possible biological effects hazards associated with radio transmission are being investigated by competent bodies; and

WHEREAS, the American Radio Relay League seeks, above all, to promulgate standards of safe operating practices; now therefore

BE IT RESOLVED: that the RF Safety Committee is established. Its membership shall be appointed by the President, the term of each member to be as determined by the President; and

BE IT FURTHER RESOLVED: that the RF Safety Committee shall act as provided by its Terms of Reference.

On motion of Mr. Maxwell, seconded unanimously, it was VOTED that the motion is amended by adding the following language:

The Committee shall:

1. Act as a consultative body to the Board and Officers, aiding in the development of ARRL policy in the RF safety field;

2. Act as consultative body to the ARRL HQ staff, especially in the development of educational methods and materials related to RF safety;

3. Monitor the technical, political and social environment for trends regarding RF safety, especially as they may potentially impact the Amateur Radio Service;

4. Provide written reports of significant trends and of committee activities for review at each meeting of the Board of Directors.

Whereupon, the question being on the original motion as amended, the same was ADOPTED. Mr. Wyatt returned to his seat.

34. Mrs. Gauzens, as liaison, presented the report of the Public Relations Committee. The committee met in Newington, Connecticut, on June 4. The committee chose a candidate for the Philip J. McGan Silver Antenna Award, and recommended that a new award be issued to recognize achievement by media professionals. The importance of public relations efforts was stressed.

35. On motion of Mr. Mendelsohn, seconded by Mr. Severson, the following resolution was ADOPTED:

WHEREAS, individuals in news media have made distinguished contributions to the public image of Amateur Radio; now therefore

BE IT RESOLVED: that the ARRL Board of Directors establishes the ARRL Professional Media Award to be presented, when appropriate, to media professionals who have demonstrably added to the positive public image of the Amateur Radio Service; and

BE IT FURTHER RESOLVED: that the Public Relations Committee shall act as a selection committee for this award.

36. The Board was in recess for luncheon from 12:10 to 1:15 PM.

37. Mr. Holladay, as Chairman, presented the report of the Long Range Planning Committee. The committee's work has been in support of strategic planning activities involving the entire Board. As recommended by the committee, a planning retreat was held on May 6 and 7 in Savannah, Georgia. A follow-up meeting was planned for the conclusion of this formal session.

38. Mrs. Craigie, as liaison, reported for the Digital Committee. No written report had been received.

39. Mr. Bodson presented the report of the Future Systems Committee. Although FCC staff has given informal approval for the use of CLOVER, PacTOR and G-TOR in the HF bands, some amateurs are concerned that these HF data systems are not explicitly addressed in Part 97. The committee is drafting technical protocols for use by the FCC in codifying these systems. The committee is also looking at minimum changes to Part 97 for inclusion in a petition to the FCC to broaden the use of spread spectrum in response to Minute 65 of the 1994 Annual Meeting.

40. Mr. Burden, as Chairman, presented the report of the Industry Advisory Council. A matter involving packet interfaces was handled by the Digital Committee. In a related effort, the committee's general concern about the lack of equipment standardization was elevated to the international level by President Wilson during a meeting with the presidents of the Deutscher Amateur Radio Club of Germany and the Japan Amateur Radio League.

41. At this point, 1:25, Mr. Race assumed the seat of Mr. Severson and, as liaison, reported for the Spectrum Committee. The committee has considered the threat to Amateur status at 2.3 to 2.45 GHz; Minnesota Repeater Council concerns; Southeastern Repeater Association questions; and mode compatibility on the 70-cm band. The committee is also seeking additional guidance in formal terms of reference.

42. Mr. Severson returned to his seat at 1:40 PM.

43. On motion of Mr. Mendelsohn, seconded by Mr. Harrison, the postponed motion was lifted from the table. The question being on the motion to amend the original motion, it was VOTED to refer the matter to the Awards Committee.

44. Mr. Rothberg, as liaison, reported for the DX Advisory Committee. The committee considered DXCC country status changes; rule changes; QSLing guidelines; call area calling; and development of a DXAC manual.

45. On motion of Mr. Quiat, seconded by Mr. Butler, it was VOTED to commend the DX Advisory Committee for their reports.

46. Mr. Bodson, as liaison, reported for the Spread Spectrum Committee. The committee is currently studying input from the field, and developing guidelines to be codified in Part 97 for review by the Future Systems Committee.

47. Mr. Stafford assumed the Chair at 1:53 PM.

48. Mr. Huntington, as liaison, presented the report of the Public Service Advisory Committee. During the past six months, the Committee has had no assigned task. However, the committee has studied on its own initiative several issues: a change in emphasis in health and welfare traffic handling; the proposed 219 to 220 MHz digital backbone; a Memorandum of Understanding with the National Disaster Medical System; the "Jump Team" concept; and the Incident Command System.

49. Mr. Holladay reported on the application of the Peoria Area Amateur Radio Club for sponsorship of the 1996 National Convention.

50. On motion of Mr. Metzger, seconded unanimously, it was VOTED that an ARRL National Convention be held at Peoria, Illinois, from September 13 through 15, 1996, under the sponsorship of the Peoria Area Amateur Radio Club.

51. On motion of Mr. Comstock, seconded by Mr. Heyn, it was VOTED that the proposal of the Tucson Amateur Packet Radio Corporation (TAPR) and the Texas Packet Radio Society to co-host the 14th ARRL Digital Communications Conference in September 1995 in the Dallas/Ft. Worth area, be accepted.

52. Mr. Huntington assumed the seat of Mr. Metzger at 2:05 PM.

53. On motion of Mr. Harrison, seconded by Mr. Kanode, it was VOTED that the Executive Vice President be directed to take necessary steps to insure the continued ARRL participation in the USTTI program aimed at providing timely training concerning Amateur Radio administration. Special emphasis should be placed on recruiting students who are opinion leaders from target countries as identified by the IARU.

54. It was moved by Mr. Gordon, seconded by Mr. Butler, that no Director or Vice Director up for re-election may publish and mail at League expense any form of material directed to the full membership within his or her division between June 15 and the deadline for the return of ballots (By-law 20) of the year he or she is up for re-election. In an uncontested election an incumbent is released from this restriction. This rule should not be interpreted to stop limited monthly mailings at League expense to affiliated clubs and organizations, or to holders of appointed positions within the division such as Assistant Directors, as long as the content of the mailing complies with the standing code of ethics prohibiting the mailing of campaign material. This rule is to take effect January 1, 1995. Mr. Heyn moved to amend the motion to refer the matter to the Election Committee, but the motion to amend was LOST. It was moved by Mr. Olson, seconded by Mr. Butler, to amend the motion to replace the text "June 15" with "August 1," but the motion to amend was LOST. Following discussion, the original motion was WITHDRAWN.

First Vice President Rod Stafford, KB6ZV, brought his Nikon F4 and snapped the photos in the accompanying article, "Smooth Sailing at Rocky Hill."

55. The Board was in recess from 2:25 to 2:45 PM. Following the recess, Mr. Wilson assumed the Chair, and Mr. Metzger returned to his seat.

56. It was moved by Mr. Gordon, seconded by Mr. Severson, that the following resolution be ADOPTED:

WHEREAS, most board members of not-for-profit organizations similar in size to ARRL serve terms of three or more years as a matter of practicality;

WHEREAS, the current two-year term forces approximately one-half of the board members to be in an election status each year;

WHEREAS, a three-year term will significantly reduce election costs to both the League and individual board members;

WHEREAS, a three-year term properly phased in will provide for five members of the Board of Directors to be in election year status annually rather than the current seven or eight; now therefore

BE IT RESOLVED: that the ARRL Executive Committee be directed to develop a plan that would modify Article 4 of the Articles of Association to phase in a three-year Board of Directors term by the year 2000. A draft of this plan should be available for review at the 1995 Annual Board of Directors meeting.

It was moved by Mr. Mendelsohn, seconded by Mr. Price, to amend the motion to refer the matter to the Election Committee, but the motion to amend was LOST. The question then being on the original motion, the same was LOST.

57. It was moved by Mr. Wyatt, seconded by Mrs. Lewis, that the following be ADOPTED:

WHEREAS, the Board desires to achieve a better understanding of present amateur activities and possible future activities in bands between 50 MHz to 300 GHz; now therefore

BE IT RESOLVED: that the Spectrum Committee initiate a study of these bands to obtain relevant data for Board guidance.

It was moved by Mr. Mendelsohn, seconded by Mr. Butler, to amend the motion by substituting the text "420 MHz" for "50 MHz." Following discussion, it was moved by Mr. Quiat, seconded by Mr. Kanode, to amend the motion by deleting the text "50 MHz to 300 GHz" and replacing it with the words "420 MHz to 450 MHz," but the motion to amend was LOST. The question then being on the earlier motion to amend, the same was ADOPTED. The question then being on the original motion as amended, the same was ADOPTED.

58. On motion of Mr. Harrison, seconded by Mrs. Lewis, it was VOTED that the secretary be directed to cast an affirmative vote on IARU proposal No. 217 for the admission to membership in IARU of the Union of Radio Amateurs of Russia.

59. On motion of Mr. Mendelsohn, seconded by Mr. Harrison, it was VOTED that the Contest Advisory Committee study expansion of the 10-GHz Contest to include all bands above 10 GHz also, and report back to the Board at the 1995 Annual Meeting.

60. On motion of Mr. Butler, seconded by Mr. Gordon, it was VOTED that the selection of ARRL Technical Relations Manager Paul Rinaldo as a member of the US delegation to the ITU Plenipotentiary Conference in Kyoto, Japan is noted and he is congratulated for his continued excellent job as an international representative of Amateur Radio.

61. It was moved by Mr. Butler, seconded by Mr. Mendelsohn, that the secretary is directed to cast an abstaining vote on IARU proposal No. 216 for the admission to membership in IARU of the Iraqi Radio Amateur Club. It was moved by Mr. Olson to amend the motion to reflect a no vote, but there was no second so the motion to amend was LOST. The question then being on the original motion, the same was ADOPTED.

62. On motion of Mr. Heyn, seconded by Mr. Comstock, it was VOTED that the Spectrum Committee be requested to give the highest priority in its band usage study to those amateur bands subject to spectrum reallocation contemplated by the US government.

63. On motion of Mr. Mendelsohn, seconded by Mr. Olson, it was VOTED that the Contest Advisory Committee study addition of a club competition system to all VHF and UHF contests and sprints, and report at the Second 1995 Board Meeting.

64. On motion of Mr. Mendelsohn, seconded by Mr. Harrison, it was VOTED that the Contest Advisory Committee study the establishment of a Summer Sprint series to be held during July and August, taking advantage of prime VHF/UHF/SHF propagation, and report back at the 1995 Second Board Meeting.

65. At this point, Mr. Comstock and the rest of the Board commended Mr. Sitton, who is not planning to run for re-election, for his dedicated service to the League. (standing ovation)

66. On motion of Mr. Mendelsohn, seconded unanimously, it was VOTED that the Board thanks the supporting staff present for helping make the meeting a success. (applause)

67. There being no further business, the Board adjourned *sine die* at 3:40 PM. (Time in session as a Board, 5 hours and 10 minutes; as a Committee of the Whole, 14 minutes)

Respectfully submitted,

David Sumner, K1ZZ
Secretary

Flooding Mobilizes Georgia Hams

By Larry Keith, KQ4BY

One week, Amateur Radio operators in Macon, Georgia, were setting up equipment in a high school football field for ARRL Field Day. A week later, on Monday, the Fourth of July, they were tuning up their rigs at home, in their cars and at the local Red Cross headquarters, preparing for a *real* emergency: Tropical Storm Alberto was heading their way.

In fact, while most people in the area were scanning the skies and wondering whether they would see a fireworks display in Central City Park, alongside the normally tranquil Ocmulgee River, members of the Macon ARC—particularly those in the Amateur Radio Emergency Service (ARES) unit—were monitoring the weather forecasts and debating their next moves. If conditions worsened, they meant to be prepared, says Debora Bridges, KC4HVO.

"We were geared up for emergencies and we were ready," she said.

The next day, Tuesday, central Georgians awoke to torrential rain. The pounding continued as the center of the storm hovered over the area. By late that night, 12 inches had fallen on ground already saturated by several previous days' precipitation.

Tom Rogers, W4AOL, didn't go to work that day, but instead headed straight to the radio command post. In place of the hardhat he usually wears as a field superintendent for a construction company, he donned a radio headset and set to work as a volunteer liaison between ARES and the Red Cross. He wouldn't go back to his regular job for another three days.

As the magnitude of the storm and the damage it was dishing out became apparent, Tom was soon joined by other MARC members in a well-rehearsed vigil. Some reported in by way of mobile gear in their cars; others relayed messages from home-based sets. Although the organization doesn't ask hams to stay at their posts past midnight, many of them did.

"A lot of us leave our radios on at our bedsides," Debora Bridges said. "You learn to sleep with that static in your ear." Debora's husband, Greg, KA4FUB, is also on the scene during every field event or emergency.

During the storm, public officials depended a good deal on information provided by the midstate hams. They checked in from Cordele to Warner Robins to Griffin, and from Forsyth to Roberta to Ft Valley: A road out here. A bridge down there. Homes under water. Youth camps cut off. Wherever people were in trouble, the word got out.

Amateurs from Milledgeville, Dublin, Savannah and Columbus, hours away by car, offered help. That afternoon, local officials advised residents to stay home unless travel was absolutely necessary. The hams stayed on the prowl and on the air. More than 30 members had signed on. At the base station, Tom was spelled by George Joyner, KD4QMY, a student at Macon College, and Willie Garst, N4XMO, a long-time ham.

Throughout the ordeal, the system operated under emergency rules. That is, general communication was restricted. Thanks to the cooperation of Georgia Power Company, which allows the local hams to use a repeater (with antenna) mounted on one of the stacks at Plant Scherer (1000 feet high), the range was exceptionally great, from McDonough, 50 miles north, to Cordele, the same distance south.

By Wednesday, with the Ocmulgee River nearing flood stage, the situation had become alarming. As soon as the Red Cross opened shelters, hams began relaying instructions and other messages. Dick Joyner, director of public support for the local Red Cross chapter, commends the dedication of the radio operators. "They kept us in touch with the status of the shelters." Such support is crucial, Joyner points out. "If we lose phone lines or they're not available in the temporary shelters, we have to have some kind of communication.

"(The hams) help us make our plans. They can tell us how bad things really are, because they see it first hand." He adds, "It's vital we get as much warning as possible."

Because they're on the scene, hams are often the first ones to see the need for evacuation or support. "The people down here need clothes, food—everything," one frustrated ham was heard to say. He was advised to send those flooded from their homes to a nearby shelter where they'd receive what they needed to get them functioning again.

Jimmy Wood, KA4GHX, is another liaison, coordinating ARES operations with the National Weather Service at Macon Municipal Airport. When he heard of the washouts on Highway 247 (which links Macon to the airport and to Warner Robins and Robins Air Force Base, where many central Georgians work), he tried to find a back road open. The going was tricky and Jimmy got stuck for a time. He eventually accomplished his mission and managed to return safely.

Hams accompanied Red Cross damage-assessment teams needing communication. These crews decide if it's safe to travel on or use a bridge or other public facility. In addition, the radio operators were in contact with the Georgia Emergency Management Association, which was trying to stay in touch from Atlanta.

Motorists who are hams were grateful for information, too. "How can we get across town?" was a frequent question. "How do we get from Florida to Atlanta?" was another. In some cases, ham tourists stranded along

NASA Stations Mark Moon Landing

A dozen amateur stations associated with the US National Aeronautics and Space Administration (NASA) were active July 19 to 22 to commemorate the 25th anniversary of humanity's first landing on the moon, on July 20, 1969, on Apollo 11. The amateur operations coincided with the time the Apollo Moon Lander (the *Eagle*) was on the moon's surface in 1969.

NASA stations included the Goddard ARC, Greenbelt, Maryland (WA3NAN); Guam Contingency Landing Site Amateur Radio Group (KC4YDP/KH2); NASA Headquarters Amateur Radio Group, Washington, DC (N4ZR); Jet Propulsion Laboratory ARC and Goldstone ARC (W6VIO); Johnson Space Center ARC, Houston, TX (W5RRR); Kennedy Space Center Amateur Radio Group, Florida (KC4TCV); NASA Lewis ARC, Cleveland, Ohio (AK8Y); Marshall ARC, Huntsville, Alabama (WA4NZD); Stennis Space Center ARC, Mississippi (K5GY); Wallops Island ARC, Wallops Island, Virginia (KE3ND); and the White Sands Complex Amateur Radio Group, Las Cruces, New Mexico (KF7E).

During a concurrent *S*huttle *A*mateur *R*adio *EX*periment (SAREX) mission, the amateur station aboard the space shuttle *Columbia* was operated as a special-event station from July 19 to 21, to commemorate the *Eagle*'s landing. Contacts made during the event will be eligible for a special commemorative certificate. Send your report and QSL card with a 9×12-inch self-addressed, stamped envelope (SASE) to the ARRL Educational Activities Department, STS-65 Apollo Special Event, 225 Main St, Newington, CT 06111.

SAREX operators were Shuttle Commander Robert Cabana, KC5HBV, and Mission Specialist Donald Thomas,

Interstates 75 and 475, both closed to traffic because of submerged roadways and bridges, participated in the traffic analyses through 2-meter units in their cars.

When the sun poked through briefly on Thursday, a new role opened up for the club's hams: coordination of water allocation. After the water-treatment plant had been inundated by the raging river, which had broken over its banks and levees, surrounding communities less affected by the storm sent huge water "buffaloes" to help Maconites who were without water. Using hand-held radios, hams were able to steer the truck drivers to the most needy sites, freeing law enforcement officers for other duties.

At about 3 PM, good news was reported to the hams at Red Cross headquarters. "We're 10 minutes away from opening one lane to I-75 South," a state patrolman relayed. Everyone in the room began to relax a little. But an hour later, bad news came. "It's raining again in Cordele. Could someone check on a rumor that a funnel cloud has been sighted?" The hams hunched over their rigs again.

Fortunately, the weather abated. On Friday, July 8, the hams on the net began relaying Health-and-Welfare messages.

The Macon-area ARES began helping the local Red Cross chapter in 1992 during and after Hurricane Andrew. Since then, the relationship has grown. "When we get into this (type of) situation, ARES can be counted on to keep communication open," says David Little, executive director of the agency. "It's helped us start moving into the 21st century."

Larry Keith, KQ4BY, lives in Warner Robins, Georgia, with his wife, Meg, and their four cats. He's been a licensed amateur since 1966 and is a senior systems engineer for Computer Data Systems Inc.

Hams Aid Cuban Refugee Boat

By Jorge L. Martinez, WP4KTF

Early on the morning of June 4, 1994, 61 Cubans left the port at Mariel in a commandeered Cuban vessel, bound for the US. About 20 minutes after setting sail, a Cuban gunboat came into view, then was joined by two more gunboats and a patrol boat. The refugees were fired on and four men were shot.

According to the Miami Herald, *a mayday call went out at about 4 AM. The call was made by an amateur named Juanito, CO2PJ,* on the amateur transceiver he had brought on board. The call was picked up on 7.118 MHz by Pedro Rodriguez, YV5JCB, who was soon joined on the frequency by Carlos Chang, HP8DCF, and Alvaro Andrade, HP1DAV.*

Andrade then telephoned his friend Jorge L. Martinez, WP4KTF/HP1XZQ, stationed with the US Army at Ft Davis, Panama. Martinez tells the story:

Alvaro, in Panama City, and Carlos, in Agua Dulce, heard desperate cries for help from Juanito, who said he was aboard a Cuban vessel, the *Rene Heredia*, accompanied by 100 men, women and children (later reported by the press as the *Rene Bedia Morales*, a state-owned dredging craft).

While attempting to escape from Cuba, they were spotted, pursued and shot at by a Cuban gunboat, only eight miles from the port of Mariel. Four people were wounded; the vessel continued moving slowly north-northeast at about eight knots.

Aware of the importance of the situation, Alvaro immediately called the Panamanian National Police, but was promptly referred to the US Southern Command (Southcom) Headquarters at Quarry Heights, Panama City. A switchboard operator promised that she would get someone to call him back. When the return call came, Alvaro, a close friend since I arrived in Panama in April of 1992, telephoned me at home.

At home in Ft Davis, a US Army post 50 miles away in Panama's province of Colón, my wife and I were just arriving from our weekly workout at the base club when the phone rang. It was 2:30 AM in Panama. I immediately recognized the voice as Alvaro's, and when I understood his message I sat down next to my beat-up, "nontransmit-ting" HF transceiver, while he stayed on the line and I tuned in to 7.118 MHz.

Juanito's call for help came through loud and clear. Alvaro explained everything he had done before he called me and, knowing I'm in the Army, asked me if I knew anyone I could call for help. With a quick, "Sure I do!" I hung up and continued to monitor in disbelief, until I was positive that it was a real emergency.

Before I had contacted anyone, I was jolted back to reality as I heard Alvaro tell Juanito that "the US Southcom is aware of the situation and it's already mobilizing."

"One staff sergeant does not Southcom make," I thought. Alvaro and Carlos repeated this message several times, so I decided that maybe the best option was, indeed, to call Southcom Headquarters. At 0730 UTC I had the Southcom Staff Duty Officer on the line. His reaction must have been similar to mine when Alvaro called me!

I continued to monitor and suggested to Alvaro, now back on the telephone, that Juanito should stay calm and continuously report his position and any further actions by the gunboats. Maybe if the gunboat crew became aware of the Amateur Radio operators listening in several countries, it would give up its aggressive chase.

Under Attack

Unfortunately, that wasn't the case and at 0815 UTC, the *Heredia* was reportedly under attack, now by two or possibly three Cuban gunboats. The vessel, 16 miles north of Cuba,

*CO2PJ isn't listed in the *Radio Amateur Callbook*, as are many Cuban licensees. We weren't able to reach him for this story, but understand that he's staying in the Miami area.—*Ed.*

KC5FVF, using the packet call sign W5RRR-1.

Meanwhile, an estimated 100,000 people attending the Aerospace American annual airshow in Oklahoma City heard a two-way contact on July 17. Retired three-star Air Force General Tom Stafford was patched by telephone to Commander Bob Cabana, KC5HBV, aboard *Columbia* via amateur stations WH6CJU in Hawaii, N6IZW in San Diego, and W5GEL in Corpus Christi, Texas, all members of a SAREX worldwide telebridge ground station network.

General Stafford is a former astronaut who flew aboard the Gemini 9 and Apollo 10 missions, and commanded the US/Russian Apollo-Soyuz test project.

The contact was managed by Frank Bauer, KA3HDO, at the Goddard Space Flight Center in Greenbelt, Maryland, and by Lou McFadin, W5DID, and Gil Carman, WA5NOM, from the SAREX Control Room at Mission Control at the Johnson Space Flight Center in Houston.

During the time coinciding with the exact 25th anniversary of *Eagle*'s time on the moon in 1969, the shuttle crew's packet station sent the following beacon to listening amateurs around the world:

"Greetings from the SAREX station aboard the space shuttle Columbia. *The crew of* Columbia *is privileged and honored on this 25th anniversary of one of humankind's greatest achievements to follow in the footsteps of our craft's namesake, the command module* Columbia, *which carried Neil Armstrong, Buzz Aldrin and Michael Collins to the moon. We wish all of you back on Earth who are celebrating this historic anniversary our best wishes and hope that the one small step for a man taken 25 years ago will be a giant leap for people of vision as we go on to International Space Station and beyond."*

reported seven wounded on board, with the captain bleeding heavily from a gunshot wound to the neck.

Forty-five minutes had passed since I joined the mayday net, and Alvaro, Carlos and Pedro continued to calm Juanito down by repeating that the US Southcom was working on it. Then someone mentioned the words "International Waters" and I reacted instinctively by calling the US embassy in Panama City.

A bewildered but helpful US Marine guard quickly connected me to a US Coast Guard representative, and after giving him all the information I had on the situation, he said that another person would call me back shortly. At 0825 UTC I received a call from US Coast Guard Commander Karmarski, a military attaché, who thanked me for the initial call and confirmed that the Coast Guard in Miami had been notified. Cdr Karmarski said that another representative would be calling back.

I called Alvaro and told him about my conversation with the military attaché at the embassy, which he relayed to Juanito on the *Heredia*. Less than 10 minutes later, he received a call from a Sgt Richards at Ft Clayton, a US Army post in Panama City, followed by a call from Guillermo Castrillo, with the US Coast Guard in Miami.

I anxiously continued to listen, as the Coast Guard relayed information through the phone link with Alvaro. Propagation was such that at one point, information was relayed from the Coast Guard in Miami (US) to Alvaro (Panama), to Nelson Perez, KC4CLO, also in Miami, to Carlos (Panama), and to the *Heredia*, now on a four-hour odyssey.

The vessel's pursuers were so close at

Behind the Diamond: Field Services Manager Rick Palm, K1CE

A rather brief "Behind the Diamond" on Rick Palm, K1CE, ran in *QST* four years ago, but it left more questions in my mind than it answered, so I decided to try my hand. There was more to this guy than meets the eye, I thought, and it didn't take long to drag the real truth out of him.

Rick went to ham radio college in the best possible place at the best possible time: Greater Boston in the mid-1970s.

You didn't even have to be close by in those days to know that Boston was a hotbed—no, a volcano—of Amateur Radio. Every band was filled with activity from a myriad of Boston-area college club stations and the ham magazines often carried technical articles by the young engineering students. Actually, this was happening all over the country, but it was Boston that had not one, not two, but a dozen or more institutions of higher Amateur Radio learning.

Rick's alma mater, the University of Lowell, was arguably the best (MIT and Worcester Poly alums, please send me e-mail, don't call!). Rick was a relatively new ham when he arrived at Lowell (today known as the University of Massachusetts at Lowell), 30 miles north of Boston. "I hung out with real hams there, who knew how to party, too," he says. Among those real hams were John Dorr, K1AR (now of *CQ* Magazine); Doug Grant, K1DG; and Wayne Hillenbrand, N2FB. This isn't name-dropping; these people all went on to illustrious careers in Amateur Radio.

John Dorr says "Lowell was the coolest ham school to be in then. That's why I went there. WA1JUY had a state-of-the-art Drake C Line, Telrex monobanders and a kick-butt homebrew amplifier. Heaven!"

So when Rick graduated in 1979, maybe it's not so surprising that he came immediately to ARRL Headquarters (and has been here ever since).

Rick's dad, Ken, was W9ZZC before WW II and then was unlicensed until 1976, when he and Rick became Novices together. Ken is now AB1N.

Rick went to classes run by the local club, the Lexington (Massachusetts) ARC, and later was an active member. He got his Extra Class license and K1CE call sign in 1978, the year before graduation from Lowell.

Rick is manager of the ARRL Field Services Department; "My major at Lowell was management, a handicap I've courageously tried to overcome in my career." At Headquarters, he started at the bottom and worked his way up.

"With a business degree, I'm odd man out in my family," Rick says. Why? Dad has a master's degree in EE from Penn; mother Barbara an MS in physics from Bryn Mawr; brother Dave an MSEE from Lowell; and sister Sue an MSEE from the University of Colorado. That's some family!

Part of Rick's job is to visit League volunteers at gatherings around the country, enabling him to practice his other hobby, rock climbing (which, according to a recent *Newsweek*, has about half a million practitioners in the US). He scaled a number of mountains before concentrating on sheer cliff faces. Obviously, he doesn't suffer from Rohnaphobia (fear of tower climbing). "I use a lot of my rock-climbing gear, like carabiners, for tower work. Hams should visit their nearest store that caters to climbers to check out all the ingenious devices that make tower work easier."

JAMES D. CAIN, K1TN

Turn Rick sideways and he disappears; he expresses concern about having his picture published. "Tell them I don't have any horrible, wasting disease," pleads the man known by some HQ coworkers as "Bones." The trick of crawling up vertical rock faces is, of course, to have as few pounds as possible to haul up with you. Rick's serious about this.

Rick didn't do any climbing on his business trip to Russia in August of 1991, but he remembers the people as "exceptionally nice." Rick and I agree that our generation was brainwashed to have a different view of the people on the other side of "The Curtain." Rick met a number of hams in the Moscow and St Petersburg areas, and attended a major convention a couple of weeks before the coup.

For souvenirs, Rick contributed to the local economy by bringing back 11 bottles of vodka (or "wodka." Ask him to tell you the Russian ham joke about "making contact with WØDKA").

Rick says his biggest Amateur Radio thrill was working the space shuttle on 2-meter FM. "Hearing my call sign coming down into my home from astronauts in outer space was simply incredible! Since then I've been hooked and have worked a few more missions, and the Russian *Mir* space station, too."

Rick, who just turned 40, and his wife, Joanne, KA1SIP, live near Newington, with their two cats. They have a modest "barefoot" station. Rick put up a triband antenna a couple of years ago and made DXCC. (Why are there two identical concrete tower bases, side by side? "That's my monument to the West Hartford Building Department," says Rick. "The first one wasn't deep enough.")

Joanne has a degree in English and is back in school now, getting certified to be a teacher.—*Jim Cain, K1TN*

times (10 meters, according to Juanito), that their crews even threw heavy ropes in the water in an apparent attempt to tangle the *Heredia's* propellers. The second-in-command aboard the *Heredia*, who had been wounded, tried to navigate the vessel with one arm, while the captain lay unconscious. Another man, hit in a leg, was also nearly unconscious and Juanito feared that they wouldn't receive medical attention in time.

Meanwhile, at 0933 UTC, an aircraft joined the chase. Members of the *Heredia's* crew, believing it to be a US Coast Guard helicopter, said they were about to turn on the vessel's running lights and fire a flare. Luckily, Alvaro quickly confirmed, through his phone link, that the Coast Guard didn't have any helicopters in the area yet and the aircraft continued west.

While Juanito described the *Heredia* as a "60-meter gray-and-white vessel with a crane in the front," Nelson contacted the organization "Hermanos al Rescate" (Brothers to the Rescue) and the Coast Guard in Key West, Florida, to assist in the operation. Guido, AB6MO, also assisted. Juanito added that "the vessel had received so many bullet impacts below deck that all of its occupants had moved upstairs and now lay exposed on deck."

The *Heredia* continued to slowly plow its way north and was now more than 20 miles from the Cuban coast. At 1009 UTC, Juanito expressed his concern about "daylight exposing the vessel to the gunboats." Fortunately, less than 30 minutes later, the pursuers gave up their chase and turned away. A strong thunderstorm moved into northern Panama prior to 1100 UTC and after a power supply exploded under my feet, I was forced to give up my listening post. As I attempted in vain to get some sleep, I hoped that our effort wouldn't be futile and that our prayers wouldn't go unanswered.

Nelson's calls alerted Osvaldo Pla, KB4TFF, and Luis Cruz, N4LDG, members of the rescue organization. While the US Coast Guard continued to search for the *Heredia*, Juanito reported seeing the *Del Monte*, a "cargo ship loaded with containers" and several other ships in the area, but they were unable to relay his desperate call for help. The *Heredia*, no longer under pressure from the Cuban gunboats, now said that only 59 people were on board, while continuing pleas for its injured.

Changing propagation, daylight static and many other hams wanting to assist made communication with the Panamanian stations impossible. This was effectively handled by Nelson, however, who took over as Net Control from Alvaro and Carlos, and asked all operators to stand by. He had Juanito give long "tuning counts " to assist the Coast Guard in locating their vessel.

Clearing the Deck

The Coast Guard instructed Nelson to have the *Heredia* follow a heading of 040°. The vessel's deck was cleaned to make way for the injured who would be taken there to be airlifted by the helicopter. Shortly afterward, the *Heredia* was instructed to shoot one of the three emergency flares available on board off the ship's bow. At 1300 UTC, Coast Guard craft sighted the *Heredia*. At 1330 UTC, the situation was under control by the Coast Guard, the wounded were on their way to a hospital on Stock Island, Florida, and the Heredia was under tow to Key West.

Unable to contact Alvaro since 0845 UTC, I tried to call him at 1800, to no avail. Calling other friends, hoping that maybe they had seen anything in the news, also proved unsuccessful. Finally, at 2300 UTC, I tuned in to a Colombian ham, as he thanked the hams involved in the rescue. An hour later, my wife came running to the shack as I let out a scream, when CNN Headline News said, "The US Coast Guard, alerted by a ham radio report, rescued 59 Cuban refugees 65 miles south of Key West..."

My log book reads in red ink: "THE FOLLOWING IS MY BEST DAY AS A HAM RADIO OPERATOR!"

Because of people like Chuck Ward, KJ4RV, my Elmer, who enticed me into such an extraordinary hobby, and because of "ham brothers," such as Alvaro, who have kept the hobby as exciting as the first day for me, our prayers *were* answered.

Staff Sgt Jorge L. Martinez, WP4KTF/HP1XZQ, a 14-year active-duty Army veteran and a ham since December of 1991, is assigned to the 747th Military Intelligence Battalion at Ft Davis, Panama.

JOINT RESOLUTION MAKES CRUCIAL PROGRESS IN DC

The ARRL's House of Representatives Joint Resolution 199 passed a major hurdle when key provisions were included in H. R. 4522, the FCC Authorization Act of 1994, during markup by the Telecommunications Subcommittee of the House Energy and Commerce Committee on July 14. Sponsored by Rep Mike Kreidler (D-WA), H. J. Res 199 earlier gained 245 Congressional cosponsors as a result of hard work by the amateur community.

The next step is action by the full Energy and Commerce Committee, and then consideration on the floor of the House. Companion legislation awaits action by the Senate Commerce Committee. If the Senate bill differs from the House bill, an additional conference committee decision will be necessary before passage.

The bill urges the FCC to "continue and enhance the development of Amateur Radio as a public benefit by adopting rules and regulations encouraging the use of new technologies," urges the Commission to make "reasonable accommodations for the effective operation of Amateur Radio from residences, private vehicles and public areas," and urges "all levels of government" to facilitate Amateur Radio as a public benefit.

The bill provides for a one-time "vanity" call sign fee of $150. The previous "annual fee" provision was deleted in favor of a one-time application charge, staving off the threat of an annual fee for all amateurs. In addition, the ARRL lobbied to ensure that the fees go to the FCC, rather than the Treasury.

The one-time fee was a calculated decision. As a result of concern on Capitol Hill about deficit reduction, new bills must be "scored" by the Congressional Budget Office to determine budgetary impact. A bill stands a better chance of passing if the Congressional Budget Office rules that it won't be an additional burden on taxpayers. The ARRL supported the $150 amount because it would generate sufficient revenue to offset new costs to the FCC and would meet the "revenue-neutral" criterion, without imposing new fees on amateurs who keep their present call signs or who receive new ones issued routinely.

FCC-ISSUED CALL SIGN UPDATE

The following is a list of the FCC's most recently issued call signs, as of July 1:

District	*Group "A" Extra Class*	*Group "B" Advanced*	*Group "C" Tech/Gen*	*Group "D" Novice*
Ø	AAØRE	KGØNM	++	KBØNHL
1	AA1JH	KD1VH	N1SCZ	KB1BIG
2	AA2SM	KF2VW	N2ZDJ	KB2QZR
3	AA3HY	KE3NH	N3SFO	KB3BCL
4	AD4SV	KR4TT	++	KE4MXM
5	AB5UN	KJ5YG	++	KC5HFC
6	AC6CT	KO6DF	++	KE6IFY
7	AB7CQ	KI7ZD	++	KC7DBL
8	AA8OZ	KG8JG	++	KB8TAT
9	AA9KY	KF9WC	N9XGH	KB9IYT
Hawaii	++	AH6NI	WH6UZ	WH6CRG
Alaska	++	AL7PQ	WL7ST	WL7CHQ
Virgin Is	WP2N	KP2CC	NP2HM	WP2AHU
Puerto Rico	++	KP4WW	++	WP4MPP

++All call signs in this group have been issued in this area.

Correction: In our story last issue about Oregon amateur Scott Diamond, KB7ZHB, and his role in foiling an apparent auto theft attempt, we misidentified his call sign. QST

Hints and Kinks

Conducted By David Newkirk, WJ1Z
Senior Assistant Technical Editor

PUTTY GOOD SOLUTION

◊ Have you ever drilled into the chassis of your rig and later found metal shavings scattered into hard-to-reach places? This problem is easily solved by placing a sticky substance like coax seal, putty or gum directly over the inside of the chassis where you intend to drill. After you drill the hole, remove the putty—and all the shavings with it.—*Phil Burlingame, N0NTL, Festus, Missouri*

TRANSCEIVER MOUNT FOR MOTORHOME

◊ Installing an HF transceiver in the cockpit of a motorhome can present problems. Among these are vibration, visibility of readout or frequency dial, accessibility of controls and a mounting system that facilitates easy installation and removal.

I've attempted to solve most of these difficulties through the use of a large block of 5-inch-thick polyurethane foam. First, I drew an outline of my Kenwood TS-430S on the surface of the 15×15-inch block of foam. Then using new, very sharp, single-edge razor blades, I carved a cavity in the foam, sloping toward the rear to a depth of 4 inches at the back.

Then I built a wood carrier from 6-inch-wide board, with a sloping bottom made from a piece of Masonite. After staining and varnishing, I added furniture drawer handles for easier lifting. The TS-430S, resting in the foam cavity, is placed in the wood carrier, which in turn simply sits on the motor compartment cover in the cockpit, between the driver and passenger seats.

Figure 1 shows the rig nested in the foam and installed in the cockpit of my Pace Arrow. In my case, a small outboard antenna tuner is fixed to the case of the transceiver with metal clips. The upward-tilted front of the rig is placed facing the the driver or the passenger, depending on who's operating. The resilient foam absorbs the vibration of the vehicle in motion and the assembly does not slide, due to the friction between it and the carpeting covering the motor canopy. All controls are easily reached by the driver.

After disconnecting the antenna and power cables, I can pick the rig up by the handles and carry it inside.—*Don Christensen, W8WOJ, Midland, Michigan*

KINKY WIRE AIDS BUILDING OPEN-WIRE FEED LINE

◊ This open-wire balanced feeder is constructed quickly and simply using pieces of ½-inch diameter PVC pipe for the spreaders and solid copper wire, either bare or insulated, for the conductors. I use #14 insulated wire, usually available by the roll at hamfests or an electrical supply house. PVC pipe comes in 8-foot lengths, and is available from any building supply store.

Since it is customary to use a matching device (tuner) with antennas fed with open-wire line, there is little need to design the feed line for a specific impedance. You may elect to do as I did and arbitrarily set the spacing at 4 inches. (This results in a characteristic impedance of approximately 575 Ω, as compared to a spacing of 1⅜ inches, which yields an impedance of approximately 450 Ω.)

Follow these steps to make your line:

Cut up the plastic pipe into pieces slightly longer than the desired conductor spacing. (For 4-inch spacing, I use 5-inch pieces of pipe.)

Drill two holes 4 inches apart in each piece. Make the holes only slightly larger than the wire diameter.

Cut the two lengths of wire. Then lay the two wires out on the floor parallel to each other.

Slip the plastic pipe spreaders onto the wires.

Starting at the first spreader, reach into each end of the pipe with your needle-nose pliers and twist each wire into a "kink" (See Figure 2).

Position the next spreader for the spacing that you desire between spreaders. (I use 10- to 12-inch spacing.)

Continue until all spreaders are spaced properly and their wires "kinked."

I have great success with feed lines constructed this way. If you have ever tried to pull a kinked wire through a small hole, you will appreciate how well the wire spacers are locked together.—*Glenn E. Yingling, W2UW, Newark Valley, New York*

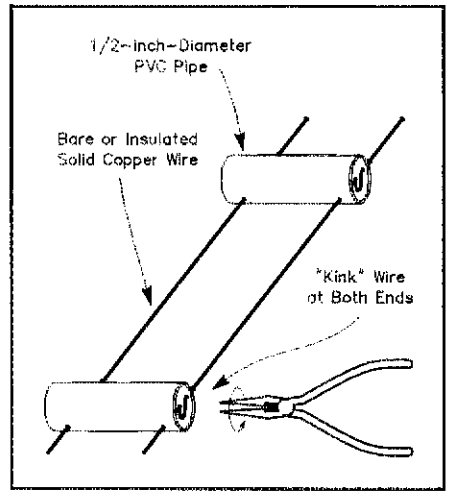


Figure 2—Tubular plastic spreaders can be held in place by lightly bending the wire as shown in this drawing

A DUMMY-LOAD QRP WATTMETER

◊ Here is an easy and inexpensive way to use the color-indicator battery tester provided with some 1.5 and 9-V alkaline batteries as a QRP power meter through VHF. Cut out a 0.1-inch square of the indicator material and glue it to the body of a ½-W 47- or 50-Ω carbon composition resistor as shown in Figure 3. Then solder the resistor

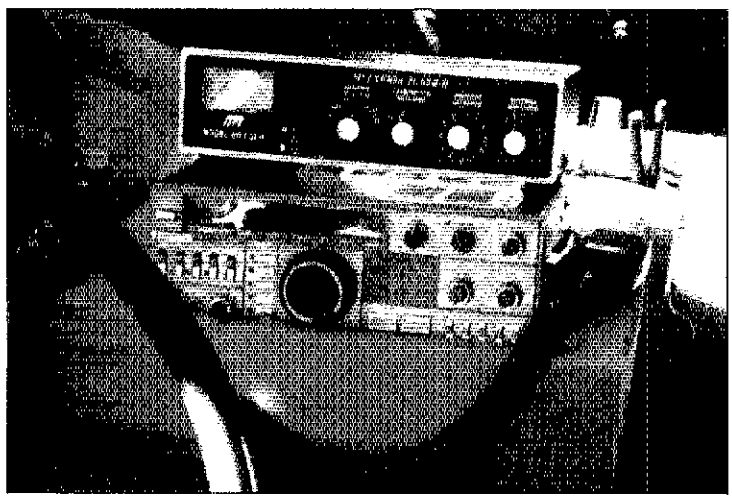


Figure 1—A block of foam mounted in a plywood box makes a secure mount for a transceiver, without the necessity of drilling holes.

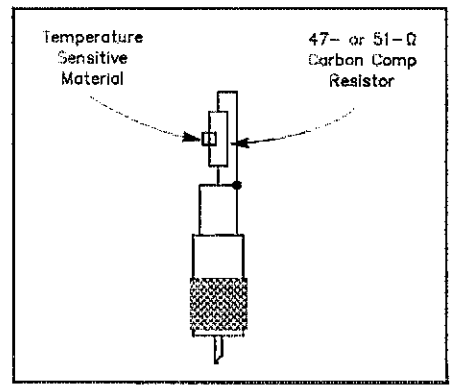


Figure 3—Cement a piece of heat-sensitive material from a battery tester to a load resistor to make a simple indicating dummy load.

to the appropriate coax connector.

To calibrate the wattmeter, observe and record the reaction of the color indicator when you connect various dc voltages across it, starting with 2 or 3 V, and note the amount of time required for the yellow spot to appear on the indicator. Allow the resistor to cool between measurements. Take note of the room temperature: all measurements should be done under similar conditions. Make a graph of voltage versus reaction time.

When measuring transmitter power output, time the color response by keying the transmitter only until the yellow appears, to avoid damaging the load resistor. Find the corresponding voltage V on your graph. Then calculate power from:

$$\text{Power} = V^2 \div R$$

where R is the exact resistance of your resistor. With this method you may be able to estimate power output to within 5%.

For higher power transmitters, use a resistor with higher power dissipation. Reaction times are slower for higher power resistors. A ½-W resistor will measure outputs from about 0.3 W (with a 20-second reaction time) up to 1.5-W (2-second reaction time).—*Glenn A. Morrison, KO9L, Evanston, Illinois*

FINE TUNING THE MFJ 207 HF SWR ANALYZER

◊ The MFJ 207 HF SWR Analyzer band switch has 10 positions, but MFJ chose to use only 6 positions ("OFF" plus A to E). Why didn't MFJ use those other four positions for 10 meters and the 12 and 17-meter bands, and use finer tuning? My approach is simpler than redesigning, but it only works for subsets of the bands. The strategy is to add capacitors in series and parallel to the main tuning capacitor to achieve finer tuning for more accurate measurements.

From the dial markings it is clear that the band switch is similar to that of most radios; that is, it changes LC components so that the main tuning capacitor covers the desired bandwidth. Accordingly, the 15, 20, 40, 80 and 160-meter markings line up, more or less (mostly less!). This indicates that the main tuning capacitor uses more or less the same capacitance for the starting point of each of these bands. 10, 12 and 17 meters do not line up.

This describes how I modified the Analyzer for the 15, 20 and 40-meter bands. The only instruments used for this analysis and modification are the station receiver, a soldering iron and the SWR Analyzer itself.

Based on the assumption that only a small portion of the main tuning capacitor was used for any particular band, I calculated the capacitance of the main tuning capacitor; then I used a fixed capacitor equal to the capacitance necesary to come close to the upper end of the bands, and a smaller variable capacitor that would tune across the bands.

Using the station receiver set at the high end of the band plus 500 kHz, the SWR Analyzer without the cover, and a short antenna connected to the SWR Analyzer, the Analyzer was slowly moved until the click was heard on the receiver. Then I repeated the procedure at the low end of each band. By marking these positions on the rotor of the tuning capacitor with a pencil, I saw that the high end of the scales began when about 50% rotor of the capacitor was used (40% on 80 meters). At the low end of the bands, 55% to 75% of the capacitor was used. On 10 meters, the bounds were 9% and 15%. With the exception of the 10-meter band, a smaller variable capacitor about 1/4 the capacitance of the original tuning capacitor would do, if a fixed capacitor about 40% of the original varible capacitor were placed in parallel to the new tuning capacitor.

What I needed to know, however, was the total capacitance of the main tuning capacitor. Through a combination of cut and try and calculation, I determined that a variable capacitor of about 35 pF would be ample to cover these bands. As luck would have it, the proverbial junk box could only provide a 27-pF variable capacitor with a similar shaft size. This proved to be too little to reach the low end of the bands, but it spread most of the 40, 20 and 15 meter bands over the face of the dial. Calibrated new dial faces are needed for each band.

In the case of the 10-meter band and the bands bunched up at the right side of the dial, a different capacitance in parallel with a different variable capacitor are needed. In the 10-meter case, approximately 10 pF is an ample parallel capacitor, but 10 meters will not be spread over as much of the band—a smaller variable capacitor is needed.

If you do not have access to a smaller variable capacitor (my case) the alternative is to put a fixed capacitor in series with the variable capacitor to "dampen" it. The parallel capacitor mentioned above must then be in parallel to both the fixed and variable capacitors. This solution is not optimum because the result is definitely non-linear. That is, the dial resolution will be very coarse at the beginning and very fine toward the end, as the capacitance of the variable capacitor is greater and greater in proportion to the fixed variable, but it will spread the dial out and make calibration easier to read.

Using this last approach for 10 meters, a 10-pF capacitor was placed in parallel to the existing variable capacitor and the 22-pF capacitor needed in series. The result was that a sweep of the dial covered only 29.7 MHz down to 28.1 MHz in the E band position.

Using these guidelines it is possible to "tack in" a capacitor when working on a specific antenna, to make tuning easier and more accurate. Another improvement you may want to make is to add a reduction drive, to spread out the dial resolution still further.—*Kris Merschrod, KA2OIG/HR3*

New Products

REMOTE-CONTROL HF MOBILE ANTENNA

◊ What HF mobile operator wants to stop and get out of the car whenever changing bands? The HS-100 antenna features a small dc motor and gear assembly to move the inductor up and down the coil. Precise antenna tuning for 80 to 10 meters is easy to do while in motion or in bad weather by using a control panel on the dashboard. The design is a commercial version of the pioneering DK3 "electric-screwdriver" antenna by Don Johnson, W6AAQ, with added features and improvements. It's safe to use in any weather and incorporates stainless-steel components and a protective shield for the center loading coil. You might also want to mount an HS-100 outside the shack, especially if you live in an apartment or place with limited space. MARS operators and shortwave listeners can also take advantage of the antenna's continuous coverage of 3.5 to 30 MHz. The basic HS-100 retails for $289. Homebrew your own installation or add just the additional items you need: $15 for an HS-110 67-inch stainless steel whip, $70 for an HS-203 universal foldover mount; $35 for an HS-301 remote-control box with limit-indicating buzzer and light; $35 for an HS-302 installation kit with 25 feet each of coaxial cable and dc power cable, coax and dc connectors, and a motor-reversing switch with bracket; and $60 for an HS-303 deluxe installation kit with everything in HS-302 and an HS-301. Bob Cobler, WQ6B, High Sierra Antennas, Box 2389, Nevada City, CA 95959; tel 916-273-3415, fax 916-273-7561.

Feedback

◊ Please make these resistor-value additions to Figure 1 of "The Null Steerer Revisited," *QST*, Jul 1994, pp 30 and 31: R3 is 200 Ω, R4 is 100 Ω and R7 is 1 kΩ. Also, the core type for T4 is the same as that of T1 to T3: FT 23-43.—*Charlie Michaels, W7XC*

◊ On page 54 of July 1994 *QST*, Henry Sahler III, N9NOX, is shown operating a packet station as part of the Lake County, Illinois, Simulated Emergency Test. Henry was mistakenly identified in that picture.

JOTA '94 Jamboree-on-the-Air

By Tracy Bedlack, N1QDO
ARRL Educational Correspondent

Popular Scout Station call signs you'll hear during this year's JOTA:

HB9S	World Scout Bureau, Geneva, Switzerland
K2BSA	Boy Scouts of America, National Office, Dallas, Texas, USA
JA1YSS	Boy Scouts of Nippon, National Office, Tokyo, Japan
PA6JAM	Scouting Nederland, National Station, Sassenheim, The Netherlands
5Z4KSA	The Kenya Scouts Association, Paxtu Station, Nyeri, Kenya
VK1BP	The Scout Association of Australia, National Station, Canberra, Australia
GB2GP	The Scout Association, Gilwell Park, London, UK

Don't let this year's Jamboree-on-the-Air (JOTA) event pass you by without calling "CQ Jamboree." This is the 37th year that Boy and Girl Scouts from around the world will contact each other through ham radio. During these contacts, Scouts exchange information about their whereabouts, themselves and their scouting activities. JOTA involves Scouts at a variety of locations from mountaintop camping trips to boating expeditions along the shore. Some of the best contacts have even been made during backyard picnics!

Are your Scouts familiar with Amateur Radio? If not, the Educational Activities Department (EAD) at ARRL Headquarters will supply you with promotional Boy Scout and Girl Scout brochures for your eager group. To enhance their understanding, treat them to a demonstration at your shack and let them make a few QSOs. This will give the troop an idea of the fun involved, and will also help calm any existing "mike fears."

For added fun, teach your group how to greet their far-away friends in different languages. Keep a US and world map handy to mark where contacts are made. Exchange mailing addresses with your new friends and become pen-pals. The possibilities are endless! For additional ideas on incorporating games and activities into your JOTA weekend, contact EAD for a JOTA information packet. In this packet, you'll find items such as radio merit badge requirements, third-party agreements and, by special request, the Neophyte Receiver building kit.

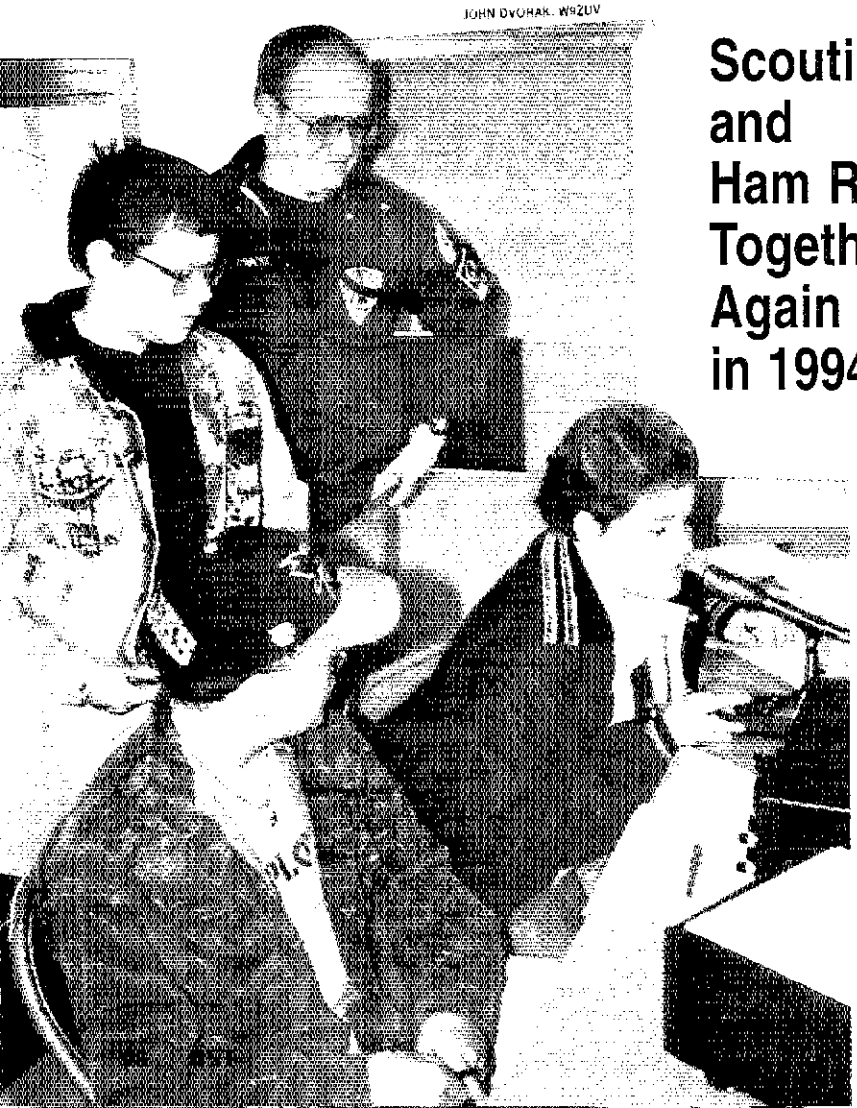
JOTA 1994 will begin Saturday, October 15, at 0000 local time and will continue through Sunday, October 16, at 2400 local (midnight, Friday, October 14 through midnight, Sunday, October 16).

World Scout calling frequencies (in MHz) are as follows: Phone: 3.740,* 3.940, 7.090,* 7.290, 14.290, 18.140, 21.360, 24.960, 28.990 and 28.350 (this frequency allows US Novice licensees to participate in JOTA on phone); CW: 3.590, 7.030, 14.070, 18.080, 21.140, 24.910 and 28.190. Please avoid congestion by using these frequencies to establish the contact, then move to a nearby frequency to conduct your contact. Most importantly, have fun!

*Not authorized to transmit in the US; however, you may listen.

Scouting and Ham Radio; Together Again in 1994

JOHN DVORAK, W9ZUV



James Riley, KB9CYL, and members of Troop 596 of Oak Lawn, Illinois, look on as Mary Chap operates W9AA during JOTA '93.

Correspondence

Conducted By Al Brogdon, K3KMO
Managing Editor

SAILOR OF THE AIRWAVES

◊ One thing about Amateur Radio that has always impressed me is its always being there for me. There may be long periods of time when family, career, home, etc, take me away from it, but ham radio waits patiently until priorities adjust so that I can return to it. As the sea calls the sailor, radio calls me to again take my place as a sailor of the airwaves.

Ham radio is as diverse as it is captivating; there is something for everyone. At least I had thought so for the 40 years I have been licensed (and also an ARRL Member), but then the first weekend in March rolled around and I started operating in the ARRL DX Contest. On 10 meters, I got a reply from someone not in the contest. So I took time from the contest to chat. Or, rather, to try to chat. The other ham got right up on his soapbox...Where is the frequency where we can talk about intelligent things—world peace, hunger, and so on?"

After a long filibuster along these lines, my turn came and I pointed out that 10 meters was wide enough for lots of QSOs and it wasn't *that* full, so he could find the QSO he wanted. But he went on and on about "intelligent" QSOs and the lack of intelligence of anyone who was involved in a contest. Geez!

It may be frustrating when you find that you want to do one thing on the air while many others want to do something else. Contests take up spectrum, but so do the "intelligent" conversations. There are the traditional ham bands, the WARC bands, VHF, UHF and SHF that you can operate on. Sir, I say to you: There's room for you in my hobby; why isn't there room for me in yours?—*Tom Burnet, W9KTB, Vicksburg, Mississippi*

NEVER TOO LATE

◊ After almost five years, I finally built the TDR pulse generator from the May 1989 *QST*. The device has proven to be wonderful in helping me determine the condition of my feed lines.

When I finished the TDR and hooked it up to my 440-MHz feed line—which had been a problem for years and which had defied my efforts at finding a solution—the TDR led me quickly to find water in the 9913 coax! The TDR told me that the coax was bad, and that there was a connector 40 feet up the tower; the connector was actually at 39 feet. Not bad!

Then, in playing with my new toy, I found an impedance bump at one of my antenna relays. It was a bad connection, which was removed by tightening the PL-259 just ¼ turn (a caution to my fellow hams: it's best to use pliers to tighten PL-259 connectors).

The TDR is a good tool to detect feed line problems before they become apparent in other ways.—*Joe Shuey, NE3H, Camp Hill, Pennsylvania*

HE'S IN GOOD COMPANY

◊ I enjoyed finally seeing what Marconi's wireless station at South Wellfleet, Massachusetts, looks like (Apr *QST*), after having come close to it, but not gaining access, many years ago.

My first ticket was issued in 1954, the year I also went into the Air Force. In 1955 I was stationed at Otis AFB on Cape Cod and, as a Nebraskan, I was enjoying seeing New England's and the Cape's historical sites. I found a historical marker about the Marconi site, and determined that the site itself was located on a military firing range. I drove back to the military post's gate and asked the gate guard how I could get to "Marconi's wireless station." The reply: "What company is he in?"

As I said, thanks for finally showing me a photo of the site!—*Joseph W. Fairfield, W0PHA, Bridgeport, Nebraska*

REMEMBERING NOSE

◊ I was saddened to learn of the death of Katashi Nose, KH6IJ. He and I received our first licenses as high school kids in 1932, he as K6CGK on Kauai and I as K6EEI on Oahu. Nose was my first QSO.

We never met face to face, but we kept in touch over the years and swapped many a yarn. It wasn't hard to find Nose; just listen in any CW contest for that wonderful fist and fine operating style. In my book, Nose was the finest contest operator ham radio has ever known.

But, perhaps more important, he was a warm, friendly person who personified the kind of spirit that binds the amateur community together. A great many of us will miss him. 73, Nose!—*Jim Crutchfield, W7OI, Friday Harbor, Washington*

GARLANDS FROM BRUSSELS

◊ I'm always thrilled to receive *QST* here. Sometimes I even look in the mailbox anxiously to see if *QST* has arrived (now is that childish, or what?).

I really like the magazine for the articles, the building projects, and, above all, the Product Reviews (although I'd like more reviews per issue, such as the comparative reviews you do from time to time). And let's not forget the ads. Especially important to me, living overseas, is Happenings, the wonderful New Ham Companion, and Up Front.

I hope the newsstand edition will help you increase the 160,000+ copies you publish, and I congratulate all the staff at *QST* for a job well done.—*Peter Panayotis Vekinis, KC1QF/SV0GV/EI4GV, Brussels, Belgium*

A TRANSLATOR WOULD BE HELPFUL

◊ I read, with interest, "Interference in Reverse," by Tom Freedom (May *QST*). I would like to add a constructive suggestion to those who might run across a problem with someone whose native language is not English. (I'm sensitive to this problem because I now live in a country where my native language, English, is not the language of the country.)

The lack of comfort when language barriers appear is often expressed as negativism, or attempts to avoid the situation. Highly educated people are not exempt from this problem; sometimes they are more prone to it, because *exact* meanings are important to them. Therefore, if you are faced with a situation such as Tom describes, returning with someone who is fluent in the second party's language would be extremely helpful, and would probably result in friendly cooperation.

I do congratulate Tom on the successful outcome he received.—*Azriel Gorski, W7SI/4X1PI, Jerusalem, Israel*

AMP WARS

◊ The letter in June 1994 Correspondence from Michael Melcher made the hair on the back on my neck stand up! What he is suggesting is to start another arms race. If you think an occasional contest period crimps your operating style, just wait until Amp Wars come to pass. An amplifier is a nice piece of equipment to have for the occasional need, but, like all good things, too many and too much usage are harmful to the health of ham radio.—*Jim Cardinal, A13K, Philadephia, Pennsylvania*

A YOUNG HAM SPEAKS UP

◊ It is encouraging to me, as a 14-year-old ham, that so many Old Timers respect the abilities of the growing number of young radio operators. However, I am getting tired of hearing from a minority of amateurs who think that young people aren't good hams.

We should all realize that Amateur Radio is simply a hobby, and a great one at that. Let's not lose the true spirit of Amateur Radio through this type of prejudice.—*Graham Guhl, KC5BZR/AA, Tusla, Oklahoma*

(Or, as we less fluent editors might say, "Lighten up, dudes!"—*K3KMO*) QST

Conducted By Bill Kennamer, K5FUV
DXCC Specialist

DX Antennas: Selecting the Height

As the summer doldrums begin to wind down, what will pass for an increase in propagation should slowly begin by the end of September through the end of October. As we begin to drop through the end of Cycle 22, however, it's apparent that conditions are worse than last year, which were worse than the year before. Ten meters is slumbering now, except for occasional bursts, and 15 meters is no longer as dependable for daily openings as before.

With the bottom of Cycle 22 expected sometime in 1996 (early to late, depending on the forecaster), it's a good idea to look at ways to increase the chances of success in putting your signal where it can be heard in the pileup. Antenna elevation patterns and expected angles of arrival for various propagation paths point out ways your signal may be improved. It can also reveal why your neighbor hears the rare DX when you can't.

The just-released 17th edition of *The ARRL Antenna Book*, edited by Dean Straw, N6BV, gives more insight into the problems of DX propagation and how to solve the mysteries of antenna heights than previous editions. With the use of computer models, Dean's made available the tools for planning an antenna system around the desired uses of the station. (See Dean's article in this issue for further information on the 17th edition.)

Dean's tool for predicting the arrival angles of radio waves is *IONCAP*, a computer program the US government has used for years. This software incorporates a detailed statistical data base that covers almost three sunspot cycles. A wide range of parameters may be specified, including time of year and different levels of solar activity. Although considered "user unfriendly" by some, it's regarded to have a high degree of accuracy. Dean has validated much of his data by comparison to many high-scoring DX contest logs of the past several years.

Because we're interested in working DX, we'll use the information provided in the *Antenna Book* to determine a practical height for a triband Yagi antenna for 20, 15 and 10 meters.

On page 23-20 of the new *Antenna Book*, Table 3 gives us the parameters from Newington, Connecticut, to Europe. Because we're interested in only three bands, we'll set up a new Table 1 (right) for those three bands.

From Table 1, we find that 100% of propagation occurs on 20 meters between elevation angles of 3 and 29°. However, 90% of the time, only angles between 4 and 13° are useful. Thus, we'd design our antenna system to include an emphasis on those angles.

On page 23-20, Figure 23 shows graphically the percentage of occurrences of a particular arrival angle. In this case, 11° has the highest occurrence, with signals arriving there 18% of the time; 12° occurs 12% of the time, and 10° also occurs 12% of the time. These angles account for 42% of all signals from Europe, so planning for an antenna height that provides peak gain at 11° seems to assure that the majority of signals would be heard. Angles above 15° aren't significant and there are only the merest of occurrences of the 29° angle.

A study of Table 4 on page 23-23 shows that even lower elevation angles are necessary for other propagation paths. For

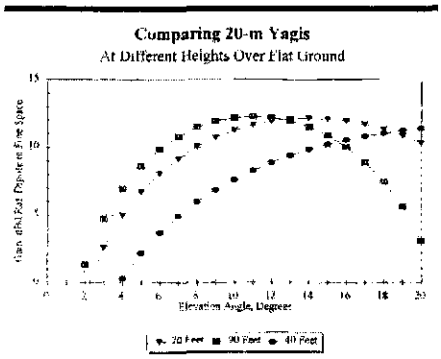


Chart 1:
The 420-261 Yagi (4 elements on a 26-foot boom) at 40, 70 and 90 feet. Notice the small difference between the 70 and 90-foot antenna at the lowest angles, and the vast difference over the 40-foot antenna. Gain at low angles = DX!

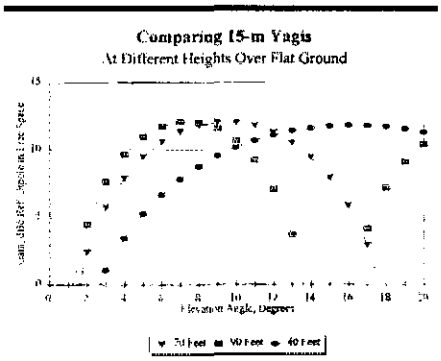


Chart 2:
The 415-18 Yagi (4 elements on an 18-foot boom): Again notice the difference between the 70 and 90-foot-high antennas. The 40-footer is left in the dust.

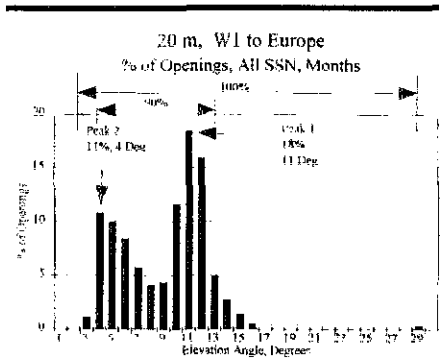


Fig 23—This chart shows the percentage of the time that propagation favors each elevation-angle from 1 to 30°. The path chosen in this case is from Newington, CT to Europe. By designing for the angles at which maximum "hits" occur, the signal strength to those areas should be maximized. [From *The ARRL Antenna Book*, 17th edition]

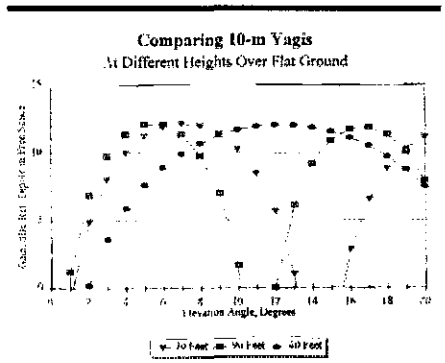


Chart 3:
The 410-14 Yagi (4 elements on a 14-foot boom) shows that a lower antenna on a higher-frequency band will begin to give acceptable performance. The 70-footer, however, is still better at the angles of interest (3-9°), while the 90-footer shows that an antenna can actually be too high to perform well at all angles because it's already beginning to be well into the null of its pattern at 8°.

Table 1
W1 (Newington, Connecticut) to Europe

	20 m	*15 m*	*10 m*
100%	3-29°	3-13°	2-13°
90%	4-13°	4-13°	3-11°
Peak Angles	11, 4°	5, 11°	9, 6°
Peak Pcts	18, 11%	18, 10%	20, 17%

example, the Far East requires angles from 1° to 16°, with the peak angles at 5° (23% of occurrences) and 10° (19%). Oceania's range is 2° to 10° for 90% of occurrences, but 5° is required 38% of the time.

Compromises are required. If one of the more useful angles is picked for optimization, however, the antenna should also provide useful takeoff angles at other desired angles, although signal strengths may be down from the main antenna lobe. The compromise would be to find a height that provides a maximum lobe at one desired angle, while avoiding a null at another desirable angle. Although the best way of doing that may be stacking antennas, that's beyond this discussion.

After looking at the tables, we can conclude that a good compromise antenna for 20 meters would cover the angles between 4° and 14°. Although there are paths where the lower angle would be best, it's more practical to center the lobe at 10 to 13°. Although the gain at 5° will be down, it will still be greater than a dipole or the same antenna at a lower height.

To illustrate, we can use the program *YA*, an adaptation of the *YO* (*Yagi Optimizer*) software by Brian Beezley, K6STI, which is included with *The Antenna Book*. With this program we can check a 20-meter antenna at any height and check the gain at any elevation angle desired. This gives us the ability to see what the antenna will do without climbing the tower.

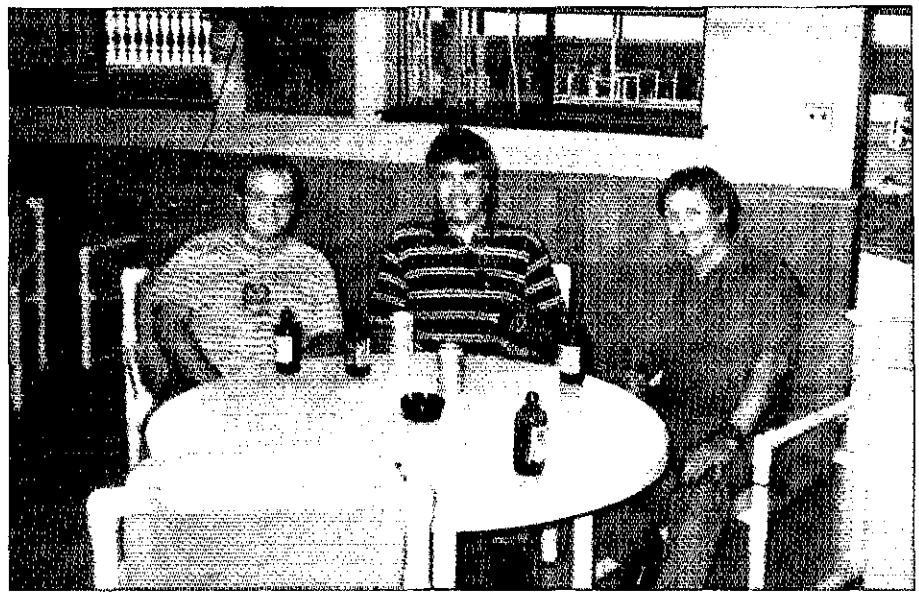
The angles of interest on 20 meters are 5° to 14°. We're looking for a height that will give satisfactory performance on 20 meters and good performance on 10 and 15 meters. We'll compromise on a lower height if possible because higher antennas on the upper bands tend to have nulls in their patterns at useful angles. If the height is too low, however, the antenna may not be useful for DX at all.

The graph of the 420-261 antenna (4 elements on a 26-foot boom) shows the gain at various elevation angles on the different bands. The lowest angle of interest in the chart is 5°. At 40 feet, only 2.18 dBd (dB over a dipole in free space is realized. The same antenna at 70 feet boosts the gain by 4.56 dB over the 40-footer. A gain of 4.5 dB is significant, being more than double the signal. By going to 90 feet, additional gain of 1.92 dB is realized, but that's hardly enough to justify the additional expense.

The angle of interest for European propagation is 11°. Here the 40-footer comes in at 8.31 dBd, up considerably from its performance at 5°. The 70-foot height provides an additional 3.33 dB of gain, however—again a doubling of effective radiated power, while the 90-footer only adds another 0.63 dB. Again, the additional expense isn't justified.

We can see that, for 20 meters, 70 feet would be a good compromise height, with the most favorable takeoff angles for Europe and at the same time, adequate gain at lower angles. To increase low-angle gain significantly would require an antenna much higher than 90 feet, and is probably best left to those who have large tracts of real estate and no antenna ordinances.

The same methodology works as well at 10 and 15 meters. The arrival angles are lower on those bands, but only by a few degrees, largely offset by the increase in frequency and thus the antenna height in wavelengths.



MIKE WADSWORTH, G3UOF

Worked Ascension Island (ZD8) lately? Then you're bound to have worked one of these guys, who have provided all the activity during the past year or so. Gathered for their regular meeting at the VC Club are (l-r) Andy Chadwick, ZD8VJ/G4ZVJ; Jim Neiger, ZD8Z/N6TJ; and Mike Wadsworth, ZD8M/G3UOF.

For example, 15 meters to Europe can be worked with angles from 4° to 13°, the Far East from 3° to 14°, South America from 3° to 10°. Although most openings favor the 10° angle, lower-angle openings occur often enough that they shouldn't be neglected.

The graphs show that the most effective antenna overall will be the 70-footer, although the 40-footer also works well at the 10° angle, being down only about 1.9 dB. The 70-footer, however, is 4.7 dB ahead at 3° and 4.26 dB ahead at 5°.

At 10 meters, it's quite possible to get an antenna too high. Angles here run between 3° and 10°. The 90-footer gives up almost 5 dB to the 70-footer at 9°, while only about 0.9 dB ahead at 5° and less than 3 dB ahead at 3°. The 70-footer is about 4 dB better than the 40-footer at the low angles, although only about 1 dB ahead at 9°.

The 70-foot antenna height represents the best compromise for acceptable DX performance on the three bands of interest. Although better results could be obtained with higher antennas in certain situations, or lower antennas at other times, it would be hard to beat a tribander at 70 feet for most DXing, regardless of where we are in the cycle. As we go into the bottom of the cycle, remember that he who optimizes his station will work most of the DX. After all, that's what Amateur Radio DXing is all about, isn't it?

FOREIGN EXCHANGE AND THE DXer

Last month we covered the situation with postage rates from Japan. This month, we'll study Germany and how the DXer can keep from providing what to him is an excessive amount of "green stamps" (US dollar bills), while making it easier for the overseas DXer to provide QSL cards direct, in a timely manner, without going in the hole. Although we're using Germany as our example, this situation applies over most of Europe (it's just that we're more familiar with rates in Germany).

The fall of the value of the US dollar has made the news this summer. If you think it doesn't affect DXing, rest assured that it does affect QSLing. For example, as this is written, the value of $1 US is about 1.56 marks. But that's only if you're trading in large quantity(hundreds of thousands). Otherwise, expect to see another 5% lost to a "haircut," and that only if you're dealing with at least $100 US. To most overseas DXers, unless they expect to handle large quantities of dollars or they expect to travel to the US, dollars tend to be traded or sold like IRCs.

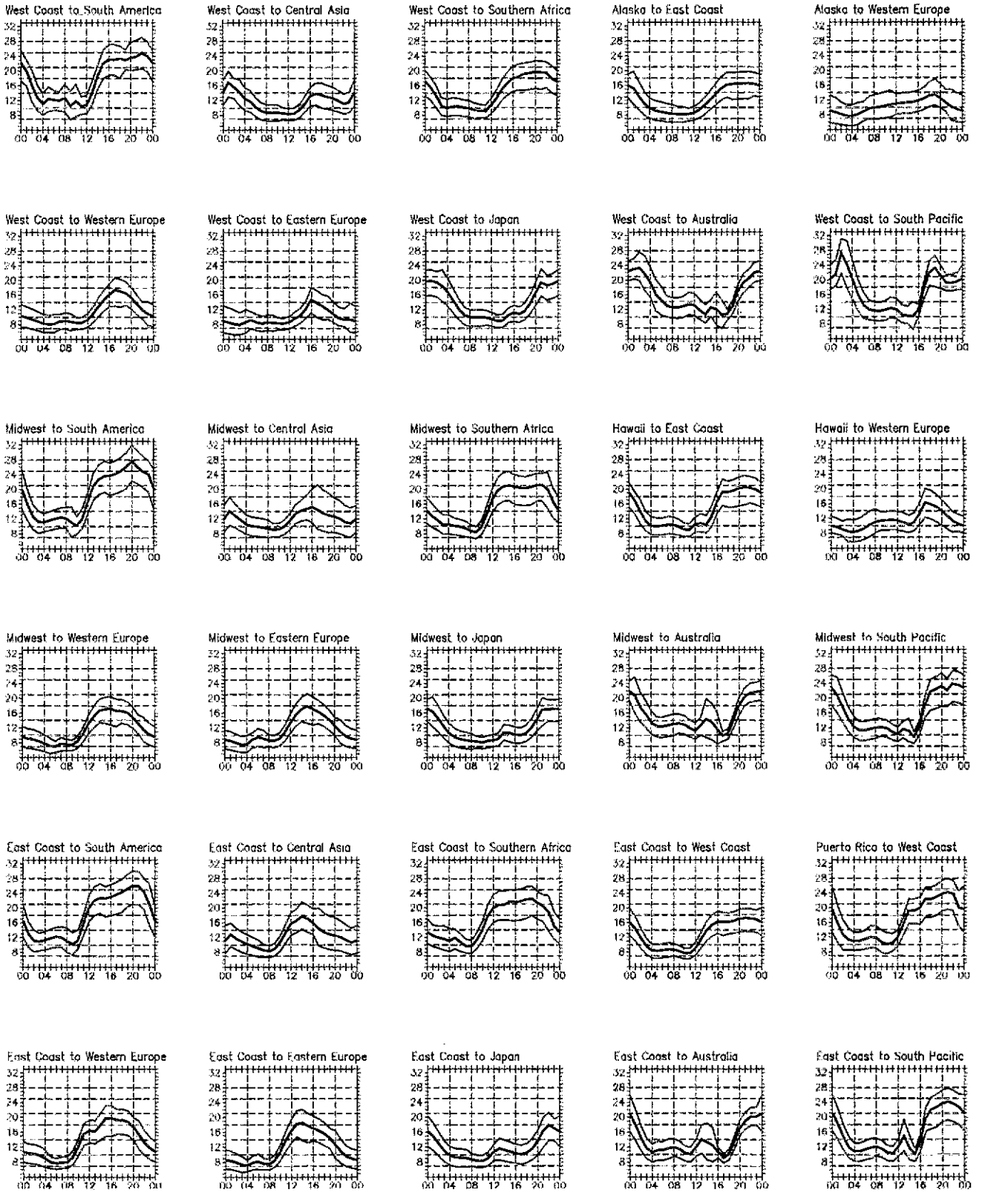
To equate that to German postal rates, one unit of Air-Mail postage is 3 marks. Two US dollars would be just equal to 3 marks before the actual rate of exchange is considered. After, it's less than 3 marks. So $2 US isn't really sufficient to provide for return postage, much less to pay the cost of the cards. The thought that anyone could turn a profit is ridiculous.

There's a way to beat the system, however, in a way that will make everyone happy. It's still possible to buy IRCs from a QSL manager for 50 to 60 cents. Two IRCs is the equivalent of 4 marks. So for $1 to $1.20, you've saved money, provided another DXer sufficient funds for postage and a chance to at least pay the cost of the cards, and lessened his hassle in exchanging funds for a negotiable instrument. Even by buying new IRCs, you come out slightly ahead of using "green stamps." When I was in the financial business, this type of trade was called an *arbitrage* and one could make good money at it until the marketplace closed the gap. But right now, it's a good swap that benefits both sides.

The story is clear: At the current value of the US dollar, it's far better to use IRCs than "green stamps." If the DXer doesn't say he'd prefer "green stamps," IRCs are always the better choice.

ERRATA

Fred Laun, K3ZO, informs us that the previous QSL manager for Tom Warren, K3TW, was Bill Kessinger, KE3A, not K3EA, as shown in July *QST*. Tom is now at the US Embassy in Warsaw, Poland, operating as SO0TW. QST



When are the bands open? These charts predict average propagation for the period September 16 through October 15, 1994, for high-frequency circuits between the US and various overseas points. One chart showing East Coast to West Coast is also included. On 10% of the days of the period, the highest frequency propagated will be at least as high as the uppermost curve. On 50% of the days it will be at least as high as the middle curve, and on 90% of the days it will be at least as high as the lowest curve. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. See April 1983 *QST*, pp 63-64, for a more detailed explanation. Curves are generated using *IONCAP*. The predictions for this period assume a smoothed 2800-MHz observed solar flux value of 80, which, after adjustment for Earth distance, is equivalent to a sunspot number of 22.

DX Century Club Awards

Conducted by Bill Kennamer, K5FUV
DXCC Manager

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official DXCC Countries List. The totals shown below are exact credits given to DXCC members from May 1 through 31, 1994. There were 326 current countries at that time. The DXCC rules and application forms are in the *ARRL DXCC Countries List*, which is available from HQ for $2.

TOP OF THE HONOR ROLL

Mixed

326

DJ5JH/352
DL8MAG/331
F6ELE/331
GW4BLE/338
HA8XX/332
HA0DU/340
HB9DX/364
JA1OOP/336
JA4JBZ/335
JA9CG/340
JH2UVL/336
JH7FMJ/336
JR3HZW/334
OE2EGL/355
OH2BBF/340
OH2VZ/358
OZ1LGF/331
U5WF/371
UR5WA/334
US5WE/346
4X6UO/331
W1EW/357
W1GME/367
KA2K/333
K2LQ/343
W2AX/372
K3NW/344
WA3IKK/352
KF4IX/333
K4DY/354
K4OQK/341
K4PYT/334
N4XO/364
WA4CXZ/341
KA5V/336
W5GC/364
W5KGX/374
K6GAK/351
K7FE/340
KR8V/334
W8LKG/337
K9SM/362
W9ARV/353
W9LA/351
K3JN/348
W0HZ/361

Phone

326

DF4PL/332
OJ2YI/372
DJ5JH/339
F6ELE/331
F6FWW/331
HB9AQW/345
IT9HLR/331
JA6AD/351
OE2EGL/354
OE2GKL/346
*OM3JW/338
US5WE/346
VE2WY/360
VE3GS/353
W2CC/345
WA3IKK/352
WA4CXZ/341
WA4IUM/333
KA5V/336
W5GC/364
W5KGX/370
K7FE/340
W9LA/351
K0QQ/346

CW

326

DJ5JH/335
NY2E/331
W4DR/336

NEW MEMBERS

Mixed

DL1UL/105
G4XRV/211
G4ZKJ/151
HB9DHI/256
HL5NFU/108
JA1GHR/314
JA3CRO/237
JE8LWZ/111
JF5FGY/236
JH1JEJ/105
JR3OYH/107
WH6ASW/147
WL7EP/107
ZL2AOH/103
4Z5DX/102
N1BFF/290
N1PTO/102
KD3PC/115
KE3EX/106
AB4RU/131
KR4DL/118
K4LXA/135
KB5STS/143
WD5AJD/130
KC6LUC/184
KE8FW/118
KM6DJ/126
W6JOX/299
KG7FU/101
KF8TC/132
WB8QFB/103
W8LAQ/229
KF9MG/110
KN9P/104
N9BED/102
W9UIH/107
NR0Y/116
N0EOR/109
N0KV/145
WJ0M/190

Phone

BV2CD/7/100
F5OHW/305
F5RBB/151
I7UBF/101
IK4THK/149
IK5MEQ/103
JA1DSH/102
JE8LWZ/109
LU3DCA/102
SV5AZP/114
WH6AG/107
WH6ASW/111
KD1OG/108
N1BFF/290
N1KWJ/105
W1RU/142
K2AZ/277
K2UVG/219
WA2ABN/124
W2GXP/133
W2LHS/106
KE3DK/109
KD4EUH/114
K4LXA/124
KB5KKL/248
KB5OHT/126
KB5STS/142
KC6LUC/181
WT6W/107
WU6T/282
KB7MOI/105
KF8N/121
WD8PCT/141
W8LAQ/159
AA0DY/209
KG0IT/110
NR0Y/116
N0KV/134

CW

DK9LJ/106
DL1SDN/317
DL2MEG/103
HB9AQW/311
HB9DHI/248
HL4CIS/105
I3MLU/104
IK0TUG/107
JA9CG/284
JF2RSF/130
JH2TIP/257
PA0TAU/313
VE7LDM/101
4X6ZK/161
WV1L/103
K2AZ/276
N2FKE/113
WZ2I/103
*WZ2M/100
WA3GOS/119
WJ4T/215
AA6EW/105
KJ6HO/111
N6CHU/126
WU6T/249
AA7AV/170
KF8TC/104
KF8VW/137
N8BEF/133
W8LAQ/161
KW0E/142
NK0N/105

RTTY

I1GMF/114
JA1WTI/111
JA7WKG/116
JH1JEJ/105
JR2CFD/316
S51DX/102

Satellite

KA1NRC/101

160 Meters

PA0TAU/126
VE3BW/101
YU7AU/110
AB4RU/131

80 Meters

DL1SDN/229
JE3CHA/104
JR2KDN/170
PA0TAU/236
PY5CC/105
AK1N/115
N1GNB/101
K2AZ/101
WO2T/104
NR3Y/103
K4ZIN/106
N4WPG/102
W4QCU/280
W4UXI/116
WW5L/109
WU6T/103
N7MC/161
W7/DL1UF/176
KF8N/118
W9KDX/132

40 Meters

DL1SDN/257
I6XGZ/104
JA0HC/120
PA0TAU/277
TI5RLI/136
4X6ZK/138
AK1N/112
AA2DY/103
KF2DT/101
K2AZ/153
WB2KSK/109
WO2T/124
KC4UH/110
K4ZIN/155
W4UXI/156
WB6ICJ/103
WU6T/122
W7/DL1UF/126
WD8LTM/111
W8LAQ/102
W9KDX/181

10 Meters

DL1SDN/311
JA9CG/105
JA0HC/111
JH2TIP/119
JR2KDN/261
PA0TAU/298
AK1N/134
N1BFF/138
KB2MY/209
K2AZ/173
K4PYT/107
K4ZIN/202
W4UXI/171
AA5F/132
KB5OHT/106
KC6LUC/116
K6UO/108
WB6ICJ/109
WU6T/206
KF7VC/113
W7/DL1UF/193
N8BEF/158
N0EOR/109
N0KV/115

6 Meters

LU3DCA/102

NEW HONOR ROLL MEMBERS

Mixed

324

DL1SDN/329

322

W9ZRX/347

321

I2SM/363
AI7B/350

320

HB9CMZ/325
ZS5NK/330

319

JH2TIP/322
WA4SFF/325
W5FIX/327

318

DJ9UM/331
HB9CZR/323
WB3LHD/323
WA4NQG/324
KF8N/323
W9KBV/327

317

EI2GS/321
HB9DDZ/322
JR4IVR/321
S59VM/326
KE2JR/321
W3ZBF/336
KM4ZO/321
KN4MO/321
WW5L/321
NG6N/321
N6HK/322
WA6VNO/321
K8AJK/345
W9ZNY/335
NO0C/321

Phone

323

JA9CG/328

322

DL1SDN/325
NI4H/329

321

EA4CQT/326
I2SM/363
W9ZRX/346

320

JA7WKG/324
ZS5NK/330

319

I2UPG/326
KM1D/331
N4GAK/324
WA4SFF/325

318

DJ9UM/331
PA0TAU/321
KR8V/326

317

OE7XMH/322
*W3IOP/328
KN4MO/321
WA5HWB/321
W5LFK/337
NN7X/321
W8VKW/324
K9ZXG/326

CW

320

KF4IX/325

317

HB9CMZ/322
KF8N/322
K0GUG/324

5BDXCC

K2AZ
DL9OBY
UB4MM
DL1SDN
W1RU
JA1WTI
NR3Y
WU6T
KF8N
KW4V
WO2T
AK1N
K9BB
WB2KSK
WB9CIF
WA6AJB
NX1Q
WI5A
4X6ZK
PA0TAU
JE2URF
WW5L

17 Meters

G3SWH
DL1SDN
WU6T
KM1D
I2PKF
N4TO
KF8VW
K9BB
K7LJ

12 Meters

G3SWH
DL1SDN
I2PKF
KF8VW
K7LJ
N4RFN

ENDORSEMENTS

Mixed

CT4YN/329
DF2UA/208
DF6TC/285
DJ6DU/332
DL7KI/232
F5OHW/316
F6HUJ/329
F6HWU/320
F6IFE/328
G3AEZ/310
G3OHN/322
GM4KLO/327
HB9BGV/306
HB9MO/369
HB9RB/312
HI8LC/331
HL4CIS/133
I1GMF/319
I2PKF/334
I9SNY/282
IK2FEO/283
IK2FIQ/324
IK6FHG/171
IK8FLW/146
JA1KQX/335
JA1WTI/346
JA3KE/135
JA4FEQ/176
JA7WKG/331
JA7ZP/337
JA8MS/349
JA0HC/174
JH1FDP/332
JH1LPZ/251
JI8KNF/326
JR2KDN/329
JR3EQA/326
LU4DMG/369
OE7XMH/324
OH4MF/323
OH8KN/339
ON4FU/365
PA3FFJ/321
PT2DMS/283
SM3AFR/317
TI5RLI/306
VE2RO/230
VE3CWE/340
VE3GS/353
VO2GD/326
YU7AU/320
YZ7AA/319
ZS2U/305
4X6ZK/309
AK1N/333
KA1A/329
KD1OG/155
KM1D/335
KT1H/227
K1MBF/218
K1RB/288
K1UM/339
NX1O/282
N1GNB/233
N1IR/340
WS1E/301
WZ1R/308
W1AM/345
W1DID/286
W1ECH/347
W1GKJ/322
W1NH/343
W1QV/325
W1RU/335
W1WRN/326
AA2DY/262
KB2CB/331
KB2HZ/331
KO2S/297
KE2VB/279
KF2DT/263
K2AZ/321
K2UVG/227
NU2W/203
NY2E/331
N2DL/348
N2EDF/314
WA2ABN/200
WA2AGO/321
WA2CBU/331
WA2VKS/320
WO2T/318
W2CC/345
W2GXP/198
W2MPI/334
W2QIP/226
K3GYD/340
K3OTY/345
NR3Y/326
N3NCW/214
WA3GOS/181
W3MFW/360
AA4NC/330
AA4Z/332
AB4IO/309
AD4BY/253
KC4FW/289
KC4UH/262
KF4L/323
KW4V/324
K4AIM/367
K4ANX/165
K4JEZ/311
K4UTE/350
K4ZIN/295
NI4H/331
N4DAZ/333
N4EED/274
N4JR/321
N4TO/358
N4ZTT/306
WA4VDE/336
WB4HSA/300
WB4NFS/176
WD4KMW/299
W4JKC/328
W4LZW/309
W4MPY/333
W4OHZ/323
W4PKU/203
W4QCU/341
W4UXI/353
W4VN/342
AA5CV/200
AA5F/156
AB5GF/200
KA5OUN/145
KA5SWC/301
KA5VFU/163
KB5CSQ/170
KB5OHT/217
KC5NY/315
KC5P/329
KF5EA/327
KF5PE/310
KZ5Q/333
K5AVH/321
K5CSK/339
K5TA/320
N5CB/330
N5ORT/320
WA5QCH/334
WA5SUE/320
WY5Q/325
W5LDH/332
W5USM/335
W5WZN/332
AA6EW/242
KA6V/332
KJ6HO/312
KM6CB/265
KM6CK/202
K6DC/375
K6UO/282
N6CHU/195
N6ULU/320
WA6AJB/296
WB6AFJ/323
WB6CUA/339
WR6R/327
WU6T/308
WZ6P/282
W6CTL/345
W6IHA/336
W6MVW/284
W6YQ/320
AA7AV/322
KG7YQ/129
KK7Y/285
KX7J/328
K7FL/236
K7LJ/331
K7TCL/325
NT7E/312
N7JXS/222
N7MC/339
N7MCA/224
WW7Q/337
W7/OL1UF/321
W7FPT/328
W7KT/271
W7LR/342
W7SFF/327
AA8CH/292
KB8GWL/268
KB8I/228
KF8VW/322
KW8T/339
K8JJC/261
K8TMK/383
NE8Q/317
N8BEF/325
WD8LTM/304
W8CY/336
W8RV/339
W8TWA/316
K9BB/344
K9BX/296
K9ZXG/335
N9CIC/305
WA9VGY/346
WD9HTC/160
W9BB/324
W9KDX/326
KB0AUK/323
KD0IB/150
KG0CY/257
KW0E/184
K0HOF/280
K0LUZ/344
NX0I/330
N0ASA/287
WD0K/143
W0DRT/231
W0GWT/210
W0JRN/337
W0MOU/125
W0PAH/354

Phone

DF2UA/148
DJ2FB/323
DJ7AX/292
EA3CZM/299
EA3GHQ/223
EI2GS/317
F6KOK/333
F6GKA/320
F6GVD/319
F6IFE/327
G3OHN/147
GU4WQP/181
HA8XX/328
HA0DU/336
HB9BGV/297
HB9CZR/313
HB9DDZ/248
HB9RB/308
HI8LC/327
HK3MKQ/210
HK6DOS/319
I2PKF/334
I0CHF/253
I0SNY/278
IK2ECN/313
IK2HTW/319
IK6FHG/171
IK8FLW/142
JA1GHR/313
JA1KQX/294
JA1WTI/343
JA4FEQ/176
JA7ZP/336
JE3CHA/262
JH2TIP/316
JH2UVL/329
JH7FMJ/332
JR2KDN/327
KP4CZ/197
LU4DMG/369
OA4BS/333
OH2VZ/302
ON8AW/345
OZ1LGF/133
SM3AFR/225
TI5RLI/306
U5WF/355
UR5WA/190
VE3CWE/306
VK6RU/377
XE1J/345
YZ7AA/296
4X6UO/330
4X6ZK/307
AK1N/328
KA1PM/316
KT1H/226
K1MBF/163
K1RB/288
N1GNB/233
N1IR/337
WZ1R/276
W1GKJ/292
W1TPB/211
W1WRN/328
AA2CN/132
KB2CB/330
KB2HZ/329
KB2MY/328
KE2JR/310
KE2VB/266
KF2DT/253
K2IUK/327
NU2W/202
NY2E/331
WA2AGO/318
WA2CBU/330
WA2PNI/237
WA2VKS/318
WB2KSK/267
WM2V/234
WO2T/317
W2GBC/352
W2MPI/334
K3OTY/345
NB3T/324
N3NCW/171
W3ZBF/289
AA4NC/298
AB4IO/270
AC4UM/206
AD4BY/251
KC4FW/287
KC4UH/233
KF4IX/318
KM4ZO/289
KQ4WD/279
KW4V/314
K4AIM/367
K4ANX/165
K4KUZ/326
K4UTE/348
N4BHJ/332
N4RFN/326
N4ZTT/128
WA4BIM/335
WA4MMO/344
WA4VDE/338
WB4HSA/300
WY4D/158
W4UXI/301
AA5CV/178
AA5O/293
AA5PO/326
KA5SWC/300
KA5VFU/163
KB5CSQ/170
KC5P/329
KZ5Q/329
N5ORT/320
N5VWM/215
WY5H/315
W5LDH/332
W5UGI/303
W5VHN/311
W5WZN/243
AA6BB/333
AA6EW/222
KA6V/332
KC6AWX/283
KJ6HI/255
KJ6HO/308
KM6CB/265
KM6CK/202
K6UO/222
N6HK/320
N6WMF/209
WA6AJB/254
WA6VNO/304
WB6AFJ/309
WR6R/312
AA7AV/307
KC7WO/319
KF7VC/285
KG7YQ/129
KX7J/309
K7FL/188
K7TCL/322
K7TUH/317
N7JXS/172
N7MCA/219
WT7Q/308
W7/DL1UF/282
W7CNC/300
W7KNT/327
W7MB/358
AA8CH/268
KB8GWL/268
KB8I/228
KB8XT/306
KC8OB/329
KF8VW/322
K8AJK/335
K8MDU/315
K8TL/331
K8TMK/333
NE8Q/316
N8BEF/323
WD8LTM/304
WE8Q/318
W8CY/336
W8KST/354
W8TWA/312
KE9OW/269
K9BB/329
K9BX/296
K9SM/349
WA9VGY/343
W9BB/282
W9IFJ/337
W9KDX/315
W9UPC/337
W9ZNY/334
KA0NNF/323
KD0AE/331
KG0CY/257
K0JN/324
K0LUZ/323
NO0C/320
NX0I/322
N0ERC/176
W0GWT/200
W0QLX/344

CW

DL7UX/322
F6HWU/317
G3OHN/184
G3SWH/292

G4BWP/331
G4XRV/206
HA8XX/299
HA0DU/334
HB9BGV/250
HB9BQB/211
HB9CZR/142
HB9DDZ/298
IK2FIQ/316
JA1KQX/324
JA1WTI/318
JA3KE/126
JA7WKG/253
JA0HC/171
JE2URF/325
JF2AFP/181
JH2UVL/312
OH2BBF/328
PT2DMS/266
SM3AFR/229
S67JZ/242
US5WE/286
VE3BW/330
VE3CWE/311
ZS2U/252
AK1N/166
KM1D/305
N1IR/256
WS1E/293
WZ1R/269
W1GKJ/205
AA2DY/222
KB2CB/303
WA2ABN/143
WA2AGO/156
WA2CBU/249
WA2HZR/330
WA2VKS/169
WB2CJL/328
WO2T/164
W2GXP/175
K3NW/316
NM3V/290
NR3Y/137
AA4NC/277
AA4NG/308
KC4UH/204
KM4ZO/172
KW4V/319
K4EOU/242
K4KUZ/333
K4OQK/211
K4UTE/320
K4ZIN/227
NI4H/322
N4GAK/240
N4TO/286
N4ZTT/228
WD4KMW/260
W4MPY/332
W4PKU/194
W4UXI/253
KA5V/152
KB5OHT/168
KC5P/249
KF5EA/284
KZ5Q/325
WY5Q/315
W5FGO/304
W5SVZ/303
K6UO/195
N6ULU/306
WA6AJB/236
WB6AFJ/207
WK6E/325
WZ6P/274
W6CTL/304
W6IHA/227
W6MVW/267
W6YQ/288
KF7JF/183
KX7J/279
K7FL/192
NN7X/316
N7JXS/166
N7MC/331
W7/DL1UF/231
W7KT/201
W7LR/337
AA8CH/198
KR8V/319
K8TL/291
W8CY/332
W8TWA/227
K9SM/167
K9ZXG/314
WA9VGY/306
W9BB/214
W9KDX/281
W9LA/178
KB0AUK/156
K0LUZ/300
NX0I/300

RTTY

DL1SDN/153
F6HUJ/316
G4BWP/201
ON4UN/187
4X6UO/215
W1GKJ/182
NY2E/133
WB2CJL/316
K3UA/266
WA3IKK/297
KF5EA/222
K6WZ/318
WB6AFJ/297
WZ6P/133
W6JOX/299
W9BB/150
W9KDX/201

Satellite

KK3K/180
N4NR/131
K9QQ/139

160 Meters

G4BWP/144
HA0DU/124
ON4UN/245
VE1ZZ/254
VE3EK/125
K3UA/179
W5FIX/123
NX0I/116

80 Meters

DF4PL/172
G4BWP/268
HA8XX/206
HA0DU/238
HB9DDZ/135
JA1KQX/166
JE2URF/117
JH2UVL/118
ON4UN/343
KM1D/145
WS1E/128
W1NH/327
WA2AGO/124
K3UA/255
W3MFW/331
KF4IX/218
KN4MO/122
K4DY/308
K4KUZ/188
K4UTE/213
N4TO/138
W4DR/335
KZ5Q/157
WB6AFJ/111
K7FL/115
KF8VW/113
K8TL/115
K9ZXG/133
K0LUZ/114

40 Meters

DF4PL/173
DJ5JH/271
EA4CQT/123
G4BWP/310
HA8XX/234
HA0DU/275
HB9BGV/152
HB9DDZ/166
JA1KQX/255
JA2BL/235
JA7WKG/118
JA7ZP/120
JE2URF/194
JH2UVL/209
JR2KDN/316
PY5CC/202
KM1D/194
K1RB/110
WS1E/206
WZ1R/215
NY2E/143
WA2AGO/113
K3NW/305
K3UA/319
NR3Y/111
AB4IQ/110
KF4IX/242
KM4ZO/116
KN4MO/140
K4DY/335
K4KUZ/267
K4UTE/239
N4TO/213
KZ5Q/225
WW5L/125
KJ6HO/150
WA6AJB/164
WB6AFJ/111
WK6E/273
W6MVW/182
K7FL/126
NN7X/128
KF8N/115
KF8VW/123
K8TL/141
K9ZXG/241
W9BB/120
K0LUZ/158
K0QQ/203
N0RR/315

10 Meters

DF4PL/283
EA4CQT/194
G4BWP/316
HA8XX/289
HA0DU/311
HB9BGV/227
HB9DDZ/235
HB9RB/199
IK6FHG/137
JA1WTI/281
JA7WKG/177
JH2UVL/248
LU1JDL/259
PY5CC/258
TI5RLI/130
VE2WY/282
4X6UO/231
4X6ZK/198
KM1D/263
K1RB/159
N1GNB/136
N1IR/294
WS1E/169
WZ1R/197
KF2JR/155
KE2VB/139
WA2AGO/154
WA2VKS/201
WB2KSK/145
WO2T/146
K3UA/319
NR3Y/250
AB4IQ/250
KC4UH/129
KF4IX/261
KM4ZO/155
KN4MO/238
KQ4WD/167
KW4V/243
K4DY/335
K4KUZ/294
K4UTE/326
N4TO/162
W4DH/342
W4LZW/125
W4VN/296
KZ5Q/283
N5ORT/251
N5VWM/215
WW5L/213
WY5H/160
AA6EW/149
KC6AWX/145
KJ6HI/147
KJ6HO/227
KM6CB/149
WA6AJB/166
WB6AFJ/232
W6CTL/225
W6MVW/126
K7FE/176
K7FL/129
NN7X/141
N7JXS/150
AA8CH/132
KB8GWL/257
KE8RV/216
KF8N/128
KF8VW/303
K8AJK/281
K8TL/192
WD8LTM/190
K9ZXG/288
W9BB/129
W9KDX/250
W9LA/127
W9WHM/325
KB0AUK/129
K0LUZ/178
K0QQ/254
N0RR/310

6 Meters

PY5CC/149

DXCC Honor Roll Corrections

The following call signs were omitted in the July issue. *Phone—319:*
IK7MCJ/322, IK8TWV/325, JA1AUJ/321, JA1JDP/336, JA1RWI/326, JA3LUK/335, JA4UQY/325, JA5CKD/324, JA5JUG/327, JA6IVR/320, JA0CWZ/328, JA0JTO/329, JA0UUA/321, JF4GXN/321, JG3QZN/323, JH1ARJ/333, JH1IFS/335, JH1ORA/326, JH3CXL/325, JH7FMJ/325, LA4HW/327, LZ2CC/327, OE2VEL/328, PY3BXW/343, SM0SMK/321, UA6JD/335, UW0MF/331, VE3DLR/336, VE3EGO/323, VE3NOS/322, VE3UDX/322, VE7EW/321, VE7WJ/334, XE1MD/325, WA1ZCC/326, W1CRL/324, AA2A/326, AA2FN/323, KA2AJT/323, KB2ZP/327, K2UU/335, NZ2L/321, N2RR/327, N2VW/326, WA2UKA/322, W2PSU/336, WS1OP/328, W3ULI/321, AA4RZ/321, AA4S/336, KA4IWG/321, KF4NO/322, KJ4WU/328, KN4F/324, K4XI/333, N4AVB/327, N4BSN/323, WA4DAN/326, WB4NXG/321, WB4TIN/331, W4CVX/324, W4JR/321, AA5PQ/322, K5CON/322, WB5ROW/322, WQ5Y/321, WV5S/323, W5INL/333, KE5LT/325, KW6U/338, K6VMN/322, N6JV/328, WA6JOO/324, WE6H/322, W6RGG/346, W6UY/338.

DST

Strays

In mid-April, I was tuning around 20 meters and came across a familiar voice. It was Rev John Henault OMI, HH6JH. He was working another Stateside station and discussing a torpedo, which at that moment was lying on the beach near his facility on a small island off the south coast of Haiti. This discussion was centered on whether the torpedo posed a danger to the large number of people coming to view the ominous-looking object.

I recalled that a division of my former company (I'm retired from ITT Corp) had a major contract to install and service a US Navy torpedo-practice range in the Caribbean years ago. I also remembered that the Navy had a local office in south Florida called AUTEC, which was connected to the operation of this torpedo practice facility.

At this point, I broke into the QSO and established contact with HH6JH. I was a familiar voice to Fr John because we'd been in contact through the International Missionary Radio Association traffic net previously. He described in detail the markings he could decipher and the general shape and size of the torpedo. The photo, which Fr John sent to me, gives an excellent idea of the anxiety level that could occur in a person viewing this object closely. Armed with this information, I asked HH6JH to stand by while I searched my telephone book for the AUTEC office here in West Palm Beach. I called, and a Lt Elrod said he'd do some checking and get back to me. I gave Fr John our progress thus far and shortly

the lieutenant called back and said that I'd soon receive a call from a Navy official in Puerto Rico.

My phone rang again and it was a chief warrant officer calling from Puerto Rico. (When I got the call from a chief, I knew we were in business.) I patched him through to Fr John. The chief expressed his recognition of the torpedo as a "practice dud" and assured Fr John that there was no danger whatsoever in handling the device. He indicated that it had been in the water about six months and had been launched in a practice exercise near the island of St Croix. The phone patch was good and there was much relief that there was no danger to the island populace from this device. (Amateur Radio came through again!)

Fr John sent me more details: The torpedo had washed ashore at Pointe Est, Île à Vache, Haiti (on the eastern tip of the island) on about April 13, 1994. It was brought to Mme Bernard in Île à Vache, the main town on the island, by two fisherman. It surprised me that two Haitian fishermen could lift it into their boat—the Navy told me it weighed 400 pounds! It had remained on the beach until the Haitian military picked it up on April 22, 1994, and took it to Les Cayes on the mainland. It was met at the dock by a crowd—I guess the word was out and the Haitian people were curious.

I thank Fr John for his work in getting the picture and information to me under less-than-ideal conditions, given the embargo and other difficult circumstances in Haiti these days.

Another aside to this anecdote for Canadian readers is that the immediate area where the torpedo was originally found is the site of the wreck of the schooner *Blue Nose*, which is depicted on the Canadian dime.—*John Vander Horn, N2VH, Boynton Beach, Florida*

Word Up, NTS?

For the past few years, the leadership of the ARRL National Traffic System (NTS) has grappled with the following question: How do we take advantage of the benefits of the digital modes, such as AMTOR, in traffic handling in a way that doesn't rob the traditional system components of that apparently scarce resource: traffic? It sounds like a toughie. If traffic bypasses a Region or Area Net via AMTOR/packet links, how are these important nets supposed to survive?

Before we attempt to answer these questions, let's take a brief look at how we got here in the first place. Back in 1991, a panel of three Digital Coordinators was appointed, one for each Area staff, to integrate digital systems with their traditional counterparts. Their duties included establishing standards for NTS applications and expanding NTS capabilities, especially in the areas of system redundancy/reliability and emergency/disaster communication. To an extent, they have succeeded: A close-knit group of operators now handle traffic daily via AMTOR and other modes, with someaccountability and reliability. Even a few veteran brass pounders had to admit that traffic could be moved accurately, reliably and quickly by these modes.

But more needed to be done, and last December they met at Lake Limestone, Texas, to review progress and chart a course for the future. A report was generated, dubbed the *Lake Limestone Accords*, and NTS officials have been studying it since its release. The plan calls for HQ staff to review additional field input and draft specific guidelines to be incorporated in the *Public Service Communications Manual*, the historical repository of such policy. The Digital Coordinators deserve a vote of thanks for their efforts.

Meanwhile, Section Traffic Managers (STMs) have been striving to ensure that packet BBSs are being cleared of radiogram traffic each day. The most effective STMs have appointed "Net" Managers to manage the radiogram function on these PBBSs. "Net" members, including Official Relay Stations (ORSs) specializing in packet traffic handling, remove traffic from the boards and deliver it or bring it to Section- and Local-level NTS nets for handling. Some STMs have gone so far as to sanction a major PBBS as an NTS Local-level or Section-level "Net." Bravo! If every Section was so vigilant, packet would be more reliable at moving traffic expeditiously than it already is.

So things are looking up, as far as digital-ready NTS is concerned. But that brings us back to our basic, troubling question: Where do we get the life-giving traffic? CW and phone traffic handlers continue to worry about the future of their first love, that key or mike, perhaps justifiably, in the face of the new digital technology. Here are a couple of solutions for you to think about and act on:

1) Every traffic handler must convey the joys and operating pleasures of traffic handling to newcomers. Looking for a good example of how this can be accomplished and how effective it can be? Refer to this column in April *QST*, "NTS Wide-Area VHF Net Attracts New Hams." Gordon Booth, N7THH, of Hillsboro, Oregon, explains how the development of a VHF net attracted dozens of new Technicians to the art of traffic handling, an example that has been repeated in other parts of the country. With new traffic handlers generating messages at the local level, the upper level nets get fueled, keeping interest and activity high.

2) Pacific Area Staff Chairman Hank Garretson, W6SX, of Littlerock, California, offered this one recently: Every amateur checking into a net must not come empty-handed. Even if it's just a howdy to Aunt Bea in Mayberry, USA, if every check-in brought at least one message to send, think of the amount of traffic that could vitalize Section, Region and Area nets. Think it doesn't have potential? Think again. Check into your Section net tonight and look at how many are QNI, QRU. "Each One, Bring One" should be our battle cry from this day forward.

With more traffic, it's a win-win situation for everybody: Digital-mode fans get traffic to hone their systems and skills, and CW/phone operators get traffic to keep the traditional phone and CW nets going. We'll have a vital NTS that can boast the latest in technology, while proudly preserving its heritage as a foundation for its mission: Accurate and efficient movement of formatted message traffic from origin to destination as a public service, and training a cadre of Amateur Radio operators to handle message traffic in an organized, integrated network environment to prepare for emergency and disaster situations.—*Rick Palm, K1CE*

SPECIAL OLYMPICS: THE SUPREME PUBLIC SERVICE EVENT

By Rob Finch, WB6KFA
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Sonora, CA 95370

"Let me win, but if I cannot, let me be brave in the attempt."

This is the story of how amateurs provide volunteer communication services for the California Special Olympics. It begins in 1989, when Tom Diskin, N7TD, and I volunteered as ham communicators at the 1989 International Special Olympics in Reno, Nevada, and the Lake Tahoe area. Working with the special athletes was, and still is, an unparalleled adventure.

The International games included athletes from all over the world, a bevy of stars from stage, screen and television, and several thousand volunteers. We discovered these games were something special, and providing support through Amateur Radio was a wonderful opportunity.

The next year, Tom and I approached the California Chapter of the Special Olympics Committee. Through Amateur Radio, we wanted to give something back to our own communities and others throughout California. Our goal was to provide emergency and logistical communication services to the California Chapter Games, supporting two of the three California games, the Fall Classic and the Winter Games. The Summer games in Los Angeles are supported by a separate amateur group. The California Chapter Games involve several thousand athletes, volunteers and family members. The Olympic games include Alpine and Nordic skiing, power lifting, volleyball, soccer, cross country, bowling and roller skating. Events of this scope and complexity require sophisticated and effective communication. Physical injury and other emergencies can occur. Transportation must be available when needed. Effective support of the games committee is critical for a successful event. Handling of scoring must be prompt. With this in mind, high-quality voice communication, computer scoring services and logistical support is our goal.

ROB FINCH, WB6KFA

Dave Clapper, KC6FGW, of San Jose, California, and Tom Diskin, N7TD, of San Mateo, at the Special Olympics in the Tahoe region.

Local amateurs contribute time and equipment. Repeaters are reconfigured and dedicated for the games events. Slow-scan TV transmits a picture from the bowling venue to the games headquarters so that games participants can view activity on the alleys. Amateurs have contributed thousands of hours since 1990 in support of the California Special Olympic games. Volunteers develop a special affection for this effort.

You can help, too. Games are held locally, by regions or chapter, and statewide. All that's needed to get started is a dedicated group of amateurs, probably a base station, possibly a packet station, and hand-held radios.

If you'd like to join the California Special Olympics "C" team or obtain advice on how to approach supporting Special Olympics in your area, contact Rob Finch, WB6KFA, or Tom Diskin, N7TD, 330 Portola Dr, San Mateo, CA 94403.

THE REWARDS OF BEING A HAM

By Fred Pachaly, N1KPY
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For 28 years I tried to get my ham license. The biggest obstacle was learning Morse code. It seemed impossible to learn the minimum 5-wpm requirement. The theory wasn't a problem because I've always liked electronics and understood electrical principles.

How I got Hooked on Handling Traffic

First, we must set the stage for this story, which took place in 1952—so long ago that many of today's hams and *QST* readers aren't familiar with the state of the communications art at that time. In 1952, the transistor was an object of experimental curiosity, having been invented at Bell Labs only a few years earlier. This was still five years before *Sputnik I* became the world's first artificial Earth satellite, so there were no communication satellites.

With the exception of commercial undersea telephone cables that served the most heavily trafficked routes (eg, North America to Europe), international communication was via shortwave radio. The technology was quite decent, with high-power transmitters, high-gain antenna arrays for transmitting and receiving, and multiple-diversity receivers.

There was a bumper crop of new hams on the air—the ones who had taken advantage of the new Novice license, which had been introduced in July 1951. I had come on the air as a Novice in January 1952 and then went on to General in April 1952. I read some current issues of *QST* and got interested in the idea of traffic nets. The National Traffic System at that time was only three years old!

At the time, I was living in Kentucky, so I bought a crystal for 3600 kHz (my first VFO was to come two years later) and made my NTS debut on KYN, the Kentucky CW Net, on October 7, 1952. "JB," W4BAZ, was performing the duties of Net Control Station that evening. Through the tutelage of JB (now a Silent Key, but still the subject of many on-the-air conversations among the hams he mentored) and other veteran traffic men, I learned enough to hold my own on KYN.

I checked into KYN the evening of November 12, 1952, and a message was listed by W4TAV for Bowling Green. I was the closest station, so I took the message, which had originated from Midway Island, and I mailed it the following morning in a First-Class envelope with a 3-cent stamp on it (remember, this was a *long* time ago). The text of the message was "ARL 3 LOVE," which (in those days) translated to, "AM PERFECTLY ALL RIGHT. DON'T WORRY." It seemed rather routine to me, except for the exotic place of origin. Wow! KM6BE, on Midway Island, way out in the Pacific!

Two days later I received a very appreciative letter from the addressee, explaining the circumstances of the message. His daughter was married to a serviceman stationed on Midway Island and she was there with her husband. A strong typhoon had tracked directly over Midway and had taken down all the big commercial and military antennas, closing down all military and commercial communication circuits. KM6BE and some other Midway hams had managed to put up temporary antennas and started transmitting health-and-welfare messages to the folks back home.

The message I had delivered was the first word the addressee had received from his daughter and son-in-law, almost a week after it was reported that the typhoon had done great damage to Midway. The news media had reported the typhoon, but then all communication with the island had gone out. Until that radiogram reached the addressee, he didn't even know if his kids were still alive. (If I had known the circumstances, I would have delivered the message by telephone! The phone number, by the way, was 4284. It was a *long* time ago!)

Hearing the story behind the message made quite an impression on me. At age 16, I had been hit over the head with the fact that Amateur Radio traffic handling could be very important to people, sometimes when you don't even recognize its importance.

So here I am, 42 years later, still checking in often on the Connecticut Net (CN), the Connecticut Phone Net, the Nutmeg (VHF) Net, and MDD (the Maryland, Delaware, DC CW net). I find myself irresistibly drawn to the Section nets. You meet nice people there—excellent operators, radio pioneers who can spin fascinating stories of their own early days in radio, and new hams that you can help as they are gaining their proficiency.

And, who knows?—one day another important message might come along that you could help with.

Copies of the *ARRL Net Directory* are available from HQ for only $2. The *Net Directory* lists the frequencies and schedules of all nets that are registered with the National Traffic System, and it lists the QN signals and other information to help you get into CW net operation. Get one and then try checking into your local and Section nets. Who knows...?—K3KMO

My luck was about to change. The new codeless Technician license became a reality and I seized the opportunity. Still wanting more operating privileges, I had a new reason to work on upgrading my license by passing the code test. After much work, I passed the 5-wpm exam with ease. My lifelong dream of being a ham finally came true. But little did I know that much more was in store.

I worked on several public service events over a period of a year (the American Diabetes Walkathon and the Tony Fenton Bike Race, to name two). I also got interested in emergency and disaster communication. It's gratifying to help others in need. On March 13, 1993, a major snowstorm with flooding hit our area. It became known as the "Storm of the Century." All morning the local repeater crackled with conversation of possibly activating Amateur Radio nets. The call was issued at 10 AM for available hams to provide emergency communication. I responded that I'd like to provide communication for the Red Cross shelter that was to open at noon at the high school across town. The Emergency Coordinators went off-line to decide if I should venture across town because of the poor driving conditions. Their decision would change my life.

The answer came back in about a minute: Yes, I should go to the shelter. I quickly gathered my portable radio equipment. I packed warm clothes and personal necessities because it looked like I might not return home for a while.

I had never been to Norwalk High School before and asked for directions over the radio while *en route*. The snow was so deep that I could hardly find the driveway. I saw the Red Cross emergency trailer by the door near the gym and I parked nearby. I walked into the gym and introduced myself to the Red Cross officials. They were glad to see me. Within half an hour, a reporter and crew for the local cable TV provider showed up and spoke with Red Cross officials and me in separate interviews.

Signs needed to be posted throughout the corridors to direct people to various facilities. I had already reported to disaster headquarters that I had arrived and set up an area for communication, so now I helped post signs (keeping my 2-meter hand-held transceiver with me). I worked with the Red Cross Disaster Services Chairperson, Felicia. I thought she was the wife of a fellow ham in the Greater Norwalk ARC. I started to ask her "Are you married...?" and realized that I couldn't remember the fellow ham's name to whom I thought she was married, so I didn't complete the sentence. Felicia's response was "no." Feeling more than a little awkward, I told her what I was trying to ask. She told me that her brother-in-law was a ham, and then we went about our work.

The author and his bride, Felicia, met in the "Storm of the Century."

We spent the next 23 hours working together. The storm was so intense, we and other volunteers opted to remain, rather than risk venturing home and requiring replacement staffing to come in. At dinner, we sat at a table with Red Cross volunteers. Felicia was directly across from me and we talked for some time. After the storm, we shut down the shelter operation. The disaster headquarters closed because the town was getting back to normal. As we shoveled our cars out of the drifts (with help from the fire department), I said goodbye to Felicia. I gave her my phone number and asked her to call me so we could go to dinner.

The following Tuesday I was wondering if Felicia was going to call. I couldn't wait any longer, so I called her. We talked for more than three hours that first time. We had dinner and agreed that we wanted to see each other again. As we talked, we found that we'd both been involved at different times in two Red Cross shelters the previous December. It seems that Fate intended us to meet and kept trying to bring us together, despite the great inconvenience it caused many other people. Last May, a little more than a year since the storm, Felicia and I were married.

Field Organization Reports
June 1994

Section Emergency Coordinator Reports

There are 37,658 ARES members accounted for in SEC records. The following SECs reported this month: CT, ENY, GA, IN, LA, KY, MDC, MI, MN, ME, NE, NFL, NTX, NV, OH, SD, SC, SFL, TN, VA, WMA, WPA and WV.

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	%Rep to Area
Cycle Two						
Area Nets						
EAN	30	628	20.93	0.521	88.9	
CAN	30	798	26.60	1.047	98.8	
PAN*	60	310	5.17	0.360	85.0	
Region Nets						
1RN	60	498	8.30	0.553	95.0	100.0
2RN	59	203	3.44	0.328	91.9	96.7
3RN	30	87	2.90	0.196	90.0	70.0
4RN	60	255	4.25	0.240	67.0	96.7
5RN	60	788	13.13	0.476	90.0	100.0
6RN	60	346	5.77	0.366	93.3	100.0
7RN	62	228	3.67	0.260	74.0	96.6
8RN	60	333	5.55	0.375	100.0	90.0
9RN						96.6
TEN	60	266	4.43	0.303	79.0	100.0
TWN	53	148	2.79	0.360	69.0	58.3
ECN						80.0
Cycle Three						
Area Net						
EAN	29	137	4.72	0.333	69.4	
Region Nets						
1RN	30	49	1.63	0.191	95.2	96.5
2RN	30	90	3.00	0.315	92.0	75.8
3RN	20	14	0.70	0.110	45.6	62.0
4RN						72.4
8RN						75.8
ECN						37.9
Cycle Four						
Area Nets						
EAN	30	903	30.10	0.974	94.3	
CAN	30	469	15.63	0.906	100.0	
PAN	27	401	14.85	0.604	82.7	
Region Nets						
1RN	60	405	6.75	0.662	96.7	90.0
2RN	60	177	2.95	0.350	95.8	90.0
3RN	57	179	3.14	0.290	95.0	100.0
4RN	60	470	7.83	0.420	91.6	96.6
5RN	55	410	7.45	0.400	90.0	100.0
6RN	60	290	4.83	0.405	94.0	96.3
7RN	60	299	4.98	0.499	78.3	96.3
8RN	47	190	4.04	0.281	72.0	100.0
9RN	60	313	5.21	0.792	96.0	100.0
TEN	60	191	3.18	0.311	65.8	100.0
TWN	60	21	0.35			55.5
ECN	47	78	1.66	0.259	76.0	96.6
ARN						86.6

*PAN operates Cycles One and Two.

ARRL Section Traffic Managers reporting: AK, AL, AR, AZ, DE, EB, EMA, ENY, EPA, EWA, GA, CO, CT, IA, ID, IL, IN, KS, LA, LAX, MDC, ME, MI, MN, MO, MT, NC, NFL, NLI, NNJ, NTX, NV, OH, OK, OR, ORG, RI, SB, SC, SD, SDG, SFL, SNJ, STX, SV, TN, VA, VT, WI, WMA, WNY, WPA, WTX, WWA and WV.

Transcontinental Corps

Area	Successful Functions	%Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	91	75.80	257	626
TCC Central	85	94.00	166	223
TCC Pacific	55	45.80	120	110
Summary	231	71.86	543	959
Cycle Three				
TCC Eastern	24	85.71	n/a	36
Cycle Four				
TCC Eastern	87	87.00	188	660
TCC Central	44	63.80	132	311
TCC Pacific	102	85.00	304	616
Summary	233	78.60	624	1587

NTS *APLink* Total: 4907

TCC Roster

Eastern Area, Cycle 2: KW1U, Director. N1DHT K1EIC W1EFW W1FYR WA1KKP N1OTC KT1Q W1WCG W2FR KA2GJV N2LTC W2MTA N2XJ N3DRM AA4AT N4GHI WX4J K4MTX N4SS K8TPF WD8V KA8WNO WB8YDZ W8YP VE3AJN VE3GNW VE3GSQ VE3ORN.

Eastern Area, Cycle 3: W2FR, Director. N1OTC W1EFW W1WCG W2FR W3OKN W3OKN K4MTX K8TPF KA8WNO.

Eastern Area, Cycle 4: W2FR, Director. N1QTC K1EIC KT1Q KW1U W1CE W1EFW W1FYR W1NJM W1UD W1WCG WA1KKP N2LTC W2FR W2GKZ W2MTA W2RQ WB2EAG N3DRM W3PO AA4AT K4MTX K4WJR K4ZK KO4BJ N4GHI N4SS W4UQ WX4H N6ANQ K8TPF KA8WNO W8PMJ WD8V VE3AWE VE3FAS.

Central Area, Cycle 2: W4CKS KG5GE W5JDF N5KKI W5KLV W5QFU K5UPN KE5ZV WØFE WBØWNJ VE5KZ.

Central Area, Cycle 4: K5GM, Director. WB4FDT K5GM W5JDF AJ5K N5TC W5TFB K5UPN KB5W W9FC K9PUI WA9QCF WØGRW NØSM.

Pacific Area, Cycle 2: ND5T, Director. NZ2T W5JOV ND5T KT6A WB6DOB AB6EU KF7AG W7TGU KA7YYR WAØYNP.

Pacific Area, Cycle 4: W7GB, Director. ND5T W5JOV W6EOT WF6O W6VZT AB6YR NR7E WA7EES KA7EKL W7EP W7GB W7GHT KB7GZU NN7H W7LG N7MPS W7VSE K9JM KJØG WTØG KØTER.

NTS *APLink* stations: W1FYR N2JAW NZ2T W4KAU N3EMD W3GL WX4J KQ4ET KK4CQ KM4DY AI5D N5KKI N5KSI KS5V W5VBO N6EQZ N6IYA AA7HS K7BUC K7SLI KD7UM KE7XO WA7SJN W7DCR WA8DRZ WI7D WA9FCH WA9WCN NØFBW NØIA, KAØJRQ.

Public Service Honor Roll

Correction: The wrong (and former) PSHR point criteria was mistakenly published in the July QST *column, page 91. We apologize for any confusion this caused. The correct PSHR criteria appears below.*

This listing is to recognize amateurs whose public service performance during the month indicated qualifies for 70 or more total points in the following eight categories (as reported to their SMs). Please note maximum points for each category:

1) Checking into a public service net, using any mode, 1 point each; maximum 60.
2) Performing as Net Control Station (NCS) for a public service net, using any mode, 3 points each; maximum 24.
3) Performing assigned liaison between public service nets, 3 points each; maximum 24.
4) Delivering a formal message to a third party, 1 point each; no limit.
5) Originating a formal message from a third party, 1 point each; no limit.
6) Serving as an ARRL field appointee or SM, 10 points each appointment; maximum 30.
7) Participating in a communication network for a public service event, 10 points each event; no limit.
8) Providing and maintaining an automated digital system that handles ARRL radiogram-formatted message traffic, 30 points.

Stations that qualify for Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from HQ upon written notification of qualifying months to the Public Service Branch at HQ.

736 NM1K
698 NZ2T
503 N2JAW
461 WB5NKD
389 WD8V
281 WB2UVB
263 AB6EU
262 N8ODZ
256 WØQYH
244 WB5NKC
237 KJ5GE
236 KA2ZNZ
234 KØBXF
233 KF2VL
228 NY1H
216 N2MSM
215 KD4ELI
201 N6NAV
198 KD4GR
196 W9YCV
192 N2FET
191 KL7Q
189 KA2VZX
188 N5YZM WA1TBY KC4TFF
187 K5DPG KK1A
185 KB2KLH
180 AD4BL
177 KQ4ET
174 K4SCL WB6DOB
173 KB5WEE
172 AF2K N4JAQ
171 KD6CCF K9DHR
170 KM4DY
168 KB2CDB WI2G WA8HED
166 K4IWW
164 N2GJ W4ZJY
163 WA1FNM
162 N2DXP WA2UKX
161 WØNBT N1FLO N2LTK
KA9KLZ WE2G NR2F
160 WA7EES
159 WB2FTX W2RRX
158 KB2EPU
156 WA9VND
155 KB5GLV
154 N1LKJ
153 N2EPH W7NWP W7VSE
152 K2DN WDØGUF
149 K2BCL NR9K WA4PFK
148 K2GNZ W5YQZ WAØTFC
147 WB2ZIE W7AZU N5WQX
146 W2HOB AD4KA
145 W2QNL KT6A ND2S
144 N1OTC
143 NX1A K4BGZ
142 KT1Q
141 W1EFW K4ZK KC4RNF
139 N2PIF W7WAT N2LTC W1KX WX4H
138 W7GB KA2GJV W2MTA N9BDL N8RBE NØWPA WA4NDA
137 KR4MU
136 KA4FZI N4GMU
135 WB2CZW KB5RUG
134 K2YAI KB9ENO WB4TVY
133 N2FHJ KA1GWE
132 K2UL KI4YV KO4DR
131 KD1LE KD7ME KJ9J
130 KA2CQX K6UYK WBØLES KFØFI
129 AA2NX KFØTK W2PTZ
128 K7UOF WB8SYA NØMEA KC3Y KD8HB WD4LOO
126 WAØSXR N1IST W9UMH
125 N3NNH WA2YBM KK3F WB8JGW N8FWA
124 KI5TI KF2KN WB4WYG W9CBE N2OM W9CBE K4AIF
123 KB7JQM KJ3E N2JBA
122 N2TQN KE2JX N1HYF K3GHH KE4KEU
121 N2YGN K2VX WA3UNX WA4JDH N2OWN
120 KG5GE W2MTO KI5NL
KA7YYR
102 KD1DS
101 KA2JMA WD5GKH KC5EIV KB8HJJ
100 WA2CUW KG2D AG9G K9KSA W4DGH
99 KA9FVX WB2QIX
98 W7GHT
97 KB2HJJ NY2V KB4WBY WB5ZJN
96 N2SAA N5OWQ N5TFB WB4ZNB W4PIM
94 KA1RSY W2CC N9KHD
93 KD5GM WD4EKA
92 N3LDY
91 WB6OTS N4LST N4ZNO WM1C
90 WB5CDX N1LRT KA7TTY N5TTU W1JTH
89 N2DLN
88 KD4QXF WA4EYU
87 N2UHD
86 WB4FDT
85 WB8KQJ WD8IKC
84 W7PFD KA6TND WA5FXQ KC5DEM
83 KA1VEC WB8BGY W4SVG W4NTI KO4OL
81 N5IKN WB6ETY N8AUH KN4FNY
80 N2JRS NU2U WF6O N5WOY KE4GEG
79 N2DIY KR6K K8ZJU
77 W2AZ KC4ZHN
76 WA4QXT WA8DHB KA2YZM WA4GLS KE3FL KD4TQN
75 N6GIW AD4IF
74 N1FWV K3ORW N6GHG
72 KD6YJB W4BNY WB2EAG KA4LRM
71 N2SOE N2SPY KC6ZEC
70 WØYMB WA3FYZ KA7CSP
119 N2SXO N2JOA KA1JXH WA8SSI AD4CN
118 AAØDM K6AGD KA7AID WA2PCS KB2KOJ AA9HN KØERM W5CTZ KBØBXE
117 KF2ER WA4EIC WJ3K WB2IIV KB5SFE KA4HHE KR4QK
116 KB1AF KA9EIZ
115 N8JSO KB2ETO KEØAH
114 N2SSS W5RZV N3DRM
113 N5OUJ WD4DSS KC4VNO
112 KG7YF WB5YDD
111 N2OPJ KD4RZP
110 KC6SKK W6VOM N4YYQ N6FWG
109 WB2VUK WNØY
108 AAØPY K7GXZ WI3A W4CKS N1DHT
107 KA5YDJ KB2MQP K8SH N2TOY
106 N7THH W2FP
105 KA1WCD WA1CSO
104 KDØYL W2DMM WB4GGS
103 N2RPI K3UWO KB4MON W4ZBA

The following stations earned PSHR during May1994, but weren't listed in last month's column: WD4DSS, WB5CDX, K5DPG, KG5GE, KI5TI, KD5UY, N5WQX, N5YZM and KA5YDJ.

Brass Pounders League

Call Sign	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	1217	685	1405	101	3408
NZ2T	465	1591	941	65	3062
WB9YPY	0	1391	121	974	2486
NM1K	633	331	871	111	1846
N2JAW	196	612	637	13	1584
WX4H	0	764	766	11	1541
W3VR	380	336	501	35	1252
WB5NKD	5	339	433	348	1125
W9AYK	0	579	42	431	1052
WB5NKC	7	499	424	74	1004
NØFBW	117	401	333	17	949
W5YQZ	4	396	393	16	809
N1OTC	3	373	425	3	804
K4DOR	151	204	348	7	710
NØBQP	31	361	77	225	694
WA9VND	12	347	313	16	688
KJ5GE	44	311	300	25	679
KK3F	13	328	308	20	669
WA4JDH	0	311	342	3	656
KCØVL	28	366	64	178	636
NØDKK	30	340	0	264	634
WB6DOB	0	201	331	56	588
KT6A	7	249	321	10	587
KB4WBY	2	441	118	4	565
N2LTC	0	279	270	1	550
KA2VZX	1	264	275	10	550
AB6YR	11	237	282	5	535
KA1VEC	10	249	253	13	525
K6UYK	327	106	79	2	514
N4GHI	7	280	214	1	502

BPL for originations plus deliveries: KD4ELI 145, WA4PUP 140

Correction to the May BPL statistics: WA4PUP 507 points

The following stations qualified for BPL during April, but weren't listed in July *QST*: WX4H 1499 points, WA9VND 955.

Independent Nets

Net Name	Sess	Tfc	Check-ins
Amateur Radio Telegraph Society	30	330	301
BEARS of Manchester	30	279	471
Carrier Net	27	42	724
Central Gulf Coast Hurricane Net	30	45	2238
Empire Slow-Speed Net	29	91	366
Green Mountain Net	26	25	598
HBN	30	327	584
IMRA	26	610	1587
Michigan Traffic Net	30	44	840
Midwest RTTY Net	30	134	258
Mission Trail Net	30	52	876
NYSPTEN	30	83	455
Southwest Traffic Net	30	246	1120
Vermont Phone Net	4	8	78
7290 Traffic Net	48	457	3388
75-Meter ISSBN	30	225	931

QST

Meeting in Markdorf

In late June the presidents of the largest Amateur Radio organizations in each of the three ITU regions met to discuss a number of topics, especially how they can best support and complement the work of the International Amateur Radio Union in developing countries, and to compare notes on common problems faced by their respective societies.

The national Amateur Radio societies taking part in the meetings, held in Markdorf, Germany, just before the popular international convention in nearby Friedrichshafen, were the Deutscher Amateur Radio Club (DARC), the Japan Amateur Radio League (JARL), and the American Radio Relay League (ARRL). Attending were DARC President Horst Ellgering, DL9MH; JARL President Shozo Hara, JA1AN; ARRL President George S. Wilson III, W4OYI; IARU Region 3 Secretary Masayoshi Fujioka, JM1UXU; ARRL Vice President for International Affairs/IARU Secretary Larry E. Price, W4RA; JARL IARU Liaison Officer Yoshiji Sekido, JJ1OEY; DARC Foreign Advisor Hans Berg, DJ6TJ; and ARRL Technical Relations Manager Paul L. Rinaldo, W4RI.

Dr Price discussed IARU development activities, including the recent 1994 World Telecommunication Development Conference (WTDC) in Buenos Aires and the Union's goal of conveying the value of the Amateur Service as a cost-effective way of transferring technology, a difficult goal to achieve, he said. As previously reported (June 1994 *QST*, page 99), the Amateur and Amateur-Satellite Services were mentioned in WTDC output documents as useful in supplementing communications in the event of a natural disaster.

The DARC's Dr Ellgering said that the countries of eastern Europe present opportunities for assisting the continued development of the amateur services. Mr Fujioka stated that development in Region 3 has been concentrated in three countries and that, in general, assistance is best provided through the IARU, as it is highly respected.

Mr Wilson noted that in the US, with the Congress and with the FCC, the ARRL has emphasized that the amateur spectrum is analogous to a public park and is worth preserving for similar reasons.

The leaders talked about the apparent downgrading of the importance of radio, including Amateur Radio, in the minds of some telecommunications professionals, noting the incongruity of this view at a time when "wireless" is the carrier for many emerging technologies.

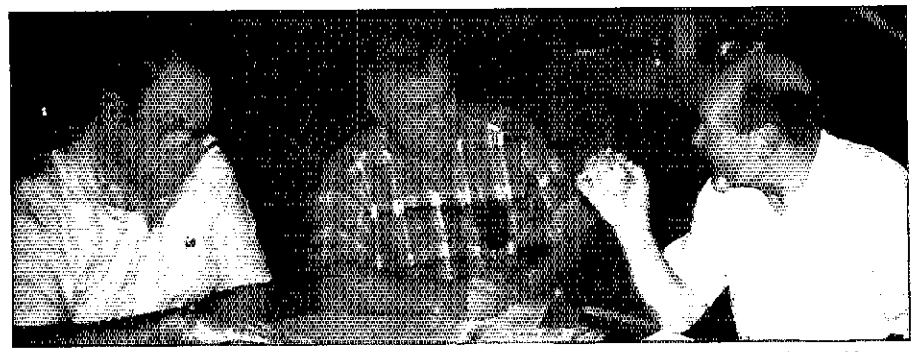
On the subject of the international regulations that require a knowledge of Morse code for licensing below 30 MHz, it was observed that discussions are taking place in some parts of the world as to whether it may be desirable to eliminate the requirement. Mr Wilson noted that it is the position of the ARRL Board that there be no deviation from the present requirement.

Most of the remainder of the meeting concentrated on how the world's major Amateur Radio societies, working with and through the IARU, can promote the development of Amateur Radio in the least developed countries (LDCs). IARU-sponsored "leadership courses" will be offered to officials and potential officials of emerging national Amateur Radio societies to help them in shouldering their responsibility to represent the radio amateurs of their countries, to the international Amateur Radio community as well as to their own governments.

It was agreed that potential development projects originated among the three participating societies will be coordinated with the appropriate IARU regional organization. It was further agreed that the IARU Administrative Council should be kept informed of any such efforts.

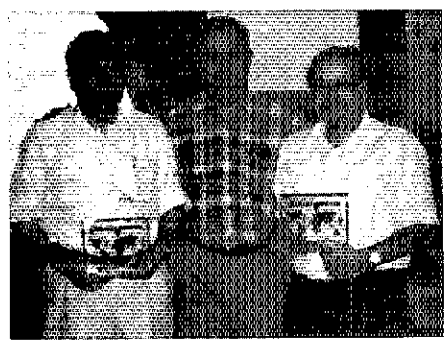
The representatives of the three national organizations shared information on their programs to promote Amateur Radio among the general population. For example, the JARL showed a highly regarded information pamphlet, while the DARC announced a PC-based multimedia course on Amateur Radio.

Other topics included the organizational structures of the three associations, including the election process, policy making, and administration; membership promotion and growth; licensing qualifications; and how interconnectivity standards for Amateur Radio equipment could be developed. QST



Larry Price, W4RA, and George Wilson, W4OYI, contemplate a point being made by Dr Horst Ellgering, DL9MH.

The Japanese delegation: Masa Fujioka, JM1UXU; Shozo Hara, JA1AN and Yoshiji Sekido, JJ1OEY.



To mark the special occasion, ARRL President George Wilson, W4OYI (center) presented glass plaques of a unique design to JARL President Shozo Hara, JA1AN (l) and DARC President Dr Horst Ellgering, DL9MH (r). It's such a nice design that we also kept one for ourselves; it is on display at ARRL Headquarters.

Conducted by John C. Hennessee, KJ4KB
Regulatory Information Specialist

Power, Type Acceptance and Modifications: Technical Standards—*Part 3*

The FCC, through Part 97, determines how the Amateur Radio service is regulated. Generally, Part 97 is a fairly broad set of rules. This is good because it gives amateurs latitude to experiment. Technical standards, in Subpart D of Part 97, are more specific and detailed than other subparts.

In the first of this three-part series on technical standards, we examined how amateur frequencies are shared with other services, domestically and internationally. The second part looked at standards for bandwidth, splatter, emission designators and spurious emissions. In this third and final part on technical standards, we'll look at the standards surrounding power and type acceptance.

Q: How much power may amateurs use?

A: Generally, an amateur transmitter may be operated with a peak envelope power (PEP) output of up to 1500 W [97.313(b)]. Under all circumstances, amateurs can't use more power than necessary to carry out the desired communication [97.313(a)]. Don't use a kilowatt when 10 meters is wide open, for example. When you reduce power, you also reduce the impact your operating has on others and your electric bill goes down.

Q: What other restrictions apply?

A: All FCC-licensed amateurs, regardless of class, are limited to no more than 200 W PEP in the following segments: 3.675 to 3.725, 7.10 to 7.15, 10.1 to 10.15 and 21.1 to 21.2 MHz [97.313(c)(1)]. FCC-licensed amateurs operating in ITU Regions 1 or 3 in the 7.050 to 7.075 MHz segment are also limited to 200 W PEP. [97.313(c)(3)]

Amateurs may use no more than 50 W PEP in the 70- and 33-cm bands near certain military installations [97.313(f) and (g)]. See page 106 of April 1994 *QST* or Chapter 5 of the *FCC Rule Book* for details. A station in beacon operation may use no more than100 W [97.203(c)] and a station being used to control a model craft can't exceed 1W [97.215(c)]. Stations using spread-spectrum emission types can't exceed 100 W [97.311(g)].

Q: Don't Novices and Technicians have additional power limitations?

A: Yes, Novices and Technicians are limited to 200 W PEP in their HF segments, including the 28.1 to 28.5 MHz subband [97.313(c)(2)]. General, Advanced and Extra Class amateurs may operate up to the full legal limit on the entire 10-meter band. Novices, but not Technicians or higher-class licensees, are limited to 25 W on the 222 to 225 MHz band and to 5 W on the 1270 to 1295 MHz subband [97.313(d) and (e)].

Q: Does this mean a Technician may use 1500 W PEP on 2 meters?

A: Yes, a ham with a Technician or higher-class license may use up to 1500 W PEP on any amateur frequency above 50 MHz. In most cases, however, it isn't necessary for most purposes to run that much power above 50 MHz.

Q: What does the FCC mean by PEP?

A: Peak Envelope Power is the average power supplied to the antenna transmission line by a transmitter during one RF cycle at the crest of the modulation envelope, taken under normal operating conditions. The modulation envelope refers to the way the information signal varies the transmitter output. Think of it as increasing and decreasing the transmitted signal. Find the maximum output signal level, then look at one cycle of the signal and measure the average power during that time.

Q: How can I measure PEP?

A: The FCC has chosen and published the following standards of measurement: (1) Read an in-line peak-reading RF wattmeter that's properly matched; and (2) calculate the power using the peak RF voltage as indicated by an oscilloscope or other peak-reading device. Multiply the peak RF voltage by 0.707, square the result and divide by the load resistance. The SWR must be 1:1.

Q: Am I required to be able to measure the power from my transmitter?

A: It isn't an FCC requirement, but if your power level is near the legal limit, it's in your best interest to make sure you don't exceed that level.

Q: Why doesn't the new power amplifier I just bought operate on 10 meters?

A: In 1978, the FCC banned the manufacture and marketing of any external RF power amplifier or amplifier kit capable of operation on any frequency below 144 MHz, unless the FCC has issued a grant of type acceptance for that model amplifier.[97.315(a)] To receive such a grant, the amplifier cannot be able to operate between 24 and 35 MHz, nor can it have accessible wiring, circuitry, internal or external controls, or instructions that will allow it to be operated in a manner contrary to FCC rules. It also must meet spurious emission standards [97.317]. The intent was to stem the flow of large quantities of amplifiers distributed for illegal use in and around frequencies used by Citizen's Band (CB) operators (under Part 95 of the FCC Rules.) There are exceptions to the type-acceptance requirement, addressed below.

Q: May I still build or modify an amplifier to operate on 10 meters?

A: Yes. Amateurs may use amplifiers capable of operation on 10 meters. The rules don't allow the *manufacture* of amplifiers that can operate on 10 meters, but the FCC allows amateurs to construct or modify an amplifier to restore or include 10 meters. An amateur may construct or modify no more than one unit of the same mode amplifier capable of operation below 144 MHz in any calendar year without a grant of type acceptance [97.315(a)].

Q: Is it legal for me to modify my amateur hand-held transceiver for operation outside amateur bands?

A: It isn't illegal to modify amateur equipment for out-of-band operation to enable Military Affiliate Radio System (MARS) and Civil Air Patrol (CAP) service, for example, because type acceptance isn't required for those services. You must, however, have authorization to operate there. *Using* an amateur transceiver to *transmit* outside the amateur bands, even if you are licensed in another radio service, is a violation because most services (excluding MARS and CAP) require FCC type-accepted equipment.

Q: May I modify nonamateur equipment for operation in the amateur bands?

A: You may modify any nonamateur equipment for operation on amateur frequencies, but once modified, you can no longer use it outside the amateur bands, in radio services that require type-accepted equipment because it would no longer be type accepted.

Q: I thought the FCC gave amateurs a preemption for transceivers with "extended-receive" capability.

A: That's correct; PR Docket 91-36 does not apply to using such a transceiver to *transmit* out of band, nor does it cover scanners separate from your amateur transceiver. For a copy, send a self-addressed, stamped envelope to RIB at ARRL HQ.

Q: How does the FCC make sure amateur amplifiers aren't modified for use outside the amateur bands, such as in the 11-meter Citizen's Band?

A: FCC Rules make it a violation for amateur amplifiers to be used for nonamateur

purposes. Nonamateurs are specifically prohibited from building or modifying amplifiers capable of operation below144 MHz without FCC type acceptance [97.315(a)]. All external RF power amplifiers and amplifier kits capable of operation below 144 MHz must have FCC type acceptance so that they can be marketed [97.315(b)].

An individual amateur may sell his or her amplifier, regardless of grants or waivers, provided that it's sold only to another amateur operator [97.315(b)(4)]. Amateurs may also sell a used amplifier to a *bona fide* amateur equipment dealer [97.315(b)(5)]. The dealer can sell those amplifiers only to other hams [97.315(b)(5)].

Q: I just bought a power amplifier at a flea market and it wasn't FCC type accepted. Am I in violation of FCC Rules? What rules must I keep in mind when buying and selling amplifiers?

A: External RF power amplifiers and amplifier kits don't have to be type accepted if one or more of the following conditions are met [97.315(b)]:

1) The device isn't capable of operation below 144 MHz;

2) The amplifier was manufactured before April 28, 1978, and has been issued a marketing waiver by the FCC, or the amplifier was purchased before April 28, 1978, by an amateur operator for use at that amateur's station;

3) The amplifier was constructed (not from a kit) or modified by the licensee for use at the licensee's station;

4) The amplifier is sold to another amateur or to a dealer;

5) The amplifier is purchased in used condition by an equipment dealer from an amateur operator and the amplifier is further sold to another amateur operator for use at that operator's station.

Q: What is type acceptance?

A: Type acceptance is an equipment authorization granted by the FCC. It's based on equipment-measurement data submitted by the applicant and is used to ensure that the equipment will function properly in the service for which it's been accepted. This acceptance applies to all identical units marketed by the same applicant/grantee.

Amplifiers or amplifier kits capable of operation below 144 MHz are the only sort of amateur transmitting equipment requiring type acceptance. Of course, all equipment must meet the FCC standards for purity of emission [97.307]. Manufacturers of amateur transmitting equipment other than HF amplifiers do not need to submit the specifications, or an actual unit, to the FCC for testing purposes unless specifically requested.

Receivers operating above 30 MHz are also subject to equipment authorization by the FCC. The emission limits for receivers are prescribed in Part 15 of the FCC Rules. Most receivers are subject to the FCC's notification process. All transmitting and receiving units that have been granted an equipment authorization from the FCC must be labeled with the FCC identification number assigned to that product.

Q: What's FCC type approval? What's the FCC's notification process?

A: Type approval is based on actual FCC examination and measurement of a sample of the equipment. Type acceptance is based on data supplied by the manufacturer. FCC notification is based on a manufacturer's notifying the FCC that the equipment has been tested and complies with FCC requirements. Notification doesn't require that actual measurement data be sent.

Q: Does the FCC ever deny type acceptance?

A: Yes. Specific type-acceptance standards are in Section 97.317. These standards ensure that amateur equipment won't be used for nonamateur purposes.

[Questions in this column have been prepared by ARRL HQ and are typical of those asked of ARRL Directors, Section leaders, HQ staffers and the FCC. Input for future columns may be sent to John Hennessee, KJ4KB, at ARRL HQ.] QST

Strays

SECRET SIGNALS

◊ A personal wartime value, precious at the time, can seem pitifully fragile years later. Yet, still bright in memory, it can live on and never dim. Here's one that's endured 50 years. Hundreds of military and commercial ship's radio operators—many of them hams, I know—serving on Allied cargo vessels during WW II often illegally transmitted coded radio signals. They were harmless emissions, logged as procedural signals; and no written copies were ever made. They probably puzzled enemy listening posts. Although there's no telling how many military and civilian Morse code operators were involved, nor who they were, it's no mystery what they sent or why they sent it.

In wartime, ships maintain "radio silence" at sea for fear of revealing the ship's position. In time, this builds up an occupational frustration in a radio operator. Trained to communicate in Morse code, he's now prevented from transmitting. All he can do is listen, listen, listen and copy, copy, copy.

WW II merchant ships got their orders from shore stations via daily coded radio broadcasts called BAMS, short for Broadcasts to Allied Merchant Ships. BAMS used a numbers code: groups of five digits transmitted at scheduled hours. And day after day, four to eight hours a day, the shipboard radio operator listened for messages addressed to his vessel and copied meaningless numbers. The only permissible transmission was **SOS** or **SSS**.

The former is, of course, the international Morse code distress signal sent only when a ship is in imminent danger of sinking. **SSS** was a special wartime distress signal sent by a ship under submarine attack. What radio operator ever wanted to have to send either of those!

But ships eventually arrive somewhere. When in a port, a merchant ship's radio operator was required to test his transmitter by requesting a signal report from the port's shore station. The wartime procedure for this kept the names of vessels in the port secret. A ship's radio operator requested a signal report by sending simply the letters **OE**—two short letters in American Morse code. An **O** in American Morse is two dits with a slight space between them. Actually, most operators used the International Morse letter **I** in lieu of the American Morse **O**, which made the signal DIDIT DIT instead of DIT-DIT DIT. Upon hearing this signal, the shore operator would reply with an International Morse number from 1 to 5, indicating the ship radio's signal strength. He never knew what ship sent the DIDIT DIT. Usually he replied with a 5, DIDIDIDIDIT. And that was the end of the exchange—officially.

Well, the ship's radioman—let's call him Sparks, for that's what his shipmates called him—has been at sea copying BAMS in the Pacific Area Theatre for who knows how long. He can't possibly be satisfied with such a tidbit of conversation. Here he is, safe from submarines in the port of Ennui, let us say, on the north coast of New Guinea, where in this steamy rainy season there's nothing ashore but jungle and mud. So, bored and frustrated, and knowing that anything else he sends is illegal, Sparks must—for politeness' sake, at least, he reasons—express his thanks for the signal report. He takes the law in hand and sends **TU**, "Thank you."

The shore operator smiles. He's been at sea and recognizes Sparks' frustration. Illegally, he sends a signal in reply: **DMI**—short for "Don't Mention It." This is a much longer transmission, takes maybe two seconds.

Delirious in the ecstasy of a long-awaited QSO, Sparks plunges ahead with another misdeed. He sends **PAM**—a 50% longer transmission, about three seconds, meaning "Pleasure all mine!" But pleasures soon end. The shore operator now tells Sparks, "Okay, good to talk with you. I got your signals fine, but I must stop now." He says all this with the affable and cordial, albeit extremely brief, customary preliminary to ending a CW QSO: DIT DIT, taking maybe half a second. One final instant of rapture remains for lonesome Sparks aboard his ship. He simply must acknowledge the shore operator's DIT DIT with the shortest signal of all. He closes the "ragchew" with the usual DIT.

Now he's ready to go back to sea. Sparks has talked with someone on the air—a pitiful "ragchew" of perhaps 10 seconds.

Big deal? Yes, it really was, at the time. A spark of enjoyable comradeship. A rare bright moment in a war that to many of its veterans was only yesterday.—*Steve McCallum, K4URX, Lexington, Kentucky*

Conducted By Emil Pocock, W3EP*

Strange Doings in the E Layer

June 1994 will be long remembered as one of the most incredible months in radio's history for sporadic-E propagation on the VHF bands. LarryLambert, NØLL, observed E-skip on 50 MHz every day of the month except June 1. Long-time FM-band DXer Pat Dyer, WA5IYX, recorded over 3500 minutes of sporadic-E signals on 88 MHz or higher during June, the third-highest month he has observed in over 20 years of continuous monitoring. That works out to an average of nearly two hours per day. In view of these indicators, it should come as no surprise that there were nine separate 144-MHz sporadic-E openings on eight days in June. But that was not all! At least two 222-MHz E-skip contacts were completed during the widespread 2-meter opening of June 21 and 22.

The spectacular sporadic-E conditions were not limited to North America. Canadians and Americans—and not only those on the East Coast—worked Europe on seven days in June, and the band opened on four other days to the Azores or North Africa only, for an astonishing total of 11 days of transatlantic 50-MHz propagation. In his monthly newsletter, 6-meter band-watcher Ted Collins, G4UPS, reported 50-MHz sporadic E on 28 days from Southern England. Other Europeans noted several days with intense144-MHz E-skip. The unusual conditions seemed to have extended to the Southern Hemisphere, as well. Bob Cooper, ZL4AAA, wrote in his monthly summary of VHF activities that there was, "a quite incredible amount of E_s propagation for midwinter, especially the 2-meter reception." Bob heard 6-meter sporadic E propagation on 26 days in June—unusual for the reverse winter season.

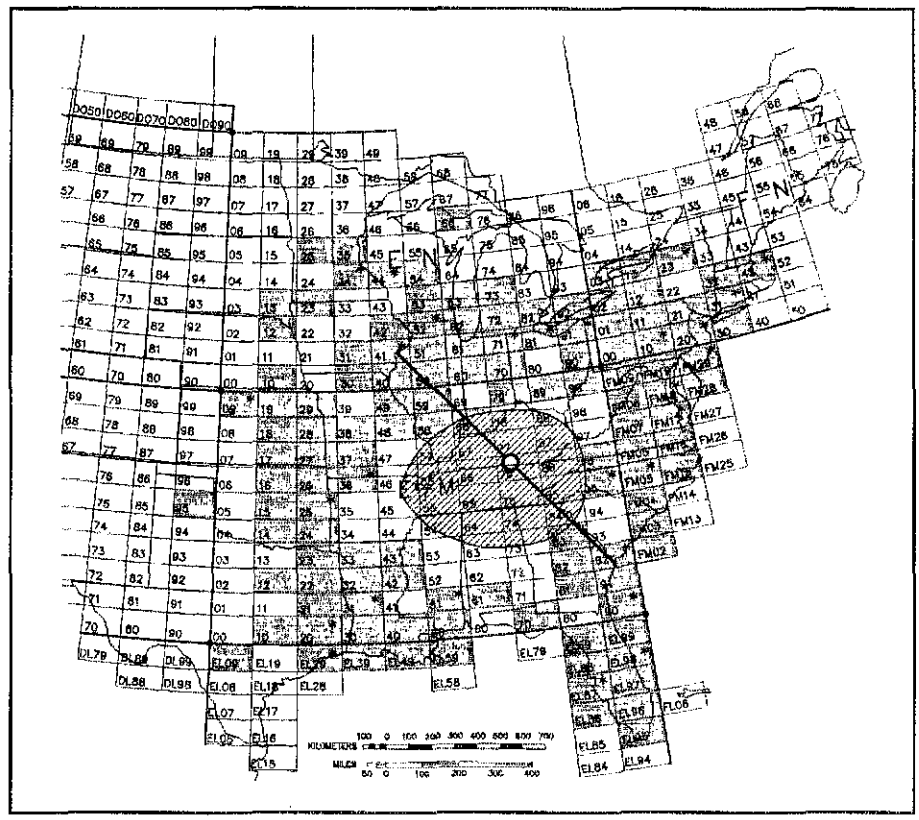


Figure 1—Much of the eastern half of the country participated in the 144-MHz sporadic-E opening of June 21-22, 2256 to 0315Z. Shaded grids are the locations of participating stations. Asterisks mark grids of stations that provided reports. Virtually all the midpoints of reported 144-MHz contacts fell within the darkened area, the presumed location of the most-active-region sporadic-E clouds. The solid line indicates the path of the two 222-MHz contacts, with their midpoints noted by the small circle.

June 21-22

Of all the sporadic-E openings that occurred during the month, that of June 21-22 was the most unusual. The day began normally. Sporadic E was evident on 50 MHz as early as 1200Z on June 21, not all that unusual for a mid-season morning, and there was E-skip most of the day over a large part of the country. During the afternoon, the maximum useable frequency (MUF) began to rise quickly. By 2250, it had reached 144 MHz. Roger Webb, WB4WTC (EM95), logged one of the first 2-meter contacts of the opening with KB5WMY (EM32) at 2256Z. He continued hearing and working E-skip on the band for nearly three hours, but others were able to enjoy the opening for a bit longer. Dave Blaschke, W5UN (EL29), probably made the last 2-meter E_s contact of the evening at 0315Z with K8UC (EM99).

Much of the eastern half of the US was able to participate in this widespread 2-meter opening during the more than four hours the MUF stayed above 144 MHz. Several hundred stations were involved, probably making this the most widespread 2-meter E-skip event every recorded. The accompanying map (see Figure 1) shows the grids with stations known to have made contacts. The midpoints of all the known contacts concentrated in an area centered over Tennessee, the presumed location of the sporadic-E clouds responsible for the opening. All but a handful of path midpoints fell within this region.

Many stations 400 to 1200 km distant from the active region were able to make 2-meter contacts with stations equally distant on the other side. Bob Smith, WD4MGB (EL87), for example, made 138 QSOs from Florida into Minnesota, Wisconsin and Michigan and then south to Missouri, Illinois, Indiana and Ohio. Similarly, Randall Windham, KG5MZ (EM51) in Mississippi, made 46 contacts with stations in New Jersey, Pennsylvania, New York, Connecticut and Massachusetts.

Typical SSB/CW signal reports were loud—well over S9, even for low-powered stations. As has been noted on many other such occasions, it does not take much to make a contact. Randy Rand, AA2U (FN20), made his first 2-meter E-skip QSO with WA5WXD (EM40) at 0152Z using just 5 W to an HF trap vertical. The distance was a typical 1800 km. Many FM contacts were made higher in the band as well. Stations most distant from the sporadic-E center, such as those in New England, reported fewer contacts and weaker signals.

Unusual Distances

The calculated maximum distance for a single sporadic-E hop at any frequency is about 2300 km, assuming an average E-layer height of about 105 km. Many contacts were reported at just about 2300 km, but a significant number were further than that. Rich Westerberg, NØHJZ (EN34), hooked up with W4EMB (EL95) at about 2400 km, for what was probably Rich's longest contact. W5UN had a string of 2300+ km QSOs from his south Texas location into New England, including one with KM1H (FN42) at about 2600 km—probably the longest contact during this opening.

These contacts stretch the theoretical limit, but are far from the 3495-km sporadic-E record. They could be accounted for by favorable tropospheric conditions on one or both ends of the path, somewhat higher than

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average E clouds, or favorable station locations. In the case of W5UN, at least, an EME array of 24 Yagis and maximum power may have also helped.

More significant were the short contacts, as distance can be directly related to the maximum useable frequency. The shorter the distance, the higher the MUF. Typical distances worked during this opening were in the 1600 to 2000-km range, indicative of a sustained MUF of 165 to 200 MHz. The MUF exceeds 222 MHz when 144-MHz contacts get shorter than 1450 km—and there were quite a few 2-meter contacts in the 1200 to 1450-km range! Among the shortest contacts were WA8KNE/4 (EM90) and KS0F (EM48) at 2318Z, KF5IU (EM31) and WB4WTC (EM95) at 0033Z, and KD0PY (EN41) and NA4I (EM83) at 0129Z. These and similar 144-MHz QSOs suggest that the MUF exceeded 222 MHz over a 2-hour period, so where were all the 222-MHz contacts?

222-MHz Contacts

In spite of what was probably the highest sustained MUF ever recorded for a sporadic-E event, just *two* 222-MHz contacts were reported. While Andy Blackburn, WD4AFY (EM92), was working Midwestern stations on 2 meters (some as close as 1450 km), he announced that he was also listening on 222.1 MHz. At 0047Z, he heard Jim Roseman, W9UD (EN41) calling CQ and quickly made contact over the 1331-km path. Ironically, W9UD and WD4AFY had just completed a 144-MHz contact at 0029Z. Signals on 222 MHz were 59 on SSB both ways, but both Jim and Andy reported that the audio sounded rough, like aurora. Andy was running 100 W to a fixed Yagi at 20 feet and had just gotten on the band a month before.

In the meantime, Jim had alerted his neighbor Pete Beedlow, NN9K (also EN41), to what was happening. Nearly an hour later, W9UD and WD4AFY repeated their feat as NN9K also hooked up with Andy at 0138Z. Pete's contact was a tad shorter—1330 km. No other 222-MHz QSOs have been reported, although all indications are that many should have been possible. In any event, these contacts were made on the highest frequency ever recorded for two-way sporadic E. Congratulations to all three operators for some fast thinking and sharp operating!

There is little doubt that these were E-layer contacts, but they exhibited some unusual characteristics. They were over exceedingly short paths, so short that conventional calculations yield an MUF of over 350 MHz. On the face of it, these contacts appear improbable. Certainly 144-MHz contacts being made at the same time indicated that the MUF exceeded 222 MHz and could have supported 135-cm paths, but over much longer distances than actually took place. This is probably not a unique occurrence. The very first 220-MHz sporadic-E QSO between K5UGM (EM12) and W5HUQ/4 (EM90) in June 1987 was also over an unexpectedly short distance—1500 km in that case.

The other odd feature of the most recent 222-MHz contacts were the reports that the audio had a rough, aurora-like sound to it. This is the same way 144-MHz contacts made by E-layer field-aligned irregularities (FAI) are described, save that FAI contacts are typically weak and never made over the direct great-circle path. Certainly something extraordinary happened at 222 MHz that does not quite fit the current models of E-layer propagation. Perhaps some other mechanism related to conventional sporadic E, but not quite the same, was responsible in both cases. Further experience with E-layer propagation at 222-MHz or higher frequencies, may help clarify these unusual circumstances.

144-MHz FAI

WB4WTC heard several 2 meter stations via FAI while all this was going on. He copied W5UN while beaming due west, considerably off the great-circle bearing; the signal was weak and rough sounding, like typical FAI propagation. Roger also heard W4ZD (EL97) on FAI while pointed 300°, but only when he elevated his EME array to 25° above the horizon. This too was consistent with FAI, especially as the scattering center was relatively close to Roger's Charlotte location. He reported several other stations via FAI as well, but they were too weak to copy calls clearly on SSB. W5UN, W4ZD and WB4WTC, by the way, were all using EME-quality antennas.

Many stations ignored the possibilities of FAI in the heat of the much stronger E-skip signals, but for many stations, FAI could have provided special opportunities. Stations to the south of the E-clouds, but too close to get in on the opening, could probably have made FAI contacts. Moderate power and antennas are usually required, and CW considerably increases the chances of making contacts. FAI paths are also skewed off the great circle and toward the center of sporodic-E activity, analogous in many ways to auroral propagation. WB4WTC has demonstrated, perhaps for the first time, the advantage of being able to elevate your antenna. Expected FAI distances range up to 2300 km.

ON THE BANDS

The greatest portion of news this month concerns the extraordinary 6 and 2-meter sporadic-E openings. The weekend of Field Day (June 25 and 26) was perhaps the best of the month, as there was both 6-meter propagation to Europe and 2-meter sporadic-E over the US. During the June 11 and 12 weekend (when the ARRL VHF contest would normally have been scheduled), 6-meter conditions were excellent across the country and 2 meters again opened via E-skip. These and other sporadic-E events overshadowed a respectable tropo opening across the Gulf of Mexico on June 28, when many Texas-Florida contacts were made as high as 1296 MHz. Gulf tropo also figures in the SSB contacts W4ZD (EL97) and K2RTH/4 (EL95) reportedly made with 6Y5RJ (FK18) on June 24 and 25. While the distance (1100 km to EL97) is not unusual, it has been rare in recent years to hear of any Caribbean contacts into the States on the bands above 144 MHz, except from the Bahamas, Cuba and Puerto Rico.

50 MHz

Transatlantic paths via multihop sporadic E opened on June 8, 11, 13, 15, 17, 19, 23, 25, 26, 27 and 29. Space allows only the briefest summaries of these exciting days. Other openings to the Caribbean and double-hop coast-to-coast contacts that otherwise might have taken the limelight must be relegated to the background this month.

Long-time DXers Bob Mobile, WA1OUB (FN43), and Bob Billings, VE1YX (FN74), started off June's transatlantic DX quest by working Portugal, Spain, and France between 2007 and 2236Z on the 8th. VE1ZZ found 5T5JC during this opening for the first ever North America to Mauritania contact, followed closely by VE1YX and other Canadian Maritime stations. Herb Spoonts, W3IWU (FN20), reported the CU3URA beacon and CU3AC on June 11, 2110 to 2120Z. A few hours later, on June 12 around 0200Z, OX3LX worked KA2DRH/4 (EM64) and others in EM63, 64, 75, 85 and possibly other grids.

5T5JC (IL30) provided many more stations from Maine to Georgia with a new country on June 13. Eric was hearing the WA1OJB (FN54) and W2CAP/1 (FN41) beacons as early as 0800Z, but had to wait until we got up to work us! 5T5JC finally logged K1TOL (FN44) at 0930Z, W1JR (FN42) at 1000Z, followed by a long string of US stations until at least 1400Z. There were long spells when Eric's calls went unanswered. There was no 48.250-MHz video that morning to provide the usual warning of transatlantic propagation. QSL to Antoine Baldek, F6FNU, BP 14, Arpajon Cedex, F-91291, France.

On June 15, between 2210 and 2235Z, VE1YX, VE9AA, VE1PZ, CY9/K0SN, and others in the Canadian Maritimes worked widely into Europe. Among the country prefixes that went into their logs were EI, G, GW, ON, PA, DL and S5. The St. Paul Island expedition, which used CY9/K0SN as well as CY9/WC9E, provided a new country for many eager Europe-

Andy Blackburn, WD4AFY, at his station in Savannah, Georgia.

ans. The usual W1 DXers were out of this one. Two days later, WA1OUB reported a lone contact with CU1EZ at 1944Z—hardly a consolation.

The first of two really widespread European openings began for Canadian and New England stations on June 19 about 1820Z and did not end until after 2300Z. Typical stations in the Northeast made at least 30 contacts into a dozen Western European countries, including Sweden, Austria, and Slovenia. Signal reports averaged about 55. Europeans were able to work through the East Coast barrage with some success, primarily between 1930 and 2030Z. Alain Stievenant, ON4KST, logged VE3LBZ (FN03), K8MFO (EN90), K8GQB (EN91), and KU8U (EN72), among others. Klaus Tiedemann, DKØTU, also found K8MFO, and PAØLSB worked N9BJG (EM57). Martin Harrison, G3USF, put N4VC (EM66) into his log, the best DX for those two stations. EH7AH and W9UD (EN41) connected, possibly the best DX for that pair. Finally, Remco Besten, PA3FYM, reported working W5EU (EM12), in addition to numerous W1s, 4s, and 8s between 1955 and 2020Z. Several of the Europeans also worked FP5EK (GN16) for a new country.

Carl Huether, KM1H (FN42), made contacts with IK2GSO and PAØHIP between 1155 and 1210Z on June 23, while PA3FYM reported working several W1s. W3EP (FN31) picked out 1, PA, G, and ON between 1220 and 1245Z. I exchanged solid 55 reports with PAØHIP and we both remarked that we were hearing few other stations. No other reports were received from this short opening.

June 25 was undoubtedly the best day for transatlantic propagation for the month. Europeans began working US stations as early as 1350, but the first Americans in their logs were Floridians—not the familiar VE1s and W1s. Tom Colyard, N4EJW (EL97) and his son John, N4EJV, began hearing European 48.250-MHz TV video at around 1120Z. At 1250, Tom heard the CTØWW beacon, and at 1336, the ZB2VHF beacon came up. They knew the band was ready to burst open. Finally at 1351, Tom heard F6ECS, for the first of over 190 Europeans the pair worked by the time it was all over for them at 2232Z—more than eight hours later! Included in their logs were S51UF, S52CO, 9A1CCY (worked between 2018 and 2030Z), YU1EU, YU1NW, and OK1IBL.

It took some time for other Florida stations, many of them looking for Field Day contacts, to become aware of what was going on. K2OU/4 (EL87) put the first of 77 Europeans into their Field Day log at 1856 and noted the roar of stations that came back to them on 50.153 MHz virtually every time they put out a CQ. Europeans worked every Florida grid with reports ranging from 55 to 59. Several picked out KJ4E (EL98) as having an especially strong signal into Europe.

In the midst of the Florida portion of the opening Dave Batcho, N5JHV (DM62), managed to eke out contacts with ON4KST, G4IGO, PA3BFM, G3ZYY, G3NSM, and PA2VST between 1652 and 1719Z for what must have been the longest E-skip contacts of the opening—up to 8500 km. The Europeans were weak into New Mexico, but apparently they were hearing Dave just fine. Every N5JHV CQ or QRZ returned a low rumble of stations competing with the noise.

Stations in the Northeast could also hear the Floridians running Europeans as early as 1830, but nothing from across the pond. At 1900Z, I heard the W4s running their pile ups, N5JHV still calling CQ, TI2NA booming in, as well as strong European TV video on 48.250 MHz. Just before 2000Z, VP9/WB4NFS turned his attention from running Field Day stations to picking out Europeans. (Jack O'Mara and his wife were in Bermuda celebrating their 10th wedding anniversary. Jack brought along a TS-690s and HF trap dipole, which just happened to load up on 6 meters.) Surely we were next!

Finally at 2020, the band opened almost simultaneously for all the Northeastern stations that had been patiently waiting. Signal reports were much weaker than those the W4s were still giving out—51 to 55 was typical—but huge pile ups of Europeans quickly formed under each W1. Among the more interesting stations among the 50 to 80 Europeans typically worked by the New England DX hounds were HB9SNR and other Swiss, who provided a new country for most of the stations working them. K1TOL (FN44), KM1H (FN42), N2CG (FN20), and others worked OK1IBL, while KM1H also logged EW3CC and EW2CP between 2027 and 2041Z. In the midst of all this excitement, 5T5JC made another appearance, providing a new country for many more Americans. Around 2030 to 2050Z he apparently worked as far west as KØTLM (EM29) and WB5YWI (EM25).

Beginning at 1300Z the next day, N4EJV heard the CTØWW beacon and at 1615Z, an EA8 calling CQ with no takers. On the 27th, CT1WW came on the air and worked a string of W4s around 1840Z. The band was quiet the following day, but on June 29 it opened again to Europe. WB4WTC heard the CTØWW beacon and Spanish stations off and on beginning at 1535Z and logged two EHs at 1543 and 1851Z. CN8ST worked a string of US stations, including WB4WTC, from around 1850Z. The only other evidence of European activity that day was the GB3CTC beacon, which W1s heard for half an hour or so after 1600Z.

In addition to the European openings, there were many days in which Caribbeans worked throughout the US and Canada. Among the stations most widely heard were C6AFP, HH7PV, P49T, P4/OZ1HJP, TG9ARJ, TI2ERS, TI2HL, TI2NA, TI4JHQ, V31DE, V44KAI, VP2EE, VP2MO, VP5/W6JKV and ZF1DC, in addition to several Cubans and Puerto Ricans. Other DX widely worked in the states included OX3LX, FP5EK, CY9/KØSN and other members of the St Paul expedition, VP9/WB4NFS, and VP9GE. With all of these countries available, several stations went over the top with 100 countries. WB4WTC started the season with 97 countries and added TG9AJR (June 12), 5T5JC (June 13), and CY9/WC9E (June 15). I, too, was fortunate to add four countries I needed for DXCC: CY9/WC9E (June 12), 5T5JC (June 13), HB9SNR (June 25), and TG9AJR (June 26).

144 MHz

The 2-meter sporadic-E openings of June 9-10, 11-12, 12-13, 21-22, 26, 28, 29 and 30 were just as exciting as those on 6 meters. The first lasted from 2330Z June 9 until 0043Z the following UTC day. Bev Cavender, W4ZD (EL97) and Condy Alley, N14Z (EL98), worked primarily into Michigan, Indiana, Ohio, and western Pennsylvania, while Clay Lane, WA4TNV (FM05), was busy with stations in east Texas and Louisiana. Mark Hoersten, N8EVA (EN91), logged a number of south Florida stations, along with N1KTM/mm in both EL94 and EL95, the first of three 2-meter E-skip openings that N1KTM/mm caught during his June voyages.

The June 11 and 12 event began around 2130Z, when Ron Klimas, WZ1V (FN31), hooked up with his first station, until about 2315Z. New Englanders worked widely scattered grids in the Carolinas, Georgia, Alabama, and Tennessee, while Jerome Byrd, K3GNC (FM29), made contacts into Missouri and eastern Kansas.

E-skip returned to the band the next day, lasting from 2340 to 0035, June 12 and 13. Most of the action took place between W1s, W2s, W3s, and VE3s and widely scattered stations from Oklahoma, Kansas and Missouri and then south to Louisiana and Alabama, including K5SW (EM25), KWØA (EM48), KF5IU (EM31), and KA2DRH/4 (EM64). At the same time, Tony Everhardt, N8WAC (EN81), worked stations in six Florida grids.

The extraordinary events that took place during the opening of June 21 and 22, from 2255 to 0315Z, have already been analyzed in the lead for this month's column. Among the many contacts made that evening were a handful by Clint Walker, N1KTM/mm, this time steaming off the Carolina Capes. He worked K5SW (EM25) and N6CL/5 (EM15) from FM35 between 2359 and 0010Z and then K5SW again from FM36 about an hour later. It may be a long time before Oklahoma again works these all-water grids in the Atlantic Ocean on 2 meters! Sam Whitley, K5SW, was also among those few operators that caught the E-skip opening of June 21, from 0135 to 0220Z. Sam worked K7ZOK (DM26) and K7CA (DM26). San Hutson, K5YY (EM36), also logged K7ZOK along with N6RPM (DM04).

The opening of June 26, 1600 to 1700Z, was notable because it took place during Field Day, when many stations were manning their free VHF station on 2 meters. Unfortunately, some operators, unfamiliar with E-skip, were thus not aware of what was going on. Nevertheless, K2RTH/4, W4EMB, and KQ4PI (all EL95), W4ZD (EL97), and other south Florida stations made contacts from Maryland to Connecticut.

In addition, Jose Amador, CO2JA (EL83), worked K3GNC, K2SMN (FN20), NW3C (FN00), and possibly other mid-Atlantic stations under most trying conditions. Arne Coro, CO2KK, mentioned in an e-mail letter that Jose had no 2-meter SSB/CW gear, but managed to improvise with his FM transceiver. He keyed the FM rig to produce a chirpy CW signal on transmit. For receiving, he tapped the 455 kHz IF of the FM transceiver and fed it into his Sony ICF 2001. That is the rig that put a new grid and a new country into several 2-meter logs!

On June 28 between 1945 and 2030Z, sporadic E visited the western part of the country once again. WB6AXW (DM12) was delighted to work N7DB and W7INX (both CN85), but could not attract the attention of NØXX/7 (CN84). In addition to WB6AXW, Dave Bernhardt, N7DB, worked XE2EED (also DM12) and heard WJ6T (DM05). On the 29th, sporadic E was back on the East Coast. WZ1V, K2SMN, and NN2T hooked up with WA5WXD, KD5FPX and KD5FPW (both EM42) around 2200Z.

The last 2-meter E-skip opening of the month, on June 30 between 1445 and 1510Z, provided the third occasion when N1KTM/mm gave out all-water grids, this time from EL67 in the Gulf of Mexico. The lucky recipents included W1AIM (FN34) and W1ENQ (FN31). W4WQM (EM72) and KC4VIC (EM70) made additional contacts into Pennsylvania, Connecticut and states in between.

Microwaves

After many months of running schedules, Al Ward, WB5LUA, finally worked JA4BLC on 13-cm EME, according to a report Al sent to the *432 and Above EME News*. The QSO was historic for two reasons. It was the first North America-Asia contact on the band and it was probably the first EME contact in which both stations used 2424 MHz. Most 13-cm EME contacts take place near 2304 MHz, but the Japanese cannot use this part of the band. JA4BLC had made three previous contacts with his 120 W to a 12-meter dish, while Al has now completed with 25 different stations on 13-cm EME.

Anyone for 145 and 241 GHz? In the second issue of *DUBUS* for 1994, Michael Kuhne, DB6NT, provides the circuit and building notes for an experimental dual-band transverter with a 144-MHz IF. At the heart of his deceptively simple design is a harmonic mixer, fed by a 24.1-GHz local oscillator. The 6th harmonic provides the 145-GHz signal while the 10th harmonic provides a small signal at 241 GHz. Although transmit power is low and receiver noise figure is high, Michael has made a 3-km contact on 145 GHz and spanned 1 km at 241 GHz. Tom Williams, WA1MBA and Jim Mead, WB2BYW made a 3.8-km contact on 142 GHz in May 1993, but there are no reported North American contacts on 241 GHz as yet. Perhaps this will give someone the hint.

Acknowledgments

More than 60 persons sent in complete logs, letters, maps and other accounts of their activities during June. Space did not permit mentioning each of you in the column this month, but all reports added to the summaries of June's exciting happenings and every report is much appreciated. Special thanks to Herb Spoonts, W3IWU.

Late-Breaking News

WA1MBA and WB2BYW have done it again! On July 11, the pair made a 1-km contact on 120 GHz, probably the first contact ever on this band. Read the details in next month's column.

On July 11 to 12, a strong duct created a massive tropospheric opening between Hawaii and the mainland. Hundreds of contacts on 144 MHz and higher were made between the islands and California, including the first ever 2304-MHz QSOs across the Pacific. A full report of this widespread event also appears next month.

NOTES FROM ALL OVER

CQ magazine's VHF Editor Joe Lynch, N6CL, has written of the success of the first joint Cuban-American VHF operation during the ARRL VHF contest, June 4 to 6. Accompanying Joe to Cuba were Lauren Libby, KX0O, Chip Margelli, K7JA, and Janet Margelli, WA7WMB. The four Americans operated CO0FRC (EL83) on five bands from 50 to 1296 MHz alongside a team of Cubans, including CO2OJ, CO2JA, CO2KG, CO2KK, CO2PL, and CO2YY. CO0FRC scored about 34,000 points, but accomplished much more than that.

Cuban operators made several historic contacts during the contest. CO0FRC linked up with CO0BGB (EL93) and WA4CHA (EL88) for the first two Cuban 222-MHz QSOs. CO0FRC also made the first 1296-MHz contact from Cuba with W4WSR (EL96). In addition to CO0FRC, at least half-a-dozen other Cuban calls went into the 6 and 2 meter logs of US stations during the contest—another step forward for the enthusiastic Cuban VHFers.

JY7SIX in Amman, Jordan, made nearly 2000 QSOs in 49 countries on 6 meters during June. The most distant contact was with WD4KDP (FM15) at about 9775 km, made on June 9 at 2145Z.

Louis Ancians, ex-HL9UH, completed his stay in Korea in June. During eight months of operating EME, Louis made 40 contacts with 34 different stations on 144 MHz and 45 contacts with 39 stations on 432 MHz. By this fall, he should be signing HP3/KG6UH on the VHF bands from his new home in Panama.

VHF/UHF/MICROWAVE NEWS

DUBUS has expanded its traditionally European focus on microwave activity and technical topics by adding columns devoted to news from abroad. "Microwave USA" is written by Kent Britain, WA5VJB, editor of *Feedpoint*, the North Texas Microwave Society's newsletter. Toshihiko Takamizawa, JE1AAH, edits the corresponding "Microwave Japan" column. In some ways, the rest of the world has some catching up to meet the microwave activity levels evident in Europe. *DUBUS* lists, for example, more than 400 Western European stations active on 10 GHz SSB/CW, at least 125 of which are in Germany alone.

This Month

Sept. 1	Radio Amateurs of Canada 903/1296/2304-MHz Sprint
Sept. 7	RAC 432-MHz Sprint
Sept. 10-12	ARRL September VHF QSO Party
Sept. 12	RAC 222-MHz Sprint
Sept. 17-18	ARRL 10-GHz Cumulative Contest
Sept. 22-24	Microwave Update (Estes Park, CO)
Sept. 26	RAC 144-MHz Sprint

Ed Ladd, W2IDZ, Silent Key

The friends of Ed Ladd will miss the familiar W2IDZ call on 6 meters. Just shy of his 80th birthday, Ed became a Silent Key this past June. He lived most of his life in New Jersey, where he was an electonics engineer for Bell Telephone Laboratories from 1944 until his retirement 10 years ago. He is survived by his wife, Leta Ladd, WA2QCE.

Ed was licensed in 1933 and quickly became one of the pioneers of VHF. He got on the 5-meter band the same year with a superregenerative receiver and a modulated oscillator for a transmitter, but soon upgraded to a homebrew superheterodyne receiver and a VFO-controlled transmitter with a 6L6 final. Ed made his initial 6-meter contact on the first day the band was opened, March 17, 1946. During the 1940s and 1950s, Ed continually upgraded his station and designed several pieces of gear for 6 meters, including the Lil-Lulu transmitter and receiver sold commercially by Whippany Laboratories. Several of his design and building projects appeared as *QST* articles. Ed was the holder of many operating awards, including 6-meter WAS No.11 and 6-meter DXCC No. 60.

The 432-MHz standings box, which normally appears this month, has been postponed until October to make room for reporting on-the-air activities.

Strays

I would like to get in touch with...

◊ amateurs who work in the horse racing industry, especially in intertrack wagering and off-track betting and telecommunications. Charles Martin, AB4Y, 1605 Singletree Way, Bowling Green, KY 42103-1425; 74211,167 @compuserve.com.

HIS MASTER'S VOX

◊ Ronaldo, PU2RRM, now HI8RMR, of the Dominican Republic, has a dog that likes to visit the shack because when he barks it turns on the transceiver's red Transmit light. Ronaldo calls him a "VOX terrier." *—Ulo Vilms, K4OV, 109 Palomino Ln, Warner Robins, GA 31088*

Linda Crockett Lingle (seated), Mayor of the County of Maui, Hawaii, proclaimed June 20 through 26 Amateur Radio Week. Joining Her Honor at the signing ceremony are (l-r) Maui ARC President Kevin Hinchcliffe, WH6KQ; Vice President Richard Eisenberg, WH6KQ; Field Day chairman Jayson Kohama, WH6BXK; and instructor Calvin Hashi, N6SSW.

The proclamation was issued in recognition of Amateur Radio public service and disaster preparedness, and coincided with Field Day and the beginning of a nine-week summer license-exam training session at Maui Community College.

Conducted By Brian Battles, WS1O
QST Features Editor

Your Dream Rig? Here's What You Said...

Back in March, when I proposed surveying *QST* readers on your most- and least-preferred features in VHF/UHF FM transceivers, I figured the follow-up column would be a cinch. I expected to see a handful of responses that I could tabulate and summarize in a couple of hours. *But no-o-o...!* You guys went nuts! Within a few days returned surveys and e-mail started coming in, and they kept coming in for a couple of months! Now the torrent has subsided, so I think it's safe to publish the results.

(Figures are based on the average score of each item, from 212 responses. Special thanks to ARRL Technical Information Specialist Mike Tracy, KC1SX, who wrote the data-entry/statistic-calculation software for me—which was precise to six decimal places!)

Ratings 1 to 10 (1 = useless, despicable, 5 = okay, 10 = wonderful, essential):

All Transceivers

2.26 Coded squelch/paging
7.79 Packet connector
(standard for 1200 bit/s, direct for 9600 bit/s)
4.63 Dual watch in-band (VHF+VHF, UHF+UHF, etc)
5.42 Crossband repeat (VHF to/from UHF)
6.53 Out-of-band receive (NOAA, MARS, CAP, etc)
4.95 AM receive (VHF aircraft band)
4.11 Clock/alarm
(real-time display, radio on/off, beep, etc)
5.89 CTCSS scan
(decode/display unknown CTCSS tone)
2.00 Automute (when other-band signal is heard)
3.16 Call sign/alphanumeric display
1.95 Human-voice status announcements
5.11 Total front-panel control illumination
5.26 DTMF memory dialing
Memory features:
2.95 Priority channel
4.74 Call channel

Hand-helds

4.58 Automatic power on/off
2.53 Full-duplex operation (eg, mike and speaker designed to use radio like a telephone on crossband QSOs)

Mobiles

6.16 Built-in antenna duplexer (ie, one connector)
2.84 Telephone-style speaker/mike handset for telephone-style full-duplex crossband operation

We asked you to add your own ideas and comments. Here are a few samples:

"I'd like to see mobiles with DIN or standard in-dash chassis sizing."

"I have a bad habit of switching my rig off and forgetting to turn it back on. How about an automatic power-on feature, with timer choices (30, 60, 90 seconds)?"

"Larger, better-lit displays on mobiles and hand-helds would make it easier and safer to operate while driving."

"How about a built-in TNC? What could the cost be—$10 worth of parts?"

"We need better control design. My radio has a lock function that's often activated if you bump one of the controls, and you have to reread the manual to unlock the controls."

"Instead of just received S meter and transmitted RF power output, add a built-in SWR meter."

"A battery 'fuel-gauge' display would save a lot of unexpected, sudden sign-offs."

"I'd like an audio-delay circuit to eliminate the annoying crash when the squelch closes."

"A Morse code IDer with 10-minute timer would help keep a lot of us legal!"

"Hand-helds and mobiles need louder, improved audio."

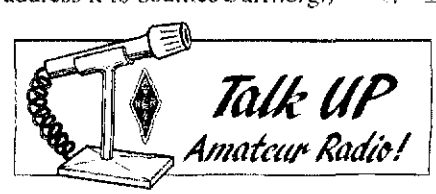
"Put more emphasis on RF performance and less on bells and whistles'!"

Subjective comments tended to reflect problems in three areas: Receiver intermodulation problems, too many frivolous features that some hams believe cause prices to be too high, and rigs that are overcomplicated to use and too small for easy operation.

A separate, dedicated standard packet connection for 1200 and 9600 bauds was by far the most-asked-for item on "wish lists." In the write-in comments, many hams concurred that they wanted multiband rigs that covered 2 and 6 meters, sideband mode and industry standard power and microphone connectors. Another popular request was for hand-held rigs to have smaller batteries with larger capacity.

I described some features of my "dream rig" in March. Here's another of my personal wishes: If you've looked at commercial or public service base, mobile and hand-held transceivers, you've noticed that, aside from Motorola and a few others, most are made by names amateurs recognize: Kenwood, Icom, Yaesu, Standard, Azden, etc. Most of them (many of which are identical, or close siblings to their ham versions) are set up by technicians who use computers to dump in all settings and memories, configured with special software provided by the manufacturers or third parties. It should be easy to provide a means for hams to do it that way, too. Heck, we sure use a lot more features than commercial and public service operators. In addition to the usual button pushing, it would be neat to optionally connect your transceiver to your PC's COM port via an RS-232 serial cable and upload settings from any of several files on disk.

That should wrap up this fascinating project. Let's hope it leads to careful consideration by the radio manufacturers' engineering and marketing wizards. Meanwhile, this oughta teach me to solicit opinions from such avid amateurs as those who are VHF/UHF enthusiasts! Seriously, it's gratifying to see such terrific participation. After all, this column is here for sharing ideas and information between all amateurs, so keep the mail, photos and submissions coming. (If you can send e-mail, address it to bbattles@arrl.org.) QST



Packet Perspective

Conducted By Stan Horzepa, WA1LOU
One Glen Ave, Wolcott, CT 06716-1442
Internet: stan.horzepa@corp.gdc.com CompuServe: 70645,247

@USBBS

This month's guest columnist is QST *Features Editor Brian Battles, WS1O (e-mail: bbattles@arrl.org).*

Anyone who has visited the Never Land of written electronic communication knows that the open forum provided by telephone bulletin boards (BBSs), the Internet and other similar media have long offered users effective means of discussing diverse issues. These environments have traditionally relied on two basic means of controlling the content of messages posted and the behavior of those who choose to participate: (1) a "gatekeeper" and (2) peer pressure. The gatekeeper (SysOp) can decide who may post material, what may be posted and if it will be forwarded. Peer pressure provides a vocal, but officially impotent form of obligation to conformity. In amateur packet radio, a third entity wields a measure of control: The FCC determines what is legally acceptable.

In the world of amateur packet radio bulletin boards (PBBSs), the spirit of democratic, uncensored participation precludes most SysOps from refusing access to uncooperative users, and induces them to make undesirable messages available to all of their local users and even to forward such messages to other PBBSs in the network. In raging discussions, misinformed or selfish users maintain that a SysOp is obligated to accept and forward every message without question, as long as it doesn't expressly violate any FCC Rules. This is entirely untrue; no SysOp is under any obligation to do anything whatsoever with any radio amateur's messages.

Educating Users

Many packet operators have spent many hours discussing the frustration of having these PBBSs, supposedly designed and built for the purpose of carrying person-to-person mail traffic and occasional bulletins of general interest, turn into electronic "classified ad pages." Notices that carry announcements of items for sale, swap or wanted noticeably outnumber other single types of bulletins. Because of its convenience, low cost and apparent effectiveness, PBBS users inundate the airwaves with a nationwide swapfest day and night. Most messages in this category are individually harmless, but when viewed as a class, are the greatest consumers of computer storage space, message-forwarding time and bandwidth.

Many SysOps and PBBS users complain that all you ever see listed on a PBBS today are screenfuls of **SALE@USBBS** messages and so on. It's an understandable lament: There's a lot of stuff in there, but most of it is "junk mail" most users never read. For example, a ham in Boston isn't likely to care about a personal computer or handheld transceiver being sold by an amateur in Seattle. But there are hundreds, maybe thousands of amateurs in Washington or perhaps the Pacific Northwest region who will read and respond to such a notice. So why waste the time and bandwidth to send this bulletin ping-ponging all over the US by addressing it to **@USBBS**?

In a sadly ironic way, most packet traffic isn't nearly as efficient as the non-SysOp packet operator believes. Notices of no significance or interest to amateurs hundreds of miles away are routinely sent out addressed to **@USBBS**. This is a lazy, or perhaps misunderstood, format that causes thousands of hams nationwide to have their local PBBSs spew forth several screens' worth of listings no one will ever read.

SysOps: Can You Do It?

Perhaps we could initiate a standard system by which SysOps would help educate users. Each user could be compelled to read an educational message about the most appropriate way to address bulletins before he'd be given the privilege to post a message intended to be forwarded to other PBBSs. This would require at least two things: (1) The PBBS software would have to support a method of doing so, and (2) The SysOp would have to be willing to invest whatever additional time it might take to grant access to potential users who acknowledge that they've read and understand the proper procedure.

Is it reasonable to suggest that PBBS SysOps route incoming messages addressed to **@USBBS** to some kind of holding bin, unless they meet certain criteria (eg, **ARL**, **KEPS**, **AMSAT**, **FCC**, **SYSOP**, **DX**, etc)? For example, do we really need so many **SALE**, **WANTED**, **HELP**, **FEST** and **EXAM** bulletins addressed to, and circulated over the airwaves to **@USBBS**? Does it offer any real advantage to the user who posts it? Isn't it more efficient, timely and appropriate to post most bulletins to a local, state or regional circulation? Could PBBS SysOps help users do this, and would they want to? How much extra time and effort would it take? Can any of this be automated? Will an investment in the time and energy now pay off later with less "junk mail" coming through each PBBS in the near future, if users can be taught to cut down the unnecessary **@USBBS** traffic? And how much actual improvement would that offer all amateurs, regarding the possible decrease in traffic transmitted via VHF/UHF backbone and HF forwarding?

This could certainly be implemented in a friendly way, with errant users gently instructed in a helpful manner. Each PBBS SysOp could prepare a "boilerplate" text he could use to inform a user whose postings were held or rerouted that would explain what was done, why it was done and how to avoid such *faux pas* in the future. A standard one-page (one-screen?) message from the SysOp could simply inform the user that **@USBBS** is, by conventional agreement, reserved for messages that, by their inherent nature, lend themselves most advantageously to distribution to the entire nation's amateurs. It could advise the user that buying, selling, swapping or evaluating almost any Amateur Radio item could be quite effectively accomplished via a local or regional bulletin, and that he should seriously consider if the hams in distant states will care or be able to take advantage of the information in certain types of messages.

Each SysOp's burden shouldn't be too great, because he would only be expected to monitor **@USBBS** messages that originate on his board. If all SysOps did so, there would be a general reduction in **@USBBS** traffic on all PBBSs.

An Alternative

This primarily concerns standard AX.25 PBBS users and SysOps because more advanced software, such as that used for TCP/IP networking, doesn't even involve PBBSs as most hams have come to know them. A TCP/IP user finds his incoming mail neatly stored in his own private mail area on his own computer's disk drive. Bulletins can be forwarded only to TCP/IP operators who specifically request them, by category, from individuals or from stations that act as "gateways" to collect useful messages from individuals and AX.25 PBBSs and mail them directly only to those who want to see them. If all US packet stations operated TCP/IP software, rather than just plain, "built-in" AX.25 TNC firmware, the traditional PBBS could be eliminated and amateur packet radio would function more like the Internet. Each station would be accessible directly by every other station, and each amateur could choose to "subscribe" to "newsgroups" that encompass particular topics.

Let's hear what you think, as a packet operator, and especially as a PBBS SysOp. Poke holes in my suggestion or offer ideas on how to improve it. Be constructive and thoughtful, and perhaps we'll be able to slowly educate our fellow packet operators so that we can all help each other maintain, expand and speed up the powerful, impressive amateur packet radio network. QST

Coming Conventions

EASTERN WASHINGTON SECTION CONVENTION

September 16 to 18, 1994, Milton-Freewater, OR

The Eastern Washington Section Convention is sponsored by the Walla Walla Valley ARC. Doors open Fri 7 PM to 9 PM, Sat 8 AM to 4 PM, Sun 8 AM to 2 PM. Refreshments, potluck dinner at noon. Free admission. Talk-in is on 147.88/.28. Contact Jack Babbitt Sr, WA5ZAY, PO Box 951, Walla Walla, WA 99362, 509-525-7003.

ILLINOIS STATE CONVENTION

September 17 and 18, 1994, Peoria

The Illinois State Convention is sponsored by the Peoria Area ARC and will be held at the Exposition Gardens Fairgrounds on Northmoor Rd and University St. Doors open for flea market setup Sat and Sun at 6 AM, commercial setup is Fri, 2 to 9 PM; Sat 6:30 to 8 AM; Sun 7:30 to 8 AM, public Sat 8 AM to 4:30 PM, Sun 8 AM to 3 PM. Forums, special-event station, VE sess (10 to 2 PM), new equipment dealers, camping (with electrical hookups, call 309-691-6332). Admission $5, 15 and under free. Talk-in on 146.16/.76. Tables $10 each with free electric hookup. Exhibit space: Ron Morgan, KB9NW, 309-694-5009 (answering machine and fax); advance ticket sales: Frank Stratton, KC9YO, 413 Hallock Hollow Rd, Edelstein, IL 61526, tel 309-274-5880 or Peoria Superfest, PO Box 3508, Peoria, IL 61612-3508, tel 309-685-6698.

ROANOKE DIVISION CONVENTION

September 17 and 18, 1994, Virginia Beach, VA

The Roanoke Division Convention is sponsored by Tidewater Radio Conventions. Doors are open Sat 9 AM to 5 PM, Sun 9 AM to 3 PM. From DC take I-95 to I-64 to Rte 44 (VA Beach Expressway), from the south take 95 to 58 E to I-64 to Rte 44 to the end. Forums, flea market, dealers, major manufacturers. Admission is $5 in advance, $6 at the door. Talk-in is on 146.37/.97. Send SASE and check for tickets to Manny Steiner, K4DOR, 3512 Olympia Ln, Virginia Beach, VA 23452, phone info 804-HAMFEST.

KANSAS STATE CONVENTION

September 30 to October 2, 1994, Wichita

The Kansas State Convention is sponsored by the Wichita ARC and will be held at the Ramada Inn at Broadview Pl. Doors open at 9 AM. Admission $8 in advance, $10 at the door. Talk-in on 146.22/.82. Len Warren, NØQHZ, 6233 Millsboro St, Wichita, KS 67219; tel 316-744-1930.

KENTUCKY STATE CONVENTION

October 1 and 2, 1994, Louisville

The Kentucky State Convention is sponsored by the Greater Louisville Hamfest Assn and will be held at the Commonwealth Convention Ctr, downtown Louisville. Admission $6 in advance with SASE, $8 at the door. Mail requests for tickets or info to PO Box 34444-Q, Louisville, KY 40232-4444; info for commercial spaces call 812-948-0037; flea market spaces 812-282-4898.

1994
October 14 to 16
Midwest Division, Omaha, NE
October 21 to 23
Pacific Division, Concord, CA
November 19 and 20
Indiana State, Ft Wayne
1996
September 13 to 15
ARRL National, Peoria, IL

NEW ENGLAND DIVISION CONVENTION

October 1 and 2, 1994, Boxboro, MA

The New England Division Convention is sponsored by the FEMARA and will be held at the Boxboro Host Hotel, Rte 495 at Rte 111. Doors open for flea market 8 AM, commercial exhibits 9 AM, Banquet, Wouff Hong ceremony Sat midnight, VE sess (all classes, Sat and Sun), seminars. Admission $7 in advance, banquet and show $21 to Mel Cole, WZ1Q, PO Box 8, Prides Crossing, MA 01965, make checks payable to FEMARA with an SASE.

MISSISSIPPI STATE CONVENTION

October 1 and 2, 1994, Biloxi

The Mississippi State Convention is sponsored by the Mississippi Coast ARA. Doors are open Sat 8 AM to 4 PM, Sun 8 AM to 2 PM. Take Hwy 90 to Biloxi. Free parking, DX forum Sat 11 AM, Rick Roderick, K5UR, DXCC card checking by Bill Moore, NC1L, from DXCC Department at ARRL HQ. Admission: No adv, $5 at the door. Talk-in is on 146.73. Contact Ken Burton, 106 Sherwood Circle, Ocean Springs, MS 39564; tel 601-872-1804.

DELTA DIVISION CONVENTION

October 8 and 9, 1994, Memphis, TN

The Delta Division Convention is sponsored by the Greater Memphis Amateurs and will be held at the Shelby Farms Show Place Arena, 105 Germantown Pkwy, Germantown, TN. Doors are open Sat 8:30 AM to 4 PM, Sun 8:30 AM to 2 PM. RV camping, forums, VE sess (Sat and Sun 9 AM to noon). Admission $5 at the door. Talk-in on 144.61/145.21, 447.0/442.0, 1272.0/1292.0. Tables 8 feet $22 for the weekend: Lee Bowers, KA4KVW, 901-867-3461 after 6 PM; general and exhibitor info: Steve Fletman, KC4ZOV, 901-363-3159 after 4 PM; Mary Moore, AC4GF, 901-758-0661 or mail to MemFest '94, PO Box 751841, Memphis, TN 38175-1841.

CONNECTICUT STATE CONVENTION

October 8 and 9, 1994, Durham

The Connecticut State Convention is sponsored by the Meriden ARC, Middlesex ARS and Shoreline ARC. Doors are open for campsite and vendor setup 4 PM Sat, public Sun 9 AM to 3 PM. Take exit 15 off I-91, to Fairgrounds on Rte 17. Vendor displays, computer flea market, VE sess (register in adv), refreshments, overnight camping, tailgating. Admission $5, under 12 free. Talk-in is on 145.29. Vendors contact John Bartscherer, 203-238-2453 days; VE info contact Ted Trudel, AA1GX, 203-345-4008, other info contact Jim McCandless, N1IZF, 203-349-3353 eves; packet: N1GNV @ W1NRG.CT.USA.NA, Internet: wilsonc @ iia.org.

Call for Applications:
1997 ARRL National Convention

The ARRL is accepting applications for its 1997 National Convention. The Board of Directors may consider applications for the 1997 Convention as early as the 1995 Annual Meeting, so applicants should forward completed forms by December 31, 1994, to ARRL HQ, attn: Gail Iannone, ARRL Convention Program Manager.

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're encouraged to register your event with HQ as far in advance as your planning permits. Hamfest and convention approval procedures for ARRL sanction are separate and distinct from the date register: Registering dates with ARRL HQ doesn't constitute League sanction, nor does it guarantee there will not be a conflict with another established event in the same area.

We at ARRL HQ are not able to approve dates for sanctioned hamfests and conventions. For hamfests, this must be done by your Division Director. For conventions, approval must be made by your Director and by the Executive Committee. Application forms can be obtained by writing to or calling the ARRL Convention Program Manager, tel 203-666-1541, ext 283.

Note: Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.

Hamfest Calendar

Administered By Christine N. Hushin
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. For example, your information must arrive at HQ by **September 5** to be listed in the **November** issue. 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 or games of chance such as raffles or bingo.

(Abbreviations: *Spr* = Sponsor, *TI* = Talk-in frequency, *Adm* = Admission.)

†ARRL Hamfest

Alaska (Anchorage)—Sep 17 and 18; set up Fri 6 to 9 PM, Sat 8 to 9 AM, public Sat 9 AM to 5 PM, Sun 9 AM to 3 PM. *Spr:* Anchorage ARC. Demos, T-hunt, QCWA exhibit, packet satellite station, RTTY contest station (KL7AA), free AARC VEC/VE sess (bring FCC Form 610 and any CSCEs). *TI:* 146.94. *Adm:* $3. Tables: commercial sellers $35, regular sellers $10. AARC, PO Box 101987, Anchorage, AK 99510-1987.

†**Arizona (Bullhead City)—Oct 8 and 9,** 7 AM to 6 PM. *Sprs:* Hualapai ARC, London Bridge ARA, Western AZ ARC, Dolan Springs ARC, ARCA. On Hwy 95 in Bullhead City, across Colorado River from Laughlin, NV. *TI:* 146.16/.76, 144.57/145.17. *Adm:* free. Charlie Ellis, W6PNM, 1935 Devlin Ave, Kingman, AZ 86401; tel 602-757-7553.

†**Arizona (Scottsdale)—Sep 17.** *Sprs:* AZ ARC, AZ Repeater Assn, AZ Amateurs on TV, Central AZ DX Assn, DeVry RC, Phoenix Packet Users Group, Scottsdale ARC, Superstition ARC, Tri ARC, ARC and W Valley ARC. 2½ mi N of Bell Rd, on Scottsdale Rd, E side of the street. Refreshments, forums, exhibits, swap meet, stations, ATV, packet, contests, RACES, seminars, AMSAT, parking ($2), tailgating ($5). *TI:* 146.76. *Adm:* adv $1, door $2. Len Winkler, KB7LPW, 602-861-0303.

California (Livermore)—Sep 4, 7 AM to noon. *Spr:* Livermore ARK, Las Positas College (because of college security concerns, buyers and sellers must stay off property until 6 AM the day of swap). Swap meet. *TI:* 147.045 from the W, 145.35 from the E. Noel Anklam, KC6QZK, 474 Humboldt Way,

Livermore, CA 94550; tel 510-447-3857 eves, or packet @WA6YHJ.#NOCAL.CA.USA.NOAM.

Colorado (Longmont)—Sep 25; set up 7 AM, public 8 AM. *Spr:* Boulder ARC. Boulder County Fairgrounds, Exhibition Bldg, Nelson and Hover Rds. Free parking. VE sess. *TI:* 146.70, 147.27. *Adm:* $3. Tables: $7. BARC, PO Box 2033, Boulder, CO 80306-2033; tel 303-441-3883.

†**Connecticut (Newtown)—Sep 18**, 8 AM to 1 PM. *Spr:* Candlewood ARA. Edmond Town Hall, Rte 6. Tailgating ($6), flea market, commercial vendors, displays, refreshments. *TI:* 147.12. *Adm:* $4. Tables: $10. Ken Weith, KD1DD, 203-743-9181 or CARA, Box 3441, Danbury, CT 06813-3441.

Florida (Titusville)—Sep 24; set up 6 AM, public 8 AM to 3 PM. *Spr:* Titusville ARC. Fox Lake Park, W of I-95 on Fox Lake Rd. Free parking, vendors, tailgating $3, flea market, refreshments. *Adm:* free. Tables: $5. Les Griner, K4SJC, 407-267-1565.

†**Illinois (Du Quoin)—Sep 11**, 8 AM to 2 PM. *Spr:* Shawnee ARA. S on Hwy 51 from I-64. Refreshments. *TI:* 146.25/.85, 146.07/.67. *Adm:* $5. Leroy Stalions, K9IEY, 1403 E Main, West Frankfort, IL 62896; tel 618-932-3880.

Illinois (Grayslake)—Sep 24 and 25; flea market 6 AM, exhibits 8 AM to 4 PM. *Spr:* Chicago FM Club. Lake County Fairgrounds, near Rtes 45 and 120. Equipment displays, VE sess (9 AM to noon), refreshments, free parking, handicapped accessible, camping (security provided). *TI:* 146.16/.76. *Adm:* adv $5, door $6. Tables: $10, electricity $4 per day. Mike Brost, WA9FTS, PO Box 1532, Evanston, IL 60204.

†**Indiana (Huntington)—Oct 2**, 8 AM to 1 PM. *Spr:* Huntington County ARS. Police Athletic League (PAL) Club, 2099 Riverside Dr. VE sess, flea market, handicapped accessible. *TI:* 146.085/.685, 448.975/443.975. *Adm:* $4. Tables: reserved 8 feet $5. Chris Richardson, N9QVI, PO Box 284, Huntington, IN 46750, 219-356-0319.

Indiana (Spencer)—Sep 10; set up 7 AM, public 9 AM to 4 PM. Owen County Fairgrounds. Refreshments, swap meet. *TI:* 146.985, Ray Beasley, N9NGL, 264 N Montgomery, Spencer, IN 47460; tel 812-829-3325 or Katie Smith, KB9INU, RR 1 Box 368D, Poland, IN 47868; tel 812-829-2140.

Iowa (Dubuque)—Sep 11, 8 AM to 3 PM. *Sprs:* IA Antique RC and Historical Society and the Great River ARC. Tri-State Blind Society, 3333 Asbury Rd. New and used equipment, demos, VE sess, refreshments, free parking, tailgating. *TI:* 147.24/.84. *Adm:* adv $2, door $3. Tables: $8 each. Gerald Lange, 2191 Graham Ctr, Dubuque, IA 52002, tel 319-556-3050; or Loren Heber, N0YHZ, 9479 Lauderville Rd, Dubuque, IA 52003, tel 319-556-5755.

Kansas (Topeka)—Sep 10: vendor set up Fri after 6 PM, swap table set up Sat 7 AM, public 9 AM to 3 PM. *Spr:* North East KS ARC. Knights of Columbus, Grand Hall, from I-470 S Topeka Bypass, take the Burlingame Rd (Washburn Rd) exit, then turn S for about ½ mi; look for signs. ARRL forum, KS Rptr Council Meeting, auction, ATV. *TI:* 146.355/.955. *Adm:* adv $3 each or 4 for $10, door $5 each or 4 for $15. Tables: adv $10 each, no door sales, includes 1 adm. Rob Nall, WV0S, 5707 SW 28th Terr, Topeka, KS 66614-2420; tel 913-271-8899.

Louisiana (Gonzales)—Sep 17; set up 7 AM, public 8 AM to 3 PM. *Spr:* Ascension ARC, Gonzales Recreation Ctr. *TI:* 147.225 (CTCSS 107.2 Hz). *Adm:* $3. George Turner, KB5EOC, 16179 Galvez Ave, Prairieville, LA 70769; tel 504-622-3598.

†**Maryland (Gaithersburg)—Sep 11**; gates 6 AM, building 8 AM. *Spr:* Foundation for Amateur Radio. Montgomery Agricultural Ctr, exit 11 off I-270. VE sess (9 AM), exhibitors, tailgating. *TI:* 146.955, 443.40, 146.52. *Adm:* $5, under 12 free. Mary Morris, 703-971-3905 or Al Brown, 301-490-3118.

Massachusetts (Cambridge)—Sep 18; set up 7 AM, public 9 AM to 2 PM. *Sprs:* MIT Research Society, MIT RS and Harvard Wireless Club. Albany and Main St. Free parking, flea market, tailgating (sellers $10 per space, $8 in adv includes 1 adm). *TI:* 146.52, 449.725/444.725 (CTCSS 114.8 Hz) W1XM/R. *Adm:* $2. Mail adv reservations before the 5th to Steve Finberg, W1GSL, PO Box 82 MIT Br, Cambridge, MA 02139; tel 617-253-3776.

Massachusetts (Framingham)—Sep 25; set up 8 AM, public 9 AM for early bird buyers, 10 AM for others. *Spr:* Framingham ARA. Framingham High School, A St, 1.3 mi N of Rtes 9 and 126 junction. Flea market, VE sess (prereg required, walk-ins not accepted after 10 AM, send check for $5.75 payable to ARRL/VEC to Dick Marshall, WA1KUG, 37 Lyman Rd, Framingham, MA 01701). *TI:* 147.15. *Adm:* $5 for early bird buyers and $2 for others. Tables: adv $10, door $14 (includes 1 free adm, to reserve tables contact Lew Nyman, K1AZE, 508-879-7456 and send check payable to FARA, PO Box 3005, Framingham, MA 01701).

Massachusetts (Pittsfield)—Sep 11; set up 7 AM, public 8 AM to 2 PM. *Spr:* Northern Berkshire ARC. Taconic High School, 96 Valentine Rd. VE sess, refreshments. *TI:* 146.91. *Adm:* $2. Tables: adv $5, door $7. Chuck Lowery, NZ1Z, 413-447-8377 after 6 PM.

Michigan (Adrian)—Sep 18, 8 AM to 2 PM. *Spr:* Adrian ARC. Lenawee County Fairgrounds. VE sess. *TI:* 145.37. *Adm:* adv $4, door $5. Greg, KZ8X, 4281 Mohawk Tr, Adrian, MI 49221, 517-263-1153.

†**Michigan (Hudsonville)—Sep 17**; set up 7 AM, public 8 AM. *Spr:* Grand Rapids ARA. Unity Christian High School, 3487 Oak St. *Adm:* adv $3, door $4. Tables: $5. Jeff Belknap, N8RWS, PO Box 1248, Grand Rapids, MI 49501; tel 616-531-7899.

Michigan (Lansing)—Oct 9; dealers 6 AM, public 8 AM to 1 PM. *Sprs:* Central MI ARC and Lansing CD Rptr Assn. Gardner Middle School, S off Jolly, 2 blocks W of Cedar. Refreshments. *TI:* 145.39. *Adm:* $4. Tables: $10. LCDRA, PO Box 80106, Lansing, MI 48908

†**Michigan (Mt Clemens)—Sep 18**, 8 AM to 2 PM. *Spr:* L'Anse Creuse ARC. I-94 to exit 236, E to Crocker, left on Crocker to Reimold, right on Reimold to last school. Refreshments, VE sess. *TI:* 147.68/.08, 146.52. *Adm:* adv $4, door $5. Dave Herrington, N8NLK, 165 Crocker Blvd, Mt Clemens, MI 48043; tel 810-465-2797.

†**Missouri (St Peters)—Sep 25**, 7 AM to 1 PM. *Spr:* St Peters ARC. St Charles County Community College Campus, 4601 Mid Rivers Mall Dr. VE sess, vendors, flea market (space $3 includes 1 adm), refreshments. *TI:* 145.41, 444.275. *Adm:* $2. Jay Underdown, W0OGS, 58 Judy Dr, St Charles, MO 63301; tel 314-723-4200.

†**New Jersey (Lincroft, Middletown Twp)—Oct 9**; sellers 6 AM, public 8 AM to 2 PM. *Sprs:* Garden State ARA, Brookdale ARC, Jersey Shore ARS, Neptune ARC, Ocean-Monmouth ARC. Exit 109 Garden State Pkwy, W to 3rd traffic light and left into Brookdale College. VE sess, forums. *TI:* 145.485. *Adm:* adv $5, door $6. Al Allen, K2LG, PO Box 129, Belford, NJ 07718; tel 908-495-3246.

†**New Jersey (Pennsauken)—Sep 18**, 8 AM. *Spr:* S Jersey RA. VE sess, refreshments. *TI:* 145.29. *Adm:* adv $4, door $5. Diane Nafis, N2LCQ, 17 Roosevelt Dr, Laurel Spring, NJ 08021; tel 609-227-6281.

†**New Jersey (Teaneck)—Oct 8**, 8 AM to 2 PM. *Spr:* Bergen ARA. Follow Rte 4 E/W to the River Rds exit and follow the signs to hamfest. Parking, refreshments, VE sess. *TI:* 146.19/.79. *Adm:* $3. Jim, K2ZO, 201-664-6725; no calls after 10 PM.

New Mexico (Santa Fe)—Sep 17. *Spr:* Northern NM ARC. Glorieta Baptist Conference Ctr, 16 mi SE of Santa Fe on I-25, exit 299. Tailgating, overnight camping (with hook-ups $10 per night, for reservations contact Glorieta Baptist Conference Ctr, PO Box 8, Glorieta, NM 87535, with remittance, to secure your spot for Fri and/or Sat night; hotel reservations call 505-757-6161). *TI:* 145.19/144.59, 147.90/.30, 146.52. *Adm:* $6. Helenrose Burke, W5IXS, PO Box 73, Ojo Sarco, NM 87550; tel 505-689-2367.

New York (Horseheads)—Sep 24, 6 AM to 5 PM. *Spr:* Elmira ARA. Chemung County Fairgrounds. Flea market, dealer displays, new equipment, refreshments. Dave Lewis, RD 1, Box 191, Van Etten, NY 14889; tel 607-589-4523.

†**New York (Queens)—Oct 2**, 9 AM to 3 PM. *Spr:* Hall of Science ARC. *TI:* 449.20/444.20, 146.52. *Adm:* no adv, door buyers $5, sellers $10. Arnie Schiffman, WB2YXB, 81-22 250 St, Bellerose, NY 11426; tel 718-343-0172 nights only.

New York (Yonkers)—Sep 25; vendors 7 AM, public 9 AM to 3 PM. *Spr:* Metro 70-cm Network. NY State Thruway, to Yonkers Ave, left to St Johns Ave, Tereasa Ave to parking lot. Refreshments, free freq check. *TI:* 146.31/.91, 440.425 R, 446.425 T (CTCSS 156.7 Hz), 223.76 R, 222.16 T (CTCSS 67). *Adm:* $5. Otto Supliski, WB2SLQ, 914-969-1053.

North Carolina (Butner)—Sep 25. *Spr:* Falls Lake ARC. NC National Guard Armory, Central Ave. VE sess (10 AM). Fred, KC4VSO, 919-575-4262.

North Carolina (Maysville)—Oct 9, 8:30 AM to 3 PM. Flea market, refreshments, VE sess (walk-ins only, but must sign in by 9 AM, contact Andrew Griffith, W4ULD, 919-726-5924 or 919-247-0967). *TI:* 146.085/.685. *Adm:* free. Jo Ann Taylor, WD4JYR, 220 Anita Forte Dr, Swansboro, NC 28584, 919-393-2120.

†**North Carolina (Shelby)—Sep 3 and 4**, 8 AM to 3 PM. *Spr:* Shelby ARC. 3 mi E of Shelby, NC on Business Hwy 74. VE sess, packet seminar. *TI:* 146.28/.88. *Adm:* adv $4, door $5. Ace Lovelace, 719 Washburn Rd, Shelby, NC 28150; tel 704-434-2140.

†**Ohio (Ashland)—Oct 2**, 8 AM to 3 PM. *Spr:* Ashland Area ARC. Ashland County Fairgrounds. *TI:* 147.705/.105. *Adm:* adv $3, door $4. Wallis Green, W3YXS, 3 E Liberty St, Ashland, OH 44805; tel 419-281-3903.

†**Ohio (Cleveland)—Sep 25**, 8 AM to 3 PM. *Spr:* Cleveland Hamfest Assn. 1 mi W of I-71 and Bagley Rd, interchange, ½ mi S on Eastland Rd. Technical forums, VE sess (all classes), refreshments, Sat night banquet. *TI:* 146.73. *Adm:* adv $4.50, door $5. Answering service in Cleveland 216-999-7388, out of Cleveland 800-CLE-FEST.

Ohio (Lima)—Oct 9; vendor set up after 4 PM Sat (all-night security) public Sun 8 AM. *Spr:* NW OH ARC. Allen County Fairgrounds, State Rte 309, 1½ mi E of I-75, exit 125. Handicapped accessible, VE sess (all classes with complete FCC Form 610 and a check for $5.75 payable ARRL/VEC to Jon Solomon, W8TY, 1370 Stevick Rd, Lima, OH 45807.

†**Oregon (Medford)—Oct 8**, 9 AM to 4 PM. *Spr:* Rogue Valley ARC. VE sess. *TI:* 146.94, 147.10. *Adm:* adv $5, door $6. Van Sias, 641 Sunrise Ave, Medford, OR; tel 503-779-0723.

†**Pennsylvania (Berwick)—Sep 17**, 8 AM. *Spr:* Columbia Montour ARC. Rte 80 to exit 36, Rte 11 N to Rte 93 S, take 93 S 5.2 mi to Fire Hall. Refreshments. *TI:* 148.225/147.225. *Adm:* $3. Dave Schack, WC3A, 6020 Ft Jenkins Ln, Bloomsburg, PA 17815; tel 717-752-6851.

†**Pennsylvania (Butler)—Sep 11**, 8 AM to 4 PM. Butler Farm Show Grounds, Rte 68 S. Commercial vendors, refreshments, flea market ($1). *Adm:* $5, 12 and under, free. Tables: $10 per 8 foot. SASE to Joe Stalhman, WA3BVQ, 499 Kiester Rd, Slippery Rock, PA 16057; tel 412-794-8383.

†**Pennsylvania (Erie)—Sep 10**; vendors 5:30 AM, public 8 AM to 2 PM. *Spr:* RA of Erie. Franklin Twp Fire Hall, 6 mi S of I-90 on PA Rte 98 (exit 4). VE sess (9 AM at Franklin Ctr Methodist Church, 1 mi N of hamfest on Rte 98), refreshments, tailgating, parking. *TI:* 146.01/.61. *Adm:* $4. Tables: $8 for 8 foot indoors, $4 space outdoors. Tom McClain, N3HPR, 3954 Solar Dr, Erie, PA 16506; tel 814-833-1640.

Pennsylvania (Uniontown)—Sep 10, 8 AM. *Spr:* Uniontown ARC. Club Grounds on Old Pittsburgh Rd, just off the intersection of PA Rte 51 and US Rte 119. Free parking, flea market, tailgating. *TI:* 147.045, 147.255. *Adm:* $3. Carl, WA3HQK, or Joyce, KA3CUT, Chuprinko, 304-594-3779.

Pennsylvania (Warrington)—Oct 2; sellers 6 AM, public 7 AM. *Spr:* Mt Airy VHF Club, Bucks County Drive In, on Rte 611, exit PA Tpke at Willow Grove, 3 mi N. *TI:* 146.52. *Adm:* $5, sellers add $8/space. Packrats, Box 451, Montgomeryville, PA 18936.

†**Pennsylvania (York)—Sep 24 and 25**; set up 6 AM, public 8 AM. *Sprs:* York ARC, Hilltop Transmitting Society, Keystone VHF Club, York

Interstate Fairgrounds. Commercial displays, refreshments, parking, ATV seminar, banquet Sat night, VE sess (Sat 8 AM, must have copy of license, ID and FCC Form 610). *TI:* 146.37/.97. *Adm:* $5, Tables: wall table $30 per 8 feet, center $25 per 8 feet, electrical outlets $10 each. York Hamfest, PO Box 351, Dover, PA 17315.

South Carolina (Rock Hill)—Oct 1, 6 AM. *Spr:* York County ARS. Knights Stadium, I-77, exit 88, 1 min from exit, 15 min S of Charlotte. Commercial vendors, computer dealers, flea market, tailgating, refreshments, VE sess. *TI:* 147.03. *Adm:* adv $5, door $6. Tables: $10. YCARS Hamfest, 2129 Squire Rd, Rock Hill, SC 29730 or George Trunk, AB4BG, 803-327-4344

†**Texas (Wichita Falls)—Sep 17**, 8 AM to 6 PM. *Spr:* Wichita ARS, I-40 to Indiana St, Activity Ctr. ARRL forum, programs, VE sess. *TI:* 147.74/.14. *Adm:* adv $6, door $7. Tel 817-691-2102.

Vermont (Randolph)—Sep 17, 9 AM to 3 PM. *Spr:* Central VT ARC. I-89 to Randolph, exit 4, 1 mi E on Rte 66. Forums, VE sess, refreshments, tailgating ($4). *TI:* 147.09/.69, 146.625/.025. *Adm:* $3. Tables: adv $6, door $8. Tom Girardi, WA1YNU, PO Box 261, Waterbury, VT 05676; tel 802-244-7836.

†**Virginia (South Boston)—Sep 24**, 9 AM to 3 PM. *Spr:* Piedmont ARC. 58 E to 360, left on 360 and follow truck right signs to Hamilton Blvd, left on Hamilton, right on N Main watch for signs, VE sess. *TI:* 146.46/147.06. *Adm:* adv $4, door $5. Kathy Hendricks, AC4LB, Rte 2 Box 144, Hurdle Mills, NC 27541; tel 910-597-2959.

Washington (Bremerton)—Oct 1, 9 AM to 4 PM. *Spr:* N Kitsap ARC. Kitsap County Fairgrounds. *TI:* 145.31. *Adm:* no adv, door $4. SASE to NKARC, PO Box 2268, Silverdale, WA 98383-2268. QST

Strays

ATTENTION WW II ETO VETS

◊ David Higgins, K1BCG, of Seaville, New Jersey, is a volunteer for the Wall of Liberty National Campaign. The Wall of Liberty will be a memorial honoring the men and women of the armed forces who served in the European Theater of Operations during WW II. The groundbreaking for the memorial took place on the 50th anniversary of D-Day, June 6, 1994, and the memorial is scheduled for completion by the 50th anniversary of V-E Day (which commemorates the victory in Europe), on May 8, 1995. If you're an ETO veteran or know of a veteran who should be honored by having his or her name inscribed on the Wall of Liberty, please contact the Battle of Normandy Foundation, 1730 Rhode Island Ave NW, Washington, DC 20036; tel 800-WW2-VETS.

QST congratulates. . .

◊ Harold Rosen (ex-W5JKW) of Santa Monica, California, on being named 1994 Distinguished Alumnus of Tulane University. Stan Pulitzer, W5JYK, of New Orleans, proudly informs us that Harold was his Elmer 51 years ago. Until his retirement in 1993, Harold was with Hughes Aircraft Co for 37 years, 18 as vice president. He's now CEO of Rosen Motors, which is working on an electric automobile that runs without batteries. Harold is considered one of the founders of the modern communications satellite industry, having developed the world's first geosynchronous communications satellite, *Syncom*, and the first commercial communications satellite, *Intelsat I*. He's helped develop about 100 satellites and holds 54 US patents.

W1AW schedule

Pacific	Mtn	Cent	East	Sun	Mon	Tue	Wed	Thu	Fri	Sat
6 am	7 am	8 am	9 am			Fast Code	Slow Code	Fast Code	Slow Code	
7 am	8 am	9 am	10 am			Code Bulletin				
8 am	9 am	10 am	11 am			Teleprinter Bulletin				
9 am	10 am	11 am	noon							
10 am	11 am	noon	1 pm		Visiting Operator Time					
11 am	noon	1 pm	2 pm							
noon	1 pm	2 pm	3 pm							
1 pm	2 pm	3 pm	4 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
2 pm	3 pm	4 pm	5 pm	Code Bulletin						
3 pm	4 pm	5 pm	6 pm	Teleprinter Bulletin						
4 pm	5 pm	6 pm	7 pm	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code
5 pm	6 pm	7 pm	8 pm	Code Bulletin						
6 pm	7 pm	8 pm	9 pm	Teleprinter Bulletin						
6:45 pm	7:45 pm	8:45 pm	9:45 pm	Voice Bulletin						
7 pm	8 pm	9 pm	10 pm	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code	Fast Code	Slow Code
8 pm	9 pm	10 pm	11 pm	Code Bulletin						
9 pm	10 pm	11 pm	Mdnte	Teleprinter Bulletin						
9:45 pm	10:45 pm	11:45 pm	12:45 am	Voice Bulletin						

Note: W1AW's schedule is at the same local time throughout the year. The schedule according to your local time will change if your local time does not have seasonal adjustments that are made at the same time as North American time changes between standard time and daylight time. From the first Sunday in April to the last Sunday in October, UTC = Eastern Time + 4 hours. For the rest of the year, UTC = Eastern Time + 5 hours.

❑ *Morse code transmissions:*

Frequencies are 1.818, 3.5815, 7.0475, 14.0475, 18.0975, 21.0675, 28.0675 and 147.555 MHz.

Slow Code = practice sent at 5, 7½, 10, 13 and 15 wpm.

Fast Code = practice sent at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice text is from the pages of *QST*. The source is given at the beginning of each practice session and alternate speeds within each session. For example, "Text is from July 1992 *QST*, pages 9 and 81," indicates that the plain text is from the article on page 9 and mixed number/letter groups are from page 81.

Code bulletins are sent at 18 wpm.

❑ *Teleprinter transmissions:*

Frequencies are 3.625, 7.095, 14.095, 18.1025, 21.095, 28.095 and 147.555 MHz.

Bulletins are sent at 45.45-baud Baudot and 100-baud AMTOR, FEC Mode B. 110-baud ASCII will be sent only as time allows.

On Tuesdays and Saturdays at 6:30 PM Eastern Time, Keplerian elements for many amateur satellites are sent on the regular teleprinter frequencies.

❑ *Voice transmissions:*

Frequencies are 1.855, 3.99, 7.29, 14.29, 18.16, 21.39, 28.59 and 147.555 MHz.

❑ *Miscellanea:*

On Fridays, UTC, a DX bulletin replaces the regular bulletins.

W1AW is open to visitors during normal operating hours: from 1 PM until 1 AM on Mondays, 9 AM until 1 AM Tuesday through Friday, from 1 PM to 1 AM on Saturdays, and from 3:30 PM to 1 AM on Sundays. FCC licensed amateurs may operate the station from 1 to 4 PM Monday through Saturday. Be sure to bring your current FCC amateur license or a photocopy.

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.

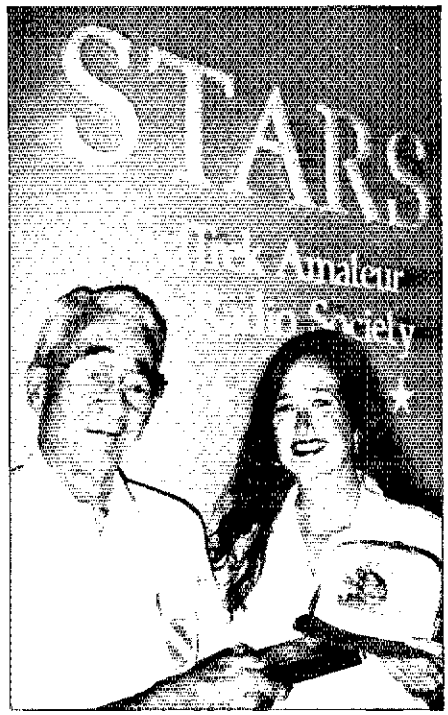
Headquarters and W1AW are closed on New Year's Day, President's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving and the following Friday, and Christmas Day. On the first Thursday of September, Headquarters and W1AW will be closed during the afternoon.

Conducted By Steve Ewald, WV1X
Assistant Field Services Manager

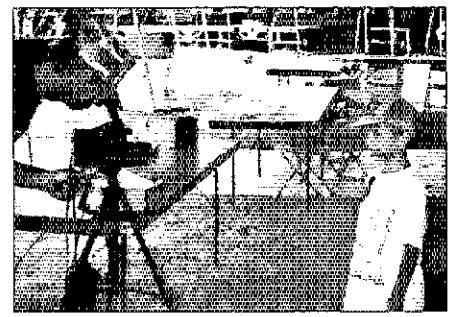
STARS Brighten the Future

Many Atlanta, Georgia, area clubs are pitching in to support SciTrek ARS (STARS). STARS is an integral part of SciTrek, a permanent museum that has more than 100 interactive science exhibits, including a fully equipped Amateur Radio station. The clubs provide funds, equipment and volunteers to help make the Amateur Radio exhibit active, popular and interesting to the many visiting young people and students.

The following clubs are among the growing list of organizations supporting the SciTrek ARS: Alford Memorial RC, Atlanta RC, Chapter 49 of QCWA, Metro Atlanta Pioneers RC, North Fullerton ARC and Southeastern DX Association. —*Thanks to Jud Whatley, W4NZJ, president of QCWA Chapter 49*



QCWA Chapter 49 officer Bill Plage, W4DQT, presents a Chapter 49-produced STARS orientation video and a QCWA cap to Angela Fletcher, Assistant SciTrek Education Coordinator. The video (the first of many) represents one way clubs are supporting the SciTrek ARS.



Smile, You're on Candid ATV—This fall, when your club participates in a seasonal fair, consider setting up an amateur television (ATV) station. Last October, the West Gulf Division Task Force sponsored a special-event station, W5TEX, at the State Fair of Texas near Dallas. Pictured in front of the ATV is Matthew Whisennand, of Dallas, son of Whiz Whisennand, KI5NL, and Cynthia Whisennand, N5TFB. Matthew and hundreds of fairgoers stopped by the station where HF, packet and other Amateur Radio modes were demonstrated. Jerry Collins, N5ZAM, is the camera operator, and coordinated this successful ATV demonstration. The West Gulf Division Task Force is made up of clubs from all four Sections of the Division.—*Thanks to Tom Anderson, WW5L, North Texas Public Information Coordinator*

TELCO ARC DONATES TO GENERAL FUND

The Telco ARC from the Los Angeles, California, area, has disbanded as an organization. The former members have generously contributed $325 to the ARRL General Fund. This donation represents the balance in the club treasury when it ceased operation. Thank you to all who were members of the Telco ARC. We appreciate your support.—*Thanks, G. E. Glidewell, W6BFT*

IOWA CLUB RECEIVES GOVERNOR'S AWARD

Congratulations to the Mount Pleasant, Iowa, ARC, for receiving the Governor's Volunteer Award in May. The club was nominated by the Iowa Department of Education for helping students of the school system learn about Amateur Radio.

The Iowa Governor's office gives the annual Volunteer Awards to groups and individuals for performing public service. The RC also received the award in 1988 for its service to the Henry County Office of Emergency Management.—*Thanks to Dave Schneider, WD0ENR*

Members of the Mount Pleasant (Iowa) ARC on hand to receive the Governor's Volunteer Award are (l-r) Ed Farley, N0VXV; John Willson, KA0FBK; Ray Gillespie, N0VXW; Iowa Governor Terry E. Branstad; Dave Schneider, WD0ENR; Dave Ruby, KA0FBL; and Jim Huffaker, N0PKH.

ARRL SPECIAL SERVICE CLUBS RECOGNIZED

Administered By Vicky Armentano

Congratulations to the following ARRL Special Service Clubs. This list reflects activity during June 1994:

Renewing Special Service Clubs
Albuquerque ARC, NM
Baton Rouge ARC, LA
Dallas ARC, TX
Calhoun County ARA, Weaver, AL
Central Georgia ARC, Warner Robins
Central Kansas ARC, Salinas
Clark County ARC, Washougal, WA
Great Bay RA, Dover, NH
Green Valley ARC, AZ
Kings RC Inc, Hanford, CA
Lake Monroe ARS, Altamonte Springs, FL
L'Anse Creuse ARC, Utica, MI
Laurel ARC, MS
Mankato Area RC, MN
McMinnville ARC, OR
Mid Atlantic ARC, Villanova, PA
Middlesex ARS/CARES, Middletown, CT
Northwest ARS, Houston, TX
Owensboro ARC, KY
Paducah ARA, KY
Pine State ARC, Old Town, ME
Radio Amateur Club of Knoxville, TN
Raritan Bay Radio Amateurs, South Amboy, NJ
Reading RC, PA
Santa Barbara ARC, CA
Scottsdale ARC, AZ
Shoreline ARC Inc, Essex, CT
Stamford ARA, CT
Suncoast ARC, Hudson, FL
Temple ARC, TX
West Park Radiops ARC, Cleveland, OH
Wichita ARC Inc, KS
Wilson ARC, Lebanon, TN

New Special Service Clubs
Gila ARS, Silver City, NM
McKean County ARC, Bradford, PA
Tri-County Amateur Radio Group, Roslyn, PA
Placentia Radio Watch, CA

Conducted By Connie Dunn, KB5LES
1807 N Elm, Suite 238, Denton, TX 76201
fax 817-387-7544, MCI Mail 138-0512, CompuServe 72245,1466

Mom, Morse & Language Skills

By Connie Dunn, KB5LES

When my now-six-year-old was four, she announced that she wanted to read—not picture books where she could make up the stories, but honest-to-goodness stories. So, having friends who home-schooled, I found what I needed and began teaching her to read. When I later began researching math programs, I began to see how patterns are an important part of learning language and math skills.

While Erin was learning all about patterns in preschool and kindergarten, I thought the patterns of Morse code seemed like a logical starting place for learning about Amateur Radio. Music, of course, is another pattern-based skill that preschoolers enjoy. It, too, has enjoyable rhythms. So, when I first introduced Morse code to Erin, she was the one who made the analogy to music.

We had purchased a couple of small, self-contained code practice oscillators called the *Codekey 1000* from Carole Perry, WB2MGP (Media Mentors, PO Box 131646, Staten Island, NY 10313-0006; $19.95 plus s/h). Erin likes to play on them, making up her own rhythms. Just like in music, it's important that children feel comfortable with their instruments.

Teaching each letter sound can be a tedious process, although we have used *Code Quick*, developed by Jerry Wheeler, W6TJP (Wheeler Applied Research, 38221 Desert Greens Dr W, Palm Desert, CA 92260; $47.95 ppd). It has been fun to say word sounds for Erin's name. And we can even sing the alphabet song in Morse code—or should I say *Quick* code?

Of course, parents should be aware that exposing a child to Amateur Radio does give them a larger vocabulary. The children of ham operators usually know words such as electronic, antenna, transmit, microphone and rubber duckie, which Erin thinks is hysterical. What other child would associate Sesame Street's *Rubber Duckie* song, which Ernie sings in the bathtub to his rubber duck, to a rubber-duck antenna?

Jerry Wheeler, W6TJP, explains why *Code Quick* works for kids and adults. "When you learn the code as dahs and dits, your brain doesn't know what to do with it. It's like noises, such as crickets, for the brain. That part of your brain is speed and sound specific. You have to learn 44 characters at each speed, then try to sort 300 to 400 characters when you hear it. What *Code Quick* does is transfer the learning to the language center, which is a faster part of the brain. When it hears *dah-di-dit*, it hears *dog did it*, and it doesn't matter how fast it's done, you still hear it. We've had parents in the home-school movement out here take four-year-olds and teach them their letters along with Morse code. The kids actually learned Morse code first."

Judi Jaksa, N0IDR, of Dallas, Texas, sends Morse code to Girl Scouts during a ham radio workshop conducted to coincide with GOTA, an international event similar to JOTA.

Kids and adults do learn differently, says Gordon West, WB6NOA, of Costa Mesa, California, who is a well-known code instruction expert. "The big thing with kids is that we teach the class just for kids or just for adults and young adults, but not for both. And we don't approach it (Morse code) like we're going to teach code. What we do for kids and code rather than have them memorize the dot and dash characters is have certain sounds stand for certain things, such as di-dah-di-dah-di-dah might be stand up. Having the kids do a clap rhythm or 'a fun rhythm tape to help learn the code' is a fun way to lead into learning code," said Gordon. "Kids are so uninhibited, they can equate sound to activity. And kids are more advanced when it comes to sound."

(It's important to remember that, while rhythm and mnemonic devices *can* greatly speed the code *learning* process, they do not necessarily facilitate on-air fluency while *using* Morse code. Other code experts not quoted here admonish their students *never* to learn the code with such devices, as they force code users to make extra, unnecessary translations while receiving Morse code: Let's see, was that "dog-did-it, doo-wack-a-doo, Johnny-jump-up, get-back-Jack?" or "name here is Bill?" You get the idea. Mnemonic learning techniques may help you learn *Morse code letters and numbers*, but they may hinder your progress later when you're trying to use higher-speed Morse on the air.—*Ed.*)

Morse code is fun to teach, says Carole Perry, WB2MGP, of Staten Island, who teaches sixth, seventh and eighth grade students at Intermediate School 72 in Staten Island, New York. "If it's approached where it's a fun thing, kids think it's fun. Of course, it's harder to teach large numbers of kids, so I do a lot of group work then. You just have to be better organized with bigger groups. But when parents teach their kids, they know how they learn best. If a kid likes to touch things or is more auditory, the parent can work with that. For an auditory learner, use tape recordings. If a child is kinesthetic, give him or her a code key. But it isn't enough just to teach them the code. They need to be motivated. They need to have a reason for wanting to do it. Do they want a radio like mommy or daddy? The parent or teacher needs to help encourage and motivate the child."

If you've heard that kids learn languages faster, Dr Gerald Knezek, KB5EWW, can confirm that tendency. "Whether it's a computer language, a foreign language or Morse code, kids think it's fun—not a chore like homework," Gerald says. He is the director of the Telecommunications and Informatics Laboratory at the Texas Center for Educational Technology (TCET) at the University of North Texas in Denton, Texas, as well as an associate professor in the Department of Technology and Cognition for the College of Education.

Dr Knezek, of Sanger, Texas, has been conducting a study on children and their eager approach to computers. He says, "They see them as toys. The computer as a tool or the computer as a toy is one and the same. And parents shouldn't worry if their kids play with the computer." He also believes it is much the same with all Amateur Radio technology. His 11-year-old son learned Morse code quickly. "He learned by rhythms. It is half-way musical. Children just naturally learn. And he probably learned at about age 7. And my now 7-year old is learning all about sign language."

During the February 20th, (Girl) Guides (and Girl Scouts) on the Air (GOTA), Tejas Council Event Chairperson Judi Jaksa, N0IDR, of Dallas, Texas, introduced Morse code to more than 250 junior, cadette and senior scouts during a two-day ham radio workshop. The scouts earned a communication patch.

"I used my oscillator, so the scouts could hear the sounds at various speeds. It's a typewriter keyboard that sends code by pressing on the letters, and I can vary the speed. The scouts are given a sheet with the letters and the code drawn on it. When they can hear SOS, then I throw in a name from the audience. Then I send a secret message, so they can decode it from their sheet. They think it's really neat, because it's a secret message," she says. QST

The ARRL Foundation Proudly Presents...

...our academic scholarship recipients for 1994! Through your generous support of our scholarship funds, we're able to help 25 promising students with their college expenses this fall. Our scholars are committed to high academic standards, making notable achievements in their scholastic careers, while continuing to enjoy Amateur Radio activities. Let's meet these fine young men and women:

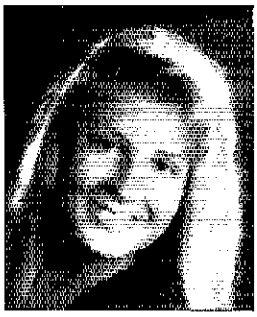
Stephen Gee, AA2GE
The ARRL Scholarship to Honor Barry Goldwater, K7UGA $5000
Rice University, Texas

Michael Taylor, KA3SVX
The You've Got a Friend in Pennsylvania Scholarship, $1000
Prairie Bible College, Alberta

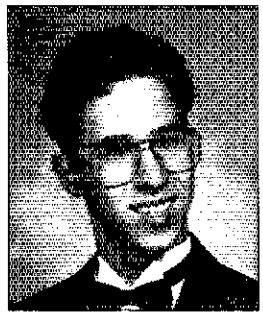
Elliot Bernstein, AA2KR
The Perry F. Hadlock Memorial Scholarship, $1000
Cornell University, New York

Jeffrey Johnson, N4YRC
The L. Phil and Alice J. Wicker Scholarship, $1000
Princeton University, New Jersey

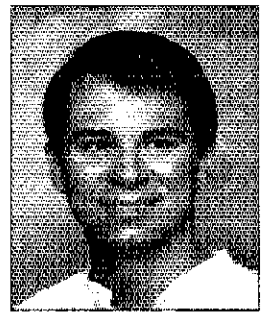
James Muiter, N6TDC
The Charles N. Fisher Memorial Scholarship, $1000
Dartmouth College, New Hampshire



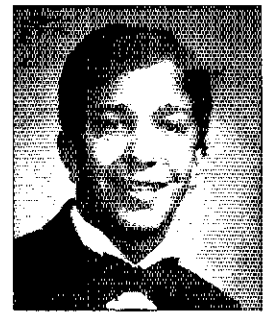
Amy Tlachac, N9TLN
The Martin Green Sr, K2TEO, Memorial Scholarship, $1000
University of Wisconsin, Madison



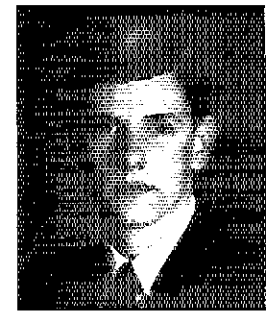
Todd Kramer, N4WOR
The General Fund Scholarships, $1000
University of Florida, Gainesville



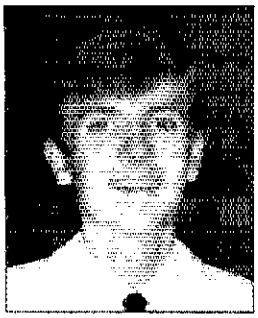
Kenneth Leitch, KB5OKI
The General Fund Scholarships, $1000
New Mexico State University



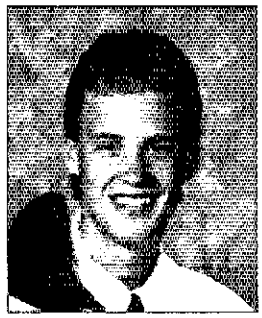
James Phillips, KA3WSZ
The General Fund Scholarships, $1000
University of Delaware, Newark



James Gregory, AD4GN
The General Fund Scholarships, $1000
Georgia Institute of Technology

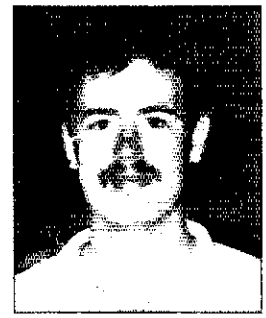


Andrew Freeston, KA1VYX
The New England FEMARA Scholarships, $600
Bucknell University, Pennsylvania



Brian Montmarquet, N1NKH
The New England FEMARA Scholarships, $600
Plymouth State College, New Hampshire

Michael Ambrose, KC1UK
The New England FEMARA Scholarships, $600
University of New Haven, Connecticut

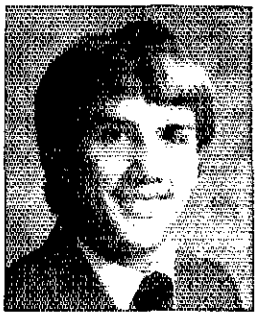


Kevin Jensen, N1KCG
The New England FEMARA Scholarships, $600
Hartford Graduate Center, Connecticut

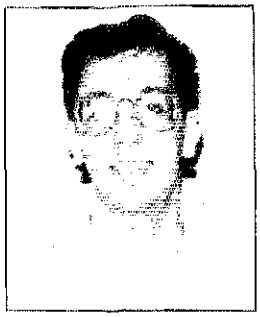
Michael Decerbo, N1FYO
The New England FEMARA Scholarships, $600
Massachusetts Institute of Technology

Michael Hawk, NØOSY
The PHD Scholarship, $500
The University of Nebraska, Lincoln

Eric Johnson, N9TAR
The Edmond A. Metzger Scholarship, $500
Case Western Reserve University, Ohio



John Crago, KB8DAN
The Edward D. Jaikins Memorial Scholarship, $500
West Virginia Institute of Technology



Owen Debowy, N2WPO
The Dr James L. Lawson Memorial Scholarship, $500
State University of New York, Stony Brook

Leanne Gordon, KFØZL
The Irving W. Cook, WAØCGS, Scholarship, $500
Butler County Community College, Kansas

Also receiving Foundation scholarships are the following young amateurs: Brian Kuehn, KBØETT, the Paul and Helen L. Grauer Scholarship ($1000); Tamara Britain, KB5RYE, the General Fund Scholarships ($1000); Justin Munger, AA1AS; Jason Lovett, N1EJD; and William Nelson, KB1AWA, New England FEMARA Scholarships, ($600 each).

Contributor's Corner

We wish to thank the following for their generous contributions to:

The Victor C. Clark Youth Incentive Program Fund
Jerrold Colten, W9CZI
  in memory of Joe Mergen, N9GID
Phil Sager, WB4FDT
  in memory of Tom Spencer, W5IGM and G. Ipock, K4JA
Carleton Gray, W4ACM
  in memory of John Gray Jr, WØIDW
Martin Meyer, HB9BGV
  in memory of Rene Oehninger, HB9AHA

The Goldwater Scholarship Fund
James Webster, W6WZX

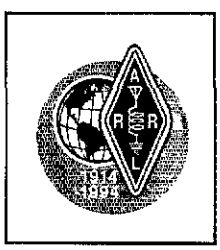
The General Fund
Sergio Temporini, LU1ARL
Clifford King, NØCNT
Frank Dalcanton, KA9PWW
Raymond Hensler, KB4BBC
Charles Adams, KF9GL
Glenn Moore, WBØFGM
Todd Young, KD6VFC
Robert McAuliffe, N2QXI
Judith Cianchetti, N2KJB
Gary Mayfield, WAØEAF
Irving Alterman, K4GQY
C. J. Mozzoehi, W1LYQ
John Triplett, KJ4VD
Jacques Corbu, V85CJ
Louise Mitchell
  in memory of Ralph Mitchell, W6EKW
Morton Goodman
Eric Yagerlener, N8YME
Don Denbow, KA9HKB
Alexander Benitez, WX3Q
Edward Pekol, W9FPE
John Crosswhite, KJ6MW
Elkhorn Valley ARC (Nebraska)
George Klassen, W8MH
  in memory of David Fraser, KH6BIH
Ruth Edelheit
  in memory of Martin Edelheit, N2LLI
Daniel Ferguson, KH6BS
William Pitts, W1LZW
James Morgan, KC6NOS
Theodore Kangas, W8HV
John Huffman, W4IRE
Edward Towner, N4PKX
Wayne Hanson, KD3KU
Andrew Romanisky, WA6WXD
David Vega Jr, WP4LWE
Robert Rathbun, W8TGH
Todd Hansen, KD6YPS
William Baker, N4WAN
John Folger, WA2REA
Gerard Shaw, N3KSQ
John Frankovich, N1FVT
Kate Williams
  in memory of Henson Williams, W4OE
Florence Regan
  in memory of William Regan, NØTXX
Shirley Stangel
  in loving memory of Arthur Stangel, W2JZH
Howland Jones Jr, W1ECC
Virginia Handwork
  in loving memory of George Handwork, W5CNI
Jerry Paquette, WB8IOW
Wilmer Bennett, WB3KSY
Wilfredo Aviles Jr, WP4RN
Donald Chapman, W4PNV
Michael Brigham, KD4AUU
Donald D'Egidio, WB3BJU
John Hlinka, W2QHY
Donald Ward, KB6KJ
Derek John Hewett
Ernst Haefeli, PY2EWZ
James Jenkins PhD
  in memory of R. W. Johnson, W6MUR
F. C. Webster Jr, W9RYK
  in fond memory of John Ferguson Jr, W3AEV
Charles Clifford Jr, W6QMY
  in memory of Lloyd Nichols Sr, W2LXT
John Denk, W9NRI
  in memory of William Heilman, W5SWH

As received and acknowledged during **May** and **June**.

QST

Strays

LEAGUE ANNIVERSARY PINS



Psst! Here's a good deal, but you must order *right away*! Special pins commemorating the 80th anniversary of the ARRL were made for distribution to those attending the recent Amateur Radio convention in Friedrichshafen, Germany. The accompanying illustration (actual size) shows the very attractive design. The large round field is blue, the League diamond is red, the globe has gold continents on a white background, and the lettering and border trim are gold. A very limited number of these special commemorative pins are available for purchase from ARRL HQ for the paltry sum of $5, postpaid. Send your order for the ***80th Anniversary Pin*** to Publication Sales, ARRL HQ, 225 Main St, Newington, CT 06111-1494.

I would like to get in touch with. . .

◊ anyone who has successfully reduced ignition noise generated by 1970s/'80s Toyota engines, heard from 7 to 30 MHz. The problem doesn't seem to exist in later models. It may be caused by the spark plugs wires and/or the distributor, and is only received via the antenna, not the power cables. Steve Clark, AG4V, PO Box 11234, Memphis, TN 38111-0234. (Also, see "Automobile EMI: The Manufacturers Speak" by ARRL Lab Supervisor Ed Hare, KA1CV, elsewhere in this issue.—*Ed.*)

◊ members of the First Radio Research Company for a project to preserve the Company's history on behalf of the historical librarian at the US Army Aviation Museum in Ft Rucker, Alabama. Ken Supranowich, 1170 Keeven, Florissant, MO 63031.

◊ any amateur who has a Medtronic drug pump implanted in abdomen with an intrathecal catheter. Denis Parker, WD4ACH, 5116 Rebecca Ln, Knoxville, TN 37920.

◊ any amateur who has information on modifications for a HAL DS-3000 KSR terminal to enhance its operation, especially a method of providing ASCII output as messages are displayed on the screen. Eric Stokes Jr, WA8ZJY, 11415 W Pkwy, Detroit, MI 48239.

Silent Keys

Administered by Katherine Fay, N1GZO

It is with deep regret that we record the passing of these amateurs:

W1AH, William E. Neff Jr, Simbsury, CT
W1CEV, Payson E. Spaulding, Gardiner, ME
K1CLH, Byron H. Kiser Jr, Marlboro, MA
WA1DEC, Robert F. Ochs, Milton, MA
KA1EHY, Alden Speare Jr, Providence, RI
N1FEQ, Paul R. Getchell, Burlington, MA
W1FPM, Clarence B. Strickland, Southington, CT
W1HEZ, Hugh C. Crouch, Springvale, ME
WA1LSU, Chester B. Kelley Jr, Centerville, MA
W1LTW, Hassall E. Nelson, Ryegate, VT
N1MMF, Paul E. Kelley, St Albans, VT
W1ON, Arthur P. Peardon, Centerville, MA
*W1PN, Hugh G. J. Aitken, Amherst, MA
W1QQC, James A. Harper, Eastham, MA
NE1T, Lucian Campana, Ludlow, MA
W1UFV, Wallace Blake, East Hartford, CT
KA1UJ, Robert J. Hobert, Weston, VT
†K2BGF, John Lynch Sr, Glendale, AZ
WB2BJA, Jules J. Friedman, Searsdale, NY
W2BSH, George L. Fuller, Schenectady, NY
N2DKL, Joseph M. Perron Sr, Hamilton Square, NJ
K2EOL, John S. Skuback, Brick, NJ
VE2FMQ, Douglas H. Logie, Brooksville, FL
W2GO, Albert H. Jones, Leesburg, IN
W2HWQ, William J. Koczon, Petaluma, CA
W2IDZ, Francis E. Ladd, Colts Neck, NJ
W2IYX, J. H. McCoy, Huntington, NY
N2LHS, Louis Salgado, West Islip, NY
WA2RLL, Sidney Barnett, Tamarac, FL
K2SQM, Frank Follweiler, Glendora, NJ
WB2TGH, Herbert Spatz, Brooklyn, NY
W2TVC, Seymour C. Nolan, Bemus Point, NY
WA2WSY, Ernest E. Fischer, Glenmont, NY
K2YGJ, Guy E. Buck, Ballston Lake, NY
WA2ZJL, George M. Chapman, Oneida, NY
N3EEO, George S. Caldes, Hockessin, DE
K3OTE, William T. Weiss Sr, Silver Spring, MD
W3SYZ, George W. Heim, Orwigsburg, PA
K3ULY, Nicholas A. D'Amato, Reading, PA
K3VYF, Rosario Morrone, Altoona, PA
WA4DRS, David W. Brown, Chunchula, AL
K4EBE, Edwin W. Nevin, Bartow, FL
K4EJD, G. L. Spann, Shellman, GA
W4GHN, Christian C. Pfitzer, Orlando, FL
WA4GVH, Ronald D. Baker, Nashville, TN
K4IKB, Robert L. Hartford, Sarasota, FL
W4JD, Forrest Pilgrim, Kingsport, TN
W4KCR, Lyn Carr, Tallahassee, FL
AA4LB, Frank Blanchard Jr, Birmingham, AL
W4NOL, Charles E. Deckard, Huntsville, AL
K4OQ, Robert B. Conaughty, Hendersonville, NC
WB4RUC, Grover C. Smith Jr, Gadsden, AL
KA4TGS, William C. Carlisle, Savannah, GA
WB4TIO, Douglas R. Hunter, West Palm Beach, FL
N4VMG, Floyd B. Neyhart, North Myrtle Beach, SC
KA4WFM, Joe L. Moore, Metter, GA
N4XMZ, Philip H. Perry, Stuart, FL
*WA4YFU, Maxwell C. Gilbert, Winston-Salem, NC
WA4YMM, Marie S. Presler, Fayetteville, NC
KD4ZJW, James G. Litsey, Montgomery, AL
N5AOX, Robert N. Arnold, Columbus, MS
N5EOD, Charles W. Sheets, Dallas, TX
WB5E, Michael Moody, Dallas, TX
N5HG, Alan H. Glass, Roger, AR
W5HHT, Irvine J. Levi, Folsom, LA
KI5LO, Paran W. Heavner, Little Rock, AR
KB5LPW, Sidney A. Sanders, Nederland, TX
W5MA, J. F. Skelton, Dallas, TX
KB5MBU, Connie Williamson, Austin, TX
WB5OUK, Trannie O. Peay, Ackerman, MS
N5PDZ, Jerry W. Webster, Vidor, TX
AJ5Q, D. L. Hinkle Jr, Altus, OK
WA5QCM, W. E. Rathert, Azle, TX
K5ST, Robert H. Brasher, Bulverde, TX
W5TJE, Jones P. Talley, Dallas, TX
KB5UE, Terence A. Harrison, Houston, TX
N5YVP, Emerson G. Hill, San Antonio, TX
W6AFZ, Robert J. Steelman, San Diego, CA
K6BEK, Theodore K. Lucke, Alliance, OH
KH6BIH, David R. Fraser, Captain Cook, HI
KD6DLW, Malcolm E. Wiechman, Vista, CA
KH6EJ, William Seymour, Hilo, HI
W6EPX, Bud Smith, El Toro, CA
KB6FDB, Andrew H. Carlson Jr, Glendora, CA
K6GO, Myron G. Pawley, Riverside, CA
W6GVK, William Sherwood, Coeur D'Alene, ID
KH6IJ, Katashi Nose, Honolulu, HI
W6PSJ, William B. Lyon, Duarte, CA
W6PUU, Arland V. Page, Lakewood, CA
N6QFS, Allan Fisher, Park City, UT
W6QMC, John A. Hultquist, Goleta, CA
N6QNV, Gordon S. Kiburz, San Bernardino, CA
W6TZP, Francis W. Hertel Jr, Ventura, CA
N6XA, Robert E. Heckert, Fullerton, CA
*N7AA, Marion R. Neary, New Plymouth, ID
N7DLP, Donald L. Dakan, Clarkdale, AZ
N7ICE, Michael W. Alexander, Wenatchee, WA
W7JFR, John R. Willson, Olympia, WA
WA7JTI, Charles A. Hodson, Seattle, WA
AK7N, Farrell A. Buckley, Grants Pass, OR
KG7XR, Elvina N. Smith, Eureka, NV
KB7ZPH, Judith L. McCarty, Lake Oswego, OR
W8AIJ, Kenneth L. Geidemann, Niles, MI
W8CHV, Frommhold K. Holtz, Columbus, OH
K8CKS, Theo F. Kuntz, Willoughby, OH
KB8CQC, Ernest L. Rooks, Milan, OH
W8GG, Alonzo Wierenga, South Haven, MI
AA8HM, Paul Kerns Carman, South Charleston, OH
K8IJM, Wilson J. Flinn, Kenton, OH
W8MMS, Anna Y. Wasmuth, Marquette, MI
KA8UJI, John W. DeForest, Cardington, OH
KB8VW, Richard Dixon, Clinton Township, MI
W8WZJ, Paul A. Burns, Harrison Township, MI
K8YUZ, D. M. McBride, Sycamore, OH
W9AGV, Everett G. Hallquist, Sycamore, IL
WB9AWI, Robert L. Miner, Indianapolis, IN
W9BIW, Merel Hammond, Laughlin, NV
W9CNL, Vance W. Lockenour, Bedford, IN
WD9CVW, Robert L. Eckhart, Auburn, IN
N9ILJ, Scotty L. Studer, Hymera, IN
W9JHV, William J. Voegeli, Glen Ellyn, IL
W9JSD, Thomas J. Moore, Springfield, IL
K9KKN, Stuart D. Park, Springfield, IL
W9SIU, George M. Shipman, Machesney Park, IL
WB9TIZ, Ernst J. Redepenning Jr, Lake Station, IN
N9TRV, Claude G. Smithhart Sr, Mount Vernon, IN
†KA9UAF, Elmer Polivka, Cicero, IL
W9YEW, James W. Stogdill, Bluffton, IN
KBØADF, Mark L. Haworth, Golden, CO
WØBPG, Harvey J. Waskow, Bettendorf, IA
WØFTW, Everett Johns, Burwell, NE
KØIQZ, Gerald F. Caduff, Pueblo, CO
WØMKP, Edward G. Nelson, Jacksonville, FL
KØPZH, Robert E. Seger, Tipton, IA
NØRBU, Robert E. Lading, Fulton, MO
NØZUJ, Gordon A. Alexander, Aurora, CO
HKØBKX, Francisco Velez, Rosepine, LA

*Life Member, ARRL

Correction: The July column listed Lucien Bazinet as a Silent Key and erroneously gave his call sign as VE2SWL. We are happy to report that Jordan Arndt, VE2SWL, is alive and well. Lucien, an ARRL Member at the time of his death, is a Silent Key.

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 sign of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

In order to avoid errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from HQ.

Many hams have remembered a Silent Key with a memorial contribution to the ARRL Foundation. Contributions to the Foundation are tax-deductible to the extent permitted under current tax law. Our address is: The ARRL Foundation, Inc, 225 Main St, Newington, CT 06111. QST

75, 50 and 25 Years Ago

September 1919

◊ The issue's black-and-red Harry R. Hick cover art depicts "Radio on land, sea, and air." Wrote K. B. Warner, W1EH, of its contents in September 1944 *QST*: "September 1919 *QST* reports with rising indignation that amateur radio is not yet reopened and no information is forthcoming why. The Navy Department, which has had control of radio during the war, had an order prepared to reopen us on August 1st but simultaneously postponed it with explanation and sent a letter to both houses of Congress requesting 'a comprehensive system of regulation and control' of radio, with new legislation which would give the Navy a monopoly of international and ship-to-shore radio...Our Board of Direction is fed up with the delay and has appointed a committee to go to Washington to arrange for the introduction of a resolution demanding the restoration of amateur radio...Canadian amateurs have been released since May 1st, with a power of 500 watts..."

The issue's features include "Efficient Trans-Ocean Reception for the Amateur" by William E. Woods; "The Amateur Situation" (unattributed); "An Undamped Receiver" by J. A. Crowdus; "Nonsynchronous Rotaries" (unattributed); and "More About Vacuum Tube Transmitters" (unattributed).

September 1944

◊ The cover and one-third of the issue's 128 pages celebrate the U.S. Army Signal Corps, as the lead editorial explains: "With pride which we believe the reader will find warranted, we present in this issue of *QST* an experiment in a new kind of reporting of the military communications scene. It is an attempt to convey in one unified picture the structure, application and conduct of military radio communications as found in combined ground force operations." The other editorial explores "Automatic Relaying": "We visualize the v.h.f. ham station of the future as possessing not only transmitter and receiver, but means for coupling the two together, so that received signals can be transmitted, the local operator also patching himself into the circuit at will. Then we can have bucket-brigade relaying, automatically...Perhaps by slow stages, numerous of these intercity routes will surely grow up. Some fine night we can see a number of these short circuits succeeding in connecting themselves up end to end, and—presto!—we'll have automatic relaying from New York to Chicago or between San Francisco and Los Angeles. And some day (we gulp twice but we're going to say it) coast to coast!" Gold Stars reports the deaths of Edward R. Downie, W5HZT, and Bernard F. Nolan, W3IRI.

The issue's non-Signal Corps features include a 112-Mc. transmitter by Dawkins Espy, W6UBT; "'Tiny Tim'—A 'QSL'-Size Portable Receiver" by Paul J. Palmer, W8UGR; "Kw. vs. Kva." (the role of power factor in transformer use) by Henry B. O. Davis, W4HZI, and the fifth part of "Practical Applications of Simple Math" by Edward M. Noll, ex-W3FQJ.

September 1969

◊ The cover: K1QQX adjusts the antenna described in Beginner and Novice's "A Three-Element Delta Loop Beam" by Lewis G. McCoy, W1ICP. The editorial, "Newcomers," reminds us that books, magazines and films can only go so far in attracting new hams: "The real exposure...comes with a visit to the shack of an already-licensed friend or acquaintance." Behind the Diamond visits *QST* VHF editor Edward P. Tilton, W1HDQ; Happenings reports the death of past ARRL President Herbert Hoover Jr, W6ZH.

Leading the issue's features, Richard S. Taylor, W1DAX, builds "A Direct-Conversion S.S.B. Receiver" and achieves an unwanted-sideband suppression of 34 dB at 20 meters. Dan Danz, WA5SKM, reviews "Squelch Circuits." In "Grinding Technique for Surplus Crystals," John B. Rosenberry, W9PBI, shows how to move crystals far up in frequency without losing "activity"—their ability to oscillate strongly and reliably. Harry Hyder, W7IV, explores "Receiver Sensitivity." Marvin Jahn, K2ERI, builds a "Microcircuit Electronic Key" underneath his paddle's base. Edward E. Wetherhold, W3NQN, presents "Modern Filter Design for the Radio Amateur."

Perry F. Williams, W1UED, reports on programs to help the blind, shut-ins and the handicapped reach out through Amateur Radio in "The Outstretched Hand." Al Noone, WA1KQM, reports the June V.H.F. QSO Party results; T. C. Cunningham, VE2CK, reports the 1968 VE/W Contest results.
—*David Newkirk, WJ1Z* QST

Results, 1994 School Club Roundup

By Lewis Malchick, N2RQ
c/o Brooklyn Technical High School
29 Fort Greene Place
Brooklyn, NY 11217

The eighth annual School Club Roundup was once again enjoyed by many young and first-time operators. The SCR is sponsored jointly by the Council for the Advancement of Amateur Radio in the New York City Schools (CAAR/NYCS) and the ARRL. This contest gives students a chance to make contact with old-timers as well as other school stations.

Ron, KØØZ, of Francis Howell North High School, wrote: "...a wonderful opportunity to let students experience HF contesting. Last year the district published our contest ranking in the local newspaper and a patron donated her father's ham radio estate to the school club! Too bad Old Sol didn't ionize 10 meters, but we sure had fun anyway."

As Ron said, conditions were not the best. Many stations had difficulty finding other schools. Operations were dispersed on more bands and modes than in previous years. Most scores were down from last year. WB2JKJ and the crew from JHS 22 have at last captured the first place position overall. Their 50-state sweep (WAS in a week!), 25 DX countries and 39 schools with just under 600 QSOs yielded 167,160 points. This was a substantial gain from last year's 132,916, but it is down compared to last year's winner, KG7PU, with 190,749 points.

N7UJJ from Carl Hayden High School, Phoenix, Arizona, topped the high school division and was second overall with 102,384 points, down from last year's 188,568 points. Allan and his students made three ATV contacts—the first reported in the SCR. The first was with Bob, WA7DTJ, at Larry C. Kennedy Elementary School, also in Phoenix. "We had two-way ATV, school to school, and also to students and teachers. We will be doing many educational ATV activities between our schools. Six other elementary schools are currently setting up receiving stations. We had a great time."

***It's a unique feeling when you suddenly have a pileup and your operator, all of nine years old, turns to you with a blank stare!*—Ed, KA8CBE**

The elementary school division was a very tight race, with KA7FGK's White City, Oregon, sixth graders edging out last year's elementary leader, N8OGY, of Fort Loramie, Ohio, by a mere 370 points. Dave, KA7FGK, said "[It's a] great way for the kids to get on the air and not have to be conversational. We'll definitely be back next year! The kids thought it was great. Thanks."

This was the first time that college and university club stations were counted as schools, with four entries from some prestigious campuses. Cleveland State's KG8EM was the leader.

Although elementary, high school and DX entries were about the same as last year, the JHS/intermediate/middle schools were mainly absent.

Comments from Other SCR Participants

Those of us who have been in the hobby a long time tend to forget just how thrilling it can be for a nine-, ten- or eleven-year-old to work Piqua or even Dayton on ground-wave. I wish everyone who worked a school during SCR could see the spark of excitement or even disbelief they kindled in some of these young eyes. It's a unique feeling when you suddenly have a pileup and your operator, all of nine years old, turns to you with a blank stare. *—Ed, KA8CBE, Hook ES ARC, Troy, Ohio*

My students had a *great* time in the contest. They hope to make more contacts next year. Amateur Radio has sparked interest in my class.—*Bill, N3IOD, Worchester Career and Tech Center, Newark, Maryland*

Where were all the school stations on 80 and 40 meters? Didn't hear any at all. Matter of fact, didn't hear any on 20 or 10 meters either. But the kids had fun.—*Mike, Sara, Sarah, Kristin, Nalalie and Erika, K6URI, Nichols hS, Lodi, California*

White City, Oregon, sixth-graders (l-r) David Brown, Jarrod Weis, Stephania Courtright, and Mike Sanderbrink at KA7FGK.

The KC5ETQ gang, Coal City, Arkansas: (front row, l-r) Jessie Carter, Steven Brown, Matthew Pipkins (KC5ETQ), Ashley Pointer, Heather McGuire, Julie Williams, and Sarah O'Neal; (standing, l-r) Christina Talkington, Johnathan Wilson, and Chrissy Taylor.

Once again we have had a wonderful experience participating in this annual school roundup! Only a few stations were contacted, but publicity and excitement here were significant and school-wide.—*Jim, WA2EIU, The Lovett School, Atlanta, Georgia*

This was my first School Club Roundup and the best Amateur Radio event I've ever experienced. Almost all of our sixth-graders had gathered courage and generated at least one QSO by week's end. We didn't work all the states but we swept the 4's from A to Z on our dupe sheet. Now we know where one lobe goes from our horizontal loop. The high point was when Joel recognized N1JAC's call and pointed to a photo QSL from an earlier QSO as he worked him. Twenty-four hours of airing young voices produced only 12 seconds of easily ignored rudeness. Thanks to all the operators who dropped by for a contact or a chat!—*Dave, AD8B, Zion Lutheran Middle School, Harvester, Missouri*

KG6FR was a real team effort. John, KD6URS (science teacher) and David, KG6FR (parent) were backed up by members of the East Bay Amateur Radio Club. They set up stations in the school library. Almost all of the 15 K-3 classes spent 15 to 30 minutes each getting a briefing on radio propagation and listening and speaking over the air. Students also dropped in during recess —*KG6FR, Jefferson Primary School, Berkeley, California*

The WCTC Radio Pioneers of Newark, Maryland: (l) Joe Turpin in front and Bryan Rogers behind Joe; Bill Hammond, center; and (r) Malcolm Price.

Band conditions were very poor and my antenna was stuck in the SW direction. How about a special bonus next year for contacts with the "founder" of the contest? I'll gladly cooperate.—*Marty, KA2NRR* (Done! Marty was the founding Chairman of the CAAR/NYCS and originated the contest called Operation SEARCH, which evolved into the School Club Roundup.—*N2RQ*)

After several days of careful listening on 20, I only found one station—WD5IAD in Mississippi. While conditions were lousy, it was fun to try.—*Rich, KW0U*

We had a good time with the contest. It was really good for the students to actually make a few contacts.—*Lee, VE6XE, at VE6GPC, Grande Prairie, Alberta*

How You Can Join the Fun in 1995

We often get suggestions to give certificates to all participating stations and to run another SCR in the Fall. We aim to please; all participants should all have received certificates for 1993 and 1994 by the time you read this in *QST*. A Fall SCR? Any volunteers?

Send inquiries, comments, and suggestions to CAAR/NYCS c/o Lew Malchick, N2RQ, at the address at the top of this article. Thanks to all who participated and made the SCR an enjoyable and successful experience.

The 1995 School Club Roundup is tentatively scheduled for Monday through Friday, February 13 through 17. We understand that this will be the week before most school districts' winter recess.

Summary, 1994 School Club Roundup

Line scores list the call sign, total score, QSO points, states, DX, clubs, schools, hours of operation, number of operators, and club and school name.

Elementary Schools

KA7FGK	21,812	266	28	7	1	9	10	12
White City 6th grade, White City, Oregon								
N8OGY	21,452	173	36	9	2	15	17	62
Fort Loramie ES, Fort Loramie, Ohio								
KO4IQ	11,865	113	30	10	5	11	19	13
Springfield Estates ES ARC, Springfield, Virginia								
N3IOP	7,084	92	20	5	1	10	18	12
North Clarion School ARC, Tionesta, Pennsylvania								
WB2MRX	6,642	81	20	1	3	11	13	16
Shaker Road ES, Albany, New York								
KA8CBE	4,720	59	17	1	1	12	8	18
Hook ES ARC, Troy, Ohio								
AL7MU	3,060	85	33	3	0	0	7	5
Woodriver ES ARC, Fairbanks, Alaska								
KG6FR	2,391	43	17	2	1	6	10	2
Jefferson School, Berkeley, California								
K6URI	1,104	23	12	0	0	7	3	6
Nichols ES Ham Club, Lodi, California								
K6MEP	256	16	11	0	0	1	10	14
Hueneme ES, Port Hueneme, California								
KC5ETQ	49	7	2	0	0	1	2	10
Westside Elementary ARC, Coal Hill, Arkansas								

Middle Schools

WB2JKJ	167,160	597	50	25	5	39	24	22
RC of JHS 22 NYC, Inc, New York, New York								
AD8B	27,810	270	43	13	1	13	24	34
Zion Lutheran MS, Harvester, Missouri								
WB2RCJ	4,350	75	20	4	2	6	6	2
Robert Moses MS ARC, North Babylon, New York								
K6JQN	3,564	81	29	0	0	3	5	6
Edison Computech ARC, Fresno, California								
N9FXY	2,385	53	12	6	1	5	9	60
Hudson JHS, Husdon, Wisconnsin								

High Schools

N7UJJ	102,384	632	36	27	2	19	23	
Carl Hayden HS ARC, Phoeniz, Arizona								
WD5IAD	62,496	372	44	21	4	19	14	6
St Stanlilaus HS ARC, Bay St Louis, Mississippi								
KO0Z	12,075	161	30	7	4	6	21	6
Francis Howell North ARC, St Charles, Missouri								
KA8HAD	5,655	65	19	1	1	13	6	3
Lewis Country HS, Weston, West Virginia								
N4HHC	5,460	78	17	1	1	10	5	34
Damascus Christian Academy, Damascus, Pennsylvania								
WB2LOE	4,544	64	18	1	1	10	12	1
Brocton Central School, Westfield, New York								
AB4YR	2,205	49	14	2	2	5	24	10
Halifax County HS ARC, South Boston, Virginia								
W2CXN	1,564	34	10	2	2	6	5	3
Brooklyn Technical HS ARC, Brooklyn, New York								
N3IOD	989	23	9	0	2	6	2	4
WCTC Radio Pioneers, Newark, Maryland								
N9JF	580	29	14	1	0	1	6	2
Seymor HS, Payson, Illinois								
NF2W	450	15	13	0	1	3	5	3
Kenmore East HS, Tonawanda, New York								
WA2EIU	216	8	3	2	1	3	2	2
The Lovett School ARC, Atlanta, Georgia								
WA3CSP	120	5	2	0	1	4	10	3
Boces Tec Center, Elmira, New York								
KD1DS	9	3	1	2	0	0	1	3
McDuffie HS ARC, Andersron, South Carolina								
KB2OYM	6	3	1	1	0	0	6	6
H Frank Carey ARC, Franklin Square, New York								

DX

VE7HSS	2,256	48	11	2	2	6	8	7
Eric Hamber School, Vancouver, British Columbia								
VE6GPC	1,665	37	12	3	0	6	7	4
Grande Prairie Composite HS ARC, Grande Prairie, Alberta								

Colleges and Universities

KG8EM	11,492	169	30	8	0	6	24	4
Cleveland State University ARC, Cleveland, Ohio								
W1AF	2,040	60	24	3	1	1	9	3
Harvard Wireless Club, Cambridge, Massachusetts								
KC5CGV	900	30	6	4	0	4	16	6
Baylor ARC, Waco, Texas								
W6BB	884	26	11	3	0	4	10	2
University of California ARC, University of California at Berkeley,California								

Individuals

KB7KLT	5,684	116	23	11	0	3	13	1
WB5CXK	5,440	32	15	1	2	30	13	1
AA3DP	2,728	22	13	1	0	22	12	1
N2TDT	432	18	6	6	1	2	6	1
KA2NRR	92	4	3	0	0	4	2	1
W7LQU	54	3	3	0	0	3	1	1
KW0U	6	1	1	0	0	1	1	1
WB0IWG	6	1	1	0	0	1	12	1

Contest Corral

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

SEPTEMBER

2-11

Hiram Percy Maxim 125th Birthday Memorial Celebration, see Aug *QST*, p 46.

3-4

All Asian DX Contest, phone, see May *QST*, p 138.

LZ-DX Contest, see Aug *QST*, p 101.

Michigan QRP Club Labor Day CW Sprint, see Aug *QST*, p 101.

Radio Club de Panama XXIII Anniversary Contest, see Aug *QST*, p 101.

6

West Coast Qualifying Run, 10 to 35 wpm, 0400Z Sep 7 (9 PM PDT Sep 6). W6OWP prime, W6ZRJ alternate. Frequency is approximately 3,590 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL HQ for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

7-9

YLRL Howdy Days, see Aug *QST*, p 101.

10-12

ARRL September VHF QSO Party, see Aug *QST*, p 100.

European DX Contest, phone, see Jul *QST*, p 126.

North American Sprint, CW, see Aug *QST*, p 101.

11

W1AW Qualifying Run, 10 to 35 wpm, 0200Z Sep 12 (10 PM EDT Sep 11). Transmitted simultaneously on 1.818 3.5815 7.0475 14.0475 18.0975 21.0675 28.0675 147.555 MHz. See Sep 6 listing for details.

16-18

ARRL 10-GHz Cumulative Contest, see Jun *QST*, p 94.

ATV Quest Contest, see Mar *QST*, p 119.

North American Sprint, phone, see Sep 10-12 listing.

QRP Afield 1994, sponsored by the QRP Club of New England, 1600Z to 2200Z Sep 17. CW only. Classes are permanent location or field location; high-power QRP (1 to 5 W) or low-power (<1 W). Permanent location stations are defined as any location using commercial power and/or permanently installed antennas; field locations are defined as any location using battery/solar/natural power and temporary antennas. QRP-NE members exchange RST, state/province/DXCC country and QRP-NE no.; others exchange RST, state/province/DXCC country and power output. Score 1 point for each contact made from a permanent location using high-power QRP; score 2 points for each contact made from a permanent location using low-power QRP; score 4 points for each contact made from a field location using high-power QRP; and score 8 points for each contact made from a field location using low-power QRP. All contest contacts must be made using the same location and power output. Multipliers are states/provinces/DXCC countries and count only once. Awards. Send logs to Chester Bowles, AA1EX, RFD 2 Box 335L, Sharon, NH 03458.

Scandinavian Activity Contest, CW, sponsored by Eksperimenterende Danske Radioamatorer (EDR), 1500Z Sep 17 to 1800Z Sep 18. (Phone contest 1500Z Sep 24 to 1800Z Sep 25.) Work LA-LB-LG-LJ JW JX OF-OG-OH-OI OHØ OHØM/OJØ OX OY OZ SI-SJ-SK-SL-SM-7S-8S and TF stations on 3.5, 7, 14, 21 and 28 MHz only. Work stations once per band; no crossmode QSOs. Categories: single operator, 1 transmitter; single operator, 1 transmitter, QRP (max input 10 W); Multioperator single transmitter; and SWL. Multi-single stations may have only one transmitted signal at any given time and must remain on a band at least 10 minutes after a band change. The use of spotting nets is not allowed. Exchange signal report and serial no. starting with 001. European stations count 1 point per Scandinavian QSO on any band. Non-European stations count 1 point per Scandinavian QSO on 14, 21 and 28 MHz, and 3 points on 3.5 and 7 MHz. Multiply total QSO points by the number of different Scandinavian call areas worked per band (LA1 = LB1 = LJ1 and NF1J/OZ = OZØ, etc) for final score. Avoid contest traffic in these subbands: 3.560 to 3.600, 3.650 to 3.700, 14.060 to 14.125 and 14.300 to 14.350, except when this conflicts with national regulations. In that case, split operation must be used. Awards. Electronic entries accepted. Mail entries for both modes with complete summary sheet by Oct 31 to EDR Contest Manager, Morten Skjold Frederiksen, OZ1FTE, Smedevej 41, Kyndelose, DK-4070 Kirke Hyllinge, Denmark.

20

W1AW Qualifying Run, 10 to 35 wpm, 1300Z Sep 20 (9 AM EDT). See Sep 11 listing for details.

24-26

***CQ* World-Wide RTTY Contest**, see Aug *QST*, p 101.

Scandinavian Activity Contest, phone, see Sep 16-18 listing.

Washington State Salmon Run, sponsored by the Western Washington DX Club, 1600Z Sep 24 to 2400Z Sep 25. Classes: CW, phone or mixed mode; QRP, low power (less than 200 W), open; single operator or multioperator-single transmitter. Single operators may not operate more than 24 hours. Non-Washington stations exchange RS(T) and state/province/DXCC country; Washington stations exchange RS(T) and county. Score 2 points per SSB, 3 points per CW and 6 points per Novice/Technician CW QSO. Multipliers are Washington counties, max 39 (Washington station multipliers are states, provinces, DXCC countries and Washington counties). Work multipliers once per mode. Portables and mobiles may be worked for credit in different counties. Final score is QSO points × total multipliers × 2 if low power, × 3 if QRP. CW–1.805 3.560 7.045 14.060 21.060 28.060; phone–1.850 3.925 7.260 14.280 21.380 28.380; Novice/Technician CW–3.700 7.125 21.150 28.160. Awards. Send logs by Oct 31 to Western Washington DX Club, W7FR, Box 224, Mercer Island, WA 98040.

1994 Fall Classic Radio Exchange, 1900Z Sep 25 to 0400Z Sep 26. Object is to restore, operate and enjoy equipment at least 10 years old. Exchange name, RST, QTH, receiver and transmitter type (home brew send amp tube or transistor). CW—60 kHz up from lower band edges (look especially on 3.560 7.060); phone—3.880 7.290 14.280 21.380 28.320; Novice/Technician—20 kHz up from lower band edges. Final score is QSOs × number of different transmitters and receivers worked per band and mode, and the total number of states/provinces/DXCC countries worked per band/mode × total years old of all receivers and transmitters used that make at least 3 contacts. (If transceiver, multiply by 2.) If home brew, count as 25 years old, unless older. Awards. Send logs and comments to Jim Hanlon, W8KGI/5, PO Box 581, Sandia Park, NM 87047.

OCTOBER

1-2

California QSO Party, sponsored by the Northern California Contest Club, 1600Z Oct 1 to 2200Z Oct 2. 160 to 2 meters, excluding the 30, 17 and 12-meter bands. Classes: Single operator, multioperator single transmitter, multioperator, multitransmitter, California county expedition, Mobile and Novice/Technician. Single operators are limited to 24 hours, time off periods must be at least 15 minutes and noted in log. Exchange QSO no. and state (county in California)/province/DXCC country. Work stations once per band and mode. Single operator and multi-single stations are allowed only 1 transmitter signal at a time. California stations may be worked again as they change counties. California stations on county lines count as 1 QSO, but multiple counties. CW QSOs must be in CW subbands, except for 160 meters. No repeater or MCW QSOs. CW—1805 and 40 kHz up from low end; phone—1.850 3.850 7.230 14.250 21.300 28.450; Novice—10 kHz up from band edges and 28.450. Try CW on the half hour; 147.540 at 2000Z, 0000Z, 0400Z; 160 at 0500Z; 80 at 0300Z and 0700Z. Scoring: phone—2 points, CW—3 points. Multiply QSO points times number of California counties (max 58). California stations multiply by number of states and provinces. Awards. Entries with more than 200 QSOs must submit dupe sheet. Electronic submissions must include a signed summary sheet. Submit entries by Nov 15 to NCCC, c/o Ken Anderson, K6PU, PO Box 853, Pine Grove, CA 95665.

RSGB 21/28 MHz SSB Contest, sponsored by the Radio Society of Great Britain, 0700Z to 1900Z Oct 2. 21 MHz and 28 MHz, phone only. Work stations once per band. Single operator and multioperator. Use of packet or other spotting nets places one in the multioperator category. Non-UK stations work UK stations only. Exchange signal report and serial no. starting with 001 (UK stations also exchange county code). 21.200-21.350 28.450-29.000. Work stations once per band for QSO and multiplier credit. Non-European stations count 3 points per QSO with UK stations. Multiply by number of UK counties worked per band. Awards. Log must be postmarked by Oct 31. Mail entries to RSGB Contests Committee, c/o Steve Knowles, G3UFY, 77 Bensham Manor Rd, Thornton Heath, Surrey, CR7 7AF, England.

VK/ZL/Oceania DX Contest, phone, sponsored by The New Zealand Association of Radio Transmitters, 1000Z Oct 1 to 1000Z Oct 2 (CW contest is 1000Z Oct 8 to 1000Z Oct 9). Single operator multiband and single band; multioperator all band, SWL. Use of spotting nets places you in the multioperator category. Non-Oceania stations work Oceania; Oceania stations work everyone. Work stations once per band. No crossband QSOs. Exchange signal report and serial no. starting with 001. Score 20 points/QSO on 160, 10 points/QSO on 80, 5 points/QSO on 40, 1 point/QSO on 20, 2 points/QSO on 15, and 3 points/QSO on 10. Multiply by total VK/ZL/Oceania prefixes worked per band. Use separate log for each band and mode. Awards. Electronic entries accepted. Mail entries postmarked by Nov 15 (phone) or Nov 22 (CW) John Litten, ZL1AAS, NZART Contest Manager, 146 Sandspit Rd, Howick 1705, New Zealand.

5

West Coast Qualifying Run, 10 to 40 wpm, 0400Z Oct 6 (9 PM PDT Oct 5). See Sep 6 listing for details.

8-9

The *Hambrew* Fall Festival, sponsored by *Hambrew* magazine, 2000Z Oct 8 to 2000Z Oct 9. CW only, use the 80, 40, 20, 15 and 10-meter bands. Single operator, single or multiband. Once a contact is made on a band, you must remain on that band for at least 10 minutes. Exchange RST, state/province/DXCC country, output power, and homebrew (H), kit (K) or commercial (C); for example, 599MD3K. Commercial stations score 1 point per W/VE QSO and 3 points per DX QSO; others score 3 points for each W/VE QSO and 4 points for each DX QSO. All stations score 5 points for each *Hambrew* editor/author worked. States and provinces count 1 multiplier per band; DXCC countries count 3 multipliers per band. Final score is QSO points × multiplier points; multiband entries add single-band scores together for final score. Awards. Mail logs within 30 days to Bruce Muscolino, *Hambrew* Contest Manager, PO Box 9333, Silver Spring, MD 20916-9333.

Ibero-Americano Contest, sponsored by the Seccion Territorial de URE del Valls Oriental and *CQ Radio Amateur de Boixareu Editores*, 2000Z Oct 8 to 2000Z Oct 9. Phone only. Classes: single operator Latin-American; single operator non-Latin-American; multioperator single transmitter Latin-American; multioperator single transmitter non-Latin-American; single operator EC (EA Novice); QRP (less than 5 W output), single operator, all band; SWL. Bands: 1.8, 3.5, 14, 21, 28 MHz. Work stations once per band. Exchange signal report and serial no. starting with 001. Count 3 points per Latin-American QSO and 1 point per non-Latin-American QSO (Latin-American stations count 1 point per QSO). Multipliers are Latin-American DXCC countries (CE, CO, CP, CR, CT, CX, C3, C9, DU, EA, HC, HI, HK, HP, HR, HT, KP4, LU, OA, PY, TG, TI, XE, YS, YV, ZP, 3C and DXCC dependencies). Final score is total QSO points times total multipliers. Awards. Send logs before Nov 30 to Concurso Ibero-Americano, Gran Via de less Corts Catalanes, 594, 08007 Barcelona, Spain.

Illinois QSO Party, sponsored by the Radio Amateur Megacycle Society, 1800Z Oct 9 to 0200Z Oct 10. Phone and CW. No repeater QSOs. 160 to 10 meters, excluding the 30, 17 and 12-meter bands. CW—3.550 7.050 14.050; phone—3.890 7.290 14.290; Novice—30 kHz up from bottom for CW, 28.390 for phone. Illinois stations exchange RS(T) and county; others exchange RS(T) and state/province/DXCC country. Count 1 point per phone QSO, 2 points per CW QSO. Work stations once per band and mode, and once per band/mode/county for Illinois mobile stations. All parties that embark with a mobile must use the mobile's call sign exclusively for the duration of the contest. Contacts with/by mobile stations on border of 2 counties count as 2 counties and 2 QSOs. Illinois stations multiply QSO total by sum of states, Illinois counties, VE provinces plus a maximum of 5 DXCC countries. IL stations count additional DX for points, but not multipliers. Illinois mobiles may add 200 to final score for each county from which 10 or more contacts were made. All others multiply QSO points by the number of Illinois counties worked. All stations may take 1 bonus multiplier for each 8 QSOs with the same Illinois county. Awards. Stations with more than 100 QSOs must submit a dupe sheet. Send logs by Nov 7 to RAMS, 3620 N Oleander, Chicago, IL 60634.

Pennsylvania QSO Party, sponsored by the Nittany ARC, 1600Z Oct 8 to 0500Z Oct 9 and 1300Z to 2200Z Oct 9. CW and phone. Work stations once per band and mode; work mobiles again as they cross county lines. Exchange serial no. and county/Section/DXCC country. Stations on county lines will give out 1 serial no., but all counties will count for multipliers. Classes: single operator, QRP (<5 W); single operator, medium power (150 W); single operator QRO; multioperator, single transmitter; multioperator, multitransmitter; Novice/Technician; portable (single operator or multi-single) and mobile. CW—40 kHz up from the bottom of the bands and 1.810; phone—1.850 3.980 7.280 14.280 21.380 28.310; Novice/Technician CW—10 kHz up from the bottom of the band. The mobile window is 5 kHz below the listed frequencies. Score 2 points/CW QSO on the 160 and 80-meter bands; score 1.5 points/CW QSO on other bands and 1 point/QSO on phone. Pennsylvania stations multiply score by ARRL/RAC Sections, Pennsylvania counties and 1 for DX (max 150); others multiply by Pennsylvania counties (max 67). Multiply score by 2 if <5 W; by 3 if Novice/Technician. Pennsylvania mobile stations add 500 points to score for each county from which at least 10 QSOs were made. Awards. Electronic entries accepted. Send logs by Nov 13 to Douglas Maddox, W3HDH, Nittany ARC, PO Box 614, State College, PA 16804-0614.

VK/ZL/Oceania DX Contest, CW, see Oct 1-2 listing.

10

W1AW Qualifying Run, 35 to 10 wpm, 0200Z Oct 11 (10 PM EDT Oct 10). See Sep 11 listing for details.

12-14

YL Anniversary Party, CW, sponsored by the YLRL, 1400Z Oct 12 to 0200Z Oct 14 (phone is Oct 26 to 28). No crossband, net or repeater QSOs. YL operators only. CW and phone are separate contests. Work stations once per band. Exchange RS(T), serial no., ARRL Section/province/DXCC country. CW—3.540 7.040 14.040 21.120 28.150; phone—3.940 7.240 14.250 21.380 28.300. Scoring: YLs in lower 48 states or Canadian provinces score 1 point per QSO with a YL in the lower 48 states or Canadian provinces or the same continent and 2 points per QSO with other YLs. Other YLs score 2 points per YL QSO on a different continent and 1 point per YL QSO on same continent. Multipliers are ARRL Sections, provinces, and DXCC countries worked. Those using 100 W CW or 200 W PEP output on phone multiply final score by 1.5. Others limited to 750 W on CW and 1500 W on phone. Awards. Send logs postmarked by Nov 30 to Carla Watson, WO6X, 473 Palo Verde Dr, Sunnyvale, CA 94086.

15-16

Simulated Emergency Test, sponsored by the ARRL Amateur Radio Emergency Service (ARES) and the National Traffic System (NTS), Oct 15 and 16. The SET weekend provides an opportunity for ARES units to test plans and capabilities of moving emergency and health-and-welfare traffic into and out of disaster areas via the NTS. The event is conducted by the Emergency Coordinators, so contact your local EC for involvement. If you don't know who your EC is, contact your Section Manager (see this issue, p 8). SET guidelines were published in July 1994 *Field Forum* and mailed to all ARRL Field Organization officials, station appointees and affiliated clubs. Contact the Field Services Department at ARRL HQ for details.

36th Boy Scout Jamboree-On-The-Air, see this issue, p 96.

JARTS WW RTTY Contest 1994, sponsored by JARTS, 0000Z Oct 15 to 2400Z Oct 16. Use the 80, 40, 20, 15 and 10-meter bands only. RTTY, Baudot only. Exchange RST and operator age. YLs may send 00; all multiops must send 99. Classes: Single operator, all band; multioperator, single transmitter, all band. Score 2 points/QSO within your own continent; 3 points/QSO with different continent. Multipliers are JA/VK/W/VE call areas and other DXCC countries, and can be counted once per band. Final score is QSO points × multipliers. Awards. Send logs to be received by Dec 31 to JARTS Contest Manager, Hiroshi Aihara, JH1BIH, 1-29 Honcho 4 Shiki Saitama 353, Japan.

QRP ARCI Fall CW QSO Party, sponsored by QRP ARCI, 1200Z Oct 15 to 2400Z Oct 16. CW only. Operate 24 hours max. Work stations once per band. All-band, high-band (20 to 6 meters), low-band (160 to 40 meters) or single-band entries. Send signal report, state/province/DXCC country and ARCI no. if member, power output if nonmember. 1.810 3.560 3.710 7.040 7.110 14.060 21.060 21.110 28.060 28.110 50.060. Count 5 points per QSO with ARCI member. Others count 2 points per same continent and 4 points for different continent. Multiply QSO points by states/provinces/DXCC countries worked per band and by power multiplier (1 to 5 W output ×7; 0 to 1 W output, ×10). Team competition: Teams consisting of 2 to 5 members will be listed as individuals and the team score will be the total of the members' scores (Team captains must send a list of its members to the contest manager postmarked at least one day prior to the QSO Party). Awards. Postmark entry no later than 30 days after the contest and mail to QRP ARCI Contest Chairman, Cam Hartford, N6GA, 1959 Bridgeport Ave, Claremont, CA 91711.

RSGB 21/28 MHz CW Contest, sponsored by the Radio Society of Great Britain, 0700Z to 1900Z Oct 16. CW only. Single operator and QRP single operator (less than 10-W output). Use of spotting networks reclassifies you as a multioperator. Exchange signal report and serial no. starting with 001 (UK stations also send County code). 21 and 28 MHz only. Avoid 21.075-21.125. Non-European stations count 3 points per QSO with UK stations. Multiply by UK counties worked. Log must be postmarked by Nov 14. Mail entries to RSGB Contests Committee, c/o Steve Knowles, G3UFY, 77 Bensham Manor Rd, Thornton Heath, Surrey, CR7 7AF, England.

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W1AW Qualifying Run, 10 to 35 wpm, 2300Z Oct 26 (7 PM EST). See Sep 11 listing for details.

26-28

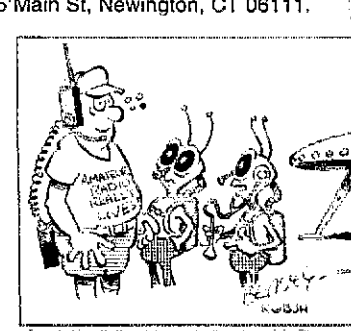
YL Anniversary Party, phone, see October 12-14 listing.

29-30

ARRL International EME Competition, see this issue, p 128.

***CQ* World-Wide DX Contest**, phone, sponsored by *CQ* Magazine, 0000Z Oct 29 to 2400Z Oct 30 (CW contest is 0000Z Nov 26 to 2400Z Nov 27). 1.8 through 28 MHz (excluding the 30, 17 and 12-meter bands). Entry classes: single operator assisted/unassisted, all bands/single bands, high power/low power/QRP; multioperator, single transmitter; multioperator, multitransmitter. QRP is defined as 5 W output or less. Multisingle: Only one transmitter and one band permitted during a 10-minute period. Exception: one—and only one—other band may be used during the same 10-minute period if—and only if—the station worked is a new multiplier. Stations found in violation of the 10-minute rule will be reclassified a multi-multi. Multi-multi stations are allowed 1 signal per band maximum. All transmitters must be within a 500-meter-diameter circle or within the limits of the licensee's address property, whichever is greater. All antennas must be physically connected to the transmitters by wires. Exchange signal report and *CQ* zone number. A station in a different zone or country than indicated by its call sign must sign portable. QSOs between stations on different continents count 3 points. QSOs between stations on the same continent, but in different countries, count 1 point. Exception: QSOs between North America stations in different countries count 2 points. QSOs with your own country count for multiplier credit, but not for QSO points. Multipliers: Count 1 multiplier for each different *CQ* zone worked per band (max 40 per band). Count 1 multiplier for each different country worked per band (DXCC and WAE lists). Maritime Mobiles only count for zone multipliers. Multiply QSO points from all bands operated by multipliers (zones plus countries) from all bands operated for final score. Single-band logs eligible for single-band awards only. Single ops must operate at least 12 hours (multiops, 24 hours) to be eligible for awards. Club competition. Team competition: A team consists of any 5 single operators. A person can only be on 1 team per mode. Team competition doesn't affect club competition. phone and CW teams are separate. A list of team members must be received at *CQ* before the contest begins. Dupe sheets required for any band with more than 200 QSOs. Entry forms are available from the sponsor for an SASE, and all entrants are encouraged to send for a set. Electronic entries accepted. Phone logs must be postmarked by Dec 1, 1994, and CW logs must be postmarked by Jan 15, 1995. Mail logs to *CQ* Magazine, 76 N Broadway, Hicksville, NY 11801.

Contest Announcements: Items for this column can be sent on a 5¼- or 3½-inch MS-DOS floppy diskette in ASCII format to ARRL HQ, fax at 203-665-7531, via modem (ARRL HQ BBS, 203-665-0090), via Internet (to contest@arrl.org), or in written form. The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **October 1** to make the **December** issue. Please include name of contest, dates, times (Z) and complete rules. Send to Contest Corral, 225 Main St, Newington, CT 06111. QST



DO YOU THINK THIS SPECIMEN IS FAIRLY TYPICAL OF LIFE ON PLANET EARTH ?

Special Events

Conducted By Warren C. Stankiewicz, NF1J
Assistant Contest Manager

Hagerstown, Maryland: The Antietam RA will operate W3CWC 1500Z **Sep 2** to 0400Z **Sep 3** and 1200Z **Sep 3** to 2400Z **Sep 4** to commemorate the 125th birthday of ARRL cofounder Hiram Percy Maxim, W1AW. 3.640 7.045 14.040 21.040 28.040; phone—3.920 7.240 14.240 21.295 28.350. For certificate, send QSL and SASE to Antietam RA, Attn: Special Event Station W3CWC, PO Box 52, Hagerstown, MD 21741-0052.

Shelby, North Carolina: The Shelby ARC will operate W4NYR 1300Z to 1900Z **Sep 3** to celebrate the 37th Shelby Hamfest. Operation will be in the lower portion of the General 40-meter subband. For QSL, send QSL and SASE to SARC, PO Box 2206, Shelby, NC 28151-2206.

Nutley, New Jersey: The Robert D. Grant United Labor ARA will operate 0400Z **Sep 3** to 0400Z **Sep 4** in honor of Labor Day. Operation will be in the General 80, 40, 20 and 15-meter subbands and the Novice 10-meter phone subband. For QSL, send SASE to station worked.

Paradise, Arizona: The Cochise ARA will operate WA7KYT 1800Z **Sep 3** to 1800Z **Sep 5** from the ghost town of Paradise. CW–7.040; phone–3.885 14.288 18.135 21.315 28.385. For certificate, send a 9×12-inch SASE to Cochise ARA, PO Box 1855, Sierra Vista, AZ 85636-1855.

Rollag, Minnesota: The Three Rivers RC will operate KAØTBY **Sep 3, 4, and 5** from the Western Minnesota Steam Threshers Reunion. Operation will be in the 80 through 15 meter General phone subbands and in the Novice 10-meter subband. For QSL, send SASE to TRRC, 8315 180 R Ave SE, Wahpeton, ND 58075.

Auburn, Indiana: The Northeastern Indiana ARC will operate 1400Z to 2200Z **Sep 4 and 5** to commemorate Auburn Cord Duesenberg Days. Operation will be in the lower 25 kHz of the General 80 and 40-meter subbands. For QSL, send QSL and SASE to NEIARC, PO Box 745, Auburn, IN 46706.

Kensington, Maryland: The Rock Creek ARA will operate W3RCN 1300Z to 2100Z **Sep 5** to celebrate the Town of Kensington's Labor Day Parade and Centennial Celebrations. 7.230 14.240 and via RS-12. For QSL, send QSL and SASE to Rock Creek ARA, PO Box 1913, Silver Spring, MD 20915.

New York, New York: The Columbia University ARC will operate W2AEE 1400Z to 2200Z **Sep 9** during Student Club Day. Operation will be in the Novice 80, 40 and 15-meter CW subbands; the Novice 10-meter phone subband; and on 144.47. For QSL, send QSL and SASE to Columbia University ARC, W2AEE, 520 SW Mudd Bldg, 500 W 120th, New York, NY 10027.

Newark, New Jersey: The Robert D. Grant United Labor ARA will operate W2MYA 1400Z to 2100Z **Sep 9** in conjunction with the Essex-West Hudson Central Labor Council's Interfaith Celebration of Labor. Operation will be in the General 80, 40, 20 and 15-meter subbands and in the Novice 10-meter phone subband. For QSL, send QSL and SASE to RDGULARA, PO Box 716, Nutley, NJ 07110-0716.

Corona/Norco, California: The Corona/Norco ARC will operate KN6CV 1600Z to 2400Z **Sep 10** to commemorate the 81st anniversary of the 1913 Corona Road Race. Operation will be in the lower portions of the General 80, 40, 20 and 15-meter subbands, and 28.400. For QSL, send SASE to Corona Norco ARC, PO Box 1783, Corona, CA 91718.

Westminster, South Carolina: Members of the Keowee-Toxaway ARC will operate KR4GZ 1300Z to 2000Z **Sep 10** to celebrate the South Carolina Apple Festival. 7.238 14.275. For certificate, send QSL and a 9×12-inch SASE to Mile Bonham, KR4GZ, 325 Albert's Rd, Seneca, SC 29678.

Bethpage, New York: The Grumman ARC will operate 1000Z to 2400Z **Sep 10** to celebrate its 50th anniversary. 14.275 21.275. For QSL, send SASE to Grumman ARC, PO Box 0644, Bethpage, NY 11714-0644.

Greeley, Colorado: The Weld ARS will operate WAØDDC 1600Z to 2100Z **Sep 10** to celebrate Potato Day. 14.250 28.490. For certificate, send QSL and SASE to Rick Hubbard, WAØDDC, PO Box 5116, Greeley, CO 80631.

Gordon, Nebraska: Gordon area hams will operate NØNAC 1700Z to 2200Z **Sep 10 to 11** from the Willow Tree Festival. Operation will be in the General 40, 20 and 15-meter phone subbands, the Novice 10-meter phone subband and on 2-meter simplex. For QSL, send QSL and an 8½×11-inch SASE to Neal Ziller, NØUVP, PO Box 93, Gordon, NE 69343.

Saxonburg, Pennsylvania: The Butler County Amateur Radio Public Service Group will operate KD3RT 1400Z to 2200Z **Sep 10** and 1400Z to 2000Z **Sep 11** at the Saxonburg Festival of the Arts. Operation will be in the lower portion of the 40- and 20-meter General phone subbands. For certificate, send a 9×12-inch SASE to BCARPSG, PO Box 1692, Butler, PA 16003.

Norwalk, Connecticut: The Greater Norwalk ARC will operate KA1OFN 1300Z to 2100Z **Sep 10** and 1300Z to 1900Z **Sep 11** to celebrate the 17th annual Norwalk Oyster Festival. Operation will be in the lower 25 kHz of the General 40, 20 and 15-meter phone subbands and in the Novice 10-meter phone subband. For certificate, send QSL and a 9×12-inch SASE to Greater Norwalk ARC, 324-7 Main Ave, Box 115, Norwalk, CT 06851.

Asheville, North Carolina: The Western Carolina ARS will operate W4MOE 1400Z **Sep 10** to 1400Z **Sep 11** from Mt Mitchell. Operation will be on the 80, 40, 20, 15 and 10-meter bands, and on 2-meter FM and packet. For certificate, send a 9×12-inch SASE to WCARS, PO Box 1488, Asheville, NC 28802.

Cleveland, Ohio: The NASA Lewis ARC will operate AK8Y 1400Z to 2000Z **Sep 10 to 12** to commemorate the 1st anniversary of the Advanced Communication Technology Satellite. Operation will be10 kHz up from the bottom of the General 40, 20 and 15-meter subbands and the Novice 10-meter subband. For QSL, send QSL and a 9×12-inch SASE to NASA Lewis Research Center ARC, Attn Don Hilderman, KW9Y, Mail Stop 54-6, 21000 Brookpark Rd, Cleveland, OH 44135.

Maastricht, The Netherlands: PA6OHD will operate **Sep 10 to 16** to celebrate the 50th anniversary of its liberation. Operation will be in the lower portion of the 20 and 15-meter bands. For information, contact M. G. Pot, PAØMGP, Beukenhoven 43, 62225 GR Maastricht, The Netherlands.

Atlantic City, New Jersey: The Southern Counties ARA will operate K2BR **Sep 12, 13, 14, 15, 16 and 17** from the Miss America Pageant. CW—65 kHz up from the bottom of the General subbands and the Novice 10-meter subband; phone—25 kHz up from the bottom of the General subbands and the Novice 10-meter subband. For QSL, send QSL and SASE to SCARA, PO Box 121, Linwood, NJ 08221.

Yosemite National Park, California: N4EZM will operate **Sep 14 to 16** from Cathedral Rock and El Capitan. Operation will be in the lower 25 kHz of the Novice CW subbands, the General phone subbands and 146.55. For QSL, send QSL with either elevation report or contact no. and an SASE to Neil Mavis, N4EZM, PO Box 920553, Norcross, GA 30092.

Nijmegen, Netherlands: The Nijmegen ARC will operate PA6OMG **Sep 15 to 20** to commemorate the 50th anniversary of Operation Market Garden. QSL via the bureau.

Kearney, Missouri: The Ray-Clay ARC and the Heart of America ARC will operate KØEET **Sep 16 to 18** at the Jesse James Festival. Operation will be in the General 40, 20 and 15-meter phone subbands; the Novice 10-meter phone subband; 2-meter SSB, and RTTY/AMTOR/packet. For certificate, send QSL and a 9×12-inch SASE to Ray-Clay ARC, PO Box 653, Excelsior Springs, MO 64024.

Pahrump, Nevada: AB7BS will operate **Sep 16** to **Sep 18** from the Pahrump Harvest Festival. Operation will be in the General portion of the 40, 20 and 15-meter subbands, and the Novice 10-meter subband. For certificate, send QSL and a 9×12-inch SASE to Phil Landmeier, AB7BS, PO Box 3000-304, Pahrump, NV 89041.

Charleston, South Carolina: The Charleston ARS will operate WA4USN 1300Z to 2300Z **Sep 16, 17 and 18** to commemorate the BOC Challenge 1994-1995 Yacht Race. Operation will be in the Novice 40-meter CW subband and 7.250 14.045 14.250 21.045 21.250 146.79/.19. For QSL, send QSL and SASE to Sheila Frank, KC4UDD, 614 Longstreet Cir, Summerville, SC 29483.

Appledore Island: WF1N, KA1DIG and K1SCN will operate WF1N **Sep 16 to 19** from Appledore Island, NA-148. QSL to Tony Spino, WF1N, 15 Regency Hill, Waterbury, CT 06708-1845.

Negaunee, Michigan: The Hiawatha ARC will operate W3KGW 1300Z to 2030Z **Sep 17** to commemorate the 150th anniversary of the locating of iron ore on the Marquette Range. Operation will be in the General subbands and 146.91/.31. Send QSL, contact no. and SASE to Charles Waters, N8SLH, 97 N Westwood Dr, Ishpeming, MI 49849.

Park City, Utah: The Mercury ARA and the Great Salt Lake Council BSA will operate K2BSA/7 0000Z to 1800Z **Sep 17** during the Utah Heritage Jamboral. 3.870 7.228 14.287 21.395. Send QSL and SASE to MARA, PO Box 11201, Salt Lake City, UT 84147-0201.

Reading, Pennsylvania: The Berks ARS will operate WA3MFT 1600Z **Sep 17** to 2000Z **Sep 18** to commemorate the restoration of the Reading Pagoda. 3.880 7.280 14.280 21.380 28.480 145.09. For certificate, send QSL and a 9×12-inch SASE to BVARS, PO Box 12632, Reading, PA 19604.

Middleville, Michigan: The Michigan Amateur Radio Alliance, Chapters 1 and 2, will operate 1400Z **Sep 17** to 1400Z **Sep 18** to commemorate Middleville Heritage Day. 3.900 7.250 14.250 28.400 145.78 144.93. For QSL, send QSL and SASE to CQ Heritage Day, PO Box 395, Middleville, MI 49333.

Clyde, Ohio: The Clyde ARS will operate NF8E 1600Z to 2400Z **Sep 17** and 1600Z to 2200Z **Sep 18** from the Winesburg Fall Fair. CW—7.125 21.150; phone—3.900 7.250 14.300 21.400. For certificate, send SASE to Steve Karr, NF8E, 302 Hamer St, Clyde, OH 43410.

Tiffin, Ohio: The Seneca RC will operate W8ID 1600Z to 2100Z **Sep 17** and 1600Z to 2000Z **Sep 18** to celebrate the Tiffin Heritage Festival. 7.235 14.235. For QSL, send QSL and SASE to Seneca RC Heritage Festival, Public Safety Bldg, 81 Jefferson St, Tiffin, OH 44883.

Gaithersburg, Maryland: The Montgomery ARC will operate WA3EWJ 1400Z to 2000Z **Sep 18** at the 12th annual Gaithersburg Olde Towne Day Festival. Operation will be in the middle of the General portion of the 40, 20 and 15-meter subbands, the Novice 10-meter subband and on VHF/UHF. For QSL, send SASE to MARC, PO Box 611, Gaithersburg, MD 20884-0611.

The Netherlands: PA6LIB will operate **Sep 18** to commemorate the 50th anniversary of Operation Market Garden and the liberation of Holland. For information, contact Ruud Groen, PA3FVC, Rietbeek 4, 5501 C B Veldhoven, Netherlands.

Danville, Pennsylvania: The Liberty-Valley Elementary School will operate WC3A, N3IRN, and N3LQS 1300Z to 1900Z **Sep 19** from "The Little House on the Playground." For certificate, send QSL to D. Miguelez, N3POB, Liberty-Valley School, 175 Liberty-Valley Rd, Danville, PA 17821.

Waunfawr, Wales, and Wahroonga, Australia: The Dragon ARC will operate GB2VK and the Wahroonga Amateur Historical RA will operate VK2WAH 0000Z to 2400Z **Sep 22** to celebrate the 76th anniversary of the first direct wireless message from the respective Marconi Wireless Stations. 14.020 14.175 21.175. For more

information,contact Dewi Roberts, GW0ABL, 23 Lon Hedydd, Llanfairpyll, Gwynedd LL61 5JY, Wales.

Columbus, Mississippi: The Lowndes County ARC will operate KA5GMN 2100Z **Sep 23** to 0300Z **Sep 25** in conjunction with the 12th annual Possum Town Pigfest. Operation will be in the 80 through 15-meter General phone subbands and in the Novice 10-meter phone subband. For a certificate, send QSL and a 9×12-inch SASE to LOCO, PO Box 9291, Columbus, MS 39705-9291.

Pea Patch Island, Delaware: The Tri-County Amateur Group will operate KD3XN 1400Z to 2100Z **Sep 23 to 25** from Ft Delaware. Operation will be in the General and Novice 40 through 10-meter subbands. For QSL, send SASE to operator worked.

Walla Walla, Washington: The BPO Elks Lodge 287 will operate **Sep 23, 24 and 25** to celebrate its 100th anniversary. Operation will be in the lower portion of the General subbands. For information, contact Robbie Gallo, KB7OBW, 351 E Rose, Walla Walla, WA 99362.

Pearland, Texas: The Pearland ARC will operate KI5MB AB5GU, and KB5RGJ **Sep 24** as part of the city's centennial celebration. 7.125 7.230 14.260 21.310 28.410. For certificate, send QSL and SASE to Marty Hafey, AB5GU, 803 Ave I, South Houston, TX 77587.

Erwin, Tennessee: The Unicoi County ARS will operate AC4QF 1300Z to 2100Z **Sep 24** to commemorate the 15th annual Erwin/Unicoi County Apple Festival. 7.265 14.265. For QSL, send QSL and SASE to UCARS, PO Box 185, Erwin, TN 37650-0185.

Dupo, Illinois: Boy Scout Troop 630 will operate N9EGL **Sep 24** to commemorate Boy Scout Camporee '94. For certificate, send QSL and SASE to Jim Hamann, N9EGM, 508 N 3rd, Dupo, IL 62239.

Addison County, Vermont: The Addison County ARA will operate WX1O and N1BBR 1400Z to 2100Z **Sep 24** to celebrate the Apple Harvest in Vermont. Operation will be in the General portion of the 40 and 20-meter phone and CW subbands and the Novice 10-meter phone subband. For certificate, send QSL and a 9×12-inch SASE to Elaine Eldridge, N1IJW, PO Box 10, New Haven, VT 05472-0010.

Hoboken, New Jersey: NJ Transit, the Hoboken Chamber of Commerce, and the Hudson County Chamber of Commerce will sponsor NJ2Y 1400Z to 2100Z **Sep 24** for the Hoboken Festival 14. Operation will be phone on the 20, 15, 10, 6 and 2-meter bands. For QSL, send QSL and SASE to NJ Transit, Newark Bus Complex, Attn: Electronics, 601 Doremus Ave, Newark, NJ 07105.

Poteau, Oklahoma: The LeFlore County ARC will operate KA5ROW 1500Z to 2400Z **Sep 24** from Cavanaugh Hill. 7.250 14.275. For certificate, send SASE to LeFlore County ARC, PO Box 664, Poteau, OK 74953.

Comanche, Texas: The Comanche County ARC will operate N5QQE 1500Z to 2200Z **Sep 24 and 25** to celebrate the 13th annual Comanche County Pow Wow. Operation will be in the lower General 40 and 20-meter phone subbands, and in the Novice 10-meter phone subband. For certificate, send QSL and a 9×12-inch SASE to Bill Patton, N5QQE, 205 Williams Dr, Comanche, TX 76442.

Belgium: The Bastogne RAG, Mons Radio Amateur Team, the Tilleur RAG and the Verviers RAG will operate OS50USA, OO50USA, OQ50USA and OR50USA 0800Z **Sep 24** to 2400Z **Sep 25** to commemorate the 50th anniversary of the liberation of the southwest and eastern parts of Belgium. For QSL, send QSL and SAE to PO Box 11, B-4800 Verviers 1, Belgium.

Ishpeming, Michigan: The Hiawatha ARA will operate KB8DNS 1700Z **Sep 30** to 0200Z **Oct 1** and 1500Z to 2000Z **Oct 1** to commemorate the 40th anniversary of the National Ski Hall of Fame and the 90th anniversary of the US Ski Assn. Operation will be in the General 80 through 10-meter phone subbands and on 2 meters. For certificate, send SASE to Rod Wallberg, KB8DNS, 1740 Rosewood, Ishpeming, MI 49849.

Special-Event Announcements: Items for this column can be sent on a MS-DOS floppy disk in ASCII format to ARRL HQ, fax at 203-665-7531, via modem (203-666-0578), via Internet (to contest@arrl.org), or in letter form. The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by **Oct 1** to make the **Dec** issue. Please include the name of the sponsoring organization, the call sign of the special-event station, the city location, dates and times (Z), suggested frequencies and QSL information. Requests for donations will not be published.

QSLing Special-Event Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9×12-inch envelope if you want an unfolded certificate or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail your QSL and your SASE to the address listed or to the address given on the air by the station you QSO. Be patient. Special-event stations often print their cards and/or certificates after the operation is over so they'll know how many to order. QST

Rules, ARRL International EME Competition

1) **Object:** Two-way communications via the Earth-Moon-Earth path on any authorized amateur frequency above 50 MHz.

2) **Contest Period:** Two full weekends. October 29 to 30 and November 26 to 27; full 48-hour period UTC each weekend.

3) **Categories:**

A) *Single operator*: One person performs all operating and logging functions, equipment adjustment and antenna alignment.

1) Multiband.

2) Single-band: Single-band entries on 50, 144, 222, 432, 902 and 1296-and-up categories will be recognized in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. See also Rule 8, Awards.

B) *Multioperator*: Two or more people participate; includes neighboring amateurs within one call sign area, but with EME facilities for different bands on different team members' premises, as long as no two are more than 50 km (30 miles) apart. Multi-operator neighborhood groups can't use the same call signs at each location; all call signs will be listed in the results.

C) *Commercial equipment*: Stations using equipment that is not amateur (such as a dish antenna or lab equipment owned by an institution or government agency) will have their scores listed separately.

4) **Exchange:** For a valid contact to occur, each station must send and receive both call signs and a signal report in any mutually understood format, plus a complete acknowledgment of the call signs and report. Partial or incomplete QSOs should be indicated on your log, but not counted for contest credit. Stations may be worked once per band for credit.

5) **Scoring:**

A) *QSO Points*: Count 100 points for each complete EME contact.

B) *Multiplier*: Each US and Canadian call area, plus each DXCC country (not US/Canada) worked via EME on each band.

C) *Final Score*: Multiply QSO points by sum of multipliers worked on each band for your final score.

6) **Miscellaneous:**

A) Fixed or portable operation is permitted. Stations operating outside traditional call areas must indicate so, identifying the call area of the operating site.

B) Contacts may be on CW or SSB. Only one signal per band is permitted.

C) A transmitter, receiver or antenna used to contact one or more stations under one call sign may not be used subsequently under any other call sign during the contest, except for family stations where more than one call sign has been issued, and then only if the second call sign is used by a different operator.

D) There's no specified minimum terrestrial distance for contacts, but all communications must be copied over the moonbounce path, regardless of how strong (or weak) a nearby station's terrestrial signal may be.

7) **Reporting:** Entries must be postmarked no later than 30 days after the contest and must include complete log data. Your summary sheet should show a band-by-band breakdown of QSOs and multipliers, and include details of your station setup and a photo.

8) **Awards:** Certificates will be issued to the top five stations worldwide in each of the entry categories: single operator, multiband; single operator, single band (separate awards for each band); and multioperator. Additional awards will be issued where significant achievement or competition is evident. In addition, each station that successfully completes at least one EME contact during the contest period will receive a certificate commemorating that achievement.

9) **Disqualifications:** See January 1994 *QST*, p 124. QST

Section News

Administered by Steve Ewald, WV1X

The ARRL Field Organization Forum

Field Organization Abbreviations	
ACC	Affiliated Club Coordinator
ARES	Amateur Radio Emergency Service
ASM	Assistant Section Manager
BM	Bulletin Manager
BPL	Brass Pounders League
DEC	District Emergency Coordinator
EC	Emergency Coordinator
LGL	Local Government Liaison
NCS	Net Control Station
NM	Net Manager
NTS	National Traffic System
OBS	Official Bulletin Station
OES	Official Emergency Station
ORS	Official Relay Station
OO	Official Observer
OOC	Official Observer Coordinator
PBBS	Packet Bulletin Board Station
PIC	Public Information Coordinator
PIO	Public Information Officer
PSHR	Public Service Honor Roll
SGL	State Government Liaison
SEC	Section Emergency Coordinator
SM	Section Manager
STM	Section Traffic Manager
TCC	Transcontinental Corps
TA	Technical Advisor
TC	Technical Coordinator
TS	Technical Specialist
VC	Volunteer Counsel
VCE	Volunteer Consulting Engineer
VE	Volunteer Examiner

ATLANTIC DIVISION

DELAWARE: SM, Randall Carlson, WBØJJX—Field Day is over and thanks to all who participated in this yearly activity. I had a chance to travel to many Field Day sites in the Section and was impressed with the level of innovation and participation by all the clubs. At the Atlantic Division Convention every year, the Ham of the Year, Grand Ol' Ham and Technical Achievement awards are presented. It's not too early to think about nominating someone from your club or group for one or more of these awards. It's a great way to honor someone in your club who has put in a lot of time and effort. For details on these awards, contact the Division Director or Vice Director. Tfc (Jun): W3FEG 5, WBØJJX 5. 73, Randall.

EASTERN PENNSYLVANIA: SM, Bob Stanhope, KB3YS @ N3KDS—ASMs: W3ZXU @ N3ACL, WB3FPL @ WB3FYL, K3DCU @ N3KDS, WA3PZO @ WB3JOE. ACC: N3HMD @WB3FYL. BM: KD3OA @ KD3OA. OOC: W3IS. PIC: W3ZVX @ N3ACL. SGL: WA3IAO @ WA3TSW. SEC: KB3QW @ KB3QW. STM: W3KOD @ KB3QW. TC: WB2LGJ @ WB3JOE. Many of us have unwanted gadgets in our shacks that the boss is tired of looking at or dusting around. We're too lazy to take it to the flea market or we just hate to part with it. As a suggestion, why not donate it to a school that has an established electronics curriculum or one that's building its own communication equipment? I know of 2 school systems that have expressed a need for old gear, dead or alive. If interested, give me a call. We're planning the annual Staff Meeting for later this month. This event is an opportunity for the Section Staff to meet as a group and present ideas, problems and solutions. By doing so, we're better able to plan a course of action for the following year. This also allows each of the people listed in the alphabet soup in the heading of this column each month to hear about each other's projects and how they effect others in the Section. In the past, we've shown that we aren't individuals leading Section functions, but a complete mgmt team, working to better our hobby. If you, as a Member, have any suggestions, please forward them to me or your team leader at the PBBS address listed above. Now's the time for everyone to make plans and solid commitment to knock the Delaware-Lehigh ARC off the champion's throne in the PA QSO Party. This will be a monumental task because it will have organized a frightful resistance to all efforts. This is a fun event that you can operate as a single-op, multiop or as a club event. Awards are given for the winners of each county, mobile, QRP, QRO, medium power, Novice-Tech and the list goes on. No one is left out! It's Oct 8-9. For information on the PA QSO Party, contact: the Nittany ARC, PO Box 614, State College, PA 16004-0614. 73 until next month—de Bob, KB3YS. *Tfc:* ORS: W3KOD 435, N3DRM 232, W3IVS 209, W3ADE, N3DEJ 137, W3HK 120, W3DP 103, N3EFW 95, N3NNH 86, WA3WQP 55, W3IPX & N3CSE 52, W3JKX 48, W3KAG 34, KB3YS 32, N3AT 30, K3TX 25, N3DCG 20, W3NNL 18, WA3CKA 15, KD3AO 14, AA3CN & KA3LVP 11, WC3F 10, W3BNR & W3TWV 7, K3ARR 6, KA3FTG & WB3GCX 4 and N3FLT 2. *PSHR:* N3DRM 114 and N3NNH 125. *Section nets:* D6ARES 76/32, EPA 319/199. EPAEPTN 391/141. LCARS 40/5. LEHCARES 161/4. MARCNET 42/3, MARCTN166/29,PFN 243/113. PTTN 129/98, SCESN 82/5 & SEPTN 108/6. @PBBS: WB3JOE11/11, WA3TSW 8/9 and N3KDS 16/26. Welcome to our new ORS, Ed Kelly, KA3FTG. 73 de Harry, W3KOD.

MARYLAND/DC: SM, Bill Howard WB3V, 410-551-6775. ACC: Tony Young WA3YLO @ KA3RFE, 301-262-1917. ASM: Jerry Gavin, NU3D @ WB3V, 410-761-1423. ASM/RACES Coord: Al Nollmeyer, W3YVQ. ASM/Youth: Cynthia Mann, KA3ZNQ, 410-647-0005. ASM/Youth: Brian Davids, KA3WWI, 410-647-2956. BM: Bill Dillon, WA3SCW @ WB3V, 410-787-1580. PIC: Mel Morenz, N3EKZ @ WB3V, 410-760-9426. SEC: Mike Carr, WA1QAA, 410-799-0403. STM: Bruce Fleming, N3EGF @ K3HKI, 301-863-6582. TC: Bob Bruninga, WB4APR @ WB3V, 410-553-6027. It's been an amazing month! Letters welcoming 26 new hams and 56 new ARRL Members have been sent. More annual ARRL club report forms have been received from Carroll County ARC, Pentagon ARC and Easton ARS. The hamfests have been a hit and it's been good to see you at the ARRL tables. I can't recall how many have commented about Field Day. The event was a great success and thank you for the messages from your FD site. Let's hope the lessons learned will be transcribed and saved for next year. DMARC has been busy reinventing the packet network in the MDC area and it needs user support. To help, contact WA3TAI or K3ORC. Is everybody ready for a Simulated Emergency Test (SET)? Our SEC and ECs have the information you need. Hani, AA3EI, has moved from the DEC position to become EC of the District of Columbia. Hani replaces Plater, N3DZQ, who will receive a Certificate of Merit for his contributions. Bob, K2EB, has resigned as the NM of MPTN, and the Garrett County EC slot has been picked up by Roland, N3KAT. 73, Bill. *With the nets—NM/QND/QTC/QNI:* MSN /KC3Y 30/39/339, PON /W3DFW 26/1/125, MDD /WJ3K 59/178/377 (*MDD Top Brass* W3YVQ/119 KK3F/107 K3JL/99). MEPN /K3ORW 31/91/625. MPTN QRT. *Tfc:* KK3F 669, KJ3E 183, K3GHH 88, WJ3K 83, N3LDY 82, KC3Y 80, K3USO 70, W3UT 65, WI3A 30, KA3T 30, N3EGF 28, K3ORW 22, WB3LTA 13,WN3C 5, KE3FL 5,WA3FYZ 4,W3ZNW 3, PSHR: KC3Y 128, KK3F 125, KJ3E 123, K3GHH 122, WJ3K 117, WI3A 108, N3LDY 92, KE3FL 76, K3ORW 74, WA3FYZ 70.

SOUTHERN NEW JERSEY: SM: Bruce Eichmann, KE2OP (@ K2AA)—ASM: W2OB, KA2YKN, WB2LOO, WA2CVJ, K2GA. SEC: W2HOB. STM: WB2UVB. ACC: K2IXE. TC: W2EKB. SGL: K2GA. BM: N2LCR. OOC: K2RCG. PIC: WA2ABF. TSs: K2JF, W2PAU, AB2Y, WB2MNF. It is with the deepest regret that I report the passing of two long-time amateurs in the SNJ Section. On Jun 20, Walter Schmidt, W2EA, became a Silent Key. Walt was known for his passion for Amateur Radio and the environment, and his yearly VHF/UHF expeditions to High Knob, PA. He conducted many Novice classes, one of which I attended in 1977. His presence will be missed. On Jun 30, Edwin Farmer, K2OSV, became a Silent Key. Ed was a long-time amateur. He was best known for his guidance to new amateurs and served as a VE with the team in Bellmawr. Ed was a great friend to Amateur Radio. If you have an SK announcement, please send it to me. I'll include it in this column. The South Jersey RA annual hamfest is Sun, Sep 18, in the parking lot of Pennsauken High School, Rte 73 W of Rte 130, 8 AM-2 PM. Talk-in is on the K2AA repeater, 145.29 (-600). Until next month, 73. *Tfc:* WA2UVB 173, WA2CUW 99, W2HOB-4 82, K2UL 64, N2MSM 56, W2AZ 42, KB2CDB 20, N2FET 18, WA2JSG 8, N2SXO 8, KA2CQX 7, KB2HJJ 6, W2HOB 4, N2FHJ 4, N2SOE 2, N2EPH 2, N2SPY 2.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—Congrats to ARES efforts in 1993 Simulated Emergency Test (SET). WNY placed 5th nationally with at least 11 counties reporting; that's an improvement from 8th nationally in 1992 SET. Special thanks to ECs in Broome, Chenango, Delaware, Genesee, Lewis, Madison-Oneida, Monroe, Onondaga, Oswego, Otsego and Yates counties for filing their reports. Now how about getting ready for 1994 SET and filing ARES Annual Reports? 12 Section and local nets reported activity during 1993 SET to put WNY in 6th place nationally, down from 5th place in 1992. Thanks to NMs of NY Phone, NYPON, NYS, NYSEMO, NYSR, OCREN, OCTEN, OMEN, STAR, TIGARDS and Western District Net for strong showing and filing net SET reports. All are encouraged to plan to take part in 1994 SET. Field Day reports were received by the SM from 12 stations: K2DN N2DSV NS9E KF2EZ W2FMM N2IKR K2IQ WF2L W2LZ W2OW W2PE K2QR W2RCX W2RGI W2SB W2SEX W2TZ K2UD KV2W. *Club news:* RVHFG presented Hank Blodgett, W2UTH, Memorial Award to KA2HSK for his many contributions. *Club officers:* GRAM KA2VTX WF2S K2ZUT; KLARA N2ODO KAØWBX KV2W N2JEN; LARA AA2BA AA2OT KB2I.TO K2BXS; RDXA WA2LCC N2PEB AA2IO; RVHFG KD5RO KA2RDO WY2Z WA2MOP; SIARC AA2IZ WB2JIR K2BWX; WNYDXA WB2RAJ WB2RFP WB2YQH. Yes, Virginia, there's a lot more to Amateur Radio than passing traffic; remember, public service is a primary tenet of Part 97.

Net Name	Time	QNI	QSP	IN	Net Name	Time	QNI	QSP	IN
EBN FM	0530	404	000	23	WEST FM	1900	319	129	29
NYSEMO	0900	068	005	04	NYS/E* CW	1900	395	172	30
NYSR CW	0930	018	004	04	OMEN FM	1930	123	006	08
NYS/M* CW	1000	303	117	30	JCRAC FM	2000	566	010	24
CHN SB	1100	206	136	29	TIGARDS	2000	029	003	04
WON/M*FM	1100	385	083	30	VHF THIN	2000	030	001	04
NYPHONE*	1700	295	176	26	BRVSN FM	2100	239	002	30
ESS CW	1800	366	091	29	ORTN SB	2100	016	000	04
NYSPTEN	1800	366	091	29	CNYTN* FM	2115	339	049	29
LCARES	1800	019	000	03	OCTEN/L*	2130	295	053	30
OCTEN/E*	1830	947	136	30	WDN/L* FM	2130	374	073	30
Q Net FM	1830	527	004	30	NYS/L* CW	2200	233	153	30
STAR* FM	1830	366	028	30	ABLSN FM	1900	526	037	28
WDN/E* FM	1830	407	068	30	*NTS Net				

Digilink: N2JAW R = 740 S = 725. *BPL (Jun):* N2JAW N2LTC. OARCN *(May)* 46-01-04. *Hamtests:* Buffalo Sep 17, Elmira Sep 24, Syracuse Oct 15, Binghamton Nov 12, Norwich Dec 3. *PSHR:* K2BCL W4BNY KG2D N2DLN K2DN KB2ETO W2FR WI2G KA2GJV N2JAW N2JOA N2JRS N8JSO AF2K KB2KOJ N2LTC W2MTA KB2QIX ND2S N2SAA N2SSS N2TOY NU2U WA2UKX NY2V KF2VI K2YAI KA2ZNZ. *Tfc (Jun):* N2JAW 1548, N2LTC 550, W2MTA 310, WI2G 288, KA2GJV 231, K2BCL 226, KF2VL 218, ND2S 169, W2FR 164, AF2K 113, K2YAI 102, KA2ZNZ 98, N2SAA 78, WB2QIX 74, KG2D 38, WA2UKX 31, WB3CUF 27, N2DLN 27, NU2U 23, N2TOY 22, N2JRS 16, N8JSO 12, N2SSS 12, KB2ETO 10. 73.

WESTERN PENNSYLVANIA: SM, Bernie Fuller, N3EFN (@ WA3ZCA)—ASM: KA3OEM (@ WA3ZCA). ASM (East): NR3T (@ W3SYY). ASM (Pkt):KC3ET (@ KC3ET). ASM (ARES): N3FOQ (@ W3SYY). ASM (Youth): N3HPL (@ KA2ZMC). SEC: N3LLR (@ KE2VW.#WNY). STM: WN3F (@ KA3JSD). OOC: K3QMR (@ K8TME). TC: AA3HP. BM:KC3ET. ACC: AK3J. How many potential members are we losing? The number of people being licensed for the 1st time is on the increase, but I don't see a corresponding increase in members of clubs in WPA. At your next meeting of the club directors, make it a point to explore this issue. Top on the list of all clubs should be an active Elmer program; a program that is made known at every opportunity. A good start in your discussions can be derived from ARRL pamphlet E11-394 *What Do You Do Now?* This publication is in the hands of all ARRL VE teams and is available for the asking from HQ. Talk to the officers of the North Hills ARC or RA of Erie—these clubs have aggressive recruiting programs. *Congrats:* McKean County ARC on achieving ARRL Special Service Club status; Nate Graham, KD3OH, on appointment as DEC; Jerry Smith, WA3ZSC, on revitalizing the Crawford ARS newsletter. *Try this:* Steel City ARC designed special T-shirts for its Field Day participants. How many clubs had an active Novice station at FD this year? One WPA club had a station where the Novices were instructors for newly licensed Techs. *Sympathy:* Our sincere sympathy to KV3L on the passing of his mother. *Club visits:* Starting next month (Oct), I'll be making my calendar for 1995; if your club would like a visit, let me know ASAP. *Welcome:* I'd like to welcome 2 new appointees to the WPA Staff—Bill Edgar, N3LLR, SEC, and Richard Gallovich, AA3HP, TC. Pat O'Malley, N3FQQ, has been appointed ASM (ARES). Pat and Bill will stress the increased emphasis on emergency ops in WPA. *Good luck:* To AA3CE, newly appointed editor of the BCARA newsletter. W3DMB has been in the editor's seat since Dec 1985 and has brought the club paper a long way in that time—thanks for all your efforts, Jerry. *Calendar:* Sep 10 Erie hamfest; Sep 11 Butler hamfest; Oct 22 Ft Venango auction/flea market. *A point to ponder:* One's ability to lead doesn't depend on the seniority of his/her Amateur Radio experience. Tfc (May): WPACW QNI 181, QTC 70; WPAPTN QNI 401, QTC 66; NWPA2MTN QNI 851, QTC 33; WPA2MTN QNI 307, QTC 18. *PSHR:* WA3UNX (121). W3NGO (64), KA3VBY (9), W3OKN (47), WA3QNT (34), WA3UNX (150). *Apr:* WPACW QNI 172, QTC 80; WPAPTN QNI 481, QTC 60; NWPA2MTN QTC 728, QTC 30, WPA2MTN QNI 324, QTC 19. *PSHR:* WA3UNX 113, W3OKN 104, WA3UNX 136, W3OKN 131, W3NGO 75, WA3QNT 42, N3EMD 42, KA3EGE 21, K3HWJ 11. *Net note:* We're glad to see K3HWJ back in the saddle.

CENTRAL DIVISION

ILLINOIS: SM, Sharon Harlan, WB9SFT—SEC: W9QBH. STM: K9CNP. OOC: KD9UL. BM: K9EUI. SGL: K9IDQ. PIO: N9EWA. ACC: KI9G. TC: N9RF. DEC: WD9EBQ.

Net	Freq	Time (local IL)
ISN	3905	1800 Dy
ILN	3665	183 +2200 Dy
ITN	3680	1900 Dy
CTN	147.60/09	2100 Dy
ILARES	3905	1630 1st + 3rd Sun
IEN	3940	0900 Sun
ILPN	3855	1645 M-F; 0830 Sun
NCPN	3915	0700 M-Sat
NCPN	7270	1215 M-Sat

It's official: the Peoria Area ARC will be host to the 1996 ARRL National Convention at the Peoria Civic Center. This is a great honor for this club. Congratulations! The amateurs from the Peoria AARC who helped with the St Francis Medical Center and the American Diabetes Association Tour de Cure bicycle ride Jun 12 were KA1MAN, WD9CIR, WD9IRE, KA9VXZ, N9LOD, KF9JR, KB4CFJ and N9SFX. About 40 cyclists rode from Brimfield toward Jubilee College State Park and then a return trip to Brimfield. There was one zealous rider who rode a full 100 mi. The Fox River Radio League manned 37 radios for the Mid-America Canoe Race Sun, Jun 5. There were 509 canoes officially "clocked" at the finish line. Communication went smoothly with all equipment performing well. Field Day is over, the equipment has been stored away for next year. From all I've heard, most clubs had a successful weekend. I received 8 pieces of Field Day traffic and each one was in the

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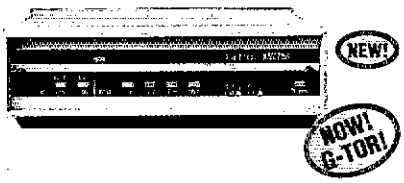

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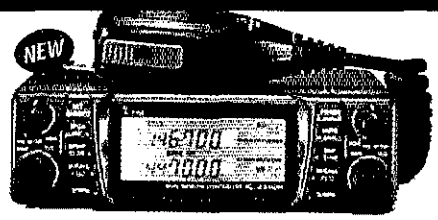

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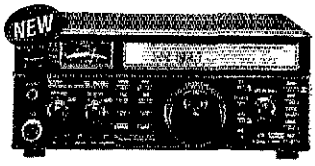

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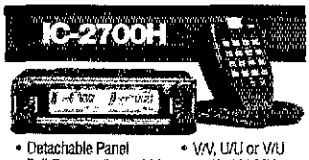

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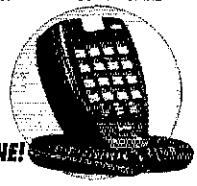

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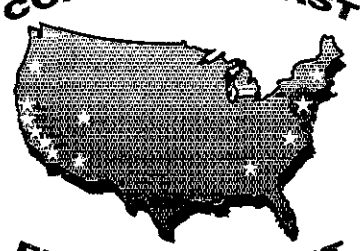
IC-P4AT	$50 off	IC-725	$50 off
IC-V21AT	$50 off	IC-728	$80 off
IC-W21AT	$65 off	IC-737A	$100 off
IC-2GXAT	$20 off	IC-970A	$250 off
IC-2iA	$50 off		

Coupon Program Expires Sept. 30!

ICOM®

COAST TO COAST



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UPS - Most items over $100

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(800) 444-9476
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(602) 242-3515
(800) 444-9476
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East of Highway 17

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Washington D.C. area
14803 Build America Dr.
(703) 643-1063
(800) 444-4799
Curtis, WB4KZL, Mgr.
Exit 161, I-95, So. to US 1

SALEM, NH 03079
Boston, MA area
224 N. Broadway
(603) 898-3750
(800) 444-0047
Chuck, KM4NZ, Mgr.
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9:30 AM to 5:30 PM
Store Walk-In Hours:
10:00 AM - 5:30 PM • Closed Sundays

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Mountain	**1-800-444-9476**
Southeast	**1-800-444-7927**
Mid-Atlantic	**1-800-444-4799**
Northeast	**1-800-644-4476**
New England	**1-800-444-0047**

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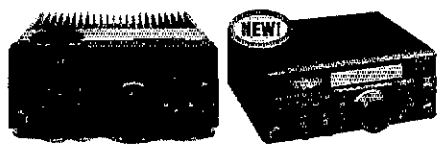
YAESU

CALL FOR THE LATEST UPDATE ON YAESU FALL SPECIALS!

Watch for "NEW" FT-900 HF Transceiver!

FT-890/FT-840



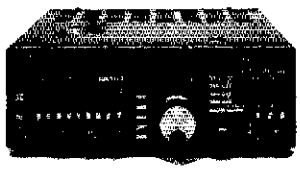
100w • Dual VFO's • QSK • DDS
IF notch filter, 12VDC
Optional built-in
auto antenna tuner

100W • 12V DC • DDS
Gen. Cov. Rx, 100 mem.
Optional Ext. Auto
Tuners Available

CALL NOW FOR OUR LOW PRICING!

FT-736R

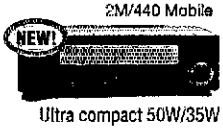
The Ultimate Oscar Machine



VHF/UHF All Mode Transceiver
25W, Built-In Pwr Supply

FT-5100/FT-5200

2M/440 Mobile



Ultra compact 50W/35W
94 Memories • Non-remotable
Dual in-band receive
Built-in DTMF paging/Coded Sql.
CTCSS Encode built-in
Backlit DTMF mic included

2M/440 Mobile

Ultra Compact
50w/35w 2m/440
32 memories
Built-in duplexer
Backlit DTMF
MIC included

CALL NOW FOR OUR LOW PRICING!

FT-1000

200W, DUAL RX,
GEN COV RX, QSK, TCXO

CALL NOW FOR OUR LOW PRICING!

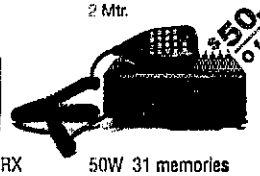
FT-2200H/FT-2400H

2 Mtr.

2M 50W Mobile + Aircraft RX
50 Mem. CTCSS Encode +
Paging Built-In.
MW-2 Optional

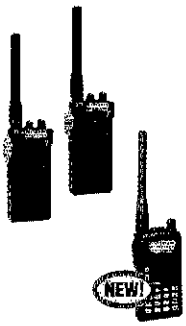
Call For Special!

2 Mtr.



50W 31 memories
2 meter mobile
Large alpha- numeric LED
Backlit DTMF mi
Mil-spec design
(Limited Stock)

HANDHELDS



FT-416/FT-816
2 Mtr 440 Mhz
2W 2M/2W 440
5W optional
Direct DC input
Built-in VOX, 41 Mem.
DTMF paging, CTCSS built-in

FT-11R/41R
2M 440mHz
150 Mem. Channels
1.5W standard, 5W option
Alpha-numeric display
Compact & back lit keypad

DUAL-BAND HANDHELDS

FT-530
2M/440mHz

2W standard, 5W opt.
82 Mems, Dual in-band Rx
DTMF paging + coded Sql. std.
Built-in VOX & CTCSS
Auto tone search
Built-in clock • Backlit keyboard

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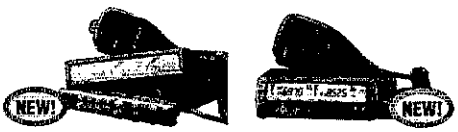
HRO San Diego #1 Kenwood Superstore!

TM-742A/TM-733A

2 M/440Mhz 2M/440Mhz



Optional 3rd band available
Up to 303 memories
101 per band
PL Encode Built in
Detachable front panel

50W/35W • 72 Mems
9600 Baud Ready
Dual Receive Same Band
Opt. Quick-Release Kit

Call Now For Your Low Price!

TS-850S

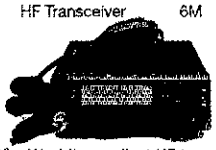
HF Transceiver

Advanced Technology Performance
108 db Dynamic Range, Optional DSP

CALL NOW FOR OUR LOW PRICE!

TS-50S/TS-60S

HF Transceiver 6M



TS-50S - World's smallest HF transceiver
100W out. (90W TS-60S, 50MHz only) • SSB, CW, AM, FM,
12V Gen. Cov. RX, 6.4 lbs., 7.16 x 2.4 x 9.32"
105 db dynamic range, 100 Mems.
Optional external ant. tuners available (TS-50S only)

CALL FOR SPECIAL LOW PRICE!

TH-79A

2M/440 HT

2.7W 2M, 2W 440
5W Optional, DTSS Built-In
82 Memories, DTMF Memories
Built-In CTCSS Encode/Decode
User-Friendly Menu System

CALL NOW FOR INTRODUCTORY SPECIAL!

KENWOOD

TGIK DAY!

SALEM, N.H.

— Sept 10th —

10 AM - 5:30 PM

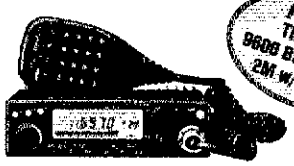
- Factory Representatives
- Special Discounts
- Demonstrations • Prizes
- Refreshments
- Grand Prize Drawing 4 PM

(No purchase necessary)

To celebrate TGIK, all HRO stores will have special extra Kenwood discounts on Sept 10th!

TM-241/331A/441A/541A

2 Mtr 220Mhz 70cm 1200Mhz
Aircraft RX



NEW! TM 251A 9600 Baud Ready 2M w/440 Rx

Compact FM Mobile Transceivers

FOR OUR LOW PRICES, CALL NOW!

HANDHELDS

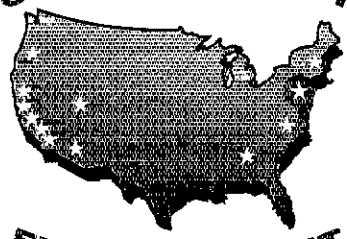
TH-28A

2M/2.5W DTSS
240 Mem.
w/optional mem. unit
UHF RX

TH-22AT

Ultra Compact
2M HT, 5W optional
40 memories
Encode Built-In

COAST TO COAST



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UPS - Most items over $100

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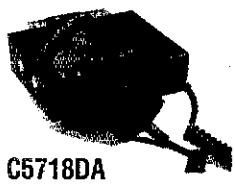
STANDARD

MOBILES



C5718DA
- 2M/440 Twin Band Mobile
- 50W 2M/40W 440MHz
- 40 Mem. channels, 9600 Baud Ready
- CTCSS Enc/Dec Standard

NEW!

C1208DA
- 2M/50W
- 100 Memories
- CTCSS Built In
- 9600 Baud Ready!

CALL FOR YOUR SPECIAL LOW PRICE!

HT's

NEW!

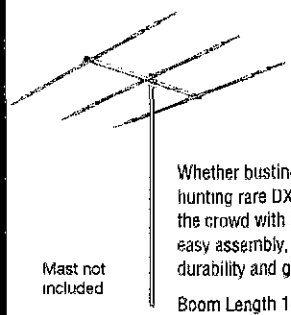
C158A
2MTR/2W
130-170 Rx
CTCSS Built-in

C228A
2M & 220MHz
2.5W

C558A
2M & 440MHz
Airband Rx
2.5W

cushcraft

A3S



DX that stands out from the crowd. With stainless steel hardware
10, 15, 20 METERS

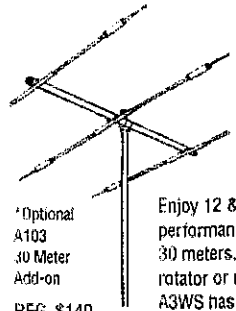
Mast not included

Whether busting pile-ups, rag chewing or hunting rare DX, the A3S stands out from the crowd with the perfect combination of easy assembly, the right size, rugged durability and great performance.

Boom Length 14 ft.
Weight 27 lbs.
Wind Surface Area - 4.36 ft.

REG. $445. ***SALE $329.95***

A3WS



New 12 & 17 Meters
DUO-BANDER

Optional A103 30 Meter Add-on
REG. $140.
SALE $109.95

Enjoy 12 & 17 meter bands with full performance beam. Easy-to-use kit adds 30 meters. Mount on lightweight tower/rotator or use with existing tribander. A3WS has all aluminum construction w/ stainless hardware.
REG. $360. ***SALE $279.95***

Boom Length: 14 feet • Weight: 22 lbs.
Turning Radius: 14.4 ft. • Wind Area: 4.1 sq.ft.

R5

14, 18, 21,24,28 MHz Half Wave Vertical

Broadband impedance matching network/ all 5 bands
Fully automatic frequency selection
Four 48" long counterpoise rods/ excellent isolation
No radials required

REG. $370.00 ***SALE $279.95***

R7

7,10,14,18, 21,24,28 MHz
7 Band Half Wave Vertical

NEW!

Fully automatic frequency selection, complete with stainless counterpoise.
No radials required. ***SALE $379.95***

AR-270

New Dual Band Ringo

The AR-270 has Ringo Ranger technology in a durable all aluminum antenna with stainless steel hardware. Instant assembly and 3 short radials make it easy to install anywhere. AR-270 features sealed phasing coil and base matching network with single 50 Ohm cable connection.

2 Meters (144-148 MHz)
70 CM (435-450 MHz)
Height: 3.75 feet

REG. $83.00 ***SALE $69.95***

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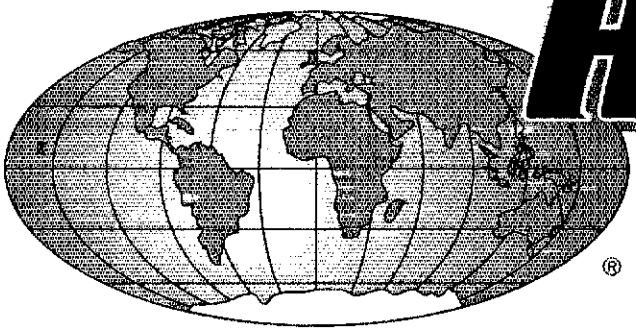

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DR-1200T

1200 Baud

2M Packet/FM
Transceiver, 25W
REG. $399.
SPECIAL $279.95
(DR-1200T)

ALINCO

USE THESE MANUFACTURER DISCOUNT COUPONS OFF OUR ALREADY LOW PRICE!

Now Good Through Sept. 30th

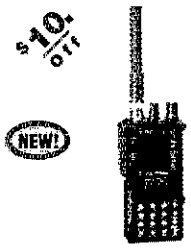
Call for Latest Update on Manufacturer Coupons!

DJ-G1T

2M/HT

2M HT w/440 RX
Aircraft RX
80 Memories
Encode built in
Channel-scope built in
CALL FOR LOW INTRODUCTORY PRICE!

DJ-F1T/DJ-F1T-HP



2w 2 meter compact HT
8 scan modes
40 memories
Now 5W Version
Available, Too!
CALL NOW FOR SPECIAL PRICE!

DR-600T

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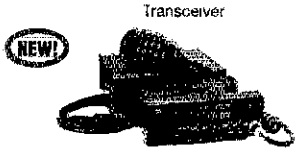

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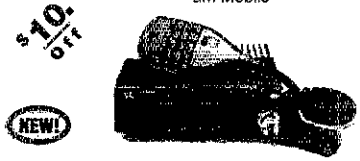

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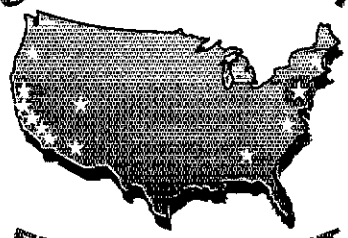

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proper form. Good going! This is my last column for the Section News. I've enjoyed being SM for the past 4 years, going to the different hamfests and club meetings. Congratulations to Bruce Boston, KD9UL, of Beardstown, who's the new SM. Bruce has done a great job as OOC and I know he'll be a good SM. Thanks to Goldie, K9AXS, for sending the W9VEY Memorial Net reports every month and for the good wishes always included. The W9VEY Memorial Net celebrated its 18th anniversary on Jun 13. WA9RUM has been NCS since it began. One treat for NCS on the anniversary was his daughter, W5NQQ, and his granddaughter, KA5JVF, of Houston, TX, checked in. The Jun report for the W9VEY Memorial Net: check ins 182; messages passed 10. *Tfc (May):* W9HLX 176, K9CNP 71, KA9IMX 35, WB9TVD 28.

INDIANA: SM, Peggy Coulter, W9JUJ—SEC: K9ZBM. ASEC: WA9ZCE. STM: KJ9J. OOC: KA9RNY. SGL: WA9VQO. PIC: KK9G. TC: KF9IQ. BM: WB9AHJ. Sympathy extended to the families and friends of Silent Keys: Jun 9, Richard Chesser, W9UL, Winslow; Jun 18, Harold "Hap" Norton, W9PRO, Ft Wayne. The Indianapolis hamfest and Central Division Convention is over for another year. There were 2 awards given at the banquet. The Outstanding Service Award presented to an amateur in recognition of outstanding devotion and service to the Amateur Radio community in IN by the Indpls Hamfest Assn, and being renamed "The Cornelius 'Mike' Head Memorial Service Award" was presented to John Patton, WB9WPV. The IN RC Council Amateur of the Year Award was presented to Loren "Sonny" McCoy, WA9DOL. To both of them, congratulations. The OBS are doing a fine job. Sending in reports were W9BRW, W9EPT, KF9MP, WA6OIZ, N9OYI, N9PSG and KA9QME. Unless you send WB9AHJ a report, we don't know what you're doing. Now that FD is over, it's time to think SET. Time goes so fast and it will be here before you know it. The repeater coordinators have changed some 6 mtrs, WB9QBR; 2 mtrs, WB9VPG; 220 MHz, KA9PCT; 440 MHz WB9KIX; 902 & up, KD9OB. The IN State RACES HF nets are held on the 3rd Sat each month at 10 AM CST on 3996.5 kHz and open to all amateurs. Jefferson Co ARES assisted in a Mock Disaster at Madison State Hospital helping were WB9AHJ, N9ASR, KE9GY, W9HMR, N9JBT, KA9QME and KA9ZOR. The Michiana ARC provided communication for the Sunburst Marathon/Hospice Walk. Taking part were NY9A, N9LJI, KA9DIG, N9VCK, W9EPT, AA9AM, WB9SCC, N9OTH, N9KIL, N9NDY, N9KBV, N9WFZ, N9QIL, N9NSU, N9UFC and K9KWI. For the OH River Sweep that began at Madison; Jefferson Co ARES provided communication. Taking part were WB9AHJ, N9ASR, KE9GY, W9HMR, KF9QO, KA9QME and KA9ZOR. NMs ITN/W9UMH, OIN/NR9K, ICN/AA9HN, WN/WA9OHX, VHF/KJ9J, PBBS/WJ9U

Net	Freq	Time Daily UTC	QNI	QTC	QTR	Sess
ITN	3910	1330/2130/2300	2246	269	1418	90
OIN	3656	1430/0000	332	188	699	54
ICN	3705	2315	181	94	755	29
IWN	3910	1310	2021	—	300	30
IWN VHF Bloomington			423	—	450	30
IWN VHF Kokomo			680	—	150	30
IWN VHF Northeast			804	—	600	30
Hoosier VHF nets(13 nets) .			1797	83	2045	61

9RN 313 QTC in 60 sessions IN represented 100% by K9PUI, NR9K, KJ9J, WA9QCF, W9FC, N9HZ and WB9UYU. *Tfc:* NR9K 379, W9FC 218, KJ9J 108, W9UMH 104, W9UEM 95, K9GBR 78, W9JUJ 65, WA9OHX 54, AA9HN 49, K9PUI 47, WA9QCF 40, KA9QME 17, N8CXB 17, WA6OIZ 16, N9JAI 15, KF9MP 15, W9EHY 15, W9GSJ 14, W9BRW 12, W9EPT 12, N9OYI 12, WB9AHJ 12, WB9NCE 5, W9RTH 5, N9PSG 4, K9DIY 4, AB9A 4, W9XD 3, KB9WI 3, K9OUP 1.

WISCONSIN: SM, Richard R. Regent, K9GDF—WI Nets Assn picnic is Sep 17 at noon, at Waupaca South Park, everyone is welcome. ECs are needed for these counties: Ashland, Bayfield, Crawford, Door, Douglas, Florence, Forest, Grant, Green, Jackson, Kewaunee, LaFayette, Marquette, Menomonee, Oconto, Pepin, Polk, Richland, Rock, Rusk, Sheboygan and Vernon. Get in touch with our SEC, WB9SMM of Brookfield, for info and application. Congratulations to W9YCV, editor of *Hamtrix*, the W Allis RAC newsletter. *Hamtrix* was awarded *superior* by the Amateur Radio News Service in a competition with 109 other newsletters. WARAC will provide communication for the Trinity Trot Sep 5. Would you like to be a Public Information Officer (PIO) and improve public awareness of Amateur Radio in your area? Contact our Public Information Coord (PIC) K9ZZ in Baraboo for details and application. WB9RQR is considering early retirement. New EC for Walworth County is N9VEV. Exams: Sep 3 Racine, Sep 10 Madison, Marshfield and Oak Creek, Sep 17 Milwaukee and Appleton; Sep 21 W Allis; Sep 24 Wauwatosa and Tomahawk. Thought of the month: *No experiment is ever a complete failure—it can always serve as a negative example. Tfc:* WB9YPY 2486, W9AYK 1052, W9CBE 307, W9YCV 154, K9DHR 150, N9BDL123, KA9KLZ 102, N9KHD 87, K9KSA 78, KB9ENO 71, AG9G 66, KE9VU 64, N9CKC 59, K9HDF 57, WB9JSW 43, WB9ICH 42, N9BCX 39, W9NGP 38, W9IHW 35, NS9Q 35, K9UTQ 34, K9FHI 33, K9JPS 33, KA9BHL 31, KG9B 30, W9PVD 25, KA9FVX 25, W9ODV 24, N9JIY 19, K9GU 18, W9UW 6.

DAKOTA DIVISION

MINNESOTA: SM, Randy Wendel, N0FKU. N0FKU @ WA0CQG.MN, RWENDEL@AOL.COM—Field Day is well behind us and school's starting again. Field Day bonus points—reports were credited to the Mankato, Rochester, Albert Lea, Red Wing, Gilbert and Gotha(?) area RCs that sent their FD reports on our ARRL-sponsored Section net on 75 meters. I know there were more Field Day events, but I never heard from you! As of this reading, I'm looking for nets in MN that carry the weekly program *This Week in Amateur Radio*. I'm compiling the info for an upcoming paper and need it ASAP! A notation for those of you who teach/instruct Amateur Radio classes—an official from the ARRL Educational Activities Dept is holding an instructor's forum at Hamfest MN in Oct at the St Paul Civic Center. Mark your calendar! It's official now—I'm entering my 2nd term as your SM beginning Oct 1. Thanks to all whose

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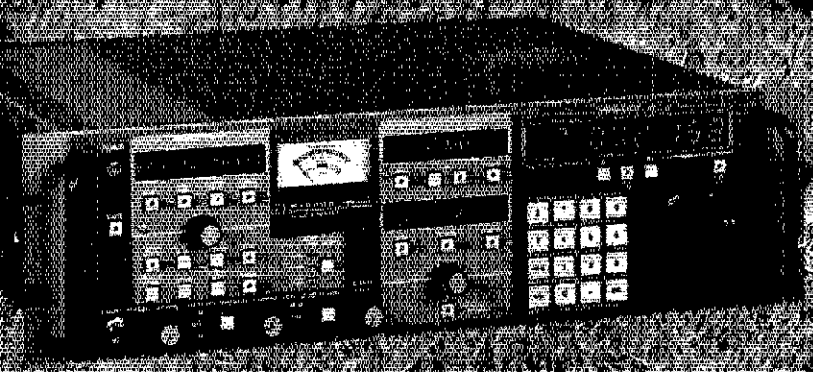

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names appeared on the nominating petition. I look forward to a 2-yr term as SM. My 1st term was a short 1½ yrs and now having gotten settled in the "new" house (1 yr already!), I hope to dedicate more time to my Amateur Radio efforts. Speaking of efforts, many clubs will return from summer breaks and new activities will surely arise, and I hope *you* volunteer in your organization. If 10% of the people do 90% of the work, I hope you're in the 10% doers bracket. The 1994 ARRL National Digital Conference, hosted by TwinsLAN packet radio club, is over and what a great weekend it was! Lots of new acquaintances were made and technology shared. On a sad note, Dean Oderkirk, KØJIY, otherwise known as "O. D." of Alexandria became an SK on Jun 28. Dean was a previous Douglas Co Em Mgr. He was a super guy and I'll miss our "annual" breakfast at the Alex Country Kitchen on the way to Fergus Falls hamfest. Our thoughts go to his family and many friends. O. D. was laid to rest on the 4th of Jul. On that note, I hope you've been having a great summer. Still time left before we button down the hatches and put the lawnmower away and dig out those shovels. 73 all. *Tfc:* WBØLES 298, WAØTFC 275, WBØWNJ 246, KGØGW 129, WDØGUF 98, WØGRW 62, KFØFI 56, KAØARP/KBØBXE 54, W3FAF 39, KØERP 35, NØJP 34, KN9U 24, KØWPK 17, WØKYG 15, KAØIZA 10, NØTNK 9, KØOGI/KAØATT 6, KAØPDM 5, WØNO 2.

NORTH DAKOTA: SM, Bill Kurtti, WCØM—With the above-normal rainfall, SKYWARN groups have been active again. Maddock area had 5 new amateurs receive their call signs recently: KBØMWV, KBØMWU, KBØMWY, KBØMWZ & KBØMWX. I received Field Day reports from 5 groups operating from our Section. WX was nice that weekend all across the state, so everyone had an enjoyable time. RRRA hams took part in the emergency drill conducted by the FAA, with other fire and emergency services. The drill fulfilled its purpose, as several bugs were found and corrected. They're working on setting up communication with the hospitals for disasters. The 146.82 repeater has been joined by a 70-cm repeater on 449.950 T 448.950 R at the same site at Petersburg. I'm always looking for news—if you have something newsworthy, please send me a written copy so I can put it in this column.

Nets	*Freq*	*Time*	*Sess/QNI/QTC*	*NM*
Goose River	1895 kHz	9AM Sun	4/29/0	KEØXT
Data	3937 kHz	6:30 CT Dy	25/570/20	NØIJR
Benson Co	147.24 MHz	9 PM CT Sat	4/12/0	KBØMWV

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—Mobridge Area hams joined some Northern Hills hams for Field Day at the Fuller Ranch on the top of a 6200-ft mountain 15 mi S of Deadwood. Our host was Dick Fuller, KBØLCG, who had things well organized. Antennas were between the tops of 70-ft pine trees. More than 600 CAW contacts were made with a class 1-A station and we all had a great time. The 75° temperature dropped to 32° by the middle of the night and went back up Sun morning. We were surprised at the large number of contact we made on 10 meters. Only 4 clubs sent Field Day messages to get the extra 100 points. The Garden City repeater is now up with 80 W, 146.07/.67 with CTCSS 203.5 tone, and is linked to Humboldt Wessington Springs Turkey Ridge. Hit the Garden City and talk through to Sioux Falls area. Mobile coverage extends N into ND. NØMEA is looking for more check-ins in the SKYWARN net. Sioux Empire ARC presented their Amateur of the Year award to Mike Marx, NØRGA. We need volunteers to be OBSs. Contact WØYMB. For ARES, contact WNØY. Total traffic for Jun was 705.

DELTA DIVISION

ARKANSAS: SM, Bob Ideker, WB5VUH—During FD '94, a real life-threatening situation existed in the Harrison area. A man was injured in a rappelling fall near the Buffalo River. It's an interesting story & too long for this article, however; luckily for the man, several hams were camping in the vicinity & along with hams in Harrison, were able to assist during the recovery. Those actively involved in ongoing communication included John, N5NOL; Patrick, KC5FDN; Barrett, KC5FLP; James, WA5EKA; Johnny, KB5JXF; Jim, KB5TZF; & Elmo, K5YWL. Once again, hams helped the public and proved that our hobby is more than just fun, it's a hobby of service, too. For a copy of the story as it appeared in the newspaper, please send me an SASE. Our traffic nets (OZARK-CW; MOCKINGBIRD; AR PHONE NET; RAZORBACK; and AR EMER COMM. NET) continue to shine. It's through their efforts that our Section is able to handle so much traffic into and through our Section. Thanks to those of you who participate in one or more of these daily nets. We need your continued help and support. The STM is Joe Johnson, W5QFU. NMs include Floyd, N5EL; Billie, WB5YLI; Gerald, N5KKD; "Pat," WØQIZ; and Dan, KI5FY. Speaking of special efforts, congrats to George, KI5BV, and Ken, AA5LT, for earning PSHR for their work during the past 12 months. For info, send me an SASE on how you can earn this nice certificate. *Tfc:* W5QFU 133; W5RIT 44, KO5E 37, WA5QMQ 24, AA5LT 23, K7ZQR 21, N5UQO 13; W5GWU 12, KA5MGL 10, W5LZU 8, KJ5IC 6, N5RJJ 4; K5YSL 4 & WF5X 3.

LOUISIANA: SM, Lionel A. "Al" Oubre, K5DPG. ASM: KB5CX. ACC: KA5IJU. STM: WB4FDT. BM: K5ARH. TC: KE5FZ. SEC: KA5YDJ. SGL: KD5SL. OOC: WB9VTN. NM LTN: KG5GE. It's time to start planning for this year's Simulated Emergency Test (SET). This is an excellent opportunity to test your unit's strenghts and weaknesses in providing emergency communication. If you'd like simulated emergency traffic sent into your area, send address, text and signature line with the time you want it entered to the SEC, Gordon McCraw, KA5YDJ, at 605 Clinebrook Dr, Gretna 70056. Packet address is KA5YDJ @ N5SSY. ECs to Gordon, check into LTN and send him your report in a message. Now that everyone's getting back on a school schedule and spending less time outside, please remember to put the LTN back on your schedule. We're looking for stations from all areas of the Section. If you're a newcomer and want to know more about traffic nets and how to handle traffic, let me know and I'll be happy to send you information. Knowing how to send and receive traffic is something every ham should know. Upcoming hamfests: Gonzales Sep 17, Alexandria Oct 16 and Monroe Nov 12.

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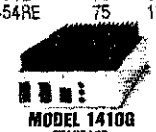
0508R	1	170	28	-/-	Repeater
0510G	10	170	25	15/0.6	Standard
0510R	10	170	25	-/-	Repeater
0550G	5-10	375	60	15/0.6	HPA
0550RH	5-10	375	60	-/-	Repeater HPA
0552G	25-40	375	55	15/0.6	HPA
0552RH	25-40	375	55	-/-	Repeater HPA
144 MHz					
1403G	1-5	10-50	6	15/0.6	LPA
1406G	25	100	12	15/0.6	Standard
1409G	2	150	25	15/0.6	Standard
1409R	2	150	24	-/-	Repeater
1410G	10	160	25	15/0.6	Standard
1410R	10	160	24	-/-	Repeater
1412G	25-45	160	20	15/0.6	Standard
1412R	25-45	160	19	-/-	Repeater
1450G	5	350	56	15/0.6	HPA
1450RH	5	350	56	-/-	Repeater HPA
1452G	25	350	50	15/0.6	HPA
1452RH	25	350	50	-/-	Repeater HPA
1454G	50-100	350	40	15/0.6	HPA
1454RH	50-100	350	40	-/-	Repeater HPA
220 MHz					
2203G	1-5	10-40	6	14/0.7	LPA
2210G	10	130	20	14/0.7	Standard
2210R	10	130	19	-/-	Repeater
2212G	30	130	16	14/0.7	Standard
2212R	30	130	15	-/-	Repeater
2250G	5	220	40	14/0.7	HPA
2250RH	5	250	40	-/-	Repeater HPA
2252G	25	220	36	14/0.7	HPA
2252RH	25	250	36	-/-	Repeater HPA
2254G	75	220	32	14/07	HPA
2254RH	75	250	32	-/-	Repeater HPA
440 MHz					
4403G	1-5	7-25	4	12/1.1	LPA
4410G	10	100	19	12/1.1	Standard
4410R	10	100	18	-/-	Repeater
4412G	20-30	100	19	12/1.1	Standard
4412R	20-30	100	18	-/-	Repeater
4448G	5	100	22	12/1.1	HPA
4448R	5	100	22	-/-	Repeater HPA
4450G	5-10	175	34	12/1.1	HPA
4450RE	5-10	175	34	-/-	Repeater HPA
4452G	25	175	29	12/1.1	HPA
4452RE	25	175	29	-/-	Repeater HPA
4454G	75	175	25	12/1.1	HPA
4454RE	75	175	25	-/-	Repeater HPA



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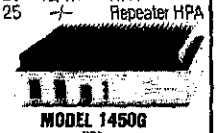

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All amplifiers (non-rptr) are linear, all-mode with fully automatic T/R switching and PTT capability. The receive preamps use GaAs FET devices rated at .5 dB NF with +18 dBm 3rd order IP. LPA, Standard and HPA amps are intermittent duty design suitable for base and mobile operation. Repeater amps are continuous duty, class C.

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RX Preamplifiers

Band	Model	NF (dB)	Gain (dB)	Connector
50 MHz	0520B	.5	25	BNC
50 MHz	0520N	.5	25	N
144 MHz	1420B	.5	24	BNC
144 MHz	1420N	.5	24	N
220 MHz	2220B	.5	22	BNC
220 MHz	2220N	.5	22	N
440 MHz	4420B	.5	18	GNC
440 MHz	4420N	.5	18	N
1.2 GHz	1020B	.9	14	BNC
1.2 GHz	1020N	.9	14	N

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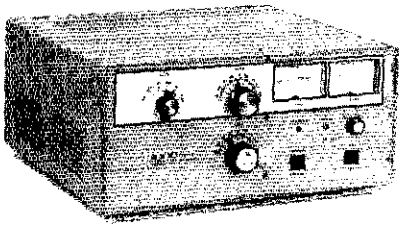
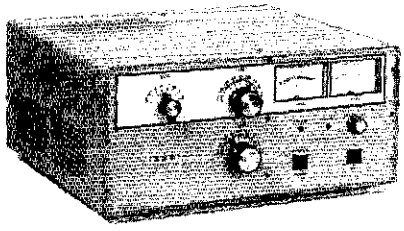


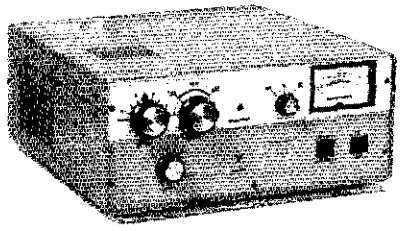
Price: *$2,695 (hypersil transformer standard)*
Band Coverage: *160,80,40,20,17,15 (12 & 10 export, also usable in U.S.A. with license)*
Output Power: *1,500 watts continuous carrier*
Drive Power: *50 to 60 watts for 1,500 watts*
Tubes: *Eimac 3CX800A7 triodes (2)*
QSK: *$250 extra cost factory installed option*
Power Requirement: *200/220 V, 50/60 Hz, 20 amperes*
Cabinet Size: *18"w x 16"d x 7-3/4"h*
Shipping Wt.: *75 lbs. UPS two cartons*

COMMANDER HF-1250



Price: *$1,745 (hypersil transformer standard)*
Band Coverage: *160,80,40,20,17,15 (12 & 10 export; also usable in U.S.A. with license)*
Output Power: *1,250 watts s.s.b., 1,000 watts c.w., 750 watts rtty*
Drive Power: *50 to 60 watts for 1,250 watts*
Tubes: *Eimac 3CX800A7 triode (1)*
QSK: *$250 extra cost factory installed option*
Power Requirement: *100/110/200/220 V, 50/60 Hz, 20 amperes*
Cabinet Size: *18"w x 16"d x 7-3/4"h*
Shipping Wt: *75 lbs. UPS two cartons*

COMMANDER II VHF



Price: *$1,645*
Band Coverage: *144 to 148 Mhz*
Output Power: *1,000 watts s.s.b., 650 watts c.w., 450 watts FM*
Drive Power: *30 watts for 1,000 watts output*
Tubes: *Eimac 3CX800A7 triode (1)*
Power Requirement: *100/110/200/220 V, 50/60 Hz, 20 amperes*
Cabinet Size: *14-3/4 x 14-3/4" x 6"h*
Shipping Wt: *60 lbs. UPS two cartons*

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LA Net Schedule:

LTN	6:30 P Local	3910 kHz	Nightly	KG5GE NM
LTN	8:00 P Local	3915 kHz	Mon	KI5TI NM

Net reports for Jun 1994: LTN QNI 254 QTC 177 in 30 sess. LEN QNI 53 in 5 sess. DRN5 for Jun 1994: 7888 messages in 60 sess. *LA represented 92% by KG5GE KI5TI N5YZM* KD5UY WB4FDT WB5CDX and K5DPG. *PSHR:* K5DPG 187, N5YZM 156, KG5GE 126, KI5TI 124, KA5YDJ 107, WB5CDX 90, WB4FDT 86. *Tfc:* WB4FDT 196, K5DPG 163, N5YZM136, KG5GE 103, WB5CDX 86, KI5TI 33, KA5YDJ 11.

TENNESSEE: SM, O. D. Keaton, WA4GLS—ASM: WB4DYJ. PIC: W4TYU. SEC: WD4EKA. STM: WA4HKU. ACC: WA4GLS. SGL: AC4JI. OOC: N4PUQ. TC: N4MW. As ARRL *TN State Convention Coordinator, I want to thank* the people who traveled so far, worked so hard and contributed so much that made the convention and Nashville hamfest a smashing success. The 1994 Field Day exercises were met with inclement weather in some TN areas; the Amateur Radio operators faced the weather bravely because similar conditions are when we're needed to perform our services to the public. Members of CARC assisted in the MS Walk, Bike-A-Thon and Special Olympics. KC4ZEK presented a program of weather training, progress of the Challenger Center and the Ocoee River events to the club membership and Hack, K4KP, has volunteered to conduct code practice on 146.79 repeater following the Sun night net. SRARC is considering the Rescue Squad's facility in Murfreesboro as a possible regular meeting place. Tom Hughes, KM4ES, made an interesting presentation on county hunting at the MARC club meeting. DARC has completed successful training classes in Novice theory by Lou, KC4WQN; fundamentals of ham radio by Roger, KC4ZPA; and CW by AC4PZ; stay tuned to DARC nets and *Sparks publication for the start of fall classes. RACK Panels* reports that RACK hamfest & computer fair in Knoxville was *a smashing success. Clubs' monthly newsletters, on which* I depend heavily for my news column, were filled with Field Day planning and not much news for Jun. Maybe more news next month. *Sectionwide net listings:* Early Morning Session TN Phone Net meets on 3980 kHz at 0540 CDT M-F. Regular morning session TN Phone Net Meets on 3980 kHz at 0645 CDT M-F; Sat, Sun, holidays at 0800 CDT, evening session TN Phone Net meets on 3980 kHz at 1830 CDT M-Sat. *Tfc:* WA4FMR 128, N4LA 60, WA4HKU 34, W4OGG 26, WA4GLS 16, Ki4V 12, WA4GZZ 11, WB4DYJ 11, N4ZXM 8, W4TYU 6, WD4EKA 6, W4PSN 4, WA4UCE 1.

GREAT LAKES DIVISION

KENTUCKY: SM,Steve Morgan, WB4NHO @ KK4XE—SEC: Bill Uschan, KC4MIS @ K4KJQ. ASM: Tom Lykins, WD4RWU. ACC: Bob Hardin, N4PNG. STM: John Farler, K4AVX. SGL: Ron Landrum, KM4DX.ASM: Rusty Smith, KD4GLC. The Purchase area is busy restructuring itself for better coordination with Paducah NWS. Paul Smith, N4FFO, is the new DEC for Area 1. A new county agreement with Red Cross is being implemented in Jefferson County. Thanks to KD4GLN, AD4NM and WA4UMR for their efforts. My congratulations to Allison Zettwock, KD4CKP, of the ARTS club, who's also a member of its board, as 1994 Young Ham of the Year. She was named by *Westlink Report* and received her award on Jun 4 in Seaside, OR. There's an effort by STM K4AVX to encourage all PBBS SysOps to get their users to help move NTS traffic. There's a need to know how many PBBSs in the state implement traffic handling. If so, are your users knowledgable in picking up and deleting the traffic? A lot of the daytime NTS traffic is being moved via PacTOR to designated outlets in each state and a functioning NTS packet network is useful. *If your club members need training in NTS traffic handling,* get in touch with the STM or me for help.

Net	*Freq*	*Time/UTC*	*QNI*	*QTC*	*Sess*	*NM*
KRN	3.980 MHz	1130Z	880	29	22	N4AFP
MKPN	3.960 MHz	1230Z	1448	69	30	WD4RWU
KTN	3.960 MHz	2300Z	960	72	30	WD4RWU
KYN-E	3.600 MHz	0000Z	154	53	30	K4AVX
KEN	3.960 MHz	0015Z	92	0	4	KC4MIS
CARN			522	26	30	KD4MSY
4ARES			382	33	30	KC4ULX

Tfc: K4AVX 52, WA4HLW 6, N4PEK 61, KC4ZSV 16, WB4ZDU 7, WB4NHO 18, KA4BCM 38.

MICHIGAN: SM, *Dale R. Williams, WA8EFK @ WB8ZPN*—ASMs: Skip Wallace, WD8KQC; Larry Camp, WB8R; Keith Allen, N8QNA; and Dick Mondro, WA4FQT @ WB8ZPN. STM: Jeff Breitner, KA8NCR @ WB8ZPN. SEC: Doug Burke, WB8CFV @ WA8URE. SGL: Dave Wise, N8CNY. TC: Dave Smith, W8YZ. BM: Dale Konyha, N8IWS. ACC: Mike Pearsall, KA8YNJ. OOC: Joe Haetner, WD8PSX. PIC: Greg Ozimek, WB8FNQ. VHF NM: Mike Karmol, N8KUF @ WB8ZPN. Appearing again are PBBS call signs for your MI Section officials. We hope this proves useful in providing ready access to/for all. It is with sadness that we report the passing of Carl Travis, K8CWI "Red," as he was known to all, was always active in the MI NTS and will be sorely missed by all of his many friends. SET is next month, and the need to demonstrate our emergency response capability will be tested, and the ability of the amateur community to develop innovative responses to certain disaster scenarios. ECs and NMs should be preparing their local ARES organizations and traffic nets for the event. Involvement of as many local community officials as possible should be a major target, as this is *the* time to demo ham radio's capabilities to the people who make our laws and zoning ordinances! Plan to include your local clubs and as many as possible of the area people who may not be club affiliated. It's the time to *invite* them to participate—here's where our new members come from. For many, I suppose, these suggestions may seem early for an event in Oct, but advance planning and training are mandates if we're to take this one small segment of our hobby seriously. I expect all of our ECs to report SET activity this year. Scenario planning can be difficult, but starting on a small scale with your local leadership can allow you to concoct a really devious plot that will keep everyone involved. We can all have a great time for the SET, learning and doing, and having fun in the process. *Jun net reports:*

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TS-790A

The TS-790A sets new performance standards. The optional 1200 MHz unit, allows tri-band coverage. Dual band readouts and controls offer main, sub band and even full-duplex cross-band operation.

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TM-733A NEW

New features set the pace in this new dual band mobile, 6 program mode memories, 72 memories. AIP, dual in band RX, CTCSS enc., DTSS enc. & more provide a performance edge enhanced by the wireless removable front panel.

$619.95

TM-255A

This new all mode mobile will provide new fun for Satellite, Packet and DXing. Features include a 9600/1200 baud data port, 40 watts, DDS circuitry,CTCSS encode and much much more.*

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TH-79A

NEW

This slim line dual bander sports a dot-matrix LCD (for a perfect Alpha numeric display), 82 memories, non-volatile memory with ID, DTSS, DTMF & CTCSS V/V & U/U receive & *FET* power make this a winner.

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This 2 meter FM mobile comes complete with extra-large display, DTMF microphone, wide band receive and illuminated switches.

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TS-450S/AT

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TS-850S/AT

Kenwood's technology endows the TS-850S/AT with specs that place it at the top of amateur radio equipment. Automatic antenna tuner, 100 memories, three scan modes, DDS, digital PLL system plus more.

$1695.95

TM-251A

This new 2 meter transceiver provides dual band receive and gives you a data port that's 9600 baud ready. CTCSS encode, 41 memories, cross band repeat, time out timer, DTSS and much more.

$439.95

TS-950SDX

Swift performance and surgical precision are second nature to the TS-950SDX. Features include dual frequency receive, 100 memories, DSP, MOS FET final section and much much more.

$3847.95

TM-742A

New VHF/UHF tri-bander with third band optional. Includes many enhancements such as, direct frequency entry, CTCSS encode, DTMF remote control and much, much more. Also available in a tri-band model TM-942A

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TH-22AT

Small just got smaller. Kenwood's new TH-22AT is in a category all its own. This new FM transceiver features long battery life, DTMF keypad, user-friendly menu system, scan functions, 41 memories, CTCSS encode, DTSS, and much more.

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IC-820H

WOW IC-970A

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SUMMER SIZZLER

This new satellite Dual band all mode base is designed to provide critical performance with Icom technology competitively priced. Features include Data port, 50 memories, TXCO, Noise Blanker, DDS, Compact size and more.

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IC-2iA

BLOW OUT!

SUMMER SIZZLER

This ultra-slim transceiver is designed for maximum portability and convenience. CTCSS, clock and 100 memories are standard features.

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Coupons Expire 9/30/94

IC-281H

This 50 watt 2 meter mobile is equipped with a data port, 440 MHz receive, 60 memories, auto dialer, auto off and cross band duplex operation. There's more to discover with Icom.

$379.95

YAESU

FT-290RII

Portable or mobile, this 2 meter all-mode transceiver delivers fun. The 25 watt amplifier clips on in place of an optional battery case to extend your operating horizon.

- **FT-590** 6m $657.50
- **FT-790** 70 cm $649.95

$558.62

FT-890/AT

SUMMER SIZZLER

A blend of high performance features borrowed from the FT-1000 family are combined in this affordable transceiver. IF shift, variable notch filter, variable noise blanker,VOX and antenna tuner are included.

$1299.95

FT-900 NEW

FT-530

SUMMER SIZZLER

The newest member of the dual band family. This handheld sports auto tone search, 82 memory channels, automatic power off, built-in VOX, dual in-band receive feature, built-in cross band repeat function and much more.

FREE BATTERY FNB 25G Limited

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ICOM

IC-2340H

NEW

This new 2 meter/440cm Dual band is another star in a new product line up for Icom. Features include separate tuning, volume and squelch controls for each band, 100 memories, high power out-put make this competitively priced unit a real winner.

$599.95

IC-2700H

NEW

This new 2 meter/70cm dual band mobile will wow you with all its new features. It sports a removable front panel, separate controls for tuning-volume and squelch. Remote control mike.

$769.95

IC-728

SAVE $80 MORE

The IC-728 is a full featured transceiver providing pleasurable HF operation with features such as passband tuning and speech compression. Perfect for mobile operation too. Also available IC-729 with 6 meters

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YAESU

FT-736R

Satellite and all-mode 2m/70cm work gets exciting with this full-feature transceiver. Linked tuning, 12 unlink memories, 100 memories, and 2 optional modules offers band extensions for 6m, 220MHz, or 1.2 GHz operation.

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FT-11R

This new HT packs the features you want in a small size. It features a new alphanumeric display, super small profile, new square "D" battery design, lit keypad, AM air craft receive, DSQ & CTCSS encode.

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Net	Freq	Time/Day	QNI	Tfc	Sess	NM
QMN*	3663	6PM Dy	484	114	60	WB8SYA
MITN	3953	7PM Dy	404	179	30	WD8EIB
UPN*	3921	5PM Dy	1175	48	34	WA8DHB
GLETN	3932	9PM Dy	920	46	30	KE8TJ
MACS*	3953	11AM M-Sa	296	53	30	K8OCP
SEMTN	145.33	1015PM Dy	319	65	30	WI8K
WSSN	3935	7PM Dy	686	41	30	K8GOU
VHF nets (combined)			671	3	34	N8KUF

Jun tfc: KA9EIZ 125, WB8SYA 116, AA8OL 120, N8FPN 103, K3UWO 100, K8GXV 62, W8YIQ 45, WA8DHB 37, K8UPE 29, K8OCP 28, WD8EIB 25, K8ZJU 21, WA8EFK 21, KI8Q 18, N8CNY 17, K8YWI 6, WB8BGY 2.

OHIO: SM, David Kersten, N8AUH @ NO8M (see p 8)—ASM: John Haungs, WA8STX @ KC8TW (513-563-7373). ASM (Packet): Steve Wolf, NO8M @ NO8M. SEC: Larry Solak, WD8MPV (216-274-8240). STM: Joyce Judy, KD8HB @ W8CQK. ACC: JoAnne Solak, KJ3O/8. BM: Doug Horner, W8PH @ KC8TW. TC: John Fakan, KB8MU. SGL: Paul Krugh, N2NS. PIC: Joe Phillips, K8QOE. OOC: Paul LaFollette Jr. WB8ONA @ W8CQK. This month we have 1 renewing ARRL Special Service Club to report: WestPark Radiops of Cleveland. ARRL Special Service Clubs and their activities are a positive selling aspect to show the benefits to be derived from Amateur Radio by the public. Is your club ARRL affiliated or an ARRL Special Service Club? Contact our Affiliated Club Coord, KJ3O/8, see above, if you have questions or need help. Joanne will be more than happy to assist in every way she can. Bill, N8POV, took on net managership of Central OH Traffic Net as of Jul 1. Bill replaced Dave, N8EFB, who has managed the net for nearly 10 years. Thanks, Dave, for the time & dedication you've given us. Speaking of nets, remember Sep 6 is the deadline for reregistration for the next issue of the *ARRL Net Directory*. Get your information to Steve Ewald, WV1X, at ARRL HQ promptly or your net won't be included. Our annual Section Conference is Oct 2 at Big Run Park in Columbus, as has been done the past several years. Big Run Park is SW of the city near I-270 and Georgesville Rd (Exit 5). *Please join us for a day of learning*, exchanging information & experiences and fellowship. Talk-in on 147.09 rptr. Details will appear in the upcoming issue of *OH Section Journal*. Are you aware of the service provided by our Section Technical Coord, John, KB8MU? John and his Technical Assts are more than willing to provide advice and assistance in solving problems you may encounter, eg, TVI and RFI; equipment problems; antenna problems; anything that may affect your equipment and station. If they can't help you directly, they'll be happy to steer you in the right direction for help. Their help and expertise are available if you seek it! Upcoming hamfests include Findlay Sep 11 and Cleveland (Berea) Sep 25. Watch the packet network for updates. Appearing regularly on the packet radio network is the K3RC/8 listing of Amateur Radio examination sites in OH. Net and station activity reports for Jun 1994 are as follows:

Net	QNI	QTC	Sess	Times	Freq	NM	QTR
BN Early	183	124	30	1845	3.577	WD8KFN	395
BN Late	265	105	30	2200	3.577	NY8V	414
				1800	3.905	W8LDQ	
OSN	163	65	30	1810	3.705	WB8KQJ	783
OSSBN	1636	587	90	1030, 1815 &1845	3.9725	WB8MZZ	2447
OSSN	225	109	30	M-F 0645, S-Sn 0800	3.577	WB8FSV	865
Ohio Section ARES Net				Sn 1700	3.675	WD8MPV	
Sub Total	2472	970	310				4974

Tfc: W8BO 307, WD8KFN 247, KA8HBN 197, WA8HED 180,KD8HB 167, N8IIP 165, N8IXF 127, N8RBE 112, W8RRB 108, N8FWA 103, W8ZOL 102, N8AUH 98, K8DHD 97, KB8HJJ 94, KB8YIT 92, N8POV 91, W8LDU 83, K8JDI 75, WB8KQJ 68, K8OUA 66, N8PNV 62, W8PBX 58, W8NO 56, N8EFB 56, WA8SSI 55, WB5ZJN 54, W8JLW 53, *WB8JGW 51, WB8FSV 49, WD8IKC 48, K3RC 47, K8IOW* 44, KA8MPD 42, KD9K N8WLY 37, WB8AWM 36, N8HJV 34, N2NS 33, NS8C 32, NY8V 31, W8RG 26, WA8MJP 26, KA8SON 25, W8LDQ 25, KF8DO 20, KB8SHW 18, WD8KBW 17, N8WCT 17, KC8JV 16, W8GDQ 16, AA8DK 14, WB8HHZ 13, N8WRG 12, N8WLE 11, N8VRR 11, WD8JYE 11, KF8FE 10, N8NCK 10, KB8LVX 9, KB8PIU 8, KB8ROA 8, N8LSG 8, N8GOB 7, N8XKR 7, W8KB 6, WB8KWC 5, KD8XL 4, N8RRB 4, KB8ESU 4, WA8JLE 3, N8ZZW 2, WB8HNV 2, KA8OQF 1, KB8AST *(PBBS)* 1. *(May)* WB8AWM 30, WB8AWM 22. *(Apr)* WD8KBW 9.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul Vydareny, WB2VUK—STM: WE2G. SEC: WB2BEJ. ACC: KV2A. SGL: KB2HQ. *BM: WB2IXR. OOC: N2DVQ PIC: WA3RKB. ASM/Public* Info: N2FTR ASM/Education: WK6R. ASM/Interclub Relations: WB2NHC. *Net reports (Jun 1994) QNI/QSP:* AESN: 42/2 CDN: 475/33 ESS: 366/91 HVN: 541/98 NYP: 282/267 NYPON: 295/175 NYS/E: 395/172 NYS/L: 233/132 NYS/M: 303/117 SDN: 413/104. Bummer is the slow time for Amateur Radio news because most clubs are on summer hiatus. (This column was written in the 1st week of Jul.) However, now's a good time to prepare for a busy fall schedule. Line up your public service activities and meeting programs now. Check the Hudson Division Speakers Bureau listing for possible speakers for fall meetings. Club presidents should have a copy. If not, contact Steve, WA2DHF, or N2FTR. Newsletter editors, please note: If your software can use graphics images, ARRL Headquarters can help. There's quite a bit of Amateur Radio clip art available via the landline BBS or by request. It includes the emblems and patches and ham-related items. You might find it useful. Special thanks to all the clubs that took the time to generate Field Day messages to me during Field Day activities. Hope you had a great Field Day! Don't forget the Hudson Division Convention, Sun, Sep 11, 9 AM-2 PM rain or shine at Rockland Community College Field House in Suffern. Plans include a number of noteworthy guests and forum speakers. There will be VE exams and checking of QSL cards for various awards. Don't miss this opportunity to hear the latest from the source! See you there on the 11th. *Jun PSHR:*

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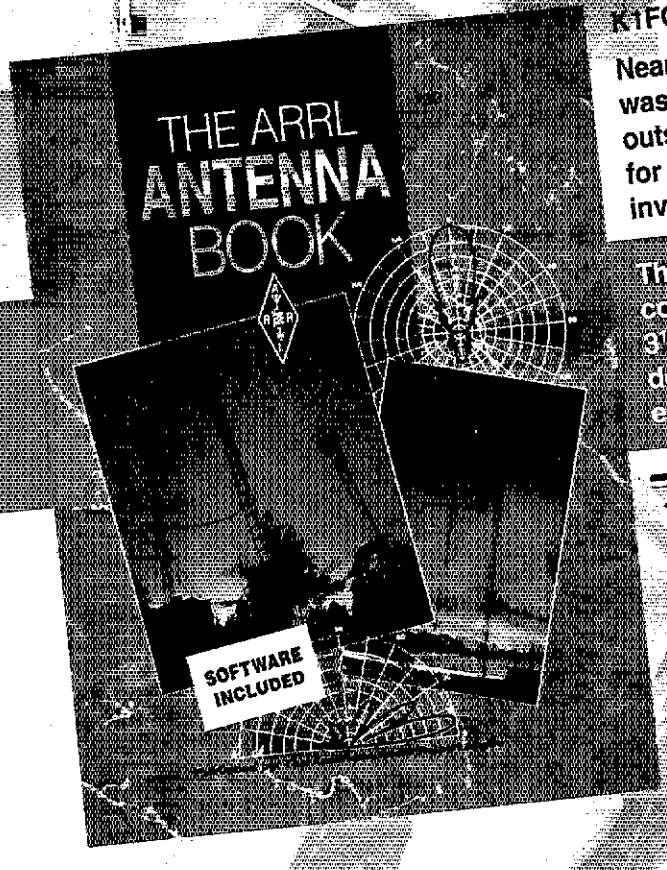

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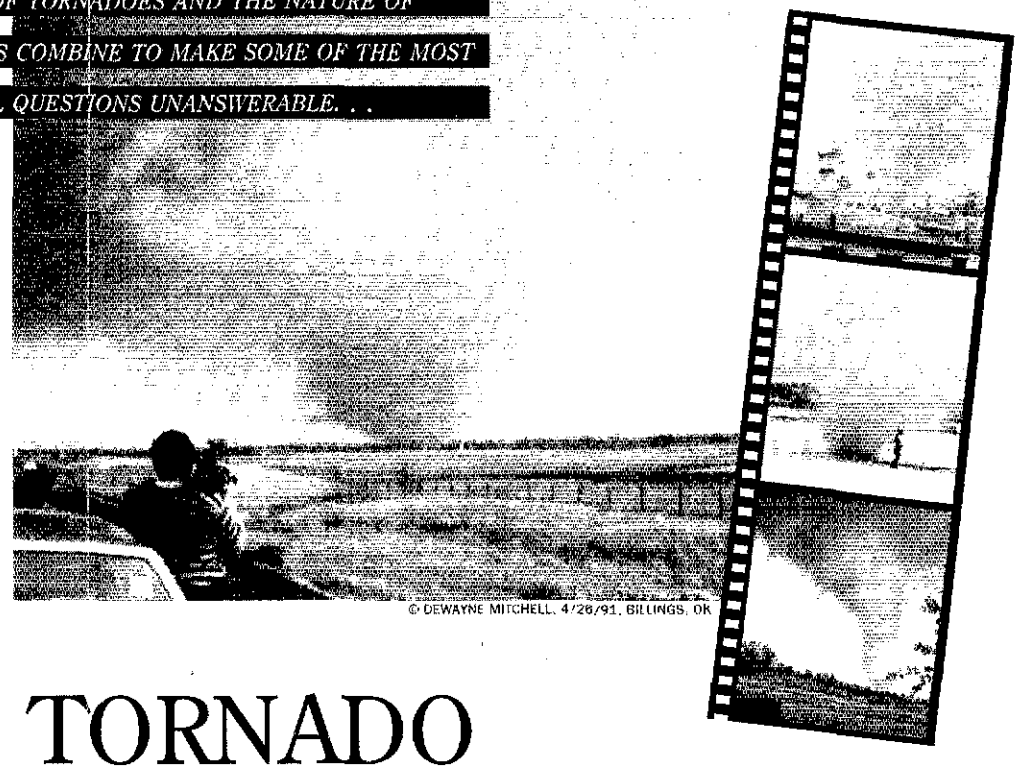

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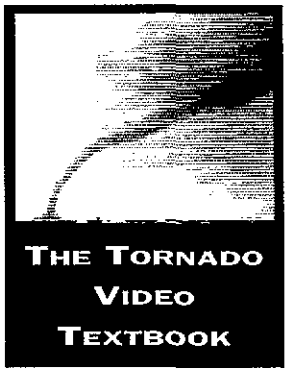

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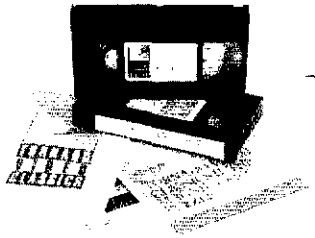

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NEW YORK CITY/LONG ISLAND: SM, Rick Ramhap, N2GQR (Internet rramhap@pipeline.com)—ASM, Emerg. Svcs: WF2T, ASM, Technical: WB2WAK. ACC: N2IMF. SEC: KA2RGI. STM: KA2VZX. OOC: Open. PIC: KA2JMA. TC: W2QUV. BM: KC2FD. LGL: N2FF. *VE Sess:* Grumman ARC (W5YI) 2nd Tue 5 PM, Grumman Rec Ctr, Plant 28, 950 S Oyster Bay Rd, Hicksville, Bob Wexelbaum, W2ILP, 516-499-2214; LIMARC, 2nd Sat 9 AM, NY Inst of Tech, 300 Bldg, Rm 308-310, Northern Blvd, Old Westbury, Al Bender, W2QZ, 516-623-6449; Suffolk Co VE Team, 2nd Sat 9 AM, Suffolk Co Comm College, Islip Arts Bldg, Rm 104, Selden, George Sintchak, WA2VNV, 516-751-0265; Gallups Island RA (W5YI), 3rd Sat at 1 PM, USMMA, Bowditch Hall, Steamboat Rd, Kings Point, Les Rauber, AA2FJ, 516-922 0947; Great South Bay ARC, 4th Sun, noon, Babylon Town Hall, ARES/RACES Rm, 200 E Sunrise Hwy, N Lindenhurst, James Worsley, N2LSJ, 516-735-9657; Staten Is ARA, 4th Sun noon, College of SI, Sunnyside Campus, Rm B144, 715 Ocean Terr, Staten Is, Richard Dyrack, 718-351-5764; Suffolk Co VHF/UHF Assn, 4th Sat 10 AM, H. Acampora Rec Ctr, 39 Montauk Hwy, Blue Point, Leonard Buonauito, KE2LE, 516-581-4595; 1st Sat 9 AM, Islip ARES, Islip Town Hall Annex, 401 Main St, Islip, Addison Levi, 516-234-0589. Report changes to testing schedules to N2GQR. The following are traffic/ARES nets in and around the section:

Net	Freq	Time Day	NM
Big Apple VHF BAVHF	146.430/R	2000 Dy	KB2KLH
Nassau Co ARES NCARES	146.805/R	2030 We	WA2WKV
Nassau Co VHF NCVHF	147.330/R	1930 M-F	N2PIF
Nassau Co VHF NCVHF	146.805/R	1930 Sa-Su	N2PIF
NYC ARES	145.350/R	2000 Mo	WB2DWC
Suffolk Co ARES SCARES	145.330/R	2100 Mo	N2HII
Suffolk Co VHF SCVHF	145.210/R	2000 Dy	KA2JMA

The 1994 Field Day Tour: Out to the east end of LI this year to visit the Peconic ARC's Field Day in Southold, right on LI Sound. Then west a bit for a quick visit with the Suffolk Co. RC. In Nassau Co. a stop at LIMARC in full swing, followed by the grand tour at Nassau ARC's revitalized site in Eisenhower Park. SM N2GQR was accompanied by ASM WB2WAK and George Gluck, WA2WKV, NC DEC. More FD news from NYC next month. Peconic ARC 94-95 officers: pres Robert, N2RBU; VP: Howard, W2AQ; Sec: Bill, N2YKH; Treas: John, KE2WR. Congrats to Stephen, AA2GE; Elliot, AA2KR; and Owen, N2WPO, all recent recipients of ARRL Foundation Scholarships. See you at the 1994 ARRL Hudson Div. Convention on Sep 11. The event will be held at the Rockland Comm Coll Field House in Suffern, NY (Rockland Co). The college is convenient to the NY Thruway (I-87/287) and the Garden State Pkwy. Everything is indoors. Talk-in on 147.165. *Jun tfc:* KA2VZX 550, KB2KLH 158, KB2MQP 141, N2PIF 83, AA2NX 74, N2YGN 69, KF2ER 60, N2TQN 48, KB2GEK 41, K2GCE, 36, NB2D 36, KA2JMA 28, N2YIC 26, K2TWZ 17, WB2ZIE 16, N2DQR 13. *Jun PSHR:* KA2VZX, KB2KLH, WB2ZIE, N2PIF, AA2NX, N2TQN, N2YGN, KF2ER, KB2MQP, KA2JMA. *NTS stats for Jun, (net, sessions, QTC):* NCVHF, 30, 141/136; SCVHF, 30, 39; BAVHF, 30, 173.

NORTHERN NEW JERSEY: SM Richard S. Moseson, NW2L (@ WA2SNA)—ASMs Education/KB2WI, Emerg Prep/WB2HBZ, Volunteer Counsel/N2IOB, Youth/N2MCV, SE/KY2S, SW/KE2HG, NW/NW2S, ACC: WA2QYX. BM: K2ULR, OO/AAC: KA2BZS. PIC: WX2R. SEC: N2DSY. STM: WB2FTX. TC: WG2W. Ham Radio Info Line 201-680-1585. I hope to see you at the 1994 ARRL Hudson Div Convention on Sun., Sep 11, at Rockland Community College in Suffern, NY. ARRL President George Wilson III, W4OYI & other League leaders are scheduled to attend. There will be VE testing & QSL card checking, forums & a huge indoor flea market. Don't miss it! STM WB2FTX reports that in its 1st 6 weeks of operation, our new Section NTS packet bulletin board—WB2FTX-4—logged more than 400 messages and has established autoforward links to N2QAE (covering Hunterdon, Warren & Sussex Counties), WB2COP (covering Monmouth Co & New Brunswick) and K2PJ (covering Somerset Co, Princeton & Trenton). Good work, Dave! Speaking of packet bulletin boards, please note that my "home" PBBS has moved (for now, at least) to WA2SNA-1. WA2JVM was put off the air by a lightning strike and isn't sure when he'll be back. I hope you saw your SM's friendly face in the Sunday *NY Times* on Jul 3. I was interviewed & photographed for an article on how ham radio is coping with the "information superhighway." Article & photo came out well. Thanks to the following clubs/groups that sent me Field Day messages for bonus points: Cherryville RA, County Line ARA, Englewood ARA, Garden State ARA, Harris RC, N2EY/2, New Providence ARC, Penn-Jersey ARC, Ramapo Mtn ARC, Sussex Co ARC and Tri-County RA. I hope you did well and had fun. Again, please direct all packet mail for me to NW2L @ WA2SNA (I'm also on Internet as NW2L@AMSAT.ORG). *Traffic report for Jun: Nets (QNI = # check-ins/QTC = # messages passed):*

Net	NM	Freq	Time	Sess	QNI	QTC
NJM	W2RRX	3695	1000	30	130	68
NJPN	W2CC	3950	1800	34	356	142
NJSN	AA2HJ	3715	1830	27	120	18
NJN/E	N2GJ	3695	1900	30	223	105
NJN/L	WA2PCS	3695	2200	30	134	36
OBTTN	W2OD	147.12	2000	30	552	70
NJTTTN	N2DXP	223.88	2100	30	225	41
NJVN/E	WB2FTX	146.895	1930	30	393	59
NJVN/L	W2PTZ	146.49	2230	30	283	53

Jun traffic (call sign/# message points/# PSHR points): W2QNL/380/145, WB2FTX/111/159, K2VX/107/121, W2RRX/105/159, N2GJ/89/164, KF2KN/74/124, WB2CZW/67/135, W2MTO/63/120, WA2PCS/62/118, W2DMM/60/104, KB2WI/58/-, N2QAE/57/37, KE2JX/54/122, N2DXP/50/162, W2CC/40/94, N2UHD/31/87, N2RPI/30/103, W2OD/29/53, K2PBP/27/133, W2PTZ/26/129,

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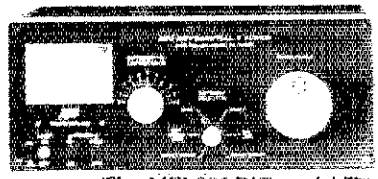

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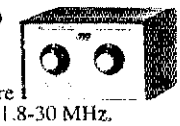

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KANSAS: SM, Robert M. Summers, KØBXF—ASM: NZØM. SEC: KØBIX. STM:WØOYH. ACC/OOC: KØBXF. SGL: AAØGL. *Net activity for May 1994*

Net	*QNI*	*QTC*	*NM*	*Freq*	*Day*	*Time*
KSBN	1238	159	WØNBT	3920	Dy	0030Z
KPN	419	43	WØNBT	3920	MWF	0645Z
KPN	—		WØNBT	3920	Sat-Sun	0800Z
KMWN	838	687	WBØYWZ	3920	Dy	0700Z
KWN	1096	859	WRØYWZ	3920	Dy	0001Z
CSTN	1231	56	AB5PA	7253	M-F	1830Z
CSTN	—	—	AB5PA	3920	Sun	1430Z
QKS	300	135	WBØZNY	3810	Dy	0100Z
QKS	—	—	WBØZNY	3810	Dy	0400Z
QKS-SS	46	0	WOOF	3710	Tue Thu Sat	0130

Congratulations to the Wichita ARC and the CKARC (Salina) on the renewal of their ARRL Special Service Club status. Congratulations are in order for the Andover School ARC on their grant from the ARRL to purchase QRP transmitter and receiver kits. The club is proud to announce that Sarah, KBØLIW, recently upgraded to Extra Class. If you have any spare straight keys, the club would be thankful for your donation. Contact Missy, AAØOF if you can help. All types of Amateur Radio activity are picking up in the Linn and Miami County area. If you're in that area and haven't heard, contact KBØDTI for info. *Tlc:* WØOYH 345, KØBXF 285, WØNBT 223, NZØM 195, AAØOM 146, KFØTK 112, WBØZNY 82, KBØMDT 38, AAØPY 38, ACØE 37, KXØI 35, WAØSXR 35, WØQBK 19, WAØOZP 11, WØRBO 3.

MISSOURI: SM, Roger Volk, KØGOB—Field Day was more than a test of emergency preparedness, as severe thunderstorms loared through the state that Sat eve. Some sites were never reactivated after the storms. Some sites had tents and antennas destroyed. And others were left with only a few operators because most members reported to SKYWARN duty. But judging by the reports I received, the majority of hams enjoyed showing the public the capabilities of Amateur Radio. The youngest operator brought to my attention was 9-yr-old Niki. On average, Field Day operators gained 4 lb because of all of the barbecue consumed. Attendance was down for the 2nd annual LARK hamfest, but that didn't bother those who attended. To assist in raising money for a handicapped person, LARK members donated several pieces of equipment to be auctioned off. A tip of my hat to the donors and to the buyers. Amateur Radio Week was proclaimed by the mayors of St Joseph and Kimberling City. In addition to the proclamation, the Kimberling ARC invited its local House Representative to attend its Jul meeting. He accepted. A proactive club can influence zoning laws, and influence zoning laws and neighborhood disputes involving amateur issues. The Warrensburg Area ARC has published its 1st-edition newsletter called *The Repeater*. The WX Service in St Louis issued a public statement thanking amateurs for their assistance during the spring storms. Mike Redman, the STL County Police SKYWARN coordinator, seconded the announcement. *Nets:* MOSSB 30/625/45 KFØHW; MEOW 30/555/82 KEØAH; HAMBUTCHER 22/434/24 KØDSQ; ROLLABB 30/334/13 NAØV; STLRPTR 4/151/2 KØWEX; QCWA 35 5/136/4 WØWIK; CARL 4/24/0 KCØMV; MIDMOARC 3/18/0 NØMNV; MIDMOYL 4/28/0 NØMNV; RAYCLAYARC 4/64/2 WJØK; WJACOARES 6/4/0 KØUAA; SEDALIARPT 5/79/5 WØENW; PAULREVERE 4/459/0 WBØEJJ; CMEN 6/146/0 NØFPE; HARC 5/188/0 NØUYN; MON1 30/86/56 WØOUD; SWMOSKYWARN 5/164/5 KEØPQ; KCABARC 4/135/4 NØIWA. *Tlc:* NØFBW 604 (Digital); WBØPLY 154, WØOUD 66, KFØHW 51, KEØAH 41, WAØYJX 33.

NEBRASKA: SM, Vern Wirka, WBØGOM—NE Amateur Radio operators must now present a photocopy of their valid FCC Amateur Radio license when new call sign vehicle license plates are applied for or when existing call sign vehicle license plates are renewed. Legislative bill 918 became effective on Jul 16, 1994, and standardized the procedure for obtaining new call sign plates or renewing existing ones for all NE counties. In the past, some county officials required proof of a valid FCC license, while others didn't ask to see a copy of the amateur license. The fee for call sign plates in NE remains unchanged. The preregistra-

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Call your dealer for your best price

Includes FREE AC adapter for meter light

More hams use MFJ-949's than any other antenna tuner in the world!

Why? Because the world's leading tuner has *earned* a worldwide reputation for being able to match just about anything.

MFJ-949's have been highly refined and have years of *proven* reliability.

Every MFJ-949E comes with . . . MFJ's famous one year *No Matter What*™ unconditional guarantee . . . first-rate performance . . . unbeatable quality . . . the best tuner value in ham radio -- *all from the world's most trusted name in antenna tuners.*

Now the latest MFJ-949E gives you even more features and more value than ever at a new lower price.

Why take chances with an imitation when you can have the *real thing* from the world's most trusted name in antenna tuners.

More reasons why more hams use MFJ-949's than any other antenna tuner in the world . . .

Full 1.8-30 MHz Operation

1000 volt tuning capacitors, extra heavy duty inductor switch, Teflon® insulating washers and proper L/C ratio gives you arc-free no worries operation with up to 300 watts from 1.8 to 30 MHz.

Lighted Cross-Needle Meter

MFJ's lighted Cross-Needle Meter shows you SWR, forward and reflected power *simultaneously*. It reads both *peak* and average power on 300 or 30 watt ranges.

The meter is illuminated for easy reading in dim light and has an ON/OFF lamp switch. The meter lamp uses 12 VDC or 110 VAC. A *free* AC adapter is included at no extra cost.

Tunes *any* Antenna

The MFJ-949E tunes out SWR on dipoles, verticals, inverted vees, random wires, beams, mobile whips, shortwave receiving antennas . . . nearly anything!

Use coax feed, random wire or balanced lines. Has oversized *heavy duty* 4:1 balun.

Super Antenna Switch

MFJ's 8 position *super* antenna switch lets you select two coax fed antennas, random wire/balanced line or built-in dummy load for use through your MFJ-949E or direct to your transceiver.

MFJ's Cross-Needle SWR/Wattmeter is always active for monitoring forward and reflected power and SWR.

QRM-Free PreTune™

MFJ's *QRM-Free PreTune*™ lets you pre-tune your MFJ-949E off-the-air into a built-in dummy load without causing QRM.

Pre-tuning into a dummy load makes tuning your actual antenna faster and easier.

Why take chances?

Why take chances with an imitation when you can have the* real thing *from the most trusted name in antenna tuners?

Full Size Dummy Load

The MFJ-949E has a *full size* non-inductive 50 ohm dummy load measuring 3/4 inch diameter by 5 inches. It *easily* handles 300 watts of abusive tune-up power.

You'll find it handy for tuning, testing and repairing your rig, setting power level, adjusting your mic gain and more.

Watchout for cheap midget size dummy loads that changes resistance as it heats up -- marginal ones could burn up your transceiver.

Custom Inductor Switch

The inductor switch is the most likely component to burn up in *any* antenna tuner.

The inductor switch in the MFJ-949E was *custom* designed to withstand the extremely high RF voltages and currents that are developed in your tuner -- it's not a flimsy *plastic* switch made for small signals and wired with *tiny* gauge wire.

Superior Cabinet

Each MFJ-949E cabinet is chemically treated and has a new tough scratch-proof *vinyl* cladding -- not paint that can scratch or chip off. You won't find a tougher, longer lasting finish anywhere.

Detailed logging scales and legends are *permanently* silk screened on a *real* aluminum front panel and back panel -- it's not merely a plastic decal or glued-on paper strip that can peel off.

Superior Materials . . . Superior Construction

Every MFJ-949E use Teflon® insulating washers, countersunk screws for meter bracket, wing-nut for ground post, fire-retardant epoxy glass PC board (*not* canvas based), heavy .063 inch thick aluminum chassis (*not* flimsy .050 inch), heavy gauge wire used throughout (*not* small gauge), custom cabinet (*not* multi-purpose with unused holes and internal protruding screws).

No Matter What™ Guarantee

Every MFJ-949E is backed by MFJ's famous one year *No Matter What*™ unconditional guarantee. That means we will repair or replace your MFJ-949E (at our option) *no matter what* for a full year.

Others may give you a *limited* warranty on defects in material and workmanship.

But what do you do if it burns up and they say, "Sorry, your *limited* warranty does not cover that?"

Continuing Service

Only MFJ gives you a *direct* toll-free technical help line -- not merely a sales line. It's answered by *electronic technicians* who are experts in antenna tuners. We're here to help keep your MFJ product performing flawlessly -- no matter how long you own it -- just call toll-free 800-647-TECH(8324).

Call your dealer for your *best* price

In stock at ham dealers everywhere!

Order your MFJ-949E today or simply pick one up at your favorite dealer or hamfest -- no shipping, no waiting, no hassles.

Free MFJ Catalog

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MFJ . . . making quality affordable

tion deadline for the Omaha Supervention 1994 ARRL Midwest Division Convention is Sep 14. The convention will take place at the Holiday Inn Central in Omaha Oct 14-16. The convention will feature commercial vendors, a large flea market, several programs for hams and nonhams, VE exams and a banquet. Section Emergency Coord Michael Buhrdanze, NØFER, continues to implement plans to accommodate the consolidation of the National Weather Service in NE. ARES severe-weather reporting procedures are changing because of the closing of local NWS offices. Eventually there will be 3 NWS stations across NE, with many automated weather-reporting systems feeding information into the 3 stations. Amateur Radio operators will continue to be an integral part of the severe-weather spotting network. *Tfc*: KEØXQ 38, WDØBFO 12, WCØO 6.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Betsey Doane, K1EIC—ASMs: KB1H, W1EFW, KZ1Z, W1WCG; ACC NK1J; BM N1API; OOC W1FAI; PIC W1FXQ; SEC NI1U; SGL K1AH; STM W1EFW; TC W1HAD. It doesn't seem possible that fall is already approaching. Mark your calendar: The Division Convention at Boxboro, MA, is Oct 1-2 and the huge Nutmeg State Convention and Flea Market at Durham Fairgrounds is Sun, Oct 9! I'm planning to attend both—see you there! And the Big E is close at hand: Sep 16-Oct 2. Clubs and individuals who want to participate should contact Larry, K1HEJ, at N4GAA, on Nutmeg VHF Traffic Net 146.88 repeater nightly at 2130 or by telephone at 223-0778. Let's make this another banner year at Big E! Thanks to the approximately 12 operators who participated at the Sailing Venue Special Olympics Jul 9-10 under the capable direction of Chuck, N3AGA, and Don, N1HAX. Those with whom I spoke were appreciative of our help. The exact role of operators in next year's event is yet to be determined, but I know Chuck and his committee will be in contact with us as the communications plan unfolds. Randy, K1WWI, coordinated a well done orienteering course for those interested in the Search-and-Report program. A word of thanks to those of you responsible for reporting your club officers annually to the ARRL in so timely a manner. I attended the Division cabinet meeting with Asst Director Pete, KZ1Z, and TC Paul, W1HAD, and learned that the percentage of clubs reporting was much higher than in past years. Your providing us with accurate info allows us to give you better service—ACC Chris, NK1J, and I thank you for making our jobs easier! Before I left for vacation, I sent all those who participated onsite in the search for a missing child in May an emergency communication commendation certificate. I mentioned this in a previous column, but I wanted to share with you the thrill it was to be able to enclose with my letter and the certificate a letter from the child's family thanking the operators for their invaluable help. Having received that letter was really special! A big thank you for your enthusiastic support of my efforts to serve you as your CT SM. The Section leaders and I have thoroughly enjoyed working with you and look forward to the new term beginning Oct 1. Your consideration of me and of one another makes this position a real pleasure—I truly feel privileged!

Net	Sess	QNI	QTC	NM
CN	55	216	91	N1AEH
CPN	30	258	61	KY1F
WCN	30	450	115	KA1GWE
NVTN	30	509	102	K1HEJ
RTN	30	342	63	WA1FCA

Tfc: NM1K 1846, KA1VEC 525, W1EFW 307, KA1GWE 184, W1EOF 95, W1NYJ 80, N2LTK 57, K1HEJ 45, KY1F 29, N1RLA 27, WA4QXT 20, W1YOL 9, N1HFX 5.

EASTERN MASSACHUSETTS: SM: Dave Crocker, W1TMO (@ K1UGM); ASM: Phil Temples, K9HI; ACC: Elaine Chase, N1GTB (@ K1UGM); BM: Bill Ladder, KA1NOI; OO/AA: Dave Potter, K1MBO (@ WA1PHY); PIC: Ed Hennessy, N1BPA; SEC: Terry Stader, KA8SCP (@ WA1PHY); SGL: Shawn O'Donnell, K3HI; STM: Jim Hatherly, WA1TBY (@ K1UGM); STC: Jim Morris, K1UGM (@ K1UGM) EMA Section Hotlines—voice: 617-455-6225, 800-310-ARRL, fax: 617-444-8316, Internet: dcrocker@world.std.com. Silent Key: J Stanley Carp MD, KT1V, passed away on Jun 20. He was the father of Al Carp, K1HLZ (former Section PIC), and Frank Carp, WA1RIY. His wife, Bea, K1YXS, had become a Silent Key in Aug 1993. He was licensed in 1956 as K1EEG. "Doc," one of the founders of the Medical Amateur Radio Council (MARCO), was active as a VE and in QCWA. Field Day: By all reports, this was one of the most successful Field Days in recent years, with a number of groups reporting scores improved over prior attempts. The better weather made it easier to get around and the SM ended up visiting 11 of the at least 36-40 Field Day sites in EMA. These included the Police Team in Westboro, BARS at Nashoba Ski area, Nashoba Valley at Groton Middle School, HP at the Andover site, Wellesley at Babson College, Framingham at Bose Mtn, Boston at Larz Anderson Park in Brookline. Sunday brought us to Massasoit at the Brockton VA Hospital, Whitmen at Ames Nowell State Park, Pilgrim at Taunton HS and Falmouth at Barnstable Fairgrounds. By way of recognition beyond the contest aspect of FD, the Section has prepared a certificate of appreciation for training and for demonstrating our ability to meet public service obligations in communication emergencies. In addition to the groups mentioned above, these certificates have been prepared for the following: Acton-Boxboro, Algonquin, Babson Wireless, Barnstable, Bristol Country, Cape & Islands, Cape Ann, Capeway, WB1GJI group-Wayland, Minuteman, MIT, North Shore, Norwood, Southeastern Mass, Sturdy, Quannapowitt, WA1G GROUP, Whams-Westport and Mayflower.

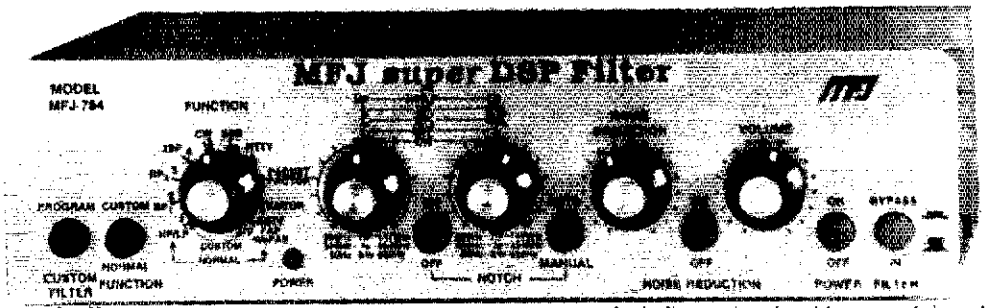
Net	Freq	EDT	NM	QNI/QTC/Sess:
EMRI	3658	1900	N1FLO	264/264/60
EMRI/PN	3915	1730	WA1FNM	68/27/30
EMRI/SS	3715	2100	K1UXB	12/6/16
EM2MN	145.23	2000	KA1RSY	358/159/30
HHTN	146.64	2230	N1IST	253/85/30
CITN	147.045	1930	KB1AF	488/100/30
NEEPN			WA1FNM	25/9/3
WAREPN			K1BZD	56/10/4

MFJ *super* DSP *filter*

. . . Tunable "brick wall" bandpass, lowpass, highpass, notch filters . . . programmable pre-set filters . . . automatic multiple notch filter eliminates heterodynes . . . adaptive noise reduction reduces noise and QRN . . . for Voice, CW, Data . . .

MFJ-784

$219.95



MFJ's *super* DSP filter automatically eliminates heterodynes, reduces noise and interference *simultaneously* on SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX, weak signal VHF, EME, satellite -- nearly any mode you'll ever encounter.

You get MFJ's *tunable* FIR linear phase filters that minimize ringing, prevent data errors and have "brick wall" filter response with up to 60 dB attenuation just 75 Hz away.

Only MFJ gives you *tunable* DSP filters. You can tune each lowpass, highpass, notch and bandpass filters and *vary* bandwidth to pinpoint and eliminate interference. The last tunable filter setting is saved -- it's ready to use when you switch back to it again.

Only MFJ gives you 6 *factory pre-set* filters and 10 *programmable pre-set* filters that you can customize. Instantly remove QRM with a turn of a switch!

You get MFJ's *automatic notch filter* that searches for and eliminates *multiple* heterodynes.

You also get MFJ's advanced *adaptive noise reduction*. It silences background noise and QRN so much SSB signals sound like a local FM repeater.

The *automatic* notch filter and *adaptive* noise reduction can be used with *all* tunable and pre-set filters.

Automatic notch filter

MFJ's *automatic* notch filter searches for and eliminates *multiple* heterodynes in *all* filter modes -- it's so fast interfering CW and RTTY signals are also eliminated.

If you leave the *automatic* notch filter on during a phone contest, you'll never be worn down by the heterodynes of tuner-uppers.

Voice signals aren't degraded. The *narrow* automatic notch is silently working in the background destroying unwanted tones when they appear.

With up to 50 dB attenuation, you'll copy stations that would otherwise be masked by heterodynes. You'll miss fewer calls and be less exhausted when the contest is over.

When you need to *selectively* remove tones -- like when you're enjoying a CW ragchew and a couple of annoying CW stations appear nearby -- you can use the *two* MFJ *tunable* notch filters to completely knock them out.

Adaptive noise reduction

Pressing the "ON" button silences background noise. Some SSB signals sound like a local repeater! It makes noisy FM and AM signals readable and works with CW, Data and other signals.

It works in all filter modes and on all types of random noise including -- white noise, impulse noise, static, ignition noise, power line noise, hiss and atmospheric noise.

The LMS algorithm gives you up to 20 dB of noise reduction depending on the type of noise. You can adjust the amount of noise reduction to prevent distorting some signals.

Reducing random noise reduces fatigue and makes QSOs more fun -- especially, when the band is full of tiring noise.

Tunable highpass/lowpass filters

For Voice and Data nothing beats MFJ's exclusive *tunable* highpass/lowpass FIR linear phase "brick wall" filters.

You can *tune* the lower cutoff frequency 200 to 2200 HZ and the upper cutoff frequency 1600 to 3400 Hz.

Signals *just 75 Hz* away literally disappear -- they are reduced a *thousand* times, 60 dB!

Unlike other filters, speech clarity is not reduced by envelope distortion caused by unequal time delay.

By adjusting the highpass and lowpass filters you can create *custom* filters for Voice, Data and other modes.

When signals are weak, you can improve copy by removing high and low speech frequencies. They contain little information but are full of noise that reduce readability.

On crowded HF bands, overlapping SSB signals make copying difficult. You can improve copy by slicing off some overlap with razor sharp "brick wall" responses.

You can also highpass filter out hum, pulses, rasp and other irritating low frequency noise.

Tunable bandpass filters

Narrow band signals like CW and RTTY jump out of QRM when you switch in one of MFJ's three *tunable* FIR bandpass filters.

You can *tune* the center frequency from 300 to 3400 Hz. And *vary* the bandwidth from 50 Hz to 680 Hz -- from super tight CW filters to wide razor-sharp Data filters.

As you narrow the bandwidth, interfering signals just drop out because, just 60 Hz away, they're down by over 50 dB.

You can use *narrower* bandwidths to fight tough QRM because these linear phase filters don't distort signals with unequal time delays.

Even with the narrowest 50 Hz bandwidth, you'll never have a problem with ringing.

One position gives you *two* tunable filters you can use together on one signal. For example, on RTTY, tune one filter to mark, the other to space and set each bandwidth tight for an incredibly sharp RTTY filter.

16 *pre-set* filters -- use factory set or program your own

With a turn of a switch you can select from *sixteen* convenient *pre-set* filters. You can use them for SSB, AM, CW, packet, AMTOR, PACTOR, RTTY, SSTV, WeFAX, FAX or any other mode you can think of.

If you don't like our *pre-set* filters, you can define your own filter by programming bandpass center frequency and bandwidth, lowpass and highpass cutoffs. *An MFJ exclusive!*

Only MFJ gives you the best of both worlds -- *tunable* filters to eliminate nearly any QRM and fast convenient *pre-set* filters customized for any mode.

Plus more . . .

A push-button quickly bypasses your filter so you can hear the *entire* unfiltered signal and see if anyone is calling you.

Built-in two watt amplifier. Has volume control, input level control, speaker jack, headphone jack, accessory jack, PTT line and PTT sense and line level output. 9x2½x6 in.

It plugs between your transceiver or receiver and external speaker or headphones. Use 12 VDC or 110 VAC with MFJ-1315, $14.95.

No Matter What™ guarantee

You get MFJ's famous one year No Matter What™ *unconditional* guarantee. That means we will repair or replace (at our option) your MFJ-784 *no matter what* for a full year.

Call your dealer for your *best* price

Automatically eliminate heterodynes, reduce noise and QRM on Voice, CW and Data. Call your favorite dealer for your *best* price and order your MFJ *super* DSP filter today!

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Tfc: N1OTC 804 (BPL), WA1TBY 416, K1UGM 415, N1LKJ 176, N1FLO 173, K8SH 130, KB1AF 114, WA1FNM 99, KD1LE 68, N1OBL 66, KA1WCD 61, WG1I 60, N1IST 49, K1BZD 44, KA1RSY 34, N1AJJ 25, KB1EB 19, N1LAH 17, KA1YLC 15, N1FWV 10, N1LRT 9, KA1EDY 5, N1BNG 4. PSHR in Public Service column.

MAINE: SM, Michelle Mann, WM1C—ASMs:WA1YNZ, KA1TKS. STM: KA1ODT. BM W1JTH. TC: KF1H. SEC KA1LPW. OOC: W3EZ. SGL WA1N. ACC: NX1A. Regret to report SK W1WCI, founder of CMEN. Congratulations to Phil and Dot Young, W1JTH, and W1TGY, for receiving the Master Volunteers' Hall of Fame Award from the American Lung Association for their work in organizing communication for the ALAM bike trek for the past 10 years. This year's participants were N1EBC, KA1JGF, KC1OC, W1TGY, KA1GPQ, W1JTH, WA1PFM, WN1TXD, N1GND, N1KWT, W1PXE, KB1YA, KA1HMB, KA1LPW, NS1Q, W1HTG, N1MHE, N1RP, N1ITN, KA1MLF and W1SIN. This event was 3 days long and included 900 bikers going through 30 intersections and rest stops throughout 6 counties in ME. Thanks for a great job by all! Congratulations to Jason Lovett, N1EJD, on winning an ARRL Foundation college scholarship—good job! Mark your calendar for upcoming hamfests: Windsor, Sep 10, Greenbush, Sep 24. Hope to see you at Boxboro this fall. This is just about the deadline for reregistering nets for the *ARRL Net Directory*. If you're an NM and haven't done this already, contact STM KA1ODT as soon as possible for help (34 Running Brook Rd, Windham, 892-5294). *Jun tfc:* W9KLS 172, NX1A 120, WM1C 96, W1KX 87, N1HYF 51, KA1ODT 43, NR1W 35, W1CE 34, W1JTH 31, N1JBD 22, AF1L 22, WA1WPH 18, KD1HH 14, WA1YNZ 11, N1NFK 9, WW1P 9, WA1LTD 9. —*73 de Michelle*

NEW HAMPSHIRE: SM:Al Shuman, N1FIK (@ WA1WOK), Internet (ASHUMAN@MV.MV.COM)—ASM: WB1GXM. SGL: W1HSB. OOC: KB4N Was pleased to see many new hams doing Field Day, despite the poor weather on Sat. Missed only central NH because of car problems; my apologies. Most clubs report higher Qs over last year. This should make the race for the NH FD plaque most interesting! Well, it's official. WA1PEL is the NE Div Volunteer of the Year and I'm darn proud to have him in NH. Award at the NE Div Cabinet Meeting on Jul 9, Bill had been lured there under false pretenses. Was he ever surprised! Central NH has again applied to be an ARRL Special Service Club; if your club is interested or in need of help in the affiliation process, call me for info. Special thanks to Great Bay, which presented me with a generous loan toward the '95 NE Div Convention. Plans are underway to make '95 better than '93. GB has a new meeting location, complete with space for a station. The IRS has new officers: congrats to pres KA1FYB, vp N1NUM, treas KD1NQ, rec secy N1OVB, and corr secy KA1ULM. Vince, N1RAN, from CVARC, wrote a nice article on Carl Evans, W1BFT. Anyone wanting a copy can drop me a line. 73, Al

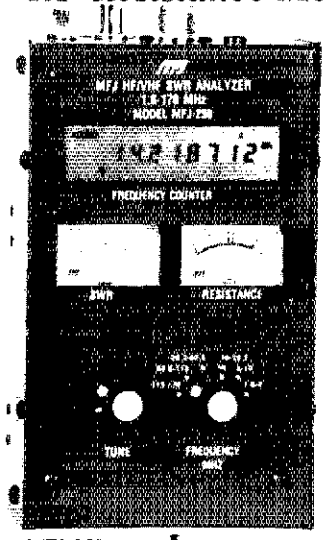
RHODE ISLAND: SM, Rick Fairweather, K1KYI. ASM: N1JFY. ACC: AA1CE. STM: WA1CSO. SEC: N1FKI. BM: KA1BNO. OOC: WA1ZFS. TC: KA1EGY. SGL: NN1K. PIO: KC1XO. At a Jul meeting of the Providence RA, New England Director Bill Burden, WB1BRE, and New England Vice Director Warren Rothberg, WB1HBB, gave a talk about current issues facing Amateur Radio and solicited input from the assembled members and guests on such issues as code requirements for Amateur Radio and a stateside QSL forwarding service for League Members. Bill presented the club with a new ARRL *Handbook* for its technical library. At the conclusion of the meeting, PRA coffee mugs and pins were presented to Bill, Warren and yours truly, by club president Frank DePetrillo, W1EYH. Field Day in RI this year was great as always, and I managed to make it to several club sites this year including South Coast Wireless Society in Stonington, CT, Northern RI ARC at Camp Varnum in Narragansett, Providence Radio Assn at Beavertail in Jamestown, Newport County RC at the Glen Farm in Portsmouth, and Blackstone Valley ARC at Buck Hill in Burrillville. Most impressive and innovative antenna seen this year was one made by a Newport Co RC member and the most unusual antenna support was a military mast used by BVARC lent to them by John, N1FUM. I'll try to get around to the clubs this fall with some of the pictures I took of the various sites. South Coast Wireless Society's Ham of the Year award was presented at Field Day to Bill, KA1ZZR, the new club's president and founder.

VERMONT: SM, Justin Barton, WA1ITZ @ N1BRT. Thanks to all who elected me, and I continue my pledge to all VT hams to bring a friendly and cooperative attitude to this office. Best wishes to outgoing SM Mitch Stern, WB2JSJ. Appointments: ASM: Duane Waller, N1BBR; ASM Ralph Stetson, KD1R. SEC: Jack Evans, WA1DLA; Asst SEC: Ron Gauthier, N1LDT. STM: Ed Bort, KT1Q. TC: Chip Taylor, W1AIM. Asst TC: Dan Thompson, N1IOL. ACC: Bernice Capron, N1NDN. These appointees are here to help everyone! BARC Hamfest and VE session, Aug 13 at Charlotte, contact Randy, KA1LEX, or Duane, N1BBR. CVARC hamfest/computer show Sep 17 at VTC, contact Tom, WA1YNU, or Steve, KD1UP. New officers GMWS: pres John Gladding, N1HLG; vp Doug Charleton, KB2BBK; secy Bob Kirbach, KA1ZNV; treas Julie Cooper, KB1APN. RANV to hold a Mobile Radio Tune-up Clinic. *PSHR:* KT1Q 140; N1DHT 109. *Tfc:* KT1Q 285, N1DHT 129. *Net Sessions/Checkins/Tfc:* VTNH 31/202/121; GMN 26/641/29;VPEN 5/49/7; TWSFMEN (Mt Ascutney) 5/54/1, (Keene) 4/61/0; BRATS 5/44/0. VT 1RN, Cycle 2 = 97%.

WESTERN MASSACHUSETTS: SM, Dan Senie, N1JEB (@ KA1SRD.MA)—ASM: NZ1Z ACC: N1JIT, PIC: N1ISB, SEC: K1VSG, STM: W1SJV. TC/OOC: WT1W. Internet: n1jeb@world.std.com. Field Day has come and gone. Faith and I visited 8 sites around the Section, met lots of nice people, took lots of pictures and even worked a whole bunch of stations on 40, 20, 15 and 2 meters, and on 70-cm while mobile! We checked into the Sunday emergency net on 75 meters while driving along the Mass Pike. Thanks to all the stations that sent me traffic that morning. Sending radiograms through the ARRL National Traffic System (NTS) is an important and fun activity. NTS is one of the oldest activities in Amateur Radio. It's a system that's proven its worth many times over. NTS serves two primary purposes on a daily basis: 1st, it provides a training ground for operators and NCSs; a trained pool of operators who understand how a directed net is operated is a real blessing when di-

MFJ *HF/VHF* SWR Analyzer™ with RF Resistance Meter

Read your antenna SWR from 1.8-170 MHz . . . 10-digit LCD frequency counter . . . RF Resistance Meter™ . . . smooth reduction-drive tuning . . . simple-to-use . . .



MFJ-259 **$219.95** If you work with antennas, MFJ's revolutionary new *SWR Analyzer*™ is the best investment you'll ever make! Now you can diagnose a wide range of antenna problems instantly with one easy-to-use instrument.

What the MFJ-259 Does

The MFJ-259 gives you a complete picture of your antenna's performance anywhere between 1.8 and 170 MHz -- you can even check SWR outside the ham bands without violating FCC rules. Set the bandswitch and tune the dial--just like your transceiver. SWR is displayed instantly!

RF Resistance Meter™

Does 2:1 SWR mean 25 ohms or 100 ohms? *The new MFJ-259 tells you at a glance!*

Now you can measure RF resistance up to 500 ohms at minimum SWR -- instantly -- on MFJ's *exclusive* side-by-side RF Resistance and SWR Meters!

Take the guesswork out of building matching networks and baluns for your antennas.

Watch the effects of spacing on radiation resistance as you adjust your antenna.

Here's What You Can Do . . .

Find your antenna's true resonant frequency from the shack.

Tune the antennas on your tower and watch SWR change instantly as you make each adjustment. You'll know exactly what to do by simply watching the display.

Tune critical HF mobile antennas in seconds -- without subjecting your transceiver to high SWR.

Measure your antenna's 2:1 SWR bandwidth on a single band, or analyze multiband performance over the entire spectrum from 1.8 to 170 MHz!

Measure inductance, capacitance, resonant frequency of tuned circuits, transmission line velocity factor/impedance/loss. Test RF chokes, transformers, baluns.

Adjust your tuner for a perfect 1:1 match without creating QRM.

And this is only the beginning! The MFJ-259 is really *four* test instruments in one: an accurate RF signal generator, a high resolution 170 MHz frequency counter, *RF Resistance Meter*™ and an *SWR Analyzer*™.

Free Manual

MFJ comprehensive 18 page instruction manual is packed with useful applications -- all explained in simple language you can understand! For free manual write or call MFJ.

Take It Anywhere

The MFJ-259 is fully portable, powered internally by 8 AA batteries or 110 VAC with MFJ-1312B, $12.95. It's in a rugged all metal cabinet that's a compact 4x2½x6¾ inches. Take it to remote sites, up towers, on DX-peditions -- anywhere your antennas are located.

For rough service, pick up a convenient **MFJ-29**, $19.95, padded carrying pouch to keep your MFJ-259 close at hand and looking like new.

How Good is the MFJ-259?

MFJ SWR Analyzers™ work so good, many antenna manufacturers use them in their lab and on the production line -- saving thousands of dollars in instrumentation costs! Professional installer and technicians use them worldwide.

Get More by Paying Less

With the MFJ-259, you get full 1.8 to 170 MHz coverage, simple operation, instantaneous readings, a high accuracy frequency counter and MFJ's exclusive *RF Resistance Meter*™-- all for a low $219.95.

1.8-170 MHz *SWR Analyzers*™

MFJ-249 **$199.95** **MFJ-249** *HF/VHF SWR Analyzer*™ has all the features of MFJ-259 but less RF resistance meter. Includes 1.8-170 MHz *continuous* coverage, 10-digit LCD frequency counter and smooth vernier tuning.

MFJ-209 **$109.95** **MFJ-209** *HF/VHF SWR Analyzer*™ is same as MFJ-259 without LCD frequency counter and RF resistance meter. Has jack for external frequency counter. MFJ-249/MFJ-209 are 4x2½x6¾ inches and uses 8 AA cells or 110 VAC with MFJ-1312B, $12.95.

Carrying Pouch

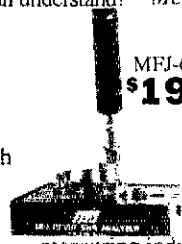
MFJ-29 **$19.95** **Tote** your MFJ-249, MFJ-259 or MFJ-209 *SWR Analyzer*™ anywhere with the MFJ-29 custom Carrying Pouch.

Made with a special foam-filled fabric, the MFJ-29 cushions blows, deflects scrapes, and protects knobs, meters and displays from harm.

Wear it around your waist, over your shoulder, or clip it onto the tower while you work--the fully-adjustable webbed-fabric carrying strap has snap hooks on both ends.

Protect your investment and keep your analyzer safe and looking like new!

Dip Meter Adapter



MFJ-66 **$19.95** **Plug** a dip meter coupling coil into your *MFJ SWR Analyzer*™ and turn it into a sensitive and accurate bandswitched dip meter.

With a dip meter you'll save time and take the guesswork out of winding coils, measuring inductance and capacitance, measuring velocity factor and electrical lengths of coax. Determine resonant frequency of tuned circuits and measure Q of coils. Set of two coils cover 1.8-170 MHz depending on your *MFJ SWR Analyzer*™.

Free MFJ Catalog

Write or call . . . 800-647-1800

10-160M *SWR Analyzer*™

MFJ-207 **$79.95** **If** you're an HF man, this compact MFJ-207 *HF SWR Analyzer*™ will help you build 10-160 Meters antennas that'll make working DX almost routine.

Just plug in your coax to find the SWR of any HF antenna on any ham band 10-160 Meters. Has jack for external frequency counter. 7½x2½x2¼ inches.

2 Meter *SWR Analyzer*™

MFJ-208 **$79.95** **MFJ-208** 2 Meter *VHF SWR Analyzer*™ finds the SWR of any antenna from 138-156 MHz. Jack for external frequency counter. 7½x2½x2¼ inches.

For Commercial VHF Radio

Same as MFJ-208 but for commercial VHF. **MFJ-217**, $79.95, covers 30-50 MHz and **MFJ-218**, $79.95, covers 150-170 MHz.

440 MHz *SWR Analyzer*™

MFJ-219 **The** New MFJ-219 *UHF SWR Analyzer*™ lets you read SWR of any antenna 420 to 450 MHz--just plug in the coax of your antenna, set the frequency and read SWR. Uses latest high-tech microwave integrated circuits and microstrip technology. Jack for external frequency counter. 7½x2½x2¼ inches.

MFJ-219/218/217/208/207/203 uses 9 volt battery or 110 VAC with MFJ-1312B, $12.95.

Bandswitch Dip Meter™

MFJ-203 **$99.95** **The** MFJ-203 is a sensitive *Bandswitched Dip Meter*™ that covers all hams bands from 160-10 Meters. There are no plug-in tuning coils to keep up with or break.

Has detachable coupling coil, dual FET oscillator, op-amp meter amplifier and jack for external frequency counter. 7½x2½x2¼ in.

MFJ *Antenna Bridge*

MFJ-204B **$79.95** **Great** for determining feedpoint resistance of antennas and for designing impedance matching networks. Measure RF resistance up to 500 ohm. Covers all ham bands 160-10 Meters. Built-in resistance bridge, null meter, tunable oscillator-driver, frequency counter jack. 7½x2½x2¼ inches. Use 9 volt battery or 110 VAC with MFJ-1312, $12.95

Nearest Dealer/Orders: 800-647-1800
Technical Help: 800-647-TECH(8324)

• 1 year **unconditional** guarantee • 30 day money back guarantee (less s/h) on orders from MFJ • FREE catalog

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sasters strike. The 2nd purpose is to provide a service to the public and a way to introduce people to Amateur Radio. A traffic booth at a local fair or at a big event like the Big E can introduce many to radio and let them send a radiogram to friends and family at the same time! The numbers at the bottom of my monthly column represent the total number of pieces of NTS traffic handled by our NTS traffic handlers. We could certainly use a few more people handling traffic! Thanks to W1KK, W1SJV and the many others who have kept traffic flowing for years. *Tfc:* N1NOZ 120, W1SJV 119, W1KK 44, KA4FRH 36, N1ISB 26, N1JEB 21.

NORTHWESTERN DIVISION

ALASKA: SM, Larry Flanagan, NL7XG (@ KL7GNG)—STM: Brenda Plessinger, AL7LX. DEC: KL7JBV. ECs: NL7DL, NL7LQ & WL7GK. TC: AL7CE. BMQBS: NL7NC. OOC: KL7IKX. OOs: KL7EB, AL7MM & WL7BF. Propagation has improved over the past couple of months so that statewide nets can be heard occasionally. The Jul *QST* Solar Cycle 23 story was encouraging. The Motley Group picnic went off well, despite some rain, low turnout and the absence of Gene Mockerman, KL7GID, Motley's NM and picnic MC, down with a bad back. The incredibly bad propagation has be the reason for such a low show at the picnic. It's with a lot of pride to be able to report one of our own. Gene, KL7GID, was recently honored with a proclamation and the AK Distinguished Service Medal by Maj Gen Hugh Cox III, Adj Gen of the AK Dept of Military and Veterans Affairs. Thanks from all of us, Gene, for 23 years of service to the state and the greatest hobby ever. Amateur Radio's image before the public is brighter for it, again thanks. Next month—Scouting. Good DXing.

Net	Freq	Time	QNI	QTC	Sess	NM
ABN	7.087	0400	1215	30	30	AL7LX
APN	14.292	1630	1157	11	22	KL7IPJ
MG	3.933	0500	1658	86	30	KL7GID
SN	3.920	0300	931	54	30	KL7GG

EASTERN WASHINGTON: SM, Kyle Pugh, KA7CSP—STM: W7GB. SEC: WA5ZAY. BM: W7EQU. ACC: WV7Y. OOC: WB7AUK. PIC: N7DWD. SGL:KD7AC. TC: N7IRM. ASM: KC7FJ. Field Day was interesting this year, weatherwise. At the start of the event, the weather was warm, sunny and clear, but the wind, rain, and lightning and thunder moved in during the night and the hams at W7NBR in Spokane packed it up around 8:30 AM on Sun. Snow fell on the FD sites near Walla Walla and Waterville. Thanks to Larry, W7FHH, from Bethel Ridge; Don, W7GB, from Badger Mtn; and Greg, AA7HG, from Sherman Pass, for your formal Field Day traffic. See you at the Walla Walla hamfest Sep 17-18. Jim, KA2LCC, is involved with Red Cross training sessions in Wenatchee. There's a new MOU between the Red Cross and the ARRL. STM Don, W7GB, reports the Central WA ARC helped with communication at the Great Canoe Race in Sun Lakes on Jul 9, and the WARTS Net annual picnic was on Jul 10 at Eagle Valley. As of Apr, the EWA Section had 4150 FCC licensees and 902 ARRL Members. 73 de KA7CSP. *Tfc:* W7GB 291, K7GXZ 110, KK7T 63, KA7EKL 21, W6UVP 4, KA7CSP 4. *PSHR:* W7GB 138, K7GXZ 108, KA7CSP 70, W6UVP 53.

IDAHO: SM, Don Clower, KA7T—ASM: K7REX. STM: W7GHT. SEC: KI7EP. I hope everyone had a fun time during Field Day. Be sure to send me your scores by Aug 1 to be in the running for the trophy. I need someone to volunteer to be the OO Coord for ID. The OO program is going to have a larger, more responsible role in the near future. There are only 2 OOs in ID and we need to increase that number, also. If you're interested, give me a call or write me a letter. *Tfc:* W7GHT 146, N7MPS 44, KB7GZU 57. *PSHR:* W7GHT 98, N7MPS 60. 73, Don.

Net	Sess	QNI	QTC	NM:
FARM	30	2204	40	W7RKI;
NWTN	30	1495	80	N7YCX;
IDACD	20	661	14	K7UBC;
IMN	30	224	62	KB7GZU

MONTANA: SM, Darrell Thomas, N7KOR—It was a real pleasure to attend the 40th Annual Father's Day Picnic on Jun 18-19. The event was hosted this year by the Valley ARC of Glasgow and held at Ft Peck Reservoir. The event was attended by more than 50 hams from eastern MT and surrounding states, and offered testing, swap tables and an overabundance of good food. It was a great opportunity to visit with old friends and meet new ones. Congratulations to the hams of Whitetail in NE MT on the formation of a new club and your application to become an ARRL affiliated organization. The MT Section was well represented during Field Day and it will be interesting to see how well you scored for your efforts. The1994 Glacier/Watertown hamfest appears to be heading towards a record-breaking event—I'll report more on that later. *Tfc:* KA7YYR 182. *PSHR* 103.

Net	QNI	QTC	NM:
MSN	80	2	KF2R
MTN	1276	64	N7AIK
IMN	224	62	KB7GZU

OREGON: SM, Randy Stimson, KZ7T—ASML W7FBP. ASM, KF7KE. ASM: KG7OK. ASM: WA7KSK. ACC: AA7OA. STC. N7HMV. OOC: NB7J. I just heard about a little incident during Quake X. Quake X was a statewide SET and the scenario was a huge earthquake. Well, Eugene Hielke, KA7JNU, who's rather involved in ARES, had to work during the SET, but being a good ham, had his HF, 2-meter and packet stations in his office. Probably most hams have their gear in the office where they work. Gene decided to check into the 3993.5 emergency net. He got "This is KA7..." out and he set the fire-alarm system off in the building. No water, just bells and whistles. No big deal, you just call the 800 number and tell them it was a mistake. So when he called, they had changed the code number, which he didn't know. Finally, out of desperation, he called the Hood River fire dept and told it to stay there: it was a mistake. There's nothing like having your own little SET. Field Day went very well. I got more messages than usual, which was encouraging. It's interesting to go to different Field Day sites and see the various ways each club does it. Don't forget the Rogue Valley Swap Meet on Oct 8 in North

MFJ Dual Band Mobile Antenna

For an incredible $14.95, you get a dual band 2 Meter/440 MHz mobile antenna with strong magnet mount, stainless steel radiator, 15 feet of coax and BNC adapter for your handheld -- It's the fastest selling mobile antenna in ham radio!

MFJ-1724B
$14.95

For an incredibly low $14.95, you get an MFJ dual band 2 Meter /440 MHz mobile antenna!

It's the fastest selling mobile antenna in ham radio!

You get excellent gain for solid, noise-free QSOs. On 440 MHz, it's a high gain ½ wave over ¼ wave radiator. On 2 Meters, it's a *full size* ¼ wave radiator.

Its tough *stainless steel* radiator is only 19 inches tall -- won't knock off when parking in your garage.

An extra powerful magnet holds it steady -- even at highway speeds.

You get 15 feet of coax with a standard PL-259 coax connector for your mobile rig.

You get a BNC adapter so you can also use it with your handheld!

Your MFJ-1724B is protected by MFJ's famous one year *No Matter What*™ unconditional guarantee.

DualBand 144/440 MHz Ground Plane

MFJ-1754
$24.95 *New!*

Dual band ground plane antenna for 2 Meters and 440 MHz gives you extra long range on 440 MHz with a high gain halfwave over quarter wave radiator. On 2 Meters you get solid quarter wave performance. Mounts on 1 to 1½ inch mast with single U-bolt. Easy-to-tune.

1/4 Wave Ground Plane

MFJ-1740
$12.95

The MFJ-1740 brings up 2 Meter repeaters as well as any ¼ wave ground plane made!

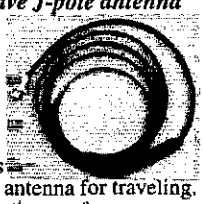
You get easy tuning, low loss ceramic antenna insulator and strong lightweight aluminum construction.

Single U-bolt mounting for 1 to 1½ inch mast. Cutting chart included for 220/440 MHz. Made in USA.

MFJ Pocket Roll-Up™

2 Meter halfwave J-pole antenna

MFJ-1730
$14.95



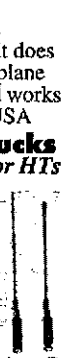
Roll up this *halfwave* 2M J-pole antenna and stick it in your pocket! It's the perfect *gain* antenna for traveling.

Get home station performance on the go. Just hang your *MFJ Pocket Roll-Up*™ in the clear and plug the BNC connector into your handheld.

It's omni-directional and has significant gain over a ¼ wave. It does not need a cumbersome ground plane so it's convenient for indoors and works great with handhelds. Made in USA

Dual Band *flexible* Ducks

144/440 MHz flexible ducks for HTs



A. *High Gain FlexiDuck*™, **MFJ-1717**, $19.95. Enjoy dependable QSOs when other rubber ducks give you noise. High gain ½ wave on 440 MHz, full size ¼ wave on 2M. Won't jab you -- bends, twists, flexes with you. 15¾ inches.

B. *FlexiDuck*™, **MFJ-1716**, $16.95. Similar to MFJ-1717. Full ¼ wave on 440 MHz, efficient loaded ¼ wave on 2 Meters. 8¾ inches.

Shorty Duck™ for HTs

Add this *short*, 4¼ inch *ShortyDuck*™ to your 2M handheld for a Q-5 signal! Impedance matched for maximum gain. High-Q helical wound radiator.

MFJ-1718
$12.95

5/8 Wave 2 Meter Mobile Antenna

MFJ-1728/B
$24.95

For *maximum range* while mobile, use MFJ's *Maximum Gain*™ 5/8 Wave 2 Meter Mobile Antenna. You'll get the maximum possible gain of any single element mobile antenna!

Competitive 5/8 wave mobile antennas can't work any better -- no matter how much more they cost.

You get low SWR so your rig can safely deliver maximum power into your antenna. It's rated at 300 watts PEP so you can use any mobile rig plus a mobile amplifier.

You get a heavy-duty magnet mount that holds your antenna tight at highway speeds and a black magnet base that'll look good for years.

You get a stainless steel radiator that'll endure years of harsh mobile use and 12 feet of coax cable.

You get MFJ's one year *No Matter What*™ unconditional guarantee.

Order MFJ-1728 with standard PL-259 coax connector or MFJ-1728B that also includes a BNC adapter for your handheld.

Stacked 5/8 Wave for 2 Meters

gives twice the omni-directional gain of a single 5/8 wave

MFJ-1764
$34.95

MFJ's stacked 5/8 wave radiators give you *more than twice* the *omni-directional* gain of a single 5/8 wave radiator!

Wide 10 MHz 2:1 SWR bandwidth . . . excellent ferrite choke balun feedline decoupling . . . shunt choke for bleeding off unwanted static . . . strong lightweight aluminum.

Fully assembled -- simply attach radiators -- no tuning required. Mounts vertically for FM/Packet or horizontally for SSB. Installs with single U-bolt on 1 to 1½ inch mast or tower leg. 1½ lbs., two 47 inch radiators, 23 inch boom. Made in USA.

Also works as excellent *6 Meter* full halfwave centerfed antenna.

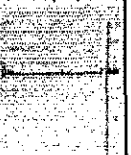
MFJ-1766, $89.95, gives you *four times* the gain of single 5/8 wave. Includes 2 MFJ-1764, phasing cables. Doubles gain on 6 Meters.

MFJ-1765, $29.95, phasing cables for 2 MFJ-1764s, other 2M ant.

MFJ *dual band* 144/440 MHz Yagi

5 elements on 440 MHz . . . 4 elements on 2 Meters . . .$49.95

MFJ-1768
$49.95 *New!*



Get two Yagis for the price of one . . . enjoy two Yagis in the space of one with single coax feed!

MFJ's *exclusive* dual band balanced feed with *FerriteChoke*™ decoupling prevents pattern skewing and gives you low SWR.

The MFJ-1768 is based on the *National Bureau of Standards* design that's optimized for maximum forward gain with high front-to-back ratio and a clean symmetrical pattern.

Mounts vertically for FM/Packet or horizontally for SSB with single included U-bolt on 1 to 1½ inch mast or tower leg.

High strength 6061-T6 aluminum 5 foot, 1⅛ inch diameter boom. 2 pounds. Elements are electrically isolated from boom. Made in USA.

Portable 3 element Yagi for 2 M

MFJ-1763
$39.95

You can set up or take down MFJ's *portable* 3 elements 2 Meter Yagi in seconds! Elements simply screw into the boom.

You can take it with you wherever you go and have the "oomph" and directivity of a beam.

It's easy to store and sturdy enough to use as your home station antenna.

Mounts vertically for FM/packet or horizontally for SSB. *Center* or *end* mounts with single U-bolt. Great for packet/PacketCluster™.

It's compact 2¾ foot boom gives you a calculated gain within 1 dB of a four element Yagi with a boom nearly twice as long.

Extra thick elements maintain high gain and directivity over entire 2 Meter band. MFJ's *FerriteChoke*™ decouples feedline.

Elements and boom are made from strong lightweight aluminum and protected by MFJ's *Permanent Molecular Bonding Technology*™.

Weighs just 2 pounds. Boom is 30½ inches. Made in USA.

5/8 Wave Ground Plane

MFJ-1750
$19.95

For a low, low $19.95, you get a *high performance* 2 Meter 5/8 wave ground plane home station antenna -- you'll get the maximum gain of any single element antenna.

More expensive 5/8 wave ground planes can't work any better -- no matter how much they cost.

You get . . . shunt fed matching that bleeds off unwanted static and gives you low SWR . . . strong lightweight aluminum construction . . . low loss ceramic antenna insulator . . . MFJ's *RapidTune*™ radiator . . . MFJ's one year *No Matter What*™ guarantee. It mounts on 1 to 1½ inch mast with single U-bolt and is Made in USA.

MFJ-1752, $19.95, for 220 MHz.

HT Range Extenders

Telescoping antennas for handhelds

A. ***Long Ranger***™ 2 Meter Halfwave, **MFJ-1714**, $16.95. For really long range this MFJ endfed halfwave is hard to beat. It outperforms a ⅝ wave on a handheld because the ⅝ wave needs a ground plane. The MFJ halfwave doesn't. It's shorter, lighter, has more gain and places less stress on your antenna connector than a ⅝ wave antenna. When collapsed, it performs like a rubber duck. 40" extended, 10½" collapsed.

A. B. C.

B. *Dual Bander*™ for 2 Meters and 440 MHz, **MFJ-1712**, $14.95. Got a new dual band handheld or separate units? One antenna fits all. It's a ¼ wave for 2 Meters and a ⅝ wave with gain for 440 MHz. 7¼" collapsed, 19" extended.

C. ***Pocket Linear***™ ⅜ Wave, 2 Meters, **MFJ-1710**, $9.95. Carry this pen size antenna in your pocket like a ballpoint pen. When you're using your rubber duck, on the fringe and noisy, put on the *Pocket Linear*™, extend it to 24½" and carry on your QSO. Has pocket clip. 5¼" collapsed.

144/440 MHz Duplexer

MFJ-916
$29.95

Lets you use dual band 144/440 MHz antenna with separate transceivers *or* separate 144/440 MHz antennas with dual band transceiver.

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Medford High School. This is their 1st, so let's support it. I'd like to welcome Dave Warner, KA7IJK, EC for Clackamas Co, and Jack Price, W7NTI, EC Lincoln Co, to the ARES family. *Tfc (P = packet):* N7UOF 236, W7VSE 208, WA7ESS 169, W7WAT 153, K6AGD 117, N7DXT 64P, N7NLM 27, KB7PPP 19, KA7AID 13, KG7YF 13, N7THH 8, W7DAN 4. (May) KA7AID 9.

WESTERN WASHINGTON: SM, Harry Lewis, W7JWJ—SEC: KC7FA. OOC: W7DNY. BM: N7CAK. STM & NLM: KD7ME. ACC: W7QGP. SGL: KD7AC. Mike Speece, new EC San Juan cty, also new call sign: KI7YU. EC/DEC reports via Herb, KC7FA, that most ctys participated on COMMEX '94. Unfortunately, the date of the exercise conflicted with the Seaside and Wenatchee hamfests. Marina, N7LSL, EC Medical Services Team, further reports findings of the COMMEX '94 for King cty in which all hospitals, except 2 VA's & 6 Group Health facilities were staffed. She's preparing a full report on the activity for this year. Lessons in tfc handling were conducted May 25. During this session, there was a repeater-shutdown drill, which enhanced the session. Regret to report that Hap, W7QKV, long-time member of WARTS, is a Silent Key.

ON!	*QTC*	*QNS*	*NM*	*Liaison:*
NTN 29/3	192	60	W7TVA	NTS-HN7
NWSSBN 648	40	30	KA7DNK	RN7
PSTS 80	42	49	KA7TTY	WARTS WSN
WARTS 2906	153	30	W7GB	HN7
WSN 646	164	80	W7AZU	RN7

PSHR: W7AZU 147, KB7JQM 123, KD7ME 131, KA7TTY 90, W7NWP 153, W7PFD 80. *Individual tfc:* W7AZU 82, KB7JQM 164, KD7ME 247, W7NWP 180, W7PFD 25, KA7TTY 41, W7LG 122, K7CLL 6.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, WB3FCV. DECs: W6CPO, N4OGL. STM: K6APW. ACC: Vacant. TS: KF6NY. The Alameda Cty Emgy Svcs (ACES) Net is held Tue at 8 PM on 147.240, 444.20 (CTCSS 107.2), 147.12, 224.74, 441.125 (CTCSS 100.0) & 145.43 (CTCSS 100.0). All are linked for the net and those interested in emergency communication are welcome to check in. FD messages were received from the Alameda County RACES and San Leandro RACES combined operation; Alameda County RC; the UCARC and NALO ARES combined operation; LARK; EBARC; W6BUR; SBARA; WHO; and W6YL. It looks like all had a great time this year. BARC members WB6ABE, W6VQ, KC6MTO, KB6SHT, KE6IA & K2GMY provided comms for the Solano County Food Bank's annual food drive. The CCCC skipped its last meeting in honor of Mother's Day. EBARC welcomes new members N6NG, N6ILD, Jan Kuhl & James Kuhl. VVRC members providing comms for the Bizarre Bazaar and Rubber Duck Race fundraiser were KA6FDI, KA6ELP, KA6ELQ, KK6SV, N6YWR, N7YYG, N6OJC, KD6PJM, KE6ENW, KD6JSC, AA6HT, KB6NRG, KE6FFR, KC6WYC & W6ROY. MDARC welcomes new members KE6EKB, KE6GKN, KE6GKP, KK6PO, N6UNT, KE6GKQ, Gregory McLean, KE6EGJ, KE6DRJ, KE6ETY, KE6GSZ, KE6FWL, KE6FUA, KE6FYO & AB6JG; and congratulates upgrades KE6GLV to General, KO6AE to Advanced & KE6FFX to Tech. LARK congratulates N6TBA on his upgrade to General. SBARA members at the latest Fremont ARES session were WU6A, KE6EXZ, KD6PJE, WB6GBE, WD6ATJ, KC6WXO, N4OGL, KB6UOK, N6UOW, KE6FFD, WA6AWI, N6MWC, KA6DRD, & KD6GMF. *Jun tfc:* WB6DOB 588, K6APW 92, W6VOM 74, WB6ETY 47. *PSHR:* WB6DOB, W6VOM, WB6ETY. *BPL:* WB6DOB. *Tfc nets:* NCN1/3630/7 PM, NCN2/3705/9 PM, NCN-VHF/145.41/8:30 PM; RN6/3655/7:45 PM & 9:30 PM; PAN/3652/7052/8:30 PM. Your check-ins are always welcome.

NEVADA: SM, Curly Silva, K7HRW—TC: NW7O, SEC: N7JEH. ACC: N7FFP. STM/SGL: N7CPP. OOC: W7KLH. Need to upgrade your license or need to take the amateur's entrance exam? In the Reno area, contact Jess, N7BIP, 702-826-0329. Las Vegas area contact Janet, NK7N, 702-565-0242. In the Elko, eastern NV area, contact Joe, N7JEH, 702-738-7110. Congrats to our OOs, who continue to assist many operators with minor problems. Ron, KG7OR, Asst to Pac Div Dir, attended a meeting in Livermore, CA, reports many good things coming up, watch *QST* and this column for updates, ie, HR 2623 to probably apply the "Good Samaritan" law to ARES or other operators who aid anyone via Amateur Radio. Still need additonal support. If you didn't get a chance to read Jun *QST*, p 13, pick up a copy from a friend and read the article on PRB-1. Elko ARC had its 1st fire training class, dealing with the "Incident Command System," good attendance for an important subject. There will be additional hands-on drills with participation with NDF, BLM, etc; contact Joe, N7JEH, for info. SNARS group in the Reno area having good start with a much-needed group. N7CPP from the SIERA club reports a good turnout for the Pony-Express Rerun. If you weren't there, plan to volunteer next year; "Try it, you'll like it." Get those traffic reports in to Bruce, N7CPP, by the 1st of the month. Tfc: KK4M 215, W4JLS 51, N7CPP 27, WA4SES 16, N7ZEW 10, K7OK 6.

PACIFIC: SM, Bob Schneider, AH6J—Field Day was a big success for Big Island ARC, especially in terms of public exposure. It ran 2 VE sessions & gave 18 people tests, of which 15 people passed at least 1 Element. 9 new licenses were passed. Former Pacific Director Chuck McConnell & his wife Cathy were here on vacation. Even though BIARC ran a 12-element Sterba Curtain, it was hard to break through the "West Coast Wall." Kalawao County ARC of Molokai reports that fire season is here with several outbreaks already. It had FD at One Alii Park. Its roster shows 40 members. Well Done! Kauai had a dozen to its FD site near the Outrigger Hotel, north of Lihue Airport. As I write this article, the California-to-Hawaii duct is fully open. I had several contacts through the repeaters. It was like a feeding frenzy. As of last night, 2 records had been broken, the 2.3 GHz & 432 MHz fast-scan TV (one way to Gordon West & others). (See Up Front in *QST* in this issue.—*Ed.*) KH6HME is still on Mauna Loa at this moment, so expect more. *Jun tfc:* KH6S 39.

SACRAMENTO VALLEY: SM, Jattie Hill, W6RFF—Section staff: STM: WA6WJZ. ACC: KB6COH. OOC: AB6GQ.

10 Bands -- 1 MFJ Antenna!

Full size performance . . . No ground or radials

Operate 10 bands: 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters with one antenna

Separate full size radiators . . . End loading . . . Elevated top feed . . . Low Radiation Angle . . . Very wide bandwidth . . . Highest performance no ground vertical ever . . .

Operate 10 bands -- 75/80, 40, 30, 20, 17, 15, 12, 10, 6 and 2 Meters -- with this MFJ-1798 vertical antenna and get *full size performance* with no ground or radials!

Full size performance gives you high efficiency for more power radiated. The result? Stronger signals and more Q-5 QSOs.

Full size performance also gives you exceptionally wide bandwidths so you can use more of your hard earned frequencies.

Full size performance is achieved by using separate full size radiators for 2 through 20 Meters and highly efficient end loading for 30, 40 and 75 /80 Meters.

You get very low radiation angle for exciting DX, automatic bandswitching, omni-directional coverage, low SWR and it handles 1500 watts PEP SSB.

MFJ's unique *Elevated Top Feed*™ elevates the feedpoint *all the way to the top* of the antenna. It puts the maximum radiation point high up in the clear where it does the most good -- your signal gets out even if you're ground mounted.

It's easy to tune because adjusting one band has minimum effect on the resonant frequency of other bands.

Self-supporting and just 20 feet tall, the MFJ-1798 mounts easily from ground level to tower top -- on small lots, backyards, apartments, condos, roof tops, tower mounts.

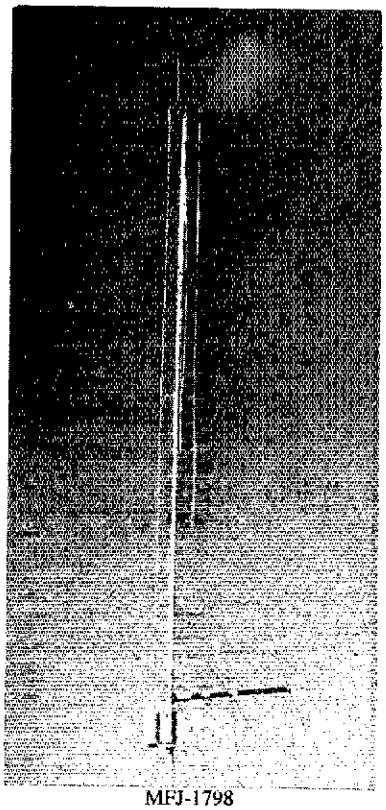
Separate *Full Size* Radiators

Separate full size quarter wave radiators are used on 20, 17, 15, 12, 10 and 2 Meters. On 6 Meters, the 17 Meter radiator becomes a 3/4 wave radiator.

The active radiator works as a stub to decouple everything beyond it. *In phase* antenna current flows in all parallel radiators.

This forms a very large equivalent radiator and gives you incredible bandwidths.

These radiator stubs provide automatic bandswitching -- there is absolutely *no loss* due to loading coils or traps.



MFJ-1798

$269.95

End Loading

On 30, 40, 75/80 Meters, end loading -- the most efficient form of loading -- gives you highly efficient performance, excellent bandwidth, low angle radiation and automatic bandswitching.

MFJ's unique *Frequency Adaptive L-Network*™ provides automatic impedance matching for lowest SWR on these low bands.

Tuning to your favorite part of these bands is simple and is done at the *bottom* of the antenna.

No Ground or Radials Needed

You don't need a ground or radials because an effective counterpoise that's 12 feet across gives you *excellent* ground isolation.

You can mount it from ground level to roof top and get awesome performance.

No Feedline Radiation to Waste Power

The feedline is decoupled and isolated from the antenna with MFJ's exclusive *AirCore*™ high power current balun. It's wound with Teflon® coax and *can't* saturate, no matter how high your power.

Built to Last

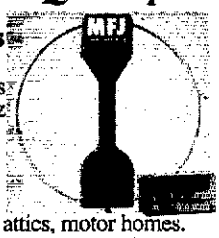
Incredibly strong solid fiberglass rod and large diameter 6061 T-6 aircraft strength aluminum tubing is used in the main structure.

Efficient high-Q coils are wound on tough *low loss* fiberglass forms using highly weather resistant Teflon® covered wire.

Teflon® is registered trademark of Dupont

MFJ *Super Hi-Q Loop*™

MFJ-1786 **$299.95**



MFJ's *tiny* 36 inch diameter *high efficiency* loop antenna lets you operate 10 to 30 MHz *continuously* -- including the WARC bands!

It's ideal where space is limited -- apartments, small lots, mobile homes, attics, motor homes.

Enjoy both DX and local contacts when you mount it vertically. You get *both* low angle radiation for excellent DX *and* high angle radiation for local close-in contacts. Handles 150 watts.

Super easy-to-use! Only MFJ-1786 *Super* Remote Control has *Auto Band Selection*™. It auto-tunes to your desired band, then beeps to let you know. No control cable is needed.

Fast/slow tune push buttons and built-in two range *Cross-Needle* SWR/Wattmeter lets you quickly tune to your exact frequency.

All *welded* construction, no mechanical joints, welded butterfly capacitor with no rotating contacts, large 1.050 inch diameter *round* radiator -- not a lossy thin flat-strip -- gives you highest possible efficiency.

Each plate in MFJ's *superb* tuning capacitor is welded for low loss and *polished* to prevent high voltage arcing. It's welded to the radiator, has nylon bearing, anti-backlash mechanism, limit switches and a continuous *no-step* DC motor for *smooth precision* tuning.

A heavy duty 1/8 inch thick ABS plastic housing with ultraviolet inhibitors protects it.

MFJ-1782, $269.95. Same as MFJ-1786 but remote control has only fast/slow tune buttons.

Super 80/40M Vertical

MFJ-1792 **$159.95**

Designed as a *high performance* antenna for 80 and 40 Meters, the MFJ-1792 features a *full size* quarter wave radiator for 40 Meters -- that's a full 33 feet of ruthless radiating power.

End loading -- the most efficient form of loading -- is used for 80 Meters. It's accomplished by a virtually lossless 4½ foot capacitance hat and a high-Q coil wound with Teflon® wire on a *low-loss* fiberglass form.

The *entire length* radiates power.

High strength 6061-T6 aluminum tubing, super strong solid fiberglass insulator, *Frequency Adaptive L-Network*™, heavy duty *swing* mount. Handles 1500 watts PEP. Requires guying and radials, counterpoises or ground screen.

MFJ-1793, $179.95. Same as MFJ-1792 but includes *full size* 20 Meter quarter wave radiator.

MFJ *halfwave* Vertical

6 bands: 40, 20, 15, 10, 6, 2 Meters . . . No radials or ground needed!

MFJ-1796 **$199.95**

Operate 6 bands -- 40, 20, 15, 10, 6 and 2 Meters -- with this MFJ-1796 *ground independent halfwave* vertical antenna! No radials or ground ever needed!

It's only 12 feet high and has a *tiny* 24 inch footprint! Mount it anywhere from ground level to tower top -- on apartments, condos, small lots, even motor homes. Perfect for vacations, field day, DX-pedition, camping.

Efficient *end loading*, no lossy traps. *Entire length* is always radiating. *Full size* halfwave on 2 and 6 Meters. High power *air-wound* choke balun eliminates feedline radiation. Adjusting one band has minimum effect on other bands.

Automatic bandswitching, low radiation angle, omni-directional, handles 1500 watts PEP. Goes together in an afternoon.

Box Fan Portable Loop

MFJ-1780 **$229.95**

No, it's not a fan -- it's a high efficiency portable loop antenna that's about the same size and shape as a 2x2 foot box fan, complete with carrying handle.

Carry it like a suitcase, tuck it in a corner of your car or check it as baggage on a plane.

When you get there, set it on a table or desk and enjoy ragchewing or DXing.

All welded construction, covers 14-30 MHz *continuously* including WARC bands, handles 150 watts. Remote control has fast/slow tune buttons. Separate control cable not needed.

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and free instruction manuals
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TC: WB6RBE. PIC: WA6OWH. BM: KB6FIX. SGL: N6IG. SEC: Vacant. DECs: WO6H, W7KEH, WA6SLA, N6SNO. Get ready for the CA QSO Party Oct 1-2. ARES groups getting workout with the forest and grass fires. Yuba-Sutter ARC VE tests at 5:30 PM on 2nd Tue of odd-numbered months at Yuba City Police Dept. GEARS VE tests 1st Sun of even-numbered months. Thanks to Nevada County ARC for inviting me for dinner at its Field Day—very nice. KN6BD upgraded to Extra Class! Are you changing your call sign again, Linda? Former SV SM W6IEW has been on the sick list. SFARC pres N7EUQ is recovering from the latest surgery on his foot. Many GEARS members helped at the Silver Dollar Fair booth—they worked 20 countries during their demonstration of ham radio. WAS Award Mgrs in SV: WB6AKF, KI6OF & N6KD. N6DHN busy working through the satellites. KM6PX gave a talk on Repeater Etiquette to RCARCS. Nevada City ARC had a booth at the Nevada County Fair. It also provided communication for the Agony Bicycle Ride, a 24-hr event. Sierra ARC held meeting to see if it would continue to be an active club. Silent Key: SCARS member KD6SNI. New club members: GEARS KD6BNH, KE6EG, KE6GNM, KE6GNR, KE6GNS; River City ARCS W6SXR, KE6HQA, KE6HCU, AB6QO, KE6GZM, KE6GZL. Each club should promote the ARRL to its membership because strength and numbers will be important to retaining our frequencies! 73. *Tfc:* KK1A 150, N6LUY 37, WA6WJZ 27, W6RFF 26, AB6ZX 2.

SAN FRANCISCO: SM, John Wallack, W6TLK—ASMs: N6KM, WX3K. OOC: KK6JJ. SEC: WB6TMS, STM: AB6EU. TC: N1AL. New appointments: KD6GCK, PIO; N6CX, ORS. Thanks to the members of the San Francisco RC for an interesting visit and excellent Field Day movies of 1938 and 1941. There continues to be a lot of ham radio activity among the hams in the far north. WA6TVQ, DEC, reports 18 Humboldt Co ARES members attended the recent Intro to Emergency Services and Damage Assessment classes by the American Red Cross. KF6FY says a job well done to all 39 Humboldt Co hams for their excellent work in the 3-day Kinetic Sculpture Race. Far West Rptr Assn has its multiclub picnic in Scotia on Sep 12. KC6IGY reports a DXpedition is planned for the rare grid square of CM79 near Shelter Cove Sep 3-5. The lower end of the HF General freqs and 2 M (146.52) will be used. More info in *QST*'s Special Events column. A special thank you to AB6TR, PIO, for having the cities of Eureka and Arcata declare Amateur Radio Week in Jun. KC6UXJ and WB6PER report 40 Sonoma County RA members had a great time at the recent campout at Sugarloaf Ridge State Park. KD6LSQ reports a roaring success for all. 46 Willits ARS members at its recent campout at Jackson State Forest. *Tfc:* AB6EU 417, N6FWG 126, N6GHG 31, N6KM 16.

SAN JOAQUIN VALLEY: SM, Mike Siegel, KI6PR—First, I must apologize for missing this column; I've been temporarily busy with some personal issues, but I'm back. Once in a while, it just happens. For the 3rd year running, the Stanislaus ARA's *Readout* newsletter received an award from the Amateur Radio News Service. The *Readout* was judged among the top 3 out of 110 entries. Congratulations to SARA's editor, WA6ZLO! Think the Boy Scouts are the only youth group involved in ham radio? Lodi ARC points out that the Girl Scouts are becoming quite involved—check it out! Congratulations to the Nor-Cal QRP Club; you'll soon be hearing its new members' rigs, the Sierra, on the air. And you can see the rig at Pacificon. A continuing tour of local public schools, with their communication bus, by the Fresno ARC and the Clovis ARP groups has resulted in a positive response. Both clubs have been working with interested students over the summer and hope to start new school clubs, as school gets back into session this fall. Kern River Valley ARC reminds us that our clubs need to review their constitutions from time to time, to be sure members' needs are properly being met. And KRV-ARC's W6TN was recently honored by Kern County Supervisors for his years of work and contributions to ham radio in Kern County—congratulations! Taking a trip? Sure, Field Day is history, but the Madera County ARC points out that whether camping or just on the road, you can take ham radio with you! Think you really understand DXing? The Central CA DX Club can provide guest speakers for your club, to explain everything from the "Whys" to the "Hows." Contact WB6VIN or AH6CO for info. The new kid on the block finally has a name: The Garrote Hams meet in Groveland on the 3rd Tue of the month. It's already involved with licensing classes and local community projects. For info, call Nancy KE6AXN, at 962-5454. This makes 3 clubs in Tuolomne County; the Garrote Hams join the Sonora Pass ARK (SPARK) and Tuolomne County AR & ES (TCARES) in public safety & training, and other local group projects. I'll be there: The "First National Hamfest" in Bakersfield, Oct 6-9, contact Kern County-Central Valley ARC. Pacificon '94 is in Concord, Oct 21-23; contact Mt Diablo ARC for tickets & info. And don't forget the California QSO Party next month—I'll be there!

SANTA CLARA VALLEY: SM, Steve Wilson, KA6S—Jun '94: This is my last column for *QST* as your SM. It's been an exciting 4 years. In that time I've had the pleasure to travel around the Section and meet you at club meetings, ARES events, swap meets and the like. That was probably the most rewarding part of the job! It illustrated to me that being a League Member is more than just having a subscription to *QST*. The League *is* its membership. The people out in the field who compose the League are its real strength. It doesn't matter whether the person holds an ARRL field appointment, is a club officer, an ARES member or just an active amateur. All these people are contributing in their own way to our service. That's what it's really about! The past 4 years have been full. Probably the aspect of this job that I'm most proud of are the accomplishments of the ARES groups in the 5 counties composing the Section. Most of this success can be attributed to the hard work of people like Dave Larton, N6JQJ, who served as SEC for 5 years; George Washburn, WA6YYM, DEC for Santa Clara; Rich Hanset, KI6EH, and John Smith, N6IYA, who both served as DEC for Santa Cruz; Dick Collins, K6ANN, DEC of San Mateo; Walt Del Conte, and Cal Miller, WW7G, both of whom served as DEC of Monterey County; and Kathy Hill, KB6INO, DEC of San Benito. People who should get special mention are Sharon Moerner, N6MWD, and Scott Hensley, KB6UOO, who've been invaluable, for the service and professionalism these ARES units have attained has

MFJ TNCs for VHF/HF Packet

MFJ-1270C super TAPR TNC clone has a world wide reputation as the most reliable packet TNC in the world! Thousands used as digipeaters, nodes, BBS and in all kinds of commerical applications working 24 hours a day -- many work for years without a single failure . . .

NEW *Super* TNC-2

- *ROM expands to 512K*
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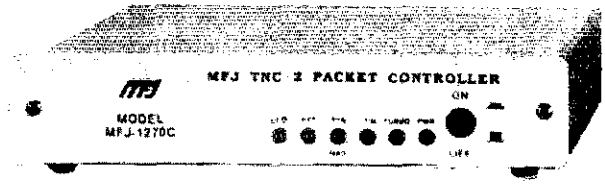
- *Front panel ON/OFF switch*
- *Enhanced DCD circuit for HF*
- *Supports 19,200 baud terminals*
- *Memory Expands to 64K, 128K or 512K*



MFJ-1270C **$119.95**

The MFJ-1270C *super* TAPR TNC clone has a world wide reputation as *the most reliable TNC in the world!*

Thousands are dedicated as digipeaters, nodes, BBS and used in all kinds of commercial applications working 24 hours a day -- many work for years without a single failure.

The Most for Your Money

The most reliable TNC in the world gives you the most for your money. See for yourself . . .

Fully TAPR TNC-2 Compatible

You get full TAPR TNC-2 compatibility -- *all* software and hardware designed for the TAPR TNC-2 standard works without modification. You get NETROM, theNET and Rose Switch compatibility that turns your MFJ-1270C into a Layer Three and Four networking node.

VHF *and* HF operation.

You get high performance VHF *and* HF modems as standard equipment -- for double fun.

You get a true DCD circuit that dramatically reduces sensitivity to noise and dramatically increases completed QSOs.

FREE AC Power Supply

You get a *free* 110 VAC power suppy at no extra cost. With other brands, the AC power supply could cost you an extra $20.95.

New *enhanced* Personal Mailbox

The *enhanced* Easy Mail™ personal mailbox lets you use a dedicated call-sign for your mailbox. Your mailbox can stay on while you operate packet. It will also auto forward or reverse forward mail to and from other BBSs. A *check mail* LED blinks when you have mail. More features: remote sysop access, sysop paging, mailbox C-text, chat mode and many other features not available in other TNCs. The mailbox memory is expandable to 32K, 128K and 512K.

WeFAX gives you Weather Maps

You get a WeFAX mode that lets you print full fledged weather maps from your HF radio to screen or printer or save to disk using an MFJ Starter Pack.

Plug-in Modem - - 2400 or 9600 Baud

You can add MFJ's optional *internal* 2400 baud or 9600 baud modem just by *plugging it in* and making a few simple connections.

KISS interface and MFJ Host Mode

You get a KISS interface that lets you run TCP/IP and MYSYS and MFJ's Host Mode that makes it easy to write efficient application programs.

MFJ *Anti-Collision*™ Technology

You get MFJ's *Anti-Collision*™ technology that prevents packet collisions and improves performance on busy channels.

Plus more . . .

You also get 32K RAM, IC sockets for easy service, 256K ROM, speaker jack, lithium battery backup, RS-232 *and* TTL serial ports, radio cable (you have to add a connector for *your* radio). Fast-Start™ Manual plus much more. Use 12 VDC or 110 VAC. 9½x1½x7½ in.

One Year *Unconditional* Guarantee

You get MFJ's famous *No Matter What*™ one year *unconditional* guarantee.

Enjoy Packet for a long, long time

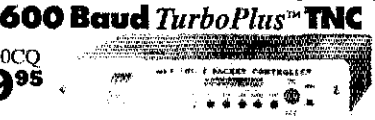
If you want a TNC that'll work 24 hours a day without failure -- *one that has more features than any other* -- get the ultra reliable MFJ-1270C today and enjoy packet for a long, long time.

2400 Baud *Turbo*™ TNC

MFJ-1270CT, $209.95. Has all the features of the MFJ-1270C plus built-in fast 2400 baud modem. Operate 300, 1200 and 2400 baud packet with the MFJ-1270CT. Radio modification is *not* necessary when operating 2400 baud packet.

MFJ 9600 Baud *TurboPlus*™ TNC

MFJ-1270CQ **$229.95**



Has all the features of the MFJ-1270C, *the most reliable TNC in the world*, plus built-in 9600 baud G3RUH compatible modem. Operate 300, 1200 and 9600 baud.

TNC ACCESSORIES

MFJ Starter Packs

An MFJ Starter Pack, $24.95, gets you on the air instantly. You get interface cable, software on disk and instructions -- just plug it all in and start enjoying packet. Order **MFJ-1284** for IBM or compatibles, **MFJ-1282** for Commodore 64/128, **MFJ-1287** for Macintosh or **MFJ-1290** for Amiga. For VIC-20 or C64/128 with tape drive use **MFJ-1283**, $24.95.

2400 and 9600 Baud Modems

MFJ-2400, $89.95, operates 300, 1200 and 2400 baud packet and works with any radio. **MFJ-9600**, $109.95, G3RUH compatible 9600 baud modem. Not all radios compatible with 9600 baud. Both plug into MFJ TNCs for easy installation.

Mailbox Memory

For MFJ-1270C/1276. Plugs into RAM socket for extra *mailbox* memory. **MFJ-45A** (32K), $14.95, **MFJ-45B**(128K), $34.95, **MFJ-45C** (512K), $219.95.

Real Time Clock

MFJ-43, $29.95, ends re-setting TNC clock everytime you turn it on. Maintains correct time even when TNC is off. Plugs into RAM socket. Works with MFJ TNCs and TAPR TNC clones.

FM Deviation Meter

MFJ-52, $29.95, plug this board into your TNC configured as TheNet X-1J Node and users can check their transceiver packet FM deviation. Requires X-1J or later nodeware. See *CQ Magazine*, Nov. 1993.

Firmware Upgrade 1.2.9

For older MFJ TNCs. **MFJ-40C**, $19.95, gives you enhanced mailbox and supports mailbox up to 512K.

Mailbox Memory Expansion Board

For older MFJ TNCs. **MFJ-47A**, $49.95, 32K RAM; **MFJ-47B**, $69.95, 128K RAM; **MFJ-47C**, $239.95, 512K RAM. Complete with firmware.

MFJ's new TNC/Mic Switch

Switch between your TNC or Mic by pushing a button!

MFJ-1272B/M **$34.95**

Switch between your microphone and TNC by pushing a button!

You won't have to unplug your microphone and plug in your TNC *everytime* you want to work packet or other digital modes.

Just plug these pre-wired cables into your rig's microphone connector and into your TNC and you're ready to go -- no more hard-to-find connectors and wiring up cables.

Works with HF, VHF and UHF radios with 8 pin mic connectors -- including Kenwood, ICOM, Yaesu, Alinco and others. *For radios with 8-pin RJ-45 modular telephone jack, select the new "M" models.*

Plug-in jumpers let you quickly set-up for virtually any radio. Factory set for Kenwood and Alinco. Includes easy-to-follow instructions. Has audio-in and speaker jacks. 3¼x1¼x4 inches.

MFJ-1272B/1272M, $34.95, for MFJ TNC/multimodes,TAPR TNC-2 clones.
MFJ-1272BX/1272MX, $39.95, for PK-232.
MFJ-1272BYV/1272MYV, $39.95, for KAM VHF/KPC3.
MFJ-1272BYH/1272MYH, $39.95, for KAM HF Port.

Pre-wired Radio-to-TNC cables . . . $14.95

	All MFJ	PK-232	PK-88	KAM™/KPC3
[1]Icom/Yaesu HTs	MFJ-5024	MFJ-5024X	MFJ-5024Z	MFJ-5024YV
[2]Kenwood HTs	MFJ-5026	MFJ-5026X	MFJ-5026Z	MFJ-5026YV
Yaesu 8 pin radios	MFJ-5080	MFJ-5080X	MFJ-5080Z	MFJ-5080YV MFJ-5080YH
[3]Icom 8 pin radios	MFJ-5084	MFJ-5084X	MFJ-5084Z	MFJ-5084YV MFJ-5084YH
Kenwood/Alinco 8 pin radios	MFJ-5086	MFJ-5086X	MFJ-5086Z	MFJ-5086YV MFJ-5086YH

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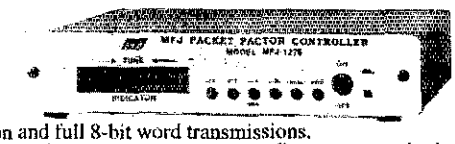

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brought them recognition from the state and their peers in neighboring Sections. It's a job well done by all who have been involved! I'd like to thank my staff people for their help. Especially Kit, WA6PWW, the Section Technical Coord, and Mitchell Lee, KB6FPW, the Official Observer Coord. These guys went beyond the call of duty in the time they've invested over the past 4 years! Lastly, I'd like to say special thanks to Glen, WB6W, who is my predecessor in this job and one of my best friends. Thanks, Glen! Thank you all for a great 4 years! 73 de Steve, KA6S

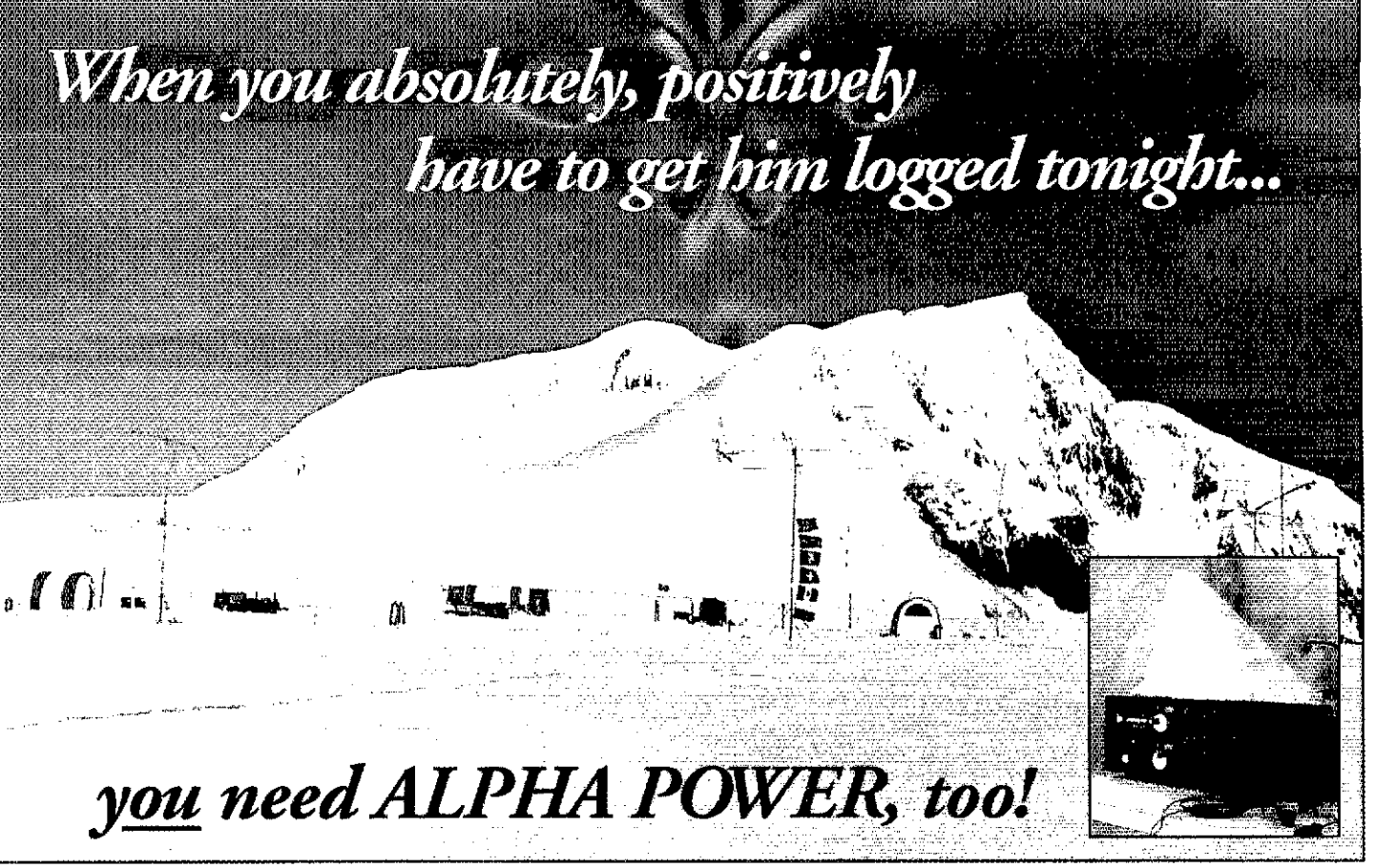
ROANOKE DIVISION

NORTH CAROLINA: SM, W. Reed Whitten, AB4W. ASMs: AB4S & KE4ML. SEC: WB4SGA. STM: K4IWW. BTM: W4EAT. ACC: WC4T. TC: KM4OX. SGL: KI4AN. OOC: W4ZRA. PIC: KN4AQ. BM: KC4CAC. Many thanks to Joe Henderson, WD4MRD, for more than 8 years of dedicated service as NM of the NC Morning Net. Joe's friendly, tactful approach has been an example for all of us. He asked if he could retire (at full pay, of course). K4IWW announced that Chuck Hoelzel, N4BJX, has agreed to serve as NM of this NTS net (NCMN, 3.927 MHz, 7:45 AM). Join Chuck, Joe and the rest of the gang for fellowship and practice in handling NTS traffic (essential for emergency communication). Good job by Mecklenberg Co ARES. EC KC4YOI reported that AEC Marty, AD4KO, activated ARES after an airline crash on Jul 2. County Em Mgt, airline officials and Red Cross (at 4 sites) used Amateur Radio for communication assistance. Barry, AD4LI, helped get access to some areas. The State Emergency Response Team (SERT) was activated and the *PacketCluster* was used to relay status reports to state officials. This doesn't just happen. Mark and other ECs throughout the Section work hard to develop a relationship with Em Mgt (and other agency) officials. Without this relationship and our participation in Em Mgt exercises, Amateur Radio doesn't have a role in the emergency plans. 1993 SET results show our Section in 3rd place for ARES and NTS participation! This shows how well our NTS & ARES program is working. Our NMs, ECs, DECs, SEC & STM are proud of this—and want to be 1st this year! SET is Oct 15 AM. Participate this year and help us reach our goal. Congrats to N4YRC, recipient of a Tandy Technology Scholarship and an ARRL Scholarship. Thanks for Field Day traffic from: Franklin ARC, New Bern ARC, Greenville ARC, Lenoir ARC, Wilson ARA, Capital Area Rptr Soc, Iredell ARS, WCARS, Morehead City ARC, Lexington ARES, Rowan ARS, TAARS, Apex IARDG, Stanly Co ARC, TEARA, CFARS, OCRA, RARS, Randolph ARC, Cary ARC, WD4BMG, Tar River ARC, Wake Tech ARC, Ashe Co ARC, Roanoke Valley ARS and BBBARTSS. Unconfirmed dates of the Falls Lake swapfest in Butner (Sep 25) and the Maysville hamfest (Oct 8). *Jun tfc:* KO4BJ 316, K4IWW 207, W4EAT 160, K4AIF 137, WB2EAG 135, KI4YV 123, NT4K 108, N4SMS 96, N4WZH 84, AC4DV 77, WD4LOO 69, N4UE 59, AB4W 56, W2JDB 41,KR4LS 39, WD4MRD 33, KC4PGN 32, KD4ZJH 32, N4LST 31, N9CGD 31, N4JTG 27, W4SVG 27, KE4AHC 17, WA4SRD 14, N2JLE 12, KD4OWS 10, K4DDY 9, W4DYW 8, K4MPJ 6, KA4KTU 5, KD4RYE 5, W4IRE 5, KD4RYF 4, N4BJX 2.

SOUTH CAROLINA: SM, Mike Epstein, KD1DS—STM: W4DRF. BM: KQ4OU. PIC: KA4LRM. OOC: W4NTO. AIRS: W4DRF. Congratulations to Emmie Patience, KA4LRM, for reaching the lofty heights of ARRL DXCC Honor Roll. Emmie's confirmed country count is 323, all worked with 100 W or less. Her interest in DX started when she was working toward her WAS and an Italian station answered her CQ. Emmie is also known for her work as NCS on sideband during Hurricane Hugo, her involvement in many capacities with the SC Single Sideband Net and as proprietor of Lee's No. 1. Her advice to new hams: Don't start out by learning code and use it on the air. Don't be in a hurry to upgrade. Use the privileges you learn as you go. I received a copy of Laurens Co Advertiser from EC Eric Hughes, KQ4KH. On p 1 is a picture of N4GFB who, with KQ4KH, addressed the Laurens City Council as Mayor Taylor signed a proclamation declaring Jun 20-26 Amateur Radio Week. Good work, gentlemen. The severe weather at the end of Jun into Jul tested the SKYWARN system in the upstate. The Greenville Co SKYWARN net was activated 3 times. N4ENX, acting as NCS, did her usual outstanding job. One net lasted most of the night until the severe storms worked their way through the area. AC4RJ, Greenville EC, reports 42 ARES members. *Tfc:* KA4LRM 74, N4PNE 66, W4DRF 51, KA4UIV 42, AD4IF 41, KQ4XE 31, KD1DS 25, AA4IX 13 (SSB) 11 (PKT), KA4SLQ 15, K4GLT 12, KD4WUU 10, K4GDL 5, AD4IU 4, W4VHZ 4, WA4HNA 3, WA4HNA 3, W4NCN 3, K8DZH 3.

VIRGINIA: SM, Ted Dingler, N4KSO—SEC: N4SCK @ KF4TE. STM: N4GHI @ WA3TAI. OOC: W8IRT. TC: N4UA @ WA4RTS. BM: W3ATQ. ACC: KA4YUY. SGL: W4UMC. Another Field Day has come and gone. I'm sure all who participated had fun and those who didn't participate sure missed a fun activity. Thanks to the Lynchburg ARC, Scott Cty ARC, Cary ARC, Roanoke Valley ARC, Mears, Mt Vernon ARC, Vienna Wireless Soc, Va Bch ARC and Busters Beach Bums for their Field Day reports. If your group didn't send the SM or SEC a msg, you missed out on an easy 100 pts. All the bands were open and all states were heard. Congrats to N4DCC for earning the PSHR certificate. Your interest in public service communication is greatly appreciated. The Lynchburg ARC has been busy this year with public service activities. It provided communication for an MS Walk, March of Dimes Walk, Tour du Pont and a footrace around the general hospital. Those working or NCSs were KC4AHV WA4RTS AC4RG WA2OLP KB2HBN N4QWF KD4OOM KD4RBX KQ4NS WD4GYW N4TIU KD4TNQ WA4FHQ W4GCE KD4HAE WD4RCQ W4RLA KA4YNO KB4MPX W4WWO KE4JGT WB4QXE KD4ZSF KD4ODP KE4KEH KD4GMU W4OKM N4KSS N4JMK and N4WHP. Your willingness to serve is greatly appreciated. If your group does a lot of public service activities, send in a report to the SEC and/or SM and let them know what's going on in your area. These activities show that we're fulfilling our public service. Exams in the Section: Sep 9 Galax, VA, contact W2NL at 703-766-3121; Sep 10 Mt Vernon ARC, Frank Mackey at 703-455-1510; Sep 10 Culpepper ARC, Bill Hawkins at 703-395-6595; Sep 18 VA Beach Hamfest/Sparks, Ed Brummer at 804-898-8031. Sep 24: Gloucester, VA, Fran Sterling at 804-484-2857. Sep 24 Hollins College, Fred Horton at 703-366-6256. As you can see, there are a lot of opportunities to

When you absolutely, positively have to get him logged tonight...



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"The *ALPHA* amplifiers performed flawlessly...."
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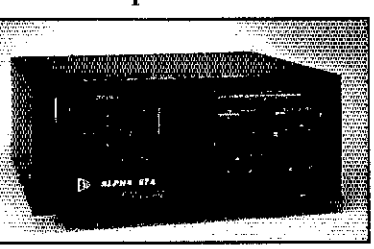

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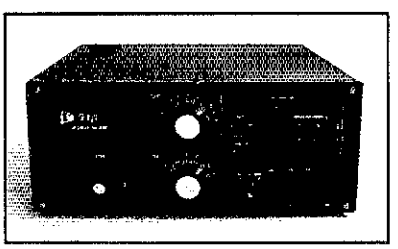

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upgrade. Take advantage of them and good luck. You'll probably get this issue of *QST* before the VA Beach hamfest Sep 17-18. Mark your calender and plan to attend. It's a good one and you don't want to miss it. While you're there, stop by the ARRL table and say hello. I'd like to meet you and find out what's on your mind. Attend the Section meeting that will be held at approx 1 PM. The Div Director is also there and would be glad to hear your concerns also. Hope to see you at the beach. 73. *Tfc:* K4DOR 710, N4GHI 502, KQ4ET 305, K4MTX 206, W3ATQ 198, WA9FCH 181, KQ4ET 179, N6ANO 161, KE4KEU 152, WB4ZNB 130, K4BGZ 125, WA8AHV 124, WD4MIS 122, KR4MU 119, KD4DDI 88, W4UQ 67, KD4JMA 54, AA4AT 51, KD4FUN 45, N6OD 44, N3PDK 44, KB4CAU 43, KE4HIA 43, KE4GEG 36, W4TZC 31, N6ABM 30, N4DCC 28, N4YVX 28, KD4NFY 28, KE4DXA 25, N4FZA 19, N4KSO 14, KE4KET 13, KE4HFX 12, N4JEO 12, KN4US 11, WB4UHC 10, WA4TVS 10, KD4UFS 8, W4HU 6, KE4DRB 5, K4VWK 5, KC4YIW 4, K4JM 3, KE4DRA 3, N4FNT 2, N4FNT 2, W84KIT 2, WA1VRL 1.

WEST VIRGINIA: SM, O. N. (Ollie) Rinehart, WD8V—STM: N8FXH. SEC: K8QEW. SGL: K8BS. TC: K8LG. ACC: WA8FLF. RFC: N8FMD. The WV Section ARRL Convention has come to a close, although it overlapped the month's end. I'll report here. The Outstanding Amateur of the Year selected was none other than my wife, Ann Rinehart, KA8ZGY. Ann, I'm particularly proud and pleased by your accomplishments. Nice to have a wife who supports you in Amateur Radio; fine job, Ann. The CW contest was another thing. Cal Basham, W8NR, and among others, Bob, W8IMX; Bill, K8TPF; Jack, KA8WNO; and ARRL Lab Supervisor Ed Hare, KA1CV, participated. It was a pleasant surprise to see Mike Moskal, N3RHO, from Pittsburgh, PA, come away with the winning solid copy of 35 wpm. Hey, guys, did I detect some intentional error? By the way, Mike is 14 years of age, 1/3 the average age of contestants. Hi Hi. John, N4MM, ARRL Division Director; Dennis, W4PWF, Vice Director; and Ed, KA1CV, did a fine job representing the League with the technical forums, ARRL forum and manning the ARRL booth, fielding questions and giving answers. I'd like to present an idea I intend to put into effect in the WV Section, which is expanding the Amateur Auxiliary/Official Observer program. The intent is to establish a working group representing the entire Section somewhat similar to DC/EC setup. This group would not only assist the League and the FCC in policing (salt) the frequencies, but would also act as liaison and PR reps for the SM and the League. *Net QNI/QTC/Sess:* WVEN 909/135/30; WVMD 718/68/30; WVN-E 160/67/30; WVN-L 154/51/30; Hillbilly 124/08/04. *Tfc:* WD8V 348, KA8WNO 342, N8IXF 162, W8YP 161, W8JWX 71, W8IMX 57, N8FXH 33, WD8DHC 18, N8OYY 18.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Tim Armagost, WBØTUB—SEC: Glen Colbert, NØLDZ. STM: Mike Stansberry, KØTER. Jack Patterson, WTØG. ACC: Ron Deutsch, NKØP. PIC: Warren Williams, NØPBY. OOC: Karen Schultz, KAØCDN & Glenn Schultz, WØIJR; SGL: Geno McGahey, AL7GQ; ITC: Kim Elmore, N5OP; BM: Stan Morris, NØJOQ. Ah! A great Field Day just finished! The following clubs and groups sent messages to the SM's office: N3SL at DIA (nonclub); NE CO ARA at Padroni, reported by NØONL; Loveland Repeater Assn at Loveland, reported by NØKTC; Longmont ARC at Nederland, reported by NØNMD; District 22 ARES at Daniels Park, reported by NØKKZ; Arapahoe RC at Rampart Range Rec Area, reported by KRØU; Club Six Sparks and a Gap, near Empire, reported by WNØB; Ski Country ARC at Four Mile Park (10,000 feet up!), reported by KØCL; High Plains ARC 5 mi W of Sterling, reported by WØLHA; and the Royal Gorge ARC at Centennial Park in Cañon City, reported by NØPZP and delivered by NØKRH. Nice going, one and all! Sad news to report: Ed Wright, WØLJF, is a Silent Key. Ed was one of the area's most active and involved amateurs and will be missed by many! More on this in next month's column. I had a nice visit with Steve Lind of the FCC here in Denver this past week. We chatted about many items too numerous to enumerate (look at the size of *that* word!) here. The main thing that's easy to pass along is that the Field Office's main objective is compliance—so a word to the wise. 73! WBØTUB. *Tfc:* NØBQP 694, KCØVOL 636, NØDKK 634, WØLVI 340, KBØHPH 296, NØJUS 293, WBØACH 231, KØYFK 210, NØFCR 165, KGØAO 124, WØWPD 71.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: K5BIX, SEC: K6YEJ. STM: ND5T. NMs: WA5UNO & WB5ZME. TC: W8GY. ACC: KA5BEM. NM Roadrunner Net meets daily 3939 at 0100 UTC, handled 108 msgs with 1301 check-ins. NM Breakfast Club meets daily 3939 at 6:30 AM, handled 143 msgs with 451 check-ins. Caravan Club 2-mtr Net, .66/.06, handled 18 msgs with 451 check-ins. Caravan Club 2-mtr Net, .66/.06, handled 14 msgs with 98 check-ins. SCAT Net, .66/.06, handled 18 msgs with 737 check-ins. Four Corners Net handled 49 msgs with 561 check-ins. GARS Net handled 3 msgs with 23 check-ins. Duke City hamfest (Albuquerque) is Aug 20. We're looking forward to the visit by ARRL HQ Lab Supervisor Ed Hare, KA1CV, and ARRL Rocky Mountain Division Director Marshall Quiat, AGØX. We understand that Walt Stinson, WØCP, a world-class DXer, is coming. The Alamogordo hamfest is Sep 3-4. Hope to see you there. Field Day was a record in several ways. We had temperatures of 103° to 112° around the state & good PR, with good TV and newspaper coverage. Plenty of good FD msgs to the SM. Good scores from all around the state. NCR5, our only STA packet station, plans to move to CA. Boy, we'll sure miss him, but we wish him the best in his move. W5QNR suffered another heart attack, but thinks he'll be okay soon. Hope to see you at QCWA National. 73.

UTAH: SM, Rich Fisher, NS7K—Jim Brown, NA7G. STM: Mike Collett, K7DOU. PIO: Lon Stuart, WM7E. OOC: Ron Johnson, WE7H. BM: WA7MEL. UT Hamfest 1994 was a big success. It's time to start looking at SET. I hope everyone is working on the grab and go kits and 72-hour kits. The bands haven't been too good for working DX. You may want to check into the Section nets that meet every day. The Beehive Net meets at 1230 MDT on 7272 kHz. The UT Code Net meets at 1930 MDT on 3710. *Tfc:* KD7UM *APLink* tfc 73, bulletins 35, others 250 KD7NX private messages 665. *Tfc:* 76 bulletins 96 users 44, WA7MEL 38.

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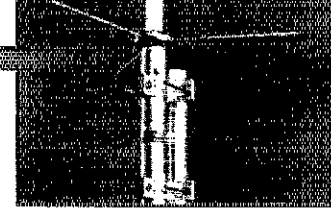

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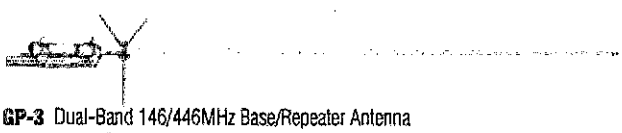
Wave: 146MHz 5/8 wave x 3 **VSWR:** 1.5:1 or less **Max Power:** 200W PEP
446MHz 5/8 wave x 8 **Length:** 17' 8" **Weight:** 5lbs. 11ozs.
Connector: SO-239 (GP-9), N-type (GP-9N) **Mounts to Mast Size:** 1.25"-2.50"
Construction: Heavy duty fiberglass, 3 sections, 92MPH wind survival

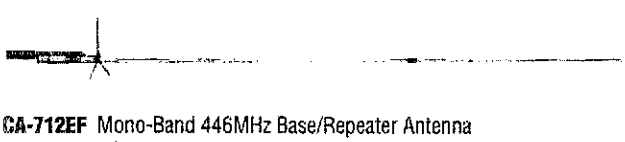
GP-6 Dual-Band 146/446MHz Base/Repeater Antenna
Wave: 146MHz 5/8 wave x 2 **VSWR:** 1.5:1 or less **Max Power:** 200W PEP
446MHz 5/8 wave x 5 **Length:** 10' 2" **Weight:** 3lbs. 8oz.
Connector: Gold-Plated SO-239 **Mounts to Mast Size:** 1.25"-2.50"
Construction: Heavy duty fiberglass, 2 sections, 112MPH wind survival



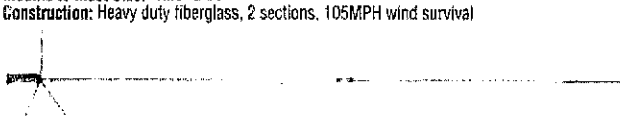
GP-3 Dual-Band 146/446MHz Base/Repeater Antenna
Wave: 146MHz 5/8 wave **VSWR:** 1.5:1 or less **Max Power:** 200W PEP
446MHz 3/8 wave x 3 **Length:** 5' 10" **Weight:** 2lbs. 9ozs.
Connector: Gold-Plated SO-239 **Mounts to Mast Size:** 1.25"-2.50"
Construction: Single piece fiberglass, 130MPH wind survival

COMET MONO-BAND

CA-ABC23 Mono-Band 146MHz Base/Repeater Antenna
Wave: 146MHz 5/8 wave x 3 **VSWR:** 1.5:1 or less **Max Power:** 200W PEP
Connector: SO-239 **Length:** 14' 12" **Weight:** 3lbs. 8 ozs. **Mounts to Mast Size:** 1.25"-2.50"
Construction: Thick-wall aluminum, 3 sections, 70MPH wind survival



CA-712EF Mono-Band 446MHz Base/Repeater Antenna
Wave: 446MHz 1/2 wave x 12 **VSWR:** 1.5:1 or less **Max Power:** 200W PEP
Connector: N-type **Length:** 10' 5" **Weight:** 2lbs. 12ozs.
Mounts to Mast Size: 1.25"-2.50"
Construction: Heavy duty fiberglass, 2 sections, 105MPH wind survival



CA-62DB Mono-Band 6 Meter FM Antenna
Wave: 52MHz 5/8 wave x 2 **VSWR:** 1.5:1 or less **Max Power:** 500W PEP
Connector: SO-239 **Length:** 21' 8" **Weight:** 5lbs. 11ozs.
Mounts toMast Size: 1.25"-2.50"
Construction: Thick-wall aluminum, 5 sections, 100MPH wind survival

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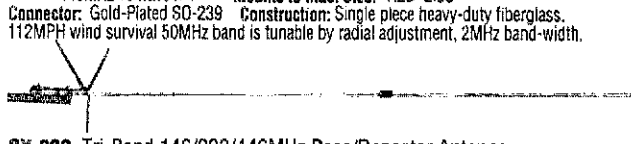
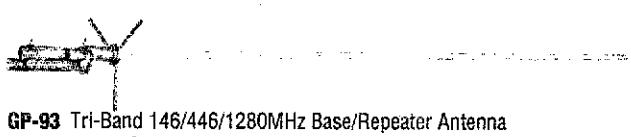
COMET TRI-BAND

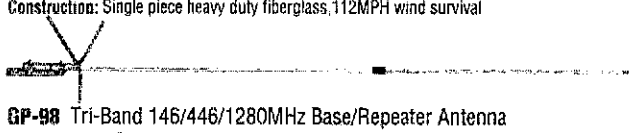
GP-15 Tri-Band 52/146/446MHz Base/Repeater Antenna
Wave: 50-54MHz 5/8 wave **VSWR:** 1.5:1 or less **Max Power:** 300W PEP
146MHz 5/8 wave x 2 **Length:** 7' 11" **Weight:** 3 lbs. 1 oz.
446MHz 5/8 wave x 4 **Mounts to Mast Size:** 1.25"-2.50"
Connector: Gold-Plated SO-239 **Construction:** Single piece heavy-duty fiberglass.
112MPH wind survival 50MHz band is tunable by radial adjustment, 2MHz band-width.



GX-333 Tri-Band 146/223/446MHz Base/Repeater Antenna
Wave: 146MHz 5/8 wave x 2 **VSWR:** 1.5:1 or less **Max Power:** 120W PEP
223MHz 5/8 wave x 3 **Length:** 10' 2" **Weight:** 3 lbs. 10 ozs.
446MHz 5/8 wave x 5 **Mounts to Mast Size:** 1.25"-2.50"
Connector: Gold-Plated SO-239
Construction: Heavy duty fiberglass, 2 sections, 112MPH wind survival



GP-93 Tri-Band 146/446/1280MHz Base/Repeater Antenna
Wave: 146MHz 5/8 wave **VSWR:** 1.5:1 or less **Max Power:** 300W PEP (146MHz)
446MHz 5/8 wave x 3 **Length:** 5' 7" 200W PEP (446/1.2)
1280MHz 5/8 wave x 6 **Mounts to Mast Size:** 1.25"-2.50" **Weight:** 2 lbs. 8ozs.
Connector: Gold-Plated N-type
Construction: Single piece heavy duty fiberglass,112MPH wind survival

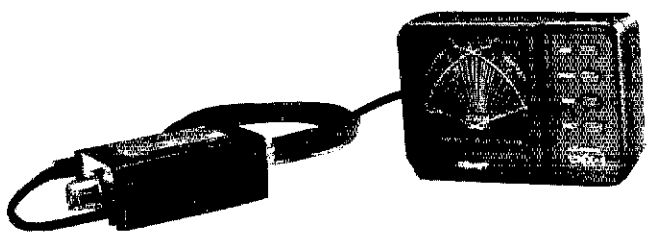


GP-98 Tri-Band 146/446/1280MHz Base/Repeater Antenna
Wave: 146MHz 5/8 wave x 2 **VSWR:** 1.5:1 or less **Max Power:** 300W PEP (146MHz)
446MHz 5/8 wave x 5 **Length:** 9' 8" 200W PEP (446/1.2)
1280MHz 5/8 wave x 12 **Mounts to Mast Size:** 1.25"-2.50" **Weight:** 3 lbs. 8ozs.
Connector: Gold-Plated N-type
Construction: **Heavy-duty fiberglass, 2 sections, 112MPH wind survival**

CROSS NEEDLE METERS

- Separate Meter and RF Sensor allows for convenient placement of the meter.
- Cross Needle Meter provides FWD, REF, and VSWR simultaneously.
- The RF-Sensor is a compact design, and has an extremely low-loss circuit.
- Beautifully illuminated when connected to power supply.
- 6 foot cable standard.
- Optional EKS-3 10 foot extension cable for a total of 16 feet between the sensor and meter.
- Compact Size: (L) 4.75" x (W) 1.75" x (H) 3.5"

CMX-1	CMX-2	CMX-3
1.8-60MHz	1.8-200MHz	140-525MHZ
0-2KW	0-200W	0-200W
30/300/2KW	20/50/200W	20/50/200W



WYOMING: SM, Rev Morton, WS7W—Field Day was a big success around the state with 8 stations checking in Sun morning with AB7BJ, who was acting as SM in my absence. It was upsetting for me to miss Field Day because I enjoy meeting everybody as I travel around the state. My plan for 1995 Field Day is to visit the towns that were on my agenda this year (Cheyenne, Laramie, Casper). I'm glad to report that Ike, WA7NZI, is home and doing well, and back to work after he gave all who know him a scare on Jun 4. Test revealed he had a mild heart attack, but knowing there was still some post-hamfest work to do, he wasn't going to let a little thing like that slow him down. Nice to have you home, Ike. The Casper ARC was busy in late Jun and early Jul. It supplied communication for the WY State Games and the Casper Classic Bike Race. Both events last 4 days or more and required a commitment of time and hard work by all who helped. Club pres Steve Spier, N7JUO, deserves a big thank you for his leadership in both events. *Tfc:* W7SQT 18.

SOUTHEASTERN DIVISION

ALABAMA: SM Ken McGlaughn KM4JD—ASMs KC4RNF, W4XI, KL7Q, KC4TFF, AA4CW, KL7P. SEC: KC4RNF. STM: W4DGH. PIC/BM: KL7Q. SGL: KC4YAU. OOC: KC4TFF. TC: N4MOK. AAC: AD4DB. Tropical Storm Alberto came ashore over the FL panhandle and slowly moved N, where it stalled over E AL and W GA, dumping record rains. These rains brought devastating floods, causing millions in property damage and the lost of many lives. AL hams reacted under the leadership of newly appointed SEC Rick Kimbrell, KC4RNF, and District 10 EC Charles Finney, N4RNU. Our primary mission was to provide communication from County EMAs and Red Cross shelters to the District EOC in Dothan; to the AL State EOC in Clanton and the State Red Cross Headquarters in Montgomery. Those who participated in support of this crisis can be proud of the service you provided your community and state. You did an outstanding job under trying circumstances. Congratulations to Harris Winston, WA4JDH, for being named Ham of the Quarter Apr-Jun 1994. Harris consistently achieves BPL status every month. Congratulations to Rick Kimbrell, KC4RNF, who serves you as an Asst SM, Section Emergency Coord and NM of the AL Traffic Net-Mike, AL Emergency Net and the 2-Meter Mon Night Welcome Net. Rick was selected ARRL AL Section Officer of the Quarter Apr-Jun 1994. *Tfc:* WA4JDH 656, KC4TFF 394, KC7Q 365, W4CKS 256, KC4RNF 169, W4ZJY 82, KR4QK 2, W4PIM 69, W4DGH 62, W4ZBA 56, KC4VNQ 53, KO4QV 31, N4YYQ 27, W4XI 21, N4ZNO 21, W4NTI 19, WB4TVY 14, KD4TQN 14, KO4OL 6. *Net/QNI/QTC/Sess:* ADN/537/338/30, AENW/182/0/4, AENZ 164/8/18, AETN/60/3/4, ASN/246/79/55, ATNM/2461/164/34, MNWN/58/1/4, SCCN/92/5/4, TRACN/182/2/10, WAEN/92/4/4.

GEORGIA: SM, Jim Altman, N4UCK. ASM: K4JNL, N4LLX, W8BLA. SEC: KA4HHE. OOC: W8BLA. STM: KM4QQ. SGL: WB4UVW. PIC: W4MZW. ACC: KB4TJO. TC: KI4XO. BM: N4CYC. I'm writing this while I sit and listen to the ARES net handling the flooding in central and S GA. The participants are far too numerous to begin to mention, and it would be unfair to mention some and not all. Everyone has heard of the 100-year flood. This was it. Who would have expected a relatively minor tropical storm would cause such devastation? The net functioned excellently the entire time. Disasters happen in 2 stages: the occurrence itself and the aftermath. This one happened in slow motion, as first Macon, then Americus, Montezuma, Albany, Bainbridge, and on and on. Traffic was going into GEMA regarding water levels rising in one community, while relief supplies were going into staging areas for another. Tens of thousands of displaced persons. Never enough volunteers. Our resources were stretched to the limit and beyond. The FCC declared a communication emergency to provide authority for a clear frequency and we owe it a great day or two in disaster areas. Please join ARES and note your capabilities. We need a more comprehensive VHF digital network. We could have handled Health-and-Welfare earlier and better if we had been able to reroute it to packet. An emergency requires mgmt, maybe that's why the government calls them "emergency management agencies." We could manage our end better with a truly statewide packet system. I'm sure the hardware is in place for such a system; creating cooperation to achieve its operation is another matter. We need an emergency plan that uses frequency agile radios to create a statewide system on demand, and cooperation to make it work. Finally, we need to avoid temptation to repeat everything we say twice in each transmission. Sometimes it's appropnate on a marginal path, but when you're "60+ over," it wastes time. A great job was done by all, congratulations. *Tfc:* W4AET 177, KM4QQ 175, KA4FOM 102, AD4KA 100, K4KIC 78, N4UZ 65, WD4DSS 52, WB4GGS 35, K4BAI 23, W4REI 14.

NORTHERN FLORIDA: SM, Rudy Hubbard, WA4PUP—ASM: N4ADI. ACC: KI4BI. BM: N4GMU. OOC: WB4GHU. PIC: W4SME. SEC: W4MLE. SGL: KC4N. STM: WX4J. TC: WØRAO. Congrats to Bernie, KQ4YD, new NM for NFPN. Term started Jul 1 and net went into special session Jul 2 because of Alberto—that's getting your feet wet quick. The state EOC requested a SET with a hurricane named PYFROM. The SET went well and several of our DECs and ECs did a good job. The NFPN Emerg Comm Plan worked effectively, however, 2 weeks later, we had to put it into actual emergency conditions as Alberto visited our state and entered at Destin on Jul 2. Okaloosa hams did a good job and all who participated should be proud of their performance. Most activity was in the W Panhandle, E Panhandle and Capital Districts. As if this wasn't enough, the FL Crown in Jacksonville was busy assisting in locating a little 5-year-old girl lost in the woods on Little Talbot Island State Park. More than 30 hams came out, and it turned out the be the best Mother's Day she ever had. Another request for hams occurred in Gainesville with 30 amateurs responding to a call because of a serious gas leak. During Jun we had Field Day. It seems a lot of amateurs were in the field, although several experienced bad weather because of summer thunderstorms. Just as we thought Alberto had moved N, it came back. As of writing this, the NFEN was activated because of flooding in E and W Panhandle. Who'd guess the net would be called into 3 sessions in 3 weeks? Congrats to WN4IIV, new pres of TARS. Congrats to WX4H and WA4PUP on making BPL for Jun. 73, Rudy. *Tfc:* WX4H 1541, N4SS 438, NR2F 395, WA4NDA 357, WA4PUP 295,

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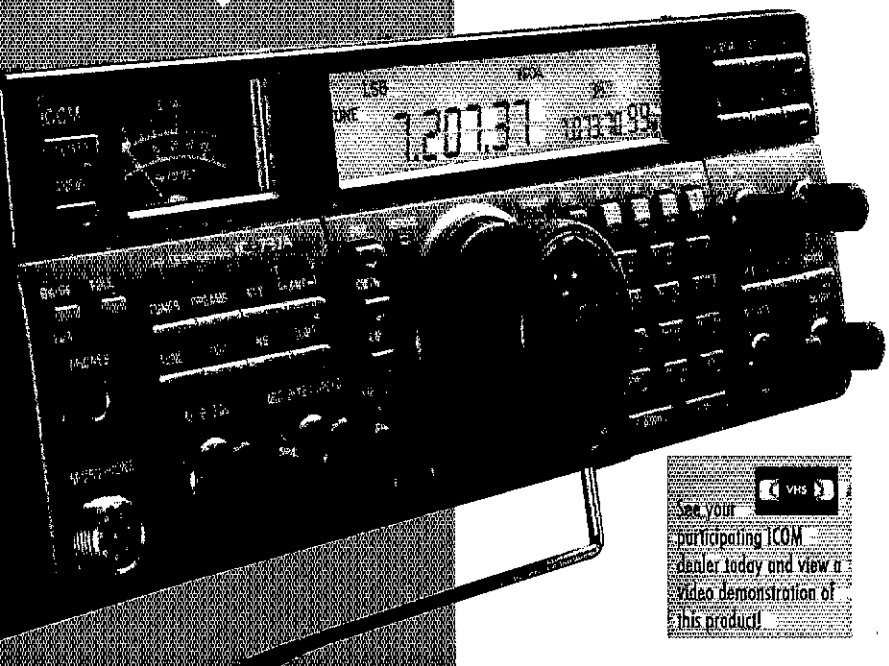

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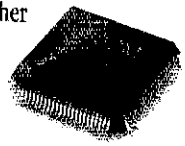
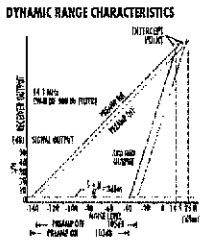
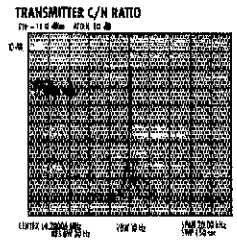
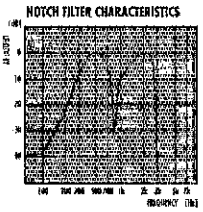


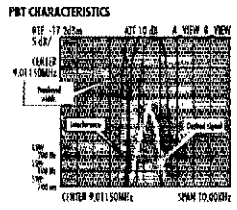
Pass Band Tuning – Electronically narrows the IF passband to eliminate interference signals (more effective than IF shift offered on competitive models).





Notch Function – Tune out an interfering signal frequency to eliminate unwanted CW or AM carrier tones, while preserving the desired signal's audio response. The combination of PassBand Tuning and Notch Function is very effective on crowded bands.





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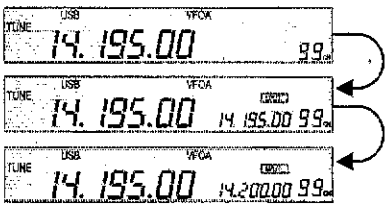

Auto Antenna Selector – Two antenna connectors let you select the best antenna for band and conditions from the front panel. Stores to both band memory and memory channels.

Double Band Stacking Register (DBSR) – Memorizes two frequencies and modes **in each band.** Can be used like extra VFOs in one band. Use one register for CW and the other for SSB if you like.

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KE4DNO 139, AD4DO 139, AD4CN 112, KM4DY 112, WA4EYU 99, W4MLE 92, WC4D 83, WX4J 79, N4JAQ 77, AD4BL 76, KO4DR 68, N4WMS 58, N4GMU 58, KD4RZP 58, KI4CO 56, KD4WDB 29, W4KIX 28, N4XUJ 22, KB4AR 21, AA4FG 16, WB4WOO 14, KB4OLY 12, KB4WCX 11, W8IM 9, KQ4YD 9, WB2IMO 6. Correction to May: WA4PUP 507. *(May)* WD4IIO 16, KD4OBQ 102.

PUERTO RICO: SM, Tele Figueroa, KP4P—I'm pleased to welcome KP4DDB as our newly appointed PR SM, Guillo is a well-known, active ham who devotes most of his time to helping others. Thank you, also, to my staff for an excellent job during the past 2 years, and to individual hams and clubs that said present at all times. The PR YL Club had a weekend activity in Jul at a resort in La Parguera. YLs and their respective OMs visited historical places at W and S part of the island. The Amateur Radio News Service awarded a certificate of excellence to *Eureka* for its contribution to Amateur Radio journalism during 1993. Congratulations to its editor, KP4PQ. PR Section sent a letter expressing our concern on the proposed Relocatable Over-The-Horizon (ROTH) radar system in PR. Thanks to KP4ADV for his advice. 73 de Tele, KP4P.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK @ KD4GR—ASM: K4ZK @ KB4VOL, ASM for Youth Activities, KA4FZI @ KE2IX. STM: AA4HT @ WD8IBY, SEC: W4SS. Asst SECs: WB2WPA @ WB2WPA, KD4GR @ WB2WPA, KD4GR @KD4GR. TC: KI4T @ N4UTO. BM: WD4KBW @ WD8IBY. PIC: WA4ATF. OOC: WB4GHU @ WD8IBY. ACC: NY1H @ W4DPH. SGL: KC4N @ W1FJI. Pkt Mgr: KB4VOL @ KB4VOL. It's with deep regret that I inform you that our STM, Bill, K4ZK, has decided to retire from that position effective Jul 31. He'll continue as Asst SM, with KA4FZI. He's had an interesting life, from marine radio operator and fish counter on a codfishing ship in the Bering Sea, merchant marine radio operator during WW II (sunk once), diplomatic corps and activity in Amateur Radio from all over the world. He's decided to write his biography, but will continue to be active on the nets. He's been a faithful leader, is a true friend and will be greatly missed in that appointment. However, the Section is fortunate to have Rip, AA4HT, willing to accept the appointment. Rip is a knowledgeable traffic handler and has been STM for NFL in the past, so K4ZK is turning it over to an extremely capable successor. Thanks to both of you for all of your help. The Hillsborough County ARES/RACES requested and received a proclamation from the Hon Lawton Chiles, Governor of the State of FL, honoring all FL Amateur Radio operators for their efforts when needs for emergency communication arise. A similar proclamation was received from Sandra W. Freedman, mayor of the City of Tampa, honoring the Tampa amateurs. Formal Field Day messages were received from Broward County AHS/RACES, Pinellas Park Metro Club, Patrick Air Force, Highlands County ARES, Ft Pierce ARC/Port St Lucie ARA, Tampa ARC, S Brevard ARC, Martin County ARA, Polk Ham Club, BB's Bunch, Okeechobee ARC, ARA of SW FL and informal messages from KD4EMI and the Charlotte ARS. Newsletters included ARA of SW FL, Martin Co ARA; Englewood ARS said WA2LKI gave a talk on emergency communication; Hillsborough Cty Emergency Planning Operations, Ft Pierce ARC, Platinum Coast ARS, Palm Beach Packet Group; Motorola ARC had an emergency HF inverted-V antenna written up with diagrams by WB4YUC; Ft Myers ARC, SWFTN, Broward ARC, Sarasota ARA, SFL FM Assn; I was gone the last part of the reporting period, so I'm sure I've missed some newsletters, but back to normal soon. Congrats to W4SS, WB2WPA, KD4GR, K4ZK and all of the ARES and traffic net ops who supported the state-sponsored Hurricane Pyfrom exercise. K4INJ sent a copy of the *Okeechobee News* that had an almost full-page article on the Hurricane Pyfrom exercise. The article had a nice picture of K4INJ. KD4GR reported that one jump team was actually deployed during the Hurricane Pyfrom drill. WD4KBW reports that 32 bulletins were sent and received in May by W4DL, WA4EIC, WT4F, WD5KBW and KB4WBY and for Jun there were 231 sent and received by W4DL 33, WA4EIC 94, WD4KBW 24 and KB4WBY 80. The ARRL Information Net meets at 7:30 AM Sat on 3940 kHz, followed by the SFL ARES Net at 8 AM on the same frequency. 73 de WA4PFK. *Tfc:* W3CUL 3408, W3VR 1252, WA9VND 688, KB4WBY 565, KD4ELJ 395, AA4HT 365, WA4PFK 313, K4SCL 284, WA4EIC 243, NY1H 217, W4DL 201, KD4GR 176, K4ZK 145, KC4ZHN 141, KD4HGU 137, KD4PNC 124, KD4QXF 120, KA4FZI 115, AA4BN 108, WB4PAM 98, KD4LQG 98, KA2YZM 94, KC4ZHN 93, AB4K 93, WB4WYG 79, KI4VT 79, K4RBR 76, KB4MON 76, K2GNZ 64, KD4HKS 39, KE4ESV 36, W4DWN 30, WB4GCK 27, N4EKC 26, W4WYR 14, WT4F 11, N2WX 10, K4BOH 9, W4NSY 8, WB2NJV 8, WA4PIL 6, KN4OX 5, W3IJR 5, AA4ZV 5.

VIRGIN ISLANDS: SM, Ron Hall, KP2N—We're in the middle of hurricane season. Please monitor the weather emergency nets. Congratulations to Vic, NP2GK, who upgraded to Extra Class, and to Ray, WP2AII, who made General. Lou, KV4JC, reports that the average check-in for the Caribbean Maritime Net now stands at 50. The St Thomas/St John ARES net report for Jun was ONI 66 with 4 sessions. NCS was NP2RT. Enjoyed a few days in the Chicago area. Attended the Hamfesters hamfest and had a good eyeball with island visitors WB9W and K8OHC. Have been active on the satellite with KP2BH. The new SM for PR is KP4DBB and we wish him good luck in his new office. 73 de Paradise de KP2N.

SOUTHWESTERN DIVISION

ARIZONA: SM, Clifford E. Hauser, KD6XH—The Southwest convention in Aug in San Diego was a great success. Everyone who attended had an interesting and educational time viewing the new equipment and listening to the talks on Amateur Radio. It was nice meeting and talking with people to get new ideas on improving Amateur Radio in AZ and the Southwest. I'll try to include these recommended changes. The main concern seems to be the increase in radio interference and personnel training. The FCC has asked us to police ourselves by using our skills to locate people using illegal operations and causing interference. We are to contact the FCC office in Douglas and provide it with documented information. Its limited budget prevents it from looking into every call for help. We need to provide it with documented information for it to act. Contact me for

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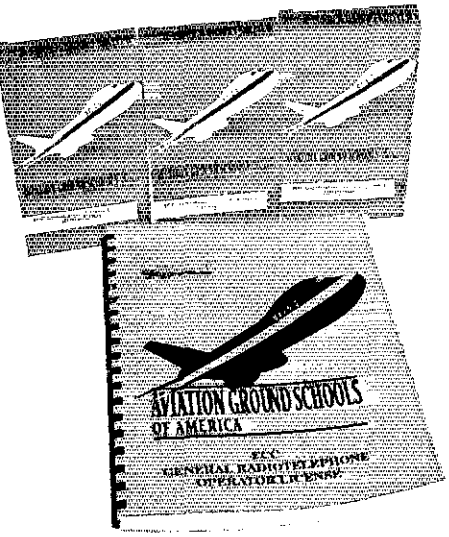

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info. The Scottsdale ARC plans to host the 1996 Southwest convention in Phoenix. Dates of this event will be forwarded as soon as available. The next big event is Family Amateur Radio Event (FARE) in Scottsdale on Sep 17. Contact Len Winker, KB7LPW, at 602-861-0303 for information. So far this year, AZ has increased its Amateur Radio population by more than 700 newly licensed individuals. The welcome letter sent to each new ham has helped increase ARRL membership and club membership. Is your club helping these new amateurs learn the do's and don'ts of Amateur Radio and proper operating procedures? Conchise Co RACES organization provided support for the forest fires during Jul. My list of clubs for AZ has increased to 42. I still need additional personnel for the positions of Emergency Coords, Official Observers and other ARRL volunteer positions in this state. If you're interested, please contact me and I'll explain the duties of your area of interest. When's the last time you tuned into Len's Amateur Radio show? This program promotes Amateur Radio in the Phoenix area and throughout the state and has gone national. His program is on Sun afternoon at 1500 hours local, on radio station KFNN (Phoenix) 1510 kHz on the AM dial. Future hamtests are Bullhead City Oct 7-8, 1994, and Tucson (OPRC) Oct 14. The state of AZ has a Silent Key: Margaret Bass, WB7VOM (wife of Ray Bass, K7OMR), passed away on Jul 4, 1994. Congratulations to the new officers of Amateur Radio Council of AZ (ARCA). 73, Clifford E. Hauser, KD6XH. *Net ON/ Tfc/Sess:* ATEN 781/86/29; ACN 145/79/30. *Tfc:* N5DKW 482, W7EP 109, WB6OTS 49, K7VC 31, K7ARZ 29, W7DQS 2.

LOS ANGELES: SM, Phineas J. Icenbice Jr, W6BF—Emergency planning is progressing at most hospitals in the San Fernando Valley, especially in Northridge Area and the Northridge Hospital that was nearly on ground zero, above the epicenter. Hank, K6YMJ, our ARRL Section Emergency Coord, has written an excellent document for Disaster Communication, especially directed to the Northridge Hospital; dated 7/20/94. Hank's fax number is 818-709-2939 if you'd like a copy. My computer hard drive crashed after the earthquake, but one local computer store reported that 40 computers were inoperative in the store as a result of the Northridge Earthquake. It's amazing what a few Gs of shock can do in a few minutes. Jun 25, Field Day report from the DCS-22, Bluff Park, Malibu, operated with 20 operators using the call sign N6FDR (4A). Bluff Park is a great location for weather and radio, according to the happy campers. Membership in the ARRL and your local club is important to you and all of our future in Amateur Radio. The programs you see and use are only as good as your involvement and your support. The legacy we leave for the next generation is up to each of us. The JPL ARC operated Field Day at Mt Gleason. The famous W6VIO call sign was used by 39 members present; 7 were ARES members and many others were JPL engineers. Our ARRL VP, Jay Holladay, W6EJJ, is an engineer at JPL and active member of the JPL ARC. It's been established beyond any doubt that Sy, N4KEL/Mobile, is the world record holder of "Worked Them All Mobile." However, Sy didn't use the largest mobile antenna to accomplish this unbelievable task. The largest mobile antenna award goes to my good friend Don Daily, AA6GE. Don has designed and built an antenna more than 150 ft high, and has operated on the beach with the van in motion! Oh, yes: Don erects the monster antenna by himself in about 20 min. You could ask about the stability of a radio van with 150-ft-high vertical antenna. Don would tell you that he's adequately prepared with batteries to run a kW for hours. A cubic yard of lead provides base stability. Don's also built a front-end winch to help navigate the steep and often soft terrain because the van does weigh a few tons. An unusual sight was spotted by a hwy patrolman between LA and San Diego: It was a Cadillac with a CA ham license plate, going south with a pair of goats riding in the back seat. The patrolman stopped the car and suggested that the ham take the goats to the San Diego Zoo. However, the next day the same patrolman spotted the same auto going north on the San Diego freeway, so he stopped the same ham and asked where he was going. The answer was that the goats enjoyed the San Diego Zoo so much that he was taking them to Disneyland. *Tfc:* K6UYK 514. 73 de W6BF.

ORANGE: SM, Joe H. Brown, W6UBQ—ASMs: Riv Co-Bob, W6LKN, 909-686-3823; Org Co- Art, W6XD 714-556-4396; SB Co-Ken, WA6ZEF 909-983-1272. PIC & ASM for section news: Jerry, AD0A 909-689-1923, Fax 909-689-3902. Field Day is past and it looks as if it was a good one for all the clubs. I had a ball on 40-meter CW, working from W6TJ. (AD0A) Newsletter publicity regarding FD was good, judging from the releases seen in the *Org Co Register* (thanks, Art, W6XD), the *Riverside Press-Enterprise* and the *San Bernardino Sun*. WB6FKR/OE3ZDB was a guest speaker at the Riverside QCWA, discussing his experience operating from Central Europe. The new club net freq for the So Cal 6-Mtr Club is 52.86 FM on the KG6WGR repeater (xmit 52.36) at 8 PM Thu. NCS is N6BKL. The Hosp Disaster Support Comm Sys (DHDSCS) winds up its activity year with 19 activations, 13 of which were drills and 6 were the real thing; HDSCS top 10 for the year, based on participation, are N6OKG, WB6RQM, WB2LRH, K0OV, WB6GCT, WA6LWF, N6KSC, KC6PPY, KM6MH and WB6DCC. Congrats to all! ARRL HQ sponsors a landline BBS with a wealth of info; the number is 203-666-0578. Hint: As soon as you log on, download a copy of FILES.BBS and log off. Print the file to paper and peruse the lengthy list of available files at your leisure (and no long-distance phone charges), then download your choices and enjoy! (Thanks to the Lee DeForest ARC newsletter for this.) Plan to display Amateur Radio to the public at the 6th ARRL Amateur Radio Public Awareness Day Sep 17. Support your PIO and your club in its setups and demos at public places. Let the public know we're a national resource, not an irritant. STM N6GIW reports the NTS is operating well in So Cal. Glenn would like to thank all who steadfastly handle tfc & net responsibilities and help to sustain the long-standing ham radio tradition of the NTS. If you have questions regarding NTS or want to learn how to get your feet wet, contact Glenn, N6GIW, at 619-364-3927, fax and voice mail. SCN/1 24 sess. QNI 61, QGC 48, SCN/2 15 sess. QNI 37, QTC 12, SCN/VHF 30 sess. QNI 276, QTC 209. *PSHR:* KD6CCF 171. KC6SSK 110, KA6TND 84, WF6O 80, N6GIW 75. *PBBS tfc:* WF6O 136. *Tfc (Jun):* KD6CCF 481,

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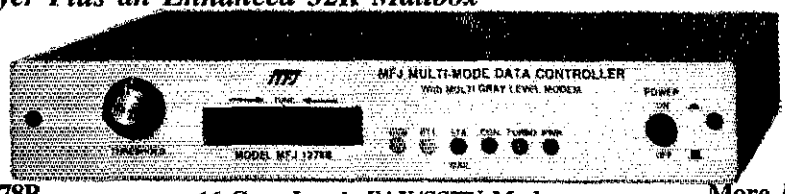

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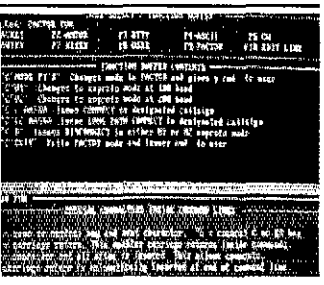

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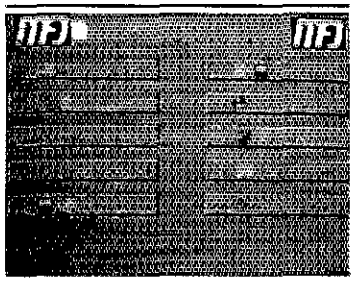

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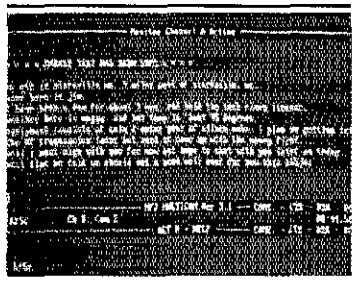

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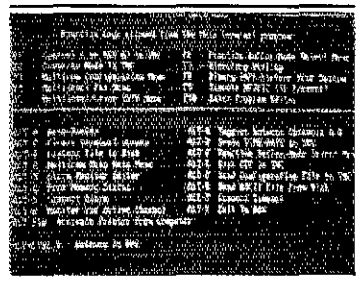

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KC6SKK 149, KA6TND 77, N6GIW 69, W6RE 60, KA6HMS 51, KC6YRH 44, AD0A 30, WF6O 30, KD6WKP 14. Thanks to NMs KD6CCF (SNC1), N6RVC (SCN2) and KA6TND (SCNV) for their service and dedication. Vy 73!

SAN DIEGO: SM, Patrick Bunsold, WA6MHZ, 619-561-0052—ASM/SEC: Richard Medhurst, KD6BFO; ASM/MARS: Harry Hodges, WA6YOO; ASM for Youth: Frank Forrester, KI6YG. ASM: John Cline KI4EX; ACC/PIC: Tuck Miller, KC6ZEC. STM: Warren Dilley, KT6A. Hope everyone enjoyed the 1994 ARRL SW Division Convention! It wouldn't have been possible without the valiant and tireless efforts of KK6NH, WGIC, W6RHV, KF6Y, KB6NMK, WB6AXW, KC6ZEC, KD6BFO, K6DS, N6ELP, N6TCB, NF6E, N6OBA, WA6YOO, N6IGC, KN6JC, K6DBJ, WD6APP, WA6ZJC, W9FQN N6QJE, KD6EFQ, KE6BUE, N6WQR, KI6YG, WA6ZEF and all the volunteers who made the convention such a spectacular success! Next major event is the Ham Radio Roundup Oct 2 (Sun) at Convair Rec Assn Missile Park 10 AM-4 PM. Most clubs and groups will be there to demo ham radio and all its aspects. All area hams and families are welcome! New PIO for SANDRA is prez Bob Helt, NY6JI San Diego City Planning Commission put in a 30-ft antenna ordinance and area hams quickly organized to fight it. Leading the charge was Mark, KB6OSP; Sybil, W6GIC; SANDARC chairman George, KC6BU (ex-KC6OIF); ASM John, KI4EX; and ASM/SEC Rich, KD6BFO. The commission is now working to reconsider this move. ARES DECs: North—Dennis, K7DCG; South—Pat KC6VVT; East—Rich, KF6KE; Central—Al, W6WYN. *Tfc*: SDCTN: sess 31, QNI 180, QTC 88; ARESP: sess 5, QNI 40, QTC 0, ARESN: sess 5, QNI 14, QTC 2. *Tfc*: KT6A: 587, KI6MP 320, KD6YJB 92, KR6K 78, KC6ZEC 50, N6WQR 13, WA6IIR 2. *PSHR*: KT6A 145, KR6K 79, KD6YJB 72, KC6ZEC 71. Packet: WA6MHZ @AA6QN. #SOCA or connect to PBBS WA6MHZ-10 on 145.01.

SANTA BARBARA: SM, Jennifer Roe, AA6MX—This is my 1st column as SM; hi there! I'm going to fill this space each month with happenings from the Section, be it traffic, ARES, clubs or whatever, but I really need your help. Call me, write me, internet me (jroe@micom.com) or packet me AA6MX@W6AKF.#SOCA.CA.USA.NA; I get my information from club newsletters and anything I hear. . .so give me a call. I'm not going to bore you with who I am or where I come from—if you need the information, call me! Poinsettia ARC has just completed its 10-week Novice/Tech class, resulting in 14 receiving some type of new ham license. Santa Barbara VEs processed 42 candidates in May, which was one of its largest sessions. Santa Ynez Valley ARES provided communication for the Carriage Classic in May. Field Day participation: Poinsettia ARC operated 2A at Dennison Park in Ojai; Paso Robles ARC operated 2A on a mountain near the HMR Winery, W of Paso Robles. Its Sat night dinner netted an attendance of 50. CVARC operated 15A and as always put in a Fine Business show operating QRP. That's quite an operation and there's a wonderful video showing its Field Day activities. Santa Barbara ARC operated 3A positioned themselves at Ellwood School in Goleta. Ventura County ARC was aided by the Leisure Village Club at its site. The Satellite ARC and SMARTT club teamed up for Field Day this year operating 2A. Simi Setters operating 4A put up its stations on a school-property field on the flats of Simi using AA6MX.

WEST GULF DIVISION

NORTH TEXAS: SM, Bob Adler, NZ2T—ASMs: W5GPO, W5IWE, KG5SC, WD5IVD, KF8L, KB5LES, WB5NPH, N5UQA, KB5YAM, N5WOY, KJ5AE. ACC: W5SOQ. STM: KJ5GE. SEC: K5UPN. PIC: WW5L. SGL: K5LP. TC: K5SXK. OOC: WB5UDA. BM: WO5H. Congrats to Brownwood ARC members KC5GLL, KC5GLU, AB5TY and KC5GLK on their new call signs. Lake Whitney ARC has an information net Thu nights at 8 PM on 147.0; All are welcome. Temple ARC renewed as an ARRL Special Service Club this month, as did the Dallas ARC. Much obliged for their support and all the work they do for all of our Section organizations. Ray, W5IWE, our dedicated ASM from Trinidad, reports that the QCWA Ft Worth Chapter has held its annual picnic at Ray's QTH. Sure wish we could have been there to share the fellowship and good chow, but as luck would have it, we were previously committed to another event. Also from Ray, congratulations to Cedar Creek ARC officers: KC5AMP, W5COL, N5WBH, K5FRB and KB5SNQ. Field Day was quite an experience for us. W5SOQ, WB7NPH and I started off at the DARC FD site in Dallas at 1 PM. We received an "SM" message via ATV, at which time we left for a route around the Section. We got to Mesquite, then Greenville and then out to Tyler. In Tyler, we visited the Tyler ARC at the Red Cross and got treated to a great dinner with a mobile Dallas County REACT ARC operation on the other side of Tyler. From Tyler to Longview, and then back to Flagpole Hill and the DARC site. The following morning, we got to Arlington, and that is as far as we got. HI HI. Next year, we'll try to get the "4 corners" of the Section and perhaps make 10 club sites. As it was, we put on close to 600 mi! Want to take a moment to recognize a real special guy, Bill Loessberg Jr, N5RWQ, of Richardson Klub. Bill has been extremely supportive of our new Council and will be putting together its 1st newsletter. Aside from this, Bill is pres of the RWK and was active in the past 2 years on the Ham-Com Steering Committee. Bill, for all you've done, thanks and keep up the great work OM! Congrats to Rena Dulworth, daughter of Ron Dulworth, KB5VED, on passing her Novice exam. A real big thanks to the 28 volunteers who made it all happen in 4 sessions during the 3-day period of the convention. I'll attempt to publish the call signs of the upgrades and new licenses over the next few months. Extra Class: WA5QOC,KC5APV, WA6SCW, KB5UCA, KB5TXN, KI5YL, R. Shafer, KJ5US. Adv: KB5WEE, KC5EWJ, KC5GDR, KC5FWI, KB5VEV, KB5UJV, KB5QCX, T. Ray, N5VCR. Gen: J Wei, KA5VVL, KA5AFP, KA5IFV, N7ZSQ, KC5CBS, KB5NAJ, KC5CAJ, KA5ZBP. (At BSA Council 10 Camp) Tech: R. Buie, M. Hart, J Mannewitz, S Patterson, E. Robinson, G. Rogers, B. Rozenfield, J. Wolf, L. Holmes, Element 2. *NTX nets*: DFWL/KB5SFE/254/152, DFWE/KI5NL/363/116, 7290/N5OWO/3388/457, TEX/KS5V/336/176, DTTN/K5UPN/517/231, TTN/ND5C/986/126.TSN/KI5LQ/141/69, HOT ROCKS/KB5FCK/6/4, NTXD/W5YQZ/11/3209. DRN5 Report: 788 msgs in 60 sessions. NTX reps W5VMP, K5UPN W5YQZ, KD5RC, W5AYX, NZ2T, KF5BL, N5TWV, KJ5GE,

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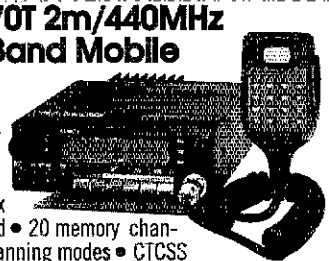
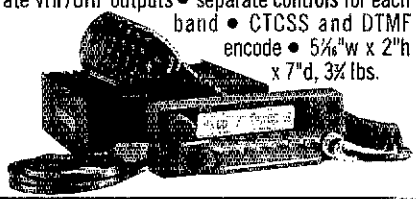


DR-600T 2m/440MHz Twin Band Mobile

45W (2m)/35W 440 MHz • receives 118-174 (including AM and 410-470 MHz • 40 memories • scan • full duplex cross band operation • remotes from any DTMF capable 2m or 70cm unit • separate VHF/UHF outputs • separate controls for each band • CTCSS and DTMF encode • 5⅞"w x 2"h x 7"d, 3¾ lbs.



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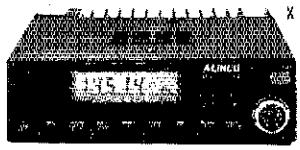
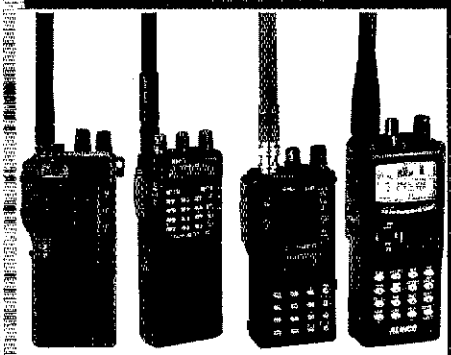


HAND HELD UNITS



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DJ-180T 2m HT – Intuitive, EZ to operate! • receives 130-174 MHz • 2.0W, 5W with optional battery. illuminated LCD display • 16 digit DTMF • 10 memories • 5½"h x 2⅜"w x 1⅜"d.

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DJ-580T 2m/440MHz Twin Band HT – 2.5W • receives 130-174 & 410-470MHz. Modifies for MARS/CAP tx, + 118-136MHz+ • 40 memories • CTCSS encode/decode • DTMF encode • DSQ. • full duplex cross band repeat • scan • autodialer • back-lit keypad • simult. rx on both bands-separate controls • 6½"h x 2¼"w x 1¼"d, 0.97 lbs.

DJ-F1T 2m Mini HT – 2.5W • receives 130-174MHz and 118-136MHz • scanning • autodialer • back lit keypad, 40 memories • call channel • CTCSS • DTMF encode • DSQ paging • 4⅜"h x 2⅛"w x 1½"d, 14 oz.

DJ-F1T/HP – Same as DJ-1FT but 5W • 12V 600mah nicad battery standard.

DJ-G1T 2m HT – 2m tx/rx + 440MHz and AM aircraft receive • Channel Scope spectrum analyzer • 80 memories -5 for autodialer • Crossband semi-duplex operation • DSQ paging • Scan • 4½"h x 1⅞"w x 1½"d, 12.6 oz.

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DJ-180T/TH	EJ-15U	$5
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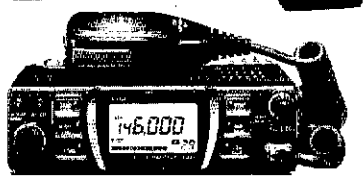
IC-T21A / IC-2GXAT

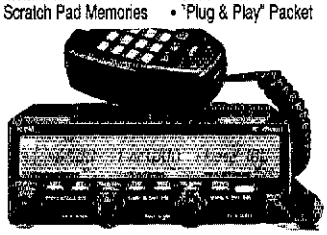
IC-T21A • 2 Meters with 440MHz receive • 6W opt. • 6 hr. op time • 114 memories: Tone Scan • Auto Repeater Shift • Selectable DTMF Speed...more!

IC-2GXAT • 2 Meters • 3W–7W optional • 40 memories • Tone Scan • Auto Repeater Shift • Selectable Autodial DTMF Speed...more!



IC-281H

- 2 Meter Transceiver
- 440MHz Receiver
- 60 Memories
- 10 Scratch Pad Memories
- 101 Memories
- Optional Voice Synth.
- 9600 BAUD
- "Plug & Play" Packet



IC-Delta-100H

- Triple Band
- 6 Different Band Combinations–Selectable
- 642 Memories
- Full Remote Control Microphone
- Antenna Flexibility
- High Performance

IC-737A

- 100 Watts
- General Coverage Receive
- Internal Tuner (incl. 160)
- Direct Keypad Entry
- 101 Memories
- Dual Antenna Select
- PBT and Notch Filter
- Full Break-in
- Built-in Keyer
- Now with VOX

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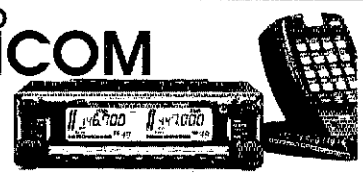
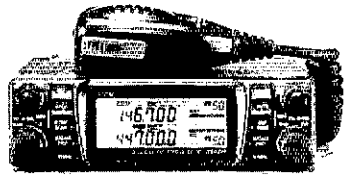


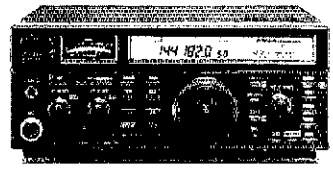
IC-2700H

- Detachable Panel
- Full Remote Control Mic
- Infrared Wireless Mic (Opt.)
- V/V U/U or V/U
- Auto Repeater Functions
- Built In Pager/Code Squelch
- CTCSS Encode



IC-2340

- 2M/440 MHz FM
- Independent Controls
- Large Display
- 100 Memories
- CTCSS Encode
- Auto Repeater Functions
- Built In Duplexer
- 2.4 W Audio

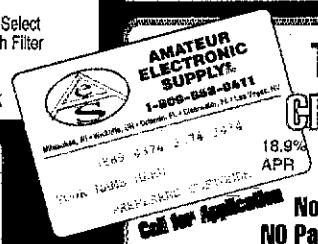


IC-820H

- 2M/440 MHz All Mode
- New DDS (I-Loop)
- 9600 BPS
- High Stability Crystal
- Satellite Features
- Compact Size

IC-736

- HF + 6 Meters
- 100 W (HF + 6 M)
- Built In Tuner (6M too!)
- Built In Power Supply
- New DDS (I-Loop)
- Built In Keyer



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IC-2GXAT ..... $20 Off	IC-4iA ..... $50 Off	IC-737A ..... $100 Off
IC-V21AT ..... $50 Off	IC-Delta 100H $100 Off	IC-970A ..... $250 Off
IC-2iA ..... $50 Off	IC-707 ..... $50 Off	Coupons expire 9/30/94

IC-P2AT $269.95	IC-4GAT $349.95	IC-228H $359.95	IC-725 w/coupon $748.95
IC-P3AT w/coupon 279.95	IC-4SRA 479.95	IC-901 ..... 899.95	IC-729 ..... 1249.00
IC-P4AT w/coupon 239.95	IC-24AT 369.95	IC-1201 ..... 499.95	IC-735 ..... 1068.95
IC-X2A 599.95	IC-28H 349.95	IC-3230H 629.95	IC-737 ..... 1299.00
IC-12GAT 379.95	IC-38A w/coupon 369.95	IC-449A 489.95	

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WB5NCM. NM WB5YDD. *Jun tfc: BPL*–W5YQZ 809, KJ5GE 679, KB5SFE 121, W5AYX 92, W9OYL 81, KB5WEE 76, KI5NL 70, KC5DEM 70, KB5GLV 68, N5WOY 50, N5TTU 45, KC5COF 39, N5TFB 39, KA5MLZ 31, KC5EIV 26, WA5EZT 25, N5XJD 17, N5WQX 16, K8LUY 16, KC5GMY 10, N8QVT 9, KF5BL 8, KB5YAM 6. Thanks to Henry, W5YQZ, for a fine job as NTXD Mgr, and good luck to new mgr KB5GLV. For now and until next month, God bless and 73 de NZ2T.

OKLAHOMA: SM, Joe Lynch—TARC Field Day was quite a show. Operating from Keystone Dam, the organizers didn't just have a Field Day, they had an event. With participation from the Salvation Army, Life Flight and loans of equipment from government agencies, TARC showed the emergency preparedness side of Field Day operations. Furthermore, it had stations operated by new hams and nonhams (under direct supervision, of course). And it had good barbecue. Your SM operated Field Day from the car, on 6 meters. Quite a hot band opening; also, quite a hot weekend. George Washburn, KB5IHD, in Cherokee, worked 5 stations in FL during a short sporadic-E opening on 2 meters on Sat eve, Jul 9. Thanks to the members of the Tulsa community for originating a petition (unknown to me at the time) nominating me for another term as SM. I'm humbled by your kindness toward me and I accept the responsibility of being SM for another term, knowing the awesome responsibility of your vote of confidence. Pat, WB5NKD, and Arley, WB5NKC, have started CW nets (training net for CW operators). The 1st operates M-F on 7110 kHz 11:30 local time. The 2nd operates at 6:30 PM on 3693 kHz every day. If you're interested in learning how to handle traffic or are interested in on-the-air code practice, check into one or both of these nets. Until next month, 73 de Joe, N6CL. *Tfc:* WB5NKD 1125, WB5NKC 1004, N5IKN 180, KE5JE 69, WA5OUV 66, K5GBN 28, WA5OGC 25, KC7CW 16, NQ5Y 6, KD5EP 4, AA5NN 4, KI5XA 4, N5VFW 4 and N5QDD 4.

SOUTH TEXAS: SM, Alan Cross, WA5UZB—From the reports, messages, letters and phone calls I've received, Field Day 1994 must have been a great success for STX amateurs. Not too many complaints about the weather (we should have a winter Field Day in this part of the country!) and a lot of reports about clubs that participated with schools, youth groups and served agencies; operations in public places with access to the general public, such as malls and parking lots; clubs that got new licensees involved by building Technician/Novice stations; and lots of positive press from the print and visual media about local clubs. All in all, a good Field Day, and I appreciate the Field Day messages sent to me. I suggest that all Field Day committees think about putting together a program to be shown at a later date; it could be an inspiration to people in your club come next Field Day. Interesting reading in the *Clear Lake Amateur Radio Gazette* and the *ECHO* newsletter about local hams who had the opportunity to operate in faraway places; KJ5MX in Russia and K5LBU in Sierra Leone. Such stories they could tell at the next convention! If you're traveling abroad and want to operate Amateur Radio, and if you don't have the experience, your 1st call should be to the Regulatory Information Branch (RIB) at ARRL Headquarters. It has all the rules, forms and helpful hints to make your operation possible and easy. Your League officials work for you, and this includes speaking at your next meeting or swapfest. In Nov, I'll be in San Antonio, speaking before the San Antonio ARC. Throughout the Section are officials and knowledgeable people more than willing to speak with your club—if you have a need, call me (and the speakers bureau.) To use the Speakers Bureau is easy: Call Tom Comstock, N5TC, the Division Director, or call Bob Adler, NZ2T, the NTX SM, or call me. NZ2T runs the most current list of speakers, topics, travel arrangements and other details (listed on p 8 of *QST*). Almost any topic of interest from a variety of experts is available for your use. League Headquarters maintains a recently updated video library of excellent presentations, all suitable for meetings and training. Several final notes to the presidents and secretaries of ARRL clubs: thank you for renewing your affiliation with the League; and there's an election coming up for Director and Vice-Director for theWest Gulf Division. I recommend that you look at candidates and cast your vote appropriately. These people represent you in policy decisions on a national and international level. And finally, special thanks to Jerry, W5KLV, an Official Bulletin Station. He's always reading bulletins on the HF nets and really came through for all of us on Field Day. The STX Section is especially proud of our OBS program, and especially proud of Jerry. For NTS and independent net reports for this month, refer to the Public Service column in this issue of *QST*. 73, Alan. *Tfc:* N5NAV 337, W5KLV 308, W5TFB 261, W5CTZ 146, K5GM 116, WB5YDD 108, KB5RUG 99, KS5V 99, WD5GKH 57, N5OWQ 52, N5OUJ 41, KD5GM 40, N5SCO 40, WA5FXQ 39, W5RZV 32, KB5GST 25, W5BGE 20, KG5CX 14.

WEST TEXAS: SM, Milly Wise, W5OVH—Congratulations to these new amateurs who received their licenses recently: The Levy's (Phillis, KC5GKX; Robert, KC5GEK; Robin, KC5GTE); George Dye, KC5GEH; Rebekah Robinson, KC5GEJ; Rodolfo Borjon, KC5GEE, Steven Nielson, KC5GKW; Terry Funk, KC5GKF; William Jackson, KC5GKE; Raymond Olson, KC5FUO; Manuel Cobos, KC5EEE; James Hargrove, KC5VEK; Richard Wineman, KC5FFU. Received many reports on FD. Thanks to all who participated. Members and hams of the Key City ARC survived the 100°+ heat while erecting antennas, etc. at the Abilene State School park. Some of those participating were David, KB5ZIQ; Don, KJ5OK; Jim, K1UQT; can't list them all. 1994 Midland ARC club officers: pres Tom, WA5WQC; vp Beverly, KC5BNT; secy Sara, N5ZMP; treas Mark, N5XXD; directors Jim, K5KUX; Wayne, WT5M; Larry, N5TQU. Thanks to the volunteer hams who helped the San Angelo ARC during Frontier Days: AB5BG, N5OKQ, KB5WSS, WS5B, KB5FCK, N5OIU, AA5PK, N5VXK, WB5NBQ, KB5NMA, N5RBW, KC5FRO, KB5EDB. Thanks to all the hams who helped during the Range Fire in Coke Co. Their efforts were greatly appreciated by the firefighter volunteers and the TX Forest Service. The hams delivered ice and food from area restaurants and the Salvation Army. Jim, KF5EI; Ron, N5OIU; Frank, WS5B; Don, AB5BF; XYL Mary; Bobby, KC5FAA; Noel, KE5NO; Ron, N5ZIX; Clint, N5MSE; Christy, KB5VRN; and Candy; Jerry, N5OKQ; and Kyle, KB5RRP.

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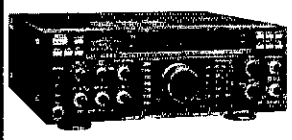
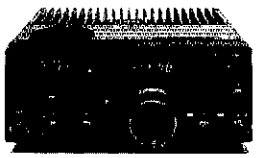
FT-1000D • *Deluxe version* • dual bandpass filter for crossband receive • temperature compensated crystal oscillator • 2.4kHz/2KHz SSB filters and 500Hz CW crystal filter..... **SPECIAL** ☎

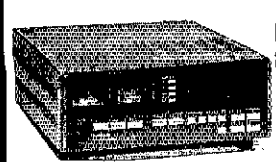


FT-990 HF Transceiver Tx: 160 to 10m Amateur Bands • Rx: 100kHz to 30MHz • 90 memory channels • SCAF • FSP • DDS • high speed antenna tuner with memories • AC power supply. 12¼"w x 4⅛"h x 11½"d, 30 lbs..... **SPECIAL** ☎
FT-990DC • DC version w/o AC supply... **SPECIAL** ☎

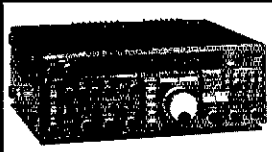


FT-890/AT Compact HF Transceiver Tx: 160 to 10m Amateur Bands • Rx: 100kHz to 30MHz • 32 memories plus two VFOs per band • 100W • automatic antenna tuner • IPO • DDS • FSP • auto 10M repeater offset • selectable CTCSS encode • requires 13.5VDC @ 20A • 9⅜"w x 3⅜" x 9½"d, 12.3 lbs.. ☎
FT-890 • HF transceiver w/o antenna tuner ..... ☎

FT-840 Compact HF Transceiver Tx: 160 to 10m Amateur Bands • Rx: 100kHz to 30MHz • 100 memories (independent Tx/Rx per memory) • Twin band stacking VFOs • optional FM • automatic 10M repeater offset w/selectable CTCSS encode • 100W • 13.5VDC @ 20A • 9⅜"w x 3⅜" x 9½"d, 18 lbs.. ☎

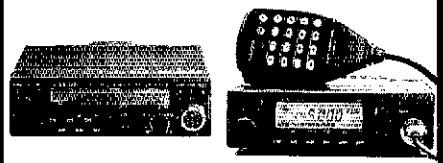


FL-7000 HF automatic 1KW Linear amplifier 70w input produces 600W out ..... ☎



FT-736R Multi-Mode U/V Full Duplex Base **2 meters:** 144-148MHz; **70cm:** 430-450MHz • optional modules for 50, 220MHz and 1.2GHz • 100 memories • full duplex crossband with inverted tracking (AO-13) • data in/out jack • 25W (144, 220, 440MHz) 10W (50, 1.2GHz) • 13.5 VDC or built-in AC supply • 5¾"h x 14½"w x 11½"d, 19.8 lbs ..... ☎

FT-850 24.5, 28 & 50MHz Multi-mode Continuous 24.5-56.0 MHz receive • 105 memories: 99 for channels, 4 programmable scan, 2 priority • 10-100W (25W AM) • 12VDC @ 18A or built-in AC power supply • 5¾"h x 11⅛"w x 11¼"d, 18 lbs..... ☎

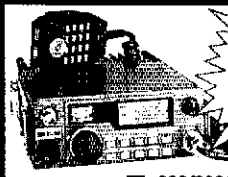


FT-5200/6200 Dual Band Mobiles (left)
FT-5200: 2m/440MHz (50/35W) • **FT-6200:** 440MHz/1.2GHz (35/10W) • 32 memories • CTCSS encode • dual receive • built-in duplexer • cross band rpt • remotable • 5½"w x 1¾"h x 6"d, 2 lbs.. ☎
FT-5100 like FT-5200 w/o remote capability..... ☎

FT-2200/7200 Mobiles (right)
2200: 2m w/110-180MHz rx (50W). **7200:** 440MHz (35W) • 50 memories • DTMF page & coded squelch • backlit DTMF mic • 5½"w x 1⅞"h x 6¼"d, 2.8 lbs. ☎

FT-2400/7400H Mobiles (left)
FT-2400H: 2m (50W) • **FT-7400H:** 440MHz (35W) • 31 memories • alphanumeric display • track tuning • CTCSS encode • backlit DTMF microphone • 6¼"w x 1⅞"h x 7"d, 3.3 lbs..... ☎
FT-912RH (right) • 1.2GHz Mobile..... ☎

FT-2500M 2m Mobile (not pix) • 50w • 31 memories • CTCSS encode • scan • backlit DTMF microphone • 6"w x 1⅞"h x 7"d, 1½ lbs..... ☎



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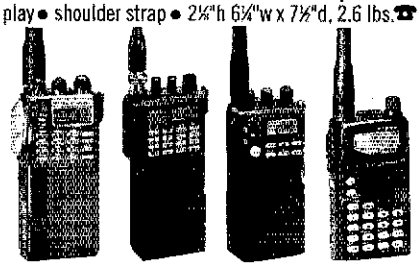
290R: 2m (25W) **690R** 6m (10W) **790R:** 430-450MHz (25W) • FM/SSB/CW • 2W portable operation using 12V DC @ 1.1A, or opt. battery case (9 C-size alkaline or nicads) • DTMF mic with up/down tune • dual VFOs • 10 memories • scan •. LCD display • shoulder strap • 2½"h 6¼"w x 7½"d, 2.6 lbs. ☎



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FT-26/27 • 5w 2meter FM HT ..... ☎
FT-76/25 • 2w 440 MHZ FM HT ..... ☎
FT-23R-17 • 2.5w 2 meter FM HT ..... ☎
FT-23R-12 • as above but 2 meters, 5w ..... ☎
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FT-530 • 2m/440 FM HT w/TTP ..... **SPECIAL** ☎
FT-11R • 1.5w 2 meter FM HT ..... ☎
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FT-41R • 440MHz FM HT ..... ☎

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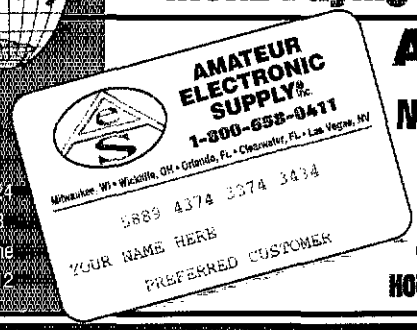

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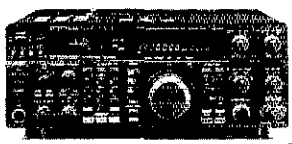
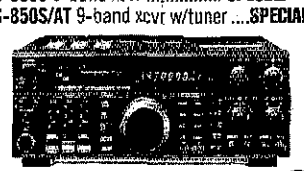
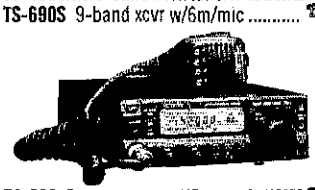


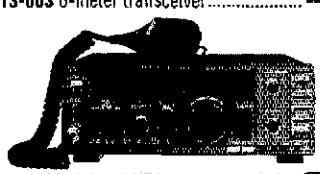
TS-850S 9-band xcvr ..... **SPECIAL** ☎
TS-850S/AT 9-band xcvr w/tuner ... **SPECIAL**



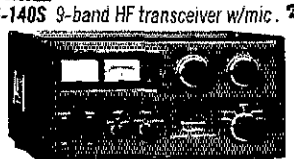
TS-450S 9-band xcvr/SW rcvr ... **SPECIAL** ☎
TS-450S/AT 9-band xcvr/tuner .. **SPECIAL** ☎
TS-690S 9-band xcvr w/6m/mic ..... ☎



TS-50S *Super compact* HF xcvr . **SPECIAL** ☎
TS-60S 6-meter transceiver ..... ☎



TS-140S *9-band HF transceiver w/mic* . ☎

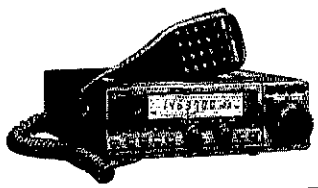


TL-922A 2KW PEP HF linear (3-500Zs) ... ☎

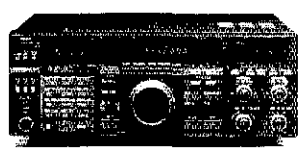
SHORTWAVE

R-5000 100 KHz-30 MHz receiver ..... ☎

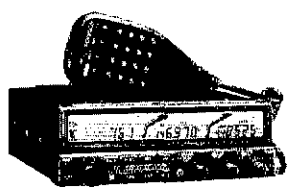
VHF & UHF



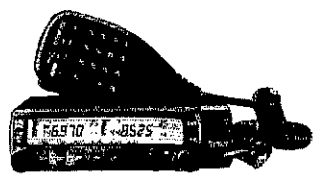
TM-255A 2m SSB/FM xcvr/9600 baud ..... ☎
TM-455A 440 SSB/FM xcvr/9600 baud .... ☎



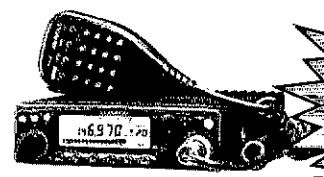
TS-790A 45w 2m/40w 440 SSB/FM xcvr.. ☎



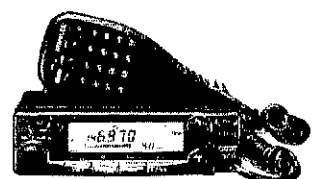
TM-642A 2m/220MHz FM xcvr w/TTP ..... ☎
TM-742A 50/35w 2m/8440 FM xcvr ..... ☎
TM-942A 2m/440/1.2 FM xcvr ..... ☎



TM-733A 50/35W 2m/440 FM xcvr/TTP ... ☎



TM-241A 50w 2mxcvr w/TTP mic ..**SPECIAL** ☎
TM-331A 25w 220 xcvr w/TTP mic..... ☎
TM-441A 35w 440 xcvr w/TTP mic..... ☎
TM-541A 10w 1.2GHz xcvr w/TTP mic..... ☎



TM-251A 2m FM xcvr w/9600 baud..... ☎
TM-451A 440MHz FM xcvr w/9600 baud. ☎

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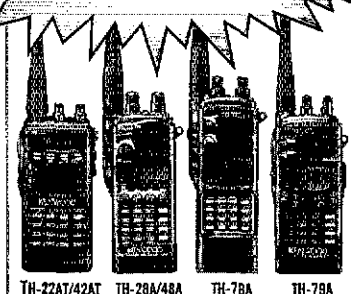

HANDHELDS

TH-22AT 3W 2m HT ..... **SPECIAL** ☎
TH-42AT 2.5W 440 HT ..... **SPECIAL** ☎
TH-28A 2.5W 2mHT/batt/cgr/TTP **SPECIAL** ☎
TH-48A 2W 440 FM HT/batt/cgr/TTP..... ☎
TH-78A 2.5W 2m/440 HT..... **SPECIAL** ☎
TH-79A 2.5W 2m/440 HT..... ☎

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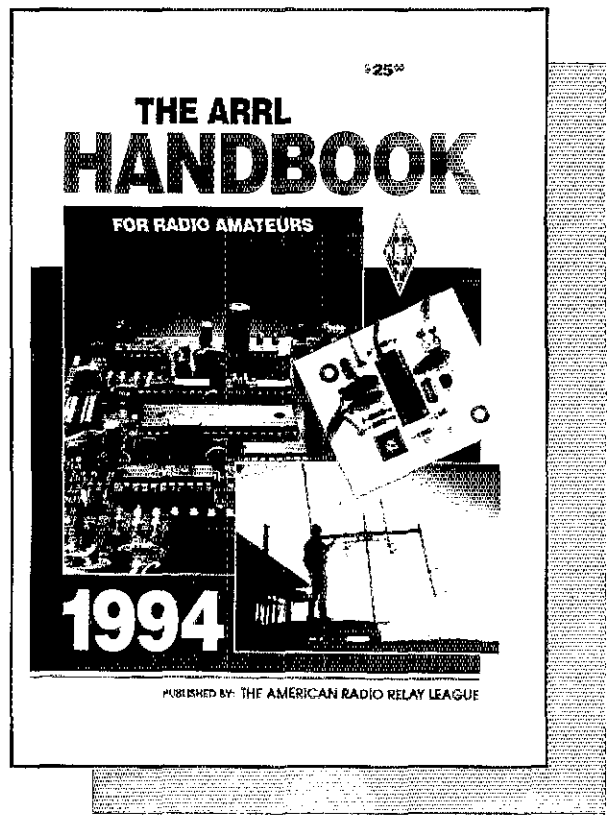
The Seventy-First Edition of the ***ARRL HANDBOOK for Radio Amateurs*** is here! That's right, the "ham's bible" is now in it's 71st edition. You'll find the latest on what's new in Amateur Radio state of the art.

Here's some of what's new in the 1994 edition:

- Added coverage of Digital Signal Processing (DSP).
- Improved treatment of Pi and Pi-L Matching networks for high-power amplifiers.
- A new all-digital-logic ID-timer section in the repeater CW IDer.
- The "Ugly Transceiver" is a simple and enjoyable introduction to RF construction!
- A five-band quad that covers all amateur bands from 20-10 meters.
- An add-on circuit turns your station fixed-voltage supply into a variable-voltage supply for experimenting.
- An active attenuator project to ensure you are the first on to the hidden transmitter.



You'll find the ***Handbook*** invaluable as an Amateur Radio reference guide. And as always, you'll find a goldmine of construction projects and radio theory.

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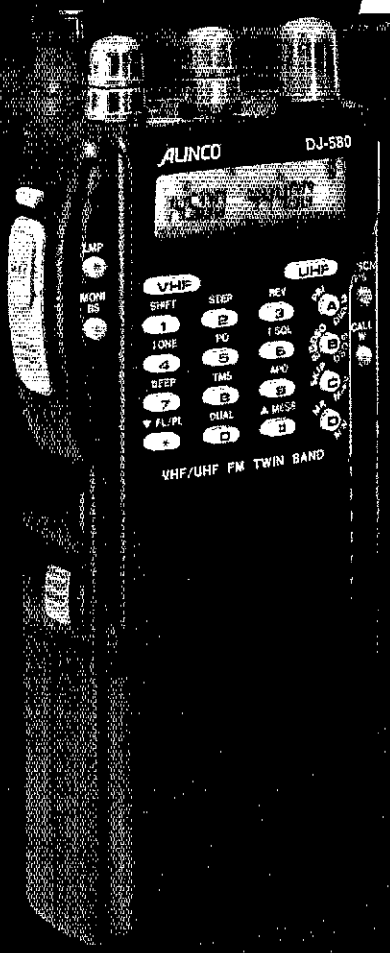

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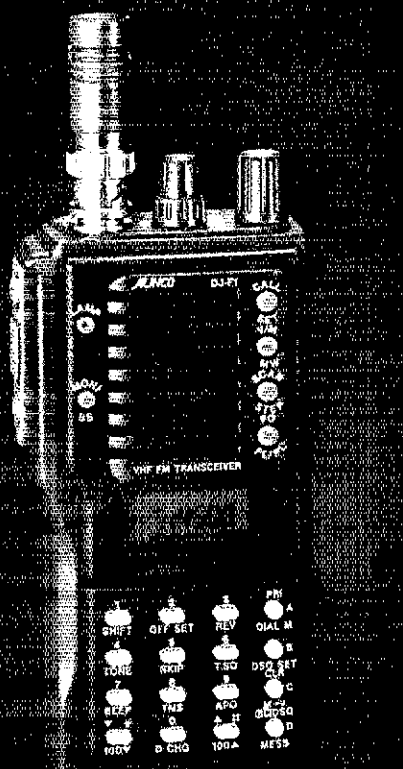
The Right Features: Alinco's DJ-580T offers powerful user friendly features that make operating easier. Many new radios available today are so complex that an instruction manual needs to be carried with the radio. We have designed the DJ-580T to be user-friendly, but also sophisticated: It has the features you need, without any useless bells and whistles. This radio can receive 130-174 MHz, 420-474 MHz, and can be modified to receive AM from 118-142 MHz. Other outstanding features include cross-band repeat function, full duplex operation, backlit keypad, 8 scanning modes, CTCSS encode / decode, and DSQ for private paging.

The DJ-580T will deliver a solid 5 Watts of power with the optional 12V battery, and our EMS-8Z Remote Speaker Microphone offers remote control of memory channels and scanning features.



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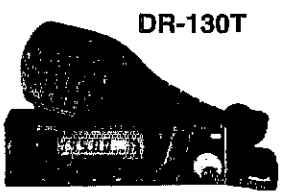
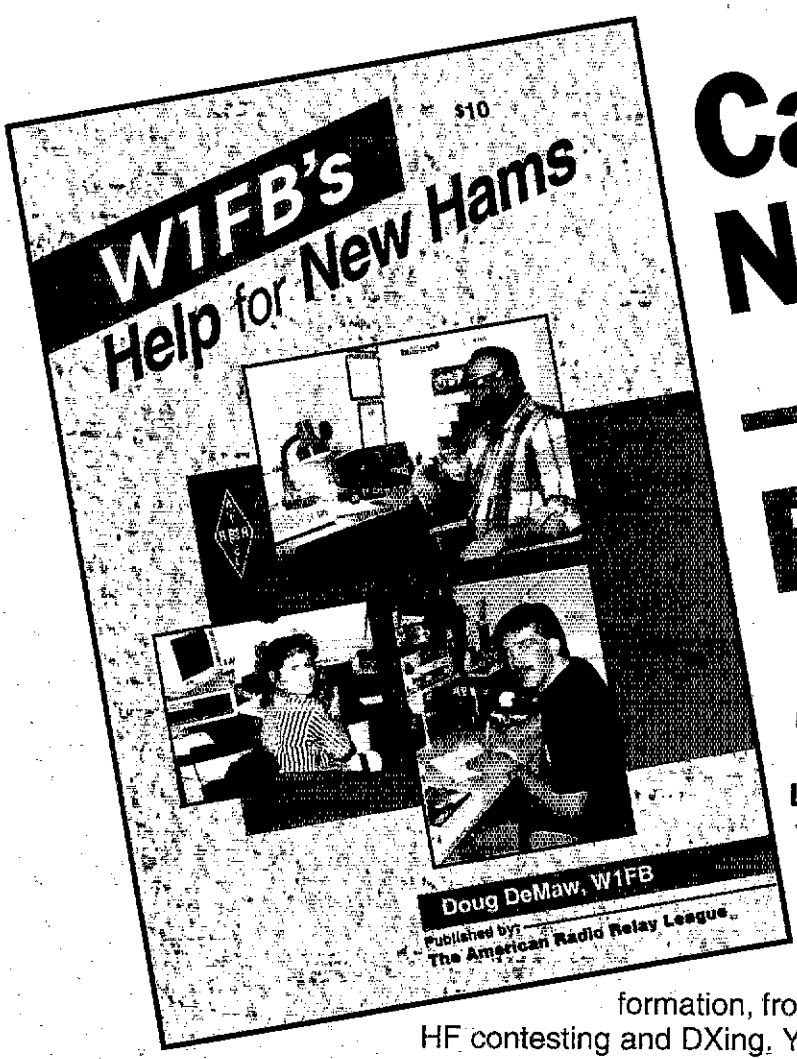


DR-130T

DJ-180T



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Overcoming Operating Problems and Fears
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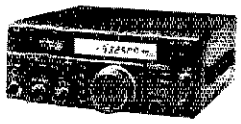

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- DTMF AUTODIALER
- COMPACT SIZE

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- AM AIRCRAFT RX
- MULTIPLE SCAN MODES

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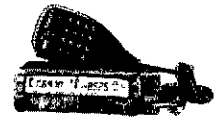

TM-742A

- DUAL BANDER FOR 2M/70CM
- SLOT FOR ADDING A THIRD BAND
- 50 WATT TX POWER ON 2 METERS
- 100 MEMORIES PER BAND

TM-733A

- COMPACT DUAL BANDER 2M/70CM
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TM-255A

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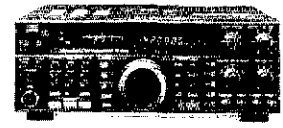
- 45 WATTS
- EXCELLENT RECEIVE PERFORMANCE
- FRONT PANEL CAN BE REMOTELY MOUNTED

HF TRANSCEIVERS



TS-50S

- SUPER-COMPACT HF TRANSCEIVER
- SELECT 100W, 50W, OR 10W TX POWER
- 100 MEMORIES
- GREAT FOR MOBILE OPERATION
- EXCELLENT RX PERFORMANCE

TS-450S/AT

- HF TRANSCEIVER FOR THE NOVICE OR EXTRA CLASS OPERATOR
- AUTOMATIC TUNER BUILT IN
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- ALL AROUND GOOD PERFORMER

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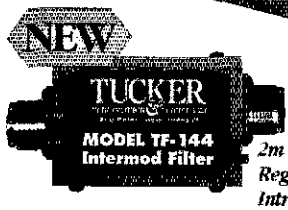

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2m Intermod Filter
Regularly $79.95
Introductory Special **$59**

Don't Let Intermod Ruin Your Hamming...
If you are like most us, your 2m radio becomes filled with the squawks and beeps of intermodulation distortion or "intermod" whenever you get close to an urban area. This is caused by the thousands of high-power pagers, FM broadcast stations, cellular sites and other nearby VHF transmissions that overload your 2m receivers sensitive front end. Most modern transceivers don't have the helical filtering to stop intermod from getting in.

Our Filter Stops Intermod...
Our team of RF engineers have designed a 3 pole filter that will end your intermod problems forever. Our goal was to design the finest, tightest intermod filter available and, after exhaustive testing, we have done so. The TF-144 automatically switches on during receive and attenuates out-of-band signals by as much as 50 dB or more.

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Simply install the TF-144 in-line between your antenna and the antenna input of your mobile rig or handheld and hook up the attached wire to +12 VDC (it draws only minimum current). We even supply a wire connector for attaching it to your existing 12 V transceiver hookup. The TF-144 takes care of the rest. It automatically switches on during receive and off during transmit. Nothing could be easier!

1 Year Warranty And Our Exclusive Tucker SatisfactionPlus Guarantee...
The TF-144, like all of our other Tucker Brand Products is built to last. It is designed and manufactured to industrial standards, not the typical "amateur grade" quality found in most amateur radio accessories. Our exclusive SatisfactionPlus Guarantee means you will be more than satisfied with the TF-144's performance- if not, simply send it back within 30 days- NO QUESTIONS ASKED!

Specifications...
Passband: 144-148 MHz (2m Amateur)
Connectors: SO-239
Power Requirement: 10-15 VDC less than 100 mA
Dimensions: 2.5" x 1.75" x 1.75"
MADE IN USA.

Tucker SatisfactionPlus 30 Days 100% Guarantee

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Regularly $149
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The Tucker T-1000 has been designed to give you more than any other tuner currently available for 300 W and its construction will let you appreciate its many features for years to come. Covers the frequency range from 1.8 to 30 MHz; 3.5 to 30 MHz, continuous 300 watts; 150 W on 1.8 MHz. Utilizes continuous rotation capacitors to provide superior transmitter/antenna tuning. Inductance is setup using a 12-position switched inductor. Antenna Selector: six positions: COAX 1 tuned and DIRECT, COAX 2 tuned and DIRECT, bypass and balanced antenna. Power Switch: high and low (300 W/30 W). Comes complete with a 1 year warranty and our risk-free Tucker SatisfactionPlus guarantee. Dimensions: 10.2" (259 mm) W x 9.4" (239 MM) D x 3.5 (89 mm) H. Weight: 3.4 lbs (1.5 kg). Made in USA. Get the best, order your T-1000 today!

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1500 Watt Low-Pass Filter **$49.95**

Every shack should have a low-pass filter to insure against TVI from harmonic interference. The new Tucker T-100 Low- Pass Filter is the finest 1500 W filter available. It utilizes a nine-pole Chebyshev design with a cutoff frequency of 35 MHz. Includes additional attenuation to TV IF frequencies above 40 MHz. 1500 Watts continuous. Comes with a 1 year warranty and our exclusive SatisfactionPlus warranty. Made in USA to last for years.

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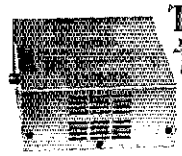
This shirt-pocket sized radio eliminates the myriad of buttons found on most other HTs and allows the simplest operation of any handheld. Sophisticated features such as 10 memories, scan modes, 24 hour clock, advanced power saving functions, tone squelch, and much more are included. Up to 5 W output is available in this unit that measures only 2.3" x 3.6" x 1.2". Leave all those complicated buttons behind- step up to the simple-to-use but powerful IC-2iA!

Tucker T-275

2500 Watt Fan-Cooled Dry Dummy Load
$169



The new T-275 is the highest-power rated dummy load on the market today! It will handle 2500 watts average for a full minute! Its quiet fan keeps the load cool for longer life. The resistors used in our T-275 is of a special ceramic construction which has stronger composition and offers better performance than the carborundum resistors used in most dummy loads. Operates from DC-150 MHz with and SWR of 1.3:1 or less. SO- 239 Connectors. Compact and lightweight. Attractive blue and gray finish. One year warranty and our Tucker SatisfactionPlus guarantee. Built to last in the USA.

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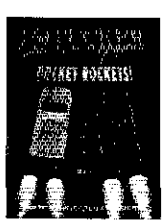

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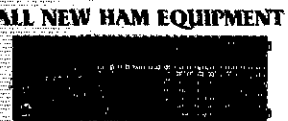

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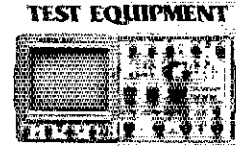

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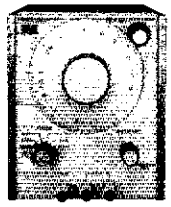
Oscillator
$249



The HP 204C is a small, lightweight capacitive-tuned oscillator. AC line or rechargeable battery operation makes this instrument ideal for both field and laboratory use. The HP 204C provides frequency from 5 Hz to 1.2 MHz in 6 overlapping ranges with a flatness of ±0.5% (from 100 Hz to 300 kHz). Delivers an output voltage of >2.5 V rms (10 mW or +10 dBm) into 600 Ω. Includes Sync Output >100 mV rms into <100 pF over entire range.

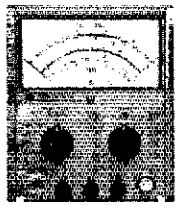
GR1433X
Resistance Decade
$599

- 111,111Ω in 0.1Ω Steps
- Six Decades

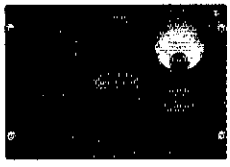
The 1433X is primarily used for precision measurement applications that require excellent accuracy, stability & low zero resistance. Offers good frequency characteristics, low temperature coefficient, and basic accuracy of ±0.02%. The 1433X is a convenient standard for checking the accuracy of resistance measuring devices and is often used as a component in DC & low frequency AC bridges and other precision measuring circuits.

700 MHz Operation at 300 VAC

HP 410C
Multi-function Meter
HP Price $2080
$199



Here is the HP Model 410C Multifunction Meter, a solid-state version of the famous HP 410B. Quality and versatility are standard with this general purpose instrument. For a limited time, we're offering this meter at great savings to you and we're including a free HP 11036A AC Probe. With the HP 11036A Probe, measurements from 20 Hz to 700 MHz (50 mV to 300 V) and comparative indications to 3 GHz are attainable. This is an easy-to-use instrument incorporating a large meter making accurate measurements simple. Whether you're in the lab, production area, or your home shop...you'll find the HP 410C an indispensable instrument. Hurry, at this price and the free AC Probe, they won't last long!



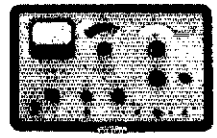
GR 583A
Audio Frequency Output Power Meter
$249

The Type 583A Output Power Meter is an easy-to-use, direct-reading instrument for measuring the power output of audio-frequency circuits. The power output is indicated directly on the front-panel meter. Power range is 0.1 mW to 5.0 W in four decade ranges. Input impedance is adjustable in forty steps from 2.5 Ω to 20 kΩ. An auxiliary scale reading decibels above 1 mW is also provided on the indicator.

DC TO 15 GHz

HP 5245L/ 5253B/2590B
Frequency Counter System with Converter
$449

The HP 5245L/5253B Frequency Counter System has been the industry standard for many years and we're making it even more dynamic by including the 2590B Frequency Converter. With the 2590B performing as a transfer oscillator and a transfer oscillator synchronizer, you'll be able to make CW frequency measurements inherently equal to the accuracy of the external time base used, even on rapidly drifting signals. While covering the frequency range from DC to 15 GHz, you'll find this system to be very versatile and easy-to-use. Input voltage range of 50 mV to 1 V rms. Measures period, multiple period, average, ratio and multiple ratio with measurements read directly from an 8-digit display. The timebase has a short-term accuracy of 2 parts in 10-10. The mainframe will also accept a wide variety of other plug-ins (sold separately).



HP 302A
Wave Analyzer
$250

The HP 302A with its narrow (7 Hz) bandwidth is particularly useful for measuring power-line frequency noise components and narrow-spaced, voice-band signals. Covers the frequency range from 20 Hz to 50 kHz with level ranges from -120 to +50 dB full scale in 15 ranges. Frequency accuracy of ±1%, resolution of 10 Hz. Utilizes built-in AFC circuitry for increased performance.

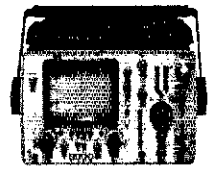
HP 10833A, B, C, D
HP-IB Interconnection Cables

10833A $35
10833B $35
10833C $30
10833D $35

Quantity Discounts Available!

We recently purchased a quantity of HP-IB cables and we're passing the savings to you! These are quality HP cables and feature a connector block at both ends. Each HP-IB cable has a plug on one side and a matching receptacle on the other, allowing several cables to be connected in parallel.

Cable length: 10833A, 1 meter (3.3 ft); 10833B, 2 meters, (6.6 feet); 10833C, 4 meters, (13.2 feet); 10833D, 0.5 meters (1.6 feet).



HP 1740A
100 MHz Portable Oscilloscope
$795

Many consider the HP 1740A as one of the best portable 100 MHz oscilloscopes ever built. This extremely well constructed scope is laid out in a very logical manner and uses color coded push-buttons and bezels to speed up finding the right features such as a true third channel trigger view (displays either an internal or external trigger signal), switchable 1 MΩ/50 Ω input impedance and a fanless chassis to keep out dust and dirt. Few oscilloscopes match the stable triggering of the 1740A. Only 1 cm of vertical deflection (or 100 mV of external signal at 100 MHz) is needed to trigger this scope. Vertical deflection to 1 mV/div and sweep range from 50 nS to 2 S with a basic accuracy of 2%.

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The New Standard—The OptoScan 456.

- CTCSS & DCS Controlled Scanning and Logging
- DTMF Decode & Log with Channel and Time
- PC Software for computer Log, Scan & Search
- RS-232C & CI-V Interface
- No Drill or Solder Installation
- Output for signal level and spectrum display

Why Computer Controlled Scanning? The computer makes the scanner perform, simply and effortlessly. Even when you are not around, the computer can continue to search out frequencies you want and record them–virtually unlimited numbers.

Why Decode CTCSS tones and DCS codes? The OS456 decodes tones, codes and touch-tone characters to provide the Radio Monitoring Enthusiast with a powerful new tool in sorting out who is talking, and accessing a repeater. ***Optoelectronics has produced the OptoScan 456 to make the PRO-2006 family radios perform to a new standard that no one else can match for any price!***

Complete Installation Kit, Model OS456, includes the assembled and tested controller board, mounting hardware (no soldering or drilling required), cables, OptoScan 456 basic software for the PC and the installation video..... **$299.**

Complete Optoscan 456 and modified Pro-2006 are available from our distributors:
Grove Ent., 1-800-438-8155, NC; Marymac Ent., Inc., 1-800-231-3680, TX; E.E.B., 1-800-368-3270, VA.

OPTOELECTRONICS

NEW NEW NEW NEW NEW NEW

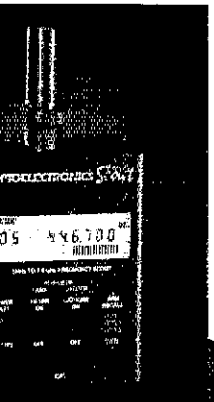
Model 25 Scout — Electronic Equivalent of Forward Reconnaissance

The Remarkable New Frequency Scout automatically finds and records frequencies for later use and will tune a receiver.

The Scout is pocket size—ready to go anywhere, and, unlike a frequency counter, the Scout can differentiate between random noise and coherent RF transmissions.

It is ideal for surveillance walk-by situations with a built-in vibrator to alert you a frequency was recorded.

For drive-by applications. a beeper lets you know when a new frequency is found or an already recorded frequency is hit. Up to 250 hits can be counted on each of the 50 frequency memories.



Reaction tunes VHF/UHF receivers equipped with CI-V serial communications interface.

- Exclusive Optoelectronics Digital Filter/Capture Technology *(pat. pend.)*
- 50 Memory Locations for unique frequencies
- 250 Hit Counter for each frequency in memory
- Reaction tunes OptoScan 456 CI-V Communications receivers
- Selectable annunicators include vibrator, beeper and EL back lit display
- Can be interfaced to a PC for data logging using OptoLog Software
- 16 Segment RF signal level bargraph for relative signal level detection
- 10MHz to 2.8GHz single frequency range.
- Six+ hour battery life—one hour rapid charge
- Pocket Sized: 3.7" H x 2.75" W x 1.2" D

The Scout Model 25 with rapid Charge and high capacity NiCad batteries..... **$399.**
Scout is pictured with optional DB32, dual band, VHF/UHF miniature antenna.....$ 29.

DC440 Decoder (pictured above) with New CI-V Interface

If you are into UHF/VHF communications monitoring then you will want to add a DC440 to your system. This popular decoder has been upgraded with a new communications interface port that is CI-V compatible. Now you can take advantage of the new scanning software that supports tones and codes If you are using an R7100 or R7000 receiver then the DC440 will connect to either the CT17 or CX12 RS-232C Convertor for single serial port use.

- Simultaneous off the air detection of 50 CTCSS tones, 106 DCS codes and 16 DTMF characters
- Six measurement modes for maximum flexibility
- Scrollable ten character display of up to 127 stored DTMF characters
- Convenient front panel controls for Power, Mode and Recall

The DC440 with CI-V Interface..... **$259.**
NiCad 44 (Optional Internal NiCad battery pack).....$ 39.

CX12 CI-V to RS-232C Interface Converter

Low cost convertor for CI-V logic level data to RS-232C for connection to a Personal Computer serial port. The CX12 is fully equivalent to the Icom CT-17 convertor.

The CX12 is an accessory for the Optoelectronics DC440 and Model 25 Scout. Price: $89.

1-800-327-5912
Fax 305-771-2052

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305-771-2050 • 5821 NE 14 Avenue, Ft Lauderdale, FL 33334 Visa, Master Card, C.O.D., Cash or Money Order. Shipping Charges Additional.

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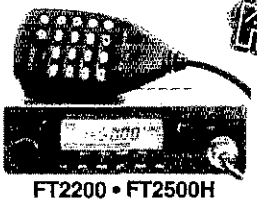
FT736R

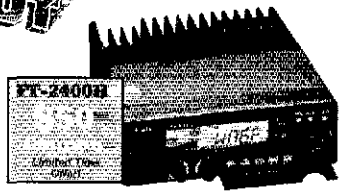
FT5100 • FT5200

FT840• FT890AT

HOT



FT2200 • FT2500H



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10 DTMF Auto-dials
Tone Enc & Dec
DTMF Paging &
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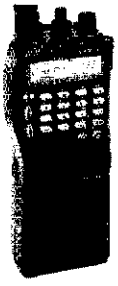

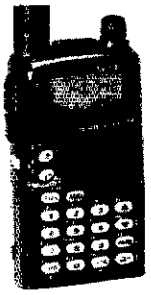

FT530 • FT11R

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Super Summer Sale!

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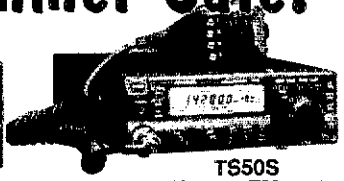
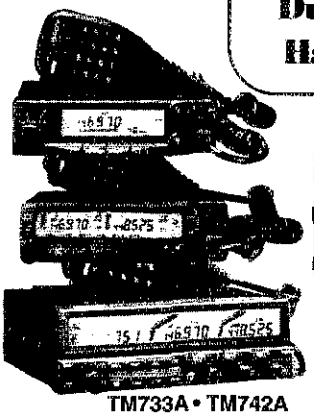
TS690S • TS850SAT



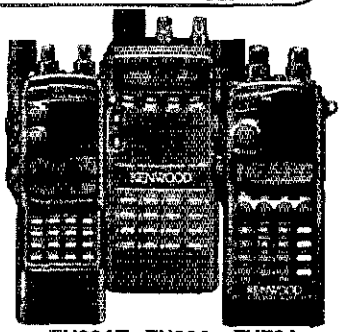
TS50S
TS60S • TM255A

On Sale!

New! TH79A Dual Band Handheld



TM733A • TM742A
TM241A • TM251A



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YOU GET AMATEUR, SHORTWAVE, MARS, CAP AND MORE.

Versatility, performance and quality.
The Paragon II performs superbly on ham bands, shortwave, MARS, CAP and other commercial/government services. It has proven synthesizer performance, "intuitive" digital features, built-in AM transmit and unequaled Ten-Tec construction.

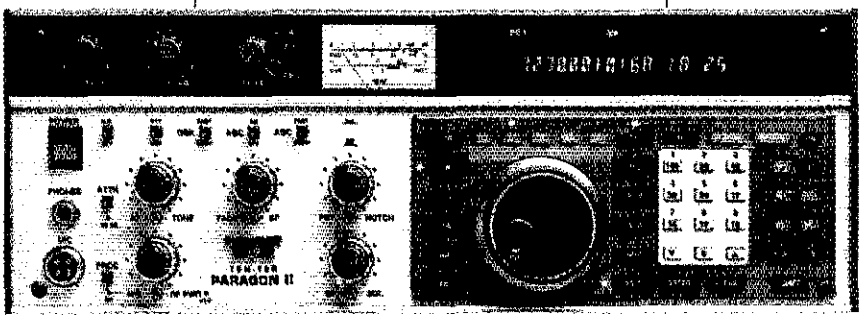
One-touch bandwidth selection.
Change bandwidth in any mode by hitting one button. 6 KHz AM and 2.4 KHz SSB filters are standard, and 1.8 KHz, 500 Hz and 250 Hz filters are available as options. So you get -- and pay for -- just what you need.

Jump between frequencies.
Bandstacking registers originally developed for the top-of-the-line OMNI VI let you jump between two frequencies on the same band, and give you single button band change.

Full power in any mode.
Only the Paragon II lets you run full power in any mode. Ten-Tec's virtually indestructible final's 100% duty cycle design is so rugged it doesn't require SWR foldback as other rigs do -- a big advantage for PACTOR and AMTOR digital modes.

Unequaled QSK.
The Paragon II has Ten-Tec's smooth, lightning-fast QSK that's earned reviews like "...the best you'll find in any radio" from QST and "excellent" from CQ. There's simply nothing better for the serious CW operator.

SPORT PC interface.
One of the most important advances in the Paragon II is Ten-Tec's exclusive SPORT (Serial Port Operation of Receive and Transmit) PC interface. It's the only one that lets you choose between RS-232 or 2-line operation, and it's compatible with most logging and contest software.



Ten-Tec's Paragon II is a high-performance HF transceiver and shortwave communications receiver.

We make it here. We're here when you need us.
Like all Ten-Tecs, the Paragon II is made right here in America. So you're keeping money -- and jobs-- here instead of exporting them to Japan. It also means we're right here with expert factory advice and legendary Ten-Tec service when you need us.

Just $2125 factory direct (plus shipping and handling).
With the Paragon II you get more radio for your money because Ten-Tec only sells factory direct. So you aren't paying extra for middlemen. And we're always ready to take your present Ten-Tec equipment in trade. We accept Visa, MasterCard and Discover, and are under GSA contract.

No-risk, 30-day money-back guarantee.
The Paragon II is protected by Ten-Tec's no-risk 30-day money-back guarantee. If you're not satisfied for any reason just return your rig in original condition for a full refund. All you pay is shipping and handling.

Call today: 1-800-833-7373.
Call Ten-Tec from 9:00 AM to 5:30 PM Eastern time, Monday through Friday for more information or to order. You can reach our repair department at 615-428-0364 from 8:00 AM to 4:00 PM Eastern time Monday through Friday. You can also fax us at 615-428-4483 or write us at 1185 Dolly Parton Parkway, Sevierville, TN 37862.

TEN-TEC

Ham Ads

1) Advertising must pertain to products and services which are related to Amateur Radio.

2) The Ham-Ad rate is $1.00 per word. This includes firms or individuals offering products or services for sale. A special rate of 30 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8½" 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 13th through September 13th will appear in October *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 check with us to determine if a production sample (which will be returned) should be submitted for examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must stand by and support all claims and specifications mentioned in your advertising.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason.

CLUBS/HAMFESTS/NETS

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN TAPR- Tucson Amateur Paket Radio Support the development of new communications technology. Benefits: newsletter, sofware/shareware, discount on kits and publications. $15/year, Visa/MC accepted. When joining, mention *QST*, receive Packet Radio into booklet ($7 value)! 817-383-0000. Mail: 8987-309 E. Tanque Verde Rd. #337, Tucson, AZ 85749-9399.

MARCO: Medical Amateur Radio Council, operates daily and Sunday nets. Medically-oriented amateurs (physicians, dentists, veterinarians, nurses, therapists, etc.) invited to join. For information write: MARCO, Box 73, Acme, PA 15610.

IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily exept Sunday, 14.280 MHz, 1:00-3:00pm Eastern time. Sr. Noreen Perelli, KE2LT, 2755 Woodhull Avenue, Bronx, NY 10469.

JOIN FAIRS — The Foundation for Amateur International Radio Service. Hams who are dedicated to building international friendships by providing technical assistance, training, exchange visits, and equipment donations on a global basis. Donations tax deductible with 501(c)(3) IRS status of FAIRS. Free information toll free 1-800-FB-KK4WW or 703-763-3311, P.O. Box 341, Floyd, VA 24091.

NOVEMBER is still beach weather in Tampa! Include our Hamfest in your late "Indian Summer" vacation plans! Over 500 tailgate spaces this year! Suncoast Amateur Radio and Computer Convention, November 19, 20, 1994. AFC ARC, PO Box 2423, Clearwater, FL 34617-2423.

INDIANA (Spencer) September 10. Set up 7am public 9am. Spr: Owen County ARA. Fairgrounds, Spencer. Amateur radio equipment & related electronic items only. Covered space $10, no tables provided. Tailgate $5. Admission & Parking free. TI 146.985. Kathryn Smith, KB9INU, Rte 1 Box 368D, Poland, IN 47868. 812-829-2140.

QSL CARDS/RUBBER STAMPS/ENGRAVING

QSLs—ELEGANT, AFFORDABLE. Samples $1 (refundable with order). AACO, Dept. Q46, 1639 Fordham Way, Mountain View, CA 94040.

DON'T Buy QSL Cards until you see my free samples. Also I specialize in custom cards and custom cards and QSL business cards. Write or call for free samples and custom card ordering information. Little Print Shop, Box 1160, Pflugerville, TX 78660, 512-990-1192.

BROWNIES QSL CARDS. Free catalog of samples (stamps appreciated). 3035 Lehigh Street, Allentown, PA 18103.

QSLS - 1) Famous KØAAB custom with background collection. 2) Railroad employees and rail fan's specials. 3) Front report styles. 4) Multiple callsigns. 5) Ham business cards. State your sample wants. 52 cent self-addressed business size envelope required for free samples and catalog. Mahre & Sons Print Shop, 2095 Prosperity Avenue, Maplewood, MN 55109-3621

EMBROIDERED CALLSIGN HATS by NØSXU $6-$9. SASE for info. Adventure Bound Enterprises, 467 Quail Ridge, Warrenton, MO 63383, 314-456-2213.

PHOTOS, Postcards — Become QSLs. Clear stick on labels. New! "Kall Kards". Stamp brings details. K-K-L, Box 412, Troy, NY 12181-0412.

QUALITY QSLs. Samples $.50. Olde Press, WB9MPP, Box 1252, Kankakee, IL 60901.

CALL SIGN BADGES, two color, mint green, sunny yellow, pink, or white background. Send name, call, state, $3. Photo buttons $3, send photo. R. Wolsh, 32F Plymouth Park, Conshohocken, PA 19428.

QUALITY PRINTING with fast personal service and 100% satisfaction guarantee is our program. SASE for free samples. QSLs by W4MPY, 682 Mt. Pleasent Rd., Monetta, SC 29105.

QUALITY QSLs By WX9X. From $28.95 per thousand. See our display ad on this page.

AMATEUR RADIO CALLING CARDS. Your Amateur call sign, name, address and tel# (if desired). Give out to your friends at your next meeting or hamfest. 100 cards for only $13.95. For free samples send SASE to Creative Imprinting Company, WB4FIH, 6522 Chesterfield Avenue, McLean, VA 22101.

QSL's — Quality for less is back! See our display ad in this issue of *QST*. Harry A. Hamlen, P.O. Box 1, Stewartsville, NJ 08886.

QSLs/Rubber Stamps: Top quality. 52¢ stamp, Free Ebbert QSLPAK, D-3, POB 24280, Columbus, OH 43224.

FULL COLOR QSLs, lowest prices anywhere! FREE Customizing, front back, Color photos, cartoons, Samples $1. K2MK QSLs, 551 Norwood Rd., Mt. Laurel, NJ 08054.

QSL SALE! 100/$8, 300$14, 500/$20, 1000/$28, 1500/$38, 2000/$48. Many designs! 1994 Callbooks $25.95, includes 100 free eyeball QSO cards. Free shipping! Phone or write for free samples or ordering. Shell Printing, KD9KW, Box 50, Rockton, IL 61072. 815-629-2193, anytime.

QSLS—OVER FIFTY DESIGNS! Custom cards. "Eyeball" cards. Samples $1 (refundable). Charlie Hansen, NØTT, RR 1, Box 106-B, Napoleon, MO 64074.

QSL SAMPLES: 50 cents. Samcards, 48 Monte Carlo Drive, Pittsburg, PA 15239.

ENGRAVING: Callsign/Name Badges by WØLQV. SASE for price sheet. Box 4133 Overland Park, KS 66204.

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COLLECTOR buys old tube power amplifiers by Dynaco, Heathkit, Fisher, Scott, Brook, Brociner, Leak, Quad, Macintosh, Marantz, Etc. Also old radios, ancient TVs, 1950's transistor radios and most HI-FI components. Stan Jacobs, 232 Highbrook Ave, Pelham, NY 10803. 914-738-3483.

1866 PRESCOTT BOOK on the Electric Telegraph (reprint) $16.95. McElroy biography $19.95. add $2 s/h to total. Artifax, Box 88-Q, Maynard, MA 01754.

COLLECTOR Looking for Pre-1942 Communications Receivers, Commercial, Amateur, Government, Kit, Homemade, etc. Anything considered. Wayne, NØTE, 1212 17th Road NW, Burlington, KS 66839, 316-364-5353.

WANTED: Old Callbooks: Amateur, Commercial, Military, Govt and Broadcast for the years 1900-1930. Bob, W4JNN, P.O. Box 166, Annadale, VA 22003 or call collect 703-560-7161.

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WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201, 818-242-8961.

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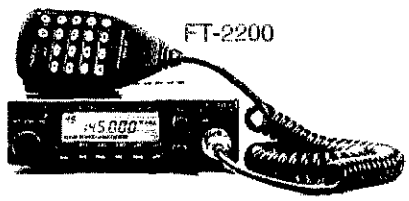

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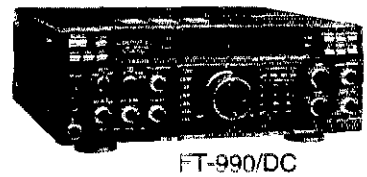

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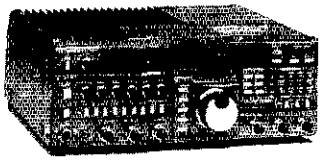

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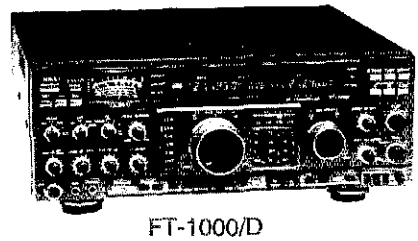

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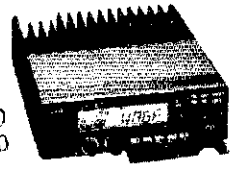

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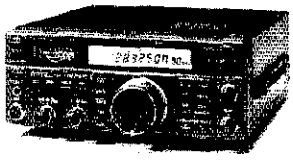

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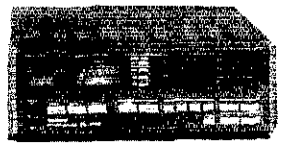

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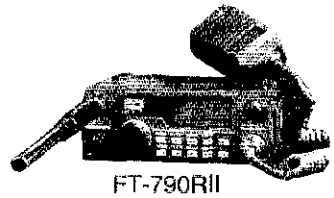

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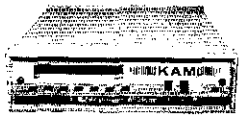

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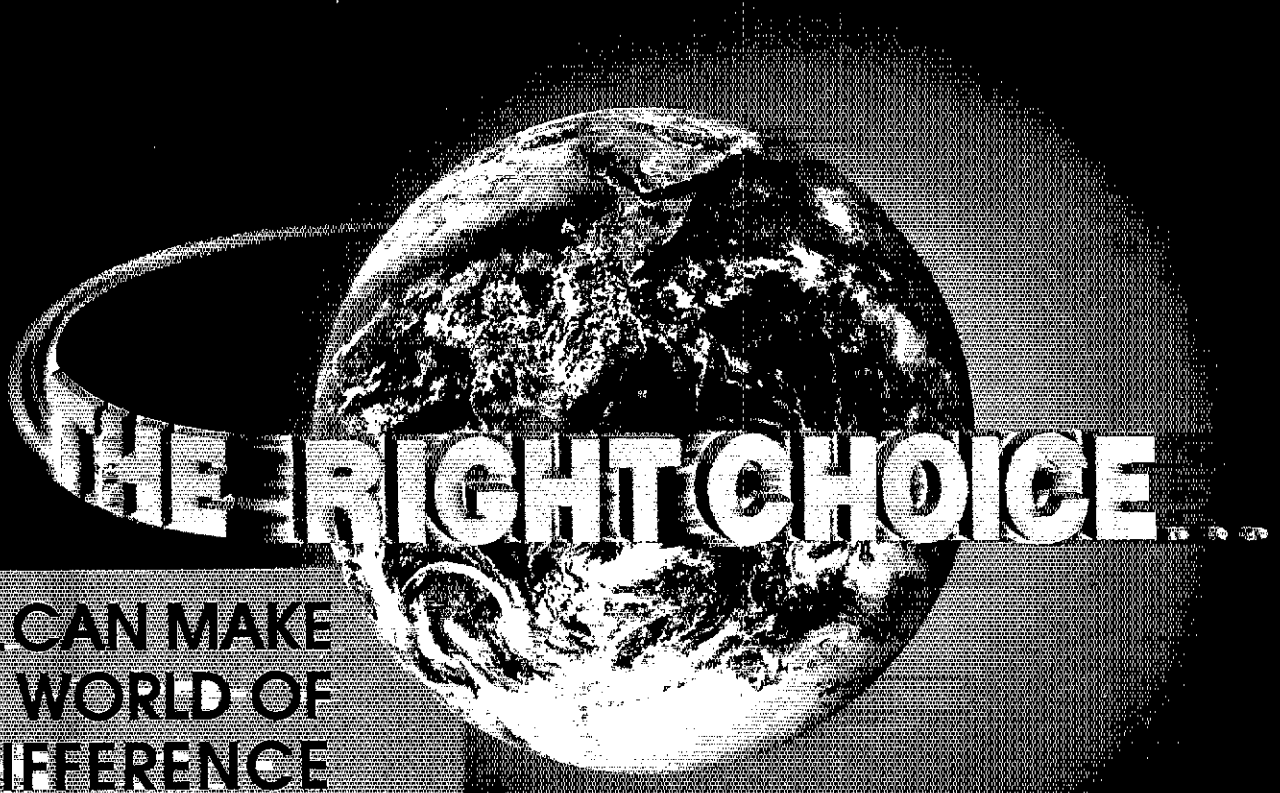

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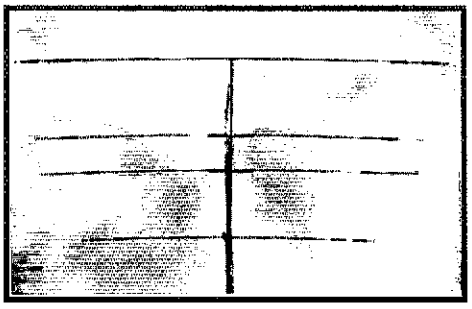

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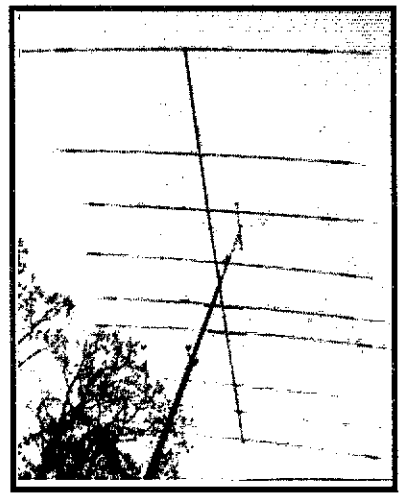

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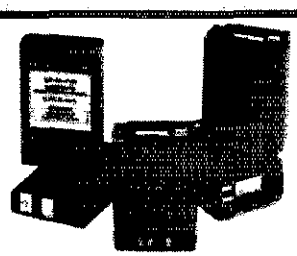

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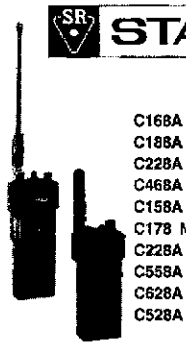

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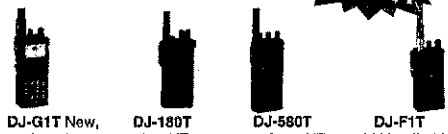

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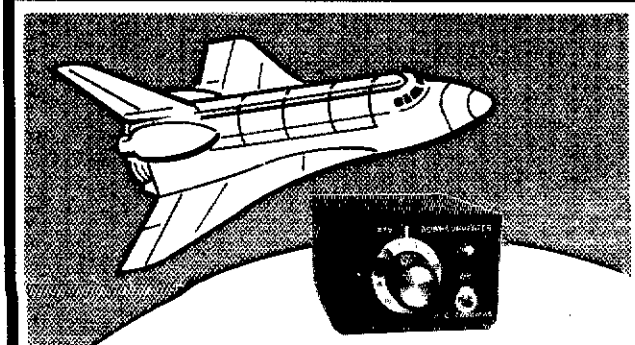

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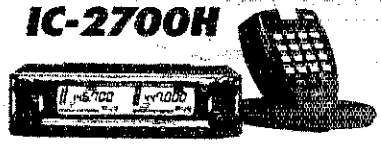
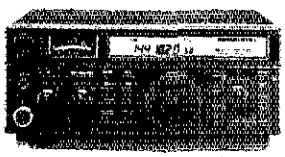
- 700 mAh Battery
- Selectable DTMF Speed

IC-2700H



- Detachable Front Panel
- Full Remote Control Mic.
- Infrared Wireless Mic. (opt.)
- Built In Pager/Code Squelch
- V/V, U/U or V/U
- Auto Repeater Functions
- CTCSS Encode

IC-820H

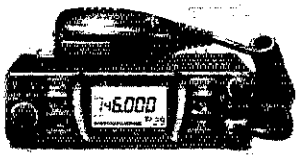


- 2 M/440 MHz All Mode
- New DDS (I-Loop)
- 9600 Baud Ready
- High Stability Crystal
- Multiple Satellite Features
- Compact Size
- 116 Memories

IC-2340H

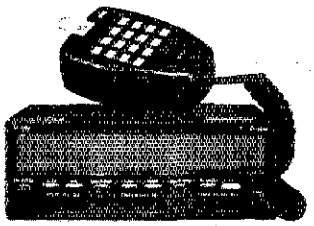
- Independent Controls
- Large Display
- 110 Memories
- CTCSS Encode
- True Dual Band
- Auto Repeater Functions
- Built In Duplexer
- 2.4 W Audio

IC-281H



- 2 M w/440 MHz Rx
- 80 Memories
- 9600 Baud Ready Plug & Play
- Tone Scan (opt.)
- Large Display
- Auto Repeater Functions

IC-△100H



- Triple Band Flexibility
- 8 Selectable Band Combinations
- Detachable Front Panel
- Full Remote Control Mic.
- 642 Memories
- High Performance
- Voice Synth. (opt.)

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IC-38A	$ 20 off
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LINEAR AMPLIFIER...Henry 2KD classic, mint condition, $700. 616-664-4963, NJ8O.

FOR SALE: 70cm transmitters-10w, video ID with auto timer, audio with line monitor, write for info. Soldering iron with stand-$21.95. Blue LEDs. N8KXV, Richard Drake, PO Box 753, Wellston, OH 45692.

HP 606A Signal generator 50KHz to 65MHz RF output continuous adj 0.1 microvolts to 3 volts 50 OHM includes manual $200. Pick up only, Bill Cridland, 57 Pinewood Rd, Bolton, MA 01740.

SELL: 1-4-400 E.Mac, new $90, Three 4-400 Jan., new $80 each Marion-John Chelkowski, W5DBN, 1103 Kayton Ave, San Antonio, TX 78210. 210-533-1876.

FOR SALE: Icom IC-W2A 2M/440 handheld, hi-cap nicad pack, $330, IC-R1 hand held communications receiver, 100 memories, continuous coverage to 1300 MHz, $250. AOR AR-3000 scanner, 100 KHz to 2036 MHz, AM, FM, WFM, SSB, CW, 400 channels, $650. Jim, KR2T, 609-424-9555 after 6 PM Eastern.

HV Power supply plate transformer, 3KV-1A, Hi Persil, taps $150. Capacitors, 2100MFD-400V, new $6. Filament transformer, 7.5V-75A, taps $100. Alan, K6GA, 714-964-3912.

USED TECHNICAL BOOKS: Radio, electronics, magazines, Etc., $1 for large list, stamps OK, Softwave, Dept. QST, 1515 Sasbawaw, Ortonville, MI 48462.

COMMODORE 64 HAM PROGRAMS—8 disk sides-over 200 Ham programs—$16.95. 29¢ stamp gets unusual software catalog of utilities, games, and British disks. Home-Spun Software, Box 1064-Q, Estero, FL 33928.

FOR SALE: Yaesu FL 7000 amp $1,495, mint. Also QTH: 3 bedroom, 2 bath, pool, tilt over tower, 13 antennas. See Prodigy or call 904-237-6351. $49,900 1 1/2 acres no restrictions, I will send photos and detailed, info on request. Wayne Smith, N4VGY, 7040 SW 17 Pl., Ocala, FL 34474.

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FOR SALE: Icom 24AT HT Hardly used $350. K6DL, 2612 N. Valencia Ave, Santa Ana, CA 92706.

FOR SALE: R390A Parts. WW5C, 505-356-5167.

FOR SALE: *QST* complete 1935 to current issue. Minimum Bid, $360. You ship or pick up. W2HPV. QTH per call book. Phone 201-992-6105.

FOR SALE: ICOM 735 w/less than 10 hrs on $675, Drake Twins T4XB-R4B+PS Exc. $350, Motorola Cellular phone like new $200. Call 612-523-2008. Don, KG0FN.

KENWOOD TS-440S w/auto. tuner, opt. filters, up-down, mike, exc. condition $625; YAESU FT-208R w/NC-8 base charger/pwr. supply, case, 2 ants. $155; AEA PK-88 w/cable $65; KL7OD, 907-451-5945; Internet: ftwlm@aurora.alaska.edu

FOR SALE: Early telegraph books! I have acquired the Technical library of teleglobe Canada consisting of many rare and out-of-print books on telegraphy and telephony dating back to 1850. Also included are various trade catalogs, 19th century telegrams, and miscellaneous ephemera. For a list to be published in late August, please send $2 ($4 foreign) to: James Kreuzer, N2GHD, Box 398, Elma, NY 14059. 716-681-3186. Phone/Fax.

RADIO RUBBER STAMPS, free brochure, Reid Associates, 6680 Mellowood, West Bloomfield, MI 48322.

WANTED: Swan 250, Gale Urbanzick, 2713 Thinnes St., Cross Plains, WI 53528. 608-798-2007.

COLLINS: 30L1 Plus 4-811s $550; TS530S $500; KAM $175; MFJ 941D $50; All mint. W2GCW, 703-433-6741.

I PASSED. Buy my Aviation Ground Schools videos and manual for General Radiotelephone license, $150. Martin, 214-231-0736.

WANTED: Unassembled Heathkit HW-9 Kit. Ken Gilcrest, KB7ZTU, 3300 N. Tenaya #2079, Las Vegas, NV 89129. 702-656-1332.

WANTED: Ham Equipment and other property. The Radio Club of Junior High School 22 NYC, Inc. is not only the Big Apple's largest Ham club but also the nation's only full time, non-profit organization, working to get Ham Radio into schools around the country as a theme for teaching using our EDUCOM-Education Thru Communication-program. Send your radio to school. Your donated amateur or related property, which will be picked upped or shipping arranged, means a tax deduction to the full extent of the law for you as we are an IRS 501(c)(3) charity in our fourteenth year of service. Your help will also mean a whole new world of educational opportunity for children around the country. Radios you can write off, kids you can't. Enjoy the coming fall season by helping someone wise and yourself, please, write-phone-or FAX the WB2JKJ "22 Crew" today: The RD of JHS 22, POB 1052, New York, NY 10002. Telephone 516-674-4072, or FAX 516-674-9600. Young people, nationwide, can get high on Ham Radio with your help. Meet us on the WB2JKJ Classroom Net: 7.238 MHz, 1100-1230 UTC and 21.395 MHz, 1300-1900 daily. A new school term is just beginning, your help now could change the course of many a young persons future.

ROHN 45 Foldover tower 59 Ft. Complete, all hardware, winch, manual, $900. Ron, NG6X, 129 Club Dr., San Carlos, CA 94070. 415-591-1357.

NC400 National receiver wanted. Jim, W6OU, 714-528-5652.

WANTED: Heathkit gear and accessories; Harvey Wells Z Matcher; tube type CB radio. Ed Clink, WA9PFB, RR1 Box 106, New Berlin, IL 62670. 217-787-8595.

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PD-8010	80, 40, 20, 10/15	130'	43.95
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WANTED: Excellent Yaesu FC-102, Reyco 20M Traps, Vibroplex Iambic Paddles. NCØN, 219 South 35th, Parsons, Kansas 67357.

CUSHCRAFT R5 used only 4 months, $225, call Alejandro at 412-635-0119.

1994 CALLBOOKS: North American, $21.95; International, $21.95; Both, $39.95; ARRL Handbook, $22.95; ARRL Antenna Book, $18.95; Antennas & Techniques for Low-Band DXing, $18.95. Postpaid USA. (CA residents: add 7%). AA6EE-Callbook Distributor, 16832 Whirlwind/Q9, Ramona, CA 92065. 619-789-3674.

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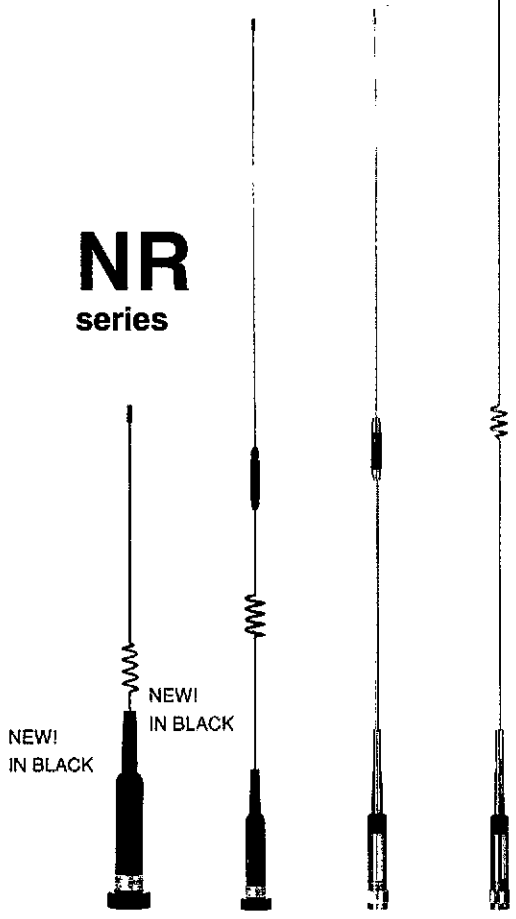

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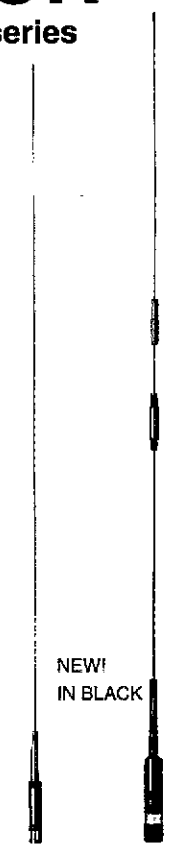

CR214S CR320A

R-72BNMO	2m/70cm		100	NMO	13.8	1/4 λ ,1/2 λ
R-73BNMO	2m/70cm		100	NMO	33.5	1/2 λ ,2-5/8 λ
R-770SA	2m/70cm		100	UHF	16.9	1/4 λ ,1/2 λ
R-770HA	2m/70cm		200	UHF	40.2	1/2 λ ,2-5/8 λ
R-770HNMO	2m/70cm		200	NMO	38.2	1/2 λ ,2-5/8 λ
R-770RA	2m/70cm		200	UHF	38.6	1/2 λ ,2-5/8 λ
R-790A	2m/70cm		120	UHF	57.5	6/8 λ ,3-5/8 λ
G-7000	2m/70cm		100	UHF	18.5	1/4 λ ,6/8 λ
G-7200NMO	2m/70cm		150	NMO	36.6	1/2 λ ,2-5/8 λ
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SG-7900	2m/70cm		150	UHF	62.2	7/8 λ ,3-5/8 λ
SG-2000	2m		150	UHF	62.6	7/8 λ
NR-140A	1-1/4m		100	UHF	36.2	5/8 λ
NR-124	23cm		100	N	25	4-5/8 λ
CR-214S	2m/1-1/4m		120	UHF	37	1/2 λ ,5/8 λ
CR-224A	2m/1-1/4m		150	UHF	68.5	7/8 λ ,2-5/8 λ
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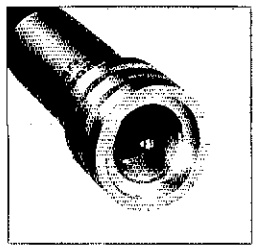

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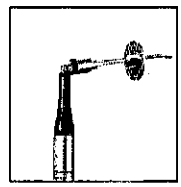
PATENTED ONE-TOUCH FOLD-OVER FEATURE



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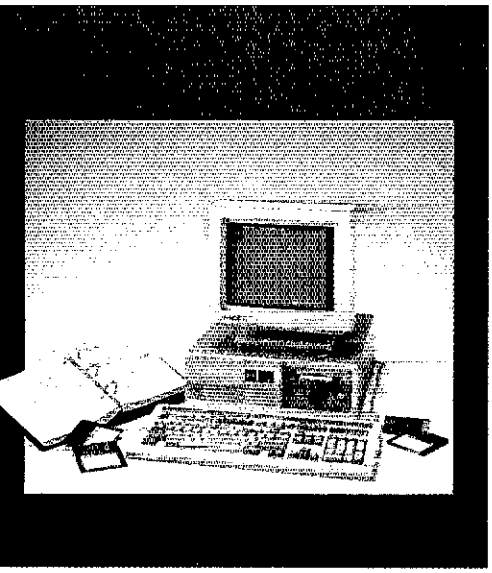
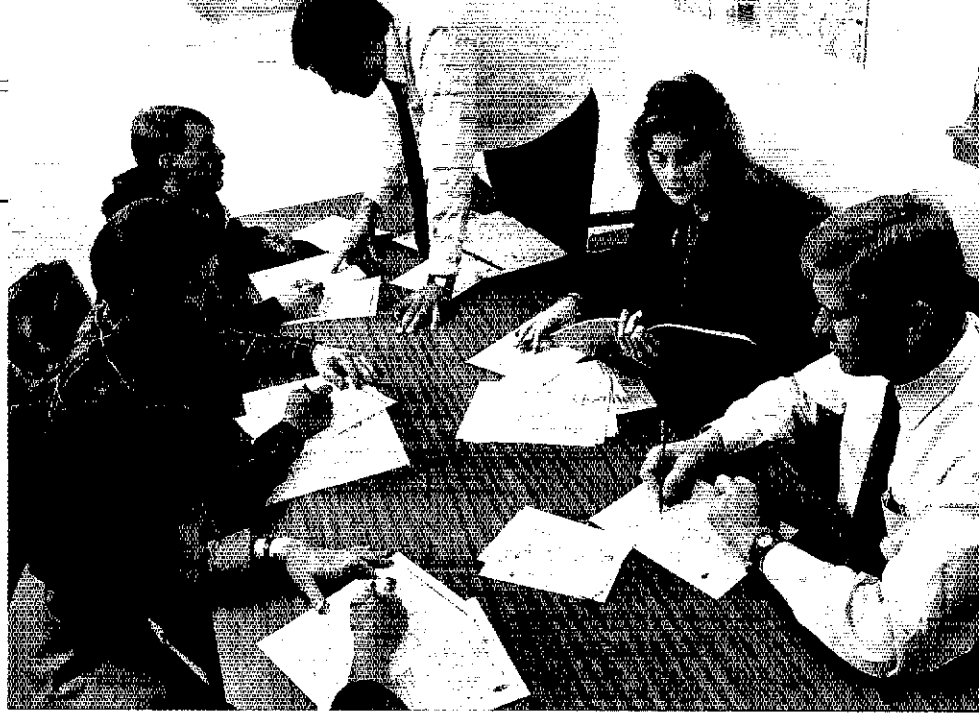
Examiner!





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Please type or print clearly in ink

Control Number
(ARRL/VEC will assign)

☐ General
☐ Advanced
Call: _____ ☐ Extra

License expiration date: _____

Name: _____
(First MI Last)

Mailing Address: _____

City: _____ State: _____ ZIP: _____

Day Phone: ( ) _____ Night Phone: ( ) _____

Was your license ever suspended or revoked? ☐ Yes ☐ No
Have you ever been disaccredited by another VEC? ☐ Yes ☐ No
If yes, which VEC(s) and when?
Do you have a call sign change pending with FCC? ☐ Yes ☐ No
Do you have any kind of Form 610 pending action with the FCC? ☐ Yes ☐ No

Person to contact if you cannot be reached? _____ _____
(name) (phone)

Mailing address where UPS or daytime delivery is ***reliably*** possible:

_____ _____
(name) (street address)

_____ _____ _____
(city) (state) (zip)

For instant accreditation, have you participated as a VE in another VEC program, and is your accreditation in that program current? ☐ Yes ☐ No
If yes, which VEC? _____

CERTIFICATION

By signing this Application Form, I certify that to the best of my knowledge the above information AND the following statements are true:

1) I am at least 18 years of age.
2) I agree to comply with the FCC Rules-(see especially Subpart F—Section 97.515 [b]).
3) I agree to comply with examination procedures established by the ARRL as Volunteer Examiner Coordinator.
4) I understand that violation of the FCC Rules or willful noncompliance with the VEC will result in the loss of my VE accreditation, and could result in loss of my Amateur Radio operator and/or station licenses, or both.
5) I understand that even though I may be accredited as a VE, if I am not able or competent to perform certain VE functions required for any particular examination, I should not administer that examination (Section 97.525[a][3]).

_____ _____ _____
(signature) (call sign) (date)

(Please attach a photocopy of your Amateur Radio license, and if applicable a photocopy of any other VEC accreditation held, to this application.)

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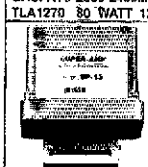

Model	MHz	NF	GAIN	PTT/VOX	$
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SP-2	144	<.9	10-20 Adj.	750	200 209.95
SP-70	432	<.9	10-20 Adj.	500	100 209.95
SP-23	1296	<.9	18	100	10 319.95
SP-13	2304	1.2	18	50	10 369.95
MC-2	144	1.0	14	200	125 134.95
MC-70	432	1.2	12	100	100 134.95
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LNA	432	<.5	18	NA	NA 189.95
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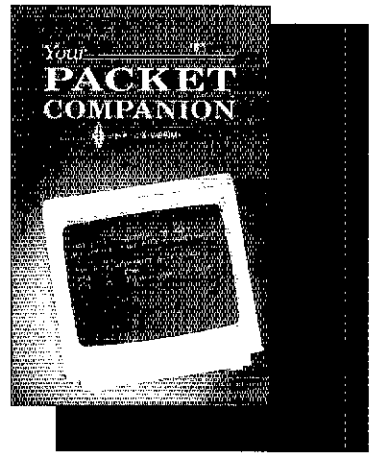

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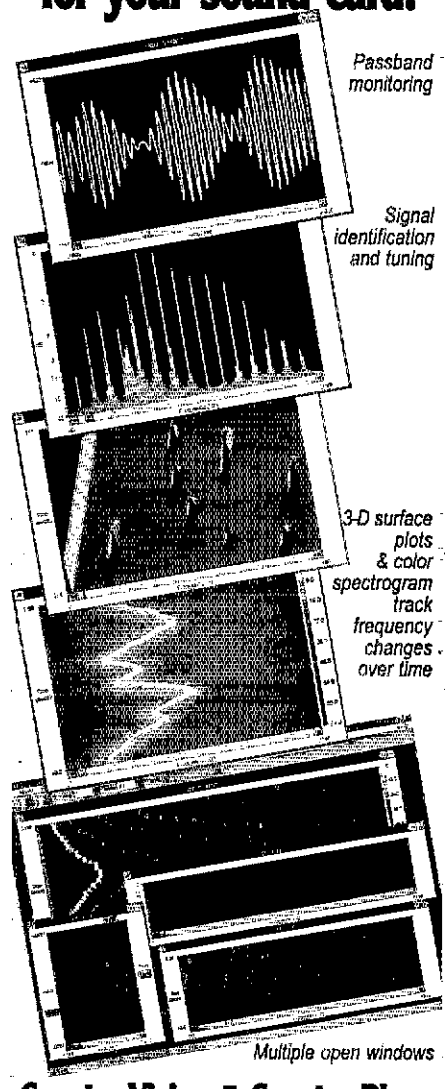

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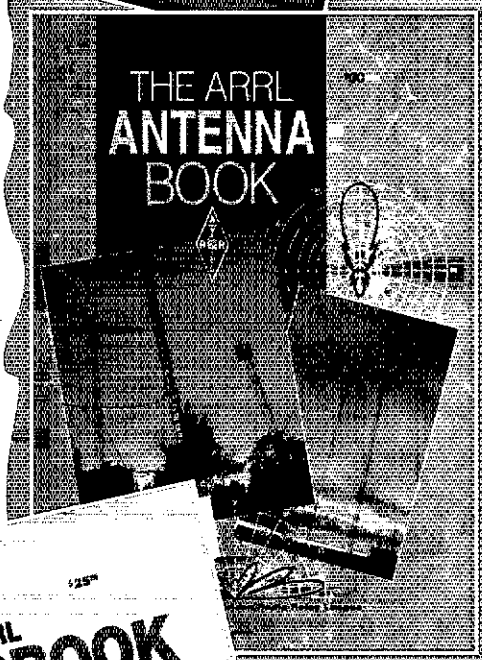

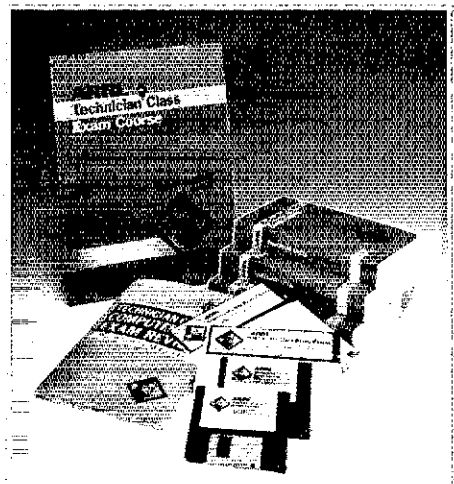

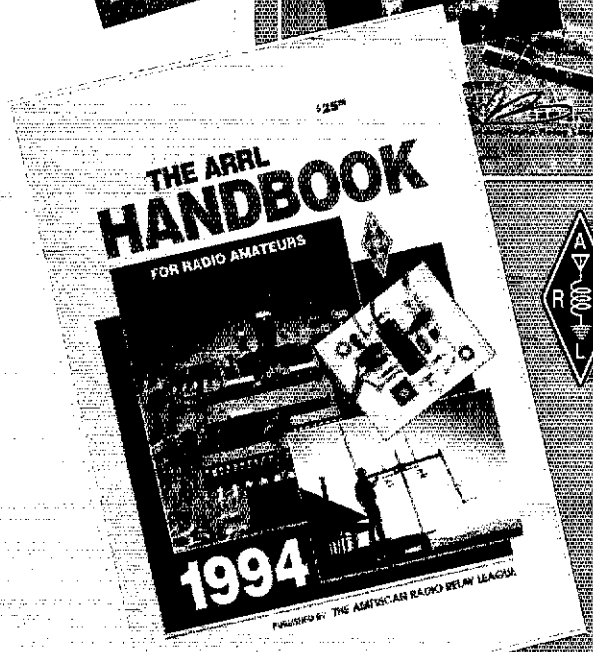

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Hampass—ARRL's license-exam-review software is a great way to prepare for the Novice and Technician tests. ***Hampass*** drills you on the Novice or Technician question pools by selecting questions from the entire pool or from subelements you specify. It also creates sample tests. Each package includes 5.25-inch *and* 3.5-inch disks.

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Upgrade Your License the Easy Way!

After you receive your license and get on the air, you'll probably want to explore additional operating privileges. The ***ARRL License Manual Series*** represents the best study material for the Technician, General, Advanced and Extra Class Amateur Radio exams. Each book is carefully revised and updated as new exam questions are released by the VEC Question Pool Committee. The appropriate examination question pool, complete with an answer key, is included for easy reference. The answer key contains page references so you can locate appropriate text explanations as you review the questions before your exam. Our ***FCC Rule Book*** should be used along with each publication in the series.

ARRL License Manual Series
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Advanced Class, 3rd ed, ©1990 (good through June 30, 1995), 280 pages .....#3274 **$8**
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The FCC Rule Book, Complete FCC rules, plus easy-to-understand explanations. 9th ed, ©1993, 288 pps .....#4270 **$9**

Code Proficiency

When it comes to the code, whether you're just starting out, or you're working on your Extra Class upgrade, practice makes perfect!

The ARRL produces five sets of Morse code tapes to get you from 0 to 22 words per minute. Each set includes two C-90 cassettes. ***GGTE Morse Tutor*** software for IBM PCs and compatibles teaches you the code, provides plenty of practice for exams and helps keep your code speeds sharp in easy, self-paced lessons. Features include code speeds from 1 to more than 100 words per minute, standard or Farnsworth modes and random QSOs. The ***Advanced Morse Tutor*** has even more features. You can send code from an ASCII text file that you create on the computer, save to disk the random QSOs created by the program for later replay, and even create your own practice text with special emphasis on problem characters, and more.

Your Introduction to Morse Code, our cassette program for beginners, makes learning the code fun. It teaches you all the characters and provides plenty of practice.....#3487 **$10**

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Set 1: 5 to 10 WPM .....#2227 **$10**
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Set 4: 13 to 14 WPM .....#2251 **$10**
GGTE Morse Tutor (5.25-inch) .....#2081 **$20**
GGTE Morse Tutor (3.5-inch) .....#2936 **$22**
Advanced Morse Tutor (5.25-inch) .....#3231 **$30**
Advanced Morse Tutor (3.5-inch) .....#3258 **$30**

Help for Beginners

W1FB's Help for New Hams, by Doug DeMaw, offers sound advice on getting started in Amateur Radio after you get your

license. Covers how to select equipment, station layout and accessories, building and using antennas, and operating. Whether you're into HF or VHF, this book will get you on the air. 2nd ed, ©1994, 304 pages ..... #4432 **$10**

Ham Radio Horizons: The Book, *What Ham Radio is All About and How to Get Started* introduces nonhams to the exciting world of amateur radio. You'll find tips from expert hams on DXing, Contesting, Serving the Public, Ham Radio in Space, Experimenting, Digital Communications and more. 1st ed, © 1993, 160 pages ..... #1234 **$12.95**

Novice Notes: The Book is a selection of articles for the beginner from the popular ***QST*** series. It's filled with useful information: What you should do before your license arrives; how to buy used gear; and much more. 1st ed, ©1989, 76 pps ..... #2561 **$6**

Written in an easy-to-understand style for electronics beginners, ***Understanding Basic Electronics*** is also for those who want to brush up on electronics principles. Loaded with illustrations, the book starts with math skills and progresses to dc and ac electronics principles. It concludes with clear, simple explanations of how components like diodes, transistors and integrated circuits work. 1st ed, ©1992, 448 pps ... #3983 **$17**

First Steps in Radio by Doug DeMaw, W1FB, is a tutorial on electronics principles tailored to the beginner. Reprinted from the popular ***QST*** series, this book will help you learn the electronics theory helpful for licensing exams and to gain some insight into how radio equipment works.
1st ed, ©1985, 88 pages ..... #2286 **$6**

Operating an Amateur Radio Station. This booklet answers the basic Amateur Radio questions often posed by newcomers: How do I decide what equipment to buy? What kind of antenna do I need? and many others.
65th ed, ©1991, 52 pages ..... #226X **$2**

Handy References

The 1994 ARRL Handbook

We're proud of the 71st edition of the ***ARRL Handbook for Radio Amateurs***. That's right–the 71st edition! ***The Handbook*** has been the "ham's bible" since 1926, and each new edition brings you the latest on what's new in Amateur Radio state of the art. ***The Handbook*** is many things:

- **a reference guide**, with updated lists of parts and equipment suppliers and other indispensable data on solid-state components and transmitting tubes
- **a guide to radio theory every ham should know**, including the latest digital modes and hundreds of explanatory and practical circuits
- **a goldmine of construction projects** that will allow all hams—beginners, old-timers and everyone in between—to build useful amateur gear for their stations.

What's new in the 1994 edition? Plenty! Here's some of what you'll find:

- Added coverage of Digital Signal Processing (DSP).
- Improved treatment of Pi and Pi-L matching networks for high-power amplifiers.
- A new all-digital-logic ID-timer section improves the operation of the repeater CW IDer.
- The "Ugly Transceiver" is a simple and enjoyable introduction to RF construction!
- A five-band quad that covers all amateur bands from 20-10 meters.

An indispensable reference for hams and engineers alike, ***The ARRL Handbook***, with its 1184 pages and 2100 charts and illustrations, is an exceptional value. ©1993 ..... #1719 **$25**

Every chapter of the 4th edition of ***The ARRL Operating Manual*** has been updated to include the latest information about every aspect of our dynamic hobby. It's simply the best book available covering on-the-air amateur operating practices. How do I operate on a repeater or on *PacketCluster*? How can I snare a contact through a DXpedition pileup? What satellites are available and how can I use them? You'll find the answers to all of these questions and many more in ***The ARRL Operating Manual***!

One impressive and colorful section features dozens of US and overseas operating awards, and a handy reference section includes an ARRL DXCC Countries List, beam-heading information, a series of maps, US counties, sunrise/sunset tables, and much, much more. No shack is complete without this valuable reference. ©1991, 576 pps ..... #1086 **$18**

The ARRL Radio Buyer's Sourcebooks are for anyone who buys, sells or owns Amateur Radio equipment. Two volumes are available: ***The ARRL Radio Buyer's Sourcebook*** covers selected ***QST*** Product Reviews from 1981 through 1991 and a few "golden oldies." ***The ARRL Radio Buyer's Sourcebook Volume 2*** contains *all* ***QST*** Product Reviews published in 1991 and 1992.

Both books explain what radios do, how well they do it, where to get them serviced and where to find articles about modifications. Handy comparative feature and performance charts cover equipment reviewed in the books. Each contains a history of Amateur Radio technology and a glossary of radio features and terms. Heading for a hamfest or ham dealer? Don't leave home without both ***Radio Buyer's Sourcebooks.***

The ARRL Radio Buyer's Sourcebook
1st ed, ©1991, 384 pages ..... #3452 **$15**

The ARRL Radio Buyer's Sourcebook Volume 2
1st ed, ©1993, 240 pages ..... #4211 **$15**

The ARRL Electronics Data Book is a valuable aid to the radio amateur, RF design engineer, technician and experimenter. All those commonly used tables, charts, and those hard-to-remember formulas and semiconductor pinout diagrams are found in one handy source. You'll also find hundreds of popular circuits and "building blocks," including oscillators, mixers, amplifiers, other devices and their operating parameters. By Doug DeMaw, W1FB.
2nd ed, ©1988, 232 pages ..... #2197 **$15**

The 13th edition of ***Hints and Kinks for the Radio Amateur*** has the best tips, suggestions and projects from the popular ***QST*** column (covering the years 1987-91). It's loaded with helpful techniques and easy projects that will enhance your operating enjoyment. ©1992, 176 pages ..... #3851 **$10**

The 1994-1995 ARRL Repeater Directory includes more than 20,000 listings for voice and digital repeaters and propagation beacons located in North, Central and South America. This edition also lists more than 500 beacons from 14 MHz to 24 GHz. You'll also find band plans, a CTCSS tone chart, a list of frequency coordinators, ARRL Spectrum Committee, Digital Committee and Future Systems Committee, and a user-friendly list of ARRL Special Service Clubs. The ***Repeater Directory*** comes in a handy pocket size for your operating convenience. 23rd ed, ©1994, 648 pages ..... #4718 **$6**

The ARRL DXCC Countries List is the ideal way to record the DXCC countries you've worked and QSLed. The latest printing

includes DXCC Advisory Committee members, an expanded cross reference for prefixes and exotic countries and more. (Free shipping). July 1994 ed, ©1994, 28 pages ..... #0291 **$2**

The ARRL Net Directory lists hundreds of Amateur Radio nets of interest to North American hams—DX, ragchew, special-interest, fun and public service nets—they're all here. Updated annually. (Free shipping).
1993-1994 ed, ©1993, 48 pages ..... #4262 **$2**

Your QRP Operating Companion shows that you don't need special rigs or expensive equipment to enjoy the excitement and challenge of low-power operating. Ragchewing, DXing, contesting—all are more enjoyable with QRP. Includes operating tips, lists of QRP clubs and organizations, net and calling frequencies, and much more. 1st ed, ©1992, 96 pages ..... #3762 **$6**

Passport to World Band Radio is the "TV Guide" of shortwave listening. Updated annually, ***Passport*** contains comprehensive schedules for hundreds of international shortwave broadcast stations—when they're on, who they're targeting and what languages they're using—in an easy-to-understand format.

Also included are useful reviews of nearly every shortwave radio currently available, and excellent articles describing the best shows to be found on the international shortwave bands.

Increase your knowledge of today's changing world with ***Passport to World Band Radio*** and make the most of your listening. 1994 ed, ©1993, 432 pages ..... #4459 **$18**

Ferrell's Confidential Frequency List is recognized throughout the world as the most comprehensive list of shortwave utility stations available. What ***Passport to World Band Radio*** is to shortwave broadcasting, ***Ferrell's*** is to utility DXing. This 9th edition has been considerably expanded and now contains well over 30,000 CW, SSB, RTTY and fax frequencies from 4-28 MHz—military, maritime, aeronautical and more—they're all here. ©1994, 386 pages ..... #2206 **$23**

The RSGB Amateur Radio Awards Booklet gives details of major Amateur Radio awards throughout the world. Each award is listed in an easy-to-use format that includes all the information on how to earn it. This edition even includes a checklist so you can track your progress. 3rd ed, ©1988, 192 pps ..... #R819 **$15**

World Radio TV Handbook is your personal 24-hour guide to the world's broadcasters and their services. Information is listed by country and in an hour-by-hour guide to English language shortwave broadcasts. Comprehensive station information includes call signs, station locations, frequencies, transmitter power, operating times, languages and much more. Join the many who have discovered the world of the international listener. 1994 ed, ©1994, 600 pps ..... #4696 **$20**

VHF/UHF/Microwave Communications

Your VHF Companion lets you explore the fascinating activities on the VHF bands: FM and repeaters, packet, CW and SSB, satellites, amateur television, transmitter hunting, and more. A handy reference section helps you locate equipment, books, magazines and software. A must for all new hams—and all "veterans" as well! 1st ed, ©1992, 208 pages ..... #3878 **$8**

The ARRL UHF/Microwave Experimenter's Manual is written for the growing number of radio amateurs who are discovering that there is life on our frequencies above 420 MHz. Technicians and engineers will find this book particularly useful. You'll find information on design and fabrication techniques, propagation, antennas and feed lines, transmission media and much more. Companion software is available for IBM PCs and compatibles.
Book, 1st ed, ©1990, 448 pages ..... #3126 **$20**
Software (3.5-inch) ..... #4726 **$10**

The ARRL UHF/Microwave Projects Manual contains dozens of construction articles for transverters, preamplifiers, power amplifiers, antennas, and test and measurement equipment. Some articles are previously unpublished; others are reprinted from conference proceedings, *QST* and *QEX*. If your interest lies in the bands above 432 MHz, you'll find this book to be invaluable.
1st ed, ©1994 (Available September 1994) ..... #4491 **$20**

If you're tired of hunting for bits and pieces of information on spread spectrum, the ***ARRL Spread Spectrum Sourcebook*** is for you. You'll find reprints of most spread spectrum articles from ***QST*** and ***QEX***, as well as articles and news items from the ***AMRAD Newsletter*** that show how SS developed from theory to a viable communications system. 1st ed, ©1991, 384 pages ..... #3177 **$20**

Beyond Line of Sight: A History of VHF Propagation from the Pages of QST explores the ways hams helped discover and exploit the propagation modes that allow VHF signals to travel hundreds and even thousands of miles. It's a subject all hams will find fascinating. 1st ed, © 1992, 234 pages ..... #4025 **$12**

Radio Auroras by Charlie Newton, G2FKZ, from the RSGB, details the interesting and unpredictable world of Amateur Radio communications via auroral propagation. Presented with a European twist is information on what causes auroras, how they are forecast and how to best use them to work DX. You'll find an abundance of tables and charts. ©1991, 96 pps ..... #3568 **$18**

VHF/UHF Manual, from RSGB, is must reading for the VHF and UHF enthusiast. You'll find information on the history of VHF/UHF communications, propagation, tuned circuits, receivers, transmitters, integrated equipment, filters, antennas, microwaves, space communications, and test equipment. 4th ed, ©1983, 528 pages ..... #R630 **$30**

Microwave Handbook, Volume 1, from RSGB, covers operating techniques, system analysis and propagation, microwave antennas, transmission lines and components, microwave semiconductors and tubes. ©1989, 220 pages ..... #2901 **$35**

Microwave Handbook, Volume 2, from RSGB, continues where Volume 1 leaves off with construction techniques, common equipment, microwave beacons and repeaters, test equipment, safety, filters and additional circuit data. ©1991, 244 pages ..... #3606 **$35**

Microwave Handbook, Volume 3, from RSGB, contains a review of microwave theory and practice, reference information, practical designs, hints and tips. Covers 1.3-24 GHz. ©1992, 284 pages ..... #3975 **$35**

Satellites/Space

The Satellite Experimenter's Handbook has the information you need to communicate through or receive signals from a growing "fleet" of orbiting satellites. Whether your interest is in Amateur Radio, weather, TV-broadcast or other spacecraft, you'll find an immense store of valuable data—everything from satellite design to ground station equipment and antennas. Written by Martin Davidoff, K2UBC.
2nd ed, ©1990, 352 pages ..... #3185 **$20**

Weather Satellite Handbook by Ralph Taggart, WB8DQT,

is a popular and easy-to-use reference for anyone interested in viewing our world from space. The revised and expanded 5th edition features an interface project that allows you to capture fascinating images from various weather satellites and HF WEFAX broadcasts (a kit is available). You'll learn how weather satellites function, how to build or modify your own receiving equipment and how to buy or build the right antennas. Companion software (revised for the 5th edition of the book) is available for IBM PCs and compatibles.
Book, 5th ed, ©1994, 224 pages ..... #4483 **$20**
Software (3.5-inch, requires high-density drive) ..... #4653 **$10**

ARRL Satellite Anthology contains the best *QST* satellite articles from 1986 through 1993. You'll find valuable information on all amateur spacecraft from OSCAR 10 through OSCAR 27, including: how to work DX via OSCARs 10 and 13, and how to get on the Pacsats and the Russian "Easysats." There's even a glimpse into the future with two articles about the advanced Phase 3D satellite. 3rd ed, ©1994, 128 pages ..... #4645 **$10**

Antennas and Transmission Lines

The ARRL Antenna Book is the definitive source for information on state-of-the-art antenna and transmission line theory and construction. The 17th edition presents the best and most highly regarded coverage of antenna fundamentals, propagation, transmission lines, Yagis and quads, as well as all popular wire antenna designs. You'll find a new chapter on HF Yagi Arrays based on the latest computer modeling software. The Radio Wave Propagation chapter has been revised to include comprehensive statistical data on the range of elevation angles needed for communication from all areas of the US to important DX locations. Included with this edition is a 1.44 MB 3.5-inch diskette for the IBM PC/XT/AT and compatible computers with software by K6STI, W1FM and N6BV for Yagi analysis, propagation prediction, transmission-line evaluation, and more. ©1994, 736 pages ..... #4734 **$30**

Three volumes are available in ***The ARRL Antenna Compendium series***, and each is packed with previously unpublished articles on all the popular types of HF/VHF/UHF antennas and some you've never heard of! In ***Volume 1*** you'll find articles on a multiband portable, quads and loops, baluns and the Smith Chart. ***Volume 2*** features several verticals, an attic tri-bander, antenna modeling and propagation. Among the 40 articles in ***Volume 3*** you'll discover a 12-meter quad, a discone, modeling with MININEC and VHF/UHF ray tracing.

All three volumes are a feast for the antenna enthusiast! Companion software is available separately for Volumes 2 and 3.
Volume 1, 1st ed, ©1985 ..... #0194 **$10**
Volume 2, 1st ed, ©1989 ..... #2545 **$12**
Companion software (5.25-inch) ..... #2626 **$10**
Volume 3, 1st ed, ©1992 ..... #4017 **$14**
Companion software (5.25-inch) ..... #4033 **$10**
Companion software (3.5-inch) ..... #4041 **$10**

Antennas and Techniques for Low Band DXing, by noted DXer John Devoldere, ON4UN, is an in-depth treatment of the antennas and operating strategies you'll need to span the continents on 40, 80 and 160 meters. You'll find operating tips, antenna designs and software culled both from the author's many years of experience and those of other active DXers, contesters and antenna experimenters.
Revised and expanded 2nd ed, ©1994 ..... #4661 **$20**

Reflections: Transmission Lines and Antennas is written by Walt Maxwell, W2DU, to clear the air of the half-truths and outright myths you hear these days about transmission lines, standing waves, antenna matching, reflected power and antenna tuners. This book has a wealth of information on matching networks, antennas and use of the Smith Chart. Companion software is available for IBM PCs and compatibles.
Book, 1st ed, ©1990 ..... #2995 **$20**
Software (5.25-inch) ..... #3118 **$10**
Software (3.5-inch) ..... #3924 **$10**

Yagi Antenna Design by Dr James L. Lawson, W2PV, presents 210 pages covering performance calculations, simple Yagis, performance optimization, ground effects, stacking, practical designs for 7-28 MHz. Hardcover. 1st ed, ©1986 ..... #0410 **$15**

W1FB's Antenna Notebook Not everyone has the room or the budget to put up a forest of aluminum. Doug DeMaw tells you how to get the best performance out of unobtrusive wire and vertical antennas, and how to build simple antenna tuners and SWR bridges. 1st ed, ©1987 ..... #2618 **$10**

Transmission Line Transformers is a source of practical design data covering the use of these devices for both commercial and amateur applications. Written by Dr Jerry Sevick, W2FMI, this book covers types of windings, core materials, fractional-ratio windings, efficiencies, multiwinding and series transformers, baluns, limitations at high impedance levels and test equipment. Hardcover. 2nd ed, ©1990 ..... #2960 **$20**

Physical Design of Yagi Antennas, by Dr David B. Leeson, W6QHS, is packed with information on how to design or reinforce Yagi antennas so they can survive in the most adverse weather conditions—like 120-mile-per-hour winds! Covers the structural design of elements, booms and masts, plus the electrical design of Yagi antennas. Hardcover. 1st ed, ©1992 ..... #3819 **$20**
5.25-inch spreadsheet diskette for IBM or compatible ..... #3827 **$10**
3.5-inch spreadsheet diskette for IBM or compatible ..... #3835 **$10**
3.5-inch spreadsheet diskette for Macintosh ..... #3843 **$10**

Antenna Impedance Matching shows you how to use the Smith Chart to develop even the most complex matching network to maximize antenna effectiveness by minimizing feed line losses. With more than 200 pages, this book is a must for the antenna designer and serious amateur. Written by Wilfred Caron. 1st ed, ©1989 ..... #2200 **$20**

Low-Profile Amateur Radio is for the ham who lives where antennas are frowned upon. You'll see that you don't need a house with acreage to enjoy your favorite hobby. One practical solution: hide your antennas. Another: operate with low power. This book tells you how to get on the air using these techniques—and others—without calling attention to yourself. 1st ed, ©1993 ..... #4114 **$8**

ARRL MicroSmith V2.00, by Wes Hayward, W7ZOI. ***ARRL MicroSmith*** is a Smith Chart simulation program for the IBM PC and compatibles. You don't need detailed knowledge of the Smith Chart. Use ***MicroSmith*** to design matching networks with fixed or variable L-C components, stub-matching sections with transmission lines, and more. It's all done graphically on your computer screen. It's also useful for a variety of network analysis problems. Includes a 48-page user's guide with numerous illustrations.
5.25-inch diskette ..... #4076 **$39**
3.50-inch diskette ..... #4084 **$39**

Practical Wire Antennas, by John D. Heys, G3BDQ, is an RSGB book that delves into the practical aspects of HF wire antennas: how the various types work, and how to buy or build one that's right for you. Marconis, Windoms, loops, dipoles and even underground antennas—they're all covered! The final chapter covers matching systems. ©1989 ..... #R878 **$14**

HF Antennas for All Locations, written by L.A. Moxon, G6XN, for the RSGB, details the design and construction of hundreds of amateur antennas—including some unusual designs. Don't let a lack of real estate keep you off the air. Whether you're in a downtown apartment or on top of a mountain, you'll find at least one antenna that'll work for you! 2nd ed, ©1993 ..... #4300 **$20**

HF Antenna Collection contains outstanding articles from RSGB's *Radio Communication*. It covers single- and multielement horizontal and vertical antennas, very small transmitting and receiving antennas, feeders, tuners and more. ©1991 ..... #3770 **$18**

Interference/Direction Finding

Radio Frequency Interference: How to Find It and Fix It is a new approach to an old Amateur Radio problem. Written by RFI experts, it's filled with proven ways to solve common—and not-so-common—RFI or EMI problems, whatever their cause. In addition, you'll learn how to build a cooperative environment with neighbors and how to contact skilled volunteers who can assist with those tricky situations. 1st ed, ©1991 ..... #3754 **$15**

Interference Handbook, by William Nelson, WA6FQG, will help you locate and resolve interference problems of every type. Sources of interference are described along with the methods used to locate them. Suppression circuits for interfering devices are discussed in detail, as are protection techniques for home entertainment equipment. 2nd ed, ©1981 ..... #6015 **$12**

Transmitter Hunting: Radio Direction Finding Simplified, by Joseph Moell, K0OV, and Thomas Curlee, WB6UZZ, is all the information you need about equipment and techniques for HF and VHF radio direction finding. Transmitter hunting is both practical and fun. Using the information in this book, you can not only locate jammers and other sources of malicious interference, but you can also locate downed aircraft, engage in "sport hunting," even help search-and-rescue groups save lives! 1st ed, ©1987 ..... #2701 **$19**

Practical Circuits

W1FB's QRP Notebook by Doug DeMaw is packed with construction projects for QRP transmitters, receivers and accessories. This second edition is the completely rewritten successor to Doug's popular ***QRP Notebook***, and features totally new circuits. Learn the inside secrets from this veteran builder, writer and former ***QST*** Technical Editor. Most of the projects feature printed circuit boards that are available from a commercial source. Gain understanding of circuits. Experience firsthand the thrill of making contacts using equipment that you built. 2nd ed, ©1991 ..... #3657 **$10**

W1FB's Design Notebook: Practical Circuits for Experimenters is just the book for the avid builder of Amateur Radio equipment. This plain-language book is filled with simple, practical projects that can be built using readily available components and common hand tools. There are explanations of how the various circuits work—without heavy mathematical analysis. 1st ed, ©1990 ..... #3207 **$10**

QRP Classics is a collection of projects for low-power enthusiasts taken from ARRL publications over the past 15 years. The equipment is generally simple and easy to build. You'll find projects for receivers, transmitters, transceivers and accessories. 1st ed, ©1990 ..... #3169 **$12**

Solid State Design for the Radio Amateur is packed with information on Amateur Radio circuit design and applications, descriptions of receivers, transmitters, power supplies and test equipment. Much of the data cannot be found elsewhere. Essential for every technical library. ©1986 ..... #0402 **$12**

Radio Communication Handbook, from RSGB, is packed with technical information and practical circuits on semiconductors, HF receivers, VHF/UHF transmitters, modulation systems, RTTY, propagation, HF and VHF/UHF antennas power supplies and more. ©1982 ..... #R584 **$35**

Packet Radio/Computers/RTTY

Your Packet Companion, by Steve Ford, WB8IMY, perfect for the packet newcomer, covers everything—from assembling a station to sending mail, from packet satellites to the latest networking systems. Its straightforward writing style and clear drawings will get you on the cutting edge of digital ham radio in no time. 1st ed. ©1992 ..... #3959 **$8**

Your RTTY/AMTOR Companion: Explore HF Digital Communications with Your Multimode Controller, by Steve Ford, WB8IMY, is your introduction to the exciting world of HF digital communications. Learn how to assemble your own RTTY/AMTOR station and communicate effectively on the air. You'll also learn the basics of new HF digital modes such as CLOVER and PacTOR. 1st ed, ©1993 ..... #4092 **$8**

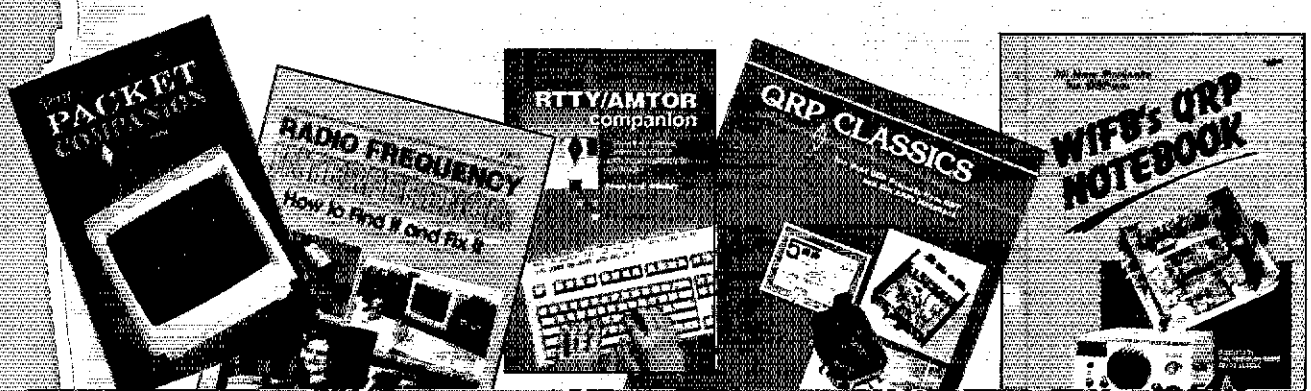
Your Gateway to Packet Radio explores one of the most fascinating areas of Amateur Radio today. Packet radio has found its way into thousands of shacks and continues to grow in popularity. If you've never tried it, find out what you're missing. If you're a packet veteran, you'll still learn something new. Written by Stan Horzepa, WA1LOU. 2nd ed, ©1989 ..... #2030 **$12**

In ***NOSintro: TCP/IP over Packet Radio*** you'll find a wealth of practical information, hints and tips for setting up and using the KA9Q Network Operating System (NOS) in a packet radio environment. The emphasis is on hands-on practicalities. You'll see exactly: how to install NOS on a PC, how to set up the control files, how to check out basic operations off-air, and how to use NOS commands for transferring files, logging in to remote systems, sending mail, etc (356 pages) ..... #4319 **$23**

AX.25 Amateur Packet-Radio Link-Layer Protocol represents the culmination of several years of work by amateurs to develop a standard data-transfer protocol for global use. Packet stations and networks can easily talk to one another if common standards are used. The link layer is level 2 of the International Organization for Standardization (ISO) seven-layered reference model of Open Systems Interconnection (OSI). ©1984 ..... #0119 **$8**

DX/Callbooks

The 1994 North American Callbook lists call signs, names



and address information for more than 500,000 licensed radio amateurs in North America, including Greenland, Bermuda and the Caribbean Islands, Hawaii and US possessions ..... #C094 **$30**

The 1994 International Callbook lists call signs, names and address information for more than 500,000 licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia and the Pacific (excluding Hawaii and US possessions) ..... #C194 **$30**

The Complete DX'er is a book by Master DXer Bob Locher, W9KNI, that shows what is going through the DXer's mind as he cracks pileups and snags rare DX stations using tried and true techniques. You'll learn how to hunt DX and how to obtain hard-to-get QSL cards. 2nd ed, ©1989 ..... #2083 **$12**

The DXCC Companion: How to Work Your First Hundred Countries, by Jim Kearman, KR1S, is filled with practical, easy-to-understand information for the beginning DXer. Follow the advice given by KR1S and you'll have your first hundred countries confirmed in no time. You'll learn about equipment, antennas, propagation and the rights and wrongs of QSLing. 1st ed, ©1990 ..... #3398 **$8**

For Instructors

In addition to ham radio study guides for students, we also produce instructor's guides to help you teach license courses. These are for use with ***Now You're Talking!*** and ***ARRL License Manuals***. The ***Instructor's Manual*** is a valuable aid for those teaching Amateur Radio classes at any level.

Proceedings of the ARRL National Educational Workshop presents ideas from top instructors to help you motivate your students and increase their enjoyment. Proceedings from the 1989 through 1994 workshops are available.

ARRL Novice/Technician Class Instructor's Guide 2nd ed, ©1993 ..... #4394 **$8**
ARRL General Class Instructor's Guide (New edition available August 1994) ..... #2669 **$8**
ARRL Instructor's Manual, 2nd ed, ©1992 ..... #2448 **$8**
Proceedings of the ARRL National Educational Workshop 1994, 1st ed, ©1994 ..... #4742 **$12**

Amateur Radio Adventure/History

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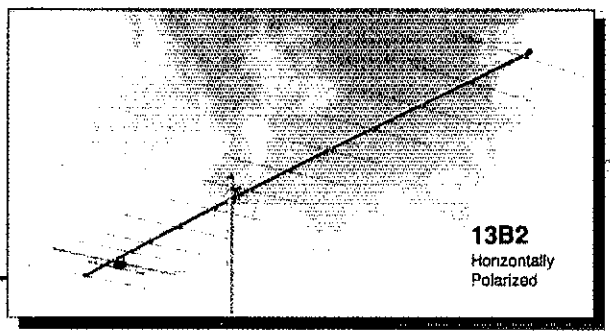

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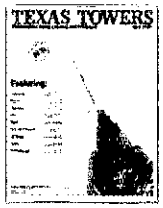

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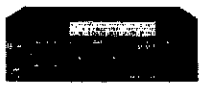

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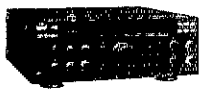

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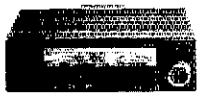

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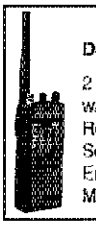

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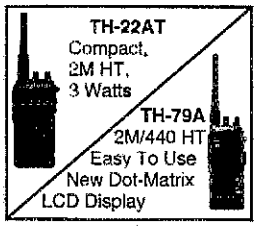

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NEW HF

Introducing an HF

"With the small snap-off remote front panel design, it's an HF mobile."

"It's a great base, too. Direct keypad entry, built-in antenna tuner, CW keyer with adjustable speed, 100 Watts, Omni-Glow display... Wow!"

"Yaesu did it again!"

Remote front panel control head measures only 2-1/4"H x 9-1/8"W x 1-1/4" D.

Uncompromising HF quality that will change your lifestyle. It's the first transceiver with true HF technology to go mobile in any vehicle or stay at home as a compact base station.

With its revolutionary, small, snap-off remote panel, the controls of the FT-900AT can install almost anyplace in your car, truck or camper. Since the 100 Watt RF deck can be installed under a seat or in your car trunk, it's away from critical automotive electronic wizardry. And, for ultimate convenience, the built-in antenna tuner simplifies in-car operation.

As a base station, the compact full function FT-900AT includes direct keypad entry for pinpoint accuracy during quick band/frequency changes. Other features you'll like include CW keyer with front panel speed adjustment, speech processor, twin stacking VFOs, and IF Shift and Notch. No competitor offers this! Bonuses, such as signal strength, power output, SWR and ALC digital meters, add value to the FT-900AT, and the proven duct-flow cooling system provides excellent long-term transmit power output reliability and frequency stability.

The FT-900AT controls mount almost anywhere in your car, truck or camper.

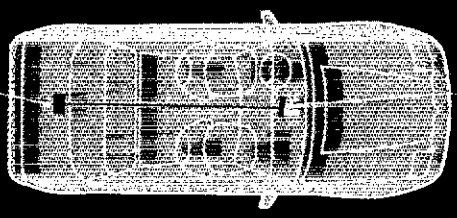
Compact HF Transceiver **FT-900AT**

that's going places.

For ease of use, Yaesu's exclusive Omni-Glow display enhances viewing in any light condition.

Trust Yaesu to know what you want. True HF you can take with you or leave at home!

100 Watt RF deck can mount in trunk, or under seat.



Detachable front panel mounts up front.

And, since the high speed antenna tuner is built-in, it means less clutter in your shack.

For sheer high-performance, anywhere, the incomparable FT-900AT ranks with the FT-1000 to further establish Yaesu as the choice of the world's top DX'ers.

Available now at your Yaesu dealer.

Choice of the World's top DX'ers

Specifications

- Remote Front Panel Design
- Built-In Auto Antenna Tuner
- Direct Keypad Entry when used as a Base Station
- Large, Bright Omni-Glow™ LCD Display
- 100W on SSB, CW, FM modes; 25W on AM
- IF Shift and 30db Notch Filter
- Digital S/RF, SWR & ALC Meters
- Programmable CTCSS Encode w/Repeater Offset
- Direct Digital Synthesis (DDS)
- 100 Memory Channels
- Frequency Range
  RX: 100 kHz-30 MHz
  TX: 160-10 meters
- CW Full Break-in Keying w/ Adjustable Speed
- Fast/Slow AGC Circuit
- Intercept Point Optimization
- Duct Flow Cooling System
- Twin Band Stacking VFOs
- Built-in Noise Blanker
- Built-in Adjustable Speech Processor

ACCESSORIES:
YSK-900 Remote Mount Kit
MMB-62 Controller Bracket
MMB-20 Mobile Mtg. Bracket
SP-7 Mobile External Spkr.
SP-6 Base Station External Spkr.
DVS-2 Digital Voice Recorder
FP-800 20A HD Power Supply
YH-77ST Headphone

"Built-in VOX? Right!"

"Dual Decode. Now that's a first!"

"Wow, a real Battery Voltage Readout!"

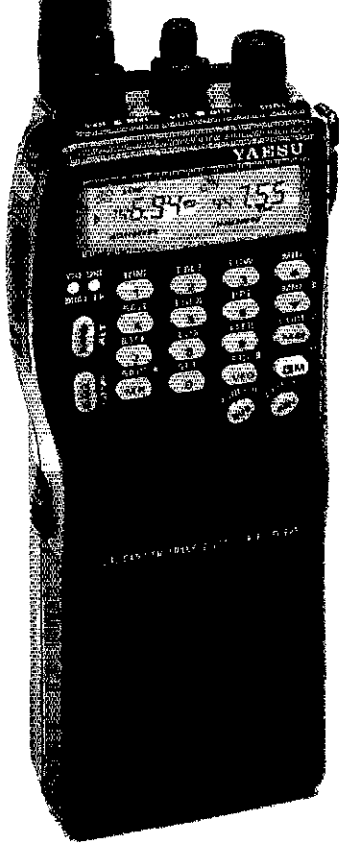
"Yaesu did it again!"

FEATURES	Yaesu FT-530	Kenwood TH-78A	Alinco DJ-580	Icom IC-W21AT
Memory Channels	82	50	40	70
Slide-out Lithium Battery	YES	NO	NO	NO
Dual CTCSS Decoder	YES	NO	NO	YES
Battery Voltage Readout	YES	NO	NO	NO
Automatic CTCSS Tone Search	YES	NO	NO	NO
Transmit Battery Saver (Repeater & Simplex Operation)	YES	NO	NO	NO
Built-In Vox	YES	NO	NO	NO
One Touch Reverse Button	YES	NO	NO	NO
Dual In-Band Receive (V+V, U+U)	YES	YES	NO	YES
Programmable External Speaker Audio	YES	NO	NO	YES
Optional Digital Display Mic with "S" Meter	YES	NO	NO	NO
AM Aircraft Receive	YES	YES	YES	YES

The Best vs. "the rest."

FT-530
Dual Band Handheld

- **Frequency Coverage:**
  2-Meter 130-174 MHz RX
  144-148 MHz TX
  70 cm 430-450 MHz RX/TX
- 4 TX Power levels:
  w/FNB-25: 2.0, 1.5, 1.0, 0.5W
  w/FNB-27: 5.0, 3.0, 1.5, 0.5W
- DTMF Paging and Coded Squelch
- AOT – Auto On-Timer with built-in clock and alarm functions
- IBS – Intelligent Band Select (provides automatic TX band select on scan stop)
- Backlit keypad and display with time delay
- Built-in cross-band repeat function
- APO – Automatic Power Off
- 5 Watts output w/ FNB-27 battery or 12 VDC
- 2 VFO's for each band
- **Accessories:**
  NC-42 1-Hour Desk Charger
  FNB-25 600 mAh Battery (2 watt)
  FNB-25 1000 mAh Battery (2 watt)
  FNB-27 600 mAh Battery (5 watt)
  FBA-12 6 AA Cell Holder
  CSC-56 Vinyl Case w/ FNB-25
  CSC-58 Vinyl Case w/ FNB-26/27
  E-DC-5B *12 VDC Adaptor*
  YH-2 Headset for VOX
  MH-12A2B Speaker Mic
  MH-18A2B Lapel Speaker Mic
  MH-19A2B Mini Earpiece Mic
  MH-29A2B LCD Display Mic with Remote Functions
  MMB-54 *Mobile Mounting* Hanger



No other dual band handheld beats the FT-530 on features for performance and ease of use. With the largest backlit keypad available, 82 memories, exclusive Dual CTCSS Decode and AM Aircraft Receive, the FT-530 is simply the best value there is.

Compare for yourself, then forget "the rest." See your dealer for the best dual band handheld you can buy. The FT-530.

YAESU

Performance without compromise.℠