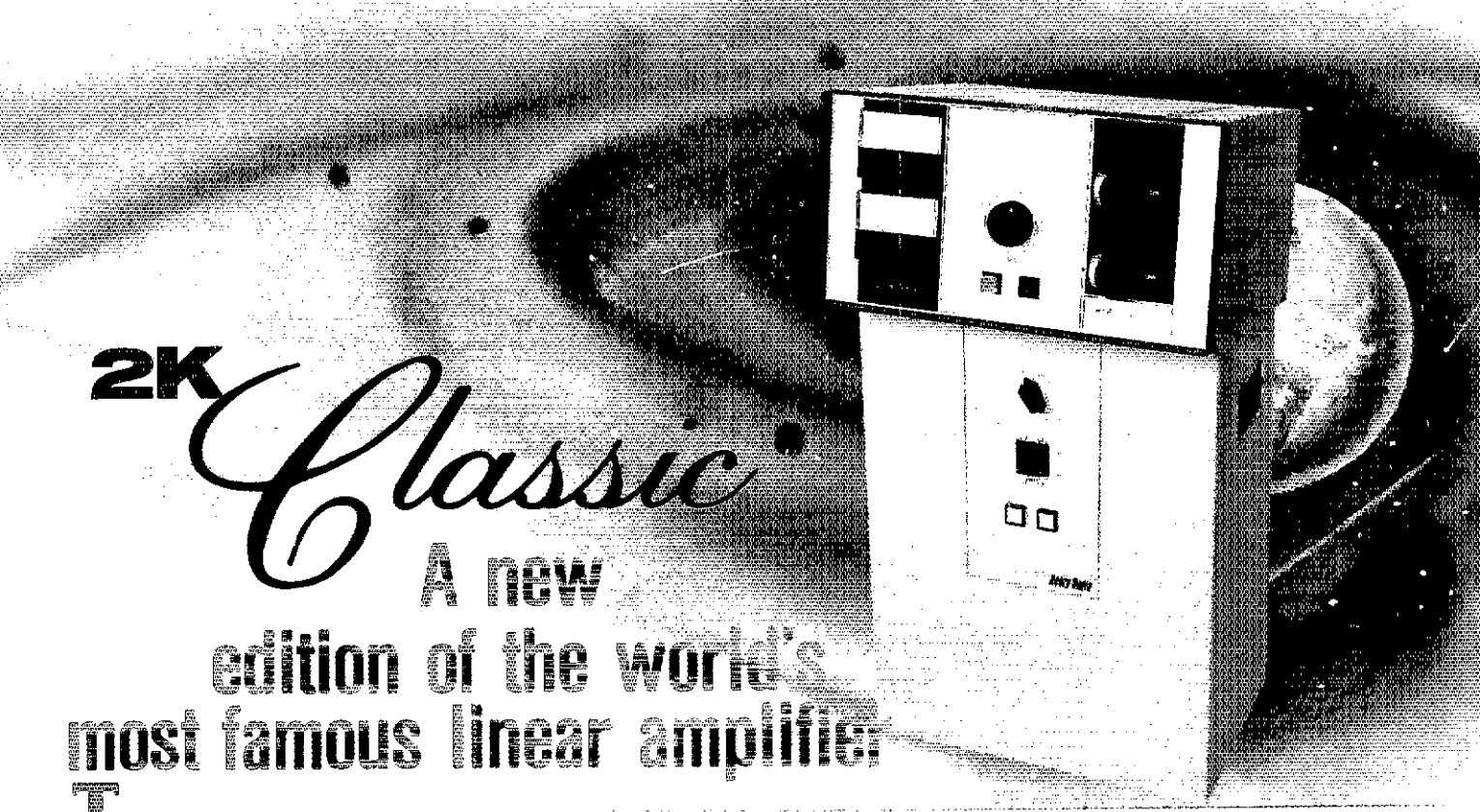
QST

devoted entirely to Amateur Radio

December 1980 $2.50



2K Classic®

A new edition of the world's most famous linear amplifier

The 2K Classic represents the culmination of fifteen years experience in developing, manufacturing and improving the 2K series. It remains as always a "workhorse", engineered and built to loaf along at full legal power for days or weeks without rest. A look inside shows why! No expense has been spared to make the 2K a truly "Classic" Amateur amplifier. Heavy duty, top quality components along with its rugged construction assures you of trouble free operation. The 2K Classic offers engineering and features second to none. It will put your signal on the air with greater strength and clarity than you ever dreamed possible. The 2K Classic operates on all amateur bands, 80 through 15 meters (export models include 10 meters).

Features:

- Two rugged Eimac 3-500Z grounded grid triodes
- Pi-L plate circuit with silver plated tank coil
- Resonant cathode pi input circuit
- Maximum legal input on all modes
- Price: $1195.00

The 1KD-5 ...Another fine member of the famous Henry Radio family of superior amplifiers. And we're still convinced that it's the world's finest linear in its class. The 1KD-5 was designed for the amateur who wants the quality and dependability of the 2KD-5 and 2K-4, who may prefer the smaller size, lighter weight and lower price and who will settle for a little less power. But make no mistake, the 1KD-5 is no slouch. Its 1200 watt PEP input (700 watt PEP nominal output) along with its superb operating characteristics will still punch out clean powerful signals...signals you'll be proud of. Compare its specifications, its features and its fine components and we're sure you will agree that the 1KD-5 is a superb value at only $695.

The 2KD-5 We have been suggesting that you look inside any amplifier before you buy it. We hope that you will. If you "lift the lid" on a 2KD-5 you will see only the highest quality, heavy duty components and careful workmanship...attributes that promise a long life of continous operation in any mode at full legal power. The 2KD-5 is a 2000 watt PEP input (1200 watt PEP nominal output) RF linear amplifier, covering the 80, 40, 20, and 15 meter amateur bands. It operates with two Eimac 3-500Z glass envelope triodes and a Pi-L plate circuit with a rotary silver plated tank coil. Price $945.

And don't forget the rest of the Henry family of amateur amplifiers...the Tempo 2002 high power VHF amplifier and the broad line of top quality solid state amplifiers. Henry Radio also offers the 3K-A and 4K-Ultra superb high power H.F. amplifiers and a broad line of commercial FCC type accepted amplifiers for two way FM communications covering the range to 500 MHz.

★ ★

Announcing!

A brand new "super" linear...the 3K Classic! Designed for the most critical Amateur Radio operator...the individual who wants and appreciates owning the finest. Available in spring 1981. *F.C.C. approval pending*

★ ★

58 YEARS OF SERVICE

Please note, as of Dec. 1, 1980 we will occupy our new world headquarters building with a new Los Angeles address and phone number.

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ICOM IC-255A

Features that have made the field proven and tested IC-255A the most popular 2 meter FM rig on the air today.

- ★ 25 W / 1 W battery saving output
- ★ Scanning (memory and programmable limit band scan), now with automatic scan resume
- ★ Programmable splits - Felxibility for new repeater offsets
- ★ Dual speed tuning - 15 KHz Steps, 5 KHz Steps with TS Switch depressed
- ★ 5 memory channels - For easy access to your favorite repeaters
- ★ Dual VFO's built in, lockable mobile mount, dynamic mic standard, RIT fine tuning.
- ★ Simple, easy to use single knob tuning system for mobile operation.

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December 1980 *Volume LXIV Number 12*

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

Offices

225 Main Street
Newington, CT 06111 Tel: 203-666-1541

Member of the Audit Bureau of Circulations

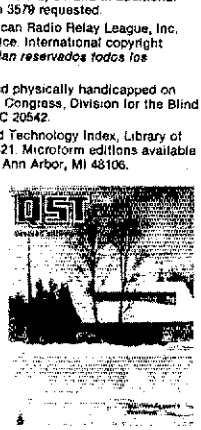
Subscription rate $18.00 per year postpaid, U.S. funds, U.S. & Possessions; $20.00 in Canada; $21.00 elsewhere. Individuals may apply for membership at the rates shown. Membership and *QST* cannot be separated. Fifty per cent of dues is allocated to *QST*, the balance for membership. Single copies $2.50. Foreign remittances should be by international postal or express money order or bank draft negotiable in the U.S. and for an equivalent amount in U.S. funds.

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

QST is available to the blind and physically handicapped on magnetic tape from the Library of Congress, Division for the Blind and Handicapped, Washington, DC 20542.

Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No.: 21-9421. Microform editions available from Xerox University Microfilms, Ann Arbor, MI 48106.

THE COVER



A crisp winter's day at W1NH, Newport, New Hampshire. As the snow flies, Bill's triband, 2-el quad on a homebuilt, foldover tower will likely once again bring in his share of DX. *(photo courtesy W1NH)*

Contents

Rack Attack from DenTron

Components are the latest in communication systems adapting to your stations' needs. The DTR-3KA and DTR-1200L are equipped with heavy-duty handles for easy rack mounting and rack brackets that can be easily removed. The DTR-1200L linear amplifier provides 1200 watts SSB and 1000 watts CW input continuous duty. It features large 3½" shadow box, back lit meters for easy reading, and tuned input for compatibility with solid state or tube transceivers. The DTR-3KA antenna tuner handles a full 3KW PEP. It features a built in 2KW dry dummy load with thermostatically controlled forced air cooling, a remote sensor box to insure meter accuracy and 50 OHM impedance. Component racks available at your DenTron Dealer.

DTR-1200L Linear Amplifier

Frequency Ranges:

80 Meter Band	3.45 - 4.6 MHz
40 Meter Band	6.00 - 9.0 MHz
20 Meter Band	10.00 - 16.00 MHz
15 Meter Band	20.95 - 23.50 MHz
10 Meter Band	Export Model

Modes: USB, LSB, CW, RTTY, SSTV
Power Input: 1200W - SSB, 1000W - CW
Power Requirements: 234/117 VAC 50/60 Hz
RF Drive Power: 150 Watts maximum and 65 watts minimum for 1 KW DC input.
DC Plate voltage: Idle + 2300V approximate
Duty Cycle: 100% SSB, CW, RTTY, SSTV
Input Impedance: 50 Ohms nominal
Input VSWR: 1.5 to 1 average
Output Impedance: 50 Ohms nominal
Antenna load VSWR: 2 to 1 maximum
ALC: negative going, adjustable from front panel
Spurious Emissions: IMD - greater than 30 db down
Harmonics - greater than 40 db down
FCC Type Accepted
Size: 5¼" H x 17" W x 13" D (19" W with rack brackets)
Weight: 46 pounds
Switchable 12VDC accessory output voltage
Multimeter:

Plate Voltage	0 - 3000VDC
Plate Current	0 - 500ma
Relative Output	Adjustable

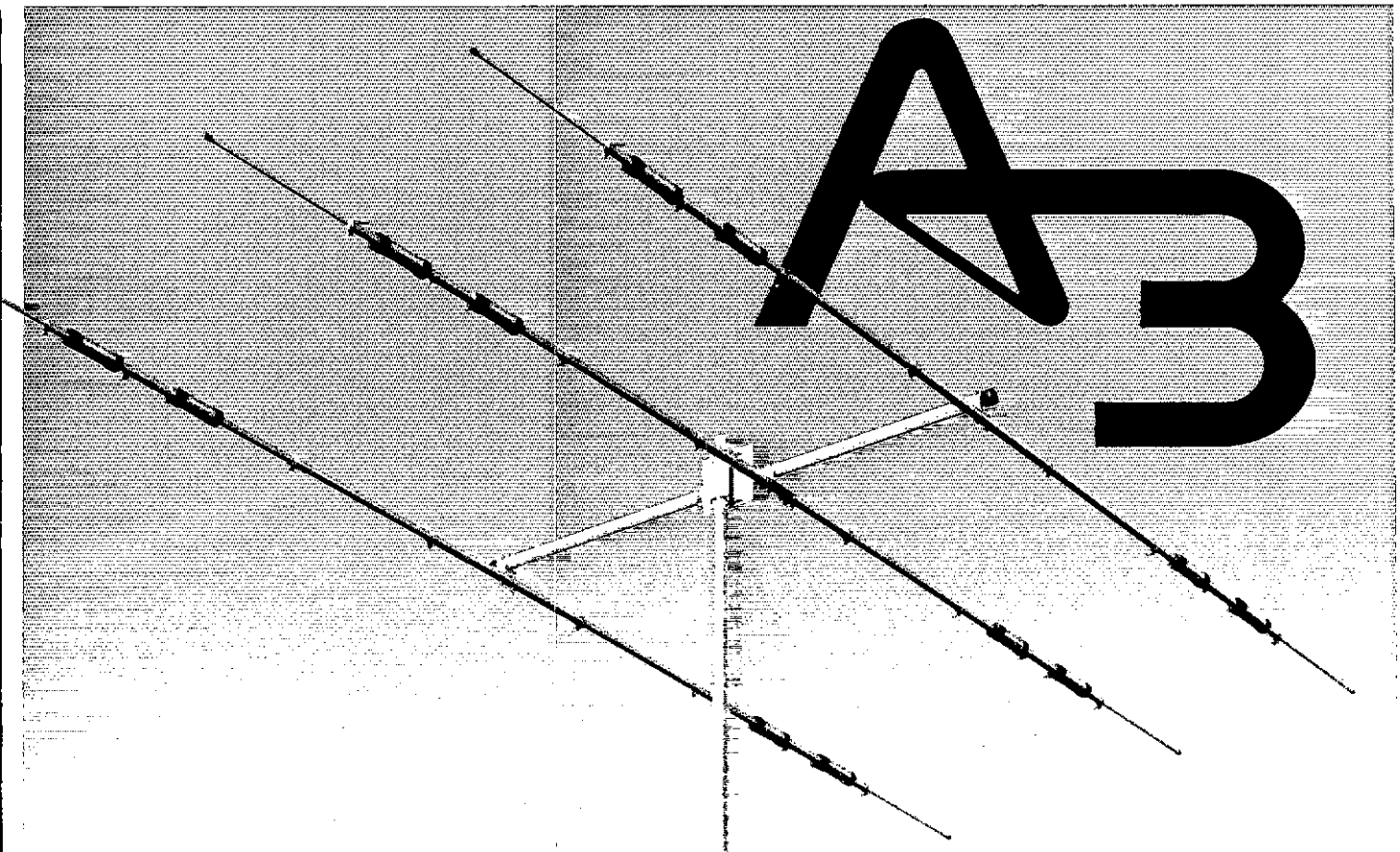
Front Panel Plate Voltage Switching

DTR-3KA Antenna Tuner

Frequency Coverage: 1.8 - 30 MHz continuous
Built in 2 KW PEP Dummy Load - Forced Air Cooled
Input Impedance: 50 ohms (Resistive) to transmitter
Antenna Inputs
- Coax 1, 2 & 3 - unbalanced—may range from a few ohms to a high impedance
- Long wire - low to high impedance
- Balanced line - 75-660 ohms

Power Capability: 3000 watts P.E.P.
Wattmeter: 200 watts forward
2000 watts forward
200 watts reflected
Accuracy: ± 5%
Remote sensor box
3½" backlit meters
Dummy Load: with manual or automatic forced air cooling.
Integral 3KW Balun

DenTron®
Radio Co., Inc.
1605 Commerce Drive
Stow, Ohio 44224
(216) 688-4973



V.S.W.R.	1.2-1 Typical
Average Bandwidth	500 KHz
Power Rating	2000 w PEP
Feed Point Impedance	50 Ω
Connector	Twin terminal stainless steel takes all coax.
Boom	1⅝"-1½" x 14'
Elements/Longest	1⅜"-½" x 27'9"
Wind Sfc. area	5.6 Feet²
Weight	35 Pounds
Turn Radius	15'6"
Mast Diameter	1¼" min. 2" max.
Material	6063-T832 Seamless aluminum
Fasteners	Zinc Plated Steel
Telescope Method	Taper tubing with full circle clamps

UPS Shippable

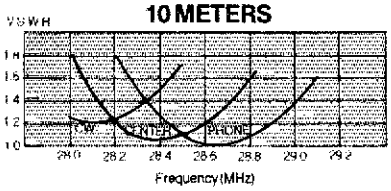
No balun required

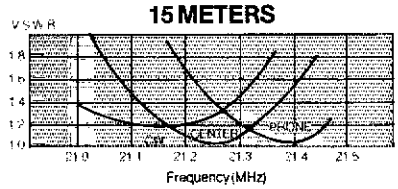
The full power, full performance 20-15-10 meter beam.

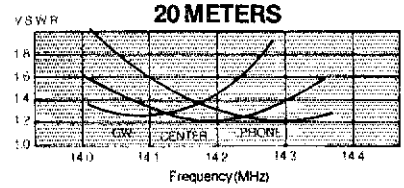
Enjoy the thrill of working rare DX with excellent A3 forward gain. Increase the pleasure of your daily contacts with A3 interference reducing front to back ratio. Use your linear amplifier with confidence in our new A3 high power traps.

Make friends of your neighbors with A3 compact dimensions, low profile, and small turn radius. Satisfy your budget with A3 economy pricing.

The Cushcraft engineering team has again created that unique combination of quality materials, easy assembly and high performance with A3, the three band beam for the eighties.







A LEADER FOR OVER 30 YEARS

cushcraft CORPORATION

The Antenna Company

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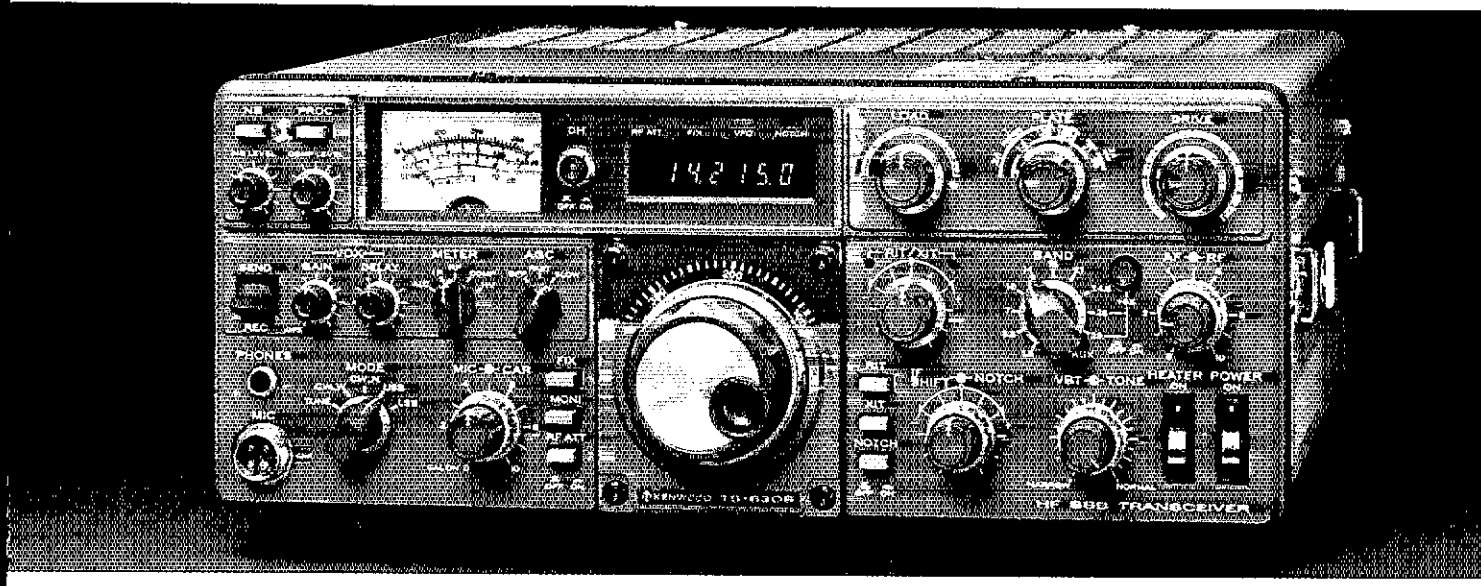
KENWOOD
...pacesetter in amateur radio

Top-Notch.



VBT, notch, IF shift, wide dynamic range

TS-830S

Now most Amateurs can afford a high-performance SSB/CW transceiver with every conceivable operating feature built in for 160 through 10 meters (including the three new bands). The TS-830S combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF. Its optional VFO-230 remote digital VFO provides five memories.

TS-830S FEATURES:

- **160-10 meters, including three new bands**
  Covers all Amateur bands from 1.8 to 29.7 MHz (LSB, USB, and CW), including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- **Wide receiver dynamic range**
  Junction FETs (with optimum IMD characteristics and low noise figure) in the balanced mixer, a MOSFET RF amplifier operating at low level for improved dynamic range (high amplification level not needed because of low noise in mixer), dual resonator for each band, and advanced overall receiver design result in excellent dynamic range.
- **Variable bandwidth tuning (VBT)**
  Continuously varies the IF filter passband width to reduce interference. VBT and IF shift can be controlled independently for optimum interference rejection in any condition.
- **IF notch filter**
  Tunable high-Q active circuit in 455-kHz second IF, for sharp, deep notch characteristics.
- **IF shift**
  Shifts IF passband toward higher or lower frequencies (away from interfering signals) while tuned receiver frequency remains unchanged.
- **Various IF filter options**
  Either a 500-Hz (YK-88C) or 270-Hz (YK-88CN) CW filter may be installed in the 8.83-MHz first IF, and a very sharp 500-Hz (YG-455C) or 250-Hz (YG-455CN) CW filter is available for the 455-kHz second IF.
- **Built-in digital display**
  Six-digit large fluorescent tube display, backed up by an analog dial. Reads actual receive and transmit frequency on all modes and all bands. Display Hold (DH) switch.
- **Adjustable noise-blanker level**
  Built-in noise blanker eliminates pulse-type (such as ignition) noise. Front-panel threshold level control.
- **6146B final with RF NFB**
  Two 6146B's in the final amplifier provide 220 PEP (SSB)/180 W DC (CW) input on all bands. negative feedback provides optimum IMD characteristics for high-quality transmission.
- **More flexibility with optional digital VFO**
  VFO-230 operates in 20-Hz steps and includes fi memories. Also allows split-frequency operatio Built-in digital display. Covers about 100 kHz abo and below each 500-kHz band.
- **Built-in RF speech processor**
  For added audio punch and increased talk power DX pileups.
- **RIT/XIT**
  Receiver incremental tuning (RIT) shifts only t receiver frequency, to tune in stations slightly frequency. Transmitter incremental tuning (XIT) shi only the transmitter frequency.
- **SSB monitor circuit**
  Monitors IF stage while transmitting, to determi audio quality and effect of speech processor.

Ask your Authorized Kenwood Dealer about the ma operating features offered by the *TS-830S... at a ve* reasonable price!

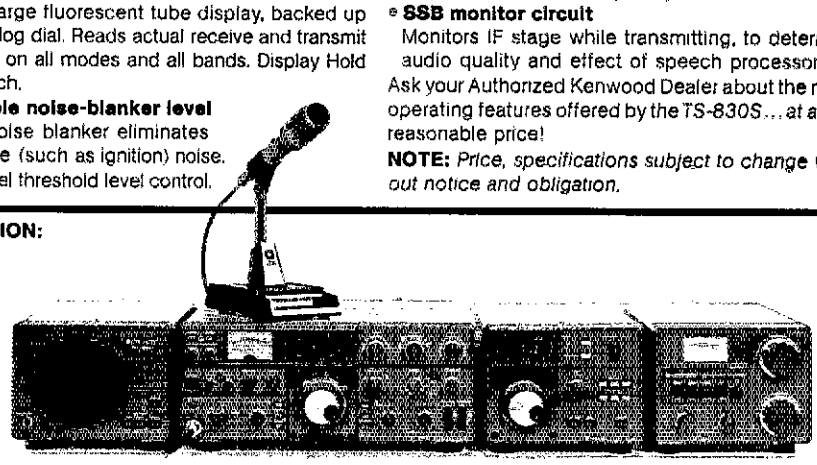
NOTE: *Price, specifications subject to change wi out notice and obligation.*

MATCHING ACCESSORIES FOR FIXED-STATION OPERATION:

- SP-230 external speaker with selectable audio filters
- VFO-230 external digital VFO with 20-Hz steps, five memories, digital display
- AT-230 antenna tuner/ SWR and power meter
- MC-50 desk microphone

Other accessories not shown:

- TL-922A linear amplifier
- SM-220 Station Monitor
- PC-1 phone patch
- YG-455C (500-Hz) and YG-455CN (250-Hz) CW filters for 455-kHz IF
- YK-88C (500-Hz) and YK-88CN (270-Hz) CW filters for 8.83-MHz IF
- HC-10 digital world clock
- HS-5 and HS-4 headphones
- MC-30S and MC-35S noise-cancelling hand microphones



TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT / COMPTON, CA 90220

Hand-shack.

Synthesized, big LCD, 10 memories, scanning, DTMF

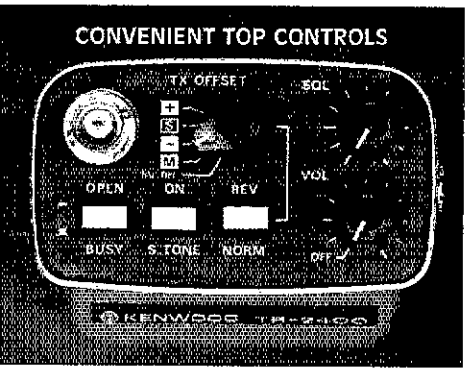
Touch-Tone ®

TR-2400

Put a ham shack in your hand. The TR-2400 is the ideal hand-held for 2 meters FM. It features a large LCD readout that can be read in direct sunlight or in the dark, 5-kHz-step PLL synthesized operation, 10-channel memory, scanning, and 16-button autopatch DTMF encoder.

TR-2400 FEATURES:

- **Large LCD digital readout**
  Readable in direct sunlight (better than LEDs). Readable in the dark (with lamp switch). Virtually no current drain (much less than LEDs) and display stays on. Rugged and dependable in hot or cold temperature ranges. Shows receive and transmit frequencies and memory channel.
- **5-kHz-step frequency selection**
  PLL synthesized keyboard channel selection system. No "5 up" switch needed. Selects from 144.000 to 147.995 MHz.
- **UP/DOWN manual scan**
  Single or fast continuous 5-kHz steps from 143.900 to 148.495 MHz for Amateur and MARS or CAP simplex or repeater operation.
- **10 memories**
  Retained with battery backup (only 2.0 mA). "M0" memory may be used to shift the transmit frequency any desired amount to operate on repeaters with nonstandard split frequencies.
- **Built-in autopatch DTMF (Touch-Tone®) encoder**
  Uses all 16 buttons of keyboard while transmitting.



- **Automatic memory scan**
  Checks all 10 memory channels. Programmable to lock automatically on either BUSY (signal present) or OPEN (no signal) channels.
- **Subtone switch**
  Activates subaudible tone encoder (not Kenwood-supplied).

- **Repeater or simplex operation**
  Convenient mode switch shifts transmit frequency +600 kHz or -600 kHz or to the frequency stored in "MO" memory.
- **Reverse operation**
  Push-button switch shifts receiver to transmit frequency and transmitter to receive frequency.
- **Extended operating time**
  With LCD and overall low-current circuit design. Only draws about 28 mA squelched receive and 500 mA transmit (at 1.5 W RF output), for longer operating time between charges.
- **Two lock switches**
  Prevent accidental frequency change and accidental transmission.
- **BNC antenna connector**
  Easy to connect external antenna.
- **LCD "arrow" indicators**
  Show "ON AIR," "MR" (memory recall), "BATT" (battery status), and "LAMP" switch on.
- **High-impact case and zinc die-cast frame**
  Extremely rugged with antenna counterpoise.
- **External PTT microphone and earphone connectors**
  Easily accessible on right side of transceiver.
- **Compact and lightweight**
  Only 2-13/16 inches wide, 7-9/16 inches high, and 1-7/8 inches deep. Weighs only 1.62 pounds (including antenna, battery, and hand strap).

Microphone PTT and audio terminals

Charger terminal

Earphone Jack

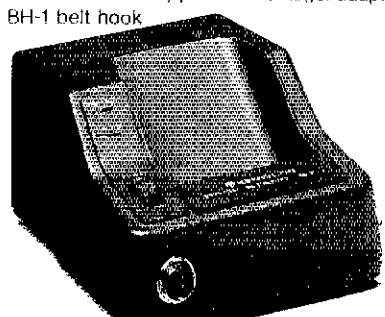
STANDARD ACCESSORIES INCLUDED:

- Flexible rubberized antenna with BNC connector
- Heavy-duty (450-mAh) NiCd battery pack
- External-standby (PTT) plug
- AC charger
- External-microphone plug
- Hand strap
- Earphone

NOTE: *Price, specifications subject to change without notice and obligation.*

OPTIONAL ACCESSORIES:

- ST-1 base stand (shown) which provides 1.5-hour quick charge and automatic switch to trickle charge, floating charge (operate while charging), 4-pin connector for dynamic microphone, and SO-239 antenna connector
- BC-5 DC quick charger (1.5 to 2.0 hours)
- SMC-24 speaker/microphone
- LH-1 deluxe leather case (top-grain cowhide)
- PB-24 extra battery pack with charger adapter
- BH-1 belt hook



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North Dakota — Lois A. Jorgensen, WAØRWM, Box 6, Abercrombie 58001 (701-553-8724)
South Dakota — Erwin C. Heimbuck, Jr., KØOTZ, 3212 Parkview, Rapid City 57701

Delta Division

Arkansas — Sid Pokorny, W5UAU, Rte. 2 — 1335 N. Ridge Circle, Horseshoe Bend 72512 (501-670-559
Louisiana — James R. Giammanco, N5IB, 9451 Corsica Ave., Baton Rouge 70810 (504-766-5583)
Mississippi — E. Ed Robinson, W5XT, P. O. Box 4181, Jackson 39216 (601-982-4440)
Tennessee — Earl Leonard, KB4G, 126 Sheridan Circle, Oak Ridge 37830 (615-482-2157)

Great Lakes Division

Kentucky — Joseph E. Miller, K4DZM, 8901 Honor Ave., Louisville 40219 (502-969-2034)
Michigan — James R. Seeley, WB8MTD, 14630 Clinton Rd., Springport 49284 (517-569-2411)
Ohio — Allan L. Severson, AB8P, 1275 Ethel Ave., Lakewood 44107 (216-521-1565)

Hudson Division

Eastern New York — Paul S. Vydareny, WB2VUK, 259 N. Washington, North Tarrytown 10591
N.Y.C. & Long Island — Paul A. Lindgren, WA2UWA, P. O. Box 1158, East Hampton 11937 (516-324-1542)
Northern New Jersey — Robert E. Neukomm, WA2MVQ, 404 O'Brien Ct., Wyckoff 07481 (201-891-3064)

Midwest Division

Iowa — Bob McCaffrey, KØCY, 3913-29th St., Des Moines 50310
Kansas — Robert M. Summers, KØBXF, 3045 North 72nd, Kansas City 66109 (913-299-1128)
Missouri — Larry G. Wilson, KØRWL, 5415 E. 97th St., Kansas City 64137 (816-966-8953)
Nebraska — Shirley M. Rice, KAØBCB, 510 East 16th St., Scotts Bluff 69361 (308-632-4337)

New England Division

Connecticut — Stanley Horzepa, WA1LOU, 72 Stiles St., Waterbury 06706 (203-755-1516)
Eastern Massachusetts — Richard P. Beebe, K1PAD, 82 Wyman Rd., Billerica 01821 (617-667-5609)
Maine — Clevis O. Laverty, W1RWG, 17 Fair St., Norway 04268 (207-743-2353)
New Hampshire — Robert Mitchell, W1SWX/W1NH, Box 137-A, Chester 03036 (603-895-3456)
Rhode Island — John Titterington, W1EOF, 45 Mountain Ave., Riverside 02915 (401-438-3619)
Vermont — Robert L. Scott, W1RNA, 9 Large St., Swanton 05488 (802-868-4944)
Western Massachusetts — Arthur Zavarella, W1KK, 1702 Main St., Agawam 01001 (413-786-9115)

Northwestern Division

Alaska — Fred S. Wegmer, KL7HFM, 1910 Rosemary St., Anchorage 99504 (907-274-3464)
Idaho — Lemuel H. Allen, Jr., W7JMH, 1800 S. Atlantic St., Boise 83705 (208-343-9153)
Montana — Robert E. Leo, W7LR, 6790 South 3rd Rd., Bozeman 59715 (406-586-6147)
Oregon — Dale T. Justice, K7WWR, 1369 N.E. Sunrise Ln., Hillsboro 97123 (503-648-8232)
Washington — Robert L. Klepper, W7IEU, 7027 51st NE, Marysville 98270 (206-659-3005)

Pacific Division

East Bay — Bob Vallio, W6RGG, 18655 Sheffield Rd., Castro Valley, CA 94546 (415-537-6704)
Nevada — Ralph E. Covington, Sr., W7SK, P. O. Box 7750, Reno 89510 (702-322-7988)
Pacific — J. P. Corrigan, KH6DD, Box 698, Kaneohe, HI 96744
Sacramento Valley — Norman A. Wilson, N6JV, Rte. 1, Box 730, Woodland, CA 95695 (916-666-1465)
San Francisco — Arthur P. Samuelson, W6VV, 440 Davis Ct. #811, San Francisco, CA 94111 (415-986-3129)
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W. Mesa Ave., Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Jettie B. Hill, W6RFF, 22410 Janice Ave., Cupertino, CA 95014 (408-255-6714)

Roanoke Division

North Carolina — William C. Parris, AA4R, 6210 Gothic Ct., Charlotte 28210 (704-552-0675)
South Carolina — Richard McAbee, W4MTK, 205 Jewel St. N.W., New Ellenton 29809 (803-652-2596)
Virginia — Richard "Rick" L. Genter, K4BKX, P. O. Box 34494, Richmond 23234 (804-271-0505)
West Virginia — Karl S. Thompson, K8KT, 5303 Pioneer Dr., Charleston 25312 (304-776-4352)

Rocky Mountain Division

Colorado — Robert W. Poirier, KØDJ, 1884 Pepperwood Dr., Colorado Springs 80910
New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd., N.E., Albuquerque 87112
Utah — Royce Henningson, K7QEQ, P. O. Box 1267, Moab 84532 (801-259-5018)
Wyoming — Chester C. Stanwaity, W7SDA, 353 S. Ferris St., Powell 82435 (307-754-3624)

Southeastern Division

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Georgia — Edmund J. Kosobucki, K4JNL, 5525 Perry Ave., Columbus 31904 (404-322-2856)
Northern Florida — Billy F. Williams, Jr., N4UF, 911 Rio St. Johns Dr., Jacksonville 32211 (904-744-9501)
Southern Florida — Woodrow Huddleston, K4SCL, 219 Driftwood Ln., Largo 33540 (813-584-0984)
West Indies — Julio Negroni, KP4CV, Georgetown, No. 269, Rio Piedras, PR 00927

Southwestern Division

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Orange — Fried Heyn, WA6WZO, 962 Cheyenne, Costa Mesa, CA 92626 (714-549-8516)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (714-273-1120)
Santa Barbara — Robert N. Dyruff, W6POU, 1188 Summit Rd., Santa Barbara, CA 93108 (805-969-3073)

West Gulf Division

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Oklahoma — Leonard R. Hollar, WA5FSN, RFD 1, 710 South Tenth St., Kingfisher 73750 (405-375-4411
Southern Texas — Roger D. Coday, N5FN, 213 Ave. G, RFD 4, Brazoria 77422 (713-798-7970)

THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

Forty Meters

Since the July Board Meeting, there has been quite a bit of discussion about the Board action concerning 7075-7100 kHz. A review of Minute 26 (page 51, September *QST*) will show that the Board knew it was dealing with a controversial issue; it should surprise no one that there are differences of opinion among the membership, because those differences were reflected by the Board in its deliberations.

The 7-MHz question came up because the 10-MHz Ad Hoc Committee, charged with studying membership comments on uses for the new shared band at 10.1-10.15 MHz, found that the new band could not be treated in isolation. The rationale for the new band that there was a wide gap between our 7- and 14-MHz allocations that had to be bridged to improve the reliability of amateur communication under varying propagation conditions, which is especially important for emergency communications. As the maximum usable frequency (muf) drops below 14 MHz, all we can do now is to move to 40 meters and hope that signals will be good enough to maintain communications. The new band at 10 MHz will help tremendously in bridging that gap.

Unfortunately, although the needs of the Amateur Service and its effectiveness as an emergency communications medium were both recognized at WARC-79, there was tremendous pressure on this part of the radio spectrum from other services as well, notably hf broadcasting. The best the Conference was able to do for us at 10 MHz was a 50-kHz band, where we can operate only if we do not interfere with stations of the Fixed Service assigned to the band. The narrowness of the new band, and the fact that it is shared, resulted in strong membership feeling that it should be a cw band. The Ad Hoc Committee agreed, and recommended to the Board that the band normally be limited to A1 and F1 (300 baud or less) emissions, as in our present cw bands. The Board unanimously concurred. Thus, cw and RTTY needs are nicely taken care of in the ARRL proposal for 10 MHz, and if we are efficient users of the radio spectrum we amateurs will transfer some of our cw activity from 40 and 20 meters into the new allocation.

Where does this leave phone? High-frequency phone is the most popular amateur activity in the U.S. and Canada — it's still more popular than vhf fm, according to the survey conducted earlier this year by Florida State University. If the new band is limited to cw and RTTY, it will not alleviate overcrowding in the phone subbands. This is one reason why the Board overwhelmingly supported a proposal for expansion of the U.S. 14-MHz phone band, but even this will not help when the muf dips below 14 MHz.

On top of this, at 7 MHz U.S. amateurs are faced with a unique problem: From dusk to dawn the entire phone band is filled with broadcasting stations in Europe, Africa, and Asia. The band is far from useless, but interference from the high-power broadcasting stations is a significant limiting factor. Transceive operation with most of the world is impossible, because amateurs outside North and South America generally are limited to 7000-7100 kHz for *all* of their 40-meter operating, including phone. In fact, working the U.S. on 40-meter phone is difficult for amateurs in many countries because they must listen in the part of the band that is used by broadcasting stations that may be located, quite literally, right in their backyards. It was for these reasons that Canada (over the objections of the Canadian Radio Relay League) opened the 7050-7100 kHz band to phone operation earlier this year.

The other side of the coin is that 40 meters is one of the most popular bands for cw and RTTY; cw and RTTY operators already have to cope with interference from nonamateur stations and from amateur phone operation outside the U.S.; the U.S. phone band was expanded by 50 kHz, to 7150-7300 kHz, back in 1972; and several cw and RTTY traffic nets use 7 MHz either as their primary frequency or as a backup to 3.5 MHz. With only 150 kHz for exclusive cw and RTTY operation, much of it beset by other interference, it is easy to see why a move to expand phone at the expense of cw would meet with opposition.

Faced with this dilemma, and under mounting pressure to expand U.S. phone allocations and bring them into line with the rest of the world, the Board adopted a modest compromise: make some provision for phone operation below 7100 kHz, but with limitations so as *to cause the least possible impact on existing cw and RTTY operation.* The report of the 10-MHz Ad Hoc Committee put it this way: "The Committee suggests that, as a compromise, a 25-kHz segment be opened for Extra Class operation on single-sideband *without eliminating the cw privileges of Advanced and General Class licensees in that segment.* This would be an important difference from the other Extra Class segments. Every encouragement should be given to limiting the use of phone in the segment to DX operating. The trade-off for cw operators would be that the 10-MHz band is to be cw only." The concept is similar to one proposed in 1971 by the FCC itself, in Docket 19162, although the Commission's version would have opened the segment to Advanced as well as Extra Class phone operation and would have caused much greater problems for cw/RTTY as a result.

As far as we can determine, the U.S. is now the only country in the world which does not permit its amateurs to operate phone *somewhere* below 7100 kHz. This tends to isolate U.S. amateurs from the rest of the amateur community and restricts our emergency capabilities. The idea of the ARRL proposal for 7075-7100 kHz is to solve that specific problem, while minimizing the impact on other modes.

Considering the problems the world telecommunications community had at 7 MHz during WARC-79, it isn't surprising that the amateur community has similar problems in determining its subbands. Anyone out there have a spectrum-stretcher we could borrow to make the band a bit wider for everyone? — *David Sumner, K1ZZ*

League Lines...

ARRL has petitioned the FCC for additional digital modes in the Amateur Radio Service. The proposal would facilitate and encourage amateur experimentation with new types of radio transmission, including but not limited to digital voice techniques, digitized video signals and computer-to-computer communications. The Commission noted in a news release that the petition was a "filing of more than routine interest." Details will appear in next month's "Happenings."

Attention Canadian amateurs. Now there is no import duty on the following amateur equipment: transmitters, receivers, transceivers and transverters, assembled or in kit form. Also included are linear amplifiers, VFOs and power supplies designed for use with the above equipment. This decision refers to tariff item 44534 2 in the budget of October 28. However, federal tax still applies to these items.

Help us update our RFI assistance list. If you are an amateur who has had a radio frequency interference (RFI) problem, please notify Hal Richman, W4CIZ, Technical Advisor, RFI Task Group. He needs the name of the person or office of the manufacturer or distributor to whom you reported the problem, including address, and any solution. Hal is particularly interested in manufacturers whose RFI-handling policy does not yet appear on our RFI assistance list, and primarily, the end result of your referral, technical details excluded in this instance. Please send a post card direct to Hal at 3908 Lake Blvd., Annandale, VA 22003.

Please note the following correction to the listing of QSL Bureaus on page 72 of November 1980 QST. The Mecklenburg ARS, P.O. Box DX, Charlotte, NC 28220 handles all 4th call area single-letter-prefix calls. The Sterling Park Amateur Radio Club, P.O. Box 559, Sterling Park, VA 22170 handles all 4th call area two-letter-prefix calls, excluding Caribbean and Pacific possessions. A corrected listing appears in next month's "QSL Corner."

The ARRL Foundation's role in the amateur space program and AMSAT was the subject of a meeting held at ARRL hq. last October 8. Present were the Foundation's President, Vice President, Secretary and Treasurer as well as the League's General Manager. Plans for a membership solicitation of funds for the promotion of amateur satellites were discussed, with special emphasis on support for the new Phase III-B satellite. Watch "League Lines" and "Happenings" in QST for further developments.

Support the ARS not the IRS! December is a good time to reassess your 1980 tax situation and make a tax deductible gift to ARRL in support of Amateur Radio. Contributions made before December 31, 1980 can be deducted on your 1980 tax return. For further information call the ARRL Development Office at League hq.

If you've ever been stumped by an abbreviation that's appeared in QST or another League publication, check out the official, updated and expanded list of abbreviations and symbols on pages 65 and 66 of this issue.

QST is looking for an Editorial Assistant/Copyeditor with an English or Journalism background and an Amateur Radio license. Main responsibilities include ensuring that submitted material conforms to style, and editing nontechnical articles and columns. The position is at ARRL hq. Contact Joel Kleinman or Laird Campbell, Production Department, ARRL hq.

An opening exists at Hq. for a manager for the ARRL Training Program within the Club & Train-ind Department. Broad experience in Amateur Radio, an Advanced Class license and experience in education and effective writing preferred. Contact Steve Place at ARRL hq.

If you are planning a DXpedition or vacation to a foreign country this spring or summer, please send us your request for reciprocal operating information as soon as possible. Most people don't allow themselves enough time to apply; application must be done through the mail in most cases, and made directly to the telecommunications authority in the country. The processing time usually takes 2 to 6 months! For information, send an s.a.s.e. to the Membership Services Department, specifying the countries in which you are interested.

Many FCC field offices are changing their schedules and/or requiring appointments for Amateur Radio license applicants. Before you travel to a field office, be sure to call or write in advance.

Organizing Amateur Communications for Public Events

Want your activity to get off to a good start? Follow these proven steps and Amateur Radio will stand out in the crowd.

By Robert Diefenbach,* W2NEK

Photo courtesy The Atlanta Journal and Constitution

Congratulations! If you have taken on the job of organizing a group of amateurs to provide communications for a public event, you are in an opportunity-filled position. Trouble is, some problems come along with the opportunities.

If things go right, you stand to get well-deserved applause from your fellow hams and the organizers of the event. But if you organize poorly, you have an equally good opportunity to wind up on everyone's blacklist. By going about your organizing chores *professionally* you will just about guarantee a successful project.

"Winging" a public service effort is the absolute tops in unprofessionalism. If you organize ham activities without careful planning, sooner or later you will wind up publicly embarrassed — like the organizer who talked a dozen or so well-intentioned hams into working a military air show without first discussing amateur participation with the officials involved.

The volunteer hams, asked to report to the host Air Force base at 8 A.M., waited without instructions for three hours in a parking lot. Finally, the organizer assigned them to various spots around the base, including a control tower where the Deputy Base Commander was surprised to see a civilian communicator appear. Clearly annoyed, the officer borrowed the ham's radio to give the hapless organizer (and all the others listening on the frequency) a few facts he should have checked beforehand. The hams' assistance was not needed and had not been officially requested. The military "official" who had initiated the project, a sergeant friend of the embarrassed organizer, had no authority to invite the hams to participate! Color several faces red.

*2402 Lauderdale Dr. N.E., Atlanta, GA 30345

The Essentials

Professional organization of a public-event project is built on these essentials:

1) Assurance that amateurs' participation is considered important by the event organizers and the local ham community.

2) Participating hams' anticipation that working the event will be hassle-free, interesting and, hopefully, fun.

3) Agreement with the event organizers on exactly what the amateur communicators' roles can and will be.

4) Careful advance planning of every facet of the operation — in detail. This includes identifying and defusing potential problems.

5) Understanding and endorsement of the operational plan by everyone involved.

6) Appropriate recognition of each participating amateur's contribution.

Without the foundation formed by these organizational "musts," you may not have a workable project. Until it is *known* that all the essentials are established or attainable, an organizer should be very cautious about accepting a project or recruiting volunteers. Instead of going naively ahead hoping that loose ends will come together, it may be wiser to decline the project. Our friend at the air show could have avoided having his wings clipped in public.

Did I hear you ask, "How will I know if those 'essentials' are established or attainable?" Good question. The answer is: Be a pro! Do what a professional in any field would do. Start by collecting the

Getting Organized

Although it doesn't cover all possible questions for every type of event, this checklist addresses some key steps in the organizing process.

Justification for Project

☐ Has amateur participation been requested or okayed by the appropriate authority?
☐ Is the requested ham involvement considered important to the success of the event by the event organizers?
☐ Among the event organizers, who has what authority?

Resources

☐ What is the least number of volunteers needed to do the job?
☐ How will volunteers be recruited?
☐ Is each volunteer's equipment appropriate? Frequency selection? Portability? Power supply? Antennas?
☐ Are certain frequencies generally too popular for dedication to the project without inconveniencing non-participating hams?
☐ Can one or more repeaters be dedicated to the event?
☐ Are special vehicles such as four-wheel drive and pickup trucks needed for some assignments?

Priorities

☐ If you have too few volunteer operators to fill all assignments, which assignments are least and most important to the project?
☐ If you have more volunteers than needed to fill all assignments, can the "extra" operators be assigned acceptably?

Logistics

☐ During the event, who must hear what?
☐ Should more than one frequency be used? If so, should they be interfaced somehow?
☐ Do assignments call for vehicle-mounted radios? Portable radios? Special power or antennas?
☐ Could bad weather or other factors cancel the event? If so, how will cancellation be announced?
☐ How will participating amateurs receive information and materials?
☐ Who has authority to okay necessary access, parking and so on?
☐ Are special passes or other credentials needed?
☐ Are earphones, noise-canceling microphones or other special equipment required?

Legal/Regulatory

☐ Who is liable for personal injury, equipment loss or damage, etc., suffered or caused by amateurs during the event?
☐ Do event organizers realize that hams must operate within FCC regulations and should not be asked to violate those regulations?
☐ Do participating hams understand that they are individually responsible for operating within FCC regulations?
☐ Will participating amateurs be reimbursed for non Amateur Radio-related expenses?*

Recognition

☐ Are all involved organizations aware of amateurs' participation in the event?
☐ Will the event publicity include mention of ham radio?
☐ Will the event organizers originate individual "thank you" letters or similar personalized recognition?
☐ If souvenirs are to be given to others involved with the event, will amateurs be included?

Miscellaneous

☐ Are there conflicts among event organizers that may affect amateur participation?
☐ Do certain amateurs prefer to work, or not work, together?
☐ Will participating amateurs allow others, such as news media personnel, to listen to QSOs for the purpose of publicizing the event?

Most, if not all, of these questions will apply to whatever project you are organizing. And there will be other questions too, specific to your project, which will need answering before and while you make your plans.

*[Editor's Note: It is best to be cautious about accepting any type of compensation from event organizers, as §97.112 of the U.S. Amateur Regulations prohibits operation of an amateur station "for material compensation, direct or indirect, paid or promised."]

Volunteer work can be fun. Careful and thorough advance planning of a public event will ensure that participating amateurs, like these in North Carolina, serve a useful and productive role.

relative information. Use that information, and other peoples' expertise if necessary, to decide: (1) What are the objectives of the amateur involvement? (2) Given the resources available, what, realistically, can be done to reach the objectives? and (3) What actual or potential obstacles exist, and how can they be avoided?

What information relates to these decisions, and where it can be found, depends on the event. Most is readily available simply by talking with event officials, looking over the site(s), checking maps, and reading promotional brochures or newspaper stories about the event or similar ones. Other information, particularly that which depends on other peoples' actions and decisions, may be more difficult to gather but is often important to your decision making. For example: You can't decide whether hams can use vehicle-mounted radios while parked on Main Street until someone else (the event organizer? the police? the mayor?) decides whether or not hams will be authorized to park on Main Street during the parade.

If you've recruited volunteers without portable capability, only to learn on parade day that all parking on Main Street is banned, your project is in trouble. But if you had thought of a last-minute parking ban as a potential obstacle during your early planning, and had hedged against it by insisting that each ham assigned to Main Street have a hand-held transceiver available, you are still in business!

Smooth The Way

As an organizer your role is to facilitate — to smooth the way. If you do your job well the hams working on the event will have a minimum of hassle because you will have prearranged everything possible and planned for every important possibility. By the end of the event, the participating amateurs will feel they have performed an important community service, worked well as a team, and had a good time doing it!

You can't do your job — facilitating others' participation — if you get too involved in participating yourself. Name other reliable amateurs to key assignments. Leave yourself free to monitor the operation and "put out fires." If you *must* assume an on-the-air role, make it an expendable one that you can abandon if you must.

Many a well-planned operation has been arrested by Murphy's Law. You need to protect yours by having alternate plans ready to substitute for those that don't work out, and by having extra operators and backup equipment available in case of no-shows and breakdowns.

But don't overdo it! Overcomplicating a project is almost as risky as "winging" one. Inexperienced organizers sometimes *over*plan events with disastrous results. Enthusiastic ham volunteers often want to use more, or more complex, equipment than is necessary. Experienced organizers avoid these traps by keeping every facet of their operations as simple as possible.

Your aim should be: (1) to put together an easily understood and executed plan, one that is just detailed enough to do the job, with appropriate extra attention given to *critical* objectives only, and (2) to line up just enough operators and equipment to handle all the assignments in your plan, with standby operators and backup equipment at *necessary* points only.

Circulate the Plan

Once you have worked out the plan for your operation, share it with everyone involved in whatever detail *each needs to* know. At the very least, hold a meeting (on the air or off) of all the amateur volunteers to describe the plan, the ham assignments and what the volunteers can

expect on the day of the event. The plan should also be explained to the event organizers and others (police, media, property owners) whose cooperation is important. Give everyone a chance to ask questions. Be receptive to suggestions: Someone may very well think of something you have overlooked.

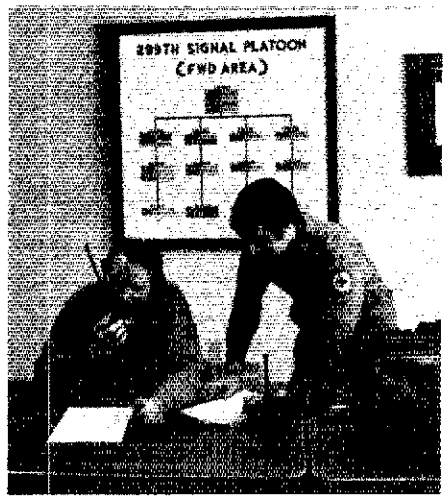
If the size and complexity of the project warrants it — and funds are available — you might distribute a printed operational plan.[1] This can include maps, traffic procedures, emergency and contingency plans, and the like. You may wish to add background information on the event, letters of thanks for the hams' participation, or a statement disclaiming liability in case of injury, damage or loss during the event.

If you have done a professional organizational job and your amateur volunteers perform with equal professionalism on E (Event) Day, you will share a satisfying experience. The entire Amateur Radio community will applaud and benefit from your efforts. You will gain an enviable personal reputation as an organizer. Hams will want to work with you on other projects, and organizers of other events will seek your help.

But before you ride off into the golden sunset of self-adulation, remember to clear up the loose ends. Ask for criticism and suggestions from the people involved in your operation. Solicited while memories are still fresh, these will be immensely helpful when you plan the next similar communications project. If the suggestions you receive include some valid ones related to the event itself, rather than to the communications effort, pass these suggestions on to the event organizers.

Be prompt and generous in thanking everyone who helped on the project. Individual letters are preferable to "Dear Volunteer" ones, and reference to a specific contribution is always a nice touch. If you receive thanks that belongs to others, too, pass them along.

While you are organizing your project, and especially on the day it all happens, remember that this is a *hobby* activity. Planning and performing like professionals doesn't take away any of the pleasure and excitement we get from Amateur Radio. To the contrary, it adds!



This Red Cross official (right), arranging an emergency fuel delivery, relies heavily on experienced amateurs for communications support. Typically, event organizers will welcome assistance from "professionally" trained amateurs.

The author is an experienced organizer of large public events and the communications supporting them. His professional and volunteer credits include two "world's largest" events.

[1]Copies of an 18-page operational plan, covering communications for a road race and parade, are available from the author at his cost ($3).

Strays

SOLAR ENERGY HELPS KEEP PITCAIRN ON THE AIR

☐ The high cost of fuel oil nearly forced Tom Christian, VR6TC, off the air recently — until a fellow amateur came to the rescue with a solar-power unit. By late 1979 the cost of fuel oil to run Pitcairn Island's diesel generators had risen to nearly $200 per barrel. At that price, the islanders could only afford to have electric power about two hours a day, and Christian's operating time was limited.

Escalating fuel cost and the fact that only a few ships call at the island each year have been frequent subjects of conversation between Christian and the amateurs who talk to him. One of those amateurs is Thorn Mayes, W7HWA, of Phoenix, Arizona. Mayes and his wife were planning a visit to Pitcairn via an island-hopping ship out of the Fiji Islands and wanted to help Christian with his power problem.

Solar energy seemed like a reasonable long-term solution, so Mayes contacted the Semiconductor Group at Motorola, Inc. Solar systems personnel agreed to help, and three 2-foot-square solar-power modules were assembled and packaged so that Mayes and his wife could take them to Tom Christian.

The Mayes's left Phoenix in late October 1979 and a month later the three solar panels were installed on Christian's antenna tower on Pitcairn. The modules contain 36 solid-state photovoltaic cells, which convert sunlight directly into electricity. Christian can store the sun-generated power in batteries, which allows him to use his rig at almost anytime of the day or night.

Christian hopes that all the island's power needs eventually can be provided through solar power. Even at today's high cost, photovoltaic power, when amortized over a 20-year period, is almost competitive with the island's cost of generating power by diesel generator. The cost of a solar-power unit of that size is more, at present, than the islanders can afford. But maybe one day Pitcairn will get all its power from electricity from the sun. — *Motorola corporate press release*

Tom Christian, VR6TC, adjusts a solar-power module on his Pitcairn Island antenna tower. The solar assembly is an alternative power source to the island's costly diesel-powered generator. *(photo courtesy Motorola, Inc.)*

Modern Design of a CW Filter Using 88- and 44-mH Surplus Inductors

Pick the values from a table, tack together some readily available (and inexpensive) components, and you've got a filter that'll aid your cw "hearability."

By Edward E. Wetherhold,* W3NQN

One of the most popular and frequently used circuits in Amateur Radio is the cw audio filter. Formerly, the passive LC filter was employed almost exclusively; however, the low cost of integrated circuits now makes the active cw filter economically practical and many such devices are now commercially available. The passive LC filter nevertheless has many important advantages. For example, passive filters are inherently stable whereas active filters are prone to instability and are more sensitive to component value changes and tolerances.[1] Passive filters require no power supply whereas active filters do, and passive filters are less susceptible to signal overload than are active filters. For the individual amateur, the passive LC filter is easier to build and is less expensive (because of the availability of low-cost surplus toroidal inductors) than the active filter.

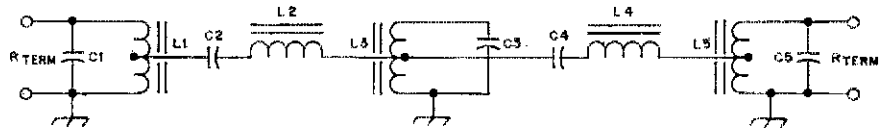
An excellent technical discussion of the passive LC filter was presented by Rife.[2] Rife's Butterworth bandpass cw filter used three 44-mH surplus toroidal inductors and a number of capacitors arranged in accordance with Norton's transformation to match the selected 600-ohm termination resistances to an impedance level required by the 44-mH inductor values. The three-resonator Butterworth filter had a calculated 3-dB bandwidth of about 40% of the center frequency, and a 36/3-dB bandwidth ratio of about 4. Although the calculated 3-dB bandwidth of 353 Hz was greater than necessary (for a center frequency of 875 Hz), Rife used

*Honeywell Inc., Defense Electronics Division, Signal Analysis Center, P. O. Box 391, Annapolis, MD 21404, Tel. 301-224-4500; Ext. 243.

[1]Notes appear on page

Table 1

Design and Performance Parameters and Component Values for 5-Resonator Chebyshev Band-pass Filters Using 88-and 44-mH Surplus Toroidal Inductors



Fixed Inductor Values

L1, 5 = 88 mH
L2, 4 = 4(88 mH) = 352 mH
L3 = 44 mH
BW_{3dB} = 32.8% F_{MEAN}

Low-pass Filter Design Parameters

R.C. = 6.3%
A_p = 0.0173 dB
ϵ = 0.0631253968
$F_{3dB}F_{A_p}$ = 1.248

G1, 5 = 0.8265
G2, 4 = 1.3375
G3 = 1.653
G3/G1 = 2.000

F-MEAN (HZ)	C1,5 (UF)	C3 (UF)	C2,4 (UF)	R-TERM (OHMS)	BW-AP (HZ)	BW-3DB (HZ)	F-LO(3DB) (HZ)	F-HI(3DB) (HZ)
1014.	.28	.56	.0700	1763.	267.	333.	861.	1194.
996.	.29	.58	.0725	1732.	262.	327.	846.	1173.
964.	.31	.62	.0775	1675.	253.	316.	818.	1135.
948.	.32	.64	.0800	1649.	249.	311.	806.	1117.
934.	.33	.66	.0825	1624.	245.	306.	793.	1100.
920.	.34	.68	.0850	1600.	242.	302.	781.	1083.
800.	.45	.90	.1125	1390.	210.	262.	679.	942.
791.	.46	.92	.1150	1375.	208.	259.	672.	931.
783.	.47	.94	.1175	1361.	206.	257.	665.	921.
774.	.48	.96	.1200	1346.	204.	254.	658.	912.
723.	.55	1.10	.1375	1258.	190.	237.	614.	852.
717.	.56	1.12	.1400	1246.	188.	235.	609.	844.
711.	.57	1.14	.1425	1235.	187.	233.	604.	837.
655.	.67	1.34	.1675	1140.	172.	215.	557.	772.
651.	.68	1.36	.1700	1131.	171.	213.	553.	766.
646.	.69	1.38	.1725	1123.	170.	212.	549.	760.
596.	.81	1.62	.2025	1036.	157.	196.	506.	702.
592.	.82	1.64	.2050	1030.	156.	194.	503.	698.
589.	.83	1.66	.2075	1024.	155.	193.	500.	693.
548.	.96	1.92	.2400	952.	144.	180.	465.	645.
542.	.98	1.96	.2450	942.	142.	178.	460.	638.
537.	1.00	2.00	.2500	933.	141.	176.	456.	632.
531.	1.02	2.04	.2550	924.	140.	174.	451.	625.

Note: Equations and definitions of F-MEAN, C1, C3, C2, R-TERM, BW-AP, BW-3DB, F-LOW(3DB) and F-HI(3DB) are given in Appendices.

the filter with gratifying results. An appendix in Rife's article listed design equations for other center frequencies.

Since Rife's paper was published, many other articles on both passive and active cw filters have appeared in *QST* and *Ham Radio*. Noble discussed the application of a single-series LC combination for cw reception.[3] Most recently, Bartlett presented a similar 2-element passive LC filter with some additional circuit refinements.[4] Although these articles were useful, the design techniques presented did not significantly advance the amateur state-of-the-art filter design or use the full capabilities of the surplus toroidal inductors.

A Simple, Selective Cw Filter

The passive LC cw filter discussed here has selectivity that is equal to the best of the commercial active filters. It is easy and inexpensive to construct using surplus 88-mH inductors in their original stack form of five inductors per stack. Detailed lowpass-to-bandpass design procedures previously unpublished in amateur circles are explained, and a tabulation of component values and performance parameters are provided for those who wish to omit the discussion of the design equations. This cw band-pass filter is based on the transformation of the 5-element Chebyshev low-pass filter with a reflection coefficient of 6.3%. All inductive elements use unmodified surplus toroidal inductors — ten 88 mH and one 44 mH. To further simplify construction, all wiring interconnections are made using the terminal strips of the two inductor stacks. This 5-resonator filter has a fixed 3-dB bandwidth equal to 32.8% of any selected geometric mean center frequency, and the ratio of the 36/3-dB bandwidths is about 2.0, or twice as selective as the previously mentioned 3-resonator Butterworth filter.

For those interested only in construction of the filter, 23 precalculated designs with mean center frequencies from 531 to 1014 Hz are tabulated with component values and performance parameters. Standard capacitor values are used for C1 and C5, with additional values just on either side of the standard value. Because of the design technique used, the termination resistance is not a constant, but varies from 1763 to 924 ohms, depending on which center frequency is selected. If the center taps of the input and output inductors are used, the termination resistance will be one-quarter of those values, or about 441 to 231 ohms. The actual termination resistance is not critical and the filter will function satisfactorily if a termination resistance within about ±20% is provided.

Computer-Tabulated Band-pass Filter Values

Table 1 shows the filter schematic diagram and lists the filter performance parameters for C1 and C5 values from 0.28 to 1.02 μF, with corresponding center frequencies (F-Mean) of 1014 to 531 Hz. The fixed inductor values and the low-pass filter prototype design parameters are listed directly under the filter schematic diagram. The low-pass filter design parameters were used to computer-calculate all of the tabulated data for the band-pass filter. The procedures are explained in Appendix C for those who may wish to calculate new designs for different inductor values of L1 and L3.

A Chebyshev low-pass prototype design having a 6.3% reflection coefficient was used so the transformed band-pass filter value of L3 would be exactly one-half that of L1. Thus, unmodified 88- and 44-mH surplus toroidal inductors can be used for L1, L5 and L3, respectively. The bandwidth of the band-pass filter is a constant 32.8% of the mean center frequency. This particular percentage bandwidth was selected so L2 and L4 each could be made from four 88-mH inductors. Consequently, the total number of 88-mH inductors is 10, or two five-inductor stacks. By using the center taps of L1, L3, and L5 instead of the customary connections at the maximum impedance points of the tuned circuits, the inductance of L2 and L4 is reduced by 75%, from 1.408 H to 0.352 H, which is much more practical.[5] The 88-mH value was selected for use in the filter construction because this value is much more commonly available than the 44-mH value.

An alternate band-pass design based on a 5-element Butterworth low-pass prototype is also possible. In this case, the 3-dB bandwidth is 25% of the mean center frequency. Although this design is more selective than the 32.8% bandwidth of the 6.3% reflection coefficient Chebyshev filter, the design is less convenient to construct. In the Butterworth band-pass filter, L3 has a value of 27.2 mH, which requires the removal of about 56 turns from each of the two windings of

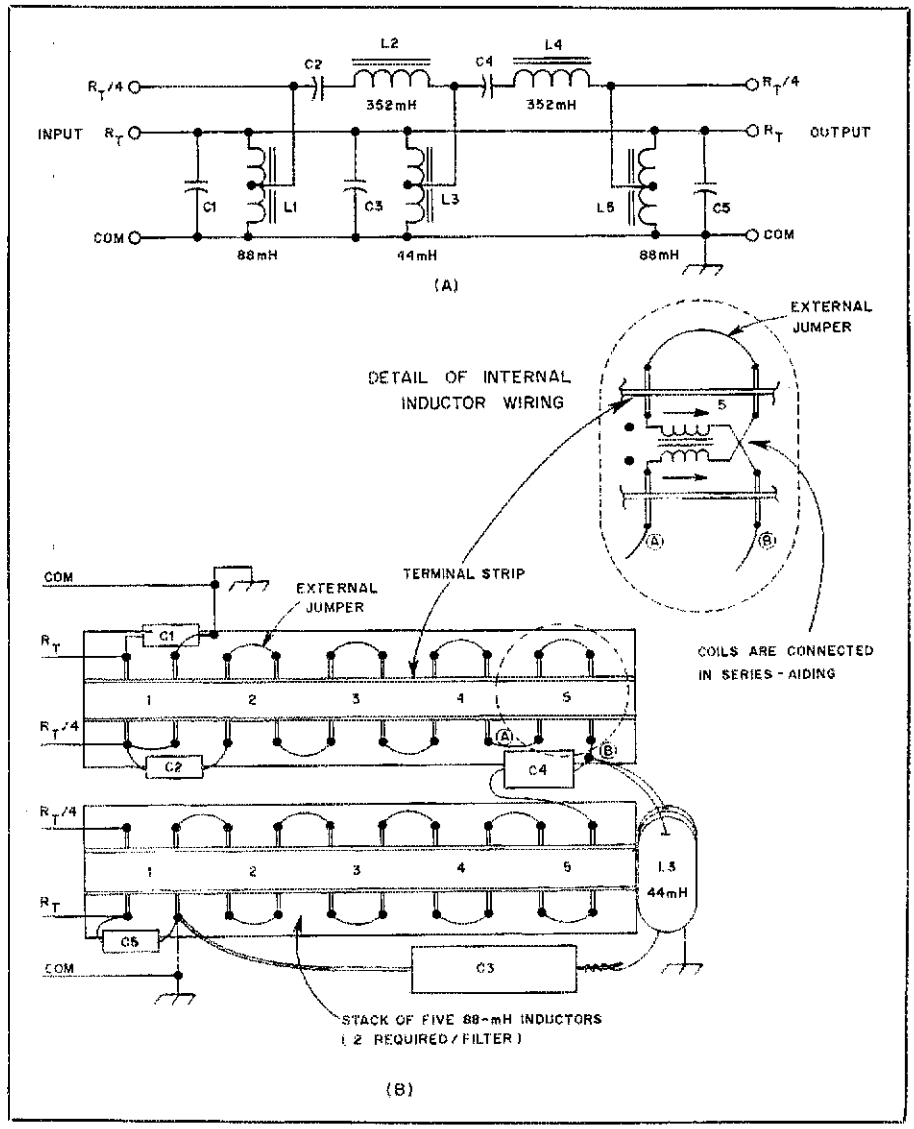


Fig. 1 — The schematic and pictorial diagrams of a 5-resonator cw filter using surplus telephone company toroids.

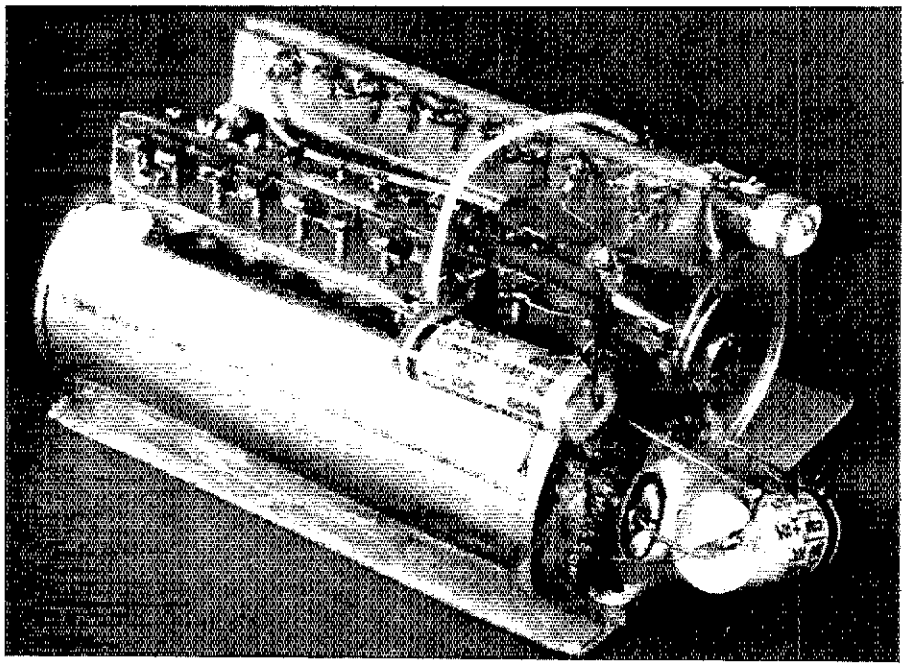


Fig. 2 — An assembled cw filter showing two 88-mH inductor stacks with the externally mounted 44-mH inductor, L3.

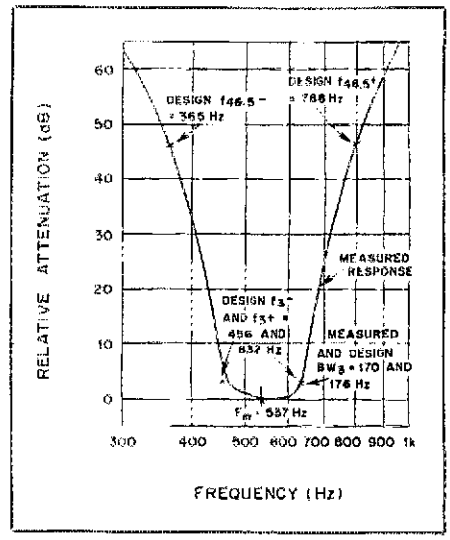


Fig. 3 — Measured relative attenuation of a 5-resonator surplus toroid cw filter.

the 44-mH inductor, and the capacitance and physical size of C3 increase. Because the disadvantages of implementing the Butterworth band-pass design appeared to outweigh any advantages gained by the slight improvement in selectivity, the Chebyshev design was chosen.

Note that the capacitance of C1 is exactly half of C3 and four times that of C2. Thus, if the desired value of C1 is not listed in Table 1, it is easy to find the values of the other capacitors. For best results, the actual capacitance values should be within 2% of the design value; how this matching may be accomplished is discussed later. The other five tabulated parameters (R-TERM, BW-AP, etc.) are less important from a construction standpoint, and they can be approximated for any nontabulated capacitance values by interpolation of the tabulated data.

Filter Wiring and Construction

The schematic and pictorial diagrams of the bandpass filter are shown in Fig. 1. The schematic diagram is redrawn differently from the schematic diagram above Table 1 to more clearly indicate the alternate input and output quarter-impedance terminations that may be used. A suggested method of filter wiring is depicted in the pictorial diagram. Inductor interconnections and the mounting of the capacitors are greatly facilitated by using the terminal-strip lugs of the inductor stacks. The single 44-mH inductor (L3) is fastened to the rear of one of the stacks with RTV silicone rubber adhesive, and its wire leads are connected to the terminal lugs as shown.

An assembled filter is shown in Fig. 2. Inductor stacks with tinned sheet-metal covers were used; they were fastened together for stability by tack-soldering the metal cases at a few points. Inductor stacks manufactured with only a cardboard cover require a different fastening method. In this assembly, C3 was mounted on top of L3, but the method shown in Fig. 1B appears more convenient. Capacitors C1, C5 and part of C3 are metallized Mylar types; because of their physical size, they are more conveniently mounted on the inductor case. C2 and C4 are much lower in capacitance and may consist of standard Mylar capacitors paralleled to produce the design capacitance value within 2%. All inductors and capacitors will fit into a 3- × 4- × 5-in. (76- × 101- × 127-mm) aluminum box with room to spare for mounting a phone jack and dpdt switch.

Filter Performance

Fig. 3 shows the measured relative attenuation response of a band-pass filter designed for a mean center frequency of 537 Hz (see the second-to-last entry in Table 1 for the corresponding design and performance parameters of this filter). For comparison, several design (calculated) response points are also plotted and are indicated by an X. The close agreement between the measured and the calculated response values confirms that the filter was assembled correctly, and demonstrates that the inductor losses are not significant for this particular application. The effect of the inductor Q is most obvious from the response curve between the frequencies of F_m and F_{3-}; F_{3-} is the lower 3-dB frequency of the filter passband.

The rounding of the response curve at the low end of the passband is more pronounced than at the high end because of the lower inductor Q. Details of the filter attenuation versus frequency calculations are discussed in Appendix D. The insertion loss of the filter is about 3 dB, typical of filters having this many elements using surplus toroidal inductors.

Installation and Operation

For best results, the filter input and output ports should be terminated in the correct resistance, either R_T or $R_T/4$, whichever value is easier to approximate. If the filter is to be installed in a low-impedance audio system, resistors should be installed in series with the filter input and output to approximate the design termination resistance. If this results in excessive signal loss or other problems caused by the extreme impedance mismatch between the filter and the low impedance of the receiver output and the headset, then transformer matching should be considered. The penalty for a gross mismatch is a narrowing of the filter attenuation skirts and the introduction of two attenuation peaks in the passband. For example, if a filter designed for termination resistance of 1000 ohms is placed in a 50-ohm system (a mismatch of 20:1), the bandwidth below 30 dB will be slightly narrower, and there will be two 8-dB attenuation peaks on each side of the center frequency.

A simple and inexpensive way of accomplishing transformer impedance matching is to use two Radio Shack no. 273-1380 (8:1000 ohm ct) audio transformers or two 300 mA, 115/6.3-volt filament transformers. Connect the low-voltage winding of the first filament transformer to the receiver headset output, and the high-voltage winding to the filter input. The high-voltage winding of the second transformer is connected to the filter output, and the low-voltage winding to the headset. Use the filter taps that give

the best match. Filament transformers are recommended for this application because of their availability and low cost, and because their impedance transformation ratio approximates that required between a 4-ohm audio system and the filter termination resistance. Because this application is for a narrowband audio function, the limited frequency response of the transformer is not important.

If the source resistance (R_S) of the receiver audio output amplifier (the output that will drive the cw filter) is not known, it can be measured with an ac VOM using the following procedure.

1) Adjust the receiver BFO and audio gain control to obtain a suitable audio output tone and voltage level. The necessary receiver rf input can be provided by a crystal calibrator, a GDO or an rf signal generator.

2) Disconnect the headset or speaker load and measure the unloaded source voltage (V_S) of the audio output amplifier.

3) Connect a known resistance (R_L) across the audio output, which causes the output voltage level to drop slightly by one or two dB, and measure the loaded output voltage, V_L.

4) Calculate the source resistance (R_S) using the equation

$$R_S = R_L (V_S - V_L)/V_L$$

where R and V are in ohms and volts. For example, if R_L = 5400 ohms, V_S = 1.0 V and V_L = 0.9 V, then R_S = 5400(1 − 0.9)/0.9 = 600 ohms.

In this procedure, the output voltage is reduced slightly to ensure that the output stage is operating in its linear range and is not overloaded; overload might occur if too low a resistance is used. Also, note that this procedure is suitable only if the source impedance is predominantly resistive, as it is in this case. Take care to see that the audio output stage does not become unstable and go into self-oscillation when the headset of speaker load is removed. This will be indicated by a high output-voltage level which may not respond to the audio gain control. If this happens, connect a high-value resistance (about 20 kΩ) across the output tap having the highest impedance level, and reduce the resistance until the self-oscillation is damped out. This condition is more likely to occur in the old, tube-type receivers (such as the author's GPR-90 receiver) than in the modern transistor receivers.

For the lower mean frequencies, such as 600 Hz or below, the 3-dB bandwidth will be less than 200 Hz; this will be satisfactory for most operators. However, the bandwidth for the higher mean frequencies (above 800 Hz) will be greater than 260 Hz. If this is found to be too wide for good selectivity, then the filters of Noble and Bartlett, mentioned previously, should be considered for addition to the 5-resonator filter. Although these simple two-element filters have poor skirt selectivity, they do have a relatively sharp response at their center frequency. Thus, the combination of the 5-resonator filter with its excellent skirt response, and the single-resonator filter with its sharp center frequency response, makes for a combined filter with optimum performance. The 5-resonator filter probably will work best if it is placed between the receiver output and Bartlett's circuit. Bartlett's active input circuit will provide the desired isolation between the two filters, and the input circuit can be adjusted to provide the proper resistive loading for the 5-resonator filter.

Some users may desire a switch-selectable, broader response for general tuning across the band of operation, while reserving the maximum selectivity for use during a QSO. In this case, some experimentation can be tried, such as reducing the inductance of L2 and L4 by half with a 4-pole, 2-position rotary switch to broaden the passband response. If this is done, the proper amount of capacitance will have to be added simultaneously to maintain the LC product of the tuned circuit. I tried this, and measurements show that this change increases the 3-dB bandwidth by half again as much as before, while still maintaining a relatively flat passband response. If a sharper skirt response is desired, it can be obtained by using a 7-element low-pass Chebyshev prototype design for a 7-resonator band-pass filter. The availability of low-cost toroidal inductors and the application of the design procedures discussed in this article make such a filter quite feasible. The 7-element Chebyshev design that appears most suitable has a reflection coefficient of 8.1%, which provides an L1/L3 ratio of exactly 2/1. Thus, 88- and 44-mH inductors can again be used without modification. If the two series inductors either side of center are made to be 352 mH, and the center series inductor is made to be 396 mH (design value of 402 mH), a 32% bandwidth will result with improved skirt response. For example, the measured 36/3-dB ratio of the 5-resonator band-pass filter is about 2, while that of the 7-resonator filter is about 1.6.

Where to Get the Inductors and Capacitors

The 88-mH inductor stacks are available from Typetronics at a cost of $3 per stack with a shipping charge of $1.75 for the first stack and 80 cents for each additional stack.[6] A single order for two of the 88-mH stacks to duplicate the 5-resonator filter is $8.55. Be sure to specify "inductor stack required *with terminal board.*" Also specify the preferred inductor style as "scramble-wound red and green wires." This winding style provides 99.8% coupling between the two windings, which is preferred for applications using the center-tap connection.

The 44-mH inductor is not available from Typetronics; it must be ordered from M. Reed at a cost of five for $5, prepaid.[7] At this time, M. Reed is the only known source of the 44-mH inductors.

If the 44-mH inductor is not available, an 88-mH inductor may be used instead, after removing enough turns to obtain the proper inductance. For the red/green-colored wire scramble-wound inductor, remove 110 turns from each winding (total turns removed = 220). For the inductor with two separate windings on opposite halves of the core and with the same color wire, remove 109 turns from each winding (total turns removed = 218). In either case, the windings must be connected in series aiding. For the scramble-wound inductor, connect the red wire of the start pair to the green wire of the finish pair. With the other inductor type, connect the "finish" end of one winding to the "start" end of the other winding. The inductor center tap is available at the junction of the two windings. The 88-mH inductors are also available from Reed at the same price as the 44-mH inductor, but the order must specify "88-mH, 5-inductor stack *with terminal board*"; otherwise, the inductors will be disconnected from the terminal board and removed from the container before shipping to minimize shipping weight and mailing cost.

If the reader is a member of a radio club affiliated with the ARRL, and lives in Virginia, West Virginia, Maryland or Washington, DC, there is another way to obtain the 88-mH inductor stacks. Through the cooperation of the Chesapeake and Potomac Telephone Company of Maryland, I have been able to obtain a limited number of 88-mH inductor stacks that are no longer usable by the telephone company. These surplus inductors are being made available to those amateurs living within the area serviced by the C&P Telephone Company with the understanding that they will be distributed by me at no charge (except for packing and shipping expenses) to those who will use the inductors in Amateur Radio applications. Those amateurs who have use for these inductors but live outside the area serviced by the C&P Telephone Company are advised to write to the Director of Public Relations of their local telephone company and request that surplus inductors be made available for those club activities and projects that will serve the public need in some manner.

To distribute the inductor stacks now on hand in the most expeditious and efficient manner, I will accept requests for up to 20 stacks from any ARRL-affiliated radio club located within the area serviced by the C&P Telephone Company. Once received, these inductors may not be sold for cash as this is contrary to the wishes of the C&P Telephone Company. To obtain a shipment, an officer of the radio club

should write to the author and request a specific number of 88-mH inductor stacks. The names and call signs of the individual members of the club who are to receive the stacks must be listed along with the intended applications. A business-sized s.a.s.e. must be included for a reply and further instructions. All shipments will be made via UPS, so a geographical location (street number, city and state) must be provided; a P. O. Box number is not acceptable. If more requests are received than there are inductors now available, the requests and return envelopes will be held until more surplus inductors are received from the C&P Telephone Company.

Quality Mylar capacitors are available at reasonable prices from several sources.[8,9,10] The best source I have been able to find for low-cost metallized polyester capacitors is Allied Electronics.[10] These capacitors are listed on page 75 of the Allied 1980 *Engineering Manual and Purchasing Guide*, no. 800. Metallized polyester capacitors are available in values from 0.33 to 2.2 μF/250 V dc, with noninductive construction and a 10% tolerance (type ECQ-E).

It is important that all capacitor values be within 2% of the design value to ensure proper operation of the filter. The simplest and least expensive procedure to obtain the correct value capacitors for the filter is to purchase a large number of capacitors and measure each to an accuracy of about 0.5%. Years ago, this was a tedious job using an impedance bridge, but today it is simple when you use one of the many capacitance-measuring meters that are now priced as low as $130.[11] The C-meter I prefer is the Data Precision Model 938, which has an accuracy of 0.1% and a 3-1/2-digit liquid crystal display (for longer battery life).[12] The cost of such a C-meter is within the budget of most radio clubs, and the use of such a meter will allow the proper selection of capacitors for all projects that the members may wish to undertake.

Conclusion

Rife's statements — that the design techniques used in his article are not new; they are routinely used by filter designers, but amateurs have made little use of them — are certainly still applicable to the present.[13] But perhaps with this second demonstration other amateurs will find new applications for both the modern design technique and the surplus toroidal inductors.

I gratefully acknowledge the cooperation of John Kirby, N3AAZ, Frank Noble, W3MT, and Bill Robert Jr., N5BON, for providing comments on the filter performance under actual operating conditions. The assistance of Rex Cox, of Honeywell Inc., and Joseph Gutowski, of EWC, Inc. is also gratefully acknowledged for their review of this article.

Appendix A
Definitions and Equations

(Refer to Figs. 6 and 7.)

F-mean — geometric mean or center frequency (Hz) of the band-pass filter attenuation response.

R-term — filter termination resistance in ohms.

A_p — peak amplitude (dB) of the passband attenuation ripple.

A_s — stopband attenuation (dB).

F_{Ap} — frequency (Hz) where the passband attenuation level first exceeds the A_p level (denotes the end of the passband).

F_{As} — frequency (Hz) corresponding to a stopband attenuation level of A_s.

BW_{Ap} — bandwidth (Hz) between upper and lower frequencies at the A_p(dB) level on the attenuation response curve.

BW_x — bandwidth (Hz) between upper and lower frequencies at x attenuation level.

$F\text{-}HI_{(x)}$, $F\text{-}LO_{(x)}$ — upper and lower frequencies (Hz) at the x dB attenuation level on the attenuation response curve.

R.C. — reflection coefficient (%).

ρ — absolute value of R.C. in decimal form (used in following equations).

ε — ripple factor, a parameter <1 related to the ripple amplitude.

n — number of branches in a ladder network (equal to number of reactive elements in the low-pass prototype filter discussed in this article).

T — Chebyshev polynomial (T used instead of C to prevent confusing with capacitance).

Ω — normalized frequency = F_{As}/F_{Ap}.

G1-5 — normalized element values (1-5).

(*1*) $\rho = (1 - 0.1^{0.1A_p})^{0.5}$

(*2a*) $A_p = -10\cdot\log(1 - \rho^2)$ dB

(*2b*) $A_p = 10\cdot\log(1 + \varepsilon^2)$ dB

(*3a*) $\varepsilon = (10^{0.1}A_p - 1)^{0.5}$

(*3b*) $\varepsilon = \rho/(1 - \rho^2)^{0.5}$

For example, if R.C. = 6.3%, then ρ = 0.063, A_p = 0.0172714 and ε = 0.0631254.

Appendix B
Calculation of F_3/F_{Ap} ratio (or BW_3/BW_{Ap} ratio)

Where F_3 is the 3-dB cutoff frequency (BW_3 is the 3-dB BW), F_{Ap} is the A_p-dB cutoff frequency (BW_{Ap} is the A_p-dB BW),

A_p is the max. passband attenuation,

n = number of filter elements, $1/\varepsilon = [(1-\rho^2)/\rho^2]^{0.5}$, and ρ = (R.C.%)/100.

(*1*) $F_3/F_{Ap} = \cosh[(\cosh^{-1}1/\varepsilon)/n]$

For R.C. = 6.3%, $1/\varepsilon$ = 15.841485.

Let n = 5.

Hyperbolic functions in terms of natural logs and exponents:

$\cosh^{-1}x = \ln[x + (x^2-1)^{0.5}]$, $\cosh y = 0.5[e^y + e^{-y}]$, e = 2.718282.

Let $x = 1/\varepsilon$, then $\cosh^{-1}x$ = 3.4547816; Let y = (3.4547816)/5 = 0.6909563, then cosh y = 0.5[1.995623 + 0.501097], F_3/F_{Ap} = 1.24836 or 1.248.

(Note: For band-pass design, $BW_{Ap} = F_{Ap}$ and $BW_3 = F_3$. Thus, $BW_{Ap} = BW_3/1.248$ for ρ = 0.063 and n = 5.)

Simplified equations to find F_3/F_{Ap} when $A_p < 0.1$dB (R.C. < 15%).

(*2a*) $F_3/F_{Ap} \approx 0.5(K + 1/K)$, where,

(*2b*) $K = (2/\varepsilon)^{1/n}$.

For example, if A_p = 0.0172714, ε = 0.063125 and n = 5, then K = 1.99602 and F_3/F_{Ap} = 1.2485.

Appendix C
Design Equations for Five-Resonator Chebyshev Band-pass Filters

In the following equations, F_{mean}, BW_{Ap}, BW_3, F_{LO} and F_{HI} are in Hz, and all capacitances and inductances are in farads and henrys unless otherwise stated. Fig. 4 (below) shows the schematic diagram of the band-pass filter.

(*1a*) $F_{mean} = 1/[2\pi(L1\cdot C1)^{0.5}]$

(*1b*) $F_{mean} = 536.51/(C1)^{0.5}$, for L1 = 0.088H with C1 in μF.

(*1c*) $F_{mean} = [F_{LO_x}\cdot F_{HI_x}]^{0.5}$, where x is any attenuation level in dB, and F_{LO} and F_{HI} are the low and high band-pass frequencies at the x attenuation level.

(*2a*) $BW_{Ap} = F_m[(G1\cdot G2)L1/L2]^{0.5}$, the basic equation for calculating BW_{Ap}. See Appendix D for G1, 2 values.

(*2b*) $BW_{Ap} = 0.25\cdot F_m[G1\cdot G2)^{0.5}]$, for L1/L2 = 0.088H/1.408H = 0.0625.

(*2c*) $BW_{Ap} = 0.26285\cdot F_m$, for R.C. = 6.3%, G1 = 0.8265 and G2 = 1.3375.

(*3a*) $BW_3 = 1.248\cdot BW_{Ap}$, for R.C. = 6.3% and BW_3 = 3-dB bandwidth of BP filter.

(*3b*) $BW_3 = 0.328\cdot F_m$.

(*4a*) $R_{term} = 2\pi(BW_{Ap})L2/G2$, where R_{term} is the filter source and load resistance in ohms.

(*4b*) $R_{term} = 6.6144\cdot BW_{Ap}$, for L2 = 1.408H and G2 = 1.3375.

(*4c*) $R_{term} = 932.773/(C1)^{0.5}$, for C1 in μF.

(*5a*) C3 = 2(C1), L3 = 0.5(L1).

(*5b*) C2 = (C1)/16, L2 = 16(L1).

(*6a*) $F_{LO_x} = -BW_x/2 + [F_m^2 + (BW_x/2)^2]^{0.5}$

(*6b*) $F_{HI_x} = F_{LO_x} + BW_x$

All resonant circuits are tuned to F_m.

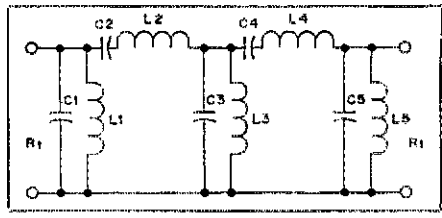


Fig. 4 — Schematic diagram of a 5-resonator band-pass filter.

Appendix D
Calculation of Filter Stop-band Attenuation and Lowpass-to-Bandpass Transformation Procedure

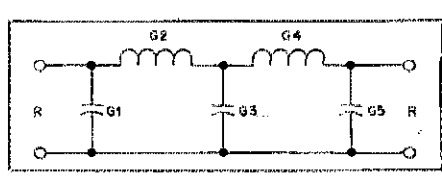


Fig. 5 — Low-pass prototype schematic diagram.

$F_{\lambda p}$ = 1 rad/sec, R = 1 ohm.

Normalized Values: G1, 5 = 0.8265 F, G2, 4 = 1.3375 H, G3 = 1.6531 F, ρ = 0.063, A_p = 0.0173 dB, F_3/F_{Ap} = 1.248, ε = 0.0631254.

Equations used in the calculation of the stopband attenuation (A_s) of a five-element low-pass filter with ρ 0.063.

(*1*) $A_s = 10 \cdot \log[1 + (\varepsilon \cdot T_\Omega)^2]$ dB

(*2*) $T_\Omega = 16\Omega^5 - 20\Omega^3 + 5\Omega$, $\Omega = F_{As}/F_{Ap}$

(*3*) $\varepsilon = \rho/(1 - \rho^2)^{0.5}$

For example, if F_{Ap} = 1 kHz, find A_s @ 2 kHz.

(*From Eq. 3*): ε = 0.0631254

(*From Eq. 2*): $T_\Omega = 16 \cdot 2^5 - 20 \cdot 2^3 + 5 \cdot 2$, Ω = 2.

(*From Eq. 1*): $A_{s2kHz} = 10 \cdot \log [1 + (\varepsilon \cdot T_\Omega)^2]$dB where T_Ω = 362.

$A_{s2kHz} = 10 \cdot \log[1 + 522.2]$ dB

$A_{s2kHz} = 10(2.719)$ dB = 27.2 dB.

In a similar manner the stopband attenuation can be found for any value of F_{As}. Table 2 lists the calculated values of $T_{(\Omega)}$ and A_s versus normalized frequency. Fig. 6 shows the attenuation response of a typical LP filter.

The LP-to-BP Transformation Procedure for Designing a Chebyshev Band-pass Filter

1) Select the desired filter F_m, the 3-dB BW and the R_t design values.

2) Select a specific reflection coefficient (ρ) and calculate the corresponding BW_{Ap} (see Appendix B). See Table 3 for normalized component values (G1-G5).

3) Use the following equations to calculate the component values of an LP filter having an A_p-cutoff frequency *equal to the BW_{Ap} of the BP filter*, and having the same R_t and ρ as the BP filter: $L' = L \cdot R_t/\omega$ and $C' = C/(R_t \cdot \omega)$, where L' and C' are the component values and L and C are the normalized values in henrys and farads, and $\omega = 2\pi \cdot F_{Ap}$.

4) Transform the LP filter into a BP filter by resonating all capacitors and inductors to F_m. For example, let F_m = 536.5, BW_3 = 176, R_t = 932.8 & ρ = 0.063. From Appendix B, F_3/F_{Ap} = 1.248, F_{Ap} = 176/1.248 = 141 Hz. Normalized values of G1, 5, G3 and G2, 4 = 0.8265, 1.653 and 1.3375. C1, 5 = $0.8265/(2\pi \cdot 141 \cdot 932.8)$ = 1.00 μF, L2, 4 = 1.3375 (932.8)/$(2\pi \cdot 141)$ = 1.408 H and C3 = 2.00 μF. Resonate all C's to F_m with shunt inductors and all L's with series capacitors using the following equations: $L_{sh} = 1/[2\pi \cdot F_m)^2 C]$ and $C_s = 1/[2\pi \cdot F_m)^2 L]$. L1, 5 = 88 mH, L3 = 44 mH and C2, 4 = 62.5 nF. The transformed BP filter schematic is shown in Fig. 4 and the filter attenuation values and other parameters are listed in Table 2.

Table 2

LP and BP Filter Parameters vs. Normalized Frequency for R.C. = 6.3%, F_m = 536.5 Hz & BW_{Ap} = 141 Hz

NORMALIZED FREQ. (Ω)	$T_{(\Omega)}$	ATTEN. RE (DB)	BW (HZ)	F-LO (HZ)	F-HI (HZ)
1.000	1.0	.0173	141.	471.	612.
1.200	11.3	1.7746	169.	459.	628.
1.248	15.8	3.0000	176.	456.	632.
1.300	22.0	4.6580	183.	453.	636.
1.338	27.4	6.0000	189.	450.	639.
1.40	38.2	8.5	197.	447.	644.
1.50	61.55	12.1	212.	441.	653.
1.60	93.92	15.6	226.	435.	661.
1.80	194.7	21.8	254.	424.	678.
2.00	362.0	27.2	282.	414.	696.
2.50	1262.5	38.0	353.	388.	741.
3.00	3363.0	46.5	423.	365.	788.
4.00	15124.0	59.6	564.	324.	888.
4.50	27724.5	64.9	635.	306.	941.

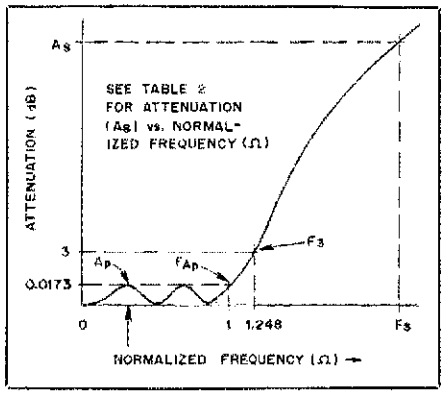


Fig. 6 — Attenuation vs. frequency for a 5-element Chebyshev low-pass filter (R.C. = 6.3%).

Table 3

Normalized Component Values (G1-G5) for 5-Element Chebyshev Low-pass Filters

R.C. (%)	F3/FAP RATIO	A-P (D B)	G1&G5 (F)	G3 (F)	G2&G4 (H)
.80	1.674	.00028	.4604	1.182	1.011
1.00	1.616	.00043	.4871	1.226	1.050
1.20	1.571	.00063	.5103	1.262	1.081
1.40	1.534	.00085	.5311	1.293	1.108
1.60	1.504	.00111	.5503	1.321	1.131
1.80	1.478	.00141	.5682	1.346	1.151
2.00	1.455	.00174	.5848	1.369	1.169
2.40	1.417	.00250	.6153	1.409	1.200
2.80	1.387	.00341	.6430	1.445	1.225
3.20	1.362	.00445	.6686	1.476	1.246
3.60	1.340	.00563	.6924	1.504	1.264
4.00	1.322	.00695	.7148	1.530	1.280
4.50	1.302	.00880	.7414	1.561	1.296
5.00	1.284	.01087	.7664	1.588	1.310
5.50	1.269	.01316	.7903	1.614	1.322
6.00	1.256	.01566	.8132	1.639	1.332
6.50	1.244	.01839	.8353	1.662	1.341
7.00	1.233	.02133	.8565	1.685	1.348
8.00	1.214	.02788	.8973	1.727	1.359
10.00	1.184	.04365	.9736	1.803	1.372

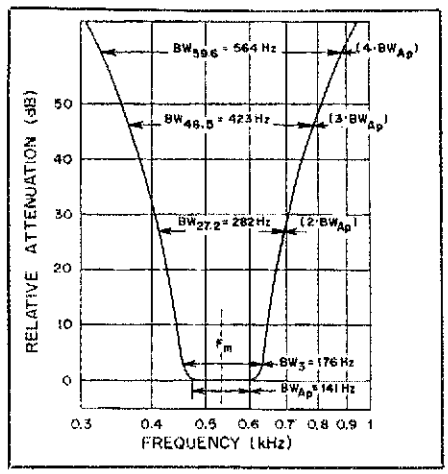


Fig. 7 — Calculated attenuation of a 5-resonator band-pass filter with R.C. = 6.3%, F_m = 536.5 Hz, and BW_{Ap} = 141 Hz.

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[6]Wetherhold, "Inductance and Q of Modified Surplus Toroidal Inductors," *QST*, September 1968.

[7]DeMaw, "The Practical Side of Toroids," *QST*, June 1979.

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[9]Wetherhold, "7-Element 50-ohm Chebyshev Filters Using Standard-Value Capacitors," *RF Design*, Vol. 3, No. 2, February 1980.

[10]Wetherhold, "Lowpass Chebyshev filters use standard-value capacitors," *Electronics*, June 19, 1980, Engineer's Notebook, pp. 160-161.

Notes

[1]Su, "Active Filters," *IEEE Circuits and Systems*, October 1976.

[2]Rife, "Low-loss Passive Bandpass CW Filters," *QST*, September 1971.

[3]Noble, "A Passive CW Filter to Improve Selectivity," *QST*, November 1977.

[4]Bartlett, "A Simple CW Audio Filter," *QST*, April 1979.

[5]Wetherhold, "Low-loss Passive Bandpass CW Filters," Technical Correspondence, *QST*, January 1972.

[6]Box 8873, Fort Lauderdale, FL 33310.

[7]Box 74, Soquel, CA 96073.

[8]Electronic Distributors, Inc., 4900 N. Elston Ave., Chicago, IL 60630.

[9]Edlie Electronics, Inc. 2700 Hempstead Tpke., Levittown, NY 11756.

[10]Allied Electronics, 401 East 8th St., Fort Worth, TX 76102.

[11]"Comparing Hand-held Capacitance Meters," *Electronic Design*, April 12, 1979, p. 161.

[12]"Product Review," *QST*, November 1979, p. 51.

[13] See note 2.

Strays

SIXTEENTH ANNUAL TELEPHONE PIONEERS QSO PARTY

☐ The Telephone Pioneers QSO Party will be held from 1900 UTC, Saturday, December 6 until 0500 UTC, Monday, December 8. Phone users call "CQ Telephone Pioneers." Cw users call CQTP. Suggested phone frequencies (plus or minus 10 kHz) 3.965, 7.275, 14.295, 21.365, 28.675, 50.1 to 50.25, 144.275 to 145.5 and 146.52 MHz; cw — 3.565, 7.065, 14.065, 21.065, 28.065; Novice and Technician — 3.725, 7.125, 21.125 and 28.125 MHz. Complete rules, scoring, exchange and reporting information available from Ted Phelps, W8TP, John D. Burlie Chapter no. 89, Telephone Pioneers of America, c/o Western Electric, Dept. 45160, 6200 East Broad St., Columbus, OH 43213.

I would like to get in touch with . . .

☐ North American amateurs, to set up skeds in French, English or Russian. Ilieff Svetozar, LZ1A-1021, 1126 Sofia, P. O. Box 33, Bulgaria.

☐ people who are interested in, or have working model of, radio-controlled or microprocessor-controlled humanoid robots. Natt Beha, N8BPI, 3752 Lane Court, St. Joseph, MI 49085.

A State-of-the-Art Terminal Unit for RTTY

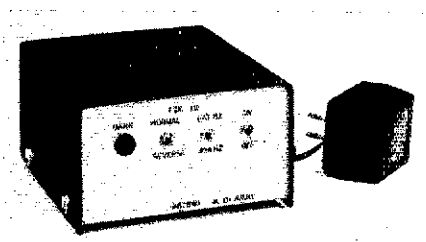
Update your RTTY installation with this two-chip terminal unit. It accommodates both your new video unit and that model 15, interfaces with a simplex loop and handles both narrow and wide shift. Try it!

By Michael J. Di Julio,* WB2BWJ

A modern reliable fsk terminal unit can be built with just two chips and a handful of parts. It will work equally well on the low bands with narrow-shift fsk or on vhf with wide shift. The device interfaces with the standard 60-mA simplex loop.

The circuit is designed around two chips manufactured by Exar Integrated Systems. These chips are the XR-2206 function generator and the XR-2211 fsk demodulator. The XR-2206 is capable of generating stable, low-distortion sine waves, the frequency of which are determined by simply varying the resistance of the circuit. Switching in different values determines the mark and space frequencies.

When pin 9 of the XR-2206 is grounded, the resistance at pin 8 determines the output frequency. With pin 9 open, the resistance at pin 7 determines the frequency. Since a low at pin 9 corresponds to a mark, R1 is set to the mark frequency of 2125 Hz and R2 and R3 are set to produce tones of 2975 Hz and 2295 Hz, respectively. These frequencies correspond to the space tones for the wide-shift standard of 850 Hz and the narrow-shift standard of 170 Hz. S1 selects the shift. R4 controls the peak-to-peak output of the sine wave available at pin 2. The output of pin 2 is fed to the microphone input of your ssb or fm radio or to a tape recorder for storage of afsk data. Keying of the chip is accomplished by the presence or absence of current in the loop via the optoisolator, U1. When current is flowing, the LED in the isolator lights, turning on the phototransistor and grounding pin 9 initiating a mark tone. When current is not flowing, the phototransistor is off and pin 9 goes high via an internal pull-up resistor and a space tone is generated. D1, R11 and C3 protect the isolator from spikes produced from the teleprinter magnets. D3 through D6 form a bridge that permits the loop supply to be connected to J1 with either polarity.



The fsk RTTY terminal unit designed and built by Michael Di Julio, WB2BWJ. At the right of this professional-appearing device is the 9-V battery eliminator that powers the unit.

PLL Determines Mark or Space

The fsk demodulation is performed by the XR-2211, a phase-locked loop (PLL) decoder similar to the popular LM565 demodulator. The VCO in the chip is tuned via R21 to $F_O = (f_1 + f_2)/2$ where f_1 is the mark frequency of 2125 Hz and f_2 is the narrow-shift space frequency of 2295 Hz. Therefore, F_O = 2210 Hz. C7, R20 and R21 determine this frequency and the values listed were chosen appropriately. R12, R17, R18, R19, C5, C8 and C9 are all elements associated with the filtering of the PLL and were selected by means of the formulas in Ref. 1 to allow optimum operation with amateur standard 60- or 100-wpm signals, both wide and narrow shift.

When a mark is detected, the PLL locks and pins 6 and 7 go high, turning on Q1, and permitting current to flow in the loop. In the absence of a mark tone, the PLL error voltage changes. Under this condition, a space is assumed by the internal voltage comparator and pins 6 and 7 go low, turning off Q1 which then stops the flow of current in the loop. Q2 and associated components form an inverter to reverse the polarity of the mark to accommodate stations transmitting contrary to the conventional mark/hold technique. Pin 5 of the chip goes low when a mark tone is detected and the LED, D2, is illuminated by means of Q3, Q4 and associated components. Audio from a receiver or tape recorder is fed to pin 2 via C4.

Pc Board, a Builder's Choice

Pc board construction is optional. The layout is not critical. S1, S2, S3 and D2 should be front-panel mounted, while J1, J2 and J3 should be mounted in the rear. J1 must be insulated from the chassis as a loop supply approaching 120 volts may be present in mechanical teleprinter equipment. For a power supply, I recommend a battery eliminator, of the type sold for tape recorders and radios, capable of supplying 9 volts at 300 mA.

Tuning Adjustment is Easy

Tuning the unit is extremely simple. Apply 9 volts to the device and ground pin 9 of U2 simulating a mark. With a frequency counter connected to the afsk

[Editor's Note: As a convenience to those wishing to avail themselves, the author offers ready-made circuit boards for this TU for $10. The ARRL and *QST* in no way warrant this offer.]

*97 Woodside Rd., Maplewood, NJ 07040

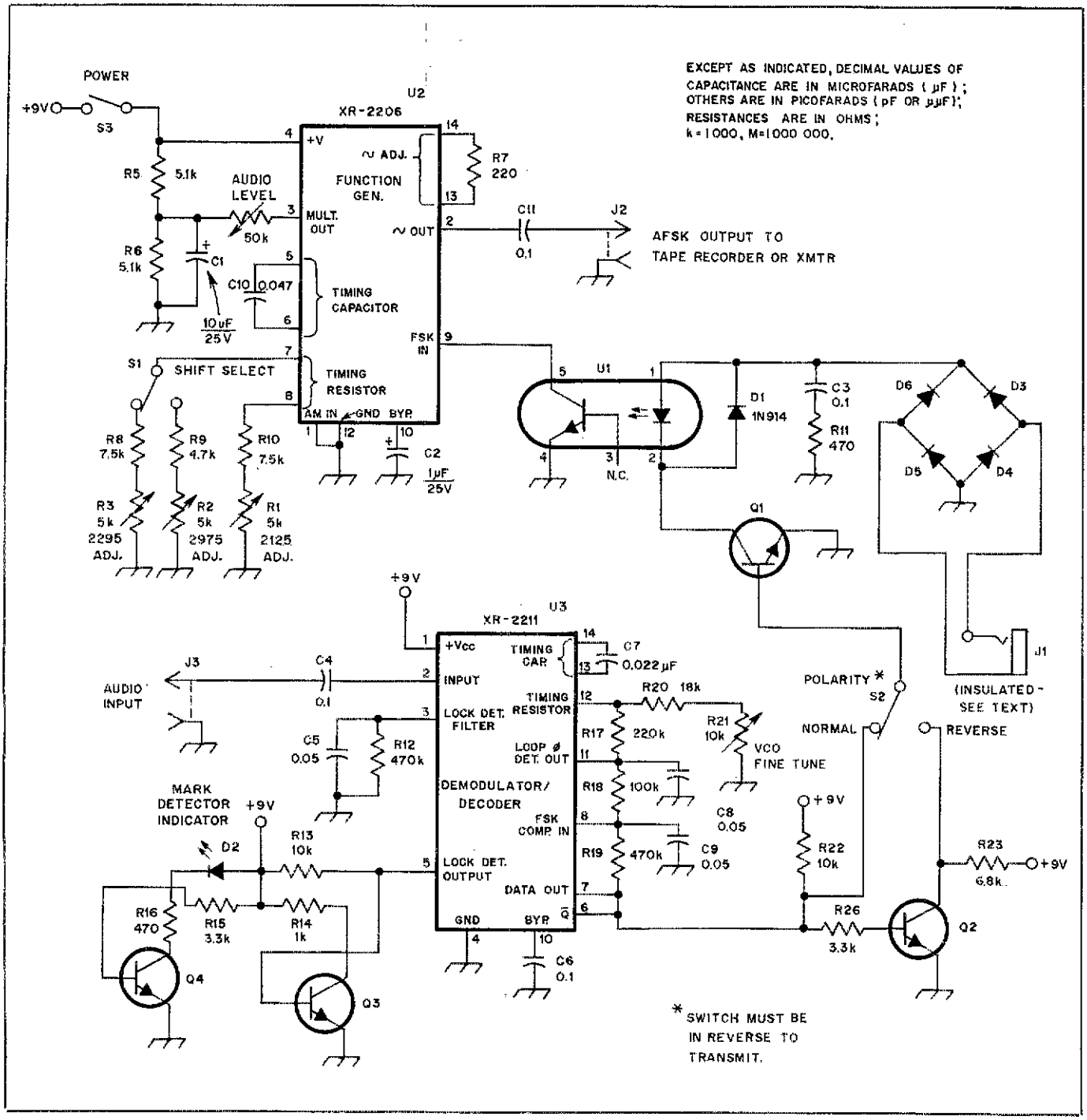


Fig. 1 — Circuit diagram for the State-of-the-Art Terminal Unit. This arrangement is compatible with both wide and narrow fsk. U2 is the function generator. U3, a PLL decoder, serves as the fsk demodulator. When current flows through the optoisolator, U1, it initiates a mark tone through U2. Because 120 V from the loop supply may be present in mechanical teleprinter equipment, J1 must be insulated from the chassis. S1 is shown in the 170-Hz position. All resistors are 5%, 1/4 watt. Pc boards are available from the author for $10 postpaid. Most other parts are available from Jameco Electronics, 1021 Howard Ave., San Carlos, CA 94070.

C1 — 10 μF, 25-V tantalum.
C2 — 1 μF, 25-V tantalum.
C3, C4, C6, C11 — 0.1 μF, 50-V ceramic disc.
C5, C9 — 0.05 μF, 50-V ceramic.
C7 — 0.022 μF, Mylar.
C8 — 0.005 μF, 50 V, ceramic disc.
C10 — 0.047 μF Mylar.
D1 — 1N914.
D2 — LED.
D3-D6, incl. — 1N4003.
J1 — 1/4-inch phone jack.
J2, J3 — Miniature phone jacks or the type of jack that interfaces with your equipment.
Q1 — 2N5655, MJE340 or TIP-48.
Q2, Q3, Q4 — 2N2222.
R1, 2, 3 — 5-kΩ 10-turn Trimpot.
R4 — 50-kΩ, single-turn Trimpot.
R5, 6 — 5.1 kΩ.
R7 — 220 Ω.
R8, 10 — 7.5 kΩ.
R9 — 4.7 kΩ.
R11, 16 — 470 Ω.
R12, 19 — 470 kΩ.
R13, 22 — 10 kΩ.
R14 — 1 kΩ.
R15, R26 — 3.3 kΩ.
R17 — 220 kΩ.
R18 — 100 kΩ.
R20 — 18 kΩ.
R21 — 10-kΩ 10-turn Trimpot.
R23 — 6.8 kΩ.
S1, S2 — Spdt switch.
S3 — Spst switch.
S4 — Dpdt switch.
U1 — OPI-2150, HEP-P5000, Motorola 4N28 or equivalent.
U2 — XR-2206 (Exar Integrated Systems, Sunnyvale, CA).
U3 — XR-2211 (Exar Integrated Systems, Sunnyvale, CA).
Misc.: One 14-pin IC socket; 9-V, 300-mA battery eliminator; one 16-pin IC socket; cabinet and pc board.

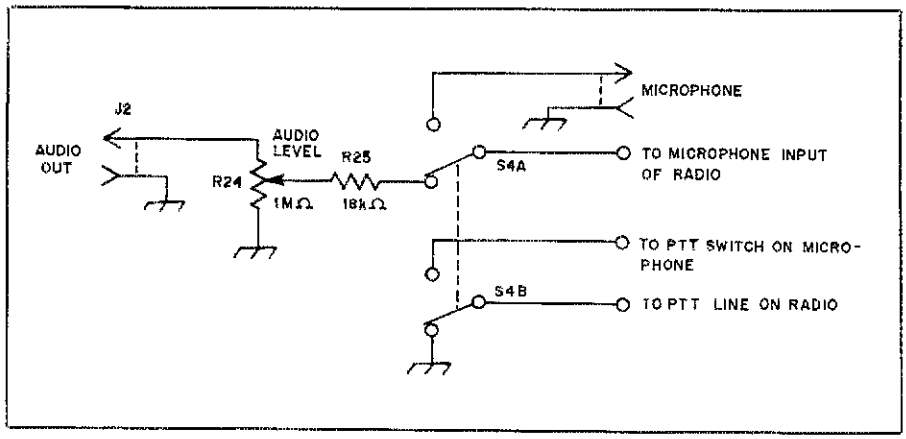


Fig. 2 — Use of the above circuit is recommended by the author as a means of connecting the microphone to the transmitter when the TU output is fed directly to the microphone input of the transmitter.

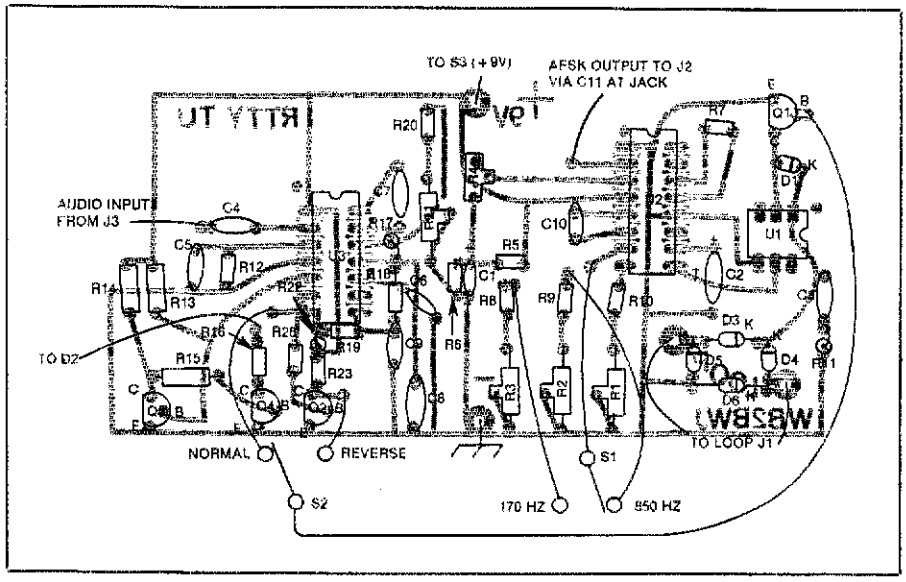


Fig. 3 — Parts-placement guide for the State-of-the-Art Terminal Unit. Parts are placed on the non-foil side of the board; the shaded area represents an X-ray view of the copper pattern. (The etching pattern appears in the "Hints and Kinks" section of this issue.)

output jack, J2, adjust R1 to read 2125 Hz on the display. Lift the ground from pin 9 and with S1 in the 170 Hz position, adjust R3 for a reading of 2295 Hz. Finally, switch S1 to the 850-Hz position and adjust R2 for a reading of 2975 Hz. To adjust the demodulator, ground pin 9 of U2 to simulate a mark and connect J2 to J3. Slowly adjust R21 until D2 lights and continue turning the potentiometer counting the number of turns until the LED extinguishes. Back the potentiometer off one half the number of turns counted so that the VCO is set to the center of the lock range. This will sufficiently approximate the optimum setting of the VCO to 2210 Hz as previously mentioned.

Operating the Terminal Unit

To use the terminal unit, connect your TTY gear through J1, J2 to the microphone circuit of your transmitter and J3 to the receiver loudspeaker. I recommend adding a switch and a potentiometer as indicated in Fig. 2 so that your microphone can also be connected to the transmitter. Adjust R4 and R24 (if used) for a clean signal from your transmitter.

If you have an ssb transmitter, you want a distortion-free signal. If it is an fm transmitter, neither distortion nor over deviation is desirable. Adjust the volume control on the receiver so that the LED, D2, starts to flicker as you tune across the band. To tune in an RTTY signal, slowly tune through the signal until the LED lights brilliantly, indicating that the PLL is locked onto the mark tone. On ssb, the tuning will be narrow; very often the TU will lock onto a signal that is so weak and plagued with interference that your ear will not be able to distinguish it from the noise. Adjust the volume to a level just above that which allows the LED to light. If fading is present, turn the volume up to a point where the LED still lights during a fade. When using the unit on vhf fm, no tuning of the receiver is required but be sure to place S1 in the 850-Hz position so that your transmitted tones will be standardized with other amateur stations. If you find "garbage" being printed, try switching S2 to reverse as the other station may be sending inverted data. On the other hand, you may have inadvertently locked the TU on the space tone instead of the mark. To ensure that you are tuning to the mark tone and not the space tone, wait for the station to be idle, at which time only the mark tone is present. Then tune in the signal properly.

Transmit With S2 in Reverse Position

When you wish to transmit or just type on a local loop, S2 must be in a reverse position. The reason is that with no audio coming into J3, Q1 would normally be turned off, thus breaking the loop. Inverting the signal to Q1 turns it on, thus connecting the loop.

If a cassette tape recorder is connected to J2 and J3 via the microphone and headphone or monitor jacks, a conversation or self-generated message can be recorded for later playback. As a station is being received and the loop is being keyed by Q1, the optoisolator, U1, is also keying U2, thus generating a clean version of the station signal which is available at J2. Cassette tape is a nice alternative to paper tape. It will allow you to discard your old model 14 typing reperferator and transmitting distributor.

The Chips as Black Boxes

My approach to writing this article is to treat the IC chips as "black boxes" and provide a minimal discussion of their inner workings. By doing so, the average person could understand the article without being burdened with a lot of technical theory. Refs. 1 and 2 provide additional technical discussion for those desiring it.

Through many months, my unit has permitted me to enjoy operation on ssb and fm with the same terminal unit. The device works equally well with my model 15 TU and my video TTY. I have presented this article on a high-performance state-of-the-art project as a means of helping you to upgrade your RTTY station.

References

"Tri-State FSK Modem Design Using XR-2206 and XR-2211," Exar Applications Note AN-05, January 1979, Exar Integrated Systems, Inc., 750 Palomar Ave., Sunnyvale, CA 94088.

Refioglu, Ilhan et al., "A Frequency-Shift Keyed Modem in LSI," *Electronic Design* no. 8, April 12, 1979.

[Editor's Note: An article entitled "Integrated Circuit Function Generator," by Frank Getz, N3FG, which appeared in August 1980 *Ham Radio*, is suggested as additional reference material.]

Capacitance Measurement with a Dip-Meter

This simple gadget is characterized by moderate accuracy and very low fiddle-factor!

By Frank Noble,* W3MT

Surplus and old capacitors have one common feature — no clue as to capacitance value, either because the label fell off or faded out, or because the color code is no longer readable. Also, even though the labeling is legible, the capacitance value may be far removed, for one reason or another. A measurement sufficiently accurate for most purposes can be obtained in a simple manner.

In the interest of providing a wide range of measurement, we chose the largest semi-circular plate variable capacitor[1] that is commonly available, 400 pF, and resonated it with a coil at about 2 MHz, the lowest usable frequency on most dip meters. The desirability of a low frequency is twofold: First, the L/C ratio is reasonable for the large capacitance desired and, second, hand capacitance effects are minimized.

Low Capacitance Measurement

To measure capacitance from zero to 400 pF, the circuit is dipped with the variable, C_R, at maximum capacitance and with the unknown capacitor out of the circuit. Then the unknown capacitor, C_X, is directly shunted across the coil (D to G in Fig. 2) and the circuit is reresonated with C_R. The capacitance removed by rotating the variable unit is equal to the unknown capacitance; accordingly, C_R is calibrated in capacitance removed so that the device will be direct reading over this range.

High Capacitance Measurement

Where the unknown capacitance is larger than 400 pF, a fixed, 400-pF capacitor is connected in series with the unknown (S to G in Fig. 2). The range is thus extended to infinity, in theory, although accuracy will suffer severely for values greater than about 3000 pF. We are fortunate here in that the required accuracy in measurement of large capacitors is usually low, since these values are generally used for bypass and coupling purposes. The external capacitance the tuned circuit "sees" in this situation is

$$C_S = C_R = \frac{400\ C_X}{400 + C_X} \qquad \text{(Eq. 1)}$$

where C_S is the capacitance of the series combination, and C_R is the capacitance removed by rotating the variable, as before. Rearranging Eq. 1

$$C_R = \frac{1}{\frac{1}{C_X} + 0.0025} \qquad \text{(Eq. 2)}$$

$$C_X = \frac{1}{\frac{1}{C_R} - 0.0025} \qquad \text{(Eq. 3)}$$

All capacitances are in picofarads. The relationship between C_R and C_X is plotted in Fig. 1.

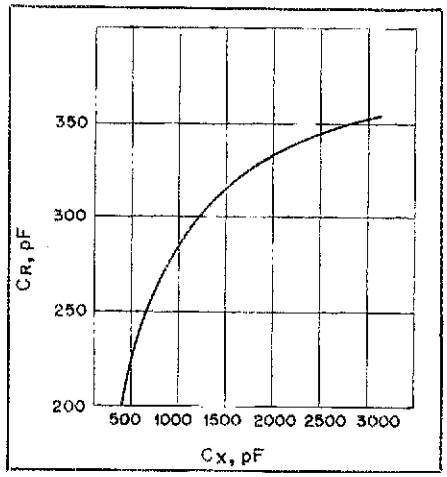


Fig. 1 — This curve shows the values for unknown capacitors in relation to various settings of the main tuning capacitor, C_R, where C_R has a range between 200 and 350 pF. See text concerning capacitance values larger than 3000 pF.

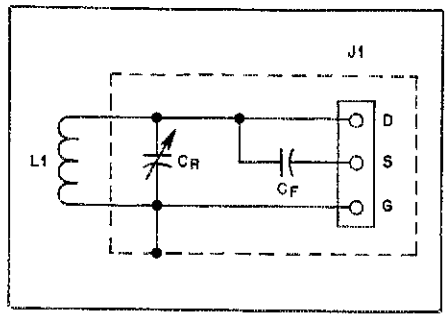


Fig. 2 — This simple resonant circuit permits the measurement, in connection with a GDO, of capacitors of unknown value. Small-value capacitors (400 pF and under) are connected between the direct (D) terminal and ground, while larger-value capacitors are connected between the series (S) terminal and ground.
C_F — 400-pF silver mica.
C_R — 400-pF air variable.
J1 — Three-terminal barrier strip.
L1 — 45 turns of no. 28 enamel wire wound on a National XR-50 form (or equivalent), slug removed. Dia 1/2 inch (13 mm), winding length 11/16 inch (17.5 mm). Outer (hot) end returned via interior through empty threaded hole.

Circuit

The schematic diagram is given in Fig. 2. Coil geometry and the operating frequency are not critical; the values used here are roughly 14 μH and 2 MHz. A good choice for the chassis is a Radio Shack 270-239 measuring 2-1/8 × 1-5/8 × 4 inches (54 × 29 × 102 mm). It is this large to prevent it from walking around.

Entirely adequate calibration can be done with four 100-pF, 5% mica capacitors. In this model, the dial skirt is labeled with the digits 0 through 4, corresponding to hundreds of pF of capacitance removed. A more-careful calibration is probably not justified because the ambiguity of the dip is considerable, even with light coupling.

Since this is a substitution method, inaccurate dip-meter calibration does not affect the measurement. The only requirement is frequency stability. This approach does not require the use of an inductor of known value, as would be the case where the "standard" technique is used. QST

[1]Although not strictly necessary, a semi-circular plate capacitor will yield a nearly linear calibration, which is much easier to interpolate.

*10004 Bellhaven Rd., Bethesda, MD 20034

The Coaxi-Match

Aren't you just itching to build something? This SWR meter is designed for utmost simplicity, low cost and convenience.

By C. Phil Guild,* KAØBEO

The Coaxi-Match is an SWR metering method that is designed to place the meter assembly at any convenient location in the hamshack. It is a useful tool for both the home antenna experimenter and mobile operator. Fig. 1 is a diagram of the system, which is composed of two separate units: the Coaxi-Match pickup unit and the meter assembly. What makes this unit so attractive is its simplicity and low cost. The majority of the parts required for construction can probably be found in your junk box or can be purchased at minimal cost. For example, a surplus 0- to 100-μA meter can be obtained for prices ranging from $2 to $5; the 3/4-inch' hard-drawn copper pipe and wire cost approximately 80 cents!

Getting Started

Fig. 2A shows a cutaway view of the Coaxi-Match. The detailed drawing of the three-hole wafers which position L1 and L2 is shown in Fig. 2B. Begin assembly by using a *hacksaw* to cut a 1/2-inch piece from one end of an 8-inch length of 3/4-inch-diameter hard-drawn copper pipe. Discard this short piece. This is done to eliminate any pipe-section indentations that might have been made by the pipe cutter used at the source of purchase. Cut a 4-3/4-inch length of pipe for use as the main section of the pickup unit; save the remaining shorter piece for later use.

Place a sheet of emery cloth or sandpaper on a flat surface and, holding the pipe in a vertical position, sand both ends of the pipe until it will stand perpendicular to a flat

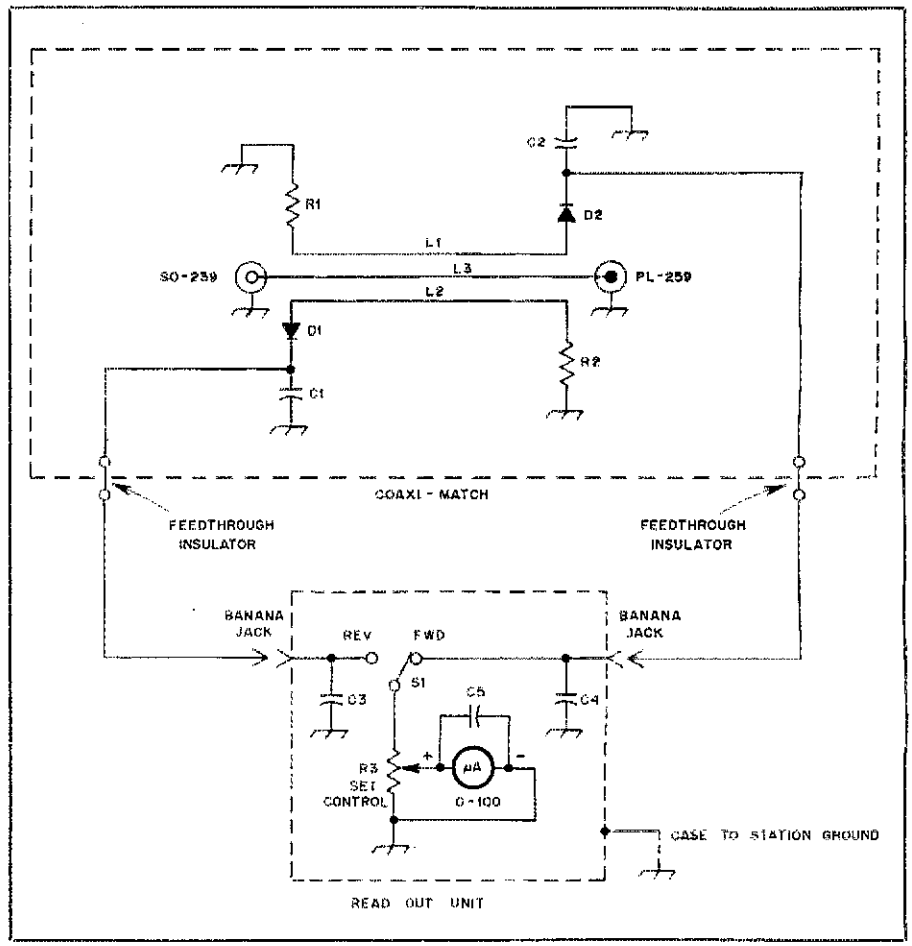
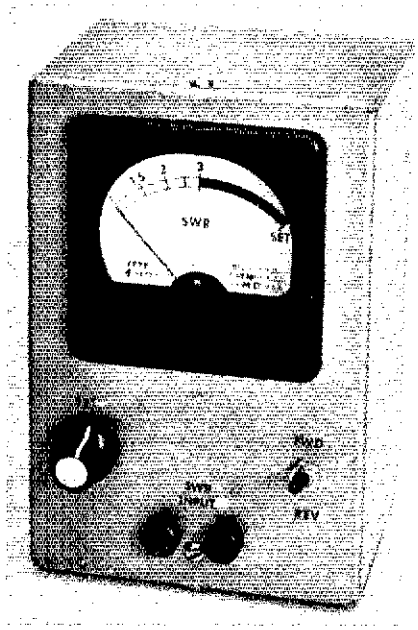


Fig. 1 — Schematic diagram of the Coaxi-Match. Many readers will recognize the circuit as that of the familiar Monimatch.
C1-C4, incl. — 0.005 μF, 1-kV disc ceramic.
C5 — 0.01 μF, 1-kV disc ceramic.
D1, D2 — 1N34A germanium diode.
L1, L2 — 3-3/4 in. no. 14 solid copper wire.
L3 — 6-1/2 in. no. 12 solid copper wire.
M1 — 0 to 100 μA.
PL1 — PL-259 coaxial connector.
R1, R2 — 150 Ω, 1/2-watt carbon resistor.
R3 — 10 kΩ, linear taper potentiometer.
S1 — Spdt toggle switch.
SO1 — SO-239 coaxial connector.
Misc. — Copper pipe, scraps of Plexiglas, Lucite or plastic (see text).

*14470 E. 13th Ave., G14, Aurora, CO 80011
'Notes appear on page 26



The Coaxi-Match metering unit. This is all you need at the operating position; the pickup unit can be located remotely.

surface on both ends. Remove the burr from inside the ends — a pocketknife will do the job well. Now sand the inside and outside walls at the ends until they are shiny.

Cut the no. 12 and 14 gauge wire to the lengths shown in Fig. 2. File or sand flat L1 and L2 at both ends and round off the ends of the no. 12 wire used for L3.

The material for the spacing wafers shown in Fig. 2 can be made from Plexiglas, Lucite or even scrap plastic; the thickness should be 1/8 inch or less. Using the same center, scribe two circles — one being the ID of the pipe and the other 5/16 inch in diameter — on 1-inch squares of the material. Scribe a line through the center of the circles; the intersection of this line with the smaller circle will locate the holes for L1 and L2. The center hole of the circles positions the main conductor of the pickup unit, L3.

Use a small drill bit to make a set of guide holes and then enlarge the holes to pass the wires with a snug fit. Shape the plastic squares into roughly defined circles using diagonal cutters. Then, holding the wafers between your thumb and forefinger, move them across a flat file or emery cloth, rotating them until they are rounded out at the outermost scribed circle. Check the wafer for fit in the end of the copper pipe; if necessary, continue the grinding process until the wafer fits snugly into the pipe.

Insert L1 and L2 into the two end wafers as shown in Fig. 2. Mix a small amount of epoxy and, using a toothpick, place a small drop on both sides of each wafer at the wire passage points. Ensure that both wires are parallel and perpendicular to the wafers, and set the subassembly aside to let the epoxy cure.

Take the short section of copper pipe and, with your sheet-metal shears, cut it along a line parallel to the axis. Straighten out the two halves as much as possible with your fingers. Then place the piece on a heavy piece of flat metal (or the flat end of your vise) and tap it gently with a small hammer until it is flattened. This piece will be used to support the coaxial connectors at each end of the pickup unit.

Scribe two 3/4-inch circles on the flattened piece so that you have equal distances between the circles and the ends of the piece. Drill the holes for the PL-259 and SO-239 fittings. The PL-259 shank hole should be made slightly smaller and then enlarged with a rat-tail file until the shank will press fit into the piece. A 5/8-inch hole is made for the SO-239 connector, the connector should fit flush with the plate. Tin both sides of the plate, remove any excess solder from the insides of the holes and cut the plate in two between the holes.

Tin the back of the SO-239 mounting flange. Also tin the shank of the PL-259 about 1/4 inch from the bottom. Now solder the back of the SO-239 to the copper plate so it is flush with the plate. Push the shank of the PL-259 connector through the hole in the other plate, letting it protrude about 1/16 inch; solder it to the plate. The coupling sleeve of the PL-259 may be kept out of the way by screwing it into a mating connector.

Coaxi-Match Assembly

Insert the L1-L2 assembly into the pipe. Mix up another small amount of epoxy. Center the assembly in the pipe and place two small drops of epoxy opposite each other on each wafer, then check to ensure the assembly is properly centered. Let the epoxy cure.

After the epoxy has cured, drill two holes in the copper pipe for the feedthrough insulators (see Fig. 2). The hole size required will depend upon the diameter of the particular feedthroughs used. Remove the burr from the inside of the pipe. Epoxy the feedthroughs in place and allow the epoxy to cure.

While you're waiting, pre-tin the pigtails of the diodes, resistors and capacitors.[1] If the capacitors have insulating material on their leads, scrape it off. Place a diode at the center of a disc capacitor, make two wraps of the diode negative lead around one of the capacitor leads (close to the body) and cut off the excess lead length. Crimp the end of the diode lead close to the capacitor lead and solder the connection. Make two of these assemblies. Bend the remaining capacitor lead back so it is parallel with the diode. Make a small hook shape in the lead to which the diode is soldered — close to the solder junction — and cut off the excess lead length. Insert the combination into the pipe so that the hook will encircle the inside terminal of the feedthrough insulator. Use needle-nosed pliers to crimp the hook around the terminal and solder the connection. Repeat this procedure at the other end of the pipe.

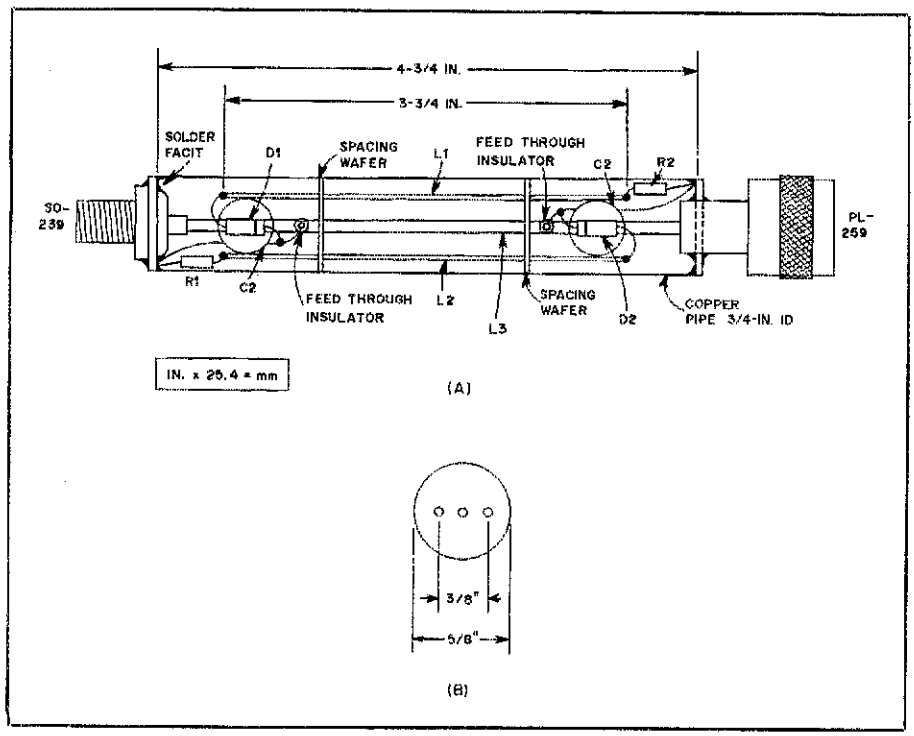


Fig. 2 — At A, a cutaway view of the pickup unit constructed from a piece of copper pipe. The insulating wafers used to support the conductors are cut to the dimensions shown at B.

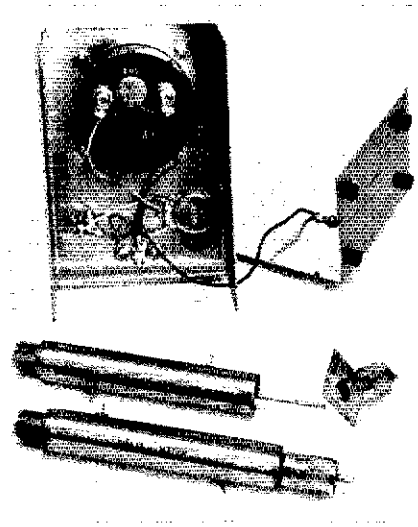
Solder the diodes and resistors R1 and R2 to the ends of L1 and L2; be sure to heat sink the diodes during soldering. File small V-shaped notches at the ends of the pipe to accept the remaining resistor and capacitor leads. Crimp the leads so that they lie against the inner and outer surfaces of the pipe.

The center conductor wire (L3) is now soldered to the SO-239 connector. Form a small bead of solder around the inside edges of the pipe and insert L3 through the center holes of the insulating wafers. Clamp the SO-239 mounting plate in a vise with the plate flush against the edge of the pipe; use wood blocks to insulate the assembly from the vise and prevent heat loss through conduction during soldering. Flow solder around the plate and end of the pipe; a 100-watt soldering iron should be sufficient to melt the bead of solder within the pipe assembly. Mount the PL-259 plate at the opposite end of the pipe in the same manner. Trim the excess lead lengths of the resistors and capacitors from both ends of the assembly.

Using sheet-metal shears, trim the connector mounting plates as close to the pipe as you can, then file the excess material until a flush finish is obtained. Finally, solder the center conductor to the PL-259 connector.

The Metering Unit

The cabinet chosen for the metering unit will depend upon personal preferences and the size of the meter. Insulated banana jacks must be used and C3 and C4 should be mounted as close to the jacks as possible. A ground lug should be provided at the rear of the cabinet to permit connection to station ground.



An inside view of the metering unit with two pickup assemblies in the foreground. The rear pickup assembly is in the final stage of construction.

To add a professional touch, the meter may be disassembled and the meter face relettered. Unwanted lettering may be removed with a sharp knife and the areas touched up with flat-white acrylic paint; small bottles of paint may be obtained at your local hobby shop.

Interconnection between the Coaxi-Match pickup assembly and the metering unit may be made with no. 20 stranded wire. The two wires may be made into a neat twisted pair by securing one end of the wires in a vise and the opposite ends in an electric drill. Run the drill at low speed, twisting the wires until three or four turns per inch is obtained.

Calibration and Operation

I calibrated the Coaxi-Match by placing it in series with a meter of known accuracy, a Transmatch and an antenna. The Transmatch was adjusted to provide deliberate mismatches, the meter readings noted and marked on the Coaxi-Match meter face.[3]

In operation, the FWD/REV switch is placed in the FWD position and the SET control adjusted to produce a full-scale meter indication. Then, switch to REV to read the indicated SWR.

The Coaxi-Match can be used outside and placed at the feed point of the station antenna, where the SWR measurement is most meaningful. Even though the unit is waterproof, the feedthrough connectors should be covered with silicone rubber after the wires to the metering unit have been attached. The end connectors may be protected from the weather by wrapping them with plastic electrical tape and covering that with a couple of coats of marine spar varnish.

I'm sure you'll find many ways to enjoy the convenience and versatility of your Coaxi-Match. And you'll also have the pride of knowing you made it yourself! QST

Notes

[1]Inches × 25.4 = mm; feet = m × 0.3048.

[2][Editor's Note: The diodes should be checked with an ohmmeter and matched as closely as possible in forward and reverse resistance; this will ensure better bridge balance.]

[3][Editor's Note: Ideally, the pickup unit should be checked for symmetry by reversing its position in the line and ensuring equal (or nearly equal) readings for a given set of conditions. Unbalance might require a repositioning of the diode lead on the pickup wire (L1 or L2).]

Strays

CHRISTMAS, FLORIDA EXPEDITIONS

☐ The Indian River ARC, of Cocoa, Florida, will operate from Christmas, Florida from December 20 to December 27, from 1400 to 2000 UTC daily. A certificate will be available to all stations worked. Please include a large s.a.s.e. with your request. Operating frequencies for W4NLX/4 will be 7.280, 14.280, 21.380 and 28.680 MHz on ssb, and 60 kHz from the bottom of the 40-, 20-, 15- and 10-meter bands on cw. The 34/94 repeater will be used for local contacts. QSL to Indian River ARC, W4NLX, P. O. Box 105, Christmas, FL 32709. — *Carl S. Zelich, AA4MI, Merritt Island, Florida*

☐ The Southeast Volusia ARC, of New Smyrna Beach, Florida, will be operating from Christmas, Florida, from 0200 to 2000 UTC on December 20 and 1400 to 2000 UTC on December 21. Frequencies will be 7.125, 21.130 (Novice), 7.250, 14.300 and 21.400 MHz (plus or minus 5 kHz). All contacts will be sent a 4- by 8-1/2-inch QSL — requests should be accompanied by an s.a.s.e. and a size 10 envelope. — *William C. Kennedy, KA4BIW, Edgewater, Florida*

BETHLEHEM, INDIANA DXPEDITIONS

☐ The Clark County ARC, of Jeffersonville, Indiana will go on a DXpedition to Bethlehem, Indiana from 1700 UTC, December 13, until 1700 UTC, December 14, 1980. They will use the call sign W9WWI/9 and operate on 3.900, 7.235, 14.285, 21.360, 28.510 and 147.300 MHz. Special Christmas season cards will be sent to all contacts. QSL with s.a.s.e. to Clark County ARC, P. O. Box 352, Jeffersonville, IN 47130. — *John W. Shean, N9TV, Jeffersonville, Indiana*

☐ The Delaware-Lehigh ARC, W3OK, will operate as part of Bethlehem's Christmas City celebration from 2300 to 0300 UTC daily from December 15 until January 1, 1981. Operation will be 15 kHz from the top of Novice bands and 15 kHz from the bottom of the General phone bands. Special QSL certificates will be sent from the Christmas City Station. QSLs or requests should contain a business-size (4-1/8- by 9-1/2-inch) s.a.s.e. and be sent to W3OK, DLARC, 1719 Callone Ave., Bethlehem, PA 18017. SWL requests welcome. — *William R. Ranzola, N3BIB, Walnutport, Pennsylvania*

A Crystal-Controlled AFSK Generator

RTTY operators — how often do you have to tweak your afsk generator tones? Build this simple digital unit and make tone tweaking a thing of the past!

By Greg McIntire,* AA5C

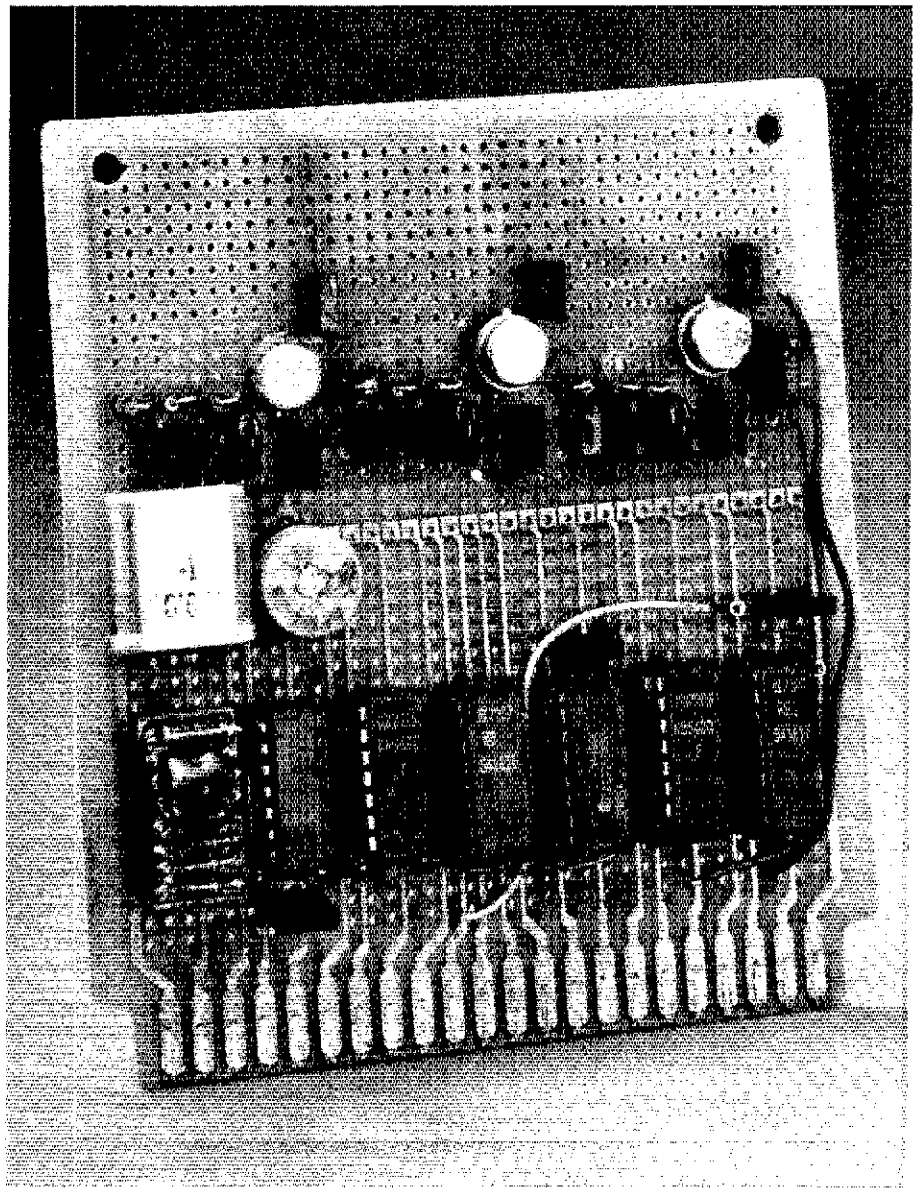
This compact afsk generator can probably be assembled over the course of a weekend. The parts are few in number and easy to find. An inexpensive TV color-burst crystal is used in the reference oscillator. All digital ICs are commonly available TTL devices, and the low-pass filter uses 741 op amps, a few capacitors and some one-percent tolerance resistors.

Circuit Description

There are two basic parts to the circuit: the frequency generator (Fig. 1) and a low-pass filter (Fig. 2). The generator is a programmable frequency divider. Y1, U1 and their associated components form the master oscillator, which operates at a frequency of 3.579545 MHz. U1C buffers the oscillator and provides a TTL level output for U5A. In turn, U5A divides the 3.579545 MHz signal by two and drives the three counters (U2, U3 and U4) with a 1.7897725 MHz clock pulse. The load inputs into the counters are gated by U6A, B, D and U1D to force the counters to divide by 421 for mark, 390 for space and 444 for a cw i-d. U5B takes the output of the counter chain and performs an additional divide-by-two and squares up the output waveform.

The equations in Table 1 show how the divide counts were derived; output frequencies are within 1 Hz of that desired, with the cw i-d tone being 100 Hz below the mark frequency. This is within FCC guidelines and as such it should not glitch the machine at the receiving end. An earlier version of this circuit used a custom-made crystal to come up with the exact RTTY tone frequencies, but what discriminator is going to "know" the difference between 2125.0 Hz and 2125.6 Hz? Table 2 details the gating of the loads

*5232 Aztec Dr., Box 77512, Lewisville, TX 75056



A readily available, multipurpose, edge-card board was used in this version of the afsk generator.

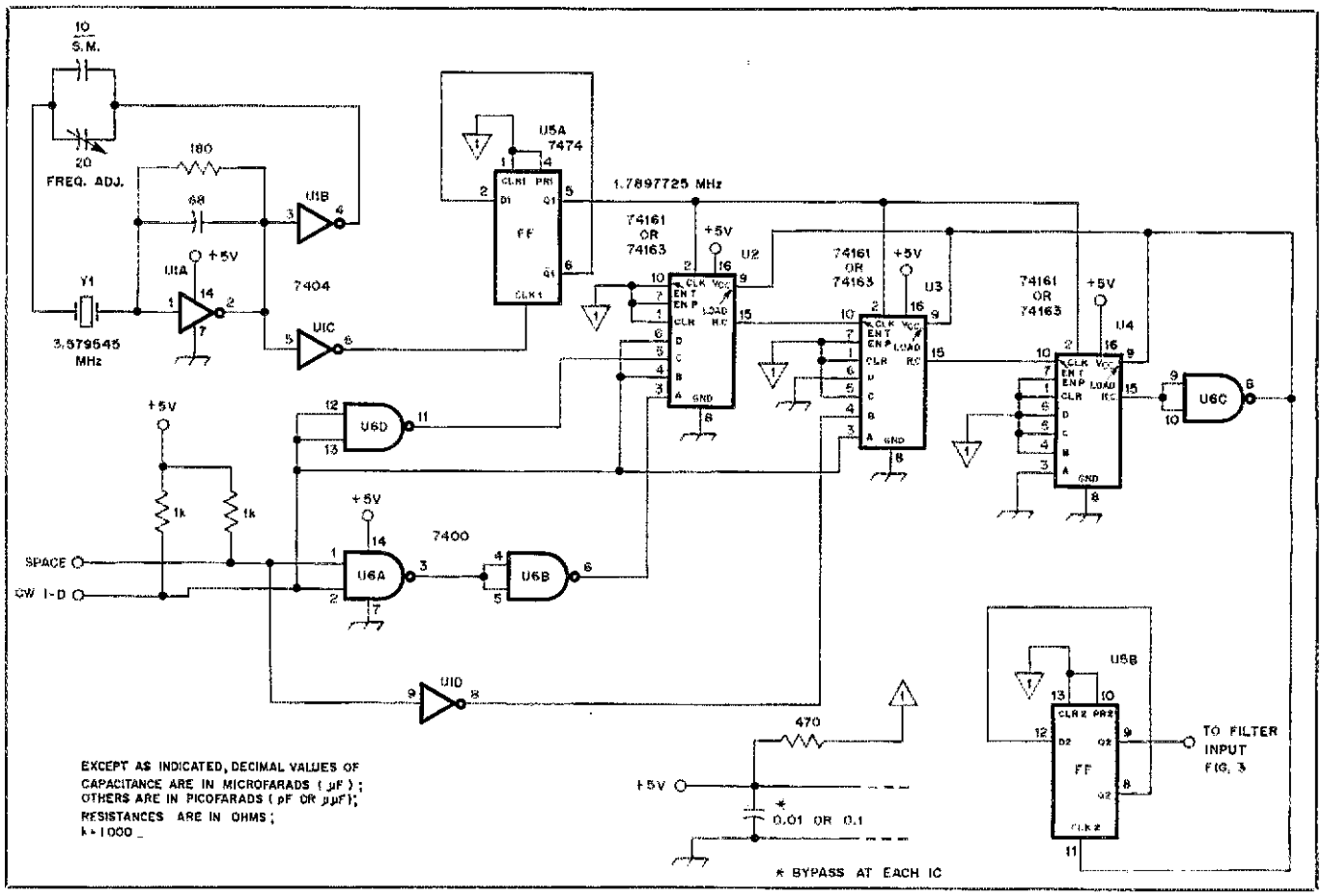


Fig. 1 — Schematic diagram of the simple, crystal-controlled afsk generator.

Table 1

Divider Counting Derivation

$$\text{Mark} = 2125\ \text{Hz} = \frac{3.579545\ \text{MHz}}{2(421)2}$$

$$= 2125.6\ \text{Hz}$$

$$\text{Space} = 2295\ \text{Hz} = \frac{3.579545\ \text{MHz}}{2(390)2}$$

$$= 2294.6\ \text{Hz}$$

$$\text{Cw i-d} = 2015\ \text{Hz} = \frac{3.579545\ \text{MHz}}{2(444)2}$$

$$= 2015.5\ \text{Hz}$$

for the counters for those who may wish to add additional gating for other system considerations, such as automatic i-d, and so on.

Tone Shift and Filtering

The generator tones are shifted by grounding the proper input for either space or cw i-d; the unit outputs a mark tone when the inputs are high. Be sure to isolate any high-voltage loops from these inputs with a suitable optoisolator circuit.

The output of the digital portion of the circuitry is a TTL-level square wave which is very rich in harmonics. Adding the nine-pole active filter shown in Fig. 2 removes the harmonics and provides a good-quality sine wave to the transmitter audio input. The output of U9 is a high-level signal capable of driving almost any audio input stage. A voltage divider with a potentiometer for level adjustment can be tailored to the user's requirements. For those intending to use the generator on vhf only, another not-so-elaborate filter may suffice; the filter described here will

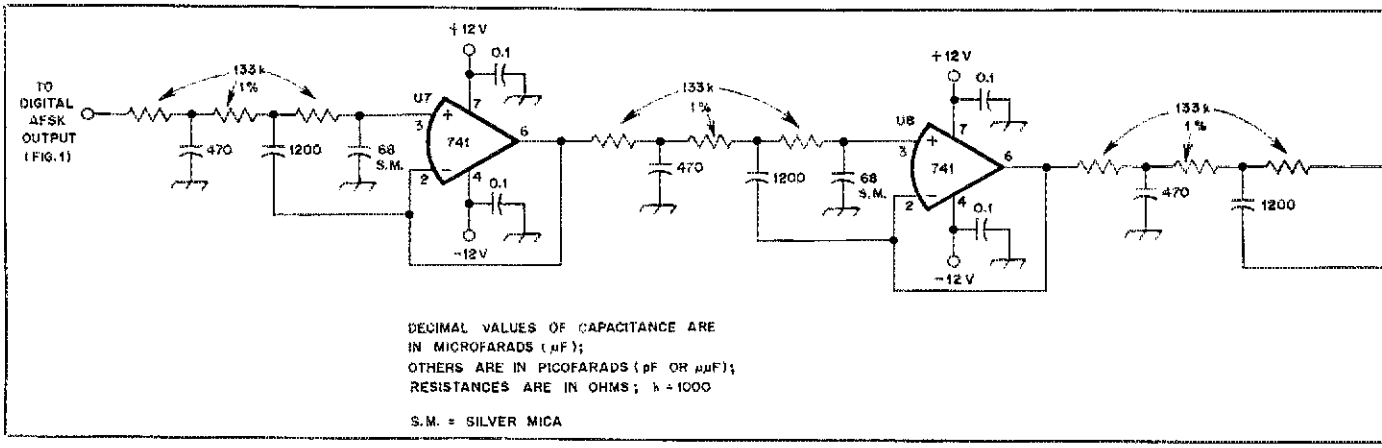


Fig. 2 — This nine-pole audio active filter "scrubs" the afsk generator output producing a good-quality sine wave. The silver-mica capacitors are 5% types (CM04, CM05). All 133-kΩ, 1% resistors are metal film types.

Table 2

Central Divide Load Values

IC and Pin no.	Mark ÷ 421	Space ÷ 390	Cw i-d ÷ 444	Change?
U2-3	1	0	0	Yes
U2-4	1	1	0	Yes
U2-5	0	0	1	Yes
U2-6	1	1	0	Yes
U3-3	1	1	0	Yes
U3-4	0	1	0	Yes
U3-5	1	1	1	No
U3-6	0	0	0	No
U4-3	0	0	0	No
U4-4	1	1	1	No
U4-5	1	1	1	No
U4-6	1	1	1	No

Note: The Change column indicates whether or not one of the load inputs of a counter needs to change between mark, space and cw i-d.

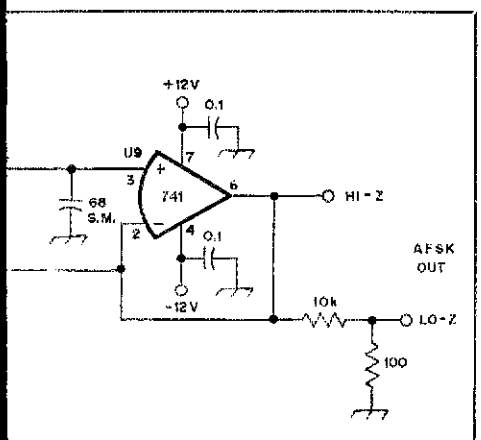
provide a top-quality signal for use on the hf bands.

Construction Techniques

Several units have been built using solder-wrap techniques. Wire-wrap or any other construction method can be used so long as good construction practices are followed. A 4 × 4-inch (102 × 102-mm) board with holes on 0.1-inch (2.54-mm) centers (such as Radio Shack 276-155) is more than adequate to accommodate all the components.

Here are some construction hints: Bypass the dc supply bus at each device with a 0.1- or 0.01-μF ceramic capacitor; use shielded wire for the audio output line and separate 741 op amps for the audio filter stages; lay out the circuit in a fashion that prevents feedback (this is a high-impedance circuit); finally, place the completed unit in a shielded enclosure to prevent rf from getting into the digital circuitry.

I hope you'll enjoy building this generator and know it will provide you with a stable source of RTTY afsk tones for a long time to come. My thanks to Otis Hanby, W5TKK, for his design of the filter, and Allan Kaplan, WA1AEL, for his advice and comments.

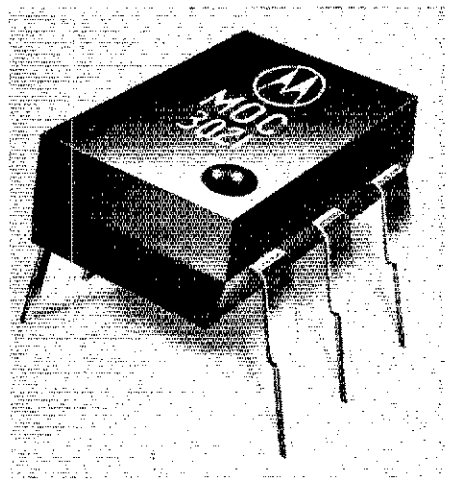


New Products

MOTOROLA OPTICALLY ISOLATED TRIAC DRIVERS

Two state-of-the-art optically isolated, 400-V triac drivers have been introduced by Motorola. According to the manufacturer, these devices exhibit a minimum peak off-state voltage of 400 volts and a minimum isolation voltage between input and output of 7500 volts. The MOC3020 and MOC3021 were designed to drive power triacs from a 220-V ac line, but amateur ingenuity will certainly find other uses for these devices.

The MOC3020/21 consists of a GaAs infrared emitter and a monolithic chip containing the detector and bidirectional triac driver housed in the popular 6-pin plastic DIP. Motorola recommends that it be used with resistive incandescents and heaters, inductive motors, solenoids and relays. The opto couplers are available from OEM sales offices and from authorized Motorola distributors. — *Paul K. Pagel, N1FB*

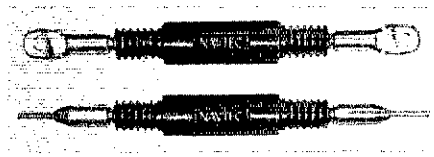


Motorola's MOC3021 requires an emitter current of only 15 mA to latch the output; the MOC3020 requires 30 mA.

NAVTEC BACKSTAY INSULATORS

Here's an item that looks like just the ticket for seagoing amateurs or others looking for a heavy-duty insulator to hold up a sky wire. Navtec, a manufacturer of stainless-steel rod rigging, turnbuckles and other rigging hardware is marketing backstay insulators designed to perform under all weather conditions. According to the manufacturer, these insulators, which have specifically designed fins to increase path length, will not break down electrically when wet with spray or rain. Mechanically, these insulators are designed to be used at high sustained loads even under a tropical sun. Navtec claims a resistance of greater than 10^8 ohms, a capacitance of approximately 60 pF, and a breakdown voltage rating of greater than 8000 volts when wet with salt water, allowing approximately one second for drainage.

The insulators come in various sizes to fit most all backstays, whether wire or rod. Available end fittings include wire swages, eyes, jaws or Navtec Headed Rod. These units are priced from $120 to $600 each depending on insulator size and end fittings required. They are available from Navtec, 527 Great Rd., Littleton, MA 01460. — *Paul K. Pagel, N1FB*

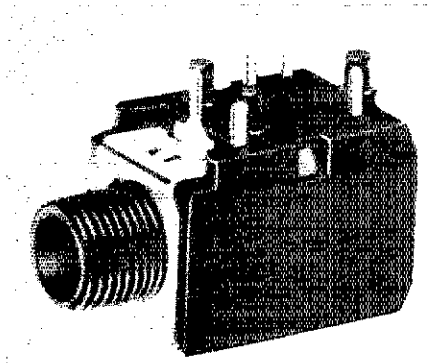


These Navtec insulators are designed to perform under adverse weather conditions. A number of different sizes and end fittings are obtainable.

SWITCHCRAFT HI-D JAX®

Switchcraft is marketing compact, two- or three-conductor jacks with built-in right angle mountings. These new phone jacks are designed to allow the plug axis to be parallel to the printed circuit board on which they are mounted. The jacks are available with or without shunt circuits and are designed to be used with 1/4-inch diameter plugs. The sleeve circuit can be insulated from metal panels by simply using a flat, nonconductive washer.

For information, write: Switchcraft, Inc., 5555 No. Elston Ave., Chicago, IL 60630. — *Paul K. Pagel, N1FB*



The Switchcraft jacks have the added features of stable standoff mountings and a sleeve circuit that can be easily insulated from metal panels.

Another Look at an Old Subject: The Bug Catcher

Why aren't more hams going hf mobile? Some say the lack of effective, inexpensive antennas keeps them away. Here is one solution.

By Charles W. Frazell,* WD5FRN and Terry D. Allison,** WB5AZI

There are many high-frequency (hf) rigs around with 12-volt capabilities, yet hf mobile operation seems to be a novelty to most amateurs. Perhaps part of the reason more amateurs are not on hf mobile is the antenna. Mobile antennas are usually large, expensive, poor performers and a general nuisance with five or six separate coils to keep track of.

The antenna described in this article, while still large, is inexpensive to build (approximately $35) when compared to commercially available models (about $120) and has quite an impressive performance record. The frequency range of the antenna is from 80 to 10 meters. Its overall height can be reduced to slightly above the roof of the car in less than 10 seconds, should a low obstacle be encountered.

Rebirth of the Old Standard

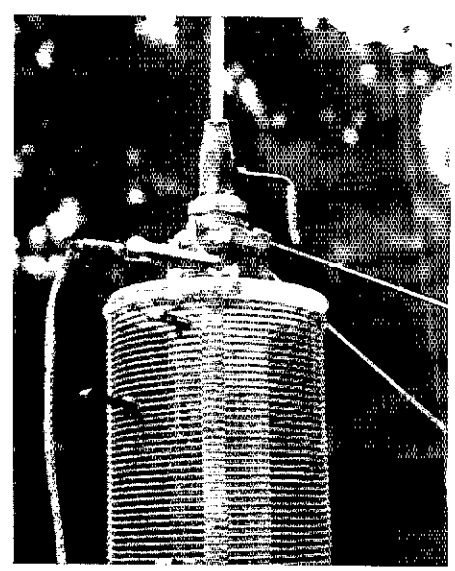
This antenna is quite similar to some of those that were popular in the '50s and the early '60s. These "Bug Catcher" types of antennas (so named because of the open coil, which collects insects) generally performed quite well. This one has some improvements incorporated into it that were not used on its ancestors:

1) It uses locally available parts.

2) It is adjustable to be a full 1/4-wave antenna on either 15 or 10 meters. Most of the parts can be obtained at either a hardware store or the plumbing-supply section of a discount store. The Plexiglas tubing and sheet will have to be purchased at a glass company. It would be a good idea to buy some extra stock and practice on it before attempting to work with the real thing as Plexiglas can be difficult to work with. The coil stock will be the most difficult part to find. It is marketed under the trade name "Miniductor" or "Airdux." We would suggest trying some of the older, more established ham stores which still cater to the do-it-yourself artist.

An electric drill with an assortment of drill bits and grinding devices is an almost essential tool to construct this antenna. A hacksaw is necessary and a saber saw is a big help. Epoxy cement works well to cement the coil assembly together, but seems to become brittle after exposure to the elements. Silicon bathtub caulk has proven to be an excellent substitute for the epoxy.

After procuring the necessary parts and tools, several subassemblies must be completed before the coil is assembled. One of these is the disassembly of the CB whip. The best way we found to accomplish this is to clamp the whip in a vise a short distance above the base fitting (ferrule).[1] Then find a small box-end wrench that will just fit over the threads, contacting the remainder of the base fitting. The base is removed by striking the wrench close to the whip, forcing the base fitting up the whip. Note: slight damage to the threads is not important, as they are going to be forced into a nonstandard fitting later. Continue forcing the base fitting up the whip until it is free and can be completely removed from the whip. The Corona ball



Here is a close-up view of the completed coil assembly. Notice the Allen wrench that has been soldered to the setscrew in the ferrule. Horizontal lines extending from the coil are the noninductive guy lines.

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**P. O. Box 544, Marfa, TX 79843

[1]Notes appear on page 32.

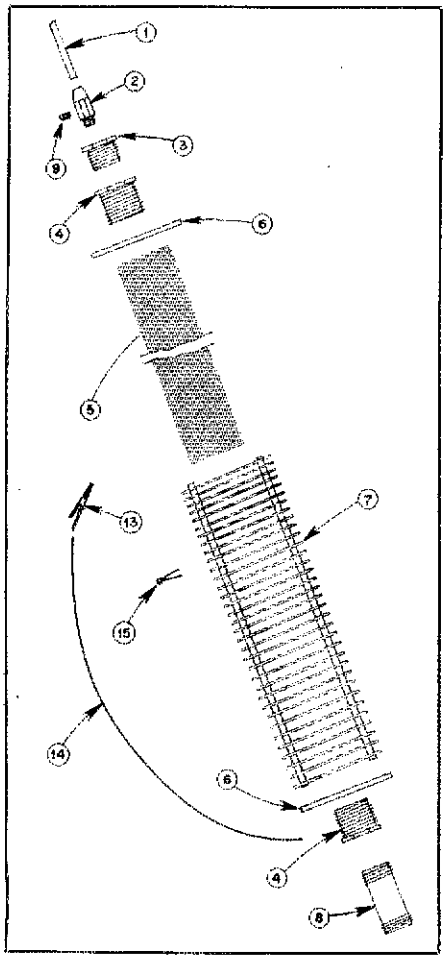


Fig. 1 — This is an exploded view of the coil assembly. Parts numbers refer to the parts list in Table 1.

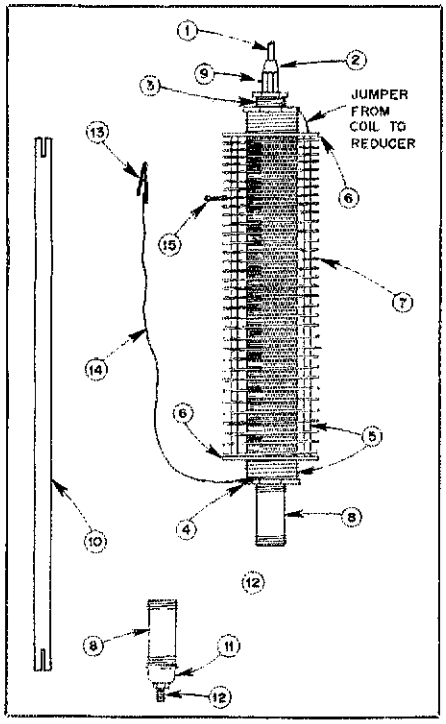


Fig. 2 — The completed coil assembly is shown here along with aluminum tubing mast. The inset shows the reducer which is threaded into the Plexiglas tubing. (Parts list is in Table 1.)

may have to be removed to allow the fitting to slide over the end. Not all whips are manufactured the same way: If, after repeated attempts, the base still won't slide over the top of the whip, then it may have to be taken off at the bottom.

Once this is accomplished, grind down the large end of the whip until the base fitting will slide freely over the whip. Some enlarging of the hole through the base fitting may be necessary. Drill and tap a hole into the side of the base fitting so that a setscrew inserted into the hole will prevent the whip from sliding through the base fitting. If you do not have the facilities to tap the brass base, then any machine shop can do it in a few minutes.

To support the coil, two Plexiglas "doughnuts" must be fabricated from the Plexiglas sheet. Fig. 1 depicts an exploded view of the coil assembly. It is best not to remove the covering from the Plexiglas until final assembly. Begin by drawing two sets of concentric circles on the covering of the Plexiglass. One should be larger in diameter than the outside of the coil, and one slightly smaller than the diameter of the Plexiglas tube. Form two discs by sawing along the larger circles. Next, drill a hole in the exact center of each disc. Enlarge the holes until a snug fit is obtained over the Plexiglas tube. The small circle can be used as a guide.

Another method of making the plastic doughnuts is to find a tin can that is slightly larger in diameter, or the same size, as your coil. Heat the open end of the can over the stove or use a propane torch or other suitable heat source. Be sure to put Plexiglas, to be cut with the can, on top of a piece of wood or other insulator as the can will get hot enough to transfer heat to the bottom side. (Note: Only the open end rim of can need be heated; use a thick glove.) When the can is relatively hot, place it on the plastic sheet and turn with twisting motion until the can starts to cool. Remove it from the plastic and heat it again. Repeat the process about three times on each side; this should render a perfect circle. Then, with a hole saw and some rotary files you can complete your doughnut.

A piece of aluminum tubing of 7/8-inch[2] inside diameter must be modified to go between the bottom of the coil and the mounting assembly. Cut a piece of the aluminum tubing approximately 30 inches long. Then cut two 3-inch-long slots (on perpendicular planes) in each end of the tubing. Slide two hose clamps over the tubing prior to final assembly.

Tackling the Coil

After the above work has been completed, the coil assembly can be tackled. First, screw one of the large reducers into one end of the Plexiglas tube. To do this, heat the reducer over a stove or with a torch until it will melt its way into the Plexiglas as it screws down. It is important that care be taken to ensure that the reducer goes in straight. After the reducer cools, slide one of the Plexiglas doughnuts over the open end of the tube until it will go no farther.

Next, make sure some wire is left sticking out of the top end of the coil stock so that a connection can be soldered to it later. Slide the coil down over the tube followed by the remaining doughnut. Heat and screw the top reducer into the tube. Again take care to ensure that the reducer is in straight. Cement the doughnuts to the tube in such a way that they have the coil tightly sandwiched between them.

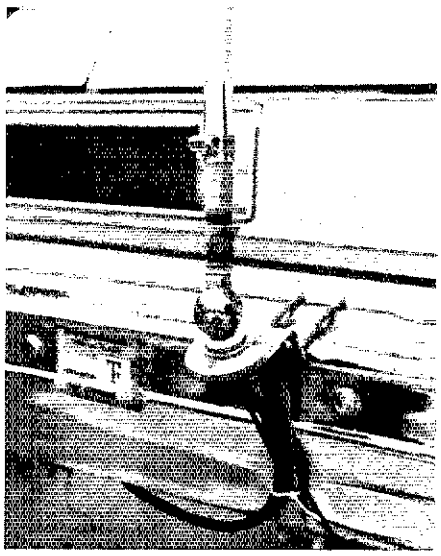
The end that has the wire available for soldering will now become the top of the coil. Screw the small reducer into the large reducer at the top of the coil. Screw the whip base into the top of the small reducer (the threads do not match perfectly but the brass base fitting will conform as needed). Solder a wire from the top large reducer to the top of the coil. When cleaning the reducer prior to soldering, don't file through the galvanizing or soldering will become impossible. Solder a piece of large, flexible wire (such as RG-58 shield) to the bottom reducer, leaving it long enough to reach the top of the coil. Solder an alligator clip to the free end of this wire. This completes assembly of the coil.

To assemble the rest of the antenna proceed as follows (Fig. 2): Drill a hole in the exact center of the pipe cap, large enough to just pass the threads of the bolt. Insert the bolt into the hollow portion of the pipe cap and through the hole. Then screw one of the nipples into the pipe cap and down onto the top of the bolt head. An alternative method would be to weld the bolt head to the bottom of the pipe cap. Regardless of which method is used to secure the bolt, screw the exposed bolt threads firmly down into your mount. (Washers may be necessary.) Screw the remaining nipple into the bottom of the coil

Table 1

Parts List[2]

1) Whip (standard 102-inch).
2) Whip base or ferrule (removed from whip).
3) 1/2-inch to 1/4-inch reducer (pipe coupling).
4) 1-inch to 1/2-inch reducer (two required).
5) 1-1/4-inch-OD × 12-inch-long Plexiglas tube.[3]
6) Plexiglas doughnuts (two made from 1/8-inch-thick Plexiglas sheet).
7) Coil (3-inch dia × 10 inch long × 8 turns/inch).
8) 1/2-inch pipe nipple (2 required).
9) Setscrew.
10) Aluminum tubing 30 inches long × 7/8-inch ID.
11) 1/2-inch pipe cap.
12) Mounting bolt 3/8 × 24.
13) Alligator clip.
14) Shorting wire (RG-58 braid, see text).
15) Coil clips (at least five needed).
16) 1-inch dia hose clamps (two required).



"Plumber's Delight" type mast is screwed into a regular CB bumper mount.

assembly. Place the aluminum tubing over the exposed end of the nipple which is attached to your mount. Clamp the tubing in place with one of the hose clamps. Try to get the tubing vertical. Force the pipe nipple at the bottom of the coil into the top of the aluminum stalk. Secure this by the remaining hose clamp. Slide the whip into the top of the coil and make sure that it will slide freely all of the way down through the assembly until it contacts the base mounting assembly. This completes assembly of the antenna.

Tapping the Bands

A tap must be placed on the coil for every band, and for portions of the 80-meter band. Several methods might be used to select the tap locations on each band. Generally it is better to start with the higher-frequency bands and work down. The method we prefer follows, but don't be afraid to try any method you think might work. To locate the tap for the 10-meter band, place the clip as close to the top of the coil as possible. This should be on the top turn next to the solder connection. (The solder connection itself may be used.) Slide the whip all of the way down and the antenna should be resonant on 10 meters. When the whip is extended to the point where the setscrew is close to the bottom of the whip, the antenna should be resonant on 15 meters with the same clip location. Small changes in resonant frequency can be achieved by sliding the whip up or down a small amount. The whip should be fully extended for operation on all lower bands.

To find the tap for 20 meters, it is best to find the point where maximum signal strength is observed in the "receive" mode. To do this, find a signal that is fairly strong and steady. Move the clip down one turn at a time from the top until a peak is observed on the receiver "S" meter. Then with an SWR bridge, move the tap up and down the coil from this point until minimum SWR is observed at the desired frequency. Place the clip here. Taps may be located on any side of the coil, or they all may be kept in a straight line if a slight increase in SWR is tolerable.

The same procedure is followed for 40 meters. The final SWR may not be as good as on 20 meters, however, since the impedance of the antenna is getting lower as more loading is used.

Eighty meters is quite difficult to tune using this method. The impedance of the antenna is down to less than 20 ohms, causing a high SWR on a 50-ohm line even at resonance. This SWR is acceptable with tube-type finals, as long as the rig loads up properly. If operation with solid-state rigs is contemplated, a matching transformer or some other form of impedance matching should be used. Because of the high SWR, the 80-meter taps must be located differently. A field-strength meter is probably the best tool to use. Tune the antenna for maximum observed field strength. If you don't have one and have access to a radio with tube-type finals, however, the following procedure works well. Locate the point on the coil where maximum noise is observed. Then with the clip located at this point, tune the rig up according to the manufacturer's instructions, except do not increase the load control at all, i.e., leave it in the maximum capacitance position. Then move the clip up and down one turn at a time until the observed dip in plate current as the plate-tune control is rotated just dips down to the normal fully tuned level.

Several taps will be necessary to cover very much of the 80-meter band. The resonant frequency of the taps extends upward from each location until the load control can no longer load the rig to normal plate current.

A Bumper Crop

Generally this type of antenna will be located on the back bumper of an automobile. Some people mount it on the fender or the rear deck. The higher it is mounted the better it will work, but the more obstacles it will hit. It is also hard to get a solid mount up high on a vehicle. If the antenna is to be mounted on the bumper, any of the heavy-duty bumper mounts made for CB whips may be used. A nonconductive guy line should be run to the rain gutter or to some other point in front of the antenna on the same side of the vehicle. The guy can be looped around the top of the coil assembly just below the whip. Either RG-8 or RG-58 cable may be used to feed the antenna.

All of the models built by local hams used some kind of "handle" soldered to the setscrew. An Allen wrench works well,

WD5FRN's antenna farm on wheels.

as does a washer. This makes it easier to adjust or remove the whip quickly should the need arise.

Most of the rigs now on the market have very good noise blankers and no noise suppression is needed on the vehicle. The subject of noise suppression is covered in *The Radio Amateur's Handbook* (available from ARRL for $10) should a problem arise, however.

The best test of a mobile antenna is to operate it on the lower frequencies. Several models have been constructed and have been in use for over a year. Mobile-to-mobile contacts on 80 meters always have been possible up to distances of 1000 miles. Several late-night contacts have been made over distances exceeding 3000 miles on 80 meters. Checking into local traffic nets rarely has been a problem, with this antenna performing better than a random wire combined with a tuner at the fixed station. Come on in and try "low-band" mobile. The water is fine!

We would like to acknowledge the help of Mark Kelly; Jimmy Vaello, WD5HBV; Texas Traffic Net; Bruce Love, WB5NOQ; members of the MSC Radio Committee at Texas A & M University and Shelly Gilbert.

Notes

[1]Most CB-style whip antennas have a completely hollow ferrule that is soldered or brazed to the bottom of the whip. Some antennas used by the commercial services have a different style of construction. On those whips, the ferrule is hollow only a portion of the way down and the whip is held in place by setscrews. It will be necessary to drill the hole all the way through the ferrule to be able to use it in this project — probably a most difficult task. We suggest starting with the CB-style ferrule.

[2]Feet × 0.3048 = meters; inches × 25.4 = mm.

[3]PVC pipe can be used instead of Plexiglas tubing if one does not mind not being able to see the base of the whip when it is inside the tubing.

A Memory for the K2BLA CMOS Keyboard

For contesting, a keyboard with memory can't be beat. If your board lacks this feature, you can add this easy-to-build circuit without modification.

By Al Helfrick,* K2BLA

After numerous requests from readers, I've designed a memory to interface with the CMOS keyboard described in January 1978 *QST* and the 1981 *Radio Amateur's Handbook* (available from ARRL for $10). In the best amateur fashion, the memory, built the night before Field Day, received its shakedown cruise during the contest. That baptism clearly indicated that, for contest work, nothing can beat a keyboard with memory. Additionally, one significant advantage to a battery-operated keyboard with memory is that no messages are lost when the generator quits — a not infrequent occurrence on Field Day! As designed, the memory can contain the usual contest exchange in one half of the memory and a contest CQ in the other half.

The memory is arranged to interface with an existing keyboard and commercially available printed circuit boards without any modifications. A circuit that contains only nine ICs and requires only a few additional connections to the keyboard achieves this goal. In fact, if the external connections are brought out to a plug, the memory can be removed simply by disconnecting the plug without disturbing the normal operation of the keyboard. Not only would this plug allow a return to micropower if necessary, but also the memory can be built and debugged independently.

*RD 1, Box 87, Boonton, NJ 07005

The Memory Add-On

The heart of the memory add-on is a pair of 2102 random-access memory chips (RAMs). The 2102s are the only non-CMOS ICs in the keyboard/memory circuit. Rather unfortunately, they consume more energy than the rest of the keyboard. To interface with the memory ICs, the supply must provide +5 volts for the entire keyboard. All keyboards built to the *QST* design will operate correctly at that voltage.

The memory ICs are arranged as a 1024-byte (word) memory with two-bit words. The two-bit word implies that four different pieces of data can be stored for each word. In the memory addition, the data words are: 10 = space, 01 = dit, 11 = dah and 00 = stop. The stop command causes the memory to stop sending and returns the keyboard operation to normal. One memory location is required for every dit, dah and space, plus one more per message for the stop command. The memory could be arranged as a single 1024-byte size or divided into halves of 512 bytes each. A little experimenting will convince you that 512 words is long enough for any normal message. The total memory space can be calculated by the following formula: Add the number of words plus the number of dits and dahs plus the number of letters plus one. A three-by-three CQ with a long call will not even begin to fill the memory.

Because the capacity of the memory, no warning device is included to warn that the memory is nearly filled. If you suspect that a message will not fit, try it anyway. Doing so takes only a few minutes and you may be pleasantly surprised. If the memory is overrun, the beginning of the message will be erased.

Both halves of a CD4520 dual four-bit counter in cascade plus one half of the dual flip-flop serve as the address counter for the memory ICs. The tenth bit of the memory address is selected by a panel switch labeled MEM A/MEM B. Dit and dah data plus the internal clock are provided by the keyboard. The dit/dah generating circuits are copied from the original keyboard. Use of the three flip-flops within the keyboard would save a few pennies. Repeating these circuits greatly eases the interface, however. That alone seems worth the investment.

The memory is constructed on a universal-type DIP board, very much like the one used in the original keyboard.[1] Not shown in the schematic diagram are three 0.01-μF bypass capacitors, which should be placed at three convenient

[1] *Universal circuit boards and construction kits* for the K2BLA Memory are available from Circuit Board Specialists, Box 969, Pueblo, CO 81002.

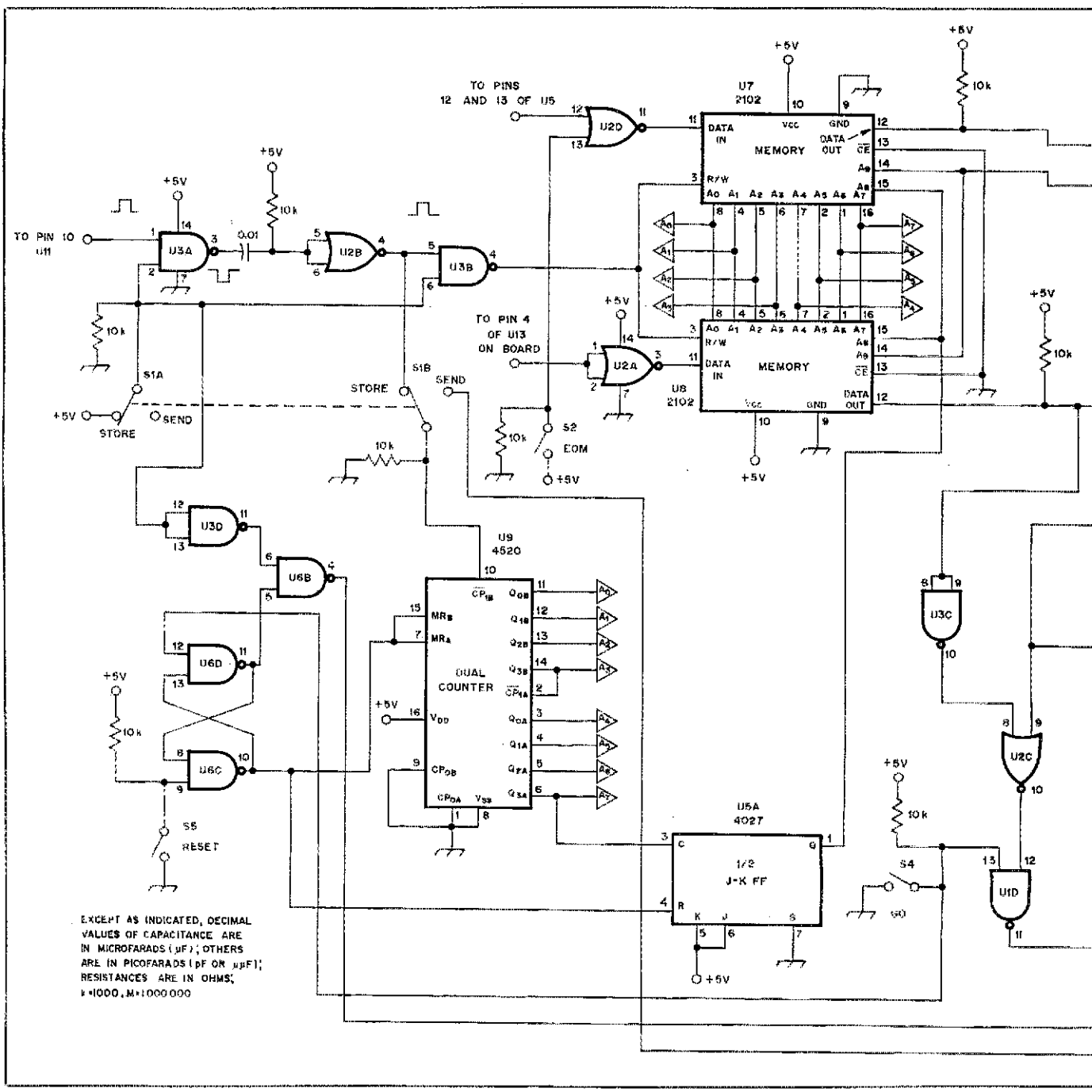


Fig. 1 — Two 2102 RAMs form the heart of this memory unit designed especially for the K2BLA CMOS Keyboard. For battery operation, four nickel-cadmium cells provide adequate power. The dit/dah generating circuit is copied from the original board. Resistances are 1/4 watt.

S1 — Dpdt, pushbutton.
S2, S4, S5 — Spst, pushbutton.
S3 — Spdt, pushbutton.
U1, U3, U6 — 4011 quad dual-input NAND gate (Radio Shack or equiv.).
U2 — 4001 quad dual-input NOR gate (Radio Shack or equiv.).
U4, U5 — 4027 dual J-K flip-flop (Radio Shack or equiv.).

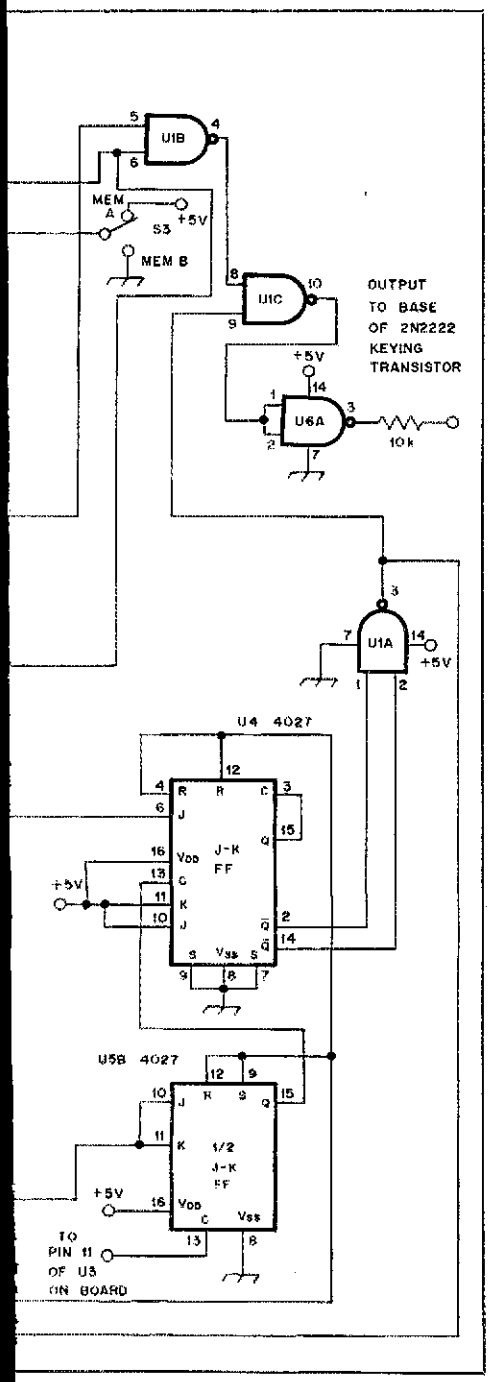
locations between the +5-V circuit and ground.

Do not make the leads longer than necessary. If the memory is to be added outside the keyboard enclosure, keep the external leads shorter than 12 inches to minimize RFI.

No Major Keyboard Modifications

Although no extensive modifications to the keyboard are required, some small items must be added. First, the power supply must be changed to provide 5 V if it is not already operating at that value. If battery operation is required, four nickel-cadmium batteries will be quite satisfactory, supplying exactly 5 V. If ordinary flashlight batteries are to be used, four cells will supply 6 V, a safe operating value.

The space bar must be connected since it is now required for storing messages. In the author's original keyboard, the space bar was removed since it was not essential for normal operation. A spare key now serves that function. Although the keyboard does not conform to a standard typewriter keyboard, with the odd space key, the occasional use of the space only for storing was judged a minor annoyance. The space key or bar is wired



U7, U8 — 2102 static random access memory (Fairchild, Intel or equiv.).
U9 — CD4520 dual counter (RCA or equiv.).

from A7 to B6. Required connections are made by tack-soldering wires to the appropriate points within the keyboard. If a plug is to be installed it may be a wise idea to check the operation of the keyboard after the connections are made to determine if there are any shorts.

Testing the Memory

The memory addition is easy to use and easy to test. To test the memory, the sequence of operation must be followed. Place the STORE/SEND switch to send, the MEM A/MEM B switch to MEM A, and press the reset button. If all is performing correctly, the keyboard should operate in a normal fashion, that is, as if no memory were attached.

To store a message, place the STORE/SEND switch in STORE, press the reset button and press GO. Anything typed from the keyboard will be stored in memory A at this time. After the desired message has been stored, press EOM (end of message) and place the SEND/STORE switch in the SEND position. To transmit the message, press RESET, then GO, and the entire message will be sent exactly as it was typed from the keyboard. A completely independent message may be stored in the B half of the memory by repeating the sequence with the MEM A/MEM B switch in the MEM B position.

Messages may be separated by the use of the EOM button. A stop command can be placed anywhere within the message and the memory will stop. The message may be restarted without resetting by pressing the GO button, whereupon the message will continue until it encounters another stop command. This may be used in the following example: The message "BK TNX FOR CALL UR RST (stop) HR IN NNJ BK (stop) QSL 73 DE K2BLA K (stop)" is stored in the memory by using the EOM key for inserting the stops without pressing the reset button. This message would be used for contest work in the following fashion. After a contact is made and the calls are sent from the keyboard, the contest message is initiated by pressing the GO button. The memory will send TNX FOR CALL UR RST and stop. The RST is entered from the keyboard and the GO button is depressed again. The memory continues, HR IN NNJ BK and stops. At this time the other station operator sends his message. Once that station signals for you to transmit again, the GO button is pressed and the memory continues, BK QSL DE K2BLA K and again stops. The memory must be reset for the next interchange. The obvious message for the second half of the memory would be a contest CQ, which could be started at this time while the chore of logging is finished.

About the Buffer Memory

A final word about the buffer memory is needed. The buffer memory differs from the memory described, since it buffers the input to the keyboard rather than to a permanent storage. Some time ago, I tried to design a buffer that would interface easily with the CMOS keyboard, but that effort was without success. It seemed that to make such an interface would be so difficult that starting from the beginning with an all-new buffered design would be simpler. See the 1981 *Handbook*. QST

Strays

TA PROFILES

☐ We are indeed fortunate to have Edward E. Wetherhold, W3NQN, of Annapolis, Maryland, as one of our ARRL Technical Advisors. His professional field of expertise is the design and application of passive LC filters. He has written numerous technical articles on the subject, which have appeared in *QST*, *Ham Radio* and many professional electronics publications. He has also contributed material for the ARRL *Radio Amateur's Handbook*. First licensed in 1947, Ed now holds an Advanced class license.

Ed received his B.S. in Radio Engineering from Tri-State University. He is a member of IEEE, with memberships in the following IEEE groups: Professional Communication, Electromagnetic Compatibility, and Communications. Employed by Honeywell, Inc., Ed does the testing of communications systems. Ed is active in tournament tennis and is ranked number 15 in Men's-45 singles by the Middle Atlantic Tennis Association. — *Marian Anderson, WB1FSB*

Meet TA Ed Wetherhold, W3NQN.

ATTENTION CERTIFICATE HUNTERS

☐ Did you know that when you upgrade to Amateur Extra Class, the FCC will issue a diploma-style certificate? If you want one, send a copy of your license to the FCC engineer in charge of the district in which you took your Amateur Extra Class examination. The certificate fits into an 8- X 10-inch frame and looks nice on the wall of your shack. — *Richard Bert, KF8I, Pontiac, Michigan*

Broad-Band 80-Meter Antenna

The cage is back! Almost forgotten since the 1920s, this multiwire antenna, arranged as a center-fed dipole, provides edge-to-edge band coverage without the help of a tuner. The low SWR will make you and your rig happy!

By Allen B. Harbach,* WA4DRU, VP5AH, VP1AH

I dislike antenna tuners! I suppose there is a place for them when one can put up only one piece of wire to cover all bands, but they definitely slow down the ability to QSY quickly from one end of the band to the other to catch the rare one.

When I began chasing DX in the early '70s, I rapidly became aware that something had to be done to broaden the response of my antenna system — particularly on the 80-meter band. The reason 80 meters is so tough is that it has the greatest percentage bandwidth of any of the popular amateur bands (see Table 1). Percentage bandwidth is a concept that gives a clue to the required Q of an antenna in order to have low SWR from top to bottom. It is calculated by dividing the bandwidth (in kHz) by the band-center frequency (in kHz) and multiplying by 100 to get percent. The 80-meter band is 13.3% wide

$$\left(\frac{500}{3750} \times 100\right)$$

which means that it requires an antenna Q of 7 or below to be able to cover the whole band at low SWR. To further illustrate the concept, the 15-meter band is nearly as wide as the 80-meter band, in kHz, but is much narrower in percentage bandwidth

$$\left(\frac{450}{21{,}225} \times 100\right)$$

An antenna Q of 45 or less will cover the entire 15-meter band with reasonable SWR (a dipole of no. 12 wire). On 80 meters the typical dipole of no. 12 wire has a bandwidth of 75 kHz at the 1.5:1 SWR points, or in excess of 5:1 at the band edges when resonated at 3750 kHz (band center).

To get around this problem, I did some reading in the library at the local engineering college. I arrived at the well-known fact that the fatter one makes an antenna, the lower the Q; hence the greater the bandwidth. But how thick? Doing some more reading and a lot of paper scratching, I arrived at some relationships that could be solved with the average scientific calculator. Later, I programmed these into our company computer to speed calculations and print tables and graphs.

The equations and math I'll tackle later for those who are interested. For the others who want to know what to build, I'll cover that now. Calculating several antennas from the equations, I found that the antenna had to be at least 3 feet in diameter to cover the whole 80-meter band with a low SWR. Now, how to put up a 3-foot-diameter pipe 120 feet long! That's the question., So back to the books!

More reading showed that one can approximate a cylindrical conductor with parallel wires of various configurations. The equivalent diameter of a conductor, made up of parallel wires, is shown in Fig. 1.

The easiest type to construct is a four-wire cage. For my antenna, I used cross sticks of 1 × 1 material, 4 feet (1.2 m) long, which were held together at the center by a couple of brads. Holes were drilled in the ends of the sticks to take the antenna wire. Wire ties served to keep the spreaders from slipping (Fig. 2). I used a no. 16 wire for each element. This is equivalent in antenna resistance to a dipole made of no. 10 wire, and it keeps ohmic losses low.

Table 1

Percentage Bandwidths for the Popular Amateur Bands

Band (meters)	*160*	*80*	*40*	*20*	*15*	*10*	*6*	*2*
Percent Bandwidth	10.5%	13.3%	4.2%	2.5%	2.1%	6.3%	7.7%	2.7%

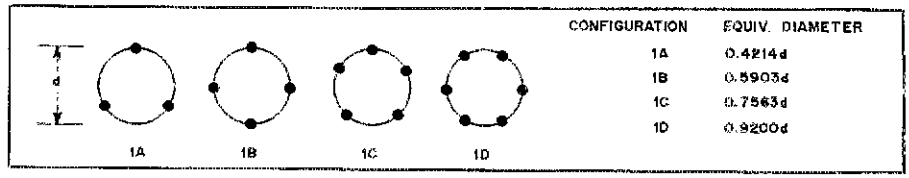


Fig. 1 — Solid-tube equivalents of wire cages.

Mechanical Considerations

Some mechanical considerations must be kept in mind. This antenna will swing in the wind. The first antenna I installed failed through fatigue both at the center and the end points. Therefore, the end sections of each half must be made of heavier material. I have used both no. 16 Copperweld and no. 12 soft-drawn copper wire for the end sections with no failures in over six years.

The ends of each half section are tapered over a distance equal to the spreader length to provide a transition between the large-diameter conductor of the antenna and the balun or coaxial connection. To keep construction simple, I did not attempt to optimize the end terminations.

Use fairly heavy insulators at the center support, as this is a heavy antenna; wind loading is five times that of the usual

*2318 S. Country Club Rd., Melbourne, FL 32901

Table 2

Characteristics for the 80-Meter Band

Freq.	*Ohms*	*Reactance*	*SWR*
3.500	53.4	−45.0	2.18
3.520	54.2	−41.3	2.03
3.540	55.0	−37.5	1.90
3.560	55.8	−33.8	1.78
3.580	56.6	−30.1	1.67
3.600	57.4	−26.4	1.56
3.620	58.2	−22.7	1.46
3.640	59.0	−19.0	1.37
3.660	59.8	−15.4	1.29
3.680	60.6	−11.7	1.21
3.700	61.4	−8.0	1.14
3.720	62.2	−4.4	1.07
3.740	63.0	−0.7	1.02
3.760	63.8	2.9	1.06
3.780	64.7	6.6	1.12
3.800	65.5	10.2	1.18
3.820	66.3	13.9	1.25
3.840	67.1	17.5	1.33
3.860	67.9	21.1	1.40
3.880	68.7	24.8	1.48
3.900	69.5	28.4	1.56
3.920	70.3	32.0	1.64
3.940	71.1	35.7	1.73
3.960	71.9	39.3	1.82
3.980	72.7	42.9	1.91
4.000	73.5	46.5	2.01

Note: Calculations for an antenna 124 feet (37.8 m) long and 3 feet (0.9 m) in dia covering 3.5 to 4.0 MHz. Zo = 62.

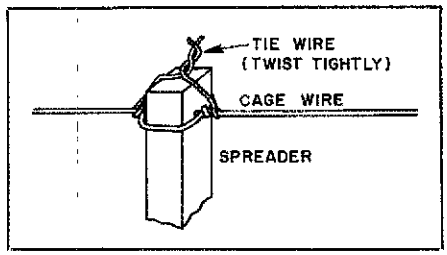


Fig. 2 — Detail of spreader ties.

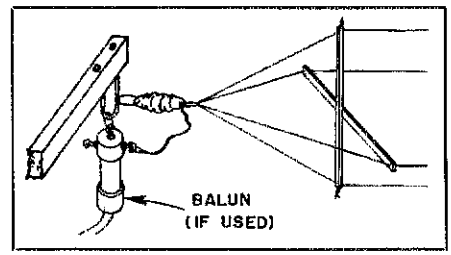


Fig. 3 — Center-support and end-taper detail of the cage.

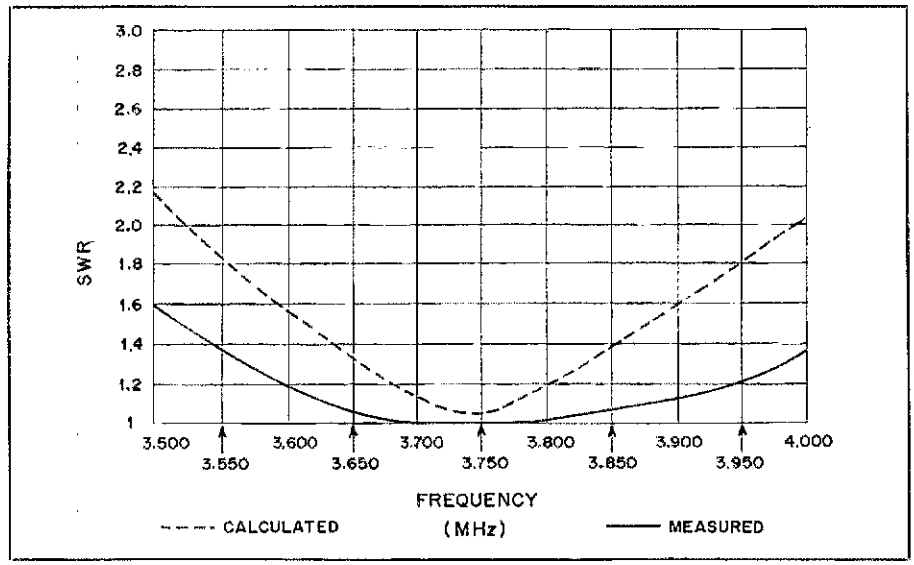


Fig. 4 — This graph shows the calculated vs. measured SWR values for the broad-band cage antenna over the entire 80-meter band. The gradual slope of the measured curve and the low SWR range indicate good bandwidth and matching.

dipole. (Do not despair! Mine has survived a twister and a hurricane!) I used a separate insulator for each half with each fastened to a U bolt in a wooden arm protruding from my tower (Fig. 3). Separate insulators at the center allow each half to be made and raised separately. A no. 12 flexible wire connects the center of each half to the balun or coaxial line.

Naturally, the higher the antenna, the better it is for DX. Mine is 68 feet (20.7 m) at the center, with one end held at 55 feet (16.8 m) and the other at 40 feet (12 m) above ground.

Testing

Once in place, the antenna is ready for testing. Each installation seems to have its own peculiarities, the result of nearby objects such as trees, houses and metallic structures. These affect the resonant length of the antenna to a greater extent than they would affect a single-wire dipole because of the larger capacitance between the antenna and nearby objects. While the length was calculated to be near 124 feet (37.8 m), I had to shorten mine to 115 feet (35 m) to have it be resonant at the center of the band. I performed the shortening in the last outboard section rather than redo the end termination. That, however, was a personal choice.

All the theory in the world is useless if the thing doesn't work! I'm delighted to say, though, that the antenna does perform well. Observe, for instance, the calculated SWR plot and the measured SWR curve in Fig. 4. The return on invested time is very high. It took me only one afternoon to put the thing up. My rewards for the 80-meter portion of both 5BDXCC and 5BWAS were gained with the use of this cage dipole. The significant advantage of this antenna, however, is that you can throw away that 80-meter antenna tuner and QSY all over the band with ease without concern about the SWR!

Math 'n Stuff

The characteristic impedance of an antenna with a length-to-diameter ratio greater than 15 is given by the expression

$$Z_{in} = R(k\ell) - j[120\,(\mathrm{Ln}\,2\ell/a - 1)\,\cot(k\ell) - X(k\ell)]$$

where

2ℓ = total length

a = conductor radius

$k\ell = 2\pi(\ell/\lambda)$, or the length of one half the antenna measured in radians.

Ln = natural logarithm

Since $\lambda = 984.25/f_{MHz}$, then $k\ell = 6.384 \times 10^{-3} f_{MHz}\ell$, where ℓ and λ are in feet.

$R(k\ell)$ and $X(k\ell)$ are quite complex functions, but are calculated as a table in Ref. 1. Fortunately, we are interested in antennas near 1/2 wavelength long. In this region, these functions can be approximated by the following linear equations:

$$R(k\ell) = 102\,(k\ell) - 87.86$$
$$X(k\ell) = 48.54(k\ell) - 34.86$$

Some error is introduced by this approximation, but it is less than 5%. Antenna location, height and trees will introduce larger errors than that! Now, the equation for the center impedance is simplified to the point where one can calculate values with the average scientific hand-held calculator.

For angles calculated in radians:

$$Z_{in} = (0.6512f_{MHz}\ell - 87.86) - j[120\,(\mathrm{Ln}2\ell/a - 1)\cot(6.384 \times 10^{-3}f_{MHz}\ell) - 0.3099f_{MHz}\ell + 34.96]$$

For angles calculated in degrees:

$$Z_{in} = (0.6512f_{MHz}\ell - 87.86) - j[120\,(\mathrm{Ln}2\ell/a - 1)\cot(0.3658f_{MHz}\ell - 0.3099f_{MHz} + 34.96]$$

SWR calculated by the *Antenna Book* formula:

$$SWR = \frac{1+k}{1-k};\ k = \frac{(R - Z_o)^2 + X^2}{(R + Z_o)^2 + X^2}$$

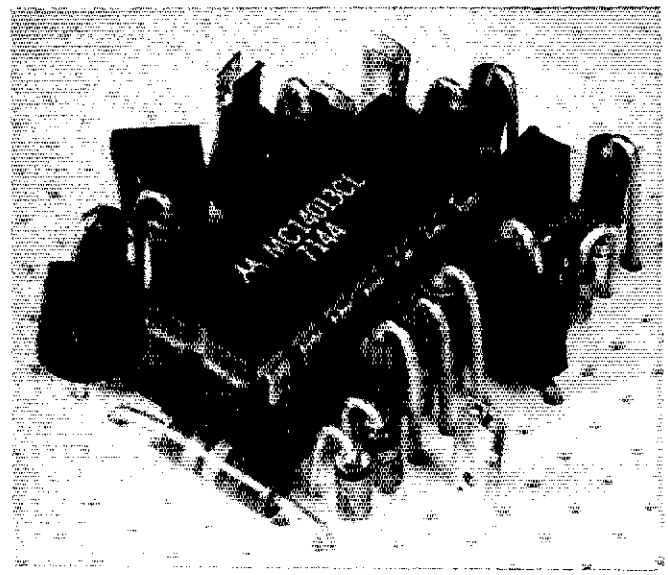
where R and X are the resistive and reactive parts of the load, and Z_o is the transmission-line impedance.

References

1. Jasik, *Antenna Engineering Handbook*, first edition, McGraw Hill, 1961, pp. 3-2 through 3-7.
2. *The Radio Amateur's Handbook*, fifty-eighth edition, ARRL, 1981, p. 19-2.

A Smart Push-to-Talk Circuit

Tired of juggling the steering wheel, the gear shift, the cup of coffee and the microphone when you make a sharp left? This circuit won't clean the coffee off your suit, but it will help with the microphone.



By Ken Stuart,* W3VVN

For a number of years I've operated 2-meter mobile with an imported car having a 4-speed manual transmission. Trying to maintain a QSO while steering, shifting gears, and holding down a microphone push-to-talk switch can be frustrating, to say the least. Often, a momentary break in the carrier while transferring the microphone from one hand to another is interpreted by the listener as an invitation to transmit, with "doubling" as the result. Also, for long transmissions on simplex or hf, holding down the microphone button can be downright tiring. I felt that there must be a better way without resorting to a toggle switch. Finally I came up with what I call a "smart" push-to-talk (PTT) circuit.

Basically, the circuit operates in two modes, dependent upon the time that has elapsed between the pressing of the microphone PTT switch and its release. If the switch is depressed for a half second or longer, when the switch is released the transceiver will return to the listen mode. But if the switch is released immediately after it is pressed (within one-half second), the circuit will latch in the on state until the PTT switch is again pushed and released.

*ARRL TA, 48 Johnson Rd., Riviera Beach, MD 21122

How It Works

The heart of the circuit is the CD4013 dual-D flip-flop (only one of the two sections is used in this application). The operation of a type D flip-flop, or latch, is quite simple. As long as no clock pulse is applied to the clock input, its output will not change state. When a clock pulse is received the digital state of the data input will be transferred to the flip-flop Q output during the positive-going transition of the clock pulse. The output will remain in this state until the next clock pulse is received, at which time the output will assume the state of the data input at that instant.

Referring to the schematic diagram in Fig. 1, let's assume that the microphone push-to-talk switch is open, and that the circuit is calling for the transceiver to be in the RECEIVE mode. Under these conditions, the voltages at the U1 clock input (pin 3) and output (pin 1) will be at +10 volts, and transistors Q1, Q2 and Q3 will be in the nonconducting state. Also C3 will be discharged and the data input on U1 (pin 5) will be near ground potential. (The data input considers any voltage from zero to about 5 volts as a logic 0.)

A transmission is initiated by closing the PTT switch. Q1 is turned on immediately by base current flowing through D1 and R3. Q1, in turn, provides base current to the Darlington-connected pair Q2 and Q3, which turn on and thereby place the transceiver in the TRANSMIT mode. Since the collector of Q1 has been pulled up to +10 volts, C3 begins to charge through R8, and reaches a voltage level of +5 volts in about a half second. Beyond a half second, as C3's voltage continues to increase with time, the data input of U1 sees this voltage level as a logic 1. (Nothing happens to the U1 output since no clock pulse has been generated by releasing the PTT switch.) So far, nothing unusual has happened to the transceiver; depressing the PTT switch has activated the transmitter, just as though the circuit were not inserted between the microphone and the rig.

Now let's examine circuit operation when the PTT switch is released. To do

so, we must consider whether the switch is released at some time after the half second has elapsed (condition 1), or before the half second has elapsed (condition 2).

When the PTT switch is held down for the duration of the transmission and then released (condition 1), the opening switch causes pin 3 of U1 to see a positive transition. This clocks the flip-flop and transfers the logic state at the data input to the output. Since the data input would be at a 1 or "high" level with C3 charged to greater than 5 volts, the flip-flop output would simply remain high. Q1's base-current path through R3 and D1 would be opened, and the transceiver would return to the receive mode since Q2 and Q3 would also turn off.

However, if the PTT switch is released before C3 has had sufficient time to charge (condition 2), the resulting clock pulse at pin 3 allows the logic 0 at the data input to propagate to the output of U1. This maintains the base current in Q1 by allowing it to flow through R3 and D2. The circuit will now remain locked in this mode until the PTT switch is again pushed and released, at which time another clock pulse will propagate the logic 1 at the data input (C3 will have charged by this time) to the U1 output, thereby terminating the transmit mode.

To ensure that the circuit is in the receive mode when power is first applied, the initial start-up network consisting of C2 and R6 has been included. These components force the output of U1 to a high level at initial turn-on by supplying a short pulse to the SET input.

Construction

Layout of the circuit is entirely non-critical, although dense packing of components is suggested to facilitate mounting the unit inside already-cramped 2-meter rigs. The photograph shows what can be expected size-wise with Vectorbord construction and vertically mounted components. If further reduction in size and component count is desired, Q2 and Q3 can be replaced with a Darlington device, such as the Motorola MPS-A13 or MPS-A14 (R12 is then eliminated). Also, if the circuit is to be powered by a well-regulated potential of 8 to 12 volts from the transceiver, Zener diode D3 and R9 can be eliminated. It is recommended, however, that protective resistors R2, R5 and R7 be retained. Otherwise, stored voltages in C2 and C3 can cause heavy charge/discharge currents in internal gate protective networks of U1 when power is applied or removed. Further, transients and rf can be picked up on the microphone cable, contributing to false operation.

And there you have it. Throw away that bottle of liniment! Enjoy a life of fewer cramped fingers and less accidental doubling on your favorite repeater. Install another unit on your hf rig and live up to that Rag Chewer's Club certificate without sacrificing quick break-in capabilities. QST

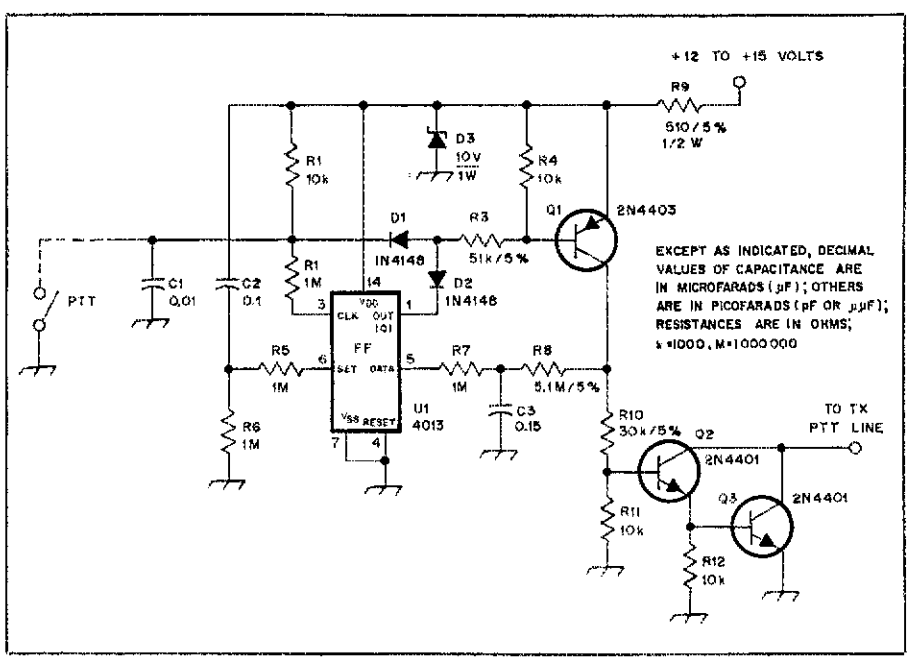


Fig. 1 — Schematic diagram of the "smart" PTT switch. Capacitors are disc ceramic. Resistors are carbon composition, 1/4 watt except where marked. Parts placement is not critical, although the more compact the construction, the easier it will be to fit it inside the case of your radio.

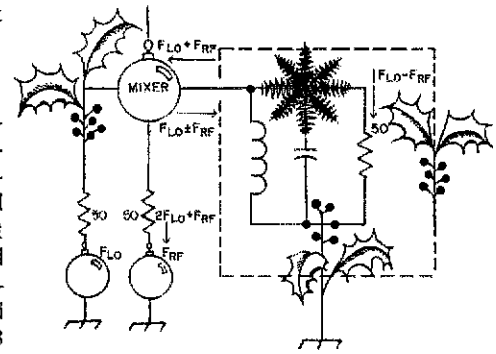
D1, D2 — Silicon signal diode (1N914, 1N4148, or equiv.).

D3 — 10-volt Zener diode (8 to 12 V suitable substitute).

Q1 — Silicon, pnp, general-purpose transistor (2N4403, 2N2907 or equiv.).

Q2, Q3 — Silicon, npn, general purpose transistor (2N4401, 2N2222 or equiv.).

U1 — Dual D flip-flop, CMOS type 4013 (CD4013, MC14013 or equiv.).



SEASON'S GREETINGS FROM THE HAMS AT ARRL/IARU HQ.

(Listed in alphabetical order of call sign)

Richard Palm	K1CE
Jeanne DeMaw	W1CKK
Laird Campbell	W1CUT
George Grammer	W1DF
Elizabeth H. Karpiej	KA1DTU
Joan Merritt	KA1DTV
Byron Goodman	W1DX
Maureen Thompson	KA1DYZ
Chris Schenck	W1EH
Shelly Fuini	WB1ENT
Stephen C. Place	WB1EYI
Paul K. Pagel	N1FB
Doug DeMaw	W1FB/VP2MFW
Hal Steinman	K1FHN
Marian Anderson	WB1FSB/VP2MFR
Marge Tenney	WB1FSN
John Nelson	W1GNC
Bob Atkins	KA1GT
Ed Tilton	W1HDQ
Lew McCoy	W1ICP
Jean Peacor	K1IJV
Stuart B. Leland	W1JEC
Joe Moskey	W1JMY
Clarke Greene	K1JX
Tom Frenaye	K1KI
Brian Downey	WA1KSF
James E. McCobb, Jr.	K1LLU
Stan Horzepa	WA1LOU
Mike Kaczynski	W1OD
Bruce Kampe	WA1POI
George Woodward	W1RN
Richard L. Baldwin	W1RU
Lee Aurick	W1SE
Jerry Hall	K1TD
Perry F. Williams	W1UED
Arline Bender	WA1VMC
Bill Jennings	K1WJ
Chuck Bender	W1WPR
Bob Halprin	K1XA
John Lindholm	W1XX
Sandy Gerli	AC1Y
Joel Kleinman	WA1ZUY
David Sumner	K1ZZ
Dave Bristol	KA2BNV
Mark J. Wilson	AA2Z
Don Search	W3AZD
Dale Clift	WA3NLO
William A. Tynan	W3XO
Gerry Hull	AK4L/VE1BXC
John Troster	W6ISQ
Chuck Chadwick	K8AXL/WA4JXE
Sally H. O'Dell	AE8P
Peter O'Dell	AE8Q
Bernard D. Glassmeyer	W9KDR
George Collins	AD0W
Harry MacLean	VE3GRO
Maxim Memorial Station	W1AW
ARRL hq. Station	W1INF

• *Basic Amateur Radio*

Antennas and Grounds for Apartments

What do you do when the landlord says "no antenna"? Where's rf ground when you are 70 feet up? You won't find any simple answers, but these suggestions are sure worth trying.

By Peter O'Dell,* AE8Q

When my wife and I decided to return to Connecticut, we spent a couple of days going over the apartment ads in the local paper. In one particular Sunday edition, there were about four pages of ads for apartments. Of all those advertising, one apartment complex stated that they "accepted pets and children." Since our family consists of two adults, one three-year-old child and a 10-year-old beagle, we didn't feel that we had much of a choice in the matter. The rental agent (a close relative of Attila the Hun) offhandedly indicated that we could take it or leave it, but that the rules of the lease, including the prohibition of *any* external antenna, would stand without *any* modification. I haven't lived in a place yet where I couldn't put up some kind of antenna and get away with it, so we took the apartment.

How many other hams are in similar circumstances? It is hard to say, but it is probably a sizeable number. If you are one of the multitude, where do you start? The first thing to decide is if there is a chance of getting permission to install an outside antenna. If there is any chance at all, pursue it with vigor. Your best bet is to document your case with drawings of the proposed installation (landlords want to protect their property from damage caused by a poor installation). Material that might make them want you to put up the antenna should be included also. (Photocopy a few articles from back issues of *QST* that tell about the activities of amateurs during natural disasters.)

*Basic Radio Editor

What Has Been Done Before?

For some amateurs there is little or no possibility of getting permission to erect an outside antenna. There are basically two different approaches to the problem: String wire inside the apartment or use something outside that will not be recognized as an antenna. Let's take a look at the last course of action first.

Antennas made of very small wire work quite well when properly fed. If the wire is size number 26 or smaller and is dull colored, it is almost impossible to see once it is a few feet above ground. Over the years this popular approach has come to be known as an "invisible antenna." Dipoles, loops and random-length end feeds are all possible configurations, depending on the physical layout and oddities of architecture that you have available.

Another approach to the problem is to use some object as an antenna that would not normally be thought of as an antenna. Richard Bell, WA4BNO, once lived in an apartment that prohibited antennas. After a couple of months off the air he tried connecting a short wire from his matching network to a down spout located near one of the windows. Having scraped away the paint from a small area, he used an alligator clip to attach the wire to the gutter whenever he wanted to operate. This system may work in other locations. If the gutters are relatively new and are made of aluminum, chances of success are better than if they appear "aged and rusty." In the case of the latter, you would run a very high risk of non-linear rectification of rf, which would generate harmonics at a rate unequaled except by rabbits and mink.

Although condominiums and "planned communities" often prohibit outside antennas, many have no rules regarding the erection of flagpoles. The owner's association of one planned community in the Kansas City area will not permit a prominent DXer to put up an external antenna (no one has spotted the invisible dipole that is mounted under the overhang

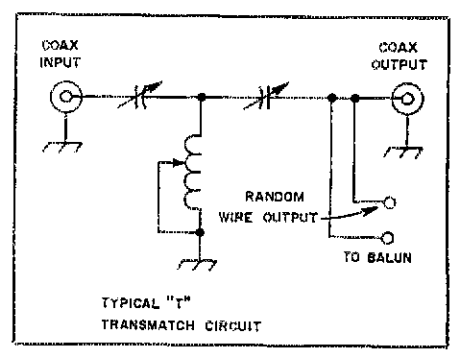


Fig. 1 — This is a typical T-match circuit that has been very popular recently; the "Ultimate Transmatch" is a variation of this circuit. Most commercial versions have a toroidal balun built in to give the user the option of a balanced output.

of his 2-story townhouse). His initial plan was to buy and erect a 60-foot flagpole. But, he was quoted prices in excess of $6000 for a new pole. He is busy searching for a used 60-foot flagpole and expects to have it up by early summer. In the meantime, he is "planting radials." He estimates that it would be relatively simple and inexpensive to put up a 32-foot flagpole (less than $300), but he is interested in 80-meter DX and is determined to have a full-size, 1/4-wavelength vertical for 80 meters.

Another approach, less costly and less involved, uses a flagpole disguise. This was described by Fred J. Schnell, W6OZF, in "The Flagpole Deluxe," which appeared in March 1978 *QST*. Fred built a very thin 40- through 10-meter trap vertical, which he placed inside a 17-foot section of PVC pipe that was fashioned into a flagpole. Anyone for a pair of flagpoles in phase?

The other major option is to string wire inside the building. Normally, with the exception of 10 meters and, in some cases, 15 meters, it will be necessary to "shorten" or "bend" any resonant antenna. Also, the proximity to house wiring, metal gutters and metal framework will affect the performance of the antenna. The antenna may be any configuration that works, e.g. dipole, loop, end-fed random length or the like. It may be horizontally or vertically polarized, or both. You can attach it to the ceiling, string it in the attic or even run it under the rug. The secret is to keep trying until you find something that works. Whatever your final choice is, it will probably be something of a compromise.

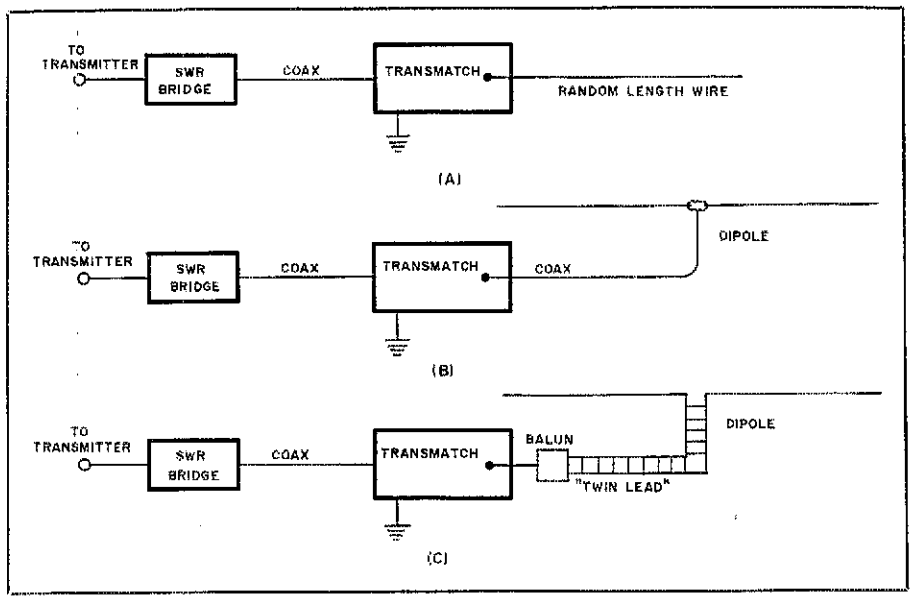


Fig. 2 — Three typical antenna systems used by apartment dwellers. Most suffer from trying to "force" an earth ground when it is physically impossible to have one. Probably the worst course of action for an apartment dweller is to "ground" his station to the cold water pipes.

Got A Match?

As a general rule, any antenna that can be put up inside or disguised on the outside will probably not present a 50-Ω load to the transmitter. Most modern transmitters do not have a wide matching range built in, so more than likely you will need some kind of matching device to trick the transmitter into seeing a 50-Ω load. In recent years the most popular circuit has been the T match (Fig. 1). Variations of this circuit are available from a number of manufacturers; for those interested in "rolling their own," complete construction plans can be found in *The ARRL Antenna Anthology*. (Incidentally, this excellent source of ideas for practical antennas is available from ARRL for $4. Even though most of the content is oriented toward outside, nondisguised antennas, the apartment dweller should derive a great deal of "inspiration" from the contents.) The chief advantage of the T match is that it will match an extremely wide variety of impedances to the transmitter — and it is not particularly critical to tune. The major drawback is that it does not do much to reduce harmonic energy; therefore, if you have one of these matching networks, it is a good idea to put a low-pass filter ahead of it.

Fig. 2 shows the three most typical setups used by apartment dwellers and others restricted to compromise antennas. Much can be done to improve on these installations. The antenna depicted in part A of Fig. 2 is similar to the system that I set up for our apartment, which was of the two-story town-house variety. A metal box had been built into the side of the apartment for installation of an air conditioner. The box provided a convenient means of getting the wire outside of the apartment. Unfortunately, this box was located on the side of the building that faced the other buildings of the complex instead of the swamp in the rear. After I acquired about 300 feet of wire and secured the help of a couple of friends, we spent one Sunday afternoon putting the darned thing up.

I purchased a powerful slingshot (about $5) and an inexpensive fishing rod and reel (about $8) from the sporting goods section of a discount store. We attached a lead weight to the fishing line and used the slingshot to shoot the weight and line over the building. We then removed the lead weight, attached the line to the end of the antenna and "reeled it in." The same procedure was used to get the wire into the tops of several trees.

Because it was Sunday afternoon, the maintenance crew was not around. Few, if any, of the other residents noticed us. The only "incident" came when we attracted the interest of a half-dozen boys playing in the vicinity. They came closer to watch us with fishing tackle and the slingshot. After a few minutes of speculating among themselves as to what we were doing, one fellow bluntly asked us what we were up to. At first I ignored him, but he was persistent and kept asking the same question. A glance from my friend indicated that he felt I would have to give him some sort of an answer. A scenario rapidly went through my mind in which the boy told his father that a radio antenna was up, followed by rumors and complaints to the management for every perceived incidence of interference. I decided that discretion was the better part of valor; I told him such a preposterous lie that he wouldn't dare to repeat it. "I'm putting this up to keep the UFOs away," I said. "Every place I go the UFOs drive me *crazy* unless I put one of these up. As soon as I put one of these up, they go away and leave me alone." The boys rapidly lost interest in what we were doing and left.

Fig. 2B shows the output of the T match feeding coax transmission line, which in turn feeds the dipole. Because the antenna impedance may be influenced by nearby objects or because the antenna may not be resonant, the Transmatch probably sees something other than a 50-Ω load looking into the antenna. A similar system exists at C, except that the coax has been replaced with twin-lead and a balun. One form of balun is a network that transforms a *bal*anced impedance to an *un*balanced impedance. Although it is shown as a separate and distinct item from the Transmatch, the balun is frequently built into the Transmatch housing. Balun transformers are wound for some specific transformation ratio. The norm seems to be to wind them on toroid cores, but they can be wound on air cores also. At very high impedances, the baluns (particularly the toroidal ones) may not perform well.

Each installation depicted in Fig. 2 shows the Transmatch connected to an

earth ground. This is what most of the books and articles have called for over the years. There is just one catch. Suppose your station is located on the second floor and that it is 16 feet (5 meters) from the end of the ground wire attached to your equipment to the end attached to a ground rod. Keep in mind that the whole idea of grounding the station for rf is to have the equipment at a low-impedance (and, therefore, low-voltage) position. How effective is the ground when the station is transmitting on the 20-meter band? At 20 meters, 16 feet (5 meters) is approximately 1/4 wavelength long. A quarter-wavelength of wire will act as an impedance inverter from one end to the other. Since the grounded end is at a very low impedance, the equipment end will be at a very high impedance!

The likely result will be rf hot spots all around the station. Suppose that instead of a wire to ground, you connect a wire to the cold water pipe in your apartment, which will ultimately go to ground. Is it a high or low impedance? But what if this pipe is connected to other pipes in other apartments? What if the telephone company has grounded its equipment to the same pipe? Cable TV? In all probability, you have created more problems for yourself than if you had left the station totally "ungrounded." Actually, in the "ungrounded" situation there may be some capacitive coupling to the ac power line, which may act like a phantom ground. This is why a brute force filter is sometimes needed to clear up TVI.

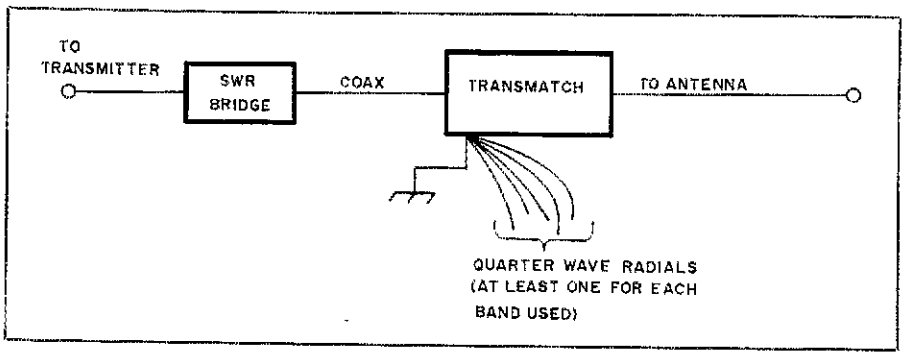


Fig. 3 — Here is an alternative to earth ground for the apartment dweller. At least one quarter-wavelength radial is cut for each band used and attached to chassis ground for the station. This is similar to what the old timers referred to as the counterpoise.

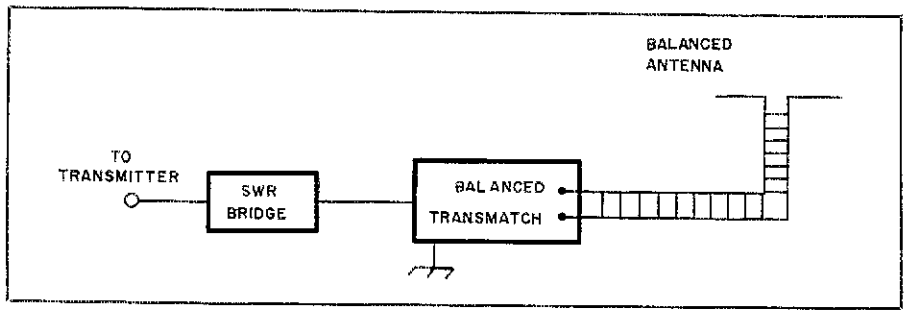


Fig. 4 — A balanced Transmatch is an alternative to the T match. Coax losses and balun losses are avoided by using this system.

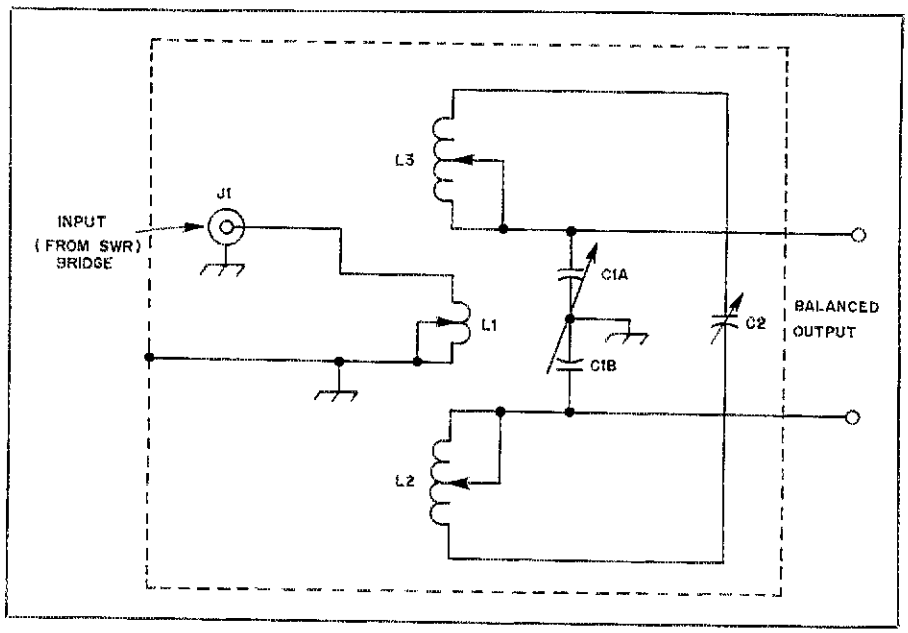


Fig. 5 — Schematic diagram of balanced Transmatch. See text for parts description. Copper-plated alligator clips should be used instead of the ordinary steel clips (Radio Shack #270-373 are suitable). A multipositioned, two-pole ceramic rotary switch may be used instead of the alligator clips on L2/L3. Similarly, a single-pole, ceramic rotary switch may be used at L1. B&W coil stock, shaft couplings, stand-off insulators and miscellaneous parts may be purchased from Radiokit, Box 411, Greenville, NH 03048, Tel. 603-878-1033.

A workable compromise is depicted in Fig. 3. No attempt is made to ground the station to an earth ground. Rather, the equipment is tied to a central point in the station through short pieces of braid. Quarter-wavelength radials are cut for each band to be used and attached to the central point in the station. This is similar to what the old timers referred to as a counterpoise, and it does work. If you have an outdoor antenna, you may want to provide a dc path to ground to allow safe bleed-off of static buildup. If this dc ground is more than a few feet long, I would suggest disconnecting it during operation (you don't operate during a storm, do you?), or at least put an rf-choke in series with the dc ground.

A Critical Balance

When you start with a compromise antenna, it is a good idea to avoid compromises elsewhere in the system since the compromises tend to compound. As mentioned above, in recent years the T match has been the most-often-used Transmatch. The T match has an unbalanced input and feeds an unbalanced output. If a coax-fed dipole is attached to the T match, it should work fine if the antenna is reasonably close to a 50-Ω load to start with. If not, the high SWR on the coax can increase losses. Twin-lead or ladder line is not nearly so lossy. So another approach is to feed the dipole with twin-lead and use a balun at the T match to convert the unbalanced output of the Transmatch to the balanced input of the twin lead. Unfortunately, at extremely high mismatches transformer baluns can also be quite lossy. Under certain conditions transformer baluns can actually generate harmonics!

Fig. 4 shows an alternative to these two systems. If we use a balanced-output Transmatch we can avoid the potential losses of coax and baluns. It can be positioned in the system just as the T match. An SWR bridge ahead of the balanced

Transmatch is used to indicate a matched condition, just as it is with the T match. Several different circuits have been developed over the years, but we recently came across one that is easy to construct and works very well (Fig. 5).[1] Additionally, it can be duplicated in short order at a very modest cost.

Component values are not critical; substitute with whatever you happen to have available. C1A and B are two sections of a three-section, ganged, variable capacitor removed from the carcass of a defunct tube-type a-m broadcast receiver. At the 100-watt output level I have not experienced any arc-over; if that does happen you may have to find a dual-section variable capacitor with wider spacing. Surplus dealers and hamfest flea markets are the suggested sources for the capacitors. C2 is a single-section, 150-pF variable capacitor (it can be one section of another ganged capacitor). Again the exact range is not critical; use whatever you can find. One thing that is somewhat critical is using insulated shaft couplings on both capacitors. Without the couplings, your body capacitance will affect the tuning. C1 can be mounted directly to the chassis, which will ground the rotor; connections to the A-section stator and the B-section stator can then be made to the solder lugs. Both the stator and the rotor of C2 should be insulated from ground; it will probably be necessary to mount C2 on ceramic standoff insulators.

L2 and L3 are made from one piece of coil stock. The coil stock that I happened to use is B&W Air-Dux 1008T (1-1/4-inch diameter, 8 turns per inch, no. 16 wire). Again, reasonable substitutions may be made. Count the number of turns on the total length of coil stock and determine the middle turn. Cut the wire portion of the coil stock at the mid-point, but do not sever the plastic spacers. Solder two insulated wires to each of the ends created by cutting the coil in two. One wire should be 6 inches long and the other should be long enough to reach C1. Attach copper-plated alligator clips to each of the 6-inch wires. The alligator clips will be used to vary the inductance of L2 and L3.

L1 is fashioned from another piece of coil stock of larger diameter, such as B&W 3051 (1-1/2-inch diameter, 4 turns per inch, no. 14 wire). Six to eight turns should be adequate; again attach a short wire with a copper-plated alligator clip on the end to one side of the coil to enable you to tap L1 for the proper amount of coupling. L1 is then slid over L2 and L3 and positioned directly above the center of the coil stock. Mount the coil assembly to the chassis with ceramic standoff insulators at each end of the coil stock (L2/L3). Solder the L1 leads to ground and to the input jack J1. If L1 is not held rigidly in place, it may be necessary to wedge strips of plastic or other insulating material between L1 and L2/L3. Complete the wiring according to the diagram in Fig. 5.

[1]Hawker, "Technical Topics," *Radio Communications*, RSGB, September 1980, p. 905.

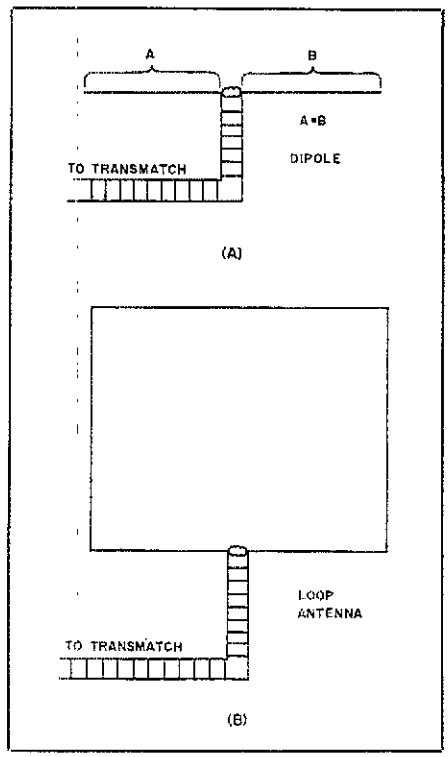


Fig. 6 — Two balanced antennas that should work well for the apartment dweller. The legs of the dipole shown in A should be as long as practical — 65 feet would be considered ideal for each for an 80-meter installation. The balanced Transmatch in Fig. 5 should match any size dipole to the other amateur bands. The loop in B is of any convenient size. It does not have to be laid out in a single plane (flat).

Match It

Adjustment is relatively simple and straightforward. Attach a 50-Ω dummy load to the output of the SWR bridge. Adjust the transmitter for a relatively small amount of power out (e.g. 15 watts from a transmitter capable of delivering 100 watts). Set the controls of the SWR bridge to read full scale in the reference (forward) position. Adjust the SWR bridge to read reflected (SWR); if there are no problems with your equipment, it should read something near 1.1 to 1. Replace the dummy load with the Transmatch and connect a balanced antenna to the Transmatch. Don't touch the transmitter controls during Transmatch adjustment.

Make sure that the taps for L2 and L3 are equidistant from the center of the coil stock; L1 can be tapped at any convenient position. Key the transmitter and adjust C1 and C2 for a dip in the SWR reading. If none is found unkey the transmitter and move the taps on L2/L3 (keeping them the same distance from the center). Repeat the above steps until a match is found. It may be necessary to vary the tap on L1 to obtain the lowest possible SWR reading. Now you can adjust the transmitter for more power and fine tune the Transmatch. Keep a record of the taps for each portion of the band used. This will speed adjustment for future operation. You may also want to use various colored marking pens to mark L2/L3 and L1 at the appropriate spots to speed adjustment.

Two useful balanced antennas are depicted in Fig. 6. The twin-lead can be any convenient length. The legs of the dipole in Fig. 6A can be any convenient length also. If the loop happens to be approximately one wavelength long, maximum radiation will be perpendicular to the plane of the loop; i.e., if it is mounted in a horizontal plane, maximum signal will be straight up. At frequencies other than a full wavelength, maximum radiation will occur in different directions. It is best to experimentally determine the ideal installation for each situation. Either of these in conjunction with the balanced Transmatch should perform adequately inside an apartment, but like other antennas, they will work better if you can get them outside.

There are a few little gimmicks that you learn as you "play around" with indoor antennas. Alan Pike, W8MGF, pointed out to me that plastic mirror clips (found in most hardware stores) are quite useful for holding coax and antenna wires in place. The clips can be mounted to a plasterboard wall with plastic anchors and matching screws. When moving time rolls around, the screw can be removed, the clip taken down and the anchor extracted from the wall. A small amount of spackling compound and a putty knife restores the wall in a few seconds. Holes to attics can be drilled or punched for routing cables and repaired the same way when moving time comes.

Where Do You Start?

The first thing to do is to survey your situation. Is it possible to get something outside? Can you get something in the attic? Is there something that you can use as an antenna that will not be recognized? Start trying things until you find something that works. Keep your eyes open for new ideas or new twists on old ideas that may be applicable to your situation. "Grounding" will probably be the trickiest part of putting in an indoor antenna system. Avoid attaching "ground" wires to the cold water pipes! Strive to optimize everything else since the antenna will probably be a compromise. If at first you don't succeed . . . oh, yeah, I thought I had found the ultimate solution to apartment antennas — a house. But now I am fighting with the city building inspector for the privilege of putting up an antenna on my own property! QST

Silk Screen QSLs for the "Gypsy" Radio Amateur

Homemade QSL cards can be attractive without being expensive. But best of all, they can be original, as well as fun to make.

By Alexander B. Murphy,* WB3IRV, HL9VI

Over the past couple of years, because of my military service, I have operated from several semi-permanent locations including Maryland, the Republic of South Korea and North Carolina. Many of you are probably familiar with the problem of providing QSLs to the many hams you've worked while operating away from the "home QTH." There is a solution to the problem, in the form of commercial QSLs that allow you to write in the QTH and even the call sign. But these generally produce a card that is not very attractive or original. So with the two basic laws of hamming firmly in hand (necessity the mother of invention and good old Murphy's Law), I decided to tackle the problem.

*21 Justin Circle, Henrietta, NY 14467

As I had no previous experience in printing and even less in developing artistic ability, I was at a loss for a starting place until I visited a nearby hobby shop. I noticed a process called silk screening which promised to produce, cheaply and easily, a quality QSL tailored to my needs of varying QTH and call sign.

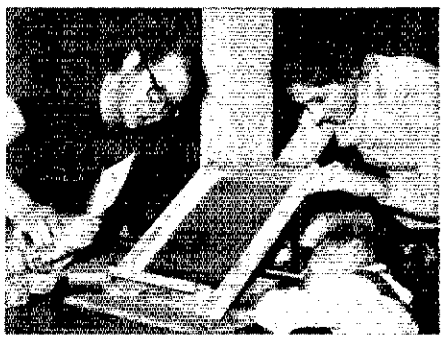
There are several kits on the market for silk screening. They are simple and fun to use. In fact, it is harder to describe the entire process than to actually do it. Table 1 tells you what you'll need, and Table 2 outlines the procedures. Basically, the process involves exposing a positive copy of the desired QSL onto a silk cloth or screen. An ordinary 150-watt electric light bulb with a tin pie plate or aluminum foil as a reflector is used to make the exposure. Time for exposure is not critical.

Table 1
Bill of Materials

Silk screen on a wood frame
Photo emulsion
Photo sensitizer
Squeegee
Paint
Masking tape
Spoon, scissors, damp cloth
Acetate sheets
Felt-tip pens
Rub-on letters
Straight edge
150-watt lamp with tin pie plate or aluminum foil reflector
3 × 5 or 4 × 6-inch (75 × 125 or 100 × 150 mm) cards

Note: The first five items are available in most silk-screening kits.

Shown at the left, the screen is exposed for about 1 hour using a 150-watt electric lamp (note the reflector made from aluminum foil and a paper plate, top of photo). The QSL positive is held on top of the screen with a piece of ordinary window glass during exposure. After the screen is washed with water, the pattern of the QSL will wash out of the screen while the exposed areas will retain the emulsion. Shown at the right is the "press" in action — ink is being squeegeed through the screen onto the card beneath. Don't worry; that ink is washable and won't stain clothing.



The blank cards to be printed are positioned under the screen. Any flat surface can be used as a base under the screen and wood frame. Here we're using a scrap piece of plywood. (It may help speed production to hinge the frame to the base and use guide marks for positioning cards on the base.) A QSL card "hot off the press" may be seen to the left of the frame. Cards can be made at 120 to 200 per hour.

After exposure, the screen is washed in ordinary water to wash out the photo emulsion where it was covered with the QSL pattern. A paste-type, water-soluble ink is then forced through the screen with a large squeegee.

The actual printing process can become a family affair. We formed an assembly line that included my XYL, our six-year old and our three-year old. In less than an hour, we had 120 cards run off the press with no fuss and a lot of fun and satisfaction.

Preparing the Positive

As for Murphy's Law, it was definitely in evidence — not in the printing, but in the preparation of the positive of the QSL. In theory, a piece of tracing paper can be used to draw your positive. However, it was my repeated experience that tracing paper produces a poor-quality screen. To get good line definition and professional quality on the first try, it is much preferable to use a clear plastic or acetate sheet. Draw your QSL on the acetate using the felt-tip pens that are made for that purpose. Dry-transfer letters or rub-ons make lettering simple and produce professional lettering. It is especially good for smaller lettering as in an address. Rub-ons are available in most stationery or office supply stores for $2 per sheet. One sheet has enough letters for several QSL designs. Several letter sizes are available, and you might want to consider the larger ones for your call sign.

Another hint to lessen your work in producing the positive is to segment the art work into two or more separate sheets of acetate. One sheet has your basic design, which seldom changes, the second may have your QTH, and a third has your call sign. By stacking the three segments you get a composite positive QSL with the current information. This is a real time-saver when all that has changed, for example, is the QTH from which you operated. You only need to remake the one acetate that has that information on it and make a new "stack." It's sort of like making a sandwich!

You can print the QSL onto a number of different things. I recommend using either 3 × 5-inch or 4 × 6-inch standard cards. They are cheap and look great. Try to get them without lines on either side. They are available in colors other than white. The big advantage of these is, of course, that you don't have to cut them. Once printed and dried they are ready to use.

This technique for making QSLs is great for those of us who move frequently or for any of us who operate from several locations. It can also be used to make a special card for a contest, operating event or Field Day. This is also a fun way to draw your family into the hobby while at the same time creating a personalized QSL that will be really appreciated by that DX station.

Table 2
Steps to Make a QSL

Step	*Time*
Prepare positive on piece of acetate.	1 hour
Coat the screen with photo emulsion and photo sensitizer.	5 minutes
Dry the screen in a dark place.	1 hour
Expose the screen with the positive taped to it or held down with a piece of glass.	1 hour
Wash the screen with water to "develop" the image of the QSL.	5 minutes
Print the cards.	120 to 200 cards per hour
Dry the cards.	1 hour
Wash the screen with water and store for reuse.	5 minutes
Wash the screen with bleach and water to remove the QSL image. The screen can be reused for a different QSL.	15 minutes

Strays

West Gulf Division Director Ray Wangler, W5EDZ (left), Past Director Roy Albright, N5RA (center) and Vice Director Tom Comstock, N5TC, manned the 20-meter cw position at the San Antonio Radio Club 1980 Field Day site.

ATTENTION HANDICAPPED AMATEURS

☐ Al Kaiser, N1API, has generously offered to build kits for handicapped amateurs who are unable to complete kits because of their disabilities. You pay for the kit and shipping charges and A1 builds your kit for you. Interested? Contact A1 at 194 Glen Hills Rd., Meriden, CT 06450.

THE CORRECT TIME IS . . .

☐ The ninth edition of the *List of Time Signal Stations*, by Gerd Klawitter, is now available from Gilfer Associates Inc., P. O. Box 239, Park Ridge, NJ 07656, for $3.95 postpaid. This 52-page booklet contains station details for time-signal transmissions from 30 countries.

ARRL Southwestern Division Director Jay A. Holladay, W6EJJ (right), gives a special award to Rep. James C. Corman (D-California) for his support of Amateur Radio in Congress. The award was presented at the ARRL Southwestern Division Convention, held in Los Angeles in September. *(K6PGX photo)*

Product Review

Conducted By Paul K. Pagel,* N1FB

Kenwood R-1000 General Coverage Receiver

Technology has progressed to the point where a moderately priced, general-coverage receiver can offer the same performance characteristics that we've come to expect from our ham-band-only receivers. The Kenwood R-1000 is one example.

The receiver is designed to cover the frequency range of 200 kHz to 30 MHz. A VFO tunes any 1-MHz portion of spectrum in this range as selected by the BAND switch located at the bottom, right-hand corner of the panel. This switch is a 30-position rotary type with light, yet positive, detent — similar in feel to the uhf tuners on the newer TV sets. Four lighted push-button switches are used to select either the a-m or product detector and also automatically select the i-f filter bandwidth. In the A-M WIDE position, a 12-kHz (at −6 dB)/25 kHz (at −50 dB) filter is switched in, and for A-M NARROW a 6-kHz (at −6 dB)/18 kHz (at −50 dB) filter is selected automatically. The USB and LSB/CW switches choose the 2.7-kHz (at −6 dB)/5 kHz (at −60 dB) filter. A cw-bandwidth filter is not provided with the unit.

The tone and volume controls are concentric, and no rf gain control is provided; rather, a four-position step attenuator (0 dB, 20 dB, 40 dB and 60 dB) is located to the right of the volume control. An i-f, diode-clipper type of noise blanker is controlled by a push-button switch located under the S meter. The blanker proved to be quite effective on several types of interference including automobile ignition noise, Loran and noise from light dimmers (a common source of interference when listening below the broadcast band).

The receiver is equipped with a digital readout that doubles as a clock. Either the frequency readout or time can be displayed as selected by the FUNCTION switch. The clock is a 12-hour type with indicator lights for A.M. and P.M. Two front-panel buttons, one for hours and one for minutes, allow setting the clock while listening to WWV or other time- and frequency-standard station; contrary to rumor, the clock module is *not* convertible to a 24-hour format. Additional circuitry is provided so that the clock can be programmed to turn the receiver on and off. High-impedance audio output and normally open and normally closed relay contacts are available for connection to automatic tape recorders. It is possible to record a program of interest without being present to do so.

On the rear panel are three antenna connectors, one for mw (200 kHz to 2 MHz) and two for hf (2 to 30 MHz); they are selectable with a small slide switch. A fuse, external speaker jack, line-voltage selector, remote jack and the ac receptacle are also located on the rear panel. The back of the receiver was designed so that it can fit flush against a wall or operating console. The receiver can be operated in a vertical position by resting it on the feet provided at the rear of the cabinet for that purpose. The rugged carrying handle serves as a bail to prop up the front of the receiver when mounted on a horizontal surface. The speaker (located on the top cover) provides adequate sound to fill most any room.

*Assistant Technical Editor

Fig. 1 — Kenwood's R-1000 is a compact performer. The carrying handle also serves as a support if additional table clearance is desired.

The Circuit

The incoming signal is routed through one of six diode-switched filters. Each filter is comprised of a low-pass and high-pass filter section combined to provide a band-pass response. Good skirt selectivity and low passband ripple result from this arrangement. Output from the filter section is fed to a 3SK74 (age'd) rf amplifier. The signal is then buffered and applied to a singly balanced 3SK74 mixer to produce an i-f of 48.055 MHz. The high-frequency PLL signal provides the necessary LO injection. Output from the first mixer is passed through a 48.055-MHz crystal filter and directly to the second mixer, also a singly balanced type. Injection for the second mixer is fixed at 47.6 MHz. The signal then encounters the noise-blanker gate and from there the diode-switched 455-kHz mechanical filters. Output from the mechanical filters is fed to two 3SK74 i-f amplifier stages and a shunt attenuator that is linked to the front-panel rf attenuator. From there, the signal is detected and applied to the audio preamplifier and output stage. BFO energy is supplied by one of two diode-switched crystal oscillators.

Operation of the PLL synthesizer is straightforward. The VFO output (in the range of 5.545 to 4.545 MHz) is mixed with the output from the 47.6-MHz crystal oscillator. The difference frequency is selected, buffered and applied to a second mixer, along with the output from the VCO, to produce an output signal in the 6- to 35-MHz range. This signal is divided by the programmable divider (programmed by the front-panel BAND switch) and compared in the MC4044 phase detector. The output from the phase detector is filtered and fed to the four VCOs that cover the 48- to 78-MHz range. As each VCO is expected to handle only a little more than 7 MHz, clean output should be ensured. An additional mixer combines the output of the VCO with the 47.6-MHz oscillator to produce a signal at the received frequency plus the second i-f. This signal is fed to the counter/clock LSI which presumably contains a preset countdown function. The BFO frequency is not counted directly. Outputs from the counter/clock LSI control a relay for connection to a tape recorder.

Operational Observations

If a knowledgeable user were blindfolded and asked to operate an R-1000 he might think he was listening to a quality, ham-band-only receiver! It has the feel of an expensive piece of equipment. The receiver was used on a continuous basis for a period of three months and within a few feet of high-power hf transmitting equipment. Unless the received frequency was quite close to the transmitter frequency, it was as though the transmitter wasn't even on the air.

Kenwood R-1000 General Coverage Receiver

Manufacturer's Claimed Specifications

Sensitivity (S + N/N of 10 dB or more):

	SSB	*A-M*
200 kHz to 2 MHz	3 μV	50 μV
2 MHz to 30 MHz	0.5 μV	5 μV

Image rejection: greater than 60 dB.
I-F rejection: greater than 70 dB.
Selectivity: *a-m wide* — 12 kHz at −6 dB, 25 kHz at −50 dB
a-m narrow — 6 kHz at −6 dB, 19 kHz at −50 dB
ssb/cw — 2.7 kHz at −6 dB, 5 kHz at −60 dB.
Frequency stability: ± 2 kHz maximum from 1 to 60 minutes after power on. ± 300 Hz maximum in every subsequent 30-minute period.
Power consumption: 20 watts.
Power requirements: 100, 120, 220 or 240 V ac, 50/60 Hz.
Dimensions (HWD): 4-1/2 × 12-3/4 × 8-1/2 in. (115 × 300 × 218 mm).
Weight: 12.1 lbs (5.5 kg).
Clock accuracy: ± 15 seconds maximum per month.
Price class: $500; BWK-1, $3; DCK-1, $6.

Although the receiver noise floor and IMD dynamic range were measured, these numbers cannot be compared directly with other receiver or transceiver measurements published previously. This is because the R-1000 does not contain a cw-bandwidth filter, and all other units checked had this option. Tests on the R-1000 produced the following numbers on 80 meters: noise floor, −133 dBm; blocking dynamic range could not be measured because of reciprocal mixing; IMD dynamic range measured 76 dB. On 20 meters, the following measurements were taken: noise floor, −132 dBm; blocking dynamic range again could not be measured because of reciprocal mixing, and the IMD dynamic range measured 82 dB. These numbers indicate reasonable receiver performance.

Each revolution of the VFO knob produces approximately a 50-kHz change in frequency. While this would be considered somewhat fast for a ham-band-only receiver, it is in line with what is needed for short-wave listening. This rate was not found to be uncomfortable for amateur band use.

The rf step attenuator positions are 0, 20 dB, 40 dB and 60 dB. In operation, the first 20-dB step was often too great and the 60-dB position was never found useful — even with large antenna arrays connected to the receiver. A modification, available from Kenwood, converts the 20-dB steps of the attenuator to 10-dB steps.

There were only two areas where I would register strong complaints. The first concerns the lack of a cw filter or the option for adding one. For the most part the receiver performs as well as many ham-band-only receivers; if it is to be used for ham-band reception, a cw filter is a must. Although an external cw audio filter could be added to the receiver, it would be a poor substitute for a good mechanical or crystal i-f filter.

The other complaint is with the digital-frequency readout. Although the correct frequency is indicated for a-m reception, an incorrect frequency is displayed on either upper or lower sideband. For example, on upper sideband, if a signal on 14.105 MHz is injected into the receiver, the frequency displayed on the readout is 14.106 MHz (when the receiver is adjusted for zero beat) — 1 kHz high. On lower sideband, the display will indicate a frequency of 14.103 MHz (when the receiver is adjusted for zero beat) — 2 kHz low. This error occurs because the BFO is not counted in this frequency-readout scheme. Although this may not be a great concern to some, when used with an amateur transmitter it could result in a station operating outside a particular band if the operator relies solely on the R-1000 frequency readout.

The manual supplied with the R-1000, written in English, German, French and Spanish, is heavy on the operational aspects and light on technical topics. For the intended purpose of the receiver, the manual is more than adequate.

Addenda

An option (DCK-1) is available that provides for 12-volt dc operation of the R-1000. Early production units may benefit from an age and a-m filter bandwidth modification (BWK-1) available from Kenwood. These changes are incorporated in later production units. The a-m age time constant is thereby shortened and the 2.7 kHz filter is switched in with the MODE switch in the AM NAR position; the 12-kHz filter is then out of the circuit and the 6-kHz filter is used in the AM WIDE position.

The R-1000 has a mute circuit for use in combination with a transmitter or transceiver. By grounding pin 7 on the REMOTE terminal (Fig. 3-9 of the owner's manual), the rf stage will be muted. This information was inadvertently omitted from early manuals, but is included for units with serial numbers 0030502 and above.

This reviewer would give the R-1000 an A-, should such ratings apply to receivers. At the price some of the larger distributors are charging for this receiver (under $400), it is well worth the money in terms of short-wave listening enjoyment and its use as an all-around test instrument. Additional information on this product can be obtained from Trio-Kenwood Communications, Inc., 1111 West Walnut St., Compton, CA 90220. — *Jay Rusgrove, W1VD*

HEATH IB-5281 RLC BRIDGE

☐ If you're an average ham, you've got some sort of junk box, that wonderland into which you may delve to produce the much-needed part for that long-awaited project. Ah! But are you certain of the value of that capacitor, inductor or desired matching resistor? If not, then perhaps the '5281 is just the item you need.

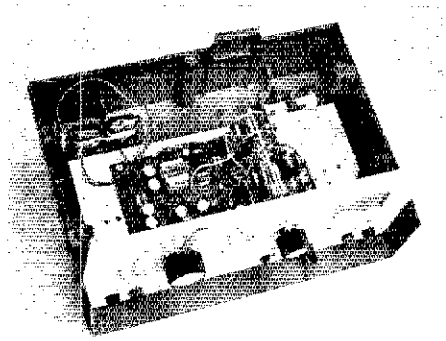


Fig. 2 — The IB-5281 RLC Bridge has compartments for two spare batteries located at the right rear of the chassis. The small vertical panel at the cabinet rear is replaced with an adapter plate when used with the external Heath power supply.

Heath IB-5281 RLC Bridge (S/N02951)

Manufacturer's Claimed Specifications

Resistance ranges: 10 Ω to 10 MΩ in three ranges.
Inductance ranges: 10 μH to 10 H in three ranges.
Capacitance ranges: 10 pF to 10 μF in three ranges.
External standard range: 1:1 to 10:1.
Cabinet dimensions (HWD): 5-3/4 × 11 × 7-3/4 in. (146 × 279 × 197 mm).
Price class: $45.

Heath introduced the IB-5281 RLC Bridge along with five other members of the same family in their 5280 series of test instruments. Aimed primarily at the beginning hobbyist, student or service technician, they were designated to permit the assembly of a low-cost test bench.

Operational Description

The '5281 is a solid-state unit that permits you to determine unknown values of capacitance, inductance or resistance within certain limits. It operates according to the principles of the Wheatstone bridge. To permit measurement of inductance and capacitance, the bridge must use an ac voltage source. In the '5281, this is provided by a Wien bridge oscillator. The oscillator has three output frequencies — 1000 Hz, 10 kHz and 100 kHz — which allow measurement of R, L and C in three separate ranges. In addition to using internal standards for matching purposes, the bridge furnishes a means of using an external standard comparison method. This becomes useful when attempting to match accurately one or more R, L or C components to each other.

The IB-5281 may be powered either by internal 9-V batteries (two required, not furnished) or a power supply capable of providing both ± 9 volts (such as the Heath IPA 5280-1) at less than 10 mA each. Unfortunately, Heath does not supply the external/internal power-supply selector switch, connectors or mounting plate for use with an outboard supply with the '5281 kit. As another alternative, the constructor of the bridge could build a power supply in the cabinet without too much difficulty; there's plenty of room.

Assembly and Calibration

There is no errata sheet to contend with and no problems were encountered during construction. The component quality is excellent. All resistors used are 5% tolerance, carbon-film types. As may be seen in the photograph, the majority of components are mounted on the single pc board of the multi-wafer RANGE switch. Assembly and testing of the IB-5281 took about four hours, not counting the time spent in tracing an incorrectly placed wire on the range switch (attributed to bleary 4:30 A.M. eyes!). Calibration of the bridge takes less than five minutes using a 100-ohm, 5% tolerance resistor supplied for the purpose.

An attractive blue and white plastic case is used to house the instrument. At the rear of the upper half of the unit is a small compartment which is used to store the clips, standard(s), or whatever else you feel you might need during

use of the instrument. Front-panel-mounted banana jacks are used to mate with banana plug/alligator clip connectors to introduce the unknown component into the bridge circuitry.

Results and Use

While the '5281 is not a precision lab instrument, the accuracy of the unit will certainly suffice for most Amateur Radio applications. After the unit was completed, I immediately set about checking some of the rf chokes, resistors and capacitors I had on hand. As many of you will appreciate, capacitor markings can be somewhat confusing, but the '5281 rapidly penetrates that cloud of confusion. Determining the values of those unmarked rf chokes in my junk box was not only fun, but enlightening: You can't "call 'em the way you see 'em" all the time! Using the '5281 is certainly a lot easier than using a GDO, some standards and a calculator to determine unknown component values.

Although no accuracy specification is given, I found that over most of the range I was able to easily interpolate the dial readings to within 10% of the actual value, and many times to within 5%. This was determined by comparing known capacitance, inductance and resistance values (measured on ARRL lab equipment) to the values indicated by the '5281. Dial markings at either extreme of the dial range are more closely spaced — and determination of the actual value somewhat more difficult — at those points. Don't forget, there also exists the ability to use an external standard (at the Z_x terminals) as a means of comparison when it is desired to closely match certain components for a specific purpose.

I feel that the low cost of this unit justifies its occupying a space on the work bench right alongside the TVOM and DMM; this is especially true if you're a tinkerer and "pack rat." Battery operation and light weight make the IB-5281 really portable — just the thing to take with you to a buddy's shack or a flea market. — *Paul K. Pagel, N1FB*

COMTRONIX-FM80 10-METER FM TRANSCEIVER

☐ With almost 400,000 amateurs in the United States, it is still a small world. After unpacking the Comtronix-FM80, I connected it to the tribander and answered WB6VZY, who was calling CQ on 29.6 MHz. We exchanged the usual information; then we found out each other's identity — I was doing a review on the FM80 and he is part owner of KonaCom, the importer of the FM80! Ten-meter fm is like that. It also has an "intercom" flavor reminiscent of 2-meter fm, but the DX aspect of it is much higher — at least while we are near a sunspot maximum.

The unit is "bare bones" with none of the bells and whistles that we have come to expect in the fm rigs designed for 2 meters. It is a 10-watt (1-watt low power), 10-meter fm-only, synthesized transceiver; the closest thing to a bell or whistle is the built-in repeater offset. It would appear that the FM80 has been built with the idea of keeping the cost as low as possible. In addition to economy, there are several advantages to taking this route. If the unit is being operated mobile, one can merely set it and forget it. This strikes me as being somewhat safer than some of the computerized rigs for 2 meters which, to be operated safely, require either a copilot to do the programming or a roadside stop to make any changes.

Comtronix FM80 10-Meter FM Transceiver (S/N 960421)

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 28.91 to 29.7 MHz.	Same
Size (less projections): (HWD) 2-1/8 × 6-1/2 × 8-3/4 inches (55 × 165 × 223 mm).	Same
Power output: 10 watts (reducible to 1 watt).	13 watts @ 13.8 V dc.
Operating voltage: 13.8 V dc (± 15%).	
Maximum current at 13.8 V dc: 2.2 A.	2.2 A
Weight: 6.5 pounds (3 kg).	
Receiver sensitivity: 0.5 µV for 20 dB of quieting.	
Price class: $260.	

In appearance, the FM80 resembles the ubiquitous imported CB rigs. Everything is broadbanded and pretuned, reducing the number of control functions to a minimum. Frequency coverage is from 28.91 MHz to 29.7 MHz in 10-kHz steps (that adds up to 80 "channels," which is presumably where the 80 comes from in the name). The 80 channels are selected by using a 40-position rotary switch to step the synthesizer up and down; in addition, two mixer crystals are switched in and out with a push-button-type switch. Two seven-segment LED displays provide readout of the "channel" number from 1 to 40. Unfortunately, there is no active visual indication differentiating between mixer crystals A and B; one must note whether the switch is "in or out." That's really a rather minor inconvenience and shouldn't be of any consequence — unless you happen to have a three-year-old harmonic who loves to push buttons (I have one). One could easily add one or two LEDs to give an active visual indication of which range the unit is tuned to.

The first nine channels of the A group are below 29 MHz, which virtually constitutes illegal operation in the U.S. FCC rules and regulations, Part 97.65(e), states: "On frequencies below 29.0 MHz the bandwidth of an F3 emission (frequency or phase modulation) shall not exceed that of an A3 emission having the same audio characteristics." It is not illegal to use fm below 29 MHz — it simply is not practical to use *legal* fm. Another problem area in terms of frequency coverage is that the satellite downlink frequencies are located in the midst of the 80 channels. Channels 10 through 20 of the B group appear on frequencies from 29.40 MHz to 29.50 MHz. Comtronix points this out in the owner's manual, but they make an error on the conservative side. They include the frequencies 29.51 through 29.55 MHz as part of the satellite frequencies. In actuality, those frequencies are in the repeater input section of the ARRL 10-meter band plan.

One of the questions that I pondered before using the rig was whether 10-kHz channel spacing had any value. (The ARRL band plan calls for 20-kHz spacing.) On a recent trip during a band opening on 10 meters I had a chance to make some first-hand observations. As seems to be usual, stations from all over the country east of the Rockies were showing up on 29.6 MHz. Operators were politely taking turns working each other. One station that I worked suggested that we "move up 10," which we did. We then carried on a "rag chew" for nearly one-half hour. In that time, I did not notice any adjacent-channel interference from the QSOs that were continuing on 29.6 MHz. On the other hand, I have tuned up or down 10 kHz when a very strong signal was on 29.6 MHz and found those tertiary channels subject to high levels of adjacent-channel interference. Probably, the prime consideration is whether or not the sidebands (from adjacent channels) that extend into the passband of the receiver are very strong. Thus, 10-kHz steps give the FM80 additional versatility by providing *possible* simplex frequencies that are sandwiched in between repeater frequencies.

Is 10 watts enough power to be useful? There is no clear cut answer — it depends. When the band is not open, if you want wide-area, simplex, mobile-to-mobile coverage, 10 watts probably isn't enough. On the other hand, when the band is open, 10 watts is more than sufficient for long-distance communications. While mobile recently, I worked an Indiana station simplex. He was using a half-wave vertical antenna at his QTH along with an FM80. I was operating the FM80 into a quarter-wave

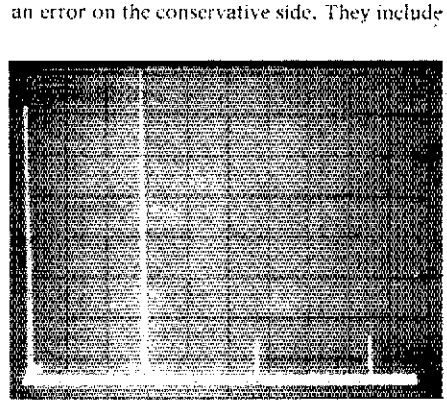


Fig. 3 — Spectral display of the Comtronix FM80 in the 10-watt position. Vertical divisions are 10 dB each. Horizontal divisions are 10 MHz each. The products close to the carrier frequency are 72 dB down. Second and third harmonics are down at least 60 dB.

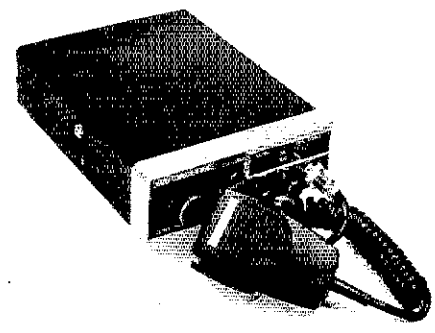


Fig. 4 — An easy way to 10-meter fm. The Comtronix FM80 presents a simple but functional control panel.

whip mounted on the bumper. He asked how much power I was using because my signal was pegging his S-meter. I replied that I was using the rig in the 10-watt position and that I would go to the 1-watt position to see if he could still copy me. I did, and he reported that the signal had fallen from S9-plus to S8, but that it was still full quieting! If an operator feels that 10 watts is not sufficient, it would be a simple matter to construct a small, solid-state power amplifier.

I am somewhat disappointed with the manual that is supplied with the FM80. Like the rig, it is "bare bones." The schematic diagram is reproduced on a single page. To say the least, the symbols on the diagram are small and densely packed. The description of the functioning of the circuits is sketchy. There are no board layout diagrams or trouble shooting hints; nor are there any alignment procedures. The manual is one place where a little elaboration would have gone a long way.

My overall impression of the FM80 is very good. It is a solid performer without a lot of frills. Additionally, it is a relatively inexpensive and easy way to get on a fun-filled band. — *Pete O'Dell, AE8Q*

THE IMPROVED BENCHER PADDLE

☐ With little fanfare and with a price increase scarcely befitting the ravages of inflation alone, Bencher, Inc., has brought out a significantly improved version of the original paddle, which was reviewed on these pages in May 1978. The improvements include: A heavier and thicker base — 5/8 in. (15.9 mm) instead of 1/2 in. (12.7 mm); crimped spring ends which pinch the adjustment screws and hold the spring captive; gold plating on the pure silver contact points; and lastly, elimination of the Achilles' heel of the basic FYO paddle design — the tendency of the mechanism to fly apart when the paddles were accidentally bumped or pushed in the wrong direction. Bencher has added pinion screws which act to limit the movement of the parts so they can never disengage from the pivots. These added screws do not interfere with the normal motion of the paddles during sending.

Some operators might prefer to have the two clear plastic finger assemblies positioned closer together than those supplied on the "stock" paddle, 11/16 in. (17.5 mm). It's an easy task to remove one of the finger assemblies and remount it on the *inside* of its metal support arm. This will reduce the spacing to 1/2 in. (13 mm).

The Bencher paddle is made by Bencher, Inc., 333 W. Lake St., Chicago, IL 60606. Price class is $43 for the steel-base model and $53 for the chrome model. — *John C. Pelham, W1JA*

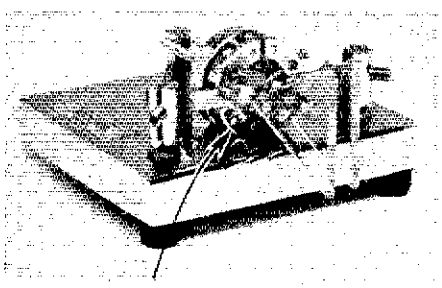


Fig. 5 — One of the two screws that secures the mechanism of Bencher's new paddle is shown by the arrow in the photo.

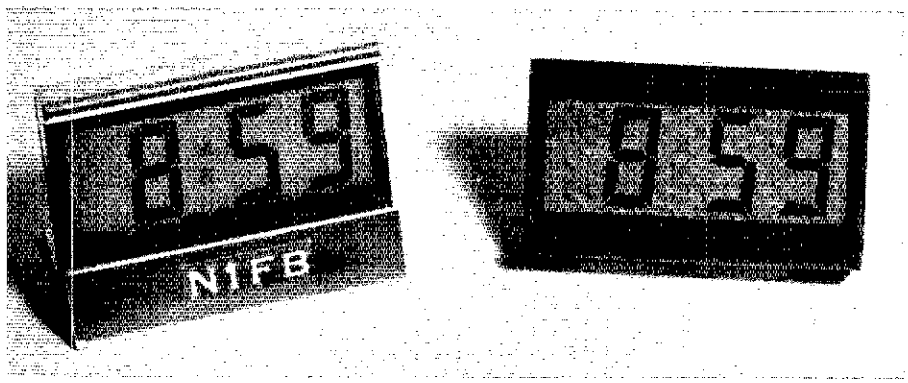


Fig. 6 — Two versions of the Mity-Time clock are shown here. The unit at the left is supported in a brushed-aluminum stand, while the right-hand unit is fitted with Velcro tape for use as described in the text.

THE MITY-TIME LCD CLOCK

☐ Timepieces have become smaller and smaller in recent years, with the advent of electronic clocks and wristwatches. The Mity-Time clock is an interesting and versatile unit, an effective timekeeper for many ham radio needs.

The clock is small — 2 × 1-1/4 × 1/2 inches (51 × 32 × 13 mm) and sports a 12-hour LCD display with 5/8-inch (16-mm)-high digits. The user has a choice of two modes of operation: The clock can either display time of day with a flashing colon for seconds, or can produce a readout with the time of day and day/month being digitally displayed. In the latter mode, the display alternates between time and date in one-second intervals. One would hope that the manufacturer would eventually produce a model with a 24-hour clock, which would be even more suitable for communications-oriented use.

The clock is supplied with a small piece of self-adhesive Velcro tape to facilitate mounting (such as on an automobile dash), and a small aluminum stand to permit desk mounting. The Mity's small size allows it to be located almost anywhere one might desire. Thanks to the Velcro tape, the clock's a natural for the car or even a motorcycle. One review unit spent some months affixed to the dash of my auto. On several occasions, the easy-to-read digits were convenient for reporting time of day when logging a repeater autopatch contact. Initially set to WWV, the clock has performed accurately within 10 to 20 seconds of that standard since then and seems to operate well despite widely varying temperature extremes. Once the display blanked out after the car had been parked in the sun for several hours. The clock was nearly too hot to touch! I turned on the air conditioner, and within a few minutes the display returned to normal; the accuracy didn't appear to have been affected at all. I haven't had the occasion to expose the Mity to extremely cold temperatures such as one would experience in a New England winter, but my initial impression is that there would be no problem.

The Mity-Time clock is made in the USA and is available from Grandview Audio Electronics, 13302 South 10th St., Grandview, MO 64030. Price class: $25. — *Sandy Gerli, ACIY*

AEA MM-1/MK-1 SUPPLEMENT

☐ Because the reviewer initially used preliminary manuals, some discrepancies appeared in the AEA MorseMatic MM-1 and MK-1 "Product Review" in October 1980 *QST*. During memory overrun, the operator can continue loading into the MM-1 memory until the monitor frequency drops significantly. At this point, paddle entries do not enter memory, but overflow. Any message(s) loaded prior to the tone change are retained. To finish an interrupted message entry, simply clear one of the stored messages and then add to the desired message entry.

Separate audio outputs are available for the monitor and feedback tones. Either one may be independently disabled by removing a diode from the pc board. Thus, the auditory feedback need not be lost if a monitor note is not desired.

The MK-1 can key either positive- or negative-polarity key lines. Under some circumstances, it is necessary to short out a diode on the pc board. This procedure is explained in the operator's manual. — *Paul K. Pagel, N1FB*

TANDY WIRE AND CABLE RG-8/M COAXIAL CABLE

☐ A recent letter from an ARRL member inquired about the new "super coax," as he called it, referring to the RG-8/M coaxial cable offered by Radio Shack. He wrote, "The specs are better than my good . . . super low-loss RG-8/U that loses 2.0 dB per 100 ft at 6 meters. If what they say is true, than that should be front page of *QST*."

A person reading the literature about RG-8/M might well be skeptical. "Our new RG-8/M coax gives you the performance of large, bulky cable in a smaller, more flexible size — just slightly larger than RG-58/U!" Now most of us have been schooled to think "bigger is better" when it comes to coaxial line with low losses. Has Tandy Wire and Cable somehow discovered the combination of materials and manufacturing techniques to disprove the idea, showing that it doesn't necessarily have to be bigger in order to be better?

We obtained a 100-ft (30.48-m) length of Tandy's RG-8/M coax for examination. Removed from its shipping box, the roll weighed in at 3 lb 8 oz (1.59 kg). That's less than 0.6 oz per foot, or about 52 grams per meter, quite light in weight when compared to ordinary RG-8/U cable. The outside diameter of the line is approximately 1/4 in. (6 mm). Standard RG-59/U fittings may be used.

This cable bears the identification, TANDY WIRE & CABLE TYPE RG/8 MINI-FOAM, and is very flexible. It uses a low-density foam

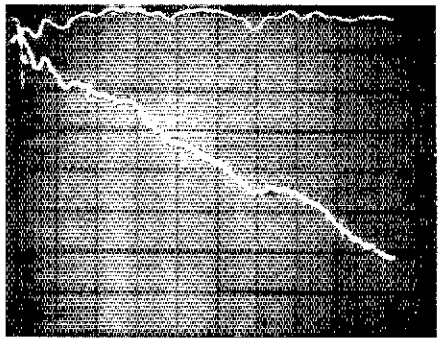


Fig. 7 — Attenuation versus frequency in Tandy's RG-8/M coax line. The line length for this measurement was 98 ft, 8-1/2 in. (30.09 m), so the attenuation data must be multiplied by a factor of 1.013 to obtain dB per hundred feet. The wavy line near the top of the photo represents the input signal level to the coax line, while the lower, thicker line in the photo represents the output into a matched load. The attenuation calibration thus is relative, rather than absolute, with the vertical scale at 2.0 dB per major division. The horizontal scale is 100 MHz per division, or 0 to 1000 MHz.

Tandy RG-8/M Coaxial Cable

Manufacturer's Original Specifications	*Measured in ARRL Lab*
Center conductor: 16 AWG, 19/29 ga. copper.	
Shield: Copper, 92.18% coverage.	
Jacket: Black PVC, 0.242-in. OD.	
Impedance: 52 Ω.	52 Ω nominal.
Capacitance: 25.5 pF per ft.	25.5 pF per ft.
Velocity of propagation: 76.4%.	76.4% at 10 MHz.
Attenuation per hundred ft.	
at 10 MHz: not specified.	1.0 dB.
at 30 MHz: not specified.	1.3 dB.
at 50 MHz: 1.5 dB.	1.5 dB.
at 100 MHz: 2.0 dB.	2.5 dB.
at 200 MHz: 2.5 dB.	3.8 dB.
at 500 MHz: 6.0 dB.	7.6 dB.
Power-handling capability: not specified.	

dielectric, but one that is quite tough and cannot be distorted by bending or scraping with a thumbnail. A short length of the line was given severe twisting motions to simulate the winding and unwinding of the line about a mast when used with a rotator, only more so. No harmful effects to the line were noted. The results of electrical measurements made in the ARRL lab are included in the accompanying chart and photograph. Our measurements did indicate the attenuation to be somewhat greater than Radio Shack originally specified. The Radio Shack catalog does not specify the power-handling capability, but similar line of another manufacturer[1] is rated at 1300 watts of input at 27 MHz, 450 W at 200 MHz, and 320 W at 400 MHz.

The manufacturer's attenuation specifications shown in the table are those published when the cable was first introduced. The manufacturer informs us now that the initial figures were in error and that the ARRL lab figures agree with measurements taken since that time.

Mini foam is available from Radio Shack stores, stock no. 278-1328. The price class in the U.S. is 21¢ per foot, with a minimum order of 25 feet. If you're planning to replace your 50-Ω transmission lines, this new "super coax" may interest you. — *Jerry Hall, K1TD*

TRIO-KENWOOD DM-81 DIP METER

A refreshing addition to the usual Kenwood line of transmitting and receiving equipment was released recently. It is a solid-state, self-contained dip meter — the DM-81 — which operates from 700 kHz through 250 MHz. The unit is housed in a rugged aluminum case that includes a snap-in type of drawer at the bottom end of the case. This drawer is used to store the seven plug-in coils, a grounding clip, a capacitive probe and an earphone. Two of the plug-in inductors are printed-circuit coils. They are used for the two vhf tuning ranges. The coil ranges are (±3%): 0.7 to 1.6 MHz, 1.5 to 3.6 MHz, 3.0 to 7.4 MHz, 6.9 to 17.5 MHz, 17 to 42 MHz, 41 to 110 MHz and 83 to 250 MHz. The review model showed only one false dip of significance. This was noted at approximately 200 MHz, but it was not deep enough to impair the performance of the dipper.

The instrument employs one FET, three bipolar transistors and three diodes. The complete circuit is shown in Fig. 9, as copied directly from the instruction booklet.

Various functions can be performed with the DM-81. Among them are the field-strength (relative) and absorption frequency-meter operations. The unit can also be used as a signal generator. A mode switch enables the operator to apply modulation to the dipper signal for adjustment of a-m receivers; a 1000-Hz tone is used.

Crystals can be checked with the DM-81 by plugging them into the FT-243 and HC-25/U accommodating sockets at the top of the case. The crystal activity is indicated on the dipper sensitivity meter. Crystals can be used in this manner to generate marker frequencies, when desired; those in HC-6/U holders can be checked by holding them so they make positive contact in the FT-243-accommodating socket.

Unknown capacitances and inductances can be determined with the dip meter. The instruction book shows clearly how to conduct tests of this type. A chart provides the exact inductance of each plug-in coil. This information is useful when checking the unknown values of capacitors.

A capacitive probe ("searching needle") is provided for probing tuned circuits that can't be reached with the plug-in coils. The probe is useful for checking resonant frequencies of toroidal tuned circuits. Conventional inductive coupling is not effective because of the inherent self-shielding properties of toroids.

The dip meter can be used for the standard amateur applications of checking antenna and tuned-circuit resonances. We can't call it a GDO (grid-dip meter), because there's no tube in the oscillator, and hence no grid! A "base-dip meter" would be appropriate in this example, since the oscillator contains a bipolar transistor.

I checked the accuracy of the dial calibration in the various tuning ranges. The capacitive probe was coupled to an Optoelectronics 1.5-GHz frequency counter for this test. Calibration accuracy was outstanding for an

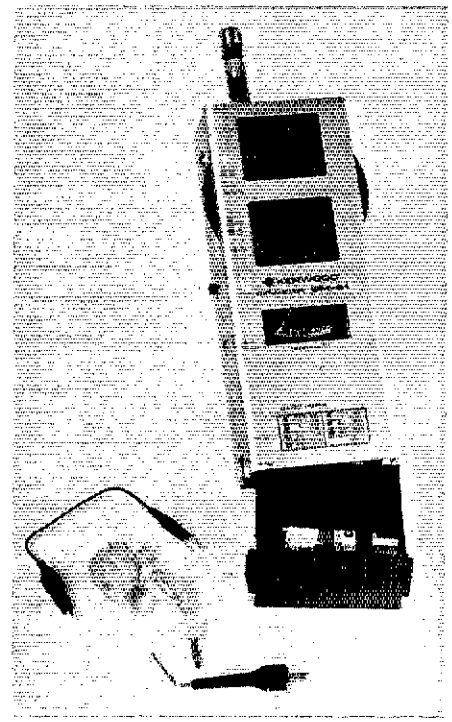


Fig. 8 — The Trio-Kenwood DM-81. The snap-in drawer at the bottom of the unit is shown here along with some of the accessories mentioned in the text.

Trio-Kenwood DM-81 Dip Meter

Manufacturer's Claimed Specifications	*ARRL Lab Results*
Freq. range: 0.7 to 250 MHz (±3%).	Same.
Modulation tone: 1000 Hz.	1067 MHz.
Power Source: 9-volt dc (battery).	
Power consumption: 9 mA.	9.4 mA.
Dial accuracy: None stated.	Excellent (see text).
Color: None stated.	Brushed aluminum with black knobs and trim.

Dimensions (HWD): 7-1/8 × 2-3/4 × 1-3/4 inches (180 × 70 × 45 mm).
Weight: 22 oz (690 g).
Price class: $125.
Manufacturer: Trio-Kenwood Communications Inc., 1111 West Walnut, Compton, CA 90220.

[1]See "Berk-Tek RG-8X Coaxial Cable," Product Review, December 1979 *QST*, p. 55.

instrument of the DM-81 variety. For example, while checking the highest range (83 to 250 MHz) the dial inaccuracy was only 100 kHz at 83 MHz and 250 kHz at 250 MHz (1%). Some of the inaccuracy was probably caused by coupling to the capacitive probe, thereby detuning the dipper.

Dip meters have long been a "standard" item in the ham shack, even if no other instrumentation was available. A dipper is somewhat a general-purpose "do all" sort of gadget, and is a valuable tool for testing or developing antennas and rf circuits. — *Doug DeMaw, WIFB*

THE MACROTRONICS RITTY RITER

☐ Are you a radioteletype aficionado who appreciates the "green key" artform? Are you using the Macrotronics M800 RTTY system with a Radio Shack TRS-80 microcomputer?

If you have answered both of these questions in the affirmative, you will appreciate Ritty Riter, Macrotronics' new TRS-80 program that provides the RTTY artist with a versatile paintbrush. Designed to be used in conjunction with Macrotronics M800 program (see the review of the M800 in November 1979 *QST*, page 50) by means of the M800 "external program" command, the key to the versatility of the Ritty Riter is the maneuverability of the TRS-80 cursor. A wide range of commands permits the user to quickly move the cursor all over the CRT display to create various kinds of RTTY art. The size of your artwork is limited by the amount of RAM installed in the TRS-80, while the creation itself is limited only by the artist's imagination.

Ritty Riter may be loaded into your computer by means of the "external program" command of the M800 or the TRS-80 BASIC "system" command for stand-alone use. In the stand-alone mode, artwork can be created, changed and saved on tape for future transmission. In the M800 mode, Ritty Riter is loaded first and then any previously recorded artwork can be loaded for transmission, or new artwork can be created on the spot. Note well — under M800, all artwork resides in the memory allocated to the M800 "big message," so do not use "big message" and Ritty Riter simultaneously.

All art created with Ritty Riter may be personalized by typing strings of the symbol "@" within the artwork. Before each transmission, the computer will ask you to personalize the artwork. By entering a call sign, name or any other statement, that entry will be repeatedly transmitted within the artwork, wherever the strings of "@" appear.

A word of advice: It is a good idea to make a hard copy of your artwork to verify that it looks like you intended it to look. My CRT display is more compact than the output of my printer and any artwork I create on the CRT tends to be elongated when a hard copy is printed. Check this out on your system and adjust your creations to compensate for any difference you may discover.

Ritty Riter is available on cassette tape and includes an adequate instruction manual. To use Ritty Riter to its fullest potential, you should have the M800 program — that requires at least 16 K of RAM, BASIC Level II and the M80 interface hardware. Ritty Riter is available from Macrotronics, Inc., 1125 North Golden State Blvd., Suite G, Turlock, CA 95380. Price class: $50. — *Stan Horzepa, WA1LOU*

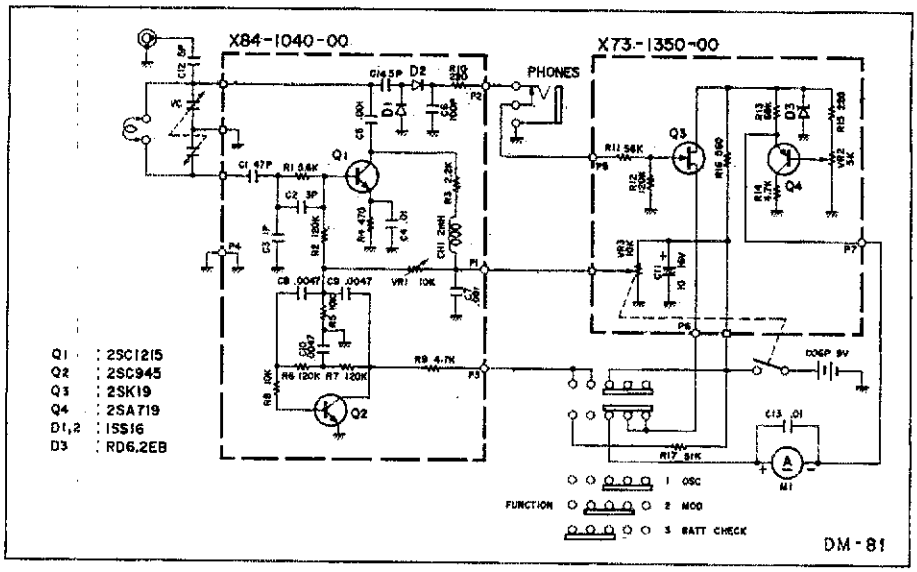


Fig. 9 — Schematic diagram of the Kenwood DM-81 dip meter. The electronic symbols do not conform exactly to those usually found in *QST*, since the diagram was taken directly from the instruction book. The dashed lines indicate individual pc-board modules.

ALLIANCE HD-73 HEAVY-DUTY ROTATOR

☐ When it comes to a rotator for that beam, most hams are of the opinion that "Well, you've seen one and seen 'em all." Many amateurs don't really stop to consider how a rotator is designed and what conveniences it might offer. After all, a rotator's only consideration is the capacity it'll handle, right? Wrong! Enter the HD-73.

The rotator head offers some interesting features that became apparent when I installed it. The mast clamp is designed to allow precise centering of the mast on the rotator body without the need for shims. Correct alignment reduces the possibility of undue stress and binding when the mast and antenna are rotated. In addition, a tight-fitting plastic cover surrounds the cable connections, ensuring that no moisture or dirt will harm the terminal strip. The ball race and gears are very substantial for a rotator head of its size, and the housing is cast aluminum and well-finished.

The control unit, finished smartly in black plastic with a brushed-aluminum face, contains the most interesting feature of the HD-73: There's no separate brake switch. What's more, there are two rotation speeds available on the control lever. Normal operation is about 1 rpm and the slow speed about 1/2 rpm. This feature is handy for turning an array slowly in high winds, or for more accurate aiming of narrow-bandwidth arrays such as might be found in vhf work. The automatic braking system uses a centrifugal friction brake rather than a locking-pin arrangement operated by a solenoid. It's well known that an antenna array will take longer to coast to a stop in high winds than if no wind were present. The brake in the HD-73 adjusts itself according to the turning forces against the array, to set the brake when turning has nearly ceased. Does this arrangement provide an adequate lock? I believe so. The rotator was installed in my tower to turn a Wilson System 40 tribander — about 13 square feet of antenna area including the masting. The HD-73's rated at 10.7 square feet! While working up on the tower recently, I observed some very strong wind gusts — I estimate nearly 50 mi/h. The rotator windmilled only once, and only for a few degrees. It appears to me that this indicates a good, strong braking system for the rated capacity, with some "breathing space" built in. Had the tribander been smaller, it's likely that there would have been no windmilling. This arrangement would seem to be more favorable than the solenoid type of positive lock that can be damaged permanently if the brake is set while the antenna system is still turning. A further fail-safe feature is a thermal limiter within the control unit that shuts down the rotator when the power transformer gets excessively warm from repeated operation. So far, the cutout hasn't opened up in my installation, which indicates that the transformer and power supply are more than adequate to handle loads the rotator is rated for.

In all, the HD-73 presents a well-designed unit. I was somewhat skeptical about using this system to turn an antenna and mast totaling 2 square feet more than its rated capacity. Alliance, however, had given me the go-ahead. Their confidence in the HD-73 is deserved — this rotator is entirely up to the task. The HD-73 is available from: Alliance Mfg. Co., Inc., 22790 Lake Park Blvd., Alliance, OH 44601. — *Sandy Gerli, AC1Y*

Alliance HD-73 Heavy Duty Rotator

Manufacturer's Claimed Specifications

Mast mounting size: 1-3/8" OD to 2-1/2" OD (38 × 63 mm).
Mounting: In tower (preferred) or on mast with extra brackets supplied.
Cable required: 6-conductor, equiv. to Belden-type 8448 with two wires not used.
Voltage input: 117 V ac, 60 Hz, ± 12 V.
Rotator weight: bare: 6-3/4 lbs (3.06 kg).
Rotator speed: dual — 1 rpm and approx. 1/2 rpm, selectable.
Power transformer protection: dual — fuse and thermal limiter.
Metering: north-centered.
Braking system: automatic, centrifugal.
Price class: $155.

Hints and Kinks

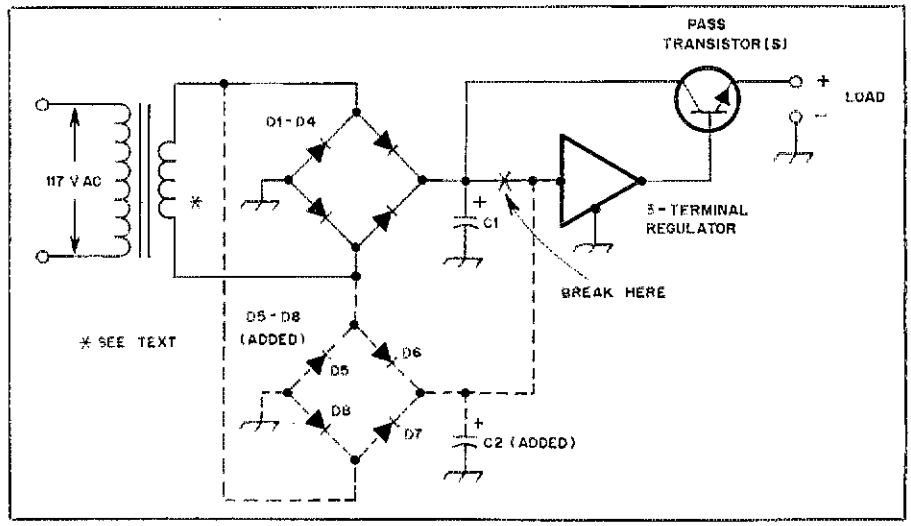
Conducted By Stuart Leland,* W1JEC

IMPROVING RIPPLE-FREE CURRENT CAPABILITY OF LOW-VOLTAGE POWER SUPPLIES

☐ The accompanying schematic diagram indicates a modification for low-voltage power supplies to upgrade their ripple-free current capabilities. If the current drain pulls the rectified voltage down to where it is insufficient for proper operation of the regulator, ripple and poor regulation will result.

Typical input requirements for a 15-volt regulator are: 17.5 V minimum, 35 V maximum and 27 V recommended. This means that ripple excursions below 17.5 V cannot be tolerated.

Addition of a second rectifier and C2 will provide adequate voltage for the regulator. C2 capacitance requirements are not high. If a center-tap transformer is used, add two diodes and C2. If the existing transformer and filter can provide the required output voltage (plus junction drop) and current to the pass transistor(s), ripple-free regulation will result. — *Howard W. Johnson, W7NU, Seattle, Washington*

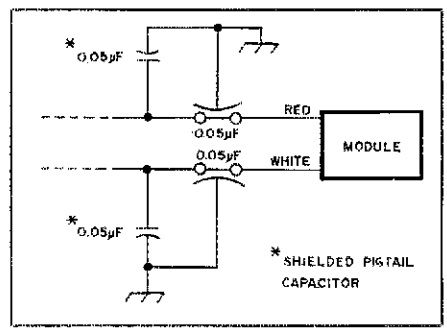


This circuit provided by Howard W. Johnson, W7NU, will furnish ripple-free regulation for a low-voltage power supply.

WHEN RF UPSETS ELECTRONIC IGNITION

☐ *QST* readers may be interested in knowing how I stopped my 130-watt low-band transmitter from affecting the electronic ignition in a 1980 Ford police patrol car. Although I have been involved in two-way radio since 1934, this was my first experience with rf disturbing the ignition system.

My remedy was to bypass the rf to the grounded side of the electrical circuit, as shown in the accompanying diagram. A 0.05-μF feedthrough capacitor was placed in series with the red lead and also the white lead extending from the ignition switch to the ignition module. As a further precaution, I also installed two 0.05-μF shielded capacitors with shielded pigtails as indicated in the diagram. The latter bypass capacitors are made by Motorola (no. 1V80700-A89). Since I took these corrective measures, the RFI no longer affects the ignition when the transmitter is being operated. — *Morris E. Hall, N4MH, Rock Hill, South Carolina*

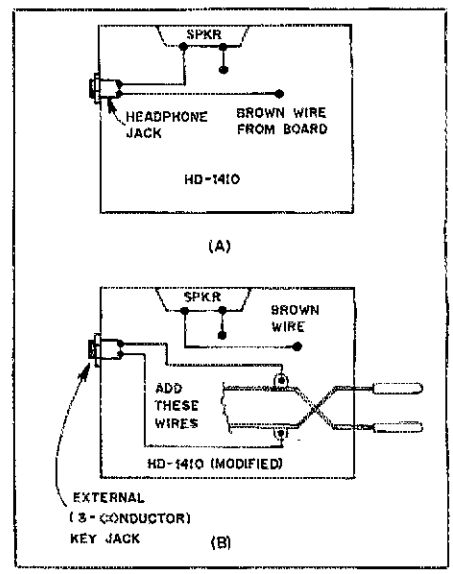


When rf from a 130-watt mobile transmitter upset the ignition system in a 1980 Ford police car, Morris Hall, N4MH, installed bypass capacitors as shown in this drawing. The remedy effectively eliminated the problem.

THOUGHTS ON THE HEATH HD-1410 ELECTRONIC KEYER

☐ I was not completely satisfied with the speed control on my Heath HD-1410 electronic keyer. Assembly instructions recommended that R9 be 10 kΩ for a speed range of 10 to 35 wpm. However, the top speed was much in excess of 35 wpm and adjustment around 20 wpm much too critical. Connecting a 5.6-kΩ resistor in series with R9 and shunting the speed control R101 with a 27-kΩ resistor brought the speed range down to 8 to 35 wpm. Also, settings of the speed control became much less critical.

Having used a single-paddle keyer for quite a while, I found I had little use for the iambic property. However, I learned that if I adjust the travel to a *minimum* and the spring tension to a very weak value, I do fine with the keyer. If the tension is too high, the darn thing jumps around on the table and if the travel is too high, using the keyer is tiring. I can do very well at 25 wpm. I'm 78 years old. Got my Extra in 1977! Earned my first ticket in 1928. — *Ira Myers, W2SVJ, Neptune, NJ*



The Heath HD-1410 keyer can be modified for use with other paddles by making the changes shown. Drawing A shows the original connections to the phone-plug connector wired according to Heath instructions. The phone connector is replaced by a three-connector stereo jack and then wired as shown to the HD-1410 paddles. The external paddle key lead is then plugged into the stereo jack.

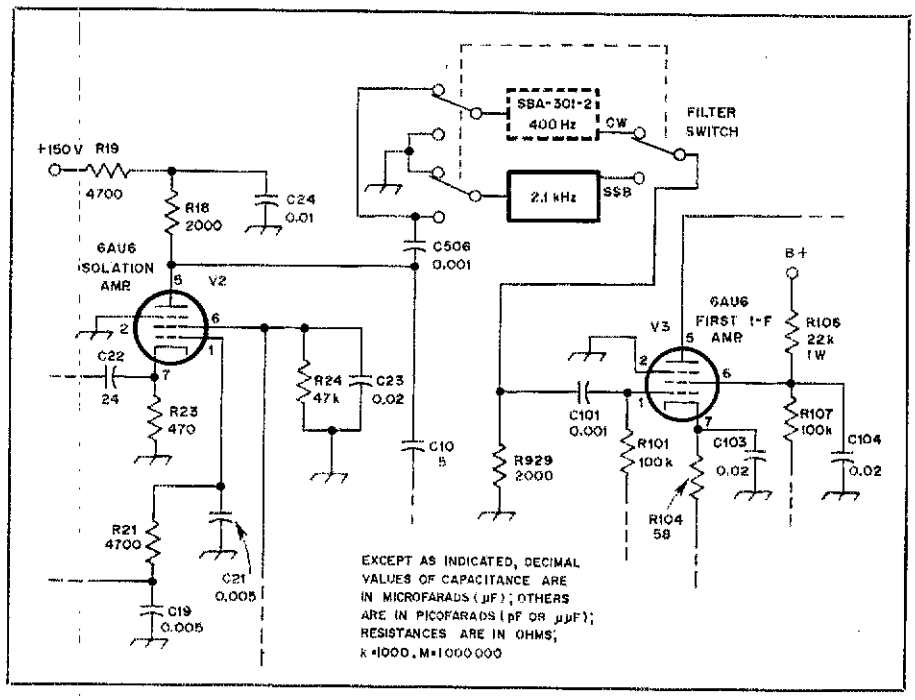
☐ To use other paddles with the Heathkit HD-1410 keyer you only have to make the following modifications. First, disconnect and remove the headset connector on the rear of the keyer and replace it with a 3-conductor stereo 1/4-inch jack. Next, reconnect the speaker directly to the board lead removed from the headphone connector. Then solder a wire on each side terminal (no. 4 solder lug) of the internal keying paddle and connect these to the new jack on the rear panel. See the accompanying drawing. — *Jim Zimmerman, WB7DGU, Flagstaff, Arizona*

☐ Several amateurs who had HD-1410 keyers found the output would hold low when transmissions were made on the various amateur bands. The bands related to this effect were not the same at all stations but seemed rf related. I found that connecting a 0.001-μF capacitor from the output of IC3C (pin 12) to ground cured all but one case among the seven keyers so modified. — *William M. Kosturko, W1VW, Stratford, Connecticut*

*Assistant Technical Editor

HEATH SB-101, LOW SENSITIVITY AND RF DRIVE

☐ The problem of low receiver sensitivity and low rf drive was noted on two SB-101 transceivers. Replacement of weak or marginal tubes and realignment did not correct the problem. The source of this difficulty was found to be a dirty spdt switch between the 2.1-kHz filter and the first i-f amplifier, V3. The contacts presented 5- to 10-ohms resistance, which would vary when the switch was operated. Disassembly of the switch disclosed that a contact lubricant had dried to a consistency of wax, resulting in corrosion and poor continuity. After the switch was cleaned and reassembled, the receiver sensitivity increased by 10 dB and the rf drive returned to normal. Possibly this problem may be common in other equipment of the SB and HW series made in the late 1960s. — *J. M. Eaves, K5YJJ, Laplace, Louisiana*



Cleaning the filter switch, shown above, in the SB-101 at K5YJJ, restored both the sensitivity and grid drive. Because of corrosion and a wax-like residue, the resistance between contacts had increased to nearly 10 ohms.

RTTY PAPER

☐ An economical source of RTTY paper is contained in the end of roll newsprint. Our local publisher has been selling these for $2 or less depending on the mount of paper remaining. The rolls are 30 inches (762 mm) wide and, by using any method employed in sawing wood, can be cut to any desired width. I cut mine on a band saw. With a little patience you can use a hacksaw or fine-tooth carpenter's saw. A wooden cylinder, with nails as mounting pins and turned to fit the tube on which the paper is rolled is ideal for mounting in the machine. A roll mounted on a broomstick inserted in a box, allowing the paper to be fed up through the slot on the rear of the printer, will also get the job done. I operated for over 18 months on my first $4 investment. — *Col. James C. Richardson, Ret., W3CLJ, Charleroi, Pennsylvania*

SCANNING IDEA FOR THE KENWOOD TR-2400

☐ There are 10 memories in the Kenwood TR-2400 2-meter transceiver and the radio will scan all 10 channels in order, at a rate of about one per second. If you live in an area where you do not have 10 frequencies to which you wish to listen, there is no way to get the radio to scan fewer than 10 channels. However, it occurred to me that if one were to program frequency A into the odd-numbered channels and frequency B into the even-numbered channels, then the net result would be the same as if the radio were only scanning two channels. This process could be applied to any number of channels up to 10 by programming the frequencies into the radio in rotating succession (e.g., A, B, C, A, B, C, A, B, C, A). To give the user a quasi-priority function, the channel sequence might go something like this: A, B, A, C, A, D, A, E, A, F. In my area, with only two repeaters to monitor, this method enables me to listen to both repeaters with only one-second delay between listening periods. If I had 10 different frequencies programmed into the radio and someone called me just after the radio looked at that channel, they could complete their call and the repeater would have dropped out before the 10 seconds elapsed for the radio to have returned to that channel. — *Clark L. Stewart, W8TN, Ravenswood, West Virginia*

HEATH SB-104 TALK BACK SOLUTION

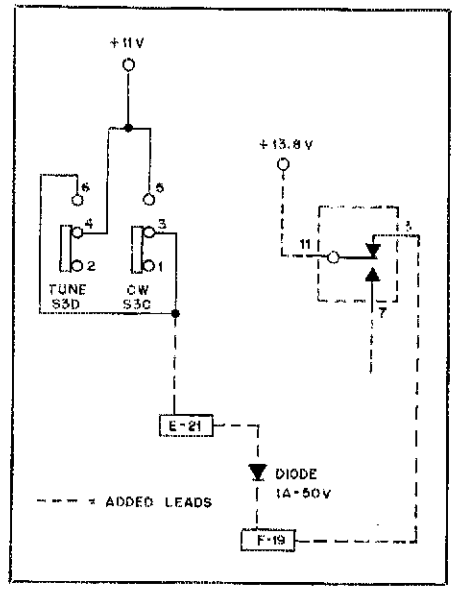
☐ After reading the SB-104 modification articles in *QST* for August 1979 (WØMYN) and May 1980 (W4YEJ) I attempted to bypass the rf on the 13.8-V line with capacitors and heavy ground connections without success. Another solution was needed in my case.

I decided that I had to remove the 13.8 V from F-19 during transmission, but I didn't particularly like the WØMYN solution because of the effect on the counter preset. The accompanying illustration shows a solution that is simple and effective. I first removed all wires from F-19 and connected them to an added tie point terminal, as suggested by W4YEJ. I then added connections, as shown on the diagram, consisting of one wire and a diode.

F-19 is held at 13.8 V except at transmit (high power) when relay contacts open and drop the voltage to zero on ssb. This eliminates the talk back. In the cw and tune modes, the voltage is approximately 10 V (11 V minus the diode drop). The purpose of the diode is to isolate the two power sources. Conduction of the diode is controlled by the polarity of voltage across it which is set by the relay mode and the cw and tune switches.

The decreased voltage at F-19 (13.8 to 10 V) does not materially affect the volume of the sidetone but the level can be readjusted. Additional loading on the 11-V supply seems minimal (approximately 50 mA).

The simplicity of the solution is apparent since it is only necessary to provide an additional tie point, connect a diode from E-21 to F-19, and a wire from F-19 to RY-3. — *Larry Tumey, K4GMZ, Lakeland, Florida*

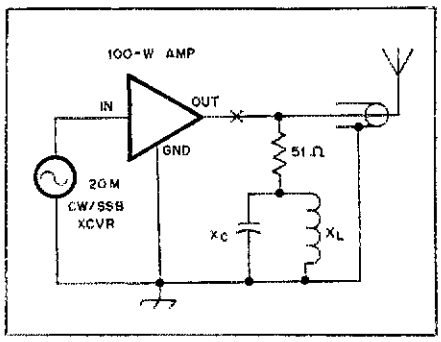


Larry Tumey, K4GMZ, developed this simple circuit modification for eliminating talkback in the Heath SB-104.

SOLVING BROADBAND AMPLIFIER HARMONIC PROBLEM

☐ After having tried to "dis-harmonic" a 100-W broadband transistor amplifier, a solution came out of my reactive bank while I was pursuing something unrelated. The objective was to terminate everything outside the 10- to 160-meter amateur bands and have the harmonic filter properly terminated (50 ohms, nonreactive) within the range of 10 to 160 meters. In commercial equipment harmonic suppression is accomplished with half-wave switched filters. However, the termination is reactive in the filter stop bands when monoband antennas are tuned by Transmatches. Besides, the half-wave filters are low-pass only, allowing strange i-f/mf signals to pass through.

My solution is to use a diplexer like the ones I use to terminate the doubly balanced mixers



Dave Windisch, K3BHJ, solved the problem of harmonics in a broadband amplifier by using the filter arrangement indicated above. Details are in the text.

in my contest-grade station. See the accompanying diagram.

Experimentally, at 20 meters, I found a Q of 2 to be sufficient to cover the band (C ≅ 450 pF and L ≅ 0.28 μH). I recommend the application of vhf construction techniques (chip capacitors, N-connectors) and a good small tubular 50-Ω termination. A 25-W Globar resistor, 3/8 inch (10 mm) thick by 1-1/2 inch (38 mm) long, is adequate. Load the circuit with 50-ohms resistance and gate dip it to resonance. You'll find the amplifier is as broad as a barn door, adheres to the "KISS" theorem and avoids Murphy's Law. Incidentally, belt-and-suspenders types can insert your half-wave filters at point X if you insist. — *Dave Windisch, K3BHJ, Baltimore, Maryland*

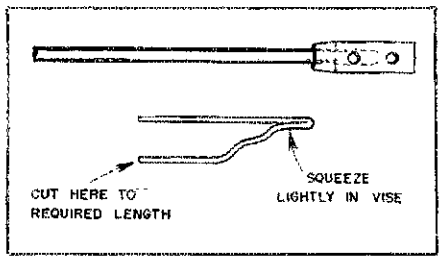
A NOTE ON THE CLIPPERTON L

☐ I was having a problem with parasitic suppressors going up in smoke on my Dentron Clipperton L until I wrote to the manufacturer and received the following reply. "The Clipperton-L will heat the parasitic choke on 10 and 15 meters if it is not loaded properly. On 10 meters, the load control *must* stay above 5. On 15 meters it *must* stay above 3. If operating with the load control below these parameters, the unit will go into parasitic oscillation and cause the parasitic choke to overheat." — *Jack Schuster, W1WEF, Glastonbury, Connecticut*

MAKING HUSKY GROUND TERMINALS AND TIPS FOR YOUR SOLDERING GUN

☐ Need a cheap, yet husky ground-terminal connector? Then try this one. Cut a 1-1/2-inch (38-mm) length of 1/4-inch (6-mm) ID copper tubing. Drill a 1/4-inch hole in one wall of the tubing, placing it about 1/2 inch (13 mm) from one end. Remove 1 inch (25 mm) of insulation from the length you need of no. 6 to no. 10 stranded copper wire. Insert this end into the tubing so that 1/4 inch of the jacket is inside the end of the tubing. Now tightly squeeze the tubing onto the wire (but not the jacket) by placing the piece of tubing in your vise 1/4 inch from the end in which the wire is inserted. Solder through the drilled hole. Next, drill another 1/4-inch hole 3/8 inch (10 mm) from the flattened end. Clean thoroughly with steel wool. If you use a tubing cutter instead of a hacksaw and a hand punch instead of a drill, you will wind up with a much neater job.

Want to save on tips for your Weller (or similar) gun? Then, try this idea. Bend a length of no. 6 to no. 10 copper wire as illustrated, fashioning the wire to resemble the manufactured tip. The wire gauge depends on the capacity of the soldering gun. — *Raul Pomales Lopez, KP4EQN, Rio Piedras, Puerto Rico*



IMPROVING THE SWAN 500 CX CALIBRATION OSCILLATOR

☐ Swan 500CX owners may find the calibration oscillator will work better if the circuit is rebuilt to the improved schematic design available from the Swan factory, rather than maintaining the component values shown in the parts list of the operation manual. The procedure is to delete R1601 (1 kΩ) and C1601 (250 μF) and the line tied to the coil of K1. Tie the −12-V line of the board to pin 3 of the accessory socket for filtered, regulated dc. Change R1607 to 47 kΩ, R1608 to 33 kΩ, R1610 to 2.2 kΩ, R1612 to 4.7 kΩ. Install C1607 (0.01 μF at 25 V (dc) and replace Q7 with an RCA SK3018, an npn silicon video i-f amplifier. Finally, calibrate the oscillator with the signals from WWV. Adjust R1609 for 25-kHz calibration. This should bring the circuit up to par. — *Dave Torgenrud, WA0PDB, Thief River Falls, Minnesota*

RADIO SHACK BOARD WELL SUITED FOR CALIBRATOR

☐ Regarding the versatile calibrator described in the feature article, "Hints and Kinks from Abroad" (January 1980 *QST* pp. 42-43), I have found that the time-base-generator circuit board sold by Radio Shack is well suited for this project. I refer to their project board no. 277-115. This board has space for up to seven 7490s or 7492s (÷ 12) and jumper pads to wire any conceivable combination. In addition there is provision for a crystal oscillator. This project board is furnished with a handsome and informative manual, all for $6! — *Edward M. Roberts, Glen Head, New York*

SILICONE TREATMENT FOR SOLDERING-IRON TIP

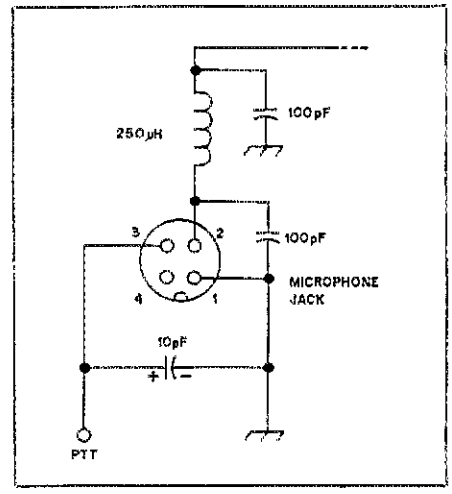
☐ One of the best favors you can do for a new soldering iron is to put a light coating of silicone on all of the surfaces that might have to be removed. Depending on the brand of soldering iron, this might involve coating setscrews or the screw thread on the soldering-iron tip. In any case, the results can be quite effective. After a year or two of use, some soldering-iron tips become so encrusted in place that they are impossible to remove. With silicone treatment, this problem is avoided. Almost any silicone compound will suffice. Dow-Corning DC-4 compound, used with heat sinks and the insulators of transistors, is one such product. — *John Schultz, W4FA, Voice of America*

REGARDING TS-520 CW MODIFICATION

☐ Here is a note of caution for those owners of a Kenwood TS-520 who may have made the cw-filter modification to their rigs according to the September 1977 "Hints and Kinks" column. According to the modification, the cw filter can be switched out of the circuit by using the CH SELECT switch on the front panel. Do not try to transmit, however, with the cw filter switched out. I find that there is a considerable power loss as a result. — *Warren Bone, KQ4X, ex-WB4OXR, Nashville, Tennessee*

ELIMINATING RF IN FT-101Z MICROPHONE CIRCUIT

☐ I had trouble with rf getting into the leads of the microphone circuit of my FT-101Z. This drawing illustrates the cure. It is simply a matter of modifying the microphone and PTT leads to coincide with the FT-101EE version. — *W. A. Wessel, W0CM, Liberal, Kansas*



CLEANING VARIABLE CAPACITORS

☐ For corroded and otherwise dirty variable capacitors, which are almost impossible to clean with a brush, I use a mixture of 4 ounces (120 ml) of concentrated lemon juice in 8 to 10 ounces (240 to 300 ml) of water placed in a sauce pan. By placing the capacitor in this mixture and boiling it for 10 to 15 minutes, the device can be made to look like new. A few drops of liquid detergent might be helpful. A drop or two of oil should be placed on the bearings when dry. — *Bill Pickens, WB5NGF, Leland, Mississippi*

KB6DQ placed his dummy antenna load in one of these attractive flower pots outside his den. This solved a problem of seeping oil. His XYL added the final touch by placing synthetic flowers around the dummy load.

IMPROVING TUBE VFOs: A NEW LOOK AT AN OLD PROBLEM

☐ The heart of any modern transmitter is the VFO, where the quality and stability of a signal begins. Modern technology has made significant improvements in this area in comparison with older VFOs that sometimes drift or chirp. Owners of older tube-type VFOs can alleviate the problem of chirp by making the circuit modification I have provided. I find it useful also in QSK operation.

Many chirps are not caused by the power amplifier pulling on the VFO. An inadequately rated power supply more likely is at fault. Such a supply can struggle to supply the VFO with a steady voltage when the transmitter is switched from standby to operate mode. This can cause the VFO frequency to slide considerably before arriving at a stable condition. Reworking the power supply is the best solution, but that involves considerable expense and often changing the physical layout of the VFO. My circuit is simple and inexpensive, and it can be added easily to many older VFOs.

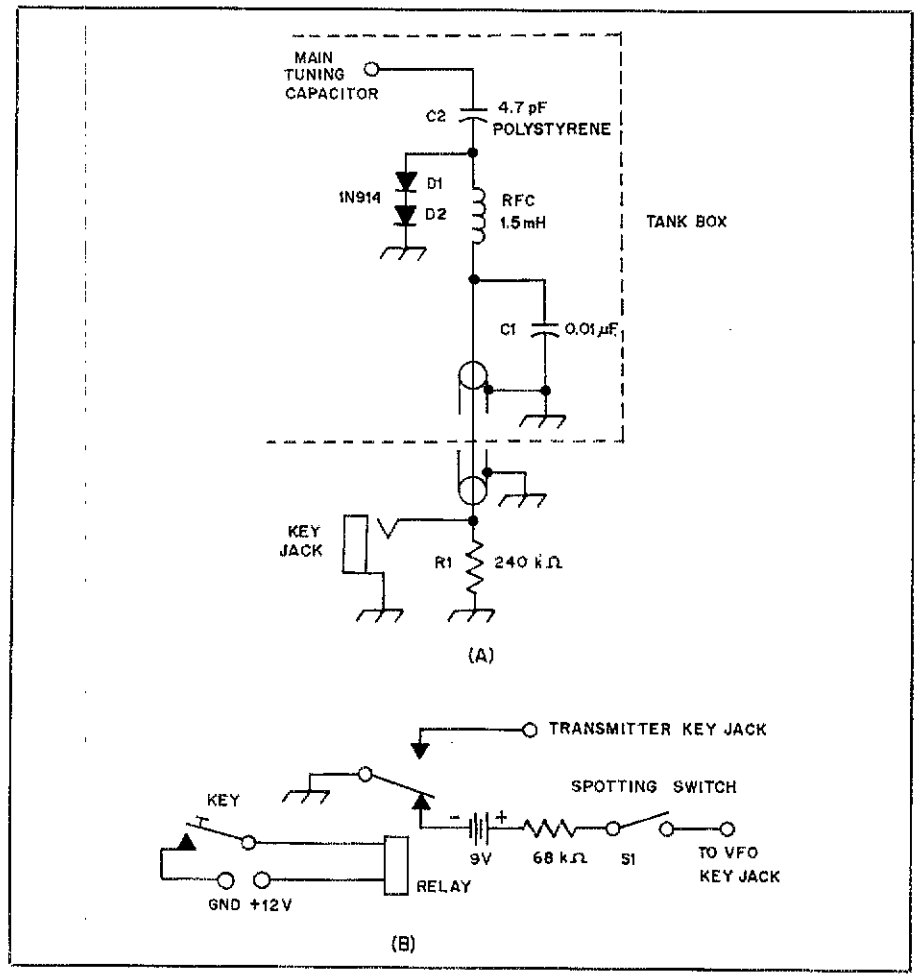
Frequency offsetting is popular in many new rigs because it helps maintain stability. It stops load variations on the power supply by ensuring that the VFO is always on. The circuit described here shifts the frequency of an Eico 722 VFO about 50 kHz on the 80-meter band, enough to take it entirely out of the Novice portion when on standby. It therefore cannot be heard during reception. Neither will it cause any QRM on the air.

Physical changes to the VFO were minimal. A terminal strip mounted in back of the tank-circuit box, a new "normally open" phone jack and rewiring the standby/operate switch were the only chassis additions.

The circuit only affects the frequency of the tank circuit when it is grounded as a result of the diodes being forward biased by a voltage greater than 1.4. Two diodes are necessary to raise the diode bias above the tank operating voltage. A shielded cable provides the path through the rf choke for the voltage to be applied to the diodes. C1 bypasses the rf and R1 bleeds the capacitor so that a frequency glide with each voltage shift is avoided. When a positive voltage is applied to the diodes, they become forward biased, grounding C2. The added capacitance shifts the frequency of the VFO downward.

All components in the dashed line of the drawing are soldered to a terminal strip mounted behind the main tuning capacitor in the rear of the tank circuit box. The terminal strip is secured by one of the screws holding the tank circuit housing to the chassis. C2, a polystyrene capacitor, stretches from the tuning capacitor to the terminal strip. I routed the shielded cable against the walls of the box through the chassis at the hole for the band switch. The normally closed phone jack was replaced with one that is normally open. To have the oscillator cathode always grounded when transmitting, I rewired the mode switch. Recalibration is performed according to EICO's recommended procedures.

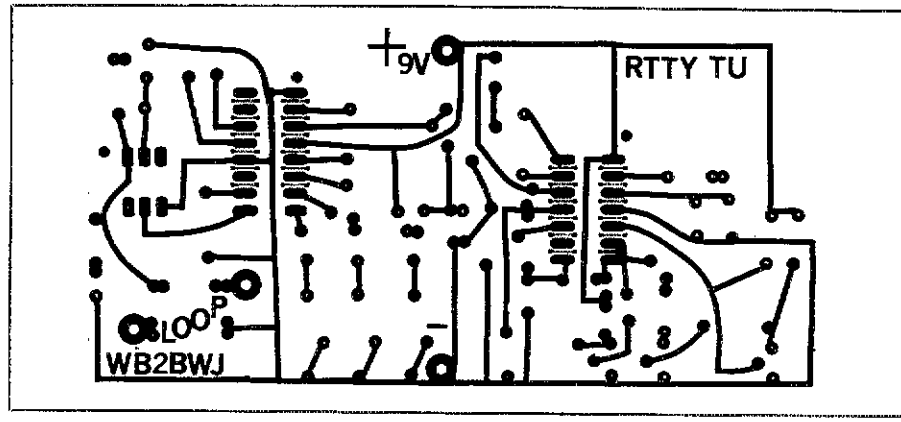
The keying circuit, shown at B, is connected to a grounded cathode circuit in my transmitter. Current drawn by the diodes is limited by the resistor. S1 permits spotting of the VFO without undesired transmission. Before the modification it took the VFO several seconds to stabilize when placed in the transmit mode, a handicap when working in the Novice bands. QSK was impossible. Since installation of the offset circuit, the VFO has been chirp-free and clean. QSK is a welcome bonus. — *Thomas D. Cook, N3AXN, Pittsburgh, Pennsylvania*



Thomas Cook, N3AXN, gave his Eico 722 VFO added stability with the circuit modification shown above. Frequency offset during standby enables the VFO to run continuously without reception interference. This stabilizes the oscillator. His keying arrangement (B) permits spotting by using S1.

THE OLD TIMER'S NOTEBOOK: A GOOD USE FOR OLD COAXIAL CABLE

☐ If you have or can find some old coaxial cable that's become too lossy for use as transmission line, use it for radials in your ground system. Lengths of the sheathing can be removed from the cable and installed as ground or bonding straps around your equipment, in your boat or on your car. A length of such cable makes a good shielded lead from your car battery to your mobile radio. — *E. A. "Whit" Whitney, WILLD, Milford, New Hampshire*



Circuit-board etching pattern for the "State-of-the-Art Terminal Unit" (see Fig. 3, p. 22 of this issue). Black represents copper. The pattern is shown at actual size from the foil side of the circuit board.

Technical Correspondence

Conducted by
Jerry Hall,* K1TD

MODIFICATIONS TO THE 144-MHZ "PLUMBER'S SPECIAL" AMPLIFIER

☐ Two problems with the popular "plumber's special" 144-MHz kilowatt amplifier are the difficulty of making a reliable lead-screw tuning mechanism and critical adjustment of the output-coupling link.[1] Both problems can be overcome by the modifications given here.

Very large circulating currents flow through the plate tuning capacitor and its associated lead-screw mechanism, and any form of sliding contact will eventually corrode and cause trouble. The problem can be avoided by using a completely insulated vane to alter the plate-to-plate capacitance.[2,3] Although the tuning range is smaller than that of a lead-screw capacitor it is still quite adequate if the length of the lines is correct.

As K2RIW has pointed out,[4] coupling is critical to adjust the maximum rf output. He solved the problem by using capacitor output coupling, and later designs have adopted the idea for single-ended amplifiers on 144 MHz.[5,6]

Capacitive output coupling can also be used for push-pull amplifiers such as the "plumber's special." Fig. 1 shows the electrical circuit of my amplifier, and Fig. 2 is an "exploded" mechanical sketch; everything else is the same as described in Ref. 1. C1 is the floating-vane tuning capacitor; C2A and B comprise the twin-gang output coupling capacitor. The push-pull outputs from C2 are combined in a half-wave coaxial balun. This output coupling arrangement maintains correct balance with respect to ground, and is adjusted easily. Increasing the coupling capacitance brings a progressive increase in plate current at resonance, and the rf output rises to a maximum, then falls as the amplifier becomes overcoupled to the antenna. It's just like an rf rig, and so different from the hit and miss of link coupling. There is a small power loss in the balun, though RG-8/U cable gets only slightly warm on prolonged tune-up. The power loss is far outweighed by the improved efficiency that comes from optimum output coupling.

The control shafts should be made from a good rf insulator; polystyrene works fine (if it tends to soften, maybe you need a bigger blower!). When the moving vanes of C1 and C2 are parallel with the stator plates, the spacing should be about 6 mm (1/4 inch). It doesn't matter if the vane of C1 accidentally touches the plate lines or the outer case, but C2 must be prevented from closing and shorting out the high-voltage. As a further precaution a shorted quarter-wave stub provides a dc ground to the output circuit.

If you are having trouble with lead-screw tuning and want to try the C1 arrangement, you'll probably have to alter the length of the plate lines to bring the system back to resonance. I found no need to change the plate lines after removing the old coupling link and installing capacitive coupling, though it may prove necessary to trim both stator plates of C2 to obtain the correct capacitance range. — *Ian White, G3SEK, 83 Portway, Didcot, Oxfordshire OX111 OBA Great Britain*

*Technical Editor, QST

References

[1] *The Radio Amateur's VHF Manual*, ARRL, all editions.
[2] RSGB *VHF Handbook*, 1st and 2nd editions only.
[3] *The Radio Amateur's VHF Manual*, 2nd edition.
[4] Knadle, "432-MHz Parallel Kilowatt," April and May 1972 *QST*.
[5] Gross, W9OH, "A Parallel 4CX250B Amplifier for 144 MHz," May 1975 *QST*, p. 11.
[6] Merry, "Stripline Kilowatt for Two Meters," October 1977 *Ham Radio*, p. 10.

TRANSMISSION LINES, SWR AND SUCH

☐ Referring to the very informative and well-presented article "The Imperfect Antenna and How It Works," *QST* for July 1979, and metaphrasing the concluding paragraph — "In the case of your antenna system, be it 'perfect' or 'imperfect,' a little of the transmitter output energy gets changed into heat in the feed line and antenna wires. The rest — all the rest — is radiated into space by the antenna."

There are other energy losses whose total is greater in magnitude than the transmission line energy loss, such as ground resistance, corona, eddy currents induced in neighboring masts, guy wires and other conductors and dielectric losses arising from imperfect dielectrics, such as insulators and trees in the near antenna field. These losses can be represented by a resistance, R1, which, when inserted in series with the antenna, consumes the same amount of energy as that which is dissipated by the sum total of the lossy elements mentioned above. The total resistance component of antenna impedance is the sum of Rr + R1, Rr being the radiation resistance.

The antenna radiated energy efficiency is the ratio of radiation resistance to the total resistance, i.e., Rr/(Rr + R1). This is the fraction of the total energy supplied to the antenna, which is converted to radiated "communication" energy. — *John J. Glauber, W4OB, 1536 Orangewood Circle, Zellwood, FL 32798*

☐ The "The Imperfect Antenna System and How It Works," July 1979 *QST*, is a very good tutorial article on the subject. There are three statements in the text which I take issue with, but these do not appreciably affect the overall objective of the presentation.

The first is "In reality, power does not travel down the line." Power certainly does travel down the line to the antenna. If the line is lossless all power arrives at the antenna. If the line is lossy, some is dissipated in the line as it passes.

The second is the statement in the seventh paragraph, "The answer is that the load will dissipate, not 100 watts, but 75 watts." The real answer is that the result cannot be predicted! The transmitter is a highly nonlinear source! Sparks and grief could result unless the transmitter is retuned!

The third comment I have is on the last two lines of the third paragraph from the end, "however, if the line losses are taken into account. . . ." If these words are deleted, the

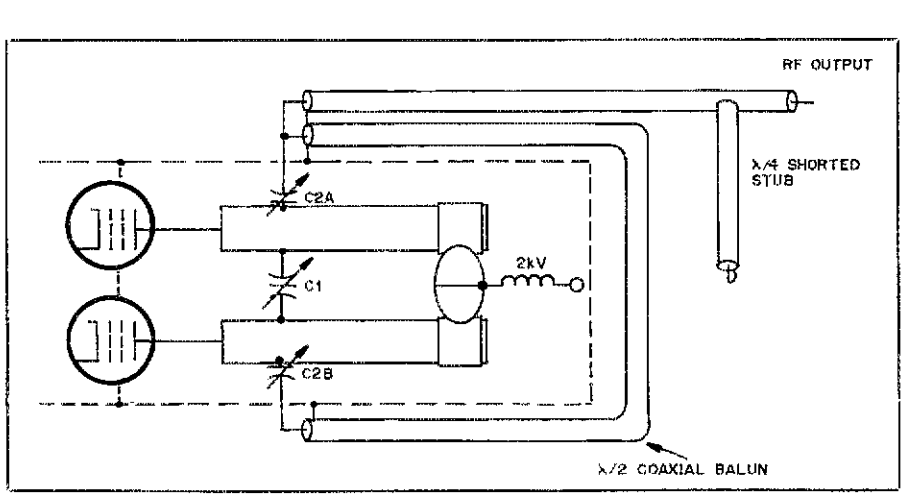


Fig. 1 — Details for modifying the amplifier for capacitive-output coupling.

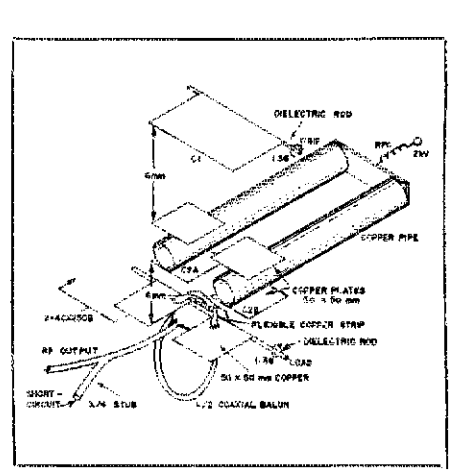


Fig. 2 — Exploded sketch of the amplifier tank with modifications.

sentence is correct. The difference between "forward" and "reflected" power is the power delivered to the load connected to the "wattmeter" output, and thus the power delivered by the transmitter (assuming the wattmeter is dissipationless!). I use quotes around "wattmeter" because I'm about to suggest changing the name of these SWR meters, reflectometers, etc. to "Whatmeters." — *J. T. Kroenert, WA1YTC, 349 New Meadow Rd., Barrington, RI 02806*

TX LINE Z_0 — IS IT REALLY 50 Ω?

☐ Some time ago, while on active duty with the U.S Coast Guard, I encountered an unusual situation while measuring the antenna impedance of a loran "A" tower at a U.S.C.G. loran station. The tower for several years had an SWR of 1.22, even though the antenna had been bridged and tuned to 50 + j0 ohms. The SWR meter was always calibrated prior to the measurement to ensure it was accurate. It was never understood why an SWR of 1.0 could not be obtained.

During a station visit intended for antenna-bridging measurements, several attempts at determining the cause of the "non-1.0 SWR" after tuning were made. One such attempt involved placing a homemade time-domain reflectometer in the signal-power building to check the transmission line and antenna system for reflections along the line. The homemade TDR was used in conjunction with a USM-117 scope. Although one might think the idea too crude to be useful, it does provide reliable information and is a valuable tool in determining changes of impedance in the transmission line and antenna[1].

The TDR indicated a mismatch at the junction of the transmission line and the input to the tuning unit. Since the antenna had just been bridged and adjusted to 50 + j0 ohms, I concluded that the connectors were causing the mismatch indicated by the TDR. The connectors were removed, cleaned, and resoldered to the transmission line (this is no easy task). The line itself was inspected for breaks and corrosion of the wires along the section on which the connectors are fitted. The TDR was used again to check for mismatch. Nothing had changed in the pattern on the scope. When the transmitter was put on the air, the SWR was still 1.22:1.

If the antenna was 50 + j0 ohms and the connections were good, then something must have been wrong with the transmission line itself. All this time it was assumed the transmission line was 50 ohms (RG-19/U).

Network theory was then employed to determine the characteristic impedance of the line:

$$Z_0 = \sqrt{Z_{sc} \times Z_{oc}}$$

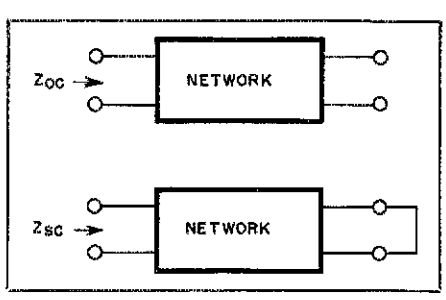


Fig. 3 — Conditions of measurement for determining the characteristic impedance of a network. The "network" may be a length of transmission line.

Table 1
Specified vs. Measured Cable Impedances

Cable Type	*Freq. Measured*	*Manufac. Z_0*	*Measured Z_0*
18 feet RG-58C/U	4 MHz	50 ohms	53.5 ohms
	29.5 MHz	50 ohms	40.9 ohms
36 feet RG-8A/U	4 MHz	52 ohms	54.0 ohms
	29.5 MHz	52 ohms	57.6 ohms
16 feet RG-213/U	4 MHz	50 ohms	52.6 ohms
	29.5 MHz	50 ohms	
15 feet RG-58/U	4 MHz	53.5 ohms	53.4 ohms
	29.5 MHz	53.5 ohms	58.3 ohms
51 feet RG-213/U	4 MHz	50 ohms	49.8 ohms
	29.5 MHz	50 ohms	48.6 ohms

0.3048 × feet = meters

Z_{sc} is the measured input impedance of the network (transmission line) with the output shorted. Z_{oc} is the measured input impedance with the output terminals open (Fig. 3).

The transmission line was disconnected from the antenna tuning unit and from the transmitter. Then Z_{oc} and Z_{sc} were measured using the same test equipment which was used to measure and set the antenna impedance at 50 + j0 ohms. The equipment involved a Stoddart NM-20A detector, URM-25 rf generator, and General Radio 916AL impedance bridge. The line impedance was measured at the loran frequency, 1850 kHz in this case. The characteristic impedance was found to be 61 ohms! The results were so startling that the equipment was moved to the other end of the RG-19/U transmission line and the impedance measured again. Still 61 ohms. If one calculates the SWR of a 61-ohm transmission line terminated in a 50-ohm load (by formula or Smith Chart), the result is 1.22 — exactly as the SWR meter had been indicating previously.

On another loran station, a similar experiment was conducted on a 12-foot (3.65-m) length of RG-8/U cable used inside a transmitter. The cable appeared to be an original component, about 25 years old. The impedance was measured at 95 ohms instead of the 52 ohms intended during manufacture.

Several other types of coaxial cables were measured to determine their characteristic impedances. A URM-25 was again used as the rf generator, but a General Radio 1606 bridge and a Hallicrafters SX-111 receiver were used as the bridge and detector. Z_0 was checked at two frequencies far removed from the standard loran frequencies. The results of the measurements are tabulated in Table 1. Most manufacturers allow a tolerance of ±2 ohms within the published characteristic impedance, so some of these cables are within specifications at some frequencies.

Thus, one should be careful to consider the transmission line's *actual* characteristic impedance when performing antenna tuning or impedance-matching techniques requiring precision. — *Clifford J. Appel, WB6AWM, 9436 South Wales Way, Elk Grove, CA 95624*

[1]See Jochem, "An Inexpensive Time-Domain Reflectometer," *QST*, March 1973.

TESTING SSB TRANSMITTER LINEARITY

☐ Most methods used for testing an ssb transmitter require either expensive test equipment or expertise for evaluating the results. The technique I devised uses a single audio tone of 1.5 kHz, 100 percent amplitude modulated with 20- to 60-Hz triangular voltage, obtained from a Hewlett-Packard 3312A function generator. A convenient substitute can be jury-rigged from any audio oscillator, complemented with a 566 IC as a triangular-wave oscillator and an MC1496 IC as a modulator.

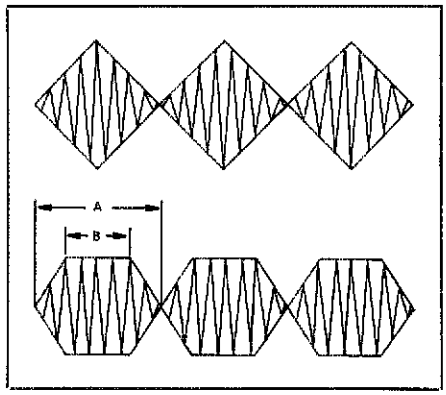


Fig. 4 — Test signal waveforms. The upper drawing shows a triangular-modulated wave from the signal source. The lower drawing shows how the clipping level of a speech compressor may be measured. (See text.)

The upper drawing of Fig. 4 shows the waveform of a test signal. The waveform of an ssb signal should be the same: Any nonlinearity in the system shows in the envelope. The rising part of the envelope can be treated as a static input-output characteristic. At frequencies greater than the bandwidth of the oscilloscope, the scope may be used to display the i-f voltage of a presumably linear receiver.

The lower drawing illustrates the case of measuring the clipping level of an hf speech processor. After measuring the lengths of A and B, the clipping level in dB can be determined from

$$L = 20 \log \frac{A}{A - B}$$

where L is the clipping level. — *R. J. Wolski, SP9AGQ, 9 Jaworowa, 41902 Bytom, Poland*

FREQUENCY-BLOCK PROGRAMMING OF CES 800 SCANNERS

☐ The Communications Electronics Specialties 800 series scanners are used with Clegg and other 2-meter synthesized transceivers. They are extremely versatile and convenient accessories. When programmed for repeater or simplex frequencies in your area, these scanners leave nothing to be desired in operating convenience. When they are used in areas where active repeater frequencies are unknown, however, scanning the entire

2-meter band is very time consuming.

The following program allows you to scan one or more continuous frequency blocks. No wiring changes are required. First, set all push buttons on the scanner to the outer, or released, position. Set the transceiver frequency to 144.00 MHz. Then:

1) Erase memory by pressing SCAN and DELT. Wait until the display "races" before releasing DELT. (It may be necessary to press RSME if the scanner was previously in the HOLD mode.) If you wish to retain the channels already in memory, you may skip this step.

2) Release SCAN. Set the lower limit of the desired block with the transceiver frequency controls, and press ENTR (for example, 146.00). Now set the upper limit of the block (for example, 147.00) and press ENTR.

3) Reset frequency controls to 144.00 MHz, then press SLOW and SCAN. The display will alternate between the upper and lower limits you have chosen. When the display shows the lower limit, press HOLD. Press ALL. Now hold down ENTR while pressing RSME. Continue holding ENTR while the frequency scans up from the lower limit; when it reaches the upper limit, press HOLD.

4) Release ALL and SLOW.

The unit will now scan only from the lower to the upper limits. It still may be programmed to add or delete additional frequencies in the usual manner. Additional blocks may be entered by repeating steps 2 through 4, with new upper and lower limits. — *Samuel Bases, K2IUV, 19 Standish Ave., Yonkers, NY 10710*

MORE TUNE-UP BRIDGE NOTES

☐ N8AJV's statement ("Don't Break the Seal," May 1980 Technical Correspondence) about the disastrous effects of grinding down 47-ohm resistors to a 50-ohm value was unsubstantiated by any data, so I made a few simple tests of my own. To produce a worst-case condition, I ground down a 30-ohm carbon-composition resistor until it measured 58.6 ohms on my Leeds and Northrup precision bridge. This big increase in resistance assured me that a large amount of the carbon resistance element would be exposed to moisture. Therefore, any effects would be magnified over the small change I had made from 47 to 50 ohms in the resistors I had ground down for my bridge.

Then I fully immersed the ground-down resistor in a glass of tap water for 24 hours so that if the resistance element was going to absorb moisture it would do so. At the end of this time I took the resistor out. I just shook the water off and immediately measured its resistance. It showed a resistance of 58.4 ohms, or a negligible decrease of 0.34%. When the resistor later dried out at ambient room conditions, the resistance again measured 58.6 ohms. So actual measurements showed there were no detrimental effects of moisture on ground-down resistors. I also made further checks on the bridge I built almost a year and a half ago, and two other units built later, all of which had ground-down resistors. All of them showed no change in their ability to obtain a satisfactory null at a load impedance of 50 ohms.

I would say that moisture, absorbed or surface, might present a problem if the resistances were of very high value. But for the 47-ohm value specifically mentioned in N8AJV's letter, I could find no significant change. He also stated that it would be better just to use 20%-tolerance resistors. Using 47-ohm, 20%-tolerance resistors would lead to an uncertainty factor, however, where a balance thought to be at 50 ohms could actually be at anywhere from 25.1 to 84.6 ohms. Simple bridge calculations will easily verify these figures of uncertainty.

Also, because so much interest has been shown in my bridge, I'd like to pass along a simplified switching circuit that eliminates D1, R1 and C1 of the original circuit ("Tune Up Swiftly, Silently and Safely," *QST*, December 1979) without degrading or changing the basic concept of the device. It is shown in Fig. 5.

I've also experimentally eliminated the entire toroid coil and used instead a carbon resistor as a pick-off device. The resistor is connected between points A and B of the diagram. The value and wattage rating of the resistor naturally depend on the power level in use, but for 100 watts of output, I found a 3.9-kΩ 2-watt resistor satisfactory. — *William Vissers, K4KI, 1245 S. Orlando Ave., Cocoa Beach, FL 32931*

IC SUBSTITUTION FOR THE MC1385P

☐ Regarding my article, "The Audiobox — An Amplifier with a Twist," which appeared in the August 1978 issue of *QST*, here is some updated information. It concerns the IC used in the original circuit.

Motorola discontinued manufacture of the MC1385P which was used in my *QST* circuit. I was going to redo the pc board to use another Motorola IC; however, there now is a simpler way. National Semiconductor introduced the LM383 — an 8-watt power-amplifier IC — which requires fewer external parts to provide the desired result.

I am including a schematic diagram (Fig. 6) which replaces the amplifier portion of the original circuit. Although I do not plan to make a revised pc board, it should be possible to install this circuit on the original board and hand-wire the components in place. — *Eric J. Grabowski, WA8HEB, 30312 Arnold Rd., Willowick, OH 44094.*

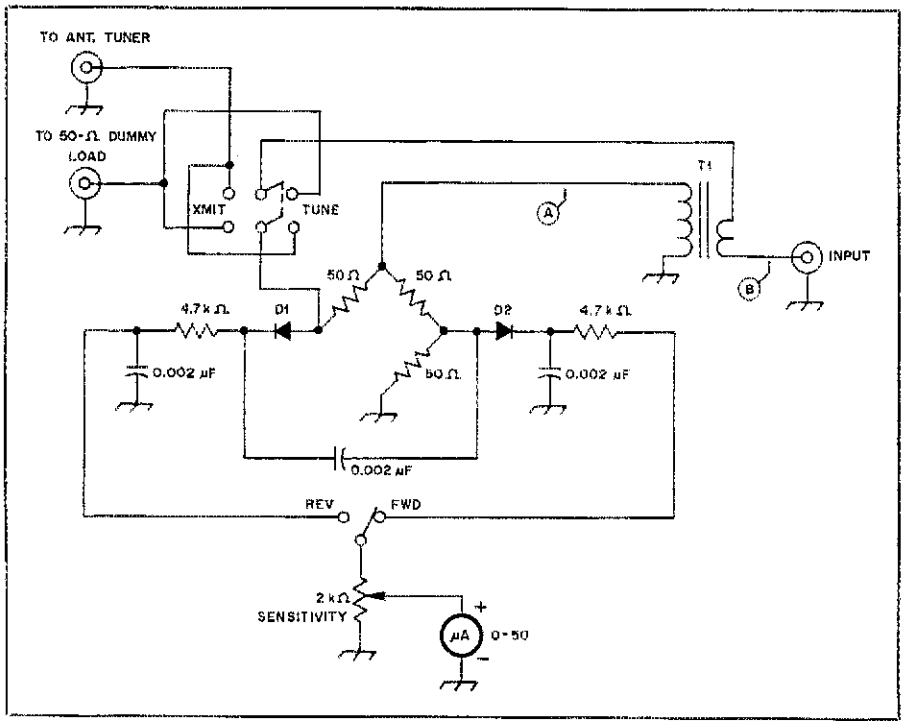


Fig. 5 — The simplified tune-up bridge schematic diagram. See the original December 1979 *QST* article for T1 specifications and additional information. A further simplification of the circuit is possible by installing a carbon resistor between points A and B, and omitting T1. See text for details.

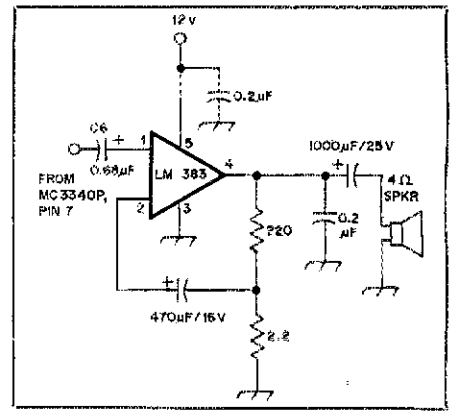


Fig. 6 — Schematic diagram of the revised circuit, which uses an LM383 IC.

Feedback

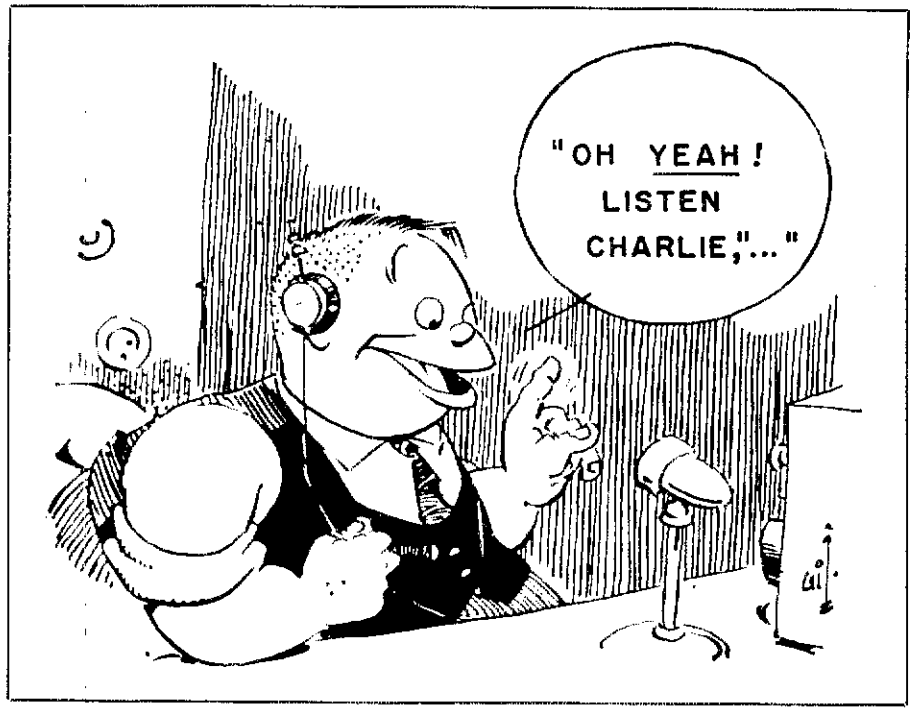
☐ Fred Brown, W6HPH, offers the following clarification for his article, "A Reflectometer for Twin-Lead," October 1980 *QST*. The last sentence in the first paragraph under *Checkout and Operation* on page 17 should read: R5 should then be adjusted to give the same voltage at its wiper as the collector voltage of Q2 before the meter is connected.

☐ The call of Leo Legleiter was incorrectly listed in the November "Silent Keys" column. It should have read WØKGJ instead of WØFIR.

King of the Hill

Anything you can do I can do better . . . with less.

By John G. Troster,* W6ISQ



Hey, Charlie, what kinda report you just get from that BZ3?"

"He gimme a 5 9 + 47 dB. What he give you?"

"Hmmmm . . . 5 9 plus . . . ahhhh . . . 43 dB over. But, I'm only runnin' the little seven-element beam and it's only up 135 feet."

"Oh yeah! So I beat ya by 4 dB. Hah! And I only got my little four-element multibander at 57 feet."

"Well, actually I see I throwd the wrong antenna switch here. Guess I'm only using my old rusty dipole layin' on the roof."

"QRX one . . . ahhhh . . . my, my, I see I'm transmittin' into a dummy load. It's amazing how good I get out with no good radiator."

"Hold it. . . . look here, Charlie, the antenna wire from the final is mis-hooked up to ground! Gotta speak to Old Marge about foolin' with the wires around here."

"I say . . . I just noticed my final ain't turned on. . . ."

"Hmmmmm . . . can't believe it, but Old Marge must of tore out the power lines too, 'cause all I got operatin' is the oscillator workin' off a dry cell. I get out pretty good for a QRPer with a hunnerdth of a watt and no antenna . . . huh?"

"Come oooonnnnn . . . I got a better signal anytime and with any power you want to play with."

"Oh yeah! Listen Charlie, I could comb my hair over my antenna tuner and beat your best rig and antenna . . . anywhere."

"Well, you got more hair than I do. Listen if I wanted to whip you, I could just throw on a little dipole and turn on my exciter . . . like this . . . beat that!"

"Oh yeah . . . I'll blast your little whistler . . . with a flip of the switch on the driver . . . and when I get this antenna screwed back in the right socket. . . ."

"No way . . . If I ever turned on my final and hooked up the old six-stack of beams, I'd melt every receiver out there at them antipodes."

"Look, Charlie . . . one snap of the switch here and my Doomsday Final comes on that destroys the ionosphere. So don't fool around. You don't want to be responsible for me meltin' all them ions up there."

"Ahhhhh . . . QRX . . . I hear that BZ3 again. All right, crank up everything ya got . . . pour it on . . . your best shot . . . and I'll show ya who's got the best ether agitator."

"BZ3 . . . BZ3 . . . how ya copy my terrific signal now? Hear that, Charlie? . . . he gimme a S9 + 48 dB. That's one dB better than you got last time. Go ahead. Try your miserable rig."

"BZ3 . . . BZ3 . . . how much louder is my rf bomb than ISQ's? Ahhhh . . . you say . . . ahhh . . . only 46 dB over? Ahhhh . . . let me look here . . . see what I forgot to hook back up."

"Nothin' you forgot to hook up. Admit it. You got a pile a junk over there. I just beat ya . . . seeee . . . I beat ya by 2 dB . . . errrr . . . this time."

"Oh yeeeeaahhhh . . . well, no wonder . . . your mountain is higher than mine by 33 feet. Half a wavelength and that's important."

"Yeah, but that means I gotta transmit my rf through all that more fog and rain that I get up here at this higher elevation. That soaks up rf in the worst way, ya know."

"Well naturally you're gonna beat me by 2 dB this time of day because the long-path skip has already gone by me and now you got the best skip. Wait till the skip evens out and I'll blast out some rf that'll neutralize anything you can. . . ."

"Wait a minute . . . from your mountain you got a better shot out across the whole wide Pacific Ocean. I only got little old San Francisco Bay to bounce offen. It ain't as salty as the ocean neither."

"Well, I'll be . . . lookie here. Looks like I'm only usin' that dadratted little old four-element multibander again. No wonder I'm down 2 dB."

"Ohhhhh . . . what do ya know . . . my switch . . . guess I must of forgot to throw it back on. I see I'm still only using my little dinky old rusty dipole on the roof."

"For goodness sakes . . . look what I forgot to hook up. . . ."

*82 Belbrook Way, Atherton, CA 94025

Radio Camp — A Visit with the HANDI-HAMs

By Richard Palm,* K1CE

What do a singing prize fighter, a social worker, a 16-year-old straight-A high school student, a North Dakota farmer and wife, and nine other handicapped individuals assembled in a remote region of northern Minnesota all have in common? A love and devotion for Amateur Radio, that's what! And it's all happening at the HANDI-HAM Radio Camps. The two week-long summer sessions meet for two purposes every summer — one, to prepare the campers for FCC amateur exams given at the end of each of the weeks, and two, to have fun! After all, man and woman do not live by silicon-controlled rectifiers alone — Radio Camp provides diversions such as canoeing, swimming, camping and more.

If you've ever discussed the relative merits of a Class AB and a Class B amplifier by the shore of a beautiful lake with the stars shining brightly and the roar of a bonfire to keep you warm, then you know of the experience that is Radio Camp. If you've routinely absorbed the list of radio propagation modes in preparation for your exam, only to pick up where you left off in *The Cremation of Sam Magee*, then you know of the joys and rewards of Radio Camp 1980.

Campers are broken up into study groups, one for each class of license. This year, a snappy lot of 13 met in these groups to prepare for the impending exams. Last year's batch of new hams and upgraded amateurs is attributable largely to the qualified and highly competent group of instructors that participated in the two sessions.

Each of the two sessions is held at a different location. The Courage Center's northern facility, Courage North ("Deep in the Pines"), is located about 250 miles north of Minneapolis, Minnesota, in the back country. It sits on the shore of beautiful Lake George, the home of the muskie and northern pike. With a number of log cabins and a centrally located lodge, the facility caters to the needs of the Courage Center programs, of which the HANDI-HAM System is one.

Camp Courage, the second facility, near Maple Lake, Minnesota, also serves the handicapped under the auspices of the Courage Center. It's equipped to handle a large number of campers every year, and specializes in therapy for individuals with speech and hearing impairments. The facility has its own farm and lake, with a church and several log cabins. A specially designed pool and gymnasium are also available for use by the campers.

The Courage Center itself is a large complex located in Golden Valley, a suburb of Minneapolis. The Center offers a great number of services — mostly rehabilitative and therapeutic programs — to handicapped people. Services such as camping, residential, recreation, education and vocational training programs are all large parts of the Center.

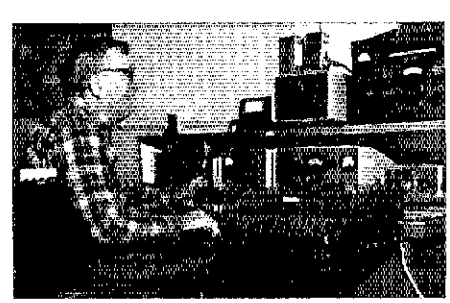
*Coordinator, ARRL Blind and Physically Handicapped Program

The ARRL Blind and Physically Handicapped Program

Administered by the Membership Services Department, ARRL hq., this program provides sources of study materials in braille, cassette and flexible-disc form. A number of organizations and libraries publish these materials, and are listed in the Program's "Index of Information for the Blind & Physically Handicapped" — a nine-page guide available from Hq. (s.a.s.e., please). The "Index" also lists nets that cater to the handicapped ham. A clearinghouse for requests from the amateur community, the Program also maintains a resource file containing schematic diagrams and sources of special devices for the handicapped ham to be used with amateur gear. For more information, and a pamphlet on the Courage Center's HANDI-HAM System, write to ARRL, 225 Main St., Newington, CT 06111.

Diane Vorwald, WD9DNQ, pounding brass at the Radio Camp "Field" station, Courage North, "Deep in the Pines." (*all photos courtesy KØHR*)

1980 Radio Campers Willie Parker; Jim Barthel; Darlene Barthel; Don Pribble, WDØFJW, instructor.



HANDI-HAM Rex Kiser, WØGLU, at the controls of Courage HANDI-HAM System Hq. station, WØZSW.

The Autobiography of Maureen Pranghofer in Reference to Amateur Radio

When I was, oh, about fifteen,
And would sit glued to the TV screen,
If lines would appear or strange buzzing sounds,
Someone would say "Must be a ham around."

The only thing I'd ever heard
Was that ham operators were absurd.
They lived in basements with knobs and wires,
Shorted out circuits and often caused fires.
And never spoke, so I'd been told,
In anything but Morse code.

But one day a teacher whom I admired,
Said he'd had a license which had expired.
And that his ham days had been such fun,
He thought I'd like it if I could be one.

So I went to my parents and told them that I,
Had something new that I wanted to try.
To get a ham license and be on the air.
They said, "fine we don't care."

But as the months passed,
I thought they'd forgot,
About me being a ham, but they had not.
For my mother'd asked someone from Courage she knew,
And they said "Write to HANDI-HAMs, that's what you should do."

So we wrote them a letter, and they sent a reply
Saying "yes, you can be a ham if you try.
If you learn something called cw,
A little electronics and rules and regs too."

Then they sent me a teacher named Jon Vervair
Who was always available to listen and care.
He taught me of Ohm's Law — I, R and E.
Gave me receiver, oscillator and key.
And drove forty miles each Sunday night,
To make sure that what I was learning was right.

In May 1971 came the day.
When I took my Novice and passed it OK.
So finally then, I was on the air,
Making friends through QSO's everywhere.

But the Novice for me just wasn't enough,
So I started studying the General stuff.
This time it was harder to do.
So much new theory and cw too.

And so in September of '71,
Radio Camp for me had begun.
I studied so hard with Sister and Ned.
Trying to remember each thing that they said.
And as the time came nearer, for the exam.
I wondered "Is it worth it — becoming a ham?"

So when they told me that I had passed,
I couldn't believe it — a REAL HAM at last.
I then set up my EICO and got on the air.
On 3925, 'cause my friends were there.
We QSO'd and QSL'd and used only voice.
Forgetting cw, that was my choice.

And during that first year — I learned oh so much.
Traffic handling, running nets, rag-chewing and such.
But by high school graduation it was clear to me,
That I wanted to become an Advanced licensee.

So during the summer I studied myself.
And when it came near to test time I called upon Ralph.
He reviewed with me diligently all that he knew,
Of filters, transistors, linears and Q.

And soon came the day when Father George and I,
Went to the FCC office to give it a try.
The FCC examiners were so strict and stern,
It was hard for me there to remember what I'd learned.

But somehow I squeaked by it — got lucky I guess.
And for me, I thought that was quite a success.
So as I went off to college I stayed on the air,
Using my new frequencies and privileges there.

And through the next eight years though many things changed,
My love of ham radio always remained.
From Heathkit, to Swan to Drake TR-4.
Ham radio was something I couldn't ignore.

So in 1980 when I got my new key,
I thought "Maybe the Extra Class could be for me."
But then I took a look at my knowledge and skill,
And knew this was a goal which I could not fulfill.

Didn't I know that the Extra was tops?
For people whose brains never did stop,
Whose minds were like computers — and so I'd been told.
Never used voice but only used code?

But the itch to try it I couldn't dissuade,
So an application to Radio Camp I made.
I didn't study theory but practiced the key
Trying to attain the magic "twenty."

And this time when radio camp came around for me,
I had a new teacher — Bruce Humphrys.
Now it was Smith charts and forty dB loss.
PLL, vectors, JFET and CMOS.
I studied the code till I thought I would drop,
But when the FCC came, the studying stopped.

I dreaded the code test which I had to take first,
But somehow I passed it and had gone through the worst.
Then came the theory which wasn't too bad.
Because of the wonderful teaching I'd had.
I did ok, or so I'd thought,
But still didn't know if I'd passed or not.

Although it was moments till I heard them say,
What the results were, it seemed like a day.
But finally Bruce came over with my news to tell.
He said "I've got something for you — it's your interim 'PL.' "

And so I went out rejoicing all through that evening,
Knowing I'd passed it — but not hardly believing.
And now as I write this I've many to thank,
For getting me up to that very top rank.
But most of all I know where I am,
Has all become possible through HANDI-HAM.

—*Maureen Pranghofer, WBØEXQ*

Maureen thanks many people in her poem — we'd like to list them by name: Jon Vervair, WAØWPP; Ralph Andrea, WØFCO; Sister Alverna O'Laughlin, WAØSGJ; Ned Carman, WØZSW (Silent Key); Fr. George Metcalf, WØJH; and Bruce Humphrys, KØHR.

1980 Radio Camp Advanced class: Jim Mowery, KØZWG; Wayne Keeney, N6CCU; Dr. Dave Justice, NØARU; Dale Ritchie, WDØBAC; Diane Vorwald, WD9DNQ; and John Kramer, N3BAL — Courage North, "Deep in the Pines."

HANDI-HAM instructor Ralph Andrea, WØFCO, with Radio Camper Willie Parker, a former prize-fighter.

Radio Camps provide unique opportunities to those handicapped individuals interested either in becoming amateurs or in upgrading present licenses. The HANDI-HAM organization promotes a true spirit of fraternity and fellowship among its friends in the amateur community. The ARRL's own program for the blind and physically handicapped heartily endorses and depends on the fine work of the HANDI-HAM System, the only organization of its kind in the U.S.

What is the HANDI-HAM System?

Under the very capable direction of the HANDI-HAM staff — Bruce Humphrys, KØHR, Dick Eichhorn, KBØAE, and student coordinator Maureen Pranghofer, WBØEXQ — the HANDI-HAMs provide a number of services to handicapped individuals interested in all facets of the hobby.[1] Presently, the System has 327 students, 260 handicapped members and 459 ablebodied members or "verticals" as they're sometimes called. The HANDI-HAM services include study materials, personal tutoring and supervision of study by volunteers, equipment loans, special training sessions (such as the Radio Camps), special devices enabling handicapped amateurs to operate radios, and regularly scheduled on-the-air nets to meet other HANDI-HAM members. Currently active in 42 states and 12 foreign countries, the System is growing rapidly. The System actively solicits membership among ablebodied radio amateurs to provide personal services, such as those mentioned above, to handicapped members and students. There are no dues to join the System and all HANDI-HAM services are provided on a pay-what-you-can, and if-you-can, basis.

Perhaps one of the most accessible and truly therapeutic resources, Amateur Radio continues to hold a profound appeal for individuals with physical handicaps. It provides a means of people-to-people contact on a basis of absolute equality — two minds communicating and conversing on a level of mutual and equal empathy. And after all, isn't that the essential element of the hobby? QST

[1]See "QST Profiles," January 1980 *QST*, p. 76.

The Handicapper's Special — Wheelchair Mobile

Being confined to a wheelchair hasn't slowed this ham down. Here's how he used a converted CB rig to get into the action on 10 meters.

By John P. Christopher,* WD6GXZ

Twenty eight years ago, I was born with muscular dystrophy. Since age six I have been confined to a wheelchair. I have learned to know these four-wheel contraptions fairly well and have never let the wheelchair stop me from achieving my goals and enjoying life to its fullest.

Two years ago I was introduced to Amateur Radio, and in that time I have learned many new and valuable skills. Over the past few months I have pondered on how I could combine my motorized wheelchair and my new-found hobby. After some thought, I came up with an idea that was sure to bring about a new twist to 10-meter operation. If amateurs could operate mobile from their cars, planes and boats with good results, then why not try it from a different angle? A wheelchair mobile!

I call my project "The Handicapper's Special" because of the special ways that a mobile CB radio can be converted and modified for 10-meter operation. Depending on the type of CB you have, you can convert it to 10 meters with very little trouble.[1] An ssb CB radio can be set up to operate a-m, fm, ssb or even cw. [Editor's Note: Any CB that has ssb capability should be adaptable to cw. The newer 40-channel types, because of the PLL, are good candidates for conversion to fm-type operation.]

The author operates his converted CB radio on 10 meters. The rig and antenna are mounted on the left arm of his motorized wheelchair.

Choosing a Rig

The average, older model 23-channel CB conversion will transmit and receive on about 300 kHz of 10 meters, and the newer, 40-channel sets will cover between 500 and 600 kHz. Most of the ssb-type CB units can be modified to cover any portion of the 10-meter phone band. So, as you can see, there is a lot to consider when converting one of these mobile units. Whatever rig you choose, it is bound to give you something special to work with on 10 meters.

The radio unit I picked to use in my project was the Cobra 134 a-m/ssb mobile transceiver. Although it is well known for its good operating characteristics and receiver section, the main reason I chose this radio was that it would fit just right on the arm of my motorized wheelchair. I selected the 28,500 to 28,800 kHz portion of 10 meters for my operation.

Having no experience in converting a CB unit to the 10-meter band and lacking the proper tools and equipment to do the job, I elected to send the unit out to a shop that specializes in this area. In just a few short weeks I was ready for 10-meter operation.

After reading the new instructions that came back with the converted radio, I proceeded to hook it to a 12-volt power supply to make sure that the radio was going to function properly and see what the new rf output would be. After attaching my wattmeter and dummy load, I keyed the radio in the a-m mode and spoke into the mike. With modulation, the radio measured 7.5 watts. Power output in the ssb mode was between 8 and 14 watts. I knew that I would have sufficient

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[1]See Lange, "10-Meter Conversion of CB Transceivers," February 1967 *QST*, page 20 and Mudge, "CB to Ten Meters," July 1978 *QST*, page 26.

power to communicate on 10 meters with satisfactory results.

Mounting the Unit

With the radio checking out fine so far, I was ready to mount the conversion on the left arm of the wheelchair. A CB slide mount was used to accomplish this. The unit could now slide down into place on the arm of the chair, and it could be easily removed when not in use.

Power was provided from the motorized wheelchair battery system. My chair uses a 70-amp, 12-volt car-type battery. The battery is housed in a box that is secured to a battery tray on the wheelchair. A 1/4-inch phone jack was installed on the battery box and a 1/4-inch phone plug was attached to the Cobra's power cord. The 1/4-inch phone jack was wired to the positive and negative terminals of the battery. When the power cord is plugged into the jack on the battery box I have power to run the radio. If you wire a radio to a wheelchair having a 24-volt system, you will need to use only one of the 12-volt batteries in the system. [Editor's Note: If the negative terminal of the 24-volt system is grounded to the metal of the wheelchair, the radio must be connected to the 12-volt battery whose negative terminal serves as the negative terminal of the system.] Do not connect a CB or CB conversion to both batteries. Most CB radios are able to handle only 16 volts maximum. If you apply a 24-volt charge, you can burn out the radio as well as short out the batteries.

Now that my "Handicapper's Special" was mounted on my wheelchair and power was going to it, I needed an antenna. It had to be simple to work with, easy to install on the wheelchair and broadbanded enough to cover the 300 kHz that

To disconnect the entire unit for service or storage, the power is unplugged and the entire arm is lifted from the wheelchair.

I would be working. It also had to have a low SWR, so there would be a good power transfer. I selected a coil for 10-meter use and attached it to the bottom portion of a vertical CB antenna. With the use of a mini antenna tuner at the base of the antenna, I was able to get the SWR down to 1.5:1 across the entire frequency range that I had to work with. I mounted the antenna on the left arm of the chair by means of a mirror-mount clamp that many people use on the side mirrors of their pickups, vans and semi trailer trucks. I was now ready to put "The Handicapper's Special" into operation.

Operating Wheelchair Mobile

I turned the radio on, increased the volume to a comfortable level and turned the RF GAIN control down a bit so that I would not get blasted out of the wheelchair. I could hear much activity, so the radio passed its first test well — it could receive. The signals were coming in great, but how well would it transmit a signal? I tuned the unit very carefully until I found a clear frequency. My next step was to make a transmission. "CQ CQ CQ 10 meters, calling 10 meters phone, here is WD6GXZ wheelchair mobile 6, Southern California, calling CQ 10 meters and standing by for any call." A few anxious seconds passed, then out of the quiet and stillness of the band I heard, "WD6GXZ, WD6GXZ mobile 6, here is KA9COQ in Illinois, how copy?" Wow, I did it; I really made contact with another amateur 2000 miles away — using low power and from my wheelchair mobile! This had to be my greatest moment in Amateur Radio. I called KA9COQ back and told him about my venture with my wheelchair and converted CB radio.

The time and effort spent on this project has paid off; "the Handicapper's Special" turned out to be a great success. KA9COQ is one of the many amateurs that I have talked to from my mobile station. I can go outdoors now, get some sunshine and fresh air and have a good ragchew, all at the same time. What the future holds for me in Amateur Radio, I do not know. As long as there is an idea or challenge to be met, projects like mine cannot be far behind.

First licensed in 1978, the author has earned WAS and WAC awards. His non-ham activities include collecting stamps, coins and paper money. Other interests are reading, kite flying and building, stereo and video recording, and travel.

Strays

Pacific Division Director Bill Stevens, W6ZM (left) presents a Charter of Club Affiliation to President Roger Gearhart, K6PKB, and Vice President Howard Rogers, N6BYL, of the Stanford Linear Accelerator Center ARC. *(photo by Joe Faust)*

ATV MAGAZINE ADDRESS CHANGE

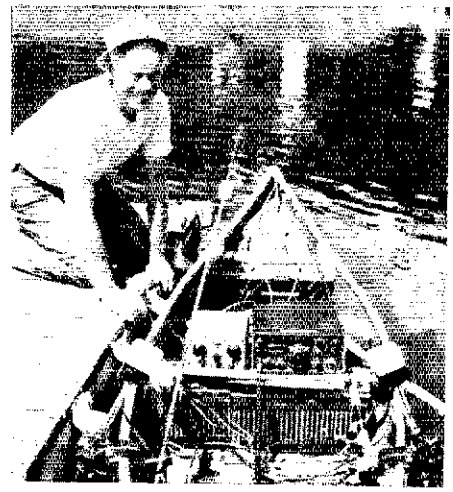
☐ Henry B. Ruh, KB9FO (not K2VCU, as listed in a "Stray" on page 31 of October 1980 *QST*), reports that the new address for all inquiries, subscriptions and other correspondence for *Amateur Television Magazine* is 7391 West State Highway 46, Ellettsville, IN 47429.

"HERE'S YOUR CHANGE"

☐ The four radio clubs that sponsored the York County (Pennsylvania) Hamfest sincerely wish to thank the person who sent the following letter:

"I received the wrong change at the admission gate at the York Hamfest. Instead of a $5 bill, they gave me a $50 bill. I am enclosing the $45 over-given me. I didn't notice till I got home."

The letter was received without a signature or return address. — *Robert Ickes, WB3LJS, Etters, Pennsylvania*



Norman Weed, W6CE, of Fremont, California proudly displays his maritime mobile canoe. Norman operates from Lewiston Lake. His rig is powered by three batteries in series and uses the whole lake for a ground. *(photo courtesy W6OCR)*

Low Power Operating from the Continental Divide

Very-low-power operation has become a popular challenge. One can judge from the number of articles on QRP projects found in Amateur Radio publications and from the increasing number of QSL cards proudly listing only a few watts in the "power" box. Still, there seems to be another large group that is too skeptical of low power to try it.

Possibly because of the way I began operating, I have always been skeptical of what *more* power can do. In terms of things one can do to make hamming more fun, increased power is very expensive for its "return on investment." I've heard it said that because more amateurs are on the air than ever before, we need more power to communicate effectively. Somehow that doesn't make sense.

If you've ever been one of the first guests at a party, you may have noticed how pleasant it was conversing with your hosts and other early arrivals. As more guests arrived, however, the conversations of other groups became "interference," and you probably had difficulty conversing effectively. Later, in a full house, the guests may have turned from speaking to shouting in an attempt to be heard over the others. Most parties quiet down only after people get tired of shouting. In the ham bands, at a "party" where everyone is Mother Nature's guest, we need to speak softly to be heard.

Getting Started

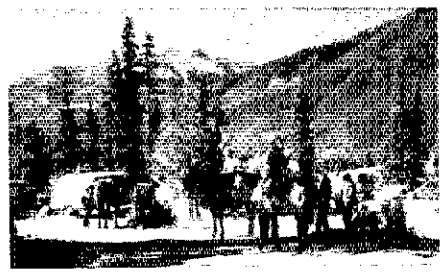
After completing my first QRP rig, before I obtained my license in 1973, and spending about $80, I was both obligated and anxious to get my Novice ticket. Within about two weeks I passed the Novice examination.

I began operating on 40 meters in May 1973. In those days you had to log each call you made, whether or not you made contact. There were many pages in my log devoted mostly to "Called CQ, no response." After about a month of operating and learning how to use low power, however, the log began to fill with contacts. I had begun to learn some of the tricks to effective QRP operation — such as immediately stating that I was operating with 3 watts or even including "QRP" in my calls.

Perhaps because I was new to the hobby, it was never discouraging to me to have to work for a contact. In fact, it was the most exciting thing in the world. It was like fishing, but with a much better "catch" waiting at the other end of the line. On each of my WNØKDE QSLs I proudly listed my 3 watts. In those days, when postage was lower, the return QSL rate was almost 100%.

Off to the Mountains

As the summer of 1973 rolled around, I was working hard to earn money to go on a Colorado backpacking trip with a youth group from my church. The night before we were ready to leave, I was in the church parking lot with the others seeing if everything for a two-week trip would fit into a Chevy Suburban, a station wagon and a homemade trailer. There were 13 of us, including three supervisors.



The site, near Pole Creek Mountain, Colorado, where the author had one of his most memorable amateur experiences — with all of 3 watts of power.

As we were tucking things into corners and rearranging, Ken Blair, WAØSEV, came over to see how we were doing. Ken's daughter, Cindy, was one of our youth-group members. Ken's ham shack was the first I had ever seen. From then on, I was sure I wanted to do whatever was necessary to become a ham. Ken had even administered my Novice test.

The first thing Ken asked, as he looked over the things I was loading, was if I had forgotten to take my radio. Why, I hadn't even thought of it!

"What! You're not going to take your radio so we can work a schedule?" he asked.

"You mean you could really copy me back here from a portable site?" I asked.

"Sure," he said, "It will be easy. Just tie some rocks to the ends of your dipole and throw it up into some trees. And don't forget your batteries."

Now I was really excited. As Ken wrote down a schedule I thought I could meet, I started making plans. That night I took down my antenna and put it, my QRP rig, code key and two 6-volt lantern batteries in an old metal case.

On the Air

The big moment had arrived. Our group was setting up camp at the headwaters of the Rio Grande River. We were near Pole Creek Mountain, elevation 13,470 feet, and only a few miles from the Continental Divide. The mountains on either side of the valley towered hundreds of feet above the comparatively insignificant pine trees I was tossing rocks at. Tied to the rocks were sections of nylon rope that were, in turn, tied to the ends of my 40-meter dipole.

Finally, I got both ends of the dipole at least 15 feet off the ground and anchored into the pine trees. What direction the wires were oriented I don't know, and I'm not sure I understood the significance at the time. All I knew was that Ken had said we could make contact and that it would be easy.

As evening crept around our campsite, and the temperature began to drop from comfortable to cold, I quickly finished my meal and left the warmth and light of the campfire to get ready for my schedule. I pulled the collar of my heavy wool coat around my neck and sat down on a big rock about halfway between the ends of my antenna. All I could see now was the coaxial cable as it disappeared into the sky. I pulled the QRP rig into my lap, put the earphones on and began to listen around 7,140 MHz.

As I sat and listened to the chirps, beeps and eerie squeals of 40 meters, I became somewhat disheartened. I had tried to make contact during the day without success. Earlier, I had to ask skeptical supervisors for special permission to be absent from a study session. It was getting very cold on that hard rock, and I was feeling a little tired from the altitude and a hard day of setting up camp. What if I couldn't get out of the valley to reach Ken after all?

Success — At Last

Suddenly my thoughts were jarred by a faint pattern coming from the midst of what sounded like everyone else on the entire band. I caught part of my own call! Yes, there it was, WNØKDE WNØKDE DE WAØSEV KN. I was momentarily pulled from the depths of my radio by Ken's daughter, who had come to see how I was doing.

"It's him!" I said. "It's your dad on the other end, but I don't know if he'll hear me."

Then I was back among the beeps and squeals frantically pounding out my call sign to signal contact. Finally I heard it. Ken came back, reporting that he was able to copy and that my father, WNØKDF, was in the shack with him. I let out a whoop to signal the others. As I momentarily looked up from the dim rays of a flashlight shining on my log, I was surprised to find I was already surrounded by the others stooping and craning to see what I was writing.

From Ken's log, I found that he had copied the following dramatic message: WE ARE IN A VALLEY — WE ARE OKAY. After that, however, our contact faded and I lost him. But I knew that we had done it! It was a fantastic feeling, one that doesn't often repeat itself.

When I returned home, I found that Ken had been amazed that we had made contact. My father, who was as new to ham radio as I was, said that when Ken heard me come back to him, he just sat back in his chair and said, "Well I'll be darned." What I hadn't copied in Colorado was that a storm had come up and Ken had been forced to disconnect his station from his antenna because of lightning.

Had I been an "experienced" ham when I took that trip into the Colorado mountains, I might never have gone to the effort to try something as silly as the scheme Ken suggested. And I would have never had one of my most memorable experiences as a ham. Try QRP — it's fun. — *Rick Link, WBØKDE, Lawrence, Kansas*

QST Abbreviations

Keep this list handy! From A to Z and alpha to omega, it will decode the symbols and abbreviations found in QST and other League publications.

A — ampere
ac — alternating current
ACNF — AMSAT coordination and network frequency
A/D — analog-to-digital
af — audio frequency
afc — automatic frequency control
afsk — audio frequency-shift keying
agc — automatic gain control
Ah — ampere hour
alc — automatic load (or level) control
a-m — amplitude modulation
A.M. — morning
AMSAT — Radio Amateur Satellite Corporation
anl — automatic noise limiter
AOS — acquisition of signal
ARA — Amateur Radio Association
ARC — Amateur Radio Club
ARES — Amateur Radio Emergency Service
ARS — Amateur Radio Society; Amateur Radio station
ASCII — American National Standard Code for Information Interchange
ASSC — Amateur Satellite Service Council
ATV — amateur television
avc — automatic volume control
AWG — American wire gauge
az-el — azimuth-elevation

BASIC — beginner's all-purpose symbolic instruction code (computer language)
b — byte; a group of bits or binary digits, usually eight
bc — broadcast
BCD — binary-coded decimal
BCI — broadcast interference
bcl — broadcast listener
bit — binary digit
BFO — beat-frequency oscillator
BPL — Brass Pounders League

C — Celsius
CAC — Contest Advisory Committee
CB — citizens band
CCIR — International Radio Consultative Committee
CCS — constant current source
cew — coherent cw; counterclockwise
c.d. — civil defense
CD — Communications Department (ARRL)
CMOS or COSMOS — complimentary-symmetry metal-oxide semiconductor
coax — coaxial cable or connector
COR — carrier-operated relay
CP — code proficiency (award)
CRRL — Canadian Radio Relay League
CRT — cathode-ray tube
ct — center tap
cw — continuous wave (code); clockwise

D/A — digital-to-analog
dB — decibel
dBd — antenna gain referenced to a dipole
dBi — antenna gain referenced to isotropic; a dipole has a gain of 2.14 dBi
dBm — decibel referred to 1 milliwatt
dc — direct current
DEC — District Emergency Coordinator
DF — direction finder; direction finding
DIP — dual in-line package, 14 or 16 pins
DOC — Department of Communications (Canada)
dpdt — double-pole double-throw
dpst — double-pole single-throw
dsb — double sideband
DTL — diode-transistor logic
DVM — digital voltmeter
DX — long distance
DXAC — DX Advisory Committee
DXCC — DX Century Club

E — voltage
EC — emergency coordinator
ECAC — Emergency Communications Advisory Committee.
ECL — emitter-coupled logic
ECO — electron-coupled oscillator
EME — earth-moon-earth (moonbounce)
emf — electromotive force (voltage)
EMP — electromagnetic pulse
EOC — emergency operations center
EUV — extreme ultraviolet radiation
EQX — equator crossing
erp — effective radiated power

f — frequency
F — farad, Fahrenheit
FAX — facsimile
FCC — Federal Communications Commission
FD — Field Day
FET — field-effect transistor
FF — flip-flop
fm — frequency modulation
FMT — Frequency Measuring Test
fot — optimum working frequency
fsk — frequency-shift keying

g — gram
GaAs FET — gallium arsenide field-effect transistor
GDO — grid-dip or gate-dip oscillator
GHz — gigahertz
gnd — ground

H — henry
HAAT — height above average terrain
hf — high frequency
HFO — heterodyne-frequency oscillator
hpf — highest possible frequency
Hz — hertz

I — current
IARU — International Amateur Radio Union
IC — integrated circuit
i-d — identification, identifier
ID — inside diameter
i-f — intermediate frequency
IMD — inter-modulation distortion
in./s — inches per second
IRAC — Interdepartmental Radio Advisory Committee
IRC — international reply coupon
isb — independent sideband
ITU — International Telecommunication Union
IW — Intruder Watch

j — indicator for reactive component of an impedance (+ j inductive; − j capacitive)
JFET — junction field-effect transistor

K — kilobyte, Kelvin
k — kilo, 1000
kg — kilogram
kHz — kilohertz
km/h — kilometers per hour
kW — kilowatt
kWh — kilowatt hour

L — inductance
LCD — liquid crystal display
LED — light-emitting diode
lf — low frequency
lhcp — left-hand circular polarization
LMO — linear master oscillator
LO — local oscillator; League Official
loran — long-range navigation
LOS — loss of signal
lp — log periodic
lsb — lower sideband
LSB — least-significant bit
LSI — large-scale integration
luf — lowest usable frequency

m — meter (distance or band)
mA — milliampere
mAh — milliampere hour
MARS — Military Affiliate Radio System
mf — medium frequency
mH — millihenry
MHz — megahertz
mike — microphone
mini-DIP — dual in-line package, 8 pins
mi/h — miles per hour
mi/s — miles per second
mix — mixer
mm — millimeter
MO — master oscillator
MOS — metal oxide semiconductor
MOX — manually operated switching
ms — millisecond
m.s. — meteor scatter
m/s — meters per second
MSB — most significant bit
MSI — medium-scale integration
MSTV — medium-scan television
muf — maximum usable frequency
MUX — multiplex; multiplexer
mV — millivolt
mW — milliwatt

nbfm — narrow-band frequency modulation
nbvm — narrow-band voice modulation
n.c. — no connection
NC — normally closed
NCS — net control station
NF — noise figure
NIAC — National Industry Advisory Committee
NiCad — nickel cadmium
NM — net manager
NO — normally open
NOI — notice of inquiry
npn — negative-positive-negative
NPRM — notice of proposed rule making
NR — Novice Roundup (contest)
ns — nanosecond
NTIA — National Telecommunications and Information Administration
NTS — national traffic system (ARRL)

OBS — official bulletin station
OD — outside diameter
OES — official emergency station
OO — official observer
op amp — operational amplifier
osc — oscillator
OSCAR — Orbiting Satellite Carrying Amateur Radio
OTC — Old Timer's Club
OTS — official traffic station
OVS — official vhf station
oz — ounce

P — power
PA — power amplifier
pc — printed or etched circuit
PEP — peak envelope power
PEV — peak envelope voltage
pF — picofarad
PIA — public information assistant
PIV — peak inverse voltage
pk — peak
pk-pk — peak-to-peak
PL — Private Line (Motorola trademark)
PLL — phase-locked loop
pm — phase modulation
P.M. — afternoon/night
pnp — positive-negative-positive
pot — potentiometer
ppd — postpaid
PRAC — Public Relations Advisory Committee
PRV — peak reverse voltage
PSHR — Public Service Honor Roll
psk — phase-shift keying
PTO — permeability-tuned oscillator
PTT — push-to-talk

QCWA — Quarter Century Wireless Association
QRP — low power (less than 10 watts input)

R — resistance
RACES — Radio Amateur Civil Emergency Service
R/C — radio control
R-C — resistor-capacitor
RCC — Rag Chewers Club
rcvr — receiver
rev/min — revolutions per minute
rf — radio frequency
rfc — radio-frequency choke
RFI — radio-frequency interference
rhcp — right-hand circular polarization
RIT — receiver incremental tuning
RM-(number) — FCC rulemaking
rms — root-mean-square
RO — radio officer (c.d.)
ROM — read-only memory
RS — Radiosport Satellite (U.S.S.R.)
RST — readibility-strength-tone
RTL — resistor-transistor logic
RTTY — radioteletype

s — second
s.a.e. — self-addressed envelope
s.a.s.e. — stamped s.a.e.
SCM — section communications manager
SCR — silicon-controlled rectifier
SEC — section emergency coordinator
SET — Simulated Emergency Test
shf — super-high frequency
S.M. — silver mica (capacitor)
SNR or S/N — signal-to-noise ratio
spdt — single-pole double-throw
spst — single-pole single-throw
SS — Sweepstakes; spread spectrum
ssb — single sideband
SSC — AMSAT Phase III special service channels
SSTV — slow-scan TV
STM — section traffic manager
SWL — shortwave listener
SWR — standing-wave ratio
sync — synchronous, synchronizing
SYNCART — synchronous satellite carrying Amateur Radio transponder

TA — technical advisor
TCA — time of closest approach
TCC — Transcontinental Corps
TD — transmitting distributor
TE — transequatorial (propagation)
tfc — traffic
THz — tetrahertz
THD — total harmonic distortion
tpi — turns per inch
T-R — transmit-receive
T-T — Touch-Tone, trademark of Bell Telephone Co.
TTL or T^2L — transistor-transistor logic
TTY — teletypewriter (from Teletype, Trademark of Teletype Corp.)
TV — television
TVI — television interference

uhf — ultra-high frequency
UJT — unijunction transistor
UOSAT — proposed University of Surrey educational/research satellite (Great Britain)
usb — upper sideband
UTC — Universal Coordinated Time

V — volt; voltage
VCO — voltage-controlled oscillator
VCXO — voltage-controlled crystal oscillator
VFBO — variable-frequency beat oscillator
VFO — variable frequency oscillator
vhf — very high frequency
vlf — very low frequency
VOM — volt-ohm-milliammeter
VOX — voice-operated switching
VR — voltage regulator
VRAC — VHF Repeater Advisory Committee
VSWR — voltage standing-wave ratio
VTVM — vacuum-tube voltmeter
VUAC — VHF-UHF Advisory Committee
VXO — variable crystal oscillator

W — watt
WAC — Worked All Continents
WARC — World Administrative Radio Conference
WAS — Worked All States
wbfm — wide-band fm
wpm — words per minute
ww — wire wound; wire wrap

X — reactance
xcvr — transceiver
xmtr — transmitter
xtal — crystal

Z — impedance
Z — see UTC

5BDXCC — 5 Band DXCC
5BWAS — 5 Band WAS

° — degrees
α — alpha; angles; common-base forward current-transfer ratio of a bipolar transistor
β — beta; angles; current gain of common-emitter transistor amplifiers
γ — gamma; angles
Δ — delta; increments
δ — delta; angles
ε — epsilon; base of natural logarithms (2.71828)
Z — zeta; impedance
θ — theta; angles
λ — wavelength; longitude
μ — mu; micro (10^{-6}); amplification factor; permeability
μP — microprocessor
π — pi; 3.14159
Σ — sigma; summation
τ — tau; time constant; time phase displacement
ϕ — phi; angles; latitude
ψ — psi; angles
Ω — omega; resistance in ohms
ω — omega; angular velocity, $2\pi f$

Correspondence

Conducted By Bruce R. Kampe,* WA1POI

40 SUB-BAND SWAPPING

☐ Reference "SEA-BOARD 80," September 1980 *QST*, pages 50 and 51, minute 26:

The proposal regarding expansion of the Extra Class phone privileges on 7075 to 7100 kHz is definitely not very good administration. A radio telephone band in the middle of a very active cw band would only encourage more illegal transmissions and cause a breakdown of the self-discipline that we enjoy in the telegraph bands.

It is urgently requested that those responsible for the foregoing proposal reconsider the consequences. Consider the sub-band 7000 to 7025 kHz for Extra Class phone expansion, because this sub-band is definitely D-E-A-D. — *Paul Williams, W6WEQ, Santa Cruz, California*

☐ I find your expansion proposals very timid when compared with those enjoyed by Canadian amateurs and have the feeling that your policy is formulated with the interests of Canadians well ahead of that of Americans. I do not know what percentage of your membership is Canadian, maybe five percent, as a guess. I can understand your not wanting to lose them. But as one who has lived and operated in Canada, I believe you will eventually lose them anyhow.

Until it is my perception you are as concerned with American hams as with Canadian, I have regretfully decided to let my ARRL membership lapse. Just for the record, I like Canadians and love Canada. — *Joe E. Ripple, WBØBQB, Boulder, Colorado*

☐ With reference to ARRL Bulletin No. 79, I am completely and unalterably opposed to allowing Extra Class, or any other ssb operators, to use the 7075 to 7100 kHz section of the 40-meter cw band, or any other band.

We cw operators have little enough now, and I feel that a dangerous precedent is being set by this proposition. — *Loren E. Baker, W1BDN, Clinton, Connecticut*

☐ If ssb is permitted on 7075 to 7100 kHz, a portion of ARRL's own National Traffic System will suffer a particular form of destruction. It is ironic an activity basically nurtured by the ARRL should also be jeopardized by an ARRL endorsement.

I overheard a non-Extra Class amateur remark that Extra Class amateurs already enjoy prime frequency allocations. He further stated he could find no reason for Extra Class amateurs to be permitted ssb on 7075 to 7100 kHz. Obviously, this person missed the real reason to withdraw support for the proposed mode modification. It makes no difference if the ssb signal is emitted by an Extra or a Novice because the interference is still there. — *Duane Shillinger, WB7NHR, Rawlins, Wyoming*

☐ I am finding it extremely difficult to understand how the ARRL directors could deliberately sanction the 40-meter DX window concept.

Those of us that check into the Pacific Area Net during the summer months know all too well the frustration and feeling of utter futility of trying to handle cw traffic through a heavy barrage of ssb QRM from our across-the-border neighbors to the North and South. The prospect of additional ssb QRM from domestic sources is appalling and can only be viewed as a serious threat to the viability of the National Traffic System in this part of the country.

May I suggest you reconsider this proposal and stake out 7000 to 7025 kHz. I believe we would all be much happier. — *Winslow W. Taylor, W7LYA, Story, Wyoming*

☐ I certainly have no objection to extending the phone bands, but I do wish to point out that under present licensing requirements large numbers of amateurs would be obliged to pass a 20 wpm code test, when all they want is full phone privileges. As K7DCG justly remarked in October 1979 *QST*, this is like asking an applicant for an automobile license to demonstrate proficiency in driving a team of horses. Does anyone still believe that cw is the only "real" mode of communication, or that there is some ineffable virtue in its practice?

That this irrational and discriminatory requirement has already been in existence for several years, in a small way, is no excuse for extending it. Any proposal for a major increase in phone allocations should be coupled with a proposal to separate at least the Extra Class license into cw and phone endorsements, as has been done in commercial licensing for many years.

I suggest you poll the membership on this issue before taking a firm position. — *Jon Morey, W2HXF, Princeton, New Jersey*

☐ I've just finished reading the Minutes of the July 23-24, 1980 Board meeting. Congratulations on such a productive session!

Item 26 is especially important regarding Extra Class allocations. If adopted, this "carrot" of more exclusive Extra phone sub-bands should bring about a lot more upgrading than heretofore. I'm all for it and feel confident the majority of hams will support the recommendations. As you know, my suggestion for 40 phone was 7050 to 7075 Extra, 7075 to 7100 Advanced-Extra and 7150 to 7300 General-Advanced-Extra. I'll settle for the board's decision! — *James A. Gundry, W4JM, Lakeland, Florida*

HANDI-HAMS

☐ I wish to express my appreciation for the work and free advertising your magazine is giving to the Courage Center Handi-Hams. Having benefitted from the work done by this organization and their fine staff headed by Bruce Humphrys, I cannot say enough in their behalf.

After three years of study under the auspices of the Handi-Hams I earned my General license last October at the age of 79 years.

Thanks again for your fine work and your very fine publications. — *Melville E. Foster, NØBGT, Minneapolis, Minnesota*

SOUND FAMILIAR?

☐ This is in response to Ron Previty's letter in August *QST* regarding apparent illegal CBers on 10 meters. I had an old single-conversion receiver with an i-f frequency of 455 kHz and very poor image rejection in the 10-meter range. This caused CBers operating legally at 27.2 MHz, for example, to appear also on my receiver at 28.110 MHz.

Perhaps Ron and other amateurs are experiencing this same problem. — *Howard Layher, KØZSR, Colorado Springs, Colorado*

FASTER THAN A SPEEDING NOVICE

☐ I second Mr. J. B. Howell's feelings and observations expressed in Correspondence for August on page 55. I too, am limited to the narrow cw Novice band and resent the "Speed Freaks" and "Boomers" interfering with our little corner of the world.

What are these inconsiderate gluttons looking for in the Novice band to start with? No one can copy them, they're so fast. Can't these "Hot Shots" remember back to their Novice days? — *Gil Simon, KA2GJI, Bronxville, New York*

CARDS, CARDS, CARDS

☐ I recently received a rather remarkable letter from Dale Elliott, WA5SHP, who is a volunteer worker at the Eighth Area QSL Bureau with responsibility for H suffix cards. The letter was remarkable for several reasons. It informed me that I had 55 QSL cards at the Bureau for my old call, which I relinquished three years ago. Of course, I claimed my cards.

Additionally, Dale pointed out some interesting facts concerning the Bureau's operation. He has, in a recent two month period, destroyed over 4,000 QSL cards which had been unclaimed for more than a year. Further, he has over 2,000 cards which will soon be destroyed, and he only handles Eighth Area H suffix cards.

Perhaps it is time to remind the membership that the Bureaus exist and do handle cards. I have never considered myself to be a particularly active DXer, though I would have been very disappointed to learn that my cards had been destroyed. As often as call signs change these days, and considering the current sunspot activity, cards for recent contacts will be coming in for years. Even if you think you haven't worked DX, keep an envelope on file. In my group of cards I received six SWL reports. Think how much America's image can be helped by responding to verification requests from foreign shortwave hobbyists.

Send in an envelope. One 15¢ stamp will get it started back to you. The size requirements mentioned in the listing for bureaus are not *requirements*, they are suggestions. The important thing is to have an envelope there. — *Darrell (Dan) Ringer, K8WV, Assistant Director, Roanoke Division, ARRL, Morgantown, West Virginia*

[Editor's Note: Envelope size requirements for QSL bureaus may not be true requirements, but it is probably best to observe them anyway.]

*Membership Services Assistant

Happenings

Conducted By W. Dale Clift,* WA3NLO

California Ham Wins Precedent-Setting Antenna Case

A U.S. District Court judge has ordered the City of Placentia, California, to pay George E. Oelkers, W6QOL, attorney fees for a case Oelkers won against the city.[1] Oelkers had sued the city for violating his civil rights in an action arising from the city's overly restrictive antenna ordinances.

George Oelkers's fight to erect two antenna towers on his property began in November 1976. Placentia's city ordinance regulating antennas stated: "*Height.* Maximum allowable height limit in 'R-1' District shall be thirty (30) feet; accessory buildings twenty (20) feet." Oelkers needed a special-use permit before he could put up his two Amateur Radio towers, because one would be 50-feet and the other 71-feet high. The city Planning Commission issued a permit for the towers but imposed the following conditions: (1) the permit would expire after one year, after which time it may be renewed; (2) the towers could have no guy wires; (3) the towers could have no appurtenant structures, i.e., no arms or accessory antennas; (4) full safety precautions had to be employed to prevent children or other persons from climbing the towers; (5) should interference develop as a result of the improper operation or maintenance of equipment, the fire and/or police department would retain the right of inspection; (6) compliance was required with the latest building and electrical codes; and (7) any necessary permits required must have been issued and inspection made of the construction.

In May 1977 Oelkers put up his towers. That November, the Planning Commission decided to extend the use permit without setting any time limit. A member of the City Council, Donald A. Holt Jr., however, on his own motion, appealed the decision of the Planning Commission to the City Council.

Two months later the City Council, on the motion of Holt, revoked Oelkers's permit. At that point, Oelkers applied for a new special-use permit, but his application was tabled. On February 7, 1978, the Placentia City Council passed a new ordinance placing a total and absolute prohibition on radio towers in excess of 25 feet in height. The city attorney sent Oelkers a letter warning him that unless he dismantled the towers, the city would seek civil retribution and criminal prosecution.

In April 1978 Oelkers's attorney, Fred Lawson, K6JAN, filed suit against the city in Federal District Court. The complaint called for declaratory relief and damages pursuant to Chapter 42 of the U.S. Code, Section 1983,[2] alleging that the city was violating Oelkers's freedom of speech. The complaint also alleged that the city's ordinance was vague, overbroad and otherwise unconstitutional, and claimed that the federal government had preempted the field of radiocommunication by the Communications Act of 1934. Oelkers charged the city with violating the equal protection guarantees under the United States Constitution and depriving him of his property without due process of law as guaranteed under the Fourteenth Amendment.

On May 2, 1978, Federal District Court Judge Robert M. Takasugi issued a preliminary injunction enjoining the city from taking further action against Oelkers. On December 11, 1978, the Court made the injunction permanent, found the ordinances to infringe upon Oelkers's constitutional right of free speech and ordered the city to bring its ordinances into conformity with the Constitution.

Oelkers's attorney filed a supplemental brief and motion on June 2, 1980, claiming attorney fees under 42 U.S.C. §1988.[3] On September 24, 1980, Judge Takasugi ordered the defendant City of Placentia to pay Oelkers the reasonable sum for attorney fees and costs.

Oelkers's attorney, Frederick J. Lawson, who has law offices in Sherman Oaks, California was assisted by ARRL and the Personal Communications Foundation (PCF). Attorneys wanting more information about the case should contact either ARRL or PCF.[4]

CALIFORNIA LAW AGAINST PAY TV BOOTLEGGERS

Governor Edmund Brown Jr., has signed into law a bill prohibiting the sale, manufacture and distribution of receivers and kits to intercept subscription television signals. Examples of subscription television are Home Box Office, ESPN Sports Network and Showtime. Section 593(e) of the California Penal Code now reads as follows:

Every person who for profit knowingly and willfully manufactures, distributes, or sells any device or plan or kit for a device, or printed circuit containing circuitry for intereception or decoding with the purpose or intention of facilitating interception or decoding of any over-the-air transmission by a subscription television service made pursuant to authority granted by the Federal Communications Commission which is not authorized by the subscription television service is guilty of a misdemeanor punishable by a fine not exceeding two thousand five hundred dollars ($2500) or by imprisonment in the county jail not exceeding 90 days, or both.

The so-called "pirates," who sell microwave antennas and decoding equipment that can receive signals from pay TV stations and satellites, have sharply criticized the law. One group, the Citizens Alliance for Public Access to the Airwaves, said it would lobby to get the law repealed. The group is comprised of officials of at least two companies involved in the bootleg TV business. One company, Bootleg TV Systems of Santa Clara, believes it has found a loophole in the law. The officers of the company turned it into a nonprofit corporation called Americans for Freedom of the Airwaves and reduced the price of its equipment. It accepts "donations" for its equipment. The law prohibits the sale, manufacture or distribution of such equipment *for profit*, the company emphasizes. Whether the District Attorney agrees with this interpretation remains to be seen, but as of this writing there has been no enforcement action against Americans for Freedom of the Airwaves.

ARRL West Gulf Division Director Ray Wangler, W5EDZ, presents Randy Light, WB5UCV, president, University of Texas Medical Branch Emergency Communications Group, with the ARRL Charter of Affiliation certificate, as club officers (l to r) Richard Niemtzow, N5EV; Jerry Golden, W5VPW; and Gary Holland, WA5QDX; look on.

ARRL TECHNICAL EXCELLENCE AWARDS

The ARRL Board of Directors voted unanimously that the 1979 award for the *QST* article showing technical excellence be awarded to Edward Oxner, KB6QJ, for his article, "Build a Broad-band Ultra Linear VMOS Amplifier," which appeared in May 1979 *QST*. Oxner is presently an ARRL Technical Advisor, and holds B.S.E.E. and B.S.R.E. degrees from Tri-State College (1948).

The Board also voted unanimously that an honorable mention be awarded to Helge Granberg, K7ES, for his article, "Printed Line Techniques Applied to VHF Amplifier Design," in September 1979 *QST*, and A. C. Doty Jr., K8CFU, and Dr. Allen B. Macnee, ex-W1JIR, for their article, "Introducing the INCONs" in February 1979 *QST*.

*Deputy Manager, Membership Services

[1]Oelkers v. City of Placentia, __ F. Supp. __, No. 78-1031-RMT (C.D. Cal. Sept. 24, 1980).

[2]42 U.S.C. §1983 states: "Every person who, under color of any statute, ordinance, regulation, custom or usage, of any State or Territory, subjects or causes to be subjected, any citizen of the United States or other persons within the jurisdiction thereof to the deprivation of any rights, privileges or immunities secured by the Constitution and laws, shall be liable to the person injured in an action of law, suit in equity, or other proper proceedings for redress."

[3]42 U.S.C. §1988 states: "In any action or proceeding to enforce a provision of sections 1981, 1982, 1983, 1985, and 1986 of this title, title IX of Public Law 92-318, or in any civil action or proceeding, by or on behalf of the United States of America, to enforce, or charging a violation of, a provision of the United States Internal Revenue Code, or Title VI of the Civil Rights Act of 1964, the court, in its discretion, may allow the prevailing party, other than the United States, a reasonable attorney's fee as part of the costs."

[4]Personal Communications Foundation, 9036 Reseda Blvd., Suite 203, P. O. Box 812, Northridge, CA 91328.

PETITIONS FOR RULEMAKING FILED WITH FCC

RM-3705 — The petitioner, Philip E. Galasso, K2PG (29 Goodrich St., Iselin, NJ 08830), requests amendment of §97.61(a) of the Commission's rules (authorized frequencies and emissions) to expand certain phone subbands to "bring the subbands allocated to slow-scan television and radiotelephony into conformity with current world-wide usage."

RM-3761 — Filed by Charles T. Rauch, W8JI (3329 Wilford Rd., Toledo, OH 43617), the petition requests amendment of the Commission's rules to restrict the lower half of each 25-kHz segment of the amateur 160-meter band to cw only. The petition further requests that, in the event the 160-meter band is returned to exclusive amateur use, the lower half of the band be restricted to cw only. "The results will be an improvement in amateur relations, a reduction in malicious and unintentional interference, and conformity with the self-policing trend on this band."

Interested parties wishing to comment on these petitions should send the original and five copies of their comments to the FCC Secretary, Washington, DC 20554 (don't forget to send a copy to the petitioner). — *Richard Palm, K1CE*

FCC TO STUDY NEW TECHNOLOGIES FOR INCREASING RADIO SPECTRUM EFFICIENCY

The FCC is seeking public comment on a proposal that would encourage more efficient use of the radio spectrum in the Land Mobile Service. In issuing the Notice of Inquiry (Docket 80-440), FCC is attempting to provide greater freedom and incentives for public and private Land Mobile licensees to explore new, spectrum-efficient technologies.

Public comment on both the Commission's basis for such action and the specific rules changes that would be required, will allow the Commission to deal with the expected steady growth of demand for land-mobile facilities. The FCC points out that "the total number of private land-mobile radio transmitters is expected to double between 1980 and 1990, and to double again by the year 2000." To accommodate this growth, two regulatory avenues are open to the FCC: to allocate additional spectrum for land-mobile use and to provide for the introduction of greater efficiencies in the use of current allocations. Although both methods have been used before, the Commission feels that, under the present situation in the Land Mobile Service, an exploration of spectrum-saving technologies should take place before any band expansion. The Commission is aware of developmental programs already underway, but hopes that this inquiry will stimulate these efforts.

The Commission feels that one way to promote greater spectrum efficiency would be to amend its rules to provide for the use of modulation types other than fm (typically, land-mobile fm signal bandwidth is 16 to 20 kHz), such as single sideband.

Although the NOI is not directed specifically at the amateur service, it should concern amateurs. Technology that could diminish land mobile's insatiable hunger for additional frequencies would perhaps reduce pressure on amateur vhf and uhf bands.

With respect to the Commission's inquiry, amateurs are in a good position to exercise their experimental and technical expertise and file appropriate comments and suggestions. Comments are due March 20, 1981 and reply comments are due May 11, 1981. For a copy of this docket, write ARRL Membership Services Department, 225 Main St., Newington, CT 06111 (s.a.s.e. please). — *Richard Palm, K1CE*

The Southeast Amateur Radio Club has donated a set of ARRL publications to the Cleveland Heights (Ohio) Public Library and organized this library display. All affiliated clubs are eligible for a special reduced rate when purchasing a complete set of League publications to donate to local libraries. (*Photo courtesy WB8PMB*)

FCC CATCHES TWO REPEATER VIOLATORS

The FCC, in response to complaints of malicious interference to amateur repeater operations in the San Francisco Bay area, investigated and issued notices of violation to two amateurs.

During the late evening hours of August 30, 1980, FCC officials observed the transmissions from a particular station operating on the input frequency of the Grizzly Peak repeater. These transmissions were constantly sprinkled with sexually explicit and vulgar terminology and were determined to be originating from a station assigned a K6 call sign and located in Oakland, California. Engineers from the Livermore and San Francisco offices conducted a follow-up investigation of the station and as a result, issued a citation for violation of §97.117, "Transmitting communications containing obscene, indecent or profane words, language or meaning".[1]

As a result of a similar investigation of the Grizzly Peak repeater by FCC officials, a General class licensee was issued a citation for violation of §97.78 (good amateur practice), §97.113 (broadcasting) and §97.125 (interference).

As of September 8, 1980, FCC has served notices to five different persons for observed violative operations while interfering with the Grizzly Peak repeater. — *FCC Public Notice*

NEW BANDS REMINDER

In a news release dated October 14, FCC reminded all radio amateurs that the three new high-frequency bands approved by the 1979 WARC are not yet authorized for amateur use. The date for exclusive availability worldwide for amateur use is July 1, 1989. The FCC plans to advance this timetable considerably for U.S. participation. January 1982 is the effective date for development of a draft allocation table, which will assign new frequencies to the fixed services now using the 10, 18 and 24 MHz bands. During the next two or three years, slow and easy transition will take place, phasing out users such as AT & T, RCA, Army, Navy, Air Force and others. At the end of this time period most of the fixed services will have been reaccommodated and amateurs may be allowed to use the bands. This will be on a shared basis if reaccommodation has not been completed. New amateur equipment may include these new bands, but until FCC issues official notification, Amateur Radio operators may not use the 10, 18 and 24 MHz bands.

LEAGUE FAVORS TV AND FAX FOR GENERAL CLASS HF

The ARRL has filed comments in support of the Commission's proposal to permit the transmission of television and facsimile signals, amplitude or frequency modulated, on all Amateur Radio frequencies above 3,775 MHz where voice transmissions are currently allowed. ARRL feels that "this proposal encourages increased technical experimentation by a larger class of amateurs, thus furthering an increasingly important aspect of Amateur Radio." It is felt that there should be little or no interference with voice operations from either facsimile or slow-scan television emissions.

The League suggested one modification to the Commission's proposal: "With respect to F4 and F5 emissions on frequencies between 50 and 225 MHz, the bandwidth allowed should be as great as the bandwidth of an fm voice signal on the same frequencies. Even though the Commission's Amateur Rules do not specify a precise bandwidth for F3 signals on these bands, amateur practice is to use deviations of 5 kHz or less, producing a nominal bandwidth of 16 kHz or less. Such limits would be appropriate for frequency modulated television and facsimile on these bands." The League is urging an early adoption of the proposed rules. — *Richard Palm, K1CE*

TWO MAJOR CB LINEAR-AMPLIFIER MANUFACTURERS HAVE INVENTORIES SEIZED

FCC's Field Operations Bureau investigative efforts against illegal marketing of CB linear amplifiers have resulted in the issuance of search warrants against Majestic Communications, Inc. of Memphis, Tennessee, and D & A Manufacturing, Inc., of Scottsbluff, Nebraska. Approximately 400 electronic devices, with an estimated value of $150,000, were seized from the Majestic plant. Similarly, approximately 44 fully assembled units, valued at $12,000, were seized from D & A's plant in Scottsbluff. The Commission's Atlanta District and Grand Island, Nebraska Special Enforcement Facility offices obtained evidence in support of prosecution of Majestic and D & A Manufacturing, respectively.

Although the Bureau's efforts have been directed against the few known large manufacturers of illegal linear amplifiers, it is expected that future enforcement efforts will also be directed against small manufacturers, distributors and known retail outlets. The use of "linear amplifiers" to boost CB power is a major factor causing the American public to suffer electronic interference. FCC's enforcement efforts are intended to reduce these difficulties. — *FCC News Release*

[1] §97.117 has since been redesignated §97.119.

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Behold the Noble Repeater

Repeater communication is *the* most popular activity in Amateur Radio today. Why this is so is indeed an engaging question. Just what is the basic appeal of the repeater?

First, there's the obvious — repeaters provide reliable short-range communications to amateurs in various states of mobility. Appealing? Certainly. But there exists another element that transcends the workaday world of the urban commuter gabbing on the local 64 machine. It's the synergistic notion that the repeater is more than just a black box with silver knobs. Repeaters often have "personalities" all of their own. A repeater is the nucleus of a club, traffic or ragchew net, an annual picnic, public service in a community, and more. The origins of the repeater can be traced back to the Greeks — in mythology, a creature that had the ears of a rabbit and mouth of an alligator, called the Repeathius, relayed messages from the gods on Mount Olympus. This month, we'll take a look at how Part 97 applies to this noble creature.

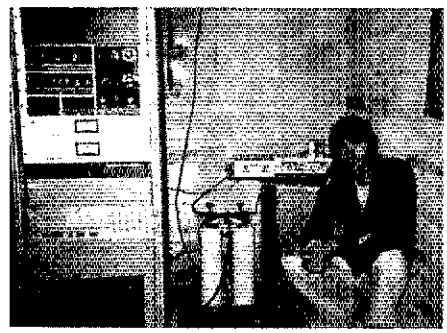
Q. What is the difference between a "repeater" and a "station in repeater operation"?

A. It's purely a question of semantics. At one time, the Commission issued "repeater" station licenses to individual repeaters and assigned special call signs such as WR1ABV. Then came deregulation in the form of dockets 21033 and 21135 so that "repeater" station licenses are now no longer issued, renewed or modified. Essentially, from a Part 97 standpoint, the Commission doesn't use the word "repeater." Instead, the rules now allow amateurs to operate their stations "in repeater operation." The licensee uses his or her own station's call sign to identify the repeater, along with a special designator — K1BA/RPT, for example — to announce that the station is operating under the special rules for repeaters.

Q. What are the special logging and i-d requirements for stations in repeater operation?

A. *Station identification:* As mentioned above, the call sign of the station licensee is used with a special designator RPT or R in cw, or the word "repeater" on phone (§97.84[d1]). Also, the regs specify that the i-d must be intelligible through the repeated transmissions and at intervals not to exceed 10 minutes (§97.84[c]). If the i-d is given by automatic means, the speed of a cw i-d must not exceed 20 wpm or 16.7 baud (§97.84[g]).

Station logging requirements: In addition to the standard log requirements of all amateur stations, the log of any station that is remotely controlled must contain certain additional information: (1) the names, addresses and call signs of all control operators, (2) a functional block diagram (see Figs. 1 and 2) and technical explanation sufficient to describe the operation



The conductor at the WA1VEI/RPT installation, Mount Lincoln in Pelham, Massachusetts. *(photo courtesy K1BA)*

of the control link, (3) a description of the means used for monitoring the transmitting frequencies and shutting the station down in the event of a control-link malfunction and (4) a description of the measures taken to prevent access to the remotely controlled station (§97.103[c]). Such measures include the placement of a repeater in a secure housing (locked cabinet or building), limited disclosure of command codes and control-link frequencies, and unlisted telephone numbers used for accessing the command functions.

If the system has more than one station in repeater or auxiliary operation, a network diagram of that system must be entered in the log.

If the repeater emits an effective radiated power (erp) greater than the limits of 25 watts @6 meters, 100 watts @ 2 meters and 400 watts @70 cm, the following additional information relating to the erp and height above average terrain (HAAT) must be entered in the log: (1) the transmitting antenna location marked on a topographical map having a scale of 1:250,000 and contour levels, (2) the transmitting antenna's HAAT, (3) the erp in the horizontal plane for the main lobe of the antenna pattern, calculated for maximum transmitter output power, (4) the transmitter output power, (5) the loss in dBs in the transmission line between the transmitter and antenna, (6) the relative gain in the horizontal plane of the transmitting antenna and, (7) the horizontal and vertical radiation patterns of the transmitting antenna, with reference to true north (for horizontal pattern only), on polar coordinate graph paper, and the method used in determining these patterns (§97.103[e]).

Q. Gee, that's quite a mouthful. How does one go about the task of figuring the repeater's erp and HAAT?

A. *ERP determination:* To determine your repeater's erp, you'll first need to know the transmitter's output power. Next, deduct from this figure losses caused by duplexers, feed lines and so forth. The resulting figure is the power that actually reaches the feed point of the antenna. Combine this figure with the gain of the antenna, and what is left is the erp. For example:

Transmitter output: 200 watts = 23 dBW
Duplexer loss: 3 dB
Feed line loss: 3 dB
Antenna gain: 12 dBd

Thus, erp = 23 − 3 − 3 + 12 = 29 dBW = 800 watts.

HAAT determination: If you've gotten this far, don't stop now. To determine HAAT, follow this procedure.

On a U.S. Geological Survey map having a scale of 1:250,000, lay out eight evenly spaced radials extending from the transmitting site to a distance of 10 miles and beginning at 0°, 45°, 90°, 135°, 180°, 225°, 270° and 315°. (Maps of greater scale can be used.) By reference to the map contour lines, establish the ground elevation above mean sea level (AMSL) at 2, 4, 6, 8 and 10 miles from the antenna structure along each radial. If no elevation figure or contour line exists for any particular point, use the nearest contour line elevation available. Now, compute the height of average terrain by adding the individual elevations at each of the 40 points and dividing that sum by 40. Thus, the HAAT is the height AMSL of the transmitting antenna's center of radiation minus the height of average terrain. Now that wasn't too bad — or was it?

Q. How is a repeater controlled?

A. A fundamental question, indeed. As with any amateur station, a station in repeater operation must be under the control of a licensed amateur called the control operator. He and the station licensee are both responsible for the transmissions of the repeater (§97.79).

There are three kinds of control — local, remote, and automatic. *Local control* means that the control operator is on duty at a control point, which is at the same place as the transmitter. The control point is defined in the rules as the operating position of an Amateur Radio station where the control operator function is performed. *Remote control* means that the control operator is on duty at a control point which is located at a place other than the transmitter site. Remote control takes place via a *control link*, such as a telephone line or radio link. A phone line can be used in the normal manner, with the operator dialing an unlisted number which rings at the repeater site. He then sends a signal which either activates or deactivates the repeater functions. Another kind of control involves a dedicated line or "hotline" — the control operator merely picks up the phone and is instantly connected to the repeater site. He then performs the same function as through a regular telephone line.

Radio remote control is possible by transmitting command signals to a special receiver interfaced with the repeater to accomplish the control function, normally with a tone

*Membership Services Assistant, ARRL

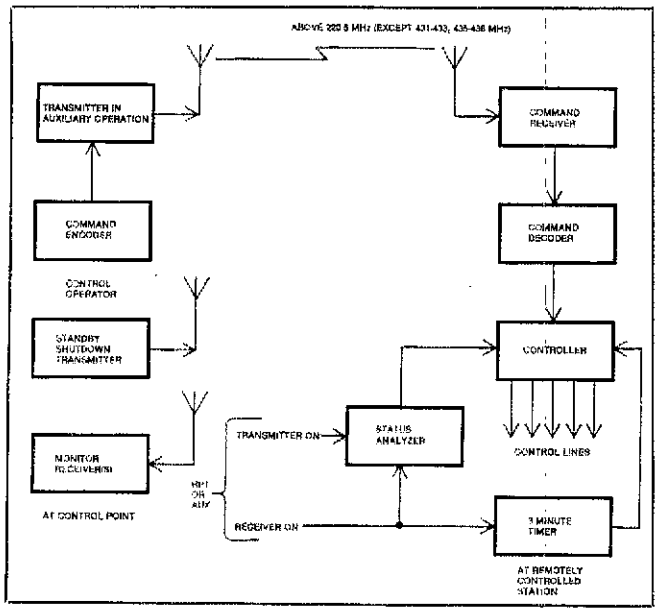


Fig. 1 — Block diagram of a radio-control link.

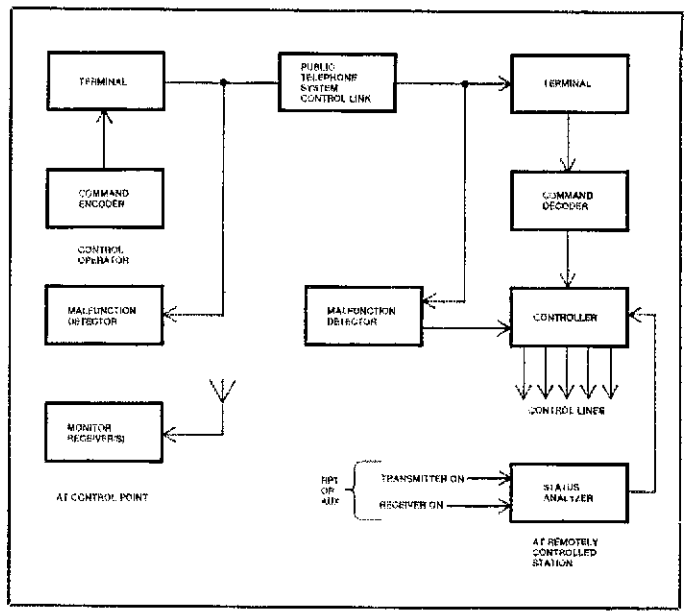


Fig. 2 — Block diagram of a public telephone system control link.

encoder/decoder device. Remember that a radio signal to control an Amateur Radio station must be transmitted on a frequency where *auxiliary operation* (radiocommunication for the purpose of remotely controlling another Amateur Radio station) is permitted: 220.5 MHz and above, except 431 to 433 and 435 to 438 MHz. Also, a repeater must *not* be controlled on its input frequency. (§97.61[d]), (§97.88[e]).

When a station is under remote control, provisions must be incorporated to limit transmission to a period of no more than three minutes in the event of malfunction in the control link (§97.88[d]). Amateurs often install a *three-minute timer* so that in the event that the control link fails, the repeater will be shut off automatically.

Q. What is automatic control?

A. A repeater may also be operated under *automatic control* which enables the machine to function without the control operator being at the control point. Incidentally, automatic control is permitted *only* for stations in repeater operation. During periods of operation where the repeater is under automatic control, the use of autopatch is *not* permitted because a control operator must be present whenever third parties participate in amateur communications (§97.79[d]). When the control operator returns to duty, the repeater is no longer considered to be under automatic control.

In concluding this section on repeater control, remember that the station licensee and any duty control operator he may designate are both responsible for the proper operation of the repeater. The control operator on duty must have *immediate* access to the control point so that, in the event of an unlawful user operation or technical malfunction, he is able to turn off the repeater.

This is not to say that the Commission will cite the station licensee or control operator for the retransmission by the repeater of an unexpected illegal transmission from a user station. But, they may be cited for a lack of proper control if they allow the repeater to consistently retransmit the illegal transmissions from the user station. This point underscores the importance of making sure that the control link is always capable of performing the control function.

Q. What frequencies are available for repeaters?

A. Frequencies available for repeater operation are: 29.5 to 29.7 MHz, 52.0 to 54.0 MHz, 144.5 to 145.5 MHz, 146.0 to 148.0 MHz, 220.5 to 225.0 MHz, 420.0 to 431.0 MHz, 433.0 to 435.0 MHz and any other amateur frequency above 438.0 MHz. Both the input (receiving) and output (transmitting) frequencies of a station in repeater operation shall be frequencies available for repeater operation (§97.61[c]).

Q. What frequencies must be used by a relay station operating as a link between two repeaters?

A. The relay station is a "station in auxiliary operation" and must be operated on frequencies available for auxiliary operation. Its input (receiving) frequencies, however, may be frequencies available for auxiliary operation, repeater operation, or both (§97.86[b]), (§97.3[l]).

Q. Is it permissible to incorporate additional inputs (receivers) and outputs (transmitters) in my repeater?

A. Yes, with certain limitations. Additional receivers and transmitters may be incorporated as long as they are used on frequencies available to repeaters. There is a further restriction on transmitters — "A station in repeater operation shall not concurrently retransmit Amateur Radio signals on more than one frequency in the same amateur frequency band, from the same location" (§97.85[c]).

Q. Are "closed" repeaters legal?

A. Yes. "Provisions to limit automatically the access to a station in repeater operation may be incorporated but are not mandatory" (§97.85[a]). Repeaters are often operated under this provision when interfered with by incidental signals on the input frequency.

Q. A local repeater has a special provision whereby it automatically retransmits a local NOAA weather reporting station broadcast on the hour. Is this legal?

A. No. The Commission specifically prohibits retransmission by automatic means of programs or signals emanating from any class of station other than amateur (§97.113).

However, there are at least two ways you can legally make this information available. If the weather service has a recorded *telephone* message, you can have one of the autopatch functions encoded to dial that telephone number. Thus it would not be a retransmission by automatic means, since it was never transmitted in the first place.

The other way is to have someone record the weather from a script onto a tape, updating the information every so often, and making the recording available to repeater station users. And, of course, it should be made available *only* to amateurs so that the transmission of the information is not intended to be a one-way communication to be received by the general public (§97.113).

Q. How can I find more information on repeaters?

A. ARRL publishes *FM and Repeaters for the Radio Amateur* (available from ARRL for $5) which details the technical, operating, and regulatory aspects of repeater operation. The ARRL *Repeater Directory* (available from the ARRL for $1) lists repeaters in the U.S. by state and frequency. Band plans for the repeater subbands, as well as the names and addresses of repeater frequency coordinators are included. Another good source of information is a local repeater club. QST

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL, have been reviewed by FCC staff. Interpretations contained herein concur with those of the FCC's Personal Radio Branch. Numbers in parentheses refer to specific sections of the FCC rules.]

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

CARF Merger Proposal Rejected

Last August, CRRL officers and directors received a letter from Bill Wilson, VE3NR, president of CARF, the Canadian Amateur Radio Federation. This letter outlined a proposal for the merger of CARF and CRRL.

Under terms of the proposal, CRRL would disappear. The name of the merged organization would be CARF, the Canadian Amateur Radio Federation. It would use the present CARF constitution as the basis for organization and administration. CRRL directors would be offered two-year terms as directors-at-large on the CARF Board, and then stand for reelection in the manner of present CARF directors. CRRL would turn over to CARF all responsibility for representing Canadian amateurs to DOC and the IARU. The ARRL Canadian director (Canadians could still belong to ARRL and receive *QST*), with a much-reduced role, would be offered an ex-officio position on the CARF National Executive. No mention was made in the proposal regarding the disposition of League Communications Department organizations and personnel in Canada.

A reply to this proposal was prepared only after extensive discussions among CRRL directors. In rejecting the proposal, CRRL President Mitch Powell, VE3OT, pointed out that much of the CARF proposal was based on the assumption that CRRL and Canadian Division of the League were two separate entities, and could be split. President Powell stressed that CRRL is part of the League, though admittedly, a very independent part. It has a responsibility to carry on the traditions and services of the League in Canada, and a responsibility to represent Canadian League members to DOC and the IARU. He added that CRRL people were working very hard to provide even better representation, and even more services, that CRRL had several exciting new projects under way, and that CRRL was not interested in disappearing from the Canadian Amateur Radio scene. No counterproposal was offered.

In informal discussions with CARF President Wilson, CRRL President Powell suggested that at this time, what was most needed between CARF and CRRL was not merger, but trust. He felt that trust could be promoted by undertaking some joint projects, and by each group giving the other credit for the things it does well. Full text of the CARF proposal, and the CRRL reply has been published in the *CRRL Newsletter*, No. 5, and is available from the editor of this column.

DOC EXAMINATION DATES

Dates for the 1981 DOC amateur examinations are February 4, April 15, June 15 and October 21. The date of first writing, February 4, is several weeks later than the date of first 1980 writing. We hope this change is partly in response to informal requests by CRRL to have this date coincide with the end of 20-week Amateur Radio courses which begin in September and end in January. Note that the regulations portions of the examinations is based on the new, amended regulations. Copies of these regulations, TRC-25, are available free, from all district DOC offices.

THOSE QSL BUREAUS. . .

This month we take a quick look at our Canadian QSL bureaus. There are nine individual bureaus in Canada, one in each VE call area and one in VO. Most Canadian amateurs know that you leave several self-addressed, stamped envelopes on file at your individual bureau. When an envelope won't hold one more card, it's sealed, dropped into the mail and sent along to you.

What few Canadian amateurs realize is that before cards arrive at their individual bureaus, they've probably passed through the CRRL Central QSL Bureau in Halifax, NS. This bureau is operated by Brit Fader, VE1FQ. Brit also operates the VE1 QSL Bureau, and has been doing so since 1937. With his name at the top of the *Callbook* list of Canadian QSL bureau managers, Brit was always receiving cards for every part of Canada. In 1977, when Len Sumner, VE3DOR, retired from the Central Bureau, Brit officially took over.

The CRRL Central QSL Bureau is quite an operation. Here are a few figures:

Year	Cards Forwarded	Postage Costs
1978	276,149	$ 822.21
1979	319,211	1036.18
1980 (first 10 months)		
VO	12,320	26.40
VE1	38,840	0.00
VE2	86,760	101.40
VE3	111,860	255.70
VE4	10,580	27.40
VE5	10,050	29.70
VE6	28,560	84.15
VE7	53,460	180.26
VE8	3150	12.25
VY	1450	8.50
Total	357,030	$ 725.76

What's really amazing is that Brit personally handles and sorts every QSL card by himself. Brit says it's really no work, that he's a mail clerk by trade, and that sorting cards is second nature to him. Still, 357,030 in the first 10 months of this year alone is a lot of cards!

Of course, there's even more sorting done at the nine individual bureaus. Two of the largest, in VE3 and VE7, are operated by clubs, the Ontario Trilliums and Burnaby ARC. Other bureaus are run by individuals. Few amateurs can properly appreciate the hours of work put in by bureau managers and their volunteer assistants to get those QSL cards out to you.

Who pays for the operation of these bureaus? Fortunately, bureau personnel don't charge for their time! Costs of operating all VE-VO QSL bureaus are covered by the League. The League pays the more than $1000 annual postage bill of the CRRL Central QSL Bureau. It also covers the operating expenses of the nine individual bureaus and pays the expenses of each bureau manager, to allow him or her to attend one major hamfest or Amateur Radio convention each year. It's an example of your League membership dues at work, helping to provide a service for all Canadian amateurs, whether they're League members or not.

CRRL officials have been busy throughout summer and early fall, visiting hamfests. They string up the League banner, display League publications, show the new film, "The World of Amateur Radio," hand out information, help with problems and, of course, sign up new League members. This shot was taken at the Guleph, Ontario, Amateur Radio Flea Market in June, but similar setups appeared at amateur gatherings in Sydney, Tadoussac, Montreal, Barrie, Toronto, Milton, London, the International Peace Gardens near Brandon, and Fort McLeod. If *your* club is planning a hamfest or Amateur Radio flea market, let CRRL officials know. They'll gladly attend!

*163 Meridene Crescent West, London, ON N5X 1G3

International News

Conducted By David Sumner,* K1ZZ

New Executive Committee for IARU Region 2

At its conference in Lima, Peru, October 13 to 17, IARU Region 2 elected a new Executive Committee to direct its activities for the next three years. Assuming the presidency is longtime Region 2 secretary Gustavo Reusens, OA4AV; moving to vice president is outgoing president Victor C. Clark, W4KFC; and assuming the responsibilities of secretary is the former vice president, Pedro Seidemann, YV5BPG. Peter Parker, VP9GO, continues as treasurer. Executive Committee members-at-large are Hugo Coscio, CP5EC; Luis Caamano, HI8LC; Alberto Shaio, HK3DEU; Fabian Zarrabe, HT1FI and Carlos Kaufman, LU9CN. The conference especially thanked W4KFC for his leadership during the past four years, which resulted in strong support for Amateur Radio at WARC-79 from the countries of North and South America.

Many matters of mutual concern in the post-WARC era were discussed by the delegates. Encouragement was given to the amateur satellite program, the Intruder Watch, curbing of phone patch abuses, a crackdown on illegal nonamateur operations in the 10- and 2-meter bands, the signing of reciprocal operating agreements among the countries of Region 2, 2-meter repeater coordination and the establishment of coordinated beacons in the 6-and 10-meter bands. A resolution was adopted condemning the interference caused by over-the-horizon radar systems such as the "woodpecker."

A policy was adopted that calls for cw and RTTY, only, to be used on the new 10-MHz band. Support was voted for the ongoing study of the IARU organizational structure initiated by IARU President VE3CJ.

A more-detailed report on the Lima conference is planned for an early issue of *QST*.

IARU REGION 1 SCHEDULES CONFERENCE

IARU member-societies in Region 1 are preparing for their triennial Conference scheduled for Brighton, England, April 27 to May 1, 1981. Already, 28 of the 48 Region 1 societies have indicated their intention to send delegations.

Founded in 1950, Region 1 is the oldest and largest of the three IARU Divisions. Among the issues expected to be discussed at Brighton are the formation of a Region 1 Satellite Working Group, band plans for 10 MHz and existing bands, progress toward a worldwide vhf locator system, electromagnetic compatibility (EMC, also known as radio frequency interception, or RFI) and Amateur Radio direction finding (foxhunting).

As noted above, Region 2 held its triennial conference in October of this year. The next Region 3 conference is scheduled for 1982 in Manila.

SOUTH AFRICA ANNOUNCES GUEST LICENSING CONDITIONS

The South African Radio League has advised that approval has been given by the Postmaster General to the issuance of guest licenses for visitors from abroad. Even where there is no reciprocal agreement between the two countries, licenses may be issued subject to the following conditions:

1) Application must be made at least *three months* prior to arrival in the Republic.

2) A complete itinerary should be made available.

3) Applicants must be in possession of a valid Amateur Radio license, other than a Novice license.

4) The guest license shall be valid for a maximum of three months.

5) Each application will be considered on merit.

6) The license fee is R10 (approximately $13 U.S.).

All applications are to be made directly to:
The Postmaster General
(Telecommunications Dept.)
Private Bag X74
0001 Pretoria
REPUBLIC OF SOUTH AFRICA

The Radio Regulations as set out in the South African Postal Regulations, as well as the IARU Region 1 Band Plan, must be adhered to. The SARL is prepared to assist visiting amateurs with details such as repeater frequencies, addresses of the 24 branches throughout the country or other inquiries. Write to The Honorary Secretary, South African Radio League Headquarters, P. O. Box 3911, 8000 Cape Town.

SPOTLIGHT ON MALAYSIA

The following profile of the Malaysian Amateur Radio Transmitters Society, MARTS, is provided by David Rankin, 9V1RH, secretary of the IARU Region 3 Association.

The country of Malaysia in Southeast Asia is a federation of 13 states. Eleven of these states are in West Malaysia on the Malay Peninsula, and the remaining two are in East Malaysia on the western side of the island of Borneo. The prefix for West Malaysian amateur stations is 9M2, and in East Malaysia the states are Sabah with the prefix 9M6 and Sarawak with the prefix 9M8.

According to the May 1980 newsletter of the Malaysian Amateur Radio Transmitters Society, the IARU member-society, there are 114 amateurs licensed in 9M2, 30 in 9M6, and 10 in 9M8. In addition to its licensed members, MARTS has approximately 130 SWL associate members and 10 overseas members.

The federal capital of Malaysia is Kuala Lumpur, known as "K.L." to the locals, in the state of Selangor. Until recently "K.L." was the home of most of the office bearers of MARTS. At the beginning of 1979, however, the council of management shifted its base to Penang, an island off the northwest coast of the peninsula. Penang is sometimes called the "Pearl of the Orient." The president is Mr. Eu Khuan Kew, 9M2BS, and the secretary is Malcolm Westwood, 9M2MW. The MARTS QSL Bureau remains at P. O. Box 777, Kuala Lumpur, but the address for the secretary is P. O. Box 13, Penang.

There is only one class of amateur license available in Malaysia at present, and the usual examination requirements of theory, regulations and Morse Code are in force. There are no reciprocal license arrangements in force and no 9M2 license will be issued to short-term visitors to Malaysia. Because of a continuing insurgent problem on its northern borders, security in Malaysia is tight and this situation is reflected in the long time taken for even Malaysian citizens to receive a license after all necessary examinations have been passed. Nevertheless, Amateur Radio is alive and thriving.

MARTS is an active society that, strangely, has only one meeting per year — the annual general meeting of the society held in January. The reason for this state of affairs is that distances within Malaysia are relatively great with the small amateur population being spread fairly thinly throughout the country.

Nevertheless, Malaysians have a well-deserved reputation for hospitality and visiting foreign amateurs, although unable to operate from their own stations, are always made welcome by the local 9M's. A short letter to 9M2MW will produce more details.

IARU Regional Secretariats

Region 1 (Europe, Africa, USSR)
R. F. Stevens, G2BVN
1 Priory Court
Barley Lane, Goodmayes
Essex IG3 8XN England

Region 2 (North and South America)
Pedro Seidemann, YV5BPG
P. O. Box 2253
Caracas 101
Venezuela

Region 3 (Asia, Oceania)
David H. Rankin, 9V1RH
P. O. Box 14, Pasir Panjang
Singapore 9111
Republic of Singapore

NEW REPEATER IN BAHRAIN

The Amateur Radio Association of Bahrain announces the installation of a 2-meter repeater that covers much of the Gulf area. The input frequency is 145.150 MHz, with output on 145.750 MHz. A 1750-Hz tone burst is required to access the repeater.

A9XBE is responsible for the repeater. The ARAB may be reached at P. O. Box 22381, Muharraq, BAHRAIN, Arabian Gulf.

REQUEST FOR ASSISTANCE FROM DOMINICA

ARRL has received the following letter from the Clifton Dupigny Technical College, Stock Farm, Commonwealth of Dominica, West Indies:

On August 29th last year the island of Dominica was severely hit by Hurricane David with winds of about 180 miles per hour, which caused extensive damage to property and much loss of life.

The Clifton Dupigny Technical College, a Government institution, and the only one on the island responsible for technical training, was heavily damaged, with practically all its tools and equipment destroyed and missing.

Since the Hurricane, we have repaired the buildings. The next phase of the project is to re-equip our workshops and laboratories, and as you know this is a very costly exercise which we alone cannot meet at the moment, but are depending on friendly donor agencies or other sympathetic organizations for assistance in whatever way that they can help.

I shall be grateful if your organization is able to donate to us any basic tools and used equipment lying around, which would be used for teaching purposes in our electronics and electrical engineering courses at the technician level.

I thank you in advance to hear from you favourably as soon as possible on this appeal.

Sincerely,
Mac Donald Alexander
Principal

The role of Amateur Radio in coming to the aid of the devastated island nation of Dominica was documented in February 1980 *QST*, pages 46-50. Now, amateurs have an opportunity to assist in the rebuilding of the island. Anyone who is in a position to help is urged to contact Mr. Alexander at the address given above. QST

*Assistant General Manager, ARRL

The New Frontier

Conducted By Bob Atkins,* KA1GT

Estimating Microwave System Performance

The nature of the signal paths involved in work on the higher microwave bands often enables us to make a fairly good estimate of signal-to-noise ratio (SNR) expected using given equipment over a predetermined path. When the path is optical, as is usually the case with 10 GHz portable work for example, then the path loss can be fairly accurately estimated. An estimate of signal strength over a given path is often referred to as a "link budget."

As an example of the utility of such a link budget calculation, WA1VUW/1 and KA1GT/1 recently planned to make a contact over a 50-mile path on 10.368 GHz ssb. Before driving the 100+ miles required to set up stations at the ends of this path, it was desired to know whether or not there was a reasonable chance of the signals being strong enough to copy. The estimated equipment parameters were: (1) transmitter power 0.5 mW PEP, (2) receiver noise figure 8 dB, and (3) antenna gains 17 dB horn at one end of the path and a 2-foot dish at the other. So, given this information, how can an estimate of received signal strength be made?

Path Loss

The first thing to calculate is the number of dB of attenuation that a signal at 10.368 GHz will suffer over a 50-mile, line-of-sight path. This is known as the free-space path loss (FSPL) and is given by

$$FSPL\ (dB) = 32.45 + 20 \log_{10} f + 20 \log_{10} d$$

where f is the frequency in MHz and d is the distance in km, or

$$FSPL\ (dB) = 36.6 + 20 \log_{10} f + 20 \log_{10} d$$

where d is expressed in miles.

Using this expression to calculate the loss over a 50-mile path at 10.368 GHz we obtain

$$FSPL\ (dB) = 36.6 + 20 \log_{10} 10368 + 20 \log_{10} 50 = 150.9\ dB.$$

Thus we now know that a signal traveling 50 miles through free space at a frequency of 10.368 GHz will suffer 150.9 dB of attenuation.

Transmitter Effective Isotropic Radiated Power (eirp)

The next value to calculate is the eirp of the transmitter. This is the amount of transmitter power, feeding an isotropic radiator, which would be required to give the same signal strength at a distant point as the actual transmitter and antenna in use. It is determined by the use of the expression

eirp (dBm) = transmitter power (dBm) + antenna gain (dB) − feed loss (dB)

In this case we have a transmitter power of 0.5 mW PEP. This is −3 dBm.

The antenna to be used is a 2-foot dish. Its gain can be estimated using the relationship

$$\text{dish gain (dBi)} = 7 + 20 \log_{10} D + 20 \log_{10} F$$

where D is the dish diameter in feet and F is the frequency in GHz. A feed efficiency of 50% is assumed. In this case a gain of approximately 33 dBi is indicated. Since the dish will be mounted directly on the transmitter there will be no feed line losses, so the eirp may be calculated as

$$\text{eirp} = -3 + 33 - 0 = +30\ \text{dBm}$$

Since we now know the eirp of the transmitter and the free-space path loss we can calculate the signal level at the receiving site. This is simply

received signal level = transmitter eirp − path loss = +30 − 150.9 = −120.9 dBm

I.e., the signal at the receiving site will be 120.9 dB below 1 mW (as received on an isotropic antenna).

Receiver Sensitivity

We now need to know whether the receiving system will be capable of detecting a −120.9 dBm signal. The calculation of receiving system sensitivity requires knowledge of a number of factors. We need to know the receiver noise temperature (or noise figure), the feed-line loss between the antenna and receiver, the antenna noise temperature, the receiver bandwidth and the antenna gain. Noise temperature is a measure of the noise contribution of any particular component, e.g., antenna or preamp, to a receiving system. It is related to noise figure (which is more commonly used) by the following expression

$$NF\ (dB) = 10 \log_{10} \left(\frac{\text{N. temp.}}{290} + 1 \right)$$

or this can be arranged to read

$$\text{n. temp. (K)} = 290 \left[\left(\text{antilog}_{10} \frac{NF}{10} \right) - 1 \right]$$

Thus, for the 8 dB noise figure receiver used here, the noise temperature calculates to be

$$\text{N. temperature} = 290\ [(\text{antilog}_{10}\ 0.8) - 1]$$
$$= 290\ (6.3 - 1) = 1537\ \text{K}$$

The antenna temperature of a tropospheric antenna (one that looks at the ground, as opposed to an EME antenna, which looks at the sky) may be taken to be in the region of 290 K. It may be lower, but the factors involved here are too complex to go into at this time and affect the total system noise temperature very little in this case.

The total system noise temperature can now be determined by the use of the relationship

$$T_s = T_a + (L_r - 1)290 + L_r T_r$$

where

T_s is the system noise temperature (K)
T_a is the antenna noise temperature (K)
L_r is the feed-line loss expressed as a ratio
T_r is the receiver noise temperature (K)

For the system under consideration this gives

$$T_s = 290 + (1 - 1)290 + 1 \times 1537$$
$$= 290 + 1537 = 1827\ \text{K}$$

We can now calculate the total receiving system sensitivity, including the noise contributions from all components which are incorporated in the system noise temperature.

$$\text{sensitivity (dBm)} = 10 \log_{10} (kTB)$$

where

$k = 1.38 \times 10^{-20}$ mW/Hz
T = system noise temperature (K)
B = receiver bandwidth (Hz)

This can be rewritten:

$$\text{sensitivity (dBm)} = 10 \log_{10} B + 10 \log_{10} T - 198.6$$

In the case of the receiver in question the bandwidth is 2.4 kHz and therefore

$$\text{sensitivity} = 10 \log_{10} 2400 + 10 \log_{10} 1827 - 198.6$$
$$= 33.8 + 32.6 - 198.6$$
$$= -132.2\ \text{dBm}$$

This means that a signal 132.2 dB below 1 mW will be as strong as the noise generated in the system, i.e., an SNR of 0 dB at the final detector stage of the receiver. Since this receiver is being used with a 17-dB-gain horn antenna, however, signals 17 dB weaker will be able to be detected with this same 0 dB SNR, making the effective receiver sensitivity −149.2 dBm.

We know from our previous calculations that the signal at the receiver site is expected to be −120.9 dBm. This is 28.3 dB stronger than the signal required to give a 0 dB SNR, and therefore should give an SNR of 28.3 dB. We have now done what we initially set out to do: estimate how strong the 10.368 GHZ ssb signals should be over a 50-mile path.

The important question to ask now is how do theory and practice agree? The answer is "surprisingly well." The measured signal-to-noise (SNR) over the path from Mount Tom, Massachusetts, to West Peak, Connecticut, was +20 dB, only 8 dB below the calculated level. This difference can be accounted for by considering the effects of intermediate ground reflections and, perhaps, optimistic estimates of equipment performance.

These calculations become routine with a little practice and can be performed using a $20 calculator. They can save much time and effort in planning DX contacts on the higher microwave bands. If a link budget is calculated for the same task as above using Gunnplexers (20 mW, 12 dB NF and 200 kHz i-f bandwidth) with 17 dB horns, the calculated SNR is 5.1 dB, much too small for fm intelligibility, considering the fm threshold and the usually optimistic nature of the calculations. Using a 2-foot dish at one end of the path should improve the SNR to 21.1 dB, which should allow the path to be worked on fm.

Receiver sensitivity calculations can also be used to predict the improvement in system performance when better preamps, lower-loss feed lines or higher-gain antennas are used.

Readers wishing to learn more about receiver sensitivity and NF calculations might like to read an article by the late Jim Fisk, W1HR (October 1975 *Ham Radio*, p. 8), and the extensive list of references cited in that article.

*c/o ARRL, 225 Main St., Newington, CT 06111

How's DX?

Conducted By Clarke Greene,* K1JX

More Station Design for DX

This month's installment is presented somewhat out of the order we originally planned. There have been so many requests for this information, though, that we're going to skip around to operating and propagation tips; back to technical stuff next month.

"Discussion of propagation will be mainly on (a) use of the long path, (b) the twilight zone, (c) use of meteor bursts for quick identification of weak local signals and (d) use of WWV advices.

"It is well known among DXers that signals frequently come in better the long way around the earth. This applies mainly to paths exceeding about 4000 miles the short way. Under some conditions, the optimum path flips from s.p. (short path) to l.p. (long path) in a few minutes, and it is difficult to choose optimum propagation. The nearest station design to ascertain the better path is that in use at W6AM. He brings each end of each rhombic, through transmission line, into his shack. By appropriate relays, the path may be tested or operated on in less than a second simply by flipping a switch. Similar technique can be (but practically never is) applied to driven arrays and Yagis.

"The question of when, in a longer term, it is desirable to search for long-path openings is not easily answered. Recent experience gives the operator his best competence. However, some general guidance is to look along the twilight zones.

"The twilight zone, globally, has an important relation to hf propagation. For example, on the long hauls, about 6000 to 20,000 miles (s.p. or l.p.), phenomenally good transmission can be realized for small portions of the day on paths nearly parallel with this zone. According to the relation between the maximum usable frequencies (muf) and operating frequencies, propagation may be better on the day or night side, or directly along the twilight zone. Seasonally, the zone runs due N-S at the equinoxes; mornings NW-SE in summer, NE-SW in winter; evenings NE-SW in summer, NW-SE in winter. The NE and SW directions are for northern latitudes. Long propagation paths perpendicular to a single intermediate twilight zone, on the other hand, tend to be poor, especially when the zone is near mid-path. This is because mufs are usually much different in night and day zones — sometimes called the 'contrast' problem. An appreciation of these phenomena is useful in estimating diurnal and seasonal openings to various parts of the world.

Sometimes signals arrive from unexpected directions, neither s.p. or l.p. Particularly, arrivals from north and south have been reported for DX signals as much as 60° displaced in geometric azimuth. Signals reflected from the aurora zone are usually characterized by a gravelly sound. To a lesser extent, this can be observed on signals propagated through the aurora. When Europeans are heard working the Far East, it's a good sign that Far East propagation will be good, later in the day, from the United States.

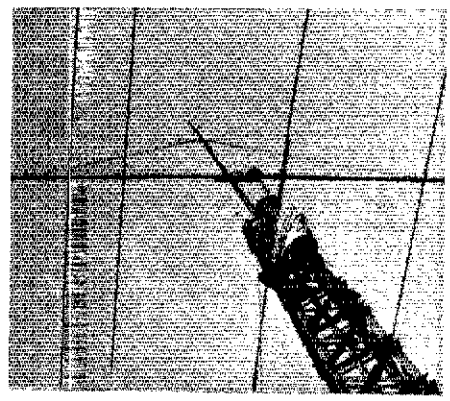
"Some propagation phenomena are useful for preliminary identification of signals in DX work. One of these phenomena is signal enhancement by reflection from meteor trails. The enhancements may be 20 to 40 dB in amplitude, and are typically about one second in duration. Unfortunately they are not always present. When they are, they serve to distinguish weak nearby (non-DX in the 20-meter skip zone) signals from bona fide weak DX. An appreciation of this saves the time of waiting for the weak station to identify by sending his or her call sign. Another phenomenon, useful in recognition, is the well-known rounding of the keying envelopes by multipath transmissions. That is, keying that has passed through several propagation hops and has arrived by a combination of several paths, is likely to sound softer (in the sense of less clicky) than ground-wave or single-hop propagation signals.

"Time and keen operating practices can be traded off, to some extent, for station technical effectiveness. Especially in this era of well-equipped DXpeditions, it is more important to be active on the right frequency at the right time than to have the ultimate in DX erp. Thus a station at home, a home within 20 minutes drive of the place of work, and a job that doesn't require being out of town on trips, can add more to the countries total (if that's your criterion of performance) than a 200-foot tower and a 50-foot boom.

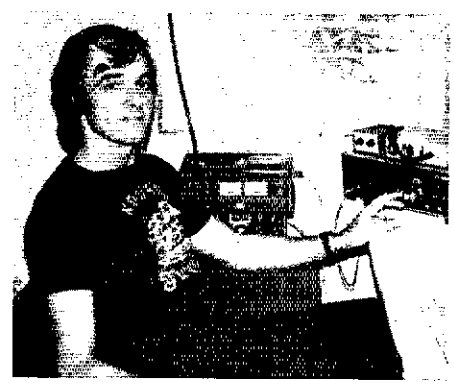
"It is better to listen several times a day for short periods than to listen for the same total of time in one session. In tuning, as from 14.0 to 14.1 MHz repeatedly, it is slightly preferable to snap back (as is done by oscilloscope horizontal sweep circuits) than to tune uniformly back and forth. In contests, it is preferable to tune from high to low, as "the pack" predominantly moves the other way. In pile-ups, a short call precisely timed and on the right frequency, can be more effective than a longer call at a higher power.

"Logging, filing and QSL procedures cannot be neglected. DX intelligence (G-2) is very important. DX-alert nets are good. But when they are not available, it is sometimes possible to exchange alerting services over telephone landlines. Particularly useful are DXers who have retired from full-time employment and spend several hours a day scanning bands. Having tools, test gear and spares close at hand can be a practical advantage in the event of breakdown at a critical time — some wrong Sunday afternoon."

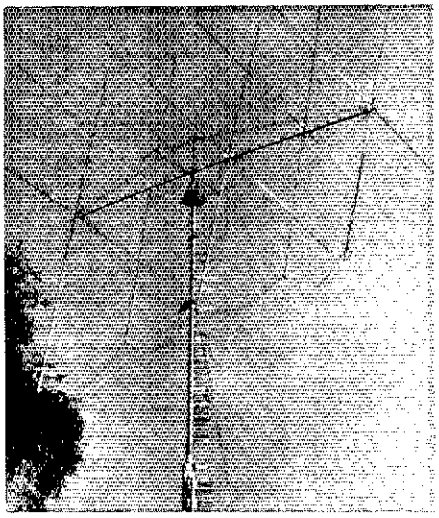
*187 Stafford Ave., Forestville, CT 06010



HM1TR is very active from Korea, especially during contests. Here is Jon inside at his station and outside on the tower.



Gerry, FY7BC, is one of the regulars from French Guiana. This station is backed up by a 3 element quad and various dipoles.



YBØAR, Jakarta, Indonesia, has one of the most potent signals from his part of the world. Here's the reason; a 5-element rotary quad log periodic.

MORE DX BULLETIN NEWS

The West Coast DX Bulletin is back! Well, not as a weekly, but as an anthology. W5DV and W6OGC have teamed up to compile all Cass's best stories and anecdotes into one volume. The manuscript is terrific; it revives those events of those 11 years for those who were there and provides good insight for those of us who weren't. The printing will be limited, so contact W6OGC as soon as possible if you want a copy of *DX Is! The Best of the West Coast DX Bulletin*. His address: James M. Allen, W6OGC, 1200 Third Ave., Suite 1200, San Diego, CA 92101.

QSL Corner

Administered By Joan Becker

INCOMING QSL BUREAU CORRECTION

Please note the following correction to the listing of QSL Bureaus on page 72 of November 1980 *QST*. The Mecklenburg ARS, P. O. Box DX, Charlotte, NC 28220, handles all fourth call area *single-letter-prefix* calls. The Sterling Park Amateur Radio Club, P. O. Box 599, Sterling Park, VA 22170, handles all fourth call area *two-letter-prefix calls*, excluding Caribbean and Pacific possessions. A corrected listing will appear in "QSL Corner" next month.

ARRL-Membership Overseas QSL Service

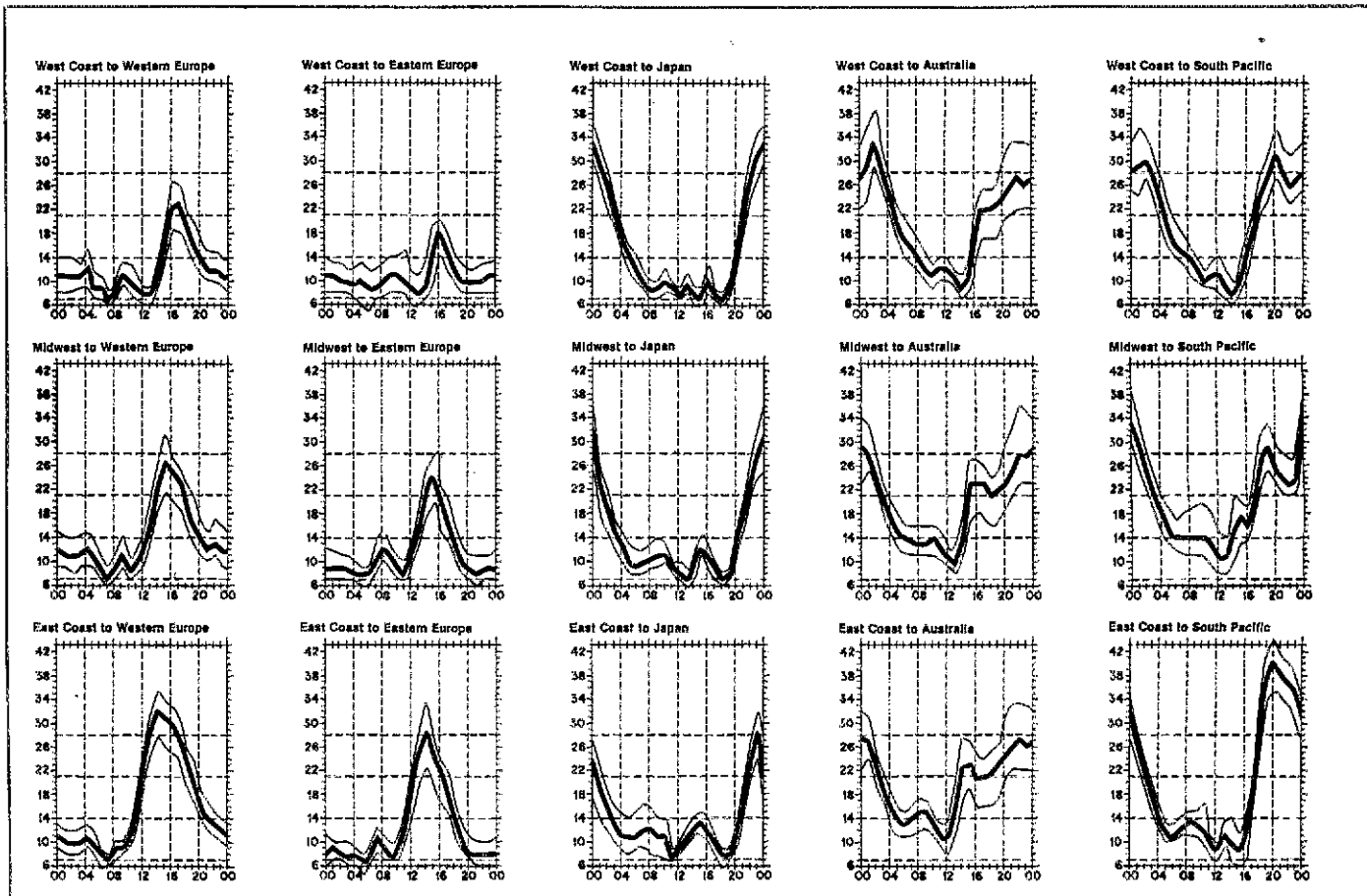
Send outgoing cards to this address: American Radio Relay League, 225 Main St., Newington, CT USA 06111

This is an "outgoing" service that allows ARRL members to send DX QSL cards to foreign countries at a minimum of cost and effort. While QSLing direct to foreign amateurs is faster, it is also more tedious. Time spent searching for addresses in the foreign *Callbook*, addressing and stuffing envelopes, and mailing could be better spent operating DX. And, the cost of IRCs, airmail postage and envelopes can be prohibitive.

An unlimited number of QSLs may be sent for distribution 12 times per year. The fee is just $1 per pound or portion thereof (155 QSL cards average a pound).

The ARRL-Membership Overseas QSL Service operates *only* in an "outgoing" capacity. To receive QSLs from DX stations, see "The ARRL DX QSL Bureau System," published every other month on this page.

U.S. amateurs may send SWL reports to foreign short-wave listeners. Unlicensed (associate) members may send SWL cards to foreign amateurs. QSL managers: write for details.



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or hpf). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or muf). On 90 percent of the days of the month, it will be at least as high as the

Requirements

1) Presort your DX QSLs alphabetically by call sign prefix (A3, AP, C6, CE, F, FG, G, GI, GM, IA, 3A2, etc.).

2) Enclose the address label from the brown wrapper of your current copy of *QST*. This information shows that you are a current ARRL member. Family members may also use the service by enclosing their QSLs with those of the primary member. Include the appropriate fee with each individual's cards and indicate "family membership."

Sightless members who do not receive *QST* should indicate that the QSLs are from a "sightless member."

ARRL-affiliated club stations may use the service when submitting club QSLs by indicating the club name. Club secretaries should check affiliation papers to ensure that membership is current.

3) Enclose payment in the form of a check, money order or cash. Sending large amounts of cash through the mail is not suggested. Please do not send stamps.

QSL MANAGER VOLUNTEERS

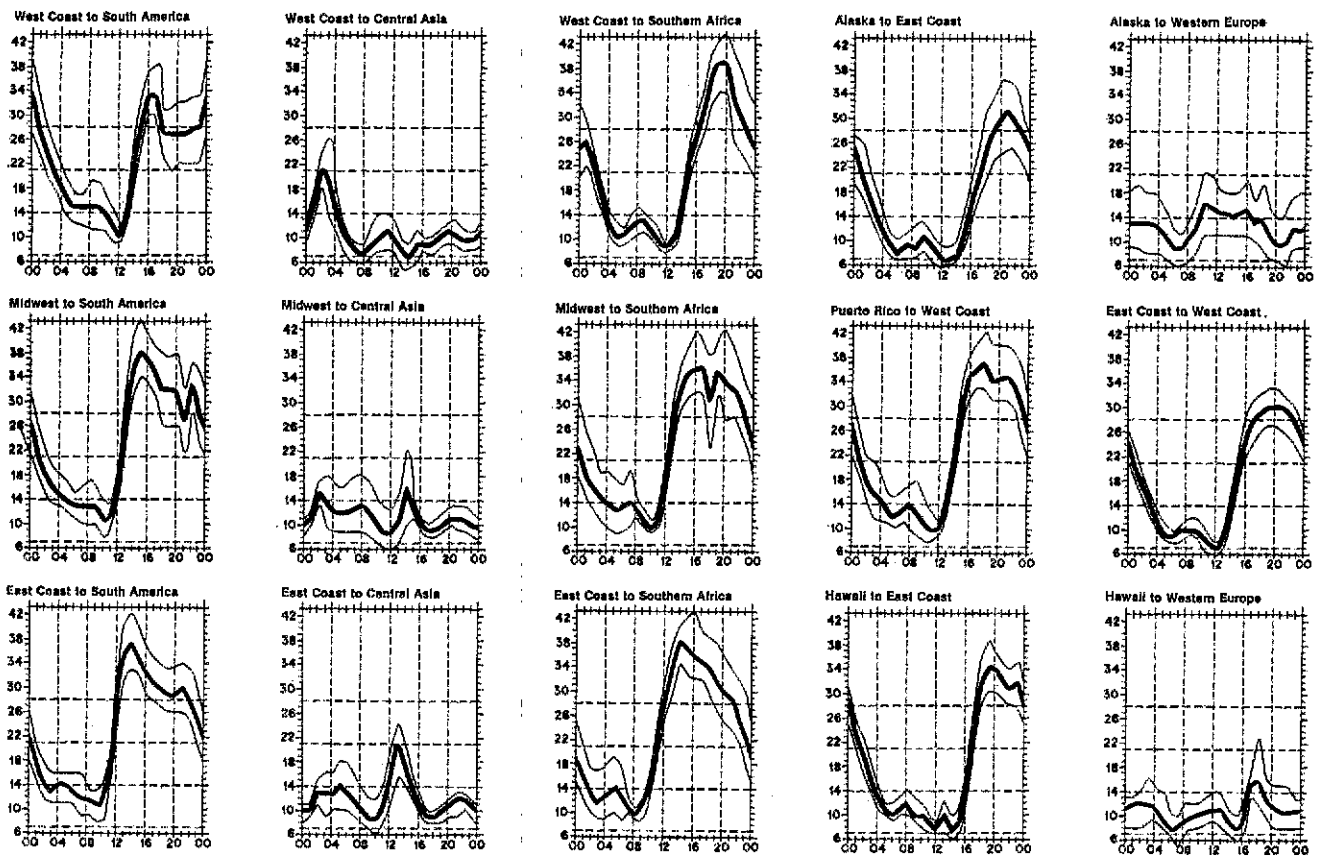
I0WDX N4BQD
WB7FAT KB5HS
K4YSF
W1OAY not manager for DU1RAK
W5RJV not manager for XE1AA
3V8PK not manager for WA1ZVS

Here is some QSL information for those who would like to QSL direct to the station location. It is passed along as we receive it and, therefore, may not be accurate.

C31MS (EA3MS)
C31UB (DJ7HZ)
C31VM (EA3BKZ)
EL2AM (WD4NXB)
EP2SV (K6KM)
ET3PG (DJ9JB)
GJ5DQE (DK3KD)
HKØAA (HK3DDD)
KC6DC (AD1S) P. O. Box 32735, Okla. City, OK 73123
KP4AER (AG2K)
PY2XB (W2UTH)
TU2JJ (KNØKCW)
T3LA (W7OK)
VP2AZE QSL direct, P. O. Box 1203, St. Johns, Antigua
VP2EEW (WD8ALG)
VP2MGT (VP2MO)
VP2MGV (K3VMG)
VP2MM (W1CDC)
VQ9RS (N6BLN)
XE1LCH (WD8NKT)
XE1RL (WD8NKT)
ZB2BL (W2UTH)
ZB2EO (K3MNW)
6Y5MR (VE3KGK) David Lambert, Box 1703, Station A, London, ON N6A 5H9, Canada

Season's greetings from the Overseas QSL Bureau staff! QST

Jerry, HL9WR, will be active until March of 1981 from this Seoul QTH. His home call is WB5NAR.



lowest curve (optimum traffic frequency, or fot). See January 1977 *QST*, page 58, September 1977 *QST*, page 35 and January 1979 *QST*, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for December 15, 1980 to January 15, 1981, assume a sunspot number of 146, which corresponds to a 2800-MHz solar flux of 190.

DX Century Club Awards

The DX Century Club certificate is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL Countries List. There are now 319 countries on the list, and the DXCC Honor Roll (published in the March and September issues) highlights those ops who are within 10 countries of that figure. Each DXCC certificate may be endorsed for additional countries over 100 — in increments of 20 up through 240, increments of 10 through 300 and increments of 5 over 300. This listing contains the call signs and exact country totals of amateurs who've joined the DXCC or increased their country-totals during the period from October 1 1978 through September 30, 1980. Think you may be ready for DXCC? Write Headquarters for details.

Mixed

365 W1GKK, W6AM, W9BG

364 K6ZO, LU6DJX, W2AGW, W2BXA, W4EX, W7MB

363 PY2CK, W3KT, W4AIT, W5KC, W8GT, W8GZ, W9ZM, W9ELA, ZL1HY

362 OE1ER, VK4QM, W1BIH, W3MP, W4OM, W7KH, W0DU

361 K6OJ, OH2NB, W2JVU, W4AAV, W4BQY, W5MMK, W6EE, W8BF, W8DMD, W0BW, W0MLY

360 DL1KB, DL7AA, ON4NC, W1HX, W2AG, W2QHH, W3EVW, W4TM, W6BZE

359 GW3AHN, ON4DM, W3LMA, W6BA, W7IR, W8LKH, W0AX

358 G3AAE, I0AMU, KH6CD, W1DK, W1FZ, W1HZ, W2DOD, W2LV, W2OKM, W5IO, W5PQA, W6CHV, W6IZD, W7DLC, W7PHO, W8EWS, W8MPW, W8RT, W9JUV, 4X4DK

357 DJ2BW, G3FKM, G3FXB, G5VT, HB9MQ, K2BZT, K3GL, K4PDV, K4SM, VE2NV, W2AO, W2AYJ, W2CR, W3NKM, W6KUT, W6PT, W6RT, W7OF, W0SYK

356 DL3RK, G2BVN, K2FL, K4YR, K6DC, OK1FF, SM3BIZ, W1JR, W1MV, W2BOK, W2GT, W2HTI, W2LPE, W2NUT, W2SSC, W3CWG, W4DR, W4ML, W5MMD, W6CAE, W6ID, W6KZL, W7GN, W8AH, W9FKC, W0PGI, W0QGI, YV5AB

355 DL1BO, DL6EN, DL7EN, LU4DMG, W2AX, W2QM, W2UE, W3GH, W4EEE, W6BS, W6YK, W7ADS, W8PHZ, W9GIL, W9SFR

354 IT9ZGY, K2BK, K2LWR, K4KQ, K4LNM, K5DX, K5UC, K6EC, LU5AQ, PY1HQ, W1JNV, W1NU, W4VPD, W6RKP, W8KPL, W9HB, 4X4JU

353 HB9TL, K3MO, K9AB, OZ3Y, W1AA, W2BHM, W2GC, W3AFM, W3CGS, W4EO, W5FFW, W5KGX, W5NUT, W5UN, W6EPZ, W8ZCQ, W9DWQ, W0AIH, YS1O, ZS6LW

352 DL1JW, GI3IVJ, K5FJ, K6LGF, K6KII, PY1HX, VE5RU, W1CBZ, W2FZY, W2GLF, W2TQC, W3GRS, W5GO, W6ET, W6FF, W7AQB, W8GY, W9DY, W9RCJ, W9RKP, ZL3IS

351 DL7AP, DL9OH, G2BOZ, HB9KB, I1ZL, I8KDB, K8DR, OH2QQ, OK3MM, SM0AJU, W1HH, W2BMK, W2FKA, W4WV, W5AQ, W5NW, W5QK, W6MUR, W7QK, W8OK

350 AE4X, G3HCT, JA1DM, K3II, PA0FX, PA0LOU, UB5WF, W1WY, W1CKA, W1PM, W4BAA, W4IF, W4NNH, W6BSY, W6HYG, W6KG, W6ONZ, W6ZM, W0GKL, W0LWG

349 DL1HH, F3AT, JA2JW, K9ECE, PT7YS, W1AXA, W2SAW, W2TP, W5LCI, W6QNM, W6SQP, W6UQQ, W7CG, W0TJ, WA2DIG

348 DL3BK, DL7HU, F9RM, G2FYT, K8ONV, KH6IJ, KP4RK, N4SU, ON4PA, SM7ANB, VE3AAZ, W2YY, W4ZD, W5AL, W5FT, W7DX, W7JYZ, W9CH, W9GU, W9TKD, XE1AE, ZS6RM

347 HB9MX, I0UA, JA1BK, K2FB, K2TQC, K4RPK, K6GA, K6RN, N6FX, VE3HO, W2XN, W4BFR, W4SSU, W5HDS, W5HJA, W5OB, W6ISQ, W8CUT, W0BTO, W0DEI, YV5AIP

346 DL1DC, HB9PL, K4EZ, W1AFF, W1MIJ, W2IRV, W3DJZ, W4OO, W4QM, W5QKZ, W6BVM, W6KH, W6REH, W9BM

345 DL7HZ, K2SHZ, K6RQ, K6WR, K6ZM, OK1ADM, ON4SZ, VE2WA, VE3BWY, W1RLQ, W2CP, W4MGN, W5GJ, W5RDA, W5EL, W6QNA

344 GM3ITN, HB9DX, JA1BN, K2PXX, K4JC, LA5HE, OH2QV, ON4IZ, VE6LU, W1DGJ, W4AXR, W6FW, W7AO, W7CMO, W0ZV, YV5ANF, YV5BZ

343 DL8CM, JA7AD, K4IEX, K8OHG, N6AR, SM7QY, W1SD, W4AVY, W4BBP, W6RJ, W8ARH, W8DA, W9FD, W0BK, YV5BX, ZS6IW, ZS6YQ

342 F9GL, I5ARS, I7ZPB, JA1BRK, K4AIM, K4MQG, N4XO, OE1FF, OH2BH, W2EQS, W2PV, W4KFC, W4UG, W5UR, W6KTE, W6TWZ, W6YA, W7BGH, W7LLC, W8ZD, W9BW, W9HJ, W9KNI, W9ZTD, W0BN

341 DL1CF, DL7BK, JA3DY, K4ID, K5AAD, K8FL, N6AV, OE1FT, ON4QJ, SM0CCE, UA9VB, W1UU, W2GQN, W4DRK, W4QQN, W5EJT, W5HE, W9GB, W9HLY, W9NA, W9PN, WA2RAU, WA2RLQ

340 DJ2AA, DJ7ZG, DL7FT, JA4ZA, K2YLM, K4YYL, K6MA, K6PU, K6YRA, K8DYZ, K8FF, N6DX, N9ZN, OK1MP, PY2PA, PY2PE, SM0KV, W4ZR, W6GMF, W6RGG, W6YMV, W9KXK, W9QLD, ZL1AJU

339 DJ5DA, DJ0KQ, HB9MO, JA1ADN, JA8AA, K2JMY, K6JG, N6GM, PY1DH, PY2BKO, UA1CK, W1OO, W2GK, W2GKZ, W2NC, W2PN, W3KA, W4EEU, W6EUF, W6YB, W8YGR, W9EB, W9LT, W0AUB

338 DJ7CX, I2KMG, K2LE, K4FJ, K4IKR, K4KG, K6QH, K8FJ, N4TO, OH4NS, PY2CQ, PY2SO, PY4OD, W1IAS, W7CSW, W8JQ, W9HZ, YU1BCD, ZL4BO

337 GI3OQR, JA1IBX, JA8ADQ, K1YZW, K4CIA, K6EV, K9BGM, K9SM, LA1KI, SM6AEK, VE3MJ, VE3WT, VK3YL, W1SP, W2LNB, W3PN, W4FX, W4KN, W6KZS, W7JYX, W8PR, W9ABA, W9AZP, W9OA, WA6GFE, WA6OET

336 AI9J, K1DRN, K4MPE, K5YY, K6AO, K6DT, K7ABV, N1XX, OZ3PO, SM1CXE, SM6AOU, W1MM, W7DY, W9KRU, WB2HXD, WB7ABK, ZL1AH, ZL1AV

335 DL8NU, G5RP, JA1BWA, JA1MCU, JA1MIN, K2LGJ, K3AV, K4DJ, K5RC, K9OTB, LA1K, OH2BC, SM5AZU, SM5BHW, VE3CLJ, VE4OX, W1ELR, W1FJ, W1FTX, W2MZV, W3GE, W4JVU, W4YN, W5LZZ, W5TO, W6FET, W6KNH, W6YO, W9DC, W9WNB

334 DJ5LA, G3JEC, G6RC, I2SM, K5LIL, K5EXO, K6XW, K8RTW, LA8LF, N4EA, ON4UN, OZ1LO, PY1APS, SM6CKS, SM6CWK, W3AC, W4NL, W8RSW, YV5AHR, ZS4MG

333 AA4MM, HB9AHA, JA8JL, K2AGZ, K2CL, K2UR, K4DY, K6KA, K8VUR, K9RJ, N4WW, N5DX, SM3CXS, SP7HT, VE3NE, W2FG, W2HZ, W3LPF, W4BRE, W5SJ, W6ANB, W6QL, W8CNL, W0PAH, WA9NUQ, YU2DX

332 DJ4AX, F9IE, JA2AAQ, JA8ZO, K1RM, K4CEB, K4XO, K9MM, KV4FZ, OZ6MI, SM6AFH, VE3BX, W1GX, W1YRC, W2AZX, W2PPG, W3PVZ, W4GTS, W5IR, W6KYJ, W8DCH, WA4WIP, YV5BBU

331 DL3OH, F2IU, F8RU, I0JX, IV3PRK, JA1ZZ, K1DFC, K2CM, K9AWK, K9KA, K0BUR, N4MM, N5RR, N6CW, N7NG, N8DX, OE2EGL, OH3SR, VE3GMT, W1GME, W4OEL, W8GKM, W8ILC, W0SD, WA3ATP, WA0OAH, WB4OSS

330 G8JM, I3EVK, JA1DFQ, JA1JRK, JA2HNP, K2KER, K4BVQ, K4HJE, K5UR, K8IFF, K8MFO, N4WF, OE1UZ, PA0TAU, VE3CTX, VE7IG, W2VJN, W2ZZ, W4AUH, W4WD, W5GEL, W6EJJ, W6MI, W6SN, W7JFO, W7RV, W9KQD, W9ZR, W9ZRX, W0BL, WA5IEV

329 DJ4PI, DJ6RX, DL3ZI, G3JAG, I2LAG, I7WL, JA1EOD, JA1UQP, JA9BJ, K2BT, K4AUL, K4BBF, K5JW, K6XP, K9RA, OZ5DX, PY2DFR, PY3CB, W1JZ, W1OHA, W1OT, W2FP, W2LL, W2MUM, W5MQ, W7LFA, W0GNX, W0MYN, WA3IKK, ZE4JS

328 DJ1XP, JA1OCA, JA7MA, K2OF, K3RS, K4EWG, K7KG, K8CH, K9GM, K9PPY, LA9CE, N4KG, N6UC, N8AA, VE1KG, W3EYF, W3GG, W6MUM, W8LBM, W8YA, W9HK, W0PT, WA2CBB, YV5AE

327 CT2AK, DK3PO, JA1CRR, JA2JKV, JA0SZ, K3ZR, KE4I, N4ZC, N6ET, PP5UG, SM6EOC, VE3GCO, W1HRI, W1NG, W4FPW, W4XR, W5JW, W6YHT, W8RCM, W9DH, W9KB, W0UD, WA3HUP, WA9LOT, WA0KDI, WB2EPG, WB8EUN, XE1KS, YU3EY

326 DJ1CG, I7HH, JA2AN, K5GO, K5OS, ON5KD, PY2ELV, SM7ASN, W4ORT, W6AE, W7OM, W8AD, W8ZCK, W9RF, WB2YQH

325 G3GIQ, JA1AAT, JH1EIG, K4RA, K8IP, K9JF, N7RO, OE8RT, OZ8BZ, SM6CVX, SM7EXE, SP3DOI, W3GJY, W3LB, W3ZN, W4JD, W4NO, W4UKA, W5JC, W6SC, W6TPJ, W7NCO, W7ORH, W8CFG, W8TA, W9IU, W0CPM, W0HZ, W0OQK

324 DJ5VQ, DL6KG, EA1BC, JA1FHK, JA8MS, K6LAE, K6LQA, K0BS, N4XX, N6AW, N0OA, PY5ATL, SM5API, UB5WE, W4WG, W5ZWX, W9GW

323 JA1GTF, K1BW, K3DCP, K3SGE, K4SMX, K5LM, K7NN, K0GVB, N4CC, N4SA, N5NW, OH2BCV, W1ER, W1HGA, W2SUA, W2SY, W3AP, W5EDX, W6GC, W7ETZ, W9TKR, WA4DRU

322 AB4H, DJ5JH, JA8KB, K3HPG, K4EEK, K4XL, K5AQ, N4RA, N5AR, OH8SR, SM5AQB, SM5DQC, W1AM, W4PZV, W4YA, W5SP, W6NNV, W7MI, W8QFR, YU1AG

321 AA4A, DK2BI, DL1PM, F2BS, JA1JAN, K2QOU, K4GLA, K8PYD, K8RWL, K9CJK, K9RF, N6RJ, N0RR, OH2XF, SM3RL, VE4XJ, W1AB, W1KG, W2CNQ, W5MUG, WA6DUG

320 AB4D, DK3GI, DL6MK, K3NL, K4IE, K4TO, K6OJO, K6UFT, K8LJG, K9IUF, K0IEA, N4UH, PA0VO, SM2EKM, W1BR, W2REH, W2YD, W4DHZ, W4YV, W5HTY, W6BUO, W6BYH, W6EYR, W9IVG, W9SS

319 IT9SEZ, K1JO, K6JR, K9FN, OE7III, VE3LGQ, W3CV, W6ZYC, W8KR, W8XX, W9AG, ZL1AMO

318 EA3NC, G3HTA, K1SS, K6AQV, W5RO, W6BIL, K6IR, K8ST, K8TL, PY2BW, W1KGH, W2BAI, W2JB, W2UI, W4FLA, W4GYP, W5IJW, W5XJ, W7LZF, W9DE, W9LNQ, WB6APX, YU1NYP

317 DK9FB, I3LLD, K2KGB, K6PZ, SM5BBC, SM5FC, W1BFA, W1LQQ, W5MJQ, W7LJ, WA9WJE, WB9EBO, YV5AK, YV5DFI

316 AA4S, DK3SF, F6CKH, JA1ELY, JA2AH, JA2KLT, K4DXO, K4XI, K7AA, VE7HP, W1GL, W2RS, W5UP, W6PLK, W6UY, W7XA

315 DJ8CR, DK5PR, JH1IFS, K1LWI, K1ZSI, K2VV, K3WS, K4XG, K4ZYU, K5KX, K5OA, K6SVL, K8RA, K9CT, K0IFL, N4JF, N6HR, VE4MP, VE4SK, W1GDQ, W1QWU, W3BTX, W4OTX, W4RJC, W6VBI, WA2JBV, WA4FFW, WA0DUB, WB2AIO, YU1NEO, YU4HA

314 DL1KS, HB9RX, JA3EMU, JA8EL, K2SB, K8ZR, K0ALL, N4OL, SM7DMN, W1DA, W1EOA, W2BXC, W2MP, W4XJ, W5DOZ, W7KWC, W8BE, WA8PYL, WB2NYM, YV5CWO

313 I7TGT, K4MG, K6XT, N4KE, SM7BBV, W2GA, W2QKJ, W4AST, W5CKT, W0CAW, W0SR, WA2EAN

312 AE3T, AE4Q, G3KDB, JH1VRQ, JA2IOD, K1KNQ, K3NN, K4LTA, K5JA, N5UD, OE1ZGA, OK1TA, VE3CVZ, W3NV, W6KPC, W7PK, W8QWI, W0IZ, WB5BID

311 AA4CJ, AC8K, HB9AIJ, JA1KF, N3ED, K3OTY, K5BZU, K5GH, K9AJ, K9KU, K9XJ, N6JV, N9MM, W1GG, W2RS, W3JXH, W3LPL, W4AFS, W4OWJ, W6DN, W9LW, WA7BEV, WB2VFT, WB4TPU, 4X4FQ

310 DK9WB, DL1LD, DL1MD, EP2TW, HB9IK, JA8AYN, K1KI, K2UU, K3EH, K3GYD, K3UA, K4GFI, K4PI, K4UTE, K5DUT, K6HTM, K7BR, K7UR, K8CSG, K0JN, KB9EZ, N4TN, N4WB, N6MU, N7BJH, OK3EA, SP9AI, W1EW, W1OR, W1YY, W2CC, W2IYX, W2MIG, W2PSU, W2SM, W4TK, W5MCO, W7DQM, W7KS, W9GDI, W9RY, W0GKE, WB6DXU, YU3ZV, YU4EBL, 9H4G

309 EA2IA, K1MEM, K2HVN, K4OCE, K5KLA, N4XR, SM3EVR, W5QIX, W6BJI, W8ZR

308 G3SJH, K7ZR, K8CW, N2OO, W3LMZ, W4NBV, W6JZU, W7DQ, WA4CXZ, WA4JTI, YS1RRD

307 DL3ZA, JA3GM, JA6EYD, K1CC, K9TN, N3II, N4RR, N6RS, N8TN, SM7BIP, W3RJ, W4BV

306 F9YZ, JA8CDT, K8RD, K9KXA, K9VQK, N4HH, N4NX, PA0INA, SM6CMU, W2LZX, W4TFB, W6BFW, W6TC, W7TE, W9VCQ, WA8LSO, WB2AMO

305 AE4Z, DJ1BV, DL1YA, G3KAA, HB9AHL, I0DUD, K2UO, K3ND, K4ADU, K4RD, K4RZ, K4TSJ, K4XP, K5OR, K6GWN, K8NA, K8NN, K9HMB, K9PQG, K0GSV, KP4A, N4JJ, N5FG, SM6VR, VE3BZ, W1UN, W2TA, W3CDG, W4LVM, W5IRG, W5ZF, W6CS, WA4TLI

304 AJ2E, HB9AQW, JA3DGC, K2XA, K3FN, K4HRG, N2CW, N3UN, OH2SB, SM6CST, VE3II, VE3IR, W1RLV, W4PB, WA2AUB, WA1EOT, WA0UFS, YU2CBM, YU7ODO

303 I2PNB, JA1FNA, K2UFM, K4IR, K6UD, K9UWA, K0LUZ, OK2BKR, W1WLW, W3ACE, W6OMR, W8MEL

302 F2VX, G3ZAY, IT9PUG, K1UO, K2GBC, K3TW, K5SSZ, K6JB, K6YCM, N4IA, W4EJN, W8KNH, W9ZA, WB4LFM, WB0HAI

301 AA4G, F2NB, G3TOE, HB9AMO, HK0BKX, JH1QOJ, JA8BMK, K4AEB, K4UEE, K6RK, KA4S, N2AP, N4VZ, N5XR, OH2FS, OY7ML, PP5YC, SM6DBB, VE7IO, VO1FB, W1RED, W3YX, W4CZU, W4RNP, W7QS, W9PIO, W9VA, YU2RTW

300 AA4V, AE4H, DJ2EH, EA5NA, F6DCQ, IT9WGI, JA2JSF, JA3DWT, JA9ESZ, K1TN, K1UM, K5NW, K5SF, K5VNJ, K6AAW, K6CBL, K6SP, K8IA, K9BWQ, K9IL, LA3XI, N2AC, N4GG, N5OK, N6BB, N6VR, OE1GHC, OZ5VT, OZ9PP, PS8YL, SK6AW, SM6EQS, SM7TV, W1ESN, W1QV, W2HAZ, W2VYX, W4FDA, W4KA, W4RIM, W4YH, W5CPI, W5KFN, W7DH, W7DV, W7JUO, W8ELE, W8GS, W8LU, W9MCR, W9VIN, W9ZWH, W0TRF, W0WP, WA9TVM, WB4EOD, WB4RUS, WB6RIU, WB6WHM, WB8ABN, 4X4NJ

299 I0ZG, K1VR, K2JGG, K5KR, K7CVL, K9BG, KH6CF, W1ECH, W6RFX, W0NAR, WB2QMU, WB4PAB

298 DL7NS, JF1PJK, K4GJD, K4TT, LA8CJ, VO1AW, W6HT, W6VD, W9NGA

297 JE1BSD, K0CL, N2KA, W6OMM

296 AA4AR, DJ2TI, JA2INS, K3AO, K3RT, KS4Z, N7US, W3GOH, W5ZPA, WA2FIJ

295 G2GM, JH1HWN, JA3VLD, JA6CNL, K4KFH, N6SW, W6WO, W7FR, W7OK, W8WOJ, WB4HOK, YU1DZ

294 AA4M, I1BAF, JA1VN, JH6HPL, JA7PL, K1MM, K2MFY, K6WD, KN4B, VE6WQ, W7CNL, WB6EXW

293 AA6AA, DJ4XA, OK3FD, JA5PUL, K1WJ, K2BXG, K6YK, K8CMO, OH2LU, PY1LW, WB4YHV

292 DL7SY, JH3DAE, JR6CWC, K3KA, N3RL, N5FW, N6MB, SM6DYK, W1BL, W3XX, W4DXI, W7IYW, W7RQ, W7UZA, W7ZHZ, W9XX, WA1AER, WA3GJZ, WA4DCP, WA4OOM, WA4VDE, WA0TKJ, WB8OFG, XE1FR, YU3OM

291 AE6U, DL1BS, I15BU, I2VDX, I3OBO, JA8HQI, K1SA, K2YGM, K5WE, K9QVB, N3RT, W4DJJ, W4HY, W4QCU, W7BJ, W9NGB, WA4MSU, WB2BNJ, YU2OB

290 AA1K, AB4Z, DL1QT, EA4CR, G6VQ, JA2KVD, K2ZRO, K4SE, K6AG, KI4M, N1AC, N2DL, N4CQT, N4TX, N0EL, SM0AQD, W1VV, W3GL, W3UJ, W3YY, W4EZ, W4JII, W4OHZ, W4YKH, W6NPY, W6NZX, W7LR, W7TVF, W8FF, W8GIO, W8NPF, W8QBG, W9NB, WA1JMP, WA3KCY, WA3SXH, WA4WYN, WA5EZQ, WA6TLA, WB2QAX, WB4NDX, WB6ZUC, WB9BGJ, YO4WU, YV4BK

289 JA8FKO, K7OXB, N1ACW, N4QF, N9BB, VE3FRA, W2DPL, W3AX, WA4GKR, WA4HDD, WA4LOF, WA6OGW, WB4OSN

288 HB9BGN, JA8DNZ, K3MNW, N4CQ, N5GM, W1IKB, W5DV

287 IT9AF, K3NZ, K6AXC, K9QXY, N5DD, N7MC, W1RR, W3TVB, W9CL, W9TA, W0VX, YU2AKL

286 DJ3NW, JA5EN, K1CV, K1FI, K7KD, K9HQM, N5JR, PY2ASA, VE3AMJ, W4DZZ, W0FF, WA3BGC

285 JA7ZF, K4QPR, K7LAY, K0SVX, KB2NU, KG4W, N2DT, N9NS, W6PQZ, W6TFO, WA4QBX, YU3QI

284 F6OHB, K1HZ, K4GPX, LA5YE, W2JGR, W2OBX, W8BIP

283 AA4DR, AC8L, AI8S, DL7CW, K5VRX, K5PP, K7RLS, N4DW, N4WX, N5AX, N7UT, PJ2FR, SM5AHK, W1QUS, W2QL, W4BD, W0NB, W0NS, W0YCR, WA8QIY, WA0VKF

282 AA4T, AB4X, DF4FX, JA7JAA, JA9CZF, K4AVC, K4IBP, K4SV, K5BLV, K5MA, K9IW, N1YL, N3US, N4TJ, SM7BOL, W3NF, W4DUP, WA2OQM, WA4MAV, YU3CM

281 AA4CK, AI5B, DJ5AI, DK5WS, K4FCT, K7ZA, K8NW, OE2VEL, OH3XZ, W2OB, W2RSJ, W4SNR, W6GO, W6PMT, W6VW, W7BCT, W9SC, W0YZB, WA4DAN, WA6TOO, WB6WIW, WB9SEJ

280 AA4VK, AA9M, AB0X, HI8LC, I2MQP, I4AND, K1HMO, K1WJL, K6ELX, K7UT, K8KAE, K9HA, K9ZO, K0CS, K0YST, N2MF, N5AB, N5TC, N8BM, OE1CP, SM4EMO, VE3DMC, VE3XK, W2KE, W2NJN, W4OMQ, W7LGG, W7PFZ, W9TY, WA6OIU, WA8OVC, WB4FJO, WB6LFR, WB8JEY, WB9YXY, WD9AHJ, YU2CDS, ZL4LZ

279 G3OZU, HC5EE, K0BJ, N5RQ, N6SV, SM0CCM, W2BBK, W2HUG, W3IRE, W4YH, W9AND, WA7ZLC, WB4CSW, 4Z4DX

278 FY7AN, K1TZQ, N4PB, N6CR, N9RS, VE2YU, W2TXB, W4IQ, W5VSZ, W7RVM, WA2OHD, WA2WSX, WA4ICK

277 K5QY, K7GLL, K7RDG, N7SW, VE5YA, W2HN, W7ZR

276 G3DOG, K2NJ, K4LR, K5RW, N9KV, OZ1CTK, W8GE, W0IUB

275 AB8K, AB8Y, AI3C, DL1ES, K4BIY, K4LQ, K9BB, K9CW, K9JS, K0CN, KB4QB, OE1BFW, VK2BC, W2IQB, W6OK, W6OKX, W7GXC, WA3WIP, WA4OBO, WA4OUF, WA0IDK, WB8OBA, WD9IIX, YU3DQ

274 CE0AE, HB9AZO, K4KBL, N1DL, N9AGC, TG4NX, VE7DFW, W5LW, W7FP, W8CC, WA4CTA, WB6ZHD

273 AB2N, CE6BGZ, DL1LZ, JA1QXY, K1EM, K4UWH, K5BOS, OH2VZ, K9FD, KA7AUH, KB8KW, N1ZZ, N4VA, W3SQ, W4JFE, W7GSP, W8LZV, W0JS, WB2HPP, WB5ZDO

272 DJ2MN, K1ST, K1VJH, K2SP, K4GXH, K8HV, K9EVB, N1UN, N4OM, N6AHU, SM7BAU, VE2AFU, VE7BBD, W1RM, W4MGX, W9NN, WA4MFS, WB7OUL, YB7AAU

271 AF5M, DL1RB, JR1TNE, K1AP, K6ZXS, K8GG, K9MK, N4XZ, N7RP, SM5BFJ, W2PK, W8ELL, W8UVZ, WA1TPR, WA4FVT, WA5IGD, WB9HIP, YU3OV

270 AE0K, DL1DA, HB9KC, I8RFD, JA1IOA, K2IJ, K4WSB, K5CSK, K5OG, K6RSY, K7SFN, K9GX, K9HLW, K9TUS, KA8T, KB9BH, KP4AM, N1TZ, N6VF, N8JW, OE2HOW, PY2DBU, VE3BHZ, W1DQH, W2AXZ, W2BTG, W2NJ, W2QXA, W3HYJ, W5XX, W6MUS, W7HR, W7NP, W8CTR, W9DDX, W9BA, WA5UBV, WA7OSO, WB4RFZ, WB6RSE, WB9ZBE

269 G3TXF, G4BUE, K4CXY, N4YO, N8II, TG9AL, W7CE, WB1DQC, WB3HAZ

268 AF4M, K3CHP, K6LPL, K8MN, ON6OS, W4RA, W9LJL, W9MCJ, WA3LJP

267 KL7H, KU4J, N4HU, N8DE, SM6CTQ, W7EOI, WA1UVX

266 AA4KA, JR1FYS, K4CG, K5EOA, K5OC, KA5V, N0SS, PY6TM, SM5BFC, SM0GMG, W1FX, W3KJ, W6CRE, WB2OHD, Y45RA

265 AE8B, CO2FA, K4OD, K6DG, KB2EN, KB4BU, KC4U, N5AN, OH6RA, W0CDC, WA2MNM, WB2MIY, WD9CWJ

264 GM3AWW, JA4BBN, N4NW, N9OK, PY4AKR, VE7RG, W6YQ, WB4ASV

263 AF6S, AG1J, DK8NG, DL0WU, HB9HT, JR1EBE, K1AWP, K1SF, K1VSK, K2IGW, K2OLG, K4FW, K5FNQ, K8BCK, N6IT, OK1DH, SM5AJR, VE6HT, W1CNU, W5VX, W6ATO, W8III, WA2LMW, WB9OQU, WB0SNG, YU4VTU

262 F6CUK, G3ZQW, JF1EZH, K1KNM, K5KV, K9RL, KH6BZF, N6OZ, N0AT, VE1AI, W1MLG, WD8MOV

261 DL9TJ, K1VKO, K4TFI, K6CLV, K6XN, K8PCZ, KH6DL, VE3IPR, VE7DP, W1HSP, W1JDE, W6OU, W8KKF, WB9SLV, WB0NAA, YU2CAL

260 AA4SC, AB1U, AJ9D, DK5AD, HB9AOU, HB9T, IT9AZS, JA6RIL, K1DP, K1RQ, K2GAT, K4ON, K5TSQ, K7AOZ, K8DJC, K9DID, K0ARS, K0HT, K0SVW, KP4EBQ, N4GE, OE3EVA, SM0BZH, W1KLY, W1NB, W2ABM, W2FHY, W3ARK, W3KH, W4WXZ, W6CQ, W6IR, W8CEU, W8MFW, W8NJC, WA4DAN, WA4GIQ, WA4JJW, WA5SUE, WA8NDL, WB8VPA, WB8ZRV

259 AA4TP, AG8B, AJ7V, DL7UX, EA2HW, JA1FGB, JA2YKA, K5TF, K6MT, K9NB, N4SX, VE3AKG, W2PD, W6TJI, YU3GI

258 JA1SJV, K2TV, K5CG, LU8BA, VE3GJH, W6INH, W7XN, W9IT, WB4KCL, WB9NKH, WD4NKP, YU2BOP

257 JA2BP, K4PVZ, K5RE, W4OVU, W9NNE

256 AF5H, JA2EIV, JH7BRG, K4KPH, K0RQF, N4BP, N5UT, N6ND, W3EV, W3FM, W9RW, WA2GEZ, WA3DSD, WA6EKL, WB7EEI, WD8KKF

255 AA4PP, AB5P, AD5O, AG5X, AI3N, JA6VA, K2DSV, K4DSE, KA1BU, K6CH, N8AFR, N0XA, PY4ALC, VE3DGX, W7ONY, W9UO, WB9RGA, YU3TYX

254 AG4L, JH1APK, JR6EFE, K0EOU, KB4FQ, KB9EN, KV4L, N3BJ, N6OJ, N9RR, PA0GMM, VE4SW, W3HXO, W6AYQ, W6JD, W9DYG, WB0NHD

253 I2AY, K1YHM, K2LX, KL7AF, LA3SG, N3GB, PY1SJ, W2MOF, W9KBV, W0SI, WA4WPO, WA6AJP, WA9MGK, WB3DNA, WB4PRU, 9J2BO

252 AB9E, DA2DC, DL7RT, DL0AA, I5EFO, IT9TNO, JA4GXS, K3IE, K4KJZ, K4JNM, K4PHE, K5GK, K6FM, K7CQ, K8VFV, K9ARZ, N5AW, N6ANN, VE3CPU, W1LJ, W4JVN, WB2KPE, WB4SXX, WB8UIA, WB9POH

251 AA4KT, HI8MOG, JA5CAX, K4DDB, K5MBE, K0DEQ, KA5W, N2JV, N2VW, SM3DMP, W1HSB, W1YN, W4HYY, W4LF, W4PRX, W8PCS, WA2IZN, WA2MTI, WA4YBV, WA7GVM, WB1CCH, WB8ZRL, YU1OCV, YU1QBC, YU2CDL

250 AC0M, DK6ED, JA1TNV, JH1AGU, JA5BSQ, JA9AQE, K2KA, K5AS, K5MK, K5QEA, K6ANP, K6OYE, K0MNG, K0TMK, K9FO, KA6RR, KB4SA, KL7IAK, N2AQH, N2UN, N4AXR, N4ZS, N6YI, SM5DBR, W1PV, W4CEB, W5SQ, W6OU, W8CHV, W8PBO, W9MYG, W9NNC, WA6YQW, WA0JYJ, WB1EMN, WB4UBD, WB0YMR, WD0BNC

249 DL7DX, IS0LYN, KP4EQF, N4OI, W4ZMC, WA6OEC, WA9USE

248 K3DR, N4DA, N7MW, W2TDQ, W5FL, W8MR, WA3DMH, WB5SKQ, YU2AAU

247 DL7NB, KD4S, N3WH, W6SWM, WA1URV, 4X4KM

246 DL7LV, IV3HL, K1OT, WB0TCQ

245 AF6Y, I3BLF, JA1EF, K4XQ, K8RCT, N9RB, OH2BFJ, VO2CW, W1GUW, W9NSO

244 DJ4C, EA8, HB9, K8PQ, K9Q, KA4, W9Q, WA1, XE1

243 JH1V, JW8, N4B, SV0, W5Y, WB1, WB1, WB3, WB4

242 AE5, N4IF, N6B, PY5, VE2, W1W, W3U, W7G, WA1, WA2, WA5, WB7

241 AD1, DL3, G3J, K1H, K2S, PT7, VE1, VE3, VE3, W2C, W6S, W6Z, W9L, W0V, WA2, YU3, ZE4

240 AA4, AA4, G3Y, K1V, K2Z, K4N, K4R, K4T, K5P, K7A, KO4, N2R, N6V, N7E, VE3, VE7, W1F, W2C, W2K, W51, W7C, W0H, W0R, WA, WA, WA, WB, WD, WD, YU3, ZL3

239 AB1, AD1, DK6, JA1, JA1, JA1, K4L, W6, WA, WB

238 K4K, K7U, K0C, KH, SP9

237 JA1, LU, KP4, SM0, W1, W2A, W3I, W4U

236 K7C, KA, VE, VE4

235 JA, K2, K4, K0, N6, WB, WB, WB, WB, WB

234 N6, VE, W4

233 AA, AA, DJ, JA

K2AGJ K4NS K5NV K7EG K8UE N6MQ SM5AKT W1PL W2MT

232
AK4N K1GFH KØDN OK1MG W3YT W4ZWZ W8KBZ WA2CYQ WB4FTU

231
ACØA AE3S EA7OH JA7HMZ K2BLL K5VT K7GD OK3CEK W2WZ W6SIJ WB4VUA WB9NOV

230
AG4S DJ5IH K4JW K6ZO K9MFI KØJSY VE2AGP W1HR W2HG W3GTL WA2FUE WA2VEE WB3JBF

229
JA8QO K1KTB W7EY WA1HJZ WB3FIZ WBØLJU

228
EA6DE JA8SW K1WC ON7EJ SM6BXV WB3AVN WD8BKM WD9ADB

227
AA1M AA7C CT4BD DJ8WD F8QB FP8DX JH1OJU JA7ZP K1RH K3OIH K4FCT KØBX KØKTP KU4N N6ST OH2BLD OH2KP W1RBU W2AAV W4TJC W7QMU WD8CRY YU1LW ZL1CN

226
AA4MW AE2A AG1K DL9YC EA1SQ HA1SB JR6BU K5TA K9ZZ N5CB N5IH SM6BZE W2IQZ W7NI W8YAH W9ON W9VWV WA2QAU WA7NEQ WB9FIW WD9IIC

225
DK3VV I2MUV JA6CRP K2QF K5EJO K6ASI K7BHM K8WD K9US K9WA KØJFV KC4B N2WS N5HB N6JM W1VH W2IFK W5IB WØULU WA2AOG WA4VXG WB5TZZ WB5ZGP YU2RQN

224
HB9AIU KØKES N2JA N2MM N9DJ PT2VE W2NHV W2ZO W4NG W6HJ WØJIN WA9ITB WD9DEE

223
DF4RD K4OAH K7KH K8CX OH6AC PY2CPU SM2EJE TF3SV W5HNS WØBWJ WA4VEK WD5DUD YU3TKL 4Z4GH

222
JE1GMM JA3ANW N3JC N4OT SM5ACQ VE1UG W2GND W4UVP W6DZ W9YH WA4WPN WA5FVI YU1NFR

221
AI9R K1TO K2PLF K4BYK K4KA K7EQM K8BVY K8ZE KØLD SP3GEM VE3DUS VE3HLC VE4AE W2AK W7FF WBØGPR XE1JTR YU3TFA ZL1ADI

220
AD7Z AF6D HK7UL K3HBP K3NS K4GFH K4NV K6BUU K7MKS K8MPF KC4CT KF6A N6FT N7RU OK2SW SM5BMM SMØGMZ UVØEX VE3BVD VE3GFN VE6EO W1EWD W2HKE W2JVZ W2NL WØMHK WØNQ WA2KDB WA6CPP WAØFBQ WD4RCO WD4RHL

219
AG6Q I8MTQ JA2CXH K2PZ K9QFR KØEVE KZ5FR LA1ND N5MM SM6HTC VE1MF W3DO W3GIA W5VJG W7EDA WA2IFS WA7RKJ WA9JWL WB6RWJ YBØADT

218
I3MQ W2FLD WA9EKA

217
K2OPJ W1ID W7IOG XE2MX

216
F8OZ JA5JGY JA6PN JHØCAZ N9BX W2FC WA2JOC WB9LFD

215
JF1DMY KØLST SM7ABL YU1NPG

214
I1TLA I5IZ JA1JQY K2WT KB9BR W1UQ W3FV W4QO W7MBW WØJCB WA4BEC WA4UBM YU2CBV 5T5CJ

213
EA1QJ K6OP W9OFV WAØHMP

212
AC6V DJØLC EA6CE EA6ET I1ZQD JH6RYY K3UC K5JUC KA1EP N4ZJ N8AQV VE3CEF W7RA WA1GSO WA4ZEC WB3FSI WB4KRH WB9MFC 6Y5MP

211
AE9L K2FJ NØAIT SM6CVE VE3MV VE7DTS W2RQH W7YKN

210
DF3FI K3EW K9UJ KB4E KN1DPS N2US N4VG W4PTH W6IA WB6TUH

209
DL1EV JH7BDS K1PNS K3RL N4AVV W4GBU W6MND W7ZI W7DAZ W9CA WA4LZR

208
AC7P G3XTT JA9NLE K1JA K9BIL W6BL WB2IZN WBØLXM WD8JFE ZS6BOK

207
DJ1ND HA5AW JH1BAN KH6GI N5CE N8EL SM5HYL WD5BCY WD5DKT

206
AA4FF AA6O AC1O AD8V DF6CY DF9ZO DK2XX HA5KKB JA5NG JA9GPA K1ALP K4FWR K6GXO NØIN W4WEG W9TX WBØWAD WD4GSF 9V1SH

205
AF7M DF4FO EA3RF JA1SGU K1FB K2FW K3WOK K6RIP K7NHV K7RS K8IC KØAXU KA4BFT N4AYO N8ACA PY5EG W2HFW WA4ZMM WA9QDO WB1FSW WD8LID YU1NZW

204
AB1A AI9F DJ4SO JA1QER JA2DOU JA2FUJ JH6UJP K2UVV K9TI KA3EGU KB5DO N4OH N8SW N9GT SP8ECV W1OU W3WGS W4FUI W6DH W6YMH WA4MOQ WA7URW WB5CRG WB5PLD WB9TIG WD4ABN

203
AK5B DJ5PA F6DYG K1THP K1WB K3JW K3QX K4JAG K6UGS KL7HR OK1AEH ON7WW OZ7NJ W1HSS W8AP W8KUZ W9JI WØOIZ WB3KAM WB6NJW

202
DL7WL FG7XA HB9AGH K1NG K2BSM K2WS K5GOE K7PY KC4FU KC5I KG4F N3KZ N4IB N6IM SM6AYM W2CVW W6DPD W7EEJ W9LOF WA1NSJ WA4GHO WA7IHN WA7IRD WB3DJF WB4PRM WB7RUV WD8RIU

201
AF7S DF2HL DF3TN DF4TD DK5AD/W3 G4BWP IØUCM JH1ANB K2MRB K4JAF K5GY K6BMX K9UR KØQMU KB8LT KB9DE KL7ITG VE2FEX VE4SN VE6CV W1SK W2KI W4WBC W6ETR W6RPK W7HX W7TS WØRYW WA6RVR WA7CWM WB9ZQA WD8ILM WD9CUP YU3CC

200
AA2Z DL8VN F9XL GW4BLE HB9AIB HB9BFS HC1HV I3EGD I5JFG IØMMI JA1ATF JA7BMR JH7LMZ JY5ZM K1GX K1WJB K1XA K2ON K3JGJ K4CTD K6ZMB K6ZOR K7NTW K7SB K7WF K9KQ K9KT KØAL KC4G KD4Z KG6RT KP4V KT4D LA5NM N2ATD N4LL N6ML NØZA SM5RH SP5HS SP8MJ VE2CK/VO1 VE3BGX VE3LAX VE4IU W2CUE W2NCG W2TKG W2XL W3CRG W3UM W6JE W6SSC W6TPR W7KVV WØDP WØTT WA1ZLK WA4QHV WA6DZM WA9ZWL WB2GUK WB4AGT WB4FOT WB6RSU WB7QXK WD8CBP YU2RJG YU3TKT

199
AH2E HB9BOI K1PMJ K2FU K4JEX K4KKJ K9RR K9WG KB5FH KB8BS KL7CC NØALL ON7EM W1YNE W3IHT W5CTM W5RJC W7IUV W8LKG WØMJA WB3DWH WB8KSG WB9VIO YU2CDQ

198
K4TWJ N4AJZ PY5CA W7KT WA3EEE WB2THN WD4KRK

197
KA6SS KBØFZ W2FTY W2KXL WA1FCN WA8EUK

196
AE3Y K4ZGB N4EF W7FOF WB4MXI WB4NFO WD8NBD 6O1ND

195
K8MO K9MZJ YV1TO

194
KB8CR PY2YP W2YC W6SZN WB7TLE

193
KA2CEK N4TZ

192
HK3YH KA3BFX W6HK W6MYP W9FAM WA4VMZ WAØDCQ WB6SRK

191
HK3AXT JR1ARK K5PR K8JK W1BWS W3MR WØSA

190
DL9PR JA4ESR JH5FQO K9IHM KØCVD N4UV W1PWK W6PKA WA4MIT WB7TXY WD9ACQ

189
CT1SH K5VV KAØE OZ2E W4FL WA2MUA WA6BBJ WA6WEI

188
AD3R K1BUR K4JEZ OK3CFA WA5NUK WB1GZE

187
AD8P F6EVS JH3LJU K5ZD K9APW KB6KF VE4UJ WB3BOA YU2CCB 5B4HF

186
G4FAM JR1URH NØRF PY1ZBJ WA1YAX

185
IT9LMK JA1FIJ JA1IVE JH1KIK W1RFQ W1TSP WA2HQH WA3INW WB7OQW YU4JHI

184
JH7BOS K2LS K6QC N6HL WØRIC

183
AJ3H OK2UA F8VO JH6BZI K1RB K3QIA K4MRZ K9MBQ KB2RZ KB9JF N4HB SMØHEP WØTU WA6BXV WB8PHO WB9EEE

182
CT1DF DL9GH EA2LY FG7XA K4EJI K6DZT VE3HHS W3BBL W6VUN W8BCL W9HR WA9REC WB6TIJ WD5HRX WD8KCO YU4EXA

181
AB2W AF2L ISØDTK K6FS K7JH K7ZM K9MIE KØFA KB8EC KC4IB N1AKX N2BIM N4PY OK1DKR W1GNC W2IY W7SLU W9HE WA2ECA WA2YEX WA7OBH WB1ANT WB3EWB WB4YFF

180
G3FVC HH2MC I2GXS JH1WDN K2MQ K2UPR K4UF K6MA K8ZA K9LHA N2MJ N3GW N7DS N9ALC NØJW OH3NM SM7RS VE3WW W1CDC W2BDE W3FAE W3YQ W4KEB W4NZR W5QPH W6AKM W6QJI WØCYY WØGXQ WØII WØJIG WØJSN WA2YUH WA5KTZ WA6EJL WA8KEM WAØVBW WB2HJW WB4BHQ WB4ONR WB5ZKR WB6WQA WB9RNF WB9YJW WD5JFM WD6ATC WDØGML YU3JS 6Y5DA

179
G3AEZ HA5NK HB9DI KA4P N8HI N9EV SP6BAA W1AIO W1YRO W7ALZ WA4LBX WA6TKT WA9TAA

178
DA1RA EA3IH K1SCQ K6HHD K8JH N4AM N5BET N6TO SM7DMT W1JNN W4RW W6SJC WA5QZH WB1FRZ WB7BQA WBØGZR XE1PF ZE2KV

177
AFØO K4KH K5RSG KV4X LA5WN VP9GD W1ERW WB8YQX WD9DCL

176
AA2F AA5C AI8D GU4EON JA1VDJ KØRWL KB6JK KC6X OK3IF W4ZBA WA2PID WB3BMX

175
AA6RF AFØQ AG1C DK1II JA1CZI JJ1KUV K8DD KA3BDW KB4GQ N4QS W5SGT WØUBT WBØRRX YU3TUX

174
AA4MI AB9V DL2GT K4AMC KB2HZ VE3FZW W5QEE W7IIT

173
AA8Z DJ6OIJ KA1DJ W1XX W2SUE W5RKK W6NHX W7FLD WA7CYB WB3JUK WB6GFM

172
AF4K DJ4XC K3NR K3VDU K4FYM VE6AJF W4HLY WA4TYJ

171
EA6EU JA6GYG K5GL N1NA OK1KRS W3MZG WA4JXI WB5UCS

170
EA7TV K7SZN N6PV N7ASZ SM5BXP SM5EC W3TEF WB2IHN WBØGGO

169
DK7NL HB9ANM K6SMH KC8E KG6S VE4MG W5UFF W6RK WØWAN WA4SNI YU3AE/X

168
F3CY JH6HYC W7JKA W8KLC YU3UAR

167
AB2Y N4AOB SMØDGO W1ETH W1GUE WA4MCH

166
AB5G AJ8L DK3QJ DL9YG KØJPX OZ5MJ W5ODD W9EIZ WB3CNB WB3FID WB9KBV WD4IKI YU3TGN YU4FTU

165
EA8IR N6MA N9AWR VE7VX VU2AAA WØEJ WB1HIX WB2KJL WB4KSQ WD6AKG WD8OWM

164
IT9QDS JY4MB K1WVX K2PX K8ZPB KA5CWE LA1S OK1AUP PY2ZEM W2VAV W3UHP W5VFJ WØANZ WA4WEB WA4ZGL WA8EQP WB2SJG WB6BPZ WB9ZKK

163
DK8AX EP2MW JG1OQZ JA2HMF K4ITV K5VR K9AZG KN4F VE3JCV W6KXV W9WI WØJLC WA3NQJ WB3IXF WD4KWI

162
AC8R ACØS AE1T EI7CS K4AVU K5DEC K8CCV K9KBW KB9IG VE2UF W1GNE W9KRI WA2MVQ WA4OMI WA7JBE WB1BVQ

161
AI5A DJ5LE JA3BEY K7WA K9BK KA2K KB4LX SLØAS W1TEE W3ABC W3OH W4VAB W7RO W8CZN W9BB W9HI WB3IGR WB9LAG WD4CXV YU2RTC

160
AA6DX AC4CRW DK7XX F6CLH K2JT K2MGM K2OWE K2ZGC K4IQJ KB6J KB8IZ KK6X N1RI N2ARE N8RA SP7KTE VE7CHK VE6KY W1DMO W1OPJ W2HKM W2TU W2YWK W3EEK W3KWH W5GAI W5NCB W7TIR W7YS W8AN W8NK WA1LOU WA2URD WA3BRW WA4NQG WA9TNC WB1GOO WB4KVM WB8SBH WB9BQV WB9OTX YU1KMN YU4VBR YU5CZ YU6KOP

159
AC2P DLØBY G3YOG IØAEC K2UFT K8OT KP4CKY N6HC PAØJIL VE3DOP W2JQ W7HN W7RYS WB6VSC YU5FAM

158
AA4RC DJ1PT EA1JO KB5QA KD6F N6NF W2FVJ W3PTV W4OYI W7POC

157
AA4KY AC2U AGØA HB9JF K8JRM N1AOZ W5QOT W6RDS WA1RGP WD9EPG

156
DJ3BE HB9ARH K1TH KA4F OH9SV VE2AQS/TG9 W6NLG WA6SZE

155
I2DMI K3SME KØTVD KA1JE KB5PO N1APA N9UN WA3UXU WB2IZX WB4SLV WB5SCI WD5GJB

154
DJ4WP G3RTU I8EWM JF1KKV JH7AEP K2AVX KA5BML KJ4V N1II PY7VJZ WB2IRK WBØRSH

153
DK9MC F8DU K1GVW K2PF K3RH K4HAV K5XE KP4DGT N1AFC N7AEM N9RC OH3SG PJ2AAX VE3LNW W6MPG WØJRN WA4GQA WA8UYM WB3CAI WB3FHO WB5YKD 4X4UH

152
JE2LQX K1FPJ K2GBH K5GUU K6NN K7OEW KB4CD KB4KA LA2AV N6VV PA9WRR W3NQC W4ET W6XI WA1PDG WA5YTX WB4EBX WB7UXK WB8ZNM WD5DRS

151
AK8A DJ3TF I8MSY K3MD K4PR K6UV K8MC KØSCM N3ARV N9AIB OK3CO VE3JGT W1AUT W3JF W4PNY W9JXN WA4CCP WB2HIQ WB3CJQ WB7VUN WB8CSH WD9CPX XE3RT

150
JA5CKD K3AER KØTB/1 KO4O N1CQ W2RC W4OGG WA2PYI WA4BBN WA4MDS WA4PSW WA8LSO WAØECB WB1AHF WB3CZK WB4ETO WB4RZN WB5UDA WB6FKR WD8KWT 4X4GO

149
AI7H I1FY JA9DDM KØDQV KF4H N6QY SMØJDR W8UPH WB3HDQ WD8KZS

148
DK2PS F6AZT K2ENT K2IAB K5BDX KA1DS N9IF W6AN W6OA WB3KKX WB5NBY

147
AGØJ DJ8CN K3LHD KA1CH WA4YZF WØOGJ WB8TRW

146
DLØII JA2JZT K1VRT KB6BG KL7JAI KL7JHI SM7EL VE3FEA W3EE W6DAC WB6SHL

145
AA6R K2DT K2ZWI K9BQL

144
JA4AEZ JA6EOR JA8BFY K4KWT K8KBB LA8KD S8AAT W2SR W4TYZ W6OUL WA2DFC WA4OPV WB2QEU WB7QFI WB9TOU WD6EEQ

143
N4OE N9EZ OH1FS VP2SQ W7KQH W8EY W9NYG WA8IGU WB3JZN WB4ZUW

142
K2CHS K5IMC KA2FOE KM6N N2CM N2GC OZ8AE VE6ARN WA4WQH WA7PQL WB9JOV WD4HYH YU1ADO 5Z4CW

141
AF4Z G3VMW HB9BLQ JE1BQE K3KO K4ZIN K8DL KØINR KE5J KL7JDR N2GW N6BTY N8OL OE8HFL OZ1TD W3KLR W3SRK W5VD W7JFI W7KE WA2PAT WA4FKK WB2GTB WDØEPE

140
ABØS AK5H K1IJU K2OVS K2QXS K2RSG K2ZSY K3NB K4CM K8QWG K9VTD N2OL N3MC OK2BJU VE3GCE VE6AM VK2BAN W1GWA W1SE W3HMR W4CLO W8INV W8QBA WØJIE WØPXW WØUY WA2IBF WB4WHE WB8EYL WB9KHK WB9TIZ WBØBIY WD4FWE ZS1JD

139
AA3E AF1U DF6NT F9GO RF7AK K9WC N3AUE N3KR N4ABZ VE6AYI W2CU W4ZEI W9JR WA2NDB WA2VUR WA4OAX WB4CCT WB6LMN

138
CT1UM K3KR K4CNW K6JEN N9AMF ON6HX W9HPG WAØOVU WD4RIL YU1NOT

137
AEJJ AI4W JJ1HEY K1PCE K7CI KB3ES W1RHN W6DDB W8CD WA6URY WD2AGS WD9DNL YU1NHV

136
I2XRG KB6ZL N2IT N6HI PT2LS VE4AFD W1VD W4FCC WA2IKO WA6RPF WB3DDS WB4DBK WB4YOL

135
AJ8J DL9HN FGØDYM/FS7 HB9BAH K4BZH K8BA KA9AUS W2ILT WB8VKL

134
CT1GC DL8AK JA7BAL K2TGE K7JWZ KØVGB KB3FA N9AKW VE3BXF W5EW WA4HMQ WB2LUD WB3DIP WBØFCY

133
DK6EF HAØHW JA1IHE OZ6ZZ TR8AC W4ZWE WB5TEQ WD8DXG 4Z4OL

132
AD4Y AD5E DK2WU EA2IK JA7TJ JH7LVK JA9KGU K4YCK K6OKW K7FC K7JVM K9KK N8BIK PY2JSF VE5JM VP2MBB W4POH W5UO WA9RAT WD8QOY YU2HJ 6Y5RL

131
DJ5KB EA7ALG HAØHS JA7ARH KØDEW KØFPC OD5MX WA4JTE WB5QBV

130
DF8XP JG3FEA JR1WDE KC4DY N4AXT N4VM W1QD W1BDU W2DHI WA4VDN WB5UFR WB6JMS WB7TJC WD8IAE WD9IRV

129
FR7BP GM3LYY HB9BMR JE2KSM KA2EWT KA9CQM KB6FT N7JB ON6RR OZ7MP PY2ZGF W4JFL W5IMJ W7IMZ WA2CWP WA2VOS WA4VSL WB9JLL WD5ABG WD8DXN

128
AD2S JA8TRT K3CQY KØCY KØSI KQ4M LA4AT N4BBB N9AOK OH2CE OH3NE OZ2RC W4VRO W6EKW W8MD W9NYW WB3LGO WB8RJX WDØFNF

127
AAØM DF1FX HB9BMW JR1VAY K1VUT K2RZ VE7AYJ W4BFB W4WFB W4WSZ W6KHI WØIQZ WA1GTQ WA2VCM WA3VUE WA8CAJ WB1ASL WB3FYL

126
AB2C AF3B DF6EX DJ3AS EI2CR JA1JXR JH1IAQ JR2HAE K2PV KA4BWD KB3AP N2EO VE3XM W5HFN W7MY WA2JCX WAØUSA WB9VGJ WBØAFO WD4LWC Y8ØACT YU3LT

125
AD8J DJ7AT DL4WO HB9BOM JA1XIA JH6XJW K1LDK K3CT K6KCM K8YZ KA6EZU KG4FW KK4A N4AIG N4BQD OH2PQ TI2BEV VE3KIK W2HGT W2TV W6LUL W8CEF WØBVY WA3VPL WB4RJG WB4YHF WB6WKM WB7PST WB8AJC WBØRHC WD4AJA WD4MLD WD9EJE YU3TUQ

124
K4ADI K5JII K5JN K8EM KA1GC KA7MS N6HE SK4BX W1JA W2KHQ W2ULO W3EVG W5LBT W7TIZ WA3LOS WA5BYG WA9LBO WB2LJK WB5OFB WB9EKM WB9TZZ WB9ZPU WD4KQC WD4MJP 5H3FW

123
AE7P DL7HX EP2LA F6AKZ HB9BBB IT9MTH JH1BMV N2GZ OY9R OZ1ABA W3GRW W4OJV WØOIR WA1STO WB3IET WD8PKF WD9GNZ XE1OM YU3TBG

122
DJ5EJ I3VJW IØFFO JT1AN K1DII K7HRW KA2FRW PAØFRA PAØJJB K2YL N9AHL OK1APS PAØRRS VE6CJO W2JU WØSL WA2OVG WA7ZLC/CT1 WAØGWC WBØOTA WD4HFK WD8MGQ

121
DJ4BC G8VR HK3BAE JF2ACK JH2JUK JH6KXG JH7UJN K3LVO K5DK K6YB K8AQM K8HF KØJTW KØLIR KA2BD NL7J OE1XBC OZ1FAO VE3PE VE5JQ W1OD W4LSI W9TNZ WA7PDW WB1AIE WB6VFF WB9QPG WD4OCO YU2OM

120
CT2CJ JA1DNZ JK1GDD JA2QVQ JE2GAL JE2IBV JA3BVD K1FR K1LEC K2GLS K2UVG K2VC K5UBD K6ARE K7KFE KØJFN KA5CTZ KH6CZ KH6IJA N4DX N4OQ N5SW OE1KJW SM5FEX SP6FER VE2DPJ VE6WV W1BFK W2BKH W3IBL W3LDD W4IVN W4RAL W6FWK W7RVQ W7YF W9GXR W9RR WØRJW WA1UUA WA3OVC WA4ELW WA5OJI WA8SJX WB2AMU WB2FUE WB2JZK WB4PUE WB5VDL WB6VRE WB7TFT WB8TGS WB9ACR WB9FRF WB9NMN WB9UKK WBØSYT WD4IZR WN4KKN 4Z4UW

119
AF7F CM2HB DJ9AS I8SCV JA1KNZ JH2WBI JR2XRH K1ZDI K3RL K4OAQ K8XF K9AEG KS4C N4SN N9ABS OE2LCL SM4AMJ VK5RD VU2IJ W4NNF W3AMF W6DQ W9FJ WØGA WA3GUT WA4DEP WB2JXZ WB4WOW WB6ITM WB9QDT ZF2BP 4X4RD

118
AJ4X DK7ML JI1GZN JA3UPM K4CRR K4CTY K5WA N6AXD PP5AJA PY6AJG VS5TX WA2PHA WA4OHX WA5HOD WA6GGC WB8OUC WB9BXX WBØTXV WDØFAZ

117
DL6JT DLØFU JA1CZG JE1CYH K2TY K3VW K5FUV KA3DDT WB5UJN WD8IDE YU5XAF

116
DF1AI IØYGV J6LGL JA1EHA JH1OGX K1NM KA5CRO W3ECN W6ECJ WA8JOC WD4NBX WD9IPP ZE1BJ

115
AF2C AGØU DF9ZP DJ8TE DK7SS DL9MP JF3KNQ JA7NVF JA9UX K1BJ K1GRB K4AXV K5ARH K8AV K9IJ K9WWT KA9M N6BOI VP2SM/W2 WØRJU WA1YGA WA3QED WA8AJH WB6VGY WN5EAT ZS1LM

114
AD8O CT2CI DJ1TI G3ZSS HB9G HS4AFD JJ1AOS JA3BAG JA4UDP JW2CF K2AIO K2XK K3TC KB4FO KB5AS KB8MG N3ARK N8AJF SM7ASL SM7GCP VE3HGD W6JCE W6KPJ W8DCW W8FI WØDF WA1YTW

113
AF9H DF2NL DL1VJ F6ARI F6CWA JR3RRY JA7AOU K4TAZ K5MFE N8ARA OE3ZDB VE3IVI W3IVG W4ROA W8UT WA2CIO WA2NEW WB1BXS WB2YJQ WB3FAA WB5EFJ WD8NVA WD9DKJ Y24IJ

112
DF3TJ DJØNU JH4PRU K3JC K3LDR K4KYI K6UM KL7HHX N4XG W6OGC W6TJS WA3WOD WA3YXD WA6TLV WB3GWS WB4AGH WB5WQG WB6QBZ YU3TIR 4X4HQ 4Z4OZ

111
AC3A AJ6O CT2YB DK6BU DL8YT F5JF F6CVI JA1KFH K3JS K3KSS K4VHH K8QYC KØSRL KA4BAS LA9EF N4CWL N4NG N7CY TF3AC W3BI W5JM W5RU W6PKB W9IXO W9YRZ WA3VJS WA4RQH WB5NXH WB8HIW K5GKC

110
AASI AB6R AI1E DF3FR DK6JV DL3SM DL7UB DL9HP EA7FC HB9ALY HB9AOF I1IGI J7DD JA1AJK JF1CCH JJ1BBQ JR3MVF JA7AXB K3QMR K8LOS K8WS K9IU KØPW KA1CAN KA2CRN KAØBAI KB5WQ KB8ED KB9LB KD6T KF5U N2AIF N6LQ NØDZ OH1EH OK3KJF VE1ST VE3KUH VE4AQG VE7DTO W1ZR W3MPN W5OU WA1SSQ WA1TIV WA6BLT WB1CWT WB2ODN WB2RWT WB3CQD WB4OIT WB5YGS WB6NXK WB6OYJ WB7DHC WB7QVI WB8QPD WB9VIN WBØNSA WD4AWR WD5HMX WD6CKT WD8JTT WD8KTO WDØEWO ZL2AUP ZP5NW ZS5BK 4S7DA 4Z4TZ

109
AB3D AB5J AE5E AI8W DJ2JS DK2UB DK5BQ DL3GK DLØDS DM2AUJ HRØQL I2BMR JA4SP JH6UBT JA7LDA K7EFB KA8ANQ KA8Y KB6MD KB7MM KB8AU KB8LL KG4V LA2BG LA9DP LZ1AZ LZ2SC N5ED N9AFE N9AQT NØAED OK1AYN ON6WV OZ6YZ OZ4CG PAØPCA PP5AVM SM6HPL SM7CQY SM7HTH VE3ANG VE3OCU W2OOJ W3PLI W4FMY W5RJV W6IAE W6UR WØPUD WA1SHR WA2DPJ WA6ZYG WA8YWR WA9RCQ WB4OKY WB4ZGS WB6JPZ WB6WOK WB9ZMA WBØOHI WBØRNP WBØRYN WBØYRN WD6OKG WD8KSY WD9BAJ WDØAWP WDØCQW YU3CCD

108
AAØU AB6U AD2R AFØW AG9V AI7M AJ4J DJØRV HA5MO HB9KT JE1CTA JA3DBD JA5IE JA6PWN JA8MHG K2EQU K4VNM K5GTL K6ODK K8GAG K8RW KA2BYC KA2CDJ KA2X KB2KN KB3HB KB6HT KC4EY KL7IXZ N1ACU N2AIR N4CMJ N4QL N4XC N5BV N6AFI NØAIE SK6DG SLØFRO VE1ABU VE3OY W1PZR W3FAF W4XC W5EIJ W6CSI W8QBY W9SL WØGK WA1VTW WA2ISM WA2TCG WA4LLE WA4LRF WA4PMU WA6QDR WA7FRP WA9GQA WB2CLL WB2ODO WB3CFD WB4DWD WB4GJR WB5LBT WB5ZAM WB9ZJW WD4EPX WD4LOZ WD5FVQ WD8DMX WD8DNG WD9GQV XF4MDX

107
AAØT AI7P AIØM DF9RW DJ5PX DK6US DKØEK DL1OM DL2UE DL8MAG J6LGK JH7CUO K6EKP K6QS K9RFW KØWA KA2CVM KB4FH N1QY N2AWM N4FD N6KM N7ADU N9ADL OH5LP SM5BOF SM6CYU VE3EZU VU2WA W3GVR W5SOD W7JGL WØHSC WØLV WØRSR WA1SMH WA2RVF WA2VZQ WA4OKW WA7ZUG WB1DLA WB2ELV WB2QZZ WB3HPJ WB5VCI WB5YJX WB8ZUW WD5CSK WD8QBP WDØFSI 4Z4LG

106
AB3P AC8C AG4V AG9E AI9L DK5ZZ FM7AV FPØMD GD4HOX HA5LV HB9Z HS1ALP JF1SLN JJ1IHS K1HTQ K1LGM K2MO K3IJ K3ONW K4BAM K5DPG K6HY KØSW KB7ND KBØBL KR4P LA2GV LA4CW N4COZ N7AIF NØBGI NØCC OH2BKT SM5CAH VE2BAX VE2FGO VE5TT W2IIX W5CBN W5VBX W6FWX W6SMD W6SWE W6SX W6TKF W7MAF WA1KSF WA1LJB WA4WLJ WA4YCB WA9AQN WB1EYZ WB2DHY, WB2MCB WB2UXS WB3ERY WB4YFW WB5PYL WB5RYC WB5VIH WB5YPE WB6DMB WB6IIQ WB6JGS WB6KXL WB8DSU WB8ZFB WB9UJP WBØMCO WBØTTA WD4BJS WD5JQB WD8MCP WD9GIC YU2CTG 4U1UN 8P6IB

105
AB4Y AB9M AC4X AI3Y CT3BX IØNFX JI1DCW JA4FCC JA5APG JA5OP K1TEJ K2AZ K2UK K3JSZ K4JBY K4MU K4QMU K4XR K5IY K7CE K8MR K8TV KØHP KA6KJ KA8ODU KB2G KB3HZ KB5IY KB8SX LZ1MH N2DE N2WM N2WR N4CIV N5NO W3UO W5YB N6HK N8BBD OH1AJ OK1AMU OK3BA PAØEFI FT7AW VE7DUS VP2MM VR1Z VU2AWL W5ADH W5VNZ W5WF W6KG/TI5 W6NCR W7ZOI W8LCU W9GGN WØVE WA2JAS WA2RXM WA3CKA WA4AFE WA4RLL WA4SFN WA4SOH WA4SZZ WA5KOS WA6CWY WA6YTQ WA8YJE WA9GFR WB1EZI/VE2 WB1GXN WB2PVO WB4LMI WB4QGX WB5LWP WB5MTV WB5SRK WB6MBF WB6NHV WB6OFM WB7DZH WB7VCI WB8APN WB9FFR WB9PIR WB9PVH WB9YLR WBØDAS WD4GSG WD4IIR WD4LRB WD5EWP WD8JXQ WD9ASU YU2RJT YU3TZZ ZS6ABA ZS6BNY

104
AD5F AG5Z AJ2P DF3BL DF4QW DJØFV DKØSR DL4FL DL9XM FY7YE G3TBK G3VTT G4BYB HA1SQ HB9BOK HL9TO I3SYA JH4UVU JH7MJB K1ITS K2CP K3YL K4ENL K5ENA K5FZM K5JI K5VA K6ELQ K7LJQ K7ZOT K8HHZ K9ACQ KØIXC KØSUB KA2ACM KA4EOS KA5CRT KAØALX KB6O KBØJX KC5M KG4KG KH6RM LA3JI N1AMB N1AN N3ANP N3MW N4AFU N5AEP N5FN N5JM N6BFA N7ALX N8BMQ NØAJZ NØGW OZ6JE PY2ZBG SM5FBL SM7FYK VE3BTQ VE3JKZ VE4UX VE7CIX VP1MPW W1TN W3DDG W3TB W3HAZ W5IYR W5TEN W6MZQ W6TAG W9LQI W9MYY W9NUD W9QUT W9YX WØRTB WA1RGT WA1YIO WA1YOC WA4FXJ WA4HHJ WA5TWF WA6HDY WB1ARC WB1CSE WB2GEX WB2MMB WB2QLG WB2SBO WB2UKT WB2VOQ WB3BUP WB3CQT WB3HTK WB3JNX WB4FMU WB4RDV WB4SYP WB4ZPM WB6PGX WB5NAA WB7EIA WB7FFG WB7OGV WB8TXG WBØSAX WD4CYN WD4KSZ WD4LGE WD9AXF WD9DWC WD9ELT WD9EMI YU4EZC ZC4MT

103
AA4EE AA4RM AA9F AF2A AF2I AG5X AG6C AI9W DF6QG DJ2FX DJ8GO/W2 DJ9WB DK7EO DK7SB DKØSA DL5NA DLØXX G3EGG G3SHL G3UMZ HB9BGG HB9BBL HM1QD I5LIN JR1KFR JE2JML JH3XGD JA7KPE JAØAIB JHØHWP JT1KAA K1KOB K2RVQ K3CR K3EGK K3KNL K5GI K5IW K6QEH K7YY K9AJW K9CM K9IE K9OAJ KØBM KØJVN KØKWU KA2CWJ KA2DOX KA5CQJ KB2TY KB5BY KB7JE KB8JX KC2L KF45 KF5V KI5S N2AID N3FG N3JD N3SJ N4BCN N4WQ N6NW N7ADY N9ADN NØAQK OE1DEW OK1JST OZ8XW SM6JHO TF3JB VE2KD VE3CK VE3HYI

VP1KG
W1VS
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W4BND
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W7ABX
W8ANM
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W9WBY
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WA2RSU
WA4GFG
WA4HQA
WA4NTP
WA6BEX
WA8TZP
WB1ACZ
WB1ATJ
WB2LCH
WB3FAF
WB5IKX
WB5NQW
WB5WDA
WB6ZJZ
WB7FBH
WB7ROE
WB7WRA
WB8JHWF
WB8WSS
WB8WZI
WB9JBF
WB9LCA
WB9QIZ
WB9UKE
WB9UQP
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WBØFAQ
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WD4BLI
WD4HKK
WD4HUT
WD6EDY
WD6EKO
WD6ERN
WD8DQR
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WD9AEU
WD9FKS
WDØFNU
YU3TAN
ZF2AG
ZF2CI

102
AA2P
AA4AT
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AC1C
AC4R
AD4J
AK6A
DJØTP
DK3XY
DLØCS
G3OLU
GW4CZK
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K2CYX
K2QE
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K4XA
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K6DQ
K6QHE
K6PWP
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K8EX
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K8YVT
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KØJHH
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KA7CRP
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KB4VJ
KB5FV
KB6Q
KB8KS
KB8PK
KC4IG
KC4IH
KD2G
KD2T
KF4N
KG5J
KG6SS
KM4C
KR4H
N2AGM
N2AKR
N3ATQ
N3VA
N4AII
N4IQ
N5ANA
N8ASU
NØCP
OE1WHC
OH2PR
OZ8AN
PA2VDZ
PAØNR
TFØTJ
VE2FOU
VE3IMV
VK9XX
W1EWC
W2APD
W2XQ
W4IAT
W5JW/KW6
W5URN
W6FGX
W6NGK
W6SBE
W7PGY
W9CG
WØBU
WØGCN
WØQQN
WØUKK
WA2JDU
WA2JZL
WA2ULA
WA3FWA
WA4EPN
WA4KEY
WA4ORG
WA4UCU
WA4WKL
WA4YUU
WA6MXD
WA6YDU/DU2
WA7MOK

WA7SVV
WA8IMO
WA9BBX
WAØPFZ
WB1ARX
WB1FDY
WB2FQI
WB2JVE
WB2KQE
WB2PQG
WB2WUN
WB3IMA
WB3JTT
WB4NAU
WB4RJQ
WB4ZIH
WB5WFB
WB6BJO
WB6CAM
WB7ODR
WB7OGZ
WB7PKO
WB7RBA
WB8JYX
WB8UEL
WB9TDR
WB9UAO
WBØJDK
WBØJQH
WBØRAO
WBØWLI
WD4GCE
WD5EWQ
WD6COR
WD6CRM
WD6FLV
WD8AFK
WD8KKW
WD8LSU
WD9ARM
WD9CYR
WD9DKS
WD9GGY
WDØFIR/KL7
WN6CND
ZL3HI/C
ZS6ALS

101
AA6PY
AA9L
AD8X
AE8W
AF5V
AI8V
DJ3OG
DK1KX
DK9IP
G3GJX
G4AAQ
GM4EQY
HB9BNF
I5HZZ
I5YTP
JA1ARM
JK1ASJ
JR1SQU
K1IJV
K1OSY
K2EXI
K2RXY
K3BHZ
K4HHM
K4HVC
K4JHT
K4JYD
K5UT
K7IX
K8SYH
K9JMA
KA2BLI
KA3BOD
KB4TS
KB5CA
KF5F
KG6SX
KJ4L
KJ4S
KM4F
LZ1KPM
LZ1WR
N2TW
N3RW
N3SM
N4CD
N5CI
N7CC
N8AAT
N8BBK
NØAUN
OE1ZDA
OK1AWH
OZ9JB
PY1YP
SM5FXF
SP6CZ
VE2DKU
VE2FGS
VE3IEN
VE3IIU
VE3IIJ
VE5ADA
VE7BBJ
W1AUQ
W1KX
W1TVF
W2EEL
W2IUC
W2JDK
W2KGR
W2ZY
W3HRD
W4DKL
W4NOS
W4PFG
W6IC
W6QL/6Y5
W6ST
W7BCS
W7FJE
W7GEN
W7HO
W9UVM
W9WH
WØGYS
WØJRP
WA1DER
WA2EWC
WA2OJS
WA2OOS
WA2OSE
WA2SEL
WA2SQY
WA3JID
WA3UFI
WA4IGL
WA5YON
WA6FUZ
WA6JVZ
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WA9OPV
WA9SLU
WB1ADD
WB1CTV
WB1DEV
WB2HWK

WB2KMY
WB2KNG
WB2YOF
WB3DBO
WB3IVL
WB3JTU
WB4CLE
WB4DYU
WB4GQL
WB4YTK
WB4YVC
WB5MPU
WB5TON
WB6FZR
WB9KOY
WB9YVO
WBØKFY
WD4FAB
WD4FFX
WD4HLK
WD4LRD
WD4NAE
WD5DDW
WD5EWD
WD8EIO
WD8KSB
WDØBHV
WDØFDE
YU3TMN
5L2BS

100
AA4BS
AA4FL
AD1V
AE5V
AD3W
AE7W
AG3H
AG8U
AG9G
AJ6T
AJ7S
AJ9Z
AK5O
CP1CQ
CT1CV
DF8GV
EA5CQ
EA8TY
F6CGS
F6CRS
F6ETL
FC2CI
G3JYT
GM4BVD
HA3KHC
HS5AKW
JI1DBV
JA5ELM
JA5SIX
K1EZZ
K1MAL
K2JK
K2KYH
K3DQ
K3LYK
K4VAY
K4WGW
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K9LVK
K9SR
KØZFL
KA1CQ
KA1EI
KA1EK
KA3BV1
KA3CMR
KA4IJK
KA8AEO
KA8BAC
KB4KR
KB4Q
KB4UO
KB5AQ
KB9DO
KD4N
KH6J
KP4DQP
KS4G
LA4XT
N2BQL
N2HE
N2OA
N4BBY
N4EZ
N4YJ
N6OB
N7AAL
N7KM
N7YL
N8BLZ
N9DC
NØGP
OA2CD
ON6GB
SM1FPE/4U
SM3DTR
SP9AGW
TI2DO
VE1ACB
VE1EJ
VE2ECH
VE2TK
VE2XB
VE3IBH
VE3JAR
VE4QP
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W1FK
W1HDD
W1MXI
W1OTQ
W1VW
W2OTS
W2UKJ
W3GCZ
W3IGK
W3IW
W3OVV
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W5SHN
W6SGU
W6UGT
W7LYP
W7OC
W8OIW
W8UBS
W8YX
W8ZNH
W9GN
W9GSB
W9NLQ
W9NT
W9TP
WØPBK
WØPQC
WA1TWN
WA1VVX
WA1YEV
WA1ZFS
WA2DGS
WA2OVE
WA2TPU
WA2UAJ

WA3PJN
WA3WMF
WA3ZKL
WA4BTK
WA4GOF
WA4HVL
WA4ITB
WA4KWC
WA4LYL/PA
WA4PSF
WA4TKR/6
WA4TQO
WA4WTN
WA4YWR
WA6AGO
WA6BXT
WA6EZM
WA6GUT
WA6LFZ
WA6TDX
WA8COK
WA9NAY
WA9NGP
WA9VIR
WA9YGS
WAØFZK
WAØTVV
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WB1AGO
WB1HKV
WB2BNH
WB2CJL
WB2HDE
WB2KTQ
WB2OEI
WB2POG
WB3AOY
WB3HYX
WB3IHJ
WB3JLF
WB3KCK
WB3KUH
WB3LQP
WB4EGX
WB4ORP
WB4PPW
WB4TLX
WB4VMS
WB4ZLK
WB5OON
WB5KTD
WB5QWI
WB5WDG
WB5ZRD
WB6KOU
WB6QPG
WB6TVX
WB7DOS
WB7UKK
WB8ZSB
WB9GCU
WB9JVR
WBØDLC
WBØMIX
WBØOAR
WBØOWN
WBØPVO
WBØRHN
WBØSSN
WBØUVG
WD4DZF
WD4OUA
WD4PVI
WD4SEU
WD5BHP
WD6BLH
WD8KQI
WD8RIN
WD9CJG
WD9GSU
WD9HWY
WD9IOS
WD9JLD
WDØBGY
WDØCNU
WDØCTV
WN3CWW
YU3TRI
ZS6BQT
6W8MW
6Y5ED

Phone

363
W6AM
W8GZ

362
PY2CK
W2BXA
W4EX

361
TI2HP
W6GVM
W8BF
ZL1HY

359
K4HEF

358
IØAMU
4X4DK

357
G5VT
VK5MS
W5IO
W7PHO
WØCM

356
ON4DM
W2OKM
W3NKM
W8AH
YV5AB

355
LU4DMG
OH4DH
W1ONK
W2HTI
W4EEE
WØBW

354
PY4TK
W1JFG
W3CWG
W3KT
4X4JU

353
G3FKM
SM3BIZ
VE3QA
W3DHM
W9RNX
W9WHM

352
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HB9TL
W1AA
W2GLF
W4DR
W5ACE
W5PQA
ZS6LW

351
DL9OH
I8KDB
VE5RU
W4SKO
W9ZM

350
DJ2BW
LU9DAH
W1MMV
W6CHV
W7ADS

349
DL1KB
GI3IVJ
K5DX
K5UC
W1HX
W3GH
W4LMX
WØGKL
WØMLY
ZL1KG

348
DJ2YI
F9RM
K2BZT
W1FZ
W5KGX
W6RKP
W7JYZ
XE1AE

347
I5UA
IØZV
K6LGF
K9ECE
PAØHBO
W2LV
W5LZW
W8MPW
YV5AIP

346
K2FL
PT7YS
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W2TP
W7GN
W9HB

345
K5JEA
K6WR
W3DJZ
W6ZM
W9SFR
WØPGI
YS1O

344
DL7HU
K4SM
OZ3Y
W1OGJ
W7DX
W9NZM
YV5ANF

343
F3DJ
JA1BK
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PY4KL
W2YY
W3GRS
W8CUO
WØQGI

342
EA2HX
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W2YYL
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W6EL
W6REH
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WØGAA
YV5AJK

341
SM5CZY
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ZS6RM

340
I5WT
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PY2PE
W3EVW
W4UWC
W4ZR
W6HYG
W6PT
ZS6YQ

339
DJ7ZG
DL7AA
EA7GF
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K5FJ
KH6OR
W6KTE
W6YMV
W9HPS
YV5AXQ

338
DL7FT
F2MO
K6YRA
KP4CL
VK4QM
W2FGD
W2GQN
W3FWD
W4CWV
W6EUF
W6HFL

337
K4MQG

K4YYL
OK1ADM
UA1CK
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VE3WT
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W6RGG
W7JYX
W9JT
WA2EOQ
WA8AJI

336
F9GL
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W2XN
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W5SZ
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W9KRU
W9TKD

335
G3NLY
I2KMG
JA2JW
JA4ZA
K5YY
K8DR
KP4CK
PY2PC
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W3MP
W5HE
W5LZZ
W7KH
ZL3NS

334
DL1JW
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I2SM
IT9ZGY
K6JG
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SM6CKS
VE3CLJ
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W4JVU
W6KNH
W9QLD
YV5AHR

333
AA4MM
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JA1IBX
JA1MIN
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UB5WF
W4EEU
W6BSY
W6ISQ
W7EPA
W8KST
W9BW
WA9NUQ
WB2HXD

332
DL8NU
EA4JL
IT9JT
K6TXR
K8ONV
SM5AZU
W1FXD
W8JTD
W9DC
W9HZ
WA4WIP
YV5BBU

331
F9MD
G3UML
HB9AAA
IV3PRK
I4ZSQ
IØJX
IØLLZ
JA1ADN
K2YLM
K8VUR
K9LKA
VE3GMT
W4BRE
W4EPZ
W5KC
W6ZKM
W7CMO
WØSFU

330
CT1BH
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F5II
F8RU
F9IE
IT9GAI
K4HJE
K6GA
KØBUR
N4WF
N6AR
OE2EGL
ON8XA
PY2CYK
VE3CTX
W1ICU
W8RX
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W5RNG
W6ARJ
W6MBD
W7JFO
W8GKM
W8VHY
WA3ATP
WAØOAH

329
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OH3SR
PY3BXW
SM6AEK
VE3NE
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W4DPS
W5MQ
W6YB
W7LFA
WØMYN
WA5IEV

YV1KZ

328
DK2BL
EA8JJ
I7SCA
JA8ADQ
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WØTJ
WA3IKK
6W8DY

327
DJ5LA
G3TJW
I5FLN
JA1EOD
JA1JRK
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JA9BJ
K5UR
N6UC
PY3CB
UA9VB
VE3UX
W3AC
W5SJ
W6GR
WA6AHF
XE1KS

326
G5AFA
HB9AHA
I7HH
JA1OCA
K5OVC
K8IFF
KV4FZ
LA8LF

325
AJØX
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K9KA
N4MM
SM5BHW
VE3GCO
W2GBC
W2QWS
W5JJA
W5UR
W6CCB
W6RCD
W8ILC
W8RT
WB2NYM
YV5ANQ
ZL3QN

324
CT1UE
DJ9ZB
DK3PO
JA1UQP
K5OS
K9SM
PP5UG
W1SEB
W1WB
W3GG
W7QK
W9LA
W9ZRX

323
CT1FL
DL7EN
G3ZBA
I1DEZ
K2KER
K4XO
K5JW
KØBS
OE1FF
N4WW
UB5WE
W1HGA
W2HZ
W4AXR
W6LQC
W8CNL
W8NXF
WB8EUN

322
EA1IY
F5VU
FG7XL
JA1AAT
JA8ZO
K6EC
K6EV
K6XW
K7NN
K8AQ
W2FG
W2FP
W5UAW
W6KOE
W6KZS
W6XP
W7EZ
W8CFG

321
OK1MP
VE3AAZ
W1BIH
W2SUA
W4NYN
W4PZV
W5EDX
W8ZET
WB2VEG
WB2WOU

320
DJ2AA
DL6KG
DL9DY
EA7IR
F6AOI
K8NJ
KE4I
OA4OS
PY2BU
PY2DSC
SMØATN
W2CNQ
W5HTY
W6USG
W7UPF
W9GU
W9SS
WA2VEG

319
DK2BI
F2BS
I2LPA
JH1EIG

K5LM
K6OJO
N4XX
N6AW

318
D4CBS
I3EVK
JA1MCU
K4BVQ
K6IR
N7RO
SMØAJU
W1DO
W1JNV
W2MPK
W5SDR
W9OA
WØMGI
XE3EB

317
DL1HH
G3WW
HP1JC
K2QOU
K4CAH
K6JR
LA1ZI
N2SS
OZ6RT
SM5FC
W2FXA
W5RO
YV5DFI
ZL4BO
ZS6BBP

316
DJ1CG
I2BOX
JA1DM
K4IEX
K6AQV
OE7JI
W4BAA
W6FET
WØYDB
WB5DJA
ZL1AV

315
AA4A
I1BGJ
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K6SVL
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K8PYO
OZ3PZ
SM2EKM
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W5ZWX
VE3BX
VE4OX
VE6LU
W4AVY
W4PJG
W4REZ
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WØBK
WA4GUZ
WB4OSS

314
DJ5DA
F6CKH
I1YG
K4DDB
K9FN
N6DX
VK6LK
VO1CU
W1SD
W9KYJ
W6ZYC
W7LJ
W8XX
WA6RTA
YV5CWO

313
EA3OJ
I7TGT
JA1ELY
JA1JAN
W4AST
W6ZC
W8JXM

312
JAØSZ
K2KGB
K3SGE
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K5OA
K8TB
N4CC
N4KE
W3NV
W5AQ
W6MBV
W8COG
W8LBM
WØPOJ
WA4OPW

311
F6BFH
IT9SEZ
K3OTY
K4MG
KØEPE
OE3WWB
W1BUH
W2VO
W3GE
W4BBL
W8PR
WA2EAN
WA7DRP

310
DJ7CX
F5JA
I2SLA
K4GFI
K6DT
K6PU
K8ZR
N4ZC
OA4BS
PY2BW
VE7WJ
W2IYX
W4ELB
W6KPC
WB7ABK
9H4G

309
DK9WB
K4DXO
K6XP
K8CSG
LU1BAR/W3

NØRR
VE7HP
W2CC
W6AXH
W7DQM
W7OM
W9RXU
WØBN
WB6DXU
WB6POP
WB6UJO
XE1J

308
EA3NC
G3SJH
JH1VRQ
OZ5EV
W2GA
W3XM
W4CYC
W7DQ
WØSR
WB4TPU
YS1RRD

307
AB4H
AE4X
G2BOZ
K2UU
K4XH
K5AQ
K8LZ
K9RF
W1NG
W9LT
WAØKDI

306
CT1MW
I1UW
K6HTM
N7BJH
VE3BDB
W2SY
W3ICQ
W9DH
WA4CXZ
WB9EBO

305
DL8KS
DL9VS
I7RNH
JA1DFQ
K2BK
K6MA
N5NW
OA4JR
W2MIG
W5UP
W6UY
W9KB
W9QQ
WA4DRU
WA4WTG
ZL1AMN

304
DK3SF
HB9AOO
I2ADI
I3ADI
IØDUD
K1KNQ
K5OR
N4RA
W2AO
WØUQD

303
CT1RM
I5PCK
I8JN
JA8BAR
K1QMV
K5UKN
SM5AQB
VE3II
W6BJI
W6GTL
W9BM
WA8PYL
ZL1AH

302
DL1MD
JA1KF
JA2HNP
JA2JKV
K1ZSI
K8SQE
OZ7OP
W3ACE
W4BQY
W6NTX
WA4JTI

301
G3TOE
IØOLK
JA1RWE
K1DFC
K1UO
K4AEB
K4MEZ
K6YCM
K7BCX
K8NA
VE4AS
W1JJ
W1JZ
W2PSU
W6AED/7
W6TSH
WA1KYW
WB6DOB

300
CT1UA
DK5XN
G3ZAY
HP1XRK
I1FNX
I2ZGC
I5AFC
JA4DLP
K2UFM
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K9HMB
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N5FG
N5UD
N6RS
PY4AKL
PY6CN
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VE3FJE
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W8MEL
WA2DXJ
WA6FPB
WB5HGS
WB6RIU

299
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N4NX
OE1ZGA
SK6AW
W1YRC

298
CT1WB
K4GJD
K6PZ
K9PQG
W2GT
W2LZX
WA1AER

297
K3EH
LU2AFH
W4TFB
W7BKR

296
AA4AR
K1JO
K4TO
K6AO
PP5YC
W3AP
W5EZ
W6BDI
W6RFX
W8YGR
W9ABA
WA6OET
WB4QGI
WB6WHM

295
F2VX
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K5KR
N5DX
OZ5VT
WA4TLI
ZL1AAS

294
G3MCS
I1BAF
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JA9ESZ
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LA3XI
W4BFR
W9IVG
WØBL

293
AA6AA
CX9CO
DJ1BV
EA3SA
JA1FNA
K1MEM
K4NJS
KØALL
W4NBV
W6BJB
W7JVG

292
JH1HWN
KA4D
N6MB
OE2GKL
OK2BKR
W1PCD
W2MP
W2QKJ
WB2QMU

291
AC4B
DK6XR
I8LEL
IØMBX
JA8HQI
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K5GO
N7US
VE4BJ
W7AE
WA4VDE

290
DL7FP
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EA8OZ
F6BDS
I8ACB
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K2POA
K5GZ
K8AXG
N2KW
K8CMO
K9FYZ
K9HDZ
KØIUC
W1FJ
W1HRI
W4JFE
W4LVM
W5LQN
W8MAW
W8SET
W9RY
W9XM
W9YRM
W9ZWH
WA4MMO
WA7UVO
WB9BGJ
YS9RVE

289
DL8CM
F6DLM
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K7UR
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WA6OGW
WB2BNJ
WB4NDX

288
JA5PUL
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W8GIO
W9NB
WA4HDD

287
JA1GTF
JF1PJK
K8NN
K9KB
KP4A
N4QF
N8BO

VE3BSJ
W4DJJ
W7LZF
W7RQ
W9XX
WA2AUB
WA4GKR

286
DJ6FN
I4WZK
K2JGG
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K7KD
K9KU
W8LU

285
JA2JSF
K3RX
LA9GV
N4CQ
PAØKB
W1VKQ
W3SNI
W7ELU
W9VCQ
W8FF
W8QBG
WA1EOT
WA4LOF

284
AA4R
K4PI
K7ICW
LA5YE
VE3AMJ
W3FZE
W3MDJ
W4EBO
W4LXL
WA4OOM

283
AC8L
IN3ANE
N3ED
N3RL
PAØLOU
PJ2FR
SM6CMU
W2EV
W8PNC
W9DE
WA5EZQ
XE1CI

282
K3KA
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W2ZZ
WA3KCY

281
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DK5WS
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W6BCQ
W8CY
W8PCA
W9TA
WØRWC
WA2OQM
WA4HSE
WB6JRL
WB6WIW
XE1GBM

280
AA4VK
DL9SV
EA3AOC
F6DZU
I1TBE
JA9CZF
K1GXU
K2LGJ
K4SE
K6RK
K6SX
K8GWM
KØIFL
KT4G
OE2VEL
VE6WQ
W1GKN
W2JGR
W2NC
W3CDG
W3FDP
W3YY
W4DUP
W6ORD
W6PMT
W8NVP
W9KXK
WA4NIB
WA9FZQ
ZL1AJL
ZL4LZ

279
I2MQP
I8KNT
JA7PL
JA8BMK
K4UAS
K9HA
KG4W
N2CW
N6SV
VE3MRS
W4YH
W7BCT
W9ZA
YV5CIL

278
DJ3CP
HI8LC
JA7ZF
K9JF
SM7BOL
W1BFB
W1ESN
W5TJY
W9DOR
WD6BSD

277
EA3TT
K1CV
N6CR
W3PN
W6BWG
W7YR
WB2AIO
WB6WCW

276
DF4FX
JA2KVD
K2GPL
K7UT
PY2DSQ
SMØAQD
W3KA
W3ZN

275
AA4CJ
CT2BB
K1GSK
K7GLL
KØ5VX
SM6VR

274
AA4CK
HK3LT
K3GBZ
K8NW
PY2OB
TG4NX
W1RR
W6GD
W7FP
WØYNZ
WA5SMM

273
AA4S
CX7BF
K7FE
N4PB
N9AGC
OA8V
W6ZUM
W7GSP
W7GXC
W8WOJ
YV4BK

272
DL3VX
HB9BGN
K4PQV
K9MD
KB5AX
N5XR
OE1BFW
PY2JY
W1EED
W3IQS
W5CB
W6OK
WA6OIU
WB2HPP
XE1NI
YU1AG
ZE1BP

271
AF3T
DL7SY
JY3ZH
K3MWV
K6ZXS
KA7AUH
LA9GV
VE3CKP
W2OEH
W4ZCB
W9IFJ
W9PN
WA4OBO
WAØPVW

270
K2SP
K3BCG
K7OXB
K7RLS
K8BTH
K8CW
K9GX
K9UAA
KP4AM
LU8CW
N9RS
VE4JK
VK3OT
W1WXZ
W2GHV
W2MPI
W2NCL
W2QL
W2SSC
W3YX
W5LDH
W7FDJ
W7FXI
W7ILR
W9DDX
WØBA
WØKU
WB3CIW
WB9HIP

269
N4YO
N6AHU
P29JS
TG9AL
VE3MC
W1TPK
W2HXF
W3GL
W3HYJ
WA1ZCC

268
I5KKW
I5WRI
K4GXH
VP9CP
WA4DAN
WB1DQC

267
DJ5VQ
I5BDE
K3RT
LA7ZO
W2SM
W5OSH
W5MUG
WA1TPR
WA4SSU

266
K9IW
K5HZH
W7DSZ
W8TWA
WD5EOZ

265
CO2FA
DJ2UU
DL6QT
K6DG
K7LAY
KØVRW
PY6TM
W4FOD
W4RA
W5VSZ

W6MUS
W6OMR
WD9CWJ

264
CE3GN
DJ2TI
DL8UI
KA5V
N3US
W2CRW
W7ZR
WA1UVX
WB2MIY
WD8MKL

263
AG1J
K1RAW
K7GEX
I3OBO
K4ONF
K6RSY
KØGSV
KB8KW
N2KA
W3YHR
W6ILH
WØFF
WB7NCD
WB7OUL

262
DJ4XA
DK4YA
K1KNM
K4CXY
K6LIK
K8GG
K8SD
KØJS
KH6BZF
OE1GHC
PT2TF
WØYMH
WA4FVT

261
K2OLG
K5IH
K9QVB
N9MP
SM5BEC
W1BAL
W2FCR
W8CBA
WA2NHE
WD5DBV

260
DJ5JH
DL9CQ
EA1QF
HC5EA
IC8EGO
IT9GCQ
K2GAT
K2YIY
K4HRG
K8DJC
K8HV
K8PCZ
K8VIR
KH6JEB
N4KG
N6JT
N9BA
OE3KTA
VE6AGV
W1WKO
W3CDL
W3KJ
W6KG
W6MFC
W7BG
W9RKP
WA4UPS
WB6DFX
WB8VPA

259
AJ7V
CN8AK
CN8CG
K1AP
K4TT
N1YL
N4AVB
W5EFA
W7EOI
W7MSI
W8BE
W8KKF
WA8GKW

258
G4BUE
I3DHN
VK3AH
WA4JDI
WB4LFM

257
F5OK
K1SF
K6EDA
KB4IT
NØAT
W6PYK
WA2BDP
WA4ICK

256
AI9J
I2JQL
K1ST
K8MN
KL7H
VE2YU
WA4MFS

255
K8UNV
KA1BU
KC4U
N4NW
N8AFR
W2BHK
W4TAC
W7BRU
WA1YTC
WB2NIC
WB4KCL

254
DF1DB
DJ3AR
EA3ALD
I1HAG
K3RPY
K7YDO
K9MK
PAØGMM
PY2AQQ
W2CPI
W2UI
W6TFO
W8GS

W9TC
WB3FOB
WB4ASV

253
CE6BGZ
EA7PW
EA8PP
K5BG
K6EID
OY7ML
VE3GJH
VE4AT
W8GUS
W8TN
WA4OEJ
WB4GNT
WB4TIN
WBØNHD

252
DK5AD
I2XNC
I5EFO
K4CDB
K4KJZ
W2IQB
W6QL
WA6DTG
WD8MOV
WD9AHJ
YU2OB
ZP5EF

251
AG4L
DJ9OV
DK8NG
EA3AEA
I1LNU
IØGFP
IV3YRN
K3HP
K6PO
N2VW
W1JR
W6OHS
W7DNY
W7TE
WØIZ
WA2IZN
YU3OV

250
CX6AM
DA2DX
EA3KW
EA6DX
I4FAF
JA4CUY
K2DS
K4EEK
K8TMK
K8VFV
KB4QB
KBØU
KL7D
N2AQH
N4AXR
N4JA
N5AJW
N9AFY
SM5VS
VE3BIF
W1EW
W2IJB
W2YTO
W4HYY
W6CN
W6EHA
W6SN
W7YEN
WA4INQ
WA4YBV
WA7ZWG
WB2EZU
WB2KPE
WB2SZH
WB4UBD
WBØOQV
WD8LJX
WD8MGQ
9Y4NP

249
EA3OD
IV3TQE
K1EFS
N9BB
VE3DGX
W4JVN
W8TA
WØNB

248
JA6RIL
K5GK
K9LW
KB4FQ
W4RKN
WB5SKQ
9G1JU

247
G3DOG
JR6EFE
W6HT
WA7GVM
WA8QIY

246
DL6SW
K4LQ
N8II
WB8ZRL
WD8BSX

245
AF5H
KD4S
N1TZ
NØSS
SM5DQC
W2MOF
W3EFA
W4DZZ
W7EEF
WA1URV

244
CT2SH
K5MFA
N1DL
OZ8EA
W1GUW
W5AL
W9NSO
WA6LFN
WD8NQE

243
K1WJ
K1YHM
K4XQ
N8ANC
W4JD
WA4QBX
WA7KNK

242
AA4PP
DK9KD
DLØWU
G3TXF
K2EYJ
N6BFQ
OK3EA
VP2VBK
W1HSP
W3HXO
W6SWM
WØEVE
WA1KUL
WB8RMD

241
CE3OE
I8JH
JG1XEZ
K2TV
K4KZZ
KØQQ
N1AC
VE3DNR
W2OB
W4KN
W8MR
WA2MID
WB4MTE
WB9NKH
WBØTCQ

240
AA4KT
I2OMF
I2UEN
I8IGS
K2ARO
K5OG
K5TGE
K6KII
K6XN
K9HLW
K9ZO
KØLUZ
KD4M
KQ4O
N4VA
VE3EGS
W4LCL
W6KBB
WØKH
WØNZA
WA1PEL
WA4QMQ
WA7TTM
WB1GDG
WB3GPR
WBØCGJ
XE1FX
ZP5RS

239
G3YBH
K1DAP
K2SGH
K6HNZ
N4TJ
VE4SD
W3DQJ
W4LLV
W4MDX
W5JME
WA4LTG
WB7WIM
XE1YO
4X4KM

238
AD1S
HI8MOG
I1AGC
K6LPL
K6SD
K8PO
W1VRK
WA4LLB
3A2EE

237
AB8Y
I1PHX
I8JVK
IØRIZ
N6OJ
PA2TMS
W2ARQ
WA2ETA
WA2JWJ

236
I4AND
JA1BWA
K9ARZ
K8QXY
KA4C
W4WW
XE1OX

235
AB9E
DK6WA
K4CG
K5MBE
KC4FU
VE4SW
XE1OW

234
DL7NB
N9RB
W5KNZ
WB2CVL
YV3AZC

233
K2IJL
N3GB
N6AFD
ZL3BK

232
AJ6A
IØPNM
N8JW
ON6OS
VE3ECP
W3KHQ
W4OWY
W5SG
WA3AXV
WD8JAB
ZL1BOQ
ZP5CD

231
LU1SE
N6SA
WB4IWW

230
JA8GZV
K3AO
K4CKS
K4JW
K4T9J
K5MK
KØJSY

N2BJ
W2PD
W2TDQ
WØVX
WB3JWC
WB5BID
WB8WZS

229
K1KTB
I2UBT
I8YZP
JA1QER
JA6AXD
KØCF
W3US
W8ZR
W9ZX
WB9NOV

228
ACØA
AF5M
EA6DE
EA7AAF
K8ZO
KB5FU
PAØHBK
VO1AW
VO2CW
W3DR
W5CPI
W5YH
W6ZPV
WA1HJZ
WD9ADB
XE1X
YV5IZ

227
DJ5IH
HB9TE
HI8GGL
W2RS
W4TJC
W9FNN
W9RW
WA2CBB
WA2VEE
WD8BKM

226
F2EX
G3VOF
JW5NM
K8CDM
K8MG
KC7T
KL7AF
LA4HW
N5ACD
N7OK
W6VZZ
WD8CRY
YU3SO

225
AA4M
I2MOV
K4OCE
K8RJI
K8WD
KØKTP
KB4BU
KB9IS
W7KTI
WØULU
WA7OIJ
WB3FIY
WB4VUA
WB7CLU
WB9VDX
WD6DLK
XE1XF

224
AE5H
DK1SE
G3YJI
JA4BKE
K7RDH
K9EHA
W2NHV
W5TKV
WB4FQP

223
DK1YP
K1KI
K3DH
K6ASI
N5IH
W2NJN
W3KFQ
W9VWV
WØBWJ
WA4HNL
WD5DUD

222
W3IOA
WA5FVI
WB7BBO

221
A9XBD
DL7SP
K1MM
K2EY
ON5FU
W1YOU
W7CUJ
WA8MPW
WD8JYR

220
G2MI
G4DJC
JA4GXS
K2KA
K8IP
N2AC
N4GG
W2PFQ
W5SAA
W7FR
W9DRL
W9NNE
W9TEI
WØRAO
WA1GBA
WA1IRN
WA4VEK
WA6CPP
WA6IJZ
WA6RLE
WB3FSI
WB5CBJ
WB8ATA
XE1JTR
ZP5CBL

219
I5LZJ
IØ5GF
JA1FHK
K9QFR
KC4CT

LU3AJW
N6ADI
TG9GI
W5VJG
W/FF
W8DOG
W9DMH
WA2LNL

218
JA6CRP
N4SX
W6OU
W7GUR
WA9JWL

217
DL7LV
JA7ZP
K3ZUF
W4LEX
WB6RMN/9

216
AA4MW
EA2JG
EA3AIN
I5ZQQ
I8INW
JF1EZH
K5EJO
K8BVY
N1ZZ
SM2EJE
SM6AHS
W4MID
WB8VZX
YBØWR

215
K8ZE
LA3SG
SV1IW
WB9LFD

214
AG6Q
EA7AGO
KB9BR
KP4R
W1LTC
W2IBZ
W8KBZ

213
W4UW
WA4BEC
WB5DUT
WD4KXB

212
K9RL
KØLD
WA2IFS
WA4ZEC
WB9JXT
WD4IHV
6Y5MP

211
CT4IB
DJ1TC
I4CSP
K6HD
N6JN
VE3MV
W2CKR
W3GDK
WAØHMP
WB4SWI
WB4TZA
WD4EFD

210
AD7Z
AF7X
DJ2RB
IØCEP
JA2CXH
JH6RYY
N4CRU
W1AB
W2YKN
WB2KWY
WB3BGI
WD4EYD

209
AA4KA
AC6V
AK4E
HK3DDD
I8YGZ
JA3DGC
K2SD
K4URK
LA1ND
N4AVV
N4DW
W5SGI
WA7UFS

208
AD6V
JH4PBM
K4KUZ
KA5W
KB5AC
KB8BS
N4VG
SM5BMD
W1HR
WØJCB
WB2IZN
WB2SJQ
WB6PSY

207
ISØBYR
KØSE
KB5DQ
KB9KD
SMØDJZ
W7LXR
WA2LNQ
WB4FNH
WD4NKP

206
JA5NG
K4FWR
OZ2YE
W3YN
WB6VSK
WD8JFE
6Y5MC

205
EP2TY
K3MA
K7CU
KØCL
KB5IW
KB8DB
KC4B
W4WEG
W5ILR

199
DF3TN
HC5NW
I2RSB
ISØNZA
JA8QO
K6DQ
KB6V
LA9TQ
PY5EG
VE5QY
W1CRL
WA1ZLK
WA6BHP
WA6PJR
WA7OYL
WA8PWF
WB3EFC
WB6FBN
WBØWAY
WDØCQI
YV4ACY
9G1JI

198
SM7ABL
WA2WYR/CX
WB6VTE

197
K2PZ
N6ST
PY5CA
W2WZ
WB9VCI

196
DF2HL
DJ4OP
JA3VLD
N8AQV
N8SW
SM6CVE
W9OFV
WB4NFO

195
DK2XX
WØTT
9V1SH

194
AD8V
AI9R
K6BMX
KG4F
SM6CTQ
WB7TLE
WDØAWL

193
HP1XKZ
K3EW
KB5DO
KT4P
N6MQ
W6SSC

192
HB9BOI
K1TN
K9BIL
WB6SRK

191
HK3AXT
I2ZLG
W6RPK
WAØUXN
WB1DGX

190
AA7C
JH5FQO
W7KT
WB7PTZ

189
N4UV

188
G4BWP
I5ENL
K5GOE
K9IHM
W6RGQ
W9YH
6Y5LA

187
DJ6IN
F9JS
K4XG
K7EG
KA3BFX
W4TXQ
WA1NSJ
WA2AOG
WA7COQ
YV1TO

186
DJ1XP
EA4YL
JE1XRZ
PY3DX
W7TVF
WA2HQH

185
IØNSA
W1LJ
W5KIA
WB9EBP

184
K8CX
K9APW
N9AUV
PY1ZBJ
WA2HFT

183
I1EVI
K1NG
K1RB
K5GY
OZ4TT
SP3GEM
W2TKB
W6CRE
W6FQF
WA4ECA

182
DJ3NW
I1HYW
I6ZAJ
KB9JF
N2ATD
N9BX
SV8JE
W9ZTP
WB3ABS
ZP5YD
5T5CJ

181
DK5AD/W3
K4VAA
K8MO
KH6HIF
OE2SXL
W4SME
W5VVD
W9VA
WA5MLT
ZL1BD

180
A6XB
AE7V
AK4T
CN8CX
I5JFG
JY1
K9QLC
KL7AHB/5
N5WH
N9GT
NØAOP
PT7TP
SM6AOU
VE3AZU
W2PQZ
W8NPF
W9NIO
W9OKL
WB4QVZ
WB7BQP

179
G3KLL
K1FB
K2OPJ
K6OYE
K9LHA
K9RR
KC6GF
KV4X
PP8DD
W2HFW
W9GBC
WA4IZK
WB4GOI
WB4VBL
WB8RFN
WD8KCO

178
I2RGV
K2ZCD
LA4HH
OK3CFA
SMØHEP
W7OGT
WB3BAP
WB3BOA
WB7BQA
WB9YJW
ZL1CN

177
AE5E
DA1MP
G3VUH
HH2MC
JA5CAX
KB5DN
KB5FH
VE2DZT
W3NB
W9TX
WB8YQX

176
AB1U
K5RSG
K6HHD
KA4P
KB4CL
KB4JA
UVØEX
W4GBU
WB1EWP
WB5ZCS
WD9FOE

175
K8IJQ
KB6JK
KC2Q
N4AJZ
N7AKQ
OH2VZ
W4ZBA
WØIE
WØPXM
WØZRA
WA6QEY
WA6VHZ
WB5KSU
WB7OQW
WBØGPR
9J2BO

174
JR2XJO
KA6SS
KB2HZ
OE1SKC
OZ3YI
PJ3DO
SM6HTC
W5QEE
WB3KEQ
WB4FOT
WB6TOY

173
HS1BG
IØWN
K3JW
KA1DJ
N2BIM
SM7RS
WØPEL
WA2JOC
WA4CNZ

172
N4HB
N7RU
PY5EX
W2IQZ
W4UYC
WB5RQM

171
AJ9B
IT9VQC
K4ZGB
K7KH
W4NYS
W6DH
W7LDJ
WD4CTG
WD5JFM
YU2AAU

170
CT2CE
EA6EU
N6HL
N8DE
VE3LAX
VE7DLM
W4HLY
WA7JUJ
WB6PEF

169
FY7AN
KB4GQ
SMØBZH
W5RKK
WD9CLQ

168
HB9AIU
JR1BFT
K7MKS
N4ZJ
VE7DFW
VP2SV
WD4FFP

167
AD3R
DA1RA
K3MNW
K7ZM
KC8E
N3KZ
VE3HHS
WA5HLQ

166
JH1KIK
JH6NUR
K9DIN
W3MR
W6CQR
WA1GSO
WB3CNB

165
DL3NE
IØSVD
JA6GYG
JA7HMZ
LA5NM
N4IB
W3FJY
WD8OWN

164
FO8DF
JA1VDJ
K1WVX
K9PSN
N9AWR
W6HK
WA2MUA
WB3KOJ
YU1NPG

163
K1TO
K3UC
K8IQB
KB4BW
KH6HHN
W9IYG
WA9EKA
WB4KSQ
WB5UIH
WB8KLC
WB8SRD

162
DJ4OK
G3NML
I8XIU
JA5JGY
K3IE
K3RL
K5DEC
KB9IG
W2ULO
WA4OIB
WB4KJZ

161
DF8FD
F3SG
K1NLQ
K2IDF
K2MQ
K8TL
W1BMY
W3FAE
W4TBF
W8WVM
WA4LPM
WA5GGF
WB1BVQ
WB6BPZ
WB7OHW

160
DL7QG
HI8UN
I2GGJ
K1ATL
K1PKT
K8EX
KB4VG
N2RR
N7DS
N9JK
NL7A
PAØPAS
S8AAP
W1ETH
W3IGU
W4WMQ
W7GYG
WA1TMN
WA2CIF
WA3YGQ
WA4UNZ
WA4ZGL
WA6NHB
WB3DJS
WB4KVM
WB4OVX
WB7RGN
WB8HLI
WB9BQV

159
AC2P
AD8P
EA7ABV
IØPSB
K1WB
KB4TE
KBØBB
WØJKM
WA4KCJ
WA6OUA
WA9WGJ
WB4VHE

158
KB8CR
KC6H
KN4F
TU2EP
W7HX
W9MDP
WØRIC
WA9TAA
WAØLHK

157
AF6Y
CT4YG
DK4UH
HI8XJO
K8JRM
KP4AAQ
N6JV

156
AB5G
G3XTT
DL7JK
K3VAX
OK2SW
W1LRR
W5QOT
W5VFJ

155
DJ8EM
HM1SX
JA1HEE
K5AS
KB2DM
WA6SZE
WD6AKQ
WDØCHO

154
DF4FO
EA2LY
JA2HMF
KB4DX
PAØJIL
W6NLG
WØIKD
WA2EIJ
WB2IZX
WB9WUT

153
AF7M
CT1NQ
DJ7XB
DJ8TP
KP4DGT
LA5WN
OZ2TH
PAØLEG
PJ2AAX
WA4GQA
WB2IRK
WBØRNF
WD4AAD

152
AA4NA
I2DMI
I8IHG
JF3ILZ
JA9GPA
K1FPJ
KB5PO
KBØHJ
PY2BGO
PY2CPU
PY5OC
SMØGMZ
W1BH
W9TY
WA4BRQ
WA4GLE
WB4VQD
WB9ZBG

151
DK5WR
EA5ACA
EI8DE
G4DKT
IØAEC
ISØUSU
K1HBM
K1MIZ
K1WH
K3OX
K8ZZO
KØARY
KB6BW
KC6X
KH6WF
LA7EU
VE2AQS/TG9
VE3KGK
W1ELZ
W5GVP
W7KZE
WØFHA
WA4PPS
WA4QZX
WAØABT
WB2JEZ
WB7NIW
WD4CWR
WD4CJA
WD9CPX

150
AA1U
I2PQW
I8ADG
IØEKM
JA1IDY
K3LRI
K5GUU
K5HT
K7DK
KA5BML
KB4KA
KB4PX
N5AXB
VE3LNW
VU2AIK
W3KBZ
W7AEP
WØDG
WA1SMI
WA4QQV
WAØQIT
WB1AHF
WB4FSN
WB4NCJ
WB4VNZ
WB6KQI
WB9RPY
YU1NZW

149
AI7H
I2HHE
I8KUT
JA2BMU
K2ZGC
KA1AWH
VE3JGT
W7ALZ
W9MWD
WA4WVW
WB2THN
WB3IIQ
WB4YNL
WD8CZA
XE1MDX

148
AE4Z
AG8B
JA6AS
JA9DDM
JHØCAZ
K2ENT
N1NA
OE1SBA
WA8KEM
WB3KHH
WB4RZN
WB7CEH
WB8ZNM
WD8MJR
WD9IIC

147
DF7QD
G3UVZ
HK5ACI
I8XIW
KA4ABA
W1JNN
W4MAT
WB1DWO

146
AP2MQ
EP2MW
JA2JZT
KB6KF
KP4AE
PA9WRR
W6LUR
WØIUB
WB5KYF

145
CT4GO
DF2XC
I1FY
KC4M
KT4U
KL7JHI
W2ITG
WA2HVZ
WB6VZA

144
CP1AT
DJ6SA
EA4QR
K4GOK
K6NN
K8EF
K9VKJ
KJ4V
N4BCV
WB5UJN

143
DK3YY
I8KPV
K4HAV
KB2LB
N4US
W1BWS
W1CWG
WB7QFI
WD8QEO
ZS1OE

142
AG1C
DK8AX
F6BDG
HK3YH
JJ1KUV
K2IAB
K6GNZ
N4BAK
OZ3RC
W9CA
W9KBV
W9NGB
WA7CWM
WB3IGR
WB8RTY
WB9TOU
ZP5WU

141
KL7JDR
VP2SQ
W1YNE
W2SUE
W3KLR
WA4ABC
WA7PQL
WB2PFO
WB5UCS
ZP5CVE

140
DA1MV
DL9TJ
I2LXA
J28AZ
JE2LQX
K2PZF
K2QIE
K3LHD
K9BQL
KØRDJ
N5AML
OH1FS
W4WVB
W5VD
W6OJW
W7KQH
W8TXM
WA1LQU
WA1WMS
WA3YGQ
WA4UVG
WA6OTV
WA7CYP
WAØLMK
WB2HJW
WB6FKR
WB7FDE
WD4KWR

139
JH7AEP
KBØPR
OE2WJL
S8AAT
W6TPC
W8CBR
WØEAN
WA2JTX
WA3FEU
WB2QEU
WB4KDU
WB4NKO
WB8CSH

138
F6EVS
N1AFC
N1AKX
OZ6KM
SV1JG
WA2JQK
WB9FUM
WD8EMI

137
AI4W
DL3EW
JA8BFY
KL7JAI
SM7BBV
W3UHP
WA2WCW
WB1GOO

136
AF1U
I2XRG
K9LWT
KØSCM
PT2LS
W6BZ
W9CZI

135
K6SMH
K8JK
KA5BWU
KH6IIP
N2GW
N3ADI
W6RK

134
CT1GC
DL9HN
WA9MCX
WB6VVI

133
AE1J
JG1OQZ
K6BKU
K7JWZ
K8ZZU
N2XJ
W1THN
W4PNY
W5BPT
WB1GTO
WB3KDY

132
K4YCK
KB7DT
N4BYU
N9AKW
N9AMF
W3IMJ
WA4JEP
WB5FLP
WB9RJQ
WB9ZKK
WBØTOH
WD2AGS
WD8AUX
3D2UP

131
DK2NZ
FG7XA
HC1EE
IØMHP
K3FN
K4FKB
K6OKW
K9KK
KA4BFT
N7JB
VE7BEN
WA4JTE
WA6PVA
WA7BPO
WB2GTB
WD9ESU
251JD

130
AA4FF
AI2F
AJ5N
CX7BV
FO8DO
K2TGE
K4DSK
KA2FRW
KB4WY
KB8DE
KS6EZ
PY2JSF
TR8AC
W1GG
WA1DPX
WB3AVN
WD8DXG
6Y5RL

129
EA9JE
HI8IH
K4KAK
K7JVM
KA5AZT
KB4HU
KB6AR
N4TZ
N7ASL
OE1BKW
W3HAY
W4KKP
WA4CYR
WA4LWL
WA6RPF
WA6VIQ
WB2JFH
WB3CAI
WD8IAE

128
AA4KY
I1ZZL
K3CIS
KB4BL
N9AOK
VE3FEA
W8JRW
W8QGP
WA2HKS
WA4VSL
WD5ABG

127
CT1VY
I2WTY
K8OOG
KA9CQM
KB6AE
W4WFB
W7BI
W9IVB
WA4BBN
WA4MCH
WB1ETS
WB3FSN
WB7RUN
WB8VKL
WB9VVX
WBØUFL
WD4DJC

126
DK6IM
DL1EV
G4FJT
G4IJW
I5NOR
JA1SGU
JAØKHO
K4WHN
K6SUC
KB2HK
VE3ENF
VP2MBB
W1DOH
W4ZWE
W5FFY
WA8CAJ
WAØCED
WB2HIQ
WB4VWO
WB5TXP
WB6TRP
WD4LWG
YN1EGW

125
DK5WC
F3PX
I1SBU
JR1VAY
KØDEQ
KB2BC
KB3FA
N4AQA
SMØJDR
VE4AFO
W5TGU
W6YMH
WA1OUB
WA2JCX
WA2NBM
WA2VCM
WA4ZUS
WA5BBR
WA5MAK
WA6SJX
WA9JNM
WB2RRB
WB6SQO
WB9VGJ
ZD7HH

124
AG2K
G4BSY
JA7BAL
K1MET
KA6V
KB9AW
KH6DF
N3ARK
N3AUE
N6BLN
VE3EGO
VE7KL
W9ISF
WA4NEY
WA9ZRL
WB5QBV
WB6LMN
XE1MEX

123
AE7P
DF7GK
EA5ET
I2AUV
I7KKS
JA1FIJ
K4IPN
KØINR
KB8DT
N4OI
OY9R
VE2DU
VE3LD
W3BUI
W4VAB
W8UVZ
WB5UDU
WD8MPY
WD8PKF
WD9DFZ
WDØFNF
5H3FW

122
HI3JON/W2
HK3TF
HS1ABE
I2XPD
J6LFZ
KA2CH
KA4CTZ
KA9AUS
LA6JU
N4ABZ
N7AET
N9AHL
OE5GML/YK
PA9MA
PY2DMT
VE5JM
W4SPK
W6EBR
W7KEU
WA5ZIJ
WB1ASL
WB3LGO
WB9EKM
WBØZHH

121
DL2KC
I6MRD
K3GJ
KL7JFV
KNØQJY
N2LA
N9IF
W4LWP
W5CRP
W5PLN
WA4RXS
WAØMYM
WB4KTG
WB4LNK
WB7QVB
WB7TAZ
WD4MJP
WP4API
YV4BD3
4Z4ZZ

120
AJ7Z
CE5CN
CT2CJ
DK6LI
DL4WD
EI8AR
EI8AU
F8VI
GM4CUB
HB9BLQ
I5VSW
I6PQO
IT9ZRQ
JF2ACK
K1PCE
K2GLS
KA1GC
KBØBU
SP8ECV
VK2FD
W1EQD
W1GDQ
W2UT
W6IBU
W6KXV
W9RR
WA6AUQ
WB5RMF
WB5VDL
WB8TGS
6Y5MR

119
F2GA
K5QLH
K7JXR
KB6CW
KBØA
N8AKF
OE8MOK
W5KZT
WØZX
WA1BYE
WB3IET
WB9QPG
ZF1HJ

118
DF5SL
FB8ZM
G3RAM
G4CMT
JA1KAW
K2UVV
K3RH
K9AEG
KB4IF
KB7FM
OE2LCL
VE3IPR
VS5TX
W1MQK
W3FQA
W3ZE
W4LMB
W9ZGP
WA2KDB

117
CT1AIF
CT2AX
DK4QO
DK7IZ
HB9BOM
IØHMD
JR2HAE
PAØRRS
VE3ET
WØEJ
WA6GGC
WB4WOW
WB5TKR

116
BV2B
JI1GZN
KA1HD
KB8BN
VE3FZW
VE7RE
WB2TBQ
WB7TFT
WD4OCO
WD6ENL
YU2OM

115
CE2HW
DF8XP
DF9ZP
DL3OV
JA1TII
JF3KNQ
JK1GDD
JA9UX
KA1GG
KB4IL
KC4BX
VK3BHN
VU2OO
W2ILT
WA6HGS
WAØVBW
WB3JVD
WB4CCT
WB4YBE
WB5HGI
WBØTXL
WD8QBB
WD9DCL
WD9IPP

114
AD8O
CT2CI
DJ3AS
F6AKZ
IØYGV
JH6BZI
K1GRB
SMØEYX
SVØAE
VE2EWD
W3HEQ
WØSEM
WØSL
WA2DZD
WB2PEL
WB3HDP
9V1TP

113
DJ3UI
DJ4DK
DL7WE
JR3RRY
JR6GEJ
N4BBB
VE3YE
VK9NI
VP2SM/W2
W1MRJ
W1RVO
W9MEF
WA1WNN
WA4GFC
WA6DJS
WB1BXS
WB2DYO
WB4ZTM
WB9UKK
WBØJFF
WD8NVA
WD9DNL
YU6ZA

112
AD2S
DF6EX
DJ8RN
DJØNU
F6DPE
I2QAH
I2WZX
JE1BQE
K4TAZ
K8TUY
KC4DY
N4AXT
N4SN
SM7GCP
VE1RQ
VE3AC
W7MBW
WØSI
WA1YTW
WA8AJH
WB1ECL
WB2GHV
WB2LCF
WB3GWS
WB5WQG
WBØAFO
WD8DEL

111
CT2YB
DF2LM
HI8ECS
HI8MFP
JA1EHA
JA2QVQ
KL7HRN
N3ART
N4BFW
N8ARA
SM7ASL
W5RU
W8QWI
WA1SFN
WA4VMZ
WB5JXT
WB6VGY
WD5DZO
WD8QOM
YU2RJV

110
CE4EM
DF1QM
DJ3KV
DJ8SO
DLØFU
EA1TA
EA7AOK
HK3AQP
I6LUJ
I8AKN
IT9TSW
JE2OTM
JR2CDQ
JHØBQU
K5BQI
K6RLY
K7OH
KA1ACC
KAØBSV
KB7DA
KB9BX
KL7JAA
N2AGD
N4AKO
W3SUE
W4KGH
W4XP
W5JM
W6AML
W7GQM
W7KNT
W9WYN
W9ZYL
WA1JKK
WA2OOL
WA4EAL
WA6SRJ
WAØQQR
WB5IKT
WB5MSU
WB5TED
WB5YGS
WB6RHC
WB7VVU
WB9UUE
WD4AAM
WD4AAQ
WD4MSL
WD5CKA
WDØGEP
ZP5ZR

109
AA6BB
AB3W
AF1W
DF4PL
DK5NH
DL4NN
EP2MS
G2HJT
G4FHL
GM3OM
GM4AGS
HKØCLS
I3NEN
I3QBR
I5HOR
JH1FTV
JE2MCW
JH6UBT
JA7NVF
JA8FKO
K3QWG
K5ANB
K5TNP
K6CID
K6JEN
K6UCG
K7KDS
K9MDO
KØJTW
KA5ASD
KA6TC
KA7DBS
KB8AU
KB8BR
KB8IO
KB9CJ
KBØC
KG4V
N6IM
N7ASZ
N8AGY
N8AJF
N8AXY
NØACH
OK1DKS
ON6NY
OZ1BAO
OZ8YP
SV1DX
VE1BUG
VO1CA
W1VBX
W2VHJ
W4PME
W5LKP
W6AEO
W7FRV
W8LRO
WB2DCP
WB4OKY
WB5CDW
WB6NFA
WB7PXA
WB9GLB
WB9TJL
WBØDHS
WBØOHI
WD5FLK
WD8CEL
WD9DHF
WD9JKT
WN6CND
9J2NG
9M2EE

108
AI5X
AK8S
CX2XC
DJ7EV
DK3EG
DK3QV
HK3GK
IC8OGS
K1UDW
K2EQU
K4BUH
K5PR
KØVGB
KA1MI
KA2CRN
KA9I
KB2DE
KB4JR
KB9PO
KC4IH
KL7HDS
N6AUA
N6AUO
N6FT
N7BES
OD5MX
OZ2DM
SV1EX
VE6ARN
W2MLH
W3MPN
W3RDE
W4RNZ
W6IAE
W6TST
W8RSW
WØLOH
WA2SSU
WA3URO
WA4OHX
WA7ECU
WA9LCU
WB2PQK
WB2YJQ
WB4RRK
WB5JJD
WB5LWP
WB5YZB
WB6SKE
WB6ZNV
WB7BYB
WB7DHC
WB7SIC
WB8PPR
WB9GMC
WBØTLL
WD4AVY
WD4FAM
WD4JMH
WD5GFP
WD6EEQ
WD9DKS
WDØGAF
ZL3AAX

107
AA9U
CT2BU
F3BR
G3XYJ
I3AAV
JH4PRU
JA7LDA
K2YGM
K4FCW
K9LCR
KA3CNL
KA8ANQ
KB2EI
KB5AO
KB6HT
LU2DSL
N1API
N6AHV
OZ2BM
PY6AJG
VE3CXL
VK2VC
W3GRW
W3OKO
W5HI
WA1VTW
WA2OEP
WA4VYS
WA4WXO
WA5EFN
WA6CTX
WA7OOB
WB1DLA
WB2VIN
WB3FMQ
WB3FYS
WB3JWM
WB4GJR
WB6VIN
WD4HZQ
WD8IIA
WD9HKI
YN5JAR
YU1NHV

106
DK4AW
DK6AD
OK6AO
DK9CK
HS1ALP
HS3TM
I2LVM
I4LRH
I8HZT
JJ1IHS
JE2KSM
K5HKG
K5ZTI
K8IXU
K8KIX
KC4BR
KD8F
LA3RP
LA3WV
N2HK
N4BBA
N7AIF
NØBKY
OE3ZDB
OK3CEE
W1OD
W2IIX
W2XL
W3CM
W5UMK
W6XI
W9KA
W9SL
WØPUD
WA2TJF
WA4FWH
WA4LRF
WA4PMU
WA9OHU
WB2CLL
WB3GOP
WB4COO
WB5YJX
WB6TKK
WB7UVA
WB8UNY
WB9LEF
WD4GSE
WD4JOV
WD5CGC
WD9IMB
ZS4W
9G1KK

105
DF1KJ
DF2FZ
DF4ZL
DJ2HZ
DJ5EJ
EA7ASW
HC1HW
JA1DCO
JE1CYH
JH2VNY
JA4AEZ
JR4BVD
K2BQW
K2CHS
K3JGJ
K4RUG
K6BQN
KA2RF
KB4FH
KB9CO
KC4AL
KL7JAR
KL7P
KN4H
N4ADH
N4BVP
N5NO
N6ZL
N8BBJ
N8BIB
NØABR
NØBKL
OH2CE
OK1TA
SVØAP
TG7VN
W2DAU
W4LSI
W5NLB
W6FWX
W6NCR
W9HGK
WØDXC
WA1SHR
WA4IAX
WA4PKQ
WA4PUF
WA4QCY
WA4YQS
WA6BIE
WB1EAZ
WB2MSH
WB3BXQ
WB3FNZ
WB4ENN
WB4LMI
WB5YPE
WB6GNS
WB7FAT
WB8DSU
WB9TRJ
WBØMCO
WD4ALD
WD5BSN
WD5EWE
WD5EWP
WD5JQB
WD5SKM
WD8ILW
WD8JSC
WD9CYT
WDØAQJ
ZL2AYF
ZS6ALS

104
AA4RF
AA5O
AE9X
CP6ID
CT2BV
DF2EQ
DF7FB
DJ4AO
DK9XD
G4BYB
G4GEE
HC1FM
HC1HC
I1YJQ
JF1SLN
JG1IIE
JA5OP
JH8MXH
K2WD
K3KSS
K3UA
K4AXV
K4BKX
K5AD
K6UWR
K6UWT
K7CE
K7LJQ
K8KOI
K9QXK
KØGND
KA1BFJ
KA3BSM
KB2ET
KB2MK
KB4NJ
KB4PW
KC4EY
LA2FV
LU6DWA
LZ1MH
N1AMB
N4BQB
N4XG
N5AWS
N6AVU
N6HC
N9ACX
N9AHM
N9AIB
PY1CZL
PY4AXJ
PP5AZ
VE1JS
W1VEI
W2AKW
W3DCT
W3ETB
W3LPN
W4KOQ
W5UJO
WA2RVF
WA6KMS
WA6SSG
WA8BCG
WA9GFR
WB1CSE
WB2KCI
WB2NEG
WB2QZZ
WB3HAK
WB3JQF
WB4YTZ
WB4YXA
WB5OFN
WB5USA
WB5VNJ
WB5WJX
WB6NHV
WB6OBB
WB6PLR
WB6SWH
WB7DZH
WB7UAM
WB7VCI
WBØMBD
WD4HDJ
WD4JRR
WD4OXA
WD8MRF
WD8RKT
XF4MDX
ZS2BD
4S7DA

103
AC6T
AD5C
AF2O
AF4Z
DA1PN
DF1EG
DJ4LN
EA1UQ
G3VAO
HB9AOF
HM1QD
JI1DCW
JA2BOV
JA8DNZ
JHØHWP
K1BUR
K1UIC
K5BTS
K5PQK
K5WZ
K6QEH
K5UJV
K8WOW
K9ARQ
K9KWL
KØKWU
KØPCK
KA1BRD
KA2CDJ
KA2EWT
KA8DAY
KB3HZ
KB6CO
KB6MQ
KB7JE
KB8ED
KC5M
KH2AD
LU6DIN/WØ
N1ADF
N1AHN
N1ED
N4CDZ
N4NG
N5AHS
N5AZK
N6HE
N7AJA
N8BGE
OH1TD
VE3GFM
VE3IYA
VE6CBE
VK2DCA/VK9N
VK5WV
W1KFY
W2NKC
W5TIO
W8ANM
WA2GEA
WA2JAS
WA3BIW
WA4FXJ
WA4YKJ
WA5TWF
WA6GTU
WA6KEY
WA6MHZ
WAØARS
WAØCZO
WB1GYV
WB2JBQ
WB2LAP
WB3EZH
WB3FAF
WB3HLJ
WB4OWD
WB4VLM
WB4YTK
WB5JMH
WB8YUO
WB9GCD
WB9IWN
WB9QIZ
WB9UKS
WB9WAI
WB9WHB
WBØVLL
WBØYUC
WD4ARY
WD4CYN
WD4LFD
ZL3VF

102
AA4EE
DA1IN
DA1QR
DF7NM
DJ6OY
DJØRV
DJØSL
DL5KX
DL7HX
F6AQX
HB9BET
JA1AJK
JR1ARK
JH2JUK
JH3IEF
JA8NEN
K2TY
K3VY
K4DMI
K4KYI
K5PID
K8BQU
K9BJ
K9BLX
K9ETK
K9MFI
KA1FQ
KA8CFW
KB2ED
KB4VJ
KB5EI
KB6OK
KB8DW
KB8SX
KBØHQ
LA2GN
LU2BAT
N2AIR
N2HG
N5BBE
N6APW
N6BFA
N6PV
N9AKM
NØAMI
NØCC
OE8WBK
OK1VE
OK1AGN
PA2VDZ
PY2GWE
SM5DUP
SP1CTN
W2GTN
W2LLS
W5IJU
W5TU
W5ZKJ
W6TJS
W7JDF
W8DQB
W9GGN
W9RVM
W9VNI
WA1PBE
WA1SMI
WA2JDU
WA2LWM
WA2TDB
WA2VUY
WA3TRI
WA4BRM
WA4FRY
WA4VCX
WA4ZXA
WA6LOD
WA7YBN
WA7YXM
WA8IMO
WAØPDA
WB2EIB
WB3GPL
WB3HTK
WB3JUK
WB3KGY
WB4DJO
WB4LED
WB4SYP
WB4WHE
WB4ZGS
WB5NDN
WB6AFJ
WB7NFK
WB7PHM
WB8RTR
WB8ZED
WB9LCA
WBØLVW
WD4BJS
WD4NDD
WD6AQJ
WD6BYF
WD8IPJ
WD9AHI
WD9CIJ
WDØBKT
WDØFVV
ZL1BQD
ZS5YA
7X5AH

101
A9XBS
AB9R
AC3A
AF7O
AG4V
F6FWW
HA1TQ
I4QCD
IØDCI
JA1RCE
JY6AR
K1IAG
K1MZN
K2HPR
K2RVQ
K2RXY
K3HFH
K3KJZ
K3LDE
K3STM
K4HHM
K4JJW
K4WXO
K5MLG
K6EKP
K6OP
K7JNB
KA4BAS
KA4BWD
KB4IS
KB8EM
KB8KB
KB8PK
KJ4Z
KD2G
KL7Q
LU6EBQ
LX1JX
N1AFB
N3VA
N4CSF
N4PY
N4QL
N4VM
N6ACU
N6BXM
N8BKB
N9ADN
OE8EPK
PT2PT
SP3HTZ
VE3HFL
VE4ADG
W1PZR
W1TPB
W2INJ
W2RFU
W3GXK
W5JMC
W6JO
W7HSP
W8JQR
W8NRE
WA1HHS
WA1LJB
WA1ZAM
WA2KLI
WA2LTZ
WA2MTR
WA2PHA
WA2TTI
WA2TYK
WA3GXI
WA3ZHM
WA4RLL
WA5ZDZ
WA6CUP
WA6OXZ/VQ9
WA7PMW
WA7USI
WA7WLT
WA7ZPO
WA8AEE
WA9BBX
WB1EZL
WB4EGR
WB4FLH
WB4HPJ
WB4QGX
WB4SFM
WB6CDM
WB6DMB
WB6WOK
WB6ZFI
WB7QID
WB8DUC
WB8WKP
WB9UQY
WB9VJN
WBØBMB
WBØFAQ
WD4IDK
WD4PMU
WD5DRM
WD6BNH
WD6ERX
WD6GKF
WD8AFK
WD8DVC
WD8KVR
WD8PUG
WD8QVD
WD9ELT
WD9FKS
WDØCCL
4U1UN

100
AC2J
AE8N
AH2AB
DF2TG
DF9RB
DJØXJ
EA5CQ
EI3CD
G3KDZ
JI1NOY
JH2LLE
JA5CKD
K1BGY
K2JF
K2PF
K2UGH
K4BWC
K4DHE
K4LEF
K4NHK
K5RMK
K6WB
K6ZSB
K8EK
K9DN
KØAL
KØSRL
KA1EI
KA1JV
KA5CTZ
KA8Y
KB3CQ/KH6
KB3HB
KB6GU
KL7IYX
LU7DI
N3AZU
N4ARU
N4AWR
N4DT
N6AIW
ON6GB
N7AGC
N7CY
NØASV
P29GC
PA3ABW
PAØVST
PY1NCJ
TG8NE
VE2FIT
VE2LH
VE3IEN
VE3JQJ
VE7ADA
VE7ARB
VP2MJE
W1NED
W2CZT
W2IP
W7CNC
W8MFU
W9AFN
W9ZMF
WØFXY
WA1VTA
WA1ZRS
WA2CHT
WA2FUM
WA2ISM
WA2JOX
WA2SEL
WA3OID
WA3ZBK
WA4GKT
WA4JNE
WA4STN
WA4YVG/VQ9
WA5WKO
WA6PTM
WA7COR
WA7PVE
WA8UNP
WB1ASY
WB2QPH
WB2RLJ
WB2SJD
WB2SXT
WB2VPV
WB4GMD
WB4JFM
WB4VEJ
WB4YKI
WB4ZLK
WB5CYK
WB5DCY
WB5MMM
WB7CAO
WB7RKE
WB8TRU
WB8ZCT
WB9OHN
WB9TDR
WB9UTM
WB9VIN
WB9YVO
WB9ZAH
WB9ZIX
WBØBIY
WBØJLY
WBØPVO
WBØTQW
WBØYEX
WD4ARZ
WD4DZF
WD4ELE
WD4HVZ
WD4HYE
WD4IXE
WD4LDS
WD5BKO
WD5DCD
WD5FXP
WD6ADH
WD8KQI
WD9AQJ
WD9EWT
WD9HWY
9X5PP

CW

310
W9KNI

307
K6GA

306
N4RJ
N4WW

304
K9MM

302
K2TQC

301
ON5NT

298
W3KT

297
K2FL
W6PT

296
JA1JRK
K3FN
W8AH
W9ZM

294
W9DWQ

293
DL6EN
K4PI
K8MFO
SM5BHW

291
JA8JL

290
SM3EVR
W1NG

288
W3GRS

287
DJ2BW
K4IEX
K4XO

286
WØWP

282
K5UR

281
JH1VRQ
W9SFR
WØBW

280
F3AT
NØRR
OZ1LO

279
DL8AN
N5JR

278
JA1GTF
WA6TLA

275
KE4I
W9BW

273
SMØAJU
W8RSW

272
JA1BWA
JA1IBX
JA1MCU
K8DYZ
K9AJ
WØSR

271
N2KW
WB6ZUC

270
W2NC
W8RT
W8UVZ

268
K8WW
W2FP
YU2RTW

266
SMØGMG
W1GL
W1JR
W7LR

265
DL1PM
JH1EIG
N1AC
OZ3Y

264
WB6RSE

263
K5RW
K7ZR

262
JH7BRG
JA8ZO
K6DT

261
AA6AA
I3OBO
JA1EMX
K6JG
N4MM

260
I5XIM
K5NW
W4WJ
W9BG

259
K5KLA
OZ1VY

257
JF1PJK
K1MEM
K8CW
W8ZCQ
WB8OBA

256
W2SM

255
JA2AAQ
K4SE
K8ZH

254
W9TY

252
DL1HH
K3KA
N6JV

251
AE6IJ
ON4QX
SMØAQO
W6TFO

250
F6DCQ
K6CBL
OH2BN
W1AB
W2MIG
W3EVW
W4KN

248
AA1K
N4WX

247
K5LM
OZ7BW
W1FZ
W1YY

246
W2LZX

245
W9GW

244
K2BZT
N4NX

243
AF6S
JA1BN
K6YK
W6TC

242
W4LVM
W5JW

241
K2IJ
W6BS

240
K8LJG
N4RR
VE3BX
WA4DAN
WA4JT1
WB8JEY

239
JA1JWP
JA7JAA
SMØCCE
W1WLW

236
K2SHZ
K7ZA
WB9SLV

235
N4SV

233
N4OW
N7UT

230
K9QVB
PY2ELV
W1MLG

229
W6RGQ

228
AA4M
N2CW

227
K1SA
K2LX
K4JC

226
N4HI
SM5AKT
W9KB

225
D4CBS
JA3GM

224
K2UO
W3AP
W4NBP
W6ID
WØOQK

223
K4LQ
K9RL
N5DX

222
HB9HT
JA2EIV
K7UR
N6MU
W6OKX

221
AD1C
F6CRT
WØCAW

220
DK8NG
F2IU
JA2INS
K4FJ
K4NV
SM6CMU
W1IHN
W4BV

219
DL8CM
K6AC
W5SJ
W8CEU

218
K1TZQ

217
JA8AA
K1RH
K5VT

216
SVØAA

214
DJ7CX
K1UO
N3RL
N4OI
ON5KD
WB4OSN

213
K3IE
K4OAH
N4IR

212
JH1NMO
W5UR

211
OE1ZGA

210
N2JA
W5KC

209
JH7BDS
K5AS
K5OR
KØKES
W2MD
W6ISQ

208
K5AQ
K9BG
OZ1CTK

207
AB4H
JR1EBE
WØNB
WA2JNN
WA9ITB

206
DL1LZ
N5TC
W1RR
W7LZF

205
DL3BK
JA1QXY
W8GKM
WA2ORX

204
DJ5DA
DL1ES
I1YRL
JH1PBR
JA2BP
K5GO
SMØCCM

203
DK5AD
JA8CFR
K4UEF
N4OT
N8II
ON7EJ
W4JD

202
AA4KT
AC1O
K4EFZ
N1ACW
OK1TA
SM6AYM
W1YN
W2RS
W3TVB
W6JD
W6UY
W6YQ

201
JA1BGS
KØRP
N7MW
VO2CW
W9ZA
WA7RKJ
WB7ASF

200
HB9ALO
JH7LMZ
K5TSQ
K8VM
K9WA
KØDEQ
N2AC
N7CW
N8BM
OK1MP
VE7CNE
W3ODJ
W9FD
WØRJU

199
JA7PL
N7MC
VE3CVZ
W6JI
WB5UWF
YV4BK

198
AG4S

196
N2UN
W9RW

195
W8DA

194
AA7C
KØSVX
N3ED
N4SX

193
N4VA

192
JA1FNA
K6WD
LA8CJ
W7WN

191
DJ4XA
I3BLF
K5KR

190
OK3CEE
W6GO

189
AE4X
WØVX

188
DF3FI
JA1KF
K3NS
W4JFE

186
DL1EV
G4BUE
I3HDH
N6IM
PY5WD

185
HP1AC
JA2KVO

184
K3EQ
KU4N
N6OZ
N7CM
N8JW
SM6CRH

183
DL7SY
K2KA
K6RLY
W3ARK

182
K1JA
K5EOA
N4BPP
W2OB
W4YN
WB2KXD

181
JH7BDS
JH7CKF
K2SX
K8HV
K9LV
K9QXY

180
AB4Z
AF6Y
K9IW
KØLST
KB8KW
KD4Z
KL7H
PY2KN

179
K7KVV
N6VR
PAØLOU
PY2CPU
WA1CCR

178
K9ZO
KAØE
N9RR
OZ1DYU

177
DJØGD
K1WJ
LA5HE
PY2BW
W6SZN
W7EEJ
WA2CBB

176
AA4AK
HK3YH
I3MLD
JR1URH
OK3EA
SM6CST
WA2EYA
WD9AHJ

175
AI1S
DL7DX
G3TXF
I5BDE
IT9GLJ
JA7HMZ
K5MK
K8FU
N2MJ
N7RO
N9KW
W3GOH
W5FL
W7EKM
WA4WYN

174
JA1EF
YU2OB

173
WB1FRZ

172
N4DW

171
AB9V
W2QL

170
IA4GXS
WA4MFS

169
AA8Z
OK/XX
DL1BS
JA1QER

168
JH6HYC
K4CXY
K9MFI
W8DCH
WA3GJZ

167
JA5CAX
K2QF
KS0GX
SP8ECV
W1WA

166
KL7AF
SM6BZE
W9XX

165
AA4KA
K3QIA
W9AQ
WA4VMZ

164
CX4LO
K4HRG
W4BQV
W9AP

163
AA4CK
JI1VLV
K4KUZ
K6QC
N4PY
PA0TA
W2WZ
W2PV
WA8SAE

162
AD6D
EA7OH
K2PX
K5KV
KB0FZ
N5RF
PY2DFR
W9LNV
W9NQ
WB2FFY
WD9ICC

161
DK5AD/W3
DL7LV
K8SW
N6MQ
N9HV
VE1UQ
W9QH

160
JA1GLT
K1TO
K6TQ
K6XN
N6PV
SL0AS
W2SSC
W2TO
W4WXZ
W9IT

WA2JOC

159
KH6HC
WB3JUK

158
KN4B
W3GL
K4ITV
W3KFQ
W9PN

157
JH6BZI
K9TI
N2XJ
OH2BSQ

156
JA3BEY
K8IP
OK1KRS

155
AC2U
VE3JUG
W1LQQ
W2IV
W7IIT
WB3CQM

154
K2NJ
N6UH

153
KA1CB
KA5W
N2US
OZ1EOE
W1EWD
WA6OEC
WB9TTL

152
DL6MK
I4AND

I@DYB
K@CVD
SM6INC'
VE1BLX
W4UG
W5ODD
WA7RQS

151
AA6DP
AG5C
DF4GV
I@WLS
JH0CAZ
K5ZD
VE1ANU
VE3GCO
W7IGE

150
HA8UB
OH2BDA
VE2AH
WD8IFX

149
K2TV
K5FNQ
K5XE
SM@DJZ
W7XN

148
DJ2TI
VE3AKG
W2ZZ

147
I2XIQ
K3NR
VE6WQ
W1BWS
W9RY
WA1FCN
WA2AUB

146
W4DZZ

W5SP

145
K6RK
KU4J
W@IUB
W@SA

144
AB8Y
KN7DPS
N1RW
N4TJ
N8DE
W3KA
W9HR
YU1NZW

143
AC4CRW
JA7EWS
K1TG
W2FTY
WA4MCH
WA4QLL
WO4IHV

142
AF5H
DF8ZH
DJ8JH
G4FAM
GM3YOR
N5AIL
N5RR
W2NJN
W3PN
W6TOR
W7MBW
W8AN
W@JLC

141
DJ@LC
JA1SGU
W9VJW
WA2CDD

140
AG@A
DJ2AA
DK5PR
DL1QT
DL9TJ
I6AVS
JA7BMR
JA7JT
K2PZ
N4GG
K9BK
W2LMO
W2PQZ
W4LOO
WA5YMW
WA5YTX
WB2IHN

139
HI8LC
I1QJC
K5BDX
KB2FD
WA1AER
WA7ZVI

138
II5BU
JA1VE
JA6CNL
JA6VA
YB7AAU

137
DJ3OE
K8MVZ
N4TN
SM@GMZ
VE6AJF
W1ZW

136
K2PF
W4DJJ
W4RJC
WA4YCI

135
AB1V
AF7M
JF1KKV
K9MK
W1KSZ
WA4LOF

134
AJ3H
F9XL
N5AW
OZ5VT
W2GA
WA9EKA
ZE4JS

133
DK6NC
N3BJ
VE3ECP
W9WI

132
K4AMC
K5WE
N6NF
W7OK
W7TS

131
JA1DY
WB3JRU

130
JA4SP
K3VDU
N4IB
N4TZ
WA4IKZ
WA7ZLC
YU7OQL

129
K1WB
W5VSZ
W9HPG
WB3JYD
WD8MOV

128
DK9MB
I3MQ
JA1CZI
K4BZH
KB4BU
W7TE

127
I2BWW
I5IZ
IT9VDQ
K3UC
K9CW
KF4H
N3KR
N4CQ
WB9KBV
WB9TIY
YV10B

126
FR7BP
JA3ARM
K9SI
N9JC
VE3II
VE3JCV
W3JF
WA@VBW
YU1AG

125
JA8TRT
K1XA
K9JPX
KH6JWK
N7US
N9ZA
VE6AYI
W1WKP
W3ESU
W6MUL
WB7PKD
WB9UIA
WD9EJE

124
AJ5Q

JA7JWF
K8BA
K9JCF
KB2BK
W3FAF
WA4RRB
WB2THN
WD9DCL

123
AA4NA
N1YL
W4MGX

122
DK6IS
GM3LYY
HB9BIF
K3QWE
K8CX
K9UQN
W3GQG
W6TVX
WB4EBX

121
N4HU
SM7FYK
W9JF
WA6PNY
WB8TRW

120
AE5H
EA6FD
HB9BBB
I2GXS
K4IYS
K9KA
N6FT
OE1TKW
OK2QX
PT7AC
W1OPJ
W3YY
WA2MUA
WA4QMQ

119
AE3Y
DK8SL
K7OEW
ON5FU
5Z4CW

118
K4DDB
KA5CWE
PA3ABB
YU2RSE

117
K4LNC
K@GUG
N2IT
N4QS
OH2EJ
OK2SW
WD9IVC

116
DL1MD
JA3UPM
W8QWI
5T5CJ

115
AB9E
WB2KJL
WB@YRN

114
AA4FF
DJ4OP
EA1JO
W5YH
WB3CAI
9V1SH

113
AI9R
JA7ARH
K2OB
W4GBU
W5AQ
W5IMJ

WB4WUO

112
DK9NM
DL1VJ
HB9ASN
JG1QQT
JJ1HEY
K8TL
K8YZ
KB8ED
OH1FM
ON7WW
TG4NX
VE1AXT
VE3DAP

111
DF3EP
EA2LY
EA7ALQ
GU5CIA
GW3GWA
IX1DAR
K4JW
JH7UJN
K6SMH
K7WA
K8AQM
K8KBB
N6HC
N9XA
OH7KJ
W7QMU
WA6FIT
WA6IGU

110
AA5C
AC9S
DK6CS
GW3INW
HB9CM
N7DA
N@BFP
OK3CAR
VE1BQQ
VE2DQ
VK1PG
WA2AXB
WA4RAL

KA6NN
KM4D
LZ2DR
PA2FDR
OH2PF
SM7CZC
W3FLA
W7DPW
W8TWA
WA2HWJ
WA4RDS
WB3FHO
WB3FIZ
9H1ED

109
AF9C
DJ3BE
DJ5PA
JR1IOS
KA2X
N4MI
N5FG
P55AVM
SV1IW
W1LY
W4BFR
WA2YSA
WD8DZO

108
AF9K
DK5XF
JJ1WWG
JA5SIX
JA6PWN
K3UA
K5EE
KK6X
N2EF
N6AXD
N7DA
N@BFP
OK3CAR
VE1BQQ
VE2DQ
VK1PG
W1RED
W4RAL

W6ATK
W6SZ
W7TC
W7TVF
WB1DGX
9H1FN

107
HB9BNB
HB9BNV
HB9HHG
LA2AV
N2EF
N6IC
N@GU
OZ2E
W1LJ
W3FE
W5HQL
WA4EGQ
WB3AVN
WB4FOT

106
AJ8J
DL3MQ
EP2LA
JA2ADY
JH2WBI
N2GC
SL@FRO
W3KV
W4MLA
W5QKZ
WA6KCX
WB6SHL
WB9UKK

105
AA4US
AB1J
AF6D
DF1NT
DF4QW
EA1VM
JH2IIH
JA3BAG
JA3DBD
JH7ARV

K3EW
K3RL
K2CU
K8AV
K9TE
K@@AB
N6JM
N6ND
N6UC
OH2PQ
SM2PKM
W3XN
W8MD
W9NTY
W9VA
W@GA
WA8MOA
WB3AXN
WB3FIY
WB4TUY
WB8TUQ
WB@RRX
4Z4MB

104
AK5Q
DL7IJ
DL7WL
IN3KBZ
I5QTC
JA1IHE
JA5JGY
K3AO
K8DL
N1JB
N4KE
OE1EH
OE1WYW
OZ1FAQ
OZ1FRR
PY2CYE
SM6HTC
TG9ML
VE2FYR
VE2WA
W1ZR
W2FCC
W2IQB
W4MPY

W8CD
WA4QML
WB7NZI
WD9IFW
YO2BTK
9M2FK

103
DL3NU
EA5DD
EI4BK
J7DD
JF1ABD
JR2XRH
K3DZ
K3NB
K5SWZ
K4XG
K5EJO
K9SM
KA5A
KB2G
KB6EP
N1TZ
N4WQ
N4ZZ
N@OA
VO1KO
W3RO
W5CJZ
W@UKK
WB3FSB
WB5TIJ
WB9LHR
WB@YUU
WD6GAR

102
AB5J
AB@X
AD1Q
DJ4EY
DK7JI
G3XTT
IS@NZA
JH3XGD
K4JST
K6CR
KA4BFT

KZ5EK
N2AIF
N6VT
OZ1BII
SM4AMJ
UB5WE
VE3CXL
VE7QLM
W2ZY
W3MR
W4AOZ
W4YDL
W4ZR
W5SVZ
W5UJY
W7IMZ
W8KBZ
W9CG
W9IZ
W9MB
W@SI
W@YBV
WA1SPM
WA4SZZ
WB1FUF
WB2MVS
WD8MAS
YU2AAU
ZL1ADI

101
AA4AT
AA4KY
AA6O
AD3R
DK7DO
EA8RL
EI9CZ
HB9BMW
HB9NL
IV3NCB
JF3FMR
JH7LVK
K2JT
K5KX
K6WG
K7EG
K8HF
K9VQK

KL7HMO
KS4G
LA9EF
N3MS
N3SL
N5QQ
N6HI
N6NW
N6SA
OA8V
OX3OA
SM7EL
VE3EPN
W2GND
W2IQO
W2YAF
W4VP
W5VGF
W6IC
W6PYY
W6QL
W6SMD
W6SYL
W6VKQ
W7HZL
W7YCK
W9NQ
WA2NPY
WA6VJP
WB1BWX
WB5PLD
WB9WRU
WD4IIR
YV1TO
2B2EO

100
AA4NC
AA8A
AC1C
AD1E
AG6C
DJ7RJ
DJ8GO/WZ
DK7SS
EP2EA
G3YBH
HA8UA

JA1
JR1
JA2
K1C
K2Q
K2U
K4K
K4P
K5P
K7E
KA2
LA2
LU1
W3
N1A
N2H
N9A
OE1
OE3
OK1
OZ8
PY2
SM6
VE2
VE7
W1G
W1V
W3Y
W4O
W4P
W5A
W6S
W7II
W8N
WA1
WA4
WA8
WB1
WB3
WB4
WB4
WB6
WB9
WD9
YU3
YU4
ZL1
2E3

DXCC Notes

DXCC Rule 5 Change: Effective January 1, 1980, as per direction of the Board of Directors, the submission endorsement levels between 100 and 250 are changed. They will be in increments of 25 to conform to the present levels that stickers are issued. Levels above 250 will remain the same.

Honor Roll Reminder:

Those wanting to update their Honor Roll standings or make the Honor Roll, must have their cards into Hq. no later than December 31, 1980. Those arriving after December 31, 1980, will not be included in the Honor Roll listing.

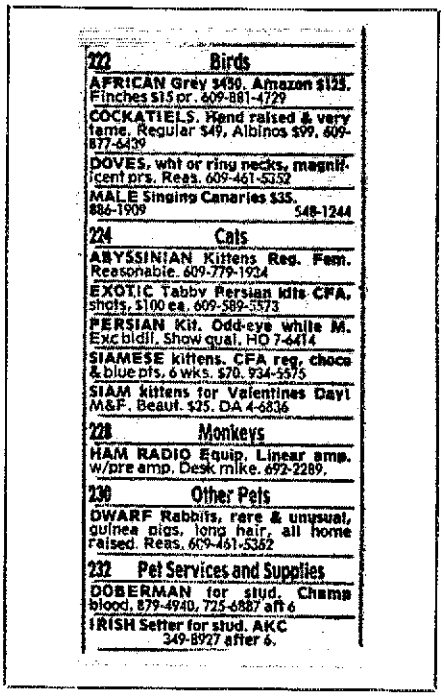
There is no Honor Roll application. If you qualify for the Honor Roll you will be placed on it. It is done automatically. You do not make Honor Roll until it is published in *QST*.

Strays

DX CONTEST PLAQUES

☐ A few plaques for the 1981 ARRL DX Contest are still without sponsors. Your tax-deductible $35 donation will be used to purchase and mail a plaque to one of the leaders in the 1981 Contest. If you or your club would like to sponsor a plaque, please contact Tom Frenaye, K1KI, at ARRL hq. for details.

Dick Victor, WD9GRI (left) and Ted Meyer, WD9CYR, were two of the Baraboo, Wisconsin area amateurs who provided communications services for the Circus World Museum parade, held in Baraboo in July. This station is set up in Ted's van. *(photo by Jim Romelfanger, K9ZZ)*



222 Birds

AFRICAN Grey $450. Amazon $125. Finches $15 pr. 609-881-4729

COCKATIELS. Hand raised & very tame. Regular $49, Albinos $99. 609-877-6439

DOVES, wht or ring necks, magnificent prs. Reas. 609-461-5352

MALE Singing Canaries $35. 886-1909 548-1244

224 Cats

ABYSSINIAN Kittens Reg. Fem. Reasonable. 609-779-1924

EXOTIC Tabby Persian kits CFA, shots, $100 ea. 609-589-5573

PERSIAN Kit. Odd-eye white M. Exc bldl. Show qual. HO 7-6414

SIAMESE kittens. CFA reg. choco & blue pts, 6 wks. $70. 934-5575

SIAM kittens for Valentines Day! M&F. Beaut. $25. DA 4-6836

228 Monkeys

HAM RADIO Equip. Linear amp. w/pre amp. Desk mike. 692-2289.

230 Other Pets

DWARF Rabbits, rare & unusual, guinea pigs, long hair, all home raised. Reas. 609-461-5362

232 Pet Services and Supplies

DOBERMAN for stud. Champ blood. 879-4940, 725-6887 aft 6

IRISH Setter for stud. AKC 349-8927 after 6.

"I thought you'd like to see," Iz Gross, W3KLR, of Plymouth Meeting, Pennsylvania, wrote, "that we're still being called derogatory names!"

James Alderman, WD5GXY (right), of Athens, Texas demonstrates the thrill of Amateur Radio at a school project fair. Here he lets fair visitors have a few words with Steve Carbone, KA1BBM, near Boston, Massachusetts.

QST congratulates . . .

☐ ARRL Technical Advisor Dave Geiser, WA2ANU, of New Hartford, New York, who was recently elected chairman of the Mohawk Valley Chapter of the Reliability Society of the Institute of Electrical and Electronic Engineers, the world's largest engineering society.

☐ Ken Blair, WA@SEV, of Lawrence, Kansas, who was honored as the Kansas "Amateur of the Year for 1980." One of Ken's contributions to Amateur Radio is the publication of the quarterly magazine *Kansas Amateur Radio*.

QST Profiles

Conducted By Dave Bristol,* KA2BNV

73 OM

Thomas R. Clarkson, ZL2AZ, was born in Christchurch, New Zealand, October 1, 1906, and later moved to Hastings (1910), Auckland (1925) and Wellington (1935). The present address of Tom and his wife, Marion, is at Lowry Bay, a marine suburb on Wellington Harbor. They have a grown family, with two children living in New Zealand and one in Canada.

In 1921 Tom obtained a provisional permit to use wireless receiving apparatus for experimental purposes. When amateur transmitting became possible in New Zealand in 1923, he quickly obtained a Grade I certificate and began operation as 2AR in April 1924. He was on the committee that founded the New Zealand Association of Radio Transmitters (NZART). In 1924 he entered the engineering branch of the New Zealand Post Office. In 1925 Tom became an engineering cadet at Auckland and also attended University College. This led to a B.S. in Physics. He passed the graduate examination of the Institution of Electrical Engineers in Wireless and High Frequency Engineering in 1933 and was granted corporate membership three years later. He later attained the grade of Fellow and has been registered as an Electrical Engineer since 1939.

A Director of the IARU Region 3 Association since its formation in 1968, Tom's ITU experience dates to 1947, when he was a New Zealand delegate to the Atlantic City Conference. He has attended International Radio Consultative Committee (CCIR) meetings regularly, serving as vice president of the CCIR Plenary Geneva 1951 and as committee chairman on several occasions since then. At WARC-79 Tom served as special advisor to the president of the IARU.

QST: *How did you become interested in Amateur Radio?*

Clarkson: As a child I had the benefit of Arthur Mee's *Childrens Encyclopedia*, which had constructional directions for experiments in static and current electricity. As a schoolboy, I found relevant books, one being the Hawkhead and Dowsett *Handbook of Instruction for Wireless Telegraphists* and another was R. D. Bengay's *Elementary Principles of Wireless Telegraphy*.

I had become impressed with the romantic aspect of sending and receiving messages without visible connections. In 1920 I had access to very few sources of information, but subsequent experience leads me to think that at that time all the radio knowledge in the world could have been put on one longish bookshelf and a keen, capable and devoted student could have absorbed *everything* known to man on the subject. We expect some progress in 60 years, but think of the difference today — any one branch of the subject, of which there are a multitude, can only have its surface scratched by a person in his whole lifetime.

In 1921 I was fortunate to get a copy of the *Wireless Experimenter's Manual*, by Elmer Bucher, of the American Marconi Company, a real compendium of knowledge at that time.

A favorite theme of Thomas R. Clarkson, ZL2AZ, is that the real strength of the amateur fraternity lies in the mental assets of its practitioners — the enquiring minds directed toward greater knowledge, theoretical and practical, of radio technique and operations.

This enabled me to tackle receiver construction fairly effectively. From 1923 on I had the benefit of *QST* and that marvelous book, *Radio Telegraphy for Amateurs*, by R. M. Ballantyne. My first transmitter was constructed in 1924 using the reversed-feedback oscillator described by Ballantyne.

QST: *Can you tell us the history of the New Zealand Association of Radio Transmitters?*

Clarkson: In August 1926 nine of us had a meeting and decided to form an association. I proposed the formation and said I thought it ought to have "transmitters" in its name. I had been inspired by seeing a report in June 1926 *QST* by the Amateur Transmitters Association of Western Pennsylvania, and considered it a good thing to have our objects clearly defined. So it was decided to call it NZART, the New Zealand Association of Radio Transmitters. There was a period of some difficulty in getting amateurs in the rest of New Zealand to join in. Nevertheless, the organization persisted and we were able to celebrate 50 years of its life in 1976. NZART was fortunate in there being an understanding of Amateur Radio in the government administration. A high government official, 2XA, was appointed its first president. He influenced important policies, as illustrated at the 1927 administrative conference of the Radio Telegraph Union (prior to ITU) at Washington. New Zealand was one of the very few supporters of proper provisions for amateur operations at the conference.

QST: *What are your present Amateur Radio activities?*

Clarkson: Amateur Radio has many separate activities in it. One is the administrative side, in which the position of the key and microphone is apt to be usurped by the typewriter. I manage enough on-the-air activity, however, to keep at least one foot in the essential subject. In addition to social contacts on 3.5 and 7 MHz, I keep quite a lot of worldwide skeds with friends on 20- and 15-meter cw, and pursue a bit of other DX from time to time.

QST: *What are some of your personal observations of WARC-79?*

Clarkson: My experience as a member of the IARU team at Geneva was a most uplifting experience. I was tremendously impressed, and still am, at the amazing high stature of my fellow members and the qualities brought to bear in the interests of our subject. I mean the knowledge, talent, patience, loyalty, devotion, courtesy, friendliness and understanding, the savoir faire for what we were trying to do. It was a great experience to be in such a circle of friends, whose existence one cannot help but attribute to the worthiness of the cause that brought us together. As a manifestation of the strength of Amateur Radio it inspires faith for the future. From the personal point of view, it was a great satisfaction to have an occasional opportunity to strike a blow on behalf of our cause and, of course, we all seized any such opportunity. There is another rewarding feeling that I have come to recognize: that we have enjoyed the confidence of our fellows in the whole world of Amateur Radio. So, that is quite an abiding reward.

QST: *Any other experiences from WARC-79?*

Clarkson: Yes, I had a valedictory experience at WARC that prevented me from concealment of my advanced age — but I have long since abandoned any claim to still be in my prime. The most contentious, lively and fully attended committee of WARC, the Allocations Committee, paused in its work to applaud one of its veterans of Atlantic City, Tom Clarkson, who was celebrating his 73rd birthday on October 1. So I had the distinction of the expression by WARC — "73 OM" — a good cw term! I must say that under the leadership of W1RU my amateur friends provided a most notable celebration of that day.

QST: *What can you tell us about your island hideaway?*

Clarkson: The amateur, according to his code, is meant to exist in a balanced manner. I have one interest that is somewhat different and, I may say, is made use of and appreciated more by my family and friends than is my propensity for Amateur Radio. I am the owner of a small island located four or five miles off the New Zealand coast, about 40 miles north of Auckland. Takangaroa gives scope for opening up and reading the ample pages of the book of nature, with many intriguing items of fauna and flora, and of course necessarily having the special maritime environment. I cannot help adding that it is an excellent QTH for DX, ZL2AZ/1. QST

*Editorial Assistant, *QST*

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1AM, Arthur S. Westneat, Newmarket, NH
ex-1BH, Wilbur Hardy, Beverly Farms, MA
WB1DQC, Peter R. D. Munroe, Holliston, MA
KA1DQE, Anthony Osowski, Norwich, CT
*W1FIY, Herbert J. Brady, Norwich, CT
W1RVZ, Harold E. Flagg, Glastonbury, CT
K1ZOC, Joseph W. Jolley, Springfield, MA
K2ATG, Stephen W. Closs, Sr., Hopewell Jct., NY
WB2CGV, Charles E. Kapp, Little Neck, NY
K2EGB, Carl D. Bates, Jr., Canandaigua, NY
W2FDI, Gordon M. Wendell, Victor, NY
WA2HFT, Allen E. Cheren, Albany, NY
K2IEH/ex-W1SUL, Arthur B. Duel, Garden City, LI, NY
W2LHV, David Goldberg, Brooklyn, NY
WB2LOJ, Dr. Anton P. Schwer, Patchogue, NY
K2OH, Kenneth S. Stern, Smithtown, NY
*W2TD, Julius Rivman, Plainview, NY
WA2YJS, Carl Wellauer, Holmdel, NJ
W3CXX, Rudy F. Mihalick, Ambridge, PA
K3DYO, Richard A. Mayers, East Stroudsburg, PA
WA3EMD, Stan Harmon, Meadville, PA
KA3ESX, Thomas "Rodder" Purnell, Georgetown, DE
W3IHT, Louis A. Robertson, Aberdeen, MD
W3KRC, Marion P. "Pete" Podluzne, Lundys Lane, PA
W3MAN, Robert O. Goettmann, Pittsburgh, PA
W3TTB, John H. Moore, Pittsburgh, PA
W3UL, Rudolph F. Brandt, Oreland, PA
W3ZCK, Joseph R. Pratt, Baltimore, MD
K4AHV, Robert MacDonald, Panama City, FL
W4CU, Ralph J. Renton, Falls Church, VA
W4DLM, Harold W. Bower, Ft. Lauderdale, FL
W4DXP, Robert L. Colbert, Jr., Miami, FL
WA4FYO, Leonard J. Burch, Moulton, AL
W4GET, Aaron M. George, Jr., Mt. Dora, FL
KC4GX, ex-WB4JSZ, G. C. "Newt" Magnuson, Sarasota, FL
K4LBV, Harry L. Callaway, Greenville, SC
W4PGW, Carl W. Schwenzfeier Jr., Fort Lauderdale, FL
WD4RNI, John W. Connaughton, Jeffersontown, KY

*Life Member, ARRL

W4SDF, Jack L. Bone, Rocky Mount, NC
KB4TC, John A. Carlson, Orlando, FL
K4TQ, Thomas E. Leonard, Fort Myers, FL
W4UHN, Everette L. Wilson, St. Augustine, FL
W4VCY, A. Edward Terpening, Tarpon Springs, FL
WB4VSR, Richard L. Nantell, Port Charlotte, FL
WA4WVW, Harrison L. Hall, Bristol, TN
WA4ZCB, William H. Neal, Titusville, FL
W4ZMR, Thomas E. Ramsay, Brevard, NC
WA5DHG, Benjamin F. Kautz, Watonga, OK
W5ECK, LaVerne R. Thomas, Corpus Christi, TX
W5HVP, Otis E. Payne, Pampa, TX
W5JPE, Hugh R. Purcell, Jr., Houston, TX
W5MNG, Burley Bagget, Abilene, TX
W5PHY, Jackson L. Mauk, Franklin, TX
K5QEF, Elliot M. Todd, Jr., Ponca City, OK
W5RH, Robert H. Irion, Kingsville, TX
WB5TIJ, James J. Hume, Jr., Springdale, AK
K5YA, Pierce E. Cantrell, Houston, TX
WA5YXZ, S. G. Gonzalez, Houston, TX
W5ZIH, Albert H. Black, Houston, TX
W6BVY, Elvyn J. Beall, Modesto, CA
W6BZV, John Q. Rickey, Jr., Sacramento, CA
W6CAE, Lawrence N. Higgins, San Diego, CA
W6ERW, Burton P. Heinmiller, Burbank, CA
KC6F, Bobbie R. Young, Pleasant Hill, CA
W6FE, Harry H. Wickersham, San Mateo, CA
*WA6GZG, Elmer R. Hayes, Pacifica, CA
K6LW, Gardner L. Hart, Pacific Grove, CA
WA6ODA, Richard I. Thomas, Concord, CA
K6OER, James L. Hynek, Fresno, CA
K6OHR, Genevieve Anderson, Hemet, CA
W6ONC, Bill L. Ritzi, Beverly Hills, CA
WA6TFY, Fred Mueller, Jr., Turlock, CA
WA6TQB, Bernice E. Marshall, Riverside, CA
W6WPI, William C. Henderson, Hemet, CA
KF6X, Bruce D. Galloway, Sunnyvale, CA
KA7BGS, Murray J. Emmerich, Medford, OR
W7BIW, Sam A. Davenport, Pasco, WA
K7BKZ, Earl S. Brooks, Seattle, WA
W7BPQ, Ernest M. Bray, Missoula, MT
W7CZX, Vilpas L. Saari, Hwaco, WA
W7EHO, Raymond F. Davies, Aberdeen, WA
W7FRU, Dewitt W. Case, Coquille, OR
K7HH, Henry W. Husting, Bellevue, WA
W7JDL, Franklin E. Firth, Morristown, AZ
W7JYH, Irvin L. Faulkner, Phoenix, AZ

W7KEN, Hugh E. Holland, Grants Pass, OR
W7LJK, Isaac W. Carson, Walla Walla, WA
W7QYO, John M. Morrow, Prosser, WA
WB7SDM, Phillip D. Willis, Sr., Sheridan, OR
W8BHQ, Eldon H. Marz, Canton, OH
WA8CPA, Dr. Harold B. Cully, Van Wert, OH
W8FKB, Thad C. Baker, N. Olmstead, OH
WA8KBE, Walter F. Clark, Loveland, OH
K8NVQ, Edward R. McCowen, Wheelersburg, OH
W8RST, Albert R. Honig, Jr., Jackson, MI
W8TGD, Eugene H. Coe, Elizabeth, WV
W8WGE, Fred A. Fletcher, Warren, MI
W8WUX, Edwin D. Haines, Cameron, WV
ex-9AAU, Dr. Charles L. Klenk, St. Louis, MO
W9BG, Ross Hansch, Madison, WI
K9CUR, Robert W. Wiberg, Sr., Hobart, IN
W9CZC, Theodore W. Cassell, Oak Park, IL
WD9DIT, Albert Jordan, Jefferson, WI
WN9FIK, William D. Gilley, Switz City, IN
W9GTL, Carl E. Beghtel, Uniondale, IN
W9PWF, Lowell V. Hargan, Ft. Wayne, IN
W9UHV, Callie M. Jones, Mt. Vernon, IN
W9ULL, Paul L. Keller, Syracuse, IL
W9VI, C. Keith Mason, Sharon, WI
W9YOM, Robert H. Larson, Madison, WI
WØDYZ, Paul V. Brobst, St. Paul, MN
KØGKT, Victor L. Verble, Sikeston, MO
WØILZ, Gillman S. Slinden, Litchfield, MN
KØLCH, Duane L. Zimmerman, North Bend, NE
*WBØOTW, Melvin B. Walker, Raytown, MO
WØOXO, Joseph L. Osterhoff, DuBuque, IA
WØOZV, Ray R. Kramer, Denver, CO
WBØQIO, Harold E. Burden, Northglenn, CO
WØUKN, Charles S. Osborn, McCook, NE
VE3BHV, Stanley Hodge, Barrie, ON
VE3DRO, Norman Harding, Dryden, ON
VE7BAX, Ian J. Devine, Vancouver, BC
VE7NS, Nelson C. Smith, Gibsons, BC
ZL1NG, T. H. Phillips, Keri, New Zealand
OH2RW, Martti Viljanen, Helsinki, Finland

Note: All Silent Key reports sent to Hq. must include the name, address and call of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

Coming Conventions

February 7-8
Florida State, Miami

April 25-26
Mississippi State, Jackson

May 15-17
Pacific Division, Fresno, California

June 5-7
Northwestern Division, Seaside, Oregon

September 19-20
New England Division, Hartford, Connecticut

October 9-11
Southwestern Division, Scottsdale, Arizona

October 10-11
Delta Division, Memphis, Tennessee

ARRL NATIONAL CONVENTIONS

March 13-15, 1981
Orlando, Florida

July 23-25, 1982
Cedar Rapids, Iowa

October 7-9, 1983
Houston, Texas

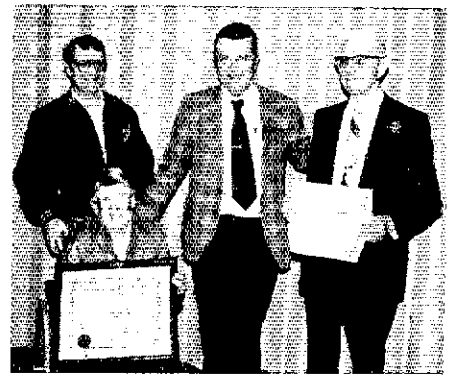
Hamfest Calendar

***Florida:** The Broward ARC will hold the Fort Lauderdale hamfest on Dec. 13-14 at the National Guard Armory, Fort Lauderdale. For more info contact Bob Sternberg, AA4EE, 9790 N.W. 24th St., Sunrise, FL 33322, Tel. 305-741-8228.

Florida: The Sarasota ARA and the Sarasota Emergency Radio Club will hold the second annual Sarasota hamfest from 8:30 to 4:30 Jan. 17, and from 8:30 to 3 on Jan. 18, 1981, at the Exhibition Hall, 801 North Tamiami Trail (U.S. 41), Sarasota. Admission is $3 in advance and $4 at the door. Swap tables (advance reservations requested), two days, donation $12 — no one-day tables. Talk-in on 146.13/73 and 52. QCWA luncheon Saturday, with guest speaker Frank Butler, Jr., W4RH, ARRL Southeastern Division director. Advance reservations requested. Activities include displays, used gear, prizes, XYL and harmonic activities, and new equipment. For more info contact John Shinkle, WD4BAJ, 1937 North Allendale Ave., Sarasota, FL 33580, Tel. 813-953-5818. For advance reservations contact Robert Siff, K4AMG, 1312 Main St., Sarasota, FL 33577, Tel. 813-366-6759.

Nevada: SAROC presents their annual Prestige Convention on Jan. 1-4, 1981, at the Dunes Hotel, Las Vegas. Cocktail party Friday night, hosted by *Ham Radio Magazine*, for exhibitors and SAROC registered guests. Exhibits, technical sessions, Dunes Hotel breakfast/brunch Saturday and Sunday. Ladies programs. Special SAROC Dunes Hotel room rate $35.50, plus room tax, includes telephone; call toll-free at 1-800-634-6971. SAROC advance registration is $16 per person. Send check or money order to SAROC Registration, P. O. Box 945, Boulder City, NV 89005.

Strays



Don Miller, W9NTP, Central Division director (standing, center), recently presented a certificate recognizing 50 years of affiliation between the Fort Wayne (Indiana) Radio Club (FWRC) and ARRL. FWRC President Lynn Hyndman, W9FC (standing, left), and Charlie Kronmiller, W9UC (right), one of FWRC's founding fathers, were on hand for the presentation. Bob Witte, W9PMT (seated), holds an original affiliation certificate bearing the signature of Hiram Percy Maxim. It was presented to the club by ARRL in 1930. *(photo courtesy K9TUS)*

Club Corner

Conducted By Sally O'Dell,* AE8P

A SPECIAL FRATERNITY

The requirements for maintaining club affiliation with the ARRL are: (1) an annual report form must be completed each year, (2) 51% of the voting members must be full or associate members of the League, and (3) at least 51% of the voting membership must be licensed amateurs.

Of the 2200 actively affiliated clubs around the country, approximately 4% are members of a special fraternity — the 100% club. Those clubs that fall into the 100%-club category have met the regular requirements and gone further — all voting members are members of the League. These clubs receive a handsome certificate and, as a sign of recognition, are included in the following list.

100 Percent Clubs

Acadiana DX Association, Erath, Louisiana; Alamo DX Amigos, San Antonio, Texas; Amherst Radio Club, Amherst, New Hampshire; AMT Amateur Radio Club, Stanford, California; Anderson Radio Club, Williamston, South Carolina; Apple Valley ARC, Woonsocket, Rhode Island; Arizona DX Club, Scottsdale, AZ; Ashtabula County ARC, Ashtabula, Ohio; Athens Amateur Radio Club, Athens, Texas; Atomics International Rocketdyne, Tarzana, California; Bald Knob Brass Pounders, Beaver Dam, Kentucky; BASH-HAL-NE-AE, Scottsdale, Arizona; Central Kansas ARC, Salina, Kansas; Charles River Wireless Society, Walpole, Massachusetts; Chicago Radio Traffic Assn., Chicago, Illinois; Chattanooga ARC, Chattanooga, Tennessee; Clinton County VHF ARC, Frankfort, Indiana; Coast Guard ARC, Alexandria, Virginia; Committee For Amateur Radio, Forest Park, Ohio; Cranford Amateur Radio Society, Roselle, New Jersey; Datapoint Amateurs & Technicians Assn., San Antonio, Texas; Delta DX Association, Metairie, Louisiana; DX Association of Connecticut, North Haven, CT; Duluth Guns Radio Club, Duluth, Minnesota; Elkhart Red Cross ARC, Osceola, Indiana; Flyweight DC Group, Kingsport, Tennessee; Frankford Radio Club, Warrington, Pennsylvania; Guantanamo Bay ARC, APO New York, New York; Hilltop Seekers ARC, Bridgewater, New Jersey; Holmdel Amateur Radio Club, Holmdel, New Jersey; Humboldt State University ARC, Arcata, California; Huntingdon County ARC, Huntingdon, Pennsylvania; Jefferson Barracks ARC, St. Louis, Missouri; Kelso-Longview ARC, Longview, Washington; Keuka Lake Amateur Radio Assn., Avoca, New York; Lake Area Radio Klub, Watertown, South Dakota; Livonia Amateur Radio Club, Livonia, Michigan; Louisville Gas & Electric Company ARC, Louisville, Kentucky; Machine Contest Club, Rives Junction, Michigan; Mason County Radio Club, Ludington, Michigan; McLean Amateur Radio Klub, Livermore, Kentucky; Megapulse ARC, Everett, Massachusetts; Meriden ARC, Inc., Meriden, Connecticut; Midland ARC, Midland, Texas; Mid-South DX Assn., Germantown, Tennessee; Milltown Amateur Radio Society, Milltown, Indiana; National Capitol DX Assn., Washington, DC; Norfolk County Radio Assn., Walpole, Massachusetts; North Alabama DX Club, Huntsville, Alabama; North Augusta-Belvedere ARC, North Augusta, South Carolina; Northeast Nebraska Radio Club, Norfolk, Nebraska; Northern Illinois DX Assn., Schaumburg, Illinois; Northern Panhandle ARC, Bridgeport, Ohio; Northern Virginia Amateur Radio Council, Inc., Burke, Virginia; Norfolk Radio Club, Norfok, Nebraska; OBP Radio Club Chapter no. 1, St. Ann, Missouri; Orange ARC, Orange, Texas; Order of Boiled Owls, East Quogue, New York; Paducah ARES Club, Paducah, Kentucky; Paynesville ARA, Paynesville, Minnesota; Philadelphia Electric Co. Employee's Assn. ARC, Philadelphia, Pennsylvania; Phoenix Amateur Radio Tech Soc. of Long Island, Uniondale, New York; Point Radio Operating Society, Pittsburgh, Pennsylvania; Potomac Area VHF Society, Damascus, Maryland; Providence Radio Association, Johnston, Rhode Island; Radio Operators Assn. of New Bedford, Lakeville, Massachusetts; Richmond County ARC, E. Rockingham, North Carolina; Saginaw DX Association, Saginaw, Michigan; Sheboygan County DX Assn., Plymouth, Wisconsin; Skokie Six Meter Indians, Skokie, Illinois; Skylands Amateur Radio Club, Pompton Plains, New Jersey; Southern New England DX Assn., Westwood, Massachusetts; Southern Sixland Contest Club, Westminster, California; Springbrook Operating & Transmitting Soc., Nashville, Tennessee; Supelco Park ARC, Bellefonte, Pennsylvania; Tamaqua Transmitting Soc., Tamaqua, Pennsylvania; Toronto Repeater Group, Toronto, Ohio; Uncle Floyd Radio Club, Glendale, New York; Valley Amateur Radio Club, Apple Valley, Minnesota; Verde Valley ARA, Cottonwood, Arizona; Virginia Century Club, Chesapeake, Virginia; Westside ARC, New Orleans, Louisiana; Wichita ARC, Wichita, Kansas; Windblowers VHF Soc., Inc., Bergenfield, New Jersey; Winnipeg DX Club, Winnipeg, Manitoba; Winona Amateur Radio Club, Winona, Minnesota; Wireless Institute of The Northeast, New York, New York; Wireless Operators of Winsted, Winsted, Connecticut; Wisconsin Nets Assn. Ltd., Wisconsin Rapids, Wisconsin; Woodland Baptist ARC, Louisville, Kentucky; Wyndmoor Repeater Club, Oreland, Pennsylvania. QST

*Club Program Manager, ARRL

50 Years Ago

December 1930

☐ In his editorial, K. B. Warner celebrates the 15th birthday of *QST*. The infant weighed 10 pages, including a technical article and a smattering of paid advertisements.

☐ George Grammer, W1DF, describes "A Two-Tube A.C. Receiver" using a '24 tetrode detector and a '27 triode audio stage. Despite the misleading title, the receiver covers the 160- through 20-meter ham bands; the "a.c." in the title refers to the use of the new indirectly-heated cathodes that are coming into vogue. Batteries or a *good* "B substitute" supply are recommended for plate power.

☐ In "The Doublet Antenna," Clyde Houldson, W1KP, the League's Technical Information Department, describes the use of a fanned section to match an open-wire line to a half-wave antenna. The extensive article is complete with many formulas and arithmetical examples, but even more frightening (to present-day sissies) is the suggestion of tapping the feed line to the output tank through fixed blocking capacitors! Tuned-circuit inductive coupling is also shown, but who wants to add another control?

☐ Ed Handy, W1BDI, in "The Story of W1MK", gives an interesting account of the history and equipment of the League's station located at Brainard Field, Hartford's airport. The state-of-the-art signal from W1MK, operated by Bob Parmenter, is well-known throughout the world (until the flood of 1936 destroyed the station and prompted the building of the Maxim Memorial Station, W1AW, in Newington).

Strays

HIGH-SPEED CODE PRACTICE

☐ WINJM says he has "a small but very select" audience of listeners to his twice-weekly high-speed code practice transmissions. During the winter months, K1JD sends the Wednesday evening (0130 UTC Thursday) sessions on 3636 kHz, using tapes prepared by W1NJM. N4KB (W1NJM at the controls) sends the Sunday evening (0130 UTC Monday) sessions on 7085 kHz. About the first of April, W1NJM plans to be back at the home station, transmitting both nights on both frequencies.

Speeds vary from 20 to 65 wpm, often starting with the high speed first, in increments or decrements of five or 10 wpm, with just under 10 minutes of plain-English text at each speed. Speeds and sequence to be transmitted are announced in advance of each session. Certificate qualifying transmissions are sent twice annually; dates and details also announced in advance.

QST congratulates . . .

☐ Leo I. Meyerson, WØGFQ, Chairman of the Board and founder of World Radio, Council Bluffs, Iowa, who was recently elected a fellow of the Radio Club of America, Inc.

Four-year old Jodi Pretekin, shown with her father Ron, AB8K, has been named the 1981 Easter Seal Poster Child for the State of Ohio. Jodi would enjoy receiving photographs of other "junior operators." Her address is 6741 Oak Field Dr., Dayton, OH 45415.

25 Years Ago

December 1955

☐ The cover, a montage of 39 memorable *QST* covers, celebrates the 40th anniversary of the magazine. A pleasant Christmas present to the readers is the reprint of all 10 pages of the first *QST* (December 1915) bound into the issue.

☐ In the comprehensive "Great Flood of 1955" National Emergency Coordinator George Hart, W1NJM, tells how hurricane Diane blew out but left behind water that caused much flood damage throughout the U.S. northeast. At least 2000 amateurs provided communications during the severe emergency.

☐ "Multimatch Antenna for 'Phone" by Max Pemberton, W9IYH, follows the lead of the trapped dipole of Buchanan, W3DZZ, but details traps that provide best operation in the voice segments of the bands. Polyethylene insulation and Formvar wire are used in the experimentally-derived traps.

☐ "A Composite Test Set" by Roy Corderman, W4ZG, describes how to extend the usefulness of a Heathkit r.f. signal generator by adding an s.w.r. bridge and a transistor d.c. amplifier.

☐ Builders anxious to construct the "ultimate" VFO will do well to read "Designing the VFO" by Louis Howson, W2YKY. The Clapp and Lampkin circuits come in for detailed discussion. — *Byron Goodman, W1DX* QST

The World Above 50 MHz

Conducted By
William A. Tynan,* W3XO

Clearing the Air

It is with great pleasure that I devote the lead spot this month to fellow columnist Bob Atkins, KA1GT (ex-G8EKB), and his fine coverage of the world above 1 GHz. Some may be confused as to where this column leaves off and the other begins. After all, isn't the title at the top of this page "The World Above 50 MHz"? The Pack Rats's VHF Conference, held in early October, provided the perfect opportunity for this conductor to explore this question face to face with the author of "The New Frontier."

It turns out that Bob's thoughts with regard to coverage of the two columns are very close to mine. To say that there is 100% agreement would probably be stretching the truth just a little, but not much. After all, when do two humans completely agree on everything? Therefore, don't expect to find a complete absence of conflicts in terminology and/or duplication of material in the two columns. Based on our conversation, however, such occurrences should be very rare indeed. The following paragraphs will serve to outline the conclusions reached between Bob and myself. It is hoped that this presentation will clear up any confusion that may exist in the minds of the readers of both columns and provide an indication of what to expect from each in the future.

In noting the subtitle, "The World Above 1 Gig," one might leap to the conclusion that "The New Frontier" will take over *all* news and information on bands above 1215 MHz (23 cm). But, isn't *this* column called "The World Above 50 MHz"? How would such an arrangement square with the title and longstanding mission of this column, originated by W1HDQ more than 40 years ago? The answer is that it wouldn't. Bob and I have agreed on this completely. In addition to being confusing to the readers, a strict frequency split would be counterproductive, particularly in view of the single page allocated to "The New Frontier." KA1GT simply has so much to offer in terms of technical know-how pertaining to microwave techniques, that the precious space available to him can certainly be best used to pass some of that knowledge along to the rest of us who have long been seeking "how to do it" microwave information. With his background of experience in the UK, where microwave activity — particularly on the 10-GHz band — is far greater than ours, Bob will be able to let us in on some of the tricks which make work on these frequencies fascinating, yet simpler, than most of us can imagine.

Thus, "The New Frontier" will concentrate on the technical side of operation on the bands above 1 Gig, with an emphasis on practical approaches we can all use, while this column will continue to stress the operating side for all of our bands above 50 MHz. Some features previously carried in these pages will be picked up by Bob. The record box is one example. I will continue to carry records for the band through 70 cm (when I can obtain solid information to support them), however. Both Bo and I agree that records are a particularly important aspect of operation on the microwave bands, as they provide at least one measure of the "state of the art" for this part of the spectrum. Therefore the publication of records for the bands above 1215 MHz will fit well into the approach outlined above. On the other hand, information relative to "openings" or the results a particular station experienced during the last contest, as well as the 23-cm standing box, will continue to be carried in this column.

The foregoing explanation should provide a guide as to which one of us will use various types of information. Sending it to the right place will be very helpful; nevertheless, we will see to it that reports that appear more applicable to the other's column are forwarded. I am looking forward to a long and pleasant association with KA1GT, and eagerly anticipate the increased microwave activity that the wealth of technical information he has to impart will surely bring forth. [Or, to put another way, the role of "The New Frontier" column is to concentrate on encouraging amateurs in the U.S. and Canada to become active on the bands above 1 GHz. Not merely to encourage the recording of operating achievements, but to show you how easy and how much fun it is to tackle the frontier above 1 GHz. — *W1RU*]

ON THE BANDS

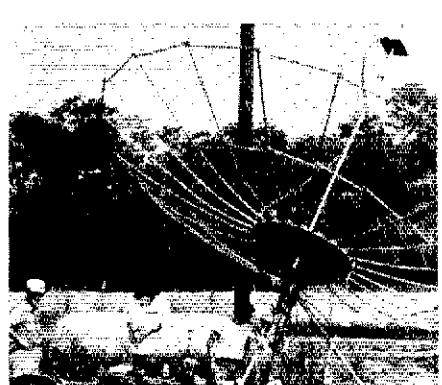
6 Meters — As this is being written, in mid-October, most of North America remains in the clutches of the "black hole." The same fate is not befalling many other parts of the world, however. At this point, probably the best located station on earth, as far as 6 meters is concerned, is ZD8TC Ascension Island. Beginning in the middle of September, Ted began working stations in South America and the Caribbean as well as Liberia. His luck continued good throughout most of the month and into October. As in past times, when other parts of the world were experiencing good F2 and TE propagation conditions, the rest of us just sat there drooling while monitoring the goings-on via 28.885 MHz. But ZD8TC's big chance came early in the morning of October 12. Beginning about 0100Z, while working PYs, Ted heard some stations calling him on ssb. They turned out to be JAs. He thereupon set out to contact 27 Japanese in the first, second, third and fourth call districts. All this time his beam was aimed at 220 degrees. It is understood that EL2AV and EL2FY participated in a similar opening two days earlier. Incidentally, EL2AV is K2UOP, who was active on the vhf bands in the Washington, DC, area for several years. Both ELs are allowed several spot frequencies, all below 50.1. They can work ssb there, but we had better remember not to do so. They will both be listening for us on cw.

Another part of the world which seems to be faring better than we (not an unusual situation) is the Pacific. KH6IAA's contacts with a number of South American stations on many evenings over the past month is one example.

WA5IYX, longtime San Antonio, Texas, propagation watcher, sends along a very interesting compilation of F2 mufs for the month of September, this year and last. His data shows that, although the solar flux levels were lower this September, the mufs to the south from his QTH exceeded arbitrary thresholds of 40, 45 and 49 MHz on more days than in the same month last year. On the other hand, mufs to the northeast showed the opposite trend. It will be interesting to see similar data from Pat from October, as the solar flux has been running in the order of 250 during the few days prior to this writing.

I hope that the black hole parts, for a while at least, and that by next month I will have all sorts of interesting DX contacts to report.

At deadline, word comes that on October 16, at 1415Z, VE1AVX worked DK1PZ via crossband. For the first North America-to-Europe work this fall. A few hours later, about 1630Z, it is understood that W2IDZ completed a marginal cw QSO with ZD8TC. I have also received a report that both W4OO and WB2VWW/4 in southern Florida worked ZD8TC a few days earlier.



The Labor Day weekend West Virginia 70-cm EME operation put on by K2UYH using the call W8AEC. In addition to Al and Bill, other participants included K2TKN, KA8CPI and WB2DIN. The dish is a 20-foot-diameter stressed type and folds up for easy transport. *(WB2DIN photo)*

2 Meters — EME for everyone? That was the question posed in last month's column describing the 24 J Boomer array newly installed at K1WHS. Initial results appear to confirm that this goal has essentially been reached. In the first week of operation, Dave reports working a number of single-Yagi stations, including KE5C Texas, running a pair of 4CX250s to 13-element non-elevatable KLM; WB7EPA Arizona with just 800 watts through 75 feet of RG-8/U to single Boomer; OZ9FW and OZ9TE, who tail ended the other Danish station. Dave's presence on the band is also having the hoped-for psychological results providing a first moonbounce QSO for many who have not previously tasted the thrill of using the mode. We finally have a station of the same general caliber as WA6LET and K3NSS, but with the greater consistency and frequency of operation inherent in home-station operation. I have already received letters from some of those who Dave has worked. In them one can feel the enthusiasm kindled by the realization that they too can work EME. I am sure that many new moonbouncers will be born as a result of K1WHS's effort.

Now Dave's attention is turned to finding the minimum equipped station with which he can hold a successful EME QSO. Makeshift set-ups are certainly possible. An example is that of Dave's brother, KØZK, who heard signals from the Maine Monster using a 20-element collinear stuck into a sand-filled trash can. That same arrangement was also successful in detecting some of the other big EME guns like WB6ESC, WA1JXN/7 and WBØQMN.

K1WHS is actively seeking additional stations t

*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730, or call 301-384-6736 and record your message.

2-Meter Standings

For WAS holders, listing is WAS number, call, state and call areas. For others, call, state, U.S. states worked and call areas. Call areas are 10 U.S. call areas plus KH6 and KL7, plus each VE and XE call area plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico. Compiled as of October 15, 1980. *indicates that one or more contacts were made via EME. †indicates WAC.

WAS Holders

1	KØMQS*	IA	12	W1XJ	RI	35	8	K3QCQ*	PA	37	8	W4VHH	NC	36	8	W7HAH	MT	17	5	WØRWG	MO	44	12
2	K6CM*	OK	12	K1PXE	CT	35	8	K3CFY	PA	37	8	W4ZD	FL	35	12	WB7EPA*	AZ	16	6	AIØL	MO	44	11
3	NØJA*	MO	12	K1GVM	MA	35	8	W3XO	MD	37	10	WA4FBH	GA	35	8	WA7JTM	AZ	10	5	KØDAS	IA	44	10
4	K9HMB*	IL	12	W1JSM	NH	11	11	W3BDP	DE	37	9	W4LNG	GA	34	8					WØPN	MN	40	11
5	K1WHS*†	ME	12	KA1GD	CT	31	11	K3WHC	PA	37	8	W4FJ	VA	34	8	W8WN*	MI	47	10	WBØVYV	IA	40	9
6	WA4MVI*†	NC	12	WA4MMP/1	RI	31	8	W3IWI	MD	36	12	W4ISS	GA	33	8	K8AT*	OH	45	10	WBØIUT	NE	37	10
7	K5JL*	OK	12	N1AIS	MA	27	12	WB3JHP	MD	36	9	N4CD	VA	33	8	WA8HTL	MI	40	9	WBØUFQ	MO	36	9
8	WA9DOT*	WI	12	K1FWF	MA	24	10	W3RUE	PA	36	8	WD4CXU	VA	30	8	WB8IGY	OH	39	8	WØPW	CO	35	9
9	WBØZXU*	IA	12	W1AIM	VT	24	8	W3KWH	PA	35	10	W3IY/4	VA	30	8	K8AXU	OH	38	11	WBØWFY	MO	35	8
10	K9CA*	IL	10	W1FJH	MA	24	8	AE3T	PA	35	8					WB2DIN/8	WV	36	9	KØAOD	MO	34	11
11	WØSD*	SD	20	W1HDQ	CT	24	7	W3OMY	PA	33	8	K5MB*	OK	49	12	WA8NLC	MI	35	9	KØTLM	MO	34	10
12	K5BMG*	LA	12					K3MWV	PA	32	10	W5JTL*	MS	46	13	K8RZB	OH	35	9	WØRAP	IA	32	10
13	K5GW*	TX	12	W2AV*	NY	44	14	WA3WUL	DE	32	10	WD5CRK	OK	46	11	K8WKZ	MI	35	8				
14	WB5LUA*	TX	17	W2AZL*	NJ	41	10	WA3DMF	MD	32	9	K5MWH	AR	47	10	WB8PAT	OH	34	9	WBØZKG	IA	32	8
15	K4GL*	SC	11	N2MB*	NY	39	11	WB3LJK	MD	30		K5SW	OK	45	10	WA8MIL	MI	33		WØVHQ	MO	29	7
16	WØVB*	MN	12	W2PGC*	NY	38	12	K1GSR/3	MD	29	11	N5KW	OK	41	10	WB8FEZ	MI	30	8	WBØDGF	NE	27	9
17	WB5LBT*	LA	12	W2BLV	NJ	37	12	K3HCE	MD	29	11	W5HN	TX	39	12	W8LCY	OH	29	8	KH6IHP		22	13
18	K4PKV*	NC	12	W2CRS	NY	37	8	W3LNA	PA	28	8	W5HFV	OK	38	10					WAØLPK/KL7*		39	11
19	WØRWH*	MO	15	K2OVS	NY	35	12	N3AHI	PA	25	8	WA5HNK	TX	35	12	W9UD	IL	45	13				
20	W8IDU*	MI	23	WB2WIK	NJ	35	8	W3ZD	PA	24	8	WA5EID*	AR	32	13	K9SGD	IL	45	12	VE1ASU		18	6
21	K1MNS*	NH	12	K2QR	NY	33	11	W3OTC	MD	22	9	W5UWB*	TX	30	9	W9YF	IL	45	10	VE2DFO*		41	10
22	WB9VEM*	IL	12	WB2CUT	NJ	33	11					WB5JVR	TX	26	10	N9SS	IL	41	9	VE3FN		37	11
23	K5FF*	NM	16	WA2FGK	NJ	33	8	WA4GPM*	VA	47	10	WA5TBE	TX	25	8	W9NLP	WI	40	10	VE3UH		35	11
24	W5FF*	NM	16	WA2PMW	NY	32	8	WA4CQG	AL	46	8					W9IP	IL	40	9	VE3EMS		33	11
25	W7FN*	WA	12	K2DNR	NY	32	8	WB4LHD	TN	40	11	WB6NMT		26	13	K9XY*	WI	39	15	VE3FKX		30	8
26	W1JR*	MA	12	WA2TIF	NY	30	11	K4IXC*	FL	40	10	K6HAA		13	4	W9VWY	IL	35	9	VE3AIB		29	10
27	WBØQMN*	CO	12	W2CNS	NY	29	11	W4DFK*	VA	39	11	K6JYO		13	4	W3EP/9	IN	35	8	VE3AQG		28	8
28	WB4EXW*	NC	18	WA2PVV*	NY	27	10	W4HHK	TN	38	9	WA6JRA		11	5	WB9QBU	IL	34		VE4MA		8	4
29	K9KFR*	IN	12	K2BWR	NJ	27	7	K4CAW	NC	38	9	N6CA		8	3	WA9UHB	IL	33	9	VE7BQH*		47	28
30	K3VGX*	PA	12	WA2SLY	NY	25	9	WB4NMA	GA	38	9	K6OXY		7	3	WB9TPV	IL	31	9	SM7BAE*		31	21
				W2RS	NJ	24	11	WA4LYS	FL	37	11	K6GAO		6	6	K9EFX	IN	28	9	G5CSZ*		23	15
	AA1A*	MA	47	20	K2YCO	NY	24	7	WD4MVO	VA	37	9	WA7BJU*	OR	50	12	KØCJ	MN	46	12	I4EAT*		12	64
	K1FO*	CT	46	18	K3VGX*	PA	46	12	WD4IIS	GA	37	8	WA1JXN/7*	MT	46	25	WØLER	MN	46	10	G4DZU*		11	8
	K1BKK*	VT	40	14	WA3VSC*	MD	40	12	WD4GXN	VA	37	8	W7CI*	AZ	45	15	WØEMS	NE	46	10	VK5MC*		7	7
	K1HTV	CT	39	14	AB3D*	DE	40	10	K4KAE	SC	36	13	W7JF	MT	44	14	WØOHU	MN	45	12	SM6CKU*		5	4
	WA1OUB	NH	36	8	W3TMZ*	MD	38	12	W4MKJ	KY	36	12	K7NII*	AZ	41	12	KØSE*	MN	45	10	VK3ATN*		4	4
	W1FZA*	NH	35	10					K4QIF	VA	36	9	WA7JUO*	NV	35	16	WØRLI	MN	45	9	ZL1AZR*		2	2
													K7ICW	NV	21	9								

work. He regularly monitors the 2-meter EME net, which meets at 1700Z on 14.345 MHz every Saturday and Sunday, looking for skeds. His phone number, for those who may wish to call him, is 207-658-9076.

The other major piece of 2-meter news concerns the operation of VP9IB. Tom got started from Bermuda about July 10 and managed m.s. QSOs with WA3VSJ, KA1GD, VE2DFO and K4PKV during the Perseids. Then, on the evening of September 20, the big break came in the form of a strong tropo opening, which produced contacts with 29 stations from southern New England to Delaware. See the 70-cm section for more of VP9IB's exploits during this episode. The 2-meter equipment at VP9IB consists of an HA-2 transverter producing about 50-watts output to a single Boomer.

W3EP/9, who has worked 35 states since March 1979 from his portable location on a hilltop near Bloomington, Indiana, wonders if there is any further need for the 2-meter standings box. Emil speculates that he can probably work only an additional six states, assuming a limit of about 1400 miles for terrestrial modes. He also notes that more than 20 already have WAS as a result of EME operation and feels that it's simply a matter of time before others join them. What do you think? Is the 2-Meter standings box still worth the valuable *QST* space it occupies, or could that space be better used for some other feature?

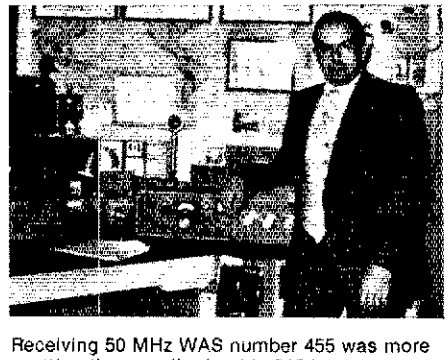
W7CKL, now W5DXN/7, reports in the latest *SWOT Newsletter* that the level of participation in the SWOT Contest held last August was somewhat disappointing. Val, who checked the logs and compiled the results for the 2-meter activity promotion organization, said that only about two dozen participants turned in reports. Suggestions for rule changes which might result in greater activity are most welcome. Address Len Hoops, W5JTA, 1704 Glenn Dr., Fort Worth, TX 76131. Some ideas have already been received. One mentioned by several is the use of counties in place of the one-degree grid squares as multipliers, as is done in the ARRL UHF Contest. This conductor wonders how well this would work under marginal conditions, especially where cw is needed to get through. Imagine the difficulty in getting some of those Indian-name counties across. Also, counties vary widely in size. As an example, San Bernardino County, California, is larger than some states. It would appear that such a rule change would revive the complaints heard about ARRL vhf contests, of favoring some parts of the country over others. Why not consider the use of the new grid-square system proposed for worldwide use by the IARU Region I vhf managers (see this column for September 1980). In this conductor's opinion, SWOT could perform a real service by assisting in the education of North America vhfers in the use of this interesting and useful new system.

WA9ULU is trying to revive a-m on 2 meters. Ed notes that many amateurs have perfectly functional gear lying around gathering dust. He urges that it be hauled out and put on the air. He suggests a frequency of 144.4 MHz, which is in the weak-signal part of the band as proposed by the VUAC. It also corresponds to the 6-meter a-m gathering spot of 50.4, so it should be easy to remember. For further information on this project, contact Edgar Reihl, WA9ULU, 545 Kidge Rd., Wilmette, IL 60091.

1-1/4-Meters — K1WHS isn't content to limit his activity to 2 meters. Dave says that he is building an 8877 for 220 MHz as well. The EME array will consist of eight Boomers and should be completed and in operation by this spring. In the meantime, he is running 250-watts output to a quad array of Boomers for terrestrial work.

KCØW claims what he believes to be the first 1-1/4-meter work between North and South Dakota, as well as between North Dakota and Iowa. This came as a result of successful skeds with WØSD and WBØTEM. The distance of 335 miles (539 km) to the latter station in Akron, Iowa, from Jack's Bismarck QTH was negotiated on both cw and ssb, despite KCØW's power output of only 25 watts to a single 14-element KLM. Conditions during the QSO were described as "not good."

The September issue of K5FF's *220 Newsletter* quotes VE3CRU as saying that he has caught up with orders for his 1-1/4-meter version of the well-known Microwave Modules transverter. Apparently the hold up was delivery of MRF-212 transistors, which he uses in the conversion. Those interested in this approach to getting on the band in a hurry may call Hans at 416-759-5562 for more information.



Receiving 50 MHz WAS number 455 was more exciting than confirming his 318th country on the hf bands, says W2MPK. Don also has 24 states on 2 meters and is newly active on 70 cm with 300 watts and a WØEYE Yagi at 80 feet. A 1-1/4-meter set-up is in the works. He asks that we point those beams toward Syracuse more often.

70 and 23 Cm — What is certainly a first occurred during the September 20 tropo opening between the East Coast and Bermuda that is reported in the 2-meter section. While working VP9IB on 144 MHz, K2RIW asked if Tom had any 432 equipment. The answer was that he had an ARCOS transverter which delivers about 2-1/2 watts and a Microwave Modules receive converter, along with a Cushcraft 480DX collinear antenna. When Dick asked him to make the attempt on 432 MHz, the reply was in the affirmative, although VP9IB also pointed out that he had no antenna changeover relay, as the 70-cm gear was intended only for OSCAR work. Nevertheless the sked was started, with Tom accomplishing the switching by plugging the antenna coax, first into the receive converter and then into the transmit converter. He heard K2RIW's signals almost immediately but it took a while for Dick to copy the 2-1/2 watts traversing the 755-mile (1215-km) overwater path. Nevertheless, after about 20 minutes of trying, the weak signal from VP9IB started to become audible. The contact was completed on cw and then they switched to ssb and were still able to copy one another. Unfortunately, VP9IB's receive converter blew as they were finishing, precluding any further contacts on this band. Apparently, the process of disconnecting and reconnecting the antenna led to a static charge buildup, which took out the front-end transistor. I am sure that next time things will be different and more 70-cm contacts will be made by VP9IB.

Good tropo openings during winter are always interesting, but this one is doubly so because it took place between Russia and the Scandinavian countries. The report comes via a translation from the Soviet Amateur Radio magazine *Radio*. The account states that, last February 22, RA1AIN came home from work early and found that his TV screen was full of signals from Sweden and Finland. At first he could get no response on 430 MHz, but finally, at 1640 Moscow time, SM3HR was raised with signals running 599. RX1MC was then alerted by phone. He first tried 2 meters and found the band alive with SM, OH, OZ, UR2, UQ2 and UP2 stations. After working a string of these, he QSYed to 1215 MHz and, after many unsuccessful tries, finally managed to contact SM5BIE for the first UA1-to-SM QSO on 23 cm. Naturally, news of this epoch contact spread rapidly. The following evening he hooked up with SM5DWC and, on ssb, SMØFFS. Two evenings later, although conditions were beginning to fade, he worked OH5NR. Distance to Sweden was listed as *707 km or about 1140 miles.*

The foregoing certainly illustrates the level of interest and equipment sophistication present on 70 and 23 cm in some other parts of the world. QST

YL News and Views

Conducted By Jean Peacor,* K1IJV

The Century Kids

What YL, still active, has been licensed the longest? The honor, so far, goes to Eunice Thompson, W1MPP, whose QTH is Orange City, Florida, for part of the year and Jackson, New Hampshire, during the summer months. Her OM is Ken Thompson, K4RO, ex-W1PS. Together, they have over 100 years in Amateur Radio and straight from their QSL card stems the term, "The Century Kids."

The Harvard Radio Club roster listed the call 1CDP before it appeared in any *Callbook*. Prior to receiving that call, Eunice, first licensed in 1920, used her initials, ER. She was later issued her present call of W1MPP.

To backtrack — how did a young YL, in 1918, become interested in Amateur Radio? Eunice's story is unique, particularly since she left her home town of Mattapoisett, Massachusetts, and headed for a Boston school to major in art. Once there, she became a page girl and waitress at Boston's Franklin Square House, for which she received room and board while attending school. As the first semester ended, Eunice started looking for a real "paying" job. Jobs for artists were few. One agent did mention that American Radio & Research Corporation (AMRAD) in Medford Hillside, Massachusetts, was looking for a tracer but "only males need apply." The agent might just as well have forgotten those last words. Eunice was on the first trolley car headed for Medford Hillside.

The chief engineer at AMRAD, surrounded by all males, machines, cuspidors and uncensored conversation, told Eunice straight out, "no place here for females." With one foot in the door, Eunice wasn't about to reverse that foot's direction — not when the job would pay her $8 per week. The C.E. was in a bind. He had no other applicants for a job that needed to be done. Eunice was given the opportunity to try.

AMRAD, in May 1918, burned midnight oil trying to keep up with the Signal Corps' wartime demands for the "trench set." This transceiver was comprised of a crystal detector, tuning coil, spark coil and key — all in a waterproof box — complete with carrying strap and weighing but 10 pounds. The barbed wire, with which all front-line trenches were protected, would serve as the antenna.

W1MPP and K4RO — The Century Kids *(photo courtesy W1ARA)*

Prior to WW I, AMRAD had erected a radio station, 1XE, on the Tufts College campus. Armistice Day found the management planning for 1XE to again become active. Since radio amateurs were about the only ones in possession of broadcast receivers at the time, an appeal was made for their assistance. They were offered the use of revamped spark coils from the trench sets and then the quench-gap. The 200-meter wavemeter, lightning switch, T-R switch, variometer and finally a complete rf receiver, the "S" tube and first electrolytic condenser (Mershon), followed.

Eunice continued with her job as tracer throughout all these changes. Had a female become accepted in this male domain? Not yet! Undaunted, Eunice survived the snakes planted in her desk drawer, and the elimination of the lock on the common toilet. The turning point came on the day when, accepting a dare, she climbed AMRAD's 300-foot radio tower. Acceptance suddenly was hers.

Eunice's tracing job expanded to include responsibilities at 1XE, where she learned much. With experience being the best teacher, and having the opportunity to do everything from throwing switches, monitoring meters and fielding complaints to developing a microphone personality, she grew along with 1XE's audience. She became renowned for her nightly broadcasts of children's bedtime stories.

"Wireless" had become a definite part of her life. Through enrollment in a course at Massachusetts Radio Telegraph School, Eunice became a licensed Amateur Radio operator in 1920. She set up her first station in Mattapoisett, where she operated during weekend visits. Irving Vermilya, 1ZE (1HAA at the time), whose QTH was in neighboring Marion, couldn't belive the strange noises he began to hear. With determination, he tracked them. His first statement upon learning that the fist behind the sparks belonged to a YL? Slowing his key way down, he said, "I am married." Upon meeting Eunice and deciding she was in earnest about Amateur Radio (she'd already shinned a tree and hung an antenna), he then offered help. His advice, which she pursued, was for her to take courses to learn the ins and outs of radio. To his peers he advised: "Don't flirt with Eunice, for she hasn't the time. Treat her as one of us; a sister operator."

The time came when AMRAD was doomed to close. Market-minded manufacturers had developed. In 1929, Eunice became an employee of N. E. Power Company, where once again she faced the pioneering responsibility of a YL in a predominantly male environment. Once again, she proved just how responsible YL power can be.

Throughout the years "The Century Kids," as many hams well know, have been active radio amateurs. They frequent the Barnyard Net on 3960 early each morning, when opportunity permits. Irving Vermilya's story about Eunice entitled "QRX for a New OW" appeared in July 1921 *QST*. OOTC's *Spark Gap Times* published "The Story of W1MPP," as told by her husband, W1PS, in February 1964. Excerpts from both articles made this article possible.

Eunice's own words sum it up nicely. What was it like being a ham in the good old days? "The drone of the gap — the smell of ozone — a wonderful experience."

KELLI TURNER, KAØIHH

There is great intrigue in Amateur Radio. You never know who you'll find on the other end of a radio signal. Mike Kenley, KA8IAZ, of Detroit, Michigan had a most memorable QSO on 15-meter cw on July 2, 1980. Mike found Kelli Turner on the other end of a radio signal and was most impressed.

Kelli, with a good fist, sent her age as 9 years old. Mike received her fine handmade QSL card a few days later.

Kelli writes: "My dad, mother and brother are all amateurs. Our local repeater club held a ham class last winter. My brother and I attended. The part that I like best is sending cw, making contacts and getting QSL cards."

Kelli may not be the youngest licensed YL, but one look at her smiling face proves her to be one of the cutest cw operators you'll ever QSO. Get out your keys and look for KAØIHH. DST

Kelli Turner, KAØIHH

These YLs are the pride of the Dakotas. The Dakota Division is ARRL's only division that has had all YL Section Communication Managers. Shown here at last year's Division convention at Sioux Falls are Lydia Johnson, WØKJZ, then South Dakota SCM; Helen Haynes, WBØHOX, Minnesota SCM; and Lois Jorgensen, WAØRWM, North Dakota SCM. *(photo courtesy WØJHS)*

*Country Club Dr., Monson, MA 01057

Strays

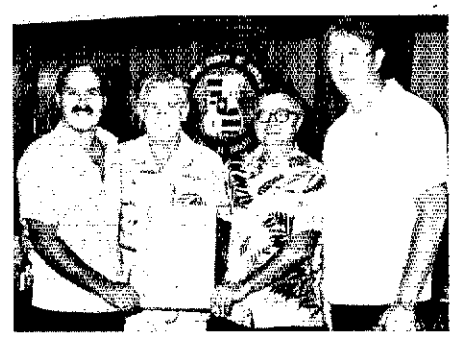
AMATEUR RADIO STAMPS

☐ Vic Clark, W4KFC, offers this list of Amateur Radio stamps as an aid to interested collectors. While none of these stamps is expensive, all are unlikely to be stocked by any single stamp dealer, and it may take a few letters or phone calls to find them all. As more amateurs collect these stamps, they may become more difficult to locate, so now is the best time to assemble a collection. Sometimes foreign amateurs can assist. In attempting to complete a collection use either the Scott or Minkus stamp catalog numbers — this will enable dealers to quickly tell if they are on hand. NYA means number not yet available.

Date Issued	*Country*	*Face Value*	*Scott Catalog*	*Minkus Catalog*	*Subject*
6/26/61	Poland	2.5 zlotys	993	1320	One of set of three. PZK.
6/26/61	Poland	3.5 zlotys	993A	1321	3-stamp souvenir sheet.*
12/15/64	USA	5 cents	1260	—	50th anniversary of ARRL.
5/23/66	Jugoslavia	85 paras	809	1443	20th anniversary of SRJ.
8/8/72	German Dem. Rep.	25 pfennigs	1391	1682	One of set of five.
4/6/73	Colombia	60 centavos	813	1269	40th anniversary of LCRA.
4/15/75	Poland	1.5 zlotys	2088	2453	IARU Reg. 1 conference.
4/16/75	Costa Rica	1.00 colones	C633	1185	Set of three airmails.
		1.10 colones	C634	1186	Sixteenth convention of
		2.00 colones	C635	1187	Fed. of Amateur Radio Clubs.
10/8/76	Dom. Republic	6 centavos	773	1283	Regular; 50th anniv. RCD.
		10 centavos	C246	1284	Airmail; 50th anniv. RCD.
9/24/77	Japan	50 yen	1312	1394	50th anniv. of Amateur Radio.
11/5/77	Brasil	1.30 cruz.	1533	1742	Amateur Radio Day, Brasil.
1/25/79	Dom. Republic	10 centavos	NYA	1358	Beata Island DXpedition.
2/23/79	USSR	4 kopecks	4733	4932	RS-1 and -2 amateur satellites.
3/26/79	Bolivia	3 pesos	NYA	NYA	38th anniversary of RCB.
9/6/79	Switzerland	70 centimes	679	NYA	50th anniversary of USKA.
3/28/59	Czechoslovakia	60 h	910	1258	10th anniversary Radiosport.
5/20/73	USSR	4 kopecks	4084	4234	Ernst Krenkle, RAEM.
1979	Germany	60 m	NYA	NYA	WARC stamp; shows KWM-2.

*Contains 2.5 zlotys Amateur Radio stamp (993/1320) and two other stamps.

In addition to the above, at least two countries are currently issuing postage stamps that carry the photographs of regents who are radio amateurs — King Juan Carlos, EA0JC, of Spain, and King Hussein, JY1, of Jordan. Listed below are a few of the several stamps available.
King Carlos — 1976 Minkus 2381-2386, Scott 1927-1930.
King Hussein — 1963 Minkus 538-543, Scott 407-412.



In recognition of amateur services and to help publicize Field Day, Honolulu Mayor Frank Fasi declared June 22 to 28 "Amateur Radio Week" for the City and County of Honolulu. At the presentation were (left to right) Carter Davis, KH6FV, RACES coordinator; Mayor Fasi; Warren Munro, KH6WM, president, Honolulu ARC; and Al Hubbert, KH6ILR, president, Emergency ARC.

OPERATION NAB

☐ West Palm Beach, Florida, area amateurs recently combined their resources and talents to help fellow amateur Bill Stoddard, WB4SCJ, recover a stolen rig. The morning after Bill's 2-meter transceiver was stolen, a new and suspicious-sounding station showed up on the local 07/67 repeater. Bill and his friends figured out what area the "bandit" was transmitting from and managed to locate the house. The amateurs then confronted the suspect and persuaded him to return Bill's rig. — *E. G. "Manny" Papandreas, W4SS, Lake Worth, Florida*

INTERNATIONAL FRIENDSHIP

☐ Teresa Garcia, who lives in Cochabamba, Bolivia, was recently in Atlanta, Georgia, for brain surgery. Javier Cremer, CP5NI, who is Teresa's fiancé, remained in Bolivia and wanted very much to keep in touch during Teresa's absence. He enlisted the aid of his brother Carlos, CP5KY, who speaks English, to establish contact with Atlanta. Just a few days before Teresa's surgery, Carlos made contact with Glenn Clark, W4LCB, in Riverdale, a suburb of Atlanta.

Phone patches were made before and after the surgery between Teresa and the family and loved ones back home in Bolivia. Teresa was talking with Cochabamba via Amateur Radio less than five hours after her surgery. After her convalescence, Teresa returned home and is now very happily continuing her studies at the university in Cochabamba.

Left to right are Javier, CP5NI, Carlos, CP5KY and Glenn, W4LCB, in Glenn's ham shack in Riverdale, Georgia.

The story does not end at this point. During their many schedules Carlos and Glenn have become close friends. The friendship extends to the entire Cremer and Clark families, both 100% licensed amateurs. Carlos and Javier's father is CP5GS and their mother is CP5KZ. Glenn's wife is WN4WDR. Last summer Carlos and Javier visited Glenn and Syble in Riverdale. Glenn and Syble are looking forward to a visit in the Cremer home in Cochabamba.

Teresa's father said in a letter to Glenn: "One more time we have evidence on the sensibility of the radio amateur group that anonymously and disinterestedly cooperates in building a united and brotherly world." — *Glenn Clark, W4LCB, Riverdale, Georgia*

Results, Third ARRL UHF Contest

There is life above 2 meters!

By Tom Frenaye,* K1KI

Uhf enthusiasts where are you? A total of 120 entries was received for the August 2 and 3, 1980, running of this annual event, which is now in its third year. The 1978 contest saw 118 entries received, while the 1979 contest, with its 159 official entries, seemed to signal that there was an increased interest in uhf contesting and participation might grow as the years passed. What happened?

Seems that at just around the 650 mark, the same number of different call signs showed up in the logs of the contest participants as in 1979. Maybe summer doldrums, vacation time and nice long, warm afternoons at the beach contributed toward a reluctance for doing UHF Contest paperwork.

Not all the Contest news is downbeat though. N6NB, again the top single operator in the UHF Contest (with a new contest record single-operator score, of course), found just about the same number of QSOs in his log as in 1979. The 3 kilopoint difference in Wayne's higher 1980 score over his 1979 effort is because of the nine additional 1980 multipliers – thanks, in part, to the efforts of the AA6DD contest expedition, which provided N6NB with nine additional latitude-longitude block multipliers.

Eight new single-operator division records also came out of the 1980 contest from the following ARRL Divisions: Canadian, Atlantic, Central, Dakota, Delta, Hudson, Southeastern and Southwestern. It might be noted that no entries were received from the Rocky Mountain Division and the N6TX still holds the Pacific Division all-time single-operator record from the 1978 contest — the only record not broken in 1979 or 1980.

The W2SZ/1 group is again the top multioperator station, breaking their own 1979 36,465-point all-time multiop record by more than 12,000 points. K2XR, meanwhile, took second-place multiop honors for 1980 with an impressive 32,238-point showing by operators K2OWR and WB2WIK.

"Best DX" by band among those stations whose operators bothered to record their best DX in miles looks something like this: *220 MHz* — W1XP/1, 350 miles; *432 MHz* — W2SZ/1, 540 miles and K2XR, 475 miles; *1215 MHz* — N6NB and XE2BC, 350 miles and W0VB, 295 miles; *10 GHz* — W2SZ/1, 57 miles.

A few people have suggested rules changes that might stimulate increased UHF Contest activity, including a multiplier for longer-distance QSOs, a change in the band segments either to allow 440-MHz fm or not allow 223.5-MHz fm, or a change in dates to avoid the midsummer vacation season.

A serious evaluation of the contest rules will be made in the next month or two in order to make any changes deemed desirable in time for the scheduled August 8 and 9 running of the 1981 UHF Contest. Make sure your ideas are heard by sending them to the ARRL for distribution to the Contest Advisory Committee members. Those of you who have the equipment to get on in the contest and for one reason or another did not are especially encouraged to supply some ideas. Can anyone schedule a good tropo opening?

*Assistant Communications Manager, ARRL

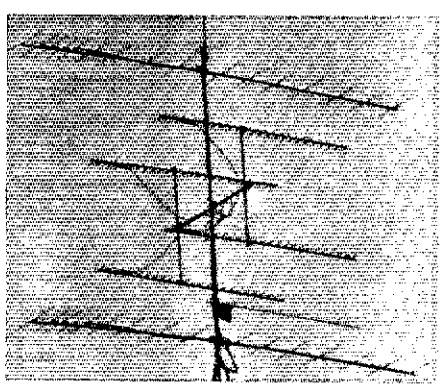
Multiplier Leaders

220 MHz		*432 MHz*		*1296 MHz*	
N6NB	19	K2UYH	45	N6NB	12
K1FO	16	K8WW	38	W3HQT	11
W2EIF	14	K2RIW	35	K2UYH	10
W1JR	14	WB8BKC	30	WA3AXV	10
W3IY/4	14	W3IY/4	27	K1PXE	9
K1PXE	13	K9KFR	26	W2VC	9
WB8BKC	12	(four)	24	KA1GT	9
W2SZ/1*	28	W2SZ/1*	35	W2SZ/1*	13
WA2SNA*	21	W4ATC*	26	K2XR*	10
		WA2SNA*	26		

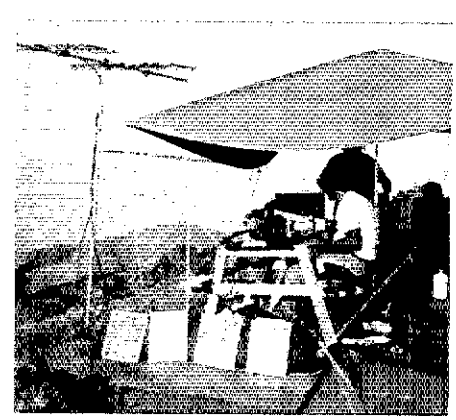
2300 MHz		*3400 MHz*		*5700 MHz*	
W7TYR	1	W7TYR	1	W7TYR	1
K7AUO*	2	K7AUO*	2	K7AUO*	2

10 GHz	
VE3CRU	1
VE3QF	1
WA2ANZ	1
W2SZ/1*	5

*multioperator stations



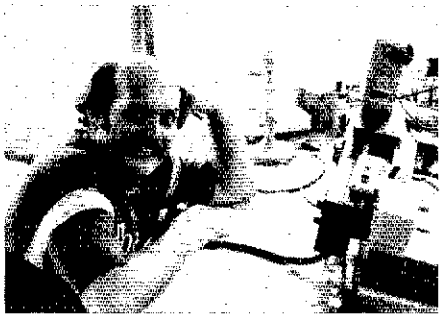
The VE3QF antenna farm includes two 16-el 144 MHz Yagis, four 27-element 430-MHz Yagis, and a 28-element, 1296-MHz loop Yagi with the transverter on the boom. *(photo by VE3AND)*

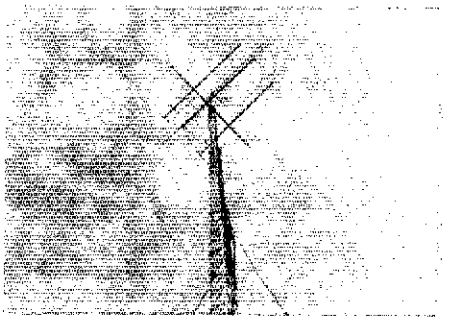


(Left to right) WA6VNN, David, WB6ACU, WB6HOZ, WA6OUZ and WA6MBZ, members of the Santa Barbara ARC, went to a lot of work to backpack their gear, including a solar-panel power supply, to the summit of Diablo Peak on Santa Cruz Island off the California coast.

SOAPBOX

Why could multiop groups make contacts with their own members above 2304 MHz in the June contest, but not in the UHF Contest? The UHF Contest seems a natural for that rule! Many contacts lost on 1296 MHz because of some stations not firing up on that band until the last hour. We have found hf liaison (i.e. 3815 kHz) very valuable in the past. Hope to see more activity there (WA6EJO). The 1296 operations were hindered slightly by a loss in receiver sensitivity. The 50 watts available on ssb didn't help much either, since most others were only running a couple of watts also. Most of the stations that were QSOd were well over 300 miles away. One of the more frustrating aspects of contesting from here in Mexico is that we don't get to work our own section/latitude-longitude block. Indeed, in the past three years of travelling into Mexico for the contests, we have yet to work XE on 1296. This may require that we bring another rig along in the future (WB6NMT/XE2BC). It seems to me that August is not the best time for our UHF contest because the number of logs submitted, and the number of stations on the air during the contest are far below the number of stations that I know to be active on the bands. Maybe the problem is that August is vacation time for many. Maybe it is because the weather is generally too hot in August to either be in the shack or to produce good uhf propagation. I would suggest the possibility of an October date for the UHF Contest (W1GXT). I was very disappointed with the low activity on 432 MHz this year. What can be done to encourage the noncontesters to make some noise on our rather sparsely populated uhf bands? For one thing, it would help to show everyone the often overlooked DX potential of the uhf segments, making the bands ultimately more attractive for contesters and noncontesters alike (AJ6T). This was our first UHF Contest and we did not set up the big stations we would have normally used for a VHF QSO Party. But the two of us (K2OWR and WB2WIK) did have fun and we kept pretty busy! Our QTH was incredible: Sunrise Mountain, the second highest point in the State of New Jersey, ground elevation — 1653 feet above sea level. We were really in the woods. Our portable crank up tower was borrowed from N6NB and it really came in handy. Had to crank it up and down several times: Up in nice weather and down when the horrendous thunderstorms blew through, which was every couple of hours (K2XR/WB2WIK). I have called one of the few 70-cm nets in the country now for almost a year and feel fairly well acquainted with propagation and conditions. I feel that the contest weekend was nothing special, enhanced far more by increased concentration of activity than tropo, inversion, etc. Our contest QSOs ranged from Massachusetts to southern Georgia, with almost all the highly populated blocks represented between these two areas. Interestingly enough, we didn't work anyone in our own block, around Raleigh, North Carolina. Everyone either forgot about the contest or was out of town (W4ATC/WD4MBK). All that I can say for the contest this year is that I hope this combination of bad conditions and pitiful activity doesn't happen again soon, or all the interest in this event is going to die out (WB9SNR). This was my first crack at the UHF Contest, and I enjoyed it so much that it may be a long time before I get my 6- and 2-meter gear back on the air. I had to take down my 6-and 2-meter antennas to make room for 220 and 1296. Unfortunately, the 1296 system bombed out quite badly, but we'll make it work — eventually (W3IY/4). QST





K2OWR (left) and WB2WIK operated multiop station K2XR with help from the borrowed portable 80-foot crank-up tower.

Scores list:

Call sign, total score, QSOs, multipliers, bands operated (C = 220 MHz, D = 430 MHz, E = 1215 MHz, F = 2.3 GHz, G = 3.4 GHz, H = 5.8 GHz, I = 10 GHz).

Canadian Division

VE3CRU 4452-12-8-C-ONT
29-16-D
4-3-E
1-1-I
VE3QF 1218-4-4-C-ONT
-13-6-D
-4-3-E
-1-1-I
VE3FN 630-15-14-D-ONT
VE2BBK 585-5-4-C-QUE
-10-9-D

Atlantic Division

K2UYH 20,532-8-4-C-SNJ
-82-45-D
-13-10-E
WA3AXV 13,455-24-7-C-EPA
-61-22-D
-15-10-E
K3IUV 8460-33-9-C-EPA
-41-14-D
-10-7-E
W3HQT 8436-14-9-C-EPA
-34-17-D
-14-11-E
W3CXU/2 8160-10-4-C-SNJ
-44-22-D
-13-8-E
W2EIF 6696-31-14-C-SNJ
-27-13-D
-7-4-E
W3IP 5148-10-9-C-MDC
-42-24-D
W2PGC 5049-14-10-C-WNY
-29-20-D
-4-3-E
WB3CZG 2448-10-3-C-EPA
-24-21-D
N3MW 2220-14-7-C-EPA
-23-13-D
WA3JUF 1998-5-3-C-EPA
-10-7-D
-11-8-E
W3CL 1887-23-8-C-EPA
-14-9-D
WA2DKB 1734-16-7-C-SNJ
-18-10-D
LA4LN/W3 1620-27-20-D-WPA
K3AKR 1482-7-6-C-MDC
-19-13-D
W3XO 1092-26-14-D-EPA
K3QQ/3 720-30-8-C-EPA
K3VYG 285-19-5-C-EPA
W4NVW/3 165-5-2-C-MDC
-6-3-D
W3MSN 12-2-2-D-MDC
W3GNR/3(+K3TFL,KA3s AWL DWR,WA3s BUC FFC JBV, WB3IQE) 3441-7-7-C-WPA
-30-24-D

Central Division

WB9SNR 6510-11-9-C-ILL
-39-22-D
-6-4-E
K9KFR 5670-6-5-C-IND
-40-26-D
-4-4-E
WB9NTL 312-3-2-C-IND
-8-5-D
-1-1-E
KA9ASH 294-9-4-C-IND
-3-2-D
-1-1-E
WD9EME 264-11-8-D-IND
WB9FNR 210-10-7-D-IND
K9XY 18-3-2-D-WI

Dakota Division

W9VB 1296-5-5-C-MN
-13-10-D
-3-3-E
W9OHU 627-17-10-D-MN
-1-1-E

Delta Division

AA4ZZ 1800-13-6-C-TN
-17-14-D
WB4JGG 297-11-9-D-TN
W5UKQ 210-8-6-D-LA
-1-1-E

Great Lakes Division

WB8BKC 7434-15-12-C-MI
-44-30-D
K8WW 7182-63-38-D-OH
WA4IPI 3741-10-5-C-KY
-31-23-D
-1-1-E
WA8VPD 3042-10-8-C-MI
-25-16-D
-2-2-E
KD8Z 1080-20-18-D-OH
WA8ZCO 231-5-3-C-MI
-6-4-D

Hudson Division

K2RIW 9240-88-35-D-NLI
W2VC 6696-44-22-D-NNJ
-14-9-E
WB2WIH 1680-18-8-C-NNJ
-17-8-D
WB2TFH 1008-28-12-D-NNJ
K2SHB 975-25-13-D-ENY
K2OVS 567-21-9-D-NLI
WA2ANZ 180-8-4-C-ENY
-1-1-I
K2XR(K2OWR,WB2WIK,oprs) 32,238-87-19-C-NNJ
-80-25-D
-16-10-E
WA2SNA(K2BJG,N2AAZ,WA2s DTJ EKM UPK,WB2RFB,oprs) 24,174-83-21-C-NNJ
-63-26-D
-6-4-E
W1QK/2(WA1s PMA WXV, WB1HCA,oprs) 7968-26-9-C-ENY
-57-23-D

Midwest Division

WB0TEM 270-3-2-C-IA
-7-7-D
KA0Y 189-9-7-D-IA
W0RAP 126-7-6-D-IA
K0DAS 48-4-4-C-IA

New England Division

K1PXE 15,870-22-13-C-CT
-59-24-D
-17-9-E
K1FO 12,402-35-16-C-CT
-47-16-D
-12-7-E
W1JR 11,931-27-14-C-EM
-52-22-D
-9-5-E
KA1GT 4968-40-14-D-CT
-16-9-E
W1GXT 2106-17-9-C-EM
-14-7-D
-4-2-E
K1LPS 2046-10-8-C-VT
-21-14-D
WA1UQC 1653-12-9-C-CT
-17-11-D
W1FAJ 1512-11-8-C-CT
-17-10-D
WB1FKF 1296-11-5-C-EM
-16-11-D
AF1T 858-8-4-C-NH
-14-9-D
WB1CWZ 432-16-9-D-CT
K1ZZ 351-3-3-C-CT
-10-6-D
AC1J 270-5-1-C-NH
-10-5-D
W2SZ/1(K1DH,WB1CBH, W2GN,WA2s AAU GFP,WB2s PKO QCJ,N4CD,WA8USA, oprs) 49,086-78-28-C-WM
-86-35-D
-19-13-E
-1-1-I
W1XM(AG1E,W1XG,WA2EYC, WA4TTG,N6BYK,oprs) 11,628-28-13-C-EM
-50-19-D
-12-6-E
W1XP/1(+K1KG,N1HR, WA5IOD) 390-10-7-C-ME
-3-3-D
W1TKZ(+K1s OGF TK UR, WA1PQY,oprs) 36-4-3-D-WM

Northwestern Division

W7TYR 1056-10-4-C-OR
-6-3-D
-2-1-E
-1-1-F
-1-1-G
-1-1-H
K7HSJ 870-20-5-C-OR
-7-4-D
-1-1-E
K7KOT 288-6-3-C-WA
-6-5-D
K7AUO/7(K7UUM,W7s GFP UDM,oprs) 792-5-1-C-OR
-2-2-F
-2-2-G
-2-2-H
-1-1-I
WB7FHF/7(+K7IUN) 285-3-1-C-OR
-1-1-F
-1-1-G
-1-1-H
-1-1-I

Pacific Division

AJ6T 195-13-5-D-SCV
W6SFH/7(+WA6KOD) 108-6-6-D-NEV

Roanoke Division

W3IY/4 8364-21-14-C-VA
-47-27-D
K4QIF 5115-37-24-D-VA
-9-7-E
WA4ZIA 4092-10-7-C-NC
-34-24-D
WA4SBC 3024-5-5-C-VA
-37-19-D
W4FJ 966-23-14-D-VA
W4ISS 798-19-14-D-NC
K4GL 585-2-2-C-SC
-13-11-D-
WA4LDU 546-14-13-D-SC
WA4WZQ/4(+KA4HKK, WA4WZP,WB4HIE,WD4GQU) 4293-28-10-C-NC
-25-17-D
W4ATC(AA4OO,WA4s BPJ OFP, WB4s ILW TQD,WD4s MBK MZX, oprs) 3960-7-4-C-NC
-37-26-D

Southeastern Division

WB4NMA 2100-5-5-C-GA
-23-20-D
WA4CQG 162-9-6-D-ALA
WB4BSZ 3-1-1-D-NFL
WA4OYH(+WA4YWK) 585-15-13-C-GA

Southwestern Division

N6NB 22,842-115-19-C-SB
-37-16-D
-13-12-E
AC6C 5418-83-10-C-OR
-13-7-D
-5-4-E
W6ABW 1755-65-9-C-LA
WB6OKJ 1176-49-8-C-LA
WA6IJZ 792-12-5-C-SB
-12-6-D
W6CN 720-40-6-C-LA
KA6DGV 576-24-8-C-LA
W6NXB 567-27-7-C-LA
N6AVW 504-24-7-C-LA
WA6DCT 360-20-6-C-LA
K6ZMW 324-9-6-E-LA
W7LUX 36-4-3-D-AZ
-1-1-E
W6KBD 18-3-3-C-SDG
W6OAL(+WA6s EJO OYS, WB6YQN,WB9KMO) 9360-82-10-C-SB
22-11-D
6-4-E
-1-1-I
K6TZ(WA6s GNY MBZ VNN, WH6s ACU HOZ OUZ) 9000-100-12-C-SB
25-12-D

West Gulf Division

WB5LUA 840-14-6-D-NT
-7-4-E
WA5VJB 486-20-3-C-NT
-7-3-D
W5JTA 45-5-3-D-NT
N5EX 3-1-1-D-NT

DX

XE2BC(WB6NMT,opr) 4347-29-7-C
-24-10-D
8-4-E

DXpeditions*

AA6DD(+KC6A) (9 locations) 732-16-11-C-6V/LA/SB
-16-11-D
-5-5-E
VE3FHM/3(2 locations) 153-10-9-D-ONT

Check Logs

WA2ECH,K4EJQ,K9SLQ

*Combined scores from all locations.

Rules, 1981 ARRL International DX Contest

It may be hard to believe, but another ARRL DX Contest season is not too far off. February 21-22 for cw and March 7-8 for phone are the weekends to mark on your calendar.

Note that the basic contest format has been returned to that of 1979, with W/VE stations working the world and everybody else working W/VE stations only. A considerable amount of deliberation went into evaluating the changes made for the 1980 contest and while the DX-to-DX format proved to be quite controversial, the changes to single-band categories and the expanded awards program proved very popular and will remain.

Conditions may not top those of the 1980 contest, but remember that the downside of a sunspot cycle isn't as steep as the upside, so there should be plenty of goodies to catch. The number of amateurs worldwide continues to climb at a steady rate so there should be more stations available than ever. Even the 1980 records could be topped.

Don't forget to send an s.a.s.e. (or two IRCs for overseas airmail) to ARRL hq. for contest forms. Most scoring and logging mistakes can be traced to homemade forms. For those of you using computers to log or check for duplicates, some type of alphanumeric print out per band is required in lieu of regular dupe sheets.

If you have plans for a DXpedition, drop us a note with the particulars so we can distribute the information via the W1AW DX Bulletin. Never heard our on-the-air bulletin? Send an s.a.s.e. and ask for the W1AW DX Bulletin schedule. Good luck!

Rules

1) **Eligibility:** Amateurs worldwide.

2) **Object:** W/VE amateurs to work as many amateur stations in as many DXCC countries of the world as possible on 1.8 to 30 MHz. Foreign amateurs work as many W/VE stations in as many states and provinces as possible.

3) **Dates:**

(A) **CW** — Third full weekend in February (February 21-22, 1981).

(B) **Phone** — First full weekend in March (March 7-8, 1981).

4) **Contest period:** 48 hours each mode (separate contests). Starts 0000 UTC Saturday; ends 2400 UTC Sunday.

5) **Categories**

(A) **Single Operator:** One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance through DX-alerting nets, etc.) is not permitted.

(1) All band.

(2) Single band (one only). It is recommended that single-band entrants who make contacts on other bands submit logs for checking purposes.

(B) **Multioperator:** More than one person operates, checks for duplicates, keeps the log, etc.

(1) Single transmitter: one transmitter on any one band during the same time period. Stations must remain on a band for 10 minutes once a contact is made on that band, with one exception. *One* other band may be used during the 10-minute time period if the stations worked are new multipliers only.

(2) Multi-transmitter: no limit but only one signal per band.

(C) **QRP:** single operator only. QRP is defined as 10 watts input or less (or 5 watts output or less).

6) **Contest Exchange:**

(A) W/VE stations (includes 48 contiguous United States and does not include Canadian islands of St. Paul and Sable) exchange signal report and state or province.

(B) DX stations: signal report and power (three-digit number indicating approximate transmitter input power).

7) **Scoring:**

(A) **QSO points:** W/VE stations count three points per DX QSO. Foreign stations count three points per W/VE QSO.

(B) **Multiplier:** W/VE stations — sum of DXCC countries (except U.S. and Canada) worked per band. Foreign stations — sum of U.S. states (except KL7/KH6) and VE1-7, VO, VE8/VY1 worked per band. Maximum of 57 per band.

(C) **Final score:** QSO points × multiplier = final score.

8) **Miscellaneous:**

(A) Call signs and exchange information must be received by each station for a complete QSO.

(B) Your call sign must indicate your DXCC country (KM6FC/1 in Maine; FG∅AAA/FS on St. Martin, etc.).

(C) One operator may not use more than one call sign from any given location during the contest period.

(D) The same station may be worked only once per band. No crossmode, crossband or repeater contacts.

(E) Aeronautical and maritime mobile stations outside the U.S. and Canada may be worked for QSO credit only by W/VE stations.

(F) All transmitters and receivers must be located within a 500-meter diameter circle, excluding directly connected antennas. This prohibits the use of remote receiving installations. Exception: Multioperator stations may use spotting nets for multiplier hunting only.

9) **Reporting:**

(A) All entrants are encouraged to use forms available from ARRL (s.a.s.e. or one IRC) in reporting contest results.

(B) Logs should indicate times in UTC, bands, calls and exchanges. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs must include cross-check sheets (dupe sheets).

(C) All operators of multioperator stations must be listed.

(D) Entries must be postmarked within 30 days of the last contest weekend (April 7, 1981). All stations are requested to send their entries as early as possible. Entries received after mid-July may not make *QST* listings.

10) **Awards:** Plaques will be awarded in the following categories for both the cw and phone contests.

(A) Top W/VE scorer in each entry category — single operator-all band, single operator-single band (1.8-28 MHz), multioperator-single transmitter and multioperator-multitransmitter.

(B) Top scorer in the single operator-all band category worldwide and on each continent. In addition, worldwide leaders in the single operator-single band, multi-single and multi-multi categories will receive plaques.

(C) Top W/VE and top DX QRP scores.

(D) Additional special plaques will be awarded as sponsored. See October 1980 *QST* for the current list and February 1981 *QST* for any additions.

(D) Top W/VE and top DX QRP scores.

(E) Certificates will be awarded to top single-operator, all-band entries from each country and ARRL section; top single-band entries in each U.S. call area and each country; top multioperator entries (both single and multi-transmitter) in each country, U.S. call area and in Canada. DX entrants making more than 500 QSOs on either mode will receive certificates.

11) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels: unlimited, medium, and local clubs. Details will be listed in January 1981 *QST*.

12) **Conditions of entry:**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, by regulations of his licensing authority, and the decisions of the ARRL Awards Committee.

(B) Disqualification: An entry may be disqualified if the overall score is reduced by more than two percent. Score reduction does not include correction of arithmetic errors. Reductions may be made of unconfirmed QSOs or multipliers, duplicate QSOs or other scoring discrepancies. An entry *will* be disqualified if more than two-percent duplicate QSOs are claimed for credit. For each duplicate or miscopied call sign removed from the log by ARRL, a penalty of three additional QSOs will be deleted. The penalty will not be considered as part of the two-percent disqualifiation criterion. If a participant is disqualified, that operator will be barred from entering the contest on that mode the following year. The calls of all disqualified participants will be listed in the *QST* contest results.

Rules, January VHF Sweepstakes

While mountaintopping is a popular activity during the June and September VHF QSO Parties, the VHF SS is a different game to play. You need only work multipliers once, regardless of the band. Your concentration should be more on QSO totals in this one.

Remember that you will get more points per QSO as you go higher in frequency, so don't ignore the uhf bands if there is activity in your area. Judging by last year's totals, a new multiplier might increase your score by 5%, so take the time to dig those weak signals out of the noise and your score will certainly benefit.

As usual, logs should contain complete QSO details, including exchanges send and received. An s.a.s.e. to ARRL will get you the basic set of contest forms needed to ensure a complete entry.

The VHF SS represents the one vhf contest during the year in which ARRL-affiliated club competition (see January 1980 *QST*, page 90) for gavels in three club-size categories takes place. All it takes is a minimum of three entries from your club to make the listings, with the club member making the largest score receiving a nice certificate. Any questions?

Scoring Example

Band (MHz)	*QSOs*	*QSO points*
50	25(× 2)	50
144	40(× 2)	80
220	10(× 4)	40
432	15(× 4)	60
1215	5(× 8)	40
2300 +	1(× 16)	16
Totals	96 QSOs	286

Final score = (QSO points) × (ARRL sections + 10).

Rules

1) **Object:** To work as many amateur stations in as many ARRL sections and countries as possible using authorized amateur frequencies above 50 MHz. Foreign stations work W/VE amateurs only.

2) **Contest Period:** Begins 1800 UTC Saturday, January 17 and ends at 0400 UTC Monday, January 19.

3) **Categories:**

(A) **Single Operator:** One person performs all transmitting, receiving, spotting and logging functions.

(B) **Multioperator:** Those obtaining any form of assistance such as relief operators, loggers or use of spotting nets.

4) **Exchange:** W/VE amateurs exchange signal report, ARRL section and a consecutive serial number (starting with 001). Foreign stations give country name instead of ARRL section (U.S. Caribbean possessions are in the West Indies section; Hawaii and other U.S. Pacific possessions are in the Pacific section). Multioperator stations (only) may use blocks of consecutive serial numbers on each band.

5) **Scoring:**

(A) QSO points: Count two points for complete two-way QSOs on 50/144 MHz; four points on 220/430 MHz; eight points on 1215 MHz; and 16 points on 2.3 GHz or higher.

(B) Multiplier: ARRL sections, plus VE8/VY1, plus foreign countries worked during the contest, plus ten (10) — *not* sections per band.

(C) Final score: Multiply QSO points by multiplier total. See scoring example.

6) **FM Restrictions:**

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted.

(B) Only these recognized simplex frequencies may be used: 144.90 to 145.10, 146.49, .52, .55 and .58, and 147.42, .45, .48, .51, .54 and .57 MHz. This restriction prohibits the use of all repeater frequencies, including 146.76 and .94.

(C) Use of the national calling frequencies 146.52 and 223.50 MHz is restricted to four hours of total operating time on each frequency, in increments not to exceed one hour each (mark clearly in log). An off period of at least 15 minutes must follow each operating period.

7) **Miscellaneous:**

(A) The same station may be worked on different bands or in different sections for QSO credit.

(B) Crossband QSOs are not permitted.

(C) Only one signal per band (50, 144, 220 etc.) is permitted at any given time; single-operator stations are allowed only one transmitted signal at any given time.

(D) Multioperator stations must locate all transmitters and receivers within a 500-meter diameter circle, excluding directly connected antennas.

(E) While no minimum distance is specified, equipment in use should be capable of real communications (i.e., able to communicate over at least a mile).

(F) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest (except for family stations where more than one call is assigned to one location by FCC/DOC — and then for family members only).

(G) Multioperator stations may not count QSOs with their own operators except on 2.3 GHz and up, and a complete different station must exist for each QSO under these conditions.

8) **Reporting:**

(A) Entries must be postmarked no later than 30 days after the end of the contest. Use ARRL VHF SS forms or a reasonable facsimile.

(B) Logs should indicate times in UTC, bands, calls and complete exchanges. Multipliers should be numbered clearly in the log the first time they are worked. Entries with more than 200 QSOs must include crosscheck sheets (dupe sheets).

9) **Awards:**

(A) Top single-operator stations in each ARRL section or foreign country.

(B) Top multioperator station in each section (three or more entries minimum), or where exceptional effort has been displayed.

(10) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels — unlimited, medium and local clubs. Details will be listed in January 1981 *QST*.

11) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: For excess duplicates and call sign/exchange errors. See January 1981 *QST* for complete details.

Operating News

Conducted By John F. Lindholm,* W1XX

Wanted: More Workers in the Traffic Vineyards

It's about five minutes to eleven in the morning. The rig is all warmed up. Beam is pointed west. Conditions sound good. Check the frequency. Seems clear. Let's give a call and see if Ralph is on frequency early. W6JXK W6JXK DE W1XX AR. Back he comes and we're off and running for another successful Delta sked of the Transcontinental Corps of NTS. The four eastbound messages will later be transmitted on phone on the Eastern Area Net (Daytime). What's so unique or unusual?

Nothing except that the eastern participant in the above scenario is new to the game. Also, this third-party traffic, which originated in the evening the night before on cw, will be relayed by phone and likely be picked up by a phone net participant (perhaps even on a local fm net) for delivery; and, the relative "newness" of the participants is related to the mode of relay.

The National Traffic System (NTS) sponsored by ARRL and originated in 1949 is the offspring of the cw-traffic-oriented amateur — especially the higher levels of traffic relay. Those who were of the microphony persuasion were looked upon with some disdain. This in spite of the fact that the majority of section- and local-level traffic nets of NTS were voice modulated.

After several futile efforts at conducting phone sessions at the region level, in 1972, ARRL unveiled a daytime-version traffic system designed to appeal to phone operators in greater numbers. The objective was to attract housewives, as well as retired and second/third shift workers, into the joys of handling traffic, especially those who looked at cw with a somewhat jaundiced eye. Initial efforts were successful. So much so that the System underwent a number of not-so-smooth evolutionary improvements. It started out almost to resemble a separate NTS for phone. But the vision of a single, unified NTS, with cw and phone operators alike joining hands for singleness of purpose, prevailed.

Thus, the goal of unity has been reached. And the expeditious handling of traffic with an effective emergency-response capability has resulted. This integration has opened the doors to many new participants. Those who are now just discovering an interest in traffic handling are solicited to participate in a systemized, disciplined approach to the handling of third-party traffic. The jobs available are many. You do not have to be long on experience. On-the-job training is encouraged. Who do we seek?

Are you retired and looking for a way to pay back the public for the privilege of having a ham ticket? We need you. Are you a student available to play radio in the late afternoon? We need you. Are you a YL who could care less whether Ma Perkins' illegitimate son runs off with Stella Dallas, and thus prime for daytime traffic net operation? We need you. Are you the breadwinner who works second or third shift? We need you. Sure, we can make use of the radio talents of others available during the more traditional nighttime hours. But this is a special invitation for participation by those who have previously felt left out. This appeal is to those who may operate exclusively on phone and feel they have been neglected. Some have failed to participate in the past because of the misconception that one must earn his or her stripes only through many years of pounding brass to the midnight oil. Not so. This is directed to those who want to have fun in their ham radio activities while serving the public need.

There are positions open now for those with little experience right up through the Transcontinental Corps. The vineyards beckon for many workers. You don't have to be a 1938-vintage chablis to qualify. This is your invitation. As with the Uncle Sam caricature . . . the finger is pointed at you. We want you.

What are some of the tasks that await you? Suppose you're a WØ retiree living in Carter Lake, Iowa. The code is not your forte and you're president of the Richard Dawson fan club. After indicating your interest in daytime traffic-handling to the manager of the Tenth Region Net (TEN), you are assigned as liaison to the Central Area Net (which meets at 2:30 P.M. Central time on sideband). Your function is to pick up all traffic going to the tenth region and bring it back to TEN later in the afternoon. It's fun, you enjoy the challenge, and you don't miss "The Family Feud."

Scenario two. You are basically a phone daytime operator living in Story, Wyoming. You volunteer for a uniform sked to pick up eastbound traffic from the daytime phone session of the Pacific Area Net. Later on in the day you meet an eastern station on a prearranged schedule to pass the traffic on a frequency and mode of mutual choice. You volunteer to perform this important job only once a week. FB!

Notice it's not a closed shop. Multiply each function by seven days of the week to indicate the number of participants needed. Therein lies the strength of NTS, i.e., many hands sharing the joy of the workload. It's a cooperative effort integrating those daytime phone operators with those of the nighttime cw cycle. And you don't have to be an expert to get into the program, as the opening scenario illustrates.

How do you get started? We recommend listening to your section and region nets to find out who to talk to to get started. If you have no idea of where and when they meet, we'll be happy to send you a copy of the ARRL *Net Directory*. If you need a name and call to contact, write ARRL hq. and we'll put you in touch with the proper party. Just write to us and say, "I've read your *QST* article on daytime traffic handling and I'm ready to pick grapes in the NTS vineyard." We'll point you in the right direction. But you have to make the first move.

SCM APPOINTMENT

In the Nebraska Section, Shirley M. Rice, KAØBCB, has been appointed to complete the term (until December 31, 1980) of Rex P. Greenwell, KØKP (resigned).

FREQUENCY MEASURING TEST

Frequency shifting occurred during the early 20-meter FMT on September 14, with stability attained near the end of the period. Late 20-meter signals suffered the fate of poor propagation and were not copied by the umpire. The umpire measured frequencies for the early run at 14,076,241, 7010.999 and 3550.415 kHz. The late run checked out at 7014.292 and 3560.422 kHz. A total of 80 entries were received, representing 825 individual measurements.

Sixty-six of the 80 who submitted entries measured within 100 Hz, an annual requirement of OO "precise frequency measurement." They are listed as follows, with average error preceding their call signs: (0 Hz) W1JH W1PLI W2AXT WA4AXA W4IBU W4NTO WA5NOM W5ZTN WA6IQL WB7CRU W8CUI W8OK W9LCK KØKV WØUSL, (1) W1BGW W3BFF W3WD W5FMO ex-7HM W8NWU, (2) K2RG K7AW, (3) WA3RXE W6RQ (4) K1VYQ WA4CAW W1FDH W6CBX K7CC, (5) K6MZN, (7) W3FYX, (8) W8LX W9HPG, (10) W2AIQ, (11) K9AUB, (12) W4DRF AJ5P, (13) K5FSA, (15) W2ND WØGW, (16) W4HU WB9VUO, (17) WØSS VE3FCU, (20) W4PKD, (22) NØST, (24) W6DLI. N8AU, (25) W3KEK W9TGN, (28) VE2JN, (29) W3KCM, (37) KE8X, (44) WA7DUY W7SC, (49) WA3CFC, (51) W6SSB, (63) N6PE, (72) VE4ZX, (75) WA2MID WA6NQF, (77) W7SK, (82) W4UCL, (88) W9KEZ and (97) W8ZRL. All entries measuring over 100 Hz have been notified individually.

Excerpts

The equipment used here for the tests consisted of a Heath SB-300 receiver using a 400-cycle band-pass filter. The VFO, i-f and bet osc. frequencies were brought out of the receiver and went to a mixer unit, which in turn went to a homemade 8-digit counter. The counter was checked against WWV to four points (W2AXT). I enjoy the FMTs and am looking forward to the next one. Keep up the good work (WA4AXA). I enjoy getting set up for the FMT nearly as much as the actual FMT itself (W4IBU). I "cheated" and borrowed an HP-3586 wave analyzer from work. It's really an FMTer's dream in that it is fully synthesized to 0.1 Hz resolution. It has a 20-Hz i-f filter and a built-in counter to measure the exact frequency of any signal in its band-pass (KØKV). My plans to use all homemade equipment for this test did not get accomplished. Perhaps by the next test, I will have the receiver working well enough to use (W3WD). Any interest in an article on "How To" for frequency measuring? (WØUSL). [Sure! — W1CKK] I use the NBS "transfer oscillator" method, using a Heath IB-1100 counter with modified time base (K1VYQ). I enjoy participating in the FMT and hope they continue for years to come (W2ND). Thanks for this event. Sometimes I even come close (W4UCL).

Feedback

W4NM measured 13 Hz average error for the May FMT instead of 72 Hz error as reported (sorry 'bout that).

November 15 (UTC) is the date set for the next FMT. Be sure to check the "Contest Corral" column in November *QST* for full details. Good luck! — *Jeanne DeMaw, W1CKK*

W1AW NOTE

The complete W1AW winter operating schedule appears in October *QST*, page 90. A W1AW schedule also is available on request from ARRL headquarters. Please enclose an s.a.s.e. See the "Contest Corral" section of *QST* for times and dates of W1AW Code Proficiency Runs.

*Communications Manager, ARRL

OSCAR Operating Schedule

	OSCAR 7			OSCAR 8			
DATE (UTC)	*Orbit No.*	*Time UTC HR MN*	*Eqx W. Long. Degrees*	*Orbit No.*	*Mode*	*Time UTC HR MN*	*Eqx W. Long. Degrees*
1 Dec.	27,653	0020	79.7	13,969	A	0018	60.5
2 Dec.	27,666	0114	93.2	13,983	A + J	0023	61.7
3 Dec.	27,678	0014	78.1	13,997	X	0028	62.9
4 Dec.	27,691	0108	91.7	14,011	A	0033	64.2
5 Dec.	27,703	0007	76.5	14,025	A + J	0038	65.4
6 Dec.	27,716	0101	90.1	14,039	J	0042	66.6
7 Dec.	27,728	0001	75.0	14,053	J	0047	67.8
8 Dec.	27,741	0055	88.5	14,067	A	0052	69.0
9 Dec.	27,754	0149	102.1	14,081	A + J	0057	70.3
10 Dec.	27,766	0048	87.0	14,095	X	0102	71.5
11 Dec.	27,779	0143	100.6	14,109	A	0106	72.7
12 Dec.	27,791	0042	85.4	14,123	A + J	0111	73.9
13 Dec.	27,804	0136	99.0	14,137	J	0116	75.2
14 Dec.	27,816	0036	83.8	14,151	J	0121	76.4
15 Dec.	27,829	0130	97.4	14,165	A	0126	77.6
16 Dec.	27,841	0029	82.3	14,179	A + J	0131	78.8
17 Dec.	27,854	0123	95.9	14,193	X	0135	80.1
18 Dec.	27,866	0023	80.7	14,207	A	0140	81.3
19 Dec.	27,879	0117	94.3	14,220	A + J	0002	56.7
20 Dec.	27,891	0016	79.1	14,234	J	0007	57.9
21 Dec.	27,904	0111	92.7	14,248	J	0011	59.1
22 Dec.	27,916	0010	77.6	14,262	A	0016	60.4
23 Dec.	27,929	0104	91.2	14,276	A + J	0021	61.6
24 Dec.	27,941	0003	76.0	14,290	X	0026	62.8
25 Dec.	27,954	0058	89.6	14,304	A	0031	64.0
26 Dec.	27,967	0152	103.2	14,318	A + J	0035	65.2
27 Dec.	27,979	0051	88.0	14,332	J	0040	66.5
28 Dec.	27,992	0145	101.6	14,346	J	0045	67.7
29 Dec.	28,004	0045	86.5	14,360	A	0050	68.9
30 Dec.	28,017	0139	100.0	14,374	A + J	0055	70.1
31 Dec.	28,029	0038	84.9	14,388	X	0059	71.4
1 Jan.	28,042	0133	98.6	14,402	A	0104	72.6
2 Jan.	28,054	0033	83.5	14,416	A + J	0109	73.8
3 Jan.	28,067	0127	97.1	14,430	J	0114	75.0
4 Jan.	28,079	0027	82.0	14,444	J	0119	76.2
5 Jan.	28,092	0121	95.6	14,458	A	0124	77.4
6 Jan.	28,104	0021	80.5	14,472	A + J	0129	78.6
7 Jan.	28,117	0115	94.1	14,486	X	0134	79.8

Orbit predictions by Project OSCAR, P. O. Box 1136, Los Altos, CA 94022. To keep abreast of the latest developments, tune in to the regular phone and cw bulletins over W1AW, AMSAT bulletins transmitted around 29.490 MHz on Mode A, 145.960 MHz on Mode B, and 435.160 Mode J, during O 7 and O 8 reference orbits, and AMSAT nets (East Coast at 0100 UTC Wednesdays; Mid States at 0200 UTC; West Coast at 0300 UTC, all on 3850 kHz lsb); (international net at 1800 UTC Sundays on 14,280 kHz usb and 1900 UTC Sundays on 21,280 kHz).

O 7 progresses an average of 28.7373° W. per orbit in a period of 114.9417 minutes.
O 8 progresses an average of 25.8013° W. in a period of 103.1974 minutes.

O 8 modes of operation are Mondays and Thursdays — Mode A. Tuesday and Friday — Mode A + J. Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D. Mode A + J is simultaneous operation of both transponders.

Spacecraft Frequencies

Spacecraft	*Uplink*	*Downlink*	*Beacon*
O 7			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.502 MHz
Mode B	432.125-432.175 MHz	145.975-145.925 MHz	145.972 MHz
O 8			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.402 MHz
Mode J	145.900-146.000 MHz	435.100-435.200 MHz	435.095 MHz

Formulas for calculating approximate downlink frequencies. x = downlink frequency.

OSCAR 7

Mode A: x = uplink frequency − 116.450 MHz ± Doppler shift
Mode B: x = uplink frequency − 578.100 MHz ± Doppler shift

OSCAR 8

Mode A: x = uplink frequency − 116.458 MHz ± Doppler shift
Mode J: x = uplink frequency − 581.106 MHz ± Doppler shift

Note: A minus sign in front of the downlink frequency indicates that the passband of the satellite is inverted in that mode. This means that signals transmitted up to the satellite at the low end of the uplink passband will appear at the high end of the downlink passband.

Additionally, upper-sideband signals transmitted on the uplink will appear as lower-sideband signals on the downlink.

Mode J Club

Become a member of the Mode J Club. Complete eight Mode-J contacts. QSL cards are not required. Just list the call sign of each station worked, date, orbit number and station equipment used. Send this information along with $3 in U.S. funds, a one-time charge to cover the certificate and newsletter costs, to Mode J Club, c/o Larry Roberts, W9MXC, 3300 Fernwood, Alton, IL 62002.

OSCAR 8 QSL

To receive an OSCAR 8 QSL card, send a copy of the telemetry from the 29.402- or 435.095-MHz beacons. Please send your report, along with an s.a.s.e., to ARRL hq.

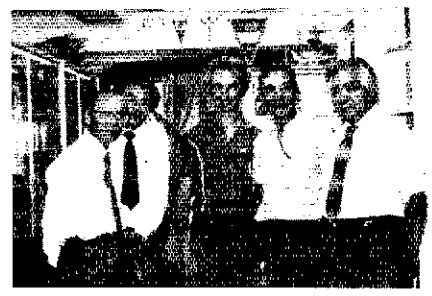
Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq.

Strays

May 17 was a red-letter day for the Milwaukee Radio Amateurs Club, Inc. Wisconsin Governor Lee Sherman Dreyfus, whose trademark is a red vest and the red pen he signs documents with, proclaimed May 17 Amateur Radio Day in Wisconsin. This notice was displayed on the Milwaukee City Hall. How's that for publicity? *(photo courtesy W9SNK)*

VISITING JAPAN?

Probably all amateurs visiting Tokyo, whether on business or for pleasure, visit the electronics paradise in the Akihibara section. But they would also do well to take the time to pay a call on the headquarters of the Japan Amateur Radio League in the Sugamo section. Easily accessible by subway, JARL occupies several floors in the *CQ* building. When we dropped in we were given a very warm greeting. JM1RYK, of the JARL Foreign Affairs Office, gave us a tour, the highlight of which was JARL's newly opened radio museum. The time spent meeting the JARL staff was truly memorable, giving us a better appreciation and understanding of our fellow amateurs in JA-land. — *Paul R. Ryack, W1ETH, South Hadley, Massachusetts*



W1ETH (center) on a tour of JARL's radio museum and headquarters. Also shown (left to right) are JM1RYK, JARL Foreign Affairs staff; JH1HNH, Publicity Manager; JA1CO, Chief of Technical Information Section and JI1RGM, JARL General Manager.

Public Service

Conducted By Robert J. Halprin,* K1XA

Amateur Radio and the Tall Ships

Jubilee 350 is a year-long series of events marking Boston's 350th anniversary. One of the events was the arrival of the Tall Ships on May 30, and their subsequent stay through June 3, when they would begin a transatlantic race to Oslo, Norway. This article describes the part played by Amateur Radio in the Tall Ships festival.

With the arrival of over 50 sailing ships, ranging from the 370-foot topsail schooner *Juan Sebastian de Elcano* from Cadiz, Spain, to the 39-foot schooner *Blue Maid* from Staatsburg, New York, as well as the aircraft carrier *JFK*, it was obvious that large crowds could be expected to view their arrival and even board some of the ships. The Boston chapter of the American Red Cross planned to set up and man first-aid stations around the harbor as the ships arrived and on the piers, where the ships would dock. It was with this agency that amateurs first became involved.

The Planning

Amateur Radio operators had recently renewed liaison with the Boston Red Cross by participating in the 1979 Simulated Emergency Test from the downtown Boston Red Cross headquarters, where a well-equipped radio room was in place. This activity initiated further meetings, which resulted in the establishment of a technical committee to proceed with putting up a wide-coverage, 2-meter repeater for emergency communications. Liaison with the Red Cross was through N1ALS, who is in charge of communications for their disaster services organization. WA1IDA was to coordinate plans from the amateur standpoint. Having had experience with large public service activities before (namely Boston's bicentennial celebration), he was the logical choice for this activity. N1ALS and WA1IDA attended meetings with the city's organizing committee ("operation sail"), and formulated plans for the communications effort. WA1IDA also held meetings with leadership officials of the Eastern Massachusetts ARRL section — SEC WA1BLG, STM WA1TBY, DEC KA1AQE, local ECs and others.

The plan was to use simplex for communications among first-aid stations, because of their close proximity along the pier. In addition, a repeater was to be used on the first day as an emergency channel to link us with the city's police communications center where the ambulance-service dispatcher was located. Thus, two channels would be available. The first would be administrative (low priority), and the second would be an emergency channel for high-priority ambulance calls *only*. One assumption made was that most people would have synthesized radios covering 2-meter fm. This turned out to be true, and was a great advantage when we were forced to modify the plan during the event.

Recruiting personnel was a major effort prior to the event because the activity would run from a Friday through a Tuesday. Except for the weekend, workdays would be involved. Also, full days would be required of the volunteers because the only access to the piers for people with equipment would be via Red Cross vehicles — which arrive once in the morning and leave once at night. Many announcements were made on the local repeaters, and a notice was put in the Eastern Massachusetts section newsletter (circulation 3000). This filled the bill.

WA1IDA decided to pursue PR well in advance of the event, rather than at the last minute. Accordingly, AB1Z was designated our PR officer; he produced and distributed news releases prior to the event, and for the most part was free to pursue radio, TV and press coverage for Amateur Radio during the activity. This worked out well, especially on the first day, when he was free to roam around and take photos of hams in action. Largely because of his efforts, we enjoyed excellent radio and television coverage — some of it live!

The Big Day

May 30, 6 A.M. The weather was clear and warm; 36 hams arrived at the Boston Red Cross headquarters. WA1IDA held a briefing, and as soon as each Red Cross vehicle was ready to depart for its position, an amateur was assigned to accompany it. The plan was to use the 146.985 repeater for the emergency (ambulance) frequency, and .91 direct for administration, under the direction of W1UVE, who was positioned high above the waterfront in the Coast Guard station. KA1HG was designated to coordinate with the Red Cross headquarters on the administrative channel.

All field stations were instructed to use the emergency channel only for summoning an ambulance when directed to do so by Red Cross personnel; otherwise they were to monitor the administrative channel. Permission of net control would not be necessary to leave the frequency for an ambulance call, as this would only slow the process, particularly when the channel was very busy. This system worked well throughout the operation, with a minimum of confusion.

At 8 A.M., *Old Ironsides* (the *U.S.S. Constitution*) left the harbor to lead the parade of ships. The crowds lining the harbor were huge. At 10 A.M., the *Constitution* reentered the harbor, cannons booming, with the magnificent sailing ships following under full sail. The largest fleet of sailing ships ever to visit Boston entered the harbor. The crowd became swept up in the excitement of the moment. Cheers erupted spontaneously from the throng, as cannons roared and sailors from all over the world exchanged excited waves and wishes of friendship and welcome. It was an all-encompassing flow of emotion that would have been impossible to predict, and would last for precious few hours. And what better group of volunteers to participate in such an event than hams who already know the meaning of international goodwill.

By this time, most of the hams were quite busy. The administrative channel sounded normal enough, with supplies being moved from here to there and status reports being transmitted to keep Red Cross officials informed. The emergency channel was hopping. In a three-hour period, KA1AQE received over 10 calls for ambulances. These included responses for an epileptic seizure, a cardiac arrest and a case of appendicitis.

The only flaw in the communications plan was the use of the direct frequency. The net control could work everyone, but it was clear that the operation could be improved if everyone could hear each other. This was the problem at the Red Cross headquarters, which was out of range of most of the communications. As a result, the ensuing days saw the use of repeaters almost exclusively. Repeater trustees and normal users were most cooperative on short notice, and things ran smoothly.

The Results

Over 3 million people came to see the Tall Ships (including 10,000 sailors). This exceeded predicted crowd sizes by 1.5 million. More than 65 hams, ranging in age from 79 to 13, participated in the event, some for all five days. As a result, the Red Cross was very well supported and most appreciative of our efforts. Although the prime Amateur Radio activity was with regard to the Red Cross activities, we also ran a message center for sailors and the general public. In addition, we helped coordinate ship-position information during the transatlantic race (Amateur Radio communications had been set up by a group of hams from Virginia). Ham radio got almost daily radio and TV exposure over Boston's WBZ during this period.

We learned some things along the way. For example, no matter how well and how long you plan, the best thing to build in is *flexibility*. Also, even in large operations, fully synthesized rigs can be counted on. And, I'm glad to say, so can the amateurs in the area, who again demonstrated an ability to get the job done. — *Rick Beebe, K1PAD, SCM EMass/Vice Director-elect, New England Division*

*Assistant Communications Manager, ARRL

ATTENTION NET MANAGERS

For details on a unique traffic-handling training program, contact Pete Skorupsky, WB2IQJ, 274 Lowell Ave., Trenton, NJ 08619. Pete is manager of the New Jersey Slow Net, which meets on 3735 kHz at 2330Z daily, and has had excellent results in the recruitment and training of newcomers to the traffic-handling world.

PUBLIC SERVICE DIARY

☐ Cheyenne, Wyoming — December 4, 1979. During strong winds, a motor home was blown across the median of Interstate 25 and flipped over, injuring one of the occupants. AGØB braved the cold, winds and snow, offering first aid. He then used 2 meters to contact the Wyoming State Patrol and an ambulance. (AGØB)

☐ North Oxford County, Maine — June 25-26. Hams helped in the search for two handicapped teenagers who became lost in the woods. Communications were maintained between the ranger station and the search party via Amateur Radio until both youths were found. (W1RWG, SCM Maine)

☐ Gila Bend, Arizona — July 8. While a radar test range in a remote area of the southern Arizona desert was being inspected, a 4-wheel-drive vehicle became stranded in loose sand. W7GZ, a passenger in the vehicle, contacted W7KOY via 2 meters. W7KOY called the Air Force and requested assistance. After nine hours, the victims were rescued. (John R. Scott)

☐ Liverpool, Ohio — July 16. During a severe storm, hams reported information regarding downed trees and power lines to local fire department and power company personnel. (K8HGY)

☐ Martha's Vineyard, Massachusetts — August 18. When normal communications circuits aboard a U.S. Navy vessel failed, a ham used 2 meters to contact a hospital in nearby Newport, Rhode Island, to report a serious injury onboard. (N5BGR)

☐ Columbiana County, Ohio — August 18. When flash flooding caused extensive damage to Salineville and Wellsville, members of the Triangle ARC were called in to assist the Red Cross, National Guard and Civil Air Patrol. WR8AJL was used for the operation, with special equipment for cleanup requested via autopatch. (K8HGY)

☐ Martin County, Kentucky — August 22. When a flood damaged over 100 homes and disrupted telephone service to the remote community of Beauty, hams provided Department of Emergency Services (DES) headquarters in Frankfort with communications via 75 and 2 meters. (WD4BUB)

☐ Coronado National Forest, Arizona — September 20. After two hikers were lost, hams used 2 meters to notify the deputy and park rangers, and to coordinate search teams. Both hikers were located a short time later. (K9HIV)

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Weirton, West Virginia — January 19. ARES/RACES members were placed on alert when 2 gallons of potentially dangerous ethylene ether were discovered in a construction building. The group monitored WR8AQA until demolition experts disposed of the material. (K8QEW, SEC West Virginia)

☐ Southeastern Virginia — February 2-3. Chesterfield County ARES members provided communications and information for the Virginia Office of Emergency and Energy Services (OEES) when a blizzard threatened the area. Hams used 2-meter Emergency Nets "B" and "C" to provide up-to-the-minute weather reports for OEES. (W4NWM, EC Chesterfield Co.)

☐ Hemet, California — February 19. When extensive flooding threatened the town, ARES members were called in to assist in setting up disaster shelters and help with the evacuation of the nearby town of San Jacinto. (WA6QMW, EC District 1)

☐ Enterprise, Utah — February 21-22. Washington Co. ARES members provided emergency communications on 40 and 2 meters when a dam was in danger of breaking. (K7WG, EC Washington Co.)

☐ Daviess Co., Kentucky — March 1. The Owensboro ARES supplied administrative communications for 100 to 150 firemen fighting a warehouse fire. (W4OYI, Asst. Dir., Great Lakes Div.)

☐ Cullman Co., Alabama — March 1. Amateurs assisted civil defense officials when a severe ice storm struck the area. The hams used WR4ASY to keep track of road conditions and provide communications for 135 people in a temporary shelter. (AK4B, EC Cullman Co.)

Here's part of the group attending the NTS Eastern Area Staff meeting in Syracuse (see August 1980 *QST* for a summary). From left: WA4CCK, W2ZOJ, KB6FR/3, WA1VEI, K1BA, W1QYY, VE1WF, VE3GOL. *(K2KIR photo)*

☐ Forsyth Co., North Carolina — March 2-3. ARES members assisted the Red Cross and other emergency agencies when a snow storm trapped many people in their homes. Hams used 2 meters to coordinate the delivery of food and fuel to stranded families. (WB4ZKF, EC Forsyth Co.)

☐ Greenwood Co., South Carolina — March 1-3. When an ice and snow storm made travel dangerous, hams assisted the county disaster preparedness service in transporting key personnel to the local hospital. The hams used simplex and the Western Carolina Emergency Net on 2 meters to dispatch the vehicles. (K4VIA, DEC Zone 4)

☐ Southeastern Virginia — March 1-3. ARES members generated hourly weather reports for the Virginia Office of Emergency and Energy Services and provided communications for the local hospital when a blizzard struck the area. (WB4UHC, DEC Yorktown)

☐ Cullman Co., Alabama — March 20. Hams established a net on WR4ASY to monitor weather conditions for the county civil defense when a tornado watch was issued. (AK4B, EC Cullman Co.)

☐ Farmington, Connecticut — March 22. The Red Cross requested communications assistance when flooding forced 150 families to evacuate their homes. Local ARES members set up communications on 2 meters and 220 MHz between the Red Cross Center, the police department and the threatened areas. (W1SY, SEC Connecticut.)

☐ Prospect, Ohio — June 4-5. When flooding forced 42 families to flee their homes, ARES members were called in to maintain communications between the Red Cross Chapter House and an emergency shelter. Hams handled more than 125 messages via WB8SEC/R during the two-day period. (WD8NEE, EC Marion and Wyandot Cos.)

☐ McLean County, Illinois — June 7. A tornado caused heavy damage, and hams provided communications for the power company when high-tension lines were downed. (K9ORP, EC McLean Co.)

☐ Owensboro, Kentucky — July 1. ARES members linked Coast Guard, DES and local police officials during the search for a drowning victim in the Ohio River. (W4OYI, Asst. Dir. Great Lakes Div.)

☐ Staten Island, New York — July 9-10. Local hams used WA2RXQ/R to help with communications during the search for a missing 10-year-old girl. (KA2CNN, Asst. SCM, NLI)

☐ Rushville, Indiana — July 9-11. As severe tornado activity struck the area, ARES members activated a 2-meter weather watch net, tracking the storms across the state. Using K9POP/R, they also assisted local authorities by obtaining status reports of those injured as a result of the severe weather. (K9POP, EC Rush Co.)

☐ Pelican Narrows, Saskatchewan — July 10-11. As a large forest fire approached the town, the Saskatchewan government contacted VE4BO, requesting that he set up a communications link to relay information in and out of the disaster area. During the ordeal, hams relayed supply and equipment requests for the over 1000 fire fighters and victims who had been evacuated to an island just off the coast of Pelican Narrows. (VE4BO, DEC Northern Manitoba)

☐ Olmstead County, Minnesota — July 12. A storm with winds greater than 100 mi/h moved through the area, causing $1 million in damage. Local hams provided emergency power and 2-meter communications via WRØAFT for Byron City Hall and the Olmstead/Rochester EOC. (KØIS, EC Olmstead Co.)

☐ Lake Erie — July 19. While vacationing on the lake, N8II saw four people on an uninhabited island waving a white flag attached to an oar. Their boat had a hole in the hull and was taking on water. N8II used his 2-meter hand held to alert the Coast Guard, and help arrived almost immediately. (K8AN, SEC Ohio)

☐ Danville, Illinois — July 20-21. ARES members used K9PD/R to handle traffic for the Emergency Services and Disaster Agency during the search for a drowning victim. (WB9YJF, EC Vermilion Co.)

☐ Muldraugh, Kentucky — July 26. When a train carrying vinyl chloride derailed and sent a toxic cloud into the air, local ARES members activated a net on WR4AIQ. They located a group of Boy Scouts camping in the woods and arranged for their evacuation. The hams also provided communications for the Red Cross. (WA4YPQ, EC District 5)

☐ San Diego County, California — July 28-29. ARES members provided 2 meter communications between Ranger Unit Headquarters and a remote fire camp when lightning started a series of wild land fires. (W6INI, SEC San Diego)

☐ Temple, Texas — August 6-8. When Hurricane Allen hit the Temple area, members of the Triangle ARC set up and maintained an emergency communications liaison with the Refugee Evacuation Center, handling weather, road and health-and-welfare information. (KD5Z, EC Bell Co.)

☐ Athens, Georgia — August 12. When a severed telephone line disrupted Teletype service between the NWS forecasting office in Atlanta and the regional radar station at the airport in Athens, ARES members set up a vhf-to-hf link, relaying periodic surface condition reports. (AA4U, EC Athens)

☐ Davenport, Iowa — August 20. After a severe windstorm hit the Davenport/Bettendorf area, ARES members assisted the local police and fire departments by providing emergency power and additional security for a large concert. The hams also assisted in clean-up operations, utilizing WØBXR/R. (KØMST, EC Scott Co.)

☐ Fargo, North Dakota — August 6. As a hailstorm pelted the town with baseball-sized hail, hams established an hf link between DES headquarters in Bismarck and the disaster sight. Over 30 messages were handled as a result of the eight-hour ordeal, during which the town was left without power, water or telephone service. (WBØBIN and WAØRWM)

☐ Rochester, Minnesota — August 28. When the town's telephone service was interrupted, hams provided communications support for fire, hospital and police personnel. (WDØHEB, Asst. EC Rochester)

☐ Delaware County, Indiana — September 13. During an eight-hour power outage, ARES members supplied backup communications for the Emergency Medical Service (EMS), which provides ambulance service to the entire county. For over an hour, Amateur Radio was the only communications link between the ambulances and the dispatcher. (K9UJK, EC Delaware Co.)

☐ Minot, North Dakota — September 15. When the main switchboard for the community malfunctioned, hams set up stations at the three area hospitals and City Hall. (WB8BZH, DEC Ward Co.)

☐ Champaign County, Illinois — September 16. ARES members coordinated a 2-meter tornado watch over a 14-county area, during which two actual touchdowns were confirmed. Fortunately, nobody was injured. (KB9BB, EC Champaign Co.)

☐ Manchester, Tennessee — September 23. After emergency telephone service to the communications center was disrupted, ARES members provided a radio link between an outside telephone and the center, relaying calls for local emergency services. (W4WJH, EC Coffee Co.)

☐ Lincoln, Nebraska — September 25. After a police officer was abducted by two armed fugitives, the Lancaster ARES was requested to assist in the search. Hams manned observation points throughout the city until the fugitives were captured, in Iowa, two days later. (KØGND, EC Lancaster Co.)

☐ Modesto, California — September 26. WB7JAZ, the pilot of a small aircraft, experienced a complete electrical failure while on an instrument flight rules (IFR) flight plan to Modesto, leaving him without communications with flight control. He contacted N6VS (also a pilot), who relayed the aircraft's position to the FAA. As the flight was nearing Modesto, WB6UMT provided a phone patch to the Modesto tower, giving the pilot direct communications with the flight controllers. (N6VS, EC San Francisco)

☐ Potsdam, New York — October 4. The St. Lawrence Valley ARES was called in to assist REACT in communications for a walk-bike-a-thon. Hams provided communications to areas not accessible by CB. (WB2NAO, EC St. Lawrence Co.)

REPEATER LOG

For *QST*'s Public Service Column

PLEASE PRINT

Repeater call sign _____ **Location** _____

Reporting period: From _____ **To** _____

	WEATHER EMERGENCY	CRIMINAL ACTIVITY	MEDICAL EMERGENCY	VEHICULAR EMERGENCY	FIRE EMERGENCY	SEARCH & RESCUE	PUBLIC SAFETY EVENTS	DRILLS/ALERTS	POWER FAILURES
Totals									

Submitted by _____, _____ **Date** _____

CD-258 (980) **Printed in U.S.A.**

The Repeater Log section of this column has evolved into a very popular feature, with repeater clubs and groups "going public" with their significant emergency and public-safety activities. To streamline the reporting procedure and encourage even more repeater clubs to send in such information, form CD-258 has been created. This form can be used to report your repeater's service to the community, for ultimate recognition in "Public Service." A supply of the cards can be requested from the ARRL Communications Department. Just send in an s.a.s.e. and ask for CD-258.

REPEATER LOG

According to reports received between September 21 and October 21, the following repeaters and simplex frequencies were involved in the delineated public service events.

	Weather Emergency	Criminal Activity	Medical Emergency	Vehicular Emergency	Fire	Search and Rescue	Public Safety Events	Drills/Alerts	Power Failures	Total
K1LT							1			1
W3UER				4	1		3			8
WA3JDX				1						1
K4HEX							3			3
K4HY	1					1				2
K4IGB								1		1
WR4AXO							3	1	1	5
WR4AZD								1		1
K5HCJ				2						2
WA5FYI				1						1
WR5ABA				3						3
WR5ABE				3						3
WR5ABI				5						5
WR5ABY		4		4						8
WR5APK				1						1
WR5APN		2								2
VE5SCA				2						2
N6BAE						1				1
W6FNO				1						1
W6IYY				4				4		8
WR6AEN			1	33	1					35
WR6AOX				3						3
K7CC			1	6	1		3			11
W7WGW		1		4	1					6
WR7AEL							1	1		2
K8BO								1		1
K8LG								1		1
K8VXH							2			2
WA8ULB			1	1						2
WB8UIN			3				1			4
WD8IEL								1		1
WR8ABO							1			1
WR8ABZ							4			4
WR8AES							4			4
K9ORP	1									1
WØEQU		1					1	10		12
WØILO	1							1		1
WAØUXT								1		1
WBØCMC		1	3		1		1	1		7
WBØSBH	1						1			2
WRØAEV							1			1
WRØAFT	1									1
Simplex				2			9	1		12
Total	5	9	9	82	5	2	39	25	1	176

ARRL SECTION EMERGENCY COORDINATOR REPORTS

For September, 27 SEC reports were received, denoting a total ARES membership of 15,333. Sections reporting were Ala, Alta, Ariz, Ark, Colo, Del, Ill, Ind, Kans, La, Mar/NFld, Mich, Minn, Nev, NFla, Ohio, Ont, SV, SDgo, SJV, SCV, SFla, SNJ, Va, Wa, WVa, WMass, WPa.

COMMUNICATIONS SERVICE OF THE MONTH

Traffic handling has long been an exciting and rewarding aspect of Amateur Radio, particularly when an emergency situation occurs. A recent experience of mine, which involved meeting the urgent need of a hospitalized patient in Brazil for a cardiac medication, brought the unusual reward of a personal note of thanks and a moving account of the episode from the patient himself.

Late in the evening of June 1, while in QSO on 15 meters with Evio, PY1FO, I was asked to help obtain medication for a cardiac patient at Silvestre Hospital in Rio de Janeiro. The particular medication requested is readily available in the U.S., but not in Brazil. I agreed to try, but went to bed wondering how to accomplish the task promptly enough to be of any use to a critically ill patient in Rio.

The following day, I started off to my morning rounds at Middlesex Memorial Hospital in Middletown, Connecticut. On the drive to work, I turned on my 2-meter rig to the Selden, Long Island, repeater, WR2AHR, and mentioned that I had emergency traffic. When Ralph, N2AHL, asked if he could help, I explained that I was looking for someone who could assist in arranging to deliver medication to J.F.K. International Airport in New York for shipment to Brazil. Using both the mobile and hand-held 2-meter rigs in his car, Ralph arranged an impromptu link between the Selden machine and the K2KLN repeater in New York City.

Through this link-up, I spoke with Mike, WA2JKG, in Manhattan, who in turn contacted Sam, WB2JZN, in Brooklyn. Sam offered to take time off from work to pick up the medication at a local pharmacy and deliver it to the airport.

Pan American Airlines, through the efforts of Miss Janet Weeks in the Special Services Office, agreed to fly the medication that same day to Rio de Janeiro, without charge. In Rio, Evio, PY1FO, received the medication at the airport and hand-carried it to Silvestre Hospital to the room of the patient, Antonio Almeida.

A little over a month later, I was delighted to receive a thank you letter from Antonio. His note ends with a moral, and a tribute to Amateur Radio: "What human solidarity, what abnegation spirit of men [who] without knowing each other did everything to help a person who was to the hospital. At a time when everybody is worried with assaults, vengeance, death for silly matters, of war among nations, invasions of embassies, until now considered sacred, we still find people [who] will get together forming a true chain of kindness. What . . . secret code maintains these people together, as true friends, only to do what is good, without knowing each other, not even the people whom they are helping? May governments propagate this special code that we may have, within our generation, the peace that so many desire." — *(Dr. David P. Johnson, WA1OVK, Middletown, Connecticut)*

THIRD-PARTY TRAFFIC AGREEMENTS

The United States has made special arrangements to permit U.S. amateurs to exchange third-party traffic with amateurs licensed by any of these 28 other countries:

North America: Canada, Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama.
South America: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela.
Europe: 4U1ITU — Geneva
Asia: Israel, Jordan
Africa: Ghana, Liberia

Canada has made special arrangements to permit Canadian amateurs to exchange third-party traffic with amateurs licensed by any of these 19 countries:

North America: Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, United States
South America: Bolivia, Chile, Colombia, Guyana, Paraguay, Peru, Trinidad and Tobago, Uruguay, Venezuela
Europe: No countries.
Asia: Israel
Africa: No countries

NATIONAL TRAFFIC SYSTEM

Pursuant to due notice, the Central Area Staff (CAS) of the ARRL National Traffic System met in Oklahoma City, July 26, 1980. Present were W9QLW, W5GHP, W5KLV, WB5NKD, K5RG, W9FC, W9JUJ, WØAM, WØHI, WBØHOX. Observers were W5EDZ, N5TC, NØIN, K5GN, N5BB, W5RB, W5REC, WB5NKC. Highlights of the meeting are as follows:

1) Cycle Manager Responsibility — the Staff recommended to the communications manager that for NTS Plan A/B, responsibility for Cycles 1 and 2 be assigned to the daytime manager, and Cycles 3 and 4 to the evening manager. Measurement Criteria — CAS recommended the Eastern Area Staff (EAS) measurement criteria (for the one-year trial period) one through five, and the deletion of categories six and seven. Creation of Central Canada Region — the Staff moved that CAS defer to Central Canadian amateurs (VE4/VE5), and to support their desire for a Central Canada region net.

2) Terms of Reference — the Staff approved the T.O.R. and the EAS modifications, with an addendum of the CAS T.O.R., regarding those items only of interest to the Central Area.

3) The Staff expressed its sorrow on the death of WA5IQU, former RN5-E manager and long-time friend.

4) CAN-E 40-meter frequency — CAS recommended that the CAN-E manager investigate the possibility of a different alternate 40-meter frequency then the current alternate, 7067 kHz.

5) CAS assistance to Section Nets — Suggestions put forth in the matter of section level activities were: a letter from members-at-large to SCMs, STMs and NMs, explaining CAS objectives, desires to assist, etc.; presentations to conventions, being recognized by convention committees, soliciting invitations to traffic forums; more financial support for SCM efforts to expand section nets, more on-the-air meetings, and CAS and headquarters support for section net newsletters. It was unanimously carried that CAS reaffirm its support of paragraph three, section I, of the NTS staff's T.O.R.

6) The Staff voted unanimous support for the formation of a region level RTTY traffic net to coordinate RTTY traffic interests within the area.

7) The Staff unanimously approved a motion that the ARRL Long-Range Planning Committee consider NTS within its deliberations with support from CAS, in relation to advancements in the communications state-of-the-art — ASCII, OSCAR, packet radio, 2-meter repeater linkups, coherent cw, adaptive filters, spread-spectrum communications, micro/mini computers — and the effect of these advancements on long-range planning for NTS. Staff Matters — W9QLW and WØAM were both reelected as members-at-large, and K5RG was elected to succeed W9QLW as CAS chairman.

8) Numbered Radiograms — discussions on the new CD-3 encompassed areas such as membership awareness of the forthcoming change, number of minor revisions to date and the need to have a trial or checkout period to eliminate these problems. The Staff unanimously endorsed the new CD-3.

9) Central Area Operational Problems — This item was a major area of CAS concern, centering on CAN-D noncompliance with the NTS restructuring plan approved by the Inter-Area Staff, November 1979. W9QLW initiated the discussion by reviewing the process that lead to the adoption of the plan. The ensuing discussion was lengthy. With CAN-D in a pivotal situation to make the plan operational, W5KLV, as manager of CAN-D, agreed to conform to the plan (one session per day at 1430 hours local time). CAS affirmed its total support and offered to assist W5KLV in clearing TCC traffic even if liaison schedules to the evening cycle were required. Pacific Area Staff (PAS) resolution of this problem was urged.

10) Membership Input — The ways and means of enhancing membership involvement with the creation of new NTS policies and procedures was introduced by W5KLV. Discussion followed. It was the opinion of all present that more input should be solicited from NTS members and more lead time allowed before new NTS policies are created or initiated by the communications manager — unanimously approved.

September Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	30	899	29.9	.755	91.7	
CAN	30	622	20.7	.387	78.9	
PAN	30	301	10.3	.245	100.0	
Region Nets						
1RN	56	202	3.6	.285	65.0	96.7
2RN	52	204	3.9	.290	78.7	90.0
3RN	55	183	3.3	.217	78.8	76.7
4RN	60	592	9.8	.370	76.4	100.0
RN5	30	293	9.8	.288	93.7	80.0
RN6	60	378	6.3	.260	70.8	100.0
RN7	60	480	8.0	.902	100.0	100.0
8RN	60	256	4.3	.457	62.0	90.0
9RN	60	298	4.9	.241	——	80.0
TEN						76.7
ECN	30	84	2.8	.266	55.6	96.7
TWN						100.0
TCC						
TCC Eastern	113[1]	514				
TCC Central	84[1]	371				
TCC Pacific						
Cycle Four						
Area Nets						
EAN	30	1649	54.9	1.337	96.9	
CAN	30	747	24.9	.715	98.9	
PAN	30	1077	35.9	.961	96.7	
Region Nets						
1RN	60	565	9.4	.477	97.7	96.7
2RN	89	706	7.9	.534	98.4	100.0
3RN	60	460	7.7	.575	98.9	90.0
4RN	60	675	11.3	.414	95.2	100.0
RN5	60	514	8.6	.378	92.9	100.0
RN6	60	633	10.6	.444	94.0	95.0
RN7	60	691	11.5	.947	100.0	100.0
8RN	60	530	8.8	.400	94.0	93.3
9RN	60	512	8.5	.395	95.0	96.7
TEN	60	276	4.6	.287	80.0	100.0
ECN	60	390	6.5	.500	78.9	100.0
TWN	60	443	7.4	.297	98.6	93.3
TCC						
TCC Eastern	87[1]	422				
TCC Central	55[1]	285				
TCC Pacific	100[1]	689				
Sections[2]	9486	23,989	2.5			
Summary	10,830	39,534	3.7			
Record	6964	40,819	15.4			

[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (205): ABN ACN ASN SSN (AK), AEND AENJ AENM AENS (AL), APN ARN (AR), ATN (AB), SWN (AZ), NCN NCTN SBARESN (CA), CWN HNN (CO/WY), CN CPN RASON WESCON (CT), DEPN DTN (DE), BEN FAST FMSN FMTN FPON FPTN GN MEN NFPN PBTN PEN QFN QFNS SBEN SPARC TPTN (FL), ARES CGVHFTN CONYERS GCN GSN GSSBN GTFCN CVEN (GA), I75M TLCN (IA), IMN (ID/MT), ILN (IL) ICN ITN QIN (IN), KPN KSBN QKS (KS), 4DARES BARES KPON KYN PAWN (KY), LAN LRN LSN (LA), EM2MN EMRI EMRIPN EMRISS HHTN NEEPN WMN WMPN (MA/RI), MEPN MMN MTN WRIN (MB), MDD (MDC), AEN MPSN MSN PTN SGN SPSN (ME), MACS MITN MNN QMN UPN (MI), MWXN MSN MSPN MSSN (MN), ACE MEOW NEMOE (MO), APN (MR/NF), MTN (MS), CMN CN CNCTN CNN JFK M2MEN NCSSBN PCTN THEN (MC), GSFM NHN (NH), JSARS NJN NJPN NJSN NJVN OBTTN UCETN (NJ), NSN (NV), CDN CNYTN ESS HVN NYPON NYS OCTEN SDN STAR (NY), BN OSN (OH), OAN OFON OLZ ONON OPEN OTWN (OK), OSNE1 CMN LN NBN OLN OPN OSND OSNE2 (ON), BSN JCARES LBARES LBLARES MPCARES OREARES OSN PDXARES PTTN SOFM (OR), ATN EPA EPAPTN NWPATMTN PEN PTN PTTN WPA WPATMTN (PA), WQV/UHF (PQ), SCSSBN (SC), SDEN SDMN SDN SOWN (SD), PWXN RARA SATN SK2MN SPN (SK), TNVHFTN (TN), TEX TSN TTN (TX), BUN UCN (UT). VLN VN VNTN VSBN VSN (VA), WINS (WE/IN), BEN BWN NWTN WIN WNN WSBN (WI), WVN (WY).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

TCC/c2 certificates were issued to the following in recognition of two years continuous service: W5KLV, WA5BHF, WA5INJ, WB5NKC, WB5NKD. New certificates were issued to: W4OGG, K5KJN, K5PE, KA5BSN, WD5HHK, WB9WGD, WD9FDB

1	2	3	4	5
Cycle Two				
TCC Eastern	120	94.1	1035	514
TCC Central	90	93.3	——	371
TCC Pacific				
Summary	210	93.7	1035	885
Cycle Four				
TCC Eastern	90	96.7	1285	422
TCC Central	60	91.7	549	284
TCC Pacific	120	83.3	1366	689
Summary	270	93.9	3200	1406

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (September) *Cycle Two* — Eastern Area (N2YL, Director) — W1s QYY XX, K1XA, K2PL, N2YL, W2s CQB ZOJ, N3SJ, WB3GZU, AK4L, W4JK, WA4CCK, WB4PNY, AF8V, K8OZ, W8PMJ, WB8YDZ, VE3s ATU CWA GOL. Central Area (W9JUJ, Director) — W4OGG, WD4HIF, W5KLV, WA5INJ, WB5s NKC NKD YDD, WD5HHK, K5s KJN PE, KA5s AZK BSN, W9s JUJ NXG, WB9WGD, WD9FDB. *Cycle Four* — Eastern Area (W4SOQ, Director) — W1s KX NJM, QYY, K1s BA EIR GN SSH XA, WA1ZAZ, W2s CS FR GKZ MTA RQ, K2NY, WA2s IGB SPL; W3s FAF PQ, K3s KW NGN, WA3WQP, W4s MEE UQ, K4s BKX KNP YX, KB4N, WB4PNY, N4s KB NK, W8PMJ, WB8WTS, VE3s ATU CWA GOL SB. KB6FR/VE3. Central Area (W5GHP, Director) — N4MD, W4ZJY, W5s RB SBE, K5GM, N5s RB TC, W9s CXY DND NXG, WØs AM HI. KØCW Pacific Area (W5KH, Director) — K5MAT, N5NG, W5s JOV KH, N6s GW PZ, W6s EOT OA SZ VZT, WB6PVH, K7s HLR KSA MC, W7s DZX EP GHT LYA, KA7CPT, KB7JW, WA7GYQ, KØs BN DJ, WØLQ, VE7ZK.

Independent Nets (September 1980)

1	2	3	4
Amateur Radio Telegraph Society	30	788	324
Central Gulf Coast Hurricane	30	116	2009
Clearing House	30	135	412
Early Bird	30	632	354
Empire Slow Speed	29	73	381
Hit and Bounce	30	345	547
Hit and Bounce Slow	30	98	288
IMRA	26	439	1052
Mission Trail	30	221	1313
North American SSB Traffic	26	74	270
Piconet All Day Watch	172	262	2790
West Coast Slow Speed	30	107	299
20-Meter ISSB	26	434	512
75-Meter ISSB	30	522	921
7290 Traffic	46	443	2911

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll September 1980

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SCM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as emergency coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points, max. 5. This listing is available to Novices and Technicians who achieve a total of 40 or more points.

760 KA9CPA, *220* AF8V, *164* WD4COL, *142* WB2HDU, *140* W9JUJ WB3GZU, *138* WB4FVV, *136* WD8LRT, *134* WA4PFK W1GUX, *132* K9PNG, *131* VE3GOL, *126* W2ZOJ, *125* WA2SPL, *122* VE3KK WD4HIF WA4CNY, *121* W5JOV, *118* KA8CPS WB5NKD WD4AWN, *116* KZ4K VE3HTL W7LNE, *115* N4ET, *114* AA2H, *113* KA1BJY KA4LNA KCØZ WB2IQJ, *112* KB3DT WB8YRY, *111* K2GCE K2VX VE3FGU WB2PJU WD8NYN, *110* W4MEE, *109* WA2MFV WA2UWA WA4JDH WB2ZCM, *108* AF2L KB5TC, *106* K7GXZ WA1UGJ, *105* KB2HM W4GPL WA4CCK WA4STO WB2TQC, *104* N6AWH WA4SRD WB1HIH, *103* AFØO N2YL WA3PXA WB3FEH, *102* K4SCM W2MTA WA1TBY WB7WOW WD9IUX, *101* AG2R AK1E VE3ATU VE5WM WØOYH W4OGG, *100* KY4K WA5RVT, *99* WA8HGH WB2EAG, *98* N9AUG, *97* KA1BTU KA2CTU KA4ASZ KB9IT N5TC W5KLV W6NTN WB5YDD, *96* K4DZM KB5EK W7GHT, *95* K3JSZ KA8EPK W1TN W5DPR W5HMR, *94* KØPIZ KA1EO W2UEZ W2XD W3EGJ WD5EUE, *93* KA4GFU N2BNB VE3DPO, *92* WAØTNM WA7MEL WB6PVH WD8KZX VE1WF, *91* K3JL WB5TAY N2APB, *90* WØFT W1RWG W4JK W4NWM, *89* W4CKS W6JXK WA3WIY WB4WYG, *88* W2ACQ, *87* K4EV N5BT WB8JGW WB8MTD, *86* AJ3R KØEZ K1JHC W8VPW WA2ZJP, *85* W2TCA, *84* W9NXG, *83* KB3LF KB5NX N4AXN W2CC WB2IDS WB7TQF WB9WGD, *82* KA1FE KA3T KB7JW N8ABA WA2KOJ WA4EYU, *81* VE5HG N7AKX *80* KA4BBA VE3GT W9DM, *79* KB4OW KG5L N5RB W1EOF, *78* K6YD W2AHV WA8PIM WB3JYZ, *77* AE2T K7JV K8OZ KF8J N2BXB, *76* W7FJZ WA4EIC, *75* KA8DJZ N4PL W2AET WA8GMT, *74* KA6A W4ANK WD4CNQ, *73* AF1L KA2CLS N3EE N4AZI WØOTF W3BBN W5CTZ WA5QFD WA7LGN, *72* KA7AQB W5VMY, *71* N2CR WA1MJE WA2CUW WA2MVO WB1DXR, *70* K4ZN KA2CNN KBØMB KB8MX N6GW WB3GUR WB5JZP WB7OEX WB8SYA WB9JSR WD5GKH, *69* KØSI KB2GT KB4OZ W8GGX WD8KBW, *68* K1BSO K4VHT KA4NXG KN6C W6RNL WA3DUM, *67* AA3B AG9G N6ANL N6WP VE3DUK W4FMN W8UE KC4MM, *66* N3AKC W1TM W4HON W7JMH W9JIJ WB6QBZ WD8DYW WB8UBR, *65* KA2GQQ KA5AVQ KB6FC WA1IOG WD9DVA, *64* K5DY W4ODE WA2MFU WA3VIL WD4CNR WD5FLM, *63* KB2KW KB5UL N4BZH WAØTFC WA2EQW WA2SEL WB9WRC, *62* K5TL KA1KP KCØT VE3JLL WB3GZV WD6CSL, *61* KA1CGP/T KB6OT N2BDW/T N2BKK WDØBMR, *60* VE3BVG W4NOL WB1HGQ WB5MMI WD5DQR WD5IDB WD8QMP, *56* WB2RMJ/T WD8ILX/T, *55* KA2GTE/T, *53* KA1CMX/T, *51* WD5JYI/T, *50* WD4JTO/N, *45* KA4IKH/N, *44* WD5EAE/N, *43* WA2WUL/T *42* WD4CFZ/T, *41* KA4AUR/N, *40* N2BGR/T.

Brass Pounders League September 1980

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: WA2MVQ, N6ANL.

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
W3CUL	714	901	1233	49	2897
WØWYX	51	889	356	533	1829
NØBOP	0	828	284	323	1433
W9JUJ	16	499	488	24	1027
AF8V	273	301	252	131	957
WA4JDH	1	487	456	3	949
WB3GZU	59	356	419	39	873
W7DZX	29	350	349	3	731
KB7JW	90	240	302	10	642
W4MEE	5	321	272	21	619
WD4AWN	2	316	282	17	617
W3VR	184	156	261	7	608
VE3GOL	34	230	304	30	598
WD4HIF	4	271	274	26	575
W7VSE	8	301	221	32	562
WA4PFK	109	179	213	36	537
W5KLV	2	285	231	18	536
WA7LGN	26	239	264	3	532

BPL for 100 or more originations plus deliveries:

W4LX	168	WA4CRI	108
WA7LGN	138	W3EGJ	105
K8KMQ	119	WD4COL	105
N8AUL	115	K4TH	102
WA8PIM	114	VE3HTL	100
KA8CPS	111	WAØRWM	100

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DEL.
6 — TOTAL

QST

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Tom Frenaye,* K1KI

DECEMBER

2

West Coast Qualifying Run (W6OWP prime, W6ZRJ, alternate), 10-35 wpm at 0500Z Dec. 3 (9 P.M. PST Dec. 2). Frequencies are approximately 3590/7090. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please enclose your full name, call (if any) and complete mailing address. A large self-addressed envelope will help expedite your award/endorsement. The complete W1AW schedule appears on page 90 of Oct. *QST*, or is available for an s.a.s.e. to ARRL.

6-7

ARRL 160 Meter Contest, Nov. *QST*, page 92.

EA-DX Contest, phone

Connecticut QSO Party, Nov. *QST*, page 98.

North Carolina QSO Party, sponsored by the Alamance ARC, from 1900Z Dec. 6 until 2359Z Dec. 7. Exchange signal report and state/province/country (county for North Carolina (NC) stations). NC stations multiply QSO total by sum of states/provinces/countries for final score. Others multiply NC QSOs by NC counties for final score. NC mobiles multiply score by the number of counties operated *from* for final total. Suggested frequencies: phone — 3900 7270 14,290 21,390 28,590; cw — 60 kHz from low end; Novice — 3720 7120 21,120 28,120. Mail by Jan. 10, 1981 to Alamance ARC, 2822 Westchester Dr., Burlington, NC 27215.

11

W1AW Qualifying Run, 10-40 wpm at 0300Z Dec. 12 (10 P.M. EST Dec. 11). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. See December 2 listing for more details.

13-14

ARRL 10 Meter Contest, November *QST*, page 92.

EA-DX Contest, cw

HA DX Contest

28

Canada Contest, sponsored by the Canadian Amateur Radio Federation, from 0001Z to 2359Z Dec. 28. 160 through 2 meters, phone and cw combined. Single operator (all band and single band) and multioperator single-transmitter categories. Cw contacts in the cw bands only. Work stations once each band, each mode. Exchange signal report and serial number (VE1 stations also send province). Count 10 points per Canadian QSO, one point for others. Ten bonus points for QSOs with VE stations using TCA or VCA suffix. Multipliers are Canadian provinces/territories per band and mode (VO1/VO2, VE1-NB, VE1-NS, VE1-PEI, VE2, VE3, VE4, VE5, VE6, VE7, VE8, VY1). Final score is QSO points multiplied by multipliers per band and mode. Suggest phone on the even hours (UTC); cw on the odd hours (UTC). Suggested frequencies: phone — 1810 3770 3900 7070 7230 14,150 14,300 21,200 21,400 28,500 50,100 146.52; cw — 1810, 25 kHz from the low end and 50.1 144.1. Postmark entries by Jan. 15, 1981. Send s.a.s.e. for results to CARF, 203-1946 York Ave., Vancouver, BC V6J 1E3 Canada.

30

W1AW Qualifying Run, 10-35 wpm at 1400Z (9 A.M. EST). See Dec. 11 listing for more details.

JANUARY

Dec. 31-Jan. 1

ARRL Straight Key Night, 24-hour period UTC (from 7 P.M. EST Dec. 31 until 7 P.M. EST Jan. 1). This is a friendly meeting on the air using straight keys. Suggested areas of operation on 80, 40 and 20 meters are 60 to 80 kHz from the lower band edge and 10 kHz from the lower edge of the Novice bands. When participating use SKN instead of RST, preceding the three-digit report, to clue in "passers-by." Following SKN send in a list of the calls of the stations worked plus your vote for the best fist heard during that period (not necessarily one you've worked). This is not a contest; quick contest-type exchanges are discouraged. Vote, too, for the most interesting QSO. Mail your report by Jan. 10 to ARRL.

3

ARRL CD Party, phone, for ARRL officials and CD appointees. Details in Winter QCD.

Zero District QSO Party, sponsored by the Mississippi Valley RC, from 2000Z Jan. 3 until 0200Z Jan. 5. Work Colorado, Iowa, Kansas, Minnesota, Missouri, New Brunswick, North Dakota, South Dakota stations once per band and mode, except mobiles each time they change counties. Exchange signal report and ARRL section (plus county for Ø stations). Zeros score by adding ARRL sections, Ø-district counties and DXCC countries, multiply by QSOs for final score. Others add Ø states worked plus Ø counties worked, multiply by Ø-district QSOs for final score. Suggested frequencies: phone — 3900 7270 14,300 21,370 28,570; cw — 60 kHz from low end; Novice — 3725 7125 21,125 28,125. S.a.s.e. for results. Mail by Feb. 15 to WØSI, 3518 W. Columbia, Davenport, IA 52804.

6

West Coast Qualifying Run, 0500Z Jan. 7 (9 P.M. PST Jan. 6). See Dec. 2 listing for more details.

10

ARRL CD Party, cw

12

W1AW Qualifying Run, 10-35 wpm at 0300Z Jan. 13 (10 P.M. EST January 12). See Dec. 11 listing for more details.

17-18

ARRL VHF Sweepstakes, this issue, page 93.

FRACAP Worldwide Contest, sponsored by FRACAP (Central America), 24 hours UTC on Jan. 18, phone only. Single operator (all band or single band) only. Work HP HR TG TI YN YS amateurs for five points each; others for one point each. Multiplier is each FRACAP country plus each call area (watch for special prefixes for extra multipliers). Final score is multiplier times QSO points. Certificates for minimum of 20 FRACAP QSOs. Mail entry by Feb. 28 to FRACAP, Box 2412, San Jose, Costa Rica.

International 160-Meter Phone Contest, sponsored by *73 Magazine*, 48 hours UTC. Single-operator stations operate maximum of 30 hours. Multioperator single-transmitter or single-operator categories. Exchange signal report and state/province/country. Count five points per QSO. Multiplier is 48 states, 13 Canadian provinces and DXCC countries (each country counts three multipliers), except USA and Canada. W/VE stations avoid transmitting in the DX window 1825-1830 kHz. Mail entry by Feb. 21 to Dan Murphy, WA2GZB, Box 195, Andover, NJ 07821.

QRP Winter Contest, sponsored by AGCW-DL, from 1500Z Jan. 17 until 1500Z Jan. 18. 160-10 meters, cw only. Categories: Class A — single operator, less than 3.5 W input; Class B — single operator, less than 10 W input; Class C — multioperator, less than 10 W input; Class D — more than 10 W input (work QRP stations only). Class C stations operate full 24 hours; others must take nine-hour break. Exchange signal report, serial number and input power. Count one point for QSOs with your own country, two points your continent, three points for different continent. Multiplier is DXCC countries, plus JA PY VE VK W and ZS call areas, plus one extra multiplier for each DX QSO. Multiply QSO points by multiplier for each band and add band totals for final score. Double your score if crystal controlled. One IRC for results. Entry must be received by March 2. Send to Siegfried Hari, DK9FN, Spessartstrabe 80, D-6543 Seligenstadt, Federal Republic of Germany. The Michigan QRP Club offers a separate competition in conjunction with AGCW-DL's contest for top scorers. Mail copy of log to Chris Hethorn, WD8RYY, Michigan QRP Club, 281 Crescent Dr., Portland, MI 48875.

QRP ARC SSB QSO Party, sponsored by QRP ARC International, from 2000Z Jan. 17 until 0200Z Jan. 19. Exchange signal report, state/province/country and power input or QRP number if a member. Count three points for QSOs with QRP ARC members, two points for nonmembers, and four points for non-W/VE QSOs. Score equals QSO points times sum of states/provinces/countries. Multiply score by 1.5 if 25- to 100-watts input; by 2 if 5- to 25-watts, by 3 if 1-to 5-watts; or by 5 if less than 1-watt input. Also, add 100 points if station powered by emergency power, except 300 points if solar or wind powered. Suggested frequencies: 1810 3985 7285 14,285 21,385 28,885 50,385. S.a.s.e. for results. Logs should be received before March 25 by QRP ARCI Contest Chairman, Edwin Lappi, WD4LOO, 203 Lynn Dr., Carrboro, NC 27510.

West Virginia QSO Party, sponsored by the West Virginia (WV) State Amateur Radio Council, from 1700Z Jan. 17 until 1700Z Jan. 18. Single operator only. Exchange signal report, serial number and county (WV only), state or country. WV stations multiply total by sum of WV countries, states and countries worked. Others multiply WV QSO total by WV counties worked. Multiply score by 1.5 if you run 200 watts or less. Suggested frequencies: phone — 10 kHz from lower edge of General Sub-band; Cw — 35 kHz from low end; Novice — 35 kHz from low end. Repeater contacts are permissible. Mail logs by Feb. 15 to N8AJC, 933 Glen Way, South Charleston, WV 25309.

25-26

REF Contest (France), cw

CQ 160-Meter Contest, cw

Classic Radio Exchange

Texas QSO Party

27

W1AW Qualifying Run

FEBRUARY

Jan. 31-Feb. 8
ARRL Novice Roundup
7-8
New Hampshire QSO Party
Two-Land QSO Party
RSGB 7-MHz Contest, phone
North American Sprint
14
ARRL Frequency Measuring Test
14-15
PACC Contest (Netherlands)
YL-OM Contest, phone
21-22
ARRL International DX Contest, cw

MARCH

Feb. 28-March 1
CQ 160-Meter Contest, phone
RSGB 7 MHz Contest, cw
YL-OM Contest, cw
7-8
ARRL International DX Contest, phone

*Assistant Communications Manager, ARRL

Section Activities

A-1 OPR ≠ EC ≠ DXCC ≠ RCC ≠ WAS ≠ STM ≠ OES ≠ OTS ≠ NM SCM ≠ ARES ≠ OVS ≠ SEC ≠ OBS ≠ TCC ≠ OO ≠ NTS ≠ WAC ≠ CP ≠

CANADIAN DIVISION

ALBERTA: SCM, E. Roy Ellis, VE6XC — SEC: VE6XC. NMs: (APSN) VE6AFO (ATN) VE6ABC. The reorganizing of the province into zones that are covered by a 2-meter repeater with an EC in charge is progressing favorably. When completed, a full report will be forwarded to Alberta Disaster Services who requested it. ATN: sessions 30, QNI 172, QTC 20. Traffic: VE6HO 88, VE6ABC 30, VE6AA1 10.

MANITOBA: SCM, Peter Guenther, VE4PG — Asst SCM: VE4JP. SEC: VE4TR. STM: VE4RO. NMs: VE4s VJ NM AEJ TE. Once again the guys took care of the annual car rally. Nice work fellows. The cw net is back on a daily sked again and QNI is already improving on this and other nets. Our congratulations to VE4AG on his appointment as Assistant ARRL Director for Manitoba. VE4ADS is taking on the duties as PR for Western Canada for CRRL. Both are aggressive and have the ability. Nets: MEPN QNI 862, QTC 39, sess 30; MTN QNI 94, QTC 37, sess 17; MMN QNI 325, QTC 30, sess 30. WRIN QNI 87, QTC 1, sess 4. Traffic: VE4AEJ 37, VE4PG 37, VE4TE 32, VE4JA 31, VE4ADS 15, VE4CR 13, VE4NM 9, VE4AAD 8, VE4ID 7, VE4NE 6, VE4XN 6, VE4FK 5, VE4LB 4, VE4AAU 3, VE4LN 3, VE4JP 2.

MARITIME — NFLD: SCM, D. R. Welling, VE1WR — ASCM: VO1FG. NMs: VO1JN VE1WF. SEC: VE1EI. STM: open. Silent Key: VE1YO. He will be sadly missed by all. VE1EI appointed SEC effective October 1, 1980. Congrats. VE1QC attended Antique Wireless Convention in Rochester, NY. VO2WL won the SONRA Field Day awards. Congrats. VO1FZ new editor of SONRA news. Changes have been announced for WAVO Award. SCM would appreciate being placed on mailing list of all club bulletins. Need info for this column, etc. Need volunteers for various appointments in the section. All queries answered. Have supply of Net Directories for the asking. APN 30 sess, QNI 146, QTC 54, time 328. Traffic: (Sept.) VE1WF 223, VE1LCR/RO 75, VE1ZB 33, VE1XF 27, VE1BMN 15, VE1BXA 10, VE1CH 9, VE1AUL 8, VE1KR 5, VO1AW 4, VE1QC 2. (Aug.) VE1QC 3.

ONTARIO: SCM, Larry Thivierge, VE3GT — A/SCM: VE3GOL — SEC: VE3GV. STM: VE3ATU. NMs VE3FPI VE3GFN VE3GNW VE3ISW VE3KK VE3BMG has stepped down as A/SCM with VE3GOL taking over the appointment in order to handle section — Red Cross liaison duties only. VE3ATU becomes the section's new STM. RSO's annual convention was very successful. While there, it was a great pleasure to eveball some of the section's top traffic handlers such as VE3s ATU AWE BZB CWA CYR DVE GOL and ISW among others. At the same time our new SEC, VE3GV, and a number of ECs were present, such as VE3s DUK GFN HOI IHX ILP IXB and WM. Incoming RSO president is VE3DWH and next year's convention will be hosted by the KWARC. Complete details have appearned in TOA. VE3EFX, whose station was hit by lightning, is very active on OSCAR. New Life Members are VE3s FSN and JTV. The following have been reported as Silent Keys: VE3s AEX and AZV. The CRRL Amateur Radio licensing manual has been very well received — it's in its third reprinting. An Advanced section will be available sometime this month. Peterboro ARC recently received the certificate as top Canadian multi-op station in the ARRL VHF contest. Quinte ARC has established a "Triple H" (help handicapped hams) committee to assist amateurs who are sponsoring, or wish to sponsor, physically limited persons to obtain Amateur Radio status. KB6FR/VE3 new OTS appointee. OLN certificates have gone to VE3s ATU LNN MKJ IXB and KQO. VE1APY now VE3LYA; VE3GEO off to VE4-Land; VE3IVE is VY1CL; VE3HCM is in Thunder Bay; VE3ISG has moved to Guelph. May I take this opportunity, on behalf of all the section's officials and appointess, to extend our best wishes to everyone everywhere, for a very merry and happy Christmas. Traffic: (Sept.) VE3GOL 598, VE3KK 468, VE3ATU 410, VE3HTL 289, VE3JLL 288, VE3CWA 206, VE3DPO 191, VE3GT 155, VE3ISW 144, VE3GNW 116, VE3FGU 95, VE3BB 83, VE3CYR 74, VE3DUK 69, VE3JAG 68, VE3AWE 51, VE3BVG 40, VE3EBC 37, VE3DVE 34, VE3EUI 24, VE3EHL 22, VE3KXB 22, VE3FPI 21, VE3AYZ 14, VE3ANJ 13, VE3EWD 13, VE3IFP 13, VE3IXB 12, VE3WM 12, VE3MKJ 8, VE3WG 8, VE3EFX 6. (Aug.) VE3KXB 82, VE3BZB 51, VE3ATU 29, VE3EBC 28, VE3CYR 19, VE3ABG 16.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2FFE. Few clubs have started code and theory classes with good attendance. With the coming of winter, we should have more traffic activities and more cw traffic handlers are needed. VE2BYW maitenant actif sur 80 metres. La soiree de VE2RMB bien reussie a permis a plusiers de se rencontrer. J'ai a vous annoncer le deces de Marcel, VE2ALB. Traffic: VE2BP 31, VE2FFE 27, VE2EC 26, VE2EKC 14.

SASKATCHEWAN: SCM, Norm Waltho, VE5AE — STM: VE5XC. SEC: VE5WM. NMs: VE5DC VE5HG VE5SF VE5WM. SATN 30 sess, 315 QNI, 22 QTC; SPN 30 sess, 1104 QNI, 43 QTC; SA2N 30 sess, 250 QNI, 1 QTC; RARA 2-M 30 sess, 379 QNI; PWXN 30 sess 440 QNI. Our sympathy to the family and friends of VE5GJ who recently became a Silent Key. Welcome back to SCM, VE5AE, who returned from north pole country and good DX with the 20-M monobander. Congratulations to VE5HP on being awarded the first Life Membership in SARL for his many years of contributions to Amateur Radio in SK. The RARA Amateur Radio demonstration at the public library was well attended. Traffic: VE5KS 27, VE5WM 24, VE5HG 21, VE5XC 15, VE5XZ 9, VE5NJ 6, VE5BBD 4.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DXX — SEC: W3PQ. STM: WA3WIY. PSHR: (Sept.) K3JL 91, WA3WIY 89, WA3DUM 68, N3AKC 66, W3DKX 56. (Aug.) N3AKC 63. WA3QLS and WA3QPX gave an excellent program on repeaters complete with demonstration at the Oct. AWARE Club meeting. WA3WIY wishes to thank all Delaware Net members for cooperation and participation and especially NCS and liaison stations. WB3DPJ/R 222.40 MHz/224.00 MHz has expanded range and improved quality by raising the antenna. KB3BQ is a patient at Riddle Hosp. WA3ZBI is running a 2-meter net on SARA repeater 147.075/675 Wed. 9 P.M. local time. DTN: QNI 346, QTC 61. DEPN QNI 54, QTC 5. Traffic: W3PQ 190, W3QO 105, N3AKC 56, WA3WIY 54, K3JL 48, W3DKX 45, WB3DUG 39, WB3FOC 23, WA3DUM 20, AC3T 10, WA3YTB 9, KA3DPR 8, WA3ZBI 7, W3WD 3, W3FEG 2.

EASTERN PENNSYLVANIA: SCM, Karl W. Pfeil, W3VA — SEC: WA3PZO. STM: WB3JYZ

Net	Freq.	Time	QNI	QTC	Sess.	Mgr.
EPAEPTN	3917	6 P.M. Dy	472	183	30	AJ3R
EPA	3610	7/10 P.M. Dy	509	294	59	AA3B
PFN	3956	5 P.M. M-S	253	262	26	WA3WQP
PTTN	3610	6:30 P.M. Dy	263	100	30	AG3R

Local and vhf nets reporting: ATN LVN WB3JOE/R total QNI 198, QTC 70, sess 25. OBS reports: W3TI W3AVJ WB3FVJ WB3CAI WB3JYZ W3ID K3EBZ. 00 reports: K3KEK W3GVR W3FAF. OVS reports: W3GOA KA3DZD WB3AZE. PSHR reports: WA3VIL K3RHI W3DP WB3FEH K3YD N3AZT KB3LF K3JSZ WA3WQP AA3C W3ID WB3GJR AJ3R WB3GZV AA3B WB3GDE WB3JYZ KA3DZD. New appointments: AF3Z N3AZT and N3BDC to OTS; W3EEK Dist 3, WB3CUF Dist 7, and KA3DZD Dist 10 to DEC. KA3DXD upgraded to Gen. K3SIO now KB3LR. New officers for Schyulkill Amateur Repeater Assn: W3EEK, pres.; K3KVK, vice pres.; WB3FVJ, secy.; WA3LOK, treas.; K3SLJ, PR. New gear dept: WB3EFI tri-band beam; K3YD a TS520; KA3A new TS830; WB3FYT a IC-2A; WE3FKP new TS120 using battery power. KB3LF & N3BHF experiencing RFI gremlins. WA3CKA working on cw DXCC. PTTN welcomes WA3EHD WB3EFI and N3AZT. EPAEPTN welcomes K3OXC KA3DXD N3AVZ WB3HTW and W3YZW. Murgas Club, K3YTL, and Hazleton gang were active in Sept. vhf test from Sullivan County. N3BAO attending school at State College. KA3AOF has WAC and WAS. WA3WOP/3 experiencing ant problems. Murgas ARC recently celebrated 75th anniversary of demonstration of wireless communication between Wilkes Barre and Scranton by Father Joseph Murgas, inventor. WA3VIL enjoying cw on PTTN. WB3FPL reports Reading ARC supplided communications for 5 foot races this past summer and local groups turning to hams for almost all events in Berks County area. K3JSZ enjoyed operating in the PA QSO Party. W3EU all set for winter with antennas pruned, tubes tested and key oiled up. K3QXC and W3GVR reports for first time. New vhf tfc net in Phila. area is WB3JOE/R 146/06. AA3C reports new call sign for Red Rose rptr is W3EUP/R and that Lancaster County has over 50 ARES members. W3ID QRL grading and planting grass, no new antenna yet. WB3CAI making lots of noise on nets with new antenna. W3KEK working on antennas. WA3EHD reports Warminster ARC has new ant for 147.69/09 repeater and new home brew repeater to be completed shortly. AA3B reports Penn Wireless Assn planning a club station. W3FAF trying lw on 160. WB3GDE glad to be back on nets again. All local and vhf nets are invited to send traffic totals and news items to this office. Traffic: W3AVJ 358, KB3LF 223, K3JSZ 203, W3FAF 148, AA3B 129, WB3FEH 128, WB3GUR 118, N3CD 108, W3BI 104, WB3JYZ 96, WA3WQP 94, AJ3R 90, WB3GZV 85, W3VA 79, WA3EHD 51, K3EIP 48, W3ADE 47, W3ID 40, WB3CUF 39, N3BFL 37, W3DP 31, N3AZT 30, WA3VIL 30, AF3Z 23, WB3KRH 20, W3GL 19, WB3FVJ 18, WA3OFD 16, WA3CKA 15, K3YD 14, N3BHF 10, WB3CAI 10, W3IPX 9, K3NB 8, W3BNR 7, K3RHI 6, K3EBZ 4, K3NGN 3, K3QXC 2, WB3AZE 1, AA3C 1, KA3DZD 1.

MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — WA3TAI is our SEC. FAR's Gaithersburg Hamfest a big success with more sellers and rich buyers! W3EGN was there. W3CDO liked the old radio gear at the Antique Wireless conference. W3ZNW is singled out as a most consistent reporter especially of ARES. KA3T has been NCS of both ssb and cw nets. He likes it! WB3JRW had an "eyeball" with Hurricane Charlie. W3JPT spent a quiet month on the radio, but made many business trips. WB3LTA WA3BMM and KA3DXZ are deputies to RO WA3UQF, helping him do the job for Montgomery County RACES. They sponsored a successful Nat. WX Service training program., W3CVE is conducting a radio survey of SOWP members. Everybody's traffic count is going up. KB3AP has 128 confirmed for DXCC. WA3BPC is the 1980 BARC proxy. N3AGM reported the amateur help for the annual crop walk in Frederick was supplied by WA3LFD WB3FWD W3FOA AB3W WA3CGU WB3FWE W3UCT and N3AGM. In Myersville by WB3DSF WB3HWH KB3IVB KB3GP WA3SFX W5JVA WB3KQU and WB3HFV W3WN provided the telphone link. BARC will be full bore in the SET. W3FZV keeps MDC in the QSO parties. AK3X is making some improvements. W3EAX, U of Md., is showing new signs of life with KA3T activity there. W3LDD has been helping the daytime traffic nets. WB3CES maintains his regular MEPN NCS job. W3DQI will not give up on the outside grilling! WB3GZU's fall and winter schedule permit him to visit statewide. N4DR is helping with liaison on both the ssb and cw nets. KA3ESC is the new editor of the Ham Arundel News, So. MD. ARC has an Octoberfest planned. Goddard ARC is publishing a news sheet and the FAR minutes were received. Thank you. With the nets: Net/manager sessions/traffic/QNI average. WR PON/W3DFW 22/39/17. MDC PON/W3OYY 4/10/22. PON meets on 3905 kHz except Sunday at 5:15 P.M. local. MEPN/WB3GZU 31/125/25 1. Toppers KA3ARH and WB3GZU. Others W3ADQ N3AGM W3DKX WA3IHW and WA2YFM. MEPN meets daily at 6 P.M. on 3920 kHz. MDD/W3PQ 60/271/8.8 Top Brass W3FA and WB3GZU. MDD meets daily 7 and 10 P.M. local on 3643 kHz. Traffic: WB3GZU 873, W3CVE 295, W3FA 235, KA3T 87, W3EAX 37, K3LDD 31, W3FZV 28, AK3X 26, W3DQI 25, N4DR 21, W3ECN 14, WB3JRW 14, W3ZNW 6, KB3AP 4, WB3CES 2, KA3DXZ 2, WB3LTA 2.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LGC — September was a slow month. Traffic totals and participation were generally down. Work did progress on the SNJ/NNJ two-meter linking scheme, with testing being done between several SNJ stations and NNJ repeaters. The path is generally a good one, and no major problems are expected in propagating a uhf signal over this distance. The computer that will control the SNJ terminus of the linked repeater system was installed and promptly removed when it was discovered that the 24 conductor interface cable had the plug at one end wired backwards!! We goofed, but expect to make another try shortly. The COSMAC based system will allow us to link with up to three other repeaters, as well as handle up to four remote inputs. This, in addition to the basic repeater operation, autopatch, clock, remote functions, fully redundant control circuitry and three modes of backup power. Provisions have been made for future modifications to permit telemetry of repeater vitals, voting of the inputs and several other features. We expect to shortly have a complete backup repeater installed with a separate duplexer and antenna, which will mean that our emergency capability is backed up in EVERY way!!! Traffic: WB2IQJ 342, AA2H 138, WB2LCC 69, WA2ONW 68, WA2CUW 51, KC2A 43, KA2GTE 42, K2YBN 28, KB2OE 22, K2UL 20, WA2WUL 16, KF2U 12, N2AEP 11, W2ZQ 11.

WESTERN NEW YORK: SCM, Lonnie J. Keller, WA2AOG — STM: W2MTA. SEC: W2BCH. Net data for Sept. (all P.M. local times):

Net	Freq.	Time	QNI	QSP	Sess.	Mgr.
NYS (e)	3677	7:00	527	244	30	W2ZOJ
NYS (l)	3677	10:00	387	219	30	W2ZOJ
NYPON	3913	5:00	643	252	30	K2KQC
CNYTN	90/30	9:15	541	94	30	WA2PUU
OCTEN	34/94	6:30	374	71	30	WA2MFV
STAR	99/39	6:30	144	39	30	WA2ZJP
WDN	04/64	9:30	831	119	30	N2APB

Congratulations to the STAR Net on their first anniversary. New officers of the Rome Radio Club are WB2RWW, pres.; K2CSN, vice pres.; KA2DAI, secy; WA2GYK, treas. WA2MFV now working lots of DX thanks to a new TH6DXX installed with the help of KA2CTU and WB2RWW. K2KIR (W2JJ) spoke on NTS at RSO convention in Toronto. RARA's new home base is the 19th floor of the First Federal S & L in Rochester. Buffalo Area DX Club members ready to make some noise this contest season: WA2AOG w/a new DTR 2000L; N2AC w/new monobanders @ 100 ft; N2CU w/new SB200 & TH6DXX @ 60 ft; WA2MBM w/new TH6DXX @ 60 ft; WA2SON w/new TR 7 & TH6DXX @ 70 ft & WB2AIO w/monobanders @ 70 ft. No BPL this month. PSHR to W2ZOJ WA2MFW W2MTA KA2CTU N2APB WA2ZJP WB2IDS WA2KOJ AE2T N2BXB W2AFT KB2GT & WA2MFU. Traffic: (Sept.) W2ZOJ 317, WA2ELD 287, N2APB 210, W2MTA 189, WA2HSB 175, WA2MFV 163, WB2IDS 111, K2GWN 103, KA2CTU 101, AE2T 98, N2BXB 97, W2FR 91, WA2ZJP 77. KA2CLT 68, WA2KOJ

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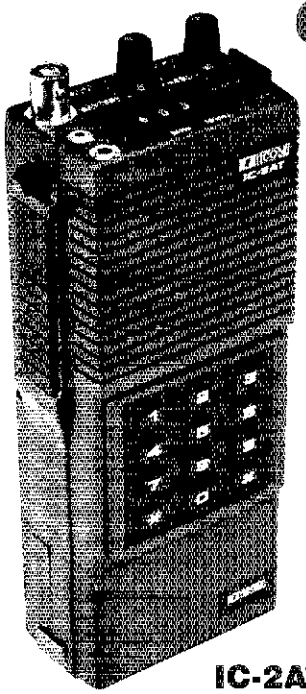

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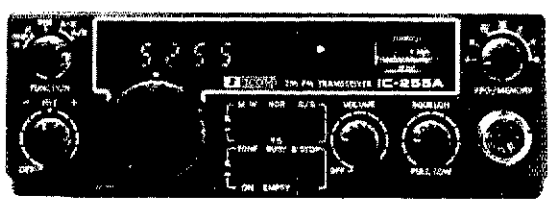

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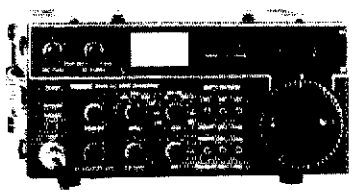

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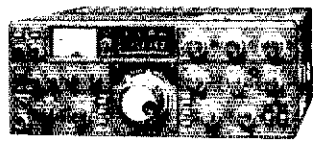

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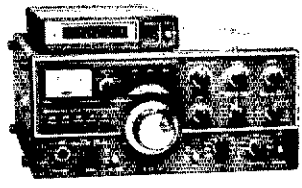

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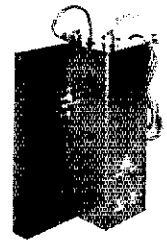

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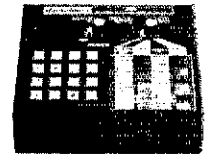

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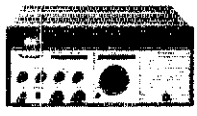

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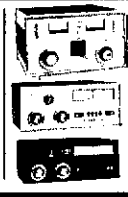

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63, W2ROF 55, WB2QIX 53, W2AET 52, WB2OWO 40, W2PPS 38, W2TZ 36, W2GJ 32, KA2HAC 26, WA2MFU 26, KB2GT 25, KG2D 24, K2KIR 20, WB2RWW 15, AF2K 14, WB2MVC 14, WB2NAO 6, K2VR 3.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler K3SMB — ASCM: N3FM SEC: WA3JBQ DEC: WB3JDI STM: N3EE. NMs: W3NEM W3MML WA3PXA.

Net	Sess.	QNI	QTC	kHz	Time/Day
WPACW	30	305	131	3585	7:00P/D
WPAPTN	30	437	142	3983	6:15P/D
WPA2MTN	30	618	90	146.28/88	8:00/D
NWPA2MTN	26	252	10	146.04/64	9:30P/D

The annual WPA Section meeting at Cook Forrest was well attended by members of the nets in the section. ARES also was represented; WA3JBQ and WB3JDI among those attending. The SEC and our first DEC, WB3JDI, will be our liaison in the northern counties of the section. We hope to have two more DECs: one to the central and one for the southern part of the section. Finally was able to travel Erie, Lower Burrell, Oil City, Butler and Cook Forrest to meet with net and ARES members in the different areas. I also answered many questions about the NTS and ARES. Steel City officers for 1980 are: K3RYA, pres.; W3IOH, vice pres.; WB3DQV treas.; WA3FYJ, rec. secy.; W3UUH, corr. secy., W3SVJ trustee. WA3YAI in Brazil & WB3HDJ is living in W2-land. W3KWH has achieved its WAS on 50 MHz. Upgrades: KA3CUO & WB3GXG to Advanced, KA3FKK to General, WB3GXF to Technician and a new Novice KA3ETC, congrats. to all. Some bad news, I'll be SCM for two more years and hope I can do a good job and keep the section up in operations. Traffic: W3EGJ 270, KB3DT 219, WA3PXA 183, W3AS 140, N3EE 138, N3FM 116, N3WS 95, W3SMV 82, AC3N 78, K3CR 66, W3KUN 44, W3MML 41, K3SMB 48, W3KMZ 40, W3NGO 37, WA3UNX 34, WB3GUK 33, W3TDW 32, W3RUL 17, W3JDI 16, K3HCT 15, WB3JGD 15, W3UHL 15, W3SN 14, KA3BGC 13, WB3IAB 11, K3VQV 8, K4HWL 4, N3KB 4, AB3X 4, AF3E 2, W3LOD 1.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst. SCM: W9RYU SEC: W9OBH NMs WA9KFK and WB9JSR. Cook County EC: W9HPG.

Net	Freq.	Times/Days	Tfc.	Sess.
ILN	3690	0030/0400 Dy	257	60
Ill Phone	3915	2130 Dy	no	report
NCPN	3915	1200/1700 M-S	77	27
IEN	3940	1400 Su	99	30
W9VEY Mem Stn.	2 meters		12	4

N9TN took the coveted QLF trophy of the ILN home from the Peoria meeting of that net. WB9PUK is now an Extra with call of KB9X. The Lincoln, Illinois repeater has been on the air for short testing and should be permanently on the air now. WB9VLW reports that the Streator Emergency Net provided communications for the horse show, the 20 mile Walkathon, the 10000-meter Run for Fun and the 30 mile Bike-a-thon. W9LNQ has received his 5 Band WAS certificate. The 9th Region Daytime Net had a message count during 60 sessions and Illinois participation was 100% with W9NXG WB9WGK WD9FDB and W9JIJ participating. The Danville Hamfest, the Rockford Hamfest, Radio Expo, Peoria Hamfest and the Sangamon Valley Radio Club Hamfest at New Berlin were well attended. The Southern Illinois University Amateur Radio Club station, W9UIH/repeater W9AKT, is on 146.13/73 and is located on top of the 17 story Smith Towers. The faculty advisor is W9CJW. They operate Slow Scan TV and teletype. The CAND had 622 messages during 30 sessions and Illinois had a 100% participation with stations W9JIJ W9NXG WB9WGK and WB9FDB. New call heard was KA9IYY, YL of N9AMY. WB9FDP has a new 16 element on 432 MHz at 70 ft and 16 element on 144 MHz at 65 ft and a 11 element on a 30 ft boom on 50 MHz. Lamoine Emergency ARC has named W9YS its first honorary member. He holds the oldest amateur license in McDonough County and was originally licensed as 9YS. The Great Lakes NTC Amateur Radio Club station (K9NGH) is back on the air on 80-10 and 2-mtr. Contact WB9MII for details, WB9MII is back at Great Lakes after an absence of 4 years in W6-Land. K9EID is the author of Ten Meter FM Handbook, a new publication available from him at P.O. Box 26, Marissa, IL 62257. KA9EPI upgraded to Technician. The Wheaton Community Radio Amateurs will hold their WCRA Hamfest on January 25,1981. New officers of the Illiana Repeater System, Inc. are WD9AFF WB9YLO WD9FBC K9AJK WB9YJF and WB9YJE. KA9GAN now N9BWV. Vandals struck the Macon County repeater (147.10/70) and after repairs, it is running on low power. N9ANP has been named editor of the Hamtesters publication, Ham Gab. The Rockford Amateur Radio Association provided communications for the Blackhawk Area Council Annual Explorer Canoe Derby. Traffic: (Sept.) W9NXG 356, WB9WGD 267, K9PNG 225, W9JIJ 191, WD9FDB 135, KB9X 98, WB9JSH 94, WA9KFK 70, W9OK 69, K9EEA 68, KN9BAM 46, W9LNQ 46, W9HOT 38, KA9ALR 34, W9HBI 34, W9TLU 33, W4IZI 27, K9BVE 25, W9KR 22, W9PRN 20, K9SW 15, WD9HZF 9, WA9AQN 8, N9TN 7, K9HVS 3, WD9EDQ 3, AA9R 1. (Aug.) K9SW 20.

INDIANA: SCM, Bruce Woodward, W9UMH — SEC: W9UMH, STM: W9JUJ NMs: ITN W9QYY QIN WD9GXW ICN N9AEI VHF W9PMT IPN W9DLF. September net reports:

Net	Freq.	Time/UTC/Daily	QNI	QTC	Sess.
ITN	3910	1330/2300	2273	321	60
QIN	3656	1430/0100/1400	837	431	90
ICN	3708	0014	97	21	29
IPN	3910	2130	1278	148	30
IPON	3910	1300	104	0	4

VHF nets report for September: QNI 4865, QTC 226, Bulletins 18. Time 4864 for 19 nets. Indiana, 100% for September. D9RN stations: W9JUJ K9CGS W9QLW W9URQ W9DLF 100% 9RN stations: W9EI WD9GXW N9HZ W9JUJ WA9QCF W9QLW W9TG W9XD WD9UYU WB9VJE N9AEI N9PS K9WWJ. 100% CAND stations: W9QLW W9JUJ K9CGS W9DLF EC reports: W9QWI WD9JLT W9TIZ W9MUI WD9BKA KB9JK WB9WWB WB9VIW WD9DVA. Lightning Bolts: W9OGH WD9IXA WA9JMU. Appointments: OTS W9WEI OBS K9SBW EC K9BLK Clay County. Silent Keys in September: K9FOV W9JSV W9KYQ. My apology to these Silent Keys who have not been listed in this column or in QST: W9ACW W9AMH WN9FIK W9GTL W9ORN W9PWF K9QFU W9UHV. Thanks to these stations that made the Indiana Chapter of the Ninety-Nines, Inc. Indiana Race a success: WB9ZPL WB9ORM W9RTH N9AST KB9IT W9WEI W9CLY WB9UKG WB9NJU WD9GFL K9YEW K9IHU

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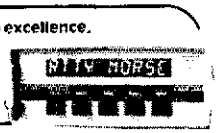

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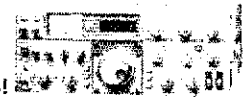

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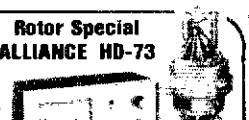

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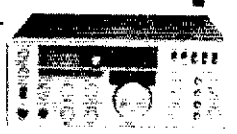

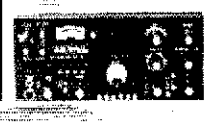

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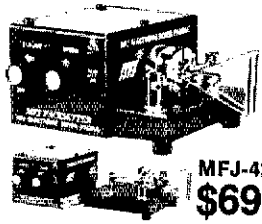

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The best of all CW worlds — a deluxe MFJ keyer in a compact configuration that fits right on the BENCHER iambic paddle! And you can buy the combination or just the keyer to fit on your BENCHER.

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MFJ-308 $79.95 (+$4)

Another MFJ "first," these low cost mobile SWL converters provide new excitement and variety for your driving/listening pleasure.

Two models to choose from. The 4-band "World Explorer I" (MFJ-304) offers complete *19, 25, 31 and 49 meter coverage* (the most popular HF bands due to their distance capabilities at various times of the day and year). Hear countries from Europe, Africa, Middle East, Asia, the Islands, North and South America. The 8-band "World Explorer II" (MFJ-308 adds *13, 16, 41, and 60 meter* bands) for even greater listening variety.

Compact and sensitive. The 4-band model measures just 5¼W x 1¼H x 4"D to *fit anywhere* in your vehicle (the 8-band version is just 1" wider and 1" deeper). Two dual-gate MOSFETS give these converters *excellent sensitivity and selectivity* when combined with your automotive receiver.

Easy to use, easy to install. Push a converter button to choose the band, tune in stations with your regular car radio. To install, just plug the car antenna into the converter and insert the converter cable into your car radio antenna jack; connect the power lead to 12 VDC.

Listen to the world on the road. Get the new MFJ mobile SWL converters — "World Explorers I & II."

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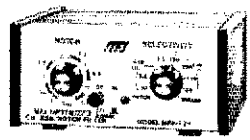

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MFJ-723 $49.95 (+$4)

Two new super-selective filters. The new MFJ-722 "Optimizer" offers *razor sharp, no-ring CW filtering* with switch-selectable bandwidths (80, 110, 150, 180 Hz centered on 750 Hz), *steep-skirted SSB filtering*, and a *300-3000 Hz tunable, 70 dB notch filter.*

The 8-pole (4-stage) active IC filter gives *CW performance no tunable filter can match.* (80 Hz bandwidth gives −60 dB response one octave from center and up to 15 dB noise reduction). *The 8-pole SSB audio bandwidth is optimized* for reduced sideband splatter and less QRM (375 Hz highpass cutoff plus selectable lowpass cutoffs at 2.5, 2.0, and 1.5 kHz, 36 dB/octave rolloff). Size: 5x2x6".

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Enjoy pleasant listening and improved readability with one of these new MFJ filters.

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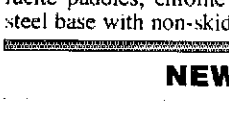

MFJ-1020 $79.95 (+$4)

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MFJ-1040 Receiver Preselector

Boosts weak signals, rejects out of band signals, reduces images. *Covers 1.8-54 MHz* with up to 20 dB gain from low noise MOSFET circuitry. *Works with 2 antennas and 2 receivers* (even XCVRS to 350W input).

Built-in 20 dB attenuator prevents receiver overload. Also includes auto-bypass, delay control, PTT jack. Operates on 9 V battery, 9-18 VDC, or 110 VAC with optional AC adapter, $7.95 +$2.

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Unique tuned circuitry with amplification *minimizes intermod distortion, improves selectivity, reduces noise* outside the tuned band, even functions as a *preselector* with an external antenna. *Covers 0.3-30 MHz in 5 bands.* Telescoping ant.; tune, band, gain, on-off-bypass; Uses 9 V battery, 9-18 VDC, or 110 VAC, with optional AC adapter at $7.95 +$2. 5x2x6".

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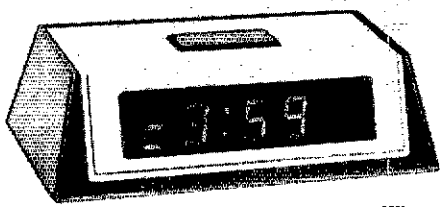

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Switch to "seconds" readout. For the times when you need the utmost accuracy.
Switch to ID timer. Alerts every 9 minutes after you tap the button (also functions as a snooze alarm).
Switch to "observed" timing. Just start clock from zero and note end time of event; counts up to 24 hours and repeats. (requires resetting clock time after use).
Switch to regular alarm. For skeds reminder or wake-up use (has alarm-on indicator).
Synchronize with WWV. Now you can adjust the MFJ clock to WWV accuracy.
Fast/Slow set buttons for easy setting of time and alarm.
Big, bright, blue digits are 0.6" for easy-on-the-eyes, across-the-room viewing.
Lock function prevents missetting.
Solid-state circuitry for long life.
Operates on 110VAC, 60 Hz (50 Hz with simple modification). UL approved.
Handsome styling with rugged black plastic case with brushed aluminum top and front. Front has sloping surface for easy viewing. Cabinet measures 6x2x3".
Put this new improved MFJ digital clock to work in your shack.

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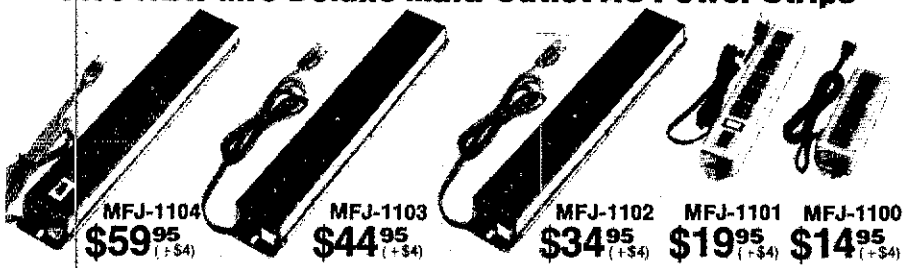

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Individual double-pi RFI filters for each of 3 pairs of outlets to completely isolate radios, computers, and computer peripherals from interference.
8 sockets, 4 pairs, all 3-prong; the fourth pair is unisolated and unswitched.
Pop-Out fuse for easy changing (15A, 125VAC), heavy duty 3-wire 6' power cord.
Lighted switch shows circuits are "on."
Deluxe heavy-gauge .063 aluminum case, finished in black, has easy mounting slots. Measures 18"Lx2¾"Wx1⅞"H.
MFJ-1103, similar but 12 sockets (2 unswitched), one RFI filter for all.
MFJ-1102, similar to 1103 but no RFI filter.
MFJ-1101: 6 sockets, all 3-prong type. Fuse protected, 15A, 125VAC. On-off switch. Lighted "On" indicator. 3-wire 6' power cord. Steel case, finished in gray hammertone, has mounting slots, measures 13⅛"L x2⅜"Wx1½"H.
MFJ-1100, similar to 1101 but 5 sockets, less switch, light, and is 8⅝"L.

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Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs — only 10¾Wx4½Hx14⅞"D
Matches coax, balanced lines, random wires 1.8-30 MHz.
3 KW PEP — the power rating you won't outgrow. (250 pf-6K V caps).
Roller inductor with a *3-digit turns counter* plus a *spinner knob* for precise inductance control to get that SWR down to minimum every time.
Built-in 300 watt, 50 ohm dummy load.
Built-in 4:1 ferrite balun.
Built-in lighted 2% meter reads *SWR plus forward and reflected power in 2 ranges* (200 & 2000 w).
6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 coax conn., ceramic feed-throughs, binding post ground.
Deluxe aluminum low-profile cabinet with sub chassis for RFI protection, black finish, black panel with raised letters; tilt bail; requires 12 VDC for meter light.

MFJ NEW PRODUCTS

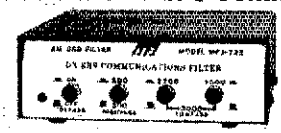
exciting new ideas from the world's leading manufacturer of amateur radio accessories

NEW MFJ VHF SWR/ Wattmeter/Field Strength Meters

MFJ-812 **$29.95** (+$4) MFJ-810 **$24.95** (+$4)

New low cost VHF operating aids.
MFJ-812: Reads SWR from 14-170 MHz to keep you informed about antenna/feedlines. SO-239 coax conn.
Reads forward & reflected power at 2 Meters (144-148 MHz) 2 scales (30 & 300W).
Reads field strength levels from 1-170 MHz. Binding posts provided for antenna.
Easy push-button switch operation.
MFJ-810, similar less field strength function.

NEW MFJ DXer's Communications Filter



MFJ-732
$79.95 (+$4)

MFJ-732 Puts more presence in SSB/AM/FM voice communications, brings more signals out of the "mud."
Easy to use, just push up to 4 buttons.
10-pole (5-stage) circuit with *Chebyshev superfast roll-off* (up to 58 dB/octave). First button: On/Off-Bypass, response 300-3000 Hz; second: 500 Hz lower cutoff; third: 2200 Hz upper cutoff; fourth: 1500 Hz upper cutoff. *Built-in speaker,* .2 watt amplifier, LED, 9-18 VDC or 110VAC with optional AC adapter ($7.95+$2), 5x6x1⅝".

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master charge **800-647-1800** VISA

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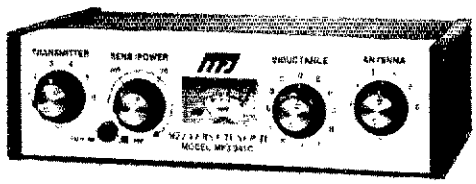
Box 494; Mississippi State, MS 39762

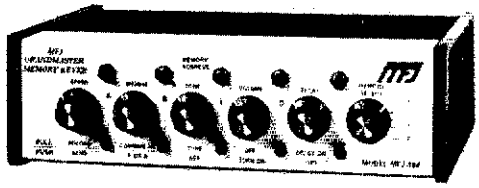
MFJ 941C Versa Tuner II



MFJ-941C
$89.95 (+$4)

Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.
SWR + dual range wattmeter (300 & 30 watts full scale, forward and reflected power). *Sensitive meter* measures SWR down to 5 watts output.
More flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.
12 position efficient airwound inductor for lower losses, more watts out.
Built-in 4:1 balun for balanced lines. 1000v capacitor spacing.
Matches everything from 160-10 meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.
Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.
MFJ-945, $79.95, like model 941C but less ant. switch. Optional mobile bracket for either model is $3.

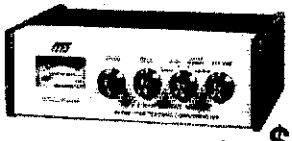
MFJ 484 "Grandmaster" Memory Keyer



MFJ-484
$139.95 (+$4)

Up to twelve 25 character messages plus 100, 75, 50 or 25 ch. messages (4096 bits).
Repeat any message continuously or with pauses of up to 2 min. LEDs show use.
Record, playback, or change messages instantly at touch of a button. Memories are resettable with button or touch of the paddle.
Built-in memory saver — 9 V battery takes over when power is lost.
Iambic operation with squeeze key. Dot-dash insertion. Optional BENCHER paddle $42.95 + $4.
Dot-Dash memories, self-completing, jam-proof spacing, instant start.
Panel controls: Speed (8-50wpm)/Record; Weight/Memories Combined; Tone/Tune; Delay (0-2 min.)/Repeat; rotary Vol/On-Off; Memory Select; Message Buttons select desired 25 ch. messages; Memory Reset button.
Ultra reliable solid state keying: grid block, cathode, solid state transmitters (−300 V, 10 mA max; +300 V, 100 mA max). Operates 12-15 VDC or 110 VAC with optional adapter, $7.95 + $2. Size 8x2x6". **MFJ-482, $99.95,** four 25 or 50 + two 25 ch. messages; **MFJ-481, $89.95,** two 50 ch. messages. **Get the best seller keyers**-MFJ "Grandmasters."

MFJ 410 "Professor Morse" Code Generator/Keyer



NEW LOW PRICE Save $20
MFJ-410 Now Only **$129.95** (+$4)

Use it to learn, use it to operate. It sends *unlimited random code* in random groups for practice; *never repeats* sequences. And when you're on the air, it's a *full feature keyer.*
Vary speed from 5-50 wpm; meter readout.
Vary spacing; give fast sound to low speed.
Alpha or alphanumeric with punctuation.
Built-in speaker and phone jack; tone and vol. Ideal for classroom or private use.
Full feature keyer includes vol., speed, tone and weight controls, tune switch, dot-dash memories; keys grid block, cathode, solid-state rigs. Optional BENCHER paddle $42.95 + $4. Operates on 9-18 VDC, two 9 V batteries or 110 VAC with optional adapter $7.95 + $2. Size 7x2x6". **Get "Professor Morse"** — you'll never outgrow it.

MFJ Dual Tunable SSB/CW Filter "Signal Enhancer"

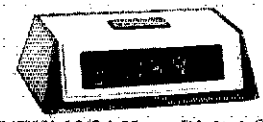
MFJ-752B **$89.95** (+$4)

Dual filters give unmatched performance.
The primary filter lets you *peak, notch, low pass or high pass* with extra steep skirts.
Auxiliary filter; *70 dB notch, 40 Hz peak.*
Both filters tune from 300 to 3000 Hz with variable *bandwidth from 40 Hz to nearly flat.*
Constant output as bandwidth is varied; linear frequency control.
Switchable noise limiter for impulse noise.
Simulated stereo sound for CW lets ears and mind reject QRM.
Inputs for 2 rigs, switch selectable. Plugs into phone jack. Two watts for speaker. OFF bypasses filter. 9-18 VDC, 300 mA or 110 VAC with optional adapter $7.95 + $2. 10x2x6". **MFJ 751, $69.95,** similar, primary filter only, less high pass & noise limiter.

MFJ BEST SELLERS

favorite products from the world's leading manufacturer of amateur radio accessories

GMT Clock/ID Timer



MFJ-102
$32.95 (+$4)

NEW 12/24 Hour Digital Clock/ID Timer Switch from 12 hr. to GMT, to "seconds" readout, ID timer or elapsed timer. WWV sync, solid-state, blue 0.6" digits, reg. alarm + indicators. 110 VAC, 60 Hz, 6x2x3".

KW Dummy Load With Oil

MFJ-250
$29.95 (+$4)

Rated at 1 kW CW or 2 kW PEP for 10 min., half that for 20 min., cont. at 200 W CW, 400 W PEP, non-inductive 50 ohm resistor, quality transformer oil (no PCB), VSWR under 1.2:1 to 30 MHz, 1.5:1, 30-300 MHz, 2:1, 300-400 MHz. Coax conn., vent cap., 7½"h x 6⅝" diam.

300 Watt Antenna Tuner

MFJ-949B
$139.95 (+$4)

Does it all! Built-in dummy load, SWR, forward and reflected power meter, antenna switch, balun, matches everything from 1.8-30 MHz (coax, random wires, balanced lines), coax conn., binding post, 10x3x7".

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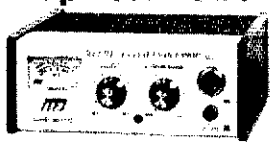
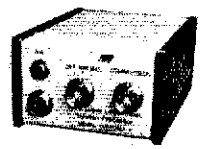
Box 494; Mississippi State, MS 39762

Up Your Power With MFJ Speech Processors



MFJ-525 **$119.95** (+$4)

MFJ-520BXII **$59.95** (+$4)



MFJ-525 RF Speech Processor gives you up to *4 times more average SSB power* on all bands. *Powerful, natural sounding speech* punches through QRM and DX piles ups. A true RF processor, *the 525 works with any rig, any mic.* No internal connections needed. **Two color VU meter** aids in setting clipping. **Full controls:** clipping level, output level, On-Off/Bypass switch, LED indicator. Shielded cable with PTT line, 4-pin mic. jack & plug, RFI protected. 12-18 VDC or 110VAC with optional AC adapter ($7.95 +$2). 6x2x6"

Super Logarithmic Speech Processors: **MFJ LSP-520BX II** gives up to 400% more RF power. Plugs between mic. and transmitter. *Three active filters* concentrate power to slice through QRM; **30 dB dynamic range IC amp.,** 9 V battery required. 4x2x6" beige & walnut grain cab. **LSP-520BX, $49.95 +$4,** similar, in metal cab. 2x3x4"

MFJ Dummy Loads — Air or Oil Cooled

MFJ-250 **$29.95** (+$4)

MFJ-262 **$49.95** (+$4)

MFJ-260 **$26.95** (+$4)

MFJ-250 1 kW load with oil only $29.95! *Rated 1 kW CW or 2 kW PEP for 10 min.,* half ratings for 20 min., cont. at 200 W CW, 400 W PEP. VSWR under 1.2:1 to 30 MHz; 1.5:1 to 300 MHz. 7½"h x 6⅝"diam.

New MFJ "Dry" Loads. Air cooled *50 ohm non-inductive resistors* in perforated metal housings; rated full load for 30 seconds, de-rating curves to 5 min. inc. **Low VSWR:** MFJ-260 (300W) 1.1:1 to 30 MHz, 1.5:1 to 160 MHz; 2½x2½x7"; MFJ-262 (1kW) 1.5:1 to 30 MHz. 3x3x13"

MFJ Deluxe Phone Patches

MFJ-624 **$59.95** (+$4)

MFJ-624 Telepatch II hybrid phone patch with unmatched performance and quality. **Crisp, clear, hum-free audio** with VOX or PTT. **VU meter** to monitor line level and adjust null depth. **Full controls:** separate transmit and receive gain controls, null control, function switch. Jacks for in, out, speaker & mic.; terminals for phone lines. Beige & walnut grain cab. 8x2x6". **MFJ-620, $49.95+$4,** similar, less meter. 6x2x6"

Low Cost MFJ Accessories From Just $19.95!

MFJ-1030BX **$49.95** (+$4)

MFJ-40T **$29.95** (+$4)

MFJ-40V **$29.95** (+$4)

CPO-555 **$19.95** (+$4)

MFJ-200BX **$29.95** (+$4)

MFJ-1030BX Receiver Preselector *boosts 10-30 MHz signals 3-5 "S" units.* Dual-gate MOSFET has 20-25 dB gain, noise figure less than 2.5 dB. Beige/Walnut. 4x2x6"

MFJ-40T QRP CW Transmitter works the world with *5 watts on 40M*; no tuning; 3 crystal sockets, or VFO input; protected transistor output; pi net; 12VDC; 2x3x4".

MFJ-40V QRP VFO; direct dial 7-7.2 MHz; less than 100 Hz drift/hr after warmup; clean 4 V peak-to-peak output flat to 2 dB; 12VDC; metal cab. matches 40T.

CPO-555 Code Oscillator; crisp clear sound from built-in speaker; enough vol. for class use; tone control; 9 V battery, 2x3x4". **TK-555, $1.95,** optional key.

MFJ-200BX Frequency Standard; gated for easy ID, markers every 100, 50, and 25 kHz into VHF; 9 V battery, 2x3x4".

More MFJ Shack Bargains

MFJ-102 **$32.95** (+$4)

MFJ-941C **$89.95** (+$4)

MFJ-408 **$79.95** (+$4)

NEW 12/24 Hour Digital Clock/ID Timer Switch from 12 hr. to GMT, to "seconds" readout, ID timer or elapsed timer. WWV sync, solid-state, blue 0.6" digits, reg. alarm +indicators. 110 VAC, 60 Hz, 6x2x3".

MFJ-941C "Versa Tuner II" matches dipoles, vees, randoms, verticals, mobile whips, beams; 160-10M; SWR + dual range wattmeter (300 & 30 watts); 6-position antenna sw.; built-in balun; 8x2x6"; mobile mtg. brkt $3.

MFJ-408 "Deluxe Electronic Keyer II"; *Curtis 8044 IC keyer chip; speed meter* to 50 WPM; dot-dash memories; RF proof; sends iambic, automatic, semi-auto, or manual; weight, speed, vol., tone controls; speaker; solid-state keying: grid block, cathode, solid-state transmitters (−300V, 10 mA max, +300V, 100 mA max); 6-9 VDC or 110 VAC with optional AC adapter ($7.95 +$2); 8x2x6".

MFJ Operating Aids & Instruments

Handy helpers from the world's leading manufacturer of amateur radio accessories

MFJ RF Noise Bridge

MFJ-202 **$54.95** (+$4)

Maximize your antenna performance. Measure resonant frequency, radiation resistance, reactance, learn how to get minimum SWR. Great for experiments, tests in tuned circuits (measure inductance, RF impedance & more). Series bridge, ±150 pf, 250 ohms, 1-100 MHz. Includes range extender for measurements beyond scale readings. 9 VDC 2x3x4".

Multi-Sensor SWR/Wattmeters

MFJ-825 **$119.95** (+$4)

Sensors $29.95 ea. + $3

MFJ-820 **$69.95** (+$4)

MFJ-825 Deluxe Power Sentry accepts any 3 sensors; operates 3 rigs; peak or avg. forward/reflected power in 2 ranges; SWR 1:1 to 6:1, 9 VDC or 110 VAC with optional AC adapter ($7.95 +$2); 6¾x5⅜x5¾"; includes one sensor of your choice.

MFJ-820 Power Sentry accepts one sensor; avg. forward/ref. power in 2 ranges; SWR 1:1 to 6:1; 3⅞"x5⅜x4½"; includes one sensor of your choice.

MFJ-830 HF Sensor, 1.8-30 MHz, 200/2000W fwd, 20/200W ref. **MFJ-831 VHF Sensor,** 50-175 MHz, 20/200W fwd & ref. **MFJ-832 QRP HF Sensor,** 1.8-30 MHz, 2/20W fwd & ref. **MFJ-833 Hi-Pwr VHF Sensor,** like #831 but 200/2000W fwd, 20/200W ref.

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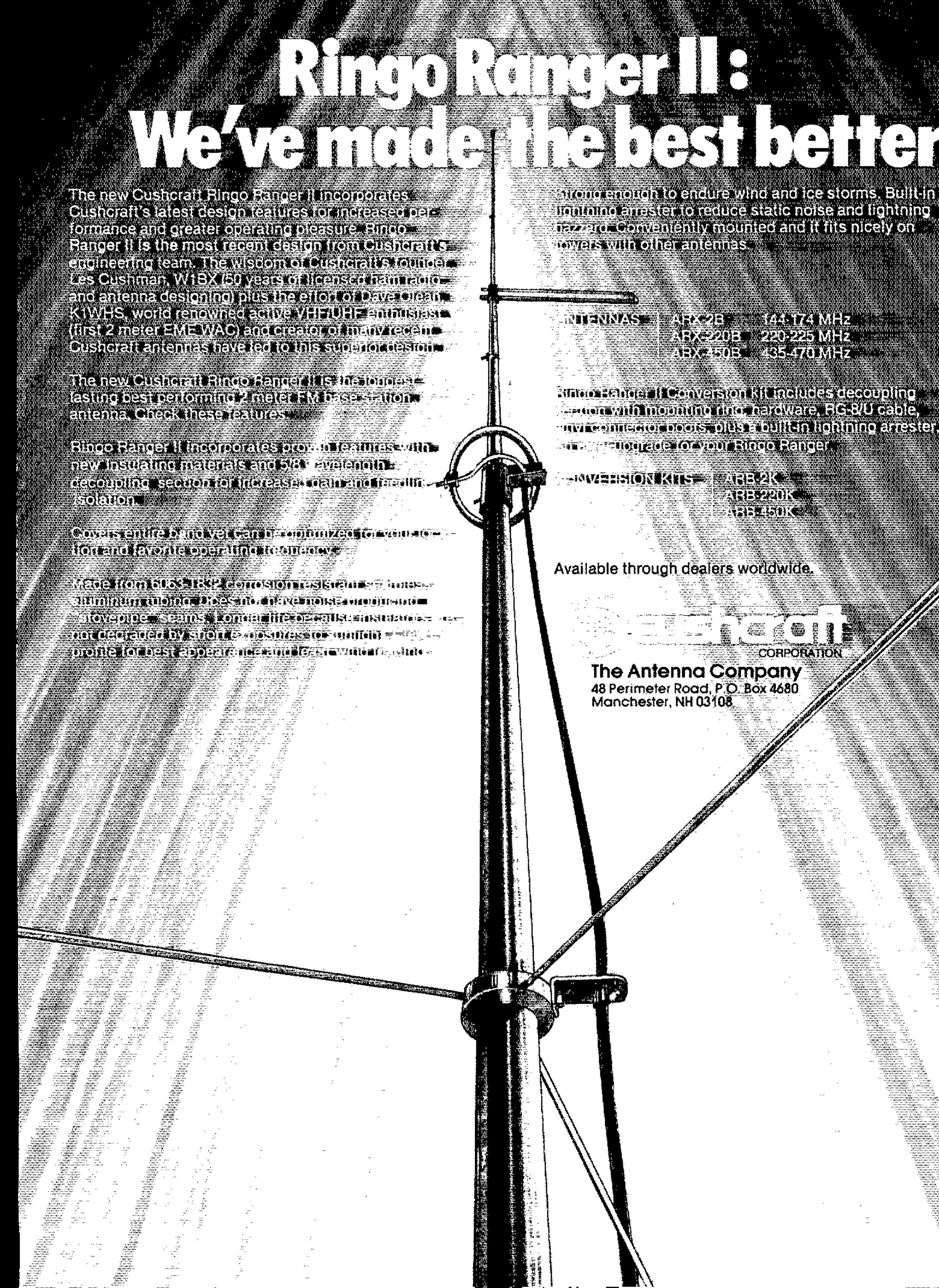
Ringo Ranger II:
We've made the best better
The new Cushcraft Ringo Ranger II incorporates Cushcraft's latest design features for increased performance and greater operating pleasure. Ringo Ranger II is the most recent design from Cushcraft's engineering team. The wisdom of Cushcraft's founder Les Cushman, W1BX (50 years of licensed ham radio and antenna designing) plus the effort of Dave Olean K1WHS, world renowned active VHF/UHF enthusiast (first 2 meter EME WAC) and creator of many recent Cushcraft antennas have led to this superior design.
The new Cushcraft Ringo Ranger II is the longest lasting best performing 2 meter FM base station antenna. Check these features:
Ringo Ranger II incorporates proven features with new insulating materials and 5/8 wavelength decoupling section for increased gain and feedline isolation.
Covers entire band yet can be optimized for your location and favorite operating frequency.
Made from 6063-T832 corrosion resistant seamless aluminum tubing. Does not have noise producing "stovepipe" seams. Longer life because insulators are not degraded by short exposures to sunlight. Low profile for best appearance and least wind loading.
Strong enough to endure wind and ice storms. Built-in lightning arrester to reduce static noise and lightning hazzard. Conveniently mounted and it fits nicely on towers with other antennas.
ANTENNAS
ARX-2B 144-174 MHz
ARX-220B 220-225 MHz
ARX-450B 435-470 MHz
Ringo Ranger II Conversion Kit includes decoupling section with mounting ring, hardware, RG-8/U cable, connector boots, plus a built-in lightning arrester, upgrade for your Ringo Ranger.
CONVERSION KITS
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ARB-220K
ARB-450K
Available through dealers worldwide.
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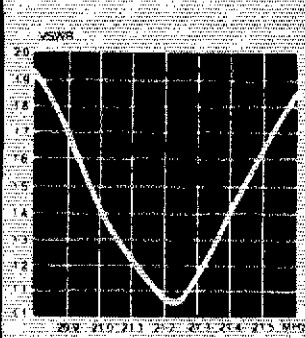
Manchester, NH 03108



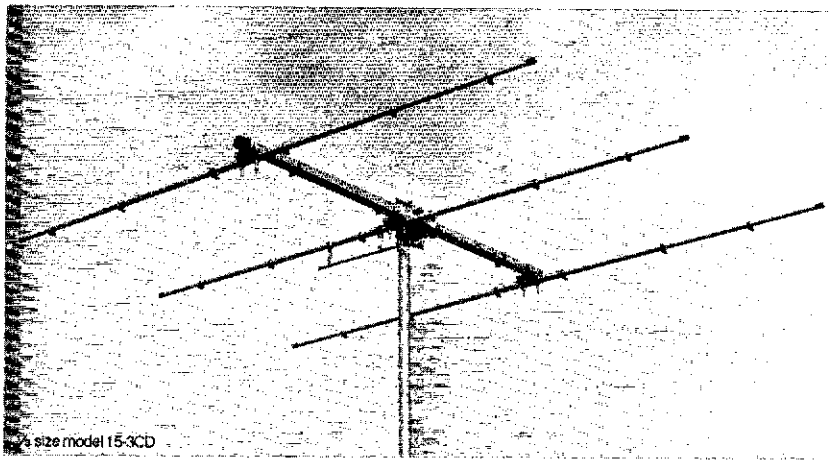
Skywalker

3 and 4 Element Single Band HF Yagis

More contacts, less waiting, less interference, and a better signal at the other end are yours with the Skywalker series of single band Yagis. The forward gain of the 4 element models will put you first in line. See the chart for all the details.

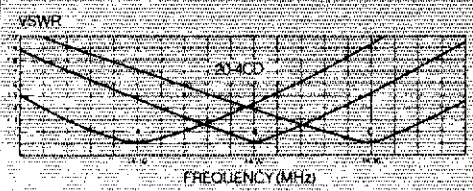
Heavy wall heat treated 6063-T832 aluminum tubing, ruggedly plated steel fasteners, and carefully formed aluminum brackets. Assembly is simple with the new Cushcraft Boom Assembly Marking System. The rugged yet light construction will result in easier assembly and installation and long life. Join the thousands that are moving up to Cushcraft Skywalkers now.

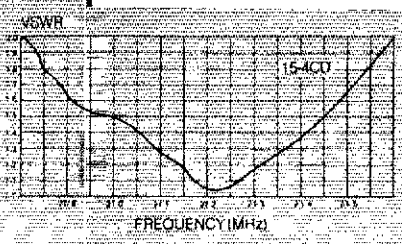

Full size 24CD

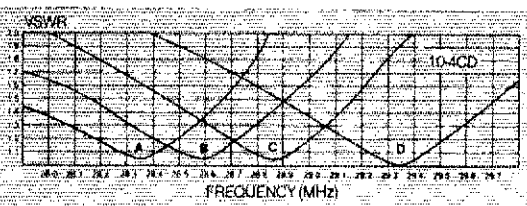

Full size model 15-3CD

Specifications

Model number	20-4CD	20-3CD	15-4CD	15-3CD	10-4CD	10-3CD
Frequency range (MHz)	14.0 – 14.35	14.0 – 14.35	21.0 – 21.45	21.0 – 21.45	28.0 – 29.7	28.0 – 29.7
Forward gain (dBd)						
Front to back ratio (dB)						
Boom length (ft) (m)	32 9.75	18 5.49	20 6.10	14 4.27	17 5.18	12 3.66
Boom dia. (in) (cm)	2⅜"-1⅛" 5.4-4.8	2⅜"-1⅛" 5.4-4.8	2"-1⅜" 5.1-4.1	1⅜"-1⅛" 4.8-4.1	1⅛"-1⅛" 4.4-3.8	1⅛"-1⅛" 4.1-3.8
Longest element (ft-in) (m)	35-10 10.92	35-6 10.87	23-4 7.11	23-2 7.06	17-10 5.43	17-8 5.38
Element dia. (in) (cm)	1¼"-⅜" 3.1-1.3	1¼"-⅜" 3.1-1.3	1"-⅜" 2.5-1.6	1"-⅜" 2.5-1.6	⅞"-⅜" 2.2-1.6	⅞"-⅜" 2.2-1.6
E-plane B/width (deg)	60	56	57	56	57	56
Side lobe attenuation (dB)	40	40	40	40	40	40
1.5-1 VSWR Bandwidth	300 KHz	800 KHz	500 KHz	500 KHz	600 KHz	700 KHz
Turning radius (ft-in) (m)	20 6.10	23 7.01	15-4 4.67	13-6 4.11	14 4.27	10 3.05
Weight (lbs) (kg)	55 24.95	30 13.61	25 11.34	20 9.07	18 8.16	11 5.00
Windload (sq ft) (sq m)	8.1 0.75	5.5 0.51	4.5 0.42	3.4 0.32	3.1 0.29	2.3 0.21







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CORPORATION
The Antenna Company
48 Perimeter Road, P.O. Box 4680

DUST COVERS

Holiday gifts that wrap up year-round protection

Here's a great idea every Ham can use. Cover Craft Dust Covers are available for hundreds of current equipment models and accessories, as well as items no longer made. Priced under $6.

Call Dealer First To Insure Availability

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VAN NUYS 213/988-2212
HOBBI-TRONICS
SAN JOSE 408/293-6268
JUN'S ELECTRONICS
LOS ANGELES 213/477-1824
QUEMENT ELECTRONICS
SAN JOSE 408/998-5900
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SACRAMENTO 916/441-7388
WEBSTER RADIO
FRESNO 209/224-5111
COLORADO
CW ELECTRONIC SALES INC.
DENVER 303/832-1111
RADIO SERVICE CENTER
DENVER 303/922-8107
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HARTFORD 203/527-1881
DELAWARE
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WILMINGTON 302/478-2757
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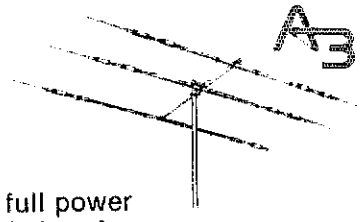

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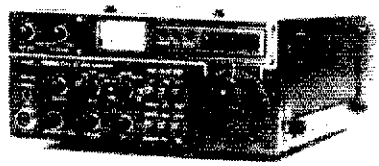
IC-2AT AND ACCESSORIES NOW AVAILABLE FOR IMMEDIATE DELIVERY

BE PREPARED FOR 6M DX OPENINGS THIS FALL WITH ICOM'S IC-551D OR IC-551



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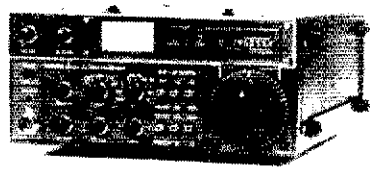
50.000-53.9999MHz, 80W (551D) 10W(551) SSB, CW, FM (optional) and AM at reduced power. Dual VFO's with 3 memories. Dual all mode scanning system. PS-20 power supply required for IC-551D. Pass Band Tuning and VOX optional on IC-551.

IC-251A 2M ALL MODE

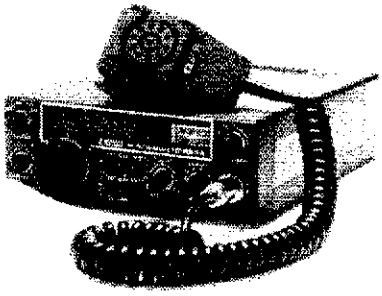


AMATEUR NET $699.00

SALE $599.95

143.8000 - 148.1999 MHz, 10W,SSB,FM,CW. Dual VFO's with 3 memories. Dual all mode scanning system. AC supply self-contained.

IC-255A 25W, 2M FM



143.800-148.195 MHz, 25W FM. Dual VFO's with 5 memories. Band scan/Memory scan also included. 7.3"(W)x2.5"(H)x8.8"(D).

CALL FOR SPECIAL PRICE

Optional Encoding Microphone Available

IC-260A 2M ALL MODE

AMATEUR NET $489.00

SALE $429.00

143.8000-148.1999 MHz, 10W FM, SSB (USB/LSB) and CW. Dual VFO's with 3 memories. Band scan/Memory scan also included. 7.3"(W)x2.5"(H)x8.8"(D).

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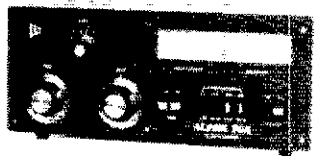
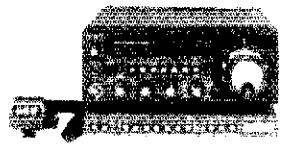
Now Available in the Northwest.



YAESU FT-707



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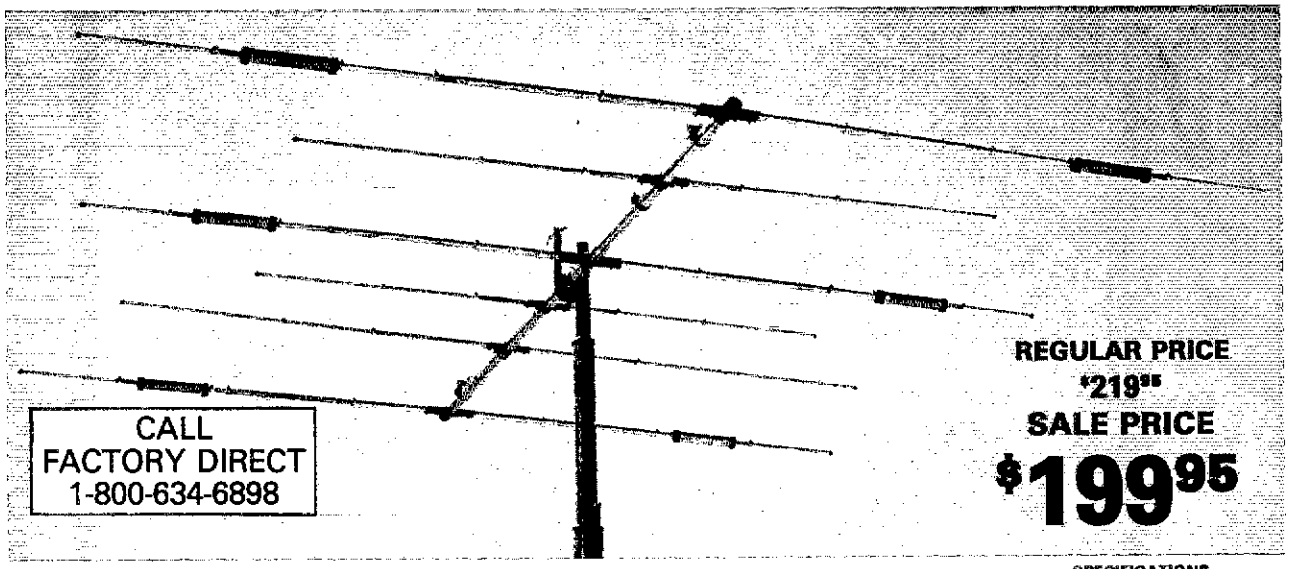
WILSON SYSTEMS, INC.

CHRISTMAS SPECIAL SALE

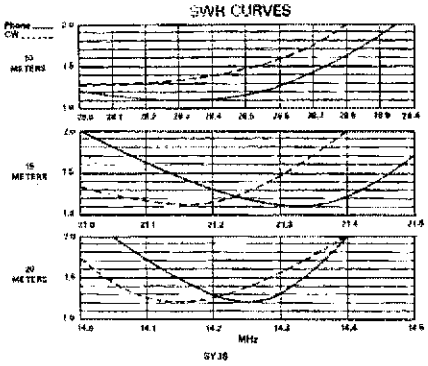
SYSTEM 36



CALL
FACTORY DIRECT
1-800-634-6898

REGULAR PRICE
~~$219.95~~
SALE PRICE
$199.95

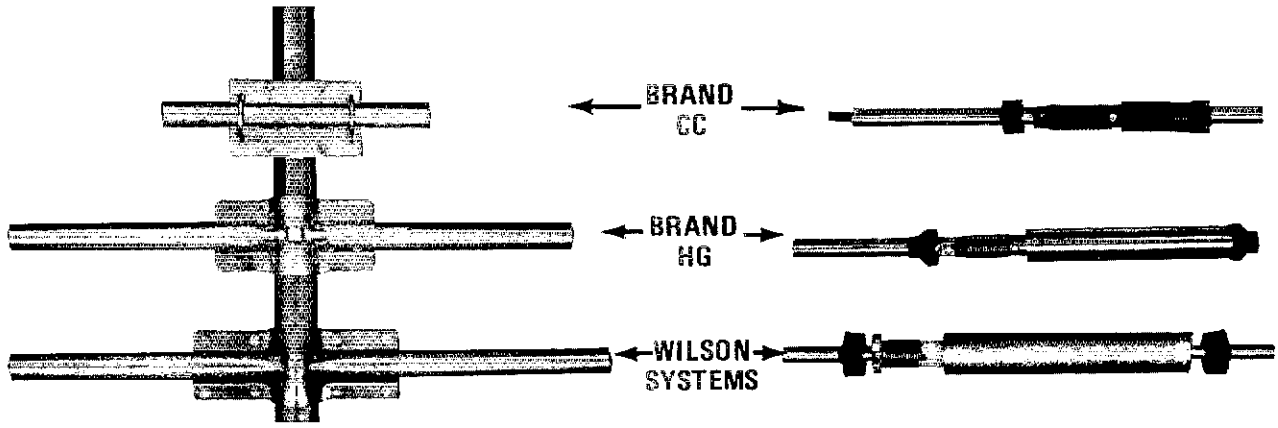
A trap loaded antenna that performs like a monobander! That's the characteristic of this six element three band beam. Through the use of wide spacing and interlacing of elements, the following is possible: three active elements on 20, three active elements on 15, and four active elements on 10 meters. No need to run separate coax feed lines for each band, as the bandswitching is automatically made via the High-Q Wilson traps. Designed to handle the maximum legal power, the traps are capped at each end to provide a weather-proof seal against rain and dust. The special High-Q traps are the strongest available in the industry today.



SPECIFICATIONS

Band MHz	14-21-28
Maximum power input	Legal Limit
Gain (dbd)	Call Factory
VSWR @ resonance	1.3:1
Impedance	50 ohm
F/B Ratio	Call Factory
Boom (O.D. x Length)	2" x 24'2½"
No. of Elements	6
Longest Element	28'2½"
Turning Radius	18'6"
Maximum Mast Diameter	2"
Surface Area	8.6 sq. ft.
Matching Method	Beta
Wind Loading @ 80 mph	215 lbs.
Maximum Wind Survival	100 mph
Feed Method	Balun (Supplied)
Assembled Weight (approx.)	53 lbs.
Shipping Weight (approx.)	62 lbs.

Compare the SY-36 & SY-33 with others...



Compare the size and strength of the boom to element clamps. See who offers the largest and heaviest duty. Which would you prefer?

Wilson Systems traps offer a larger diameter trap coil and a larger outside housing, giving excellent Q and power capabilities.

For Christmas Special

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WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

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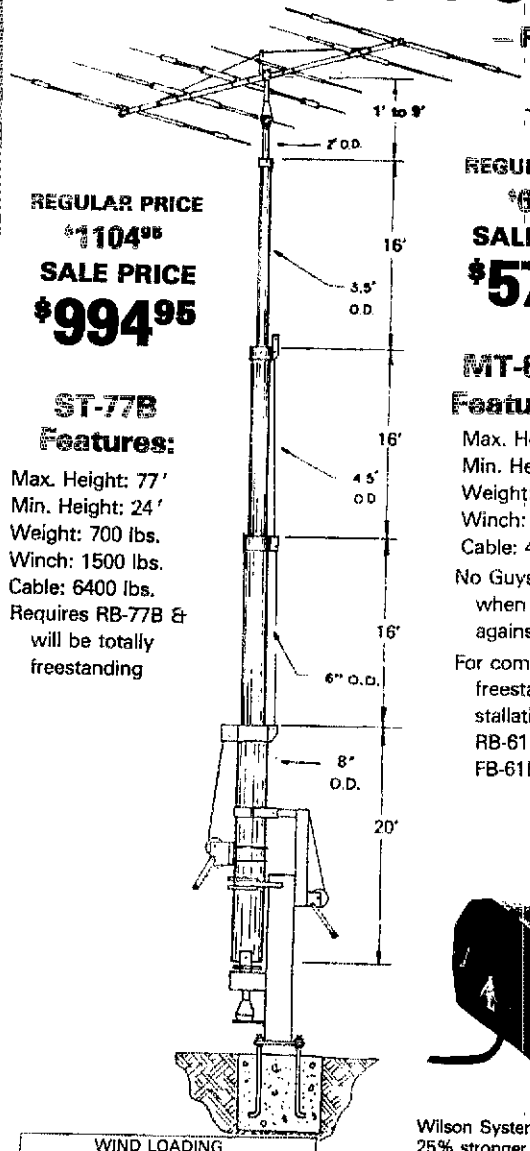
WILSON SYSTEMS TOWERS

— FACTORY CHRISTMAS SALE —



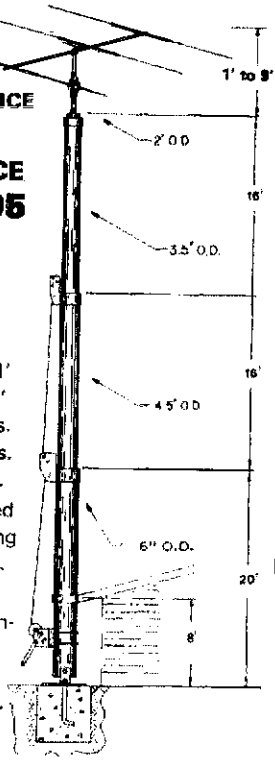
REGULAR PRICE ~~$1104.95~~

SALE PRICE

$994.95

ST-77B Features:

Max. Height: 77'
Min. Height: 24'
Weight: 700 lbs.
Winch: 1500 lbs.
Cable: 6400 lbs.
Requires RB-77B & will be totally freestanding



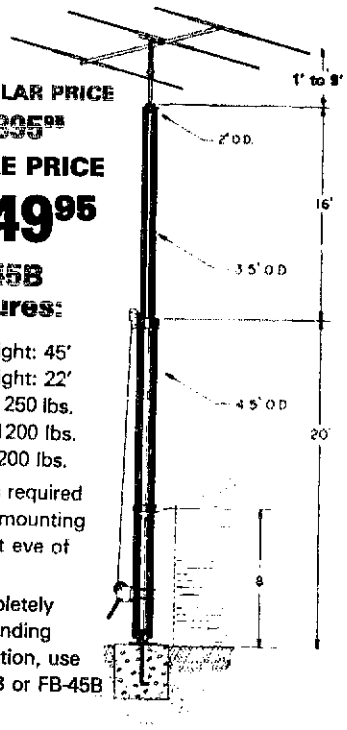
REGULAR PRICE ~~$619.95~~

SALE PRICE

$579.95

MT-61B Features:

Max. Height: 61'
Min. Height: 23'
Weight: 450 lbs.
Winch: 1200 lbs.
Cable: 4200 lbs.
No Guys required when mounting against house.
For completely freestanding installation, use RB-61B or FB-61B below.



REGULAR PRICE ~~$395.95~~

SALE PRICE

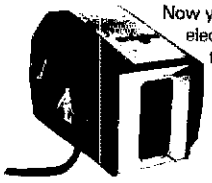
$349.95

TT-45B Features:

Max Height: 45'
Min. Height: 22'
Weight: 250 lbs.
Winch: 1200 lbs.
Cable: 4200 lbs.
No Guys required when mounting against eve of house.
For completely freestanding installation, use RB-45B or FB-45B below.

WIND LOADING			
Tower	Height	Sq. Ft.	
ST-77B	69	18	Square Footage Based on 50 MPH Wind
	77	10	
MT-61B	53	18	
	61	12	
TT-45B	37	18	
	45	12	

NEW! Wilson Electric Winch



Now you can raise and lower your Wilson Tower electrically. The electric winch will replace the hand operated winch. Available for use on the TT-45, MT-61 and ST-77 towers.

EW-45 (TT-45)
EW-61 (MT-61)
EW-77 (ST-77)

$249.95

Remote Switch . . . $24.95

BASE CHART		
TOWER	WIDTH	DEPTH
TT-45B	12" x 12"	30"
FB-45B	30" x 30"	4½'
RB-45B	30" x 30"	4½'
MT-61B	18" x 18"	4'
FB-61B	3' x 3'	5½'
RB-61B	3' x 3'	5½'
ST-77B	See Below	
RB-77B	3½' x 3½'	6'

Wilson Systems uses a high strength carbon steel tube manufactured especially for Wilson Systems. It is 25% stronger than conventional pipe or tubing. The tubing size used is: 2" & 3½"-.095; 4½" & 6"-.125; 8" -.134. All tubing is hot dip galvanized. Top section is 2" O.D. for proper rotor and antenna mounting.

The TT-45B and MT-61B come complete with house bracket and hinged base plate for against-house mounting. For totally freestanding installation, use either of the tilt-over bases shown below.

The ST-77B cannot be mounted against the house and must be used with the rotating tilt-over base RB-77B shown below.

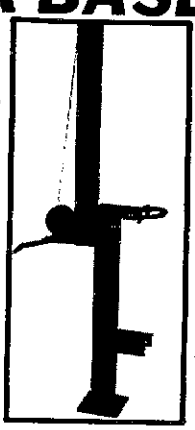
TILT-OVER BASES FOR TOWERS

FIXED BASE

The FB Series was designed to provide an economical method of moving the tower away from the house. It will support the tower in a completely free-standing vertical position, while also having the capabilities of tilting the tower over to provide an easy access to the antenna. The rotor mounts at the top of the tower in the conventional manner, and will not rotate the complete tower.

FB-45B...112 lbs...$169.95

FB-61B...169 lbs...$244.95



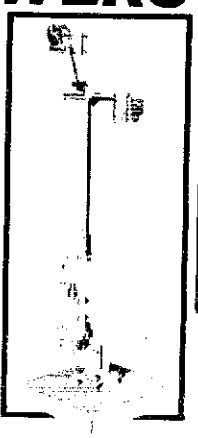
ROTATING BASE

The RB Series was designed for the Amateur who wants the added convenience of being able to work on the rotor from the ground position. This series of bases will give that ease plus rotate the complete tower and antenna system by the use of a heavy duty thrust bearing at the base of the tower mounting position, while still being able to tilt the tower over when desiring to make changes on the antenna system.

RB-45B...144 lbs...$234.95

RB-61B...229 lbs...$309.95

RB-77B...300 lbs...$463.95



Tilting the tower over is a one-man task with the Wilson bases. (Shown above is the RB-61B. Rotor is not included.)

CHRISTMAS SPECIAL SALE
Call Factory Direct
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Order the CHRISTMAS SPECIAL!

Prices Effective 11-1-80 thru 12-31-80

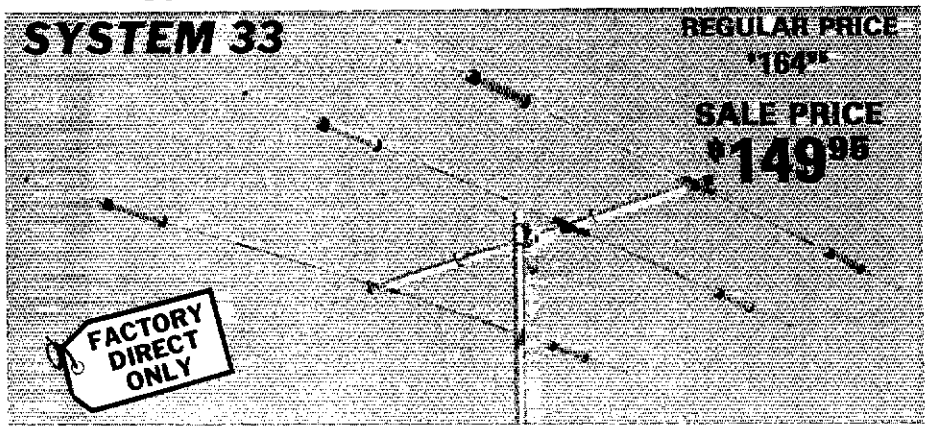
WILSON SYSTEMS, INC.

4286 S. Polaris Ave. • Las Vegas, Nevada 89103

WILSON SYSTEMS INC.

SYSTEM 33

REGULAR PRICE
$164.95
SALE PRICE
$149.95



Capable of handling the Legal Limit, the *SYSTEM 33* is the finest compact tri-bander available to the amateur.

Designed and produced by one of the world's largest antenna manufacturers, the traditional quality of workmanship and materials excels with the *SYSTEM 33.*

The boom-to-element mount consists of two 1/8" thick formed aluminum plates that will provide more clamping and holding strength to prevent element misalignment.

Superior clamping power is obtained with the use of a rugged 1/4" thick aluminum plate for boom to mast mounting.

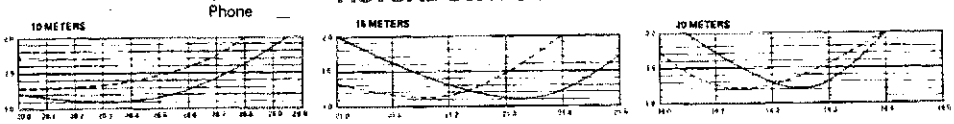
The use of large diameter High-Q Traps in the *SYSTEM 33* makes it a high performing tri-bander and at a very economical price.

A complete step-by-step illustrated instruction manual guides you to easy assembly and the lightweight antenna makes installation of the *SYSTEM 33* quick and simple.

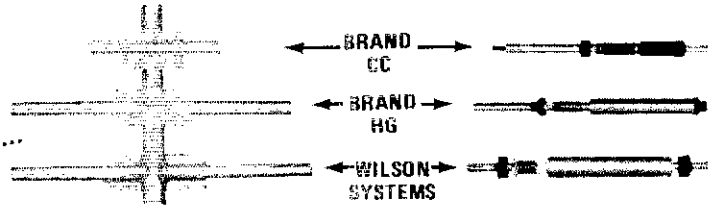
SPECIFICATIONS

Band MHz. 14-21-28	Boom (O.D. x length)2" x 14'4"	Wind load @ 80 mph . . 114 lbs
Max power input. . . . Legal limit	No. elements. 3	Assembled Wt. . . . . 37 lbs
Gain (dbd) . . . . . Call Factory	Longest element. . . . . 27'4"	Shipping Wt. . . . . 42 lbs
VSWR at resonance. 1.3:1	Turning radius. . . . . 15'9"	Direct 52 ohm feed
Impedence . . . . . 50 ohms	Max. mast diameter. . . 2" O.D.	no balun required
F/B ratio. . . . . Call Factory	Surface area . . . . . 5.7 sq. ft.	Max wind survival . . . 100 mph

ACTUAL SWR CURVES



COMPARE THE SY33 WITH OTHERS...



Compare the size and strength of the boom to element clamps. See who offers the largest and heaviest duty. Which would you prefer?

Wilson Systems traps offer a larger diameter trap coil and a larger outside housing, giving excellent Q and power capabilities.

ADD 40 METERS TO YOUR TRI-BAND WITH THE 33-6 MK

— IN STOCK —

REGULAR PRICE
$65.95
SALE PRICE
$59.95

Now you can have the capabilities of 40-meter operation on the *SYSTEM 36* and *SYSTEM 33.* Using the same type high quality traps, the 40-meter addition will offer 150 KHZ of bandwidth. The 33-6 MK will fit your present SY36, SY33, or SY3 and use the same single feed line.

The 33-6 MK adds approximately 15' to the driven element of your tri-bander, increasing the tuning radius by 5 to 6 feet. This addition will offer a rotatable dipole at the same height of your beam.

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REGULAR PRICE
$65.95
SALE PRICE
$59.95

WV-1A

4 BAND TRAP VERTICAL (10 - 40 METERS)

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across the full width of each band.

Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity.

Easily assembled, the WV-1A is supplied with a base mount bracket to attach to vent pipe or to a mast driven in the ground.

NOTE:
Radials are required for peak operation or above ground mounting. (See GR-1 below)

SPECIFICATIONS

- 19' total height
- Self supporting — no guys required
- Weight — 14 lbs.
- Input impedance: 50 Ω
- Powerhandling capability: Legal Limit
- Two High-Q traps with large diameter coils
- Low angle radiation
- Omnidirectional performance
- Taper swaged aluminum tubing
- Automatic bandswitching
- Mast bracket furnished
- SWR: 1.1:1 or less on all bands

GR-1

GROUND RADIAL KIT

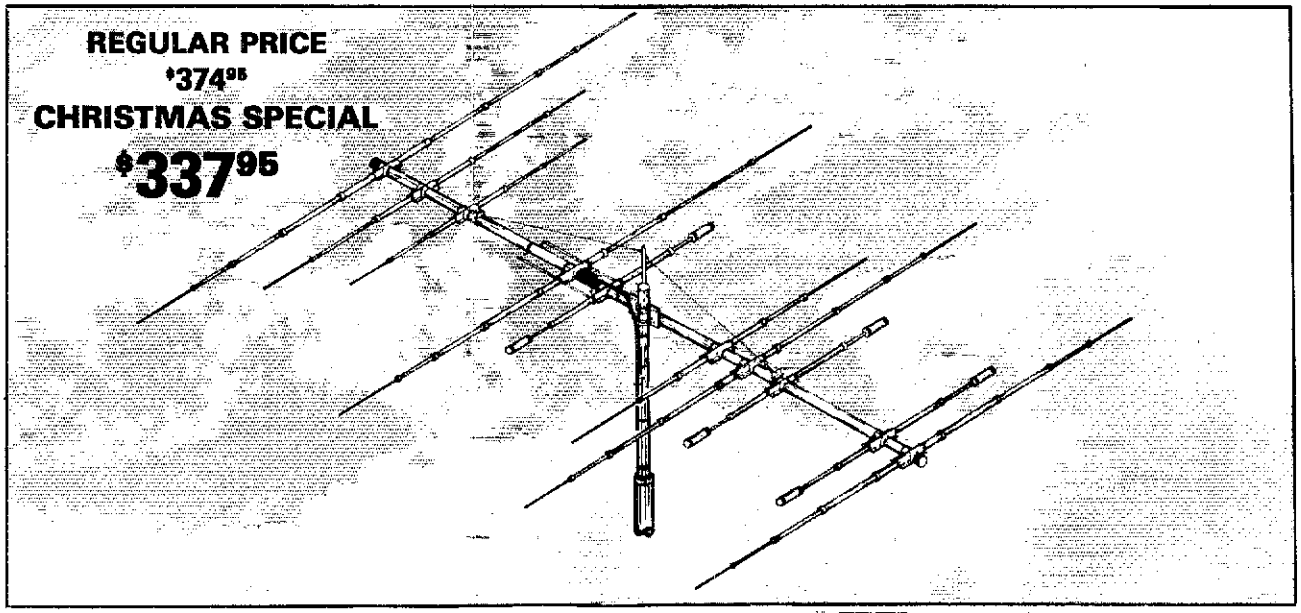
REGULAR PRICE
$14.95
SALE PRICE
$12.95

The GR-1 is the complete ground radial kit for the WV 1A. It consists of 150' of 7/14 aluminum wire, heavy duty egg insulators and instructions. The GR-1 will increase the efficiency of the WV-1 by providing the correct counterpoise.

WILSON SYSTEMS, INC. PRESENTS

CHRISTMAS SPECIAL THE SYSTEM 40 TRIBANDER

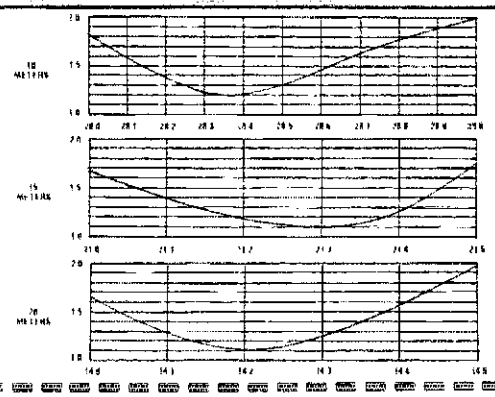
3 MONOBAND ANTENNAS IN ONE — EACH WITH FULL MONOBAND PERFORMANCE



- FOR THE SERIOUS DXer WHO WANTS MONOBANDERS ON 10-15-20
- FOUR FULL SIZE 20 MTR ELEMENTS
- FOUR WIDE SPACED 15 MTR ELEMENTS
- FIVE WIDE SPACED 10 MTR ELEMENTS
- ONLY ONE FEED LINE REQUIRED
- HEAVY DUTY BALUN INCLUDED
- DESIGNED WITH NO INTERACTIONS BETWEEN ELEMENTS
- ALL DRIVEN AND DIRECTOR ELEMENTS ARE INSULATED FROM BOOM
- SAME QUALITY HARDWARE AS USED IN ALL *WILSON* ANTENNAS

— SPECIFICATIONS —

Max. Pwr. Input	Legal Limit	Longest Element	36'
VSWR @ Res.	1.2:1	Turning Radius	22'6"
Impedance	50 ohm	Boom	26'
Feed Method	Balun Supplied	Surface Area	12.1 sq. ft.
Matching Method	Modified Beta	Wind Loading @ 60 mph	309 lbs.
F/B Ratio	Call Factory	Assem. Weight	75 lbs.
Gain	Call Factory	Shipping Weight	99 lbs.



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Las Vegas, NV 89103 — (702) 739-7401

FACTORY DIRECT ORDER BLANK

CHRISTMAS SPECIAL SALE

Toll-Free Order Number
1-800-634-6898

Qty.	Model	Description	Shipping	Price
	SY40	10 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	337.95
	SY36	6 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	199.95
	SY33	3 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	149.95
	33-6 MK	40 Mtr. Mod Kit for SY33 & SY36	UPS	59.95
	WV-1A	Trap Vertical for 10, 15, 20, 40 Mtrs.	UPS	59.95
	GR-1	Ground Radials for WV-1A	UPS	12.95
	M-420A	4 Elements on 20 Mtrs.	UPS	174.95
	M-515A	5 Elements on 15 Mtrs.	UPS	139.95
	M-520A	5 Elements on 20 Mtrs.	TRUCK	224.95
	M410A	4 Elements on 10 Mtrs.	UPS	74.95
		ACCESSORIES		
	T²X	Tail Twister Rotor	UPS	274.95
	HD-73	Alliance Heavy Duty Rotor	UPS	109.95
	RC-8C	8/C Rotor Cable	UPS	18¢/ft.
	RG-8U	RG-8U Foam Coaxial Cable — Ultra Flex center conductor, 11 guage	UPS	28¢/ft.
	EW-45	Wilson Electric Winch for TT-45B	UPS	249.95
	EW-61	Wilson Electric Winch for MT-61	UPS	249.95
	EW-77	Wilson Electric Winch for ST-77	UPS	249.95

Qty.	Model	Description	Shipping	Price
	RM-1	Remote Switch for EW	UPS	24.95
	TT-45B	Freestanding 45' Tubular Tower	TRUCK	349.95
	RB-45B	Rotating Base for TT-45B w/tilt over feature	TRUCK	234.95
	FB-45B	Fixed Base for TT-45B w/tilt over feature	TRUCK	169.95
	MT-61B	Freestanding 61' Tubular Tower	TRUCK	579.95
	RB-61B	Rotating Base for MT-61B w/tilt over feature	TRUCK	309.95
	FB-61B	Fixed Base for MT-61B w/tilt over feature	TRUCK	244.95
	ST-77B	Freestanding 77' Tubular Tower	TRUCK	994.95
	RB-77B	Rotating Base for ST-77B w/tilt over feature	TRUCK	463.95
	GK-46	Guying Kit for GT-46	UPS-TRK	74.95
	GK-45B	Guying Kit for TT-45B	UPS-TRK	69.95
	GK-61B	Guying Kit for MT-61B	UPS-TRK	79.95
	GK-77B	Guying Kit for ST-77B	UPS-TRK	99.95
	WTB-1	Thrust Bearing for Top of Rotating Towers	UPS-TRK	59.95

NOTE:
On Coaxial and Rotor Cable, minimum order is 100' and 50' multiples.
Prices and specifications subject to change without notice.
Ninety (90) Day Limited Warranty — Shipping Not Included in Above

Christmas Prices Effective Nov. 1-Dec. 31, 1980 Nevada Residents add Sales Tax
Ship C.O.D. ☐ Check enclosed ☐ Charge to VISA ☐ MasterCharge ☐

Card No. _____ Expires _____

Bank No. _____ Signature _____

Name _____ Phone _____

Street _____

City _____ State _____ Zip _____

Prices and specifications subject to change without notice.

K9TF W9RVM N9TV K9BLK W9HIW K9VMG W9UMH WB9ZHL. Congratulations to the Randolph County ARES and EC W9VJX for their activity during the telephone emergency. Stations were: K9DZU WB9IJZZ WA9CFW KA9CPH WD9FPZ W9GJG KA9GKM WB9SYL KA9CXY K9OIM WD9ATT KA9DMJ WD9GBH WB8EBY K9SGB WB9PGV WB9WXP WD9GQL. Congratulations to K9UJK and the Delaware County ARES for their help with the Endurathon and EMS ambulance service. Stations were: W9OIM WB9IGS KA9CXY WB9BSE K9LXH WB9HFG. To encourage Public Service Honor Roll, here is how it is done courtesy W9JUJ: 30 points for cw nets, 30 points for phone nets, 12 points for NCS on cw, 12 points for NCS on phone, points for NTS liaison, 24 points for messages delivered, 15 points for handling emergency messages, 5 points for STM, total 140. I participated this month with NAFE ARC in covering a horse jumping contest. It was exciting, helpful, and FUN. A wonderful public service activity. Here is to WB9LCN, may he win the Murphy's Law Award, given by the WWVARC. Traffic: W9JUJ 1027, W9FC 214, WD9GXW 137, N9AEI 102, W9PMT 83, WB9WRC 77, W9QLW 75, WD9DVA 63, KB9IT 60, WB9ZQE 52, W9WKM 50, W9EI 49, W9DLF 41, N9PS 41, WA9OHX 37, WA9QCF 36, W9UEM 35, W9OKK 33, W9URO 33, W9XD 33, WB9LCN 30, WB9OTX 30, W9DZC 23, K9FZX 22, WA9JNC 22, WB9ZHL 21, WA9GJZ 18, K9KTB 18, K9DIY 17, K9WWJ 16, K9CGS 14, WB9AWI 10, W9RTH 10, WD9CIS 9, W9IOH 8, WB9YAY 8, W9WEI 7, W9VAY 6, W9ZW 6, WD9CIV 5, W9KMY 5, K9TKE 5, WD9ART 4, W9BDP 4, K9DCX 4, W9DKP 4, W8HUF 4, WB9KOT 4, K9OUP 4, W9OZJ 4, W8LKU 3, WA9TJS 3, W9UPI 3, N9ACG 2, N9AST 2, W9POF 2.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN: WB9YPY. ONI 923, QTC 985. BEN: WB9ESM. ONI 688, QTC 1122. WSBN: WB9ICH. ONI 1058, QTC 223. WNN: N9AUG, ONI 184, QTC 38. WIN-E: W9DM, ONI 352, QTC 84. WIN-L: K9LGU, ONI 258, QTC 77. WIXPO: WA9NIX, ONI 402, QTC 25. New manager for BWN is WB9YPY. Thanks to W9AYK for this past service as manager. K9QXY won the FLARC hidden transmitter hunt held Sept. 2. WNA meeting was successful. WD9IUX, pres.; W9IEM, treas.; W9AYKJ, secy. W9AYK's corn roast was superb. Next year WNA picnic is slated for North Wood County Park, the conveniences there are excellent, shelter house, kids' playground, ball diamond, camping all real close by. Sorry to report K9YYB W9GKO W9PTN Silent Keys. New Novice Prentice area, KA9JFK, OM of WD9IUX. West Allis ARC Swaptest, January 10, 1981, at Waukesha County Exposition Center. KA9CPA made BPL. WD9IUX, acting manager of D9RN, reports it handled 298 messages. Wisconsin stations were well represented on D9RN and CAND. Green Bay area 2-meter net had 10 QNI, 2 QTC. NWTN had 528 QNI, 58 QTC. Glad to see all the new members joining our nets, welcome to the group. We hope we can help you. Traffic: KA9CPA 1783, WD9IUX 431, W9CXY 181, WB9YPY 152, N9AZI 151, N9AUG 113, K9FHI 110, WD9ESZ 104, W9YCV 92, K9AKG 86, W9DND 71, WA9WYS 67, WB9ESM 57, W9DM 56, WB9NRK 53, WB9ICH 47, W9IEM 46, AG9G 45, W9AYK 44, W9LDO 43, K9LGU 40, W9IGL 40, K9UU 40, N9CP 39, WB9WHQ 34, K9JPS 33, K9AQ 32, W9FDY 32, WB7OJV 31, AD9X 31, WB9BRE 29, KB9NG 29, N9BCX 26, WA9ZIY 26, K9HDF 25, W9IHW 23, W9CJE 22, KB9NF 22, WB9YPZ 22, WB9JSW 21, W9SQJ 21, WD9AJA 19, WD9BCM 16, K9KSA 16, W9UW 16, K9CPM 13, K9UTQ 12, WB9PAW 11, WD9GJV 6. (Aug.) WB7OJV 25, K9KSA 21, K9JPS 18, W9SQJ 17.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX — Our sincere sympathy goes out to KØEWA and family in the loss of KØQRO who became a Silent Key in Sept. and to the family of WAØCUA who became a Silent Key in Oct. Our thanks go out to KØPIZ who has managed the MSN 2 for the past 3 years. He is soon leaving Amateur Radio by his sharing part of his time now with his family, who are bowlers. Join our nets when you can and thanks for a job well done. KØJCF of St. Charles, is our newly appointed manager of MSN 2. He is a DX hound, a pilot, a farmer, works at the clinic and is interested in public service, which traffic is. We are all with you. Traffic: WAØTFC 427, KØPIZ 115, AFØZO 115, WDØCGM 106, KCØZ 93, KBØMB 86, KCØT 78, WØDFX 75, WBØUKT 61, WAØAIN 44, WØRIQ 40, WBØHOX 38, WBØNZB 31, KØJCF 30, KØCSE 27, WBØGPX 20, WBØSCN 20, NØRBC 20, WAØYVT 14, WØOTX 13, KØTS 10, WBØWXU 8.

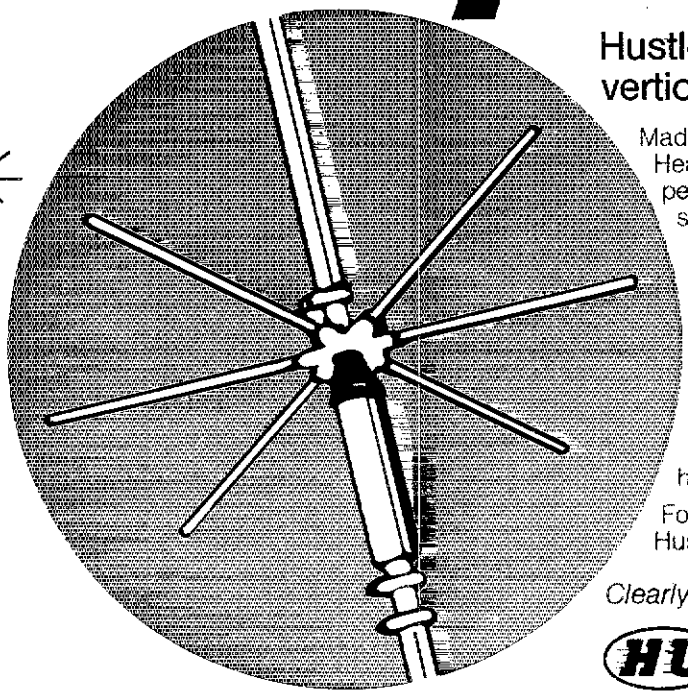
NORTH DAKOTA: SCM, Lois A. Jorgensen, WAØRWM — SEC: WBØTEE. OBS: WØDM. NM: WAØCRH. OO: WDØCLB. Dakota Division Convention in Fargo was dedicated to WØTSN, past pres. of ARRL and the present pres., W2HD, was the main speaker. The Fargo Radio Club was the host and it was well attended by 400. NC Emergency Traffic Net of Minot was activated Sept. 16 as telephone communications for the entire city were out as a result of an air conditioning malfunction which resulted in the main switchboard computer to malfunction and was asked by c.d. director for their assistance. Congrats to KAØJGL as Novice. Congrats to KØRHX and WDØECG on their new harmonic. KØATK went to VA to visit his brother. New hams in Grand Forks are WA6VRS and AA6HZ. Traffic: WAØRWM 107.

SOUTH DAKOTA: SCM, Erwin Helmbuck, KØOTZ — SEC: WAØTNM. NMs: WØHOJ WØWE WAØTNM. Congrats to WAØTNM and WDØBMR on making PSHR again. New hams are NØBZP and KBØRG in Yankton and KAØJGQ in Ideal, congrats. KBØQA operated KØOTZ for the CAN-AM CW Contest, hope he did well on that. AAØF is building a 432 moon bounce array. South Dakota School of Mines Ham Club reports a very large membership and good attendance at their code and theory classes. KAØDDS gave a talk about ham radio at the Lead Kiwanis. Let's hear about more of this. I want to take this opportunity to say hello to all of you out in the state and I hope to get to visit with all of you in the next year. Let's hear from all of you about your activities, contesting, VHF, RTTY, the whole hobby. Traffic: WDØBMR 138, KØFRE 93, WØDVB 82, WAØTNM 70, WBØOMF 31, WØWRE 4.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: K5TML. NMs: WA5LGN W5MYZ W5POH WA5ZWZ. Nets: ARN 3.995 0030/dy 1058 47 WA5LGN; OZK 3.760 0100/dy 177 39 W5MYZ, APN 3.937 1200/M-S 647 36 W5POH; M-B 3.928 2230/M-F 654 23 WA5ZWZ; SCARC 28.765 0230/M&T 36-12 WA5VSV. Thanks to WA5VNV KA5DFT & KA5DQG for radio booth at Ark State Fair. WB5SQJ & YF proud parents of twin boys. Our sympathy to family

Heavy Favorite



Hustler's 5-BTV™ five band vertical antenna.

Made heavier for better performance and quality. Heavier optimum Q traps assure accurate and permanent resonance for greater bandwidth. Heavier solid one-inch fiberglass trap forms give optimum electrical and mechanical stability.

One setting provides total band coverage from 10 through 40 meters with SWR of 1.6:1 or better at band edges, and up to 100 kHz on 75/80 meters.

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5 Watts 2m FM 800CH Synthesizer.

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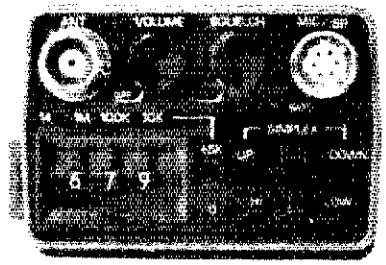
MODEL DG800

With Rubber Ant Wall Charger Battery Pack



All controls are on the Top.

• High Power Output 5 watts, switchable down to 1 watt. • High capacity battery pack. 12 V 450 mAh Sealed and Removable. • Small size 165 mm (H) 63 mm (W) 40 mm (D) • 144 to 147.995 MHz by 5 kHz Step • BNC antenna connector • External Speaker Microphone Connector • Internal condensor Microphone • Lo-stand-by current - 22mA • Super Sensitivity - .2 uV 12 db SINAD • SuperSelectivity - 16.9 MHz Monolithic filter and 455 kHz Ceramic filter. • All stages varactor tuned both on RX and TX • 500 mW of clean audio output. • Accessories: Touch Tone® Pad (Digitran) $29.00 Speaker Microphone - TBA Desk Top Charger - TBA.

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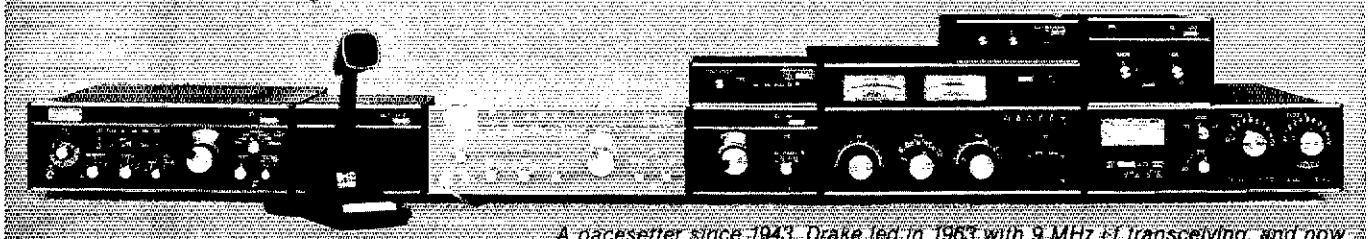
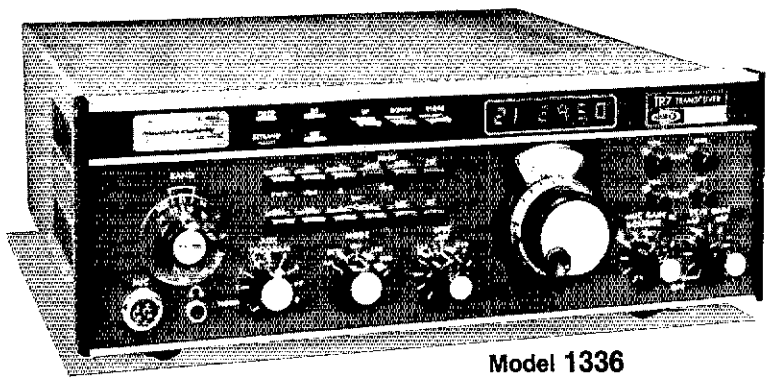
DRAKE 7-Line Family



A pacesetter since 1943, Drake led in 1963 with 9 MHz i-f transceiving, and now with 48 MHz i-f "Up Conversion"... Drake brings you tomorrow's state of the art today.



Model 1336

TR7

solid state continuous coverage synthesized hf system

Continuous Frequency Coverage—The TR7 provides continuous coverage in receive from 1.5 to 30 MHz. Transmit coverage is provided for all amateur bands from 160 through 10 meters. The optional AUX7 Range Program Board allows out-of-band transmit coverage for MARS, Embassy, Government and Commercial services as well as future band expansions in the 1.8 through 30 MHz range.* The AUX7 Board also provides 0 through 1.5 MHz receive coverage and crystal-controlled fixed-channel operation for Government, Amateur or Commercial applications anywhere in the 1.8 to 30 MHz range.

Synthesized/PTO Frequency Control—A Drake exclusive: carefully engineered high-performance synthesizer, combined with the famous Drake PTO, provides smooth, linear tuning with 1 kHz dial and 100 Hz digital readout resolution. 500 kHz up/down range switching is pushbutton controlled.

Advanced, High-Performance Receiver Design—The receiver section of the Drake TR7 is an advanced, up-conversion design. The first intermediate frequency of 48.05 MHz places the image frequency well outside the receiver input passband, and provides for true general coverage operation without i-f gaps or crossovers. In addition, the receiver section features a high-level double balanced mixer in the front end for superior spurious and dynamic range performance.

True Passband Tuning—The TR7 employs the famous Drake full passband tuning instead of the limited range "i-f shift" found in some other units. The Drake system allows the receiver passband to be varied from the top edge of one sideband, through center, to the bottom edge of the opposite sideband. In fact, the range is even wider to accommodate RTTY. This system greatly improves receiving performance in heavy QRM by allowing the operator to move interfering signals out of the passband, and it is so flexible that you can even transmit on one sideband and listen on the other.

Unique Independent Receiver Selectivity—Space is provided in the TR7 for up to 3 optional crystal filters. These filters are selected, along with the standard 2.3 kHz filter, by front panel pushbutton control, independent of the mode control. This permits the receive response to be optimized for various operating conditions in any operational situation. Optional filter bandwidths include 6 kHz for a-m, 1.8 kHz for narrow ssb or RTTY, and 500 Hz and 300 Hz for cw.

Broadband, Solid State Design—100% solid state throughout. All circuits are broadbanded, eliminating the need for tuning adjustments of any kind. Merely select the correct band, dial up the desired frequency, and you're ready to operate.

Rugged, Solid State Power Amplifier—The power amplifier is internally mounted, with nothing outboard subject to physical damage. A Drake designed custom heat sink makes this possible. The unique air ducting design of this heat sink allows an optional rear-mounted fan, the FA7, to provide continuous, full power transmit on SSTV/RTTY. The fan is not required for ssb/cw operation, since normal convection cooling allows continuous transmit in these modes.

Effective Noise Blanker—The optional NB7 Noise Blanker plugs into the TR7 to provide true impulse-type noise blanking performance. This unit is carefully designed to maximize both blanking and dynamic range in order to preserve the excellent strong-signal handling characteristics of the TR7.

* NOTE: Transmitter coverage for MARS, Government, and future WARC bands is available only in ranges authorized by the FCC, Military, or other government agency for a specific service. Proof of license for that service must be submitted to the R. L. Drake Company, including the 500 kHz range to be covered. Upon approval, and at the discretion of the R. L. Drake Company, a special range IC will be supplied for use with the Aux7 Range Program Board. Prices quoted from the factory. See Operator's Manual for details. (Not available for services requiring type acceptance.)

TR7

ACCESSORIES

Model 1336	Drake TR7 General Coverage Digital R/O Transceiver
Model 1338	Drake RV7 Remote VFO
Model 1502	Drake PS7 120/240V Ac Supply for continuous duty operation (25 amps)
Model 1570	Drake PS75 120/240V Ac supply for intermittent duty (15 amps continuous, 25 amps intermittent)
Model 1553	Drake SP75 Speech Processor
Model 1230	Drake LA7 Line Amplifier
Model 1533	Drake CS7 Coax Switch
Model 7077	Drake Desk Microphone
Model 1520	Drake P75 Phone Patch
Model 1536	Drake Aux7 Range Program Board **
Model 1531	Drake MS7 Matching Speaker
Model 1537	Drake NB7 Noise Blanker
Model 1529	Drake FA7 Fan
Model 7021	Drake SL-300 Cw Filter, 300 Hz
Model 7022	Drake SL-500 Cw Filter, 500 Hz
Model 7023	Drake SL-1800 Ssb/RTTY Filter, 1.8 kHz
Model 7024	Drake SL-6000 A-m Filter, 6.0 kHz
Model 1335	Drake MMK-7 Mobile Mounting Kit
Model 7037	Drake TR7 Service Kit/Extender Board Set
Model 385-0004	Drake TR7 Service/Schematic Book

**Aux7 must be used with either Model 1546 RRM-7 Range Receive Module, or Model 1547 RTM-7 Range Transceive Module. Use one module per 500 kHz range. Modules plug directly into Aux7.

TR7 SPECIFICATIONS

GENERAL

Receive

Without Aux7	1.5 to 30 MHz, continuous, no gaps.
With Aux7	Same, plus 0 to 1.5 MHz at reduced performance.

Transmit

Without Aux7	1.8-2.0, 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-30.0 MHz.
With Aux7*	Above ranges, plus any eight 500 kHz segments from 1.8 to 30 MHz.

Modes of Operation	Usb, Lsb, Cw, RTTY, A-m equiv. (A-3H).
Frequency Stability	Less than 1 kHz first hour. Less than 150 Hz per hour after 1 hour warm up. Less than 100 Hz for ± 10% line voltage change.

Frequency Readout Accuracy

Analog	Better than ± 1 kHz when calibrated at the nearest marker point.
Digital	15 ppm ± 100 Hz.

External Counter Mode

Maximum Input Freq.	150 MHz.
Input Level Range	50 mV to 2 V, rms.

Power Supply Requirements

11-16 V-dc (13.6 V-dc nominal), 3A receive, 25A transmit.

Dimensions

Depth	12.5 in. (31.75 cm), excluding knobs and connectors.
Width	13.6 in. (34.6 cm).
Height	4.6 in. (11.6 cm) excluding feet.
Weight	17.1 lb. (7.75 kg).

RECEIVER

Sensitivity

Ssb, Cw	Less than 0.5 μV for 10 dB (S+N)/N.
A-m (30% Mod.)	Less than 2.0 μV for 10 dB (S+N)/N.

Selectivity	2.3 kHz at − 6 dB and 4.4 kHz at − 60 dB (1.8:1 shape factor).
Ultimate Selectivity	Greater than 100 dB.
Agc	Less than 4 dB output variation for 100 dB input signal change, referenced to agc threshold.
Intermodulation	Intercept Point, +20 dBm. Two-tone Dynamic Range, 99 dB (at spacings of 100 kHz and greater).
I-f Frequency	First i-f—48.05 MHz. Second i-f—5.645 MHz.
Image and I-f Rejection	Greater than 80 dB.
Spurious Response	Greater than 60 dB down.
Internally Generated Spurious	Less than 1 μV equivalent, except 3 μV equivalent from 5 to 6 MHz (reduced specs on internal osc frequencies).
Audio Output	2.0 watts @ less than 10% THD (4 ohm load).

TRANSMITTER

Power Input (Nominal)

Ssb	250 watts PEP.
Cw	250 watts.
A-m equiv.	80 watts (carrier), plus upper sideband.

Load Impedance	50 ohms, nominal.
Spurious Output	Greater than 50 dB down.
Harmonic Output	Greater than 45 dB down.
Intermodulation Distortion	30 dB below PEP (24 dB below one of two tones).

Undesired Sideband Suppression

Greater than 60 dB @ 1 kHz.

Duty Cycle

Ssb, Cw	100%.
Tune, SSTV, RTTY, A-m	w/o 1529 FA7 Fan—33%, 5 min. transmit, max. with 1529 FA7 Fan—100%.

Wattmeter Accuracy	± 5% @ 100 watts (50 ohm load).
Carrier Suppression	Greater than 50 dB.
Microphone Input	High Impedance.

Specifications, availability and prices subject to change without notice or obligation.

R.L. DRAKE COMPANY

DRAKE

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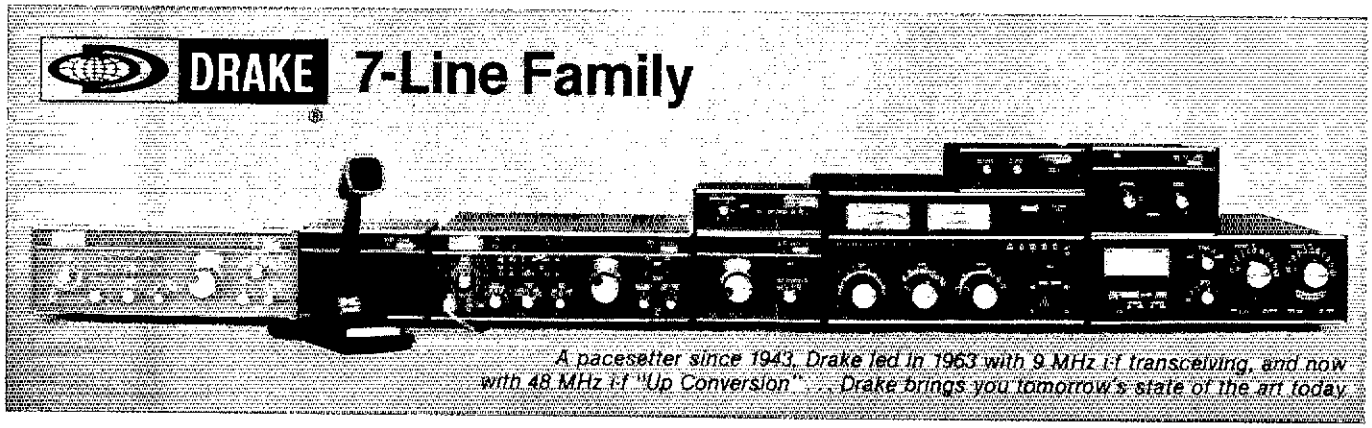
DRAKE 7-Line Family



A pacesetter since 1943, Drake led in 1963 with 9 MHz i-f transceiving, and now with 48 MHz i-f "Up Conversion" . . . Drake brings you tomorrow's state of the art today.

R7

Synthesized General Coverage Receiver

Model 1240

Full general coverage reception, 0-30 MHz, with no gaps or range crystals required.

Continuous tuning all the way from vlf thru hf. Superb state-of-the-art performance on a-m, ssb, RTTY, and cw—and it transceives with Drake TR7.

- **100% solid state broadband design,** fully synthesized with a permeability tuned oscillator (PTO) for smooth, continous tuning.
- **Covers the complete range 0 to 30 MHz** with no gaps in frequency coverage. Both digital and analog frequency readout.
- **Special front-end circuitry** employing the high level double balanced mixer and 48 MHz "up-converted" 1st i-f for superior general coverage, image rejection and strong signal handling performance.
- **Complete front-end bandpass filters** are included that operate from hf thru vlf. External vlf preselectors are not required.
- **10 dB pushbutton-controlled broadband preamp** can be activated on all ranges above 1.5 MHz. Low noise design.
- **Various optional selectivity filters** for cw, RTTY and a-m are switch-selected from the front panel. Ssb filter standard.
- **Special new low distortion "synchro-phase" a-m detector** provides superior international shortwave broadcast reception. This new technique permits 3 kHz a-m sideband response with the use of a 4 kHz filter for better interference rejection.
- **Tunable i-f notch filter** effectively reduces heterodyne interference from nearby stations.
- **The famous Drake full electronic passband tuning system** is employed, permitting the passband position to be adjusted for any selectivity filter. This is a great aid in interference rejection.
- **Three agc time constants** plus "Off" are switch-selected from the front panel.
- **Complete transceive/separate functions** when used with the Drake TR7 transceiver are included, along with separate R7 R.I.T. control.
- **Special multi-function antenna selector/50 ohm splitter** is switch-selected from the front panel, and provides simultaneous dual receive with the TR7. This makes possible the reception of two different frequencies at the same time. Main and alternate antennas and vhf/uhf converters may also be selected with this switching network.
- **The digital readout** of the R7 may be used as a 150 MHz counter, and is switched from the front panel. Access thru rear panel connector.
- **The built-in power supply** operates from 100, 120, 200, 240 V-ac, 50/60 Hz, or nominal 13.8 V-dc.
- **The R7 includes a built-in speaker,** or an external Drake MS7 speaker may be used.
- **Built-in 25 kHz calibrator** for calibration of analog dial.
- **Low level audio output** for tape recorder.
- **Up to eight crystal controlled fixed channels** can be selected. (With Drake Aux7 installed.)
- **Optional Drake NB7A Noise Blanker** available. Provides true impulse type noise blanking performance.

R7

Accessories available

Model 1531	Drake MS7 Speaker
Model 7021	Drake SL-300 Cw Filter, 300 Hz
Model 7022	Drake SL-500 Cw Filter, 500 Hz
Model 7023	Drake SL-1800 Ssb/RTTY Filter, 1800 Hz
Model 7024	Drake SL-6000 A-m Filter, 6.0 kHz
Model 7026	Drake SL-4000 A-m Filter. 4.0 kHz
Model 1532	Drake NB7A Noise Blanker
Model 1536	Drake Aux7 Range Program/Fixed-Frequency Board
Model 1548	Drake R7/TR7 Interface Cable Kit
Model 385-0005	Drake R7 Service/Schematic Book
Model 3506	Drake RP700 Receiver Protector
Model 1230	Drake LA7 Line Amplifier

R7 SPECIFICATIONS

Frequency Coverage, continuous tuning 0.01 to 30.0 MHz

Plus any eight additional 500 kHz segments between 0 and 30 MHz when programmed into Aux7 Board.

Crystal Controlled Fixed Frequencies: Up to eight crystal-controlled fixed frequencies within the 0-30 MHz range with Aux7 Accessory Board. Proper 500 kHz range for desired fixed frequency is also programmed into Aux7.

Frequency Stability: Less than 1 kHz first hour. Less than 150 Hz per hour after 1 hour warm up. Less than 100 Hz for ± 10% line voltage change.

Digital Readout Accuracy: (DR-7 installed) 15 PPM ± 100 Hz

Analog Dial Accuracy: Better than ±1 kHz when calibrated to nearest calibrator marker.

Modes of Operation: Ssb, cw, RTTY, SSTV, a-m.

Sensitivity (ssb): 1.8-30 MHz Less than .20μV for 10dB (S+N)/N with preamp on (typically .15μV) (Noise floor typically −134 dBm) Less than .50μV for 10 dB (S+N)/N without preamp (typically .30μV) (Noise floor typically −128dBm). .01-1.5MHz Less than 1.0μV for 10 dB (S+N)/N

Sensitivity (a-m): 1.8-30MHz Less than 1.2μV for 10dB (S+N)/N @ 30% modulation, preamp on. Less than 2.0μV for 10 dB (S+N)/N @ 30% modulation, preamp off. .01-1.5 MHz Less than 4.0μV for 10 dB (S+N)/N @ 30% modulation.

Selectivity (2.3 kHz filter supplied): 2.3 kHz at −6 dB, 4.4 kHz at −60 dB (1.8:1) shape factor. Optional 300 Hz, 500 Hz, 1800 Hz, 4 kHz, and 6 kHz filters are available as follows:

Accessory Crystal Filters

SL-300 cw filter: 300 Hz @ 6 dB, 700 Hz @ 60 dB
SL-500 cw, RTTY Filter: 500 Hz @ 6 dB, 1100 Hz @ 60 dB
SL-1800 ssb/RTTY Filter: 1800 Hz @ 6 dB, 3600 Hz @ 60 dB
SL-4000 a-m Filter: 4 kHz @ 6 dB, 8 kHz @ 60 dB
SL-6000 a-m Filter: 6 kHz @ 6 dB, 12 kHz @ 60 dB

Ultimate Selectivity: Greater than 100 dB

Intermodulation:

Two-tone dynamic range: 99 dB *	1.8-30 MHz
Third order intercept point: +20 dBm	preamp off
Two-tone dynamic range: 95 dB *	1.8-30 MHz
Third order intercept point: +10 dBm	preamp on

Blocking: >145 dB above noise floor

** (at tone spacings of 100 kHz and greater)*

I-f and Image Rejection: Greater than 80 dB (48.05 MHz 1st i-f) (5.645 MHz 2nd i-f) (50 kHz 3rd i-f)

Agc Performance; Less than 4 dB audio output variation for 100 dB input signal change above agc threshold. Agc threshold is typical .8μV with preamp off and .25μV with preamp on.

Attack time: 1 millisecond. Three selectable release times: Slow—2 seconds; Med—400 m sec; Fast—75 m sec. Also, "Off" position is provided.

Antenna Input Impedance: Nominal 50 ohms

Audio Output: 2.5 watts with less than 10% T.H.D. into nominal 4 ohm load.

Power Requirements: 100/120/200/240 V-ac ±10%, 50/60 Hz, 60 watts or 11.0 to 16.0 V-dc (13.8 V-dc nominal), 3 amps

External Counter Mode (DR-7 installed): Readout: to 100 Hz. Accuracy: 15 PPM ±100 Hz. Maximum input frequency: 150 MHz. Input level range: 50 mV to 2 V rms.

Dimensions/Weight:

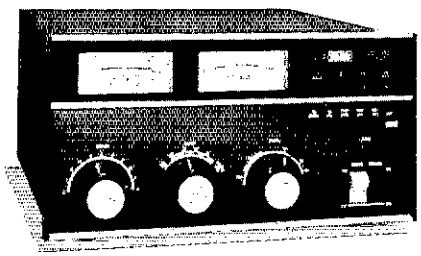
Depth—13.0 in (33.0 cm) excluding knobs and connectors.
Width— 13.6 in (34.6 cm)
Height— 4.6 in (11.6 cm) excluding feet
Weight— 18.4 lbs (8.34 kg)

Specifications, availability and prices subject to change without notice or obligation.

R.L. DRAKE COMPANY DRAKE
540 Richard St., Miamisburg, Ohio 45342. USA
Phone: (513) 866-2421 • Telex. 288-017

DRAKE 7-Line Family

A pacesetter since 1943, Drake led in 1963 with 9 MHz i-f transceiving, and now with 48 MHz i-f "Up Conversion" . . . Drake brings you tomorrow's state of the art today.



Model 1528

Drake L7

Continuous Duty
160-15* Meters

2kW Linear Amplifier

Temperature-controlled design for "key-down" operation over a wide frequency range.

2 kW PEP, 1 kW cw, RTTY, SSTV operation—all modes full rated input, continuous duty cycle.

160-15* meter amateur band coverage, plus expanded ranges for any future hf band expansions or additions within FCC rules. These ranges also include increased coverage for MARS, embassy, government, or other such services.

The Drake L7 utilizes a pair of Eimac 3-500 Z triodes for rugged use, and lower replacement cost compared to equivalent ceramic types.

Accurate built-in rf wattmeter, with forward/reverse readings, is switch selected. Calibrated 300/3000 watt scales.

Temperature controlled two speed fan is a high volume low noise type and offers optimum cooling.

Adjustable exciter agc feedback circuitry permits drive power to be automatically controlled at proper levels to prevent peak clipping and cw overdrive. Front panel control.

By-pass switching is included for straight through, low power operation without having to turn off amplifier.

Bandpass tuned input circuitry for low distortion and 50 ohm input impedance.

Amplifier is comprised of two units—rf deck for desk top and separate power supply.

Operates from 120/240 V-ac, 50/60 Hz primary line voltage.

DRAKE L7 SPECIFICATIONS

• **Frequency Coverage*:** Ham bands 160 through 15 meters*. Non-amateur frequencies between 6.5 and 21.5 MHz may be covered with some modification of the input circuit. • **Plate Power Input:** 2000 watts PEP on ssb and a-m. 1000 watts dc on cw, RTTY, and SSTV. • **Drive Power Requirements:** 100 watts PEP on ssb and 75 watts on cw, a-m, RTTY, and SSTV. • **Input Impedance:** 50 ohms. (Bandpass tuned input) • **Output Impedance:** Adjustable pi-network matches 50 ohm line with SWR not to exceed 2:1. • **Intermodulation Distortion Products:** In excess of −33 dB. • **Wattmeter Accuracy:** 300 watts forward and reflected, ±(5% of reading + 3 watts). 3000 watts forward, ±(5% of reading + 30 watts). • **Power Requirements:** 240 volts 50-60 hertz 15 amperes, or 120 volts 50-60 hertz 30 amperes. • **Tube Complement:** Two of 3-500Z or 8802/3-500Z or 3-400Z. • **Dimensions: Amplifier** 13.69"W x 6.75"H x 14.25"D (34.8 x 17.1 x 36.2 cm). **Power Supply** 6.75"W x 7.88"H x 11"D (17 x 20 x 28 cm). • **Weight:** Amplifier 27 lbs (12.25 kg), **Power Supply** 42.5 lbs (19.3 kg).

**Export model includes coverage of the 10-meter Ham Band.*

Model 1539

Drake Matching Networks MN7 and MN2700

Models 1538 and 1539

- **Frequency Coverage:** 1.8 - 30 MHz
- **Antenna Choice:** Matches antennas fed with coax, balanced line (use optional B-1000 Balun), or random wire.
- **Antenna/By-Pass Switching:** Allows matching unit by-pass regardless of antenna in use, and selects various antennas.
- **Extra Harmonic Reduction:** Employs "pi-network" low pass filter type circuitry for maximum harmonic rejection.
- **Built-in Metering:** Accurate Rf Wattmeter and VSWR Reading, pushbutton controlled from front panel.
- **Input Impedance:** 50 ohms resistive.
- **Power Capability:** MN7—250 watts average continuous duty (0-300 W scale). MN2700—1000 watts average continuous duty (2000 watts PEP). (0-200 or 0-2000 W scale).
- **Dimensions:** MN7—13.1"W x 4.53"H x 8.5"D excluding knobs and connectors (33.26 x 11.5 x 21.6 cm). MN2700—13.1"W x4.53"H x 13"D excluding knobs and connectors (33.26 x 11.5 x 33 cm).
- **Weight:** MN7—10 lbs (4.5 kg). MN2700—11 lbs (5 kg).

Drake MN7 and MN2700 Specifications

• **Frequency Coverage:** 1.8 to 30 MHz. Band Switch marked for 160, 80, 40, 20, 15, and 10 meter amateur bands; however, frequency coverage between amateur bands is possible by using the nearest band positions with a small reduction in matching capability. • **Input Impedance:** 50 ohms (resistive). • **Load Impedance:** 50 ohm coaxial with VSWR of 5:1 or less at any phase angle (3:1 on 10 meters). 75 ohm coaxial at a lower VSWR can be used. • **Balanced Feedlines:** With the Drake B-1000 accessory balun, which mounts on rear panel, tunes feed point impedances of 40 to 1000 ohms, or 5:1 VSWR referenced to 200 ohms (3:1 on 10 meters). • **Long-Wire Antennas:** Feed point impedances up to 5:1 VSWR referenced to 50 ohms. Also, 5:1 referenced to 200 ohms with the Drake B-1000 accessory balun (3:1 on 10 meters). • **Meter:** Reads VSWR or forward power. • **Wattmeter Accuracy:** ±5% of reading ± 1% of full scale. • **Insertion Loss:** 0.5 dB or less on each band after tuning. • **Front Panel Controls:** Provide for the adjustment of resistive and reactive tuning, antenna switching, band switching, VSWR calibration, and selection of watts or VSWR calibration, and selection of watts or VSWR functions of the meter. • **Rear Panel Connectors:** The rear panel has four type SO-239 connectors (one for input and 3 for outputs), three screw terminal connections (for long-wire and open-wire feeder systems), and a ground post.

Specifications, availability and prices subject to change without notice or obligation.

R.L. DRAKE COMPANY DRAKE

540 Richard St., Miamisburg, Ohio 45342, USA
Phone: (513) 866-2421 • Telex: 288-017

DRAKE 7-Line Family

ACCESSORIES

A Model 7077 Dynamic Desk Microphone

• **Audio and level characteristics** custom designed to match the transmit audio requirements of the Drake TR7. • **Features both VOX and PTT** operation without modification. • **High impedance** • **Includes coil cord and plug** wired for direct connection to the Drake TR7. • **Style and color** provide a beautiful match to the Drake 7-line • **Size** 4.3"W x 5.8"D x 9.3"H (10.9 x 14.7 x 23.6 cm). **Weight** 1 lb 7 oz (650 g).

C Model 1553 SP75 Speech Processor

Provides an increase in average power/readability of a single sideband voice signal during weak signal, high interference conditions. The SP75 is connected between the microphone and microphone input of the ssb transmitter, requiring no modification of existing transmitter or transceiver. A front panel switch allows the processor to be switched in or bypassed. Two additional inputs, such as a tape player or phone patch, may be front panel selected.

Rf envelope clipping adjustable between zero and twenty decibels. LED indicates proper audio input level.

Muting circuitry reduces gain during speech pauses, allowing VOX operation with the processor on.

SPECIFICATIONS • **Processing Type:** Preclipping audio compression followed by rf envelope clipping at the processor intermediate frequency. • **Rf Clipping Range:** Adjustable 0 to 20 dB from front panel control. • **Input Level (Microphone Input):** 3.5 mV minimum for full processing. Gain adjustable to accommodate up to 300 mV maximum. • **Input Level (Tape and Patch Inputs):** 15 mV minimum for full processing. 30 mV maximum. • **Input Impedance (Microphone):** 1 megohm. • **Input Impedance (Tape and Patch):** 50 kilohm. • **Output Level w/Processing:** 0-50 mV adjustable into 50 kilohm load. • **Output Impedance:** 50 kilohm. • **Muting (Microphone Input Only):** 10 to 20 dB attenuation during speech pauses. • **Frequency Response:** 400-6000 Hz@6 dB. • **Distortion:** Less than 5% T.H.D.@1kHz, 20 dB clipping. • **Power:** 11-16 V-dc@95 mA. • **Size:** 7"L x 6¼"W x 2¼"H (17.3 x 15.9 x 5.4 cm). • **Weight:** 1.4 lbs. (.63 kg).

D Model 1520 P75 Phone Patch

Hybrid Phone Patch for use with 7-line or other receiver/transmitter combination. • In/out Switching • Adjustable TX and RX level controls.

E Model 1535 CS7 Coax Switch

• Switches up to five coax-fed antennas via one main feed line. • Allows selection of up to five radios at other end of main feed line. • Minimizes amount of coax needed for multi-antenna installation. • Grounds unused inputs (both local and remote).

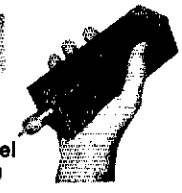
DRAKE CS7 SPECIFICATIONS • **Maximum Input Power:** 2000 watts PEP • **Frequency Range:** Up to 30 MHz, insertion of Switch changes VSWR no more than 1.05:1. From 30 MHz to 150 MHz, insertion changes VSWR no more than 1.5:1 (both switches). • **Operating Temperature Range:** – 40°F. to 150°F. • **Supply Voltage:** 120 V-ac or 240 V-ac selectable, 50/60 Hz, 50 watts. • **Dimensions & Weight: Console**—5.25"H x 6.81"W, 7.06" cabinet depth (13.3 x 17.3 x 17.9 cm); 4.33 lbs (1.96 kg); **Remote Antenna Switch**—7.13"H x 5.88"W x 4.39"D (18.1 x 15.0 x 11.1 cm). 8.19" (20.8 cm) center to center mounting; 5 lbs (2.27 kg).

B Model 1531 MS7 Matching Speaker

• **Size:** 7.5"D x 6.9"W x 4.6"H excluding feet (19 x 17.5 x 11.6 cm). • **Weight:** 2.5 lbs (1.13 kg).

"Dry" Dummy Loads
—no oil required

Model 1551



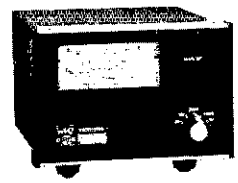
Model 1550

Model 1551 Drake DL-1000

• **1000 watts** for 30 seconds, with derating curve to 5 minutes. Accepts Drake FA7 cooling fan for extended high power operation. • **VSWR of 1.5:1 max.** 0-30 MHz • **SO-239 coax connector** • **Rubber feet** for desk or bench use • **Size** 14" x 3.6" (35.6 x 9.1 cm). **Weight:** 2 lbs (910 g).

Model 1550 Drake DL-300

• **300 watts** for 30 seconds, with derating curve to 5 minutes. • **Built-in PL-259** coax connector for direct connection to rear of transceiver or transmitter—no jumper coax necessary. • **VSWR of 1.1:1 max.** 0-30 MHz 1.5 max 30-160 MHz • **Ideal as bench test device** for amateur or commercial hf and vhf gear. • **Small size** fits conveniently in any field service tool box. 6.7" x 2.08" (17.0 x 5.3 cm). **Weight:** 11 oz (310 g).



WH7 Directional Rf Wattmeter
Model 1514

• Directional, in-line wattmeter. • Removable coupler provides remote metering. • Three calibrated scales (0-20, 0-200, and 0-2000 watts. • Fourth scale provides direct reading VSWR.

SPECIFICATIONS: • **Frequency Coverage:** 1.8-30 MHz. • **Line Impedance:** 50 ohm resistive. • **Power Capability:** 2000 W continuous. • **Jacks, Removable Coupler:** Two SO-239 input and output connectors. • **Semiconductors:** Two power meter rectifiers. • **Accuracy:** ± (5% of reading + 1% of full scale). • **VSWR Insertion:** Insertion of wattmeter in line changes VSWR no more than 1.05:1. • **Shipping Weight:** 3 lbs (1.4 kg). • **Dimensions:** 5.3"H x 6.9"W x 7.5"D (13.5 x 17.5 x 19 cm).

Model 1230 LA7 Line Amplifier

Line output, 1 mW nominal into 600 ohm balanced, adjustable by internal pre-set level control.

TV Interference Filters

High Pass Filters for TV Sets

More than 40 dB attenuation at 52 MHz and lower. Protect the TV set from amateur transmitters 6-160 meters.

Model No. 1603
Drake TV-300-HP

For 300 ohm twin lead. New terminals for easy installation.

Model No. 1610
Drake TV-75-HP

For 75 ohm TV coaxial cable; TV type "F" connectors installed.

Low Pass Filters for Transmitters

Four pi sections for sharp cut off above the hf amateur bands and to attenuate transmitter harmonics falling in any TV channel and fm band. 52 ohm. SO-239 connectors built in.

Model No. 1608 **Drake TV-3300-LP**

1000 watts max. below 30 MHz. Attenuation better than 80 dB above 41 MHz. Helps TV i-f interference, as well as harmonic interference.

Model No. 1605 **Drake TV-42-LP**

A four section filter designed with 43.2 MHz cut-off and extremely high attenuation in all TV channels for transmitters operating at 30 MHz and lower. Rated 100 watts input.

Specifications, availability and prices subject to change without notice or obligation.

R.L. DRAKE COMPANY DRAKE

540 Richard St., Miamisburg, Ohio 45342, USA Phone: (513) 866-2421 • Telex: 288-017

of W5HF, he was professor at U of A Law School and also at U of A Medical Sciences. KA5BSW now General, KA5HPX new Tech. KC5AO now Extra, also 2nd Radiotelephone. KA5JTR & KA5JVJ new Novices. NOTE: all nets will be one hour later Zulu time, same time local. OBs WA5LGN 2 W5UAU 3. Traffic: W5QFU 50, W5POH 28, KA5CFB 15, WB5GQH 15, W5BLP 14, W5UAU 14, K5DW 6, W5EIJ 5.

LOUISIANA: SCM, Jim Giammanco, N5IB — Congrats to N5AVV, who is new EC for Calcasieu Parish, and to W5VBX, new bulletin station for the New Orleans VHF Club. 24 LARC members used 3 repeaters to gather election returns in Lafayette Parish. The results were used by 3 TV and 2 radio stations. The MTA ARC held a successful disaster drill in mid-July, making a good impression on local officials. The Baton Rouge Chapter of QCWA toured a LORAN-C station near Grangeville. WD5FLM and SPARC set up an exhibit ham station at the Toledo Fall Festival in Many. Ten hams operated the station and handled traffic for the public. New GELARC officers are: WB5QDJ, pres.; K5ANK, vice pres.; WB5CX, treas.; KB5XV, secy.; W5VXG WD5CWK K5KTV, bd mem. The Exxon ARC is a new member of the LA Council of ARC. At this writing, GNOARC station, W5UK, should be on the air. SELARC is planning a hamfest for the third weekend in January, in Hammond. Welcome aboard to a new ARRL affiliated club, the Acadiana DX Assn.

Net	Freq	TIME	QNI	QTC	Mgr.
LAN	3615 kHz	7 & 10 P.M. Dy	242	90	N5RB
LTN	3910 kHz	6:30 P.M. Dy	244	37	N5EK
LSN	3703 kHz	7:30 P.M. M-F	89	41	WD5EAF
LRN	3587.5 kHz	6:30 P.M. Su	20	20	N5RB
LEN	3910 kHz	8:00 P.M. Su	—	—	

Traffic: (Sept.) N5RB 167, W5VMY 79, N5BFV 63, K5TL 42, WD5EAF 38, WD5FLM 38, WB5JZP 32, WB5QDJ 24, N5IB 24, WD5CWK 22, K5WOD 15, WB5IKT 5, WD5EMZ 2. (Aug.) W5GHP 138, WD5EAE 52, KA3BER 15. (July) W5GHP 126.

MISSISSIPPI: SCM, E. Ed Robinson, W5XT — SEC: WB5FXA. The rains have come and the days of 100° + temperatures have been broken. With a break in the weather, school back in session and vacations ended, more of us will be increasing our ham activities. Fall hamfests are upon us and hopefully eyeball QSO's will be taking place the next few weeks. Increased activity reported from the Jackson area clubs as well as the MS coast area clubs. Support your state and local activities and please send in your reports to make this your column. CAND (W5KLV) sess 30 QTC 622. DRN5 rep. 100% by MS station N5AMK. DRN5 (WB5NKD) sess 30, QTC 393 with MS rep 100% by KA5AFT N5AMK W5EDT KA5BPJ WD5EYM WB5HAS. CGCHN (KC5M) sess 30, QNI 1920, QTC 128. MSBN (WD5FYM) sess 30, QNI 2022, QTC 40. MTN (K5OAF) sess 30, QNI 2015, QTC 120. MSN (KA5GGG) sess 13, QNI 74, QTC 6. MN (K4JSB) sess 30, QNI 551, QTC 4. RACES (N5AMK) sess 4, QNI 154, QTC 3. Capital AEN (KA5HED) sess 4, QNI 110, QTC 4. GCEN (KB5W) sess 22, QNI 528, QTC 17. Traffic: N5AMK 165, K5OAF 101, W5EDT 93, KB5W 78, WB5SNB 40, W6X1 23, W5WZ 19, KA5AFT 15, WD5EYM 8, WD5CSU 5, W5RIM 4.

GREAT LAKES DIVISION

KENTUCKY: SCM, Joseph E. Miller, K4DZM — STM: KZ4G. SEC: WB4ZML. Nets Reporting (*section):

Net	QNI	QTC	Net	QNI	QTC
KRN*	449	24	PAWN	490	42
MKPN*	896	60	CARN	204	22
KTN*	1202	151	TRI-ST	371	43
KNTN*	344	126	D-9RN	83%	288
KYN*	286	116	8ARES	92	10
KSN*	179	35	4ARES	41	4
KPON	64	6	5ARES	50	2
			6ARES	154	10

WA4SWF new DEC for District 9. Still need new organization reports from Districts 3, 4, 5, 10, 11, 12, and 14. DEC's from these districts PSE. Note: Dist. 13 ARES has been handling emergency communications all over the state, our thanks to them. Traffic: K4DZM 92, WA4SWF 86, WD4LXX 78, K5AV 73, KA4GFU 69, KB4OZ 67, KA4MBF 56, WA4JTE 50, WD4JTO 50, WA4GAL 44, WD4CQF 43, WA4AVV 38, KZ4G 38, KA4AZT 33, K4YZU 33, W4PKX 29, WA4EBN 22, KA4IKH 22, WB4AUN 21, WD4EKZ 21, KA4MZY 21, WB4APC 17, K4AVX 16, WA4YPO 15, WD4LTD 14, WD4CJQ 13, WA4AGH 11, K4MHL 10, WD4BSC 9, N4AOF 8, WA4NOG 6, W4CDA 2.

MICHIGAN: SCM, James R. Seeley, WB8MTD — ASCM: WA8DHB. SEC: WA8EFK. STM: WB8YRY. DECs: WB8FLK K8RCT W8VWY. NMs: WD8BHE WA8DHB K8LNE K8KMQ WD8LRT WA8PIM WA8RNB WD8RNQ W8SCW AF8V WB8YDZ W8YIQ K8ZJU.

Net	Freq.	Time/Day	QNI	TFC	Sess.
QMN*	3683	1800/2200 Dy	906	423	60
MITN*	3953	1900 Dy	613	411	30
GLETN	3932	2100 Dy	985	295	30
MACS*	3953	1100 Dy	719	276	30
MNN*	3722	1730/2000 Dy	484	125	60
UPN*	3922	1700 Dy	623	100	34
SEMTN*	146.64	2045 Dy	157	69	29
8R	3930	1730 M/S	415	48	25
WSSBN	3935	1900 Dy	522	25	30
MEN	3930	0900 Su	160	7	4
VHF Activity 13 reports			1173	41	104

*NTS nets. Times local. 3932 kHz is the Michigan emergency frequency. Traffic workshop Sundays, 3953 kHz, 1600. ARES net Sundays, 3932 kHz, 1730. ARES (U.P.) Thursdays, 3922 kHz, 1800. QO reports: K8JH K8NKB W8QG WB8RUQ AG8U KE8X. OBS reports: KA8EPK WD8IYA K8NKB WA8RNB. New ECs: WD8JRT, Cheboygan & Presque Isle Cos. (Many thanks to WB8PRN for his long service); WB8UNB, Eaton Co.; N8BBR, Bay Co. New OO: W8DT. WA8PIM is new general manager for QMN; W8SCW air manager for QMN Fast Net, and WD8RNQ for QMN Slow Net. Silent Keys: K8HWK W8JXI W8NKJ. New officers for Delta Co. ARS: WA8DHB, pres.; WB8OIY, vice pres.; KA@AID, secy.; WD8IYA, treas. For Delta Co. Repeater Assn: W8LSZ, pres.; WD8OIY, vice pres.; K8RCT secy/treas. For Hiawatha ARC (Marquette Co.): W8LSX, pres.; WD8OIJ, vice pres.; WD8AKE, secy.; W8OIC, treas.; W8MAR W8JXJ WD8DJA, board. For Motor City RC: KC8K, pres.; N8BIB, vice pres.; KA8IKC, secy.; WB8WTF, treas. N8AG will be on as ZF2AG December 3 to 20. The "experimental" ARPSC workshop in Gaylord was well worth the effort, 36 in attendance, and much good work accomplished. A lot was accomplished at the Lansing workshop as well. September was a banner month for traffic *and* reporting. Five BPL awards were earned: N8AUL KA8CPS K8KMQ WA8PIM and AF8V. I enjoyed the Adrian Hamfest. Many good "eyeballs", and sitting next to the FCC was a new twist for me! Traffic: AF8V

New Automatic Antenna Tuner Auto-Track Model AT-2500

Check these state-of-the-art specifications

- Power Capability: 2500 W PEP.
- Frequency Range: Continuous 3.0 to 30 MHz (Including WARC Bands).
- Impedance Matching: 10 ohms to 300 ohms to 50 ohms resistive.
- Direct Reading SWR Meter: 1:1 to infinity.
- Direct Reading Power Meter: Two meter scales from 0 W to 250 W and 0 W to 2500 W; front panel switch selects FWD or Reflected Power *(Illuminated panel meters)*
- Power meter displays RMS with continuous carrier and automatically displays PEAK when driven with SSB signal.
- Average "Automatic" tune-up time: 15 seconds or less.
- Tune-up time not affected by power level; can be as low as 1 W (5-10 W preferred).
- A unique "Linear Disable" circuit automatically switches companion linear amplifier to standby within milliseconds whenever SWR exceeds a threshold preset on front panel, thus protecting the linear from excessive SWR.
- Toroidal bridge coupler provided in separate enclosure, permitting it to be installed directly at the output of the transmitter for meaningful SWR measurements.
- Power requirements are 115/230 VAC 50-60 Hz, 10 W operating/5 W standby, or 13.5 VDC, 1 A operating/.5 A standby.
- Antenna tuner packaged in cabinet 17"W x 5¼"H x 14"D (Front panel handles or rack mount optional).

Specifications subject to change without notice.

Write for literature.

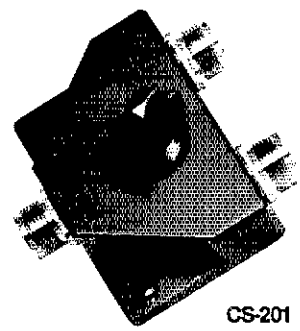
J.W. Miller Division
BELL INDUSTRIES

19070 REYES AVE. ■ P.O. BOX 5825
COMPTON, CALIFORNIA 90224

More DAIWA INDUSTRY CO., LTD. Communications Essentials From J. W. Miller

Automatic Antenna Tuner
Model CNA-1001

Frequency Range: 3.5–30 MHz (Including WARC Bands)
Power Rating: 500 Watts PEP
Internal Dummy Load: 50 Watts/1 Minute
Impedance Matching: 15–250 Ohms to 50 Ohms Resistive
Input Power Required for Automatic Tune: 1, 5 or 10 Watts
(Set by rear panel switch)
Tune-up Time: 45 Seconds Max
Power Requirement: 13.8 VDC/2 Amp



CS-201

RF Speech Processor
Model RF-440

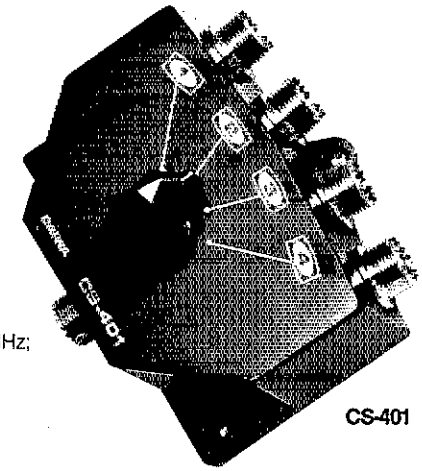
Increases talk power with splatter free operation. RF clipping assures low distortion. Simply install between microphone and transmitter.

Talk Power: Better than 6 dB
Clipping Threshold: Less than 2 mV at 1 kHz
Panel Meter indicates clipping level
Bandwidth: 2200 Hz at 6 dB down
Frequency Response: 300-3000 Hz at 12 dB down
Distortion: Less than 3% at 1 kHz, 20 dB clipping
Output Level: More than 50 mV at 1 kHz
Power Requirement: 115V AC, 60 Hz, 1 W, for self contained AC power supply; or 13.5 V DC, 55 mA for alternate external power
Dimensions: 150 x 70 x 150 mm; 6 x 2.5 x 6 in.

Coaxial Switches
2 Position/Model CS-201
4 Position/Model CS-401

Professionally engineered cavity construction.

Power Rating: 2.5 kW PEP, 1 kW CW
Impedance: 50 Ohms
Insertion Loss: Less than .2 dB
VSWR: 1:1.2
Maximum Frequency: 500 MHz
Isolation: Better than 50 dB at 300 MHz; better than 45 dB at 450 MHz; adjacent terminal
Unused terminals grounded
Connectors: SO-239



CS-401

Exclusive USA agent for these units; inquiries invited.

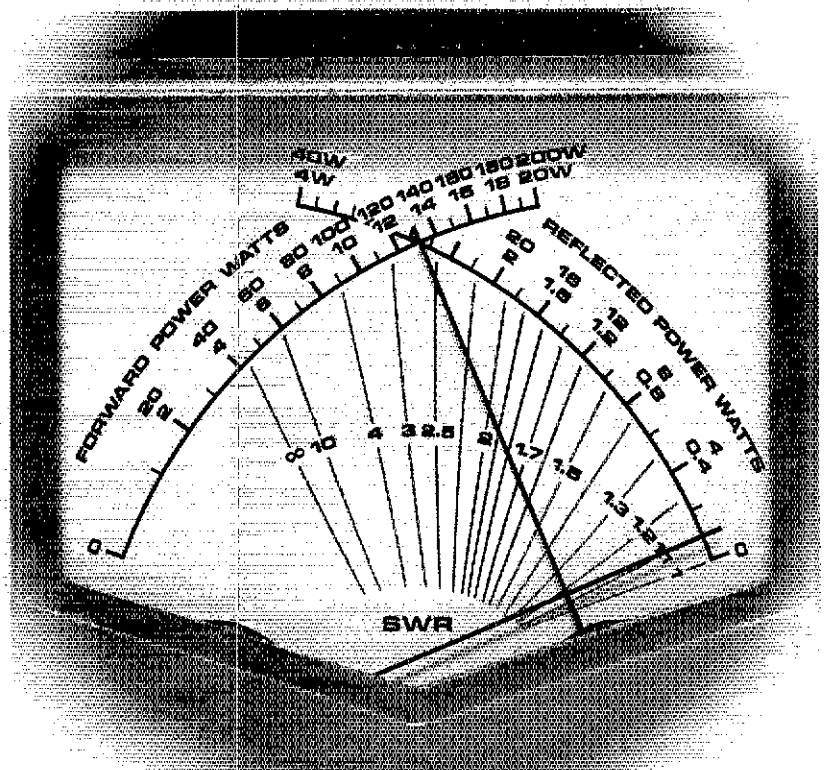
Write for literature.

J. W. Miller Division
BELL INDUSTRIES

19070 REYES AVE. ■ P.O. BOX 5825
COMPTON, CALIFORNIA 90224

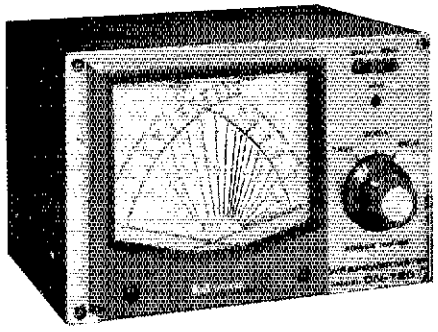
Specifications subject to change without notice

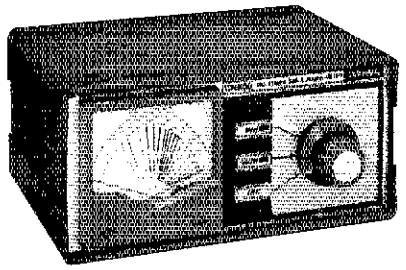
DAIWA INDUSTRY CO., LTD. Cross Needle Meter



Simultaneous SWR/Forward & Reflected Power Readings

CN-720



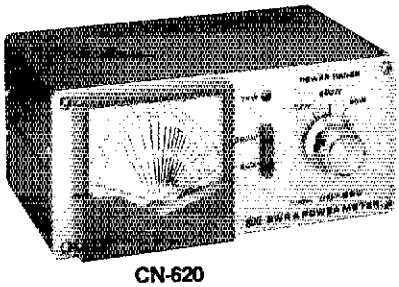


CN-630

SWR & Power Meter Model CN-630

Simultaneous direct reading SWR, Forward Power and Reflected Power.

Frequency Range: 140—450 MHz
SWR Detection Sensitivity: 5 Watts min.
Power: 2 Ranges (Forward, 20/200 Watts)
(Reflected, 4/40 Watts)
Tolerance: ± 10% full scale
Input/output Impedance: 50 Ohms
Connectors: SO-239
Dimensions: 180 x 85 x 120 mm;
7.12 x 3.37 x 4.75 in.



CN-620

SWR & Power Meters Models CN-720 and CN-620

Simultaneous direct reading SWR, Forward Power and Reflected Power.

Frequency Range: 1.8—150 MHz
SWR Detection Sensitivity: 5 Watts min.
Power: 3 Ranges (Forward, 20/200/1000 Watts)
(Reflected, 4/40/200 Watts)
Tolerance: ± 10% full scale
Input/output Impedance: 50 Ohms
Connectors: SO-239
Dimensions: 180 x 120 x 130 mm;
7 x 4.75 x 5 in.
165 x 75 x 97 mm;
6.5 x 3 x 4 in

Specifications subject to change without notice.

Exclusive USA agent for these units; inquiries invited.

Write for literature.

J. W. Miller Division
BELL INDUSTRIES

19070 REYES AVE. ■ P.O. BOX 5825
COMPTON, CALIFORNIA 90224

KENWOOD
...pacesetter in amateur radio

TS-830S

"Top-notch"... VBT, notch, IF shift, wide dynamic range

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF. Its optional VFO-230 remote digital VFO provides five memories.

TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV.
- Wide receiver dynamic range. Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter (high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Built-in digital display (six digits, fluorescent tubes), analog subdial, and display hold (DH) switch.
- Noise-blanker threshold level control.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit to check transmitted audio quality.
- RIT (receiver incremental tuning) and XIT (transmitter incremental tuning).

OPTIONAL ACCESSORIES:

- SP-230 external speaker w selectable audio filters.
- VFO-230 external digital V with 20-Hz steps, five memories, digital display.
- AT-230 antenna tuner/SWR and power meter/antenna switch; 160-10 meters, including three new bands
- YG-455C (500-Hz) and YG-455CN (250-Hz) CW filters for 455-kHz IF.
- YK-88C (500-Hz) and YK-88CN (270-Hz) CW filte for 8.83-MHz IF.

(VFOs for TS-830S, TS-130 Series, and TS-120S are compatible with all three series of transceivers.)

SP-230 TS-830S VFO-230 AT-230

TS-130S/V

"Small wonder"... processor, N/W switch, IF shift, DFC option

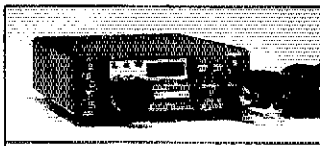
The compact, all solid-state HF SSB/CW mobile or fixed station TS-130 Series transceiver covers 3.5 to 29.7 MHz, including the three new bands.

TS-130 SERIES FEATURES:

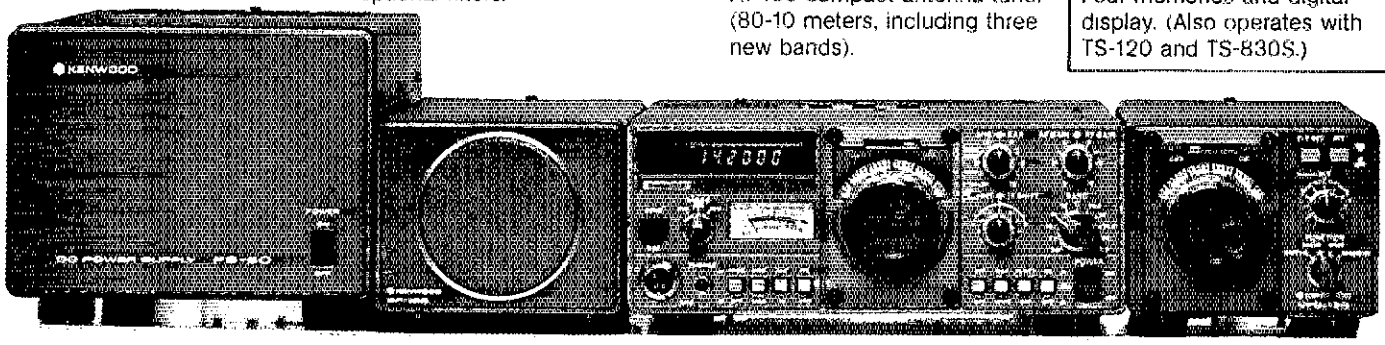
- 80-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV.
- TS-130S runs 200 W PEP/160 W DC input on 80-15 meters and 160 W PEP/140 W DC on 12 and 10 meters. TS-130V runs 25 W PEP/20 W DC input on all bands.
- Built-in speech processor.
- Narrow/wide filter selection on both CW (500 Hz or 270 Hz) and SSB (1.8 kHz) with optional filters.
- Automatic selection of sideband mode (LSB on 40 meters and below, and USB on 30 meters and above). SSB REVERSE switch provided.
- Built-in digital display.
- Built-in RF attenuator.
- IF shift (passband tuning).
- Effective noise blanker.

OPTIONAL ACCESSORIES:

- PS-30 base-station power supply.
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 compact antenna tuner (80-10 meters, including three new bands).
- SP-120 external speaker.
- VFO-120 remote VFO.
- MB-100 mobile mounting bracket.
- PS-20 base-station power supply for TS-130V.



Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-23 Four memories and digital display. (Also operates with TS-120 and TS-830S.)



PS-30 SP-120 TS-130S VFO-120

TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT / COMPTON, CA 90220

TS-180S with DFC

High quality...top performance, with optimum features

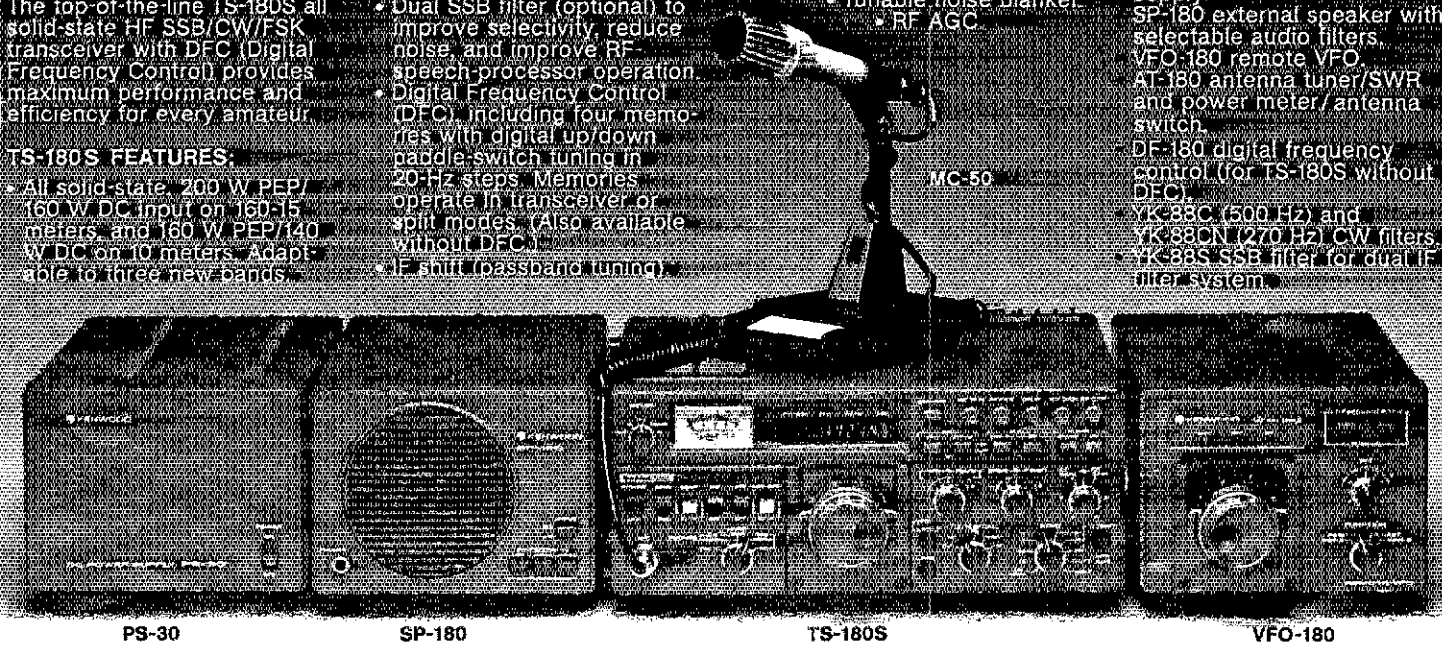
The top-of-the-line TS-180S all solid-state HF SSB/CW/FSK transceiver with DFC (Digital Frequency Control) provides maximum performance and efficiency for every amateur.

TS-180S FEATURES:

- All solid-state 200 W PEP/160 W DC input on 160-15 meters, and 160 W PEP/140 W DC on 10 meters. Adaptable to three new bands.
- Dual SSB filter (optional) to improve selectivity, reduce noise, and improve RF-speech-processor operation.
- Digital Frequency Control (DFC), including four memories with digital up/down paddle-switch tuning in 20-Hz steps. Memories operate in transceiver or split modes. (Also available without DFC.)
- IF shift (passband tuning).
- Built-in digital display with differential function. Shows actual VFO frequency and difference between VFO and "M1" memory (or "hold" without DFC) frequencies.
- Selectable wide and narrow CW bandwidth.
- Tunable noise blanker.
- RF AGC.
- Automatic selection of upper and lower sideband (with SSB NORMAL/REVERSE switch).
- Dual RIT (VFO, memory/fix).

OPTIONAL ACCESSORIES:

- PS-30 base-station power supply.
- SP-180 external speaker with selectable audio filters.
- VFO-180 remote VFO.
- AT-180 antenna tuner/SWR and power meter/antenna switch.
- DF-180 digital frequency control (for TS-180S without DFC).
- YK-88C (500 Hz) and YK-88CN (270 Hz) CW filters.
- YK-88S SSB filter for dual IF filter system.



PS-30 SP-180 TS-180S VFO-180

TS-520SE

"Cents-ability" in a quality 160-10 meter SSB/CW rig

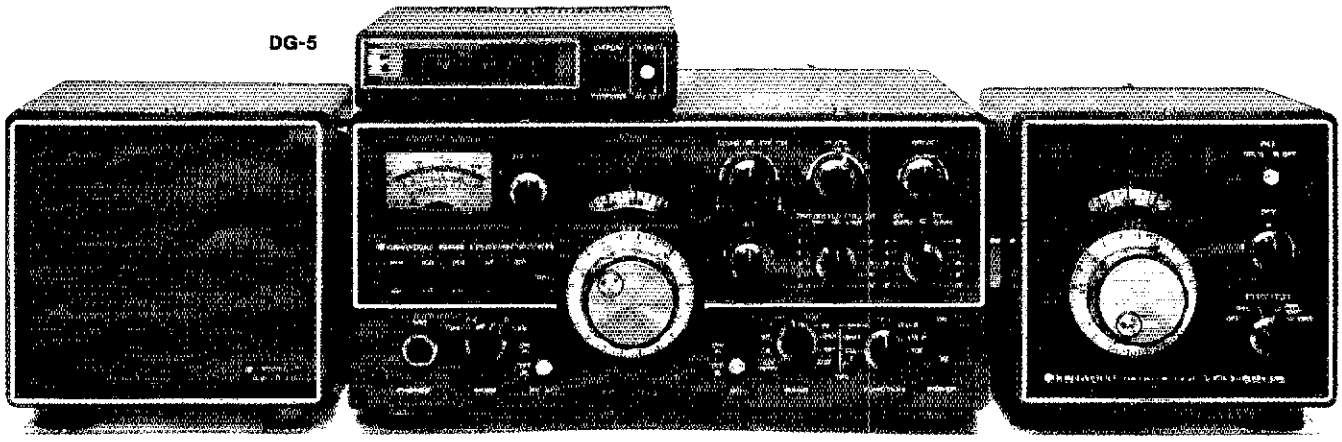
The TS-520SE is an economical, full-featured 160-10 meter transceiver, found in more ham shacks than any other rig.

TS-520SE FEATURES:

- 160-10 meters . . . and receives WWV on 15 MHz.
- 200 W PEP (SSB)/160 W DC (CW) input on all bands.
- CW WIDE/NARROW bandwidth switch for use with optional 500-Hz CW filter.
- Speech processor for extra audio punch.
- Effective noise blanker.
- 20-dB RF attenuator.
- RIT (receiver incremental tuning) control.
- Digital display with optional DG-5, showing actual operating frequency while transmitting and receiving.
- Eight-pole crystal filter for excellent selectivity.
- Built-in 25-kHz calibrator, adjustable to WWV.
- VOX and semi-break-in CW with sidetone.
- Built-in speaker.
- Solid-state, with tube driver and final.
- Amplified-type AGC circuit.
- Amplified-type ALC.
- Front-panel carrier level control.

OPTIONAL ACCESSORIES:

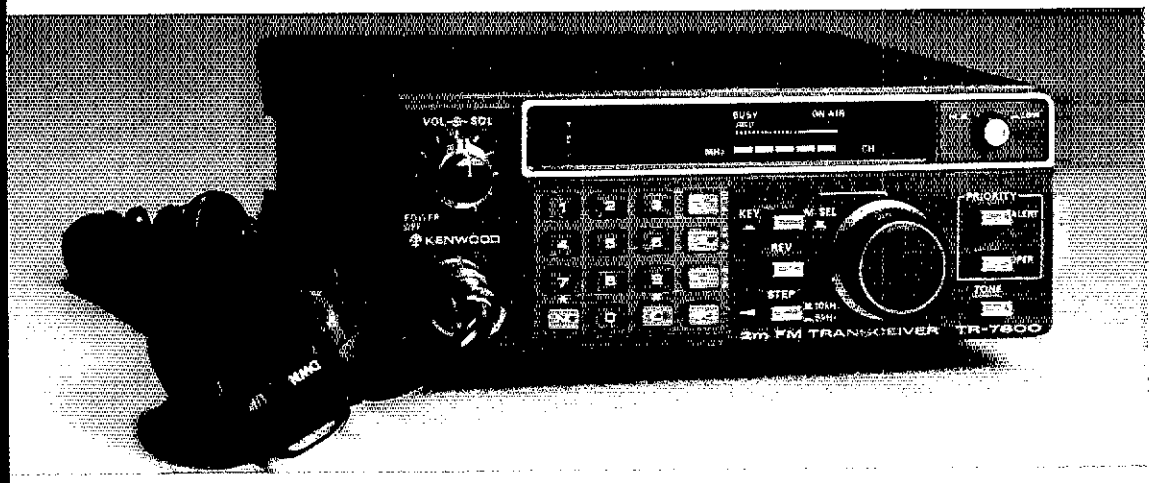
- SP-520 external speaker.
- DG-5 digital frequency display and 40-MHz counter.
- VFO-520S remote VFO.
- CW-520 500-Hz CW filter.
- AT-200 antenna tuner/SWR and RF power meter/antenna switch.



SP-520 TS-520SE VFO-520S

KENWOOD

...pacesetter in amateur radio



TR-7800

"Easy selection"...15 memories/offset recall, scan, priority, DTMF (Touch-Tone®)

Frequency selection with the TR-7800 2-meter FM mobile transceiver is easier than ever. The rig incorporates new memory developments for repeater shift, priority, and scan, and includes a built-in autopatch Touch-Tone® encoder.

TR-7800 FEATURES:

- 15 multifunction memory channels, selected with a rotary switch. M1-M13 . . . memorize frequency and offset (±600 kHz or simplex). M14 . . . memorize transmit and receive frequencies independently for nonstandard offset. M0 . . . priority channel, with simplex, ±600 kHz, or nonstandard offset.
- Internal backup for all memories, by installing four AA NiCd batteries (not Kenwood-supplied) in battery holder.
- Priority channel (memory "0") and priority alert.
- Covers 143.900-148.995 MHz, in 5-kHz or 10-kHz steps.
- Built-in autopatch DTMF (Touch-Tone®) encoder.
- Front-panel keyboard for selecting frequency, transmit offset, and autopatch encoder tones, programming memories, and controlling scan.
- Automatic scan of entire band (5-kHz or 10-kHz steps) and memories.
- Manual scan of band and memories, with UP/DOWN microphone (standard).

SP-40

Compact, high-quality mobile speaker

- Matches all HF, VHF, and UH radios for mobile operation.
- Only 2-11/16 inches wide by 2-1/2 inches high by 2-1/8 inches deep.
- 4-ohm input impedance.
- Handles 3 watts of audio.
- Mounting bracket with ferrit magnet. Adhesive-backed steel plate supplied for mounting virtually anywhere

- Repeater REVERSE switch.
- Selectable power output. 25 W (HI)/5 W (LOW).
- LED S/RF bar meter.
- TONE switch to actuate subaudible tone module (n Kenwood-supplied).

OPTIONAL ACCESSORIES:

- KPS-7 fixed-station power supply.

TR-8400

"Go synthesized on 440 MHz FM"... 5 memories, memory/band scan

The TR-8400 synthesized 70-cm UHF FM mobile transceiver covers 440-450 MHz in 25-kHz steps and includes five memories, automatic memory and band scan, UP/DOWN manual scan, and two VFOs.

TR-8400 FEATURES:

- Synthesized coverage of 440-450 MHz in 25-kHz steps.
- Five memories and memory backup terminal on rear panel.
- Two VFOs.
- Offset switch for ±5 MHz transmit offset and simplex operation. Fifth memory allows any other offset by memorizing receive and transmit frequencies independently.
- Automatic scan of memories and of 440-450 MHz band (in 25-kHz steps). Locks on busy channel and resumes when signal disappears. HOLD or mic PTT button cancels scan.
- Up/down manual band scan in 25-kHz steps with UP/DOWN microphone supplied with TR-8400.
- Only 5-3/4 inches wide, 2 inches high, and 7-5/8 inches deep. Weighs only 3.75 pounds.
- TONE switch to activate s tone device (not Kenwoo supplied). DTMF (Touch-Tone ") terminal on rear pa
- Four-digit frequency displ and S/RF bar meter. Othe LEDs indicate BUSY, ON and REPEATER operation
- HI/LOW (10 W/1 W) RF-output power switch.

OPTIONAL ACCESSORIES:

- KPS-7 fixed-station power supply
- SP-40 compact mobile speaker

TR-9000

"New 2-meter direction"...compact rig with FM/SSB/CW, scan, five memories

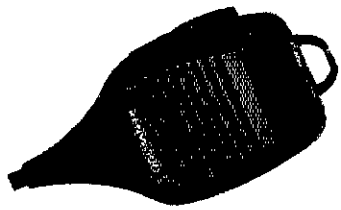
The TR-9000 combines the convenience of FM with long distance SSB and CW. It is extremely compact . . . perfect for mobile operation. Matching accessories are available for optimum fixed-station operation.

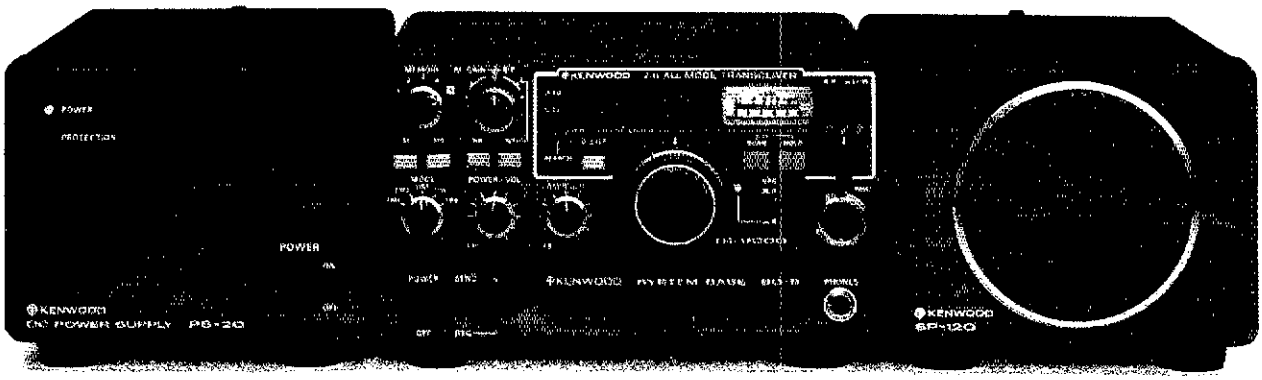
TR-9000 FEATURES:

- FM, USB, LSB, and CW.
- Only 6-11/16 inches wide, 2-21/32 inches high, 9-7/32 inches deep.
- Two digital VFOs, with selectable tuning steps of 100 Hz, 5 kHz, and 10 kHz.
- Digital frequency display. Five, four, or three digits, depending on selected tuning step.
- Covers 143.9000-148.9999 MHz.
- Band scan . . . automatic busy stop and free scan.
- SSB/CW search of selectable 9.9-kHz bandwidth segments.
- Five memories . . . four for simplex or ±600 kHz repeater offsets and the fifth for a non-standard offset (memorizes transmit and receive frequency independently).
- UP/DOWN microphone (standard) for manual band scan.
- Noise blanker for SSB and CW.
- RIT (receiver incremental tuning) for SSB and CW.
- RF gain control.
- CW sidetone.
- Selectable RF power outputs . . . 10 W (HI)/1 W (LO).
- Mobile mounting bracket with quick-release levers.
- LED indicators . . . ON AIR, BUSY, and VFO.

OPTIONAL ACCESSORIES:

- PS-20 fixed-station power supply.
- SP-120 fixed-station external speaker.
- BO-9 System Base . . . with power switch, SEND/RECEIVE switch (for CW), memory-backup power supply, and headphone jack.

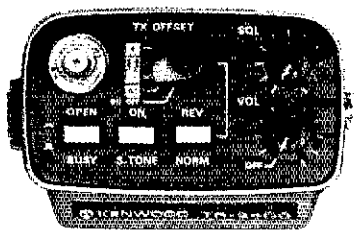




PS-20 TR-9000 BO-9 SP-120

TR-2400

"Hand-shack"...synthesized, big LCD, scan, 10 memories, DTMF (Touch-Tone®)



CONVENIENT TOP CONTROLS

The TR-2400 has the most convenient operating features desired in a 2-meter FM hand-held transceiver.

TR-2400 FEATURES:

- Large LCD digital readout. Readable in direct sunlight (virtually no current drain) and in the dark (lamp switch). Shows receive and transmit frequencies and memory channel. "Arrow" indicators show "ON AIR," "MR" (memory recall), "BATT" (battery status), and "LAMP" switch on.
- Keyboard selection of 144.000-147.995 MHz in 5-kHz increments. No "5-UP" switch needed.
- UP/DOWN manual scan in 5-kHz steps from 143.900 to 148.495 MHz.
- 10 memories. Retained with battery backup. "M0" memory may be used to shift transmitter to any frequency for nonstandard-split repeaters.
- Built-in autopatch DTMF (Touch-Tone®) encoder, using all 16 keyboard buttons.
- Automatic memory scan.
- Repeater or simplex operation. Transmit frequency shifts ±600 kHz or to "M0" memory frequency.
- Reverse switch. Transposes receive and transmit frequencies.
- Subtone switch (tone encoder not Kenwood-supplied).
- Two lock switches to prevent accidental frequency change and accidental transmission.
- External PTT microphone and earphone connectors.
- Rubberized antenna with BNC connector, NiCd battery pack, AC charger, PTT and mic plugs, handstrap, and earphone included.
- Extended operating time with LCD and overall low-current circuit design. Only draws about 28 mA squelched receive and 500 mA transmit (at 1.5 W RF output).
- High-impact case and zinc die-cast frame.
- Compact and lightweight. Only 2-13/16 inches wide, 7-9/16 inches high, and 1-7/8 inches deep. Weighs only 1.62 pounds (including antenna, battery, and hand strap).

OPTIONAL ACCESSORIES:

- ST-1 Base Stand (provides 1.5-hour-quick, trickle, and floating charges, 4-pin microphone connector, and SO-239 antenna connector).
- BC-5 DC quick charger.
- LH-1 leather case.
- BH-1 belt hook.
- PB-24 extra NiCd battery pack.
- ***NEW*** SMC-24 speaker/mic.

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R-1000

"Hear there and everywhere"... easy tuning, digital display

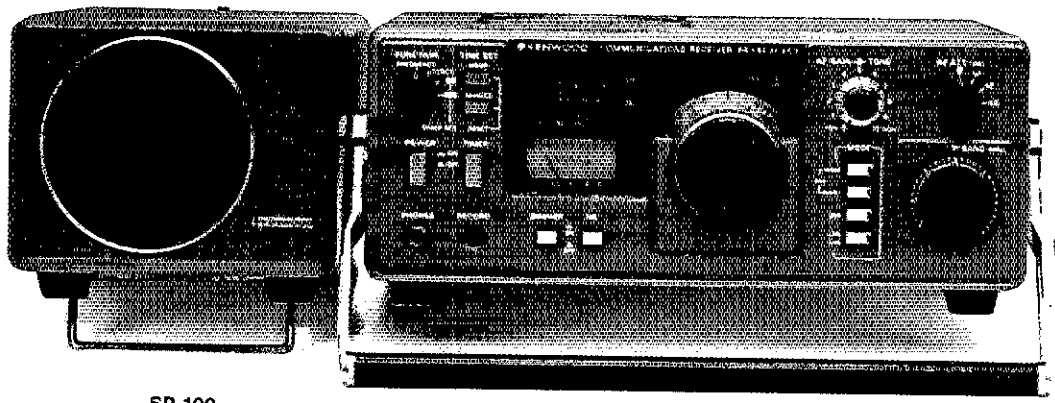
The R-1000 is an amazingly easy-to-operate, high-performance, communications receiver, covering 200 kHz to 30 MHz in 30 bands. This PLL synthesized receiver features a digital frequency display and analog dial, plus a quartz digital clock and timer.

R-1000 FEATURES:

- Covers 200 kHz to 30 MHz continuously.
- 30 bands, each 1 MHz wide.
- Five-digit frequency display with 1-kHz resolution and analog dial with precise gear dial mechanism.
- Built-in 12-hour quartz digital clock with timer to turn on radio for scheduled listening or control a recorder through remote terminal.
- Step attenuator to prevent overload.
- Three IF filters for optimum AM, SSB, CW. 12-kHz and 6-kHz (adaptable to 6-kHz and 2.7-kHz) for AM wide and narrow, and 2.7-kHz filter for high-quality SSB (USB and LSB) and CW reception.
- Effective noise blanker.
- Terminal for external tape recorder.
- Tone control.
- Built-in 4-inch speaker.
- Dimmer switch to control intensity of S-meter and other panel lights and digital display.
- Wire antenna terminals fo 200 kHz to 2 MHz and 2 to 30 MHz. Coax terminal 2 MHz to 30 MHz.
- Voltage selector for 100, 1 220, and 240 VAC. Also adaptable to operate on 1 VDC with optional DCK-1

OPTIONAL ACCESSORIES

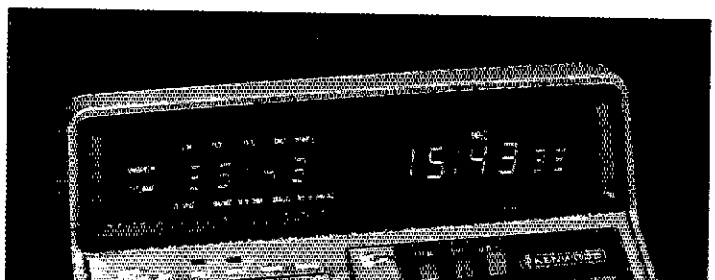
- SP-100 matching external speaker.
- HS-5 and HS-4 headphon
- DCK-1 modification kit for 12-VDC operation.



SP-100

R-1000

HS-5



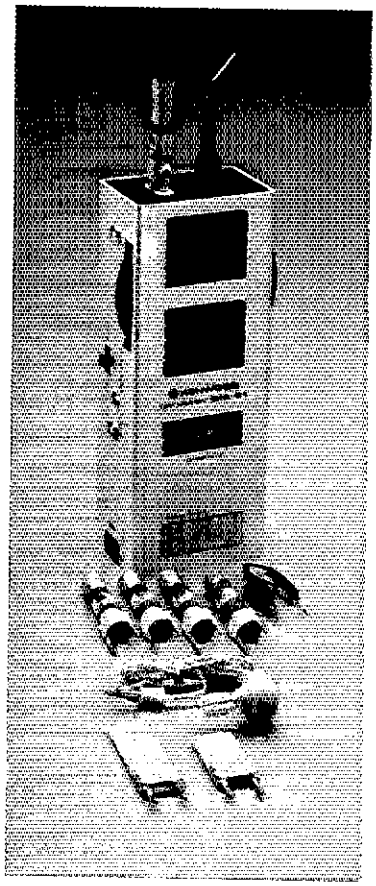
HC-10

Digital world clock with two 24-hour displays, quartz time base

The HC-10 digital world clock with dual 24-hour display shows local time and the time in 10 preprogrammed plus two programmable time zones.

HC-10 FEATURES:

- Two 24-hour displays with quartz time base. Right display shows local (or UTC) hour, minute, second, day. Left display shows month, date, world time in various cities, memory time (QSO starting time), and time difference (in hours from UTC).
- Preprogrammed time in 10 cities around the world, plus two programmable time zones.
- "TOMORROW" and "YESTERDAY" indicators.
- Memorization of present time. Can be recalled later, for logging purposes.
- High accuracy (±10 seconds/ month).



DM-81

Dip meter performs many R measurements

The DM-81 dip meter is high accurate and features, in ad tion to the traditional inducti coupling technique, capaciti coupling for measuring meta enclosed coils and toroidal co

DM-81 FEATURES:

- Measuring range of 700 kH 250 MHz in seven bands.
- Built-in storage compartme for all seven coils, capaciti probe, earphone, and grou clip lead.
- All solid-state and built-in battery.
- HC-25U and FT-243 socke for checking crystals and marker-generator function.
- Amplitude modulation.
- FET for good sensitivity.
- Absorption frequency mete function.
- Earphone for monitoring transmitted signals.
- Capacitance probe for measuring resonant frequen cies without removing coil shields, and also for measuri resonant frequencies of toroidal coils.

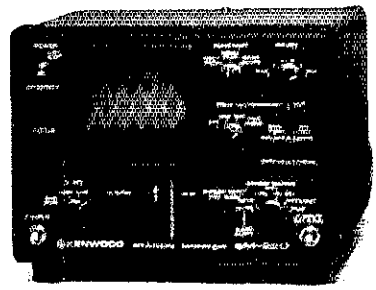
TL-922-A

Maximum legal power on 160-15 meters

The TL-922A linear amplifier provides maximum legal power on the 160-15 meter Amateur bands.

TL-922A FEATURES:

- 2000 W PEP (SSB)/1000 W DC (CW, RTTY) input power on 160, 80, 40, 20, and 15 meters, with 80 W drive
- Excellent IMD characteristics.
- Pair of EIMAC 3-500Z high-performance transmitting tubes.
- Safety protection.
- Blower with automatic turnoff-delay circuit.
- Variable threshold level type ALC.
- Two meters, one indicating plate current, and the other indicating grid current, relative RF output, and high voltage.



SM-220

High-performance oscilloscope for various monitoring functions

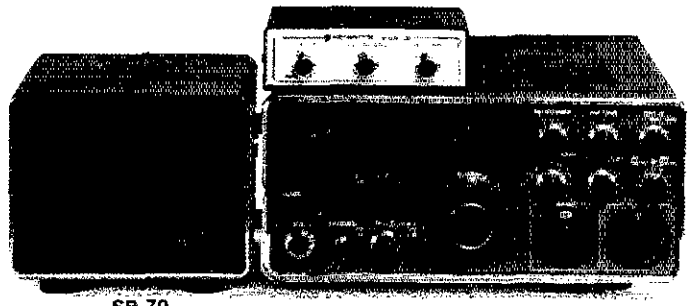
The SM-220 Station Monitor provides a variety of waveform-observing capabilities, and an optional pan display.

SM-220 FEATURES:

- Monitors transmitted SSB and CW waveforms from 1.8 to 150 MHz.
- Monitors signal waveforms in receiver's IF stage.
- Functions as high-sensitivity, wide-frequency-range (up to 10 MHz) oscilloscope.
- Tests linearity of linear amplifiers (provides trapezoid pattern).
- Allows observation of RTTY tuning points (cross pattern).
- Built-in two-tone (1000-Hz and 1575-Hz) generator.
- Expandable to pan-display capability for observing the number and amplitude of stations within a switchable ±20 kHz/±100 kHz bandwidth.

OPTIONAL ACCESSORIES:

- BS-8 pan-display module for TS-180S, TS-830S, and TS-820 Series.
- BS-5 pan-display module for TS-520 Series.



SP-70 TS-600 W/VOX-3

TS-600

All-mode, all solid-state 6-meter transceiver

The TS-600 is a 6-meter, all-mode, all solid-state transceiver with VFO (and crystal-controlled) coverage of the entire band.

TS-600 FEATURES:

- SSB (20 W PEP input), FM and CW (10 W output), and AM (5 W output).
- Operates on 120/220 VAC, 50/60 Hz or 13.8 VDC.
- VFO coverage of 50-54 MHz in four bands, with two-speed dial mechanism. Favorite frequencies may be crystal-controlled.
- Effective noise blanker.
- VOX operation with VOX-3 accessory (standard).

TS-700SP 2-meter, all-mode, all solid-state transceiver is also available . . . with similar features, plus:

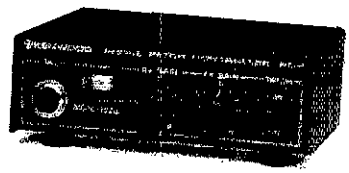
- Digital frequency display, with 100-Hz resolution.
- VFO coverage of 144-148 MHz in four bands.
- Simplex and repeater operation, including all repeater subbands. REVERSE switch.

OPTIONAL ACCESSORIES:

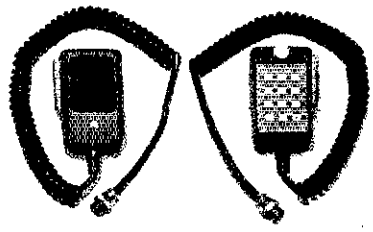
- VFO-700S remote VFO (for TS-700S/SP).
- SP-70 external speaker.

ACCESSORIES

A wide selection of optional accessories is offered for optimum operating flexibility. In addition to the optional items listed with each piece of equipment described in this catalog, the following accessories are also available:



PC-1 phone patch with hybrid circuit and VU meter for null and audio gain measurements.



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OHIO: SCM, Harold C. Chapman, WB8JGW — Asst SCMs: W8MOK AF8O. SEC: K8AN. NMs: K8AAZ WD8KBW WB8KWD K8OZ WD8QMP WB8YGW. Net reports:

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	323	201	45	6:45/10 P.M.	3.577
BNR	115	10	28	6 P.M.	3.605
ONN	90	36	23	6:30 P.M.	3.708
OSN	230	164	30	6:10 P.M.	3.577
OSSBN	2532	930	90	10:30 A.M, 4:15 & 6:45 P.M.	3.9725
06mN	342	46	30	9 P.M.	50.160

If you are a regular check-in to a certain net and the NCS asks you to act as liaison to a higher net (in event regular rep didn't show, or in case of overloads), go ahead — volunteer. If you can handle OSSBN you can handle D8RN; if you can handle OSN you can handle BN; if you can handle OSN you can handle 8RN. The biggest change would be from 8RN to EAN but if WB8JGW handled it, so can you. To those of you holding station appointments keep in mind that those appointments must be endorsed by your SCM every two years. If you hold an appointment and have not been forwarding the required monthly reports, expect to hear from your SCM; the reports are necessary to maintain your appointment and to keep the SCM advised of your activities. Thanks to all of you in the section for your assistance, cooperation, patience and help during the past two years. Without your efforts the section would not have done as well as it did. It's the individuals and their efforts that determine the end result; the SCM is only a figurehead. Good luck to each of you and to AB8P in the years to come.

Local Nets	QNI	QTC	Sess.
BARF	96	47	24
BRTN	315	130	30
COARES	76	3	3
FRCN	72	21	4
LCINWOARES	340	54	26
MASER (AUG)	72	7	4
(SEPT)	76	7	4
TSRAC	587	70	29

Upgrades: W8EPI/Extra, WB8MMK/Adv, KA8CTC/Gen, K8DHK/Gen, KA8JEI/Gen, KA8LAB/Nov, (last 3 in N8FU household). Appointments: EX WD8DJR/Preble Traffic: WA8GMT 302, W8PMJ 267, K8BYR 266, K8OZ 252, WB8JGW 240, WA8HGH 215, WB8DMF 174, WD8KBW 171, K8SCH 170, WB8KWD 166, WB8UBR 164, WB8MEK 160, WB8WTS 148, WD8KFN 144, K8DHK 128, W8ENI 122, W8OZK 118, W8GGX 110, W8MOK 105, W8QEM 100, K8AAZ 95, WD9HDZ 84, AB8P 78, WA8SSI 78, KA8DJZ 71, W8JMD 67, WD8OMP 61, WB8SIO 59, K8AN 52, WD8NEC 51, N8JR 47, K8DL 46, WD8ILX 46, WB8MZZ 44, WD8DYW 43, WB8RSM 40, WB8AWM 36, KA8CTC 34, WB8UQY 33, WD8DDE 30, WB8TKU 30, W8BHL 28, N8GW 28, K3RC 27, WB8PIY 26, W8WEG 26, WB8YGW 26, WB8MRL 25, WA8MAZ 22, K8CKY 21, W8MGA 21, WB8TTQ 21, WD8INK 20, WD8QAC 20, WD8OYK 17, WD8OYO 16, WD8PMW 15, WB8QXN 12, WB8CJU 11, WD8EKI 11, WB8QHU 11, WB8VLR 11, WB8SRC 10, W8WAV 10, WD8DTG 8, WD8LZW 8, AB8P 8, W8RG 8, WA8BOV 6, W8HVA 5, WB8TRK 5, WB8YUS 5, W8EK 4, WD8PXI 4, WB8QHV 4, WB8YTD 4, W8IM 4, W8BJJU 3, W8OQL 3, WB8WNH 3, WB8NHV 2, WB8NTR 2, N8AJU 1. (Aug.) K8UZW 264, W8EK 11.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Paul S. Vydareny, WB2VUK — SEC: KB2TM STM: WA2SPL. ASCM, K2AV W2IT KB2KW. NM: W2WSS WA2HZM N2BDW WB2ZCM WB2EAG WA2SPL. Nets: EPN 6 P.M. 3902; NYPON 5 P.M. 3913; ESS (slow) 6 P.M. 3590; NYSPTEN 6 P.M. 3925; NYS 7 P.M. 10 P.M. 3677; CDN (Troy) 6:30 P.M. 34/94; HVN (Beacon) 7:30 P.M. M-F 37-97; SDN (White Plains) 9:30 P.M. S/T/T 66/06 M/W/F 615/015. WA2SPL, STM, net manager of the new Eastern New York phone net, EPN, Empire Phone Net operating on 3.902. Net is doing really well. Much time and effort went into development. Let's all give it the support it deserves. Schenectady area hams provided communications for the cross country marathon at Lake Placid per Bob Lopez's request. Remember him from the Olympic Torch Relay Run? W2YJR running QRP — 2 watts while rig is being overhauled. W2WSS suggests some traffic be routed thru ESS for training of members. Great idea! Rip Van Winkle elected new officers — WA2FTI WB2UEB W2FSI KA2DIF. Mt. Beacon officers — WA2UGO K2DPL W2GIJ WA2TIF. W2DW busy monitoring as OO. The 1980 HARC Convention is history. Good, but missed banquet and speaker. Note: PSHR is 60 points for all except Novices and Techs. Reports must be in by 10th or will not appear in column. PSHR: W2ACQ N2BOW WB2EAG WA2EQW WB2HDU KB2KW WA2SPL N2YL WB2ZCM. Traffic: WA2SPL 403, N2YL 285, W2EFU 214, WA2JBO 175, WB2EAG 158, WB2HDU 152, WB2ZCM 105, W2ACQ 96, KB2DW 95, W2IQK 74, N2BDW 57, AA2Y 42, KA2CLX 40, WA2EQW 40, W2YJR 35, WA2CJY 34, WB2MCO 30, N2JK 29, K2MI 29, WB2SON 18, WB2GOJ 8, W2IT 8.

NEW YORK CITY — LONG ISLAND: SCM, Paul A. Lindgren, WA2UWA — Asst SCM: Stephen H. Bloom, WB2IDP. Asst SCM NYC: Dwight Ernest, KA2CNN. The following are traffic nets in and around the section.

Net	Time/Day	Freq.	NM
NLI*	1900/2200 Dy	3.630	WB2TQC
NSPN*	1815 Dy	3.928	WA2SEL
BAVTN*	2030 M-F	147.315	KA2DBW
ESS	1800 Dy	3.590	W2WSS

Nets denoted with an asterisk are NTS section nets. High QNI: NSPN — WB2TQC KG2S WA2SEL K2GCE; NLI — WB2TQC W2AHV KA2CLY K2GCE. EC reports

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received from WA2ZHA and N2EM. The Grumman ARC provided communications for the Juvenile Diabetes Walkathon. Congratulations to new Novices KA2JXF and DA2KEJ and new General KA2EPY. WB2BNY gave talk on traffic handling at September meeting. SIARA had exhibit at Staten Island Mall. Congratulations to WB2SCC who was honored by CUNY as professor emeritus retroactive to 1978. Radio booth at Riverhead County Fair manned by WB2AII WA2LBJ WB2EUF WA2UWA KA2IEX and W2LYH. WB2IDP named National Merit Scholarship semi-finalist. N2BKK moved from Staten Island to Northport. Hope everyone in the section has a happy holiday. Correction: WB2QO1 (present holder), reported as a Silent Key, is very much ORV Traffic: WA2UWA 187, KA2CNN 131, WB2TQC 102, K2GCE 91, W2AHV 83, WB2EUF 67, N2BKK 61, W2MLC 59, WB2BNY 56, KA2CLY 43, W2DBO 34, WB2KGT 28, WA2SEL 19, N2BGR/T 13, WB2IDP 11, WA2KXE/T 4, WB2BNA 1.

NORTHERN NEW JERSEY: SCM, Robert Neukomm, WA2MVQ — SEC: WB2VUF. STM: W2XD. NMs: N2CR KB2HM W2PSU KA2GQQ W2TCA W2UEZ & WB2IQJ.

Net	Mgr.	Freq.	Time/Days	Sess.	QNI	QSP
NJN/E	W2UEZ	3695	7 P.M. Dy	30	426	195
NJN/L	W2UEZ	3695	10 P.M. Dy	30	348	154
NJSN	WB2IQJ	3735	6:30 P.M. Dy	30	224	52
NJPN	N2CR	3950	6 P.M. Dy	34	468	186
NJVN	W2TCA	49/49	10:30 P.M. Dy	30	226	102
PBTTN	KB2HM	72/12	8 P.M. Dy	30	490	101
UCETN	KA2GQQ	985/685	7:30 P.M. Dy	29	172	42

Fairlawn ARC had a very successful demonstration at the Bergen Mall. They had a radio station, code demonstrations and a nice QSL card display and received a number of messages for the New Jersey Phone Net. QQ reports received from the following: W2NR WA2QZD W2TPJ and WA2MVQ. A lot of very chirpy signals and some out-of-band operation during "rare DX" working split-frequency. Club news: Sussex County ARC had a very successful hamfest. The WX was with them at the fairgrounds setting. WA2LHX won the Tempo S-1 hamfest door prize. Their annual dinner is set for November 7 at the "Still" in Tranquility. Holmdel ARC election: W2XD, chmn.; Ed Underwood, vice chmn.; Randy Nash, secy/treas. Tri-County Radio Association reports WB2AEE is now operational from "Mount Olympus." How's no SV@ call?? The following are running for office: W2OJ, pres.; W2HWW, vice pres.; WB2RMH, secy.; W2DQA, treas. They have 80 "paid" members. That is a good club to take your next upgrade ticket as they have continual classes. Bergen Amateur Radio Association held a very successful flea market at Bergen Community College and it was well attended despite some much needed "wet weather." Ramapo Amateur Radio Association plans to hold a "Field Day" at Camp Tamarack for the Jamboree of the Air the 3rd weekend in October when the world-wide Boy Scout Jamboree-of-the-Air is held. Congratulations to: WA2SLG now KB2UC and N2BQO who is KB2TY. Old Bridge TTN celebrated its second anniversary and now "claims" to be the most active 2-meter traffic net. N2BNB and others from Sussex County ARC provided communications for a recent bike race. W2XD passed first tone with radar endorsement and gave traffic talks at Holmdel, S. Plainfield and Ramapo Radio Amateur Association. WA2MVQ was in the hospital again — this time with pericarditis and this report somewhat late getting up to the League! Traffic: (Sept.) W2UEZ 332, W2CQB 237, K2VX 237, AG2R 201, W2XD 126, AF2L 105, KF2T 99, W2TCA 96, KB2HM 78, W2CC 77, N2BNB 69, N2CR 67, WB2RMJ/T 48, N2XJ 48, WA2MVQ 46, K2PH 45, KA2HNQ/T 36, W5DPR 26, KA2GQQ 20, WA2OVO 14, WA2DPK 12, W2UH 12, N2BQL 9, WB2KLF 9, KA2EEQ 6, WA2UPH 6, W2CVW 3, W2ZEP 2. (Aug.) W2CVW 2. (July) N2BNB 47, W2CVW 8.

MIDWEST DIVISION

IOWA: SCM, Bob McCaffrey, K@CY — SEC: W@RPK. NMs: WB@AVW W@YLS. K@HYH new EC for Jefferson Cnty. WD@CPD new OBS District I. Still looking for a few to fill EC and DEC positions. Congrats to upgrades K@BGJ WA@VKF WA@QAI WD@BBC WD@DOK KA@ICU KA@DNB. Mobile W@OJB has "worked back home from 45 states." N@BJL has 2nd Commercial. W@SR keeping busy with DXAC. Thanks for all the newsletters. Mt. Pleasant Old Threshers Reunion totaled 117 from 11 states. Central Iowa DXers meet each Sun at 8 P.M. on 146.07/.67. W@SVD "roasted" by the DMRAA, 31st annual Operation Santa Claus in Des Moines Dec 16th. Aug/Sep TEN 100%/98% with W@SS W@YLS AE@R K@GP N@SM KA@X WB@UPF K@EVH. CAND/DTRN 95% with WA@AUX and KA5DBV/@. Hats off to those who consistently represent Iowa NTS. Sooland Repeater Assn assuming Novice classes led by WB5MKT WB@RNM K@AAR. K@PCG WB@JGJ WB@WKQ keeping Iowa SSTV hopping. Another great CVARC Hamfest. Mason City added 100 feet to antenna of .16/.76. New Spencer repeater .36/.96. WB@MBZ working on RTTY repeater. W@RPK KA@CIS and K@CY can be found on OSCAR. QQ reports from W@ZAZ WB@VL and WD@HUJ. WD@FOY has 6-m WAS. Have a great Holiday Season.

Net	Time/Days	Freq.	QNI	QTC	Sess.
Iowa 75M	1830 M-S	3970	1221	60	26
Iowa 75M	2330 M-S	3970	1032	60	26
TLCN	0030/0400 Dy	3560	320	110	60

Traffic: WA@AUX 532, W@YLS 97, W@SS 87, AE@R 86, WB@KHO 86, K@GP 85, K@CY 49, KA@X 28, W@LFF 10, WB@AVW 8, W@RPK 6, WB@UPF 4.

KANSAS: SCM, Robert M. Summers, K@RXF — SEC: W@KL. Net Mgrs: W@OYH W@FT. This being a catch-up month due to the listing of the EC's last month. PSHR: (Aug.) W@OYH 117, K@EZ 90, W@FT 73. Net reports: (Aug.) KWN QNI 827, QTC 505; QKS 265/97; KSBN 982/133; KPN 308/34; CSTN 1440/146. Just received word that the 1981 Midwest Division Conv. will be held first weekend of October at Salina, Kansas, watch for more details. Hiawatha ARC officers for 1981 are: WD@DEC, pres.; W@PB, vice pres.; WA@SRR, secy/treas.; WD@DMV, activities mgr. QKS QKS QKS de K@BXF. All stations are welcome to CHECK INTO net daily on 3610 kHz at 7 and 10 P.M. It's not a secret organization, it's a PROUD but small group providing a public service. You are encouraged to find out more about QKS! Net reports: (Sept.) QKS QNI 277, QTC 107; KWN 808/504; CSTN 1510/120 KSBN 1014/133; KPN 323/32. W@KL would like to see AERS totals reach 1000 members by Xmas. How about helping him attain his Xmas present. Traffic: (Sept.) W@FIR 103, W@OYH 103, K@EZ 80, WB@LYT 68, W@FT 67, WD@ACG 52, K@BXF 50, W@AM 45, W@KL 33, W@PB 26, K@YTA 21, W@RBO 16, WB@LKA 7. (Aug.) W@AM 127, W@OYH 123, W@HI 95, WD@ACG 86, W@FIR

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MISSOURI: SCM, L. G. Wilson, K0RWL — Asst SCM: Joe Flowers, W0OTF. SEC: WB0FKY. The most recent news, of course, is the ARRL Midwest Convention. According to sources in Lincoln, the convention was a big success. The KC DX Club was well represented in their hospitality suite. Slides were shown of their recent DXpedition to Belize and a recent DXpedition to St. Kitts. The 0-Land QSL Bureau had a booth at the convention. Just a reminder — if you are a DXer, make sure you have envelopes on file with the QSL Bureau. They have stacks of cards for many Missouri stations but no envelopes. These people really do a good job for you, so don't forget to send your envelopes. Congratulations to the following upgrades: Tech — KA0IST; General — WD0GXK; Extra — KB0DM. Congratulations and best wishes go out to W0LT upon retirement from MOPAC after 31 years.

Net	QNI	QTC	Net	QNI	QTC
NEMOE	113	0	MOSSBN	549	93
HBN	384	43	MON	137	132
ACE	16	1	MON2	131	61

The Ozark Amateur Radio Society is presently conducting Novice classes. W0JU is now sporting a new TS-830S. WB0LFY is using a new 40 meter wire beam and W0VWW is going back up with another quad. Could all this activity indicate that contest season is upon us once again? Some of you Missouri stations get on the air and tune in the world. Our deepest sympathy to the families and friends of W0JXI WA0ITA and KA0AGB who joined the ranks of the Silent Keys. Traffic: (Sept.) K0ONK 498, W0BMA 224, W0OUD 137, W0BV 133, K0SI 125, K0PCK 120, W0OTF 58, KA0E 35, KA0P 16, K0RWL 10. (Aug.) K0ONK 528, K0SI 353, K0PCK 352, W0BMA 306, KA0E 242, W0OUD 166, WD0BEV 157, W0OTF 77, WB0NIE 10, K0RWL 10.

NEBRASKA: SCM, Shirley M. Rice, KA0BCB — SEC: WA0ASM. Sept 10, W1XX regretfully accepted the resignation of K0KP as SCM. Good luck to him in his new job. As your new SCM, I will be listening for any suggestion. Please let me know if I can HELP! TNX for the smooth transition of reports. Our sympathy to W0UF7 on the loss of his XYL, W0TUQ, who was one of the first YL hams. Congrats to WD0BON & KA0BWM for upgrade to General, KA0ASD for NM of the Platte Valley 2-Mtr Net. W0FQB reports W0UFD of Omaha has been an amateur over 60 yrs. Full page article in Hastings paper about W0LJO and ham radio is great public relations! FB.

Net	Freq.	UTC	NM	QNI	QTC
NE Cornhusker	3980	1830 Dy	WB0GMQ	784	81
Morning Phone	3982	1330 Dy	WB0GWR	1286	92
NE P.M.	3978	2130 Dy	WA0AUX	114	1
NE Storm	3982	0030 Dy	WA0LOY	960	234
NE 75 ARES	3982	1430 Sn	W0IRZ	157	5
Pawnee 2-Mtr	04/64	1230 M-F	WB0MKD	119	—
PV 2-Mtr	34/94	0200 M	KA0ASD	71	2
QCWA	3980	1500 S	W0EUT	55	—
Western NE	3950	1400 Dy	W0NIK	478	5

Traffic: W0FQB 462, W0WDP 309, WD0BOG 140, K0AIE 108, WD0CID 67, KA0BCB 58, W0EUT 39, K0BRS 36, WB0TED 32, WA0OOX 31, W0HOP 24, WA0PCC 24, WB0GWR 14, WD0FJY 13, WA0OEX 13, W0LJO 9, WB0GMQ 8, W0NIK 8, K0ODF 6, KA0BWM 4, W0HTA 4, W0DJU 2, WB0MKD 2, K0SFA 2, K0UDW 2, WA0LOY 1.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, Stan Horzepa, WA1LOU — SEC: W1SY. STM: KA1KD. Asst SCM: WB1AIU.

Net-NM	Freq.	EST	Sess.	QTC	QNI
CN-K1EIR	3640	1900 + 2200	59	227	283
CPN-K1EIC	3965	1800/1000 Su	30	116	297
NENN-WB1CPF	3720	1815			
Nutmeg-WA1ELA	28/88	2130	30	95	403
RASON-WA1FSM	13/73	2100 MWF	13	16	103
WESCON-WB2PJU	78/18	2030	30	79	452

Hi QNI CN: W1EFW WB1ESJ WB2PJU; CPN: K1AQE KA1KD KA1KP. Hi QTC Nutmeg: W1EFW. Tri-City ARC and RASON members provided communications for the East Lyme marathon. WR1AIE repeated for the Stamford-Denmark Friendship Yacht Race and WA1RSD/RPT did the same for the Greenwich Road Race. The Bethel Middle School ARC is now ARRL affiliated. T'was a good Connecticut turnout at W1HHR's Public Service Corp meeting in Newington. Also, a lot of Nutmeggers attended the Boxboro convention. New appointees: DECs — K1DFS (Farmington area), K1WGO (Torrington area) and W1XI (Middlesex County); EC — WB1CWT (Waterford). To get involved in the Amateur Radio Emergency Service (ARES) contact your area EC or DEC (if you don't know who he is, ask your SCM). The Greater Fairfield ARA has agreed to exchange slide presentations with the Norfolk College of Arts and Technology Radio Club in King's Lynn, England. Upgrading: KA1BHQ now N1BDY, KA1FFK = N1BDQ and KA1FFL = N1BDR. Novice classes at Southington High School instructed by N1NZ. KA1BEJ recuperated from hospital hiatus by chasing DX on 28 MHz. K1PQE is the new net manager of the Clearinghouse Net. W1QV celebrated golden wedding anniversary. Handle traffic? . . . then send a monthly report to your SCM; your callsign and traffic count will be listed at the end of this column and you will help assist the ARRL in arriving at a more accurate statistical analysis of the National Traffic System. Traffic: K1GF 194, WB2PJU 157, K1XA 85, W1NJM 84, W1BDN 72, K1DM 70, KA1CMX 58, WB1ESJ 57, KA1KD 54, W1GVT 48, KA1KP 34, K1AQE 29, WB1CRH 29, WA1WOG 27, WA1LOU 25, W1KV 21, K1CE 18, KA1BHT 17, KA1FZU 12, K1EUW 9, W1CUH 7, W1QV 7, KA1DZV 5 W1ICF 2.

EASTERN MASSACHUSETTS: SCM, Rick Reehe, K1PAD — STM: WA1TBY. SEC: WA1BLG. ASCM: WA9NEW.

Net	Mgr.	Freq.	Time (loc)/Dy	QNI	QTC
EMRI	N1GQ	3.668	19/2200/Dy	353	228
EMRIPN	KA1BJY	3.898	1730/Dy	342	152
EM2MN	KA1CGP	90/30	2000/MWF	93	30
EM2MN	KA1CGP	145.8	2000/TTH	—	—
NEEPN	K1BZD	3.945	0830/Su	51	22
HHTN	K1BSO	04/64	2230/Dy	653	219
EMRISS	WB1DHW	3.715	2030/Dy	208	58

I hope everyone had a good time at the convention in Boxboro. The weather cooperated for the flea market and the program was quite good as usual. Congrats to the committee. W1FAD home from hospital. Middlesex Club members call the FCC in Maine (207-338-4008) and Maryland (301-725-3474) when they get fed up with malicious interferers. You should too. WA1ZLQ and WA1TBY did the planning for amateur communications during the Boston 350 Parade. W1YTB retiring to Florida (winters) and Maine (summers). Chelmsford Club

A LIFETIME GUARANTEE AND 11 OTHER REASONS TO BUY AN "OPTOELECTRONICS" FREQUENCY COUNTER

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3. ALL METAL CASES: Not only are the heavy gauge aluminum cases rugged and attractive, they provide the RF shielding and minimize RFI so necessary in many user environments.

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5. ACCURACY: A choice of precision to ultra precision time base oscillators. Our ±1 PPM TCXO (temperature compensated xtal oscillator) and ±0.1 PPM TCXO are sealed units tested over 20-40°C. They contain voltage regulation circuitry for immunity to power variations in main instrument power supply, a 10 turn (50 PPM) calibration adjustment for easy, accurate setability and a heavily buffered output prevents circuit loads from affecting oscillator. Available in the 8010 and 8013 series is our new ultra precision micro power proportional oven oscillator. With ±.05 PPM typical stability over 10-45°C, this new time base incorporates all of the advantages of our TCXO's and virtually none of the disadvantages of the traditional ovenized oscillator: Requires less than 4 minutes warm-up time, small physical size and has a peak current drain of less than 100 ma.

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7. PORTABILITY: All models are delivered with a 115 VAC adapter, a 12 VDC cord with plug and may be equipped with an optional ni-cad rechargeable battery pack installed within its case. The optional Ni-Cad pack may be recharged with 12 VDC or the AC adapter provided.

8. COMPACT SIZES: State-of-the-Art circuitry and external AC adapters allowed design of compact easy to use and transport instruments.
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Series 7010: 1-3/4" H x 4-1/4" W x 5-1/4" D

9. MADE IN U.S.A.: All models are designed and manufactured at our modern 13,000 square foot facility at Ft. Lauderdale, Florida.

10. CERTIFIED CALIBRATION: All models meet FCC specs for frequency measurement and provided with each model is a certificate of NBS traceable calibration.

11. LIFE TIME GUARANTEE: Using the latest State-of-the-Art LSI circuitry, parts count is kept to a minimum and internal case temperature is only a few degrees above ambient resulting in long component life and reliable operation. (No custom IC's are used.) To demonstrate our confidence in these designs, all parts (excluding batteries) and service labor are 100% guaranteed for life to the original purchaser. (Transportation expense not covered).

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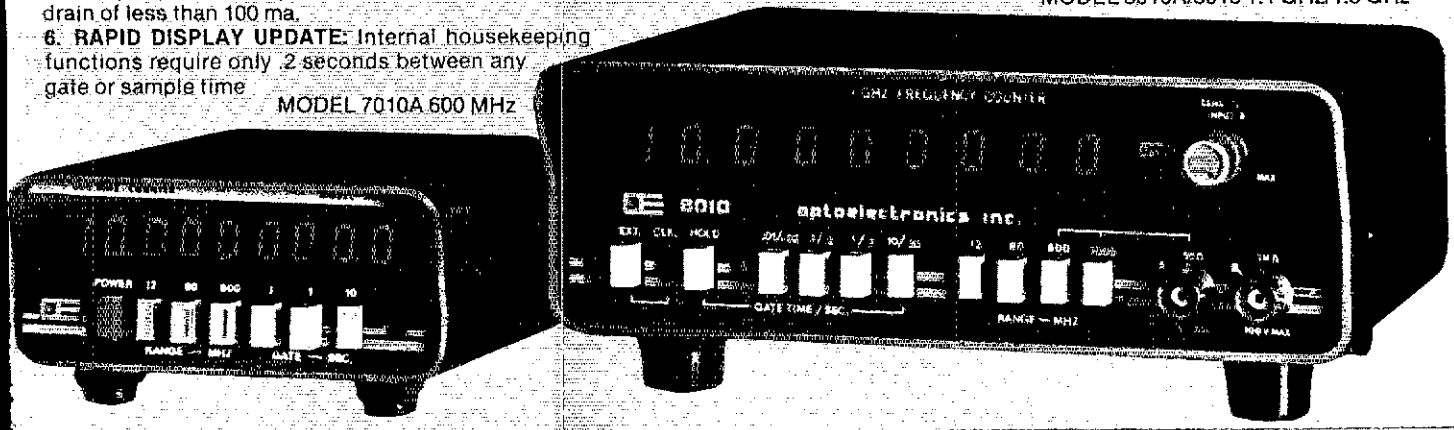
MODEL 7010A 600 MHz

MODEL 8010A/8013 1.1 GHz/1.3 GHz



MODEL	RANGE (From 10 Hz)	10 MHz TIME BASE STABILITY	AGING	AVG. SENSITIVITY DESIGN	10 Hz to 500 MHz	500 MHz to 1.1 GHz	GATE TIMES	RESOLUTION 12 MHz	60 MHz	Max. Freq.	EXT. CLOCK INPUT/OUTPUT	SENSITIVITY CONTROL	NI-CAD BATTERY PACK
0A	600 MHz	± 1 PPM	<1 PPM/YR	TCXO*	15 mV	N/A	(3) .1, 1, 10 sec	1 Hz	1 Hz	10 Hz (600 MHz)	YES OPTIONAL	NO	YES OPTIONAL
1A		± 0.1 PPM											
0A		± 1 PPM											
1A	1.1 GHz	± 0.1 PPM	<1 PPM/YR	TCXO*	15 mV	30 mV	(4) .01, .1, 1, 10 sec	1 Hz	1 Hz	10 Hz (1.1 GHz)	YES STANDARD	YES	YES OPTIONAL
05A		± .05 PPM		OCXO**									
1	1.3GHz	± 0.1 PPM	<1 PPM/YR	TCXO*	15 mV	30 mV	(4) .01, .1, 1, 10 sec	1 Hz	1 Hz	10 Hz (1.3 GHz)	YES STANDARD	YES	YES OPTIONAL
05		± .05 PPM		OCXO**									

*TCXO = Temperature Compensated Xtal Oscillator **OCXO = Proportional Oven Controlled Xtal Oscillator

ES 7010A

0A	600 MHz Counter - 1 PPM TCXO	$199.95
0.1A	600 MHz Counter - 0.1 PPM TCXO	$249.95
ONS:		
H	Handle/Tilt Bail (not shown)	$2.95
Cad-701	Ni-Cad Battery Pack & Charging Circuitry Installed Inside Unit	$19.95
70	External Clock Input/Output	$35.00
70	Carry Case - Padded Black Vinyl	$9.95

SERIES 8010A/8013

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#8010.1A	1.1 GHz Counter - 0.1 PPM TCXO	$450.00
#8010.05A	1.3 GHz Counter - .05 PPM Oven	$499.00
#8013.1	1.3 GHz Counter - 0.1 PPM TCXO	$550.00
#8013.05	1.3 GHz Counter - .05 PPM Oven	$599.00
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#CC-80	Carry Case - Padded Black Vinyl	$ 9.95

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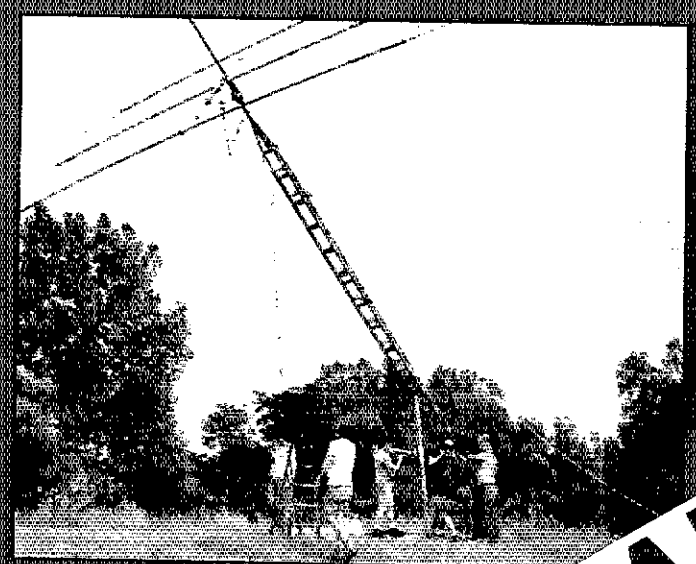

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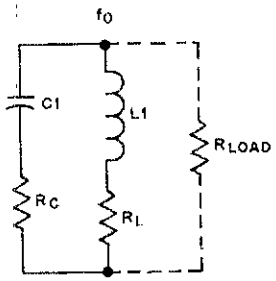
QST DATA FILE NO. 3

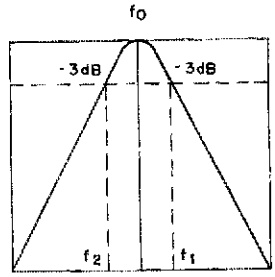
AMPLIFIER TANK-CIRCUIT Q AND HARMONICS

$$Q_U = \frac{X\,(OHMS)}{R\,(OHMS)}$$

$$Q_U = \frac{Q_{L1} \times Q_{C1}}{Q_{L1} + Q_{C1}}$$

$$Q_L = \frac{R_L}{2\pi f_O L}$$





$$Q_L = \frac{f_O}{(f_2 - f_1)_{-3dB}} = \frac{f_O}{BW}$$

There are some specific level requirements spelled out by the FCC for the suppression of harmonics and other out-of-band spurious responses exiting at the output terminal of manufactured Amateur Radio transmitters and amplifiers. For operation at most power levels in the medium- and high-frequency bands it is required that all such responses be 40 dB or greater below peak output power. For the vhf spectrum the rules are somewhat more rigid: All spurious products must be 60 dB or greater below peak output power. The 40-dB rule is easy for us amateurs to realize with homemade equipment, and most of the manufacturers have complied with or exceeded the requirement in recent years. The 60-dB-down rule at vhf is not so easy to address without high-quality filtering at the amplifier output. Even though the FCC rules about spectral purity don't apply to amateur-built equipment, they are good rules for us to follow in helping to reduce TVI and potential interference to other services. All of the transmitting gear designed by the League technical staff exceeds the FCC requirements for spectral purity before the circuits are published.

Most amateurs are aware that the higher the network Q the greater the selectivity, or the narrower the bandpass characteristic of the tuned circuit. We can envision this simply by placing an inverted ice-cream cone alongside a grapefruit half. The cone would symbolize the response of a high-Q LC circuit and the grapefruit would represent a low-Q circuit. The skirts (bottom right and left extremes) of the response curve would be broad in terms of frequency, whereas the cone skirts would be pulled in closer to center frequency, greatly narrowing the bandwidth of the transmitted energy. Hence, the narrower the tuned-circuit response the greater the attenuation of unwanted energy (responses) outside the band of interest.

An acceptable range of Q for tube-type transmitter tank circuits is 10 to 15. (Higher Qs lead to excessive circulating currents and heating.) This rule of thumb applies to pi networks (low-pass response) as well as to conventional parallel-tuned circuits (bandpass response). Conversely, solid-state amplifiers call for lower Qs (1 to 5, typically) in the interest of amplifier stability. As a result, fairly elaborate harmonic filtering is required at the output port of a solid-state amplifier to compensate for the low-Q output networks or broadband transformers.

The Q of a tuned circuit is dependent upon the quality of the L and C components in terms of their resistances. In the case of a capacitor the resistance is considered to be in series with the capacitor, hence $Q = X_c \div R$. The greater the X_c to R ratio the higher the Q. The same is true of coil resistance (R) versus X_L. The Q characteristic just discussed is the *unloaded* Q, or Q_u. In designing a transmitter tank circuit we are interested in the *loaded* Q (Q_L). Although the traits that determine Q_u are important, we must take into account the load connected to the tuned circuit (amplifier tube or transistor and antenna load) when designing for a Q_L of 10 to 15. This is because the load resistances are in *parallel* with the tuned circuit, thereby *loading* it. From this we can see that the loaded Q will always be lower than the unloaded Q. Capacitors with high dielectric quality, and coils with large conductor diameters, reduce the series-R component, thereby providing high values of Q_u.

Expanded information of this subject is contained in the early chapters of *The Radio Amateur's Handbook* for 1981. There is an excellent practical example of a high-Q tank circuit in W1VD's 6-meter, 4CX1000A, 2-kW PEP linear amplifier in the vhf transmitting chapter. To optimize the tuned-circuit Q and reduce the circulating tank currents he eliminated the plate tuning capacitor and designed a slick high-Q silver-plated copper-tubing tank coil. A unique mechanical system is used to compress or expand the coil for tuning the circuit to resonance. There is also a circuit for an effective 6-meter harmonic filter. You will also find in the '81 *Handbook* some easy-to-use tables for designing your own pi- and pi-L networks over a range of recommended Qs. No amateur, student or practicing engineer should be without the revised and updated 1981 edition of the *Handbook*. — *Doug DeMaw, W1FB*

For more information about *The 1981 Radio Amateur's Handbook*, see page 133 of November 1980 *QST*. To order, see page 145 of this issue.

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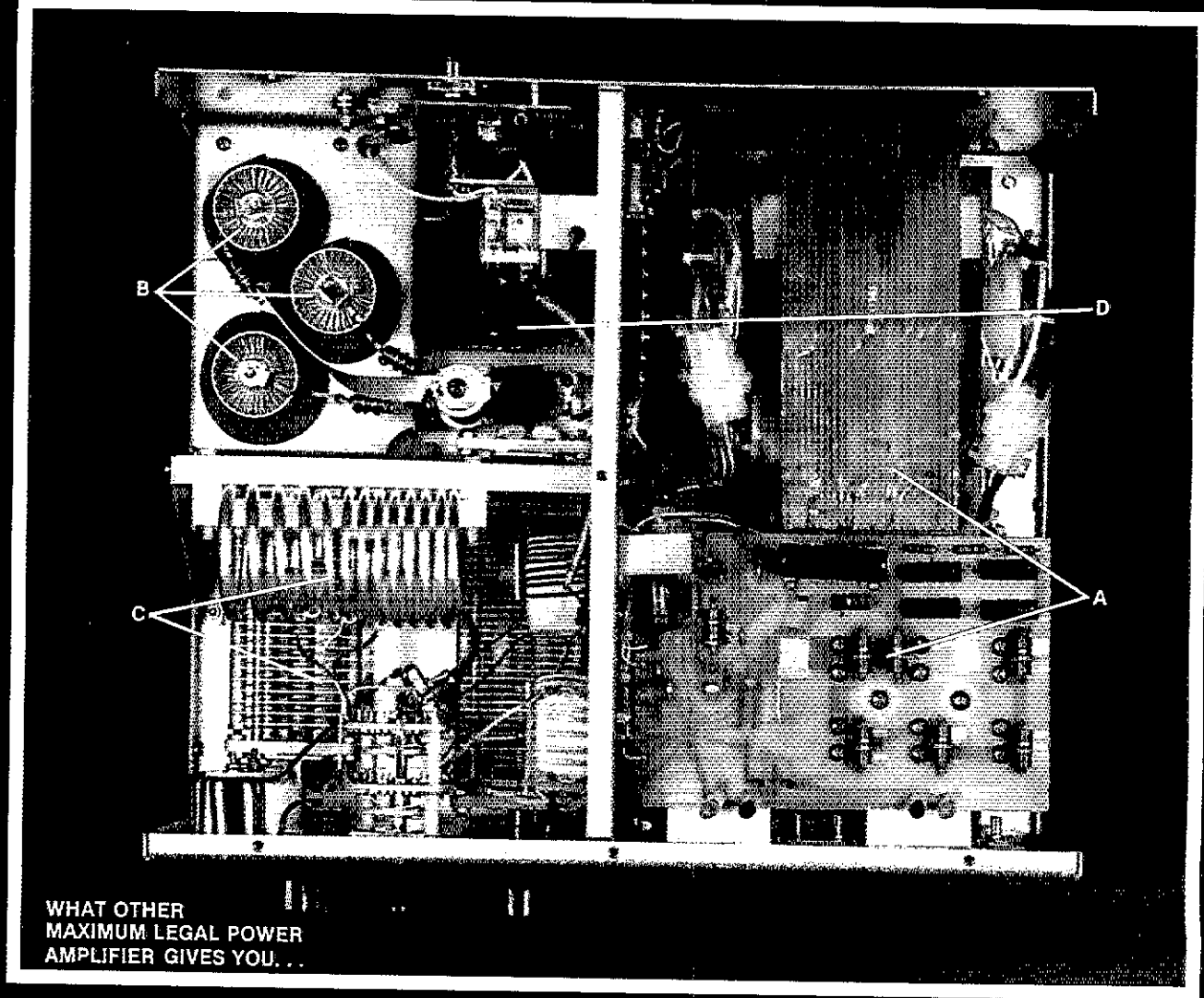

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ETO

presented WB1GMT with citation for his work as hospitality chmn. Acton-Boxboro Club running Novice classes. WA1UEH reports that the fee for call letter license plates are going up to $20. W1AEC repeater in N. Dartmouth was hit by lightning and damaged. The K1BA/R repeater on 145.23 is now working fine atop the old John Hancock Bldg in Boston. This is a public service machine and is open to all related activities. Along this line, there is an early session of The Heavy Hitters Traffic Net at 6:15 P.M. local on this repeater. Until now, this had been impossible because all other repeaters are too busy with commuter QSOs at that time. Kudos to WB1EZT WB7TPY KA1CGP K1BA and others for their efforts on this project. K1BA was also the recipient of the 2nd annual EMASS Public Service Award for 1980. W1JR improved 144 EME array and now all vagis point to the moon at the same time. W1GXT reports an all time low for conditions on the vhf bnds in Sept. Arlington Town Day had amateur help. KA1CGP new net manager for WM2MN. Many tnx to WA1IRE, retiring after years of faithful service. By the time you receive this, the holidays will be upon us so — Happy Holidays!! Traffic: (Sept.) WA1TBY 434, WA1UGJ 190, K4YX 173, K1GN 168, WB1DHW 158, KA1BJY 139, WB1DXR 101, WB1EZT 89, KA1CGP 65, N8TM 59, K1BSO 42, WB1GWS 34, W1XA 34, W1GZB 32, WA2ORV 28, K1BZD 14, WA1DXT 14, W1GE 12, WB7TPY 10, WB1ANT 6, K1PJ 6, WA1FNM 4, W1MJ 4, W1PJ 4, KA1CC 3, W1LE 3, KA1BTV 2 (Aug.) WB7TPY 23.

MAINE: SCM, Cliff Laverty, W1RWG — STM: W1KX. SEC:KL7IJG. Attended the ARRL Convention at Boxboro with a large representation of ME hams. Aroostook and Central ME Emergency Nets submitted reports on activity in state-wide CEP simulated emergency; both successful. PSHR: KA1EO 94, W1RWG 90, AFIL 73. Sess/QNI/QTC: PTN 30/96/286; SCN 26/105/1108; CMEN 14/12/130; MSN 13/11/49; AEN 6/40/98; SPSN 12/8/88; BN 5/27/775; RACES 5/5/41; MPSN 5/20/50. W1KX and KL7IJG have been actively preparing for SET. Need information on club activities, elections, public svc. projects. Traffic: W1RWG 105, W1BJ 95, W1JTH 65, WB1BYR 61, W1HDC 53, W1KX 51, N5YX/1 42, AF1I 31, WA1YNZ 30, WB1GLH 24, KA1EO 24, KA1EKT 19, W1AHM 18, W1CTR 18, WA1JZP 18, W1BMX 14, W1NGO 10, W1GKJ 9, W1OTO 5, WA1ZJL 5, WA1JCN3.

NEW HAMPSHIRE: SCM, Robert C. Mitchell W1NH — SEC: K1RSC. STM: W1TN. NMs N1NH AK1E. This report from the convention at Boxboro NH hams are everywhere. Seen on Hyways & Byways. WA1EFN WB1FGV & KA4FDY. It is sad to report WA1AYH a Silent Key. The NHN had 139 QNI, 132 QTC. W1GUX vacationing in Florida. W1CUE's XYL now KA1FMG. The D1RN liaisons are WB1HGW AK1E W2OYY KA1CXP WA1WRS W1TN W1GUX. Three GSFM Net had 432 QNI, 113 QTC. N1NH relocated his shack and active OO again. KA1FFX, Sunapee High School, is holding ham classes. Our thanks to W1QYY & XYL for an excellent time during the NH traffic handlers meeting. N1ABA has the first New Hampshire Fox Hunt Award. The Nashua club meets on 13/73, Tues at 8 P.M. Just found out K1JUL ran out of gas last year. W1JY recuperating after eye surgery. K1MFQ has new IC-2AT. The King Ridge Hamfest had excellent weather and lots of goodies in the flea market. The very best seasons greetings to all. Traffic: W1GUX 320, W1QYY 316, W1TN 160, AK1E 134, N1NH 77, W1MHX 50, K1OSM 55, WB1HGQ 42, K1YMH 36, W1ALE 23, N1ALM 22, K1UQX 12, N1BAP 10, W1NH 9, WA1PEL 8, W1CUE 7, KA1JA 5, W1BYS 3.

RHODE ISLAND: SCM, J. Titterington, W1EOF — WA1OSL reports RIEM 2-m Tfc Net in 22 sess had QNI 266, TFC 35. N1RI spent vacation on 6 day bicycle trip thru Utah & Arizona. ARES Net now operates on 146.55 simplex. K1DS & K1PAM working hard to keep state on the vhf map. Apple Valley has 12 new Novices — KA1s EIU, ELB EMD EMF ENX EOD EXO FDN FEF FJZ FKA & FKG. New Advanced — KA1BAR N1ASR N1AVZ & N1AOK. New Generals — N1BDS KA1CAD KA1CNY WA1UZZ KA1FEG KA1ELK KA1DNB N1BDJ N1BAA KA1BMI, & new Tech — WB1AGS. Apple Valley has a great record for developing new hams and upgrading those people in rapid style. Your SCM wishes all of you a Merry Christmas and Happy New Year. Let's make 1981 a bigger and better year in RI. Traffic: (Sept.) KA1BTU 224, W1EOF 64, KA1FE 45, N1RI 4. (Aug.) N1RI 16.

VERMONT: SCM, Bob Scott, W1RNA — SEC: W1VSA. WA1HSG repeater group is starting code and theory classes. By the time this comes out, the Green Mountain Wireless Society may be ARRL affiliated — sure hope all goes well along these lines. 146.34/94 repeater has been having moving problems — work of the mtn. BARC trying best to get it back in good shape & its past coverage. GMN 26/492/48; Carrier 26/470/52; VSB 28/455/101; VTRFD 4/70/7; VPN 4/54/6. Nice to hear new mbrs coming into the nets.— VT & others. Everyone is welcome, traffic minded or not! Many handling tfc do not report — would like reports from them whether one piece or more handled. Those on GMN or in my area know how to contact me on the air! Catch as catch can! But I'm usually caught! Traffic: K1BQB 91, N1ARI 85, W1RNA 7.

WEST MASSACHUSETTS: SCM, Art Zavarella, W1KK — ASCMs: K1BE W1BVR STM: W1TM. SEC: W1JP. Nets: WMN/W1UD, Dy 7 P.M. 3562; WMPN/WA1MJE, M-F 4:30 P.M. 3935; WMEN/W1UPH, Sun 8:30 A.M. 3937 with 9 A.M. interface six local 2-m repeater nets. W1UD repeater now 147.460 input/output 146.460. Montachusett ARA covering Fitchburg Blind walkathon with WB1EWS WB1FCV WA1DWS WB1FXJ WA1GXN N1AZG W1UD KA1ACH KA1CYP K1JHC/NCS. Berkshire DX hounds W1GG W1ZT K1AU KA1ARO all beaming tribanders. W1OA WA1OUZ W1KZU on the mend after recent hospital improvements. PSHR: WB1HIH 104, K1JHC 86, WA1MJE 71, W1TM 66. Traffic: WA1MJE 244, K1SSH 176, WB1HIH 138, W1TM 115, W1EFC 58, W1KK 49, K1JHC 44, WA1OPN 40, W1ZPB 33, W1JP 15, W1YI 13, W1UPH 10, W1BVR 9, WB1CWH 6.

NORTHWESTERN DIVISION

ALASKA: SCM, Fred Wegmer, KL7HFM — The tragic fire on board the Prinsendam was the impetus for maximum Amateur Radio traffic out of Alaska. AL7AW, Anc. EC, quickly organized efforts of Alaskan and lower 48 hams. KL7BLZ, Sitka City Mgr, was very QRL with messages and taking care of survivors. KL7JFT, Juneau EC, was up all night coordinating skeds and KL7GQ spent the ordeal in Valdez with $7 in his jeans. KL7C protected the environment by bailing KL7GQ out of Valdez. The Anc ARC 9th annual Flea Mkt was best ever. KL7GQ extracted record amounts from unwary customers with his expert auctioneering. I want to personally thank the

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Louisville hams for their superb hospitality during the CAP Nat'l Conv and Kentucky State ARRL Conv. Traffic: KL7GQ 120, KL7IYX 26, AL7O 32.

IDAHO: SCM, Lem Allen, W7JMH — The Pocatello Club had an interesting film on the Teton disaster. Report on W1MN was given, as well as the Seattle Convention. One member visited W1AW and gave an interesting report. The PARC news advises us of new hams KA7ISH and KA7ISK — congrats and welcome to hamdom! We are glad that W7HZL is home and recovering nicely from open heart surgery and is actively chasing DX again.

Net	Freq.	Time	Sess.	QNI	QTC
FARM	3935 ssb	8 P.M. Dy	30	1235	15
CD	3990 ssb	8:10 A.M. M-F	23	628	16
	3635 cw	9 P.M. M-F	21	213	90

Send a greeting message for your neighbor during the holidays. Traffic: W7GHT 275, AC7P 84, K7JV 40, W7JMH 35, N7APC 26.

MONTANA: SCM, Robert Leo, W7LR — IMN: QNI 224, QTC 92; WB7UTJ Net QNI 254, QTC 13. W7BQE toured YE5, 6-land. W7IDK two-mtr stn at c.d. hq. WB7DZX QNI 81 net sessions, QTC 85 herself — FB! WA7OBH reports 2 mtr DX opening 9 Sept for MT and SD. New appointments. WB7UTJ, NM; N7AGP, EC; W9NFW (Lolo), EC; KA7ILA (Lolo, Too), OO; WB7DZX, OTS. WB7TNH, IMN net certificate. W7OIO sends list of hams that helped in Dillon Parade air crash accident: N7AQV WB7BUA WB7SMI W7JMX WA7CAC W7CT K7CCZ W7TYN W7JPD N7AFS WA7FLG W7OIO. Traffic: (Sept.) WB7DZX 51, W7LR 4, W7NEG 4, W7LBK 1. (Aug.) W7IXD 48, WB7DZX 25.

OREGON: SCM, Dale T. Justice, K7WWR — SEC: K7OLN STM: W7VSE Section nets:

Net	Time/Days	Freq	QNI	QTC	Mgr.
BSN	0145Z Dy	3908	584	45	WB7POU
OSN	0230Z Dy	3587	532	404	KB7JW
	0600Z Dy				
OARES	0230Z Dy	3993.5	357	77	W7HLF
WCN	0300Z Dy	3702 (Aug)	299	107	K7ZIG
PTTN	0300Z Dy	146.76	590	117	W7LRB
LBEARES	0330Z Dy	146.79	686	8	WB7OQH
PdxAARES	0330Z Dy	147.32	628	43	K7WWR
JCARES	0315Z Dy	147.06	131	10	W7VSE
MPCARES	0300Z Mo	146.85	323	3	WA7ZAF
	0300Z Th	147.02			
SOFM	0230Z Mo	146.64	104	1	W7FDU

N7DB operated in the VHF Contest. OTVARC saw the new ARRL film. N7BIJ made WAS. Salem ARC annual dinner had 86 present, including Vice Dir. K7BT and SCM K7WWR. Videotapes of FD and a coffee-stop over Labor Day were shown. WB7UXN is moving to a new Salem QTH. KA7EHS is now Tech. Traffic: (Sept.) KB7JW 642, W7VSE 562, WA7LGN 340, K7NTS 296, WB7OEX 163, KA7AOB 157, W7LNE 69, K7WWR 31. (Aug.) W7FDU 15, W7DAN 1. (July) W7DAN 3. (June) W7DAN 4.

WASHINGTON: SCM, Bob Klepper, W7IEU — STM: W7DZX. SEC: WA7RWK. Nets reporting this month are: NTN QNI 1350, QTC 72; WARTS QNI 3188, QTC 199; NWSSBN QNI 711, QTC 46; WSN QNI 562, QTC 211; PSTS QNI 138, QTC 90; EWTN QNI 112, QTC 33; SCARES QNI 69, QTC 1. A Merry Christmas and a Happy New Year to all. WA7YCM has changed his code practice schedule to 9 P.M. Tues and Thurs. Whidbey Island Repeater Group (WIRG) holds weekly net at 8 P.M. on 147.82/22. Items of interest to Amateur Radio will be discussed. It has been suggested that I start the "mini" sessions on traffic handling again, but I would like to see each net conduct some training sessions. Also, would you be interested in a slow speed session of WSN? If so let me know and we'll see what can be done. K7DBA gave West Seattle ARC a demonstration on constructing and testing a 2-mtr Yagi antenna at symposium on antennas at 12th Annual National Association for S&R Conference. BEARS training chairman, WA7ACQ, will not have fall classes due to extensive revision of training material. N7BER running phone patches from Icebreaker Polar Star. Island Cty ARES net has moved to the Island Cty Rptr 147.22 8 P.M. Wed. W7GMC and Yakima ARC operated club stn W7AQ from Central Washington Fair, also provided communications for grand parade. 145.24 Rptr, K7KNZ/R, now operating from Capitol Peak. W7LEC and N7AVP have become SKs. WB7WUS is newly appointed chairman of 1981 BAncouver Hamfair. North Seattle ARC officers and trustees looking for suggestions to improve attendance at club mtgs. Clallam Cty ARC provided communications for 6 mile race during Derby Days activities in Port Angeles. Radio Club of Tacoma had display at Puyallup Fair. W7OS and members of Radio of Tacoma initiated nearly 275 amateurs into the Royal Order of Wouff Hong at SEANARC '80. RASC enjoyed 2nd annual rptr party at the QTH of KL7JEB and KB6AL in Concrete. WA7KGT/R has been increased in power by addition of an amplifier. WB7SWW is new EC for Skagit Cty and KA7ECN is new EC for Yakima Cty. SEC WA7HWK working on Weather Net to assist National Weather Bureau in Seattle. HAMS Club donated Ringo Ranger II to be mounted on Marysville Police bldg. Traffic: W7DZX 731, WB7TQF 427, K7GXZ 336, WB7WOW 308, W7FJZ 210, K7CTP 122, W7IEU 117, W7GB 71, N7AFY 67, N7AFZ 60, WA7BDD 45, WB7CFH 42, W7BUN 39, WA7RCR 26, W7APS 15, K7RBT 14, W7LG 9, N7CT 8, W7CDM 1, W7ERH 1.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — Asst SCMs: W6ZF VE2AQV/W6. SEC: WB6KQU. If W6JXK's (deleted) antenna ever gets up, he thinks it will work. KA6ERF has been inactive of late. BEARS (Berkeley Emergency Amateur Radio Service) holds a net each Wednesday at 1930 local on 146.43 MHz. LARK is running a 12 week training course for Technician/General Class. KA6LEW recently upgraded to Tech. WB6CFD and XYL were blessed with a child. MDARC membership at 312! They were awarded the first annual Pacific Division Club of The Year Award, large club category, for 1980. Congratulations to all 312 of you! EBARC meets the second Friday of each month at the Salvation Army Center, 36th and Rheem, Richmond, at 1930 local time. Traffic: W6JXK 353, WB6UZX 35, K6UGS 33, WA6BOB 16, KA6ERF 4.

NEVADA: SCM, Ralph E. Covington, W7SK — ASCM: N7RH. SEC: WA7KCD. We are saddened at the passing of W7IUD. He was a good friend to all and will be missed very much. It appears that all clubs are planning Christmas social programs. Contact the club in your area and help make each gathering a success. SAROC in Las Vegas in January. N7AKX has new Triton IV and TS700. Sagebrush Net meets nightly 7:30 P.M. on frequency of 3906 kHz. W7BS is net manager. Items for

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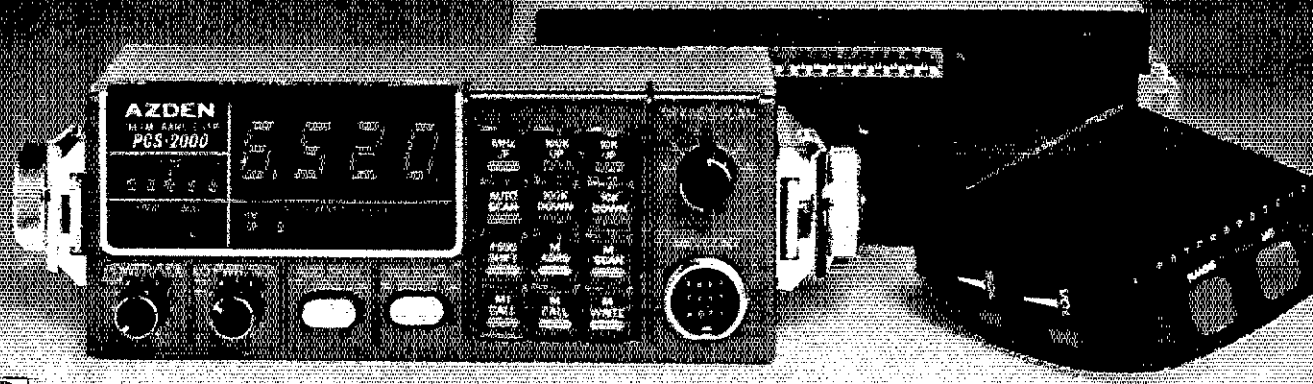

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publication in this column due by first of the month. Traffic: (Sept.) N7AKX 289, W7BS 109. (Aug.) N7AKX 330, W7BS 123, W7CX 8.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: WB6GFJ. ASCM: A16T. WB6GFJ has returned from his operation as FO0FB after 1500 QSOs. Those interested in a weather watch please contact the SEC. WB6PDM is the acting president of the El Dorado Co. ARC. The Golden Empire ARS held their annual Steak Bake in Chico. The Telephone Pioneer Radio Newsline is available for information on activities and will also record your input. Call 484-7388. Please have all club newsletters or your personal input for this column to the SCM by the 7th of the month. It's hard to stutter on a typewriter. K6ZY has been busy making printed circuit boards for electronic keyers. Traffic: W6SX 45, W6DEF 10, W6RSP 3.

SAN FRANCISCO: SCM, Art Samuelson, W6VV — SEC: WB6ZRK. STM: K6TP. The new EC for San Francisco is N6VS, who assisted in providing communications for an aircraft piloted by WA7JAZ that had lost its regular communications due to an electrical failure. WB6UMT provided a phone patch between the aircraft and the control tower. Well done! San Francisco RC provided communications for bridge to bridge run. N6DBZ active on 6 meters, Sonoma County radio amateurs helped in March of Dimes run. K6GWE/R and Humboldt ARC/Far West Repeater Association report successful picnics. An Amateur Radio booth was set up at the Boonville Fair Apple Show. PSHR: W6RNL. Traffic: (Sept.) W6IPL 186, W6RNL 128, K6TP 103, WA6QXV 9, W6GGR 8. (Aug.) W6NL 165.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6YAB. Asst SCMs: W6TRP WA6YAK WA6HIN. New officers of the Tulare County ARC are: KA6HAY, pres.; WD6FUF, vice pres. KB6UK is new vp of the Fresno ARC. All SJV clubs are asked to inform the SCM and the ARRL Club and Training Dept of changes in officers. WD6BJK and KA6LGG have General. WB6UDD is Advanced. KA6LGN has a new tower and beam. KB6DH is KQ6C. WA6YAB has a RM 76. W6WPV has a PCS 2000. KB6DI works DX occasionally. All clubs should send a representative to the Public Information Workshop at the 1981 ARRL Pacific Division Convention and 39th Fresno Hamfest to be held May 15-17, 1981 at the Hacienda. All ECs and SECs are invited to attend the Emergency Communications Forum that is a part of the CD appointees meeting at the convention. Merry Christmas and Happy New Year to ALL!!!! Traffic: N6AWH 110, WA6YAB 24, WB6TTP 13, K6RAU 6, WD6FRS 6, W6DPD 3, WA6JDB 2.

SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF — SEC: WB6IZF. The Williams Hill ARRS' 4th annual Smoked Hamfest was a huge success with 135 in attendance and an excellent barbeque. WB6IZF and his group did an excellent job. W6KZJ off for a month's vacation. W6AUC active on 75 and 15 meters. Most clubs are in need of instructors for theory and code for their classes; if you can help out, they would appreciate hearing from you! SCCARC held a hidden TX hunt, preparing to elect officers and ready for annual banquet. KD6BD, EC Santa Cruz, and group are preparing the old county RACES station, and looking for more operators. K6UD presented a slide show "As A Guest Of China" to PAARA and other clubs are scheduled. PAARA's annual auction and flea market was its usual success. New PAARA members are K6XO and N6AUV. SLVARC's WR6AOK now has battery back-up and is good for 24 hours; they are also purchasing a uhf rptr. LERA ARC provided communications for the LERA Fun Run. W6OLO spoke to LERA ARC and Sonoma RC on "Whatever Happened to Project Moonray?" SMRC had a showing of movies of their 1980 Field Day operations, a picnic at SLAC, and their license course is in progress. An interesting talk and demonstration by AA6PZ and WD6FMG was given to FARS members and several different receivers were tested for performance. FARS Flea Market had a good turn out and lots of "stuff" changed hands. New upgrades for NPSARC members are WB6PXR and WB6CAM Extra and N7AGO Advanced. A club station is being put together by the Memorex ARC. W6RFF presented FARS with a Charter of Affiliation for ARES in SCV Section. Traffic: W6YBV 212, W6KZJ 55, W6AUC 53, W6RFF 32, WB6IZF 2.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Bill Parris, AA4R — Asst SCM: N4UE. STM: WD8NYN. SEC: WA4BFT. NMs CN AB4S, CMN WD8NYN, THEN WD4CNR, JFK WD4CNQ, NCSSBN WB4CES, CNN WD4JJK. Congrats to WD8NYN the new STM for NC effective Nov 1. Many thanks to K4VHT for an outstanding job as STM for the past year. K4TP now providing numerous clubs with fine program on "Ham Radio Memories." KU4W has turned author with nice series on power supplies in the Cape Fear ARS newsletter. Carry ARC recently sent AMSAT a club donation . . . any others doing the same? Alamance ARC and Mecklenburg ARS now have Novice & General classes going. WD4FTR has recently reactivated the Azalea Coast ARC cw net on 28.150 each Wed @ 9 P.M. Congrats to Centralina ARC now an affiliated club of ARRL in the Newton/Conover area. 30 Raleigh ARS members recently coordinated the transfer of 170 patients on 20 vehicles from the old to the new Rex Hospital in Raleigh. Recent upgrades to General include KA4NBY & KA4NOR who is now N4DSF. WA4EXW & N4DSF put together nice demo station at Fair for the Brightleaf ARC of Greenville. New appointees this month include WD4NAO & N4CJJ both as OTS. Traffic: (Sept.) K4GCN 328, KWD4CNQ 296, WD8NYN 278, WA4UTC 191, WB4WII 178, AB4S 172, W4EAT 144, WD4CNR 127, WA4SRD 125, WB4CYN 118, K4VHT 101, KU4W 99, W4HKB 62, WA4OBR 58, K4FTB 57, KZ4A 49, AA4R 48, WD7NAO 47, WA4OJU 38, N4CJJ 32, W4ACY 26, N4ARY 24, KF4R 24, K4VHQ 23, WB4RGS 19, N4UE 19, W4FMN 17, WA4CUD 14, WB6OTS 10, K4XE 10, W4VTP 8, WD4PDU 7, WD4CFZ 6, K4HF 6, WB4HRR 4, WA4IHG 4, WD4LOO 4. (Aug.) W4VTP 13.

SOUTH CAROLINA: SCM, Richard McAbee, W7MTK. SEC: WD4HLZ. STM: W7ANK. Congrats to new Novices & upgrades. KY4S NA4I NC4F KY4B KC4KZ N4DJE. The Blue Ridge ARS provides comm for Greenville County ARPSC involving c.d. Red Cross, 4 hospitals, 2 fire departments, local law enforcements. The North Augusta-Belvedere ARC had exhibit at Aiken Makin on Sept 27. 61 pcs traffic were passed. Congrats to York County ARS for winning Field Champion Plaque. Tnx to all who participated. A good time was had at the 29th Rock Hill Hamfest. Check-ins/traffic: SC SSBN 1456/241; Blue Ridge 2-Meter Net 1022/50; SCNTN 326/87;

Lancaster County 2-M Net 222/13; Western SC Emergency Net 175/15; Newberry County ARES Net 62/7; Carolina State Line Net (Aug.) 44/2, 37/2; District 5 ARES Net 16/0; Cnn 256/37; Trident ARC 130/0; Dixie 6-Meter Net 20/0; SC 2-Meter SSB Net 72/0; SC ARES Net 17/0. Traffic: (Sept.) K4ZN 222, W4ODE 162, W4FMZ 143, W4ANK 131, W4OCX 117, NC4F 102, W4NTO 90, WD4PPM 51, K4FRX 44, W4MTK 43, W4NOL 30, KA4AUR 29, WB4UDK 29, WD4OBZ 24, WD4OLV 19, WD4BUM 13, AF4K 13, N4ATO 10, WA4MIY 10, WA4VYS 10, WA4JWS 8, WD4EDM 3, W4DRF 2, WB4QHF 2, WD4DOL 1. (Aug.) WD4OBZ 24.

VIRGINIA: SCM, Rick Genter, K4BKX — ASCMs: W4YE N4NK WA4FDV. SEC: N4AZI. STM: WA4STO. Chief OO: W4HU. Chief OVS: N4CD.

Net	kHz	Time-PM	Sess	QTC	Mgr.
VSBN	3947	6:00	30	320	KY4K
VSN	3680	6:30	29	122	WB4KSG
VN-E	3680	7:00	30	185	KB4N
VN-L	3680	10:00	30	102	KB4N
VLN	3947	10:15	26	122	WA4YIU
VNTN	3907	Noon	30	114	N4LE

Effective Nov. 1, WD4FTK will replace N4LE as manager of the VNTN. Many thanks to N4LE for a tough job very well done and good luck to WD4FTK. WA4YIU, after serving as mgr. on the VSN and presently as mgr. of the VLN will be turning over the paperwork to KY4K. He will remain active on the nets as usual and will continue as the DEC for the Southside VA ARES District. Many thanks for your contributions. On Dec. 1, KY4K will add the VLN to his list of duties. With both the VSBN and the VLN, he is going to be quite busy; let's all give him our full support. W4KFC attended the SW Div. Conv. and Wichita Hamfest; also DXPO. K0JH spent all of July and August op. at sea, but is on vacation for Sept. & Oct. which means on the air! N4DCL is building Loudoun County ARES. WA4STO is looking for more OTS applications. W4NWM is working hard toward 5BWAS; especially since KI4W now has hers. WB4PNY was awarded the Division Award from Director Phil Wicker (W4ACY). K4GR is building a new Heath hand-held freq. counter. This year's recipients of the Virginia Section Distinguished Achievement Award were K7EJ KY4K KZ4K and WA4LJI. As many of you know, W4ACY is retiring as Roanoke Division Director. W4UG will become the new vice-director. Traffic: WA4GGK 478, WB4PNY 439, W4JK 414, WA4STO 406, K4KNP 279, W3BBN 180, KY4K 172, KZ4K 143, WB4FTK 134, N7AZI 125, W4SOO 116, W4SUS 105, WB4FLT 93, W4OKN 92, K4EJ 88, WA4LJI 81, N4RF 73, W4NWM 71, WB4KSG 61, WB4UHC 58, WA4YIU 53, WB4DQZ 51, KA4ETG 41, N4IF 41, K4KDJ 38, WA1VRL 38, W4YVG 38, N4CIR 36, WB4ZTJ 36, WB4BAT 33, W3BBQ 32, WA4QWC 32, K4GR 31, AA4CK 23, N4GJL 21, N4BJX 18, WB4RWY 18, N4LE 15, WB4ZNB 15, WD4KQJ 13, W4KFC 12, W4LXB 12, K4VWK 12, K4JST 11, K4OHB 10, KC4HN 10, W4YE 10, WD4DUU 9, WB4SHK 9, W3ATQ 8, K4JRT 8, WA4WGG 8, WA2WDT 7, WA4EQW 6, WB4KIT 5, N4NK 5, W4KXE 4, KB4OF 4, KI4W 4, N4DCL 4, WA4JUO 4, WA4FGW 3, N3RC 3.

WEST VIRGINIA: SCM, Karl Thompson, K8KT — STM: KD8G. SEC: K8QEW. NMs: K8MHR W8FZP KD8G. (Chas hams assisted with 1st annual Scarlet Oaks Golf Classic. WB8LAI is trying to work all counties on 2-M. Good luck. W8DUV & W8DUW now living in FL, were guests of W8JM & WB8LAI. K8SU/r is now on the air on 147.87/27 in Putnam Co. Code prac. to be started on 146.07/67 in Ripley by WA8USO.

Net	Freq.	Time(Z)	Ck-in	TFC	Sess.
Hillbilly	14290	1700 Su	178	52	4
Phone	3990	2300 Dy	825	60	29
Phone(MD)	3990	1700 Dy	222	31	30
WVN	3567	0000 Dy	154	48	30
Blk-Dia	25/85	1200 Tu	37	10	4
KFC ARA	87/47	0130 Tu	96	14	4

Traffic: KD8G 106, N8AJC 42, W8FZP 32, K8QEW 32, W8HZA 23, AI8I 21, K8MHR 20, KD8X 16, W8CKX 13, W8CAL 10, W8JM 8, WD8MJE 7, WB8UDY 6.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Robert W. Poirier, K0DJ — SEC: W0ACD. STM: WB0MCL. NM: K0CNV W0HE W0HXB KB0Z WD0AIT. Loveland repeater now able to operate on full emergency power. PAS meeting in Seattle provided a compromise solution to the NTS restructuring controversy. Newly appointed TCC Directors out of the meeting were W0HXB for daytime cycle and yours truly for the evening. SET plans were being formulated in several CO districts for the annual event in October. SEC W0ACD reports ARES activity is reaching an all time high statewide. Plans being made to provide direct communications to Denver district Red Cross Headquarters from all state local chapters and a full time link from Denver to regional headquarters in San Francisco, CA. PPFMA and PPRAA provided much needed communications for a motorcycle enduro near Woodland Park. Nets: Columbine 26 sessions, ONI 1030, QTC 102, informals 192, QNF 1015; CWN 30 sessions, ONI 200, QTC 108, QNF 754; HNN 29 sessions, ONI 1445, QTC 156, informals 211, QNF 1390. Traffic: W0WYX 1829, N0BQP 1433, K0DJ 228, WD0AIT 129, W0LAE 125, K0BN 111, KB0Z 88, W0GO 62, W0RE 32, N0BLU 19, KU0M 15.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. NMs WB5NNG KG5L K5OMB. Southwest Net (SWN) meets daily on 3583 kHz, at 1930 local and handled 234 msgs with 207 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 kHz at 1800 local and handled 177 msgs with 1074 stations in. New Mexico Breakfast Club meets daily on 3940 kHz at 0700 local, handled 137 msgs with 693 checkins. Yucca 2 Mtr Net handled two with 541 checkins. 6-Mtr SSB Net 50.11 or higher, 7:00 P.M. local Tue. WA5MIY improving after hosp. stay. Good SARA newsletter. Congrats to W5EAW for handling emergency ship tfc. Good NMESC mtg at Los Alamos. Many tnx to WB5NNG & K5GMB as new NMs. 325 colorful hot air balloons brought many visiting hams to NM. Traffic: W5UH 393, W5DAD 284, W5JOV 177, KG5L 150, W5ENI 131, KA5DDW 87, K5MAT 62, N5SJ 52.

UTAH: SCM, Royce Henningson, K7OEQ — SEC: WB7FGB. STM: W7OCX, WA7MEL reports good DX openings to Europe on 20 meters. W7OCX reminds us that the BUN reverts to standard time at the end of October. WB4NVO, OO, reports 146.31/91 from Little Mountain in Odgen, W7GPN/R, now on the air and 146.22/82 to be on the air from Kaysville Peak by Oct. 11. KA7IBR K7AHD W7KFZ WB7RQP and WB4NVO operated communications for Peach Days Marathon in Brigham City. Traffic: K7HLR 172, WA7KHE 136, WA7MEL 71, WA7JRC 43, W7OCX 24.

WYOMING: SCM, Chester C. Stanwarty, W7SDA — Congratulations to N7BVX, new General in Buffalo, to KA7ILZ, new Novice and KA7FKF and N7BRQ new

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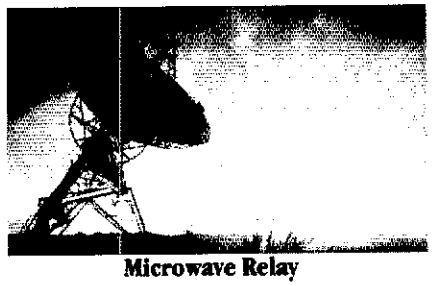

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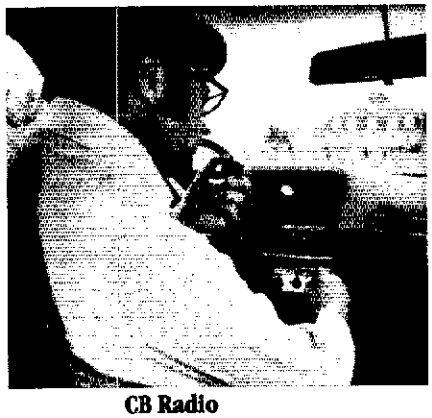

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Astro 200 Xcvr	$379
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Desk cgr for HT-146	19
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75S-3B Ham Rcvr	499
75S-3B Rcvr (round)	549
51S-1 Rcvr (round)	1295
32S-1 Transmitter	275
32S-3 Transmitter	450
32S-3 Xmtr (round)	499
30L-1 Linear	495
312B-4 Console	199
KWM-2 Xcvr	575
KWM-2 Xcvr (round)	625
351D-2 Mobile mt	49
516F-2 AC supply	199
MP-1 DC supply	49
COMDEL	
CSP-11 Processor	$ 49
DENTRON	
160-XV 160m Xvtr	$119
160-XV MARS Xvtr	119
80-10AT Wire tuner	39
160-10AT-3kw tuner	119
MT-3000A Tuner	279
DTR-3KA Tuner	279
160-10L 1200w PEP amp	299
DTR-1200L Linear	349
GLA-1000B Linear	299
MLA-2500 Linear	569
AF-1A Audio proc	99
DRAKE	
SW-4A SWL Rcvr	$225
SSR-1 SW Rcvr	249
7B Ham Rcvr	179
2BQ Spkr/Q-mult	29
2C Ham Rcvr	189
2CQ Spkr/Q-mult	29
2LF Low freq conv	19
R-4 Ham Rcvr	259
R-4A Ham Rcvr	279
R-4B Ham Rcvr	329
R 4C Ham Rcvr	399
MS-4 Speaker	19
FL-4000 Filter	35
MS-7 Speaker	29
SC-2 2m rcv conv	69
SC-6 6m rcv conv	69
CPS-1 Conv ps	19
CC-1 Conv console	39
2NT Transmitter	99
T-4X Transmitter	299
T-4XB Transmitter	349
T-4XC Transmitter	399
TR-3 Xcvr	299
TR-4 Xcvr	349
TR-4/NB Xcvr	389
TR-4C Xcvr	399
TR-4CW Xcvr	450
TR-4CW/RIT Xcvr	489
34PNB Blanker	75
FF-1 Xtal adapt	29
TR-6 6m Xcvr	529
AC-3 AC supply	65
AC-4 AC supply	89
DC-3 DC supply	65
DC-4 DC supply	85
TR-7 w/3 filters	1195
PS-7 AC supply	199
MN-4 Matcher	69
MN-7 Tuner	129
TR-22C 2m FM Xcvr	125
TR-33C 2m FM Xcvr	139
AA-22 2m amp/preamp	69
AA-10 2m 10w amp	39
AC-10 AC ps	29
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PS-150-12 DC supply	$ 69
SR-400 Cyclone II	349
SR-400A Cyclone III	399
P-500AC AC ps	99
HEATHKIT	
HR-1680 Ham Rcvr	$199
HY-GAIN	
3750 Xcvr	$699
ICOM	
IC-701 Xcvr/ps	$849
IC-22 2m FM Xcvr	109
IC-202 2m SSB port	175
IC-211 2m Xcvr	449
IC-215 2m FM port	149
IC-215/BC-20 batts	179
IC-230 2m FM Xcvr	169
IC-245 2m FM Xcvr	269
IC-245/SSB 2m Xcvr	329
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80 Camera	199
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DC-200 DC supply	$ 69
FTDX-401 Xcvr	399
FTDX-560 Xcvr	399
FTDX-570 Xcvr	449
FR-101S Ham Rcvr	349
FL-101 Transmitter	349
FL-101/processor	399
FT-101E Xcvr	599
FT-101EE/fan Xcvr	579
FTV-250 2m Xvtr	189
FT-301S DIG 20w Xcvr	399
FT-301 Xcvr	499
FT-301 DIG Xcvr	599
FP-301 AC ps	99
FT-301D Deluxe ps	159
FV-301 Remote VFO	89
YO-301 Scope	179
FT-78 Xcvr	450
FV-901DM Ext VFO	299
FC-901 Tuner	139
FT-107M/DMS Xcvr	875
FP-107E Ext AC ps	99
SP-107 Speaker	19
SP-107P Spkr/patch	55
FV-107 Remote VFO	119
FC-107 Tuner	99
FT-221R 2m Xcvr	379
YC-221 Dig display	79
FT-227R 2m FM Xcvr	219
FT-227RB 2m FM Xcvr	269
FT-620B 6m Xcvr	299
FT-625RD 6m Xcvr	499
FT-627RA 6m FM Xcvr	279
CPU-2500R 2m FM Xcvr	299
CPU-2500RK 2m FM	319
FT-207R 2m FM HT	249
FRG-7 SW Rcvr	239
FRG-7000 SW Rcvr	450
YP-150 Dummy/meter	49
YC-355D Counter	129
YC-500-J Counter	149

10-17-80

Call TOLL FREE 1-800-558-0411 & Order Today!

(1) This list was prepared from an inventory taken on the date shown. The quantities vary. In some cases there are several of one item, others only one. Due to the lead and distribution time of this publication some of the items may have already been sold by the time you see this ad. But, due to the number of trades we are involved in each day, some items are in stock that are not listed. When ordering state more than one choice, if possible. (2) AES reserves the right to sell power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) To insure quality, our used gear is serviced and made ready for shipment after we receive your order. Please allow 5 to 10 working days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment specials, closeouts, etc. shown on this page.

The following are NEW Close-outs, Overstock merchandise, New displays, Demos, etc. Most are factory-sealed, all carry New warranties. Limited quantity. First come, first served. Most Close-outs available at Milwaukee only. Terms of sale: Payment in full with order, Mastercharge, or Visa (Bankamericard); no trades.

	reg.	NOW
AEA		
AD-1 Autodialer	$129	99
AD-1P Portable autodialer	129	99
ALDA	reg.	NOW
103 80-20m Xcvr/nb/cal/mic	$573	299
PS-130 30A power supply	149	129
ALLIANCE	reg.	NOW
HD-73 Rotor	$154	109
AMECO	reg.	NOW
BIU Bridge indicator unit	$ 21	5
AMPEREX	reg.	NOW
4-400A Tube	$118	99
ANTENNA SPECIALISTS	reg.	NOW
HM-181 6m trunk mt ant	$ 37	19
HM-182 6m roof mt ant	35	15
HM-7A 2m ground plane	20	12
HM-17 2m ¾ wave gnd plane	35	19
HM-20 2m ¾ wave marine ant	49	29
HMR172 2m 5 el beam	34	19
HMR173 2m 11 el beam	59	35
HM-177 2m ¾ wave roof mt ant	37	17
HM-179 2m ¾ wave roof mt ant	37	17
HM-180 2m ¾ wave tnk mt ant	42	19
HM-187 2m mag mt ant	46	26
HM-220 220 roof mt ant	15	9
HM-221 220 trunk mt ant	29	15
HM-223 220 ¾ wave tnk mt ant	37	19
HM-224 220 ¾ wave tnk mt ant	39	19
HM-225 220 ¾ wv marine ant	39	19
HMR174 450 11 el beam	54	29
HM-175 450 ¾ wave roof ant	37	19
HM-176 450 ¾ wave tnk mt ant	41	25
ATLAS	reg.	NOW
DMK/XL Mobile mt	$ 65	39
210X/NB Xcvr DEMO	810	549
215XS (LE) Xcvr	765	569
215XS/NB (LE) Xcvr/blanker	810	599
220CS/VX-5 AC ps w/VOX	210	149
DCC DC cable		14
MTK Bracket kit	7	5
RX-110S Receiver	299	199
RX-110 Rcvr+TX-110L Xmtr	438	299
RX-110+TX-110H/PS-110H	636	399
B & W	reg.	NOW
340A Q-mult/notch for KWM-2	$ 79	59
372 Clipreamp	27	19
560 5 pos BNC coax switch	11	9
800 2.5kV 500ma plate choke	11	8
850A 1kw bandsw pi-net nduct	79	59
851 500w bandsw pi-net nduct	57	39
3001W Hybrid phone patch ns	85	75
FC-50 50A filament choke	45	25
FC-30A 30A filament choke	31	16
FC-25A 25A filament choke	16	8
FC-15A 15A filament choke	25	12
CDE	reg.	NOW
AR-22XL Light duty rotor	$ 65	55
AR-40 Solid state rotor	82	69
BT-1A Moderate preset rotor	103	85
CD-45-II Medium duty rotor	109	95
HAM IV Heavy duty rotor	198	159
T2X Extra heavy duty rotor	297	239
CDI	reg.	NOW
AM filter for FT-101	$ 39	29
CES	reg.	NOW
210 Thin TTP	$ 39	29
210A Thin TTP	39	29
213 TTP w/auto PTT	50	39
215 Mini TTP	39	29
215A Mini TTP	34	25
230A TTP microphone	44	35
232 TTP mic w/batt	59	48
235A TTP mic w/autodialer	79	65
240 ANI pad w/prog switches	100	79
240A ANI pad	80	65
251T 10# autodialer	99	79
251TB 10# autodialer	99	79
300P Acoustic TTP	49	39
800-YS Scanner, FT-227R	99	49
800-ML Scanner, 13-510	99	79
800-ML(A) Scanner, 13-510A	99	79
800-KW Scanner, TR-7400A	99	79
CIR	reg.	NOW
Astro 200 Xcvr	$995	460
Astro 200/CW filter	1045	499
BPS-200 AC supply	135	125
SPR-200 Speaker	30	24
SPS-200 AC ps/speaker	165	149
SGC-200 Stn console	295	195
MIC-STA Desk mic	38	29
COLLINS	reg.	NOW
KWM-2A Xcvr	3992	2992
PM-2 Portable supply	768	499
32S-3A Transmitter	3673	2673
516F-2 AC power supply	467	367
MP-1 DC power supply	680	280
312B-4 Station console	737	499
302C-3 Wattmeter	557	357
351D-2 Mobile mount	826	299
DL-1 Dummy load	305	150
CC-2 Carrying case	297	197
CC-3 Carrying case	297	197
MM-1 Mobile microphone	73	49
SM-1 Desk microphone	36	29
SM-3 Desk microphone	189	99
F455Y-60 6 KHz Rcvr filter		50
F455Y-40 4 KHz Rcvr filter		50
35U-1 Low pass for 75A-4		9
399B-1 KWM-1 DX adaptor		19
399B-5 KWM-2 Xtal adaptor	260	160
F455FA-60 6 KHz filt for 75S-3	120	99
F455FA-40 4 KHz filt for 75S-3	120	99
F455FA-31 3.1 KHz filt; 75S-3	120	99
F455FA-15 1.5 KHz filt; 75S-3	137	99
X455KQ-200 200 Hz filt; 75S-3	406	299
CUSHCRAFT	reg.	NOW
A14-2 2 el 20m beam Truck	$119	69
A14-3 3 el 20m beam Truck	169	99
A21-3 3 el 15m beam Truck	99	59
A21-4 4 el 15m beam Truck	129	79
A28-3 3 el 10m beam	69	49
A28-4 4 el 10m beam	89	59
ASQ-6SK Stack kit; 2 6m Squalo	17	9
A50-10 10 el 6m beam Truck	119	89
AR-25 2m 500w Ringo	34	29
ABW-12S Stack kit; 2 Big Wheel	18	9
ABW-14S Stack kit; 4 Big Wheel	29	15
ASQ-2 2m Squalo		19
ASQ-22 2m stacked Squalos	42	39

AMATEUR ELECTRONIC SUPPLY®
4828 W. Fond du Lac Ave. • Milwaukee, WI 53216 • Ph. 414-442-4200

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In Wisconsin (outside Milw. Metro area) 1-800-242-5195

STORE HOURS: Mon, Tues, Wed & Thurs 9-5:30; Fri 9-8; Sat 9-3

Specials, Closeouts & Overstock equipment, etc. continued from opposite page.

CUSHCRAFT - Continued	reg.	NOW
AQK-244 Stack kit; 4 A220-11s	89	49
A432-20T 20 el 432 twist ant	59	49
A450-20T 20 el 450 twist ant	50	35
DX-VPB Vert polarization bkt	9	5
A-3 3 el triband beam	219	169
ATB-34 4 el triband beam	319	239
ARX-2 2m Ringo Ranger	39	34
ARX-2B 2m Ringo Ranger II	44	39
Other Major Cushcraft Antennas		CALL
DATA SIGNAL	**reg.**	**NOW**
Cricket 2 Keyer	$ 75	59
Mighty MOS Keyer	39	29
CMOS keyer kit	24	19
FMS-3 HF freq standard	33	25
ITP-1 12 digit TTP	59	39
ITP-2 16 digit TTP	69	49
DATONG	**reg.**	**NOW**
ASP Speech processor DEMO	$195	99
DENTRON	**reg.**	**NOW**
HF-ACS 12v 10A supply	$129	49
160-XV 160m transverter	249	199
80-10AT 80-10m wire tuner	59	39
PS-10 VOM/wattmeter	49	29
PS-20 VOM/wattmeter	69	39
W-1 Wattmeter/SWR DEMO	69	55
WVP-2A VHF peak wattmeter	99	79
W-2 Wattmeter	129	99
W-2 PEP Wattmeter	159	119
AF-1A Rcv audio processor	199	129
GLA-1000 Linear DISPLAY	379	299
GLA-1000B Linear	399	349
DTR-1200L Linear	665	455
Clipperton L Linear	699	499
MLA-2500B Linear	1299	799
DTR-2000L Amp Air Freight	1329	999
Jr. Monitor Tuner	79	49
Super Tuner Plus Tuner	149	119
MT-3000A Tuner	399	349
RT-3000 Tuner	299	249
AT-1K Tuner	149	129
AT-3K Tuner	259	219
BL-1 Balun; AT-1,3K/RT-3000	49	45
DTR-3KA Tuner	449	349
Big Dummy Dummy load	39	37
MC-1 Mobile microphone	29	19
DRAKE	**reg.**	**NOW**
PS-75 Power supply os	$199	169
DSR-2 SW Rcvr	3400	2400
R-4C Receiver	699	499
MS-4 Speaker	33	29
AC-4 Power supply	150	135
RP-500 Receiver protector	90	69
AN-5 Shortwave ant	8	6
MN-7 250w tuner os	175	149
MMK-3 Mt for TR-4	10	8
7072 Hand mic	19	9
FL-6000 6 KHz filter for R-4C		52
FL-4000 4 KHz filter for R-4C		52
FL-500 500 Hz filter for R-4C		52
SCC-4 Xtal cal for SPR-4		20
DC power cord for SSR-1	5	3
DC power cord for SPR-4		5
1523 FS-4/SPR-4 adapt kit	9	5
1524 FS-4/4-line adapt kit		5
CB Xtal kit for SPR-4		5
Marine Xtal kit for SPR-4		57
Tropical Broadcast Xtal kit		15
MARS Xtal kit for SPR-4		26
Amateur Radio Xtal kit		31
Teletype Xtal kit for SPR-4		20
Time & Freq Xtal kit for SPR-4		26
1525EM Encoder mic	49	35
UV-3 3-band FM Xcvr	995	899
UV-3/CH Extra control head		90
PS-3 Power supply		89
ETO	**reg.**	**NOW**
76A Linear	1695	1339
76A w/lightweight Xfmr	1860	1499
76PA Linear	1995	1595
76CA Linear w/light Xfmr	2195	1795
374A Linear	2195	1695
78 Linear	2895	2295
77DX Linear Air Freight	4495	3495
Vomax Speech processor	195	179
Vomax AC supply	15	15

Note: Above ETO prices apply to limited quantity of units in existing inventory, which were purchased at old prices.

EIMAC	reg.	NOW
100TH Tube	$183	99
ELECTROVOICE	**reg.**	**NOW**
641 Microphone		29
400 Stand	14	7
600E Mobile microphone	28	15

HY-GAIN	reg.	NOW
TH6DXX 6 el Truck	$329	259
TH5DX 5 el tri-band Truck	289	229
TH3Mk3 3 el tri-band Truck	259	209
TH3JR 3 el tri-band, 600w	186	146
TH2Mk3 2 el tri-band beam	149	119
Hy-Quad 2 el tri-band quad	299	229
402BA 40m 2 el beam Truck	239	199
205BA 20m 5 el beam Truck	329	259
204BA 20m 4 el beam Truck	249	199
203BA 20m 3 el beam Truck	139	119
155BA 15m 5 el beam	199	149
153BA 15m 3 el beam	89	75
105BA 10m 5 el beam	129	99
103BA 10m 3 el beam	74	59
Hy-Tower 80-10m vert Truck	389	299
18AVT/WB 80-10m vertical	114	94
14AVQ/WB 40-10m vertical	69	57
12AVQ 20-10m vertical	47	39
2BDQ 80-40m trap doublet	59	49
5BDQ 80-10m trap doublet	112	89
LC-80Q 80m load coil for vert	17	9
707 2m ¾ wave tnk mt ant		12
3807 Nicad for 3806	34	19
1106 Wall cgr for 3806	9	5
1104 TTP for 3806	49	39
1107 Cig cord for 3806	9	6

ICOM	reg.	NOW
IC-701 6-band Xcvr/ps/mic	1375	999
IC-245 2m FM Xcvr	579	279
IC-245/SSB 2m Xcvr	699	349
IC-255A 2m FM (orig model)	389	299
IC-255A (resumes scan model)	389	329
IC-3PA Power supply/spkr	99	49
IC-502A 6m SSB port os	229	199
IC-202 2m SSB port DEMO	289	189
IC-30A 450 FM Xcvr	449	349
IT-1215 TTP microphone	49	39
KLM	**reg.**	**NOW**
Force 5 Xcvr w/AC ps	1344	599
661 6m Xcvr	695	499
FDM-148 Desk microphone	29	19
PA10-70C 450 10/70w amp	229	179
KT-34A 4 el triband Truck	389	329
KT-34XA 6 el triband Truck	569	489
28-30-6 6 el 10m beam Truck,os	289	239
28-30-4 4 el 10m beam	129	99
144-148-9 9 el 2m beam	33	24
144-148-14 14 el 2m beam	65	45
219-226-11 11 el 2m beam	32	22
1500HD Hvy duty rotor Truck	795	395
KENWOOD	**reg.**	**NOW**
TS-820 Xcvr	1100	699
DG-1 Dig kit for TS-820	199	149
TS-820 w/DG-1 installed	1323	869
TS-520S Xcvr	849	649
S-599 Spkr for R-599	25	19
R-300 Shortwave receiver	279	229
YK-88S 2nd SSB filter; TS-180S	59	49
AM-520 AM filter* only; TS-520		45
*Requires other modification.		
PS-5 3.5A 12v ps w/clock	79	59
PS-6 3.5A 12v power supply	79	49
TR-7600 10w 2m FM Xcvr	375	279
TR-7625 25w 2m FM Xcvr	425	329
RM-76 Programmer	125	69
TR-8300 450 FM Xcvr	369	299
MIDLAND	**reg.**	**NOW**
13-510A 2m FM synth Xcvr	$399	329
18-940 2m tnk/roof ant	31	15
18-950 220 tnk/roof ant	31	15
18-951 220 magnet ant	37	19
MIRAGE	**reg.**	**NOW**
B-23 2/30w 2m amp	$ 89	79
B-108 5-15/80w 2m amp	179	159
B-1016 5-15/160w 2m amp	279	249
B-3016 15-45/160w 2m amp	239	209
MOSLEY	**reg.**	**NOW**
CL-36 6 el tribander Truck	$392	292
TA-36 6 el tribander Truck	392	292
CL-203 3 el 20m beam Truck	290	190
TA-40KR TA-33,36 40m kit(Fla)	119	83
RV-4C 40-10m vertical	82	57
RV-8C 75/80m kit for vert (Fla)	49	34
RKV-345 Vert roof mt kit	14	9
DIV-80 1 band dipole kit	18	12
SWV-7 49-11m SWL vertical	90	63
MY-144-5 5 el 2m beam (Fla)	47	29
DI-2A Deluxe 2m Diplomat	57	29
DI-220 220 Diplomat gnd plane	23	16
DI-430 430 Diplomat gnd plane	21	14

NYE	reg.	NOW
250-25-4 500w ant tuner	$202	88
PALOMAR	**reg.**	**NOW**
Kachina 6 & 10m Xcvr AS-IS	$689	189
DC-15 15A 12v ps w/spkr	170	85
PANASONIC	**reg.**	**NOW**
RF-8000 .15-230 MHz Rcvr	2500	1750
RFE	**reg.**	**NOW**
RFE-100 Dig disp; Drake, etc	$189	169
REDI-KILOWATT	**reg.**	**NOW**
401 Programmable keyer	$159	99
406 Memory keyer	79	49
REGENCY	**reg.**	**NOW**
EC-175 Freq counter DEMO	$449	149
MT-15S 15w VHF marine Xcvr	349	149
MA-8 Small speaker	16	9
MA-46 70 db filter kit	37	19
ROBOT	**reg.**	**NOW**
400 SSTV scan converter	$795	699
800 ASCII/Baudot/CW terminal	845	759
SEI	**reg.**	**NOW**
SPS-10 12v 10A power supply	$ 79	49
SPS-10M 10A ps w/meter	99	69
SMA-100 2m 5-15/70-80w	149	99
SMA-101 2m 1-5/70-80w amp	179	129
SPA-101 1-5/70-80 amp, ps	329	199
SPECTRONICS	**reg.**	**NOW**
SC-30 30 MHz counter	$169	59
SC-250 250 MHz counter	219	89
STANDARD	**reg.**	**NOW**
811S 2.5w VHF marine Xcvr	$199	99
805Z 6 ch VHF monitor		29
C-118 2m FM HT/batt/cgr	313	149
C-118/TTP 2m FM HT/TTP	373	189
CL-25 2m 25w amplifier		59
SWAN	**reg.**	**NOW**
102BX 6-band Xcvr	1195	949
PSU-6 Power supply	189	169
102BXA 6-band Xcvr	1195	999
PSU-6A Power supply	189	169
Astro 150 5-band Xcvr	925	749
PSU-5 Power supply	179	159
PSU-5A Power supply	179	159
Astro 150A 5-band Xcvr	925	799
PSU-5B Power supply	179	159
100MXA Xcvr	699	499
HF-700S Xcvr/PSU-3A ps	878	599
1200Z 1200w PEP linear	499	399
1500Z 1500w PEP linear	599	499
WM-1500 Wattmeter	74	59
WM-3000 PEP wattmeter	87	69
WM-6200 6 & 2m wattmeter	87	59
FS-1 Field strength meter	18	9
117X Basic AC supply	129	119
PS-20 20A 12v supply	179	119
14A DC conv; 350B/D	79	69
14C DC module	119	99
14CP Pos gnd DC module	75	49
14XP Pos gnd DC module	70	49
GMTK Mobile mount	6	4
MTK Mobile mount	11	6
SSMTK Mobile mount	18	9
DD-76 Dig disp for HF-700S	199	179
FC-76 40 MHz counter	169	79
ST-1 Antenna tuner	189	129
ST-1A Antenna tuner	189	149
LP-3400 Low pass filter	49	19
TMD Trunk mount only	9	6
TB-3H 3 el tribander Truck	219	149
TB-2 2 el tribander Truck	149	99
4010V 40-10m vertical ant	79	59
1040V 40-10m 'gold' vert ant	122	79
75MK 75m kit for 1040V	39	19
742 75-20m mobile ant	109	79
TPL	**reg.**	**NOW**
350 450 5-15/25-40w amp	$179	99
502B 2m 1-4/30-45w amp	99	59
802 2m 2-10/50-80w amp	209	129
TEMPO	**reg.**	**NOW**
1KD-5 Linear amplifier	$695	645
VBC-3000 NBVM adaptor os	349	299
RBF-1A Wattmeter/SWR	47	39
S-1 2m FM HT	259	239
S-1T 2m FM HT w/TTP	289	269
S-5 5w 2m FM HT	299	279
S-5T 5w 2m FM HT w/TTP	339	319
S-2 220 FM HT	349	315
S-2T 220 FM HT w/TTP	399	359

TEN-TEC	reg.	NOW
Omni-D (original) DEMO	1069	699
Triton IV/digital DEMO	869	499
540 Xcvr	699	499
544 Digital Xcvr	869	599
240 160m converter	110	99
241 Xtal oscillator	35	29
242 Remote VFO; 540/544	179	169
244 Digital readout	197	179
245 CW filter for 540/544		25
248 Noise blanker; Omni	49	39
249 Noise blanker; 540/544		29
249MK NB; 540 below 01349	29	19
262M 18A 12v ps/VOX/meter	159	139
274 Digital kit for 570		90
208 CW filter for 509	29	19
KR-1A Keyer paddle only	35	19
KR-20A Keyer DEMO	69	59
KR-50 AC/DC keyer	110	79
TRI-EX	**reg.**	**NOW**
RCB-54LT Base, LM-354 Truck	$210	157
RCB-51 Extra base, W-51 Truck	160	120
TA-54L Tilt acc, LM-354 Truck	437	327
MC-50 Motor kit, LM-354	442	331
AD-100 2" x 10' mast Truck	56	42
AD-150 2" x 15' mast Truck	78	58
CO-3 Coax standoff kit	38	28
TB-2 Thrust bearing	52	39
TURNER	**reg.**	**NOW**
HL-6 Desk microphone	$ 45	35
VHF ENGINEERING	**reg.**	**NOW**
PS-15C Kit 12v 10A supply	$ 99	79
RX432 Kit 432 receiver	84	75
RXCF Kit 70 db acc filter	9	8
RF432 Kit 432 front end	29	25
TX50 Kit 6m 1w exciter	44	39
PA144/15 Kit 2m 1/15w amp	49	44
PA2501H Kit 2m 1/25w amp	69	59
PA4010H Kit 2m 10/40w amp	69	59
CD3 Kit 10 ch 450 rcv xtal deck	14	12
SC3 Kit 10 ch autoscan adapter	21	18
VENUS SCIENTIFIC	**reg.**	**NOW**
SS-2 SSTV monitor	$325	199
WILSON	**reg.**	**NOW**
1402 2m FM 2w HT	$254	149
1402/TTP 2w HT w/touch tone	316	179
Mk II 2.5w HT/LED/batt	254	199
Mk IV 4w 2m HT/TTP/LED/batt	346	279
WE-800 2m FM Xcvr DEMO	499	399
M-320 3 el 20m beam	149	99
WV-1 40-10m vert ant	79	59
WM-62 6/2m mobile ant	29	14
YAESU	**reg.**	**NOW**
FT-107M 6-band Xcvr	1045	799
FP-107 Internal ps	139	125
FP-107E External ps	145	129
FC-107 6-band ant tuner	150	119
FT-901DM 6-band Xcvr	1535	1035
FT-901D Xcvr	1259	899
FC-901 6-band ant tuner	199	149
FT-101ZD 6-band Xcvr	942	749
FT-101ZD 9-band Xcvr	942	799
FT-101FE Xcvr	759	699
FT-7B Xcvr	675	575
SP-401PB Speaker/patch	59	49
SP-101B Speaker	25	22
YO-101 Monitor scope	320	199
YO-301 Monitor scope	263	229
YC-500I 10 ppm counter os	239	199
YC-500S 1 ppm counter os	359	299
YC-500E .02 ppm counter os	537	437
FTV-250 2m transverter	275	225
FR-101S Receiver	599	349
FL-101 Transmitter	649	399
LL-301 Phone patch	49	45
YP-150 Dummy/wattmeter	86	79
XF-31C CW filter for FT-401	45	35
QTR-24 World clock	35	29
FT-625RD 6m Xcvr	895	649
FT-227RB 2m FM Xcvr	380	329
CPU-2500R 2m FM Xcvr	559	359
CPU-2500RK 2m FM Xcvr	467	399
FT-202R 2m FM HT	199	139
FT-207R 2m FM HT	349	299.99

NDI	reg.	NOW
HC-1400 2m FM Xcvr	$299	288

MINI-PRODUCTS	reg.	NOW
HQ-1 Tri-band mini-quad	$159	139

Technicians in Cokeville. W7PT is on a short vacation
the west coast. W7SDA has a new HF-200A. WB7NH
reports the Wyoming Cowboy Net held 22 sessions wi
622 QNI and 12 QTC. WA0PFJ reports the Wyomi
Jackalope Net held 24 sessions with 371 QNI and
QTC. Traffic: W7SQT 634, W7LYA 323, WA7GYQ 24
K7VWA 83, WB7NHR 82, K7SLM 9.

SOUTHEASTERN DIVISION

ALABAMA: SCM, James M. Bonner, K4UMD — SE
W4IBU. The Anniston first annual hamfest was he
Sept. 28, all had a good time, best of luck in comi
years. AENI had 39 QNI in four sess. AEND 192 QNI,
sess, 80 messages handled. The 1980 SET was a gre
success, and will be better next year. W4XI reports ne
officers of TARC are: W4XI, pres.; W4TXK, vice pre
WB4LLQ, secy/treas. New members of BARC: KB4
and KC4MT. EARS new officers: WB4ZPS, pre
WD4KWM, vice pres.; WB4YSJ, secy. Chattahooc
ARC is making plans to start a Ala. QSO Party. Anyo
interested or think it's a good idea, contact CVR
MSARC did hold their first annual transmitter hu
sometime in Oct. Local hams from MSARC helped tr
fic control when President Carter talked in Tuscumb
on Labor Day. Those helping were WB4NQH N4C
WA4JPK WA4WNV KB4CB WA4HRV WB4ZVH KC4
K4JXS WA4ITB & WA4LBX. New members BAR
N4DLG KA4PPD N4DJW. HARC will hold Novi
classes; if you are in the area contact WB4EKJ
details. N4CCT reports he now has his Extra. KC4MT
justly proud of his Extra. Ala. participated in Gulf Coa
Emergency Net 100% by N4AZO, W4CTK KA4D
KA4EEE KB4GA WD4LYE WD4LYX KA4NSV WD4OD
W4USB W4VDI. GAND manager reports 622 messag
in 30 sess. DRN5 was 100% by W4CKS WA4J
KA4MKH WA4RAJ. AENB QNI 214, QTC 84, QTR 6
minutes. AENM QNI 2538, 208 traffic in 34 sess. Traff
WA4JDH 949, W4CKS 165, K4AOZ 62, W4IBU
WA4ZPZ 31, N4DMA 25, K4UMD 22, AA4J 18, K4HJX
KA4NXG 14, WD4DHI 12, N4CCT 5, N4CSX 4, WB4EKJ
WB4TVY 2, WA4VEK 1.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — ASC
K4VHC. SEC: K4SWJ. ASEC: WB4HXE. STM: W4WX
Chief OBS: W4BIA.

Net	Freq.	Time (All EST)	Mgr.
GCN	3995	0700 Dy 0800 Su	K4DMK
GSN	3595	1900 & 2200 Dy	W4PIM
GTN	3718	1815 Dy	Vacant
GSSBN	3975	1830 Dy	WB4ZVX
ARES	3975	1700 Su	WD4ADV
GA TFC "A"	7243	1200 Dy	W4GH
GA TFC "B"	3957	1830 Dy	W4GH
GERN "RTTY"	3620	2130 Fr	WA4ZHC

K4DMK, Georgia's 1980 Amateur of the Year. K4DN
honored with testimonial for his many years of servi
to the Georgia Cracker Net. Lanierland's Hamni
brought rain, but did not hurt the attendance. ARES pr
gram continues to grow. Would like any interest
amateurs to contact their EC's and register. WA4ZH
still needing RTTY checkins on Fri evenings. He is offe
ing a beautiful certificate for those who qualif
BGMRC, Newnan, continues with fine programs
public service work. Fine PR article published in Inc
paper. Coastal Area Repeater Society in Savannah no
ARRL affiliated club. W4LCB & WN4WDR did splend
job with phone patches & other aid with Bolivia while
young lady was in Atlanta hospital undergoing bra
surgery. A real plug for the hobby. Club bulletins
dicate more & more public service work being done
the section. K4OUB commences his 21st year as NC
for the GSSB Net. Congrats. Many tnx to K4SWJ
WA4PZD for the fine SET program that they set u
Dallas NWS meteorologists were in Atlanta during SE
observing the FB program we have. This is the mon
that all people get together to celebrate Christmas. Ha
py Holidays to all. Watch for announcements on t
nets from K4VHC about time, etc. that he will be on t
air from the North Pole. Traffic: (Sept.) W4WXA 1
W4PIM 126, WB4LBM 84, K4JNL 62, WB4RUJ 52, K4E
51, WD4ADV 46, W4GH 46, W4ELO 42, N4UZ 21, K4VH
20, W4HON 18, AA4EI 15, K4AZM 13, K4BAI 13, KA4AT
12, AK4T 12, W4AAY 6, WB4KYL 6, K4PIK 4, W4CMX
(Aug.) WA4PUP 6, AA4EI 1.

NORTHERN FLORIDA: SCM, Billy Williams, N4UF
STM: N4WA. SEC: WA2GIN. NM: N4BZH WD4DNC. H
Medium Speed CW Net active on 3.651 kHz. at 223
Daily. WA4OEM WB4EXA and K9AJN set up traffic st
tion at Spring Hill Chicken Plucking contest. Fl
Sheriffs Boys Ranch held open house and WD4DN
along with K4KE activated traffic station. 34/94 repeat
also active from Boys Ranch. Lake County ARA is one
the few clubs in the state which owns its clubhouse
enjoyed my visit there in October. AA4ES is now AK1
OPARC had club auction and good turnout. KA4KL
and KL7IWS running Novice class in OP. Halifax OCW
now has weekly net at 9 A.M. local time on 3,897 kH
W3EFG demonstrated Slow Scan TV at Oct. DBAP
meeting. DFARA sponsoring a Worked All Florid
Counties Award for period Oct. 15 — Feb. 1. Detai
available through WA4CRI. K4HDO upgraded to Extr
WB4NYK and GCARC working on communication
trailer. Tallahassee Red Cross and TARS will work clos
ly to improve emergency communications capabilitie
TARS now over 100 members. KA4DCD closing in
DXCC. In Jax, hams helped Red Cross in test disaste
N4DOW was first on scene with N4BFX project cha
man. WD4BII now Editor of RANGE Squelch Tal
NOFARS auction very successful with K4OAC as au
tioneer. Jax ARES and Duval Co. Civil Defense renewe
agreement. W4JL recovering after stay in hospital & a
tive again on QFN and RN5. WD4HIF made PSHR ar
BPL! WA4EYU gave Amateur Radio demo to a churc
group of 100. Please send me any documentation
Amateur Radio public service activity. Traffic: WD4H
575, N4PL 393, WA4CRI 227, W4SIZ 206, WB4FJY 9
WD4IIO 80, N4BZH 73, W4KIX 69, W4MGO 68, W4JL 5
WB4TZR 55, W4BSP 40, W3IDO 39, WA4STZ 38, KB4T
K4RNS 18, N4UF 17, N4AXN 15, KF4U 15, WB4QBB
WB4DTS 12, WB4YKV 8, KA4KMP 5.

SOUTHERN FLORIDA: SCM, Woodrow Huddlesto
K4SCL — Asst SCM: W4KGJ. SEC: AA4WJ. STM: K4T
Our congrats to Friendship ARC, Miami/Hollywood are
upon becoming a newly affiliated club. They are havi
a Charter Party Oct. 21 in which Vice Director Evely
Gauzens, W4WYR, will present the charter and sho
ARRL films. Brevard County Radio Amateurs provide
communications for 6 hours, Sept. 27th, for Leukem
Society Swim Classic. ECs WB4WYG, North Brevar
and KB4OW, South Brevard, coordinated amateur acti
ty. Partial list of those active includes W4LVA K4F
WB4POL K4VNO WB0NSI N4COY KB4OW a

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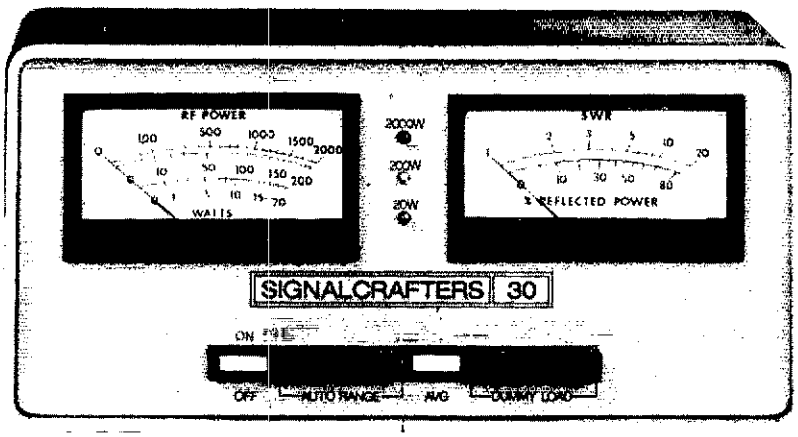

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WB4WYG. WA4CZW announces a new repeater Pinellas County on 144.85/145.45, open to all, 24 hour The nationwide Simulated Emergency Test this ye promises to be one of the biggest ever. For the first tin in history, NTS is doing 4 complete cycles per day. It hard to imagine what kind of natural disaster would 50 extensive as to require the entire nation mobilize but this is what we are testing. In addition to long-ha NTS communications, the last few years have seen e plosive growth in our capability to provide short-rang emergency communications in the local areas, using v and uhf fm. Recognition of Amateur Radio and its impo tant capability has been growing. The SET gives us a opportunity to test, not only our own capability to co municate by radio, which we already have a pretty goo knowledge of, but also our capability to make ourselv known to the local governments and service agencie which will have need of us in disasters. It is indeed sa to hear a local government official lament, after disaster is over, "I needed you, but I didn't realize yo had that capability." Most typically, when our servic are offered, a busy official, hit suddenly by a disast large or small, trying to figure out what happened an what to do about it, doesn't want to be bothered b Amateur Radio. Few of them know our capability n how to use us to help with their problem. We don't wa to be "pushy" and force ourselves onto anybody, but w wish there were some way the various agencies cou automatically consider Amateur Radio as part of the problem-solving resources. We think an excellent exam ple of how this may be done is the agreement betwee Seventh District Coast Guard Operations Center, Mian LCDR J. E. Bowersox, and Dade County Emergenc Planning Committee, Andy Clark, W4IYT, in whic Amateur Radio provides back-up emergency com munications. I understand the Op. Center lists Amate Radio contacts on their emergency check-off lists s any Duty Officer knows how to proceed. This ha resulted in the C. G. Center requesting Amateur Rad assistance 7 times in 8 months. The system is workin to the mutual satisfaction of all! Traffic: (Sept.) W3CI 2897, W4MEE 619, WD4AWN 617, W3VR 608, WA4PF 537, K4SCL 423, K4TH 349, W4LX 339, K4ZK 33 WB4FVV 296, WD4COL 267, W4GPL 251, W4NFK 24 WB4WYG 175, KA4LNA 136, WA4EIC 122, N4ET 11 W4IRA 97, K4EUK 79, W3TLV 72, WB4PIB 71, KB4OW 3 WB4GCK 33, KA4BBA 32, WA4HXU 24, KA4ASZ 2 WA4UQO 18, W4WYR 18, W4DVO 14, W4SMK 1 WA1IOG 12, WB4NJU 11, WD4LWT 4. (Aug.) W4NFK 14

WEST INDIES: SCM, Julio Negroni, KP4CV — Followin unqualified success of WINS, STM, NP4D, is planning 2 mtrs. traffic net under NCS KP4EMX. WINS will pa ticipate on SET next Oct. 19 on 7110 kHz. SE Direct Frank Butler, W4RH, has approved application for West Indies Section Convention to be held April 25-2 1981 in conjunction with the PRARC Convention. A plication will be considered by the Board of Directors Nov. 19. Club station at Mayaguez UPR Dept. of Ele trical Engineering, KP4VA, is getting set for OSCA KP4EMY getting set for 4RN. Early session condition for 4RN are getting better. Weekend sessions on mtrs. on 4RN are a boon for this area. Traffic: NP4D 17 KP4DJ 64, KP4U 52, WP2ABQ 30, KP4EMY 11, KP4EM 9, KP4FBT 5.

SOUTHWESTERN DIVISION

ARIZONA: SCM, W. L. Haskell, AC7D — SEC: N7E STM: W7EP. Many msg, formal and infor. have been re by your SCM re: the proposal of ssb opr. on 7075 to 71 kHz. This band segment is heavily used for RTTY and c ttc. Nets, also NTS operations utilize these freqs. (S pg 51 of Sept. QST for detail). Most comments rcvd a in discord with this proposal!! Make your feelin known to ARRL ASAP! W7EAH and K7VXS are und doc's care at this writing — speedy recovery! The Arr Guard Net (4.030) is expanding, look for new units Sierra Vista, Lake Havasu City,, Williams, Bullhead Ci Fredonia, Cottonwood, Wickenburg, Page Showlow a Tucson. Ham of the Year Award for AZ was W7KOY. Fi ther awards not known at that time are: Special Achiev ment for Training and Support of the Handicapp KA7BUT KB7BQ K7ESA. For Dedication to Ham Rad Classes: W7YS WB7DTJ WB7DGP. Assisting Fello Hams and the Advancement of Ham Radio: WB7NU Advancement of Repeater Communications: WB7DR Check into the Thurs. nite TRA Net for the latest ARR Bulletins. 7:30 P.M. 22/82. AF7M wkd over 240 countri in the 15 months! (cw)! Good show! Stork delv'd fem h monic to AG7H and WA1VAM! Nets: SWN QNI 270, Q 234; A-10 QNI 932, QTC 200; Cactus QNI 867, QTC Keep mts. coming! Traffic: W7EP 91, WA7KDE K7NMO 44, K7JKM 41, KA5DDW 34, W7LVB 8, KA7HA WA7JCK 6, WA7NXL 6, WA7WEB 5, WB7QOM 3.

LOS ANGELES: SCM, Stan Brokl, N3YQ — ASC N6UK. SEC: WB6FAK. STM: W6INH. We have six new a pointments this month NM K5DY, EC WB6YIZ, EC N6Z EC WA6DUB, EC K6IYK, and Asst. DEC W6ORD welcome aboard — your help in the section is valuable. N6VI worked the Sept. VHF QSO party from M Pinos with multi-op station AE6E. They broke t multiop record. W6NKE just moved from an apartme to a new home with 1/3 acre. He's planning an anten farm for 80 thru 10. The TRW ARS W6TRW holds a sw meet every month on the last Saturday of the mont Call in, freq. is 147.51 simplex and the swapmeet is he in lot 17 on Aviation Blvd. in Redondo Beach. All a welcome. WB6YID, OO, made 17 reports during Aug. a Sept. K6CL made 5 OO reports. W6TOG made 26 repo and K6KA made 75 OO reports during September. Ke up the good job. I received club bulletins from the So C ATV Club, the Pasadena Radio Club, SGVF ("Loudspeaker"), Western ARC ("Feedback") and t Northrop ARC W6VPZ. Traffic: (Sept.) W6INH 1 K6OT 109, K5DY 105, KB6FC 91, K6OWA 85, N6PZ 5 W6BRO 49, WA6LVO 42, KA6CTI 39, K6CL 20, W6BW 26, WA6OCM 20, W6NKE 18, WB6MKA 4. (Aug.) KB6 100.

ORANGE: SCM, Fred Heyn, WA6WZQ — ASC WA6WZN. STM: KA6A. SEC: W6UBQ. DECs: K6G W6LKN WA6TLE WB6YZY. ECs: W6DQR W6TD W6G W6HDY WA6ZVS W6ZZZ WB6OSP N6BXY WA6P W6PZD WA6QMW WD6DGI WA6HFE W6GQB WB6VM N6ANL W6WPP WB6JBI WA6TLE W6RE. Congrats new ECs WD6BNG for San Bernardino County RAC Dist. #7 (Barstow area) and AI6I for liaison to Ca Department of Forestry. All EC and NM SET reports d by the end of the year. WB6BZW appointed AEC a OES as ARES liaison from Orange County ARC. N OOs: W6TKV & WB6SHL. 3GNZ on 3698 kHz h changed to a new time of 8:15 P.M. Region nets: RN6

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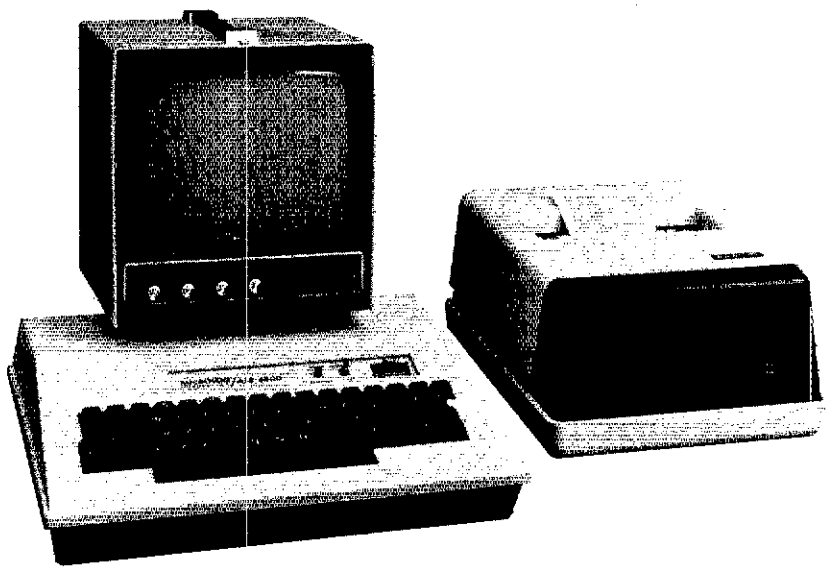

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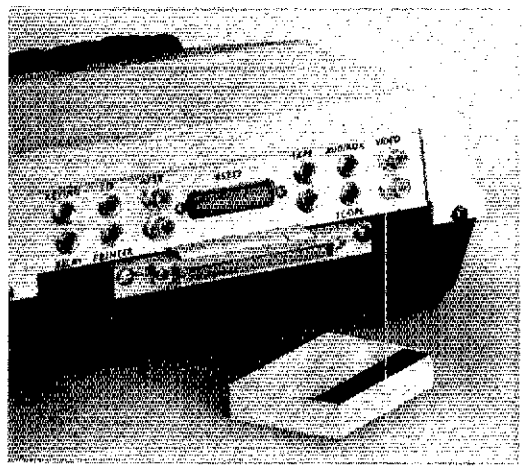

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3655 kHz — 7:45 P.M. & 9:30 P.M. and RN6D on 7275 kHz 7:45 A.M. & 1 P.M. Area nets: PAN 3675 kHz — 8:30 P.M. & 14.3175 MHz — 11:30 A.M. National Novice Net (NNN) on 21.150 kHz — 2100Z now meets daily. In addition to W1AW code practice, look for W6QIE on 3990 kHz at 8 P.M. Tues. thru Sun. and for beginners K6RAU on 3780 kHz at 6:30 P.M. Mon. thru Fri. The San Bernardino County ARES Net is now on 3935 kHz at 9 A.M. on Sat. Barstow ARC supported "Calico Days" under the leadership of KA4FDX with free radiograms at the telegraphic office and a display of the antique radio gear of WA6TNK. East Whittier Radio Club new officers: WB5NSM, pres.; KB6X, vice pres.; W6AYI, treas.; WA6JGQ, secy.; K6HC,KK6I WA6MJL WD6CKJ WD6EIF, dir. SCATS sponsors a RTTY repeater (W6IWO) on 146.17 which includes an information net on Wed. at 8 P.M. For information on the Southern Calif and Mexico Amateur Radio Mobile group contact W6OZD. Look for UHF SSB DX on 220.1 MHz (as well as 220.2 MHz) and 144.2 MHz. Also try the West Coast ARC FM Weak Signal/SSB Net operating nightly at 5 P.M. on 144.33 MHz with OVS WB6NOA as net control. Traffic: (Sept.) N6ANI, 407, WB6EIG 346, WB6OBZ 275, KN6C 166, W6NTN 94, KA6A 58, W6RE 52, WD6CSL 32, WA6QCA 31, KA6HNY 26, K6ZCF 23, WB6LGL 19, K6WI 18, WA6WZO 8, WA6WZN 4. (Aug.) N6ANI, 589, WB6EIG 388, WB6QBZ 188, W6NTN 143, KA6A 73, KA6HNY 44, KA6LSC 42, WA6QCA 37, WD6CSL 34, W6RE 22, K6ZGE 14, WA6WZO 11, WB6LGL 10, WA6WZN 6, KA6BNF 2, KA6SCL 2. (June) W6NTN 161.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM: N6GW. SEC: W6INI. Asst SEC: N6RD. While on vacation, W6IJQF witnessed eruption of Mt St Helens. Alphy's on La Mesa Blvd is gathering place for hams on Saturday mornings. Newly appointed to OTS is KA6DNF. WA6COE visited the Tijuana Radio Club, XE2TBC. During recent ARES activity with the Calif. Dept. of Forestry, WB6TQF and N6BUK discovered W6SBK piloting a CDF helicopter. North County Traffic Net reports Aug activity of 30 sessions, 30 messages. In Sept it was 29 sessions, 46 messages. This net on Palomar ARC's 146.13/73 MHz provides excellent opportunity to break into traffic handling. It operates nightly at 2000. ARC of El Cajon boasts a membership of 122. For info on club classes contact WA6MHZ (286-9785). Upgraded to Extra: W6MNO W6TZV. Tower height limitations are in the wind for Oceanside. Poway ARC nets: Mon at 2000 on 28.7 MHz and Wed on 147.225/825 MHz at 2000. Traffic: WA6PVH 364, N6GW 153, W6HUJ 153, KA6DNF 88, N6AT 78, K6HAP 62, KM6I 54, WB6MLB 50, KO6Z 14, WA6COE 6, WB6FTY 4, WA6UFY 3.

SANTA BARBARA: SCM, Robert N. Dyrutt, W6POU — SEC: WB6BWZ. STM: N6WP. October SET — annual mating ritual between locally-oriented ARES and nationally-oriented NTS — test of two good services as yet unable to effectively cooperate, coordinate, communicate efficiently with each other. Some good signs in SLO and Ventura Co's. S. W. Div. unable to organize this year. Poinsettia boasted 100% ARRL member turnout at new hall. Talented editor N6BPF. WD6ARO culled Callbook for all 1500 calls. Ventura Co. ARC (K6MEP) won contest plaque — is DX oriented. SBARC member WB6QDS/EL0AY/mm works from west of VK. K6PHV Cambria new SCN-2 head. PSHR: K6YD 78, N6WP 67, N6YH 46. Traffic: N6WP 155, N6YH 116, K6YD 67, WB6TRP 66, K6DZT 12, WA6RDI 10, W6POE 9.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — SEC: W5GPO. STM: W5VMP. Asst SCM: AE5C. NMs: AA5J AE5I N5BT W5HMR KK5B. Our feature club for the month is the Panhandle ARC of Amarillo. The club meets the first Tuesday at 7:30 P.M. Officers are: WB5VSJ W4YID WB5UBM KB5FS WB5IZH W5SVF WB5MDJ N5AOS and WB5SBN. WB5VSJ is chairman. The club newsletter, "The Local Oscillator", tells of all past news items, current events, and future activities. This fine organization sponsors many public service activities, a Novice class, and lots of socializing. The PARC also sponsors the Panhandle Traffic and Emergency Net, which meets daily @ 0000Z on 3933 kHz and invites your participation. The club is heavy into ARES activities and emergency preparedness under the stern leadership of W5CBT. The ARES unit participated in a drill with the local Red Cross Chapter on Sept. 9th. For furthur info on the PARC; write to: Panhandle ARC; P.O. Box 1022; Amarillo, TX 79106. PSHR: W5CTZ WD5JYI N5BT W5HMR WA5QFD WD5EUF KB5UL KA5AVQ. Traffic: W5TI 321, N5BT 193, WD5EUF 129, K5QKM 115, W5CTZ 93, W5HMR 66, WD5FYJ 51, WA5QFD 41, WB5BKM 36, WD4SIH 21, WB5YYK 21, KB5UL 18, WD5JYI 15, KA5AVQ 13, KA5CFP 11, AJ5F 9, K5PC 9, K5HKN 4, WA5KHE 4, W5RAH 4.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — According to my calender, it is time to thank each and every one of you for your help this past year, and to wish you the best of Season's Greetings and a Wish for a Happy and Peaceful New Year. On Sept. 17th, I presented W5DRZ with a fine plaque from the League in recognition of the FB work that he has done over the years for Amateur Radio. Would that we all take heed of his 'Preachins' and be better operators. KA5AJU and WA5FSN have new beams. KB5EK working on 110 plus DXCC. W5JJ spent most of Sept. visiting in CO & Utah. Reports received from all section NMs, 2 OOs, 1 OVS and 31 OTS reflect a lot of activity traffic-wise. Many code and theory classes operating; should have many new and upgraded ops soon. Remember that OAN is a FB place for code practice as well as traffic handling experience. KA5JHQ KA5JHR KA5JJP KA5JLY KA5JLZ KA5JPG KA5JZS & KA5KAV new calls on the air. Shawnee ARC and c.d. operated booth at county fair. Amateurs and Red Cross operated booth and demonstrations from Texas County Fair. Traffic: WB8NKC 266, WB8NKD 225, W5REC 201, W5RB 170, KB5EK 128, K5CXP 105, WD5IRB 104, KF5A 102, WB5DYI 94, K5OWK 74, W5IQL 73, W5UYH 73, WA5FSN 59, WA5OUV 56, WD5IDB 48, K5TEY 48, W5VXU 45, WB5EAY 40, WD5IFB 37, K5CAY 33, W5VLW 28, WD5ETB 26, W5VOR 26, W5AS 24, W5SUG 16, WA5RKU 15, WD5IRR 14, W5FKL 12, WA5UTO 7, N0IN 6, W5JJ 1.

SOUTHERN TEXAS: SCM, Roger Coday, N5FN — SCM/STM: N5TC. SEC: AK5N. OO reporting this month, WA3OVC/5. STX stns making PSHR are KB5TC WA5RVT W5KLV N5TC WB5YDD WB5TAY KB5NX WD5GKH WB5MMI WD5DOR. Congrats to the following upgrades: Extra — KB5TB WB5BSB; Advanced — N5CFM KA5BYF N5BXU KA5DYO; General — N5CDN N5CCO. The Cleveland 31/91 repeater has been moved to a new 200-ft tower at QTH of WA5SNL. WB5TAY has a new Omni C on order. WD5AAH, OES, attended training sessions in

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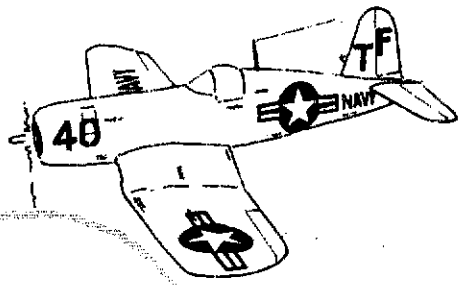

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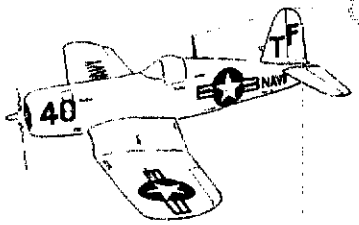

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Cushcraft	A-147-20T	49.00
Santec	HT-1200	327.75

Houston in preparation for SET. The Alvin Comm. College RC doing some work of late on the equipment at the National WX Service ham station. KA5BSN W5KLV W5SHN and WB5YDD still are carrying the load for STX on CAND. KC5M reports that W5AYZ has confirmed DXCC #250 and his total now stands at #125. KC5M's antennas are inverted vees at 29 and 27 feet for 20 and 15 meters — nice going. New officers for the 7290 Tfc Net are WD5FYJ, NM; W5TUK, ANM; K5BNH, secy.; KA5AZK, treas. WD5FGY has been off the air of late due to illness in family. KA0CSM back in Texas for awhile. K5IW has worked all counties for USA-CA #275. K5RG now the owner of a Yaesu FT207R. K5RVF reports South East Texas hams supplied communications for an air show at the Jefferson County Airport, Williamson Cty. ARC has an emergency net on 04/64, 2000, Thursday evenings. Traffic: W5KLV 536, WB5YDD 396, N5TC 143, K4HZR 116, WB5MMI 110, W5SHN 87, KB5TC 65, WB5TAY 56, KA5BSN 50, K4RG 43, WD5GKH 41, WB5YRV 40, WA5RVT 33, K4PE 31, KB5NX 30, W5RGF 26, WD5DOR 19, AK4M 18, WB5BSB 15, KL7P/5 8, K5DG 7, WB5EFJ 7, WB5UYV 6, KA0CSM 2, WD5FGY 2, K5RVF 2

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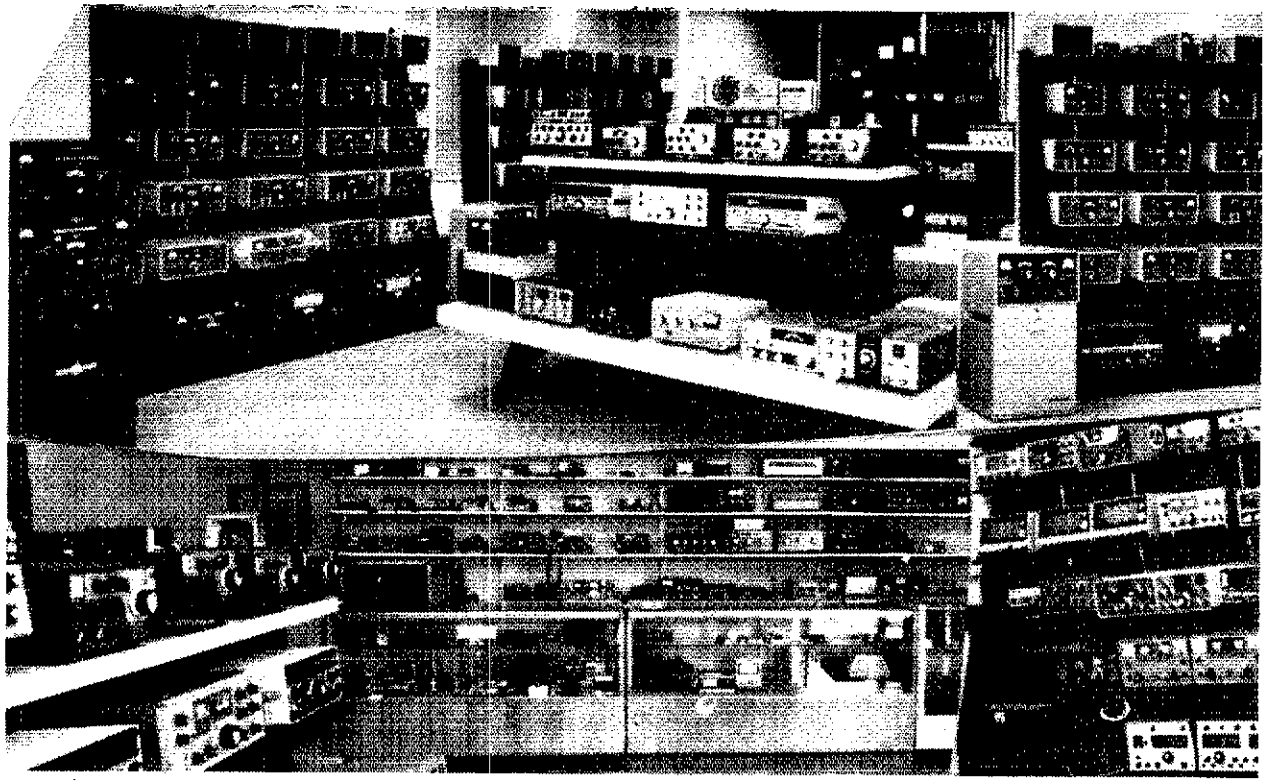

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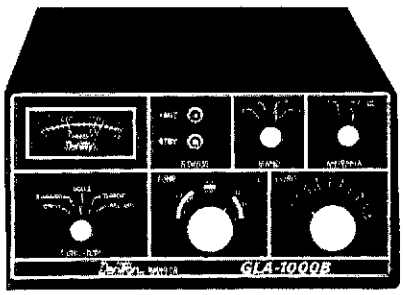

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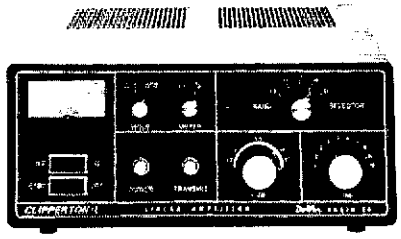

DenTron **Clipperton-L** Linear. 160-15m. 2KW PEP SSB, 1KW DC CW, RTTY/SSTV. (4) 572B's w/untuned input. 65-150w drive. 6"h x 14½"w x 14½"d, 42 lb.

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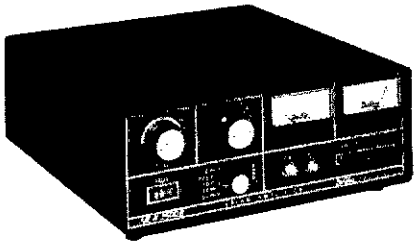

DenTron **MLA-2500B** Linear. 160-15m with some MARS. 2KW PEP SSB, 1KW DC CW, RTTY/SSTV. (2) 8875's, 60-135w drive. 5½"h x 14"d x 14"d, 47 lbs.

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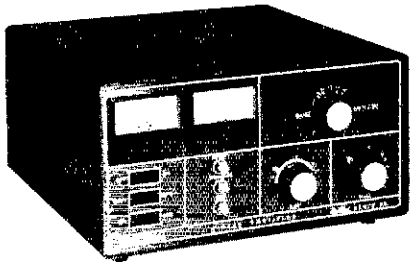

DenTron **DTR-2000L** Linear. 160-15m with some MARS. Legal power limit on SSB, CW, RTTY/SSTV. (1) 8877, 65-125w drive. 7¼"h x 14½"w x 14½"d, 54 lbs.

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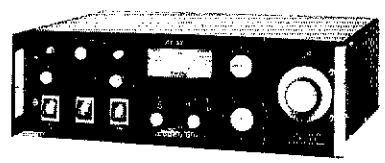

DenTron **DTR-1200L** Linear. 80-15m with some MARS. 1200w PEP SSB, 1000w CW. (2) 572B's, 65-150w drive, tuned input compatible with Solid-State rigs. 5¼"h x 17"w (19" w/rack bkts.) x 13"d, 46 lbs.

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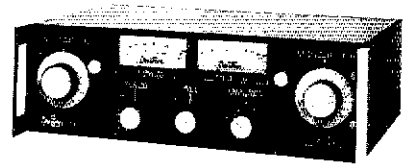

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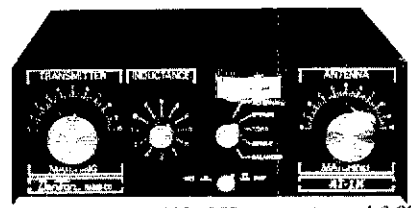

DenTron **AT-1K** 1200w PEP antenna tuner. 1.8-30 MHz - tunes coax, wires and balanced line with optional BL-1 balun. 3¾"h x 10"w x 9½"d, 7 lbs.

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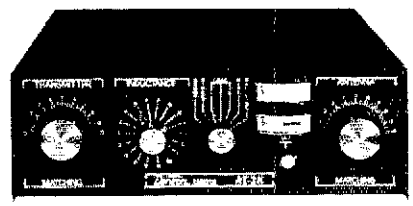

DenTron **AT-3K** 3 KW PEP antenna tuner. 1.8-30 Mhz - tunes coax, wires or balanced line with optional BL-1 balun. 4"h x 12"w x 13½"d, 12 lbs.

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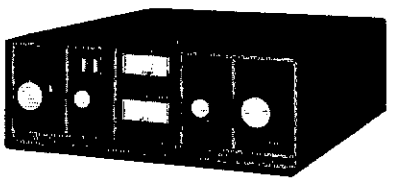
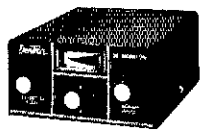


DenTron **MT-3000A** 3 KW PEP tuner. 1.8-30 MHz. Built-in balun & dummy load. Tunes coax, wires and balanced line. 5¼"h x 14"w x 14"d, 18 lbs.

Regular $399 - ***Sale Price $349***



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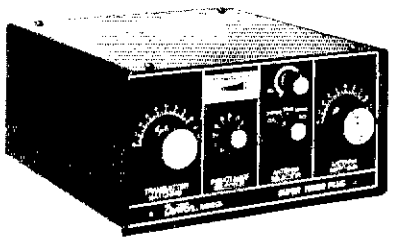

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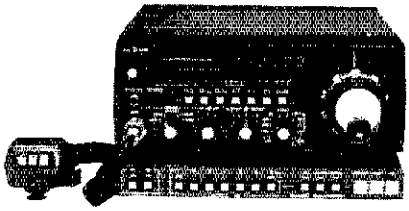

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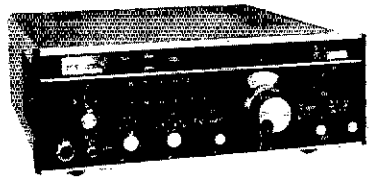

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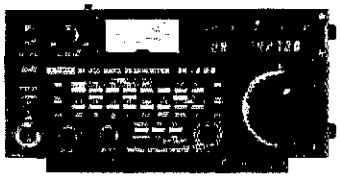

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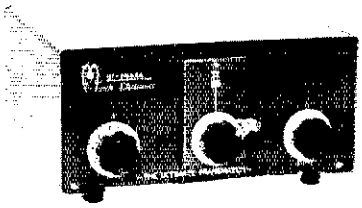

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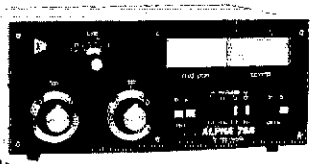

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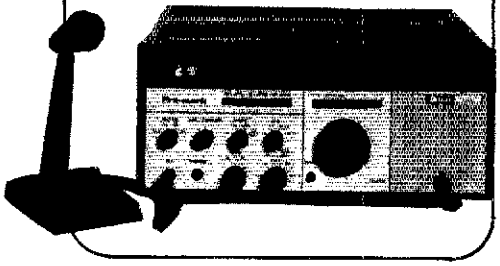

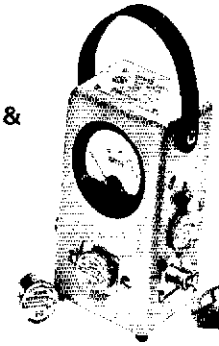

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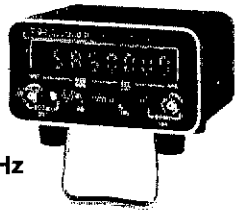

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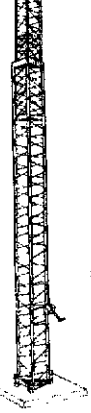

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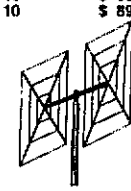

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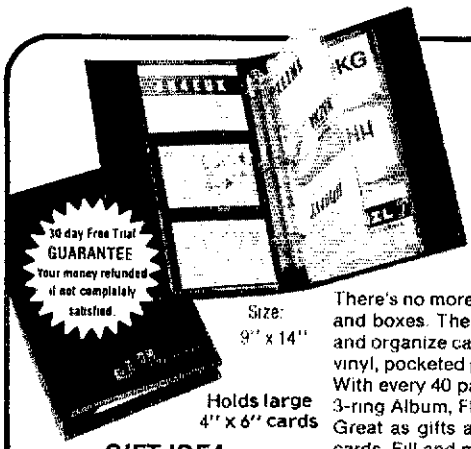

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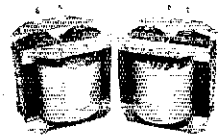

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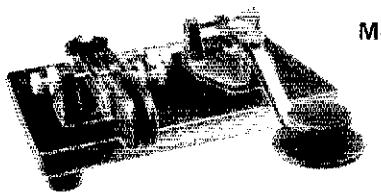

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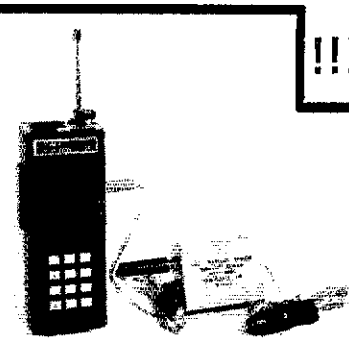

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RUBBER stamps $3.50 includes postage. NJ residents add tax. Clinton Hoar, W2UDO, 32 Cumberland Ave., Verona NJ 07044.

FREE Ham Radio Insider Newsletter! Send large s.a.s.e. W5YI; Box 10101-Q; Dallas, TX 75207.

SAVE money. Learn to service your own equipment. Owner Repair Of Radio Equipment book. $8.70 postpaid. K6RQ 14910 LG Blvd, Los Gatos, CA 95030.

CALL Toll-free (800-327-7798). Ask for Bob Hoffman, Jaro Electronics Corp. We buy all types of tubes. Top prices paid for Varian, Eimac, Amperex, RCA, Western Electric, Raytheon, in Florida Call toll free: 800-432-8524. Address: 412 27th St., Orlando, FL 32802.

RADIO collector pays top dollar — radios magazines parts etc. Before 1928. Weingarten 67-61 Alderton Street, Flushing NY 11374 212-896-3545.

RTTY FOR Sale: Model 28KSR, M28 stand-alone TD, M28 receive-only typing reperf, M28 keyboard typing reperf, M28 triple TD, M28 under-dome typing reperf, M28 motorized paper winder, answerback, auto CR-LF kit for M28 printers. Model 33 and 35 machines. Gears, geashifts, parts and supplies for all Teletype machines. Send s.a.s.e. for list and prices. Lawrence R. Pfleger, K9WJB, 2600 S. 14th Street, St. Cloud, MN 56301.

WANT to buy dead or alive HROs, HRO parts and pieces and HRO manuals, tubes, etc WB7PAM, 2501 Stratford, Eugene, OR 97402.

QST BACK ISSUES — Before 1924 — s.a.s.e., 1924-1929, $3. an issue — 1930-1939, $2, 1940-1955, $1 W3ZD 520 Centennial Road, Warminster, PA 18974 215-675-4539.

ICOM, Kenwood owners: If you're not receiving our separate monthly newsletters, your equipment is not tuned into a wealth of information. Details s.a.s.e. User's International Radio Clubs. 606 Brack Road Ft. Pierce, FL 33450.

PREPARING for FCC Ham exams? Use POSI-CHECK, self-test study guide. Now completely rewritten to cover January 1980 FCC syllabi for new exams. Novice, $5.50; General, $6.95; Advanced, $7.75; Extra, $7.95. Packet contains FCC syllabus for its class, Rules and Regulations that apply, our own multiple-choice questions and diagrams over each point of the syllabus. Same form as FCC exams. Also IBM sheets for self-testing, keyed answers with explanations. Third Class Radiotelephone, Elements 1, 2 and 9, $8.95. First class mailing USA. Same day service. Send check or money order with order. POSI-CHECK, P. O. Box 3564, Urbandale, Des, Moines, IA 50322.

RALPH HICKS, W5BCO — Your dealer for Motorola fm, ssb and marine. P. O. Box 15633, Tulsa, OK 74112.

MOTOROLA radios wanted. I want to buy MICORS, MOTRACS, MOCOMS or any Motorola mobile or base. I pay all shipping. Len Rusnak — WA3TJO 301-441-1221 anytime.

AMATEUR RADIO experts since 1932, Portland Radio Supply, "The" radio store of Oregon. Factory authorized dealer for Collins, Drake, Kenwood, Yaesu, Icom, Swan, Dentron, Ten-Tec and many more. We feature excellent service before and after the sale. Portland Radio Supply, 1234 S. W. Stark St. Portland, OR 97205. 503-228-8647, 800-452-0908 Oregon toll free.

MICROPHONES sought for broadcast historical archive; i.e.: early RCA and Western Electric types. James Steele, National Association of Broadcasters, 477 Madison Avenue, New York, NY 10022.

COLLINS and Drake nationally recognized service — factory trained technicians. Other major brands also serviced. Portland Radio Supply, 1234 S.W. Stark, Portland, OR 97205. 503-228-8647, 800-452-0908 Oregon toll free

WANTED: Cushman Communications Service Monitors also plug in modules, any model any condition, will pay cahs or take over payments; WB8IJX, Fred Slaughter, 5844 Grisell Rd; Oregon, OH 43618 Phone 419-698-8597.

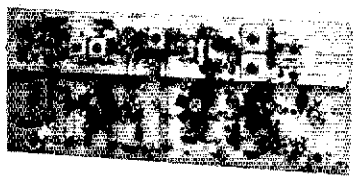
TRS-80/LEVII QSO Robot makes unassisted QSOs. Interface unnecessary. Cassette $19.95. Clint Sprott, 5002 Sheboygan 207, Madison, WI 53705.

CRYSTALS — 2-Meters, ICOM, Wilson, Kenwood, Drake, HyGain, Yaesu, Clegg, Midland (standard, splits, sub-bands), Regency, Standard (no splits or sub-band) 220-MHz for Clegg, Midland (standards, many splits) Crystals guaranteed. 24-hour delivery of in-stock

These Low Cost SSB TRANSMITTING CONVERTERS

Let you use inexpensive recycled 10M or 2M SSB exciters on UHF & VHF!

- Linear Converters for SSB, CW, FM, etc.
- A fraction of the price of other units; no need to spend $300 – $400!
- Use with any exciter; works with input levels as low as 1 mW.
- Use low power tap on exciter or simple resistor attenuator pad (Instructions included).
- Link osc with RX converter for transceive.



XV4 UHF KIT — ONLY $99.95

28-30 MHz in, 435-437 MHz out; 1W p.e.p. on ssb, up to 1½W on CW or FM. Has second oscillator for other ranges. Atten. supplied for 1 to 500 mW input, use external attenuator for higher levels.

Extra crystal for 432-434 MHz range $5.95
XV4 Wired and tested $149.95

XV2 VHF KIT - ONLY $69.95

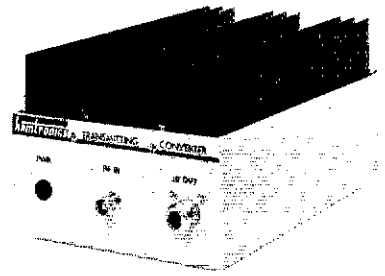
2W p.e.p. output with as little as 1mW input. Use simple external attenuator. Many freq. ranges available.

MODEL	INPUT (MHz)	OUTPUT (MHz)
XV2-1	28-30	50-52
XV2-2	28-30	220-222
XV2-4	28-30	144-146
XV2-5	28-29 (27-27.4 CB)	145-146 (144-144.4)
XV2-7	144-146	50-52

XV2 Wired and tested $109.95

XV28 2M ADAPTER KIT - $24.95

Converts any 2M exciter to provide the 10M signal required to drive above 220 or 435 MHz units.



NEW! COMPLETE TRANSMITTING CONVERTER AND PA IN ATTRACTIVE CABINET

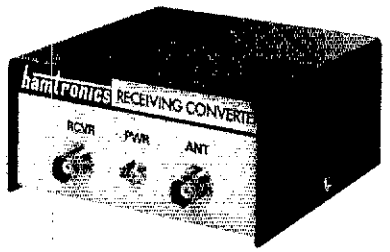
Far less than the cost of many 10W units!

Now, the popular Hamtronics® Transmitting Converters and heavy duty Linear Power Amplifiers are available as complete units in attractive, shielded cabinets with BNC receptacles for exciter and antenna connections. Perfect setup for versatile terrestial and OSCAR operations! Just right for phase 3! You save $30 when you buy complete unit with cabinet under cost of individual items. Run 40-45 Watts on VHF or 30-40 Watts on UHF with one integrated unit! Call for more details.

MODEL	KIT	WIRED and TESTED
XV2/LPA2-45/Cabt (6M or 2M)	$199.95	$299.95
XV4/LPA4-30/Cabt (for UHF)	$229.95	$349.95

Easy to Build FET RECEIVING CONVERTERS

Let you receive OSCAR and other exciting VHF and UHF signals on your present HF or 2M receiver



- NEW LOW-NOISE DESIGN
- ATTRACTIVE WOODGRAIN CASE
- Less than 2dB noise figure, 20dB gain

MODEL	RF RANGE	OUTPUT RANGE
CA28	28-32 MHz	144-148 MHz
CA50	50-52	28-30
CA50-2	50-54	144-148
CA144	144-146	28-30
CA145	145-147–or– 144-144.4	28-30 27-27.4 (CB)
CA146	146-148	28-30
CA220	220-222	28-30
CA220-2	220-224	144-148
CA110	Any 2MHz of Aircraft Band	26-28 or 28-30
CA432-2	432-434	28-30
CA432-5	435-437	28-30
CA432-4	432-436	144-148

Easily modified for other rf and if ranges.

STYLE	VHF	UHF
Kit less case	$34.95	$49.95
Kit with case	$39.95	$54.95
Wired/Tested in case	$54.95	$64.95

Professional Quality VHF/UHF FM/CW EXCITERS

- Fully shielded designs
- Double tuned circuits for spurious suppression
- Easy to align with built-in test aids

T50-50	6-chan, 6M, 2W Kit	$44.95
T50-150	6-chan, 2M, 2W Kit	$44.95
T50-220	6-chan, 220 MHz, 2W Kit	$44.95
T450	1-chan, 450 MHz, ¾W Kit	$44.95

See our Complete Line of VHF & UHF Linear PA's

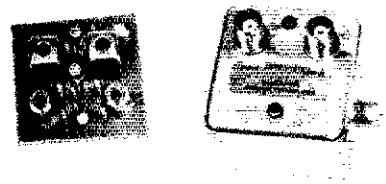
- Use as linear or class C PA
- For use with SSB Xmtg Converters, FM Exciters, etc.

LPA2-15	6M, 2M, 220; 15 to 20W	$59.95
LPA2-30	6M, 2m; 25 to 30W	$89.95
LPA2-40	220 MHz; 30 to 40W	$119.95
LPA2-45	6M, 2M; 40 to 45W	$119.95
LPA4-10	430MHz; 10 to 14W	$79.95
LPA4-30	430MHz; 30-40W	$119.95

See catalog for complete specifications

FAMOUS HAMTRONICS PREAMPS

Let you hear the weak ones too!
Great for OSCAR, SSB, FM, ATV. Over 14,000 in use throughout the world on all types of receivers.



- NEW LOW-NOISE DESIGN
- Less than 2 dB noise figure, 20 dB gain
- Case only 2 inches square
- Specify operating frequency when ordering

MODEL P-30 VHF PREAMP, available in many versions to cover bands 18-300 MHz.

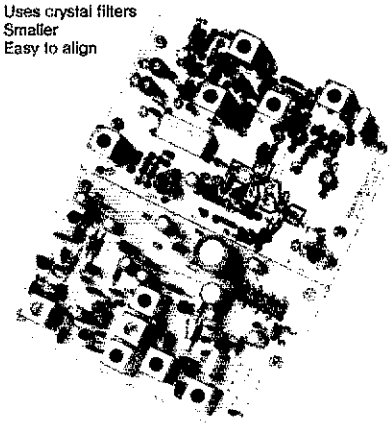
MODEL P432 UHF PREAMP, available in versions to cover bands 300-650 MHz.

STYLE	VHF	UHF
Kit less case	$12.95	$18.95
Kit with case	$18.95	$26.95
Wired/Tested in Case	$27.95	$32.95

NEW VHF/UHF FM RCVRS

Offer Unprecedented Range of Selectivity Options

- New generation
- More sensitive
- More selective
- Low cross mod
- Uses crystal filters
- Smaller
- Easy to align



R75A* VHF Kit for monitor or weather sattelite service. Uses wide L-C filter. -60dB at ± 30 kHz..... $69.95

R75B* VHF Kit for normal nbfm service. Equivalent to most transceivers. -60dB at ± 17 kHz, -80dB at ± 25 kHz... $74.95

R75C* VHF Kit for repeater service or high rf density area. -60dB at ±14kHz, -80dB ±22kHz, -100dB ±30kHz.... $84.95

R75D* VHF Kit for split channel operation or repeater in high density area. Uses 8-pole crystal filter. -60dB at ±9 kHz, -100dB at ± 15 kHz. The ultimate receiver!.... $99.95

* Specify band: 10M, 6M, 2M, or 220 MHz. May also be used for adjacent commercial bands. Use 2M version for 137 MHz WX satellites.

R450( ) UHF FM Receiver Kits, similar to R75, but for UHF band. New low-noise front end. Add $10 to above prices. (Add selectivity letter to model number as on R75.)

A14 5 Channel Adapter for Receivers..... $9.95

NEW R110 VHF AM RCVR

AM monitor receiver kit similar to R75A, but AM. Available for 10-11M, 6M, 2M, 220 MHz, and 110-130 MHz aircraft band $74.95. (Also available in UHF version.)

IT'S EASY TO ORDER!

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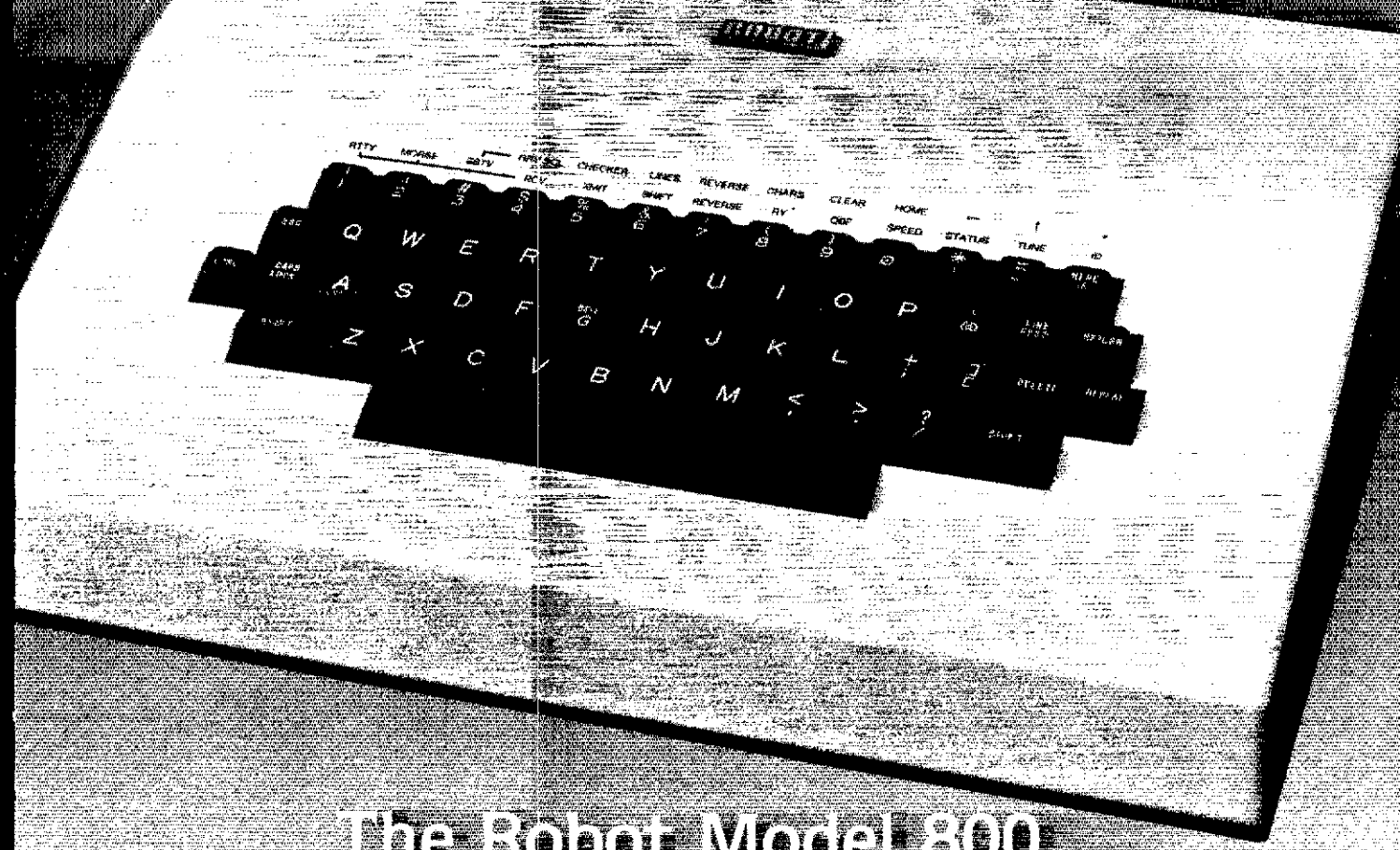

The Robot Model 800 SUPER TERMINAL

Not just a keyboard, but the first integrated specialty mode terminal.

The Model 800 Super Terminal offers a complete list of features and capabilities, including our built-in demodulator, all in one package that connects directly with your amateur station's transmitting and receiving equipment. All that's needed to have a complete operating system is the addition of a standard TV monitor.

BAUDOT/ASCII OPERATING FEATURES

DISPLAY: Full 24 line by 72 character standard TTY display.

WORD MODE: Transmits a complete word each time the space bar is depressed. Any mistakes made in the word can be edited out prior to transmission.

LINE MODE: Transmits an entire line when the carriage return line feed key is depressed. Allows editing of the entire line prior to transmission.

AUTO START: The Model 800 writes characters on the screen only after detecting the presence of an incoming RTTY or ASCII data signal. This prevents printing of unwanted random characters on the screen while tuning or during gaps in reception.

PROGRAMMABLE WRU (WHO ARE YOU) AND SELCAL FEATURES: Upon receiving a user programmed 8 character code, the Model 800 will automatically key the transmitter and transmit one of its 64 character (HERE IS) messages. Upon receipt of the user programmed 8 character SELCAL code, the Model 800 will automatically go into receive mode and store up to a full page of received information in its display memory.

HERE IS: The Model 800 has two 64 character programmable HERE IS messages.

ON SCREEN STATUS INDICATOR: A status line at the top of the screen tells the operator exactly which combination of operating modes have been selected.

ON SCREEN TUNING INDICATOR: Accurate tuning is an absolute requirement for accurate trouble-free reception during poor signal conditions. The best results are obtained when the output of the mark and space discriminator filters are equal in amplitude. The on screen tuning indicator in the Model 800 is the "plus-plus" type, which provides this information.

CURRENT LOOP KEYER FOR HARD COPY

PROGRAMMABLE NARROW SHIFT ID

DEMODULATOR: The demodulator built into the Model 800 is superior in quality to any RTTY demodulator offered on the market. The key feature which makes this claim possible is the use of separate two tone active discriminator filters for demodulation of the RTTY signal.

ADDITIONAL ASCII OPERATING FEATURES: The Model 800 will send and receive ASCII at 110 baud. It has all of the transmission and editing features of the RTTY mode.

SIMPLE TO OPERATE

One of the most important features to keep in mind with the Model 800 is that all functions that are used frequently are easily accessed by the user. Many competitive units boast elaborate features which are either not used in amateur operation or that require complicated access procedures which make them inconvenient. All of the frequently used control functions in the Model 800 are either associated with a key which is labeled with the function, or have silkscreening above the key which describes the function.

MORSE CODE OPERATING FEATURES

OPERATION: The Model 800 has all of the transmission and editing modes of RTTY during Morse code operation.

MORSE AUTOTRACK: The Model 800 automatically tracks incoming code without manual speed adjustment. The speed range for transmission and reception is 3 to 99 words per minute.

SIDE TONE OSCILLATOR: The Model 800 has a built-in side tone oscillator so that the operator can listen to incoming code as it is interpreted by the computer.

MORSE CODE TRAINER: The Model 800 can be set to generate random five letter groups of characters at any preset speed for Morse code training purposes.

SPEED INDICATOR: In addition to all of the other functions, the status line in the Morse code mode indicates the speed of the incoming code.

SSTV GRAPHICS OPERATING FEATURES

The ROBOT Model 800 allows alphanumeric characters to be typed in an SSTV format, displayed on a TV monitor, and transmitted as a normal SSTV picture. This eliminates the need for "menu board" or hand-lettered SSTV pictures, thereby freeing up the slow scan camera or scan converter for other operations.

World leaders in Slow Scan TV, Phone Line TV, and Image Processing Systems.

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crystals. ARRL band plan ONLY. Can order any others, allow 5 weeks for delivery. $7 pair, 25c shipping. No charge cards or COD. WILLIAMS RADIO SALES, 600 Lakedale Road, Colfax, NC 27235.

FT-707 WAYFARER — Like new — All WARC bands — $650. Contact Chuck K8AXL at 203-666-0657 after 330 PM EST Tue thru Friday only.

QST: Every issue since 1960, excellent condition, also various Handbooks and other texts. Celestron 8" telescope, complete including solar filter. Make offer, will trade. Ron, K8YAH 614-890-0609.

WRITER completing a book on Hallicrafters seeks, data, ads, photos, catalogs showing the sets, reminiscences of users, Gl's Hallicrafters employees, opportunity to examine, photograph or buy S1 thru S5. Also want S20, S22, S29, S39 can Xerox material & return or whatever. Ed Romeny N4DFX, Box 524/ Spartanburg SC 29304 803-583-3081.

WRITE OFF some of your Amateur Radio expenses! Proven Amateur Radio Tax Savings booklet is itself tax deductible and can easily save you many times it price. Perfectly legal; not a "gimmick." $3.95 to Communications Engineering Services, 27131 Indian Peak Road, Rancho Palos Verdes, CA 90274.

HAM RADIO Magazines, in binders, every issue, perfect, make offer will trade Ron, K8YAH, 614-890-0609.

QUAD builders — blizzard/hurricane proof your antenna. Fiberglass vaulting poles. Incredible strength. S.a.s.e. for info K5WSE, Box 1032, Cedar Park, TX 78613. 512-259-2164.

ROHN TOWER — Buy direct from worldwide distributor of all Rohn products. Sample prices 25G sections $38.72 ea., 45G sections $88 ea., FK2548 foldover tower with freight paid $693., BX48 free standing $218.90. Hill Radio, Box 1405, Bloomington, IL 61701, 309-663-2141.

COLLINS 75A-4 solid-state 6BA7 mixers replace tubes with better performance. $21.50 ppd. Sartori Associates, W5DA, Box 2085, Richardson, TX 75080 214-494-3093.

SIGNAL/ONE CX7A. $895. Larry Higgins, W5QMU. 512-656-0311, 8601 Village Drive, San Antonio, TX 78217.

TIRED OF PROMISES — but no delivery? Try ADIRONDACK RADIO SUPPLY — largest ham inventory in the northeast — in stock — Collins, Kenwood, ICOM, Yaesu, etc. for delivery — not promises — call today ADIRONDACK RADIO SUPPLY, INC. 185 West Main Street, Amsterdam, NY 12010 518-842-8350.

HT220. six channels with crystals, switched tone burst, 16-button pad, nicad, charger. $325. Larry Higgins, W5QMU. 512-656-0311, 8601 Village Drive, San Antonio, TX 78217.

SSTV: Robot 70A monitor and 80A camera with macro lens. All manuals included. Excellent $400. Postpaid. Steve Carlozzi KA1BIN 40 Market St. Brockton, MA 02401.

BUY SLY! George Sly's Antenna Farm. Rohn 25G $38. Hy-Gain, Cushcraft, CDE Alliance, Daiwa, Bird. Tower/antenna hardware and accessories. 6460-H General Green Way, Alexandria, VA 22312 703-569-1200. Pittsburghers: Tom K3WT 412-653-3880.

PITTSBURGHERS: Hy-Gain, Cushcraft, KLM, Hustler, CDE, Alliance, Rohn, MFJ. See "Buy Sly" ad. Tom K3WT 412-653-3880.

NEW Ten-Tec Delta $695. W6XM 714-459-5527.

GUNNPLEXERS: Microwave Associates 87141-1, brand new boxed, $202 pair delivered, Glen Whitehouse K1GW, Newbury Dr., Amherst, NH 03031.

WANT used receivers, working or not. Also service/owner's manuals, parts, etc. Fala, P. O. Box 04134, Milw. WI 53204.

CALCULATORS, card programmable. TI-59 with PC-100C printer, mint, $360. HP-67 very good, $275. Extras. Haarsager, 310 Skyline, Pullman, WA 99163.

SELL: Collins KWM-2, rejection tuning, noise blanker, 516F-2 power, winged, $650.; Kenwood TS-900, AC-DC power, $500. W7KPA, 1240 W. San Lucas Dr., Tucson, AZ 85704.

DON AND VERLINE'S Christmas specials — U.S. Callbook $15.95 — D.X. $15.25 — Both $30. Ten-Tec Omni-C $999 Delta $729 — TRS-80 software just received send business s.a.s.e. for our new catalog. All prices are cash and FOB Ferris Radio 21738 John R. Hazel Park — MI 48030 313-398-6645.

COLLINS plug in filters, for 75S-3C receiver wanted: 200 Hz, 500 Hz & 1500 Hz; all in good condition. Also CP-1 crystal packet, & speech processor designed for the 32S-3 transmitter, and 30S-1 amplifier. Charles Godsey/WB9TKW, 3637 Plaza Drive, Bloomington, IN 47401.

WANTED — old microphones — pre 1940, for my microphone museum. Also mic-related items. Write Bob Paquette, 443 N. 31 St., Milw WI, 53208.

COLLINS new KWM-380 or older gear is the best. For test results call K1MAN 207-495-2215.

WANTED!! Mint Turner Model 80 mic and matching C-4 stand, or a mint Collins SM-1 mic. Also want sales literature for the Collins 75A-4 and KWS-1 and accessories. Mint or clean, please, no damaged copies or reprints. Sell — mint Hammarlund HQ-145X with xtal calibrator, 24-hour clock/timer, matching speaker and manual $175 including shipping UPS insured. First M.O. or certified check gets it. A. N. Gerli, AC1Y, 35 Brookmoor Road, Avon, CT 06001. 203-555-1541, ext. 213 days.

HAPPY HOLIDAYS from the QST advertising gang!! Lee, W1SE, Sandy, AC1Y and Jean.

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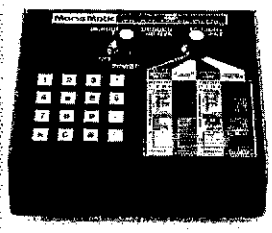
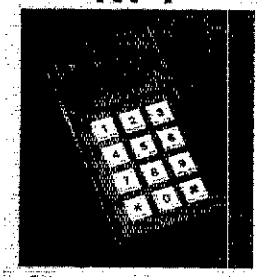
AEA Invites You to Compare the AEA Keyer Features to Other Popular Keyers on the Market.

MM-1



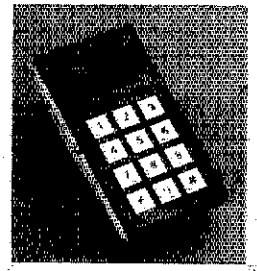
MorseMatic™

KT-1



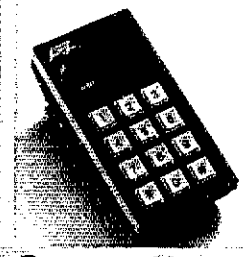
Keyer Trainer

MT-1



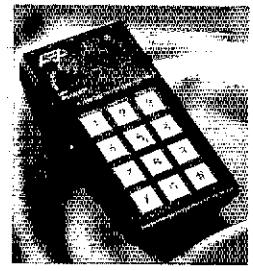
Morse Trainer

CK-1



Contest Keyer

MK-1



Morse Keyer

IMPORTANT KEYER AND/OR TRAINER FEATURES	AEA MM-1	AEA KT-1	AEA MT-1	AEA CK-1	AEA MK-1	COMPETITOR A	COMPETITOR B	COMPETITOR C	COMPETITOR D
Speed Range (WPM)	2-99	1-99	1-99	1-99	2-99	8-50	5-50+	?	8-50
Memory Capacity (Total Characters)	500			500		400	100/400	400	
Message Partitioning	Soft			Soft		Hard	Hard	Hard	
Automatic Contest Serial Number	Yes			Yes		No	No	No	
Selectable Dot and Dash Memory	Yes	Yes		Yes	Yes	No	No	No	No
Independent Dot & Dash (Full) Weighting	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Calibrated Speed, 1 WPM Resolution	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
Calibrated Beacon Mode	Yes			No		No	No	No	
Repeat Message Mode	Yes			No		Yes	Yes	Yes	
Front Panel Variable Monitor Frequency	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Message Resume After Paddle Interrupt	Yes			Yes		No	No	Yes	
Semi-Automatic (Bug) Mode	Yes	Yes		Yes	Yes	No	No	No	No
Real-Time Memory Loading Mode	Yes			Yes		Yes	Yes	No	
Automatic Word Space Memory Load	Yes			Yes		No	No	Yes	
Instant Start From Memory	Yes			Yes		No	No	Yes	
Message Editing	Yes			Yes		No	No	No	
Automatic Stepped Variable Speed	No	No	No	Yes	No	No	No	No	No
2 Presettable Speeds, Instant Recall	No	No	No	Yes	No	No	No	No	No
Automatic Trainer Speed Increase	Yes	Yes	Yes						No
Five Letter or Random Word Length	Yes	Yes	Yes						No
Test Mode With Answers	Yes	Yes	Yes						No
Random Practice Mode	Yes	Yes	Yes						Yes
Standard Letters, Numbers, Punctuation	Yes	Yes	Yes						Yes
All Morse Characters	Yes	Yes	Yes						No
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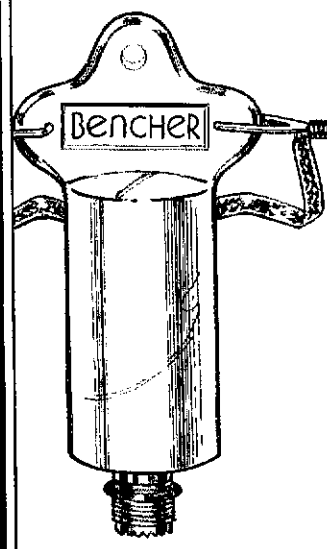

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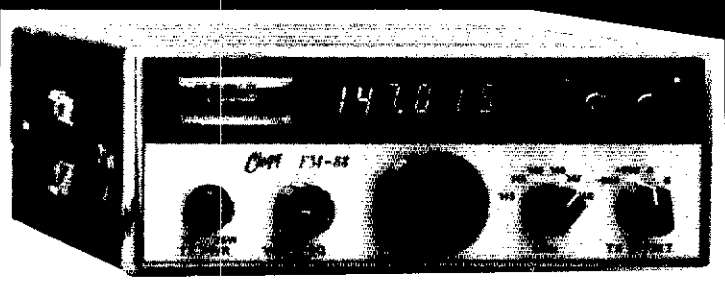

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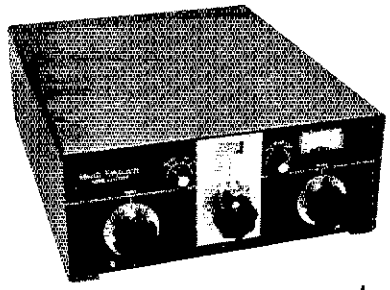

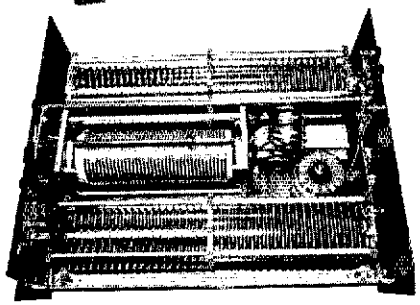

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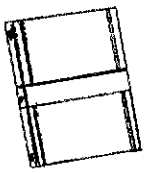

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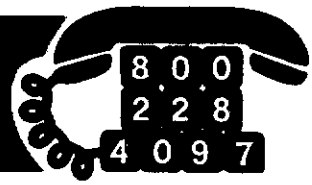

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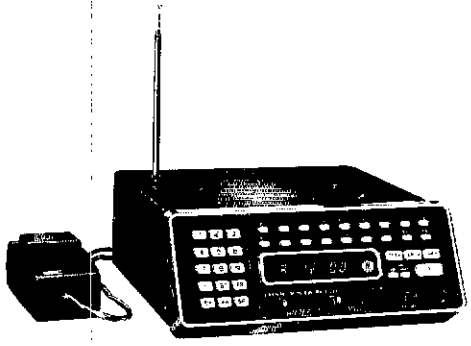

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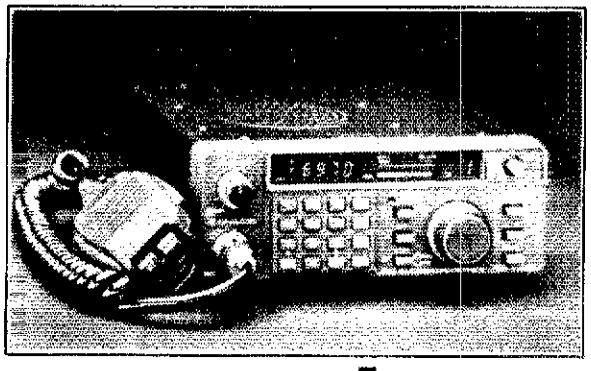

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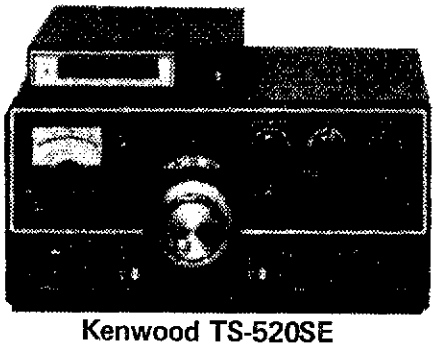

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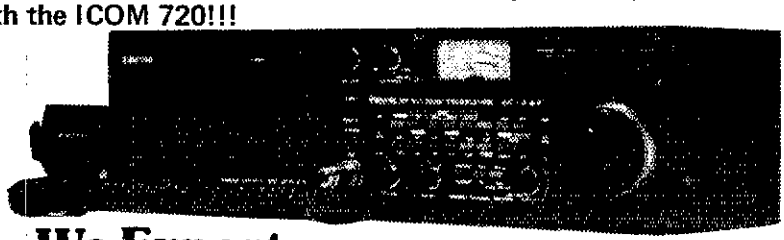

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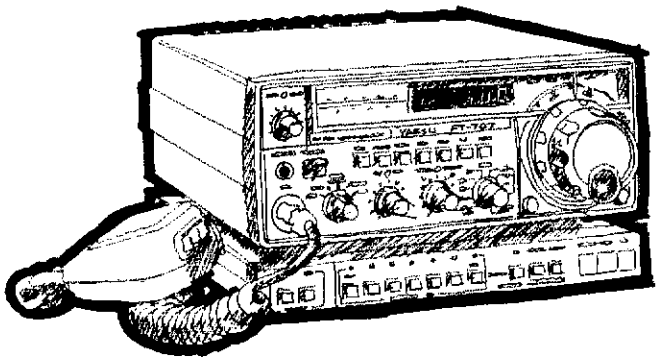

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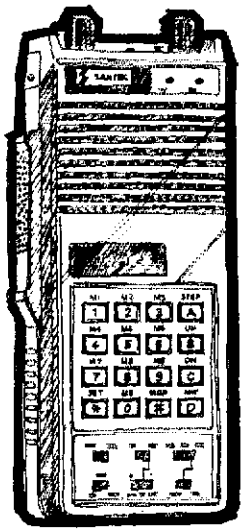

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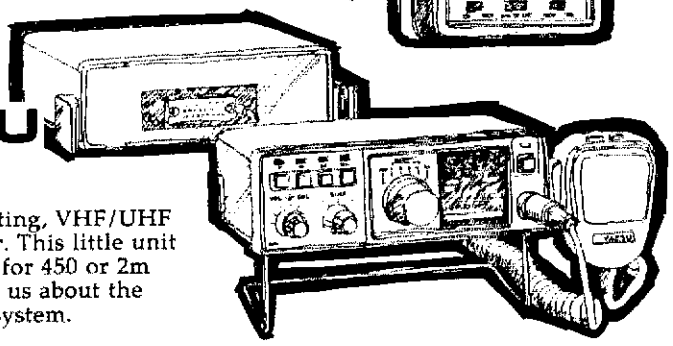

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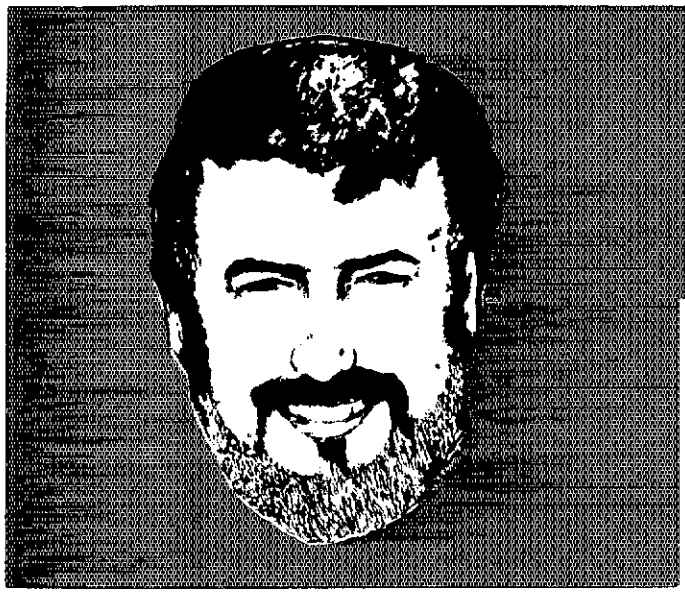

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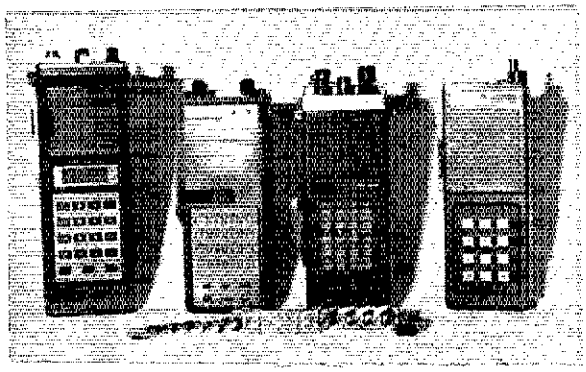

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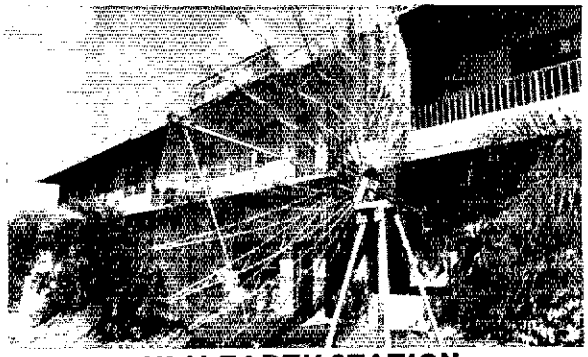

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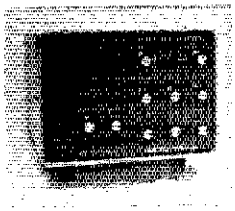

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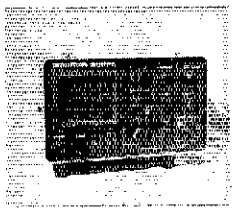

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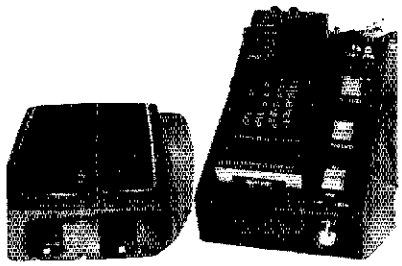

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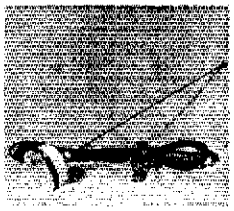

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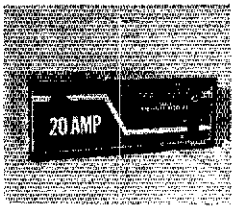

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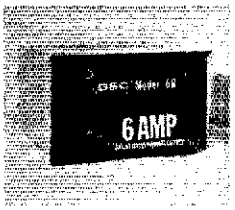

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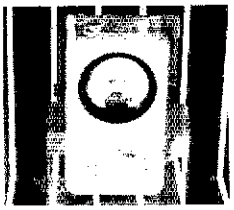

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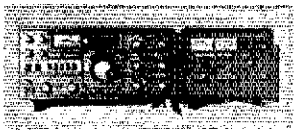

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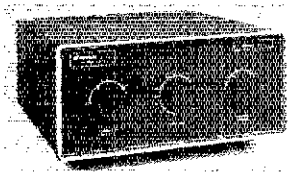

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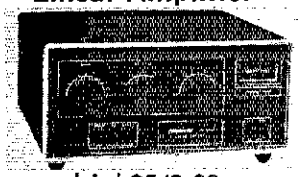

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(1.8 to 148 MHz)

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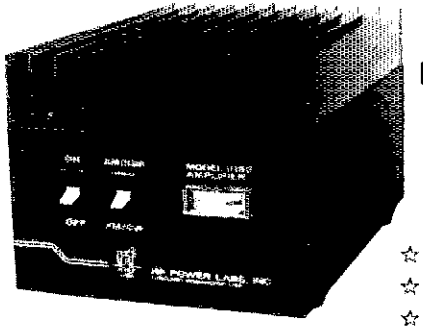

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- ☆ Automatic T/R Switching
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MODEL	FREQUENCY	INPUT	OUTPUT	SIZE WxDxH	WEIGHT	FAN KIT REQUIRED	PRICE
**C500X	2-22MHz	15-40W	500W	432x330x203mm	23.4 kg (52 lbs)	CW & FM	$1395.00
A1000	160-15 Meter	50-100W	600W	432x330x203mm	23.4 kg (52 lbs)	CW & FM	1395.00
**A1000X	160-10 Meter	15-40W	600W	432x330x203mm	23.4 kg (52 lbs)	CW & FM	1395.00
V76	50-54MHz	8-15W	100-120W	216x330x178mm	11.7 kg (26 lbs)	No	399.00
V360	50-54MHz	5-10W	400-450W	432x330x203mm	23.4 kg (52 lbs)	Yes	1085.00
V70	144-148MHz	10-15W	75-90W	216x330x178mm	11.7 kg (26 lbs)	No	349.00
V71	144-148MHz	1-3W	75-90W	216x330x178mm	11.7 kg (26 lbs)	No	399.00
V180	144-148MHz	5-15W	170-200W	216x330x178mm	13.5 kg (30 lbs)	CW & FM	599.00
V350	144-148MHz	10-20W	350-400W	432x330x203mm	23.4 kg (52 lbs)	Yes	1085.00
F110	Fan Kit, 115VAC			135x135x50mm	1 kg (2.2 lbs)	—	$ 39.00
F220	Fan Kit, 230VAC			135x135x50mm	1 kg (2.2 lbs)	—	39.00
*F135	Fan Kit, 115VAC			381x140x89mm	3.2 kg (7 lbs)	—	75.00
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SELL: National NC-300 with crystal calibrator, speaker, dust covers, full set extra tubes. Matchless, scratchless condition. Best reasonable cash offer. K1CQR, Stamford, CT.

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SWAN TU2B transverter for 2 meter ssb-cw. Also new signal tracer $35. WA3IWW Phone 1-215-365-3343.

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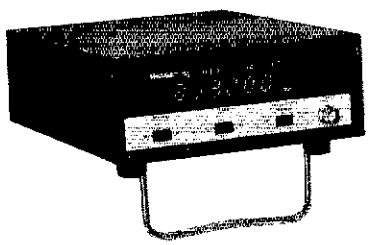

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- 3.38" H x 7.25" W x 9.0" D

SM-2410 ..... 159.95
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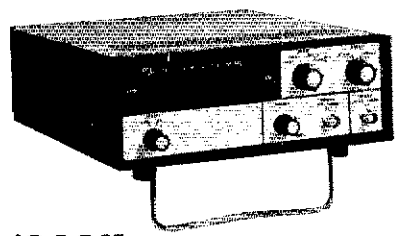

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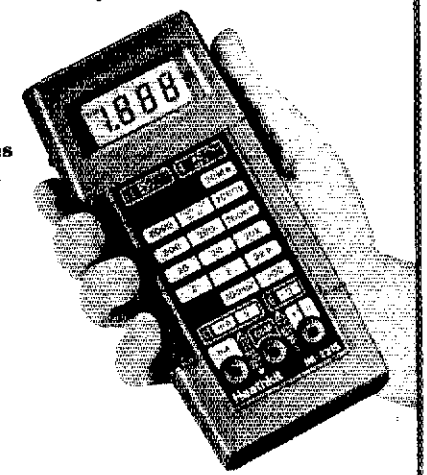

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- Ripple less than 10 mVrms
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SP-2717 ..... 210.00
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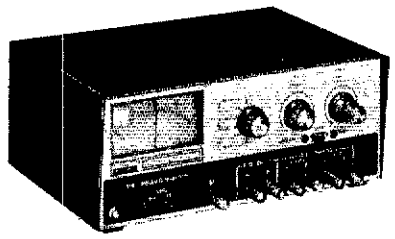

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- Fixed 5 VDC at 1.5A and two continuously-adjustable 0-20 VDC at 500mA
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- 4.5" H x 10.75" W x 9.0" D

SP-2718 ..... 185.00
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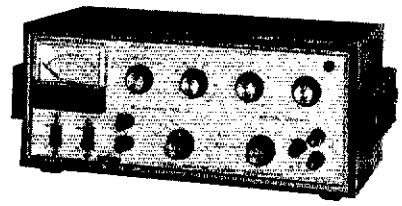

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- 1 Hz-100 kHz frequency range
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- 0.003-1 V sine wave output (600 Ω load)
- Meter calibrated in volts and dB
- −62 to +22 dB ranges
- 0.1-10 V square wave output (2000 Ω load)
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- 5.13" H x 13.25" W x 7.0" D

SG-5218 ..... 185.00
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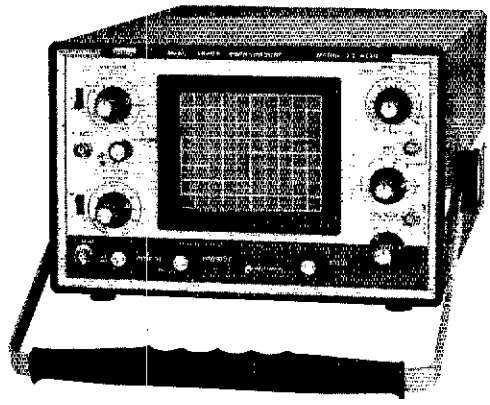
Dual-trace DC-10 MHz Oscilloscope



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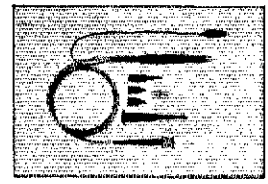
- Two vertical input channels with 10 mV/cm sensitivity
- 11-step attenuator for 10mV/cm to 20V/cm deflection factors
- 19-step horizontal time base from 0.2 sec/cm to 0.2 usec/cm
- Vertical accuracy within 3%
- X5 horizontal expansion
- Calibrated 1V peak-to-peak square wave signal
- 35 ns vertical rise time
- Automatic triggering
- 120/240 VAC, switch-selectable
- 6.9" H x 12.9" W x 19.3" D

SO-4550 ..... 650.00
($5.50 shipping & handling)

Combination x1, x10 Scope Probe

$29.95



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- DC to 15 MHz (x1) and DC to 80 MHz (x10) bandwidths
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UV199's to modern tubes. 10 new pages antique/modern gear. 30c s.a.s.e. Harms, W4BLQ, B158, Edgewater, FL 32032.

MUST SELL — need money for college: Atlas 110S deluxe ssb/cw transceiver with ac supply, cw filter and RIT. Choice of 250 or 20 watts. Excellent with warranty cards. $400, plus UPS, Richard Brock N8RB, 15806 Fernway Road, Shaker Heights, OH 44120 216-752-0355.

FOR SALE: Spectrum Intl. 40 Wt out varactor tripler 432 MHz $50, IC502 with 40 Wt. amp. $150, MFJ deluxe speech processor $20, Lunar 4-40P handheld amp. $75, Bird 43 with 3 slugs $140, Regency 16 channel programmable scanner $140, NPC 108RM power supply $40, Panasonic digital rcvr RF-2900 $175. WA9CUH '80 Callbook or call 715-886-4111.

TENTEC 570 and 1170 excellent condition $250. K3VYL 302-368-3908.

NC240D deluxe base matching 10" Jensen speaker mint best offer W2CYM.

ATLAS 350-XL, digital dial, power supply PS-350, Dentron Jr., antenna tuner, mic, excellent. $950., K6AWH 503-981-0465.

FOR SALE: Yaesu FR-101S rec. 10-160 meters plus 9 SWL bands. also built in 2 meter converter, fm detector board and filters. Excellent condition. Purchased new 4-10-80, compatable with FT101 series. $500 Bill 218-326-0671.

WANTED — manual and schematic for Gonset G-76 transceiver. Ray Sigda, American Embassy, Box 36, APO San Francisco 96346.

QSTs, 1926-1979. Condition from very good, progressively to like new. (1926 March, 1939 Feb. missing.) (Jan., Feb. 1926, Feb. 1939 no front cover.) Reasonable written offers solicited. We will not breakup set. Joe Harms, W4BLQ (W1GET, W2JME, W3COP) B158 Edgewater, FL 32032.

JOHNSON NAVIGATOR, $45, hmbrw xcvr p.s. $35, Curtis EK-480M $85, Accu-Keyer $25, Conar 5-inch scope $100, Conar color bar gen $45, Heath IT-5283 $35, NLS 3.5A DMM $50, meters, caps, list large s.a.s.e. N1FB 4 Roberts Rd., Enfield, CT 06082.

SELL Heathkit HR-1680 80-10m receiver $170. TenTec Argonaut 509 power supply, and crystal calibrator $300. Century 21 $270. Brian Shiptoski WA3NGU.

HALLICRAFTERS SX99 good condition, ham & general coverage, xtal filter $60. Will ship. Steve 301-647-8059 after 7 PM.

OLDIES cleaning house, Hallicrafters S40A $65, Central Electronics 10B $65, Heathkit Shawnee HW10 6 meters $49, DX35 $35, DX40 $35, Gonset G50 $94, Communicator III 6 meters $49, early RME receiver black Box $95, RME VHF 152A VFO $49, Multi-Elmac PMR-6A mobile receiver $89, Eldico S-119 ssb T102 transmitter R104 receiver P109-AC M135 control station $390. Lamkin 105A $45. Aerotron 600 Have 2 for $90. R388 as is $95. N4LX F.E. Coble 251 Collier Ave., Nashville, TN 37211. Phone 615-833-2724.

TS830S, 130S, R1000-call; Cubic 103 $1199.; 102BXA $999.; 150A $779; 100MXA $499; ICOM 720/AC-call; Dentron Clipperton L $649; - 10% off stock Telrex beams; CDE Ham 4 $169; Belden 8448 rotor cable 24c/ft.; Robot 400 $675; ICOM 255A $319; Santec HT1200 $339.; Cetron 572B $34.; Rohn tower - 20% off dealer; Belden 9405 heavyduty rotor cable 38c/ft; CDE BT1A standard duty rotor $79.95; GE, Amperex 6146B $9.95; Amphenol PL259 silverplate $1. Mallory 2.5A/1000 PIV epoxy diode 19c; Janel QSA5 $41.95; Prices FOB Houston, subject change without notice. Madison Electronics, 1508 McKinney, Houston, TX 77010. 713-658-0268.

ICOM IC-22S 2m transceiver, $150. Steve Rector, KF5H, 4212 Siete Leguas Rd., El Paso, TX 79922.

WANTED: Collins 32S1 instruction book. N4DGI 841-180th Ave., Redington Shores, FL 33708.

FOR SALE: radio and electricity books, many old. Send lg. s.a.s.e. 90 Robinwood Rd., Hamden, CT 06517.

COLLINS KWM2A, round PM2 $850, 516F2 $150, 312B4 $195, R390A $350. Drake R4 $210, Kenwood TS820S $750, Regency HR2 $90, Tailtwister control box $45, 312B4 cabinet, new, $25. Randy Schaaf, 1-414-532-6643.

HEATH SB-303, SB-401, $250. WB9LCD, 414-648-5370.

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Key-Touch Tuning

To tune a station manually, you simply punch in the station frequency numerals on the direct-access, digital tuning keyboard. Press the "Execute" key and the command is entered, the station is received and LCD readout confirms tuning. If you punch in an incorrect frequency by mistake, the ICF-2001 tells you to "Try Again" by flashing those words on the display. The instant, fingertip tuning provides total accuracy and convenience. And the LCD digital frequency display confirms the exact, drift-free signal reception.

Automatic Scanning

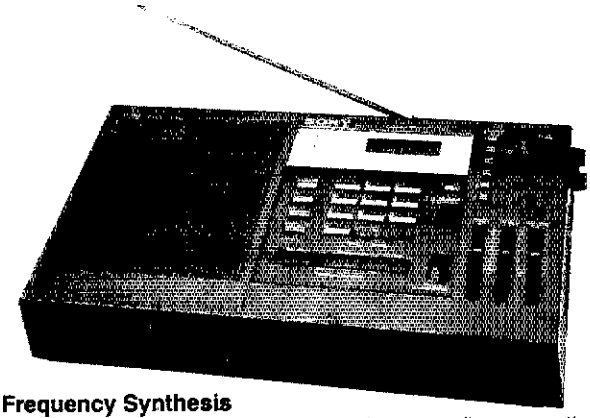
In auto-scan mode, the tuner can be set for continuous scanning of a given frequency range, which you set by means of upper and lower limit keys designated "L_1" and "L_2." You may want to scan an entire frequency range. For instance, the 76 to 108 MHz FM spectrum. If you want scanning to stop at any strong signal–one that reads "4" or "5" on the LED signal-strength indicator– switch on "Scan Auto Stop." For continuous scanning, leave the switch off, and just press the "Start/Stop" key to listen to a station or resume scanning.

Manual Tuning

Like the auto-scanning mode, manual tuning is useful for quick signal searching when you don't know particular station frequencies within a given range. You simply press the "Up" or "Down" key, and the tuner does the searching for you. And if you press the "Fast" key at the same time, the scanning rate increases for especially rapid station location. When you hear a broadcast you want to receive, just release the keys for instant reception, presssing the "Up" or "Down" key again if necessary for exact tuning.

Memory Presets

After you've tuned a station using punch-in, key-touch tuning or either scanning mode, you can enter it in the 2001's memory for instant, one-touch preset reception. Which means no retuning hard-to-find foreign broadcasts. Plus instant access to your favorite local stations for music and news. Six preset buttons allow up to six stations–in any wave range–to be memorized. And there's LCD digital readout of the memory buttons being used on each band. What's more, the upper and lower limit keys can be used as memory presets when they're not being used for scanning, allowing a total of eight frequencies to be memorized for instant, one-touch reception.



Frequency Synthesis

The 2001's direct-access tuning and outstanding reception quality are made possible by the unit's all-band quartz-crystal, PLL frequency synthesis. Instead of the conventional analog tuning system, with its variable tuning capacitor, the 2001 incorporates an LSI and a quartz-crystal reference oscillator. Which means that the local-oscillator frequencies used in superheterodyning are locked to the "synthesized" quartz reference frequencies. The result is the utmost in tuning stability, without a trace of tuning drift. In addition, dual-conversion superheterodyning for AM assures exceptionally clean, clear reception across the entire 150-to-29,999kHz spectrum.

Features

- FM/AM/SSB/CW/wide spectrum coverage
- Dual-conversion superheterodyne circuitry of AM assures high sensitivity and interference rejection
- Quartz-crystal, phase-locked-loop frequency synthesis for all bands assures the utmost tuning stability, without a trace of tuning drift
- Direct-access, digital tuning keyboard and LCD digital frequency readout for quick, key-touch station selection–maximum accuracy and ease of use
- Manual tuning and automatic scanning for effortless signal searching, easy DXing
- 6-station presets, plus 2 auxiliary presets, for instant reception of memorized stations on any band–plus LCD memory indication.
- 5-step LED signal-strength indicator
- Local/Normal/DX sensitivity selector for AM
- SSB/CW compensator for low-distortion reception
- Telescopic antenna, plus external antenna included
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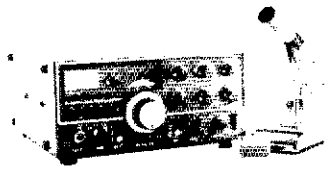

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YK-88 CW FILTER	
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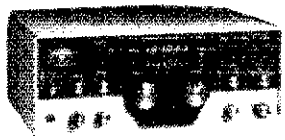

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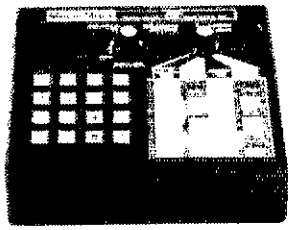

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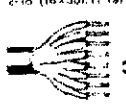
		100	1.8	5.9
		200	2.6	8.5
		300	3.3	10.8
		400	3.8	12.5
RG8/u Foam .81VF	8214 32¢/ft.	50	1.2	3.9
		100	1.8	5.9
		200	2.6	8.5
		300	3.3	10.8
		400	3.8	12.5
RG8/u Regular .66VF	8237 28¢/ft.	100	2.0	6.6
		200	2.9	9.5
		400	4.2	13.5
		900	7.8	25.6
RG8/u Non-contaminating	8267 36¢/ft.	100	2.0	6.6
		200	3.0	9.8
		400	4.7	15.4
		900	7.8	25.6

8448 24¢/ft.

No. of Cond. — 8
AWG (in mm) —
6-22 (7×30)
2-18 (16×30), (1.19)



9405 38¢/ft.

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SELL: HW101 w. HP23B, cw filter — $325. SB500 transverter $125. HD1410 keyer $40. FT620B $275. FTV650B transverter $150. K1EM, 203-683-3111.

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TR4/nb with AC4 and RV4C remote VFO sold together only $525. With new extra set of finals Bob WD8NKT 517-892-6878.

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HELP!! Want AC3 or AC4 p/s for Drake T4X. Jerry Hall, K1TD, 181 Brimfield Road, Wethersfield, CT 06109 203-529-1346.

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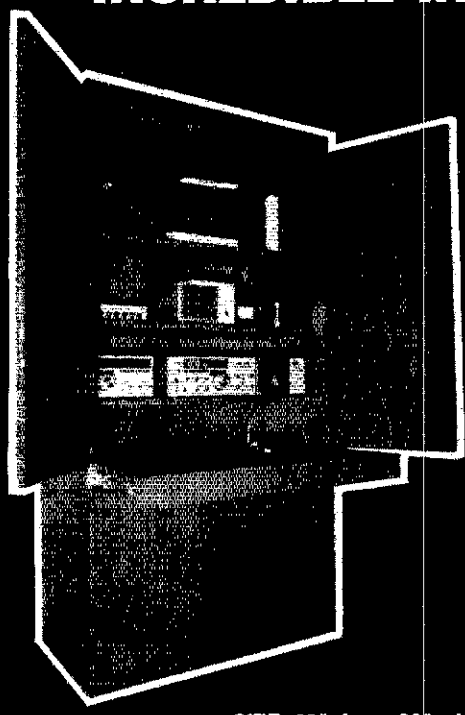

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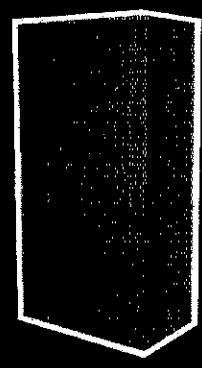

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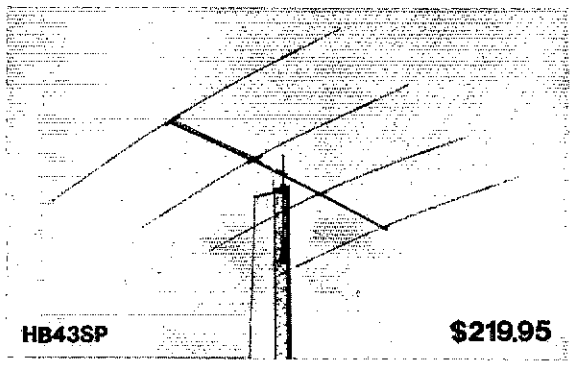
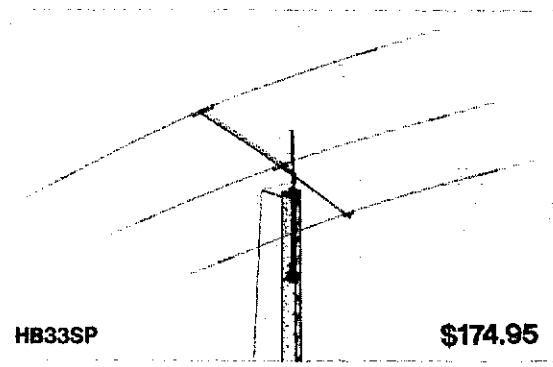


HB43SP **$219.95**



HB33SP **$174.95**

MODEL	BANDS	ELE-MENTS	ELE-MENTS PER BAND	MAX -PWR	VSWR	IMPEDANCE	MAX ELEMENT LENGTH	BOOM LGTH	TURN-ING RADIUS	WIND SURFACE AREA	WIND LOAD @80 mph	BOOM DIA-METER	MAST SIZE	WT.
HB43SP	14/21/28	4	4	2KW	BELOW 1.5	50 Ohm	27'	19'8"	16'9"	6.62 s.f.	131.3 lbs.	2"	1½-2"	38 lbs.
HB33SP	14/21/28	3	3	2KW	BELOW 1.5	50 Ohm	27'	13'2"	15'0"	4.73 s.f.	102.0 lbs.	1-9/16"	1½-2"	27 lbs.

- State of the art antenna technology. Designed to provide phone and CW operation with solid state transceivers without using an antenna tuner.
- Dual driven elements for maximum power transfer and broad bandwidth.
- VSWR Bandwidth (1.5:1): 14.0-14.35, 21.0-21.45, 28.0-29.2 MHz. Typical 1.1:1 at resonance.
- Highest quality materials throughout. All tubing 6061-T6 aluminum alloy. Stainless steel fasteners for all electrical connections. Tubing is cut and drilled to precision tolerances for easy assembly.
- Superior performance when compared against conventional yagi designs. (Call factory for gain dBd and front to back ratio.)
- Light weight and low wind area for simpler installation.

MULTIBAND ANTENNAS

3F37DX 20/15/10M Triband Yagi, 7 Elements.....$ 269.95
HB43SP 20/15/10M Dual Drive Triband 4 Element Beam...219.95
HB33SP 20/15/10M Dual Drive Triband 3 Element Beam...174.95
TE43L 40/15/10M Triband Yagi, 4 Elements.....174.95
MV4BH 40 thru 10M Vertical.....59.95
MV3AH 40/15/10M Vertical.....47.95
MV3BH 20/15/10M Vertical.....47.95

HF ANTENNAS

SQ10 10M 2 Element Swiss Quad.....$ 61.95
HB10F3 10M 3 Element Broadband Beam.....63.95
HB10F4 10M 4 Element Broadband Beam.....77.95
HB10F5 10M 5 Element Broadband Beam.....113.95
SQ15 15M 2 Element Swiss Quad.....63.95
HB15F3 15M 3 Element Broadband Beam.....72.95
HB15F4 15M 4 Element Broadband Beam.....135.95
HB15F5 15M 5 Element Broadband Beam.....199.95
HB20F3 20M 3 Element Broadband Beam.....135.95
HB20F4 20M 4 Element Broadband Beam.....199.95

VHF/UHF ANTENNAS

SQ61 6M 2 Element Swiss Quad.....$ 59.95
HB6F6 6M 6 Element Broadband Beam.....89.95
HB6F8 6M 8 Element Broadband Beam.....119.95
SQ22 2M Dual 2 Element Swiss Quad.....54.95
SQ22DX4 2M Dual 4 Element Swiss Quad.....99.95
AX210N 2M Cross Polarized 2X10 Element Beam.....89.95
AX210NW 2M Cross Polarized Dual 2X10 Element Beam..189.95
SQ007 70CM Dual 2 Element Swiss Quad.....79.95

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TE35A 11.5' Roof Tower with Thrust Bearing.....$ 149.95
TE55B 18.0' Roof Tower with Thrust Bearing.....214.95
TE75C 25.0' Roof Tower with Thrust Bearing.....279.95
20B add on Tower Section for 35A & 55B.....64.95
KS065 Thrust Bearing for Mast Diameter 1½-2½".....29.95
KS050 Thrust Bearing for Mast Diameter 1¼-2".....19.95

ROTATORS

KR400 Azimuth Rotator rated for 8.6 s.f. Wind Load.....$ 99.95

KR2000 Azimuth Rotator rated for 32 s.f. Wind Load.....299.95
Limited Quantity of KR2000 Available at.....249.95
KR500 Elevation Rotator Rated for 7½ s.f. Wind Load....189.95

Prices Effective November 15, 1980

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WANTED: Junk Viking Ranger I or II for parts, specifically switch part number 22.991 8w-4 operate switch W5GWD 1085 Hwy 304, Hernando, MS 38632 601-368-7039.

KDK-2016A 2M Excellent $220. 203-245-9679 WA1RQU.

WANTED: Plug-in coils for National SW-3/5, FB-7, AGS, AGU, SRR, I-10, HRO. Nagle, 12330 Lawyers, Herndon, VA 22071.

SELL, Heath SB 110, SB600 $275. Magnum 6 for Drake T-4X $50. Old magazines and Handbooks to 1921. Send s.a.s.e. Don Birch 7725 N. Redwing Circle, Tucson, AZ 85704.

HEATH HW-101 cw filter, pwr supply, manuals $335. Heath Marauder cw, ssb, am 180 watts manuals $150. Heath HD-15 phone patch $40. Drake phone patch $35. One kW amp pp810's $145 with power supply for 500 Watts Hustler 4BTV vertical $50. AN/SRR/13A Navy gen coverage receiver 2 to 32 Mz. $145. Model 19 teletype make offer. You ship, most gear with manuals F. W. Nicholas W7RBF, Phone 602-995-0131 after 3 P.M. No collect calls.

DRAKE TR-4C/RV-4C/AC4 retubed realigned $500; Heath HW2036A $145; HA202A $40; HP1175 with OV mod. $45; Clegg PS20 12V 20A supply $80. Heath HM102 $25; Standard C118 tacc. $150. All units excellent. I ship insured UPS. Randy 717-733-0719.

FOR SALE: General coverage receivers, including shipping. Heath GR-78 $54; Yaesu FRG-7 $219; Larry Albert, 925 Ridgewood Drive-Apt 6 Ft. Wayne, IN 46805 219-484-0029

WANTED: Heath Apache TX-1 with or without SB-10 ssb adapter. Also want Heath HX-10 Marauder xmtr, RX-1 Mohawk rcvr and HA-10 kW linear. State price and condition. All replies answered. WA3MNS, 4032-27th Ave, Hillcrest Hts, MD, 20031 301-423-7311.

COLLINS 75S1 receiver. $275. KB5OP. 504-821-4203.

TEMPO ONE (silver), AC One supply, VFO. Mint. $350. WA6IGU Rich 805-498-7251.

SALE: HW-7, $50. HW-8 & p.s., $100. TMC RFC-1 2-28 MHz linear (no p.s.)-spare final, $175. Collins R388/URR 5-30 MHz works great, $250. Teletype amodel 15 printer + typing reperg + TD, $125. Collins ART-13 (5), $20 ea. HW-202 + 5/8 ant, $110. Prices include manuals — FOB - K9NE, RR 3 Box 607, Linton IN 47441.

FOR SALE: TenTec Century 21 with crystal calibrator. Purchased April 1980. excellent cond. $230. I ship Edward Littin 205 West End Ave., NYC, NY 10023 212-877-0463.

FOR SALE: HAL DS3100 ASR video terminal, new cable and connector set, full maintenance and service manuals, $1400. HAL ST-6000 demodulator w/scope, $400. Both together $1650. Like new. W7GYR, Allan H. Moser, Route 1, Box 16, Samuels, Idaho 83862. 208-263-3726.

SELL: Yaesu 560; FV400S; Yaesu mike tubes. $450. Hammarlund SP600 rackmount $105. all schematics, Shure SM12 Headworn mike and receiver. $35. Sony ECM 50PS Mike $70. ElectroVoice 635A $35. All new. W2JYV 2762-3rd PL Baldwin, NY 11510 516-223-5454.

WANTED: Alignment instructions and circuit improvement information to the Central Electronics 200V. Will trade good condx tractor feed ASR-33 with manual set for good working condx facsimile recorder with manual. Write John Hensley; 5054 Holloway Ave., Baton Rouge, LA 70808 or call 504-925-9611.

SELL: Atlas 180 fxcr; xtnl cdx; with 117AC power supply; $200. Moe Joffe, 7259 Willoughby Ave , Los Angeles, CA 90046.

SELL NCX-5 MKII, ac and dc ps, new finals, good cond. $250. W6TWW, 1241 Arroyo Seco Dr., Campbell, CA 95008.

SELL Heath SB-104A with ps, speaker, nb & cw filter $425. Millen grip dip osc. $75. GPR-90 comm. rx with GSB-1 ssb adapter $150. Hallicrafters FPM-300 MK II with fan $275. Murch UT2600A transmatch $75. All equipment in excellent condition: W6OWD, 415-728-7136.

SWAN 700 CX/SS-16, w/117XC, VOX mint condition $425. Larry Fillman KA9EGP, Box 111 Biggsville, IL 61418 309-627-2988.

DRAKE TR6 6 mtr xcvr w/noise blanker and mobile console $599. Clegg 27B 2 mtr xcvr $295. Turner Plus 3 mic, $34.95 VHF Eng. RPT 220 W/T $595 WA2CII 607-748-1814.

DRAKE 2C receiver, Drake 2-NT transmitter, Drake 2-CQ speaker Q-multiplier, Johnson model 122 160-10m VFO. With manuals, excellent condition. $300. Call evenings, WA2FJI 516-791-6792.

HEATH HW-2036A, 2-meter transceiver. No mods. Mint. $175. WA6IGU Rich 805-498-7251.

COLLINS 51J4 incorporated IC product detector/FET oscillator original owner mint $395. Box 453 Shelter Island, NY 11965 KA2JZH.

VHF ENGINEERING 2 meter power amplifier 25 to 30 watts in brings 140 watts out. fm. cw., only, 15 watts will excite. Works well I'll pay shipping. $135 firm write WB8MJB/3 Box F Dover, PA 17315.

HEATH HR-1680 receiver $150, HX-1681 transmitter with power supply $215, SA-2040 antenna tuner $100. All excellent condition. Cliff Culpepper WB4ODK, 806 Fairhurst Dr., Roanoke, VA 24012. 703-366-4970.

GE uhf handheld good condition works excellent PR-25

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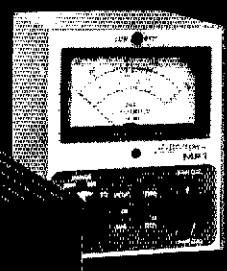

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1.8 to 30 mhz
25, 200, 2000 watts ± 5%
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B108 10 W. in = 80 W. out	$179.95
B1016 10 W. in = 160 W. out	279.95
B3016 30 W. in = 160 W. out	239.95

These amplifiers have built in RX preamps. The B108 and B1016 may be used with HTs or transceivers. They will key with 1 watt input.

RC - 1 Remote Control $24.95

NEW !!

B23 2 Meter HT Amplifier
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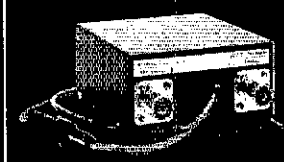

2 W. in = 30 W. out
100 mw to 5 W. Input
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100W—4:1, 6:1, 9:1, or 1:1 (pick one)	6.00

Many other interesting coil kits in our NEW LIST 5C. You must send a stamped envelope to receive our coil kit list.

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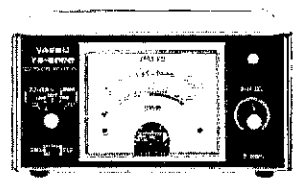

- PEP/RMS SWR/Wattmeter
- 1.8 - 60 MHz
- Also available: YS-200 RMS SWR/Wattmeter 150 MHz

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—AED continues to expand its line of quality scanners.
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—In the scanner OFF mode the rig operates normally. In the scanner ON mode the scanner locks on an occupied frequency, pauses for a preset time (about 5 sec.) and then resumes scanning (except 22S & TEMPO).
—The frequency being scanned is displayed on the digital readout (except 22S, IC2AT, TEMPO)
—This gives you the ability to eavesdrop all over the band without lifting a finger. When you hear something interesting you flip the switch to the LOCK mode and the rig is ready to transmit.

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Tempo series and IC2AT - pre-assembled only

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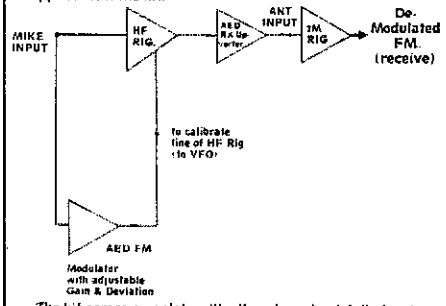
10 METER FM - THE NEW FRONTIER - the AED FM ADAPTER is now available

—The AED adapter converts existing HF transceivers to transmit on 10 meter FM.
—To use the adapter you are required to have an HF SSB transceiver and a 2 M FM transceiver or receiver.
—The AED kit consists of 2 P.C. boards. Both boards are designed to fit entirely inside your HF rig. (each board measures 1" x 2").
—One board serves as the modulator which FM's your existing HF transceiver's VFO.
—The second board is a receiver-adapter which converts your HF transceivers I.F. to a 2M frequency. This will allow you to receive noise free 10M. FM on your 2M transceiver.
—This modification can be disabled with the on-off switch supplied with the kit.



—The kit comes complete with all parts and a detailed instruction manual. (crystal not included)

PRICE FOR KIT $39.95
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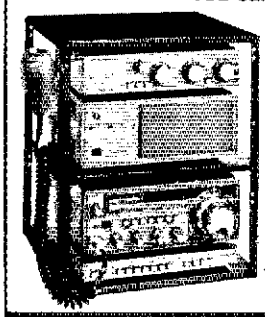

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  Use in your RTTY Loop to add CW. Works with any TTY or video terminal such as the SCT 100. Send from your keyboard or key and auto copy 1-150 wpm. CPU controlled, 32 character buffer; 80 Hz active filter plus sidetone. *Enclosure included with kits!!!*
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- **COMPLETE VIDEO KEYBOARD STATION KIT SKT-100**
  Includes GRI 56 key Keyboard Kit, SCT 100 Full Kit, assembled power supply board with RS232, drilled 18" enclosure, assembled cables and full mounting hardware. The alternative to your TTY.
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  Use with SCT-100 56 Keys - Upper & Lower Case Add $20 For Assembly
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  12MHz Bandwidth, uses composite video

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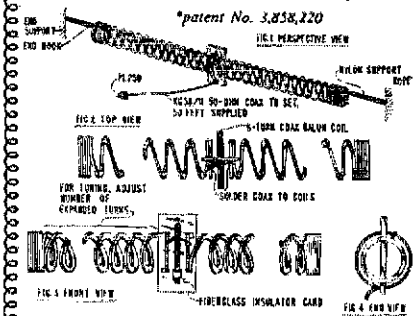

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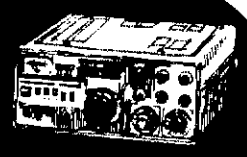

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- **M80** Send / Receive CW & RTTY Software, Interface PC Board, Manual $149.
- **CM80** Same as M80-in cabinet $279.
- **TM80** Complete! Includes Software, computer interface, active filter RTTY demodulator, AFSK in attractive cabinet with RTTY tuning meter. EASY HOOKUP! EASY OPERATION! $499.
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- **M65** Send / Receive RTTY & CW Software, Interface PC Board, Manual $129.
- **M650** Advanced RTTY (split screen) & CW in cabinet $210.
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APPLE

- **CA650** Advanced RTTY & CW (split screen) in cabinet $259.
- **TA650** Adds active filter RTTY demodulator and AFSK to CA650 $499.
- **A6500** Adds Disk Based RTTY to CA650 / TA650 $50.

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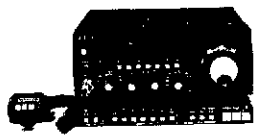

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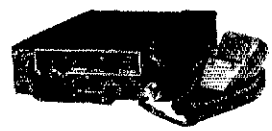

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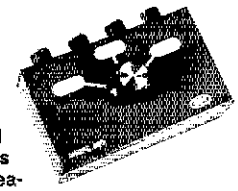
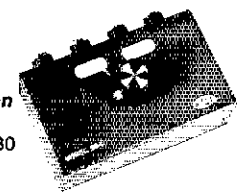


Model 593

- ***Single Pole*** 3 Position with grounding of all unused positions
- ***Crosstalk*** (measured at 30 MHz) is -45db between adjacent outlets and 60 db between alternate outlets



Model 594

- ***2 Pole 2 Position***
- ***Crosstalk*** 45db (measured at 30 MHz)

Specifications for both switches

- ***Power*** 1 KW-2 KW PEP
- ***Impedance*** 50-75 ohms
- ***VSWR*** 1.2:1 up to 150 MHz
- ***Dimensions*** 1¾" high, 5" wide, 3" deep
- ***Weight*** 1 lb.
- ***Mount*** Wall or desk

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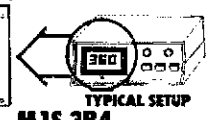

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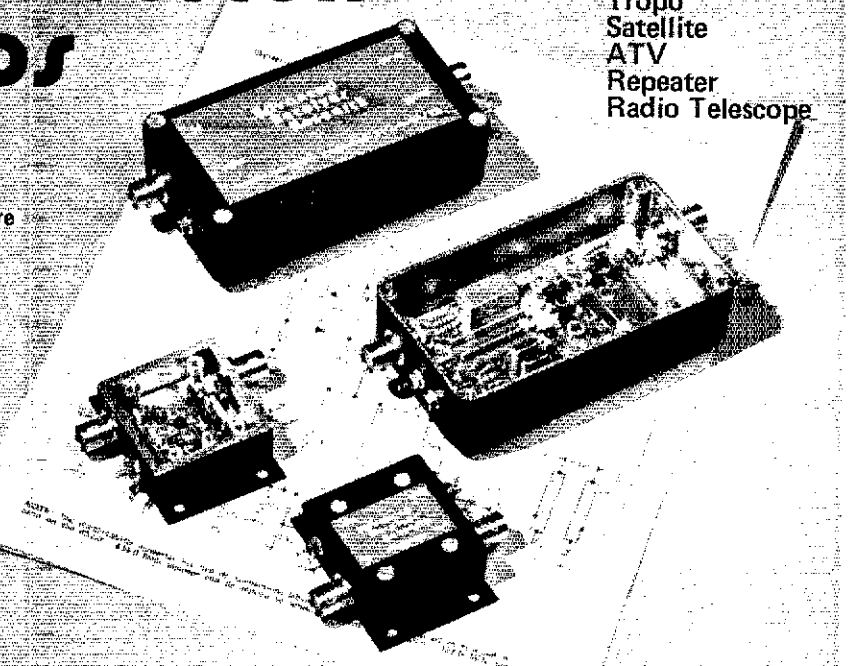

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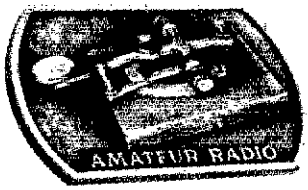

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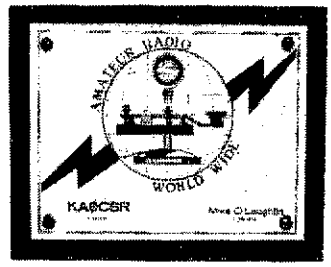

(H) **Plaque** — 8" x 10" solid walnut base with hanger. Name and call printed on parchment which is mounted under plexiglass. Blue and brown design with black imprint.

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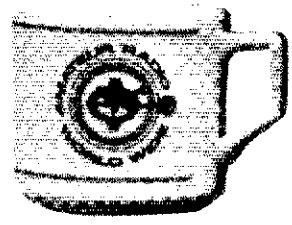

(E) **Coffee Cup** — Fine white porcelain. Gold and black brass key design. 11 oz. size.

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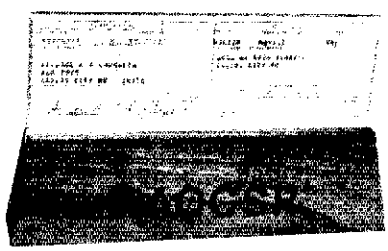

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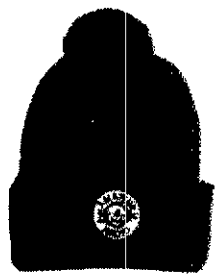

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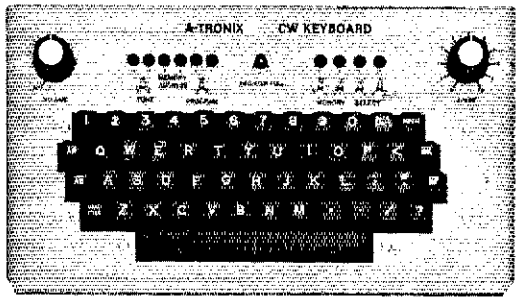

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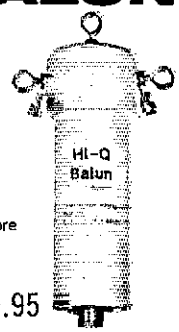

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- Construction of antenna loading coils or multiband traps

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D-40	40/15	66	23.95	21.95
D-20	20	33	20.95	19.95
D-15	15	23	19.95	18.95
D-10	10	16	22.95	18.95
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SD-80	80/75	90	31.95	29.95
SD-40	40	65	26.95	24.95
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PD-8010	80/40/20/10/15	130	34.95	32.95
PD-4010	40/20/10/15	66	33.95	31.95
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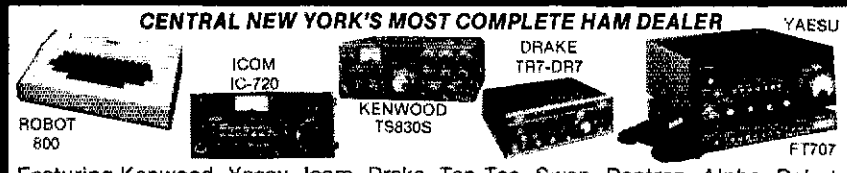

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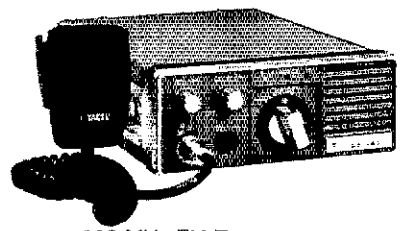

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WANT: Appleby's book "Mahlon Loomis;" Dual-trace 30 MHz scope. W9LL, 178 Eighth, 60016.

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KENWOOD R-599D/T599D $550. Henry 2-K amplifier, Dahl transformer $700. Datong FL-1 audio filter $125. Tom Frenaye, K1KI, P.O.B. 62 Unionville, CT 06085 203-673-5429.

NEEDED: Schematic, Atlas 210X will pay costs. Art, KA1DJF, Box 433, Plainville CT 06062.

FOR SALE: Yaesu FT620B 6 meter ssb transceiver mike $295. Kenwood TR7400A 2 meter fm synthesized transceiver 25 watts mike $210. George Konnick, 1750 West Main Street Riverhead, NY 11901 516-727-6294.

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MAXI TUNER antenna tuners. Trade your tuner or other ham gear. Own this quality tuner. Handles legal power limit. Most gear considered for trades. Write with offer. Brochure, tuner component list available. AXG Products, 975 Delaware Ave., West St. Paul, MN 55118.

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SELL: Standard 146-A HT, ncads, charger, rubber duck, crystals, case. All excellent $165. Jamie WB2PUN, 201-725-1348.

SELL: QST, CQ, 73, HR, books send for list. W5CAM 1505 W. 14th Pine Bluff, AR 71603.

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TR-7800	2-meter FM xcvr	399.95
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YAESU

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FC-707	Antenna Tuner	
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Note: all items can be used with the 101ZD series except (*) items.

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MU-901*	Memory unit	124.00
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"	70cm adapt. only	255.00
YO-901P	Monitor w/scope	515.00
YR-901	Code / RTTY	730.00
FV-901DM	Syn. VFO	415.00
FC-901	Antenna tuner	199.00
XF-8.9HC	CW filter	45.00
XF-8.9B	AM filter	45.00
XF-8.9HCN	350Hz filter	50.00
ZD-1	Digital readout	150.00
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NC-2	3hr drop-in chgr.	90.00
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FBA-1	Battery sleeve	8.00
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FTS-32E	32 tone CTCSS	40.00

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720/PS	9 band HF Xcvr, AC & 12V Sup/Mic-PS15	
	9 band HF Xcvr, AC & 12V Sup/Mic PS15	1298.00

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255A	2M FM 25W Synthesized	389.00
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402	430 MHz SSB Portable	349.00
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PS20	12V Power Supply	190.00

ACCESSORIES

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SM2	Desk mike	32.50

DRAKE

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L-7	160-15 M Amplifier	1890.00
3-500Z	Tube for L7 (2 req.) ea.	120.00

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TR-7/DR-7	Dig HF transceiver 160-10M	1549.00
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SL-500	500Hz CW filter for 7-line	55.00
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CUSHCRAFT

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		List Price
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R-3	Tri-Band Ringo	269.95
A-3SK	Stainless Hardware Inc A3	39.95

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A449-11	449 MHz 11 element	42.95
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AR-220	220-225 MHz Ringo	24.95
AR-450	440-460 MHz Ringo	24.95
ARX-2K	135-170 MHz Ranger kit	21.95
ARX-220	220-225 MHz Ringo Rgr.	44.95
ARX-450	435-450 MHz Ringo Rgr.	39.95

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VHF / UHF BEAMS

A50-3	50 MHz 3 element	54.95
A50-5	50 MHz 5 element	74.95
A50-6	50 MHz 6 element	99.95
A144-7	144 MHz 7 element	32.95
A144-11	144 MHz 11 element	44.95
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HUSTLER

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5-BTV	5-band vertical	$139.95
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G6-144B	6 db fixed station, 2 m	69.95
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MO-2	54" mast for bumper	22.95
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RM-75	75 meter strd. resonator	18.95
RM-75S	75 meter sup. resonator	38.95
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Index to Volume LXIV — 1980

EDITORIALS

FM/RPT

HAPPENINGS

HINTS AND KINKS

INTERNATIONAL NEWS

IN TRAINING

KEYING & CONTROL CIRCUITS

MEASUREMENTS & TEST EQUIPMENT

MISCELLANEOUS GENERAL

MISCELLANEOUS TECHNICAL

NEW BOOKS

OPERATING PRACTICES

PRODUCT REVIEW

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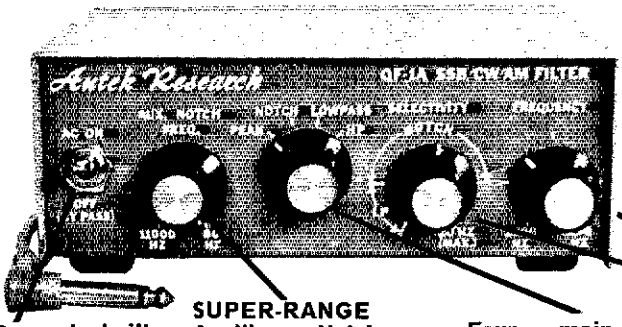

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For SSB & CW

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Four main filter modes for any QRM situation.

Continuously variable main selectivity (to an incredible 20 Hz!)

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Due to cost and panel-space limitations, even the latest rigs only include a fraction of the **QF-1A** features. We recommend you buy the best rig you can afford, spend $3,000 or more, then add a **QF-1A** and listen to the improvement! **WORKS WITH** Yaesu, Kenwood, Drake, Swan, Atlas, Tempo, Collins, Heath, S/1, etc., **ANY RIG!**

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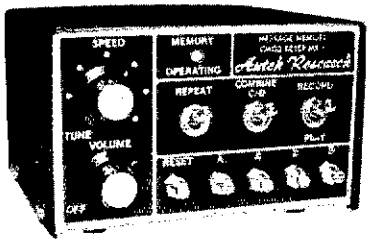

Calls CQ while you relax.

Also remembers name, QTH, contest exchanges.

Record anything you want in seconds!

Model MK-1 $99.50 ppd. U.S.A.

Our classic **MK-1** should make you wonder why anyone would buy an ordinary keyer, when memory costs so little! Records 4 messages. Just select "record," tap the A, B, C, or D message, and start sending at any speed! Record over old messages as easily. Playback by tapping the same button. Each message holds about 25 characters (letters, numbers). Total 100 characters. Handy repeat switch repeats message forever until reset. Very useful for **CQ's. YOU SIT BACK AND WAIT FOR A CALL!** Another switch combines two messages for 50 characters. "Memory-saver" feature standard.

This "state-of-the-art" keyer pleases beginners and CW "pros" alike. **DOT AND DASH MEMORIES. TRIGGERED CLOCK. IAMBIC. SELF COMPLETING. JAM PROOF. 5 to 50+ WPM. LATEST CMOS FOR LOW CURRENT.** Built-in monitor, speaker. Widely adjustable tone, volume. Perfect weighting at all times. No fiddling with an adjustment that varies with speed. **NEW: DUAL TRANSMITTER OUTPUTS** key **ANY** modern (post 1963) ham rig directly without a battery or relay, including difficult-to-key solid-state rigs. **115VAC** supply built in, or connect **9-14 VDC** to rear panel. Use with **ANY** paddle. 6x3½x5". Burned-in and tested. Sockets for **IC's.** Full instructions.

NOW AVAILABLE. 4096 BIT MEMORY EXPANDER (ME-1) allows 16 messages, 400 chars. & "combine" for longer messages. Plugs into memory socket of **ANY MK-1** ever made. Installs in 10 to 30 mins. Full instructions. Buy your **MK-1** now and easily add memory later if you wish!

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- ☐ TA-2 telescopic whip antenna
- ☐ YM-24 speaker microphone
- ☐ LCC-7 leather case
- ☐ FSP-1 external speaker
- ☐ MMB-10 mobile mounting bracket
- ☐ FTS-32E CTCSS/burst encoder
- ☐ FTS-32ED CTCSS encoder/decoder
- ☐ NC-1A 15-hr. desk charger
- ☐ NC-3 4-hr. quick charger
- ☐ NC-9B wall charger
- ☐ PA-2 mobile battery eliminator/charger
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- ☐ FEP-1 earphone

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1280

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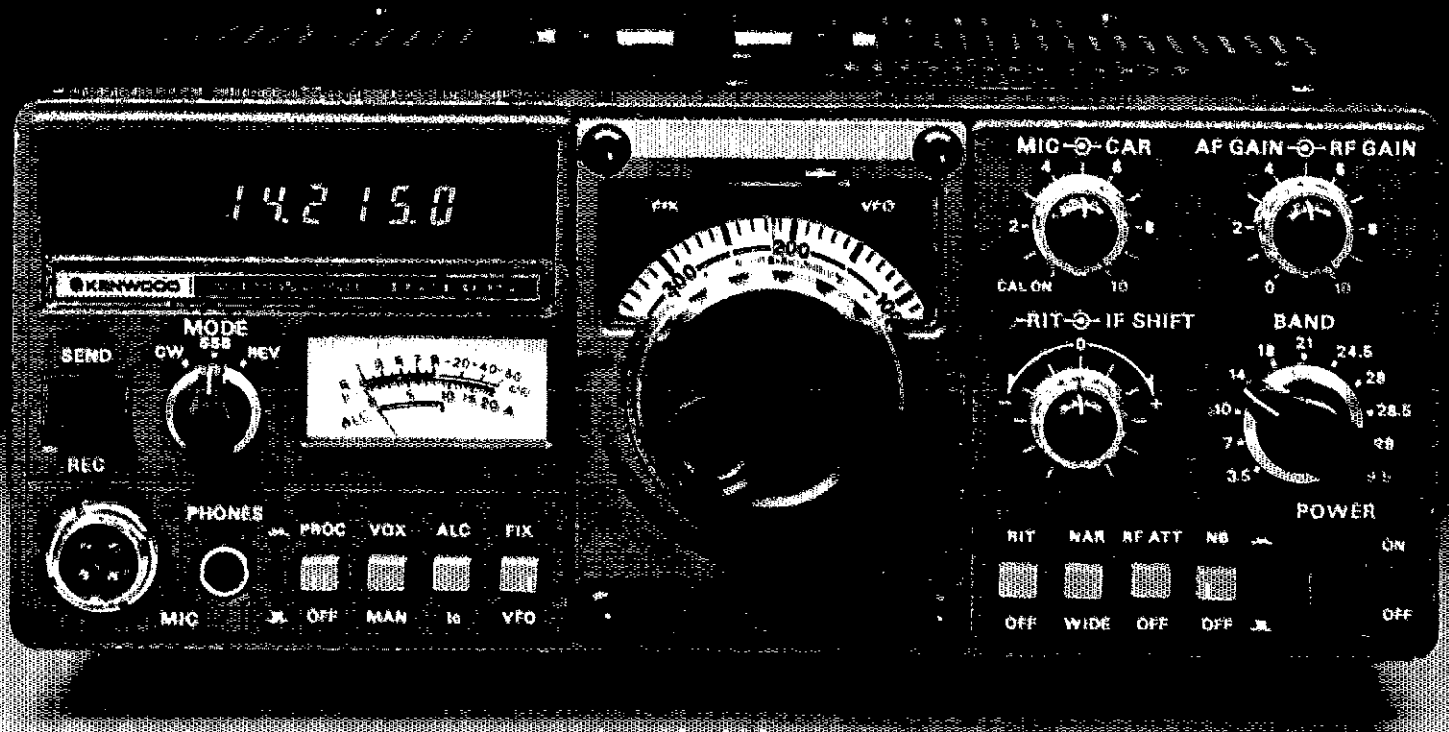
Processor, N/W switch, IF shift, DFC option



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An incredibly compact, full-featured, all solid-state HF SSB/CW transceiver for both mobile and fixed operation. It covers 3.5 to 29.7 MHz (including the three new Amateur bands!) and is loaded with optimum operating features such as digital display, IF shift, speech processor, narrow/wide filter selection (on both SSB and CW), and optional DFC-230 digital frequency controller. The TS-130S runs high power and the TS-130V is a low-power version for QRP applications.

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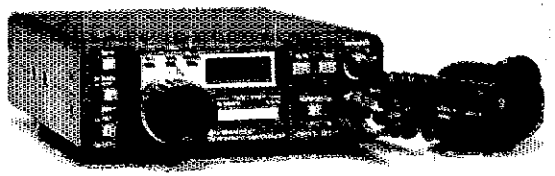

Optional DFC-230 Digital Frequency Controller
Allows frequency control in 20-Hz steps with UP/DOWN microphone (supplied with DFC-230). Includes four memories (handy for split-frequency operation) and digital display. Covers 100 kHz above and below each 500-kHz band. Very compact.