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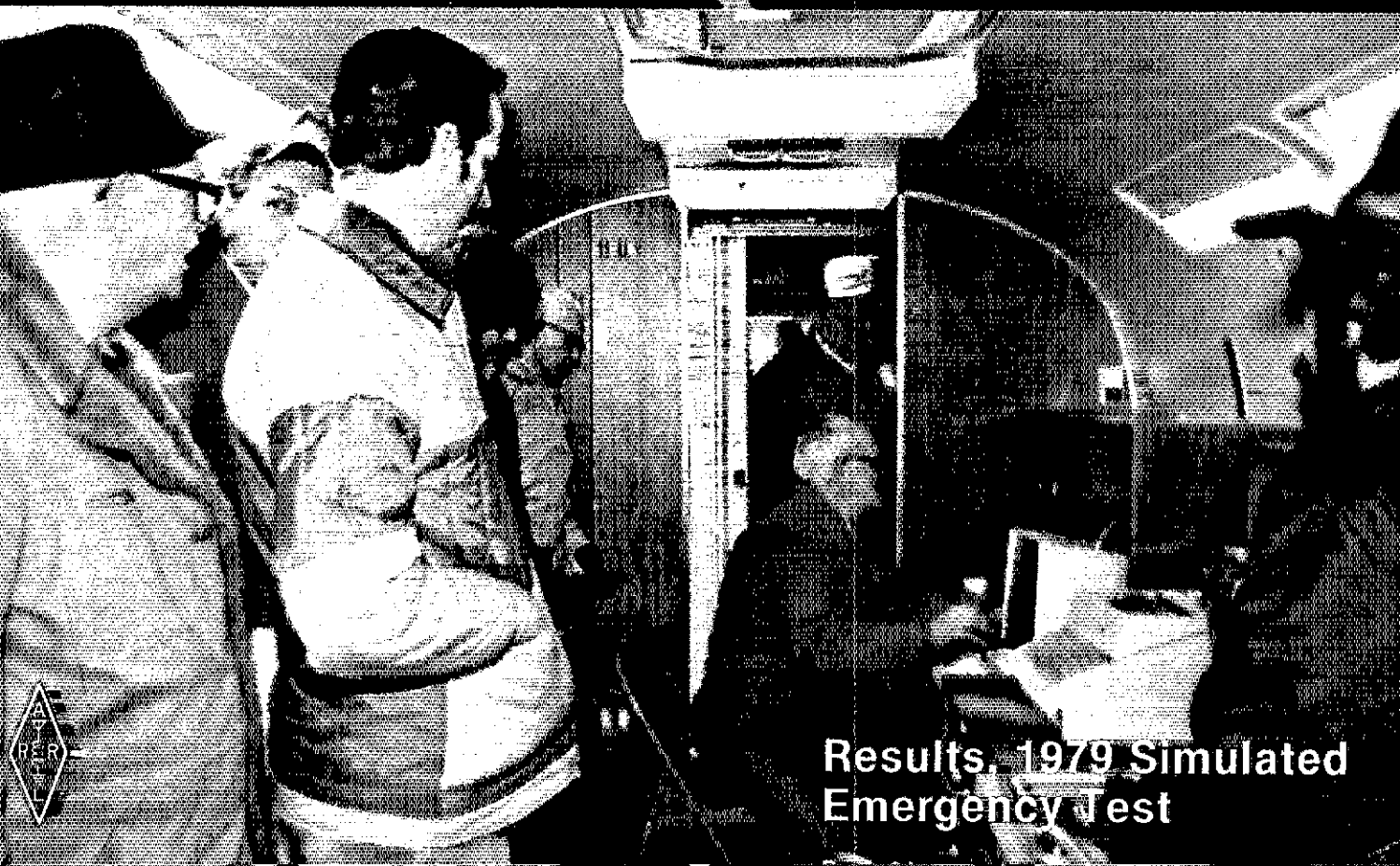

Results, 1979 Simulated Emergency Test

...STILL THE TOP FAMILY IN LINEAR AMPLIFIERS

IT'S A FACT...HENRY RADIO STILL PRODUCES THE BROADEST LINE OF SUPERIOR QUALITY AMPLIFIERS IN THE WOR WHETHER FOR AMATEUR RADIO, COMMERCIAL OR MILITARY USE, WE OFFER A CHOICE OF FIELD PROVEN STA OF-THE-ART UNITS TO FIT THE REQUIREMENTS AND BUDGETS OF THE MOST DISCRIMINATING USER.

1KD-5 ...the newest member of the famous Henry Radio family of fine 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-4A, 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 nominal output) along with its superb operating characteristics wil punch out clean powerful signals...signals you'll be proud of. Com its specifications, its features and its fine components and we're you will agree that the 1KD-5 is a superb value at only $695.

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 continuous operation in any mode at full legal power. The 2KD-5 is a 2000 watt PEP input (1200 watt PEP nor output) RF linear amplifier, covering the 80, 40, 20, and 15 m amatueur bands. It operates with two Eimac 3-500Z glass enve triodes and a Pi-L plate circuit with a rotary silver plated tank coil. $945.

THE 1KD-5 IS ON DISPLAY AT THE FOLLOWING DEALERS

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Hamtronics Inc.
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And don't forget the rest of the Henry family of amateur amplifiers...The 2K-4A, 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 a broad line of commercial FCC type accepted amplifiers for two way communications covering the range to 500 MHz.

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In 2 Meters Today...
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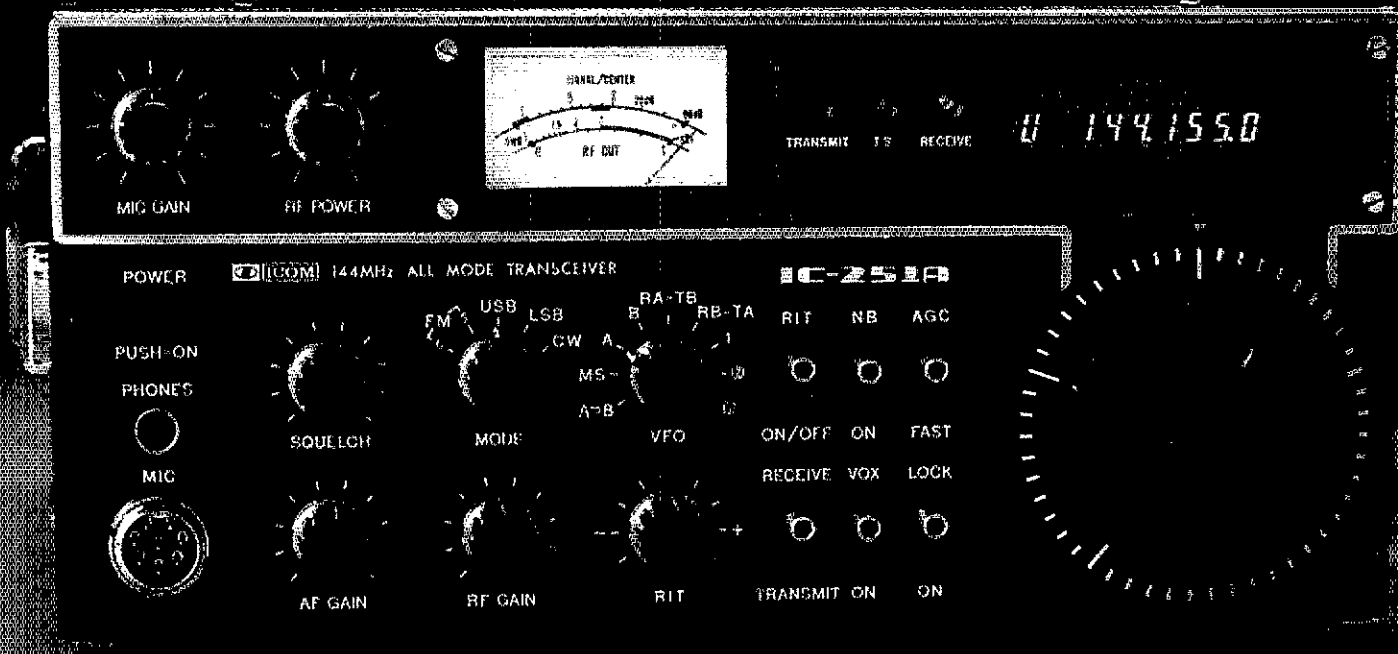

ICOM IC-251A

ICOM has always been the amateur communications equipment industry's leader in 2 meter solid state digital technology. ICOM continues its established leadership with the all new IC-251A 2 meter multi-mode base transceiver. ICOM's advanced engineering incorporated a multi-memory system, 2 programmable scanning systems, 2 internal VFOs, and built in repeater offsets.

The New ICOM 251A is the most advanced, flexible 2 meter system on the market, incorporating features customers ask for most:

- ☐ Memory scan — automatically stops on an active frequency programmed in the memory.
- ☐ 3 memories built in (quick access to your favorite frequencies)
- ☐ Programmable band scan — scan the whole band, or any portion of it you desire (adjustable scanning speed). Automatically resumes scanning after 16 seconds if desired.
- ☐ Squelch on SSB! The 251A will automatically and silently scan the SSB portion of the band seeking out the SSB activity on 2.
- ☐ Multi-mode operation — USB, LSB, CW, FM. Great for getting into Oscar, plus enjoying SSB rag chewing as well as repeater operation (including the new subband).
- ☐ 600kc Repeater offset built in. Easy repeater operation on the FM portion of the band.
- ☐ Variable repeater split — with the 2 built in VFO's, it's possible to work the odd splits plus accommodate future repeater band plan changes.

The RF amplifier and first mixer circuits using MOS FET's, and other circuits provide excellent Cross Modulation and Intermodulation characteristics. The IC-251A has excellent sensitivity demanded especially for mobile operation, high stability, and with Crystal Filters having the high shape factors, exceptional selectivity.

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ICOM INFORMATION SERVICE
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Bellevue, WA 98004

Please send me: ☐ IC-251A specifications sheet; ☐ full color ICOM Product Line Catalog; ☐ List of Authorized ICOM Dealers.

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April 1980
Volume LXIV Number 4

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, Connecticut 06111
Tel: 203-666-1541

Subscription rate $18.00 per year postpaid, U.S. funds, U.S. & Possessions; $20.00 in Canada; $21.00 elsewhere. 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

The Dayton Amateur Radio Association's nifty communications van was active during the fall edition of the Simulated Emergency Test. See page 91.

Contents

Introducing .....

the All New DTR Component Series.

Is your operating ability superior to the equipment you're using?

If you're a serious amateur who takes pride in his talent you should own the best, the new DTR Communication Stystem.

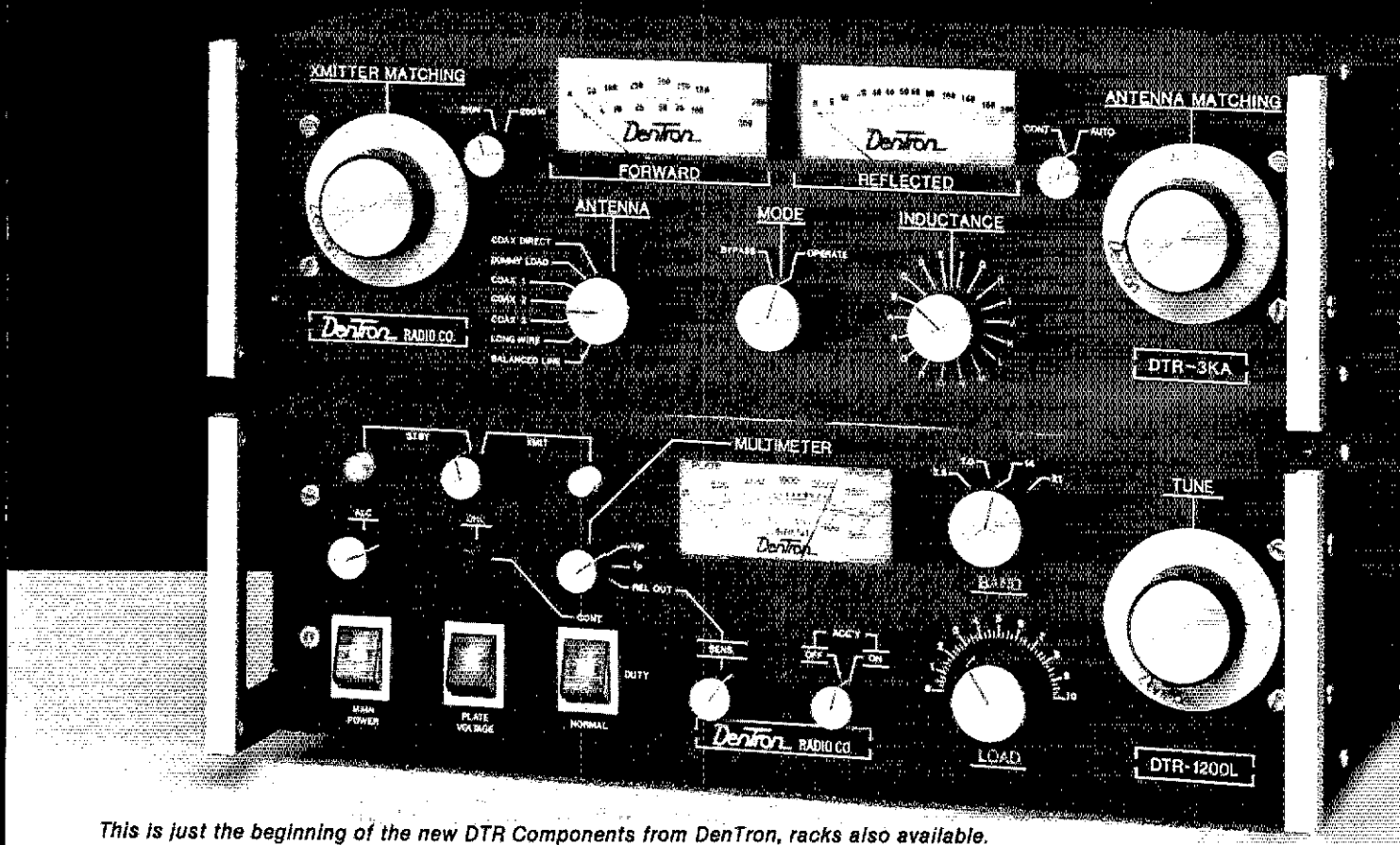
Amateur Radio has developed over the years into a sophisticated hobby. We all recognize the thrill of transmitting global signals, but to many hams it is the finesse with which those signals are transmitted that determines his pride and success as a ham.

The DTR 1200 linear amplifier provides 1200 watts SSB and 1000 watts CW input, continuous duty. We used 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 dummy load with thermostatically controlled forced air cooling, a remote sensor box to insure meter accuracy and 50 ohm impedance.

The DTR stackable components are designed to give you a complete communication system with mobility and versatility. Rack mount the DTR components on either a stationary rack or one on wheels. The DTR components are equipped with heavy-duty handles for easy rack mounting. If you opt for a desk-top station, the DTR components may be stacked or used separately.

Isn't it time you owned equipment to match your ability and increase your station's success?



This is just the beginning of the new DTR Components from DenTron, racks also available.

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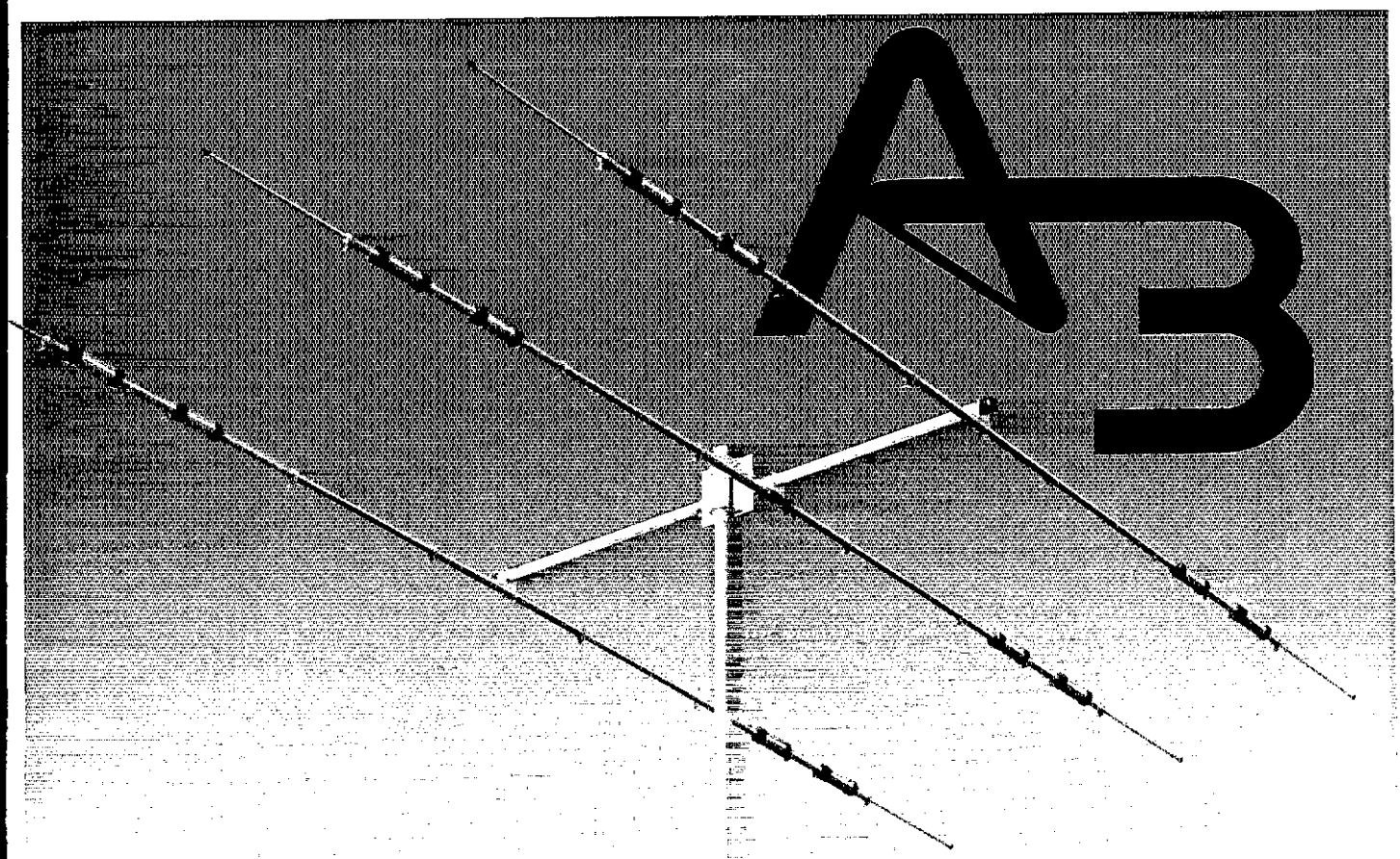


$199.95

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

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	6.6 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

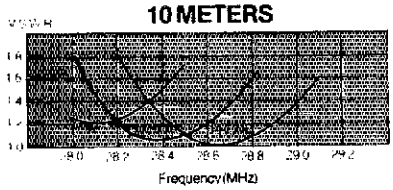
No balun required

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.

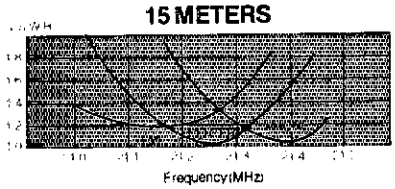
Make friends of your neighbors with A3 compact dimensions, low profile, and small turn radius. Satisfy your budget with A3 economy pricing.

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.

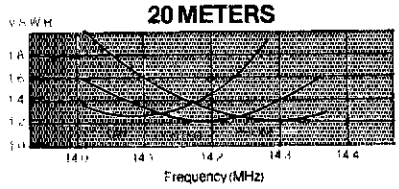
10 METERS



15 METERS



20 METERS



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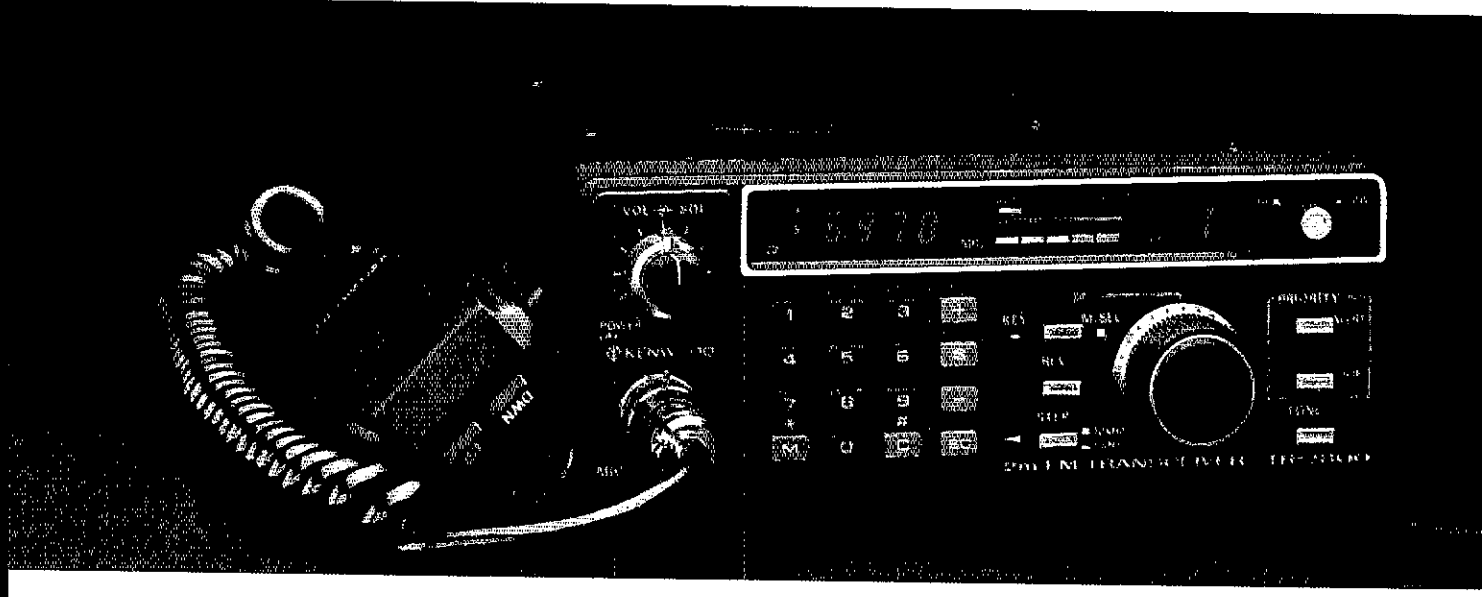

15 memories/offset recall, scan, priority, DTM

Touch-Tone ®

TR-7800

Kenwood's remarkable TR-7800 2-meter FM mobile transceiver provides all the features you could desire for maximum operating enjoyment. Frequency selection is easier than ever, and the rig incorporates new memory developments for repeater shift, priority, and scan, and includes a built-in autopatch DTMF encoder.

TR-7800 FEATURES:

- **15 multifunction memory channels, easily selectable with a rotary control**

  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 operation

- **Internal battery backup for all memories**

  All memory channels (including transmit offset) are retained when four AA NiCd batteries (not Kenwood-supplied) are installed in battery holder inside TR-7800. Batteries are automatically charged while transceiver is connected to 12-VDC source.

- **Priority alert**

  M0 memory is priority channel. "Beep" alerts operator when signal appears on priority channel. Operation can be switched immediately to priority channel with the push of a switch.

- **Extended frequency coverage**

  143.900-148.995 MHz, in switchable 5-kHz or 10-kHz steps.

- **Built-in autopatch DTMF (Touch-Tone®) encoder**

- **Front-panel keyboard**

  For frequency selection, transmit offset selection, memory programming, scan control, and selection of autopatch encoder tones.

- **Autoscan**

  Entire band (5-kHz or 10-kHz steps) and memories. Automatically locks on busy channel; scan resumes automatically after several seconds, unless CLEAR or mic PTT button is pressed to cancel scan.

- **Up/down manual scan**

  Entire band (5-kHz or 10-kHz steps) and memories, with UP/DOWN microphone (standard).

- **Repeater reverse switch**

  Handy for checking signals on the input of a repeater or for determining if a repeater is "upside down".

- **Separate digital readouts**

  To display frequency (both receive and transmit) and memory channel.

- **Selectable power output**

  25 watts (HI)/5 watts (LOW).

- **LED bar meter**

  For monitoring received signal level and RF output.

- **LED indicators**

  To show: +600 kHz, simplex, or -600 kHz transmitter offset; BUSY channel; ON AIR.

- **TONE switch**

  To actuate subaudible tone module (not Kenw supplied).

- **Compact size**

  Depth is reduced substantially.

- **Mobile mounting bracket**

  With quick-release levers.

See your Authorized Kenwood Dealer now for de on the TR-7800... the remarkable 2-meter FM mo transceiver!

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

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MATCHING ACCESSORY:

- KPS-7 fixed-station power supply

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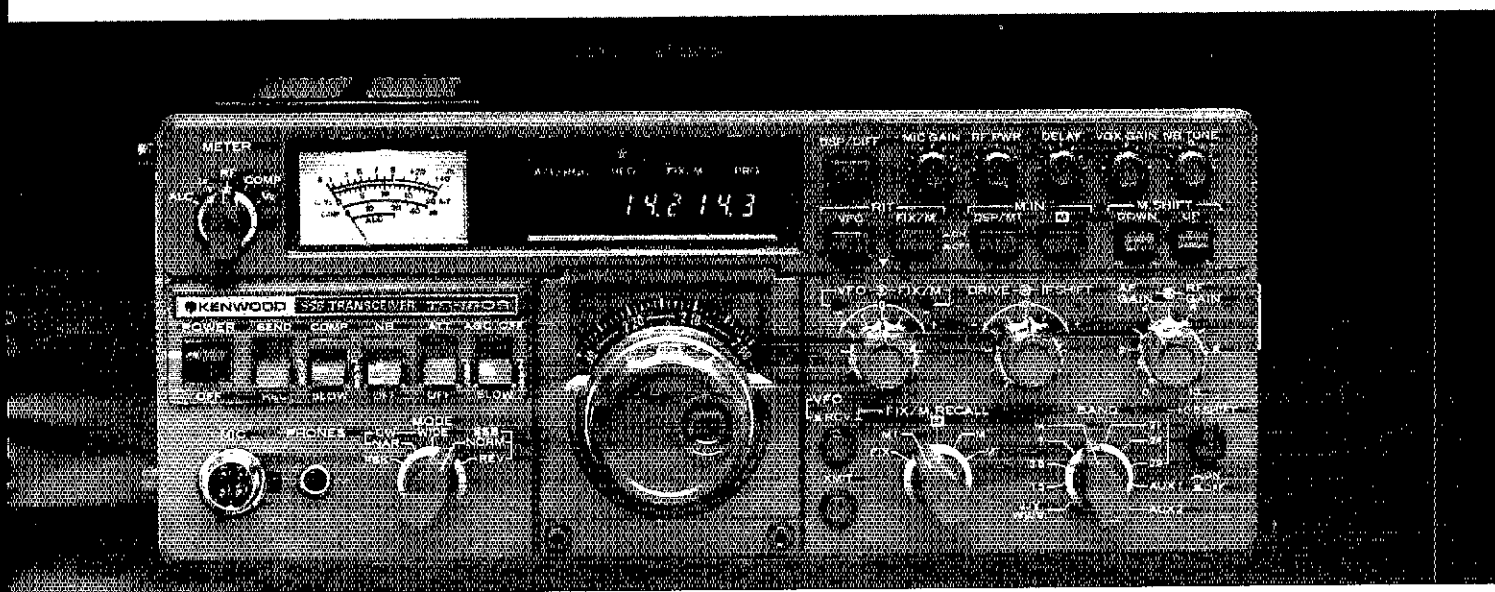


Maximum convenience with optimum features

TS-180S

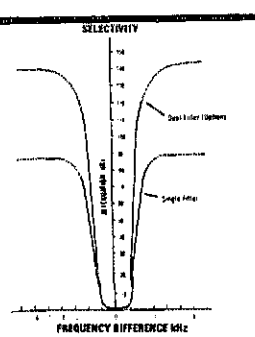
The TS-180S is Kenwood's top-of-the-line all solid-state HF SSB/CW/FSK transceiver. New circuit-design technology has been incorporated throughout the transceiver, resulting in optimum receiver and transmitter performance, as well as advanced operating features that every DXer, contest operator, and all Amateurs would desire for maximum efficiency and flexibility.

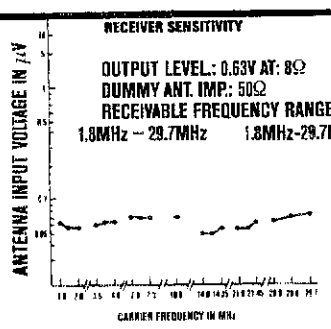
TS-180S FEATURES:

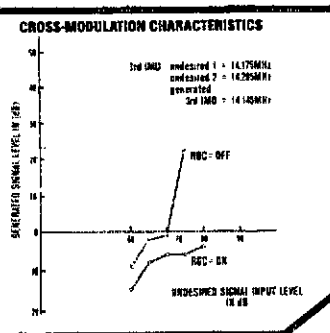
- Digital Frequency Control (DFC), including four memories and manual scanning. Memories are usable in transmit and/or receive modes. Memory-shift paddle switches allow any of the memory frequencies to be tuned in 20-Hz steps up or down, slow or fast, with recall of the original stored frequency. It's almost like having four remote VFOs!
- All solid-state... including the final. No dipping or loading. Just dial up the frequency, peak the drive, and operate!
- High power... 200 W PEP/160 W DC input on 160-15 meters, and 160 W PEP/140 W DC on 10 meters (entire band provided). Also covers more than 50 kHz (100 kHz with DFC) above and below each band (MARS, etc.), and receives WWV on 10 MHz.
- Adaptable to all three new bands.
- Improved dynamic range.
- Dual SSB filter (optional), with very steep shape factor to reduce out-of-passband noise on receive and to improve operation of RF speech processor on transmit
- Single-conversion system with highly advanced PLL circuit, using only one crystal with improved stability and spurious characteristics.
- Built-in microprocessor-controlled large digital display. Shows actual VFO frequency and difference between VFO and "M1" memory frequency. Blinking decimal points indicate "out of band." Monoscale dial, too.
- IF shift... Kenwood's famous passband tuning that reduces QRM.
- Selectable wide and narrow CW bandwidth on receive (500-Hz CW filter is optional).
- Automatic selection of upper and lower sideband (SSB NORM/SSB REV switch).
- Tunable noise blanker (adjustable noise-sampling frequency).
- RF AGC ("RGC"), which activates automatically to prevent overload from strong, local signals.
- AGC (selectable fast/slow/off).
- Dual RIT (VFO and memory/fix).
- Three operating modes... SSB, CW, and FSK.
- Improved RF speech processor.
- 13.8 VDC operation.
- Also available is the TS-180S without DFC, which still shows VFO frequency and difference between VFO and "hold" frequencies on the digital display.
- Full line of matching accessories, including 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, DF-180 digital frequency control, YK-88 CW filter, and YK-88 SSB filter.

All of these advanced features can be yours ... and at an attractive price! Visit your local Authorized Kenwood Dealer and inquire about the exciting TS-180S with DFC!

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







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Indiana — John M. Kell, W9LTU, RR 8, Box 383, Greenfield 46140 (317-462-6097)
Wisconsin — Roy Pedersen, K9FHI, 510 Park St., Juneau 53039

Dakota Division

Minnesota — Helen Haynes, WBØHOX, 16 N.E. 7 Ave., Rochester 55901 (507-288-2437)
North Dakota — Lois A. Jorgensen, WAØRWM, Box 6, Abercrombie 58001 (701-553-8724)
South Dakota — Lydia S. Johnson, WØKJZ, 506 Green St., Lead 57754 (605-584-1449)

Delta Division

Arkansas — Sid Pokorny, W5UAU, Rte. 2 — 1335 N. Ridge Circle, Horseshoe Bend 72512 (501-670-559
Louisiana — S. T. "Tom" Losey, Jr., K5TL, 172 Moor Rd., Shreveport 71106
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, 411 W. Morrell, Jackson 49203 (517-784-1782)
Ohio — Harold C. Chapman, WB8JGW, 990 Northwest Potee Rd., S. Vienna 45369 (614-852-4260)

Hudson Division

Eastern New York — Guy L. Olinger, K2AV, 126 Dahlia Dr., Mahopac 10541
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

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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 — Rex P. Greenwell, KØKP, 4201 Locust St., Lincoln (402-488-4317)

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Eastern Massachusetts — Richard P. Beebe, K1PAD, 82 Wyman Rd., Billerica 01821 (617-667-5609)
Maine — Edward B. Bristow, Jr., WA1MUX, Box 187, Route 4, Skowhegan 04976
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 Larae 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 11874, Reno, NV 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, 3707 Bonmark Dr., 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. Pomier, 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 1257, 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 — Fred K. Marchman, AA4FG, 901 E. Missouri Ave., New Port Richey, FL 33552 (813-849-122
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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Los Angeles — Perry Masterson, KD6C, 485 S. Euclid Ave., Pasadena, CA 91101 (213-793-8557)
Orange — Roy C. Zukerman, AC6H, P. O. Box 8305, Fountain Valley, CA 92708 (714-962-8318)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (714-273-1120)
Santa Barbara — D. Paul Gagnon, N6MA, 3800 So. J St., Oxnard, CA 93030 (805-484-1951)

West Gulf Division

Northern Texas — Phil Clements, K5PC, 1313 Applegate Ln., Lewisville 75067 (214-221-2222)
Oklahoma — Leonard R. Holler, 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..."

The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, bonded for the promotion of interest in Amateur Radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worthwhile amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in Amateur Radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite, although full voting membership is granted only to licensed amateurs.

All general correspondence should be addressed to the administrative headquarters at Newington, Connecticut 06111.

Proof of License at Point of Sale

Back in 1977 the FCC, disturbed because so many CBers were boosting their 27-MHz power by using amateur linears, decided that the solution to that problem was to prohibit the sale of linears which had 24-35 MHz capability. Presumably this would stop the sale of linears to CBers, and if legitimate amateurs couldn't buy legitimate amplifiers — well, tough. One of the Commissioners at the time, in a dissenting opinion, agreed with some of the FCC staff that the ban of linears was largely cosmetic. The Commissioner went on to say, "But the Commission, when asked about TV-interference, proudly can say: 'See what we have done.' " The League, and many others, had protested the proposed rulemaking, but to no avail. The League took it a step further, and went to the Court of Appeals for the District of Columbia Circuit. Just recently that Court agreed not to overturn the linear ban, saying that it did not want to substitute its judgement for that of the Commission. To quote the Court, "Had we been the rulemakers in this case, we might have been more hesitant in encroaching on the domain of the innocent amateur operators."

So, now amateurs can only buy linears that have no 10-meter position on the bandswitch, and presumably CBers buy no linears at all — unless there happen to be some companies around making illegal linears and selling them to CBers. But you wouldn't expect a thing like that to happen, would you? Of course not.

More recently, there have been ads in various magazines (but not, we think, in any of the truly amateur magazines) offering Gunnplexers or something similar, which can be used for jamming police radar (so they say) or for microwave links at 10 GHz, even though not type-approved for that latter use. Often, there are inferences in the ads that this is "amateur" equipment, which is hardly the kind of publicity we want. What to do?

Well, perhaps there could be a regulation forbidding the manufacture and sale of such devices with outputs near 10 GHz. This would turn off the supply of radar jammers and ersatz microwave links, wouldn't it? Well, what about the people who have a legitimate use for equipment at those frequencies, eh? What about them? Yes, what about them indeed? And what about the amateurs and their needs? No, that's a poor solution to the problem — we've already learned that, thank you. Those who have a legitimate use for the equipment should not be denied that use, and those who don't have a legitimate use for the equipment *should* be denied it.

There *is* a solution. It may not be the only solution, but at this point it looks like the best solution. That is to insist on proof of license at point of sale. If someone is to buy equipment which is capable of being used to transmit, let him demonstrate that he has a license for legitimate use of that equipment. A law which required proof of license at point of sale would, if enforced, turn off the sale of *any* kind of radio transmitting equipment to people who were not entitled to use it. It would, undeniably, temporarily inconvenience some would-be amateurs who wanted to buy a transceiver and use the receiver portion until they obtained their licenses. It would once again permit legitimate amateurs to purchase equipment which they had earned the privilege to use. It would be a fair and equitable solution.

The Commission does not believe that it now has authority to implement the requirement for proof of license at point of sale. There is, however, a glimmer of hope. Currently, there are a couple of Congressional bills being worked on to make some modifications of the Communications Act. One provision of these changes could be to provide the authority for proof of license. You'll be hearing more about these bills in *QST* as the months go by, because perhaps they will permit a better solution to the problem of the misuse of amateur (and other) equipment, a solution in which the legitimate amateur doesn't end up being the person penalized. — *Richard L. Baldwin, W1RU*

League Lines...

In order to study possible uses and subdivisions by mode of the new 10-MHz amateur band, taking cognizance of the membership views and considering the shared nature of amateur occupancy of this band, ARRL President Dannals has named an ad hoc committee consisting of Vice President Max Arnold, W4WHN, chairman; Southeastern Division Director Frank Butler, W4RH; and Assistant General Manager David Sumner, K1ZZ. The committee has been directed to make a recommendation to the ARRL Board at its July meeting, and so needs your input promptly. The Committee welcomes your suggestions on the use of 10.1-10.15 MHz, considering mode of emission, class of license, band use, possible subdivision by other countries, and so on. Send your comments to W4WHN, whose address is on page 9 of this and every issue of QST.

AMSAT-OSCAR Phase III (to be called AMSAT-OSCAR 9 after launch) is scheduled to be launched during the period of May 20-28, 1980, aboard the LO2 ESA Ariane mission from Kourou, French Guiana. The daily launch window is 1500-1800 UTC. W1AW in cooperation with AMSAT will transmit real-time launch information for the entire launch sequence. Monitor W1AW bulletins and the AMSAT Net for the latest-breaking news on the actual launch date. Details to follow in May QST.

A reminder that pursuant to Minute 42 of the January ARRL Board Meeting, additional input is requested from the membership concerning possible further changes to the updated Numbered Radiogram List, Form CD-3. If you haven't already made your views known on this subject, please send them to Hq., to the attention of the Communications Department.

The ARRL Board of Directors has directed the VHF Repeater Advisory Committee (VRAC) and VHF/UHF Advisory Committee (VUAC) to consult with appropriate groups to develop a cooperative plan of frequency allocation for A1, 6A3, 3A3 and 16F3 operation in the 50-MHz band. The committees welcome your suggestions. Please drop a line to VRAC/VUAC, ARRL, Newington, CT 06111, and your comments will be photocopied and distributed to the members of the committees.

Would you like to purchase copies of the new Dave Bell film, "The World of Amateur Radio"? Copies may be ordered from the Westlink Radio Network at 7046 Hollywood Blvd., Suite 718, Hollywood, CA 90028. Tel. 805-259-8243. Because this entire project is being done "at cost plus shipping," full payment must accompany all orders. Please make checks payable to "William M. Pasternak." The prices are: Tape -- VHS $30, Betamax $30, 3/4-inch U-Matic, $55; film -- color-sound print $95. These prices include shipping. Please note that for Betamax orders only Beta I or Beta 1-Hour is currently available. (This is also known as Educational Beta Format.) Orders for Beta II or Beta III will be returned. Orders will be shipped "4th Class - Educational with Special Handling." Therefore, please allow at least a 4-week delivery time.

Bookings to show "The World of Amateur Radio" are handled by Modern Talking Picture Service. To order the film or videocassette, contact the Service at 5000 Park St. North, St. Petersburg, FL 33709. Tel. 813-541-6661. Your ARRL director may also have a copy for loan. See page 8 for the names and addresses of directors.

The American Hiking Society is sponsoring a transcontinental hike from San Francisco to Washington, DC starting April 12, 1980, until sometime in April 1981. Trail coordinator Lawrence "Monty" Montgomery, W9WP, is looking for hams to hike or help as trail monitors. The route will cross central California and Nevada, southern Utah, Colorado, Kansas, northeastern Oklahoma, northwestern Arkansas, southcentral Missouri, southern Illinois, central Kentucky, western Virginia, along the Appalachian Trail, down the C & O Canal through Maryland to Washington, DC. Interested hams should contact W9WP, 910 West Calhoun St., Macomb, Illinois 61455. This hike has been endorsed by the President's Council on Physical Fitness, the U.S. Interior Department's Heritage Conservation and Recreation Services, and many local and national organizations, and is being promoted by Backpacker, a national magazine.

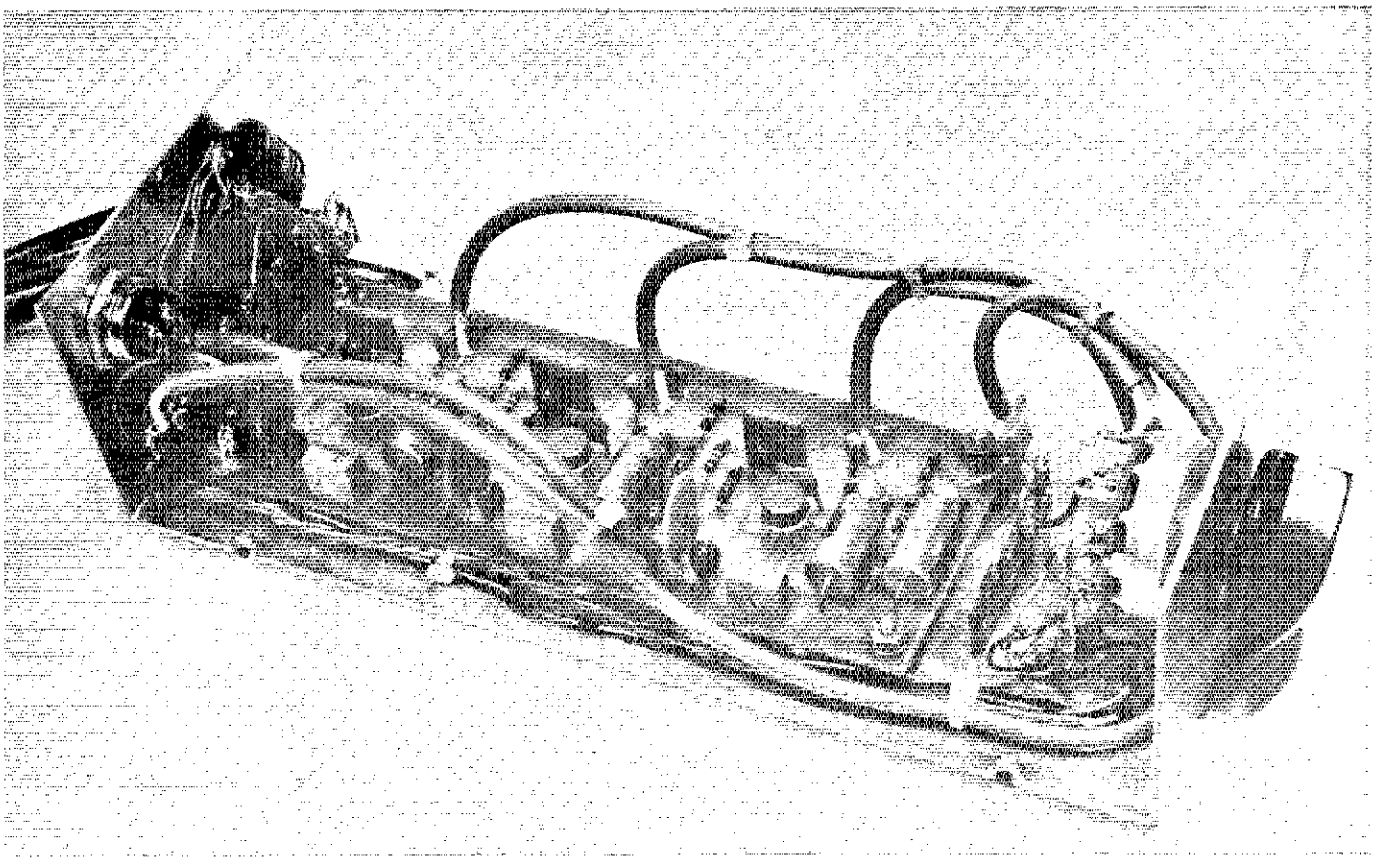
The Ham auction of the South Shore Repeater Association, Weymouth, Massachusetts, has been changed from April 12 to April 19, 1980.

League members! You should pay no more for amateur equipment when making credit card purchases than when paying cash. The Truth in Lending Act, administered by the Federal Trade Commission, prohibits creditors from imposing a surcharge on credit card transactions. Hq. would be interested in knowing of any problems in this area.

An Adjustable-Gain Microphone Amplifier

Here's a useful station accessory that's just right for a first project.

By Glen Thome,* N8AKS



Completed 3-channel microphone amplifier with cover removed. A 4-pin input connector is used in this model.

How often has this situation occurred? A desk-stand microphone sits unused because its output is too low to modulate a transmitter adequately. To further compound the problem, the rig transmits very well when using a hand-held microphone, and the same rig is used for both mobile and fixed service. Obviously, the internal microphone-gain potentiometer cannot be readjusted in this case since overmodulation or overdeviation would surely result when using the hand-held microphone, even though the rig may transmit well with the desk-stand unit.

The most practical solution to this dilemma is to amplify the output of the desk-stand microphone, but certain restrictions apply to this plan of attack: (1) The amplifier should be simple and compact; a solid-state design is immediately indicated; (2) the power should be obtainable from the rig or a small battery; power consumption should be minimal; (3) audio bandwidth should be fairly wide, with a flat response from 300 to 3000 Hz; (4) circuit gain should be adjustable over a wide range to adapt the amplifier to any combination of microphone and transmitter; and (5) the amplifier input should accept either high- or low-impedance microphones and

*917 Delaware Ave., Elyria, OH 44035

feature both high- and low-impedance outputs so either one could be used as required.

Theory of Operation

As shown in Fig. 1, the microphone amplifier consists of an adjustable-gain operational amplifier circuit. The signal from the microphone is applied to the non-inverting input of U1 through coupling capacitor C1. The circuit input impedance is determined by R1, or by the parallel combination of R3 and R4. Connecting R1 matches the input circuit to a low-impedance microphone; with R1 removed, R3 and R4 determine the input impedance, which, in this case, allows use of a high-impedance microphone. R3 and R4 also serve to bias the noninverting input of U1. Since U1 is operated from a single-ended power supply, the bias voltage is necessary to linearize the amplifier output and avoid clipping one side of the input waveform. To help ensure that power supply noise does not disturb the input, R2 and C3 are included as a ripple filter. C2 provides low-reactance bypassing of the power bus.

The gain is determined by the setting of R5, and is adjustable from approximately 0 to 40 dB. During testing of this circuit with a 1-kHz sine wave, no distortion was evident on the output waveform

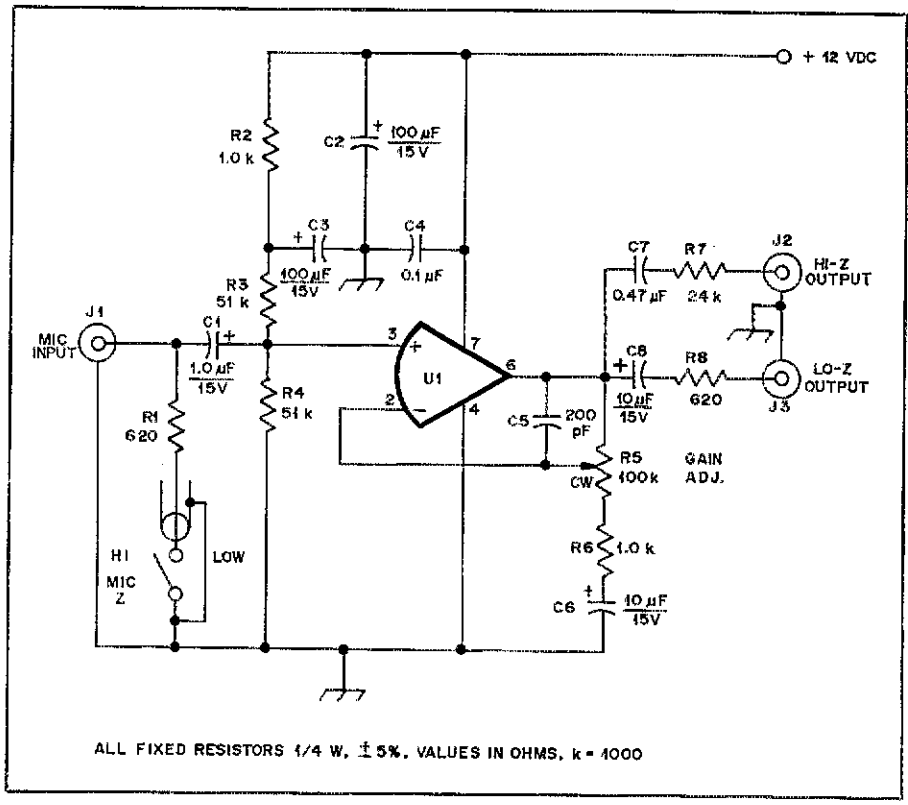


Fig. 1 — Schematic diagram of the microphone amplifier. C1, C6 and C8 are tantalum electrolytics; C2 and C3 are aluminum electrolytics. All other capacitors are tubular or disc ceramic. R5 is a pc-mount potentiometer (Helitrim 72XWR100K or equivalent). U1 is a 741 op amp IC or high-performance equivalent having an 8-pin package.

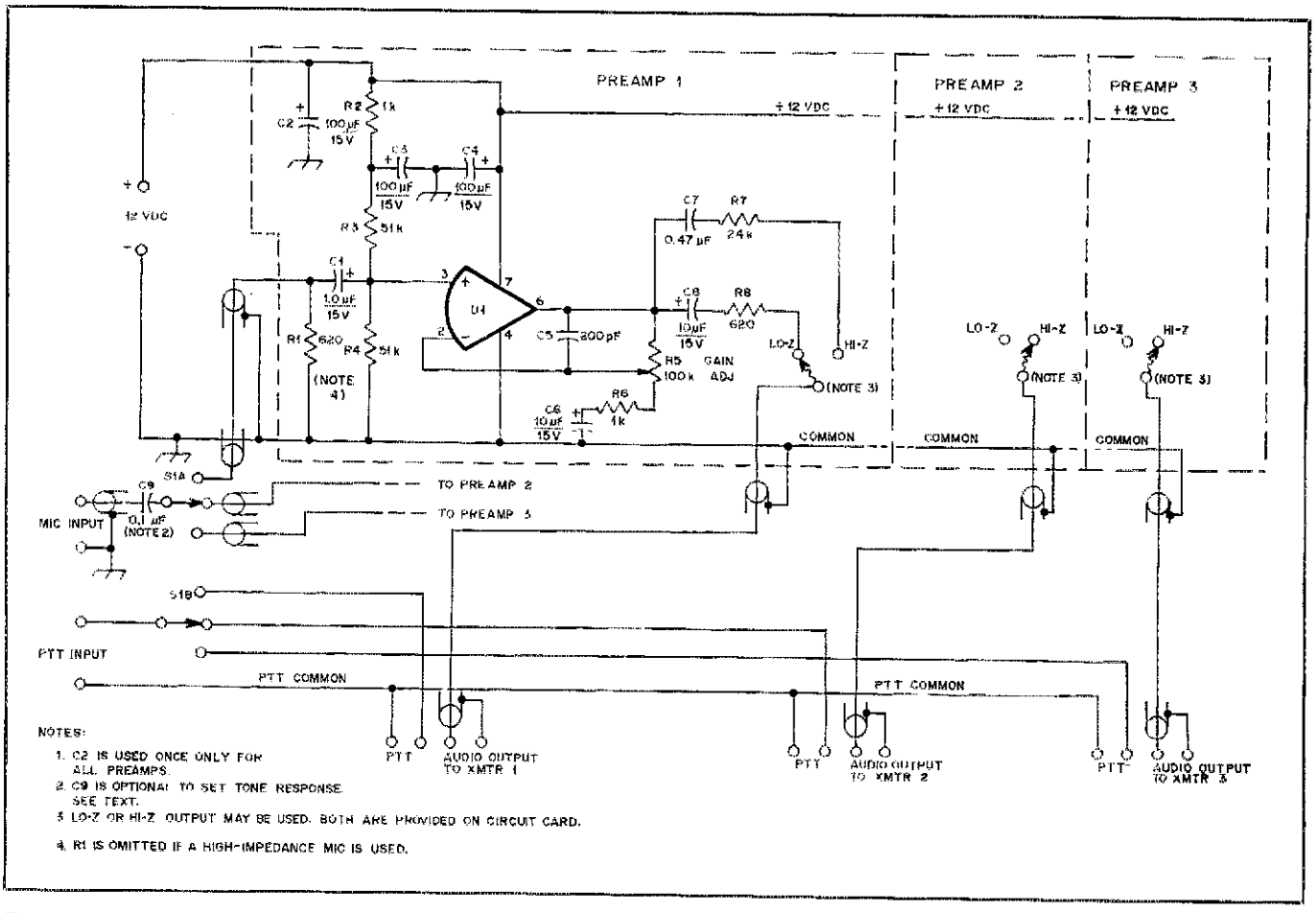


Fig. 2 — Schematic diagram of a multi-channel microphone amplifier featuring PTT switching.

throughout the gain adjustment range of the amplifier.

The output from the amplifier is available at either low or high impedance, selectable to match the characteristics of the audio input circuit of the transmitter to be used. Since the output impedance of an ideal operational amplifier is zero, the desired output impedance can be obtained by means of a series resistor. This amplifier offers output impedances of approximately 600 Ω and 24 kΩ.

A common 741 op amp is used at U1 in the author's unit and it performs adequately. The purist may elect to use one of the more modern low-noise, wide-bandwidth devices, such as the MC1741SCP, MC1456, CA3140, NE5534, or LF356.

Construction

The amplifier is constructed on a circuit card designed for chassis mounting. Any number of amplifiers can be built on one circuit card to match the needs of individual stations. The author constructed a three-channel amplifier and mounted all components in an aluminum Minibox. The schematic diagram for the three-channel amplifier, shown in Fig. 2, indicates the method used for switching the microphone to any one of the amplifiers. The push-to-talk (PTT) circuit is also switched so that only one transmitter can be keyed at a time. By using separate amplifiers, output levels can be set individually, the required output impedance can be selected to match the individual transmitters, and only one microphone is required for fixed-station operation.

Construction should require only a few evenings, and all components should be available from local electronics supply stores or mail-order firms. Layout drawings appear in Figs. 3 and 4 for those who desire to fabricate their own pc cards. The finished amplifier should be mounted inside a Minibox or other enclosure that affords complete shielding. Any suitable connectors that are fully shielded can be used for input and output terminations. Alternatively, the output cables can be hard wired to a terminal strip inside the enclosure, as shown in the photo of the three-channel unit. Whichever method is chosen, be sure that all input and output cables are fully shielded to avoid hum and rf pickup. Any good-quality microphone cable can be used; however, avoid "economy" cables since the percentage of shielding around the center conductor may be too low to shield effectively against hum. Sometimes it's better to ground the braid of an audio cable at only one end, to avoid ground loops. Start with the arrangement shown in the diagrams, but be prepared to experiment to find the configuration yielding the lowest noise level.

If a readily accessible gain adjustment is desired, a 100 kΩ potentiometer mounted on the enclosure may be used as a substitute for R5. Shielded leads soldered to the pads normally used to mount the trimmer should be used for the connections.

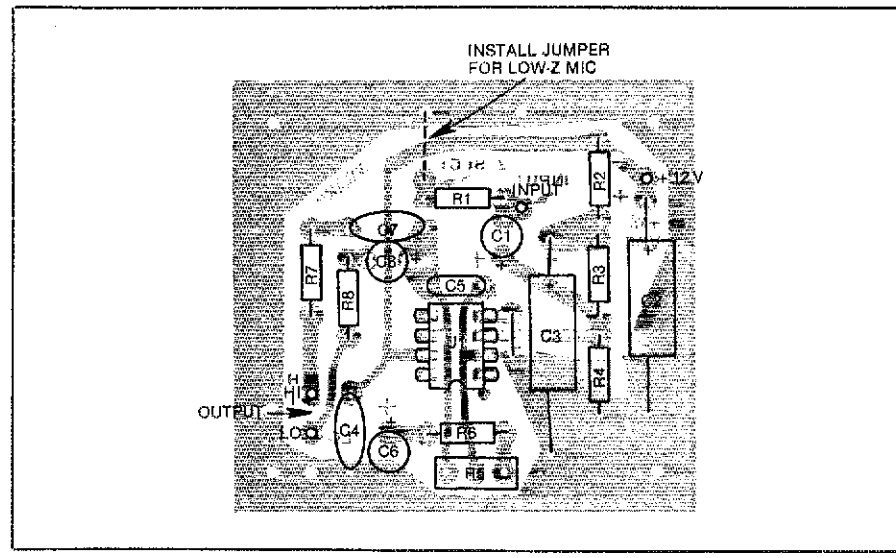
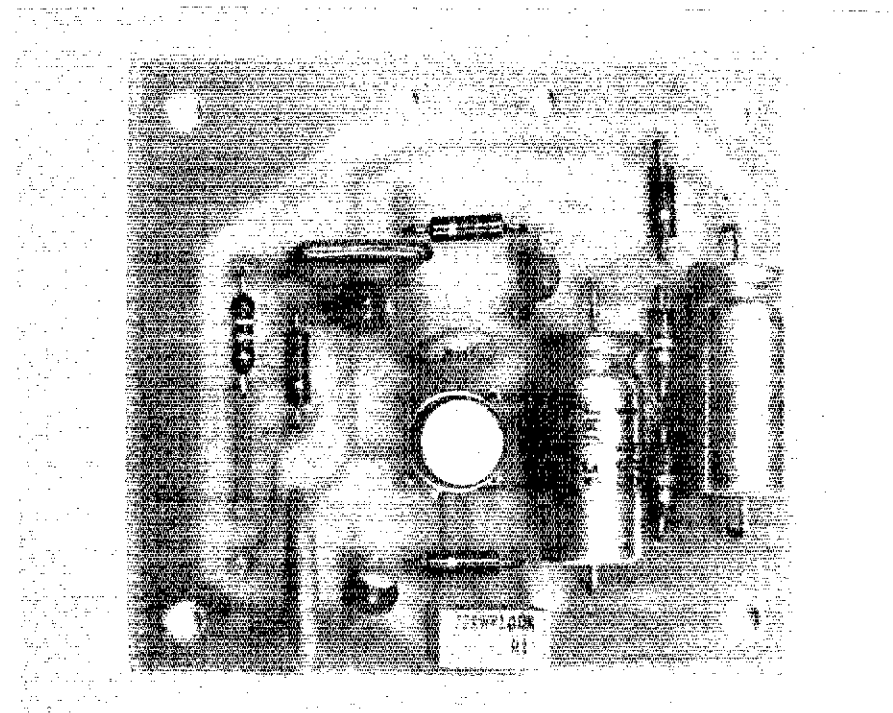


Fig. 3 — Parts-placement guide for the single-channel pc card. Parts are placed on the nonfoil side of the card; the shaded area represents an X-ray view of the copper pattern. (The etching pattern appears in the "Hints and Kinks" section of this issue.) Unmarked lines indicate wire jumpers.



Close-up view of the circuit board. Metal-can or Mini-DIP package op amps may be used without layout changes.

Adjustment

The gain of the microphone amplifier must be adjusted to avoid overmodulation or overdeviation in the transmitter. For a-m or ssb rigs, a monitor scope should be used to check the rf envelope. For fm rigs, a deviation meter is the most convenient way to check for proper audio level. In the absence of such test equipment, a few on-the-air checks can be made for optimum gain adjustment.

Since the frequency response of this amplifier effectively covers the voice range, some operators may desire to attenuate the low-frequency response. For communications purposes, speech is more intelligible if the high-frequency tones are accentuated. C9, shown in Fig. 2, is placed between the microphone and the amplifier. The value of 0.1 μF was chosen

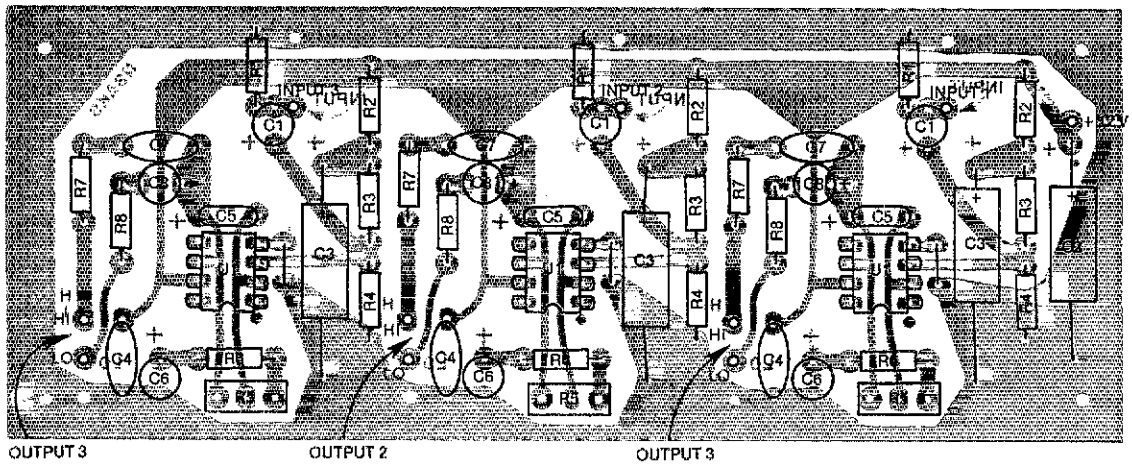
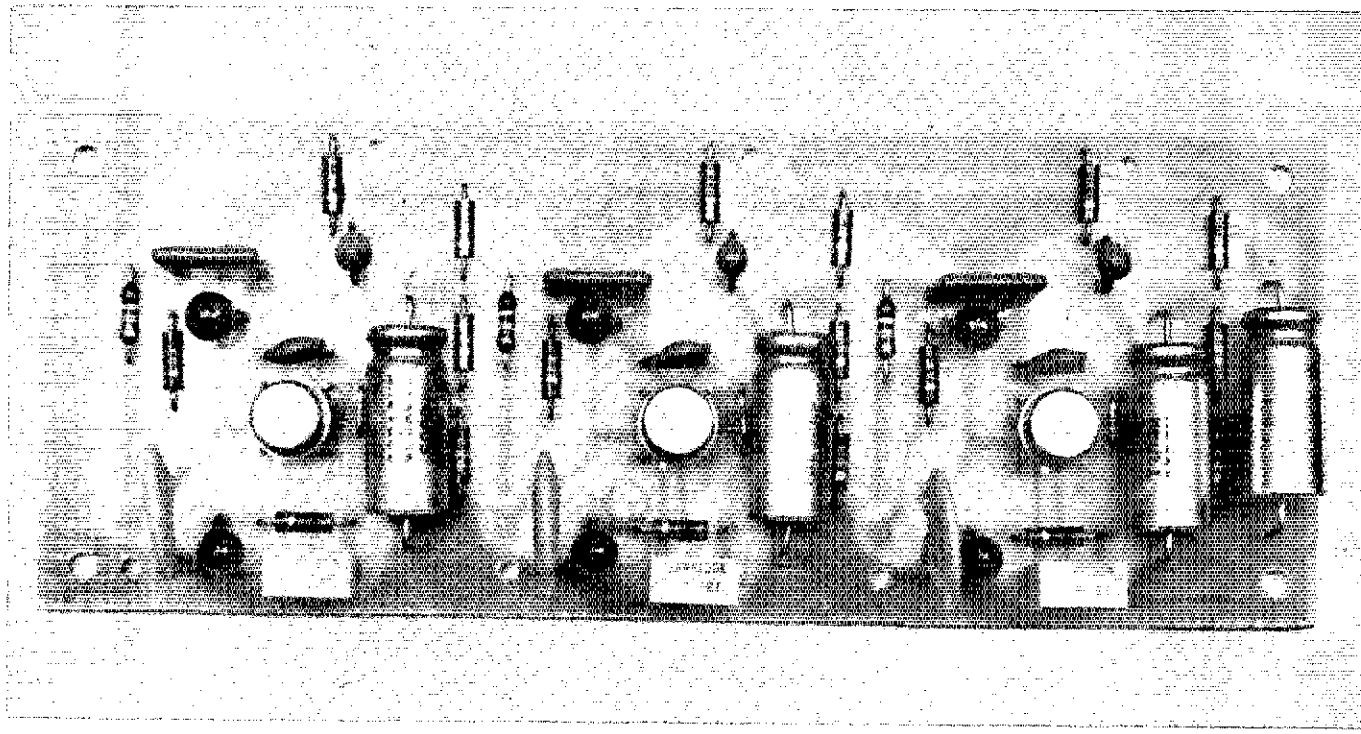


Fig. 4 — Parts placement guide for the three-channel pc card. R1 is omitted if the station microphone is a high-impedance unit.



Three amplifiers built on one pc board. This technique can be extended to any number of amplifiers.

experimentally, observing the amplifier output on an oscilloscope while sweeping a band of frequencies applied to the input through C9. This value of capacitance attenuates the low-frequency response to some extent. In conducting tests, various stations advised the author of favorable tone response using the amplifier and a desk-stand microphone as compared to an unamplified hand microphone. These tests were conducted on 2-meter fm. Differences in individual voices and characteristics of the microphones used may necessitate some experimenting to determine the optimum value of C9, but 0.1 to 0.47 μF should prove satisfactory in most cases.

Conclusion

The author incorporated the three-channel version of this amplifier and a 600-ohm dynamic microphone into his station to provide audio to 2-meter fm, 6-meter a-m, and hf-band ssb rigs. Initial reports indicate favorable performance despite the more pronounced bass response as compared to the tone qualities of the average voice transmission. Since the amplifier greatly increases the microphone sensitivity, the operator can speak at a conversational level for long periods without voice fatigue. Because of the increased sensitivity, you must be careful to keep the ambient noise level low. Besides being a useful station accessory and an easily constructed "first project," this amplifier can give the operator a chance to dust off that long-unused desk microphone or extend the usefulness of a microphone already in service.

Acknowledgement

The author expresses special thanks to George Woodward, W1RN, for his design suggestions.

• *Basic Amateur Radio*

A Beginner's Look at Op Amps

Part 1: Op Amps are part of many *QST* projects. Here's your chance to get acquainted with these handy devices. The math is easy. We start with a "black box" approach.

By George Woodward,* W1RN

"Op amp" is an abbreviation for "operational amplifier." We tend to think of op amps as integrated circuits (*ICs*), but the term can be applied to any high-gain amplifier circuit whose transfer characteristic is determined by external components. "Transfer characteristic" means the manner in which the output varies as a function of the input. The external components in an op-amp circuit create a closed loop, or feedback path between output and input. Special-purpose feedback amplifiers emerged shortly after the triode electron tube, but amplifiers designed to perform in a wide variety of feedback loops are a product of the computer age. Analog computers require many op amps to perform mathematical operations such as summation, absolute value generation, differentiation and integration. There's no need to be intimidated by these terms. When you finish this series, you'll be able to throw them around with some authority.

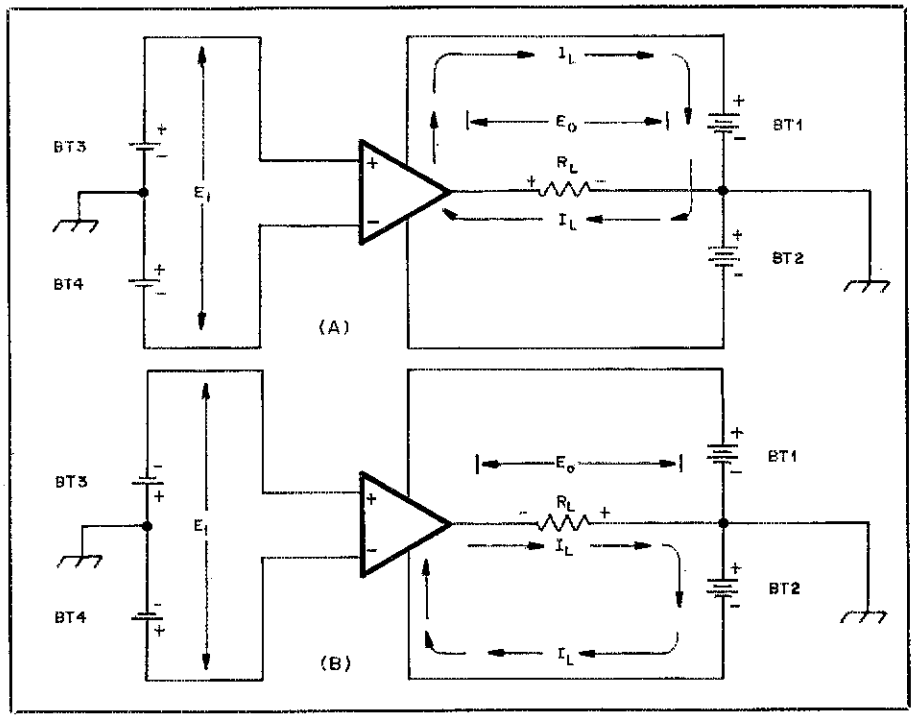


Fig. 1 — Input connections and output current flow in a differential amplifier. The arrows depict the direction of actual electron flow. In A, the input signal causes the amplifier to sink the load current. Reversing the input polarity, as in B, causes the amplifier to source the load current.

The Ideal Op-Amp

A perfect amplifier would have infinite input impedance, infinite gain, and zero output impedance. Infinite input impedance means the amplifier responds to the signal voltage without drawing any current from the source. A device having zero output impedance will supply a constant voltage regardless of the current taken by the load. Another characteristic of our ideal amplifier is absolute linearity, meaning the output is a perfectly proportioned magnification of the input. Obviously we can't have any linearity at all if the amplifier gain is infinite, but we shoot for infinity, hoping for "extremely high" gain. Of course we'd like our amplifier to exhibit infinite bandwidth, zero phase shift and zero noise. We can't realize these characteristics in practice, but the ideal amplifier is a useful model on which to base our study of op-amp theory. For the time being, we'll think of our ideal amplifier as a "black box," without concern for what goes on inside.

Differential Inputs

Most electrical devices have two input terminals and two output terminals. Your VOM, for example, has two probes, and its meter movement has two lugs. One probe may be connected directly to the meter, but for electrical analysis they must be considered separately. When using your VOM, you often clip one probe to the chassis of the equipment you're testing and make all measurements with respect to "ground," but you're still making a two-terminal measurement. Many dedicated amplifier circuits are designed with a common input/output terminal, often connected to ground. We'll look at some of these circuits in this series, but the important thing to remember about op amps is that the input (and sometimes the output) terminals are uncommitted; we may connect them as we please.

An amplifier may have two input terminals referenced to a common point such that the input/output transfer functions have opposite signs. This would be called a *differential* amplifier. Sounds awful,

*Assistant Technical Editor, *QST*

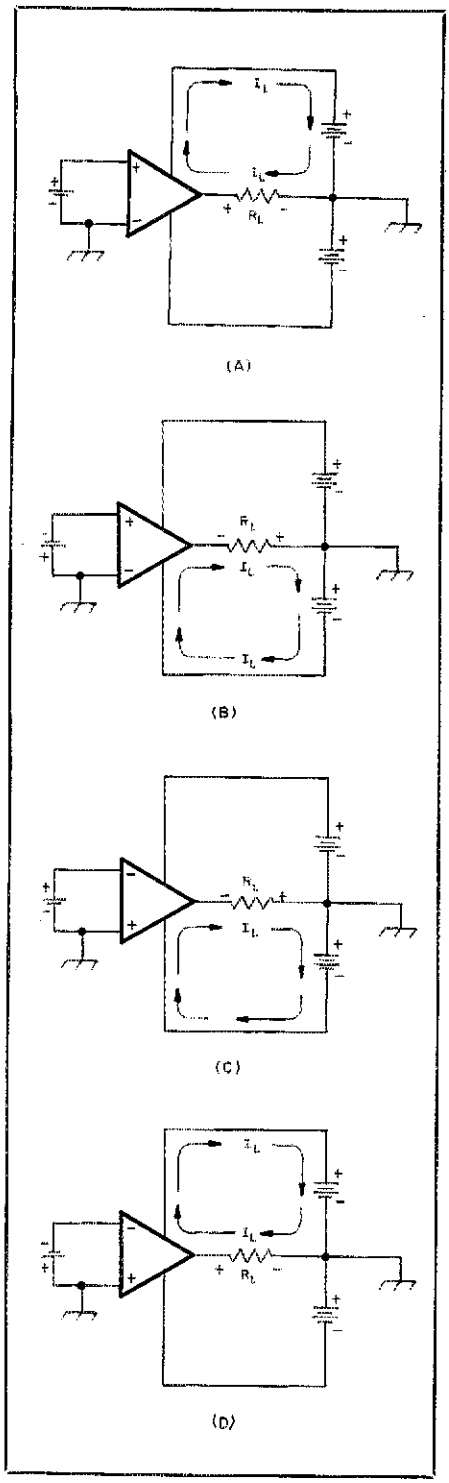


Fig. 2 — Differential amplifier circuits having one input terminal common to the output and power supply returns. When the "+" input terminal is above ground, as in A and B, the amplifier is noninverting, meaning the polarity of the output voltage (with respect to ground or common) is the same as the input. In C and D, the "–" terminal is above ground, and the amplifier inverts the polarity of the input signal.

doesn't it? Just look at Fig. 1 and it should become perfectly clear. Two dc power sources, BT1 and BT2, bias the amplifier and supply the load current. Notice the polarity of the power sources, and that they have a common reference point, which is one of the amplifier's output terminals. The input signal is generated by BT3 and BT4, having equal voltages, which are also referenced to the common output terminal. The terminal marked "–" is called the inverting input, and the one marked "+" is the noninverting input. In Fig. 1 a positive voltage (with respect to "ground") applied to the noninverting input causes the "high" side of the output to go positive and "sink" the load current. Similarly, a negative potential applied to the inverting input causes the output to be positive. Reversing the input batteries, as in Fig. 1B, will make the output go negative and "source" the load current. This time the "–" terminal inverts the positive input signal, and the "+" terminal amplifies the negative input signal with no polarity reversal. If only one of the batteries were reversed, the inputs would oppose rather than aid each other, and the output voltage would be zero. If the input voltages are unequal, the output is proportional to their differences; hence the name *differential* amplifier.

Single-Ended Inputs

For simplicity, we sometimes make one of the amplifier inputs common to the output circuit. I've illustrated this configuration in Fig. 2. The inverting input terminal is common in A and B. The amplifier is noninverting. In C and D an inverting amplifier, made by grounding the noninverting input terminal, is shown. Later we'll see how to get away with a single-ended power supply, too.

Closing the Loop

Remember that our device amplifies the potential difference between the inputs? We can introduce negative feedback around the circuit and use the differential effect to establish almost any desired transfer characteristic. To see how, let's take a simple but practical example. The amplifier in Fig. 3A has its inverting input grounded through R_B. There's no harm in inserting this resistance, because our ideal device doesn't draw any input current. So far we have the same noninverting amplifier we saw earlier (Fig. 2A and 2B). Adding R_A as in Fig. 3B alters the circuit's operation dramatically. For convenience, let's make its value equal to that of R_B. If we apply 1 volt (positive) to the noninverting terminal, the output voltage will rise in the positive direction. When the output potential reaches 2 volts, the potential at the inverting terminal will be 1 volt because R_A and R_B form a two-to-one divider. But now both inputs have the same potential and there's no difference to amplify, so the output stops increasing. If the output overshoots the 2-volt mark, the inverting input will exceed 1 volt. Now we have some input differential, and its polarity forces the amplifier's output voltage in the negative direction. Our circuit is a servo system, and as long as the amplifier doesn't develop too much phase shift, it will be stable.

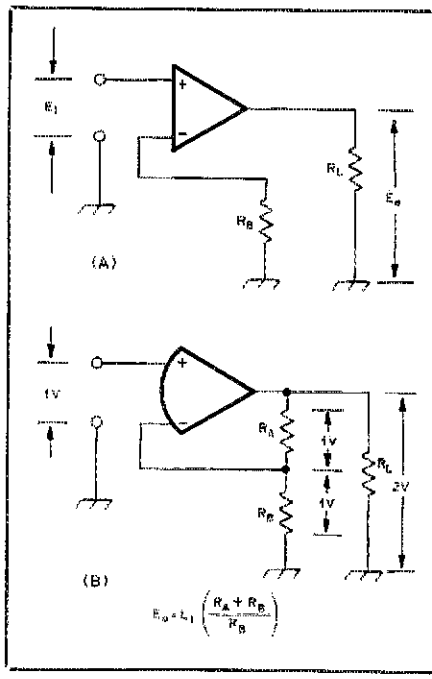


Fig. 3 — Our ideal amplifier has infinite input impedance; therefore we can insert a resistor in either input leg. In A, R_B is between the "–" terminal and ground. The circuit is very similar to those of Figs. 2A and 2B. In B, R_A creates a negative feedback path. Differential amplifiers intended for closed-loop applications are called op amps and are represented schematically by a convex edge on the input side. Given an ideal amplifier, the characteristics of the circuit in B are determined almost entirely by the feedback network.

Let's make R_A twice as large as R_B. If we apply the same 1-volt input signal, the inverting input voltage won't reach 1 volt until the output reaches 3 volts, because R_A and R_B form a three-to-one divider. By now, I'm sure you've deduced that the numerical voltage gain of this type of circuit is simply the ratio

$$\frac{R_A + R_B}{R_B} \quad \text{which reduces to } 1 + \frac{R_A}{R_B}.$$

What has become of the input and output impedances? If we make the load resistor smaller, we'd expect the output voltage to drop. If it does, the input-voltage differential will increase, causing the output voltage to return to its lightly loaded value. Defining dynamic impedance as $\Delta Z = \Delta E/\Delta I$, where Δ (delta) is a small change, we see that $\Delta Z = 0$, because $\Delta E = 0$. Actually, I'm only talking about the *resistive* component of impedance here. My use of "impedance" rather than "resistance" is not an attempt to confuse the reader, but rather a reflection of popular usage.

The input impedance of the device is high to begin with, but applying negative feedback makes it still higher. The tiny current taken by the input of an actual op amp is a function of the differential input

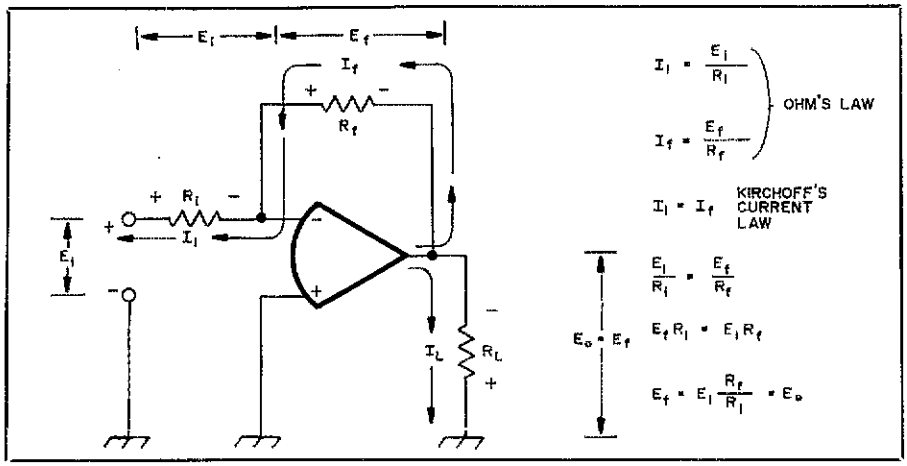


Fig. 4 — An inverting op-amp circuit showing the polarities and directions of the input, feedback and load voltages and currents. The equations are discussed in the text.

voltage. By minimizing the differential input voltage, the feedback minimizes the input current, making the dynamic input impedance approach infinity. We can establish any convenient input impedance by shunting a resistor from the noninverting input to ground. Glen Thome uses this technique in his variable-gain microphone preamplifier, described elsewhere in this issue.

The Voltage Follower

If we eliminate R_B in Fig. 3B, we will have 100% degenerative feedback. To maintain zero input voltage differential, the output must track the input exactly. Our voltage gain is unity. R_A can be a short circuit in most voltage follower applications. What's the point of building an amplifier with no voltage gain? A voltage follower is the ultimate impedance transformer. The feedback causes the input impedance to approach infinity, and the output impedance to approach zero. With this circuit we can sample the signal from a high-impedance source without loading it down, and apply it to a low-impedance load without any voltage step-down. The result is a tremendous power gain.

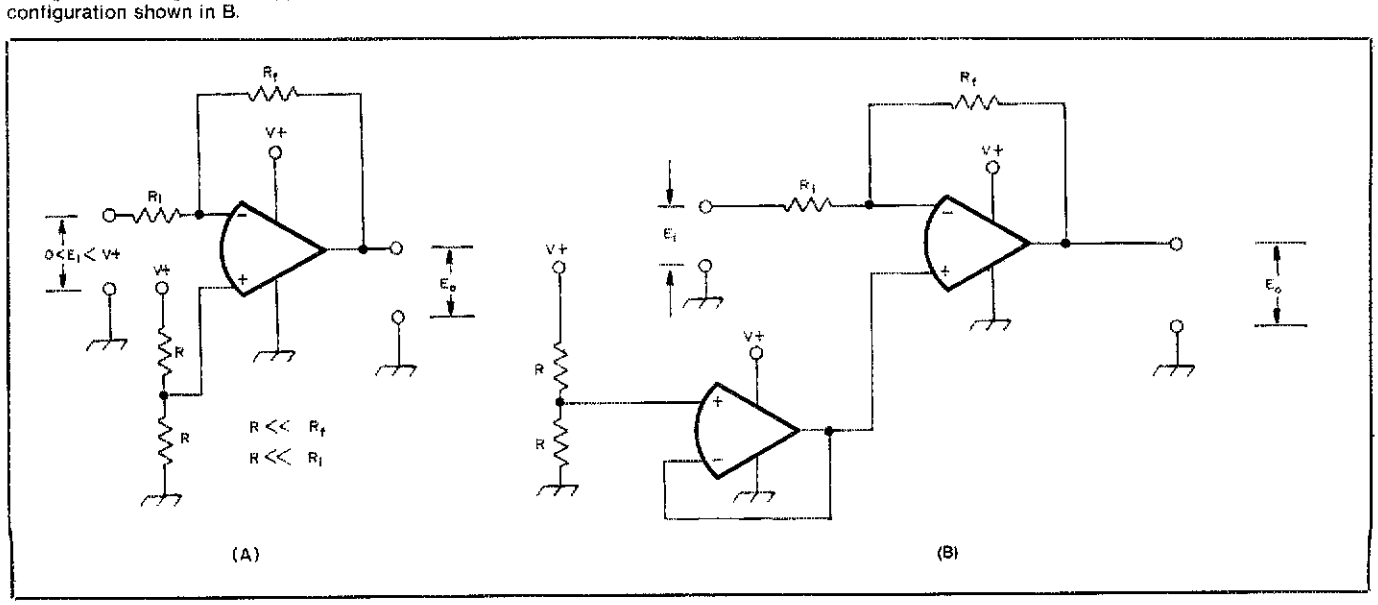
Inverting Amplifiers

How do we control the gain of an *inverting* amplifier? Fig. 4 shows a common circuit. For this configuration, the noninverting terminal is grounded and the signal is applied to the inverting terminal through an input resistor R_i. A feedback resistor, R_f, is connected from the output to the inverting input. The servo action of the feedback loop will tend to maintain a zero voltage differential between the input terminals. Since the noninverting terminal is tied to ground, which is our zero-voltage reference point, the inverting input will have zero potential also.

When the amplifier is connected this way, we call the inverting input a *voltage node, summing junction* or *virtual ground*. Because the voltage at this point is always zero, the junction looks like a ground to the rest of the circuit, hence the name "virtual ground." The circuit's input impedance, then, is simply R_i. We can't tie the junction to true ground because that would short circuit the amplifier's input terminals. Let's make R_f twice as large as R_i and inject a positive 1-volt input signal. Because the inverting input terminal is held at zero potential, our 1-volt input signal is developed across R_i. The current through R_i, denoted as I_i, equals E_i/R_i, which in our example is $1/R_i$. Our ideal amplifier doesn't draw any significant current, but the input current has to go *somewhere*. The only available path is through the feedback resistor. Kirchhoff's current law states that the sum of the current flowing into a junction must equal the sum of the current flowing out of the junction. (You need to know this law for your General class license exam.) The feedback current, then, I_f, equals E_f/R_f. Since we made R_f twice the value of R_i, $I_f = E_f/2R_i$. By Kirchhoff's current law, $I_f = I_i$. Therefore we can equate the expressions for I_f and I_i: $E_i/R_i = E_f/R_f = E_f/2R_i$. The means-extremes property of proportionality tells us that $2R_iE_i = E_fR_i$. Dividing both sides of this equation by R_i leaves $2E_i = E_f$. E_f is measured from the output to the inverting input, which is a virtual ground, so $E_f = E_o$. Our circuit has a voltage gain of two, which you suspected all along, right? The gain of an inverting op-amp circuit is simply R_f/R_i, and this equation is derived in Fig. 4. Just as in the noninverting case, the output impedance is zero.

Sometimes only one power supply is available. If we leave the noninverting input terminal grounded, a positive input signal will cause the output to attempt to swing negative. Without a negative supply, the amplifier isn't capable of negative

Fig. 5 — An op amp may be operated with a single power supply if the common input is returned to an artificial ground having half the supply voltage. In A, this ground is approximated by means of a resistive voltage divider, but a lower impedance can be obtained from the voltage follower configuration shown in B.



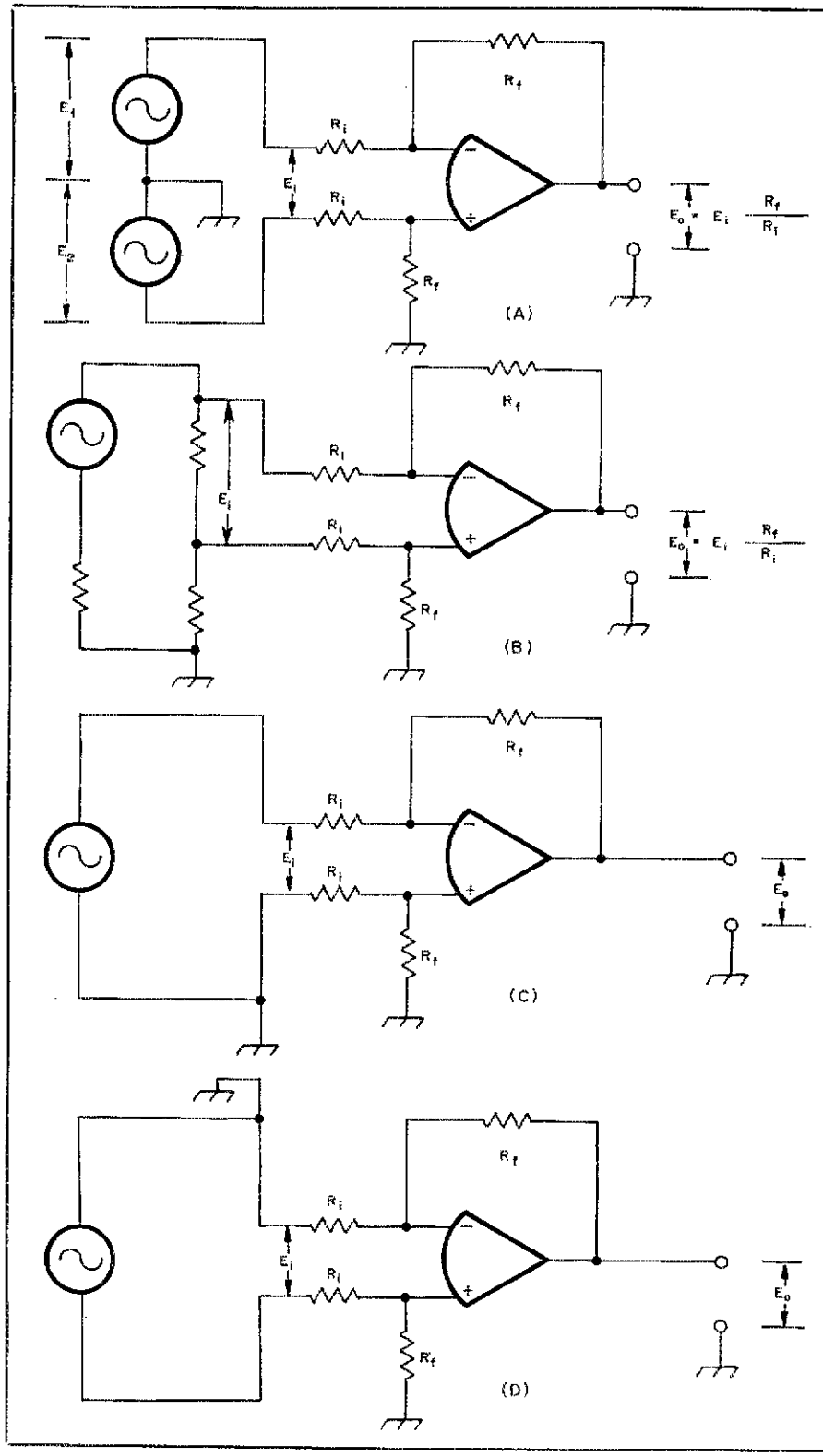


Fig. 6 — Differential op-amp circuits. In A, the input voltage E_i is represented by two components, E_1 and E_2, each referenced to ground. In B, the input voltage is sensed across a resistor with neither end directly grounded. C and D illustrate the two limiting cases used to derive the transfer and impedance equations for the general case presented in A.

output. The trick here is to attach the noninverting terminal to a "pseudo ground" having half the supply voltage. A simple resistive divider as in Fig. 5A will work, but the resistors must be small compared to the input and feedback resistors if the ground is to be "stiff" enough. A better solution is illustrated in Fig. 5B. Here the divider is isolated from the inverting amplifier by means of a voltage follower. With this circuit, the noninverting terminal sees a zero impedance at half the power supply voltage. The exact voltage isn't important so long as it's within the expected input signal range, but biasing the amplifier to half the supply voltage ensures the widest input dynamic range.

Closed-Loop Differential Amplifiers

Suppose we want to sense a voltage source with neither side grounded. The circuit in Fig. 6A will serve the purpose. Of course, the input source must return to ground *some* way, but it can take a roundabout path. The generator and resistor network depicted in Fig. 6B is a typical situation. The equation for the transfer function is $E_o = E_i R_f / R_i$, where the polarity of E_o is that of the noninverting side with respect to the inverting side. Without going through a rigorous proof, we can motivate this result by analyzing the two limiting cases. Fig. 6C shows one side of the input voltage source grounded. Since the input terminals of the device don't draw any current, the values of the resistors connected to the noninverting terminal are inconsequential, and the circuit degenerates to the single-ended inverting amplifier we've already studied. In this case, the voltage gain is R_f/R_i. Grounding the other side of the source, as in Fig. 6D, makes the circuit look something like our original noninverting configuration. The gain from the noninverting input to the output is

$$\frac{R_f + R_i}{R_i}$$

but we have a loss coefficient of

$$\frac{R_f}{R_f + R_i}$$

between the source and the inverting input. Our source-to-load gain is the product of these coefficients:

$$\left(\frac{R_f + R_i}{R_i}\right)\left(\frac{R_f}{R_f + R_i}\right)$$

The $(R_f + R_i)$ terms cancel and the expression reduces to R_f/R_i. Intuitively, we can conclude that placing the ground reference anywhere between these extremes will not alter the gain. In the differential op-amp circuit of Fig. 6A, the equivalent impedance to ground looking into the inverting side is

$$\frac{|E_1|R_i}{\left|E_1 + E_2\left(\frac{R_f}{R_i + R_f}\right)\right|}$$

You must account for the polarities of E_1 and E_2. For the noninverting side, the equivalent impedance to ground is simply $R_i + R_f$. In the degenerative cases illustrated in Fig. 6C and 6D, the input impedances to ground become R_i and $R_i + R_f$, respectively.

And Next Time . . .

That's enough to digest for now. In the next part of this article we'll look inside the black box and talk about some things to consider when designing real circuits.

An Analysis of the Balun

What does a balun do for you? What happens if you don't use one? Does a balun really make a difference?

By Bruce A. Eggers,* WA9NEW

bal·un (bal'un), n. a word formed from the words "*bal*anced" and "*un*-balanced." Identifies any of a series of devices used to couple unbalanced transmission lines to balanced loads.

Okay, so that's what a balun is. But what does it do for you? You've probably heard that a balun is used to feed a balanced antenna. What is a balanced antenna? The determining factor is how the antenna is fed. Perhaps the best way to answer this question is to cite some examples. A half-wave dipole, current fed across a center insulator, is perhaps the most common example. This antenna is designed to perform best when each side is fed separate currents of equal amplitude and opposite phase.

Having established this basic idea on defining a balanced antenna, we can now look at some common variations. The folded dipole is one. The currents flowing in the various elements of a folded dipole may be of different amplitude, and you can have more than the common two radiators, but if the feed principle is the same, it's a balanced antenna. The cubical quad can be viewed as a variation of the folded dipole. From this you can see that loops, rhombics, Yagis, and a whole host of antennas, depending upon how they are fed, can all be balanced antennas. On the other hand, a vertical antenna and a ground-plane antenna are unbalanced — the current in these antennas does not flow in identical fashion away from each of the two conductors of the feed line.

In today's marketplace just about all of the transmitters use the same output circuit, the pi network. This single-ended circuit has become very popular for a variety of reasons, not the least of which is the popularity of coaxial cable. While coax isn't the answer to all of the problems with feed lines (and it certainly has high loss problems at the higher frequencies), it does have some redeeming qualities. One of the more convenient things about coax is that, when used properly, you can route it just about anywhere. No need for standoff or feedthrough insulators.

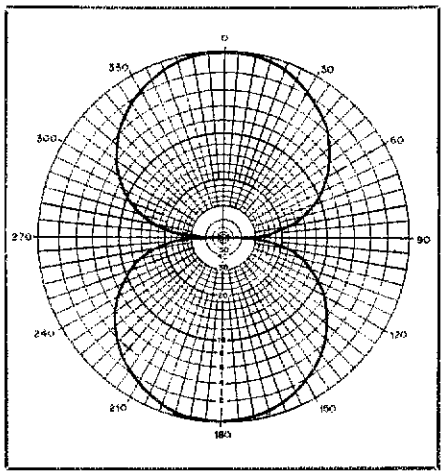


Fig. 1 — Classic response pattern of a half-wavelength dipole in free space. The concentric-circle scale is indicated in decibels down, relative to the response in a broadside direction from the axis of the dipole. The outer scale shows degrees of departure from one broadside direction. The axis of the conductor is common with the line between the 90° and 270° outer-scale markings.

But coaxial cable is an unbalanced feed line. All of the current flows *inside* the line. The inner conductor and the inside of the shield are the two conductors in this line. Therein lies the problem. Feeding a balanced antenna with unbalanced feed line may cause currents to flow on the *outside* of the shield. In fact, given a feed-line length that is significantly long at the operating frequency (e.g., greater than on the order of 0.15 wavelength), one can model the coaxial feed line connecting a single-ended or unbalanced transmitter output to a balanced antenna as a three-conductor feed line!

The "third conductor" and its associated current is the outside of the coaxial shield. The magnitude of this current is a function of the impedance to ground of this conductor. And this impedance can be controlled. If the feed-line length is greater than one quarter of a wavelength long, a "skirt" one quarter of the wavelength long can be placed around the outside of the shield and shorted to the shield one quarter of a wavelength from the load. Such a device, commonly referred to as the "bazooka," is adequately documented in all recent editions of the ARRL *Handbook* and *The ARRL Antenna Book*. It is also well described in any of several other references.[1]

If the feed line is not a quarter wavelength long, or if one wants to accomplish the same effect with lumped components, then there are a variety of other ways to accomplish the same thing. One of the more recent and original ideas presented in the literature on this subject is contained in the article by Reisert, W1JR, in the September 1978 issue of *Ham Radio*.[2] So now let's move on to the question, "What happens if you don't use a balun?"

The Great Experiment

Everybody recognizes the classic "figure-eight" radiation pattern of a half-wave dipole in free space. Fig. 1, taken from *The ARRL Antenna Book*,[3] shows

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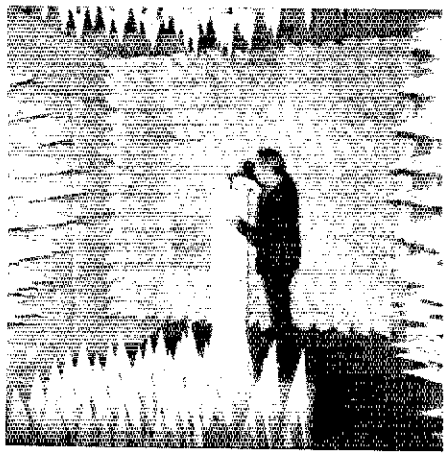
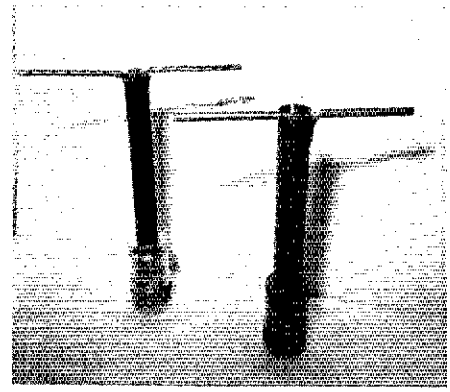
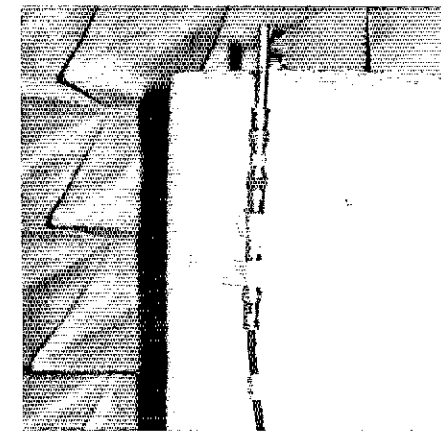
[1]References appear on page 21.



The author positioning one of the test antennas on the rotatable Styrofoam support in the rf anechoic chamber.



Close-up photograph of the two 1.6-GHz half-wave dipole antennas used in the author's tests.



The balun-fed test antenna mounted on the antenna support. (This mounting technique is not recommended for regions subjected to high winds or heavy icing.)

what this looks like. But this figure is an idealized pattern based on current flowing only in the antenna. What does this pattern look like in a real-world situation and what happens to it if we allow current flow on the outside of the feed line? Figs. 2 and 3 answer the question.

The radio-frequency anechoic chamber at North Carolina State University was available to us. An rf anechoic chamber is simply a room in which the walls, floor and ceiling are covered with a material that is designed to break up an electromagnetic wave and absorb its energy. If you put an antenna in such a chamber it can not "see," or be influenced by, any surface or objects that can reflect or reradiate electromagnetic energy. How about that! "Free space" right here on earth! But putting just one antenna in a chamber isn't going to do you any good. You still can't see or measure the radiation pattern. To take care of that problem you have to provide a source of radio-frequency energy. Then if you put an antenna in the chamber, you can observe how it performs as you change its orientation.

For these tests the source of the rf was a half-wave balun-fed dipole, similar to the one on the right in the photograph above, mounted horizontally at one end of the chamber. The balun is electrically equivalent to the quarter-wave bazooka balun discussed above and in reference 1. It was mounted at the same height as the receiving antenna and fed a few milliwatts of power at 1.6 GHz. The test antennas were then mounted, one at a time, horizontally, at the other end of the chamber, on a rotating support. The supports for both antennas were made of Styrofoam with a relative permittivity of about 1.03.[4] (No metal towers to affect this pattern!) The test antennas were then rotated a full 360 degrees. The received signal was carried to the receiver outside of the chamber on a coaxial feed line. The feed line dropped away from the antenna perpendicularly for a distance of about nine wavelengths. (How would you like to

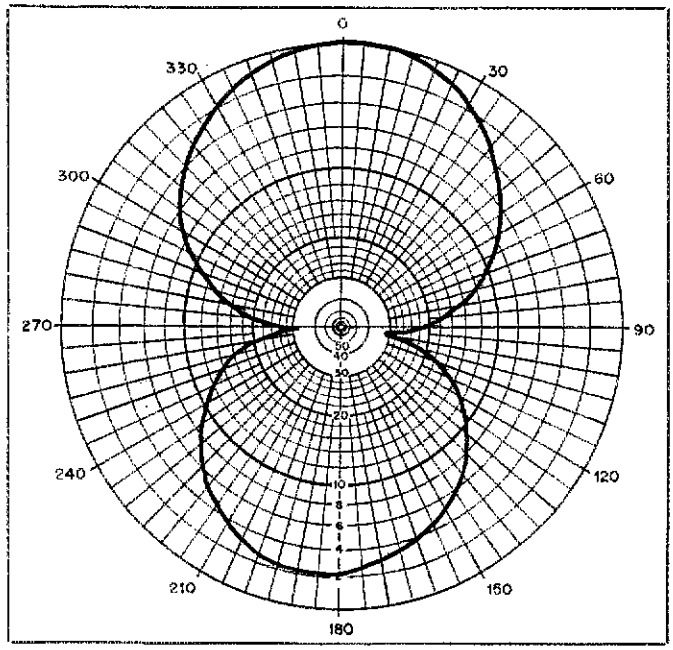


Fig. 2 — Response pattern of the balun-fed half-wavelength dipole in the rf anechoic chamber. The apparent front-to-back ratio exists because the antenna was not located at the exact center of the rotating support. This response and that of Fig. 3 are drawn to the same relative scale.

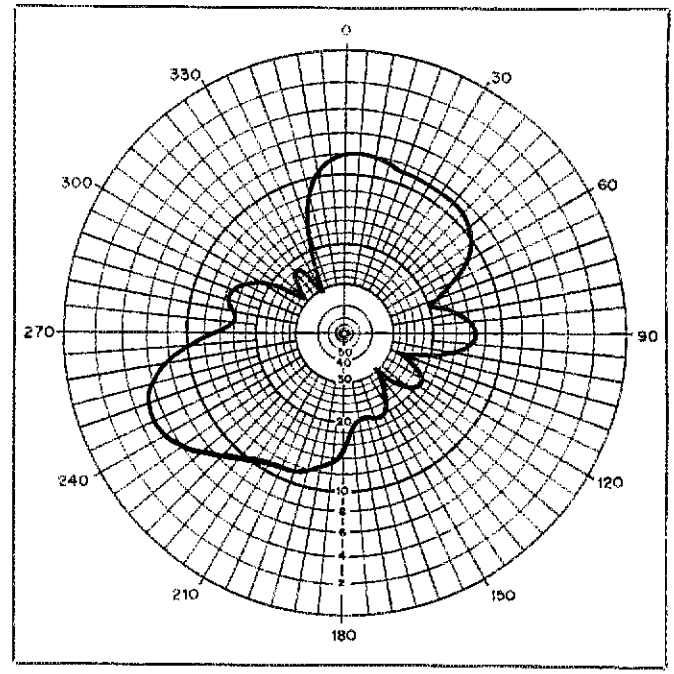
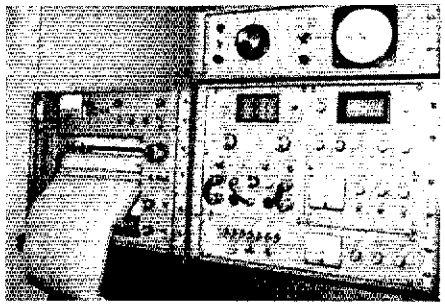


Fig. 3 — Response pattern of the half-wavelength dipole without a balun. The pattern changed significantly during tests if the coaxial feed line was relocated, no doubt caused by changes in the amplitude and phase of currents flowing on the outside of the line.



The Scientific-Atlanta, Inc. test equipment outside of the chamber. The series 1520 rectangular recorder is on the left. The series 4100 position-control unit sits atop the series 1600 receiver.

have your 80-meter dipole that high!)

The receiving, recording and antenna-positioning equipment are all from Scientific-Atlanta, Inc. The series 1600 receiver tunes from 50 MHz to 32.8 GHz in nine bands. The received signal level is fed to a series 1520 rectangular recorder,[5] where the feed rate of the chart is controlled by the series 4100 position-control unit. The recorded signal level is kept as low as possible, consistent with producing a usable output signal with the antennas in the least optimum position, to minimize the effects of any reflected energy that might be received and processed.

Fig. 2 shows the pattern of the balun-fed antenna. The signal level in the nulls off the ends of the antenna is about 32 dB below the "broadside" signal level. Noise precludes identifying nulls significantly deeper than that level in this particular setup.

Fig. 3 shows the pattern of a dipole without the benefit of the balun. The peak amplitude of the signal is about 5 dB below that of the balun-fed antenna and one of the nulls, 30 degrees from broadside, is just as deep as was the null off the end of the balun-fed antenna. There are a couple of points about this trace that need to be considered. First, the exact location of peaks and nulls is highly dependent upon the relative location of the feed line as the antenna is rotated. In repeating the experiment with a different relative position of either, the pattern changes. Fig. 3 can only be considered as representative of how a half-wave dipole performs as a receiving antenna when used without a balun and when used with a long feed line. Second, the overall drop in signal level is not necessarily representative of what you should expect from the antenna in a transmit application. Reciprocity notwithstanding, antenna currents flowing on the outside of the coax are, in general, lost to the receiver. These same currents, in the transmit mode, can radiate energy which effectively fills in the nulls noted here. The pattern of Fig. 2 is fully predictable and can be easily reproduced in a repeated experiment. That of Fig. 3 cannot.

So what does a balun do for you? It gives you a predictable pattern. The biggest benefit which accrues from this feature is applicable to using a balanced element in a directional array. Can you imagine using a radiator with a pattern like that of Fig. 3 in a parasitic array? But many do! In such an application, the presence of the parasitic elements in the near field no doubt tends to smooth out the irregularities of the far-field pattern. But, as the old saying goes, "You can't make a silk purse out of a sow's ear."

Conclusions

The results of this experiment should not necessarily be interpreted to mean that installing a balun on your 80-meter dipole is going to result in any detectable differences. Remember, this dipole was in "free space." Your antenna interacts with all kinds of reflecting and reradiating objects. Every piece of material in the vicinity of the antenna has an effect. And it seems reasonable to assume that the number of nulls and peaks in Fig. 3, and the depth of the nulls, is related to the length of the feed line. The pattern of your 80-meter dipole might not look as bad as Fig. 3, but you can rest assured that it probably doesn't look like Fig. 2 either. The majority of the variations between a real-world antenna pattern and an idealized pattern, at least in regard to simple antennas on the lower frequencies, will result from objects in the near field of the antenna. The additional variations introduced as a result of not using a balun in an application of a coaxial-fed balanced antenna will become most significant at higher frequencies with multielement antennas.

If one had ready access to a facility such as this anechoic chamber on a regular basis, it would be most interesting to run a series of these experiments using a variety of different antenna types. Perhaps someone could do that. I, for one, would like to see the effects of a balun on other antenna types. The author wishes to express his appreciation to Dr. J. Frank Kauffman of the Department of Electrical Engineering at North Carolina State University for his assistance in the conduct of the experiment, and to Pershing Hicks for his photography.

References

[1]Jordan and Balmain, *Electromagnetic Waves and Radiating Systems*, 2nd edition, Prentice-Hall, p. 407.

[2]Reisert, "Simple and Efficient Broadband Balun;" *Ham Radio*, September 1978, p. 12. Also see Nagle, "High-Performance Broadband Balun," *Ham Radio*, February, 1980.

[3]*The ARRL Antenna Book*, 13th edition (1974), Fig. 2-13, p. 37.

[4]Kraus and Carver, *Electromagnetics*, 2nd edition, McGraw-Hill, p. 58.

[5][Data provided in rectangular form by the author has been replotted in the more familiar polar form for presentation in Figs. 2 and 3. — Ed.]

Strays

NARROW BAND COMMUNICATIONS PROJECT

☐ Narrow Band Communicators (NBC) recently activated a 100-mW, 2-meter, linear translator in the hills of Oakland, California, about 800 feet above sea level. Signal reports from the San Francisco bay area are excellent. Stations in the San Joaquin-Sacramento valley and the Sierra Nevada mountains have also worked the translator. The system which is operating very well, demonstrates the efficiency of narrow-band communications. — *Vivian Franco, WB6VTG, Daly City, CA*

NORTHWEST ONTARIO SENIOR CITIZENS TUNE IN THE WORLD

☐ An Amateur Radio Station, VE3LMB, has been established in Grandview Lodge, a senior citizens home, in Thunder Bay, Ontario. Funds for the project were provided through a "New Horizons" grant from the Department of Health and Welfare. This project gives retired people the opportunity to share their interests, skills and talents in developing and carrying out projects of their own design and choosing.

Early last year 10 retired hams founded the Northwestern Ontario Senior Citizens Amateurs, and a search began for a site to set up a senior citizens station. They needed a site with adequate space, light and heat, as well as easy access for handicapped persons and flexible operating hours. Club members discovered that the Grandview Lodge had a ground floor room available. Soon thereafter work began on the radio room. The club gained a room and the lodge gained a hamshack. The club has fulfilled all three of its original objectives: (1) to establish and operate an Amateur Radio station for senior citizens, (2) to establish a service department where members can repair their own equipment, and (3) to assist senior citizens throughout Northwest Ontario in making contacts with friends and loved ones.

MORE MILES PER WATT

☐ Frank Crowe, WB6UNH, of Carpinteria, California, reports working nine states on 1 mW or less output. Frank has also worked about 35 states at 1 watt or less, and is working on DXCC with 10 watts or less output. His best miles-per-watt performance is from Carpinteria to WB9LTY in Indianapolis, Indiana, on 0.1 mW output. Worked *All Continents at 10* watts was "too easy" — he's working on getting it with 250 mW.

• *Basic Amateur Radio*

20, 40 and 80 Meters with the "Basic Radio Receiver"

Last month we learned the fundamentals of simple receivers. Now let's build a down-converter for reception of signals on 20, 40 and 80 meters!

By Doug DeMaw,* W1FB and Bob Shriner,** WAØUZO

Have you been anxious to listen to something other than WWV on 2.5 MHz since constructing our tunable i-f receiver from March *QST*? By now you must have every clock in the house, and the one on your wrist and in the automobile, set precisely to the second! So let's get on with the remainder of the project. You're probably anxious to hear amateur signals in the 80-, 40- and 20-meter bands.

With this month's converter, visible in Fig. 1, you can listen to any 200-kHz segment of the three amateur bands for which our converter is designed. The only change that needs to be made in the circuit of Fig. 2 for ssb reception is the selection of crystal frequencies for Y1, Y2 and Y3. One set will permit coverage of the cw bands, and the other will allow you to listen to the phone portions of the bands.

How Does a Converter Work?

A converter merely changes one frequency to another frequency as a matter of convenience. In our case, the main tunable receiver covers from 2.5 to 2.7 MHz. Therefore, we must do something to the 3.5-, 7.0- and 14.0-MHz signals so

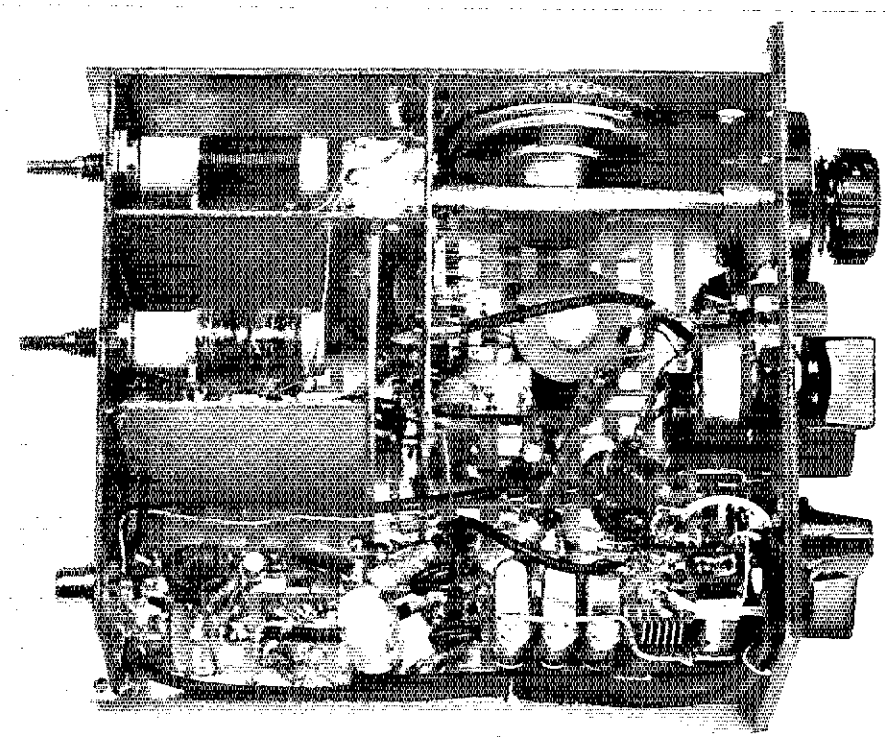


Fig. 1 — View of the composite receiver after the crystal-controlled converter was built along the side of the main circuit board. An additional pc-board shield plate has been added (left center of photograph) to help isolate the converter from the tunable receiver described in March *QST*. The coax cable from T1 of Fig. 1 is routed through a small hole in this partition to L1 of the main receiver. This view is seen without the receiver side wall in place.

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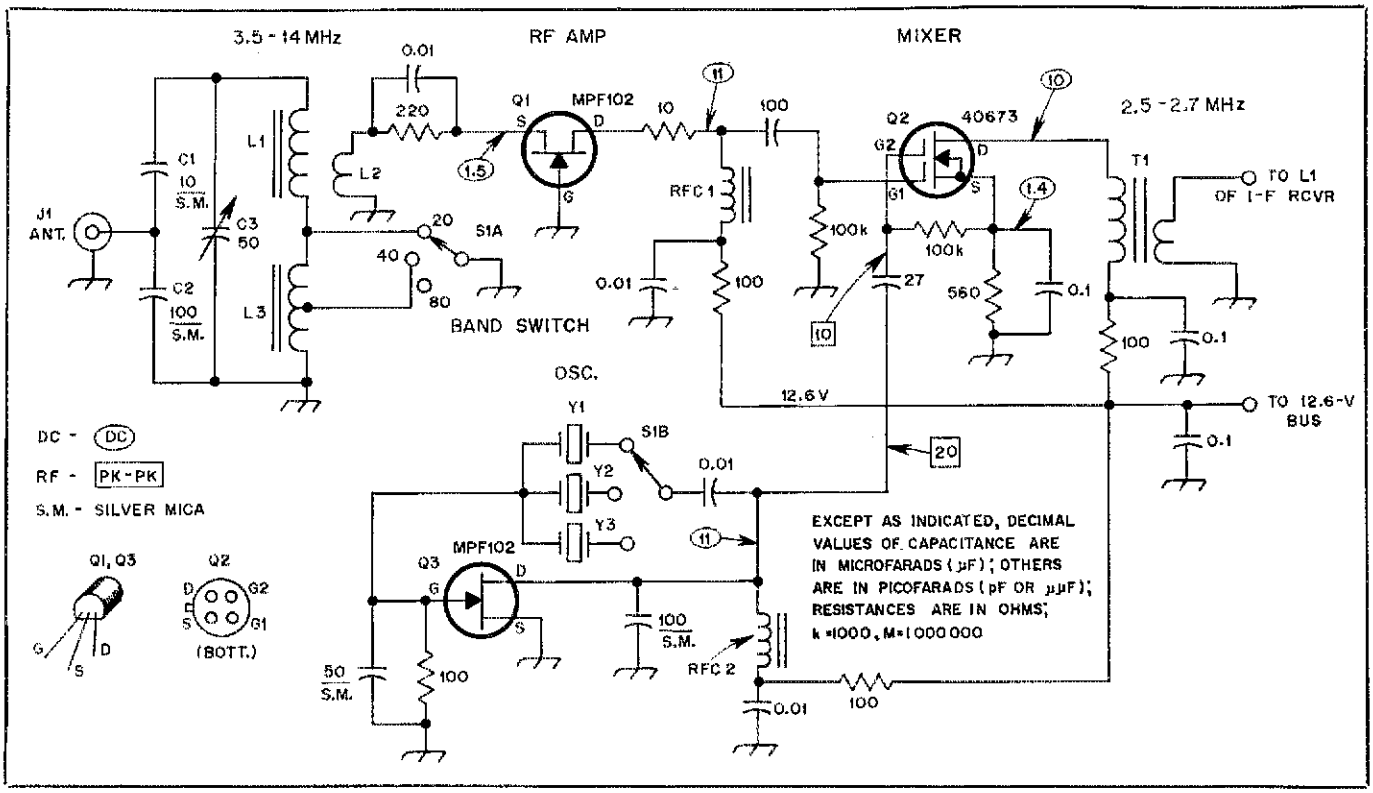


Fig. 2 — Schematic diagram of the three-band down-converter. Fixed-value capacitors are disc ceramic unless otherwise indicated. Resistors are 1/4-or 1/2-watt composition types.

C3 — 50-pF variable.

J1 — Phono jack (J1 from March *QST* project).

L1 — 4-μH toroidal inductor. Use 31 turns of no. 24 enam. wire on an Amidon T50-6 toroid core.

L2 — 6 turns of no. 24 enam. wire over L1 winding on same core.

L3 — 46-μH toroidal inductor. Use 90 turns of no. 30 enam. wire over Amidon T68-2 toroid core. Tap 35 turns from L1 end.

Q1, Q3 — High-frequency n-channel JFET. Motorola MPF102, Siliconix U310 or 2N4416.

Q2 — RCA dual-gate MOSFET. 3N211 also suitable.

RFC1, RFC2 — 1mH rf choke. J. W. Miller Co. 70F103AI or equivalent.

S1 — 4-pole, 3-pos. single wafer switch.

T1 — Broadband toroidal transformer, 112:1 impedance ratio. Primary contains 40 turns of no. 28 enam. wire (1 mH) on an Amidon FT-50-43 toroid core (950 mu). Secondary consists of 4 turns of no. 28 wire over the primary winding.

Y1 — For 20-meter cw — 16.7 MHz. For 20-meter ssb — 16.85 MHz.

Y2 — For 40-meter cw — 9.7 MHz. For 40-meter ssb — 9.8 MHz.

Y3 — For 80-meter cw (3.5-3.7 MHz) — 6.2 MHz. For 80-meter cw (3.6-3.8 MHz) — 6.3 MHz. For 75-meter ssb (3.8-4.0 MHz) — 6.5 MHz. All crystals are in HC-6/U style holders, 30 pF load capacitance. International Crystal Co. type GP or equivalent.

that the receiver can accommodate them. Thus, the task is one of mixing the signals from each of these bands with a suitable local-oscillator frequency so that the resulting intermediate frequency (i-f) is in the 2.5- to 2.7-MHz range. A converter can be used to accomplish this job. In essence it converts 3.5, 7.0 or 14.0 MHz to 2.7 Mhz for use with our direct-conversion receiver from March *QST*. When the little receiver is tuned to the opposite end of its range (2.5 MHz) we will hear amateur signals at 3.7, 7.2 or 14.2 MHz, depending on the position of S1 of Fig. 2. In other words, as we tune the receiver we will hear amateur signals between 14.0 and 14.2 MHz, 7.0 and 7.2 MHz, and 3.5 and 3.7 MHz.

The technique we are employing is called "down-converting." It is possible and practical to "up-convert" also. Some commercial receivers use that scheme. For example, if we had a tunable receiver that covered 14.0 to 14.2 MHz, we could build an up-converter that would enable us to hear the 80-meter band from 3.5 to 3.7 MHz. We would have to select the proper crystal frequency for the converter oscillator. It would be necessary also to employ the appropriate coil and capacitor values for reception of the 80-meter band. From this it can be seen that up-converting is as practical as down-converting.

Our Project this Month

It will be helpful to those who build this month's project if we examine the circuit of Fig. 2 and explain how it works. The first stage of the circuit employs a grounded- or common-gate JFET rf amplifier. The input impedance at the source element of the FET will be low — on the order of 200 ohms, depending on the exact transconductance of the FET used ($Z_{in} = 10^6/g_m$, where Z is in ohms and g_m is the transconductance in micromhos). Therefore, a small coupling link (low impedance), L2, is used between the input tuned circuit and the source of Q1. L1 and L3, in combination with C1, C2 and C3, permit the input circuit to be tuned to 80, 40 and 20 meters. The circuit is designed for use with 50-ohm antennas. That is why a capacitive divider (C1 and C2) is employed. The junction of the two capacitors provides a 50-ohm connection point for the antenna feed line.

Q1 does not provide as much gain in the grounded-base configuration as it would in a grounded-source arrangement. The gain of Q1 in this circuit is on the order of 6 dB. If the output of Q1 had a tuned circuit instead of an rf choke, the gain could be as great as 15 dB, according to theory. Practically, it would be closer to 12 dB. In a grounded-source circuit the gain could approach 20 dB. But we have chosen the grounded-gate hookup in the interest of circuit stability. Generally, if the gate lead is kept short in this type of circuit there will be little chance for unwanted self-oscillation of the rf amplifier. The 6 dB of amplifier gain is ample for our purposes. The collective gain of Q1 and the mixer, Q2, is 15 dB. This is about right for our tunable i-f receiver in the interest of good performance under strong-signal conditions. Too much gain leads to receiver overloading — a condition we want to avoid.

The output of Q1 contains a 10-ohm resistor. It prevents unwanted vhf parasitic oscillations. RFC1 acts as a very broad tuned circuit, thereby allowing us to accommodate signals from 3.5 to 14 MHz without a tuning capacitor in that part of the circuit. The primary sacrifice in using this arrangement is a loss of stage gain, which we discussed earlier.

Q2 is the mixer in our converter. It mixes the incoming amateur signals with energy from the oscillator (Q3) to provide the desired 2.5- to 2.7-MHz i-f. A broad-

Fig. 3 — Closeup view of the band switch, showing the toroids and some other small parts mounted on the rear of the switch (see text).

band transformer (T1) is used at the mixer output. It eliminates the need for still another tuned circuit, which would have to be adjusted each time we moved the tuning dial on our main receiver. Once more, the elimination of the mixer-output tuned circuit reduces the amount of gain the mixer is capable of providing. The proper name for mixer gain is *conversion gain*. Q2 in this circuit provides 9 dB of conversion gain. With a tuned circuit for 2.5 to 2.7 MHz in the drain circuit, the gain would be approximately 15 dB in a

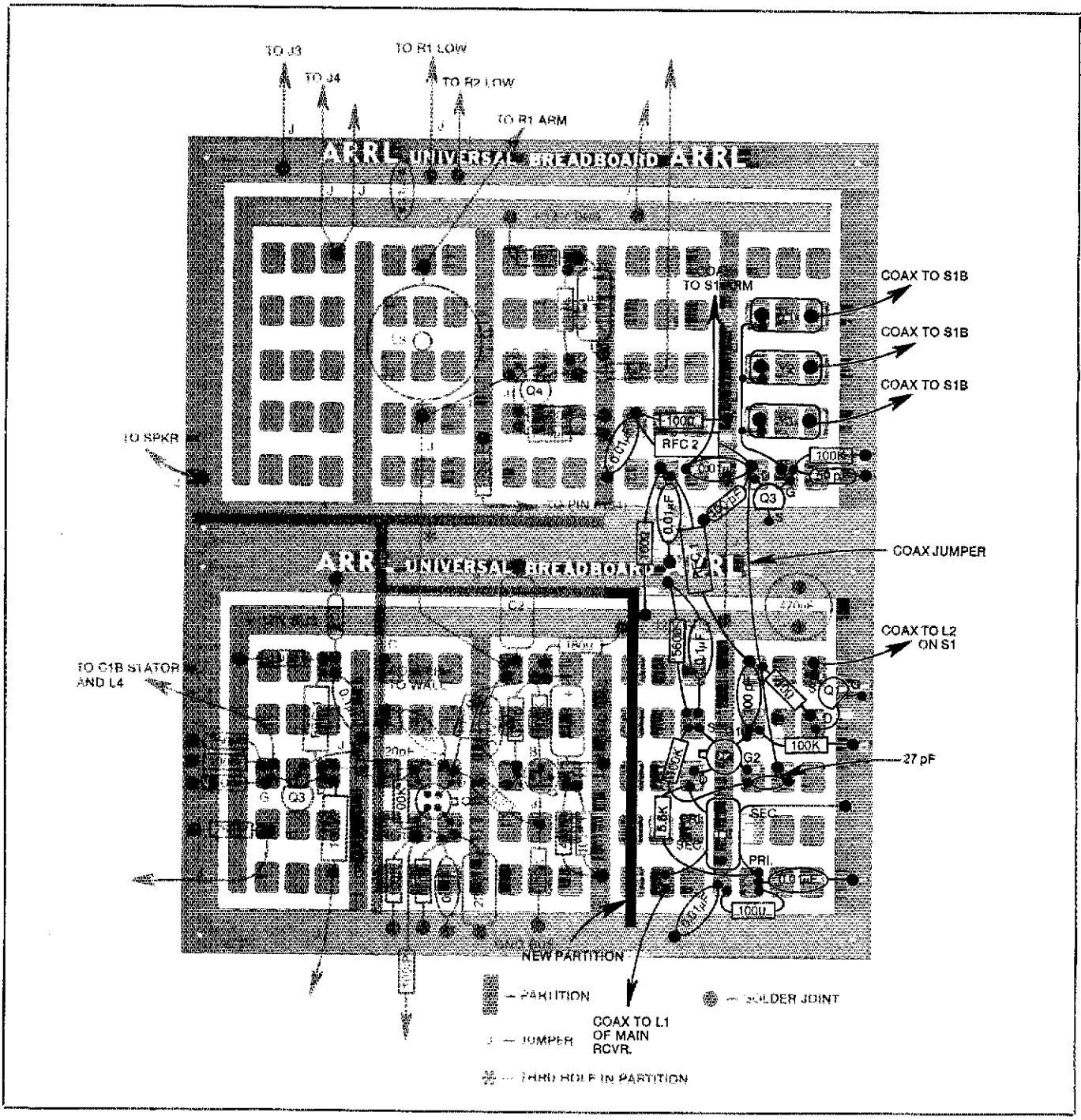


Fig. 4 — Parts-placement guide for the overall receiver. The converter components are shown at the right in heavy lines. The black dots indicate solder joints. The scale black-and-white pattern for this board was presented in Basic Radio, September 1979 *QST*. C3 is mounted on the front panel.

well-designed circuit.

A Pierce type of crystal oscillator is used at Q3. RFC2 is used instead of three individual tuned circuits to simplify our circuit and eliminate the need for an extra switch section at S1. The 50- and 100-pF silver-mica capacitors determine the feedback ratio for the oscillator. The values were chosen to ensure reliable oscillator operation while providing approximately equal amounts of rf output voltage to Q2.

Assembling the Converter

Fig. 1 shows the converter after it was built into the vacant space of our March *QST* receiver.[1] All component leads should be kept as short as possible to prevent self-oscillations and stray signal pickup. Miniature coaxial cable (RG-174/U or equivalent) is used between the contacts of S1 and the circuit-board pads to which it connects. Similarly, the small coax cable is used between J1 of Fig. 2 and S1. A short length of the cable is employed between the output winding of T1 of Fig. 2 and L1 of the main tunable receiver. The shield braid of the coax cable should be grounded at each end of each cable.

A length of bare wire is soldered to the case of each crystal, then soldered to the ground lug of C3 and the front panel. This prevents the metal cans on the crystals from radiating energy into other parts of the receiver.

C1, C2 and the Q1 source resistor and capacitor (220 ohms and 0.01 μF) are soldered directly to the switch terminals of S1 (see closeup photograph in Fig. 3). In a similar manner, L1 and L3 are located at the immediate rear of S1.

We can see more clearly how the parts are mounted on the circuit board by observing the layout in Fig. 4. Make certain that good solder joints are made each time a part is added. Be sure to start mounting the parts near the center of the receiver, then work your way out to the edge of the circuit board. This will simplify your work with the soldering iron. It should also prevent you from burning the components that are already in place! Details of the switch wiring are given in Fig. 5.

After all of the parts are mounted you should check carefully for loose joints and unwanted solder bridges between circuit-board pads. Wiggle each component to make sure its pigtails are soldered firmly in place on the board.

Checkout and Use

Attach an antenna for the band of interest (J1). Set the band switch to the appropriate band. Turn on the power supply and peak C3 for maximum signal, as heard in the speaker or phones. If all is as it should be, no further work will be

[1]Circuit boards, negatives and parts kits for this and other *QST* projects are available from Circuit Board Specialists, Box 969, Pueblo, CO 81002.

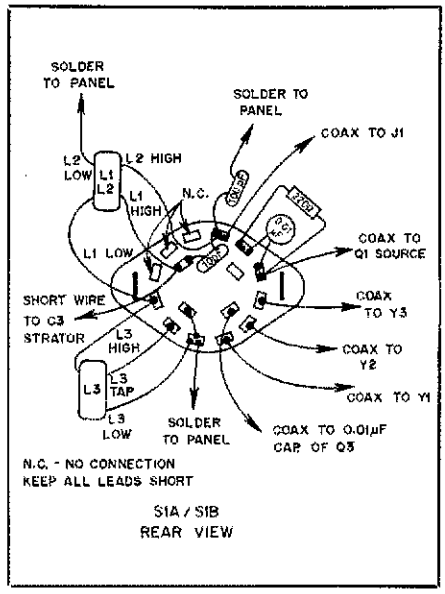


Fig. 5 — Pictorial detail of how the band switch is wired. The blank switch-section lugs are used as tie points only.

necessary. If the circuit fails to function, check the various voltages that we have noted on the schematic diagram in Fig. 2. Departures of 10% are entirely acceptable, owing to differences in the characteristics of the transistors you may have wired into the circuit. If there are major differences in the operating voltages, check to see if the transistors are wired correctly into the circuit. If they are, but the circuit still will not perform, recheck your wiring job and look for errors.

There should be a definite peak in signal level for each of the bands when you adjust C3. The crystal frequencies we have specified are for reception of the cw bands. If you are interested only in ssb reception, consult the parts list of Fig. 2 for alternative crystal frequencies.

After the circuit is made operational you may install the remaining pc-board side panel on the receiver. A top cover can be fashioned easily from perforated aluminum stock of the type sold at hardware stores. A cover can also be made from double-sided pc board.

Some Final Comments

We hope you have learned something about simple receivers while reading the March and April issues of *QST*. If you want to get deeper into the receiver design, read the ARRL's *Solid State Design for the Radio Amateur* ($7 from ARRL or your local dealer).

This is by no means the end of our Basic Radio series, so please stand by for more interesting projects and the accompanying theory. Later on we'll be describing a simple keyer with built-in paddle, a universal tester and a frequency counter. Be sure to have a good supply of solder and plenty of replacement tips for your soldering pencil! QST

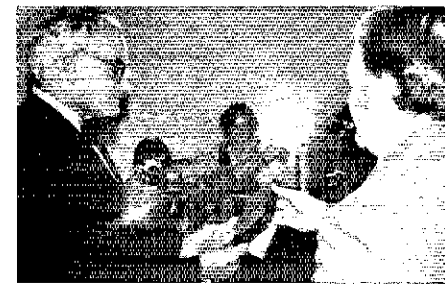
Strays

NN3SI OPERATING SCHEDULE

☐ Special-event station NN3SI, operating from the Nation of Nations exhibition of the Smithsonian Institution, Washington, DC, adheres to the following schedule:

Day	Time (UTC)	Frequency (MHz)
General Monitoring		
Monday-Friday	1300-1345	7.090
	1700-1800	7.265
Sunday	1800-2130	28.1-28.2 or 21.1-21.2
Daily Scheduled Operation		
Monday	1900-2000	28.640
	2030-2130	14.220
Tuesday	1900-2000	28.640
Wednesday	1900-2000	28.640
Thursday	1500-1700	18.030-28.040
	1800-1900	21.030-21.040
	1900-2100	14.030-14.040
Friday	1900-1945	21.255-21.265
	2015-2100	21.155-21.165
	2130-2200	3.925
Saturday	1900-2000	14.300
Sunday	1500-1700	7.125
	1900-2000	28.640

NN3SI is operated in conjunction with the Smithsonian ARC and the Independent Volunteer Placement Service of the Smithsonian Associates. QSL address is NN3SI, Smithsonian Institution, Washington, DC 20560.



Senator Barry Goldwater, K7UGA (R-AZ), recently accepted an honorary membership in the Binghamton (NY) Amateur Radio Association (BARA) from BARA treasurer John J. Connors, WB2GHH. Senator Goldwater was honored for his constant efforts to advance the radio art and for representing the amateur in legislative matters.

Granville Klink, Jr., W3AFV (right), received the ARRL 50-year membership award from ARRL President Harry J. Dannals, W2HD, at the Old Timers QCWA annual banquet in Gaithersburg, Maryland, during 1979.

A T-Network Semi-automatic Antenna Tuner

Good harmonic suppression and the capability of matching a wide range of antenna-system impedances are offered by this T network. Semi-automatic tuning is an added bonus!

By Bill K. Imamura,* JA6GW

There it is, ready for the initial test! For a moment you stand admiring your just-installed antenna, anticipating the new wallop your signal will have. Even though the work had been hampered by weather and the mischievous workings of Murphy's law, you've added the final touch only moments before darkness approached. Now to the rig!

As the first surge of power goes down the transmission line to the antenna, you anxiously watch the meters to see "how she loads up." Then there is a hesitation, retuning of the final, followed by a telltale frown. Ah so, the "Law" has one more game to play. The SWR turns out to be much more than the 1.5:1 or 2:1 you'd expected. What then? Adjustments on the antenna could produce an improvement, but suppose the improvement is not enough? In that case, the alternative is to construct a matching network.

If, in reality, you are faced with the need to acquire an antenna tuner (more properly an antenna impedance-matching network), one decision to be made is whether to buy or build. If you elect the construction approach, the next choice will be that of the circuit.

Various configurations of so-called "tuners" have been described in Amateur Radio publications. L and pi networks, used extensively in the past, have been replaced as popular choices by the T-network Transmatch circuit introduced to *QST* readers nearly two decades ago by Lew McCoy, W1ICP.[1] The T network found in the Transmatch is basically a form of a high-pass filter that contains two capacitors in series with the transmission line.[2] These are sometimes referred to as capacitance arms. But, another configuration of the T match is the basic low-pass network. This arrangement is used widely in broadcasting in America. The advantages of the low-pass network (with inductive arms) are good harmonic suppression and the capability of matching on three separate bands without band-switching. I use this system, as described

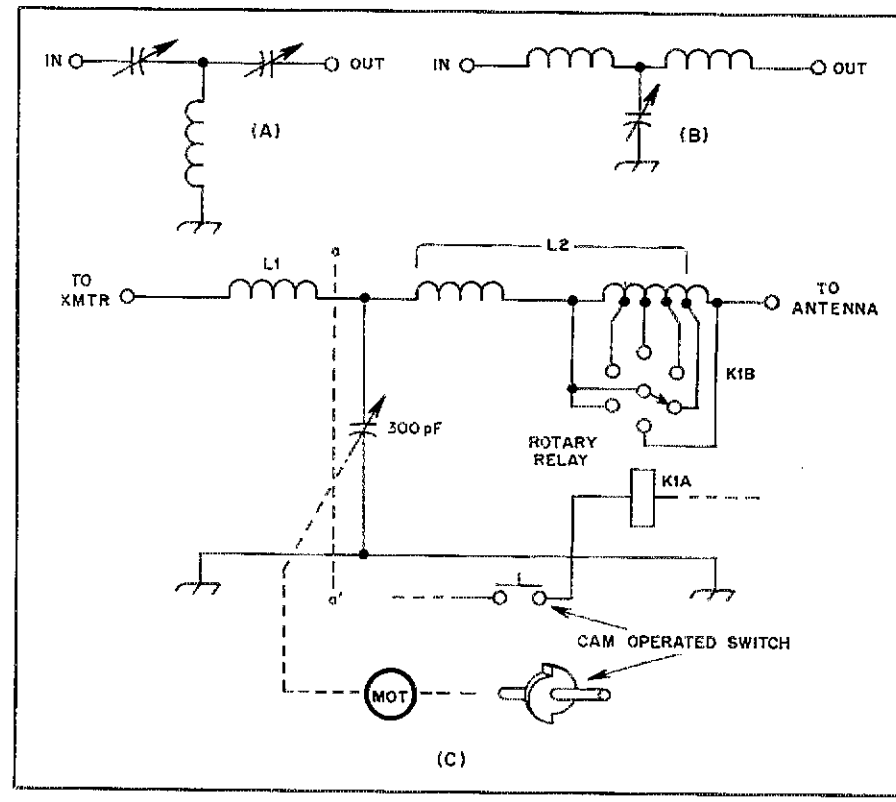


Fig. 1 — T-network configurations. An arrangement with capacitive arms is shown at A, while B shows a T network with inductive arms. The system with inductive arms, at C, offers a wide range of antenna impedance matching besides being an efficient means of harmonic attenuation. Step switching of the taps on L2 is provided by a rotary relay. The variable capacitor is motor tuned.

*2-3 Hikari-ga-oka, Fukuoka City, Japan 816
[1]Notes appear on page 30.

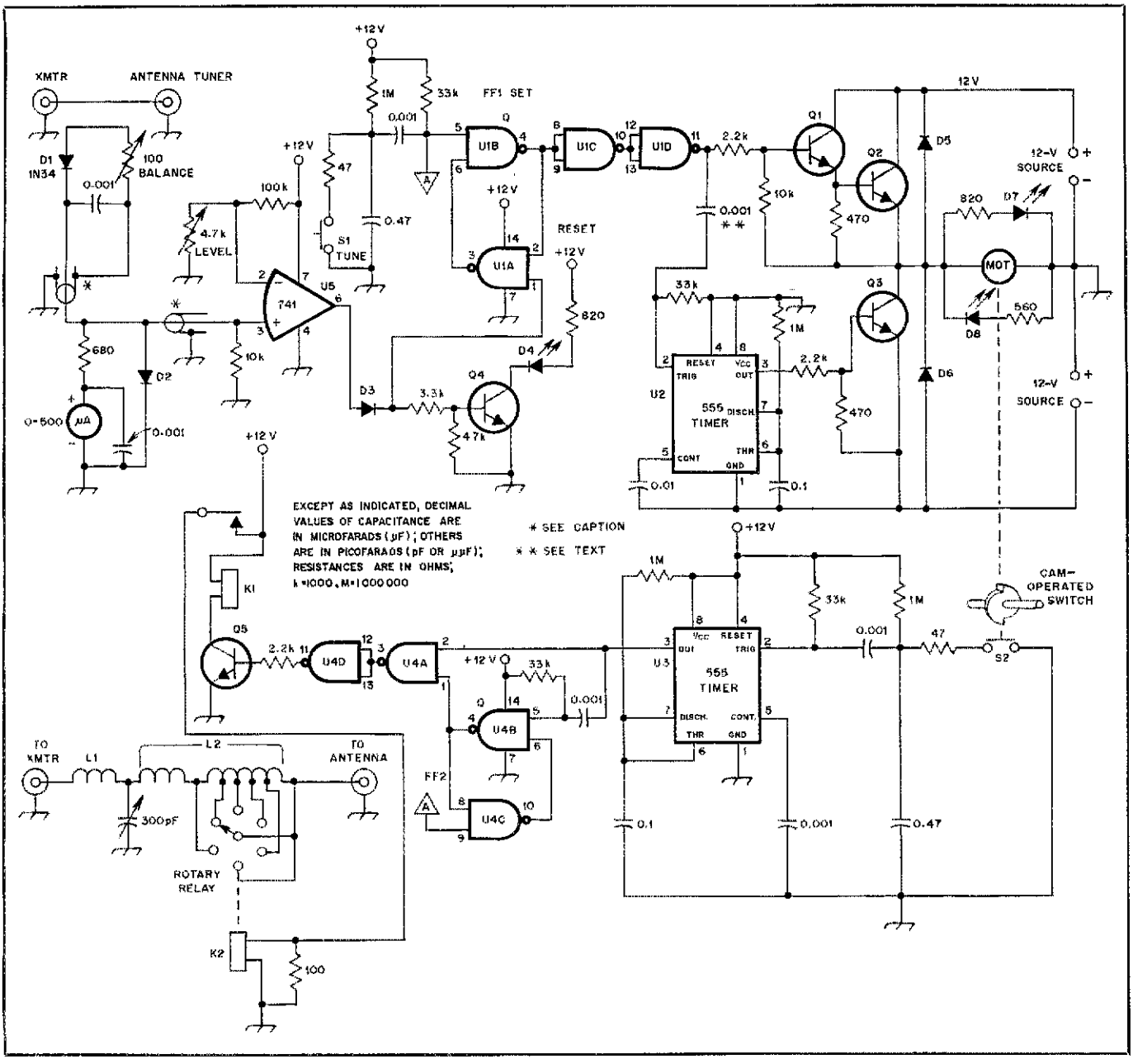


Fig. 2 — The solid-state semiautomatic antenna tuner designed by Imamura. A cam mounted on the shaft of the variable capacitor actuates the micro switch (S2) at every 180° of rotation. The motor, (MOT), a small, 12-V clutch type, is connected to the variable capacitor through a gear train. A dual-polarity power supply furnishes the required 12 volts.

D1 — 1N34 germanium diode.
D2, D3 — Silicon diodes, Toshiba LS1588, Workman 1062 or equiv.
D4, D7, D8 — LED, Radio Shack 276-033 or equiv.
D5, D6 — 1N4002 diodes, 600 V, 1 A.
K1 — 12-V miniature relay, Radio Shack no. 275-003 or equiv.
K2 — Rotary relay, Poly Paks no. 92CU6052.
Q1, Q4 — Npn silicon transistor, Toshiba 2SC372, Workman 372 or equiv.
Q2, Q3, Q5 — Npn silicon transistor, National (Panasonic) 2SC1226, Workman 751 or equiv.
U1, U4 — Quad 2-input NAND gates, MC14011.
U2, U3 — 555 timer.
U5 — 741 operational amplifier.

below, in conjunction with my tribander antenna on 14, 21 and 28 MHz. The T match is most satisfactory for this situation.

The T Network

Fig. 1 illustrates the two general types of T networks, namely the type with capacitive arms and that with the inductive arms. The circuit I use is also shown in this drawing. It provides good matching between the 50-ohm output of a transmitter and the feed point of any antenna if the SWR is no greater than 3:1. In the design of this tuner, I chose an operating Q of 2.0 for 14 MHz and a Q of 4.0 for 28 MHz. An optimum matching-circuit design is one in which the Q is low.

As you look at the circuit diagram in Fig. 2, you will note that only four taps are on the output coil, L2. The reason for this is that the rotary relay I have provides five positions. The fifth position serves to short out the coil.

For a T-network design such as the one I've shown, the worst-case SWR might be as high as 1.06:1 after final tuning adjustments are made. I believe that an SWR of 1.06 is quite practical for Amateur Radio purposes.

I wish to state that an SWR of 1.06, as referred to above, can be quite different from the 1.06 displayed on some SWR meters. Let me explain. Many SWR monitors sold these days consist of a capacitive/inductive (C-M) sensor

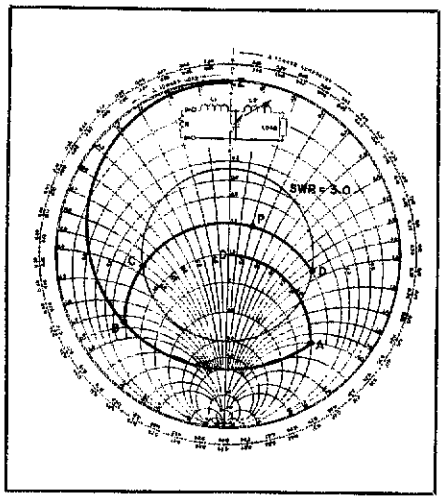


Fig. 3 — The T network is designed with the aid of this Smith Chart. This tuner will match those impedance values that lie within the 3.0-SWR circle. See text for details.

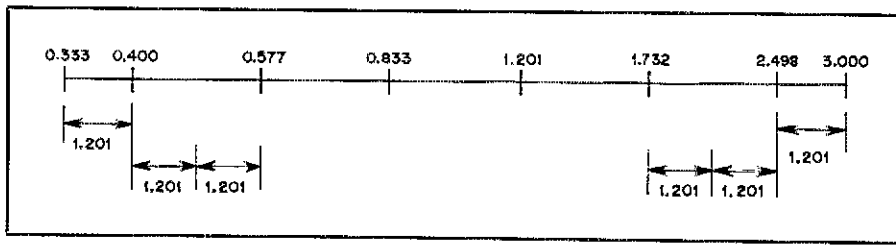


Fig. 4 — See explanation in text.

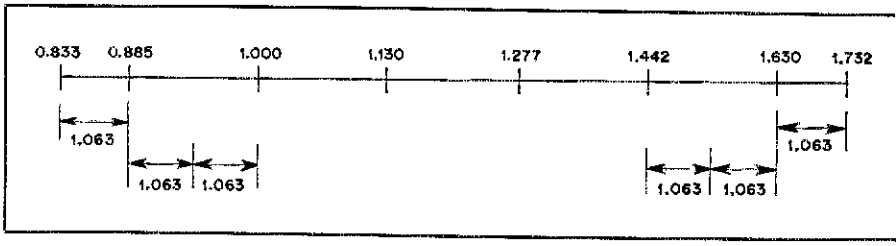


Fig. 5 — See explanation in text.

whereby the pickup coil is coupled to the transmission line through capacitance, mutual inductance and a diode rectifier. Because a diode does not conduct until the voltage across it reaches a certain value, known as threshold voltage, I am doubtful if inexpensive SWR meters will show any reliable deflection at low SWR levels such as 1.06.

Network Design

Delving into a theoretical discussion of network theory is not the intention of this article. I offer, instead, only a brief explanation of the procedure for determining the values of the T-network components.

Calculating the parameters of a T network is simplified by the use of a Smith Chart[3] like the one in Fig. 3. Observe that a constant SWR circle representing an SWR of 3.0 is shown. We are to understand, then, that the network to be designed is to match any impedance within this circle. Every impedance for the design is normalized. That means we divide the impedance by 50 ohms, which is the characteristic impedance of the transmission line.

The impedance of the input port is R = 1.0 and is plotted at prime center, 0. With an operating Q of 2.0 at 14 MHz, the reactance X_{L1} is 2.0. Connecting X_{L1} in series with R permits us to move the impedance to the right along the resistance circle of R = 1.0 until the reactance coordinate reads X = 2.0. Then the impedance at a-a′ in Fig. 1 is represented by point A.

Draw a circle centered on the resistance axis and let it pass through points A and Z. With the capacitive reactance of the variable capacitor in parallel, the impedance locus moves along the circle, for example, to B. AB is the value of capacitive reactance of the circuit.

Now let's suppose the load impedance is shown at P with R = 0.7 and X = 0.2. The length of the arc BP represents the reactance required for X_{L2}. Therefore, along the resistance circle of R = 0.7, the length of BC or BD yields, respectively, the minimum or maximum reactance required for X_{L2} to match a load impedance, which appears on the resistance circle of R = 0.7.

Varying R in the resistance circle from 3.0 to 0.33 in small increments enables you to calculate the required reactance values. The results are shown in Table 1. Values of the resistance component of load impedances within the SWR 3.0 circle range from R = 0.333 to R = 3.000. Note in Fig. 4 that the range of 0.333 to 3.000 is divided in a geometric ratio having six steps. What we are saying here is that we can cover from R = 0.333 to R = 3.000 with a worst-case SWR of 1.201:

$$\left(\frac{3.000}{0.333}\right)^{1/12} = 1.201$$

Table 1 shows that the maximum reactance for L2 occurs at R = 1.732, and the minimum at R = 0.833.

Table 2

Coil and Capacitance Data

Band	Operating Q	L1	C	L2
14	2.0	1.14μH	128→261pF	0.47→2.11μH
21	3.0	1.14	69→127pF	0.61→2.03
28	4.0	1.14	41→74pF	0.61→2.01

Now let's divide the range (1.732 to 0.833) into six steps as shown in Fig. 5. We see that any impedance can be matched with a worst-case SWR of 1.063:

$$\left(\frac{1.732}{0.833}\right)^{1/12} = 1.063$$

Reactance X_{L2} should be 0.822 at a minimum and 3.711 at a maximum. Values for 14 MHz, therefore, are 0.47 μH and 2.11 μH. The values of the inductance and capacitance calculated for each band are tabulated in Table 2.

Circuit Description

A negative-going pulse, generated when

Table 1

Results of Smith-Chart Calculations

On Resistance Circle OF	Reactance Coordinate of B	Resistance Circle Intersects with SWR Circle At		Reactance Required for X_{L2}	
R = 30	−2.449	0		2.449	
2.498	−2.500	−1.042	+1.042	1.458	3.542
1.732	−2.379	−1.332	+1.332	1.047	3.711
1.201	−2.136	−1.249	+1.249	0.887	3.385
0.833	−1.863	−1.041	+1.041	0.822	2.904
0.577	−1.598	−0.768	+0.768	0.830	2.066
0.400	−1.356	−0.416	+0.416	0.940	1.772
0.333	−1.247	0		1.247	

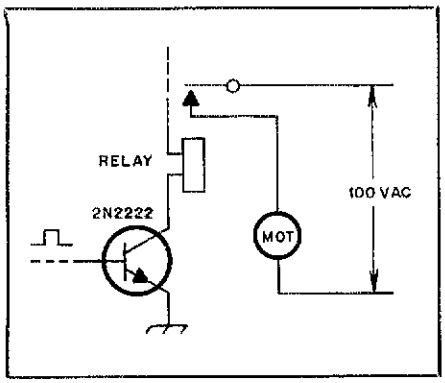


Fig. 6 — A method of actuating a tuning motor such as the one described in the text.

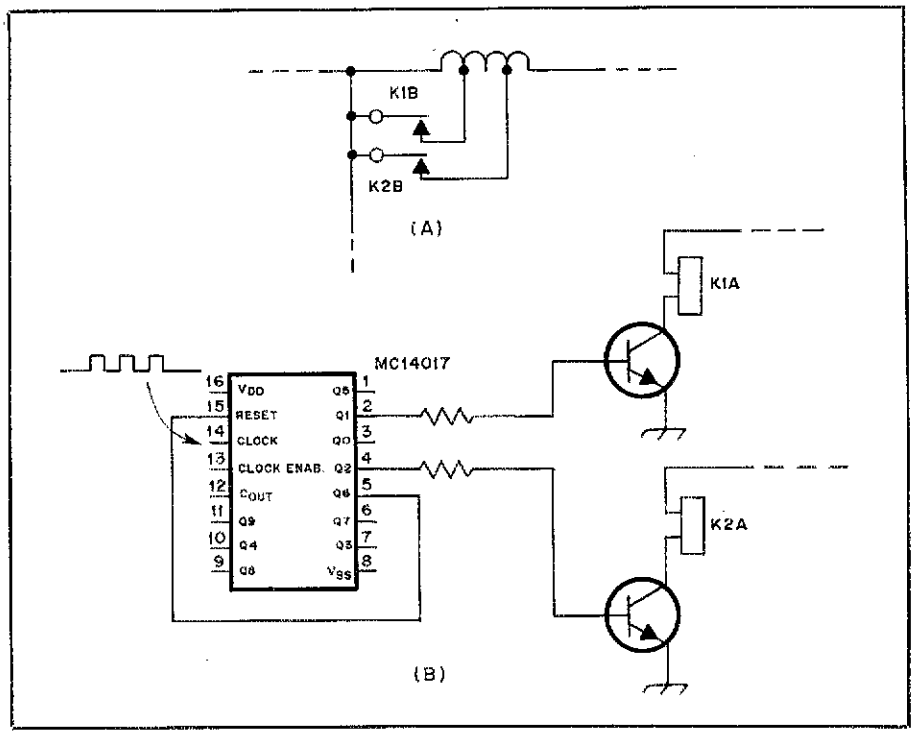


Fig. 8 — An alternative to the rotary relay may be constructed with multiple relays controlled by a decade counter, as suggested by this diagram.

the TUNE button is pressed, sets FF1 (gates U1A and U1B), causing the output Q of the gates to go high. This action turns on the Darlington pair, consisting of Q1 and Q2, causing the motor to turn. A reduction gear train connects the motor to the tuning capacitor. Two inverters in cascade between FF1 and Q1 prevent noise pulses, generated when the motor starts or stops, from falsely triggering the flip-flop.

A Micro Switch is actuated at every 180-degree rotation of a cam mounted on the shaft of the variable capacitor. Closing of the switch permits the rotary relay to be energized, resulting in a change of the coil tap position.

The reflected wave is detected at the C-M sensor, then applied to the comparator. The 741 operational amplifier operates without negative feedback. A slightly positive bias is applied to the inverting input by means of the voltage divider.

Depending on whether the voltage of the reflected wave at the noninverting input is greater than or less than the bias voltage at the inverting input, the output voltage of the comparator swings up to + Vcc or down to − Vcc. As the variable capacitor reaches resonance, the reflected voltage becomes zero, causing the output of the 741 to drop to − Vcc. FF1 consequently is reset. With the output Q driven back to low, the motor comes to a stop. Voltage at the reset input of FF1 is prevented from going below zero by D3.

With the resetting of FF1, the transition of the output voltage from high to low is differentiated by the small capacitance of 0.001 μF and the 33-kΩ leak resistance.[4] A negative pulse is produced that triggers the monostable multivibrator type 555 which, in turn, develops an output pulse of a certain length of time. The values of 0.1 μF and 1 MΩ, shown connected to the 555 in Fig. 2, are chosen for a time constant of 0.1 second. As Q3 conducts, the motor is momentarily driven backwards, causing it to work as an effective brake.

On-the-air testing of the matching unit in conjunction with my TA-33 triband antenna disclosed that one of the taps had enough margin to cover the variation of load impedance on both the 14- and 21-MHz band. The SWR is fairly low even at the band edges. Coil-tap switching is found unnecessary on those bands, provided an antenna of good design is in use.

I devised a scheme to skip the first pulse from the Micro Switch to ensure at least 180° of rotation of the tuning capacitor before the coil tap is switched. It shortens tuning time.

By pressing the TUNE button, a negative-going pulse is generated as mentioned earlier. This pulse is applied to the reset input of FF2 (U4B and U4C). The output of Q goes low, turning off gate U4A through which no pulse can then pass.

The first pulse from the Micro Switch cannot go through gate U4A but the pulse does set FF2. The output Q then goes high and the gate opens. Because the second pulse and subsequent ones pass the gate, the rotary relay is energized.

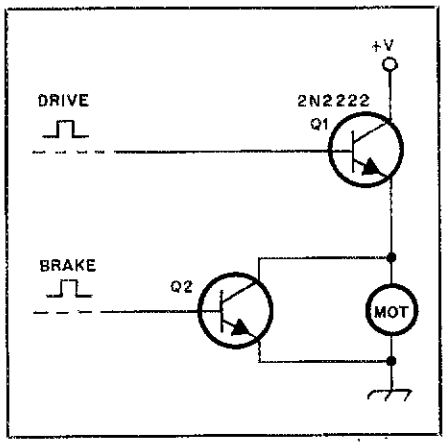


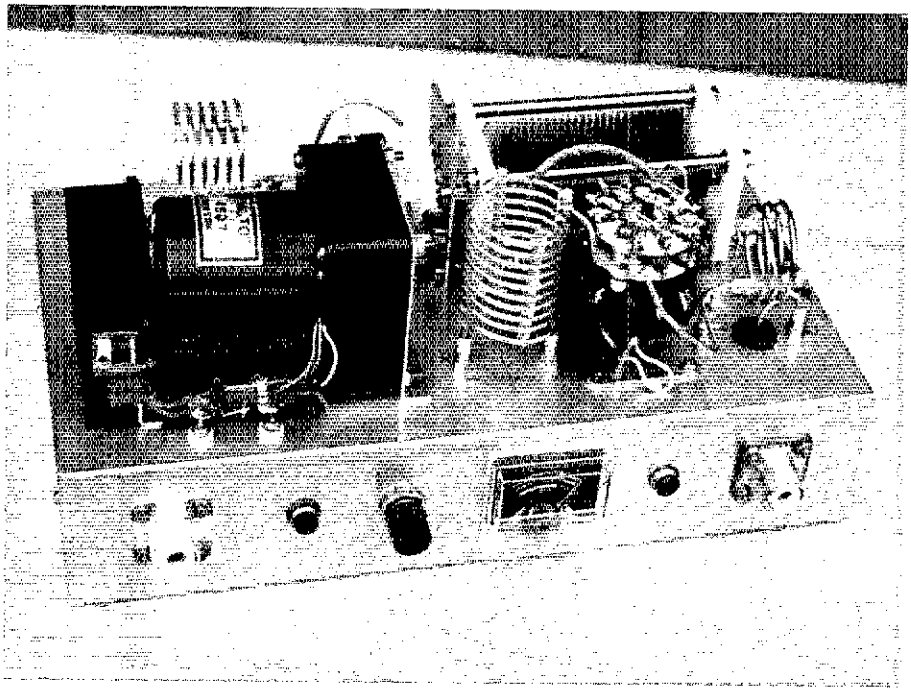
Fig. 7 — The circuit illustrates how a small motor, such as the ones mentioned in the text, may be instantaneously stopped by shunting the armature with a transistor.

About the Motor and Rotary Relay

My tuner was constructed on a junkbox basis. The motor is no exception, for I found it at a junk shop in Tokyo. Although the manufacturer and specifications are unknown, the motor appears to be well made and probably was fairly expensive when new.

I would like to recommend the use of a motor with a built-in magnetic clutch. Recently, Yokogawa Sertec Co. placed such a motor on the market. It is satisfactory in every respect except the price (10,000 yen or about 40 dollars). For information concerning the availability of this motor, you could write to the Yokogawa Sertec Co. Ltd., 1-380 Nekabu, Ome-shi, Tokyo-to, Japan 198. A suggested control circuit for the Yokogawa Sertec motor is shown in Fig. 6. This is for 100-V ac operation. I must mention that there is no brake circuit. For those *QST* readers interested in this arrangement, a Radio Shack no. 275-003 relay should handle the relay requirements.

Small dc motors manufactured for toy



Imamura's semiautomatic antenna tuner.

cars are more economical. A popular motor in Japan in known as the Mabuchi, named after the manufacturer. I found one, along with plastic reduction gears, at a local toy shop. The price is quite reasonable. A desirable feature of this motor is that it has a permanent-magnet field, whereby effective brake action may be obtained by simply short-circuiting the armature. To control this type of motor, I suggest the use of the circuit in Fig. 7.

When Q2 of this circuit is *on*, the armature is electronically shorted. Since the motor performs as a dynamo with infinite load, it stops immediately. Q2 should be a transistor or IC capable of handling 2 amperes.

Suitable motors of the toy type are produced by the Sankyo Seiki Mfg. Co. Ltd., 1-17-2 Shinbashi, Minato-Ku, Tokyo, Japan 105. Type GA-201B-01 is capable of turning at 2300 rpm. The price range in Japan is 700 yen or about three dollars.

Suitable rotary relays are currently available from Poly Paks of Lynnfield, Massachusetts (see ads in *QST*). The catalog number is 92CU6052. At the time of this writing, Poly Paks priced them at $11 for a set of three.

Amateurs who have difficulty in obtaining a rotary relay may consider the scheme shown in Fig. 8. In this arrangement, a decade counter, such as the MC14017, serves to drive six relays through buffers. This method should be satisfactory.

Final Comments

The tuner has been used successfully for more than a year at JA6GW. Yet, I consider it still in the experimental stage, for there is room for future development. I am pleased that the reading of the reflected-wave indicator is practically zero when the tuner comes to a stop.

I'd like to point out that stopping the motor instantaneously is of prime importance. A revolving mechanism which has no momentum cannot be found. For that reason, a motor with a built-in magnetic clutch is strongly recommended for this tuner.

Another matter concerns how much operating Q should[4] be selected. Indeed, the higher the Q, the better the harmonic suppression, but where a higher Q is desired, a more precise stop mechanism is required. A Q of 2 on 20 meters is a compromise between the electrical performance and the availability of the drive mechanism.

One word of caution concerns bypassing. Every Vcc terminal of active devices and + Vcc lines must be bypassed adequately in order to eliminate switching spikes. More likely than not, rf intrusion through the power supply can cause trouble. The necessity of good bypassing cannot be overemphasized. QST

Notes

[1]McCoy, "The Ultimate Transmatch," July 1970 *QST*.

[2][Editor's Note: Even though the circuit configuration of the Ultimate Transmatch is that of a high-pass network, it will provide attenuation of harmonic energy when properly adjusted for a match.]

[3]See *The ARRL Antenna Book*, 13th edition, ARRL, 1977, pp 76-81.

[4]Refer to Fig. 2. See connections to U2 marked with asterisks (**).

Strays

QST congratulates . . .

☐ Don Harris, WB4DLB, of Columbia, South Carolina, who recently received the first annual Bill Wall, WA4WND memorial "Ham of the Year" award from the Columbia ARC. Don was presented the award for the many hours he has spent helping fellow hams in the construction of antenna towers.

APPLE COMPUTER INFORMATION

☐ The Apple computer net meets Sunday nights at 0100 UTC on or near 14.239 MHz. If you have a suggestion or problem concerning programming this may be the place to air it. SWLs may mail questions to Jim Hassler, WB7TRQ, 129 Park Ave., Orchard Valley, Cheyenne, WY 82001.

LISTEN FOR THE MORSE HOME

☐ The Poughkeepsie (NY) ARC has undertaken a project to celebrate the public opening of the Young-Morse National Historic Site, in Locust Grove, NY, on Sunday, May 18. To help celebrate this event and to remind all amateurs of our debt to Samuel F. B. Morse, the club will operate from Locust Grove from 1300 UTC on May 18 until 0100 UTC on May 19. Both phone and cw will be used on 10 through 80 meters. A commemorative QSL card will be available for all contacts (s.a.s.e., please). For an additional fee of $1, contacting hams will also receive a commemorative certificate. Amateurs and the general public are invited to visit the club station on May 18 during normal site visiting hours (10-5) when a special reduced admission fee of $1 will be in effect.

This house, on an estate on the east bank of the Hudson River, was the home of Samuel F. B. Morse from 1847 until his death in 1872

A Portable 2-Meter Repeater for Emergency Communications

Thinking of assembling a repeater? Perhaps some of the ideas presented here may well suit your needs. The complete unit is geared for maximum emergency preparedness.

By Everett L. Beall,* K6YHK

Portability of equipment, low cost and general freedom from noise have made 2-meter fm a popular means of communication. This popularity and the operational characteristics of the band make it a "natural" for amateurs who engage in public service or who provide emergency communications during periods of real or simulated disaster. If hand-held transceivers are used to communicate over an appreciable area, another item is necessary — a suitably located repeater.

The group of amateurs who supported fire-fighting efforts during the 1977 Marble Cone fire in California discovered the desirability of a precisely located repeater. Fortunately, a 28/88 "machine" happened to be ready to go and was waiting for a hilltop home. It was installed quickly to provide communications coverage of the fire area, and it really paid off!

The significance of the occurrence was not forgotten when a group of Santa Barbara County amateurs met to assess our emergency-preparedness status. We learned a most important lesson — the excellent repeater facilities normally enjoyed could be lost easily as a consequence of the very disaster for which its use would be required. Local repeaters that afforded the best coverage were dependent on commercial power, were not designed for portability and, in fact, were located in rather high-risk fire areas. A need existed for a portable repeater; an emergency communications tool to be used as a backup for, or supplement to, a local fixed repeater. It would be a minimal facility maintained in a ready condition, but not kept on the air. The machine should have the following features: (1) be truly portable, no more than 1 or 2 cubic feet in size (which ruled out a large-cavity duplexer system); (2) operate from a 12-V dc source, unattended, for several days (this dictated a power output in the vicinity of 5 watts); and (3) break down into approximately three packages — repeater, power source and antenna system. Each package would be of a weight and size that would allow the entire system to be hand carried or backpacked almost anywhere by a few people. It should operate on a repeater pair for which local amateurs had crystals. Yes, *crystals!* Not many amateurs own hand-helds or small portable rigs that are synthesized. Finally, the package must function as a repeater only, or as a net-control base station with built-in repeater capability to "tie the hand-helds together."

These goals mandated that power consumption be kept to a minimum, especially when the repeater was to be operated unattended. Therefore, steps were taken to reduce power drain to a low, practical limit; turn off the local audio amplifier when the repeater was unattended; and include an automatic cw i-d timer system and a minimal remote-control system. (The FCC requires that one be able to turn the machine off.) When the repeater is to be used as a net-control or base station, provisions should be made to allow it to operate as a base-station transceiver while retaining simultaneous repeat capability. It should also be able to turn off the automatic i-d system and use whatever 12-V dc source is available — battery or ac-operated supply. Included in the package should be battery clamps, alligator clips, banana plugs and other items that afford flexibility.

Question: If a cavity duplexer system were not used, how would receiver desensing be avoided? Some "digging" led to a *QST* article by Ed Tilton, W1HDQ.[1] Intrigued, we built one of the "trap filters" and were amazed at the degree of isolation this small unit was capable of providing. Perhaps two filter systems would permit the use of one antenna for duplex operation. Although we were skeptical of satisfactory operation using one antenna,

*715 East Cook St., Santa Maria, CA 93454

[1]Notes appear on page 36.

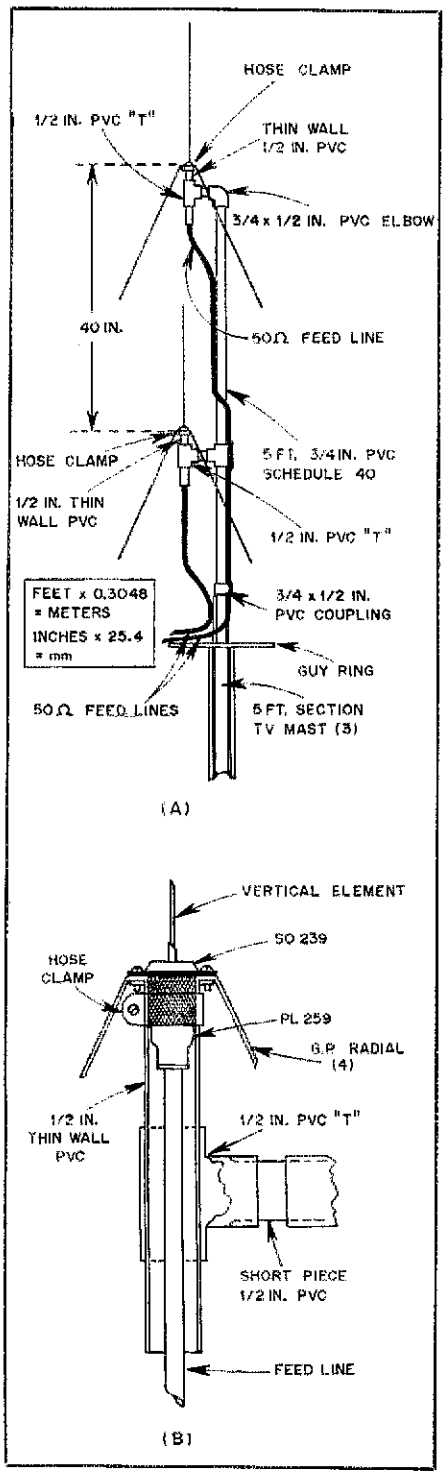
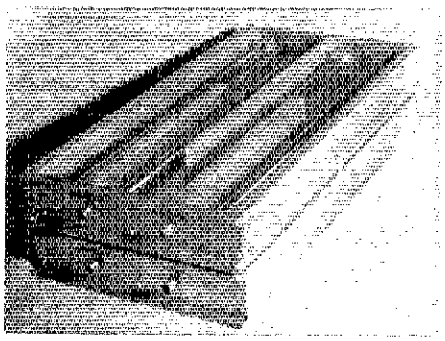


Fig. 1 — Mechanical details of the 2-meter ground-plane antenna. See text.



The input/output end of the filter assemblies. The two units shown here are bolted together using 6-32 hardware making a rigid and compact duplexer package. The tuning-capacitor adjustment screws and loading plates are at the opposite end of the assemblies and not visible in this photograph. Note the use of aluminum channel stock for unit construction.

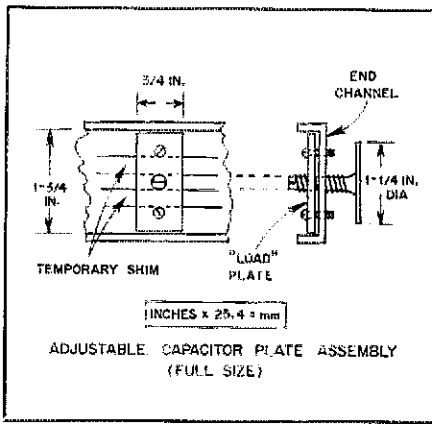


Fig. 2 — This drawing shows the assembly of the adjustable capacitor plate. The "loading" plate is provided to eliminate sloppiness in the capacitor plate adjusting the screw.

the two-filter system offered the promise of allowing the use of two closely stacked vertical antennas.

Initial Tests

Two trap filters were constructed and a few tests confirmed our suspicions: It is both wiser and easier to use two ground-plane antennas, closely stacked, than to devise a method of using a single antenna. Next, two quarter-wavelength ground-plane antennas were constructed and mounted so the vertical separation could be altered for test purposes. We stopped just short of "nesting" the vertical element of the lower (receive) antenna into the ground-plane radials of the upper (transmit) antenna, and still had no trace of receiver desensing! This degree of spacing might not be sufficient if higher transmitted power levels are used. The antenna system adopted for K6YHK/rpt consists of two quarter-wavelength, ground-plane antennas stacked vertically 40 inches (102 mm) between feed points and mounted on a support of schedule-40 PVC pipe, as shown in Fig. 1.

This antenna system is almost as compact as one J or 5/8-wavelength antenna. The receiver bandpass filter is tuned to the center of the received frequency, while the trap filters are tuned to notch out the transmit frequency. The transmit bandpass filter is tuned to the transmit frequency, and the trap filters are tuned to the receive frequency. Adjustment may be accomplished as outlined in the Tilton article.

The Filters

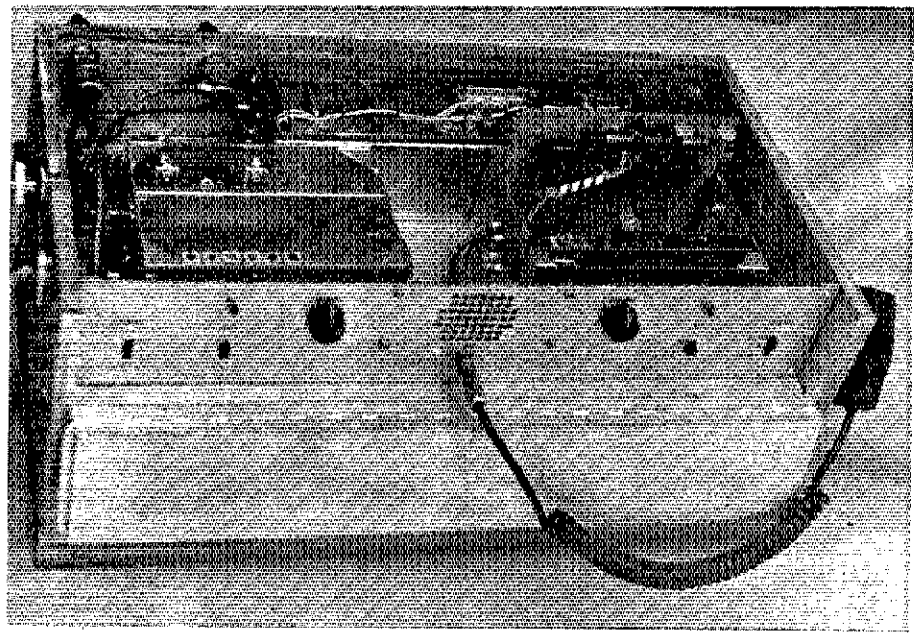
The trap filters are the heart of the system. Therefore, they will be examined in detail.

Tilton stressed the need for a mechanically rigid assembly. For this project, 2- × 1/2- × 1/8-inch web-extruded aluminum-channel stock was used for the frame.[2] Typical construction may be seen in the accompanying photograph. The work involved may be easily handled using ordinary hand tools. Holes through the 1/2-inch lip may be drilled and tapped, a procedure that is necessary in the aperture-forming partitions and other places. In some areas, 4-40 machine screws and nuts may be used for most of the assembly (buy the hardware in boxes of 100s to save some money). The filter length is 18 inches on the inside with tuned lines 17-1/2 inches long. This length of line requires less capacitance to tune the filter to the desired frequency. This allows the use of wider capacitor-plate spacing, which mean less chance of flash-over in the transmit filter. Wide spacing also tends to minimize detuning caused by temperature changes. The voltage present at the tuned end of these high-Q lines can be very high at resonance, even when used with a low-power transmitter. The plates on the end of the tuned lines were increased to 1-1/4 inches square in size and the discs on the capacitance-adjustment screws were made 1-1/4 inches in diameter. Tests indicated the transmit line filter had an insertion loss in excess of 3 dB when the notch of the series traps was tuned to the receive frequency, 600 kHz away. Reducing the aperture between the bandpass section and the series traps decreased the insertion loss caused by over-coupling, but with some sacrifice in notch depth. As adjusted, the aperture at 5-1/2 inches produced an insertion loss of under 2 dB with a notch depth of more than 60 dB. No changes were made in Tilton's aperture dimensions for the receive filter. Two frames and four aperture partitions may be made from a single 16-foot length of aluminum channel. The aperture-forming partitions between the bandpass lines are fashioned from two pieces of 2- × 3/16-inch aluminum bar stock. The cross section of each filter element is 2 × 2 inches. Thus, the overall inside width of each enclosure is 8 inches plus the thickness of the three partitions. A 2- × 8-11/16- × 1/16-inch thick brass plate inside the input end of the filter has 5/8-inch holes (made with a chassis punch), into which the tuned lines were press-fit and soldered. The lines were made from 1/2-inch copper water pipe. The top and bottom plates are made of aluminum stock 0.040- to 0.050-inch thick.

Some Hints

There must be absolutely no looseness in the capacitor-adjustment-screw

The drill press is being used as a clamp to aid in the assembly of the filter lines. To prevent the drill press table from acting as a heat sink during soldering, scrap aluminum, asbestos sheet and a block of wood are used between the table and the brass end plate of the filter line assembly.



The interior of the repeater with the covers removed. The audio/control board is raised to the top of the card guides within the auxiliary equipment enclosure which also houses the i-d board at the front and the COR board near the center. Two LM309K regulators are mounted outside this enclosure. The box to the left contains the 2-meter exciter in the front compartment and the power amplifier on the back wall. The PA heat sink is mounted outside this back wall.

assemblies. A change of even 0.001 inch in the position of the tuning-capacitor disc associated with a trap line will change the notch depth many dB. Locknuts are not an answer to the problem. A method of "loading" the 10-32 adjustment screws is needed since conventional threading results in far too much play.

One solution is shown in the detailed drawing of Fig. 2. Make two plates from brass or hard aluminum cut to the dimensions shown. Center one of these plates over the spot where the capacitor-adjustment screw comes through the end channel. Drill two holes through the loading plate and end channel using a no. 43 drill. Drill out the holes in the loading plate to clear 4-40 screws (no. 33 drill) and tap the holes in the end plate for 4-40 machine screws. Temporarily shim the loading plate from the end channel with metal strips approximately 0.010-inch thick. Tighten the 4-40 screws. Drill a small pilot hole through the loading plate and the end channel at the center of the 2-× 2-inch cross section of the filter. (This hole should line up with the center of the square plate on the end of the tuned line.) Enlarge the pilot hole by means of a no. 21 drill. Use a 10-32 tap to tap a hole all the way through both the loading plate and the end channel. The loading-plate shims are removed after final assembly. The 4-40 screws are then used to provide the desired amount of loading for the capacitor-adjustment screw.

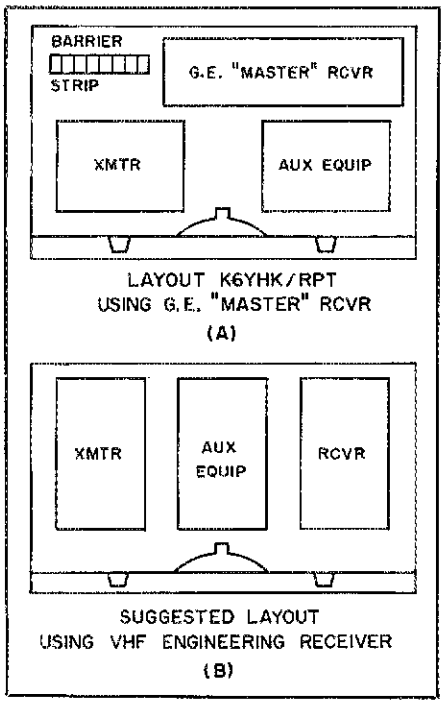


Fig. 3 — At A, the layout of the K6YHK repeater using a GE "Master" receiver. A suggested layout for use with the VHF Engineering equipment is shown at B.

A drill press is helpful in making the tunable capacitor disc assemblies. Discs are cut from heavy sheet brass or copper (0.020-inch thick) with a diameter slightly larger than 1-1/4 inches. Cut a screwdriver slot in the threaded end of a 1-inch long, 10-32 flat head, brass machine screw. Secure the screw in the drill press and place the flat head of the screw against the center of one of the discs and lock the drill-press feed. Solder the disc and screw using a propane torch or high-wattage soldering iron. When the work has cooled, unlock the feed and, with the drill press running, place a file against the edge of the rotating disc to round it out. A fine-grade sandpaper may be used to finish the disc.

Two useful jigs may be fashioned from a scrap of aluminum and a piece of lumber measuring 2 × 4 × 12 inches. Cut an aluminum plate the size and shape of the brass end plate. Lay out the location of the 5/8-inch holes, clamp the two plates to the piece of wood, and drill four small pilot holes through both metal plates and into the edge of the wood. The holes in the metal plates may be enlarged with a 5/8-inch chassis punch. A 5/8-inch high-speed wood bit in the drill press (with the depth stop set for approximately an inch) will make all four holes in the wooden piece of equal depth. Now the brass plate with four 17-1/2 inch copper lines is press fit into the four holes. The jig on the opposite end of the lines is mounted in the drill press which is used as a clamp. Check for alignment of the four copper lines and then solder them to the brass end plate. The 5/8-inch holes in the aluminum jig are reamed to permit sliding the jig on the lines. The jig maintains correct spacing of the lines while drilling through them and the bottom plate of the enclosure, where the 3/4-inch ceramic standoff insulators will be installed. The drill press may be used as a clamp while soldering the square end plates to the copper lines. (Note: Remember to remove the aluminum jig before soldering!)

Packaging

The minimum size of the repeater

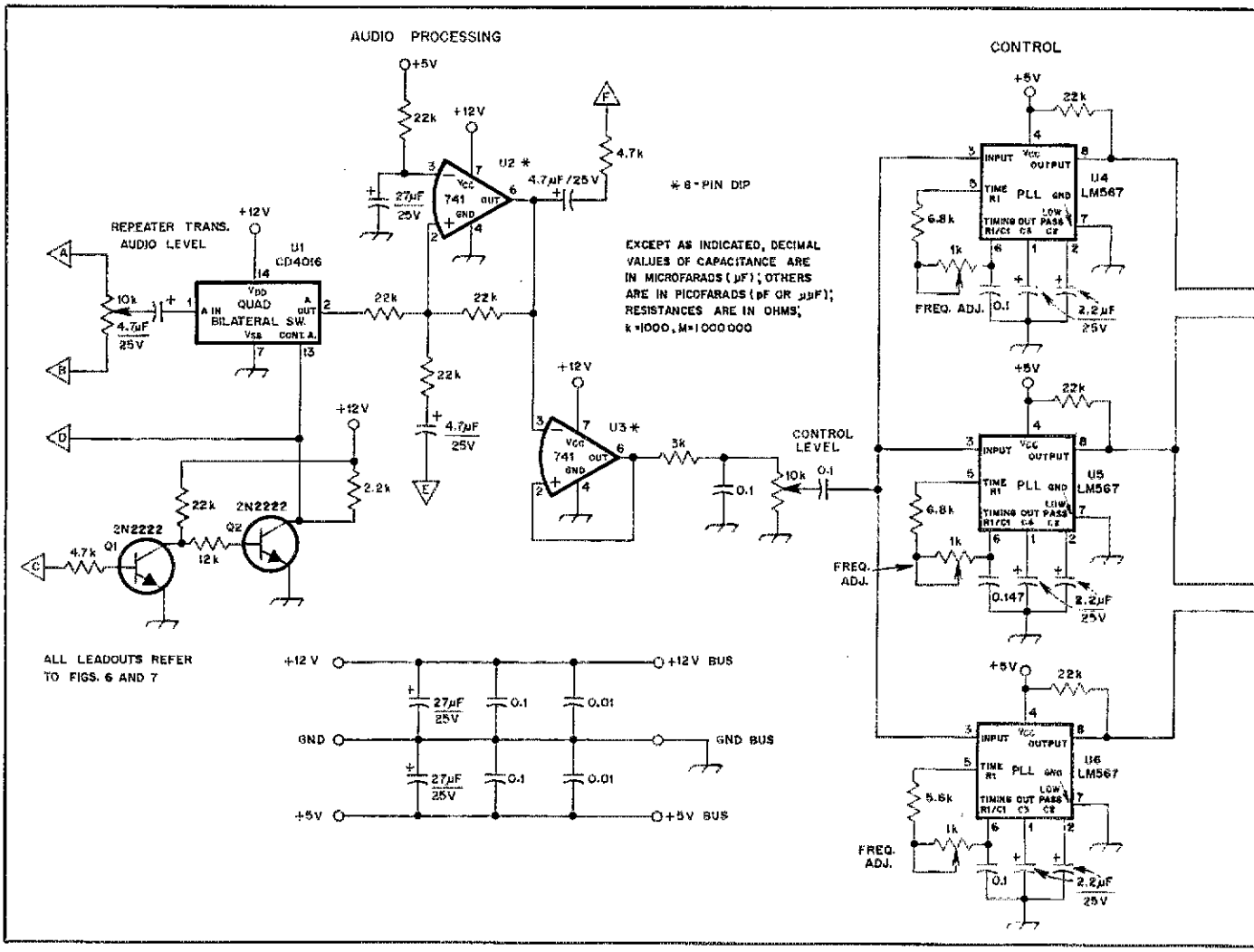


Fig. 4 — The audio processing and control section of the repeater. All fixed-value resistors are 1/4 W.

enclosure was dictated primarily by the size and shape of the filters. Each filter assembly is approximately 2-1/2 × 19 × 9-1/2 inches (HWD). The repeater proper is 4 inches high. The enclosure, made of 1/2-inch plywood covered with sheet aluminum, is 10 × 22 × 12 inches (HWD) — just over 1.5 cubic feet of repeater! Fig. 3 is a sketch of the layout of the repeater electronic packages. A shelf was cut from 3/8-inch plywood and covered with a sheet of aluminum on the top side. This makes a good ground plate on which to mount the modules. The 3-1/2 inch front panel was placed 1 inch back from the front edge of the shelf to allow for clearance between the control knobs and switches and the closed front door of the package. This is shown in the accompanying photograph.

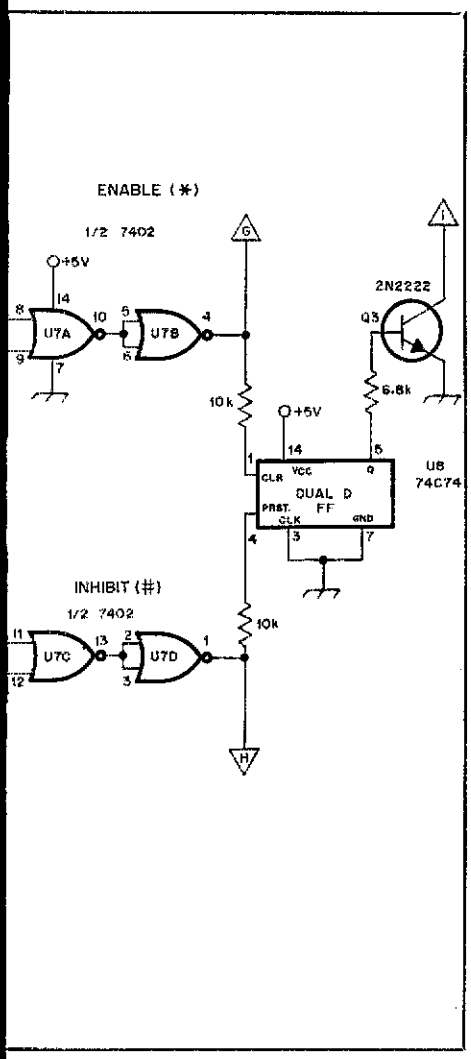
An article by George Allen, W1HCI, and Bob Brown, W2EDN, will be valuable to anyone constructing a repeater.[3] Allen and Brown stressed the necessity of adequate rf shielding and bypassing, and suggested that cast-aluminum enclosures be used for both the transmitter and receiver modules. LMB no. 753 chassis boxes provide adequate rf shielding. Do not forget to use feed-through capacitors for all dc and audio lines into and out of the chassis boxes.

Other Considerations

The machine was intended to be used as a command post net-control station while it was simultaneously operated as a repeater. This meant that a fixed level of audio must be used for the transmitter while providing a local audio-gain control for the base station. A method of accomplishing this by means of L or T pads is shown in Allen and Brown's article.

The system used here (see Fig. 4) was designed to allow the use of a tone decoder for the remote-control system and with the hope of conserving power. The audio for the transmitter and the control decoders is taken from the high end of the audio-gain control potentiometer. This way, the audio-gain control affects only the local audio level and permits turning off the audio-power amplifier when the unit is operated as an unattended repeater. With this arrangement, however, the repeater audio was obtained from a point ahead of the squelch system in the receiver, so an additional squelch system had to be incorporated. This was done by using the receiver COR (carrier-operated relay) voltage to switch the repeater audio on and off. One section of a CD4016 does this nicely, but since the COR voltage must be raised to + 12 V, a two-transistor dc amplifier was added to the COR line. A 741 op amp following the switch also derives its input from the identifier (i-d) board and furnishes repeater audio to the transmitter. The 741 loaded the audio amplifier in the transmitter exciter and made it impossible to use the local microphone. A 4.7-kΩ isolation resistor was installed at the line input of the transmitter to correct this problem. The output of the first 741 feeds a second 741, whose output goes to the control-system-level potentiometer. Here, it was necessary to incorporate de-emphasis at the output of the second op amp to balance the level of the tones going to the NE-567 tone decoders.

The control system is straightforward. When using the asterisk (*) for on and the pound sign (#) for inhibit, the



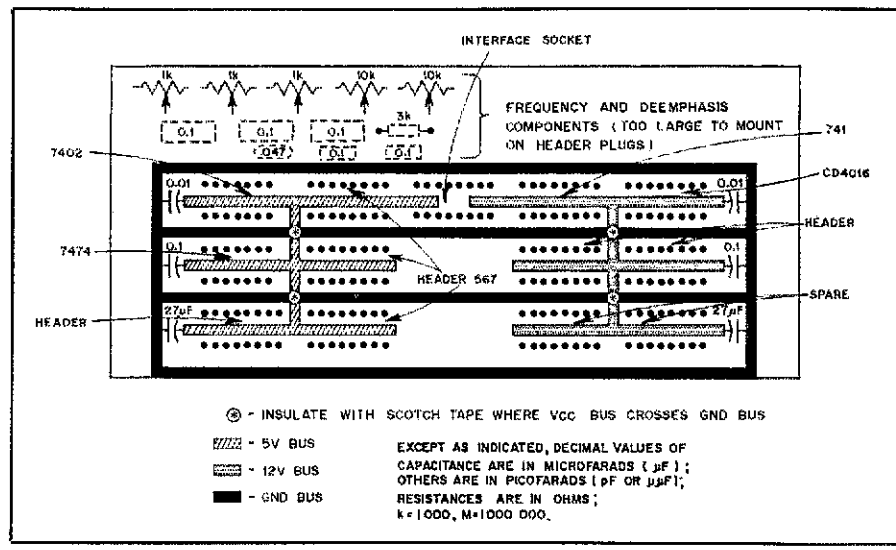


Fig. 5 — A drawing of the audio-processing and control-board layout of the K6YHK repeater. This is a wire-wrap layout and is offered as a suggestion. A mechanically neat decoder assembly may be made by mounting an 8-pin header plug and an NE567 IC in a single 16-pin DIP socket. The header plug is used to mount most of the parts that are external to the IC. Note the bypassing of the Vcc buses.

configuration is as shown. If a different code is desired, select one tone common to both tone pad pushbutton switches. The output of the tone decoder is low when locked. With a low at the output of the two decoders, the output of the associated 7402 gate goes high and it is necessary to invert the signal again with another 7402 gate. To shut down the transmitter, a high from the 74C74 is used to bias the transmit-inhibit transistor on. While this control system works perfectly, the total savings in battery drain while operating the system as an unattended repeater turned out to be quite small.

The audio/control circuitry is built on 0.1-inch spacing Vector board having the same dimensions as the VHF Engineering cw i-d board. The layout is shown in Fig. 5. It is necessary to use wire-wrap sockets

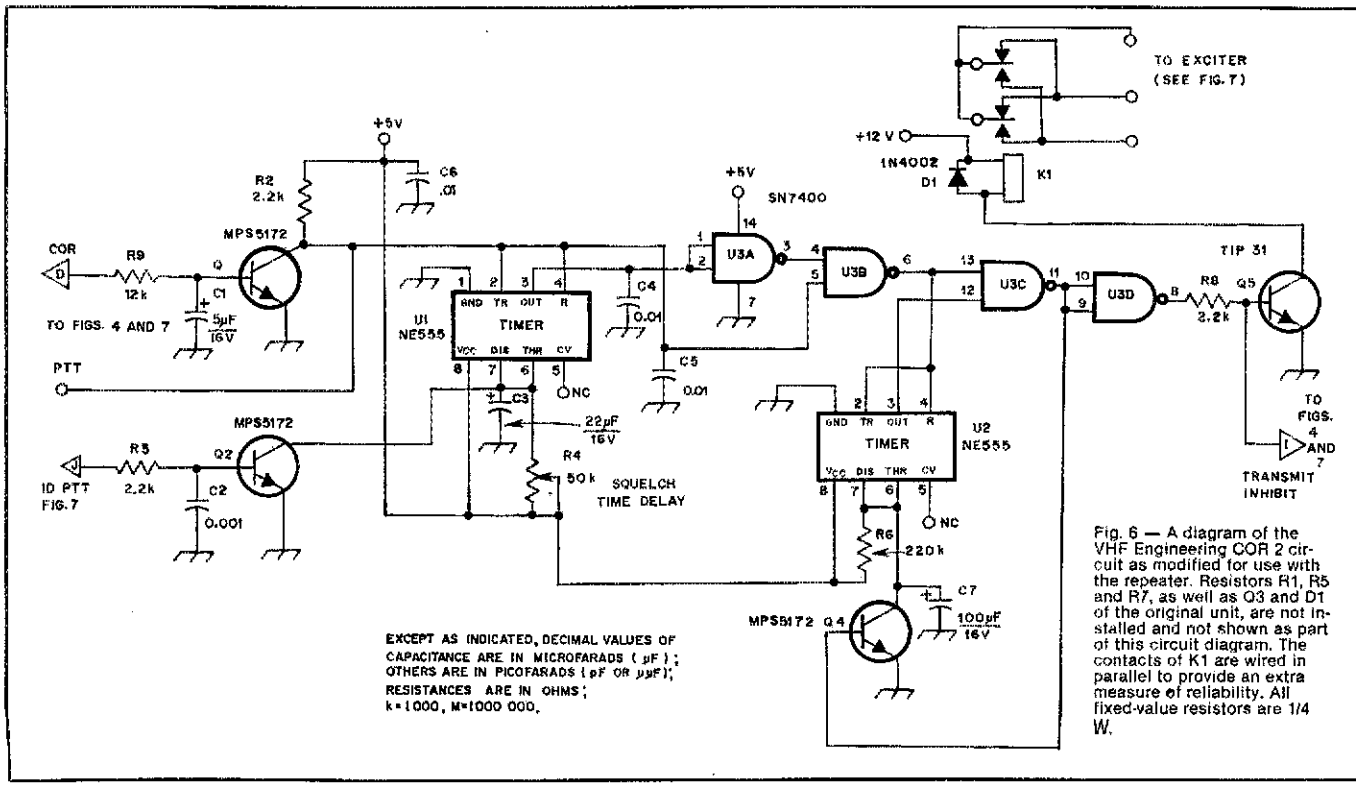


Fig. 6 — A diagram of the VHF Engineering COR 2 circuit as modified for use with the repeater. Resistors R1, R5 and R7, as well as Q3 and D1 of the original unit, are not installed and not shown as part of this circuit diagram. The contacts of K1 are wired in parallel to provide an extra measure of reliability. All fixed-value resistors are 1/4 W.

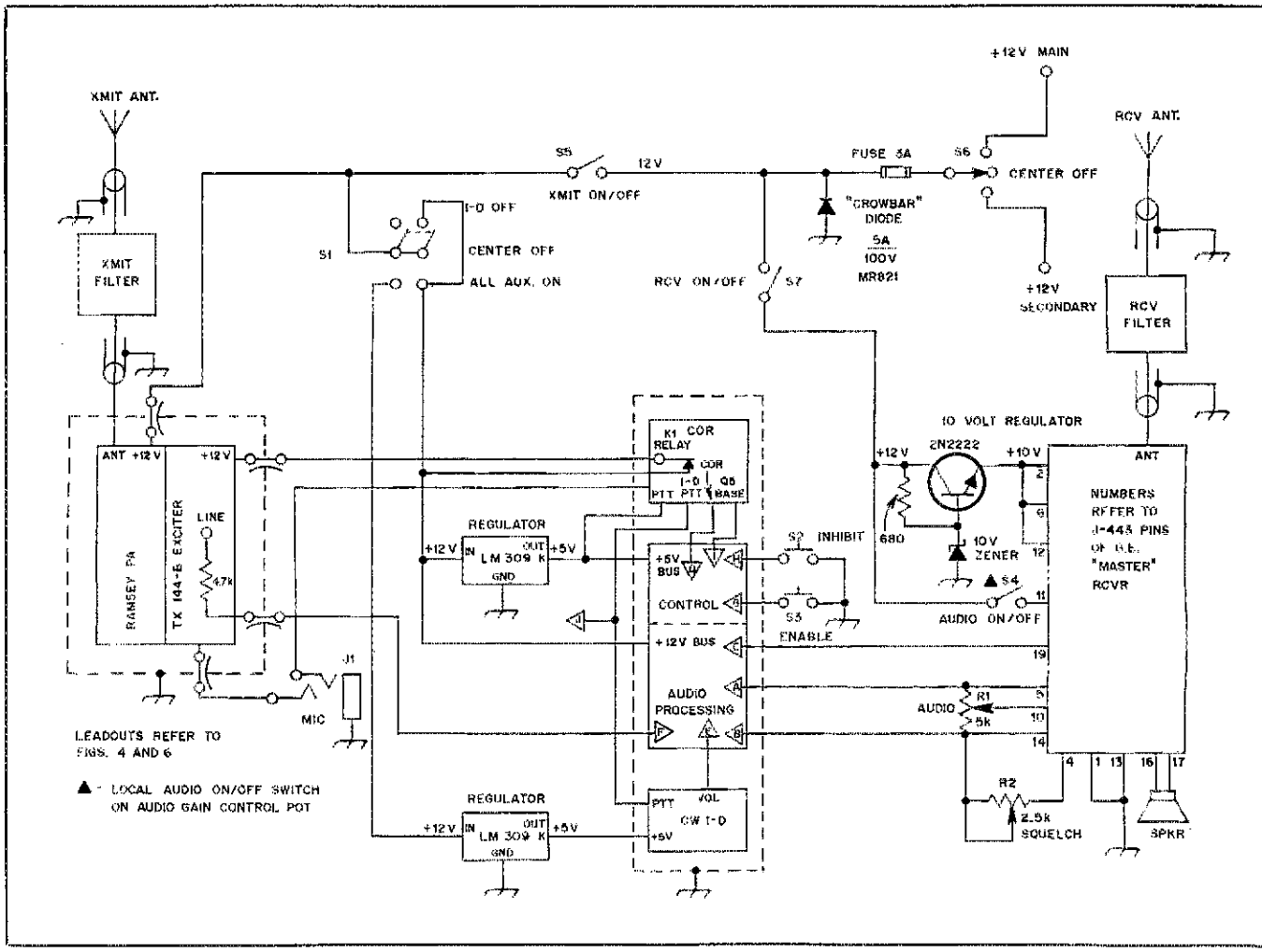


Fig. 7 — The interface wiring of the K6YHK repeater. The main requirement of the polarity-protection diode is that it be capable of carrying sufficient current to allow the fuse to open and prevent damage to the repeater circuits.

and related techniques to obtain the required component density. A DIP socket and plug are used for interfacing. The terminations at the DIP socket are shown in the audio-control diagrams. Adhesive-backed copper tape was used for the 5-V, 12-V and ground buses. Layout is noncritical. The use of positive and negative buses eliminates a large part of the "rat's nest" of wire-wrap construction and greatly facilitates trouble shooting. Also, it is wise to align all wire-wrap IC sockets on a board with pin 1 facing in the same direction.

The 2-meter amplifier, a 30-watt solid-state unit, loafs at 5-watts output with approximately a watt of drive from the VHF Engineering TX144B. The COR contacts are in the 12-V line to this exciter. The amplifier has the 12-V line permanently connected to it.

The VHF Engineering COR was modified as shown in Fig. 6. Do not install R1, R5, R7, Q3 and D1 of the original circuit. Connect "COR IN" to Q1 through a 12-kΩ resistor. The base of Q4 is connected to U3 pins 9, 10 and 11. This arrangement allows the 3-minute timer to be reset only when the repeater carrier drops. The transmitter-inhibit line is connected to the PTT input point at the base of Q5. The COR relay is mounted on the bottom of the control box rather than on the pc board.

The VHF Engineering cw i-d unit is used without modification. Program the desired call, make time, level and speed adjustments and connect it to the audio/control board at the point indicated on the diagram. The supply voltage may be routed through a switch to provide a means for disabling the i-d.

A close look at the photograph of the repeater interior will clarify how the i-d, COR and audio/control boards were installed in the auxiliary-equipment enclosure. Fig. 7 shows the interconnections of the separate units. Surplus card guides were used and all interconnections were cabled with sufficient slack to allow any card to be lifted clear of the enclosure (while still being connected) for adjustment or troubleshooting.

Summary

This repeater was not a club project, although all members of the committee are also members of the Satellite Amateur Radio Club, Inc. (W6AB), Vandenberg Air Force Base, California. A great deal of credit goes to Bob Couger, W6KPS, Ron Dickerson, WD6EYB and Ray Isenson, N6UE. Bob acted as chief engineer of the project, Ron was my good right hand in construction, and Ray lent his talents to photography and technical writing. The team donated all components used — scrounging or building what we could and buying only what we had to. We sincerely believe it was worth the effort. QST

Notes

[1]Tilton, "A Trap-Filter Duplexer for 2-Meter Repeaters," *QST*, March 1970, p. 61.
[2]Inches × 25.4 = mm. Feet × 0.3048 = meters.
[3]Allen and Brown, "Build Your Own Repeater for Only $365," *73 Magazine*, February 1975, p. 76.

FDX — A Challenge Accepted

This is a singular account of atypical amateur genius, covering several years of R & D. The conclusions reached by the author will make you proud to also be a "ham."

By Justin Thyme,* WAOK

During the past two decades, the plethora of papers on receiver sensitivity has probably been exceeded only by the definitely definitive treatments of SWR and its importance. Here at SAAR* the writer's interest in receivers was rekindled by a reference to Gooch's Paradox[1] and the obvious truth that radio signals never die, they just get weaker. Most investigators have apparently concluded that the signals get too weak to be heard in the noise. But what about those long-delay echoes that have been reported and studied? After all, the decay curve should be exponential, similar to a capacitor discharging through a high resistance, and we know that never reaches a value of zero. (See Fig. 1.)

Boldly borrowing from radio astronomy and satellite techniques, a hyper-sensitive receiver was constructed that yielded a *negative* noise figure. (The secret is an obvious one, once known to but forgotten by many an old timer. Use regeneration, or "negative resistance" as it is sometimes called. Just see what happens when you use *negative* resistance in the formula for noise factor.[2]) There was only one slight disadvantage — it didn't work. *That* required getting *below* the cosmic noise level!

This realization slowed down the work for almost a week. However, recalling

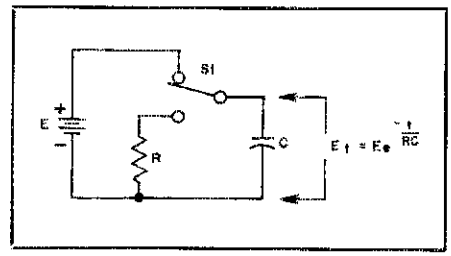


Fig. 1 — Classical capacitor-discharge experiment. When S_1 is closed, capacitor C discharges through resistor R in accordance with formula shown. (See *Radio Amateur's Handbook*, 1980 edition, page 2-16.) Use care in duplicating the experiment, since the capacitor is never completely discharged unless R = 0.

that the great recent strides in receiver design involved only *frequency* selectivity, *amplitude* selectivity was considered. It was the answer! Once an amplitude-selective system was devised, it became a simple matter to go *below* the noise and copy the weak signals with the hyper-sensitive receiver.

Many entertaining hours were spent copying signals that had originated days, weeks, months and finally years ago (March 1975) as the receiver was refined and honed to a high degree. One evening while "reading the mail" (as they say) a thought occurred. Why not build a transmitter that would permit a QSO with this 1975 group, or others in the past?

The idea was very intriguing. But a little cogitation showed it to be impossible. Logs that still exist today would have to be changed, but how? Two of the operators heard are now Silent Keys — might not my operating inadvertently reveal my privileged knowledge and upset them? No, it was impossible. And, anyhow, how could a radio signal be sent back in time?

The Alternative

But how about sending a signal *forward* in time? It is well known from wave-guide techniques that phase velocity (PV) exceeds the speed of light. PV^n is even swifter.[3] Using atomic overdrive, the velocity depends simply on the overdrive ratio (n = 1 ÷ overdrive ratio).

There was only one way to determine if this principle could be applied to a radio system; it is the ham way. Try it! A breadboard version of an atomic-overdrive phase-velocity local oscillator was built and substituted for the local oscillator injection of an existing transceiver that used the hyper-sensitive principles in the receive mode. (Phase-velocity oscillators are computerized end results of the primitive pm transmitters currently used on 144 MHz. The overdrive is the author's modest contribution.)

While waiting impatiently for some of the hardware fabrication to be completed, thought was given to where to send the signals (forward) in time. The author has worked a majority of the terrestrial

*c/o Society for Advanced Amateur Research, Knollridge, KS 60606

[1]"The rf never gives up," Dr. J. B. Gooch, 1948.

[2]NF = 10 $\log_{10}$ 20 IR

[3]From Thomas Swift, an early pioneer. n is a very positive integer.

countries and he has bounced signals off the moon. Where will the signals of future hams be found? Obviously either around the Earth or out in space. It was decided to try first for future signals still Earth-bound. The 14-MHz band seemed the logical choice, since it is obvious that in the future no one will be able to afford the real estate required for a good 40- or 80-meter antenna. And, too, present surveys show an increasing decline in activity in the "good old 20-meter band," so the QRM shouldn't be too bad.

The relatively minor problems with the converted transceiver were purely physical and technical and are of little concern to most radio amateurs. However, one aspect might be of interest. First tests at the remote field station were completely negative and a bit discouraging. Everything seemed to be working properly but absolutely no signals were heard. Was there a war? Had we lost the 20-meter band? Finally, after many hours of fruitless search, the unit was turned off. Just as it was turned off, a signal blasted through. Eureka! With the PV^n in overdrive it was running forward in time too fast for any possible signal copy! An additional control was added, to permit the operator to run out the oscillator to a future date and then lock it in to a normal light-velocity rate. This simple addition readily brought in signals from stations that weren't in the 1979 *Callbook*. (Can you believe WMØDCHG, or RU12OM?) "Reading the mail" on a number of QSOs, much discussion seemed to revolve around the relative merits of "panoramics" vs. "scanners."

A Test

It was decided to use a north-south orbit for the first CQ, since calculations indicated the magnetic field of the Earth would add an extra 37.4 dB of power, hopefully helping to compensate for energy loss through the time journey of our signal. After tuning up in a clear spot on the uncrowded band, it must be admitted that it was not without some trepidation that we ventured a short CQ. Suppose our work was for naught? Suppose we were on a one-way street again?

As the rig dropped back into the receive mode, it immediately became apparent that something was wrong. Smoke curled up from the unit just before it burst into flames!

While recuperating in the hospital, the author analyzed the incident and decided that he wasn't quite ready for FDX (future DX). Obviously his simple old-fashioned CQ on what seemed to be a clear spot was enough to precipitate a pile-up that his FDX receiver section could not handle. However, on the drawing board there is already a more-sturdy design. If that doesn't work it might be wiser, for the sake of science, to omit from his next signover, "Portable in Tibet."

Strays

OPERATION SANTA CLAUS IN DES MOINES

☐ The 30th annual "Operation Santa Claus" sponsored by the Des Moines Radio Amateur Association collected $7000 for needy families in the Des Moines, Iowa, area. Fifty-seven hams participated in the event. Proceeds aided 3300 people from 769 families. — *Bob McCaffrey, KØCY, Des Moines, IA*

FOOTBALL OR OSCAR?

☐ What do OSCAR command station operators talk about when they get together? When Bill Clepper, W3HV, journeyed to California for the Super Bowl he got together with Bud Schultz, W6CG, and George Dillon, W6ELT, and discussed OSCAR, of course. They did find time to attend the Super Bowl game, but most of their time was spent discussing OSCAR. One of the items discussed was the six-turn helix antenna that Bud and George built for 435 MHz.

These three AMSAT-ARRL volunteers are part of the worldwide team of command station operators. Dedicated to the preservation of our existing satellites, these operators have the equipment and expertise to keep the OSCAR satellites operating normally. Demanding as these jobs are, these amateurs still find time to operate through the satellites and give lectures about Amateur Radio and the Amateur Satellite Service. Want to join in? New satellites are on the horizon! Write today to AMSAT Hq., P. O. Box 27, Washington, DC 20444, or ARRL Hq., 225 Main St., Newington, CT 06111, for AMSAT membership forms. Help support the future of Amateur Radio. — *Bernie Glassmeyer, W9KDR*

FANCY 6-METER WAS CERTIFICATE AVAILABLE

☐ If you are a recent recipient of the 50-MHz WAS (prior to award number 360), we now have "fancy-lettered" 6-meter certificates available. To receive one of the newer certificates, send all the information that is typed on your original certificate to the Communications Department at ARRL hq.

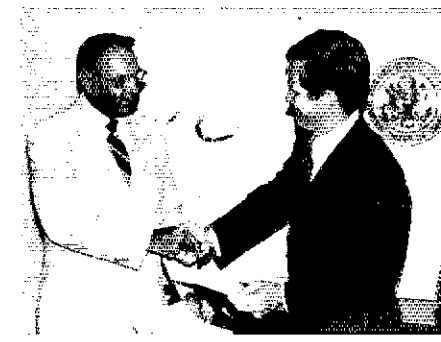
EXPERIENCE — THE BEST TEACHER

☐ Steve Flyte, K7SF, of Portland, Oregon, was recently able to put some of his 15 years of experience with Amateur Radio antennas to good use. Steve, who is an electronic news gathering (ENG) engineer with TV station KATU, ran into difficulties when setting up a microwave circuit to transmit video tapes. The circularly polarized feed section for the 4-foot dish antenna that is mounted on the roof of the mobile news van was missing. Without this component, the news van was out of business. A check of a local TV station and an electronics company did not turn up a replacement or substitute part.

Faced with certain failure, Steve found a short piece of RG-11/U coaxial cable in the back of the news van. He called back to the TV station and asked someone to check the proper focal length for the dish antenna feed section. It turned out to be about 22 inches. Remembering his years of Amateur Radio experience with dipoles and Yagis, Steve fanned the shield and center conductor on the end of the RG-11/U coax into a small dipole, each side being 3/4-inch long. He ran the coax through a small hole in the center of the 4-foot dish, pulled it out to 22 inches from the center and taped the little dipole in place. After some minor adjustments and tuning, a clear, fine-quality signal was being transmitted back to the TV station. A mixture of Marconi, Rube Goldberg and Steve's experience put the news van back in business.

BATTLESHIP OPERATION

☐ The Azalea Coast ARC, WD4ORA, will operate from the battleship *U.S.S. North Carolina* Memorial in Wilmington, North Carolina, from 1430 to 2200 UTC on April 12 and 13. Operating frequencies will be 25 kHz up from the lower edge of the General phone bands. QSL with s.a.s.e. to ACARC, P. O. Box 4044, Wilmington, NC 28403.



Charles Watters, W4RHE, left, receives a letter of appreciation signed by President Carter from Florida Congressman Bill Nelson. The letter thanked Charles for his "valuable work in maintaining communications between the United States and Iran during the recent upheaval last winter."

Over-the-Horizon or Ionospheric Radar

Here's the story of our powerful new neighbors in the hf spectrum. The new U.S. Air Force radar will follow a "good neighbor" policy.

By O. G. Villard, Jr.*, W6QYT

Front view of receiving antenna near Columbia Falls, Maine. V-shaped monopoles are driven with respect to a large ground screen (in the foreground); telephone poles support a vertical grid of wires forming a reflecting screen.

At one time or another, almost every user of hf has heard the insistent "knock-knock-knock" of the Soviet over-the-horizon radar. Now, it seems, the U.S. Air Force has begun a year of experimentation with an over-the-horizon radar of their own, located near Bangor, Maine. This article describes both the radar and the efforts that are being made to avoid interference to hams and other services. Some interference, however, may be unavoidable owing to sidelobes in antenna patterns and modulation waveforms. This article tells roughly what to expect, and whom to contact if you have a problem.

An event clearly impacting users of the hf spectrum, including hams, is the comparatively recent appearance of powerful over-the-horizon radars (OTHRs). Under development since the early 1960s, these devices are now approaching the operational testing phase, which means that signals much stronger than those of the past are being used. Furthermore, they tend to be on the air 24 hours per day. Because a perfect antenna and perfect receiver selectivity don't exist — particularly at hf — there may, alas, be instances of interference caused to other services by the radars, and vice-versa. Since the radars serve a useful purpose, and represent a considerable investment, they

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aren't likely to disappear overnight. It seems that the only reasonable attitude for hf operators like the writer is to learn what they are, how they work, and how best to live with them. It's a bit like the Loran A pulses on 160 meters — sharing is awkward, but it can be done.

OTHRs Described

Over-the-horizon radars use the ionosphere as a mirror to "see" around the curvature of the earth. They have a variety of uses, both civilian and military. At present, the Soviet Union is operating what sounds like a most potent one (the ubiquitous "woodpecker").[1,2] The United States Air Force has just placed into service an experimental facility in Maine which, if successful, will be expanded into two major facilities, one on the East Coast and one on the West Coast. The Australians have also been testing a prototype. In addition, lower-powered developmental sets such as the NRL (Naval Research Laboratory) "MADRE"[3] and the ONR (Office of Naval Research) Wide Aperture Research Facility[4] have been in sporadic operation for years.

Although there are obvious disadvantages, OTHR has certain fundamental attractions. First, it can cover an enormous area in comparison with line-of-sight radars, and do so from *one station*. Second, it has been estimated to be less than one-tenth as expensive as putting radar(s) in orbit. Third, OTHR can track aircraft targets right down to ground level, and for all practical purposes cannot be underflown. OTHRs can be used for tracking the eye of a hurricane traveling over water (see Fig. 1), for providing warning of regions of high winds and waves and the location of weather "fronts," for tracking aircraft and ships, and warning of the launch of ballistic missiles.

How OTHRs Work

The foregoing capabilities are impressive, and the story of how it is done is fascinating. The essential tricks are these:

1) The normal ionosphere proves to be much more stable than had previously been thought. The physical reason for this is that the incredibly tenuous ionized gas which does the reflecting actually has a molasses-like viscosity. There are daily tidal changes, of course. But over intervals of half an hour or so, the F layer at a given location is actually quite well-behaved. This is true in the sense that, in the absence of disturbance, the F layer can bounce a given signal in a nearly constant direction with nearly constant amplitude — just what is required for good radar operation. The regular E layer is even better behaved.

2) The way to take advantage of this useful characteristic is to separate the modes, or "hops," and to use the smallest possible number. This a radar can do by using its range resolution and by choosing the right radio frequency. Unfortunately, the traditional hf communicator cannot in general gain the same advantage, because he deals with essentially continuous signals and must operate on a few fixed, assigned frequencies where multipath propagation is present for a very large fraction of the time. This is why the radar possibility escaped attention for so many years; everyone knew that signals from distant shortwave stations fade comparatively rapidly, and that their direction of arrival constantly fluctuates. But until pulsed oblique sounders came along in the 1950s or thereabouts, there was no opportunity to separate modes and thus to observe how remarkably stable the individual ionospheric layers are.

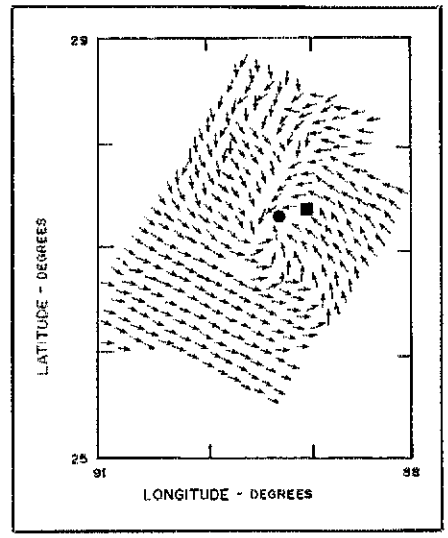


Fig. 1 — A hurricane in the Gulf of Mexico tracked in real time by an hf radar located in California. Wind directions, indicated by arrows, are determined by processing radar scatter from water waves. The round dot indicates the position of the hurricane eye as derived from the arrows; the square represents the best information available from the National Hurricane Center. (Hurricane Eloise, September 22, 1975, 2030Z. Plot courtesy of Dr. J. W. Maresca.)

3) Like any radars that must look down at the earth's surface, OTHRs receive enormous amounts of backscatter, both from land and sea. They have to be designed so as not to be overloaded by this clutter. Since targets of interest are normally in motion, they can be picked out by the Doppler shift of their echoes, even though the shift may amount to only a fraction of a hertz. Digital data processing makes possible both great dynamic range and remarkably fine frequency discrimination.

4) OTHRs make use of wide-aperture antennas to generate antenna beamwidths comparable with microwave practice, even though the wavelength is some 200 times as long! Since detection distances are so great, however, the distant area from which backscattered energy is received at any given instant (the resolution cell) may be 15 by 15 miles (24 by 24 km) in size, or larger.

5) One might think that to an hf radar, salt water would effectively be a smooth surface — at least in comparison with land characterized by trees, mountains and the like. But, as sailors know, the open sea is traversed by waves of all sizes, moving in a variety of directions. There will always be some that are moving directly toward the radar, and some that will be moving away. The radial direction is a preferred one insofar as the radar is concerned because energy scattered from such waves comes straight *back*, instead of going off elsewhere.

In the size spectrum of waves moving in these radial directions, there will always be a component whose length exactly matches that of the radio wave. Radio scattering from these length-matched ocean waves is very strong (perhaps 20 dB) in comparison with the ocean background, because scatter from them adds up coherently at the radar, and the radar pulse is long enough to include many such length-matched waves. (This is known as Bragg scattering; it is analogous to the method of operation of the diffraction grating in optics.) It turns out that clutter received by an OTHR looking at the ocean is comparable in strength to land clutter because of the Bragg effect, and its frequency spectrum contains just two lines, each Doppler shifted by the motion of the waves in the two radial directions! To an hf radar, the ocean is a moving target, and a fixed object, such as an island, stands out because of its lack of motion.

Ocean waves in the size range picked out by OTHRs have another valuable property: Their amplitude follows the local wind velocity very closely. (Sailors know very well how quickly a sudden wind increase is followed by appearance of a nasty chop.) Thus, these ocean waves can be used as tattle-tales to indicate to the distant radar operator both wind direction and speed. By fine-grain analysis of resonant ocean-wave scatter, it is possible to infer the size and to some extent the directional spectrum of all the ocean waves in the illuminated region.

Historical Perspective

Radars operating at hf date back to World War II. In those days, vacuum tubes developed for shortwave broadcasting were the only sources of high rf power. It is therefore not surprising that the earliest British radars worked in the high end of the hf band where they were bothered by what we now know to be over-the-horizon ground clutter. This actually led to wartime attempts to detect convoys approaching Britain by use of skywave propagation, but the problem

[1]Notes appear on page 43.

wasn't understood well enough at the time and tests were dropped.

The U.S. and USSR apparently started to develop ionospheric radar at about the same time.[5,6] *QST* readers with long memories may remember an article on backscatter sounding which appeared in March 1952.[3] The cover photo of that issue was, in fact, a plan-position display of ground clutter as registered by a ham set converted into a crude rotating-antenna "radar." Such displays proved useful for study of the ionosphere, and a world wide chain of similar sounders was established during the International Geophysical Year.

To pick out aircraft target echoes having Doppler shifts of only a few hertz in the midst of such clutter required sophisticated technology. A "magnetic drum integrator" was developed in the 1960s by the Naval Research Laboratory and used in their pioneering MADRE radar — the first in the free world to show that the normal motion of ionospheric layers is small enough to support aircraft detection.[3] Not long thereafter, the Office of Naval Research-supported "WARF" facility in California showed that the same stability extends also to direction-of-arrival, thus making truly precision hf radar possible.[4]

Relatively little is known in the U.S. about the USSR's OTHR development effort over the years. It is possible that the Soviets were impressed from the very outset by military applications. Their present easily audible signals dubbed the "woodpecker," probably come from radar installations which for some types of targets (such as nuclear explosions) may well have a worldwide range.

CONUS OTHB

The U.S. counterpart of the woodpecker is still experimental. The first word of the name is an abbreviation for "*Con*tinental *U.S.*"; the "B" of OTHB stands for "backscatter," to distinguish it from another, earlier form of OTHR called "forward scatter." The mission of CONUS OTHB is to give early warning of bomber attack via the northeast oceanic approaches to the U.S. and Canada. It will do this by establishing a surveillance zone, or barrier, which is the solid-white region shown in Fig. 2. Since all aircraft flying over the water must routinely file flight plans in advance, those seen by the radar within the above zone are then compared with their reported plan; if a target or targets cannot be associated with such a plan, appropriate action is taken. The radar can go from a general search mode to a spotlight mode for a closer look if desired. Fig. 3 shows in more detail how the tracking would be done.

Although the Soviet radar transmits on-off pulses (a conventional approach that permits the transmitting and receiving functions to share one antenna), the U.S. radar employs separate transmitting and receiving sites so that the transmitter can radiate a continuous signal which is fm-modulated or "chirped" for range resolution.

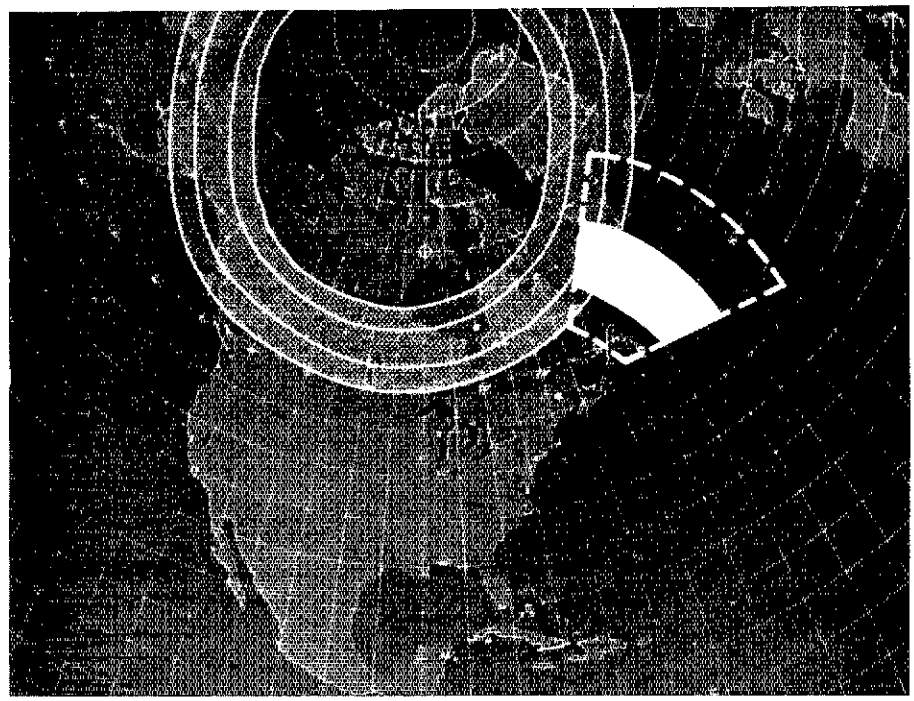


Fig. 2 — Solid-white region shows the coverage area of the USAF's CONUS OTHB experimental radar system, located in Maine.

The radar is located in Maine to place the barrier far enough away from the U.S. border for adequate warning time. Maine also provides a good test both of the extent to which "unknowns" can be discriminated from the very heavy North Atlantic air traffic, and the extent to which the radar can cope with occasional auroral disturbance in the northerly portion of its operating region. To this latter end, the receiving antennas have been provided with exceptionally good sidelobe discrimination.

OTHB Specifics

The relatively long wavelength used requires antenna dimensions of impressive proportions. For example, the broadside receiving array shown in the title photo, located at Columbia Falls, Maine, is about 4000 feet in length. Since mechanical rotation would hardly be practical, scanning is accomplished by digital beamforming and slewing. The beam is made unidirectional by means of a reflecting screen located about a quarter-wave behind the radiating elements.

Essentially the same design is used at the transmitting location, except that the transmitting beam is made wider so as to floodlight the area within which multiple receiving beams conduct a fine-scale search. The average transmitter power is roughly 1 megawatt.

It will be noted that the individual receiving-array elements are broad-band vertical elements over a ground screen. (The transmitter array is similar, except that it uses dipoles.) Thus the transmitted and received beams are fan-shaped, with only modest vertical directivity. This was a concession to economics. The radar must, of course, be able to operate at short ranges as well as long, and must cope with varying ionospheric layer heights. It would be nice to have vertical directivity and steerability, but the cost of the necessary towers and electronics was felt to be prohibitive.

Economic considerations have dictated the present operating frequency range — 6.7 to 22 MHz. It would be nice to be able to go both lower and higher, and perhaps this will be possible in the future.

Fig. 4 shows the frequency bands in which the radar is authorized to operate. Note that the amateur, as well as the maritime- and aeronautical-mobile bands (and several others) are specifically protected. Operation of the radar is permitted on a "noninterference" basis, which means that if there is a significant threat to any other service, something has to be done. The bands in which the radar *may* operate include such services as point-to-point teleprinter (whatever is left of it these days), shortwave broadcasting, and the like.

OTHB Operating Philosophy

Since the primary mission of the radar is to maintain a watch within the solid-white regions of Fig. 2, it must choose frequencies which (1) propagate into the region, and (2) are as free of interference as possible. The radar is, of course, computer-controlled and extraordinarily

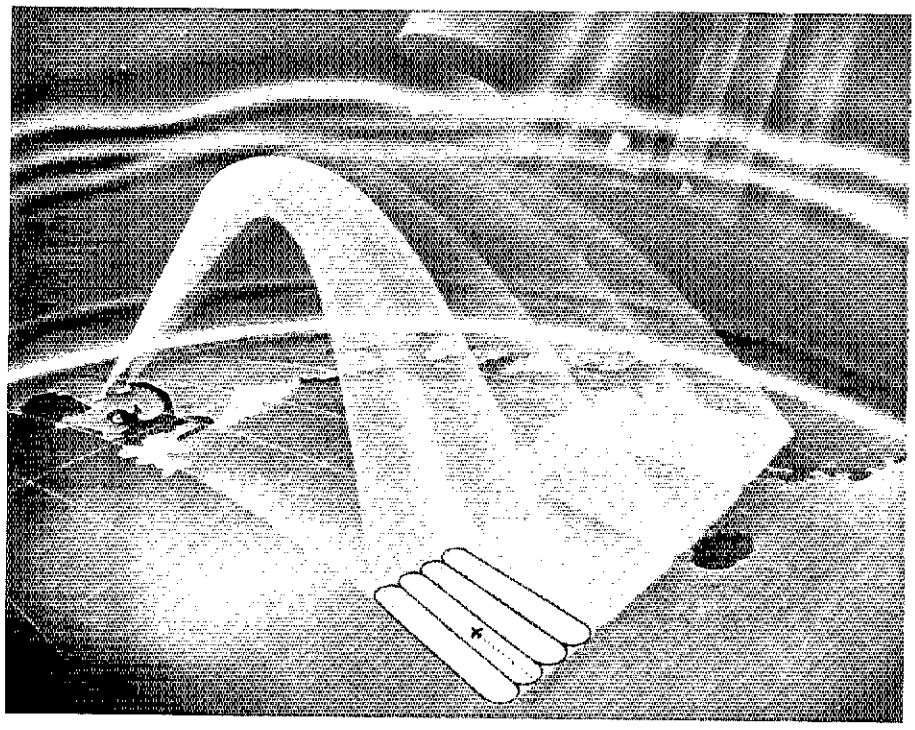


Fig. 3 — Closeup view of the way in which approaching aircraft would be tracked. Large squares are the regions illuminated by the transmitting beam; narrow strips are defined by receiving-antenna directivity.

flexible. It is provided with a low-power auxiliary sounder which repeatedly checks all the available frequencies to determine what propagation paths are present, what their loss is, whether they are adequately stable, and whether multipath is present. A separate facility automatically checks all the available channels for interference, measuring not only the level at any given instant, but also the time history of that channel's usage.

All these input pieces of information plus many, many more (such as worldwide geophysical data) are taken into account by the radar's main computer, to which, of course, is fed mission-related information. For example, how likely to be dangerous (on the basis of other information) is a given unknown reflection?

So long as it is performing its mission satisfactorily, the radar's operating guideline is to cause as little interference as possible. Thus, when propagation is good, it can reduce power. (Much of the time, the full transmitter power of an OTHR is not needed. It is, of course, required when propagation loss, e.g. absorption, and QRN levels are high.)

The actual method of operation is approximately as follows. First, the useful band of frequencies is determined from soundings and other data. Then the open allocated channels within that band are identified and ranked in order of desirability. Low path loss, low multipath and low noise are the chief criteria. The radar then comes up on the most desirable frequency and continues there until conditions change or interference develops, at which point is instantaneously changes to the frequency which at that moment is at the top of the continuously updated "most desirable allowable frequency" list.

Often the radar will shift from an otherwise excellent frequency in order to resolve range or Doppler (velocity) ambiguities. A practical problem is coping with multipath. The ionosphere — even if there is only one layer doing the reflecting and thus one "hop" — can support essentially four paths by which signals can travel between one point and another. These are the lower ray, the upper ray, and the two magnetoionic versions of each of these, the so-called O-mode and the X-mode. Fortunately, the latter two show up mainly as polarization rotation; but even so, an ionospheric radar under even simple conditions can normally receive two echoes for every target. It might be thought that such proliferation would cause intolerable confusion, but actually there are many remedies. Changing the frequency slightly is one.

Co- or adjacent-channel interference is perceived by the radar as another form of "noise." OTHRs are designed to work through some level of interference, no matter what its origin. For example, there are circuits which convert interfering carriers (from Teletype or shortwave broadcasting stations, for example) into what the radar receiver perceives as relatively harmless broadband noise. This can be done because the radar has full control of its transmitted signal and receiv characteristics.

How to Recognize Radar Interference

There is little problem in recognizi the Soviet OTHR signals, so long as th continue the present format consisting millisecond-length pulses at a rate of per second. When these first came on t air, they seemed to come up on almost a frequency, often for long periods of tim to the great annovance of almost all use of the hf spectrum. The situation is no much better; the radar seems to respe the bands occupied by low-power statio and even the amateur bands, althoug there are occasional transgressions. A m jor change is that they no longer stay f very long on any given frequency; th constant shifting around makes it possib for fixed-frequency users to get essenti traffic through, albeit with occasion delays.

The American radar signals, by way contrast, will sound on an a-m receiv more like power-line hum, but at any o of several modulation frequencies from 2 Hz to 60 Hz. They should be much le irritating than on-off pulsing. Becaus they will be coming from a sourc physically closer to some U.S. amateurs however, they may be troublesome whe propagation is exceptionally good. Th essential problem is illustrated in Fig. 5 As everyone knows, it is impractical t build a receiver with a passband havin perfectly square sides. Similarly, it unfeasible to transmit a waveform havin a spectrum with perfectly square sides. A a result, when a radar such as CONU OTHB operates adjacent to a ham ban and its signals become strong enough there may be enough side-frequenc spillover to be bothersome.

The radar, of course, radiates an in tense beam in the forward direction. N American amateurs will be located in th CONUS OTHB illuminated area (unles of course they are operating maritime o aeronautical mobile). Since the transmit ter beam (like the receiver) is formed by broadside array of elements, an almos equally strong beam would appear in th reverse direction were it not for the actio of a reflecting curtain, which cuts th backward radiation by some 20 dB, th exact amount depending on the fre quency. Thus, amateurs off the back o the transmitting array in the appropriat direction will be the most likely to en counter interference when propagation i strong.

What To Do If Interference is Encountered

First, be sure that the troublesom signal really comes from Maine. This ca be checked by switching between anten nas, or by rotating a beam. *Second*, check the center frequency of the signal by tuning outside of the band using a

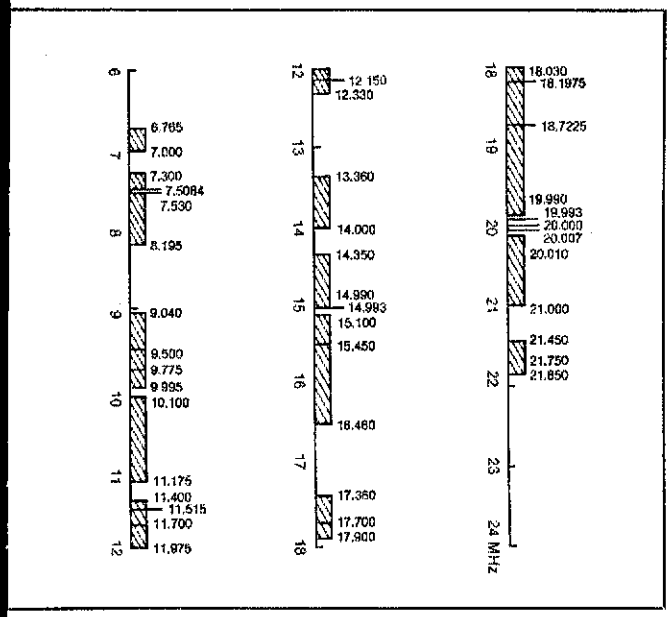


Fig. 4 — The crosshatched frequency intervals are the ones expected to be used on a noninterference basis by the CONUS OTHB.

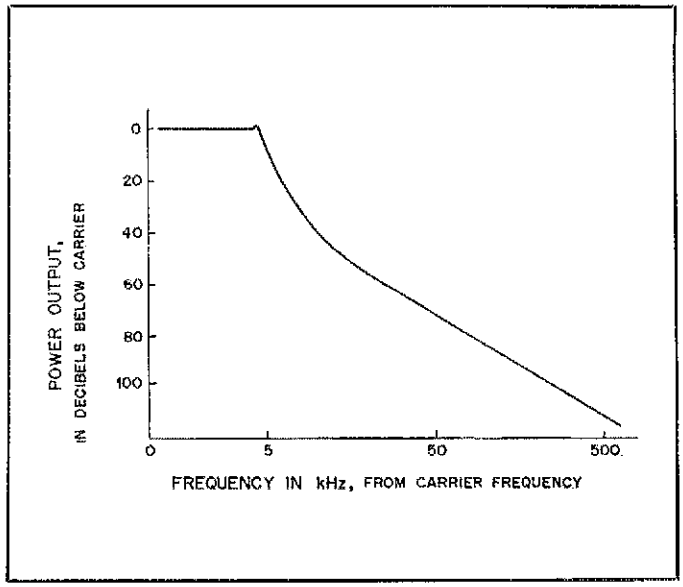


Fig. 5 — Plot of the frequency spectrum of the experimental OTHB radar, in normal operation. Note the very rapid dropoff at the edge of the band.

separate receiver if necessary. If the center frequency falls inside the band, report it to the FCC at once. But if the center frequency (that is, the frequency at which the signal is strongest) is clearly outside the band, then proceed as follows. *Third,* check the rate at which the interference falls off as you tune into the band from the band edge. If it falls off rapidly, that may well be the normal situation. In such a case there isn't much that can be done. The radar should not stay on any one frequency very much of the time. If you are bothered by it for more than four or five minutes, by all means do complain, as that shouldn't happen either. *Fourth,* if the interference seems to fall off quite slowly as you tune into the band, the problem you are experiencing may well be caused by cross-modulation of the front end of the receiver. Checking with a neighboring ham having a different type of receiver would be useful in such a case. Many solid-state receivers are easily overloaded by strong out-of-band signals. A simple attenuator, if not already provided, can work wonders. A better but somewhat more complicated method is to provide additional rf selectivity — a high-Q tuned circuit which helps restrict reception to the ham band in use. There are commercial preamplifiers on the market which can perform this function. *Fifth,* if the interference is really broad-band, check to make sure there are no rectifying contacts anywhere in or close to your station that are causing cross-modulation or harmonic generation. Corroded fence wire, tired TV antenna guy wires, etc., are often culprits. Such secondary signal sources can be searched for by use of a portable receiver; their signal strength should increase very rapidly as the source is approached. Shaking possible offending wires will often cause a telltale change in signal intensity. Checking with a neighboring ham often helps diagnose these problems.

Finally, if the interference persists in spite of all the above, maintain an accurate log of times and frequencies and contact your local FCC field office. The Air Force has made the necessary arrangements to have reports of actual interference by the OTHB handled promptly and expeditiously. A special board of QRM experts has been set up as overall interference coordinator for the CONUS OTHB. This board will appreciate your report and will do everything possible to assist you. Its address is: OTH Radar Office, U.S. Air Force Electronic Systems Division, Code OCUE, Hanscom AFB, MA 01731.

Amateur Help Requested

CONUS OTHB is the most powerful radar of this type ever to have been operated in the U.S. Interestingly, a number of U.S. experimental radars (WARF, MADRE, White House) all having a power output about an order of magnitude lower than CONUS OTHB, have been operated for a number of years with practically no reports of interference. However, these radars have not been obliged to operate 24 hours a day in all kinds of ionospheric conditions. In spite of careful electromagnetic compatibility studies made in advance, there is always a chance that something unexpected may occur. As a result, the U.S. Air Force will welcome amateur reports of its signals and their apparent level, whether there is interference or not. Reports of signal strength (and time), with antenna characteristics included, will be of value in checking propagation and in relating this to radar performance.

Acknowledgement

The author wishes to thank the Electronic Systems Division of the U.S. Air Force for assistance in the preparation of this article and for permission to publish it. QST

Notes

[1]Jane's *Weapon Systems* 1979-80 edition, suggests that there are "up to four" stations, and that the powers are in the "20 to 40 megawatt" range. (Jane's Yearbooks, London. McDonald and Jane's Publishers, Ltd., Toulton House, 8 Shepherdess, London N1 7LW.)

[2]Cohen, "Dateline . . . Washington, D.C.," *CQ*, August 1979, p. 60.

[3]Headrick and Skolnik, "Over-the-Horizon Radar in the HF Band," *Proceedings of the IEEE*, Vol. 62, No. 6, June 1974.

[4]Washburn and Sweeney, "An On-Line Adaptive Beamforming Capability for HF Backscatter Radar," *IEEE Transactions on Antennas and Propagation*, Vol. 24, No. 5, September 1976, pp. 721-732.

[5]"Instantaneous Prediction of Radio Transmission Paths," *QST*, March 1952, pp. 11-20.

[6]Kabanov and Osetrov, "Backscatter Ionospheric Sounding," *Moscow*, The Soviet Radio Press, 1965.

An Oriental Wedding

Here's a shot of the happy couple. Years of wedded bliss are in store for the well-matched pair!

Here's an inexpensive way to "marry" a remote VFO to your FT-101ZD. Not only are the bride and groom happy with the arrangement, but so is the best man — you!

By Paul K. Pagel,* N1FB

One of the currently popular amateur transceivers on the market is the Yaesu FT-101ZD.[1] Billed as the "little brother" of the FT-901DM, the '101 offers many of the features of its larger relative while some of the frills have been eliminated. This results in a substantial savings to the would-be purchaser. The itch to bring a new rig into the shack had been needing a scratch for some time. When the neat gray box was seen face-to-face, I knew trading time was at hand. Now, how about a remote VFO? Well, that took a little more thought.

The companion VFO for the FT-101ZD is the FV-901. This unit was designed to mate also with the FT-901DM and the price tag shows it — over $400! But were the scanning and memory features of the FV-901 really needed? Not really, just the basic VFO. A search disclosed that a number of remote VFOs are available that cover the same basic frequency range of 5.0-5.5 MHz, some with a bit of overlap at the band edges. Any of these units (such as the Heath series) can be adapted to work with the '101ZD. Through the good graces of W1FB, I acquired a Kenwood VFO-520 he had in his shack. Now all that had to be done was to get the combination running!

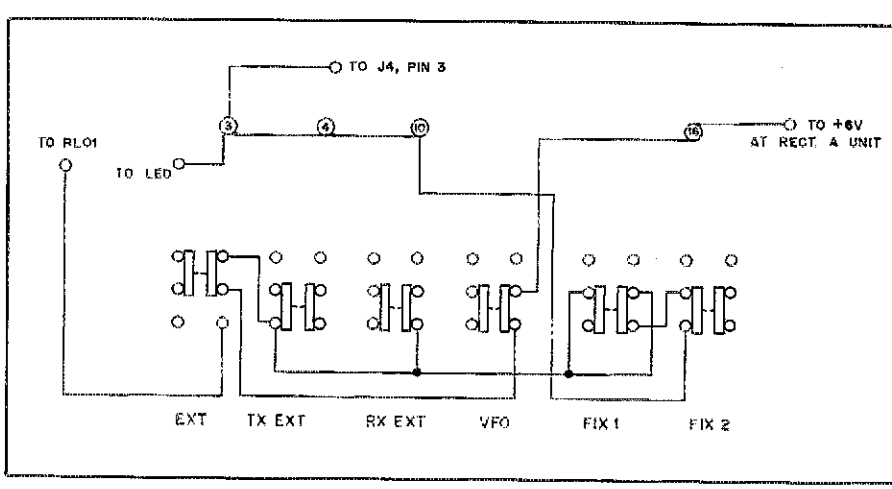


Fig. 1 — A simplified wiring diagram showing how the operating voltage is applied to the remote VFO jack in the FT-101ZD. Note that the EXT switch has been selected and the VFO switch is "out."

*Assistant Technical Editor, *QST*
[1]Footnotes appear on page 45.

Table 1

Pin Connections and Voltages Present at the Pins

FT-101ZD Pin no.	*Voltage present*	*VFO-520 Pin no.*
1	Remote VFO signal	1
2	Cable shield	2 and 3
3	+6 V	9
4	12.6 V ac (HEATER on)	4
5	+ 12 V dc (on xmit)	5

Minor wiring changes are required at the sockets of the two units; refer to the text for clarification.

Table 2

Switch Positions During Operation

FT-101ZD	*VFO-520*
VFO	Inoperative
RX	REC or REC/XMIT
TX	XMIT
EXT	REC/XMIT

Table 3

Frequency Coverage of the Two VFOs

Band Segment	*FT-101ZD*	*VFO-520*
160	1.4607 - 2.0284	1.4775 - 2.1351
80	3.4609 - 4.0286	3.4777 - 4.1353
40	6.9612 - 7.5290	6.9780 - 7.6357
20	13.9612 - 14.5290	13.9781 - 14.6357
15	20.96. - 21.5288	20.9779 - 21.6356
10A	27.9607 - 28.5285	27.9776 - 28.6352
10B	28.4615 - 29.0292	28.4784 - 29.1359
10C	28.9614 - 29.5292	28.9783 - 29.6359
10D	29.4609 - 30.0287	29.4778 - 30.1354

The result is similar to a mixed marriage of a couple of countrymen. The interconnecting cable reflects a bit of individuality at each end. Nevertheless, as in all good marriages, a little "give and take" is necessary. So, too, compromise is made here to the delight of everyone concerned. Funny enough, the 9-pin plug (found in the junk box) that was used to mate with the Kenwood VFO was from an ICOM unit. Matchmakers and modifiers are a heartless group!

The Circuitry

A glance at the diagrams is worth a thousand words. At first it may seem that the switching scheme of the '101ZD is a bit confusing, but if one remembers that the switches are mechanically interlocked, it should become easier to trace the paths. The switches shown in the FT-101ZD diagram are arranged such that all are in the "out" position with the exception of the internal VFO button which is "in." The diagram of Fig. 1 shows the '101ZD switches set with the EXT button depressed and the VFO button "out." This allows +6 V to appear at J4, pin 3, to power the remote VFO. This voltage is also applied to the proper LED on the '101 display panel. The TX EXT and RX EXT buttons also route the required operating voltage to the remote VFO socket. With these switching choices, RL01 of the transceiver enters into the picture as well.

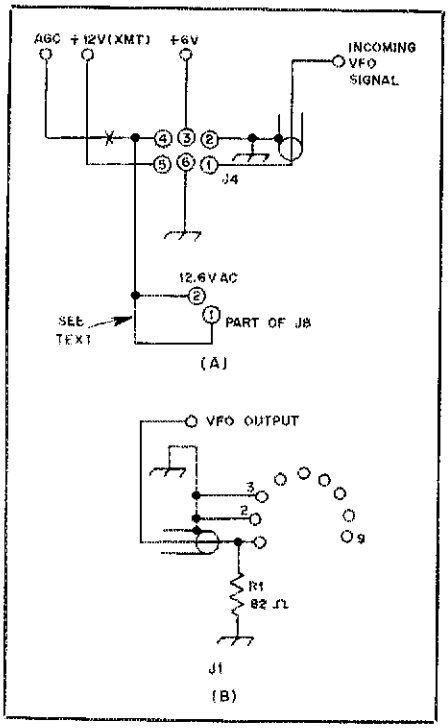


Fig. 2 — The wiring changes to J4 of the FT-101ZD may be seen at A. B shows the wiring addition to J1 of the VFO-520. Pins 1 and 2 of J8 are jumpered by means of the external plug supplied with the FT-101ZD. R1 is a one-half watt resistor. A 9-pin miniature plug (Amphenol 86-897 or equivalent) is used to mate with J1 while a 6-pin DIN plug (GC Electronics 18-106 or equivalent) is mated with J4.

The age function available at pin 4 of J4 in the '101ZD is not needed. The existing wire at this pin may be removed, covered with insulated sleeving and tied back. A new wire is connected between pin 4 of J4 to either pin 1 or 2 of the accessory socket, J8. (These pins are jumpered by means of the external plug on the '101ZD.) This added wire will be used solely to supply ac voltage to the dial lamps on the remote VFO. Wired in this manner, the remote VFO dial lamps will not be lit unless the HEATER switch on the 'ZD is switched on. If it is desired to have the lamps lit any time the transceiver is turned on, regardless of the HEATER switch position, the wire from pin 4 of J4 should be run to location H on the rectifier A unit.

Pin 3 of J1 in the VFO-520 must be grounded to complete the circuit for the lamps and the internal relay. Interconnections for the two units are shown in Table 1 and the required socket wiring changes are shown in Fig. 2.

It was found that the output level of the '520 VFO was a bit higher than that of the '101ZD. This became evident during transmission and was spotted when checking a cw carrier on an output monitoring 'scope while switching back and forth between the internal VFO of the 'ZD and the remote '520. Installation of an 82-ohm, 1/2-W swamping resistor across the output of the '520 VFO (at J1) brought the level to that of the 'ZD VFO. If the output level of the remote VFO isn't decreased, the drive level on the '101ZD will have to be adjusted when switching between VFOs for transmitting.

With these changes accomplished, make up the connecting cable using the appropriate connectors. A cable length of no more than 3 feet (900 mm) is recommended. Caution should be observed if the type of DIN plug specified is used. The pins are mounted in plastic and even a 25-watt soldering pencil held too long a time on the pin will melt the plastic allowing the pin to move. This will result in misalignment of the pin.

Operation

The function switch of the VFO-520 may be left in any position when not in use. Unless the remote VFO is specifically chosen by the delegation switches on the FT-101ZD, the remote VFO will not operate. Naturally, it must be in any operative position for it to be functional when chosen. In other words, if you have the remote VFO in the off position and select any of the external VFO positions on the 'ZD, you'll have no VFO input signal. The display will read a strange 9-MHz frequency to let you know that you goofed! By referring to Table 2, you can correlate the transceiver/VFO switch positions needed for proper operation. Such operation is indicated by the LEDs on both the transceiver display panel and the VFO dial face. When the RIT button is pressed, the appropriate LED should light and the RIT function be enabled.

As shown in Table 3, the frequency coverage of the VFO-520 is a bit greater than that of the '101ZD on the upper frequency ends of each band segment. The FT-101ZD, on the other hand, has more spillover on the lower ends of each band. By alternating between the two VFOs, you can average about 123 kHz more coverage on each band segment. This extended coverage should prove of interest to MARS operators.

It is hoped that this presentation will provide an incentive for others to follow suit.[2] The use of 5.0-5.5 MHz as a VFO frequency is rather common. Similar applications could be made to other manufactured or home-built gear. Often, a bit of time spent in thought and with a soldering iron in hand can wind up saving a fellow a lot of money. Now — with all that money I've saved — where's that ad for the general-coverage receiver? QST

Notes

[1]DeMaw, FT-101ZD, "Product Review," *QST*, December 1979.

[2]At the time this "marriage" occurred, the only companion VFO for the FT-101ZD was the FV-901. Recently, Yaesu has announced the availability of the FV-101Z at somewhat lower cost.

Technical Correspondence

Conducted By
John C. Pelham,* W1JA

EXTENDING TRANSMATCH RANGE

☐ When trying to tune my balanced 300-ohm feeders with a Dentron 160-10AT Transmatch on the low end of 80 meters, I found that the output capacitor "wanted" to be at more than the maximum capacitance available. My first thought was to add a fixed padding capacitor of about 500 pF with a high-voltage switch to put it in parallel with the output capacitor when needed. However, I came upon a simpler solution which requires no modifications at all.

In tuners like the Dentron, Heath, Ultimate Transmatch and others, the output capacitor is connected to the single-wire antenna terminal. This is then connected with an external connecting link to one of the balanced feed terminals. By substituting a small air-wound coil of about 2.4 μH for the link (as shown in Fig. 1), the effective value of output capacitance can be increased. The reasoning behind this is as follows: The coil is in series with the output capacitor, which has a maximum value of approximately 500 pF in the Dentron tuner. The resonant frequency of this series L-C combination is just above 75 meters, at 4.6 MHz. A series circuit just below resonance behaves like a capacitor of very low impedance. This is another way of saying that it behaves like a large value of capacitance, larger than the actual capacitor alone.

At 3.5 MHz the effective reactance of this series L-C combination is

$$X_{net} = X_L - X_C$$

$$= 2\pi (3.5 \times 10^6)(2.4 \times 10^{-6}) - \frac{1}{2\pi(3.5 \times 10^6)(500 \times 10^{-12})}$$

$$= 52.8 - 90.9 = -38.1 \text{ ohms.}$$

This net capacitive reactance is equivalent to a capacitor of value

$$C = \frac{1}{2\pi f X_C} = \frac{1}{2\pi(3.5 \times 10^6)(38.1)} = 1190 \text{ pF.}$$

In my case the coil was a length of B & W no. 3014 Miniductor stock 1.75 inches (44.5 mm) long, 1 inch (25.4 mm) in diameter, 8 turns per inch. It is left connected on both 80 and 40 meters, but should be disconnected and the link replaced for operation on the higher frequency bands where the coil reactance becomes quite high. It is well to remember, however, that very high voltage can exist at these terminals. Make sure that the transmitter is turned off. Don't make the mistake of leaving the rig on VOX when changing connections on the antenna tuner; the more you yell, the more you'll get zapped! If the output capacitance of the tuner is other than 500 pF, choose L to resonate at a frequency between 4.5 MHz and 5.0 MHz. The exact value is not critical. — *Jacob Z. Schanker, W2STM, 105 Colony La., Rochester, NY 14623.*

*Asst. Technical Editor, *QST*

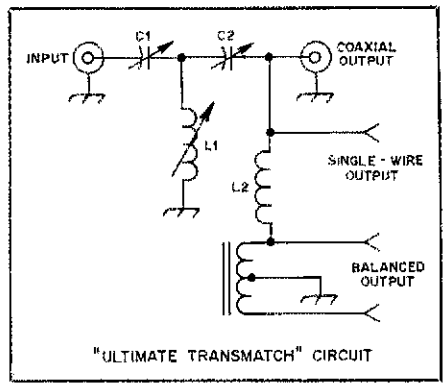


Fig. 1 — A small coil, L2, is added to the basic Transmatch circuit when needed to increase the effective value of output capacitance.

A TUNE-UP BRIDGE NOTE

☐ I built the bridge described in "Tune Up Swiftly, Silenty and Safely," in December 1979 *QST*. I found the circuit to be an excellent QRM-reducer. It allowed me to tune up with 250 mW instead of the much higher power level usually used.

During initial tests of the bridge I noted a problem, however. I conducted a response test of the toroidal transformer used in the bridge with a spectrum analyzer and a signal generator. The results indicated a response rolloff on 40 and, especially, 80 meters. The accepted procedure when designing broadband transformers is to use a reactance value of five times the circuit impedance for good low-frequency response. This would require a secondary reactance of 250 ohms (5 × 50 ohms). I calculated the inductance of the secondary as shown in the article to be 0.57 μH, or 12.5 ohms of reactance at 3.5 MHz. This is far below the ideal value of 250 ohms.

My solution was simple: Increase the reactance of the transformer secondary to at least 250 ohms at 80 meters. This was done by using a toroid of higher permeability. A Ferroxcube type 3E2 0.38-inch (9.65-mm) core was on hand, so I used it to test the idea. I didn't measure the inductance of the coil but would have to say it was quite high. Tests indicated that the useful low-frequency response of the transformer had been extended to 500 kHz, and the upper-frequency limit was 100 MHz. If the type of core I used isn't available, FT23-43 or FT23-61 cores should work as well for power levels of 100 watts or less. Use larger cores for higher power levels. — *Kenneth E. Stringham, Jr., AE1X, 13 Linden St., Attleboro, MA 02703*

[Editor's Note: Also see "A Useful Meter Amplifier" in the "Hints and Kinks" section of this issue.]

AN ANTENNA-PRUNING SHORTCUT

☐ I believe most hams use the formula $L = 468/f$ to determine the correct half-wavelength of wire for a dipole. Many times when this length of wire is installed in its final location, checks may indicate a resonant frequency quite different from what was intended. The question then is how much wire to add or subtract to bring resonance to the desired frequency. Rather than haphazardly adding or subtracting wire, requiring many raisings and lowerings of the antenna before a final length is determined, I have found the following method quite satisfactory and less left to chance.

As an example, say a half-wavelength dipole resonant at 7.05 MHz is desired. 468 divided by 7.05 gives 66.4 feet. However, when the antenna is in its final location, a check with an SWR bridge reveals a resonant frequency of 7.15 MHz. Multiplying the original 66.4 feet times the actual resonant frequency of 7.15 MHz yields 475, a new constant to use in the formula in this particular installation; $L = 475/7.05 = 67.4$ feet. If the original short dipole is now lengthened to 67.4 feet, the resonant frequency will be very close to the desired 7.05 MHz. — *Joseph H. NeCamp, W4JBQ, 1728 Highland Pike, Fort Wright, KY 41011*

ABSOLUTELY CLICKLESS KEYING?

☐ In the past several months, subjective cw listening tests on the new breed of hf transceivers have been disappointing. Most of them have slight to severe clicks, especially when they are used with a power amplifier. You are to be congratulated for publishing oscilloscope waveform photos for the Yaesu FT-101ZD (December 1979 *QST*) and the Ten-Tec Omni D (January 1980 *QST*). Unfortunately, none were shown for the FT-901DM, IC-701 or TR-7, reviewed earlier.

Restricting my comments to the TR-7, FT-101ZD and Omni D units (just haven't run into many fellows using the '901 or '701 units, or perhaps they have clickless keying and are not noticed), my observations are that almost without exception their key clicks are noticeably more prevalent as compared to the older units such as the Drake T4-X or the Collins 32S-3 transmitters. From the keying waveforms of the FT-101ZD and Omni D, it is no wonder one hears clicks from these units. All it takes is a little hardening of the keying through an amplifier or a minor misadjustment and one has almost a square wave on the "break."

In reference to comments on page 48, January 1980 *QST*, under Fig. 3, I believe you

are just a wee bit off base. Ideally, 5 ms from start of carrier to full carrier on the "make" and from full to zero carrier on the "break" will result in clickless keying. But this time span should not be measured from the time one presses or releases the key! As a more authoritative source, let me refer you to any one of the ARRL Handbooks under the chapter "Code Transmissions." The figure 5 ms is again mentioned as the time for rise and decay times referenced to the carrier, not to the keying circuits.

Thus I feel you should revise your statement, as this will mislead many amateurs into thinking their new and fancy rig has "absolutely clickless keying" when this is not true at all. One or two ms rise and decay times are just not enough. — *H. Dale Strieter, W4QM, 928 Trinidad, Cocoa Beach, FL 32931.*

[Editor's Note: OM Streiter's letter is one of several received commenting on the appearance of the cw keying waveforms in the "Product Review" column; the response has been quite favorable. Perhaps others have misinterpreted the caption referred to in Dale's letter. To further clarify the statement, the 5-ms make and break (rise and fall) time constants referred to are meant to apply to the time it takes the actual waveform to rise from 10 percent to 90 percent or fall from 90 percent to 10 percent of its maximum amplitude. It does not apply to the time between the make or break of the key and the generation or degeneration of the wave.

It is unfortunate that many amateurs do not know what their on-air signal sounds like since they have no means of monitoring it or haven't taken steps to check it. Readers may be interested in reading "Why Key Clicks?" by W1DF, in the October 1966 issue of *QST*. — *Paul K. Pagel, N1FB, Product Review Editor, QST.*

TUNED FEEDERS ARE BETTER

☐ I often wonder why most antennas described in books and articles use coaxial feeders when tuned feeders of parallel-conductor line work so much better. They permit the use of an antenna system on several bands, with the added benefit of gain (compared to a dipole) on the higher frequency bands.

An example is the article, "Better Results with Indoor Antennas," in October 1979 *QST*. I liked the way author Brown discussed comparing antennas and the variables involved. The "resonant breaker" is an interesting and useful device. However, I suggest that Mr. Brown use a multiband antenna with tuned feeders in his attic instead of the coaxially fed trap antenna described in his article. If an antenna 20 feet (6.1 m) in length on each side of the feed point (the approximate length of his trap antenna) were installed, on 15 meters it would be a collinear array of approximately two half waves in phase with a gain of 1.8 dB over a dipole. On 10 meters the antenna would be an "extended double Zepp" collinear array with a 3-dB gain advantage over a dipole. On 40 meters the antenna would work as well as the trap dipole. The antenna would also work very well on 20 meters and be usable on 80 meters, two bands not covered by the trap dipole.

Since low SWR has become somewhat of a fetish among amateurs, many of them are using coax-to-coax antenna tuners to reduce the SWR. They don't seem to mind the extra knob-twisting required. If they used balanced tuned feeders they could enjoy the advantages of a truly efficient mutiband antenna system. A coax-to-coax tuner can be easily adapted for use with balanced feeders by adding a 4:1 balun such as described in the ARRL Handbook or Antenna Book. — *Bill Stocking, WØVM, 1030 Weidman Rd., Manchester, MO 63011*

ACCURATE TRANSISTOR VOLTMETER CORRECTIONS

☐ I made two errors in my article, "An Inexpensive High-Z Accurate Transistor Voltmeter," which appeared in December 1979 *QST*. The value of R13 in Figs. 2 and 3 should be 2.4 kΩ *only*, not 2.4 kΩ in series with 100Ω.

Also, unless R21 and R22 of the calibration circuit are selected carefully, it is possible to get a very high error in the calibration voltage. I suggest that the circuit shown here in Fig. 2 be used instead. Adjust the 500-ohm potentiometer for an output of exactly 100 mV, and calibrate the voltmeter on the 100-mV range. — *R. E. Barber, G3NEF/ZC4RE, 7 Northern Ave., Henlow, Bedford, England*

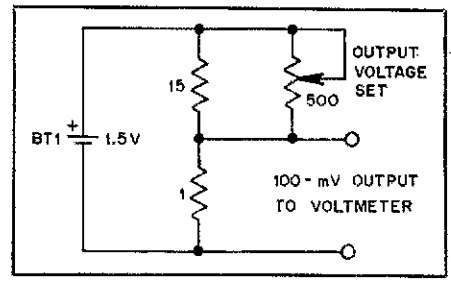


Fig. 2 — A modified calibration circuit for the G3NEF voltmeter. All resistances are in ohms.

CLOTHES-DRYER QRN

☐ For quite some time I'd been having electrical noise interference on the 10- and 15-meter bands. The noise would be on for about six seconds and off for about 20 seconds. It repeated this pattern for many hours. It was present some days for most of the day, lasting well into the night. On other days it was totally absent. I enlisted the help of the local power company to track it down. They used a receiver with a directional antenna.

It turned out to be an old gas clothes dryer with a gas pilot, located about 300 feet from my station. A defective solenoid was the cause; when the dryer would call for heat, the voltage would arc across the open solenoid coil! The main burner would still operate. A large family with lots of clothes to dry was the reason that the noise was present for such extended periods. — *George C. Alich, WØLNT, 924 Bayard Ave., St. Paul, MN 55102*

Feedback

☐ There are three errors in Fig. 1, page 45, of "A Static Morse Keyboard," January 1980 *QST*. Directly under Q1, a wire should be added from the anode of the left-most diode to the base of Q1. A 100-kΩ resistor should be added from the number 12 "B" coordinate line to ground, on the anode side of the diode. In keeping with *QST* style, a connection dot should be added where the cathode of the fifth diode up from the bottom of the schematic meets the vertical line to the right.

☐ In the March 1980 *QST* article, "Microcomputers and Radio Interference," the dimensions given for the third-stage-effort enclosure should have been 3 × 7 × 12 inches.

☐ An error exists in Fig. 3A of "A Simple and Sensitive Impedance Bridge," March 1980 *QST*, page 30. C1 should be placed across the output of the bridge at points X and Y.

☐ In "A Cheapy-Charger for NiCad Batteries," February 1980 *QST*, the charging-current table mentioned in the text of the article was inadvertently omitted. It is given here.

Table 1

Suggested Trial Charging Currents for Cells with Unknown Characteristics.

Cell Size	*Charging Current*
D	60 mA
C	50 mA
AA	25 mA

☐ The new ARRL *Advanced/Extra Q and A Book* has two errors in the Advanced section on electrical principles. In Q. 107, delete the work "peak" or its abbreviation wherever it occurs in the question or the answer. The power dissipated by the resistor is 1 watt. In Q. 113, +30 dBm is 1 watt, not 100 watts as printed. The PEP of a multiple-tone (equal-amplitude) signal equals the rms power of any single tone times the *square* of the number of tones. The "Technical Correspondence" section of May 1980 *QST* will contain a letter detailing these calculations.

☐ The "Stray" item on page 20 of March *QST* mentioned that WA3ZRY had the misfortune of having his home — and QSL card collection — gutted by fire. WA3ZRY is Arthur E. Smith, of 112 Two Line Rd., Telford, PA 18969. The name and address given in the March issue were incorrect. If you have worked WA3ZRY, please send duplicate QSLs to Art at the above address.

☐ An omission occurred in "The WARC Warriors" (March *QST*, page 60). Mr. R. H. Robinson, W4ZR, is a contributor of $100 to the ARRL Foundation WARC Fund.

☐ In paragraph 3 of "FM/RPT" (February *QST*, page 83) 300 characters per *second* (cps) should have been 300 characters per *minute* (cpm) and 550 cps should have been 550 cpm.

☐ The publisher and editor of *RTTY Journal* ("Correspondence," February *QST*, page 77, "Special Techniques" Returns) is Dee Crumpton, P. O. Box RY, Cardiff-By-The-Sea, CA 92007.

☐ John L. McCarthy, W9OTE, was inadvertently listed in the March "Silent Keys" column.

☐ In "A Universal Digital Frequency Readout," January 1980 *QST*, a few errors occurred in Fig. 2 on page 13. U3 is a CD4060, U14-U17 incl. are 74LS190 and U10-U13 incl. are 9374 ICs. All diodes are 1N914 or 1N4148.

Product Review

Conducted By Paul K. Pagel*, N1FB

The HAL DS3100 ASR Video Display Terminal

The HAL DS3100 ASR is a tri-mode terminal capable of sending and receiving Morse, Baudot RTTY (with an optional demodulator) and ASCII. It's the latest addition to HAL's lineup and is their "big gun." Unlike a big gun, however, this terminal is q-u-i-e-t. Hardly a sound comes from the neat-looking brown and tan unit as it quickly goes through its paces; just the soft rattle of the keyboard and the sound of the built-in monitor (active during Morse and for certain line indications), which may be hushed to a low-level mewing. During RTTY operation, there are no whirring motors, slamming carriages, clunking line feeds or the whack of type faces on ribbon and paper. Instead, a restful and easy-to-read green phosphor display silently greets the eye, telling you not only what you're receiving but what you're transmitting, as well as a multitude of terminal status reports including the date and time.

The DS3100 arrived for a review complete with the ST-6000[1] RTTY demodulator and a set of cables prepared for connection to my transceiver. (The customized cabling is an extra-cost option.) A loose-leaf binder contains the instruction manual, and a handy pocket reference highlights the important phases of system operation. Thus, one need not consult the instruction manual for its detailed information when one simply desires to know a key function, for instance. The system interfaces with the outside world by means of RS232C levels as well as the standard high-voltage RTTY current loops. Transistor switches are also provided to key either negative or positive circuits simultaneously.

The 12-inch diagonal measure screen of the monitor (which mounts atop the keyboard assembly) displays a total of 24 lines of 72 characters each in a split-screen format. Generally, the upper 12 lines show received characters and the lower 12 are assigned to text that is to be transmitted. The received text is presented with a brighter intensity than the keyboard-generated text. The display may be altered to devote the entire 24 lines to received text or view operator-selected portions of either the receive or transmit buffers. All data passes through the buffers. Received data is stored in a 150-line buffer, and transmit text in a 50-line buffer. The screen is merely a "window" used to view either storage area. Each displayed line of text is numbered at the left-hand margin of the screen. The right-hand side of the screen keeps the operator informed of the terminal status by means of 13 status indicators. Two transmit buffer cursors show the transmit-output location and the keyboard-entry location. A third cursor indicates where the next received character will be placed.

At the keyboard, you may choose: Morse at speeds from 1 wpm to 175 wpm; Baudot RTTY at 45 to 100 baud; ASCII at 110 to 9600 baud, all both send and receive. With the KOS (Keyboard Operated Switch) and the KY (KeY switch) features, receive/transmit and auxiliary-function switching is done automatically; no need for external PTT or foot switches.

The HAL DS3100 ASR Video Display Terminal. This completely buffered terminal offers a multitude of features for completely automated transmission and reception of Morse, Baudot and ASCII RTTY.

If you're not a good typist, the '3100 will make you appear to be a "pro." You need never make an error again — that is, at least so that anyone would notice! Hit the wrong key? Simply go back and correct the error before it is transmitted. You can prepare a complete transmission while receiving then simply sit back and watch it "roll off your fingertips." If typing in real-time, SYNCHRONOUS IDLE will make it appear as though you're thinking of something profound to say while all the while you're looking for the right key! SYNC IDLE works not only in ASCII and Baudot modes, but Morse as well appearing as $\overline{BT}$ (- · · · -).

QBF (Quick Brown Fox/1 - 0) and RY test messages are available at the touch of a key. Selectable USOS (UnShift On Space), automatic generation of CR (Carriage Return) and LF (Line Feed) and the non-overprint features help eliminate garbled messages. WORD WRAP-AROUND is a non-overprint feature which transfers all characters following the last space to the following line to prevent splitting of a word.

There is a total of 10 different 32-character messages which may be programmed and used as desired by the operator. Two of these messages may be saved even during power-off periods since they are part of the systems EAROM (Electrically Alterable Read Only Memory). Another EAROM function is a WRU (Who aRe yoU) message which may contain up to 10 characters. SEL CAL (SELective CALling) and IDENT (IDENTification) are available too. The IDENT feature will allow Morse only transmission of one of the EAROM messages regardless of the existing terminal mode. The IDENT status indicator in-

[1]"Product Review," *QST*, May 1977.

*Assistant Technical Editor, ARRL

forms the operator that a 10-minute transmission period has elapsed but it does not insert the Morse identification by itself.

The '3100 operator may transmit chosen portions of received text. The information is selectively switched from the receive buffer to the transmit buffer to prepare it for transmission. Editing, too, is easy. Not only may one correct "typos" as they happen, but the operator may return to any line, word or letter (prior to its transmission), and alter it to suit his taste. Half-duplex (normal) or full-duplex operation is possible with the system. Full-duplex operation allows *simultaneous* active receive and transmit functions to be operative. CONTinuous, LINE and WORD transmit modes refer to the manner in which transmitted text is handled. In the CONTinuous mode, characters are transmitted as they are released from the buffer without stopping until the end of the text is reached. LINE mode transmits one line at a time; information within a line not being transmitted until after a new line has been typed. WORD mode outputs one word at a time. A word will not be transmitted until the system recognizes the first character of a new word following a space between words.

There is an internal real-time, 24-hour clock within the '3100. This clock may be programmed with the time, zone and date, and the information may be transmitted at the touch of a button. The clock has to be reprogrammed each time the power is removed from the system.

Operating the '3100 proved to be the most fun I've experienced in a while. ASCII operation was not attempted since it hadn't been approved at the time of review, but Morse and Baudot RTTY proved delightful. I first tried the unit on cw. Having used a keyboard cw generator before, I felt somewhat secure. No matter which mode of operation is chosen, the secret to being an errorless emitter of information and rf is to set the speed of the HAL to somewhat less than your typing speed and prepare some transmit text during the receive period. (Now my secret's out!) The only transmitting "hang-up" I had was my inability to use the space bar effectively. I had never "sent spaces" on a key before! The cure for that turned out to be spending a couple of weeks at the keyboard running RTTY. When I went back to cw, the space-bar malady had disappeared.

Receiving cw with the '3100 was interesting. I never could quite break myself of the habit of copying along by ear; I also wouldn't recommend it be done. While the '3100 does a pretty good job of copying cw, it cannot equal the human brain when it comes to copying a really tough "swing" or copying under conditions of heavy QRM and/or QSB. Occasionally, the unit would get "stuck" (usually because of a station tuning up close to the frequency) but a depression of the CLR (CLeaR) key would get it going again. It's also surprising to watch the screen and see the print-out displayed one letter behind the received information. The system does lag to ensure that the transmitting operator is maintaining the same sending speed, and it will attempt to compensate for timing errors. If the received signal speed changes, the system copying speed changes automatically. It isn't necessary to set a received-speed control for cw; the unit clocks the incoming signal and figures this out all by itself.

Although I'd had some limited exposure to transmitting RTTY many years ago, I'd done nothing but copy RTTY in the recent past. I did quite a bit of practicing with the '3100 (while using a dummy load) to get the "feel" of the operation. My first QSO was a success, and from then on I was "hooked." Cw, my favorite mode of operation, fell by the wayside, and the '3100 (coupled with the ST-6000) kept me occupied for the next few weekends on RTTY. My "better half" was all in favor of such noiseless operation as was I. However, I did miss having an occasional "hard copy" for certain situations, such as RTTY picture reception. A mechanical printer can easily be accommodated by the '3100 for use in such circumstances.

Video-terminal RTTY and cw are quite commonplace today: ASCII is sure to follow soon. With the HAL DS3100 ASR, you'll have it all at your fingertips — silently. The HAL DS3100 ASR is available from HAL Communications Corp., Box 365, Urbana, IL 61801. Price class: $2000. — *Paul K. Pagel, N1FB*

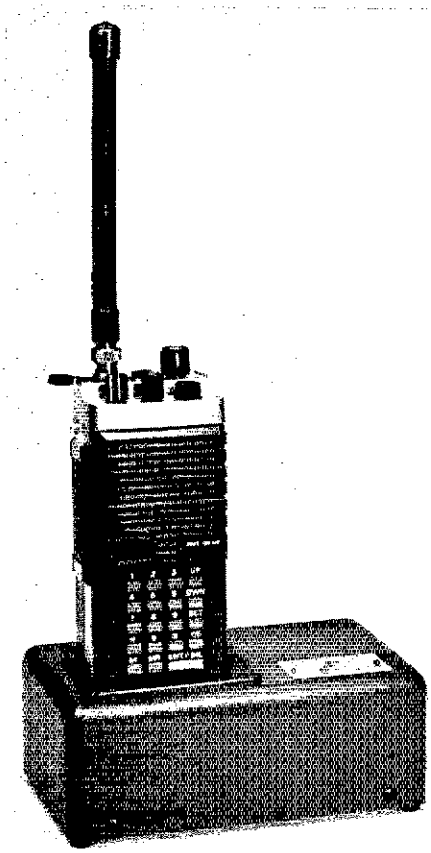
THE YAESU FT-207R HAND-HELD 2-METER FM TRANSCEIVER

Not long ago, having a synthesized 2-meter rig put you among the "elite" on this popular band. It was also convenient if the transceiver had a built-in Touch-Tone encoder so that one wouldn't have a length of wire and a surplus encoder dangling around the car or shack. A few months ago, the Tempo S-1 arrived (see *QST*, June 1979, page 37). Thanks to the wonders of miniaturization, this hand-held package contained its own built-in frequency synthesizer. The gang wondered where we'd go from there. Well, here's the first microprocessor-controlled hand-held — the Yaesu FT-207R!

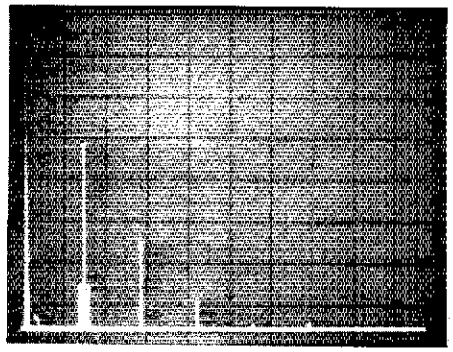
This rig has caused a real stir among radio amateurs, and for good reason. Its versatility is remarkable. The keyboard, shown in the accompanying photograph, is the "command center" for all the transceiver functions. While the intent is not to review the '207R's operating instructions, an example of how you put 'er on frequency is in order.

When the transceiver is first turned on, the LED display (yes, a digital display!) shows 7.00, representing 147.00 MHz. This readout will be displayed following any interruption of power to the memory, such as installation of a fresh set of batteries. For operation on 146.28/146.88 MHz, the keyboard entry is "688," then "ENT/DIL." This programs in the frequency. The −600-kHz repeater offset is available as one of the settings on the appropriate control knob on the top of the transceiver case. Simplex operation and ±600-kHz splits are built into the '207R for convenience. But there's more — splits of *any* amount, 10 kHz minimum, are programmable as long as they do not pass outside the 144- to 148-MHz limits of the transceiver. In a case of mistakenly (or deliberately — I tried!) programming a split resulting in possible out-of-band operation, an "E" on the display flashes to indicate that you goofed!

There are four memory channels in the FT-207R, and any of the splits may be used in conjunction with them. One of the more interesting features is the scanner. The band may be scanned in 10-kHz increments from 144 to 148 MHz (or vice-versa) by depressing the UP or DOWN button. The scan will continue for as long as either button is held down and may be set to stop at a clear or busy channel — a boon to locating repeaters in an unfamiliar area. The scan feature may be employed as well with the four memory channels. Touch-Tone operation is built in, too, as a keyboard function. A CTCSS subaudible tone feature will be available



The Yaesu FT-207R 2-meter synthesized hand-held transceiver is shown nestled inside its matching NC-2 charger.



ARRL lab spectral photograph of the output of the Yaesu FT-207R transceiver. In this photo, the rig was operating at 144.00 MHz with 2.5 watts output. Vertical divisions are 10 dB each; horizontal divisions, 100 MHz. The fundamental frequency has been attenuated approximately 30 dB by means of a two-cavity notch filter in order to prevent overload distortion in the spectrum analyzer. The most significant spurious signal, 10 MHz above and below the fundamental, is down approximately 65 dB; the second harmonic is down approximately 55 dB. This photograph represents the worst-case test; other tests within the band showed better attenuation of spurious products. The FT-207R, therefore, complies with current FCC specifications regarding spectral purity.

Yaesu FT-207R 2-Meter FM Hand-Held Transceiver

Claimed Specifications

Transmitter:

Power output: 2.5 W (min.)/200 mW high/low
Deviation: 5 kHz
Spurious radiation: –60 dB or better at 2.5 W output (see spectral photo for ARRL lab measurements)
Frequency coverage: 144.000-147.995 MHz
Transmitter offsets: 600 kHz or simplex built-in, others programmable, 10 kHz minimum.

Receiver:

Circuit type: Double-conversion superheterodyne
Sensitivity: 0.32 μV for 20 dB quieting
Selectivity: 7.5 kHz at –60dB
I-f: First, 10.7 MHz; second, 455 kHz
Audio output: 200 mW at 10% THD

General

Batteries: 450 mA NiCad pack
Current Consumption: Rx, 150 mA (35 mA squelched, display off) Tx, 800 mA (Hi); 250 mA (Low) Memory backup, approx. 4 mA
Voltage requirement: 10.8 V dc, nominal
Dimensions: 68 × 181 × 54 mm (HWD)
Weight: 680 g including batteries
Price class: FT-207R with wall charger, rubber duck antenna, earphone, belt clip and shoulder strap — $399.
Options: NiCad battery pack — $23; YM-24 speaker/microphone — $32; NC-2 desk quick-charger/ac supply — $86; TA-2 telescoping 1/4-wave antenna — $8.50.

soon as an aid to operation with repeaters in congested areas.

There are other conveniences, too: a LOCK switch for disabling the keyboard so that frequencies can't be accidentally changed; a 5 UP position for repeaters needing that extra 5 kHz (this digit doesn't appear on the display), and a DISP switch which is used to turn off the display to conserve battery power. This latter function may appear to be inconvenient, but it's not. Even with the display off, each time a frequency is changed the display momentarily comes on to show just what is happening. The 4-bit microprocessor chip inside the rig makes it all happen! the operator has a choice of 2.5 W or 200 mW of output power, switch selectable from the bottom of the transceiver case. For a hand-held, this certainly is a multitude of functions.

It takes some reading to cover the thorough instruction manual supplied with the '207R, but on-the-air contacts become easy to make once the operator has been "programmed." There is, for memory support, a constant drain on the NiCads in the transceiver. Consequently, if the rig is fully charged and unused for several days, the unit will have to be recharged. The memory draws 4 mA, so the 450 mA NiCads (fully charged) will run the transceiver for about four days with the unit at rest. By means of the offset switch, the memory backup may be disabled, thereby increasing the battery charge life.

One minor inconvenience I've noted during operation outdoors is that the LED display couldn't be read unless it was shaded with my hand. In the car, for ease of operation, I have been using a UG-255/V BNC-to-UHF adaptor to mate the '207R connector to my existing antenna lead in. The 2.5-watt power level is adequate for working repeaters in this area. Yaesu's optional speaker/microphone would be a welcome addition for extended mobile use. During all repeater contacts, I received excellent audio-quality reports.

When the FT-207R arrived here at Headquarters, it was supplied with the optional NC-2 desk charger/ac supply and two optional NiCad battery packs. The charger has a tapering charge rate, from an initial 450 mA to a pulsed 45 mA. Although the charge rate doesn't drop off completely, the LED indicator will show a slow pulsing as the batteries approach a fully charged condition, indicating that the '207R's ready to go. Yaesu does not recommend that the charger be left on indefinitely, as possible damage to the NiCads may occur from overcharging.

There's a lot in this small package, indeed, but it's well presented and housed in a rugged case. A belt clip and shoulder strap are provided. My overall operating impressions are very favorable. Once the operating instructions are mastered — not difficult at all — the FT 207R really shines in 2-meter versatility. — *Sandy Gerli, ACIY*

MURCH UT-2000-B TRANSMATCH

"Slick and built to handle the power" were my thoughts as I peered into the exposed innards of the Murch UT-2000-B matching network. The fundamental circuit is pretty similar to that of most of today's commercial Transmatches, but the circuit of such a unit is not the only consideration. The matching resolution is just one function to contemplate. Another is whether or not the components can handle the full legal amateur power without arcing, overheating or melting. This Murch unit fills all of these requirements.

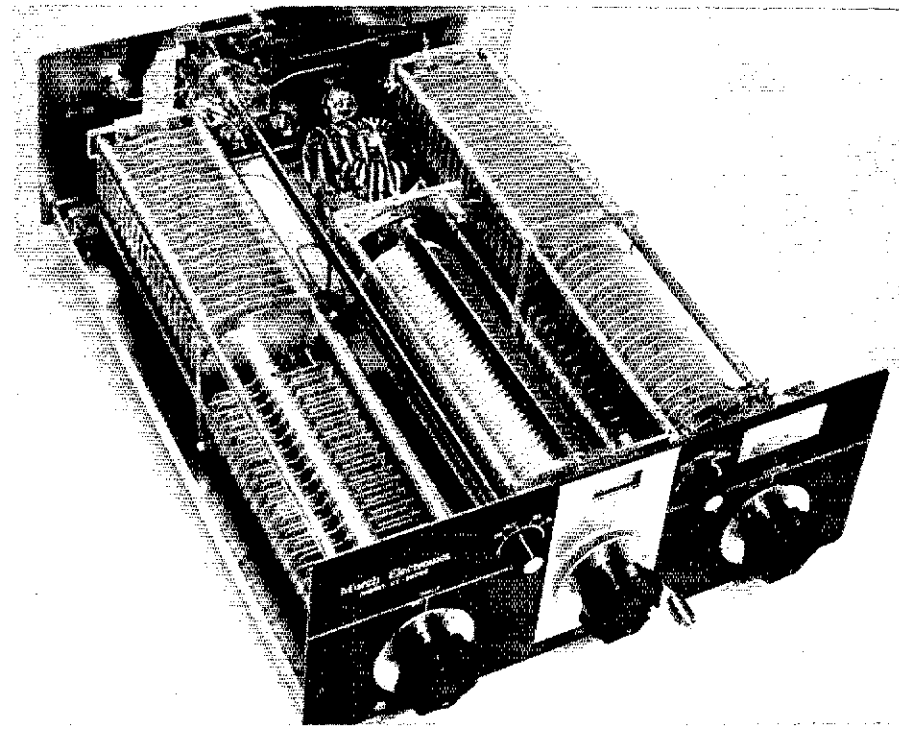
The circuit is essentially the popular T-network that evolved from the James Millen Co. 50-Ohmer matching network which was developed some years ago. Late in the 1960s, a homemade version — The Ultimate Transmatch — was described in *QST* by W1ICP. That innovation of the 50-Ohmer inspired numerous manufacturers to use the design for their marketed wares. Murch was the first to produce a commercial version of the so-called Ultimate Transmatch. The UT-2000-B is the newest model being sold by Murch, and one might well class it as their "super matcher."

Circuit Highlights

Fig. 1 shows the basic circuit of this type of Transmatch. The version at A is found in many commercial products. However, the technique at B (single-section input capacitor) provides equal results at reduced mass and cost. This was demonstrated a few years ago in the ARRL laboratory by Walt Maxwell, W2DU.

It can be seen that under certain load conditions the network functions as a high-pass circuit, and, hence, there is no harmonic attenuation. Under different load conditions, the circuit can perform as a bandpass network (desirable). Furthermore, a match can be obtained at a variety of settings for some load conditions. Minimum insertion loss will occur when the series output capacitor is at the maximum-capacitance setting that will provide an SWR of 1.

Matching resolution, mentioned earlier, is best achieved by using a roller inductor type of coil. The UT-2000-B contains one. Some commercial Transmatches utilize tapped inductors, which do not always permit a perfect match to a given load. The roller inductor, on the other hand, provides continuously variable inductance, right to a fraction of a coil turn. This becomes especially important at the upper part of the hf spectrum. I had occasion during my VP2MFW operation on Montserrat to use a "brand X" high-power Transmatch which did not have a roller inductor. Consequently, the match on 20, 15 and 10 meters was never 1:1. Admittedly, an acceptable match could be ob-



The Murch UT-2000-B Transmatch. The function switch (see text) is a welcomed operator convenience which eliminates cable switching.

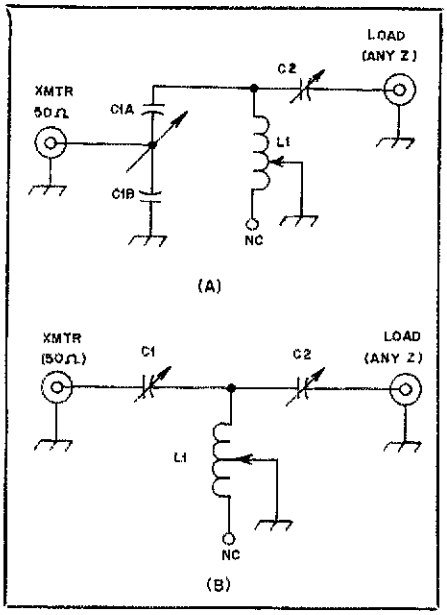


Fig. 1 — The circuit at A is found in most commercial Transmatches. It contains a dual-section variable capacitor at C1, which is not necessary for proper performance. The circuit at B is less expensive and will work as well as that at A (see text).

tained (1.5:1 to 2:1), but most of us like to shoot for a 1:1 condition when possible.

A reflected-power meter is built into the UT-2000-B. A 200-μA dc movement is used to permit good sensitivity even at low power levels. A sensitivity control enables the operator to set the meter response in accordance with the power output of the transmitter. I made comparative tests with a Bird wattmeter and learned that the Murch meter tracks very well with that of the Bird.

The function switch provides for bypassing the Transmatch, placing it in the transmission line or routing the transmitter output into a dummy load. A fourth position grounds the antenna for safety purposes during storms.

This instrument can be used with unbalanced or balanced feed lines. In the balanced condition, a toroidal transformer (broadband) converts the otherwise single-ended output to a balanced arrangement. This is useful when antennas are fed by means of twin-lead or open-wire lines. Similarly, the unit will work well with end-fed wire antennas. The maximum power rating for the Transmatch is 2-kW PEP.

Laboratory and on-the-air tests with 1 kW of dc input power to the amplifier showed no significant power loss through the unit. There was no arcing of the switches or variable capacitors, and none of the network components became unduly warm.

Craftsmanship

Perhaps the most notable aspect of this product is the craftsmanship which is evident throughout. Charlie Murch manufactures nearly all of the components he uses. The roller inductor, including its ceramic form, is made by Murch. The variable capacitors and switches are also made at the factory. The natives of this region like to refer to this kind of endeavor as "good old New England craftsmanship." This ex-Midwesterner certainly must agree with the description!

The only exception to the foregoing was noted after several weeks of daily use. The roller inductor became increasingly difficult to rotate. Eventually, the turns-counter dial no longer provided meaningful readings; the calibration became inaccurate as a result of the mechanical problems attendant to the rotary inductor.

Inspection indicated that the movable contact (small brass wheel) on the rotary-inductor coil had been binding on the brass rod that passed through its center. In fact, the binding had been so severe that the rod had developed shallow grooves that were formed by the restricted wheel during adjustment of the inductor. Excess torque had also caused the brass contact arm at the minimum-inductance end of the roller to bend and become loose, thereby allowing the small brass wheel to skip coil turns. This caused the turns-count calibration to get out of kilter. The loose parts were removed, bent back into the proper shape, then reinstalled. A thin coating of silicone grease was applied to the brass rod on which the wheel travels. This cured the binding problem and made the Transmatch much more enjoyable to use thereafter. Owners of a Murch Transmatch may want to apply silicone grease to the aforementioned area *before* the malady becomes manifest.

Who Needs a Transmatch?

For the newcomers to Amateur Radio, Transmatches are known loosely as "antenna tuners" and "antenna couplers." Some even borrow the E. F. Johnson trade name and call them "Matchboxes." Transmatches provide a matched condition between the *transmitter* and the feed line, but do not correct for a mismatch at the antenna feed point. It is important to remember this basic rule.

What a Transmatch will do for you is permit the transmitter or amplifier to look into a 50-ohm load. Most transmitters are designed for that ouput impedance. A proper match for the transmitter is especially important when using solid-state rigs, as most of them have an SWR shut-down circuit which lowers the power output as the SWR increases. Thus, if you have an antenna that has a low SWR on one end of the band, but has high SWR in some other part of the band, a Transmatch can be used to "fool" the transmitter into delivering full rated power output. I need a Transmatch at my station to work both the cw and phone bands with my tri-band trap Yagi beam. I like to think that I'm getting a bit of additional TVI protection in the process! However, there is no need for a Transmatch if you're using a properly matched antenna system. — *Doug DeMaw, W1FB*

Murch UT-2000-B Specifications

Size (HWD): 5 × 12 × 15 inches (127 × 305 × 380 mm).
Weight: 10 lbs (4.54 kg).
Color: Two-tone gray and black.
Frequency range: 1.8 to 30 MHz.
Power rating: 2-kW PEP.
Price class: $220.
Manufacturer: Murch Electronics, Inc., Box 35, Franklin, ME 04634. Tel. 207-565-3312.

THE AEA ISOPOLE* 2-METER ANTENNA

Let's face it: The ISOPOLE is one of the most unusual antennas this reviewer has ever seen.

*ISOPOLE is a registered trademark of Advanced Electronic Applications.

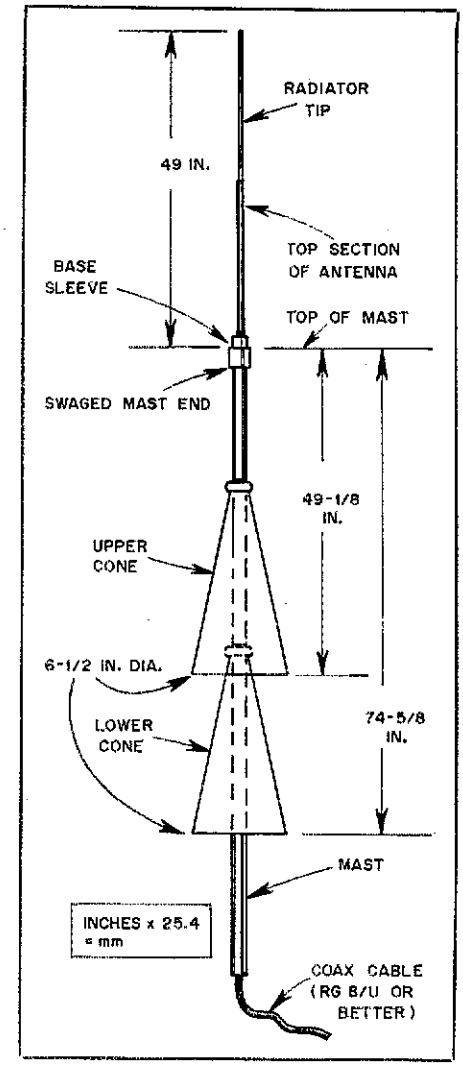


Fig. 2 — A drawing of the AEA ISOPOLE antenna. The purpose of the two cones is discussed in the text.

All the more reason to take it home and put it together.

What makes it look so different are the twin, resonant decoupling sleeves. What makes it work so well is a lot of thought given to decoupling. It is virtually impossible to sufficiently decouple an antenna feed line (and the mast on which a vertical antenna is mounted) from the antenna and thereby preserve the ideal pattern the designer had in mind. In the case of a vertical antenna mounted on a vertical mast and fed with a long vertical run of coax, it is difficult, at best, to prevent distortion of the pattern toward the horizon. Furthermore, a vertically polarized antenna that is poorly decoupled will provide horizontally polarized radiation from any horizontal components in its field, including runs of coax cable.

Each of the above factors tends to reduce the vertical gain toward the horizon, just the opposite of what one hopes to achieve with a vertically polarized 2-meter antenna. Enter the ISOPOLE.

A drawing of the ISOPOLE appears in Fig. 2. The twin, resonant decoupling sleeves are responsible for the decoupling of the antenna from its supporting mast and coax feed line. The decoupling sleeves are conical in shape (something like a small megaphone) and are mounted firmly on the supporting mast.

In fact, part of the supporting mast functions as part of the antenna. Look at it this way. The coax passes up through the mast and terminates in a female coax receptacle at the bottom of the 49-inch, two-section tube and rod that is fastened by set-screws to the top of the mast. This 5/8-wavelength section is the top part of the antenna. Above the coax connector (and part of the same weather-insulated housing) is a sealed matching network, factory adjusted, which provides broadband matching from 142 to 150 MHz. The manufacturer claims that the antenna will exhibit less than 2:1 over this bandwidth. This reviewer measured a VSWR of no more than 1.4:1 over the 144- to 148-MHz amateur band.

The first decoupling sleeve is adjusted so that the bottom of the sleeve is exactly 49-1/8-inches below the top of the mast. The radiating part of the antenna consists of the top 5/8-wavelength long, two-section rod and tube and the top portion of the mast down to the bottom of the first decoupling sleeve. Essentially, the active radiating part of the antenna, as described, may be looked upon as a 1-1/4-wavelength dipole. The manufacturer says it may also be referred to as "two 5/8-wavelengths in phase." The flared end (bottom) of the decoupling sleeve starts the isolation of the radiating part of the antenna from the mast. The second decoupling sleeve, fitted just below the first, completes the decoupling and effectively isolates the radiating part of the antenna from anything below it.

The ISOPOLE assembles in a few minutes on a 1-1/4-inch mast (not supplied). Maximum mast length is unlimited, though the minimum length should not be much less than 8 feet so that the antenna may be attached to its supporting structure.

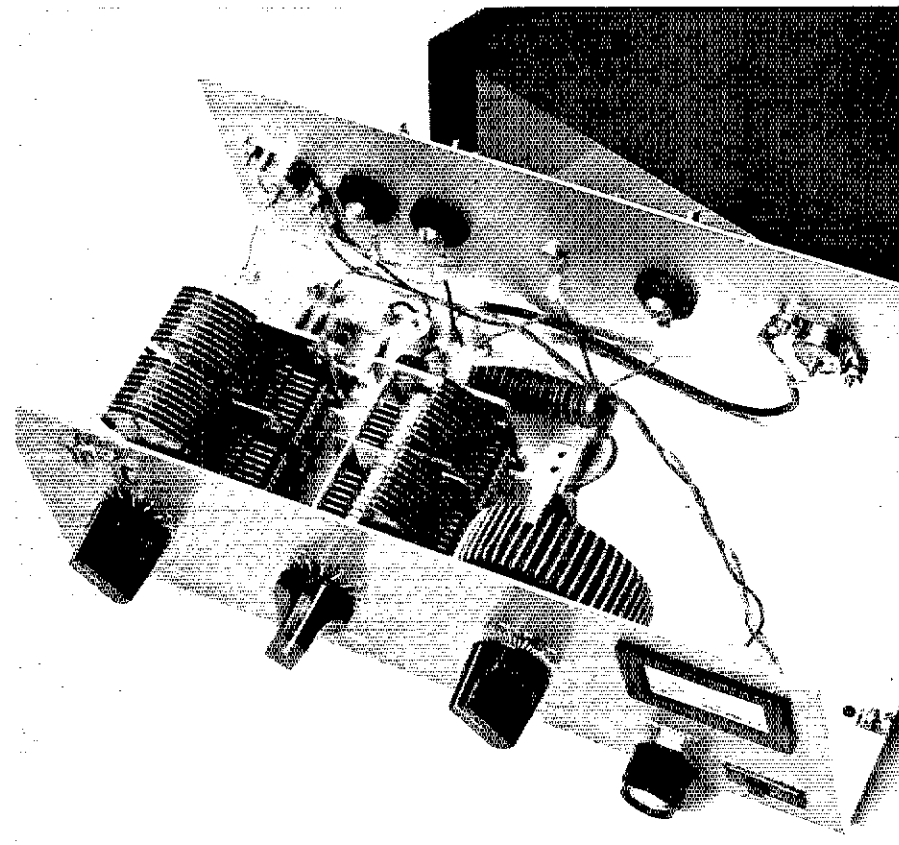
As usual, this reviewer couldn't wait to mount the antenna on roof or tower. As soon as the brief assembly was completed, the mast was strapped to the railing of the rear deck of the house, about 8 feet above ground. A quick check with a quality VSWR bridge good to 150 MHz indicated no more than 1.4:1 over the entire 2-meter band. Armed with the ARRL *Repeater Directory*, and with the antenna at its commanding height of 8 feet, I proceeded to raise 29 repeaters in Connecticut from my centrally located point, along with several in Massachusetts and even a few on Long Island, approximately 50 miles distant. The remaining repeaters in Connecticut were either "down" or private. Most of the repeaters were raised with 5 watts output. Access to a few required 25 watts output for reliable contacts.

The antenna does not appear to be designed to withstand 6-inch ice loads on 10,000-foot mountains, but if you have need for an effective omnidirectional, horizon-oriented antenna you may wish to look into the AEA ISOPOLE. It appears to be ideal for modest repeater and home locations. The antenna offers a projected surface area of 1.75 sq. ft., weighs less than 3 pounds and sells for $49.95.

The ISOPOLE is available from Advanced Electronic Applications, P. O. Box 2160, Lynnwood, WA 98036. — *Lee Aurick, WISE*

TEN-TEC 247 AND 277 ANTENNA TUNERS

Ten-Tec is currently marketing Transmatch models 247 and 277 which are designed to match the 50- to 75-ohm unbalanced outputs of transmitters and transceivers to both balanced and unbalanced loads. What distinguishes the 277 from the 247 is that the model 277 contains a built-in SWR bridge and meter.



The Ten Tec model 277 Transmatch shown above employs the popular W1ICP Ultimate Transmatch circuit. Provision is made for feeding both balanced and unbalanced loads. The balun is located immediately behind the center capacitor. At the left of the SWR meter is the variable inductor. All terminals are on the rear panel.

These Transmatches are compact and lightweight (only 3 pounds), factors that should interest the vacationer or Field Day operator. Cabinet dimensions (HWD) are 3-1/2 × 10-1/4 × 6-1/2 inches (89 × 260 × 165 mm) for the model 277. Measurements for the model 247 are 2-15/16 × 7-3/4 × 6-11/16 inches (75 × 197 × 170 mm).

The attractive enclosures make either unit a suitable desk-top accessory. Front and rear panels are finished in metallic gray. Both covers (sides and tops) are dressed in a black textured material. Operating controls for the main variable capacitors and the variable inductor are on the front panel.

Mounted on the rear of the cabinets are the PL-259 coaxial connectors which accommodate the transmitter and antenna transmission lines. Terminals are also furnished on the rear panel for a balanced transmission line, a single-wire antenna and a ground.

A decade ago, Lew McCoy, W1ICP, introduced the Ultimate Transmatch circuit. Without doubt, this configuration is the most popular antenna tuner design today. Both the 247 and the 277 Ten Tec tuners follow the W1ICP format, with the exception that Ten Tec elected not to use a differential capacitor in the input. Instead, the differential capacitor is replaced by a ganged, dual-section unit. This capacitor, however, does seem capable of handling most matching requirements.

The shunt inductance of the T-network is wound in a manner that reminds one of a rheostat, especially inasmuch as it is equipped with a rotary slider similar to that on a rheostat. By means of the slider, the operator can select the amount of inductance required for matching.

Although both Transmatch models are designed to match a variety of loads, there are some restrictions. The maximum *balanced* load from 1.8 MHz to 4.0 MHz is 600 ohms. In laboratory tests with *unbalanced* loads, 300 ohms appears to be the upper limit on 160 meters. On the other hand, tests on 80, 40 and 20 meters indicated that on these bands, unbalanced loads as high as 2000 ohms could be accommodated. Loading on 10 and 15 meters at 2000 ohms was not satisfactory. On these bands, loads of 1500 ohms and less presented no problem. After all, not many amateurs would seek to match such high impedances on these bands. Feedpoint impedances of popularly used antennas for 10 and 15 meters are well within the range of either tuner.

Being a 160-meter buff, I rather naturally tried both of these Ten Tec Transmatches on the "top band" first. Antennas that have low-impedance feedpoints (30- to 150-ohm range) proved to be no obstacle. But for the chap who wants to end feed a single-wire half-wavelength antenna on 160, use of the Ten Tec networks is out of the question. Perhaps the manufacturer will, in the future, modify the circuit to overcome this disadvantage. One competitive Transmatch producer does furnish an accessory coil that compensates for a similar shortcoming.

In order to determine the insertion loss of the

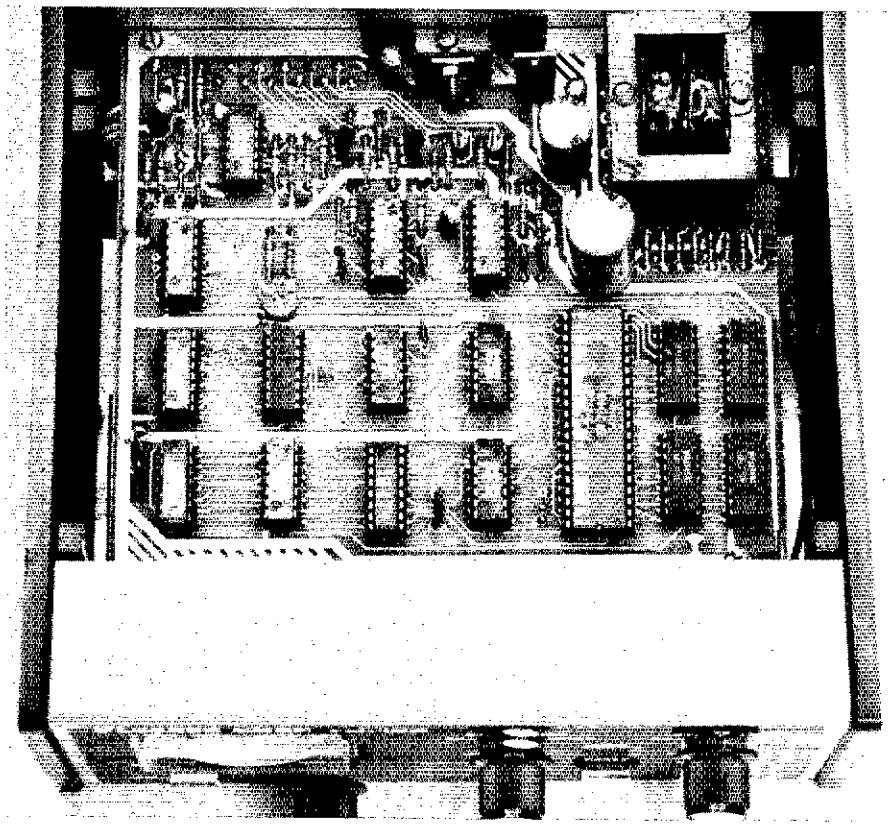
Ten Tec tuners, the test circuit included two Bird Wattmeters and a laboratory type dummy load. From 10 through 80 meters, the loss was constant at 0.46 dB, a value considered normal. The loss was somewhat higher on 160 meters, 0.79 dB.

Ten Tec made an improvement following the examination of an initial pair of these Transmatch units submitted for lab checking last year. We reported back to Ten Tec that the balun severely overheated when subjected to the full rated power, as did the variable inductor. Also, as a result of further discussions with their engineering department, it was agreed that listing the continuous-carrier power rating of these tuners at 100 watts instead of 200 watts would be more appropriate for the specifications.

As a matter of personal preference, I would like to see the model 277 equipped with an SWR meter that has a zero-set adjustment, a feature lacking in the current model. Other than that, I do find that the type of meter Ten Tec employs serves the purpose and agrees fairly well with the Bird Wattmeter.

I wish to commend Ten Tec for the fine set of instructions supplied with these units. Indeed, they form a concise review of transmission-line and antenna theory that is clearly presented in a well-organized manner.

Price class for the model 274 is under $70; the model 277 is in the $85 range. Ten Tec products are available from authorized dealers or from the manufacturer in Sevierville, TN 37802. — *Stu Leland, W1JEC*



The top cover of the Flesher TR-128 has been removed to disclose the neat interior layout of the unit. All ICs are socketed.

FLESHER TR-128 BAUD RATE CONVERTER

Stuck at one RTTY speed? Ever feel frustrated because your printer has only 60-wpm gears while somebody is sending some Star Trek art at 100 wpm? Or, after picking up that model 28ASR at a bargain price, you find it has 100-wpm gears and you now have to spend $50 for 60-wpm gears to slow the machine down to copy everyone else? Maybe you are a hunt-and-peck typist — wouldn't you like to smooth out your transmissions? Well, the Flesher TR-128 is the solution.

Speedy Relief

With the TR-128 on line, one can tune in any RTTY station transmitting at any standard amateur speed (60, 67, 75, or 100 wpm) as well as the commercial speed of 110 wpm. The TR-128 will convert that speed to your local equipment operating speed. Similarly, in the transmit mode, your local equipment speed can be changed to be transmitted at any of the four legal amateur speeds. For example, if you tune in a station transmitting at 75 wpm and your teleprinter is a 60-wpm machine, with a couple of twists of the TR-128 controls the 75-wpm transmission is reduced to your teleprinter's 60-wpm speed, and when you are ready to transmit, your 60-wpm transmission is altered to 75 wpm.

The TR-128 also transfigures a hunt-and-peck typist into a smooth operator. Simply set the SPEED control as high or low as you wish (one character per second is the lowest, while the top speed is the highest operating speed of your keyboard), and start typing. If you hunt and peck at an average speed of 30 wpm, set the SPEED control for approximately 30 and your erratic hunting and pecking is reshaped into a smooth and consistent 30 wpm. You'll be known on the air as "slow and steady."

Building the Kit

You may purchase the TR-128 assembled and tested ($239.95) or as a kit ($179.95). This reviewer built the kit in less than 8 hours; no problems were encountered. Nearly all the components are mounted on one circuit board and sockets are included for all 23 ICs.

Testing and calibrating the unit is an involved process — the manual has six and a half pages of assembly instructions and nearly five pages of testing instructions. Patience and care in testing and calibration procedures will be rewarded by a flawlessly operating unit.

Buffer and UART

A 128-character memory buffer is the "heart" of the TR-128; a UART is its "soul." The UART converts the incoming serial data into parallel data, and reconverts the parallel data to serial form. Normally, the buffer is a temporary holding register through which data passes. However, in the PRELOAD mode, 128 characters of data may be stored in the buffer to be released for transmission or reception at will. Also, this stored message may be restored and be repeated if necessary. A meter indicates just how full the buffer is at all times.

The '128 is built into a neat little package and is a perfect match for the Flesher TU-170 demodulator/afsk unit (reviewed in March 1979, *QST*, pages 42-43). The front panel contains all of the controls and metering, while the rear panel contains screw terminals for all interconnections — signal connections are TTL-compatible.

If you are interested in controlling the speed of your RTTY station, the TR-128 provides the means. It is available from the Flesher Corporation, P. O. Box 9760, Topeka, KS 66601. — *Stan Horzepa, WA1LOU*

TET 3F35DX TRI-BAND ANTENNA

The TET 3F35DX is an unusual triband antenna — and from all appearances, it is an efficient one as well. At this writing, the antenna has been installed and in use for two months. During that time, the antenna has not been in constant use; it is one of several available to this reviewer. However, it has been the *only* antenna used on 10, 15 and 20 meters. An examination of the station log indicates that, under very casual operating conditions, some 17 different countries on five continents have been worked, some of them many times. Input power was never more than 150 watts, and both cw and ssb were used. DX contacts ranged from the Pacific area to Africa, Europe and Asia; excellent reports were received at all times.

The 3F35DX functions as a 3-element Yagi on each of the three bands. There is a separate driven element for use on each band; these elements have no traps. The traps are confined to the reflector and director. It is because there are no traps in the driven elements to "soak up" transmitted power that the manufacturer makes high-performance claims for this antenna. Testing under actual operating conditions without the benefit of an antenna measuring range makes it difficult to maintain an objective approach and impossible to obtain qualitative answers. However, there is one method of testing at our disposal — that of comparison. That is: How does the 3F35DX fare when compared with a previously installed antenna? The comparison antenna is a 4-element, fully trapped tribander with a much larger (26-foot) boom that had been taken down several weeks earlier. This was to be a test of the antenna's ability to produce results. Here's how they stacked up.

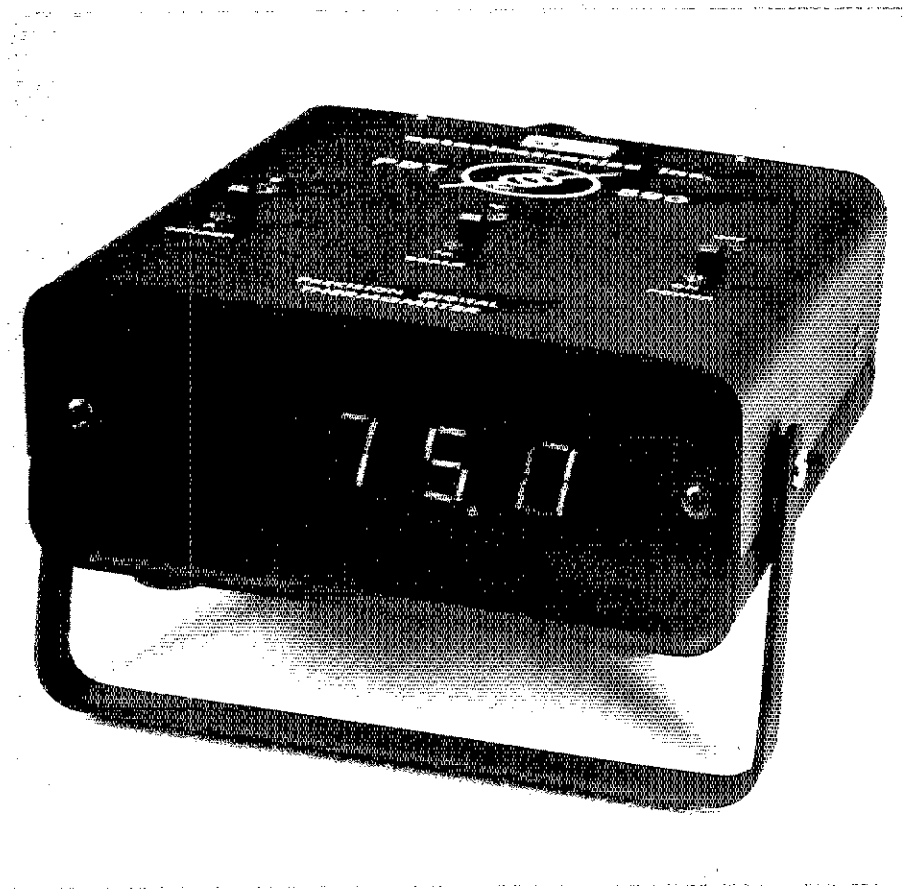
Using the trapped tribander, I needed but

one or two calls to snag a DX station. The 3F35DX usually produced such replies on the second or third call, with other replies on either the first or fourth call. Assuming all other conditions were the same, one would have to conclude that the larger antenna had an edge over the 3F35DX — but not much. There are some real advantages afforded by the '35DX, too. Estimated weight is under 25 pounds; about half the weight of the comparison antenna. Boom length is considerably shorter, just 16 feet. These two factors are definite advantages if one contemplates mounting such an antenna on a modest tower.

Perhaps the greatest advantage that this antenna has to offer is that it is relatively "flat" over both the cw and ssb segments of each of the three bands. With the larger antenna, one selected a portion of the band most frequently worked (either the lower or upper end) during the initial adjustment of the antenna. The high-Q traps in the driven element would not permit one to operate both band segments without a resultant high SWR occurring in the lesser-used portion of the band. The 3F35DX, as a result of the full-length driven elements (and resultant lower Q), offers full-band operation with a modest VSWR. On 20 meters, the maximum VSWR is 2.25 to 1 at 14.35 MHz. On 15 meters, the VSWR is 1.3 to 1 at both band edges, and on 10 meters it is below 1.3 to 1 to beyond 29.5 MHz, rising to 1.6 to 1 at 29.7 MHz.

The assembly instructions are better than many this reviewer has seen; dimensions are given in both inches and millimeters. One piece, a swaged section, has only one hole and one screw, despite the instructions which insist it has two holes and screws. Fig. 5 is supposed to be an assembly drawing of the director and reflector; it isn't. The drawing refers to the assembly of the driven elements and feed system and attachment to the boom. Some day the instructions for all antennas will catch up with reality. (Of course, on that day horses will fly!) Despite the aforementioned annoyances, the beam goes together very easily and there are no complications.

The 3F35DX triband antenna offers wide bandwidth and usual gain in a reasonably compact, lightweight construction. It is manufactured by TET U.S.A., Inc., 425 Highland Pkwy., Norman, OK 73069. Price class: $190. — *Lee Aurick, W1SE*



The Optoelectronics PDT 590. This precision digital thermometer provides an LED temperature readout in either Fahrenheit or Celsius scales. The probe cable length may be made quite long for remote temperature-sensing applications.

OPTOELECTRONICS, INC. DIGITAL THERMOMETER

Question: "Where in the world would a radio amateur use a precision digital thermometer?" Well, how many QSOs have you heard start out with the RST report, QTH, name and local weather report? Plenty, for sure, even though that type of QSO is pretty mundane. Those who feel compelled to report local temperatures to other hams must certainly need a good outdoor or indoor/outdoor type of thermometer. The Optoelectronics PDT-590 precision digital thermometer can be used as an indoor/outdoor temperature indicator. It reads temperature in Fahrenheit and Celsius scales with the flick of a switch.

But what if you don't give a hoot about passing out weather data to those you work? Well, think how handy it would be for the amateur experimenter to measure transistor case temperatures, tube-envelope temperatures or the ambient temperature in a VFO compartment. Another application is the monitoring of etchant-bath temperatures, if you make your own pc boards.

Instrument Features

The PDT-590 comes in kit form. It employs large-scale integrated circuitry (LSI) and utilizes two switch-selected temperature probes which can be connected via many feet of cable for sensing at remote locations. The accuracy is ±0.5°C (0.9°F) from −50° to +150°C. This equates to a range of −60° to +200°F. Resolution of the digital readout is 0.1°C or 0.1°F.

The sensor probes function as temperature-dependent current sources. Response time is 3.4 seconds to reach 63.2% of an increment change in temperature, as determined in an agitated liquid bath. The stock cable length for each probe is 10 feet (3 m), but they can be extended to several hundred feet if the need arises.

The selected temperature probe Celsius or Fahrenheit output voltage is measured by means of a 3-1/2-digit DVM (digital voltmeter). The DVM has a −1.999 to +1.999 voltage range. Hence, when the scaled output voltage falls below the internal reference voltage a negative temperature is displayed. Because the input voltage is 10 mV per degree C or F, the decimal point is placed between the 1- and 10-mV position to obtain a readout in degrees C or F.

A complete diagram of the digital thermometer is provided in Fig. 3. It has been reproduced directly from the Optoelectronics operating manual ($2 per copy). Therefore, the symbology of the diagram does not match the IEEE symbology used by the ARRL. The

Optoelectronics PDT 590 Precision Digital

Specifications

Dimensions (HWD): 1-1/4 × 4-1/4 × 5-1/4 inches (32 × 108 × 133 mm).
Weight: 14 ounces.
Operating temperature environment: 0 to 50°C.
Power requirements: 9 to 14 volts ac or dc at 175 mA (1.7W).
Readout range: −50° to +150° Celsius, −60° to +200° Fahrenheit.
Readout resolution: 0.1°C and 0.1°F.
Price Class: $100.
Manufacturer: Optoelectronics, Inc., 5821 N.E. 14th Avenue, Ft. Lauderdale, FL 33334. Phone: 305-771-2050.

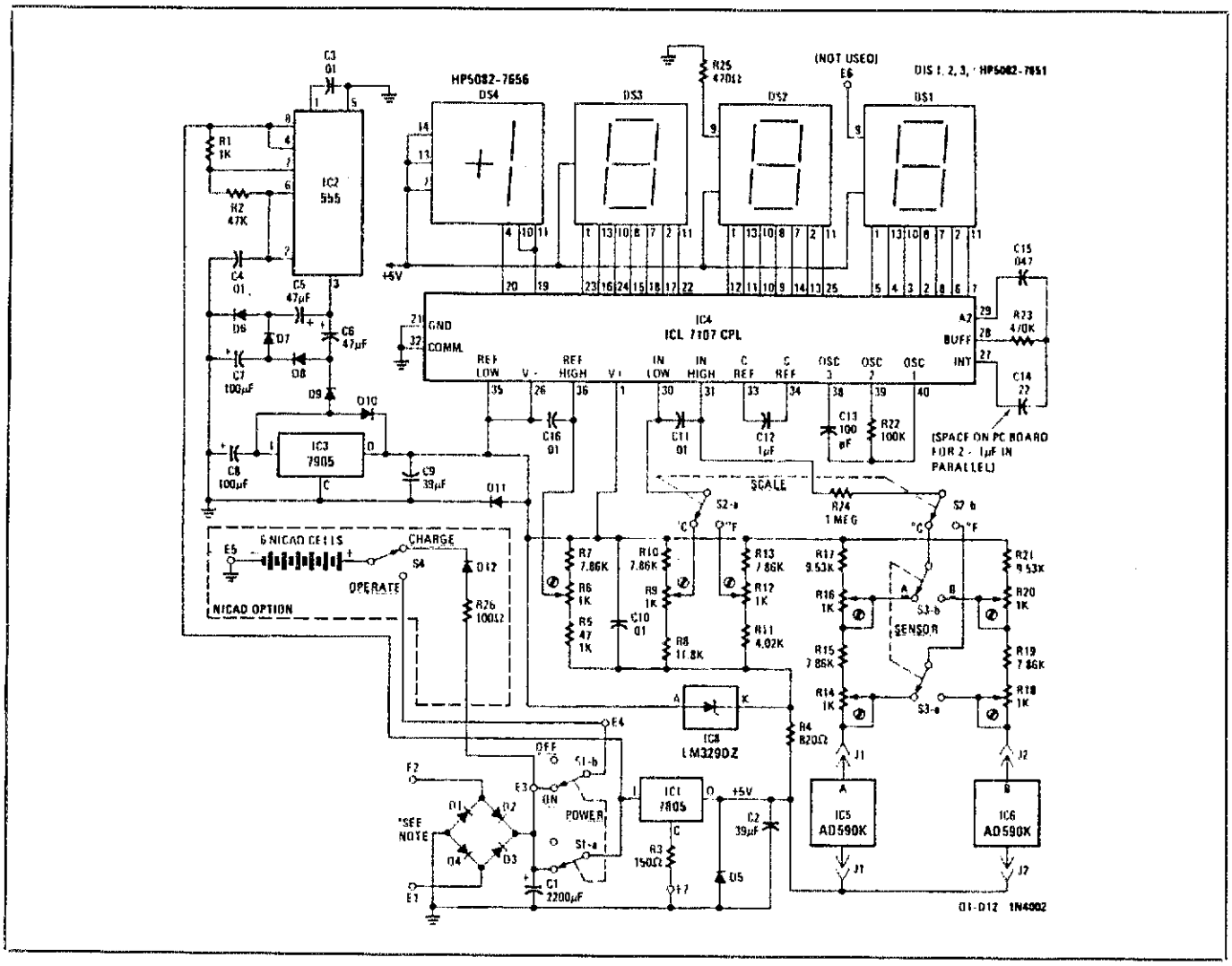


Fig. 3 — Exact reproduction of the manufacturer's schematic diagram for the PDT-590. The symbols differ in style from those used in ARRL publications.

diagram is, however, very clean and easy to follow.

Assembly of the Kit

This kit may be slightly beyond the capability of an inexperienced amateur. A modicum of technical knowledge and experience is needed to comprehend some of the step-by-step assembly instructions. The dialogue is a bit terse in spots, requiring some "decision logic" which is based necessarily on practical experience with circuits. Also, the assembler needs to have good vision to read the parts numbers and the labeling on the pc board: The unit is fairly miniature, and so seems the aforementioned printing to those (like the reviewer) with aging eyes! A magnifying glass is highly recommended for this project. One of the greatest aids to assembly of this kit was the black-and-white matte-finish photograph of an assembled kit (pc-board view with compartments in place). Apparently, the photograph is part of the instruction manual. It helped in determining where some of the parts belonged.

A double-sided pc board is used, but without plated-through holes. Instead of through-hole plating, the component leads are soldered to pads on each side of the board, where applicable. Yellow squares or rectangles are painted on the pc board at each location where soldering on both sides is required. In the long term this technique may prove better than that of the plated-through hole. Many "through-hole" boards seem to be failing these days as a function of time and heat cycling. Assembly time for an experienced kit builder should be approximately 10 hours, inclusive of calibration.

The calibration procedure is interesting. First, the builder must prepare a pot of boiling water, insert the probes, then adjust a Trimpot to obtain a reading of 100.0°C. There is a Trimpot for each probe. Next, a bowl of ice cubes and an equal volume of water is stirred until it stabilizes. The probes are inserted in the ice water and allowed to stabilize. Two more Trimpots are tweaked so that each sensor provides a readout of 0.0°C. The Fahrenheit calibration is done after the probes are dry and allowed to stabilize at room temperature. A pair of Trimpots are used to accomplish this. The Celsius reading is simply converted to Fahrenheit during this final adjustment step. The constructor must have access to an accurate digital voltmeter. The initial calibration calls for adjusting the voltage references by means of internal Trimpots. Since decimal-value voltages are involved (2.73 and 4.59 volts), resolution and accuracy are vital.

Using the Instrument

Both sensor probes must be plugged in at all times in order for the remainder of the circuit to function correctly. Furthermore, one must keep track of probes A and B with respect to the A and B jacks on the thermometer. This is so because the calibration is done with specific probes in the jacks. Differences in sensor characteristics dictate that A and B probes always be used with the inputs for which they were calibrated.

For use as an indoor/outdoor thermometer one probe can be placed out-of-doors while the remaining one is located in the shack. Since the sensor ends are the cases of small ICs (metal), they can be placed in contact with tube envelopes, transistor cases, IC cases or whatever is being checked by direct-contact means. I even measured my body temperature by placing one of the sensors under my tongue — however unrelated to radio that might have been.

If the sensors are placed in etching solution, be sure to clean them thoroughly after use — preferably before any of the etchant can dry on the probes. — *Doug DeMaw, W1FB* QST

Hints and Kinks

Conducted By Stuart Leland,* W1JEC

REMOTE SWITCHING FOR 3-BAND QUAD

Recently I built a two-element, 3-band quad antenna now installed atop a 54-foot tower. Being an avid QRP operator, I used a 7/8-inch (22-mm) Heliax cable to avoid losing those precious milliwatts. The remotely controlled switching arrangement I've illustrated permits the use of a single transmission line that is extended to the top of the tower. Push-button control with pilot lights provides positive indication of which band has been selected.

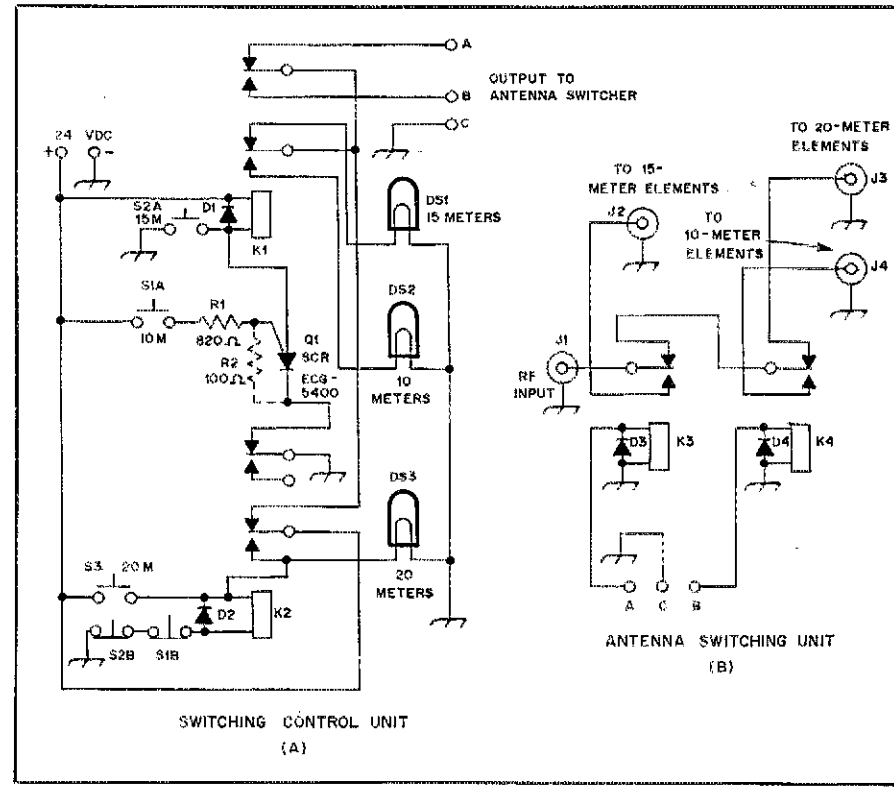
The switcher and remotely controlled unit are both constructed mainly from junk-box parts. Suitable enclosures for the control box and the switcher are choices for the builder. A means of weatherproofing should be provided for the antenna switcher inasmuch as this unit is to be placed at the top of the tower.

There is a set of normally open and normally closed contacts in each of the Dialco push-button switches selected for this project. When S3 is pushed, K2 is latched; voltage is removed from the wiper contacts of K1 and the ground is disconnected from the SCR, opening K1. As a result, there is no voltage going to the switcher. Therefore, the 20-meter circuit is, in broadcast industry terms, "normaled through."

When S1 is pressed, the normally closed contacts open and relay K2 is unlatched, supplying voltage to the wiper contacts on K1. The normally open contacts in S1 close causing K1 to latch. The normally open contacts of K1 are closed, placing voltage on terminal B. Voltage at B in the switcher activates K4 of that unit and connects the rf input to the 10-meter connector.

Pressing S2 once again opens the normally closed contacts and K2 is unlatched applying voltage to the wiper contacts of K1. Contacts that are normally open in S2 short the low side of K1 to ground, cutting off the flow of current through the SCR which is then unlatched. As S2 is released, K1 relaxes supplying voltage to terminal A. Voltage at A in the switcher causes K3 to activate, providing connection to the 15-meter antenna.

This arrangement can be adapted to other antennas. It is well suited, for example, to the installation of three half sloper extended from the top of a tower. Any one of these may be selected by the push of a button. — *Girard Westerberg, NØAFI, technical director of KLAK and KPPL, Denver, Colorado*



NØAFI uses this band-switching method for selecting the proper elements of this triband quad. Three wires are required to interconnect the control box with the switching unit. If the shield of the coaxial cable is used for the common lead, the third wire can be eliminated. Parts are available from Newark Electronics, 500 N. Pulaski Rd., Chicago, IL 60624.

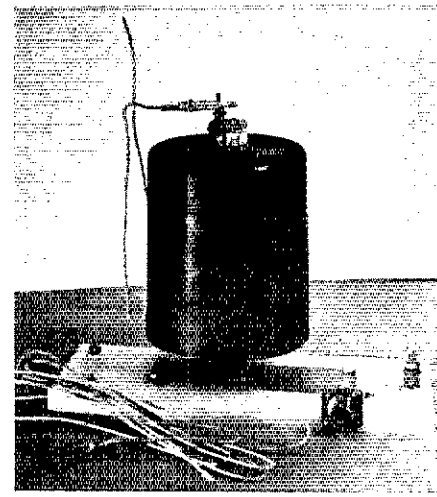
Control Unit Parts:
D1, D2 — 1N4004 diodes.
DS1-DS3, incl. — Dialco push-button lamps, no. 387.
K1, K2 — Dpdt relays, 24 V.
Q1 — ECG-5400, SCR.
R1 — 820 ohms, 1 W.
R2 — 100 ohms, 1 W. For small relays with high-resistance coils, this resistor is not required.
S1-S3, incl. — Dialco two-circuit switches, no. 513-0601-604.

Antenna Switcher Parts:
D3, D4 — 1N4004 diodes.
K3, K4 — Spdt relays, 24 V.

AN EFFECTIVE INDOOR ANTENNA

The five dollars you may have to spend at a flea market to acquire an old Johnson Whiploader antenna can be worthwhile. It can provide you with the hardware to make a reliable 5-band indoor emergency antenna.

Begin modification of the Whiploader by removing the 75-pF air-variable capacitor which allowed coverage of the entire 80-meter band. This feature will be retained by a different method. Removal is necessary because the capacitor otherwise would limit the power-handling capability of the coil to 75 watts. Because the capacitor was installed before the coil, there is no other choice but to destroy the capacitor, removing the parts piece by piece with the aid of a pair of hefty longnose pliers.



The heart of an old Johnson Whiploader can be modified to provide a 5-band indoor emergency antenna. See text.

The Whiploader is mounted on a piece of bakelite or plastic measuring 4 × 10 × 1/2 inch (100 × 250 × 12 mm) by means of a 3/8-24 hole tapped into the approximate center. A piece of sheet metal or a large solder lug is placed between the nut and the board to provide electrical contact with the coil. A 10-32 screw is put into the side of the board for an external ground. This machine screw is connected to the shield side of the SO-239 connector by a short piece of wire.

Replace the 8-foot steel whip which normally protrudes from the top of the coil with a 3/8-24 nut-bolt-washer combination with a 3/8-inch solder lug sandwiched between. A 6-32 screw is threaded into the outer end of the large solder lug to allow connection of the antenna (shown

*Assistant Technical Editor, *QST*

folded in the foreground of the photograph). The antenna is simply an 8-foot (2.44-m) length of hookup wire. It is connected to the top of the coil and then suspended from the ceiling or any nonmetallic object. The wire may slope as much as 45 degrees from vertical. I have found that a 6-foot (1.8-m) length of wire connected to a cold water pipe will provide a satisfactory SWR on 80, 40 and 20 meters. In some cases a Transmatch may be necessary on 15 and 10 meters.

A 1-foot (305-mm) piece of wire, connected by an alligator clip to the coil assembly, serves to tune the antenna across the entire 80-meter band (see photo). When this wire is removed, the antenna resonates at 3960 kHz. For in-between frequencies, the wire is bent away from the fiberglass cover.

Dozens of stations have been worked on 40-meter phone with the antenna sitting on my operating table. Power output at W4YOK is about 100 watts. W6 stations have been worked on 20 cw and a DL station on 15 cw gave me an RST 569. I have checked into the Kentucky phone and cw nets on 75 and 80 using this set-up for traffic handling.

In order to construct the coil from scratch, here are the specifications:

32 turns, no. 12 wire, air wound
Diameter — 3-1/2 inches (89 mm)
Coil height — 3-1/2 inches (89 mm)
Turn spacing — 0.030 inches (0.76 mm)
Location of taps — 0 turns for 10 meters; 2 turns for 15 meters; 4-1/2 turns for 20 meters; 19 turns for 40 meters and 31 turns for 80 meters.

The location of the 80-meter tap is quite critical. It may be necessary to move the tap along a particular turn an inch or so at a time until the right spot is found. Use of a dip meter can be helpful. A Transmatch should be placed as close to the coil as possible. — *T. W. Webb, W4YOK, Henderson, Kentucky*

GROUNDING GUY WIRES ELIMINATES QRM

While trying to get a set of duplexers working on the Wilson, Kansas, 37/97 repeater, we were picking up fm signals from broadcast stations besides other interference. The difficulty was solved by bonding the tower guys together and grounding them. A ground rod was installed at each anchor. This cured the interference problem. Desensing of the repeater receiver was also eliminated.

Tension on the guy wires apparently had not been sufficient to allow the turnbuckles and anchors to furnish good connections. A combination of high resistance and some diode action was responsible for the interference.

Installing ground rods is easier in many cases if you follow this advice. Soak the earth thoroughly with water first. — *Paul Grauer, WØFIR, Wilson, Kansas*

STACKED ANTENNAS, KILOWATT TRANSMITTERS CAUSE RECEIVING PROBLEM SOLVED BY TRAPS

While I was helping to operate HH2MC during a recent cw contest, severe QRM affected the receivers when one transmitter was operated on 10 meters and the other on 15. The antennas were stacked on the same tower with only a few feet of separation. Furthermore, both transmitters were running 1-kW input.

Quarter-wave, open-ended traps, constructed from RG-58/U coaxial cable, provided the solution to the problem. The formula for the traps is 246 V/f. V, the velocity factor, is 0.66 for RG-58/U, so the lengths (for the cw band) were 5 feet, 5 inches (1.65 m) for the 10-meter trap, and 7 feet, 9 inches (2.36 m) for the 15-meter trap. Putting the 15-meter trap at the receiver input on the unit for 10 meters and the 10-meter trap on the 15-meter unit completely eliminated the interference.

The particular transceivers used were FT-101ZDs. These have a phone-plug input for connecting an auxiliary receiver. That made the installation very simple. Other sets may have similar facilities. For those that are not so equipped, use of a T connector at the antenna terminal with a trap attached to one of the T posts is a good alternative.

This method can, of course, be extended to other bands. The procedure may help alleviate problems specifically associated with multi-transmitter installations at Field Day sites or DX test locations. WA4DRU and W2SR brought this method to my attention. I feel it is worthwhile to pass along to others. — *H. Dale Strieter, W4QM, Cocoa Beach, Florida*

A HYBRID MULTIBAND ANTENNA

Wanted — an all-band auxiliary antenna requiring little space, having some gain on the high frequencies, but simple enough for a Novice. With the aid of *The ARRL Antenna Book*, I constructed an antenna that met these requirements by combining a 10-meter extended double Zepp with an open-wire transmission line in an L configuration. Not only did this antenna seem feasible for low-band operation, but I also realized that an extended double Zepp for 15 meters can become approximately two half waves in phase on 10. On 80 and 160 meters you can use one wire of the feeder connected to the tuner, thus forming an inverted L antenna. Or, by tying the two wires of the feeder together and connecting both to the single wire terminal on the tuner, the antenna is converted into a T-type radiator.

An antenna-matching network is essential for this antenna. Not only does it provide necessary impedance matching, but also the network will attenuate any harmonics from the transmitter.

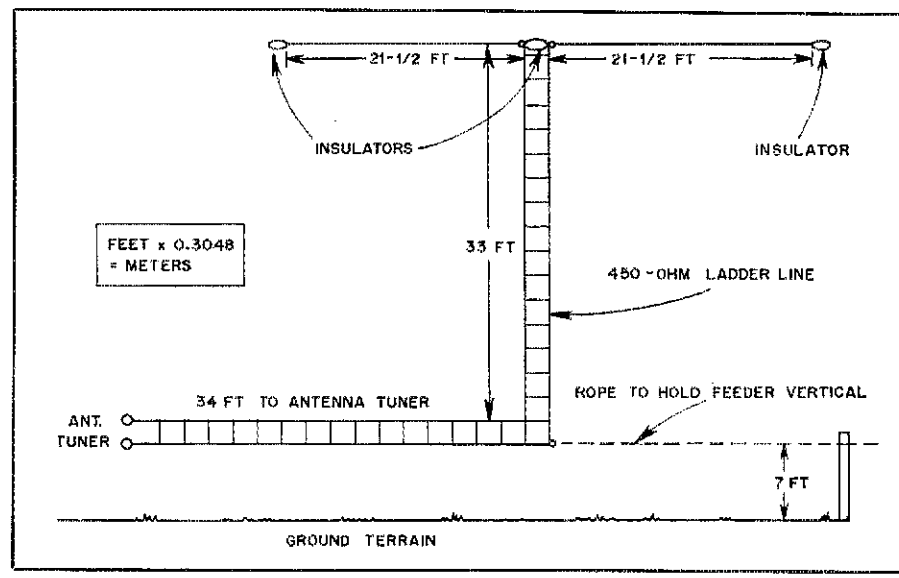
For the 10-, 15-, 20- and 40-meter bands, the feeder wires are individually connected to the balanced output terminals of the tuner in the normal manner. For 80 and 160 meters, the feeders are tied together and attached to the single wire terminal. A good ground, preferably in the form of radials, is needed for operation on these two bands. Ground leads should be connected first to the tuner and then to other equipment. From the standpoint of electrical safety, proper grounding of both the antenna and station equipment is required.

The following comments are for newcomers. The cost of the antenna is under $12. Feeder lengths shown in the drawing are not the only ones that may be used. Some lengths, however, may result in poor SWR readings. You can compensate for this by adding a few feet of line at a time until a suitable SWR is attained. On 80 meters, with radiation mostly in the vertical plane, there is little directional effect. On 160 the antenna is both short and low. Communication will not be optimum, but the antenna will allow your equipment to operate on this band.

As for overall performance, with a transmitter output of 100 watts, I get an answer to almost every call or CQ except perhaps in a DX pileup. Most foreign reports on 10 and 15 meters are S9. On 20 meters, the antenna seems slightly better than a half-wave dipole. The approximate gain over a half-wave dipole on 15 meters is 1.5 dB, and on 10 meters 3 dB. — *Merrick (Red) A. Counsell, W1BNS, Medfield, Massachusetts*

TIPS FOR MOSLEY CL-33 AND CL-36 TRIBAND ANTENNAS

Mosley Electronics furnished me with useful information that may help other amateurs who, like me, experienced difficulty in obtaining suitable SWR indications after installing a CL-33 or CL-36 antenna. First, I was advised



A hybrid multiband antenna for 10 through 160 meters. The feeder is 450-ohm ladder line. Light weight of the line avoids sagging at the center of the antenna. For good radiation from the vertical portion of the line when used as a T antenna on 80 and 160 meters, the antenna should be at least 40 feet above ground. The author recommends this as a good beginner's antenna.

to check the matching-tube assembly. The two insulated wires attached to the connector on the assembly are for capacitively coupling the coaxial transmission line to the radiator element. Sometimes the insulation on these wires shrinks back, allowing the center wire to short against the inside of the radiator element tubing. This could lead to weird SWR readings on all bands. Check the ends of these wires. Second, mounting other types of antennas above or below triband beams is frowned upon because of the detuning effects which may result. Where other antennas are so installed, they should be at least 10 feet apart. Even close-proximity 2-meter beams and ground-plane antennas can be troublesome. A third bit of advice is to be sure the traps are properly installed and placed in the right direction. — *Tom Frenaye, K1KI*

NONCONDUCTIVE GUY LINES

By choice or by chance, many licensed Amateur Radio operators are trapped in urban environments that provide little space for antennas. Where space does exist, the use of conductive guy wires can often create havoc with low-level beam antenna installations.

The use of metallic guy wires with appropriate installation of insulators has long been the approved practice. But even under the best of such conditions, amateurs who are forced to install beam antennas close to the rooftops of apartments and condominiums are likely to note severe SWR skewing as the antenna is rotated. This effect can be reduced, if not eliminated, by the use of nonconductive, nonstretch guying material.

Such material has recently been introduced for use as sailboat halyards for raising sails. The line, manufactured from Dacron and other trademarked materials, is sold at many stores handling marine supplies. Because it is strength and stretch rated, I find it well suited for Amateur Radio installations. This information makes the choice of diameter easy.

Amateurs who are familiar with techniques for splicing line can include terminating thimbles and turnbuckles in their guys. Those not capable of making splices can apply easily learned knots. These, however, will require periodic inspection for wear.

Either way, the use of nonconductive guy lines serves the purpose reliably. In my restricted situation, I use a Model HQ-1 Mini-Quad on a mast that's only 31 feet above ground and only eight feet above the roof of a 2-1/2 story condominium. The total roof space available is 18 × 36 feet (5.5 × 11 meters).

Admittedly, my maximum power output is no more than 120 watts on 10, 15 and 20 meters. But with the use of nonconductive guy lines plus all essential filters, I run a clean station. The nearest neighbor's TV antenna is less than 18 feet from my Mini-Quad! — *Jay Reisman, KB6IZ, Marina del Ray, California*

MORE ON REMOVING TOWER SECTIONS

While reading your September 1979 *QST* article, "Simple Technique for Tower Separation," I thought of the following comments which might be of use to other readers. Using silicone grease or a good grade of water pump grease to completely grease the flared portions of a tower leg before assembly will make the work of installing and dismantling a tower easier. Bolts that secure mating sections should not be over tightened, a precaution that will prevent compression of the tubing. Old bolts can be knocked out easily by using a small center punch. Leg hardware is available from Rohn tower distributors. Use of new hardware is recommended when reinstalling a used tower. — *James H. Hayes, W4XS, WIZO Radio, Franklin, Tennessee*

ROTOR CONTROL CABLE QUICK DISCONNECT

There are times when it would be convenient to disconnect the control unit of rotators from the tower-mounted equipment for reasons such as relocation or station modification. Although the terminal strip on the rear of most rotor control units is substantial, neither the terminal strip nor the wire ends (even if soldered or otherwise terminated) will stand too many loosenings or retightenings. Also, it is possible to make an improper reconnection (Murphy's Law!).

A very convenient, safe and positive way of solving this problem is to install a male/female 8-pin connector assembly in the line conveniently close to the control unit. Exercise caution, though. Connect the wires of the control cable to the connector pins in the same sequence as was done on the terminal strips for both the tower-mounted rotator and the control unit in the shack. Doing so will save many headaches later during trouble shooting sessions.

If the cable run is at a maximum length for a particular rotator in use, then any additional resistance offered by adding a connector may lead to troublesome operation of the rotator. Some rotators are susceptible to operating problems if an overlength control cable is used. In the case of the Ham-M II, for instance, the maximum cable length is 150 feet. — *John F. Marthens, W6SE, Encinitas, California*

BURNDY CONNECTORS AID LENGTHENING OR SHORTENING A DIPOLE ANTENNA

All my active years as an amateur since 1928, I've practiced and passed on to others the following means of adjusting the length of an antenna. (Refer to the accompanying drawing.) Pass ends of the antenna wire through the insulator eyes. Clamp the ends with Burndy connectors as shown in the illustration. The advantage of this method is that the wire can be lengthened or shortened without cutting until the desired length is obtained. After the correct length is obtained with the aid of a dip oscillator or other means of measurement, the excess may be cut off after tying at the insulators. You may choose, however, not to cut off the excess — a good idea if you may decid later to resonate the antenna at a lower fr quency.

Use of a little graphite grease on the connec tor threads is suggested. The connectors, Burn dy no. KS-15, are obtainable through man electrical supply houses. — *Antonio G. C Gelineau, W1HHF, Burlington, Vermont*

ATTACHING COAXIAL CONNECTORS

I use a method of attaching PL-259 coaxia connectors that seems rather foolproof. Newe hams, and maybe a few older ones, may ap preciate help in this direction.

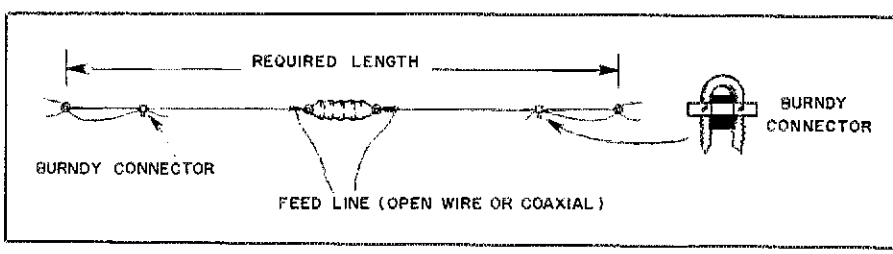
To prepare the PL-259 connector, disassem ble it. File off the nickel plating next to one o the holes normally used to solder the braid Repeat on the opposite hole. The reason fo this is that the base metal brass is easier t solder to than the nickel. Tin the filed area with a hot iron (up to 200 watts). Use minimal amount of solder. Apply heat n longer than necessary to make a good connec tion. Tin the center pin, leaving no exces solder.

In preparation of the coaxial cable, if RG 59/U, RG-58/U or the new Micro-8/U cable are to be used, slide the ferrule of appropriat size and the PL-259 knurled nut over the end o the cable. Tie a single overhand knot in th cable to capture them. Next remove 1-1/ inches (38 mm) of the outer vinyl sheath fron the cable. Comb out the braid into two bundle of equal numbers of strands (within reason) s the bundles are opposite each other. Twist th strands into a tight bundle, then carefully in spect them for and remove any broken strands Cut 1/2 inch (13 mm) off each strand bundle Tin the ends for 3/8 inch (10 mm). Put 45-degree bend on the very end of the soldere area away from the center conductor. Remov all but 1/4 inch (6 mm) from the center conduc tor insulation. Tin the full length.

Assembly begins with squeezing the brai bundles together against the center conducto and inserting them into the connector body The center conductor should enter the pin Then you jockey the shield ends until they ap pear in opposite holes. To get the center con ductor to pop out of the pin, grab the shiel ends and pull them in opposite directions.

Proceed next to slide the ferrule up the cabl and screw it into the connector body using tw pairs of pliers to make sure that seating is firm The shield ends will retract slightly.

At this point of assembly, make an ohm meter check for possible shorts between shiel and center conductor. If no correction i necessary, follow the ohmmeter test by com pleting the assembly. Cut the shield bundle leaving about 1/4 inch (6 mm) protruding fron the holes. Solder the braid to the body whil



Use of Burndy KS-15 connectors facilitate lengthening or shortening antenna wires. After correct length has been found the ends may be left as shown above or tied at the insulator with the excess wire being cut off.

pushing the braid against the body. Remove any excess solder below the threaded area. Cut off the center conductor flush with the end of the center pin and solder. Remove any excess solder that appears on the side of the pin. Now slide the connector nut up and thread it over the connector body.

The job isn't completely done until the cable is checked out! Use your ohmmeter, set for the low-ohms scale, to check for near zero ohms, one end of the shield (connector body) to the other end. Do likewise for the center conductor. The final test is to set the ohmmeter on the high-ohms scale and test again for any resistance between shield and center conductor. Properly, the reading should be infinite.

For RG-8/U I suggest combing the shield into four bundles. File off the nickel plating all around and tin the same area all around. Following the steps outlined will provide excellent mechanical and electrical bonds that will ensure trouble-free life. — *E. Raymond Hardy, W3BSS, Delmar, Delaware*

SHOOTING A FISHING LINE OVER A TREE

Maybe this has been tried before, but it was a first time for me and surely saved a tangled fishing line! In preparation for installing an antenna I needed to get a line over the top of a tree. My gimmick was to use a Zebra 202 closed-face spinning reel attached to a fishing rod. The procedure is to lay the lower part of the fishing rod on the ground. Fasten the line to the arrow. Push the reel release button, grab the bow and arrow and fire away. The method sure works! — *Larry Briggs, W3MSN, Oxon Hill, Maryland*

MODIFIED CAPACITOR FOR THE UNIVERSAL TRANSMATCH

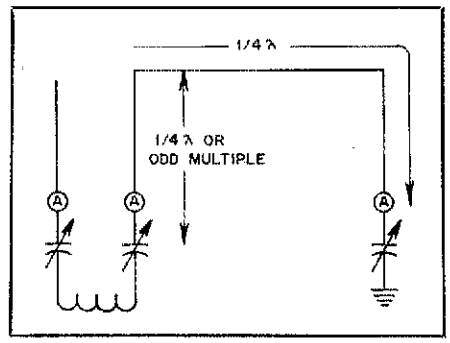
To provide a differential capacitor for the Universal Transmatch described in the 1975 edition of *The Radio Amateur's Handbook* I removed the rotor from a Millen 16250 variable capacitor, loosened the clamping nuts and rotated one set of the plates 180 degrees to give a differential action. The circuit adjustment is now much smoother and matches a wider range of impedance than I was able to obtain with the two-section variable suggested in the parts list.

A good initial adjustment procedure is to start with C2 fully meshed and C1 at midrange. C1 and L3 are then varied for a minimum SWR reading. If a null cannot be obtained, open C2 about 10 degrees and again adjust C1 and L3. Repeat until a perfect match is obtained. — *Frank C. Getz, N3FG, Newark, Delaware*

THE OLD TIMER'S NOTEBOOK: A MARCONI-ZEPP ANTENNA

With this system, a Zepp designed for 80 meters can be used on 160, or one designed for 40 can be used on 80. Plenty of amateurs with small backyards can use it to advantage since the flat-top is only a quarter-wave affair.

Since accurate tuning of the flat-top is a little ticklish, it calls for a bit more care than with an ordinary Zepp. First, the system should be tuned at the transmitter end with the condenser (capacitor) set about midway. Observe the current in each feeder. If the currents balance, everything is okay. If not, the flat-top will call for some tuning of C1. C1 should have a fairly high capacitance (350 pF). Adjusting this capacitor moves the current loop around. When the loop is in the center of the coupling coil (where it should be) the currents will balance and cancellation results.



Grounding the far end of a Zepp antenna permits using it as a quarter-wave Marconi with end feed. With this arrangement the antenna may be operated on a lower frequency than the fundamental.

The idea can be carried a bit further by making the length of the antenna between the end of the feeder and the connection to C1 equal to a half wave for the next-higher frequency band. Then install a switch at C1 so that the condenser and ground connection can be opened when the antenna is to operate as a half-wave Zepp. The length of lead between C1 and ground can be any convenient length, provided that the total length is not more than three-eighths of a wavelength since the series condenser will shorten the electrical length. — *George Underwood, W1GPE, North Providence, Rhode Island,* "For the Experimenter," August 1934 *QST.*

THE OLD TIMER'S NOTEBOOK: REMEMBER THE WONDER BAR ANTENNA — A 10-METER BOW TIE?

We receive many requests at the ARRL for information about the simple loaded dipole, only 8 feet long, that was described by Dr. Edwin T. Bishop, K6OFM, in November 1956 *QST.* This miniature 10-meter antenna, made from the elements of a conical TV antenna, became a hit because of the low cost and good performance. In summarized form, therefore, here are the details.

If you can obtain a conical television antenna, you will have all the parts needed except two standoff insulators, a B & W Miniductor no. 3013 (12 turns no. 16 wire, 1-inch dia, 3 inches long) and a few nuts and bolts — it's that simple! If a TV antenna is not available, 1/2-inch OD aluminum tubing can be substituted. Dimensions are shown in the drawing.

The outer ends of the four 48-inch antenna elements and the ends of the 30-inch bars are flattened for a distance of 1 inch. These ends are then drilled to accept whatever size machine screw you choose to use.

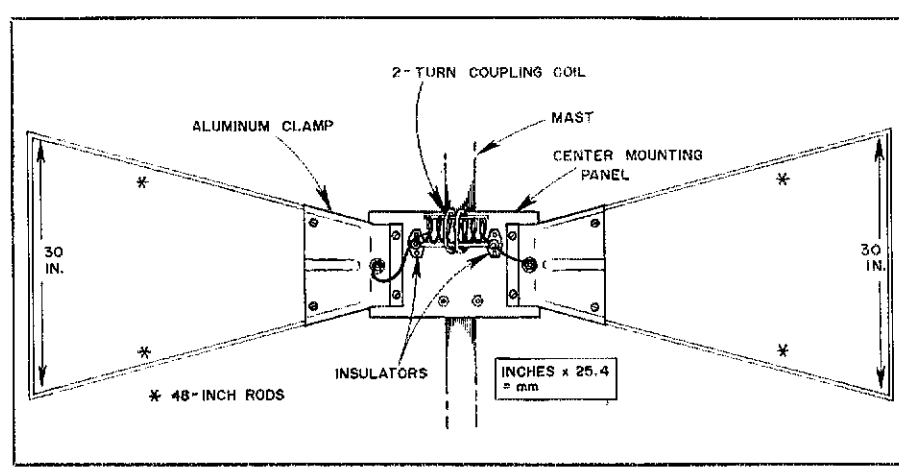
Any nonconducting weatherproof material may be used for the center panel. The dimensions are not critical, but should be large enough and strong enough to accommodate the antenna and mounting hardware.

Two of the original clamp mountings hold the halves of the revamped TV antenna. The aluminum clamps and the antenna should be well cleaned before assembly. Application of Mosley's Penetrox at all connecting joints will ensure good continuity. In order that both sections of the bow tie lie in the same plane, mounting plates should be straightened for that purpose.

The Miniductor coil is supported by two 1-inch standoff insulators placed 3 inches apart on the center mounting panel. One end of this coil is connected directly to one of the antenna sections by means of a short length of no. 12 wire. Another short length of no. 12 wire, connected to the other section of the antenna, is tapped onto the coil so that there are approximately 10-3/8 turns between the connections. The transmission-line coupling coil consists of two turns of plastic-covered solid no. 14 electricians wire, loosely coupled around the center of the loading coil. The coils should be adjusted for minimum SWR.

Either RG-8/U or RG-58/U may be employed for the transmission line, which may be terminated at the antenna by means of coaxial connectors or simply wired directly to the coupling coil. In any case, the end of the line should be waterproofed. One means of waterproofing is Duxseal, available at some plumbing and heating supply houses, and also from Motorola Communications equipment branches.

In order to maintain the centered position of the coupling coil, the author elected to cement the leads to the mounting panel with water-



The Wonder-Bar 10-Meter Antenna. This bow-tie was originally described in November 1956 *QST.* In response to continued reader interest, it is presented once again. This antenna is fashioned from a conical TV antenna.

proof cement. This was done at the point where the leads pass through holes in the panel. Several light coats of Krylon spray, applied to the antenna, help resist the effects of weather.

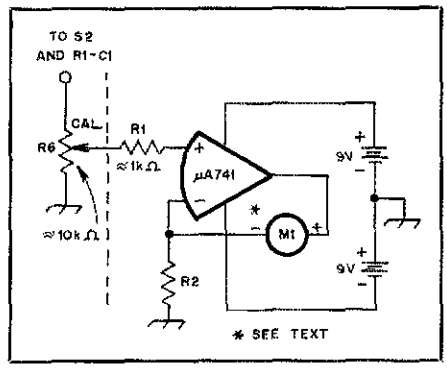
Keep in mind that this is not a form of folded dipole. The rods for each section of the bow tie converge at an electrically common point — a common point for the right section and a common point for the left. In this respect, the construction is the same as a conical TV antenna.

To conclude his article, Dr. Bishop said: "Signal reports really bring home the bacon to the ham! Try it and I do believe you'll agree with me!" — *Stu Leland, W1JEC*

A USEFUL METER AMPLIFIER

K4KI's tune-up bridge, described in December 1979 *QST*, is an outstanding circuit. Every amateur station should have one or something similar to relieve tune-up QRM. His circuit calls for a 50 μA meter. Other circuits in *QST* have specified various meter values. I frequently do not have the proper value meter in my junk box, and since I am not a wealthy person, my hamming is done on a very modest budget. My solution is to use the simple meter-driver circuit shown in the accompanying drawing. With it you can adapt a meter of any value to practically any circuit.

Basically this amplifier is a voltage-to-current converter that is well described in many IC handbooks. It has a very high input impedance that will not load the sensing circuitry. A 1-mA movement can therefore be used in place of a 20-μA movement. Low current drain permits the use of inexpensive batteries for power. Voltage is not critical.



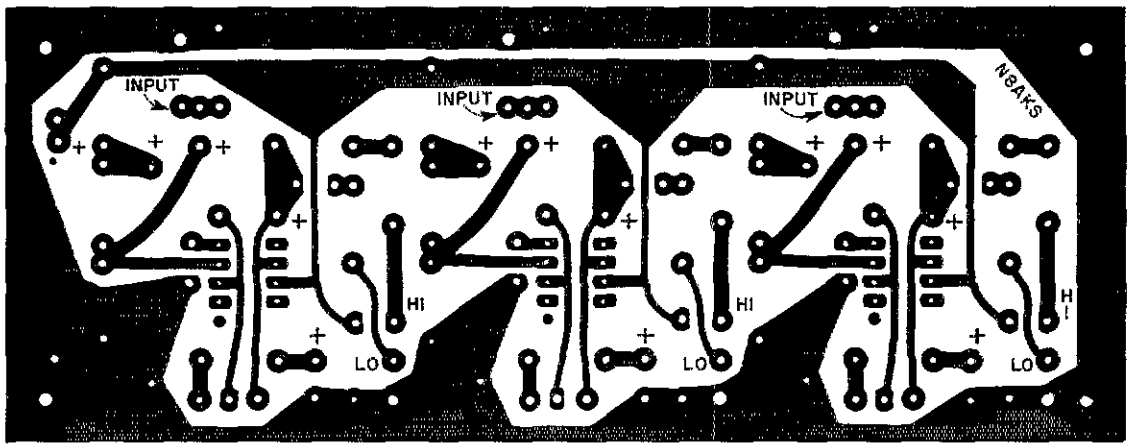
This circuit, provided by KA7CDR, permits the substitution of meters other than the one specified for a given project. The circuit as shown will adapt a 0-1 mA meter to the K4KI tune-up bridge described in December 1979 *QST*. The value of R2 is determined by dividing the maximum voltage at the + terminal of the 741 by the meter current required. R6 may be as little as 2 kΩ but higher values decrease the loading effect. The upper limit is about 100 kΩ.

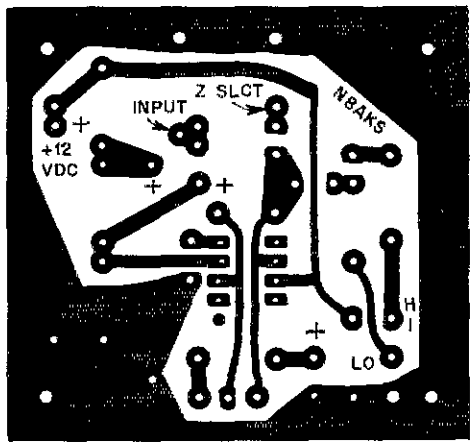
The circuit, as shown, will adapt a 0-1 mA meter to K4KI's circuit. Resistor values are also not critical and are selected according to the value of whatever potentiometer is on hand. R1 should be no more than 1/10 the value of R6. The voltage "felt" at the + terminal of the μA741 will also be found across R2. The μA741 will supply whatever current is required to maintain that voltage balance (limited to about 25 mA). A good choice for R2 is to use a 1-kΩ pc-board style potentiometer that can be adjusted during assembly and checkout and then ignored. Different meters have different V-I characteristics. Therefore use of a one-time-adjusted potentiometer will eliminate any design calculations with this circuit. Any meter movement can be used by simply experimenting with a few resistors. If the maximum input voltage is known, just divide that voltage by the meter-current requirement to obtain the value for R2. If the voltage is not known, then a potentiometer or some experimenting is in order. The entire driver circuit, including batteries, can be glued to the back of the meter. A dpst switch can be included to conserve the batteries if desired. The 741 is an experimenter's delight. I can burn dozens of them up for the price of one good meter. — *Michael C. Trull, KA7CDR, Las Vegas, Nevada*

[Editor's Note: Also see "A Tune-up Bridge Note" in the "Technical Correspondence" section of this issue.]

ANTENNA HINT FOR DXERS

A word of caution on special low-noise receiving antennas — put them as far away from your vertical or semi-vertical transmitting antenna as possible. The distance should be one wavelength or more. If there is insufficient separation, the receiving antenna will pick up the same noise and crud you've tried to avoid. The noise can be reradiated from the transmitting antenna. — *Stewart Perry, W1BB, Winthrop, Massachusetts*





Circuit-board etching patterns for the adjustable-gain microphone amplifier (see Figs. 3 and 4, pages 13 and 14 of this issue). Patterns are shown at actual size from the etched side of the board, with black representing copper. The pattern at A is for the 3-channel amplifier, and that at B for the single-channel amplifier. Boards have copper on one side only.

World Friendship Through Amateur Radio

Don't take our word for it — come and see for yourself. . . at the 1980 ARRL National Convention, July 25-27, in Seattle, Washington

By John Brown,* W7CKZ

Have you heard about the Pacific Northwest and wondered if the stories about lumberjacks are true? Well, in addition to lumberjacks, the Pacific Northwest also has a large group of active Amateur Radio operators, and Seattle, Washington, will host the 26th National ARRL Convention on July 25-27, 1980.

Bring the family and vacation in the most beautiful country atmosphere in the world. Enjoy fishing, hiking, water sports and tours to some of the most interesting transportation and cultural spots on the globe. Kenworth Truck, The Boeing Company, China Town and Indian lore are fascinating diversions to occupy your time when not enjoying the ARRL convention, dubbed SEANARC '80 (Seattle National Amateur Radio Convention '80).

Seattle fits the convention theme, "World Friendship Through Amateur Radio," because of the melding of people — Indians, Orientals, Scandinavians and the many transplants from around the United States and Canada.

The convention, at the SEA-TAC Red Lion Motor Inn, is easily accessible by land, sea and air (the convention site is just across the street from Seattle-Tacoma Airport) so make plans early because this convention will be a *big one!*

The Convention

Here is a brief listing of convention activities, just to whet your appetite. There will be many seminars, displays, major equipment exhibitors and featured speakers. But wait a minute: We will also have WARC results with Vic Clark, W4KFC; featured banquet speaker Roy Neal, K6DUE, of NBC News; ARRL officials plus ARRL President Harry Dannals, W2HD. You're sure to find something to suit your particular interests among the many scheduled forums: Amateur Radio PR, microprocessors/ computers, Personal Radio Foundation, DX activities, insurance problems of the radio amateur, plus the last of the convention FCC exams — and much, much more. Special programs are planned for the ladies, and of course there will be special tours for those who want to see this part of the country.

Want to know more but don't know whom to ask? For tourist information, write the Washington State Department of Tourism, Department of Commerce and Economic Development, General Administration Building, Olympia, WA 98504. For convention registration materials, write SEANARC '80, P. O. Box 68534, Seattle, WA 98168.

Come to the 26th National ARRL Convention in Seattle and learn the truth about the chain saw totin', buckskinned frontier DX operators. I am sure you will be as amused as we are!

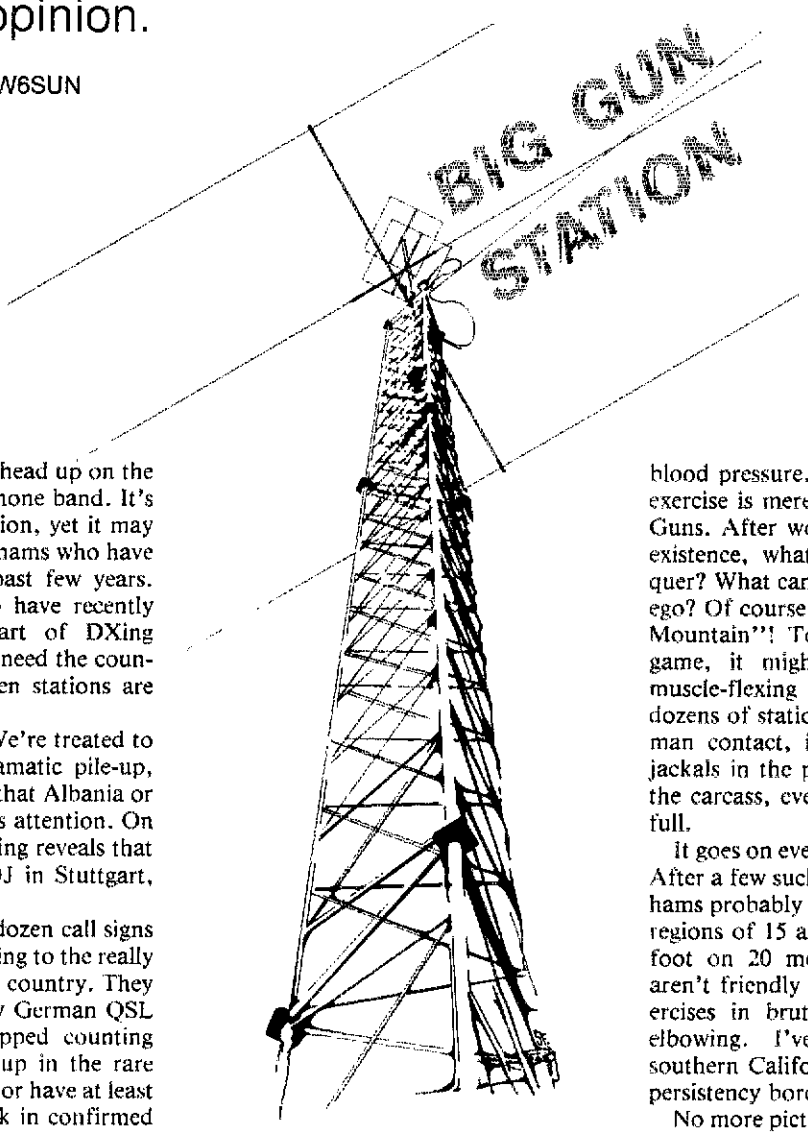
*725 88th Avenue S.W., Olympia, WA 98502

Seattle at night, with the famous Space Needle in the right foreground. *(photo courtesy Seattle-King County Convention & Visitors Bureau)*

The CMP Plan for 20-Meter DXing

Is 20-meter DXing a friendly competition open to all hams or merely an ego builder for Amateur Radio's superstations? Here's one opinion.

By George McCarthy,* W6SUN



A DX station pokes its head up on the low end of the 20-meter phone band. It's not a particularly rare station, yet it may be needed by many of the hams who have joined our ranks in the past few years. Even older amateurs who have recently discovered the exciting art of DXing through cycle 21 may also need the country. Probably several dozen stations are thirsting for this contact.

But what do we hear? We're treated to the sounds of a truly dramatic pile-up, one that has us convinced that Albania or Bhutan is attracting all this attention. On the contrary, patient listening reveals that this "rare" station is a DJ in Stuttgart, West Germany.

We recognize at least a dozen call signs in the pileup, many belonging to the really "Big Gun" stations in this country. They all probably have so many German QSL cards that they have stopped counting them. Most of them are up in the rare reaches of the Honor Roll, or have at least passed the fabled 300 mark in confirmed countries.

When contact is finally made we are often treated to some version of this typical dialogue from Mister Big Gun. "Well, it's certainly nice to talk to you again, Hans. Your signal isn't quite as loud as it was yesterday, but the band is in poor shape. I imagine that you're only hearing the really strong stations from over here."

Radio's Great Mystery

Just what are these Big Guns doing in this pile-up? Why are they yelling longer and louder than everyone else? This is surely one of the great mysteries of Amateur Radio. It seems that the purpose of this type of contact is not so much to enlighten Hans as it is to impress the great unwashed multitudes listening in that the Big Gun has been the first one heard, has already worked the DX station and can get through first whenever he wants to.

In addition to leaving Hans wondering at this sudden popularity, the Big Gun leaves many eager DXers grinding their molars and trying to deal with escalating blood pressure. I contend that the whole exercise is merely an ego trip for the Big Guns. After working all the countries in existence, what worlds are left to conquer? What can further massage a hungry ego? Of course! Winning at "King of the Mountain"! To the participants of this game, it might seem like a harmless muscle-flexing exercise. But for the dozens of stations who really need a German contact, it's more like the biggest jackals in the pack continuing to tear at the carcass, even though their bellies are full.

It goes on every day; you've all heard it. After a few such experiences, hundreds of hams probably flee to the less-competitive regions of 15 and 10 meters, never to set foot on 20 meters again. These games aren't friendly competition. They are exercises in brute strength and relentless elbowing. I've heard some of our southern California Big Guns call with a persistency bordering on hysteria.

No more pictures need to be drawn. We all know the story, scene, chapter and verse, and have had nightmares of trying for stations that gradually fade out while the big egos get massaged. Maybe it's more prevalent here in California. We certainly have more than our share of superstations; the term "California Kilowatt" didn't originate spontaneously!

Chasing the Fox

There's a way to solve this problem, however. I call it CMP, or the "comparative muscle power" plan. All that would be required is for several designated DX stations to take turns playing the

*2739 N. Atherwood Ave., Simi, CA 93066

"fox" for the hunt. The DX station would call CQ on a specified frequency at a predetermined time. He could be answered only by *bona fide* and *certified* Big Gun stations. After all, the rest of us would only clutter up the frequency and add low-level QRM to the happening. In this manner the Big Guns would know that they would be competing only against other Big Guns; the possibility of some standard station fortuitously slipping in his call at the right time would be eliminated.

Think about CMP before you scoff. By using this plan, the Big Guns' massive ego needs would be satisfied in a controlled and orderly manner. The rest of the band would be left to us lesser lights who are still eagerly seeking new countries to add to our lowly DXCC total. We would only have to avoid the approximately 12 kHz that these superstations normally require. If newer hams needed a lesson in DX technique they could listen in on the Big Guns. There they could learn the nuances of tail ending, quick breaking and the pretended contact, which is effective only when one station tries it at a time. Listeners also would discover that if all else fails, there's always the "I think he came back to me, fellows" ploy, an advanced version of the pretended contact.

Once these tricks have been learned at the feet of the masters, the new DXer can apply them to those contacts he really needs. Of course, the DXer should realize that what he gains in new countries he will lose in respect from his fellow hams. The cutthroat competition during a pile-up has rarely induced an aura of good fellowship. Should he make such a gross error as to forget to switch his VFO to receive only and transmit on the DX station's frequency in a split-frequency operation, he can rest assured that the frequency will be monitored by at least a dozen policemen who will inform him of the transgression, while burying the DX station under their pompous and self-important admonitions.

If my CMP idea does not gain acceptance, perhaps the ARRL, in its enlightened wisdom, will devise some new Mount Olympus for the Big Guns to scale. Then the rest of us will be left in peace to pursue our plebian efforts to log the more-mundane countries. How about a special contest for working brown-eyed operators who have blue-eyed parents? The GRDXS (Genetic Rarity DX Station) certificate could be issued to those submitting QSL proof of this accomplishment. Anything to get the Big Guns off our backs. QST

[Editor's Note: The opinions expressed in this article are those of the author, and are not necessarily shared by the Hq. staff.]

Strays

WRITING TO QCWA?

☐ Correspondence to the Quarter Century Wireless Association (QCWA) should be forwarded to the Secretary, Ethel Smith, K4LMB, 2012 Rockingham St., McLean, VA 22101, Tel. 703-536-8469; or to the General Manager, Ted Heithecker, W5EJ, 1409 Cooper Dr., Irving, TX 75061, Tel. 214-438-8038.

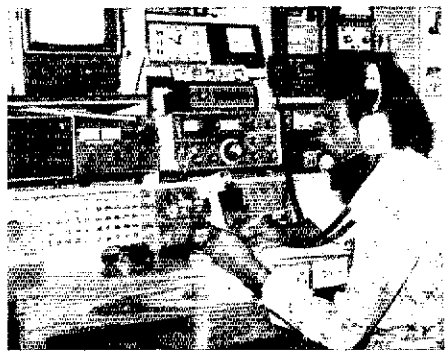
WIESBADEN ARC HAMFEST

☐ The Wiesbaden ARC (Federal Republic of Germany) and DOK F20 of Wiesbaden will sponsor a hamfest in Auringen, 5 km north of Wiesbaden on highway 455, on Sunday, May 4, starting at 10 A.M. Activities will include flea market, vendors, displays, computer demonstrations, technical assistance, cw contest, prizes and refreshments. Talk-in on 145.55 MHz. Signs will be posted with directions to the hamfest from the major autobahns passing Wiesbaden. — *Steve Hutchins, DA2HS/WD6BKA, APO NY*

HURRICANE DISASTER STATION, VP2MO

☐ Among the many Caribbean amateur stations that were dedicated to handling emergency traffic during hurricanes David and Frederick was VP2MO on the island of Montserrat. Errol "Bobbie" Martin, shown at his operating position, was one of the full-time disaster-network stations that was not on Dominica during the crisis. His XYL, Joanna ("Mae"), VP2MN, was on hand to assist with the operations.

Another very active island station was VP2MF, owned by Doc Hollatz. Doc ran ssb traffic for 48 hours between the islands on battery power with a Ten Tec Argonaut and a 1000-foot closed horizontal loop antenna, 60 feet above ground. This antenna proved very effective from 160 through 10 meters during a 2-week DXpedition by W1CKK/VP2MFV, WB1FSB/VP2MFR and W1FB/-VP2MFW in November 1979.



Errol "Bobbie" Martin, VP2MO, was one of the many amateurs who handled emergency traffic during hurricanes David and Frederick.

VP2MO is a friend to visiting amateurs from other countries. In fact, he's the chap who issues the amateur licenses on Montserrat. His amateur station is rather complete, judging from the accompanying photograph. Bobbie says that the only item he needs badly is a good used linear amplifier to complete the equipment array! — *Doug DeMaw, W1FB*

DUTCH HAMS DECORATE WITH LICENSE PLATES, NOT TULIPS

☐ A group of Dutch hams, from PI1ARS, Telecomm Groep Dirksz Admiraal, Den Helder, Holland, use license plates to decorate the "wild west" bar in their clubhouse. The club members would like more donations, particularly from the fifth call area, to fill their collection. Can you help? — *H. A. Kanon, PAØHTR, Den Helder, Holland*

Jan, one of the operators of PI1ARS, is shown in the clubhouse bar. Notice the U.S. license plates. (*photo courtesy PAØHTR*)

LIECHTENSTEIN DXPEDITION

☐ The Wiesbaden ARC (Federal Republic of Germany) will go on a DXpedition to Liechtenstein from May 24 until June 1, 1980. Using the call sign DA1WA/HBØ, they will operate phone on 3.780, 7.090, 14.280, 21.350 and 28.650 MHz (± 5 kHz). Cw operation will be 25 kHz from the bottom of each band. U.S. and Canadian stations QSL (with 15-cent s.a.s.e.) via regular U.S. mail (15 cents) to Steve Hutchins, DA2HS/WD6BKA, Box 4573, APO NY 09109. Others QSL via Hugo Jakobljevich, DJØLC, Am Weinburg 10, 6201 Auringen, West Germany. — *Steve Hutchins, DA2HS/WD6BKA, APO NY*

AMSAT-OSCAR Phase III on the Horizon

Part 2: Spacecraft and station requirements — designing your Phase III ground station in terms of what the satellite both provides and requires is the intelligent way to go.

By Steve Place,* WB1EYI

The next time you wander into your shack — assuming you're able to restrain your twitching fist as it passes through the "gravitational field" of your mic and key — put your feet up for a few minutes and reflect on why you chose that particular array of gear sitting before you. Why not the dream $6000 commercial rig that once caught your eye? Could it be that your son's orthodontist has the unpleasant habit of expecting his bills to be paid on time? Or are you still one of those unabashed sentimentalists who believes that putting food on the family table is at least as important as owning the latest in rf bells and whistles?

For that matter, why don't you have a forest of 200-foot towers growing in your back yard? Possibly you're faced with local zoning laws and somehow can't figure how to make 200 feet of steel fall within 100 feet of real estate. Or, like me, you can't picture a 200-foot monster thrusting unobtrusively from your third floor apartment's balcony. Neighbors and apartment managers have a way of expressing their casual displeasure. And why don't all backpacking hilltoppers haul 2-kW linears to distant summits? I suspect that if the climb didn't "burn out" the hiker, the first "QRL?" would certainly vaporize his AA-cell battery pack.

Steve Robinson, W2FPY, testing the flight version of the onboard computer in AMSAT's lab at Goddard Space Flight Center in Maryland. Steve, as a volunteer for AMSAT, was responsible for the flight computer circuit board layout. *(W4PUJ photo)*

Every station plan evolves from decisions that are based on a unique blend of needs, desires, resources and external constraints. Just as you know why you've chosen your present gear, given the system requirements *you* will know the best approach for *your* Phase III ground station. Let's take a look at how the Phase III (AMSAT-OSCAR 9 after successful launch) design evolved, what the spacecraft hardware has in store for us and how

*Manager, Club and Training Department

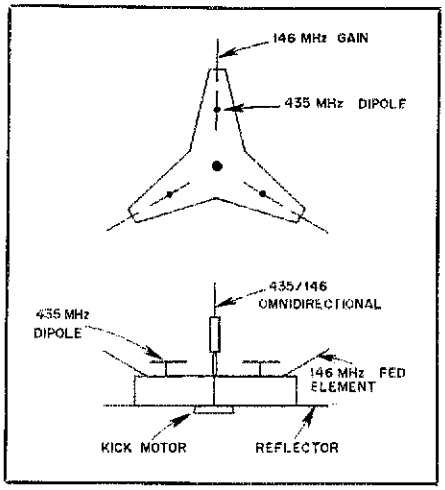


Fig. 1 — Top and side views showing antenna placement on the Phase III structure. See text for a detailed description.

this knowledge will help define our equipment alternatives.

Basic Satellite Design Considerations

AMSAT's initial planning problem was well defined — design a satellite that will afford the greatest geographical coverage possible with long periods of access for the greatest number of radio amateurs. Coverage is a function of altitude — the higher a satellite is (to a point), the greater its coverage. As access for all hams throughout the world is important, geostationary orbit was ruled out. The other alternatives were reduced by available launch opportunities to the high, elliptical orbit on which AMSAT finally settled. Furthermore, keeping apogee over the Northern Hemisphere for the first few years will give maximum access to the largest ham populations while providing at least some access to all hams in the Southern Hemisphere.

This orbit, however, places new demands on the communication system. Its very high apogee, about 35,800 km, leads to a significant increase in pathloss over previous OSCARs.[1] At worst case (the longest slant range at apogee) Phase III's pathloss is about 178 dB, compared with the previous Mode B-carrying OSCAR 7's 158 dB. In other words, an additional 20 dB of pathloss must be overcome on *both* the uplink and downlink of Phase III.[2] A portion of this 20 dB can be made up in both spacecraft uplink and downlink antenna design, though stabilization/orientation considerations, physical size and weight, space limitations under the launch vehicle's shroud and the acceptable level of complexity constrain the designers' alternatives somewhat. Similarly, though increasing the transmitted power from the satellite to high levels would help, the size and weight of rechargeable NiCad batteries, solar-cell efficiency, surface area available for solar panels and cost limit the realistic amount of power a satellite can provide.

AMSAT has struck a balance in each of these areas by designing small, simple, gain antennas for apogee that nestle easily within the shroud, increasing the transmitted power while maintaining a positive power budget (adequate power for expected demand without shutdown periods), quadrupling the bandwidth to accommodate the greater number of simultaneous users, improving transponder performance, and devising elegantly simple solutions to other less obvious problems. Not all of the 40-dB deficit is overcome within the spacecraft, however; a good deal is left to us, the users. Before discussing what we can do, let's look at the final satellite design more closely, focusing on those aspects that are most relevant to our plans.

Spacecraft Antennas[3]

Phase III's Mode B transponder receives on 70 cm and transmits in the 2-meter band. For reasons we'll discuss shortly, both a directional, gain antenna at apogee and an omnidirectional antenna at perigee are needed for each band. (As reference, note that each of the tri-star structure's three arms is 0.6 meters long from its end to the center or spin axis of the spacecraft.)

The 70-cm apogee, receive (uplink) antenna consists of three phased dipoles, each mounted 2/5 of the way out along the centerline of its spacecraft arm, and 1/4-wavelength above the upper surface (see Fig. 1). The antennas are thus both physically separated and electrically phased 120° apart. The measured gain of this phased dipole array is about 11 dBi with a relatively clean pattern (see Fig. 2) only slightly distorted at a few points. Polarization is right-hand circular.

The 2-meter apogee transmitting (downlink) antenna is a unique design comprising three quarter-wave driven elements and three reflectors. Each driven element is mounted 0.53 meters out from the spin axis, and is tilted along the centerline of its spacecraft arm at 30° above the upper surface. Each reflective element is mounted along the centerline of the lower surface of its arm, protruding 0.28 wavelength beyond the arm's end. These three pairs of elements are also both physically separated and electrically phased 120° apart, with resultant right-hand circular polarization. The array's measured gain is about 10 dBi. As the spacecraft structure is not really large enough at 2 meters to provide an adequate image plane, three significant sidelobes occur at the three junctions formed by adjacent pairs of arms. The sidelobes are spaced 120° around the spin axis.

The 70-cm and 2-meter omnidirectional perigee antennas are unusual in that they are coaxial and are mounted along the satellite's spin axis, perpendicular to the satellite structure's upper surface, directly above the kick motor. At 145 MHz the antenna acts as a quarter-wave monopole with smooth pattern, exhibiting slight gain (a little over 2 dBi) along the spin axis. At 435 MHz, the antenna is effectively an elevated, coaxial-sleeve vertical that is fed at the center. The tip of the 2-meter monopole serves as one half this "dipole," while an equally long coaxial sleeve forms the other half. The 70-cm pattern shows a slight null off the back of

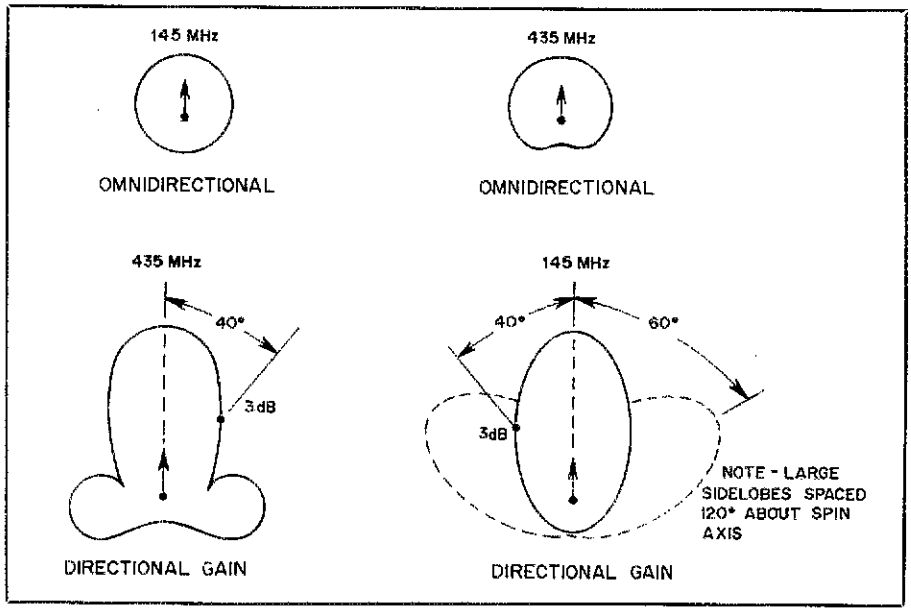
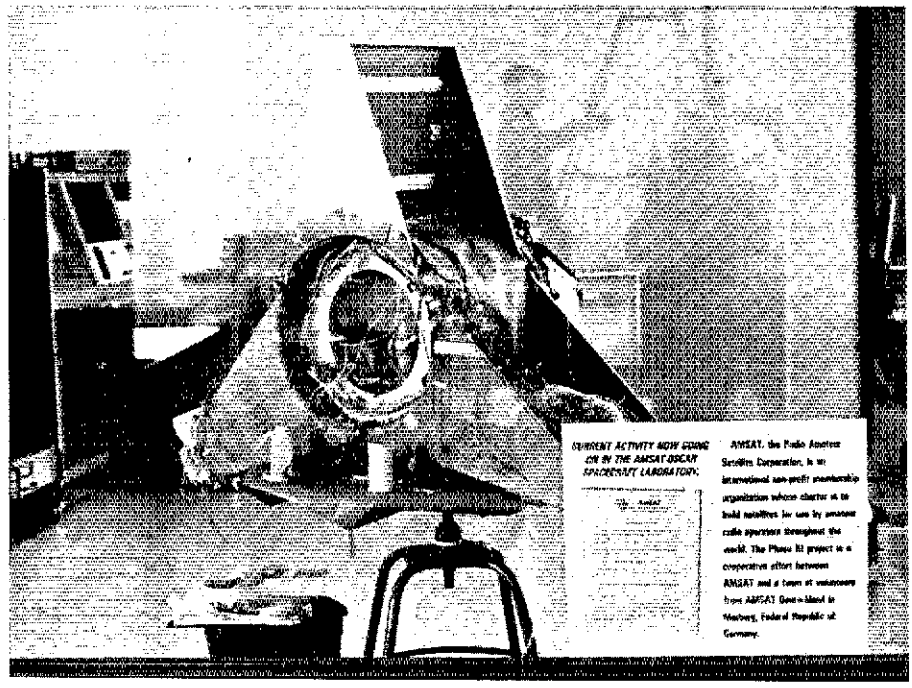


Fig. 2 — Antenna patterns of the 2-meter omnidirectional monopole, the 70-cm omnidirectional coaxial sleeve dipole, the 70-cm directional phased dipole array and 2-meter directional array, as measured by K1JX.

[1]Notes appear on page 68.



A visitor's-eye-view of the Phase III structure through the large AMSAT Lab window. The room in which Phase III was built is affectionately known as the "Fishbowl" by the AMSAT personnel who assembled the satellite in full view of the public at the Goddard S.F.C. Visitor's Center. What appears to be the ghost of Dr. Robert Goddard watching over the satellite is the reflection of his statue: a memorial to the late rocketry pioneer for whom the Space Flight Center was named. Other rocketry and astronautics displays surround the area. *(W4PUJ photo)*

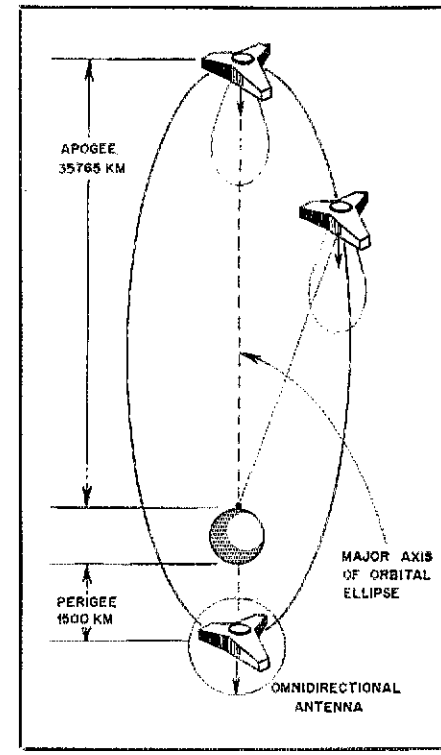


Fig. 3 — Spacecraft orientation and antenna selection at various points along the orbital ellipse.

the spacecraft and gain roughly equivalent to its 2-meter counterpart. In this configuration, the 70-cm coaxial sleeve dipole receives uplink signals at the same time the 2-meter monopole transmits downlink signals. Simultaneous operation is possible as the 70-cm feedpoint appears as an electrical short at 2 meters.

Stabilization-Orientation

For any communications satellite to be effective, much consideration must be given to problems of stabilization and orientation. Simply stated, if the satellite isn't pointed in the right direction, it doesn't do us much good. Recent OSCARs, for example, have used extremely strong permalloy bar magnets. With time the magnets fell into alignment with the earth's geomagnetic field causing the satellite to revolve gradually as it orbited over one pole and then the other. (After hours spent installing these magnets on OSCAR 8, Dick Daniels, W4PUJ, found that his expensive, antimagnetic wristwatch rarely agreed with WWV — manufacturer's guarantee notwithstanding.)

Phase III, however, needs much greater stability and precision than simple passive devices can provide. As a result, a system comprising positional sensors, an onboard computer and electromagnetic torquing coils has evolved. Immediately after separation from the launch vehicle, AMSAT-OSCAR 9 will be "spun up" or caused to rotate about its spin axis for stability. Sensor readings will then indicate whether it is properly oriented and even whether it is right-side-up. Then, using the torquing coils, ground telecommand stations will make the necessary adjustments to ensure precise positioning for the subsequent kick motor firing.

Once in final orbit, the spacecraft will be maintained in an attitude in which its spin axis will remain parallel to the major axis of the orbital ellipse (see Fig. 3). Thus, at apogee the directional antennas will point directly at earth; at perigee, they will point 180° away from earth.

This is, of course, the ideal situation at apogee; we will benefit from the antennas' maximum gain. But as Phase III moves off apogee, we begin to operate farther off the side of the main lobe, suffering a decrease in received power at both ends. Fortunately, as the satellite moves off apogee, it also moves toward earth and our old nemesis, pathloss, is reduced. Thus, the system has been designed in such a way that we should suffer little or no *apparent* loss in signal strength; what is lost as we work farther off the main lobe is recovered in proximity.

At perigee, where the gain antennas point away from Southern Hemisphere stations, the omnidirectional antennas will prove adequate. Though they have little gain toward earth, the distance to traverse is only 1500 km. At what point can we expect the switch between apogee antennas and perigee antennas? The decision is not as simple as it may seem.

The rapidly spinning spacecraft (up to 60 rpm) and the undesirable sidelobes described earlier (see Fig. 4) introduce a new phenomenon: spin modulation. Near apogee, spin modulation is negligible, but as Phase III moves off apogee, the sidelobes play an ever increasing role. At 60 rpm, 1 revolution per second, the 3 sidelobes contribute a 3 Hz amplitude modulation of the entire passband. The resultant alternating fade-peak-fade-peak-fade-peak every second will be more pronounced the farther from apogee the satellite travels. At some point, the omnidirectional antennas will perform as well as, or better than, the directional ones and the antennas will be switched. By definition, users should not notice a sudden change in signal level.[4]

Transponder Improvements

Compared to its predecessor, which flew on OSCAR 7, Phase III's Mode B transponder has been significantly improved — though that may seem impossible to you veteran OSCAR ops who remember OSCAR 7's remarkable performance. Improved shielding, isolation, and filtering and new technology have resulted in a reliable transponder with an overall system noise figure of 4 dB. Bandwidth has been increased from about 40 kHz to 150 kHz and transmitted power from eight to 50 watts PEP. AMSAT reports

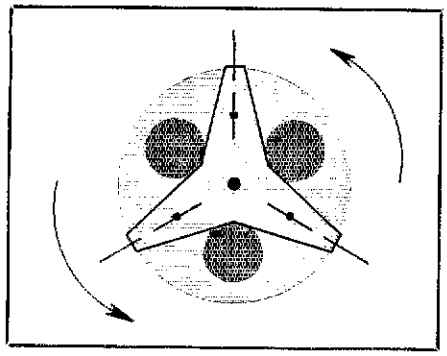


Fig. 4 — Graphic interpretation of the location of the 2-meter array's major lobe and its three large sidelobes. At apogee, the sidelobes exert minimal effect. Off apogee, the sidelobes are swept around as the satellite spins, causing what appears to be an amplitude modulation of the entire passband: spin modulation.

Uplink Pathloss Calculations for OSCAR 7 and Phase III

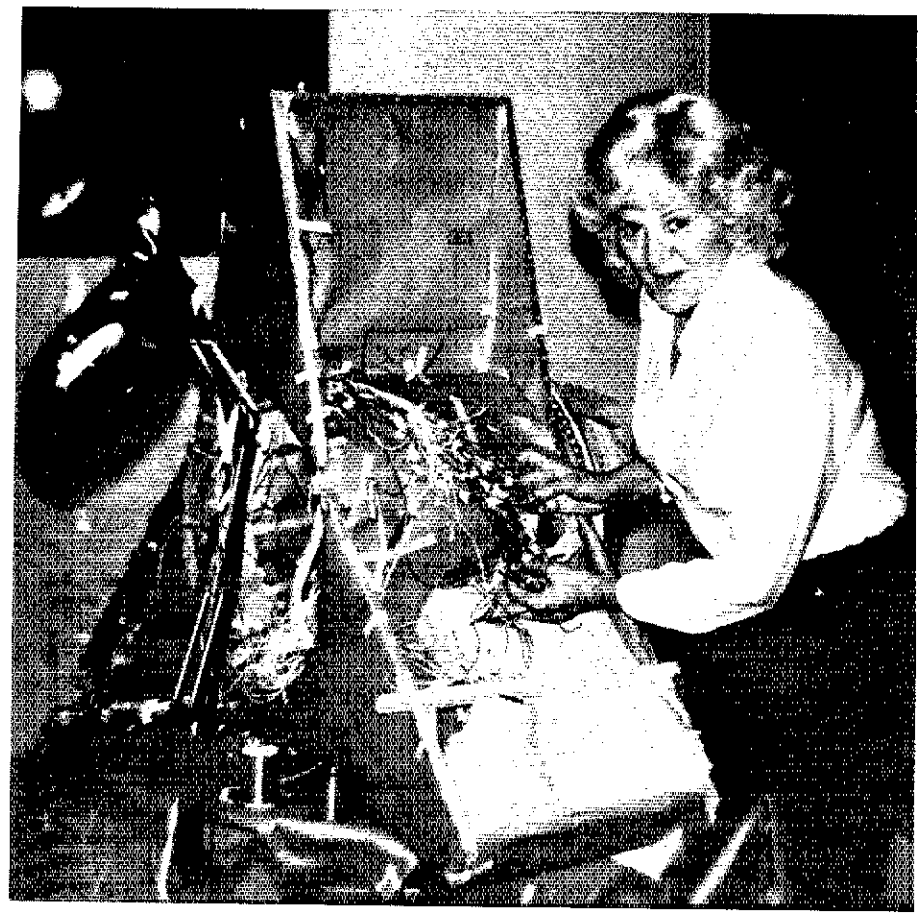
PL (dB) = 32.45 + 20 log F(MHz) + 20 log D (km)

	OSCAR 7	*Phase III*
F(MHz)	432.1	435.2
D (km)	4554	41,673

Note 1: Pathloss worst on uplink, which is at higher frequency.
Note 2: D is longest *slant range* at apogee.
Note 3: Figures based on prelaunch predictions are *estimates*.

OSCAR 7 PL = 32.45 + 20 log 432.1 + 20 log 4554
= 158 dB

Phase III PL = 32.45 + 20 log 435.2 + 20 log 41,673
= 178 dB



Marie Marr cuts and measures the cabling that will eventually make up Phase III's intricate wiring harness. Marie, recently featured on television "magazine" shows in Washington, DC and Baltimore, has done the wiring for AMSAT on the past four OSCARs. We can all thank her patience and deft touch for the reliability we've all come to take for granted. *(W4PUJ photo)*

that all has tested well; we tip our hats to Karl Meinzer, DJ4ZC, who designed the transponder, and Werner Haas, DJ5KQ, who assisted in its construction.

What's the Bottom Line?

We now have enough information to determine what impact AMSAT's spacecraft design decisions will have on our ground-station planning. What will we have to provide in our ground stations to ensure effective operation through Phase III?

Taking the simple case of the uplink first, we now know that we have a 20 dB pathloss deficit to overcome compared with OSCAR 7. The new 70-cm phased-dipole array that produces a 10-dB advantage over OSCAR 7's canted turnstile accounts for about half, leaving the remaining 10 dB for us to make up. Ten dB more power will do the trick. If we increase OSCAR 7's maximum allowable uplink power of 80 to 100 watts erp (effective radiated power — power out times antenna gain, all minus feedline losses) by 10 dB, to 800 to 1000 watts erp, we will have solved the problem. One thousand watts erp at 435 MHz is well within the realm of possibility.

The downlink comparison is not as straightforward. A similar 10-dB gain downlink advantage at 2 meters over OSCAR 7's canted turnstile eliminates part of the deficit, but here things begin to get complicated. Phase III's 50-watt output does compare favorably with OSCAR 7's 8 watts, but the Phase III passband is four times larger. And however conveniently it simplifies the comparison, you cannot correctly assume equivalent densities of users, equally distributed across the passband and all using equal power. As the relationship is not linear, your conclusions would not be valid.

In reality, actual performance will continually vary with the number of users at a given time, and the power they are using. (Unlike OSCAR 7, however, with several users in the passband, increasing your transmitted power above prescribed limits will have minimal effect; you will not gain a proportional advantage over the more considerate low power users.)

Where does this leave us? Without getting into the details of the link calculations, suffice it to say that maximizing your 2-meter receive station performance by using measures that are "old hat" to all effective VHFers and UHFers, you should come pretty close to compensating for any residual losses and have no trouble in working through Phase III for hours at a time (we'll describe these measures shortly). Now that the task is defined, it's up to you to decide which path makes the most sense in your particular situation.

Uplink Ground Station Options

Your first task is to generate 1000-watts erp at 435 MHz. Keep in mind that 1000-watts erp is the product of transmitter output power, amplification and antenna gain, all minus system feedline losses, and can be achieved with any of a number of appropriate combinations.

One alternative is to begin with a 70-cm exciter capable of 10-watts output. Some of these are fm boxes (fm is *verboten* on the Phase III transponder) which can readily be adapted for cw work. Or, assuming you already own a rig that transmits at 28 MHz, you can begin with a linear transmitting converter, most of which also put out 10 watts. This is probably the most flexible and convenient way to go, as few good 70-cm multimode rigs are available. Some low power "assemble-it-yourself" kits are available with

matching "final" amplifying stages that also run at 10 watts.

Given a "standard" 10 watts at 435 MHz as the first step, you have several paths to follow to reach 1000-watts erp. What you don't pick up with amplification, you'll have to pick up in antenna gain. A number of 10-dB gain, 80- to 100-watt class, solid state "brick" amplifiers beckon from the advertising pages of *QST*. As with nearly everything else, those with bells and whistles will cost more than "plain vanilla" bricks, and nearly all require power supplies capable of 13.8 volts at 20 amps or greater. You may even find ads for solid-state-linear kits or used homemade gear tucked away unobtrusively in the "Ham Ads" section — either can mean savings. Finally, several suitable roll-your-own circuits have appeared in ham publications — let your fingers do the walking through annual or cumulative indexes or check into the AMSAT net for a few friendly suggestions. One interesting approach for cw operation, for example, is the Tramplifier that appeared in January 1976 *QST*. It triples a 10-watt 2-meter signal in frequency and amplifies it to 100 watts, though the final amplifier stage may be built separately and will deliver 100 watts with 10 watts of drive at 435 MHz.

Once you've achieved the 100-watt level, your antenna can make up the needed difference. Reasonably sized 70-cm Yagis or helices will often yield 10- to 13-dB gain, which, when you've subtracted the inevitable 2- or 3-dB system feed line loss, puts you right in the 800- to 1000-watt erp range. You won't find a shortage of commercially built 70-cm Yagis to choose from, though you may find homebrewing suitable Yagis, quagis or helices more rewarding. The *ARRL Antenna Book* and *1980 Radio Amateur's Handbook* offer several homebrew alternatives.

Incidentally, you'll need right-hand circular polarization to combat spin modulation and ensure the best performance possible, but this can easily be obtained either with a 70-cm helix or with crossed Yagis fed 90° out of phase (see *1980 Handbook*, chapter 14).

Another alternative is to use smaller, lower-gain antennas (their wider beamwidth and smaller size make aiming easier) and picking up more of the necessary power through amplification. Several suitable tube-type amplifier circuits have been published (see the *ARRL VHF Manual* and circuits that have appeared in *Ham Radio* and other publications) and many of these are capable of producing several hundred watts. The amateur with plenty of clear roof space can get away with minimum amplification by putting up a good-sized high-gain antenna array with precise tracking in azimuth and elevation. The ham who intends to operate Phase III from the rolling deck of a yacht, however, may have to forego the narrow beamwidth of high-gain antennas and pick up the power through amplification.

No, this is not R2-D2's first born son. It's the Thiokol TE-45 motor that will "kick" Phase III from its initial transfer orbit (17° inclination, 200 km perigee) to its more secure final orbit (57° inclination, 1500 km perigee). It will be mounted along the spin axis inside the central chamber of the tri-star structure, directly beneath the omnidirectional perigee antenna. On command, a valve in the base will open and a 20-second blast of pressurized propellant will rush out through the nozzle. *(W4PUJ photo)*

In every instance, minimize your losses by using the shortest possible runs of high quality, low-loss coax (RG-8U or better), and install low-loss connectors (N type for example) as cleanly and solidly as possible. Every 3 dB lost through feed line "short-cutting and economizing" cuts your hard-won signal in half.

Downlink Ground Station Options

Simply put, you'll want the best performance possible from your 145-MHz receive station. Multimode 2-meter rigs abound today and obviously present one of the more attractive alternatives in planning a ground station. Such commercial rigs, however, often suffer from unnecessarily high noise figures and may benefit from low-noise preamps — at 145 MHz, a noise figure of 2 dB is not too much to ask.

A high quality, low noise, 2-meter receive converter is an economical choice if you have an uncommitted 28-MHz receiver. Keep in mind that you won't be able to use one transceiver with both a 70-cm transmitting converter and 2-meter receive converter — you won't have the full-duplex capability that is necessary for efficient satellite operation. You must be able to hear you own signal as you transmit to make sure you're on the same frequency as the station with whom you're talking. Otherwise, you could easily chase each other unsuccessfully up and down the passband.

The next consideration is your receive antenna, which you will again want to be right-hand circularly polarized. (The best of all worlds is to provide for switchable right- or left-hand circular polarization. For a variety of reasons, despite the spacecraft antennas' sense of circular polarization, the opposite sense may at times provide a better signal. Switchable polarization can be achieved in several ways, one of which is described in chapter 14 of the *1980 Handbook*.[5]) As helices are cumbersome at 2 meters, your best bet will probably be crossed Yagis, again fed 90° out of phase. Several commercial models, designed specifically for satellite use, are available, though two simple Yagis may be mounted side-by-side on the same boom but rotated so that elements of one are orthogonal to the elements of the other.

Finally, you'll need to minimize feed line loss in the receive station as well. Short runs of quality coax fitted with the best connectors you can get will save you plenty of headaches. Mount the antennas as clear of obstructions as possible and provide adequate clearance for az-el pointing. Az-el rotors provide the most convenient approach and may even be necessary for remote installations. For those of us on a low budget, however, the less-elegant "armstrong" technique will suffice for an hour or two either side of apogee. During this period, Phase III will move slowly enough across your sky that aiming adjustments every half hour or so will do the trick.

If you plan more-exotic operation such as ASCII, RTTY or SSTV, you'll need equipment capable of handling these modes. But if you intend to begin with ssb and cw, you may be surprised at how far along you already are in assembling an effective Phase III ground station. With a careful analysis of your resources, what you need and what's available, you're likely to make a decision you won't later regret. Only *you* know what's best for *your* situation. Good luck — we look forward to hearing you in the passband. QST

Notes

[1]Values of orbital parameters stated in this article are approximate projections. Precise values will not be known until after the launch sequence is completed.

[2]We will use rough comparisons with OSCAR 7's first Mode B system, thereby avoiding the complex link calculations that are beyond the scope of this article. AMSAT's more rigorous calculations, however, support the relative performance conclusions made in this article.

[3]Thanks to Clarke Greene, K1JX, of AMSAT for his assistance with the antenna data.

[4]Thanks to Jan King, W3GEY; Clarke Greene, K1JX; and Tom Clark, W3IWI, for their suggestions and assistance with the performance comparisons.

[5]An upcoming *QST* article will cover polarization, stabilization and methods of switching antenna polarization.

Canadian NewsFronts

Conducted By Ron Hesler,* VE1SH

Antenna Covenants Questioned

According to a recent article in the *Toronto Globe and Mail,* it appears as if some covenants prohibiting outdoor antennas might not be able to be enforced. The assistant deputy minister of the Justice Department was quoted as stating that, because of the technical areas of property law, enforcement chances would be quite slim. This official also said that, in Ontario, the law is such that it permits the Court to relieve a property owner from a restriction if it is too onerous.

If, as, or when one of our members may have problems in this area, we suggest that you immediately get in touch with CRRL General Counsel Bob Benson, VE2VW, who will be only too pleased to give you advice and counsel without obligation.

CANADIAN HAMS ASSIST IN NORTHWEST PASSAGE ATTEMPT

An Icelandic language newspaper in Winnipeg, *Logberg,* recently had a very interesting story about two men who were trying to navigate the Northwest Passage in a very small boat in the summer of 1979. Six radio amateurs, VE4TF, VE4AS, VE4SK, OX3NB, TF3KM and TF5TP, helped to secure assistance from a Canadian icebreaker.

HAM CEILIDH 80

As previously reported, The Sydney Amateur Radio club will be sponsoring Ham Ceilidh 80 — "The Gathering of the Hams" — August 29 to September 1, 1980. The program has been pretty well finalized and details may be obtained by writing to the club, Box 1051, Sydney, NS B1P 6J7.

For those interested in the meaning of the word "Ceilidh" we would like to quote from a recent release from the club. ". . . Ceilidhs were often times spontaneous get-togethers and lasted for many hours. They were occasions for hearty laughter and pleasant conversations. An ideal time for a Hamfest, Ceilidh is pronounced 'Kay-li' and is an old Celtic word which means a friendly visit, or an evening entertainment, usually including story telling and singing or dancing."

The word was chosen for the coming convention because of the strong Scottish and Irish heritage of Cape Breton Island and because of the recent International Gathering of the Clans held in Nova Scotia." — *Don't miss it — mark your calendar now.*

*President, CRRL

During August 11-18, 1979, station XJ3TBC celebrated the centennial of Bancroft, Ontario, and experienced over 1300 contacts from 48 countries. Although the Bancroft Amateur Radio Club is very small (12 members), the success of the special-event operation was caused by the enthusiasm of all of the members. During the operation the club station was honored by the presence of DJ7GH from Munich, West Germany. Here he is shown with VE3IWA and Club President VE3KFA.

RECENTLY RELEASED INFORMATION DOCUMENTS

A provocative study of broadcasting in Canada between formation of the Aird Commission in 1928 and the enactment of the current Broadcasting Act in 1968 has just been published by the Department of Communications. The study is an excellent introduction to scholarly works in the field and could serve as a basis for discussion in post-secondary courses on broadcasting, political science and Canadian studies. The publication, *Evolution of the Canadian Broadcasting System,* is available in either English or French from: Canadian Government Publishing Centre, Supply and Services Canada, Hull, PQ K1A 0S9, for $3.25 a copy ($3.90 outside Canada). Please specify Co 21-6/1979 (English) or Co 21-6/1979F (French). Make cheque or money order payable to the Receiver General of Canada.

A DOC free publication, entitled "Canada and the 1979 World Administrative Radio Conference," outlining Canadian proposals to the 1979 WARC, with background information on international frequency allocations, is available from: Information Services, Department of Communications, 300 Slater St., Ottawa, ON K1A 0C8.

The CRRL Film Library of 16-mm Sound Films

Title	*Description*	*Quebec/Maritimes*	*Ontario*	*Western*
The World of Amateur Radio	Color, U.S. made, new!	Modern Talking Pictures 485 McGill St., Montreal, Quebec.	Modern Talking Pictures, 1875 Leslie St., Don Mills, Ontario	Sid Jones, VE6MJ, 10706 57 Ave., Edmonton, AB
This Is Ham Radio	Color, U.S. made. Some excerpts from HWW. Intended for early high school age group.	City Films, 4980 Buchan St., Montreal, Quebec	Association Films 333 Adelaide St. W., Toronto, Ontario	VE6MJ
Fine Business	Color, Canadian made by Dr. Ted Sparrow, VE3BQN	CRRL Headquarters P. O. Box 418, Sackville, NB E0A 3C0	Wilf Antheunis, VE3FEA 1254 Avenue Rd., Toronto, ON, M5N 2G7	VE6MJ
Moving Up to Amateur Radio	Color, U.S. made by ARRL, especially for GRS groups.	CRRL Headquarters, P. O. Box 418, Sackville, NB E0A 3C0	Wilf Antheunis, VE3FEA 1254 Avenue Rd., Toronto, ON M5N 2G7	VE6MJ

Ham's Wide World has been withdrawn from distribution.

NOTE: There is *no charge* for the use of any of these films. They will be shipped prepaid. You are requested to please return them prepaid *and on time* immediately after use.

FM/RPT

Conducted By Stan Horzepa,* WA1LOU

Why ASCII?

In the February installment of this column ("ASCII/RPT", page 83), there was a discussion about the merits of a proposed repeater system designed for ASCII communications. As a result of that column, a number of readers asked, "Why ASCII?" Many agreed that ASCII would provide the fastest means of Amateur Radio communications, but that advantage would be lost because the majority of hams cannot even type as fast as the slowest Baudot speed of 60 wpm.

The basic question that must be addressed is, can ASCII be used for practical communications? ASCII communications will be different than most of the forms of communications we amateurs are presently accustomed to. ASCII's closest cousin is Baudot-encoded radioteletype (RTTY). If you are familiar with Baudot RTTY, you know about the utilization of prepunched paper tape and prerecorded magnetic tape to send "RTTY art" and "brass" messages (messages that contain general information about the operator and his shack). This preprogrammed information is created before it is ever actually transmitted. In ASCII, in order to use high communication speeds to their fullest potential, preprogrammed information will be the name of the game.

The communication of preprogrammed information is not limited to art and brag messages. Some hams, who are also computer hobbyists, are already exchanging computer programs via Baudot RTTY. Programs written in machine language, as well as in higher-level languages such as BASIC, are being transmitted on 20 meters daily. Most of these programs must be converted from seven-level ASCII (assuming that these programs were written on computers using ASCII) to five-level Baudot. Software, hardware and sometimes both are necessary to perform the conversion. Now that hams are allowed to use ASCII, the conversion to Baudot is no longer necessary, and the conversion software and hardware can be eliminated.

Let's get something straight — a computer is not necessary for ASCII communications. A computer is an accessory. The reason that ASCII and computers are synonymous is that ASCII is used by most computers. ASCII is simply another code, as are the Morse and Baudot codes. The transmission and reception of ASCII will require equipment very similar to that used to transmit and receive Baudot. Some kind of ASCII terminal is necessary. A printer and keyboard will do the job or, if you prefer, the keyboard may be used with a video terminal instead of a printer. As in Baudot, the digital information leaving the terminal equipment must be converted to analog information (to the frequency-shift-keyed pulses used in radioteletype transmission). And all received (analog) signals must be converted back into digital information in order that the terminal equipment may display the received message. The conversion from digital to analog and analog to digital is accomplished with a modulator and demodulator just as it is accomplished in Baudot communications today.

Traffic handlers, who are interested in achieving the most efficient means of relaying traffic, might discover that ASCII can help them reach their goal. High-speed communications will mean high-speed traffic handling, and to take full advantage of ASCII and its relationship with the computer world, an ASCII traffic system may be created.

The key to this system would be regional ASCII-traffic repeaters. Such repeaters would need good coverage and would have to be tied to a microprocessor with a good-size memory. These repeaters would accept ASCII-encoded traffic 24 hours a day. As each message was received, it would be sorted by the microprocessor according to its destination and stored in memory for future relay. Local traffic would eventually be relayed to other stations checking into the repeater that could handle the traffic. Traffic destined for adjacent regions could be relayed to the regional ASCII-traffic repeaters in those adjacent regions. These inter-regional relays would be accomplished by linking the repeaters on a regular schedule. During each link, traffic destined to the other region could be relayed to the other repeater where it would be stored for local distribution. Traffic destined to go beyond adjacent regions could be relayed to a ham who would be a liaison to an hf ASCII transregional traffic net, or perhaps this traffic could be distributed to the distant regions by means of the future Amateur Radio satellites.

The only computer involved in this system would be the one in operation at the repeater. Users of this system would only need a terminal, modulator and demodulator to participate in ASCII traffic handling. Eventually, when the country is completely covered with regional ASCII-traffic repeaters, the hf liaison could be eliminated and traffic could be relayed from regional repeater to regional repeater right across the continent.

A ham in Newington wishing to send a message to his cousin in San Diego would sit down at his terminal and compose the message. The message could be punched on paper tape or typed into a message buffer. When the message was complete and ready for transmission, the ham would access the Hartford regional repeater and transmit the message at 1200 baud. This transfer would only take a few seconds, and when it was completed the repeater would acknowledge receipt. The repeater microprocessor would check the message's destination and store it for relay. On schedule, the Hartford repeater would link with the Bridgeport repeater and the message would be relayed to Bridgeport. Later, when Bridgeport and New York City linked, the message would again be relayed. After 20 or so links and relays, the message would reach the San Diego repeater. Upon being received there, the message would be sent into the microprocessor's "local" storage file. When a San Diego ham checked into the system, the message would be relayed to that check-in, who would deliver it to the cousin via the telephone.

Local groups could utilize similar ASCII repeater systems for local activity. Such systems could be the focal point for information exchange between radio club members. Messages addressed to individual members could be sent to the repeater and stored for relay to the addressed individual whenever he happened to check into the repeater. Club bulletins and Amateur Radio news could also be stored for relay to all stations checking into the system. Computer games could be played through the system. Individuals could compete against each other or against the repeater's computer. Systems similar to this are already in operation. They are using Baudot at the requisite slower speeds, however. Some of these may switch to ASCII in the near future.

High-speed communication is desirable, practical and advantageous in some situations. Extensive on-the-air experimentation with ASCII will teach us a lot about the mode. The FCC has opened the way — it's up to us to perfect ASCII Amateur Radio communications.

ASCII Privileges

ASCII, conforming to the American Standard Code for Information Exchange as defined in the American Standards Institute Standard X3.4/1968, is permitted between 3.5 and 21.25 MHz as an F1 emission on frequencies where this emission is permitted at a maximum speed of 300 baud; between 28 and 225 MHz as F1, F2 and A2 emissions where these emissions are permitted at a maximum speed of 1200 baud; above 420 MHz as F1, F2 and A2 emissions where these emissions are permitted at a maximum speed of 19.6 kilobaud.

The Old Baud Game

Baud is the number of bits transferred in 1 second. So, 1200 baud means that 1200 bits are transferred in 1 second — 1200 bits per second (bps).

A bit is a contraction of *binary digit*. It represents the smallest single unit of information in a binary system. This information is either on or off; on is represented by 1, while off is represented by 0.

ASCII alphanumerics each contain 7 bits (for example, the letter "H" is ASCII-encoded as 1000100). Each character may be followed by an optional "parity" bit which is used to detect errors — for a total of 8 bits per character (7 character bits and 1 parity bit). If the transmission timing depends upon the reception of each character (asynchronous transmission), each character is preceded by a "start" bit and followed by one or more "stop" bits, for a total of 10 or more bits per character.

At 1200 baud, 171 7-bit characters will be transferred in 1 second, and 10,285 7-bit characters will be transferred in 1 minute. If parity, start and stop bits are added, only (*sic*) 120 characters will be transferred in 1 second, and only (*sic*) 7200 characters will be transferred in 1 minute.

*72 Stiles St., Waterbury, CT 06706

The New Frontier

The World Above 1 Gig

Conducted By Bob Cooper Jr.,* W5KHT

$30 Video Microwave System

Interconnecting ham locations to one another with high quality "real-time" video has been a dream of many amateurs for years. Limited successes with ATV operation in our 420- to 450-MHz and 1215- to 1300-MHz bands and a renewal of interest in fast-scan TV utilizing these uhf bands in recent years points up that amateurs continue to have the desire for fast-scan work.

Most ATV operators are primarily interested in two-way contacts, not unlike hf voice or cw. With the limited spectrum available in the 420- to 450-MHz region and the subdividing of the band for multiple modes of communications, dedicating a 4.5- to 6-MHz bandwidth to full-time videolinking is not practical except in remote areas. The recent WARC reconfiguring of the 1215- to 1300-MHz band (down to 1240 to 1300 with some subpartitioning of the remainder) greatly restricts the number of "wideband" channels available to amateurs in the future in that band as well.

Not all amateur wideband (which includes both the video or video plus aural subcarrier and real-time computer and wideband data links) needs fit the mold of two-way QSOs. A companion need for full-time or near-full-time transmission circuits is also apparent. Interlinking of ATV repeaters, repeater security systems and computer-to-computer links are but three of the needs that can be fulfilled with low-cost wideband microwave transmission systems.

In our March column we described briefly a very simple, low-cost system created by Bob Richardson, W4UCH/2. As related in March, he

*Rte. 5, Box 364, Guthrie, OK 73044

Channel Allocations

Transmit GPX (GHz)	*Receive GPX (GHz)*	*I-f Output (MHz)*	*NTSC TV Channel*
10.180	10.235	55	2
10.168	10.235	67	4
10.152	10.235	83	6
10.060	10.235	175	7
10.048	10.235	187	9
10.036	10.235	199	11
10.024	10.235	211	13

fm's Gunnplexer transmitters in the 10- to 10.5-GHz amateur band and recovers the frequency-modulated video (including the subcarrier audio offset by the NTSC standard 4.5 MHz) on a standard a-m television receiver. He has also stacked GPX transmitters, each modulated with a different baseband video and audio source, spreading their operating frequencies through the 10.180- to 10.024-GHz region and he then receives the channels (up to seven video plus audio) on a standard unmodified NTSC television receiver.

Richardson's channel allocation works out as shown in the Table. It is based on the need to create an i-f output from the Gunnplexer receiver which will match a standard NTSC television channel assignment.

In Fig. 1 we see how Richardson applies baseband video and audio to the Gunnplexer transmitter. On the audio side an amplifier drives a 4.5-MHz oscillator/buffer chain. Video (1 volt peak to peak) is applied along with the 4.5-MHz audio modulated carrier to the GPX varactor. The 27-k resistor and 0.01 capacitor preemphasize the audio for crisp sound; the 25-k potentiometer (R3) allows you to set audio deviation. The MPF-109 oscillator is coarse tuned to 4.5 MHz with a 4- to 80-pF trimmer and set square on the money with the 500-ohm potentiometer (R1) on the MV2209 varicap. The pair of 2N3563 buffer/amplifiers isolates the MPF-109. The "coarse" and "fine" tune potentiometers (R4, R5) allow you to set the Gunn oscillator to the proper operating frequency. The Gunn oscillator is tuned as closely as possible to the desired (transmitting) operating frequency with the ceramic tuning slugs on the GPX proper at a varactor voltage of +4. The GPX receiver is set in the same manner to an operating (i.e. local oscillator) frequency that is offset from the transmitter frequency by the desired amount of the i-f (i.e. 55 MHz for NTSC channel 2). We'll look at low-cost methods of stabilizing these operating points next month.

The effective range with the 17-dB gain horns the GPX units typically come equipped with is in the 1/2-mile region or less. However, if you will interface a reasonably low noise figure (under 3 dB) moderate gain (15 to 25 dB) i-f amplifier between the i-f output on the receiver GPX and the input to the television receiver, you can double this range. Add more-suitable antennas (such as 25-inch Snosleds as parabolic reflectors) and up to 5 miles is possible, line of sight. Normal tune-up procedures suggest you start off with both units close together to insure everything is on frequency, then expand the path length as you add system gain. Assuming you have a TV receiver to begin with, and already own a pair of Gunnplexers, Richardson suggests you can add the balance of the system for under $30!

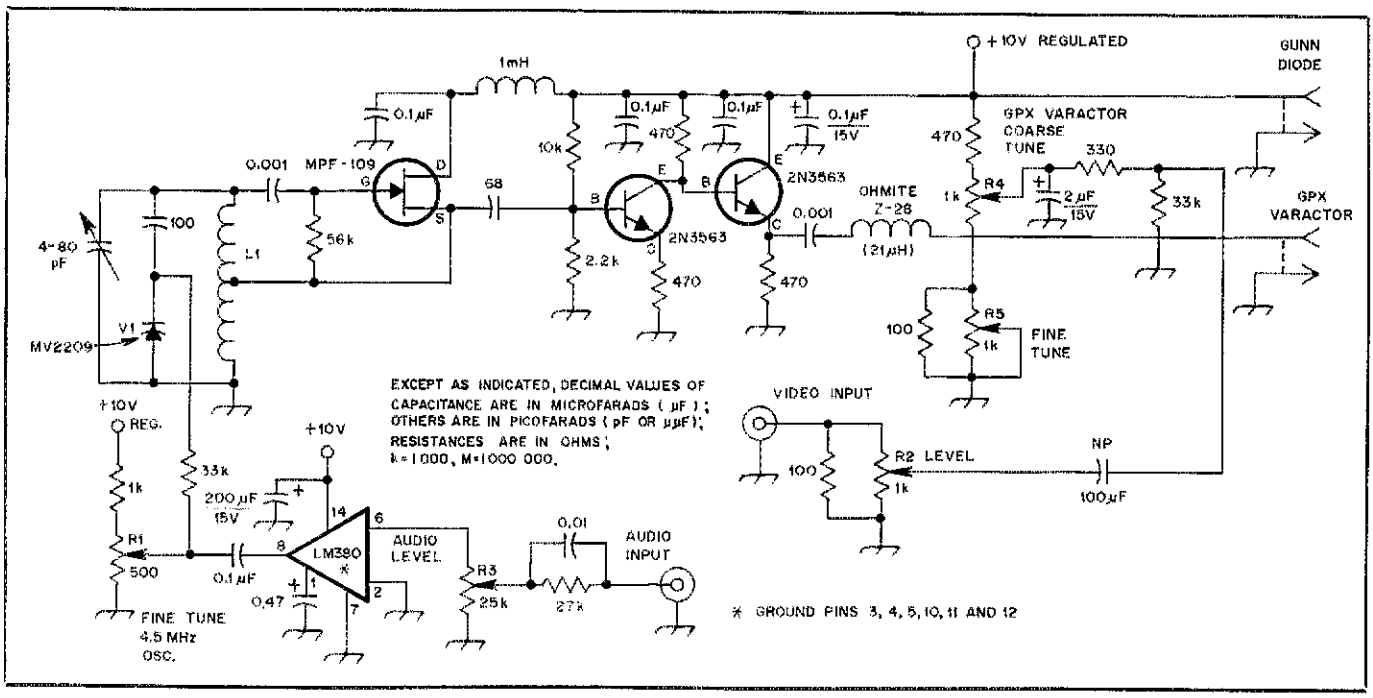


Fig. 1 — Diagram of the GPX video and audio modulators. L1 consists of 66 turns of no. 32 enameled wire wound on a 1-M, 1-W resistor; tap at 22 turns from the bottom end. The GPX varactor impedance is regarded as infinite.

Correspondence

Conducted By Perry F. Williams, W1UED

The publishers of QST assume no responsibility for statements made herein by correspondents.

PLEASURE DESTROYED

☐ While listening to a pile-up on a fairly rare station recently, I was appalled at the behavior of some of the hams who were calling. In just those few minutes that I listened, I heard most of the swear words now on record used by some of those involved in the melee to describe and insult the others. At the same time, there was a station on frequency very deliberately trying to jam it, using false call signs and strange noises.

Even a 10-meter DX Net has been plagued on several occasions with deliberate interference by stations who apparently dislike order and would rather jump all over each other in pursuit of DX. It distresses me to see even this bit of civilized DX operation bothered by those of us who have no respect for others.

What can we do about this situation? We could convert to total DX Net operation; that is very nice in theory but would never work in practice. We could abolish the DXCC award to remove the competitive mofivation; I wouldn't want to see that happen. I have been an avid DXer since I first received my license in 1975, and I enjoy it very much. But I resent other hams who destroy the true pleasure of DXing — which is just communicating with another amateur a great distance away. Most operators are courteous. The offenders in the pile-up were only a handful out of perhaps hundreds. We should all make a conscious effort to be orderly; DX stations should keep control by using lists or by limiting stations answered to one call area at a time. Think about it: is it really so important to work that one new country? — *John M. Mitnick, WA2CMK, Short Hills, New Jersey*

☐ I read with interest the "Strays" and advertisements extolling the accomplishments of "QRPp," extremely low transmitter power. However, too many of us think nothing of taking over a frequency simply because we can outpower the station already on the spot. I've been blown off 40 meters by another station who started calling on top of me after I've been in contact with a station for the better part of an hour. Yes, he can hear me; oft times he's not too far from my contact. This type of individual ignores repeated pleas to recognize the right of others.

I enjoy QRP, too, as I run a Heathkit HW-8 in addition to my other equipment.

Have you ever considered a vote for "Lid of the Month"? — *G. Bruce Maxwell, N5GB, Los Alamos, New Mexico*

☐ The increasing severity of deliberate interference on the amateur bands is most disturbing.

Reports of such interference to the FCC made in writing go unacknowledged. I understand FCC pleads inability to deal with the problem due to lack of personnel and budgetary restrictions.

I for one would be most happy to pay a license fee if the resulting funds could be applied to enforcement. — *Charles T. Meilleur, K2CMV, Syosset, New York*

[Editor's Note: The problems noted above have been occurring all over the country, and affect all kinds of operating. The Board of Directors devoted some time to this subject at the January meeting. And the Editor wrote about Malicious Interference, page 9, March *QST*.]

WHY *QST* IS MISBOUND

☐ Enclosed is a list of a dozen possible reasons why my January 1980 issue of *QST* is missing the first 24 pages: 1) ARRL is trying to beat inflation. 2) The postman is building one of the projects on the first two dozen pages. 3) There were not enough articles to fill a complete issue. 4) Your managing editor thought the first article, "Dipping your Finals," was a little too racy for a conservative magazine. 5) The printer's union voted to strike in sympathy with amateurs until the FCC approves ASCII for RTTY. 6) Every possible article on the ultimate QRP, all-band, solid state super deluxe cw transceiver had been written and *QST*'s staff could not come up with a new article. 7) A paper shortage resulted from the enormous amount of junk mail sent out during the holiday season. 8) Wayne Green bought the pages for *73*. 9) The monthly technical article wasn't available because Doug DeMaw is really one of the hostages in Iran. 10) It was an attempt to reduce mailing costs on a magazine that grows monthly with advertisements. 11) The "It Seems to Us" crew made a New Year's resolution to keep their opinions to themselves. 12) Termites!

In any event, how about sending me a copy with all the pages? — *Jim Bishop, K5UT, Austin, Texas*

[Editor's Note: *Jim Bishop*, huh? Seems like we've *heard* of a gent with that name. If we don't want to see a book entitled, "The Day *QST* Blew Up," we'd better send a copy *muy pronto*!]

MORE ON WARC

☐ After hearing from my dear friend in Geneva, with whom I've kept in constant contact all during WARC, I have to admit the amateurs did a very fine job at the Conference. Please accept — along with all the other amateurs who gave of their time in our behalf at the Conference — my thanks and appreciation for a job so well done.

It pleased me when I was notified that influential and knowledgeable amateurs were appointed to several of the Working Groups, especially of Committee 5, where "making hay" pays off the most.

Although we were allocated the 10-MHz band on a secondary, non-interference basis with the Fixed Services, we do have a foot in the door. My personal analysis of the situation is that in a short time the Fixed Services will go entirely satellite, and then, no doubt, we can be allocated a primary assignment therein. The 10-MHz band is something I've advocated for many years, in fact ever since the 1927 Washington Conference where the amateurs "lost their shirts." I operated commercial fixed services in the 10 meg area and it is a most excellent frequency for both day and night operation. — *Ronald G. Martin, W6ZF, Napa, California*

RADIO CONTROL ON SIX METERS

☐ I read with interest the "FM/RPT" column in December *QST*, page 77, concerning radio control and repeaters on the 6-meter band.

I would like to dispel the impression that a radio-controlled model is a toy to be received at Christmas time. Most model airplanes are painstakingly and carefully constructed from kits or from scratch, as suits the builder. Few are purchased ready to fly. Cost of these models — without the radio transmitter being counted — is usually $200 to $400.

Early work with radio-controlled models was done by hams and included such pioneers as Ross Hull and Dr. Watt Good. In those days, an amateur license was necessary to legally operate the radio gear. In the 50s the frequency 27.255 was allotted as a CB frequency for radio control, and this launched a boom in model-flying. Today, most non-ham modelers use the channels assigned the radio control service in the 72-76 MHz band. Those of us who are hams — including some who went through all the trouble of getting a Technician license just to have access to 6 meters — avoid QRMing the other modelers by using one of five channels at the top of the band: 53.1, 53.2, 53.3, 53.4, 53.5 MHz.

I urge that these previously selected radio control frequencies be preserved for this use by amateurs who have the additional hobby of model control. The "gentlemen's agreement" should be honored and communications use of these frequencies should be avoided. — *Ken Spittler, NØJP, Winona, Minnesota*

☐ R/C activity on 6 meters is quite large and is growing each year as more amateurs come into the R/C hobby and more modelers get amateur tickets. I question the need for more repeater space on the 6-meter band. In light of the fact that 220 and 420 have very little repeater use it would seem better to utilize these bands. I understand that 6 meters may be the best choice in some cases, but since this will be true in only a few instances, I feel the present plan can be adhered to.

The model aircraft being flown by the average 6-meter user is not a small plastic model, but is usually a large, fairly powerful machine weighing up to 40 pounds and capable of doing considerable damage should it go out of control. All of these models require many hours of painstaking work to build, trim and fly. No modeler likes the idea of all that work and money being wiped out by the press of a mic button.

The requirements of R/C are very modest, perhaps 10 spot frequencies and power on the order of one half to one watt. I think other users of 6 can afford to spare this much. — *Ike Kerschner, N8IK, Kunkletown, Pennsylvania*

ELMER DIDN'T KNOW?

☐ After reading that fine article by Lee Aurick, W1SE, in the November issue of *QST* ["Things Your Elmer Forgot to Tell You," page 62] I would say the reason Elmer forgot was because someone forgot to tell Elmer! The following observations all were made in the General Class portion of the 40-meter band, where more-experienced amateurs hang out.

I hear long CQ calls that serve only to help those suffering from insomnia — at least, they put me to sleep! Then I hear a CQ followed by KN, which really translates: "I called CQ but please do not answer." After all, KN means "Specific station, go ahead. All others, please keep out." After the CQ, one hears TA or TET in place of K, and double endings still abound: "AR K."

Everyone seems to know about using the letter N for the number 9, but few seem to know about using the long dash for zero or the question mark for a repeat or error. And most important, how about checking a frequency before calling CQ by sending either tE (didit dit) or QRL?

A QSO usually ends with 73 — or a bunch of them! Isn't one enough? By the way, it means, "Best Regards," so when you hang an S on it, you're wishing someone, "Best regardses"! — *George A. Schopperth, K2IVG, Haledon, New Jersey*

☐ Although I am a flagrant idealist, I really believe that displaying some common sense and courtesy on the cw bands is not too much to ask. A simple "QRL?", meaning, "Is this frequency in use?" transmitted before tuning up or calling CQ is quite effective in preventing hot tempers and ruined QSOs. Even listening for a nanosecond before transmitting is at least 50 percent effective.

But alas, how many people will read this? What would it take to attract attention?

SEX!! DRUGS!! MONEY!!

There, did that do it? Well, regardless of the methods you use to gain consciousness, always remember that on the amateur bands, a little courtesy goes a long way. (Yes, Virginia, just as in real life.) — *Jeff Helman, WB6QZJ, Cool, California*

OTHERS SAY THANKS

☐ The Amalgamated Transit Union held its convention in Los Angeles last September. One of the functions involved moving more than 800 people by bus from the hotel to Universal Studios and back. This move utilized 20 buses and required lots of coordination. The assistance of K6SUJ and other amateurs in providing communications was greatly appreciated. They helped make this function a success. — *Richard D. Simpson, W6NAL, Executive Board, Amalgamated Transit Union, Los Angeles, California*

☐ I would once again like to thank the members of the Long Island Mobile Amateur Radio Club for their outstanding contribution in the 20-kilometer run of December 2, 1979. Your contribution to runs sponsored by this department are truly a valuable commodity and we greatly appreciate it. Your professionalism was most evident during this race as runners and committee members were kept abreast of every aspect of the event. It is very difficult to single out any one individual as all your members did such a wonderful job, but the man closest to us was Artie Altarac. He did a wonderful job, and we hope he will be part of the team that coordinates the Island's biggest event, the *Newsday* Long Island Marathon. — *Abram C. Williams, Commissioner, Nassau County Recreation and Parks Department, East Meadow, New York*

☐ The January *QST* article ("Washington Mailbox," page 67) concerning RACES and civil defense communications hit the nail on the head. Those of us who are concerned with emergency communications in undeveloped areas of the nation have to depend on amateur operators. The Amateur Service is able to fill in gaps for us that would otherwise leave us vulnerable in time of emergency.

With the advent of sophisticated 2-meter repeater and microwave systems, as well as the standard hf bands, RACES can cover the state in places where local resources cannot afford the high cost of large emergency services radio stations. This is especially true here in West Virginia where low population density and our terrain make it always tenuous and sometimes impossible to communicate.

Many of us in state civil defense communications posts around the country have been so impressed with RACES and the Amateur Radio Service that we have, ourselves, become hams! — *Les Hamrick, KA8HTN, West Virginia State Communications Officer, Charleston, West Virginia*

NEW TERRITORY

☐ *QST* says we may have a new "30 meter" ham band as early as January 1, 1982 . . . fantastic! However, this is less than two years away. I think we had better decide soon just what we want to do with this new band. FCC will be setting up new rules for the 10.1- to 10.15-MHz segment before long, and we should give them our input before they start writing proposals. The rulemaking proceedings may take a year.

Our new band will be only 50 kHz wide. If we split it up half cw and half ssb, then that means we can get only about 10 or 11 ssb QSOs and 50 or 100 cw QSOs on the band at the same time. This assumes optimum spacing between stations, good receiver filters, and no very strong signals next to weak ones. For this reason I propose that we permit only the narrow-band modes — cw, RTTY and maybe narrow-band voice. Perhaps the narrow-band ssb could be limited to Advanced and Extra Class licensees to add further incentive to "incentive licensing."

In any case, the major point is that with only 50 kHz to play with, we should do everything we can to reduce QRM. If we don't, the band will become all but useless to everybody except the "big guns" with the kilowatts and giant antenna arrays needed to punch through the interference. — *Alan Bloom, N1AL/6, Santa Rosa, California*

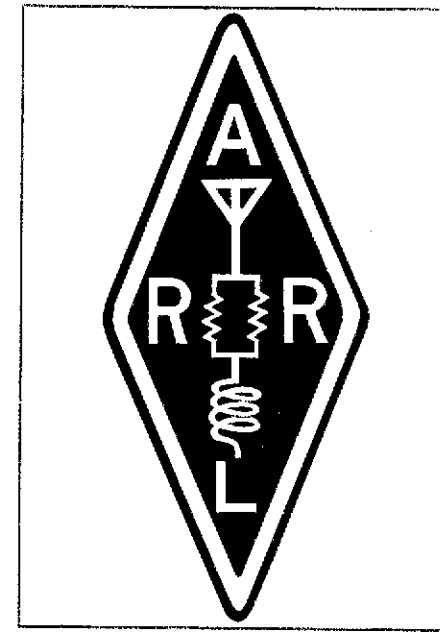
☐ The Amateur Service justly earned several precious kilohertz of frequency spectrum at WARC-79. Without doubt, the new bands should be utilized to relieve the densest congestion, that being the Novice/Technician cw allocation. These present sub-bands are saturated beyond capacity, with 40 meters being "shared" with high-power broadcast stations. The congestion on these frequencies results in many discouraged Novice operators. Allocation of the new hf bands to all amateurs for AI use would be of greatest service to the fraternity. — *Michael J. Masterson, WB1EMX/2, Flanders, New Jersey*

[Editor's Note: A Board committee will be studying the use of the 10.1- to 10.15-MHz band in the next few months. Correspondence can be directed to the Vice President Max Arnold, 129 Page Rd., Nashville, TN 37205.]

NEW EMBLEM?

☐ I know that our present ARRL emblem has been established for many years, but please allow me to submit the enclosed emblem sketch for consideration.

As you will notice, there is not a great deal of difference between this and the present emblem. I just changed the component symbols slightly so that the letters of the emblem correspond to the circuit symbols; i.e., *A*ntenna, *R*esistor *R*esistor *L* for inductance. This emblem would be more representative of the basic circuitry of Amateur Radio. — *Gene Lewis, N5CE, Slaton, Texas*



HURRICANE ANTHOLOGY

☐ I would like to express my appreciation for your very timely and informative article in the February issue of *QST*, page 46, entitled *Hurricane Anthology*. I thought that George Naftzinger, W4PPC, did a good job of placing credit where credit was due, with those amateurs that greatly aided all of us, following Hurricanes David and Frederick last Autumn. — *Bruce Tucker, KA4EWD, Tanner, Alabama*

OPTIONS, PLEASE!

☐ While the desk-top layout of cabinets has certain appeal for those with lots of space, many of us just can't spare the horizontal room required for multiple units. But we do have vertical space for a floor or table-top relay rack taking only 20 inches of width.

I have a 6-foot rack on casters at home, and a similar rack of steel angle irons aboard my yacht. The rack at home is simply wheeled out to the dining room table for convenient operating.

I would like to update my equipment with modern solid-state, synthesized gear, but several dealers tell me they haven't seen rack-mount ham gear in years! How about that option? — *Corey Thomson, VE2IR/C6AEI, Brossard, Quebec*

Happenings

Conducted By W. Dale Clift,* WA3NLO

FCC Releases Official Wording of New ASCII Rules

The Federal Communications Commission has officially adopted rules that permit Amateur Radio operators to use the American National Standard Code for Information Interchange (ASCII) for radioteleprinter communications, remote control operations, the operation of data networks and other uses consistent with the Amateur Radio Service. Effective March 17, 1980, §97.69 of the amateur rules is re-entitled "Digital transmissions" and is amended to read as follows:

§97.69 Digital transmissions.

Subject to the special conditions contained in paragraphs (a) and (b) below, the use of the International Telegraphic Alphabet No. 2 (also known as the Baudot Code) and the American Standard Code for Information Interchange (ASCII) may be used for such purposes as (but not restricted to) radio teleprinter communications, control of amateur radio stations, models and other objects, transfer of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems); provided that such operation is carried out in accordance with the other regulations set forth in this Part.

(a) Use of the International Telegraphic Alphabet No. 2 Baudot Code is subject to the following requirements:

(1) Transmission shall consist of a single channel, five-unit (start-stop) teleprinter code conforming to International Telegraphic Alphabet No. 2 with respect to all letters and numerals (including the slant sign or fraction bar); however, in "figures" positions not utilized for numerals, special signals may be employed for the remote control of receiving printers, or for other purposes indicated in this section.

(2) The transmitting speed shall be maintained within 5 words per minute of one of the following standard speeds: 60 (45 bauds), 67 (50 bauds), 75 (56.25 bauds) or 100 (75 bauds) words per minute.

(3) When frequency shift keying (type F1 emission) is utilized, the deviation in frequency from the mark signal to the space signal, or from the space signal to the mark signal, shall be less than 900 Hertz.

(4) When audio frequency shift keying (type A2 or F2 emission) is utilized, the highest fundamental modulating frequency shall not exceed 3000 Hertz, and the difference between the modulating audio frequency for the mark signal and that for the space signal shall be less than 900 Hertz.

(b) Use of the American Standard Code for Information Interchange (ASCII) is subject to the following requirements:

(1) The code shall conform to the American Standard Code for Information Interchange (ASCII) Standard X3.4-1968.

(2) F1 emission shall be utilized on those frequencies between 3.5 and 21.25 MHz where its use is permissible; and the sending speed shall not exceed 300 bauds.

(3) F1, F2 and A2 emissions may be utilized on those frequencies between 28 and 225 MHz where their use is permissible; and the sending speed shall not exceed 1200 bauds.

(4) F1, F2 and A2 emissions may be utilized on those frequencies above 420 MHz where their use is permissible; and the sending speed shall not exceed 19.6 kilobauds.

In its written opinion accompanying the Third Report and Order in Docket 20777, FCC noted that, while its intention was simply to expand the operating capabilities of amateurs by providing in the rules for ASCII, the comments filed by interested parties generally went beyond this scope. Some parties' comments expressed interest in allowing radioteleprinting codes other than Baudot or ASCII. Frequently mentioned were the Binary Coded Decimal (BCD), Extended Binary Coded Decimal Interchange (EBCDIC), Moore and Correspondence (IBM Selectric) codes. The Commission said that, while it is not opposed in principle to more-extensive deregulation of radioteleprinting operation, there may be a problem in being consistent with Article 41 of the International Telecommunication Union (ITU) Regulations. A preliminary opinion on this matter is that Article 41, Section 2(1) (which states, in part, that "transmissions between amateur stations of different countries . . . shall be made in plain language") could be construed to allow the use of "standard" radioteleprinter codes for international communications, but no other type of radioteleprinter code, whether it be used for experimental purposes or otherwise. But, Article 41 does not appear to prohibit the use of an unlimited number of radioteleprinter codes domestically. The Commission concluded, "Additional exploration is needed to verify the literal and implied intent of Article 41 in relation to international radioteleprinter communications."

The FCC received approximately 55 comments from interested parties, and almost 80% expressed the opinion that the Commission must allow ASCII with few, if any, restrictions or standards if it were to be true to the spirit of the basis and purpose of the Amateur Radio Service. These comments made reference to §97.1 of the amateur rules, especially the provisions concerning "continuation and extension of the amateur's proven ability to contribute to the advancement of the radio art" and "advancing skills in both the communications and technical phases of the art." There was widespread agreement that the Commission should not concern itself with the use of a parity bit, the order of the bits, or the use of synchronous or asynchronous transmission. Also, there was general agreement that the permissible bandwidths of ASCII or other radioteleprinter signals should be similar to the traditional bandwidths associated with the use of the Baudot Code in the various frequency bands. Therefore, the FCC said that the only specific limitation it was imposing on the use of ASCII was a maximum sending speed applicable to each band.

U.S. COURT OF APPEALS UPHOLDS AMPLIFIER BAN

The U.S. Court of Appeals for the District of Columbia Circuit has decided, in a unanimous opinion, to uphold FCC's ban on the commercial manufacture and sale of radio frequency power amplifiers capable of operation between 24 and 35 MHz. The ARRL appealed the Commission's action because it felt that the ban, which was enacted to prevent citizens band operators from using amplifiers, unfairly penalized law-abiding radio amateurs. The ban also prevents the commercial manufacture and sale of amplifiers for the amateur 10-meter band.

The Court's three-judge panel decided that the Commission did not abuse its authority; however it appears that the League struck a favorable chord among the judges. "Had we been the rulemakers in this case, we might have been more hesitant in encroaching on the domain of the innocent amateur operators," wrote Circuit Judge Tamm. "Nonetheless, we cannot say that the agency abused its discretion in adopting the rules that it did."

The opinion also noted that the Court's review of rulemakings is "generally quite limited." Its "only role is to decide whether an agency's rulemaking was 'arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.' " The opinion cited the landmark case of *Ethyl Corp. v. EPA*, which held that the court "presumes agency action to be valid." Moreover, it forbids the court's substituting its judgment of that of the agency, and requires affirmance if a rational basis exists for the agency's decision.

Further information about the amplifier ban can be found in May 1978 *QST*, page 46.

PETITIONS FILED WITH FCC

Misuse of Beacons: RM-3522, filed by Charles Spencer, K4RXX, and others, proposes that §97.89(b) of the amateur rules be amended to give the Commission explicit authority to control abuses of frequency utilization disguised as beacon operation when the actual intent appears to be otherwise. An example of an abuse would be a station, which is purported to be a beacon, transmitting on the known input or output frequencies of a repeater station.

Relaxation of third party rules: RM-3562, filed by Raymond Dopmeyer, NØBGP, ask-

*Deputy Manager, Membership Services, ARRL

the FCC to amend the amateur rules to allow third-party traffic, especially autopatch, for making "essential and important calls in the scope of business, provided the amateur operator is representing himself personally, or representing someone in his immediate company such as a passenger in his car, or representing a non-profit making charitable or service organization, and commercial telephone facilities are either nonexistent, out of order, or not reasonably accessible to the caller." The petition gives the following examples of where autopatch should be allowed: (1) for summoning a mechanic to one's stalled car and notifying one's boss (if en route to work) of the reasons for being late; and (2) for notifying a doctor, judge, etc., that one will not be able to keep an appointment because of car trouble or some similarly unforeseen predicament.

General class frequency expansion: RM-3565, filed by Arthur G. Bauernfeind, W9MCJ, asks that General class licensees be allowed to operate on the lowest 25 kHz of the 80-, 40-, 20- and 15-meter amateur bands. Under the present rules, these frequencies are restricted to Extra Class licensees.

PETITIONS DISMISSED BY FCC

Report of test results to applicants: The Commission has dismissed a 1976 proposal, RM-2665, filed by Nickolaus E. Leggett, WA3YFU, which would have required Commission personnel to grade license examinations and provide the applicant with a score report. This report would have indicated the general subject areas where the applicant needed to improve his knowledge. The Commission, in denying the petition, stated that though a reporting system may help improve an applicant's knowledge of radio, the purpose of examinations is to determine minimal competence. Also, the Commission noted that critiquing the 246,000 amateur and commercial radio exams administered in 1979 would have cost $144,000, with an additional cost of $185,000 for printing new commercial examinations, revising commercial grading books and mailing evaluations.

Temporary Amateur Radio operator licenses: FCC has dismissed two petitions proposing to provide for temporary Amateur Radio operator licenses. The petitions were filed by Henry Perozzo (RM-2774) and L. J. Switz (RM-3000).

Mr. Perozzo, W7UD, of Tacoma, Washington, proposed that Amateur Radio opeators holding Advanced or Extra Class licenses be permitted to sponsor up to three temporary licensees at any given time. Temporary licensees would be permitted to operate on the 50-54 MHz, 28-30 MHz, 3.7-3.750 MHz and 1.8-2.0 MHz bands, using a temporary call sign consisting of the sponsor's call sign and one digit from the numbers one through three. The duration of these licenses would not exceed 90 days and could not be renewed until the lapse of 90 additional days.

Mr. Switz, W6LPP, of Fremont, California, proposed the creation of a new class of Amateur Radio operators that would function under the authority of licensed radio operators. The purpose would be to enable members of a licensed amateur's household to contact each other on amateur equipment to exchange family or "personal" information. These transmissions would deal with reporting such events as delayed arrival because of traffic problems or the monitoring of route progress of a family member driving alone at night or during bad weather.

Reno Goetsch, W9NA, has been honored for his 45 years of outstanding service to Amateur Radio and to the Wisconsin Valley Radio Association of Wausau, Wisconsin. Pictured here is Reno and his wife, Eunice, at the Association's annual banquet last year. Reno is a charter member of the club, which was formed in October of 1934.

In a statement denying both petitions, the Commission said that Mr. Switz's proposal was essentially requesting that the Amateur Radio Service be used as a personal communications radio service, as is the Citizens Band Service. However, the Commission said that the Amateur Service is not a personal radio service; it is a highly technical service. It said it would not be reasonable or prudent to allow unlicensed individuals to operate Amateur Radio equipment. Both Mr. Switz's and Mr. Perozzo's petitions would permit the control of an Amateur Radio station by an unlicensed (and possibly unqualified) operator, presenting the potential of interference to other radio services.

Retransmission of NOAA Weather Broadcasts: The Commission has also denied a petition filed by Jerome Falletta, WA2DWN, of Elmira, New York, to allow licensed Amateur Radio operators to rebroadcast the National Oceanic and Atmospheric Administration's weather broadcasts. In a statement denying RM-3457, the Commission noted that retransmission of broadcasts by amateurs has been prohibited since before FCC was created in 1934. The prohibition reflects the essential difference between the broadcasting and amateur services: Broadcasting provides one-way communication of information and entertainment, while the amateur service provides for two-way communication of information solely for personal aims without business or pecuniary interests. "We see no reason to blur the distinction between these two very different services," the Commission stated. "In addition, the assistance that Amateur Radio operators now provide should not be overlooked. According to participants in this proceeding, amateur operators who have access to weather information provided by either NOAA or commercial broadcast stations have consistently relayed the content of these broadcasts to other amateur operators. Our rules in no way prohibit the continuation of this service. Amateur operators are free to exchange weather information from whatever source it is obtained. They are only prohibited from any form of broadcasting, and from the retransmission of another service's radio signals."

FCC BUREAU CHIEF RETIRES

C. Phyll Horne, chief of the FCC's Field Operations Bureau, has retired after a total of nearly 27 years of Federal service. Phyll came to the FCC on December 28, 1961, as engineering assistant to then-Commissioner (later Commission chairman) Rosel H. Hyde. In April of 1971, Phyll moved to the Frequency Allocation and Treaty Division, Office of Chief Engineer, and subsequently became deputy chief engineer in 1973. He was appointed chief of the Field Operations Bureau in May 1974, and served in that capacity until his retirement.

Phyll began his career in the U.S. Army during World War II. Following the war, he worked as a consulting engineer until 1949, at which time he was employed by the National Bureau of Standards. Phyll also worked for the Department of the Army and the Federal Civil Defense Administration prior to his employment by the FCC.

CANADIAN AMATEUR RULES AMENDED

The Canadian Department of Communications (DOC) has released the following amendments to the radio regulations. Signed February 28, 1980, the changes affect Canadian amateurs *immediately*. The changes are as follows:

1) Canadian amateurs have lost 420-430 MHz; however, 430-450 has been retained for amateur use.

2) A new amateur band has been created at 902-928 MHz. A3 and F3 emissions only are permitted at these frequencies.

3) Logging requirements pertaining to mobile and portable operation have been deleted.

4) On the frequency band 7050-7100 kHz A3 operation is permitted.

Additionally, Schedule Five is amended to permit A3 operation on the frequency band 1800-2000 kHz in six months. The complete amended regulations will appear in the *Canada Gazette* March 12, 1980.

CHICAGO-AREA HAM WINS ANTENNA CASE

Cook County Circuit Court Judge Arthur L. Dunne has ruled that the Village Board of Trustees for the Village of Hoffman Estates, Illinois, acted unconstitutionally when it voted in December 1978 to deny a permit for the construction of a 65-foot antenna tower. Paul A. Philip, AC9O, applied for a special use permit in November, and the Zoning Board of Appeals of the Village, in a 4-to-1 vote, recommended that the permit be granted. The Village Board, however, refused to follow the recommendation and denied the permit by a 4-to-3 vote.

Philip filed suit in the Circuit Court of Cook County in March 1979. In the suit, he charged that the Village Board acted unconstitutionally in denying the permit. Specifically, Philip charged that Village President Virginia M. Hayter and Village Trustees voted to deny the permit without any facts showing that the deinial was in the interest of Village residents.

In oral argument before Judge Dunne, Philip's attorney, Timothy M. Gallagher, of the Chicago-based law firm of Fergus, Gallagher & Repel, charged that the Village Board acted in blatant disregard of Illinois court cases and the State and U.S. Constitutions. "Any restriction on an owner's right to

use his property as he sees fit must bear a substantial relation to public safety," Gallagher argued. "Philip's antenna complies in all respects to rigorous safety standards set by the Village. There is no basis under prevailing principles of Constitutional law to support the Village Board's action," he said.

PLAIN-ENGLISH RADIO/CONTROL RULES PROPOSED

The FCC has proposed revising the Radio Control Radio Service's rules into plain English in a Notice of Proposed Rulemaking, PR Docket 80-8, released February 11, 1980. The Radio Control Radio Service is a private, one-way, short distance, nonvoice communications service for the remote control of model craft and other devices.

The Commission began a program in 1976 to simplify its rules by dividing Part 95 of its rules governing the personal radio services into four subparts: Subpart A, General Mobile Radio Service; Subpart C, Radio Control Radio Service; Subpart D, Citizens Band Radio Service; and Subpart E, Technical Regulations. In March 1978, the Commission released a plain-language version of the CB rules. Now, it hopes to repeat its success with the CB rules by revising the radio control rules.

All interested parties are invited to file comments regarding this proposal on or before July 30, 1980, and reply comments on or before August 29, 1980. For further information, contact John B. Johnston, FCC, Private Radio Bureau, Rules Division, Washington, DC 20554.

VOLUNTEER EXAMINERS: LICENSE PHOTOCOPY NOT REQUIRED

The FCC has dismissed an old proposal which would have required a volunteer examiner to accompany his request for examination papers with a photocopy of his license. The Report and Order in Docket 20679 terminates the proceeding, which began in December 1975. At that time, the Commission was aware of "substantial" abuses of the volunteer licensing procedure. Volunteer examiners had sometimes claimed qualifications they did not possess, and some names submitted as volunteers proved to be fictitious. This was most prevalent when examinations involved Technician and Conditional class licenses conducted by mail. In another proceeding, however, the First Report and Order in Docket 20282, the Commission limited the availability of volunteer-administered examinations to two categories of applicants: applicants for the Novice license, and applicants who show by a physician's certification that they are unable to travel to a Commission examination point because of a protracted disability.

The Commission noted that there was little incentive for Novice class applicants to cheat because that examination is simpler than the examination for other amateur licenses. On this basis, and on the basis of the amendments brought about by Docket 20282, FCC believes that the proposal looking to require volunteer examiners to send photocopies of their licenses should not be adopted.

WE GOOFED

In the September 1979 "Happenings" column we published an item stating that the operator license of Alexander G. Sullivan, WD8NLS, was ordered suspended by the FCC. This was in error. In fact, Sullivan requested a hearing in the matter, and any further suspension order was held in abeyance pending the outcome of the hearing. At this writing, no decision has been reached in the case.

STAFF NOTES

The swallows return to Capistrano, the buzzards return to Hinkley — it should not be surprising that the O'Dells have returned to Connecticut. Peter O'Dell, AE8Q, who formerly headed ARRL's Public Information Program, has returned to Headquarters after a brief stay in West Virginia. Now working in the Technical Department as an assistant technical editor for *QST*, Peter likes slow-speed cw, 2-meter fm and the Pittsburgh Steelers. Another of Peter's likes is Sally, AE8P, his wife. Sally has joined the Club and Training Department staff as manager of the Club and Youth Groups Program. Prior to coming on board, Sally spent her time looking after their 2-1/2-year-old daughter, Anita. Although Anita is not yet licensed, she has been teaching the code to the other children in nursery school. The O'Dells live in Middletown, Connecticut with their beagle, Niki. Niki is not licensed, either, but does enjoy working 75-meter phone late at night with AE8Q serving as control operator.

Andrew J. Tripp, of Warehouse Point, Connecticut, has joined the staff as Public Information Officer in the Membership Services Department. He had been editor of *The Entertainer Magazine* of Hartford. Earlier, he was an associate/writer for the Hartford Board of Education, public relations coordinator for the Community Renewal Team in Hartford, and office manager/customer relations manager for an automobile dealership. He holds a B.A. in political science from Central Connecticut State College, and more recently completed courses in editorial writing and journalism from the same institution. He is not an amateur yet but plans to obtain a license.

Bruce Kampe, WA1POI, has joined forces with the Membership Services Department. He will be working in the area of general membership services duties while keeping an eye on the international services desk until a full-time replacement for that position can be hired. First licensed in 1971, Bruce holds the Advanced class license. He joined the ARRL Club and Training Department in 1976, but left in 1977 to complete school at Johnson Wales College, Providence, Rhode Island. He received his B.S. degree in Data Systems Management this past year. Bruce, who is actively engaged in vhf and OSCAR work, particularly enjoys the study of propagation at vhf. Bruce also plays fine jazz piano and enjoys cartooning. Welcome back, Bruce. — *Rick Palm, K1CE*

NEW WASHINGTON AREA COORDINATOR, NEW DEPARTMENT MANAGER AT ARRL HQ.

Perry F. Williams, W1UED, formerly the manager of the Membership Services Department, has been named Washington Area Coordinator by ARRL General Manager Richard Baldwin, W1RU. Perry was first licensed as W1UED in 1951, and joined the Hq. staff in 1954 as assistant secretary. Prior to his employment by the League in 1954, he was a radio operator with the Strategic Air Command, USAF.

Perry Williams, W1UED, new Washington Area Coordinator for ARRL.

Hal Steinman, K1FHN, new manager for the Membership Services Department at ARRL Hq.

In addition to his job-and-hobby of Amateur Radio, Perry is active in the Episcopal Church at parish, Deanery and Diocesan levels, and director of the church choir. Perry resides in Unionville, Connecticut, with his wife, Martha, and the two youngest of their four children.

Hal Steinman, K1FHN, formerly the Washington Area Coordinator for the League, has been named manager for the Membership Services Department at Headquarters. Hal first became licensed in 1963 as KN1FHN and joined the Hq. staff in 1974. Prior to working for the League, Hal had served in the U.S. Army at Fort Sam Houston, where he specialized in computers. After being discharged by the Army in 1972, he attended Dartmouth University Graduate School, studying higher mathematics. He has since earned his Master of Business Administration degree from the University of Connecticut.

An avid jogger, Hal's favorite runners' competition is the Green Mountain Marathon in Vermont. Hal resides in New Britain, Connecticut, with his wife, Sue.

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Alien

One of the most intriguing aspects of Amateur Radio is the ability to operate a station in a foreign land. Amateurs continually express interest in bringing along a rig to some enchanted island during their next vacation. International and national regulations provide for just such an occasion. Reciprocal operating privileges exist because of agreements between the United States and various countries throughout the world. These agreements, because they are reciprocal, also allow foreign amateurs the opportunity to operate here in the U.S. This month's edition will explain how, in the world, you can operate!

Q. I am planning a trip to South America this summer and would like to bring along my hf rig. Is it possible to operate my station while visiting?

A. If the particular country you are planning to visit has a reciprocal agreement with the U.S., permission to operate should be readily obtainable from that foreign government. Procedures vary from country to country, and there is no one standard form. For information and forms pertaining to particular countries, contact the Membership Services Department, ARRL, Newington, CT 06111.

Q. Will I be issued a special call sign for use during my stay?

A. Again, this varies among countries. Some will issue your station a special call sign when authorizing your station operation. For example, in England, you will be issued a "G5..." call sign. In other countries, you will use your own call sign with a suffix: W1XX/OHØ, for example. The important thing to remember is that reciprocal licensing procedures vary greatly from country to country, and that application must be made to each country you plan to operate in. Allow plenty of time for the processing of these applications, sometimes as long as six months!

Q. At the present time, what countries does the U.S. have reciprocal operating agreements with?

A. Agreements have been reached with the following countries: Argentina, Australia, Austria, Barbados, Belgium, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Denmark, Dominica, Dominican Republic, Ecuador, El Salvador, Fiji, Finland, France, Greece, Germany (Federal Republic), Grenada, Guatemala, Guyana, Haiti, Honduras, Iceland, India, Indonesia, Ireland, Israel, Jamaica, Jordan, Kuwait, Liberia, Luxembourg, Monaco, Netherlands, Netherlands Antilles, New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, Philippines, Portugal, Sierra Leone, Spain, Surinam, Sweden, Switzerland, Trinidad & Tobago, United Kingdom, Uruguay and Venezuela. Negotiations are in progress with other countries.

Q. I'm planning to visit a country that does not have a reciprocal operating agreement with the United States. Does this mean that I will not be able to operate my station there?

A. If you wish to operate in a country that doesn't have an agreement with the U.S., you may still be in luck. Some countries don't allow any amateur operation by an alien, but many do. Each country grants permission to operate within its boundaries in a different manner. Some countries absolutely forbid such operation; unwary or careless foreign amateurs attempting to operate may seriously jeopardize the possibility of ever establishing such privileges. *Always* go through proper channels and authorities when seeking foreign operating privileges; *never* make careless assumptions. "Well, my friend, the High Llama said it was okay," simply won't do.

Q. In the recent past, the People's Republic of China has been increasingly receptive to western customs and activities. Do you think that I might obtain permission to operate in this country?

A. The contact that the International Amateur Radio Union has had with Chinese officials indicates that while the Chinese favor the reinstitution of Amateur Radio, they have made it clear that they will proceed at their own pace. For this reason, the ARRL/IARU is not encouraging attempts by amateurs to obtain operating permission in that country, since we don't want anything to upset the main goal: getting Chinese nationals on the air.

Q. When operating under a reciprocal permit, is it permissible to pass third-party traffic back to the U.S.?

A. Yes, but only if the U.S. has a third-party agreement with the country you are operating in. Amateurs often confuse the reciprocal-agreement countries list with the third-party countries list. At the present time, the United States has third-party agreements with the following countries: Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Ghana, Guatemala, Guyana, Haiti, Honduras, Israel, Jamaica, Jordan, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad & Tobago, Uruguay and Venezuela. It is very important that you do *not* pass third-party traffic from a country that does not have an agreement with the U.S. Observation of third-party rules protects Amateur Radio as a service in that country. In many countries, the phone service is a government controlled monopoly, and amateur phonepatch operation only means unnecessary competition. Even in countries that do have agreements with the U.S., there are specific conditions under which third-party traffic may be passed. Before conducting any such operation, be sure to check the rules and the associated conditions pertaining to the particular country you are visiting. A good source of information is the *ARRL License Manual*.

Q. What frequencies and emissions do I use when operating under a foreign operating permit?

A. When a foreign country permits operation within its boundaries, the frequencies and emissions used will be prescribed or limited by that country's government. Generally, an amateur visiting another country will be bound by the provisions of Part 97 (as a Commission licensee), as well as the provisions and limitations set forth by the host's government. (97.95)

Q. I'm going to be sailing to several areas next year. What are the provisions regarding maritime operation?

A. Even though your voyage may take you through international waters (or those of another country), section 97.101 applies to your operation, since you hold a U.S. amateur license. You should be familiar with its provisions concerning installation and operation of your amateur station. As long as you are sailing or anchored in international waters, you may operate with your U.S. license. You may wish to identify as "maritime mobile," followed by the ITU region number 1, 2 or 3, for informational purposes. It is important to note that you are permitted to operate only on those amateur frequencies specifically allocated to the region you are in at the time of operation. As soon as you enter the territorial waters of another country, you may operate *only* if you hold a reciprocal-operating permit.

Q. Recently I heard that you no longer need a written permit to operate in Canada. Is this true?

A. Yes. Automatic reciprocity between the U.S. and Canada began on January 21, this year. This means that U.S. amateurs may operate in Canada without having to obtain written permission from the DOC. Canadian amateurs may operate in the United States in the same manner. Additionally, U.S. Novice and Technician class amateurs may now operate in Canada with the privileges of mode and frequency authorized to them in the U.S. Similarly, Canadian Digital class operators may operate in the U.S. with the frequency privileges authorized them on vhf and uhf in Canada. However, all visitors to the U.S. must stay within the U.S. mode and band limitations.

Q. Is there anything else I should keep in mind while operating my station in another country?

A. Yes. Two things: (1) Remember that, as a radio amateur, you are an overseas ambassador for all radio amateurs, as well as a representative of your country. In all cases, it is *you* and the way you go about operating in a foreign country that can have far-reaching effects on that country's attitudes toward Amateur Radio, and (2) Have a good time!

[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.] QST

*Membership Services Assistant, ARRL.

Coming Conventions

April 18-20
Missouri State, Kansas City, MO

May 16-18
New York State, Rochester, NY

May 24-25
Midwest/Central Division, St. Louis, MO

May 31-June 1
Kansas State, Salina, KS

June 7-8
Delta Division, Senatobia, MS

June 7-8
West Gulf Division, Dallas, TX

June 21-22
Georgia State, Atlanta, GA

July 5-6
West Virginia State, Jackson's Mill, WV

August 2-3
Louisiana State, Shreveport, LA

August 30-September 1
Pacific Division, San Jose, CA

August 31
Illinois State, Rockford, IL

September 5-7
Southwestern Division, Los Angeles, CA

October 3-5
New England Division, Boxborough, MA

October 10-12
Midwest Division, Lincoln, NE

November 7-9
Hudson Division, South Fallsburg, NY

ARRL NATIONAL CONVENTIONS

July 25-27, 1980
Seattle, Washington

March 13-15, 1981
Orlando, Florida

MISSOURI STATE CONVENTION

April 19-20, 1980, Kansas City, MO

The PHD Amateur Radio Association, Inc., of Liberty, Missouri, will sponsor the 1980 Missouri State ARRL Convention (11th annual Northwest Missouri Hamfest) on Saturday and Sunday, April 19-20, in the Trade Mart Building at the Downtown Kansas City Airport.

There will be a complete program of forums: ARRL, DX, contest, technical, SCM, XYL, commercial exhibits, and more than 100 swap tables, all inside the 45,000 square foot, one-level, air-conditioned building. Unlimited free parking adjoins the site. RVs welcome, no hookups. Doors are open from 10 to 5:30 both days. Commercial exhibitors may set up from 8 to 10 P.M. Friday or 7 to 9 A.M. Saturday. Swappers 9 A.M. Saturday.

There will be a Saturday night banquet at the world-famous GOLD Buffet. Guest speakers will be NASA Astronaut Major James F. Buckli, from the Johnson Space Center, Houston, Texas, speaking on Space Age Communications; George Woodward, W1RN, assistant technical editor, *QST*; John Lindholm, W1XX, ARRL communications manager, and Midwest Division Director Paul Grauer, WØFIR.

Preregistration is $2; admission at the door $3. Banquet tickets $9. Those desiring banquet tickets are urged to order them in advance. All preregistrations will be held at the door. Talk-in on 146.34/94. For information and preregistration write to PHD Amateur Radio Association, Inc., P. O. Box 11, Liberty, MO 64068, 816-781-7313 or 816-452-6953.

Hamfest Calendar

***Arkansas:** The Central Arkansas Radio Emergency Net, Inc. (CAREN), ARC of Little Rock will hold its annual hamfest April 19-20 at the North Little Rock Community Center on Pershing Street. Three motels within walking distance. Covered flea market area. Air conditioned dealer area, forum rooms and cafeteria. ARRL President Harry J. Dannals, W2HD, will speak at Saturday night banquet. Talk-in on 34/94. For info contact Dale Temple, W5RXU, 1620 Tarrytown, Little Rock, AR 72207, Tel. 501-225-5868.

California: The 8th annual Sacramento Valley Amateur Radio Ham Swap, sponsored by North Hills RC, will be held Sunday, May 4, from 9 to 3 at Machinists Hall, 3081 Sunrise Blvd., Rancho Cordova. Table rentals, food, club auction, prizes and free admission. Talk-in on K6IS on 144.59/145.19 and 223.18/224.78.

Connecticut: The Pioneer Valley Repeater Association 3rd annual flea market is Sunday, April 27, from 10 to 5 at Newington High School, Newington. Free parking. Admission $1. Table rental $7.50, includes chairs and electricity. Flea market, dealer displays and sales, family activities and prizes. Further details from Arnie Depascale, K1NFE, P. O. D. M, Plainville, CT 06062, or Evangelo Demetriou, K1MMX, 38 Volpe Ct., New Britain, CT 06053.

Illinois: The Rock River Radio Club will hold its 14th annual hamfest on Sunday, April 13, at the Lee County 4-H Center, south of Dixon. Camping available. Tables $5. Talk-in on 146.52 or 146.37/97. Tickets $1.50 in advance or $2 at the gate. For details or reservations write Chas. Randall, W9LDU, 1414 Ann Ave., Dixon, IL 61021.

Illinois: The Moultrie Amateur Radio Klub's 19th annual hamfest will be Sunday, April 20, at Moultrie County 4-H Center Fairground, 3-miles east of Sullivan on Illinois 121 and 1-mile north on Caldwell Road. Heated indoor and covered outdoor flea market. Food. Tickets $2 or 3 for $5. Major prize. No charge to vendors. Some space available for group meetings. Talk-in on 146.94 and 146.655/055. Write MARK, P. O. Box 327, Mattoon, IL 61938.

Illinois: The Kishwaukee Radio Club and DeKalb County Amateur Repeater Club are having their 22nd annual indoor/outdoor hamfest on Sunday, May 4, from 8 to 3 at Notre Dame School, 3 miles south of DeKalb. Tickets $1.50 in advance or $2 at the door. Indoor tables available; bring your own table and setup is free. Talk-in on 146.13/73 and 94 simplex. For tickets and info send s.a.s.e. to Howard Newquist, WA9TXW, P. O. Box 349, Sycamore, IL 60178. Requests received after April 26 will be held at the door.

Illinois: The Centralia Wireless Association hamfest will be held Sunday, May 4, at Kaskaskia College in Centralia. Flea market and prizes. Info from WB9QEG at 618-532-6606.

Indiana: The Lake County ARC will hold the 27th annual Herbert S. Brier Memorial Banquet at 6 P.M. on Saturday, April 19, at the Griffith Knights of Columbus Hall, 1400 S. Broad St., Griffith. Surprise guest speaker, prizes, awards and lots of good food. Tickets available from any club member at $8 each, until March 1. After March 1 tickets will be $10 each from LCARC, P. O. Box 1909, Gary, IN 46409.

*ARRL Hamfest

Louisiana: The Baton Rouge ARC hamfest "Hambalaya" will be May 3-4 at Catholic High School in Baton Rouge. Free admission and parking. Swap tables $5 for both days. Saturday night banquet. Prizes, speakers and entertainment. Free coffee and donuts 8 A.M. Saturday. Talk-in on 19/79, 52 and 3910. For info or reservations write Baton Rouge ARC, P. O. Box 4004, Baton Rouge, LA 70821, or call Herb Ramey, KB5AQ, at 504-344-6746 (days) or 504-654-6087 (evenings).

Massachusetts: The Central Massachusetts ARA will hold an auction and flea market on April 25 at the Main South American Legion Post 341 in Worcester. Doors open at 6 P.M., auction begins at 7. Flea market tables $5. Prizes, refreshments. Talk-in on 37/97 and 52. For info contact Rene Brodeur, WA1LEA at 617-753-7480 or Dave Penttila, K1COW, at 617-885-4995.

Massachusetts: The Framingham ARA will hold its annual spring flea market on Sunday, April 27, from 10 to 3 at the Framingham Police Station drill shed. Sellers admitted at 9. Admission $1, sellers $6 per table. Sellers must register in advance. Talk-in on 75/15 and 52. Contact Ron Egalka, K1YHM, FARA, P. O. Box 3005, Saxonville, MA 01701, Tel. 617-877-4520.

Massachusetts: The 4th annual Bristol County ARA flea market and radio auction will be held Sunday, May 4, from 9 to 5 at the Knights of Columbus Hall, Meridian St., Fall River. Talk-in on 146.31/91. For more info write Gerald P. DiChiara, AA1Q, 35 Central Ave., Assonet, MA 02702.

Massachusetts: The Wellesley ARS will conduct its annual auction on Saturday, April 12, beginning at 11 A.M. at the Wellesley High School cafeteria on Rice St. Talk in on 63/03, 04/64 and 52. Doors open at 10. Contact Kevin P. Kelly, WA1YHV, 7 Lawnwood Pl., Charlestown, MA 02129.

Massachusetts: Hampden County Radio Association's annual flea market will be held Friday, May 2, at the Feeding Hills Congregational Church in Feeding Hills at the intersection of Routes 57 and 187, west of Springfield. Doors open at 7 P.M. Free admission. Sellers tables $3. For info contact Andy Bouchard, WB1BZW, at 413-786-2301.

Michigan: The South Eastern Michigan ARA will hold their 22nd annual hamfest on Sunday, April 13, from 8 to 3 at South Lake High School, St. Clair Shores. Info from Shirley Jensen, WD8PCQ, 1205 Three Mile Dr., Grosse Pointe Park, MI 48230.

Minnesota: The Rochester ARC and the Rochester Repeater Society will sponsor the Rochester Area Hamfest on Saturday, April 12, at St. John's School Gymnasium, 490 W. Center St., Rochester. Doors open at 8:30 A.M. Large indoor flea market, prizes, refreshments and plenty of free parking. Talk-in on WRØAFT on 146.22/82. Further info from RARC, WBØYFE, 2253 Nordic Ct. N.W., Rochester, MN 55991.

Nebraska: The Ak-Sar-Ben ARC of Omaha will hold their annual auction on Sunday, April 13, at the Holiday Inn, 72nd & Grover Sts., Omaha. Equipment check-in and buyer registration at 8 A.M. with auction beginning at 9. Special registration for those over 90 miles from Omaha. For further info call Jim Sanford, NØAIH, at 402-451-1443 or Mike Bruening, NØAON, at 402-291-6781.

New Jersey: The Delaware Valley Radio Association, W2ZQ, assisted by the Lawrenceville Amateur Repeater Group, will hold their annual flea market on Sunday, April 20, from 8 to 4 at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Rd., in Lawrence Township. Advance registration $2, $2.50 at the gate. Adequate indoor and outdoor flea market area. Sellers are asked to provide their own tables. Prizes and refreshments. Talk-in on 146.52, 07/67 and 147.84/24. Info and reservations from DVRA, P. O. Box 7024, West Trenton, NJ 08628.

New Jersey: The Irvington RAC's hamfest is Sunday, April 20, from 9 to 4 at the P.A.L. Building, 285 Union Ave., Irvington. Take the Garden State Parkway to exit 143 north or 143A south. Talk-in on 34/94 and 52. Refreshments. Admission $1, tables $3. Info from Pete, WB2FAS, at 201-763-8220, or write IRAC, P. O. Box 894, Union, NJ 07083.

New Jersey: The 5th Trenton Computer Festival will be held at Trenton State College, Trenton, on Saturday and Sunday, April 19-20, from 10 to 5. Commercial exhibits, electronics flea market, technical sessions and free short courses on Sunday. Admission $5, students $2. For info write TCF-80, Trenton State College, Hillwood Lakes, P. O. Box 940, Trenton, NJ 08625, or call 609-771-2487.

New Jersey: The Tri-County Radio Association's annual indoor hamfest/flea market will be held from 9

Sorry, no purchases at the door.

to 4 on Sunday, May 4, at the Passaic Township Youth Center, Valley Road, Stirling. Admission $2, tables $5. Prizes. Talk-in on 147.855/255 and 146.52. For info write TCRA, Box 412, Scotch Plains, NJ 07076 or call Herb, W2CHA at 201-647-3461.

New York: The 21st annual Southern Tier ARC hamfest will be held Saturday, May 3, at the Owego Treadway Hotel, Route 17, exit 65, in Owego. Flea market, vendors, tech talks. Buffet and admission $8. Admission $2. Reservations and info from STARC, P. O. Box 11, Endicott, NY 13760. Hotel rooms from Debbie Chambers, Owego Treadway, Owego, NY 13827, Tel. 607-687-4500.

***North Carolina:** The Raleigh ARS 8th annual hamfest will be held Sunday, April 20, at Crabtree Valley Mall, U.S. 70 West, Raleigh. Activities begin at 9 A.M. Admission $3. Prizes, covered flea market and meetings. Motels and restaurants nearby. Talk-in on WR4ACF on 146.04/64 and WR4AOE on 146.28/88. For info, details or reservations write RARS Hamfest, P. O. Box 17124, Raleigh, NC 27619.

Ohio: The Miami Valley F.M. Association 11th annual B*A*S*H* will be held on the Friday night of the Dayton Hamvention, April 25, in the Convention Center, Main and 5th Sts. Parking in adjacent city garage. Free admission. Refreshments available. Prizes. Live entertainment. For info contact Miami Valley F.M. Association, P. O. Box 263, Dayton, OH 45401.

Oklahoma: The Lawton-Ft. Sill ARC Inc., will present their annual hamfest April 18-20 at the Montego Motel complex in Lawton. Swapfest, ARRL and MARS meetings, and family activities. Preregistration deadline is April 10. Further info from Lawton-Ft. Sill ARC Inc., Box 892, Lawton, OK 73501.

Pennsylvania: The Penn Wireless Association Inc., will hold its Tradefest '80 on Sunday, April 13, at the National Guard Armory, Southhampton Road & Roosevelt Boulevard, 1/2-mile south of Pennsylvania Turnpike exit 28. Sellers 6- by 8-foot space, $5; bring tables; limited number of power connections, $3. General admission $3. Prizes, refreshments, rest area, displays and surprises. Talk-in on 146.715 and 52. Contact Robert L. Daut, Jr., WB3KRV, P. O. Box 734, Langhorne, PA 19047.

Pennsylvania: The Tamaqua Transmitting Society will hold its annual HAMBOREE, rain or shine, Sunday, May 4, starting at 9 A.M., at the F.O.P. grove, one-half mile east of Ramaqua, off Rte. 309. Pavilions available for vendors. Space for tailgaters. Donation $2. Tailgaters $1. Talk-in on 146.07/67 and 52. For info write HAMBOREE, Tony Sarli, W3CMA, 164 Spruce St., Tamaqua, PA 18252.

Pennsylvania: The Warminster ARC 6th annual Ham-Mart will be held Sunday, May 4, from 9 to 4, rain or shine, at the William Tennent Intermediate High School in Warminster. Registration $2 per person, YL, XYL and children free; sellers (tailgater) space $3, bring your own table; indoor table $5. Food and drink available. Flea market, free fm clinic, auction and prizes. Talk-in on 146.16/75 and 52. For info write WARC, P. O. Box 113, Warminster, PA 18947, or call Pat Cawthorne, W3DNI, at 215-672-5289.

Puerto Rico: The Puerto Rico ARC announces its 1980 convention and hamfest to be held the weekend of April 26-27 at the Montemar Inn, Aguadilla. For info and reservations write GPO, Box 693, San Juan, PR 00936.

***Washington:** The Skagit ARC hamfest is April 19 at the Grange Hall in Bryant. Cost of $8 includes program and banquet. Contact Norman G. Ray, W7LFA, 14005 132 Ave., Kirkland, WA 98033, or call 206-821-2985.

Washington: The Inland Empire VHF Club is sponsoring "Swap Fest 80" on April 26, at the Spokane Interstate Fairgrounds. Commercial and noncommercial display booths and sales tables. Auctions, swap tables, snack bar, prizes, displays, contests and a professional Dixieland band. Info from Swap Fest 80, Jan Thiemann, KA7DDU, Chairman, 78-3 E. Mission, Spokane, WA, Tel. 509-928-1778.

West Virginia: The Plateau ARA will hold its 2nd annual hamfest and flea market on Sunday, April 20, at the American Legion Hall. Just off U.S. Route 19 at 205 W. Maple Ave., Fayetteville. Admission $2, children under 12 free. Doors open at 9 A.M. Hot food, prizes, free parking. Talk-in on 19/79 and 52. For further info contact Bill Wilson, WA8YTM, 302 Central Ave., Apt. 2, Oak Hill, WV 25901, Tel. 304-469-9910 or 304-469-9313.

Wisconsin: The Madison Area Repeater Association, Inc., will hold its 8th annual Madison Swapfest on Sunday, April 13, at the Dane County Exposition Center Forum Building in Madison. Doors open at 8 A.M. for sellers and exhibitors and 9 for the public. Parking and hotel accommodations available. Commercial exhibitors and flea market. Prizes. Pancake breakfast and Bar-B-Q lunch available. Free movies. Admission $2.50 in advance, $3 at the door. Children 12 and under free. Tables $4 each in advance, $5 at the door. Talk-in on WR9ABT on 146.16/76. For reservations and info write MARA, P. O. Box 3403, Madison, WI 53704.

Wisconsin: The Milwaukee RAC annual auction of equipment and parts is Thursday, May 1, at 7:30 P.M. at the Club meeting hall, 7500 West State St., Wauwatosa. Open to all hams and proteges. No sales charges or admission fee. No flea market dealers. Please tag all gear to be sold with seller's name and minimum opening bid.

Wisconsin: The 3-F ARC annual swapfest is Saturday, May 3, from 8 to 3 at the Neenah Labor Temple, 157 South Green Bay Rd., Neenah. Talk-in on 52. Large parking area, indoor and outdoor swap area, free auction, refreshments. Tickets and tables $1.50 in advance, $2 at the door. Contact Mark Michel, W9OP, 339 Naymut St., Menasha, WI 54952, Tel. 414-722-4034. QST

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1BCZ, Bernard P. Davis, North Kingstown, RI
W1BST, Dr. Karl A. Steady, Lakeport, NH
W1DRL, Florence E. Bull, Arlington, VT
W1HWN, Ladislav H. Vydra, Woodstock, CT
WA1QAJ, Charles W. McKinnon, Kingston, MA
W2BBT, Raymond I. Betts, East Berne, NY
N2FM, Frank Melville, Elmsford, NY
W2GTW, Kenneth J. Hartman, Dade City, FL
WA2IGQ, Roy J. Eise, Sr., Rahway, NJ
WA2KWX, Kenneth Faude, Buffalo, NY
W2OZO, Albert C. Heil, Clarksboro, NJ
WB2RPL, Sterling M. Martin, Saratoga Springs, NY
W2RXW, Walter L. Babcock, Oneida, NY
WA2TBS, James A. Evans, Fords, NJ
W3AHT, Charles W. Harvey, Bowie, MD
W3BNC, John D. Rowe, Sr., Hagerstown, MD
W3DMV, R. Thomas Adams, Gettysburg, PA
W3DPP, Dr. Charles E. Halsey, Westover, MD
W3IHD, Samuel J. Consalvo, Washington, DC
W3LJJ, Richard D. Watson, Silver Spring, MD
W3KQH, Luther B. Grove, Mifflinburg, PA
W3NG, Lewis B. Blair, Cheverly, MD
WA4BGV, William G. Johnson, Centreville, AL
W4CS, Charles H. Stout, Greensboro, NC
WA4CYK, Robert M. Thorkidsen, Pensacola, FL
W4EJN, James W. Fields, Bremen, GA
WB4GTS, Frederick H. Vogel, Naples, FL
W4HIH, Glenn Hatcher, Gatlinburg, TN
K4HXP, Ernest L. Sailor, Winter Park, FL
W4LMM, Ray H. Billings, College Park, GA
WA4MJG, Rebecca K. Edwards, Durham, NC
K4NWY, Dr. Jo Rogers Hood, Birmingham, AL
W4OBN, Winslow P. Freeman, Plantation, FL
W4OW, C. Edward Koontz, Norfolk, VA
W4PJD, Ellis L. James, Albany, GA
WA4WGQ, Russell B. Hayes, St. Petersburg, FL
W5BUF, Sylvester G. Thompson, Metairie, LA
KA5CGN, Col. Carlton P. Smith, San Antonio, TX
W5DSB, Weldon W. Webb, Beaumont, TX
W5QPX, Gilbert L. Baker, Amarillo, TX
W5RZF, Irwin R. Carroll, Midwest City, OK
*W5TVH, William L. Gabbert, Lake Charles, LA
ex-W5UIJ, Thomas E. Conner, Lamesa, TX
W5VWB, Fred J. Trotter, Kerrville, TX
W6AMH, Henry R. Herting, Walnut Creek, CA
W6AMJ, Ira B. White, Jr., Covina, CA
WB6BQH, Col. Paul F. Nay, Santa Monica, CA
*K6CU, Joseph R. Bridges, San Jose, CA
W6EMW, Amos M. Hardin, Carmel, CA
W6FVF, Seth Gunthorp, Coronado, CA
K6HOC, Richard L. Bomar, Riverside, CA
W6ICS, John E. Peoples, Burbank, CA
K6KZH, Beulah C. Humphries, San Rafael, CA
K6MI, James C. Matheny, Pomona, CA
W6MR, Llewellyn H. Bailey, Paradise, CA
W6PFF, Frank C. Champlin, Rosemead, CA
W6PQD, Gilbert F. Burnett, Sedona, AZ
W6QGU, William H. Winchell, Spring Valley, CA
ex-W6SLD, Robert H. Knight, San Francisco, CA
WB6SLF, Griffin W. Pifer, San Jacinto, CA
K6YI, Walter W. Wallace, Yucaipa, CA
W6ZV, Dr. Ted C.S. Leavenworth, San Diego, CA
W7CJY, George "Tommy" Thompson, Clatskanie, OR
W7LZR, Hugh M. Rossire, Kelso, WA
W7PNX, Robert A. Koons, Seattle, WA
W7SQN, Powell H. Abrams, Sun City, AZ
K7TTW, John S. Peterson, Garfield, WA
K7VMK, George Beater, Mesa, AZ
WA8ACZ, Virgil R. Sponaugle, Lima, OH
W8BXX, Fred Williams, Harrison, OH
K8CWR, Edward D. Chapman, Traverse City, MI
N8HI, John C. Widman, Traverse City, MI
WB8LHZ, David H. Kern, Loveland, OH
W8MBA, Willard F. Overton, Scottville, MI
WB8MTW, William H. Murphy, Huron, OH
K8PNH, Dr. Robert L. Atkinson, St. Joseph, MI
W8SXT, Huber H. Lodge, Dayton, OH
K8WRJ, Wilford C. Lacock, Indian River, MI
W8YKU, Lura King, Youngstown, OH
W9AFO, Ralph M. Billings, Three Lakes, WI
K9BOV, Harold B. Drapeau, Oak Park, IL
KA9EIW, Louis F. Elpers, Evansville, IN
W9FJG, Richard H. Mitchell, Indianapolis, IN
W9KAB, Walter C. English, Antioch, IL
W9NAH/WA7PTW, Richard H. Cook, Sun City, AZ
K9RWQ, Louis E. Schmidt, Marion, IN
W9RZO, George W. Jacobs, So. Bend, IN
WBØAAF, Donald R. Blankenship, Houston, MO
NØAGN, Bert C. Emery, Minneapolis, MN
WØBXB, Kenneth E. Arnold, Kansas City, MO
WØEQN, Cliff T. Taylor, Sioux City, IA
WØJJ, William L. Farmer, Kansas City, KS
WBØOBH, Warren P. Hurst, Wichita, KS
WØOHW, Charles W. Lawson, Excelsior, MN
WØRTE, Matthew A. Simonich, Minneapolis, MN
WØTKN, L. Jack Withers, Mason City, IA
KP4CB, Paul A. Girard, Hato Rey, PR
VE1GY, Joseph G. "Hammy" Wilkinson, Parrsboro, NS
VE1KA, D. Reid MacMillan, Moncton, NB
VE1LX, Joseph E. Connors, Rothesay, NB
ex-VE3CAD, Edward A. Atkins, Ottawa, ON
VE3KD, Kenneth O. Cromwell, St. Thomas, ON
VE3TL, Albert H. Iseman, Downsview, ON
VE4GR, Henry Roth, Winnipeg, MB
VE7UI, Keith D. Clarke, Vancouver, BC

*Life Member, ARRL

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. QST

YL News and Views

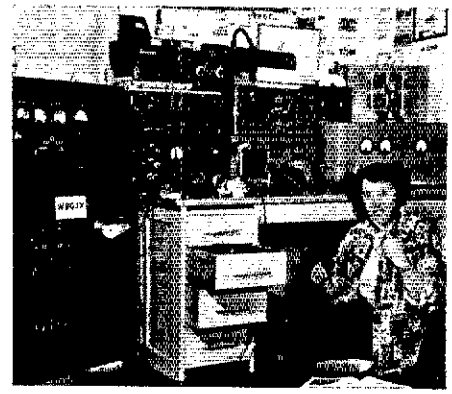
Conducted By Jean Peacor,* K1IJV

Fifty Years of Exciting Experiences

The year was 1928. Two radio-minded high school students heard the faint squeal from Admiral Byrd's expedition to the Antarctic region. Their listening was rewarded when late one evening they heard the expedition sending traffic home. The receiver was a home-built affair that had no resemblance to any present-day receiver. One student could copy the messages. The other decided to learn how that very evening. From then on, coded messages were tossed back and forth between them in school. That began an exciting radio career for Helen Schmock of Ludington, MI. Helen then attended the Slyfield Radio School in Frankfort, MI, and received her first license in 1929, W9GJX.

Her first transmitter was a 15-watt Hartley with a Silver Marshal receiver and a doublet antenna. With this she worked all states and plenty of DX. ARRL membership soon followed, as did becoming second net-control station for AARS in her section, route manager in 1931 and ORS from 1931 on. Helen was elected to the Al Operators Club. In 1941, she added to her activities by joining YLRL.

During World War II her radio experience proved valuable to the Air Force, where she taught radio. At war's end, she continued



W8GJX in 1950, when ham gear really filled the shack.

teaching radio, this time to the Civil Air Patrol. Helen's own station was also put back on the air, but now as W8GJX because of district changes in Michigan. The station now consisted of a BC610, BC458, BC499 transmitters, an SX-25 receiver with a preselector for a 10-meter phone, and a BC348 for cw operation. Antennas had grown to a 3-element rotary beam and a longwire for cw (see photo.)

In 1949, Helen upgraded to a Class A license. In 1954 she became the first YL member of QCWA Chicago Chapter, no. 293. Last year she was awarded QCWA certificate no. 173 for 50 years as a continuously licensed ham.

Helen met her present husband on the air waves. For three years they talked daily before actually having an "eye ball" at a ham convention in Saginaw, MI.

Her radio career has covered many aspects. She's talked with marine, air and submarine mobiles, handled traffic, made BPL and helped with emergency traffic. She's worked all continents and 96 countries. She's been witness to 50 years of Amateur Radio's growth and changes.

The BC610 gave way to other transmitters along the way. At present, being an apartment dweller, Helen is using a Ten Tec 544 feeding a Hustler 4BTV with 75-meter capabilities mounted on the roof 80 feet in the air. She also has 2-meter capabilities.

Little did Admiral Byrd realize the effect his expedition had on others. It created 50 years of exciting experiences for Helen Schmock, W8GJX.

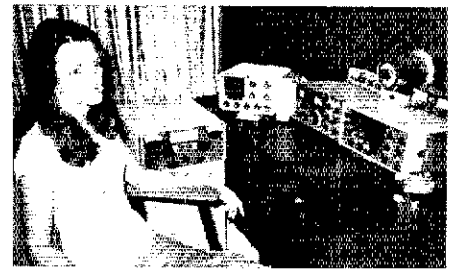
Coralie Petri, NØAWV *(photo courtesy of WØRBE)*

THIRTEEN WEEKS IS ALL IT TOOK

After being introduced to ham radio by WØRBE, and with no technical knowledge, Coralie Petri decided that a ham license would be ideal for her. As a teacher of Spanish and German for a chemical corporation in Kansas City, MO, she would have the opportunity to use both languages frequently. Thirteen weeks later she'd gone from Technician to General to Advanced license and is now NØAWV. Ole!

SANDI HEYN, WA6WZN

Every radio club needs active members like Sandi of Costa Mesa, CA. Active in six general radio clubs in her area, Sandi also presently holds offices in YLRC-I A and YLRL, and is a member of the YL ISSB Executive Council. She's an OES, member of RACES and ARES and a delegate to the Orange County Council of Amateur Radio Organizations and Los Angeles Council of Amateur Radio Clubs. She's earned an Extra Class license and is an ARRL Life



Sandi Heyn, WA6WZN

Member. Employed as a full-time electronic technician, Sandi still finds time to pursue her other hobbies of sailing, yoga, computers and skiing.

THAT TRUE HAM SPIRIT

September's Great Ionosphere Hole Experiment was a success. If all the participants were as enthusiastic as

Eunice Gordon, W1UKR

Eunice Gordon, W1UKR, how could it fail? Prepared to stay at the rig all night, Eunie monitored ht signals from the time of the rocket launch at Kennedy Space Center until 3 A.M. Her observations, together with those of many other volunteers, helped to evaluate the effects on radio wave propagation when a rocket burns through the ionospheric F region. The certificate she holds was awarded by Radio Service Laboratory, Stanford, CA, and A. F. Geographic Laboratory, Bedford, MA. Nice going, Eunie!

RESULTS, HOWDY DAYS

Peggy Arciero, WB2OHD — member winner
Christa Elksnat, DL4GA — nonmember winner

RESULTS, YLAP

Ssb — First place N.A., N1YL, 12,006. First place DX, DJ1TE, 10,780. Second place N.A., WA1KKP, 10,647. Second place DX, DL1MS, 9690. Third place N.A., WD5FQX, 10,296. Third place DX, G4GAI, 6944.

Cw — First place N.A., WB4PRM, 2200. First place DX, VK3KS, 637.5. Second place N.A., N1YL, 1728. Second place, DX, LZ1QG, 506.25. Third place N.A., K1QFD, 1674. Third place DX, DF2SL, 228.

Cw — Gold Cup, WB4PRM.
Ssb — Gold Cup, N1YL.
Hagar Award, VK3KS.
Corcoran Award, N1YL.

Special congratulations to KA5DIU/Novice who did a great job in the contest.

YL ACTIVITY DAY — A SUCCESS

The airwaves came alive with YLs on January 6 (as anyone listening well knows), particularly on 10-meter sideband. Diana Hughes, G4EZI, suggests that more stations call "CQ YL" around and near the frequency rather than forming large groups. A huge YL net defeats the original intents — to get to know more YLs worldwide and really chat, unlike either a net or a contest. Change in suggested cw frequencies: 28.058, 21.058, 14.058 MHz.

*Country Club Dr., Monson, MA 01057

How's DX?

Conducted By Clarke Greene,* K1JX

When the Stadium is the Whole World

Amateur Radio is treated much differently in countries outside the United States and Canada than it is in North America. DXing and contesting in particular take on entirely different roles in these other societies. The accompanying translation/summary (direct translations are in quotes), provided by Dex Anderson, K3KWJ, provides some insight as to how one very large society visualizes and utilizes Amateur Radio. Read it and judge for yourself!

"When the Stadium is the Whole World," by V. Bondarenko, chief of the CRC USSR, named after E. T. Krenkel.

"Radiosport is becoming more and more popular and is becoming one of the mass military-applied forms of sport. Specifically, from year to year the number of shortwave and ultrashortwave enthusiasts increases. Suffice it to say that the quantity of Amateur Radio stations is growing annually by 8 to 12%, that is to say 1000 to 1500 shortwavers and ultrashortwavers are going on the air for the first time. According to data at 1 January 1979 in our country there were 30,034 radiostations, among them 3629 collective, 17,234 individual shortwave, and 9171 ultrashortwave."

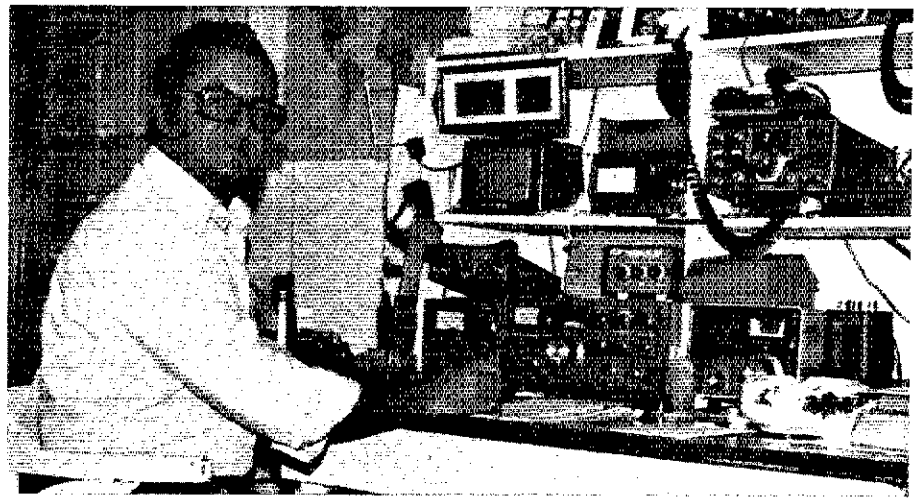
The most noticeable growth is seen in Moscow and Leningrad and certain other parts of the RSFSR; in the Ukrainian SSR, especially in Donetskaya SSR; etc. On the other hand, there are areas where the situation with respect to the development of radiosport is actually getting worse; thus, in 1978, compared with 1977, the number of amateur stations decreased in the Georgian SSR, in Krasnodarskiy and Stavropol'skiy krays, and in L'vovskaya, Sumskaya, Khersonaskaya, Chernovitskaya, Aktyubinskaya, Permskaya, Tyumenskaya, and Kemerovskaya oblasts. In many other areas the number of stations remained the same, bearing testimony to the fact that, here too, DOSAAF radiotechnical and unified technical schools are apparently not giving sufficient attention to the development of shortwave Amateur Radio or to the growth in the number of amateur stations, especially those for collective use; but it is precisely these that play an important role in introducing youth to shortwave and ultrashortwave and to radiosport as a whole.

Hundreds and thousands of Soviet amateurs participate yearly in at least 27 to 30 of the most important shortwave contests conducted by foreign amateur organizations. Each year the number of participants grows, with 350-400 to 800-900 Soviet shortwavers typically operating in the most popular tests. The quality indicators of our snipers of the airwaves are also improving. Whereas in 1975 Soviet amateurs won 132 prizes, in 1976 the number was 147 (64 first, 42 second, and 41 third), and in 1977 159 (64 first, 47 second, and 48 third).

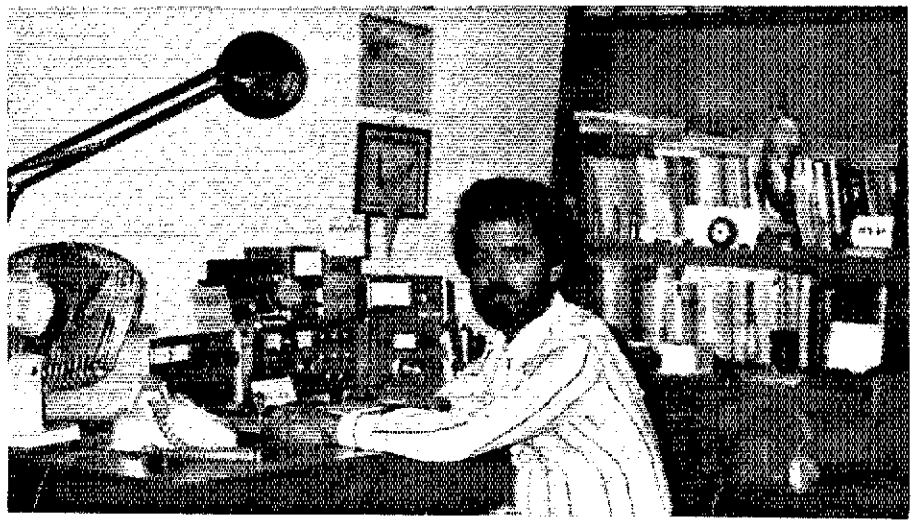
Although as this article is being written, 1977 results on Soviet participation in all of the international contests are not yet available, we can already conclude that significant progress has been made. First of all one should note the success of our sportsmen in the first official radiocommunication championship organized in 1977 by the IARU; Soviet amateurs took eight places in the first 10 in the group 'one operator, phone, cw.' Soviet stations did well in the 1978 IARU championship also, with the UK9AAN team at Chelyabinsk again taking second place in its group. In the CQ WW DX Contest of 1977 cups were awarded to collective stations 4L6M and UK9AAN. Collective stations UK9AAN, UK6APA (Sochi), and 4J6A have been leaders in the new category "several operators, several transmitters."

The popularity of the 'Miru-Mir' (to the world peace) competitions is growing steadily. Whereas three or four years ago not more than 350 or 400 foreign amateurs from 30 or 35 countries took part, in 1977 738 individuals from 43 countries sent in reports, and in 1978 1100 from more than 60 countries did so.

While giving Soviet amateurs their due, it is necessary also to note some shortcomings in their operation. First of all there is the fact that contest results of our individual stations are not very high. "Of course, here there are also certain objective factors that put sportsmen from the USSR in an unfavorable situation. These are the low power of radiostations and frequency-segment limitations in several amateur bands, and the extreme crowding of the 40-meter band in our Region with official and broadcasting stations." But besides these



5B4SP, Andreas Pavlides, of Larnaca, Cyprus, appears on 15 meters almost daily around 21.370 MHz in the company of WA4SKE. *(WA4SKE photo)*



SV1JG, Cliff, from Athens, Greece, was part of the DXpeditions to Crete, Dodecanes Islands and Mount Athos. Cliff can be found mainly on 20 meters. *(photo courtesy WA4SKE)*

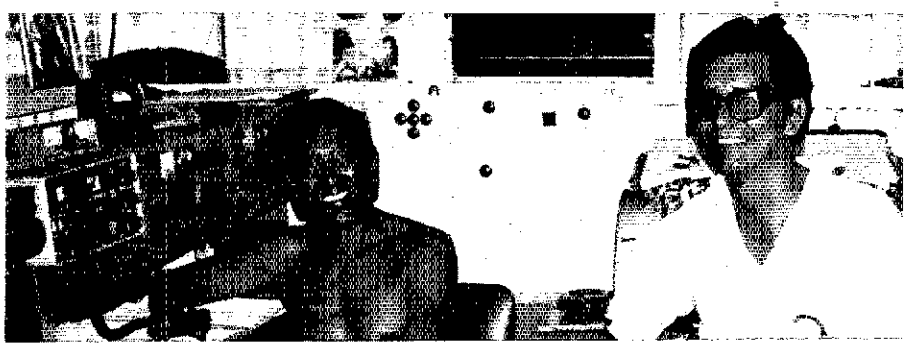
*7815 Mandan Rd., Apt. 102, Greenbelt, MD 20770

factors, a comparison between prize-winners and the number of participants from each country does not turn out in our favor — significantly more Soviet stations take part in competitions in comparison to those from other countries. Under contemporary conditions, sportsmen require many-faceted preparation in order to achieve good results — physical, technical, tactical, moral psychological; unfortunately our sportsmen do not always have sufficient mastery of all these qualities.

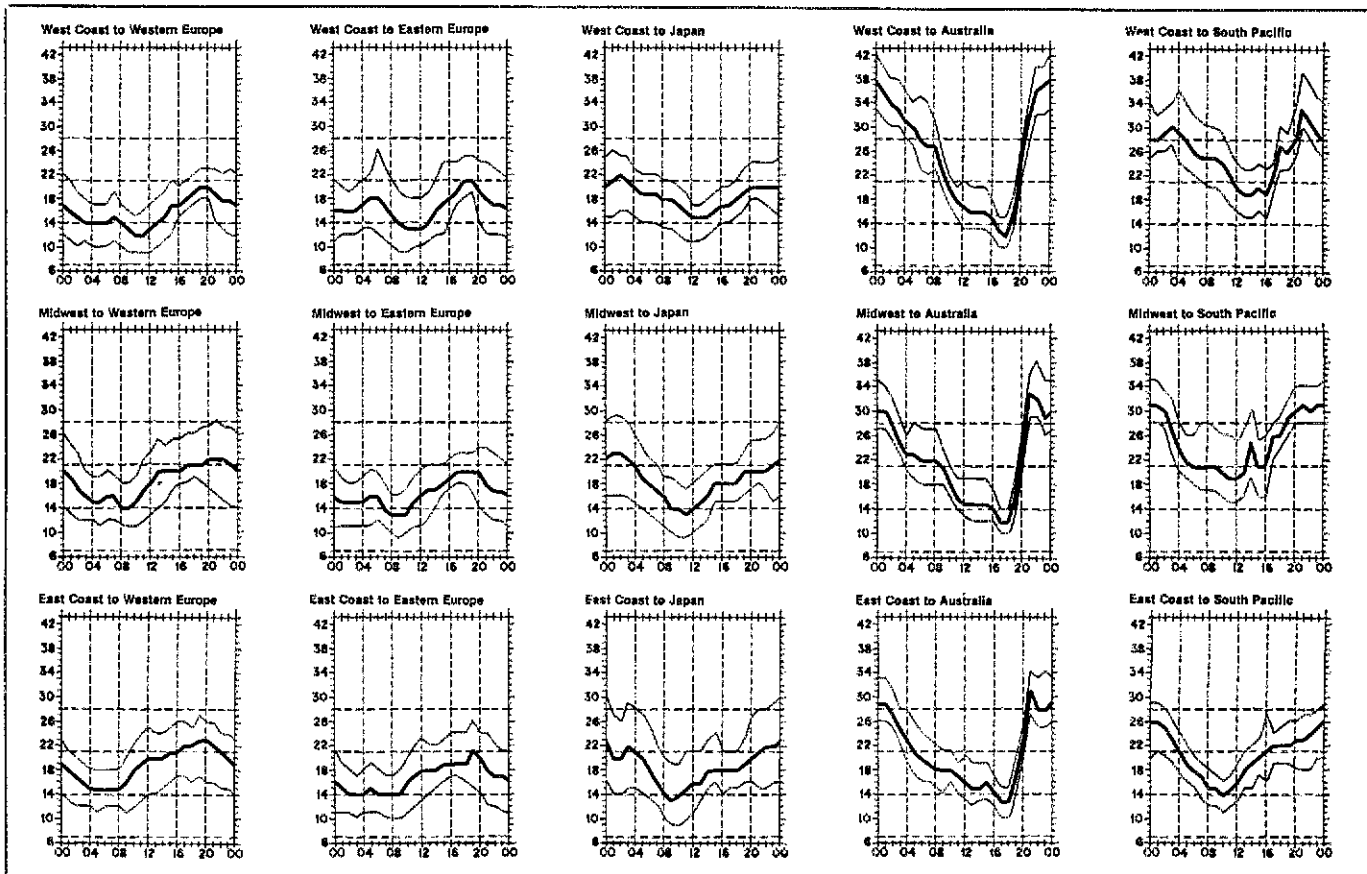
"From local radio sport federations and individual radioamateurs-shortwavers, letters have come in to the RSF and the CRC of the USSR containing various suggestions concerning improvements in the training of our sportsmen that would facilitate their achieving victory in international competitions. Many valuable comments were made also at the All-Union Conference on Shortwave and Ultrashortwave Sport, held in Moscow at the end of 1978. These suggestions basically boil down to the necessity of creating a mixed USSR team on the basis of collective radiostations, from among the strongest shortwavers and ultrashortwavers of the country, and also the setting up, at a convenient geographical point in the territory of the USSR, of a radioamateur center offering favorable conditions for the conduct of sport struggle."

"Suggestions are also put forward for the equipping of such a center with the necessary technology so as to permit sportsmen to enter all sub-groups of competitions. Questions are raised concerning giving such a collective the right to operate equipment with the maximum power accepted in international practice, to operate in the frequency segment 3.65 to 3.8 MHz, to use special call signs that are short from the point of view of number of characters." Pre-contest assemblies for instruction and training could be organized, as is now done for face-to-face forms of radiosport.

Solving these problems will take money and will not be easy, but if we want to struggle seriously for superiority in the international sports arena we need to work toward this without letting up. The FRS and the CRC of the USSR rely here on the active assistance of local federations, sport clubs, and individual amateurs. There is reason to expect that if existing tasks can be fulfilled, then in the next 3 to 4 years the number of Amateur Radio stations in the USSR will increase one-and-a-half to two times, and the skill shown by Soviet radiosportsmen in the international arena will increase significantly. QST



9M2FK, Ismail "Ishee" Razak (left), is net controller of the Southeast Asia (SEA) net and an avid DXer on both cw and phone. 9M2MW, Malcolm Westwood (right), also from Penang, Malaysia, is active on 20 meters and was coordinator of the recent SEA net convention. *(WA4SKE photo)*



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

QSL Corner

Administered By Joan Becker

ARRL-Membership Overseas QSL Service

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.

Requirements

1) Presort your DX QSLs alphabetically by call sign prefix (A3, AP, C6, CE, F, FG, G, GI, GM, JA, 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 utilize 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.

Corrections

W8HV is not the manager for any T12 or TG9 calls. K3ALE is not the manager for OK3TAB/D2A. (K3ALE is a Silent Key.) OK3ALE is the QSL manager for OK3TAB/D2A.

Corrections:

ZD7HH	(W4FRU)
TG4DX	(TG4NX)
8Z4A	(WA3HUP)

New manager and address for VK5 QSL bureau: VK5 QSL Bureau, Ray Dobson (VK5DI), 16 Howden Rd., Fulham, South Australia, 5024.

New HL9 QSL bureau address: American Amateur Radio Club of Korea, Dependent Mail Section, APO San Francisco, CA 96301.

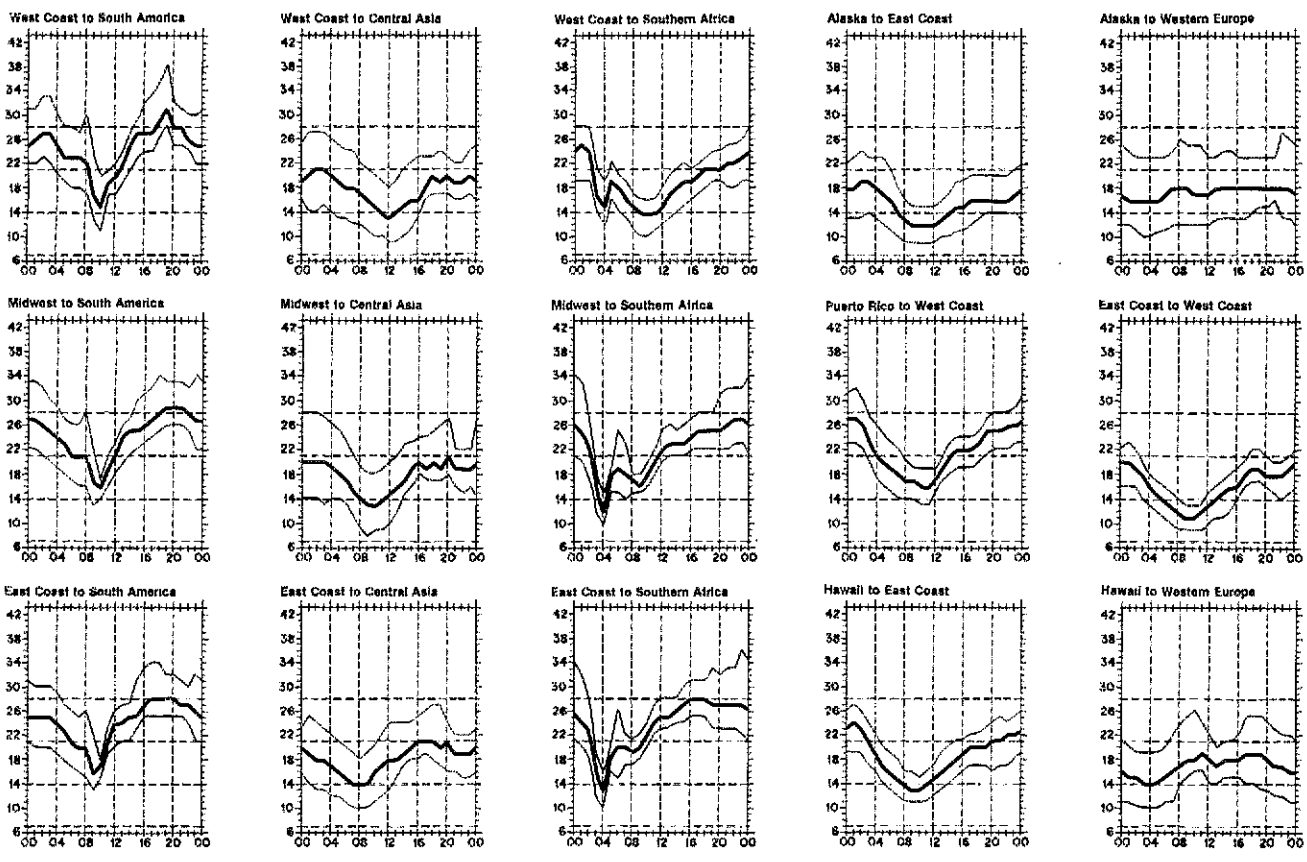
Tnx to W2QL and AA4MI for QSL info. Do you have some information that might help? All contributions are always gratefully received.

For those of you who would like to QSL direct, this information is passed along as we receive it and, therefore, may not be accurate.

A7XD (WA4PYE)
FO8BW (W6JFM)
J6LIM (VE2EWS)
J7DBB (YASME)
KC4UST (K3JA)
K9EF/8R1 (K1RH)
OD5LX (SMØGMG)
OX3OZ P. O. Box 1012 Godthraab, Greenland
SVØAC (WB8LFO)
SVØAK (WB2ENW)
TN8AJ (DM2XLO)
TR8DX (F6ESH)
VE3BVD/ST2 (VE3FRA)
VS6DO (K4CIA)
VE8HB (VE4TZ)
YBØACL (W4QO)
YS9PBE (W8QWI)
YV2BYT (K8IC)
VP2SA and VP2SX (AB1U)
VP2MFX (W3SUE)
3C1AB (EA1QO)
4M3AGT (YV3AJ)
6Y5DA (VE4JK)
9X5LG (DL8AO)

QSL MANAGER VOLUNTEERS

WB3CDX	KA3CMR
WD9HZK	WD9DZV
K1IX	VE5QY
WB1ACZ	



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, CO. These predictions, for April 15 to May 15, 1980, assume a sunspot number of 156, which corresponds to a 2800-MHz solar flux of 199.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 20-country increments through 240, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from November 1 through November 30, 1979. An s.a.s.e. will bring your the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

DF1AI/116	OK2SW/220	W1LJ/239	WA2ISM/108	WB3LQP/100	WA4AFE/105	WB5VDL/120	W8KLC/168	WB9QPG/121
DK9IP/101	SM6JHO/103	WA1YOC/104	WA2OOS/101	AA4RM/103	WA4LLE/108	KB6Q/102	WA8YJE/105	WD9DCL/177
DL9HN/135	VE2FEX/100	AB2N/217	AD3W/100	KB4KA/110	WB4YHF/106	W6LUL/101	WD8DXN/100	WD9GSU/100
EA7ALG/131	VE3IIU/101	K2IJL/200	K3OIH/181	KB4KR/100	W5ODD/107	WA6JVZ/101	WD8KSY/109	WD9IRV/130
EA7FC/110	VK5RD/119	K2RVQ/103	K3YVA/102	N4SN/119	W5SHN/100	WB6MBF/105	AA9L/101	AGØJ/107
JR2HAE/126	5H3FW/124	K2RZ/100	KB3AP/104	W4JFL/107	WB5OFB/100	WD6COR/102	N9ADL/107	KØDQV/149
JH7CUO/107	K1TH/156	N2AKR/102	WB3CJO/151	W4LSI/101	WB5RYC/106	K7FC/132	N9HC/100	NØGW/104
JH7UJN/121	N1AN/104	W2NJN/228	WB3CNB/166	W4NWM/103	WB5TON/101	K7IX/101	WA9YGS/100	WBØSAX/104
LA9DP/109								

Radiotelephone

CT1GC/101	KG4F/116	VE7ADA/100	WB1BVQ/139	WB3CNB/166	KB4KA/107	WB5JMH/103	WA8KEM/148	WB9JBH/110
DL5KX/102	KS6EZ/130	VK2FD/120	AC2J/100	WB3EZH/103	N4SN/112	WB5RMF/100	WB8SRD/106	WB9QPG/119
DL9HN/134	LA3WV/106	VK9NI/113	K2IJL/196	WB3IIQ/101	WA4IZK/100	WB5VDL/120	WD8IPJ/102	WB9WAI/103
F3BR/107	OK2SW/156	VO2CW/168	K2WD/104	AA4KY/102	WA4YQS/105	KB6BW/103	WD8JAB/137	WD9DCL/115
HB9AOO/304	PA2TMS/237	5H3FW/123	W2INJ/101	K4CXY/217	WA4YVG/VQ9/100	W6EBR/122	KB9IS/101	WD9EWT/100
HC1HC/104	PP5UG/155	K1PCE/104	W2NJN/163	K4KUZ/102	WB4FLH/101	WB7QID/101	W9AFN/100	KØAL/100
I5HOR/109	SV8JE/104	W1LJ/165	WA2ISM/100	KA4CTZ/122	WD4CKS/121	WB7UAM/104	W9MEF/113	WBØJFF/113
I5JHW/118	VE6CBE/103	W1MQK/118	W3SUE/110	KA4P/131	KB5EI/102	K8ZZO/151	WB9EBP/185	WBØPVO/100
JR2HAE/117								

CW

DK7JI/102	JH7UJN/111	SM6INC/110	AB1J/105	W1LY/109	K4KKJ/100	W5ODD/104	W6SN/100	WD9DCL/124
EA7ALG/111	LA5HE/158	VE2DQ/108	KA1CB/101	W2NJN/102	N4HU/121	AA6O/101	WB6SHL/106	AGØA/112
ISØNZA/102	OK2QX/120	VE3JCV/110	N1ACW/109	W2ZY/102	W4RHZ/102	W6GO/102	N7CM/184	KØJPX/104
JG1QGT/112	OK2SW/117	YO2BTK/104	W1ILJ/107	N3MS/101	N5FG/109			

RTTY

W3FV

160 Meters

N4EA

5BDXCC

OK3CGP YS9RVE SMØGMG N8II W2HN DK5PD W1GL

Endorsements

Mixed

DJ1CG/326	KH6DL/250	YU3DM/292	K2BT/329	W3BBL/162	W4EEE/355	W5KFN/290	WB6GFM/151	AI9F/204
DJ5VQ/324	KL7H/260	YU3DQ/263	K2DT/145	W3JXH/311	W4JD/323	W5NUT/352	WB6SHL/146	K9FD/250
DJ7CX/338	LA3SG/241	YU3TUX/151	K2GLS/120	W3KH/250	W4LF/251	W5ZF/305	K7KH/223	N9EZ/143
DJØLC/212	OE1BFW/246	YU4HA/293	K2HVN/281	W3LPF/333	W4OYI/149	WA5EZQ/281	K7UT/252	N9UN/130
DK3FD/284	OH2LU/293	YU4VTU/263	K2JGG/299	WA3EEE/161	W4RA/268	WA5SUE/250	N7EG/136	W9FAM/155
DL1DA/205	OK3MM/351	YV5ANF/344	K2XA/304	WA3VUE/127	W4TJC/227	WB5TZZ/175	W7EEJ/199	W9FD/339
DL1ES/275	ON5KD/325	YV5CWO/314	K2ZRO/290	WB3FYL/127	WA4DAN/260	WB5YKD/127	W7JFO/329	W9HI/161
DL1LZ/263	OY7ML/301	AC1O/206	N2OU/140	AA4KT/251	WA4MIT/170	WB5ZDO/250	W7JYX/336	W9JI/190
DL6MK/320	PAØLOU/348	K1CC/280	W2CNQ/321	AA4KY/129	WA4ZEC/212	WD5BCY/164	W7LJ/317	W9LOF/202
DL7HU/348	PY2ELV/326	K1DP/225	W2FHY/250	AA4VK/270	WB4FJO/270	K6DZT/182	W7RO/161	W9RF/326
EA2HW/199	SM3RL/321	K1KTB/203	W2GLF/352	K4EJI/182	WB4PRU/241	K6UV/151	WA7CWM/161	W9TY/271
EA2IA/302	SM5AJR/263	K1PNS/209	W2GQN/341	K4FCT/227	WB4RUA/290	K6WR/345	WB7OUL/251	WB9RGA/255
EA3NA/290	SM6AYM/181	K1WJ/272	W2HAZ/290	K4GFH/220	WB4UBD/208	K6XN/205	AE8B/241	WB9SLV/240
F2BS/309	SM7QY/343	K1ZSI/310	W2HKE/200	K4JAF/201	WB4YHV/280	K6XW/332	AI8S/273	WB9YXY/252
F6DCQ/289	SMØKV/340	N1ACW/265	W2IQB/243	K4KH/177	WD4CKS/126	K6YK/279	K8IFF/330	KØALL/308
F9XL/200	SP3DOI/323	N1II/135	W2JB/315	K4KKJ/199	WD4IHV/240	N6ET/327	K8VFV/217	KØCS/252
G2GM/295	SP6BAA/179	W1CBZ/351	W2QXA/270	K4KPH/236	WD4IKI/126	N6TO/178	K8WD/150	KØRQF/231
GM3AWW/264	VE2AFU/272	W1EW/310	WA2AOG/225	K4KUZ/136	WD4RCO/180	W6BFW/296	N8TN/300	WØBL/328
HB9AHA/333	VE3BZ/295	W1HSP/226	WB2KPE/202	K4LTA/273	AG5X/202	W6BVM/340	W8CUT/346	WØJIE/140
HB9ANM/169	VE3GCE/120	W1JZ/326	WB2MIY/265	K4RPK/347	AK5H/140	W6GC/320	W8DMD/360	WØJIG/180
I2LAG/329	VE3OI/241	W1NG/323	WB2QAX/269	K4RZ/294	K5GK/232	W6GO/234	W8JQ/338	WØPT/316
I2VDX/270	VE4XJ/321	W1QV/294	WB2QMU/299	KB4BH/218	K5NV/233	W6NZX/275	W8PR/336	WØSD/329
IT9SEZ/319	VK3YL/337	W1SE/140	AD3R/131	KD4M/240	K5OG/243	W6SJC/141	WA8QEF/134	WØULU/150
JA1CZI/175	VO2CW/194	W1WEF/201	AE3T/310	KD4Z/180	K5TA/126	W6ZM/350	WA8UYM/129	WAØIDK/275
JA1PIG/PZ/239	XE1AE/348	WB1BVQ/142	AI3N/151	N4HU/267	N5CB/199	WA6OIU/270	WB8JEY/280	WAØJYJ/225
JA5PUL/281	YU1DZ/260	WB1GZE/152	K3CQY/112	N4KE/313	N5FW/274	WA6TKT/162	WB8TRW/147	WAØKDI/327
JA6CRP/199	YU2CAL/250	AA2F/161	K3NL/320	N4UH/310	N5IH/182	WA6WEI/189	WD8IXV/228	WDØFZJ/137
JA8TRT/128	YU2RQN/200	K2BLL/231	W3ABC/161	W4CLO/140	N5TC/229	WA6YQW/239	WD8NBD/196	

Radiotelephone

DJ1CG/316	I8JH/241	VE4IS/150	KB2AM/124	W3DR/140	WA4ZEC/212	KB6DJ/202	W7JFO/329	K9KA/322
DJ2YI/347	I8JN/303	VK3OT/231	W2BHK/255	W3YHR/263	WB4MTE/163	KB6V/199	W7JYX/336	K9UAA/240
DJ5VQ/267	IT9SEZ/311	XE1AE/348	W2CNQ/320	WB3ABS/182	WB4UBD/208	N6AFD/182	W7LJ/314	K9ZO/240
DJ7CX/310	JA5PUL/276	XE1JTR/158	W2GLF/352	AA4KT/240	WB4VNZ/127	N6MU/255	W7LXR/144	W9ABA/290
DJ9ZB/319	JA6CRP/189	YV5ANF/344	W2GQN/338	AA4VK/270	WD4AAD/153	W6GO/218	WA7DRP/300	W9KB/304
DK9KD/242	KC6GF/178	YV5CWO/314	W2HXF/220	AK4T/139	WD4IHV/212	W6ILH/243	WA7JUJ/120	W9WHM/353
DL3NE/165	KH6JEB/241	ZL1BOQ/201	W2IQB/202	K4ONF/252	K5GK/228	W6MFC/250	WB7CEH/126	W9ZTP/150
DL3VX/272	KL7H/250	K1KTB/203	W2ULO/142	K4PI/284	K5IH/255	W6USG/320	WB7OUL/244	WB9SLV/168
DL7HU/344	LA3SG/178	K1ZSI/296	WA2AOG/187	KD4M/240	K5OG/216	W6ZM/345	AI8S/270	WD9CLQ/169
DL9DY/316	OA4JR/305	N1ACW/259	WA2CBB/184	N4BHJ/126	KB5AC/164	WA6DTG/242	K8AQ/316	WD9FOE/125
DL9VS/305	OE1BFW/239	W1HSP/193	WA2HVZ/145	W4BBL/311	N5IH/179	WA6OIU/262	K8IFF/326	KØALL/260
EA3AOC/250	OE1BKW/129	W1NG/294	WB2EZU/240	W4JD/220	W5URN/129	WA6PJR/199	K8VFV/216	KØGSV/241
EA3KW/250	OY7ML/253	W1VKO/159	WB2KPE/200	W4EEE/355	W5VVD/172	WB6TDY/125	K8WD/150	KØIUC/269
F2BS/307	PY4KL/343	W1VRK/238	WB2MIY/264	W4RA/265	WA5EZQ/273	WD6DLK/180	WD8BSX/199	WØPEL/173
G5AFA/325	PZ1BK/168	WB1DQC/235	WB2QMU/292	W4SME/181	WB5KSU/149	K7FE/236	WD8MKL/219	WØULU/150
HB9AHA/326	SMØAJU/236	K2GBC/291	K3HP/211	W4TJC/227	WB5LZG/204	K7KH/171	WD8NQE/180	WØUQD/304
I2LAG/329	VE2DZT/177	K2GLS/120	K3MA/205	WA4NIB/280	K6WR/344	K7UT/250	K9EHA/224	WØYMH/204
I2OMF/240	VE3HZH/140	K2JGG/286	K3MWV/271	WA4OIB/162	K6XN/188	W7AE/272	K9FYZ/259	WAØKDI/307
I5KKW/268	VE4BJ/281	K2SGH/239	KB3HE/141	WA4PLR/200	K6XW/322	W7ELU/276		

CW

DJ7CX/214	F9XL/134	ON4QX/251	VE3BX/220	W2MD/209	W4DZZ/146	N5TC/133	WA7RQS/124	W9TY/239
DJØLC/141	I1YRL/171	OZ7BW/247	YV1OB/127	WA2EYA/130	W4JD/139	K6YK/227	W8RT/249	KØDEQ/177
DL1LZ/181	JH1NMO/212	PY2ELV/230	AC1O/202	WB2KXD/182	W4WJ/222	N6MU/152	W9FD/200	WØRJU/158
DL6MK/152	JA8TRT/125	PY2KN/160	W1NG/269	WA3GJZ/168	WD4IHV/143	W6ID/224	W9KB/226	WDØFZJ/128
F6DCQ/229	KL7H/180	SM6AYM/181	W1WA/167	K4PI/282	AG5C/124	W7EEJ/159		

DXCC Notes

Annual Listing Correction

Correction: cw, W6ID/100 should be 200.

Rule 9 Implementation

A decision to implement the rest of DXCC's new rule 9 has been made. Beginning April 1, 1980, those now having less than 250 countries credited on their present DXCC's, from a former location who made DXCC before February 1, 1978, can transfer their DXCC credits to their present location.

Those who made DXCC before February 1, 1978, from their present location can submit cards for DXCC credit for contacts made from a previous location or from a call formerly held from a previous location.

Those submitting applications before April 1, 1980, under this completion stage of the new rule 9 will be rejected and returned and asked to resubmit after April 1st. *Please* do not submit until April 1, 1980.

The DXCC note in the December 1977 *QST* regarding new DXCC awards still applies. QST

The World Above 50 MHz

Conducted By
William A. Tynan,* W3XO

WARC and the World Above 50 MHz

The 1979 World Administrative Radio Conference (WARC) is over and the results are in. As in the rest of the spectrum, Amateur Radio fared well on the vhf and higher bands. The full story appeared in February *QST*. Naturally, not everything came up roses, however, There was no progress in obtaining 6-meter privileges for our European and African brethren. We appear to have gained some new sharing partners on the 1-1/4-meter band. It was clear, even before the Conference that the VEs were going to lose 420 to 430 MHz. Gone is 1215 to 1240 MHz. But that's about the extent of the negative side of the equation. On the positive side, we retained the status quo with respect to the rest of our assignments and stand a good chance of obtaining a new band in the 902- to 928-MHz region. That, of course, will have to await FCC action. The assignment, as stated in February *QST*, calls for "FIXED, Amateur, Mobile and Radiolocation" (radar) in Region 2 (North and South America). *Mobile* can mean police, fire, taxicabs or CB! *Fixed* means point-to-point such as studio-to-transmitter links and similar services. Just how the Commission decides to apportion this slice of the radio spectrum remains to be seen. What it does may well depend on what we, as amateurs, recommend and how good our arguments are. Your League will certainly be submitting proposals, and your ideas on what these proposals should contain are most welcome. Here are a few facts and questions which may help stimulate your thinking.

In this hemisphere, the 902- to 928-MHz band is designated as a range in which Industrial, Scientific and Medical (ISM) operation is permitted. This means that any service also allocated in the band must be prepared to accept any interference that might arise from various types of rf heating devices. In addition, we all know that FCC is seriously eyeing this part of the spectrum for a new CB band. How wide should such a CB band be, if indeed there should be one? How much space do we amateurs need in this part of the spectrum? That certainly depends on the use which we intend for the new band. Should it be primarily an entry-level microwave band on which simple equipment such as modulated oscillators would dominate? Should it be principally used for fm repeaters like the upper portion of 70 cm? Do we need a weak-signal slice in the band? How much space should we devote to this mode? Maybe ATV, which is hard-pressed for space on the 70-cm band, should find a home here. You will probably have many other ideas. Let's hear what you think. I'll pass your inputs on to the ARRL Plans and Programs Committee, which is studying the possibilities for use of this band in conjunction with the appropriate advisory committees and the staff. (Minute 41, page 66, March *QST*.)

Probably one of the greatest gains achieved at WARC was the allocation of space to the Amateur Satellite Service in a number of our bands above 1240 MHz, on the same basis as the 435 to 438 assignment. This means that, for the first time, new amateur satellites can be built using frequencies much more suitable to satellite operation than is the case with present and past "birds." On these higher frequencies, problems associated with conflicts between satellite operation and other amateur activities should not exist. What combinations of uplinks and downlinks should be used in these amateur satellites of the future? I am sure that AMSAT would be interested in your opinions. Note, as stated below, that some of the new satellite allocations are designated as uplinks (earth to satellite), while others are authorized only for downlinks (satellite to earth). Still others can be used either way. Another point to consider is that a harmonic relationship between the uplink and downlink frequencies usually causes trouble, either at the satellite or for stations on the ground, depending on whether uplink or downlink frequencies are lower. It has also been the experience in the past that trying to have uplinks and downlinks too close to each other has led to problems. Possibly, this should be less serious in the microwave bands, where filters are not so heavy and bulky.

Another question we might wish to consider is related to satellites and their possible influence on our terrestrial operations. Note that the new frequencies allocated to amateur satellites are 1260 to 1270 (uplink only), 2400 to 2450, 3400 to 3410, 5650 to 5670 (uplink only), 5830 to 5850 (downlink only) and 10.450 to 10.500 MHz. Would it not be a good idea to coordinate our weak-signal terrestrial work so that it occurs on frequencies adjacent to the satellite bands? In this way one piece of equipment could serve for both applications. What about our current operation at 1296 and 2304 MHz? Those particular spots were selected for serious weak-signal work because of their harmonic relationship to 144 and 432. But in these days in which mixers are supplanting triplers for getting from one frequency to another, it doesn't seem quite so important to maintain this relationship with the lower bands. I am sure that your thoughts on this will be welcomed by the Plans and Programs Committee in their band-plan considerations.

Another important provision of WARC is the allocation of Amateur and Amateur Satellite bands well up into the GHz range. In addition to the 24-GHZ assignment, which we already had, we picked up bands at 47, 75.5, 120, 142 and 241 GHz. Thus, we have the green light to continue our upward march in frequency and related advancement of techniques that have typified Amateur Radio since our beginning.

WARC has given us, who populate the world above 50 MHz, what we have been needing — stability in the form of frequency allocation that we should be able to count on for the remainder of the century. How we use this valuable resource is up to us. Your League and this column stand ready to help in any way we can, but to be effective we must have your reports of success or failure as well as full-length articles on your latest preamps, transverters, antennas and the like. There is a great opportunity ahead. Let's make the most of it.

CONFERENCE SEASON COMING UP

With spring, a vhf man's (or woman's) fancy turns not only to putting up new antennas and improved DX, but also to the new round of vhf conferences. Leading the pack will be the 25th Annual West Coast VHF Conference, to be held May 9 through 11 at the Miramar Hotel, Santa Barbara, California. This silver-anniversary conference will feature technical- and operating-oriented sessions for beginners and advanced vhfers, plus the traditional noise-figure and antenna-gain measurements.

One highlight will be a program featuring some of the key participants in the historic vhf/uhf propagation of 1979-80, which included spectacular worldwide 6-meter openings, the Vermont-to-Texas tropo of September 1979, and the first 70-cm contact ever between Hawaii and the U.S. mainland.

The event opens with registration at 6 P.M. Friday, May 9, followed by a full day of technical sessions starting at 9 A.M. Saturday. After Saturday's dinner break, Louis Anciaux, WB6NMT, will coordinate the noise-figure measurements. Sunday's highlight will be an on-the-beach antenna-gain competition on 144.05, 222.0, 432.1 and 1296.0 MHz.

Preregistration fee for the conference is $4 until May 1. After that, and at the door, it's $6. Registration forms, hotel information and further details may be secured from Wayne Overbeck, N6NB, the conference coordinator, at 5818 Woodlake Ave., Woodland Hills, CA 91367. An s.a.s.e. would be appreciated.

The weekend of May 17 and 18 features the Eastern VHF/UHF Conference. This year's affair will be held at the Sheraton Inn, Rtes. 495 and 111, Boxborough, Massachusetts, beginning at 9 A.M. A full program of technical talks will be held as usual along with noise-figure measurements for 30 MHz and up, and possibly an antenna-gain competition on 70 cm. An s.a.s.e. to Joe Reisert, W1JR, 17 Mansfield Dr., Chelmsford, MA 01824, will bring further details.

In August, we can look forward to the 1980 Central States VHF Conference in Colorado Springs, Colorado and in October it's the Mid Atlantic VHF Conference held in Pennsylvania each year by the Pack Rats. Additional details on these and other doings will be carried in succeeding columns. I hope to see many of you at one or more of these very worthwhile events.

ON THE BANDS

6 Meters — It is sad but true that, as this is being written just prior to mid-February, the marvelous conditions that prevailed in late autumn have disappeared completely. In fact, as far as this part of the world is concerned, except for an aurora January 28/29, and a simultaneous strong Florida-to-South America opening, there has been nothing since mid-January. This is despite solar flux readings hovering around 220, and "A" Indexes in single figures. During that Florida-to-South America opening, HC1JX reports that he hooked up with 20 Florida stations plus an XE and a KP4. Very good signals were in for about an hour beginning around 0200 UTC. Many expected

*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730, or call 301-384-6736 and record your message.

something to happen on the north-south path on the following morning, but nothing materialized. The lack of good conditions has been very strange and disheartening. It has been particularly disheartening for E16AS, who received permission to operate on 6 meters on January 16. As of this writing, Al has yet to work anyone. Another disappointed vhfer is TF3SG, who was just getting started when conditions collapsed. Sveinn is particularly sorry that he has not yet worked W1JR, as it was Joe who convinced him to try for official permission and to assemble the necessary equipment for 50-MHz operation. Naturally, there are many of us poised to put Iceland in our logs if, and when, favorable conditions return.

Apparently not all parts of the world are suffering the dearth of 6-meter propagation to the same extent as those of us in North America and Europe. WB3HZC, who operated as 8P6JJ for about 10 days in mid-January, noted many TE-type openings to southern South America. On the evening of January 15, Roger worked LU6DCA, LU3EX, LU6DLL, PY1RO, PY1DMQ, PY2XB, CP8AZ, HC1BI and HC1FM (the latter station's first 6-meter QSO). The 620B and 3-element beam used were left with 8P6BN so that either he or 8P6FV can supply Barbados QSOs to those who need them, whenever conditions permit. That country can be worked on Es during the summer, as witness the many contacts provided a few years ago by 8P6EN. But, there are many new people on the band who weren't around while he was active, so the new 8P6s should be popular indeed.

Other tantalizing DX tidbits being worked in other parts of the globe include a link-up at 0620 UTC, February 5, between JA3EGE and Sri Lanka station 4S7EA. In addition, PY2XB reports three contacts with IR6RRD, Okinawa, around 0200 UTC on January 31, February 4 and February 11. Sao Paulo and Okinawa are approximately on opposite sides of the earth from each other, so you can't get much better DX than that! Fred says his beam heading was southwest, toward EU, at the time of these QSOs. Also from PY2XB comes word that PPØMAG, Trinidade Island, off the coast of Brazil, has been working into South America and the Caribbean about 2300 UTC on many evenings. He has been running a 1-watt rig supplied by PY2XB and antenna lent by PY1RO, but it is understood that he has a small amplifier and will be on the island until about mid-April.

Many have asked about QSLing HP1XRK. This is the new Panamanian call for KZ5JM. Jim's QSL manager is K1RQ. If you prefer to QSL direct, his address is Jim Miller, PSC Box 790, APO Miami, FL 34002. In addition to himself, Jim informs me that HP1XDS is also active. Another station for which many have been seeking QSL information is CP8AZ. Address for Darrol is P. O. Box 64, Riberalta, Beni, Bolivia, South America. Those awaiting cards from KZ5NW/HP2XPW are asked to be patient. Manager WB6PTI has run out but more are on order. Incidentally, Phil is now signing WA6GKJ/KP4.

WA6HXM informs me that, despite what was said in a previous column, he has not yet worked EI2W. He came close, but others butting in to help relay reports apparently fouled things up. Pete makes the very valid point that such "help" is no help at all. How can anyone claim credit for a contact when all the pertinent information was relayed by other stations? This kind of thing is heard all too often on the ht bands, but let's not start it in the world above 50 MHz. Speaking of EI2W, Harry sends along the following information concerning his 6-meter operation. He began on October 20, using an FT-620B kindly lent by South Midlands Communications Ltd. of Southhampton. The antenna is a 3-element Yagi. The first station contacted was VE1AVX (who else?); Bob had the most consistent signal from across the pond. Through the end of December, a total of 1552 QSOs with approximately 600 different stations were completed. All U.S. call areas, along with VE1 through 4 and VO, were represented. Also worked were KP4 and KP2 (KV4) as well as XE1FE. Harry's best day was November 18, when 106 stations were contacted. Other good days were November 20, when 70 stations were worked, and December 11, when 83 went into the log. On December 15 the mut rose to 62.25 MHz and 72 6-meter stations were worked including KØSFH, Kansas, running just 3 watts but, nevertheless, putting in a 5X7 to 8 signal. Although Harry had to return the original 620B, WA6GYD has purchased another one and shipped it to Ireland along with a 120-watt amplifier donated by WB6NMT of Lunar Electronics. EI2W's permit is still in force, so all we need is the return of suitable conditions. Harry states that he will look for 5s, 6s and 7s between 1545 and 1745 on any days the band is open. He asks that others not call him during those times unless he indicates otherwise.

2 Meters — With increased aurora and some pretty good wintertime tropo, 2 meters has begun to hold its own again in contending for our time and attention.

Holders of 50-MHz WAS[1]

WØZJB*	K7BBO	WAØSBZ	KØJC
WØBJV*	K6ZXS	K5OOJ	KB8DE
WØCJS*	K7MUR	WA7UJH	WL7ACY
W5HN*	WB6WAG	WA7EPU	WACNL
W9ZHL*	W7FN	WB9HHW	W1BOM
W9NJT*	WB6IMV	WBØPVM	K9KB
W6OB*	WB6OKK	K6YK	WA3NZL
WØINI*	K7ZOK	K3MWV	WBØVYV
W1HDQ*	WA6OLE	WB5DSH	WA9BTT
W5MJD*	W6PO	WA7VIS	W5BXA
W2IDZ	K7JJU	AB6H	WBØTEM
W1LLL*	K9BDJ	WB7EAX	WA8MOA
WØDZM*	WA5FPS	N2ASC	N7EG
WØHVW*	K6IBY	WB7TOV	KBØGR
WØWKB*	K6QAX	WA2DPU	WB5CXF
WØSMJ*	WA6OZC	W3ILG	K6QXY
WØOGW*	WA6HXM	W8WQP	K1BXC
W7ERA*	K7CIN	WA6BYA	W8GZ
W3OJU*	WB6NKO	K6KLY	K1JRW
W6TMI*	WA7CGS	WA1UQC	WA4LJO
K6EDX*	W7ZBS	K1ZFE	KØUDZ
W5SFW*	WA7FLB	WA7LYI	K2KLP
WØORE*	WB6HOU	W5XO	K1MNS
W9ALU*	WA6AOX	N5WM	W5EU
W8CMS*	WB6BMB	WB8IGY	WB8VYF
WØCY*	K6QHC	W1FZ	W7ABX
WØCNM*	WA6BOE	WA8OGS	KØWM
W1VNH*	WB6UWY	WB5JAR	WA8MPW
WØOLY*	WA6KLR	W3XO	K8WW
W7HEA*	K7GWE	W7DVB	WB9OPD
KØGQG*	WA7BJU	K6KSY	WB8GEU
W7FFE*	K7TUO	W7KMA	WB5CZS
WØPFP*	WA6NRV	AE3T	K8PHE
W6BJI*	WB5CNZ	NØLL	WØIBL
W2MEU*	K5HVC	W5TIH	K1ZKR
W1CLS*	WA7ECY	K3OMX	K9VNM
W6PUZ*	WA7RTA	K4VPK	K9XY
W7ILL*	VE7AFB	WA3DMF	WA3AXV
WØDO*	W6SMS	K8EFS	K2BWR
K9DXT*	K5CM	WA5LIG	K1DH
W5BAZ*	W7INX	WØSI	W6BWG
VE3AET*	W6DPD	K8WKZ	K7IEY
W9JFP*	WA5IYX	K1IKN	W8OJN
WØQIN*	W6KQG	VE1ASJ	WB7PKD
WØWWN*	WA6JUD	W1EJ	K7WXW
K9ETD*	WB6VIN	KØILB	WB4RDT
WØFKY*	K7KV	WB8GEW	K4CKS
W8LPD*	K6DYD	KA4AOK	K1FO
WØZTW*	WB6NMK	W7HR	N6BFG
W6GCG*	K7YAG	VE4AS	W9JMS
W2RGV*	K7YAE	WB8NWY	WA8NTT
W1DEI*	W5TRB	WB8GEX	W2EIF
W1HOY*	K7OFW	WB8BKC	KA5BIY
W6BA	WB6HDB	K8HFX	W5EUB
W1SUZ*	K7NN	WØRGU	K1GPJ
W1AEP*	K7PXI	W7FIV	KAØCSI
W5LFH*	K7DVK	WØADE	W7KFS
W6NLZ*	WA5VHN	KØALL	WA9KGQ
W7MAH*	K5ZMS	W7UGK	AL7C
W2BYM*	WA5HNK	KØSE	KØWLB
W7ACD*	WA9DOT	WBØJTH	K7HRW
K6PYH**	K7DBR	K4ROM	K8REG
W4HOB*	K7VNU	WBØZKG	W2BOC
KØJJA**	K6ITZ	W2UTH	WA8FMD
K6RNQ**	WB7DBP	K5UGM	WA9FGC
W9QWT**	WA7JEI	VE1AVX	WA9EZI
W6EDC**	N7DB	WB5KTC	WA8ONQ
K6VLM	K7GSE	WB2RYY	WBØYOS
K6GOX**	WA7JTM	WA1EXN	N3AHI
WØEDM**	W7ZSL	WA9KUS	N9RS
W9JCI**	WA6SXM	WØRWC	W1KZS
WØLLU**	WA9HUX	K3DUA	W9NFE
W7RT	W7FU	WDØFDZ	K8UNV
W7RDY	K6DTR	WB9YAI	WB5LUA
W6KIN	K5GE	W7HBH	W9UD
W6OKR	WB5CHW	K9SM	WB6LBR
K6GMX	W6XP	WA4HFN	WB4SBU
W7DYD	WA7RIB	KØTLM	K2SGX
K6ZEE	N5KW	W4EOR	W2CAP/1
K6HCP	WB5WLK	WB8WXZ	K8RZB
K6YIL	WB8BGY	WA7TDU	WA1NGR
K6GMV	W7XF	W3JMY	WA1KYH
K7BAG	N5KK	K6SVL	WA1RFA
W7ZOW	W5HA	KS4J	K3NFV
W7ZPS	N6HZ	W5KHT	WA2BPF
K6EPT	WA6MHZ	WA9GBP	W1JR
K7KHU	WA9PKL	WA6GYD	KAØAYN
K5SW	W6YKM	W8UCI	K9LHA
WA7FPO	WA9AHZ	W5FF	WA9ETW
WA6HXW	AE9M	K5FF	WB4ROR
W6NIT	K9HMB	VE7SL	W6DMJ
K7ICW	WBØPKN	K1TOL	WA5OLT
K6EJO	WA8EOW	K7GGJ	WA2AWX
W6NLO	N6CT	WDØAWG	WA4LOX

[1]Listed in chronological order beginning with award number 1.
*48-State WAS
**49-State WAS
All others are 50 states.

One report of what the band has had to offer comes from K9EFX, Indiana. On January 15, John caught a good tropo session, for the time of year, and came up with two new states in the form of W4GJO, Georgia, as well as WB4VVF and WD4GSM, Virginia. During the evening of the 28th (29th UTC), he made hay with the very fine aurora, also reported by many others. On this occasion K9EFX picked up five more new states, bringing his total to 20. Altogether, 13 stations from Massachusetts to Nebraska went into his log. Another reporting success in this same buzz session was VE3FN, Ottawa. Among a number of other QSOs, Ray completed a contact with KØSE, Minnesota, at about 820 miles, his best aurora DX to date. Also worked was W2AZL, New Jersey, on 70 cm. Aurora contacts on that band are always news.

DXCC on 2 meters? No, not yet, but I4EAT is more than halfway there. Fausto lists 53 countries worked, all confirmed. Only W and VE were via EME, but a number were contacted via the moon in addition to other modes. One very good catch, ZS3, was contacted on TEP/FAI, and another, SV, was apparently via the new mode reported last year by K4GFG. I4EAT is especially interested in EME skeds. Address is Fausto Minardi, Via Cantagalli 18, 48018 Faenza, Italy. Telephone number is 0546-620124.

I would appreciate hearing from others with particularly good 2-meter DX totals. Publication of such information is one way of demonstrating that vhf is not a local proposition.

The latest to join the 2-meter WAS ranks is W8IDU. Art made the grade via EME with K7WUP, Utah, for state number 50. Another moonbouncer who doesn't have far to go is WB4EXW. Watson needs only Utah and Wyoming and was skedding K7WUP as of the end of January. He says that the new 160-element collinear and shack-located controls are a real help in working stations, compared to his previous four-Yagi-array system with "armstrong" aiming.

After many years in which various people stated intentions, it's finally happened! WA6NNE informs me that a Bay Area organization known as NBC (Narrow Band Communications) has constructed and placed into operation a 2-meter linear translator. The unit, designed by WB6JNN, has its input at 144.52 and its output at 145.12, with a 10-kHz passband. Power output is temporarily 100 milliwatts, but soon more power will be available and the translator will be moved to a more lofty QTH than its present 800-foot elevation. Among the other advantages demonstrated is the unit's ability to relay two ssb signals simultaneously.

70 Cm — At the rate things are going, 70 cm may be the first band above 30 MHz that DXCC will be accomplished on. Every issue of the K2UYH *432 EME Newsletter* carries tidings of new stations achieving moonbounce capability. In the DX realm, the latest include OH3TH, with eight F9FTs, OK3CTP, who has an array of 16 F9FTs and a BFT-66 preamp producing 13 dB of sun noise, and OE6AP who, in company with OE6RM, OE6HS and OE6TH, has set up a system of four J Beams with which they have heard K2UYH. From Canada, VE4MA reports that VE4ABF has an array of eight 15-element Quagis. In this country, K9KFR has put Indiana on the EME map with 16 19-element RIW Yagis. In his first month of operation, Bob worked 20 different stations. From Montana, W7JF is keeping busy making his state available. Ready to go from Nebraska is WBØYZS with an array of 16 homebrew copies of the new RIW Yagi. Jim's system includes capability for polarization rotation. Iowa should not be hard to find when KAØY, formerly WBØZXU, gets his fully steerable 40-foot dish into operation.

The latest to come up with WAC is DL7YCA, who nailed down his last continent by completing a QSO with VK5MC. N4CD, Lynchburg, Virginia, writes concerning those skeds he has been running over a 460-mile path with WB2BXP, Schenectady, New York, mentioned in the January column. Bob notes that with the power and antennas involved, they can't make the grade unless there is some tropo enhancement. They observe best results when a front lies parallel to the path and about 100 to 300 miles to the west. The passage of any front across the path wipes out the signals, however.

23 Cm and Down — A letter from K6ZMW provides an update on his 23-cm activities. Joe is now running a pair of water-cooled 7289s, a la WB6IOM, and is getting 200 watts out. This goes through 90 feet of FoamFlex to a modified 6-foot uhf TV dish mounted at 70 feet. Polarization is right-hand circular. Receiving is aided by a 3-dB noise figure, 30-dB-gain preamp consisting of cascaded HP-21s, mounted at the antenna. With that very impressive setup, skeds are being run with K7GNV, near Phoenix, each Tuesday and Thursday evening between 1930 and 2000 PST. Others who desire skeds may call K6ZMW at 213-539-8790. Joe also reminds us that WB5LUA is collecting information for a 23-cm roster. Anyone on, or about to get on, should send Al an s.a.s.e. for the forms. Address is Albert J. Ward, Rte. 2 Box 65A, McKinney, TX 75069.

A new East Coast station on the band is N3AHI, near Allentown, Pennsylvania. Jim has 3 watts of cw to a 27-inch dish. Best DX to date is WA1NGR/3, Delaware.

Straight Key Night

Something old, something new . . .

By Bill Jennings,* K1WJ

Joe comes through again. "SKN — just like the enjoyable QSOs of the '20s and '30s."

An interesting New Year. A lot of noise about the start of a new decade, a fresh start, wiping the slate clean, all the 70s are behind us, etc. The 1980 New Year's running of Straight Key Night was a time to pause and think of what the 1980s will bring for us as radio amateurs, but just as important, SKN was a time to reflect on times gone by — that first QSO as a Novice, your hand shaking so badly that you could barely tap out the code characters . . . Friends, some now lost to us forever, whose fists were every bit as recognizable as their voices . . . That link with wireless pioneers, who also sat and manually formed those same Morse code characters in their own style . . . SKN — the meeting place of past, present and future.

The latest running of SKN brought in a grand total of 155 individual reports. A whopping 1332 QSOs were reported and 908 different call signs were found in the logs. Besides W and VE, 15 other DXCC countries were on and worked during the SKN. They included; DJ, G, HB9, HKØ (San Andres), JA, LA, OH, OZ, PAØ, SM, TG, XE, YO, YU and YV. In fact, we only needed an African QSO in the logs to have made WAC (worked all continents).

In the "Best Fist" competition, tied at five votes apiece were VE3BIA and W9TG. Good show! Other multiple vote getters in this category were: at three votes each — W1AW (W1RN, opr.), N8FB, W8IRT and WØAP. Two votes each for N1CC, WB1EKI, WB1CEG, K2LY, K3NCO, K4HDV, N4CD, W6IO, W7ITJ and WA9ZBW.

The "Most Interesting QSO" honors are, again a shared proposition, with W5WE and WA7NXL each being nominated three times. VE3FXX, AA4MK, N4CD, K7CI and W8SS each received two votes as having been involved in the "most interesting QSO."

Time for a few lines of verse from the poet laureate of SKN — George, W5JOV:

In this old world of hurry up
It's hard to pause for "just a cup."
But Straight Key Night finds extra time
To QSO then make a rhyme.

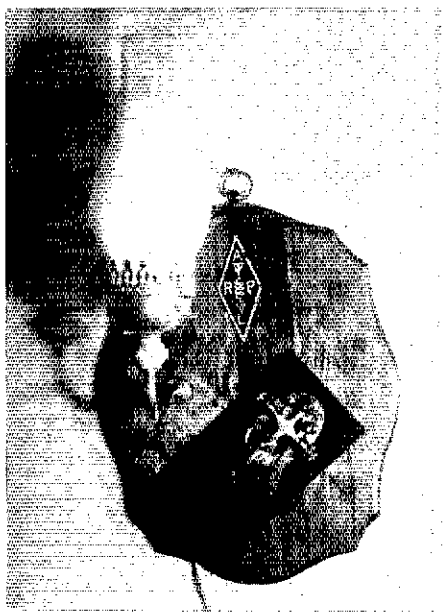
It's Jerry, Bob and Art you see
Who make it so much fun for me.
And you, my friends, take special part
For Jerry, Bob and also Art.

Hunt, KØHT, calls his poetic effort "CQ Doggerel X-Ray":

I entered the shack filled with fear
And sat down trembling in front of the gear.
I bit my tongue and got a hold on myself,
Took the rusty key from the dusty shelf.
The band was alive with a sonar ping,
It made my head ring and ring.
Phone operation is more my style,
So I think I'll wait for a little while.
Give me time and I'll jump right in,
CQ, CQ, SKN.

Key Clix

I enjoyed the "contest" and will be in there next year if my rig and arm are still working. Several of the SKN participants sounded as though they were QLF, and I thought that one chap was sending in a "foreign" code (W5WE). It was a good feeling to hold a key again. It reminded me of when I was being tested with the examiner sitting down and watching every letter sent (N9YL). My advice to anyone thinking of joining in on his first SKN is to practice with a straight key *before* SKN. Maybe your wrist and arm will hold up longer (KF6A). I will be looking forward to my next SKN. I would encourage everyone to try it. It's a change from the pile-ups, chasing DX or working break-in on a traffic net. It's a relaxing type of QSO, which is going to cause me to be on the cw bands a little more than in the past (W9VAJ). . . had my best QSO with XE1FR. It was his first straight key QSO in 40 years. He was using the key that he got with his first rig in 1930! I am 17 years old and SKN is my favorite operating activity (NØBGI). . . I found that my shortest QSO was 31 minutes . . . I don't like to work contests so you can see I must fully put in my two cents for SKN (KA3BTX). I pounded the old brass for so long that the color of my straight key went from shiny brass to black and blue! The spirit of SKN lives on in this shack (KA4HLI). I used three different keys, a heavy pre-WW II brass job, a WW II German number, made of cheap plastic and pot metal (very easy to use), and a 1906 Manhattan Supply Co. telegraph key, which the other ops all liked best (W8IRT). Another Straight Key Night safely shielded from the revels of Baccus, and I had a ball! (W5NZ/3). I use a straight key all the time and can send about 22 words per minute. Is this fast? Maybe the readers of *QST* would be interested in the world record for sending on a straight key. (What is it? I don't know.) (WB7VLC). [We don't know, either. Any thoughts on this? — Ed.]. What!! no sideswipers, and not even anyone with a "tuna-boat-swing". . . What is the ham world coming to?? For shame (W7TO). Just before Christmas I was rummaging through a box of odds and ends looking for a repair part. The repair part was never found but the old key used in learning the code back in the twenties turned up. Many memories were brought back, some sad for friends now silent keys, happy ones of many enjoyable hours on the air, helping hands when needed and helping when I could, etc. The key had lain unused for over 20 years but with a quick clean up and adjustment the key was ready to go. Go it did, for about seven and a half hours of SKN operation, broken now and then with spelling lessons for a rebellious arm and fingers (W4ST). Boy, what a thrilling day. Someone said "I like your sending better than that of an electronic keyer." Then W4ZD called and said he had heard me, checked *QST* to find out what SKN meant. He had to make an adaptor to plug his straight key into his rig. Then he tells me that this is the first use of his straight key since 1949. Gosh! What a compliment! (W7ZMD). Re the "SKN" article on page 95 of the October issue of *QST*, the photo of K3FR's Bunnell key raises a question in my mind. I believe that key was not classified as a straight key, but as a "sideswiper" whose horizontal action is entirely different from the vertical motion of a straight key. I made my first sideswiper in 1925 from a hacksaw blade and later acquired two Bunnells — one a heavy duty job with heavy contacts. Wish I still had 'em (K4RF). The sound of a straight key is, to me, like the sound of an important movement in the "great symphony of life" — a "largo" movement, I think (N8LA). QST



Poundin' the brass is sometimes said to brighten our lives. W3CEI takes it to the limit with this dandy lamp, which was built several years ago by Larry's dad.

*Communications Assistant, ARRL

Results, 10th Annual ARRL 160-Meter Contest

Who would have guessed that the sunspot maximum would help produce the biggest scores ever on 160?

By Tom Frenaye,* K1KI

Many people figured that the 1979 ARRL 160-Meter Contest would suffer from the high solar activity during the sunspot maximum. Not quite so! In fact the weekend was blessed by relatively low noise levels and at least average conditions. Add to that increased activity from all parts of the country and a dozen new Division records were set (more than in 1977 and 1978 combined).

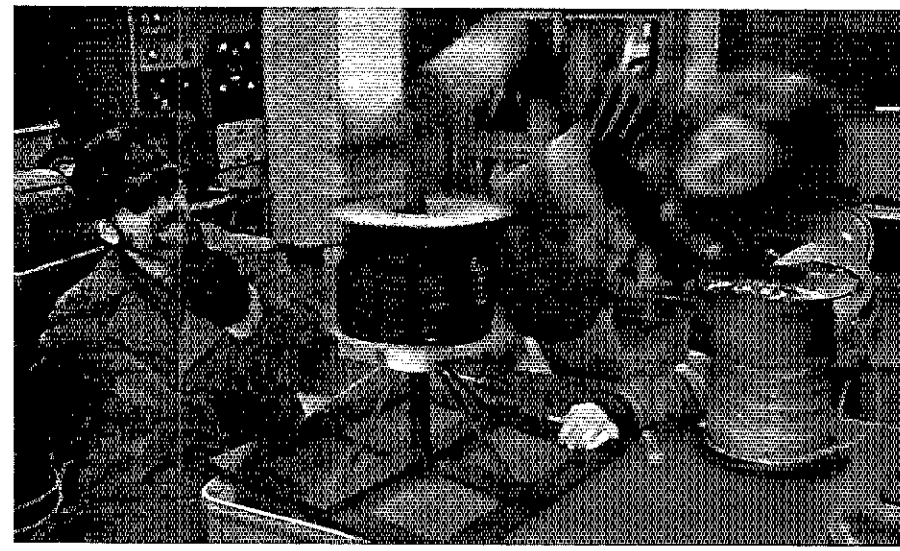
The total number of logs received was up slightly to 382. The top-scoring stations had QSO totals into the 700s this year, compared with the 500s in the 1978 contest. Those most successful in hunting multipliers were W8JI (multiop) with 90, W8LRL with 87, W9ZR at 82 and K5NA who captured 81. W8LRL even snagged country number 147 with UA1DZ (watch for Russian stations just above 1850 kHz). Last year no one broke the 100,000-point mark, while this year the average top-10 single-operator score was 101,201! Both W8LRL (single operator) and W8JI (multioperator) smashed previous all-time records, and by substantial margins, though second-place stations were not far behind.

Top scorers from the West Coast were K6SE, followed by N6RZ and N7DD, with QSO totals in the 400s. JA3ONB reports hearing W4EX, W8LRL, W8JI and K8XR, in addition to having many successful QSOs from west of the Mississippi.

Observance of the traditional "DX window" from 1825 to 1830 kHz was rather dismal, with many complaints from all portions of the country. It appears that with the number of newcomers to 160 meters, the pressure for more room is growing. Encouraging results from WARC should lead to some relief in both power and frequency restrictions for W/VE amateurs as Loran is phased out. See February *QST*, page 55, for more details.

For the second year in a row, KØPP/7 claims the number-one spot in Montana, helping many toward a WAS.

Jack, K4CNW, nailed down the sixth spot in the top 10 with the help of his 90-foot vertical.



W8ERD (left) and K1LT leisurely roll up 1000 feet of coax feeding one of the W8LT Ohio State University Beverages. *(K8ND photo)*

*Assistant Communications Manager, ARRL

Division Leaders

Single Op	*Division*	*Multiop*
VE3ABG	Canadian	VE2OJ
*K3WW	Atlantic	K3SXA
*W9ZR	Central	W9AZ
KØPK	Dakota	*KØDD
N5AN	Delta	*K5GO
K4FU	Great Lakes	*W8JI
*W2IB	Hudson	WA2YEI
WAØTKJ	Midwest	KØDI
W1PL	New England	N1RI
W7NCO	Northwestern	W7IXZ
*N6RZ	Pacific	—
*W8LRL	Roanoke	K4ADI
*KØRF	Rocky Mountain	*WØMS
AI8H/4	Southeastern	N4BP
K6SE	Southwestern	—
*K5NA	West Gulf	*KØJPX/5
AA7A/VP2A	DX	—

*New Division record

Top Scorers

Single Operator

W8LRL	130,674
W9ZR	123,082
K3WW	110,200
K5NA	98,901
W2IB	95,394
K4CNW	92,929
KØRF	92,340
K4FU	91,980
N8EA	89,700
WØAIH/9	86,814

Multioperator

W8JI	124,290
KØDD	121,581
K5GO	106,626
WA8SJX	95,985
W8LT	92,130

DX

Asia	JA3ONB
Europe	EI9J
North America	AA7A/VP2A
Oceania	ZL1ADI
South America	YV1OB

FEEDBACK

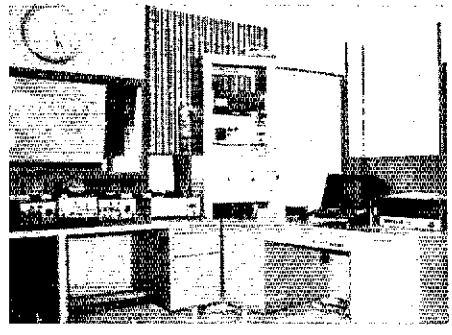
A few errors crept into the results from last year's contest. K9ZUH should have been listed as a multiop effort. Both OK1ATP (84-14-6-3) and K3UA (28,294-301-47-13) were overlooked when the scores were typed.

SOAPBOX

Conditions were fair considered with those last year when no QSOs were made. Outstanding signals from K5NA (EI9J). Must thank grandma for letting me use her 100-acre farm and facilities for the contest (WA9PFB). It was an absolute joy to operate this contest from VP2A. The highlight was working PAØHIP, giving him Europe's first 160-meter DXCC. It would interest me to know if some concern might be given to allowing DX-DX contacts and DX multipliers for DX stations. This might stimulate DX activity in the contest (AA7A). Band conditions, a most pleasant surprise, seemed to belie these times of high "solar pox" (W7XZ). We really need a 3.5-MHz cw contest similar to the 160 test — but only one night (Saturday) in February or March (K4FU). I hadn't worked anybody on 160 since I was W9IKW in 1940 (WØNU). Do you have a prize for the "low man on the top band totem pole"? (WB9JVR). I've got to learn to hear better with a better receiving antenna (K6TS). Hard to do well with a height restriction of 35 feet! (N6NW). The JAs were fine here both mornings but we were outgunned during the opening. One JA2 almost got the call right before his signal died (KØJPX/5). Best contest in my ham life (JA7AO). DET

Hidden in the trees around the WØAIH/9 estate are four slopers, an extended Zepp at 120 feet and a 145-foot vertical, in addition to the Yagis at the top of the tower.

The KØJPX/5 Oklahoma multiop effort included imported talent from New Mexico. Left to right: W5KI, N5MF and KØJPX.



The W7IXZ multiop crew seems to have been camera shy. They turned in the top score from the Northwestern Division with two 326-foot phased verticals with 120 radials on each one.

Scores

Score listings indicate call sign, score, QSOs, multipliers, hours Example: CO2KK 140-10-7-3 indicates 10 QSOs and seven multipliers for 140 points during three hours of operation.

DX

Japan

JA3ONB 2394- 57-21-
JA7AO 928- 29-16-
JA3BCT 24- 6- 2-
JA7YAA(JH7HWR,JR7OMD, JA9PPC,ops) 70- 14- 5- 5

France

F8VJ 70- 7- 5- 1

Czechoslovakia

OK1DIJ 50- 5- 5- 2

Ireland

EI9J 570- 19-15-

Guatemala

TG9ML 396- 18-11-

Antigua

AA7A/VP2A 26,194-222-59- 6

St. Vincent

VP2SAX(W6KG,opr) 1564- 34-23-

New Zealand

ZL1ADI 240- 12-10- 4

Netherlands Antilles

W1GNC/PJ2 112- 8- 7- 2

Venezuela

YV1OB 1584- 36-22- 3

U.S.A.

1

Connecticut

AA1K 61,557-420-71-30
W1WEF 54,684-438-62-20
N1JW 24,717-304-47-16
K1TN 23,069-194-59- 5
W1FK 17,958-219-41-18
K1DW 11,988-162-37-11
K1EM 11,070-135-41-
W1SE 9804-129-38-12
W1QV 7781-124-31- 7
K1LGM 7308-126-29- 7
W1XX 4830- 79-30- 3
K1RT 2448- 51-24- 2
N1CC 480- 24-10-
W1CK(+W1UL) 35,448-312-56-21
K1VTM(+K1JX) 34,128-310-54- 6

Eastern Massachusetts

W1PL 66,333-471-68-28
W1CR(N1EE,opr) 42,660-392-54-25
AD1G 17,640-177-49-
WA1EQT 6104-109-28-
AD1Z 5270- 85-31- 7
K1MEM 3630- 60-30- 3
W1AXA 3364- 58-27- 4
W1BB 2280- 44-24- 3
W1AY 2160- 45-24-
AE1P(+WB1FLA) 9940-142-35-20

Maine

K2QE/1 19,995-231-43-15
K1AQ 15,856-202-39-
K1NBN 14,445-159-45-

New Hampshire

AB1Y 27,900-225-60-15
W1FZ 9520-133-35-
W1TZ 8330-119-35-10
N1ACH 1044- 29-18- 2

Rhode Island

K1AD(W1XO,opr) 60,905-465-65-25
N1RI(+KA1AIR,N1s DM XW, W1OH,WB1s DEZ DXQ) 54,846-399-66-28

Vermont

K1IK 51,456-381-17-13
WB1GQR(WB2JSJ,opr) 48,552-432-56-26
WA1GYS 3968- 64-31-

Western Massachusetts

WB1HIH 21,504-256-42-24
N1YY 4350- 87-25- 3

2

Eastern New York

W2IB 95,394-604-78-
W2XV 64,280-459-68-10
K2GBH 59,680-432-64-28
WA2IKR 38,280-345-55-18
K2MN 4640- 80-29- 6
W2DW 4200- 70-30- 3
W2AZO 1472- 46-16- 1
WB2PUH 352- 16-11- 3

New York City - Long Island

K2PHF 16,482-201-41-
W2GP 14,391-183-39-
W2KTU 11,585-164-35-15
WB2DLA 2394- 63-19-17
K2SX 360- 15-12- 1
WB2RNT 24- 4- 3-
WA2YEI(+KA2AEV) 2268- 63-18- 5

Northern New Jersey

W2FJ 53,676-417-63-29
W2RQ 39,088-349-56-
W2PZY 10,716-108-47-
AI2K 7524-148-39- 8
W2CC 2250- 45-25- 8
N2IN 1500- 50-15-
W2UL 50- 5- 5-

Southern New Jersey

W2EHN 15,594-168-46-17
K2BWR 15,180-171-44-
W2PAU 10,998-141-39- 8

Western New York

WA2IKO 32,670-297-85-26
W2MTA 28,420-290-49-17
KB2I 19,178-223-43-23
AA2O 15,708-187-42-20
W2ZOJ 12,728-148-43-10
WA2RXB 10,716-141-38-11
K2OS 8214-111-37- 8
WA2EYA 7980-105-38- 8
W2IE 7878-101-39- 3
WA2ECA 7590-115-33- 2
WB2FUV 4264-113-28-18
K2IGW(+WB2AIO) 76,107-550-69-19

3

Delaware

K3HBP 10,783-130-41- 9
K3SXA(+K3HBP,N3ND) 71,050-500-70-31

Eastern Pennsylvania

K3WW(K3WJV,opr) 110,200-701-76-
W3BUR 46,161-324-69-
W3AJS 33,488-299-56-26
W3BGN 30,510-275-54- 5
W3CNS 25,021-227-53-12
K3OQF 16,296-194-42-
K3ONW 16,125-186-43-15
W3ADE 12,060-166-36-13
WB3DCT 6666-101-33-
K3DG 4480- 80-28-
WB3FAA 3584- 64-28- 6
N3KZ(WA2BFW,opr) 2014- 53-19- 5
W3AP 1710- 45-19- 1

Maryland - D.C.

K3ZZ 70,056-482-72-26
W3GN 61,504-494-62-
KD5M/3 35,728-305-58-
W3YOZ 28,779-270-53-
W3FA 24,941-253-49-11
K3AO 23,210-205-55- 7
N3CO 17,836-182-49-14
K3ZJ 15,522-199-39-
W3HVM 11,020-145-38- 9
K3AA 8200-100-41- 5
K3RA(WA3WTQ,N4NW,oprs) 29,498-298-49- 8

Western Pennsylvania

K3BSY 78,408-640-72-
W3QM 47,096-403-58-27
K3UA 29,574-233-46- 8
AD8J/3 3120-120-26- 3
WA3FWA 1968- 41-24- 4
W3IW 1296- 36-18- 1

4

Alabama

N4AID(+N4QB,WB4s VSH, ZBN) 28,548-273-52-26

Georgia

AI8H/4 50,820-390-66-29
K4IJEE 36,630-273-66-12
WB4NMA(+WA4QYH) 19,688-214-46-

Kentucky

K4FU 91,980-624-73-22
WB4PRU 33,175-286-49-
W4YOK 19,133-179-63- 6
WB4HNH(+WB4ASW) 16,740-186-45-13
WA4QQV(+WA4QMQ) 10,824-132-41-15

North Carolina

W4TMR 64,600-497-68-29
N4SU 50,022-387-63-18
W3ESU/4 21,573-210-51-13
N4PY 8448-125-33- 4

Northern Florida

K4IEX 15,533-157-49- 6
N4KE 11,424-119-48-
AG4S 520- 27-20- 4

South Carolina

K4CNW 92,929-625-73-32
AE4Y 12,298-145-43-
WA4JWS 10,452-134-39-16
K4ADI(+WB4TGQ) 6014- 97-31- 9

Southern Florida

N4IN 46,632-338-67-24
K4XB 7128- 99-36-12
W4QWJ 1656- 36-23- 3
N4BD 6- 3- 1-
N4BP(+N4UM) 55,860-390-70-28

Tennessee

K4XU 34,485-301-67-10
K4AMC 5208- 84-31- 4
K4ON 2688- 48-28-

Virginia

KA4DSL 54,208-419-64-
W4YE 40,440-334-60- 9
AA4M 35,454-303-67-14
AA4FF 32,832-305-54-21
K4PQL 32,992-299-64-17
W4NVN 22,736-232-49-21
N4RA 16,320-170-48- 8
K4RS 11,767-142-41- 7
W4XD 9000-125-36- 7
W4KMS 5880- 98-30-
K4FJ 5220- 87-30- 3
W4DM 4992- 78-32- 2
WD4NLX 3120- 60-26- 2
WD4GCE 864- 27-16- 2
WB9NZY/4 832- 26-16- 8

West Indies

KP4FEY 4865- 65-35- 9

5

Arkansas

K5GO(+K8CC) 106,626-670-78-30

Louisiana

N5AN 82,713-513-79-22
K5KLA 11,172-146-38- 6
WA5EID 9520-119-40-

Mississippi

W5AQ 21,018-165-62-19
W5GWD 8800-100-44-20
AE5H 4752- 72-33- 8

New Mexico

W5DO 24,180-191-60-

Northern Texas

N5TP 60,532-403-74-18
K5IU 57,800-422-68-26
N5JB 53,605-375-71-20
K5QY 29,348-253-58-19
W5QF 17,934-183-49-14
N5XU 17,328-152-57-
N5UA 17,264-166-52-14
W5FJX 8862-104-43-14
W5SOD 5236- 77-34-11
K5RA 5040- 63-40- 5
W5HFN 440- 20-11-

Oklahoma

W5EHY 7070-101-35- 6
KBJPX(N5MF,W5KI,oprs) 71,978-490-73-33
K5QNM(+KN5TTN) 2288- 44-26-

Southern Texas

K5NA 98,901-588-81-28
AC5K 82,696-212-54-17
K5TM(K5ZD,opr) 15,848-143-56- 3
K5DL/5 13,632-142-48-24
W5AHC 3078- 57-27- 5
W5SSV(AC5R,KE5O,N5BST, WB5QYD,WD5BIP,oprs) 23,052-226-51-26
N5EM(+WA4EWV,K5HGB) 12,083-140-43-

6

East Bay

K6HIH 25,896-231-52-24
WA6EUZ 24,347-238-61-27
N6RO 19,716-186-53- 6
AD6D 16,626-160-51-24
K6TS 11,562-141-41-15
WB6ZEP 252- 14- 9- 2

Los Angeles

K6SE 72,520-454-74-23
K4ZIN/6 10,664-121-43-
N6NW 3168- 66-24- 7
WB6RZH 2832- 59-24- 9
KG6O 1764- 49-18-

Orange

N6PE 1848- 42-22- 2

Santa Barbara

W7CB/6 26,796-319-42-10
N6VR 24,090-213-55-13
W6TYR 3588- 69-26-18
W6JEO 3000- 60-25-12
K6MXO 2420- 55-22-
N6TR 528- 24-11- 4

Santa Clara Valley

N6RZ 62,832-441-68-
WA6PGB 33,672-267-61-22
WB6NSF 25,218-226-54-21
W6OKK 10,944-142-38-
N6FG 9672-116-39-16
N6QW 5600-100-25- 8
W6MTJ 4290- 65-33- 7

San Diego

N6ND 14,432-164-44-17
W6ABT 4900- 70-35- 6
K6QM 3410- 55-31-
AA6EE 320- 16-10- 2

San Francisco

W6PM 20,880-174-60-13
AE6U 6012- 76-36-

San Joaquin Valley

K6MQ/6 24,327-222-63-14
K6YK 7848-106-36- 5
KA6BIM 2586- 62-24-13
K6TG 1760- 55-16- 7
WB6ITM 360- 20- 9- 2
W6RKX 40- 5- 4- 2

Sacramento Valley

N6JV 41,250-306-66-
AA6DX 37,107-315-57-37
W6GO 5390- 72-35- 4
W6SX 1980- 55-18- 4
WA6BRV 1748- 43-18- 4
W6FCU 4- 2- 2- 1

Pacific

KH6CC 23,302-202-54-18

7

Arizona

N7DD 59,924-416-71-
W7RV 53,828-358-72-24
W7YS 14,758-153-43-11
K6LL/7 11,088-132-42- 4

Idaho

N7SU 31,878-253-63-

Montana

K0PP/7 33,516-266-63-20
W7HAH 18,810-171-55-20
KL7EDQ/7 2444- 47-26-
K7CPC 595- 35-17- 6

Nevada

WA7NIN(AI6V,opr) 58,960-413-67-28
W7XZ 42,624-324-64-28
N7BCQ 6528-102-32-13
W7ABX 3250- 65-25- 5

Oregon

W7NCO 40,986-300-66-
W7TC 10,944-144-38-22
AE7W 7886-121-34-17
W7LT 1728- 54-16-10
WB7SQM 1152- 36-16- 4
W7IXZ(+KB7EJ,WB7VZP, W7IYA) 33,807-273-59-25

Utah

K7UM 26,220-230-57-13

Washington

N7AM 32,760-248-63-28
WB7BFK(K5WTT,opr) 22,064-194-56-26
WA7OFH 21,001-160-60-25
W7BYK 19,494-165-57-19
WA7GCI 17,732-163-52-22
W7DRA 9694-131-37-11
W7AWA 7210-104-35-
W7KP 6968- 92-37-10
KA7FXS 3220- 70-23- 8
W7UMX(WB1DAL,KB7FX, N7AAC,oprs) 4648- 83-28-20

Wyoming

W7HLA 300- 20-15- 2

Alaska

KL7HBK 5040- 87-28- 8
KL7GIH 3792- 79-24-11

8

Michigan

N8EA 89,700-589-75-22
W8TU 43,146-341-63-21
W8VSK 34,048-257-64-
K8NG 30,622-251-61-21
W8EPT 19,769-185-53-23
KB8IA 14,523-153-47-10
W8HFS 13,932-162-43-28
WD8NKA 5180- 74-35- 5
WB8HCV 5104- 88-29-10
K8LJG 5032- 74-34- 3
WA8SJX(+K8s FC JM) 95,985-697-79-32
WB8OHO(+W8HJ) 58,608-399-72-26

Ohio

K8CCV 78,329-529-73-30
K8AC 56,225-430-65-27
WB8B 47,554-382-62-15
K8MN 45,050-342-65-
WA8TNO 34,224-304-64-28
W8MVN 24,165-200-55-32
AD8I 22,834-343-66-10
W8FN 22,636-320-66-19
K8ES 20,080-215-56-17
AI8M 19,458-207-47-15
K8MR 16,591-175-47- 4
W8EX 13,516-126-53-
W8VK 11,934-153-39-15
WD8MBK 11,172-147-38-18
K8RYJ 11,166-131-43-18
W8LHV 10,000-100-50- 6
AJ8J 9292-203-46-17
KB8L 8844-116-37- 4
W8GRP 8320-104-40-
W8PCS 2800- 50-28- 3
W8JI(+K8KAS,KA8BVM, WA8VEC) 124,240-643-90-20
W8CT(K1LT,K8s EM LT, W8ERD,WB8s INY TXE WKB YU,oprs) 92,130-612-74-38
AC8E(+W8IDM) 23,664-232-51-13

West Virginia

W8LRL 130,674-709-87-36
K8OQL 41,772-354-59-20
K8UC 9600-120-40- 5
W8JWX 7305- 92-37- 5

9

Illinois

K9RF 67,166-470-71-24
WA9PFB 67,104-463-72-27
K9BGL 66,960-459-72-30
K9ZO 62,700-475-66-20
W9CH 51,060-367-69-24
K9BG 47,679-343-69-
WA9EYY 45,440-352-64-16
K9AB 38,998-313-62-12
WB9TIY 37,881-273-69-10
K9KU 31,293-255-61- 8
W9PNE 21,788-208-52-15
W8XII/9 21,216-204-52- 9
W9DCN 18,142-193-47-16
WB9YTT 16,920-188-45-17
WB9JVR 12,336-133-46-20
WD9GGY 7524-106-36- 6
WD9IIX 7130-119-31-18
K9CC 6232- 76-41- 2
W9REC 4416- 69-32-
W9QSB 1110- 37-15-
W9AA(WD4FFW,K9IIO NR, WB9ZKK,WD9CSA,oprs) 60,168-436-69-

Indiana

K9CLO 63,140-449-70-
W9RE 45,175-343-65-10
N9GT 39,655-359-55-12
N9RC 18,356-176-52-15
W9LT 7452-102-36- 3
W9CM 234- 13- 9- 1
K9ZUH(+WB9PXR) 50,292-381-66-20
W9EI(+W9NJD) 35,836-286-62-22

Wisconsin

W9ZR 123,082-732-82-27
W9AIH/9 86,814-543-78-18
K9DAF 41,772-353-62-
W9GIL 21,492-198-54-20
N9KS 9348-123-38- 6

0

Colorado

K0RF(W0UA,opr) 92,340-594-76-30
W0CP 25,752-222-58- 7
W9MS(+WB0CMM) 70,591-479-73-42

Iowa

K0GVB 54,320-386-70-28
W0IO(WA3PWL,opr) 43,626-329-66-11
WA0QMU 5880- 98-30-10

Kansas

WA0TKJ 69,058-470-73-25
N0IN 44,472-327-68-11
WB0ISW 6660- 90-37- 7
KA0BCW 3350- 67-25- 4

Minnesota

K0PK 41,210-317-65-20
W0JX 33,496-281-62-17
K0FRP 32,088-246-64-11
W0HW 20,628-191-54-
W0EKS 14,586-143-51-
K0SE 4408- 58-38- 4
K0DD(+K0KX) 121,681-763-79-36
K0TG(+N0BG,WA0RBW) 73,152-504-72-16
K0JUS(+AC0D,AE0N,K0SHO, WB0NHD) 53,064-403-66-29

Missouri

N0TT 65,817-462-71-23
W0BTD 36,864-288-64-19
AE0K 31,470-277-65-19
K0YR 30,073-245-61-

Nebraska

K0DI(+K0NB) 35,750-275-65-13

North Dakota

W0ZTL 34,304-268-64-11
WB0EHC 10,682-109-49- 6

VE

Maritime - Newfoundland

VE1AXT 14,760-140-60- 9

Quebec

VE2WA 7378-119-31-
VE2JR 1680- 72-24-18
VE2OJ(+VE3s HJV KLB) 26,730-247-46-

Ontario

VE3ABG 50,752-395-63-
VX3LEW 48,340-360-67-
VE3INQ 30,580-278-55-34

Manitoba

VE4XK 21,924-203-64-13
VE4WR 3416- 61-28- 4

Saskatchewan

VE5JQ 71,616-132-44-17

British Columbia

VE7CC 37,359-286-63-

Check Logs

W4WZR,W6XM,W0NU,K5JZN/0

Results, 1979 Simulated Emergency Test — Edition Two

The Story Continues . . .

By Robert Halprin,* K1XA

I spent the better part of the afternoon aimlessly walking the streets of the city. To return to the small town from whence I came would mean only one thing — disgrace. How could I explain my sudden termination from a great midwestern newspaper (see June 1979 *QST*, page 78) so that people would understand? It was just an honest mistake — ah, too late for that now.

Instinctively, I wound up near my apartment; I decided to go upstairs for want of anything better to do. My phone was ringing even before I got the key in the door. "Now what," I thought.

"Hello?"

"Lunchbucket?" a gruff voice demanded.

"Yes . . ."

"I called your office but they said you were out."

"Yeah, I'm out — permanently," I said bitterly.

"Don't be so sure. I'm going to lay a scoop on you . . ."

"Scoop?! Pal, I just told you, I've been fired. Get yourself another reporter."

"There's no other reporter with your background in this matter," he exclaimed. "And I'm taking a big risk just calling you."

"Look . . ."

He interrupted: "If you would keep quiet for a minute, I can give you the biggest story of your life. Not only will they give you your job back, but they'll probably make you a dean of a journalism school. This is *bigger* than Watergate or Abscam."

"Okay, I'm listening," I told him. After all, I now had plenty of spare time; the agenda for the evening was to get loaded and feel sorry for myself. But this guy, whoever he was, sounded unbalanced. He had to be, to call me. I was no bargain. "What's this all about?"

"It's a conspiracy (he sounded out-of-breath) that threatens one of western civilizations most revered institutions."

"Conspiracy?" My heart started pounding. A conspiracy yet — and I bruise so easily.

[Editor's Note: This is the second installment of the continuing adventures of Larry Lunchbucket; part one appeared in June 1979 *QST*.]

*Assistant Communications Manager, ARRL

Why Is There a SET?

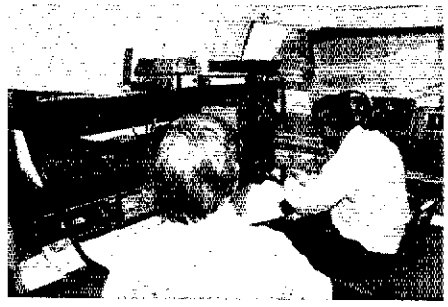
For the uninitiated, the purpose of SET is

1) To test the capability of the local amateur communications organizations (primarily ARES and RACES) under emergency conditions.

2) To test the ability of nets (primarily NTS) to function under overload conditions.

3) To demonstrate to served agencies (Red Cross, c.d, Salvation Army, etc.), to the public and to the media, Amateur Radio's value as an emergency communications service.

4) To provide operator training and experience in emergency communications practices.



This is the inside of the Dayton Amateur Radio Association communications van, featured on the cover of this issue. WA2KOO (at left) and Montgomery/Greene Counties emergency coordinator, W8ILC, are shown dispatching traffic to all points. *(WD8CYD photo)*

This is the Dayton Amateur Radio Association's club station, W8BI. Trustee W8ZM, is on the phone while an unidentified amateur operates. *(WD8CYD photo)*

"It's a plot against the ARRL Simulated Emergency Test!" he declared.

My hopes for re-employment faded as my blood pressure subsided. "You've got to be kidding, buster. And I'm not in the mood for jokes."

"I'm serious," he said. "And I'll prove it to you. Have you noticed that for the past several years, the January SET was preempted by real emergency conditions, usually blizzards and ice storms, thereby ruining all the great simulated emergency scenarios that were planned by Amateur Radio groups?"

"Yeah, but that kind of thing is not out of the ordinary in January."

"Okay fine," he agreed. "So the League, at the request of many of these groups, returned the SET to October. Fine business, right?"

"Right!" I agreed, hoping that this would get him off my back.

"Wrong!" he exclaimed. "Hurricanes, tornados and floods played havoc with the October SET."

"Pure coincidence."

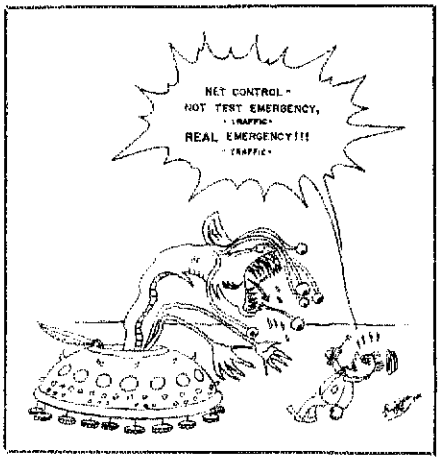
He began shouting. "You are really naive, aren't you. Why, this evil gang of plotters even went so far as to cause a rare New England tornado to attempt to annihilate ARRL headquarters and its staff, sounding the death knell for Amateur Radio itself. Luckily, it touched down a few miles to the north and *mecca* was spared."

"Now that particular fantasy is in very poor taste. Goodbye."

"Wait," he pleaded. "I don't have much time. I'm the only one who knows who *they* are. You've got to help me. Reveal this conspiracy to the world."

A bottle of booze beckoned invitingly across my small apartment. "I've got to go — I have another appointment."

There was no stopping his ravings: "This conspiracy is not only evident in overt ways. For example, you heard all the complaining about the October SET occurring when the weather is *too* nice. And then the hams complain that SET now follows a holiday weekend. Guess what? There are several major contests, during favorable weather periods, that are adjacent to holiday weekends. But do you see activity in contests fall off? Not at all. In fact,



contest activity is overwhelming. How come these ARES groups claim to be adversely affected, while contests thrive?"

I really didn't care, but now that he mentioned it, it was kind of strange: "Maybe these so-called public service guys are tapped-out as compared to contesters."

"No way." I had unwittingly given him back some momentum. "This is just another way that the conspirators are subtly manipulating public opinion. And how about this — did you notice that the headline in June *QST* said 1978 SET Results, when it was actually the first 1979 SET results?"

"A mere typo," I offered, somewhat lamely.

"Typo, my hand-held. *QST* doesn't make typos. And how about the fact that the NTS bigshots for so many years couldn't agree on a SET/emergency contingency schedule?"

"At least that problem is finally solved," I retorted, "with the recommendation from the combined-area staff meeting concerning a unified NTS sequence." (See "Public Service," this issue.)

"Don't be too sure," he replied. "This gang, in the guise of the forces of ignorance, will try to undo all the progress that was made."

"Oh brother — please, I've had a rough day and —"

Desperation was obvious in his voice: "I don't know how else to convince you — wait! This same conspiracy is also responsible for another unspeakable act of villainy — the ARRL Numbered Radiograms!"

I gasped. The realization dawned on me. This frantic man, who I assumed had taken leave of his senses, must be telling the truth. "Yes, yes, I believe you. Tell me, who are they?"

There was a muffled cry on the other end of the line and then a click.

"HELLO HELLO," I cried. To my horror, I found that the line was dead . . .

Soapbox

It was a good idea moving the SET to October. The simplified scoring is much better too (AG3R). This is the first SET that my group has participated in; they are already looking forward to next year and planning to make it bigger and better (W8GBR). This particular SET culminated several successive tests of a similar nature to test the communications potential of our desert region. The next SET is planned to give training and test message-handling capability of the net (WA6KZV). Thanks for the simplified form. Activity on this SET was slow. This is not the right time of year in this locality; too much hunting, camping, last minute outings, etc. (K7CXG). This exercise was held in conjunction with the Southwest Florida Traffic Net. This was the first activity of this kind in this area for a long time and was better than expected — all stations performed in a very professional manner and were a credit to the ham community (WD4CHP). This year we had four repeater amateur groups — two English-speaking and two Spanish-speaking, plus two CB groups. This is the first year we used CB'ers in SET — they used ARRL traffic format and did a very good job, according to the RACES radio officer in Miami. This is our very best SET! (W4IYT). I particularly like the idea of using emergency power, although no stations were using it in my net, as far as I'm aware (WØBV). Sorry — no simulation in our SET. Hurricane Frederic caused evacuation. All we could do was the real thing (KC4N). This was the first SET in Erie County in many a year; the simulated situation was a boat load of refugees from Cambodia at the Erie Public Dock. It came as a complete surprise to our amateur community. Considering the circumstances, Erie hams responded quite well (WB3IFD). Some got an overdose of the January SET and have not yet recovered (N2NS). Traffic was down from January. Think that a number of sections took the 30-day leeway (WB4PNY). As to my own observations, I thought the exercise went reasonably well but would have liked to see more stations on emergency power on the lower bands (WA1TBY). The SET went very well, even better than January. The upper peninsula of Michigan was very well organized; looking forward to next October (WA8DHB). W8MPD gave us an excellent exercise in emergency communications and search & rescue. I'm sure he could write an interesting article for *QST* about it (N8ABA). Sunday afternoon there was a call for help to search for a lost person. This was a real emergency and there was a good showing of hams from two repeater groups involved as a single team (W1UPH). I enjoy SET very much, especially when working with a nice group such as we have (WØOYH). Traffic was slower than in the past; this was probably because this was the second SET of the year (WB9JSR). Had a great October '79 SET; will have a better one next year (WB4BDP). 2-meter coverage great from local EOC at Greenwood County (South Carolina) Courthouse (K4VIA). This was the first SET conducted under this EC; it was sprung as a surprise during the regular Wednesday evening 2-meter net of the Sheboygan (Wisconsin) Amateur Radio Club. Although we were rough around the edges, we had fun and got some experience getting messages down on paper. Tactical communications were also important — being able to think on our feet and say what must be said accurately, in as few words as possible (K9XI). Novices need more exposure to SET — it would be good training for them in the future (WD8BHE). I am very happy with SET in the month of October. Our e.d. director has been very active in this exercise. I hope to have many tests and drills in the months to come to get our amateurs ready for the day we hope never comes (WB9PXT).

How to Get Involved

SET is the one annual event that involves thousands of amateurs in what they do best — providing public service. Any interested amateur can participate in this or any of a number of activities that will benefit your community in times of emergency or disaster.

A good way to get involved is to procure an application form for the Amateur Radio Emergency Service (ARES) from the ARRL. Ask for form CD-98. After it is filled out and returned, it finds its way to your local emergency coordinator. The EC, who is probably active on the local repeaters, can show you how to help provide communications during the next drill, walk-a-thon or real emergency.

If your community doesn't have an EC, contact your section communications manager (SCM) listed on page 8 of each month's *QST*. Perhaps you might be the one for this challenging job. The Radio Amateur Civil Emergency Service (RACES), which operates under the direction of state or local government officials, is also active in many communities. Contact your local civil defense director for details.

Free literature on the various public service programs is available from Headquarters; a 9 × 12 self-addressed envelope with postage for seven ounces will get you a complete Public Service Package by return mail. The latest Net Directory will be included, but can be ordered separately for a large return envelope with 41-cents postage.

WB6CAM (foreground) and KB6QR were two of the Monterey Peninsula/Big Sur ARES members who handled communications during a simulated flood in Carmel Valley, California. *(WD6COR photo)*

Fall 1979 SET ARES/Local Activity

Reports submitted	266
Number of ARRL Sections reported active	58
Total reported amateurs participating	6150
Emergency-powered stations	3730
Emergency-powered repeaters used	267
Total number of points	62,730

Total scores of participating groups are based on the sum of the following: two points for each amateur participating in SET activities; one point for each message originated or delivered on behalf of served agencies; five points for each station on emergency power; five points for each emergency-powered repeater used during SET; five points for each agency for whom messages were handled; ten points for each community in which agencies were contacted; and ten points for submitting a press release to the news media.

Another Monterey/Big Sur ARES member, W6OIl, gives his okay to the group's emergency generator. *(WD6COR photo)*

Fall 1979 SET Net Activity

Nets reporting	194
States/provinces active	33
NTS liaison or affiliation	128
Number of messages handled	14,164
Total reported amateurs participating	6,286
Emergency-powered stations	1,817
Total number of points	40,226

Net scores are based on the sum of the following: one point for each message handled; two points for each different station participating; three points for each station checking in on emergency power; five points for each different net control station; and five points for each different station performing NTS liaison. Last year's score is listed in parentheses.

LOCAL ACTIVITY

Jurisdiction	Reported By	Total Points
Maritime/Nfld	(1025)	1014
Cape Breton	VE1IG	180
Halifax/Dartmouth Metro	VE1ASW	813
New Brunswick/Nfld.	VE1OCJ/ VE1ASW	125
Prince Edward Is.	VE2AIC	96
Ontario	(2050)	483
Kemptville/Merrickville	VE3GNW	56
Kirkland Lake	VE3JHE	55
Oakville	VE3ITN	196
St. Catherines	VE3DVE	95
York Region	VE3HOI	81
1		
Connecticut	(1184)	6491
CARWRS	K1DFS	56
Fairfield Co.	W1VW	93
Northern	WA1EMI	5511
Southeastern	WB1DHZ	255
State of Connecticut Civil Preparedness Headquarters	K1IAX	136
Civil Preparedness Area 1	W1BGT	59
Civil Preparedness Area 2	WA1YHL	72
Civil Preparedness Area 3	K1MVQ	78
Civil Preparedness Area 4	W1HHR	78
Civil Preparedness Area 5	W1DND	101
Wallingford/Meriden	WA1CCR	51
E. Massachusetts	(1545)	286
Bellingham	W1XA	59
Billerica	K1HAQ	87
Greater New Bedford	W1LE	120
Maine	(1064)	1265
Aroostook Co.	WA1YNZ	1063
Penobscot Co.	W1HDC	202
New Hampshire	(485)	106
Rockingham Co	KA1CB	106
Rhode Island	(193)	170
Newport	W1JFF	117
Rhode Island	K1DT	53
W. Massachusetts	(337)	182
Hampden Co.	W1UPH	182
2		
E. New York	(1245)	371
Albany Co.	WB2ZCM	243
Orange Co.	WB2SON	128
N.Y.C. — L.I.	(789)	265
Brookhaven Town	WB2LOU	110
Islip Township	WB2YUJ	155
N. New Jersey	(786)	562
Englewood	W2CC	95
Hunterdon Co.	W5DTR	233
Morris Co.	WB2VUF	76
Union Co.	N2NS	158
S. New Jersey	(1239)	465
Camden Co.	WA2ONW	465
W. New York	(1485)	1175
Allegany Co.	W2BYO	405
Chemung Co.	WA2DHZ	196
Onondaga Co.	WA2PEA	431
St. Lawrence Co.	WB2NAO	143
3		
Delaware	(194)	152
New Castle Co.	WB3FOE	152
E. Pennsylvania	(1607)	447
Bucks Co.	AG3R	233
Montgomery Co.	W3ID	34
Tioga Co.	WA3CSP	180
Maryland-DC	(351)	757
Allegany Co.	W3DFW	430
Anne Arundel Co.	N3AWG	17
Baltimore	N3EB	271
Calvert Co.	W3ZNW	39
W. Pennsylvania	(2485)	696
Blair Co.	WB3EFO	258
Butler Co.	WA3FLR	127
Erie Co.	WB3ISQ	46
Huntington Co.	WA3YVL	182
Indiana Co.	KJCWL	1
McKean Co.	W3OCR	72
4		
Alabama	(2580)	618
Etowah Co.	WA4QOW	111
St. Clair Co.	WA4UKB	411
Tuscaloosa Co.	WD4DAT	96
Georgia	(3132)	1226
Athens	WA4FVT	101
Central	WB4BDP	100
Cowera/Heard/ Peachtree City	WA4PUP	183
Gainesville	K4GRO	358
Muscogee Co.	N4BGN	148
Rockdale/Newton Co.	WB4SLZ	127
Rome	K4YRL	209
Kentucky	(2019)	1616
District 1	WB4NPD	213
District 2	WA4ZVL	279
District 3	WB4NHO	691
District 5	WA4YPQ	114
District 9	WB4ILF	152
District 10	K4AVX	98
Disrict 14	WA4IGD	33
Franklin Co.	K4HOE	36
North Carolina	(3871)	1421
Alamance Co.	WB4SGA	235
Bladen Co.	K4JEX	104
Buncombe	WB4PLA	542
Cumberland Co.	WD4TRW	46
Dare Co	W4PCN	170
Guilford Co.	KB4IZ	273
Haywood Co.	N4SM	52
N. Florida	(4525)	3479
Alachua Co.	W4OQX	180
Duval Co.	WA4VZF	297
Escambia Co.	WA2GIN/4	721
Jackson Co.	W4BKD	143
Leon Co.	KC4N	92
Marion Co.	W4UEA	202
Orange Co.	W4UJL	1610
Pasco Co.	WB4TZR	121
Seminole Co.	WA4VLX	72
Walton Co.	WB4WOD	40
South Carolina	(656)	137
Greenville Co.	K4SUG	64
Greenwood	K4VIA	73
S. Florida	(4275)	4757
Broward Co.	WB4KKG	459
Central Brevard	WB4WYG	92
Collier Co.	W4ESH	191
Dade Co.	W4IYT	1458
Eastern Palm Beach Co.	WB4RLU	294
Hendry Co.	AA4BN	95
Hillsborough Co.	AA4WJ	451
Lee Co.	WD4CHP	138
Manatee Co.	K4DYB	163
Pinellas Co	K4SCL	625
Polk Co	WB4FVV	228
South Brevard Co.	KB4OW	565
Tennessee	(3121)	1220
Anderson Co.	W4GEK	174
Bradley Co.	WB4BKF	84
Kingsport/ Sullivan Co.	N4AEO	382
Roane Co.	K4TKQ	401
Rutherford Co.	N4BBB	70
Washington Co.	WD4BGR	109
Virginia	(2707)	2079
Central	W4WWQ	335
Fairfax	WB4MAE	182
Goochland/Louisa/ Powhatan/Greene/ Fluvana/		
Albemarle Co.	WD4KUK	38
Hampton, City of	WB4ODZ	234
Hampton/York Co./ Newport News/James City Co /Gloucester/ Matthews Co.	WB4UHC	249
Northern Shenandoah District	WA4STO	387
Rockbridge Co.	WA4LJI	246
Virginia Capital District	WB4PNY	428
West Indies	(—)	188
Puerto Rico	KP4CV	188
5		
Arkansas	(—)	30
Boone Co.	WB5MQH	30
Louisiana	(246)	343
Caddo/Bossier Parish	WB5USS	244
Webster Parish	K5WOD	99
N. Texas	(1505)	2033
Collin Co	K5MWC	266
Dallas Co.	WA5ZNZ	539
Lamar/Red River Cos.	WA5KZA	98
McLennan/Bosque/ Hill Cos.	W5TAH	312
Tarrant Co.	K5DDI	732
Titus Co.	WD5GFP	92
Oklahoma	(1151)	463
Ellis Co.	WB5OVT	274
Payne Co.	W5QIV	85
Stephens Co.	W5QOZ	104
6		
East Bay	(652)	803
Contra Costa Co.	W6LKE	803
Orange	(1166)	749
Inyo Co.	W6DQR	120
North Orange Co.	WB6JBI	204
Western Riverside Co.	W6LKN	425
Pacific	(—)	469
Hawaii Co.	AH6K	144
Honolulu Co.	KH6ILR	209
Maui Co.	KH6H	116
Sacramento Valley	(85)	293
Yuba/Sutter Co.	WB6GFJ	293
San Diego	(1238)	798
Northern District	WB6HFE	309
San Diego	WI6NI	293
Southern District	WD6CSS	196
San Francisco	(105)	850
Marin Co.	WA6MCK	255
Sonoma Co.	W6CYM	595
San Joaquin Valley	(591)	438
Eastern Kern Co.	WA6KZV	118
Fresno Co.	WA6CTR	64
Kings Co.	WB6TTP	212
Madera Co.	W6BWM	44
Santa Clara Valley	(1238)	945
Half Moon Bay	WA6EEP	125
Monterey Peninsula/ Big Sur	WD6COR	240
Palo Alto/Mountain View/Los Altos/ Los Altos Hills	WA6ASH	580
7		
Arizona	(1454)	475
Coconing Co.	WB7CDO	258
Mohave Co.	W7KAX	217
Idaho	(459)	196
Ada Co.	K7QXG	147
Cassia Co.	WA7NRP	49
Montana	(1094)	32
Phillips Co.	K7OZU	--
Sidney Mt./ Richland Co.	WB7UTJ	32
Oregon	(343)	288
Hood River Co.	WB7QFH	13
Jackson Co.	WB7RQG	275
Utah	(126)	126
St. George	K7WG	--
Salt Lake Co.	WA7ZBO	117
Weber Co.	AC7K	9
Washington	(1778)	1108
Clark/Skamania Co.	WB7FDE	115
Grant Co.	W7GB	24
Pierce Co.	WA7ZZA	378
Skagit Co.	KL7JEB	304
Spokane Co.	WB7FGC	277
8		
Michigan	(7449)	5034
Alpena Co.	K8QBZ	49
Branch Co.	K8XE	129
Calhoun Co.	WB8FBJ	220
Clinton/Ingham Co.	WA8BAP	639
Delta Co.	WD8IXZ	360
Emmet/Charlevoix Cos.	WA8AXF	97
Gogebic/S.W. Corner Ontonagon Cos.	WB8PLK	66
Houghton/ Keweenaw Cos.	WA8VBZ	112
Ignia Co.	W8LCU	41
Iosco Co.	N8AZM	88
Jackson Co.	WB8BGY	151
Kalamazoo Co.	KB0QB	129
K.I. Sawyer AFB	WB8YIG	174
Livingston Co.	WD8PAF	199
Luce/Mackinac Cos.	W8GBR	183
Macomb Co.	WA8QAF	118
Mecosta Co.	WD8NKA	17
Monroe Co.	WB8SEZ	1383
Oakland Co.	WB8SIW	140
Ottawa Co.	WB8BZF	142
St. Clair Co.	K8UPE	274
Sanilac Co.	W8CUP	61
Van Buren Co.	WB8BNN	9
Washtenaw Co.	W8LMT	296
Ohio	(12657)	7963
Adams/Brown Cos.	WA8CFX	85
Allen/Auglaize Co.	K8EIJ	127
Belmont Co.	K8IP	217
Central	W8BKO	1235
Clermont Co.	WA8TSK	373
Clinton Co.	WA8ERO	131
Cuyahoga Co.	AB8P	509
Darke	WA8KZR	147
Guernsey/Noble Co.	WB8TRK	72
Hamilton Co.	K8JE	818
Hardin Co.	W8OQL	245
Highland Co.	K8CKY	66
Knox Co.	WB8AYM	59
Lorain Co.	W8KRF	382
Marion/Wyandot Cos.	WB8EDO	299
Medina Co.	W8GSR	115
Motgomery/ Greene Co	W8ILC	2596
Ottawa Co.	WA8HGH	127
Richland Co.	WB8GGR	270
Summit Co.	K8EIO	50
Tusgarawas Co.	WB8DMF	40
West Virginia	(492)	885
Brooke Co.	WD8MJE	44
Fayette Co.	K8CFT	183
Hancock Co.	K8QEW	104
Marshall Co.	WD8PQG	289
Monongalia Co.	WA8GYU	160
Pleasants Co.	K8KXE	18
West Virginia SEC	K8QEW	67
9		
Illinois	(1120)	895
Cook Co.	W9HPG	884
Dekalb Co.	WB9NPC	77
DuPage Co.	WA9WXC	66
Wabush Co.	AI9H	66
Indiana	(5476)	2340
Clark Co.	K9TE	337
Dubois Co.	N9AHP	254
Jay Co.	WA9KWH	15
LaPorte Co.	K9ET	282
Madison Co.	WB9ZIT	206
Marion Co.	W9UMH	220
Owen Co.	WD9BKA	33
Pike Co.	WB8WCE	127
Steuben Co.	N9WW	74
Vanderburg Co.	WD9DVA	174
Warrick Co.	K9TKE	308
Wayne Co.	WB9LCN	90
Whitley Co.	N9EV	220
Wisconsin	(624)	932
Calumet Co.	WA9FBO	66
LaCrosse Co.	W9LZO	257
Milwaukee Co.	WB9SMM	---
Outagamie/No. Winnebago Cos.	KB9CT	131
Sheboygan Co.	K9XJ	39
Washington Co.	WB9EQX	438
♦		
Colorado	(866)	308
Arapahoe Co.	K3PUR	239
Garfield Co.	WA♦YED	70
Iowa	(266)	92
Lee Co.	WB♦VYG	92
Kansas	(1330)	1382
Zone 1	WB♦SZS	196
Zone 6B	WA♦LXI	356
Zone 7	WB♦YWZ	472
Zone 10C	WD♦EPX	64
Zone 12	W♦OAG	88
Zone 14	WD♦CFZ	206
Minnesota	(439)	339
Dakota Co.	K♦JTA	117
Olmsted Co.	K♦TS	222
Missouri	(926)	334
Adair Co.	W♦OTF	71
Boone Co.	WB♦KUW	188
Jefferson Co.	K♦GPL	75
Nebraska	(252)	153
Lancaster Co.	K♦GND	153
South Dakota	(—)	76
Harding Co.	WA♦CUL	38
Lawrence Co.	WA♦BWF	38

NATIONAL TRAFFIC SYSTEM AREA AND REGION NETS

	Total Points
Eastern Area, W2JJ/WB4PNY	1125
Central Area, W♦HI/W5KLV	745
Pacific Area, W7EP/WA♦YNP	505
First Region, K1BA/WA1VEI*	252
Second Region, W2MTA/W2RQ*	214
Third Region, W3NEM/WA3THT*	143
Fourth Region, W4SHJ/WA4CCX	409
Fifth Region, WA5IQU*/WB5CDX	182
Sixth Region, WA6UAZ/WA6LVO	1084
Seventh Region, W7VSE/WA7IHS	256
Eighth Region, W8PMJ/WD8NKA	508
Ninth Region, W9FC/W9HOT	527
Tenth Region, W♦SS/WB♦HOX	351
Eleventh Region, VE1WF	186
Twelfth Region, AD♦A/W♦HXB	304
*Did not file report	6663

SECTION/LOCAL NETS

State/Province	Reported By	Total Points
Maritime/Nfld.	(1711)	431
Cape Breton Emergency	VE1IG	112
New Brunswick/ Nfld. SET	VE1OCJ/ VE1ASW	66
Nova Scotia Emergency	VE1ASW	253
Ontario	(4326)	2224
Oakville ARES	VE3EUN	192
Ontario Emergency	VE3GOL	2032
Alabama	(3433)	164
Etowah Training	WA4QOW	88
West Alabama Emergency	WD4DAT	76
Arizona	(872)	166
Hualapai A.R.C.	W7KAX	166
California	(4044)	468
Indian Wells Valley Emergency	WA6KZV	71
Santa Barbara Section ARES	K6DZT	85
Southern California	N6WP	196
Western San Joaquin Valley FM	WD6BPC	116
Colorado/Wyoming	(1178)	182
Colorado/Wyoming	WD♦AIT	182
Connecticut	(2217)	729
Connecticut CW	K1EIR	205
Connecticut Phone	K1EIC	350
Western Connecticut	WA1LOU	174
Delaware/Maryland	(3018)	1186
Delaware Emergency Phone	K3JL	126
Delaware Traffic	W3WD	102
Maryland Amateur VHF Emergency	WA3BPC	282
Maryland Emergency Phone	AA3S	280
Tri-State 2-Meter	W3DFW	396
Florida	(3623)	1848
Florida Midday Traffic	WB4AID	377
Florida Phone Traffic	WB4WYG	421
Northern Florida Phone	WD4PDK	348
South Brevard Emergency	KB4OW	249
TBRA	WB4BQZ	281
West Pasco ARES	AA4FG	192
Georgia	(30137)	2235
Chattahoochee Valley Emergency	N4BGN	105
Georgia Single Side Band	WB4ZVX	1215
Georgia State	W4WXA	123
Georgia Traffic	W4GH	148
Georgia Training	WB4ZOJ	105
Newnan ARES	WA4PUP	355
NE Georgia Emergency	AA4U	64
SKYWARN VHF	WB4BDP	122
Hawaii	(—)	154
Honolulu County SKYWARN	KH6ILR	154
Illinois	(—)	243
Illinois Section	WB9USR	194
Wabash Co.	AI9H	49
Indiana	(11774)	3314
Allen County Emer. Communications	WB9YER	222
Clinton Co. Amateur Emergency	WB9WWB	44
Dubois Co. Emer. Services	N9AHP	157
Indiana Code	N9AEI	112
Indiana Traffic	W9QYY	1434
Jay County ARES	WA9KWH	31
Madison County SKYWARN	WA9CWE	174
Marion County ARES	WB9BAA	253
Pike County	WB9MCE	85
Southeast Indiana	K9TE	367
Steuben County Emergency	N9WW	84
Warrick County	K9TKE	192
Whitley County ARES	N9EV	159
Kansas	(3680)	1881
ARES Zone 7	WB♦YWZ	208
Chippewa ARC (Zone 6-B)	W♦IXA	256
Kansas CW Section (QKS)	W♦FT	173
Kansas Phone	W♦OYH	302
Kansas Sideband	W♦OYH	744
Tri Zone ARES	WB♦SZS	139
Zone 10C ARES	WD♦EPX	59
2 Meter		
Kentucky	(470)	2075
Big Sandy Two Meter	WA4SWF	77
Franklin Co. Weather	K4HOE	29
Kentucky CW Traffic	WA4WSM	144
Kentucky Fifth District ARES	WA4YPQ	88
Kentucky Novice Traffic	KB4OZ	287
Kentucky Slow CW	WB4NPD	333
Kentucky Traffic	WB4AUN	682
Pennyrile Area Weather	WA4ZVL	169
Purchase Area Emerg.-WX-Tfc.	WD4CWT	186
Southeast Kentucky Emergency	K4AVX	70
Massachusetts/ Rhode Island	(1207)	1015
Aquidneck Island Communications	W1JFF	96
Bellingham ARES	W1XA	34
Eastern Mass/Rhode Island	WA1VAB	160
Eastern Mass/Rhode Island Phone	W1FJI	250
Eastern Mass/Rhode Island Slow Speed	KA1BJY	44
Heavy Hitters Traffic	K1BSO	283
New England Emergency Phone	K1BZD	79
Rhode Island ARES	K1DT	69
Michigan	(6695)	4794
Alpena County ARES	K8QBZ	35
Branch County ARES	WD8RHU	69
Calhoun Co. Amateur Radio Emerg. Services Network	WB8FBJ	154
Copper Co. Radio Amateur Assn. 2-Meter	WA8VBZ	96
Delta County 2-Meter Emergency	WA8DHB	256
Holland Emergency	WB8BZF	110
Michigan Traffic	KB8AI	281
Ionia ARES	WB8LCU	46
Jackson ACTION	WB8UWX	155
Livingston Co. ARES	WD8PAF	160
Macomb Co. ARES	WB8ZJL	163
Michigan Amateur Communications System	K8LNE	626
Michigan Novice	WD8BHE	56
Michigan Thumb 2-Meter	W8CUP	126
Monroe County ARES	WB8SEZ	635
QMN	N8ABA	250
St. Clair County ARPSC	K8UPE	320
Upper Peninsula	WA8DHB	672
Sawyer Emergency Traffic	WB8YIG	136
Washtenaw County ARES	W8LMT	234
Minnesota	(1358)	44
Minnesota Section No. 2	K♦PIZ	44
Missouri	(1567)	903
Central Missouri Emergency	KA♦E	202
Jefferson County ARES 2 Meter	K♦QPL	61
Missouri CW	W♦BV	102
NEMOF and ACE	W♦OTF	74
Southwest Missouri ARC	WB♦TNX	64
Montana	(749)	61
Early Morning Montana	WB7UTJ	61
New Hampshire	(1543)	98
New Hampshire ARES	K1RSC	98
New Jersey	(8069)	1310
Camden Co 2 Meter Emergency	WA2ONW	236
Hunterdon ARES	W5DTR	149
New Jersey CW	W2UEZ	187
New Jersey Phone	K2VX	404
New Jersey VHF	W2ICA	137
Old Bridge Trash and Traffic	WA2OPY	46
Union Co. Emergency and Traffic	WB2RMI	149
New York	(5129)	1295
Albany Emergency Service	WB2ZCM	296
Allegany County	W2BYO	205
ARES Fri /Sun. Nite	WB2TUM	104
Big Apple VHF Traffic	KA2CNN	92
Capitol District Rpt.	WB2ZCM	183
Chemung Co. ARES	WA2DHZ	104
Orange County ARC	WA2THE	68
Southern District	KB2JG	227
Town of Oyster Bay Emergency	K2MZ	36
North Carolina	(6623)	777
Alamance County ARES	N4EY	205
Cape Fear ARS	WA4UGY	52
Fessenden Amateur Radio	W♦JEH/4	86
Guilford County ARES	K4BUH	202
Haywood County ARPSC	N4SM	37
Metrolina 2-Meter Emergency	WA4OJU	216
Ohio	(13739)	2228
Adams and Brown Counties ARES	WA8CFX	66
Buckeye	K8AAZ	202
Burning River Traffic	WA8GMT	303
Eastern Ohio Traffic	WD8JTT	163
Highland Amateur Radio Assn.	WA8KIW	67
Knox County Emergency	WB8AYM	34
MASER	K8ERV	153
M2M Group	WD8ERT	113
Ohio Single Sideband	WB8OMO	1022
Ohio Slow Washington Co.	WD8KBW	41
ARES	WB8UHP	62
Oklahoma	(619)	134
Northwest OK Service	WB5OVT	134
Pennsylvania	(2903)	693
AREC Indiana	K3CWL	10
Blue Knob Emer. Prep.	WB3EFQ	269
Montogomery Co. Pa. AREC	W3ID	15
Tioga County A.R.N.	WA3CSP	101
WPA CW Traffic	W3YO	73
Western Pennsylvania Phone and Traffic	WA3PXA	225
South Carolina	(310)	102
Western South Carolina Emergency	KB4RA	102
Tennessee	(2629)	1416
Anderson Cty. CD/ARES	W4GEK	56
CARC	WA4JET	138
Kingsport Emergency	W4JD	156
Middle East Tennessee Emer.	KD4C	219
Roane Co. ARES	W4EBT	461
Rutherford Emer.	N4BBB	52
Tennessee CW	AF4T	98
Tennessee SSB	W4ZJY	237
Texas	(3127)	1062
Denton Co. Public Service	WA5QFD	69
Lamar-Red River Co. Emergency	WA5KZA	68
Texas Traffic	K5QEW	542
October SET 1000 Session	WA5KXX	78
October SET 1230 Session	WB♦LII	187
October SET 1400 Session	WB♦LII	118
Utah	(316)	193
Beehive Utah	W7OCX	193
West Virginia	(136)	633
ARES/RACES	K8QEW	54
Fayette Co.	K8CFT	85
Marshall Co. Emer. Center	WD8PQG	335
Monongalia Co. ARES	WB8AHH	84
West Virginia SSB	WA8WPW	75
Wisconsin	(687)	182
Jefferson Co. ARES	WB9PAW	32
Neenah-Menasha ARC 2-Meter	KB9CT	91
Wisconsin Intrastate Net/Early	W9DM	58
Wide-Coverage Independents		
New England Teleprinter	K1DFS	48
Tri-State Emergency Weather	WD♦BMR	--

Public Service

Conducted By Robert J. Halprin,* K1XA

National Traffic System Meeting Report

The first *Inter*-Area National Traffic System staff meeting was held at ARRL hq. on November 10 and 11, 1979. Four "official" (with vote) delegates were present, along with a number of observers, for the purpose of addressing important issues and problem areas in NTS, advisory to the ARRL Communications Manager. The official delegates were: K2KIR, N2YL, K3KW and WB4PNY, representing the Eastern Area Staff; W9QLW, W5GHP, W9JUJ and WØAM, representing the Central Area Staff; and W7DZX, W5KH, N6GW and W7EP, representing the Pacific Area Staff. Participating observers were N4NK, chairman of the Emergency Communications Advisory Committee, ARRL Communications Manager W1XX and Assistant Communications Manager K1XA. VE3GOL served as recording secretary. Highlights of this meeting, along with the subsequent *action* taken, follow.

Agenda items one and two concerned "integration of daytime and evening cycles of NTS with regard to TCC relationships and revised daytime sequencing" and "NTS and emergencies, including NTS's role in the Simulated Emergency Test." These items were discussed in detail, including a presentation of ECAC's concerns by N4NK.

Later, the committee recommended that the Eastern Area Staff (EAS) NTS restructuring proposal be adopted and implemented in its present form, and that this proposal be tried and evaluated for a period of one year. This recommendation was accepted — with the implementation date of June 1, 1980.

Here is some background information on this important step forward in NTS: On August 11, 1979, the NTS Eastern Area Staff developed a simplified daily NTS schedule that could easily be expanded to extra sessions during emergencies, as well as emergency-preparedness activities such as the SET. EAS approved the plan, and submitted it to its sister staffs, which culminated in the above recommendation from the combined-area staff. Major considerations in the development of this plan were:

1) Traffic origination on the West Coast in the daytime cycle should enjoy same-day delivery through the facilities of the evening portion of the NTS schedule, and the two cycles should not be "isolated" from each other.

2) Area nets should have a minimum of 60 minutes allotted to them, daytime or evening, and all 60 minutes should be available for the clearing of inter-area (TCC) traffic.

3) The system should be symmetrical, regular and repeatable. This means, first, that the structure of the net sequencing should be consistent from area to area; and, second, that a net session occurring at a given local time in the Eastern Area should subsequently occur at the corresponding local time in the Central and Pacific Areas.

4) The starting and ending times of nets within the evening portion of NTS are fairly tightly constrained (say ± 15 minutes) to their present values by limited hours available. The daytime cycle does not need to be so restricted, however, and one of the advantages to participants in the daytime cycle is greater flexibility in the times that section and region nets meet, as well as "breathing space" between net sessions.

5) The daytime and evening cycles of the system are parts of a *single* NTS, and linkage of the two cycles is a primary function of TCC.

6) Modifications to the system schedule for emergencies and emergency-preparedness exercises such as SET should augment the basic cycles and should be replications of the basic cycle, overlaid on the same time scale. Most importantly, normal daily sessions of nets at all levels in the system should remain intact during emergency operation.

7) The schedule of any given area is the same as the schedule in any other area, offset by the time-zone difference. Thus, all daytime area nets will meet, as of June 1, 1980, at 1430 local time. The daytime cycle is identical to the evening cycle (see Fig. 1) except for greater flexibility in duration of starting times of region and section nets. The late-daytime section nets and the early-evening section nets can be separate nets or they can merge into a single net in the 1630-1930 local time frame. There is adequate provision adjacent to all section nets for a layer of local nets.

8) Traffic from the Eastern Area Net (EAN) to the Central Area Net (CAN), in either the

*Assistant Communications Manager, ARRL

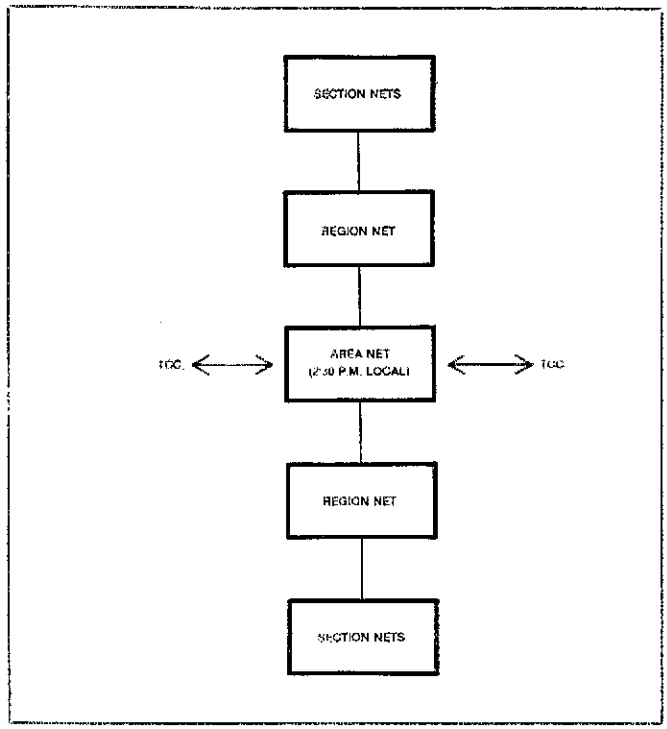


Fig. 1 — Revised NTS daytime schedule.

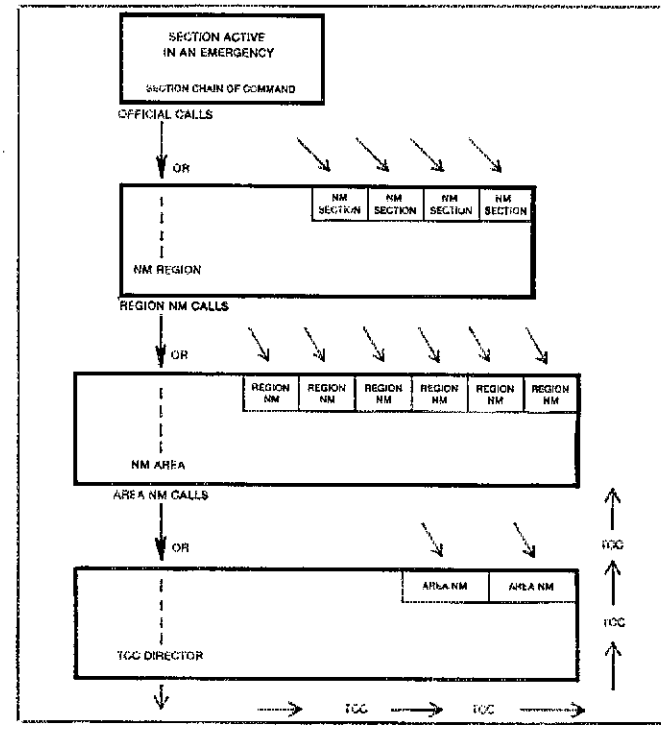
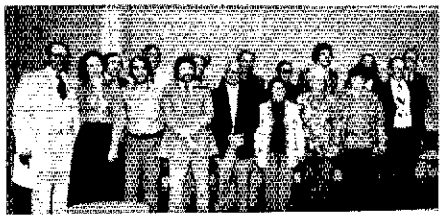


Fig. 2 — NTS alerting plan.



This is the august group that was present during the NTS deliberations. Left to right, front row: W2MTA, VE3GOL, K1XA, W5KH, W7EP, WB4PNY, W9JUJ, N2YL and W5GHP. Back Row: N4NK, W1XX, WØAM, W9QLW, N6GW, K2KIR (chairman), K3KW and W7DZX. Those not present during the picture-taking session were K1BA, K1CE, W1OD, W1TN, WA1VEI, W2CS, WA4EQW and N5YX. *(K5RG photo)*

daytime or evening cycle, is handled by direct QNI into CAN by a TCC station. All other TCC functions are out-of-net schedules, allowing optimum choice of bands and mode to fit the situation.

9) The time between the end of the daytime Pacific Area Net (PAN) session (no later than 2330Z) and the start of the evening EAN (0130Z) allows for an out-of-net TCC sked followed by direct section net QNI on the East Coast, to speed up same-day delivery service.

Table 1

TCC Functions

Stn	*QNI*	*Meet*	*To*	*Time(s) UTC*
A	EAN		Rx CAN	0130-0230
	CAN		Tx CAN	0230-0330
B	EAN		Rx PAN	0130-0230
		H	Tx PAN	0230≈0430
C	CAN		Rx EAN	0230-0330
		K	Tx EAN	0330≈1930
D		J	Rx EAN	0530≈1930
	EAN		Tx EAN	1930-2030
E	CAN		Rx PAN	0230-0330
		G	Tx PAN	0330-0430
F		I	Rx CAN	0530≈2030
	CAN		Tx CAN	2030-2130
G		E	Rx PAN	0330-0430
	PAN		Tx PAN	0430-0530
H		B	Rx PAN	0230≈0430
	PAN		Tx PAN	0430-0530
I	PAN		Rx CAN	0430-0530
		F	Tx CAN	0530≈2030
J	PAN		Rx EAN	0430-0530
		D	Tx EAN	0530≈1930
K		C	Rx EAN	0330≈1930
	EAN		Tx EAN	1930-2030
L	EAN		Rx CAN	1930-2030
	CAN		Tx CAN	2030-2130
M	EAN		Rx PAN	1930-2030
		S	Tx PAN	2030≈2230
N	CAN		Rx EAN	2030-2130
		V	Tx EAN	2130≈0130
O		U	Rx EAN	2330≈0130
	EAN		Tx EAN	0130-0230
P	CAN		Rx PAN	2030-2130
		R	Tx PAN	2130-2230
Q		T	Rx CAN	2330≈0230
	CAN		Tx CAN	0230-0330
R		P	Rx PAN	2130-2230
	PAN		Tx PAN	2230-2330
S		M	Rx PAN	2030≈2230
	PAN		Tx PAN	2230-2330
T	PAN		Rx CAN	2230-2330
		Q	Tx CAN	2330≈0230
U	PAN		Rx EAN	2230-2330
		O	Tx EAN	2330≈0130
V		N	Rx EAN	2130≈0130
	EAN		Tx EAN	0130-0230

10) TCC skeds are from one cycle to the same cycle (westbound traffic) or from one cycle to the next immediate cycle (eastbound) traffic). That is to say, TCC functions which bring traffic from the West Coast to the East Coast, for example, connect the daytime PAN session with the evening EAN sequence (if necessary), or the evening PAN session to the next daytime EAN sequence. Table 1 is a listing of the required TCC functions.

11) Expansion of the system during SET or in times of emergency is conceptually simple and involves adding a duplicate of the existing schedule, slid over three hours, to the original. Therefore, in addition to the normal Area Net sessions at 2:30 P.M. and 8:30 P.M. local, potential new Area Net sessions at 11:30 A.M. and 5:30 P.M. can be held, along with their associated Region, Section and Local nets. The significance of this concept is that it combines the discipline and training of a predetermined schedule with the spontaneous determination of the level of activity required for any specific emergency exercise/situation.

Moving on to other matters, WB1EYI of the Hq. staff addressed the group on the new Phase III satellite and the importance of supporting the special channel officially allocated to NTS; see page 85, September 1979 *QST*, for more details.

The committee recommended that a Region or Area Net Manager's appointment should be cancelled after a three-month failure to file reports. This recommendation was accepted, with the "investigation procedure" by K1XA to commence after the first failure.

The staff recommended that there be a return to the prior individual evening and daytime reporting system, with separate reports published in *QST*. The matter is stayed, pending a complete and extensive discussion and poll of all NTS Officials by the appropriate Staff chairman.

Regarding the matter of assistant managers' credentials to be taken under advisement by the Communications Manager: It seemed that the guiding principle of holding the voting privilege, acting as an authorized representative of the Net Manager during Area Staff Meetings, would govern. The key then is that the replacement be authorized prior to the staff meeting. W1XX directed K1XA to review the *Terms of Reference* for the three Area Staffs, so that a common denominator will exist on this point of proper authorization for an assistant manager to act in the stead of the manager and be eligible for reimbursement privileges. The commonly drawn *Terms of Reference* will be referred to the three Area Staffs for their approval.

Another recommendation concerned the methods and techniques for improving accessibility to NTS, not only to ARES, but to the general public, and that the information of accessibility be published and disseminated through the revised *Emergency Coordinator's Workbook*, *QCD*, *QST*, the *Public Service Communications Manual* and net bulletins, and that the full gamut of public relations facilities be utilized for video and audio presentation at conventions, hamfests and club meetings. This recommendation was also accepted, with every effort made to accomplish these broad objectives outlined, within the limitations of budget and manpower.

The committee recommended to Hq. that the NTS alerting system (see Fig. 2) be adopted by the ECAC and Hq. for publication and implementation. This was accepted; the alerting system will be from the standard Section level chain of command to the corresponding Region Net Managers, their assistants, or other Section Net Managers within the Region.

The staff endorsed the concept of regular NTS liaison with Central and South America, particularly in times of emergency (as was done during the recent hurricane emergency). Effective February 6, 1980, a regular NTS liaison was established with the INTERCON Net on 20 meters on an experimental basis, with WA4CCK and N2YL coordinating. W5GHP commented on K1XA's excellent work in *QST*'s "Public Service Column," at which point the committee applauded enthusiastically.

With the guidance provided in this historic gathering of NTS officials, we can all look to an even better National Traffic System, answering the challenges of a new day in Amateur Radio.

☐ SEC Reports. For January, 33 SEC reports were received, denoting a total ARES membership of 16,708. This represents a 13.8-% increase in reports received one year ago (29), and a 38.2-% increase in ARES membership (12,089). Sections reporting were Ala, Alta, Ariz, EPa, Ind, Iowa, Kans, Ky, Lou, Me, Mar/NFld, Mich, Miss, Mo, Nev, NFla, NTex, Ohio, Okla, Ont, SV, SDgo, SJV, SBar, SCV, SFla, SNJ, Utah, Va, Wa, WVa, WMass, Wis.

COMMUNICATIONS SERVICE OF THE MONTH

Amateur emergency service activity in Chester County, Pennsylvania, had declined to a point of nonexistence until Rich Eckenrode, WB3AAC, and others volunteered their services at the county courthouse during the Three Mile Island incident last May. County officials recognized that great potential lay in the amateur ranks. Rich's team set about rebuilding the system.

Meetings between County authorities and the ARES team were scheduled, planning sessions were arranged and, thanks to the Philadelphia Area Repeater Association and its trustee, K3ECV, a training net on 34/94 was formed. Results were gratifying.

The fledgling system had its first test on December 12, 1979, at about 7:30 A.M., when an unpredicted snowstorm hit the county. The critical factor was not its depth, but a layer of sheet ice under the snow. Traffic on most of the main arteries ground to a halt. The communications system became seriously overloaded from calls by stranded commuters and requests for salting. At approximately 8 A.M., County officials requested the services of the ARES net.

Shortly thereafter, traffic reports, weather conditions and alternate routes were being reported to the county Emergency Services headquarters. "County officials were amazed and pleased," said Tim Campbell, the County government's emergency coordinator. "We hope the system will grow and prosper."

Next — two mini-SETs prior to a countywide emergency drill. — *W3QT, Southern Chester County Amateur Radio Club*

REPEATER LOG

According to reports received between January 20 and February 20, the following repeaters were involved in the delineated public service events.

	Weather Emergency	Criminal Activity	Medical Emergency	Vehicular Emergency	Fire	Search and Rescue	Miscellaneous	Total
WR2ABH				1				1
WR2ACN		1	1	5			3	10
WB2NHO	2	2	5	23	3		44	79
WR2RBQ				1				1
W2VL	2	2	5	24	3	1	43	80
WR3ACU			1	1				2
K3PSP				3				3
WR4ACY				20	1		2	23

	Weather Emergency	Criminal Activity	Medical Emergency	Vehicular Emergency	Search and Rescue	Miscellaneous		Total
				Fire				
WR4AXO	1			3				4
WR5ABA				2				2
WR5ABI				1				1
WR5ABY			2	14				16
WR5AIB				1				1
WR5AJG				2				2
WR5APK				1				1
N5DD				1				1
K5DI				1				1
WA5FYI			1					1
WA5VKY							1	1
K5XY							1	1
W7WGW				1				1
W8UPV		1	1		3			5
Total	5	9	13	105	10	1	94	237

NATIONAL TRAFFIC SYSTEM

The "grand lady" of traffic handling in Western New York, Clara Reger, W2RUF, passed away suddenly February 1, 1980. It was said that everyone was buoyed by her outgoing nature, her love of people and her dedication to ham radio.

January Reports

Area Nets

	2	3	4	5	6	7
EAN	93	2928	31.5	1.001	94.4	
CAN	93	1531	16.5	.607	99.2	
PAN	62	1480	23.9	.670	99.5	
Region Nets						
1RN*	58	595	10.3	.534	97.9	91.4
2RN	145	910	6.3	.480	92.4	97.8
3RN	93	602	6.5	.584	99.7	100.0
4RN	124	1491	12.0	.528	85.7	97.8
RN5	92	912	9.9	.403	87.4	100.0
RN6	124	1106	8.9	.343	91.5	98.9
RN7	124	1212	9.8	.901	100.0	98.9
8RN	121	704	5.8	.412	88.5	98.9
9RN	154	857	5.6	.359	95.0	100.0
TRN	93	553	5.9	.176	73.2	98.9
ECN	62	370	5.9	.532	89.8	80.6
TWN						98.9
TCC						
TCC Eastern	187[1]	911				
TCC Central	212[1]	818				
TCC Pacific	108[1]	665				
Sections[2]	6210	25,200	4.1			
Summary	7648	42,845	5.6			
Record	6155	50,754	19.1			

*Incomplete report

[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (199): AEN AENB AEND AENJ AENM AENS (AL), ARN OZK SCARC (AR), ATEN HARC (AZ), NCN NCN/VHF NCTN (CA), CN CWN HNN (CO/WY), CN CPN NVTN WESCON (CT), AEPN DEN FAST FPON FPTN GN MEN PBTN PEN QFNS SBEN SPARC SWFTN TPTN (FL), CGVHFN GCN GRN GSN GSSBN GTFCN GTN MAEN (GA), I75MN IACN TLCN (IA), IMN MTN (ID/MT), ILN ILPN (IL), ICN ITN QIN (IN), KPN KSBN OKS 4DARES 5DARES 6DARES KNTN KRTN KSN KTN KYN MKPN SEKEN (KY), LAN LRN LSN LTN (LA), EM2MN EMRI EMRIPN EMRISS HHTN NEEPN WMN (MA/RI), MEPN MMN MTN WRIN (MB), MEPN (MDC), AEN CMEN MPSN OCRN PTN SGN SPSN (ME), MACS MITN MNN QMN UPN (MI), MAWXN MSN MSPN MSSN (MN), ACE MEOW MON NEMOE (MO), APN (MR/NF), MTN (MS), CMN (NC), WNN (NE), GSEMN NHN (NH), JSARS MCN NJN NJPN NJVN OBTTN UGETN (NJ), NMRR SWN (NM), NSN (NV), BAVTN CNYTN NLI NLIPN NLIVHF NYPON NYS OCTEN STAR WDN (NY), BN BNR NCSSBN ONN OSN OSSBN (OH), NWOSN OAN OFON OLZ ONON OPEN OTWN (OK), CMN LN ODN OLN OPN OSN (ON), 16/76 AREST BSN OSARES OSN PDXAARES (OR), EPA EPAEPTN NWPATMTN PFN PTTN WPA WPAPTN WPATMTN (PA), WQV/UHF (PQ), SCSSBN (SC), NJQ SDN SDSSN SDWN (SD), SATN (SK), MCRN METEN MTPSN RCARESN TN TPN TSN WTVHFN (TN), DFW TEX TSN TTN (TX), BUN UCN (UT), VNTN VN VSBN VSN (VA), WARTS WSN (WA), NWTN BEN BWN WAPON WIN WSBN (WI), BDTN WVMDN WVN WVNN WVPN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

Certificates: W9HOT (TCC-C/D); KB6FR/3 (TCC-E/D); W2FR (TCC-E/E) (17th annual); W3FAF (TCC-E/E) (3rd annual).

	2	3	4	5
TCC Eastern	193	96.9	2337	911
TCC Central	217	97.7	1477	818
TCC Pacific	124	87.1	1310	665
Summary	534	93.9	5124	2394

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (January): Eastern Area (N2YL/K3KW, Directors) — W1s KX NJM, WA1ZAZ, K1s BA EIR GN SSH XA, W2s CS CQB EFU FR GKZ MTA RQ ZOJ, K2NY, N2YL, WA2s ICB SPL SYR, W3s FAF PQ, WA3WQP, K3s KW NGN, N3SJ, W4s JK MEE SQQ UQ, WA4CCK, WB4PNY, K4s BKX KNP, N4s KB NK, KB6FR/3, W8s PMJ VPW, WA8WPW, WB8WTS, K8s AAZ KMQ, VE3s CWA GOL SB. Central Area (W5GHP/W9JUJ, Directors) — W4ZJY, WD4HIF, K4YZU, WN4KKN, N4MD, W5s KLV RB, WA5s BHF INJ RKU, WB5s NKD OXE, YDD, WD5HHK, K5s GM MC, N5s RB TC, W9s CXY DND HOT JIJ JUJ NXG, N9TN. WB9WGD, WØs AM HI, WAØTNM, KØs CW EZ. Pacific Area (W5KH, Director) — N5s MR NG, W5KH, K5MAT, N6s GW PZ WP, W6s EOT OA SX VZT, WB6PVH, W7s DZX EP GHT LYA VSE, K7s HLR KSA MC, WA7GYQ, ADØA, KØs BN DJ, WØFG, VE7ZK.

Independent Nets (January 1980)

	2	3	4
Amateur Radio Telegraph Society	31	1702	532
Central Gulf Coast Hurricane	31	175	2751
Clearing House	31	243	498
Early Bird	31	812	—
Empire Slow Speed	31	98	468
Hit and Bounce	31	350	538
IMRA	27	500	985
Mission Trail	31	260	1562
New England Novice	30	42	138
New England Teleprinter	12	25	46
North American SSB Traffic	25	261	260
North American Traffic and Awards	31	47	756
Piconet All Day Watch	173	286	3861
Washington Region PON	17	22	372
West Coast Slow Speed	31	205	402
20-Meter ISSB	26	252	480
75-Meter ISSB	31	501	1254
7290 Traffic	48	438	2930

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll January 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.

293
KA9CPA
203
K4TH
WD4COL
173
WA4CNY
147
N4CCT
144
WA4PFK
142
WB3GZU
136
WA2SPL
133
W2ZOJ
132
W1GUX
126
N2YL
WA5RVT
127
WA3NAZ
120
W4MEE

119
VE3JIR
W9JUJ
WA3PXA
WA3WQP
116
K4SCL
WB7WOW
WD8LRT
113
W2RQ
112
W7VSE
WB2RMI
111
K1BSO
K5TL
WB6PVH
110
WA4CCK
WB2EAG
109
AF4T
N4NK
W1TN
W2UEZ
WA2UWA
108

AA2H
AJ3R
107
AFØO
W6OA
WB8YRY
106
KA5CDX
WA1TBY
WB4VVL
WD8NYN
105
AF8V
AG2R
K2GCE
KB8GC
VE3GOL
WB2TOM
104
KL7HSF
WB1DXR
103
KA1BJY
N2APB
VE5AE
102
KA1CC
KB4OZ

WA2MFV
WB2PJU
WD4RNI
101
AF2L
K1BA
KB4N
N6AWH
WBØZBJ
WD4HIF
100
KØPIZ
KL7JEB
99
KA4FZI
VE5HG
WB8MTD
98
K4DZM
K8AAZ
VE1WF
W1RWG
WA2ZJP
WA4JDH
WD4AWN
97
W5OTR
WB5NKD

96
K3ORW
K7JV
N5TC
VE3DPO
WA4SRD
WA4STO
94
K7GXZ
WØOYH
WB4FVV
WB8ZNS
93
W2MTA
WB1CPF
WB8YDZ
92
VE1BMN
VE3JRT
W2XD
WA4YIU
WB8YTD
91
KC8C
N4AZI
WD8KZX
90
KA4IVO
KB6FR
W4CKS
W5HMR
WB1ANT
WB2HDU
WB4WYG
WD5IVD
89
WØFT
W8VPW
WAØTNM
WB5LAT
WD9BCM
88
N3AKC
W5VMP
WB4ZQJ
WB7OFI
87
N4WA
N5AWG
N9AUG
W4NWM
W7GHT
WA2MVQ

86
K4BKX
K7ZIG
NØACW
WB1BYR
85
K4EV
N4LE
W7EP
84
KB2GT
W9NXG
83
KØEZ
WA7IHS
82
AA5J
W5KLV
W8GGX
WB5LBR
81
AF1L
80
N8ABA
N8CW
WB8SYA
79
AJ5F
VE3CWA
78
KB2HM
W1WP
W3GQJ
WA1VAB
WB2BNY
77
K3JL
WB5YDD
WB7TQF
76
K4JGW
W1EOF
75
W2YJR
WB9JSR
74
K4XE
73
K5OWK
N2CR
N6GW

N7AFZ
W2TCA
WB8SIQ
72
K6YD
N5RB
71
WØOTF
W9JIJ
WB2ZCM
WDØBMR
WD5EUE
70
KA6ACD
KB2KW
W3YQ
WA2KOJ
69
K1JHC
N2BKK
W4ZJY
WA8QAF
68
KB8MX
W4LXB
WB6UBR
67
K4VHT
VE3GT
WØHXB
W4FMN
W9XD
WA8GMT
WBØHOX
WB1FZX
WB4ZDU
WB7URE
66
N1AMF
N9ASX
WA2AFE
WB5MMI
WB5NKC
65
KA5FKU
N7APC
W1BJ
W8RG
WA5QFD
64
KAØAIT
N5BT

VE3KK
WAØTFC
WA2HEB
63
KA2CNN
KB4OG
N5EK
W1TM
WA1LOU
WA4EYU
WB8WTS
WD5JYI
62
W7FJZ
W9HOT
WA7JRC
WD8PEI
61
K9PNG
K9UIN
KM4G
N2BC
W2AET
W5SBE
WA4ZHC
WD5CWK
60
KB5EK
N3EE
VE3IFP
W7GB
W9IEM
WA7MEL
WB5CIT
WD4PDK
59
WD4CFZ/T
55
WB2RMJ/T
54
N2BDW/T
53
WD8BHE/T
50
WB7CFH/T
46
KA2DBW/T
45
WA4JTO/T
40
WA2MEE/T

Brass Pounders League January 1980

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: WB3JGP and W7LUP.

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.

	2	3	4	5	6
W3CUL	1034	998	1644	126	3802
WØWYX	56	1033	222	813	2124
WA4JDH	5	601	618	2	1226
KA9CPA	28	743	94	251	1116
WAØHJZ	28	642	20	403	1093
WA2SPL	2	384	537	35	1058
W9JUJ	3	446	471	8	928
WA3WQP	3	486	438	30	957
W3VR	257	215	321	19	812
K1BCS	71	263	450	25	809
W4MEE	5	339	314	31	689
WB3GZU	64	223	283	46	616
W7DZX	28	281	292	4	605
W7VSE	0	329	257	11	597
AJ3R	7	278	309	2	596
WBØZQY	0	286	57	229	572
WB6PVH	2	279	255	31	567
K4TH	16	245	177	116	555
KL7JEB	17	261	225	36	539
WA4CNY	24	295	205	5	529
K4SCL	0	259	257	10	526
KB4N	0	235	265	5	505
W7LUP	27	239	225	14	505
WA4VKD (Dec.)	0	311	274	8	593
WD4COL (Dec.)	72	205	197	63	537
W7EP (Dec.)	0	265	234	30	529
W6LFJ (July)	518	12	8	2	540

BPL for 100 or more originations plus deliveries:

WAØRWM	237	WD4COL	112
WA3ATQ	235	VE3CWA	106
KBØIP	152	KØAIE	106
N4PL	134	W1WP	105
K7NTS	114	W7DAN (Dec.)	182

Multioperator stations:

WD4IIO	154

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DEL.
6 — TOTAL

Operating News

Conducted By John F. Lindholm,* W1XX

Post-WARC is Here! Now What?

It seemed so very far away. "Start planning for WARC so early? 1979? Oh, that's years away. Worry about that tomorrow."

With the turn of the decade into the seventies, 1979 *did* seem so very far away. How someone could plan effectively for an event so far into the future seemed futile. But men of vision *did* peer into the future and formulate plans, and *now* it has come and gone. 1979 and WARC are behind us. We are in the post-WARC era. So what happens *now*?

Predictions of those more clairvoyant than I put microprocessors into every hamshack. The computerized station will be as commonplace as the vfo is today — they say. If so, what will become of the more traditional popular roles of Amateur Radio — like working DX, contesting and ragchewing? Will they go the way of the brontosaurus and pterodactyl or are not these activities founded on a more basic humanistic motivation of man and so will continue on unabated into the future? We think so. The gadgets in the shack will change. But the basic object to communicate with our fellow man is no different now than Neanderthal's cave drawings, bone carvings or smoke semaphores. The aim is the same — to communicate. The thrust of today's Amateur Radio communication is no different than that of Dr. Leakey's zinjanthropus. Just a different slot in the spectrum, that's all. Why should it be different in the future? The hardware may become more sophisticated, but the basic purpose will remain unaltered.

The post-WARC era poses some really interesting challenges for us, not the least of which is proper management of the spectrum alloted to us. Our long-range objective will be to properly utilize the new spectrum awaiting our use at 10, 18 and 24 MHz. Let's focus our attention for now on 10 MHz, our most immediate concern.

The allocation is from 10.1 to 10.15 MHz, with the Amateur Service secondary and the Fixed Service primary. Thus we will be there on a noninterference basis. Permitted usage of this band (and any band) is on a country by country basis — a matter for each country's telecommunications authority to decide. Some countries may not even permit operation on this band. Usage could begin as early as January 1982, but not necessarily universally. Thus, some pragmatic *operating* concerns about proper usage of this band must be addressed by you, the operating public.

The 10-MHz band is a most desirable portion of the spectrum, especially during the ebb in the sunspot cycle. When 20 meters closes down, the maximum usable frequency (muf) will hover between 10 and 14 MHz, thus providing worldwide communication on this new band. This will render some relief to the overworked 40-meter band. Anyone with a 40-meter Yagi will certainly consider such an antenna for 10 MHz, as will those who can twirl it on 20 meters. It is prime choice on the spectrum platter.

Band-occupancy rules will dictate the type of activities that are nurtured there, a matter in which the League and its members will have a strong voice. The question of whether there should be sub-bands by mode and license class must be answered. From those decisions will flow a responsibility to control the band's population for the most effective usage of all. This will include decisions as to the types of League-sponsored awards and contests that will or will not be promoted there.

For example, with a 50-kHz-wide band, do we promote the best interests of its usage by permitting DXCC contacts to count for credit? Can anyone realistically outlaw such a basic amateur instinct as working DX? Perhaps contacts should count only for the basic DXCC award thus closing the door on any 6BDXCC that includes 10 MHz. Or do we see the advent of the 6-, 7- and 8-band DXCC? The vibes of the amateur community are needed on this DX operating issue.

Contests present another potential problem. The rules structure can control band usage, and so inclusion or exclusion of contest contacts on this band is a matter that must be addressed. Hordes of contesters could certainly saturate the entire allocation with ease. Should the rules prohibit contest operation on this band?

The 30-meter band is also nicely situated "on the dial" to answer another crying need — emergency communications. The hemisphere has been ravaged by storm and earthquake over and over again. We have only to recall the destruction on Dominica and the Dominican Republic last summer. No doubt nature will continue to display its awesome power. Since

*Communications Manager, ARRL

W1AW Schedule

April 28-October 25, 1980

W1AW code practice and bulletin transmissions are sent on the following schedule:

MTWThFSSn = Days of Week Dy = Daily

UTC	Slow Code Practice	MWF: 0200, 1300 2300; TTh: 2000; S: 2000; Sn: 0200, 2000
	Fast Code Practice	MWF: 2000; TTh: 0200, 1300 2300; S. 0200, 2300; Sn: 2300
	Cw Bulletins	Dy: 0000, 0300, 2100; MTWThF: 1400
	RTTY Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Voice Bulletins	Dy: 0130, 0430
EDT	Slow Code Practice	MWF: 9 A.M., 7 P.M.; TThSSn: 4 P.M., 10 P.M.
	Fast Code Practice	MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M.
	Cw Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	RTTY Bulletins	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.
	Voice Bulletins	Dy: 9:30 P.M., 12:30 A.M.
CDT	Slow Code Practice	MWF: 8 A.M., 6 P.M.; TThSSn: 3 P.M., 9 P.M.
	Fast Code Practice	MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M.
	Cw Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	RTTY Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Voice Bulletins	Dy: 8:30 P.M., 11:30 P.M.
PDT	Slow Code Practice	MWF: 6 A.M., 4 P.M.; TThSSn: 1 P.M., 7 P.M.
	Fast Code Practice	MWF: 1 P.M., 7 P.M.; TTh: 6 A.M.; TThSSn: 4 P.M.
	Cw Bulletins	Dy: 2 P.M., 5 P.M., 8 P.M.; MTWThF: 7 A.M.
	RTTY Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Voice Bulletins	Dy: 6:30 P.M., 9:30 P.M.

Code practice and cw bulletin frequencies: 1.835, 3.58, 7.08, 14.08, 21.08, 28.08, 50.08, 147.555 MHz.

RTTY bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.

Voice bulletin frequencies: 1.835, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is at 5, 7-1/2, 10, 13 and 15 wpm.

Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 wpm.

Code practice texts are from *QST* and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from February 1980 *QST*, pages 9 and 82" indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 82.

Cw bulletins are sent at 18 wpm; Teletype bulletins are sent at 60 wpm with 170 Hz shift.

W1AW is open for visitors Monday through Friday from 7:30 A.M. to 1 A.M. EDT and on Saturday and Sunday from 3:30 P.M. to 1 A.M. EDT. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 P.M. Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, RTTY at 15 minutes past the hour, and cw on the half hour.

W1AW will be closed on May 26, July 4 and September 1.

Station staff: Chief Operator/Asst. Communications Mgr. C. R. Bender, W1WPR; Chris Schenck, W1EH; Charles Chadwick, K8AXL.

we are starting out from scratch on this band, what better time than now to set aside emergency frequencies? Perhaps the top-10 kHz. Recognition of such emergency frequencies has failed in the past because they were enacted upon existing band usage. This is virgin amateur territory. Recognition of such emergency frequencies from day one could be far more easily achieved.

How shall we proceed on these operating matters? That's for you to help decide. Decisions here will no doubt set the trend for 18 and 24 MHz further down the road. Let *your* voice be heard. To whom?

On DXCC matters, your microphone is the DX Advisory Committee, while on contest matters, the Contest Advisory Committee. For emergency communications matters, key-up the Emergency Communications Advisory Committee. On matters of overall band management, the Board's special 10-MHz Ad Hoc Committee is QRV — all are vehicles available to you via Headquarters routing.

We are in the post-WARC epoch. Now what?

SCM ELECTION NOTICE

To all ARRL members in the Southern Florida, North Dakota, West Indies, Oklahoma, Minnesota, Connecticut, Idaho, Western New York and Ohio sections: You are hereby solicited for nominating petitions pursuant to an election for Section Communications Manager. A petition, to be valid, must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition*. No member may sign more than one petition. It is advisable to have a few more than five signatures on each petition.

Petition forms (CD-129) are available on request from ARRL headquarters, but are not required. The following form is suggested:

(Place and date)

Communications Manager, ARRL
225 Main Street, Newington, CT 06111

We, the undersigned full members of the . . . ARRL Section of the . . . Division, hereby nominate . . . as candidate for Section Communications Manager for this Section for the next two-year term of office. (Signature . . . Call . . . City . . . ZIP . . .)

An SCM candidate must have been a member of the League for a continuous term of at least two years and a licensed amateur of General class or higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, June 6, 1980.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on July 1, 1980, and returns counted August 19, 1980, and SCMs elected as a result of the above procedures will take office October 1, 1980.

If only one valid petition is received for a section, that nominee shall be declared elected without opposition, for a two-year term beginning October 1, 1980.

If no petitions are received for a section by the specified closing date, such section will be resolicited in October *QST*, and an SCM elected through the resolicitation process will serve a term of 18 months.

Vacancies in any SCM office between elections are filled by appointment by the communications manager.

You are urged to take the initiative and file a nominating petition immediately.

John F. Lindholm, W1XX
Communications Manager

REPEAT SCM NOMINATING PETITION

Since no petitions were received for the South Dakota and Louisiana sections as a result of notices in the October and November *QST*, nominating petitions for these sections are herewith resolicited. See the above notice for details on how to nominate.

Appointments: In the Northern Florida Section, Fred K. Marchman, AA4FG, was appointed to complete the term (until June 30, 1980) of Frank M. Butler, Jr., W4RH (resigned). QST

	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 Apr.	24,596	00:00	69.4	10,565	AJ	01:12	67.9
2 Apr.	24,609	00:54	83.0	10,579	X	01:17	69.2
3 Apr.	24,622	01:49	96.6	10,593	A	01:22	70.5
4 Apr.	24,634	00:48	81.4	10,607	AJ	01:27	71.8
5 Apr.	24,647	01:42	95.0	10,621	J	01:33	73.1
6 Apr.	24,659	00:42	79.8	10,635	J	01:38	74.4
7 Apr.	24,672	01:36	93.4	10,649	A	01:43	75.7
8 Apr.	24,684	00:35	78.3	10,662	AJ	00:05	51.2
9 Apr.	24,697	01:30	91.9	10,676	X	00:10	52.5
10 Apr.	24,709	00:29	76.7	10,690	A	00:15	53.8
11 Apr.	24,722	01:23	90.3	10,704	AJ	00:20	55.1
12 Apr.	24,734	00:23	75.1	10,718	J	00:25	56.4
13 Apr.	24,747	01:17	88.7	10,732	J	00:31	57.7
14 Apr.	24,759	00:16	73.6	10,746	A	00:36	59.1
15 Apr.	24,772	01:10	87.1	10,760	AJ	00:41	60.4
16 Apr.	24,784	00:10	72.0	10,774	X	00:46	61.7
17 Apr.	24,797	01:04	85.6	10,788	A	00:51	63.0
18 Apr.	24,809	00:03	70.4	10,802	AJ	00:56	64.3
19 Apr.	24,822	00:58	84.0	10,816	J	01:02	65.6
20 Apr.	24,835	01:52	97.6	10,830	J	01:07	66.9
21 Apr.	24,847	00:51	82.4	10,844	A	01:12	68.2
22 Apr.	24,860	01:46	96.0	10,858	AJ	01:17	69.5
23 Apr.	24,872	00:45	80.9	10,872	X	01:22	70.8
24 Apr.	24,885	01:39	94.5	10,886	A	01:27	72.1
25 Apr.	24,897	00:39	79.3	10,900	AJ	01:33	73.4
26 Apr.	24,910	01:33	92.9	10,914	J	01:38	74.7
27 Apr.	24,922	00:32	77.7	10,928	J	01:43	76.0
28 Apr.	24,935	01:27	91.3	10,941	A	00:05	51.5
29 Apr.	24,947	00:26	76.2	10,955	AJ	00:10	52.8
30 Apr.	24,960	01:20	89.7	10,969	X	00:15	54.1
1 May	24,972	00:20	74.6	10,983	A	00:20	55.4
2 May	24,985	01:14	88.2	10,997	AJ	00:25	56.7
3 May	24,997	00:13	73.0	11:011	J	00:31	58.0
4 May	25,010	01:08	86.6	11,025	J	00:36	59.3
5 May	25,022	00:07	71.4	11,039	A	00:41	60.6
6 May	25,035	01:01	85.0	11,053	AJ	00:46	61.9
7 May	25,047	00:01	69.9	11,067	X	00:51	63.2

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).

Soviet RS data have been discontinued.

O 7 progresses an average of 28.7372° W. per orbit in a period of 114.945676 minutes.
O 8 progresses an average of 25.8074° W. in a period of 103.225426 minutes.

O 8 modes of operation are Mondays and Thursdays — Mode A. Tuesday and Friday — Mode AJ. Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D.
Mode AJ 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.

Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq. OSCAR locators for O 7, O 8 and Soviet RS are available in the *Satellite Communications* package at your dealer or direct from ARRL; $4.75 U.S., $5.50 elsewhere.

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Tom Frenaye,* K1KI

APRIL

1

West Coast Qualifying Run (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0500Z April 2 (9 P.M. PST April 1). Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send to ARRL hq. for grading. Please enclose your full name, call (if any) and complete mailing address. A large self-addressed envelope will help expedite your award/endorsements.

5-6

ARRL Open CD Party, cw, March *QST*, page 92.

QRP ARC QSO Party, sponsored by QRP ARC International, from 2000Z April 5 until 0200Z April 7. Exchange signal report, state/province/country and QRP number (nonmembers send power). Count two points for nonmembers, three points for members and four points for other than W/VE stations. Multiply QSO points by sum of states/provinces/countries. Multiply that total by one if you run more than 100 watts input, by 1.5 if 25-100 watts, by 2 if 5-25, by 3 if 1-5, and by 5 if less than 1 watt. Suggested frequencies: phone — 1810 3985 7285 14,285 21,385 28,885 50,385 kHz; cw — 1810 3560 7060 14,060 21,060 28,060 50,360 kHz; Novice 3710 7110 21,110 28,110 kHz. Awards. Special award to the station with the three QSOs using the lowest power. S.a.s.e. for results. Send full log data and equipment description in time to be received by April 30. Send to ARP ARCI Contest Chairman, Edwin Lappi, WD4LOO, 203 Lynn Dr., Carrboro, NC 27510.

SP-DX Contest, cw, sponsored by the Polski Zwiazek Krotkofalowcow (PZK). (Phone contest April 19-20) from 1500Z Saturday, until 2400Z Sunday, 80-10 meters. Single operator (single- or multiband) and multioperator single transmitter categories. Polish stations will transmit signal report and a two-letter Wojewodztwo (province) indicator. Others send signal report and serial number. Count three points per SP QSO and multiply by the total number of Wojewodztwos worked (not per band) for final score. Complete log information and a signed declaration that all rules were followed should be mailed by April 30 (May 15 for phone) to PZK, SP DX Contest Committee, P. O. Box 320, 00-950 Warszawa, Poland.

8-9

DX-YL to North American-YL Contest, phone, sponsored by the YLRL, from 1800Z April 8 (Tuesday) until 1800Z April 9 (Wednesday). YLs only, 160-10 meters. Exchange signal report, serial number and ARRL section or DXCC country. All contacts count one point. Multiply contact total by total number of ARRL sections and DXCC countries for final score (additional multiplier of 1.25 if you run less than 150 Wdc or 300 W PEP. Awards. Complete log info should be sent by May 3 to YLRL Vice President Ione O'Donnell, WA2DMK, Newcomb, NY 12852.

10

W1AW Qualifying Run, 10-35 wpm at 0300Z on April 11 (10 P.M. EST April 10). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. The complete W1AW schedule appears in the "Operating News" column this month. Other details are the same as for the April 1 listing.

12-13

ARRL Open CD Party, phone, March *QST*, page 92.

County Hunters SSB Contest, from 0001Z April 12 until 2400Z April 13 with two mandatory off periods from 0800Z until 1200Z. Suggested frequencies: 3920-3940, 7220-7240, 14,275-14,295, 21,375-21,395, 28,575-28,595. Keep 3925-3935, 7225-7235 and 14,280-14,290 clear for working mobiles only. Mobiles may be worked each time they change counties or bands (second band contacts for multiplier points only). County line contacts can count for two multipliers. Fixed stations can work other fixed stations only once during the contest. No contacts on net frequencies. Exchange signal report, county and state. Score one point with U.S. or Canadian stations, five points for DX (including KH6/KL7) and 15 points for mobiles. Final score equals number of U.S. counties plus Canadian stations worked multiplied by total number of QSO points. Awards. Complete log and summary data must be received by June 1, 1980. Send to John Ferguson, W0QWS, 3820 Stonewall Ct., Independence, MO 64055.

15-16

DX-YL to NA-YL Contest, cw, see April 8-9 listing.

19-20

ARRL International EME Contest-I, February *QST*, page 92.

ARRL Morning Special, from 0800 until 1000Z April 20 (1 A.M. PST/4 A.M. EST Sunday morning). 75-meter phone only. Suggested frequencies 3875-3925 kHz. Exchange consists of a one- or two-digit number indicating how many years you have been licensed and the first call sign you ever held. Example: W3AZD might send "25 WN3AZD" for his exchange. Score equals total QSOs. Standard disqualification criteria apply. Top scorers will be listed in *QST*. Send an s.a.s.e. for complete results. Complete contest log info should be sent by May 5 to ARRL.

SP-DX Contest, phone, see April 5-6 listing.

YL ISSB QSO Party, March *QST*, page 98.

26-27

Trophy H.M. The King of Spain Contest, sponsored by Agrupacio Radioaficianats Calella, 160-10 meters. From 2000Z April 26 until 2000Z April 27 with one rest period of at least four hours. One point per QSO with EA stations. EA stations will send signal report and province indicator (example 599B for Barcelona). Others send signal report and serial number. Contacts with Calella count as extra multipliers. Final score equals QSO points times the sum of provinces per band. Participation award for 50 QSOs. Send 2 IRCs for results. Mail by June 1 to Agrupacio Radioaficianats Calella, Apartado 181, Calella, Barcelona, Spain.

Helvetia Contest, from 1500Z April 26 until 1500Z April 27, cw or phone, 160-10 meters. Exchange signal report and serial number. Swiss stations (HB) will also send the abbreviation of their canton (county). Canton abbreviations are: ZH BE LU UR SZ OW NW GL ZG FR SO BS BL SH AR AI SG GR AG TG TI VD VS NE GE JU. Count three points per QSO. Multiply by sum of cantons worked per band for final score. Awards. Mail by May 27 to TM USKA K. Bindschedler, HB9MX, Strahleggweg 28, 8400 Winterthur, Switzerland.

27

W1AW Qualifying Run, 10-35 wpm at 2300Z (7 P.M. EDST). See April 10 listing for more details.

30

West Coast Qualifying Run, 10-35 wpm at 0400Z May 1 (9 P.M. PDST April 30. See April 1 listing for more details.

MAY

3-4

SEANARC Totem Pole Contest, sponsored by the Western Washington DX Club, to promote the ARRL National Convention in Seattle (July 25-27). 48-hour period, 80-6 meters. Single operator only, cw or phone only. Washington stations count one point per QSO, others count two points for Washington QSOs and one point for others. Awards. Entries must be received by July 26. Send to Totem Pole Contest, W7FCB, P. O. Box 499, Issaquah, WA 98027.

New York State QSO Party, sponsored by the University of Buffalo Amateur Radio Society, WA2NPQ, from 1700Z May 3 until 0500Z May 4 and 1200Z until 2359Z May 4. Phone and cw. New York stations may work each other. Mobile/portable stations may be worked again if they change county. Exchange signal report, serial number and state/country (county for New York stations). Suggested frequencies: Phone — 3900 7275 14,285 21,375 28,550; cw — 1810 3560 7060 14,060 21,060 28,060; Novice 3725 7125 21,125 28,125. Score one point per QSO. New York stations multiply by sum of states/provinces/countries. Others multiply by number of New York counties worked. Check sheets required for more than 100 contacts. Mail by June 10 to Michael Bergman, WD2AJS, 45 Swartson Ct., Albany, NY 12209.

9

ARRL Frequency Measuring Test, begins with a call-up at 0200Z and 0500Z May 10 (10 P.M. EDST May 9 and 1 A.M. EDST May 10). W1AW transmitters will be on the air simultaneously on 20, 40 and 80 meters for the duration of the test but in order to correlate your readings with those of the umpire, measurements should be made during the specified periods. Approximate frequencies and measuring periods for the early run are 14,065 kHz between 0207 and 0212Z, 7100 kHz between 0215 and 0220Z, and 3545 kHz between 0223 and 0228Z. For the late run, 14,100 kHz between 0507 and 0512Z, 7040 kHz between 0515 and 0520Z, and 3525 kHz between 0523 and 0528Z. Submit your averages for each period to be compared with the umpire, a professional frequency measuring laboratory. Indicate how many readings you took to form your average. Your report must be received by May 22. W1AW will transmit official results in an ARRL bulletin beginning May 24.

10-11

World Telecommunications Day Contest, phone, sponsored by the Liga de Amadores Brasileiros de Radio Emissao (LABRE). 1980 dates not confirmed at presstime. (Cw weekend May 17-18.) 48-hour period, 80-10 meters. Single operator and multioperator/club categories. Exchange signal report and ITU zone.

*Asst. Communications Manager, ARRL

Contacts with your own country for zone credit only. Count one point for same zone, different country QSOs, three points for same continent, different zone, and five points for different zone, different continent QSOs. Multiply QSO points by total number of ITU zones worked (not per band) for final score. Awards IRCs for results. Mail by June 30 to LABRE, U.I.T. Contest Coordination, P. O. Box 07-0004, 70000 Brasilia, DF, Brazil.

CQ-M Contest, sponsored by the Radio Sports Federation of the USSR, from 2100Z May 10 until 2100Z May 11, 80-10 meters, phone and cw. Do not use the bottom 5 kHz on 80 and 40 meters and the bottom 10 kHz of 20-15-10 meters. USSR stations will send signal report and region (oblast) number. Others send signal report and serial number. Count one point for contacts on your own continent and three points for others. Contacts with your own country for multiplier only. Multiply QSO points by sum of countries worked per band for final score. Single-operator all band, single-operator single band and multioperator single transmitter categories. Awards. Badges to those making 10 QSOs. Mail entries by July 1 to CQ-M, Box 88, Moscow, USSR.

Rocky Mountain Division QSO Party, sponsored by the Arapahoe Radio Club, from 1800Z May 10 until 2400Z May 11. Rocky Mountain (RM) Division states are Colorado, New Mexico, Utah and Wyoming. Exchange signal report and ARRL section (RM stations also send county). Count one point per phone QSO, two points per cw QSO and three points for QSOs with portable club stations (signing /C). RM stations multiply QSO points by sum of ARRL sections, RM counties and DX countries. Others multiply by sum of RM states and RM counties per band. Bonus of 50 points for working 5 RM Novices or Technicians. RM mobiles earn 100 bonus points for making 10 QSOs in at least three different counties. Portable RM club stations earn 100 bonus points if at least five operators make 10 QSOs each. Suggested frequencies: Phone — 3900 7270 14,300 21,370 28,570; cw — 60 kHz from low end; Novice — 3725 7125 21,125 28,125. Awards. Send s.a.s.e. for results. Mail by June 15 to KAØCLS, 8973 W. Harvard Dr., Lakewood, CO 80227.

12

W1AW Qualifying Run, 10-35 wpm at 0200Z May 13 (9 P.M. EDST May 12). See April 10 listing for more details.

17-18

ARRL International EME Contest-II
Armed Forces Day
World Telecommunications Day Contest, cw.
Common Market DX Contest
Florida QSO Party
Massachusetts QSO Party
Michigan QSO Party

24-25

CQ WPX Contest, cw
Ibero-American Contest, phone.

29

W1AW Qualifying Run

JUNE

7-8
Teenage DX Contest

14-15
ARRL VHF QSO Party

21-22
All Asia Contest, phone

28-29
ARRL Field Day

JULY

12-13
IARU Radiosport Championship

AUGUST

2-3
ARRL UHF Contest

50 Years Ago

April 1930

In a 9-1/2-page article, Technical Editor Jim Lamb describes the exciter section of a 30-MHz experimental transmitter at NKF, the Naval Research Laboratory. (Our 10-meter band went to 30.0 Mc. in those days.) This beautiful c.w. rig, housed in a 6-foot-high frame, uses a triode (210) oven-controlled 3.333-Mc. crystal oscillator, followed by two tetrode (865) triplers, delivering 7-1/2 watts out at 10 meters. A pair of 861s in the amplifier boosted the output to 500 watts, but the article covers only the driver sections. Two fixed-type curtain beam antennas are described, to show what the Navy was using to keep a 10-meter circuit open for a solid five hours each day to ships off the coast of California.

Editor Lamb also has an article on the state of the art of crystal grinding at that time, pointing out the advantages of the X-cut crystal over the more common Y cut. (In those days one still thought in terms of *power* output from crystal oscillators, and 1-inch square crystals were the norm.)

Rydberg, W9AED, and Doty, W9GDG, pointed the way to the ultimate in regenerative detectors in "The Superiority of Screen-Grid Detectors." In an article showing the circuit for a 224 (screen-grid) detector and a 227 (triode) audio amplifier. (Ultimate? Well, almost. A 1941 6AC7 would have been even more super!)

Paul Zottu, a senior at Wesleyan University (and later a well-known radio engineer) has a beautiful 6-page article, "The ABC of Filter-Design." Complete with formulae and graphs (and a number of typographical errors in the math), it undoubtedly helped to nail down *QST*'s reputation of being "too technical."

25 Years Ago

April 1955

Communication (radio) and power people often had different symbols for the same device, through WW II and up to 1954. (In retrospect) it makes good sense to have one standard for both industries. The cover suggests, and Harold Westman (former *QST* staff member) presents, the newly-agreed-upon graphical symbols for schematic diagrams. In this compromise, some symbols are going to look strange to power people, some are going to look strange to communications people (which includes hams). *QST* announces that it will be using the new industry standard from now on. (Stay tuned for the reader reaction!)

In the February 1953, *QST*, John Kaye, W6SRY, stood the cw ops on their ears with his "The Ultimatic — the Keyer with a Memory." Two years later, in this issue, he introduces an all-electronic version of the original, which wasn't too overwhelmingly popular because it used *seven* (!) relays. The all-electronic job includes squeeze-keying (double lever paddle).

V.h.f. dean Frank Jones, W6AJF, describes "Director Beams," in which the usual reflector is omitted in favor of a close-spaced director. The price for the increased gain is decreased bandwidth, a not-too-serious trade-off at 144 and 220 Mc.

Further on 220 Mc., Ed Tilton, W1HDQ, describes a four-stage transmitter featuring the new Amperex 6360 inexpensive dual tetrode. A crystal at 8.15 Mc. and tripling in the oscillator and two subsequent stages, permits straight-through operation on 220.

In another article, Ed points out some of the pitfalls when using crystal-controlled converters ahead of tunable receivers for v.h.f. reception. Improving the receiver antenna connector (to reduce stray pickup) and improving the tuning rate of a general-coverage receiver are the two very practical recommendations.

The "d.c. bands" are not neglected. Technical Editor George Grammer, W1DF, reviews the Collins 75A-4 receiver and points out the several improvements in this latest model of a classic. Among the modifications are the inclusion of separate detectors for a.m. and s.s.b./c.w. — *By Goodman, W1DX*

Strays

NEW SOURCE FOR ANTIQUE RADIO SERVICE NEEDS

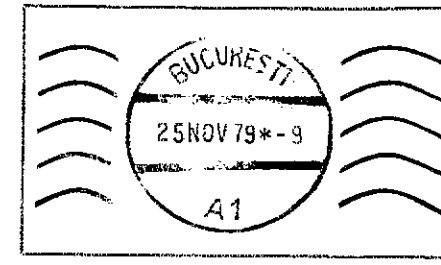
If you're interested in antique radios or TV sets, or early servicing manuals, you can write to Antique Radio Services, Attn. Hartford Beitman, 646 Kenilworth Terr., Kenilworth, IL 60043.

HOW LONG SHOULD YOU WAIT FOR A QSL CARD?

Bill Conant, W1BPY, of East Hartford, Connecticut, recently received a QSL card with IRCs and an s.a.e. from Harold Chorley, G5YH, of London. The card was for a QSO with a VR3 station who incorrectly gave Bill's call as a QSL manager. The G5YH call sounded familiar and a check of old logs showed that Bill and Harold had been in QSO several times back through the years. A QSL card had been made out for their first QSO on July 11, *1934*. The log did not show a card received so Bill asked for a confirming card. Harold obliged, and Bill received a card confirming the 1934 QSO — it was postmarked December 3, 1979. Quite a wait! — *Bill Conant, W1BPY*

II GUIDE DOG AWARD

The Union of Radioaficinonados Minusvalidos Espanoles (URME), in cooperation with the URE's Vigo division, announces the "II Guide Dog Award" for operation from 0000 UTC on Monday, June 2, until 2400 UTC on Friday, June 6, 1980. Points will be awarded for hf phone contacts with URME members, designated by their organization, who will use the phrase "perro guia" (guide dog) after their call sign. Each QSO with an official station will count one point. There will be a station with a special call sign worth two points. Rules and list of prizes are available from Union de Radioaficionados Espanoles, Delegacion Local de Vigo, Apartado No. 742, Vigo, Pontevedra, Spain.



Fred Anderson, KØIHG, Minneapolis, Minnesota, received this envelope containing a YO3CR QSO card confirming a 15-meter cw contact at 1818 UTC, March 18, 1979, in the ARRL DX Contest. Fred asks, "Does the Romanian Postal Department always indicate the mode of emission in the postmark when a QSL is mailed?

Amateur Radio brought the voices of Santa Claus, Russell Burroughs, WA3PVL, and his assistant Mark Burroughs to children at the North Arundel hospital, Glen Burnie, Maryland. Edward Avella is shown sending his Christmas wish for a Rolls Royce. Bob Merkle, WB3FTT (center), and Bill Cook, K3CN, were Santa's helpers in the hospital. *(photo courtesy Edyie Tangreti)*

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, S. T. Jones, VE6MJ — SEC & Asst SCM: E. Roy Ellis, VE6XC. Net Mgr (APSN): VE6AFO. Net Mgr (ATN): VE6BBL. Weak Signals heard from Victoria BC originating from our escape the winter weather SCM, VE6MJ. Hang in there. The NARC executive is busy planning and getting things rolling for Alberta's 75th anniversary by way of a hamfest this summer. Dates to be firmed later. VE6BBL is extra busy as a NCS for the APSN and running the ATN, QNI the RN7 and other nets. The provincial government is requesting Alberta ham participation in a provincial wide communications exercise the last week in March. Contact the SEC for details. Traffic: VE6BBL 70, VE6CHK 55, VE6ABC 19, VE6XC 15, VE6QN 13, VE6VS 6, VE6JH 5, VE6CCW 4, VE6SA 4, VE6CAA 3, VE6AMB 2.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB — If they don't see BC Section in QST, I am told. But all we ever hear from is our net managers, and thanks to them, BCEN CW Net scored a high with twenty QNIs, sorry but QTCs are becoming less each month. Why? BCARPSC Net even had a low of sixty from the average check-ins of hundred or more per session. Traffic: VE7ZK 87, VE7COA 44, VE7DFY 44, VE7BLO 20, VE7FB 18.

MANITOBA: SCM, Peter Guenther, VE4PG — Asst SCM: VE4JP. SEC: VE4TR. STM: VE4RO. NMs: VE4s VJ TE NM AEJ. Our sincere thanks to VE4IZ for his dedication as net manager for the last few years. VE4AEJ will take over those duties on MTN, so VE4IZ can now get more involved in his many other activities. VE4AGB our slow net manager, has moved out to BC, which means we are looking for a manager for that net. Looks like RTTY is again becoming an active mode, and the list is growing. Somewhat unusual, VE4LB was absent from the airways for about three weeks. MMN: QNI 572, QTC 33, sess 31; MEPN: QNI 1356, QTC 30, sess 31; MTN: QNI 84, QTC 84, sess 31; WRIN: QNI 145, QTC nil, sess 4. Traffic: VE4PG 74, VE4RO 67, VE4IZ 40, VE4HR 35, VE4AEJ 31, VE4QU 29, VE4TE 29, VE4QJ 28, VE4ID 22, VE4LB 21, VE4JA 16, VE4AED 13, VE4FK 11, VE4LN 7, VE4NM 7, VE4NE 6, VE4AAD 5, VE4IX 4, VE4ACX 3, VE4AAF 2, VE4AAU 2, VE4CR 2, VE4DP 2, VE4BD 1.

MARITIME — NFLD: SCM, Aaron D. Solomon, VE1OC — A/SCM: VO1FG. STM: VE1WF. SEC: VE1ASW. NMs VO1JN VE1WF. Silent Keys: VE1CD VE1FS ex VE1GG ex VE1HB VE1VK VO1EG VO1GW. Condolences. Hosp. VE1s AFA AMB AMM AZN BEZ DF HA FN BI LO MA VO1GP. Speedy recovery. New SARC officers: VE1FT, secy.; VE1BND, treas. VE1XS writes abt. "Don, Evelyn and Jenny" friends of late VE1RT in SARC Bulletin. VE1GFN ex VE1ADH writes abt. the role of Am Radio in *ET* Canada Jan '80 re Mississauga derailment. 31 HARC amateurs part. in gr. search for three rabbit hunters. SARC conducted gr search exercise. VE1s BXI BXJ now in Dartmouth. VE7CAM teaching at Dal. until Apr. Ham Ceilidh '80 award went to Bob Perry, Lower Sack. MAARC & IRG Bull contain up-to-date list Mar rptrs. VE7AGZ ex VE1NB sends 73 to VE1s. VO news: VO1NP acted as Santa on Nfld Phone Net, also NCS ROAR Net. VO1HP handles 2K QSLs/month. VO1JN active on 6 meters. APN: sess 31; QNI 208, QTC 112/107. ECN: sess 62, QTC 370, Rate 0.53. Traffic: VE1WF 319, VE1LCR/RO 100, VE1CH 50, VE1BMN 79, VE1BXA 18, VE1OC 18, VE1XF 11, VE1AUL 9, VE1KR 8, VE1HJ 2.

ONTARIO: SCM, Larry Thivierge, VE3GT — SEC: VE3APK. STM: VE3GOL. VE3JPP of the South Pickering ARC appeared on educational TV promoting Amateur Radio and the ARPSC to the Dutch Canadian community. Many YLs saddended to hear of the passing of W2RUF, struck by a car. VE3TRS on 449.5/444.55 MHz is the Kitchener-Waterloo area's newest repeater, located QTH of VE3CHQ. Traffic handlers appear adjusting to the use of the new revised numbered radiogram list, CD-3. VE3DEV now VE3TM. VE3HQT looking for a 1921 issue of the Dept of Marine & Fisheries radio listing, while VE3AYL looking for a 1931 issue of the Call book to confirm 50 years in radio. Bootlegging of amateur calls appear to be on the rise as noted when delivering messages from the QSL Bureau. Incidentially, do you have your s.a.s.e.s' on hand at the bureau — it will go a long way to making their job much easier and you'll receive your cards much faster. OCWA membership has spread across the world and has a total of 122 chapters with an active member list approaching 9000. I'm looking forward to joining later this year. Cdn Division Director, VE3OT, has been appointed to the ARRL International Affairs committee. K6GNU/VE3, EC for Port Colborne, has VE3s HLE ISD AIO and EYP as asst's. VE3s DIF and BJK on RTTY. The Leamington ARCs executive consists of VE3GNH, pres.; VE3IIX, vice pres.; VE3IIS, secy.; VE3IHB, activities; VE3CWD, treas. VE3BVG newest OTS appointee. VE3s JB and FVR planning and rebuilding repeater VE3SKY. Halton ARC publishes a nifty bulletin. Skywide ARC issues a certificate to promote on the air contacts with fellow club members — VE3UR leads the way with 120. The 20th Annual "CARTG" RTTY DX 'NEW DECADE' Sweepstakes will take place on the weekend of October 18-20, 1980. VE5RG won the gold medallion & ribbon for high score for Canada in the '79 sweepstakes. Traffic: (Jan) VE3GOL 448, VE3CWA 430, VE3JIR 342, VE3DPO 218, VE3KK 205, VE3JRT 169, VE3CYR 165, VE3ISW 139, VE3GT 116, VE3GJG 111, VE3EWD 84, VE3SB 84, VE3GYD 68, VE3JLL 56, VE3DVE 53, VE3IFP 53, VE3DUK 46, VE3FZG 44, VE3APK 42, VE3BVG 41, VE3GFN 39, VE3HCS 31, VE3JJK 25, VE3FGU 21, VE3IMR 18, VE3JHE 15, VE3AIZ 11, VE3ANJ 10, VE3CBR 9, VE3IXB 9, VE3FGV 8, VE3KXB 7, VE3DZH 2. (Dec) VE3AYZ 157, VE3HCS 75, VE3FHZ 20, VE3HOI 8.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. New appointee: VE2FEX as OTS. The next convention of Radio Amateur du of Quebec Inc. (RAQI), will take place in Tadoussac on August 22, 23 and 24, 1980. More details later. VE2HG has moved from Chibougamau to Val d'Or and putting out a good signal from new QTH. Plusieurs OTS sont actifs et font du beau travail, donc notre section se comporte assez bien, cocernant le traffic quoique nous avons grandement besoin de stations pour le QSN en cw. VE2CRG a de nouveau cette annee, fait un succes de sa soiree annuelle. Traffic: (Jan) VE2FFE 21, VE2EC 19, VE2BZL 12, VE2FEX 12, VE2EKC 10, VE2APT 7, WB1EZI/VE2 6. (Dec) VE2BZL 12, VE2APT 9, VE2BDM 4.

SASKATCHEWAN: SCM, Norm Waltho, VE5AE — NMs: VE5HG VE5DC VE5WM VE5SF. The Prarie Weather Net under the direction of VE5SF has now been added to the list of Sask nets. This net meets at 1430 UTC on 3785 daily for the purpose of passing WX information across the west. The net has been running for some time with a fair amount of activity. A new repeater that will be going up very shortly is the one at Grenfell which will be on 146.07-146.67. By the time you read this the new QSO magazine will be out to the amateurs in the province, let's give it our support fellas. SPN QNI 1294, QTC 39; SATN QNI 427, QTC 36; RARA QNI 460, QTC 4; PWxN no rpt. Traffic: VE5AE 37, VE5HG 24, VE5XC 18, VE5AAT 14, VE5WM 13, VE5QY 11, VE5BBD 11, VE5BBH 8, VE5AK 2, VE5TT 2, VE5NJ 1.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX — SEC: W3PQ. NMs: W3WD W3QQ. PSHR: N3AKC 88, K3JL 77, K3HBP. Olympic Torch Run Coordinator accompanied WB3ENF and WB3FOE on the caravan through DE. WB3LGC and WB3EOU were official radio operators for the entire route from Yorktown, VA to Lake Placid. Sussex ARA repeater has a new antenna and a dramatic improvement in coverage is reported. K3JL/r frequencies are: transmit 147.075, receive 147.675. TMARK coordinated. Congrats to AK3A (ex WB3FUO) on Extra. K3HBP is now QSL Mgr. for TU2IN. DTN: QNI 340, QTC 51; DEPN: QNI 62, QTC 18. Traffic: N3AKC 71, K3JL 39, WA3WIY 38, W3QQ 37, W3DKX 35, WB3DUG 29, W3WD 18.

EASTERN PENNSYLVANIA: SCM: G. S. Van Dyke, Jr, W3HK — SEC: WA3PZO. STM: K3NGN. NMs: W3VA WA3WQP AJ3R K3NGN. Net reports: LVN: QNI 111, QTC 4; LVN(2): QNI 27; EPAEP&TN: QNI 414, QTC 101; PFN: QNI 323, QTC 248. OVS repts KA3DZD WA3BJQ W3GOA AJ3R K3RHI W3CL WB3GUS WB3AZE. OO repts: W3FAF W3KCM W3CL W3RJ. OBS repts: AJ3R W3VA W3CL WA3AVJ K3EBZ BPL: WA3WQP AJ3R WA3ATQ. PSHR: WA3WQP AJ3R KB6FR/3. KA3CHG busy on 2-m. WA3ATQ says winter is here! She is also working some rare DX. Lots of traffic coming up from Seminole FL! Tfc a bit down after Xmas rush. WB3FEH has leg in cast, says it put a cramp on ham activities - does he send with his leg? AA3B assisted in tank car evacuation of North Hampton Twp with PWA. Looks like the Pack Rats may have done it again. WB3GAV on 2-m. K3JMU is handling things for LVARC(W3OI). WB3JUK came out first in PA QRP CW Contest. N3AMP now AJ3Z. KA3CSN now N3BBW, active on 2-m. K3MWA enjoying IC-701. MURGAS Club getting lots of publicity in local papers. They also have classes for Tech, General and Advanced in progress; 220 activity growing. New officers Fkd ARC: N3AW, pres.; N3AD, vice pres.; K3VW, secy.; N2LT, treas. Reading Rdo Club: WB3EPW, pres.; WA3SPJ, vice pres.; W3UQC, secy.; WB3AAK, treas. Add N3AIU to OBS's reporting. The election should be over by now and the new SCM known. I would like to thank all the NMs STM SEC and appointees for their splendid cooperation during my term of office. It was your fine work that made EPA come out on top! Keep up the good work and report regularly and on time to the new SCM. Traffic: (Jan) WA3WQP 957, AJ3R 596, WA3ATQ 416, K3KW 263, KB6FR/3 185, WB3JYZ 131, W3IPX 130, WB3CAI 105, W3DP 102, N3CD 99, W3BI 96, W3VA 81, W3FAF 77, WB3GUR 48, WB3GZV 42, WB3FEH 38, N3AIU 28, KA3BER 26, WA3TAV 26, K3RHI 17, AA3B 16, W3CL 16, W3ADE 14, N3CP 14, WB3FPL 14, K3EIP 11, WA3YDC 11, W3AVJ 8, KA3CHG 8, K3EBZ 7, WA3VIL 7, W3HK 6, K3AI 4, WB3GUS 4, WA3BJQ 3, WB3AZE 2, KA3DZD 1, W3EU 1, W3GOA 1, WB3JUK 1, W3KEK 1, W3RJ 1. (Dec) N3CD 90, WB3CAI 26.

MARYLAND — DISTRICT OF COLUMBIA: Karl R. Medrow, W3FA — WA3GYW reports that BARC, W3FT, held their annual Christmas and Holiday Greeting set up in Towson with WA3SOR, K3FT WA3YYR KB3CV WA3HQX WA3ZKV WB3DJU W3QYL WB3EVQ N3ARL W3VBM WA3BPC WB3KZX N3IC K3RA W3HYY W3CBV and K3GRI all helping. K3ORW had a January birthday celebration, and W3ADQ called the roll to celebrate the MEPN's birthday. WØVJD/3 uses the mobile van as his emergency power source. W3DFW and W3OYY live in snow country. W5NZ/3 says work is interfering with his radio. AA3S has been traveling, and K3TNM is a close second in the number of trips. N3QA would take a rep job but for work; meanwhile, WB3GZU bemeans those snow cancellations. W3VBM received his Old Timers Certificate from ARRL. Congrats, and also to KA3CHT who upgraded to General. WB3KDQ missed PSHR by one point. WA3YNW sadly reports K3VHJ a Silent Key. WB3CES bowled 300, but that was for 3 games of Duckpins. WB3KYL applies for his journeyman electrician license. K3IU is getting all set for the DX contests. W3FZV is our rep in the CD parties. N3SJ squeezed his report in last. W3WBY finds some good 6 and 10 meter openings. W3VUT returns with modern equipment after 10 years. WB3JRW says he is like Avis-trying harder. W3ECN is out of CD 210 forms and they are no longer in print. W3ZNW is our Calvert County cw rep. KB3AP has too much rf in the traps of his dipole. WA3LTA WA3BMM and KA3DXZ were NCS with RACES and REACT snow emergency call up. N3ATH KA3AVH N3BAK W3CYQ WB3DAJ W3EXP WB3FAP WB3FGH WB3GNM WB3HAD W3IWG WB3KGD WB3KXR K3KYH WB3LHT K4LYW WA3RRG and WA3UQF were all helpers. WA3HEM misses the MEPN because he teaches at net time. N3AFM had another month of fun on 6 meters. N4AIG/3 and K3JL have the Sussex ARA repeater 147.075-.675 in fine shape. With the nets: Sessions/QTC/QNI average. MEPN/AA3S 31/234/27.6. Topper K3ORW. Others W3ADQ N3AGM N3AMA WB3BFK WB3GZU WA3IHW AA3S and WA2YFM. Point winners K3ORW 91, AA3S 61, WB3GZU 56, W3DKX 54, K3YUC 45. Congrats to you all. WRPON/W3DFW 17/22/21.9. MDC/PON/W3OYY 5/18/24.6. Traffic: (Jan) WB3GZU 616, K3ORW 417, N3SJ 137, WØVJD/3 117, W3FA 103, WB3KDQ 99, K3IU 94, AA3S 44, WB3KYL 43, W3ECN 40, W3FZV 26, WB3JRW 24, N3QA 13, WA3YNW 12, KB3AP 9, WB3LTA 9, W3ZNW 3. (Dec) N3SJ 116.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — SEC: W2HOB. STM: WB2LCC. January proved to be a quiet month, with very little happening in the section. January always has been kind of dull, but with the SET now in October it is even more so! On the good side, many clubs are now planning their winter/spring round of licensing classes, and now just might be the time to look into upgrading that ham ticket like you have wanted to for so long. Or, on the other side of the coin, why not pitch in and help your club teach their classes. Teaching is a job you're sure to enjoy and one which will give you a tremendous feeling of satisfaction in helping others. Who knows, you might even learn something in the process. About the only thing of major importance int he ARPSC structure was the planning of a March 15 meeting at Bell Labs in Holmdel to discuss the statewide repeater system which has been in the works for so long. On the agenda are items like how to accomplish the link, when and how to operate the new net, and other topics that relate. It is hoped the system will be at least in limited operation later this year. A full report on the meeting will appear in this column in June QST, and in the May issue of the New Jersey Traffic Bulletin. Traffic: AA2H 124, WB2LCC 93, KC2A 42, WB2GTW 30, WA2HEB 29, KA2GTE 28, WA2ONW 28, WB2IQJ 18, K2YBN 18, W4NLC 16, N2AFN 14, N2ALS 14, WA2WUL 14, KB2NN 12, N2AEP 6.

WESTERN NEW YORK: SCM, Lonnie J. Keller, WA2AOG — It is with deep regret that I report the passing of W2RUF of Feb. 1, 1980 in an automobile accident. After 47 years of helping literally hundreds of people to obtain their licenses and training even more in the art of traffic handling, courtesy and patience, we pray that she rest in peace. N2APB reports a landmark in traffic - a message relayed across the entire state (NY) on VHF-only traffic nets in 46 hours. Nets used were WDN/CNY/OCTEN/CDN/HVN/NYC. W2AET joins W2ZOJ in tackling the nets with QRP as throughout the month, he checked into 51 cw and 35 phone sessions of NTS affiliated local and section nets with 5 watts max input power and, to top it off, all on emergency power. Traffic: (Jan) W2ZOJ 263, WA2ELD 244, WA2HSB 233, WA2MFV 225, N2APB 127, WA2ZJP 121, W2FR 113, W2MTA 107, WA2KOJ 101, WA2AFE 82, WB2OTC 43, KB2GT 40, WB2OMZ 39, AF2K 34, WB2OWO 22, N2ALB 19, WA2GJU 13, W2AET 9, WB2NAO 5, K2VR 4, WA2ANU 3, WB2VSJ 3. (Dec) W2RQF 49, WN2CCE 31. (Nov) N2APB 133, AF2K 17.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — ASCM: N3FM. STM: W3YQ. SEC: WA3VUP. Asst SECs: WA3LJW WA3JBQ. NMs W3NEM W3KUN W3MML WA3PXA.

Net	Sess.	QNI	QTC	kHz	Time/Day
WPACW	31	394	153	3585	7:00 P/D
WPAPTN	31	676	161	3983	6:15 P/D
WPA2MTN	31	653	121	146.28/88	8:00 P/D
NWPA2MTN	26	189	12	146.04/64	9:00 P/D
WPARACES	3990.5	9:00	A/S	PTTN	3610 6:30 P/D

We have two Silent Keys to report, WA3FPY and W3SFH an old timer in the area. Our sympathies go to their families. New officers for Beaver Valley ARA are: WB3CNB, pres.; K3OTS, 1st vice pres.; WB3JZN, 2nd vice pres.; WB3FKE, secy.; WB3HWB, treas. Congrats. Welcome to K1DB in his move from Dover, NH to Erie PA. KØBUD has purchased a radio station in Lafayette, IN. He will be signing /9 instead of /3, our best wishes to him. W3DGK and I visited the Sky View Radio Society where W3DGK spoke about ARES and RACES progress in Ally County. K1KI visited the PROS in Pittsburgh and a very nice evening was had by those present and we learned a lot about the contest department. He went to Mercer the next day. I also spoke at the ATA of WPA on the ARRL appointments. WB3LLY is now N3AZZ. Upgrading: KA3COP & KA3CNP to Tech; KA3CKO to General. Traffic: WA3PXA 253, W3SMV 177, W3EGJ 146, W3YQ 91, N3EE 68, N3FM 58, W3MML 53, K3SMB 51, WA3UNX 47, WB3JDI 46, W3KMZ 43, WA3JBQ 37, WB3HGL 36, KB3DT 36, N3AZH 32, K3HCT 31, N3KB 25, W3RUL 25, W3KUN 24, WB3DKV 21, K3ISO 21, W3UHL 20, WB3HUJ 19, N3ASB 18, AF3B 16, AC3N 16, N3WS 15, W3SN 14, WA3VRE 14, W3TDW 12, W3EXC 11, W3TTN 10, WB3GWJ 9, K3VQV 9, KA3DXP 7, N4DR/3 5, AB3X 4, W3AS 2, W3LOD 2.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst SCM: W9RYU. SEC: W9AES. NMs: WA9KFK WB9JSR. Cook County EC: W9HPG.

Net	Freq.	Times/Days	Tfc.	Sess.
ILN	3690	0030/0400 Dy		
ILL Phone	3915	2130 Dy	146	31
NCPN	3915	1200/1700	149	54
IEN	3940	1400 Su	6	4
W9VEY				
MEM Stn		2-meter	6	4

WD9EVV K9IFO KA9DTE WD9CSA K9JLK WB9WIR KA9CQM WB9YQI and K9NR are the new officers of the Kankakee Area Radio Society. Our sympathy to the families and friends of W9UAQ W9JSL K9LTC W9RC W9SF and WA9KOA who recently joined the ranks of Silent Keys. The 9RN daytime net had a traffic count of 284 messages during 92 sessions and Illinois had 100%

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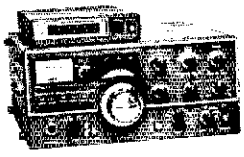

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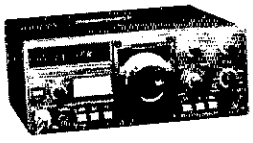

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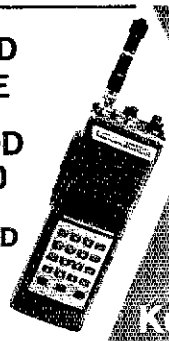

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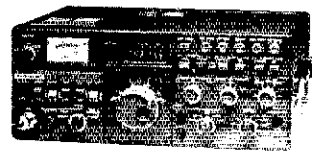

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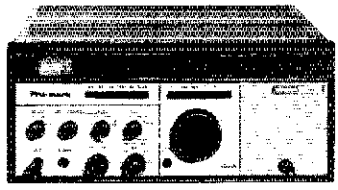

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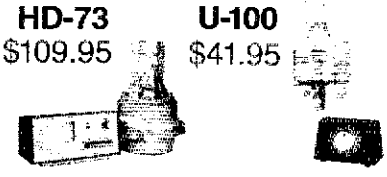

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participation with W9YCE W9JIJ W9NXG WB9WGB WD9FDB N9ADJ WA7OEC/9 and W9HOT checking in. W9HPG was awarded Hamfester of the year by the Hamfesters Club of Chicago. W9SXL is waiting for some warm weather to update his tower. The Wheaton Community Radio Amateurs Hamfest was a very FB and successful affair with many eyeball QSOs for the first hamfest of the year. Coming hamfests include Sunday June 1st at Princeton. The Starved Rock Radio Club's annual hamfest and on Sunday June 8th, the 6 Meter Club of Chicago will hold theirs at Santa Fe Park in Willow Springs. WB9DCX now KB9JF, W9FJP now AI9H, WA9NSH now KB9FI and WA9NXX now N9BFB. KA9ADR is a new General. WB9ZDB is teaching at Wabash College at Mt. Carmel. The new officers for the Six Meter Club of Chicago are K9ZWU WA9FIH K9ENZ K9ZWV WD9GDA WA9MJJ WA9REH and K9USW. The VHF Club of Decatur has changed its name to Macon County Amateur Radio Club. The new officers are K9IQH WA9RTI and N9ACA. The Egyptian Radio Club Hamfest is scheduled for Sunday June 8th. WD9GGE is now KB9JE. W5KLV/9 reports that the CAND had a total of 517 messages during 62 sessions and that WB9RCA WD9FDB W9YCE WB9WGD W9NXG W9HOT and W9JIJ added to the Illinois 100% participation in the net. Traffic: W9JIJ 354, W9HOT 261, K9BVE 227, W9NXG 208, WB9JSR 165, WD9EVV 136, W9OBS 125, W9YCE 96, W9OYL 79, N9TN 71, K9PNG 69, W9OK 66, WB9PUK 66, K9EGA 59, WD9FDB 58, K9IJN 57, KA9DTE 53, WD9BEX 52, WB9WGD 51, KA9ALR 40, KN9BAM 40, W9LNQ 35, WØRJW 32, W9TLU 30, K9SW 24, WB9YJF 23, W9KR 17, K9WMT 12, WD9EBQ 11, W9PRN 10, N9MX 11, WD9HZF 9, W9HPG 8, W4IZI 6.

INDIANA: SCM, J. M. Kell, W9LTU — SEC: W9UMH. STM: W9JIJ. Net Managers: ITN W9QYY, QIN WD9GXW, ICN N9AEI, VHF W9PMT. January net reports. Times in UTC and freq in kHz.

Net	Freq.	Time	QNI	QTC	Sess.
ITN	3910	1330/2330 Dy	2013	172	62
QIN	3656	1430/0100/ 0400 Dy	800	423	93
ICN	3708	0015 Dy	142	23	31
IPN	3910	2130 Dy	1252	88	31
IPON	3910	1300 Su	88	3	4

IN 100% on D9RN for January. VHF Nets report for January QNI 5333, Tfc 290 from 15 nets. K9DCX has a net each Saturday morning, 1500Z on 7135 kHz called Snail's Tail Net for cw net training. WB9UYU has resigned as manager of QIN and WD9GXW has been appointed as new manager. Thanks to WB9UYU and best wishes to WD9GXW. W9PMT is now getting a good response from the vhf nets on monthly reports. VHF Nets list continued.

Net	Freq.	Day	Time	Net Mgr.
MC ARES	146.04/64	Mon	8:30 P.M.	WB9WTX
SCRA	146.865/265	M-F	8:00 P.M.	WA9VJA
21 Rpt	147.75/15	M-F	7:00 P.M.	WB9AMK
PC VHF	147.60/00	Tue	8:30 P.M.	WB9NCE
PCARES	147.96/36	M-F	8:00 P.M.	W9SNJ
ECI	146.60/00	Tue	8:00 P.M.	K9JRK
SC Emrg	147.81/21	Thu	7:00 P.M.	N9WW
SC Emrg	146.52	Thu	7:00 P.M.	K9RGF
TS Emrg	147.75/15	Wed	9:00 P.M.	W9KXP
TS Adv	146.19/79	Wed	9:30 P.M.	WB9FNN

Conclusion next month. (MC is Monroe County) Traffic: W9JIJ 928, W9OLW 337, WB9IJYU 225, W9FC 199, WD9CIS 178, W9TG 122, N9AEI 64, W9XD 62, WA9QCF 58, W9HUF 44, W9PMT 39, K9WWJ 28, W9WEI 25, N9PS 23, W9IOH 22, WA9GJZ 15, KA9CVZ 14, K9CGS 12, W9RTH 12, K9DIY 9, W9ENU 7, WA9TJS 7, W9BDP 1.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. NMs: W9DM K9LGU N9AUG WB9ICH W9IEM W9AYK. WB9LLW N9AU have Advanced. KA9EYH KA9AZB KA9CFC went from Novice to General. WB9NCT WD9EAQ helped sheriff on 2-meters, keep up the good work gals. KA9BPF has Gen. New officers for Mancorad club are: WB9MNQ, pres.; K9LWI, vice pres.; WB9IGH, secy.; WB9ERN, treas.; WB9EYC K9HAG W9BZU, directors. N9BBQ ex-K9PDJ back on air from Paddock Lake. W9FZC received QCWA 50 year certificate from ARRL. New Novice Portage area, KA9GKK. New Novice Baraboo area, KA9GNY. Green Bay Area 2-meter Net had 32 QNI, 3 QTC in 30 minutes. K9IMM just upgraded. NWTN had 516 QNI, 37 QTC in 1155 min. KA9CPA made BPL. Don't forget WNA picnic July 13 at Elderon County Park near Wittenburg, lets have a good turnout for this event. N9AUG is new manager of the Wisconsin Novice Net, give him your full support, and I want to thank WD9EAQ for taking the reins of that net for a few months, but has to give it up. Traffic: (Jan) KA9CPA 1116, W9CXY 173, W9YCV 129, WB9YPY 129, N9AZI 107, W9DND 105, W9IEM 105, K9HFI 102, WD9BCM 98, W9AYK 94, N9AUG 83, WD9ESZ 78, W9DM 67, W9UCL 61, W9OT 60, N9CP 51, K9LGU 50, WB9ICH 48, AA9A 46, K9AQ 46, KA9ARI 40, WD9DHF 40, K9AKG 39, WB9NRK 39, WB9ESM 38, AG9G 31, W9UW 31, W9GKO 28, K9HDF 28, W9LDO 27, K9VSY 27, KB9CV 26, W9YYL 24, W9FDY 23, W9SFL 22, K9UU 20, KB9FM 19, K9JPS 19, K9KSA 18, K9UTQ 15, K9ANV 12, W9MFG 12, WB9YPZ 12, WD9AJA 11, WB9PAW 9, WA9WYI 6, W9CJE 5, N9BCX 4, WB9RRU 2. (Dec) AE9H 82, WA9WYT 4.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX — STM: AFØO SEC: WAØQIT

Net	Time	Freq.	Mgr.	QNI	QTC	Sess.
MSPN N	1805Z	3.945	WAØAIN	544	46	31
MSSN	2315Z	3.710	WBØZBJ	131	26	27
MSPN E	2345Z	3.929	KAØAIT	839	167	31
WX NET	0015Z	3.929	WAØONE	470	341	31
MSN 1	0030Z	3.685	AFØO	225	59	31
MSN 2	0400Z	3.685	KØPIZ	163	63	31
RARESN	0130Z (146.22/82) Su		KØTS	117	10	5
St Gld ARES	0330Z	Su	WØMBD	44	0	4
Elk River/ ARES Rptr Su	0300Z	1-47.97	WØCF			4

Greetings from your SCM, WBØHOX. You can tell that spring is not far away when the talk concerning hamfests begins. At this time the Rochester fest is the earliest, April 12th at St. Johns School in Rochester. There will be ample parking, prizes, good food, and fellowship - so all of you come! Welcome to WDØGLS, the EC of Dodge County. We are happy to have him signed up. Welcome is extended to KØJCF, our latest OO and OTS. He says he is glad to be back in the fold again

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POWER REQUIREMENTS: 120/240, ± 5% V AC, 50/400 Hz, internal switch selection. Requires approximately 100 W receive, 700 W peak at full transmit input.

SIZE: 16¼"W, 7¼"H (w/o feet), 14"D. **WEIGHT:** 50 lbs. **PRICE:** $5900

RECEIVER PERFORMANCE

SENSITIVITY: Better than .25 uV for 10 dB S+N/N at 10 meters; .35 uV all other bands. Matched 50 ohm measurement (10 dB noise figure).

SELECTIVITY: Standard SSB-dual matched 2.4 kHz 8 pole and ± 12 kHz 4 pole crystal bandpass filters deliver 20 pole 1.4:1 shape factor performance (6/60 dB). Standard CW 300 Hz filter, 1.2:1 shape factor (6/60 dB).

DYNAMIC RANGE: 98 dB with a 2.4 kHz bandwidth.

INTERMODULATION DISTORTION: Third order intercept point, +20 dBm (two signals spaced 25 kHz at a level of -23 dBm).

IF AND IMAGE REJECTION: Greater than 95 dB.

TRANSMIT PERFORMANCE

POWER OUTPUT: 150 W CW/SSB output, all bands and modes into 50 ohms thermostatically controlled. FSK at full output requires optional blower assembly; 200 W output option requires heavy duty vacuum relay module and blower assembly.

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HARMONIC OUTPUT: *-55 dB minimum.* ***MIXER PRODUCTS:*** *-40 dB minimum*

CARRIER AND UNDESIRED SIDEBAND

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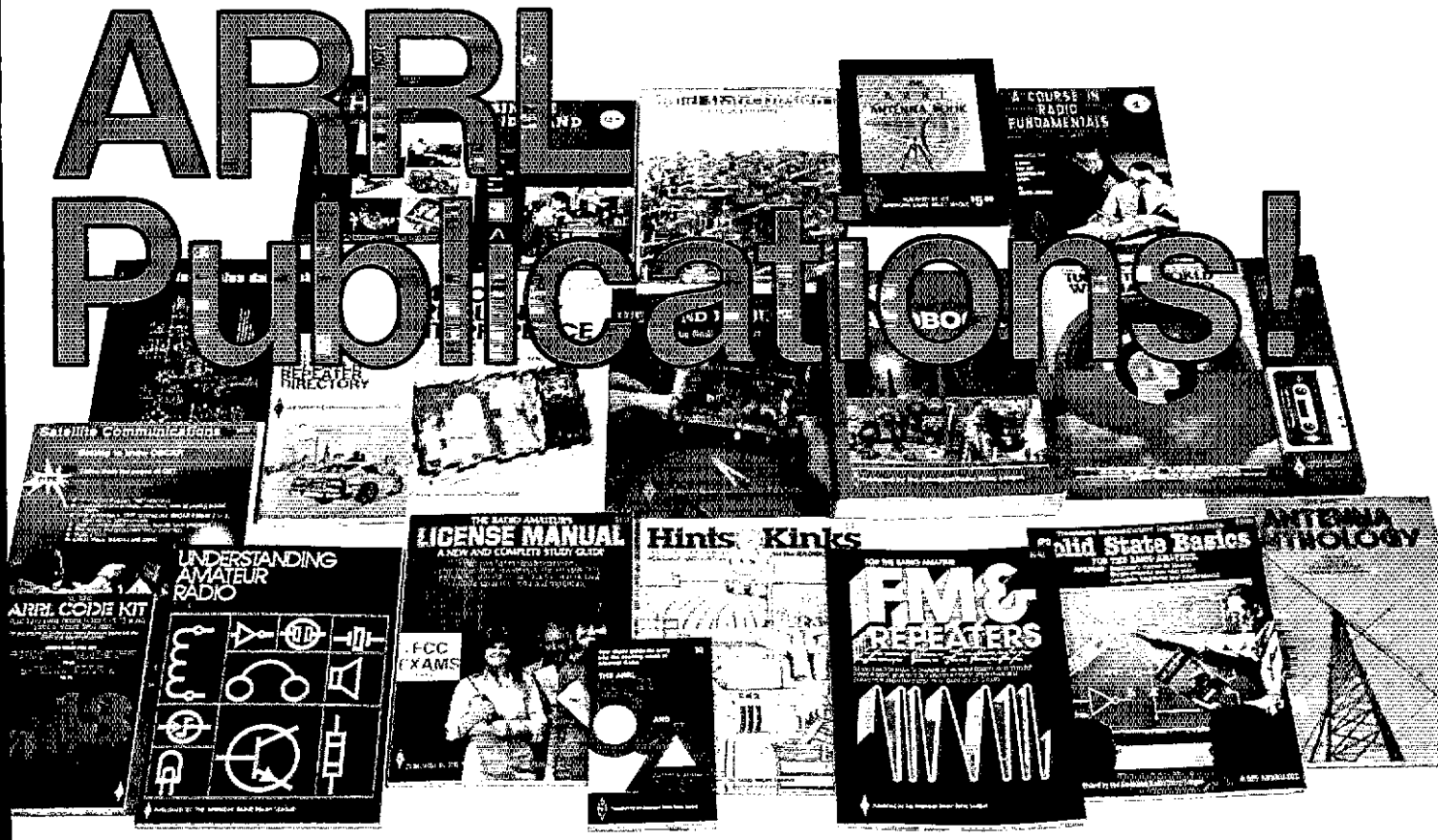

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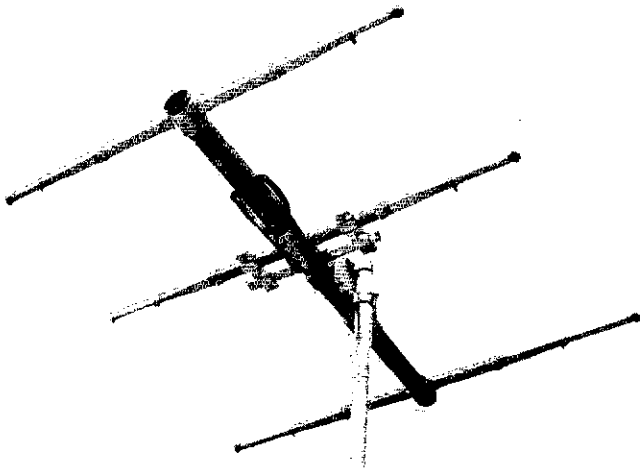

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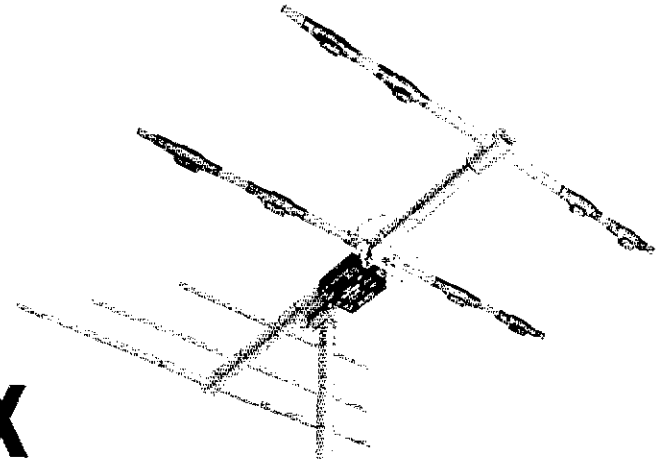

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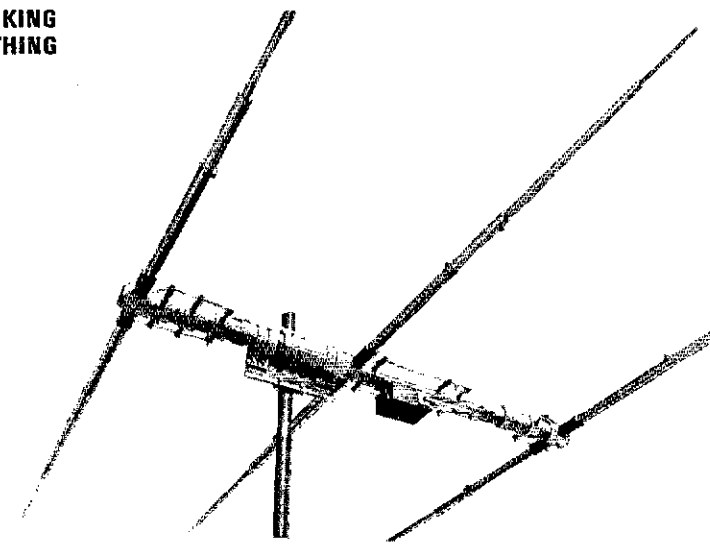

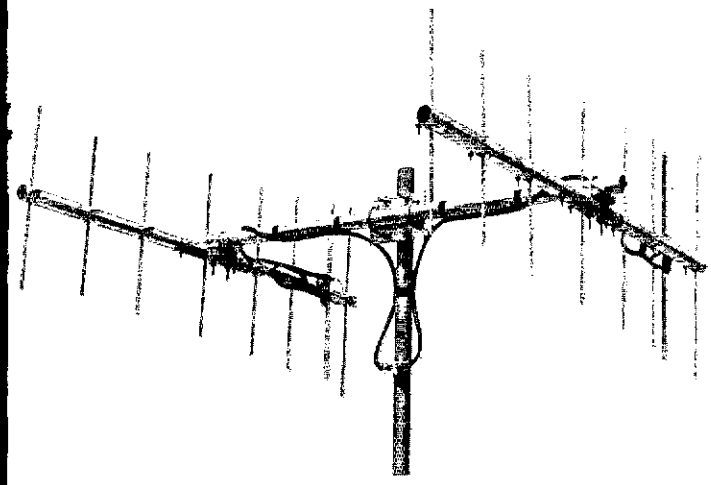

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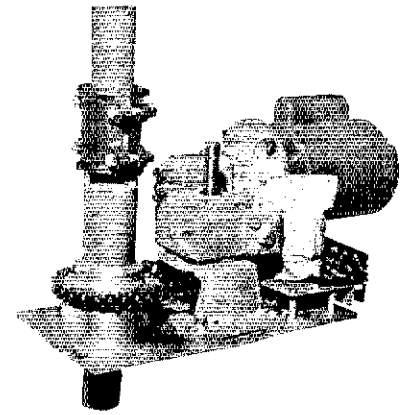

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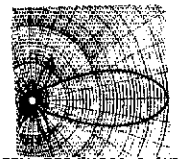

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BAUDOT, ASCII, MORSE, SSTV! ROBOT'S Super Terminal has them all!

There are no hidden costs. Most RTTY/Morse code systems require the use of costly external hardware and modifications in order to achieve the capability and performance of the Super Terminal. Some have receive or send capability, but not both. Some don't send or receive Morse code, others only have single line display, most have no terminal unit. One even requires a full computer to function.

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.

WORD WRAP-AROUND: Used in the receive mode, this feature prevents splitting of words at the end of a line by automatically moving the text of the last word to the following line.

AUTO CARRIAGE RETURN, LINE FEED

USOS-UNSHIFT ON SPACE: When used, this feature shifts the keyboard back from figures to letters automatically when the space bar is hit. This prevents unintentional transmission of strings of figures.

KEYBOARD STATION CONTROL

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. This eliminates the confusion which can result from the many combinations of operating modes by giving the operator direct and immediate feedback as to which 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. The indicator is in the form of a bar which increases in length with respect to its input signal amplitude. The indicator alternately displays the outputs of the mark and space discriminators. The operator then tunes the receiver so that the bar does not jitter, which means that the outputs of the two discriminators are evenly matched. This method of tuning is more accurate and effective than some other methods, such as LED's or meters. The Model 800 also has scope outputs on the back panel so that an oscilloscope may also be used as a tuning aid.

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. In the ASCII mode, the Model 800 can send and receive both upper and lower case characters.

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. Since the Model 800 is a complete RTTY/Morse system, station interconnection is much easier.

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 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.

To transmit a picture, the operator merely types his message out on the keyboard while watching it appear, in place, on any fast scan display. A "winking" cursor indicates the next character position on the screen, making it an easy matter to quickly and easily format your message. Complete cursor control allows for easy access to any position on the screen. Cursor commands include: move cursor up or down, left or right, and home to top of screen. Additionally, there are carriage return-line feed, delete character and clear screen controls.

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after many years of doing other things. Your SCM, WBØHOX, is now Starfish 473 of the Civil Air Patrol. If you see a red and yellow striped balloon floating around, take a good look and listen, it just may be WAØPUJ. The grapevine has it that he floats about while the ground crew, interested hams, do the work. Hi! According to SEC WAØQIT, we are still looking for County ECs. Why don't you check with your County Civil Defense or other hams in your county, and if there is no EC, join up. You certainly will be welcome and would be able to help provide the emergency services which are sometimes needed. Congrats to our new licensees and/or upgrades: Advanced to Extra KØJTW WAØQWY WBØVAZ; General to Advanced, WBØETR; Tech to General, NØAVB; Novice to General, NØBLA; Novice to Tech, KAØCRO. If you have not contacted me with this information, please do so for next month. Traffic: WBØHOX 370, WØHZU 235, WAØTFC 218, AFØO 175, KØPIZ 144, NØDFX 117, KAØAIT 113, WDØCGM 92, WAØONE 96, NØHY 74, WAØAIN 65, WBØZBJ 64, WBØUKI 61, WDØFFF 56, WBØNZB 54, WØDUW 47, KAØBJP 42, KØCSE 33, WAØLVG 32, WAØYVT 23, WDØCEX 25, WBØSCN 20, NØJP 10, KØTS 7, WØSZJ 6, KØJCF 5, KØBDD 3.

NORTH DAKOTA: SCM, Lois Jorgensen, WAØRWM — SEC: WBØTEF. OBS: WØDM. NM: WAØCRH. DATA Net is on 3996.5 kHz at 0030 UTC daily and on Monday nite the SWAP Net is after DATA. If you have anything or wish for anything, check in or notify AGØR for info. Repeaters back on the air are: 04/64 Carrington, 19/79 Valley City, 16/76 Minot and 25/85 Bismarck. Hawknest Radio Club new officers are: WDØDFT, pres.; KØATK, secy.; KBØIP, treas. WAØRWM was also a visitor and 5 new members joined the club. Fargo Radio Club is working for the Dakota Division Convention to be held in Fargo this fall. WØDXC has received his DXCC Certificate. Congrats. KØBWZ has a new TS520SE. WAØVGJ and WAØRWM a new TR7. WDØCWJ is now home after a heart attack.

Net	kHz	Day/CST	Sess.	QNI	QTC
Goose River	1990.0 kHz	Su 0900	4	50	1
D.A.T.A.	3996.5 kHz	Dy 1830	28	325	56
YL WX	3996.5 kHz	Dy 0730	31	572	545

Traffic: WAØRWM 477, KBØIP 251, WAØCRH 109, WØFNZ 64, NØAFP 46, KØGGI 35, WDØGMD 35, KØBWZ 31, WØCDO 31, WBØJGM 27.

SOUTH DAKOTA: SCM, Lydia S. Johnson, WØKJZ — Asst SCM: WØDVB. SEC: WAØTNM. NMs: WØWE WØZWL WAØs TNM VRE WDØBMR. Congrats to PSHR earners WAØTNM 89 points and WDØBMR 71. South Dakota nets: Wx on 3960 at 1400Z M-S. NJQ on 3960 at 1815Z daily. SSBN on 3955 at 0015Z nightly. SDN on 3650 at 0100Z nightly. TEN liaisons WBØEVQ KØFRE WØKJZ WAØTNM WAØNZA. The following ARRL appointees and affiliated radio clubs deserve a great vote of "THANKS" for loyalty, cooperation, support and assistance in order that my SCM duties could be carried out. First to Dorotha, WØDVB Asst SCM; WAØTNM SEC; ECs WAØs BWF BZD CUL KØs JM JV WØHOJ WØWE WBØs OMF PZO KØTVJ; to OVS WØIT KØVXM; OO WØKAR; OBS KØCX KØJV WØWE; to all the OTS WAØARZ KØAS WDØBMR WØCLS WØDVB KØFRE WBØIJV KØJV WAØNZA WØHOJ KØRA WAØRIQ WBØVGN WØWE WBØZEB KØZZ; to NMs WØs HOJ MZI WE ZWL NEO WAØs TNM VRE UEN WDØBMR; and all others who have contributed. New SCM re-solicitations will be made in April and May issues QST. Traffic: WDØBMR 201, WØDVB 133, WØHOJ 112, WAØTNM 110, KØFRE 103, WAØUEN 101, WAØVRE 85, WBØOMF 37, KØAS 31, WBØEVQ 29, WØKJZ 25, WØIG 6.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: WD5IRB. NMs: KC5E W5MYZ W5POH WA5ZWZ. Nets freq time/day QNI QTC mgr. ARN 3.995 0030/dy 1397 & 75 KC5E; OZK 3.760 0100/dy 254 27 W5WYZ; SCARC 28.765 0230/M-T 87 9 WA5VSV; APN 3.937 1200/M-S 873 43 act mgr W5UAU; M-Bird 3.928 2230/M-F 905 36 WA5ZWZ. New officers SCARC: WB5AOB, pres.; WB5URE, vice pres.; W5EU, secy/treas. Cancel OTS of AD5D. New EC Crawford & Sebastian Counties, WB5OFN. WD5JYL new 140 ft tower topped with tri-bander and 2-mtr twist beams. WB5MYF & YF proud parents of 6 lb 3 oz girl born Nov 21, 1979. Sorry to report resignation of SEC, WD5IRB, who is moving to Okla City. CAREN will again sponsor the Little Rock Hamfest April 19 & 20 at new location, the NLR Community Center. More info write CAREN, P. O. Box 2844, Little Rock, AR 72203. 25 or more new Novices resulted from radio classes held at UALR. New SEC for AR, K5TML, effective Mar 1st. CAREN held their Xmas party Dec 14. Ft. Smith ARC held their Xmas dinner and meeting Dec. 17th. Traffic: (Jan) K5AJM 84, W5UAU 51, K5AO 29, KC5E 25, K5DW 16, W5KL 8, WB5GQH 5, WB5KUI 5. (Dec) W5KL 18.

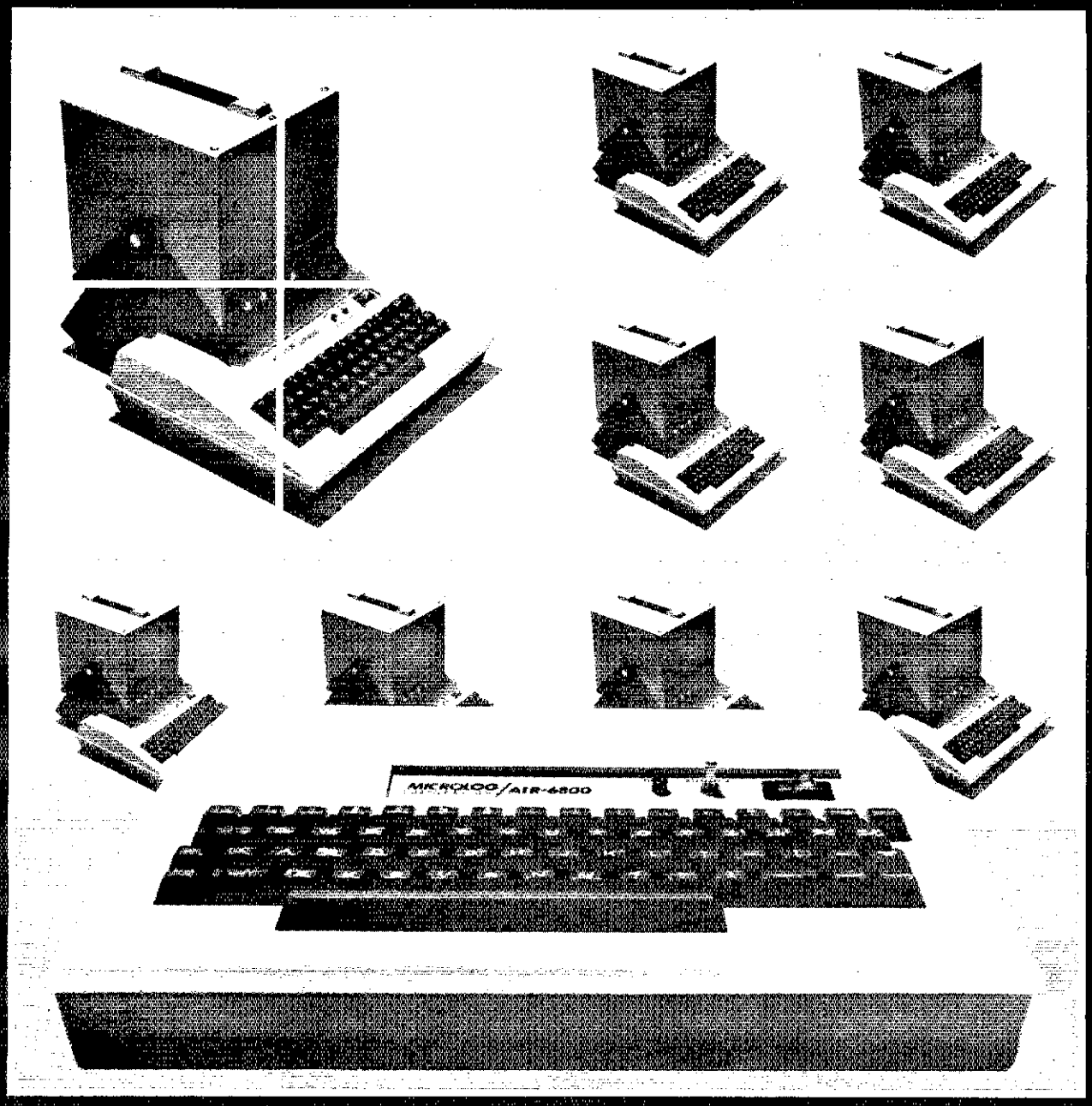
LOUISIANA: SCM, S. T. "Tom" Losey, Jr., K5TL — Asst SCM: K5DPG. SEC: WB5TPG. NMs: N5RB K5TL WB5LBR WB5TPG WB5USS. N5EK K5BLV WD5CWK WA5TQA and N5ADE all active on DRN5. WB5EMU and W5VMY new LAN NCS. WB5JZP back in country and active on nets again. Our section is proud to have the Division Director, congrats Al, we all know you will do a fine job. K5KDO WD5JRA WD5JFY WB5UVX K5SL W5LO WD5BEB WD5BCC K5TNP KA5DDC W5AJS WB5LJQ of SARA are all active in cw on 10 and 15 meters. Congrats to this bunch for their efforts. New Officers for OOTC in New Orleans are: W5EDY, pres.; W5CJO, vice pres.; W5UO, secy. Congrats to WB5UIH for DXCC Award; K5LM for confirming 310 countries and earning Honor Roll Status; K5KR for 5-Band WAS. Congrats to Jefferson ARC for their thinking on how a club should be put together. With their many activities and social events, the members have much to choose from. K5BO moving to Little Rock. N5ARZ is officer for Orleans Parish.

Net	Freq.	Time	QNI	QTC
LAN	3615 kHz	7&10 P.M. Dy	336	139
LTN	3910 kHz	6:30 P.M. Dy	656	101
LSN	3703 kHz	7:30 P.M. M-F	123	23
LRN	3587.5 kHz	8:30 P.M. Su	10	18
LEN	3910 kHz	8:00 P.M. Su		
RACES	3910 kHz	8:45 P.M. Su		

Traffic: K5TL 165, N5RB 155, WB5LBR 81, N5EK 40, K5BLV 35, W5VMY 32, WB5JZP 21, WD5CWK 18, W5MI 15, WA5MUW 8, KB5AS 6, WB5IKT 6.

MISSISSIPPI: SCM, E. Ed Robinson, W5XT — SEC: WB5FXA. By the time you read this I hope spring weather will be upon us and with spring — hamfests. Jackson is planned for Apr. 19-20. Support our MS hamfests this year with eye-ball QSOs. Two notices you should have seen elsewhere but worthy of repeating: W4WHN has resigned as Delta Div Director on being elected ARRL Vice President — congrats. Also ARRL Bulletin No 12 as to FCC rule changes now permitting

ATR-6800



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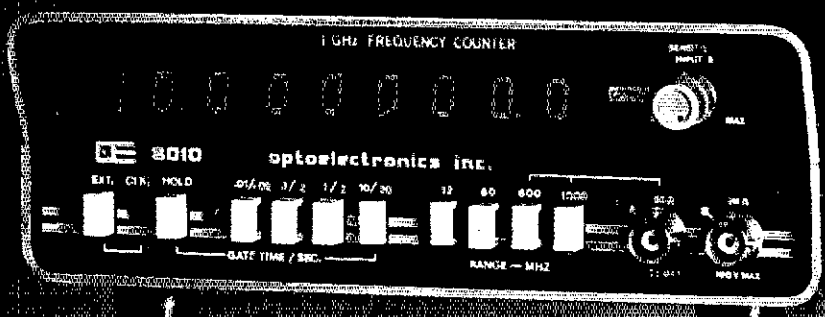
When quality counts...count on Optoelectronics.

MODEL 8010 1 GHz

MODEL 7010 600 MHz



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MODEL	$ PRICE	RANGE 10Hz to	LED DIGITS	SENSITIVITY 50 OHM INPUT 25-250 MHz	50 OHM INPUT 250-450 MHz	450 MHz-1GHz	HI-Z INPUT 10Hz - 60 MHz	GATE TIMES	RESOLUTION 12 MHz	60 MHz	MAX. FREQ.	TCXO TIME BASE 20 -40° C	FREQ	EXT CLOCK INPUT	NI-CA BATT PACK
7010 *7010.1	145.00 225.00	600 MHz	9	5-20 mV	10-30 mV	20-40 mV to 600 MHz	1-10 mV	[3] .1, 1, 10 SEC	.1Hz	1 Hz	10 Hz 600 MHz	1 PPM 0.1 PPM	10 MHz	YES OPTION $25.	YES OPTIO $15.
8010 *8010.1	325.00 405.00	1 GHz	9	1-10 mV	5-20 mV	10-25 mV	1-10 mV	[8] .01-20 SEC	.1 Hz	1 Hz	10 Hz 1 GHz	1 PPM 0.1 PPM	10 MHz	YES STD	YES OPTIO $39.

* Has precision 0.1 PPM TCXO time base

MODEL 7010

#7010 600 MHz Counter - 1 PPM TCXO $145.00
#7010.1 600 MHz Counter - 0.1 PPM TCXO $225.00

OPTIONS

#Ni-Cad-701 Ni-Cad Battery Pack & charging circuitry installs inside unit $ 15.00
#EC-70 External Clock Input, 10 MHz $ 25.00
#CC-70 Carry Case, Padded Black Vinyl $ 8.95

MODEL 8010

#8010 1 GHz Counter - 1 PPM TCXO $325.00
#8010.1 1 GHz Counter - 0.1 PPM TCXO $405.00
#8010.1-13 1.3 GHz Counter - 0.1 PPM TCXO $495.00

OPTIONS

#Ni-Cad-801 Ni-Cad Battery Pack & charging circuitry installs inside unit $ 39.00
#CC-80 Carry Case, Padded Black Vinyl $ 9.95

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#TA-100 Telescope Ant with Right Angle BNC $ 9.95
#P-100 Probe, 50 ohm, 1X $13.95
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ham transmission of ASCII code. OK, go to it if you computer hams! CAND (W5KLV) sess 31, QTC 306 with MS rep 100% by N5AMK W5EDT K5DMD WA5OPT AG5Z W5TDG. CGCHN (AG5X) sess 31, QNI 2751, QTC 175. MSBN (K5MK) sess 31, QNI 2542, QTC 170. MTN (K5OAF) sess 31, QNI 122, QTC 56. MN (WA5OPT) sess 31, QNI 621, QTC 8. HACES (N5AMK) sess 4, QNI 187, QTC 1. JCARCEN (KB5W) sess 22, QNI 723, QTC 24. Traffic: K5OAF 113, N5AMK 93, WB5FHA 75, W5EDT 54, WB5SNB 36, W5XT 21, WD5CSU 11, K5MK 6, KA5AFT 4, WD5EYM 2.

TENNESSEE: SCM, Earl Leonard, KB4G — SEC: W4NZW. STM: W4ZJK.

Net	Freq. (MHz)	Day/Time (UTC)	Mgr.
TPN	3.980	M-F 1040	WA4EWW
		M-F 1145	W4PFP
		S-Su 1300	
		M-S 2330	K4VM
TN	3.635	Dy 0000	AF4T
		0300	
TSN	3.710	M-F 2300	WA4CNY
ETTMN	28.7	W&F 0100	WB4NFI
MTTMN	28.8	T&F 0100	WB4GHS
ETVHFN	50.4	T-Th-F 2300	WA4SXM
	145.2	W&F 0100	WB4DZG
TCDWN	146.16/76	W 0100	WA4BOC
	146.31/91	W 0100	
WTVHFN	146.37/97	Dy 2300	WA4VVX
MCRN	147.72/12	Dy 0030	WB4VXW
RCARESN	147.72/12	Th 0030	W4EBT

New officers Bays Mt. Radio Club: WA4BNM, pres.; WD4FJL, vice pres.; KB4VL, secy/treas.; WD4BHD, Zero-Beat Editor. The Chattanooga Tri-State FM Assn Inc: WB4ZDY, pres.; WB4IEJ, vice pres.; WA4RMC, secy.; K4BPE, treas. Cleveland ARC: WA4DLJ, pres.; WB4KFW, vice pres.; WB4BKF, secy.; WD4DES, treas. Delta ARC: WA4OYI, pres.; WB4KQQ, vice pres.; WB4TJH, secy.; K4GMU, treas. Net certificates awarded: WD4AKU WB4BKS W4CUQ WB4EBR WA4FWH W4GGM WA4GKU WB4HCG WA4HJY WA4HLC K4HRY WB4HWW WB4JCR WD4LGL WB4LLM WD4OJU WA4OOG WB4QIC WD4RAT WB4VXW WA4WGN K4WKA W4XS W4YCI WA4ZYX KA4BLT. Net summaries: PHONE, 215 sess, 7328 check-ins, 1009 pieces of traffic. CW, 76 sess, 532 QNI, 309 QTC. WA4CNY again earns the Brass-pounders award. Congrats to Space Institute ARC on their affiliation with the League. KA4GQX, pres. Traffic: WA4CNY 529, AF4T 203, W4ZJY 187, WA4NIF 183, WB4BKF 156, WB4PRF 79, K4JGW 68, WA4FMR 64, K4WOP 50, WD4NJR 49, WB4LEH 32, WB4ZSZ 30, W4MRD 28, N4BGA 25, WD4SIG 24, K4XE 23, WA4CGK 13, W4EBT 13, WB4HOQ 10, N4BBB 9, N4BVY 9, W5PSN 7, WA4GLS 6, WB4YPO 6, WA4WVW 6, W4EWR 4, W4RUW 4.

GREAT LAKES DIVISION

KENTUCKY: SCM, Joe Miller, K4DZM — STM: K4HRF. SEC: WB4ZML. Nets reporting (section nets*)

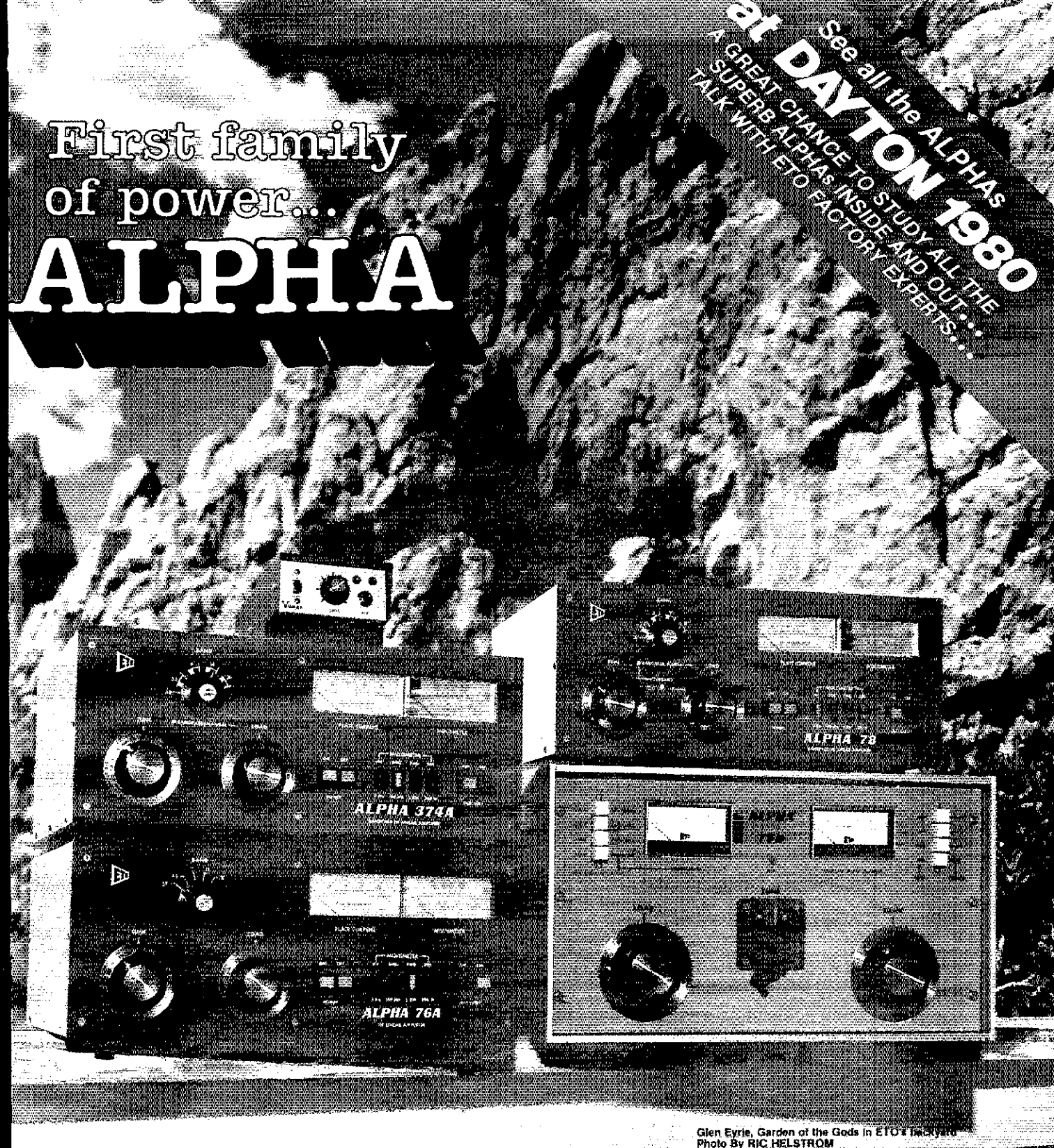
Net	QNI	QTC	Net	QNI	QTC
KRN*	473	30	TS2MN	358	33
MKPN*	1227	86	SEKEN	25	3
KTN*	1608	202	AATN	405	31
KNTN*	444	160	PAWN	405	31
KYN*	254	112	CARN	238	26
KRTN*	167	62	4-ARES	22	3
KSN*	233	64	5-ARES	78	10
KPON	62	5	6-ARES	201	25
9RN-D	77%	284	8-ARES	92	15
CAN-D	100%	517	EWPN	239	—

PSHR: WD4JTO WB4ZDU WD4RNI KB4OZ K4DZM. 20 new Novices in Ashland area &19 in new class. New Novice KA4MBF. WD4CJQ new pres Bullitt County ARS. WD4RKN & KA4ELF upgraded. Henderson Club having Novice class. Hope to see everyone at this years hamfests. It's antenna time use care. Traffic: KB4OZ 159, K4DZM 125, WA4AVV 106, KS4V 95, K4YZU 81, WB4ZDU 81, KA4AZT 75, WD4RNI 76, K4JLX 66, WA4EBN 59, WB4AUN 45, KA4IKH 41, WD4KDG 41, N4AOF 40, WA4JTE 39, WB4APC 36, WA4AGH 34, WD4CQF 32, WA4NOG 32, W4PKX 32, W4CDA 31, WA4SWF 25, K4HOE 24, WD4JTO 24, WB4BSC 23, WD4LXX 23, K4HRF 22, WB4RIT 22, KA4GFU 20, WB4RRI 18, WA4JAV 17, K4AVX 16, WA4YPQ 16, WA4OMH 14, W4BAZ 8, WD4CJQ 8, K4MHL 8, WD4EKZ 5, WA4CSH 4, WD4LTD 4, KB4YH 4, WA4IGD 3, KA4MBF 1.

MICHIGAN: SCM, James R. Seeley, WB8MTD — Asst SCM: WA8DHB. SEC: WA8EFK STM: WB8YRY. NMs N8ABA WD8BHE WA8DHB K8LNE K8KMW WD8LRT AF8V WB8YDZ.

Net	Freq	UTC/Day	QNI	QTC	Sess.	Mgr.
QMN*	3663	2300/0300 Dy	1517	397	93	N8ABA
MiTN*	3953	0000 Dy	752	269	31	WD8LRT
GLETN	3932	0200 Dy	1387	245	31	WD8BSE
MACS*	3953	1600 Dy	762	184	31	K8LNE
UPN*	3922	2200 Dy	929	98	36	WA8DHB
MNN*	3722	2230/0100 Dy	403	102	31	WD8BHE
WSSBN	3935	0000 Dy	830	45	31	WB8VAI
BR	3930	2230 M/S	543	35	27	W8HIN
MEN	3930	1400 Su	165	1	4	W8HIN
VHF Local Nets 11 reports			579	30	45	AF8V

*NTS Section Nets. Field appointments: NM for MiTN, WD8LSV, replacing KB8AI, retiring after 15 months of fine service. OTS: WD8NJQ. OTS-B: WD8BHE WD8OEP. OO reports from K8AIT K8JH W8MVR/8 W8OG. OBS reports from WD8IYA K8NKB AF8V. New club officers Branch Co. ARC: WD8IBY, pres.; WD8RHU, vice pres.; N8BJD, secy.; WA8LGO, treas.; WB8DFK, act chmn. Chelsea Communications Club: WB8HSN, mng. dir.; WD8JAZ, secy/treas.; WB8AFU, act chmn. Cascades ARS (Jackson): WD8MJQ, pres.; WD8LSV, vice pres.; K8BR, secy.; AI8D, treas.; KA8AEE, act mgr. Mich-a-con ARC (Iron Mountain): N8LT, pres.; W8HFS, vice pres.; W8JWN, secy.; WD8LVN, treas.; K8IRC, trustee. Upgrades: KA8CLM to General; WD8CPS to Tech; WD8LRT to Extra. Edison Radio Amateur's Assn. (Detroit) has a new repeater in downtown Detroit, K8OCW/R, 144.73/145.33 MHz, with good coverage reported in surrounding communities. A thought for those who think I'm off base in my little campaign against ht toll-diversion phone patches: ever try to make one through a vhf repeater autopatch? What's the difference, then? They're recognized as illegal on vhf, how can they be legal on hf? Traffic: (Jan) WB8MTD 288, WD8KZX 249, W8VPW 191, K8KMQ 175, WB8ITT 167, N8BIK 165, AF8V 158, WA8PIM 111, K8DTG 102, W8LCU 102, WD8LRT 96, WB8YRY 96, WB8YDZ 89, KB8MX 84, W8IHX 81, N8ABA 80, WD8BHE 76, W8CUP 72, KB8GC



Glen Eyrie, Garden of the Gods in ETO's backyard
Photo By RIC HELSTROM

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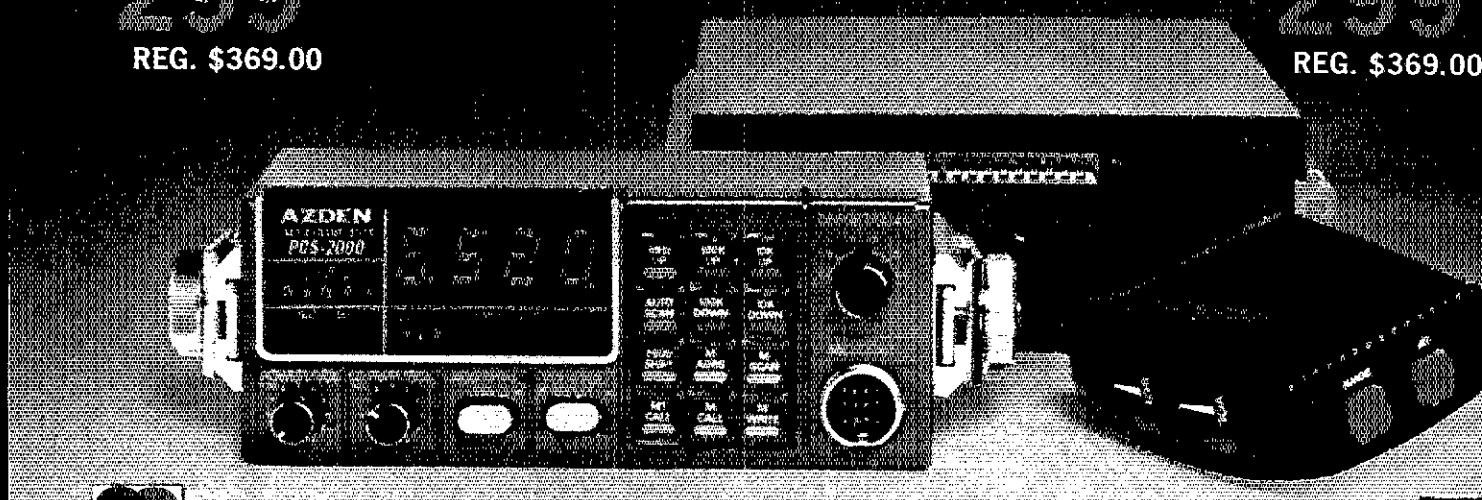

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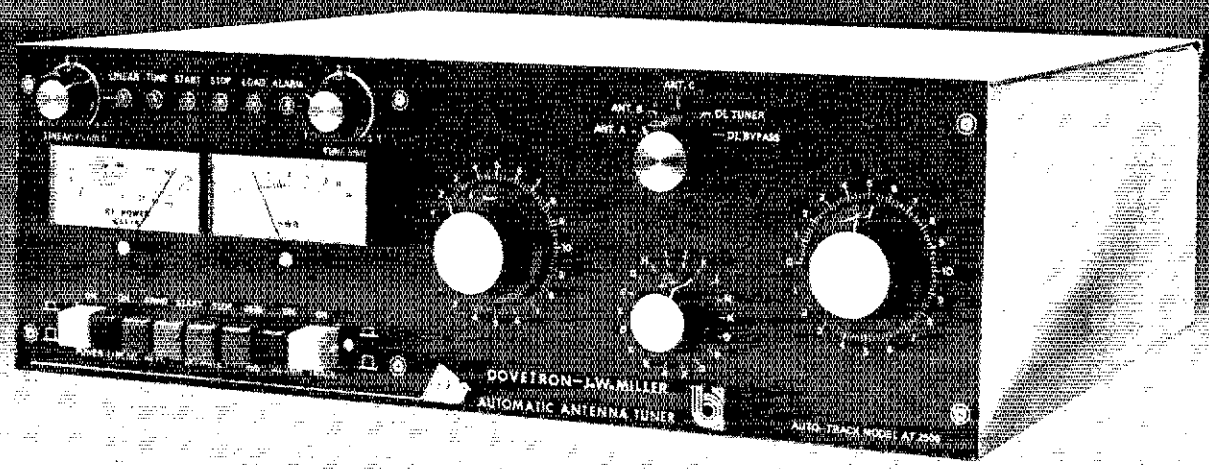

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72, W8GQJ/8 69, WA8DHB 68, WB2LZN/8 65, K8RV 5
WA@TAQ/8 59, K8LNE 52, WD8MJB 52, WB8ZIY 5
K8DYI 50, WD8EIB 50, W8YIQ 49, WD8BSE 48, W8WC
47, WB8HPZ 43, WD8NKT 43, WB8EEU 37, WB8VAI 3
W9NXD/8 32, WB8ZNS 32, AC8F 31, WD8NKA 3
WA8QAF 31, K8ZJU 29, W8HIN 28, WB8QYU 28, W8VI
28, W8DT 27, , K8OCP 27, KB8Q 26, W8SCW 24, K8UP
23, WD8IXZ 21, W8PBO 21, WD8DUC 20, KA8DWP 2
WD8IBY 18, WB8HNB 17, WD8ROK 17, WA8AXF 1
WB8SYQ 16, WD8IYA 13, N8ACL 12, KB8EQ 1
WB8HSN 12, W8JXJ 12, N8RE 11, WB8TTA 11, KB8F
10, W8BEZ 9, KA8CPS 9, WD8RNQ 9, KA8GMJ
WD8OEP 8, WA8FJF 6, WD8JOL 6, WR8ALB 5, WD8OK
5, W8WVL 5, K8BZ 4, WD8NJQ 4, WD8ORQ 4, K8DD
WB8NCD 3, WB8NDB 3, K8QBZ 3, KB8GT 2, W8LOU
(Dec) WA@TAQ 58, WD8NJQ 11.

OHIO: SCM, Harold C. Chapman, WB8JGW — Ass
SCMs: AF8O W8TP. SEC: K8AN. NMs K8AAZ WD8KB
WB8KWD WB8OMQ WD8PUH WB8YGW.

Net	QNI	QTC	Sess.	Time(Local)	Freq.
BN	711	284	62	6:45/10 P.M.	3.577
BNR	153	28	31	6 P.M.	3.605
ONN	122	28	30	6:30 P.M.	3.708
OSN	361	156	31	6:10 P.M.	3.577
OSSBN	2978	752	93	10:30 A.M./4:15 & 6:45 P.M.	3.9725
06mN	468	60	31	9 P.M.	50.160

"Under-identification" & "over-identification" in ne
operation (both phone & cw) seems to be a topic whic
needs review frequently to guarantee legal and/or eff
cient operation. When checking into a net, it is absolute
ly necessary that you identify both the NCS and you
station just as you do with a normal QSO. Once you ar
checked in, it is not necessary to identify when conduc
ting business "on net frequency," because you hav
already established yourself as part of the net. Fron
that point on NCS identifies for the entire net. If NCS
directs you and other stations to another frequency t
handle traffic, it is necessary to identify with each sta
tion both before and after handling traffic, as you woul
do in a normal QSO. Net closings are usually handled
bit differently. CW nets normally QNX stations whe
possible — at that time you should again identify NC
and your station. Phone nets are normally dismissed a
a group by the NCS when there is no further business
When closing the net, NCS identifies for the group an
no further identification is necessary. "Under
identification" leaves you open to violation pro
ceedings. "Over-identification" only creates confusio
& delays proceedings. Officers for 1980 for section
clubs include: Canton ARC: WD8AYE, pres.; WD8DIT
vice pres.; WA8ADA, secy/treas. Dial (Middletown) ARC
WD8DEZ, pres.; K8ZZO, vice pres.; WB8MGO, treas
K8GET, secy. Greater Cincinnati ARC: W8MFT, pres
WA8SSI & WB8WAV, vice pres.; W8GS, rec secy.; K8CK
corr secy.; WA8STX, treas. Mt Vernon ARC: W8JZF
pres.; AB8W, vice pres.; WD8ONT, secy/treas.; OH-KY-I
VHF ARS: Wb8QOH, pres.; WB8RSC, vice pres.
WD4OFJ, rec secy.; K8DHK, corr secy.; K8THT, treas
Appointments: EC WD8BGN/Pike, WD8MPV/Portage
WD8SAB/Jefferson; OES WA8RUO; OTS N2MA W8WA
W8UPD.

Local Nets	QNI	QTC	Sess
BRTN	454	130	31
COARES	120	18	4
FRGN	82	6	5
MASER	59	7	4
TSRAC	714	99	30
VWCEN	55	6	4
WOEIARESN	39	15	4

Traffic: (Jan) WB8KWD 455, K8AAZ 444, W8PMJ 302
K8ND 270, K8OZ 238, WA8GMT 168, WB8WTS 154, K8FT
117, WD8KBW 111, W8GGX 108, W8QZK 106, WB8UBR
104, W8MOK 98, WB8OMQ 93, N8CW 92, WB8JGW 87
WB8SIQ 86, K8AN 72, WB8YTD 71, W8UPD 64, WA8SS
58, W8ENI 56, K8KWO 54, WD8KFN 51, WD8OYO 50
WB8SRC 50, WB8MEK 48, W8RG 47, WD8DTG 46, W8TH
46, W8TP 46, WB8YTQ 42, K8DL 41, WD8LPP 40
WD8PUH 39, WB8YGW 34, W8WEG 32, WD8JIK 31
K3RC 31, WD8PEI 28, WB8AWM 26, W8LZE 26, WB8NHV
25, WB8PIY 25, WD8QMP 25, WA8RUO 24, WB8ICL 23
WB8TRK 23, WD8PEI 22, WB8QXN 22, WD8QZM 20
N8AKS 19, N8JR 19, N2MA 19, WD8MKC 19, WA8SED 19
WB8GJU 18, K8CKY 18, WB8YUS 18, KB8LQ 17, AB8F
17, WB8QHU 17, W8ILC 16, WD8ILX 16, AF8A 15, K8HLJ
15, WD8PID 15, W8IM 14, WB8TPX 14, W8WAV 14,
W8HVA 13, WB8OHV 13, WB8FWF 12, KB8KV 12
WA8MAZ 12, WA8HGH 11, WA8TSX 11, N8AUH 10
W8BHL 10, KA8DJZ 10, WB8VZX 10, WD8JTT 9, W8MGA
9, WB8MRL 9, WA8BOV 8, W8XT 6, K8YUW 5, WB8HMI 3
W8KN 3, W8DYF 2, KA8EZB 2, W8ZM 2, WB8SMC 1
(Nov) WB8KWD 599, K8AAZ 552, W8PMJ 417, W8GGX
221, WB8WTS 204, W8FU 202, WA8GMT 194, N8CW 192
WB8UBR 125, WA8SSI 124, W8TH 117, W8UPD 115
WB8SRC 108, W8TP 95, W8QZK 93, WB8OMQ 90
WD8LPP 89, W8MOK 89, WB8SIQ 89, WB8DLP 86
WB8YTQ 85, WD8KBW 74, W8WEG 71, K8FE 64, K8QZ
63, N8JR 59, K8AN 57, WB8MEK 50, W8ZPF 50, WB8JGW
49, WD8KFN 49, WB8HMI 42, K3RC 41, WB8YTD 39,
WD8OYO 37, WB8TRK 35, WB8QHV 32, W8LZE 31,
WD8PUH 31, WB8CJU 30, WA8MAZ 29, WB8YGW 28,
WB8MZZ 27, N8AKS 26, AF8A 24.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Guy L. Olinger, K2AV —
SEC: WB2VUK. STM: WA2SPL. ASCM: WB2VUK
WB2KDC W2IT. NM: W2CS W2WSS KB2JG WB2QOH
WB2ZCM WB2EAG Nets: NYPON 6 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. Regret to accept the resignation of long
time OBS & ASCM WB2COY due to business pressure.
Good luck. Hope you all had a chance to hear the Olym-
pic Torch Relay come through on the various repeaters.
Look elsewhere in QST for a detailed story. I am very pro-
ud of the support ENY gave, both local ham assistance,
use of repeaters, and ENY ops on the run (by far the
largest group, including ENYs SCM SEC and STM). On a
tragic note, I can hardly comprehend the passing of
W2RUF. She was the grand lady of NY traffic handlers, a
unique combination of spunk, grace, warmness, a traffic
handler's version of Casey Stengel, and her own special
craziness, at once exasperating and beguiling. She will
be missed by us all. PSHR: N2BDW WB2ZCM WA2SPL
W2YJR N2YL WB2EAG KB2KW WB2HDU. Traffic:
WA2SPL 1058, N2YL 328, WB2EAG 277, W2YJR 127,
W2BIW 102, WB2HDU 100, WB2ZCM 99, W2EFU 76,
KA2AOQ 67, KB2KW 60, N2BDW 37, WA2CJY 28,
WB2SON 21, AA2Y 19, W2SZ 19, K2HNW 17, W2IQK 13,
N2EF 10.

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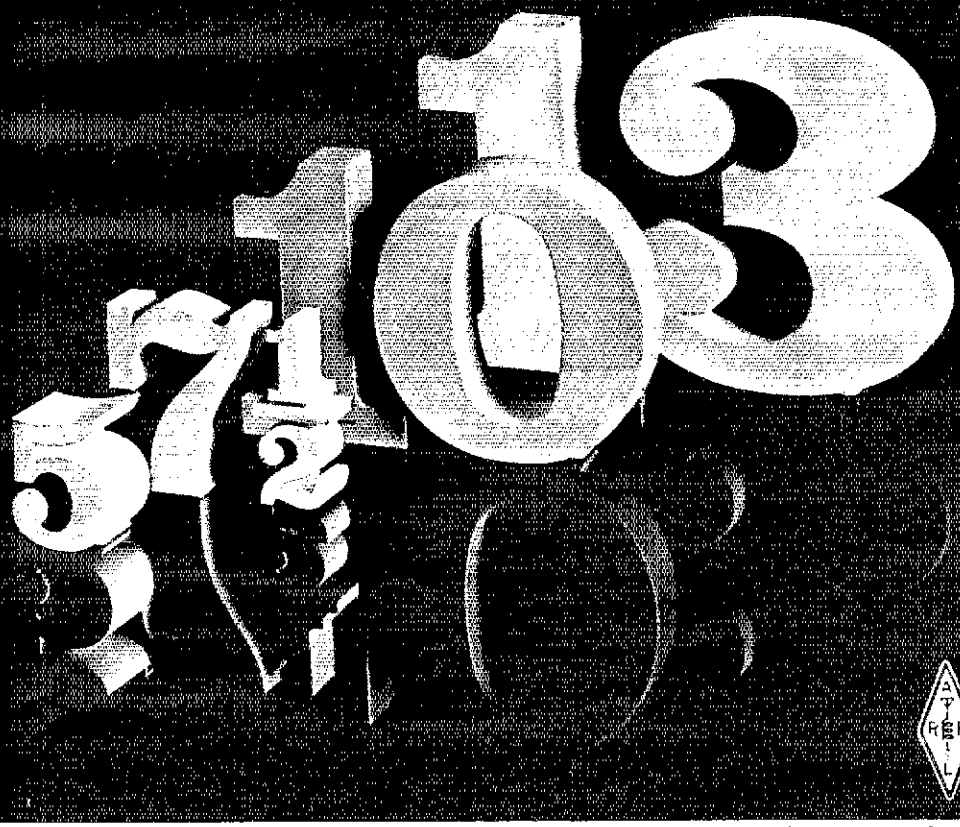

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NEW YORK LONG CITY — LONG ISLAND: SCM, Paul A Lindgren, WA2UWA — Asst. SCM: Steve Bloom WB2IDP, Asst/NYC Dwight Ernest, KA2CNN STM WB2BNY NM: KA2DBW. The following are nets in and around our section. Join one.

Net	Time/Day	Freq	Mgr.
NLI*	1900 Dy	3630	WB2BNY
NLI*	2200 Dy	3630	WB2BNY
NSPN*	1815 Dy	3928	WB2HIQ
BAVTN*	2030 M-F	147.915/315	KA2DBW
ESS	1800 Dy	3590	W2WSS

*Denotes section net. High QNI NLI: K2GCE WB2BNY K2HD W2AHV WA2UWA W2MLC: NSPN: WA2UWA WB2HIQ WB2BNY W2MLC WA2SEL WA2USJ: BAVTN W2AHV N2BGR N2BKK WA2JWR KA2DBW WA2MEE KA2CNN and KA2DBW participated in the Olympic Torch Run and had a great time. KA2CNN N2BK K2LIE and W2AHV doing yeomans job as liaison from BAVTN to hf nets. BAVTN co-founder. WB2BNA, back on air and has been heard in BAVTN and NSPN. On January 19th we had an extremely sucessful section meeting. There was a large turnout and much was accomplished. The SCM and assistants had the pleasure of meeting many of our active section members. FCC examinations will be given at Stony Brook in mid May. This will be the final opportunity. For further information contact WB2QIY. Semi-annual LIMARC Flea Market May 18 at Islip Speedway. Should be as good as ever. Kings County VHF Radio Assn had WA2ZAN give a talk on open wire feed line at their January meeting. K2PR has been nominated for life membership in Staten Island Radio Association. Grumman ARC reports K2MC as new Hauppauge repeater chairman and W2INJ as license upgrade chairman. New officers for Intercounty ARC: WA2JKX, pres.; WA2HYY, vice pres.; WA2KBZ, treas; W2AHV, secy. OO reports received from N2NT and K2POY. Congrats to the following on PSHR for January. KA2CNN K2GCE WB2BNY N2BKK WA2MEE/T KA2DBW/T. Congrats to N2BKK on new appointments as OTS and EC for Staten Island. NLI welcomes KA2CLY and welcoms back W2XS. NSPN welcomes WA2SEL and WA2LDS. Congrats on renewed 00 appointment to W2NL. WB2IDP would like to hear from other section members who are active on the Long Island Regional Instructional Computer System (LIRICS) K2LIE still having TVI problems which is keeping the traffic count low. Traffic: WA2UWA 222, KA2CNN 136, K2GCE 119, W2AHV 117, W2MLC 82, N2BKK 69, KA2DBW/T 52, WB2BNY 51, WA2MEE/T 38, K2HD 30, N2BGR/T 28, WB2BNA 18, K2LIE 15, WB2IDP 9, N2NT 1.

NORTHERN NEW JERSEY: SCM, Robert Neukomm, WA2MVQ — SEC: WB2VUF STM: W2XD. NM: K2VX W2PSU KB2HM WB2RMI W2TCA W2UEZ WA2CUW.

Net	Freq.	Time	Days	Sess.	QNI	QSP
NJN	3695	7 P.M.	Dy	31	578	171
NJN	3695	10 P.M.	Dy	31	335	118
NJPN	3950	6 P.M.	Dy	36	617	279
NJVN	49/49	10:30 P.M.	Dy	31	263	107
OBTTN	147.72/12	Dy	31	349	76	
UCEN	146.85/685	Dy	31	258	43	
NJRTTY	147.51	Dy	31			
NJSN	3735	6:30 P.M.	Dy	31		

N2CR was acting NM for NJN for part of December and January while K2VX was in Australia. W2CC got 5-Band WAS. KA2AVA is now NCS for the Ramapo Mountain ARC 2-meter SSB Net, 144.225, Tuesday, 9 P.M. WA2MVQ is finally on RTTY with ST-6 and 28ASR. NJ Radio Club Info Net had 42 checkins, 33 bulletins and 8 sessions. Nutley ARC lists the following upgrades: to Novice, KA2HDR KA2HHB KA2GSG KA2HDS and KA2CHG. Ramapo Mountain ARC lists following upgrades: to Novice, KA2HNQ; to Tech, KA2HKM and KA2ERI; to Advanced, WB2WEX, W2LVT conducts cw training net nitely on 3.710 at 8 P.M. In May the club is having a "Microcomputor" meeting led by WB2QEA. BARA reports following upgrades: to General, KA2CZK KA2FZH; to Tech, KA2FXS and to Advanced, WB2KPR. BARA now has its first newsletter — good show! TCRA newsletter reports upgrades to General: WB2UUK and KA2FSZ. WB2RMJ helped Union Council Boy Scouts with their Klondike Derby. WB2HSG had a new Tedco Model 1 QRP transceiver working one watt on 80. AF2L reports Old Bridge Repeater helped furnish Olympic Torch Run communications in central New Jersey on February 4th. WA2NJV upgraded to General and working DX with new Quad. K2UM is a new NCS on NJN and N2BNB is NCS on NJSN. NJVN had its first anniversary and it wishes to thank the Ramapo Mountain ARC for the use of its 49/49 repeater. Checkins the first session were K2AM W2HOB WB2IOW AF2L/NJN WB2LCC WA2MVQ WB2RMI WB2RMJ W2SWE W2UH and W2XD/NCS — except for W2SWE (now a Silent Key) all the above are still active in traffic on the local, sectional, regional or area nets. The Morris Area Red Cross Chapter is installing 2-meter facilities in the chapter house in Morristown. Traffic: (Jan) W2RQ 443, W2UEZ 268, AG2R 250, W2CQB 248, WB2TOM 230, N2CR 137, WB2RMI 135, WA2MVQ 96, W2TCA 90, KB2HM 89, N2BC 78, WB2RMJ/T 69, AF2L 43, WB2KLF 31, WA7DPK/2 27, W5DTR/2 24, W22EP 22, K2VX 20, KA2EQO 16, KA2GQO 16, N2BNB 15, WB2HSG 12, W2UH 12, K2WM 10, KA2DOH 8, WA2QWR 7, W2CU 6, KA2GTY 4, W2CC 2, N2NS 2. (Dec) WB2RMJ/T 68, K2VX 52, N2NS 13.

MIDWEST DIVISION

IOWA: SCM, Max R. Otto, WØLFF — SEC: WØIYW. Election results: Iowa-Ill ARC: KAØEGP, pres.; KØHQG, vice pres.; WAØMJQ, secy.; KØIWA, treas.; KØKOP, prog dir. Tri-State ARC: K9BD, pres.; WBØIJE, vice pres.; WDØADD, secy/treas.; WBØVNR, corres. secy.; WAØGON, trustee; WBØLKT, trustee a.l.; WBØTNO, ro; WBØVYG, ec. Iowa City ARC: AEØR, pres.; KBØJM, vice pres.; KØCF, secy/treas.; NØAFL, act. Iowa City Repeater Assn.: KØRLT pres.; KØCKX, vice pres.; WØLFF, secy/treas.; WØAYH trustee; WBØPJU, at large. Great Plains ARC at Hazleton is a duly affiliated society. WAØAUX and KA5BDV gave Iowa 98.4% on DTRN, and WØYLS WAØPYD AEØR WØSS AIØQ KØGP KØEVH WBØUPF KAØX NØSM WØTIU gave 100% on NTS-TEN. AKØP has DXCC, almost all cw. WDØBRD has WAS on 160 in one year. WBØZKG AKØP WBØRMT and KAØCLQ had 107 QSOs in 13 States in VHF SS. KØGXC has IC215, and WBØIZG has IC245. WDØGAQ new Iowa EC for MARS. Algona repeater WDØEKJ/R on 7.81/21. Sioux City changes: 7.87/27 now 6.31/91 6.04/64 now 7.66/06. WDØAXF and WBØGAD gave the YMCA a thrill with Amateur Radio. KBØDD N5AGJ WDØAQC WBØIJE WØSWY WBØVNR WDØADD operated the Santa Claus Net. WØDUN plus WØFZO equals a century of ham radio. Congrats Dept: KAØEFX and KAØEXY to Tech; KAØFOM to General; WDØFOY WBØYOW and KØACF for Kojak

Award, WDØFWB for QLF Award, and KØAAR received Fern Koskovich award. WBØZKG has WAS on 6m plus 600 Club since June. WBØTXL flushed the fox in 23 minutes.

Net	Freq.	Time(Z)Days	QNI	QTC	Sess.
Tall Corn	3560	0030 Dy 0400	421	121	62
Iowa Code	3713	0100 T-T-S	67	13	12
Iowa 75M	3970	1830 M-S	1185	40	37
Iowa 75M	3970	2330 M-S	1060	50	27

Traffic: WAØAUX 396, WØYLS 128, WØSS 116, KAØX 62, AEØR 53, WBØUPF 42, KØGP 40, WBØNSS 15, WBØMCX 12, KAØBYI 8, WBØAVW 6, WDØHNB 6, WBØNVL 3.

KANSAS: SCM, Robert M. Summers, KØBXF — SEC: WØKL. NM: WØFT WØOYH WDØESF WAØSZS. Most net activity appears to be up, up, up. WAØOMB, mgr for CSTN, reports a big QNI 1676 and QTC 101. QKS-SS, QNI 169, QTC 45 and looking for more to QNI the net each evening, 3735 kHz at 6:30 P.M. local time. QKS-SS is the state slow speed traffic and training net — give it a try. KWN won a January battle — no emergency sessions, QNI 1040 and QTC 543. February might see more snow, sleet and whatever else can happen and a few more sessions of KWN. QKS @3610 kHz daily 7 and 10 P.M. for those with a cw appetite. QNI 446, QTC 143. KSBN: QNI 1425, QTC 112; KPN: QNI 314, QTC 11. All of our nets are open to anyone to QNI and pass traffic or to learn how it is to be active in this end of PUBLIC SERVICE. Why not ask to be cosidered for a NCS spot or an alternate. Liaison stations are always needed, give your net a shot in the arm — ASSIST. Traffic: KØEZ 120, WØOYH 94, KBØG 86, WØAM 85, WØFT 79, KØBXF 64, WAØLBB 59, WDØACG 56, WØHI 50, WDØVRZ 48, WØFIR 47, NØABA 45, WØCHJ 32, WØPB 27, WBØYLP 26, WBØOAO 24, WØRBO 14, NØIN 12, WØKL 12, WØRT 10, WAØSEV 9, WØFDJ 8, WAØWJX 1.

MISSOURI: SCM, L. G. Wilson, KØRWL — Asst SCM: Joe Flowers, WØOTF. SEC: WBØFKY. The last reports from Christmas are filtering in and it looks like Santa was pretty good to a few area hams. Sporting new antenna towers are KBØDM KØZZH WBØJVQ WDØDCB WAØKUH and WBØUXI. The PHD ARC is sponsoring a Novice class and first attendance was good with 61 prospective amateurs present. New officers for the Bluff Amateur Radio Club are: WØOMG, pres.; WBØBTG, 1st vice pres.; WBØLGY, 2nd vice pres.; WØHMA, secy/treas. New officers for the Central Missouri Radio Assn are: KØPCK, pres.; NØPCK, vice pres.; WDØAFB, treas.; WAØAXZ, rec secy.; WBØTEG, corr. secy.; KAØFXN, hist. Two upcoming events for everyone to make on their calendars are the Central Missouri Radio Association Hamfest which is set for April 5th and the PHD Hamfest which is scheduled for the third weekend in April.

Net	QNI	QTC	Net	QNI	QTC
HBN	405	39	NEMOE	137	2
MON	230	183	ACE	25	1
MON2	149	41	MOSSBN	958	42
SCEN	69	4	MEOW	590	34

MON/MON2 needs check-ins from the northwest part of MO. All check-ins are welcome and beginners are encouraged to participate. The net meets on 3585 at 0100 and 0245 daily. Hearty congrats to WBØFKY and his XYL on their new harmonic, a boy, born Feb 10. Congrats to WØLFW upon retirement after 40 years with Braniff Airlines. KAØEVJ is sporting a new Century 21. We extend our deepest sympathy to the family and friends of WØAXL who joined the ranks of Silent Keys. Congrats to the following new licensees. Novice: KAØGGP through KAØGGS, KAØGGU through KAØGGZ, KAØGHA through KAØs GHD GHF GHH GHM GHN GHR GHX THX GHZ GJF GJK GJN GJR GJS GKM GKO GKP GKQ GKV GKZ GLG GLL GLN GLP GLS GLU GLV GMW GNA. Tech: NØBIS NØBKE. General: NØs BKG BKH BKK KAØs AUV AVG. Advanced: WDØs BWY BWZ. Extra: WBØTCQ WBØTNY. Traffic: WØBMA 364, KØONK 242, WØBV 107, WØOTF 96, KØSI 91, WØOUD 49, WØHH 25, KØBM 17, KAØE 17, KØPCK 14, WØVTF 12.

NEBRASKA: SCM, Rex P. Greenwell, KØKP — SEC: WAØASM. WØEUT has been doing a superb job of representing NE on the TEN Regional Traffic Net the past few months, but reports he could use some help. TEN meets nightly on 3680 kHz, any cw ops interested? Congrats WØERM for your 50 year award from QCWA. The Nebraska Association of Independent Insurance Agents is presenting their yearly award for outstanding community service to the Radio Amateurs of the NE Section this May in Omaha. This award is for all the hard work done by amateurs across the section! FB! Keep the news coming in! Clubs, check your lists to see if the SCM is receiving your club newsletter, its very important! Nets: 160 meter WX: QNI 755; Cornhusker: QNI 1031, QTC 48; Morning Phone: QNI 989, QTC 29; Nebr Storm Net: QNI 1445, QTC 32; Platte Valley 2-mtr: QNI 62, QTC 4; PM Net: QNI 348, QTC 15; QCWA Net: QNI 57; Western Net: QNI 633, QTC 62. Traffic: KØAIE 106, WØEUT 56, KØBRS 47, WØVYX 24, WØZNI 20, WØHTA 13, WØNIK 13, WBØGWR 9, WØYER 9, NØATK 6, WAØPCC 6, KØSFA 6, WBØGMQ 5, WAØAPY 4, KØODF 4, WAØKHK 2, WDØVPV 2, WAØLOY 1, KØRRL 1.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, William J. Pace, W1ID — Asst SCM: WA1LOU. SEC: W1SY. STM: WB1AIU. NMs: K1EIC K1EIR WB1CPF WA1ELA WA1LOU.

Net	Freq.	EST	Sess.	QTC	QNI
CN	3640	1900/ 2200 Dy	62	343	414
CPN	3965	1900 M-S 1000 Su	31	101	294
NENN	3720	1815 Dy			
NUTMEG	28/88	2130 Dy			
RASON	13/73	2100 MWFSu	15	25	118
WESCON	78/18	2030 Dy	31	109	452

HI QNI: CN WB2PJU/1 W1WP KA1AWY. HI QNI: CPN WB2PJU/1 WB1FZX K1AQE W1HMI K1EK. The PVRA announces their third annual flea market Sunday, April 27, 1980, indoors at the Newington High School, rain or shine. This is the big one!!! Congrats to W1WP who not only made PSHR but BPL as well. Ditto to W1QV who was re-elected pres ARRL Foundation. FARA held their annual awards ceremony for the FARA 1979 DX contest. Top honors went to W1GWA on phone and to WA1ZFX for cw. WB1GVZ received award for rarest country worked. KA1BJH received Novice award. Five CT hams were among 16 throughout the USA to be awarded very rare medals and certificates by the Central Radio Club in Moscow USSR, for being among the first in the world to communicate through the Russian satellites, Radiosport I and II. Gold medal winners were W9KDR/1 and K1HTV. The silver medals went to W1NU N1CC and

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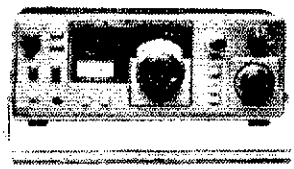

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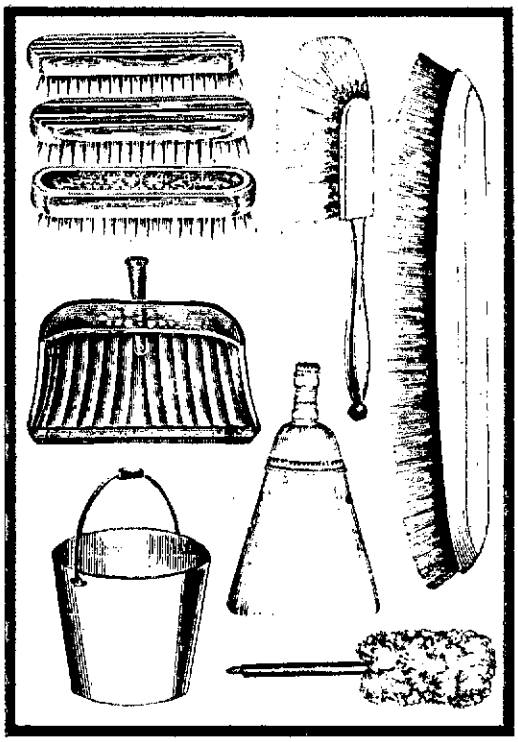

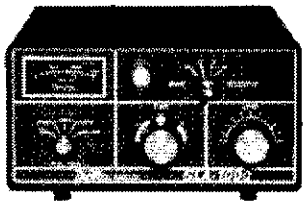

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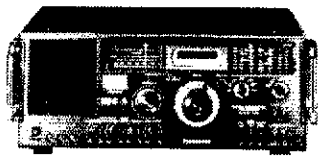

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153BA	3 el. 15M beam	89.95	79.95
103BA	3 el. 10M beam	74.95	59.95
402BA	2 el. 40M beam	239.95	189.95
BN-86	Balun for beam antennas	15.95	15.95
TH2MK3	2 el. 10 15 20M beam	149.95	119.95
18HT	Hy-Tower 80-10M vertical	$359.95	$289.95
18AVT/WB	80-10M Trap vertical	105.95	84.95
14AVQ/WB	40-10M Trap vertical	69.95	57.00
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14RMQ	Roof Mounting kit (verticals)	33.95	29.95
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our own Asst SCM, WA1LOU. Congrats to all!! K1EIR of CN reports 205 points in 1979 SET. K1EIC reports 350 points for CPN. SARA(Stamford) now airing a weekly radio program on WSTC am and fm at 7:30 P.M. Tues and Wed. They may be heard on 1400 kHz and 96.7 MHz respectively. Tri-City Club planning their EXPO '80 participation for April 11 and 12. Time-Out, the official journal of the Insurance City Repeater Club, is an excellent example of an amateur club news letter. Pertinent and to the point, it reports the things that are of interest to all members, including an excellent table of dos and don'ts for repeater usage. Remember all, inspite of personal opinion, the new ARRL numbered radiograms are the only ones that can now be legally used! Traffic: (Jan) W1WP 276, K1GF 233, WB1CPF 230, WB2PJU/1 222, W1DFT 163, W1EFW 154, WA1UIJA 68, WB1CEG 63, WA1LOU 63, WB1DGR 61, K1AQE 59, W1GVT 51, K1CE 50, WB1EFJ 44, W1BDN 41, KA1CMX 39, WB1FZX 34, K1XA 33, W1CUH 14, K1EUW 14, W1WQG 14, W1QV 10. (Dec) WB1MGC 24.

EASTERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD — SEC: WA1BLG. STM: WA1TBY. OO reports rcvd from W1NF W1UI W1EGE W1MK WA1NAE W1HL. EC reports rcvd from W1XA K1HAQ KA1BTV W1LE. OBS reports rcvd from W1XA WA1IFE. OES reports rcvd from W1XA W1EGE. OVS rpt rcvd from W1JR.

Net	Mgr.	Freq	Time/Dy	QNI	QTC
EMRI	WA1VAB	3.658	19/220 Dy	403	254
EMRIPN	W1FJI	3.898	1730 Dy	346	203
EM2MN	WA1IFE	90/30	2000 MWF	78	29
EM2MN	WA1IFE	145.8	2000 TTh	---	---
NEEPN	K1BZD	3.945	0830 Sn	57	5
EMRISS	KA1BJY	3.715	2030 Dy	50	39

The Mass QSO Party will be held in May again this year. Times will be May 17 at 1600Z to May 19 at 0200Z. The time was moved up a bit so that people going to exotic places like Nantucket would not miss any of the party due to ferry skeds. Look elsewhere in QST for more details. Will anyone beat K1GSK's 1483 QSO total of last year? The Police Amateur Radio Team (PART) in Westford had an impressive opening to their new emergency station on 146.52. The station is located at the police station and is manned 24 hours per day. They have a nice high location and will accept any emergency calls with emphasis on mobiles. They are not limiting their coverage area to just Westford either. Special thanks are in order to the police chief, WA1UYR, and other part time members for getting this important ham/police project off the ground. The callsign they are using is WA1GOF. The Capeway Club had a very nice celebration of their 1000th on-the-air meeting with stations operating on all bands and offering a handsome certificate to all check-ins. Congrats to all those who kept the meeting going over the years. Quannapowit member, WA1AER, now has 302 countries confirmed. Massasoit and Billerica clubs had banquets. The Whitman Club has a club station on the air from their clubhouse. The Spark Gap from the Wellesley Club reminds us that we can now operate in Canada without a special permit with the exception of Novices, who can not operate. Framingham Club graduated 9 from Novice course. Mitre Bedford Club had a talk on personal computers. Action/Boxboro Club had a talk on RTTY and graduated 6 from their Novice class. N1AMF's daughter now KA1EAQ. Traffic: (Jan) WA1TBY 317, K1BA 234, WA1VAB 230, K1BSO 149, KA1BJY 135, WB1DXR 123, KA1CC 112, W1PEX 111, K1GN 106, WA1FNM 89, W1DMH 77, W1DMS 66, N1AMF 59, WB1EZT 59, W1FJI 43, WB1ANT 35, W1ATX 32, KH6JNQ 30, KA1CGP 27, W1TR 26, WA1IFE 22, K1BZD 16, N1EE 13, W1AEC 12, WA3TMR 11, WA2ORV 7, WB7TPY 7, W1ALP 6, W1FJ 6, KA1BTV 4. (Dec) N1ADY 135, W1DMS 107, WB1ABM 59, W1CE 51, WB7TPY 40, WA2ORV 13, K9HI 10, W1EMG 7.

MAINE: SCM: Ed Bristow, WA1MUX — New EC Lincoln Cty, WA1GIN. A statement of understanding being prepared betw Maine CEP & Maine ARES. New officers PAWA: K1SA, pres.; K1JB, vice pres.; WB1AIY, secy.; WB1BWO, treas.; W1GX, ch op. AEMRU: KA1CVM, pres.; K1NIT, vice pres.; Dot Young, secy/treas. Classes: Westbrook KA1AOY; Portland WA1WRI; Augusta/AEMRU W1WCI; Skowhegan WA1PSJ. YARC Hamfest 6/28 at Oxford Fairgrounds. Seacoast Wireless Assn new League affiliate. PSHR: W1RWG WB1BYR AF1L W1BJ. SGN in 40th year. Sess/QNI/QTC: SGN: 27/1290/161; PTN: 31/274/132; MPSN: 4/56/3; AEN: 5/51/0. PTN Dec 31/244/215. Traffic: (Jan) W1RWG 128, W1ISO 102, W1KX 90, WB1BYR 77, WA1MUX 64, AF1L 56, WB1GLH 44, W1BJ 39, W1JYH 35, K1GUP 33, WA1JZP 33, N5YX/1 28, K1TVT 27, W1AHM 26, WA1ZJL 16, WA1JZP 14, W1BMX 12, KA1EO 11, W1GKJ 6, WA1JCN 6, WA1YNZ 6, WA1JHT 5, W1OTQ 4, KA1AYC 4. (Dec) W1BJ 60, WA1FLG 22, W1CTR 19, WA1GIN 8.

NEW HAMPSHIRE: SCM, Robert C Mitchell, W1NH/W1SWX — SEC: K1RSC. STM: W1TN. NMs: N1NH WB1HFI. New officers Anherst ARC: K1GW, pres.; W1HNZ, vice pres.; WA1SCF, treas.; W1MHX, secy. The Century Kids. W1MPP & K4RO, send greetings from sunny Orange City, FL. Chief Ground Hog, N1CB, says the 3rd annual Ground Hog Net on 3898.2 trapped 75 check-ins. Plan ahead for next year. Concord Brasspounders new officers: W1VBX, pres.; KA1AUK, vice pres.; WB1DXN, secy/treas. Seen on Hyways & Byways: K1GAU W1BVE K1GQ N1WR & K1YLA. The NH Net had 162 traffic & 191 check-ins. WB1HJP new pres. of Saddleback Repeater Assn. K1ACL worked VQ9KK on 80 meters. OBS, W1GUX, airs official bulletins & training traffic work notes. WB1ALS received QSFM Net certificate. This net had 460 check-ins & 201 traffic. Many complaints about no more CD-210 cards from CD department at ARRL. W1TXK & XYL vacationing in FL. W1RR W1FZ & W1LGQ hold cw only DXCC. K1JUL now working the low bands. KA1CRN is on 80 Novice band. W1TN lost tower & antennas in recent storm. Spring is here, at last. Traffic: (Jan) K1BCS 809, W1GUX 240, W1TN 217, K1OSM 158, N1NH 112, WB1HFI 102, K1YMH 77, W1MHX 70, WB1HGQ 65, K1ACL 37, WA1YAZ 37, N1ALM 34, W1NH 12, WA1PEL 2. (Dec) K1OSM 308.

RHODE ISLAND: SCM, J. Titerington, W1EOF — SEC: K1DT. STM: N1RI. New officers at PRA: N1AKO, pres.; K1DT, vice pres.; W1GS, secy., WA1TAQ, treas.; W1EYH K1GDS WA1WTF, dir. At W1AQ: K1JI, pres.; WA1CVF, vice pres.; K1NOC, secy.; W1DK, treas. Upgradings: WA1WKK & N5BGR to General; WB1DFA to Technician. Congrats. PRA Club Net meets Sun 1100 on 3985; EBAWA Net: Mon 1930 on 21190; Fidelity: Sun 2100 on 147.51. All times local. Support your club net! WA1WKK, net mgr, reports RIEM 2-mtr Tfc Net with sess 22, QNI 204, Tfc 53. Also announces her resignation. Sorry to see you leave. A job well done. All hands are invited to QNI the RI AERS Net on Wed 1900 on 146.52, all are invited. For more details, contact K1DT at 949-0283. K1GOW

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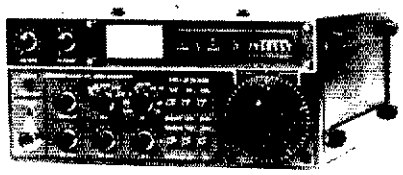

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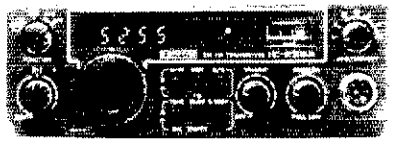

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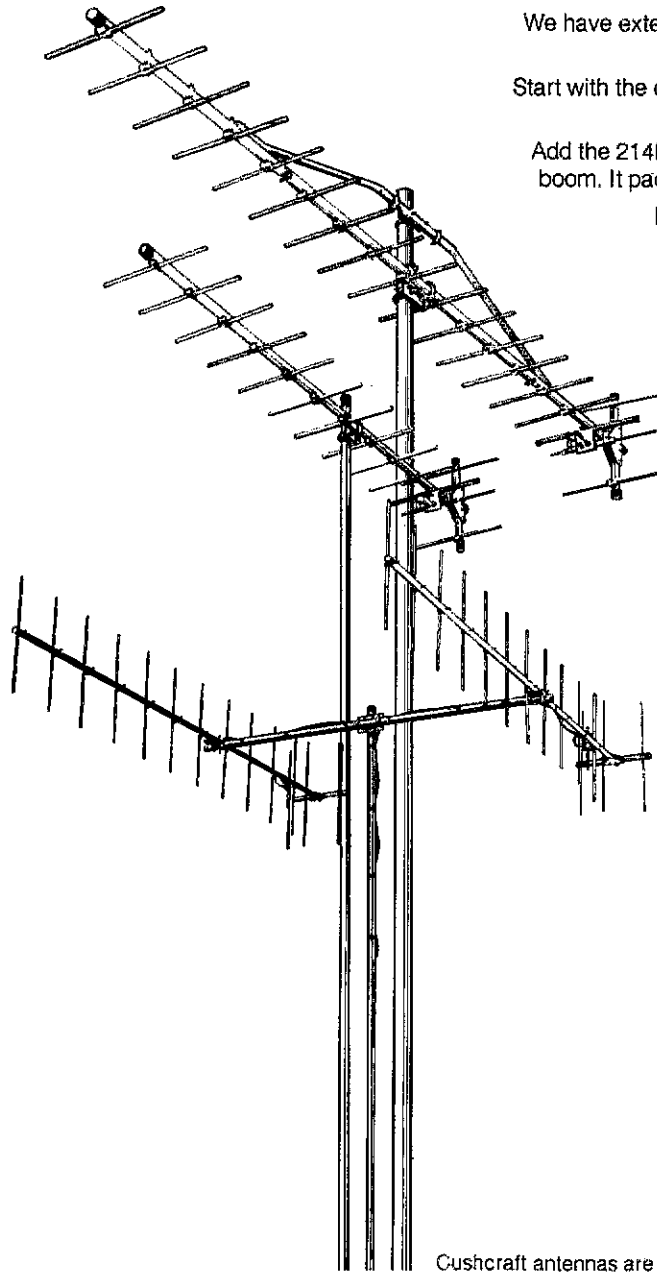

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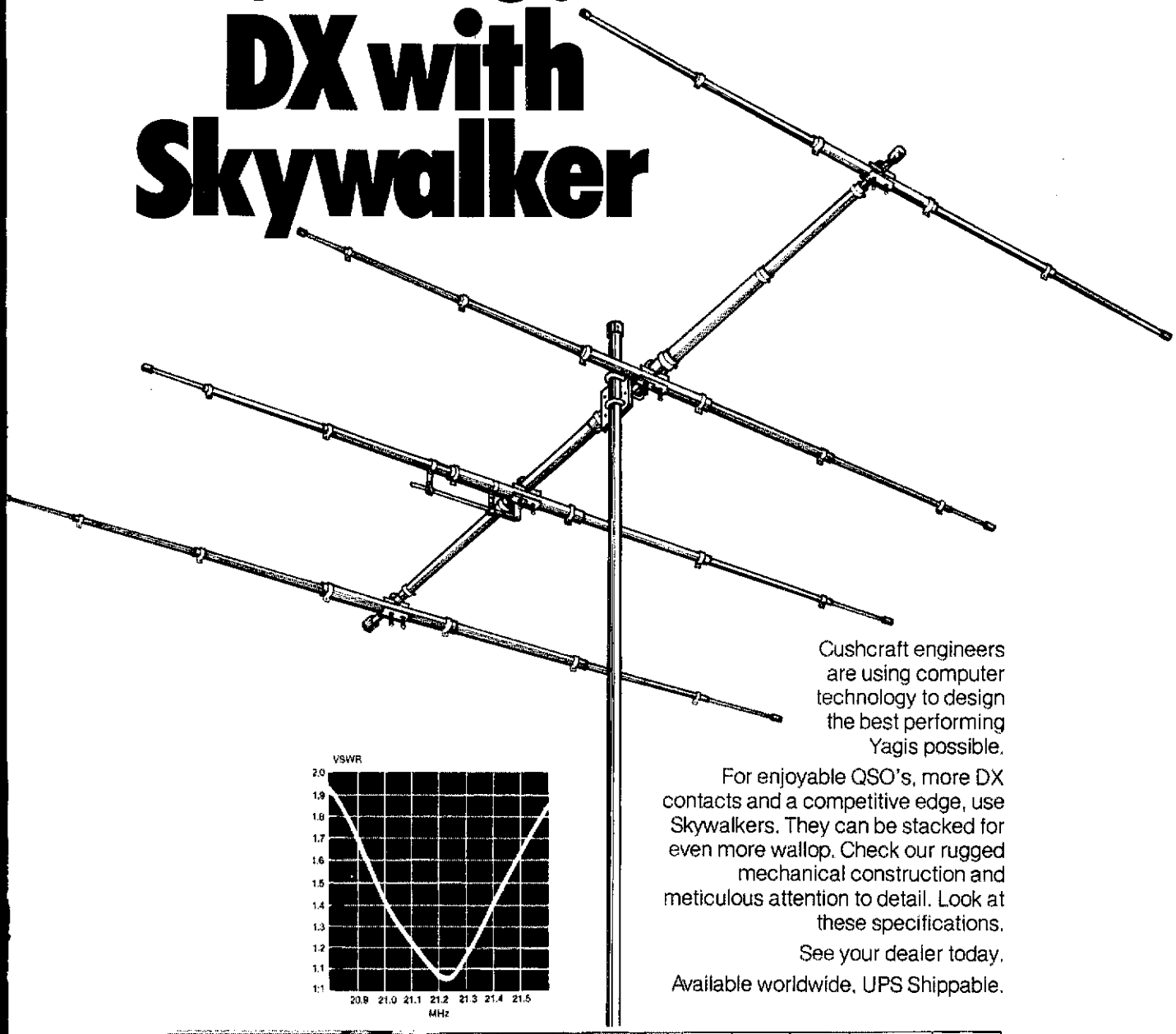

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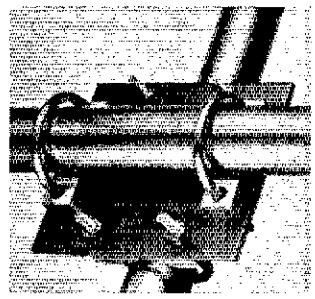

MODEL	BAND	ELEMENTS	LONGEST ELEMENT	BOOM	BEAM WIDTH	TURNING RADIUS	WEIGHT
20-4CD	20	4	35ft 10in	32ft	57°	23ft 4in	50lbs
20-3CD	20	3	35ft 8in	18ft	56°	20ft	30lbs
15-4CD	15	4	23ft 4in	20ft	57°	15ft 6in	25lbs
15-3CD	15	3	23ft 2in	14ft	56°	13ft 6in	20lbs
10-4CD	10	4	17ft 5in	16ft	57°	14ft 3in	18 lbs
10-3CD	10	3	17ft 8in	10ft	56°	10ft	11lbs

MATERIALS: 6063-T832 hard drawn aluminum

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wants to borrow a Quad shrinker! Traffic: KA1BTU 72, W1EOF 55, KA1FE 36, N1RI 22, K1GOW 11, AE1S 10.

VERMONT: SCM, Bob Scott, W1RNA — SEC: W1VSA. Silent Key: W1TJ. W1EMQ of Strafford is now in Pelham, NY. VT SSB reports total for 1979, 344/5971/1292. No report for Jan rcvd. Glad to hear more and more VT hams checking into our various nets. Your reports would be appreciated. Any wanting appointments, please let me know. Carrier: 27/634/44; GMN: 27/575/51; VPN: 4/69/6; VTRFD: 4/61/22. W1BLC sounds in good shape recovering from leg amputation and from cataract operation. WA1OVW appointed OBS. The Jay Peak 2 FM frequency is 146.145/.745, WA1HSG. Covers the Northeast Kingdom and northern part of the state very well. W1KOO 2-mtr. Emer. Net ops every Sun A.M. on 146.34/.94 at 1100. Traffic: K1BQB 178, W1RNA 23.

WESTERN MASSACHUSETTS: SCM, Art Zavarella, W1KK — STM: W1TM. SEC: W1JP. NMs: WA1MJE W1UD W1UPH. Asst SCMs: W1BVR K1BE. Jan PSHR welcomes K1JHC along with vereran W1TM. Phone workhorses WA1MJE W1UKR W1KUE keeping WMA in the tfc limelight. Congrats OTs W1BKG fixing W1BVR's phone rig; N1PF teaching class of Generals; W1ZPB on 2-m fm; W1WF "bustin into print" as editor NOBARC's SQUELCH TALE; W1YI Area 4 c.d. comm.; W1DOY, veep of Central Mass. ARA with associates WB1GSO, pres.; WA1HFJ, secy., N1TZ, treas. Upward mobility: WA1MJE, asst dir.; WB1CJH Area 4 RACES; WA1YCA to Advanced. NOBARC officers 1980: WA1UBZ, pres.; WA1VPX, vice pres., WA1ABL, clerk; WB1HIH, treas. QNI activity brisk ARES Sun 8:30 A.M./3937; WMPN M-F 4:30 P.M./3935; WMN Daily 7:00 P.M./3562. Traffic: W1UD 213, W1TM 184, N1CW 57, WA1OPN 46, K1JHC 45, W1KK 43, W1BVR 29, K1BE 9, WB1HIH 8.

NORTHWESTERN DIVISION

IDAHO: SCM, Lem Allen, W7JMH — Club News: PARC had a great Xmas party with K7KVS as MC. WB7DCI gave a short but sweet review of his grandfathers life as an amateur (K7ALA), who was then presented an ELMER for his continual helpfulness. They are getting up an AREC list, and need a new EC. Good Luck follows! KARS: 39 attended Xmas dinner party and fun. Congrats to WB7ECU and XYL - its a girl! AD7N and XYL are in HI. K7ID and XYL are in CA, becoming grandparents again. WB7WDJ and XYL used 2-meters to call for help to get their 4WD pickup out of deep snow. W7GNU & W7LQT came to their aid. Contact with town was maintained with, K7UBC and K7RPB. Thanks to all who helped. BOISE/IARC: A crash Novice Class has just been completed with 12 "graduates" who have taken FCC exams. Good luck, hopefuls! Tnx to W7IWV K7CXG WA7TXB W7GCL K7REX and other instructors. Net reports.

Net	Freq.	Time	Sess.	QNI	QTC
FARM	3935 ssb	7 P.M. Dy	31	1610	37
CD	3990 ssb	8:10 A.M. Dy	23	746	6
IMN	3635 cw	8 P.M. M-F	23	217	58
MT HARRISON	146.40/00 FM	8 P.M.	4	69	3
MINI CASSIA	146.52/52	8 P.M. Sa	4	15	1
PARC	147.06/66	8 P.M. Su	4	139	8
KCD	146.37/97	7:30 P.M. Th	4	44	—
TV EMG	145.44/44	9 P.M.Su	4	158	—

WB7URE transferred to Guam - hopes to be on in mid April. WB7RUL and WB7QYI active on DRN-7 in Mountain Home area. We need more ops on DRN-7 in Nampa-Caldwell area. Keep those reports coming in! Traffic: W7GHT 204, AC7P 96, WB7URE 83, N7APC 66, W7JMH 49, K7JV 40, W7HZL 14.

MONTANA: SCM, Robert Leo, W7LR — MTN Jan report from W7TGU: 23 sess, QTC 20, QNI 1327. IMN report from WA7BDD, 23 sess, QTC 58, QNI 217. K7HWK Miles City report; ARC officers: WB7WBA, pres.; K7TNJ, vice pres.; K7WUL, secy/treas. Also rptr club reorganized. KA7CUY to Tech. MT Section Net now meets 7240 1630Z Sun A.M. N7AGP reports GFARC officers: WB7ETI, pres.; W7RLL, vice pres.; WB7WBW, treas.; KA7DPA, secy. WB7WBW to Gen class, 10 in Novice class. Montana had RACES drill in Jan, lots of activity 2 & 75 mtrs. Bozeman & Butte clubs met on several joint events, expect to host MT QSO Party. FCC 1980 MT exams: Helena Apr 15-17, Oct 14-16; Billings June 11-12, Dec 10-11. File forms with Seattle by first of those months. W7DB sends OBS bulletins over MTN. WB7UTJ 40 mtr net report: 13 sess, QNI 173, QTC 7. K7ABV asks good question: how & when did radio symbols/schematics begin? Keep up good work on many FB state club newsletters. KA1EA OVS report: OSCAR, 6 mtr, 2-mtr activities by KA1EA KA7DLC KA7CBV W7JF etc. 6 mtr sporadic E Jan 5, 6, 7, 12, & 14 states worked. Aurora on Jan 29th. KA7GGX new Livingston ham, 50.11 skeds at 03Z. Low scores in VHF SS. W7IDK Havre sez Gen class 30 Jan. KA7DPF wants YL newsletter news. Traffic: (Jan) W7THU 128, W7DEO 84, WB7UTJ 13, W7DB 2, W7LR 2. (Dec) W7TGU 170.

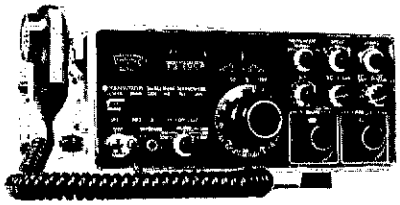
OREGON: SCM, Dale T. Justice, K7WWR — SEC: K7OLN. Section Nets.

Net	Time	Days	Freq.	QNI	QTC
OAES	0100Z	Dy	3993.5	561	121
OARES	0300Z	Dy	3993.5	107	19
BSN	0145Z	Dy	3908	675	42
OSN	0230Z	Dy	3587	187	119
PdxAARES	0330Z	Dy	147.32	735	71
WCN	0300Z	Dy	3702	402	205
1676	0300Z	Dy	146.76	769	156

Another ice and snow storm hit Portland Jan. 5 through 12. Many downed antennas. Numerous hams participated in relief effort with Multnomah County and Red Cross. Umpqua Valley ARC now has 39 members. OTVARC started more classes at PCC for all license classes. An excellent program on antennas was presented at the Jan meeting by W7NI. 4Z4AI is now AK7Q. K7YRU and W7QNI worked Pakistan with SSTV. Thought to be the first ever US to Pakistan SSTV. New McMinnville repeater on 146.66. Prairie Peak moved to 146.68 to accommodate. Traffic: (Jan) W7VSE 597, K7NTS 315, WA7IHS 279, WB7OFI 196, K7ZIG 138, W7HKE 134, W7HLF 50, K7QPW 50. WB7OIJ 40, K7SGU 28, W7LT 11. (Dec) W7DAN 202, K7ZIG 103, K7GV 62.

WASHINGTON: SCM, Bob Klepper, W7IEU — SEC: WA7RWK: STM, W7DZX. Nets reporting this month: NTN QNI 1821, QTC 96; WARTS QNI 3632, QTC 209, NWSSBN QNI 702, QTC 36; WSN QNI 551, QTC 172; PSTS QNI 154, QTC 92; Snoco ARES QNI 89. Long time member and recorder of NTN has become a SK, he is replaced by N7AFZ. W7UFL also became a SK. New officers of Whidbey Island ARC are: N7ACC, pres.; AJ7N, vice pres.; WB7WOW, secy/treas. W7AIB lost his antennas in January ice and snow storm. WA7YCM plans a Novice Net. W7JIE hears some interesting broadcasts on 40 mtr

KENWOOD
VHF Specials



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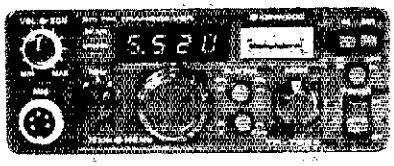

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IW, K7GZO reminds all King Cty amateurs of ARES Net 9 PM Sundays on BEARS Rptr 145.33. Looking for an outlet for your tic? Puget Sound Traffic System meets daily on 146.92 at 5:30 and 10:15 PM. MBRAC GROUNDWAVE report from W7UMH states that after 5 years of operation the WR7AEF Rptr on 146.73 has been keyed up 1,722,169 times or about 944 times a day and total on air time of 7113.7 hours or about 4 hours a day. 1980 officers for RASC are: WB7SWW, pres.; WA7GMX, vice pres.; KA7ACY, secy/treas.; W7IXF, VHF; WA7JUJ, DX; KA7ACY, editor. EC, KL7JEB is also an excellent traffic handler and has been appointed DRN7 manager. WB7TQF actively speaking at clubs in Spokane area on traffic handling. New officers for LCARA are: WB7UUP, pres.; KA7CRO, vice pres.; KA7CRN, secy.; WB7PEI, treas. W7BYK has completed WAS on 160 meters. Don't forget Skagit Hamfest April 19 and Spokane Swapfest April 26. HAMS Club officers are: WA7VQO, pres.; WB7DEO, vice pres.; WA7OJI, secy.; WB7AIV, treas. Please check the PSHR column in QST to see if you can qualify for PSHR, N/T need 40 points rest need 60 points, the heading of the column explains how many points you can report in each category. WWDX Club officers are: W7YOZ, pres.; WA7GRE, vice pres.; N7CY, secy; K7YDO, treas.; W7OTO, WB7WEI, trustees. 147.42 is good place to look for West Seattle ARC members, it's the club frequency and was used to alert members of meeting cancellation during recent snow storm. Officers of Tri-Cities ARC are: K7TGH, pres.; N7BES, vice pres.; WA7EMM, secy.; WB7PHP, treas.; K7APK, WA7CBN, WA7OSO, rptr trustees. Enjoyed letter from K7LYT about his station activities, especially the 1000 MILE-PER-WATT award for 1 watt QRP. Anyone else working QRP? New officers North Seattle ARC are: WB7QWJ, pres.; N7BDI, vice pres.; KA7APK, secy.; W7GPS, treas. Have you sent latest update on your rptr to the WWARA? K7CR would like this info to keep files updated. Traffic: (Jan) W7DZX 605, KL7JEB 539, W7LUP 505, WB7WOW 437, WB7TQF 231, K7GXZ 198, K7CTP 166, N7AJ 127, W7IEU 127, N7AFZ 122, WB7CFH 82, WA7YCM 79, W7GB 57, WA7BDD 56, WB7EBP 41, W7FJZ 38, W7BUN 28, W7APS 19, WB7OAS 18, N7AFY 16, W7LG 9, WA7EDQ 7, WB7QWC 7, W7ERH 1. (Dec) W7BCS 6.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — Asst SCMs: K6UWR W6ZF VE2AQV/W6. SEC: WB6KQU. WB6KQU of Fremont has taken over as SEC. My sincere thanks to K6UWR for his considerable contribution to the section during his tenure as SEC and SCM before that. The earthquakes of this month produced much activity! Livermore RACES members responded within minutes of the Jan 24th quake and had their communications van in place at te Livermore Police Dept with members at the Red Cross office (which had no telephone service) and damage assessment teams reporting in until darkness fell. Alameda County RACES members activated their emergency communications center, and their radio officer joined other county officials at Livermore as well as providing a link to the County EOC. The quake of the 26th precipitated action, on a smaller scale, by both Livermore and Alameda County RACES. If you are not now trained in emergency communications, there is no better time for you to become active in your county's, city's, or club's RACES or ARES program. PSHR: W6OA. W6BIY returned to Lake County ARS after a two-month absence. Welcome to new section QO, N6NE. K6ARE planning a short stay in hospital for surgery, followed by 8 weeks of intensive QO activity while recuperating. N6IG quite active as OVS. Traffic: W6OA 267, K6UGS 40, WB6UZX 30.

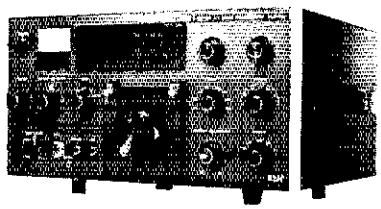
NEVADA: SCM, Ralph E. Covington, W7SK — ASCM: N7RH. SEC: WA7KCD. Wide Area Data Group of Reno conducting test to link up with new two-meter machine of WB7PKV (Mount Lewis) expanding coverage to include all of northern Nevada. LVRAC getting started on Field Day plans. June is coming up fast. The Las Vegas group is also conducting classes with N7XE K7GW and WB7TJT as the instructing staff. Upgrades and congratulations to WB6VVM WA6SUV WB6VLK and WA6SIM, W7ISA and N7YL with new tower and 40 meter beam. Nevada Sagebrush Net meets nightly at 7:30 P.M. Pacific time on new frequency of 3906 kHz. The new frequency has far less QRM. Net Manager is W7BS. Station activity reports due by the end of the month. Traffic: W7BS 331, N7AKX 254.

PACIFIC: SCM, J. P. Corrigan, KH6DD — STM: WØKON. SEC: KH6CKJ. PAC Sect ARES had mini emerg test on Feb. 9-10. Emerg ARC new officers: KH6ILR, pres.; K1LNJ, vice pres.; KH6INK, secy.; KH6EVY, treas. They look forward to a very active, productive year. KH6GDR visited WB6YQW in Tripler Hospital after her injury during Palmyra Isl. DXpedition. She is now back in CA recuperating. The infamous Jan Hurricane devastated Hawaii's hams with about 35 suffering major damage or complete loss of antennas. Hundreds had lesser damage. Hams manned EOC's and Nat. WX Serv. offices during the storm performing yeoman duties. KH6IPY elected First Vice Pres of ARRL. Our applause. With FCC's ASCII ruling many KH6's will be on the air with their computers.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: WB6GFJ. ASCM: W6NJU. The Golden Empire ARS new officers are: WA6WJZ, pres.; W6BIN, vice pres.; K6HTM, secy.; WD6FAN, treas/editor; N6AAF, pub. Further south, the Nevada Co. ARC elected WA6ZCY, pres.; KA6EZF, vice pres.; KA6ETN, secy/treas. The Yuba/Sutter County's annual emergency drill will be in May. N6AUB N6AWI W6CFQ KA6AWX WA6PLE and WB6GFJ participated in the recent flood watch on the Yuba and Feather Rivers. WA6WNE recovering from surgery. WA6UPE has moved to the Auburn area. W6RLP/mm participated in relief work after the hurricane in Dominica. The Yuba/Sutter ARC has started another Novice class. The Tahoe ARA has chosen WA6SUV and W7KJU as club emergency coordinators. WD6ANX is the new EC for Sutter County. Traffic: W6SX 52, W6RSP 35, W6DEF 21.

SAN FRANCISCO: SCM, Art Samuelson, W6VV — SEC: WB6ZRK. STM: K6TP. Congrats to K6TCS on upgrade to extra and N6AKX (now KB6VD) WD6GCV WD6GDN KA6HIR WB6TJU and WA6YTD to Advanced. WB6AMP has new Zepp on 80 to 10. New officers of Redwood Empire Radio Amateurs are: WD6FYE, pres.; W6SVQ, vice pres.; WB6SVF, secy/treas. High scores reported in Can-Am contest from WA6TOE AA6DX and WD6EQG; Redwood Country Contest Club was number 4 in U.S. WB6JAA touring South Seas on "Humboldt Ham" boat. N6BLN and KB6LO active handling phone patches for overseas military personnel. W6BYS WB6GZT and

AES *Closeouts • Specials • Overstock*



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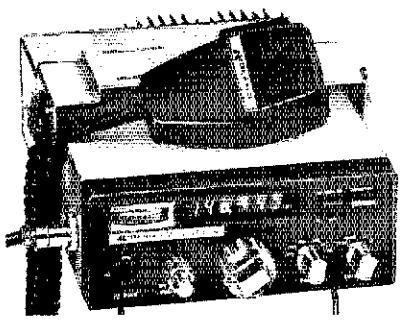
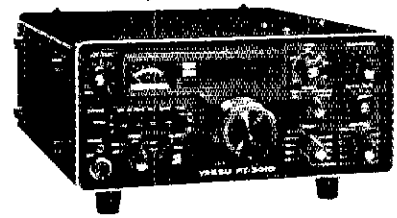
18-951 220 5/8 magnet mt.	37.95	19.00



MIDLAND 13-510A 2m FM Xcvr. 12vdc, 25/1w, 143 - 149 MHz. PLL synth. for 600 freq. in 10 KHz steps + 5 Khz shift-up for 600 more. 4 offsets, + or - 600 KHz and 2 opt. FET front w/ high-Q resonator filter and ceramic IF filters. LED readout. Polarity/ VSWR protected. Jacks for tone burst, discrim. meter & ext. speaker. S/RFO meter. Covers MARS & C.A.P. adjacent to the 2m band.

Reg. $399 - ***Closeout $329***

Package Purchase



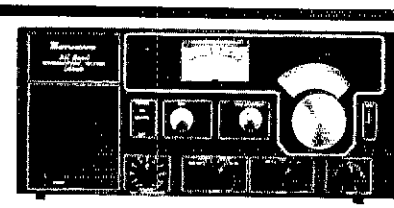
YAESU FT-301AD All Solid-State Digital Readout Transceiver. 13.5vdc. 160-10m, 200w SSB/CW, 50w AM/FSK. No Tune-up. Rej. tuning, noise bl., sp processor, VOX, bk-in CW, 25/100KHz calib., sel. AGC, spkr., 11 xtal ch., RIT. 11¼"w x 14½"l x 6"h..... **REGULAR PRICE $935.**

FP-301D AC power supply/speaker with digital clock and automatic I.D. provision..... **REGULAR PRICE $239.**

YO-301 Monitor Scope ..... **REGULAR PRICE $263.**

Total Regular Price - $1437

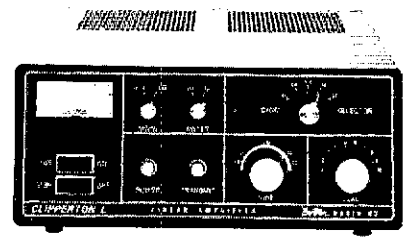
***Package Price* - $999**



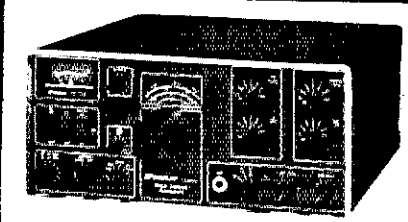
STANDARD C-6500 Solid-state, Synthesized General Coverage Receiver. 5 to 30 mHz. in 3D ranges. AM CW, USB and LSB. Sens: 3-1.0 uV. Sel: 5.5 kHz (AM); 3 kHz (SSB & CW). Readout within 5 kHz. 117vac, 12vdc with (8) D cells (not supplied) or ext. source. Whip or ext. antenna. Built-in speaker and large S meter.

Reg. $379 - ***Closeout $249***

Clipperton-L 2 Kw Linear



Reg. $699 - ***Sale $499***



SWAN HF-700S 80-10m Transceiver. 500 watts PEP input on single-sideband, USB, LSB or CW. Amplified ALC and AGC. Grid block keying. CW Sidetone. Dual-ratio planetary tuning system. 100/25 kHz crystal calibrator. Crystal filter with 2.7 kHz bandwidth, 1.7 shape factor and ultimate rejection in excess of 100 dB. 8D/100Hz CW audio filter. Size: 5.5"h x 13"w x 11"d. Weight: 17¼ lbs. (Regular Price . $699)..... **CLOSEOUT $499.**

SWAN HF-700S/SS-16B As above, with optional Super-Selective 16 pole Crystal Filter. 2.7 kHz bandwidth, 1.28 shape, rej. 140 dB. (Reg. $799)..... **CLOSEOUT $595.**

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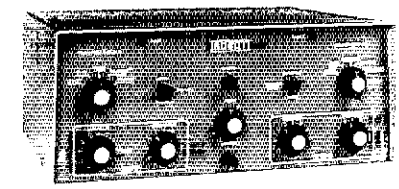
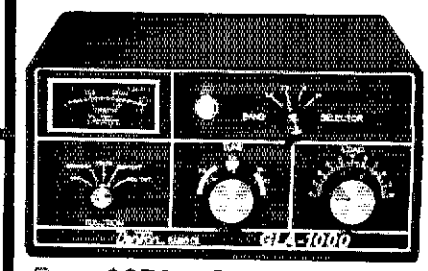


Reg. $795 - ***Sale $636***

DenTron GLA-1000



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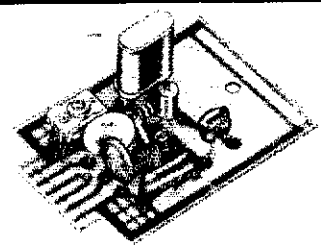
- Signal Generators For Receiver Alignment
- Quick-Change Plug-In Oscillators

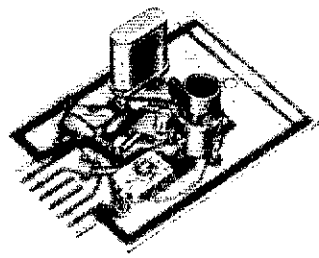


Five transistor oscillators covering 20 MHz-160 MHz. Standard 77°F calibration tolerance ± .0025%. The frequency tolerance is ± .0035%. Oscillator output is .2 volts (min.) across 51 ohms. Power requirement: 9 vdc @ 10 ma. max.

Catalog Number	Oscillator Type	Oscillator Range	Temperature Tol. – 40 F to 150 F	Oscillator (Less Crystal) Price
035200	OT-124	20-40 MHz	± .0035%	$9.28
035201	OT-146	40-60 MHz	± .0035%	9.28
035202	OT-161	60-100 MHz	± .0035%	9.28
035203	OT-1140	100-140 MHz	± .0035%	9.28
035204	OT-1160	145-160 MHz	± 0035%	9.28

LOW FREQUENCY (70 KHz - 20,000 KHz)

- Band Edge Markers
- Frequency Markers For Oscilloscopes
- Portable Signal Standards
- Accessory Cases



Four transistor oscillators covering 70 KHz — 20,000 KHz. Trimmer capacitor for zeroing crystal. When oscillator is ordered with crystal the standard will be ± .0025%. Oscillator output is 1 volt (min.) across 470 ohms. Power requirement: 9 vdc @ 10 ma. max.

Catalog Number	Oscillator Type	Oscillator Range	Temperature Tol. – 40°F to 150°F	Oscillator (Less Crystal) Price
035205	OT-11	70-150 KHz	± .015%	$9.28
035206	OT-12A	150-400 KHz	200-600 KHz ± .01%	9.28
035207	OT-12	400-5,000 KHz	600-5,000 KHz ± 0035%	9.28
035208	OT-13	2,000-12,000 KHz	± 0035%	9.28
035209	OT-14	10,000-20,000 KHz	± .0035%	9.28

SUPPLEMENTAL CRYSTAL ORDERING INFORMATION FOR ICM OSCILLATORS

Please refer to the "4" Series Crystal Specification Sheets. **(Available on request.)** Prices on crystals will vary with frequency being ordered.

CALIBRATION TEMPERATURE:
Customer's choice, usually 26°C.

RANGE: Depends on crystal frequency being ordered.

TYPE: CS ② is recommended.

HOLDER:
F-605 ① for all except crystals below 160 KHz.
F-13 ⑧ required for crystals below 160 KHz.

LOAD:
OT-11, OT-12, OT-12A . . . 24PF ④
OT-13, OT-14 . . . . . 20PF ③
OT-124, OT-146, OT-161, OT-1140, OT-1160 . . . . . SERIES ⓪
ALIGNMENT OSCILLATORS, Models 812, 814 . . . . . 32PF ⑤

Note: Circled numbers refer to numbers on Crystal Specification Sheets.

EXAMPLES

OT-11 Catalog Number = 4 1 1 2 8 4
(75 KHz*, CS, F-13 Holder, 24PF)

OT-14 Catalog Number = 4 3 3 2 1 3
(10.5 MHz*, CS, F-605 Holder, 20PF)

OT-1140 Catalog Number = 4 7 4 2 1 0
(120 MHz*, CS, F-605 Holder, Series)

**All "4" Series Catalog Numbers require crystal frequency specified by Customer.*

FOR ADDITIONAL INFORMATION WRITE:

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K6SEX teaching Novice classes for SFRC. WR6ACI/WB6FDT getting active in emergency preparedness. WB6CIE, new editor of K6GWE/R newsletter. Traffic: (Jan) WB6AMP 290, W6RNL 209, K6TP 128, W6GGR 6. (Dec) WB6RTE 63. (Nov) WB6RTE 29. (Oct) WB6RTE 24.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6YAB. Officers of the Delta ARC are: WA6HIN, pres.; WB6BXA, vice pres.; WD6BQJ, secy.; WA6WRP, treas. Officers of the Tulare County ARC are: WA6FGM, pres.; W6ZZC, vice pres.; W6ARE, secy/treas. WB6ZXG WB6NVR and WD6BIX are Silent Keys. WD6FRS is OTS. WA6KZV reported 100% in 1979. WB6FUS is KB6TB. KA6BTW is KB6UK. WD6GQC is Advanced. N6CIY and WA6CUL are General. K6QPE has a TS 180S. WB6HEQ KB6DI and N6CDD have TR7625s. W6JPS has a TRS-80. W6DPD has a solid state Collins 75S-3C. WA6YAB has WAC. WB6LBR made WAS on 6 meters. NCN for January: ONI 1969, OTC 644. The Fresno DX Convention is April 19-20. The 38th Fresno Hamfest is May 9-11 at the Hacienda. The ARRL National Convention is July 25-27 in Seattle. Traffic: (Jan) N6AWH 124, KA6ACD 32, W6DPD 18, WA6YAB 16, N6AMA 10, WB6TTP 7. (Dec) WB6WYA 8.

SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF — SEC: WB6IZF. Memorex ARC is now ARRL affiliated. W6ZM spoke at their noon meeting. W6OII busy with nets and repairing quad after wind storm. W6ZRJ busy as usual, but visited Hq for board mtg. WB6IZF operating from new QTH on Signal Hill. New EC for Salinas is WD6EKR and AEC is WB6TSS. W6KZJ and W6YBV are regulars on Northern Calif. Net. W6AUC helping a Novice with code speed and busy with phone nets. W6CF little activity due to work and rig problems. N6OM of SPARK on a mini DXpedition to Fiji and Tonga. K1TOY/6 recovering from operation. SPECS repeater has new duplexer, but not installed at El Camino Hospital as yet. Call is W6ASH/R. San Mateo RC meets 3rd Fri of each month. SMRC held A White Elephant Sale at its Jan meeting. All of the SCV clubs report excellent turn out for their holiday parties. The LERA ARC storage house blew over the fence during winter storms, but most equipment salvaged. They report new members K6HWR and WB2JTQ, also Silent Key KA6DLC. LERA ARC officers re-elected for 1980 term. N6KO was another victim of the heavy winter winds, his 40 mtr antenna went down. A breakfast was held to support K6BJ/R, by SCCARC. PAARA had K6RU as a speaker, topic, DX Foundation — DX Beacons. New PAARA members KA6GRU KA6IRT N1AFN KB6RZ and W6KTP. N6CCM and N6CHI both upgraded to Gen. class. KA6GZG now Advanced class as well as KA6DZM. W6WF is home recovering from a broken hip. The SCCARA 10 mtr Net meets Wed at 1930 local time on 28.620. SCV ARES Net Wed 7 P.M. on WR6ADX 147.99/39. WB6IZF net control. Northern Calif. Net meets 3630 kHz at 7 & 8:30 P.M. and on WA6EUZ/R 144.81/145.41 at 7:30 P.M. daily. Traffic: W6AUC 227, W6YBV 197, W6KZJ 110, W6RFF 47, W6OII 10, W6ZRJ 10, WB6IZF 5, W6CF 2.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Bill Parris, AA4R — Asst SCM: N4UE. STM: K4VHT. Azalea Coast ARC (Wilmington) will be operating their club station, WD4ORA, from the USS North Carolina memorial on Apr 12-13. Look for them on all bands 25 kHz up from lower edge of general phone bands. WA4LZD reports good turnout and participation in recent emergency in which both Sampson & Cumberland Co. ARES units were activated. Charlotte ARC would like to thank all who helped with communications for the recent Charlotte Marathon. Novice classes have begun in Burlington(Alamance ARC) and Asheville (WCARS). Cabarrus ARS new officers are WB4COO, pres.; WA4BCN, vice pres.; WD4FFY, secy/treas.; WD4KCN and N4ASE, dir. Charlotte ARC officers: WA4TIJ, pres.; N4BTK, vice pres.; KA4AVL, secy.; WD4BEJ, treas.; WA4UNZ, act mgr. New officers for Alamance ARC are: WD4JFG, pres.; WB4SGA, vice pres.; W4CYN, secy/treas.; WA4FFW, engr.; KA4AKB, dir. New leaders on the THEN(3923) are: WD4CNR, Net Manager; K4VHT, secy/treas.; directors serving 3rd term WD4DYC & W4EAT. Great turnout at first Section Traffic Meeting held in Raleigh, thanks to all who attended and to N4UE for making all the arrangements. New appointees include KB4OV(OTS) KB4PD(OTS) WD4CFZ(OTS) N4ARY(OBS) and WA4CQM(EC Robeson Co). Congrats to KB4PD & WA4IVR on recent upgrades to Extra. Remember to mark your calendars for the Raleigh Hamfest April 20. Traffic: (Jan) WD8NYN 306, WB4WII 255, KC4AM 218, KF4R 136, WD4CNQ 136, AB4S 115, WA4SRD 111, W4EAT 98, K4VHT 97, WB4MXG 90, WB4VVL 89, WA4CUD 83, K4MC 80, N4ZH 76, N4UE 59, WA4BFT 56, WA4IHG 50, K4NLK 48, WA4OJU 44, AA4R 43, WA4CYN 41, K4FTB 40, WD4JJK 37, WB4VQZ 36, WD4NAO 35, WB4GSN 34, WA4FJM 33, WD4CFZ 32, WA4OBR 31, W4FMN 30, WB4CES 29, KB4PD 29, W4ACY 28, W4HKB 27, WA4UTC 26, KQ4M 24, WD4OCO 24, WD4CNR 22, WA4UYS 14, WD4FCH 13, K4AI 12, WD4AIE 12, WD4KPK 11, KB4OV 11, N4AET 8, W4EHF 8, KA4DNL 8, WD4RDT 8, WB4PDU 6, WD4JNZ 3, WD4DIP 2, WA4PID 2, W4RVE 1. (Dec) WB4GSD 138, KA4DNL 75, N4ZH 58.

SOUTH CAROLINA: SCM, Richard McAbee, W4MTK — Asst SCM: WB4UDK. SEC: WD4HBX. STM: W4ANK. NMs: WA4SJS KA4BGX. Congrats to newly formed club Islander AR Assn: W4NQL, pres.; WD4MAX, 1st vice pres.; W4ILN, 2nd vice pres.; N4CGG, secy.; W2FCC/4, treas. Congrats to upgrades KB4TN. Congrats to W4COG inducted into SC Hall of Fame from Marion County. North Augusta-Belevedere ARC active in public service 10 Km Red Nose Run. Carolina State Line's new new mgr. K4LQO meets every Sun 8 P.M. 146.13/73. Check-ins/traffic: SC SSBN, 1872/212; Blue Ridge 2-m Net 928/34; Anderson 2-m Net 476/19; CNe, 351/180; Lancaster Cty. 2-m Net 160/17; Western Carolina ARES Net 140/7; Newberry County ARES Net, 59/17; Carolina State Line Net, 59/17; Dillon County ARES Net 17/0; District 5 ARES Net, 17/0. Traffic: K4ZN 399, WD4AWN 272, W4NTO 137, WD4RMA 135, W4ANK 98, W4FMZ 79, W4NQL 67, WB4UDK 60, WD4PPM 44, K4VIA 42, WB4MXW 41, K4FRX 41, W4MTK 39, N4BPK 28, W4FVV 22, N4BCD 21, WD4BUM 20, WD4EDM 17, K4LYU 17, WA4VYS 16, WB4NBK 14, WB8TCT/4, WD4HBX 10, KB4CO 8, N4EE 7, WD4DOL 6, W4DRF 4, WA4SJS 4, WB4DRT 3, WD4FJP 2, WA4JWS 1.

VIRGINIA: SCM, Rick Genter, K4BKX — ASCM: Buddy Smith, W4YE. SEC: N4NK. ASEC: N4AZI. STM, W4SQQ. ASTM: WA4STO. Chief OO: W4HU. Chief OVS: WA4PGI.

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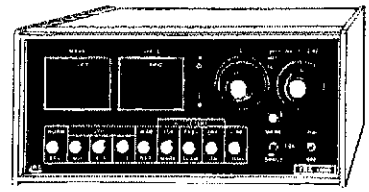
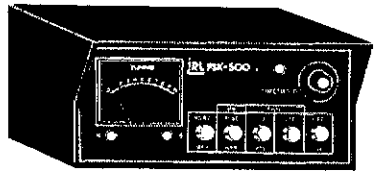
RTTY Demodulators

FSK-1000 T.M.





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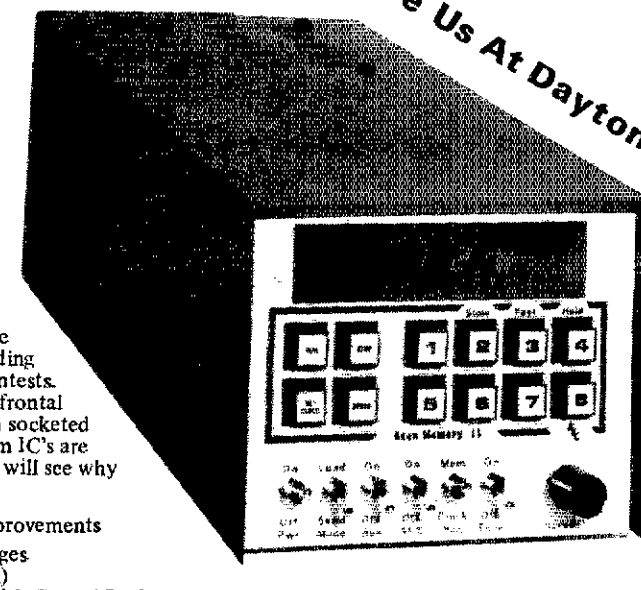

The Accu-Memory II is an improved version of the original Accu-Memory as described in the ARRL Handbook and now in use by thousands of amateurs. These improvements were made by the designer, WB4VVF, based on requests from DX'ers and contest users for additional capabilities and for an assembled version. Features such as large computer grade pushbuttons, not small round ones, and easy memory loading allow the memory to be used and not fought with during contests. An all metal case, 4x5x13 inches, was designed for minimum frontal area and maximum EMI protection. Plug-in main boards with socketed IC's and LED's assure easy maintenance. No expensive custom IC's are used. Compare these features and those listed below and you will see why your friends are using Accu-Memories!

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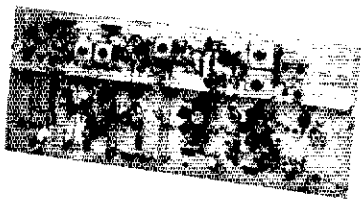

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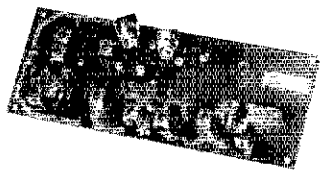
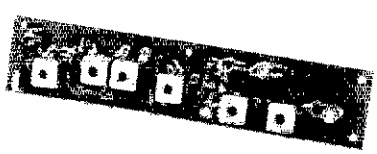


XV2 VHF KIT - ONLY $69.95

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

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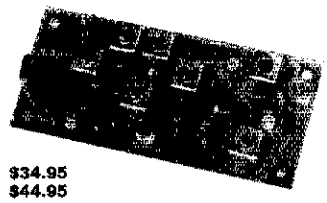
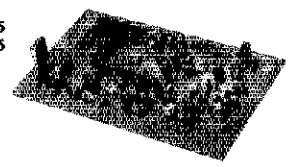


VHF KIT $34.95
VHF Wired $44.95

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	28-30
or	144-144.4	27-27.4 (CB)
CA146	146-148	28-30
CA220	220-222	28-30
CA220-2	220-224	144-148
CA110	Any 2MHz of	26-28
(less xtal)	Aircraft Band	or28-30

Kit less xtal $29.95



UHF KIT $34.95
UHF Wired $44.95

MODEL	RF RANGE	OUTPUT RANGE
C432-2	432-434	28-30
C432-6	435-437	28-30
C432-4	432-438	144-148

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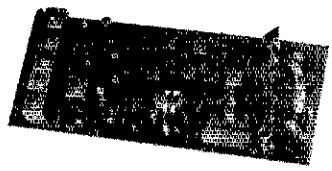

T50-50	6-chan, 6M, 2W Kit	$44.95
T50-150	6-chan, 2M, 2W Kit	$44.95
T50-220	6-chan, 220 MHz, 2W Kit	$44.95
T450	1-chan, 450 MHz, ¾W Kit	$44.95

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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; 25 to 30W	$119.95

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P9 Kit $12.95
P14 Wired $21.95
Specify band when ordering

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- 1½" x 3"
- Models available to cover any 4MHz band in the 26 to 230 MHz range
- 12 Vdc
- 2 stages
- Ideal for OSCAR
- 20 dB gain

P8 Kit $10.95
Specify band when ordering

- Miniature vhf model for tight spaces–size only ½ x 2⅜
- Models available to cover any 4MHz band in the range 20 to 230 MHz
- 20 dB gain
- 12 Vdc

P15 Kit $18.95
P35 Wired $27.95

- Covers any 10 MHz band in UHF range of 380 to 520 MHz
- 20 dB gain
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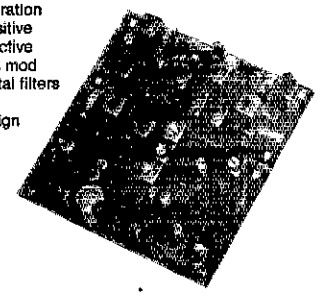

R75A* VHF Kit for monitor or weather sattelite service. Uses wide L-C filter. -60dB at ± 30 kHz. $69.95

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

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R85( ) UHF FM Receiver Kits, triple conversion, include C432 UHF Front End Module. Add $20 to above prices. (Add selectivity letter to model number.)

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Net	kHz	Time-PM	Sess.	QTC	QNI	Mgr.
VNTN	3907	Noon	31	188	471	N4LE
VSBN	3947	6 & 10:15	62	549	1561	WA4STO
VSN	3680	6:30	31	112	403	WA4YIU
VN	3680	7 & 10	62	354	817	WB4FLT

Traffic was down in January. I guess everyone was recuperating from the Christmas rush. Rest up. The Easter rush will be next. WA4CCK and the Olympic Torch Run crew did an excellent job in providing communications for the Torch Run from Yorktown to Lake Placid, NY. Thanks gang! Only 1 BPL (KB4N), but we had 12 on the Public Service Honor Roll: WA4CCK N4NK KB4N WA4STO WA4YIU N4AZI W4NWM K4BKX N4LE W4LXB N9ASX and KB4OG. Many thanks to W4JK for his outstanding job as VSBN manager; truly one of the best NMs the VSBN has ever had. In fact, due to the tremendous effort involved with the net, it will have a manager for each session in the future. WA4STO will be NM for the early session and WA4YIU will move from NM of the VSN to NM of the late VSBN. As of this writing, STM. W4SOQ, is still reviewing applicants for the VSN managership. The Virginia Ham has gone to subscription rates: $7.50 per year. Send your check to the "Ham's" treasurer, Scott Harwood, K4VWK, P.O. Box 523, Farmville, VA 23901. Traffic: (Jan) KB4N 505, WB4PNY 434, WA4LJI 385, WA4CCK 326, WA4STO 325, K4KNP 264, N4NK 216, W4SQQ 213, W4UQ 167, K8LGA 164, WB4FLT 159, WB4ZTJ 138, W4OKN 114, W3BBN 106, WA4BTP 101, K4AXF 100, N9ASX 96, N4AZI 89, K4BKX 81, N4RF 68, N4IF 67, N4LE 65, K4GR 63, W4NWM 59, N4BJX 52, K4EJ 52, W4CEU 50, W4YVG 44, KB4OG 41, W3BBQ 36, WD4FTK 34, WA4OWC 34, WA4YIU 33, KA4HRD 32, WB4KIT 30, N4ABM 29, W4SHJ 29, WA4RTS 26, WB4UHC 22, KB4OF 21, N4UQ 21, KI4W 20, WB4RWY 19, WD4NEI 18, WB4ODZ 18, WB4SHK 18, W4YE 17, KA4ETG 16, WB4MAE 16, W4TZC 16, W4JAZ 15, W4CFV 14, K4DHB 14, WB4DQZ 14, K4VWK 14, WD4EUV 13, W4JUJ 13, WA4YJF 13, WA4ISA 12, W4KXE 11, W4LXB 11, WB4ZNB 11, W4PVA 9, W4SUS 9, KA4EWG 8, KA4GIO 8, WD4DUU 7, WD4DZF 7, N4UY 7, WD4MGF 6, WB4RDV 6, W4WWQ 6, WA4FDV 5, WA4ONR 5, AF4O5, KJ4J 4, KB4OB 4, K4MLC 3, K4BAV 2, N4BHI 2, KA4BQK 2, K4ITV 2, WA4JUO 2, WD4KUK 2, WB4LAB 2, WD4RKN 2, WA1VRL 2, WA4WOG 2, W4DM 1, K4JRT 1, KM4X 1. (Dec) K4DHB 101, K4KDJ 50, WB4SGV 49, N4FM 20, N4UY 13, N4DW 5.

WEST VIRGINIA: SCM, Karl Thompson, K8KT — STM: KC8C. SEC: K8OEW. NMs: K8MHR WD8JYM WB8AKQ. So long and best wishes to AE8P and AE8Q. They are returning to Newington and AE8Q will again be a member of Hdqrts staff. WB8NSL appointed EC for Ritchie Co. Other new ECs are: KA8CVR, Monroe Co; WA8LFW, Pocahontas Co; WD8RNR, Wayne Co; WD8CYK, Harrison Co; WD8MJK, Preston Co. Our emergency organization assisted State OES with five county communications test on March 3. Statehouse activities coordinated by K8BS. WA8WPW, now KC8C, has earned gold medallion for BPL. Huntington Hamfest will be a two day affair, June 7 and 8 at new Huntington Civic Center.

Net	Freq.	Time-Z	Ck-In	Tfc	Sess.
Hillbilly	14290	1700 Su	191	70	4
WV Phone	3990	2300 Dy	952	113	31
Phone-MD	3990	1700 Dy	343	56	29
CW	3567	0000 Dy	249	69	30
Novice	3730	2315 Dy	35	6	11
Bk Diam. 2-m Net	25/85	0200 Tu	25	4	4

Traffic: KC8C 348, WB8AKQ 47, W8HZS 40, W8JWX 33, N8AJC 33, WD8JYM 29, K8MHR 24, WD8EAV 22, WD8PQG 21, K8KT 18, AJ8J 16, KA8ETV 16, W8TJ 15, WB8UDY 15, W8CKX 14, W8YP 13, WD8DHC 12, W8CAL 11, WD8LDY 11, WB8BMX 7, WA4SWF 6, WB8NSL 4.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Robert W. Poirier, KØDJ — SEC: WØGOW. STM: WBØMCL. NM: ADØA WDØAIT KØCNV WØHE WØHXB WBØZQG. WØWYX reports that despite poor band conditions, traffic is moving smooth as ever and participation is up on the WX Net. A 2-meter SSB Net, newly formed in Loveland, is meeting at 9:00 MST on 144.250 MHz. Heavy snows provided much service by amateurs in many parts of the state. WØBWJ, newly promoted to ARRL First Vice President, gave an extensive account of the WARC in Geneva during the Jan. meeting of the CCARC in Denver. Arkansas Valley ARC new ARRL affiliate. PPFMA and the Frosty Network newest members of CCARC. WAØHJZ organizing amateurs for the Ch. 9 sponsored health fair in the Denver area on the week of April 13-20. Pueblo 34/94 moving to 19/79 to alleviate interference with Squaw Mt. The move should have taken place by the time you read this. Net tfc: Columbine, 31 sess, QNI 1153, QTC 127, informals 215, QNF 1038; CWN 31 sess, QNI 233, QTC 117, QNF 1034; Hi-Noon, 31 sess, QNI 1736, QTC 173, informals 372, QNF 1383. Traffic: (Jan) WØWYX 2124, WAØHJZ 1093, WBØZGY 572, WØLAE 128, ADØA 89, NØACW 69, KØDJ 66, WDØAIT 64, WØHXB 39, WØGO 29, WØNFW 28. (Dec) NØACW 140.

NEW MEXICO: Joe T. Knight, W5PDY — SEC: W5ALR. NMs: WD5AHH K5KPS. Southwest Net (SWN) meets daily on 3583 kHz, at 1930 local time and handled 182 msgs with 199 stations reporting in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 kHz at 1800 local and handled 198 msgs with 1155 stations reporting in. New Mexico Breakfast Club meets daily on 3940 kHz at 0700 local, handled 100 msgs with 824 checkins. Yucca 2-Mtr Net handled 100 msgs with 204 checkins. Sorry to report the passing of K5CXN. Congrats to solar powered stations K5SDF & W5PIZ. WB5MII, the VA Hospital station, handling lots of helpful traffic. W5NUI WB5REA WB5QMT K5QIN WA5RPC WA5VLX WB5PFZ and many others helped in the Santa Fe Prison riot. Traffic: N5NG 342, KL7HSF 322, W5UH 271, W5DAD 266, W5ENI 108, W5BWV 12, WA5MIY 12.

UTAH: SCM, Royce Hennigson, K7QEQ — SEC: WB7FCB. STM: W7OCX. The Utah VHF Society Weather and Road Net held 44 sess with a total of 1334 check-ins in Jan. On Jan 27 W7AWK was asked by the San Juan County Sheriff to assist in locating a downed helicopter. He in turn notified K7QEQ, who notified the EC for Grand County and the Moab Amateur Club. W7JBW, the EC, then set up communications on 2-meter with W7AWK via the 01.61 and 16.76 machines in the area. K6QEQ set up a 40 meter link to W7FSC in Kearns who provided a phone link to CAP mission hq. An unidentified ham from Richfield was in the CAP plane with DF equipment and located the downed aircraft abt 11:30 A.M. The pilot and the two passengers were unharmed, but the copter was a total loss. On the same day another search for a lost aircraft was going on near Logan with

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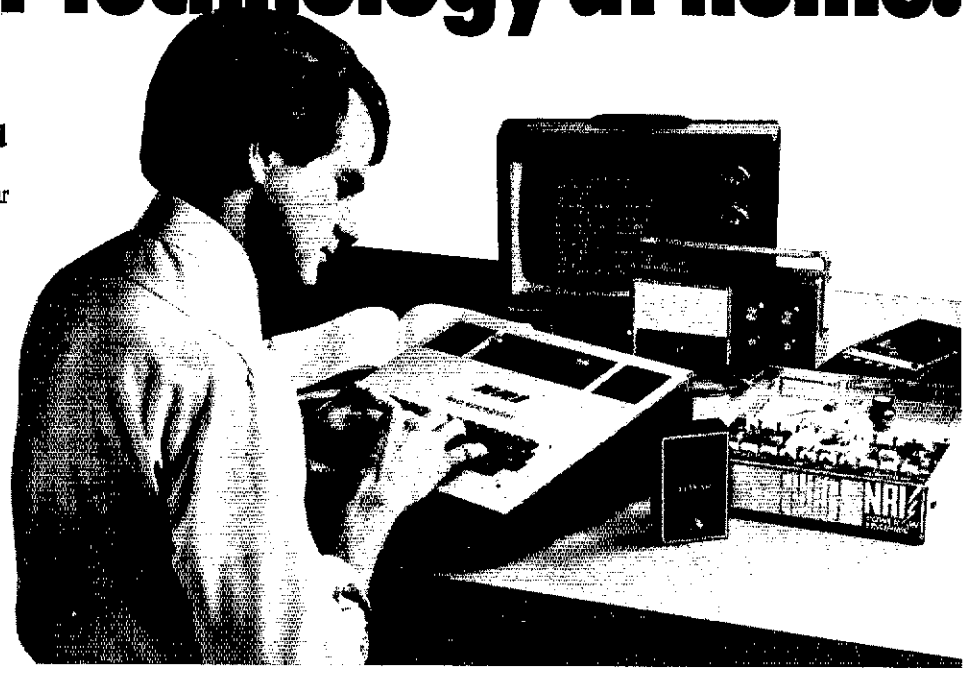

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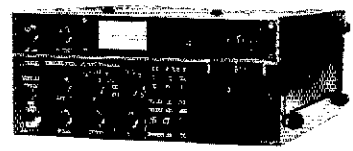

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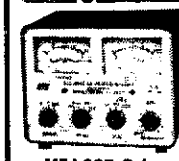

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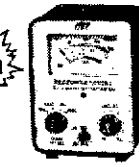

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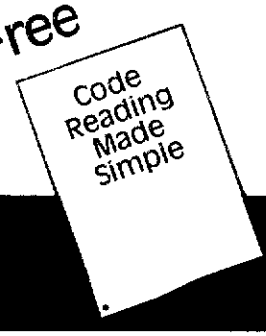

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amateurs helping in that one also, but I did not receive the calls signs of that group. Utah Emergency Coordinators Net is meeting on 7272 kHz at 2000Z every Sun. W7OCX has been instructing the members how to handle traffic. AC7O has been instructing on how to put up emergency antennas. Traffic: K7HLR 209, WA7MEL 92, WA7JRC 49, N@AHA 39, W7OCX 14, W7VTM 12.

WYOMING: SCM, Chester C. Stanwaity, W7SDA — Asst SCM: K7IKO. SEC: WB7EIN. NMs: WB7NHR WA7WFC W7LYA. Congratulations to WA7USI on upgrading to Extra, also to WB7QGH to Advanced. WA7USI has a new Ten-Tec Omni. Our deepest sympathy goes to W7HNI and family on the loss of his wife, also to WB7EUT and family on the loss of his brother, WB7NPI. WB7NHR reports the Wyoming Cowboy Net held 23 sess with 813 QNI, 9 QTC. WA@PFJ reports the Jackalope Net held 28 sess with 784 QNI, 4 QTC. Traffic: W7LYA 279, K7KSA 128, WA7GYQ 118, WA7SGG 16, W7SQT 12, K7SLM 10.

SOUTHEASTERN DIVISION

ALABAMA: SCM, James M. Bonner, K4UMD — SEC: W4IBU. A good many ECs and DECs have been appointed for Jan '80. All should have heard from ARRL by now. Plse report to your SEC monthly, lets keep AL strong for emergencies. RN5 in Jan represented 100% and 97% for Dec '79, by WA4JDH N4MD WA4VKD WA4ZPZ N4CCT W4UP WA4CNY W4CK6 KA4IVD WB4BRG K4RY. New officers of TARC: WD4DAT, pres.; KA4JOE, vice pres.; KA4JWE, secy/treas. The TARC reports upgrading of license to general by WB4RIV; WB4QXM and KT4E to Extra, Congrats. BARC has following new members joining Jan 3, '80: WD4BXH K4BWL KA4LHC KA4HKC WA4QBX. Mobile Hamfest is April 12-13. BARC Hamfest '80 will be May 17-18, so plan for both. WA4JPK, NM AENJ, reports 693 check-ins for Jan. New, Two-meter Net AENL from Dothan 25/85 each Tues. Traffic: (Jan) WA4JDH 1226, N4CCT 293, W4CKS 107, K4UMD 57, K4AOZ 30, W4UP 29, WA4FYO 28, W4IBU 20, WA4JPK 17, KA4BUI 13, WB4VI 11, KA4JOE 8, W8ICM/4, WB4TVY 3. (Dec) WA4VKD 593, WD4LMJ 36.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — ASCM: K4VHC. SEC: K4SWJ. Asst SEC: WB4HXE. STM: WA3NAZ/4. NMs: WD4ADV (ARES) K4DMK (GCN) W4GH (GA TFC) W4HON (VHF) W4WXA (GSN) WA4ZHC (RTTY) WB4ZOJ (GTN) WB4ZVX (GSSBN).

Net	Freq.	Time (All EST)	QNI	QTC
GCN	3995	0700 M/S 0800 Su	544	31
GTN	3718	1815 Dy	222	39
GSN	3595	1900 & 2200 Dy	509	212
GSSBN	3975	1830 Dy	1613	129
ARES	3975	1700 Su	428	2
GA TFC "A"	7243	1200 Dy		
GA TFC "B"	3957	1815 Dy (combined)	434	125
GERN	3610	2000 Wed (RTTY)	14	7

At this writig the GA Emergency Radioteletype Net (GERN) is conducting a simulated emergency situation. Tnx to WA4ZHC & the RTTY gang for the tine interest. The very important traffic system in the section is now complete. Please note the above net schedules and participate in the ones suited to you. The vhf nets in the state continue to do a FB job in local areas. ARRL bulletins are ably being aired by the following: W4BIA W4CMX KB4LA WD4LYV & WA4ZHC. K4OUB continues as NCS for GSSBN for the 20th year. Congrats. Savannah celebrated it's 40th year as an ARRL affiliate on Feb 4th. This is great. KA4GCQ now N4CUL. Contact W4GTS if you have a nominee for a scholarship that is being provided by the Atlanta Radio Club. Club bulletins indicate interest throughout the state with NWS's Skywarn activities. This is a very worthwhile undertaking for all amateurs. Remember that GTN moves to 7118 when we change to EDST. Traffic: W4WXA 173, W4GH 138, K4AZM 126, WA3NAZ/4 119, WB4ZOJ 90, N4CMF 59, WB4ZVX 58, W4ELO 57, WA4ZHC 35, WD4ADV 27, K4EV 27, K4JNL 26, N4UZ 21, K4BAI 15, AK4T 15, W4BIA 8, K4HBI 2.

NORTHERN FLORIDA: SCM, *Frank M. Butler, Jr., W4RH* — SEC: AA4FG. STM: N4WA. NM: WD4HXS WD4LUG WD4PDK. New appts: WA4VCB as OBS; WB4FJY as OTS. SNCs earned by AA4FG and KA4FDF on AFPN and by N4CMF on GA SSB Net. Sorry to report several Silent Keys this month: K4FTI WA4CYK WA4SRQ and the XYL of WB4SKI. AA4W made WAS and K4RUG has 106 countries confirmed, both using QRP. WB4NIP worked Wyoming on 6 meters for his last WAS state. Santa Rosa County hams have formed a new club; meetings are at 7:30 P.M. each 3rd Tue in Milton. Officers are: WD4PPG, pres.; K4SVX, vice pres.; KA4KBI, secy/treas. W4BVE W4LRC W4MMW and W4WKQ gave demonstration of Amateur Radio in the local schools. K4JJE elected pres. of the Panama City ARC. The club has started a newsletter, with KL7JGI as editor. W4BW is a new voice on 2-m in Tallahassee. WA4DON won an S-1 HT at Orlando Hamfest! WD4HWE has his Christmas present up now, a 3 el tribander. KA4EDX, only 13 years old, staged a very interesting magic show at NOFARS meeting. N4BZH now an NCS for NFPN and FAST Net. WA4DUD, a past VP of RANGE, now a Silent Key. The Beaches ARC has its own newsletter now, edited by N4AXH.. WA4ZIL is new pres. The Beaches AREC Net now meets at 8 P.M. Sun on 146.52 and at 9 P.M. on 29.0 MHz. W4BSO W4KMX and WA4MCH upgraded to Extra. New officers of Silver Springs ARC: W4UEA, pres.; WA4HHC, vice pres.; K4OSM, secy/treas. Orlando ARC will have a 22/82 repeater going soon. New time and freq. for Daytona Beach Traffic Net is Sun, 0030Z, on 3740 kHz. This will be my final report as your SCM, after 22 years and some months. I leave it in the good hands of AA4FG, who I know you will support as you have me. I hope to continue getting your newsletters in my new job as Director, SE Division, ARRL. Traffic: (Jan) W4HIF 394, N4PL 390, WD4IIO 312, WD4HXS 189, N4WA 187, AA4FG 163, WD4DNC 148, WB4IZR 134, WD4NYY 123, W4JL 95, KF4U 86, W4FZX 79, WA4CRI 72, WD4PDK 68, W4KIX 66, WB4FJY 65, WA4EYU 60, W4MGO 60, N4BZH 48, K4RNS 40, W4RH 38, KB4T 38, WB4ADL 28, WB4RIS 25, WB4WOO 22, WB4DTS 21, W4MVG 20, N4BBY 10, WA4CLY 4. (Dec) W4FZX 377, W4LDM 164, KB4T 81, KB4B 23.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — Asst SCM: W4KGJ. SEC: AA4WJ. STM: K4TH. New appointment this month: K4TH OTS and STM. My sincere appreciation to K4TH for relieving me as STM and to W4GPL for relieving me as EC Pinellas County. Hopefully I will now be able to devote more time to our 2-meter and 220 MHz repeaters and to AMSAT. I am proud to report K4SCL is now Life Member #1241 of AMSAT. Cost of this is going up 120% soon, so if you are interested, hurry. The Miami Tropical Hamboree turned out to be occasion for announcing additional fast moving changes in ARRL. AA4FG is new SCM Northern

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Florida, replacing W4RH, who stepped up to Director, SE Div. W4WYR replaced W4RH as Vice Director. W4RA had vacated the Director slot to become a Vice President, ARRL. W4PPC with K1XA and others worked out a plan whereby the net on 14,303, called The Hurricane Net during David and Frederick, will be called into session as needed for international emergencies and will have liaison to NTS provided by stations to be scheduled by TCC Director. At their recent meeting, the NTS Inter-Area Advisory Committee worked out a plan for increased schedules by NTS for emergencies and drills. Recommendations on this were made to communications manager, so you will probably see more on this soon. The new CD-3, Numbered Radiograms, came in for considerable criticism at Miami — and apparently elsewhere as well. Anyway, Directors have asked for an investigation as to whether it should be changed some more. Suggest you send your comments to ARRL Headquarters, but if you want to send them to me, I will forward them. We are real proud of our Official Bulletin Stations who do so much to help keep us abreast of these fast moving times. This month we especially recognize W4DL K4TH and WA4FKE for their OBS work. Would like to call attention of all traffic handlers to my letter in Florida Skip relative the FMTN problem. Several people have written me their views, but I still need more input. You traffic men and women who are the backbone of NTS probably want me to fight for your interests, but I'm not hearing from enough of you to be sure I have a clear mandate to make NTS rules stick. Mostly all I hear is people lambasting me — and it's getting kind of tiresome. If you want me to stay your SCM and fight for you, I want you to say so. And I want you to take an active part and help with the tough decisions. I am tired of feeling like I am alone — working me tail off for nothing. Traffic: (Jan) W3CUL 3802, W3VR 812, W4MEE 689, K4TH 555, K4SCL 526, WA4PFK 421, WD4COL 263, WB4WYG 253, WB4FVV 176, W4LX 175, WA4EIC 168, WB4PIB 159, W4IRA 127, W4NFK 121, K4ZK 114, K3EUK 113, W1NJM/4 108, KA4FZI 106, W4GPL 102, WB4AID 101, KM4G 98, N4KB 79, KA4ASZ 70, WD4CHO 69, WA4HXU 60, W4DVO 56, WB4SNX 49, W4WYR 43, N4ET 30, WA4FKE 30, WB4KYE 26, KA4GDV 24, KE4O 20, W4SMK 20, WB4NJU 19, WB4DWU 10, W4TJM 10, KA4BBA 8, WA4BYT 6, WB4GSV 5, W4MML 4, N4APE 3. (Dec) WD4COL 537, KA4GDV 93, KA4ASZ 20, WB4ZVD 18, W4MML 6.

WEST INDIES: SCM, Julio Negroni, KP4CV — PRARC Mini-Hamfest at Cerro Gordo Beach on Jan. 13 was an unqualified success. KP4DEM took upon himself the task of making this one of the most numerous gatherings of hams of the area. PRARC decided to purchase and install a new 2-m repeater on PR highest peak, Cerro Punta to operate on 147.66/06 MHz. KP4EJN in charge of construction. New SEC, KP4BSQ, very active in the reorganization of ARES in time for next hurricane season. Puerto Rico's best coverage repeater on 146.16/76 has been silent for months. KP4O informs rig is under modifications and repairs. In the meantime, a new repeater is in operation on 147.87/27 at the same site. A group of local hams recently visited the Arecibo Ionospheric Laboratory at Arecibo, invited by KP4EKA. Among the visitors were KP4BCQ KP4FHC WP4AGS WA6KDW WP4ARL and WP4AIG.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Willard L. Haskell, AC7D — SEC: N7EH. In April ARES/RACES, members of the Hualapai HC, will take part in furnishing communications for the Gordon Bennet Balloon Race, April 26/27 at Long Beach, CA. Congrats to KA7ETB KA7ESY es KA7EVK recently upgraded to Tech. (all senior citizens), also KA7ETA. WB7CPY reports that the TX Hunt sponsored by the OPRC Jan 20, was a great success. 1st winner was a combo, W7UV and AF7M; 2nd WB7TLR; 3rd WA7UHM and XYL KA7CAU. TX Hunts must be catching as WB7ESQ was playing hide and seek in Feb and plans further activity in the Tucson area. New Novices from OPRC: KA7EXZ KA7FKV KA7GAC and KA7GFR. (Might mention the training section of the OPRC is headed by WB7DJT who is doing an outstanding job!). If you haven't seen the ARCA Year Book for 1979/1980, initate action with your RC to obtain same — it is without question the most comprehensive amateur directory that I have seen. Covers the multitude!! Do not miss it!! ARCA also produces a AZ FM Directory cover 52, 220, 440 and 144 thru 148 MHz. If your RC doesn't have this, contact W7KIN ARCA pres or WB7PNZ, secy/treas for Coconino Cty. ARC rpts "80" officers are: W7GXW, pres.; WB7OPT, vice pres. The Hualapai ARC VHF Net is going strong in Kingman. During a 10 month period QNI was 1713, about 171/month and a total of 43 sessions or 4 per month. QTC total 51, with WA7WEB N6ANL and WA7WZX being the big boosters in trc handling. W7KAX disseminates Ham Radio Reports via HARC Rpt. Tapes being made available to other nets as well. WA7OPO and his NCSs doing a great job. New ECs Maricopa Cty: N6HJ and K6TKA. A-10, QNI 1205, QTC 184; SWN, QNI 199, QTC 152; Cactus, QNI 1159, QTC 106. Traffic: W7EP 219, K7MC 161, W7LVB 79, K7NTG 60, WA7KQE 52, K7NMQ 32, WB7NJY 24, AC7D 15, K7JKM 13, WA7WEB 12, W7LBW 6, N7EH 2, WA7NHQ 1, W7DQS 1.

LOS ANGELES: SCM, Perry Masterson, KD6C — The following message is from SEC WB6FAK. ARES in this section is currently operating from a position of relative weakness in that it is lacking substantial amateur participation; and many agencies having a need for Amateur Radio communications are either unaware of the service we can provide or have been uninterested in the past. Because of this, only a small portion of the section is organized at the present time. I am currently working on several projects which will substantially increase the need for amateur participation in ARES. The largest of these is coordination with the City of Los Angeles to provide backup and overload communication for many city agencies. In past years, Los Angeles was completely uninterested in any kind of volunteer participation; what they lacked at any given time, they just went out and purchased. The present climate has caused a change of heart wherein they are very receptive to discussing ways in which the amateur service can provide assistance. We are very fortunate in these discussions in having the assistance of the Director and Vice Director of the SW Division, among others. Another project, and one which will reach across section boundries, is discussions which we are having with the seismological laboratory at Cal Tech concerning their earthquake monitoring program. This university has seismographs buried throughout much of Southern CA and sends field teams out to earthquake sites following significant quakes. The field teams are often without

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communications between teams, not to mention repor ting back to the laboratory. I hope to be able to establis a net to assist them in the near future. For their part they will attempt to train amateurs in identifying th types of surface faulting which they need to locat following a quake. Our greatest need at the present tim is for persons to fill the extremely important position o Emergency Coordinator in many areas. By the time teams of operators can be built up and trained, these and other plans should come to fruition. Traffic: WB6YI 190, N6PZ 113, K5DY/6 93, KB6FC 76, K6OWA 65 WA6LVO 52, N6NQ 40, W6BRO 29, W6BWG 25, K6CC 12, W6NKE 8, WA6OCM 8.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM N6GW. SEC: W6INI. Asst SEC: N6RD. So. Bay ARS o ficers for 1980: K6SJA, pres.; WD5BEF, vice pres. KB6CJ, treas.; K6QM, secy. Escondido ARS 1980 o ficers: N6AQV, pres.; W6UQF, vice pres.; WB6SSF secy.; WD6CWM, treas. San Diego Amateur Radio Coun cil plans to sponsor an Amateur Radio exhibit at So Calif. Exposition June 26 thru July 6. N6ART has upgrad ed to Advanced. New ARES members: WB6CDV W6EBF KD6F KA6FDK WA6OTE W6RXA WB6TOH WA6USA WB6WWS. No. Shores ARC Feb. program featured WA6PWA/EP2RI in slide/talk on his experiences in Iran Jan program of 220 club was W6THR's talk on Canne Sun - use of solar power. During flood conditions on Ja 30, WB6PVH provided communications from Ba General Hosp. (Chula Vista) to Tijuana General Hosp t support a surgical team from Bay General. XE2BC wa the Tijuana contact. W6TET assisted with translation WA6LZS made the arrangements in Mexico KA8HNI/KA6BZG has left area for greener pastures i Maryland. Good luck! Traffic: WB6PVH 567, N6GW 181 W6HJJ 101, N6AT 73, N6AWC 72, WB6MLB 52, N6RD 35 K6HAP 29, WA6UFY 28, WB6FTY 22, WA6SKU 22 WA6COE 19, WB7SUA 11.

SANTA BARBARA: SCM, D. Paul Gagnon, N6MA — Many clubs held elections this month. The Bunker Ram Club elected W6TLG, pres.; WB6RNT, vice pres. WB6PLG, treas.; KA6GID, secy. The Poinsettia AR elected WD6FJD, pres.; N6AHL, vice pres.; KA6BPH treas.; KA6EZU, secy.; WD6ASF, N6BPF, KA6BP WA6NZL, bd members. Sulphur Mountain Repeate Assn elected AC6I, chmn.; K6VK, chmn.; K1HCG, pres. WB6BPL, vice pres.; WA6UEO, secy.; N6MA, treas. Sim settlers elected WB6QNX, pres.; W6SUN, vice pres. WD6BZN, secy.; WA6MQU, treas. Speakers included W6TSH at Conejo Valley on radio astronomy, an W7MSR at SMRA on satellites. Central Coast AR meets at 1 P.M. the second Sun in various locations Contact W6LB for info. N6BPF is the new editor for th Poinsettia Club Newsletter and WD6ADG is Kay Kli editor for Santa Barbara Club. W6JTA/KB6NA an WB6SYB have earned section net certificates. The ne meets Sun at 1000 on 7235. PSHR award for 1979 wa won by K6YD and the traffic award was won by W6KO with N6WP a close second. W6ZRR sent 150 bulletins Upgrades include KG6K Extra, N6CBI and WB6UX General, KA6CUA Adv, and KA6BAG, N6CFO, an N6AOD Tech. K6LFQ has new Tentec with voice readout. WA6MBZ has Omni D and KT-34. PSHR: K6YD 72, N6YH 67, N6MA 22. Traffic: N6YH 109, K6YD 90 WB6TRP 66, N6MA 18.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — Ass SCM: AE5C. STM: W5VMP. SEC: N5WB. NMs: AA5 AE5I. Our feature club of the month is the Red Rive Valley ARC in the Paris area. The club meets at the REA building on the first Thurs of each mo. @ 7:00 P.M. loca time. The club sponsors the 146.16/.76 repeater WR5ALX. This years slate of officers are: KL7AHB, pres. WD5GWF, vice pres.; WB5JFL, secy/treas.; W5JXV, act A well rounded slate of activities and public service pro jects are undertaken by the club, along with an excellen ARES program, headed by EC WA5KZA. The fine mon thly newsletter highlights all activities and includes ver good tech articles too. Contact WB5JFL for more info Two new League affiliated clubs in our section are: Car thage High School ARC, and Rockwell-Collins ARC Welcome aboard! N5XU takes the helm as pres Key City ARC @ Abilene. New EC for Shackelford Co. is N5BUW He is also Co. c.d. Coordinator. EC W5TAH held ARES workshop, and has completed the Mc Clennan Co. Emer Plan revision. W5ARV rebuilding stn. and adding 2-mtr. fm capability. New slate of officers for the Sabine Valley ARA in the Greenville area is: N5ANN, pres.; WB5TVD vice pres.; W5GQR, secy.; WD5FMP, treas. WD5JYI was erroneously listed in tfc list and PSHR as WB5JYI last mo. my apologies! PSHR for January: WB5LAT WD5JY AA5J WD5EUE KA5FKU N5AWG W5HMR W5VMP WA5QFD N5BT AJ5F WD5IVD. Traffic: W5TI 410, N5BT 140, W5CTZ 136, WD5HHK 136, WD5EUE 113, AA5J 108 W5VMP 99, WB5OXE 98, N5AWG 79, WA5INJ 72 WD5IVD 60, WB5LAT 56, W5HMR 40, WA5KTZ 32, K5MC 27, W5ERT 22, KA5FAS 21, AJ5F 20, KA5FKU 20, WD5JY 18, WB5YYK 118, WA5EZT 14, KA5Q 13, KB5DR 12, AE5 12, WD4SIH 11, K5PC 9, K5SOR 9, WA5ZNZ 9, W5TAH 4

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — New ap pointments for January: N5ABM WB5RXX WB5UUX ECs W5AS OBS. A welcome to OK to WA5RKU. He comes to us from the STX Section and we are very glad to have him help in our cw nets. Operation Sky Warn spotter training seminars being well received. WB5PWY has worked long and hard putting these on and deserves our most sincere THANKS. WB5NKD new asst mgr for CAND and DRN-5. Monthly net reports show excellent participation. Traffic count is down from last year. We received 1 OVS report, 1 OO report, 2 OBS reports and 7 EC reports. This is much less than 50% of the total that could be received. Tahlequah organizing a new radio club. Best wishes. Hope to hear more from them later. Preparations are well underway for 'Ham Holiday 80' due in Oklahoma City July 25-27. Have received some FB reports from our local area nets (repeater nets). We are getting better coverage of OK and can always use more. WB5DYI & WB5DYJ helping with OK Traffic and Weather Net. Net still needs NCSs and more WX reporting sta tions. If gasoline and other circumstances will allow, will try to see more of you this spring and summer. Traf fic: WB5NKC 365, K5JGZ 244, W5REC 234, K5OWK 222 WB5NKD 156, W5RB 107, WA5OUV 44, W5SUG 41 WA5FSN 40, W5UYH 34, W5VOR 31, K5CAY 29, W5DRZ 26, WA5AFO 18, WB5EAY 16, WD5IFB 13, KB5EK 12 WD5ETB 12, WD5DYI 11, WB5ELG 10, W5JJ 8, WB5AOH 7, W6HGH 7, W5VXU 7, KA5DRD 3.

SOUTHERN TEXAS: SCM, Roger Coday, N5FN — Asst SCM/STM: N5TC. SEC: AK5N. Tnx to all stations repor ting this month, 25 reporting OTC, eight making PSHR. Congrats to Brenham ARC for ARRL affiliation and

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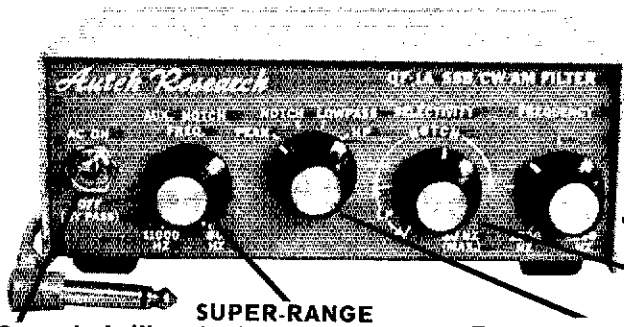

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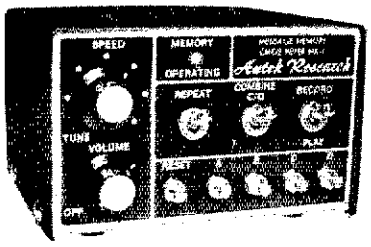

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thanks for inviting SCM for very nice charter party. WA5KCZ doing nice job with TEX cw net bulletin, THE TEXAN. WB5CIT and WA5LNL presented TIRS progress report to San Antonio ARC Feb 1. Congrats to N5RA on reappointment to VHF-UHF Advisory Committee. W5KR has new Ten-Tec Omni D. He has speech processor working properly now and enjoying QSK cw. WB5CIT reports addition of Autek QF-1 filter to station accessories. WD5HSN is beginning his last semester of seminary studies. K5HZR reports confirmation of Kerrville State Park as site of 7290 Net Picnic April 25, 26, 27. K5RG has been elected member-at-large, Central Area Staff, NTS. AG5Y has just confirmed DX contact #217. KA5BUA is now operational with 50 ft tower and 3 el tri-band yagi. Congrats to W5RYO on upgrade to Advanced. WA5RVT EC/OTS Brazoria Cty. reports new Asst. ECs WB5PBL and WD5AAH. Nice report from OVS, WA5QCP. He had good opening 6 Jan. on 6 mtrs and is still debugging 10 GHz amp. WILLCARC planning several activities for upcoming year reports N5TT. W5IYF now settled in new home. SCM would appreciate receiving newsletters from clubs. Tnx to those now sending them. Traffic: W5KLV 406, WB5YDD 240, W5SBE 152, N5TC 143, WA5RVT 97, KA5CDX 94, K5GM 92, K5PE 90, K5HZR 84, W5SHN 73, WB5YRV 56, WB5MMI 40, N5FN 36, WB5CIT 30, K5RG 23, WD5GKH 21, KB5NX 20, WB5EFJ 16, W5KR 14, WD5HSN 11, W5BGE 10, WD5FGY 8, K5QEW 7, KD5O 4, WD5DQR 3.

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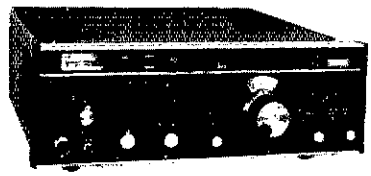

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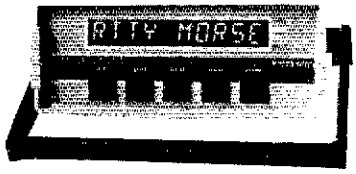

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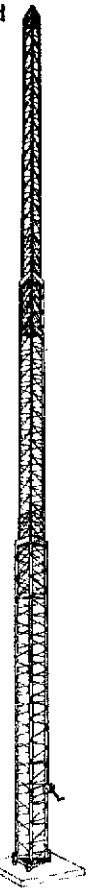

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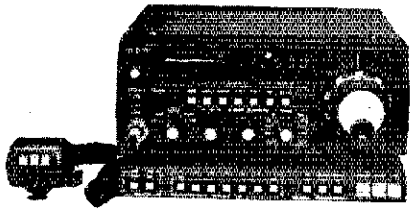

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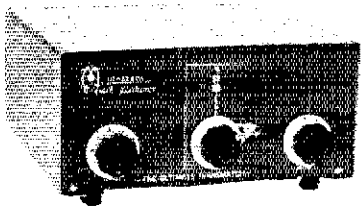

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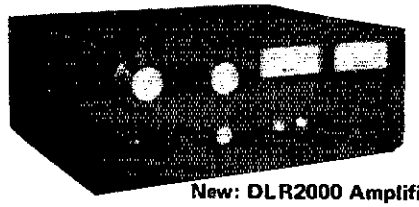

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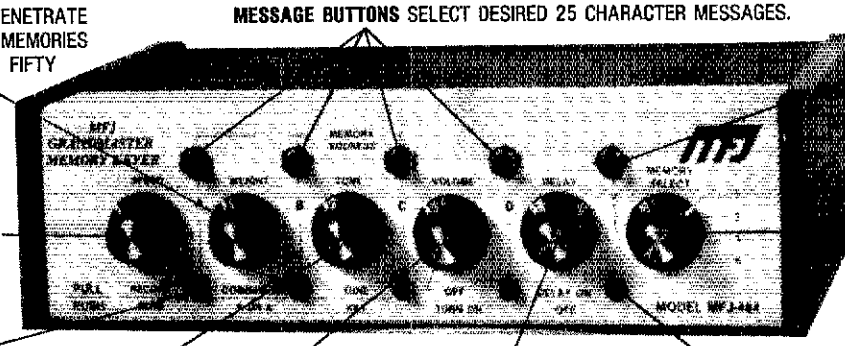

WEIGHT CONTROL TO PENETRATE QRM. **PULL** TO COMBINE MEMORIES A AND B FOR 1, 2, OR 3 FIFTY CHARACTER MESSAGES.

MESSAGE BUTTONS SELECT DESIRED 25 CHARACTER MESSAGES.

RESETS MEMORY IN USE TO BEGINNING.

SPEED CONTROL, 8 TO 50 WPM. **PULL** TO RECORD.

MEMORY SELECT: POSITIONS 1, 2, 3 ARE EACH SPLIT INTO MEMORY SECTIONS A, B, C, D (UP TO TWELVE 25 CHARACTER MESSAGES). SWITCH COMBINES A AND B. **POSITION** K GIVES YOU 100, 75, 50, OR 25 CHARACTERS BY PRESSING BUTTONS A, B, C, OR D.

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A switch combines 25 character messages for up to three 50 character messages.

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Built-in memory saver. Uses 9 volt battery, no drain when power is on. Saves messages in memory when power loss occurs or when transporting keyer. Ultra compact, 8x2x6 inches. All IC's in sockets.

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CQ and QST 1950-1978 also 73 and Ham Radio issues for sale. Two dollar minimum order Cost 50 cents each 1976 and later issues — all other 30 cents each including USA shipping. Send s.a.s.e. chronological order and payment to W6LS. 2814 Empire Ave., Burbank, CA 91504. Available issues and refund sent within one month.

ROCHESTER Hamfest & NY State ARRL Convention. May 16-17. Add your name to mailing list. Send QSL to Rochester Hamfest, Box 1388, Rochester, NY, 14603. Phone 716-424-1100.

THE 11th annual FM B*A*S*H will be held on the Friday night of the Dayton Hamvention, April 25, 1980 at the convention center, Main and Fifth Streets. Parking in adjacent City garage. Admission is free to all. Sandwiches, snacks and C.O.D. bar available. Live entertainment provided for a super social evening. Dont miss it. Awards include a new synthesized HT. For further information contact the Miami Valley FM Assn., P. O. Box 263, Dayton OH 45401.

FLEMINGTON, NJ Annual Hamfest of the Cherryville Repeater Association will be held Saturday, April 19, 1980. For advance information contact Bill Inkrote, K2NJ, Star Route A, Box 64, Flemington, NJ 08822 or phone 201-788-4827 between 6 and 10 P.M.

THE 16th Annual Penn Central Hamfest will be held Sunday, April 20, 1980, at the Woodward Township Fire Hall, from 11:00 AM to 5:00 PM Talk-in on 13/83 and 52. For info write: WB3KRN, Kathy Wehr, R.D. no. 1 Watsontown, PA 17777, or phone KA3CXB at 717-323-7311.

RADIO EXPO '80 Sept. 6 & 7 Lake County Fairgrounds, Rt. 45 & 120 between Chicago and Milwaukee. Commercial exhibits, huge flea market, seminars, ladies programs. Advanced tickets $2, $3 at gate. Send $2. for each and s.a.s.e. to P. O. Box 1532, Evanston, IL 60204 Call for information 312-B-S-T-E-X-P-O.

THE Wabash County ARC will hold its 12th Annual Hamfest on Sunday, May 18, 1980 from 6:00 AM until 3:00 PM at the Wabash County 4H Fair Grounds, Wabash, IN. Admission will be $3 at gate or $2.50 advance. There will be plenty of food and parking. Also will have camping spaces available for Saturday night. Talkin on 7.63/.03 or .52 simplex. For tickets or more info send an s.a.s.e. to Dave Spangler N9ADO, 45 Grant St., Wabash, IN 46992.

SIXTH Annual Northwestern Pennsylvania Hamfest. May 3, 1980, Crawford County Fairgrounds, Meadville, PA. Note date change. Gates open 8 AM. Bring your own tables. $5 per table to display inside, $2 per car space outside. $3 admission, children under 12 free.

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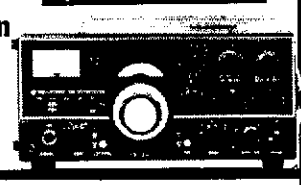

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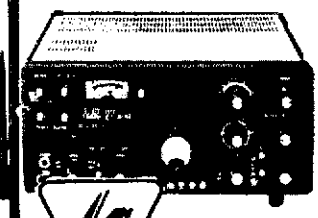

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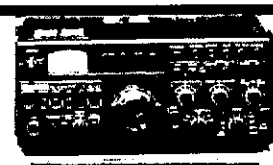

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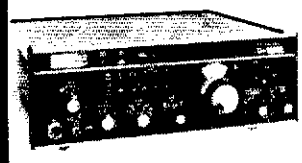

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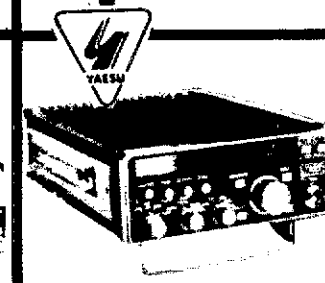

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DELTA Convention, Tri-State Hamfest. Senatobia, MS. June 7-8. Flea mkt. dealers, distributors. Write P. O. Box 2, Hernando, MS. 38632 Phone 601-368-9531. Ray W5VBY.

MOULTRIE Amateur Radio Klub 19th annual hamfest, Sunday, April 20th at Moultrie County 4-H Center Fairground located 3 miles east of Sullivan on Illinois 121 and 1 mile north on Cadwell Road. Heated indoor and covered outdoor flea market. No charge to vendors. Some space available for group meetings. Write M.A.R.K., P. O. Box 327, Mattoon, IL 61938. Talk-in 146.94 and 146.655/.055.

MAY 18th, LIMARC sponsors ARRL Hamfair '80 at the Islip Speedway, Islip Ave., (Rte. 111), Exit 43 Southern State Parkway. 9 AM to 4 PM with over 300 exhibitors, no reservations needed. Cw Qualifying Run at 1 PM. Many awards will be given! For info call at nite Sid Wolin, K2LJH 516-379-2861 or Hank Wner, WB2ALW 516-484-4322. Rain Date June 1st.

21ST Annual STARC Ham Fest. Saturday, May 3, 1980. Owego Treadway, Route 17, Exit 65. Buffet and General Admission $8; gate $2. Reservations received after April 20 held at door. Address STARC, P. O. Box 11, Endicott, NY 13760. Hotel room accommodations: Debbie Chambers 607-687-4500 Owego Treadway, Owego, NY 13827. Flea market, vendors, tech talks. Talk-in 16/76.

6TH ANNUAL Hamfest and flea market sponsored by the Eastern Connecticut Amateur Radio Association will be held on May 18th at Point Breeze Restaurant, Webster MA. Info via K1SY! Richard Spahl, Lake Parkway, Webster, MA 01570 Telephone 617-943-4420 after 8 P.M.

NEW JERSEY: The Tri-County Radio Association's annual indoor hamfest/fleamarket is May 4th at Passaic Township Youth Center, in Stirling. Contact: TCRA, Box 412, Scotch Plains, NJ, 07076, or call 201-647-3431.

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MS-4 Speaker	19
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2NT Transitter	99
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SR-150 Xcvr	259
SR-160 Xcvr	159
SX-146 Receiver	175
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SX-111 Receiver	149
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HQ-110AC Receiver	149
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HQ-170C Receiver	159
HQ-180 Receiver	379
HQ-215 Receiver	259
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HX-50 Transmitter	149

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DX-60B Transmitter	69
HW-32 Transmitter	85
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H-10 Monitor	69
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HW-12 Transmitter	75
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HP-23B AC Supply	59
HW-202 2M FM Xcvr	159
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SB-634 Console	175
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SB-644 VFO	129.50
SB-230 Linear	359
SB-104 Transceiver	625

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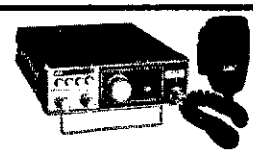

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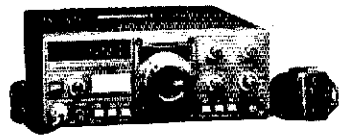

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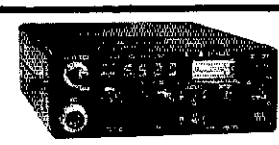

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ARCOS — Amateur Radio Component Service. VHF/UHF high power amplifier kits, parts and accessories. High voltage power supplies. Proven performance in world-wide use. Dowkey, Eimac, Bird, KLM. Sase for catalog. Fred Merry (W2GN) 35 Highland Drive, East Greenbush, NY 12061.

RALPH Hicks, W5BCO, Dealer: Motorola, Atlas and Magnus ssb. P. O. Box 15633, Tulsa, OK 74112. 918-582-1333.

MANUALS for most ham-gear made 1937/1970. Send 25c coin for 16 page "Manual Catalog" postpaid. H. I. Inc., Box 0864, Council Bluffs, IA 51502.

COLLINS repair and alignment, $75. Former Collins engineer, First Radiotelephone, Extra, calibration laboratory, K1MAN 207-495-2215.

TRANSFORMERS rewound. Jess Price, W4CLJ, 507 Raehn, Orlando, FL 32806.

Drake R-7 Synthesized, General Coverage Receiver

Model 1240

Full general coverage recepti 0-30 MHz, with no gaps or range crystals requfred.

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 the Drake TR-7.

100% solid state broadband design, fully synthesized with a permeability tuned oscillator (PTO) for smooth, continuous 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 a 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 grea aid in interference rejection.

Three agc time constants plus "Off" are switch-selected from the front panel.

Complete transceive/separate functions when use with the Drake TR-7 transceiver are included, along with separate R-7 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 TR-7. This makes possible the reception of two different frequencies at the same time. Main and alternate antennas and vhf/uhf converters may also be selecte with this switching network.

The digital readout of the R-7 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, 20 240 V-ac, 50/60 Hz, or nominal 13.8 V-dc.

The R-7 includes a built-in speaker, or an external Drake MS-7 speaker may be used.

Built-in 25 kHz calibrator for calibration of analog di

Low level audio output for tape recorder.

Up to eight crystal controlled fixed channels can b selected. (With Drake Aux-7 installed.)

Optional Drake NB-7A Noise Blanker available. Pro vides true impulse type noise blanking performance

DRAKE

R.L. DRAKE COMPA

Optional accessories available

Model 1531 Drake MS-7 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 NB-7A Noise Blanker
Model 1536 Drake Aux-7 Range Program/Fixed-Frequency Board

DRAKE R-7 SPECIFICATIONS

Frequency Coverage, continuous tuning (With Drake DR-7 Digital R/O, General Coverage Board)
0 to 30 MHz continuous (With or without Aux-7 board) (No gaps in frequency coverage)

Frequency Coverage, continuous tuning (Without DR-7 Board installed)

0.01 to 0.5 MHz 0.5 to 1.0 MHz 1.0 to 1.5 MHz 1.5 to 2.0 MHz 2.5 to 3.0 MHz 3.5 to 4.0 MHz	Without Aux-7 Board	5.0 to 5.5 MHz 7.0 to 7.5 MHz 14.0 to 14.5 MHz 21.0 to 21.5 MHz 28.5 to 29.0 MHz

Plus any eight additional 500 kHz segments between 0 and 30 MHz when programmed into Aux-7 Board.

Crystal Controlled Fixed Frequencies: Up to eight crystal-controlled fixed frequencies within the 0-30 MHz range with Aux-7 Accessory Board. Proper 500 kHz range for desired fixed frequency is also programmed into Aux-7.

Frequency Stability: Less than 100 Hz drift after temperature stabilization including ±10% line voltage variation.

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, 4.2 kHz at −60 dB (1.8:1) shape factor. Optional 300 Hz, 500 Hz, 1800 Hz and 4 kHz filters are available as follows:

Ultimate Selectivity: Greater than 100 dB

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

Strong Signal Handling

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)

THE NEW AEA MORSEMATIC™! 37 FANTASTIC FEATURES!

The amazing AEA MorseMatic. Whether you are a contester, serious VHF DXer, learning code for the first time, studying for a marine radio operator's ticket, or simply a CW enthusiast, you can now own the finest electronic Morse keyer ever built and program it to your specific needs. Count these features!

1. Two custom designed microcomputer chips. 2. Two wpm to 99 wpm in one wpm increments. 3. Selectable dot and/or dash memory.

4. MorseMatic is a memory keyer. 5. 500 Morse character memory (optional to 2,000 characters) 6. Unique "Soft-Partitioning"™ to eliminate wasted memory space. 7. Use entire memory for one message or divide memory in up to ten messages. 8. Message loading begins with first character sent. 9. Easy to load memory. Choice of automatic mode for perfect format or real-time mode for individualizing messages. 10. Special editing mode for memory load correction. 11. Load memory in automatic keyer mode or semi-automatic "bug" mode (garbage in/perfection out). 12. Low power memory hold. 13. Memory limit indicator lights when 20 characters are left in memory. Monitor tone changes when memory overflows.

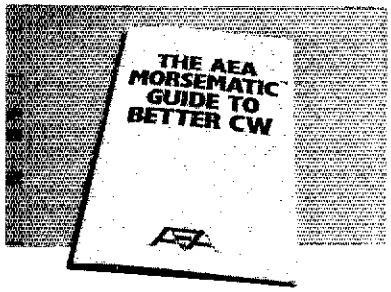
14. MorseMatic is a Morse trainer. 15. Computer generated Morse trainer. Incorporates ten repeatable (answers available) and one random starting position. 16. Programmable speed-up of code rate from beginning to end of practice session. 17. Select "slow code" or "fast (Farnsworth) code" method. 18. Select five character code groups or random group lengths. 19. Selectable, unselectable, uncommon characters for advanced radio operator training. 20. Use trainer mode to key transmitter for on-air practice.

21. MorseMatic is a beacon. 22. Unique beacon mode for beacons; moon-bounce, scatter or tropospheric DX scheduling. 23. Computers set message code speed to fit programmed transmitting window.

24. MorseMatic has serial number. 25. Automatic serial number sequencing for sweepstakes and other contests. 01 - 9999 (even beacon mode). 26. Serial number placement at any point within message. 27. Serial number repetition within same message. 28. Easy serial number repeat in next message.

29. Operates with all popular paddles-30. Easy to learn and use keypad control for all features. 31. Plug in IC's. 32. Independently selectable dot and/or dash weighting. 33. Can be used to key transmitter for tuning. 34. Transmitter keying output for grid block, cathode or transistor circuits. 35. Operates off 8 to 16 volts DC. 36. Fully tested and 96 hour burn-in. 37. Introductory price only $199.95.

The MorseMatic is also available strictly as a non-memory keyer for only $79.95 (introductory price). For your free MorseMatic booklet explaining these and more features, or for information about ordering a MorseMatic, write or call Advanced Electronic Applications, Inc., P.O. Box 2160, Lynnwood, WA 98036. Phone 206/775-7373. (Dealer inquiries invited.)



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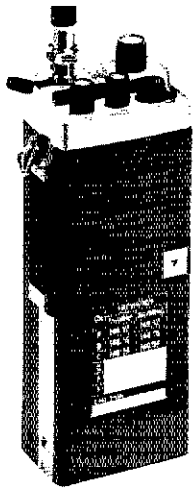

Yaesu FT-202R *Closeout*

SAVE $60

Yaesu FT-202R 2m FM Hand Held Transceiver. 144-148 Mhz. 1 watt min. output. Sens: .32 uV for 20 dB quieting. 6 ch. w/crystals for 146.52/52, 16/76 & 34/94 supplied, 3 optional. 9.6 Vdc (12v max.); uses 7 **inexpensive penlites** or 8 AA ni-cads (not supplied). Meter shows battery condition and signal strength. Built-in speaker and condenser microphone with jack for ext. spkr/mic. Adj. 2250 Hz tone and flexible ant. 2¼"w x 2"d x 7"h, 1 lb. (Reg. $199) ..... **Closeout $139**

ACCESSORIES

NC-1 Drop-in desk top charger	$39.00
(8) AA ni-cad batteries	18.00
YM-24 Speaker microphone	32.00
PA-1 Mobile battery eliminator	39.00
LC-202 Leather carrying case	35.00
VC-202 Vinyl case w/strap	9.85
Crystal certificates ..... ea.	5.00

SPECIAL OFFER: Purchase NC-1 and (8) ni-cads together **$49.00**

Quantity Limited. Order Direct from this ad. Send Check, Money Order or call TOLL FREE and use your Mastercharge or VISA. Allow $5 for UPS shipping and handling in the 48 states.

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Phone: (305) 894-3238
Florida in-state WATS: 1-800-432-9424

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MOTOROLA Wanted: I need Micors, Motracs, HT 220's, "MX's" or any Motorola equipment and parts. Radios must have serial plates. Len Rusnak, WA3TJO, 9605 Dubarry Avenue, Seabrook, MD 20801. 301-441-1221.

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WANTED: Hallicrafters receivers, transmitters, parts, accessories and manuals for private collection. C. Dachis, WD5EOG, 4500 Russell, Austin, TX 78745.

FREE-Fascinating Electronics Idea Book — hundreds of unusual parts & surplus items unavailable in stores or catalogs anywhere. Bargain prices on everything. Write today for latest issue. ETCO Electronics, Dept. 075, Box 762, Plattsburgh, NY 12901.

MOBILE Ignition Shielding gives more range, no noise. Kits and custom systems. Literature. Estes Engineering. 930 Marine Dr., Port Angeles WA 98362.

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HOSS-Trader Ed says "We refuse to be undersold: Big-Sale, the Hoss needs hay for his ponies. Shop around for the best price then telephone the Hoss last." New Drake TR-4CW. Regular $799., cash $675. Close out new Swan HF-700S, $475. New Rohn 50' foldover tower prepaid, $599. Mosley display TA-33 beam, $149. Used Ham-4 rotor, $119. New Swan Astro-150 transceiver, regular, $925. Cash $749. New Alpha linear, $1440. Specials: New Dentron 2000 watt Clipperton-L linears, $499. New Drake TR-7 transceiver, $1239. New Dentron GLA-1000 watt linears; $239.95. Alliance HD-73 ham rotors, regular $165., cash $94. Used Collins S-line, $895. Moory Electronics Company, P. O. Box 506, DeWitt, AR 72042, Tel: 501-946-2820.

HAM Radio Repair, alignment. New location near Chattanooga for fast service by UPS, or visit our modern mountaintop lab. "Grid" Gridley, W4GJO, Route 2, Box 138-B, Rising Fawn, Georgia 30738. 404-657-7841.

VHF Amplifier kits, ssb-fm, 75 watt, complete kit, see Sept. QST, 1979, pages 11-16. $99.95 post paid. Communication Concepts, Inc. 2648 North Aragon Ave., Kettering, OH 45420.

UHF Amplifier Kits, FM-SSB-ATV, 420-450 MHz 100 watt, solid state, $94.60 post paid. Communication Concepts, Inc., 2648 North Aragon Ave., Kettering, OH 45420.

DRAKE R-4/T-4X Solid Tubes replace vacuum tubes to give better performance! Pre-mixer and mixers 6EJ7/6HS6/6BE6-C plus T-4X 12BA6 $17.50 each, ppd. R-4 B/C Improvement kits, $20.60, ppd. Sartori Associates, W5DA, Box 2085, Richardson, TX 75080. 214-494-3093.

STANDBY Power Alternators 1,300 watts to 7,000 watts — Engine and belt drive — club discounts. Write for lit. and price list. Outdoor Outfitters, Ken N9KS Box 411 Waukesha, WI. 53187, 414-542-7772.

PITTSBURGH hams; safety belt, ginpole rental. Towers antennas, rotators, cables. Tom, K3WT 412-653-3880.

TOROIDS, 88 or 44 mHy. Five for $5. M. Reed, Box 74, Soquel, CA 95073.

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.

WANTED: Eimac 5CX1500A tube. Okubo, 529 Kevin Way, Placentia, CA 92670. 714-528-5652.

COMPUTER ham programs. Also code practice cassettes and bibliographies — your gear. Details s.a.s.e. Savage, POB 351, New Castle, VA, 24127.

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.

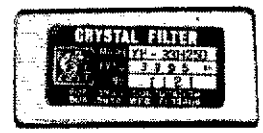
KEYER kits $12.95 to $26.95. Several types. S.a.s.e. for information. MSC, 1304 Toney Drive, Huntsville, AL 35802.

NEW edition "Owner Repair of Radio Equipment" $8.70 postpaid. 25 percent more pages. Service it yourself. K6RQ, 14910 LG Blvd., Los Gatos, CA, 95030. While they last — 1st edition $2.95.

WE have it, if you are looking for ht, vht, or uht gear we have it. VHF, KLM, Wilson, Kenwood Drake and many more. Send s.a.s.e. for our new catalog. L&D, P. O. Box 44425, Los Angeles, CA, 90044. KA6AIL

COLLINS 75A-4 Solid Tubes directly replace vacuum tubes to give better sensitivity, dynamic range, and reliability. 6BA7 mixers, $21.50 ppd. Sartori Associates, W5DA, Box 2085 Richardson, TX, 75080 214-494-3093.

BUY THE BEST!



Whether your SSB rig is old or new, there is no easier or essentially less expensive way to significantly upgrade its performance than by improving its IF passband filtering. FOX-TANGO filters are made of specially-treated high-Q quartz crystals, affording excellent shape factors and ultimate rejection exceeding 80 dB. They are custom made for drop-in installation; matching perfectly, both physically and electronically. Our Diode Switching Boards make possible (now or in the future) the addition of a variety of switch-selectable filters affording superior variable bandwidth without the need to buy an expensive new model. If you want the best for less, you'll buy FOX-TANGO. Just tell us the bandwidth(s) desired for your make and model

8-POLE FILTER BANDWIDTHS IN STOCK

MAKE AND MODEL OF SET	CW (Hz) [1]						SSB-AM (kHz) [2]				SEE NOTE #
	125	250	400	500	600	800	1.8	2.1	2.4	6.0	8.0	
YAESU	$55 EACH											3
*FT-101/FTDX-101		✓		✓	✓		✓		✓			1c
*FT-301/FT-7B/620		✓		✓				✓		✓		
*FT-901/101ZD/107		✓		✓					✓			11
FT-401/350/570		✓		✓			✓	✓				4
FT-200/TEMPO I							✓	✓				
KENWOOD	$55 EACH											3
*TS-520/R-599		✓	✓				✓					
*TS-820/R-820		✓	✓				●		• 2nd IF			5
HEATH	$55 EACH											3
ALL HF		✓	✓				✓	✓				
DRAKE	FOR PRICES, SEE NOTES											3
R-4C	GUF-1 (BROAD 1st IF)								✓	✓		4
	GUF-2 ✓ ✓ (NARROW 1st IF)											7
	✓ VERY SHARP CW (2nd IF)											8
	GUD — PRODUCT DETECTOR KIT											9
COLLINS:	SPECIAL $125 EACH											3
75S-3B/C	✓ EQUALS OR EXCELS $400 COLLINS UNIT											10

NOTES:

1. a) **250 Hz Filters**. Very sharp. Ideal for DX and contest work, yet not too narrow for ordinary operations.
   b) **400 and 500 Hz Filters.** Slightly narrower than 6-pole or less usually available as options, and superior 8-pole type.
   c) **600 Hz Filters** for '101 are 6-pole. $45 each.
2. a) **1.8 kHz Filters**. Intended to supplement (or supplant) standard SSB filters whose bandwidth is about 33% greater. Useful in overcoming QRM.
   b) **2.1 kHz Filters.** Provide significant improvement over standard units, even of same bandwidth, because of superior 8-pole characteristics.
   c) **2.4 kHz Filters.** Superior replacements for standard units having less than 8 poles.
   d) **6 kHz Filters.** Essential for optimum reception of short-wave broadcasts, CB, etc.
3. **Filter Prices** include Airmail Postpaid to U.S., Canada, Mexico. Elsewhere, add $3 per filter.
4. For FT-560/570/401/401B and FT-200/Tempo 1.
5. Filter marked with star (★) is a new 455 kHz 2nd IF unit for **superior** R-520S SSB. Similar in quality to Collins unit below. **Introductory price:** $125 each.
6. **GUF-1.** Replaces present 1st IF unit for CW and SSB. Shape factor 1.5, ultimate rejection 100 dB+. Original unit, 4.7 and 65 dB. **Specify** desired bandwidth: 6 or 8 kHz. $65 each.
7. **GUF-2**. Filter plus relays, etc. on PC board. Easy installation. Automatically replaces broad 1st IF unit during CW. **Specify** desired bandwidth: 600 or 800 Hz. Use with or without GUF-1. $90. each.
8. **56H125 Filter**. Sharpest CW filter available (2nd IF). Front-panel selected, plugs into rear apron of set. **Special:** $90 each.
9. **GUD**. Converts existing product detector to superior double-balanced type. Wired and tested mini-board, easy installation. $30 each.
10. Special plug-in unit equals or exceeds specifications of $400+ Collins X455Q200 **Special:** $125 each
11. FT-101ZD has no AM mode; for 901 only.
12. Superior to existing ceramic filter.

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Permit inboard mounting of one, two (or more) filters than those for which the manufacturer provides room; all switch-selectable using existing front-panel switches in some cases. Available for all **Yaesu** and **Kenwood** equipment listed except FT-401 series and tube-type sets. **Specify** Make, Model and Filter to be used on DSB.

Single-filter type: $12 Airmail postpaid worldwide.
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I'm the lucky possessor of your OMNI-D. As far as I know I'm the only one in my country working this set, almost every day. My first days of ham radio go back to the year 1935. My favorite brand always was Collins. Sorry for Collins, but now since I know the OMNI-D, I changed my mind. The performance of your transceiver astonishes me still almost every day. I cannot stand not letting you know how satisfied I feel with your OMNI-D. Believe me, soon you'll hear from radio friends of mine. Your OMNI-D is irresistible!

Dr. Max Horbach, PA0MAC

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I've had my OMNI-D since Christmas. This is my first piece of TEN-TEC gear, but not my last. I am now looking at the possibility of purchasing an Argonaut. I've had nothing but good reports about the audio, even when my signal has been down in the mud. The receiver portion of the OMNI is excellent and I am pleased with the selectivity and sensitivity.

I chose my OMNI-D over many competing brands because of TEN-TEC's acknowledged leadership in solid state equipment. Based on the reports I've received, I know I made a wise decision.
Sincerely yours,

Bud Hovey, Jr., KB2FC

Number 28 of a Series

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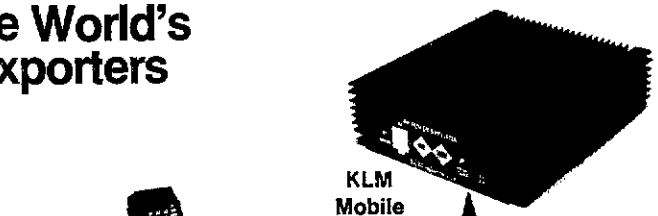
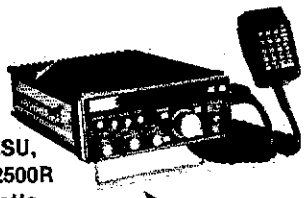


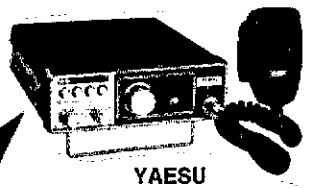
KLM Mobile Power Amplifier Up to 60 watts out.

KLM electronics, inc.

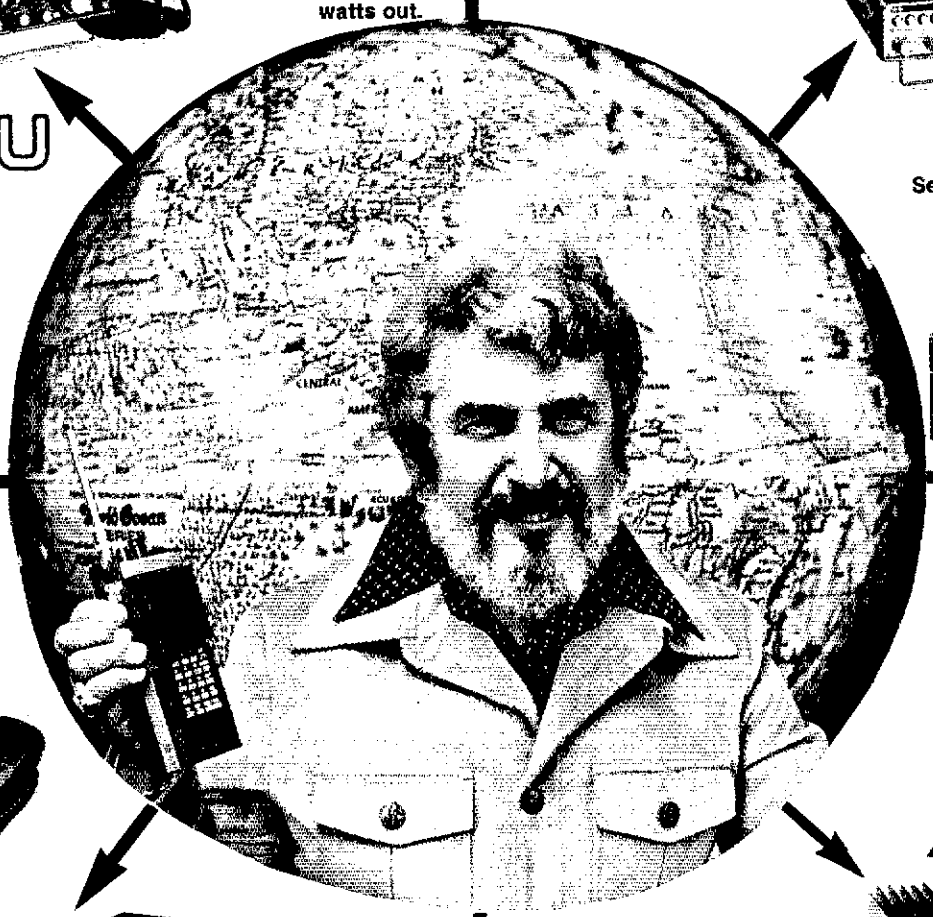


YAESU, CPU-2500R 25 watts.

YAESU



YAESU Memorizer FT-227R, Selectable power, 1-10 watts.



N&G

YAESU KLM N&G Mobile Power Amplifier, 25 watts out.

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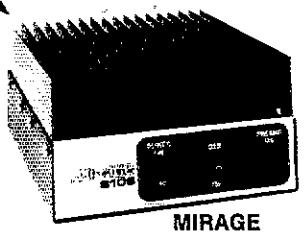

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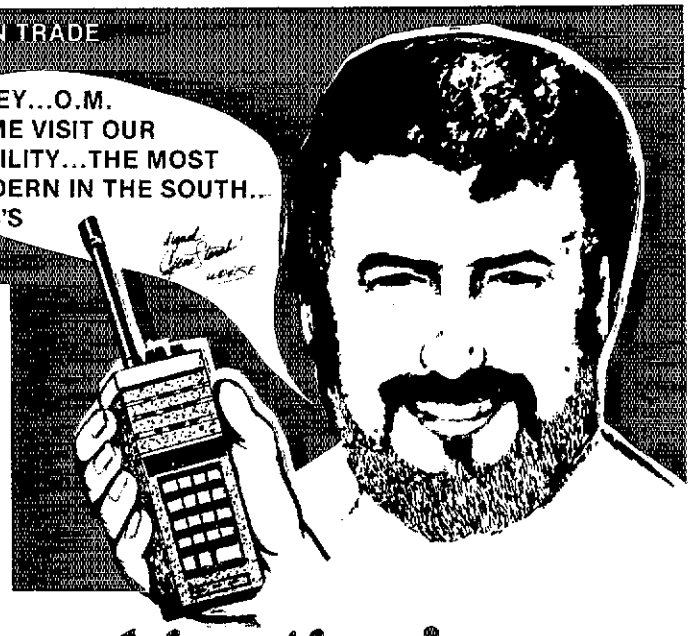

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You get the fabulous features of the FT-207R **PLUS** KLM's integrated 25 watt power amplifier, 5 watt audio/PA amplifier, and receive preamp . . . **ALL IN ONE COMPACT PACKAGE — a N&G exclusive!**

KLM/N&G MA-25B
Power Amplifier
SPECIFICATIONS

Freq. of Operation: 144-148 MHz
Power in: 3 watts
Power out: 25 watts
Preamp: 2.5 dB N.F., 11 dB gain
Mode: FM
Amps @ 13.5 VDC: 5
Audio/PA amp: 5 watts
@ 8 ohms

Custom designed and built for N&G by KLM for use only with the Yaesu FT-207R.

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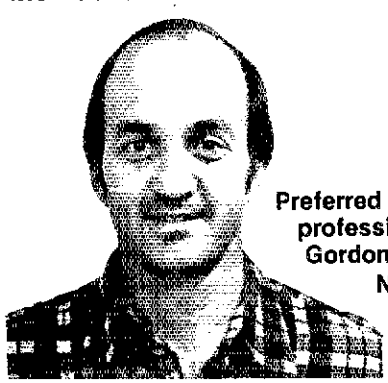

Preferred by the professionals: Gordon Lane, N4BUO Eastern Airlines Pilot

FREE award information. S.a.s.e., WB8RTR P. O. Box 341, Hinckley, OH 44233.

WANTED: Collins 30S-1, 62S-1, Telrex antennas 4 el and larger, towers, QST magazine collection 50s to current. Equipment Mint condition only please! for sale: Henry 2K-2 converted to 2K-3 by Henry, Collins 30L-1, Collins KWM-2A. All in like-new condition. Best offer. Hugh Smith, KA7CPA, 3609 SW Juneau, Seattle Washington 98126 1-206-937-7155.

NOVICES: Owner Repair of Radio Equipment book bridges gap between license manuals and handbooks. $8.70 postpaid. K6RQ, 14910 LG Blvd., Los Gatos, CA 95030.

MOBILE HF antenna 3.2 - 30 MHz inclusive, 750 watts PEP, center loaded, tuned from the base, eliminating coil changing or removing from mount. Less than 1.5 to 1 VSWR thru entire coverage. $129.95 ea. plus shipping. Contact your local dealer, if none in your area order direct. ANTECK, Inc., Route One, Hansen, ID 83334. 208-423-4100 Master Chg., and Visa accepted. Dealer and factory rep. inquiries invited.

ICOM International Users' Club. Details s.a.s.e. N8RT, Pohorence, 9600 Kickapoo Pass, Streetsboro, OH, 44240.

HELP, student needs GE Master (Pro, II, etc) 450, 2m equipment for senior project. WA6FSP.

COLLINS for sale — 75A4, $300, KWS-1 $600, pair $800. 51J4, $475. All mint. Jim, K1LLU, 617-887-8126.

SELL: Wilson 1402SM handitalkie; FRG-7; IC-22S; Bearcat 210; Micoder-I. Thurber, 631 North Overbrook Drive, Fort Walton Beach, Florida 32548.

KENWOOD TS 820-S, SP-820, with cw filter. Very good cond. $875. Will ship UPS. WB3FKC, 412-266-2198.

COLLINS 75S-3C 32S-3A 516-F2. Round emblem. Mint. $1300 K4NYK 404-457-6842.

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FOR SALE: Kenwood TS820S (with cw filter & W6TOG modifications) and VFO820S mint $950. firm. Telrex TB6EM (6 element tri band beam) $400. + shipping. RCA VCT400 4 hour VHS video cassette recorder $800. RCA VCT200 4 hour VHS video cassette recorder $600. Daiwa RF440 speech processor $90. WA2SRM James Grandinetti, Post Office Box 106, Lakewood, New Jersey 08701

QSTs wanted. December, 1915; January thru July, 1916, with covers. Joseph Mullan, W3RLR, 217 Northway, Baltimore, MD, 21218. 301-467-3500.

SELL: Ten-Tec Argonaut, factory checked cw filter pwr supply $275, Ten-Tec '405 100 watt linear and '251 power supply $165. Very gd rig but bought Triton. WB1DWC, 688 North Ave., Burlington, VT 05401. 802-862-5547.

TOWER: Aeromotor, 110 foot, self-supporting, rated for 30 square foot load. Excellent galvanizing, lifetime investment for serious DXer. $7,000 value, for $2500. Allen, Box 444, Madison, TN, 37115.

FAST guaranteed repair Collins; all commercial radio gear. 28 years experience, First Phone, Extra, W6TD. Lasky Radio, Drawer L, Lone Pine, CA 93545. 714-876-4440.

MOTOROLA HT-220s 6 freq w/remote mic $345. w/GLB2000 synthesizer built-in $445. Wilson WE800 $345. All have TTpad and homebrew charger. Radio Shack TRS-80 used. K2DCY 201-226-9185.

SELL Heath SB-104A with spkr/ps, cw filter & N.B. $650. SB-230 80-10 mtr. linear $300. All in excellent condition. Will split shipping. W6OWD, 415-728-7136.

FOR Sale: Drake C Line, T4XC, R4C, MS4, AC4, W4, FS4 (synthesizer), FR4 (Etek digital display), package deal only $1,250. Drake SPR4 communications receiver $500. Kenwood 7400A 2 meter mobile $300. AN/SRR 11A & AN/SRR 13A Navy vlf and 2 thru 32 MHz communications receivers $300. Murch UT2000A antenna tuner $100. Heathkit scope SB610 $80. WA2TSQ Robert Schillaci, 1913 Silverton Road, Toms Rivr, N.J. 08753, 201-255-2822 (after 6:00 P.M.).

WANTED: McIntosh tube type audio gear. Marcus, WA9IXP, 3320 N. Cherry Hill Drive, Brookfield WI, 53005 414-781-7434.

ASR-33 tty, rdr, kbd, punch & ptr used. Needs repair — $300, Used good condition $500, brand new in unopened boxes $1000 — local pickup for cash only. Joe Mehaffey, K4IHP, 404-952-9401, Atlanta.

RADIO Amateur Warehouse spring clearance: Kenwood — Icom, Ten-Tec, Yaesu, Dentron & more TS-520SE — $549.95, TS120 — $589.95, TS180 w/dfc — $989.95, IC701 w/ps — $1159.95, IC251, $589.95, IC255 — $309.95, Omni D — $899.95, FT-227RB — $339.95, FT107M — $899.95, all Hustler discounted 15%. Call or write for quote 817-469-9000, all FOB Dallas, Radio Amateur Warehouse, P. O. Box 2728, Dallas, TX 75201.

WANTED Radio boys, radio girls other Juvenile Radio/Electronic fiction. Quote, title, price, condition. W6ISQ 82 Belbrook Atherton CA 94025.

THE DX Bulletin weekly; postcard for sample. 306 Vernon Ave., Vernon CT 06066.

FAST professional ham repair service New York City area. Amateur Extra; FCC Commercial license. Fully equipped shop. Reasonable. Rich Tashner N2EO 212-352-1214.

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Temperature controlled design for "key-down" operation over a wide frequency range. Newly engineered for coverage of any new or expanded hf amateur bands within FCC amplifier rules. Also features wide frequency coverage for MARS, and other services authorized for this type of amplifier.

2 kW PEP, 1 kW cw, RTTY, SSTV operation—all modes, full rated input, continuous duty cycle.

160-10* 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 L-7 utilizes a pair of Eimac 3-500 Z triodes for rugged use, and lower replacement cost compared to equivalent ceramic types. Tubes are included.

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 L-7 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/AM and 1000 Watts DC on CW, RTTY, and SSTV.

Drive Power Requirements: 100 Watts PEP on SSB and 75 Watts on CW, AM, 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 8163 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.

DESK console for under $95. Build your own. Drawings, photographs; $4.95 Bill Morris, WA5RSC, P. O. Box 411, Lubbock, TX 79408.

TRADE Drake TR-22C for 220 fm rig. Fully crystaled including 34/94, 52/52, 28/88, 37/97, 40/00, 31/91, 13/73, 16/76, 19/79, 46/46, 75/15. Includes mint carrying case and strap. Unit modified for touch tone input. BNC antenna input jack replaces built in whip. BNC with whip attached included. Peter O'Dell, AE8Q 203-666-1541 days, 203-347-3012 early evenings.

COLLINS new KWM-380 or older gear is the best. For test results call K1MAN 207-495-2215.

KDK FM2015R: excellent shape w/touchpad mic, manual. $225. AC1Y 203-667-2494 Mon-Thurs 9-4. I'll ship insured.

WANTED: QST collector needs some missing copies between years 1930 and 1980. Write for my needs, describe and price. Norman L. Klentz, Reeseville, Wis. 53579.

WANTED old microphones — pre 1940, for my microphone museum. Also mic-related items. Write Bob Paquette, 443 N. 31 St., Milw. WI, 53208.

ATLAS 180 with VOX/cw module, excellent $335; Standard SRC 826M, 2m transceiver, 10 W., 12 channels $95, WB2IVV, 516-698-1024.

ANTIQUES: Wavemeter, 130 to 230 meters, pilot light resonance indicator, by American Radio & Research Co., Medford, Mass. Also Radiotron brass base 201-A and RCA brass base WD-12. W2HHK, 929 Riverside Dr., Pine Beach, NJ 08741. Best offer.

DRAKE 2C receiver, 2CQ multiplier, calibrator; ready for WARC, clean, $185. Ssb processor, $49. RME DB-23, $35. HQ-129X, HC-10, $150. WA2OVG, 212-490-2160 days. 796-8617 eves.

DRAKE C-line, AC-4, $900; Swan 350, both power supplies, $325; Kenwood TS-120S, new, $585. K7LR, 208-634-2374.

SB-110A $290. W6RFL, 1539 Montalban Dr., San Jose, CA. 95120. 408-268-8380.

ATLAS 350 XL DD6 × LW/VFO, digital dial. 350 p.s. w/clock, alarm, phone patch. Complete station $950. Drake R4B rec. $325. MS-4 speaker $15. mint cond. P&H Spitfire LA-500M linear amp. w/PS 1000B D. C. power supply, new never used $225. Clegg Zeus 2&6 mtr am transv. w/pwr supply perfect working cond. clean w/manual $150. Atlas model 220-CS console supply $75. Samuel Oran WB4YQU, 4851 Griffin Rd., Ft. Lauderdale FL, 33314 305-587-2413.

LAFAYETTE HA-800B receiver. 80 to 6. with 100 kHz calibrator and manual. Good condition and appearance. $75 plus shipping. KP4EKK, Box 13572, Santurce, PR 00908.

SELL: Dentron super tuner plus, $115. Yaesu YO-101 monitor scope, $250. Both mint condition. KM4I, 4620 SW 89th Avenue, Miami, FL 33165. 305-223-9789.

COLLECTOR wants Gibson Les Paul guitar. Will trade radio equipment or cash. Paul, W1XQ, 99 Botsford Road, Seymour, CT 06483. 203-888-6922.

QST, 1921-1934, 116 issues. Jim White, Box 437, Slatersville, RI 02876. 401-767-3052.

MUST unload telephone answering and recording sets, some need repair, cheap. Or trade for good 2 meter HT set. W9EBH 317 SE 5th Aledo, IL, 61231.

KDK FM2015R: excellent shape w/touchpad mic, manual. $225. AC1Y 203-667-2494 Mon-Thurs 9-4. I'll ship insured.

MOTOROLA — 2 HT-220 H33FFV new 5 watt, 1 freq. Batteries, antennas, case, $350 each. 3 HT 200 2 watt, 2 freq. antennas, charger. $200 each. A. Neisser, 6210 Meadway, Houston, 77072 713-498-4540.

SELL FT620B — $300 Mosely 5 el. six meter beam $25. K1EM, 203-583-3111.

SELL: SB-110A, AC & DC supplies $350 IC-502 mint $200. Microwave module 6-2 trans. w/ac supply $200. SX-115 mint $325 or B O. Janel 2m conv $50, HP-37B dual trace scope $250. K1GAO, 617-438-4041.

10 PAGES, radiogear. Antique-modern. WD11, UV200A; books; meters; dials; sets. 30c stamped s.a.s.e. W4BLQ, B158, Edgewater, FL 32032.

WANTED: Kenwood T-599A in good condition with cables. Joseph Latawiec, W6OIQ, 81 North Buena Vista St., Redlands, CA 92373. 714-793-4776.

DRAKE TR-4, mint, ac power supply, noise blanker, FF1 adapter, $400. K. Zander, 2907 No. Baker St., Bakersfield, CA, 93305, phone 805-322-6183, 805-322-3667.

REPEATER builders: new Teltone M307 touchtone decoder, $75; new Teltone M902 line monitor, $25; used dual Teltone M161 touchtone to rotary converter (2 lines with rack) $100; all units with manuals. N1RM, 4 Maple Lane, Bronkfield, CT 06804. 203-775-4061.

TS700SP with speaker, KLM 14 element, 2m beam. Brand new. $725. WA1SZE, D. Raynes, Box 50, Madbury, NH, 03820.

TEN-TEC 540 xcvr (80-10 mtr) solid state 200W PEP & 262 M p/s with ammeter & VOX control $650. WD6EQR 213-370-3410 20113 Wayne Ave., Torrance, CA 90503.

YAESU FT221 xcvr. 144-148, all-mode, 10W, 12/110V, continuous tune. WA4ASF. 813-863-3358.

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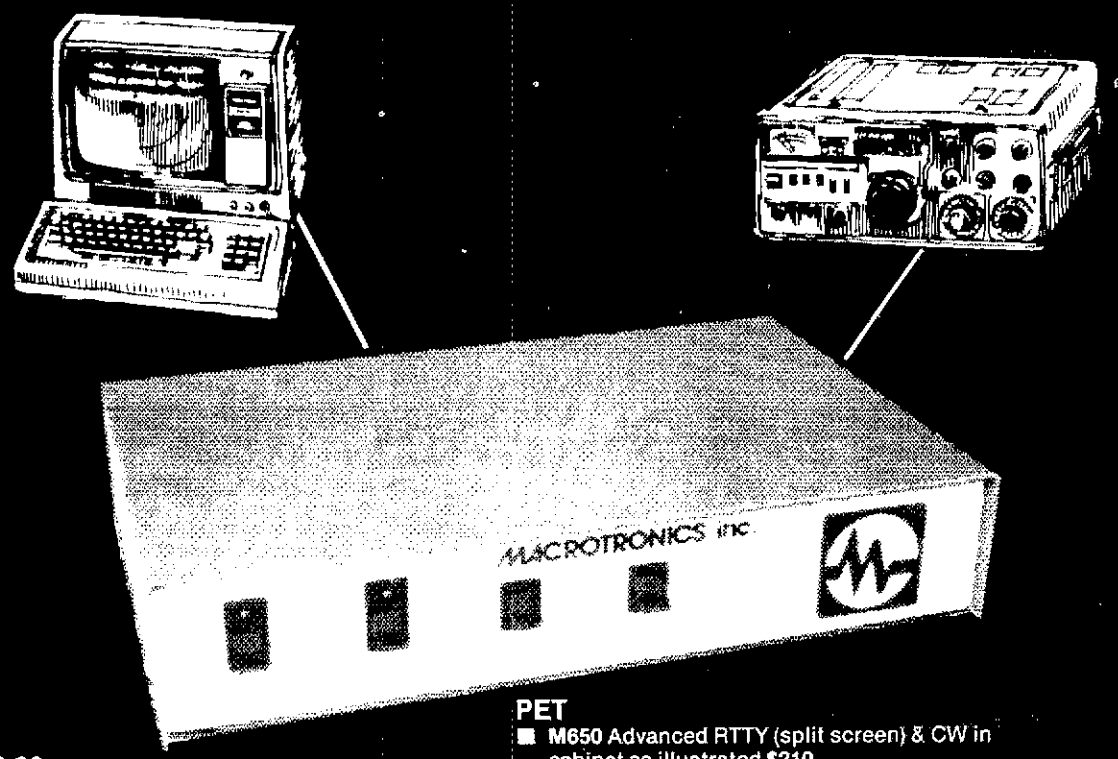
Ham Interface Systems



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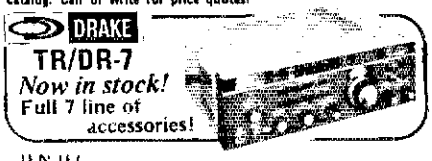

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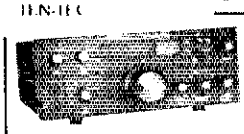

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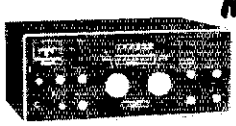

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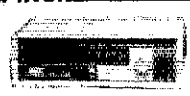

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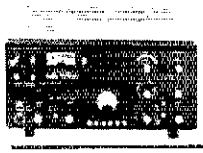

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Amateur Radio Supply of Nashville, Inc.

SUPER value: Hardly used solid-state Alda 103 transceiver for 80/40/20 ssb and cw. Includes noise blanker and xtal calibrator; only $289. Fred, KB8HR, 313-353-7864. 20975 Glenmorra, Southfield MI, 48076.

RED-HOT specials from Conley Radio: Atlas 350XL, DD6-C, 350PS for $1323, RX-110S $249., RX-110 $219. 215-X $575., 210-X/NB $599., Yaesu FT-901DM $1199., FT-901D $1000. FT-901DE $1000., FV-301 $106.25, YO-301 $233.55, FP-301D $203.15, YC-500J counter $189., YC-500S $319., YC-500E $429., Drake C-line sold as set only, T4-XC, R4-C, AC-4, MS-4 $1389, SSR-1 $299. Dentron MT-2000A $169.55, MT-3000A $314.55, Clipperton $599.50, DTR-2000L $999 50 MLA-2500B $779.50, Supertuner Plus $134.55, Junior Tuner $59.95, CLA-1000B $299.50 Icom IC-245 $399., IC-245/SSB $459., IC-211 $695., IC-701 system $1249. IC-31 $449., IC-21A $299., DV-21 $249., call or write today FOB COD/cash 318 N. 16th St., Billings, MT. 59101 406-259-9554 eff. through April.

SWAN WM-1500 wattmeter like new $50 K4AOZ, 205-822-0585.

SLOW-SCAN TV. Venus camera and monitor. Like new condition. $500. Arnold Bob, 148 West 77 Street, NY, NY 10024. 212-580-0541.

DRAKE R4C, nb, 1.5 filter, 10 crystals, T4XC, MS4, PS4. $995 WB5OCL 713-498-0194.

FOR SALE: HAL DS-3000, V. 3, RTTY video keyboard, mint, must sell. Write or call John B. McGrath, Jr., AB[illegible]T, 1750 Portland Avenue, St. Paul, MN 55104 612-644-3869.

WANTED: Circuit diagram for Panorama Model SA-3, Type T3KCE. Also instruction manual for this set. Odilo Dollmann, DD2CB Ulrichstrasse 2, D-8021 Icking, F.R.G.

SALE: HW-16 $110. KA4EBW.

OMNI-D, series B, cw filter, n.b., a.c. supply and keyer. Cost $1428., sell $1100. Collins 30L1, new 572B's $600. firm p.u. only. Want KWM2A R.E. with 312B5 console. Submit trade: WB6PCZ, 312 E. Cedar, Burbank 213-842-2929.

FOR SALE: Yaesu FT301D, FP301, am filter, YO-301D used less 2 hours. Mint cond., $825 ppd. David Welton, 827 S. 880 W, Payson, UT, 84651.

SELL: SB400, L-P filter, Ni-Key, SWR bridge. SS1-R rcvr. $450. W2HPE, 201-939-2338 evenings.

HQ1 — MiniQuad beam. DX proven. Used 6 months. Manual. $85. W4TSV, 205-432-1705-Days; 205-478-9427 nights.

DRAKE — R4C, T4XC, AC-4, MS-4 xtals, filter, tubes, 10 hrs. $900. J. Loch, 1624 N 69th St., Milwaukee, WI, 53213. 414-453-5025.

CODE cassettes: EASYREAD code instruction is more than computer generated code. Time is important in code practice. Use your time to practice quality material. EASYREAD 90 minute cassettes were formulated by an experienced code instructor using proven techniques. Each contains balanced content of QSO, text, groups, numbers and punctuation. All have computer controlled character to word speed ratio. Specify beginners, 5, 7-1/2, 10, 12-1/2, 15, 17-1/2, 20, 22-1/2, etc. to 35 wpm. Speeds overlap. $5.95 each, any 5 $27.50, any 10 $49.90, any 25 $99.75. Marshall K. Kingery K4ER, Box 268Q Manchester TN 37355.

FOR SALE: Heath HW101 with power supply and crystal filter. 2-1/2 years old. $450 or best offer I'll ship. WD9EKA Bob, R.R. 15 Box 416, W. Terre Haute, IN 47885.

SELL: SB200 amplifier perfect w/10m $325; xfmr 2000V -1 amp + $65; new HyGain 153BA $55. Call WB2BEV, 212-332-2622.

WANTED: Hallicrafters HT-37. Needed for parts so condition not important. Will pay freight and fair price. Steve Hopkins, 3700 Monty, Midland, TX 79703. Ph. 915-697-7598.

WANTED: Collins S-line, 30L1, and 30S1; Alpha or Henry linear; Telrex beams. W9QYH, 1605 Ridge Rd., Green Bay, WI, 54304.

SELL Heath SB-200 linear, new finals, $300, Hallicrafters HT-37 xmtr, great audio, $170. Steven Krane, WB2EKW, 33 Washington Square West, New York, NY 10011. 212-475-3249.

WANTED: KLM Echo-II ssb xcvr 432MC W6RQZ, 1330 Curtis, Berkeley, CA, 94702.

FOR SALE: SB104A, HP1144, SB604, SB614, Dentron 160-10AT Supertuner, Drake W4 wattmeter and mike. $650 for everything. Henry, WD5BVD, 1-504-454-6192.

RTTY gear: DEI demodulator w/manual, $35; 565 PLL demodulator with 20 mA loop supply, $35; new VE4Logic ASCII to Baudot converter kit including ICs and memory, $60. N1RM, 4 Maple Lane, Brookfield, CT, 06804. 203-775-4051.

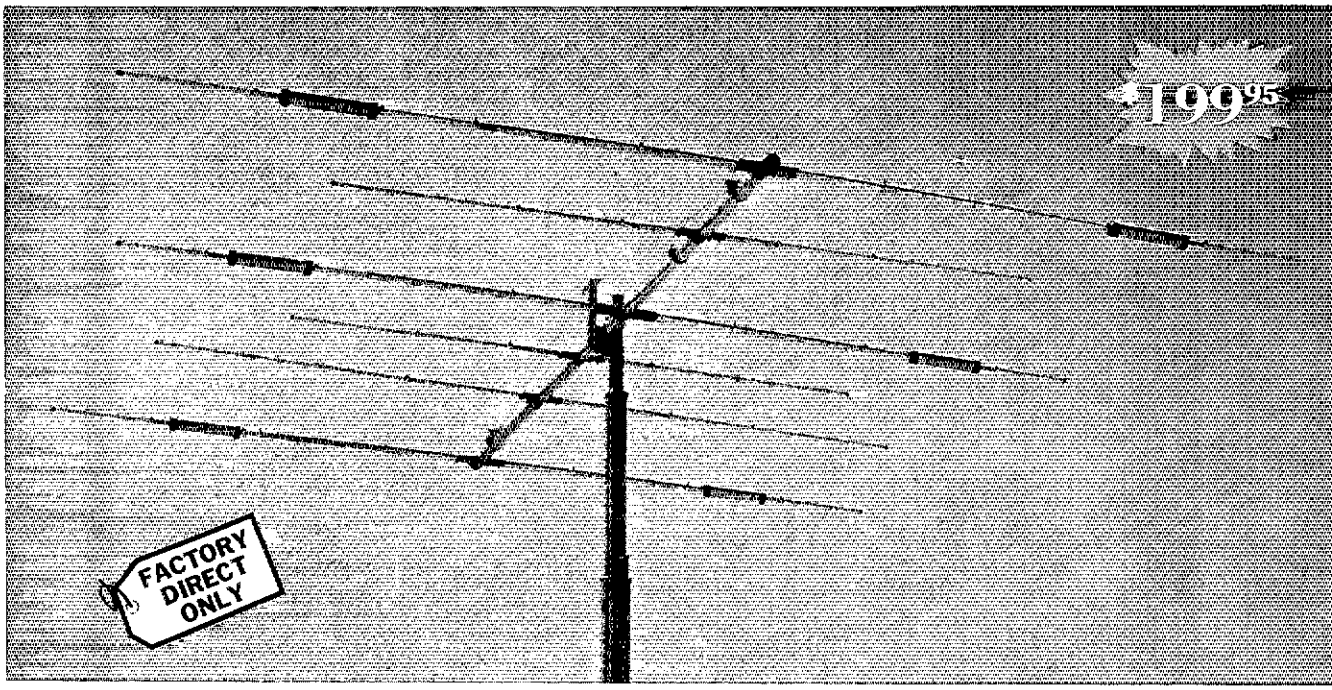
WANTED: Drake L4B, mint condition. For sale: Yaesu station FT-301D, FP-301, $695. FL-2100B linear amp, $400. Kenwood TR-2200A, $175. All in top condition with original manuals. Alan Highers, Box 38114, Germantown, TN 38138.

HALLICRAFTERS SR-150 with power supply, SWR bridge/FSM, TVI filter, phone patch, key, coax. All in good condition. $280 WA2CTW Long Island, 516-484-2645.

SELL C.I.E. 1st Phone Course, exams and answers W2HPE 201-939-2338.

GREAT QTH. Large 3 bedroom, well insulated house located in Parkersburg, WV. Has rental unit attached to help pay the mortgage. New stove and frig. Towers no problem. Convenient to shopping, business and plants.

WILSON SYSTEMS, INC. presents the SYSTEM 36

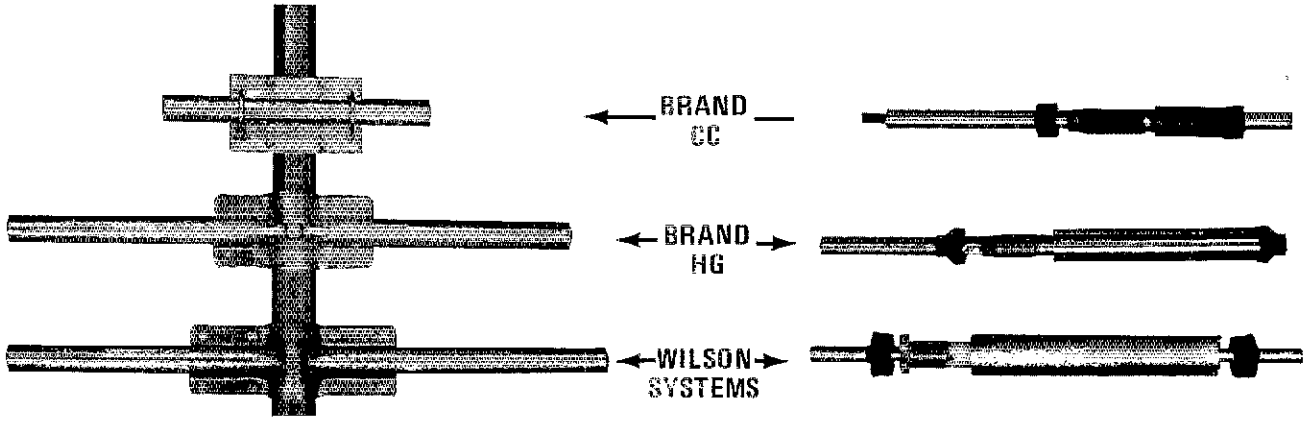


A trap loaded antenna that performs like a monobander! That's the characteristic of this six element three band beam. Through the use of wide spacing and interlacing of elements, the following is possible: three active elements on 20, three active elements on 15, and four active elements on 10 meters. No need to run separate coax feed lines for each band, as the bandswitching is automatically made via the High-Wilson traps. Designed to handle the maximum legal powe the traps are capped at each end to provide a weather-proc seal against rain and dust. The special High-Q traps are th strongest available in the industry today..

SPECIFICATIONS

Band MHz 14-21-28	Boom (O.D. x Length) . . 2" x 24'2¼"	Wind loading @ 80 mph . . 215 lbs.
Maximum power input . Legal limit	No. of elements. 6	Maximum wind survival . . 100 mph
Gain (dBd). . . . . Call Factory	Longest element . . . . . 28'2½"	Feed method . . . . . Coaxial Balun
VSWR @ resonance . . . 1.3:1	Turning radius . . . . . 18'6"	Assembled weight (approx. 53 lbs.
Impedance . . . . . 50 Ω	Maximum mast diameter. 2"	Shipping weight (approx.). 62 lbs.
F/B ratio . . . . . Call Factory	Surface area . . . . . 8.6 sq. ft.	

Compare the SY-36 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.

CALL FACTORY DIRECT 1-800-634-6898

WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

Prices and specifications subject to change without noti

WILSON SYSTEMS TOWERS

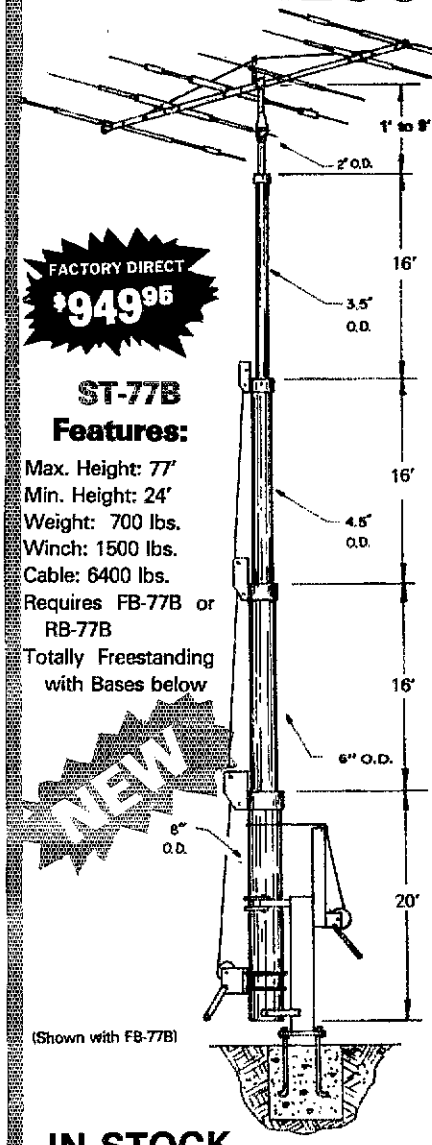
— IN STOCK —

FACTORY DIRECT $949.95

ST-77B Features:

Max. Height: 77'
Min. Height: 24'
Weight: 700 lbs.
Winch: 1500 lbs.
Cable: 6400 lbs.
Requires FB-77B or RB-77B
Totally Freestanding with Bases below

NEW

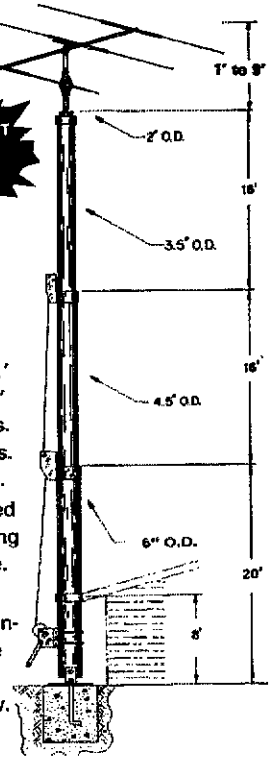


(Shown with FB-77B)

FACTORY DIRECT $549.95

MT-61B Features:

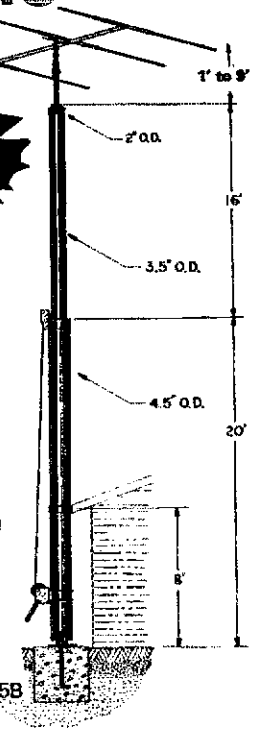
Max. Height: 61'
Min. Height: 23'
Weight: 450 lbs.
Winch: 1200 lbs.
Cable: 4200 lbs.
No Guys required when mounting against house.
For completely freestanding installation, use RB-61B or FB-61B below.



FACTORY DIRECT $314.95

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 RG-45B or FB-45B below.



IN STOCK

WIND LOADING			
Tower	Height	Sq. Ft.	
ST-77B	69	18	Square Footage Based on 50 MPH Wind
	77	12	
MT-61B	53	18	
	61	12	
TT-45B	37	18	
	45	12	

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	Bases
FB-77B	3½' x 3½'	6'
RB-77B	3½' x 3½'	6'

Wilson Systems uses a new 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 can not be mounted against the house and must be used with the tilt-over base FB-77B or RB-77B shown below.

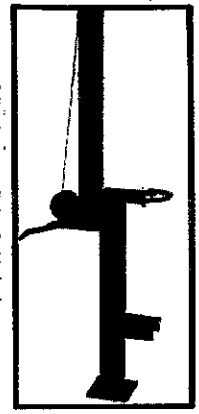
All three towers above are able to handle large arrays of up to 20 sq. ft. at 80 mph WHEN GUYED with one set of 4-point Guys at the top of the 3½" section. Guying Kits are available at the following prices: GK-45B—$59.95; GK-61B—$79.95; GK-77B—$99.95. When using the Guy System with RB Series Rotating Base, an additional thrust bearing at the top is required. The WTB-1 is available for $49.95.

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.

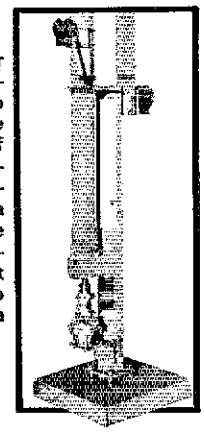
FB-45B... 112 lbs... $154.95
FB-61B... 189 lbs... 214.95
FB-77B... 250 lbs... 299.95



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... $219.95
RB-61B... 229 lbs... 299.95
RB-77B... 300 lbs... 449.95



Tilting the tower over is a one-man task with the Wilson bases. (Shown above is the RB-61B. Rotor is not included.)

ORDER FACTORY DIRECT 1-800-634-6898

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

WILSON SYSTEMS INC. MULTI-BAND ANTENNAS

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

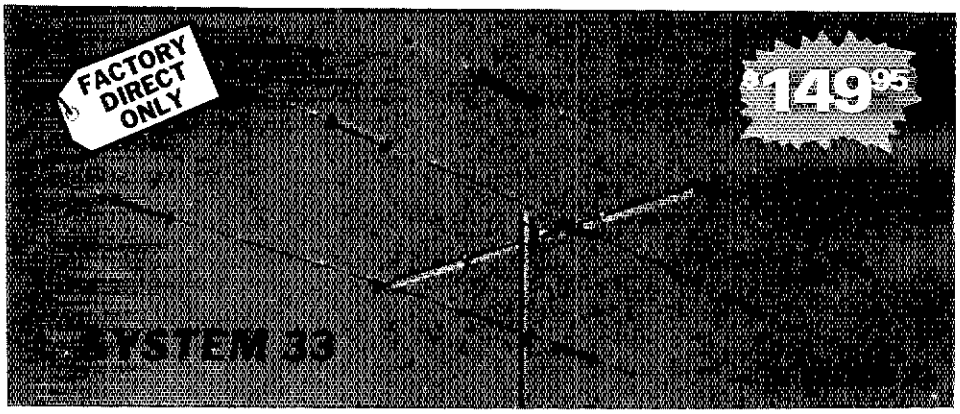
Band MHz 14-21-28	Boom (O.D. x Length) . . 2" x 24' 2½"	Wind Loading @ 80 mph . . 215 lbs.
Maximum power input . Legal Limit	No. of Elements. 6	Maximum wind survival . . . 100 mph
Gain (dBd). . . . . Call Factory	Longest Element . . . . . 28' 2½"	Feed method . . . . . Coaxial Balun
VSWR @ resonance. . . 1.3:1	Turning Radius . . . . . 18'6"	Matching Method. . . . . Beta
Impedance. . . . . 50 ohm	Maximum mast diameter . 2"	Assembled weight (approx) . 53 lbs.
F/B Ratio . . . . . Call Factory	Surface area . . . . . 8.6 sq. ft.	Shipping weight (approx) . . 62 lbs.

NEW! ADD 40 METERS TO YOUR TRI-BAND WITH THE NEW 33-6 MK

$49.95

— IN STOCK

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 200HKZ of bondwidth at less than 2:1 SWR. The new 33-6 MK will fit your present SY36 or SY33, and using the same single feed line.



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 excells with the "SYSTEM 33". New 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 loading at 80 mph . . . . 114 lbs.
Maximum power input . Legal Limit	No. of elements 3	Assembled weight (approx) . . 37 lbs.
Gain (dbd) . . . . . Call Factory	Longest element. . . . . 27'4"	Shipping weight (approx) . . . 42 lbs.
VSWR at resonance. . . 1.3:1	Turning radius. . . . . 15'9"	Direct 52 ohm feed — no balun required
Impedance . . . . . 50 ohms	Maximum mast diameter . 2" O.D.	Maximum wind survival . . . . 100 mph
F/B Ratio . . . . . Call Factory	Surface area . . . . . 5.7 sq. ft.	

WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

Prices and specifications subject to change without notice

ORDER FACTORY DIRECT
1-800-634-6898

$49.95

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.
(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

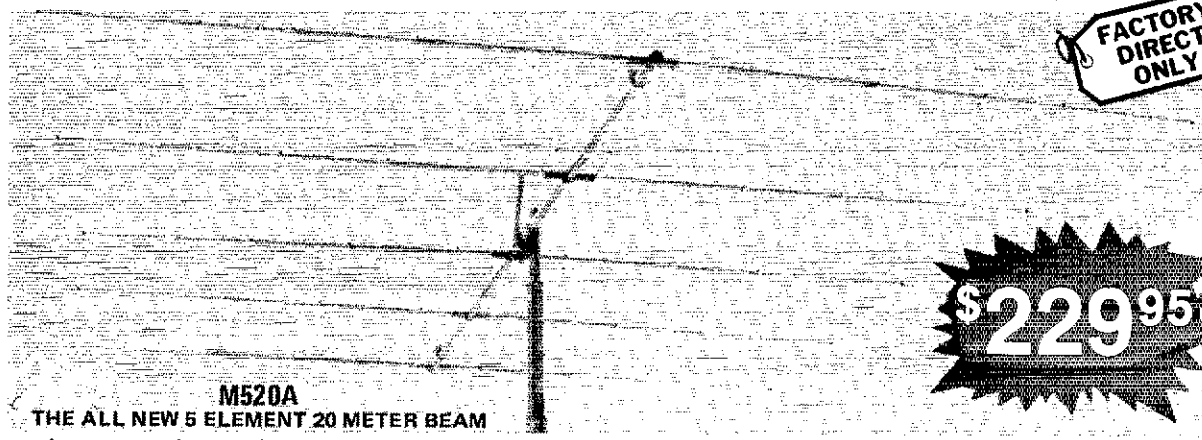
GR-1

$12.95

The GR-1 is the complete ground radial kit for the WV-1A. It consists of: 150' of 7/14 stranded copper wire and heavy duty egg insulators, instructions. The GR-1 will increase the efficiency of the GR-1 by providing the correct counterpoise.

WILSON MONO-BAND BEAMS

FACTORY DIRECT ONLY

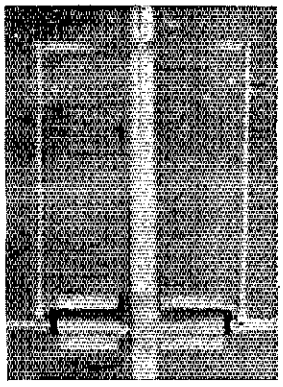


$229.95

M520A
THE ALL NEW 5 ELEMENT 20 METER BEAM

At last, the antennas that you have been waiting for are here! The top quality, optimum spaced, and newest designed monobanders. The Wilson System's new Monoband beams are the latest in modern design and incorporate the latest in design principles utilizing some of the strongest materials available. Through the select use of the current production of aluminum and the new boom-to-element plates, the Wilson Systems' antennas will stay up when others are falling down due to heavy ice loading or strong winds. Note the following features:

1. **Taper Swaged Elements** — The taper swaged elements provide strength where it counts and lowers the wind loading more efficiently than the conventional method of telescoping elements of different sizes.
2. **Mounting Plates — Element to Boom** — The new formed aluminum plates provide the strongest method of mounting the elements to the boom that is available in the entire market today. No longer will the elements tilt out of line if a bird should land on one end of the element.
3. **Mounting Plates — Boom to Mast** — Rugged 1/4" thick aluminum plates are used in combination with sturdy U-bolts and saddles for superior clamping power.
4. **Holes** — There are no holes drilled in the elements of the Wilson HF Monobanders. The careful attention given to the design has made it possible to eliminate this requirement as the use of holes adds an unnecessary weak point to the antenna boom.



Wilson's Beta match offers maximum power transfer.

With the Wilson Beta-match method, it is a "set it and forget it" process. You can now assemble the antenna on the ground, and using the guide-lines from the detailed instruction manual, adjust the tuning of the Beta-match so that it will remain set when raised to the top of the tower.

The Wilson Beta-match offers the ability to adjust the terminating impedance that is far superior to the other matching methods including the Gamma match and other Beta matches. As this method of matching requires a balanced line it will be necessary to use a 1:1 balun, or RF choke, for the most efficient use of the HF Monobanders.

The Wilson Monobanders are the perfect answer to the Ham who wants to stack antennas for maximum utilization of space and gain. They offer the most economical method to have more antenna for less money with better gain and maximum strength. Order yours today and see why the serious DXers are running up that impressive score in contests and number of countries worked.

SPECIFICATIONS

Model	Band Mtrs	Gain dBd	F/B Ratio	Bandwidth @ 2:1 VSWR Limits	VSWR @ Resonance	Impedance	Matching	Elements	Longest Element	Boom O.D.	Boom Length	Turning Radius	Surface Area (Sq Ft.)	Windload @ 80 mph (Lbs.)	Maximum Mast	Assembled Weight (Lbs.)
M520A	20			500 KHz	1.1:1	50 Ω	Beta	5	36'6"	2"	34'2¾"	25'1"	8.9	227	2"	68
M420A	20			500 KHz	1.1:1	50 Ω	Beta	4	36'6"	2"	26'0"	22'6"	7.6	189	2"	50
M515A	15	CALL		400 KHz	1.1:1	50 Ω	Beta	5	25'3"	2"	26'0"	17'6"	4.2	107	2"	41
M415A	15	FACTORY		400 KHz	1.1:1	50 Ω	Beta	4	24'2¾"	2"	17'0"	14'11"	3.1	64	2"	25
M510A	10			1.5 MHz	1.1:1	50 Ω	Beta	5	18'6"	2"	26'0"	16'0"	2.8	72	2"	36
M410A	10			1.5 MHz	1.1:1	50 Ω	Beta	4	18'3"	2"	12'11"	11'3"	1.4	36	2"	20

WILSON SYSTEMS, INC. — 4286 S. Polaris
Las Vegas, NV 89103 — (702) 739-7401

FACTORY DIRECT ORDER BLANK

Toll-Free Order Number
1-800-634-6898

WILSON SYSTEMS ANTENNAS

Qty	Model	Description	Shipping	Price
	SY40	10 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	274.95
	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	49.95
	WV-1A	Trap Vertical for 10, 15, 20, 40 Mtrs.	UPS	49.95
	GR-1	Ground Radials for WV-1A	UPS	12.95
	M-520A	5 Elements on 20 Mtrs.	TRUCK	229.95
	M-420A	4 Elements on 20 Mtrs.	UPS	159.95
	M-515A	5 Elements on 15 Mtrs.	UPS	129.95
	M-415A	4 Elements on 15 Mtrs.	UPS	84.95
	M-510A	5 Elements on 10 Mtrs.	UPS	84.95
	M-410A	4 Elements on 10 Mtrs.	UPS	69.95
		ACCESSORIES		
	TVX	Tail Twister Rotor	UPS	199.95
	HD-73	Alliance Heavy Duty Rotor	UPS	109.95
	RC-8C	8/C Rotor Cable	UPS	.12/ft.
	RG-8U	RG-8U Foam-Ultra Flexible Coaxial Cable, 38 strand center conductor, 11 guage	UPS	.21/ft.

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 — All Products FOB Las Vegas, Nevada

WILSON SYSTEMS TOWERS

Qty.	Model	Description	Shipping	Price
	TT-45B	Freestanding 45' Tubular Tower	TRUCK	314.95
	RB-45B	Rotating Base for TT-45B w/tilt over feature	TRUCK	219.95
	FB-45B	Fixed Base for TT-45 B w/tilt over feature	TRUCK	154.95
	MT-61B	Freestanding 61' Tubular Tower	TRUCK	549.95
	RB-61B	Rotating Base for MT-61B w/tilt over feature	TRUCK	299.95
	FB-61B	Fixed Base for MT-61B w/tilt over feature	TRUCK	214.95
	ST-77B	Freestanding 77' Tubular Tower	TRUCK	949.95
	RB-77B	Rotating Base for ST-77B w/tilt over feature	TRUCK	449.95
	FB-77B	Fixed Base for ST-77B w/tilt over feature	TRUCK	299.95
	GK-45B	Guying Kit for TT-45B	UPS	59.95
	GK-61B	Guying Kit for MT-61B	UPS	79.95
	GK-77B	Guying Kit for ST-77B	UPS	99.95
	WTB-1	Thrust Bearing for Top of Tower	UPS	49.95

Prices Effective April 1-30, 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 _____

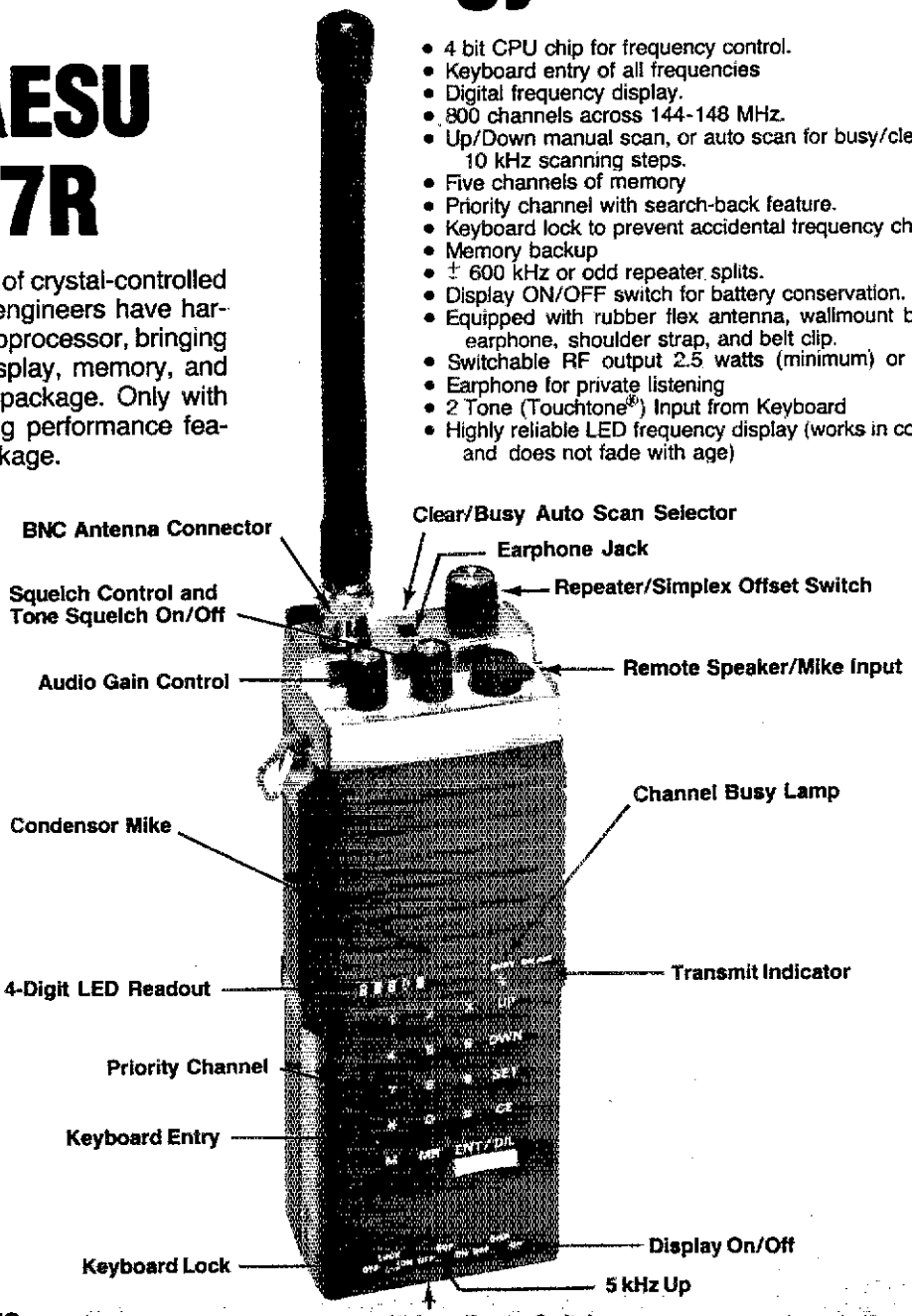
Prices and specifications subject to change without notice.

Tomorrow's Technology—Here Toda

THE YAESU FT-207R

The "horse-and-buggy" days of crystal-controlled handies are gone! Yaesu's engineers have harnessed the power of the microprocessor, bringing you 800 channels, digital display, memory, and scanning from a hand-held package. Only with Yaesu can you get these big performance features in such a compact package.

- 4 bit CPU chip for frequency control.
- Keyboard entry of all frequencies
- Digital frequency display.
- 800 channels across 144-148 MHz.
- Up/Down manual scan, or auto scan for busy/clear channel 10 kHz scanning steps.
- Five channels of memory
- Priority channel with search-back feature.
- Keyboard lock to prevent accidental frequency change.
- Memory backup
- ± 600 kHz or odd repeater splits.
- Display ON/OFF switch for battery conservation.
- Equipped with rubber flex antenna, wallmount battery cha earphone, shoulder strap, and belt clip.
- Switchable RF output 2.5 watts (minimum) or 200 mW
- Earphone for private listening
- 2 Tone (Touchtone®) Input from Keyboard
- Highly reliable LED frequency display (works in cold tempera and does not fade with age)



SPECIFICATIONS:

GENERAL

Frequency coverage: 144-148 MHz
Number of channels: 800
Emission type: F3
Batteries: NiCd battery pack
Voltage requirement: 10.8 VDC ± 10%, maximum
Current consumption:
Receive: 35 mA squelched (150 mA unsquelched with maximum audio)
Transmit: 800 mA (full power)
Case dimensions: 68 x 161 x 54 mm (HWD)
Weight (with batteries): 680 grams

RECEIVER

Circuit type: Double conversion superherterodyne
Intermediate frequencies.
1st IF = 10.7 MHz
2nd IF = 455 kHz
Sensitivity: 0.32 uV for 20 dB quieting
Selectivity: ± 7.5 kHz at 60 dB down
Audio Output: 200 mW at 10% THD

Price And Specifications Subject To Change Without Notice Or Obligation

TRANSMITTER

Power Output: 2.5 watts minimum /
Deviation: ± 5 kHz
Spurious radiation: -60 dB or bette
Microphone: Condenser type (2000 ohms)

OPTIONS

LC-C7 Leather Carrying Case
YM-24 Remote Speaker/Microphon
Tone Squelch Unit
NB-P9 Battery Pack
NC-2 Quick Charger

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67' CRK-UP EZ Way TWR-beam-rotor Best offer — estate — PA. Call 215-295-3276.

WANTED: 1937 U.S. Callbook W1GAY Box 637 Vineyard Haven, MA 02568.

TEMPO 2020 with Yaesu YD844 mike, $495. I pay shipping. KB4SS 10730 Parsons Rd., Duluth, GA 30136.

SWAN 250C 6 mtr & 117XC $325. Conar signal tracer $55. Swan 350D, $550. WA3IWW. Phone 1-215-385-3343.

FT101B, fan, cw-filter, spare finals Shure 444 mic, MFJ 16010-ST ant tuner. All mint, $535. + shipping WB2FIG Mike Berlin, POB 6182, Syracuse, NY 13217 315-474-7508.

TEST gear: H-P 778D dual directional coupler; H-P 10514A DBM; Simpson 260 adapters model 651, 653, 656, 657; CDE capacitance bridge model BN; Jackson 641 RF signal gen .1-120 MHz w/internal modulation; H-P 140 dB 50 ohm step attenuator; Non-Linear Systems model 5005 DC DVM; US Signal Corps BC-221B w/book; Heath AF-1 freq meter; Crescomm model 600 deLuxe freq. counter w/TCXO and 12VDC power cable, etc; all in excellent condx and working to specs. WB2WIK, 24 Louis Dr., Budd Lake, NJ 07828 201-691-8198.

SELL: DX-60, HR10B works good, $110 ppd, KA4EBW.

HOUSECLEANING, list large s.a.s.e. Heath Warrior amp, test gear, meters, etc. N1FB, 4 Roberts Rd., Enfield, CT 06082.

TOWER: 15'-100' telescoping, pneumatic, very husky aluminum, tilts, one man operation. $8000 new, good condition $1600. 509-878-1292.

SELL: ALDA 103A/cal/nb. Mint. $300. Tom Cann, 1620 Richmond, Joliet, IL 60435.

SELL 228 QST 1949 to 1975. Thirteen complete years. 30 CQ 1953 to 1970. Fourteen radio catalogs from 1960s. Send s.a.s.e for list. Make offer plus UPS. W9THK.

DRAKE/Yaesu-factory sealed cartons — TR7/DR7 $1199, PS7 $229, L-7 $989, RV7 $175, WH7 $85, FT901DM $1199, FT101ZD $769, FT101Z $629. Mint Heathkit SB104, matching power supply/speaker, latest factory installed mods $499. Texas Towers, 1309 Summit Ave., Suite 2, Plano, TX 75074 214-423-2376.

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FOR sale Ten-Tec Model 574 Century 21 Digital xcvr: 277 ant tuner/SWR bridge; 670 keyer; 276 xtal cal. Brand new condx. Sacrifice $400. firm. Certified check only. R.S. Crowell, 640 Stonehenge Dr. Mary Esther, FL 32569. 904-244-0307 after 4 PM CST.

WANTED: FV-101 VFO. Write, giving price and condition. KB7ID, 4460 Caminito Este, Tucson, AZ 85718.

SALE: QSTs $6 per year after 1930, plus shipping. Charles Williams 400 Broadway, Cincinnati, OH 45202. W8AXQ.

FOR SALE: Johnson 500. Harper Richards, W1IV, Argyle, NY zip 12809.

DRAKE TR-4, AC-4, MS-4, MN-2000, Shure 444. First $500 takes this complete station. WA6QWB, 2520 Biship Apt. L, Bakersfield CA 93306. 805-871-9577.

HENRY 3K-A commercial grade linear amplifier used less than ten hours, $1400., Dentron MT-2000-A tuner, four months old $140., Mini-Products HQ-1 Mini Quad, four months old $120. All in perfect condition. KA5GRK, Jeff Poll, 9206 Canter Drive, Dallas, TX, 75231 214-349-6432.

SELL: Yaesu FT-221R. Mint appearance. Better than new electrically with built-in Janel preamp. With operating and service manuals, original carton and packing. $400 firm. John Pelham, W1JA, 128 Dowd St., Newington, CT 06111. 203-667-1622.

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COLLINS 312B-5 station control/VFO/wattmeter/phone patch, very clean, excellent, $425. W5FR 713-488-0517.

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COLLINS: 32S-3 (WE) excellent condx $575; 516F-2 $110: 30L-1, excellent, new tubes, $550 (RE); CP-1 Xtl Packet 114 Xtls $175.; R-390-A works FB, $195 plus shipping; SWAN TB-2A tri-band beam (had little use) $85; Viking 6&2 (new tubes) $45; Heathkit SB-230 (mint - low hours) $375; GRI ASCII keyboard no. 756 with no. 702 enclosure and XITEX SCT-100 video terminal $195; MW associates 432/28 transverter (new) $175. W4ET 2101 Hobson Ct., Augusta GA 30906, 404-798-0787.

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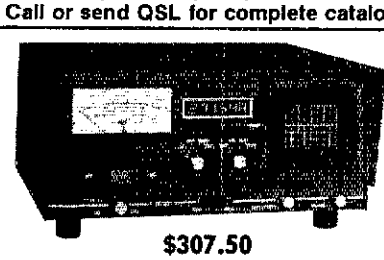

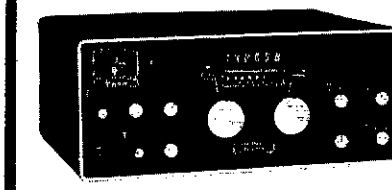

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HOSS Specials: New factory sealed carton, Robot 400, $600. Mirage 2 meter amplifier, Model B 108, $140. B,1016, $230. KLM 15-160BL, $209.99 PA4 160BL, $255. Yaesu FRG-7, $270. Ten-Tec 580, Regularly $849., special introductory price, $743.68. For similar savings, call me on Yaesu, Kenwood, Drake, or Icom amateur equipment. Ross Distributing Company, 78 South State, Preston, Idaho 83263 208-852-0830. Tuesday-Saturday 9:00 AM to 6:00 PM Monday closed at 2:00.

WANTED: FL-110 mobile amp or comparable unit. Will pay top dollar. WA2KIR 201-920-1978.

FOR SALE: Heath HW-2036 A, Microder II, mobile antenna, manuals, Used one month, $200. WB5WHP, Dave Stadtlander, 8610 Echo, El Paso, TX 79904.

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WANTED plate meter, Galaxy V MK II. Good price. Ray King, 9025 N. Division, Spokane, WA 99218.

SALE TR4C, with dx compressor and nb, AC4, DC4, MS4, MC4, RV4C, with manuals, $700., SB101, SB600, ac supply, $300., you pay shipping. W6SJR, 714-598-5244.

SELL: National NCX-3 xcvr, RIT, $140; rcvr HR-10 (needs work) $25; xmtr HT-40 $40; 2M fm HW-2021, $150; cw, audio filter, $18. KAØALZ, Hai Nguyen, 2295 San Marcos Dr., Colorado Springs, CO, 80910; 1-303-572-7162.

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WANTED: Yaesu antenna tuner FC-901 Paul Herson, KA5Y, 417 Ten Mile, Desoto, TX 75115.

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SALE: Heath HW-101, HP-23B absolutely mint, $300 FOB. Steve Hassenfritz, WBØSSX, RR 3, Mt. Pleasant, IA 52641. 319-696-3465.

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BARGAIN: MFJ Grandmaster memory keyer; Bencher iambic keyer with many parts for another Bencher keyer — including batteries, plugs and other accessory fittings. All in absolutely mint condition. $125. I will ship UPS. Philip Nordmark, N7BR, 520 Summitt Ave., East Apt., 405 Seattle, WA 98102.

NEEDED: h.v. transformer for H.P. 175A scope. Dick Ely P. O. Box E, Kingston RI 02881.

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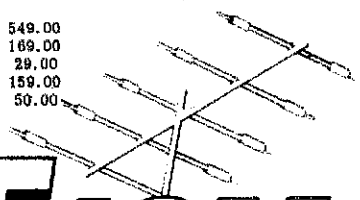

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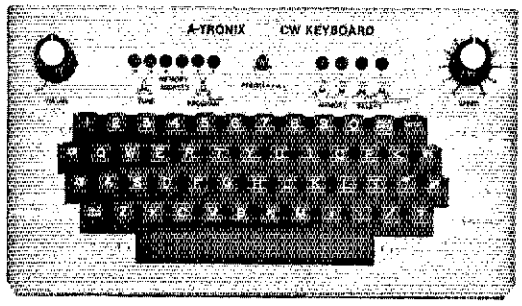

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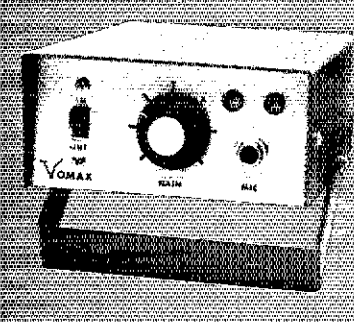

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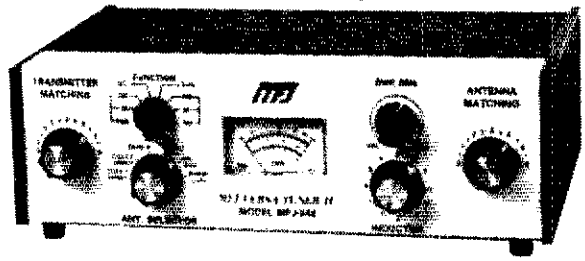

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Solid American Quality

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The MFJ-949 *Deluxe* Versa Tuner II gives you a combination of quality, performance, and features that others can't touch at this price . . . or any price.

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FEATURES: A 200 watt 50 ohm dummy load lets you tune up for maximum performance.

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Call 601-323-5869 for technical information, order/repair status. Also call 601-323-5869 outside continental USA and in Mississippi.

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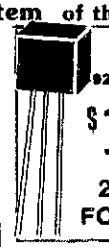
2 for $2
Cat. No. 92CU5787

Manufactured by Monsanto, this MCA7 type Optoisolator consists of a GaAsLITE emitting diode that generates infrared light and a silicon planar photo darlington. Because the on-axis radiation of the emitter, and the on-axis response of the detector are both perpendicular to the face of the device, the photo-darlington responds to the radiation emitted from the diode only when a reflective object or surface is in the field of view of the detector. SPECS: VF 1.26V (typ.) BVCEO 55V (typ.) Max. Forward DC current, input diode) 75mA. Rise/Fall time (output darlington), 0.6 mS. Includes data sheet. Size: .50" x .10" x .475".

"HALL EFFECT" MAGNETIC FIELD DIGITAL SENSORS



Cat. No. 92CU6117
$1.99
2 FOR $2

Unusual device in a 3 pin TO-92 package is used in position sensing and contactless switching, where the "Hall Effect" detects a magnetic field. Device consists of a silicon Hall generator, differential amplifier, trigger, dual open collector output stages and a voltage regulator. By placing a small PM magnet or any magnetic field over device (750 gauss maximum and 100 gauss minimum) will trigger to "ON" or operating point @ 20 gauss each. VCC operates from 5V to 16VDC. DUAL OUTPUTS, "ON" current 20 mils. Drives scrs, triacs, TTL and DTL compatible, drive line operated loads, etc. Similar to UGN3201M.

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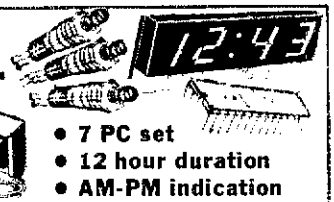

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Cat. No. 92CU6320

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- 12 hour duration
- AM-PM indication

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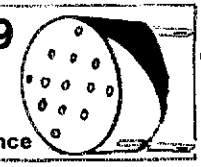

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2 FOR $1.50

Frequency Response: 100-30,000 Hz. (approx.) Solder tab terminals with polarity marked. Low impedance. (150 ohms). Cat. No. 92CU6335

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- Low Impedance

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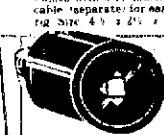

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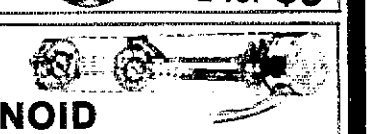

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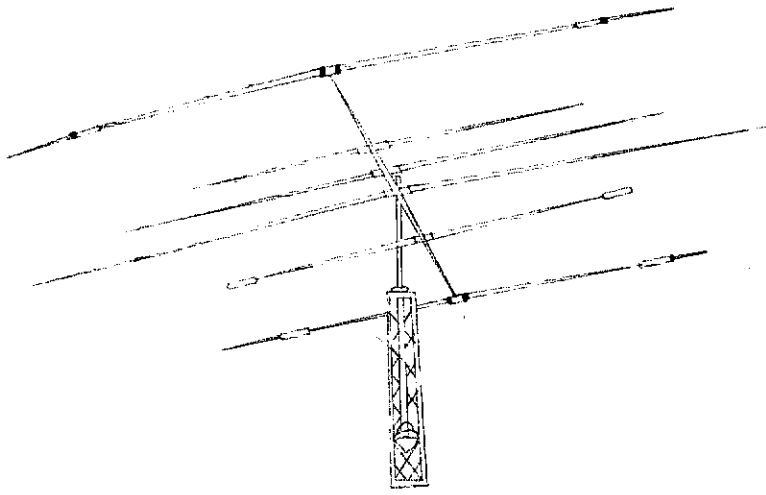

SPECIFICATIONS -	3F36DX	3F37DX
Band	14/21/28	14/21/28
Elements	6	7
Elements per band	20M 3	3
	15M 4	5
	10M 4	5
Antenna Gain dBd	call factory	-----
Front to Back ratio	call factory	-----
Maximum power	full legal	full legal
VSWR	Below 1.5:1	Below 1.5:1
Impedance	50 Ohm	50 Ohm
Max Element Length	34'5"	33'11"
Boom Length	16'5"	24'8"
Turning Radius	17'3"	17'5"
Wind Surface Area	9.58 sq. ft.	11.3 sq. ft.
Wind Load @ 80 mph	191 lbs.	226 lbs.
Mast Size	2"	2"
Weight	46.3 lbs.	55 lbs.
Shipping weight	52 lbs.	62 lbs.
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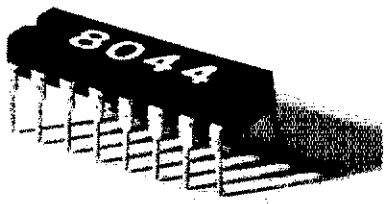

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P-5	C-5	5	P-354		35, 40
P-68	C-68	6, 7, 8			
P-91	C-91	9, 10, 11			
P-10	C-10	10			
4P-12	4C-12	12, 13, 14			
P-14	C-14	14			
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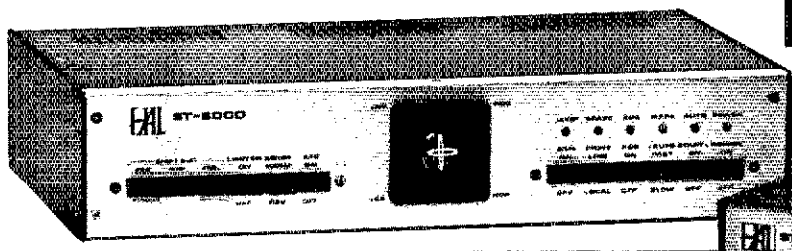

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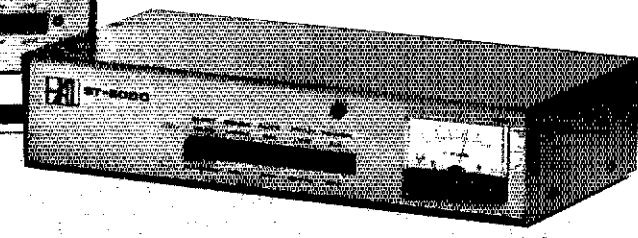

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FOR SALE: Microcraft, code reader, $125, or trade for frequency counter, KA9DJT, 1-414-353-5221.

SWAN Cygnet 270B with dc converter, $350. one year of use, six years in case in Reno. Going on air again with new reciprocal agreement. WA7GHQ, Paul Etxeberri, San Fermin 16-3, Pamplona, Spain.

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SELL: Collins 75S2, Hammarlund HQ-170, Seyffert, 1700 Church, Scotland Neck NC, 27874. 826-3409.

VACUUM tubes — 1000+ new, boxed for lot sale. Xmtr. Rcvr. free list. John Hughes — P. O. Box 8921 Albuquerque, N.M. 87198.

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WANTED: National NC-100 or NC-100X (general coverage with HRO-type dial) W7OD, Box 355, Kent, WA 98031.

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TEMPO fm/ssb two meter synthesized transceiver 10 watts $200 N7EW/6 209-292-7060.

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WANTED Hallicratter HA-10 in good condition, specify

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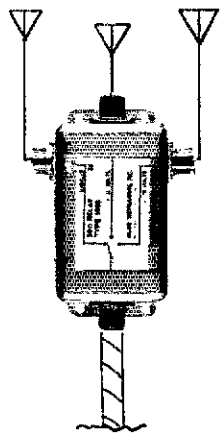

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Type 103	20 to 550 MHz	1000 W PEP	48.45
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Three position relays

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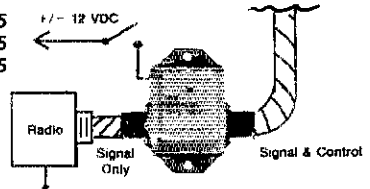

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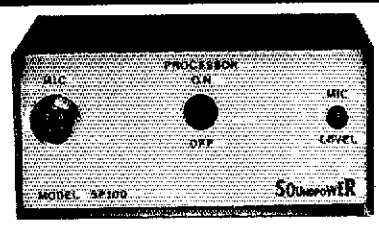

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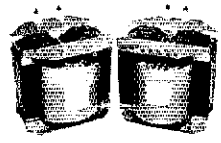

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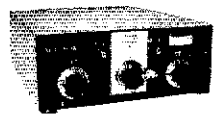
NEW FROM MURCH ELECTRONICS

MODEL UT-2000A
ULTIMATE TRANSMATCH

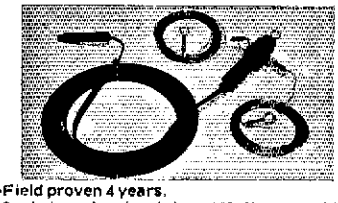
Similar to the one in Lew McCoy's article July 1970 QST
- Use with any coax or end fed random wire antenna, ideal for apartment dwellers.
- 80-10 continuous, including MARS.
- Rotary inductor with turns counter for precise and rapid tuning.
- Full legal power, 4,000 volt capacitors.
- Use with any SWR/wattmeter.
- 12"W x 12"D x 5½"H, 12 lbs. shipping wt. $139.95 +shipping.

NEW — MODEL UT-2000B



- Continuous coverage 160-10 meters.
- Rotary inductor with turns counter.
- Three core balun, 4,000 volt capacitors, full legal power.
- Built-in line sampler for precise tuning.
- No external meter required.
- Use with any antenna.
- Function switch — in, out, dummy load (not supplied), ground.
- 12"W x 15½"D x 5"H, 13 lbs. shipping wt. $218.50 +shipping.

MODEL 68A
MULTIBAND ANTENNA 10-80M



- Field proven 4 years.
- Sealed center insulator, 102 ft. wire, 30 feet heavy duty twin lead.
- Coax fitting to connect twin lead to 52 ohm transmission line (68 feet or more, not included)
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- 2000w P.E.P.
$44.50p.p.

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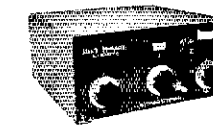

- With all the features of the popular UT-2000A.
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- No external meter required.
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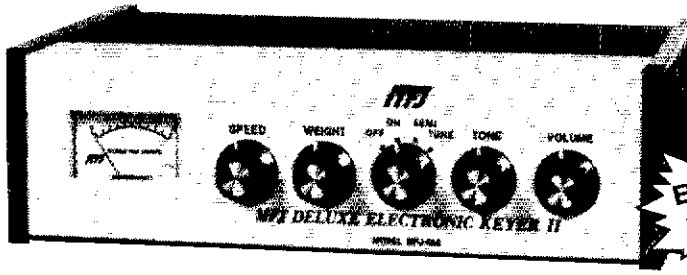

BRAND NEW

Speed Readout Meter lets you read to 50 WPM.
Socket for Curtis memory, random code generator, keyboard.

$79.95

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Iambic operation with squeeze key. Dot-dash insertion. **Semi-automatic "bug" operation** provides automatic dots and manual dashes.

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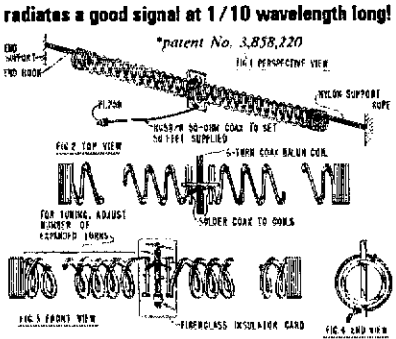

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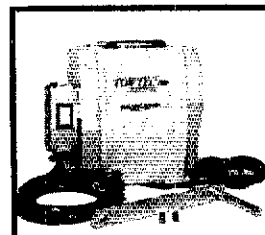

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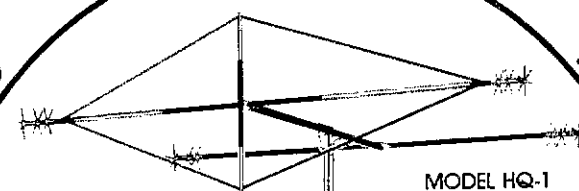

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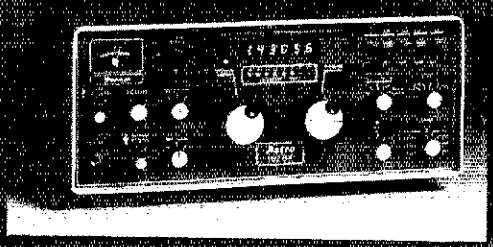

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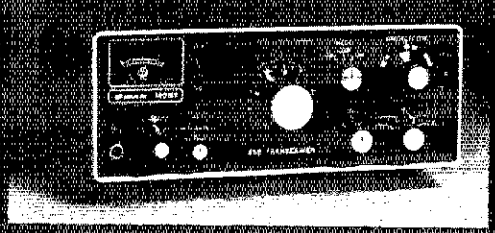

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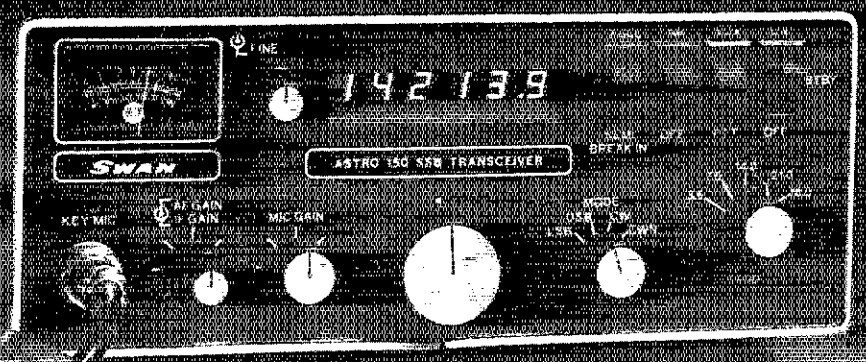

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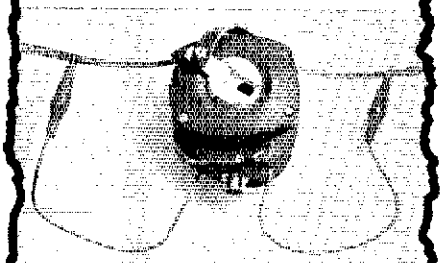

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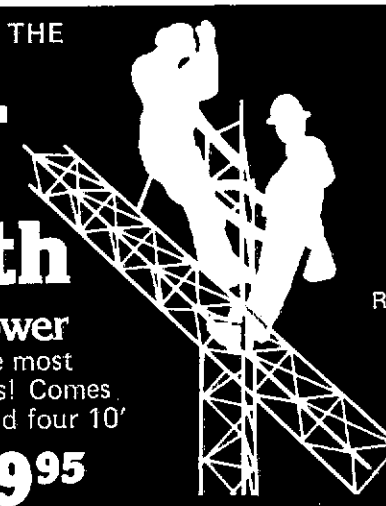

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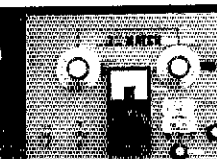

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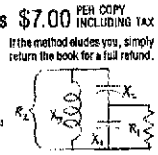

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432 YAGIS by RIW — "Two RIW 432-19's break 70 cm terrestial record, July 18, 1979 — KH6HME, Hawaii to WB6NMT, San Diego." Send for info on the highest-gain 432 MHz Yagi available. RIW Products, Box 191, Babylon, NY 11702.

DRAKE R4C and MS4. Exceptional condition $395. Pemberton, Rt. 10 Box 578, Fort Myers, FL 33908. 813-481-5273.

APRIL specials: Azden PCS-2000 $315. Icom IC-255A $330. IC-260A $440. Yaesu FT-107M $920. FT-101ZD $750. FT-207R $360. FT-127RA $400. Kenwood TS-520SE $570. TS-180/DFC $1025. TenTec Argonaut $350. SST, Ltd. 201-334-1723.

SALE: Drake R4B rcvr and T4XB xmttr with ac supply and spkr $500. HQ129 $50. N2AO 315-673-1981 evenings.

YAESU FT-301D, ps, VFO, excellent condition, $700; Icom IC-22A, 2m, 10w, $140, WA4OEJ, 205-881-5327.

SELLING SB102/104A transceivers. Wanting receiver similar SSR1. Joe, 919-223-5959.

COLLINS: 312B4, $195; 312B5, $475; 30L1, $595; 32S1, $325; 516F2, $150; SM-1 mic, $35; 75S1, $295; DD1C digital $150. Schaaf, Box 301, DePere, WI 54115 1-414-532-6643.

CENTURY 21, Model 570, $220 postpaid. Bill Latta, N4LH 7309 Greenlawn Rd., Louisville KY 40222.

S-BAND Motorola Wideband Space Craft test rack 2rks, 1-TX, 1-xlator etc. with manuals. Send $1 & s.a.s.e. for data sheets from six manuals. Also selling DEC-(digital) tape unit TU-56 and HT-200 on 16/76. WA3CRM, 2317 Parrish St., Phila. PA 19130, 215-232-6618.

WANTED for parts: Collins 310B-3 exciter or antenna tuner from same. WB8YUW, 232 Amazon, Columbus, OH 43214.

SELL Collins 51J-4, $450. Hallicrafters SX-71 with 100-kHz calibrator, $110. Hallicrafters S-22 Skyrider Marine, $75. Heath GR-110 with eight 2m crystals, $80. Gertsch FM-3, $100 or best offer. Aerotron marine 40 watt, 12 channel base with 52/52, 49/49 and 28/88, $100 or best offer. WA8EPM, 365 Kensington Road, Rocky River, OH 44116. 216-333-0076 after 6PM.

Jobs for Hams

SUMMER camp counselor, General or better, to teach Novice program and DXing to boys at private New Hampshire Summer camp. Top equipment, triple beam tower, established program, am station too. Approx. June 22-Aug. 23d. Winter offices: Camp Cody, 5 Lockwood Circle, Westport, CT 06880, Dr. Stolz, 203-226-4389.

CAMP Counselor — over 19, General or Extra Class license. Summer camp for boys in Maine. Excellent salary & benefits. Allowance to bring own rig. Write: Director, P. O. Box 178, Carle Place, NY 11514.

COUNSELOR — Maine boys camp, Ham Radio Electronics code, General license — May bring own equipment. June 20th Aug. 18th. Write: R. Krasker, 95 Woodchester Drive, Chestnut Hill, MA 02167.

WANTED: Ham radio specialist for outstanding summer camp. Excellent salary, teach campers ham. Contact New Jersey Y Camps, 21 Plymouth Street, Fairfield, NJ 07006, 201-575-3333.

COUNSELOR: Operator with general license to teach ham radio at Pennsylvania co-ed camp. Have completely equipped ham station. Write Trail's End Camp, 215 Adams Street, Brooklyn, NY 11201.

BROADCAST Engineer to maintain full-time AM-FM station. Good pay and benefits. Send resume to KBUR/KGRS, Box 70, Burlington, IA 52601.

COUNSELORS: Ham Radio, Camp Wayne children's camp, NE PA. At least 18-1/2 +. 12 Allevard St., Lido Beach NY 11561 (include tel #) 516-889-3217.

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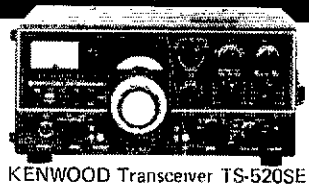

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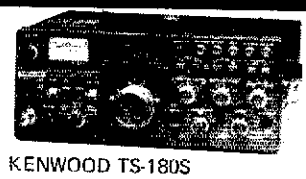

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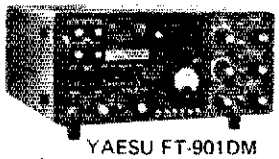

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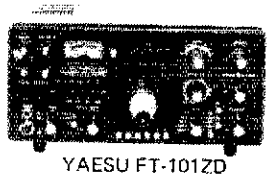

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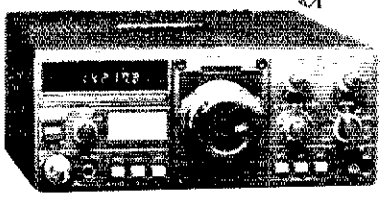

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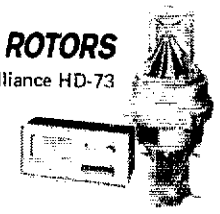

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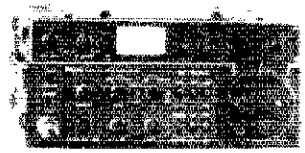

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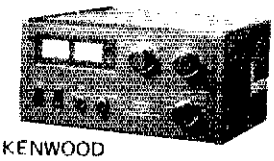

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2-Meter Hand-held Transceiver with 10 memories plus many more features.
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This NEW MFJ Versa Tuner II . . .

has SWR and dual range wattmeter, antenna switch, efficient airwound inductor, built in balun. Up to 300 watts RF output. Matches everything from 1.8 thru 30 MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.

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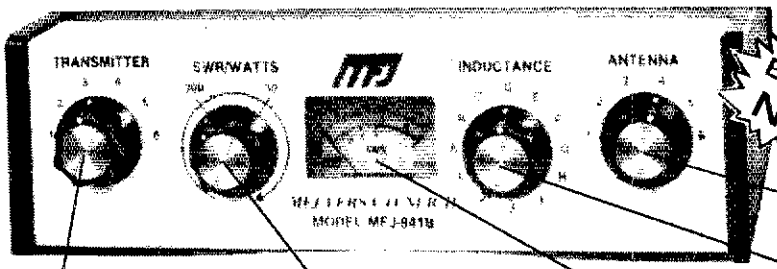

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Transmitter matching capacitor. 208 pf. 1000 volt spacing.

Sets power range, 300 and 30 watts. Pull for SWR.

Meter reads SWR and RF watts in 2 ranges.

Efficient airwound inductor gives more watts out and less losses.

Antenna matching capacitor. 208 pf. 1000 volt spacing.

Only MFJ gives you this MFJ-941B Versa Tuner II with all these features at this price:

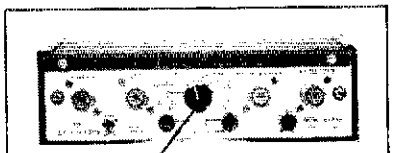
A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

An antenna switch lets you select 2 coax lines direct or thru tuner, random wire/balanced line, and tuner bypass for dummy load.

A new efficient airwound inductor (12 positions) gives you less losses than a tapped toroid for more watts out.

A 1:4 balun for balanced lines. 1000 volt capacitor spacing. Mounting brackets for mobile installations (not shown).

With the NEW MFJ Versa Tuner II you can run your full transceiver power output — up to 300 watts RF power output — and match your



ANTENNA SWITCH lets you select 2 coax lines direct or thru tuner, wire/balanced line, dummy load.

transmitter to **any** feedline from 160 thru 10 Meters whether you have coax cable, balanced line, or random wire.

You can tune out the SWR on your dipole, inverted vee, random wire, vertical, mobile whip, beam, quad, or whatever you have.

You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

Increase the usable bandwidth of your mobile whip by tuning out the SWR **from inside your car.** Works great with all solid state rigs (like the Atlas) and with all tube type rigs.

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SO-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balanced line inputs (2), random wire input (1), and ground (1).

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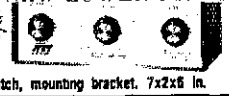

Same as MFJ-941B, less SWR/Wattmeter, antenna switch, mounting bracket. 7x2x6 in.

ULTRA COMPACT 200 WATT VERSA TUNERS FOR ALL YOUR NEEDS.

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The FT-107 Series with "DMS"*
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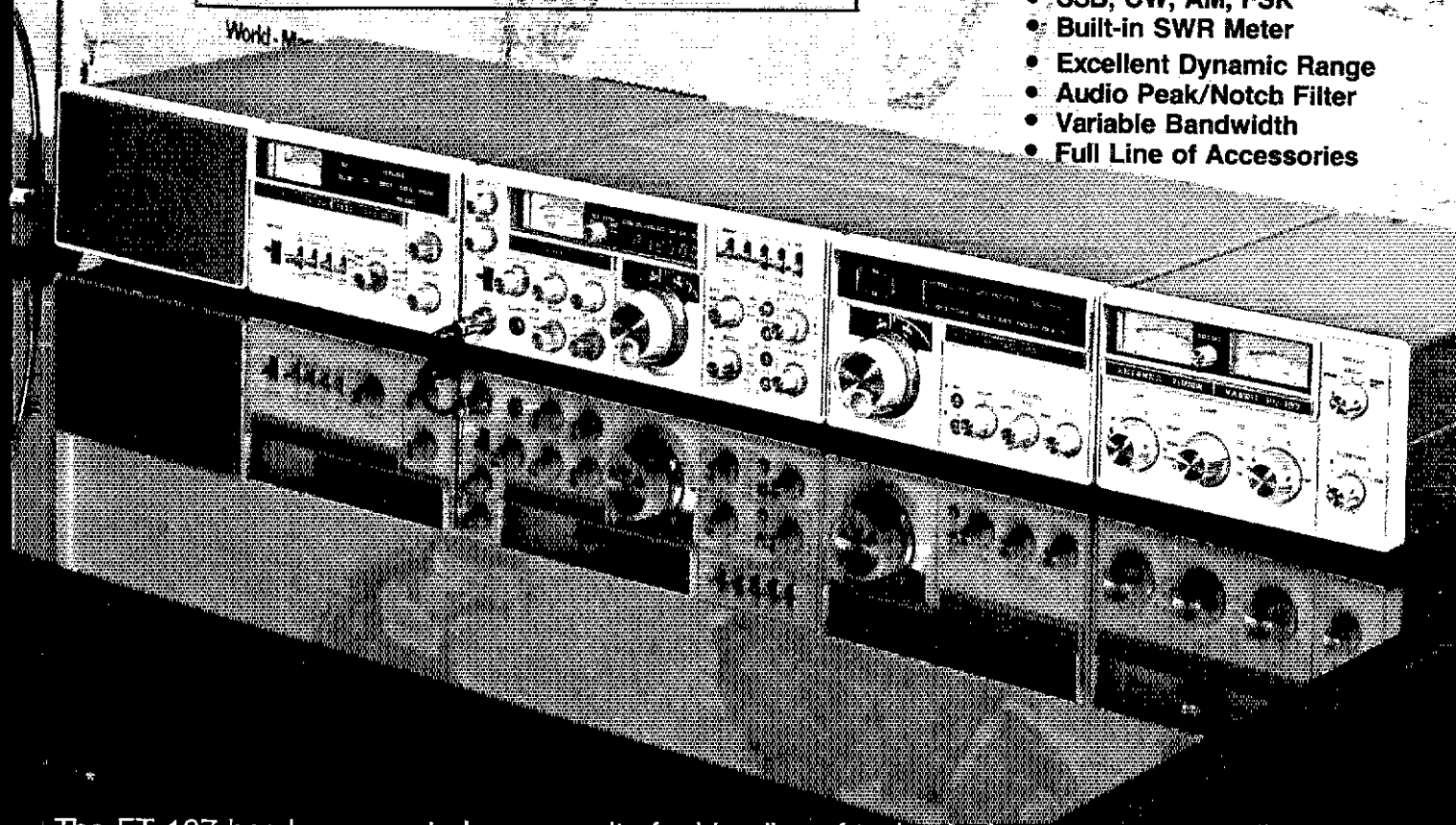
12 discrete memories. Stores individual frequencies or use as 12 full coverage VFOs (500 kHz each)



The FT-107 has been created as a result of a blending of technologies — computer, solid state and RF design. By careful utilization of these disciplines and the experience gained from our FT-301 series, YAESU has achieved an HF transceiver which offers unique features (e. g. "Digital Memory Shift"), efficient operation and a level of performance that has been previously unattainable.

FT-107 TRANSCEIVER SPECIFICATIONS

(Receiver Section)

Sensitivity: 0.25 uV for 10dB S/N, CW/SSB, FSK
1.0 uV for 10dB S/N, AM
Image Rejection: 60dB except 10 meters (50dB)
IF Rejection: 70dB
Selectivity: SSB 2.4 kHz at −6dB, 4.0 kHz at −60dB.
CW 0.6 kHz at −6dB, 1.2 kHz at −60dB.
AM 6 kHz at −6dB, 12 kHz at −60dB
Variable IF Bandwidth
20dB RF Attenuator
Peak/Notch Audio Filter
Audio Output: 3 watts (4-16 ohms)
Accessories: FV-107 VFO (standard not synthesized)
FTV-107 VHF (UHF Transverter)
FC-107 Antenna Tuner
SP-107 Matching Speaker
FP-107 AC Power Supply

(Transmitter Section)

Power Input: 240 watts DC SSB/CW
80 watts DC AM/FSK
Opposite Sideband Suppression: Better than 50dB
Spurious Radiation: −50dB.
Transmitter Bandwidth 350-2700 hz (−6dB)
Transmitter: 3rd IMD −31dB neg feedback 6dB
Transmitter Stability: 30 hz after 10 min. warmup
less than 100 hz after 30 min.
Antenna Input Impedance: 50 ohms
Microphone Impedance: 500 ohms
Power Required: 13.5V DC at 20 amps
100/110/117/200/220/234V AC at 650 VA

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1179R

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KENWOOD'S TR-2400

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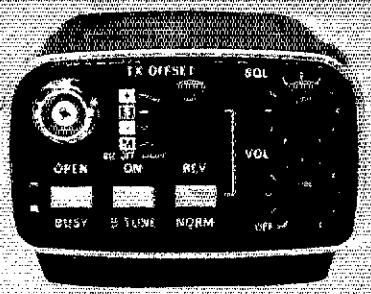
Kenwood TR-2400...it's a synthesized 2 meter hand-held transceiver...the answer to any Amateur's operating requirements! Its many advanced features include:



CONVENIENT TOP CONTROLS

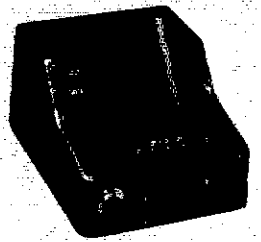
- **LCD digital readout**
- Readable in direct sunlight (better than LEDs)
- Readable in the dark (with lamp switch)
- Virtually no current drain (much less than LEDs) and display stays on
- Shows receive and transmit frequencies and memory channel
- **10 Memories** (always retained with battery backup)
- **Automatic memory scanning** (for "busy" or "open" channels)
- **Mode switch for the following operations:**
- Simplex
- Standard repeater by offsetting the transmit frequency + 600 kHz or − 600 kHz
- Repeater with nonstandard splits by offsetting the transmit frequency to any frequency stored in memory 10
- **REVERSE** momentary switch for the following applications:
- Checking signals on the input of a repeater
- Determining if a repeater is "upside down"
- **Built-in Touch-Tone generator** using 16-button keyboard
- **Keyboard selection** of 5-kHz channels from 144.000 to 147.995 MHz
- **UP/DOWN manual scanning** and operation from 143.900 to 148.495 MHz in single or fast continuous 5-kHz steps. Even operates on MARS repeaters within this range by using memory 10 for transmit offset frequency.
- **LCD "arrow" indicators**
- "ON AIR"
- Memory recall
- Battery status
- Lamp switch on
- **Two lock switches** to prevent accidental frequency change and accidental transmission
- **Subtone switch** (subtone module not Kenwood-supplied)
- **BNC antenna connector**
- **1.5 watts RF output**

The TR-2400 comes with the following standard accessories:

- Flexible rubberized antenna with BNC connector
- Nicad battery pack
- Battery charger

Optional accessories include:

- Leather case
- Base Stand (for quick charge and easy base-station operation)
- DC (automobile) quick charger



ST-1 BASE STAND (OPTIONAL)

SEE YOUR AUTHORIZED KENWOOD DEALER FOR MORE INFORMATION ON THE TR-2400.

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