QST

December 1981 $2.50

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the first in synthesize portables gives you the broadest choice at the lowest price

...the new S-5

* The only synthesized hand-held offering 5 wa output. (Switchable for 1 or 5 watt operation)
* The same dependability as the time proven S Circuitry that has been proven in more than a million hours of operation.
* Heavy duty battery pack.
* External microphone
* The S-5's exciting
* With touch to

CHECK WITH US OR YOUR TEMPO DEALER

SPECIFICATIONS

Frequency Coverage:	144 to
Channel Spacing:	Receive & transmit Simp ± 600 kHz
Requirements:	9.6 VDC
Drain.	17 ma-standby 900 ma-transmit
Impedance.	50 ohms
	40 mm x 62 mmx 170 mm (1.6" x 2.5" x 6.7")
	17 oz.

...antenna, ni-cad batter... charger.

OPTIONAL ACCESSORIES

12 Button touch tone pad (not installed) $39 • 16 Button touch tone pad (not installed): $48 • Tone burst generator: $29.95 • CTCSS sub-audible tone contr $29.95 • Rubber flex antenna: $8 • Lea holster: $16 • Cigarette lighter plug m charging unit: $6 • Matching 30 watt output 13.8 VCD power amplifier (S30): $89 • Matching 80 watt output power amplifier (S80): $149

TEMPO'S CHRISTMAS SPECIAL ...Factory reduced prices on the S-5, S-4 and S-2

Tempo S-2

...po is first again. This time with a superior quality synthesized 220 MHz ... transceiver. With an S-2 in your car or pocket you can use 220 MHz repea... throughout the U.S. It offers all the advanced engineering, premium qu... components and exciting features of the S-1. The S-2 offers 1000 channels ... extremely lightweight but rugged case.

If you're not on 220 this is the perfect way to get started. With the addition of t... 25 (25W output) or S-75 (75W output) Tempo solid state amplifier it becom... powerful mobile or base station. If you have a 220 MHz rig, the S-2 will ... tremendous versatility. Its low price includes an external microphone capab... heavy duty ni-cad battery pack, charger, and telescopic whip antenna.

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2W	80W	80A02	$169
10W	80W	80A10	$149
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2W	30W	30A02	$ 89

UHF (400 to 512 MHz) models, lower power and FCC type accepted models also available.

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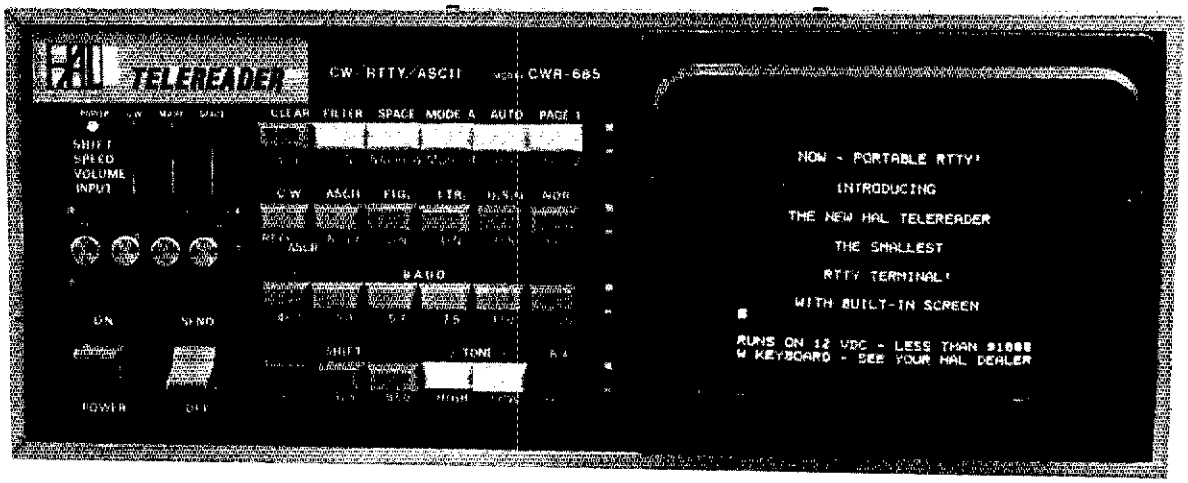

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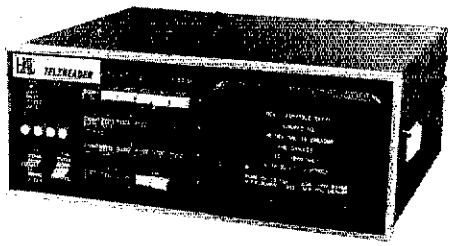
- **Built-in 5" Green CRT**
- **Four-page Display**
- **Compact Size (12¾W x 5H x 11½"D)**
- **With External Keyboard**
- **Runs on 12 VDC**



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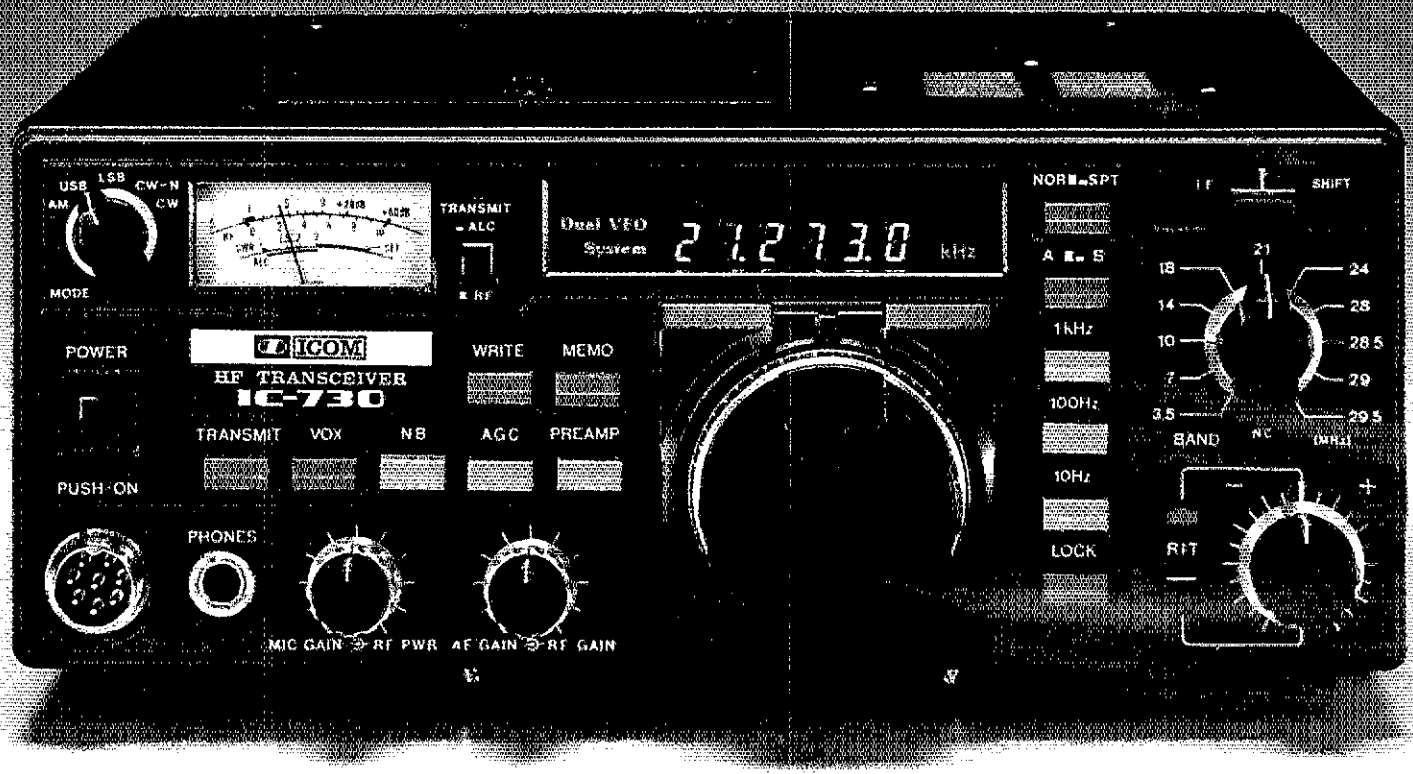
ICOM IC-730

ICOM's Go-Anywhere HF Rig for Everyone's Pocketbook



Compact.

Only 3.7 in (H) x 9.5 in (W) x 10.8 in (D) will fit into most mobile operations (compact car, airplane, boat, or suitcase)

Affordable.

Priced right to meet your budget as your main HF rig or as a second rig for mobile/portable operation.

Convenient.

- Unique tuning speed selection for quick and precise QSY, choice of 1 KHz, 100 Hz or 10 Hz tuning.
- Electronic dial lock, deactivates tuning knob for lock on, stay on frequency operation.
- One memory per band, for storage of your favorite frequency on each band.
- Dual VFO system built in standard at no extra cost.

Full Featured.

- 200W PEP input—powerful punch on SSB/CW (40 W o on AM)
- Receiver preamp built-in • VOX built-in
- Noise blanker (selectable time constant) standard
- Large RIT knob for easy mobile operation
- Amateur band coverage 10-80M including the new WARC bands
- Speech processor—built-in, standard (no extra cost)
- IF shift slide tuning standard (pass band tuning optional)
- Fully solid state for lower current drain
- Automatic protection circuit for finals under high SWR conditions
- Digital readout • Receives WWV • Selectable AGC
- Up/down tuning from optional microphone
- Handheld microphone standard (no extra cost)
- Optional mobile mount available

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December 1981 *Volume LXV Number 12*

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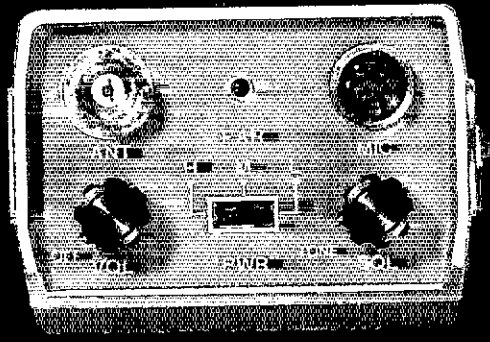
THE COVER

A crisp winter's day at OH6NU/OH6NM, Jyvaskayla, Finland. Wherever you may be, why not prepare to join in the host of operating activities described on pages 93, 94, 101 and 102.

Contents

ST-144/μP, 2 Meter FM



It's Time!

■ It's time you got your share of the excitement of full-feature synthesized handheld operations. ■ SANTEC(nology zaps to the lead of the state-of-the-art in 2 meter handhelds with the new ST-144 μP. ■ Only SANTEC hands you all the up-to-the-minute features of this "clockwise" precision jewel.

■ The 24 hour format digital clock on the LCD display is uniquely SANTEC, and it typifies the thoughtful operator-oriented design incorporated throughout the ST-144 μP. ■ Not only does it give you accurate time checks whenever you want, but also it can display the time instead of the frequency, while this handful of radio continues to operate on your "favorite" frequency.

24 Hr Clock provides time of day even while the radio is turned off, or it can be selected by the front panel switch while in QSO

Full Frequency Display showing offset selected, battery condition and current scan mode. At turnon, the contents of M-1 are loaded into the operating register and the display looks like this.

The Memory Mode is indicated by the small "M" above " + " the "5" indicates that the data were stored in Memory 5 before recall. The " + " indicates that the + offset was stored with the frequency.

Memory Scan with "Priority Scan Auto-Resume" has stopped on Memory 9 to listen for a few seconds.

Transmit is indicated on a minus 600 kHz offset from 146.820 MHz which was stored in M-6. Activity on Memory 6 was found by using the "Search" mode of Scan

■ The 10 frequencies that you put into the memories are stored with your repeater offsets, and you can have them scanned, searched or instantly recalled at the touch of a button. ■ Memory 1 even gets priority treatment in the memory scan mode. ■ That's timely complexity made amazingly simple: and the high power option of 3.5W (nominal) is simply the greatest reach you've ever held in your hand.

■ "Battery saver" function by the computer to hoard battery power when the frequency is quiet ■ Programmed limits for both ends of bandscan ■ Simplified frequency entry only by keyboard ■ Full capacity, low impedance audio output to drive an external speaker ■ Wide band span for MARS, CAP, AF MARS: 142.00-149.995 MHz ■ Quick-change 500mAh battery ■ Separate level controls for MIC, TT, PL and DEV ■ & so much more that we don't have space to mention ■ SANTEC hands it all over, while others can't even give you the time of day.

All stated specifications are subject to change without notice or obligation.

Accessories for SANTEC Handheld Radios
clockwise from upper left
- Leather Case (ST-LC)
- Base Charger & Power Supply (ST-5BC)
- Remote Speaker (MS-50S)
- Mobile Charger (ST-MC)
- Speaker Microphone (SM-1)

Sale of the ST-144 μP is subject to FCC certification, approval and availability expected January, 1982.

SANTEC

2000 Avenue G, Suite 800, Plano, Texas 75074
Phone (214) 423-0024 • INTL TLX 203920 ENCOM UR

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YOU MAY SEND A DUPLICATE OF THIS FORM.

More for 440

■ Now more convenience, more functions, and more value for your investment. ■ The ST-440 μP microprocessor UHF-FM is the radio whose time has come. ■ Only SANTECnology can hand you all the up-to-the-minute UHF pleasures you want in a handheld.

■ The 24 hour format digital clock on the LCD display is uniquely SANTEC, and it typifies the thoughtful operator-oriented design incorporated throughout the ST-440 μP. ■ Not only does it give you accurate time checks whenever you want, but also it can display the time instead of the frequency, while this handful of radio continues to operate on your "favorite" frequency.

24 Hr Clock provides time of day even while the radio is turned off, or it can be selected by the front panel switch while in QSO.

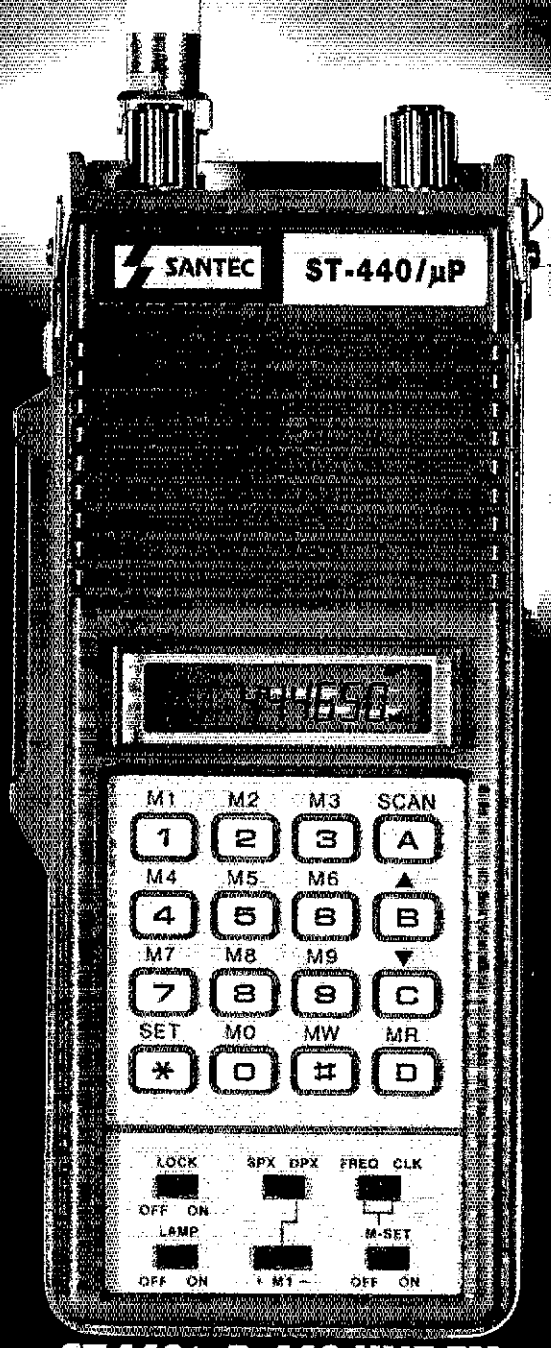
Full Frequency Display showing offset selected, battery condition and current scan mode. At turnon, the contents of M-1 are loaded into the operating register and the display looks like this.

The Memory Mode is indicated by the small "M" above "+". The "7" indicates that the data were stored in Memory 7 before recall. The "+" indicates that the + offset was stored with the frequency.

Memory Scan with "Priority Scan Auto-Resume" has stopped on memory 3 to listen for a few seconds.

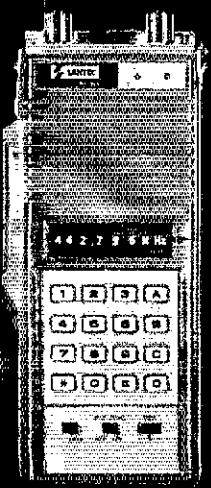
Transmit is indicated on a minus 5 MHz offset from 449.175 MHz which was stored in M-8. Activity on Memory 8 was found by using the "Search" mode of scan.

■ The 10 frequencies that you put into the memories are stored with your repeater offsets, and you can have them scanned, searched or instantly recalled at the touch of a button. ■ Memory 1 even gets priority treatment in the memory scan mode. ■ That's timely complexity made amazingly simple: and the high power option of 3W (nominal) is simply the greatest reach you can hold in your hand.



ST-440/μP, 440 UHF-FM

■ "Battery saver" function by the computer to hoard battery power when the frequency is quiet ■ Programmed limits for both ends of bandscan ■ Simplified frequency entry only by keyboard ■ Full capacity, low impedance audio output to drive an external speaker ■ Quick-change 500mAh battery ■ Separate level controls for MIC, TT, PL and DEV ■ & so much more that we don't have space to mention ■ SANTEC hands it all over, while others can't even give you the time of day.



All stated specifications are subject to change without notice or obligation

ST-7/T, 440 UHF-FM

■ Synthesized and simplified, with touch tones and subtones. ■ Three power options of up to a big 3W (nominal). ■ The front panel thumb wheel controlled ST-7/T is simply a lot of little radio, whose big power output doesn't require a big cash outlay. ■ Grab the most economical of the 440 synthesized handhelds.

Sale of the ST-440 μP is subject to FCC certification, approval and availability expected January, 1982.
The ST-7/T is approved under FCC Part 15

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YOU MAY SEND A DUPLICATE OF THIS FORM.

Top-Notch.

VBT, notch, IF shift, wide dynamic range

TS-830S

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

TS-830S FEATURES:

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

More information on the TS-830S is available from all authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, California 90220.

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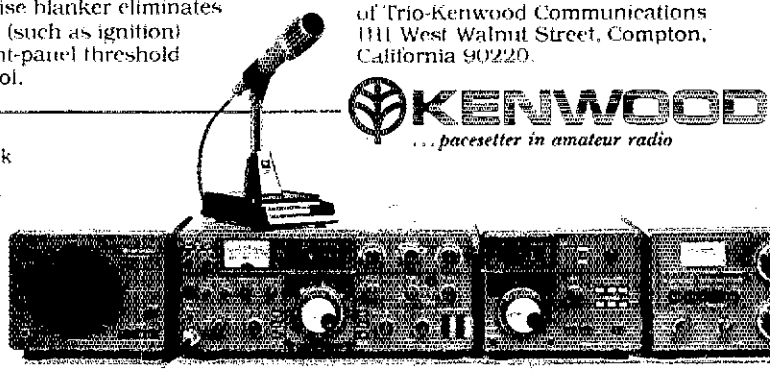
Matching accessories for fixed-station operation:

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

Other accessories not shown:

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



Specifications and prices are subject to change without notice or obligatio

Power up.

40 W, 15 memories/offset recall, scan, priority, DTMF touch-pad

TR-7850

Kenwood's remarkable TR-7850 2-meter FM mobile transceiver provides all the features you could desire, including a powerful 40 watts RF output. 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 touch-pad (DTMF) encoder. A 25-watt output version, the TR-7800, is also available.

TR-7850 FEATURES:

- **Powerful 40 watts power output**
  Selectable high or low power operation. High 40-watt output provides reliable signal for wide area coverage.
- **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-7850. Batteries are automatically charged while transceiver is connected to 12-VDC source.
- **Extended frequency coverage**
  143.900-148.995 MHz, in switchable 5-kHz or 10-kHz steps.
- **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.
- **Built-in autopatch touch-pad (DTMF) encoder**
  Front-panel touch pad generates all 12 telephone-compatible dual tones in transmit mode, plus four additional DTMF signaling tones (with simultaneous push of REV switch).
- **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.
- **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 Kenwood-supplied).
- **Compact size**
  Depth is reduced substantially.
- **Mobile mounting bracket**
  With quick-release levers.

More information on the TR-7850 is available from all authorized dealers of Trio-Kenwood Communications 1111 West Walnut Street, Compton, California 90220.

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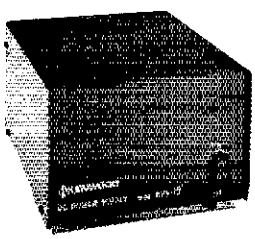
...pacesetter in amateur radio

Matching accessory for fixed-station operation:
- KPS-12 fixed-station power supply for TR-7850

Other accessories not shown:
- KPS-7 fixed-station power supply for TR-7800
- SP-40 compact mobile speaker



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Manitoba — Peter Guenther, VE4PG, Box 178, Morris R0G 1K0 (204-746-2218)
Maritime-Nfld — Donald R. Welling, VE1WF, 36 Sherwood Dr., St. John, NB E2J 3H6 (506-696-2913)
Ontario — L. P. Thivierge, VE3GT, 34 Bruce St. W., Renfrew K7V 3W1 (613-432-5967)
Quebec — Harold Moreau, VE2BP, 80 Principale, St. Simon Co., Bagot J∅H 1Y∅ (514-798-2173)
Saskatchewan — W. C. "Bill" Munday, VE5WM, 132 Shannon Rd., Regina S4S 5B1 (306-586-4963)

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Maryland-D.C. — Karl R. Medrow, W3FA, 718 W. Central Ave., Davidsonville, MD 21035 (301-261-4008)
Southern New Jersey — William C. Luebkemann, Jr., WB2LCC, 116 Country Farms Rd., Marlton 08053 (609-983-8844)
Western New York — William Thompson, W2MTA, RD 1 Rock Rd., Newark Valley, 13811 (607-642-8930)
Western Pennsylvania — Otto Schuler, K3SMB, 3732 Colby St., Pittsburgh 15214 (412-231-6890)

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Tennessee — John C. Brown, NO4Q, P. O. Box 37, Eva 38333 (901-584-7531)

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Maine — Clevis O. Laverty, W1RWG, 17 Fair St., Norway 04268 (207-743-2353)
New Hampshire — Robert Mitchell, W1SWX/W1NH, Box 137-A, Chester 03036 (603-895-3456)
Rhode Island — Gordon F. Fox, W1YNE, 13 York Dr., Coventry 02816 (401-828-6045)
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)

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Idaho — Lemuel H. Allen, Jr., W7JMH, 1800 S. Atlantic St., Boise 83705 (208-343-9153)
Montana — L. C. "Les" Belyea, N7AIK, P. O. Box 327, Belgrade 59714 (406-388-4253)
Oregon — William R. Shrader, W7QMU, 2042 Jasmine Ave., Medford, 97501 (503-773-8624)
Washington — Joseph N. Winter, WA7RWK, 819 N. Mullen St., Tacoma 98406 (206-759-9857)

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Nevada — Ralph E. Covington, Sr., W7SK, P. O. Box 7750, Reno 89510 (702-322-7988)
Pacific — J. P. Corrigan, KH6DD, Box 698, Kaneohe, HI 96744
Sacramento Valley — Norman A. Wilson, N6JV, Rte. 1, Box 730, Woodland, CA 95695 (916-666-1465)
San Francisco — Robert Odell Smith, NA6T, 320 Park St-P.O. Box 1425, Fort Bragg, CA 95437 (707-964-4931)
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West Indies — Julio Negroni, KP4CV, Georgetown, No. 269, Rio Piedras, PR 00927 (809-764-8099)

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THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

LRPC Report Marks New Era for ARRL

On page 56 you will find a summary of the Phase II Report of the ARRL Long Range Planning Committee. As chronicled last month, the report was accepted by the League's Board of Directors at its meeting in September and the long, complex process of implementing its recommendations has begun.

Based on an exhaustive study of the factors that are likely to exert the greatest influence on the future of Amateur Radio, the LRPC recommended the following actions by the ARRL Board of Directors:

- Consideration of the creation of a permanent ARRL Headquarters department with responsibility for developing and sustaining effective liaison at all levels of government, employing volunteers to the greatest extent possible.
- Establishment of a permanent ARRL presence in Washington, DC, for the purpose of assuring uninterrupted attention to developments affecting Amateur Radio, beginning in their earliest phases.
- Creation of a program for closer affiliation with ARRL and greater recognition of those local radio clubs that conduct effective programs for the protection, promotion and advancement of Amateur Radio at the local level.
- Improvement of the ARRL organizational structure, particularly at the section level, along the following lines:

1) Replacement of the office of Section Communications Manager with an office called Section Manager having broadened responsibilities for ARRL programs at the section level.

2) Creation of a Division Steering Committee to advise and assist the Division Director, with Section Managers, Assistant Directors, Advisory Committee members, and the Director and Vice Director as members.

3) Reorganization of the Advisory Committees along divisional lines, with the Division Director responsible for the appointment of his division's representatives.

4) Enhancement of ARRL Headquarters support to the section-level administrations.

5) Transfer of responsibility for administrative matters from the Division Director to other volunteer officials.

- Creation of a voluntary certification program with the objective of familiarizing as many amateurs as possible with the principles of emergency communications, preferably early in their amateur careers, and consideration of a similar program for volunteer leadership officials in the emergency communications field.
- Preparation of "how-to" material for use by local amateur organizations presently lacking an Amateur Radio Emergency Service or other trained group of public-service communicators.
- Careful monitoring of technical developments in areas that might enhance the public-service communications capabilities of radio amateurs.
- Establishment of a program to stimulate technical activities having the following objectives:

1) To promote awareness of, and interest in, the technical aspects of Amateur Radio.

2) To encourage amateurs to undertake simple technical projects, preferably early in their amateur careers, primarily working through local affiliated clubs.

3) To encourage amateurs to maintain their own equipment whenever possible.

4) To promote greater involvement in advanced technical activities.

5) To foster cooperation between ARRL and specialty groups within Amateur Radio.

6) To encourage greater familiarity with personal computers and their use in Amateur Radio applications.

- Full support for the ongoing efforts of the International Amateur Radio Union to improve the responsiveness of its organizational structure.
- Creation of a permanent group to advise the Board on long-range planning, utilizing the talent and experience of the general membership as well as the Board and staff.

The Committee also recommends that early attention be given to possible programs in several areas outside the scope of this report, notably in the fields of ARRL finances, recruitment, public relations and government relations.

If you're interested in the future of Amateur Radio and its national organization, please study the article on page 56 carefully. And, let us know what you think. The key to the League's success is membership involvement. As we launch this ambitious effort, membership involvement is more important than ever. — *David Sumner, K1ZZ*

League Lines...

Because of problems with the statements of candidates included with the ballots mailed to members in the Great Lakes and Pacific Divisions, new director ballots will be mailed to the members in those divisions about the first of December, with ballot-counting scheduled for the 20th of January, 1982. Ballots mailed by members in those divisions in response to the mailing in the early part of October will be opened only to count the votes for vice director in the Pacific Division, and to remove the inevitable membership renewals, Technical Information inquiries, and the like. Those October ballots not counted will be stored until the annual meeting of the ARRL Board in March, 1982. The new director ballots, to be mailed about the first of December, will be color-keyed so that they will not be mixed with any prior ballots.

The FCC has proposed a change in the effective radiated power output limits for repeaters operating on 6 and 10 meters. PR Docket No. 81-697 would make the following changes to the chart in §97.67(c) of the Amateur Rules:

Antenna height above average terrain in meters	Maximum effective radiated power for frequency bands above:		
	29.5 MHz	420 MHz	1215 MHz
Below 32 (105 feet)	800 watts	Paragraphs (a) and (b)	Paragraphs (a) and (b)
32-160 (105-525 feet)	400 watts	800 watts	. . do . .
160-320 (525-1050 feet)	200 watts	800 watts	. . do . .
Above 320 (1050 feet)	100 watts	400 watts	. . do . .

Members wishing to file formal comments in this proceeding are invited to send a self-addressed, stamped envelope (business-sized, please) with 20¢ postage to ARRL Hq., NPRM Docket 81-697, 225 Main St.,Newington, CT 06111. Formal comments may be filed with the Commission by sending an original and five copies to The Secretary, FCC, Washington, DC 20554. Comments are due January 15, 1982, and replies are due February 15.

5-Band WAS and DXCC plaques will cost $20 after July 1, 1982, with certificates provided free of charge. See DXCC Notes (p. 85) for details.

The Ham Newsline telephone number has been changed. The new number is 203-666-1545, and it can be called 24 hours a day to report amateur news items of national interest.

U.S. Postal Rates have increased again! Be sure to send your QSL Bureau enough additional postage to cover envelopes you have on file. It would be a good idea to send more envelopes, too, to be sure that you don't run out. The new first-class postage rate is 20¢ for the first ounce and 17¢ for each extra ounce. Addresses of the U.S. and Canadian QSL Bureaus are on page 82.

The Board of Directors has requested VRAC and VUAC to prepare a band plan for the 23 cm (1215- to 1300-MHz) band. If you are using 23 cm, please drop us a note briefly stating the mode, frequency and bandwidth of your operation. Send the information to Peter O'Dell, KB1N, VRAC Hq. Liaison, ARRL, 225 Main St., Newington, CT 06111.

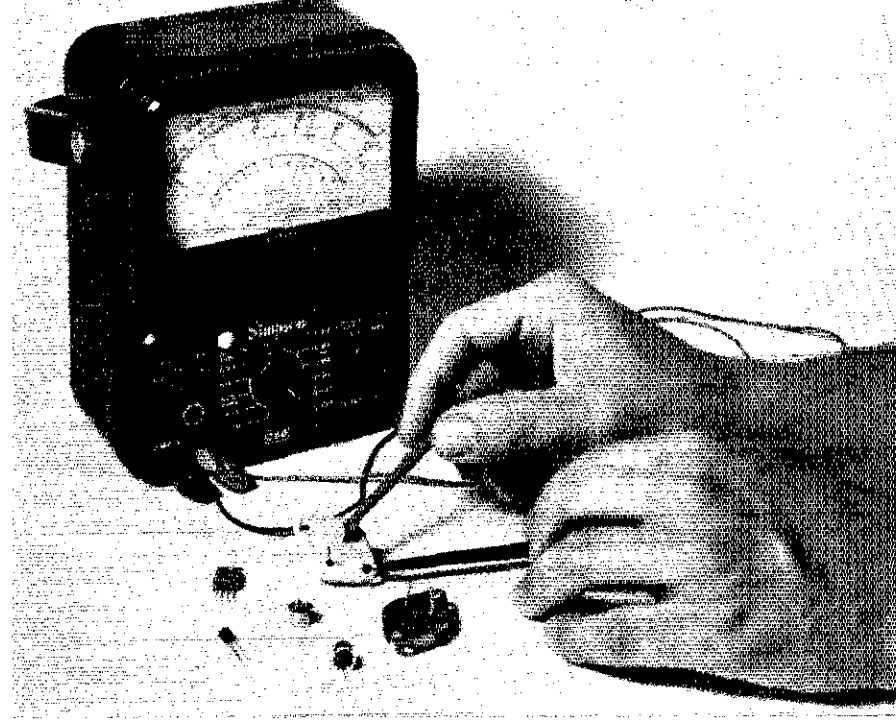
W1AW has a job opening for a station operator. Duties are primarily equipment maintenance, and preparation and transmission of code practice and bulletins. At least a General class license is required, with an interest in computers a plus. Interested? Contact W1AW Chief Operator Chuck Bender, W1WPR, for complete details.

W1AW/R (2-meter version) is on the air! Give a shout on 144.85 MHz (145.45 out) next time you find yourself in central Connecticut. Bob Shriner, WAØUZO, designed and assembled the machine from surplus gear, and Cushcraft Corp. donated the antenna. The Newington Amateur Radio League is responsible for maintenance, and ARRL Communications Manager John Lindholm, W1XX, is trustee.

BSA Radio Merit Badge Counsellors, Scouts and Explorers: NOW is the time to share your ideas and suggestions for new and deleted Radio merit badge requirements -- and your reasons -- with Steve Place at Hq. This is your last chance for some time to advise the BSA on this important award.

BEGINNER'S BENCH

Some Basics for Equipment Servicing



Part 1: Costly repairs to amateur equipment can often be avoided if we do our own repair work. Knowing the nature of semiconductors is a vital means to that end.

By Doug DeMaw,* W1FB

"Gosh, I sure wish the ARRL would have a series of articles on how to fix ham gear at home!" Have we heard or read that comment at Hq.? You bet we have! Our dereliction has not been intentional. Rather, we wondered how such a series might be structured to provide an effective set of practical guidelines. With all of the brands and models of commercial gear in use today, where would we start? The answer seemed to be elusive until we reasoned that a *general treatment* of the basic troubleshooting procedures for solid-state circuits should be entirely applicable to most amateur equipment.

Servicing Commercial Gear

It can be perplexing to peer into the cabinet of today's factory-built equipment. Our eyes are greeted by countless circuit-board modules, most of which stand on end in inaccessible areas of the gear. It's logical to ponder, "How in the world can I check these circuits, and where shall I start?" Rule number 1 should be to purchase the factory service manual for the equipment we own. Rule number 2 calls for buying circuit-board extender cards or cables from the manufacturer. If they aren't available, things will get pretty "sticky" when servicing is necessary. The factory manual provides detailed data on the individual modules in our rigs, X-ray views (sometimes) of the pc boards, lists of typical failures and the causes, and alignment procedures. Extender cables, on the other hand, permit us to extract the suspected module and test it with signal and operating voltage applied. This is important when attempting to locate a faulty voltage or component.

The standard operating manual that comes with most amateur equipment is fairly deficient with respect to servicing information, but the circuit diagrams may be adequate for much of the troubleshooting work. It is practical in some instances to make our own extender cables, provided we can obtain mating sockets for the plug-in pc-board modules. This approach should not be overlooked as an economy measure.

Basic Test Equipment

We need not own a research lab in order to repair our own gear (although at times it might help!). Most of the common failures can be resolved through the use of a high-impedance VOM (VTVM or FET VM).[1] An oscilloscope is a very useful tool, but it will be of little use in signal tracing and analysis unless it responds well to the frequency of the circuit under investigation. We are concerned in this case with the *bandwidth* of the scope. If the instrument has, say, a 30-MHz bandwidth, it should be accurate up to that frequency, and it should be able to yield an accurate waveform display up to 30 MHz. But, if harmonic or spurious energy is present very far above 30 MHz, it won't appear on the waveform being investigated. Ideally, we would have a scope with a 250- or 500-MHz bandwidth for our amateur repair work. Some of the older Tektronix and Hewlett-Packard vacuum-tube scopes can be purchased used at reasonable prices. Check the big radio flea markets for bargains in used test equipment.

A signal generator is recommended if signal tracing and alignment work is to be done. Again, we should keep an eye out for bargains at flea markets. WW II URM signal generators are excellent, as are

*Senior ARRL Technical Editor

[1]Notes appear on page 14.

General Radio Model-80 signal generators. (Numerous inexpensive items of homemade test equipment are described in the League book, *Solid State Design for the Radio Amateur*, chapter 7.)

A homemade or commercial rf power meter and a 50-ohm dummy load should be a part of our repair-shop bill of goods. A solder-sucker tool and a low-wattage pencil type of soldering iron are also standard items. A high-intensity desk lamp and magnifying glass will always be useful, too.

Diode Testing

We can determine the general condition of germanium and silicon diodes by means of an ohmmeter. One end of the suspected diode must be unsoldered from the circuit board to isolate it from other components. If this is not done, transistors or resistors that are attached to the immediate circuit of the diode can cause false resistance readings.

Diodes can be tested for forward and back resistance as shown in Fig. 1. Silicon diodes will show a forward resistance between 200 and 300 ohms (R × 100 scale) and a back resistance of 100 to 1000 megohms, typically (R × 1-megohm scale). Germanium diodes will show a forward resistance of roughly 200 to 400 ohms, with a back resistance of 100 k to 1 megohm. These two readings are obtained with either type of diode by simply reversing the leads of the VOM and changing the VOM multiplier scale. This procedure is useful when selecting matched diodes from a group of diodes. They should be matched as closely as possible for the forward-resistance characteristic.

If no resistance reading is obtained, the diode junction is open. Conversely, if a low-resistance reading is obtained in both directions, the diode is shorted.

Zener Diodes

Zener diodes can be tested for forward and back resistance in the same manner as the diodes we just discussed. But, we are concerned also with the regulation characteristics of our Zener diodes. This parameter can be checked by using the setup shown in Fig. 2. A low current, variable voltage dc power supply is required. The Zener diode under test (D1) is connected across the test leads of a dc voltmeter, as shown. A 1-W, 180-ohm limiting resistor (R1) will suffice for diodes with ratings up to 18 volts. Assume we are checking a 9.1-V Zener diode in Fig. 2. We will set the dc voltmeter to the 15-volt scale. Next, we will vary the power-supply voltage from zero to a point where the voltage across D1 does not increase. This will be the regulation zone of D1. The reading should not increase significantly when the power-supply voltage is raised further. If we are unable to observe a voltage-stabilization point at or near the specified regulation characteristic of the diode, the component can be considered defective. Always be certain to connect the positive lead from the power supply (via R1) to the *cathode* of the Zener diode, as shown in Fig. 2. This will be the banded end of the diode. This technique is useful for learning the "zener" value of unmarked Zener diodes, such as those obtained as surplus.

Bipolar Transistors

Most failures involving bipolar transistors are caused by faulty associated components, voltage surges or transients that subject the transistors to unsafe voltage or current. In a proper environment the transistor should be capable of outlasting its owner. Therefore, if we locate a defective transistor we should search for the "culprit" that caused the untimely demise. It would be highly speculative simply to pop a replacement transistor into the circuit board!

Although there are a number of simple (and not so simple) transistor testers available, some basic home-workshop checks can reveal the most common faults in these devices. Specifically, we can test them for opens, shorts and high leakage. It is possible to check the transistors for approximate current gain as well.

Junction Testing

Let's think of the bipolar transistor as two diodes (p-n junctions), as in Fig. 3. Malfunction generally results from one of the diodes being damaged (open or shorted). Incorrect operation may result also from excessive leakage (reverse current). If a junction is open, chances are that the failure was caused by excessive current. A shorted junction is most often caused by perforation brought on by voltage spikes that rise beyond the safe rating of the transistor. These conditions serve as clues to the cause of the failure.

Observation of the junction condition can be made if we use an ohmmeter, as shown in Fig. 3. We can check the forward resistance of the junctions in the manner indicated. The ohmmeter polarity is set for testing an npn type of transistor. The positive and negative meter leads must be reversed when checking a pnp device. The method is otherwise the same as that shown in Fig. 3. A normal resistance reading should be 300 to 600 ohms, depending on the transistor under test (TUT). High resistance readings indicate an open junction.

We can test the junctions for shorts by reversing the ohmmeter leads and switching the meter to a higher resistance scale. This is shown in Fig. 4. This reverse-resistance reading is taken with the ohmmeter switched to the R × 10 k scale. The meter places a reverse bias on the junctions in this hookup. Low- to medium-power transistors (npn) should indicate a reading of 800 kΩ to as much as several megohms. A typical range for germanium

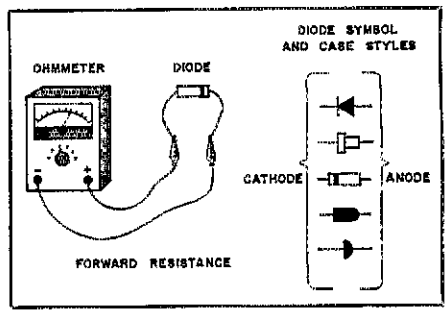


Fig. 1 — Method for checking the condition of small-signal and rectifier diodes with an ohmmeter.

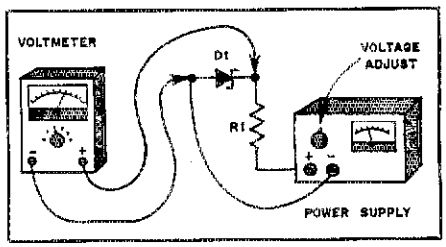


Fig. 2 — Zener diodes can be tested by using a variable dc power supply and a voltmeter.

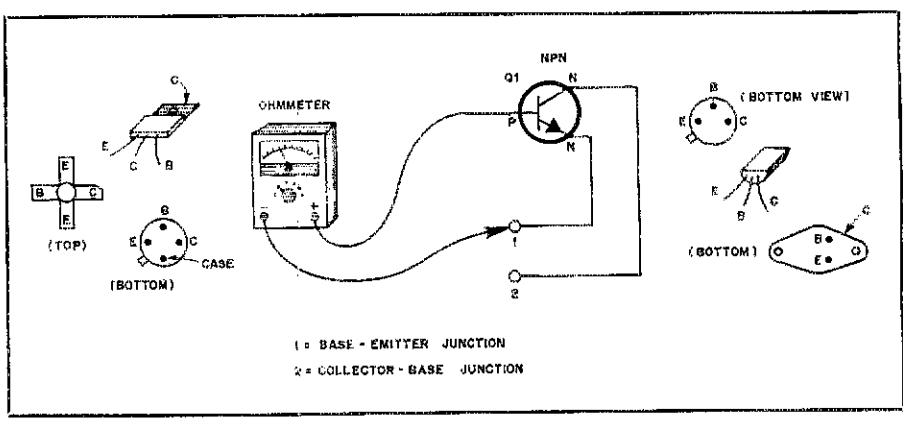


Fig. 3 — Technique for checking the forward resistance of a bipolar transistor. Shorts and opens can be detected in this manner.

transistors is 500 kΩ to 1.5 megohm. High-power transistors have much larger junctions. Therefore, the reverse readings will be lower than for small-signal transistors. Typical readings will be on the order of 50 kΩ or greater. This test indicates the leakage (large) trait of the transistor. We need only reverse the meter leads from the polarity shown in Fig. 4 when testing pnp transistors. It is important that we note the following: The resistance readings we obtain are relative at best, since an ohmmeter can respond accurately only to linear resistances. The readings we obtain will differ with various brands of instruments. Similarly, they will be different if we use meter scales other than R × 100 and R × 10 k. If there is doubt concerning the reliability of our measurements, we can obtain a set of typical readings first by testing an equivalent transistor of known quality (new) and by using the readings as a standard when testing suspected transistors.

Direct-Current Measurements

A more precise method of measuring leakage can be accomplished by using a dc-voltage source and a 100-μA dc meter (see Fig. 5). Most low- and medium-power pnp (germanium) transistors will exhibit collector-base (I_{cbo}) and emitter-base (I_{ebo}) leakage currents on the order of 15 μA maximum at approximately 25° C. High-power transistors will have leakage amounts of 90 μA or greater. Silicon npn transistors have much lower leakage — usually less than a microampere. Excessive leakage in any transistor indicates that excessive heat or overloading has taken place. Since ambient temperature (which affects the junction temperature) has a marked effect on the leakage readings we should double the expected leakage current for each 10° C increase in temperature. Pnp transistors can be checked by reversing the battery and meter polarity from that of Fig. 5.

Testing for Current Gain (Beta)

The dc beta is the ratio of the collector current to the base current. Hence, if a base current of 1 mA were flowing, and the resultant collector current became 70 mA, the beta would be 70. A check of the manufacturer's specifications would indicate whether or not the transistor was exhibiting a beta within the published boundaries. A typical beta spread might be, say, 30 to 100 for a given transistor, owing to nonuniformity of performance characteristics for a specified transistor type from a particular manufacturing batch. In other words, if we picked up 10 type 2N2222A transistors, it would be unlikely that any two would have identical beta traits.

Ac beta is a parameter of interest to us in signal-amplification circuits. This is a bit more difficult to measure accurately with simple methods. But, we can make

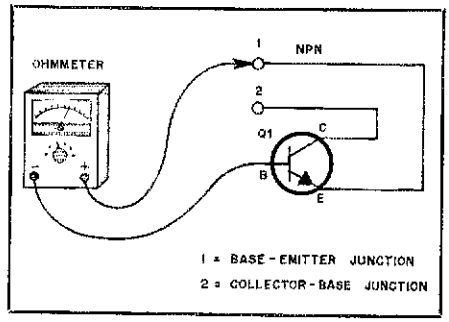


Fig. 4 — Reverse junction resistance of a bipolar transistor can be tested in this fashion.

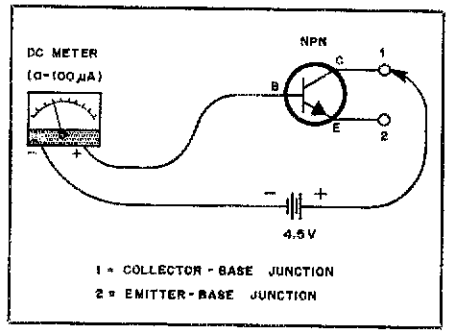


Fig. 5 — Transistor leakage can be investigated with a voltage source and a microammeter, as shown.

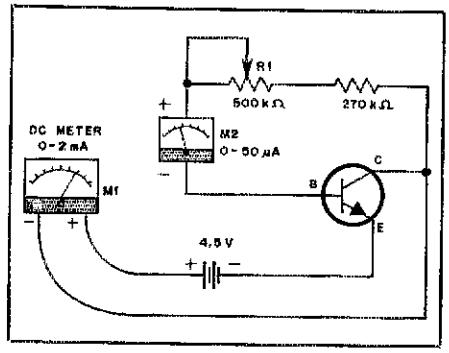


Fig. 6 — Test set-up for determining the dc beta of a transistor.

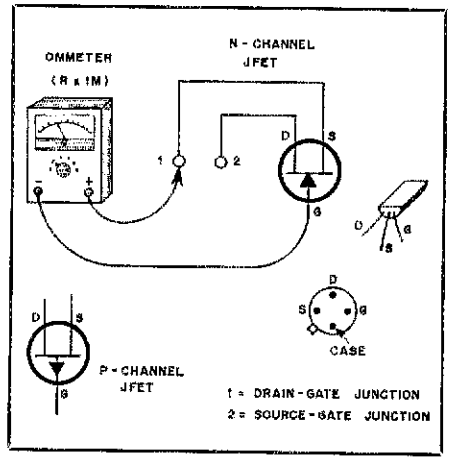


Fig. 7 — System for checking the forward and reverse resistance of a junction FET.

the reasonable assumption that if the dc beta is within the specified range, the ac beta will be all right too.

A simple technique for measuring the dc beta of a transistor is illustrated in Fig. 6. R1 is set for a base current of 10 μA. Then the collector current is noted on M1. From this we can determine the dc beta from I_c/I_b with both currents expressed in μA. Therefore, if we had 10 μA of base current and 0.75 mA of collector current, the beta would be 750/10 = 75. By reversing the meter and battery polarities in Fig. 6 we can check the dc beta of pnp transistors.

Junction Field-Effect Transistors (FETs)

N-channel JFETs can be checked for opens or shorts if we use the method shown in Fig. 7. With the ohmmeter negative lead hooked to the gate, check positions 1 and 2 with the positive meter lead. If the FET is good, the resistance reading (R × 1 megohm scale) will be several megohms, possibly as high as 1000. If we connect the positive meter lead to the gate and check from source to gate, and drain to gate, we should obtain a resistance reading (R × 100 scale) of 500 to 1000 ohms, typically. P-channel JFETs can be tested by reversing the polarity of the meter leads and performing the same tests. Low-resistance readings indicate high leakage or shorts. Infinite readings in reverse resistance indicate an open junction.

Dual-Gate MOSFETs

It becomes a bit more difficult to test metal-oxide-silicon FETs (MOSFETs), since the gates are insulated from the drain and source of the transistor by a thin, fragile layer of oxide insulating material. If the gates are not protected internally (Zener diodes from the gates to the source) even the static charge on our fingers can destroy the gate insulation. MOSFETs with Zener-protected gates can be damaged easily by voltage peaks greater than about 6 volts, so it is best to handle them with more care than we might give to JFETs or bipolar transistors.

Owing to the gates being insulated from the drain and source, we cannot make forward and reverse measurements with an ohmmeter. An alternative test method is to plug them into a simple crystal oscillator of the type presented in Fig. 8. Rf energy from the oscillator drain is rectified by a diode doubler (D1 and D2), and the resultant dc is monitored at M1. If the MOSFET is defective there will be no meter deflection. A transistor socket can be placed on the test fixture to permit easy connection of the device to be checked. *Warning:* Make sure that S1 is in the OFF mode before plugging Q1 into the tester; likewise when removing Q1.

Y1 can be any fundamental crystal in the hf range, but the circuit constants in

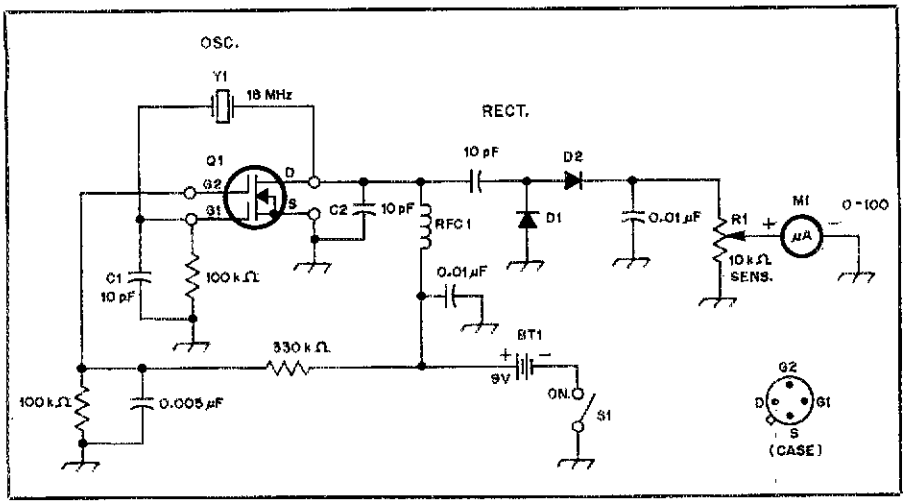


Fig. 8 — Practical circuit for testing a MOSFET (see text). All capacitors are disc ceramic, 10 V or greater. BT1 can be a 9-V transistor-radio battery. D1 and D2 are small-signal germanium diodes (1N34A or equiv.). M1 may be a 50- or 100-μA dc meter. R1 is a linear-taper composition control, and RFC1 can be a miniature rf choke (500 μH to 2.5 mH suitable).
S1 — Spst slide or toggle switch.
Y1 — High-frequency, fundamental-cut crystal, any frequency (see text).

Fig. 8 are for use from 15 to 21 MHz. If crystals for lower frequencies are used it may be necessary to increase the value of feedback capacitors C1 or C2, or both. A similar tester that accommodates bipolar transistors, JFETs and MOSFETs, inclusive of a polarity-reversing switch, appears in the measurements chapter of the *Handbook* (past several editions). A simple go-no-go type of MOSFET tester is shown in an RCA publication.[2] *Caution:* Before performing any of the tests that require the use of a VOM, make certain that a positive potential does, in fact, exist at the positive output jack! Some VOMs and VTVMs exhibit a negative potential at the positive jack, and a positive potential at the negative or ground jack. The condition of your instrument can be checked by attaching a second voltmeter in parallel with the output leads of the first meter. A forward needle deflection on the second voltmeter will indicate which jack of the first instrument is positive. Use that lead as the positive one for all of the tests that require a VOM.

What About ICs?

It would be a difficult, if not impossible, undertaking to determine the condition of an integrated circuit (IC) by simple means. We have such a wide variety of ICs to deal with that it seems almost incomprehensible. Things are complicated further by the myriad pin-out arrangements and case styles. We wouldn't even find it convenient to build a functional tester of the type in Fig. 8, because each type of IC would require a special functional-test circuit. The most practical option before us is to localize the malfunction and make a strong assumption that the IC in that part of the circuit has caused the equipment failure. Removing the suspected IC and substituting a new one will provide the answer. Voltage checks (ac and dc, as applicable) at the pins of the ICs may offer clues concerning the IC performance, but generally will not yield conclusive results.

Summary Remarks

This installment on servicing can best be thought of as "openers" for the game of home-workshop repair. Subsequent treatment of amateur servicing techniques will deal with voltage measurements (typical voltages at the semiconductor terminals), isolating the problem area, signal tracing and waveform analysis. Meanwhile, you should be able to apply the principles discussed in Part 1 to locate minor faults and make easy repairs.

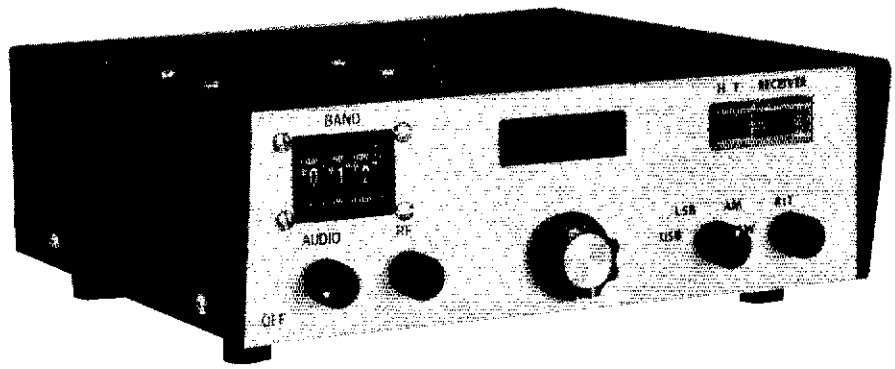
Notes

[1] An inexpensive homemade FET VOM is described (pc board pattern included) in recent editions of *The ARRL Radio Amateur's Handbook*, measurements chapter. The next installment of Beginner's Bench will describe the construction of a high-impedance voltmeter and an rf probe.
[2] *RCA Solid-State Servicing* (TSG-1673A), ch. 7, p. 260.

SEASON'S GREETINGS FROM THE HAMS AT ARRL/IARU HQ.
(Listed in alphabetical order of call sign)

Joel Kleinman	N1BKE
Richard Palm	K1CE
Jeannie DeMaw	W1CKK
Laird Campbell	W1CUT
George Grammer	W1DF
Elizabeth H. Karpiej	KA1DTU
Joan Merritt	KA1DTV
Byron Goodman	W1DX
Maureen Thompson	KA1DYZ
Stephen C. Place	WB1EYI
Paul K. Pagel	N1FB
Doug DeMaw	W1FB
Hal Steinman	K1FHN
Marian Anderson	WB1FSB
Marge Tenney	WB1FSN
John Nelson	W1GNC
Bill Webb	WB1GOO
Bob Atkins	KA1GT
Ed Tilton	W1HDQ
Jim Clary	WB9IHH
Jean Peacor	K1IJV
Stuart B. Leland	W1JEC
Brian Downey	WA1KSF
Dennis Lusis	W1LJ
Stan Horzepa	WA1LOU
Peter O'Dell	KB1N
Sally H. O'Dell	KB1O
Mike Kaczynski	W1OD
Bruce Kampe	WA1POI
George Woodward	W1RN
Ed Kalin	K1RT
Richard L. Baldwin	W1RU
Lee Aurick	W1SE
Gerald L. Hall	K1TD
Perry F. Williams	W1UED
George Collins	KC1V
Arline Bender	WA1VMC
Bill Jennings	K1WJ
Chuck Bender	W1WPR
Bob Halprin	K1XA
John Lindholm	W1XX
Sandy Gerli	AC1Y
Ellen White	W1YL/4
David Sumner	K1ZZ
Steve Pink	KF1Y
Carol L. Colvin	AJ2I
Mark J. Wilson	AA2Z
Don Search	W3AZD
W. Dale Clift	WA3NLO
Larry Wolfgang	WA3VIL
William A. Tynan	W3XO
Gerry Hull	AK4L/VE1CER
Paul Rinaldo	W4RI
John Troster	W6ISQ
Chuck Chadwick	K8AXL/WB8MOB
Chuck Hutchinson	K8CH
Bernard D. Glassmeyer	W9KDR
Harry MacLean	VE3GRO
Maxim Memorial Station	W1AW
ARRL Hq. Station	W1INF

A Modern Upconverting General-Coverage Receiver



Why limit yourself to those slivers of spectrum called the amateur bands? Build this upconverting, synthesized receiver and hear what the rest of the world sounds like!

By Albert D. Helfrick,* K2BLA

Once the mainstay of communications receivers, the general-coverage receiver has until recently been missing from the new-equipment scene. Some modern receivers are suited only for casual shortwave broadcast listening, while others are designed for serious users. The better-quality receivers naturally carry appropriately higher price tags. One thing that has still been sorely lacking is an article describing a good do-it-yourself construction project for a general-coverage receiver.

This article describes an upconverting, synthesized, digital readout, general-coverage receiver. This is not a project intended for the newcomer or the faint of heart. It is a thoroughly modern communications receiver, requiring construction ability and a knowledge of communications receivers. On the other hand, those with the necessary experience will find the project interesting and rewarding.

Although the size and performance of upconverting receivers is impressive, most designs, such as the one described by Rohde,[1] require parts that are difficult to obtain and quite expensive. Most notable among these are the shaft encoder and the first i-f filter. I was determined to design a small, high-performance receiver that could be built by the amateur from readily available parts. This receiver evolved from two earlier designs. The first upconverting receiver I built was a fully synthesized 100-kHz to 20-MHz receiver made primarily for broadcast reception. The channels were 10 kHz apart, and thumbwheel switches were used for frequency selection. The only other control on the receiver was a volume control. It was a single-conversion affair with a 21.4-MHz i-f. The purpose of that design was to allow me to gain experience with the upconverting scheme before making any further design efforts. Although the receiver functions well for its intended purpose, the design was never published. The second cut was a versatile receiver with a BFO, product detector, three degrees of selectivity and digital readout. This unit was designed to be a communications receiver and has been serving that end for some time.[2] While this unit can be built from readily available parts, it is large and relatively complicated in design. What was desired for attempt number three was a small, portable, upconverting receiver with wide dynamic range and digital readout. The receiver described here meets these requirements in a 3 × 8 × 8-inch (mm = in. × 25.4) package.

Circuitry

Fig. 1 shows the block diagram of the receiver. The input signal passes through a low-pass filter that removes the 90- to 120-MHz image band. This filter must be relatively flat for constant receiver sensitivity across the entire hf band. Also, it should have 80 dB or more attenuation at 90 MHz and about 60 dB or more at 45 MHz, the first i-f. A small compromise between flatness and attenuation was made, and a 1-dB ripple filter was used. The first mixer is an active type from Plessey Semiconductors. This device was thoroughly evaluated by the author and by Collins and DeMaw.[3] Although there are higher performance active mixers, the Plessey SL-6440 is suitable for all but most the demanding applications. The 100-kHz to 30-MHz input spectrum is converted to the first i-f of 45 MHz by mixing with a 45.1- to 75-MHz local oscillator signal from the synthesizer. The first i-f filter has a 13-kHz bandwidth and was made for use in commercial uhf fm receivers. This device is very small and

[1]Notes appear on page 22.

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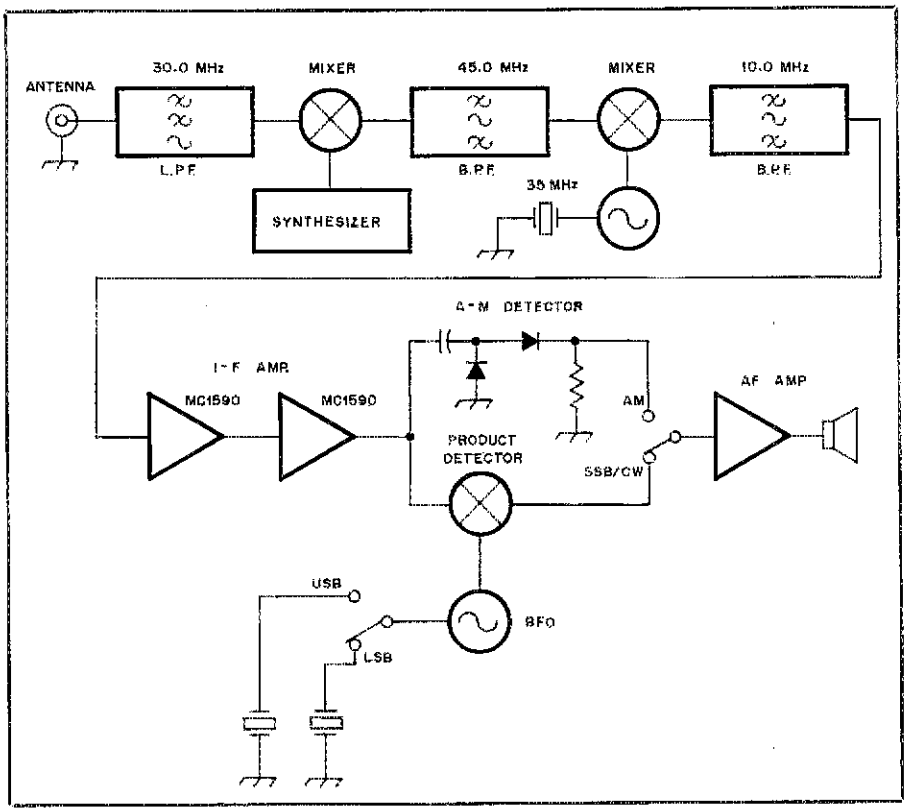


Fig. 1 — Block diagram showing the major functional units of the synthesized general-coverage receiver.

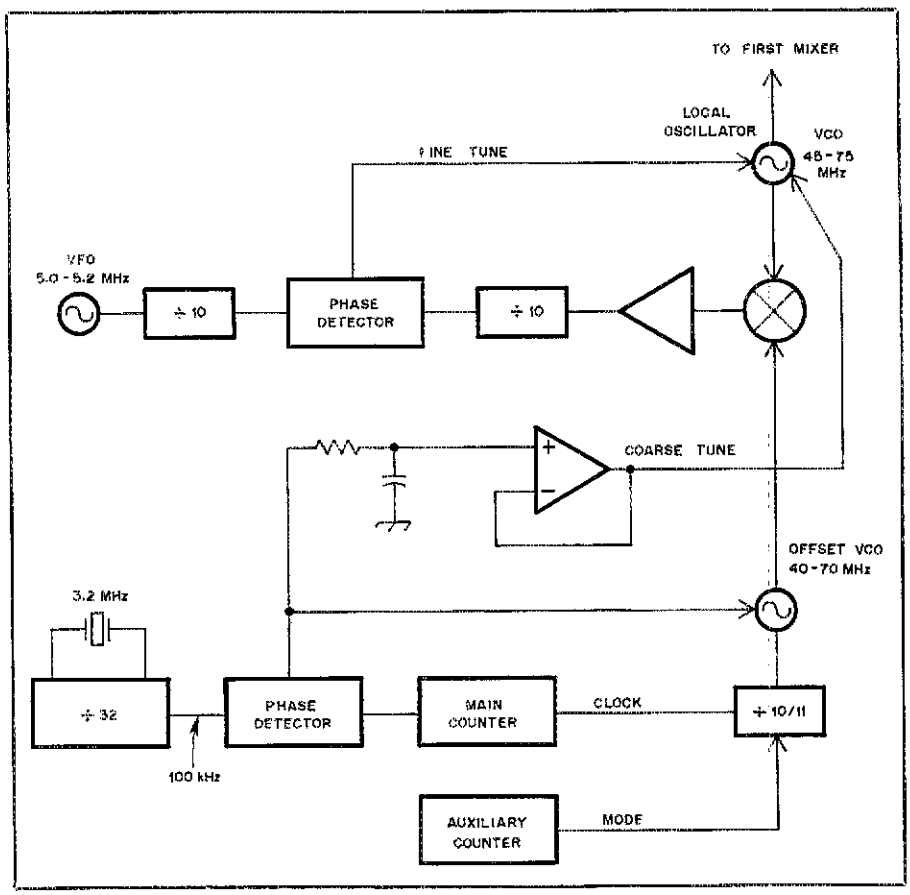


Fig. 2 — The synthesizer, shown here in block form, uses a dual-loop system. The main and auxiliary counters are programmed by the thumbwheel switches located on the front panel. Fine tuning is provided by the varactor-tuned VFO.

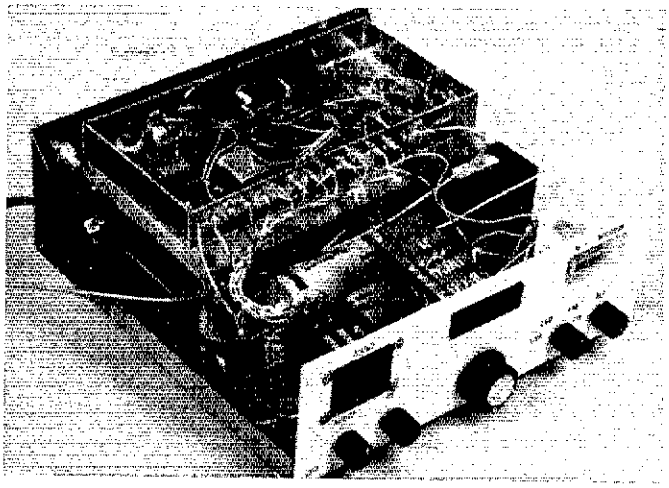
relatively inexpensive. Since it is used in high-volume applications, the price is expected to drop considerably when it has been designed into equipment. The second mixer is also a Plessey '6440. The signal from the first i-f is converted by this mixer to the second i-f of 10 MHz. Since passband tuning is not contemplated, a simple crystal oscillator is sufficient for the second local oscillator. The output of the second mixer passes through the second i-f filter, which provides the operating selectivity of the receiver.

Although a considerable amount of gain is available from the active mixers, it is not desirable to use the maximum obtainable gain. If a large input signal is present, the mixers are capable of producing enough output power to damage the crystal filters. The manufacturer suggests that the power input to the filters be kept below 10 mW. This limit is assured by operating the mixer at a low supply voltage, so that even when the mixer is in saturation the power to the filter is below 10 mW. The combined gain of the two mixers is about 20 dB. This implies that when the input level is 20 dB below 10 mW, or 100 μW, the second mixer is in saturation. For greater input signal levels there would be severe distortion and intermodulation. This situation occurs only when the input signal is within the first i-f filter passband; thus a large input signal is only a problem when it is very close to the frequency to which the receiver is tuned. To prevent intermodulation for frequencies close to the desired frequency, the first-mixer gain has been kept to a minimum. Total first-mixer gain, including the losses of the input low-pass filter and the first i-f filter, is about 6 dB. The remaining 14 dB of gain is obtained in the second mixer.

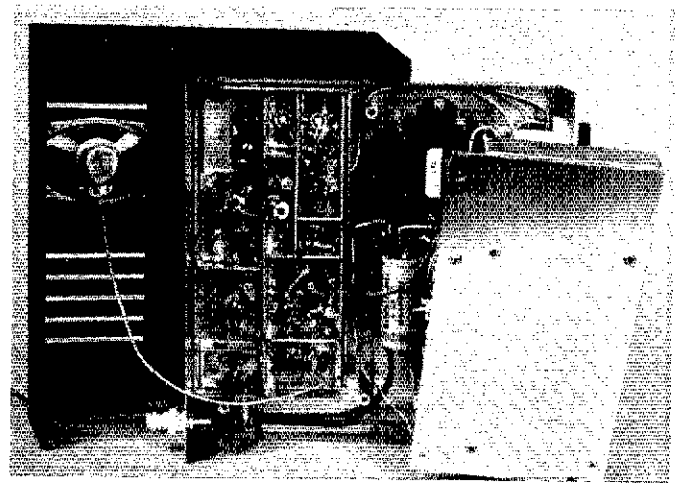
The output of the second mixer feeds the 10.0-MHz crystal filter. An odd i-f of 10.0 MHz was chosen because of filter availability. To use another i-f, such as 9.0 or 10.7 MHz, only the frequency of the second local-oscillator crystal, and the BFO crystals, need be changed. Changing the second i-f will have no effect on receiver performance.

The i-f amplifier uses two high-gain ICs and is heavily loaded with resistors for maximum stability. Most upconverting designs have very little gain between the antenna input and the second i-f amplifier. Typically, two balanced diode mixers are used, each with a loss of 6 or 7 dB compared with the combined gain of nearly 20 dB in this design. The difference is about 32 to 34 dB. Often an i-f amplifier is included at the first i-f, but even with the amplifier, the differential gain between the usual upconverting receiver and this design is considerable. Because of this, not as much gain is required at the second i-f.

However, there is no mixer age capability, and the i-f amplifiers are called upon



Interior view of the receiver. The synthesizer box, with the cover removed, is situated at the top. The power supply and frequency counter are located near the front of the cabinet.



The compartmented circuit-board box containing the rest of the receiver can be seen with the synthesizer removed. The receiver cabinet measures 3 × 8 × 8 inches.

to supply all of the agc action. Only about 50 dB of gain is required of the amplifiers, but the entire 100-dB agc capability of the ICs is used.

The i-f amplifier feeds two detectors simultaneously: a two diode voltage doubler for a-m and a product detector for ssb and cw. The diodes used in the a-m detector are Schottky types, with fixed dc bias for maximum sensitivity and effective agc operation.

In addition to being the a-m detector, the Schottky diode voltage doubler serves as the agc rectifier. Temperature compensation is achieved by using two similar Schottky diodes, biased with the same current, as a voltage reference for the agc amplifier. It would be difficult to achieve the desired temperature stability without this biasing.

The product detector is a commercial doubly balanced diode-ring mixer. The BFO is a crystal-controlled oscillator with diode-switched crystals. Because the i-f amplifier does not have the large amount of gain often found in receivers using passive mixers, it is not difficult to prevent the BFO from entering the i-f amplifier and causing problems with the agc system.

Audio gain, sufficient to drive a small, self-contained loudspeaker, is provided by a single IC amplifier. It is capable of about 1 watt of output.

The Dual-Loop Synthesizer

The key to good upconverting receiver performance is the synthesizer design. A synthesizer is required to provide a 45- to 75-MHz local oscillator signal of high stability and low noise. In addition, a method of frequency readout must be provided that has at least 100-Hz resolution. The synthesizer in this receiver uses a partially synthesized dual-loop system. Band switching is accomplished with a conventional phase-locked loop, while fine tuning is done with a VFO. The internal frequencies of the synthesizer are chosen so that a conventional frequency counter can be used for frequency readout.

Refer to the block diagram in Fig. 2. The offset phase-locked loop operates in 100-kHz steps from 40.0 to 69.9 MHz and is programmed from the thumbwheel switches. A setting of 40.0 MHz corresponds to 00.0 MHz on the band switch, and 69.9 MHz corresponds to 29.9 MHz on the band switch. The tuning voltage generated by the offset PLL is buffered, filtered and fed to one of two varactor diodes in the local oscillator VCO. The local-oscillator and offset VCOs are designed so that the nominal local-oscillator frequency is about 5.1 MHz above the offset VCO. Both VCOs feed a mixer that has the output tuned to 5.1 MHz. This difference frequency is divided by 10 and fed to a phase detector. A VFO operating from 5.0 to 5.2 MHz is also divided by 10 and fed to the same phase detector. If a phase detector that had a 5-MHz capability were used, both divide-by-10 circuits could be eliminated. Very few integrated circuit phase detectors are capable of reliable operation at 5 MHz. Reducing the frequencies by a factor of 10 allows a popular and reliable phase detector to be used. The output of the phase detector is filtered and fed to a second varactor diode in the local-oscillator VCO to close the loop. The fine-tune loop maintains the frequency difference between the two VCOs exactly equal to the frequency of the front panel tuned VFO.

There are several important characteristics of this synthesizer that make it suitable for a high-frequency receiver. First, all of the phase-locked loop reference frequencies are high. The offset loop has a reference of 100 kHz, and the main loop has a reference of 500 to 520 kHz. When the reference frequency is this high, it is not difficult to filter out the reference sidebands while removing phase noise from the VCO. Second, the VCOs have a switched capacitor to reduce the required tuning range of the VCO. It is possible to generate both the 45- to 75-MHz and 40- to 70-MHz signals without switching VCO capacitors, but the amount of noise at the low-frequency end, where the tuning sensitivity is high, would be excessive. It would also be difficult to achieve tracking.

The 5.0- to 5.2-MHz VFO is varactor tuned from the front panel by a 10-turn potentiometer. Frequency stability at 5 MHz is not difficult to obtain, but varactor tuning is not as stable as a capacitor-tuned VFO or a PTO. An N150 temperature-compensating ceramic capacitor is used to reduce the temperature drift to acceptable limits. Since the tuning range is only 200 kHz, the degradation in stability is not troublesome. The tuning rate is about 220 kHz for 10 turns or 22-kHz per turn, which is ideal for amateur use.

Anyone experienced with receiver design will suspect that this receiver has spurious response problems resulting from the nice even numbers used as i-fs and in the synthesizer. The first i-f is 45.0 MHz, and the second i-f is 10.0 MHz. The VCO covers 5.00 MHz, and the offset oscillator covers the range from 40.00 MHz to 70.00 MHz. The round numbers were chosen, with full knowledge of the potential for spurious response, to allow for a simple tuning and frequency-readout system. To reduce the spurious responses to a low level, the synthesizer parts are divided and shielded very carefully. Some spurious responses remain, and it is doubtful that any receiver built to this design can be completely free from such responses. It is doubtful that any general-coverage receiver can be *totally* free from spurious responses. There is one spurious signal that will be present in any receiver of this design, regardless of construction.

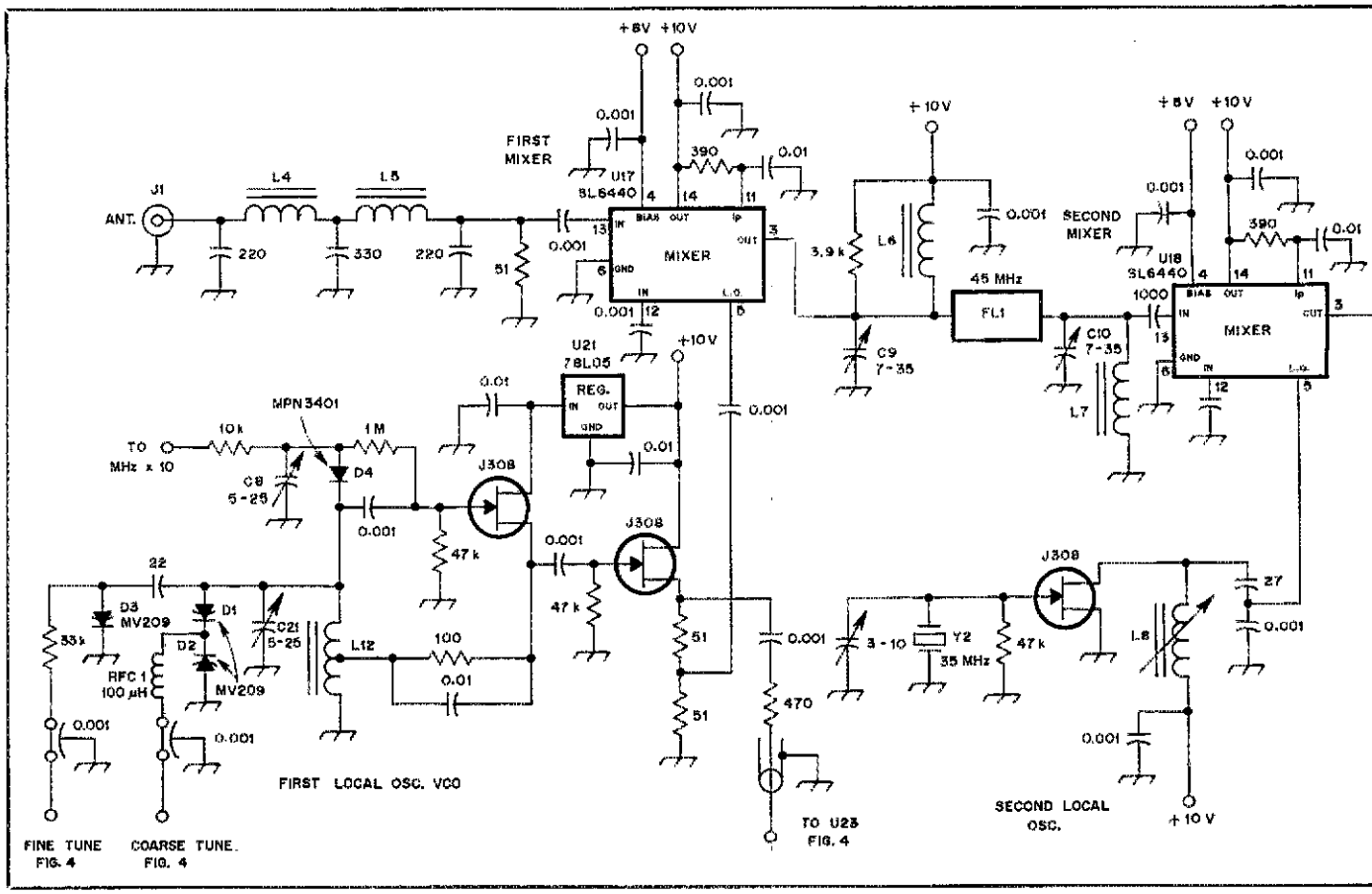


Fig. 3 — Schematic diagram of the general-coverage receiver. Numbered components not given in the parts list are for text reference only.

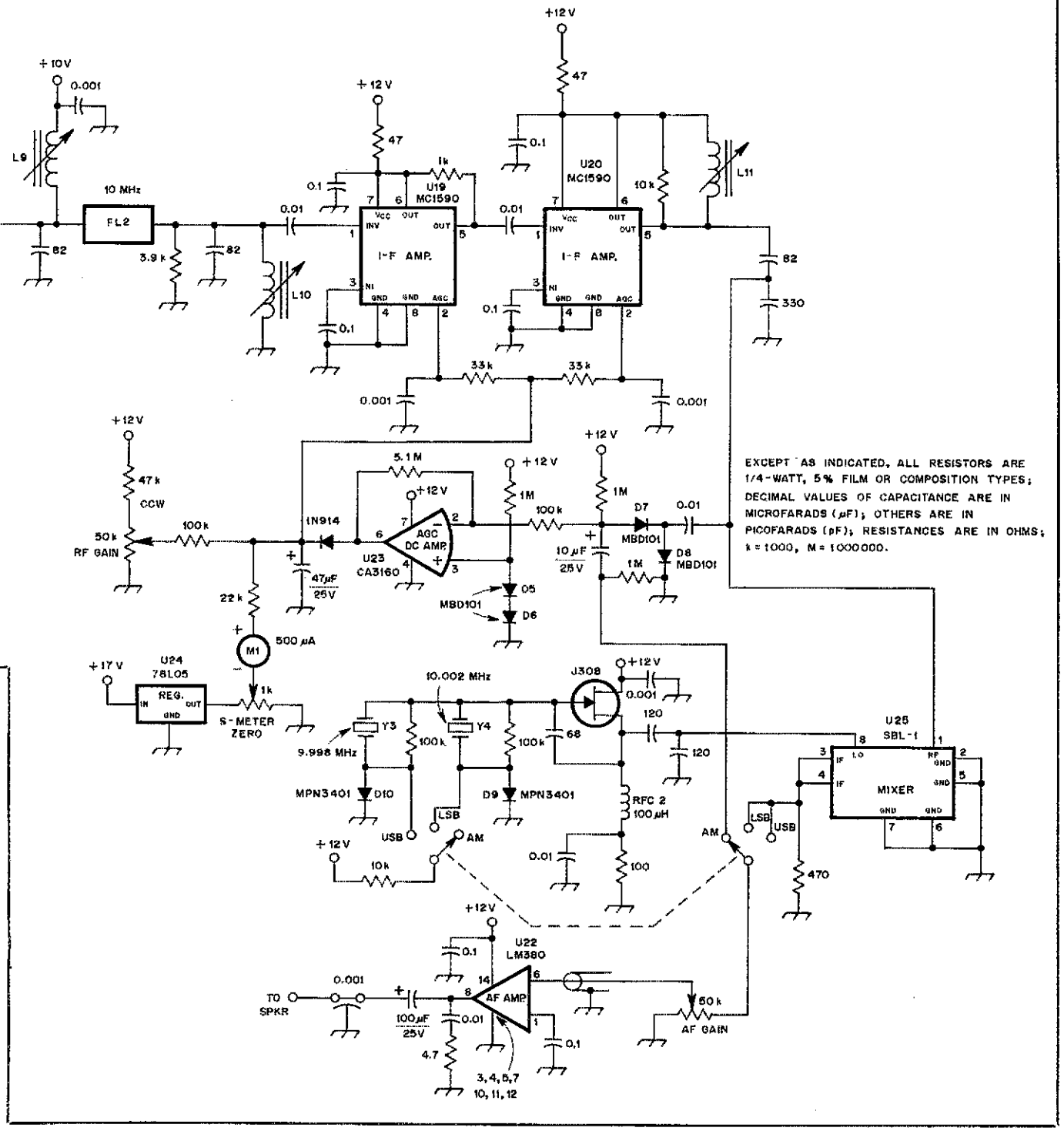
D1-D3, incl. — Motorola MV209 voltage variable capacitance diode, 26 to 32 pF.
D4, D9, D10 — Motorola MPN3401 PIN switching diode.
D5-D8, incl. — Motorola MBD101 hot-carrier diode.
FL1 — 45.0-MHz crystal filter, 13-kHz bandwidth. Piezo Technology Inc. model 2833A or equiv.
FL2 — 10.0-MHz crystal filter, 2.5-kHz bandwidth.
L4, L5 — 13 turns of no. 30 enameled wire on a T16-10 toroid core.
L6, L7 — 16 turns of no. 28 enameled wire on a T30-10 toroid core.
L8 — 1.0-µH slug-tuned inductor.
L9-L11, incl. — 3.0-µH slug-tuned inductor.
L12 — 11 turns of no. 28 enameled wire, tapped 2 turns from ground, on a T37-2 toroid core.
U17, U18 — Plessey SL6440 doubly balanced mixer IC.
U19, U20 — Motorola MC1590 i-f amplifier IC.
U21, U24 — Fairchild µA78L05 three-terminal voltage regulator, 5 volts at 100 mA.
U22 — National LM380 af amplifier, 1-watt IC.
U23 — RCA CA3160 op amp IC.
U25 — Doubly balanced diode-ring mixer. Mini-Circuits SBL-1 or equiv.

When the band switch is set to 5.0 MHz, the offset VCO is operating at exactly 45.0 MHz, which is the first i-f. Even though good shielding can reduce this level to a few microvolts of equivalent signal, the VCO produces a beat with every signal tuned in that range. The solution to this problem is simple: When tuning signals in the 5-MHz range, use the 4.9 MHz bandswitch positions. The 200-kHz range of the VFO allows continuous tuning through 5 MHz.

It may appear that a simple solution to the spurious signal at 5 MHz would be to change the offset synthesizer to operate 5 MHz above, rather than 5 MHz below, the local oscillator. In this case the offset VCO would cover the range of 50 to 80 MHz and not pass through 45 MHz. The VFO frequency would be the offset VCO frequency minus the local oscillator frequency, and the receiver would tune in the direction opposite the VFO. The frequency readout derived from the VFO would have to be changed to account for this difference. An up/down counter could be used for the 5-MHz frequency display. The counter would be preset to 5000 and counted down. However, this would preclude the use of an LSI frequency counter and would require at least 10 additional ICs.

The design and construction of the two VCOs used in the synthesizer are very important if the receiver is to function reliably. First, the noise levels of the VCOs must be very low. The total noise contribution of the local oscillator will be the sum of the noise of both VCOs plus any noise contributed by the programmable divider and phase detector. Each VCO uses a high-Q toroid tank with minimal loading as well as a low operating voltage (supplied by individual 5-V regulators). Adequate buffering is used between the VCO and the dual-modulus prescaler. This prevents noise and sidebands from being generated by the prescaler. Only one stage of buffering is needed between the local oscillator VCO and the two mixers it drives. This is because the first receiver mixer has an inherent isolation, and the synthesizer mixer is fed from a large resistive divider. A fixed-value capacitor is switched across the VCO tank for receive frequencies below 10 MHz. This corresponds to 55 MHz at the local oscillator VCO, and 50 MHz at the offset VCO. To maintain frequency tracking, identical tank components, varactors, coils, wire sizes and FETs are used in the two VCOs.

The synthesizer mixer is fed by both VCOs. The offset VCO, providing about 200 mV, is used as the high-level signal, while the local-oscillator VCO is used as the low-level signal at about 30 mV. The mixer output circuit is tuned to 5.1 MHz and loaded to produce a wide-band tank. An FET amplifier provides the necessary gain for driving the TTL divide-by-10 IC. It is the mixer output circuit that requires the frequencies of the VCOs to track. If the VCOs should differ by more than about 7 MHz or less than 4 MHz for any reason, the output of the amplifier will not be sufficient to drive the divide-by-10 circuit, and the loop will not lock up. If the frequency is too low, because the VCOs are too close in frequency, the absence of output pulses from the counter



will appear to the phase detector as zero frequency.

The fine-tune loop will then go to the highest tuning voltage. This is the correct direction to restore the loop to operation. Providing the VCOs are not extremely misaligned, the high tuning voltage of the fine-tune loop will cause the VCOs to move more than 4 MHz apart, and the system will acquire lock. However, if the frequencies are separated by more than 7 MHz, the pulses to the phase detector will also cease. The phase detector will again interpret this as zero frequency and change the tuning voltage on the fine-tune loop to its highest value. This is the wrong direction and will only aggravate the situation. The loop will become latched-up and never return to operation. This situation can occur on a transient basis when changing bands.

To prevent latch-up during band changes, an out-of-lock detector is included. It reduces the fine-tune voltage to about half the maximum value when an out-of-lock condition occurs in the fine-tune loop. The reduction occurs for only a short period of time to prevent latch-up from occurring when the loop is out-of-lock because the VCOs are too close in frequency.

Constructing the Receiver

The receiver is built in two shielded boxes constructed from double-sided pc board. Although not the prettiest way to build electronic circuits, the flexibility to add shielding as needed is a must for a receiver of this type. Feedthrough capacitors are used liberally whenever a low-frequency signal or power passes into the shielded box. The larger bypass

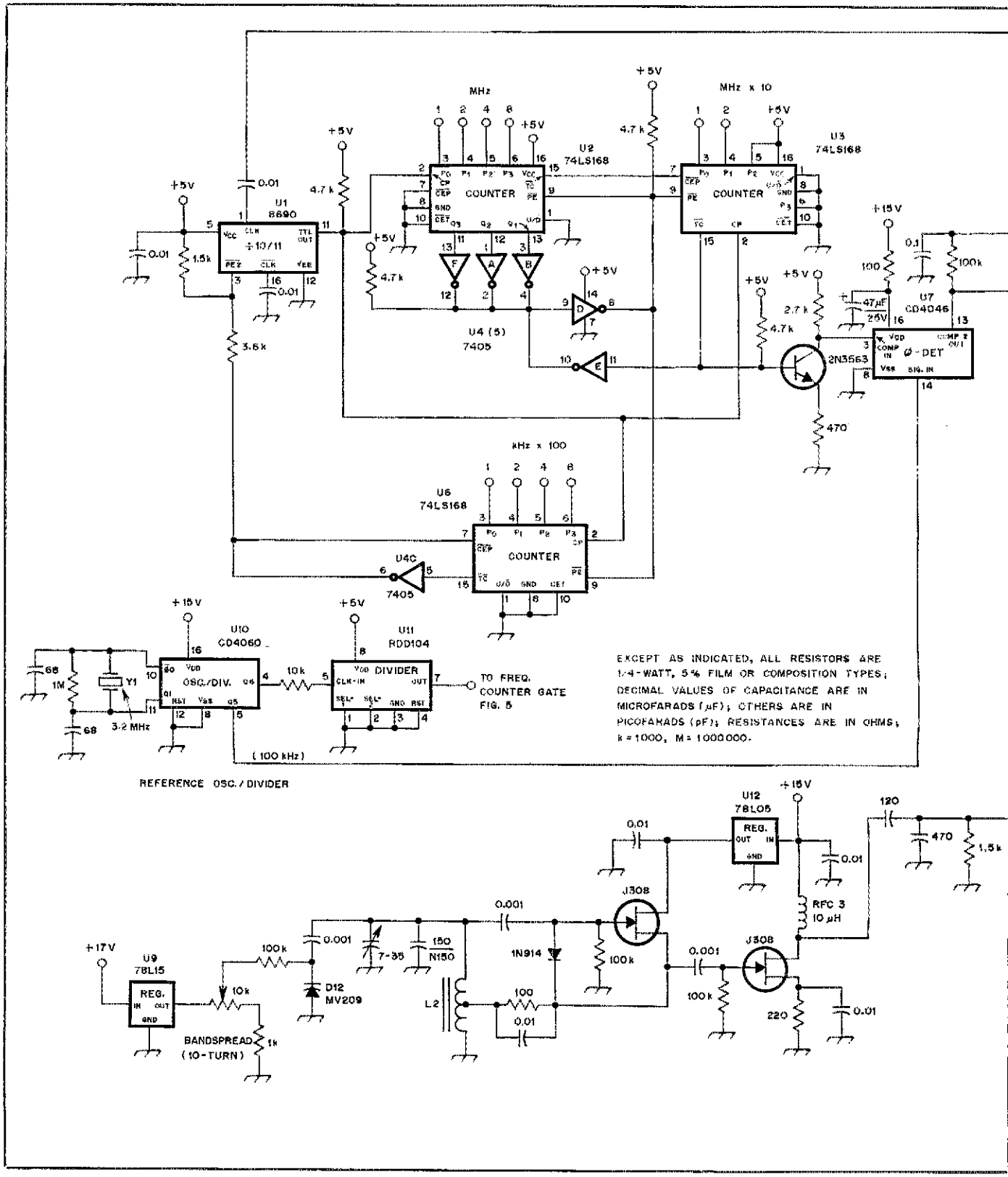


Fig. 4 — Schematic diagram of the synthesizer section of the general-coverage receiver. Numbered components not given in the parts list are for text reference only.

D9 — Motorola MPN3401 PIN switching diode.

D10-D12, incl. — Motorola MV209 voltage variable capacitance diode, 26 to 32 pF.

L1 — 12 turns of no. 28 enameled wire, tapped at 3 turns from ground, on a T37-2 toroid core.

L2 — 41 turns of no. 28 enameled wire on a T50-6 toroid core.

U1 — Plessey SP8690B low-power, programmable divide-by-10/11 IC.

U2, U3, U6 — 74LS168 low-power Schottky TTL presettable up/down counter.

U4 — 7405 TTL hex inverter with open-collector output.

U5 — RCA CA3160 op amp IC.

U7, U15 — CD4046B CMOS micropower phase-locked loop IC.

U8, U12 — Fairchild μA78L05 three-terminal voltage regulator, 5 volts at 100 mA.

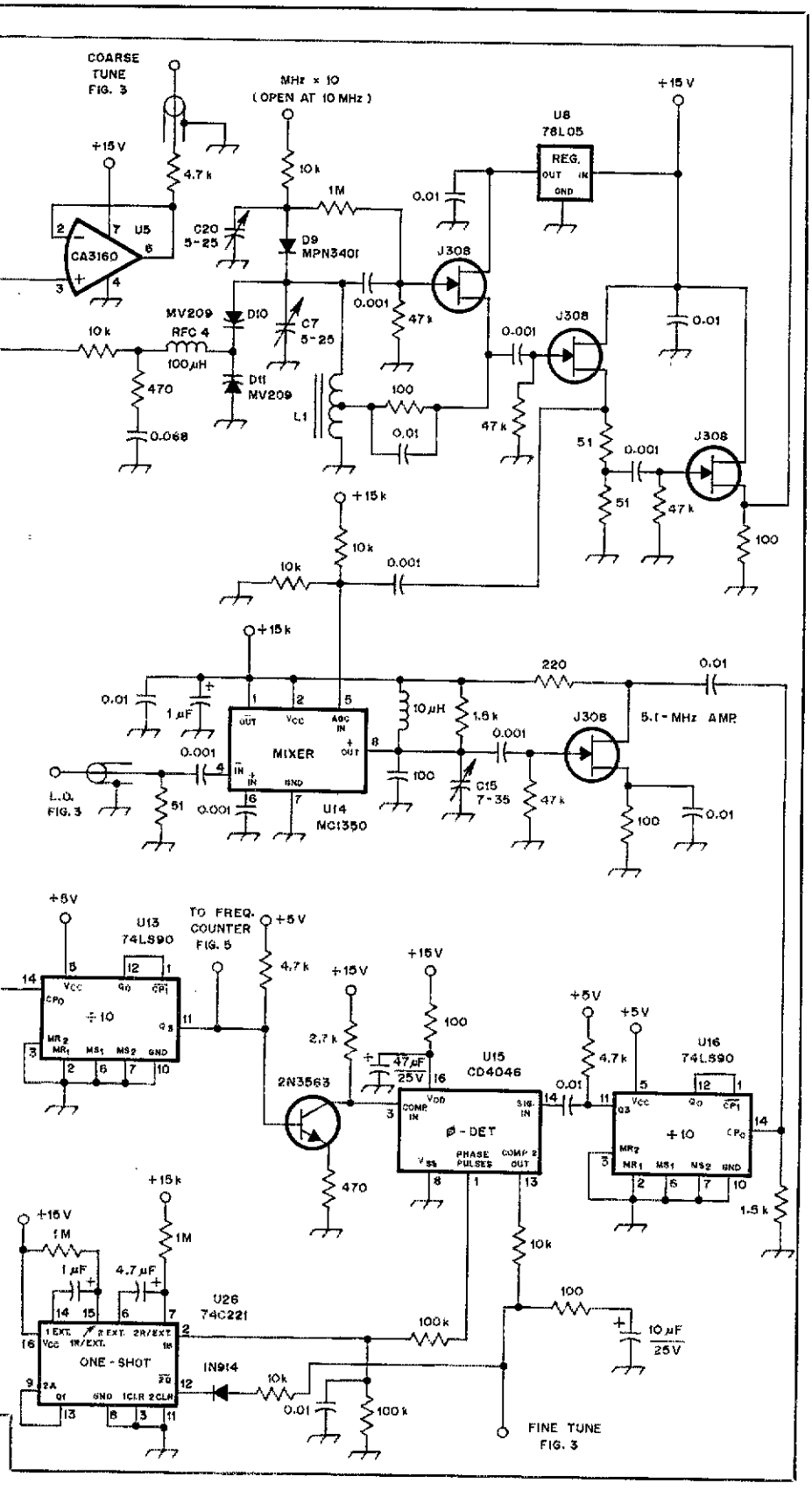
U13, U16 — 74LS90 low-power Schottky TTL decade counter IC.

U10 — CD4060B 14-stage binary counter and oscillator IC.

U11 — RDD104 CMOS selectable decade divider. LSI Computer Systems Inc. (two CD4518s connected to divide-by-10,000 can be used to replace the RDD104).

U14 — Motorola MC1350P i-f amplifier IC.

U26 — 74C221 CMOS dual monostable multivibrator IC.



capacitors and ferrite decoupling beads are mounted on the outside of the boxes. It is particularly important to keep the BFO away from the i-f amplifier and front end. If the isolation between these areas is insufficient, either the agc system will be affected or a healthy signal will be received at the BFO frequency. The box containing the synthesizer is similar to the one housing the rest of the receiver, except that a piece of perforated board is used to mount the digital circuit inside the enclosure. The programming wires to the thumbwheel switches are routed through feedthrough capacitors. The VCOs for the offset and local oscillators are made with very short leads and rigid connections.

A 3 × 8 × 8-inch cabinet houses the receiver, including an ac power supply. Although the small size suggests portability, no special considerations were given to low power consumption. The active mixers, LED frequency-counter readouts, illuminated thumbwheel switches and S meter all consume fairly large amounts of power. The power supply uses several regulators, spread throughout the receiver, to provide isolated sources of power; this too is inefficient. The power requirement is 18 volts at about 750 mA. This requirement is beyond a self-contained battery, but not a mobile installation. I plan to construct a regulated 12-volt to 18-volt inverter, using a high-frequency transistor supply for mobile applications.

The complete receiver is easy to check and tune if the proper test equipment is available. First checks can be made with only the receiver section functioning. The synthesizer will be made operational after the receiver section has been aligned. First, monitor the gate voltage of the 35-MHz crystal oscillator with a high-impedance voltmeter, and adjust L8 for maximum negative voltage. While monitoring with a frequency counter, tune the first local oscillator to 45 MHz by connecting an external variable power supply to the coarse-tune input. At this point, using the a-m detector, a strong signal from the first local oscillator should be received. This should occur with about 2 volts on the VCO control line. If necessary, adjust C8 for a frequency of 45 MHz at 2 volts. Feed a signal, less than 10 MHz in frequency, to the receiver input. Tune it in using the variable tuning voltage from the external power supply. Tune C9, C10, L9, L10 and L11 for maximum S-meter indication. L9 and L10 should then be retuned for best filter response. Switch the receiver from a-m to usb and lsb to check the operation of the BFO.

Now the synthesizer should be connected. If all is operating correctly, the control voltage at the offset VCO should change as the band switch is changed. Adjust C7 for a control voltage of 12 at a band-switch position of 29.9 MHz. Adjust C20 for a control voltage of 12 at 9.9 MHz. Set the tuning control for a VFO frequency of 5.1 MHz (100.0 on the counter) and use a scope to observe the waveform at the drain of the 5.1-MHz amplifier. Set the band switch to 10.0 MHz, and carefully tune C15 for maximum amplitude response.

Observe the dc level at the output of the fine-tune phase detector, and adjust C21 for approximately 7.5 volts. While measuring the dc level of the fine-tune phase detector, change the band switch in 1-MHz steps to 29 MHz. If the voltage

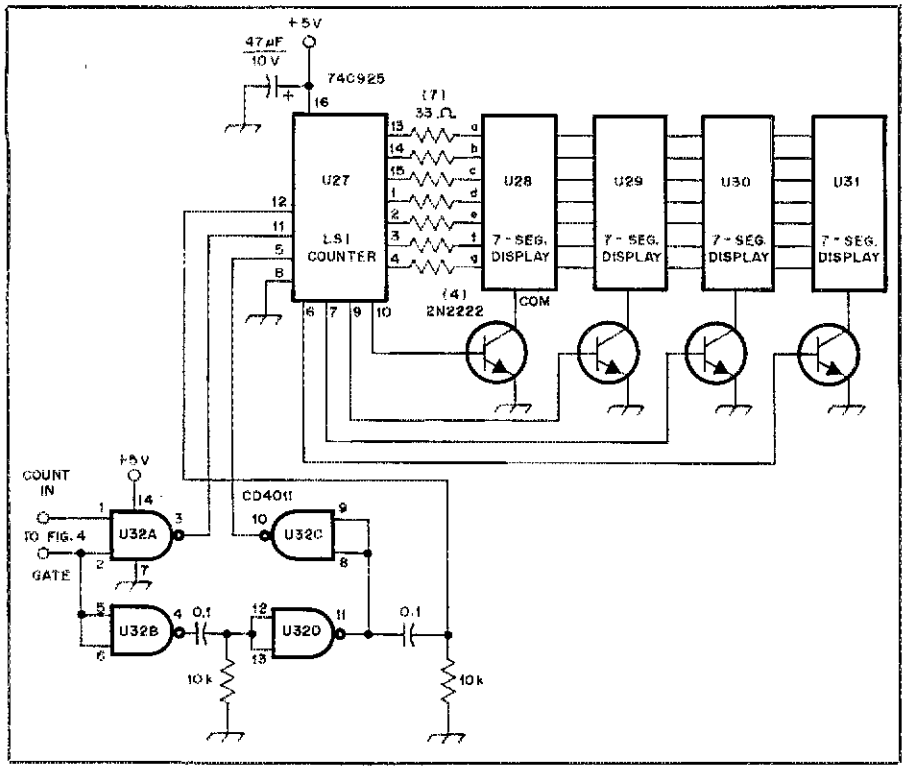


Fig. 5 — Schematic diagram of the frequency readout circuitry. All resistors are 1/4-watt, 5% carbon film or composition type units.
U27 — 74C925 CMOS 4-digit counter with 7-segment output drivers.
U28-U31, incl. — Common-dathode 7-segment LED displays.
U32 — CD4011 CMOS quad two-input NAND gate IC.

goes lower than 1 volt, or higher than 14 volts, readjust C21 until it stays within these limits. Repeat this procedure for 00.0 MHz and 9.0 MHz, using C22.

Performance Evaluation

It is difficult to evaluate a high-performance receiver without the proper test equipment. Fortunately, two calibrated signal generators were available in the author's shop for intermodulation measurements during the development of the receiver. A spectrum analyzer was borrowed for making synthesizer evaluations.

The first step in the receiver evaluation is to terminate the receiver with a 50-Ω load and listen for spurious signals. The expected spurious signals were present, including the constant "birdie" when the band switch is in the 5.0-MHz position. It would be a time-consuming job to test all 300 of the band-switch positions, so a few selected positions, especially those corresponding to amateur bands, were tested. Several spurious signals were heard, but the vast majority of them were too weak to move the S meter, which will deflect on a 1-µV signal. The atmospheric noise will be stronger than most of these signals when an antenna is attached to the receiver. There were a few other spurious signals that were greater than 1 µV in level. They appeared to emanate from the synthesizer. It is possible that additional ferrite beads and bypassing could eliminate these unwanted responses.

A laboratory grade spectrum analyzer was used to evaluate the local oscillator for spectral purity. Because the performance expected of the local oscillator exceeds the capability of the spectrum analyzer local oscillator, the receiver local oscillator should appear as good as a crystal oscillator would to the analyzer. The first look at the local oscillator showed a pair of 60-Hz sidebands about 40 dB down from the carrier. The receiver was operated from a separate regulated power supply, and the 60-Hz sidebands disappeared. Ground loops from the filter capacitors or magnetic-field modulation of the synthesizer were responsible for the sidebands. Either way, the problem can be solved by moving the power transformer, rectifier diodes and filter capacitors out of the receiver case to an external box. In addition to the 60-Hz sidebands, there was a wideband noise spectrum that extended several hundred hertz from the carrier and was 60 dB down. Disconnecting the frequency counter eliminated the noise. Since the counter was not shielded, I feel that enclosing it will eliminate this wideband noise. Fig. 6 shows the spectrum-analyzer display of the local oscillator when the receiver is operated from an external dc supply and the frequency counter is disabled. The display shown is practically identical to that obtained from this spectrum analyzer and a crystal oscillator. What is shown is the noise of the spectrum analyzer; the receiver local oscillator is better than what is shown. The noise level is about 70 dB below the carrier at 100 Hz from the carrier frequency. This would translate to about −76 dB at 1000 Hz.

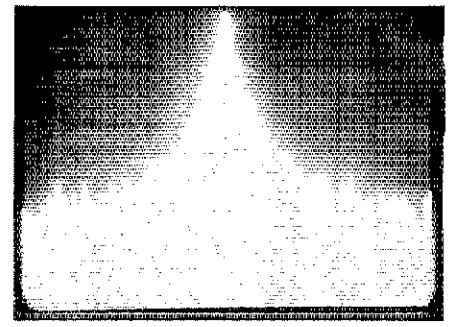


Fig. 6 — Spectrum-analyzer display of the synthesized local-oscillator output. The analyzer bandwidth is 5 Hz, and the scan width is 20 Hz per division. Each vertical division is 10 dB. The measurement of LO noise is limited by the noise generated within the analyzer (see text).

Judging sensitivity "by ear" indicates that a 0.1-µV signal is just discernible. This corresponds exactly to the theoretical value. The required input level is 0.5 µV for a 10-dB signal plus noise-to-noise ratio.

Two signal generators were connected to the input of the receiver through step attenuators. Since the attenuators were simply "Teed" together at the receiver input, each attenuator looked into a load of about 25 Ω. A correction was made to the signal levels to account for this mismatch. When two input signals were applied, separated by 10 kHz, and each at a level of −27 dBm, a third-order intermodulation product could be heard. According to the calibrated S meter, the IMD product was equivalent to an input signal of roughly 0.5 µV, or about the sensitivity limit of the receiver. This corresponds to a third-order intercept of about +17 dBm and a two-tone dynamic range of 94 dB.

The third-order products decrease when the two input signals are separated by more than 20 kHz. This is because only one of the two signals can pass through the first i-f filter and generate IMD in the second mixer. The gain of the first mixer is 6 dB, which implies that the third-order intercept is +17 dBm when the intermodulation is generated in the second mixer. The intercept should be about +29 dBm when generated only in the first mixer. This figure agrees with the measurements made and with the manufacturer's specifications. QST

Notes

[1]U. Rohde, "Synthesized High-Frequency Transceiver," *Ham Radio Magazine*, March 1978.
[2]A. Helfrick, "A High Performance Up-Converting Communications Receiver," *Ham Radio Magazine* (to be published).
[3]D. DeMaw and G. Collins, "Modern Receiver Mixers for High Dynamic Range," *QST*, Jan. 1981.

The Euro-Asia to Africa VHF Transequatorial Circuit During Solar Cycle 21

Part 2: Five-thousand-mile 2-meter circuits explained? Do the theories fit the observations? Where do we go from here?

By Ray Cracknell,* ZE2JV, Fred Anderson,** ZS6PW, and Costas Fimerelis,*** SV1DH

Part 1 of this article appeared in November 1981 *QST*. In that installment we provided the fundamental details of the propagation experiments and defined the kinds of equipment that were used in the tests. This installment concludes the discussion of the work done by the authors.

Doppler-Shift Measurements

Variations in the time taken for a signal to travel from the transmitter to the receiver indicate changes in the propagation medium. A mobile medium will produce changes in the frequency of the received signal, increasing it as the path shortens (a positive shift) or lowering it as the path lengthens (a negative shift). These changes, known as Doppler shifts, were measured by ZS6PW and SV1DH on 144 MHz. Both stations had access to laboratory frequency counters of sufficient accuracy to determine the frequency of transmission and reception to within 10 Hz. They took frequent readings throughout several openings and reported them to each other via a 28-MHz ssb link.

The results varied in a random as well as in a systematic manner. Results of two evenings, when conditions were good enough for measurements to be made throughout the duration of the openings on 144 MHz, are illustrated in Fig. 12. Measurements made on other evenings are shown as dots, and they indicate random variations. Nevertheless, there seems to be a systematic variation where the Doppler shift starts slightly negative and swings to a small positive shift. Then it becomes progressively more negative with a shift of up to 200 Hz at the end of an opening.

The average shift recorded was about 100 Hz negative. This confirmed reports from Cyprus, Zimbabwe and South Africa of a downward Doppler shift on back-scattered signals received simultaneously with a weak ground-wave or tropospheric signal at 144 MHz. It would appear that these systematic, random, short-term Doppler shifts are characteristic of TE on 144 MHz over the Euro-Asia to Africa circuit.

Back-scatter Observations

Although 144-MHz back-scatter reports are rare, available evidence points to a rising or retreating region of the ionosphere from which back scatter on 144 MHz occurs. This is consistent with the observed Doppler shift on such signals. Nowhere along the circuit are the 144-MHz signals observed to return to the earth with sufficient strength to scatter from there and to produce a detectable signal level back at the transmitting site.

By contrast, ZS6PW has observed ground back scatter of 50-MHz signals transmitted from his vicinity at times when multihop F-layer propagation was open to Europe. The regularity of back scatter on 28 MHz is remarkable. In these cases Doppler shift is not present, indicating that ionospheric height is relatively constant.

ZE2JV and ZS6PW, who are separated

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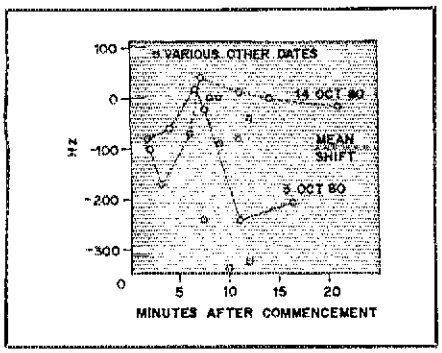

Fig. 12 — Doppler-shift measurements on 144.9 MHz between ZS6PW in Pretoria and SV1DH in Athens.

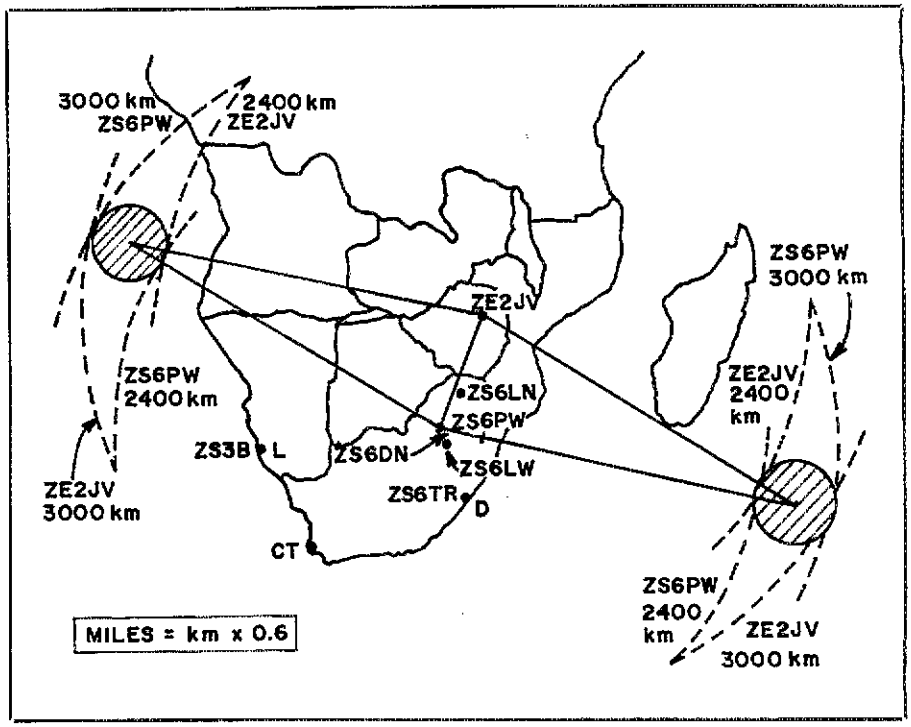

Fig. 13 — Map of Southern Africa showing the locations of ZS6PW and ZE2JV and the optimum areas for back scatter between them on 10 meters. The locations of other 2-meter stations heard in the Mediterranean area are also shown.

by 600 miles (km = mi × 1.6093), have a back-scatter QSO almost every day of the year on ssb on 28,988 kHz at 5 P.M. local time. Their respective 10-meter beacons can be heard at each other's location from early morning until late at night, sometimes outlasting all other signals on the 10-meter band.

Surprisingly, it has been shown conclusively that this back scatter on 28 MHz comes mostly (and perhaps exclusively) from the ground and not, as might be expected, from the ionosphere. ZS6PW observed the pulses from the ZS6DN beacon located eight miles away, and measured the time delay between the ground-wave and back-scatter signals. He found a delay that varied between 16 and 20 milliseconds. This is equivalent to reflection from a distance of 1500-1900 miles, a typical one-hop F-layer range at 28 MHz. At such a distance the ionosphere is wholly below the radio horizon and can not act as the source of back scatter. These results were confirmed by beam-rotation tests between ZS6PW and ZE2JV.

The experiment showed that optimum back scatter was obtained from two areas equidistant from the two stations and within the range indicated. This system is illustrated in Fig. 13. Of the two, the area to the northwest is much more reliable, because it is near the high density area of the tropical ionosphere. Backscatter also comes from the north. The 600-mile difference in distance means that the area best illuminated by ZE2JV's signals does not coincide with the area best seen by ZS6PW's receiver. This leads to weaker and sometimes distorted ssb signals.

Angles of Arrival

Tests between Salisbury and Cyprus during the International Geophysical Year (IGY) revealed that at 50 MHz, Yagi beams tend to lose their directivity in a random manner. The loss of directivity was related to the southward spread of TE signal toward the southern end of Africa. Elevation tests conducted by SV1AB on ZE2JV's 2-meter signals indicated similar random variations. The best signals were received sometimes with a nine-element Yagi elevated at 20 degrees and at others with it horizontal. Reports from 5B4WR indicate occasional preference for a beam heading 15 degrees to the west of the great circle bearing on 144 MHz. ZS6PW and SV1DH conducted tests on 6 meters at times of multipath propagation, as illustrated in Fig. 10 (see Part 1, November *QST*). These showed that turning beams to a more westerly bearing accentuated the longer-delayed pulses.

In these tests the propagation time of the first arriving pulse on 6 meters decreased steadily from about 8:30 P.M. to 9:30 P.M. local time. It disappeared when the delay became 24.3 ms. Fig. 8 (see Part 1, November *QST*) shows that the elevation angle of the wave was then 0 degrees. This means that the ionosphere at the distance concerned had then just dropped below the horizon for $2F_2$ propagation.

Nobody as yet has been able to follow a moving ionospheric target through the course of an opening on 144 MHz. Also, no one has reported a preference for a beam heading to the east of the great circle path. When an opening occurs on 144 MHz, there is an area of the ionosphere that becomes receptive to TE signals. Doppler shifts confirm that it is mobile. Beam tests indicate that the ionosphere target gets smaller with greater distance from the magnetic dip equator. At the limit of the TE range (approximately 2500 miles from the dip equator) it presents a point target on the horizon.

Patterns of Fading and Frequency Spreading

TE signals have a characteristic sound often reported as being similar to signals reflected from aurora. The flutter-fading frequently present on late evening 28- and 50-MHz signals often appears to chop the signal to the extent that Morse signals may become unintelligible. From 70 to 144 MHz the flutter becomes increasingly rapid, giving the signal a raw, ac-sounding note. When frequency spreading is in evidence the signal becomes broad. At times no beat note can be obtained with the receiver BFO. Such a signal only makes an increase in the noise produced by the receiver, with perhaps an accompanying change in the quality of the noise. The signal is, therefore, rather difficult to detect by ear, especially when it is weak.

An assessment of the degree of frequency spreading is largely subjective. The spreading on 2-meter signals is believed to be as much as several hundred Hz. On occasion it is often less than this amount. Figs. 14, 15 and 16, which are sonograms of received signals, illustrate the various fading patterns. They give some indication of the degrees of frequency spreading that are encountered on the 10-, 6- and 2-meter bands over the southern Africa to Mediterranean TE circuit.

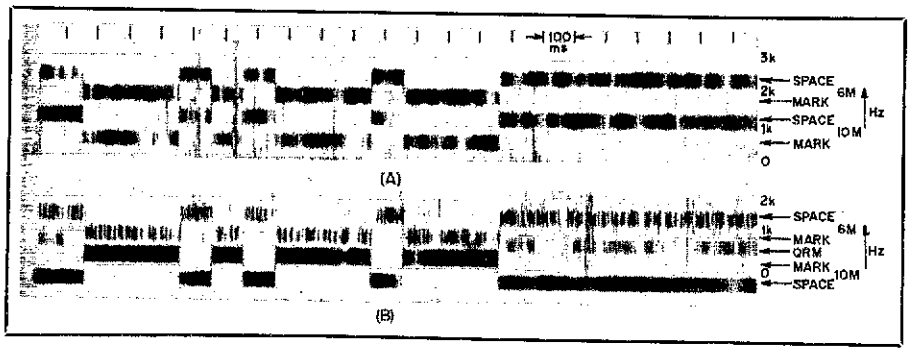

Fig. 14 — Sonograms of fsk signals on 10 and 6 meters from 5B4CY as received by ZS6PW showing (A) moderate amplitude flutter on both frequencies, and (B) a clear signal on 10 meters and severe flutter on 6 meters.

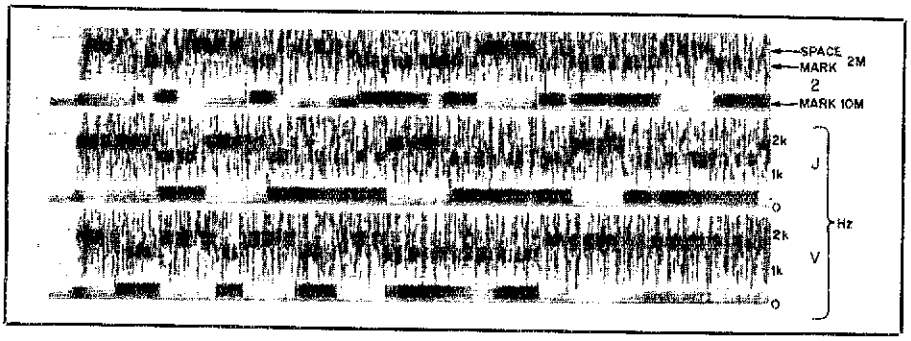

Fig. 15 — A sonogram of simultaneous fsk signals on 10 and 2 meters as received by SV1DH from ZE2JV showing slight flutter on 10 meters and severe flutter on 2 meters. The frequency spreading on 2 meters is not sufficient to make differentiation of the mark and space possible.

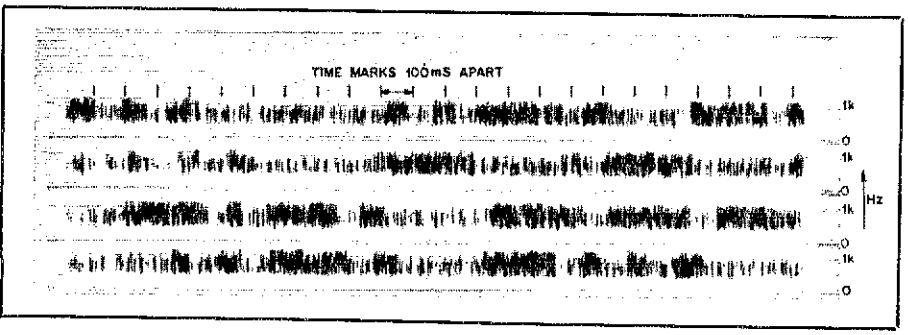

Fig. 16 — A sonogram of an A1 (cw) signal from ZS6DN as received at SV1DH. This signal produced no audible tone with the receiver BFO and was readable only as changes in the noise. It reads, bottom left to top right, FB Costas F.....

Under the best conditions, communication by ssb is marginally possible. A completely clear ssb signal has not yet been heard over the Africa TE circuit at 144 MHz. The rate of flutter and the degree of frequency spreading depend on the frequency of the signal. Variations in the quality of the signal, and the degree of fading and spreading, seem to be random. They do not correlate with loss of beam directivity. Strangely enough, sharpening the beam width does not reduce the degree of flutter and spread.

The Supporting Ionospheric Mechanism

TE is a mode that was not readily explainable by the knowledge of the tropical ionosphere available at the time of its discovery. This invited many unsubstantiated theories and explanations from academic, professional and amateur sources. These can be classified as theories of scattering from one or two areas, theories of tilts and gradients, and theories of ducting under, through or outside the ionosphere.

In 1960, ZE2JV[7] claimed to have isolated three distinct modes of propagation operative between 28 and 70 MHz from Salisbury to Cyprus. These were two-hop F-layer, F-type TE and pure TE. He distinguished them by the characteristics of the signals, their propagation delays and times of occurrence. Two-hop F-layer and F-type TE were described as supported by the high density (HD) zones. HD zones tend to form some 10 to 15 degrees on either side of the magnetic dip equator from about midday. They persist until late at night.

Two-hop F layer ($2F_2$) up to frequencies well above 50 MHz supported circuits between Salisbury and Cyprus. Frequently chordal-hop F-type TE replaced $2F_2$ through the afternoon and early evening. Vhf signals "see" the HD zones as lenses; only half the bending is required for a chordal hop. Frequencies up to a maximum of 90 MHz could be propagated by this means. This mode depends on the horizontal density gradients on the equator side of the HD areas. It is sometimes referred to as "afternoon" or "early evening" type TE and sometimes as the FF mode. The mechanism and seasonal variations are generally thought to be understood and accepted. At that time many investigators thought TE resulted from the rise, breakup and descent of the tropical F region. After ionosphere sunset, "blobs" of ionization persisting in the HD areas scattered and deflected signals.

This late-night or pure TE was the first to be observed. Reports of "scatter" QSOs, back scatter and flutter-fading on transequatorial paths go back to the early 1930s. The name "TE scatter propagation" appeared in Amateur Radio literature until well into the 1960s. By that time, F-type TE became of importance because of the wonderful conditions it afforded on 50 MHz. It is a nuisance as a source of interference on the lower TV channels for four or five years out of every 11-year solar cycle. The strength of F-type TE signals is sometimes greater than the free-space signal strength over a comparable distance. This made the term "scatter" inappropriate, so it was dropped.

During solar cycle 21, pure TE has come back into prominence with record-breaking QSOs on 144 MHz. The possibility of repeating them on 432 MHz becomes apparent. No complete and totally satisfactory theory has yet been advanced. Many theorists tend to oversimplify down to a model that is related to mathematical analysis. This provides explanations for some, but not all, the phenomena that we observed. We have nevertheless consistently maintained that only a much greater knowledge of the morphology of the tropical ionosphere can provide the answers we seek. Without that knowledge, we are, to a large extent, guessing.

Some Recent Research and Proposals

Those who are interested in a

Notes appear on page 27.

theoretical approach to an intriguing propagation problem will find much of interest in the 50-MHz radar research of Woodman and La Hoz at Jicamarca.[8] They report "plumes" and "bubbles" of ionization depletions rising up to a height of 600 miles over the magnetic dip equator. This phenomenon gives rise to prolific 50-MHz backscatter echoes. Rastogi[9] has worked for many years on the tropical spread-F phenomenon. A critical frequency at vertical incidence is no longer apparent on vertical sounders, and diffused returns result. It seems to have a close association with TE regarding times of occurrence. It is present in that part of the ionosphere through which TE is propagated, namely up to 20 degrees either side of the magnetic dip equator.

Aarons and his coworkers[10] describe the dynamics of equatorial irregularity patch formation and decay. They postulate the formation of huge bridge-like structures, 1250 miles in length and a few hundred miles wide. These structures straddle the magnetic dip equator at right angles and align themselves along the magnetic field of the earth. These patches develop toward the west after the setting sun. Once formed, they break off and drift eastward with velocities ranging from 300 to 600 feet per second. They have a life of up to two and a half hours. Heron[11] used a mathematical model to explain the possibility of the depletion bubbles described by Woodman and La Hoz. He suggests they form ducts through the ionosphere, following the lines of the earth's magnetic field, and straddle the dip equator with "cones of acceptance" at each end. This allows for off-line propagation into gigantic natural waveguides. Woodman and La Hoz reported the easterly drift of the background ionosphere, which Aarons also observed. Heron uses this to explain Doppler shifts similar to those we observed. His concept of ducting is illustrated in Fig. 17, with the permission of the author.

Also writing in 1979, ZE2JV and 5B4WR[12] proposed a multiplicity of similar, but smaller, field-aligned ducts in a mobile and turbulent plasma. Small-scale irregularities in the lower levels of the F region also cause spread F. The effect is that of frosted glass. Some of the signal bounces and bends into the ducts, which are changing constantly.

In 1980 Tsunoda[13] published confirmation that the ducts exist. They pass right through the tropical-F region and align along the magnetic field of the earth. Radar on 155.5 MHz from the Pacific island of Kwajalein (magnetic dip latitude 4.3° N) showed depletions within these ducts of as much as 90% and greater than 750 miles in length. They are present in the nighttime tropical ionosphere.

Discussion

Large transequatorial bridges of high-density irregularities, their growth, and subsequent drift and decay is to some extent supported by our observations of multipath propagation and Doppler-shift measurements. Several of these irregularity patches could be reached simultaneously. Aaron suggests that "several patches could be melded together." From this we can visualize various propagation paths, each with its own propagation time and Doppler shift. When the signals from the differing routes are combined, the resultant signal could carry the frequency-dependent rate of fading and the frequency spreading that characterize TE.

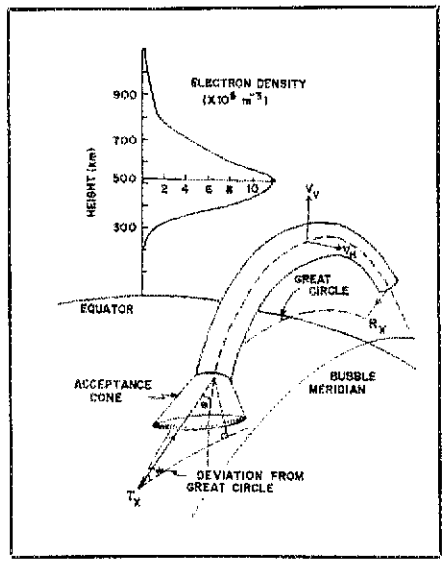

Fig. 17 — The supporting mechanism for TE as suggested by M. L. Heron of James Cook University, Townsville, Australia *(reproduced by permission of the author).*

Although Heron discusses one discrete waveguide, he does not preclude the presence of several such structures. It is perhaps significant that workers in Australia and Africa came independently to the conclusion that only ducting, and not scattering, could account for the very wide band of frequencies propagated by pure TE. It seems that Aaron's findings and Heron's theoretical proposals could be combined to provide a plausible explanation. Both omit spread-F phenomena, and neither could explain the chopping and pulse-splitting action of flutter-fading. To explain these phenomena we envisage ducts that open and close as smaller-scale irregularities and bubbles shift and realign themselves within the larger structures.

Another interesting phenomenon not explained is that on many evenings around 7:30 P.M. local time, signals arriving by F-type TE on 50 MHz fade down or disappear, to be replaced soon afterward by pure TE signals. However, pure TE signals do not obey the usual rules, whereby lower frequencies appear first. Two meters often opens before the return of the 50-MHz signals, which may be delayed up to an hour. The effect is presumably caused by the size of the ducts, the scattering irregularities or the greater penetrative power of higher frequencies. Whenever 144-MHz signals appear, however, pure TE also seems to be operative on lower frequencies later at night. The general rule of a hierarchial fade-out probably holds good although our observations on 432 MHz were too few to confirm this. Fifty- and 28-MHz signals last far too late into the night to be observed regularly.

There are also two major points of disagreement between our observations and the theories we have discussed.

1) The beam heading preference is toward the west rather than the east. Aarons and Heron proposed an easterly drift of the propagating medium. This should lead to a positive frequency shift when it approaches the direct line between stations, and a negative shift as it drifts away to the east. The average Doppler shift was observed to be about 100 Hz negative. This should lead to a preference for a beam heading to the east of the direct line. The opposite was in fact observed. Whenever a preference was noted, it was always to the west, as it would be if the propagating medium were retreating after the setting sun.

2) F-type TE has a longer propagation time than normal two-hop F-layer propagation.

This observation was first noted in 1960; the transponder propagation times reported then were confirmed by recent studies. A simple FF or chordal hop should take a similar or slightly shorter propagation time than two-hop F layer, according to its ray geometry. This is certainly not so, and the propagation times for F-type TE and pure TE are very similar. The question of whether both follow a very similar path has to be considered, but at present current theories can not explain this observation.

Conclusion

High density ionized zones exist 10 to 15 degrees north and south of the magnetic dip equator. These zones account for excellent transequatorial propagation in the 6- and 10-meter bands. Amateurs recently discovered that the ionosphere will support communications at 144 MHz, and at times, up to 432 MHz. These circuits can open between stations located up to 5000 miles apart. The stations must be spaced approximately equidistant from the dip equator, and the line joining them must be perpendicular to the equator. Amateurs situated in optimum areas have a unique opportunity to engage in pioneer research. We have the chance to investigate and to prove or disprove many interesting theories. Such opportunities are rare in radio today.

Our observations and experiments

provide many clues into the nature of this propagation. The final explanation must await the findings of basic research into the morphology of the nighttime tropical ionosphere. This will require resources far greater than those we employed. Ingenuity notwithstanding, the resources required may be beyond the limits of most amateurs. Time will tell.

APPENDIX

ZS6PW's pulses were derived from a 100-kHz oscillator locked to the 100-kHz modulation carried by the 'ZUO vhf link. This 100-kHz signal is of very high stability and is derived from a cesium frequency standard.

Dividing 100 kHz by 7990 gives pulses that are the required 79.9 ms apart. Their timing relative to UTC is set by starting the divider at the correct instant with reference to the UTC second, which is also obtained from 'ZUO.

The basic time interval of the Mediterranean Loran C system is 79.9 ms, and that of the UTC system is 1 second. It follows that 10,000 Loran C periods take precisely 799 seconds. Consequently, every 10,000th Loran C period coincides precisely with every 799th UTC second. Such moments (13 minutes, 19 seconds apart) are called "Times of Coincidence" (TOC).

The Lampedusa data, including tables of TOC, were kindly supplied by the U.S. Naval Observatory in Washington, DC.

Although the distance from Lampedusa to Pretoria is over 4400 miles, the 100-kHz signal can usually be received late at night, and this enabled the accuracy of ZS6PW's timing system to be checked by measuring the time of arrival of the Lampedusa pulse groups in Pretoria. The calculated and measured propagation times were found to correspond within 20 microseconds on most evenings. The application of this system is discussed in Part 1.

Notes

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[2]R. F. Woodman and C. La Hoz, "Radar Observations of the F Region Equatorial Irregularities," *Jnl. Geophysical Research*, Aug. 1976, pp. 5447-5466.

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[5]M. L. Heron, "Transequatorial Propagation Through Equatorial Plasma Bubbles — Discrete Events," *AGARD Conference Proc.*, No. 163, Nov. 1979.

[6]R. G. Cracknell and R. A. Whitney, "Twenty-one Years of TE," *Radio Communication*, 56, June/July 1980 (Part I) and Aug. 1980 (Part II), RSGB, London.

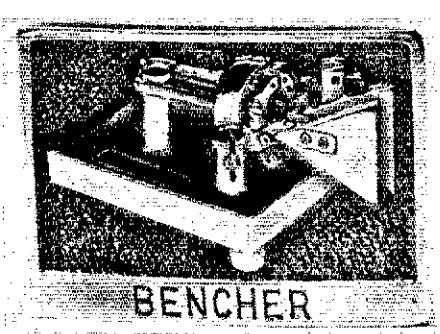
[7]R. T. Tsunoda, "Magnetic-Field-Aligned Characteristics of Plasma Bubbles in the Night-Time Equatorial Ionosphere," *Journal of Atmospheric and Terrestrial Physics*, 42, Aug. 1980, pp. 743-752.

New Products

BENCHER BELT BUCKLE FOR CW OPERATORS

There's always "something new under the sun," but who'd ever expect a belt buckle that was designed specifically for radio amateurs? "Seeing is believing," if I may borrow another cliche. An unsolicited parcel arrived on my desk from Bencher, Inc., and upon opening it I was pleasantly astonished to perceive a bright, rugged belt buckle that exhibited the very paddle I use in the home station, a Bencher.

The paddle on the buckle is raised to give a three-dimensional format. A check of the weight (no pun meant!) indicated that the buckle tipped the scale at approximately 4-1/2 oz (140 g), which makes it substantially heavier than any of the numerous buckles I have collected in recent years.

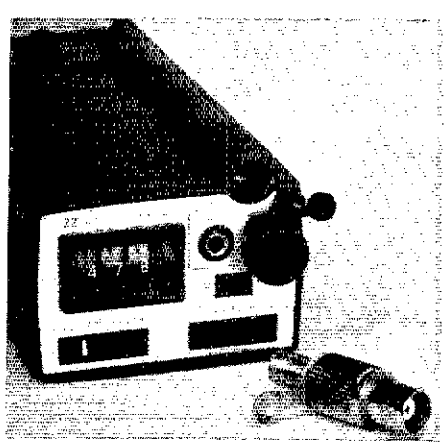


When I wrote an acknowledgment letter to Bob Locher, W9KNI, of Bencher, I said in a jocular fashion, "Not only is the big buckle beautiful, but it would be excellent for street fighting!" Bob came back with, "Cw operators are gentle people. They don't engage in street fighting." At any rate, it is a pretty object, and is done in a high-gloss, yellow-bronze motif. It seems like just the thing to wear to hamfests, conventions and club meetings. If you wear it where hams aren't present, you'll be asked some interesting questions about what that "funny emblem represents"!

The price is $7.95, plus $1 for shipping and handling, from Bencher, Inc., 333 West Lake St., Chicago, IL 60606, tel. 312-263-1808. — *Doug DeMaw, W1FB*

ANTENNA ADAPTER FOR TEMPO "S" PORTABLE TRANSCEIVERS

Henry Radio is manufacturing and selling an antenna adapter for the Tempo "S" series synthesized portable transceivers. It converts the 5/16-32 threaded antenna jack to a standard BNC type. This permits the user to connect RG-58/U coaxial cable directly to the S1, S2, S4 or S5 without fear of damage to the radio. The adapter is sturdier and less susceptible to damage than is the built-in miniature phone jack used for external antenna connection. Ground connection is made by means of an indented lug that rests against the grounded portion of the antenna jack. Tempo owners who frequently use external antennas will find this adapter useful. Price class is $10. For further information, contact: Henry Radio, 2050 S. Bundy Dr., Los Angeles, CA 90025. — *Peter O'Dell, KB1N*



Antenna adapter for the "S" series synthesized portable transceivers. The threaded portion makes contact with the center conductor while the lug provides the ground connection.

Build a Gossamer Quad

Can the wire loops of a quad antenna survive without being supported by several hundred pounds of tower, mast, boom, spiders and spreaders? Sure! A seven-pound "gossamer quad" will sway in the wind, but it won't break.

By R. F. Thompson,* W3ODJ, ZF2CD

Gossamer antennas may become popular alternatives to the massive tower/mast/boom structures usually associated with beam antennas for the 10-, 15- and 20-meter bands. Rapidly rising costs of metal towers have caused some radio amateurs to look for other ways of supporting beam antennas at effective heights. Since the weight of a beam antenna is a principal factor, ways of making the antenna lighter are to be considered. The minimal weight of the gossamer places this antenna in the foreground in this respect. The essential parts of a two-element monoband quad are the two copper-wire loops that weigh less than 2 pounds (kg = lb × 0.4536). Conventional use of several hundred pounds of "passive" metal to support a few pounds of "active" copper seems absurd.

This article describes the evolution and construction of a two-element gossamer quad that began as a vacation exercise and has since developed into the main 20-meter antenna at W3ODJ. Presently, the antenna is made of copper wire, four wooden poles and a fiberglass pole. Two trees and a pair of nylon ropes elevate the antenna 50 ft (meters = feet × 0.3048) in the air. Another pair of ropes provides a means for steering the antenna around the compass. Although the total weight of the antenna is less than 10 lb, it has survived all weather to date, including winds reported to exceed 50 mi/h. It can be fabricated to fit into a ski case for easy transport.

Gossamer Evolution

Over the years, many radio amateurs have put up dipole antennas between trees, hoisting simple rigging into or over tall trees by throwing weighted lines, casting with rod and reel or launching a light leader line with bow and arrow.[1] Gossamer design begins with the observation that the same light rigging supporting a dipole can support one or more additional dipoles as well. If the dipoles are kept parallel and spaced properly, then a fixed-direction wire Yagi beam can be made. A recent example of a three-element gossamer Yagi is the "Ten Dollar Disposable 15-Meter Beam," described by Bruce Burnham, C6ADN, in November 1980 *QST*.[2] He supported his Yagi between two trees by means of two ropes. Two lengths of PVC tubing kept the three wire elements properly spaced and parallel. His gossamer beam survived Hurricane David with only minor damage.

Considered as a mechanical structure, a

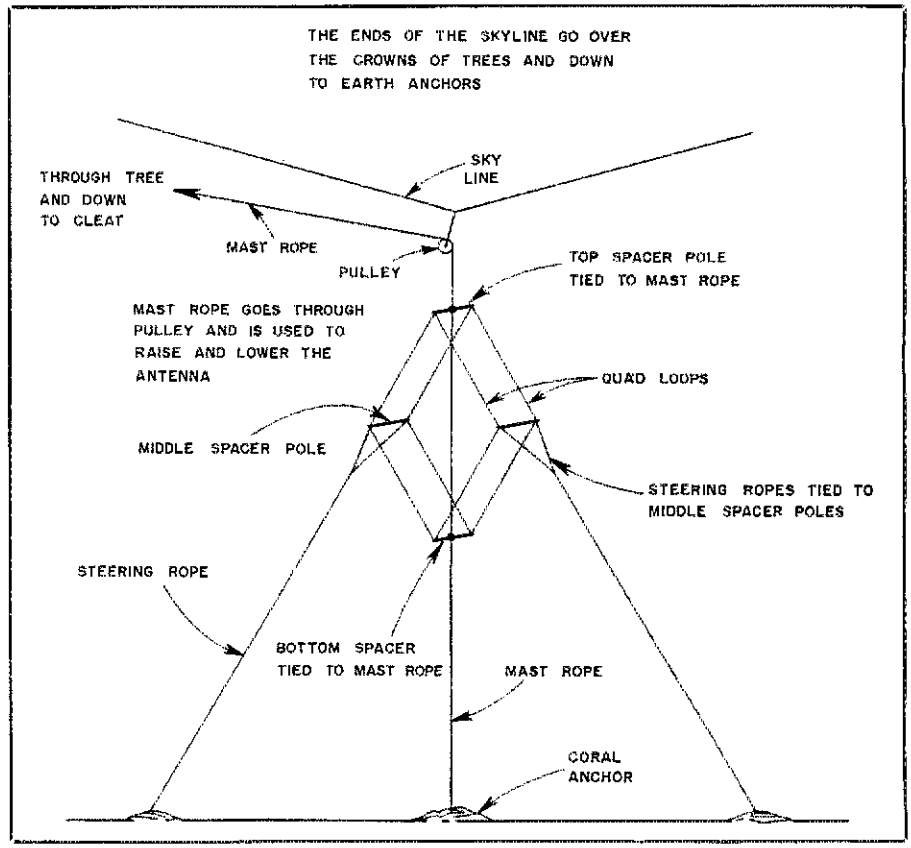


Fig. 1 — The two-element, 20-meter Cayman quad. Quad loops are pulled out into a diamond shape by the steering lines. The spacer poles are 9 feet long. The distance between opposite spacers (not critical) is 25 feet. See text for loop dimensions. Feed point for the driven element is at the bottom. A quarter-wave, 75-ohm matching section (not shown) is used.

[1]Notes on page 31.

*Rte. 7, Box 31, Waldorf, MD 20601

dipole antenna rigged between two trees is a suspension wire holding up several pounds of coaxial cable. Replace the dipole wire with rope and the center insulator with a pulley and you have a "sky line" and "sky hook" that can hold up the several pound weight of a gossamer quad antenna. The quad hangs like a pendulum from the pulley. A pendulum is naturally stable; displace it from equilibrium and gravity restores it to equilibrium. Conventional quads are supported by a tower that, to some degree, acts as an inverted pendulum. An inverted pendulum is unstable; displace it from equilibrium and gravity pulls it down. Towers must be massive to overcome the instability. By simply replacing the massive tower with a thin mast-rope, the gossamer quad gains natural stability, construction is simplified and the expense of owning a quad is greatly reduced.

Since the antenna is supported from above, tension in the wire loops can support light spacer poles that separate the loops and keep them parallel. Thus, the loops are both mechanical and electrical elements in the gossamer quad. The top and bottom spacer poles are tied to the mast rope, which extends upward through the pulley for hoisting the antenna to the sky line.

Prototype — The Cayman Quad

In June 1980, Paul Schmid (W4HET, ZF2BN) and I made a vacation DXpedition to Grand Cayman Island. Our Cayman QTH provided tall trees and a wide clearing, just right for gossamer experiments. One end of a 40-meter dipole was rigged by nylon rope stretching 50 ft across a clearing to a pine tree. A pulley at the midpoint of that sky line was the sky hook for a 20-meter gossamer quad.

On the flight to Cayman, I took eight quarter-inch diameter wooden rods as carry-on luggage, all taped together rather like a poor man's walking stick. Pairs of these sticks joined by 1-ft lengths of snug-fitting PVC tubing were used as 9-ft spacers between two quad loops. All the PVC tubing, wire, coils of rope and coaxial cable had been packed with clothing in a suitcase. The sides of the loops were pulled into a diamond shape by light ropes sloping down to the ground and held in place with large sand-filled conch shells and shards of coral. (See Fig. 1.) The first time the antenna was pulled up to the sky line, it was obvious that the top spacer would not support the antenna. As a replacement, two mop handles obtained from a local supermarket were spliced together with filament tape and placed in the antenna. The completed array included 1.75 pounds of copper wire, plus approximately 5 pounds of rope, PVC tubing and sticks. The entire quad weighed less than a pair of heavy-duty spiders used in conventional quads.

There are two noteworthy features of this Cayman design. The Cayman quad can be rotated by picking up the conch and coral and then walking in a circle. Furthermore, the entire antenna can be assembled on the ground and pulled up to the sky line by the mast rope that passes through the pulley. Any part of the antenna can be lowered rapidly to shoulder height for adjustment or repair.

On the ground, the assembled Cayman quad looked like a great fragile tangle. Winds gusting from the sea delayed the first hoisting, but that delay later seemed unnecessary because once the antenna was pulled up to the sky line, the quad withstood winds the likes of which are seldom experienced in Maryland. The dynamic stability (ability to withstand strong winds) of the Cayman quad was impressive. Neither the copper wire nor the 9-foot sticks had significant wind resistance.

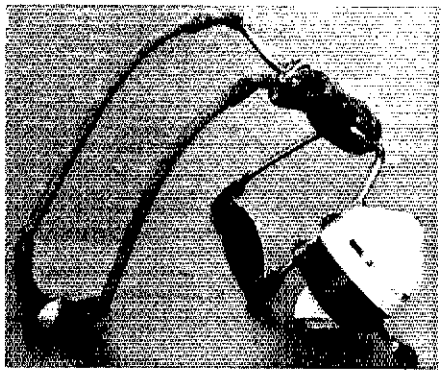
The bottoms of the loops were only 6 feet above the sand, but the quad was a great performer. Paul was working numerous European stations when the quad was ready for the first test. We therefore aimed the antenna at Europe, a move that enabled us to compare it with a vertical antenna located on the beach. When switching rapidly between the two antennas, received signals from Europe were at least two S units stronger on the quad.

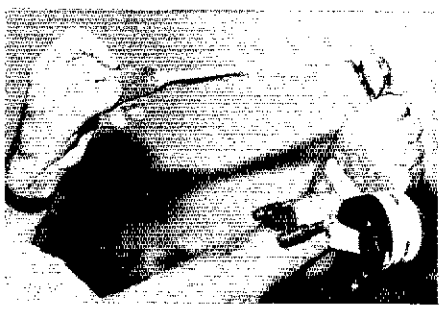
This was the first 20-meter beam I had ever used. It gave such great performance for so little money and effort that I decided to try it at home. I left the disposable walking-stick spacers on Cayman, repacked the wire and ropes, and hand carried the large conch shells on the flight home (they make great gifts!).

Gossamer Construction

Back home, the Cayman quad was installed between two oak trees at a height of 50 ft. The sky line was launched by taping light monofilament nylon fishing line (15-lb test) to an arrow that was then shot over the tree crowns by means of an archery bow. This light leader line in turn served to pull the ends of the 1/4-in. nylon sky line over the crowns and down to the earth anchors.[3] Another nylon rope goes through the pulley that is attached to the sky line. From the pulley this rope extends vertically down to become the "mast rope" on which the antenna is constructed. The other end of this rope passes over the nearest tree, and then down to a cleat. This end of the rope is used to pull the antenna up or lower it. If the hoisting end of the mast rope is returned straight down from the pulley, the vertical load on the sky line is doubled, and the additional sky-line sag would cause an unnecessary loss of antenna height.

The antenna is so easy to raise or lower that several design changes resulted in the antenna's becoming a remotely controlled rotating quad. Now, the top spacer is a 1-1/4 in. (mm = inches × 25.4) diameter wooden closet pole. The lower spacers are made of 3/4-in. square wood stock. Each of these is treated with two coats of white latex paint. Insulators for attaching the quad loops were formed by wrapping Scotch-88 electrical tape around the ends of the spacers (Fig. 2). A groove was





Small hose clamps are used to attach a casting reel to the wrist bracket of a slingshot. Monofilament nylon line tied to a 1-ounce (0.8 g) sinker is easily shot over any tree. The line can be rewound for repeated shots, and it is used to pull a heavier line over the tree when a suitable path through the tree is found.

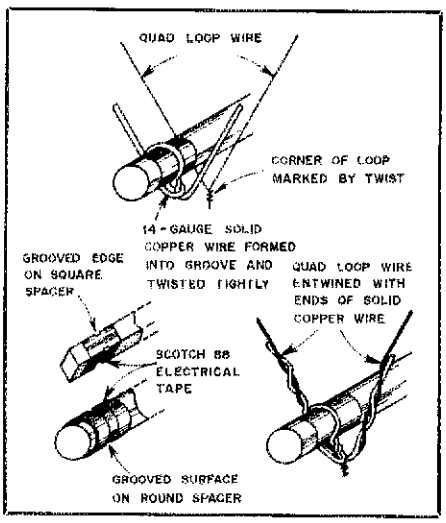


Fig. 2 — The quad loops are secured to the spacers by entwining the loop wire with solid copper wire that has been formed into grooves in the wooden spacers. The spacer ends are first wrapped with Scotch-88 tape, and the grooves are then formed by placing the shaft of a round nail or drill on the tape and "whacking" it with a hammer.

formed in the wood beneath the tape by placing a nail lengthwise (not the point) on the tape and striking the side of the nail with a hammer. A short length of no. 14 solid copper wire was formed into the groove and twisted tightly, leaving the free ends 3 or 4 inches beyond the twist. During construction, the quad loops were fastened to the spacers by twisting these free ends around the loop wire.

At first, the steering lines were anchored by bricks on a large steering circle, but several backyard obstacles prevented 360° rotation. A smaller circle without obstacles could be used if the steering lines did not have to pull the loops into a diamond shape. Therefore, one major addition to the Cayman design is a 27-ft spreader (Fig. 3), which pushes the two middle spacers to opposite corners of the diamond. This pole consists of two telescoping fiberglass poles that extend from 6 to 16 ft. These weigh only 1.25 lb each. Skylane Products Co.[4] filled our order for them. Aluminum angle stock and hose clamps are used to join the poles end-to-end. The telescoping sections are extended and clamped for a combined length of 27 ft.

Both middle spacers are strapped to wood blocks drilled for snug passage of a short length of copper water pipe having one capped end (Fig. 4). Hose clamps fix the position of the block on the pipe. The spacers are mounted on the spreader by slipping the copper tubes over the ends of the spreader pole. This spreader and the top and bottom spacers can be tied to double bowlines in the mast rope. If you are not too familiar with double bowlines, ask a Boy Scout or Girl Scout, check a Scout manual or seek the aid of a mountain climber. Practical information on ropes and knots may also be found in books on mountaineering. Knowledge of knot tying and ropes can be most useful in constructing a gossamer and other antennas.[5] With the spreader pole in place, the steering lines can be brought to opposite points on a 13-ft-diameter circle on the ground. The steering procedure becomes much easier by tying the steering lines to the ends of a pole and pinning the center of the pole with a cinder block. Then the steering procedure is simply a matter of removing the block, rotating the pole and replacing the block.

Recent improvements include the placement of a vertical cedar pole under the center of the antenna, installation of a rotator atop the pole and putting a 13-ft steering pole on an 18-in. wooden mast attached to the rotator. A small length of PVC tubing is strapped to the short mast. The mast rope is passed through this tubing and is wrapped around the cleat on the cedar post to immobilize the pendulum. Light ropes are attached from the center of the bottom spacer out to the ends of the steering pole, and from the rotator mast out to the ends of the bottom spacer.

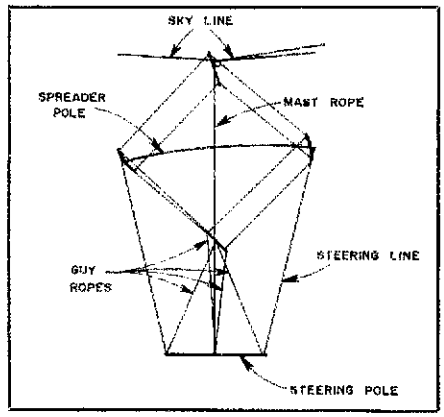


Fig. 3 — The gossamer quad is a slightly modified Cayman quad. Less steering room is needed if a spreader pole is added to push the loops into a diamond shape. The steering lines can be tied to a steering pole anchored on the ground or attached to a rotator. Guy ropes between the bottom spacer and steering pole steady the diamond in strong winds.

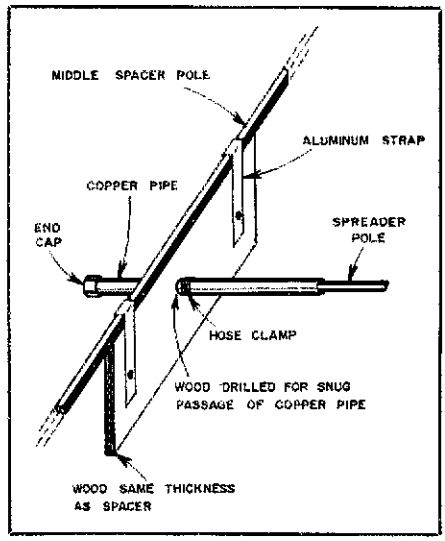


Fig. 4 — A spreader/spacer bracket is strapped to each middle spacer pole and slipped over the ends of the spreader pole. A hose clamp limits the motion of the board on the pipe.

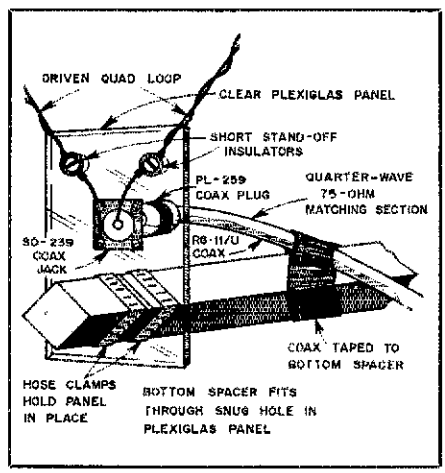


Fig. 5 — The coaxial-cable feed-point fixture is made of clear Plexiglas and slips onto the bottom spacer.

These four guy lines steady the lower part of the antenna and help maintain the diamond shape in strong winds. Although the steering pole for this antenna is 14 ft above ground, any height above heads and clotheslines would be satisfactory.

Cutting, Shaping and Feeding Loops

Quad dimensions are not very critical.[6] The loops are cut to length and spaced for f = 14 MHz according to published formulas.[7]

Length of one side of driven radiator: 250/f = 17.86 ft.

Length of one side of closed reflector: 258/f = 18.43 ft.

Spacing between loops: 118/f = 8.43 ft.

The loop wires are twisted to mark the four corners. (See Fig. 2). When the loops are formed into a diamond with square corners, the horizontal and vertical diagonals are close to 25 ft long. The spreader pole has to be 27 ft long to overcome spreader-pole droop and to allow for the spreader-spacer brackets. But again, this is not critical. In fact, the quad might have more gain if the vertical diagonal is longer than the horizontal diagonal (side lengths same as above). Loop gain depends on the separation between current maxima. These occur at the top and bottom corners when a diamond loop is fed at the bottom corner. Folke Rasvall, SM5AGM, has been told by his computer that a one-wavelength diamond with equal diagonals ought to have 1-dB gain relative to a half-wave dipole[8] (the corresponding element in a Yagi beam antenna). But if the vertical diagonal is made three times longer than the horizontal diagonal, so that the loop looks like a thin ARRL emblem, then the loop ought to have about 1.7-dB gain. The trade-off is more gain at the expense of reduced bandwidth and lower input impedance. The spreader pole on a 3 to 1 diamond would be only about 12 ft long, and the feed point would be 35 ft below the top spacer.

A quarter-wave section of 75-ohm coaxial cable was carefully pruned to 14 MHz using a grid-dip meter. This matching section is inserted between the 50-ohm feed line and the feed point at the bottom corner of the radiator loop. (See Fig. 5.) Minimum SWR ocurs below 14 MHz. The loops could be shortened to improve the SWR profile over the 20-meter band. What the transmitter "sees" is a standing-wave ratio of 1.4 to 1 at 14 MHz, and 1.9 to 1 at 14.35 MHz. No attempt has been made to optimize the quad for gain or front-to-back ratio, but when it is aimed correctly the received signals are usually two S units stronger on the quad than on either a vertical or a dipole.

Trees and Ropes

One ice storm lowered the quad two feet, the height loss resulting from droop-

ing tree crowns and a sagging sky line. But, because the mast rope and guy lines are rigged for rapid adjustment, the antenna can be trimmed in a few minutes for prevailing conditions. The mast rope is wrapped around the cleat on the cedar post. Clothesline tighteners having spring-loaded cam wedges are used to adjust the guy lines.

Trees "eat" rope. Prolonged abrasions from rough tree bark can eventually sever the rope. To minimize wear, ropes should be routed for the least contact with the tree. The abrasion problem can be reduced by choosing suitable rope. A given amount of abrasion weakens a thin rope relatively more than a thicker rope. Good manila rope loses more strength to abrasion than does good nylon rope, but some inferior nylon ropes have poor abrasion resistance.[9] Several hundred feet of 1/8-in utility nylon takes little space in a suitcase and is probably adequate for a temporary expedition installation. For a permanent antenna, however, a good choice is 1/4-in. Mountain Climbing Goldline, an economical, high-quality nylon rope of three-strand, hard-lay construction, which (as this is written) costs about 15 cents per foot. It is sold by Recreational Equipment, Inc., Seattle, WA 98188.

Recently, Alan Hack, WA5VLX, suggested that the best way to get an antenna into a tree is to use a slingshot and casting reel combination such as developed by Robert Cowan, K5QIN.[10] In rerouting the mast rope I found that method definitely superior to using a bow and arrow. A one-ounce sinker painted yellow makes highly visible ammunition for the sling shot. Load the reel with fluorescent monofilament nylon, and the path through the tree is easier to see.

Comments

The gossamer quad is not a rigid structure. It bends against a strong wind rather like the venerable oaks that support the sky line. The steering is soft, and the antenna yaws at sudden gusts. No doubt there exist locations subjected to frequent gales where gossamer antennas often might be useless, but in Waldorf, Maryland, the author's quad has remained 100% usable in all weather experienced to date.

Some local ordinances against having beam antennas might not apply to a gossamer quad since there is no "unsightly" tower, and no mast or boom. One thin sky line below the tree line is less conspicuous than a dark swath of telephone or power lines, and a light-colored sky line is virtually invisible in many aspects of daylight. It is usually difficult to see the loop wires. Often the spacer poles seem to float magically in the air.

The quad will reward all efforts to rig it as high above ground as possible, but it does not have to be very high to outperform dipole and vertical antennas. Any radio amateur who can get a dipole 40 ft or more in the air can rig a sky line in its place. If there is a suitable clearing under the sky line, a two-element gossamer quad can replace the dipole and provide noticeably better results.

Acknowledgment

Paul Schmid (W4HET, ZF2BN), helped reactivate W3ODJ after many years. His enthusiasm for operating on Cayman convinced the author to join in the fun. Paul also encouraged the writing of this article. Thanks, Paul! QST

Notes

[1] *The ARRL Antenna Book* (Newington, CT: ARRL, 1976).
[2] B. Burnham, "A 15-Meter Beam for $10," *QST*, Nov. 1980.
[3] See Note 1.
[4] Skylane Products, 406 Bon Aire Ave., Temple Terrace, FL, 33617.
[5] W. Wheelock, *Ropes, Knots and Slings for Climbers* (La Siesta Press, 1967). Available from Recreational Equipment, Inc., Box C-88125, Seattle, WA 98188. Price in 1980: about $2.
[6] See Note 1.
[7] W. Orr, *All About Cubical Quad Antennas* (Wilton, CT: Radio Publications, Inc.).
[8] F. Rasvall, "The Gain of the Quad," *Radio Communication*, Aug. 1980, p. 784.
[9] H. Manning (Editor), *Mountaineering*, 2nd ed. (Seattle: The Mountaineers, 1967).
[10] A. Hack, "The Best Way to Get an Antenna into a Tree," *Ham Radio*, March 1981, p. 84.

Strays

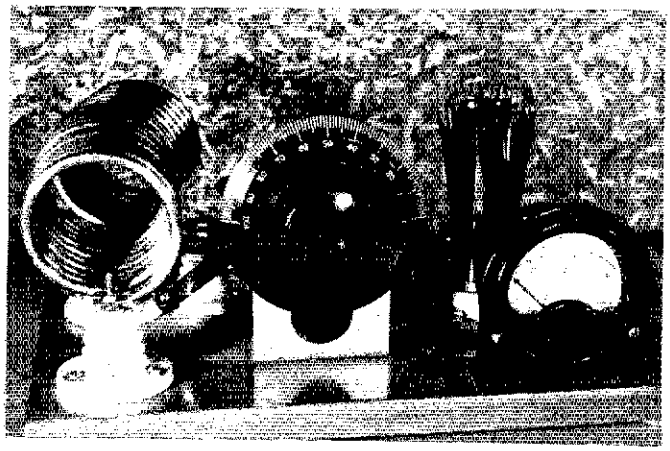
I would like to get in touch with . . .

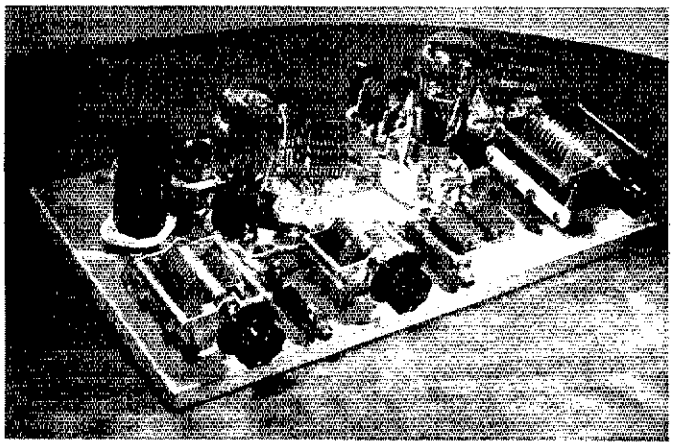
☐ anyone who has a collection or file of troubleshooting and maintenance information about the Heath SB-303 receiver and the Heath SB-401 transmitter. I will pay reproduction and postage costs. John Carter, KT6R, 412 Jamaica Way, Bakersfield, CA 93308.

☐ amateurs with a knowledge of and interest in the old WRL Galaxy V transceivers and accessories. Mike Flowers, KA3FJD, 1022 Woodland Way, Hagerstown, MD 21740.

☐ amateurs with information about the HW 12-22-32 Triband conversion made by Dynalab. Jim Fyles, WBØCZI, 820 El Paso Blvd., Denver, CO 80221.

☐ hams who are also teachers of electricity, electronics or industrial arts courses, to start an 80-meter net to discuss new projects. John Nenning, Industrial Arts, W. D. High School-Beckman Annex, Dyersville, IA 52240.





Gary Legel, N6TO, built these replicas of his first transmitters, a 59 Tri-Tet crystal oscillator and 301 amplifier (left), and the more modern Hartley 210 (right). Interest in nostalgic equipment is rising, and rigs such as these are cropping up with greater frequency. *(photos courtesy N6TO)*

Build this Extended, Expanded Collinear Array

Liven up the "Lazy H" and put it on its feet. Have a ball with this broadband beam for 2 meters.

By Walter W. Schmidt,* W2EA

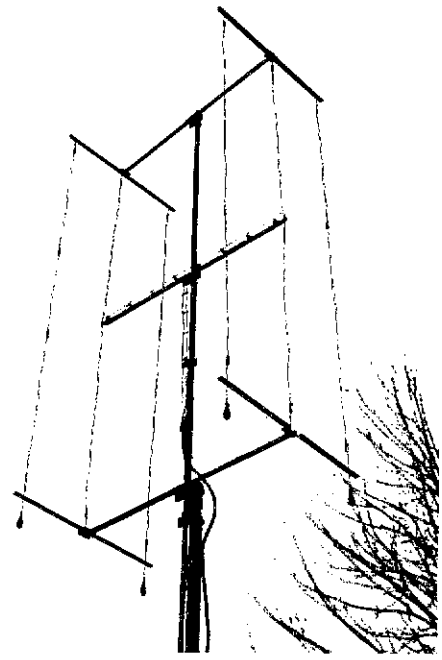


Fig. 2 — The extended, expanded collinear array in place. The wire elements terminate in insulators made of 3/8-inch Teflon rod. Monofilament fishing line is used for vertical spacing between parasitic elements. Four 8-ounce fishing sinkers are used to provide even tension on the parasitic elements.

I had a problem! For more than 25 years I have been operating in the vhf bands, first on a-m and later using cw and ssb. Horizontal Yagi antennas had worked fine until two developments combined to limit their usefulness: I began using fm repeaters, and I became a member of New Jersey Army MARS. I needed a vertically polarized antenna. It would have to be broadband, as Army MARS repeaters have their inputs on 148.010 MHz and their outputs on 143.990 MHz. My antenna would need fairly high gain; I live in southern New Jersey about 6 miles[1] southeast of Philadelphia, and wanted to use a MARS repeater in the northern part of the state. That repeater is 72 miles away in mountainous terrain with the antenna only 30 feet[2] above the ground.

I considered a multielement Yagi, but quickly discarded that idea because of the narrow bandwidth. Antenna designer E. M. Brown, W2PAU, former vhf editor of *CQ*, suggested several antennas that might do the job. They were the W8JK array, coaxial sleeve dipoles with reflectors and directors, and the "Lazy H."

My research indicated that the "Lazy H" would meet my requirements, and I could build it using only hand tools. The basic design is found in *The ARRL Antenna Book*.[3] It is an array consisting of two pairs of collinear half-wavelength elements; all of the elements are driven in phase. To provide vertical polarization the H would not be "lazy," of course; the four driven elements would be mounted vertically.

Design Details

Maximum gain is obtained with a pair of collinear elements when they are spaced at 0.625 λ. That is the spacing between the sides of the "Unlazy H." Brown suggested a way to get a bit more gain, and the *Antenna Book* confirmed it. All I had to do was extend the length of the collinear elements (sides of the H).[4] Each side of the H would now be composed of two elements 0.64 λ long instead of 0.5 λ. That resulted in one additional decibel of gain (3-dB gain over a dipole) for each pair of elements. Two 0.64-λ elements driven in phase form the extended double Zepp. Based on that information, I decided to build my antenna design around a vertical or "Unlazy H." The sides would be a pair of extended double Zepps, and they would have a spacing of 0.625 λ between them.

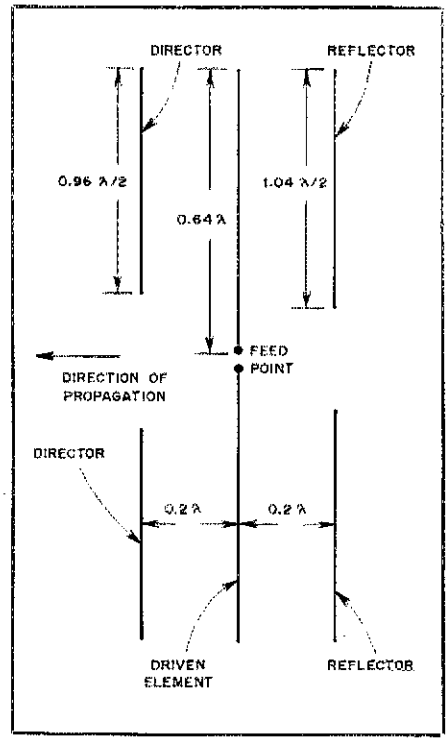


Fig. 1 — A drawing of half the antenna. The extended double Zepp may be thought of as two end-fed driven elements. When a parasitic reflector and director are added to each of these, a 12-element array is the result . . . and the results are good.

A *QST* article by Reisert[5] confirmed that this was the basis for an effective antenna. He described an extended, expanded collinear antenna array with optimum-gain spacing between collinear element pairs. That is essentially what I have made. It should be noted that with collinear elements of 0.64 λ, the spacing between current maximum points on the pair is about 0.78 λ. (This is an extended double Zepp.) The increased spacing (from 0.5 λ) is the reason for the increased gain.

I decided to increase the gain further by adding parasitic elements to each of the four driven elements. To do this, I cut four directors for the high-frequency end of the 4-MHz-wide band and four reflectors for the low-frequency end. The spacing between the parasitic and driven elements was set for 0.2 λ at 146.0 MHz. This gave me a 12-element, unidirectional array. See Fig. 1.

Construction Technique

Fig. 2 shows how the antenna was

[1]Notes appear on page 33.

*709 E. Graisbury Ave., Haddonfield, NJ 08033

actually built. A wooden center-support pole was employed to minimize the effects on the antenna pattern. I wrapped the pole with fiberglass tape and coated it with resin to seal it against the weather. Two aluminum support frames were constructed and mounted to the center pole. The wire elements, made of no. 16 AWG Formvar wire, run between these frames. Insulators for the array are fabricated from 0.375-inch-diameter Teflon rod.[6] The rod is cut into 24 pieces, each 2 inches long. These are then drilled 0.25 inch from the ends.

The 1/2-inch loop formed at the end of an element, when it is passed through an insulator and soldered, will act as a capacitive hat. I used my dip meter to determine how great a loading effect the loop has. Adding the loops at the element ends shortens the length by 3 inches for resonance at 146 MHz. I used the multiplication factor of 0.64/0.50 to calculate the element length for the extended double Zepp. This gave me a dimension of 47 inches.

I wanted the reflectors to be 4% longer than a half wavelength at 144 MHz. That meant they would resonate at 138.25 MHz. Once again the dip meter provided the answer. The wire, including loops, is 38.5 inches long. Similarly, the directors were to be 4% shorter than a resonant element at 148 MHz. A bit of math and the dip meter indicated 34.3 inches of wire, with loops, was resonant at 154.0 MHz.

Open-wire line is used to feed the driven elements. It and the matching stub are constructed using no. 16 AWG wire — the same kind used for the elements. Teflon rod of 0.25-inch diameter was used for the line insulators. I cut and drilled them to provide 1-inch spacing between the conductors. The stub is connected at the center of the feed line. Fig. 3 illustrates how the feed line, matching stub and balun are connected to the driven elements.[7]

Tune-up Procedure and Results

To start, the matching stub was made slightly longer than 0.5 λ. The sliding short and balun were equipped with clips. That allowed the connection points to be moved easily. Next, I tuned up my rig into a dummy load, selecting a seldom-used simplex frequency near the top of the band. (I was interested in the 148.010-MHz repeater input frequency.) I then inserted my vhf wattmeter in the line near the antenna, using a short piece of RG-8/U coaxial cable. A foot switch and a long ac cord allowed me to key the transmitter while near the antenna. The antenna was mounted at a 45-degree angle during adjustment of the array. This directed the signal into space so that ground reflections would not affect tuning. The adjustments were made "cold," but I wanted to take no chances. I wore a pair of cotton work gloves while moving

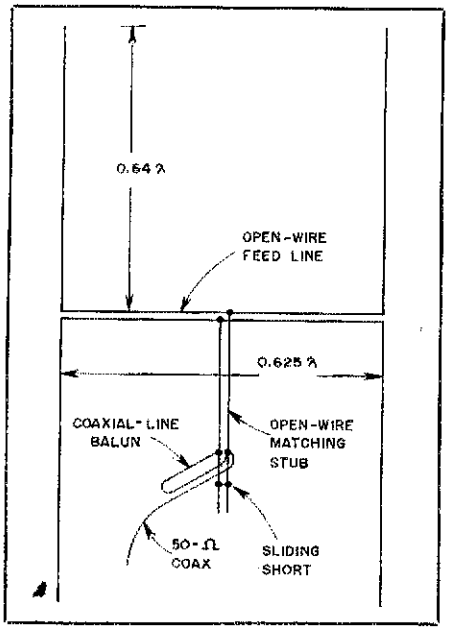


Fig. 3 — A coaxial-line balun and a stub match are used in the feed to the driven elements that form an "Unlazy H" in this vertically polarized array. The parasitic elements are not shown in this drawing.

the clips (to prevent rf burns).

In general, the position of the sliding short was adjusted to provide maximum output: the balun clips were located to obtain minimum reflected power, as shown on the wattmeter. The two adjustments interact, so it is necessary to adjust them alternately until an optimum match is found. When I had determined the best positions, I removed the clips and soldered the short and the balun to the stub. The wire below the short was cut off.

The antenna is working well. Since the photograph was taken I have installed a rotator and am now able to use the amateur repeaters in the northeastern part of the state. I enjoy reliable access to the MARS repeater in Wilmington, Delaware, but the same cannot be said for the NNJ MARS repeater, because of distance and terrain. When the plans to move that repeater to New Brunswick, New Jersey, are realized I should enjoy reliable communications through it. Initial pattern tests with W2PAU indicated a good front-to-back ratio. I feel that the results are worth the effort expended in the design and construction of this antenna. QST

Notes

[1]km = mi × 1.6.
[2]m = ft × 0.3048.
[3]*The ARRL Antenna Book*, 13th ed. (Newington: The American Radio Relay League, Inc., 1980), p. 143.
[4]*The ARRL Antenna Book*, p. 137.
[5]J. H. Reisert, "VHF Antenna Arrays for High Performance," *QST*, Dec. 1974, p. 38.
[6]mm = in. × 25.4.
[7]See *The ARRL Antenna Book*, pp. 115 and 229, for information on the balun and stub matching used on this antenna.

Strays

RELAY REMINISCENCES

☐ Sixty years ago, when radio was in its infancy and *QST* was in its fourth year of publication, I became the radio editor of the Hartford *Times*, a job I took to earn money to go to college. My job as radio editor came about as follows:

City Editor — "What do you know about radio?"

Me — "Nothing."

City Editor — "That's fine. Then you won't have any prejudices. You're our radio editor, in addition to your other obligations."

I didn't worry too much about the assignment because there was a radio store and the ARRL Headquarters nearby to whom I could take questions and then print the answers. If a telephone call came into the office, ". . . the radio editor is out, but if you will submit your query in writing, he will be pleased to answer it." (Once in a while I was scrambling because my colleagues double-crossed me by saying that the radio editor was *in*.) After hearing the caller's plight, I used either of two standard ploys. (1) Are your batteries delivering the necessary juice? (2) If your connections are not soldered, that may be your trouble. I always added, "Try this. If it doesn't work give me a diagram of your set, and I'll print an answer."

In 1922 the first national radio show was scheduled to be held in New York City. I wanted to be sent there to cover the show, but my editors didn't think it was worth the expense. Then I had a stroke of genius: the *Times* would cover the radio show by radio. It turned out that K. B. Warner, editor of *QST*, was going to the show, and Hiram Percy Maxim offered to get Mr. Warner's signal from Jersey City on his own set, 1AW.

Around 8:00 of the appointed evening, I went to Mr. Maxim's home to await word from Mr. Warner. Every 15 minutes 1AW called the Jersey City station, but there was never a response. At about 1 A.M., we were discouraged and ready to fold up. Then came a call to us from a ham in Lewiston, Maine. "I've been listening to Jersey City calling you and to you calling him. Apparently there's some weather interference because both of you are coming in loud and clear here. I'll be glad to relay any messages." (Don't forget, this was before the days of voice; it was all done in Morse.)

The venture was a success, and later that day the *Times* proudly printed a 100-word story of the first radio coverage of the first national radio show. And it was all because of a radio relay between two early pioneers of radio, Hiram Percy Maxim and K. B. Warner. — *Victor A. Rapport, Sarasota, Florida*

An Introduction to the Bilateral Transverter

VHF DXing with 100-mW ssb interest you? Get into the act with a "BT" for great fun with "whisper" power!

By Fred Brown,* W6HPH

If your shack is typical, it is equipped with an "all band" (80- through 10-meter) ssb/cw transceiver. Vhf bands, and even 160 meters, can be added to these ubiquitous boxes by means of a *transverter* (Fig. 1A). The transverter up-converts the transceiver rf output to the desired vhf band and also down-converts the received vhf signal to the hf band. Since a common local oscillator is used for the heterodyne process, the receive and transmit frequencies are translated an identical amount, and the transceiver operates just as it would on hf.

Reduced to its barest essentials, the transverter simplifies to nothing more than an oscillator-mixer combination, as in Fig. 1B. If the mixer is of a *bilateral* type, it will handle both the up and down frequency conversions, no antenna switching or changeover relays will be needed.

The principal advantage of such a bilateral transverter (BT) is simplicity, as should be apparent from comparing Figs. 1A and 1B. Of course, a price must be paid for this simplicity: Power output will be very limited, and the receiver noise figure will not be the ultimate. The BT, by itself, will not meet the needs of the demanding vhf DXer. Nevertheless, it is adequate for working the locals and for getting started on a new band. Furthermore, the BT can be upgraded later by adding a power amplifier and/or a receive preamplifier.

Work DX with four diodes? Here's proof of the pudding. These cards confirm contacts with W6HPH, who was using nothing more than an attic dipole in conjunction with the 50-MHz BT described here.

System Principles

Theoretically, there is no efficiency or power limitation to the frequency-conversion process. In principle, we could convert as much as 100 watts of hf ssb into nearly 100 watts of vhf ssb with nothing more than a passive mixer. To do this with presently available devices, and with a reasonable local oscillator power level, is not within the current state of the art.

Probably the most practical form of bilateral mixer is the four-diode, ring-modulator type of doubly balanced mixer originally developed for telephone communication. As with any mixer, sum and difference frequencies in addition to harmonics of the local oscillator are produced. These unwanted mixer products must be removed by a good band-pass filter.

The diode mixers used in the transverters described here operate at an rf output level of 100-mW PEP. To some, this might seem like a QRP level where communication would be impossible, but the author has made solid 3000-mile (km = mi × 1.6) contacts with the 6-meter BT. Usually, range is limited more by the antenna and location than power. Remember, if you are 40 dB over S-9 with a kilowatt, you will still be S-9 with 100 mW. Realistically, 100 mW is a power level suitable for the vhf beginner who is interested mainly in exploring a new band and working the locals or other easy-to-work stations.

As a receiver, the BT will never win any noise-figure contests. The best you will be able to do is about 8 dB worse than the NF of your hf transceiver. Even so, signals as weak as 0.5 microvolt are easily readable. With only 100 mW on transmit, you will always be able to hear more than you can work. Furthermore, one point in favor of the BT as a receiver is its excellent cross-modulation performance. In this department it will surpass any vhf converter.

The 6-Meter BT

Twenty meters was chosen as the i-f for the 6-meter BT because both the 21- and 28-MHz bands would have been too close in frequency to one half of 50 MHz. As can be seen from Fig. 2, four transistors are used to provide 36-MHz injection for the doubly balanced mixer. About 1 watt of rf is developed; any crystal-controlled 36-MHz source that provides this level of power could be ap-

*1169 Los Corderos, Lake San Marcos, CA 92069

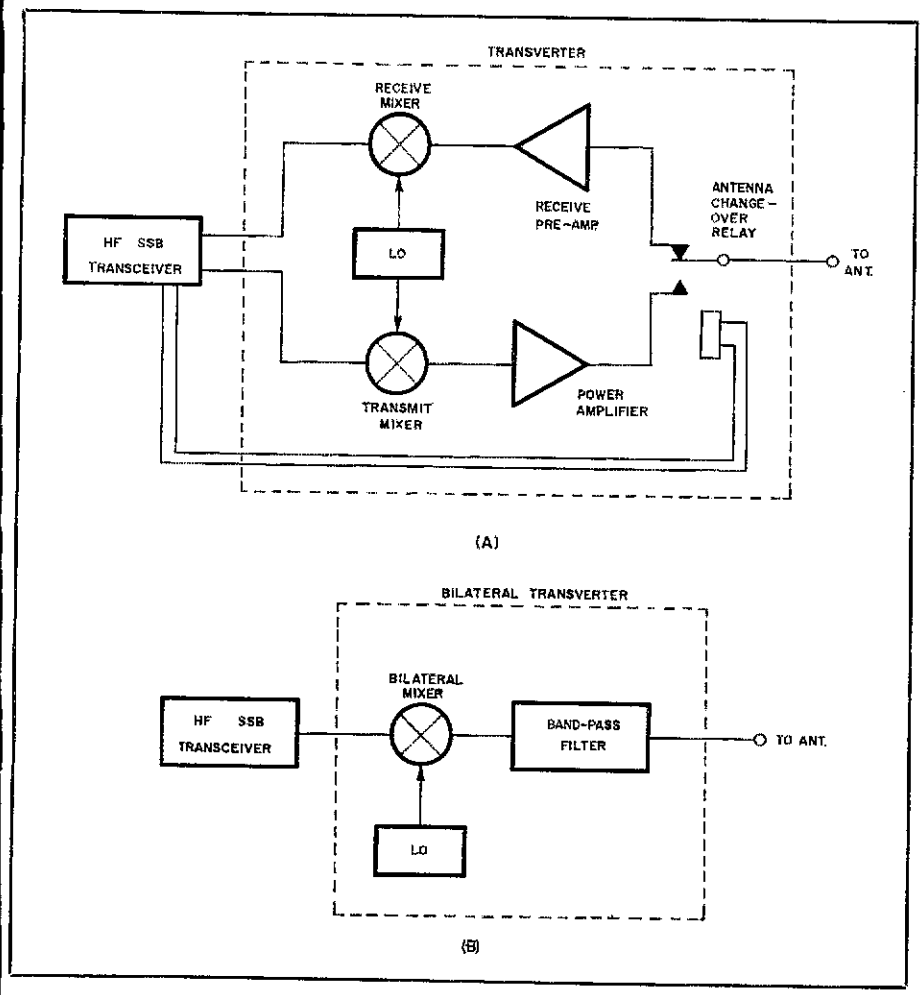
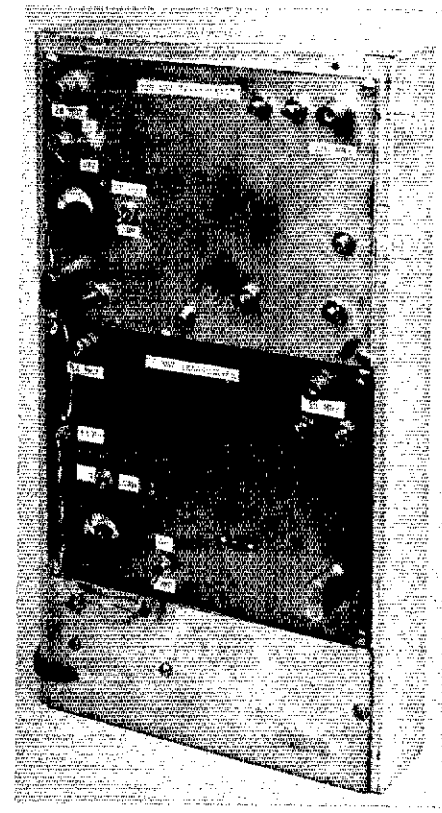


Fig. 1 — The conventional transverter shown at A requires two rf connections to the hf transceiver, plus a push-to-talk control voltage for the antenna changeover relay. The much simpler bilateral transverter at B requires only one connection to the hf transceiver.



The two transverters are shown here "rack" mounted in a 7- × 13- × 2-in. aluminum chassis. Behind the bottom panel is a regulated 12-V power supply. Total shielding is recommended to avoid i-f leakthrough problems. If a nonmetallic box is used, it should be lined with metal foil.

plied. For instance, a reworked CB rig could be substituted for the LO rather than the circuit shown.

The doubly balanced mixer (DBM) is followed by a two-pole filter (L6-C6 and L7-C7), which prevents the unwanted image and harmonic products from reaching the antenna. To some degree, this filter also acts as an antenna coupler, since C6 and C7 can be adjusted to match any impedance that does not depart radically from 50 ohms (resistive).

Any of a large number of transistors could have been chosen for Q1 through Q4. The 2N2222As were used because they are inexpensive and readily available. Q1 is a conventional overtone crystal oscillator. Q2, a buffer/amplifier, drives the parallel combination of Q3 and Q4. The latter two transistors are fitted with small heat sinks. An L-pi network[1] is used between the collectors of Q3/Q4 and the DBM to provide optimum coupling along with good harmonic suppression. A stabilizing network (C4, L5 and R1) performs as a parasitic suppressor for Q3 and Q4. The low L-C ratio tank circuit (C4 and L5) is parallel resonant at 36 MHz and prevents power loss in R1 at this frequency. At all other frequencies, R1 loads Q3 and Q4, thereby preventing parasitics. L5 may be adjusted by squeezing or spreading turns to resonate with C4 at exactly 36 MHz. Resonance should be determined with a dip meter, which in turn has been checked against a frequency counter or calibrated receiver to indicate the precise frequency.

A 0-100 microammeter can be switched to monitor either DBM dc current or rf output voltage. The former is used in tuning up the LO chain, and the latter is used for tuning the DBM and two-pole filter for maximum rf output.

The ring modulator is unusual in that the four diodes are self-biased by the bypassed resistor, R2. As a result, the diodes act as varactors throughout most of the rf cycle, which means the balanced mixer functions partly as a parametric upconverter. This permits a much higher saturated power output than could be attained with a conventional ring modulator.

Unfortunately, like most parametric converters, it is also subject to parasitics. These parametric parasitics can be extinquished by reducing the value of R2, but at the expense of lower saturated output. The value of R2 should be the maximum that will permit completely stable operation.

[1] *VHF-UHF Manual*, 1969 edition, RSGB, p. 6.12.

Construction

Both the 50-MHz and the 220-MHz BTs are constructed on 5- × 6-1/2 inch (mm = in. × 25.4) double-sided circuit boards, the correct size for a standard 5- × 6-1/2- × 1-1/2-inch meter box. Suggested component layouts are shown in Figs. 3 and 5.

Terminal-strip construction was chosen in preference to the more popular printed-circuit technique. There are several reasons, the main one being that all components are maintained close to a conducting ground plane. This is important in vhf work because it avoids the radiation and ground-loop problems of pc boards. In addition, if the board is used as the cover of a conducting box, a completely shielded rig results. Furthermore, terminal-strip or stand-off construction makes circuit alterations easier than would be the case with pc board construction.

Tune-Up

Collector current of Q2 can be observed

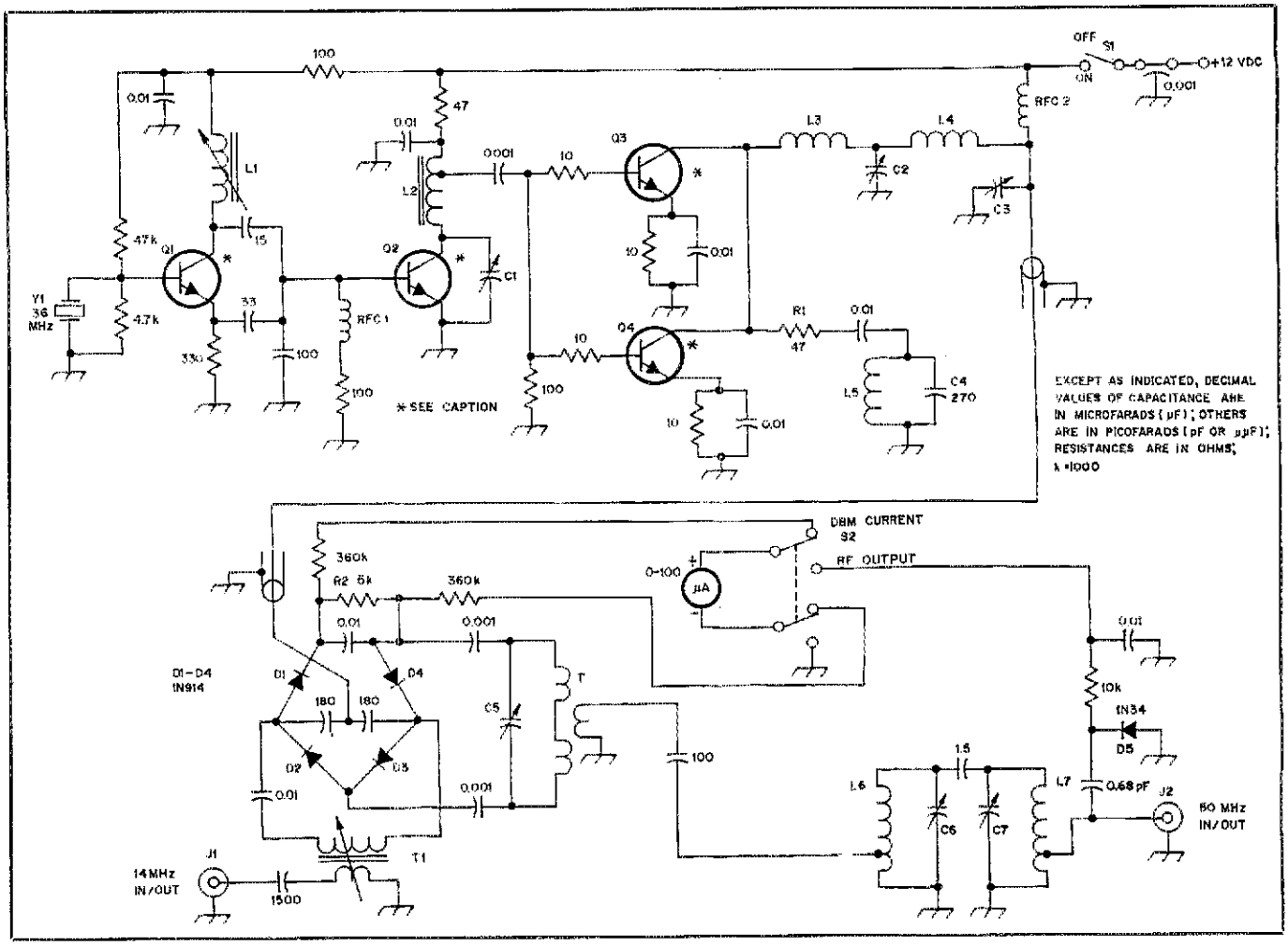


Fig. 2 — Inexpensive 2N2222A transistors may be used in the 6-meter BT. The doubly balanced mixer consists of diodes D1 through D4 coupled to the antenna through a 2-pole filter.

C1 — 2.5-11 pF ceramic trimmer.
C2 — 100-pF APC trimmer or Arco 463.
C3, C5 — 9-180 pF mica trimmer, Arco 463.
C6, C7 — 3-32 pF, E. F. Johnson 160-130.
D1-D4, incl. — Switching diode, 1N914
D5 — Germanium diode, 1N34.
L1 — 11 turns no. 22 enam. copper wire, close wound on 1/4-in. slug-tuned form.
L2 — 9 turns no. 24 enam. copper wire on Amidon T37-2 toroid form, tapped at 3 turns.
L3 — 1.1 μH, 23 turns no. 24 enam. copper wire close wound on 3/16-in. dia form.
L4 — 0.95 μH, 8 turns no. 18 enam. copper wire, 3/8-in. ID, close spaced, air wound.
L5 — 3 turns, no. 14 enam. copper wire, airwound, 3/8 in. ID, 1/2 in. long.
L6, L7 — 11 turns, no. 14, copper wire, 5/8-in. ID, 1-3/8 in. long, air wound. Tap two turns from ground end.
RFC1, RFC2 — 22 μH, J. W. Miller no. 70F225A1 or equiv.
S1 — Spst.
S2 — Dpdt.
T1 — Primary: 5 turns no. 24 hookup wire wound over secondary tape. Secondary: 1.5 μH, 16 turns no. 26 enam. copper wire, close wound on 1/4-in. slug-tuned form and covered with a single layer of vinyl tape.
T — 2-1/2 turns each side of center, no. 18 enam. copper wire on 1/2-in. dia form with 3-turn no. 24 enam. copper wire link. See Fig. 3.

by connecting a voltmeter across the 47-ohm resistor in series with L2. There will be no Q2 collector current unless Q1 is oscillating. L1 should be adjusted to maximize this current. In like manner, the emitter currents of Q3 and Q4 can be checked by measuring the dc voltages across the two 10-ohm emitter resistors. These voltages should be around 0.6 V and should be roughly equal. If unequal, they can be balanced by reducing the value of the 10-ohm base resistor of whichever transistor is drawing the smaller current. C2 and C3 can then be adjusted for maximum DBM diode current as indicated on the microammeter. It should be possible to exceed 60 μA.

With the LO chain functioning properly, the next step is to connect the 14-MHz port to a receiver and to run a moderately strong 50-MHz signal into the antenna

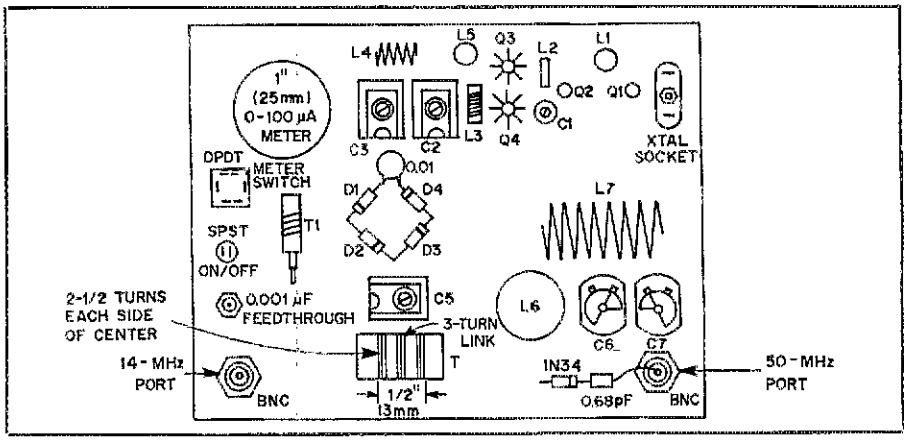


Fig. 3 — Suggested component placement for the 50-MHz BT. The copper-clad board measures 5 × 6-1/2 inches. Only the larger components are shown. Coils are generally oriented to minimize inductive coupling between them. Winding details of L5 are shown. Transistors Q3 and Q4 are fitted with small heat sinks. A short length of miniature coaxial cable can be used to connect C3 to the ring modulator. All other rf leads should be reasonably short and direct.

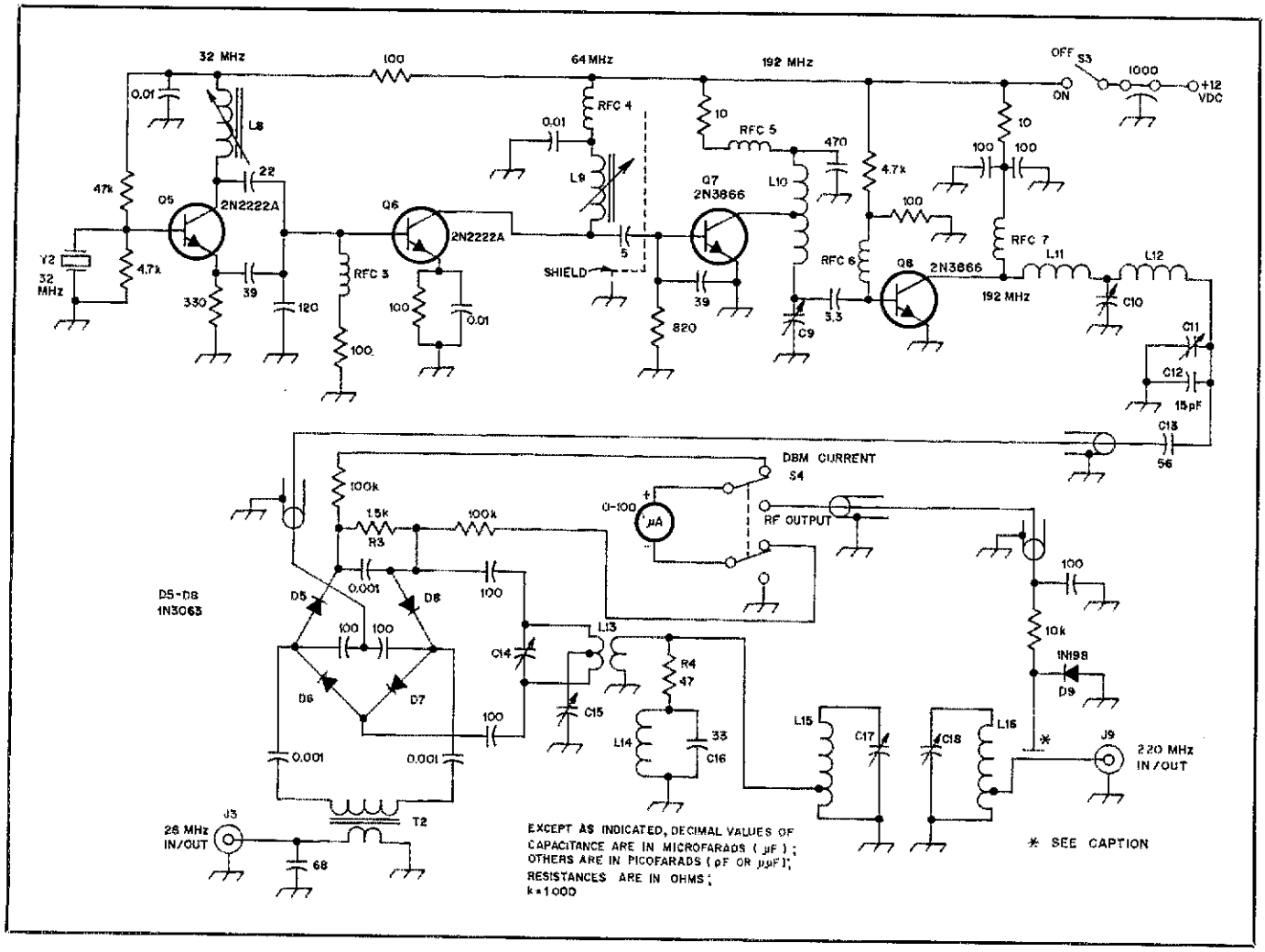


Fig. 4 — The 220-MHz BT is similar to the 50-MHz model but uses a 28-MHz i-f. Input and output impedances are 50 to 75 ohms. The rf pickup (*) for the meter is a short length of insulated wire brought near the center conductor of the coaxial fitting. It is adjusted for half-scale meter deflection when you are running full output into a matched load.

C9, C10, C11 — 2-9 pF, E. F. Johnson 160-104.
C12 — 15 pF disc ceramic.
C13 — 56 pF disc ceramic.
C14, C15 — 4-40 pF, Arco 422.
C17, C18 — 1.5-5 pF, E. F. Johnson 160-102.
D5-D8, incl. — Silicon switching diode, 1N3063.
D9 — Germanium diode, 1N198.
L8 — 10 turns no. 28 enam. copper wire, close wound on 1/4-in. slug-tuned coil form.
L9 — 9 turns no. 28 enameled copper wire, close wound on 0.215-in. dia slug-tuned form.
L10 — 4 turns no. 16, 1/4-in. dia, 5/16 in. long, air wound, center tapped.
L11 — 8 turns, no. 16 copper wire, 3/8-in. ID, 9/16 in. long, air wound.
L12 — 8 turns, no. 16 copper wire, 1/4-in. ID, 9/16 in. long, air wound.
L13 — One turn no. 14 copper wire, 5/8-in. ID, center tapped with a 1-turn, close-coupled link. See Fig. 5.
L14 — One turn no. 18 copper wire, 1/4-in. dia. Resonates with C16 at exactly 221 MHz.
L15, L16 — 5 turns, no. 16 copper wire, 3/8-in. ID, 1/2 in. long, tapped one turn from low end.
RFC3 — 22 µH, J. W. Miller no. 70F225A1 or equiv.
RFC4-RFC7, incl. — 1.5 µH, J. W. Miller no. 4604 or equiv.
S3 — Spst.
S4 — Dpdt.
T2 — Secondary is 5 turns no. 28 enameled copper wire close wound on 0.3-in. dia. by 0.6 in. long powdered-iron slug. Inductance is 0.5 µH. Cover secondary with one layer of vinyl electrical tape, and wind three-turn primary with no. 24 hookup wire over tape.

port, C5, C6, C7 and T1 can then be tuned for maximum S-meter reading.

The equipment is now ready to be connected to an antenna or dummy load and tuned up. First, be sure that the transceiver drive has been reduced to a very low level so that the output is well below 1 watt. Switch the transceiver to cw, and press the key. The DBM current should not rise more than 20%. If it does, the drive should be reduced further. Typically, the required drive will be +27 dBm. Switch the microammeter to the rf-output position, and again close the key. Tune C5, C6 and C7 for maximum meter readings, repeating the process a few times, since there is some interaction among these adjustments.

Your BT is now ready to go on the air. Normally, the DBM current will kick up 10% or so on voice peaks, but if it goes much higher, that indicates the DBM is overdriven. This will result in flat topping.

The 220-MHz BT

The 220-MHz model has an intermediate frequency of 28 MHz. Many transceivers cover 28 to 30 MHz fully, a range that permits coverage of 220 to 222 MHz if the LO is at 192 MHz. Again, any crystal controlled source that develops 0.25 watt or more at this frequency, such as a reworked Sonobuoy transmitter, could take over as the LO.

The oscillator-multiplier chain, shown in Fig. 4, uses commonplace and inexpensive transistors. Q5 is an overtone crystal oscillator at 32 MHz, and Q6 doubles to 64 MHz. If a 64-MHz crystal is available, one transistor could be eliminated. Q7 is a tripler to 192 MHz. Its output is amplified by Q8, which develops about 0.25 watt of drive for the DBM. An L-Pi network matches the collector impedance of Q8 to 50 ohms, and the rf energy is delivered to the DBM through a short length of miniature 50-ohm coaxial cable.

Details of the DBM layout are shown in Fig. 5. Because of their switching speed, 1N3063 diodes were chosen. Like the 6-meter version, the DBM proved susceptible to parasitics. Rather than sacrifice output by reducing the value of R3, a parasitic suppressor was used on the out-

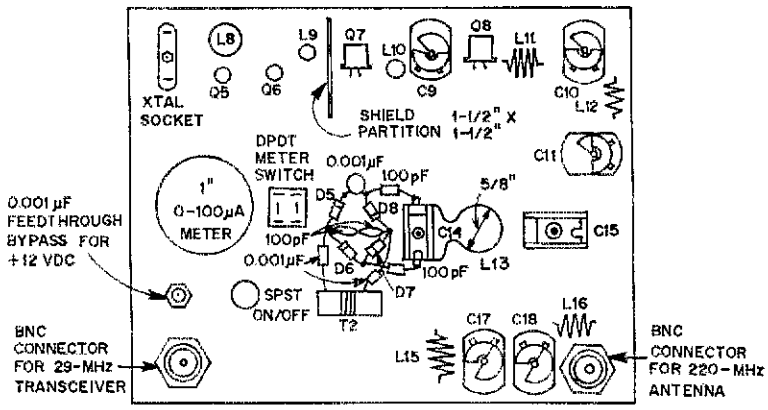


Fig. 5 — Suggested parts placement for the 220-MHz BT. Short lengths of miniature coaxial cable are used for connecting C11 to the DBM and for connecting the link of L13 to the tap on L15. L13 is spaced 1/2 inch above the board. The one-turn link is directly below it and tightly coupled. All rf leads must be short, especially the emitter leads.

Table 1

Measured Collector Currents

Q1 — 4.3 mA	Q5 — 6.7 mA
Q2 — 39 mA	Q6 — 4.2 mA
Q3 — 60 mA	Q7 — 27 mA
Q4 — 60 mA	Q8 — 61 mA

put link. This network consists of R4, C16 and L14. The combination of C16 and L14 forms a low L-C ratio tuned circuit, which must be resonated to precisely 221 MHz. This tuned circuit prevents the desired output from being lost in R4.

The two-pole filter (L15-C17 and L16-C18) ensures that only 220-MHz rf reaches the antenna. In Fig. 4 there is apparently no coupling between these two tank circuits. Each coil is oriented to minimize inductive coupling, but since the two capacitors are mounted adjacent to each other, there is sufficient stray capacitance between the two stators to provide "top coupling." As in the 6-meter transverter, some antenna impedance matching can be accommodated by careful adjustment of C17 and C18.

Tuning

Tune-up procedure is similar to the 50-MHz BT method. There are sampling resistors in series with the collectors of Q5, Q7 and Q8, which permit measurement of collector current if a voltmeter is connected temporarily across the appropriate resistor. Emitter current of Q6 can be checked in the same manner. It will be zero unless Q5 is oscillating. L9 should be adjusted to maximize this current. C8 should be adjusted for maximum collector current of Q7, and C9 for maximum Q8 collector current.

Collector currents should be approximately as shown in Table 1, with everything properly adjusted. C10, C11 and C15 should be adjusted for maximum DBM current as indicated by the microammeter. It should exceed 65 µA.

Rough adjustments of C14, C17 and C18 can be made by feeding a strong 221-MHz signal into the antenna port and tuning for maximum S-meter reading on a 29-MHz receiver.

Switch the transceiver to the cw mode, and begin the tune-up with the drive control turned all the way down, gradually advancing it to a point where the DBM current increases about 10%. Then switch the meter to indicate rf-output voltage. Next, alternately adjust C14, C17 and C18 for maximum meter reading. Repeat the adjustments a few times, since there is some interaction. Approximately +23 dBm of drive power is required. This completes the tune-up.

Results

With the help of the November 1980 6-meter band opening, the author has worked all eight northeastern states and three Canadian provinces. The antenna was nothing more than an attic dipole, 13 feet above ground. Amateur operators at several stations were incredulous that such a good signal could come from four diodes. On 220 MHz, the F2 layer does not provide transcontinental DX; but with a small Yagi, several Los Angeles stations, 75 miles away, have been worked with good reports.

[Editor's Note: Both bilateral transverters described in this article meet FCC requirements for spectral purity. Laboratory tests show the most significant spurious emissions for the 50-MHz transverter were 50 dB below the power of the fundamental. For the 220-MHz transverter, the most significant spurious emission was 43 dB down. Spectral analysis of the two-tone tests on these units disclosed that the third-order products for the 50-MHz and 220-MHz transverters were both 30 dB below PEP.]

Strays

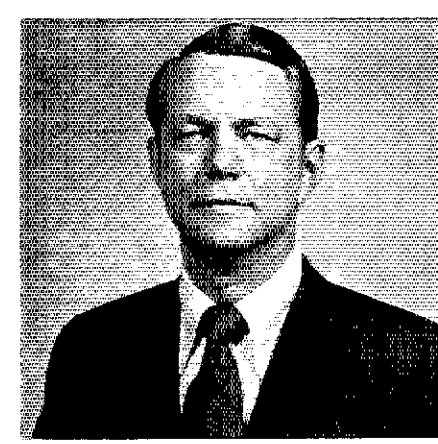
TA PROFILES

☐ We are indeed grateful to have ARRL Technical Advisor Paul L. Rinaldo, W4RI, on our TA team. He is our specialist for computer communications, spread spectrum and technical aids to the handicapped.

Licensed in 1949 as W9IZA Paul received his Extra Class license in 1954, and he also holds a First Class Radiotelephone license, a Second Class Radiotelegraph license and a Ship Radar Endorsement. W4RI has been an active computer enthusiast since 1975.

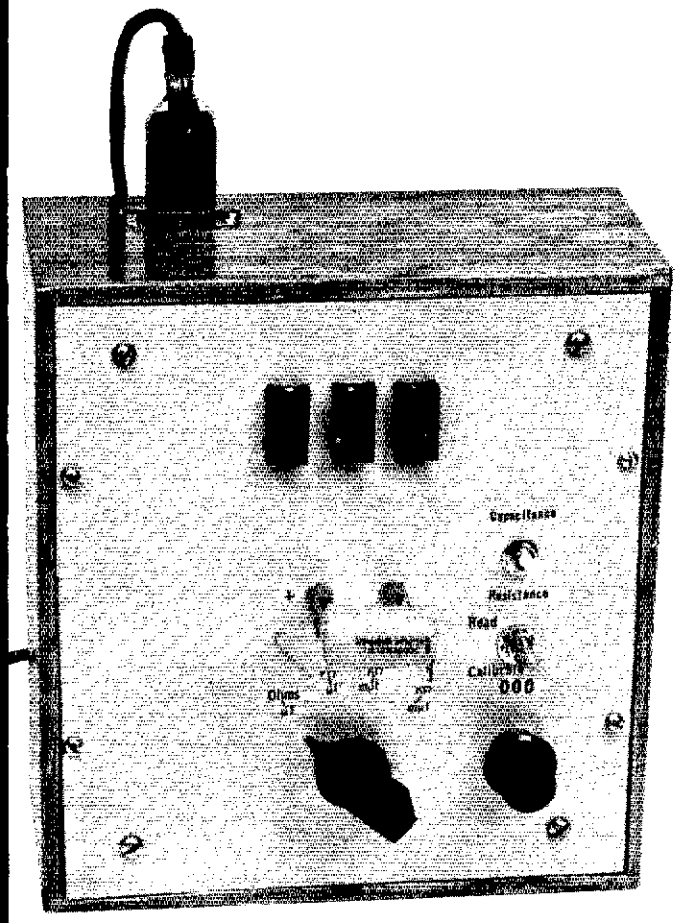
Paul is a Life Member of the ARRL, an author of technical articles published in *QST* and editor of *QEX: The Experimenter's Exchange* (see August 1981 *QST*, p. 48). He has organized five ARRL Technical Symposia and has managed two personal computing shows. A Life Member of AMSAT, a member of AFCEA and IEEE, W4RI is active in vehicular technology and computer societies. He is president and director of the Amateur Radio Research and Development Corporation (AMRAD). Under AMRAD, he is program manager for a two-year grant from the U.S. Department of Education for research in applying personal computers to telecommunications for the deaf.

Residing in McLean, Virginia, Paul is president and founder of Communications Resources, Inc., and has provided consultant services in communications, communications security, electronic countermeasures and business computers. He previously served in various positions with the Federal government as a technical advisor working with foreign countries, as a technical manager and as a communications officer. His experience includes planning, systems development, operations, training, installation and technical writing. — *Marian Anderson, WB1FSB*



TA Paul Rinaldo, W4RI

A Digital Resistance-Capacitance Meter



This item is certain to find use in your shack. Enjoy it twice — when you build it and when you use it!

By W. Conley Smith,* K6DYX

Instead of building just a capacitance meter, why not a combination resistance *and* capacitance meter using the principle on which most capacitance-only meters are based? That is, use the time constant of an RC circuit to gate a reference frequency to a counter and devise things so that the counter will indicate either the value of an unknown resistance or the value of an unknown capacitor. After some experimentation with the versatile 555 timer IC in various modes, a circuit that performs admirably was developed. It reads resistance values to one megohm and capacitance values to 10 μF, with 3-digit resolution. Furthermore, it has a built-in calibrator to ensure confidence in the readings.

*67 Cuesta Vista Dr., Monterey, CA 93940

Circuitry

The 3-digit display circuit is conventional in design. To minimize jitter, however, only the three most significant figures of a 4-decade counter are used. The "heart" of the circuit of Fig. 1 is U1, a 555 timer in the monostable mode. If pin 5 (the modulation input) of this timer is simply bypassed to ground without the calibrating circuit, the width of the gate pulse from pin 3 is given by $T_g = 1.1$ RC. This is the time required for the capacitor to recharge to 2/3 V_{CC} after a trigger pulse is applied to pin 2. The calibrating circuit will vary this time, effectively increasing or decreasing the gate width.

A 100-kHz reference frequency makes the arithmetic simple. To get, say, 9990 counts through the gate at this frequency requires a gate width of nearly 0.1 second. According to the formula for T_g given previously, and using a 999-ohm resistor, this would require a capacitor of approximately 100 μF, which is too large. A 10-μF capacitor can be used, if the gate is opened 10 times before the latches are opened, to show the total number of 100-kHz pulses that get through. This is accomplished by the triggering oscillator U4, a 555 timer in the astable mode. Driven by this oscillator, U2 triggers U1 and causes the gate of U5D to open 10 times, as counted by U3. After the 10th trigger, U6 opens the latches of the display to register the total number of

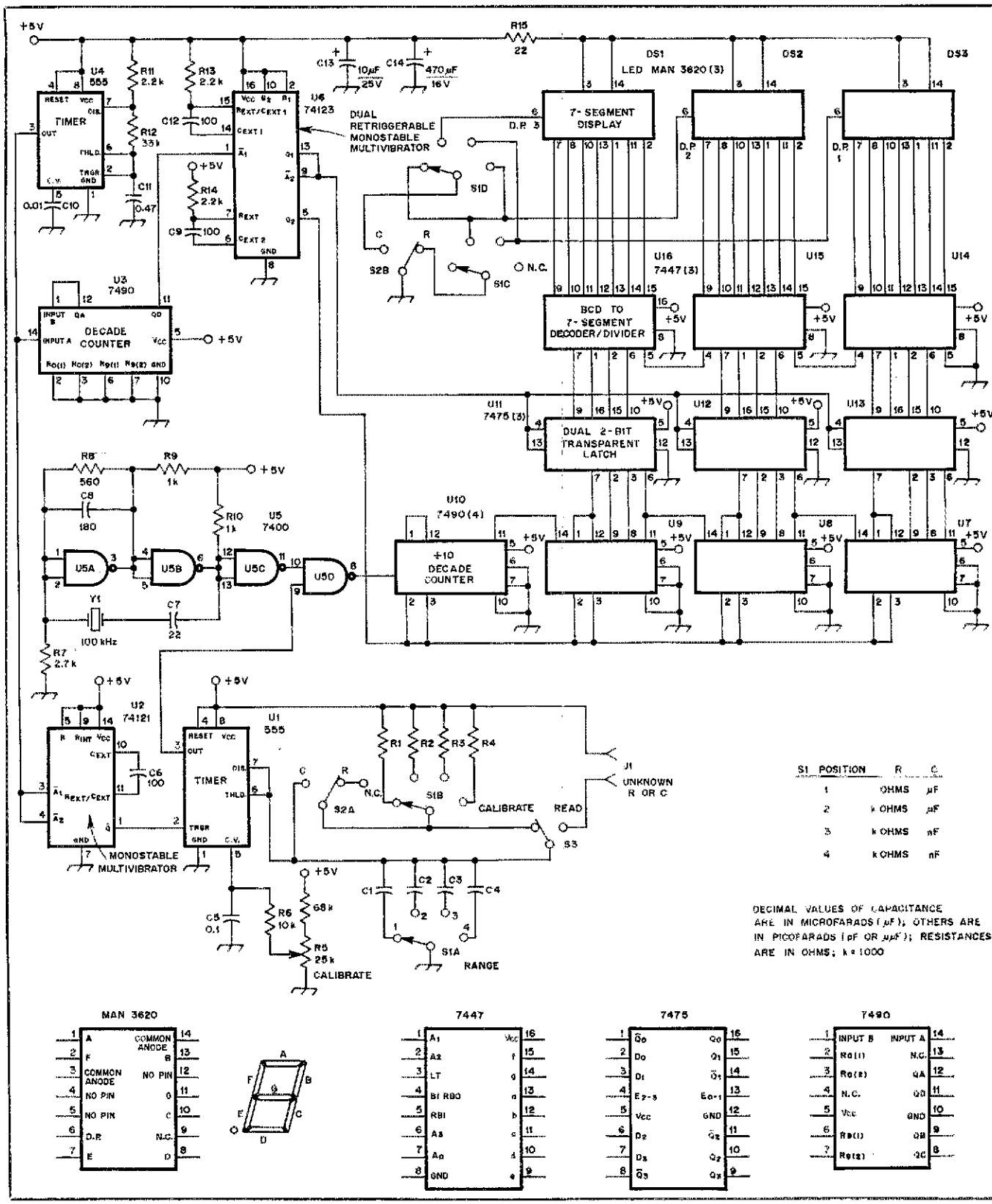


Fig. 1 — Digital resistance-capacitance meter schematic diagram. All resistors are 1/4-watt carbon composition types; capacitors are disc-ceramic 50-volt units unless otherwise specified.

C1 — 10 µF, 1% tolerance (see text).
C2 — 1 µF, 1% tolerance (see text).
C3 — 0.1 µF, 1% tolerance (see text).
C4 — 0.01 µF, 1% tolerance (see text).
DS1-DS3, incl. — Common anode, left-hand decimal point LED display, MAN 3620 or equiv.
J1 — See text.
R1 — 1 kΩ, 1% tolerance.
R2 — 10 kΩ, 1% tolerance.
R3 — 100 kΩ, 1% tolerance.
R4 — 1 MΩ, 1% tolerance.
R5 — 25-kΩ linear-taper potentiometer.
S1 — 4-section, 4-position rotary nonshorting switch.
S2 — Dpdt toggle switch.
S3 — Spdt toggle switch.
U1, U4 — Linear timer 555.
U2 — TTL monostable multivibrator, 74121.
U3, U7-U10, incl. — TTL decade counter 7490.
U5 — TTL quad 2-input NAND gate 7400.
U6 — TTL dual retriggerable monostable multivibrator, 74123.
U11-U13, incl. — TTL dual 2-bit transparent latch 7475.
U14-U16, incl. — TTL BCD to 7-segment decoder/driver 7447.
Y1 — 100-kHz crystal, HC-13/U holder.

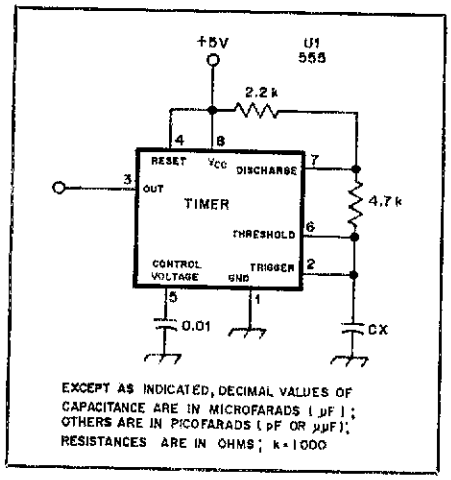


Fig. 2 — Schematic diagram of the test circuit used to select the proper values of capacitance (CX) required for the various meter ranges. Resistors are 1/4-watt carbon types.

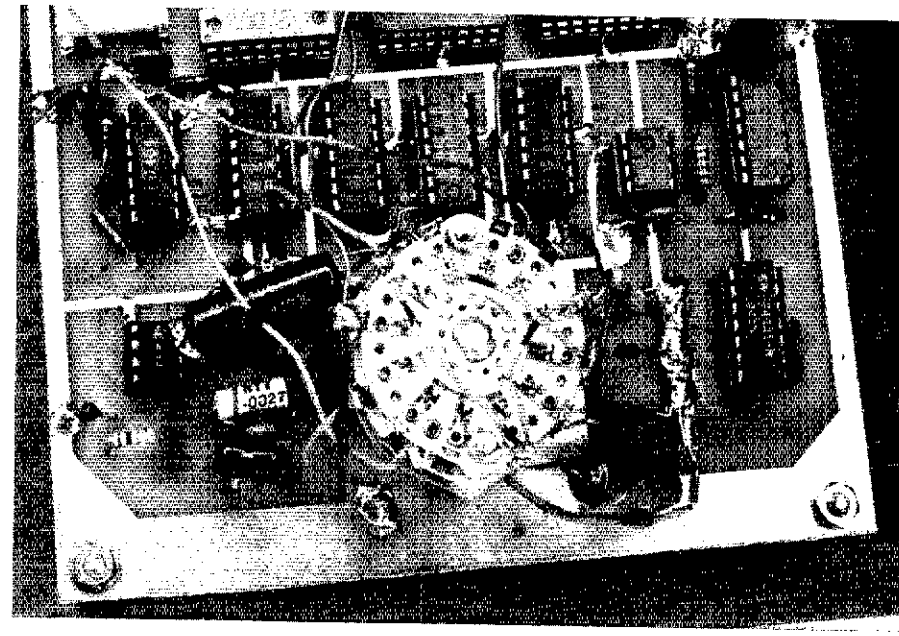


Fig. 3 — Component side of the double-sided board near S1. The board shown is a prototype and differs slightly from the final version.

pulses accumulated. Then the 4-decade counter, U7-U10, is reset. The display is therefore the average of 10 samples of the time constant or, effectively, 10 measures of the unknown.

Accuracy

The ultimate accuracy depends on the precision of the calibrating components.[1] Resistors with 1% tolerance are readily available at modest prices, but precision capacitors are another matter! I solved this problem by making a test circuit, using a 555 timer in the astable mode, as shown in Fig. 2. Other things being constant, the oscillation frequency of this circuit is inversely proportional to the capacitance used. Using a 1% tolerance capacitor of 0.0124 μF, I measured the frequency to be 10,554 Hz. By proportion then, I should get a frequency of 13,087 Hz with a 0.01 μF capacitor (0.0124 × 10,554/0.01). Similarly, frequencies of 1308.7 Hz, 130.87 Hz and 13.087 Hz are expected with capacitors of 0.1 μF, 1.0 μF and 10 μF, respectively. I then assembled single or parallel combinations of capacitors that would yield frequencies within 1% of those determined. In the case of the 10 μF unit, I found it more accurate to match the period of oscillation (76.41 ms). How accurately these capacitors are chosen may be determined easily: With S3 in the CALIBRATE position, it should not be necessary to readjust the calibrating potentiometer when S1 is switched to the different ranges.

You might be tempted to add a fifth measurement position, using a 100-MΩ resistor and a 0.001 μF capacitor in the calibrating circuit. Theoretically, this would allow measurement of capacitors in the range of 100 pF to 999 pF, with 3-digit resolution. The distributed capacitance, however, unavoidably built in with all the switching, is such that the accuracy of the readings is questionable. Therefore, this range has been omitted.

The capacitance measurement ranges of the author's unit shown in the photographs are: 0.01 to 1.99 nF (1×10^{-9} farad), 0.1 to 19.9 nF, 0.001 to 0.999 μF and 0.01 to 9.99 μF. These ranges increase in a counterclockwise direction, as may be determined from the panel markings. Resistance measurement ranges are: 1 to 999 ohms, 0.01 to 9.99 kΩ, 0.1 to 99.9 kΩ and 1 to 999 kΩ. These ranges increase in a clockwise direction. Direct measurement of resistance values of less than approximately 300 ohms is not possible. This will be discussed later. No over-range indicator is incorporated in this design; such a feature would require an additional circuit.

Construction

All circuit components except the CALIBRATION control R5, S2, S3 and J1 are mounted on a double-sided pc board.[2] The three 7-segment LED displays are mounted in wire-wrap sockets, which are soldered to the opposite side of the board. The wire-wrap sockets for the readouts stand off from the board at a height that will bring the displays through, or at least flush with, the panel. Holes can be drilled in the pc board for passing connecting wires to the +5-volt bus and panel-mounted components. A close-up view of the area surrounding S1 is shown in Fig. 3.

The board is bolted to the panel by means of 3/4-in. (19-mm) spacers. This allows plenty of clearance for the panel-mounted parts. Ensure the shaft of S1 is long enough to extend through the panel. Since one of the terminals of J1 is at a potential of +5 volts, nonconductive panel material, such as Formica, is recommended. The unit shown in the photographs was built in a cabinet made from scraps of mahogany. Surplus binding posts (unidentifiable) were used for J1, but 5-way binding posts or Fahnstock clips may be substituted.

Adjustment and Use

The device is powered by an external source. Current drain is approximately 400 mA at 5 volts. The 7447 decoders and readouts "hog" most of the current.

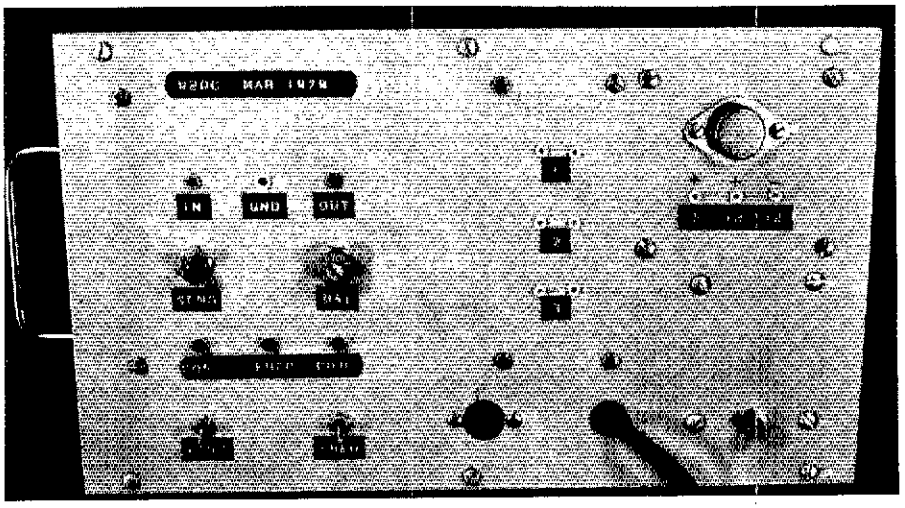
With S3 in the CALIBRATE position, adjust the CALIBRATE potentiometer (R5) until the display shows 000. The count through the gate is then within 0.1% of 10,000, with only the middle three digits being displayed. When S3 is switched to the READ position, the count will change, and the display will indicate the value of the unknown resistor or capacitor connected at J1, depending on the position of S2. For resistances of less than about 300 ohms, U1 will not sink enough current to completely discharge C1, and the reading will be in error. To measure low-value resistors, one should first measure one of several hundred ohms and then make another measurement with the low-value resistance in series. Once you're familiar with the operation of the unit and the range settings, I'm sure you'll find this unit as useful in your shack as it is in mine.

Notes

[1] Measurements performed in the ARRL lab using the author's meter showed a worst-case capacitance measurement accuracy of ±5%. A Data Precision 938 digital capacitance meter was used for comparison measurements. Resistance measurements agreed within ±3% when compared with results obtained using a Fluke 8020A DMM.

[2] Pc-board templates and a parts overlay may be obtained from the ARRL at a cost of $1 and a business-sized s.a.s.e. Boards are not available from the author.

Digital Frequency Filter for Repeater Inputs



Is adjacent-channel splatter keying your repeater? Try this easy-to-build filter that keeps the "garbage" from flying in through your window.

By Bill Fisher,* W2OC

Off-frequency signals can key repeaters, and few users or operators find this desirable. This circuit (Fig. 1) shows a filter that will discriminate between splatter from adjacent channels and an on-frequency carrier. (Originally I intended to call it a "discriminator," but I decided that it would lead to confusion, since that term is used almost exclusively to mean a demodulator where fm receivers are concerned.)

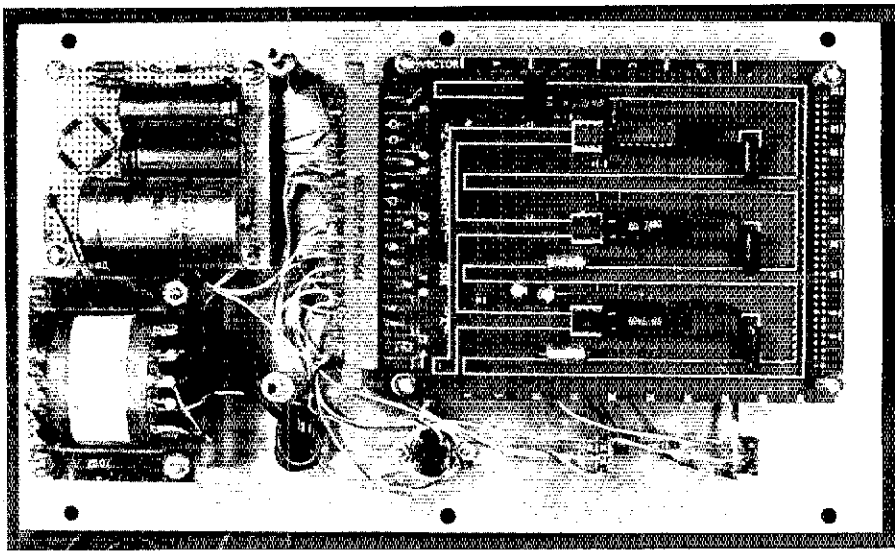
Selectivity is adjustable from a few hundred hertz to several kilohertz. Obtaining an equivalent amount of selectivity with crystal filters would be very difficult and probably more expensive. I designed and installed this circuit at WR2AGI to permit the use of a nonstandard repeater input frequency for a 2-meter satellite receiver.

Heart of the Circuit

The demodulator of the receiver must produce an output voltage that swings positive and negative as the instantaneous frequency varies. The Foster-Seeley discriminator is an example of this kind of demodulator. A coincidence detector is an example of a demodulator that would not work with this circuit.

The input of U6 (test point A) is connected to the output of the receiver discriminator (Fig. 1). The discriminator voltage is then amplified by U6 and fed to the inputs of U4A and U4B, pins 1 and 13 respectively. When the output of U6 is positive and reaches the threshold of U4A (approximately + 1.2 volts), pin 3 will fall abruptly from a high (+ 4 volts) to a low (approximately 0 volts).

Similarly, when the output of U6 is negative and reaches the threshold of U4B (adjusted by balance potentiometer R2 to approximately − 1.2 volts), the state of pin 11 will rise abruptly from a low to a



Inner workings of the Digital Frequency Filter. Straight-forward design permits clean layout. The unit shown has a built-in power supply.

*2 Barnard Rd., Armonk, NY 10504

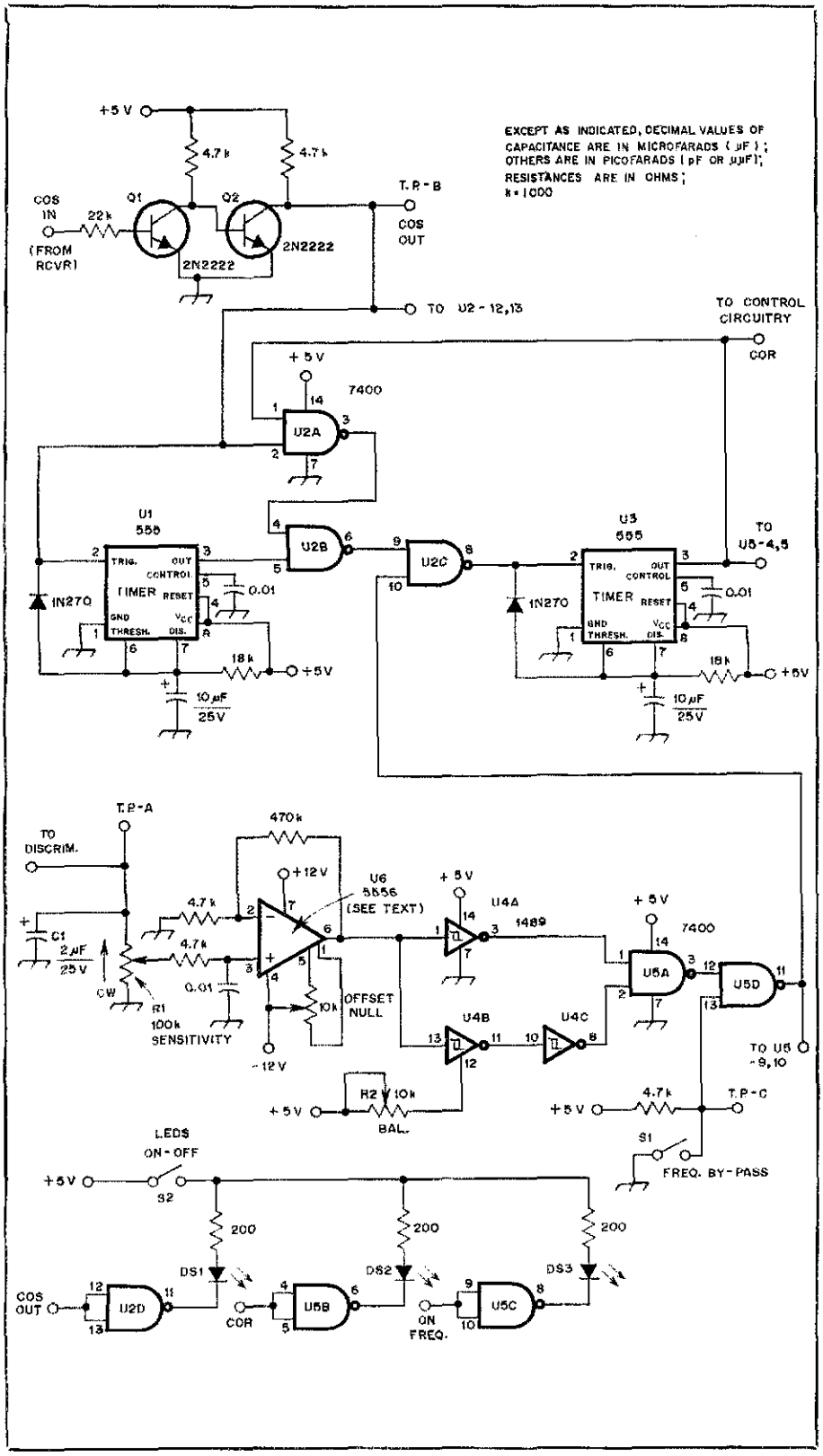


Fig. 1 — Schematic diagram of the digital filter. Fixed-value resistors are 1/4-watt carbon-composition type. Capacitors are disc ceramic, except those with polarity indicated, which are electrolytic. Note: Part numbers in parentheses are Radio Shack.

D1, D2 — Small-signal germanium diode, 60 PIV, 85 mA (276-1123).
DS1-DS3, incl. — LED (276-070, 276-071, 276-072 or equiv.).
Q1, Q2 — Npn silicon, general purpose, 2N2222 or equiv. (276-2009).
R1 — 100-kΩ, pc-mount potentiometer (271-338 or 271-220).
R2 — 10-kΩ, pc-mount potentiometer (271-335 or 271-218).
S1, S2 — Spst switch, type noncritical (275-401, etc.).
U1, U3 — 555 timer IC (276-1723).
U2, U5 — TTL quad 2-input NAND gate (276-1801).
U4 — Quadruple line receiver IC, MC1489, SN75189 or equiv.
U6 — Operational amplifier IC, SN5556, MC1486 or equiv. (See text.)

high. U4C is utilized to invert the output of U4B. U5A then functions effectively as an OR gate, producing a high output on pin 3 if either pin 1 or pin 2 is low. The output of U5A is gated (and inverted) through U5B, which provides an inhibit action, if desired, by grounding pin 13. The end result, assuming pin 13 of U5A is not grounded, is that the condition at pin 11 of U5B will be low whenever the discriminator output indicates an input frequency above or below the desired "frequency window" set by input sensitivity potentiometer R1.

Q1 and Q2 comprise a level translator needed to convert the Carrier Operated Signal (COS) of the GE receiver used at WR2AGI from a level of 0 to 2 V to a level of 0 to 5 V. This part of the circuit may not be needed, or may have to be modified, depending on the particular receiver used. In any case, the signal level at test point B should be 3 to 5 volts positive with carrier input, and approximately 0 volts without carrier input.

U1 is a 555 timer that provides a delay of approximately 200 ms following receipt of a carrier input before checking if the carrier is within the frequency window. This prevents key-ups of the repeater by any instantaneous spikes on the input or by stations off frequency but with occasional on-frequency splatter. U2A and U2B effectively bypass U1 once the carrier-operated relay (COR) signal is activated.

U3 is a similar 555 timer that prevents interruption of the COR signal during brief (less than 200 ms) dropouts of carrier such as might be experienced with a marginal mobile signal. The output of U3 (pin 3), labeled COR, is intended to be used to activate the repeater transmitter via existing control circuitry.

Spare gates of U2 and U5 are used to operate LEDs that show the status of the COS, COR and on-frequency signals. S2 permits turning off the LEDs when they are not needed for test purposes. A manual frequency bypass switch, S1, is provided for local test purposes. With this switch in the open position, test point C can be used, if desired, to control the frequency filter remotely via the repeater control circuitry.

Adjustment Procedure

Turn the SENSITIVITY control, R1, fully counterclockwise (i.e., arm of potentiometer at ground), and adjust offset null control R3 for zero output voltage on pin 6 of U6. Next, connect test point A to the output of the receiver discriminator, and apply a signal to the receiver input. Vary the frequency of the input signal above and below the receiver center frequency while monitoring test point A. You will find that some receivers will show a positive discrimination reading above center frequency while others will show a negative one.

Once you have determined the positive-output direction, offset the frequency of the input signal in that direction by the amount you desire for half the width of the frequency window. For example, if moving below center frequency produces a positive output and you wish the window to be 6 kHz (i.e., ±3 kHz) wide, set the input frequency 3 kHz below center. With this signal on the receiver input, slowly adjust R1 clockwise while monitoring the voltage on pin 3 of U4A. Leave R1 set at the point at which pin 3 of U4A drops abruptly from a high (approximately 4 volts) to a low (approximately 0 volts).

Next set the input signal to 3 kHz on the opposite side of center frequency. Monitor the voltage on pin 11 of U4, and adjust the BALANCE control, R2, to the point at which the state of pin 11 rises abruptly from a low (approximately 0 volts) to a high (approximately 4 volts). This completes the adjustment procedure.

Sensitivity potentiometer R1 controls the width of the frequency window. *Increasing* the sensitivity by rotating R1 clockwise will *decrease* the width of the window. Conversely, decreasing the sensitivity by rotating R1 counterclockwise will increase the width of the window. Balance potentiometer R2 controls the symmetry of the window and can be adjusted with R1 to provide an unsymmetrical window, if desired. In some repeater situations an unsymmetrical frequency window can be advantageous.

C1, the 2 μF (paper) capacitor connected from test point A to ground, was added to correct an anomaly that showed up after initial installation of the unit. We discovered that although an off-frequency (outside the window) signal appearing on the input would not bring up the repeater, the repeater would be keyed up momentarily when that off-frequency signal was removed from the input. The off-frequency indication at pin 10 of U2 was returning to the normal on-frequency indication faster than the COS signal was being removed from pin 9 of U2. The addition of C1 to the input (test point A) slowed the response of the frequency-sensing circuit enough to correct this condition.

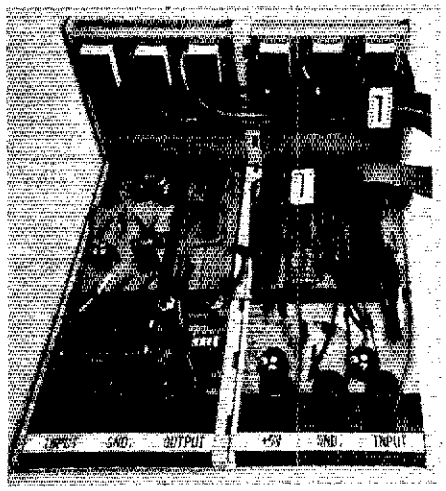
If the 5556 chip used for U6 is not readily available, a 741 or one-half of a 5558 without the offset null adjustment, will serve as a satisfactory substitute. Power requirements are +5 V, +12 V and −12 V (less than 100 mA each).

Our users and control operators are much happier with the performance of the repeater now that we are using this circuit. Virtually all "falsing" has been eliminated. Perhaps this circuit or one similar to it will keep the garbage from coming in your window. I will be glad to answer any questions from readers desiring to use this circuit if they will include an s.a.s.e. with their correspondence.

New Products

A P PRODUCTS INC. HOBBY-BLOX

☐ "Hobby-Blox" tends to kindle childhood memories of building houses and forts out of little wooden (yes, I go back *that* far!) or plastic blocks. But that's not what we're talking about here. While Hobby-Blox are made of plastic (acetal copolymer) and are used for building, we're now building electronic circuits — breadboarding, actually.



The Hobby-Blox system is a solderless (just plug in the components and wires), expandable (modules can be added to expand existing projects), compatible (all sizes of DIPs and discrete components are accommodated) and affordable (compare prices) means of assembling breadboards. Modules are color-keyed to aid in identification of their designed function and are cross-indexed with letters and numbers to identify rows and columns rapidly.

If you'd like to sample the wares, two starter packs are offered. A project booklet (one for either discrete-component or IC-circuit construction) accompanies each pack. While components are not included, a listing of every part required to complete the projects described in the respective booklet is provided on the back of the bubble-package card.

Of course, you're not limited to purchasing the starter packs. Individual modules are available to suit your personal needs. The module line-up includes: bus, terminal, discrete component and distribution strips; and LED strip that accommodates six LEDs and includes a common bus for current-limiting resistor termination; horizontal and vertical trays; control, speaker and blank panels; extender clips, binding posts and a battery pack. There are more modules to come, according to the manufacturer.

Interconnections are made using 22-gauge solid hook-up wire. You can make your own leads or purchase a jumper wire kit (p/n 923351), which contains a large assortment of pre-cut and stripped wires of various colors.

Use of a system such as Hobby-Blox should kindle your project-building enthusiasm. Keep 'em hidden from the kids, though, 'cause those colorful modules might disappear! Hobby-Blox are manufactured by A P Products Inc., 9450 Pineneedle Dr., P.O. Box 603, Mentor, OH 44060. You can obtain the name of your nearest dealer by telephoning 800-321-9668. — *Paul K. Pagel, N1FB*

SO-1 UNIVERSAL ANTENNA STANDOFF

☐ If you have ever tried to homebrew a standoff for your tower in an effort to side mount a vhf/uhf antenna, then you will be interested in this inexpensive solution. The SO-1 has been in use at W1SE for just about a year, and has supported an AEA Isopole 2-meter, twin 5/8-λ antenna through a variety of New England gales and storms. It is ideally suited for antennas up to and including Ringo Ranger types. The standoff is made of welded and galvanized steel angle, rod and tube, and may be clamped to virtually any pipe or tower. Installation takes only a few minutes with the two stainless-steel hose clamps provided. The SO-1 is manufactured by, and available from, IIX Equipment Ltd., P.O. Box 9, Oak Lawn, IL 60454. Price class: $30, UPS included. — *Lee Aurick, W1SE*

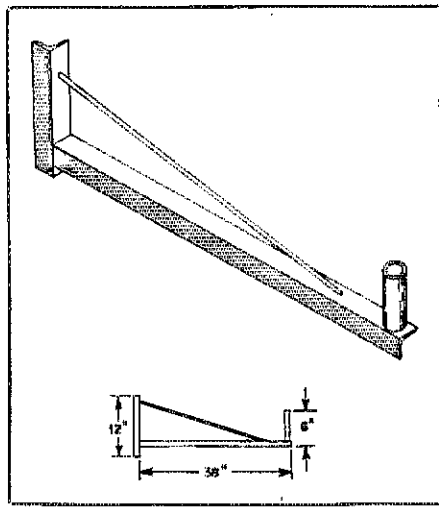


Fig. 1 — SO-1 universal antenna standoff dimensions.

Braille Tactile Transducer — New Freedom for the Sightless

Digital techniques and an ingenious electromechanical device combine to offer greater freedom, flexibility and self-sufficiency to blind radio amateurs.

By Professor G. W. Horn,* I4MK

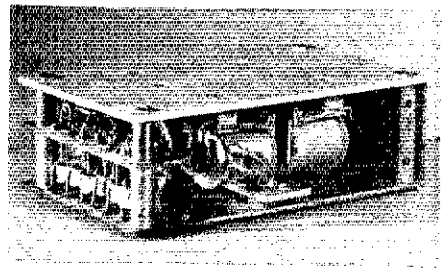
If you were blind, how would you determine the operating frequency of your transmitter? How would you read a voltmeter? Acquiring data in a usable fashion is an obstacle that has plagued the visually impaired operator since the earliest days of wireless. What are some possible solutions?

Variable tone and amplitude oscillators are often used to indicate the status of circuits in an analog manner, but these systems convey information in a relative form only. Digital data can drive voice-synthesizer circuits, but such designs are often cumbersome to use. Various other systems have been developed, each having advantages and drawbacks. Because many blind people read Braille, a readout device that converts electrical pulses to a mechanical Braille format would seem ideal. Until recently, little attention has been paid to designing and building such a device.

*40017 S. Giovanni in Persiceto, Via Pio IX n. 17, Bologna, Italy

Braille is Digital

Braille characters are formed on a six-dot matrix. The presence or absence of a dot at each of the six positions determines the "value" of the character. If we assign a sequence to the six dots, we can process Braille data with standard digital techniques. Translating Braille to and from other digital codes (e.g., ASCII) becomes trivial.

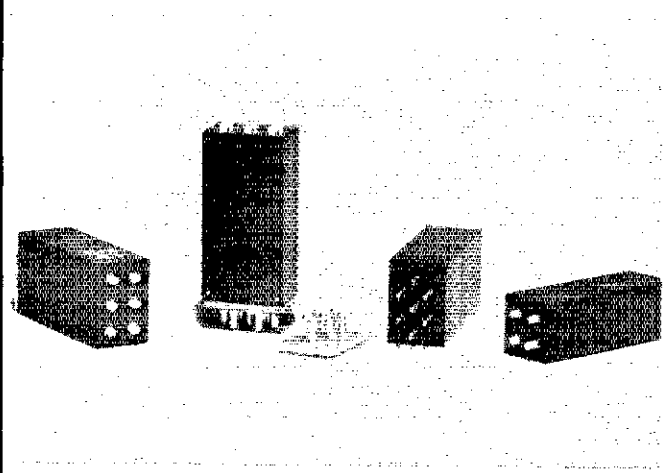


The author's early attempt using relays and cantilevers to produce a Braille transducer. The major drawback is the space required by the relays and cantilevers, which makes it impractical to mount several units side by side.

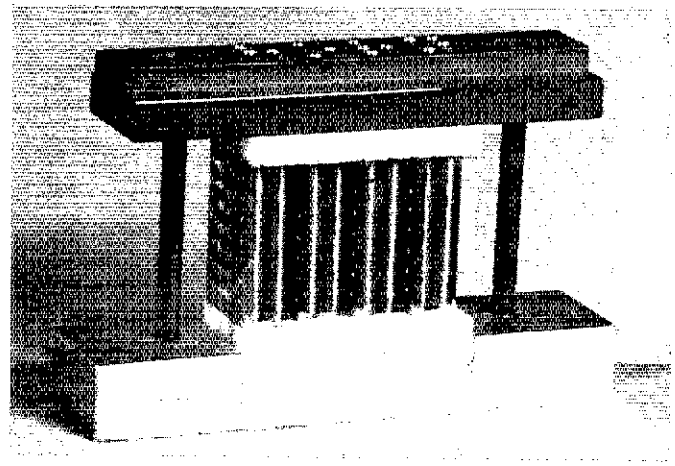
Fig. 1 shows a simple circuit for converting binary-coded-decimal (BCD) data to Braille. The source of the data could be a multimeter or other device. BCD data is not always conveniently accessible; Fig. 2 depicts a circuit that converts 7-segment display data into Braille. Similarly, Baudot or ASCII pulses passed through a series-to-parallel converter could easily be converted to Braille.

The problem, however, lies not in the manipulation of the data, but rather in the readout. Almost all digital-readout devices rely on the user's eyesight. LEDs, LCDs and other digital *displays* are of little use to the blind amateur.

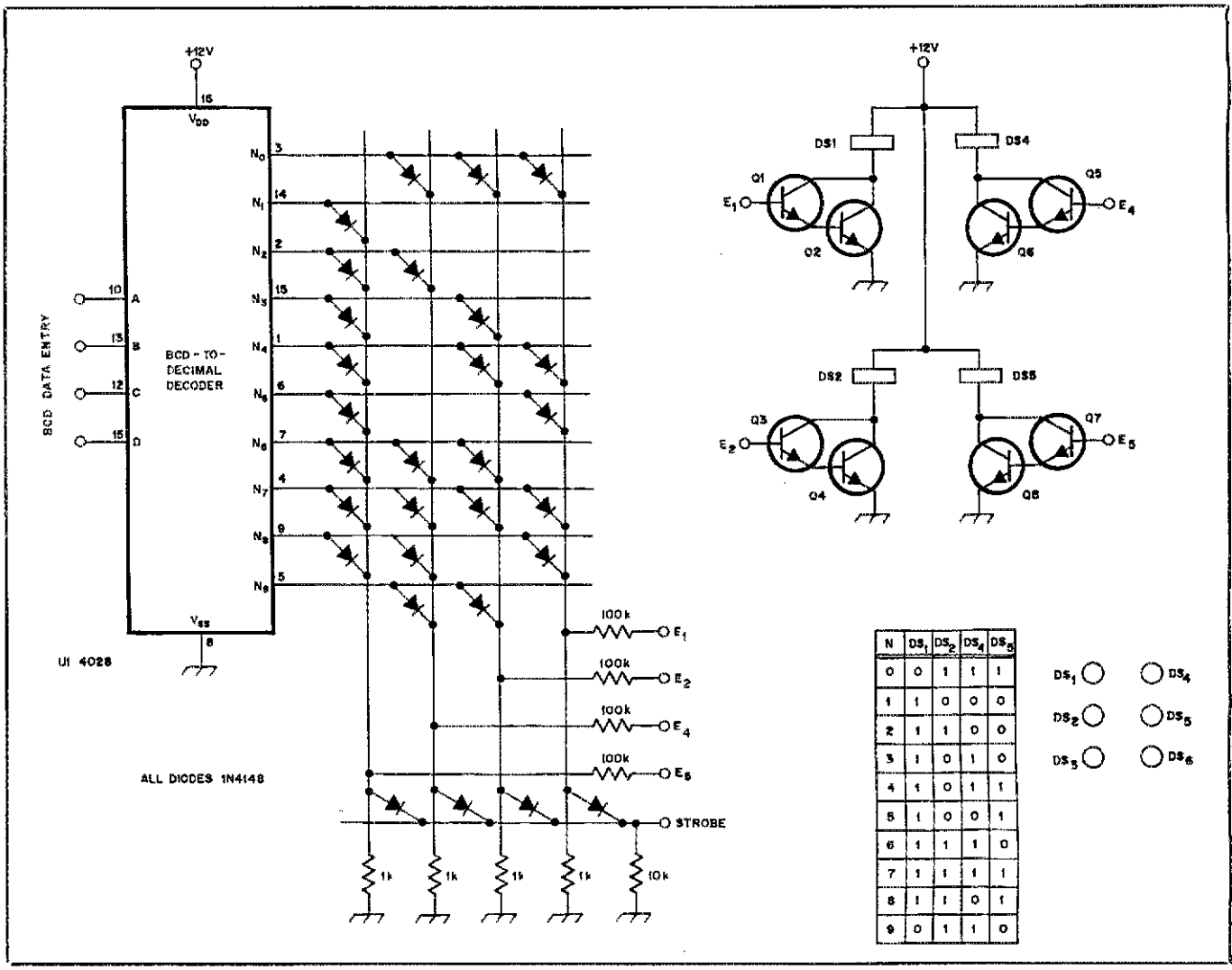
A tactile transducer for Braille consists



Commercially available electromechanical transducers used by the Italian telephone company. The four-dot model on the right is useful for displaying figures only.



Row of four 6-dot, latching-type transducers designed and built by the author. The word displayed on the Braille readout is "HORN" (⠓⠕⠗⠝).



N	DS_1	DS_2	DS_4	DS_5
0	0	1	1	1
1	1	0	0	0
2	1	1	0	0
3	1	0	1	0
4	1	0	1	1
5	1	0	0	1
6	1	1	1	0
7	1	1	1	1
8	1	1	0	1
9	0	1	1	0

Fig. 1 — BCD-to-Braille code converter circuit driving a 4-dot (figures only) nonlatching Braille transducer. The standard Braille matrix and the pattern for figures 0 through 9 are shown also. This is a representative circuit and is not intended as the basis for a construction project.

of six pins arranged according to the standard Braille pattern. The pins are raised from the "no dot" (0) level to the "dot" (1) level corresponding to the logic voltages of the circuit. This is very easy to describe, but it is not so easy to construct.

My first approach was to drive the pins with cantilevers attached to miniature relays. I found it impossible to package the relays in any manner that would permit side-by-side mounting of several characters. (See the accompanying photograph.)

In the meantime the telephone company (Italian) introduced Braille transducers[1] in 4- and 6-dot formats for use by blind operators. Six suction solenoids drive and maintain the pins in their raised position when excited. By putting some of these units side by side, you may assemble a Braille row.

These units suffer from two drawbacks: The dimensions of the matrix are slightly larger than standard Braille, and the pins tend to recede under fingertip pressure. Both of these factors make reading the output difficult.

A Different Approach

Keeping in mind the shortcomings of the other units, we developed a different kind of transducer. The pin is energized by a single coil, and mechanically latches into two stable positions. A positive pulse (10 ms, 80 mA at 10 V) causes the pin to raise to logical 1. A similar negative pulse resets it to the logical 0 (no-dot) position. Because of the mechanical latching mechanism, the pins will not change state without a signal, regardless of fingertip pressure.[2]

The solenoids draw power only during the excitation periods (write/erase). This feature makes muliplexing operation very attractive because it drastically reduces both power dissipation and hardware. Finally, the 6 pins are arranged into a matrix of the exact standard Braille dimensions.

Fig. 3 depicts a circuit used to control this kind of transducer. A row of eight transducers is multiplexed. The two opposite polarities are supplied by an operational amplifier followed by a pair of complementary-symmetry transistors. Since the solenoids are excited by positive as well as negative currents, the design calls for a bidirectional switch that is capable of withstanding the peak current demanded by the unit. If all six pins should be raised or reset at the same time, the current would be 480 mA (6 × 80 mA).

Future Trends

We can construct a row of many Braille characters to allow us to read RTTY or the output of a computer terminal. Serial-to-parallel conversions, in addition to code conversions, would probably be involved in any such endeavor. Multiplexing is an advantageous approach for these

[1]Notes appear on page 47.

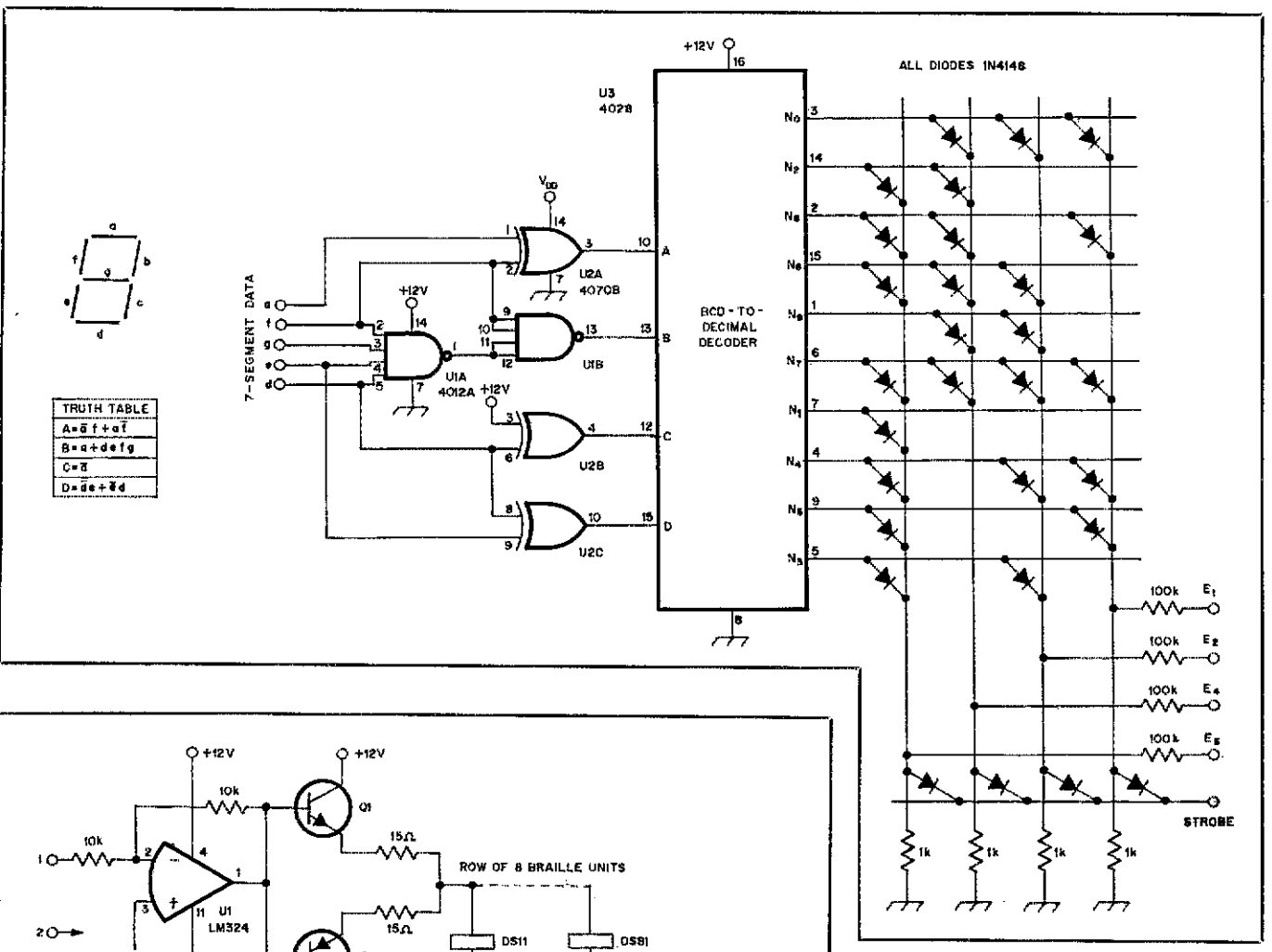


Fig. 2 — Circuit for converting 7-segment display data to Braille code. This representative circuit demonstrates the relative ease with which other forms of digital data can be translated into Braille code.

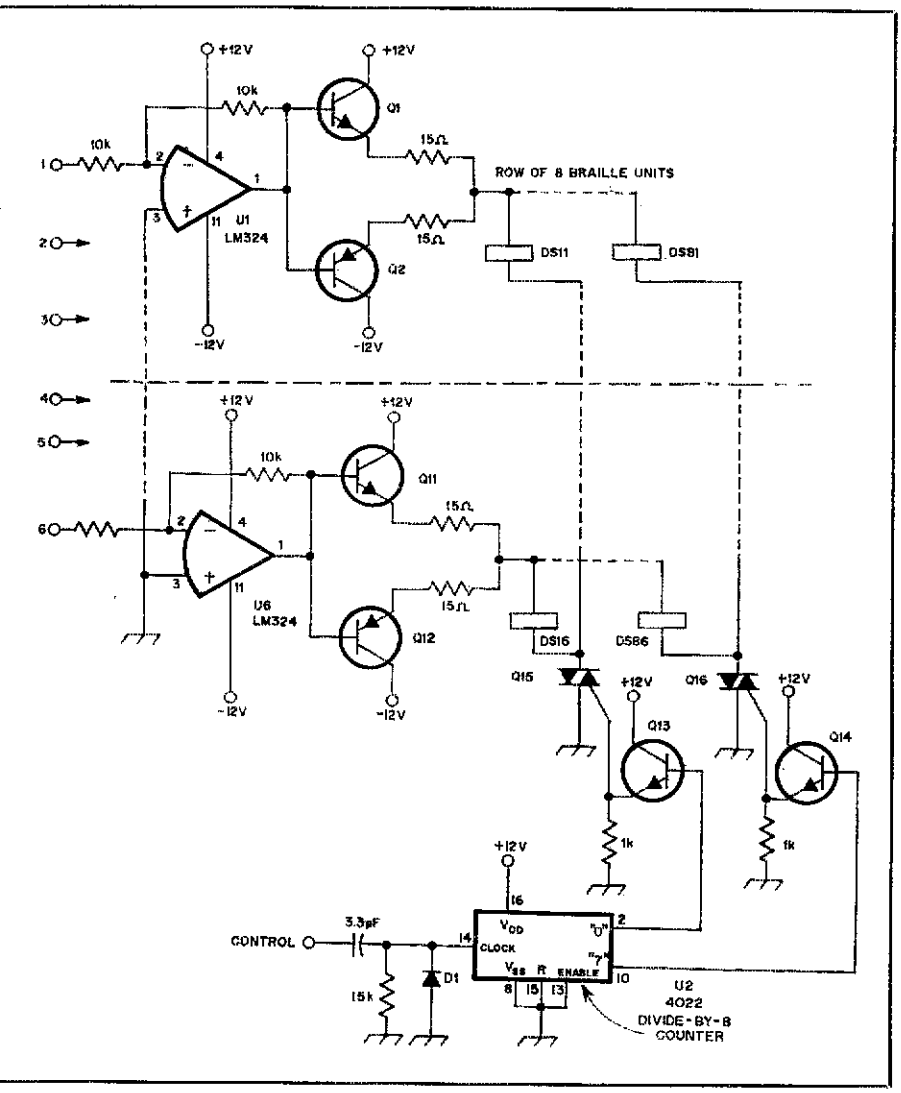


Fig. 3 — Representative circuit showing the simplicity of multiplexing a row of eight Braille latching units. The triacs, fired by the output of a decimal counter, act as bidirectional switches.

projects! Because of the small size, the transducers fit nicely into a small, compact row!

Voice-synthesizer circuitry points toward the possibility of translating the output data of digital instruments into synthetic speech. Still, my preference (I'm blind) is for a "written" Braille text as opposed to spoken letters, words or figures. This is particularly true for electronic readouts. If you were blind, which would you prefer? QST

Notes

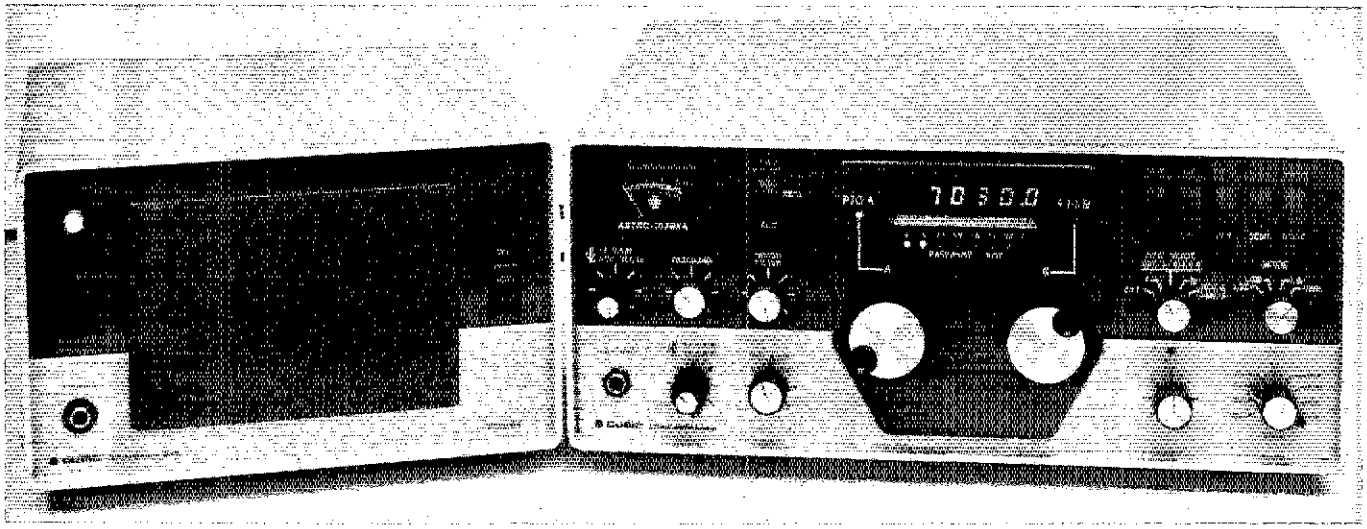
[1]For more information about these units, contact the supplier directly: Coelte Inc., P.O. Box 25, 24032 Calolziocorte, Bergamo, Italy.

[2]Professor Horn has established a licensing agreement with Coelte (see note 1) for the production and distribution in Italy of the latching transducer. He indicates that he would consider licensing the unit for production in the United States. (For more information, contact Professor Horn directly.) He has made available several additional circuit diagrams for use with the transducers. If you would like a copy of these diagrams, please send an s.a.s.e. to the Membership Services Department, ARRL, 225 Main St., Newington, CT 06111.

Product Review

Conducted By Paul K. Pagel,* N1FB

Cubic Astro 102BXA Transceiver



American made? Yes, indeed! The Astro 102BXA (formerly Swan/Astro) is built by a tenured engineering firm, Cubic Corporation, of Oceanside, California. The manufacturer once stated that "75 of our engineers were involved in the design of the Astro." Those who subscribe to the "buy American" doctrine should be pleased with this product.

If your buying urge is stimulated by the presence of dazzling geegaws, this rig may not be for you. But if truly functional and important operating features inspire you, the 102BXA might be what you've been waiting for. It has what the operator needs, and nothing more.

Coverage is from 160 through 10 meters in six bands. This transceiver is completely transistorized (inclusive of ICs and diodes). Twin PTOs are included to provide split-band operation when desired. Other features are variable age time constant, passband tuning, and separate controls for rf and i-f gain. It also has RIT, selectable break-in delay or full QSK, noise blanker and speech processor. The panel meter indicates forward and reflected power in watts, alc level and the relative strength of incoming signals.

A large red digital display provides readout of the operating frequency to six places, such as 21,025.3 kHz. An eight-level LED string shows the status of the passband tuning from 0.6 to 2.7 kHz. There is also a notch filter that is adjustable from the front panel of the transceiver.

The passband-tuning control sets the i-f bandwidth with either a high-pass or low-pass cutoff. Clockwise rotation of the control attenuates low-frequency audio, while counterclockwise rotation reduces the high-frequency response. The LEDs mentioned earlier indicate the effective audio passband of the receiver. I learned that the control needs to be set for approximately 1.0 kHz or higher when the sharp cw accessory filter (300 Hz) is being used. Otherwise, no cw beat note is heard.

The microphone impedance is specified as 47,000 ohms. A key jack is located on the rear panel of the transceiver, but the PTT line (accessible at the mike jack) can also be used as a keying-control line.

Other connection points on the rear apron of the equipment are EXT RELAY, EXT MODULATION, EXT LO, ANTENNA, GND and EXT SPEAKER. There is a built-in speaker, plus provision for an external one. The EXT MODULATION jack provides an interface for AFSK, and the MIC GAIN control on the front panel is used in that mode to control the level.

The speech-processor action is determined automatically by the setting of the MIC GAIN. There is no separate external adjustment for the processor. Similarly, the noise blanker is factory-adjusted. It has no external threshold control. Carrier-level control during cw operation is provided by the MIC GAIN control.

I am mystified by the presence of a SOFT/HARD keying switch on the transceiver front panel. The keying waveform in the "hard" position is what we at ARRL consider objectionable in terms of clicks (see Fig. 3). The "soft" position yields an excellent waveform, closely approaching the desired 5-ms rise and fall times that result in click-free keying. That panel switch might have been put to better use as a CARRIER LOCK control, which has not been included in the design. This makes tune-up difficult unless the keyer has a "carrier hold" switch.

Other features that aren't present in the Astro 102BXA are a crystal calibrator or WWV band-switch position. Fortunately, the 40-meter coverage is from 7.0 to 7.5 MHz, which permits reception of Canada's CHU time/standard station in some areas of the country.

The internal switching feature for an external amplifier is compatible with the manufacturer's Astro 1200Z and 1500Z amplifiers. Unfortunately, the internal solid-state switching circuit is limited to a maximum of + 200 V and 200 mA. Therefore, most amplifiers of different manufacture can't be switched by the Astro 102BXA — at least not directly. I had to interface the transceiver with my Heath SB-221 by means of an external relay that was actuated by the solid-state switch in the Astro. A 12-V dc relay can be used (low-current coil), and power for it can be borrowed from the + 12-V bus in the transceiver. If an external relay is used, it will negate the use of full QSK since many control relays will not follow the cw speeds that are used by most operators.

I was impressed with the skirt selectivity of the i-f system. The variable passband tuning of the receiver complements the i-f filters to reduce wideband noise and enhance the effective selectivity. In fact, acceptable cw selectivity can be had when using the ssb i-f filter by ad-

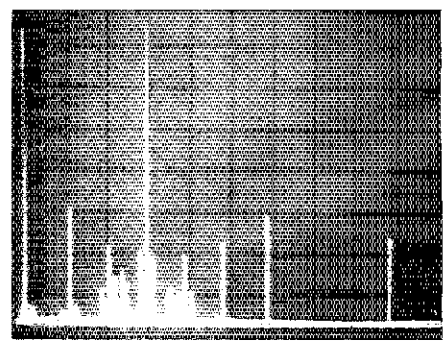


Fig. 1 — Worst-case spectral display of the Cubic Astro 102BXA. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is approximately 100 watts at a frequency of 28 MHz. Spurious emissions are at least 49 dB down from peak fundamental output. The Astro 102BXA complies with current FCC specifications for spectral purity.

*Assistant Technical Editor

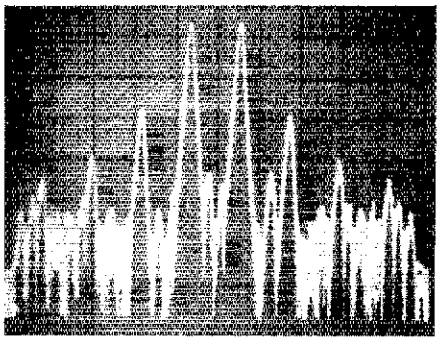


Fig. 2 — Spectral display of the Astro 102BXA output during transmitter two-tone IMD test. Third-order products are 28 dB below PEP, and fifth-order products are 39 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transceiver was being operated at rated input power on 14 MHz.

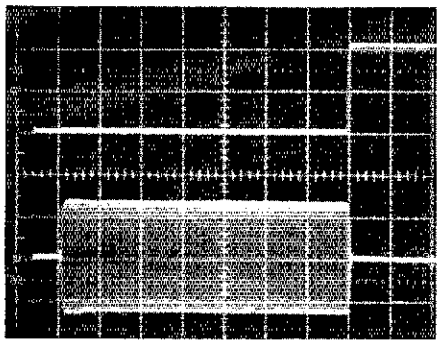


Fig. 3 — Cw keying waveform of the Astro 102 with the selection switch in the "hard" keying position. The upper trace is the actual key closure; lower trace is the rf output envelope. Each horizontal division is 5 ms. This waveform will generate key clicks.

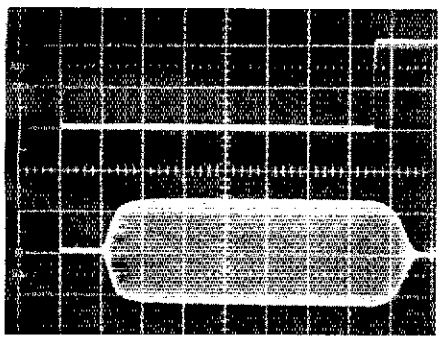


Fig. 4 — Cw keying waveform of the Astro 102 with the selection switch in the "soft" keying position. The upper trace is the actual key closure; lower trace is the rf output envelope. Each horizontal division is 5 ms. This waveform is essentially click-free.

justing the variable passband control to the counterclockwise end of its range.

Cw offset is 800 Hz. In the sharp cw mode (300-Hz accessory filter installed), the cw filter is operated in series with one of the two 8-pole ssb filters. This greatly reduces wideband noise from the i-f amplifiers and provides an apparent improvement in overall receiver signal-to-noise ratio. During ssb operation the two 8-pole filters are in use. The ssb filters have a bandwidth of 2.4 kHz, and the shape factor is 1.4, referenced to the 6- and 100-dB points on the response curve.

Cubic Astro 102BXA HF Transceiver Serial No. 659

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 160, 80, 40, 20, 15, 10 meters.	As specified, plus additional coverage above and below each band: 1378-2106 kHz; 3379-4106 kHz; 6879-7606 kHz; 13,878-14,606 kHz; 20,878-21,606 kHz; 27,878-30,106 kHz.
Operating modes: Cw and ssb.	As stated.
Readout: Digital (red LEDs).	
Resolution: 100 Hz.	25 kHz per 360° turn of tuning knob.
Backlash: Not specified.	Nil.
Power requirements: 12-14 volts dc, negative ground, 20-A peak.	As stated.
Transmitter rf power output: 100-W PEP into 50-ohm load at 13.5 V dc.	80/40 m = 125 W; 20/15 m = 108 W; 10 m = 100 W.
Transmitter third-order IMD: Not specified.	Approximately −28 dB (worst case) on 20 m (see photo).
Spurious suppression: 55 dB below peak power.	Approximately 49 dB (worst case), 10 m (see photo).
Harmonic suppression: 45 dB below peak power.	Approximately 50 dB (worst case), 10 m (see photo).
Frequency stability: Not specified.	80 Hz from cold start to one hour later.
Receiver audio output power: Greater than 3 W into a 4-ohm load.	Not measured.
RIT range: Not specified.	±1 kHz.
S-meter sensitivity (μV/S9): Not specified.	160 m = 85; 80 m = 65; 40 m = 55; 20 m = 50; 15 m = 50; 10 m = 75.
Receiver sensitivity: 10 dB S + N/N, 0.35 μV typ.	Receiver dynamics measured with optional 300-Hz crystal filter installed:

	80 m	*20 m*
Noise floor (MDS) dBm:	−125	−129
Blocking DR (dB):	*	*
Two-tone, third-order: IMD DR (dB):	90	84
Third-order input intercept (dBm):	−10	−3

Size (HWD): 6-3/8 × 14-1/4 × 13-1/4 in.
Weight: 23-1/2 lb.
Color: Not specified.

'mm = in. × 25.4, kg = lb × 0.454.

*unmeasured — noise limited.

Other Features

The transmitter is rated at 100 watts output for peak ssb and cw. Power output is limited to this level by the alc circuit. Available output power is 100% of this amount with VSWR values up to 1.7:1 at 50 ohms. It drops to 60% when the VSWR is 3:1. During an open or short condition the factor is 25% (equivalent voltage). A built-in VSWR sensor causes the foregoing shutdown power amounts to protect the PA transistors from damage.

Mobile operation is possible from the automotive dc-voltage system. The safe operating range is specified as 10 to 15 volts dc. Apart from the fairly large dimensions of the Astro 102, it is well suited to mobile use because it employs broadband tuning in the receiver and transmitter sections. Only minor adjustments are necessary when changing bands. The receiver is a single-conversion type with a 9-MHz i-f. Five weak birdies were noted in the receiver tuning range.

Those wishing to have full RTTY capability, plus inclusion of the WARC-sanctioned 10-, 18- and 24-MHz amateur bands, may want to consider purchasing the Astro 103BXA transceiver. The 102 and 103 models are otherwise identical. Price class: $1200. Manufactured by Cubic Communications, Inc., 305 Airport Rd., Oceanside, CA 92054. — *Doug DeMaw, W1FB*

KENWOOD TR-9000 MULTIMODE 144-MHz TRANSCEIVER

☐ If you read the survey article in March 1981 *QST*[1] carefully, you may have been surprised to learn how much activity was reported on "vhf/uhf, a-m/cw/ssb." Of the survey respondents active in Amateur Radio, 18% said they averaged at least an hour of such activity per week. For comparison with other vhf/uhf figures, the percentage for fm was 48%, for "other modes" 3% and for satellite communications (where cw and ssb are also used), 2%. Numbers like that make it easy to understand why new vhf transceivers with multimode capability keep popping up in the marketplace. (Less easy to understand is why Japanese manufacturers have totally dominated this particular market, but that's another story.) Not surprisingly, 2 meters has been the most popular band for the vhf multimode rigs, as it has been for fm rigs.

In the past, these multimode transceivers generally could be characterized in two ways: whether they were designed primarily for fm or for ssb, and whether they were designed primarily with fixed station or mobile operation in mind. If a rig is intended mainly for ssb, it will give the operator a "feel" very similar to a conventional high-frequency transceiver; if for fm, it will have the features you have come to look for in a sophisticated fm rig — ease of selection of the most frequently used channels,

[1]D. Sumner, "Survey of Amateur Radio, 1980," *QST*, March 1981, pp. 11-18.

Kenwood TR-9000 Transceiver Serial No. 0121075

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 144.0000 to 147.9999 MHz.	143.9000 to 148.9999 MHz.
Modes of operation: Fm, usb, lsb, cw.	As specified.
Frequency readout: Digital; 5-digit, red LED display, 100-Hz resolution.	0.3 inch' digits.
kHz/turn of knob: Not specified.	5 kHz or 500 kHz (cw/ssb); 5, 250 or 500 kHz (fm).
RIT range: ± 1 kHz.	± 2.5 kHz.
S-meter sensitivity: Fm—Full scale occurs at 15 μV; ssb — S9 = 5 μV.	As specified. S9 = 2.5 μV. S9 = 6.5 μV.
Receiver sensitivity: Fm—0.5 μV for 30 dB signal-to-noise; ssb — 0.25 μV for 12-dB SINAD.	0.26 μV for 20-dB quieting As specified.
	Noise floor (MDS) dBm: −132
	Blocking DR (dB): 122
	IMD DR (dB): 76
	Third-order input intercept (dBm): −18
Transmitter power output: 10 W.	Fm: 14 W. Ssb: 10 W PEP.

Size: (HWD) 3 × 6-7/8 × 9-3/4 in.
Weight: 5.5 lb.
Manufacturer: Trio-Kenwood Communications, Inc., 1111 West Walnut St., Compton, CA 90220.
Price class: $500.

adjustable output power level, scanning and the like. If the manufacturer expects you to put the rig under the dashboard of your car and leave it there, it will be a lightweight, low-profile package sans ac power supply.

Kenwood was one of the earliest and most successful of the entrants into the vhf multimode fray. The TS-700A was introduced to North America in 1975[3] and was soon followed by the TS-700S[4] and TS-700SP. There was no question but that these rigs were intended primarily for home-station use and that they had been designed with ssb operation in mind.

It is much more difficult to classify Kenwood's current entry, the TR-9000, in the multimode sweepstakes. It appears that Kenwood designers hoped to make the rig be all things to all people. The basic rig is much smaller, and is quite a bit less expensive, than the TS-700 series, and it has features undreamed of just a few years ago. On the other hand, these improvements have not come without a penalty, especially for the operator whose main interest is something other than fm.

[3]"Kenwood TS-700A 2-Meter Transceiver," Product Review, QST, March 1976, p. 38.
[4]"Trio-Kenwood TS-700S 2-Meter Transceiver," Product Review, QST, Feb. 1978, p. 31.

Description

The TR-9000 is all solid-state and is rated at 10 watts rf output on fm, cw and ssb (upper or lower sideband). It is designed to operate from a nominal 13.8-V source; an external ac power supply is an option. Other options available include a "system base" for added convenience in fixed-station operation and an external speaker (although the internal speaker, mounted in the bottom of the transceiver case, is entirely adequate unless the bottom of the case is blocked). There is no provision for VOX operation.

Frequency coverage is 143.9000 to 148.9999 MHz, in steps of 100 Hz, 5 kHz or 10 kHz. The step rate is selectable from the front panel (you'll figure out how to do it in the first few minutes you use the rig, but two switches, neither one adequately labeled, are involved, and explaining the maneuver is something else again!). The 100-Hz step rate translates to 5 kHz per revolution of the main tuning knob, which is much too slow for casual tuning around on ssb or cw, but the 10-kHz step rate (5 kHz is not available in the ssb and cw modes) will cause you to miss stations on these two modes.

The frequency control selects the receiver frequency, the transmitter being on the same frequency or 600 kHz higher or lower depending on the position of the TX OFFSET switch. Five memories are provided, one for operation with any split (e.g., something other than 600 kHz). A useful feature on many fm rigs is the ability to swap the receiver and transmitter frequencies at the flick of a switch to permit monitoring of a repeater input or to make it easy to use "inverted" repeaters; this is not a feature of the TR-9000. Rapid switching from fm to ssb, or between frequencies that are not programmed into memory, is facilitated on this Kenwood rig by a pushbutton that shifts the VFO between two independently selected settings.

The main tuning knob is not the only way to select the operating frequency. Two push buttons on top of the hand-held microphone are used to move the frequency up or down one step at a time, or more rapidly if a button is held down for a couple of seconds. A "beep" will be heard each time a button is depressed, which may be annoying under some circumstances. Unfortunately, in mobile operation the "beep" may be the only indication you have of your operating frequency, because the red LED frequency display is unreadable in bright sunlight.

An interesting feature of the TR-9000 is its scanning capability. The normal method of operation is to put the transceiver in the fm mode and to let it scan up in frequency to the first busy channel. It takes about 90 seconds to scan its entire range in 5-kHz steps. Narrower limits cannot be set; you must scan the entire range. The memories cannot be scanned. On ssb/cw there is no provision for stopping automatically on a busy frequency, and because it takes so long to scan in 100-Hz steps, you are more likely to use a special feature that permits the scanning of a 10-kHz segment than to scan the whole band. This feature lets you scan between, for example, 144.190 and 144.200 MHz, but not between 144.195 and 144.205 MHz; the limits must be integral multiples of 10 kHz.

Other features of interest include an rf gain control, noise blanker, receiver incremental tuning, combination signal strength and relative power output meter, and rear-panel jacks for a tone pad and back-up power supply (to retain memory when the main power is disconnected).

All on-the-air reports received during the testing period were complimentary. On receive, the time constants in the agc circuit switch automatically from slow, for ssb, to fast, for cw; the recovery time on ssb is slower than many operators would prefer. While it's difficult to quantify, the "feel" of the controls and the ruggedness of the physical package give the impression that the rig should provide years of trouble-free operation.

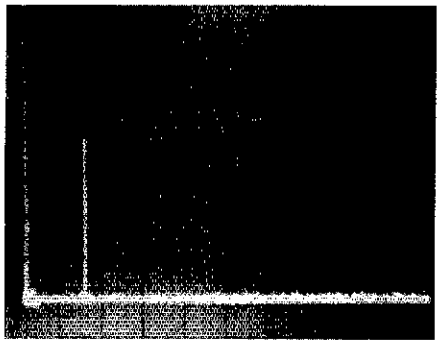


Fig. 5 — Spectral display of the Kenwood TR-9000. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. Output power is approximately 10 watts at a frequency of 146 MHz. The fundamental has been reduced in amplitude approximately 32 dB by means of notch cavities; this prevents analyzer overload. The TR-9000 complies with current FCC specifications for spectral purity.

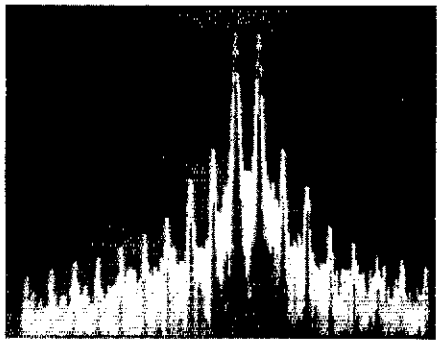


Fig. 6 — Spectral display of the TR-9000 output during transmitter two-tone IMD test. Third-order products are approximately 33 dB below PEP, and fifth-order products are 43 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 2 kHz. The transceiver was being operated at 10 watts of PEP output on 146 MHz.

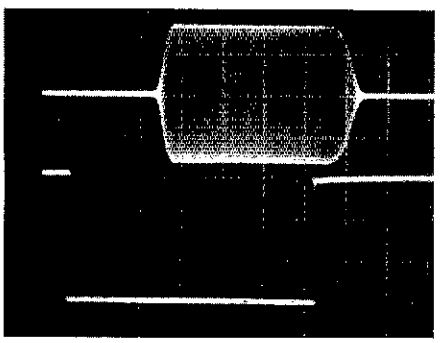


Fig. 7 — Cw keying waveform of the TR-9000. The lower trace is the actual key closure; upper trace is the rf output envelope. Each horizontal division is 5 ms.

Summary

If you're interested primarily in fm but would also like to have ssb and cw capability in a box no larger than most single-mode rigs, you will want to give serious consideration to the TR-9000. On the other hand, if you're interested mostly in OSCAR or in the low end of the band, you're likely to be disappointed at what has been left out of the box in the interests of compactness and economy. — *David Sumner, K1ZZ*

CUSHCRAFT 20-4CD SKYWALKER 20-METER MONOBAND YAGI ANTENNA

☐ Regardless of attempts to improve the triband Yagi, monobanders are still accepted as "the way to go" for top performance. Cushcraft's most recent offering in this category is the new Skywalker line of computer-designed 3- and 4-element Yagis. The 20-4CD tops the line, providing 4 elements wide-spaced on a 32-foot, 8-inch boom. As expected, the Skywalker is quite a large antenna; it weighs 55 pounds and has a wind surface area of 8.1 square feet. The longest element is 36 feet, 1 inch, and the turning radius is 23 feet, 8 inches. Because of its massiveness, it is recommended that the Skywalker be mounted only on towers of considerable loading capacity, and that a heavy-duty rotator and braking system be used as well.

Construction

The 20-4CD is shipped in two boxes. All small parts are neatly packaged in plastic bags, making a check of the contents quite painless. The materials used are all first quality — 6063-T832 aluminum for the elements and boom, with cadmium-plated hardware used throughout. Element clamps are stainless steel, excluding the worm gear, leaving some potential for corrosion after extended periods in harsh-weather areas.

Construction is quite simple using Cushcraft's method of assembly. All elements and boom sections are premeasured and marked at the factory. All one must do for assembly is slide matching pieces together up to the proper mark, then tighten the clamps. Just to make sure, the element lengths were checked with a tape measure and found to be exactly as specified.

The 20-4CD Skywalker is fed with 50-ohm coaxial cable through a gamma match, which Cushcraft refers to as its "Reddimatch." Adjustment is carried out with the aid of an SWR indicator or wattmeter. A single aluminum slider is moved to achieve the best possible match. The adjustment must be carried out with the antenna elevated above ground level. Even though this is a full-sized antenna, construction time was only four hours.

Testing

Following assembly, the antenna was installed atop a 60-foot self-supporting tower. During installation, the Yagi had to be moved from a horizontal position to a vertical one, and considerable flexing was noticed in the boom. Cushcraft has chosen to use small-diameter tubing for the boom to keep weight and wind loading to a minimum. While the vast majority of antennas this size have 3-inch O.D. booms, the Skywalker has 2-1/8 inch O.D. tubing for the boom. Although the antenna has held up to summer thunderstorms, heavy winter icing and high winds may leave a small mechanical safety factor. It should be noted that the boom *is* strengthened by the use of two struts that join it to the mast above. This is standard procedure on long booms; however, it is not a good substitute for larger diameter aluminum tubing. The additional strength offered by a 3-inch boom overrides the disadvantages of added weight and windloading in this antenna class.

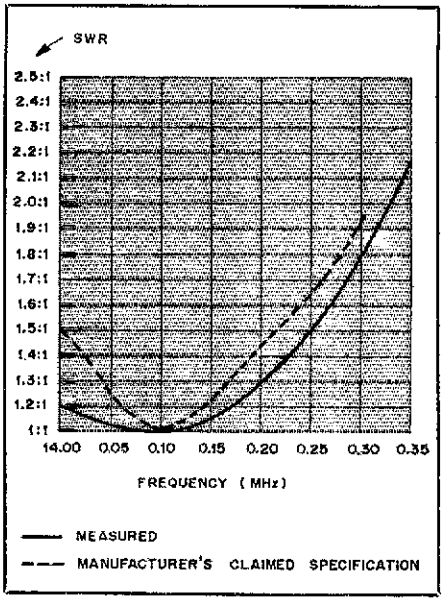


Fig. 8 — SWR curve of the Cushcraft 20-4CD.

An initial test was gratifying. Reflected energy was within manufacturer's specifications in the cw band for which the antenna was set. (The antenna may also be optimized for the low or high end of the phone band.) No additional tuning of the gamma match was necessary in this case. Although optimized for cw, the Skywalker provided a good match across the entire band.

Performance

It has been a couple of months since the Skywalker was put into use, and the performance has been exceptional. Practically any DX pileup can be cracked with very little effort — many with only one call. Repeated testing with other local amateurs using triband Yagis at the same height has shown the superiority of the Skywalker. Signals emanating from the monobander are consistently louder than those from the tribanders, and often by a considerable margin. At no time did the tribanders provide a superior signal report while working DX stations.

Overall the 20-4CD Skywalker provides exceptional gain, front-to-back and front-to-side ratios. It should provide all the "muscle" even the most critical operators require. The 20-4CD Skywalker Yagi is manufactured by the Cushcraft Corporation, P.O. Box 4680, Manchester, NH 03108. Price class: $320. — *Dennis Lusis, W1LJ*

'm = ft × 0.3048; $m^2 = ft^2 \times 0.093$; mm = in. × 25.4; kg = lb × 0.454.

Hints and Kinks

Conducted By Stuart Leland,* W1JEC

SIMPLIFYING ANTENNA MATCHER BAND CHANGING

☐ The article by Collin Dickman, ZS6U, in April 1981 *QST*, prompted me to write of my experience using an L-matching network for multiband operation. Since the L network is effective in matching high-impedance loads, anything longer than a quarter-wavelength wire can be matched effectively, regardless of the configuration (end-fed wire, inverted V, inverted L and so on).

Amateurs may avoid using an end-fed wire because of the inconvenience of having to adjust an antenna matcher each time they change bands. My desire for a quickly band-switched antenna for contest work resulted in the L network shown here. Although I use a 90-ft (27.4-m) end-fed inverted L, this network works well with most end-fed antennas. See Fig. 1.

I make semipermanent taps on the coil by using small alligator clips, leaving the capacitor settings alone. I can work a 100-kHz or greater segment of each band, with the SWR below 1.3:1. The capacitor values are not particularly critical, and I have found that most broadcast-band variable capacitors (C1, C2) are adequate for power levels up to a few hundred watts. As a rule, you will need smaller values of capacitance as you increase frequency: This is a good way to use some of those variable capacitors that have been gathering dust in your junk box. It won't take long to find the right combination of inductance and capacitance to attain a proper match for each band. Once the values are set, they will need only an occasional tweaking to compensate for ice or condensation on the antenna. This suggests the possibility of mounting the network remotely and using a motor-driven switch to change bands. I keep the tuner on my windowsill, with the antenna wire routed out the window.

As Dickman describes, the maximum radiation of an end-fed wire that is electrically long in terms of wavelength, is off the end of the antenna. This is true to such a degree on the higher bands (15 and 10 meters) that I prefer using dipoles on these bands for better general coverage, although this L network could easily be expanded to work on any existing or WARC-proposed bands. If you are looking for an easy antenna for multiband use, an end-fed wire of almost any configuration, with the L network described here, may be suitable for you. — *Paul Schaffenberger, KB8N, Petoskey, Michigan*

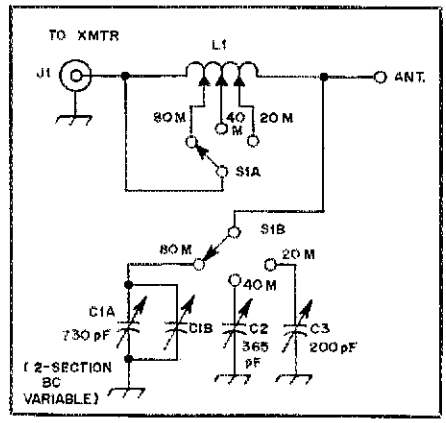


Fig. 1 — The simple band-switching method used by KB8N for his L network. S1 is a two-section, three-position (or more) wafer switch. L1 is a 5-inch length of B&W 3029 coil stock, 2-1/2 inches in diameter, 8 turns per inch, no. 16 wire. (mm = inches × 25.4)

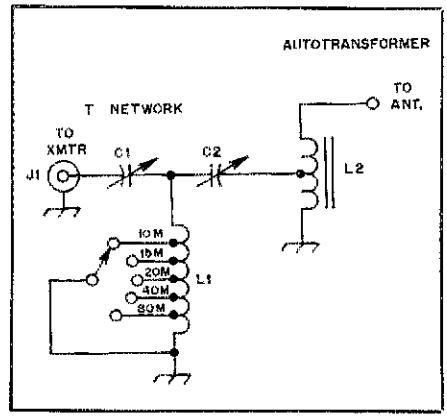


Fig. 2 — Typical "mobile" antenna tuner. Connect the transformer center tap to the tuner, one end to the ground system and the other end to your high-impedance antenna.

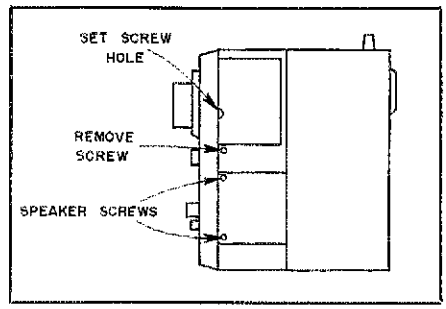


Fig. 3 — Diagram showing location of screws for access to the ICOM 502 VFO.

A BROADBAND IMPEDANCE STEP-UP FOR ANTENNA MATCHERS

☐ Most Transmatches or tuners on the market today are the T-network type. These are designed primarily for matching a 50-ohm source to a low- or medium-impedance antenna. If you have difficulty getting your restricted-range "mobile" matcher to work with your all-band wire, try using this simple impedance step-up circuit. See Fig. 2.

The circuit contains a simple broadband autotransformer that is wound on one or more Amidon T-200-2 forms, exactly as you would wind a 4:1 balun. I recommend the Amidon balun kit, which has winding information, a T-200-2 core and wire with high-voltage insulation. I suggest parallel spaced turns rather than twisted ones. Wrap the completed transformer with several layers of 3M glass electrical tape, and varnish the whole thing.

I mounted my transformer externally on the rear of my tuner, but it could be mounted in a box that can be removed quickly when the rig and tuner are pressed back into mobile service. — *James Coote, WB6AAM, Los Angeles, California*

INCREASED BANDSPREAD FOR THE ICOM 502

☐ Most 6-meter ssb operation occurs between 50.1 and 50.2 MHz. This simple modification will spread out the first 300 kHz of the band over the entire dial to allow smoother, easier tuning. Only one 47-pF silver-mica capacitor needs to be installed in the VFO.

To gain access to the VFO can, remove both side covers. Then remove the screws on top of the transceiver (front strap bracket). Remove the front rubber foot pad, and remove the screws under the pad. Next, remove the screw on each side of the front edge of the pc board, just below the VFO can. Finally, remove the two screws on the speaker frame as shown in Fig. 3. Now gently pull the front of the transceiver away from the case.

Six screws and one nut hold the cover of the VFO can to be removed. It may be necessary to free the tuning capacitor from the vernier control to remove the bottom screw. While facing the battery side, turn the dial until the recessed screw is visible in the oblong hole of the VFO mounting bracket. Loosen the screw, then turn the dial to 50.0 so the stop screw becomes visible, and loosen this screw. The VFO can now be pulled away from the front panel to allow access to the bottom screw.

Remove the cover from the VFO and look for C4 and C5, which are mounted in parallel on one side of the main-tuning capacitor. They are wired from the plates of one section to a stiff ground wire. Solder the 47-pF silver-mica capacitor in parallel with C4 and C5. Reassemble your IC-502.

To calibrate the dial, connect a frequency counter to J5 and J6 (ground side) on the main board. Set the dial to 50.0, and adjust the core of L1 in the VFO to obtain a reading of 36 MHz. Adjust trimmer C3 to obtain the highest possible reading, then readjust L1 to 36 MHz. Now rotate the dial, and make note of the 100-kHz points.

You may use the original dial markings for reference points of the new coverage, or for a more personalized job rotate the dial 180 degrees and use the blank side to make new calibration marks. To do this, remove all knobs and the recessed nut on the volume control. The front plastic will pull off and allow you to rotate the dial.

The nice thing about this is, should you ever want to sell or trade the rig, the "mod" can be undone with no one the wiser, but you. In the meantime, enjoy your increased bandspread. — *James Batka, WA9CUH, Nekoosa, Wisconsin*

*Assistant Technical Editor

UNIVERSAL QRP TRANSMITTER KEYING IMPROVEMENTS

☐ The Universal QRP Transmitter (ARRL's *Solid State Design for the Radio Amateur*, page 26) is an excellent performer, but the natural tendency is to add more stages to increase the power output. Unfortunately, the addition of Class C stages can cause severe key clicks because of the sharp keying characteristics of the transmitter and nonlinearity of the amplifier stages. Attempts to shape the oscillator keying with inductance and capacitance resulted in excessive chirp. The solution is to key the amplifier stage and process it separately from the oscillator keying. The oscillator must still be keyed to prevent a backwave and to allow break-in operation. Fig. 4 shows the circuit devised to perform this function.

The transmitter oscillator is turned on immediately upon closing the key, through U3B and Q1. U1 provides a short time delay (to allow for oscillator chirp) before turning on the amplifier with U3C and Q2. Note that Q2 does not turn on immediately; the amplifier keying is filtered by R and C. On releasing the key, U3C turns off, followed slowly by Q2 (again shaped by R and C). U2 provides a time delay to hold the oscillator on briefly while Q2 slowly turns off the amplifier.

The transmitter was followed by two push-pull transistor stages providing an output of 50 to 100 watts, depending on battery voltage (12 to 14 volts). On-the-air observations indicated good results. The oscilloscope envelope display appears fairly sharp with well-rounded corners. — *C. J. Klinert, WB6BIH, National City, California*

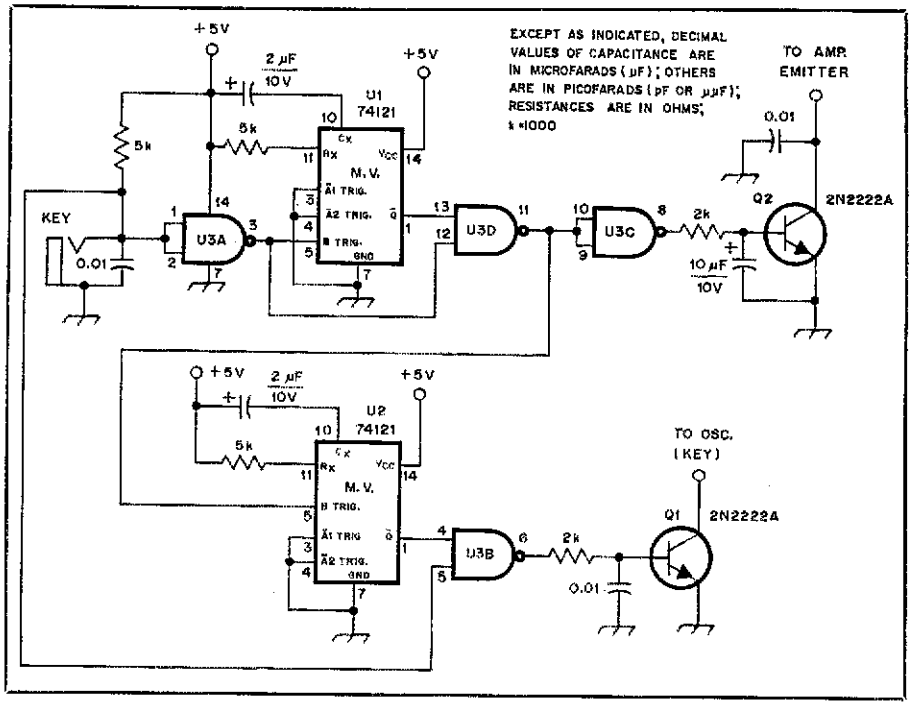


Fig. 4 — Differential keying circuit. U3 is a 7400 NAND gate. Lift the emitter of the amplifier, and connect it to the collector of Q2. The 0.01-µF bypass capacitor should be located near the amplifier emitter lead.

ACCIDENTAL TURN-ON OF THE CENTURY 21

☐ The Ten Tec Century 21 uses a push-on, pull-off type of ac power switch. A simple addition I made to my Century 21 front panel was a rubber grommet that fits snugly around the switch shaft to prevent an accidental push, which would turn the unit on. See Fig. 5. I found the correct grommet size to be 9/16-in. ID × 1-1/8-in. OD × 1/4-in. thick. I cut a piece approximately 3/16 in. wide from the grommet to allow it to stretch over and around the switch shaft and fit snugly between the front panel and the switch knob. The width of the grommet keeps the switch immovable. To keep the grommet handy I tied about 4 inches of 1/8-in. diameter Teflon tubing around it, opposite the cutout. I attached the other end of the Teflon to the screw on the front of the bottom panel, near the switch. — *Edward Bowley, W2VLH, Elmhurst, New York*

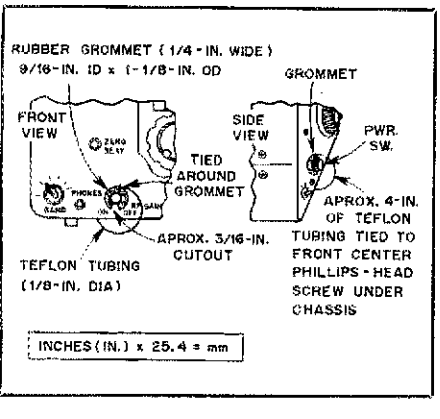


Fig. 5 — Sketch showing the addition of a rubber grommet between the front panel and the ac power switch on the Century 21 to prevent accidentally turning the rig on.

NO-MESS ETCHED-CIRCUIT BOARDS

☐ Homemade etched-circuit boards can add to the fun of an electronic project. Unfortunately the etching process is usually messy and not very exciting. The etchant should be poured into a nonmetallic container, which must be cleaned afterward (especially if you use a good plastic kitchen container!). Another problem is dredging the board up from the bottom of the container to check on progress (too long in the etchant means goodbye pattern). This may be accomplished by probing the dark depths of the etchant with a wooden stick or whatever is handy. (Don't use your best silverware!) Finally, the process can require a lot of time if a large amount of copper is to be removed, or if the etchant is near depletion. The etching process can be speeded up by heating the etchant, but that usually means time in a barely warm oven. These problems have a simple solution.

The key is a 'Ziploc' sandwich or storage bag. The etchant can be poured into the bag, and the board dropped (carefully) in. Seal the bag, and check for leaks. The bag can now be submerged in warm water to heat the etchant. Check the progress by pinching the board to the plastic. When the board is completed just pour the etchant back into its container, rinse the board, then seal and discard the bag. No mess! — *Tom Workman, KØTW, Tucson, Arizona*

USE PERF-BOARD HOLES AS DRILL GUIDES FOR ETCHED-CIRCUIT BOARD IC SOCKETS

☐ Having trouble drawing and drilling holes for ICs on copper-clad pc boards? Here's a suggestion that may help. In most cases you can use carbon paper to trace the circuit onto the copper-clad board. Next, locate the parts of the circuit requiring IC sockets. Sandwich a micro-miniature (1/10-inch spaced holes)[2] perf board with the copper-clad board. Be sure the holes in the perf board line up with each individual IC drawing. Hold the sandwich together with small pieces of tape, and drill the required holes using the perf board as a guide. After all the IC socket holes are drilled, use resist ink to draw in the circuit, matching the circuit lines to the holes drilled for the ICs. Make sure the edges of the holes are well covered with the resist ink to protect them from the etchant. Continue with the normal process of etching, washing and drying. — *John Bentler, KE7I, Renton, Washington*

ECONOMICAL QST HOLDERS

☐ Recycle empty laundry-detergent boxes as files for your *QST* magazines. Use the family size, which should closely match the *QST* size. Cut the box at an angle and insert your magazines. This will allow the date to be seen for easy reference. Make the files more colorful by applying contact paper or wallpaper. — *Matt T. Shamonsky, W3OST, State College, Pennsylvania*

'Ziploc is a registered trademark of the Dow Chemical Corp.

[2]mm = in. × 25.4.

Technical Correspondence

Conducted By
Doug DeMaw,* W1FB

ON WINDING FERRITE CORES

☐ The key to how effective a magnetic core is when it is contained in a coil field is the core permeability, P [expressed also as μ_i for initial permeability, and μ_e for effective permeability — Ed.]. Core manufacturers will state the permeability of their products. Manufacturing tolerances permit a variation of plus or minus 25 to 30 percent.

Many surplus magnetic cores find their way into the hands of experimenters, and the permeability is unknown. The following equations can be used as an aid to winding coils on cores of this type. Three factors are involved:

P = the *apparent permeability* of the core when it is fully engaged within the coil field. The *effective permeability* will vary in accordance with the core penetration into the field of the coil. In the case of pot cores and E-I cores, the air gap (space) allowed between the mating core sections will affect the permeability. This gap can be a valuable aid in obtaining a desired inductance.

LWO = The coil inductance with the core material absent.

LW = Coil inductance with the core in full penetration.

Therefore,

$$P = \frac{LW}{LWO} \text{ and } LWO = \frac{LW}{P}$$

The LWO equation is useful when you want to wind a specific inductance on a core of known permeability. The P equation will enable you to determine the permeability of unknown cores when you have provisions to measure inductance.

Coupled Coils

Some experimenters miscalculate the inductance values of coils that are used in series or in parallel, treating them like resistances in determining the net inductance. This approach is unsuitable when the coils are coupled closely, with the windings aiding (wound in the same sense). These equations are useful in situations of this kind:

$$\text{Series } Lt = L1 + L2 + 2M \text{ and}$$

$$Lt = \frac{1}{\frac{1}{L1 + M} + \frac{1}{L2 + M}}$$

where Lt is the total inductance, M is the mutual inductance, and L1 and L2 is expressed as the self-inductance of each coil.

It is hoped that this information will be useful to amateurs who like to experiment. — *Ken Cornell, W2IMB, 225 Baltimore Ave., Point Pleasant Beach, NJ 08742*

DBM LO INJECTION LEVEL VERSUS VSWR

☐ *QST* and *Handbook* presentations about high-performance mixers have elicited some interesting questions among our readers. One of them I have answered frequently concerns the effect of the local-oscillator injection power on a diode-ring, doubly balanced mixer (DBM). That is, a number of amateurs indicated that they had VFOs or synthesizers that delivered marginal or insufficient output power for a DBM. They wondered if this would significantly impair the mixer performance. The answer is a resounding "yes."

We must recognize the specified operating parameters given by the manufacturers of diode-ring mixers: The impedance of the ports is given as 50 ohms over the bandwidth of the mixer, and the LO injection power is stated as +7 dBm for most low-level DBMs. This means that we must deliver 5 mW (0.005 W) of rf power into 50 ohms (0.5-V rms) to have a VFO or synthesizer with proper injection capability. Since commercially made mixers are presumed to have a specified LO injection power range that ensures a 50-ohm port characteristic, it is wise to adhere to the dBm levels specified. Mixer conversion loss is also a function of the LO injection power.

VSWR can be considered the degree of mismatch presented to the interfacing circuits. This is also a function of the LO power and operating temperature. The VSWR of a mixer can be determined by

$$VSWR = \frac{1 + |\rho|}{1 - |\rho|}$$

where

$$\rho = \frac{Z_L - Z_o}{Z_L + Z_o}$$

with ρ being the reflection coefficient, Z_L the mixer input impedance and Z_o the system characteristic impedance.

But, the VSWR doesn't represent the phase of ρ, so we don't know if Z_L is close to the specified 50-ohm characteristic mixer impedance. To confuse the issue even more, if a VSWR of 2:1 was measured in the 50-ohm line to the LO port of the mixer, we would not know if the port impedance was 25 or 100 ohms. Typically, a large number of complex impedances are present when we move the LO frequency over a broad range.

The VSWR measured at the rf, i-f and LO ports of the DBM are related directly to the LO power. Any change that occurs at the LO port is reflected to the two remaining ports. The LO port is the significant one in this discussion, since the signal levels at the rf and i-f ports are too low to have a major effect on the biasing of the mixer diodes (Schottky types). We can see from this that as the LO power changes, the resulting shift in diode impedance is seen as VSWR at the three mixer ports.

When we build homemade DBMs it is important to set the LO injection level so that the VSWR is optimum, consistent with the specified power rating stated by the diode manufacturer. Once this is done we can tailor the rf and i-f ports to match their respective load impedances in our composite circuit. The advantage is, of course, to ensure maximum signal-power transfer at each mixer port. Maximum power transfer occurs when an optimum impedance match exists — a fundamental law of electronics. — *Doug DeMaw, W1FB*

ANTENNA TOWERS — A WARNING!

☐ Peter O'Dell's article in July 1981 *QST* on towers must not be construed by readers as an opening of the door to "home brewing" towers. I am writing this letter the day after the Kansas City Hyatt Hotel walkway collapsed!

The cardinal advice is to obtain a building permit prior to installing a tower. It can be obtained from your local city engineer, building-permit department. Seek his verbal advice and a list of requirements. This will vary by locale, owing to wind differences, icing conditions, seismic effects, load factors and so on.

The tower manufacturer should mail the necessary stress calculations, drawings and other data that the building inspector might request. If the required data is not available from the tower manufacturer, consult a registered civil engineer.

After some 30 years of designing commercial and amateur towers, I have seen some unfortunate "after the fact" situations. With today's society so inclined to sue, a ham without a building permit is similar to a person driving an automobile without registration tags! — *Jesse G. Ball, W6BFO (registered civil engr.), 7112 Deveron Ridge Rd., Canoga Park, CA 91307*

MORE ON 50-OHM HELIX FEED

☐ The June 1981 *QST* article, "Easy 50-Ohm Feed for a Helix," brought to mind how the North Dakota Highway Department engineers fed and matched helical antennas for their 460-MHz radio equipment. My friend, Dick Moritz, came up with a "tin-snip" method. The resultant capacitive transformers proved to be rugged, reliable and unaffected by ice, rain and dust over a 15-year period.

A coaxial N connector, hollow "bee hive" cone or similar standoff insulator, piece of no. 14 wire and an aluminum plate (about 205 mm square) are required. The details are given in Fig. 1.

First, drill and tap all of the holes necessary to mount the connector and standoff retainer ring on the ground plane. This feed assembly is mounted at the beginning of the helix, as shown in Fig. 4 of the original *QST* article. Then determine the proper length and shape for the copper wire, to permit the bolt to be soldered to one end and the connector to the remaining end. Assemble the connector on the ground plane, slip the standoff over the bolt (on the helix side), install the retainer ring, then attach the aluminum plate and helix end on the top of the standoff. Tighten carefully!

Now, use a wattmeter and 50-ohm dummy load that are suitable for the operating frequency, and tune up the transmitter into the dummy load. Note the power output and PA current. Next, remove the dummy load and connect the helical antenna. Point the antenna

*Senior Technical Editor

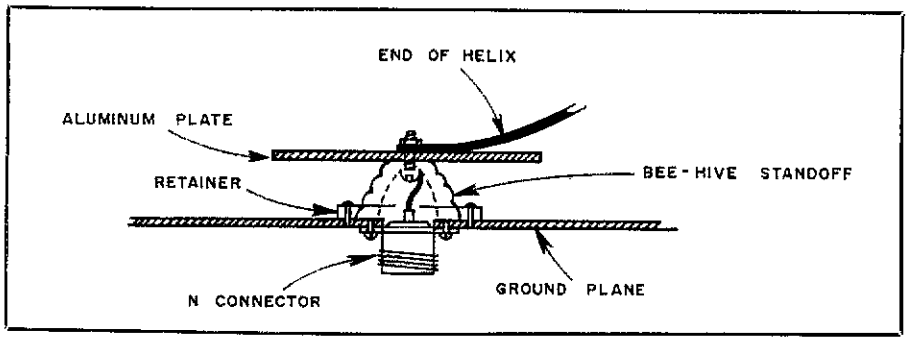


Fig. 1 — Construction details of the feed assembly for helical antennas. The VSWR is adjusted by using the "tin-snip" tuning method.

straight up and away from conductive objects. Use a pair of tin snips to trim away some small pieces of the aluminum plate, rounding off the corners first. Trim the plate for minimum indicated reflected power, with the forward power reading equal to that delivered earlier to the dummy load. The PA should be drawing the same current as when the dummy load was used. When these conditions are met, the feed line has been matched to the antenna. — *Dennis R. Murphy, KØGRM, 1109 Memorial Hwy., No. 4, Bismarck, ND 58501*

MR. H. H. BEVERAGE ON BEVERAGE ANTENNAS

☐ I read with great interest the article on page 51 of September 1981 *QST*, entitled "Beverage Antenna for Amateur Communications," by John S. Belrose. He apparently expressed the effective height of the antenna in terms of decibels below the length of the antenna. I have calculated the effective height of the antenna and expressed it as the height of an equivalent vertical antenna. I used the equation for wave tilt, which is

$$T = 0.235 \times 10^{-10} \frac{f}{\sigma} \qquad \text{(Eq. 1)}$$

where f is the frequency in Hz and σ is the ground conductivity in emu.

Eq. 1 does not include any effect related to the dielectric constant of the earth, which may explain some of the difference of my calculations compared with the results reported by Mr. Belrose, assuming that he took the earth dielectric constant into account. At very low frequencies the effect of the dielectric constant is negligible compared with the conductance of the earth. At high frequencies, the dielectric constant of the earth will reduce the wave tilt, T, resulting in a lower effective height.

I have calculated the example of an antenna 100 meters long at 2,000,000 Hz versus ground conductivity (see table).

My calculations appear to be in fair agreement with the results reported by Mr. Belrose for an antenna height of 1 meter above ground. As Mr. Belrose pointed out, the effective height is slightly greater for an antenna a few feet above ground. I expect that this results from the increased velocity of the current along the antenna keeping closer in phase with the wave in space, which is traveling at the velocity of light.

I have not attempted to check Mr. Belrose's calculations for antennas of different lengths in terms of the wavelength of the signals being received. In general, the velocity of the current along the antenna will vary between 80 and 90 percent of the velocity of light, depending on several variables. Because of the lower velocity, optimum results are obtained with an antenna one wavelength long. With antennas more than two wavelengths long, there may be sufficient phase lag, such that the signal strength will actually decrease with an increase in the antenna length. — *Harold H. Beverage, ex-W2BML, P.O. Box BX, Stony Brook, NY 11790*

THE HELIOGRAPH REVISITED

☐ I found the Technical Correspondence item on unguided light beams (August 1981 *QST*) very interesting. During World War II when I lived on Long Island, Western Union had some experimental towers out there, and we were told that they were being used for experimental infrared beam communications. As the Technical Correspondence item suggested, the idea of light beams has surfaced periodically over the years, and I fully expect it will be utilized in practical ways eventually. I suspect it has been sidetracked in the push for radio development. Some years ago I became interested in the signaling heliograph. The heliograph is of historic interest now, but is fascinating, nevertheless.

I heard that the Army electronics lab at Fort Huachuca, Arizona, got out some old helio instruments, just to see if anything could be learned from a new look at an old idea. I have two helio instruments. One is homemade, and the other is Canadian surplus. A friend has done some helio work with me, using 2-meter gear for backup. Actually, light flashes — whether helio or from another source — are easy for any competent cw operator to read. But it requires a different kind of concentration than we are used to. In 1894 a world record of 183 miles in communication was established by means of heliograph between Colorado and Utah. Distances of 25 to 50 miles were common during Apache campaigns in Arizona. Thanks for the good work in *QST*. — *Lewis B. Coe, W9CNY, 115 E. 113th Ave., Crown Point, IN 46307*

From *QST*			Calculated by Eq. 1		H_{eff}	
Condition	*dBl*	*Ratio*	*emu*	*T × L (m)*	*m*	*Feet*
Poor Gnd.	−9.3	0.343	1.0×10^{-14}	0.331 × 100	33.1	108
Average Gnd.	−12.0	0.251	1.9×10^{-14}	0.248 × 100	24.8	81
Good Gnd.	−15.0	0.178	4.0×10^{-14}	0.166 × 100	16.6	54

PHOTOPHONE — ALEXANDER GRAHAM BELL'S OTHER VISION

☐ I refer to W1FB's motivating article titled, "Communication via Unguided Light Beams," in August 1981 *QST* and would like to offer the following for consideration within the frame of his topic.

According to a report in a segment of the book *Light Beam Communications* by F. Mims III (Howard W. Sams no. 21147, $4.95), Alexander Graham Bell invented also a so-called "Photophone." The article claims that Bell was more enthused about this Photophone than his better-known telephone that used wires. In addition to mention of that invention, its principles are explained and those applied much later by various other countries for, primarily, military purposes, because this system precludes detection of signals.

I assume that *QST* readers will be interested in this information, per se, and for experiments in the spirit of the W1FB Technical Correspondence item in August 1981 *QST*. — *Rudolf Steiner, WD6CDG, 3624 Inglewood Blvd., Los Angeles, CA 90066*

Feedback

☐ In the article "Crystal Filter Design with Small Computers" by Dr. Ulrich L. Rohde, DJ2LR, in May 1981 *QST*, Table 2 is for narrow-bandwidth filters. The reference to 41-MHz in the heading for Table 4 should be eliminated. Fig. 4 is for crystals that can be manufactured.

☐ Laurence B. Stein, W1BIY, points out an error in Fig. 6 of "Meet the Friendly Oscilloscope!" (page 42 of September 1981 *QST*). The 100-kΩ resistor shown in series between the 1-MΩ resistor and the coaxial cable should be shown wired in shunt. Remove the right end of the 100-kΩ resistor from the coaxial cable and connect it to chassis ground. Attach the coaxial cable center conductor to the common connection of the three components. The probe ratio is 11:1; for a 10:1 ratio, the shunt resistor should have a value of 110 kΩ.

☐ In the Beginner's Bench article, "CW Filtering for the Beginner," October 1981 *QST*, the coupling capacitors for the passive audio filter in Fig. 4, page 40, should be 1.0-μF units rather than the 0.1-μF types listed. Thanks to ARRL TA Ed Wetherhold, W3NQN, for calling this to our attention.

Long-Range Planning — Phase II Report Accepted by Board

Important changes to ARRL adopted in principle; work continues on details of implementation.

By David Sumner,* K1ZZ

What will Amateur Radio be like in the 1990s and beyond? What should the ARRL be doing, now and in the years to come, to shape and protect the future of Amateur Radio? For almost three years, the members of the ARRL Long-Range Planning Committee have been pondering these and other weighty questions. Finally, in late summer they were ready to give their answers to the League's Board of Directors in the form of the LRPC Phase II Report.

As reported in *QST* last month,[1] at its meeting in September the Board of Directors accepted the Phase II Report. This document builds upon the foundation provided by the Phase I Report, accepted in March and summarized in August *QST*,[2] and recommends a number of significant changes in ARRL programs and organizational structure. Once implemented, these changes are likely to affect every active member of the League. Therefore, it is important for members to understand the objectives of the LRPC proposals, and to have an opportunity to influence the process of implementation.

It is not possible to reprint the entire 58-page Phase II Report in *QST*. Instead, here we present excerpts detailing the proposals for early action that are likely to be of greatest significance to the membership.

A) Effective Working Relationships with All Levels of Government

Amateur Radio is subject to a variety of government regulations at all levels. Some protect and promote our interests, while others restrict our operating privileges. Many regulations are enacted by people who are not familiar with Amateur Radio. For our interests to be protected, every official and opinion leader must have, at minimum, a positive impression of Amateur Radio. Those whose actions could have a direct impact upon us must understand our needs in their area of responsibility, and preferably should be active supporters.

Trends of concern at the federal level include a dramatic increase in the number of rulemaking proceedings affecting Amateur Radio, a decrease in FCC responsiveness to our expressed preferences and a proliferation of regulatory agencies that threaten new restrictions, particularly in the areas of antenna structures and rf radiation.

If anything, the problems are even more acute at other levels of government. Amateurs must become much more involved in local, county and state government affairs to head off unduly restrictive regulations governing antenna erections and radio-frequency interference. Instead of fighting defensive battles, we must take the initiative to convey to government officials a proper understanding of Amateur Radio as an important public resource, deserving of support. By necessity this must be a volunteer effort, involving individual members, affiliated clubs and the League's field organization. These volunteers will require guidance and direction.

Therefore, the Long-Range Planning Committee recommends that the Board of Directors give careful consideration to the establishment of a permanent department of the Headquarters, having as its primary function the programs listed above. Its responsibilities would include:

1) Continuous contact with the Congress, the Federal Communications Commission and other agencies in Washington, DC.

2) Collection and promulgation of information on local, county and state ordinances affecting Amateur Radio.

3) Recruitment, guidance, encouragement and support to members who wish to represent the interests of Amateur Radio at all levels of government.

4) Keeping the Board fully informed of regulatory matters.

5) Supervision of staff and volunteer personnel engaged in on-scene government liaison activities.

Recognizing the increased tempo in Washington, the LRPC further recommends the establishment of an ARRL presence there that goes beyond the retention of legal counsel, though not necessarily to the immediate establishment of a physical office facility. The immediate requirement is that the American Radio Relay League perform and be widely perceived as the representative of the Amateur Radio Service in the United States, locally available and on a continuous and short-call basis.

B) Membership Involvement in League Affairs

Many members see themselves as consumers of ARRL services, and not as a part of a national organization through which people work together to solve common problems. They will support the organization only as long as the direct services they receive represent good value for their dues. Of course, membership should be a good value, but members also must recognize that their time, energy and talent are just as important as their dollars to the success of their organization. Many of Amateur Radio's problems, especially at the local level, simply cannot be solved by a professional staff at a national headquarters; they must be solved by volunteers working at the local level. To be most effective, those volunteers must feel that they are a part of the national "team."

The LRPC believes that the local club is the best representative of Amateur Radio's interests at the local level. However, the present affiliated club program as it applies to Category I clubs does not provide enough guidance as to the kinds of programs clubs should be engaged in.[3] The only obligations of an affiliate are:

(1) Membership of at least five; (2) Meetings held at least quarterly; (3) Governed by a written constitution and by-laws; (4) Completion of annual questionnaire sent from Hq.; (5) 51% of voting members licensed amateurs, and 51% of voting members ARRL members; and (6) "Sympathy with and allegiance to the aims and policies of the League."

On the other hand, the benefits accorded affiliated clubs are not particularly extensive, either. The program must be changed so as to identify those local clubs that are performing effectively as local representatives of Amateur

[1]Notes appear on page 60.

*Assistant General Manager, ARRL

Where is the Technology Taking Us?

What will Amateur Radio be like 5, 10 or even 20 years down the road? Probably it will be a lot like today, but with new opportunities and challenges created by advancements in electronics technology. Here are some of the future developments envisioned by the LRPC:

Five Years

☐ Expanded use of home computers in Amateur radio communications.
☐ Growing use of visual displays for cw and RTTY, and of electronic keyboards and programmable keyers.
☐ More extensive linking of repeaters and remote base stations at 220 MHz and higher.
☐ Digital voice experimentation.
☐ Increasing use of packet radio techniques.
☐ First geostationary satellite.
☐ Increased use of solar and alternative sources of power.
☐ Improved networks for disaster communications, national and hemispheric.
☐ Increased use of ASCII in communications.
☐ Improvements in dissemination of information from Headquarters to members via radio.
☐ Improvements in speed and accuracy of traffic handling via amateur networks as microprocessor-based hardware comes into more widespread use.
☐ Development of station-location networks to identify and correct interference.
☐ Emphasis on vhf/uhf/sht communications as a result of greater availability of equipment, dishes and so on.

10 Years

☐ Routine portable and mobile communications through satellites.
☐ Widespread use of digital techniques on amateur bands.
☐ Refinements in application of selective and personal calling devices.
☐ Development of practical narrow-band video transmission systems.
☐ Possible General World Administrative Radio Conference.
☐ Increasing number of computer-commanded and -controlled stations.
☐ Availability of computer stored information on wide range of topics for access by radio.

20 Years

☐ Worldwide geostationary satellite capability for ATV and high data rate communications.
☐ Linking of satellites for worldwide coverage.
☐ Development of new communications systems, permitting denser spectrum occupancy.
☐ Probable General World Administrative Radio Conference.
☐ Many homes with some form of computer.
☐ Increased use of the moon as a passive reflector in routine amateur communication.

Radio, to provide guidance to other clubs who wish to do so and to provide increased support to these organizations without reducing the benefits provided to other League affiliates.

The LRPC recommends that a category of closer affiliation be established for local Amateur Radio clubs, tentatively called "ARRL Blue-Ribbon Clubs."[4] To qualify, an affiliated club would be required to conduct programs in the following areas, the effectiveness of which would be subject to periodic review:

1) Public Relations. Ongoing programs for:

a) Placing favorable publicity concerning Amateur Radio in the local media, and organizing exhibits at public places.

b) Countering unfavorable publicity when it appears in the local media.

c) Resolving TVI/RFI and antenna/zoning problems in a way that reflects favorably on Amateur Radio.

d) Passing news about outstanding amateur contributions in the area to the ARRL Section Public Information Officer (see the next section of this report) and ARRL Headquarters for regional and national dissemination.

2) Emergency Communications

a) Sponsorship of an emergency communications group or close cooperation with the local RACES/ARES organizations.

b) Ensuring of regular representation of the club's area of coverage in the appropriate National Traffic System networks.

3) Training

a) Participation in or organizing of licensing classes for new amateurs at least twice a year.

b) Participation in or organizing of upgrading classes for Technician/General and Advanced licenses at least once a year.

c) Providing for some form of "continuing education" for club members once they attain the class of license they desire.

4) Technical Activities

a) Sponsorship of local "working groups" for specific technical activities, depending on the members' interests, such as ATV, moonbounce, computers, OSCAR and so on, with the stipulation that news of group activities be shared with the club at large, and with the ARRL Section Technical Coordinator (see the next section of this report).

b) Maintaining a club library of Amateur Radio and technical publications for the members' use, or providing financial support for such a section in the local public library.

5) ARRL Liaison

a) Designation of a club member as ARRL Liaison Officer, i.e., to share information from League officials and Hq. with the club members *and* to relay information on members' activities and concerns to the appropriate person or body within the ARRL organization.

b) An ongoing program to encourage members to join ARRL.

6) Other Activities

a) An organized effort to have liaison, as required, with local government.

b) Maintenance of a permanent club address (such as a P.O. Box) and telephone directory listing for inquiries and referrals, and to establish a local ARRL and Amateur Radio "presence."

c) A program to combat deliberate interference and to encourage high operating standards, which is responsive to the work of the ARRL Interference Task Force.

d) A program to encourage and assist new amateurs in getting on the air.

e) Regular dissemination of ARRL bulletins to club members.

f) Annual participation in Field Day and at least one other ARRL operating activity.

Of course, a truly effective club will not stop here but will also publish a newsletter, sponsor a repeater and/or a net, hold meetings at least once a month, maintain a chronicle of the club's history and so forth.

In return, special services to blue-ribbon clubs could be provided, such as:

1) Lists of new licensees in their areas as this information is received at Headquarters.

2) Automatic referral of new ARRL members to the clubs in their areas.

3) Increased *QST* coverage of club accomplishments.

4) More-frequent visits by League officials.

5) Special insignia for club members.

6) Possible consignment of ARRL materials for resale.

7) Authority to process and present certain ARRL operating awards.

8) Training programs for club officers.

Suggestions of other services that might be provided would be welcomed.

To summarize, the main objective of the Committee's proposal for ARRL blue-ribbon affiliated clubs is to establish a more effective local presence for Amateur Radio by providing a greater opportunity for local-club involvement in League activities. Club members who are active in the affairs of their local club ought to feel they are acting as a part of the League. If their club is doing a good job for Amateur Radio at the local level, they ought to be given recognition.

Other Areas Requiring Attention

In addition to the priority areas discussed in detail in the Phase II Report, the LRPC identified a number of others where early attention is needed. The report identifies these areas without making specific recommendations for action:

☐ A program to strengthen the League's financial position.
☐ Programs for recruitment of new amateurs, especially from among the young, minorities, women and senior citizens.
☐ A strong public relations program for Amateur Radio.
☐ A program directed at building ARRL membership.
☐ Development of a plan for anticipating the need for and securing desirable regulatory changes.
☐ Establishment of a working arrangement with FCC for ARRL input to the development and administration of amateur license examinations.
☐ A comprehensive program to improve the present situation with respect to local regulations affecting amateur antenna installations.

C) The Need for Improvement of the ARRL Organizational Structure

The League's organizational structure is important because it defines how decisions are made in the name of the League, and provides the framework within which its work is performed by volunteers and staff.

The decision-making process must be seen by the organization's members as both rational and democratic. It must also provide decisions that are based upon all available relevant information, and which are reached in a timely and efficient manner.

The League's framework for volunteer action must cause members to want to get involved; must help those who contribute their time and talent to work together in pursuit of the League's overall objectives; must clearly define the responsibility and authority of each

individual and group within it; and must reward those performing effectively and encourage them to seek greater responsibilities within the organization.

The individual performance of many of those who work within the existing structure is nothing short of outstanding. There is, however, considerable room for improvement in the structure itself, which has not been the subject of an overall review in many years. Many feel that the administrative burdens on the volunteer Directors, who are responsible for determining the overall policies of the League, have grown to excessive proportions. Some League programs call for direct communication between the Headquarters and the local-level volunteer, which frequently is inefficient and ineffective. Finally, the ARRL structure has evolved into two almost-separate branches: the "deciding" part (the Board of Directors) and the "doing" part (as typified by the Field Organization of the Communications Department). In fact, the Board has developed its own "field organization" of Assistant Directors, Public Information Assistants and Advisory Committees, and in many cases the responsibilities overlap with those of the CD Field Organization and the affiliated club program. The Committee believes there should be a single structure, combining the "deciding" and the "doing" functions, with the emphasis at the top of the pyramid on the former and at the bottom on the latter. However, necessary changes must be made with an eye toward retaining the loyalty of those who work within the present structure; there must be a sense of continuity from old to new.

Canadian members should bear in mind that the following recommendations apply primarily to the U.S. None of the members of the LRPC has first-hand experience with the unique circumstances in the Canadian Division, where the Canadian Radio Relay League is evolving under the direction of its Canadian leaders. While a number of features of the proposed restructuring would benefit Canadian amateurs, their adoption is a matter best decided by Canadians.

Fig. 1 outlines the present ARRL structure in simplified fashion. In addition to the volunteer posts shown here, several others play important roles in the work of the League. These include affiliated club officers, training instructors and Technical Advisors. In general, the link between these volunteers and the rest of the ARRL organization is accomplished through Headquarters.

Fig. 2 outlines a proposed structure that the LRPC believes would greatly facilitate the work of the organization. In it, the present position of Section Communications Manager is replaced by an office called *Section Manager*. The Section Manager would be elected by the membership just as the SCM is today, but his responsibilities would be much broader and he would be expected to delegate more to his appointees. He would be the leader of a team of assistants with the following responsibilities:

Section Emergency Coordinator — As at present, but makes appointments of District Emergency Coordinator, Emergency Coordinator and Official Emergency Station himself, and receives the reports of these appointees.

Section Traffic Manager — As at present, but makes appointments of Net Manager and Official Relay Station himself, and receives their reports.

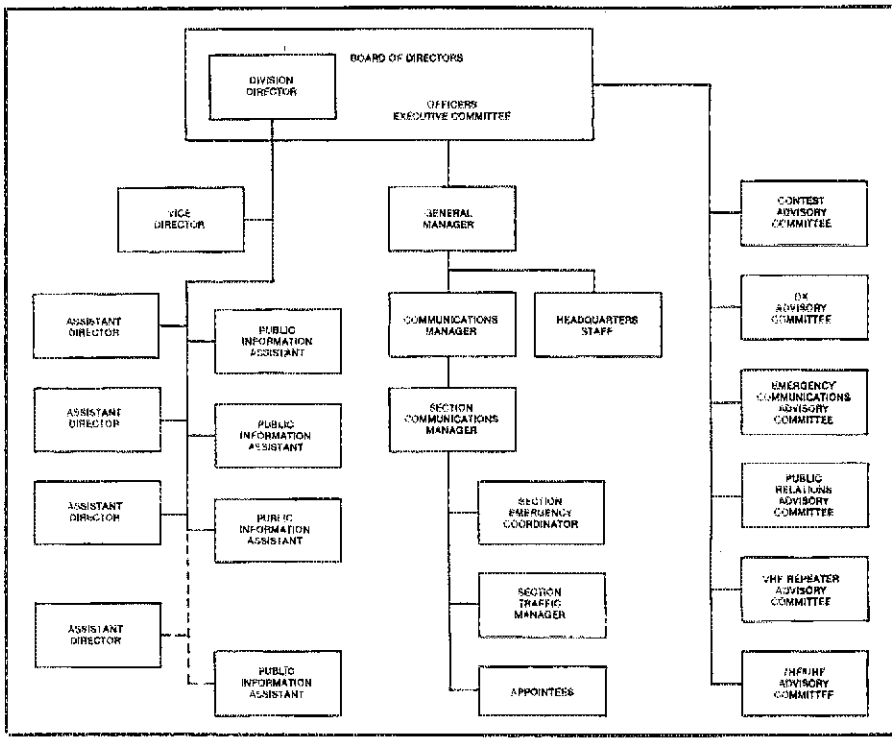


Fig. 1 — The present ARRL structure (simplified).

Official Observer Coordinator — Responsible for the OO program in the same way the SCM is today. Might also assume responsibilities for combatting deliberate interference.

Affiliated Club Coordinator — Responsible for liaison between the affiliated clubs in the section and the rest of the ARRL organization. Assists affiliated clubs in meeting the League's objectives at the local level, *including* the training of new amateurs and the sponsoring of hamfests.

Public Information Officer — Responsible for the ARRL and Amateur Radio public relations activities in the section. Initially this post likely would be given to a Public Information Assistant (PIA), whose function would be to coordinate the efforts of the other PIAs and the affiliated clubs in the section. The PIA position, as such, would be eliminated although present PIAs would be encouraged to accept a position in the new structure. Affiliated clubs would assume a greater responsibility for the public relations function, and would need the help of present PIAs. In the larger sections, the Public Information Officer might also require the services of Deputies in a support structure similar to that of the SEC.

State Government Liaison — Responsible for the representation of Amateur Radio's interests at the state government level. In those states with more than one section, the State Government Liaisons from each section would constitute a committee to accomplish this function. In those sections where there is more than one government entity, i.e. Maryland-DC, West Indies and Pacific, there could be a Liaison appointed for each entity.

Technical Coordinator — Responsible for involving amateurs in the section in innovative technical projects, and for having them share the results of their work with the rest of the League's members through *QST* articles, programs at conventions and club meetings, and so on.

What Actions Did the Board Take in September?

A number of the motions adopted at the September 10-11 meeting of the ARRL Board of Directors were based upon the LRPC Phase II Report. In taking the following actions, the Board began the long and complex process of implementing the Committee's recommendations:

- Minute 48: Formal acceptance of the report, with thanks to the LRPC members.
- Minute 54: Program to be developed to encourage amateurs to attempt simple technical projects.
- Minute 55: Development to proceed of specific plans, cost information and timetables for implementation of changes in section-level and division-level structure, with full report due in March 1982.
- Minute 60: Development to proceed of material to assist amateurs in providing local-level volunteer communications services.
- Minute 70: Articles to be sought covering techniques for maintenance and repair of amateur equipment at home, and for modifications to improve performance of commercial equipment.
- Minute 71: Options for establishing a more continuous Washington presence for ARRL to be explored.
- Minute 77: Development to proceed with detailed plans for creating a higher class of ARRL affiliation for clubs meeting prescribed standards in the protection, promotion and advancement of Amateur Radio at the local level.
- Minute 83: Study to be undertaken of volunteer certification program in emergency communications techniques.

Bulletin Manager — Responsible for th dissemination of news and information of in terest to the ARRL members and othe amateurs in the section. Bulletins from Hea quarters would be supplemented by material o regional and local interest.

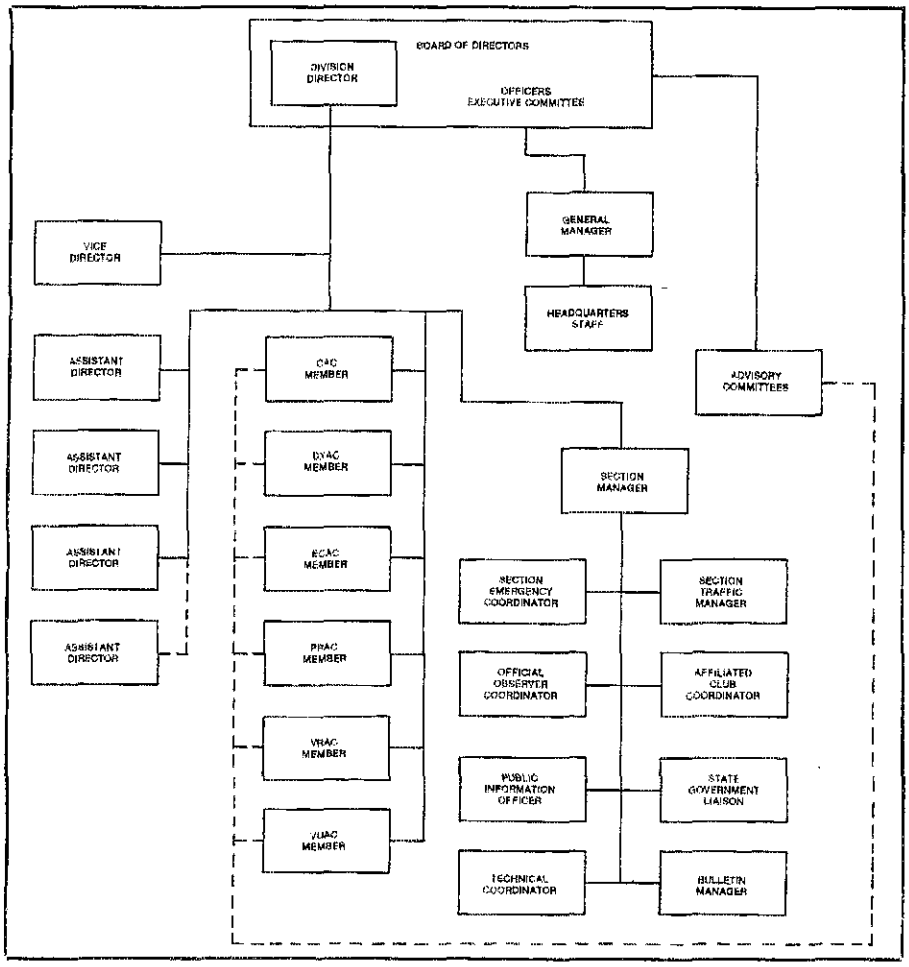


Fig. 2 — The structure proposed by the LRPC (simplified).

All eight (or fewer, if in a smaller section some functions were combined) would be appointed by the Section Manager and would serve at his discretion. Each assistant in turn would be receiving assistance from other appointees, who would report to the appropriate functional manager. Thus, while the Section Manager would have broader responsibilities than the SCM does today, more responsibility and authority would be delegated to others.

These changes should permit the League's headquarters to provide more effective support than at present, by allowing the staff to focus its attention on supplying the section leaders with what they need (as opposed to dealing directly with local-level volunteers). The all-important task of identifying and motivating volunteers at the local level can be accomplished much more readily by the section-level volunteers than by a distant administrative headquarters.

Proceeding from the section to the division level, the LRPC proposes that the present Advisory Committees, presently organized on a call-area basis with appointments made by the ARRL President, be reorganized to provide a member of each committee from each division, appointed by and responsible to the Division Director. Committee members henceforth would be responsible not only for functioning on the national-level committee, but also for advising their Director on an individual basis on matters concerning their special field of expertise. This would be accomplished through membership in a Division Steering Committee, consisting of the Director, Vice Director, the Section Managers in the Division, the Advisory Committee members and the Assistant Directors (who would be appointed in a manner similar to present practice, though they might be fewer in number). The Division Steering Committee would meet before and after each regularly scheduled meeting of the ARRL Board of Directors to review the issues of concern to the Division and to arrange the implementation of actions directed by the Board.

The basic structural framework of the ARRL has not changed markedly since 1923. In that year there were 12 Divisions in the U.S.; today there are 15. In 1923 there were fewer than 14,000 ARRL members; today there are *10 times* that number. The changes proposed above should help to reduce the isolation felt by many members, and to provide greater opportunities for volunteer involvement in the ARRL organization.

D) Expansion of Public Service Involvement of Amateur Radio

For Amateur Radio to survive, it is necessary that government officials at all levels, and the general public, recognize that radio amateurs serve the public interest. Several factors give us increasing opportunities to expand the public-service role of Amateur Radio:

1) Emergency communications is regarded as the most important justification for Amateur Radio by today's amateurs, especially those licensed recently.

2) Equipment suitable for use in emergencies, especially vhf mobile and hand-held transceivers, is in the hands of a large and increasing number of amateurs.

3) Technology will provide powerful new tools for public service communications, such as packet radio networks and inexpensive sources of emergency power.

4) Government budget cuts will cause increasing reliance to be placed on volunteer programs.

Amateurs recognize the importance of public service as a general concept, but more emphasis must be placed upon specific activities: particularly, the organizing and training of operators and the training of volunteer leaders. Every amateur should feel an obligation to perform public service communications as a part of his or her amateur activity, and should have the opportunity to do so. Amateurs should be exposed to the fundamental concepts of network discipline and formal message handling. Local Amateur Radio Emergency Service (ARES) groups have provided such training for years, and these efforts should continue. For those amateurs not in a position to participate in ARES, however, it is recommended that a voluntary certification program be developed. Amateurs who demonstrate their basic knowledge of, and skill in, emergency communications would receive a certificate to that effect. Ideally, earning that certificate should become as important a part of one's early Amateur Radio development as, for example, upgrading one's license, or the quest for the Worked All States, Worked All Continents or other certificates of achievement. A similar program, aimed at a higher level, may be appropriate for leadership officials.

Finally, the Committee recommends that the League be particularly sensitive to technical developments that can expand the opportunities for radio amateurs to serve the public interest. For example, developments in digital data communication promise to revolutionize the handling of large volumes of message traffic in much the same way the held-held transceiver and the repeater have revolutionized local voice communications.

E) Enhancing the Technical Interests and Abilities of Radio Amateurs

In spite of the trend toward technically sophisticated commercial equipment that is

Acknowledgments

The members of the Long-Range Planning Committee thank the members of the ARRL Board of Directors who assisted with their many ideas and suggestions, and acknowledge the considerable support and input provided by several hundred thoughtful amateurs, including several members of the ARRL Headquarters staff, who wrote to the LRPC to share their views concerning the future of Amateur Radio and the League. We are grateful, also, to former FCC Chairman Richard Wiley, and to other members of the Commission, past and present, who took time to make their views known, as well as to several thoughtful and dedicated amateurs, at home and abroad, who spent time with committee members in discussions of the shape and demands of the future. — Victor C. Clark, W4KFC, Chairman; Richard L. Baldwin, W1RU; Charles Dorian, W3JPT; Jay Holladay, W6EJJ; Herbert Hoover, III, W6ZH; Larry E. Price, W4RA; Hazard Reeves, K2GL; David Sumner, K1ZZ; Harry J. Dannals, W2HD (Ex-officio).

beyond the ability of the average amateur to fully understand, let alone to service at home, most experienced amateurs believe that the technical side of Amateur Radio is a vital one that must be preserved and encouraged. The LRPC recommends a technical program having six objectives:

1) To promote awareness of and interest in the technical aspect of Amateur Radio.

At the earliest opportunity, new amateurs should be encouraged to learn more about how their rigs work and the fundamentals of diagnosing and remedying problems. Newcomers should be exposed to the variety of interesting technical activities within Amateur Radio and the opportunity to gain a good practical background in many phases of modern electronics and communications.

2) ARRL sponsorship of technical activities.

Projects designed for use by local clubs are needed so clubs can expose newcomers and other members to the satisfaction and knowledge that come from undertaking technical projects of an appropriate level of difficulty.

3) Encouragement of amateurs to maintain their own equipment.

Local clubs can sponsor seminars on equipment maintenance, adjustment and repair (including when *not* to attempt repairs!). Practical guidance on home maintenance of equipment can be provided in League publications, including *QST*.

4) Promote greater involvement in advanced technical activities.

A greater percentage of *QST* content cannot reasonably be devoted to advanced technical subjects. However, other publications, including the newsletter *QEX*, can fill this need. Experimenters must be encouraged to share the results of their work with the rest of the amateur community. Guidelines are needed to determine which requests for FCC special temporary authorizations (STAs) to permit advanced on-the-air experimentation merit League support.

5) Cooperation with AMSAT on the amateur satellite program and with the Amateur Radio Research and Development Corporation (AMRAD) on technical seminars are good examples of the kinds of joint efforts that benefit Amateur Radio, and should be continued.

6) Encourage greater familiarity with personal computers and their use in Amateur Radio applications.

The LRPC recommends the adoption of policies that result in:

a) Development and publishing of a series of "How to" articles on uses of computers in Amateur Radio.

b) Sponsoring and encouraging development of software for Amateur Radio applications.

c) Developing of reliable construction projects for interfacing between a computer and Amateur Radio equipment (e.g. transceiver frequency controls, signal processing and detection, RTTY/ASCII converters, antenna rotators and so on.).

d) Implementing, on an experimental basis, a computer bulletin board at ARRL Headquarters with information of interest to amateurs, especially in technical areas (with access limited to members).

e) Sponsoring development of computer-based tutorials or Computer Assisted Instruction (CAI) type programs for licensing and for technical areas.

f) Exploring further the concept of a "digital experimenter's license" as a means of attracting experimentally minded persons into Amateur Radio. Any such approach should be implemented in a way that would not lead to lowering of the standards of the service nor to abandoning the Morse code licensing requirement.

F) International Amateur Radio Organization and Policies

The 1979 World Administrative Radio Conference provided dramatic evidence of the impact of international forces upon Amateur Radio. In the course of preparations for WARC-79, the International Amateur Radio Union made impressive strides toward becoming a viable, cooperative and energetic worldwide alliance of national Amateur Radio societies. The long and dedicated performance of ARRL as the IARU Headquarters society is generally recognized and appreciated around the world. Recent years have witnessed the development of the three regional organizations of IARU as the "action" arms of the Union, however, and calls for a mechanism to assure regional input at the world leadership level are heard increasingly.

A special committee has been established under the direction of the IARU President to consider these matters with the objective of improving the organizational structure of IARU. The LRPC recommends support of this committee and its objective, and urges that its recommendations be given careful consideration. Through this effort, the worldwide Amateur Radio community can organize itself to address the challenges that lie ahead.

What Now?

With the acceptance by the Board of Directors of Phase II of the Long-Range Planning Committee report, a new era begins in the history of the American Radio Relay League. Even though the Committee did not address every area of concern in depth, it will be a major undertaking to implement the recommendations that it did make on the highest-priority subjects. The actions taken at the September meeting of the Board are the first steps down a very long road.

As we take the first steps toward implementation of the LRPC recommendations, it is important that members take an active role in the effort. In most cases, questions of detail remain to be decided. If you have some observations that would be helpful as the Board and staff tackle the formidable task of implementation, now is the time to speak up!

For the members of the Long-Range Planning Committee, work on the committee has provided a host of enriching experiences. Thanks go to you, the concerned and active members of the ARRL, for making it so! QST

Notes

[1]P. Williams, "Steps to the Future," *QST*, Nov. 1981, p. 51.
[2]V. Clark and D. Sumner, "Long-Range Planning — An Update," *QST*, Aug. 1981, pp. 50-53.
[3]Category 2 (regional) and Category 3 (youth) organizations are not being addressed at this time.
[4]Suggestions for a better name for this program would be welcomed.

Strays

Perry Williams, W1UED (right), the League's Washington Area Coordinator, adjusts the ARRL membership pin on the lapel of Peter Roussel, K5JCC. Roussel was recently appointed Deputy Press Secretary to President Reagan. *(official White House photograph)*

HAMS HELP RESTORE SIGHT

☐ The Eyebank Network, made up of amateurs in over 60 U.S. cities that have eye banks, meets on the air twice a day to exchange information about where eyes are needed and where they are available for coroneal transplants. Dr. Alson Braley, WØGET, an ophthalmologist (now retired), founded the net in 1962 because of his frustration at not being able to locate corneas for patients who needed transplants. According to an Associated Press report, the net has been instrumental in locating over 10,000 eyes. "All we do is make contact; the eye banks work out the details," says WØGET. An eye bank calls a local ham if it needs an eye or has one available, and this information is relayed via Amateur Radio. Emergency cases such as burns or ulcers of the cornea are the primary concern of the net because time is of the utmost importance. Although designed to serve eye banks in the U.S., the network has taken on an international flavor by helping send eyes to places such as Paris and Hong Kong. — *Leonard Sahs, KØHWX, Cedar Rapids, Iowa*

I would like to get in touch with . . .

☐ amateurs who have TI-99/4 home computers to exchange programs and tapes, and to look into the possibility of computerized QSOs. Rich Bonkowski, W3HWJ, 23 Hampshire Dr., Greenburg, PA 15601.

☐ hams who need rare ND counties so that the Minot ARC can plan outings to put those counties (please specify) on the air. David Heintzleman, NØBQW, Box 27, Berthold, ND 58718.

Anatomy of a DX Vacation

Planning your first "hamcation" outside the USA? If so, these guidelines may save you from problems and unnecessary despair.

By Doug DeMaw,* W1FB/VP2VGT, Jean DeMaw,** W1CKK/VP2VGU and Bill Martinek,*** W8JUY/VP2VGW

"Learning by doing" has its virtues in some instances, but several years of practicing that ritual on mini-DXpeditions has caused the authors a substantial amount of frustration and disappointment. If something positive can be said about the exercise, it's that some ground rules have evolved that can be applied to any out-of-country amateur operation. Among these are: having a list of recommended procedures to follow when planning the trip, knowing what accessories to take along on the junket and learning about Amateur Radio conduct abroad, specifically at the hotel or resort where the DX operation is to take place. Here are some tips that are founded on many years of DXpeditioning in the West Indies.

Advance Planning

Rule no. 1: Don't go blindly to a country or island you know nothing about! Obtain brochures from your travel agent or the Bureau of Tourism in the country you wish to visit. Choose a travel agent who has actually visited the resorts he or she represents, then describe exactly the type of accommodations and atmosphere you prefer. W1FB has used an excellent agency for the purpose for many years, and the operator (not a ham) fully understands the practical requirements of amateurs when abroad.

Find out in advance about local licensing procedures and regulations. A letter or phone call to the Membership Services Department at ARRL Hq. will help you learn about the licensing set-up in the country of your choice. Alternatively, you can write to the telecommunications officer in the country you want to visit. Be sure to include an s.a.e. and sufficient IRCs to cover return postage. Some Caribbean islands will license you in advance of your arrival, while others require that you appear in person after reaching your destination.

It is prudent to place a phone call to the U.S.-based consulate of the country of interest, inquiring about their customs regulations concerning radio equipment. Some countries require, upon arrival, a substantial cash deposit (Trinidad and Tobago, for example), which is returned to you on your departure. Be prepared. Ask also about vaccination and passport requirements. Few of the West Indies islands require passports or vaccination certificates, but a passport is still the best document to carry when abroad. A birth certificate will suffice on most islands where passports aren't required.

It comes as a surprise to many who have asked about the cost of a two-week hamcation, that in many instances the trip is no more expensive than going to some of the resort areas in the USA. In fact, it can sometimes cost less to visit the West Indies. The air fare is the primary "fly in the ointment," and rates continue to spiral upward! You can save several hun-

*Senior *QST* Technical Editor
**ARRL Awards Manager
***Martinek Jewelers, Traverse City, MI 49684

dred dollars by renting "housekeeping" units and doing your own cooking.

Licensing

Some countries issue a local call to the visiting operator, while others require the use of your U.S. call followed by the call prefix of the country you're in. Antigua, for example, required W1FB/VP2A as an identifier; likewise with St. Thomas (W1FB/KP2). On Montserrat it was simply VP2MFW, and on Barbados, 8P6EU. From an operating point of view, especially on cw, it is more desirable to have the native call. Imagine having to sign WB1FSB/VP2A!

Licensing fees vary greatly. The least we have paid is $5 for one year (or remaining part thereof), and the highest fee was $25. The license term is one year in most countries, renewable in January. Thus, if you arrive in December, you may pay the full license fee for only a few days of operating. Tortola has a more equitable arrangement, wherein you pay half the yearly fee if you apply after July. Telecommunications Officer Art Swain, VP2VJ, will issue your license in advance, by mail, on receipt of a photocopy of your U.S. license and a U.S. postal money order to cover the license cost, plus that of mailing and handling.

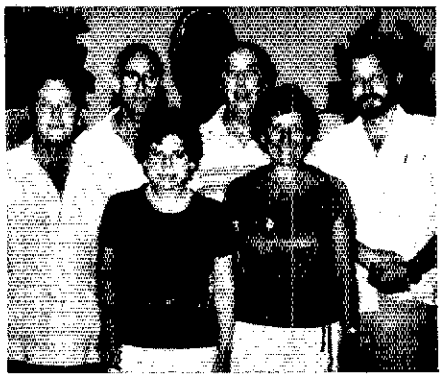
If you are required to appear in person to obtain a foreign operating license, be patient. We've had to wait a few days after applying in at least one Caribbean country. Things seldom move at the pace they do in your workaday lives in the USA!

Hotel Selection

Our best results have been with ocean-front quarters, respective to having the antennas in the clear. Second-story units over or near the seashore are preferred. This permits the use of slopers (half-wave dipoles) or inverted Vs that can be supported from the verandas that come with most resort units. It is important, however, not to string wires and feed lines across the view area of adjacent verandas. Nonham tourists pay for the ocean view, and don't appreciate having it "tainted" by spiderwebs of wire! Care must be taken also to erect the antennas safely so that people do not come into physical contact with them. Assuring the hotel operator of these precautions in advance will aid your cause considerably.

Always contact the hotel manager, before arriving, to ask for permission to operate your amateur station and erect antennas. We haven't yet been turned down when following that procedure. Owen Ellison of Coconut Creek Hotel on Barbados even offered to lend us some of his staff members to help erect the antennas!

Most modern tourist resorts pipe hi-fi music throughout the compounds at specific times of the day and night. Exceptionally long speaker leads are the rule rather than the exception, which permits undue rf pickup from the ham rig! When you first go on the air, make certain that your station is not ruining the music system. If it is, you have two options: (1) observe self-imposed quiet hours at the crucial times, (2) offer to suppress the hi-fi system at your cost. (This must be done with the knowledge and cooperation of the hotel management!) We usually carry a dozen 0.01-μF disc ceramic capacitors and some jumbo, high-permeability ferrite beads for use at the speaker terminals of the hi-fi amplifier. Bypassing the terminals to the chassis, and grounding the chassis, usually resolves the problem. You'll make a hit with the hotel operator and will certainly enhance the image of Amateur Radio. We have yet to see TV sets in West Indies resorts, so chances are that TVI won't be a problem.



Any hamcation should include meeting the local amateurs. Our group is shown here with two of the club members on Tortola. Left to right (back row) are W8JUY/VP2VGW, W1FB/VP2VGT and VP2VAT. Front row: VP2VJ, W1CKK/VP2VGU and WB1FSB.

Transporting the Gear

The printed instructions issued by the major airlines warn against shipping specific items as checked-through baggage. Notable among the items is *radio equipment!* The transceiver should be hand carried on the plane if it is to be kept safe from theft and damage. This may require a few extra explanations at the airport security-clearance port, but it's well worth the trouble. This year we watched in horror from the airplane window at Bradley International Airport in Connecticut, and again at Miami Airport, as indifferent baggage handlers *threw* our luggage on the conveyor to the plane's belly. One of our bags was tagged with a large red FRAGILE sign, but that made no difference. As a result, the FT-707 power supply arrived on Tortola with the top and front panel staved in. (The moral of this story might be to carry aboard the plane a transceiver with built-in power supply.) Even worse, the luggage might never be seen again, as was the situation with WB1FSB's suitcase that contained all of her jewelry and new clothes! The airline we dealt with, as well as others in the past, exhibited annoyance and indifference when we reported the missing baggage.

If your equipment must be shipped through, pack it in foam plastic (lots of it), and put it in a rugged carrying case. But don't label it as *electronics equipment*, for you may never see it again! Pilferage is rampant at airports all over the world nowadays.

Operating Conditions

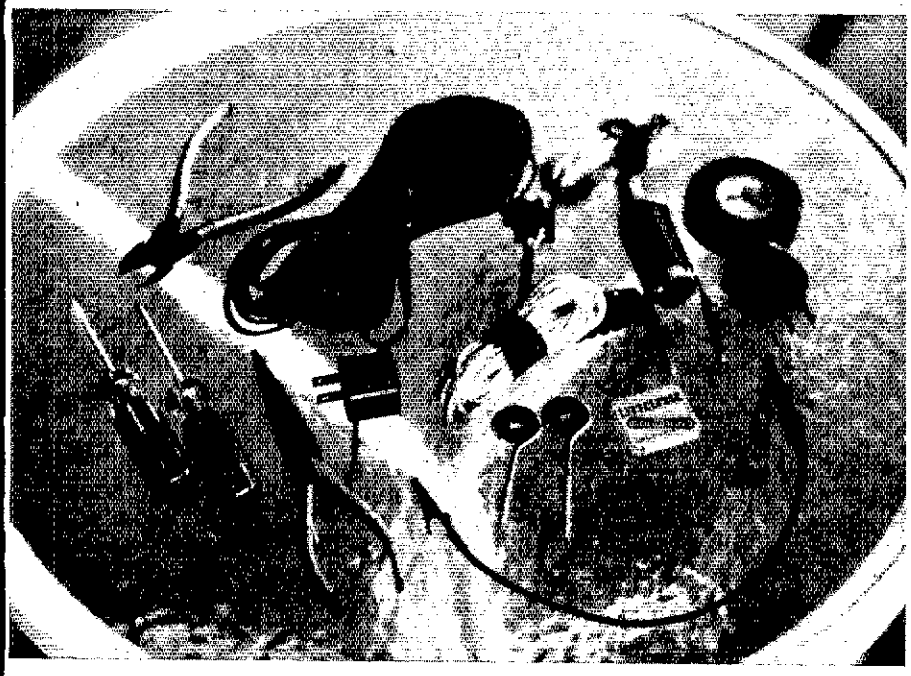
Island locations present some problems an amateur may never think of. Salt air is ever present, especially if you stay at a seaside resort. That, plus the heat and humidity of the tropics, can affect your equipment. The contacts on keyer paddles become fouled constantly, requiring frequent cleaning with alcohol. This year we took a new Bencher paddle, which has gold electrical contacts. The contact-corrosion problem was resolved, but flying sand and grit got into the contacts and made periodic cleaning of the paddle a necessity.

Most islands have 50- rather than 60-Hz line frequencies. If your power transformer runs hot at home, chances are it will burn up on 50-Hz current. Make sure the power supply can sustain extra heating before you trundle off to exotic places with it! During an operation on Barbados we had to remove the cabinet from our FT-301D power supply and direct the air from a small fan onto the transformer. Before we did that, the paint on the power supply cabinet began to smoke and crinkle! The stock cabinet had very few (and small) vent holes. Furthermore, the line voltage on many islands is apt to vary from 90 to 120 volts ac at any given time of the day or night. Total or partial planned and unplanned power outages are quite common, so a battery-operated QRP rig is handy for use at such times. We always carry a low-power cw QRP transceiver for use in case the main rig breaks down or when the power is out. Flashlights and candles are useful when darkness arrives suddenly!

The salt air and moisture also affect relay contacts and antennas. It's wise to solder all antenna joints and wrap your coax connectors with vinyl electrical tape to seal them against the elements: Copper-wire antennas turn green in a few days on some islands. Aluminum antennas also corrode quickly, but a temporary deterrent is a coating of silicone grease.

More Tips

It may not be necessary to use standard insulators for wire antennas if a good 250-pound test nylon cord is in your travel



An example of the numerous accessories one should pack in the travel kit when taking amateur equipment abroad. A hundred feet of four-wire rotator cable (not shown here) is handy and inexpensive, since it offers 400 feet of wire for antennas and ground systems at low bulk.

Small Items to Take

It is seldom possible to purchase small parts, wire or tools at DX locations — many islands don't have an electronics parts store. So, the travel pack should contain some basic items. We'd like to suggest the following:

1 — diagonal cutters, pliers, Phillips and standard screwdrivers, and a 1/4-inch hex driver.
2 — Allen wrenches, as required.
3 — alignment tool.
4 — 40-W pencil iron and solder.
5 — 6 spare fuses for rig.
6 — spare PA and driver tubes, or PA transistors.
7 — instruction manual and diagram for rig and keyer.
8 — jackknife.
9 — roll of electrical tape.
10 — large roll of strong nylon cord.
11 — few feet of hookup wire.
12 — 3-way wall plugs (cube taps).
13 — short extension cord.
14 — 3-pin to 2-pin ac plug adaptors.
15 — sufficient wire to make a counterpoise ground (see text).
16 — spare power-supply diodes.
17 — tube of Crazy Glue or equiv.
18 — assortment kit of misc. capacitors and resistors. Also, small-signal diodes.
19 — large scratch pad, log and pencils.
20 — U.S. and foreign licenses.
21 — antenna and feed lines, plus insulators and connecting cables for equipment.
22 — clip leads of assorted lengths.

kit. We use the cord as guy line at the ends of the antenna, and it also works fine as insulating material. It performs well as a line to pull up and secure an inverted-V antenna in a coconut palm or other tree.

Wire for a counterpoise (simulated) ground is quite essential. Many foreign power companies do not have a three-wire ac line, and hence no ground connection. Furthermore, most of the plumbing is done with plastic pipe to avoid corrosion; thus, there is no earth ground. We've always had problems with rf getting into our keyers and speech amplifiers, and onto the cabinets of the rigs. Clip leads are handy in trying to locate the hot spots when jumpering the paddle to the rig, the keyer to the rig or what have you. We laid a 60-foot length of wire on the ground in the jungle brush on Tortola last year, and it proved effective in removing the unwanted rf from the keyer and equipment enclosures. The problem becomes especially critical when trying to use multiband antennas with a Transmatch. We used, as one antenna last year, a 40-meter inverted V with tuned feeders for 80 through 15 meters. Unwanted rf energy was on all of the gear until the ground wire was laid and hooked to the Transmatch. The 10-meter full-wave loop worked fine without grounding the Transmatch. On one of our DXpeditions we learned that clip-leading the rig to the air conditioner frame was sufficient to remove the rf from our gear cabinets.

What Type of Antenna?

It should go without saying that a DX call provides an automatic 20 dB of signal gain! Additionally, being near the salt water and having a clear shot across the water, helps the signal strength, too. The first contact made by VP2VGT occurred the night we arrived. In checking the gear we threw a 30-foot hank of wire on the veranda floor, and in somewhat helter-skelter fashion. When checking the receiver on 40 meters we heard a friend in Connecticut — W1RM. It was impossible to resist calling him, so we matched the wire to the rig and gave him a short blast. Amazingly, he came back with an RST 579 report, and we had a half-hour QSO. Can you imagine using an antenna like that from the home station in the USA?

During our travels we have discovered that any reasonable wire type of antenna (dipole or end fed) does a good job into Europe, Asia and the USA. Sloping dipoles fed with coaxial cable remain a preference with us. They do a commendable job, are lightweight and transport in a small package. Some DXpeditioners we know like to ship verticals and small beams through with the luggage. A favorite seems to be the Mini-Quad beam, which we understand breaks down into a package about 6 feet long and 6 inches in diameter.

Some Final Comments

It is well to remember that most overseas airlines limit a customer to two shipped-through bags and one carry-on piece of luggage. Anything in excess of that requires a fairly stiff freight charge. The 44-pounds-per-person weight limit for luggage was lifted a few years ago.

Remember to take with you any necessary prescriptions and cosmetics; it's not likely you will be able to get a needed prescription filled abroad. Insect repellent is often worth taking along. Also, be prepared to drive on the left side of the road in the West Indies. You may want to carry a case of canned meats, cheeses and other snack items for those between-pileups breaks. Abroad, items of that type are hard to find and are expensive.

We'd like to offer a word about personal conduct in the Caribbean. The local folks don't like to be photographed. If you want a picture, ask first. Sometimes a dollar bill will bring a smile and a "go ahead" for picture taking. The residents of the islands don't appreciate tourists who wander about in their towns with shorts, no shirts, shirts open to the waist or bare feet. "When in Rome . . ."

Be sure to take earphones for your rig. The blaring sounds of cw and ssb are annoying to nonamateur residents at vacation sites. Be mindful of third-party agreements before trying to pass any kind of traffic from a foreign location, and keep an accurate log at all times.

We hope these tips will help make your first hamcation an enjoyable event. Some of the suggestions, if followed, will aid the image of Amateur Radio and will make it easier for the next ham who visits the area. Above all, have fun! QST

K2BSA/4 — 1981 National Scout Jamboree

The hills of eastern Virginia echoed with the cry, "CQ CQ from K2BSA/4 at the National Scout Jamboree," as 35,000 Scouts and Scouters caught a glimpse of Amateur Radio in action.

By Steve Place,* WB1EYI

Scouting and Amateur Radio — few activities fit so well together. And what better way to introduce the two groups than at a National Scout Jamboree? From July 27 through August 4, over 35,000 Scouts and Scouters took part in a mix of Field Day, license classes, traffic handling, DXing, construction and public service at the 1981 National Scout Jamboree at Fort A. P. Hill near Fredericksburg, Virginia. The event was a tremendous success, thanks to a great crew and the cooperation of literally hundreds of people — from BSA officials, local amateurs and visiting hams, to equipment manufacturers and even the United States Army. Mentioning Amateur Radio and the Boy Scouts of America in the same breath works powerful "magic."

The K2BSA/4 gang: (standing) K2BS, KB7QW, W2GJ, WB1EYI, K3RC, WD8DDE, WA7HQU (crouching), WB2JWD and WB8TRK.

From the outset, many, many months before the first CQ DE K2BSA/4 rolled off a Scout's fist, we had decided to set up the radio tent as a station for the boys. It was to be a place where Scouts would *do* what hams do and meet others in Scouting on the air. A simple exhibit cranking out contacts would not live up to National Jamboree standards: The Scouts would have the chance to "get their hands dirty" and learn about Amateur Radio first hand.

Licensed Scouts would serve as control operators for their unlicensed brethren. Everyone would be encouraged to send a message home via Amateur Radio. Basic theory classes would get the Scouts through the rough stretches on the road to the Radio Merit Badge as well as lay the foundation for future Novice study. Scouts would learn proper soldering and contruction techniques at a beginners' workbench. And everyone would share in stories about Scouting and Amateur Radio. Questions by the hundreds would fill the long hours from early morning reveille to well after taps. Only during slow hours (of which there would be very few) would the staff get on the air and "run 'em contest style" to pass out contacts. This was a difficult choice for a gang of hams who enjoy hours at the mike and key, but a choice best suited to getting across the message of Amateur Radio.

NTS Under Siege

Message handling at large public events is often the easiest tactic to get the greatest number of people involved — easiest, that is, at the counter. Unfortunately, a good day of traffic-taking leaves a stack of originations large enough to cause even the most dedicated NTSer's heart to skip a beat. Virginia was alerted, and a great local NTS crew accepted the challenge. Jim Brodhead, KA4ERP, EC for the Fredericksburg area, rallied the local troops to the cause and took the responsibility for coordinating equipment and volunteers in his area. The plan was to handle some of the traffic directly from the tent to demonstrate NTS in action, and to pass the bulk of the messages physically to local outlets. Our small staff of nine could not handle a deluge of traffic on the air and still accomplish our primary goal: showing thousands of Scouts the many facets of our hobby. Rather than limiting the amount we'd take, we relied on the enthusiastic volunteer efforts of Jim and his gang, who helped as guest ops on site when possible and who accepted pile after pile of forms for home-station origination.

We were able to keep the traffic flowing. Over 2200 messages were processed and sent over a seven-day period! Long hours at the key by W2GJ, K3RC and WB8TRK of the K2BSA/4 staff, a 2-meter RTTY feed from KA4ERP to WA4STO, and the last-minute Herculean

*Manager, Club and Training Department

efforts of Ray and Silvia Massie, K3RZR and KA3DTE, qualified several stations for BPL Medallion with Purple Heart Cluster. Our congratulations and thanks to the Hundreds of NTS "unsung heroes" who saw these messages through to delivery. The system works, even when stressed to its limits. July and August BPL tallies in the Virginia Section are very interesting.

How Many Ya Got Now?

Nothing captures the attention and imagination of a Scout more than a challenge (unless, of course, it's the blonde in his third-period English class). K2BSA/4 set out to work all continents, all states and 100 countries, and we made our intentions known. Up-to-the-minute tallies were posted prominently, as were lists of countries worked and states needed. As the states-needed list grew smaller and smaller each day, the crowds of inquisitive Scouts grew larger and larger. Everyone wanted to know if and when his state had been worked, and if so, "Who was it?" and "Where did he live?" Montana proved to be the tough one, a fact emphasized by the increasingly frequent visits of Montana Scouts eyeing the tally. When the "Big Sky" state finally fell, attention turned to the quest for 100 countries.

"HI SIS X JUST BOUGHT SEVEN-WEEK-OLD RABBIT X BUY FOOD BUILD CAGE DON'T TELL MOM"

At the previous Jamboree in 1977 in western Pennsylvania, K2BSA/3 crew member Shelly Weil, K2BS, had set the same goal. Noisy power lines, rain — lots of rain — and generally poor conditions left the gang about 11 countries short. Taking this as a personal affront, Shelly set out to slay the "DXCC Dragon" single-handedly at K2BSA/4, his seventh Jamboree. When the dust had settled after several all-night jousts with QRN and QRM, we had bagged 109 countries and were rewarded with a long, enthusiastic ovation from the Scouts who had doubted that we could do it. Though K2BS worked the bulk of them, several countries fell at the hands of fellow staffers and licensed Scouts. The spirit of challenge and the satisfaction of accomplishment, however, were shared by all.

A First Step

Scouting is a program of achievement, a context within which kids 11 years old and up can experiment with responsibility and leadership, try on new skills for size and be recognized for their accomplishment. Of the 50 or so merit badges offered at the Jamboree, Radio proved to be one of the more popular, though one of the more demanding. Thirteen Scouts who had begun studying the Morse code a few weeks before the Jamboree were able to pass all of the requirements at K2BSA/4, and 52 others earned partial completions. Instructors beware: Over 800 Scouts took their enthusiasm for Amateur Radio home with them and have requested information on local licensing classes!

Mike Brown, WB2JWD, ran the classroom most of the time, including both classes in basic theory and construction technique. Many hesitant newcomers to radio first hoisted soldering iron and wire under Mike's tutelage, demonstrating their skills on projects ranging from transistor and 555-timer CPOs, to a variety of kits donated by Heath Company. The most popular project of the lot was a Heath HW-8 on which 11 Scouts performed constructive surgery. At the conclusion of the Jamboree, a Scouter from Panama, HP1XKO, drew the name of one of the builders; Andre Thompson, a ham-to-be from Detroit, proudly accepted the radio with thanks to his fellow Scouts for their contributions.

Building a working circuit from a handful of components excited more Scouts than we were able to handle comfortably. But the extra effort was well worthwhile. The tones blaring from the code-practice oscillators signaled success, giving the kind of satisfaction one can get only by conquering a new challenge, and satisfaction was reflected in the smiles of many Jamboree Scouts.

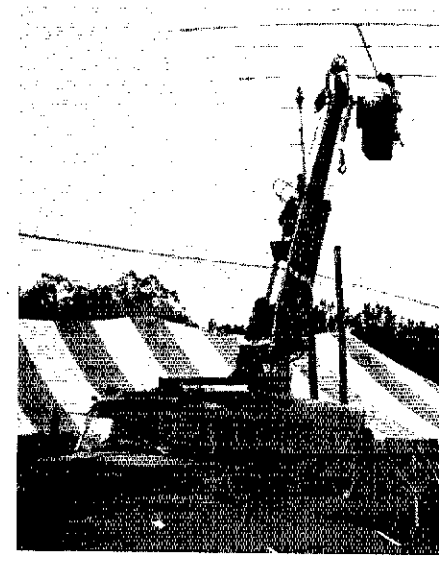
"Give Our Best to the Gang"

Two weeks of Scouting and Amateur Radio set the stage for many special moments. Staffers from the radio tents at past Jamborees stopped by to say hello, as did visiting Scouter-hams from Japan, Switzerland, Australia, Panama and other DX locales. Literally hundreds of visiting U.S. hams dropped by to sign in at K2BSA/4 and to make a contact or two.

A patrol of Scouts from Venezuela peered over the counter at the operation and haltingly asked if they could send a message home to their families. One of the boys in particular, not able to speak English, seemed a bit forlorn, overwhelmed by all that was happening around him (one could speak English well and still be overwhelmed by the immensity of a National Jamboree!). A little coaxing from his friends and our promise to do the best we could left him grateful but not reassured. Luck was with him, however, as to everyone's amazement, we stumbled across a ham in his hometown within a few minutes and passed the message. The twinges of homesickness gone, one more smiling Scout rejoined the fray.

WB8TRK peaks up the SSTV for an eager group of Scouts. The KWM-380 was lent by Rockwell International, and the Robot 800 and associated equipment by Robot for the duration.

Many Scouts learned the fine art of soldering under the watchful eye of WB2JWD. With this new skill they went on to pass certain Radio Merit Badge requirements, build code-practice oscillators and even assist in building several kits, including an HW-8, that were donated by Heath Company.



Field Days were never like this! The "Cadillac" of gin poles under the guidance of SP/4 Mark Howard, "bucket truck wizard," on loan from the 25th Signal at Fort Bragg, hoists WD8DDE, KB7QW, a Classic 38 and full tool bag aloft to the waiting Ham IV rotator, one of two donated by Cornell Dublier.

A young Scout from Oklahoma, suffering a similar affliction, had failed to meet several skeds with his father. Day to day, with each failure to make the connection, his spirits visibly sank to new depths. Finally tossing in the towel, the Scout gave us his "Thanks anyway," and slumped toward the exit when he recognized the voice at the other end of a 20-meter QSO. Not exactly a schedule, but son was able to reassure Dad, and vice versa.

The original planner of K2BSA/4, Harry Harchar, W2GND, was unable to attend the Jamboree and reluctantly relinquished the reins to others. To make sure we didn't forget him, though, Harry dropped in frequently on the air to check our progress and keep us honest. Being an avid SSTV buff, Harry even helped solve a technical problem that was keeping our slow-scan operation off the air. Harry can take much of the credit for the success of this and other Jamboree stations, as well as for the continuing success of Amateur Radio in Scouting: He is deeply involved with the Boy's Life Radio Club, is trustee of K2BSA and is U.S. coordinator for the

"HOPE YOU ARE HAVING GOOD TIME WITH ME AWAY FROM HOME X JUST GET READY FOR MY LAUNDRY"

annual Jamboree on the Air. . . Always there in spirit, sometimes there on 75.

The more rewarding experiences for the crew usually related to new Novices who had not yet been on the air. They would hover timidly at some distance from the Novice station, watching every detail intently. When asked if they'd like to try their hand, they would shy away with a nervous laugh and "No, thank you." A few hours or a few days later, the Novice would nervously slip a brand new license from his wallet and, trembling, ask for help. With a little nudge and a lot of patience, a staff member would bring the Novice to his first CQ, after which you couldn't tear the Scout away from the radio.

At the other end of the spectrum we had Bart Cranford, KA4BNK. Bart, a Scout from North Carolina, had passed his General well before the start of the Jamboree and had waited in vain for the ticket to reach him before his departure for Virginia. A frequent visitor to the station who was comfortable with a key in the Novice bands, Bart clearly wanted to work 20-meter ssb without a control operator. As luck and the USPS would have it, his folks had received the license at home the day after he left; they forwarded it to the Jamboree site immediately. On the final day of operation, we first heard his shout as Bart crested the hill at full gallop waving his General ticket in the air. Not slowing for congratulations, he skidded past the counter and hit the seat at the 20-meter position in mid-CQ. Now there's a Scout with enthusiasm for Amateur Radio!

Where Credit's Due

Countless numbers of people contributed to the success of the K2BSA/4 operation. The Boy Scouts of America played an obviously important role in planning, administration and support. A great gang of volunteers and professionals on the Exhibits and Displays staff intervened on our behalf, solving problem after problem. From increasing our electrical service from 20 A to 60 A, to fighting to get us on the schedule of the one Army "bucket truck" within 50 miles that could handle our antenna erections, Hank Biggers and crew came through. Special thanks must go to Spec. 4 Mark Howard, the "Wizard of the Bucket Truck," for his deft handling of tricky situations. Both he and his immediate supervisor caught the bug and plan to pursue their Novice licenses.

From the planning stages to cleanup, the Corning Glass Works of Corning, New York, offered a tremendous amount of assistance. Several complete stations from their club's emergency communications bank were loaned, replete with spare components. Pete Radding, W2GJ, represented the company on the K2BSA/4 staff and personally provided invaluable cooperation right down the line. Should any of you wonder why the Glass Works stepped forward and offered its assistance so willingly, Dr. Thomas MacAvoy, its president, is the current president of the Boy Scouts of America, and one who recognizes the value in both Scouting and Amateur Radio.

Many manufacturers provided equipment to help keep K2BSA/4 on the air. Scouts and Scouters got to try their hands at a Rockwell Collins KWM-380, Icom IC-251A and IC-720A, Yaesu FT-101ZD and FT-480R, Robot 800 Terminal and 400 Scan Converter, an assembled Heath HW-8 QRP transceiver, and Heath kits ranging from CPOs and a keyer to an SWR bridge and HW-8. Two Cornell Dublier Ham IV rotators and 300 feet of Times Wire and Cable coax carried our signal from the tent and headed it in the right direction. The staff helped fill in the gaps with examples of mobile and portable gear, inexpensive surplus equipment and even a "boat anchor" or two. And Robert Luetzow, K9ZLU, lent us his prototype variable-speed casette controller that was featured in September *QST*.

K2BSA/4 was our way of introducing over 35,000 Scouts to the wonders of Amateur Radio. K2BS and K3RC "work the counter," explaining the requirements for a Novice license, how "free messages" are handled by Amateur Radio, and how much progress we had made on our goals of working 7 continents, 50 states and 100 countries.

Thanks also to *73 Magazine* and *CQ* for supplying issues of their magazines and to *Ham Radio* for supplying copies of issues and a quantity of Amateur Radio publications. Last, but far from least, the Boy Scouts of America has expressed its appreciation to the ARRL for its support in providing manpower, publications, incidental equipment and a year of planning and coordination, from the initial on-site visit to the final QSLing.

Though he was not directly involved with the K2BSA/4 operation, a special nod of appreciation must go to Gordon Thomas, WB4LMT, and his crew of over 30 volunteers, who assisted the BSA in coordinating the massive traffic flow on opening and closing days. The roads to Fort A.P. Hill were crammed with hundreds upon hundreds of buses, cars and campers overflowing with the 35,000 Jamboree-bound Scouts. Thanks to Gordon's gang and Amateur Radio, fast arrivals and departures were made without a hitch.

Most credit, however, must be given to the K2BSA/4 crew who put in a long string of 16-hour days: Pete Radding, W2GJ; Mike Brown, WB2JWD; Shelly Weil, K2BS, an old hand at National and World Jamboree Amateur Radio stations; Bob Johnson, K3RC, chairman of the 1977 event; Ed Crow, WD8DDE; Dee Larsen, KB7QN; Billie Dickson, WB8TRK; Dean Klingler, WA7HQU; and Steve Place, WB1EYI. Whether suffering the early morning braying of Pedro, our mascot QSL "Burro," fending off carnivorous insects the size of F-18s, finding a way to wash some well-worn laundry or holding up the battered tent besieged by severe storms, one couldn't ask for a more conscientious, reliable crew.

Two weeks of exhausting, yet exhilarating work demonstrated just how well Amateur Radio and Scouting mesh. Hundreds of boys left Virginia with memories of talking to faraway places, of new friends made and of the intriguing "mystery" of radio. K2BSA/4 touched many people; our thanks to all.

QST Abbreviations List

These abbreviations, compiled and updated annually, appear in QST and other League publications. Keep them handy for easy future reference.

A — ampere
ac — alternating current
ACNF — AMSAT coordination and network frequency
A/D — analog-to-digital
af — audio frequency
afc — automatic frequency control
afsk — audio frequency-shift keying
agc — automatic gain control
Ah — ampere hour
alc — automatic load (or level) control
a-m — amplitude modulation
A.M. — morning
AMSAT — Radio Amateur Satellite Corporation
anl — automatic noise limiter
AOS — acquisition of signal
ARA — Amateur Radio Association
ARC — Amateur Radio Club
ARES — Amateur Radio Emergency Service
ARS — Amateur Radio Society; Amateur Radio station
ASCII — American National Standard Code for Information Interchange
ASSC — Amateur Satellite Service Council
ATV — amateur television
avc — automatic volume control
AWG — American wire gauge
az-el — azimuth-elevation

BASIC — beginner's all-purpose symbolic instruction code (computer language)
b — byte; a group of bits or binary digits, usually eight
bc — broadcast
BCD — binary-coded decimal
BCI — broadcast interference
bcl — broadcast listener
bit — binary digit
BFO — beat-frequency oscillator
BPF — band-pass filter
BPL — Brass Pounders League
bps — bits per second
BW — bandwidth
BWL — loaded bandwidth

C — Celsius
CAC — Contest Advisory Committee
CB — citizens band
CCIR — International Radio Consultative Committee
CCITF — Consultative Committee for International Telegraph and Telephone, a part of ITU
ccw — coherent cw; counterclockwise
c.d. — civil defense
CD — Communications Department (ARRL)
CMOS — complementary-symmetry metal-oxide semiconductor
coax — coaxial cable or connector
COR — carrier-operated relay
CP — code proficiency (award)
CPU — Central Processing Unit
CRRL — Canadian Radio Relay League
CRT — cathode-ray tube
CSMA — carrier sense multiple access
ct — center tap
CTCSS — continuous tone-coded squelch system (PL)
cw — continuous wave (code); clockwise

D/A — digital-to-analog
dB — decibel
dBc — decibels referenced to carrier level
dBd — antenna gain referenced to a dipole
dBi — antenna gain referenced to isotropic; a dipole has a gain of 2.14 dBi
dBm — decibels referenced to 1 milliwatt
DBM — doubly balanced mixer
dc — direct current
D-C — direct conversion
DEC — district emergency coordinator
DEMUX — demultiplexer
DF — direction finder; direction finding
DIP — dual in-line package
DOC — Department of Communications (Canada)
dpdt — double-pole double-throw
dpst — double-pole single-throw
dsb — double sideband
DTL — diode-transistor logic
DTMF — dual-tone, multi-frequency
DVM — digital voltmeter
DX — long distance
DXAC — DX Advisory Committee
DXCC — DX Century Club

E — voltage
EAROM — electrically alterable read-only memory
EC — emergency coordinator
ECAC — Emergency Communications Advisory Committee
ECL — emitter-coupled logic
ECO — electron-coupled oscillator
eirp — equivalent isotropically radiated power; erp referenced to an isotropic antenna
EME — earth-moon-earth (moonbounce)
emf — electromotive force (voltage)
EMI — electromagnetic interference
EMP — electromagnetic pulse
EOC — emergency operations center
EPROM — erasable programmable read-only memory
EQX — equator crossing
erp — effective radiated power
EUV — extreme ultraviolet radiation

f — frequency
F — farad; Fahrenheit
FAX — facsimile
FCC — Federal Communications Commission
FD — Field Day
FET — field-effect transistor
FF — flip-flop
FL — filter
fm — frequency modulation
FMT — Frequency Measuring Test
fot — optimum working frequency
FSD — full-scale deflection
fsk — frequency-shift keying
ft — foot

g — gram
GaAs FET — gallium arsenide field-effect transistor
GDO — grid-dip or gate-dip oscillator
GHz — gigahertz
gnd — ground

H — henry
HAAT — height above average terrain
HDLC — high-level data link control
hf — high frequency
HFO — heterodyne-frequency oscillator
hpf — highest possible frequency
Hz — hertz

I — current
IARU — International Amateur Radio Union
IC — integrated circuit
i-d — identification, identifier
ID — inside diameter
i-f — intermediate frequency
IMD — intermodulation distortion
in. — inch
in./s — inches per second
I/O — input/output
IRAC — Interdepartment Radio Advisory Committee
IRC — international reply coupon
isb — independent sideband
ITF — ARRL's Interference Taskforce
ITU — International Telecommunication Union
IW — Intruder Watch

j — indicator for reactive component of an impedance (+j inductive; −j capacitive)
JFET — junction field-effect transistor

K — kilobyte, Kelvin
k — kilo, 1000
KB — keyboard
kg — kilogram
kHz — kilohertz
km/h — kilometers per hour
kW — kilowatt
kWh — kilowatt hour

L — inductance
lb — pound
L-C — inductor-capacitor

LCD — liquid crystal display
LED — light-emitting diode
lf — low frequency
lhcp — left-hand circular polarization
LMO — linear master oscillator
LO — local oscillator, League Official
Loran — long-range navigation
LOS — loss of signal
lp — log periodic
LPM — letters per minute
lsb — lower sideband
LSB — least-significant bit
LSI — large-scale integration
luf — lowest usable frequency
m — meter (distance or band)
mA — milliampere
mAh — milliampere hour
MARS — Military Affiliate Radio System
MDS — minimum discernible signal
mf — medium frequency
mH — millihenry
MHz — megahertz
mi — mile
mike — microphone
mini-DIP — dual in-line package, 8 pins
mi/h — miles per hour
mi/s — miles per second
mix — mixer
mm — millimeter
MO — master oscillator
modem — modulator/demodulator
MOS — metal-oxide semiconductor
MOX — manually operated switching
ms — millisecond
m.s. — meteor scatter
m/s — meters per second
MSB — most-significant bit
MSI — medium-scale integration
MSTV — medium-scan television
muf — maximum usable frequency
MUX — multiplex; multiplexer
mV — millivolt
mW — milliwatt

nbfm — narrow-band frequency modulation
nbvm — narrow-band voice modulation
n.c. — no connection
NC — normally closed
NCS — net control station
NF — noise figure
NIAC — National Industry Advisory Committee
NiCad — nickel cadmium
NM — net manager
NMOS — n-channel MOS device
NO — normally open
NOI — notice of inquiry
npn — negative-positive-negative
NPRM — notice of proposed rule making
NR — Novice Roundup (contest)
ns — nanosecond
NTIA — National Telecommunications and Information Administration
NTS — national traffic system (ARRL)

OBS — official bulletin station
OD — outside diameter
OES — official emergency station
OO — official observer
op amp — operational amplifier
ORS — official relay station
osc — oscillator
OSCAR — Orbiting Satellite Carrying Amateur Radio
OTA — operational transconductance amplifier
OTC — Old Timer's Club
OTS — official traffic station
OVS — official vhf station
oz — ounce

P — power
PA — power amplifier
pc — printed or etched circuit
PEP — peak envelope power
PEV — peak envelope voltage
pF — picofarad
PIA — public information assistant
PIV — peak inverse voltage
pk — peak
pk-pk — peak-to-peak
PL — Private Line (Motorola trademark)
PLL — phase-locked loop
pm — phase modulation
P.M. — afternoon/night
PMOS — p-channel MOS device
pnp — positive-negative-positive
pot — potentiometer
ppd — postpaid
PRAC — Public Relations Advisory Committee
PROM — programmable read-only memory
PRV — peak reverse voltage
PSHR — Public Service Honor Roll
psk — phase-shift keying
PTO — permeability-tuned oscillator
PTT — push-to-talk

QCWA — Quarter Century Wireless Association
QRP — low power (less than 10 watts input)

R — resistance
RACES — Radio Amateur Civil Emergency Service
RAM — random access memory
R/C — radio control
R-C — resistor-capacitor
RCC — Rag Chewers Club
revr — receiver
rev/min — revolutions per minute
rf — radio frequency
rfc — radio-frequency choke
RFI — radio-frequency interference
rhcp — right-hand circular polarization
RIT — receiver incremental tuning
RM-(number) — number assigned by FCC to a petition for rulemaking
rms — root-mean-square
RO — radio officer
ROM — read-only memory
RS — Radiosport Satellite (USSR)
RST — readability-strength-tone
RTL — resistor-transistor logic
RTTY — radioteletype

s — second
s.a.e. — self-addressed envelope
s.a.s.e. — stamped s.a.e.
SCM — section communications manager
SCR — silicon-controlled rectifier
SEC — section emergency coordinator
SET — Simulated Emergency Test
shf — super-high frequency
S.M. — silver mica (capacitor)
SNR or S/N — signal-to-noise ratio
spdt — single-pole double throw
spst — single-pole single-throw
SS — Sweepstakes; spread spectrum
ssb — single sideband
SSC — AMSAT Phase III special service channels
SSTV — slow-scan TV
STM — section traffic manager
SWL — shortwave listener
SWR — standing-wave ratio
sync — synchronous, synchronizing
SYNCART — synchronous satellite carrying Amateur Radio transponder

TA — technical advisor
TCA — time of closest approach
TCC — Transcontinental Corps
TE — transequatorial (propagation)
tfc — traffic
THz — tetrahertz
THD — total harmonic distortion
tpi — turns per inch
T-R — transmit-receive
T-T — Touch-Tone, trademark of Bell Telephone Co.
TTL — transistor-transistor logic
TTY — teletypewriter (from Teletype, trademark of Teletype Corp.)
TV — television
TVI — television interference
uhf — ultra-high frequency
UJT — unijunction transistor
UoSAT — University of Surrey educational/research satellite (Great Britian)
usb — upper sideband
UTC — Universal Coordinated Time

V — volt; voltage
VCO — voltage-controlled oscillator
VCXO — voltage-controlled crystal oscillator
VFBO — variable-frequency beat oscillator
VFO — variable-frequency oscillator
vhf — very high frequency
vlf — very low frequency
VMOS — vertical power FET
VOM — volt-ohm-milliammeter
VOX — voice-operated switching
VR — voltage regulator
VRAC — VHF Repeater Advisory Committee
VSWR — voltage standing-wave ratio
VTVM — vacuum-tube voltmeter
VUAC — VHF-UHF Advisory Committee
VXO — variable crystal oscillator

W — watt
WAC — Worked All Continents
WARC — World Administrative Radio Conference
WAS — Worked All States
wbfm — wide-band fm
wpm — words per minute
wVdc — working voltage, dc

X — reactance
xcvr — transceiver
xmtr — transmitter
xtal — crystal

Z — impedance
Z — see UTC

5BDXCC — Five-Band DXCC
5BWAC — Five-Band WAC
6BWAC — Six-Band WAC
5BWAS — Five-Band WAS

° — degrees
α — alpha; angles; common-base forward current-transfer ratio of a bipolar transistor
β — beta; angles; current gain of common-emitter transistor amplifiers
γ — gamma; angles
Δ — delta; increments
δ — delta; angles
ε — epsilon; base of natural logarithms (2.71828)
θ — theta; angles
λ — wavelength; longitude
μ — mu; micro (10^{-6}); amplification factor; permeability
μP — microprocessor
π — pi; 3.14159
Σ — sigma; summation
T — tau; time constant; time phase displacement
ϕ — phi; angles; latitude
ψ — psi; angles
Ω — omega; resistance in ohms
ω — omega; angular velocity, $2\pi f$

UoSAT-OSCAR 9

By Bernie Glassmeyer,* W9KDR

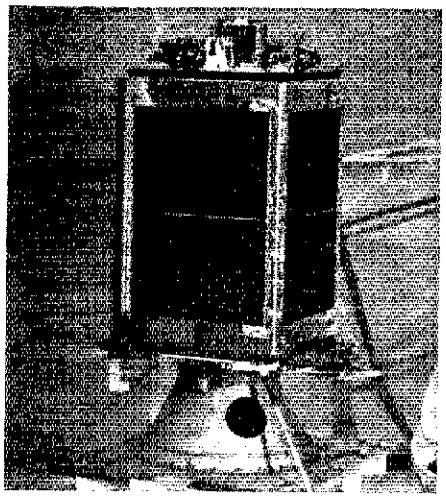
Want to listen to the latest satellite news as OSCAR 9 passes overhead? Use your computer to read the ASCII messages from space? Make your own propagation predictions using the hf beacons? It may be time to investigate this new addition to the OSCAR series of Amateur Radio satellites.

Some of the systems of OSCAR 9 were described on page 105 of November 1981 *QST*. Our purpose this month is to help you find out when to listen and how to use some of the data being sent.

Since the launch on October 6 from Vandenberg AFB, California, OSCAR 9 has been sending signals back to earth during its 15 orbits each day. These signals will be sending data to the University of Surrey engineering evaluation team to help determine the status of the spacecraft. One of the most important first determinations to be made will be the spin rate. This rate will be stabilized by ground control of the "magnetorquer" coils which will be activated to point the gain antennas and onboard camera toward the earth. When this maneuver has been completed, the command station will push the magic button that will extend the 50-foot-long stabilization boom from the spacecraft. With a 6.5-lb Magnetometer at the end of this long boom, it will also be used to radiate the hf beacon signals being excited by a smaller dipole. When these tests are complete, the OSCAR 9 spacecraft will become operational.

If you have the "all-new OSCARlocator package" (available from ARRL for $7 U.S., $8 elsewhere postpaid), you can use either the OSCAR 7 or OSCAR 8 plastic overlay to make an OSCAR 9 plotter. To modify your new OSCARlocator, remove the large plastic overlay from the snap fastener and place it over Fig. 1. Position the tracking curve 90 degrees to the existing track to cause least interference. Align the cross at the north pole and fasten it with a paper clip. To trace the curve, we use a Pilot SC-UF ultra-fine-point black permanent marker. This pen sells for less than a dollar and can also be used to mark high-gloss QSL cards. You may divide the minute marks even further if you wish, but the three-minute intervals were found to be adequate. To find successive orbits, place the plastic overlay back on the snap fastener. Align the 0 minute mark of the OSCAR 9 tracking curve with 0 degrees longitude. Progress around the circle and make a mark every 24 degrees. You will find this divides 15 times, telling you that OSCAR 9 makes 15 orbits in 24 hours. Starting at 0, number each successive mark 1, 2, 3, etc. until you reach 14. The 15th successive orbit will be the 0 mark. This completes the large tracking circle modification.

Remove the small range circle (the one centered over your QTH) from your map and place it over the OSCAR 9 circle (Fig. 2). Try not to draw through any numbers on the circle you use, as this will cause less confusion when determining the azimuth and elevation headings. Reassemble your plotter and look up the OSCAR Operating Schedule in *QST* (this issue, page 100).



UoSAT-OSCAR 9 resting on the same cone-shaped base that was used for OSCARs 7 and 8. On top is the large can-shaped Magnetometer, which will be extended 50 feet from the spacecraft upon command by the University of Surrey command station. *(W9KDR photo)*

The orbit of OSCAR 9 was planned so the satellite will pass overhead at approximately the same time every day. Presently the overhead passes are around 3 A.M. and 2 P.M. local time (0800 and 1900 UTC). This will usually give access to three orbits (sometimes only two) on early morning and afternoon passes. Calculate orbits that will be in your range and monitor the 145.825-MHz General Beacon frequency.

If possible, make provisions to tap into the audio of your receiver and make a good noise-free recording of the satellite data. Some data will use phase synchronous afsk and can be recorded for playback later. Most good-quality present-day recorders will work with the 1200/2400 Hz tones. Since overhead passes provide the maximum time to receive data (approximately 12 minutes, 20 seconds), it will be convenient to record the signals.

To decode the afsk data, you will need a tape interface that will convert the audio tones to a TTL (transistor-transistor logic) signal. This signal will provide ASCII serial input to a computer or video display terminal. The TTL signal could also be run through a Level Translator to provide an RS-232 or 20 mA loop that will drive a computer or TTY terminal.

A tape interface unit drawing was provided by Steve Gomez, KE5O. We have found it to work well with a strong, noise-free signal at 1200 bps. To receive a copy of this simple circuit (only three chips) and a copy of the telemetry allocations and equations for decoding all 60 channels, please send $1 and an s.a.s.e. to ARRL, OSCAR 9 Telemetry, Club and Training Dept., 225 Main St., Newington, CT 06111.

*OSCAR Program Manager, ARRL

Fig. 1

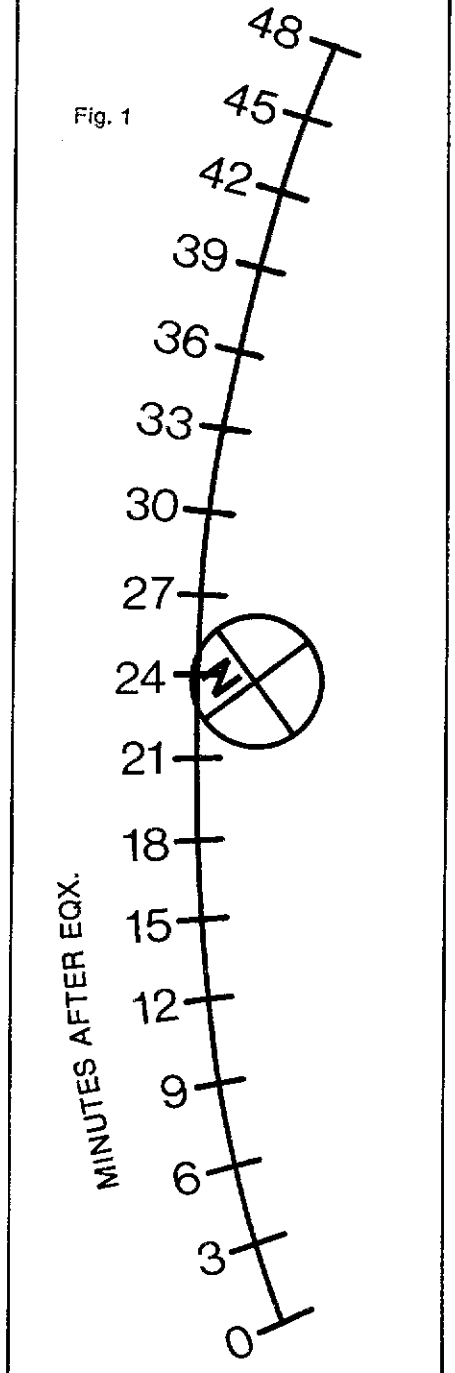
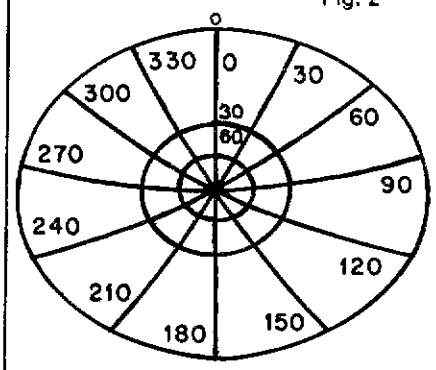


Fig. 2



Happenings

Conducted By W. Dale Clift,* WA3NLO

Spread Spectrum Proposed for Some VHF Amateur Bands

Amateur Extra and Advanced class operators will be experimenting with spread-spectrum modulation techniques on three vhf bands if the Federal Communications Commission's proposal in General Docket No. 81-414 is adopted. The Commission has proposed that the top two license classes be allowed to use spread-spectrum on 50-54 MHz, 144-148 MHz and 220-225 MHz. Spread-spectrum techniques, originally developed for military applications, occupy a very large bandwidth, perhaps many megahertz, as compared with the bandwidth of the information signal.

Because the signal's energy is scattered over a wide band of frequencies, however, there is only a small amount of energy at any one point of the spectrum. This wide bandwidth provides for a signal that is very hard to detect or jam with conventional equipment. These qualities, important to the military, also represent qualities that may be desirable to civilian users of the spectrum.

To allow amateurs maximum flexibility in the design of spread-spectrum systems, the Commission proposes to permit direct sequence modulated, frequency hopping, pulsed-fm and hybrid systems. However, it will require that a system's bandwidth be equal to or less than the width of the amateur band that the system is operating in and that it be retained within that band. Detailed descriptions of some of these spread-spectrum systems may be found in an IEEE press publication entitled *Spread Spectrum Techniques*, edited by Robert C. Dixon (New York: IEEE Press, 1976). *QST* has also published an article that cites spread spectrum as a technology ripe for amateur experimentation. See Rinaldo, Paul L., "Spread Spectrum and the Radio Amateur," *QST*, November 1980, pp. 15-17.

The reason the FCC has proposed the 50-, 144- and 220- MHz bands for spread-spectrum experimentation is an International Telecommunication Union (ITU) regulation that requires that "transmissions between amateur stations of different countries . . . shall be made in plain language." The frequency bands above 50 MHz are naturally limited in propagation, and no international communications using spread spectrum will, in any event, be allowed. The reason the Commission has not proposed spread-spectrum authorization for amateur frequencies above 225 MHz is to avoid the need to coordinate spread-spectrum experiments with government users of these shared bands. However, the Commission welcomes requests for special temporary authority to perform limited spread-spectrum experiments in the amateur bands above 225 MHz and will consider these on a case-by-case basis.

One of the major concerns in authorizing spread spectrum in the Amateur Service is the Commission's, and the amateur's own, ability to monitor and locate stations transmitting wide-band emissions. Presently, the Commission's Field Operations Bureau (FOB) has no capability to monitor spread-spectrum emissions. The proposal in General Docket No. 81-414 includes some provisions to facilitate monitoring by both FOB and other amateurs, however. For example, the Commission will preclude the use of esoteric encryption schemes and instead require that spreading codes be generated by linear shift registers. This will result in signals that may be received by anyone with reasonable effort. This should facilitate self-monitoring, which historically has been very effective in the Amateur Radio Service. Additionally, the Commission proposes that amateurs log the technical characteristics of their signals and identify their transmissions in telegraphy on their center operating frequency.

Because the characteristics of spread spectrum are such that its transmission should not be disruptive to other users, the FCC expects that the safeguard it has proposed will be sufficient. However, the Commission requests that amateurs address their comments to the proposed safeguards and to other conditions the Commission could require to lessen enforcement problems. Additionally, the Commission asks that comments address (but not be limited to) the following questions: (a) Are the emission limitations specified sufficient to prevent interference from spread-spectrum users in adjacent bands? (b) Will interference to conventional amateur communications be a major problem? If so, what steps can the Commission take to mitigate this problem? What types of other communications will be most vulnerable? (c) Is it necessary for the Commission to have the capability to monitor the content of all amateur communications? If not, how can it enforce the limitations on the use of the amateur service and detect unlicensed transmissions? (d) Will the specific shift registers proposed facilitate self-monitoring by the amateur community?

ARRL members who wish to receive a complete copy of the FCC's proposal to authorize spread spectrum in the amateur service are invited to submit a long business-size, self-addressed stamped envelope with 37¢ postage to ARRL Hq., Docket 81-414, 225 Main St., Newington, CT 06111. Persons wishing to file comments with the FCC are required to file an original and five copies of their comments by March 1, 1982. Reply comments are due April 15. Participants wishing each commissioner to have a copy of their comments should file an original and 11 copies. Members of the general public who wish to express their interest by participating informally may do so by submitting one copy. All comments are given the same consideration, regardless of the number of copies submitted. All comments should be clearly marked "General Docket No. 81-414," and should be sent to: Secretary, Federal Communications Commission, Washington, DC 20554.

RFI COMMENTS, STRONGLY WORDED, FILED BY LEAGUE

Once again, ARRL has filed comments with the Federal Communications Commission regarding one of Amateur Radio's oldest nemeses, radio-frequency interference (RFI). The League's comments, a terse, eight-page filing, were in response to the Commission's Further Notice of Inquiry in General Docket 78-369.

In what can best be described as "bristling," the League first took issue with the need for the Further Notice of Inquiry (FNOI). "The League is frustrated by the continued failure of the FCC to take needed action on a problem for which the solutions and cures have been well known for at least 30 years." ARRL points out that Congress has had an interest in the RFI problem over the past nine years, starting with the first RFI bill introduced by Representative Charles M. Teague in 1972. RFI bills have been introduced in each session of Congress since then, the most recent being Senator Barry Goldwater's S-929. Yet in spite of this Congressional interest, the FCC did nothing until November of 1978 when it issued its first Notice of Inquiry in Docket 78-369. The League reiterates its comments from that proceeding now in this, the FCC's *Further* Notice of Inquiry in 78-369: "The ARRL is particularly disturbed by the Commission's decision to investigate further the extent and causes of TVI and RFI when the facts have been before it for years in one form or another . . . The ARRL is at a loss to understand why additional information and comments on the subject of RFI, its causes and cures, are required. The need for action by the Commission becomes more imperative each day."

The Most Offensive Suggestion.

The most offensive part of the Commission's Further NOI is a policy option that would place strict liability on transmitter operators for all RFI problems: "Placing responsibility for resolving RFI problems on the operators of transmitters, regardless of technical fault, is completely, totally and unequivocally unacceptable." ARRL holds that it is unconscionable that the Commission would give even a second glance to this idea. Such a policy would assess a penalty against the operator of a radio transmitter based on factors over which he or she has no control. Furthermore, such a policy would eliminate the incentive for those who are responsible and in a position to resolve the problem. The League recognizes that this policy option is only one of several being considered, but the fact that it is being considered at all is a giant step backward in the progress that has been made in the war against RFI and the understanding of its causes.

The League also takes issue with claims made previously by the Electronic Industries Association (EIA) that the RFI problem is of such small proportions as not to justify government intervention. If the problem is as small as the EIA claims, the League contends that the electronics industry should then be *receptive* to a policy option placing the liability for RFI on the *manufacturers* of electronic home-entertainment devices. After all, it would be

*Deputy Manager, Membership Services, ARRL

necessary only for the industry to maintain a small group of technicians to resolve the few RFI problems that would occur as a result of insufficiently filtered or shielded electronic equipment.

In short, the League totally rejects the policy option that would make transmitter operators strictly liable for resolving RFI problems. This policy option would impose liability on persons having no control over the situation. Furthermore, this imposition would be totally against fundamental fairness and against constitutional principles. The only party having sufficient control to reduce susceptibility to RFI is the manufacturer of the receiving equipment. Therefore, it can be only the manufacturer who is held responsible for the occurrence of such RFI phenomena.

Combined Transmitter/Receiver Limited Liability

Another policy option that the Commission considers in its Further NOI is the policy that, essentially, it now follows. The present assessment of liability is based on technical fault. In other words, if the transmitter is radiating harmonic energy or spurs that cause TVI, fix the transmitter; if the problem is inadequate selectivity or shielding in the TV receiver, fix the TV set. This is a sound policy.

Many manufacturers are willing to cooperate with owners of their home-entertainment equipment to cure RFI problems on a case-by-case basis. The League publishes a list of manufacturers and points of contact for consumers who need assistance, and ARRL applauds these manufacturers for their efforts. Nevertheless, the consumer is often totally unaware of the availability of this assistance. ARRL contends that the electronic home-entertainment industry has not squarely met its responsibility of informing the public that RFI assistance should be sought from the manufacturers of the equipment experiencing susceptibility problems. This is simply an example of the Commission's allowing the manufacturers to "discharge their responsibility through other means," thereby removing any incentive to reduce the susceptibility of their equipment to RFI.

Mandatory Standards v. Voluntary Standards

ARRL points out that where practical and effective, voluntary standards are preferable to mandatory standards. However, the irrevocable fact is that the electronic industry has shown little inclination to voluntarily reduce the RFI susceptibility of the equipment it manufactures. Those who are making a voluntary effort are risking that their competitors will not follow suit, thereby gaining a competitive price advantage. The League contends that voluntary standards are not practical or effective because there is no marketplace incentive to lessen the RFI susceptibility of home-entertainment equipment and other electronic equipment. There is no indication that voluntary standards are working now, or that they will work in the future. This is why the League has been a proponent of mandatory standards ever since the first RFI bill was introduced in 1972.

Labeling

The League would certainly support a program of receiver susceptibility grading and labeling, but it prefers mandatory standards. Grading and labeling of receivers and other equipment would be not nearly as effective as mandatory standards for RFI susceptibility, but it would be an improvement over the present situation. At least a consumer would be given prior warning that the receiver about to be purchased may be susceptible to rf energy it should not receive. There is also a possibility that such prior knowledge may create a marketplace incentive for manufacturers to reduce the susceptibility of their own equipment voluntarily, an incentive that does not now exist.

ARRL asserts that further study of radio-frequency interference prior to Commission action is unnecessary. Policy options that place liability for resolving RFI problems on parties who are not responsible for and exercise no control over the situation are unacceptable and will be opposed vigorously by the League. Voluntary industry efforts have been minimal, indicating that mandatory government standards are necessary. The Commission should support legislation now before Congress that would give the FCC authority to require manufacturers to incorporate filters, circuits or other techniques to reduce the susceptibility present-day home-electronic devices have to radio-frequency interference.

ARRL members wishing to receive a copy of the League's filing in this Further Notice of Inquiry are invited to submit to Hq. a long business-size, self-addressed, stamped envelope with 20¢ postage to ARRL Hq., League Comments FNOI 78-369, 225 Main St., Newington, CT 06111.

Vincent Gambino, WB4QJO, puts his signature on the *first* issued Italian license under the recently enacted reciprocal agreement between Italy and the United States. Looking on with approval are (left) John Lindholm, W1XX, of ARRL and the *second* issued holder of a reciprocal license; Dr. Wanda Binetti, Chief of the Radio Amateurs Branch of the Italian Telecommunications Ministry; and (right) Mario Monaco, IØMXM, Chairman of the international Amateur Radio effort in behalf of UNICEF. Information on reciprocal licensing in Italy can be obtained from ARRL Hq. (*photo by IØIJ*)

NEW JERSEY APPELLATE COURT RULES AGAINST AMATEUR RADIO

The Appellate Division of the Superior Court of New Jersey has uphelp an ordinance adopted by Winslow Township that makes it unlawful to "transmit . . . any radio emission, signal or transmission which either causes or creates electrical visual or audible interference, or, by said transmission annoys, disturbs or endangers the comfort, repose, health, peace, safety or general well-being of others within the limits of the Township. . . ." The decision also affirms a lower court decision that found Randy Bynum, WB2SZK, to be in violation of the ordinance.

According to the court, arguments by Randy that the Federal Communications Act of 1934 preempted the Winslow Township ordinance were "unpersuasive." The ruling said, in part: "There is no express or implied intent by Congress to exercise exclusive control over the actual operation of amateur radio transmission. Indeed, the Federal Communications Commission has expressly recognized this fact: 'Transmission of radio communication or messages by an amateur radio station for any purpose or in connection with any activity which is contrary to federal, state or *local* law is prohibited.' 47 C.F.R. §97.116 (emphasis supplied)."

The court also held that the Winslow Township ordinance is a proper exercise of police power. "The regulations in question are clear, specific and reasonable. They deal with abatement of noise nuisances which interfere with the use and enjoyment of property by others. Loud and unusual noises which 'annoy, disturb, injure or endanger the comfort, repose, health, peace or safety of others' are banned. It is an entirely proper exercise of police power to protect the health, safety and welfare of local residents by abatement of nuisances and perservation of order."

In December of 1979, field engineers from the FCC Phildelphia office investigated Randy's station. The Commission's conclusions were that WB2SZK had a clean bill of health and that the neighbors experiencing the interference should contact the manufacturers of the devices, explain the problem to them and request filters. Ennis Coleman, Engineer in Charge of the FCC's Philadelphia Field Office, told a local newspaper reporter that the ham radio equipment affected the receivers simply because the receivers lacked proper filtering.

The neighbors apparently could not accept the results of the FCC investigation because

Amateur I-D Rules Simplified

The Federal Communications Commission has simplified the rules governing station identification in the Amateur Radio Service. Effective October 23, 1981, amateur stations are required to identify at the end of their transmissions only, and every 10 minutes or less during a communication. However, those stations engaging in international third-party traffic will still be required to give the call sign of the station located in the foreign country, in addition to its own call sign, at the end of the exchange of third-party communications. Teleprinter operators, however, formerly required to give their call signs only, will now be required to give the call sign of the station worked if they are conducting international third-party traffic.

The Commission proposed the changes in a Notice of Proposed Rulemaking in PR Docket No. 80-136. See "Happenings," June 1980 *QST*, page 58. The Commission received approximately 40 comments in this proceeding, of which only seven were opposed. Additional support was received from more than 250 persons who signed petitions fully supporting the proposed rule amendment, but who did not discuss its merits.

The text of the new rule is as follows:

In Section 97.84, paragraph (a) is amended and paragraph (h) is added to read as follows: §97.84 Station Identification. (a) Each amateur radio station shall give its call sign at the end of each communication, and every ten minutes or less during a communication.

* * * * *

(h) At the end of an exchange of third party communications with a station located in a foreign country, each amateur radio station shall also give the call sign of the station with which third party communications were exchanged.

they continued to demand that township officials take further action against Randy. On December 19, 1979, Winslow Township adopted Ordinance No. 50-10.2, entitled "Interference by Radio Transmitter." In February of 1980, Randy was again summoned to court, this time on charges of violating the new RFI ordinance.

Local radio amateurs and clubs contributed nearly $4000 to the "Randy Bynum Defense Fund," which is headed by Harry Stein, W3CL, of Glenside, Pennsylvania. This enabled Randy to challenge the new ordinance in New Jersey Superior Court. Randy's attorney also received legal research aids and copies of case opinions from ARRL. In May of 1980, however, the New Jersey Superior Court upheld the new ordinance. The Defense Fund again enabled Randy to appeal to higher authority. On September 25, 1981, however, the Appellate Division of the Superior Court affirmed the lower court decision. (*Bynum v. Mayor and Township Committee of the Township of Winslow*, Case No. A-4752-79T4, Super. Ct. of N.J., App. Div., Sept. 25, 1981.)

Although Randy has since moved to California because of a job transfer, he still owns his house in New Jersey and wants to continue the fight. At presstime, however, Randy was undecided whether he would be able to appeal this latest decision: "It depends on whether I can muster more support. We have used up nearly all of the $4000 already contributed. I would like to continue the fight, but I can't afford to go it alone." Randy has also requested funding from ARRL. The League's Executive Committee was scheduled to consider Randy's request at its November 21 meeting.

HARRY A. McCONAGHY, W3SW

It is with sadness that we report that former ARRL Atlantic Division Director Harry A. McConaghy, W3SW, passed away at his home in Bethesda, Maryland, after suffering a heart attack. He was 71. Known to thousands of ham radio operators as "Connie Mac," he was active as both operator and experimenter. He was on the air up to the day of his death.

First licensed in 1934 as W3EPC in Phildelphia, Connie Mac served as a director of the League from 1970 to 1979. He was a life member of QCWA, the Society of Wireless Pioneers and the Antique Wireless Association. A graduate of the University of Pennsylvania, Connie Mac worked as a broadcast engineer in Phildelphia in the 1920s and 1930s. During World War II, Connie Mac saw action in the Pacific Theater as a naval aviator. Part of the time he served there was as a member of the famous fighter squadron led by Commander "Pappy" Boyington. Near the latter part of the war, he was severely injured in a crash landing aboard an aircraft carrier, but following the war Connie Mac recovered to continue serving as a commander in the Naval Reserves. He retired from the Navy in 1970.

Connie Mac made numerous significant contributions to the design of Naval electronic equipment during his years of government employment following his active Navy duty. In 1970, he retired from Civil Service employment and for several years operated his own marine engineering service. Survived by his wife, Rae, daughter Linda and two grandchildren, Connie Mac surely will be missed by the many friends he made throughout the world both as a ham radio operator and as a gentleman. —*W. Dale Clift, WA3NLO*

Former ARRL Director Harry A. (Connie Mac) McConaghy, W3SW

ADDITIONAL DIGITAL CODES FOR AMATEURS PROPOSED

The Federal Communications Commission has proposed that Amateur Radio operators be authorized to use any digital code in the transmission of communications on frequencies above 50 MHz for domestic communications only. The proposal, PR Docket 81-699, was made by the Commission in response to a petition filed by the American Radio Relay League. The League earlier petitioned the Commission to permit the use of new and experimental digital processes by radio amateurs.

Currently, the only digital codes authorized for amateur use are ASCII (American Standard Code for Information Interchange) and the Baudot code. According to the Commission, such limitations may be discouraging the kind of innovation in the Amateur Radio Service the Commission has explicitly sought to encourage. For example, in 1976 the FCC began a rulemaking in Docket 20777 to deregulate the Amateur Service by eliminating emission-type restrictions. Because of the comments filed in that proceeding, the Commission decided not to relax emission requirements but did authorize amateurs to use the ASCII. Because Docket 20777 is dated, however, the Commission is terminating that proceeding and incorporating the ARRL's request into a new proceeding in PR Docket 81-699.

The proposal would still require stations to identify themselves using conventional voice or telegraphy and maintain a record of the codes used, making that record available to the Commission on request. Also, at any time the Commission could restrict or prohibit the use of codes other than ASCII or Baudot by certain stations. These provisions are intended for monitoring and enforcement purposes.

Members wishing to receive a copy of this Notice of Proposed Rulemaking are invited to submit to Hq. a self-addressed, stamped envelope with 20¢ postage. Address your request to ARRL, NPRM 81-699, 225 Main St., Newington, CT 06111. Persons wishing to comment on the proposal should send one original and five copies to FCC Secretary, Washington, DC 20554 by January 15, 1982. Reply comments are due February 15.

ARRL COMMENTS ON PROPOSED INLAND EXPANSION OF RADIOLOCATION ON 420-MHz BAND

In response to the FCC's proposal to allow inland expansion of non-government radiolocation in the 420-MHz band, the League has given a cautious and qualified go-ahead for some additional sharing on a non-interference basis. Under the present rules, amateurs already share the 420-MHz band with *government* radiolocation, which is the primary user. Also under the present rules, amateurs share the band with *non-government* radiolocation, which is permitted only along the shorelines of Alaska and the contiguous 48 states, and then only on a noninterference basis with the amateur and government radiolocation services.

The FCC's proposal, a Notice of Proposed Rulemaking (NPRM) in General Docket 80-135, would permit non-government radiolocation to be used inland in forestry, agricultural and aerial surveying applications requiring precise electronic positioning. (See September 1981 *QST*, page 57.) This proposal is in response to a petition filed by Del Norte Technology, Inc., a radiolocation equipment manufacturer seeking to market equipment using spread-spectrum modulation. Spread spectrum is a modulation technique using a pseudo-random digital sequence to scatter energy over a wide band of frequencies so that there is only a small amount of energy at any point of the spectrum. (See November 1980 *QST*, page 15, for an explanation of spread spectrum.) The League's filing in the 80-135 proceeding consists of 10 pages of comments and a 23-page appendix of results of tests conducted at ARRL Headquarters laboratory and at the FCC laboratory in Laurel, Maryland. The tests examined interference potential to amateurs from equipment supplied by Del Norte Technology, Inc.

ARRL found, after careful consideration, that some non-government spread-spectrum radiolocation operations in inland areas can be accommodated in the band *if* several concerns are adequately addressed. However, the League views with alarm any expansion into the 420 MHz of conventional pulse-ranging operations (P0 emission) by nongovernment users. ARRL urges that nongovernment radiolocation operations using P0 emissions continue to be prohibited at inland locations until such time as the compatibility of these systems with narrow-band communications systems is demonstrated. Amateurs in Europe have experienced severe interference from a French-designed system, called SYLEDIS. The League believes that systems similar to SYLEDIS are incompatible with existing operations in this band.

The League says that, before any operations are expanded, some means should be developed by which amateurs can identify and locate the operators of spread-spectrum systems. Otherwise, the "noninterference basis" stipulation is meaningless. Conventional means of identifying transmissions by a Commission-assigned call sign may be impractical for radiolocation purposes, and certainly methods of identification that significantly increase the interference potential of the operations should not be employed. However, one possible alternative is for the Commission to issue a public notice on a regular basis, perhaps monthly or quarterly, listing the licenses issued for nongovernment radiolocation. The same information could be kept at FCC monitoring stations so that an amateur experiencing radiolocation interference could telephone a monitoring station to determine if the source

was a nongovernment operation.

Education of Radiolocation Operators

The FCC is proposing that Section 90.103(c)(21) of its rules spell out that nongovernment radiolocation be required to protect the Amateur and Amateur Satellite Services from interference. The League, however, submits that this is not enough to inform potential purchasers of radiolocation equipment as to the responsibilities they will incur. This information must be provided to potential purchasers before their buying decision is made. Therefore, as a condition for type acceptance of equipment for nongovernment radiolocation operations in the 420-MHz band, the League requests that the noninterference stipulation be spelled out in the marketing literature describing the equipment.

Power Limit

Tests conducted at ARRL Hq. and FCC demonstrated that while some potential for interference to amateur operations from spread-spectrum radiolocation exists, this potential is less than with conventional systems. Harmful interference from spread-spectrum systems is unlikely except on line-of-sight paths of a few miles or less. Nevertheless, because the interference potential of any transmitter is directly related to its power output, the League believes that the maximum power output of 50 watts be maintained for further expansion of such operations.

Frequency Limitations

According to ARRL surveys and tests, the likelihood of interference to amateur operations from nongovernment radiolocation is greatest at 431-438 MHz because of the sensitivity of receiving systems commonly employed for "weak-signal" and amateur satellite operations using these frequencies. There is also a greater likelihood of interference at amateur frequencies 440-450 MHz because of the widespread nature of amateur fm repeater activity in this part of the band. Also of interest, ARRL tests demonstrate that amateur television is somewhat more tolerant of the Del Norte spread-spectrum system than are any other modes.

It appears to the League that the likelihood of interference-free operation is much greater if nongovernment radiolocation can be confined to the band 420-431 MHz. If the Commission chooses not to stipulate such a limitation in its rules, those marketing the systems are urged to keep this point in mind during the selection of operating frequencies.

Future Spread-Spectrum Operations by Amateurs

Recently, the Commission has taken steps to encourage amateur experimentation with spread-spectrum techniques. With this in mind, the League urges that no steps be taken now that might preclude future use of spread spectrum by radio amateurs in the 420-MHz band. It is recognized that the nature of certain *government* operations in the band may preclude such operation by amateurs indefinitely; all that is desired at this stage is a statement of Commission policy that *nongovernment* operations in this band shall not be a bar to the future use of spread spectrum by amateurs.

If the legitimate concerns of the amateur community can be addressed effectively, the League believes that some inland nongovernment radiolocation operation using spread-spectrum techniques can be accommodated in the 420-MHz band without causing harmful interference to the Amateur and Amateur Satellite Services. However, under no circumstances should the Commission authorize inland nongovernment radiolocation operation using conventional techniques until a comprehensive review of spectrum use by nongovernment radiolocation is undertaken.

ARRL members wishing to receive a copy of the League's comments in General Docket 80-135, including the appendix of the Del Norte test results, are invited to submit a long business-size, self-addressed, stamped envelope with 37¢ postage. Address your request to ARRL Hq., League Comments NPRM 80-135, 225 Main St., Newington, CT 06111.

TWENTIETH-ANNIVERSARY AMATEUR SATELLITE FUND DRIVE

The ARRL Foundation continues to receive fine support from members in its program for the promotion of "hams in space." Recent contributors of $100 or more include: Charles E. Martin, AB4Y; Kenyon E. McGuire, WA2VFN; Dutchess County VHF Society; Vir James, WØEY; and Dr. William B. Hulett.

Want a piece of the action of tomorrow's telecommunications world? Send your tax-deductible contribution to: ARRL Foundation, Satellite Program, 225 Main St., Newington, CT 06111 — *Richard Palm, K1CE, Assistant Secretary, ARRL Foundation*

AMATEUR LICENSE-PLATE FEES RAISED IN MISSOURI

Amateur Radio operators must now pay more for their Amateur Radio license plates in Missouri. The new law, raising the fee from $5 to $12, went into effect this past October. Missouri hams are fighting the fee hike by lobbying their state legislators. — *Howard Barnes, WDØDFW*

ARRL FOUNDATION NEWS

The ARRL Foundation Executive Committee met this past September 9, in Newington, to discuss its ongoing programs and to take actions in several areas. With President Robert York Chapman, W1QV, in the chair, the EC heard the report of Treasurer F. George duPont, WA1SVY. He reported balance sheet figures of cash assets, $56,029, and marketable securities, $21,271, representing total assets of $77,300 for the fiscal year ending June 30, 1981. Income for the year totaled $66,660; contributions amounted to $62,824; interest $2,923; and dividends $913. Expenses for the year totaled $11,561.

Director-Secretary Andrea T. Parker, K1WLX, reported on the Foundation's scholarship awards (see "Happenings," November 1981 *QST*). Mr. duPont presented an overview of his trip to Washington, DC, to present AMSAT with the Foundation's contribution of $56,115, representing donations of members in the Twentieth-Anniversary Amateur Satellite Fund Drive. Director Jay Holladay, W6EJJ, reported briefly on the status of the amateur satellite program. Phase III-B construction is well under way with a confirmed ride on Ariane 8 to be launched in October 1982, Holladay said. President Chapman presented a plaque to Dr. Larry Price, W4RA, expressing appreciation for his dedicated years of service to the ARRL Foundation. A similar plaque was awarded to Larry Shima, WØPAN, in appreciation of his devoted work for and with the Foundation.

Assistant Secretary Richard Palm, K1CE, was called upon to discuss the programs of the Courage HANDI-HAM System so that the committee could act upon their recent request for support. The Executive Committee voted to appropriate $200 from unrestricted funds to the Courage HANDI-HAM System in support of its fine work with Amateur Radio and the disabled.

CHANGE IN 6- AND 10-METER REPEATER POWER LIMITATIONS PROPOSED

In last month's "League Lines" we reported that the FCC had adopted a Notice of Proposed Rulemaking that would relax the effective radiated power limitations for amateur stations in repeater operations between 52 and 54 MHz. We also reported that the proposal would extend some power restrictions to repeater stations operating between 29.5 to 29.7 MHz, and said that details would appear in this month's "Happenings." The text of the proposal still was not available to us at "Happenings" presstime. Check "League Lines" in this issue for any possible additional information.

FCC WARNING: ILLEGAL AND UNAUTHORIZED RETRANSMISSION OF RADIO MESSAGES

All FCC licensees and cable television system operators are reminded that the Communications Act prohibits the interception of point-to-point radio transmissions and divulgence without permission, by retransmission or any other means, of the existence, summarized contents or texts of messages transmitted by others.

Section 605 of the Communications Act (47 U.S.C. §605), with limited and specific exceptions, forbids *any person* not authorized by the sender to intercept and divulge or make use of a radio communication intended for others. Section 605 applies to all persons, including FCC licensees. It is enforced by criminal and other penalties specified in the Communications Act. A private party may also seek a remedy by civil litigation.

Broadcasters and all other licensees of the Commission are reminded that FCC rules (47 C.F.R. §73.1207) provide specifically for the permission that must be sought and granted before any part of the substance or text of a radio transmission may be broadcast by a person not a party to the communication.

A transmission by a privately owned nonbroadcast station, such as a commercial aircraft, may be retransmitted only after express permission of the transmitting party and authorization by the FCC in Washington, DC, have been obtained. FCC authorization may be requested informally by telephone, but a written request must follow, accompanied by written permission of the originating station.

A message transmitted by a nonbroadcast station operated by an agency of the federal government may be retransmitted only after receipt of authorization from that federal agency. FCC authorization is not required, but written notification must be sent to the FCC in Washington, DC, within one week of the retransmission, confirming that prior authorization was obtained from the agency. — *FCC Public Notice*

Moved and Seconded

LIFE MEMBER APPLICANTS
SEPTEMBER 9, 1981

Henry A. Albright, KA8AZP; Jack J. Alexander, WA4YLB; Mildred Alexander, WD4OSI; J. Gray Allen, WB4VLM; G. H. "Skipper" Amis, Jr., N5CFM; Gordon Baird, AK5W; John L. Baldwin, Jr., KA9CGA; Robert M. Banasik, NIAEC; John P. Basilotto, WA8ZAN; Mike Belenski, N7CBI; Giles W. Berry, KA3CHY; John J. Bouvier, WD6FPJ; Georg J. Boyens, W5FFZ; George A. Bradley, K5IA; Robert H. Buddell, WB6SYB; Jim Buswell, N5BEQ; John A. Butler, WB2NFB; Robert A. Cerasuolo, WA6IJZ; Paul M. Chambers, NØBBD; James R. Cherry, W3WGR; Ronald F. Chiappari, N6AUV; Henry L. Chiu, N9BZH; Sacha B. Clay, KA5JZR; Rozella L. Clulow, KA7CED; Edward Coan, AIØD; Lora W. Cooper, KA4KGI; Daniel R. Creech, KKØP; Alan L. Creswell, WA7WGE; Michael W. Cross, WB7AYU; Joe Davidson, WB1DHI; Thomas W. Doak, WB6JUR; Thomas J. Donahue, WB7EAW; Jessie J. Dunn, WD8PXW; Paul L. Eakin, KB4ES; Joseph W. Elliott, NØBNS; Maria L. Evans, WBØSPT; John D. Fackler, W1FDY; James E. Fithian, K6OEG; Robert W. Fleming, WA4PEE; James A. Fogle, K6EXB; Charles A. Foley, KB3BG; Charles W. Foley, KG9J; Lisa H. Foote, KA1ETK; Douglas Fowley, WA4RPY; Allen R. Friedman, K6YRA; Doug Frietchen, KA8IHI; J. W. Frye, KC5FV; J. Fugate, AG4F; Ronny D. Gandy, KB5GU; Robert E. Garner, W5NK; Albert O. Goldstone, WA1IWL; John B. Graham, Jr., WA1YTL; Reuben E. Grant, Jr., KD4QI; Daniel Grapentien, KA8GUU; Henry L. Greve, WB9KUB; Gavin Griffith, KB7KX; Ernest C. Guerri, W6MGI; Clarence Gunsolus, N6DUK; Jerry C. Hagenbrock, KNØQJY; Gaines Hall, WA4VZA; Thomas J. Harke, AA9A; William Harris; Marc W. Herold, KN7MVO; Kenneth Hickok, KAØJRX; William Joseph Hilburn, Jr., K4UOO; Allen E. Hoffman, WB7WSQ; Jim Hoffman, N5FA; Harold L. Honnold, III, WA6LHE; A. L. Howard; Donald E. Huntington, K1DH; Joe R. Hyatt, K5GRB; Lauren R. Incarnato, N9AXJ; Dan F. Janda, Jr., KC5JA; Eric H. Jeltrup, N4HW; Robert R. Jenkins, KA6BQF; Eric Johnson, KAØDTH; Peter Johnson, KAØDRG; Scott L. Jones, WB3KKX; Florien Kamin, AJ9G; Kevin J. Kane, WB3ANX; Roy Keller, KA5DFE; Larry D. Kennedy, WA5GLO; Alfred J. Keppelmann, Jr.; Larry Klein, WAØWLC; Glenn E. Koropp, W6YFW; Lora Kravec, N8CWV; Allan Kruger, KT4P; Howard Langerman, W2LBJ; Edward E. Latta, KAØDAD; James G. Leasure, WB6WSA; Thomas Lee, K8AZ; Richard C. Leigh, K9RL; Albert T. Libby, WB1EPK; William M. Light, WB6NAC; Allan W. Lindsay, KA7AJS; Richard L. Lowe, WD4NJN; Al Maenchen, AD6E; Lloyd B. Magruder, III, KB4OM; Bruce E. Mallon, WA4GCH; Michael A. Mancuso, WA3ZFI; Pauline J. Marchand, WB7OVI; Charles E. Marshall, WB4FTI; Michael J. Mattleman, WA3BZM; Janet R. McMahan, KA9HCH; Kent E. Meinholdt, WD5IBQ; Robert E. Moncrieff, KE6E; William R. Morris, KH3AB; John C. Murray, Sr., WD4FTK; Jon E. Musgrave, K8UCN; Sakae Muto, KI6P; Ronald D. Nebeker, K7UT; Elizabeth Nimmo, WBØQKZ; Martie Nimmo, WBØQLB; John Stephen Nix, KB7CZ; Dennis Noe, WB9HDK; Stanley E. Olszewski, KA1GIY; Joseph R. Paquette, KL7J; John C. Parker, KA5HWX; Edward H. Parkhurst, KA6KSO; Harold Parks, WB2BNH; Lewis A. Pillsbury, Jr., WB1AJS; Catherine W. Pillsbury, WB1ADN; Robert A. Pinsky, WD6ANZ; Carl B. Presler, Jr., W4LPL; Carl B. Presler, III, WA4YMD; Marie S. Presler, WA4YMM; R. A. Rawson, N6CMJ; Jan E. Rehler, W5KNZ; Jay G. D. Reid, KD4DG; Marc A. Ressler, K3NCO; Bobby G. Robbins, VP9JW; Steven T. Ross, W6HKX; Paul A. Rousseau, WB1DOI; Jay B. Rusgrove, W1VD; M. A. Schaefer, KA4FFQ; Karl Schenk, WBØUXP; William W. Schenler, WB6AAR; Glenn H. Schroeder, WD9CZC; Donald L. Sealy, W8QKO; Michael Seefeldt, WBØWAA; Harry L. Seibert, WB4RRI; Michael D. Shamberger, KB3E; Steve Sledge, KJ6Z; Martin R. Small, WA2APT; Duncan Smith, WA1IUI; Harry A. Smith, KAØJKG; Robert R. Smith, N3BLH; Roy V. Soggard, W7CVW; Richard H. Sparks, N6WJ; Margaret A. Stahl, KA4SPA; Meron R. Stanley; Jodie Steggerda, N8ALJ; Ralph T. Stetson, KD1R; Charles E. Strawser, KA3K; Robert L. Street, WA4AIB; William R. Sutton, Jr., KB4NC; Andrew H. Takasaki, K7GO; Charles P. Taylor, WD4IMC; Lambert A. Tellier, VE2GAG; Bruce G. Thompson, WB7RHT; Martha B. Thornton, WA4GJY; George S. Tiffany, WB9SYF; Anderson R. Tillman, WA4NVM; Harold Tinlin, WD6CEW; Albert M. Upton, WB4KTI; Thomas Valenzuela, WB6VIR; Robert F. Von Rekowsky, K2HFX; James P. Walburn, WB7TAZ; Travis Walters, Jr., WØNPH; George M. Welch, Jr., W6TUC/W4DFS; Edward S. Westbrook, WA6IUM; Charles Whaley, WBØOFA; Donna M. White, WN4VAU; William R. Wiese, WØHBH; William E. Wilkinson, N6BXD; David G. Winkler, N4AGA; Marc B. Wiskoff, WA2JDK; Robert L. Woodhead, KF4H; H. B. Woodward, KA5IQM; Bill Wynkoop, KB7WU; Peter H. Young, WA3IWB; Eric L. Zust, KMØR; Judy A. Zust, KMØP.

MINUTES OF EXECUTIVE COMMITTEE MEETING
NO. 392
OCTOBER 13, 1981

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Inc., met by telephone conference call at 7:28 P.M. EDST, on Tuesday, October 13, 1981. Present on the line were President Harry J. Dannals, W2HD, in the Chair; Directors Gar Anderson, KØGA, Mitch Powell, VE3OT, William J. Stevens, W6ZM, and Stan Zak, K2SJO; and General Manager Richard L. Baldwin, W1RU. Also on the line was General Counsel Robert M. Booth, Jr., W3PS. (First Vice President Carl L. Smith, WØBWJ, was in Argentina on an IARU trip, and no effort was made to include him in the conference call.)

The Executive Committee had before it the October 6th letter of the General Manager concerning biographical material included with the ballots to the members of the Great Lakes Division. After extended discussion, during which Mr. Dannals asked for the views of each participant in the telephone conference call, the Executive Committee voted unanimously to let the election in the Great Lakes Division proceed as already scheduled, with ballots to be counted on the already-designated date of November 20.

The General Manager was directed to telephone Director Nathanson promptly and inform him of the decision of the Executive Committee.

Turning to another separate but related subject, the General Manager reported that there appeared to be an unusually high number of errors on the part of the independent contractor who performs our bulk mailing, with a number of members in the Great Lakes Division and the Central Division reporting receiving all of the enclosures except the ballot itself. The staff is responding to individual complaints, and will remail to zip-code blocks if it can be determined that will solve the problem.

There being no further business, the telephone conference call was adjourned at 8:07 P.M., EDST.

Respectfully submitted,
Richard L. Baldwin, W1RU
Secretary

Hamfest Calendar

[Note: Sponsors of large gatherings should check with League Headquarters for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL Hq. for up to two years in advance.]

Florida: The Broward Hamfest sponsored by the Broward Amateur Radio Club will be held at the National Guard Armory, Rte. 84, in Fort Lauderdale, Dec. 12-13, 1981. Hours are 9 to 5 on Saturday and 9 to 4 on Sunday. Admission is $4 advance, $5 at the door — good for both days. Prizes, technical programs, vendor booths, swap tables, ARRL Forum, MARS Meeting, contests, food and refreshments. Talk-in on 146.31/91 and .52. For info and reservations contact Tom Loughney, KA4GSK, 901 S.W. 22nd St., Fort Lauderdale, FL 33315, tel. 305-764-8138.

Florida: The 3rd Annual Sarasota Hamfest will be held at the Exhibition Hall, 801 N. Tamiami Trail (U.S. 41), Sarasota, Jan. 16 from 8:30 A.M. to 4:30 P.M., and Jan. 17 from 8:30 A.M. to 3 P.M. Members of the Sarasota Amateur Radio Assn., Inc., and the Sarasota Emergency Radio Club, Inc., will participate. Donation covering the two days is $3 advance, $4 at the door. Swap tables for two days advance reservations requested) donation $12, includes door donation. No one-day tables. Talk-in: 146.13/73, 146.46 and 52. QCWA luncheon Saturday. Advance reservations requested. Luncheon information, contact: Frank Barsody, K4EC, 8056 Claries Dr., Sarasota, FL 33580, tel. 813-355-2493. For advance tickets, booths, tables, information for hamfest contact: John Shinkle, WD4BAJ, 1937 N. Allendale Ave., Sarasota, FL 33580, tel. 813-953-5818, or write: Sarasota Hamfest, P.O. Box 3182, Sarasota, FL 33578.

Indiana: South Bend Swap & Shop, Jan. 3, at the Century Center downtown, on U.S. 33, *one-way* north between St. Joseph Bank Building and river. Half acre on carpeted floor. Industrial history museum in same building. Talk-in 52 and area repeaters. Sponsored by Repeater Valley Hamfest Committee. Contact: Wayne Werts, K9IXU, 1889 Riverside Dr., South Bend, IN 46616, tel. 219-233-5307.

Virginia: The Richmond Amateur Telecommunications Society will hold its annual FROSTFEST on Sunday, Jan. 10, Virginia State Fairgrounds, Richmond. Gates open at 8 A.M. Cw and home-built contests will be featured, along with many other activities. Admission is $3, plus table charges for flea-market displays and tailgaters. Plenty of indoor space, well lighted and heated. Many awards. Call Joe Stern at 804-737-0333 for information.

Wisconsin: The 10th Annual Midwinter Swapfest of the West Allis RAC will be held Saturday, Jan. 9, at 8 A.M. at the Waukesha County Exposition Center. *Our 10th anniversary thank you* is a 50¢ coupon (on ticket) toward sandwich purchase. Prizes awarded. Sandwiches available. Tickets $2 in advance, $3 at the door. Tables: reserved (4 feet) $3, at door $2; free tables only on balcony. All indoor swapfest. Write: 1982 Swapfest, P.O. Box 1072, Milwaukee, WI 53201. — *Marjorie C. Tenney, WB1FSN, Hamfest/Travel Coordinator, ARRL*

Coming Conventions

February 6-7, 1982
Florida State, Miami

February 27-28
Ohio State, Cincinnati

March 27-28
Nebraska State, Kearney

ARRL NATIONAL CONVENTIONS

July 23-25, 1982
Cedar Rapids, Iowa

October 7-9, 1983
Houston, Texas

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Radio Frequency Interference — A Rules Primer

Radio Frequency Interference, or RFI, is among the prominent issues of the day in Amateur Radio. The FCC, in releasing its Further Notice of Inquiry in the RFI docket (78-369), is drawing an increasing amount of comment as it considers various ways and means of dealing with the problem (see "RFI," September 1981 *QST*, page 9). ARRL prefaced its comments in the Commission's Further NOI by stating: "Radio frequency interference is not new. Its causes, problems and cures have been studied time and time again for decades. In fact, radio amateurs pioneered in this area, motivated principally by the advent and growth of commercial television in the late 40's and early 50's. The voluntary and essential work of ARRL-sponsored TVI committees is well known to the Commission, and has been documented before. Amateurs, because their survival depended on it, long ago estabished methods for dealing with, and discovered the appropriate cures for, RFI." The problem of coexistence of countless transmitters and receivers in many radio services in an rf-filled environment remains.

The purpose of this month's column is not to debate the merits of the Commission's proposals, but simply to put into perspective the Part 97 aspects of RFI and how they affect amateurs. The matter is one that should receive the full attention of the amateur community now, and in times to come.

Q. First things first, what is RFI?

A. Radio frequency interference (RFI) occurs, or has the potential to occur, whenever an electronic device finds itself surrounded by a field of radio frequency (rf) energy. The source of this rf might be an amateur, CB, police, broadcast or television transmitter, or any other device capable of generating rf energy and causing interference. The electronic device being interfered with and picking up the unwanted rf energy could be a television set, a hi-fi system, a garage-door opener or other sensitive receiver. RFI actually occurs when the electronic device in the midst of the rf field behaves or responds in an undesirable manner because of the presence of the radio frequency field. Sometimes the transmitter is at fault, but usually, as FCC statistics show, the fault lies with the electronic device itself, because of insufficient shielding or filtering.

Q. Who is responsible for RFI?

A. The FCC specifies standards for amateur emissions. Amateurs must make sure that their transmitted signals are within these standards, or rules, found in Part 97. These include limitations on the fundamental signal and harmonics (multiples of the fundamental frequency) and parasitic or spurious emissions (radiations from a transmitter that are outside the authorized amateur band being used). If an amateur signal does not meet these standards and is causing interference, it is the responsibility of the station licensee or control operator of the transmitter to eliminate it. Similarly, if the transmitter is producing a signal that exceeds FCC power limitations, the responsibility for any problems lies with the transmitter operator. If, however, the transmitter is being operated in accordance with the rules and radiating rf energy only on its fundamental frequency, any rf susceptibility that results is caused by design deficiencies such as insufficient shielding and filtering in home-entertainment devices (TVs, stereos and so forth). The responsibility in this case lies with the owner who must modify the equipment to make it immune to unwanted rf energy.

Q. What are the rules pertaining to RFI?

A. In typical amateur-neighbor situations, FCC statistics show that RFI usually results from design deficiencies such as those discussed above in the home-entertainment device experiencing interference. In each case, however, the amateur must determine whether his or her equipment, or the neighbor's, is at fault.

Section 97.65 is concerned primarily with bandwidth limitations of the various emissions, e.g. how much space on a given band may be used by a given emission type. Section 97.67 deals with amateur power limitations. Of particular significance is paragraph (b) ". . . amateur stations shall use the minimum amount of transmitter power necessary to carry out the desired communications."

Purity of emissions is covered in Section 97.73. Paragraphs a and b specify attenuation standards for spurious emissions. Paragraphs c and d are fully as important: All spurious emissions must be reduced or eliminated in accordance with good engineering practice, and if any spurious emission causes harmful interference to another radio station, the licensee may be required to take corrective action in accordance with good engineering practice. This provides the FCC with considerable flexibility in dealing with interference matters.

Q. What is meant by "quiet hours"?

A. "Quiet hours" refer to periods of restricted operation, an administrative sanction found in Section 97.131:

"(a) If the operation of an amateur station causes general interference to the reception of transmissions from stations operating in the domestic broadcast service when receivers of good engineering design including adequate selectivity characteristics are used to receive such transmission and this fact is made known to the amateur station licensee, the amateur station shall not be operated during the hours from 8 P.M. to 10:30 P.M., local time, and on Sunday for the additional period from 10:30 A.M. until 1 P.M., local time, upon the frequency or frequencies used when the interference is created.

(b) In general, such steps as may be necessary to minimize interference to stations operating in other services may be required after investigation by the Commission."

Additional quiet hours and further administrative sanction may be imposed in the event of multiple violations of technical standards. In these cases, an amateur must prove to the Commission that problems have been corrected before full privileges will be reinstated (§§97.133, 97.135, 97.137).

Q. What must I do if I receive a Notice of Violation?

A. You must reply to the FCC office issuing the Notice within 10 days of receipt (unless you have a valid excuse for a tardy response). If the Notice relates to a physical or electrical problem, you must state fully what steps you have taken to correct the situation to ensure future compliance with the rules. This information should include manufacturers' names of remedial equipment installed. The reply should be complete in itself and may not be abbreviated by reference to other communications or notices. If the notice relates to some lack of attention to or improper operation of the transmitter, the name of the operator in charge must be given (§§97.137). It is very important to reply to a Notice of Violation — FCC will initiate license-revocation proceedings should you choose not to respond!

Q. Is there anything brewing on the legislative front in RFI matters?

A. The first RFI bill was introduced in Congress in 1972. RFI bills have been introduced in each session of Congress since then, the most recent being Senator Goldwater's S-929, which, in part, would grant the FCC authority to establish minimum radio frequency rejection standards for electronic equipment, including TV receivers, making such equipment less susceptible to interference from other electronic equipment (including amateur). At this writing, S-929 has passed the Senate and awaits approval of the House of Representatives. Amateurs wishing to voice their support for the Goldwater bill, S-929 should write their Congressmen. Watch for news of developments in "Happenings."

Q. Are there any sources of practical information for hams and the lay public concerning RFI problems?

A. Yes, the FCC publishes a guide, *How to Identify & Resolve Radio-TV Interference Problems.* This is incorporated in the ARRL publication, *Radio Frequency Interference*, a booklet of practical and technical information on how to identify and cure RFI in a transmitter, in CB radios and in a neighbor's TV or stereo. The booklet is available from ARRL Hq., 225 Main St., Newington, CT 06111. Please enclose $3 with your request to help us defray our costs of printing and mailing.

*Assistant Manager, Membership Services, ARRL

Correspondence

Conducted By Bruce R. Kampe,* WA1POI

VOICES FROM RADIOLAND?

☐ The article, "Your Outgoing QSL Bureau," in the September issue of *QST* was adequate in all respects, except for one point that you failed to indicate. If the DX station to whom the card is sent is not a member of his country's *incoming* DX "buro," then your QSL cards will be sent back to you. I've experienced this several times.

I think the "Outgoing Buro" is great, and I certainly do use it in most cases. But my wish is that more DX stations would use *theirs*. As an avid DXer seeking confirmation from some of the rare countries and also trying for 5-Band DXCC, my postage expenditures are becoming astronomical.

I agree when you say "there is a cheaper way," but the DX stations that are hard to come by will usually say, "via *Callbook*, a green stamp or three IRCs."

Please enroll me in any effort the League undertakes to get more DX stations to use *their "buro."* — *Frank A. Castellano, KC2DI, Massapequa Park, New York*

☐ I have been using this service of yours for about seven or eight months, and I want to take a moment to drop a line and personally thank you and your troops for the fine job you're doing for us. I guess my monthly QSLs have averaged anywhere from 10 to 16 ounces . . . each month! I think there was one contest month where the QSLs totaled about a pound and a half! Boy, that'd kill me to have to shell out to the various foreign QSL bureaus, individually, for postage!

Again, thanks for a great job and service, and I want you to know that some of us out there in radioland appreciate it! — *Jack Wichels, W7YF, Edmonds, Washington*

LITERARY FALLOUT

☐ It seems that Robert Hendrickson's article, "Nuclear Weapons Effects on Communications Systems" (August 1981 *QST*) has created some fallout of its own in the "Correspondence" column of the October *QST*.

Letter writers Bartlett, Ewing and Covey all decry the futility of nuclear war and suggest we put our energy into maintaining the peace. I would certainly applaud and support such efforts, but I am not going to bury my head in the sand.

The possibility of a regional or global nuclear war exists, and as awful as it may be to think about, it is a subject that deserves serious thought. Radio amateurs will be in a unique position both to help and harm whatever is left of this country after a nuclear holocaust.

Even with immediate casualties of say 100 million, there will be survivors, including many hams. Many will be relatively unaffected immediately, and a surprising number will never feel the effects of blast, fire or radiation. Surviving hams with gear shielded from EMP waves, and with emergency power, would probably find themselves the only viable source of intra-continental communications this nation had left, for government and military communications systems, including satellites, would surely be on the enemy's primary "hit list."

But should the unthinkable ever occur, hams should think twice before getting on the air, particularly on the hf bands. Amateurs could unknowingly aid the enemy in programming targets for follow-up strikes. Imagine for example, some untouched ham in Riverside, California, getting on 20 meters after an attack, calling around to see what American cities had been hit and which had not. Assuming that the enemy's satellite surveillance had been knocked out by a U.S. retaliatory strike, it seems likely that the enemy would monitor the complete radio spectrum, including the amateur bands. The enemy would hear our ham on 20 meters and know right away that their missiles targeted for March Air Force Base, a Strategic Air Command base just outside of Riverside, had somehow missed their target. March AFB, and nearby Riverside, would then be targeted for a secondary strike. With his natural curiosity and his big mouth, our ham on 20 meters might be responsible for the additional deaths of 100,000 people, including himself. It is indeed something to think about! If you cannot be of some definite help to your local community, perhaps it would be best to stay off the air. — *Roger Mitchell, N6CDD, Coarsegold, California*

LISTS

☐ Ellen White writes a very good DX column for *QST*, but in the September issue she referred to list operations as the "welfare rolls of Amateur Radio," which makes me a bit testy. I LIKE lists, which puts me squarely on the welfare rolls.

A local ham, now in Houston, once did a hilarious program for the Midland ARC in which he charted his expenditures for antennas and equipment against the number of countries he had confirmed. I suspect that most of those who holler loudest against lists: (1) have big, expensive antennas, (2) live on mountains or on beaches, (3) inhabit East Coast houses or, not quite as good, West Coast houses, (4) have spent at least $4000 on DX-related equipment or gear. Some of us like to DX but have to do with less. To us a list is GREAT!

We old welfarers don't begrudge the luckier ones. But please don't preach to us about how good operating makes up for the lack of bucks or less than optimum location. It's rarely so. And, in particular, don't preach unless you're running less than 200 watts into a tribander at no higher than 50 feet. — *Homer T. Fort, WB5IKX, Midland, Texas*

I'VE GOT A SECRET

☐ I agree with WA4YOS's letter, "Secret Antennas," on page 69 of September 1981 *QST*. Since my wife wants to live in this restricted area with its underground utilities, why should I mar the landscape for both my wife and neighbors?

My tree-surrounded, ground-mounted, five-band trap vertical and Ten-Tec Triton II (which just had its seventh birthday) has confirmed 5BDXCC and WAZ, and has worked over 250 countries on cw. Of the last 100 log pages (ARRL Log Books), only 24 do not have a WAC; many have three, and a couple have four. As of September 24 this year, I have already worked 4BDXCC and 60 countries on 80 meters. So who needs an eyesore, lightning arrestor and TVI generator that serves as a catalyst for high blood pressure, heart attacks, law suits and higher utility bills? No one has worked a station a bit farther with "new state-of-the-art" gear than we used to with a 45 Hartley, a hunk of wire out the window, a three-tube blooper (with tin foil from cigarette packages pasted to the back of the wooden panel) and a good set of ears. It is just a bit easier. There is a lot more activity. — *S. R. "Sarge" Horn, W5IB, San Antonio, Texas*

NOT QUITE A HAL 9000

☐ The user of a Microcomputer QSO Robot for cw, as described by J. C. Sprott, W9AV, in July *QST*, is a spectator and not an Amateur Radio operator.

That's about as exciting as having a mechanical device roll the ball for you in bowling. — *Earl R. Linder, W9DZG, Lombard, Illinois*

☐ The author responds: I fully agree with W9DZG that there is little excitement in watching a machine make QSOs for you. For me the challenge was developing the computer logic to make it work. It was a great learning experience for me and a considerable thrill for many who worked the robot.

For that reason, I did not publish a complete program in *QST* but only the send and receive routines and some ideas for incorporating them into a "smart" program. I don't see a serious threat of our bands being taken over by robots, and I hope others will tolerate those of us who get our kicks exploring this new technology. Perhaps some really interesting and useful applications will ultimately emerge. — *J. C. Sprott, W9AV, Madison, Wisconsin*

IT CAN BE DONE

☐ This may or may not be a record, but at least it should be an inspiration to senior citizens interested in Amateur Radio.

On June 23, my friend John K. Darling, who is past 76 years old, skipped the Novice exam and went directly to the General, which he passed with a good grade. He should have his call and be on the air in about eight weeks.

It can be done. — *Walter S. Baumgartner, W6WLH, San Marino, California*

[We had meant to print this note last month. Mr. Darling, we hope you're on the air by the time this appears in print! — Ed.]

*Membership Services Assistant, ARRL

Canadian NewsFronts

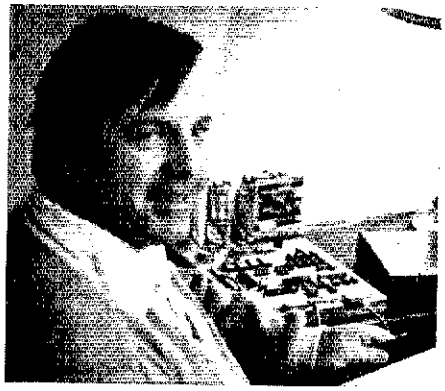
Conducted By Harry MacLean,* VE3GRO

The Anik-B Project

The Anik-B Project is now completed. Anik-B is a Canadian commercial-experimental satellite, in geostationary orbit, about 70° west, above the equator. It operates on 14 GHz and is mainly used to relay television signals. With the joint sponsorship of CRRL and CARF, two teams of five amateurs each (one in Ottawa coordinated by Hugh Pett, VE3FLL, and the other in Vancouver coordinated by Doug Lockhart, VE7APU) were allowed to use an Anik-B voice channel — four hours a day, five days a week, throughout July, August and September — to conduct packet radio experiments.

Many amateurs are not familiar with packet radio. An excellent article describing this technique appears in October *QST*. In a nutshell, a computer is connected to your normal station equipment. You type your message, the computer stores it and, on command, sends the entire message to your transmitter in one short burst. Of course, only another computer can understand this burst, so a second computer at the receiving end receives the message, stores it and, on command, displays it for all to read.

This is the kind of communication that was relayed by Anik-B. By July 3, the initial loop test had been completed. Computer information was converted to audio tones and sent by landline to the satellite ground station at Shipley, Ontario. It was received by the ground station at Burnaby, British Columbia, and sent back to Shipley for verification. This basic system worked perfectly.



Doug Lockhart, VE7APU, with some of the hardware that made it possible for amateurs in Ottawa and Vancouver to communicate using packet radio and the Anik-B satellite.

Then came the difficult task of integrating two very different packet radio systems to create something that could be used for two-way communication. It took amateurs at both ends many hours to develop the computer instructions that put everything right. Those hours were very hard to come by. The Anik-B voice channel was available only between four and eight in the evening, *Eastern Time*. This was fine for the amateurs in Ottawa, but came at normal working hours for the amateurs in Vancouver.

In a second phase of the project, the amateurs in Ottawa linked their home equipment to the satellite ground stations, using 220 MHz. Before the end of the project on September 28, the Vancouver amateurs were using a similar link on 144 MHz.

By September 28, the amateurs had met all their objectives. They had wanted to show that they could sustain reliable packet communication through a satellite, using readily available or easily duplicated equipment. For one and one-half hours they communicated back and forth. It was 100% copy all the way. There were *no* outages.

If more time had been available, there would have been a third phase to the project. Amateurs outside the two teams, in both Ottawa and Vancouver, might have been given access to the system. Perhaps another time — because Hugh and Doug and the others are looking for another time.

They are looking for a user of an existing satellite channel who might be willing to share that channel. They say any channel will do — television, telephone, it doesn't matter. They have the capability to work in almost any mode, at almost any frequency. They also have the capability to inject a low-level packet signal into say, a wide-band television signal, without causing interference to the television signal. We hope that they find what they are looking for. The Anik-B Project was a great Amateur Radio pioneering effort, one that deserves to go further.

TARIFF UPDATE

Earlier this year, CRRL Counsel Bob Benson, VE2VW, submitted a rewording of tariff item 44534-2 to the Canada Tariff Board. Acceptance would result in duty-free entry of amateur antennas, amateur transceivers with provisions for the new WARC bands and/or general-coverage receive functions, and all types of amateur amplifiers. The proposal seems to have been well received. The Tariff Board has forwarded the proposal to the office of the Minister of Finance, which has notified Bob that the proposal is definitely "under consideration." Hopefully, it will have appeared in Finance Minister MacEachen's November budget.

1981 RSO CONVENTION

Over 500 amateurs attended the Radio Society of Ontario Convention held October 2-4 in Waterloo, Ontario. It featured excellent forums on direct mobile satellite communication, slow-scan colour television and packet radio. The DOC forum drew a particularly good crowd. Here are some items from that forum.

DOC will open up the 160-meter band shortly, as has already been done in the U.S. The new 160-meter regulations will protect one remaining East Coast Loran-A chain, operating on 1950 kHz. DOC plans to give Canadian amateurs access to the new 10-MHz band as early as next year. There are no plans to give early access to new bands at 18 and 24.5 MHz, as is being done in the United Kingdom. DOC will be watching the United Kingdom "experiment" with interest. DOC is stalled on implementing their proposed TRC-24. CARF seems to have accepted that proposal, suggesting only minor changes. CRRL, based on input from amateurs across Canada, has objected. The main problem for DOC is setting appropriate levels of difficulty for the Amateur and Advanced Amateur certificates. DOC officials said they would consider hiring amateurs with a background in education to do the job. Finally, Vic DeCloux, director of Operations Branch, Telecommunications Regulatory Services, DOC, and a longtime friend of Amateur Radio, announced his "retirement." Vic will be moving to Saudi Arabia, to play golf in the sand and to assist the Saudis with establishing their own telecommunications system.

The convention also featured the good food and hospitality of the German people who originally settled in the Kitchener-Waterloo area. At the banquet, CRRL President Powell introduced CRRL Counsel Benson, who presented Bob Forbes, VE3QI, with a cheque for $1038 — full payment for legal fees and other costs incurred in the successful appeal of Bob Forbes's RFI case. Bob had been convicted of violating a Mississauga anti-noise by-law. It was a case that could have set a dangerous precedent for all Canadian amateurs.

BITS AND BYTES

☐ The next set of DOC Amateur Radio examinations will be held across Canada on February 10. Other dates of writing for this year are April 21, June 16 and October 20. In every case, those planning to write must register with DOC one month before.

☐ Sometimes it takes a while, but we do get around to things. *QST* is now available on tape for Canadian blind amateurs. Mitch Powell, VE3OT, reads "League Lines," "Canadian NewsFronts" and articles of general interest. He describes new equipment and interesting projects, all with his usual wit and humour. To receive *QST* on tape, send a blank C-90 cassette to CRRL, Box 7009, Station E, London, ON N5Y 4J9.

☐ CRRL has a new, revised handout for Amateur Radio classes or groups conducting Amateur Radio demonstrations. "Answers to Your Questions About Amateur Radio" is available free, in any reasonable quantity, from CRRL, same address as above.

☐ CRRL is the Canadian member-society of IARU, the International Amateur Radio Union. Last year, CRRL Central Director Tom Atkins, VE3CDM, represented CRRL and all Canadian amateurs, at the IARU meeting in Lima, Peru. At all IARU meetings, CRRL has its own vote. This vote is separate from the ARRL vote. CRRL is not represented to IARU through ARRL. Canadians have had their own vote since 1927, when IARU began, and the ARRL Canadian Director, or "General Manager" as he was then known, represented Canadian amateurs to IARU.

☐ We've been doing some thinking about CRRL. It's been a great year, with many accomplishments. We hope that you feel that you share in these accomplishments. You should. You are *the* League.

Best wishes for a happy holiday season, and a wonderful 1982, from your League representatives and workers across Canada. — *VE3GRO*

*163 Meridene Crescent West, London, ON N5X 1G3

International News

Conducted By Richard L. Baldwin,* W1RU

Emergency Communications Conference in Sicily

From the ashes of disaster rise up new structures of even greater achievement, once more proof positive that there is a measure of good in what seems at the moment to be evil. So it was with the terrible Italian earthquake of Novemer 23, 1980, that wrought misery and havoc to the Italian populace. It was in response to the cries of help from their fellow countrymen that the radio amateurs of Italy gave so unselfishly of their communications talents and use of their radio equipment.

But even when yeoman service has been performed to provide the only means of communication to the devastated areas, the critique of the aftermath asks: "Could we have done better?" And with every such improvised communications response, the answer of, "Yes, we could have done better," points to better planning in the future in anticipation of that next disaster — the one we hope will never come. Such is the soul of the radio amateur.

Thus was born the rationale for the International Conference for Emergency Communications (primarily for Region 1) held in Cefalu, Sicily, September 9 through 13. Representatives from over a dozen European and African countries, as well as representatives from the two most amateur-active countries (JM1UXU from JARL and W1XX from ARRL/IARU Hq.), were present. Host for the proceedings was the Termini Imerese section of ARI (Associazone Radioamatori Italiani), Salvatori Alescio, IT9AZS, President. Every detail of the accommodations was attended to expertly by our most gracious hosts, including simultaneous translation of conference proceedings into French, Italian and English. ARI was well represented by President Rosario Vollero, I8KRV; Secretary-General Sergio Pesce, I1ZCT; Secretary Rosella Spadini, I1RYS; and several regional directors from all over Italy. The Italian Post and Telecommunications (PTT) as well as the military were interested participants. Valuable liaison to the Region 1 Executive Committee was provided by Juergen Roettger, DJ3KR.

The agenda and discussions focused on administrative and operational facets of emergency communications. Initial discussion centered on WARC-79 Resolution BN (see page 71, February 1980 *QST*). Since the different countries represented vary widely in their legal capabilities of supplying public service communications (most are prohibited from engaging in the exchange of third-party traffic, for example), the significance of Resolution BN as a mighty lever to engineer government sanction of such activities needed to be initially recognized. Delegates were firm in their resolve to return to their respective societies to press for such official sanction from their licensing authority. Operational matters included the recognition of adopting standard procedures and formats, as well as the universal need for emergency power capability. Specific proposals for Region 1 consideration will be forwarded to the executive committee via the working group for emergency communications.

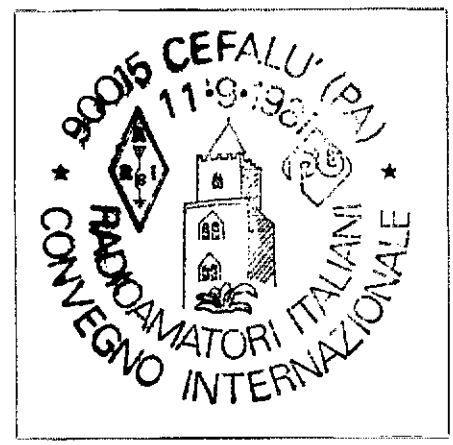
*Secretary, IARU

Japan Amateur Radio League delegate Mr. Fujioka, JM1UXU, listens intently to the English translation of the conference while checking his notes and agenda. *(W1XX photos)*

Conference chairman Dr. John Allaway, G3FKM, blocks the microphone while he receives procedural instructions from (l-r) Antonio, I2VIE; Rosella, I1RYS; and Salvatore, IT9AZS.

Rene, ON4VY (left), and Anders, LA9NT (right), during a break in the action.

The outcome of this conference cannot be measured simply in terms of specific operating procedures considered for adoption. But rather the conference broke ground in an area of communications that we in Region 2 tend to take very much for granted. The proliferation of hundreds of traffic nets dedicated to serving the public is a commodity that our friends in Region 1 thirst after. Amateur regulations fall along a continuum with regard to public service communications, all the way from "it is not permitted" to some rather sophisticated networks. Fueled by the free exchange of information and ideas, the conference was a huge success measured in terms of the increased awareness that resulted — not just in the heightened interest of radio amateurs, for there



A special Amateur Radio PTT postal cancellation commemorated this international conference on emergency communications held in Cefalu, Sicily, in September 1981.

is no lack of dedication by radio amateurs to help their fellow citizens during the hour of need, but more so in the recognition by the government licensing authority to legitimize what is already fact to various degrees in different parts of Region 1 and the world.

Indeed, the host country, Italy, did receive such assurances at the impressive closing plenary session from the ministers of the PTT. The entry of radio amateurs into the apparent quasi-legal area of emergency communications operations to back up and augment the official communications systems was both recognized and appreciated, a definite coup for our Italian friends! This is a good omen indeed, for the need has been demonstrated clearly in this tremor-ridden country since before Pompeii. The presence of so many foreign delegates in Sicily was no doubt a strong indication of the commitment and legitimacy of radio amateurs worldwide to the cause of providing communications during catastrophe. This may pave the way for ARI to even further organize Italian radio amateurs into emergency preparedness teams with full government sanction. And so it is anticipated that emergency communications capabilities can be further enhanced throughout Region 1 and eventually with official liaison to shores abroad. With the conference now history, we stand one step closer to the reality of the National Traffic System of the U.S. and Canada perhaps one day becoming the *International* Traffic System.

It was with a bit of reluctance that the delegates went their homeward way at the conclusion of five days of intensive meetings. But they all left with the confidence and assurance that radio amateurs have come that giant step forward toward being better prepared to meet the next test of providing needed communication to mankind in the spirit of peace and fraternity, a major theme of this congress. — *John F. Lindholm, W1XX, Communications Manager, ARRL*

YL News and Views

Conducted By Jean Peacor,* K1IJV

DX Adoptees

Jeanne Doncaster, KA3CEO, has served as YLRL's International Membership Chairwoman during 1981. Licensed for just one year, Jeanne was a bit overwhelmed when asked to serve. But, with the help of many YLRL members, she has enjoyed her year in this office and has seen 167 DX YLs become YLRL members. About two-thirds of these YLs are sponsored by U.S. YLs. Between receiving letters from sponsors as well as from YLs worldwide, Jeanne's trips to the mailbox have proven most exciting throughout the year.

When U.S. YLs sponsor a DX YL for membership they can request a YL from a country of their choice. Whenever possible, Jeanne complies. Or, you can leave the choice up to Jeanne, and it can prove to be most rewarding. Having adopted a DX YL, it is then every sponsor's hope to contact that YL via Amateur Radio. With that goal in mind, Jeanne and her OM Dick, WB3AJC, have just assembled a three-element tri-band quad, and she has high hopes that she will be able to contact her adoptee, Usha, VE2UGI, in Bombay.

It was my good fortune to have Jeanne choose Jennie Warrington, VK5ANW, as my adoptee for this year. Jennie listed "letter writing" as one of her hobbies, and one of her letters is proof of that.

Jennie Warrington, VK5ANW

Jennie Warrington — VK5ANW

Jennie, her OM Mike, VK5AMW, and their three children live in Clarence Gardens, South Australia. Mike earned his Limited License in 1964. He upgraded in 1977 on the same day that Jennie sat for her Limited (this is full theory and regulations; cw can be done on its own at a later date). She operated until April of 1980 using the call VK5ZBI.

Jennie is the first YL delegate ever to attend the Federal Convention held in Melbourne. She had served on the VK5 Divisional Council of the Wireless Institute of Australia, and in April of 1981 was reelected and nominated to attend the Federal Convention as one of three delegates from VK5 land. One other YL, Brenda Edmonds, VK3KT, attended part of the convention and has agreed to become the next Federal Education Officer.

Jennie learned a great deal in the course of three days of convention meetings. The extensive agenda covered topics including frequency, policy items, IARU, forward and long-term planning, and post-WARC matters. She was honored at a dinner by being the recipient of the Remembrance Day Trophy presented to her by Ross Ramsey, First Assistant Secretary to the Minister, who was the guest speaker. Since the convention, Jennie has been appointed Secretary for Council and General meetings as well as Alternate Federal Councillor for the VK5 district.

ALARA

Jennie is a member of the Australian Ladies Amateur Radio Club (ALARA), and has kindly sponsored me for membership in this club. ALARA Net meets each Monday at 1030 UTC on 3.570 MHz; Open House Net is Tuesday and Thursday from 1000-1200 UTC on 14.322 (look for Gill, VK6YL); VK/VE/ZL Net meets Fridays at 2300 UTC on 28.450 MHz (that's a cw-only frequency for U.S. YLs).

Latest Rules for the ALARA Award

The award is available to all radio amateurs and SWLs. VK/ZL stations work 10 members, to include 5 Australian states; DX stations work 5 members, to include 4 Australian states. Contacts must have been made on or after June 30, 1975. Two-meter repeater contacts are not allowed. Submit a complete extract of log entries, certified correct by two other amateurs with their appended signatures. Applications must include full name, address, signature and call sign of applicant. All contacts must be made from the same call area. ALARA Net contacts do not qualify. Special endorsements are available, e.g. Mixed, All CW, All Phone, All 28 MHz, etc. Endorsement stickers are available for each 10 additional members contacted; 5 additional for DX. Application should be accompanied by the equivalent of 3 Australian dollars or 7 IRCs; fee for additional stickers, 1 Australian dollar. ALARA Custodian: Mavis Stafford, VK3KS, 16 Byron St., Box Hill South, Victoria, 3128, Australia.

The Australian YLs are active. In six years, ALARA has grown from a handful of members to more than 100 VK YLs. They have a State Coordinator from each state. Jennie is the Coordinator from VK5. It's a pleasure to have her as an adoptee. YLRL's International Membership Chairwoman provides the link for you also to enjoy an adoptee. For further information, see November *QST* "YL News."

A NICE RESPONSE

In a column of this kind, sources for material are limited. There are the news items that can be sought out; there are the voluntary contributions. Surprisingly, much news that is contributed voluntarily stems from OMs. Bless them!

How nice, therefore, to receive a response to the June request for news of YLs active during Field Day from Harry Chandler, W4FLW, President of northwest Tennessee's Tri-County Radio Club. This radio club was active, and so were YLs.

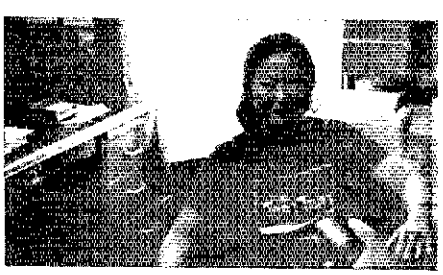
Midge Sykes, KA4RTU, operated 40 meters during Field Day. Marie Watson, wife of KA4NLI, assisted Midge with logging. Midge and her OM, KD4HQ, are active on both amateur and MARS frequencies.

A nice response — nice to see.

*Country Club Dr., Monson, MA 01057

Field Day's YLs — KA4RTU and wife of KA4NLI

Emberly Johnson, KA8NEQ, of New Baltimore, Michigan, earned her Novice this year while she was 8 years, 10 months old. Her dad, Neil, N8BAR, is rightfully proud.



Kalaya Martin, KA4UEK, of Bowling Green, Kentucky, is presently studying for her Technician license — and U.S. citizenship. Her husband, Chuck, AB4Y, and ham radio, are helping in both her studies.

On Line

Conducted By Stan Horzepa,* WA1LOU

Computer RF

Most computers sold for home use are housed in nonmetallic enclosures and are interconnected to peripheral devices by means of unshielded cables. This is a source of consternation when computers are used in radio environments such as Amateur Radio stations.

A computer naturally generates rf energy, which a nonmetallic enclosure cannot contain. It escapes freely and may be detected by close receiving systems. By tuning an hf receiver that is near a computer, one can hear numerous carriers of varying strength spread across the radio spectrum. (Murphy's Law says that a strong computer "carrier" will invariably fall on the same frequency as the station you are trying to copy.)

A nonmetallic computer enclosure provides a two-way street for rf. Rf flows into the enclosure as easily as it flows out. A nearby transmitter may generate enough rf to gum up the works of the computer. During a transmission, TVI may be present on the computer's video display, the keyboard may act erratically and the program may crash.

There are ways of circumventing these problems. Witness the number of hams who are successfully using computers on the air.

FCC to the Rescue

Some time ago, as the proliferation of home computers increased, the problem of computer rf was brought to the attention of the FCC when that agency began receiving complaints about computer interference to other consumer electronic devices such as televisions and hi-fis. To cure the problem, the FCC created a new set of standards for computer devices that forced manufacturers to reduce the amount of rf escaping from their computers. The manufacturers had to redesign their products. In some cases, their products were beyond redemption and were abandoned (e.g. Radio Shack's TRS-80 Model I).

The end result of the FCC's action was that cleaner computers are now being sold. Computers that meet the FCC's Part 15 standards generate a lot less rf than their predecessors and can better withstand the rf pounding from nearby transmitters. Part 15 is not the ultimate solution with regard to Amateur Radio communications. Computer rf can still be heard in hf receivers, but it is so diminished that most hams live with it and communicate unimpeded. But what if you own a pre-Part 15 computer or are considering buying one used?

Cleanup

Back in the March 1980 issue of *QST*, N6EY described in "Microcomputers and Radio Interference" how he cleaned up his system consisting of a TRS-80 Model I and a Macrotronics M-80 interface. His suggestions are applicable to all computers. Some work is involved, but it is worthwhile because good results can be achieved. Shield everything including enclosures and cabling. Disconnect peripherals and peripheral cabling when not in use (disconnect the cassette recorder after loading a program). Decouple the ac line with "brute force" filtering.

Personally, I didn't find the computer rf that objectionable. The noise that was present only precluded me from working the weaker stations. I could always find plenty of strong stations to keep me occupied. This summer, however, intending to enhance my station for dxing and contesting, I inadvertently reduced the computer rf in my shack.

In August, I assembled a good antenna system for 10, 15 and 20 meters. Abandoning dipoles on 15 and 20 and a converted CB beam on 28 MHz, I mounted a T.E.T. HB43sp four-element beam on top of a 40-foot crank-up tower, and, voila, my computer didn't make as much noise as I was accustomed to. Now I could hear and work those weak RTTY stations on 14 MHz.

The improvement was the result of a number of factors. The old antennas were very close to the computer. The 10-meter beam was on the roof, less than 15 feet above the computer, and the dipoles were hung from the beam's supporting mast. The new antenna is approximately 40 feet from the computer. This increased separation has to be a big factor in the system's improvement.

The gain and rejection characteristics of the T.E.T. antenna are another factor. I can now point the antenna at the weak signals while, most of the time, pointing away from the computer. Another factor is the use of a good grade of coaxial cable between the antenna and radio. If your antenna system can stand improvement, you might consider upgrading it and improving your computer system, too.

PX

The "On Line" program exchange marches on! This installment of "PX" features two programs with Amateur Radio applications: a program for calculating the color codes of resistors and another for keeping track of 10-10 numbers.

Charles B. Nesbitt, WA3SKC, has written a program called "Standard Resistor Values." Charles admits that, not working regularly with electronic components, he has trouble recalling the color code used to identify resistor values. This program lets the computer figure out the color codes for the resistors he needs while he is elbow deep in a project without a color code chart at hand. The program was written in BASIC on the Radio Shack TRS-80 Model III. The memory requirements are minimal.

K. C. Johnson, KC4OC, is an avid 10-10 number collector. After working a few hundred 10-10 members, it's hard to remember who you did or did not work. K. C.'s program is the solution. It's a lot quicker than searching through a card file. Another BASIC program, it was written on the O.S.T. Superboard Computer with 8 K of RAM.

To obtain a listing of K. C.'s 10-10 program or WA3SKC's color code program, send a self-addressed business envelope (no. 10) with first-class postage to PX, 72 Stiles St., Waterbury, CT 06706. And, if you have a program that you'd like to share with our readers, send it to the same address for future inclusion in "PX."

TIDBITS

QSOing Robots

KB7G has been using W9AV's "Microcomputer QSO Robot" program (July 1981 *QST*) and offers some tips to those attempting to communicate with a "robot"!

1) Use a keyer. The "robot" can only copy machine-generated cw.

2) Only send what the "robot" asks. It cannot decipher extraneous comments such as, "TNX FB QSO."

3) Try not to make mistakes. The "robot" cannot reason and won't be able to correct mistakes.

4) Zero beat. The "robot" cannot tune frequency.

Net Directory

"On Line" is still looking for information about on-the-air computer nets for the computer net directory being compiled for a future installment of this column. Send net name, days and times of meetings, net frequency, geographic area covered, purpose of net and call sign of net manager to WA1LOU, 72 Stiles St., Waterbury, CT 06706.

BASIC = BASIC

W2UN comments that "no one should be turned off because a program may have been written for a TRS-80, and one owns an Apple or something else." If a program is written in BASIC, it should be convertible to other computers' BASIC without too much difficulty as long as the program doesn't call up a machine language subroutine or uses PEEKs and POKEs to get or put a value into memory. An excellent tool for converting from one BASIC to another is a book I mentioned in October's column, *The BASIC Handbook*, by David A. Lien, W6OVP. The second edition is now available and is highly recommended for this kind of task.

* 72 Stiles St., Waterbury, CT 06706

How's DX?

Conducted By Ellen White,* W1YL/4

DXCC — A Post-WW II History

History is a tangled skein that one may take up at any point, and break when one has unraveled enough. (Henry Adams, The Education of Henry Adams, 1907.)

A fascinating journey into history, geography and world events is yours (via the magic carpet of the pages of *QST*), traveling the years since the end of World War II. What happened during this era is a reflection upon the world we've lived in and, in several aspects, on human nature itself. The voyage illustrates the fact that DX and ham radio are very much a part of the mainstream we all travel through life. As space permits we'll travel the road from December 1945 until the present — providing space holds out. If not, we'll pick up the skein and unravel some more next month!

1945: "It won't be long before it is possible to resume our DX contacts. Just what form the postwar DX picture will take no one can say, but we do know that as we get back our long-range bands, DX work will again take its place as one of the most fascinating of amateur activities. There are sure to be many changes in the lineup of countries. There will be hams at innumerable spots we just dreamed of before. The DX Century Club, as we knew it, will be far outdated. It must be reorganized to fit the new conditions." (*QST's* DX Editor during this period was W1JPE, now sporting the alias W1DX.)

1946: Announcement of the ARRL DXCC Award, starting from scratch, and the end of the Pre-WW II DXCC.

1947: The first of what would have proved to be many additions to the list appeared in the form of the Isle of Man, GD. At that time it was decided that there was enough political difference between the Isle of Man and the other British Isles to justify the separate listing.

1949: An active year of change was documented within the pages of our journal. Norfolk Island was added, as well as Vatican City, Israel (including both 4X4 and ZC6) and Macquarie Island (still a good catch). The first post-WW II deletions began to appear. Effective April 1, 1949, Newfoundland and Labrador were deleted. On that date they became officially part of Canada. In September of that year, the pages of *QST* announced with regret that LU1ZA, an Argentine station operating from the South Orkneys, would not count "separately" since the South Orkneys were officially a dependency of the Crown Colony of the Falkland Islands. As such they were under the direct jurisdiction of the British Commonwealth.

1950: How to determine whether an entity should be on the list was the subject on everyone's mind. Confusion was apparent as to whether VP2LX was in the Leeward or Windward Islands. (The latter was the case, as it turned out!) VP8AK in "Antarctica" turned out to be a station operating from Deception Island, which counted as South Shetlands. An early application of Rule 7 was made by not counting DA and DK stations — unlicensed stations operating from countries where there were normally licensed amateurs. A revision to the list took place. Amsterdam Island, FB8, was now to be grouped with Kerguelen Islands, FB8.

1951: Saarland, 9S4, was a new addition. A change of heart, too, in that Amsterdam Island (as noted above) was moved to the Amsterdam/St. Paul listing. Anyone submitting 3A1A cards hoping for Monaco credit was in for a big disappointment. It was learned that the 3A1A operating location was someplace other than Monaco. Credit was also deducted from records containing PX1A credits. Conclusive proof surfaced that the operation took place illegally from Mexico. Two other pirates whose credits were expunged from numerous lists used the calls CZ2AC and ZA2AA. (This reminds this writer of the gag going around some years back that acquisition of 25 phoney ZA QSLs counted for one good Albania credit!)

1952: FCC gave the green light to U.S. amateurs to work Netherlands New Guinea, PK6 and PK7. However, some PK6 stations were actually operating from the Celebes and Molucca group, so caution was still advised. Definitive words were received from the U.S. government concerning Antarctica in that no claims of individual countries to the Falkland Dependencies (or any part of the Antarctic mainland) were recognized. To be consistent, ARRL provided for crediting of all confirmations from this area for the Antarctic listing, without regard to prefixes or nationalities of stations. The Sheikdom of Qatar (on the Persian Gulf near Bahrein Island) was added to the list of workables, although no official prefix was known as of the time the note appeared in the October issue. Amateur two-ways were opened up for OD5 and JA/KA. However, the banned list still included PK (except Netherlands New Guinea), FI, EP, EQ, HS and OE (except Allied occupation forces still stationed in Austria.) Bob White, W1WPO (now W1CW/4), took over administration of the DXCC program in September, an era that would last 24 years.

1953: August noted that the banned list still included AR (OD), EP, EQ, FI, HS, J, OE, PJ and PK (except JA and OE allied forces and PK7). HL was added to this aggregation in mid-year.

1954: The "go" light went on for OE operation for contacts on or after April 1 that year (or before December 21, 1950). New to the list was San Andres and Providencia Islands.

1955: The January issue announced the deletion of French India (as of November 1, 1954,) since on that date it officially became a part of India. Another deletion, Tanna Tuva, appeared in June, which also noted the addition of Wallis and Futuna Islands. (This grouping is located 1100 miles north/northeast of New Caledonia, of which they were a dependency). Kermadec joined the list of possibles as of November 1 that year. Kermadec is located approximately 660 miles NNE of North Cape, New Zealand, and is administered by ZL. Close to year-end (November), *QST* announced the addition of Laos, Cambodia and Viet Nam. Temporarily this was a moot point since Cambodia and Viet Nam were still on the banned list. French Indochina (FI8) went by the boards as of July 19 that year.

1956: Article 42, Section 1, of the International Regulations was quoted. It states, in part: "Radiocommunications between amateur stations of different countries shall be forbidden if the administrations of one of the countries concerned has notified that it objects to such radiocommunications." As a result, FCC Public Notice of December 21, 1950, led ARRL to reject confirmations on or after that date from AR-OD, EP-EQ, PK (with the exception of PK7, HS, FI8, which then included Cambodia, Viet Nam and Laos), PJ, Japan (with the exception of allied occupation stations) and OE (with the same exception). HL was added to that list as of June 1, 1953. Since the original 1950 notice, additional FCC proclamations modified the original notice so credit was possible for: PJ-3/11/52, OD and JA (nationals) — 10/15/52, OE (nationals) — 4/1/54, XW8 7/20/55 and HS — 9/1/55. (More headaches for Headquarters to keep track of!) Nauru was added to the list of workables, thanks to the globe-trotting operations of G2RO. This island is located in the west Pacific Ocean 26 miles south of the equator, longitude 167° E., and lies west of the Gilberts. Another new possibility was Revilla Gigedo, a group of islands in the Pacific Ocean about 450 miles west of Mexico (the largest of this group is Socorro), added effective October 1, 1956. (An interesting note in Webster's *Geographical Dictionary* indicates that there is another Revillagigedo Island off mainland southeastern Alaska — different climates, of course!)

1957: The Finnish territory of the Åland Islands joined the possibles as of March 1. The islands are located in the South Gulf of Bothnia, between Sweden and Finland. Deletions began to pile up in the form of Saarland and Trieste (with their return to Germany and Italy, respectively), effective April 1, 1947. To compensate a bit, perhaps, we got a new addition in the form of Ghana, formerly the Gold Coast, as of March 5. The Indian Ocean island of Rodriguez, approximately 375 miles east of Mauritius, became separate as a result of application of DXCC point 2.

1958: Prior to mid-year 1958, the British Caribbean islands were pretty easy to keep in mind, Leewards or Windwards. That all changed, however, with the Federation of British Territories of the Caribbean. Thus, there were two deletions and the addition of Anguilla, Antigua/Barbuda, the British Virgin Islands, Dominica, Grenada and Dependencies, Montserrat, St. Kitts/Nevis, St. Lucia, St. Vincent and Dependencies, and VP5 (Jamaica, including the Caymans). How the pre- and post-changes were administered gets a bit hairy to explain, but can be found in the June issue. Other interesting tidbits added to the pot were Fernando de Noronha (a Federal Territory of Brazil), located approximately 225 miles due east of Natal, in the Atlantic, Lord

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Howe Island (in the Pacific, approximately 380 miles east of Port Macquarie) and Chatham Island (in the South Pacific, about 420 miles east of New Zealand). Quite a brouhaha developed over ZL1ABZ in the Kermadecs because of doubtful reports of legitimate two-ways plus subsequent confirmation of same. An interesting quote proves the point that the more things change, the more they stay the same! "The ARRL cannot permit off-beat individual and group action in setting up false documentary claims to QSOs to make DXCC become a less meaningful award."

1959: After a hectic 1958 reported above, the last year of the 50s was relatively quiet. The Republic of Guinea was added to the list. Guinea formerly was counted as a part of French West Africa and became eligible for separate consideration as of March 1. Manahiki (oftimes called the Northern Cook Islands) achieved separate status as of November 15, 1945, and cards were accepted after March 1, 1959. The main islands in this grouping include Manahiki, Danger Island (Pukapuka), Tongareva and Rakahanga. Another addition was Roncador Cay and Serrana Bank, U.S.-controlled territory located approximately 200 miles east of Nicaragua. Credits were accepted post-August 1. Further clarification revealed that ZL1ABZ cards for 80 meters now were acceptable for DXCC credits. (This must have made the West Coast pretty happy!)

This editorial version of time travel, ham radio style, turned out to be more in-depth than originally conceived. In order to have space left for more current DX news, we'll just have to unravel some more of the skein next issue, when we'll see what developed in the world of DX in the 60s.

BURMA

The DXCC desk has been informed through the United States State Department that the 19-year moratorium on Amateur Radio transmitting is still in effect. Recent operations from within Burma (XZ5A and XZ9A) were authorized by the insurgent government of Kawthoolie. This government is not recognized by the central government in Rangoon. Ergo, cards being submitted for DXCC credit for these operations will not be credited.

DESECHEO, JUNE 1981

The Summer/Fall 1981 issue of the *International DX Foundation Newsletter* carried an interesting description of the popular KP2A Desecheo operation. The statistics note that 21 MHz was top band on both ssb and cw, outranking 20 meters by some 2000 QSOs. The 14-MHz total was made from one station using a 204BA. Desecheo statistics by band:

MHz	*Ssb*	*Cw*	*Total*
1.8	1	135	136
3.5	974	860	1834
7.0	1853	2188	4041
14.0	9611	4567	14,178
21.0	10,640	5685	16,325
28.0	4507	1636	6143
50.0	15	71	86
Totals	*27,601*	*15,142*	*42,743*

Word has it that KP2A will be the featured speaker at the Miami Hamboree first weekend in February.

TAIL-ENDING

It is with mixed emotions that your editor reports FCC's relaxation of the call-sign regulations. On October 1 W1AW reported that FCC approved the Docket 80-136 proposal to delete the requirement that hams identify the station with which they are in contact, except in third-party traffic cases (this action became effective 30 days following publication in the *Federal Register*). Starting last October 23, it became legal to sign just your call (for W-licensed hams) and not the identifier of whom you're working. Oh well, chances are you didn't know who you worked when you first called, anyway! (Remember, however, in cases of third-party traffic it still will be necessary to furnish *both* calls.)

YASME SAILS AGAIN

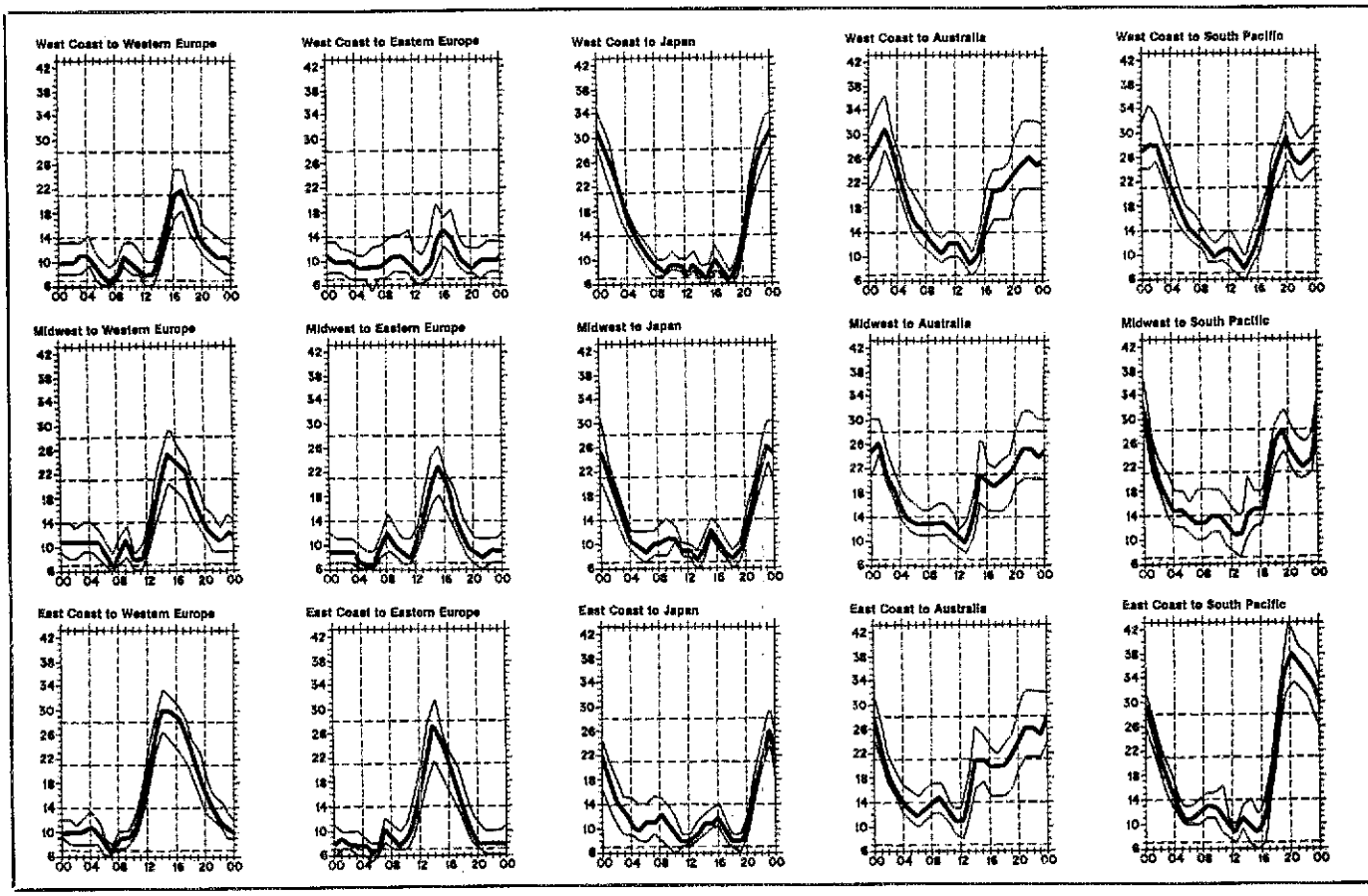
Though not literally, the spirit of the *Yasme* sails again, we're informed by W6AM (President, The Yasme Foundation), with the departure six weeks ago of W6KG and W6QL. The plan is for a half-year DX-pedition, operation on all hf bands, 50-50 phone/cw. The Colvins have applications pending for several rare countries. In the meantime, their itinerary calls for month-long stops at 8P6, 9Y4, FY0, PZ, 8R1 and PJ1. Activity should be brisk in the major DX contests of the season. QSL via the Yasme Foundation, Box 2025, Castro Valley, CA 94546.

SMOM

As of January 1 you'll be able to submit cards for IA0KM credit, for the Sovereign Military Order of Malta — previous contacts will count, of course. Late fall activity for IA0KM looked like a sure thing at the time of this column's composition.

QSLING

FO8CX, FO8HI, FO8HL — QSL via WB6GFJ. VE2MJ wants the whole world to know he is *not* the manager for VP2VJ. N2BVJ/LX cards for contacts through the end of August this year go to the '81 *Callbook* address. After August, however, pasteboards to N2BVJ care of 1501 W. First St., Abilene, KS 67410. Confusion abounds regarding the VP2A operation by K9MK and KN5N. Cards for both those calls go directly to Mike A. Krzystyniak, K9MK/5, 6061 Dunson Ct., Watauga, TX 76148.



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

W6SOT/DA2KR still has a number of cards left from his Luxembourg trips and has just recently completed a trip to Monaco. His W6SOT for Sept. '79, Feb. '80, July '80 and portable 3A for June this year go to Roger Krautkremer, W6SOT, Box 522, APO, New York, NY 09132. The '81 *Callbook* address for DA2KR will get to him also, but will cost more in postage. Four USA hams will be operating in the Negev Desert through June 1982: WA5RPJ/4X, WB3JWG/4X, WD5HIW/4X and W2KF/4X. QSL manager for all four stations is W2KF, K. K. Miller, at either Box 289, Beersheba, Israel, or Box 1133, Cherry Hill, NJ (or via the bureau). Cards with postage/IRCs will go out promptly and directly, all others via the bureau. Correspondence other than for confirmations go to W2KF at RCA, APO, New York 09673. Equipment there includes a complete Drake station and the super Thunderbird beam about 75 feet up on a high plateau in the mountains. Operation is generally after 1500Z Mon. - Sat., and most all of Sundays. G3PSC affirms that he is not the manager for 5A2BM. Stand by for the avalanche. S. Ruchan Ozatay, TA2SRO, wants to know if anyone is interested in being his QSL manager! Line up for him c/o Teka Koll. Sti., Abdülhakhamit Cad. 18/3, Taksim-Istanbul, Turkey. W2JPO wants all to know that he is *not* the QSL manager for 7Z0UA, nor for anyone else. Ed is benched by illness and hasn't been on the air for some years, and he has never acted as a QSL manager. Work KC2CS/C6A mid-October? Ron notes that QSLs, with s.a.s.e., go to the listing for KC2CS or to his old call, WB2QLO.

TUNING THE BANDS

☐ Last month's candidate for calls that penetrate this author's mind *slowly*, NH6D/KH4, furnishes some interesting Pacific data. Bill reports that Midway Island has a population of about 450 sailors, no dependents. However, it is going over to a private contractor about the beginning of the year, so perhaps a couple of hams will be on-island with the contractor's staff. Bill's job requires him to travel quite a bit, and he carries his portable station whenever he is headed for an interesting location (KH2, KH3, KH4, etc.). He comments that each of his trips is a story in itself, and without exception he has been truly impressed with the hospitality exhibited by the hams at each location. The hams on Johnston and on Guam are reknowned for their courtesies and are no slouches when it comes to snappy operating. NH6D makes interesting noises about the possibility for a Kure operation. AS

☐ The Canada DX Association's *Long Skip* reports that several stations are now sporting the new corrected prefix for Qatar, as per ITU guidelines; i.e. A71AD, ex-A7XD. [I wonder what ever happened to the ITU guidelines prohibiting two digits in the prefix? — Ed.] The Sheikhdom of Qatar occupies a peninsula projecting into the southwestern Persian Gulf and consists chiefly of low hills and sandy areas. Your scribe recalls some years ago that HZ3TYQ/ex-W1TYQ noted that Qatar is pronounced gutter — just in case you're ever asked on a quiz show!

☐ Speaking of new prefixes, it is time to imprint the memory banks with V3A (for VP1, Belize) and, soon, V2A (for VP2A, Antigua). Oh for the good old days!

☐ QCE is not a good idea, cute though it may sound, notes AA4MI. This editor agrees with Carl in that Q signals are indeed defined and regulated in accordance with international agreements. We as individual Amateur Radio operators have no business going around "inventing" Q signals. The use of a Q signal for other than intended and specified has within it the possibility of disaster and loss of life. The Joint Communications Board instructions notes that "QCE?" means, "When may I expect approach clearance?" No low flying, crew — ergo, let's drop QCE.

☐ If plans worked out, a group of LA DXers were QRV for the first DXpedition ever in Jan Mayen Island for the late-October CQWW SSB Contest. DXpedition QSLs/IRCs/etc. go via Stig Lindblom, LA7JO, Myrsnipvein 38,7082 Kattem, Norway.

☐ Postage, postage, postage! U.S. postage went up November 1 to 20¢ an ounce. Please remember to send your domestic QSL bureau sufficient quantities of 2¢ stamps to cover your 18¢ envelopes on file. Woes too for Canada, as of September 25! As of that date Canada announced a massive postal rate increase to take effect on January 1. First-class rates to almost everywhere will go up 100%, necessitating a rise in rate to *Canada DX Report* subs; to new rates for U.S. (in U.S. funds) are $17.50 for this bi-weekly.

☐ Mid-September N9BOE worked on 21.317, TI4ETQ, who was looking for Rhode Island to complete his WAS.

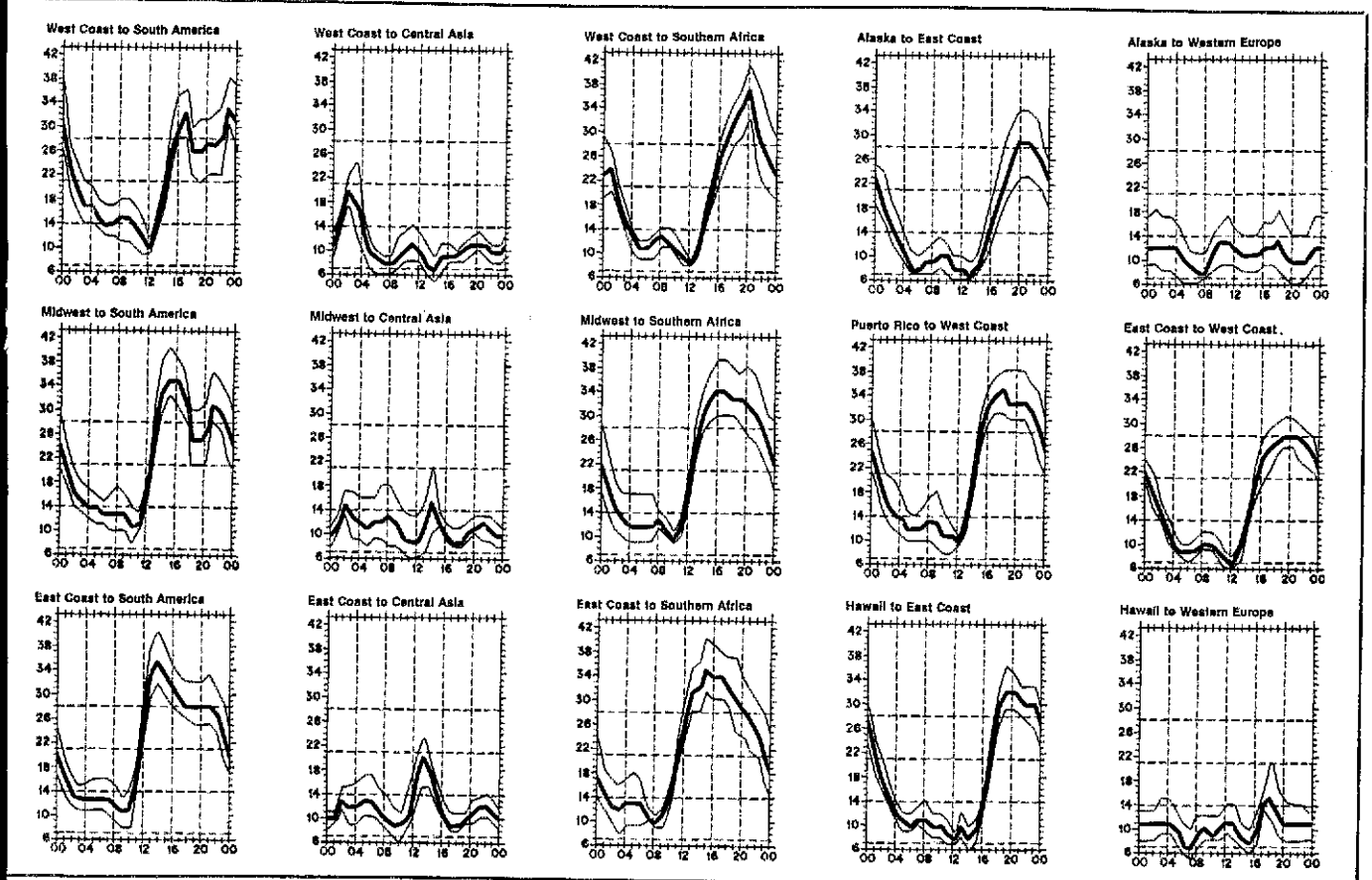
☐ The Dutch Monaco CW Dxpedition should be opening up about the time you receive this December issue — December 24-January 2, 1982. PA0LVB/VDV/WRS will all be signing "portable 3A" working up 25 kHz from the band edges, with the exception of 80 and 40 where they'll be taking brief excursions to the bottom of the band. The crew alerts amateurs on the North American mainland to the fact than Monaco is almost completely screened to the north and northwest by high mountains. Watch for those long-path openings! QSLs as follows: PA0LVB, H. Vollema, A. Veerhof 15, 3413 NE, Jaarsveld, Netherlands; PA0VDV, J. Van der Velde, Fazantenhof 57, 3755 EE, Eemnes, Netherlands; PA0WRS, W. De Regt, Lorenzhof 11, 2871 JP, Schoonhoven, Netherlands.

☐ Word has it that *Long Skip*, the Canadian DX Association's monthly paper, has begun publication with VE3EUP at the helm. Information via Garth Hamilton, VE3EUP, Box 1156, Fonthill, ON L0S 1E0. The group's weekly DX net appears to be back in operation on 14.173 MHz Sundays at 1600Z.

☐ Well-known Guatemalan DXer TG4NX is the proud possessor of a brand new General class license, N4FKZ. Many will note that Francisco is one of the few Central Americans really active on cw.

☐ K1PLR takes issue with the general remark that American hams are rotten DXers when it comes to fair play, QRM, cheating and so on. He notes that to call our foreign brother hams totally blameless is also not correct. His point is that the black sheep are everywhere. Harry, fluent in German, Russian and Serbo-Croatian, would like to volunteer as a QSL Manager, especially for a DX station working mostly 10 meters. He can be reached at his Florida QTH: 1697 N. Hermitage Rd., Fort Myers, FL 33907.

☐ Globe-trotting 9V1OP, "Big John," is now headquartered in Melbourne, Florida. His new job plans will still keep him portable at frequent intervals from exotic QTHs.



lowest curve (optimum traffic frequency, or fot). See January 1977 *QST*, page 58, September 1977 *QST*, page 35 and January 1979 *QST*, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for December 15, 1981, to January 15, 1982, assume a sunspot number of 119, which corresponds to a 2800-MHz solar flux of 165

K1CC is shown with some of the 250 participants at the VII National Convention in Piekary Slaskie at SP9KRT in early fall 1981. Rich spent two weeks in Poland and presented a popular program in Polish consisting of over 250 slides and several movies, thanks to the generosity of U.S. hams and ARRL, who lent much of the material. The convention featured an exhibit of some fine home-built gear, programs on RTTY and equipment construction. The enthusiasm of Poland's 7000 hams is hampered by the lack of parts for home-built projects, TVI and the inability to purchase commercial gear. Rich found time for 1800 two-ways, mostly made as SO3CC from the station of SP3DOI. Operation on hf and vhf also took place under SO2CC, SO5CC and SO9CC. Also active in this period were SNØMSP and SNØWPC (SP3KEY) commemorating the World Pentathalon Championships held in Drzonkow. Finally, SPØDXC was activated at the annual SPDX Club convention in Lublin, September 26-27. QSLs for SO3-3-5-9CC go to K1CC, SNØMSP/WPC via SP3AUZ.

I'll leave you with a laugh this issue with a quote from the Northern California DX Club paper, *The DXer*. Under the heading of "Famous DX Movies" we find the Four Star Ratings going to: Butch Cassidy and the Sundance Kid, Forever Ampere, Maltese Final, Pileup on the Orient Express (I like *that* one!), Magnificent 5 by 7 and Gone with the Wind (Story of TH6DXX). Shown as Bombs and Dogs are: Abbott and Costello Go to Kingman, Adventures of Huckleberry Slim, Mutiny on the Bureau, Gunga Slim, and Godzilla Attacks Okino Torishima.

Thanks to all of you for your letters, your support and your confidence during this first year of my DX column editorship. May all of you have a happy and safe holiday season, ample new gear under the tree and many new countries confirmed. MX/HNY, all! QST

QSL Corner

Administered By Joan Becker

The ARRL DX QSL Bureau System (Incoming)

Within the U.S. and Canada, the ARRL DX QSL Bureau System is made up of call area bureaus that act as central clearing houses for QSLs arriving from foreign countries. These "incoming" bureaus are staffed by volunteer workers. The service is free and ARRL membership is not required.

How it Works

Most countries have "outgoing" QSL bureaus that operate in much the same manner as the ARRL Membership Overseas QSL Service. The member sends his cards to his outgoing bureau where they are packaged and shipped to the appropriate countries.

A majority of the DX QSLs are shipped directly to the individual incoming bureaus where volunteer workers sort the incoming QSLs by the first letter of the call sign suffix. One individual may be assigned the responsibility of handling from one to three letters of the alphabet.

For detailed information on the operation of the bureau serving your district, please send an s.a.s.e. for a prompt reply.

Claiming Your QSLs

1) Send a 5- × 7-1/2-in. s.a.s.e. to the bureau serving your district.

2) Neatly print your call sign in the upper left hand corner of the envelope.

3) A preferred way to send envelopes is to affix a 20-cent stamp. If you expect to receive more than 1 oz. of cards, please affix postage accordingly.

4) When requesting *any information* from the bureau serving your district, always include an s.a.s.e. for a prompt reply.

Some incoming bureaus sell envelopes or postage credits in addition to the normal handling of s.a.s.e.'s. They provide the proper envelope and postage upon prepayment of a certain fee. The different stages of presorting and sorting cards take time. A period of 6 to 8 months, or longer, may take place before you receive your cards.

Helpful Hints

Good cooperation between the DXer and the bureau is important to ensure a smooth flow of cards. Remember that the people who work in the area bureaus are volunteers. They are providing you a valuable service. With that thought in mind, please pay close attention to the following DOs and DON'Ts.

DOs

Do keep self-addressed 5- × 7-1/2-in. envelopes on file at your bureau, with your call in the upper-left corner, and affix at least one unit of first-class postage.

Do send the bureau enough postage to cover envelopes on file and enough to take care of possible postage-rate increases.

Do respond quickly to any bureau request for envelopes, stamps or money. Unclaimed card backlogs are the bureau's biggest problem.

Do notify the bureau of your new call as you upgrade.

Do include an s.a.s.e. with any information request to the bureau.

Do notify the bureau *in writing* if you *don't* want your cards.

Do be appreciative of the fine efforts of these volunteers.

DON'Ts

Don't expect DX cards to arrive for several months after the QSO. Overseas delivery is very slow. Many cards coming from overseas bureaus are over a year old.

Don't send your outgoing DX cards to this bureau (see "ARRL-Membership Overseas QSL Service" in this column every other month).

Don't send envelopes to your "portable" bureau. For example, WA1SQB/2 sends envelopes to the W1 bureau, *not* the W2 bureau.

ARRL DX QSL Bureau System

First Call area: all calls* — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

Second Call Area: all calls* — North Jersey DX Assn., P. O. Box 8160, Haledon, NJ 07538.

Third Call Area: all calls* — Leon Lapkiewicz, K3GM, P. O. Box 6238, Philadelphia, PA 19136.

Fourth Call Area: single-letter prefixes — Mecklenburg ARS, P. O. Box DX, Charlotte, NC 28220.

Fourth Call Area: two-letter prefixes — Sterling Park Amateur Radio Club, P. O. Box 599, Sterling Park, VA 22170.

Fifth Call Area: all calls* — ARRL W5 QSL Bureau, Box 1690, Sherman, TX 75090.

Sixth Call Area: all calls* — ARRL Sixth (6th) District DX QSL Bureau, P. O. Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls — Willamette Valley DX Club, Inc., P. O. Box 555, Portland, OR 97207.

Eighth Call Area: all calls — Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.

Ninth Call Area: all calls* — Northern Illinois DX Assn. Box 519, Elmhurst, IL 60126.

Zero Call Area: all calls* — WØ QSL Bureau, Ak-Sar-Ben Radio Club, P. O. Box 291, Omaha, NE 68101.

Puerto Rico: all calls* — Radio Club de Puerto Rico, P. O. Box 1061, San Juan, PR 00902.

U.S. Virgin Islands: all calls — Graciano Belardo, KV4CF, P. O. Box 572, Christiansted, St. Croix, VI 00820.

Canal Zone: all calls — LPRA, P. O. Box 9A-175 Panama 9A, Republic of Panama.

Hawaiian Islands: all calls* — John H. Oka, KH6DQ, P. O. Box 101, Aiea, Oahu, HI 96701.

Alaska: all calls* — Alaska QSL Bureau, 4304 Garfield St., Anchorage, AK 99503.

Guam: AH2, KH2, WH2 and KG6 calls — MARC, Box 445, Agana, Guam 96910.

SWL — Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.

QSL Cards for Canada (VE and VO) may be sent to: CRRL Central QSL Bureau, Kennebecasis Valley Amateur Radio Club, Box 51, St. John, NB E2L 3X1. Or, QSL cards may be sent to the individual bureaus.

VE1* — L. J. Fader, VE1FQ, P. O. Box 663, Halifax, NS B3J 2T3.

VE2 — A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal, PQ H3R 2E3.

VE3 — The Ontario Trilliums, P. O. Box 157, Downsview, ON M3M 3A3.

VE4* — Larry R. Lazar, VE4SL, 30 Bathgate Bay, Winnipeg, MB R3T 0L2.

VE5 — A. Lloyd Jones, VE5JI, 2328 Grant Rd., Regina, SK S4S 5E3.

VE6* — G. D. Holeton, VE6AGV, 4003 First St., N.W., Calgary, AB T2K 0X2.

VE7* — Burnaby ARC, Box 80555, South Burnaby, BC V5H 3X9.

VE8* — Rolt Ziemann, VE8RZ, 2888 Lanky Ct., Yellowknife, NT X1A 2G4.

VO1, VO2 — CRRL VO QSL Bureau, P. O. Box 6, St. John's, NF A1C 5H5.

VY1 — ARRL QSL Bureau, W. L. Champagne, VY1AU, P. O. Box 4597, Whitehorse, YT Y1A 2R8.

*These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information.

Here is some QSL information for those of you who would like to QSL direct to the station location. It is passed along as we receive it and, therefore, may not be accurate. The call sign in parentheses is the QSL manager.

C31PF (G3WPF)
FK8CE (K2ROR)
FMØEOM (F2VT)
FO8GP P.O. 5281, Piraie, Tahiti
FOØB (WB6GFJ)
FØAHY/FC (DL4FF)
FWØBE (DJ9ZB)
FY7BW P.O. Box 743, Cayenne, French Guiana
GJ5EBQ (DF1JM)
HHØN (WD4JNS)
HMIPW (W3GNM)
HT1CTJ (HK3LT)
IP9ARI (IT9WVK)
J88AQ (W2MIG)
LU3MCJ (W8DZC)
P29EJ P.O. 1486, Lae, New Guinea
SNØWPC (SP3AUZ)
SO3CC (K1CC)
SP2AOY (SP2UU)
TA1MB P.O. Box 1167, Istanbul, Turkey
TG9QK P.O. Box 115, Guatemala City
TU2JJ (KNØKCW)
YU7PEF (YU7GMN)
YZ9HDE (YU2HDE)
VP2VJ (VE3MJ)
VP2MH (W8HM)
V3AWS P.O. Box 306, Belize City, Belize
ZD8RH (G4DBW)
ZF2FH (WB3GPR)
ZLØAES (K1MM)
4N2RTW (YU2RTW)
4X6DX P.O. Box 21567, Tel Aviv
5V7HL (DK9KD)
5W1DD (OE2DYL)
5W1DK (VK9NL)

QSL MANAGER VOLUNTEER

KB8BS

Please note valid addresses for QSL bureaus: VK2 QSL Bureau, Box 73, Teralba, N.S.W. 2284 Australia; (PA) Dutch QSL Bureau, P.O. Box 330, 6800 AH-Arnhem, The Netherlands.

QSL BUREAUS

"QSL Corner," September 1981, page 67, contains information about the ARRL-Membership Outgoing QSL Service. For information about the bureau operation (incoming and Outgoing) send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.

Our thanks to W9LNQ, AA4MI and W2QL for their contributions of information. Season's greetings from the QSL bureau staff. QST

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from August 14 through August 31, 1981. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

DF6AI/114	HB9ANK/225	PAØMAW/108	ZL3AZ/102	AI2O/111	KD4KU/100	N6ZV/162	KG7P/108	WB8GSN/105
DL1KS/249	JE1TTI/213	SMØJHF/119	AE1L/104	WA2PUB/286	N4DSS/111	W6ABW/108	N7ES/108	WB9RFT/105
DLØCM/108	JR1DLW/120	UA3LX/102	K1GW/125	KA3CQB/102	ND4Y/101	W6OB/300	WB7NKY/110	KØJLG/100
EA5AMR/118	KL7IF/124	UK2PCR/303	K1NJE/323	KA3CVD/101	WA4OXD/133	W6RON/260	WB7TIJ/109	KAØAHR/102
EA5BRG/116	LZ1AB/110	VE3KPD/130	KA1ED/128	N3CHL/101	WB5UIS/101	W6TWO/104	KB8YG/112	KAØDIL/103
EA7ATE/198	OZ1GHQ/101	VK9YA/116	WA1UAW/102	WB3CDE/105	KA6IYE/103	WD6BQN/120	N8BTT/100	WDØDGU/105
G4CNY/268	OZ9QW/149	VP1KS/110	WB1GLH/100	KA4RJC/104	KB6XD/124	K7BVT/122	W8QBF/100	WDØEUP/107
HB9AJY/166								

Radiotelephone

CP1FQ/133	EA7BLO/130	I3QDK/108	VE3DAX/101	WA2PUB/280	WA4OXD/114	AG6W/110	WB7NKY/109	WB9OAR/110
DF4HZ/132	G3UZM/101	JA6DUI/104	YV1DEG/247	AF3R/101	WB4CTW/184	KE6AL/102	N8ASV/108	KAØAHR/100
DF6AI/109	G4JPM/110	JR6EIF/104	4Z4HS/104	N3CHL/101	K5CTG/216	N6ZV/115	W8CIH/100	WØLXZ/103
DF9QC/106	HB9ANK/206	JA8CDL/100	K1GW/101	WB3CDE/103	WB5HBR/115	WA6TCK/107	W8QBF/100	WDØBNP/100
DJ3XD/133	I1TLJ/219	SM6JNT/137	K1NJE/321	W4PNC/107	WB5YLT/110	K7BVT/110	N9DX/118	WDØEUP/106

CW

DK5XO/109	HT1JCC/125	LA8KD/105	SMØJHF/101	K1ITS/106	WA4YZF/109	WA7CWM/102	N9DX/215	WØJIE/105
HB9AJY/141	JA2AIR/211	SM6JNT/111	VE3DZV/201	WB3JZN/102	K7DOR/109	W8QBY/115	WD9GGY/119	

Endorsements

Mixed

CX6CW/315	JA1BWA/336	VE2FMH/133	W1OHA/331	K3AV/337	W4OWJ/330	K6ANP/280	WA7CWM/255	KA9FKL/171
DJ3CO/134	JE1CYH/164	VE3DZV/255	W1SP/342	K3NB/180	W4VUL/203	K6HTM/315	AD8O/206	KC9C/126
DJ5PA/226	JH1IFS/318	VE3KK/199	WB1FPF/125	K3NL/328	W4XC/233	K6QPE/169	K8MC/227	N9DX/247
DJ6OV/210	JA2AIR/305	VE4SK/318	AC2P/182	K3QIA/206	W4YKH/303	K6VL/181	KB8BS/277	W9NUF/168
DK1YK/265	JA3ARM/150	YB7AAU/296	K2BLA/126	KB3OM/183	WA4PSF/160	KB6JK/255	KB8LT/261	W9TX/245
DL1PM/328	JA5JGY/261	YU2AKL/299	K2PX/242	W3AIC/127	WA4WIP/336	N6JM/253	KD8F/184	WB9TIY/271
DL3GK/128	JA5PUL/306	YU2JG/225	KB2QN/226	W3AX/300	WB4VMS/150	W6VBI/319	W8DA/345	WD9BBI/170
DL3ZA/314	JA7EHU/323	YU2OM/225	KF2G/150	W3LDD/125	WD4KQC/148	WD6COR/153	W8NGO/349	WD9EPG/252
DL7WL/260	JA8KB/324	K1LEC/180	KF2U/133	W3SOH/250	WD4RHL/239	WD6EQP/208	W8QFR/325	KØAYO/126
DL9HN/197	JA9DDM/232	K1MM/306	N2AMS/150	K4FX/268	K5JUC/279	AA7C/250	W8UPH/175	KØLST/262
DLØWU/281	LA1ND/251	K1OXD/156	W2BBK/280	K4JW/251	K5KX/319	AE7P/154	W8YA/329	KØQMU/251
G3KAA/311	OE8RT/330	K1TN/310	W2HAZ/310	K4KUZ/270	K5PP/299	KB7SB/206	W8YAH/264	KØYRX/317
G3OLU/154	OH3SG/198	KA1NL/288	W2IQZ/251	K4YXJ/280	KA5BOZ/126	KI7I/124	WA8OVC/300	KDØB/206
GM3AWW/272	OZ7JR/221	N1AEC/165	W2PD/298	N4AXR/280	KB6EK/155	W7BCT/294	WB8GWB/248	WØBF/175
HB9AUT/157	SM6DEC/159	N1NA/209	WA2OOS/225	N4IR/268	KB5IY/181	W7POC/214	WD8MGQ/292	WØSYK/358
HB9BZA/203	SM6DYK/304	W1ETH/206	WB2CLL/144	N4TZ/215	W5XX/300	W7QMU/280	K9BWQ/310	WAØDCQ/271
I1ZQD/254	SM6JNT/177	W1FJ/336	WB2HPP/279	NE4L/133	W5ZF/312	W7TVF/304	K9MK/290	WBØSNG/283
I2VDX/298	SM6NT/151	W1GL/319	AG3H/150	NI4Y/152	WB5HBR/127	W7XN/280	K9PQG/312	WBØSYT/140
I3VJW/165	SM7ASL/186	W1HSB/283						

Radiotelephone

DK1YK/257	JE1CYH/154	PP8DD/204	W1FJ/301	WA2DGS/209	WA4NIB/301	W6RON/260	AD8O/206	K9LKA/332
DL7FP/300	JA5JGY/208	SM7ASL/186	W1JFG/355	WB2CLL/141	WA4WIP/336	WA6SJX/152	K8IQB/185	K9MK/277
DL9HN/192	JA5PUL/300	VE2FMH/131	W1SP/341	WB2HPP/277	K5BG/274	AA7C/213	KA8BUM/129	K9PQG/304
DLØWU/262	JA7EHU/317	VE3BDB/314	WA1WTP/259	K3DH/259	KB5AC/254	AE7P/153	KB8BS/282	KB9KB/282
EA3VM/284	JA8BAR/310	XE1MDX/214	AC2P/181	W3FZE/289	KB5EK/150	K7CCP/202	KD8F/181	KE9U/246
HB9AUT/153	JH8MXH/201	YB7AAU/227	KA2ELW/203	K4FX/207	K6HTM/310	K7DS/280	W8NGO/327	W9GBC/226
HP1JC/319	JA9DDM/225	YU2OM/217	KB2ED/174	K4JW/251	K6XJ/316	K7RDH/251	W8WVM/200	W9TX/224
HP1XRK/305	LU4MEE/251	K1MM/296	KB2VK/253	N4AXR/280	KB6JK/255	KB7SB/204	WB8GWB/243	KDØB/204
I1FNX/305	LU7MAJ/230	KA1ND/258	KF2U/133	N4BCV/252	KC6H/212	W7BCT/293	WD8CZR/174	NØAFL/248
I4KET/225	OE1BKW/163	KA1NL/246	W2FXA/324	W4FC/127	KC6X/205	W7TVF/227	WD8MGQ/291	WBØCIW/159
IØOLK/312	OE1SBA/160	N1NA/184	W2IQZ/199	WA4CYR/159	N6JM/231	W7UPF/326	K9BWQ/309	WBØOQV/276
JA1BWA/307	PY5OC/202	W1ETH/201	W2PD/264	WA4MMO/310	N6ZL/200	WA7CWM/206	K9IML/155	

CW

DF3FJ/217	JA1BWA/284	XE1KC/133	K2BLA/126	K3QIA/187	N5DEE/225	W7TVF/156	KB9KB/275	KØCVD/215
DJ5PA/158	JA8JL/296	YB7AAU/165	K2OPJ/145	K4KUZ/225	KC6X/129	W7XN/175	KE9U/153	KØLST/232
DK5PR/200	LA1ND/125	AI1S/225	K2PX/229	N4IR/250	N6JM/156	WA7NXL/125	N9KW/225	KJØU/179
DL1PM/282	LA2KD/138	K1MM/271	K2UFM/208	N4TZ/155	AA7C/219	KB8BS/126	W9ZM/300	NØBFP/174
DL7WL/176	SM6DEC/153	KA1NL/134	KB2FD/200	W4YN/207	KB7MO/150	W8DA/235	WB9TIY/157	NØRR/296
HB9BFU/124	VE7CNE/223	W1GL/278	W2IQZ/131	W4ZR/150	W7QMU/204			

DXCC NOTES

Honor Roll Corrections: Mixed, W5EDX 309/327, JA1MJ 312/331, K5OS 313/328 W9HKC 317/358. Phone, W2QWS 310/335.

September Listing Correction: Mixed, KB2WW should be KB2WV/100.

Honor Roll Reminder: Those wanting to update their Honor Roll standings or make the Honor Roll must have their cards into Hq. no later than December 31, 1981. Cards arriving after December 31, 1981, will not be included in the Honor Roll listing.

5BDXCC/5BWAS: Board Minute 53 (September 1981) directs that a suitable certificate be awarded to those qualifying for the 5-Band DXCC (and 5-Band WAS), with plaques available at cost to those desiring them. Effective with applications received July 1, 1982 and after, a fee of $20. U.S. will be charged for those who want the 5-Band plaque. A handsome certificate will be awarded to all applicants free of charge. The plaque will continue to be offered free of charge for all applications received prior to July 1, 1982.

The World Above 50 MHz

Conducted By William A. Tynan,* W3XO

A VHF/UHF Primer — EME, Continued

In November, I introduced the exciting subject of moonbounce and explained why operating this mode is so challenging. This month, I will discuss basic equipment considerations for attaining EME capability.

As stated last month, the high attenuation existing on the earth-moon-earth path requires the utmost in amateur station capability. This means very near the legal limit in power, an antenna system with 20 dB or more in gain and a low-noise receiving system. It goes without saying that excellent frequency stability and clean T-9 oscillators throughout are very important. Good frequency readout and reset capability are also extremely useful.

For the transmitter, one may begin with a good, stable multimode rig or an hf set-up followed by a transverter. Since equipment of this type was covered in the April column, I won't go into the low-power portion of the transmitter here. Instead, I will discuss high-power amplifiers. Tube-type amplifiers are used almost universally for amateur moonbounce. Even in this high-power category, however, transistors may be on the way. RF Power Labs of Woodinville, Washington, has recently been advertising a 400-watt output 144-MHz solid-state unit. Amplifiers can be divided into two general classes: those with high power gain that can be driven to full output with the approximately 10 watts available from most transverters and multimode rigs, and those that require 50 to 100 watts of drive power. Most EME operators build their own high-power amplifiers, but commercial units are now available for those who prefer that route. In the home-built category, by far the most popular design for 2 meters is that using the 8877 tube as described by Bob Southerland, W6PO, in August 1971 *Ham Radio*. Another design using the same tube type is discussed in *The Radio Amateur's Handbook* and was described more fully by Ed Meade, K1AGB, in December 1973 and January 1974 *QST*. Since the 8877 is a triode, these amplifiers are in the high drive power class. The very popular 4CX250 series of tubes, and offshoots such as the 8930, form the basis for most low drive power EME-capable amplifiers. *The Radio Amateur's VHF Manual* contains one design of this type using a push-pull configuration. Increasingly, however, the parallel approach has been gaining in popularity in recent years. This is largely because of the 70-cm amplifier design published by Dick Knadle, K2RIW, in April and May 1972 *QST*. Not only has this design been the workhorse on 70 cm, including the moonbounce contingent, but it has been adapted to amplifiers for 1-1/4 meters, 2 meters and even 6 meters.

For 2-meter operation, in the commercial realm, the Tempo 2002 amplifier has captured considerable attention and has been used successfully by a number of EMErs. This unit uses two 8874 triodes so it should be considered to be in the medium to high drive power class. A company specializing in vhf and uhf high-power amplifiers is Amateur Radio Component Service, P.O. Box 546, East Greenbush, NY 12061. This firm offers complete amplifiers for 2 meters, 1-1/4 meters and 70 cm based on the K2RIW design, as well as kits of parts.

For receiving, the same transverter employed for transmitting can be used, but a good low-noise preamp should be placed ahead of it. Many who use multimode rigs for transmitting go to a separate converter and hf receiver rather than the receive section of the transceiver. There are a variety of reasons for this. One is the greater ease of tuning off the transmit frequency, which is made necessary because of the Doppler often present on moon-reflected signals. Also, it is usually easier to get narrow i-f selectivity with a good hf receiver. More on selectivity later.

One of the most important components in an EME station is the receiver preamp. This is also the area in which the greatest strides have been made over the past few years and where homemade gear is still the norm. Good commercial preamps are available, however. Lunar Electronics of San Diego, and Advanced Receiver Research of Burlington, Connecticut, are two firms offering good quality, high-performance preamps for the bands from 50 MHz up. How good must a preamp be to produce acceptable moonbounce signals? For 2 meters, a noise figure in the 1- to 2-dB range will do the trick. In the case of 70 cm, it would be well to get down to the 1-dB or less region. A myriad of transistors of both the bipolar and field-effect types, if properly used, will produce noise figures of less than 2 dB at 144 MHz. Most of them are quite inexpensive. For 70-cm operation, the pickings are much slimmer, and costs can be fairly high. In addition, devices come and go. Some are removed from the market by their manufacturers, and others just lose favor because of availability of better, and perhaps cheaper, transistors. Currently popular among 70-cm moonbouncers are the 3SK-97 by Panasonic and the D-432 from Dexcel. Both of these are gallium arsenide field-effect transistors or GaASFETs. The Dexcel device is presently available through Lunar Electronics.

As to preamp circuits, they are far too numerous and varied to go into here. The *432 and Up EME Newsletter* put out by K2UYH carries preamp circuits from time to time. More on this newsletter and other useful EME information later.

Even with the best of preamps and large antennas, copying moonbounce signals is often not easy. They are often buried in the usual noise we have grown so accustomed to hearing while tuning the bands above 50 MHz. To enhance signal-to-noise ratios, some EMErs employ narrow i-f filters of 500 Hz or less. Others claim that they can copy better using the normal ssb bandwidth. What these people are doing, in reality, is letting their brains do the signal processing, that is, looking for the coherent sinewave signal in the midst of large amounts of random noise. This is one of the learned skills of the accomplished EME operators. The use of headphones is essentially a must under the weak signal conditions prevailing most of the time. Another means, employed by some, of emphasizing the signal with respect to the noise, is the use of very narrow filters in the audio output of their receivers. The tunable active type is becoming increasingly popular with those who espouse this approach.

The antenna system of the "typical minimum 2-meter moonbounce station" consists of four Yagis. Each beam is 15 to 20 feet long and is spaced about 12 feet apart each way. The system should be well matched with a VSWR less than about 1.5. The "minimum" 70-cm EME antenna usually consists of eight Yagis, each about 10 to 12 feet long and spaced approximately 6 feet apart. For both bands, comments made in the June column with regard to the performance of various antennas apply here, too.

The feed line should be RG-17 or some type of "hardline" and should exhibit a loss of about 1 dB or less. For this reason, the 2-meter receive preamp can be in the shack where it is easily protected from the weather and lightning. An obvious embellishment is to place the preamp near the antenna and thereby eliminate the feed-line loss, which adds directly to the system noise figure. This, of course, adds a host of problems involving switching and protection of the unit. Nevertheless, this approach is used by many, and it is one of the things that marks the difference between the "minimum" 2-meter EME station and those with capability somewhat above that level. On 70 cm, the antenna-mounted preamp is all but an absolute necessity because of the higher feed-line losses encountered at that frequency. The EME antenna need not be high off the ground as long as it has a clear shot at the area of the sky traversed by the moon. Some are mounted on towers, however, because of this requirement. If on or near the ground, aiming may be by the "armstrong method". On the other hand, many EMErs employ remote aiming using conventional antenna rotators of the large amateur variety, not the TV type, for azimuth. Various contrivances are used for elevation adjustment. There is little in the way of commercially available rotators suitable for the elevation drive, at least at prices most of us are willing to pay. Readout is often by synchros or some kind of optical device. The direction indicators in most rotators are usually not adequate to provide the necessary accuracy.

I will continue this discussion in the months to come, introducing some methods of determining where the moon is. Meanwhile, for those who are seriously interested in delving further into moonbounce, with a view to actually getting on, I recommend the *432 and Up EME Newsletter*, published by K2UYH. To

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 and record your message.

begin receiving this monthly publication, send a stack of s.a.s.e.s to Allen Katz, c/o Department of Engineering Technology, Trenton State College, Trenton, NJ 08625. Bob Sutherland, W6PO, of Varian has produced a very informative collection of notes dealing with various aspects of moonbounce, from antenna design to moon tracking. Bob is willing to add to his mailing list anyone really interested in moonbounce and intending to get on. Address is Robert Sutherland, Varian Eimac Division, 301 Industrial Way, San Carlos, CA 94070.

ON THE BANDS

6 Meters — All indicators point to very good F2 conditions this fall. In fact, from the reports received, it may turn out to be better than last year and may compare favorable with 1979. The paths over which contacts have been made, as of about October 12, suggest that propagation may be running about two weeks ahead of fall a year ago. Reports from ZD8TC, carried in the November column, provided some evidence of this trend, but further confirmation came on October 5 when JA1RJU reported an opening from Japan to East Africa and Gibraltar. Kazu worked both ZB2BL and 2B2GW, plus EL2AV and EL2FY. EL2AV is reported to have QSOed 57 Japanese on that occasion. On the 8th, K5FF (near Albuquerque) worked into ZL on the first such opening of the fall. The same day, KH6IAA QSOed WB7OHF (Arizona) and NØLL (Kansas). The following morning, as a magnetic storm subsided, the first really good, widespread F2 opening for the eastern part of the country of the fall season occurred. 9Y4JW, the Trinidad call for 8P6KX, provided a running account on 28.885. John and his wife Elsa, 9Y4LL, began hearing LUs and PY2XB about 1330Z and a few W5s and 8s shortly thereafter. They worked some of the LUs but were unable to complete any contacts with Ws because of QRM from the LUs. PY2XB was somewhat more fortunate. Fred worked a total of 21 U.S. stations including 2s, 3s, 4s, 5s, 8s, 9s, and Øs. He also hooked up with HI8DAF and a new country in the form of VP5D. Signals were relatively weak, generally running 5×2 to 5×5 with a smattering of 5×7s. The FY7THF beacon was also heard weakly for a short time along the East Coast. That beacon was in again, this time with an S-9 signal on Sunday the 11th, indicating that something was up. Nothing much developed for those of us in the eastern part of the country that day, but elsewhere things were different. KH6IAA worked a number of stations in the western states, and T23AB (Christmas Island) appeared, giving many out west a new country. In addition, some ZLs and a few VKs were worked.

Columbus Day produced a few discoveries, including a new country for this conductor in the form of PY6BN, at about 1420Z, and a solid S-9 QSO with EL2AV for K1TOL about an hour later. The afternoon hours brought the western states an opening to DL3ZM/YV5 and more contacts with T32AB and other Pacific areas.

The preceding reports of better-than-expected conditions are certainly in line with comments of N5WM. Bill speculates that this cycle may be stretched out as a result of the "grand alignment," in which the planets line up in one direction from the sun. He notes that potential effects from this occurrence, which is to be at its fullest extent in March 1982, are discussed in a book entitled *The Jupiter Effect* by John R. Gribbin and Stephen H. Plagemann. This conductor hastens to point out that, although the conclusions reached in this book are quite controversial and by no means generally accepted by the scientific community, the scientists have been wrong before. N5WM also echoes the various comments made from time to time with respect to the annual repeatability of openings over particular paths. He recalls that the KL7s and JAs came into Oklahoma on November 5 in both 1979 and 1980.

It is always interesting to receive news of Dxpeditions involving 6 meters. JA1BK passes along details of one to Wallis Island, which took place in September. The group, which included FK8DJ, JA1MIN, as well as JA1BK, operated under the call FWØBK and ran up a total of 1225 6-meter QSOs, all but 21 with JAs. Altogether, seven countries were worked including JA, JD1 (Ogasawara), KH2, KH6, KC6, H44 and FO8. Very impressive, especially for September.

Another 6-meter operator who had the wanderlust is VE6RO. Graham wasn't satisfied with what he could work from his QTH in Bunbury, south of Perth on Australia's West Coast, so he set out in his car with a 10-watt FT-680R and an IC-502, as a back-up, along with a homemade quarter-wave whip on the roof of the car. The route traveled took him 1250 miles up along the Northwest Coast of Australia as far as Broome. Altogether, between September 3 and 14, the trip netted him a total of 434 JA QSOs, plus one with HL2JD (in Korea), using all modes including ssb, a-m,fm, and cw. With expenses, Graham figures that each contact cost $1.36! Some interesting signals were heard including Chinese fm broadcasting on about 52.6 MHz, TV from Malaya on 53.75 (up to S-9 plus 40 dB) and two-way radio (some with American accents) on various frequencies including 50.54, 50.55, 50.642, 51.0 and 51.95 MHz. Graham's observations of propagation while at Broome are particularly interesting, displaying classic TE behavior. He noted that the muf didn't rise above 43 to 45 MHz during the day, but shot up rapidly to well over 53 MHz at sundown.

2 Meters — What may be the first recorded occurrence of 2-meter transequatorial propagation being observed within the continental U.S. is reported by W5UNY. Bill says that on the evening of September 23, CP5CL (Cochabamba, Bolivia) checked into a net on the 147.81/21 WB5QFM/R repeater located 10 miles south of Arcadia, Louisiana. The South American was full quieting into the repeater for about 30 minutes and then dropped to what Bill characterizes as 3×5 for the next two hours. A number of stations were on hand to hear and contact CP5CL through the repeater. Apparently no one tried to work him direct, however. I calculate the distance from the repeater to Cochabamba to be approximately 3960 miles. Although not a DX record for 2 meters, it may be one for fm repeater work. This report is interesting as it indicates that, in the southern states at least, 2-meter TE is possible from the continental U.S.

From the neighboring state of Mississippi, WD5IKD reports that ssb/cw activity is on the increase. Alan asks that 2-meter operators turn their beams toward his state more often. An amplifier is in the works at his station, and moonbounce should not be too far behind.

WAØLPK/KL7 reports the first EME contact from Alaska by one of the fairer sex. Jim says that KL7OR worked K1WHS from his station and seemed to enjoy the mode very much. It would be nice to think that Ellen might become one of the mainstays on 2-meter EME from up north. Present plans call for WAØLPK's six-Yagi array to go to KL7MJ in preparation for Jim's return to the "lower 48" sometime next spring.

1-1/4 Meters — Those who may be contemplating carrying a 1-1/4 meter EME set-up to the top of a mountain for a contest had better get in touch with K1WHS. After what he went through in doing just that for the September QSO Party, Dave will probably try to talk you out of it. Lack of sufficient space prevents me from detailing all of the trials and tribulations that he, and cohorts W1GW, K1KA, WA1QFY, WB1FGW and K1KEC, went through to set up a kilowatt and array consisting of eight 220B Yagis on top of Pack Monadnock, New Hampshire. It required a four-page letter for Dave to narrate the tale of woe. Nevertheless, after several equipment problems were solved and much sleep was lost, they did manage to work KAØY, K5FF, W5FF and WBØTEM off the moon. They also heard, but were unable to work, W6PO. Unfortunately, skeds with WØVB and WB6NMT were not successful, either. In addition to their EME operation, a number of tropo contacts were made with stations as far west as Michigan and as far south as the Washington, DC area. Would you like to try again for the January bash, Dave?

In other 1-1/4 EME news, K5FF reports the first EME contact on the band from Canada, as well as the first from Alaska. And they both took place on the same day, October 10. VE3EMS blazed the trail to put Canada on the 220-EME map, and, in the 49th state, it was KL7NO who came through. Both K5FF and W5FF have two new countries and one new state as a result of these fellows putting forth the effort.

WB9SNR (near Chicago) comments, as have many others this year, on the lack of east-west tropo openings. As Jim notes, however, this has been compensated for, at least for some, by the number of good north-south openings. He reports on one of these that occurred the evening of September 24 and the following morning. It resulted in two new states for him on 1-1/4 meters and 70 cm as a result of working K5BMG (Louisiana) and W4ODW (Florida) on both of the bands. The only complaint was the low level of activity. More of us should try to get on, especially when conditions are as good as they apparently were that night. Various ways of telling when the bands are open have been suggested. Monitoring uhf TV signals is one method espoused by WØOHU.

Two days earlier than the above opening, WB5LUA (near Dallas), while running 650 milliwatts to a home-built 4.2-wavelength Yagi at 80 feet worked W4ODW. At 650 miles, that's one mile per milliwatt. Knowing Al, I am sure that he will have more power on the band before too long.

70 Cm and Down — The Tropo opening around September 22 to 25 described in the 1-1/4 meter section is detailed further in WØOHU's FB publication *432 News*. This news-sheet covers all aspects of 70-cm activity other than EME. A stack of s.a.s.e.s to Ed at 1628 Northern Heights Dr., Rochester, MN 55901 will put you on the list to receive it. One of the items in the September issue concerns the Sable Island beacon. Its frequency has been moved down to 431.95 to clear up some QRM that EMErs operating around 432.0 MHz have been experiencing. Speaking of EME operation, there is another move afoot to come up with a common sequence for all bands. Currently, the 2-meter procedure involves the use of two-minute sequences, while on 70 cm, and other bands, a 2-1/2 minute sequence is used. This, among other things, is discussed in K2UYH's *432 and Up EME Newsletter* in both the September and October issues. A proposal to adopt a common system was offered several years ago with neither group agreeing to change its procedure. It would be nice to think that this impass can be resolved this time around, but it seems unlikely. This conductor does believe that a single common sequence for conducting EME contacts on the various bands would be extremely beneficial to all, but especially to newcomers.

K2UYH's newsletter for October contains much other interesting information, including the fact that Argentina is again to be represented on 70-cm EME. LU9EHR, with his 20-foot dish and kilowatt, should be quite popular. Also from the October newsletter comes word of the first all-solid-state moonbounce contact. The principals were WA2FGK and G3LTF, and the feat was accomplished on 23 cm. The final of the transmitter on the U.S. end employed just two MSC bipolar transistors. A higher power version, boasting 250 to 300 watts of output, is in the works and is expected to be in operation soon. Is this last bastion of the vacuum tube, the high-power rf amplifier, about to fall, too?

1-1/4 Meter Standings

Columns list call, U.S. state, number of U.S. states and call areas worked. Call areas are the 10 U.S. call areas, plus KL7 and KH6 plus VE and XE call areas plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico.

K1FO	CT	22	7	W2PGC	NY	16	10	WA3JUF	PA	12	5	W5RCI	MS	10	5	K8HWW	MI	11	6	KCØW	ND	3	1
W1JR*	MA	20	9	K2DNR	NY	15	6	K3IUV	PA	12	4	K5JL	OK	7	4	K9HMB	IL	23	10	VE2YU		8	3
K1PXE	CT	18	6	W2CRS	NY	14	5	W3RUE	PA	11	6	WB6NMT*	CA	10	6	WB9SNR	IL	22	9	VE2DFO		7	5
W1YTW	ME	14	8	W2SEU	NY	13	5	W3IY/4	VA	18	8	W6WSQ	CA	6	4	K9KFR	IN	11	6	VE2HW		6	2
W1GXT	MA	14	8	K2YGO	NY	12	5	K4LHB	VA	13	6	W7JF	MT	8	5	K9XY	WI	7	4	VE3AIR		10	8
W1HDQ	CT	13	5	WA2FUZ	NY	11	4	N4CD	VA	9	4	K7NII	AZ	8	4	WBØTEM*	IA	26	7	VE3EMS		10	7
W1QXX	MA	13	5	WA2YWP	NY	7	3	K4GL	SC	6	2	W7CNK	WA	6	3	KØDAS	IA	16	7	XE2BC*		2	3
K1JIX	MA	12	4	W3GPY*	PA	25	10	K4IXC	FL	5	3	K7ICW	NV	4	2	WØPW*	CO	14	6				
W1AZK	NH	10	3	W3UJG	MD	15	8	K5FF*	NM	23	12	WB8BKC	MI	18	9	WØVB*	MN	12	6				
K1BFA	MA	10	3	W3IP	MD	13	6	W5FF*	NM	18	10	W8IDU	MI	15	7	WØSD	SD	9	5				
K2CBA*	NY	19	7	W3HMU	PA	13	4	W5HN	TX	16	6	K8AXU	OH	12	7	WAØQLP	SD	4	2				

*Indicates some states worked via EME

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

Solid-State EME on 1296 MHz

The first solid-state EME contact on 1296 MHz was made on September 20, 1981, at 0840 GMT. The operators involved were Andy Furlong, WA2FGK, Al Katz, K2UYH, and Bill Ashby, K2TKN. Using the call WA2FGK the group worked Peter Blair, G3LTF, on a random CQ call. All the equipment on the stateside end of the contact was solid state.

Andy Furlong is a senior technician for the Device Development Group at Microwave Semiconductor Corporation in Somerset, New Jersey. When MSC introduced a new L band 100-W long pulse device to their transistor line, Andy tried it out on cw and found that it would put out 85 to 90 W with a 50% duty cycle (5 seconds on, 5 seconds off . . . very long pulses!). Coupling a pair of these devices together gave a power output (≈160 W) capable of EME operation with the right antenna. K2UYH's 28-ft dish was just such an antenna. It was originally planned to mount the amplifier at the feed of the dish, but because of problems with power-supply cables, it ended up being used in the shack with 70 ft of feed line to the dish feed. Despite line losses there was no difficulty in working G3LTF.

Two more projects are underway at this time. One is a 250-W amplifier for 1296 MHz, and the other is a 100-W amplifier for 2304 MHz. Both these amplifiers are being designed for cw operation. But some experimentation is being done to see if the same transistors can be biased into something close to linear operation for ssb work.

More information can be obtained from Andy Furlong, WA2FGK, 6 Evagrod St., Bridgewater, NJ 08807, tel. 201-722-0205.

COMMENTS ON THERMAL TUNING DRIFT IN AMPLIFIERS USING TUBES OF THE 2C39 SERIES

Most tube amplifiers used at 1296 and 2304 MHz use the 2C39 (or other tubes of the same series such as the 7289, 3CX100A5 or 7211) as the power output tube. A common problem with amplifiers using these tubes is thermal drift of tuning during operation. As the tube heats up, thermal expansion causes small changes in interelectrode spacing (and consequently capacitance), requiring retuning of input and output circuits for maximum efficiency and output power. Tuning drift occurs because of the difference in thermal loading of the tube between operating and standby conditions. There are a number of ways to reduce, if not completely eliminate, this thermal tuning drift.

1) Make sure that the amplifier is operating as efficiently as possible, perhaps by using a slug or stub tuner on the output circuit. The more of the DC input power that is converted to rf output, the less is converted into heat in the tube.

2) Try to ensure close-fitting connections to the grid ring of the tube. This will ensure good thermal and electrical connection and will minimize grid temperature rise. Low inductance grid contacts will also maximize amplifier gain.

3) Charlie Suckling, G3WDG, recommends using an efficient blower during transmit periods, but turning off the blower when in the receive mode (*Radio Communications*, August 1981, p. 732). This will be fine as long as the amplifier runs in Class C, and the tubes are not called on to dissipate any power in the receive mode, or if the amplifier is run in linear operation, and the plate voltage is removed during receive periods.

4) Another solution that has been successfully employed at KA1GT is to operate all stages of the tube amplifier chain in Class A (linear) with about 50 mA per tube of standing current (1-kV plate voltage). The plate voltage is then left on at all times, both in transmit and in receive. During receive periods the output of the amplifier should be switched to a 50-ohm load to make sure that oscillation of the amplifier does not occur. The blower is of course left on at all times. Using this scheme there is no observable thermal drift during operation; however, the amplifier does not run as efficiently as it might in Class C. Using the W2CQH et al. 2-tube amplifier (*Ham Radio*, March 1970, p. 43) at 1296 MHz, 100 W of cw or ssb output is obtained at about 40% efficiency.

5) Heater power can often be lowered in tubes of the 2C39 series, since operation at high power levels can provide substantial heating of the cathode. Heater voltage can be lowered to 5.8 volts (or often lower) during operation with no observable effects on power output.

MIDATLANTIC STATES CONFERENCE

The MidAtlantic States VHF Conference, usually referred to as the "Pack Rats" Conference, took place on October 3 in Warrington, Pennsylvania. As usual, an excellent technical program was organized, with microwave techniques prominent, if not dominant, in the program! 1296 MHz linear transverters built by W3HQT and WA3JUF were discussed and displayed, and there was talk of demonstrating solid-state linear transverters for 2304 MHz next year. W3CXU gave a talk on the design and construction of loop Yagi antennas, especially for use at 1296 MHz. K2UYH spoke on low-noise preamplifiers, WA3AXV on solid-state power amplifiers and K2RIW on Yagi antenna patterns. I am sure that all who attended this conference enjoyed it very much and would wish to thank the Pack Rats for its organization. Those who can should reserve the first weekend in October next year for the 1982 Conference!

MICROSTRIP PROGRAM

The computer program listed in Table 1 calculates the characteristic impedance of a microstrip and the wavelength in that microstrip at any frequency. The program is written in BASIC using no programming "tricks," and should be usable on most home computers. A few notes may be useful.

All references to LOG are natural logarithms (i.e., log to the base 2). Lines 10 to 65 and 210 to 220 input the information required for the calculation. Lines 80 to 120 constitute a subroutine for calculating microstrip impedance. The first pass through this subroutine (line 140) calculates the impedance of the microstrip whose parameters have been entered. The second pass (line 170) calculates the impedance of the same microstrip with air substituted for the dielectric. This second impedance is used in the calculation of the effective dielectric constant at the frequency of interest. Lines 180 to 200 and 230 calculate the effective dielectric constant of the microstrip dielectric at the frequency input in line 220.

The program was written using data from an article by Darko Kajfez and Mark Tew that was published in *Microwave Journal*, December 1980, p. 39.

Table 1

Microstrip Impedance and Wavelength Program

```
10  PRINT "INPUT DIELECTRIC CONST
    ANT"
20  INPUT E
30  PRINT "INPUT DIELECTRIC THICK
    NESS (MM)"
40  INPUT H
50  PRINT "MICROSTRIP WIDTH (MM)"

60  INPUT W
63  PRINT "MICROSTRIP THICKNESS (
    MM)"
65  INPUT T
70  GOTO 140
80 A = (1 + (1 / E)) / 2
90 D = (1 +  LOG (4 /  SQR (((T /
    H) ^ 2) + ((1 / (3.14159 * (
    (W / T) + 1.1))) ^ 2)))) * (
    T / 3.14159)
100 P = W + A * D
110 B = ((14 + (8 / E)) / 11) * (
    4 * H / P)
120 Z = (42.4 /  SQR (E + 1)) *  LOG
    (1 + (4 * H / P) * (B +  SQR
    ((B ^ 2) + (A * 3.14159 * 3.
    14159))))
130  RETURN
140  GOSUB 80
150 X = Z
160 E = 1
170  GOSUB 80
180 I = (Z / X) ^ 2
190 J = X / (0.8 * 3.14159 * H)
200 B = 0.6 + (0.009 * X)
210  PRINT "FREQUENCY (GHZ)"
220  INPUT F
230 K = E - ((E - I) / (1 + B * (
    (F / J) ^ 2)))
240 L = (29.98 / F) / ( SQR (K))
250  PRINT "WAVELENGTH = ";L;" CM
    "
260  PRINT "IMPEDANCE = ";X;" OHM
    S"
270  END
```

*111 Reinman Rd., Warren, NJ 07060

50 Years Ago

December 1931

☐ "High-Power Performance From the Small 'Phone Transmitter," by Jim Lamb and George Grammer, the *QST* technical staff, is the 13-page description of the new "Class-B" audio technique applied to modulator design. Full how-to-do-it details are furnished for a unit using a pair of '10s in push-pull, driven by a pair of '45s in Class A. Commercial transformers are not yet available (neither are zero-bias triodes) so full information on winding the interstage and output transformers is included. The need for good power-supply regulation is stressed, an unnecessary requirement for the inefficient Class-A modulators of contemporary gear.

☐ In "Improving the Receiver Using a Screen-Grid Coupling Stage," Howard Cassler uses the tickler coil of the regenerative detector for inductive coupling from the r.f. "coupling stage for improved impedance match and better performance. (Common practice was to use a screen-grid tube between antenna and detector, with "untuned" input and tuned impedance coupling between r.f. and detector.)

☐ Old timer John Reinartz, W1QP, returns to print with "The Crystal Monitor." John takes a 1000-kc. push-pull crystal oscillator, adds a couple of cross-connected capacitors and ends up with a squegging crystal standard that provides many more calibration points than usual.

☐ "In the Field With IPH" is the account by Bernard Sandham, W6VO, of the second leg of the expedition surveying the proposed International Pacific Highway route. This 3-month journey was from Mexico City to La Libertad, El Salvador, and much credit is given to hams across the U.S. for helping to relay traffic and press.

25 Years Ago

December 1956

☐ The editorial points out that just 35 years ago the League-sponsored trans-Atlantic receiving tests were conducted and were successful. Receiving expert Paul Godley was sent to Scotland, where he set up a tent and antenna, and copied signals from more than 30 U.S. amateurs. The editorial also points out that Sumner B. Young's 10-page "Foreword to Volume V of *QST*," in this issue, by happy coincidence covers the preface and aftermath of those historical tests. The editor says, "What was almost an incredible achievement in 1921 is now a common occurrence, so that today even the newest Novice can work a G as his very first contact."

☐ Louis Hutton, WØRQF, describes his unit for "Automatic Antenna Tuning for the Amateur." Separate reversible motors driving the L and C in the antenna network are controlled by phase and resistance detectors to resonate the antenna and provide a 50-ohm load for the line to the transmitter.

☐ Ed Tilton, W1HDQ, reports on "Polarization Effects in V.H.F. Mobile" and makes a good case for trying horizontal polarization on 6 and 2, especially for distances over 50 miles.

☐ A "Technical Topic" by W1HDQ discusses "Linear Amplifiers for the V.H.F. Man," pointing out that they are being eyed by many QRP a.m. operators. Ed reviews the power-level considerations involved, along with the adjustment techniques.

☐ The "Phased Array for 40 Meters" of A. E. Lux, W7RTP, uses two folded dipoles as inverted Vees, 1/8 wavelength apart. Phasing networks in the shack ends of the feed lines are reversed to flip directivity.

☐ L. J. Jensen, WØMIQ, finds "The 4X150A as a Grounded-Grid Linear" suits his needs for medium-power s.s.b. operation. The unit he describes is compact and complete with power supply.

☐ Lew McCoy, W1ICP, shows how rock-bound Novice operators can jump around conveniently by adding "A Simple Crystal Switcher" to their rigs. Mac's design provides for several different types of crystal holders.

☐ "The Poor Man's Signal Slicer" of Sam Canter, W6TSQ, uses the Murray Crosby triple-triode product detector at 50 kc., with a crystal-controlled conversion from the receiver i.f. The author finds the added selectivity of the 50-kc. transformer and the signal-handling of the detector make s.s.b. and c.w. copying a pleasure.

☐ "Modernizing the C.W. Clipper-Filter," as done by Laird Campbell, W1CUT, involves taking George Grammer's 6-year-old design and adding adjustable threshold to the clipper, together with improving the selectivity of the filter. Switching offers four modes of operation.

☐ "A Low-Noise Preamplifier for Satellite Tracking" is described by V. R. Simas of the Naval Research Lab. Cascaded grounded-grid triodes are used, and typical noise figures are given for five tube types.

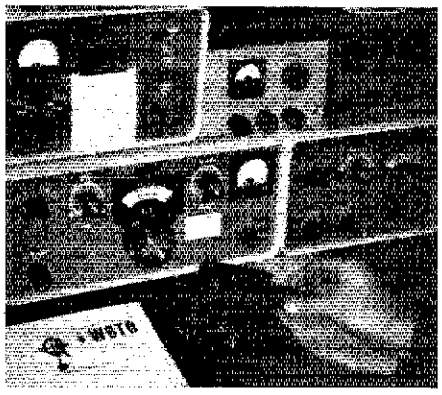
☐ "One Island — Two Rare Countries" is Reg Tibbetts' account of his operation at Sint Maarten and Saint Martin, signing PJ2MC and FS7RT. (W6ITH's report of the highly successful trip can engender only one reaction: ENVY!)

☐ "Losses in Feed Lines," by W1DX, is sub-titled "What (Not) To Worry About in Your Antenna." What a bargain! This book-length subject is completely (?) covered in just over two pages.
— *Byron Goodman, W1DX*

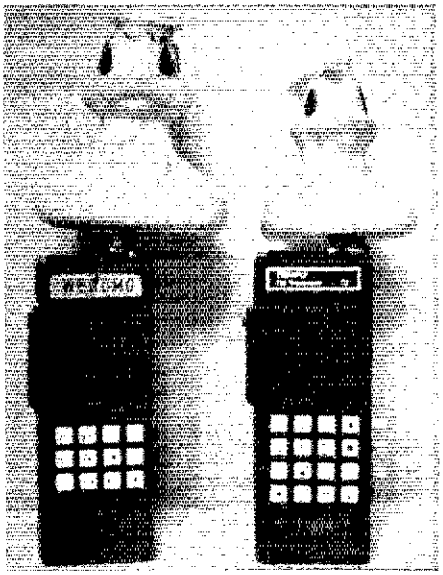
Strays

"CQ North Pole," appear to be the words of patient Daniel Erwin and John Holmes, WA5WXA, one of the Dallas (Texas) amateurs who decided to let children talk to Santa Claus via Amateur Radio. Their project blossomed into the Dallas Amateur Radio Operators' Handicapped Children's Fund, which attempts to give kids the exact gift they request. Santa's helpers, including WB5ZQT, WB5ZQS, KB5HQ, K5CYB, KJ5U, WA5SKY and WD5OQG, visited over 300 children last year, and plan to spread their holiday spirit to even more kids this season. *(information courtesy Jim Turner, WA5EWB)*

Philatelists note that this Federal Republic of Germany stamp, commemorating the 1979 World Administrative Radio Conference in Geneva, can be added to the growing list of stamps worldwide honoring Amateur Radio. *(information courtesy Hans Schroeder)*



What's the solution to cold cw fingers during winter? According to Terry Downey, W6TD, of Lone Pine, California, it's electric socks. Terry says they will almost certainly increase code speed by 10 wpm. So from now on, expect to hear no more glass fists from cooler climates, only wool fists! *(photo courtesy W6TD)*



And you thought you'd seen everything! When John Gebuhr, WBØCMC, of Omaha, Nebraska, says that his radios are using rubber-duck antennas he really means it. John claims that the 220 rig (right) even squeaks at a higher frequency. *(photo courtesy WBØCMC)*

HOLDUP HEROES

☐ The "long arm of the law" only had to reach four blocks last August because of Amateur Radio assistance. Jeff Karger, KC2AG, observed a bank heist in progress in Riverdale, New York, and relayed the information to Gus Levy, W2LAP, via a local repeater. Gus immediately called the police who apprehended the three armed suspects very quickly thanks to descriptions and the pinpointed escape route provided by KC2AG (who followed the gunmen!). So nothing exciting ever happens on 2 meters? Bet that sentiment won't be voiced on the Westchester FM Repeater Association's 31/91 machine for some time!
— *Gus Levy, W2LAP*

MOVING? UPGRADING?

☐ When you change your address or call sign, be sure to notify the Circulation Department at ARRL Hq. Enclose a recent address label from a *QST* wrapper if at all possible. Address your letter to Circulation Department, ARRL, 225 Main St., Newington, CT 06111. Please allow six weeks for the change to take effect. Once we have the information, we'll make sure your records are kept up-to-date so you'll be sure to receive *QST* without interruption. If you're writing to Hq. about something else, please use a separate piece of paper for each request.

Club Corner

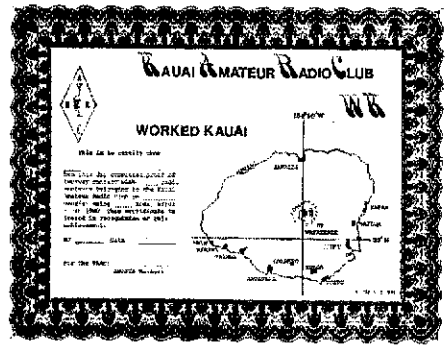
Conducted By Sally O'Dell,* KB1O

100% CLUBS

Affiliated clubs meet specific requirements to maintain their status. Each year they (1) return a completed report form early in the calendar year, (2) 51% of the voting members are licensed amateurs, and (3) 51% of all club voting members are full or associate members of the League. Affiliated clubs whose members are *all* ARRL members receive a handsome "100% certificate."

The clubs that qualify for this certificate are: Acadiana DX Assn., Lafayette, Louisiana; Aeronautical Center ARC, Oklahoma City, Oklahoma; Alamo DX Amigos, Helotes, Texas; A.M.T. ARC, Palo Alto, California; Ambassador ARA, Glendora, California; Arkansas DX Assn., Little Rock; Atomics International Rocketdyne, Tarzana, California; Bald Knob Brass Pounders, Beaver Dam, Kentucky; Calvary Baptist ARC, Los Gatos, California; Cape Kennedy Area ARC, Kennedy Space Center, Florida; Central Kansas ARC, Salina; Central Virginia Contest Club, Richmond; Charles E. Newton Radio Club, Griffin, Georgia; Charles River Wireless Society, Braintree, Massachusetts; Chippewa Hills ARC, Weidman, Michigan; Cleveland Wireless Association, Westlake, Ohio; Columbia ARS, Inc., Lake City, Florida; Committee for Amateur Radio, Forest Park, Ohio; Conneaut Amateur Radio Emergency Service, Conneaut, Ohio; Crystal Radio Club, Valley Cottage, New York; Datapoint Amateurs & Technicians Assn., San Antonio, Texas; Delta DX Association, Metairie, Louisiana; Eastern Connecticut ARA, Danielson; Explorer Post 204, Endicott, New York; Fairfield Community Schools ARC, Fairfield, Iowa; Friendship Amateur Radio Club, Baltimore, Maryland; Fulton County ARC, Inc., Wauseon, Ohio; Gleason Employee ARS, Rochester, New York; Hilltop Seekers ARC, Bridgewater, New Jersey; Holmdel Amateur Radio Club, Holmdel, New Jersey; Ill-Wind Contesters, Addison, Illinois; Kentucky Mountains ARC, Hazard, Kentucky; Lake Area Radio Klub, Watertown, South Dakota; Lake Cumberland ARA, Somerset, Kentucky; Lakes Area ARC, Jasper, Texas; Laughery Valley ARC, Sunman, Indiana; Long Island DX Assn., Brooklyn, New York; Los Angeles ARC Elec. Assn., Carson, California; Loudon County ARC, Lenoir City, Tennessee; Mason County Radio Club, Ludington, Michigan; Maui Amateur Radio Club, Kahului, Hawaii; Memphis DX Society, Memphis, Tennessee; Mid-South DX Assn., Germantown, Tennessee; Morris Radio Club, Whippany, New Jersey; National Capitol DX Assn., Derwood, Maryland; Norfolk Radio Club, Norfolk, Nebraska; North Alabama DX Club, Huntsville; Northeast Mississippi ARC, Inc., New Albany; Northeastern Indiana ARC, Auburn; OBP Radio Club Chapter #1, St. Ann, Missouri; Ohio Valley ARA, Cincinnati; Orange Amateur Radio Club, Inc., Orange, Texas; Order of Boiled Owls, East Quogue, New York; Order of Boiled Owls of Ohio, Columbus; Pacific Radio Amateurs Transmitting Soc., Kan' Ohe, O'ahu, Hawaii; Philadelphia Electric Employees Assn. ARC, Philadelphia, Pennsylvania; Phoenix Amateur Radio Tech. Society, Uniondale, New York; Pickens Amateur Radio Club, Jasper, Georgia; Point Radio Operating Society, Pittsburgh, Pennsylvania; Port City Amateur Radio Club, Portsmouth, New Hampshire; Potomac Area VHF Society, Damascus, Maryland; Providence Radio Association, Inc. Johnston, Rhode Island; Radio Amateur Transmitting Soc., Nashville, Tennessee; Radio Operators' Assn. of New Bedford, Marion, Massachusetts; Red Stick DX Assn., Baton Rouge, Louisiana; St. Louis Amateur Radio Club, St. Louis, Missouri; Scarborough ARC Inc., Scarborough, Ontario; Sheboygan County DX Assn., Sheboygan, Wisconsin; Shelby Amateur Radio Club, Shelby, North Carolina; Skokie Six Meter Indians, Skokie, Illinois; Smokey Mountain Amateur Radio Club, Maryville, Tennessee; South East Oklahoma ARA, Hugo; South Jersey Contest Coalition, Glassboro; Southern California Contest Club, Simi Valley; Southern Sierra ARS, Tehachapi, California; Springbrook Operating & Transmitting Soc., Nashville, Tennessee; Texas DX Society, Houston; Tioga Repeater, Inc., Owego, New York; Tri City Amateur Radio Assn., Vineland, New Jersey; Twin City DX Association, Maple Grove, Minnesota; Uncle Floyd Radio Club, Glendale, New York; University of California ARC, Berkeley; Verde Valley ARA, Clarkdale, Arizona; Vermillion Amateur Radio Club, Ely, Minnesota; Virginia Century Club, Portsmouth; W/K ARC of Greater Milwaukee, So. Milwaukee, Wisconsin; Waltham Amateur Radio Assn., Waltham, Massachusetts; Warrington Area Repeater Assn., Warrington, Pennsylvania; West Virginia DX Association, Charleston; Wichita Amateur Radio Club, Haysville, Kansas; Windblowers VHF Society, Totowa, New Jersey; Winnipeg DX Club, Winnipeg, Manitoba; Wisconsin Nets Assn. Ltd., Wisconsin Rapids; Woodland Baptist ARC, Louisville, Kentucky; York County ARS, Rock Hill, South Carolina; Wyndmoor Repeater Club, Oreland, Pennsylvania.

*Club Program Manager, ARRL



You could earn one of these attractive certificates after a few QSOs with Hawaii. Write (s.a.s.e.) KARC, Box 548, Kalaheo, HI 96741 for details.

In Training

Conducted By Steve Pink,* KF1Y

UPGRADING OR DEGRADING?

These days instructors have been asking themselves an important question: "Should I teach my students the theory and regulations necessary to be knowledgeable ham radio operators of a certain license class, or should I teach them only to pass the FCC exam?" These two questions used to amount almost to the same thing. The FCC supplied a syllabus in the form of a Study Guide for each license level, and the various license manuals would cover each point on the syllabus with text and study questions. These license manuals taught electrical concepts and applications of formulas that would allow the student to answer the specific FCC question by *applying* the general knowledge learned in the manual or course.

But FCC exams changed and, many say, became more difficult. It became a chore to learn the theory well enough in general to answer the specific questions on the test. Thus, when the questions that actually appear on the tests and their answers were published, students were tempted to take a shortcut. It is, for many, easier to memorize the exact questions and answers than to learn the theory and how to apply it. It is a common rationalization of this activity that memorizing the questions and answers on the test is, after all, really learning the theory. And, of course, it is not. One does not learn to apply a reactance formula, for instance, by knowing the answer ahead of time. Another common rationalization is to convince oneself that one will learn the material after the new ticket has come in the mail and one has had experience with the new privileges. This is not to say that one's intentions were not honorable while making this resolution. But we all know that limitations on our time for Amateur Radio can prevent one from doing anything *except* operating with those new privileges.

In the end it is Amateur Radio — all of us — who pay the cost of poorly trained operators on our bands. It *is* important to increase our ranks and encourage upgrading to higher license classes. But are we really strengthening the amateur service by graduating people who have not really mastered the theory and regulations? Quantity does not make up for lack of quality. We hope the tendency to taking shortcuts to an amateur license will not adversely affect the quality of our hobby.

The ARRL instructor can make an important contribution in this regard. She or he chooses the curriculum for the course and determines how the course will be taught. The training program that the ARRL has in place and is continually updating is based on the philosophy that gaining a thorough knowledge of the points on the FCC Study Guide will enable a student to pass the license exam.

The Radio Amateur's License Manual (78th edition) has been written and organized with this approach in mind. The book is divided into sections corresponding to the higher class licenses: Tech/General, Advanced and Extra Class. The FCC Study Guide syllabus for each license begins every section; text that explains each point in the syllabus follows. Study questions are included that test the student's knowledge of the material. These questions are designed to test general knowledge of the concepts, formulas and regulations: If the student can answer these questions, then he or she is ready for the questions on the FCC exam.

To help you teach a license class, we offer instructor guides that suggest a way of organizing a 10-week course that adequately prepares your students for the license test.

Shortcuts may be available to getting an amateur license, but there are no shortcuts to the training of a competent radio amateur. We in the ARRL training program will continue to strive to make excellent amateur operators out of students of ham radio. We hope that you will join us in that effort.

*Training Program Manager, ARRL

Results, Fourth Annual ARRL UHF Contest

By Mark J. Wilson,* AA2Z

This is a little more like it! Despite generally poor conditions across the country, activity in this year's UHF contest was up substantially. The post office brought us 156 official entries, up 30 percent from last year's 120 and just three shy of the all-time high from 1979. The increase in entries indicates that there is, indeed, interest in the regions above 2 meters.

As usual, 432 MHz was the "bread and butter" band on the East Coast, while 220 MHz was the place to be out west. However, a careful look at the results shows a marked increase in East Coast 220 activity. WB8BKC led the single ops on this band with 23 multipliers, while W2SZ/1 snared 38, 10 more than last year. In addition to the top single- and multi-operator scores, there is a table this year listing the top scores from participants who used one band only. Check out W3GPY's 220-only score of 42 contacts and 22 sections. Also of note: K2RIW again led the Hudson Division with his 432 MHz-only entry. That 16-Yagi array really plays!

The big single operator scores came from the East Coast this year, as two stations beat the previous single-op record. Long-time uhf enthusiast W3HQT edged out K2LNS, operating K2UYH, for top honors, breaking N6NB's three-year win streak. In the multioperator class, the W2SZ/1 group made a tremendous showing from their Mount Greylock QTH, making more than 87 kilopoints — 38,547 better than their own 1980 record multiop score. Out west, the K7AUO group operated all bands from 220 right up to 10 GHz and turned in an impressive 9300-point score.

Nine ARRL Divisions sported new single-operator records at the end of this year's contest. Next year's participants will have to work even harder to set records in the Canadian, Atlantic, Central, Delta, Great Lakes, Hudson, Midwest, Northwestern and West Gulf Divisions.

Each year, the "Best DX" in miles continues to grow. Not all stations remembered to record their farthest contacts, but those who did reported the following: *220 MHz* — W2SZ/1, 537 miles, WA8TXT, 496 miles and W3HQT, 470 miles; *432 MHz* — K2RIW, 541 miles, W2SZ/1 and WA8TXT, 496 miles, W3HQT, 475 miles and WB5LUA, 430 miles; *1296 MHz* — W2SZ/1, 421 miles, W3HQT, 370 miles and WB9SNR, 350 miles; *2300 MHz* — W2SZ/1, 91 miles and K7AUO, 80 miles; *3400 MHz and 5700 MHz* — K7AUO, 80 miles; *10 GHz* — K7AUO, 80 miles, W1VD and K1ZZ, 78 miles and W2SZ/1, 67 miles.

The microwave contacts reported above point out what can be done with relatively modest equipment. For example, the contact between W1VD and K1ZZ was made using Gunnplexers with the stock 17-dB horn on one end and a 2-foot dish at the other.

With the growing interest in uhf and the availability of commercial equipment, next year's contest should be even better.

*Assistant Communications Manager, ARRL

Multiplier Leaders

220 MHz		*432 MHz*		*1296 MHz*	
WB8BKC	23	K8WW	34	W3HQT	14
W3GPY	22	K2RIW	33	K2UYH	11
WA8TXT	21	K2UYH	33	W2PGC	11
W2CRS	20	W3OZ	33	WA3JUF	11
W3HQT	19	W3HQT	30	WA8TXT	10
W2PGC	18	WA8TXT	30	K8WW	10
WA8JHW	18	WB8BKC	29	WB8BKC	9
W9IP/4	17	W7EKI	28	K1FO	8
VE3CRU	17	WB3CZG	27	K2YCO	8
W2SZ/1*	38	W2SZ/1*	37	W7EKI	8
VE3LNX*	19	W8DJY*	26	WB9SNR	8
W3GNR*	19	W3GNR*	22	W2SZ/1*	17
				WA1UQC*	7

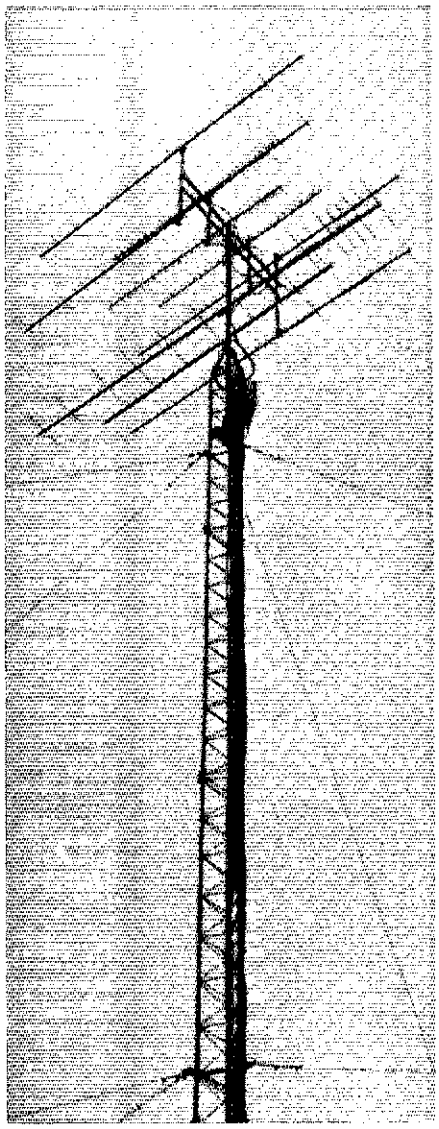
2300 MHz		*3400 MHz*		*5700 MHz*	
N6TX	2	N6TX	1	K7AUO*	6
K6UQH	2	K7AUO*	5	K7WWR*	4
W2SZ/1*	7	K7WWR*	3		
K7AUO*	5				

10 GHz	
W1VD	5
W2CRS	3
W2SZ/1*	8
K7AUO*	6

*multioperator stations

WD4MBK at the W4ATC multiop. The group spent about 50 man-hours to put North Carolina in 23 logs, but they think uhf is worth the effort.

KF5N put together this 1296 portable station, which was good for a 45-mile contact with WB5LUA during the uhf contest.



WB9SNR used this antenna system to set a new Central Division record. The 52-foot tower supports four 19-el 432 antennas, four 32-el loop Yagis for 1296, 14-el on 220 and a 2-meter Yagi.

SOAPBOX

To say it was bad would be an understatement, but I'm still enthused (N0ALV). How about starting time revision? 1100Z Saturday to 1100Z Sunday would take advantage of early morning improved propagation (N3AHI). At last — QRM on 432! (K4CHE/3). This was my first time on 432 in 20 years (W3ZZ). With all the vhf/uhf activity in the Philadelphia area, you would think that 223.5 would be busy. Not so! It was like a herd of turtles in the middle of winter (WA3AAJ). Conditions and activity were as usual, awful, except for 1296 where virtually every active station showed up. Quite an increase in activity in Ohio (WB9SNR). Score should be good for last place (K3QQ). I found the 432-MHz conditions quite poor, but activity quite good. The quality of equipment being used on 432 is improving rapidly. Rather few *do not* have ssb (K2RIW). This contest is too short. I suggest that the next ARRL UHF Contest begin at 1600Z and last for 36 hours. This would give more potential operating time to the person who works on weekends (N2CG). QRP on 432 sure is different from QRO on hf. My 5 watts worked 8 multipliers and 6 states (W2RS). The 220-MHz activity continues to look good, and this time no QSOs were on fm (K1PXE). I hurried home from a cross-country backpacking trip to the Pacific Northwest just in time to catch the last few minutes of the contest (AF1T). Murphy took his toll on WA1PBU's 1296 tonnage (again). With all the bugs out of the system, Kim expects to have 1296 operating reliably for the Sept. VHF QSO Party (K1TR). Aug. 8 temperature in Portland was 107 degrees. Rotors wouldn't work right. When 1296 collinear wouldn't work, I laid a 3-lb coffee can on the chimney and made contact with W7TYR (K7HSJ). UHF activity in Alaska is a little scarce!!! So, to amass this fantastic score, I equipped Curt, KL7IUJ, with my spare 432-MHz gear. He and his family took a Saturday drive through four 1-degree squares. My best DX was about 42 miles (KL7WE). Next year, I gotta get on 24 GHz (N6TX). I called CQ on 432 and 1296 for about 18 hours of the contest. The bands did not quite open to the mainland, but my best DX on 432 was about 205 miles to WH6AMX near Pearl Harbor. Had a very good time and will try next year (KH6HME). Nice shakedown cruise for the newly acquired N6NB red bus. Location was my favorite, Mount Hamilton (K6GSS). My closest QSO was about 75 miles and my longest about 350, so again I failed to work my own "square" (VE3FN). For the contest, I loaded up my 220 and 432 gear and headed for Kentucky. This was pretty much a spur-of-the-moment trip, and the lack of advance advertisement hurt. I have the feeling many stations didn't even look in my direction. I very much like the grid square format (W9IP). Much more contest activity than in past years. Sure makes the contest more fun with the multiplier sections being the same for everyone (WØOHU). All QSOs were made while operating mobile in my pickup truck. The longest contact on 432 was about 200 miles, and I was running 18 watts to a homebrew mini-wheel (WD8KLU). Now I know why N6NB goes east for vhf contests (K2DNR/7). Propagation was definitely below par. The Saturday morning cold front that took away our 100-degree days also wrecked propagation. Wow! The logs are a lot easier to recopy than the June contest's (WA5VJB). Had my first official 1296 QSO at 1903Z. Had to QSY to hospital at 1939Z with my pregnant wife, who gave me my first son at 2145Z. A few things are more important than uhf contesting (W3IY/4). Where were all the New England stations? I thank Marconi that SZ/1 goes there every year; without them, no one west of the Hudson would hear anyone from the Land of Nod! (W2PGC).

K4CHE put 7539 on the map, working stations on 220 and 432.

Top Scores

Single Operator

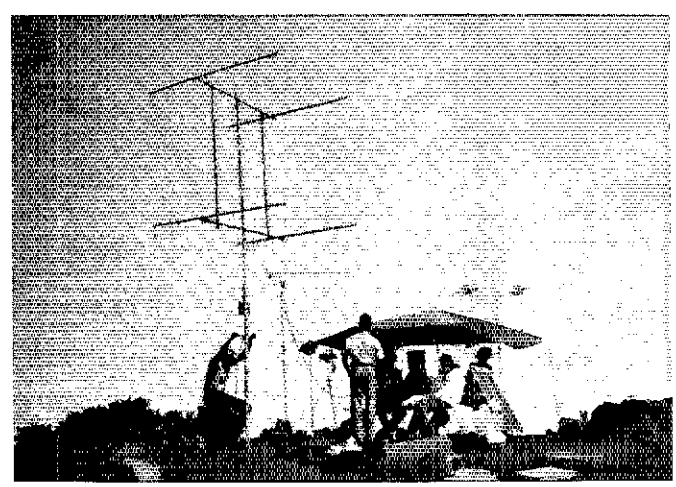
W3HQT	28,728
K2UYH	27,018
WB8BKC	17,568
WA8TXT	17,202
K8WW	12,126
W2PGC	12,087

Multioperator

W2SZ/1	87,633
WA1UQC	20,304
W1XM	10,710
W8DJY	10,449
K6TZ	10,260

Single-Band

W3GPY (*220 MHz*)	2772
W6ABW	2430
K2RIW (*432 MHz*)	9702
W3OZ	6336
K2DNR/7 (*1296 MHz*)	12



Santa Barbara ARC members went to Diablo Peak on Santa Cruz Island again this year. This time, however, they managed to find a helicopter to drop in over 500 pounds of gear. Sure beats backpacking it all up there! Antennas included four-bay quagi arrays on 220 and 432, a 28-el loop Yagi on 1296, and a 17-dB horn for 10 GHz. All equipment was solar powered.

Scores List:

Call sign, total score, QSOs, multipliers, bands operated (C = 220 MHz, D = 430 MHz, E = 1215 MHz, F = 2.3 GHz, G = 3.4 GHz, H = 5.8 GHz, I = 10 GHz).

Canadian Division

VE3CRU 9240-21-17-C-ON
31-21-D
9- 6-E
VE2BBK 462- 3- 3-C-PQ
11- 8-D
VE3FN 351-13- 9-C-ON
VE3LNX (+VE3s ADJ, IQZ)
7182-28-19-C-ON
25-16-D
5- 3-E

Atlantic Division

W3HQT 28,728-38-19-C-EPA
78-30-D
18-14-E
K2UYH (K2LNS, oprs.)
27,018-39-13-C-SNJ
87-33-D
16-11-E
W2PGC 12,087-21-18-C-WNY
32-22-D
13-11-E
WB3CZG 8733-22-13-C-EPA
47-27-D
14-12-E
W2EIF 8162-34-13-C-SNJ
33-15-D
9- 4-E
W3CXU/2 7650-18-10-C-SNJ
35-17-D
11- 7-E
WA3JUF 7584-16- 6-C-EPA
33-15-D
15-11-E
W3IP 7582- 8- 7-C-MDC
63-25-D
2- 2-E
K2GK 6510-16-11-C-WNY
30-17-D
8- 7-E
W3OZ 6336-64-33-D-MDC
N3AHI 5490-26-13-C-EPA
35-17-D
K2YCO 4320- 8- 7-C-WNY
22-15-D
9- 8-E
W3GPY 2772-42-22-C-EPA
K4CHE/3 2079-11- 7-C-DEL
22-14-D
W3CL 1890-24- 5-C-EPA
21- 9-D
W3ZZ 1248-26-16-D-MDC
K2LZF 630- 7- 7-C-WNY
6- 6-D
1- 1-E
WA3AAJ 621- 7- 1-C-EPA
16- 8-D
K3QQ 315-21- 5-C-EPA
WA3NUF 72- 8- 3-C-EPA
N3BHS 48- 8- 2-C-EPA
K3GAS 18- 6- 1-C-EPA
K2QR 12- 2- 2-D-WNY
WA3JMM 6- 2- 1-C-EPA
WA3KFT 3- 1- 1-C-EPA

W3GNR (K3TFL, KA3AWL, WA3s BUX FFC JBV, oprs.)
9384-22-19-C-WPA
34-22-D
6- 5-E
K2BWR (+K2ZRJ)
4425-21- 9-C-SNJ
32-13-D
3- 3-E
K3HKK (N3BBH, LA4LN/W3, oprs.)
3720-15-12-C-WPA
25-19-D

Central Division

WB9SNR 11,088-18-14-C-IL
44-26-D
9- 8-E
WA9YLB 2997-14-11-C-IL
23-16-D
WD9EME 540-10- 8-C-IN
5- 4-D
WB9QBH 330-11-10-D-IL
W9TFY 324- 2- 2-C-IL
8- 6-D
1- 1-E
N9BWB 294- 7- 2-C-IN
5- 4-D
1- 1-E
K9XY 75- 5- 5-C-WI

Dakota Division

W@VB 1188-10- 8-C-MN
12-10-D
W@OHU 855-19-15-D-MN

Delta Division

AA4ZZ 2736-34- 7-C-TN
14-12-D
W5UKQ 630-21-10-D-LA
W5UCY 198-11- 6-D-MS
WB4GQX 168- 3- 3-C-TN
5- 4-D

Great Lakes Division

WB8BKC 17,568-29-23-C-MI
45-29-D
11- 9-E
WA8TXT 17,202-28-21-C-OH
42-30-D
12-10-E
K8WW 12,126- 4- 3-C-OH
60-34-D
11-10-E
WA8JHW 8694-29-18-C-OH
24-17-D
8- 7-E
W7EKI 6882- 3- 1-C-OH
41-28-D
9- 8-E
W9IP/4 4752-20-17-C-KY
24-19-D
KD8Z 1200-30-20-D-OH
WA8HTL 1140-10- 9-C-MI
10-10-D
K8ATQ 810-18-15-C-OH
WB8IGY 528-16-11-D-OH
N8AXA 221- 4- 3-C-OH
7- 4-D
WB8YFE 168- 8- 7-D-MI
WA8ZCO 105- 2- 2-C-MI
5- 3-D
WD8KLU/M 45- 5- 3-D-MI
N8NB 3- 1- 1-C-MI
WB8TGY 3- 1- 1-C-MI
W8DJY (+W8UJC)
10,449-21-11-C-OH
44-26-D
6- 6-E

Hudson Division

K2RIW 9702-98-33-D-NLI
W2VC 8976-19- 9-C-NNJ
49-19-D
10- 6-E
W2CRS 8307-34-20-C-ENY
27-15-D
1- 1-E
3- 3-I
WA2TEO 3234-19- 9-C-ENY
24-11-D
1- 1-E
1- 1-F

WA2YWP 2907-14- 7-C-NLI
37-12-D
KA2BTD 2310- 8- 2-C-NNJ
47-12-D
K2SHB 2064-43-16-D-ENY
WB2WIH 1722-11- 5-C-NNJ
30- 9-D
WA2TIF 1620-36-15-D-ENY
KC2CC 1530-34-15-D-NNJ
KA1GT/2 1248-18- 9-D-NNJ
7- 4-E
K2OVS 1152-32-12-D-NLI
N2CG 1104- 6- 5-C-NNJ
17-11-D
WB2QNA 870-29-10-C-NNJ
W2RS 384-16- 8-D-NNJ
K2BJG (+WB2RFB)
3477-49-16-D-NNJ
6- 2-E
N2BOW (+N2s BMP CEI)
1755-17- 6-C-NNJ
22- 9-D

Midwest Division

KA@Y 960- 4- 3-C-IA
16-13-D
W@RT 462- 2- 2-C-KS
12- 9-D
N@ALV 12- 2- 2-D-MO
W@@RWM (+WB@NVB)
663-17-13-D-IA

New England Division

K1PXE 11,115-33-15-C-CT
68-23-D
15- 7-E
K1FO 7680-26-11-C-CT
28-13-D
13- 8-E
WB1CJT 7020-32-13-C-NH
38-15-D
4- 2-E
W1JR 5184-24- 8-C-EM
34-12-D
5- 3-E
1- 1-F
K1FWF 4830-20- 8-C-EM
50-15-D
W1GXT 2907-32- 9-C-EM
19- 6-D
3- 2-E
W1FAJ 1824-21- 8-C-CT
17- 8-D
WA1WXV 1332- 5- 2-C-CT
30- 9-D
1- 1-E
W1VD 792- 5- 3-C-CT
7- 5-I
W1AIM 720-10- 6-C-VT
10- 6-D
KA1BRD 690-23-10-C-CT
KA1DHO 540-10- 3-C-EM
10- 6-D
W1KK 378- 5- 3-C-WM
9- 6-D
K1VYU 294-14- 7-D-CT
K1EM 105- 7- 5-D-CT
AF1T 72- 3- 2-C-NH
3- 2-D

W2SZ/1 (WA1UQE, WB1CBH, WA2s AAU GFP, WB2s PKO QCJ, AG2X, N4CD, WA8USA, oprs.)
87,633-88-38-C-WM
101-37-D
24-17-E
7- 7-F
8- 8-I
WA1UQC (+KA1APR,
WA1RWU)
20,304-51-18-C-CT
65-21-D
10- 7-E
2- 1-I
W1XM (K1MK, WA4TTG, oprs.)
10,710-26-11-C-EM
52-19-D
12- 5-E
W1TKZ (K1s OGF TK UR, N2AWG, oprs.)
2622- 2- 1-C-VT
32-16-D
K1TR (+WA1PBU)
594-22- 9-D-WM

Northwestern Division

W7TYR 2079-14- 9-C-OR
9- 9-D
3- 2-E
1- 1-F
K7HSJ 1638-14-10-C-OR
8- 8-D
2- 2-E
K7RUN 105- 4- 3-C-OR
3- 2-D
N7DB 72- 3- 2-C-OR
3- 2-D
WA7UMM 36- 4- 3-C-OR
KL7WE 12- 1- 4-D-AK
K7AUO (K7UVK, W7s ADV UDM VRM, WB7FHF, oprs)
9306-12-13-C-OR
8-11-D
3- 1-E
2- 5-F
2- 5-G
2- 6-H
4- 6-I

Pacific Division

N6TX 2640- 6- 5-C-SCV
5- 2-D
12- 4-E
2- 2-F
1- 1-G
1- 1-H
1- 1-I
K6UQH 1584-10- 5-D-SCV
13- 4-E
3- 2-F
K6ELQ 270-16- 6-D-SBAR
AJ6T 156-13- 4-D-SCV
KH6HME/6 45- 3- 2-D-PAC
1- 1-E
K6GSS (multiop)
1023- 1- 1-C-SCV
18- 7-D
9- 3-E

Roanoke Division

K4QIF 6633-49-26-D-VA
9- 7-E
WA4SBC 5346-15-10-C-VA
39-23-D
W3IY/4 4929-11- 9-C-VA
26-16-D
8- 6-E
WA4ZIA 2730-10- 5-C-NC
25-21-D
K4CAW 945-21-15-D-NC
W4FJ 528-16-11-D-VA
WA4LDU 270-10- 9-D-SC
WA4WZQ/4 (+K4YBC, KA4HKK, WA4WZP, WD4GQU)
3312-27-10-C-NC
21-13-D
W4ATC (KA4HAM, N4s ELM FEP, WA4s BPJ DFS, WB4TQD, WD4MBK, oprs.)
1242- 7- 6-C-VA
16-12-D

Southeastern Division

WA4NJP 1122- 2- 1-C-GA
20-16-D
W4ODW 660- 6- 2-C-NFL
14- 9-D
W5HUQ/4 216- 9- 8-D-NFL
WB4NMA 75- 5- 5-C-GA
K4KJP 60- 5- 4-D-NFL
WD4IIS 48- 3- 3-C-GA
1- 1-D
WA4OYH (+WA4YWK)
75- 5- 5-D-GA

Southwestern Division

KC6A 2550-24- 8-C-LAX
16- 7-D
5- 2-E
W6ABW 2430-30- 9-C-LAX
N6NO 132-11- 4-C-LAX
KD6FL 108- 9- 4-C-LAX
KG6Y 48- 8- 2-C-LAX
W6OJA 27- 3- 3-C-ORG
K2DNR/7 12- 2- 1-E-AZ
K1VOW 6- 2- 1-D-AZ
K6TZ (WA6s MBZ VNN, WB6s ACU HOZ OBB OUZ, oprs.)
10,260-124-9-C-SBAR
33- 8-D
3- 1-E
2- 2-I
K6MEP (K6VMN, KD6GP, WA6IJZ, oprs.)
5796-121-8-C-LAX
17- 6-D

West Gulf Division

WB5LUA 2736-30-14-D-NTX
7- 4-E
1- 1-F
K5SW 420-14-10-D-OK
KF5N 108- 1- 1-C-NTX
4- 3-E
WA5VJB (+KA5KOI)
1380-26- 4-C-NTX
12- 3-D
4- 3-E

DXpeditions*

K7WWR/7 (+WB7CHK)
(8 locations)
2055-23-16-C-OR
20-14-D
3- 3-F
3- 3-G
4- 4-H
4- 4-I
K1ZZ (+KA1EKY)
(3locations) 324- 6- 4-C-NH/WM
3- 2-I

Check Logs

K1WJ, KA1EKY, W1AW, WB1FVS, WA2OMY, K6JKQ

***Combined scores from all locations.**

Rules, January VHF Sweepstakes

Each January, the bands above 50 MHz spring to life as thousands of vhf enthusiasts take to the airways for the weekend of the ARRL VHF Sweepstakes. This is the largest of the ARRL vhf contests in terms of entries received. Part of its popularity is that multipliers count only once, regardless of band, giving the operator with a small station a chance to be competitive.

Every year we get logs that do not contain the information we require for a complete entry. *Remember that you must enter the complete exchange for each station worked for contest credit!* Besides writing the signal report in your log, you must enter the serial number and ARRL section of each station you contact. Logs without this information will be reduced in score or counted as checklogs.

Official entry forms are available from ARRL Hq. for a 4- × 10-inch ("business size") s.a.s.e. with one unit of first-class postage. These forms will help you to include the proper information and help us to get the right information into *QST*.

The VHF Sweepstakes also provides an opportunity for your ARRL-affiliated club to submit an aggregate score in competition with other clubs. Three entries are all it takes to make the club listings, and the top-scoring single-operator station in the club earns a certificate. If your club is not affiliated, contact the Club and Training Department at Hq. to find out how to join the 2100 clubs that are.

Now's the time to start planning for a successful effort in January!

Rules

1) **Object:** To work as many amateur stations in as many ARRL sections and countries as possible using authorized amateur frequencies above 50 MHz. Foreign stations work *W/VE* amateurs only.

2) **Contest Period:** Begins 1800 UTC Saturday, January 16 and ends at 0400 UTC Monday, January 18.
3) **Categories:**
(A) **Single Operator:** One person performs all transmitting, receiving, spotting and logging functions.
(B) **Multioperator:** Those obtaining any form of assistance such as relief operators, loggers or use of spotting nets.
4) **Exchange:** W/VE amateurs exchange signal report, ARRL section and a consecutive serial number (starting with 001). Foreign stations give country name instead of ARRL section (U.S. Caribbean possessions are in the West Indies section; Hawaii and other U.S. Pacific possessions are in the Pacific section). Multioperator stations (only) may use blocks of consecutive serial numbers on each band.
5) **Scoring:**
(A) QSO points: Count two points for complete two-way QSOs on 50/144 MHz; four points on 220/430 MHz; eight points on 1215 MHz; and 16 points on 2.3 GHz or higher.
(B) Multiplier: Total ARRL sections, plus VE8/VY1, plus foreign countries *worked during the contest*, plus 10 — *not* sections per band.
(C) Final score: Multiply QSO points by multiplier total. See scoring example.
6) **FM Restrictions:**
(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted.
(B) Only these recognized simplex frequencies may be used: 144.90 to 145.10; 146.49, .52, .55 and .58; and 147.42, .45, .48, .51, .54 and .57 MHz. This restriction prohibits the use of all repeater frequencies, including 146.76 and .94.
(C) Use of the national calling frequencies 146.52 and 223.50 MHz is restricted to four hours of total operating time on each frequency, in increments not to exceed one hour each (mark clearly in log). An off period of at least 15 minutes must follow each operating period.
7) **Miscellaneous:**
(A) The same station may be worked on different bands or in different sections for QSO credit.
(B) Crossband QSOs are not permitted.
(C) Only one signal per band (50, 144, 220 etc.) is permitted at any given time; single-operator stations are allowed only one transmitted signal at any given time.
(D) Multioperator stations must locate all transmitters and receivers within a 500-meter diameter circle, excluding directly connected antennas.
(E) While no minimum distance is specified, equipment in use should be capable of real communications (i.e., able to communicate over at least a mile).
(F) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest (except for family stations where more than one call is assigned to one location by FCC/DOC — and then for family members only).
(G) Multioperator stations may not count QSOs with their own operators except on 2.3 GHz and up, and a complete different station must exist for each QSO under these conditions.
8) **Reporting:**
(A) Entries must be postmarked no late than 30 days after the end of the contest. Use ARRL VHF SS forms or a reasonable facsimile.
(B) Logs should indicate times in UTC, bands, calls and complete exchanges. Multipliers should be numbered clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include crosscheck sheets (dupe sheets).
9) **Awards:**
(A) Top single-operator stations in each ARRL section or foreign country.
(B) Top multioperator station in each ARRL section (three or more entries minimum), or where exceptional effort has been displayed.
10) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels — unlimited, medium and local clubs. Details will be listed in January 1982 *QST*.
11) **Conditions of Entry:**
(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.
(B) Disqualifications: For excess duplicates and call-sign/exchange errors. See January 1982 *QST* for complete details.

Scoring Example

Band (MHz)	*QSOs*	*QSO points*
50	25(× 2)	50
144	40(× 2)	80
220	10(× 4)	40
432	15(× 4)	60
1215	5(× 8)	40
2300+	1(× 16)	16
Totals	96 QSOs	286

Final score = (QSO points) × (ARRL sections + 10).

Rules, 1982 ARRL International DX Contest

Do yourself a favor and plan to be a part of the Number One DX Contest in all of "Hamdom" — the ARRL International DX Contest. There will be DX aplenty, judging by the turnout in the 1981 contest, which saw a record 397 DXCC country multipliers in the phone log of one of the top single-operator stations and enough different entry categories (single operator — all band, single operator — single band, multioperator — single transmitter, etc.) to make the competition for the many plaques and class winner certificates well within the reach of each and every participant. Come on out for the competition, or drop in to make a few QSOs to add to your DXCC totals. There will be room for everyone who wishes to participate on the weekends of February 20-21 for cw and March 6-7 for phone.

Use of the official entry forms just about eliminates the needless hassle of the post-contest paperwork "blizzard" at your end and makes the job of compiling the results a lot easier at our end. If you want the entry forms (summary sheet, log sheet and dupe/check sheet) we've got 'em. A self-addressed, stamped business-size envelope for U.S. amateurs or a self-addressed envelope and 2 IRCs from DX amateurs will be sufficient to get a complete set sent to your QTH. Mail early, and avoid the last-minute postal delays.

Planning a DXpedition to see what it's like from the DX station's end during the contest? If so, please let us know well in advance so we can include the information on your DXpedition in the weekly W1AW DX Bulletin.

If you participated in the 1981 contest, you're that much ahead of the pack because the rules are almost exactly the same as those in the 1981 contest. A slight change can be found in rule 8E, which now states that aeronautical and maritime mobile stations may *not* be worked by W/VE amateurs for contest credit.

Complete rules are listed below. If you've any questions on any aspect of this contest, get in touch with us here at ARRL Hq., and we'll do our best to help you out. Good luck.

Rules

1) **Eligibility:** Amateurs worldwide.
2) **Object:** W/VE amateurs work as many amateur stations in as many DXCC countries of the world as possible on 1.8 to 30 MHz. Foreign amateurs work as many W/VE stations in as many states and provinces as possible.
3) **Dates:**
(A) **CW** — Third full weekend in February (February 20-21, 1982).
(B) **Phone** — First full weekend in March (March 6-7, 1982).
4) **Contest period:** 48 hours each mode separate contests). Starts 0000 UTC Saturday; ends 2400 UTC Sunday.
5) **Categories**
(A) **Single Operator:** One person performs

all operating and logging functions. Use of spotting nets (operator arrangements involving assistance through DX-alerting nets, etc.) is not permitted. Single-operator stations are allowed only one transmitted signal at any given time.

(1) *All band.*

(2) *Single band* (one only). Single-band entrants who make contacts on other bands should submit logs for checking purposes.

(B) **Multioperator:** More than one person operates, checks for duplicates, keeps the log, etc.

(1) *Single transmitter:* one transmitter on any one band during the same time period. Stations must remain on a band for 10 minutes once a contact is made on that band, with one exception. *One* other band may be used during the 10-minute time period if the stations worked are new multipliers only.

(2) *Multi-transmitter:* no limit but only one signal per band.

(C) **QRP:** single operator, all band only. QRP is defined as 10 watts input or less (or 5 watts output or less).

6) **Contest Exchange:**

(A) W/VE stations (includes 48 contiguous United States and does not include Canadian islands of St. Paul and Sable) send signal report and state or province.

(B) DX stations send signal report and power (three-digit number indicating approximate transmitter input power).

7) **Scoring:**

(A) **QSO points:** W/VE stations count three points per DX QSO. Foreign stations count three points per W/VE QSO.

(B) **Multiplier:** W/VE stations — sum of DXCC countries (except U.S. and Canada) worked per band. Foreign stations — sum of U.S. states (except KL7/KH6) and VE1-7, VO, VE8/VY1 worked per band. Maximum of 57 per band.

(C) **Final score:** QSO points × multiplier = final score.

8) **Miscellaneous:**

(A) Call signs and exchange information must be received by each station for a complete QSO.

(B) Your call sign must indicate your DXCC country (KM6FC/1 in Maine; FGØAAA/FS on St. Martin, etc.).

(C) One operator may not use more than one call sign from any given location during the contest period.

(D) The same station may be worked only once per band — no crossmode, crossband or repeater contacts.

(E) Aeronautical and maritime mobile stations outside the U.S. and Canada may *not* be worked for QSO or multiplier credit by W/VE stations.

(F) All transmitters and receivers must be located within a 500-meter diameter circle, excluding directly connected antennas. This prohibits the use of remote receiving installations. Exception: Multiopeator stations may use spotting nets for multiplier hunting only.

9) **Reporting:**

(A) All entrants are encouraged to use official forms available from ARRL (s.a.s.e. or two IRCs) to report contest results.

(B) Logs should indicate times in UTC, bands, calls and exchanges. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs total must include cross-check sheets (dupe sheets).

(C) All operators of multioperator stations must be listed.

(D) Entries must be postmarked within 30 days of the last contest weekend (April 6, 1982). All stations are requested to send their entries as early as possible. Entries received after mid-July may not make *QST* listings.

10) **Awards:** Plaques will be awarded in the following categories for both the cw and phone contests.

(A) Top W/VE scorer in each entry category — single operator-all band, single operator-single band (1.8-28 MHz), multioperator-single transmitter and multioperator-multitransmitter.

(B) Top scorer in the single operator-all band category worldwide and on each continent. In addition, worldwide leaders in the single operator-single band, multi-single and multi-multi categories will receive plaques.

(C) Top W/VE and top DX QRP scores.

(D) Additional special plaques will be awarded as sponsored. See October 1981 *QST* for the current list and February 1982 *QST* for any additions.

(E) Certificates will be awarded to top single-operator, all-band entries from each country and ARRL section; top single-band entries in each U.S. call area and each country; top multioperator entries (both single and multi-transmitter) in each country, U.S. call area and in Canada. DX entrants making more than 500 QSOs on either mode will receive certificates.

11) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels: unlimited, medium and local clubs. Details will be listed in January 1982 *QST*.

12) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, by regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualification: An entry may be disqualified if the overall score is reduced by more than two percent. Score reduction does not include correction of arithmetic errors. Reductions may be made of unconfirmed QSOs or multipliers, duplicate QSOs or other scoring discrepancies. An entry *will* be disqualified if more than two-percent duplicate QSOs are claimed for credit. For each duplicate or miscopied call sign removed from the log by ARRL, a penalty of three additional QSOs will be deleted. The penalty will not be considered as part of the two-percent disqualification criterion. If a participant is disqualified, that operator will be barred from entering the contest on that mode the following year. The calls of all disqualified participants will be listed in the *QST* contest results.

Strays

PROJECT BETHLEHEM

☐ The CQ Radio Club of Bethlehem, Connecticut, would like to contact other clubs located near a town named Bethlehem to coordinate special holiday season operations. Contact Bob O'Neil, W1FHP, Hard Hill Rd., Bethlehem, CT 06751. — *Ronald Brooks, KA1AFN*

QST congratulates . . .

☐ Charles Anderson, NK4F, who was recently elected to the Board of Directors of the Electromagnetic Compatability Society of the IEEE.

☐ Jerry Stover, W5AE, who has been awarded the Sarnoff Citation by the Radio Club of America for significant contributions to the advancement of electronic communications.

W6VO, a member of the adventurous 1931 2nd International Pacific Highway Expedition (see Dec. 1931 *QST*), stands in front of their mobile set-up in southern Mexico. The expedition was plagued with hardship, including poor radio propagation, but succeeded in mapping out portions of the proposed highway. *(photo courtesy W8ANO)*

I would like to get in touch with . . .

☐ amateurs to correspond with me about the general topic of ham radio. Jeffery Davis, 88955 Camp D-H-3-1-2, Angola, LA 70712.

☐ anyone who contacted Jim Hammans, KC5TF, between July 1 and Oct. 19, 1981. Because of a typo on the license, I was using the wrong call. Jim Hammans, KC5TP, 16 W. 34th St., Sand Springs, OK 74003.

☐ hams who served at Fort Knox, Kentucky, in the Communications Department, Instructors Regiment, during WW II. Harry M. Garrett, W8OQY, 5230 Scenic Dr., Whitehall, MI 49461.

☐ anyone with a circuit diagram for the WO56A RCA oscilloscope. O. W. Brownlee, WD8NTA, 616 Maple St., Perrysburg, OH 43551.

☐ amateurs who were members of Luftnachrichtentruppe, especially those of Regiment 351 or 352, during WW II. George Berling, VE7EHD, Box 132, Nakusp, BC VØG 1RØ.

Public Service

Conducted By Robert J. Halprin,* K1XA

That Creative Urge

One of the recurring themes in evidence at hamfests and conventions, when traffic handlers get together, is that no one can hear anyone else. So, this column is addressed to those traffic handlers in the National Traffic System whose signal quality can only be described, in the vernacular, as puny weak. An individual in this category will check into an NTS net — on 80, 40 or 20 meters — once, twice, a thousand times, and nobody can hear him (or her). Although he may be handling traffic, this amateur just doesn't get "the message" that action is required to improve his signal.

Granted, many of us are limited by the constraints of location, ordinances and/or finances. However, anyone who wants to play a major role in NTS (at the area net level or as a member of the Transcontinental Corps) must have a good signal, and must be equipped for five-band operation. At times, it seems like traffickers regard a five-band station (and capability for more than one mode) as an impossible dream. Hardly. An effective five- (or six-, or seven-) band installation happens to be a fact of Amateur Radio operating life. Check with the DXers, the contesters and just about any other on-the-air ham; they strive to improve their signal quality and station effectiveness within their own particular constraints. And don't forget 10 MHz, which should prove to be a good traffic-handling band.

Is a good signal that hard to achieve? Your conductor operated from a city lot in Hartford (yes, within the city limits) during the IARU Radiosport Championship in July. The antenna system consisted of a tribander and a funky wire at average height. It turned out (based on the published high-claimed scores) that this modest station racked up the second-highest QSO total in the United States on cw. As a noted sportswriter used to say, "You can look it up!" The fact of the matter is that having a good signal from a city lot is definitely *not* an impossible dream. You can achieve it with a tribander, a wire and, preferably, an amplifier. A good signal is a prerequisite for any amateur who aspires to the higher levels of NTS. If you have a limited station or an ineffective signal, why inflict unpleasantness and frustration on both yourself and your fellow traffic handlers in an otherwise enjoyable operating activity? Just step aside, temporarily, until you have the wherewithal to pump out a decent signal. Another operating specialty, more suited to your station, should be found.

In most cases, if you live in an apartment or condo, you must face the fact that for you, TCC skeds are out, until you relocate. (There are exceptions, of course.) You do have the option, however, of continuing your NTS involvement from a club station or from the shack of a friend. In the meantime, you could also participate in the burgeoning number of 2-meter fm traffic nets.

On the other hand, if you live on a typical lot, and you're weak, most of your fellow traffickers will be unable to understand why you insist on torturing them. Look into yourself for what W9FC calls the "creative urge." It's the ambition for self-improvement, the all-American desire to improve one's "station in life." There is certainly enough ARRL literature on antennas for you to consult, in addition to the expertise available to you from the local hams.

Do you hear what I'm saying?

PUBLIC SERVICE DIARY

☐ Memphis, Tennessee — July 26. A seriously ill three-year-old child needed a rare formula for treatment. TG9HW contacted WA4IQL, who was able to locate the serum within Memphis, and the drug was placed on the first available plane destined for Guatemala. The child was later reported to be recovering from severe malnutrition. (WB5SNB, SCM Mississippi)

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Mendenhall Glacier Park, Alaska — September 22. A flat tire on a tour bus became a minor emergency because no commercial communications was available locally. The driver, KL7RU, called for help using KL7GPG/R, and was answered by KL7AW. KL7AW called the Transportation Dept. and the driver's company. Another bus was sent out to pick up the passengers who were scheduled to board a ship soon thereafter. (KL7JFT, EC Juneau)

☐ Breckenridge, Texas — October 13-14. Rising flood waters caused concern in and around the area, and emergency ARES hf nets were started quickly. During the two-day period, the nets handled 72 pieces of health-and-welfare traffic. (W5GPO, SEC North Texas)

☐ Murfreesboro, Tennessee — October 21. A tanker containing liquid propane gas started leaking and part of the town had to be evacuated until after the tanker's remaining contents were removed. Local ARES members assisted with not only back-up communications but also the evacuation. An emergency net was established on the WB4LHO repeater, and N4BBB and W5IMJ served as net controls stationed at the police dept. (N4BBB, EC Rutherford Co.)

Several local public safety agencies were represented when the Bayonne (New Jersey) Emergency Management ARC, W2ODV, demonstrated Amateur Radio's capabilities recently. From the left are: Nancy O'Keefe, assistant director of the Regional Emergency Communications System of Northern New Jersey; Bayonne-area EC W2KB; Newark Fire Department Battalion Chief Freda; and WA2FPO. *(photo courtesy of W2KB)*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For September, 38 reports were received denoting a total ARES membership of 19,499. Sections reporting were: Al, Alta, Ariz, Colo, ENY, Ind, Kans, Ky, La, Me, Mich, Minn, Mo, Nev, NH, NLI, NFla, NTex, Ohio, Ont, Org, RI, SV, SDgo, SBar, SJV, Sask, SCV, SC, SFla, SNJ, Tenn, Va, WMass, WNY, WPa, WVa, Wis.

COMMUNICATIONS SERVICE OF THE MONTH

Rescue at Sea: For Kenneth Gaskill, third engineer aboard the tanker *Puerto Rican*, the situation was serious and could have had a tragic ending. It didn't because the captain, WA6PVB, had the foresight to set up an excellent amateur station aboard his vessel.

At 2230 local time, July 29, the *Puerto Rican* was some 240 miles from the East Coast of the United States, enroute from Puerto Rico to Wilmington, North Carolina. WA6PVB was listening to the Seafarer's Net on 14.313 MHz, and Ken was on duty in the engine room when he became aware that a bone

*Assistant Communications Manager, ARRL

Meet Gene Santoski, K9UTQ, section traffic manager for Wisconsin. *(K9ZZ photo)*

was stuck in his throat. After the 49-year-old engineer reported his condition to the captain, WA6PVB and the other officers applied various first-aid techniques to try and dislodge the bone. Ken was breathing comfortably, but was in considerable pain, and no one knew if or when his condition would worsen to the point where his life would be in imminent danger.

The following is an account of the events that took place aboard the *Puerto Rican* on July 28 and in the early morning of July 29.

2245 — WA6PVB contacted KA9ALE, the net control of the Seafarer's Net. Because the tanker's location was extremely unfavorable for good propagation on 20 meters, it was necessary for several other amateurs to become involved, and K4MH, N4DIM and W5MWJ stood by willingly to relay the emergency traffic to N4BMK in Miami.

WA6PVB's objective was to contact the Coast Guard to initially obtain some medical consultation from their doctors and then to possibly arrange for Ken's evacuation from the ship. Soon N4BMK had enough information and was able to contact the Coast Guard by telephone. WA6PVB later commented that there were several other amateurs who helped that night, but, because of the tenseness of the situation and the speed with which the contacts were made, some did not find their way into the log.

July 29, 0000 — By this time, the *Puerto Rican* was located at 31° 06' N, 76° 00' W. The Miami Coast Guard had consulted the doctors, and everyone felt that Ken should be evacuated from the tanker as soon as possible. Propagation was becoming nearly impossible on 20 meters, so WA6PVB, N4MH and N4BMK decided to change to the 40-meter band to work Miami direct. WA6PVB next used cw on the commercial frequency, but he emphasized that the commercial band would have been virtually useless at the onset because of the probable loss of information through all the relays. At this hour, Ken's condition was still stable, and the *Puerto Rican* was advised to divert its course to Jacksonville, Florida, approximately 270 miles away.

0030 — WA6PVB contacted the Miami Coast Guard again on the commercial frequency using cw, and he was told to again change his course, this time to Wilmington, North Carolina, the original destination. Helicopter 1496 was dispatched from Portsmouth, Virginia, to intercept the ship, but since the *Puerto Rican* was just in the fringes of the helicopter's range, a C-130 plane was dispatched as well.

0500 — Using direction-finding techniques, WA6PVB established contact with the C-130. Thirty minutes later, at 0530, voice contact was made with the helicopter.

0605 — Perhaps the most exciting part of the rescue was about to take place. From a precarious position overhead, a wire basket was lowered from the helicopter to the deck of the tanker. Ken was successfully hoisted to the plane and was soon on his way to the New Hanover Hospital in Wilmington, where he received the appropriate treatment and was eventually discharged. Fortunately, the weather was favorable, with winds about 15 knots out of the southwest. Although it was the first evacuation by helicopter for the *Puerto Rican*, WA6PVB remarked that the task was a relatively easy one because of the excellent prearranged procedures and manner of operation by the Coast Guard personnel.

No doubt, there are in the log books of private yachts and commercial vessels alike, accounts of rescues much more dramatic and spectacular than this one. Possibly Ken might have been treated through the advice of doctors who had already been contacted by the amateurs on the 20-meter net. Certainly, many of the crewmen aboard the *Puerto Rican* became aware of the valuable services that Amateur Radio is capable of providing, and the net managers of the Seafarer's Net as well as the United States Coast Guard can congratulate themselves on another job well done. — *Linda M. Turner, WD4OCI, Yacht* Moon Shadow

THIRD-PARTY TRAFFIC TREATIES

Here is the latest list of countries with which U.S. and Canadian amateurs may legally handle third-party traffic.

U.S. Agreements

North America	Canada
	Costa Rica
	Cuba
	Dominican Republic
	El Salvador
	Guatemala
	Haiti
	Honduras
	Jamaica
	Mexico
	Nicaragua
	Panama
South America	Argentina
	Bolivia
	Brazil
	Chile
	Colombia
	Ecuador
	Guyana
	Paraguay
	Peru
	Trinidad and Tobago
	Uruguay
	Venezuela
Europe	4U1ITU
Asia	Israel
	Jordan
Africa	Ghana
	Liberia
	The Gambia
Oceania	Pitcairn Island*

*Informal agreement. See "League Lines," October 1981 *QST*, for details.

Canadian Agreements

North America	Costa Rica
	Dominican Republic
	El Salvador
	Guatemala
	Haiti
	Honduras
	Jamaica
	Mexico
	Nicaragua
	United States
South America	Bolivia
	Chile
	Colombia
	Guyana
	Paraguay
	Peru
	Trinidad and Tobago
	Uruguay
	Venezuela
Europe	None
Asia	Israel
Africa	None
Oceania	Australia.

Keep in mind that during emergency situations, special, *temporary* third-party agreements are often established between the countries concerned. W1AW carries information on these temporary authorizations. When in doubt, monitor W1AW.

REPEATER LOG

According to reports received between September 21 and October 21, the following repeaters were involved in the delineated public service events.

	Weather Emergency	Criminal Activity	Medical Emergency	Vehicular Emergency	Search and Rescue	Fire	Public Safety Events	Drills/Alerts	Power Failures	Total
K1FFK	1				1					2
KA1AAP							1	1	1	3
WC1RAC								4		4
WA1DGW					3	1		2		6
WR1AIE							1			1
W1XJ							1	5		6
K1BA							1			1
K1HF							1			1
K1YJG							1			1
W2VL					9	2			1	12
WR2ADJ					4		1			5
VE2RM							1			1
WB2NQV				2	3			1	1	7
W2SEU							1			1
WR2AGH							1			1
KC2CY	1				2			2		5
WB2ZII							1			1
WR3ABI							1			1
WA3GMS							1			1
WR3ABI							1			1
N3AIA				1	2					3
K3JSZ					2			13		15
WA3ZXG								6		6
W3CWC	1				8		1	2	6	18
N4CKE								1		1
W4LBL					30					30
WB4LET					5			5		10
NN4N					1					1
WB4QES	4	3	5	47	1			11	3	74
W4VQA							1			1
WA4GLG							1			1
WR4ANO							1			1
WB4FUS							1			1
K4NLX							1			1
WB5VFF					1					1
W5RVT					3				1	4
VE5SS							1			1
K6KSU							1			1
WB6FUB							2			2
N6BAE							1			1
N6AUB	1					1	1	5		8
WB6MMJ					1					1
KH6HHG					1			5		6
WA6ATY					1					1
WA6EUZ					3	1				4
W6WGZ							1			1
WA6WTT			1		5					6
W7IXF							1			1
WR7ACE					2	1				3
W7WGW					2		1			3
W7LJN							1			1
WR8AES							5	4		9
WR8ADO								5		5
W8NXD									1	1
WB8WXE							1			1
WR8ARB					3					3
WR8AJL							1			1
WD9DWI							1			1
WR9ADU	1									1
WR0AFT							1			1
WB0CMC				3	4	1		3	2	13
WR0AMX	60									60
W0VQR				1		1		1		3
WR0ADD								1		1
W0ZVX								1		2
TOTAL	69		4	12	145	9	1	46	77	8	371

NATIONAL TRAFFIC SYSTEM

The following were awarded 4RN/c4 certificates by manager W4SHJ: AA4EI AB4S K4BAI K4EV K4JM K4JST K4KNP K4SCL K4ZB K4ZK KE4O KF4R KF4U KP4F KP4FBT KZ4K N4EC N4KB N4PQ N4RF NB4L NC4H NJ4L W3ATQ W4ANK W4CZN W4GOG W4NFK W4NTO W4PCN W4PIM W4UQ W4WXA WA4CCK WA4SRD WA4STO WB4FDT WB4FLT WB4PNY WD4AWN WD4DNC WD0EKS. TEN/c2 certificates went to VE5AAT WA0AOY WA0AUX WD0BQG VE4JA KB0MB WB0QAM W0QMT WA0RWM WB0SXM WB0SXN WA0TFC VE5UX.

September Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	30	810	27.0	.633	86.7	
CAN	30	669	22.3	.322	100.0	
PAN	22	234	12.8	.403	40.8	
Region Nets						
1RN	57	339	5.9	.304	72.2	100.0
2RN	60	290	4.8	.302	89.7	93.3
3RN	30	127	4.2	.313	97.8	56.7
4RN	60	504	8.4	.202	76.1	90.0
RN5	30	264	8.8	.289	91.2	100.0
RN6	87	478	5.5	.255	61.1	85.0
RN7	60	464	7.7	.604	95.6	83.3
8RN	56	204	3.6	.297	73.3	96.7
9RN	60	272	4.5	.273	100.0	100.0
TEN	30	182	6.1	.188	74.4	100.0
ECN						83.3
TWN	54	189	3.5	.341	45.3	60.0
TCC						
TCC Eastern	109[1]	501				
TCC Central	86[1]	401				
TCC Pacific	80[1]	248				
Cycle Four						
Area Nets						
EAN	30	1678	55.9	1.516	96.1	
CAN	30	746	24.9	.794	100.0	
PAN	30	969	32.3	.970	97.2	
Region Nets						
1RN	48	639	13.3	.576	91.0	90.0
2RN	89	567	6.4	.490	90.7	93.3
3RN	60	267	4.5	.488	98.3	100.0
4RN	60	665	11.1	.599	92.0	100.0
RN5	60	558	9.3	.451	89.8	100.0
RN6	60	631	10.5	.365	100.0	98.3
RN7	60	638	10.6	.965	95.3	98.3
8RN	57	326	5.7	.199	91.0	96.7
9RN	60	469	7.8	.362	98.0	100.0
TEN	60	238	4.0	.276	74.8	100.0
ECN	60	220	3.7	.397	92.8	96.7
TWN	60	444	7.4	.361	96.2	95.0
TCC						
TCC Eastern	104[1]	721				
TCC Central	80[1]	301				
TCC Pacific	113[1]	682				
Sections[2]	6352	25,251	4.0			
Summary	7746	40,908	5.3			
Record	8955	51,307	15.2			

[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (217): APSN ATN (AB), ABN ACN ASN SN (AK), AENB AEND AENJ AENK AENM AENZ (AL), ATEN SWN (AZ), NCTN (CA), CN CPN NVTN RTN WCN (CT), FAST FMSN FMTN FPON FPTN MEN PEN QFN QFNS SPARC SWFTN TPTN (FL), CGVHFN CVEN GCN GSN GSSBN GTN (GA), I75MN ICN INPMN ITEN TLCN (IA), BSN IMN MSN (ID/MT), ILN (IL), IGN IPN ITN QIN (IN), KPN KSN (KS), 3ARES 4ARES 5ARES 6ARES 11ARES BARES CARN CCEN KEN KNTN KRN KSN KTN KYN KYPON MEN MKPN PAEWTN PAWN SEKEN TSTMN (KY), EM2MN EMRI EMRIPN EMRISS HHTN NEEPN NENN (MA/RI), MEPN MMN MTN WRIN (MB), MEPN (MD), AEN MPSN NSN PTN SGN SPSN (ME), MACS MITN MNN QMN UPN (MI), MSN MSPN MSSN (MN), APN (MR/NF), MN MSBN MSN MTN (MS),4CARES C2MEN CMN CN CNCTN CNN JFK PCTN RARS THEN (NC), MNARES NCHN NEMOE NSN PARC2MN PVTN WNN (NE), GSFM GSPN (NH), NJPN NJVN NWNJVN OBTTN UCETN (NJ), NSN (NV), BAVHFN CDN CNYTN EPN HVN NLICW NLIPN NLIVHFN NYPON NYS OCTEN SCVHFN SDN STAR WDN (NY), ALERT BN BRTN COARES FRCN HCARES 06MN ONN OSN OSSBN SCARES TATN (OH), OFON OLZ ONON OPEN STN (OK), KTN LN OLN OPN OSN (ON), ORARES (OR), D3ARES D6ARES D10ARES EPA EPAEPTN LCARES PFN PTTN (PA), QSN WQVUARES (PQ), S2MN SCNTN SCSSBN (SC), SATN (SK), TNCW TNPN TNVN (TN), DFW TEX TJN TSN TTN (TX), BUN UCN (UT), VLN VN VNTN VSBN VSN (VA), VTN (VT), PSTS WSN (WA), WINC WINS (WE/IN), BWN NWTN WIN WNN WSBN WSSN (WI), WVARES WVHN WVMN WVN WVNN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

1	2	3	4	5
Cycle Two				
TCC Eastern	120	90.8	1002	501
TCC Central	90	95.6	646	401
TCC Pacific	120	66.7	494	248
Summary	330	84.4	2142	1150
Cycle Four				
TCC Eastern	121	85.9	1342	721
TCC Central	90	88.9	656	301
TCC Pacific	120	94.2	1361	682
Summary	331	89.7	3359	1704

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (September) *Cycle Two* — Eastern Area (N2YL, Director) — K1s CE EIC, N1BHH, W1s QYY XX, N2YL, AH2M, KO2H, W2XD, WA2SPL, K3JSZ, WB3GZU, WA4CCK, WB4PNY, AF8V, W8PMJ, WB8YDZ, VE3s GOL HTL QI. Central Area (W9JUJ, Director) — WD4HIF, K4VM, W4OGG, W5s CTZ KLV, KB5TC, N5AMK, WA5EQQ, WB5s NKC OXE YDD, K5s BNH KJN, W9s HOT JIJ JUJ. Pacific Area (WØHXB, Director) — W5JOV, KA5DDW, WB6EIG, KM6I, KT6A, W7s DZX GHT TGU VSE, WA7GYQ, WØs EJD HXB, WDØAIT, KØDJ. *Cycle Four* — Eastern Area (W2CS, Director) — K1EIR, N1BHH, W1s EFW NJM TM, WB1CPF, AH2M, KB2KW, N2YL, W2s CS FR GKZ XD, WA2SPL, W3s FAF PQ, WB3GZU, W4UQ, K4s KNP ZK, KB4N, WB4PNY, AF8V, W8PMJ, WB8s ITT WTS YDZ, N8XX, VE3s ATU CWA GOL. Central Area (W5GHP, Director) — W4s WXH ZJY, W5s RB SBE, N5s BB BT RB TC, K5s GM TL, KB5W, KC5SF, W9s CXY DND, WB9UYU, AEØR, WØs AM HI, KØEZ. Pacific Area (KØDJ, Director) — K5MAT, W5KH, N6s GW PZ, W6s EOT OA VZT, KN6C, KT6A, K7s HLR KSA, KN7B, W7s AK, DZX EP GHT LYA VSE, WA7GYQ, WB7NHR, KØs BN DJ, KCØD, NØIA,WØs HXB LQ OGH, WDØAIT, VE7ZK.

Independent Nets (September 1981)

1	2	3	4
Amateur Radio Teletype Society	30	635	285
Central Gulf Coast Hurricane	30	197	2277
Clearing House	30	232	400
Early Bird	30	790	366
Empire Slow Speed	30	80	373
Hit and Bounce Slow	30	104	372
Hit and Bounce Traffic	30	277	540
IMRA	26	419	1140
Midwest RTTY	30	51	168
Mission Trail	30	203	1207
North American Single Sideband		266	172
Piconet All Day Watch	155	254	2471
Southwest Traffic	29	157	1252
20-Meter ISSB	26	594	595
75-Meter ISSB	30	368	1025
7290 Traffic	46	544	3152

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll September 1981

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.

805 KA9CPA
184 K5CXP
183 KAØAID
167 WD8LRT
154 W2GLH
153 WB3GZU WD4COL
152 KA5CXW
149 WB2MCO
148 N1BHH
144 WA1TBY
142 KA3CDQ
140 W9JUJ
136 KA1ON
130 W2AHV
127 WA4PFK
125 W5DTR
123 WB4FVV
122 KB2WI KY4K
121 W2XD NG4J
120 KZ4K WD4HIF
118 W8GGX
114 WB1CPF
113 AD7G WB4WYG W2YJR K4SCL W4GPL
112 WB2ZCM WB2EAG WD4AWN
111 WB2IQJ WB1ABQ WA5RVT WA4JDH
110 W7VSE
109 WB4TZR KA1BBI
108 AG2R
W1EOF AF8V
106 N8BJD KA8CPS AA2H K7GXZ
105 WD4ALY AK1W WB7DZX WB1HIH
104 W9DM KB4WT
103 W4NWM W8VPW
102 WB5YDD KC5NN
101 WA3WIY VE3FGU
W9YCV KA4ASZ
100 WB1CRH
99 WA4SRD
98 K3JSZ WA4QXT W7LNE W2MTA WB8JGW WB1GXZ KC9CJ KA4LNA
97 KT6A
96 W1RWG WA2CUW KA4GFU WA4CCK
95 KA1BTU K3JL WD8RHU WD8IBY WD4CNQ
94 W4OGG KB5NX WA4PIZ WB8MTD N1ARI KA4MZY WDØAIT
93 WB2BNY N2CER WA2KOJ WA4STO N4EDH KB5EK AG9G N9BYK
92 VE1WF WB7TQF WD5JYI
91 WØOYH W1TN K3CR KA2BHR W4WXH KF8J
90 W3VA KK2R K2VX WA7MEL W7GHT W2BIW
WB9YPY W5KLV WB8YDZ
89 K4EV VE3DPO W4CKS K1JHC
88 KB2KW KA2GSL N2APB
87 N4DZW
86 WØKJZ N2BNB KØEZ N5TC
85 WB3FKP WAØTFC N6AWH W7JMH W7FJZ N5BT W5CTZ WA4EIC
84 AA4FG VE3GOL KA2CTU
83 W4ANK
82 KA7JEX WB8SYA KB4OZ WB2IDS
81 KB3DT W5VMP N8BQK K4IWW KA9HPQ
80 WB2PKG WB5MMI K8OZ WD5GKH
79 WB3HTW W6RNL K2GCE WD5AAH
77 W4ZJY KBØMB AC3N KY4U
76 W3DP
WA1VRL
75 K5TL
74 KP4DJ K1BSO VE3KK WA7LGN
73 KA5KRI KAØJQG KØDJ KA9IKR
72 KØSI N2XJ AFØO N8CTI
71 KB5TC WA4EYU WØRJW WA7IHS
70 W1TM N6BCY WA4LXP KA7HHJ N4PL N4BZH
69 WB2OWO KA1EMQ WA7DPK VE3LDU VE3WM N9AZI KA4BBA
68 WA8DHB N6GW
67 K2RN VE3HTL W6HUJ WB1CGK WB9YPZ
66 AA3B KA7ELI WBØQAM KC5SF
65 NØBDG WB9WGD KB6CC KC4LA K4ZN N8AUH
64 W4HON
WB4NTW WD5KBK WA8PIM K4ZB W1JP VE2GAG VE3GT WB9JSR N9ATP
63 WA3WQP N4EAM NN4D N4UF W4BSP N3ADU W9IEM
62 N1BFD K2ZM W2PZL WA8GMT
61 N7CSP KC5FX NØAJI KA5AZK K4VWK KA2JMH KA4IUM KB5UL W5VMY KA2GOH N2ARD K6YD W9JIJ KA1T KG9B
60 WD9HZF K5DY VE3BVG WD8KBW WØOTF N2WX KA4AUR WP4BDS
53 KA5IWF/T
47 KA8DEZ/N
46 N2CSB/T N8DAD/T
45 KA8IWW/N
44 KA4SAA/N
42 KA9GBG/N
41 N2CPX/T

Brass Pounders League September 1981

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: W1EOF, WP4BDS, WB4EXA, KT6A, W7LRB, W7TGU.

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
NØBQP	44	1728	286	993	3051
W3CUL	646	921	1319	61	2947
KA9CPA	38	1065	153	746	2002
WAØHJZ	21	694	80	409	1194
WA4JDH	3	499	452	10	964
W9JUJ	4	450	463	24	941
WD4HIF	7	376	395	26	804
KS6T	64	305	369	0	738
WB3GZU	37	312	324	52	724
W7DZX	4	341	343	3	691
WB7TQF	63	311	293	18	685
WB2EAG	10	224	438	16	684
N1BHH	0	305	328	42	675
KCØAS	1	542	115	9	667
W7VSE	3	340	275	10	628
W3VR	239	73	254	11	591
W1UD	6	318	208	30	562
NG4J	16	256	214	21	507

BPL for 100 originations plus deliveries:

W7TGU 225, K7NTS 116, WA3WIY 101, K7LRD 204, W1NPL 111, WD8LRT 100, KB2WI 155, W1YI 105, WP4BDS (July) 130, KAØAID 149, WP4BDS 102, K4TH (July) 120, KØPCK 128, AF8V 101, KB2HM (July) 102, WD4COL 121

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DEL.
6 — TOTAL

Operating News

Conducted By John F. Lindholm,* W1XX

ARRL, That Building in Newington

"I've got a bone to pick with the League!" quipped the obviously perturbed gentleman in a midwestern drawl, while pouring himself another glass of ginger ale at the bar. Having had much practice in dropping my call into a DX pileup during a lull in the shrieking, I didn't wait for him to catch his breath. As the glass parted his lips, I quickly interjected my query; "Are you a member of the League?" It didn't help my case. His "Of course, I am!" came with reddened face, which told me I probably wasn't going to score too many points with this exchange.

He persisted, however: "I'm really mad at the League, because . . ." Without a moment's hesitation, I discerned that priority communication called for immediate breakin. My years of 2-meter repeater operation were about to save me. As the adage, "Don't *break* unless it's an emergency," flashed before my mind's eye, I pressed on with my point: "If you are a member of the League, then you must be mad at yourself." Again, I didn't bring the figure standing before me around to my persuasion.

His wrinkled brow told me that we were still beyond the point of comprehension. Dismissing my interruptions as sophomoric, he insisted: "I'm not mad at myself. I'm at peace with myself. It's the League that I am angry with." He was close to grid current.

After a repeat instant replay of the same two-way, an expression of understanding lit up his eyes. He mellowed as his finals began to loaf, thus giving way to intelligent dialogue. The problem could now be discussed as "our" problem, for the "League" had now been properly located. He had caught my drift. He intuitively understood the point of my obstinance. The "League" is not a building hundreds of miles away. The League needn't be veiled behind the "Codfish curtain." The League's antenna can be truly an omnidirectional array reaching out to every Middlesex village and farm. The League is not a building. The League is not in Newington. The League is neither the Headquarters staff, nor the directors. Rather, the League is an alliance of radio amateurs banded together for a common cause, primary of which is self-preservation and enhancement of the service.

The above is a real-life scenario from a recent convention get-together. So is the case of the amateur who boasted, "I quit the League because . . ." You can fill in the blank with any of 1000 or more reasons. When confronted with such ego inflation, my usual response is that if anyone cares to listen, I can list another 999 reasons for quitting. But none are valid. You can't quit the League without quitting on yourself. *You are the League.* You can't quit the League without quitting on the Amateur Radio Service and your fellow amateurs. Those who quit because of some sort of unhappiness don't know what the League is. The unity of purpose is weakened by each nonparticipant.

Obviously, with a group as large and diverse as radio amateurs, there are bound to be points of disagreement. You may not be content with everything the League does. But that's the point. You can work for modification. You may even find yourself won over to the views of your adversaries. That's democracy.

Why this soapbox harangue in "Operating News"? Because your representatives in operating matters direct the operations of the Communications Department. You may need to both volunteer your services and influence the opinion of your elected officials, your section communications manager and your director. That's how the League, of which you are a part, works. The League should be everywhere. The League should speak out on operating ethics that affect the DX bands. The League should promote good operating skills in its contest program, without inflicting significant loss of spectrum from those who wish to ragchew. The League, through its field organization of over 5000 volunteers, should promote the highest ideals of public service communications. The League should be at the tip of your soldering iron. The League need be no farther away from you, the member, than the W1AW operating frequency, or the local repeater sending ARRL bulletin information . . . or your local radio club . . . or Public Information Assistant. That's where the League is at.

If, for you, the League is a building out east somewhere, perhaps it should be moved. Not necessarily geographically, but philosophically. Such "moving" requires the participation of *all* the players. Were we all *really* a part of the League, think how much easier it would make the organizational job. And, I bet, we could be much more successful!

SCM APPOINTMENT

In the North Carolina Section, Ian C. Black, WD4CNR, has been appointed to complete the term (until March 31, 1982) of Ed B. Stephenson, AB4S (resigned).

In the Connecticut Section, Peter Kemp, KA1KD, has been appointed to complete the term (until September 30, 1982) of Stanley Horzepa, WA1LOU (resigned).

W1AW NOTE

The complete W1AW winter operating schedule appears in September *QST*, page 98. A W1AW schedule also is available on request from ARRL Headquarters. Please enclose an s.a.s.e. See the "Contest Corral" section of *QST* for times and dates of W1AW Code Proficiency Runs.

FREQUENCY MEASURING TEST

For almost 50 years, the ARRL has given everyone a scheduled opportunity to compare their own frequency measuring results against those of a professional laboratory. The decision has been made, and previously announced, to end these tests with the September 13 FMT.

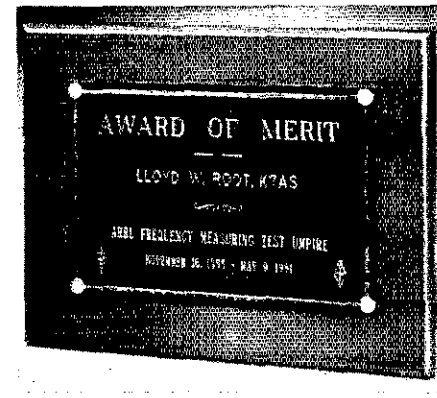
The official frequencies for the early run were — 14,098.868, 7120.809 and 3519.531; for the late run — 14,023.646, 7001.164 and 3537.150. Seventy-five participants joined us for this final FMT, submitting a total of 1150 measurements. Sixty-two measured within 100 Hz of the official listed frequencies (all entries over 100 Hz have been notified individually). They are as follows with average error preceding their calls: (0 Hz) W1JH W1PLJ W2KNU K2RG W3WD W4ANK WA4CAW W4NTO W5IJW WA5QMI W5ZTN W6CBX K6MZN W6RQ W8CUI W8NWU W9TJ W0USL (1) W1FDH W2HLO AK2S W2ND WA3RXE KY4X KA8KYR KØMOZ, ex-7HM (2) W2YTO W4HU W5SG K7VIC Potter/VE3 (3) W3BFF N4DC WB4MCE (4) WA4YCQ (6) K5GE W8ZM (7) KK7J WD4BYJ (8) NJ4O (9) K7AW (12) W4PKD (16) W1BKG (20) W6WBT (23) N1QY KK4Y (24) WA7DUY (25) W4UCL (32) WB1HIH (36) VE3BAJ (40) WA3CFC K5WG (45) W1SPP W3FYK (47) KH6CZ (51) W3GVR (52) VE7FDR (54) K4AO (65) VE2JN (66) WØOTF (82) W4YOK. Special thanks go to all the calculator aid of Brandy Kenney (CD aide).

FEEDBACK

K6MZN submitted an average error of 2 Hz instead of the 8-Hz error as reported for the May 9 FMT.

EXCERPTS

Well, I just about forgot about this one! I only had five minutes to get ready. Using a Drake T-4XC xmitter and R-4C receiver, I rigged a set-up using the xmitter as a signal generator into a dummy load, with the frequency counter hooked to a Bird sampling slug in a wattmeter that was in that line. I tuned the desired signal in on the receiver for zero beat and then adjusted the xmitter to provide a signal in the receiver of approximately the same level as the desired signal and also for zero beat. The receiver was connected directly to the antenna, and the results from the frequency counter were multiplied by a correction factor arrived at by measuring WWV at 10 MHz — the counter by itself is an inaccurate piece of junk (KK7J). I have a copy of *QST* in front of me, dated September 1931, in which it tells about the first FMT. We are all sorry to see the FMT "bite the dust," but as I said in my letter, the FMT has outlived its usefulness. We have enjoyed the program over the years, but all good things must come to an end (W6CBX). Many thanks for your past efforts (W8ZM). Wouldn't you know it, the last FMT and it would be the one when the equipment acts up! (W5ZTN). It has been great fun and, sometimes in the past, a real challenge (W4PKD). I'm real sorry that you have found it necessary to stop the FMT. I can understand that it isn't realistic to expect it to be continued for such a small percentage of the membership. It has been a very interesting activity and has challenged me to do a considerable amount of interesting construction and measurement technique work and to try and improve my results. I'll miss the activity (W3WD). It has been great fun for more than 20 years for me. Perhaps someday . . . Sayonara! (WØUSL) — *Jeannie DeMaw, W1CKK*



As reported in August *QST*'s "Behind the Diamond," Lloyd Root, K7AS, stalwart FMT umpire, retired from official rulings in May of this year. As a token of appreciation for his quarter century of service to the ARRL FMT Program (since discontinued), Lloyd received this handsome bronze and walnut plaque. Thanks for the memories, Lloyd.

*Communications Manager, ARRL

OSCAR Operating Schedule

Date (UTC)	OSCAR 9 Orbit No.	OSCAR 9 Time (UTC) Hr Mn	OSCAR 9 EQX W. Long. (Degrees)	OSCAR 8 Orbit No.	OSCAR 8 Mode	OSCAR 8 Time UTC Hr Mn	OSCAR 8 EQX W. Long. (Degrees)
1 Dec.	838	0051	159.4	19,063	A + J	0113	84.2
2 Dec.	853	0040	157.4	19,077	X	0118	85.4
3 Dec.	868	0030	155.4	19,091	A	0122	86.5
4 Dec.	883	0019	153.4	19,105	A + J	0127	87.7
5 Dec.	898	0009	151.4	19,119	J	0131	88.9
6 Dec.	914	0134	173.3	19,133	J	0136	90.1
7 Dec.	929	0123	171.3	19,147	A	0141	91.2
8 Dec.	944	0113	169.3	19,160	A + J	0002	66.6
9 Dec.	959	0102	167.3	19,174	X	0006	67.8
10 Dec.	974	0051	165.4	19,188	A	0011	68.9
11 Dec.	989	0041	163.4	19,202	A + J	0016	70.1
12 Dec.	1004	0030	161.4	19,216	J	0020	71.3
13 Dec.	1019	0020	159.4	19,230	J	0025	72.5
14 Dec.	1034	0009	157.4	19,244	A	0029	73.6
15 Dec.	1050	0134	179.3	19,258	A + J	0034	74.8
16 Dec.	1065	0124	177.3	19,272	X	0038	76.0
17 Dec.	1080	0113	175.3	19,286	A	0043	77.1
18 Dec.	1095	0103	173.3	19,300	A + J	0048	78.3
19 Dec.	1110	0052	171.3	19,314	J	0052	79.5
20 Dec.	1125	0041	169.3	19,328	J	0057	80.7
21 Dec.	1140	0031	167.3	19,342	A	0101	81.8
22 Dec.	1155	0020	165.3	19,356	A + J	0106	83.0
23 Dec.	1170	0010	163.3	19,370	X	0110	84.2
24 Dec.	1186	0135	185.2	19,384	A	0115	85.3
25 Dec.	1201	0124	183.2	19,398	A + J	0119	86.5
26 Dec.	1216	0114	181.2	19,412	J	0124	87.7
27 Dec.	1231	0103	179.2	19,426	J	0129	88.9
28 Dec.	1246	0052	177.3	19,440	A	0133	90.0
29 Dec.	1261	0042	175.3	19,454	A + J	0138	91.2
30 Dec.	1276	0031	173.3	19,468	X	0142	92.4
31 Dec.	1291	0021	171.3	19,481	A	0004	67.7
1 Jan.	1306	0010	169.3	19,495	A + J	0008	68.9
2 Jan.	1322	0135	191.2	19,509	J	0013	70.1
3 Jan.	1337	0125	189.2	19,523	J	0017	71.3
4 Jan.	1352	0114	187.2	19,537	A	0022	72.4
5 Jan.	1367	0103	185.2	19,551	A + J	0026	73.6
6 Jan.	1382	0053	183.2	19,565	X	0031	74.8
7 Jan.	1397	0042	181.2	19,579	A	0036	76.0

Orbit predictions for OSCAR 8 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, or to AMSAT nets (East Coast, Mid States or West Coast), all at 9 P.M. local time, on 3850 kHz; international net at 1800 UTC Sundays on 14,280 kHz and 1900 UTC Sundays on 21,280 kHz. OSCAR 9 predictions are for reference only. Because of its low attitude, long-range predictions are not always accurate. Use W1AW and AMSAT Bulletins for weekly updates.

O 9 progresses an average of 23.8675° W. per orbit in a period of 95.2976 minutes.
O 8 progresses an average of 25.8006° W. in a period of 103.1858 minutes.

O 8 modes of operation are Mondays and Thursdays — Mode A. Tuesdays and Fridays — Mode A + J. Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D.
Mode A + J is simultaneous operation of both transponders.

Mode J Club: Become a member of the Mode J Club. Complete eight Mode-J contacts. QSL cards are not required. Just list the call sign of each station worked, date, orbit number and station equipment used. Send this information along with $3 in U.S. funds, a one-time charge to cover the certificate and newsletter costs, to Mode J Club, c/o Larry Roberts, W9MXC, 3300 Fernwood, Alton, IL 62002.

OSCAR 8 QSL: To receive an OSCAR 8 QSL card, send a copy of the telemetry from the 29.402- or 435.095-MHz beacons. Please send your report, along with an s.a.s.e., to ARRL Hq.

Spacecraft Frequencies

Spacecraft	Uplink	Downlink	Beacon
O 8			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.402 MHz
Mode J	145.900-146.000 MHz	435.200-435.100 MHz	435.095 MHz

OSCAR 9

Hf Beacons — 7,050, 14,002, 21,002 and 29,510 kHz. On-off keying with Morse telemetry, interspersed with a carrier or continuous carrier.
Vhf Beacon — 145.825 MHz nbfm ±5 kHz. ASCII, Baudot, voice, afsk and Morse.
Uhf Beacon — 435.025 MHz nbfm ±5 kHz. ASCII, Baudot, voice, afsk and Morse.
S-Band Beacon — 2401.0-MHz nbfm ±10 kHz. ASCII, Baudot, voice, afsk and Morse.
X-Band Beacon — 10.470-GHz steady carrier. S- and X-band beacons use lhcp.

OSCAR 8

Mode A — x = uplink frequency − 116.458 MHz ± Doppler shift
Mode J — x = uplink frequency − 581.106 MHz ± Doppler shift

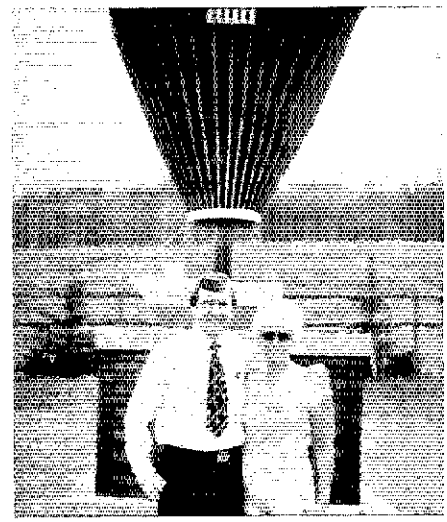
Note: A minus sign in front of the downlink frequency indicates that the passband of the satellite is inverted in that mode. This means that signals transmitted up to the satellite at the low end of the uplink passband will appear at the high end of the downlink passband. Additionally, upper-sideband signals transmitted on the uplink will appear as lower-sideband signals on the downlink.

NOTE

OSCAR 7 has not been operational since June 1981. Orbital elements and only three reference orbits will be listed on this page until further notice. Reference orbits for December 1: 32,226—0047 UTC—95.2°; Dec. 15: 32,401—0002—84.2°; Dec. 31: 32,602—0105—100.4°.

Further information on the radio amateur satellite program can be obtained free of charge from ARRL Hq. The all-new OSCARLOCATOR package is now available: $7 U.S., $8 elsewhere.

Strays



Maxie Anderson, Captain of the *Double Eagle II*, and Phyllis Davis, KA1JC, stand before a replica of the balloon that carried Anderson and two others across the Atlantic in 1978. The metal facsimile is in a park in Presque Isle, Maine, site of the launch. The Aroostook ARC sponsored a special-event operation at the park during dedication ceremonies in August. *(photo courtesy KA1JC)*

"THE EYES OF TEXAS ARE UPON YOU"

☐ Lee Young, KC5RP, and Phil Shreves, KA5IBI, were installing an antenna on a 200-foot-high tower near Del Rio, Texas, when they spotted a suspicious group hiding under nearby brush. According to the Kinney (Texas) *Cavalryman*, KC5RP (while still on the tower) used his hand-held to contact W5FLG, who alerted the border patrol. From his bird's-eye viewpoint, KC5RP then guided the patrolmen to the concealed group. Thirty illegal aliens were apprehended as a result of the quick thinking of these Amateur Radio operators, all members of the Border ARS. — *Pat Dugan, KA5GKO*

Saul Abrams, K2XA (center) is presented 5BDXCC no. 1000 by two previous recipients, John Yodis K2VV (left) and Bob Rasche, W2NC (right). All three are members of the Albany (New York) Amateur Radio Association. *(photo by Sam Dickstein, N2AKR)*

I would like to get in touch with . . .

☐ SWL hams, particularly those holding "WPE" call signs, to form a club and net. Vern Weiss II, WA9VLK, 533 S. Lincoln Ave., Kankakee, IL 60901.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1AXH, Rufus J. Foster, North Chatham, MA
W1DDI, Otto F. Persson, Lynn, MA
W1EMV, Kayla H. Hale, Costa Rica
KA1FDY, James M. Jordan, East Providence, RI
K1PVK, Thomas A. Deleo, Everett, MA
W1TO, Robert H. Parker, Augusta, ME
WA1URY, George H. Thomas, Warwick, RI
W1WAZ, Brendan J. Millikin, Groton, CT
N2AHE, Bill P. Young, Syosset, NY
K2AOS, Raoul Poliakin, Bay Harbor Island, FL
W2CDU, Vincent C. Howerdell, Point Pleasant, NJ
W2CNQ, Lowell E. White, Kissimmee, FL
WA2EHJ, William A. Eybers, Sr., Pearl River, NY
W2FEI, Martin A. Rexsen, Cedarhurst, NY
N2GM, Jeffery M. Goodwin, Allendale, NJ
KA2GVS, Jerome L. Gaynor, North Brunswick, NJ
W2HJV, Edward S. Lewis, Jamaica, NY
K2HOH, Arthur C. Boehringer, Greenwich, NY
K2LK, Albert E. Jorett, Jr., Town Bank, NJ
WA2NVK, Samuel L. Price, Vestal, NY
K2PDX, George W. Morgenroth, Essex Fells, NJ
WA2PTH, Willis Van Nosdall, Hollis, NY
WB2TNZ, Eldred L. Holley, Watertown, NY
WB2UCH, Douglas H. Harse, North Syracuse, NY
W3AHA, G. Porter Houston, Baltimore, MD
W3BGK, Effie H. Antonio, Mansfield, PA
K3GBZ, Havard R. Jones, Hatboro, PA
W3NNW, Roswell J. Parker, Clarks Summit, PA
W3QOK, Wayne H. Acton, Coraopolis, PA
*W3SW, Harry A. "Connie Mac" McConaghy, Bethesda, MD
WA3YWV, Everett G. Swaner, Cumberland, MD
ex-W4APP, Harold A. Gaffney, Miami, FL
K4BFD, Ann E. Weinstock, Miami Beach, FL
K4DE, Donald C. Mead, Jr., Greensboro, NC
W4KEN, Henry Canaday, Sarasota, FL
W4LHU, George E. Childs, Lighthouse Point, FL
WD4MXN, John J. Ventura, Fredericksburg, VA
W4NCU, E. Allen Freiburger, Falls Church, VA
W4NQL, George H. Petry, Hilton Head Island, SC
*W4OFO, Patrick L. Burt, Swansboro, NC
WD4PTT, David A. Nash, Port Charlotte, FL
WB4RZK, Robert H. Moats, Newport News, VA
W4SNR, Frank W. Hogan, Fairfax, VA
WA4WQZ, James L. Natton, Lebanon, TN
W4WWH, Frank S. McCullough, Dunnellon, FL
W5AUX, William L. Ratisseau, Jr., Galveston, TX
W5FKL, James E. Holley, Lawton, OK
WA5FQQ, J. Gary Hodges, Truth or Consequences, NM
W5IWX, Wilfred M. Bacchus, Albuquerque, NM
KA5KNL, Marie E. Ditmore, Aztec, NM
W5KT, Albert L. Kristek, Flatonia, TX
W5NXY, W. H. Moore, Cedar Hill, TX
W5TD, Arthur D. Tennant, Waco, TX
WD6AMV, Edward M. Levizon, Hawthorne, CA
W6BIL, George S. Maxey, Redding, CA
WB6BST, Paul S. Chappell, Los Alamitos, CA
WB6FBM, Richard A. Frisch, Irvine, CA
W6GIO, George H. Nonnemaker, W. Coving, CA
W6GXO, William D. Parker, San Gabriel, CA
W6IGY, Howard Harvey, Anaheim, CA
KA6JIM, Harold S. Compton, Jr., Delano, CA
N6JT, Morton Grotenstein, Upper Marlboro, MD
W6KVU, Harold V. Keith, Arleta, CA
W6OPG, Gainor E. Maxwell, Canoga Park, CA
WB6OTP, Marian V. Peak, San Diego, CA
W6QF, Robert E. Rice, Valley Center, CA
KA7EMH, Charles H. Glines, Lebanon, OH
W7IIM, Donald M. Beaudine, Sun City, CA
WA7LMA, Gordon Leavitt, Port Angeles, WA
*K7NHK, Edward W. Howe, Columbus, IN
W7PRY, Kirby H. Baldrey, Everett, WA
WB7RZL, Bruce Wren, Jr., Tucson, AZ
W7VQ, Francis E. Canning, Bend, OR
W8BJ, William W. Lamb, Sr., Wheeling, WV
W8HCW, Col. Webster F. Soules, Buchanan, MI
WA8MEY, Lester H. Henry, Kettering, OH
W9CZM, Lloyd J. Hallam, Oxford, OH
W9GF, Carl F. Thoms, Milwaukee, WI
WA9HLA, Hobart H. Keppler, Muncie, IN
KA9IKA, Walter B. Grogan, Evansville, IN
W9KWU, Richard G. Mies, Chicago, IL
W9RLA, Elmer L. Matson, East Moline, IL
W9TZG, Robert W. Settles, Hampton, IL
K9VEM, Albert W. Grand, Chicago, IL
WØBBY, Lloyd Reed, Mankato, MN
WØCZA, Marvin L. Seyffert, Troy, MO
KAØDGF, Max B. Scarborough, Ottumwa, IA
WDØEDX, Michael D. Matt, Ballwin, MO
WØFNK, William H. Bailey, Rochester, MN
KAØGGS, Steven R. Beal, Rapid City, SD
KØGNI, John W. Oksa, Embarrass, MN
WAØKQQ, Myron D. Baustian, Lansing, KS
WØKUI, Wilbur "Jim" Tabor, Welch, MN
KØMMQ, Elaine M. Babinate, Sioux City, IA
WØMOY, E. Richard Flottman, Raytown, MO
ex-WØRJL, Ray R. Hunter, Great Bend, KS
ex-KZ5MN, Max Nissenbaum, Albrook, CZ
VE2GH, Gerard F. Hudon, Hollywood, FL
VE3EZC, Clifford H. Smythe, Agincourt, ON
VE3GNV, Frank E. Benedetti, Sudbury, ON
VE3IDU, Rowland J. Smith, Petawawa, ON
VE3PY, Vernon A. McCourt, Ottawa, ON
VE3VY, Norman Abrey, Niagara-on-the-Lake, ON
VE3XI, E. George Hammond, Port Elgin, ON
VE6ON, Ralph Howard Beckman, Edmonton, AB
G3BID, Edgar M. Wagner, London, Great Britain
SM1AWD, Berndt C. Thisell, Tingstade, Sweden

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys will henceforth be confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

Special Events

Conducted By Mark Wilson,* AA2Z

December

Pearl Harbor, Hawaii: Pearl Harbor Submarine Base ARS will operate KH6SP *Dec. 5-6* in recognition of the 40th anniversary of the Japanese attack on Pearl Harbor. Frequencies: phone — 14.295 and 21.370; cw — 14.040 and 21.040. Certificate for large s.a.s.e. to KH6BD, 810 Hays Circle, Honolulu, HI 96818.

Santa Claus, Indiana: Pike County ARC and Old Post ARS will operate W9CZH from 0000Z *Dec. 4* until 2300Z *Dec. 6*. Frequencies: phone — 3.925 7.270 14.305 21.410 146.52; RTTY — 14.090-14.100. QSL postmarked at Santa Claus for s.a.s.e. to: Santa Claus, P.O. Box 111, Ireland, IN 47545.

Bethlehem, Indiana: Clark County ARC will operate W9WWI/9 from 1700Z *Dec. 12* until 1700Z *Dec. 13*. Frequencies: phone — 3.905 7.240 14.290 21.365 146.25/85. Certificate with special Bethlehem postal hand stamp for large s.a.s.e. to: Clark County ARC, P.O. Box 532, Jeffersonville, IN 47130.

West Farmington, Maine: Sandy River RC members will operate *Dec. 19-21* to give amateurs the opportunity to earn a certificate for working members. Frequencies: phone — 10 kHz up from the lower General band edge; cw — 35 kHz from lower band edge. Certificate for large s.a.s.e. to: KA1TJ, Box 504, West Farmington, ME 04992.

Bethlehem, West Virginia: Triple States ARC will operate WD8DDL/8 from 1400-2300Z daily *Dec. 17-21*. Frequencies: phone — 7.275 14.325 21.425 28.550; cw — 7.110 14.075 21.110 28.110. Special card for s.a.s.e. to: TSRAC, 26 Maple La., Bethlehem, Wheeling, WV 26003.

South Point, Hawaii: Big Island ARC will operate KH6JRM from the southernmost part of the United States, from 2200Z *Dec. 19* until 2200Z *Dec. 20*. Frequencies: phone — 7.175; cw — 1.805 7.075 7.125 14.075 21.075 21.175 28.075 28.175. Special QSL card for s.a.s.e. to: KH6JRM, General Delivery, Laupahochoe, HI 96764.

Christmas, Florida: Coronado Wireless Assn. will operate K4HML from 1500-2200Z *Dec. 19* and 1300-2200Z *Dec. 20*. Frequencies: phone — 7.281 14.281 28.581; cw — 60 kHz from lower band edge. Special QSL card for s.a.s.e. to: K4HML, Box 1, Edgewater, FL 32032.

Brant Rock, Massachusetts: AA1A will be active during *Christmas week* to commemorate R. Fessenden's two-way transatlantic radio experiments between Brant Rock and Macrahanish, Scotland. Frequencies: 80-10 meter phone bands. QSL to: AA1A, 11 Walnut St., Marshfield, MA 02050.

Rotorua, New Zealand: ZL1GGA will operate from the Girl Guide Association of New Zealand jamboree *Dec. 29 through Jan. 7*. Frequencies: 3.690 7.080 14.200 21.350 28.550. QSL to ZL1AWI.

Note: The deadline for receipt of items for this column is the 15th of the second month preceding publication. For example, your information would have to reach Hq. by November 15 to make the January issue.

*Assistant Communications Manager, ARRL

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Mark Wilson,* AA2Z

DECEMBER

1

West Coast Qualifying Run (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0500Z Dec. 2 (9 P.M. PST Dec. 1). Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify your copy was made without aid and send to ARRL for grading. Please enclose your full name, call (if any) and complete mailing address. A large s.a.s.e. will help expedite your award/endorsement.

5-6

ARRL 160-Meter Contest, Nov. *QST*, page 100.

Connecticut QSO Party, Nov. *QST*, page 106.

Telephone Pioneers QSO Party, Nov. *QST*, page 106.

EA-DX Contest, phone (this year's rules not received).

10

W1AW Qualifying Run, 10-40 wpm at 0300Z Dec. 11 (10 P.M. EST Dec. 10). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. See Dec. 1 listing for more details.

12-13

ARRL 10-Meter Contest, Nov. *QST*, page 100.

EA-DX Contest, cw.

HA-DX Contest (this year's rules not received).

27

Canada Contest, sponsored by the Canadian Amateur Radio Federation, from 0000Z until 2359Z Dec. 27. 160 through 2 meters, phone and cw combined. Single operator (all-band and single-band) and multioperator single-transmitter categories. Cw contacts in the cw band only. Work stations once each band and mode. Exchange signal report and serial number; VE1 stations must also send province. Count 10 points per Canadian QSO, one point for others. Ten bonus points for QSOs with VE stations using TCA or VCA suffix. Multipliers are Canadian provinces/territories per band and mode (VO1/VO2, VE1-NB, VE1-NS, VE1-PEI, VE2, VE3, VE4, VE5, VE6, VE7, VE8, VY1). Final score is QSO points multiplied by provinces/territories per band and mode. Suggest phone on even hours (UTC) and cw on odd hours (UTC). Suggested frequencies: phone — 3.770 3.900 7.070 7.230 14.150 14.300 21.200 21.400 28.500 50.100 146.520; cw — 1.810 3.525 7.025 14.025 21.025 28.025 50.100 144.100. Mail entries by Jan. 28, 1982, to: P.O. Box 2172, Stn D, Ottawa, ON K1P 5W4, Canada.

29

W1AW Qualifying Run, 10-35 wpm at 1400Z (9 A.M. EST) Dec. 29. See Dec. 10 listing for more details.

JANUARY

Dec. 31-Jan. 1

ARRL Straight Key Night, 24-hour period UTC (from 7 P.M. EST Dec. 31 until 7 P.M. EST Jan. 1). This is a friendly meeting on the air using straight keys. Suggested areas of operation on 80, 40 and 20 meters are 60 to 80 kHz from the lower band edge and 10 kHz from the lower edge of the Novice bands. When participating use SKN instead of RST preceding the three-digit report to clue in "passers-by." Following SKN send a list of the calls of the stations worked plus your vote for the best fist heard (not necessarily one you've worked) during that period. This is not a contest; quick contest-type exchanges are discouraged. Vote, too, for the most interesting QSO. Mail your report by Jan. 10 to ARRL Hq.

2-3

ARRL CD Party, phone, for ARRL officials and CD appointees. Details in Winter *QCD*.

Zero District QSO Party, sponsored by the Mississippi Valley Radio Club, from 2000Z Jan. 2 until 0200Z Jan. 4. Work Colorado, Iowa, Kansas, Minnesota, Missouri, North Dakota, South Dakota stations once per band and mode. Mobiles may be worked each time they change counties. Exchange signal report and QTH (ARRL section and county for Zero District stations, ARRL section for others). Suggested frequencies: phone — 3.900 7.270 14.300 21.370 28.570; cw — 60 kHz from lower band edge; Novice — 25 kHz from lower band edge. Count one point per QSO. Zero District stations multiply by total of ARRL sections, Zero-District counties and DXCC countries worked. Others multiply by Zero-District ARRL sections and counties worked. Awards. Mail logs by Feb. 15 (include large s.a.s.e. for results) to: WØSI, 3518 W. Columbia, Davenport, IA 52804.

6

West Coast Qualifying Run (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0500Z Jan. 7 (9 P.M. PST Jan. 6). See Dec. 1 listing for more details.

9-10

ARRL CD Party, cw.

Hunting Lions in the Air Contest, sponsored by Lions Clubs International, from 1200Z Jan. 9 until 1200Z Jan. 10. Contest open to Lions Club members and nonmembers. 80-10 meters, phone and cw. Phone and cw considered separate for scoring purposes. Single and multioperator categories; also competition among radio clubs and radio societies. Exchange signal report and serial number; Lions and Leo club members also send club name. Count one point per QSO with same continent, three points per QSO with different continent. No multiplier. Count phone and cw QSOs separately. Mail logs by Feb. 10 to: Lions Club of Rio de Janeiro ARPOADOR, Rua Souza Lima 149 apt. 402, 22081-Rio de Janeiro-RJ-Brazil.

First Annual 40 and 80 Meter Phone Contest, sponsored by *73 Magazine*, from 0000-2400Z Jan. 9 (40-meter event) and 0000-2400Z Jan. 10 (80-meter event). Stations may be worked once per band, phone only. No crossmode QSOs. Single operator and multioperator, single-transmitter classes. Single ops operate a maximum of 16 hours on each band; off times must be at least 30 minutes each and noted clearly in the log. Multioperator stations may operate the full 24 hours on each band. Entry categories: 40-meter only, 80-meter only and combined 40 and 80 meter. Exchange signal report and QTH (state, province or territory for W/VE stations; DX country for others. KL7 and KH6 count as DX). Count one point for each QSO within own country, two points for DX. Contacts made between 1000 and 1400 local time count double. Multiply by sum of states, provinces, territories and DX countries worked per band. Usual disqualification criteria. Awards. Mail entries by Feb. 11 (include large s.a.s.e.) to: Whidbey Island DX Club, 2665 N. Busby Rd., Oak Harbor, WA 98277.

11

W1AW Qualifying Run, 10-35 wpm at 0300Z Jan. 12 (10 P.M. EST Jan. 11). See Dec. 10 listing for more details.

16-17

ARRL VHF Sweepstakes, this issue, page 93.

International 160-Meter Phone Contest, sponsored by *73 Magazine*, from 0000Z Jan. 16 until 2400Z Jan. 17. Single-operator and multioperator, single transmitter categories. Single ops operate 36 hours maximum; multiops may operate full 48-hour period. Exchange signal report and QTH (state, province or territory for W/VE stations; DX country for others. KL7 and KH6 count as DX). Count 5 points per W/VE QSO, 10 points per DX QSO. Add 5 bonus points for each QSO made between 1000 and 1400 local time each day. Multiply by sum of states, provinces (max. 12) and DX countries (except U.S. and Canada) worked. W/VE stations avoid transmitting in 1825-1830 kHz DX window. Usual disqualification criteria. Awards. Mail entries by Feb. 18 (include large s.a.s.e.) to: 160-Meter Phone Contest, Dan Murphy, WA2GZB, P.O. Box 195, Andover, NJ 07821.

23-24

North Dakota QSO Party

Texas QSO Party

26

W1AW Qualifying Run

30-31

Classic Radio Exchange

CQ 160-Meter Contest, cw.

REF Contest (France), cw.

FEBRUARY

Jan. 30-Feb. 7 ARRL Novice Roundup

6-7

QRP Club SSB Contest

RSGB 7-MHz Contest, phone.

13-14

Two-Land QSO Party

YL-OM Contest, phone.

20-21 ARRL International DX Contest, cw.

27-28

CQ 160-Meter Contest, phone.

REF Contest, phone.

RSGB 7-MHz Contest, cw.

YL-OM Contest, cw.

MARCH

6-7 ARRL International DX Contest, phone.

*Assistant Communications Manager, ARRL

Strays

I would like to get in touch with . . .

☐ hams who are also interested in hang gliding. Todd Mitchell, NØART, 2403 Inca La., New Brighton, MN 55112.

QST congratulates . . .

☐ Kenneth Bourne, W6HK, and Don Wallace, W6AM, who have been elected Fellows of the Radio Club of America, Inc.

☐ James J. Lamb, former Technical Editor of *QST* and the inventor of the "noise silencer," who was awarded the Pioneer Citation by the Radio Club of America for substantial contributions to the success and development of the art of radio communications.

AWARD INFORMATION

☐ Write to Scott R. Douglas, KB7SB, P. O. Box 46032, Los Angeles, CA 90046, for details about the Work the Pacific, Work the Carribbean, AI-Operators Certificate of Merit and Western States County Awards.

Section Activities

A-1 OPR ≠ EC ≠ DXCC ≠ RCC ≠ WAS ≠ STM ≠ OES ≠ ORS ≠ NM SCM ≠ ARES ≠ OVS ≠ SEC ≠ OBS ≠ TCC ≠ OO ≠ NTS ≠ WAC ≠ CP ≠

CANADIAN DIVISION

ALBERTA: SCM, E. Roy Ellis, VE6XC — SEC: VE6XC. ASCM: VE6AMM. STM: VE6ABC. NM: (ATN) VE6ABC (APSN) VE6AFO. SET plans are under way with EC VE6ABC heading the Prov. group scheme. Your SCM will be in hospital at that time and miss the fun. Fall schedules are back in line with nets and clubs active. Traffic: VE6ABC 36, VE6CHK 6, VE6CAA 5, VE6YW 4, VE6QN 3, VE6XC 3.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB — Many thanks for trusting the SCM's office to me for another two years. It now makes twenty four years as SCM. VE7BGJ Wait who has read swap and shop from braille for eighteen years on BC phone net is winding his term down and VE7CJP is taking over. Dogwood Chapter QCWA has new pres VE7AOX and secy VE7DVS. Vancouver ARCs code and theory class has produced several new calls. VE7ARR is new president, secy VE7BBA. QSL bureau Burnaby ARC since postal problem they are sorting several thousand QSLs. Have you your sae there?? Traffic: VE7ZK 84, VE7EWI 38, VE7BLO 21, VE7COA 18, VE7FAZ 12, VE7FB 11, VE7BZI 6. (Aug.) VE7ZK 143, VE7EWI 64, VE7CCJ 40, VE7BLO 29, VE7BNI 6.

MANITOBA: SCM, Peter Guenther, VE4PG — ASCM: VE4JP. STM: RO. SEC: HK. NMs VJ NM TE ACX. A staff meeting held September 19, 20 should improve ARES. Net procedures was also discussed. We welcome VE4ALX to the ham bands. It is always a pleasure to hear a good fist on the cw net. Congrats to VE4AP for winning the CRRL ham of the year. Best wishes go to VE4JF on a speedy recovery in the Brandon hospital. MEPN QNI 787 QTC 16 sess. 30 MTN QNI 69 QTC 44 sess 26. MMN QNI 442 QTC 27 sess 30. WRIN QNI 142 QTC nil, sess 5. Traffic: VE4PG 39, VE4ACX 34, VE4TE 29, VE4AJE 28, VE4AAD 13, VE4JA 11, VE4FK 8, VE4ID 8, VE4CR 6, VE4NM 5, VE4LB 4, VE4NE 4, VE4ABU 3, VE4AP 3, VE4CF 2, VE4ADS 1, VE4BE 1.

MARITIME/NFLD: SCM, D. R. Welling, VE1WF — ASCM: VO1FG. NMs: VO1JN VE1WF. SEC: VE1EI. STM: open. Hospital VE1VW VE1WY; Silent Key VE1AAR. New Executive MAARC: VE1XF, pres.; VE1BXT, v.p.; VE1ASO, sec.; VE1BDM, tres. Congrats to all. LCARC held successful display at local Sportsman Show. Record month registered by CRRL Central QSL Bureau with 74190 cards shipped by VE1ASJ. Help needed on APN during winter months. Any volunteers contact VE1WF. VE1JT now operating from new QTH in rural N.B. APN: QNI 203 QTC 56 Time 359 mins. Traffic: VE1WF 285, VE1LCR/RO 40, VE1XF 27, VE1BXA 12, VE1BPM 7, VO1PR 2.

ONTARIO: SCM, Larry Thivierge, VE3GT — ASCM: VE3GOL. SEC: VE3GV. STM: VE3QI. Congrats to VE3OT who continues as ARRL Canadian Div Dir. and to VE3CDM, who was elected Vice Dir. VE3TIR/R in Timmins in process of becoming solid state rptr with help of VE3FFD and VE3FPI. VE3JHE who has become VE7 was EC Kirkland Lake, not Timmins as reported earlier. Due to site problems, the proposed rptr, VE3WRR for White River was moved to an excellent site in Elliot Lake. Frequency is 147.60/.00 and mobile coverage is expected from Bruce Mines to Espanola while base stations from "Soo" and Sudbury should have access. The Kingsmere Traffic Net on VE2KPG/R has moved the M/W night sessions to 2100 local. VE3s BQN EJW EPM II and MDL are life members of Toronto FM Society. K8JA recently enjoyed hospitality of VE3HZT and XYL VE3HZS in London. The Ottawa ARC using the call, VE3NCR, presented a very comprehensive demo of Amateur Radio at Central Canada Exhibition. VE3KDA has Advanced. The Buffalo Amateur Radio Rptr Assn. and Auburn, NY, group demonstrated splendid example of cooperation with VE3RPT and VE3YRC where mutual rptr interference problems were concerned. The Ottawa VMRCs new executive is headed by VE3FSN and consists of VE3s ABC KLX JRR CDS FN MPB CUR. It seems enthusiasm for Field Day is increasing. Condx were excellent this June and many groups reported they had best time they have had in years. On behalf of all the section's officials and appointees, our sincere best wishes for a Merry and happy Christmas. Traffic: VE3GOL 232, VE3KK 203, VE3GNW 130, VE3HGJ 123, VE3CYR 111, VE3DPO 97, VE3HTL 97, VE3QI 84, VE3GT 70, VE3FGU 56, VE3WG 55, VE3JRT 46, VE3BVG 40, VE3WM 39, VE3AJN 36, VE3DVE 36, VE3BZB 34, VE3AWE 29, VE3KCZ 24, VE3KXB 24, VE3DUK 23, VE3LNN 22, VE3FPI 18, VE3ISW 18, VE3ANJ 17, VE3LSJ 14, VE3AYZ 11, VE3LDU 10, VE3EWD 9, VE3KLX 7, VE3MO 4. (Aug.) VE3HOI 15, VE3ANJ 12, VE3EFX 6.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2PJ. NMs: VE2PJ VE2FSA. Code and theory classes are under way at many clubs and from reports all are doing well with full attendance. Congrats to VE2IJ, who was re-elected CRRL Eastern Director. VE2IJ is also our QSL bureau manager. On his first activity report, VE2GAG, (ORS) made PSHR with 64 ponts. Maintenant a une nouvelle location, VE2RBE, la repetitrice de St-Hyacinthe, couvre une tres bonne distance. Bienvenue a VE2FJZ, un nouvel amateur de la Mauricie. Traffic: VE2EC 67, VE2BP 48, VE2PJ 45, VE2FFE 41, VE2EDO 40, VE2EKC 25, VE2FKI 19, VE2GAG 15.

SASKATCHEWAN: SCM, W. C. (Bill) Munday, VE5WM — STM: VE5XC. SEC: VE5II. NMs: VE5DC VE5HG VE5OI VE5SF. September signifies the end of summer activities and the start of fall and winter events for Amateur Radio. Club meetings and Amateur Radio courses are starting up and from the new call signs showing up on the local nets, it looks like an interesting season ahead of the SK hams. The first "Garry Velestuk Memorial Marathon" was held September 12th with members of the Regina Amateur Radio Association providing communications using the vhf repeater VE5SS on 146.280/146.880 MHz. Traffic: VE5WM 10, VE5NJ 5, VE5AAT 4.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX — STM: WA3WIY. SEC: W3PO. PSHR: WA3WIY K3JL. All Delaware hams extend sympathy to KA3AUG on the passing of his XYL. N3BRT has moved to Fla. while W3DEO is now a resident of SC. WB3HYW and WB3IKK left the Wilmington area for Seaford. Thanks to K3HBP K3JL AC3T and all who helped make the Delvmarva Hamfest a success. More participation by clubs and individuals will make next year's hamfest even better. The AWARE Club announces a paid membership of 174. Can any Del. club top this? Both AWARE and DARC have fall classes underway. Interested hams should sign up for the next sessions. SEN QNI 43 QTC 3. DEPN QNI 41 QTC 6. DTN QNI 323 QTC 45. Traffic: W3QQ 65, WA3WIY 43, K3JL 39, W3DKX 34, WB3DUG 22, W3FEG 8, W3WD 7, K3ZXP 5

EASTERN PENNSYLVANIA: SCM, Karl W. Pteil, W3VA — SEC: WA3PZO. STM: WB3JYZ.

Net	Freq.	Time	QNI	QTC	Sess.
EPA	3610	7/10 PM Dy	336	160	51
EPAEPTN	3917	6 PM Dy	449	151	30
PFN	3958	5 PM M-S	238	188	26
PTTN	3610	6:30 PM Dy	182	60	28

Local and vhf nets reporting: D3ARES D6ARES D10ARES Luz Co ARES Mtg Co AREC WARCVTN with a total QNI 413 QTC 43 in 28 sess. OBS reports: KA3FKD KB3QW K3EBZ W3CL W3VA WB3FVJ. OO reports: W3GVR W3KEK. OVS report: W3GOA. PSHR reports: K3JSZ K3EBZ N3AIA N3CJP W3CL W3DP W3BUR W3GOA WA3TKU WA3WQP WB3FKP WB3FYT AA3B. New appointments: W3EEK NM D3ARESN; W3WKK NM D10ARESN; N3CJP OBS ORS; WA3ENE OBS, congrats. EPA welcomes WA3OGM WB3KUZ. EPAEPTN welcomes KA3FQT KB3UD WA3JXW WN3NIU WB3FYT. PTTN welcomes KA3BKK KA3BQS KB3UD KB3UL WA3UNX. Upgrades: WB3GZV to Extra. KA3ASG KA3EAQ KA3GJT KA3FKD, who is awaiting new call sign, to Advanced. Congrats to all. KA3DZD now N3CJP; WB3JZD now KB3UA. N3BFL, EC Monroe Co, reports 146.265/865 repeater has been moved to the State Heliport on top of Big Pocono Mt. New gear: WB3KUZ, TX-1 and oscilloscope; W3GK, a keyboard; KB3QW, IC251A; K3YD, IC25A, and replacing hf gear with all new solid state equipment. WB3FYT has new half-sloper for 75 mtrs. N3BMC has moved to Florida. New Novice ops in the Tamaqua area are KA3HDY KA3HXA KA3HXI KA3IDH. KA3IDC in Luzerne Co. WN3CDW moving to new QTH in Mountain Top. Hazelton and Lehigh Valley ARCs are sponsoring radio classes in their areas. K3JSZ, NM PTTN, advises cw tfc training courses are now available. Please contact him if you are interested. W3BUR will visit HB9-Land soon. AA3B is QRL with grad school again. W3ID hopes to have new ant up before snow arrives. AA3B, NM EPA, needs help with NCS and 3RN roster. Come on gang, give him your support. The Reading RC is celebrating its 50th anniversary, 40 years ARRL affiliated, with 5 special events, one of which will be a live TV show and a demonstration at shopping mall. N3AIA reports hams did a fine job during TMI joint exercise and received numerous favorable comments from both federal and state officials. Traffic: K3JSZ 270, W3DP 182, WA3WQP 146, W3IPX 135, W3VA 135, WB3HTW 104, AA3B 101, W3FAF 77, KA3GJT 60, N3CD 51, WB3FKP 49, WA3OFD 38, W3YZW 38, W3ID 34, W3ADE 21, N3CJP 18, AG3R 16, WB3KUZ 15, K3QXC 13, W3CL 10, WA3CKA 8, W3BUR 6, K3YD 6, N3AIA 5, K3EBZ 5, KB3QW 5, WB3FYT 4, W3PTM 4, KB3UD 4, N3AKQ 2, WA3FKD 2, AF3Z 2, WB3FVJ 1.

MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — WA3TAI and WB3LTA led FAA sponsored SET-type exercise. See the SEC report and congrats to all of you who participated. WB3GZU is the section BPL leader. KA3CWA K3KJZ KA3DBM W3GMI N5CGE were recent upgrades. KA3GXN now N3CHR. KA3BVI to KB3TF to KE3W faster than could be reported in the MEPN roll call. WB3GZU General to Advanced to Extra in 11 days. Congrats to all. N3II is busy sorting his cards for 5BDXCC. KA3GWH reports the DSSN on 3735 kHz TTh and 7:30 PM local and 6:00 PM local Sundays. KA3CDO plans to help WA3WIY activate this slow speed net on other nites. KS6X is into marathons. KA3HIY becomes an ORS-II, and WB3KJT joins the ranks as ORS. KA3FYY opines hamfests are a slow way to get special radio parts. KC3D tried the MEPN NCS job and liked it. W2CDQ enjoyed the FAR hamfest along with just about everyone else. KA3DXZ keeps hoping the horrendous workload will ease. W3ZNW is showing up now that the days are getting shorter. W3JPT was 5 weeks in Geneva operating 4U1ITU. Sorry to report Silent Keys WA3QQT K3AHB W3SW. KB3NL did a good job as director. N4DR/3 is his replacement. W3UT makes a loud sound with the horizontal antenna. WB3BFK enjoyed the Berryville hamfest along with many PON members. W3LDD finds time for traffic and DX. KA3CDQ has expanded the MEPN roll call into a nice bulletin. WA8EES and KA3CWA are his near neighbors. KB3LV is a college teacher. AK3X is building a cw keyboard. Look out! W3DQI has at least two bylines in "Auto-Call" Net/manager, sessions/traffic/QNI average. WC2 Mtr/WB3GEJ, 5/5/20.4. MDC PON/W3OYY, 4/18/22.6. WR PON/W3DFQ, 22/35/20.4. MEPN/WB3GZU 31/104/25.7. Toppers: KA3CDO W3DKX W3LDD. Others WB3BFK W3FA WA3DUM. Traffic: WB3GZU 724, KA3CDQ 188, W3FA 135, WB3BFK 53, W3LDD 52, W3UT 28, KA3CWA 15, W3DQI 10, WB3KJT 8, AK3X 7, KC3D 4, WB3LTA 4. (Aug.) KB3NL 2.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — STM: WB2LCC. SEC: W2HOB. Many fall classes are now underway, judging from the many club newsletters I receive each month. Don't forget to get me complete details on how your classes went by December 31, so I can print them in the March column. Several more classes will be starting soon. I maintain an up-to-date list of who is teaching what, so if you or someone you know just doesn't know where to go or who to contact, please give me a call. I'll be happy to refer you to the closest classes. A number of ARES groups are forwarding intersting reports of different types of communications activities they've been involved with. What is your group doing? Get it to me each month for possible inclusion in this column. Traffic: WB2IOJ 425, N2CER 169, KA2GSL 130, AA2H 115, WA2CUW 93, WB2PKG 54, W2ZQ 36, WB2GFM 31, KA2BKF 24, N2AEP 22, KM2E 18, N2CNR 16, N2CXD 13, WB2LCC 10, WA2GTJ 4.

WESTERN NEW YORK: SCM, William W. Thompson, W2MTA — SEC: W2BCH. STM: N2APB. ASCM: W2GLH. DECs: WA2AIV WA2DHZ WB2NAO WB3CUF. Appointments: (OES) WB2JAB. (EC) W2BYO Allegany, K2DUR Oswego, W2FEY Genesee, WB2JWD Tompkins, WA2NAC Steuben, K2OIU Monroe, WB2QZL Niagara, WA2VAM Cortland. (ORS) W2AE W2ICE K2NY W2TZ WB2VSJ. WA2PUU awarded Certificate of Merit for National Sports Festival III efforts. Next May 14/15 Rochester hosts Atlantic Division and New York State Convention; K2HC requests your QSL card and commitment to attend. Silent Key WA2SOZ. PSHR: N2APB N2ARD KA2BHR N2CSB KA2CTU W2GLH KA2GOH WB2IDS WA2KOJ W2MTA WB2OWO W2PZL K2RN. Reports: (OVS) K2QR; (OO) N2NW (3), WB2MMB (16), W2AET; (OBS) W2GLH K2KWK.Oneonta has new Novice crop; KC2FY Asst EC. N2APB expounded tfc at Drumlins. W2RQF 432 MHz with IC-451A. WB2LJK in Sun Run. Evac exercise at Nine Mile Point earned hams "well done" from Albany and SEC W2BCH. Greene ARC active at Labor Day Picnic; GARC Officers WB2JQN WA2RBJ. Lockport LARA has seven new Novices. Louisville, Hamburg, Elmira and Syracuse hamfests well attended. No BPL.

Net	Freq.	Time/Day	QNI	QSP	QND
NYSCN	3677	1000/Sun	36	6	4
THIN	3913	1600/Sun	45	—	4
NYPON*	3913	1700/Dy	605	265	30
NYSPTEN	3925	1800/Dy	770	93	30
ESS	3590	1800/Dy	373	80	30
NYSRATT	3625	1830/Dy			
OCTEN	34/94	1830/Dy	470	104	30
Q NET	31/91	1830/Dy	432	3	30
STAR/E*	99/39	1830/Dy	121	59	26
WDN/E*	04/64	1830/Dy	411	62	30
BSN	93/33	1900/Dy			
NYS/E*	3677	1900/Dy	406	204	30
JCARCN	10/70	2000/Dy	652	16	30
OARCN	25/85	2000/Dy	85	0	5
WNYECN	3955	2000/3rd Sn			
SLVARES	31/91	2100/Sun	25	0	3
CNYTN*	40/00	2115/Dy	547	93	30
NARASEN	22/82	2130/Sun	30	0	3
STAR/L*	325/925	2130/Dy	62	4	16
WDN/L*	04/64	2130/Dy	776	148	30
NYS/L*	3677	2200/Dy	333	255	28

*NTS nets. EMERGENCY COORDINATORS STILL NEEDED Chautauqua, Cattaraugus, Chemung, Essex, Fulton, Hamilton, Herkimer, Madison, Orleans, Schoharie, Schuyler and Seneca Counties, WATSAY? WNY now has grown to 3425 ARRL members. Traffic:

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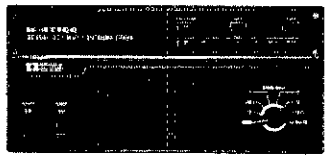

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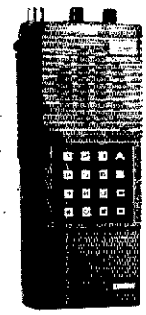

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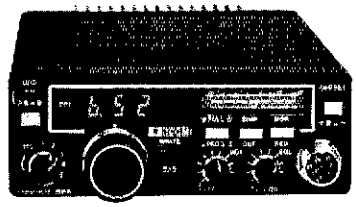

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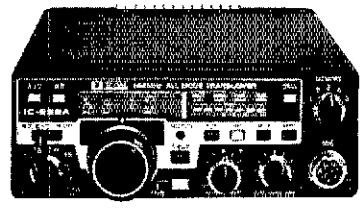

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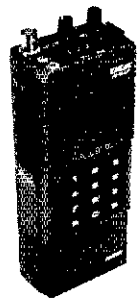

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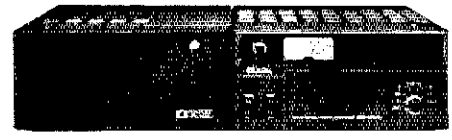

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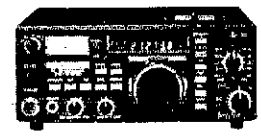

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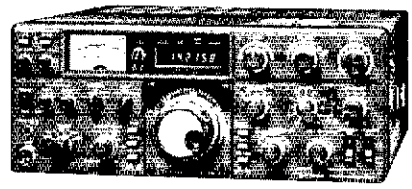

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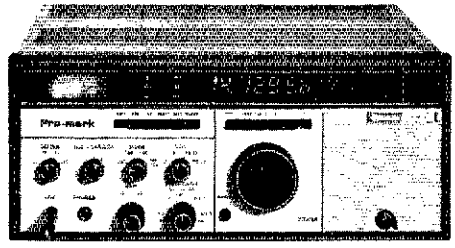

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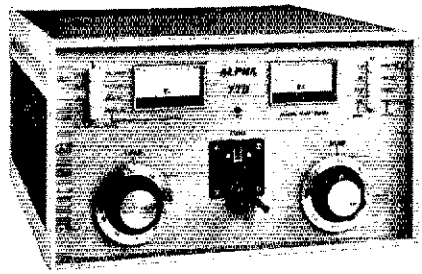

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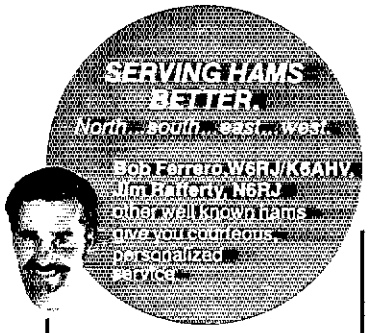

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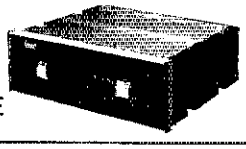

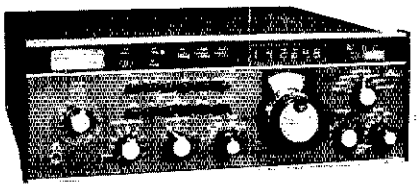

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Simply plug in your Icom IC-2A and your synthesized portable becomes a 25W synthesized mobile rig — take it out again, all charged and ready, when you want hand-held operation.

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The Power Pocket accepts any version of the IC-2A, applies its output to a wideband rf amplifier, and delivers 25 watts to your mobile antenna. Mobile talk-out power!

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The Power Pocket provides 2½ watts of audio output and a 4-inch speaker so that messages can be heard above road noise, even with the windows down. Also, by using the Power Pocket's audio amplifier, you can operate the IC-2A at low volume — thus lower drain on the power pack.

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The Power Pocket accepts and charges all Icom battery packs. Its spring-loaded charger pocket adapts to short or tall packs, assuring firm, positive contact for proper charging. The charging function has its own independent switch and indicator, so that you can charge the pack whether or not the amplifiers are turned on.

MIC PREAMP

The Power Pocket is compatible with any standard mobile microphone, thanks to its microphone preamplifier. It is also compatible with the Icom speaker/mic through jacks on the front panel.

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KO2H 265, W2MTA 256, WA2HSB 220, WA2ELD 213, KA2CTU 206, WB2IDS 193, W2GLH 181, WB2OWO 150, N2APB 122, K2GWN 105, KA2CLT 104, KA2BHR 100, W2FR 92, W2AET 78, KA2GOH 72, WA2KOJ 61, W2ZOJ 50, WB2LJK 42, WA2MFU 42, W2PZL 39, WB2QIX 38, W2TZ 37, N2ARD 36, N2CSB 35, W2ROF 30, KG2D 28, WA2RXO 28, AF2A 23, KA2DBD 18, AF2K 17, K2RN 17, WB2TXK 17, WA2AIV 13, WB2SGI 11, WB2NAO 8, K2IUT 3. (Aug.) W2TZ 31, W2RQF 28, WA2AIV 11, WB2NAO 5, WB2VSJ 1.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — ASCM/SCM: N3EE. NMs: AC3N N3ADU W3NEM W3MML. SEC: AB3Q. DECs WB3JDI WB3EFQ WB3KJH.

Net	Sess.	QNI	QTC	kHz	T/D
WPACW	30	408	147	3585	7:00 P/D
WPAPTN	30	557	166	3983	6:15 P/D
WPA2MTN	30	540	99	146.28/88	8:00 P/D
NWPA2MTN	30	380	8	146.04/64	9:00 P/D

First I would like to apologize to the various clubs that I had promised to visit at their activities the last month. I had the misfortune to contract a case of shingles and was confined to my home. They are now clearing up. Too bad they could not be used for roofing; I need a new roof. Upgrades. Tech: KA3HJA. Advanced: N3BRP N3BRU KN3ZAN KA3GXJ WB3KDY KA3EDP KA3DPY KA3BMU. ?? KA3IAA. New officers for 1981-82: Fort Armstrong Wireless Ass'n: KN3ZAN, pres.; KA3GPY, v.p.; W3YEY, secy/treas. University of Pgh ARA K3LL, pres.; WB3AXN, v.p.; AC3C, secy. WA3VRE, treas. KA3CDE (age 60) after being away from Amateur Radio for some time came back and got his Extra. Congrats to all upgrades and new club officers. W3BZN is new OBS. Congrats to WB3GXG who is now the third district chairman for the YLRL for 1982. I would like to report that more and more interest is being shown in our emergency plans in the section. The DECs & ECs are doing a fine job. Thanks! Traffic: N3ADU 315, K3CR 194, KB3DT 189, N3FM 148, N3EE 145, AC3N 130, W3SGJ 89, KB3BG 80, W3IA 60, WB3GUK 49, K3SMB 47, W3MML 35, WA3ONT 35, W3EGJ 34, N3KB 34, K3VQV 34, W3EXC 28, W3YI 26, N3BKV 25, W3RUL 24, WA3UNX 24, N3WS 23, W3NGO 22, K3HCT 19, WB3JGD 19, WB3GXG 18, WB3ITS 14, WB3EFQ 12, W3KUN 12, W3TTN 12, W3VX 12, WB3JDI 10, W3SN 10, KA3BGC 9, WA3UNX 8, W3YQ 4, W3BPY 3, W3LOD 3, W3SMV 3, W3AHH 2, K3LTV 1.

CENTRAL DIVISION

ILLINOIS: SCM, Larry M. Keeran, K9ORP — SEC: W9OBH. STM: WB9JSR. ASCM: W9RYU.

Net	Freq.	Times/Days	QTC	Sess.
ILN	3690	2330/0300 Dy	161	60
Ill Phone	3915	2130 Dy	151	30
NCPN	3915	1200/1700 Dy	107	49
IEN	3940	1400 Su	6	4

D9RN 100% stations were W9HOT W9JIJ WB9ODN K9UZA WB9WGD. DRN9 100% stations were WB9WGD W9HOT W9JIJ. W9VEY Memorial Station had a QTC of 12 in 4 sessions on the 22/82 Gillespie repeater on the 8:30 PM Monday net. The new officers of the McHenry County Wireless Association are: W9GSB, pres.; W9KXH, v.p.; KA9HRI, treas.; N9BWY, secy. The Chicago Suburban Radio Association at their September 9th meeting had Les Torrey speak on light experiments, light transmission, light guides, light communications. He showed how scientists have stepped into the future, using lasers and light guides to transport audio, data, and video across the nation. The October 14th meeting was just as exciting; KA9W and WD9GQV presented "The Chinese Connection" (BY-Land), and "A Look at the Peoples Republic", a fascinating and educational slide show. AD9S WB9VGO KA9KZN and other CSRA members gave a live demonstration of Amateur Radio in the Oak Park Mall on September 12th. The demonstration at the mall sparked a request by Cub Scout Pack #4 at Irving School for a program on how to be a ham. WB9VGO and K9AJW made the presentation. Communications were provided for the Community Center Classic 6.2 mile run through River Forest by KA9AEK WB9AJB WB9SPV WB9TZC KA9BFG WA9DLH WD9HNQ N9TM WD9HNR WA9ASD WB9VGO W9KBU K9AJW. The Sterling-Rock Falls Amateur Radio Society celebrated its 25th anniversary on September 12th. The chet KB9RT and assistants WB9RVY WD9CON WB9RXK were complimented on the delicious bar-b-qued hog that they prepared. The committee served punch to the kids and joice to the OM during the meal. Then, WD9CON started two large bonfires for everyone to gather around and spread stories and good cheer. Fifteen members of McLean County's ARES group provided communications for the annual county-wide disaster drill, "Operation Rainbow". The simulated radioactive accident was held simultaneously with Dewitt County's similar drill to test the capabilities of the area hams to work together. The officials were pleased with the work of hams from Platt, McLean and Dewitt Counties on September 19th. The new NMs are: NCPN W9QUF; ILN K9BVE; IPN WB9CEB. Traffic: W9HOT 271, W9JIJ 152, K9BVE 135, W9RJW 99, WB9WGD 99, W9TLU 85, KB9X 84, WB9JSR 66, K9EHP 54, KN9BAM 40, W9QK 38, WD9EBQ 36, WB9QFO 36, W9HBI 28, W9LNQ 22, WD9HZF 19, WuKR 17, W4IZI 8, W9HLX 5, KA9BYB 4, W9SSP 2, W9HPG 1. (Aug.) W9HPG 13.

INDIANA: SCM, Bruce Woodward, W9UMH — SEC: W9UMH. STM: W9JUJ. NMs: ITN W9QYY, OIN WD9GXW, ICN N9AEI, VHF W9PMT, IWN K9DCX, IPN W9DLF.

Net	Freq.	Time/UTC/Dy	QNI	QTC	Sess.
ITN	3910	1330/2300	2435	273	60
OIN	3656	1430/0000/0300	842	397	90
ICN	3708	2314	153	32	28
IPN	3910	2130	1049	98	30
IWN	3910	1315	1430		30

Hoosier vhf net report for September late. Vhf NMs PLEASE get your reports to W9PMT by the 1st of the month. 9RN — late D9RN 100% QNI: K9CGS W9JUJ K9KTB WB9MIK W9URQ. QTC 272 in 60 sess. CAND 100% QNI: W9JUJ K9CGS. QTC 667 in 30 sess. Appts: W9QYY ITN NM; KB9QR, EC Wayne Co., KA9HKC, EC Porter Co. Indiana radio clubs by counties: Pike County ARS WA9FGT, pres., Porter County ARC Inc. KA9FAW, pres.; Pulaski: none; Posey none, Putnam none; Randolph County ARA WB9PGV, pres.; Ripley none; Rush-East Central Indiana Repeater Assn K9PQP, pres.; Scott none; Shelby Blue River Valley ARC K9CDB, pres.; Spencer none; St. Joseph-Michiana ARC Inc. WA9GOP, pres.; Radio Teleprinter Society of Northern Indiana WA9OKC, pres.; Michiana Amateur Repeater Assn. W9LVS, pres.; Stark County ARC WB9QNJ, pres.; Steuben none; Sullivan none; Switzerland none;

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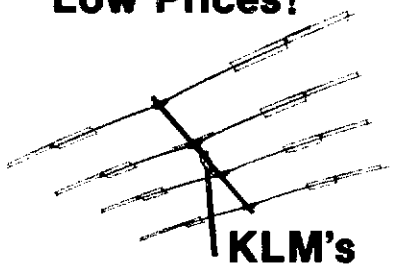

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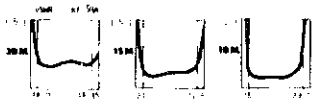
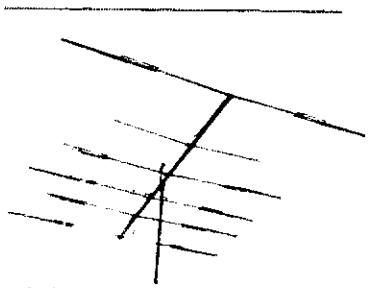


List Price ~~389~~[95] SALE PRICE $319



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15-4CD	4-El. 15 mtr. Beam	$ 99
10-3CD	3-El. 10 mtr. Beam	$ 69
10-4CD	4-El. 10 mtr. Beam	$ 89
A50-5	5-El. 6 mtr. Beam	$ 59
617-6B	6-El. 6 mtr. "Boomer"	$169
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A144-20T	20-El. 2 mtr. Satellite Antenna	$ 66
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155BA	5-El. 15 mtr. "Long John"	$149
105BA	5-El. 10 mtr. "Long John"	$ 99
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203BA	3-El. 20 mtr. Beam	$119
153BA	3-El. 15 mtr. Beam	$ 69
103BA	3-El. 10 mtr. Beam	$ 59
DB1015A	3-El. 10/15 mtr. Beam	$129
64B	4-El. 6 mtr. Beam	$ 49
66B	6-El. 6 mtr. "Long John"	$ 89
18HT	80-10 mtr. Hy-Tower Vertical	$279
18AVT/WB	80-10 mtr. Trap Vertical	$ 85
214	14-El. 2 mtr. Beam	$ 33
2BDQ	80/40 mtr. Trap Dipole	$ 49
5BDQ	80-10 mtr. Trap Dipole	$ 89
BN86	80-10 mtr. KW Balun	$ 14

HUSTLER

3TBA	New 3-El. Triband Beam	$169
4BTV	40-10 mtr. Vertical	$ 79
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G6-144B	2 mtr. Base Vertical	$ 69
G7-144	2 mtr. Base Vertical	$ 99

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HYGAIN Model 157 Center Insulator w/SO239	$11.95
450 OHM H.D. Low Loss Ladder Line	$ .14/ft.

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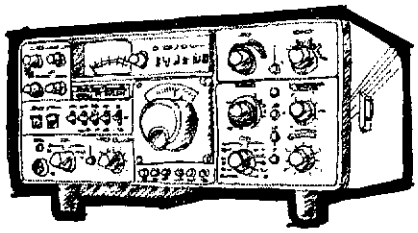
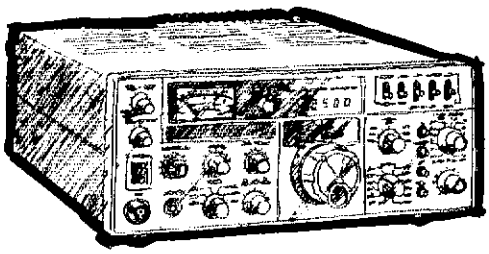


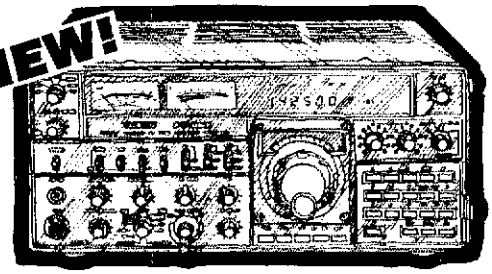
FT-902DM

YAESU

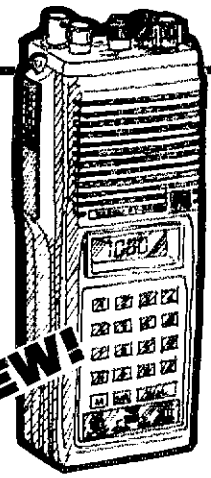
FT-707



FT-107M



NEW!



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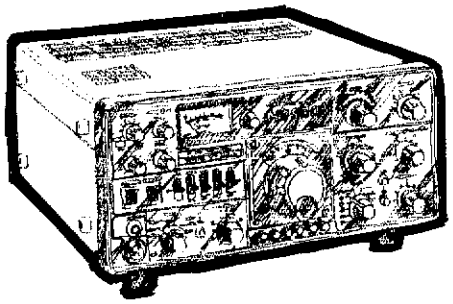

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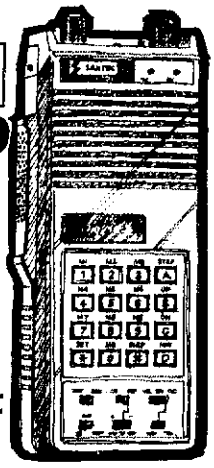

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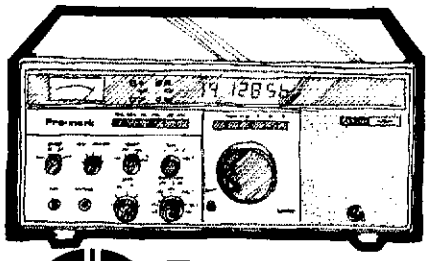
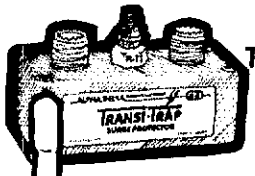


Pro-Mark KWM-380



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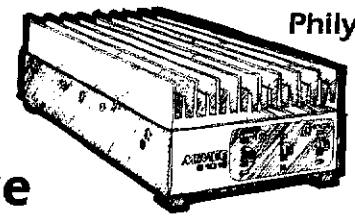

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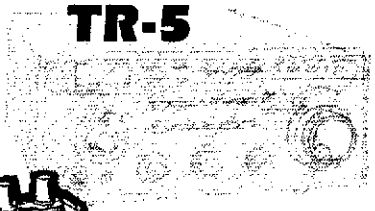
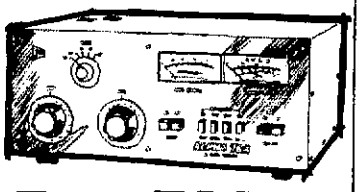
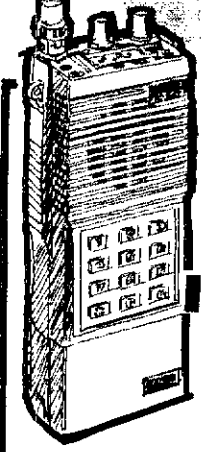




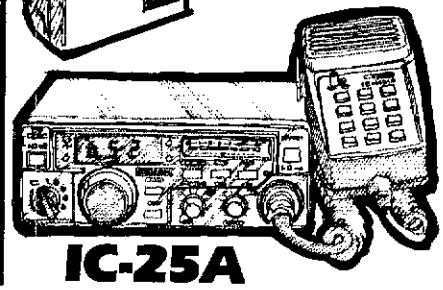
ALPHA 76A



ICOM

IC-2AT

IC-720A



IC-25A

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20M646	Call for price
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TB4EC	Call for price
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40M329	Call for price
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Tippecanoe — Tippecanoe ARA W9YIP, pres.; Lafayette Amateur Repeater Corp. WB9TIB, pres.; Western Indiana Radio Emergency Service WB9QPG, pres.; Purdue ARC N9NC, pres., Cary Quad ARC WB9NJU, pres.; Tipton none, Union none; Vandenburg Tri-State ARS KB9NR, pres.; Vermillion none; Vigo-Wabash Valley ARC N9BEG, pres.; ARTS N9BRN, pres.; Terre Haute Repeater Club WB9MCD, pres.; Rose Hullman ARC WD9FET, pres.; Warren none; Warrick County ARC WN9HRB, pres.; Washington none; Wayne-White Water Valley ARC KB9UT, pres.; Richmond ARC W9PPD, pres.; Wells County ARC N9CEW, pres.; White Tioga ARS WB9VOK, pres.; Whitley none. Congrats to: K9PQP for his NWS Award; WA9KZO and Naval Avionics ARC for their work at the cross country horse show; KA9FDF N9AOJ KF9B KA9DAP N4DBJ KA9DGZ WA9FCM KA9FDH KA9FLR KA9ILF KB9LQ KA4MXO W9TDI K9TE N9TV WB9DWD K9QWJ K9QWK WB9WDW for two parades and two races; N9CPK for his upgrade to Tech; Columbus ARC for their help with the bike ride. Traffic: W9JUJ 941, K9SFQ 128, WD9GXW 119, W9QYY 87, W9EI 83, W5NPM 76, N9AFI 63, K9DCX 61, K9WWJ 44, W9WKM 42, K9FZX 33, WD9ART 21, WA9QCF 20, WB9ZOE 19, KG9K 17, WD9DWD 16, N9PS 15, W9DLF 14, W9EUP 11, WA9OHX 11, W9UEM 11, N9BJX 10, WB9AWI 9, W9URQ 9, WD9CIV 8, WA9KWH 8, W9UPI 8, W9WEI 7, W9BDP 5, N9AST 4, N9BLK 3, W9RTH 3, K8WI 2, N1ACG 1.

WISCONSIN: SCM, Roy Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1115Z QNI 1129, QTC 1266 WB9YPY. BEN 3985 1700Z QNI 580, QTC 139 WB9ESM. WSBN 3985 2200Z QNI 950, QTC 258 WD9ESZ. WNN 3723 2300Z QNI 252, QTC 74 KA9HPQ. WSSN 3545 M-F 2330Z QNI 106, QTC 22 N9BYK. WIN-E 3662 0000Z QNI 328, QTC 128 W9YCV. WIN-L 3662 0300Z QNI 310, QTC 118, K9LGU. XPO 3925 1701Z QNI 429, QTC 37 WA9NIX. NWTN .34/.94 2330Z QNI 598, QTC 34 WB9YPY. Gr. Bay .72/.12 Wed 2330Z QNI 22, QTC 0 WB9NRK. BPL to KA9CPA. Thanks to K9UTQ for making out August report to ARRL. WSBN certificate to W9SFL N9ATP, W9IAL has OBS. K9GTQ was awarded ARRL life membership on his 20th anniversary as a ham. KA9IRE has Advanced not KA9IKR as stated in previous QST. N9BCA WA9BZW K8DXR WB9NRK have Advanced. Sorry to report WD9DSY K9BP as Silent Keys. New Novice Shawano area KA9KKB. New Novice La Crosse area KA9LQF. N9BEY is now KC9ES. KA9KHV KA9KKH KA9LER have Techs. ARES conference was well attended and went well, although those who didn't notify the SEC whether they would attend or not should have. We can't take you by your hand and lead you. The conference is slated for next year; watch for details later. KA9HHZ has General. GSCP was guest of QCWA. (Watts Snoo, Green Fox). Traffic: KA9CPA 2002, WD9ESZ 418, WB9YPY 342, W9YCV 232, W9CXY 213, N9AZI 183, K9GDF 148, WD9DHF 132, K9UTQ 111, N9BYK 109, W9IEM 108, W9DND 97, K9AKG 96, WB9YPZ 87, KA9HPQ 76, K9FHI 70, AG9G 70, KA9GYD 70, W9UCL 67, W9SO 60, WD9FRI 58, WB9NRK 52, WB9ESM 50, W9LDO 49, K9LGU 47, W9FDY 41, K9AO 40, WA9ZTY 39, KG9B 36, KC9CJ 36, WA9DXW 36, N9BCX 35, W9IHW 35, WB9JSW 35, N9BDL 32, WA9YVC 32, W9KTG 30, N9ATP 29, KB9NG 29, WD9RKT 28, WD9CYT 28, K9HDF 26, KA9EMF 24, WA9WYS 24, KA9GBG 23, W9UW 22, K9UU 21, WB9ICH 19, WD9IMZ 19, WA9GGH 16, KA9IHR 13, WA9UJK 10, KE9C 9, KA9IKR 9, KB9FM 7, KB9TC 4. (Aug.) KA9HPQ 59, N9BCX 32, WA9BZW 2.

DAKOTA DIVISION

MINNESOTA: SCM, Helen Haynes, WBØHOX. STM: AFØO. SEC: KAØALF.

Net	Time	Freq.	QNI	QTC	Mgr.
MSN/1	2330Z	3685 kHz	193	52	AFØO
MSN/2	0300Z	3685 kHz	112	29	KØJCF
MSPN/N	1710Z	3945 kHz	593	57	WAØAIN
MSPN/E	2245Z	3929 kHz	958	212	KCØT
MNAMWXN	2315Z	3929 kHz	504	275/27	WDØCGM
MSSN	2215Z	3710 kHz	96	0	WBØWXU

A welcome back to the Minnesota Amateur Weather Net after the summer vacation. This popular net has taken off with a bang this fall. A winter hamfest is in the offing for those Hams who are already getting cabin fever. The big day is December 5th at the Eagles Club in Faribault. Registration is at 9 am. Attractions include a flea market, dinner, program and prize drawings. Everybody welcome. Let's have a fine turnout. Congrats to the following upgrades: Tech to General: NØBCB KAØIAC; Novice to General: KAØJTA. A warm welcome to the ham fraternity to the following Novices: KAØLRR KAØKYL KAØKTI KAØKYM KAØKYP KAØMGJ KAØMDX. Minnesota's loss is Colorado's gain. WAØEWK and XYL are taking up residence in Colorado; exact QTH unknown at this time. WØOPX and OM WØRIO are making their annual trek to warmer climes and KAØFSM is among the many to be in the process of closing up their summer cabins. Our sympathies go to the families of WØLJZ WØFNK. WØFNK was a Charter Member of the Rochester Radio Club. Traffic: WAØTFC 253, KBØMB 238, WBØHOX 213, AFØO 128, W9DM 117, WDØGGM 102, KAØJUX 85, WØDFX 83, WAØONE 66, WBØNZB 57, KAØIAO 50, WAØAIN 28, NØCLG 20, KØCSE 20, WØOPX 19, KØJCF 18, WBØWXU 16, KAØFSM 14, WØRIO 14, AFØO 7, NØBRC 6, NØJP 5.

NORTH DAKOTA: SCM, Lois Jorgensen, WAØRWM — The annual hamfest and banquet at Grand Forks will be held in later part of Nov. Listen on the nets for date. Congrats to those who upgraded. Ex: KBØVO KAØCYB KAØDNN now KCØEE. Adv.: KAØCAF WDØCHC now KCØCU, KAØJSJ now NØCXK KAØJGL KAØAHR now KD4PS NØCYT WBØYXA NØBXT. Gen.: KAØKZZ NØAEY WBØYJZ. Tech.: NØCYK NØCYL NØCYM NØCYN KAØLPX KAØKZY. Nov.: KAØLZD KAØMAV. Congrats to KCØW who has been appointed to ARRL Ad-Hoc committee on vht uht contesting. Congrats to the BARK Club on receiving a special certificate of appreciation from Gold Award Comm. for their instrumental role in the SKYWARN system utilized during the July tornado at Bismark. Congrats to KCØW and XYL on their new harmonic. WDØCPY is pres. and KØTMH is secy. for Ramsey Club.

SOUTH DAKOTA: SCM, Erwin C. Heimbuck, KØOTZ — South Dakota lost two old time hams, WØYOB and KØOOU, this past month, both to long term illnesses. Elections have been held in several areas and we extend congrats to all who have the priviledge of serving. Good luck to all. The time of year is here when you should have inspected all antenna, tower systems for winter months that are here. If you have not checked them do so on one of the nicer days that occasionally crop up. If anyone is interested in becoming SCM for this section, please get your petitions in. Due to increasing work load I will not be running for reelection. Let's hear it from

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8 MHZ COVERAGE • 142 to 149.995 MHz in 5 kHz steps, including CAP and MARS.

IDEAL SIZE & WEIGHT DISTRIBUTION • 7.8" high by 2.4" wide by 1.8" deep, 1.4 lbs.

MICROCOMPUTER CONTROL • All frequency operations are done by means of a microcomputer keyboard with acquisition tone.

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16 KEY AUTOPATCH • Keyboard works as a Touchtone® pad while transmitting.

PL TONE SWITCH • Activates optional subaudible tone module.

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9 CHANNEL MEMORY WITH SCAN • Eight addressable channels and one externally accessible up/down channel retain frequency and standard offset. Backup drain is a scant 10 microamps!

AUTOMATIC INCLUSIVE OR EXCLUSIVE PROGRAMMABLE BAND SCAN • Limits may be reset in seconds. Scans either inside or outside the limits.

BUSY AND VACANT SCAN MODES • Scan for either an occupied or empty frequency.

KEYBOARD LOCK • Prevents accidental change of frequency or scan status.

TRANSMIT LOCK • Avoids unintentional transmission.

DIGITAL S/RF AND MEMORY ADDRESS METER • Shows relative signal strength on receive, relative power on transmit. Also shows memory address.

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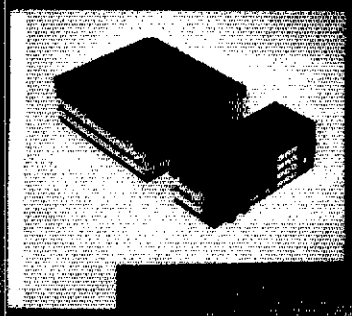

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- 8 MHZ FREQUENCY COVERAGE, INCLUDING CAP/MARS BUILT IN: Receive and transmit 142.000 to 149.995 MHz in selectable steps of 5 or 10 kHz. COMPARE!
- SIZE: Unbelievable! Only 6¾" by 2⅜" by 9¾". COMPARE!
- MICROCOMPUTER CONTROL: All frequency control is carried out by a microcomputer.
- MUSICAL TONE ACCOMPANIES KEYBOARD ENTRIES: When a key is pressed, a brief musical tone indicates positive entry into the microcomputer. COMPARE!
- PUSHBUTTON FREQUENCY CONTROL FROM MICROPHONE OR PANEL: Frequency is selected by buttons on the front panel or microphone.
- 8 CHANNEL MEMORY: Each memory channel is reprogrammable and stores the frequency and offset. Memory is backed up by a NICAD battery when power is removed.
- INSTANT MEMORY 1 RECALL: By pressing a button on the microphone or front panel, memory channel 1 may be accessed immediately.
- MEMORY SCAN: Memory channels may be continuously scanned for quick location of a busy or vacant frequency.
- PROGRAMMABLE BAND SCAN: Any section of the band may be scanned in steps of 5 or 10 kHz. Scan limits are easily reprogrammed.
- DISCRIMINATOR SCAN CONTROL (AZDEN EXCLUSIVE PATENT): The scanner stops by sensing the channel center, so the unit always lands on the correct frequency. COMPARE this with other units that claim to scan in 5-kHz steps!
- THREE SCAN MODES WITH AUTO RESUME: "Sampling" mode pauses at busy channels, then resumes. "Busy mode stops at a busy channel, then resumes shortly after frequency clears. "Vacant" mode stops at a vacant channel and resumes when signal appears. If desired, auto resume may be prevented by pressing one button. COMPARE!
- REMOTABLE HEAD: The control head may be located as much as 15 feet away from the main unit using the optional connecting cable. COMPARE!
- PL TONE OSCILLATOR BUILT IN: Frequency is adjustable to access PL repeaters.
- MICROPHONE VOLUME/FREQ. CONTROL: Both functions may be adjusted from either the microphone or front panel.
- NON-STANDARD OFFSETS: Three accessory offsets can be obtained for CAP/MARS or unusual repeater splits. CAP and Air Force MARS splits are BUILT IN! COMPARE!
- 25 WATTS OUTPUT: Also 5 watts low power to conserve batteries in portable use.
- GREEN FREQUENCY DISPLAY: Frequency numerals are green LEDs for superior visibility.
- RECEIVER OFFSET: A channel lock switch allows monitoring of the repeater input frequency. COMPARE!
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- ILLUMINATED KEYBOARD: Keyboard backlighting allows it to be seen at night.
- TRUE FM, NOT PHASE MODULATION: Transmitted audio quality is optimized by the same high standard of design and construction as is found in the receiver. The microphone amplifier and compression circuits offer intelligibility second to none.
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CREDIT CARD HOLDERS MAY USE OUR TOLL FREE ORDERING NUMBER.

DigiMax Instruments Corporation

DigiMax has purchased the designs and inventory of DSI frequency counters and accessories. When DSI was publicly auctioned earlier this year DigiMax purchased the inventory and obtained rights to the products.

DigiMax did not acquire DSI or assume any of DSI's liabilities whatsoever. Some of DSI's ex-employees were employed by DigiMax due to their experience with the products. None of these employees have any relationship with DigiMax management or financial responsibility.

On behalf of the DigiMax staff we welcome all our new dealers and customers.

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Sunnyvale, CA 94086
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Corona, CA 91720
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Westcom
1320 Grand Ave.
San Marcos, CA 92069
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714-239-0361

COLORADO

Grand Junction/Walker Elec. Co.
P.O. Box 1949/537 North 1st St.
Grand Junction, CO 81502

DELAWARE

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3208 Concord Pk Rt 202
Wilmington, DE 19803
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FLORIDA

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1800 E. Drew Street
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621 Commonwealth Ave.
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Ray's Amateur World
1590 US 19 South
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2213 Vandalia St.
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618-345-6448

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Allied Broadcast Equipment
635 South E Street
Richmond, IN 47374
317-962-8596

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1203 E. Douglas
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316-264-9166

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617-251-7216

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DIGIMAX

DELIVERS MAXIMUM — PERFORMANCE — ACCURACY

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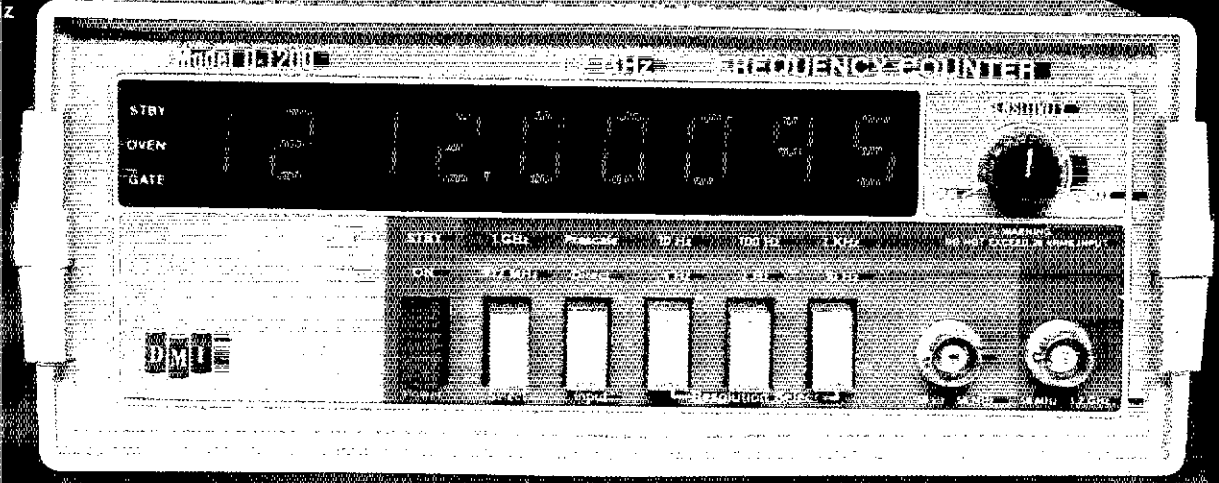
GHz

.1 PPM Accuracy

10 MHz Oven Osc.



8 X 8½ X 3"

MODEL D1200 INCLUDES — .001 Hz RESOLUTION — SENSITIVITY CONTROL — HANDLE

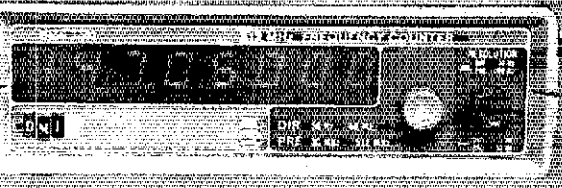
built-in .1 PPM (20° to 40°C) 10 MHz proportional oven OSC. Bright .5 in. LED readouts make the D1200 or D612 ideal for all those difficult bench and field problems. When checking frequency tones the D1200 will resolve 1/1000th Hz in ten (100th Hz in 1 sec., and 1/10th Hz in only .1 sec. This is possible by the built-in audio multiplier. (D612 resolves 1 Hz sec and 1/10th Hz in 10 sec.) The D1200 also has a prescale sensitivity control — and the models D612/D1200 include a Hz prescaler — which makes checking an 860 MHz mobile ansmitter a snap. The D1200 and D612 will meet all FCC land- broadcast, telecommunications requirements. In addition ay check Complex PLL, TV Tuner, VTR, and Computer CRT's ey can help to meet your QSO on the correct frequency. Add 12 (20 Hr Stby) rechargeable battery pack and your counter y for field use. Rugged construction — rigid quality control s — and 48 hr. burn-in testing helps to assure years of free service.

WHY BUY DIGIMAX?

Because we produce the most accurate frequency counter for the money — Because most models count to 1 GHz even 1.7 GHz (standard prescaler) — Because DigiMax model types have sold more than 25,000 units — Because DigiMax has the best quality specifications to price ratio in the industry — ENJOY! Because if you settle for any counter with lesser specifications than DigiMax offers, or pay $100, $200, or even $500 more — You have simply made a mistake. We feel confident that when you compare DigiMax specifications & prices, you will discover for yourself that DigiMax instruments provides the best features for the price of any frequency counter manufacturer. Your choice is clear — Buy quality — Buy Performance — Buy Effectiveness — Buy DigiMax.

ALL MODELS MEET FCC LANDMOBILE BROADCAST TELECOMMUNICATIONS REQ.

512 MHz or 1 GHz — .1 PPM — PORTABLE — 1 MEG — 50 OHM INPUTS



5¼ X 5 X 1½

The D500 will count from 50 Hz to 512 MHz — the D510 from 50 Hz to 1 GHz — the 500 series includes a .1 PPM (17° to 35°C) TCXO — combined with the compact size and portability when a BAC-5 rechargeable battery pack is added. The 500 series becomes the perfect addition for any tool box, car, boat, or ham shack — plus they can help you meet your QSO on the correct frequency, or check your transmitter frequency. The D500 will resolve 1 Hz to 50 MHz, 10 Hz to 500 MHz, and the D510 will resolve 10 Hz to 1 GHz. The excellent accuracy, high reliability, clearly makes the D500 or D510 the perfect choice for that bench, tool box, or ham shack. Plus DigiMax's low cost will fit most any budget.

VISA

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DIGIMAX INSTRUMENTS CORP.

MODEL	PRICE	FREQUENCY RANGE	ACCURACY OVER TEMPERATURE	READ OUTS	SENSITIVITY TYP 50 Hz-25 MHz	SENSITIVITY TYP 25 MHz-450 MHz	POWER REQ.
D500	$149.95	50 Hz-512 MHz	1 PPM 17°-35°C TCXO TIME BASE	8	15 to 50 MV	40 to 50 MV 80 to 100 MV @ 1 GHz	8-15 VDC 300 MA AC-17 REQ. FOR 110 VAC
D510	$179.95	50 Hz-1.0 GHz					
D612	$259.95	50 Hz-1.2 GHz	1 PPM 20°-40°C PROPORTIONAL 10 MHZ OVEN	6	15 to 50 MV	15 to 50 MV 60 to 75 MV @ 1 GHz	8-15 VDC 300 MA
D1200	$269.95	10 Hz-1.2 GHz			$10 50 MV		

D12 AC ADAPTER $6.95 — D1200 BNC BASE 21" ANT. $6.95 — BAC-12 $14.95 — BAC-5 $20.95

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TUNE IN THE WORLD WITH HAM RADIO

- **NEW EDITION - 80% NEW MATERIAL**
- **NEW CODE - TEACHING CASSETTE**

Over 200,000 persons have used TUNE IN THE WORLD WITH HAM RADIO as their steppingstone into Amateur Radio, the space-age hobby. The third edition of this popular package has been expanded with over 80 percent new material. The code cassette has also been redone and improved. Packed into the *Tune in the World* booklet are chapters on:

EXPLORING HAM RADIO: Hams come from all walks of life; age is no barrier; building your own station; a look back in time.

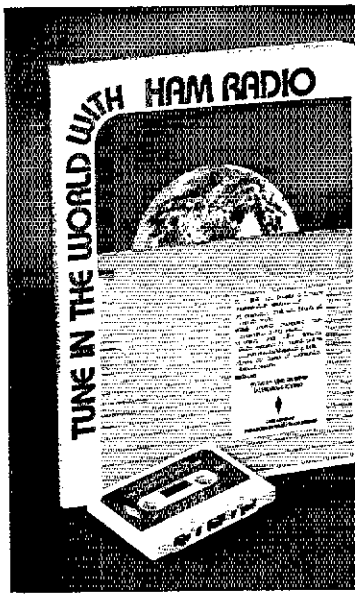
MANAGING THE RADIO SPECTRUM: The FCC; rules and regulations; the Novice license; licensing classes.

LEARNING YOUR NEW LANGUAGE: The Morse Code — why every ham knows it; how to learn it the right way.

UNDERSTANDING BASIC THEORY: Easy-to-learn explanation of electronic theory and what you need to know to qualify for a Novice license.

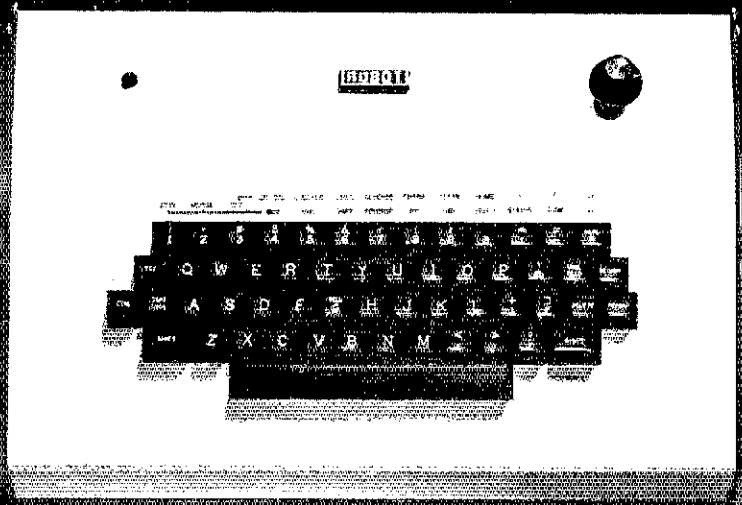
SETTING UP YOUR STATION: Choosing a location; how to select your equipment; what antenna to use; glossary.

OVER THE AIRWAYS PAINLESSLY: How to operate; tuning up; safety; identifying stations in foreign countries; awards; clubs; The ARRL and *QST*.



Consisting of 134 pages of easy-to-understand text and an additional 26 pages of equipment and publication advertising, the booklet provides a perfect introduction to an exciting hobby. The cassette prepares the prospective Novice for the 5-words-per-minute code exam by teaching the code character by character — a proven method. Code practice at 5 words per minute follows. The entire package is available for $8.50 (in U.S. funds) and is available at your favorite dealer or from **The American Radio Relay League, 225 Main Street, Newington, CT 06111.**

BAUDOT • ASCII
SPLIT SCREEN • MORSE
CODE • SSTV GRAPHICS
BUILT-IN DEMODULATOR
ADVANCED OPERATING FEATURES



This terminal has it all in one compact package at one low price.

THE ROBOT 800 SPECIALTY MODE TERMINAL.

If you have been shopping around for RTTY equipment, you probably have asked yourself, "How can I get high performance, multiple-mode capabilities without spending a fortune?" Robot Research has answered this question through the use of microprocessor technology. The Model 800 is the most complete specialty mode terminal ever offered for under $1000; yet it has features and performance capabilities which put it in the class of systems costing twice this amount or more! All that's needed to have a complete operating system is the addition of a standard TV monitor.

HOW DID WE DO IT?

The most advanced RTTY systems on the market are designed for multiple applications. As a result, these systems are burdened with exotic features which are seldom used on amateur radio. These features add to the cost, complicate operation, and in some cases even compromise performance!

The 800 does not attempt to double as a hobby computer, or a time-share terminal. It was designed expressly for use as a specialty mode communications terminal for amateur radio, and nothing else! By focusing our attention on this simple concept, we are able to provide a product which works better, costs less, and is easier to operate than those systems which try to do "everything" and end up doing nothing very well.

ONE EXAMPLE:

The single most important factor which affects RTTY receive performance is the quality of the demodulator. In the 800, we do not allow for a wide variety of shift frequencies through the use of tuneable filters. There are only two shifts which are used in amateur RTTY, and tuneable discriminator filters are both expensive and are poor in performance. The 800 uses separate mark and space discriminator filters for each of these two shifts which are precisely tuned at our factory. Even though the center frequency for the mark filter is the same for both wide and narrow shifts, the bandwidth is different and therefore requires separate filters. By giving careful attention to these details, we can equal or exceed the performance found only in expensive stand-alone terminal units.

WHAT ABOUT FEATURES?

The Model 800 has all of the advanced operating features such as split-screen, word and line editing, message memories, autostart, SELCOM, and many others. In addition, the 800 has a complete set of operating aids such as an on-screen status line, graphic tuning indicator, and a side-tone oscillator. To get a complete picture of all of the features which the 800 offers, we suggest that you contact us for a full-color brochure, or visit one of our dealers for a demonstration.

ROBOT RESEARCH • 7591 Convoy Court, San Diego, CA 92111 • (714) 279-9430

ROBOT

WORLD LEADERS IN SLOW SCAN TV, PHONE LINE TV, AND IMAGE PROCESSING SYSTEMS.

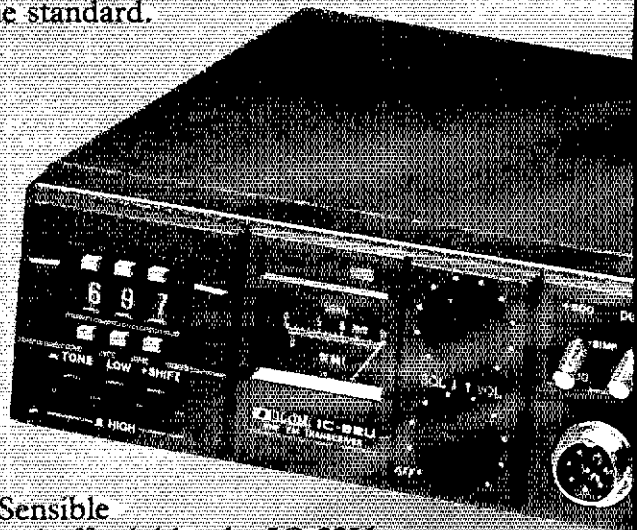
ICOM VHF Mobile

Amateur Communications using Space Age Techniques

ICOM's smallest 2 meter FM mobile, the **IC-25A** offers extremely compact size (5¾" × 2" × 7" deep) without sacrificing features. 25 watts, 5 memories, 2 scanning systems, priority channel, 2 VFO's and touchtone™ HM-8 microphone standard.

The best 2 meter multimode mobile on the market today, the **IC-290A** has features to make multimode mobile a snap. 2 VFO's, 5 memories, priority channel, memory and band scanning, squelch on SSB, selectable AGC and NB and RIT. Touchtone™ encoding provided with HM-8 microphone standard.

6 meter mobile at its best with the **IC-560**, a multimode mobile transceiver for working FM repeaters or sideband simplex, local or DX, 3 memories, 2 VFO's, scanning, squelch on SSB.



Sensible and affordable, the **IC-22U** offers simplicity with ease of operation. Easy to use push buttons for up and down tuning. 800 channels at the push of a button. 4 MHz coverage. EX-199 optional remotable frequency selector.

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ICOM

ICOM HF

Two Great Systems to Meet Your HF Needs

IC-2KL Solidstate Linear | IC-720A 9 Band Xcvr w/General Coverage Rcvr | IC-720A Phone Patch

IC-720A. ICOM's Top of the Line HF System.

IC-720A. ICOM's full featured HF Xcvr...with top of the line features:

- 9 band Tx/Rx (all new WARC bands included) 160 - 10 meters broadbanded.
- General coverage receiver .01 to 30MHz continuous tuning.
- Passband tuning built-in standard.
- Digital display of mode/VFO and frequency.
- 200 watt PEP input...all solidstate.
- Automatically bandswitches IC-2KL/AH1.
- 2 VFO's built-in standard.

IC-2KL. Broadband solidstate linear automatically bandswitched by the IC-720A, IC-730 (w/optional LDA unit), or IC-701...1000 watt PEP input...compact, no tuning required.

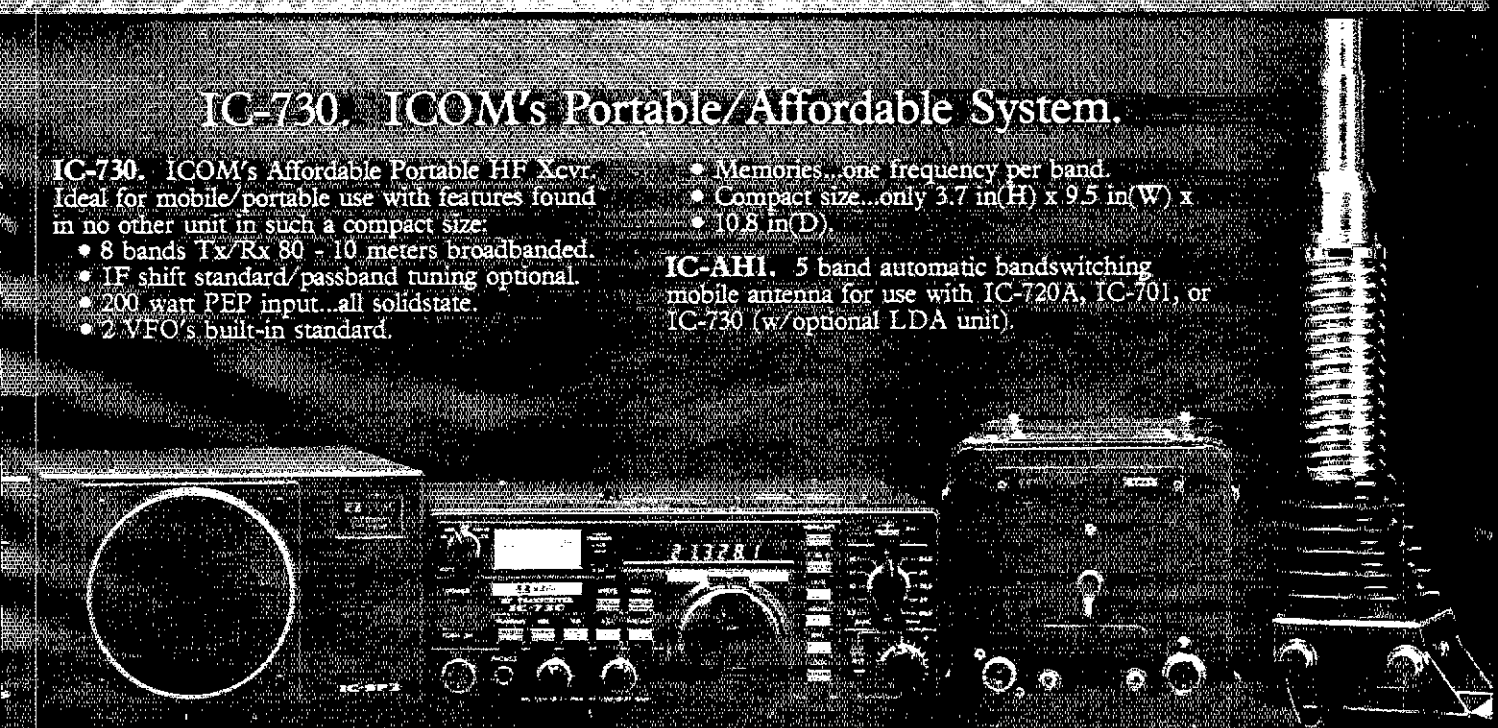
ICOM Phone Patch. Works directly with IC-701, IC-720A or IC-730. FCC certified.

IC-730. ICOM's Portable/Affordable System.

IC-730. ICOM's Affordable Portable HF Xcvr. Ideal for mobile/portable use with features found in no other unit in such a compact size:

- 8 bands Tx/Rx 80 - 10 meters broadbanded.
- IF shift standard/passband tuning optional.
- 200 watt PEP input...all solidstate.
- 2 VFO's built-in standard.
- Memories...one frequency per band.
- Compact size...only 3.7 in(H) x 9.5 in(W) x 10.8 in(D).

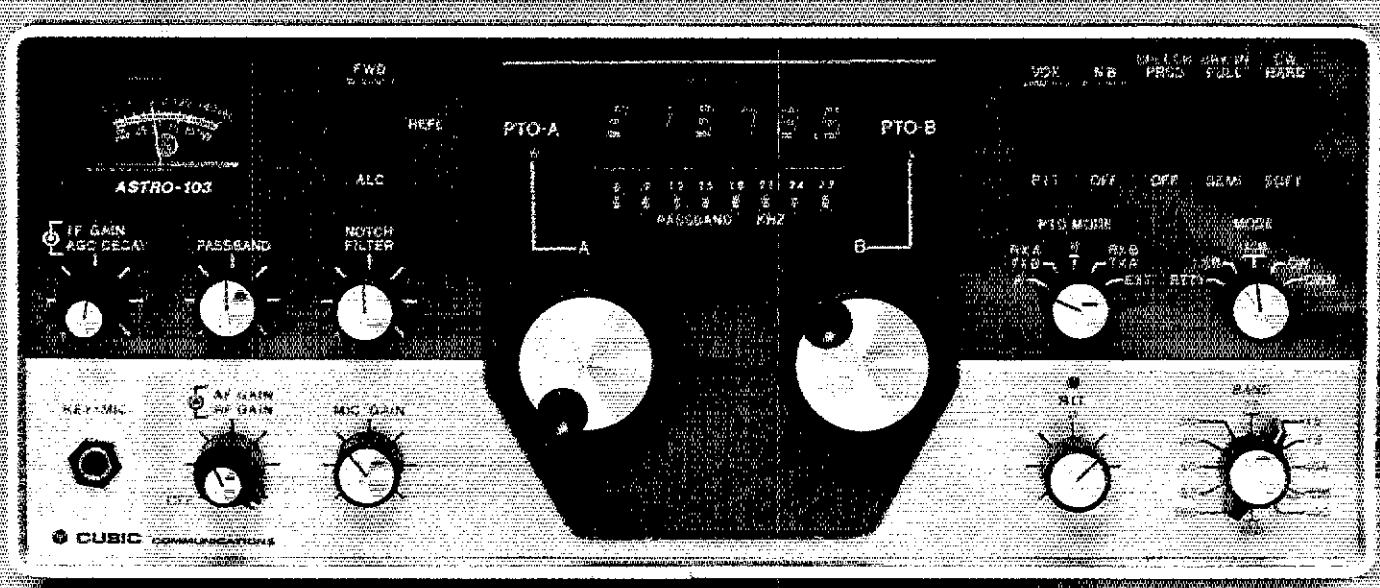
IC-AH1. 5 band automatic bandswitching mobile antenna for use with IC-720A, IC-701, or IC-730 (w/optional LDA unit).



IC-SP3 - External Speaker | IC-730 - 8 Band Mobile/Base Xcvr | IC-AH1 - Automatic Bandswitching HF Mobile Antenna

ICOM

Step Up To The Cubic Communications "ASTRO 103"



Dual VFOs Give You Two Radios for the Price of One!

Competitively priced, quality American design and construction by Cubic . . . a leader for 3 decades in defense and commercial electronics

Features:

All band coverage including WWV and the new WARC bands

DUAL VFO's each provide complete band coverage. (You are not limited to a single memorized frequency)

235 Watts input, SSB and CW on all frequencies

IF Passband Tuning not to be confused with ineffective "IF shift"

Utilizes an 8 pole filter which is continuously variable for either high pass or low pass.

CW Crystal Filter (optional), 400Hz 6-pole

Unique Visual Display of Passband

External Receive Antenna Jack allows separate transmit and receive antennas

Tunable Notch Filter when combined with passband tuning, provides the ultimate in removing interference

Full or Semi CW Break-In

Selectable hard/soft keying makes the difference in pile up

Continuously Variable AGC lets you hear the weak signal which would normally be masked by strong adjacent channel interference

Logrithmic Speech Processor

AF, RF and IF Gain Controls to provide an infinite selection of receiver dynamics

4 Function Meter reads "S" units in receive, and selects forward power (calibrated in watts PEP), reflected power, or ALC level in transmit

Military Quality PC Boards of double sided, plated through glass epoxy material

Modulated Construction with PC boards and assemblies interconnected by plug-in strip line and coaxial connectors. Chassis and cabinet are of rugged steel construction

Call or write for a Free Brochure

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A member of the Cubic Corporation family of companies
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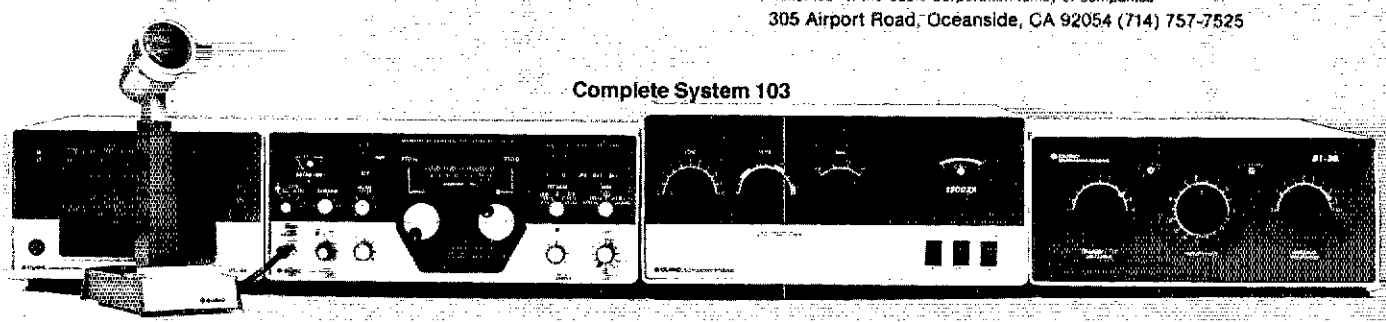
Complete System 103



PSU-6A
Power Supply/Speaker

ASTRO 103
Transceiver

1500Z-A
1500 Watt Linear Amplifier

ST-2B
2kW Antenna Tuner

Entirely professional level!
You'll find the difference the more you use it.

ULTIMATE QUALITY, NRD-515

Receiver, NRD-515

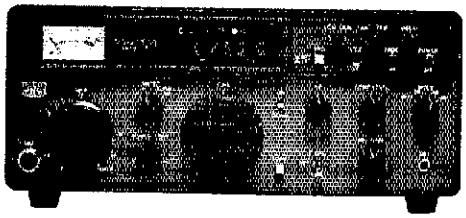
SPECIFICATIONS

Receiving frequency range:	100kHz to 30MHz continuous (30 bands)
Receiving modes:	USB/LSB/CW/RTTY/AM
Receiving system:	Up conversion type Double superheterodyne First IF: 70.455MHz
Sensitivity (S/N 10dB):	CW/SSB AM
1.6 to 30MHz	0.5μV 2μV
100 to 1600kHz	2μV 6μV
Selectivity:	6kHz/2.4kHz/0.6kHz/0.3kHz (*Option)
Stability:	Within 50Hz/one hour
Power requirements:	AC 100/117/220/240V, 50/60Hz, 50VA
Dimensions and Weight:	340mm(W)×140mm(H)×300mm(D), Approx. 7.5kg
Preset memory (Option):	24ch.
Frequency stability:	Less than 50Hz per hour after warming up.
Image rejection ratio:	70dB or more
IF rejection ratio:	70dB or more
Input impedance	50 to 75 ohms, unbalanced
AF outputs;	
Speaker output:	1W or more (4 ohms)
Record/line output	1mW or more (600 ohms)

Highest grade all-wave receiver

NRD-515

Best for 59 **Transmitter, NSD-515**



SPECIFICATIONS

Rated output power:	100W NSD-515 (50W 28MHz band)
Frequency range	1.8MHz-2.0MHz/3.5MHz-4.0MHz/7.0MHz-7.3MHz/14.0MHz-14.35MHz/21.0MHz-21.45MHz/28.0MHz-29.0MHz/29.0MHz-29.7MHz (Optional new bands approved by WARC '79 10.1MHz-10.15MHz/18.068MHz-18.168MHz/24.89MHz-24.99MHz/
Mode of emission:	A3J (USB/LSB) A1 (CW) F1 (RTTY)

• For more information please contact to;

JRC Since 1915 **Japan Radio Co., Ltd.**

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NEW ZEALAND: Dunedin—RADIO ENGINEERING LTD. Phone: 51-075

TS-130S/V

"Small wonder"...speech processor, N/W switch, IF shift, digital display

The compact, all solid-state HF SSB/CW mobile or fixed station TS-130 Series transceiver covers 3.5 to 29.7 MHz, including the three new bands.

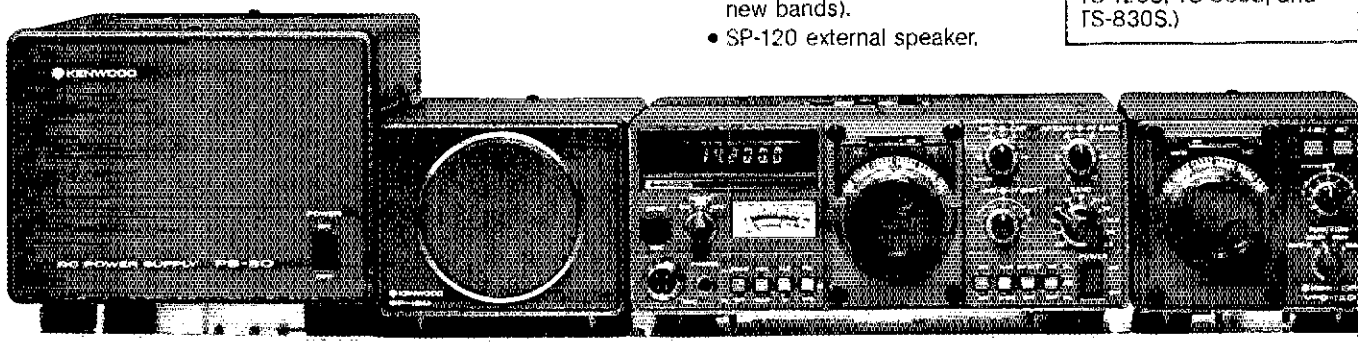
TS-130 SERIES FEATURES:

- 80-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV.
- TS-130S runs 200 W PEP/160 W DC input on 80-15 meters and 160 W PEP/140 W DC on 12 and 10 meters. TS-130V runs 25 W PEP/20 W DC input on all bands.
- Built-in speech processor.
- Narrow/wide filter selection on both CW (500 Hz or 270 Hz) and SSB (1.8 kHz) with optional filters.
- Automatic selection of sideband mode (LSB on 40 meters and below, and USB on 30 meters and above). SSB REVERSE switch provided.
- Built-in digital display.
- Built-in RF attenuator.
- IF shift (passband tuning).
- Effective noise blanker.

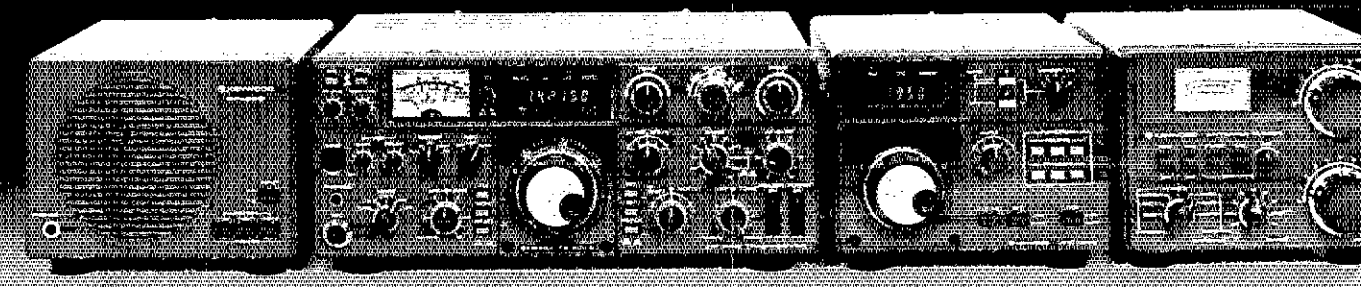
OPTIONAL ACCESSORIES:

- PS-30 base-station power supply.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.
- AT-130 compact antenna tuner (80-10 meters, including three new bands).
- SP-120 external speaker.
- VFO-120 remote VFO.
- MB-100 mobile mounting bracket.
- PS-20 base-station power supply for TS-130V.

Optional DFC-230 Digital Frequency Controller
Frequency control in 20-Hz steps with UP/DOWN micro phone (supplied with DFC-2 Four memories and digital display. (Also operates with TS-120S, TS-530S, and TS-830S.)



PS-30 SP-120 TS-130S VFO-120



SP-230 TS-830S VFO-230 AT-230

TS-830S

"Top-notch"... VBT, notch, IF shift, wide dynamic range

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

TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV.
- Wide receiver dynamic range. Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter (high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Built-in digital display (six digits, fluorescent tubes), analog dial, and display hold (DH) switch.
- Noise-blanker threshold level control.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit to check transmitted audio quality.
- RIT (receiver incremental tuning) and XIT (transmitter incremental tuning).

OPTIONAL ACCESSORIES:

- SP-230 external speaker selectable audio filters.
- VFO-230 external digital with 20-Hz steps, five memories, digital display
- AT-230 antenna tuner/SW and power meter/antenna switch 160-10 meters, including three new ban
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW f for 8.83 MHz IF.
- KB-1 deluxe heavyweigh
- (VFOs for TS-830S, TS-5 TS-130 Series, and TS-12 are compatible with all series of transceivers.)

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TS-530S

IF shift, digital display, narrow-wide filter switch

The TS-530S SSB/CW transceiver covers 160-10 meters using the latest, most advanced circuit technology, yet at an affordable price.

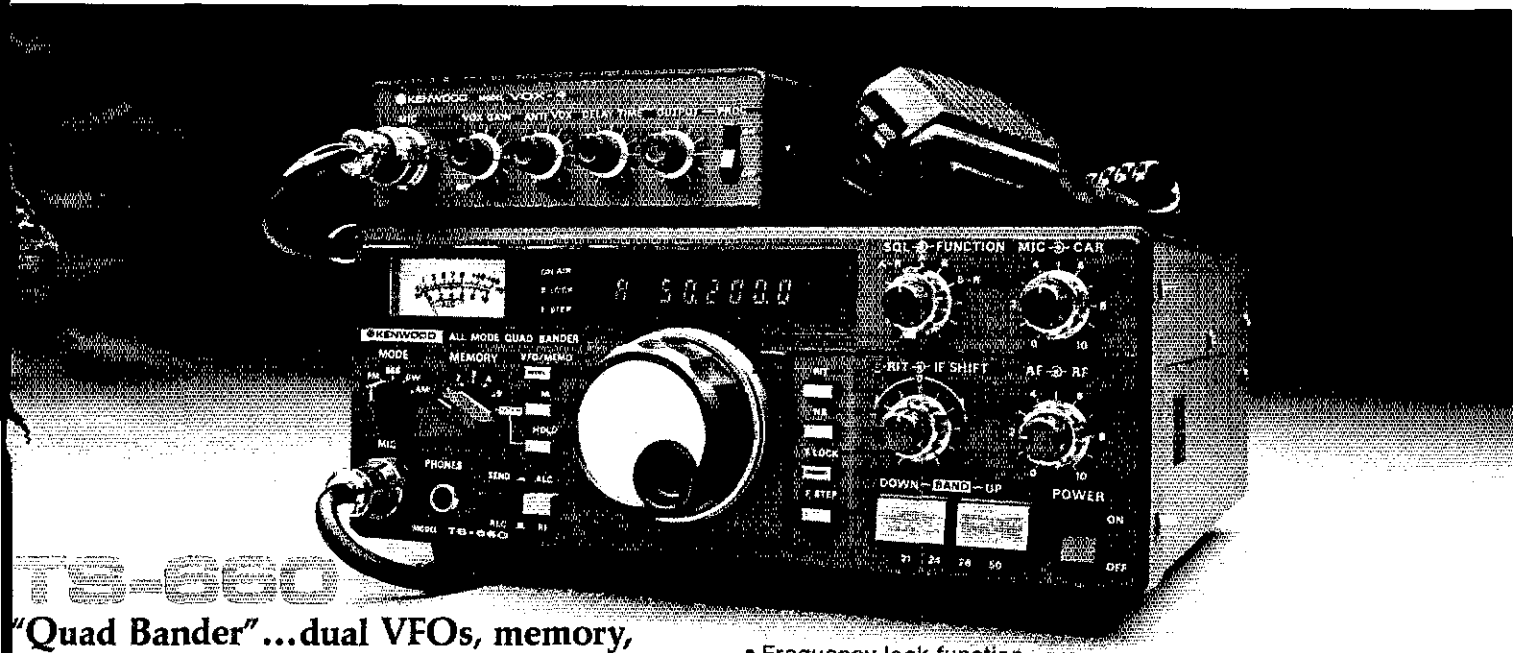
TS-530S FEATURES:

- 160-10 meter, LSB, USB, CW, all amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- IF shift tunes out interfering signals.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- Wide receiver dynamic range, with greater immunity to overload.
- Two 6146B's in final, allows 220W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.
- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of transmit or receive frequencies.

OPTIONAL ACCESSORIES:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.

SP-230 TS-530S VFO-240 AT-230



TS-660

"Quad Bander"...dual VFOs, memory, scan, IF shift, FM, SSB, CW, AM

The TS-660 is a unique, all-mode transceiver designed for operation on 6, 10, 12, and 15 meters.

TS-660 FEATURES:

- FM, SSB (USB), CW and AM operation.
- 10 Hz step digital VFO. The frequency step is determined by mode of operation.
- F. STEP switch allows alternative step size in each mode.
- Dual VFOs built-in.
- 5 channel memory stores frequency and band information.
- Memory scan scans all bands, skips channels not in use.
- UP/DOWN push-button frequency control on microphone.
- UP/DOWN bandswitch.
- Frequency lock function switch.
- IF SHIFT circuit built-in.
- Fluorescent digital display shows Tx/Rx frequencies.
- Squelch circuit for FM, SSB, CW and AM.
- CW semi break-in circuit, with CW side tone.
- 10 W RF output on SSB, CW, FM. 4 W on AM.
- Two antenna terminals provided.
- RIT control. • Noise blanker.

OPTIONAL ACCESSORIES:

- PS-20 power supply.
- SP-120 external speaker.
- MB-100 mobile mounting bracket.
- YK-88C normal CW, (500 Hz) filter or YK-88CN narrow band CW, (270 Hz) filter.
- YK-88A AM (6 kHz) filter.
- VOX-4 speech processor/VOX unit.

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Digital world clock with two 24-hour displays, quartz time base

The HC-10 digital world clock with dual 24-hour display shows local time and the time in 10 preprogrammed plus two programmable time zones.

R-600

"Now hear this"... digital display, front speaker, easy tuning

The R-600 is a high performance, general coverage communications receiver covering 150 kHz to 30 MHz in 30 bands, at an affordable price. Use of PLL synthesized circuitry provides high accuracy of frequency with maximum ease of operation.

R-600 FEATURES:

- 150 KHz to 30 MHz continuous coverage, AM, SSB, or CW.
- 30 bands, each 1 MHz wide, for easier tuning.
- Five digit frequency display, with 1 KHz resolution.
- 6 kHz IF filter for AM (wide), and 2.7 kHz filters for SSB, CW and AM (narrow).
- Up-conversion PLL circuit, for improved sensitivity, selectivity, and stability.
- Communications type noise blanker eliminates "pulse-type" noise.
- RF Attenuator allows 20 dB attenuation of strong signals.
- Tone control.
- Front mounted speaker.
- "S" meter, with 1 to 5 SINPO scale, plus standard scale.
- Coaxial, and wire antenna terminals for 2 MHz to 30 MHz. Wire terminals for 150 KHz to 2 MHz.
- 100, 120, 220, and 240 VAC, 50/60 Hz. Selector switch on rear panel.
- Optional 13.8 VDC operation using DCK-1 cable kit.
- Other features include carrying handle, headphone jack, and record jack.

OPTIONAL ACCESSORIES:

- DCK-1 DC Cable kit.
- SP-100 External Speaker.

R-1000

"Hear there and everywhere"... easy tuning, digital display

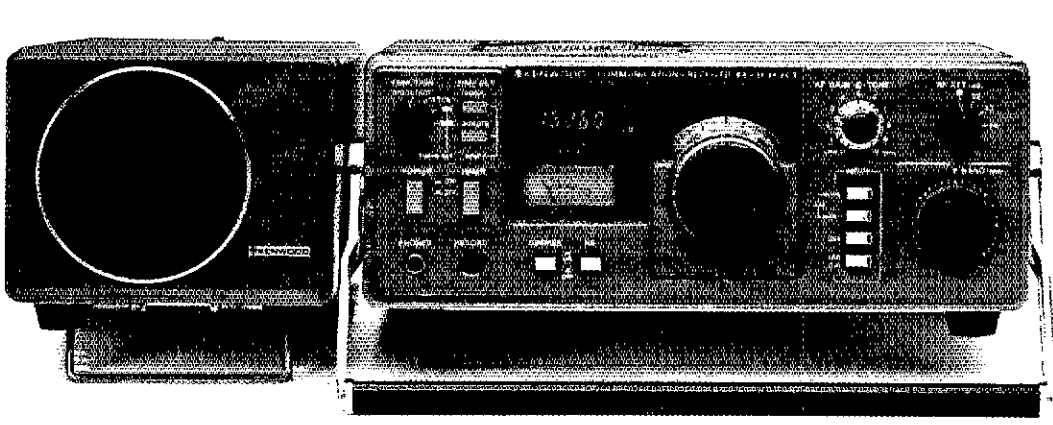
The R-1000 is an amazingly easy-to-operate, high-performance, communications receiver, covering 200 kHz to 30 MHz in 30 bands. This PLL synthesized receiver features a digital frequency display and analog dial, plus a quartz digital clock and timer.

R-1000 FEATURES:

- Covers 200 kHz to 30 MHz continuously.
- 30 bands, each 1 MHz wide.
- Five-digit frequency display with 1-kHz resolution and analog dial with precise gear dial mechanism.
- Built-in 12-hour quartz digital clock with timer to turn on radio for scheduled listening or control a recorder through remote terminal.
- Step attenuator to prevent overload.
- Three IF filters for optimum AM, SSB, CW. 12-kHz and 6-kHz (adaptable to 6-kHz and 2.7-kHz) for AM wide and narrow, and 2.7-kHz filter for high-quality SSB (USB and LSB) and CW reception.
- Effective noise blanker.
- Terminal for external tape recorder.
- Tone control.
- Built-in 4-inch speaker.
- Dimmer switch to control intensity of S-meter and other panel lights and digital display.
- Wire antenna terminals for 200 kHz to 2 MHz and 2 MHz to 30 MHz. Coax terminal for 2 MHz to 30 MHz.
- Voltage selector for 100, 120, 220, and 240 VAC. Also adaptable to operate on 13.8 VDC with optional DCK-1 kit.

OPTIONAL ACCESSORIES:

- SP-100 matching external speaker.
- HS-6 lightweight, open-air headphone set.
- HS-5 and HS-4 headphones.
- DCK-1 modification kit for 12-VDC operation.



SP-100 R-1000

HS-5

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TR-2500

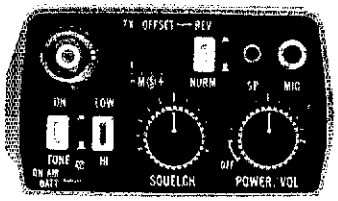
BIG performance, small size, smaller price!

The TR-2500 is a compact 2 meter FM handheld transceiver featuring an LCD readout, 10 channel memory, lithium battery memory back-up, memory scan, programmable automatic band-scan, Hi/Lo power switch and built-in sub-tone encoder.

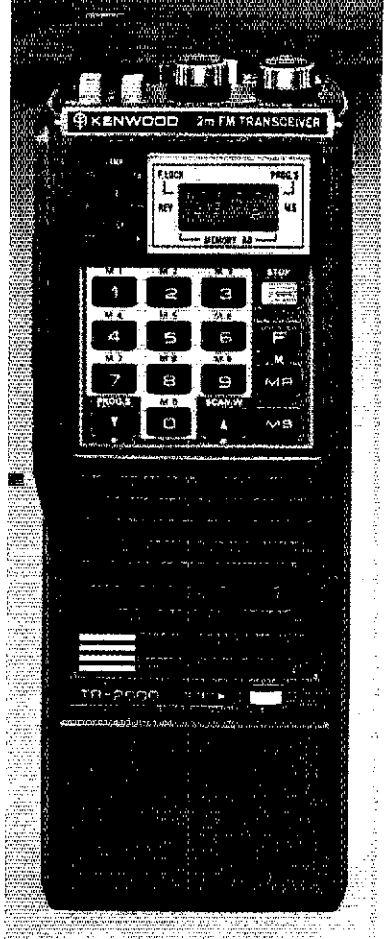
TR-2500 FEATURES:

- Extremely compact size and light weight 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches), 540 g, (1.2 lbs) with Ni-Cd pack.
- LCD digital frequency readout, with memory channel and function indication.
- Ten channel memory, includes "M0" memory for non-standard split frequencies.
- Lithium battery memory back-up, built-in, (estimated 5 year life) saves memory when Ni-Cd pack discharged.
- Memory scan, stops on busy channels, skips channels in which no data is stored.
- UP/DOWN manual scan in 5 KHz steps.
- Repeater reverse operation.

CONVENIENT TOP CONTROLS



- 2.5 W or 300 mW RF output. (HI/LOW power switch.)
- Programmable automatic band scan allows upper and lower frequency limits and scan steps of 5 KHz and larger (5, 10, 15, 20, 30 KHz . . . etc) to be programmed.
- Built-in tuneable (with variable resistor) sub-tone encoder.
- Built-in 16 key autopatch encoder.
- Slide-lock battery pack.
- Keyboard frequency selection across full range.
- Extended frequency coverage; 143.900 to 148.995 MHz in 5 KHz steps.
- Optional power source, MS-1 mobile or ST-2 AC charger/ power supply allows operation while charging. (Automatic drop-in connections.)
- High impact plastic case.
- Battery status indicator.
- Two lock switches for keyboard and transmit.



STANDARD ACCESSORIES:

- Flexible rubberized antenna with BNC connector.
- 400 mAH heavy-duty Ni-Cd battery pack.
- AC charger.

OPTIONAL ACCESSORIES:

- ST-2 Base station power supply and quick charger (approx. 1 hr.).
- MS-1 13.8 VDC mobile stand/ charger/power supply.
- TU-1 Programmable "DIP switch" (CTCSS) encoder.
- SMC-25 Speaker microphone.
- LH-2 Deluxe top grain cowhide leather case.
- PB-25 Extra Ni-Cd battery pack, 400 mAH, heavy-duty.
- BT-1 Battery case for AA manganese or alkaline cells (not Ni-Cd).
- VB-2530 RF power amplifier.
- BH-2 Belt hook.
- WS-1 Wrist strap.
- EP-1 Earphone.

TR-7850

40 W, 15 memories/offset recall, scan, priority, autopatch (DTMF)

Kenwood's remarkable TR-7850 2-meter FM mobile transceiver provides all the features you could desire, including a powerful 40 watts output. A 25 watt version, the TR-7800 is also available.

TR-7850 FEATURES:

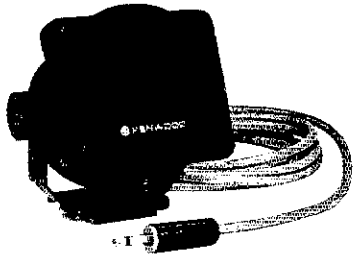
- 40 watts output, with selectable high or low power operation.
- 15 multifunction memory channels, easily selectable with a rotary control. M1-M13 . . . memorize frequency and offset (±600 KHz or simplex). M14 . . . memorize transmit and receive frequencies independently for non-standard offset. M0 . . . priority channel, with simplex ±600 KHz or non-standard offset operation.
- Internal battery back-up for memories. Requires four AA Ni-Cd batteries, (not supplied).
- Extended frequency coverage, 143.900-148.995 MHz in 5 or 10 KHz steps.
- Priority alert. Beep alerts operator when signal appears on priority channel.
- Built-in autopatch encoder (DTMF). All 12 plus four additional DTMF signaling tones. (With simultaneous push of REV switch.)
- Autoscan of memories and entire band. Scan resumes automatically.
- Front panel keyboard.
- Compact size.
- UP/DOWN manual scan of entire band and memories, using UP/DOWN microphone (supplied).
- Repeater reverse switch.
- Separate digital displays for frequency and memory channel.
- LED S/RF bar meter.
- Tone switch.

Matching accessories for fixed station operation:

- KPS-12 power supply (for TR-7850)
- KPS-7 power supply (for TR-7800)

SP-40

Compact mobile speaker.
Only 2-11/16 W x 2-1/2 H x 2-1/8 D (inches)
Handles 3 watts of audio



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The TR-7730 is available in two variations: a 16-key autopatch UP/DOWN microphone (MC-46) version, and a basic UP/DOWN microphone version.

TR-7730

Miniaturized, 5 memories, memory/band scan

The TR-7730 is a very compact 25 watt, 2-meter FM mobile transceiver, reasonably priced.

TR-7730 FEATURES:

- Dimensions: 5-3/4 W x 2 H x 7-3/4 D, inches. Weighs 3.3 lbs.
- Extended frequency coverage, 143.900-148.995 MHz, in 5 or 10 KHz steps.
- 25 watts RF output power, with HI/LOW power switch.
- 5 memories for operation in simplex or repeater modes.
- Memory scan, plus automatic band scan.
- UP/DOWN manual scan on microphone (supplied).
- Four digit LED frequency display.
- S/RF bar meter. LED indicators for BUSY, ON-AIR, REPEATER offset.
- Tone switch for internal tone encoder (not Kenwood supplied).
- Offset switch, ±600 kHz. Non-standard offset uses fifth memory.

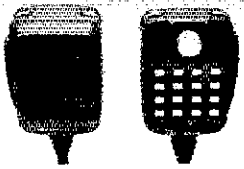
OPTIONAL ACCESSORIES:

- MC-46 16-key autopatch UP/DOWN microphone.
- SP-40 compact mobile speaker.
- KPS-7 fixed station power supply.

TR-8400

Synthesized 70-cm FM mobile rig

- Covers 440-450 MHz, in 25 KHz steps, with two VFOs.
- Transmit offset switch for ±5 MHz. Non-standard offset uses fifth memory.
- HI/LOW power switch selects 10 or 1 watt RF output.
- Similar to TR-7730 in other features, including five memories, memory scan, automatic band scan, UP/DOWN manual scan, four digit display, S/RF bar meter, LED indicators, tone switch, and same optional accessories.



- MC-46 16-key autopatch UP/DOWN microphone.

TR-9000

"New 2-meter direction"...compact rig with FM/SSB/CW, scan, five memories

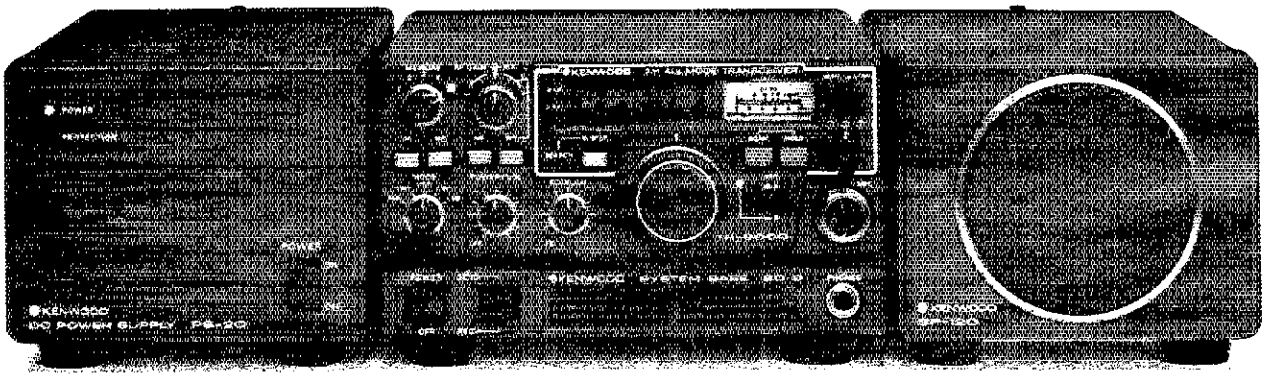
The TR-9000 combines the convenience of FM with long distance SSB and CW. It is extremely compact . . . perfect for mobile operation. Matching accessories are available for optimum fixed-station operation.

TR-9000 FEATURES:

- FM, USB, LSB, and CW.
- Only 6-11/16 inches wide, 2-21/32 inches high, 9-7/32 inches deep.
- Two digital VFOs, with selectable tuning steps of 100 Hz, 5 kHz, and 10 kHz.
- Digital frequency display. Five, four, or three digits, depending on selected tuning step.
- Covers 143.9000-148.9999 MHz.
- Band scan . . . automatic busy stop and free scan.
- SSB/CW search of selectable 9.9-kHz bandwidth segments.
- Five memories . . . four for simplex or ±600 kHz repeater offsets and the fifth for a non-standard offset (memorizes transmit and receive frequency independently).
- UP/DOWN microphone (standard) for manual band scan.
- Noise blanker for SSB and CW.
- RIT (receiver incremental tuning) for SSB and CW.
- RF gain control.
- CW sidetone.
- Selectable RF power outputs . . . 10 W (HI)/1 W (LO).
- Mobile mounting bracket with quick-release levers.
- LED indicators . . . ON AIR, BUSY, and VFO.

OPTIONAL ACCESSORIES:

- PS-20 fixed-station power supply.
- SP-120 fixed-station external speaker.
- BO-9 System Base . . . with power switch, SEND/RECEIVE switch (for CW), memory-backup power supply, and headphone jack.
- MC-46 16-key autopatch UP/DOWN microphone.



PS-20 TR-9000 BO-9 SP-120

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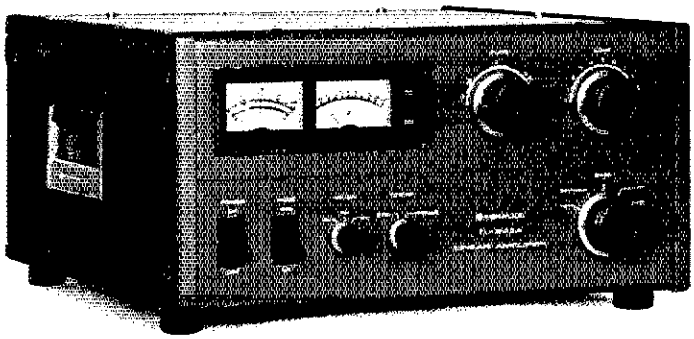


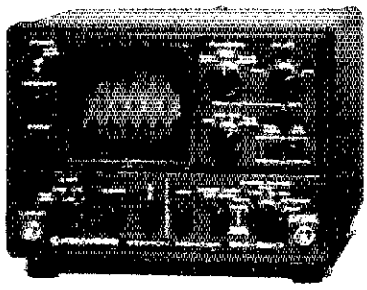
TL-922-A

Maximum legal power on 160-15 meters

The TL-922A linear amplifier provides maximum legal power on the 160-15 meter Amateur bands.

TL-922A FEATURES:

- 2000 W PEP (SSB)/1000 W DC (CW, RTTY) input power on 160, 80, 40, 20, and 15 meters, with 80 W drive.
- Excellent IMD characteristics.
- Pair of EIMAC 3-500Z high-performance transmitting tubes.
- Safety protection.
- Blower with automatic turnoff-delay circuit.
- Variable threshold level type ALC.
- Two meters, one indicating plate current, and the other indicating grid current, relative RF output, and high voltage.



SM-220

High-performance oscilloscope for various monitoring functions

The SM-220 Station Monitor provides a variety of waveform-observing capabilities, and an optional pan display.

SM-220 FEATURES:

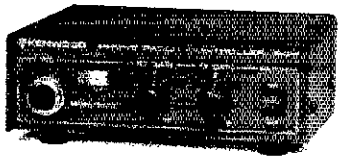
- Monitors transmitted SSB and CW waveforms from 1.8 to 150 MHz.
- Monitors signal waveforms in receiver's IF stage.
- Functions as high-sensitivity, wide-frequency-range (up to 10 MHz) oscilloscope.
- Tests linearity of linear amplifiers (provides trapezoid pattern).
- Allows observation of RTTY tuning points (cross pattern).
- Built-in two-tone (1000-Hz and 1575-Hz) generator.
- Expandable to pan-display capability for observing the number and amplitude of stations within a switchable ±20 kHz/±100 kHz bandwidth.

OPTIONAL ACCESSORIES:

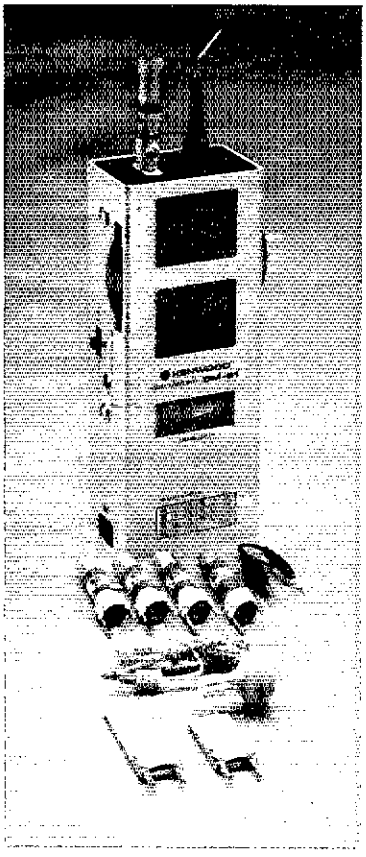
- BS-8 pan-display module for TS-180S, TS-530S, TS-830S, and TS-820 Series.
- BS-5 pan-display module for TS-520 Series.

ACCESSORIES

A wide selection of optional accessories is offered for optimum operating flexibility. In addition to the optional items listed with each piece of equipment described in this catalog, the following accessories are also available:



PC-1 phone patch with hybrid circuit and VU meter for null and audio gain measurements.



DM-81

Dip meter performs many RF measurements

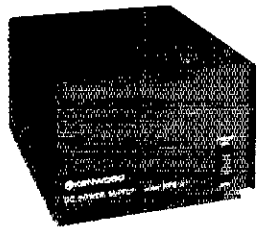
The DM-81 dip meter is highly accurate and features, in addition to the traditional inductive-coupling technique, capacitive coupling for measuring metal-enclosed coils and toroidal coils.

DM-81 FEATURES:

- Measuring range of 700 kHz-250 MHz in seven bands.
- Built-in storage compartment for all seven coils, capacitive probe, earphone, and ground clip lead.
- All solid-state and built-in battery.
- HC-25U and FT-243 sockets for checking crystals and marker-generator function.
- Amplitude modulation.
- FET for good sensitivity.
- Absorption frequency meter function.
- Earphone for monitoring transmitted signals.
- Capacitance probe for measuring resonant frequencies without removing coil shields, and also for measuring resonant frequencies of toroidal coils.

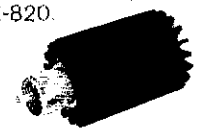
MC-60 deluxe dual impedance (50KΩ/500Ω) desk microphone with 4-pin connector. Also available with UP/DOWN switch, in 6 or 8-pin connector versions.

HS-6 lightweight, open-air headphone set.

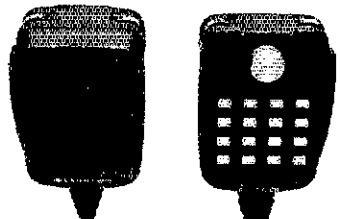


KPS-21 13.8 VDC fixed-station power supply, 21A intermittant, 16A continuous.

KB-1 deluxe, heavyweight, aluminum knob for TS-830S, TS-530S, TS-180S, TS-820S, and R-820.



RD-20 50Ω RF dummy load, (DC-500 MHz) 50 W intermittant, 20 W continuous.



MC-46 16-key autopatch UP/DOWN microphone.

OTHER ACCESSORIES:

MC-50 dynamic dual-impedance (50 kΩ/500Ω) desk microphone.
MC-30S (500Ω) and **MC-35S** (50 kΩ) dynamic noise-canceling hand microphones.
HS-5 deluxe 8Ω headphone set.
HS-4 8Ω headphone set.

NOTE: **Prices and specifications of all Trio-Kenwood products are subject to change without prior notice or obligation.**

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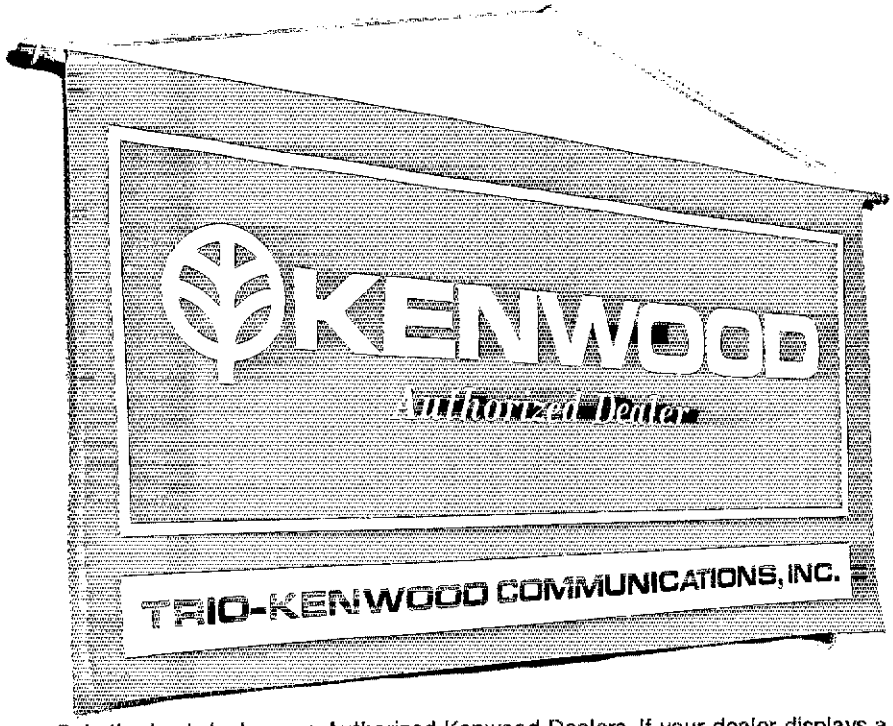
Look for the Kenwood banner.



Only the best dealers are Authorized Kenwood Dealers. If your dealer displays a Kenwood Authorized Dealer banner and plaque in his store, you will know he can provide you with the service you demand . . . of the same quality as factory service. Authorized Kenwood Dealers employ factory-trained service technicians, maintain an extensive inventory of spare parts, and have direct access to factory service information. When you deal with an Authorized Kenwood Dealer, you deal with an expert on the entire line of Kenwood Amateur Radio equipment.

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Birmingham, AL 35233
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ALASKA
Reliable Electronics
3306 Cope Street
Anchorage, AK 99503
(907) 279-5100

ARIZONA
Power Communications
1640 W. Camelback Road
Phoenix, AZ 85015
(602) 241-9288

CALIFORNIA

Ham Radio Outlet
2620 West La Palma
Anaheim, CA 92801
(714) 761-3033

Ham Radio Outlet
999 Howard Avenue
Burlingame, CA 94010
(415) 342-5757

Ham Radio Outlet*
2811 Telegraph Avenue
Oakland, CA 94609
(415) 451-5757

Ham Radio Outlet
5375 Kearny Villa Road
San Diego, CA 92123
(714) 560-4900

Ham Radio Outlet
6265 Sepulveda Boulevard
Van Nuys, CA 91401
(213) 988-2212

Henry Radio, Inc.
931 North Euclid
Anaheim, CA 92801

Henry Radio, Inc.
2050 S. Bundy Drive
Los Angeles, CA 90025
(213) 820-1234

Webster Radio
2602 East Ashlan
Fresno, CA 93726
(209) 224-5111

COLORADO
CW Electronic Sales Co.
800 Lincoln Street
Denver, CO 80202
(303) 893-5525

FLORIDA
Amateur Electronic Supply
621 Commonwealth
Orlando, FL 32803
(305) 894-3238

Amateur Radio Center
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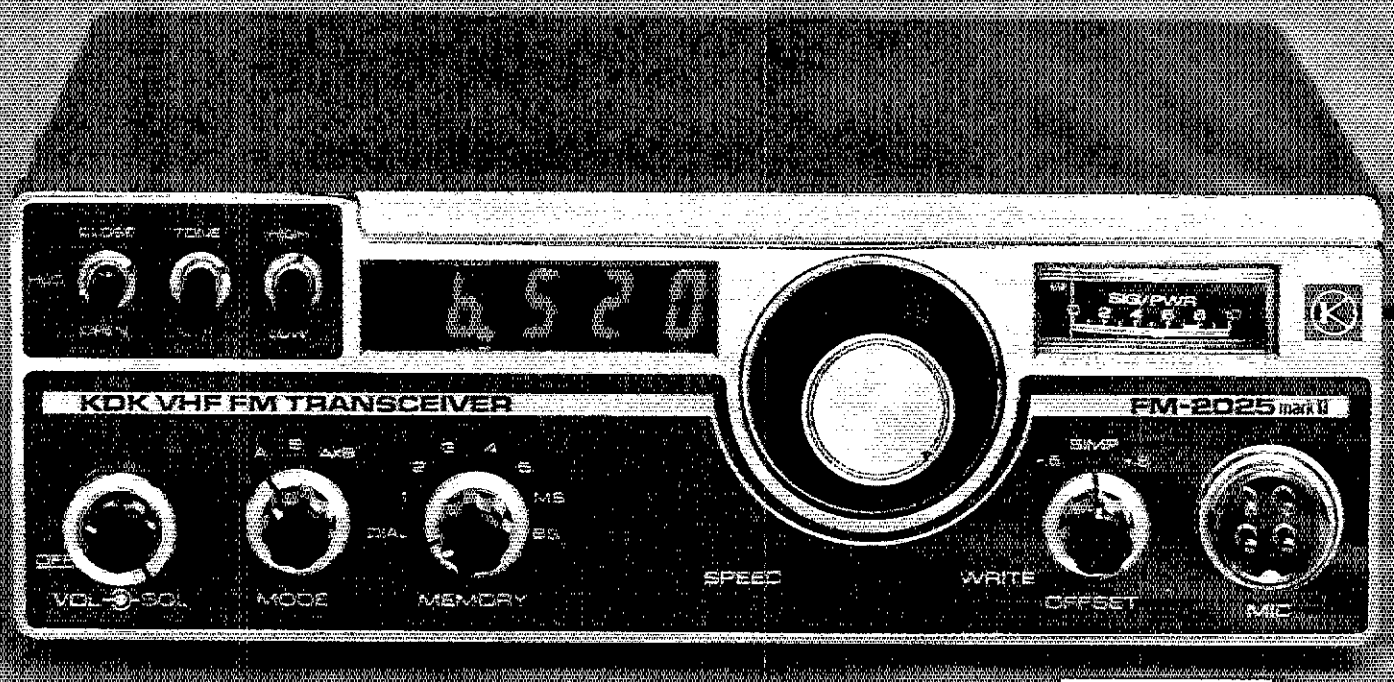

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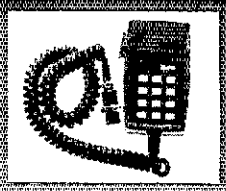

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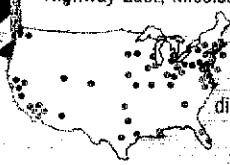

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DELTA DIVISION

ARKANSAS: SCM, Dale Temple, W5RXU — SEC: WB5IGF. NMs: KC5CE ARN, W5MYZ OZK Net, W5UAU APN, WA5ZWZ MBIRD. Condolences to the family and friends of Silent Key WA5EJH, who was licensed at about age 14 and was killed erecting a tower near Fayetteville when the tower fell crushing his chest. A member of CAREN in Little Rock, he was instrumental in putting 13/73 on the air. He lived in the Fayetteville area and was a member of NWAARC and put the Springdale and Mt. Gaylor repeaters on the air. Terry was the first Arkansas repeater frequency coordinator. He will be greatly missed. ADXA Info. Net, 3815 Mondays GMT will move from 0200Z to 0100Z when daylight savings time changes.

LOUISIANA: SCM: Jim Giammanco, N5IB — Some of the papers documenting the history of the Jefferson ARC are being donated to the University of New Orleans, Louisiana memorabilia collection. JARC celebrated its 25th anniversary at its October hamfest. Baton Rouge ARC and Acadiana ARA are both beginning a new series of Novice classes. The 1980 traffic statistics show that LA ranks 42nd among the 72 sections, down from 39th last year. 171 reports were received accounting for 9807 traffic points. LA fared better in ARES statistics, ranking third in class and 15th overall, up from 13 and 58 respectively in '79. W5TYF and K5GUU have conducted successful experiments with computer-to-computer data transmissions on 146 MHz. The deadline for nominating petitions for SCM is only a few days away as you read this, so if you have a candidate in mind, act now. Don't forget the SELARC hamfest in Hammond on Jan. 16.

Net	Freq.	Time	QNI	QTC
LAN	3815 kHz	7 & 10 PM, Dy	577	262
LTN	3910 kHz	6:30 PM, Dy		
LSN	3703 kHz	7:30 PM, M-F		
LRN	3087.5 kHz	6:30 PM Su, 8 PM W		
LEN	3910 kHz	8:00 PM, Su		

Traffic: K5TL 155, KC5SF 68, W5VMY 43, N5BFV 35, N5IB 18, WD5CWK 14.

MISSISSIPPI: SCM, Paul Kemp, WB5SNB — SEC: WB5FXA. STM: KB5W. Freq Coord: WD5DCI. Biloxi Hamfest big success. Sri 1 missed it. KC5EY is KT5T. W5EDT is KT5Z. WD5BSJ has new harmonic. Winter is now upon us, time to get projects started or completed. Good turnout at MSBN picnic. WD5DCI publishing new rptr directory for MS. List last count at 60. Tnx for comprehensive listing and good up to date info. CAND (W5KLV) 30 sess QTC 869. Ms rep 100% by W5EDT WA5OKI. DRN5 (WB5YDD) 30 sess QTC 264. Ms rep 97% by W5BEV W5EDT WB5HAS W5HKW WA5OKI KD5P KT5T. MN (WB5RMW) 30 sess QNI 435, QTC 11. MSBN (WD5EYM) 30 sess QNI 1935 QTC 40. MTN (K5QAF) 30 sess QNI 120 QTC 54. MSN (KA5GGG) 20 sess QNI 145 QTC 6. GSAEN (KB5W) sess 22 QNI 478 QTC 29. CAEN (KA5AGD) sess 4 QNI 88 QTC 0. RACES (K5GE) sess 4 QNI 147 QTC 0. Traffic: KB5W 258, K5OAF 77, KT5Z 54, WB5HAS 7, WD5EYM 4.

TENNESSEE: SCM, John C. Brown, NO4Q — STM: K4YOL. SEC: W4NZW. A "Certificate of Merit" was awarded to WB4BKF for eight years service as an OBS to the section. A well deserved and a pleasure to award to a very dedicated and faithful amateur. We have been and are still missing some net reports from several NMs. Would really like to include your activity in this report. The 1981 SET is now history and am sure that we could have done better. Always room for improvement. The 1982 Delta Division Convention will be held in Knoxville. Ordinarily that would not be anything to get too concerned about this early, but best do that anyway as you know the 1982 Worlds Fair will also be early opening as will the Knoxville Hamfest. Lodging will be at a premium. The aspect will be a liability rather than an asset. Honor roll for the month are TSN: KA4RJC KA4HPW WB4YSN N4DZW KA4OXO WA4LXP WA4CMS N4EFB KA4OVE WD5FUN N4EAM KA4RUE KA4PWU. Another near record. Keep up fine work. TN cw net: W4DDK K4WOP W4WXH W4ZJY NO4Q with a net certificate to NO4Y. W4HOT awarded TPN certificate. Nets: if: sess 95 QNI 3948 QTC 164; vhf: sess 87 QNI 2053 QTC 553; cw: sess 64 QNI 737 QTC 331. Station activity reports are up again. Traffic: NG4J 507, W4WXH 308, N4EAM 225, W4OGG 159, W4ZJY 156, WB4BKF 139, N4EFB 102, WD4SIG 69, W4MRD 62, KA4OXO 46, K4VM 41, KY4L 37, W4DDK 32, N4DZW 32, K4WOP 32, NM4W 31, KA4RJC 28, W4PFP 27, KA4BSG 22, W4TYV 19, K4YOL 19, NN4D 9, W4PSN 8, KA4MC 6, W4EWR 5, W4NZW 5, K4ON 5, K4UMW 5, WA4GLS 3, WB4YPO 3, W4DPO 1. Your SCM has been approached about organizing a RTTY net. If that is your thing, let me know what time would best suit your schedule.

GREAT LAKES DIVISION

KENTUCKY: SCM, Dave Vest, KZ4G — STM: KA4GFU. SEC: N4EEL. Net/QNI/QTC: *MPKN/838/82 *KRN/570/38 *KTN/1130/144 *KNTN/385/139 *KYN/240/111 *KSN/205/63 KEN/230/11. BARES/112/18 3ARES/20/4 4ARES/33/3 5ARES/127/30 6ARES/127/10 11ARES/61/1 PAEWTN/262/27 TSTMN/426/61 CCEN/71/8 PAWN/7/0 WARES/10/1 MEN/112/5 CARN/170/18 SEKEN/30/0 KPON/60/8. DCAN/D9RN had 100%. New appts: WA4IUW, DEC; WA4UQA, EC. Dist 13 ready team; WA4JQS, OO; K4MNF, EC, Clark Co.; WA4AGH AC4F, OBS. Upgrade: KA4MAP Adv. Silent Keys: W4VWQ KA4PZS. Let's all originate some holiday QTC and increase activity on the nets. KC4VB won cw contest in Lvl, with NO4R running a close 2nd. KA4SAA voted best newcomer of year. NCSs of year: WA4IUW W4JGU WD4BSC KA4MBF KC4VB KC4WN. Best wishes to each of you for a happy holiday season. Traffic: KA4MZY 172, KA4GFU 108, K4ZWB 89, KB4OZ 87, WD4IYI 86, K4JLX 83, KC4VB 76, KC4XM 64, KC4WN 54, KS4V 51, KA4SAA 46, K4MHL 39, KZ4G 38, N4EEL 37, WA4JTE 37, WB4NHO 35, WA4AVV 31, WD4BSC 30, KA4MBF 29, KA4BCM 26, K4HOE 25, N4EZE 24, WA4EBN 21, NN4H 21, WB4CJQ 18, WD4COF 17, WA4JAV 17, WA4YPQ 15, WB4ABE 14, WA4AGH 14, WA4UIV 13, W4PKX 12, KD4SN 9, WB4AUN 8, KA4GBZ 8, WA4UQA 8, K4AVX 7, N4FFS 7, KA4SKV 6, WD4IYH 3, KA4ADF 2, WA4IGD 2, KA4MAP 2, WB4UPI 2.

MICHIGAN: SCM, James R. Seeley, WB8MTD — ASCM: WA8DHB. SEC: WA8EFK. STM: AF8V. DECs KC8DN K8RCT W8VWY. NMs: KA8DEZ WA8DHB K8LNE K8KMQ WD8LRT WD8NKT WA8PIM W8SCW WD8RNQ WB8YDZ W8YIQ K8ZJU.

Net	Freq.	Time/Day	QNI	Tfc	Sess.	Mgr.
MITN*	3953	1900 dy	739	365	30	WD8LRT

CT2100

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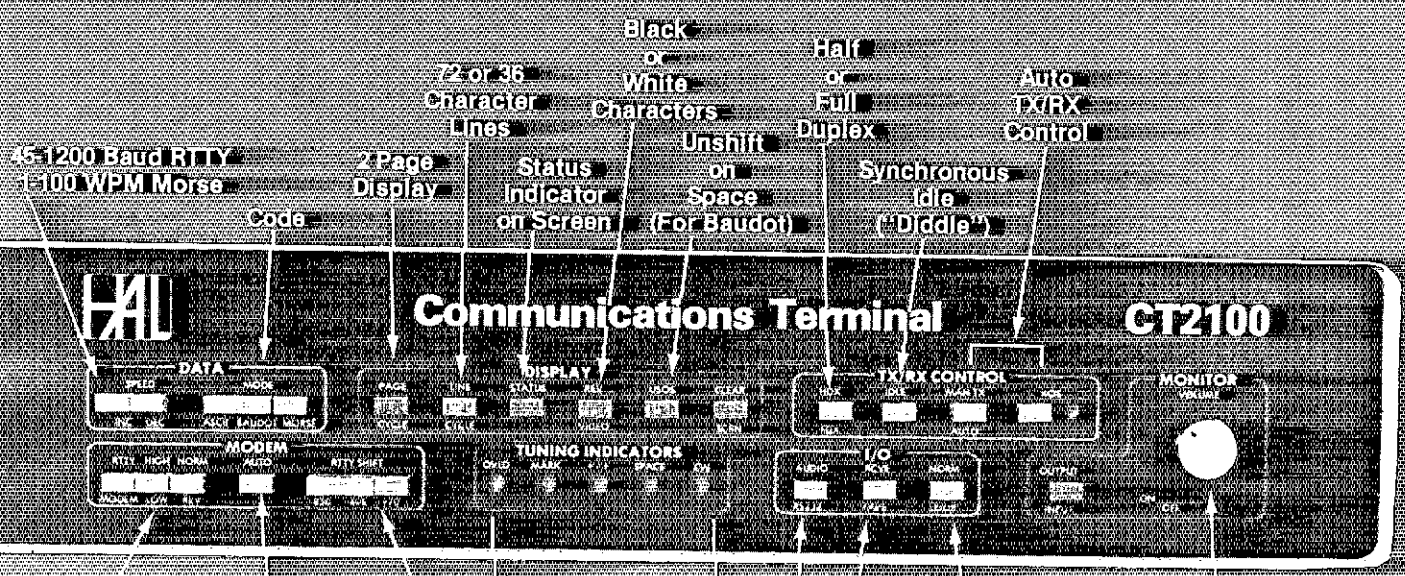

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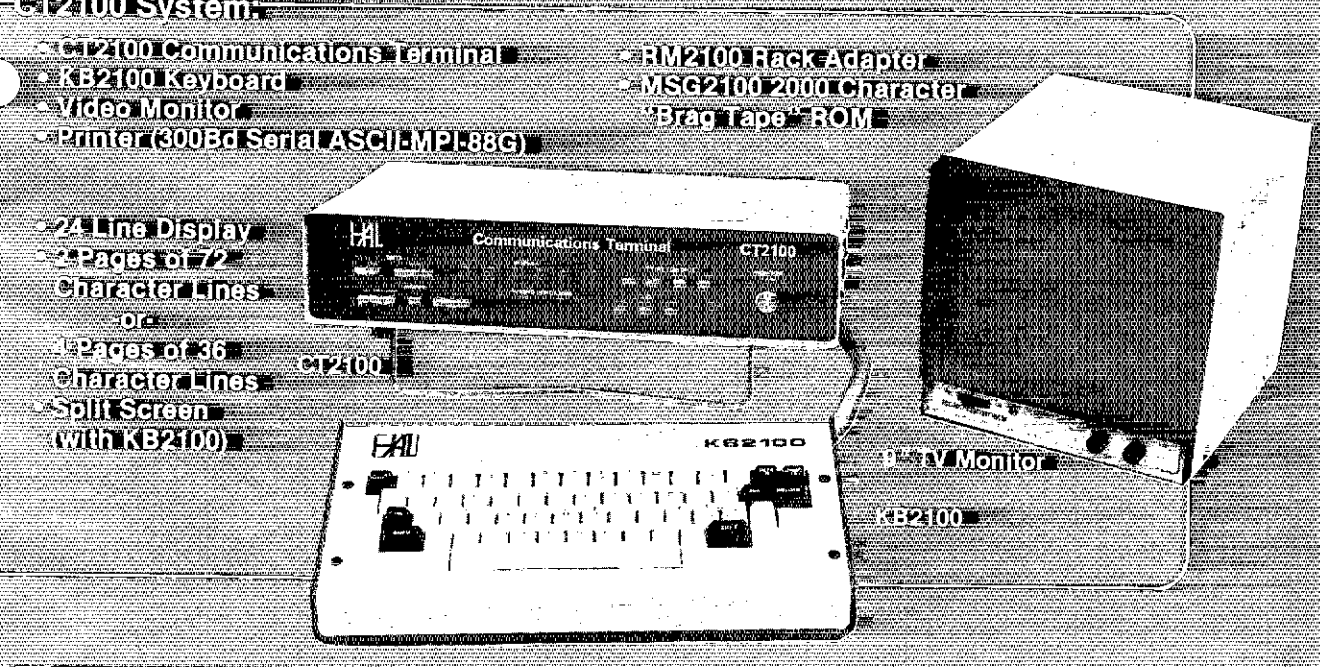

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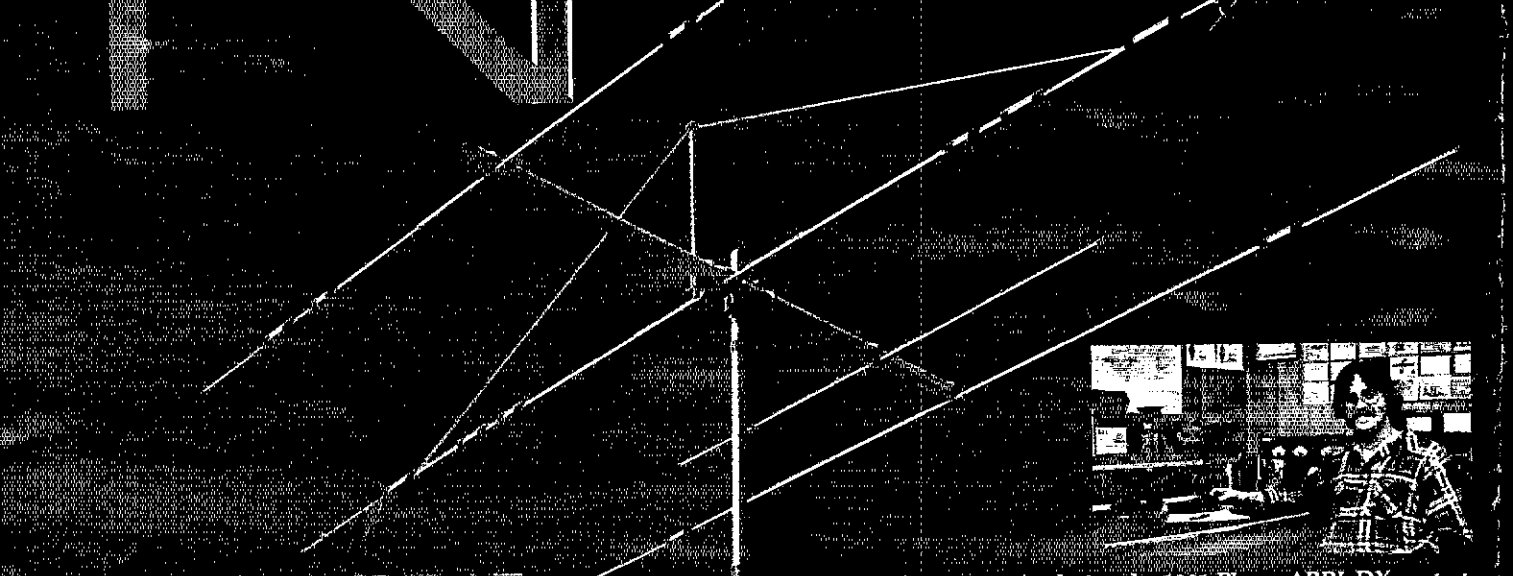

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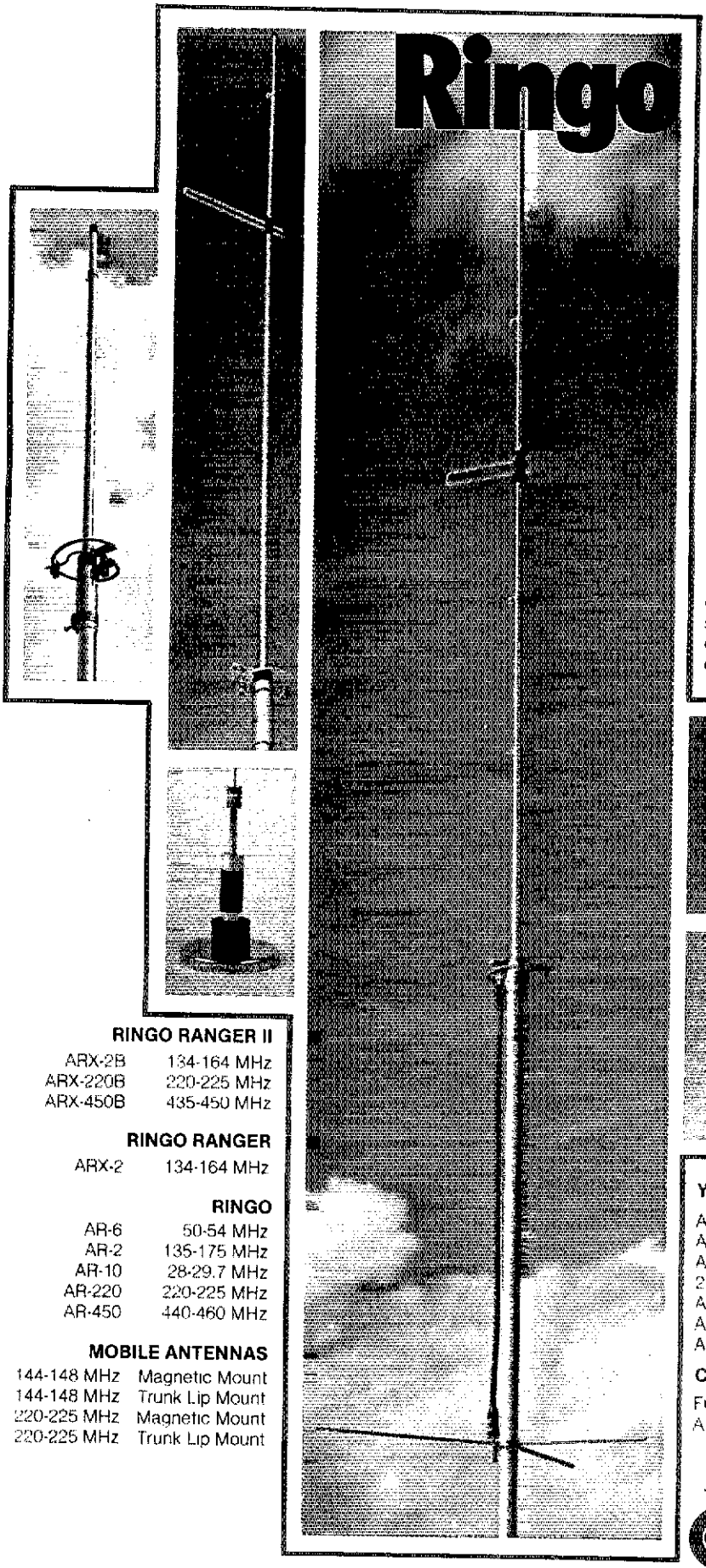

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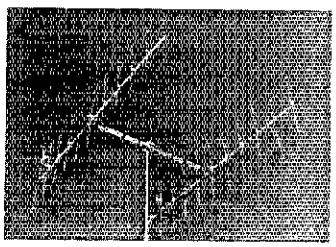

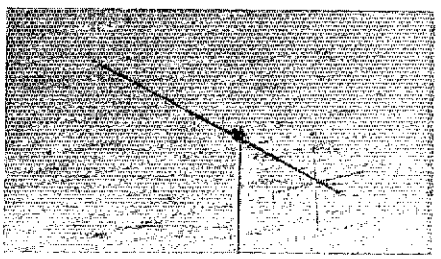

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RINGO RANGER

ARX-2	134-164 MHz

RINGO

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BR	3930	1730 M/S	361	19	25	WB8ZGP
MEN	3930	0900 Su	125	5	4	WB8ZGP
VHF Nets		9 reports	550	35	41	WD8NKT

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Su 1300. 3932 kHz is MI emergency frequency. Tfc workshop Su 3953 kHz 1600. ARES net Su 3932 kHz, 1730. UP ARES Thur 3922 kHz, 1800. QO reports: K8JH W8QG AC8Y. OBS reports: K8NKB AF8V. Silent Keys, with deep regret: W8SOE K8ZOH. New officers for BRARC: KI8Z, pres.; WA8PRJ, v.p.; WD8MEY, sec/treas.; WB9GCG, act. dir. For MCRC: W8MPD, pres.; KB8AI, v.p.; KA8IKC, sec.; KB8NV, treas. For Midland ARC: WD8SDX, pres.; W8WOJ, v.p.; N8AUW, sec/treas. For CMAR: WD8AUL, pres.; N8AUW v.p.; KA8HUY, sec.; WD8OMV, treas. For rptr council: W8LSS, chairman; W8QOI, v.c.; WB8VWK, sec/treas. The Division convention in Louisville was great. It was a pleasure meeting W4OYI, vice director-elect. George will be a worthy replacement for W8AP, retiring after many years of service in this post. Congrats to K8RCT, our DEC for the U.P., and his new XYL, Jennifer. Also in the U.P., something I never knew existed, or *could* exist: The Copper County RAA that has no membership dues. Funds are raised through donations, swaps, etc. Mbrs can come and go on a no-questions-asked basis. Michigan traffic awards (20 or more public organizations): KA8CPS WD8LRT. BPL: KA8AID, WD8LRT. Traffic: AF8V 433, KA8AID 384, WD8LRT 329, KA8CPS 302, WB8MTD 289, WB8YDZ 157, WA8DHB 129, WA8PIM 122, WD8IBY 105, K8KMQ WD8OSE 103, WD8MJB 100, W8IHX 83, K8GXV 71, KA8DEZ 68, KB8MX WA8WZF 63, WA8TAQ 61, W8YY 59, WD8EIB WB8SYA 57, W8VPW 51, N8BNC KC8DC W8VIZ 50, WD8RNQ 48, W8YIQ 44, N8BJD 43, W8PDP 40, WD8NKT 38, WD8IXZ 37, W8ECK 36, WD8RHU WB8YWA 35, KA8EQP 34, K8LNE 32, WB8TTA 27, WB8ZGP 24, W8CUP WB8ITT 23, KA8IWW 22, WD8RWR 21, K8OCP WD8OEP K8ZJU 20, WD8IYA K8UPE 18, WB8DJS KB8GT 17, N8CTI W8SCW 16, KJ8T 15, KI8Q 13, WD8JRT 12, WD8LIP 11, K8KQJ W8CBH 10, WD8BEN KA8LHJ 9, N8AOM W8JUP 8, WB8HPZ 7, WA8QAF 6, WA8YBP 5, W8LOU 4, KE8X 3, WB8AXI KI8Z 2, K8DD 1. (Aug.) W8ECK 120.

OHIO: SCM, Allan L. Severson, AB8P — ASCM: W8MQK. SEC: K8AN. STM: K8OZ. NMs: W8EK KF8J WB8JGW WD8KFN WD8OMP WB8YGW.

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	356	202	60	6:45/10 p.m.	3.577
BNR	444	59	29	6 p.m.	3.605
ONN	45	10	24	6:30 p.m.	3.708
OSN	204	120	30	6:10 p.m.	3.577
OSSBN	2275	667	90	10:30 a.m. 4:15 & 5:45 p.m.	3.9725
06MN	470	32	29	9:00 p.m.	50.160

Yes, indeed, sports fans, there will be an Ohio Convention in Cincinnati on February 27 and 28, 1982, just in time to banish our late-winter blahs. This year, my family shouldn't need to import bottled California smog to convince me that I wouldn't wish to return to the warm winters of the west. While the folks in Cincinnati can't offer beaches, surf, and the exotic trappings of Tropicana-land, they do offer warm friendships, superior facilities and housing, and a variety of forums, exhibitions and other gatherings. This hospitable combination leaves me with a sunny glow; I hope you feel similarly. More convention specifics next month. See you there. Congratulations to W8ADW, chairman, W8EFW W8NJF KA8ARI and all the others on the committee from QCWA Cleveland Chapter 1 for putting on the annual QCWA Convention and one of the grandest banquets I've attended. Well done, QCWA Cleveland Chapter 1! Club elections: Greater Cleveland ARA: WA8SSI, pres.; K8WWA & WD8JGB, v.p.; W8GS, recording secy.; KB8KI, corresponding secy.; WA8STX, treas. Appointments: N8BLC, EC Lawrence-Scioto County; K8IOW, EC Warren County; K8IP now also has EC responsibility for Monroe County. Upgrades: N8BZJ and KC8CA to Extra.

Local Nets	QNI	QTC	Sess.
BRTN	363	171	30
CCOMF (Aug)	102	11	9
CCOMF (Sept)	75	3	8
COARES	115	6	4
Firelands Red Cr.	55	3	5
LCNWOARES	857	150	60
RARA	84		5
TATN (Aug)	347	206	31
TATN (Sept)	288	97	30
TSRAC	1002	145	38

Traffic: W8PMJ 295, W8GGX 272, WD8KFN 226, WB8JGW 210, N8XX 182, AB8P 146, KF8J 128, N8BQK 115, WB8DMF 105, W8EK 90, K8OZ 90, WA8GMT 88, WB8MZZ 85, W8MOK 84, W8CZK 83, W8MGA 81, N8JR 76, N8APM 74, W8CJU 73, KA8HCT 71, WB8QHU 69, WB8WTS 69, WD8DYW 65, WD8KBW 63, WB8UBR 63, W8WEG 62, K8AN 61, WD8OYO 55, WB8NCD 54, W8TP 53, WB8SRC 50, WB8PIY 49, WD8DDE 44, WD8OYK 44, WB8SIO 35, N8AKS 34, KA8CDE 34, K8PYT 34, WB8MRL 33, WA8BUW 32, KA8DJZ 28, K8JDI 28, W8LZE 28, K8DL 26, N8DAD 24, WD8NEC 24, WB8SJE 24, N8AUH 23, WA8OYJ 23, WA8ZID 23, K8GET 22, K8NJQ 22, K3RC 22, WA8SSI 21, KA8HGH 20, WD8MIO 20, WD8ODV 20, WB8QXN 17, W8UQY 17, W8BHL 16, N8CGM 16, WD9HDZ 16, W8UPD 16, KA8IUK 15, WB8KKI 15, W8RG 15, WD8RGS 15, WB8RSM 15, WA8HED 14, N8CW 13, W8CAR 12, K8NQW 12, W8OQL 12, WD8EKI 11, KA8KFW 11, W8RZN 11, WD8INK 9, WB8QHV 9, K8JE 8, K8CKY 6, N8AJU 4, WD8JAJ 4, WA1QAA 4, KA8GGZ 3, WB8NTR 3, WB8NHV 2 (Aug.) N8XX 362, WB8ICL 124, KA8HCT 80, WD8JAJ 22, K8NJQ 20, WA8BOV 14, W8WAV 12, WB8TRK 6.

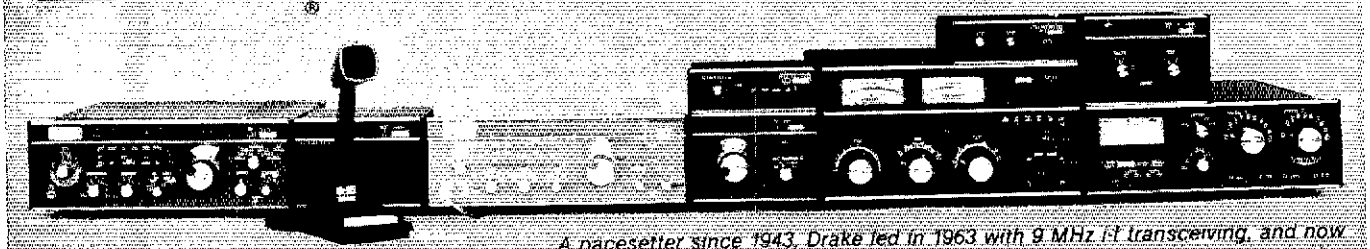
HUDSON DIVISION

EASTERN NEW YORK: SCM, Paul S. Vydareny, WB2VUK — SEC: KB2KW. STM: WA2SPL. ASCM: W2IT KB2TM.

Net	Time/Day	Freq.	Mgr.
EPN	2300Z	3.902	WB2MQO
ESS	2300Z	3.590	W2WSS
NYS	0000/0300Z	3.677	KA2CTU
NYPON	2200Z	3.913	K2KQC
NYSPTEN	2300Z	3.925	AA2Y
NYS RATT	2330Z	3.625	W2ODC
CDN	2330Z	146.34/94	WB2ZCM
HVN	0030Z T-S	146.37/97	N2BDW
HVN	0030Z S-M	144.535/135	N2BDW
SDN	0230Z	147.66/06	K2ZVI
SCRN	0200Z	147.735/135	WB2HDU

PD5 results should appear in next month's column. Keep your fingers crossed! A great big thanks to all the staff and all those who supported the local county organizations and made the PD a success. Some plans

DRAKE 7-Line Family



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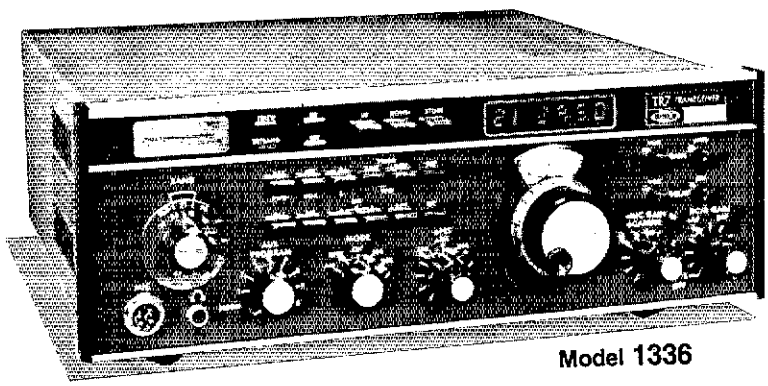

Model 1336

TR7

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Continuous Frequency Coverage—The TR7 provides continuous coverage in receive from 1.5 to 30 MHz. Transmit coverage is provided for all amateur bands from 160 through 10 meters. The optional AUX7 Range Program Board allows out-of-band transmit coverage for MARS, Embassy, Government and Commercial services as well as future band expansions in the 1.8 through 30 MHz range.* The AUX7 Board also provides 0 through 1.5 MHz receive coverage and crystal-controlled fixed-channel operation for Government, Amateur or Commercial applications anywhere in the 1.8 to 30 MHz range.

Synthesized/PTO Frequency Control—A Drake exclusive: carefully engineered high-performance synthesizer, combined with the famous Drake PTO, provides smooth, linear tuning with 1 kHz dial and 100 Hz digital readout resolution. 500 kHz up/down range switching is pushbutton controlled.

Advanced, High-Performance Receiver Design—The receiver section of the Drake TR7 is an advanced, up-conversion design. The first intermediate frequency of 48.05 MHz places the image frequency well outside the receiver input passband, and provides for true general coverage operation without i-f gaps or crossovers. In addition, the receiver section features a high-level double balanced mixer in the front end for superior spurious and dynamic range performance.

True Passband Tuning—The TR7 employs the famous Drake full passband tuning instead of the limited range "i-f shift" found in some other units. The Drake system allows the receiver passband to be varied from the top edge of one sideband, through center, to the bottom edge of the opposite sideband. In fact, the range is even wider to accommodate RTTY. This system greatly improves receiving performance in heavy QRM by allowing the operator to move interfering signals out of the passband, and it is so flexible that you can even transmit on one sideband and listen on the other.

Unique Independent Receiver Selectivity—Space is provided in the TR7 for up to 3 optional crystal filters. These filters are selected, along with the standard 2.3 kHz filter, by front panel pushbutton control, independent of the mode control. This permits the receive response to be optimized for various operating conditions in any operational situation. Optional filter bandwidths include 6 kHz for a-m, 1.8 kHz for narrow ssb or RTTY, and 500 Hz and 300 Hz for cw.

Broadband, Solid State Design—100% solid state throughout. All circuits are broadbanded, eliminating the need for tuning adjustments of any kind. Merely select the correct band, dial up the desired frequency, and you're ready to operate.

Rugged, Solid State Power Amplifier—The power amplifier is internally mounted, with nothing outboard subject to physical damage. A Drake designed custom heat sink makes this possible. The unique air ducting design of this heat sink allows an optional rear-mounted fan, the FA7, to provide continuous, full power transmit on SSTV/RTTY. The fan is not required for ssb/cw operation, since normal convection cooling allows continuous transmit in these modes.

Effective Noise Blanker—The optional NB7 Noise Blanker plugs into the TR7 to provide true impulse-type noise blanking performance. This unit is carefully designed to maximize both blanking and dynamic range in order to preserve the excellent strong-signal handling characteristics of the TR7.

* NOTE: Transmitter coverage for MARS, Government, and future WARC bands is available only in ranges authorized by the FCC, Military, or other government agency for a specific service. Proof of license for that service must be submitted to the R. L. Drake Company, including the 500 kHz range to be covered. Upon approval, and at the discretion of the R. L. Drake Company, a special range IC will be supplied for use with the Aux7 Range Program Board. Prices quoted from the factory. See Operator's Manual for details. (Not available for services requiring type acceptance.)

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TEMPO S-1 800 ch., 144-147.995 Mhz, 2 watts out.
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TEMPO S-1T as above w/12-button TTP installed.
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S-30 2m FM 30w amplifier (Reg.$89)	SALE	84.95
S-80 2m FM 80w amplifier (Reg. $149)	SALE	139.95
TS-HA 2m threaded flexible antenna		8.00

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TS-HA-2 220 MHz threaded flexible antenna		8.00

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Regular $319 - ***Sale $289.95***

S-4T-16 as above with 16-button TTP installed.
Regular $339 - ***Sale $309.95***

S-4 Accessories:

HM-6 Speaker/microphone		$ 35.00
S-40 440 MHz 40w amp. (Reg. $149)	SALE	139.95

Accessories for all models:

TS-AD Antenna thread to BNC adaptor	$10.00
TS-CC Carrying case	20.00
TS-CC-TT Carrying case for TTP HT	20.00
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are in the works for an award for the county/county group which places first! Please support your local vhf net as well as the section and multisection net as the holidays approach and the traffic gets heavier. Help will be greatly appreciated! Albany ARA reports KA2HUY Extra and WA2LFZ Adv. KB2UK now KN2I and KB2UL now KM2I. Congrats to DECs N2BDW AA2Y WB2ZCM. PSHR: WB2MCO W2YJR WB3EAG WB2ZCM W2BIW KB2KW K2ZM N2CPX. BPL: WB2EAG. Traffic: WB3EAG 684, WA2SPL 315, WB2MCO 246, KB2KW 151, WB2ZCM 149, W2YJR 119, W2BIW 96, K2ZVI 59, W3EFU 58, AA2Y 58, K2ZM 51, N2BDW 39, N2CPX 24, WA2CJY 22, K2MI 20, WB2SON 14, WB2OHR 9, N2CSX 8. (Aug.) WB2OHR 19.

NEW YORK CITY - LONG ISLAND: SCM, John Smale, K2IZ — SEC: WA2KKJ. STM: WB2BNY.

NLI CW	3630 kHz	1900/2200	K2GCE
NLIPN	3925 kHz	1815	WA2SEL
NLS	3710 kHz	1930	WB2EUF
NCVHF	146.04/64	2100 M W Su	WA2SOE
BAVHF	147.915/315	2030 M-F	N2BMF
SCVHF	144.77/145.37	2030 M-F	WA2ARC
LIMARC	146.25/85	2045 F	WA2SOE

Note: All times are local. Please try and help out by checking in whenever you can. On behalf of myself, the XYL and the 4 jr. ops, I want to wish everyone Merry Christmas and Happy New Year. Don't forget, the Hudson Division convention will be held at the Playboy Club at Great Gorge, NY, Oct 29-31. Plan your vacation accordingly. It is with deep regret that we list N2KR as Silent Key. New officers for the Suffolk County ARC are: KA2T, pres.; WB2PLT, vp; AC2P, treas.; WA2UWF corr. sec.; WB2TYN, rec. sec. The Suffolk County ARC is now sponsoring an Explorer Post. It is now under the supervision of KA2HRX and KA2GOO. KA2IUK now N1BQQ; WA2DMK now KO2N; N2BFR now KC2DI. Officers for Wantagh RC are: AK2Z, pres.; KB2HK, vp; WB2NMA, corr. sec.; WD2AFA, rec. sec., KA2ECS, treas. Congrats to WA2SEL and KA2KGH who both upgraded to Extra. In the "Another One Bites the Dust" Dept., congrats to WA2HSQ and his new XYL who, despite many long talks by K2IZ, were married Oct 3.; best man was WB2AMU. Also in attendance was N2MS. K2XJ is now studying in Munster, West Germany, and can be heard on the air as DJ0UM. Anyone wanting info about amateur operation in West Germany that they can't get from the ARRL should contact him. In between semesters, he is sailing as radio officer on American cargo ships. WA2SEL is now past the 125 mark on DXCC. KA2KGH is now NCS for NLIPN. Radio Central ARC held an Exposition at the Smith Haven Mall. They handled traffic and demonstrated many different modes of Amateur Radio. WB2ART and XYL are proud parents of a boy, born Sept. 14. Radio Central also did the Little Gull Island expedition this past summer. Traffic: W2AHV 237, WB2BNY 97, K2GOE 80, N2AKZ 76, W2GKZ 76, N2BSS 40, N2BGR 36, N2BQD 34, K2IZ 20, WB2KCT 19, WA2SEL 16, W2DBQ 14, KA2KGH 8, WB2JAY 2, WA2KXE 1. (Aug.) WA2SEL 49, W2DBQ 4.

NORTHERN NEW JERSEY: Robert Neukomm, KB2WI — ASCM: W5DTR/2. SEC: WB2VUF. STM: W2XD. NMs W2CC N2BOP W2PSU KA2GOQ N2XJ WB2IQJ N2BNB.

Net	Mgr.	Freq.	Time	Sess.	QNI	QSP
NJPN	W2CC	3950	6 PM Dy 9 AM Su	34	525	255
NJN/E	N2XJ	3695	7 PM Dy	30	425	162
NJN/L	N2XJ	3695	10 PM Dy	30	364	206
NJSN	WB2IQJ	3735	630 PM Dy	30	178	56
OBTTN	N2BOP	72/12	8 PM Dy	30	582	124
UCETN	KA2GOQ	085/685	730 PM Dy	30	379	163
NJVN	KA2HNQ	49/49	1030 PM Dy	30	379	162
NWNJVN	N2BNB	90/30	830 PM W	4	20	17
NJRTTY	W2PSU	147.51	Autostart	30	36	8

The Jersey Shore ARS advises their net meets daily at 1930 local on 146.31/91. Those amateurs who can work this repeater please check in. The Trans-New Jersey net is on 146.895/295-147.075/675. This is the new linked repeater group which meets on the above two frequencies and then are linked on Wednesdays only at 1030 PM. RAVEN reports involvement in the October Crop Walkathon plus their first fall drill which was held October 21 between 7-11 PM. K2SE has been asked by the Boy Scouts of America to help organize an Amateur Radio Explorer Post. We wish Ed well in this endeavor and would hope that men and women involved in Scouting throughout the rest of NNJ would try establishing more radio Explorer Posts. NNJ upgrades: WA2OVE KC2FO to Extra; WA2MIF KA2ITC to Advanced; KA2FXB to General; KA2MRH to Technician. New calls: KQ2H KO2A N2CWC N2CXX. Ramapo Forty Niner reports cw instruction by WA2VZW together with theory courses are being held at the Pequannock High School Monday nites. W2MJA/4 was up visiting us from NC. KA2NER, XYL of K2LPG, is a new ham. The highlight of September's meeting was W2BCC's talk on his new 2-meter coaxial antenna. UCETN is meeting M W F on WR2AEE 147.255/855, which is the Tri-County Radio Assn. Repeater. The rest of the week they are on their regular frequency. This is a "test" with the TCRA machine and has resulted in several new members into the net including WA2MIF who has become an ardent trafficker. WA7DPK has has 12 consecutive months on the PSHR. I am sure there are others and each operator should keep his/her own tally and report it. N2AVI KA2BZS KA2DAU KA2CHK operated WC2AAV during Union County's SET Sept. 28th. KB2HM made her first BPL in July; somehow *QST* failed to report it. TCRA News: Upgrade KA2KXO to Advanced and now KC2FH. New calls: KC2FR was N2CDZ; KC2FS was N2CEV. I am becoming a snowbird for the next several months and will winter in Mesa, AZ. In the interim please send all Section Activities Reports to W5DTR until further notice. Traffic: KB2WI 226, W2XD 209, AG2R 174, N2XJ 126, K2VX 121, KK2R 107, N2BNB 85, WB2KLF 81, N2BOP 67, WA7DPK 61, W5DTR 43, KA2JMH 42, W2CC 29, N2BSS 24, W2NKD 24, KO2A 14, KA2IRO 12, KC2AK 7, N2BC 5, K2WM 4. (Aug.) WA2MIF 65. (July) WA2MIF 28. (June) WA2MIF 62.

MIDWEST DIVISION

IOWA: SCM, Bob McCaffrey, K0CY — SEC: W0RPK. STM: KA0X. WB0AVW WD0HND W0YLS WA0AUX. Congrats to WB0QAM KA0JQG ORS. KB0ZP new District I DEC. Thanks to the IaCy Clubs for their hospitality. KA0Y has a 43' dish in his back yard! Lots of traffic and PR from "old threshers" at Mt. Pleasant. DXCC for KF0F and WB0YTI. Sympathies to OBS W0JAQ in the loss of his wife of 48 years. As usual the CR hamfest a great success. Mark July on your calendar for National Convention in CR. Did KF0F ever return from Norway? DSM participated with YMCA triethalon and diabetes bik-a-thon. W0RPK K0CY attended second meeting of IVOAD

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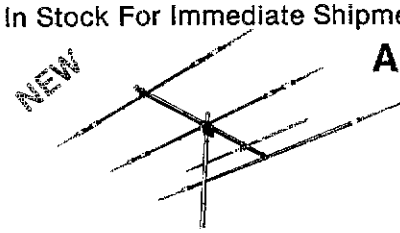

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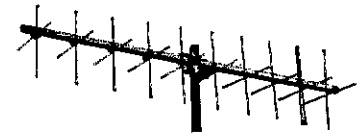

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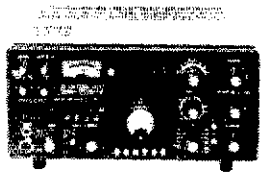
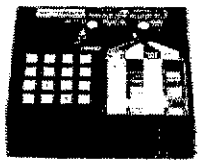
FT-101ZD Mark III



Amateur Net $925.00

AEA MORSEMATIC



- Dual Microcomputers provide many features.
- Approximately 500 character memory with unique "soft-partitioning."
- Morse trainer mode with programmable speed-up.
- Beacon mode for VHF DX scheduling.
- Automatic serial number sequencing.

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Amateur Net $199.95

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- Achieve maximum attainable gain for a twin 5/8 wavelength antenna.
- Patterns independent of mounting or feedline length.
- Greater than 9 MHz band width.
- Completely weather protected matching network and RF connections.
- Easiest to assemble. Mounts on standard TV master (NOT SUPPLIED).

FOR LIMITED TIME ONLY

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IC-730 THE AFFORDABLE MOBILE HF TRANSCEIVER

CALL FOR YOUR PRICE
Amateur Net $829.00

Truly an exceptional buy. Measures only 3.7"(H) x 9.5"(W) x 10.8"(D). Dual VFO's with 1 frequency memory per band. Covers 10-80M including the new WARC bands. 200W PEP input.

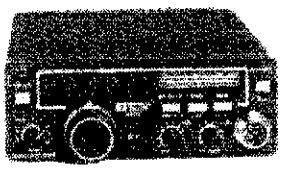
NEW! AT-100 AUTOMATIC ANTENNA TUNER

Amateur Net $349.00

No adjustments necessary when changing frequency or bands. Fully automatic. Compatible with IC-730 and IC-720A.

MINICOM IC-25A

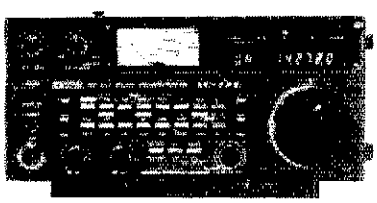
Full featured 2m FM transceiver in a very compact package. 25W too!



CALL FOR YOUR PRICE
Amateur Net $349.00

Measures 2"(H)x5½"(W)x7"(D). Dual VFO's with band scan and memory scan with automatic resume after preset delay or carrier drop. Encoding microphone also included. 5 memories with priority channel. Tuning rates 5KHz (A VFO) or 15KHz (B VFO).

IC-720A HF TRANSCEIVER



CALL FOR YOUR PRICE
Amateur Net $1349.00

Available with all accessories

IC-2KL SOLID STATE LINEAR AMPLIFIER SPECIAL FACTORY OFFER

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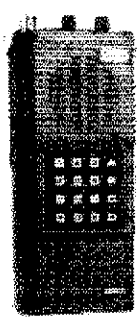
Compatible with IC-701, IC-720A and IC-730. 500W output power on 160 thru 15M including 10MHz and 15MHz WARC bands.

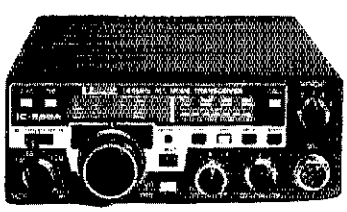
NEW! IC-3 AT



A 220mHz handheld based on the very popular IC-2A/2AT. Compatible with all 2A accessories. IC-3AT (shown) with 16 button encoder.

Amateur Net $299.95.

IC-290 2M ALL MODE TRANSCEIVER



CALL FOR YOUR PRICE
Amateur Net $549.00

Covers 143.8 to 148.1999MHz FM,SSB (USB/LSB) and CW. Output 10W/1W. 5 memories with 2 VFO's and priority channel. Tuning rate 5 KHz or 1 KHz on FM. 1 KHz or 100Hz on SSB and CW. Squelch with scan operational on SSB.

THE VERY POPULAR IC-2A/IC-2AT

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Am. Net $239.50
(Shown)

IC-2AT
Am. Net $269.50
(with encoder)

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and it was very productive. KBØVI presented talk about SKYWARN to state CD directors. Nice to see all that attended Midwest convention. WBØQAM KAØJOG made PSHR. Good participation on TEN with 100% (WØFO KØGP KAØJQG AEØR NØSM WØSS. WBØUPF KAØX WØYLS).

Net	Freq.	UTC	Days	QNI	QTC	Sess.
TLCN	3560	0030-0400	dy	351	151	60
75M phone	3970	1830-2330	M-S	2075	124	52
ICN	3713	0100	TThs	135	32	14

Traffic: WAØAUX 297, WØSS 184, KØCY 101, AEØR 92, WØYLS 88, KAØJQG 86, WBØQAM 81, KAØX 59, WDØHND 62, WBØUPF 44, WBØAVW 25, WØBW 24, KØGP 16, KBØOZ 13, NØCKO 11.

KANSAS: SCM, Robert M. Summers, KØBXF — For those of you waiting for the start of the slow speed net QKS-SS, you may now check into same at 7:30 PM each Monday night. NØBDG is the acting NM. As soon as QNI warrants he will try for a Wednesday and Friday session also. Frequency — 3735 kHz. WØKL reports the fall activities are very slow in picking up this year. Guess it is the fine weather WAØLBB has been in charge of. He reports KWN QNI 889 and QTC 570 and no emergency weather sessions. We are still looking for additional stations to help represent Kansas on the Daytime Tenth Region Net. If you are interested see either WØQMT or KØBXF for more details. WØKL still looking for 102 real live amateurs out there some place in Kansas. ARES is standing at 898 and 9 ECs reporting for the month. KPN QNI 371 with 23 QTC and KSBN QNI 1022 in 30 sessions with 99 QTC. Traffic is down some; the stations reporting totals fell off also. All that attended the Midwest Division Convention had a good time. Real fine facilities. The KS DX Club and the KC DX Club kept the *spirits* up for all. Congrats to CKARC for a fine job. Congrats to WAØTNS as councilman for newly formed Bellaire in the Wichita area. Traffic: WØQMT 100, WBØZEN 73, WØHI 70, KØEZ 65, WØFIR 65, WØAM 54, KØBXF 47, WØCHJ 24, WØPB 17, KAØCUF 10, WØRBO 9, WØKL 6, WØRT 4.

MISSOURI: SCM, L. G. Wilson, KØRWL — ASCM: WØOTF. STM: KMØL. SEC: NØAJI. The Heart of America Radio Club recently operated WØRR at Boy Scout Jamboree at Camp Powell for approximately 600 scouts. At the same time the South Side ARC was operating station at the Bannister Mall in Kansas City. The Eastern Ozark ARC in addition to conducting Novice classes will be putting on a demonstration at the Washington County Fair. After last months *QST* came out, many clubs sent copies of their newsletters. Thanks to those who did and hopefully from time to time we will print articles of interest about your activities. The St. Charles ARC is preparing its newly acquired 25G for Field Day 1982. Those guys like to start early.

Net	QNI	QTC	Net	QNI	QTC
NEMOE	120	3	MEOW	281	25
ACE	43	1	HBN	393	39
MOSSBN	647	112			

Good to hear NØCEE back on the air after a long absence. WAØAOJ is sporting a new Hy-Tower vertical. Congrats to WØFY for vhf-QSO Party score. The new MOSSBN manager for the coming year is WBØWLU. Congrats, new officers for the Warrensburg ARC are WBØQLA, pres.; WDØBFZ, v.p.; WBØMII, sec/treas.; KAØKRI, program chairman. Congrats to the following new licensees and upgrades: Novice: KAØs LGY LGZ LHA through LHG, LUV LUW; Tech: KAØKBW; General: KAØGRP; Advanced: WBØWKW WDØFNF KCØGB; Extra: WBØWXE KAØBHK KMØZ. Traffic: KCØAS 667, KØPCK 276, NØAJI 101, KØSI 94, KØBM 87, WØBMA 64, WØOTF 59, KIØK 51, WØOUD 27, KCØCL 21, KØRWL 10.

NEBRASKA: SCM, Shirley M. Rice, KAØBCB — SEC: NØAIH. STM: WDØBQG. I second WDØEGK's nice comment in Link Log abt WDØFJY. She's sec & tres. of club, Adv ticket, teaches Novices & completes jobs well. Tnx! Congrats to WØEUT & Dean who celebrated 50th wed anniv in Sept. New NE Novices: KAØLDJ KAØLDK KAØLDL KAØLDM KAØLDN KAØLDZ KAØLNB KAØLQA KAØLSZ KAØLDT KAØLQD KAØLQE KAØLQC KAØLLX KAØLQB KAØLUK KAØLPY KAØLPZ KAØLRH KAØLVF KAØLVG KAØLVA KAØLRE KAØLRF KAØLRG KAØLVB KAØLDY KAØLEK KAØLGN KAØLNE KAØLYD KAØLXF KAØLOR KAØKZN KAØLVC KAØLHJ KAØLHK KAØLHL KAØLHM KAØLUG. Techs: NØCSE NØCSF NØCWL KAØJSN. Gen.: WBØUXU KAØHJY. Adv.: KAØDYE. Anyone interested in working NTS pse contact WDØBQG. Need phone operators daytime & cw at nite. Merry Christmas to all!!

NEW ENGLAND DIVISION

CONNECTICUT: SCM, Stan Horzepa, WA1LOU — SEC: W1SY. STM: KA1KD. ASCM: WB1AIU.

Net	Freq.	EST	Sess.	QTC	QNI	NM
CN	3640	1900 + 2200	60	341	394	K1EIR
CPN	915/315	1800/1000 Su	26	53	186	WB2PJU
NVTN	28/88	2130	30	98	316	WA1ELA
RTN	13/73	2100				WB1CPF
WCN	78/18	2030	30	134	387	W1DPR

High QNI: CN: WB1CRH KA1EGE WB1EKV WB1ESJ K1UQE. CPN: K1AQE K1EUW KA1KD. High QTC: NVTN: W1EFW. The Connecticut QSO Party coming up the first weekend in December; contest rules will appear in the Contest Corral column in *QST*. Hope to work, y'all. Tri-City ARC members participated in East Lyme Marathon. WR1AIE provided communications for the Stamford-Denmark Friendship Yacht Race. New appointees: N1BFD, OES ORS; KA1BU, OO; WB1CRH, OBS; WN1CRX, OES; KA1KD, OBS. Weather Conn meets Tuesdays, Fridays and during stormy weather at 7:30 p.m. local on 146.52. Meriden ARC participated in Meriden Square Harvest Fest. Greater Fairfield ARA is still soliciting contributions for its club station; K1HWL recently donated a TS-520. New Candlewood ARA officers: KE1H, pres.; KA1ECL, v.p.; KA1GPG, secy; WA1VOP, treas. WB1CPF adding THS-80 Model III for RTTY and cw. KA1KH is now an Extra. KA1HQS a new Novice. In a few days (around October 20), I will retire as SCM and turnover the reins to Pete Kemp, KA1KD. It's been interesting and I thank all of you who have made it so. The big 73 de Stan, WA1LOU. Traffic: W1EFW 450, WB1CPF 336, K1GF 245, WB1GXZ 173, WA1LOU 162, WB1CRH 126, K1EUW 98, WB1EKV 92, WB1ESJ 69, K1AQE 62, W1BDN 61, W1DPR 47, KA1KD 45, N1BFD 43, KA1BHT 42, K1UQE 39, W1XX 36, WB9IHH 29, W1HUE 14, K1OQG 8, W1CUH 6, W11ICF 4, W1QV 4.

EASTERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD — STM: WA1TBY. SEC: WA1BLG. ASCM: K9HI.

Net	Freq.	Time (loc)/Dy	QNI	QTC
EMRI	3.658	1900/2200/Dy	310	350
EMRIPN	3.898	1730/Dy	299	196
EM2MN	90/30	2000/MWF	177	57

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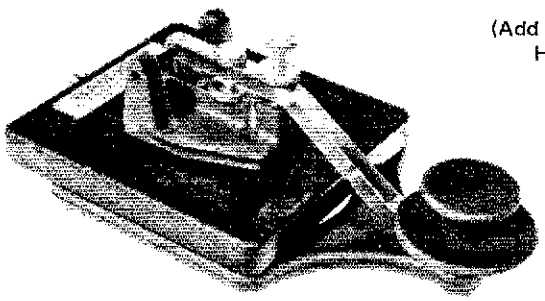

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- ★ Heavy Base. No need to attach to Desk.
- ★ Navy Type Knob.
- ★ Smooth Action.

CC-3P Shielded Cable & Plug to attach HK-3M to transmitter. **$1.50**
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TRIPOLE MULTI-BAND

The TRIPOLE antenna covers the 160, 80, 40, 20, 15, 10 and 6 meter bands without retuning or a tap change. 80 to 120 ft length. 2 KW PEP. Twinverted V and horizontal without an antenna tuner. Neat appearance, built-in balun, rugged, aids mast or tower guying. A best choice for an all-around amateur station antenna.

Guaranteed. Kit T80-K $74.95; Assembled T80-A $84.95 Prices postpaid cash. TX residents add 5% sales tax.

Call or send card for information on TRIPOLE antennas and feedline kits. Order direct or ask your Dealer.

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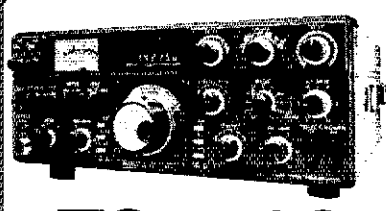
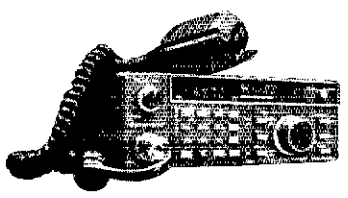
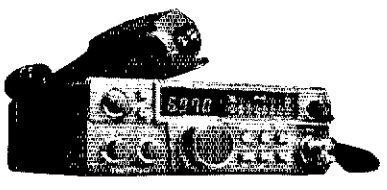


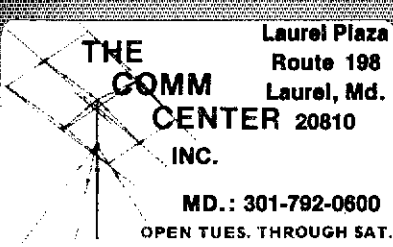
TS530S



TR7850



TR7730



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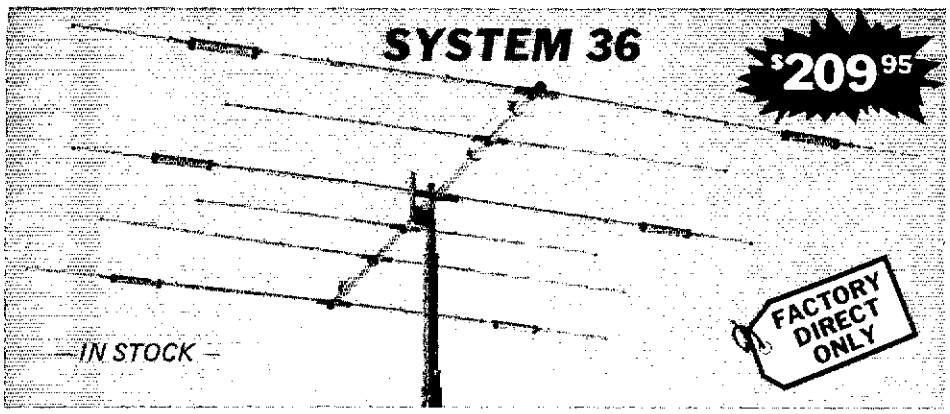
WILSON SYSTEMS INC. MULTI-BAND ANTENNAS



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
		Longest Element	28' 2½"	Feed method	Coaxial Balun (supplied)
VSWR @ resonance	1.3:1	Turning Radius	18'6"		
Impedance	50 ohm	Maximum mast diameter	2"	Assembled weight (approx)	153 lbs.
		Surface area	8.6 sq. ft.	Shipping weight (approx)	192 lbs.

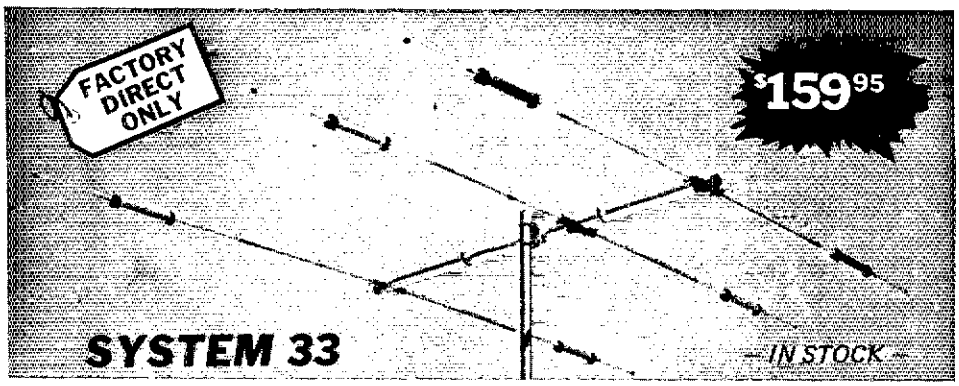
NEW!

ADD 40 OR 30 METERS TO YOUR TRI-BAND WITH THE NEW 33-6 MK

$59.95

—IN STOCK —

Now you can have the capabilities of 40-meter or 30 meter operation on the System 36 and System 33. Using the same type high quality traps, the new addition will offer 200 HKZ of bandwidth 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.
		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
		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

$59.95

WV-1A

4 BAND TRAP VERTICAL (10 - 40 METERS)

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across the full width of each band.

Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity.

Easily assembled, the WV-1A is supplied with a hot dipped galvanized 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

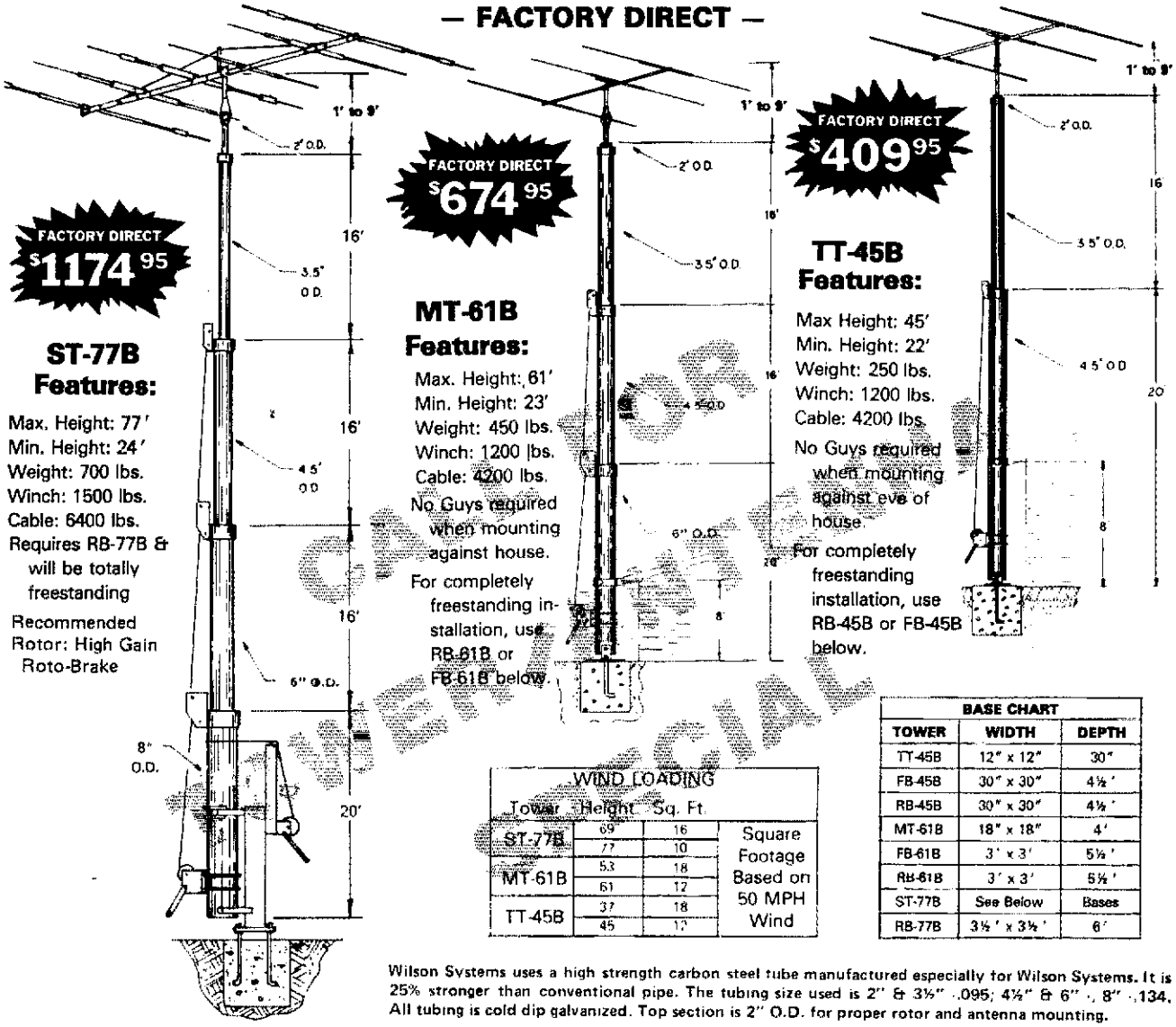
GR-1

$14.95

The GR-1 is the complete ground radial kit for the WV-1A. It consists of: 150' of 7/14 stranded aluminum wire and heavy duty egg insulators, instructions. The GR-1 will increase the efficiency of the GR-1 by providing the correct counterpoise.

WILSON SYSTEMS TOWERS

— FACTORY DIRECT —



FACTORY DIRECT $1174.95

ST-77B Features:

Max. Height: 77'
Min. Height: 24'
Weight: 700 lbs.
Winch: 1500 lbs.
Cable: 6400 lbs.
Requires RB-77B & will be totally freestanding
Recommended Rotor: High Gain Roto-Brake

FACTORY DIRECT $674.95

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 $409.95

TT-45B Features:

Max Height: 45'
Min. Height: 22'
Weight: 250 lbs.
Winch: 1200 lbs.
Cable: 4200 lbs.
No Guys required when mounting against eve of house.
For completely freestanding installation, use RB-45B or FB-45B below.

WIND LOADING			
Tower	Height	Sq. Ft.	
ST-77B	69	16	Square Footage Based on 50 MPH Wind
	77	10	
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
RB-77B	3½' x 3½'	6'

Wilson Systems uses a high strength carbon steel tube manufactured especially for Wilson Systems. It is 25% stronger than conventional pipe. The tubing size used is 2" & 3½" .095; 4½" & 6" - 8" -.134. All tubing is cold dip galvanized. Top section is 2" O.D. for proper rotor and antenna mounting.

The TT-45B and MT-61B come complete with house bracket and hinged base plate for against-house mounting. For totally freestanding installation, use either of the tilt-over bases shown below.

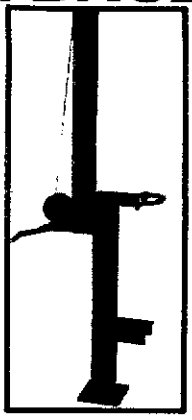
The ST-77B cannot be mounted against the house and must be used with the rotating tilt-over base RB-77B shown below.

TILT-OVER BASES FOR TOWERS

FIXED BASE

The FB Series was designed to provide an economical method of moving the tower away from the house. It will support the tower in a completely free-standing vertical position, while also having the capabilities of tilting the tower over to provide an easy access to the antenna. The rotor mounts at the top of the tower in the conventional manner, and will not rotate the complete tower.

FB-45B.. 112 lbs...$209.95
FB-61B.. 169 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...$289.95
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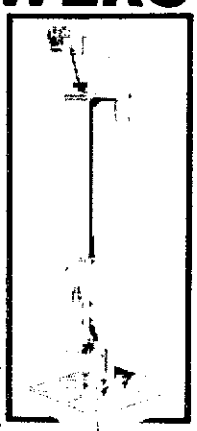

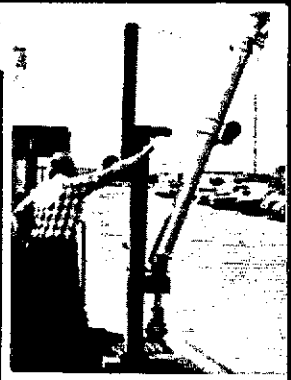

Tilting the tower over is a one-man task with the Wilson bases. (Shown above is the RB-61B. Rotor is not included.)

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Our assistant SCM K9HI has been working hard to help get our house in order for the new Repeater Directory. He has sent letters with registration cards to all listed trustees urging them to fill in the card and return it to the League. Also, repeaters not listed in this years Repeater Directory have been solicited and sent registration cards. I feel confident Eastern Mass will be in better shape this year than last, thanks to K9HI. The Board of Directors has suggested the elimination of Life Membership because it's a losing proposition financially with inflation what it is. If you've been thinking about doing it, do it soon. The League is considering putting a permanent office in Washington to provide a closer working relationship with the FCC. What do you think? With the new computer at the League, your membership status will be checked when you call or write for a service so keep your membership active. New club officers for the Acton-Boxboro club are N1ASF, pres.; W1DHD, v.p.; AE1B, secy; N1AVS, treas. AB club is also running Novice course. Algonquin club member WA1UDH received his DXCC and WA1JXR is a proud papa. N1RC reports for the Norwood club that they have "triumphed" once again and won New England in Field Day. Capeway member KA1ACL checked into the weekly net with his usual strong signal. Only difference was that he was mobile in Michigan. Wellesley club celebrated its 50th anniversary. Traffic: N1BHH 675, WA1TBY 402, K1BSO 228, KA1ON 145, KA1MI 104, KA1EMQ 85, K1GN 84, WB1GQO 62, WB1DXT 53, N8TM 46, AE1X 44, W1ATX 38, W1MJ 22, K1BZD 17, W87TPY 17, WA1FNM 11, N1AJJ 8, W1CE 7, K9HI 2, KE1U 1. (Aug.) W1MJ 5.

MAINE: SCM, Cliff Laverty, W1RWG — STM: W1BJ. SEC: KL7IJG. Yankee ARC elected new officers: K1TVT, pres.; W1HTG, v.p.; W1EZR, secy.; W1FZO, treas.; W1CUW, dir. AEN handled coms for state-declared emerg in co. caused by flash flooding. N1SS WB1HLT WA1URS KA1B KA1JC WA1YNZ KA1CNC W9TVH K1TFX KA1ENL K1JGX N1BJX WB1CNM N1ANG assisted FD, CEP, police. Arcadia ARA assisted St. Jude's Bikathon with WA1JMM W2KRI KA1GGE. Aroostook Co. has been hit by several disasters and hams were ready. Sess/QNI/QTC: SGN 28/1044/164; MSN 10/59/9; CMEN 9/115/18; AEN 4/53/0; PTN 30/276/141; SPSN 13/141/21; RACES 2/16/2. PSHR: AK1W W1RWG. Traffic: AK1W 187, W1BJ 123, W1RWG 95, KA1CIB 93, W1KX 86, WB1BYR 60, W1AHM 56, K1NAN 39, W1JTH 34, W1ISO 27, N1BJW 15, N1BCE 14, K1TVT 14, W1GKJ 12, KL7IJG 11, KA1TJ 10, WA1YNZ 10, WA1ZJL 10, N1BCT 8, KA1AIF 7, W1BMX 6, KA1GNO 5, KA1EIW 4, WA1FCM 2, KA1ENL 2.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1NH/W1SWX — SEC: AK1E. STM: W1TN. NMs: N1NH K1OSM W1VTP. FRN certificates to AK1E KB1A W1TN KA1BJ W1GUX W1QYY W1CUE KA1CXP WB1DKX WA1WRS. The Portsmouth repeater operational on 146.805. Correction: It was AF1T not W1FZ who cycled the NW USA and Canada. W1DPV/4 sends 73 from Iron Mountain. K4NEH/R in Amherst on the air. Try 145.150 —. GSPN had 418 QNI, 96 QTC. KA1BBI is FRN NCS Mondays. Officers Saddleback Repeater: WB1HJP, pres.; W1GWU, v.p.; KA1DON, secy/treas.; WB1FGV W1NPJ WA1QWV tech. advisors. NH Slow Speed Net is on 3547 Sun. at 10. KA1CXP is NCS. WA1DXO AB7Q gave RTTY demo at Nashua club. Preparations for winter completed by N1BFK WB1ANG at the 170 foot level of the 85 machine tower. GSFMN had 696 QNI 262 QTC. Merry Xmas to all. Traffic: W1TN 203, KA1BBI 175, KA1CXP 145, K1OSM 144, KA1BJ 129, W1GUX 101, N1ALM 80, KA1FWQ 80, N1NH 80, KB1A 71, W1VTP 68, K1YMH 61, W1ALE 56, W1MHX 49, AK1E 31, KA1CJI 20, KA1FMU 15, N1AKS 12, WA1PEL 12, W1NH 7.

RHODE ISLAND: SCM, Gordon Fox, W1YNE — SEC: KA1EHR. STM: KA1FE. NM: WA1OSL. RIEM2MN; 22 sess. 202 QNI 44 QTC. New appointments: KA1AZ, EC Bristol Co.; KA1BAT, EC Kent Co. Endorsements: KA1BTU, OTS. W1AGB home from stay in hospital. N1RI home after cross-country bike trip. K1DS is new AMSAT coordinator for RI. He is available for talks to interested clubs. OSARG (10/70) group on front line again in assist to Warwick 50th anniversary parade. First section ARES staff meeting held to plot course of emergency effort in section. Traffic: W1EOF 344, KA1BTU 296, W1YNE 72, N1RI 31, KA1FE 27, KA1EHR 4.

VERMONT: SCM, Bob Scott, W1RNA — SEC: WB1ABQ. STM: N1ARI. Rutland upgrades: Extra: WA1GKS W1GXY WA1EED WA1ZMS; Adv: N1s BGS AGY ARI KA1s EHF FCX FCW WA1ZOJ WB1GMH; Gen: WB1s GMB HHH; Tech: KA1s EHN EOM HJC; Novice: KA1s HQM HIY HIZ HJA HJC HJB HJD. VSB 30/585/127. GMN 26/501/55. Carrier 26/469/33. VTN 27/83/29. RFD 4/79/15. VPN 4/59/7. With all the activity per net reports the activity reports from stations are few; How about VT tfc handlers coming out from under the barrel?! The checkins can't all be just rag chewers — or can they? Most do not seem to be bashful! At least on the air. This report results from info sent in that is of general interest. I'm not an editorial writer! Generally, that is. Traffic: K1BQB 191, N1ARI 112, WB1ABQ 104, W1RNA 28, AE1T 13.

WESTERN MASSACHUSETTS: SCM, Art Zavarella, W1KK — ASCM: K1BE. STM: W1TM. SEC: W1JP. NMs: W1UD WA1ITL W1UPH. W1TN reports FRN certificates to W1YI WA1YYW WA1ITL WB1HIH W1KK W1KUE W1JP W1UKR WA1MJE. Excellent PR for Hams in Pioneer Valley by N1CQ hosting Amateur Radio show Tues 7:30 PM WRSI 95.3 FM Greenfield. Tfc Hambrose this month with 1500+ public greetings originated at the Big E. Displays and SSTV also well received due mainly to efforts of Mt. Tom EC WB1CJH. Valuable warm-up for the Oct SET. The six PSHRs and BPLs W1UD W1NPL W1YI attest to the brisk tfc on ITY cw ssb and 2-m simplex channels, as listed below. PSHR: WB1HIH K1JHC W1TM WB1CGK W1JP KA1T. Traffic: W1UD 562, W1TM 432, W1UKR 368, K1IJV 365, W1NPL 330, W1YI 329, W1YP 297, KA1T 185, WB1HIH 150, W1KK 109, K1JHC 100, WA1ITL 91, WB1CGK 79, K1BE 38, WA1OPN 29, W1ZPB 16, W1UPH 6, WA1MJE 3.

NORTHWEST DIVISION

ALASKA: SCM, Fred Wegmer, KL7HFM — ASCM: AL7AC KL7IBG. SEC: AL7CM. STM: AL7O. The 10th annual Anc ARC flea market has been proclaimed as the best ever. KL7CUK and KL7CV 50th anniversary party marks their annual departure for sunny Florida. KL7IXT and KL7IZJ, hosting the Iditarod Kick-Off party, report another promising race coming up. The Alaska Bush Net has moved to 7285 kHz to avoid strong interference. Congrats to KL7Q and WB4WBL who both became new

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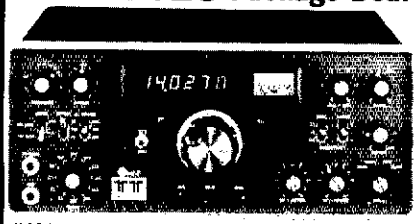

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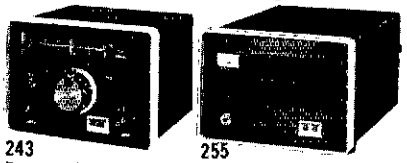
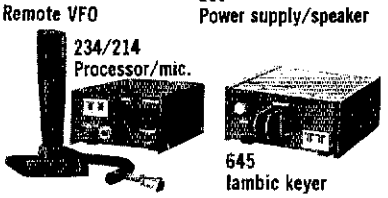


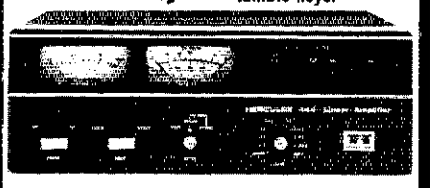
243 Remote VFO

255 Power supply/speaker



234/214 Processor/mic.

645 Iambic keyer



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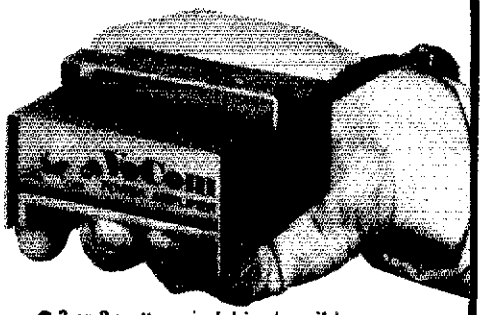

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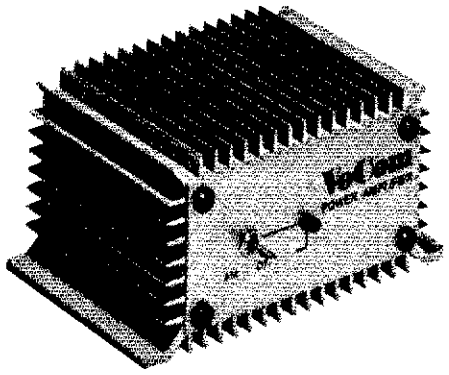

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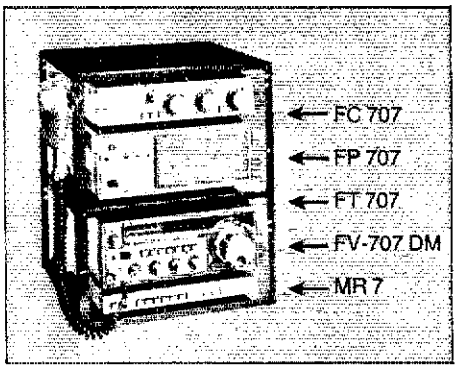

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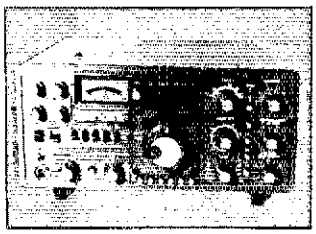

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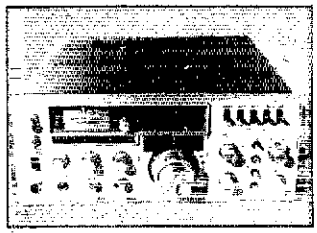

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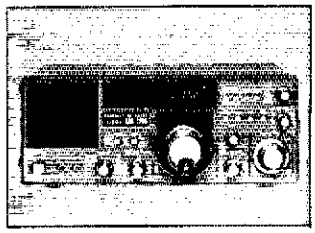

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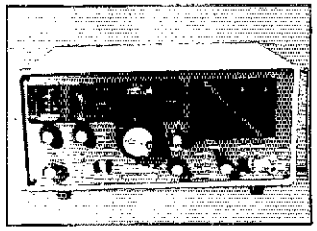

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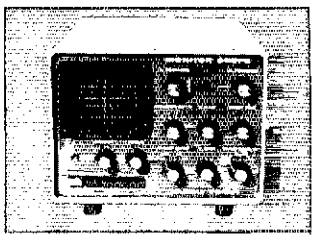

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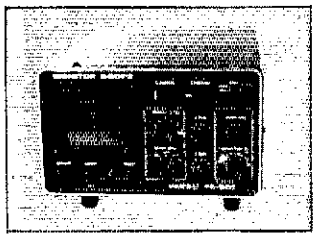

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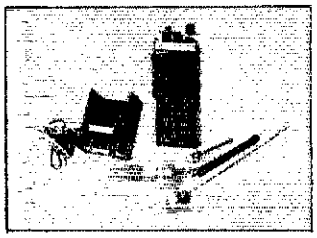

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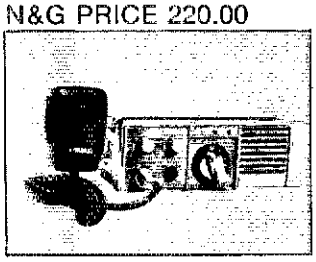

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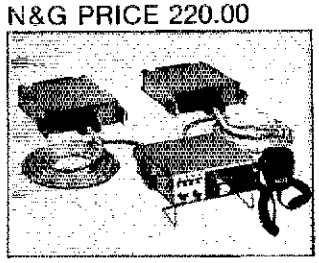

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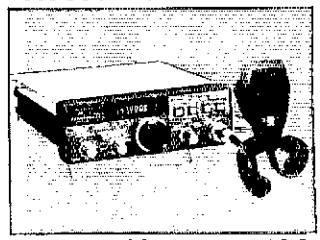

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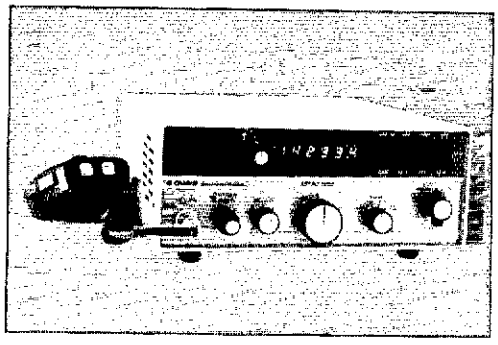

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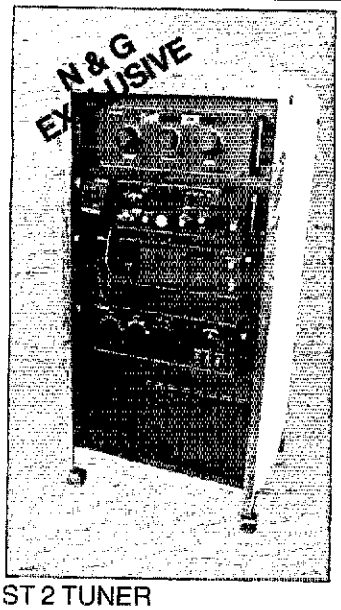

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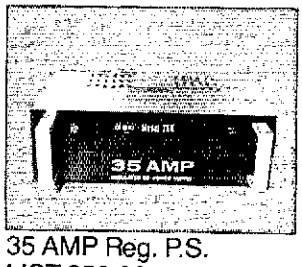

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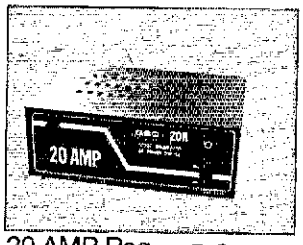

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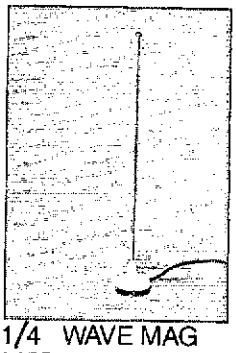

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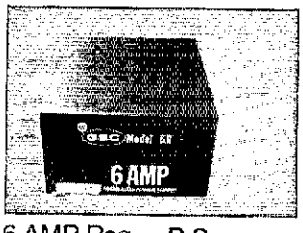

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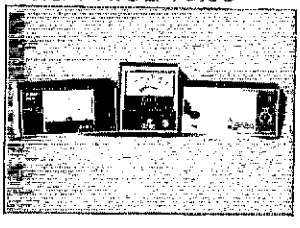

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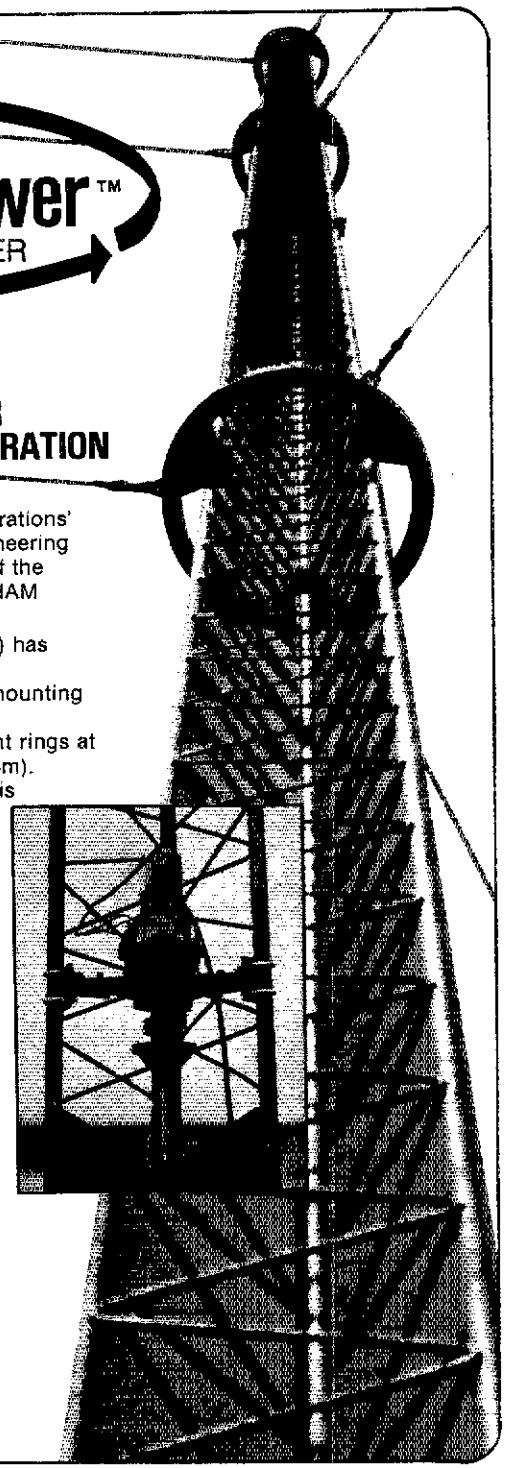

Master Sergeants on October 1. AK7O and KL7CQ are running for SCM; should be an interesting race. All the Alaska ARCs that she visited have acclaimed W7QGP as the most pleasant ARRL Director they've met. KA7APJ brought ZL2BHF to Alaska for a tour and many happy visits. Come back anytime, Jim! 73

IDAHO: SCM, Lem Allen Jr., W7JMH — Club news: The Voice of Idaho Club has installed linked rptrs on Snow Bank 146.02/62 and Cinnabar 147.84/24 that are very handy to mid-Idaho hams and travelers. People and things: K7JV has instrument pilot rating. WB7CYI moved to Veneta, OR, temp. W7IGR back in Boise for short time for medical tests. W7IWV W7APH back in ID after OR trailer trips. WB7RZH got Icom hf rig at Walla Walla hamfest. W7HZL designing 40-meter beam for DX. W7GHT made extended vacation trip, hamming all the way east and back.

Net	Freq	Time	QND	QNI	QTC
FARM	3935	8 PM Dy	30	1210	22
CD	3990	8:10 AM M-F	22	631	38
IMN	3635	9 PM M-F	22	197	72

Traffic: W7GHT 212, W7JMH 69, AC7P 50.

MONTANA: SCM, Les Belyea, N7AIK — Seasons Greetings to all. Communications for Havre Festival Days and Milk River float trip were handled by Hi-Line ARC with great success. New officers for Lower Yellowstone ARC are K7CDN, pres.; KB7BO, vp; WA7GVT, secy.; WB7PAQ, treas. WB7QZP is now KC7FY. W7TTC returned from park and active on hf as well as 2 meters. K7LK been so busy with his contracting biz that he has been cutting down his time on the bands, but finds time to do FB job as NCS on the MTN. Lots of hams from Billings and Red Lodge area handled communications at prairie fire near Joliet. Many thanks to W7DB (OBS) for getting ARRL bulletins out so quickly. N7AIK attended Southwestern Division convention in Scottsdale, AZ. WB7DBY has spent last three months in Malta, leaving XYL WB7DZX home to run the station. Net reports: MTN QNI 806, QTC 55; IMN QNI 197, QTC 72; BSN QNI 225, QTC 27. BPL W7TGU; PSHR WB7DZX. Traffic: W7TGU 412, WB7DZX 162, K7SIK 76, N7AIK 41.

OREGON: SCM, William R. Shrader, W7QMU — SEC: K7WWG. STM: W7VSE.

Net	Time/day	Freq.	QNI	QTC
BSN	0145Z Dy	3908	696	46
OSN	0230/0600Z Dy	3587	436	472
OARES	0115Z Dy	3993.5	484	130
OARES	0230Z Dy	3993.5	106	17
WCN	0300Z Dy	3706	415	155
PTTN	0300Z Dy	146.76	567	160
LCARES	0300Z T, W, F, Su	146.85	334	18
SOARES	0330Z M, Th, S	146.94	371	225
SOFM	0330Z Tu	146.64	126	2

OTVARC new VP N4BOS. W7KBP new ass't manager for BSN. KM7Z (N7BMY) and KN7B (KB7JW) working DX dawn till dusk. KA7BSD and KB7CC furnished communications for Shrine football game. Upgrades: WA7QBI (Adv), W6TRO (Gen). New call KA7KWB (Mfd). N7ANV WA7OYY N7CSH handled communications for Cascade Cycling Classic in Bend. KA7LIO is youngest ham in family of four; WA7LGN (Dad), KA7ELI (Mom), KA7EFJ (brother). Jackson/Josephine Counties had a REAL SET this year. A 2500 acre "wildfire" required communication assistance. It was quite a show. Traffic: W7VSE 628, K7NTS 223, W7LNE 194, WA7LGN 176, WA7IHS 159, W7ZB 139, KA7DBS 124, N7BGY 118, KA7ELI 102, W7TC 60, KI7Y 43, K7ZIG 43, W7QMU 40, W7DAN 32, K7QPW 24, K7VM 9, W7LT 8. (Aug.) W7DAN 18.

WASHINGTON: SCM, Bob Klepper, W7IEU — STM: W7DZX. SEC: WA7RWK. NTN QNI 901, QTC 54. WARTS QNI 3097, QTC 241. NWSSBN QNI 586, QTC 50. WSN QNI 565, QTC 201. EWTN QNI 78, QTC 112. PSTS QNI 111, QTC 69. SCARES QNI 84, QTC 3. W7GB conducts Pacific Coast Training Net (PTN) Mondays and Wednesdays at 6:15 PM on 3730 kHz. This net is designed to train cw operators in traffic handling for WSN and other cw nets. Members of EARS participated with Jefferson County s & r in search for a lost hunter. Members of RASC provided communications for slow-pitch softball tournament and Skagit Flats Bicycle Marathon. Skagit County ARES was involved in two searches for lost hunters. One was successful, the other not. W7IDZ and amateurs of Spokane enjoyed a visit from G2AFQ who stopped to visit his 10-meter buddies. W7APA and WB7OUK are SKs. Your new SCM WA7RWK, has appointed KD7G as ASCM; W7GB, STM; K7SH, SEC. Those of you who have reported to me I know will support WA7RWK, and I hope the rest of you will get involved instead of letting just a few of us do the work and make the decisions that affect us all. Good luck and 73. Traffic: W7DZX 691, WB7TQF 685, K7LRD 408, N7CSP 174, K7GXZ 170, W7FJZ 159, N7AFZ 120, AD7G 119, K7CTP 101, W7GB 93, W7IEU 84, N7AFY 76, WA7BDD 60, W7BUN 48, WA7RCR 46, WA7JEB 19, W7APS 13, KA7CSP 8, W7ERH 6, WB7CFH 5, K7RBT 4.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — ASCMs: W6ZF N6DHN VE2AQV/W6. SEC: WB6KQU. OO K6APW active patrolling the cw bands and put up new antenna and is being heard again. Now for the rest of the shack projects. Editor N6APQ of HARCs "The Chewed Rag" recently returned from vacation. So many of their members were active in club events that space won't allow listing them. Their Novice class has started under the direction of WD6CAZ in newly-painted clubhouse. SBARAs "The Groundplane" is under the management of new editors KO6A KB6TQ N6DRW and KA6OIX. You guessed it, a family team. EBARCs "The Blown Fuse" lists a flea market to support their Salvation Army Radio Fund and emergency communications plans for Contra Costa County. LARKs Tech/Gen class is under way and 19 members turned out for a RACES drill supporting the Livermore Air Show. KB6BD won their "Klutz of the

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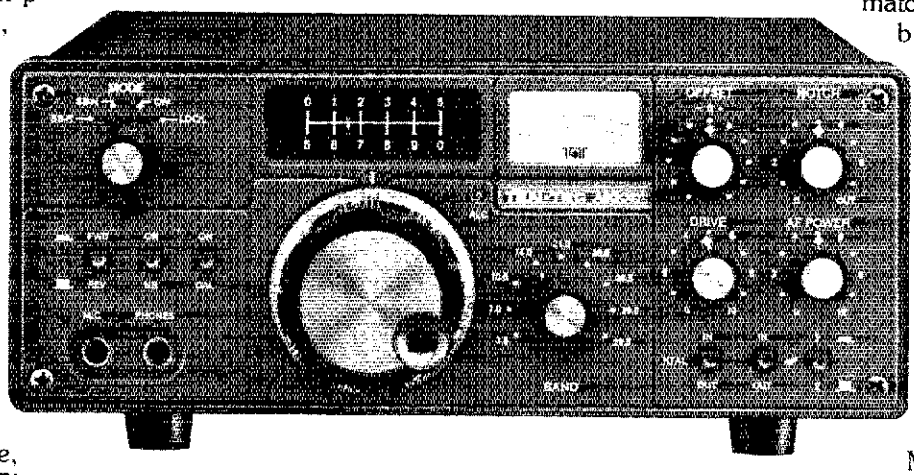

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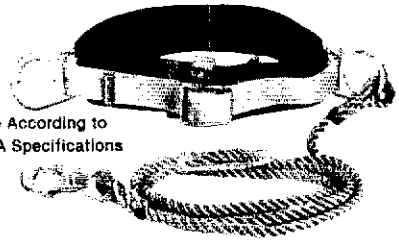

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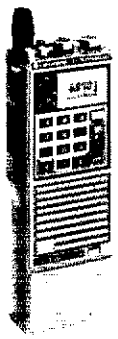

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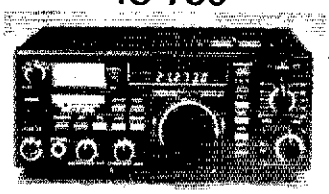

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The holiday rush has hit in all its fury. This year, more than ever, spouses are calling and buying "hammy" presents for their other halves. Topping the list are Talkies. The Yaesu 208R, the Santec HT1200, and the Kenwood TR2500 are running neck to neck with Icom. And the UHF rigs are coming on strong.

I get a kick out of the word from Tang and Mumford. They are both trying to outdo the other. Mumford just sent a hot flash about Collins bringing out a new rig, but the details are incomplete. His crayon broke before he finished the message. Tang, on the other hand, has taken to sending messages in fortune cookies. They look interesting, but I can't read them. Something about new mobile rigs for HF.

If you get a chance, send Vic a Christmas card here at the store. He rarely reads this, and it'll drive him nuts for a week.

Now that 1982 is coming and 1981 will go into history, the entire Madison crew would like to extend to all our customers around the world our best wishes for the holidays and ask that you join with us in hoping for peace on earth, goodwill to men through ham radio. And maybe this year I'll get a contact with mainland China!

See you next month!

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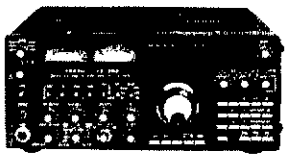

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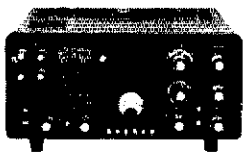

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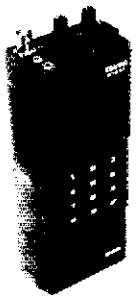

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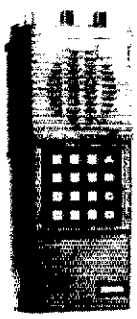

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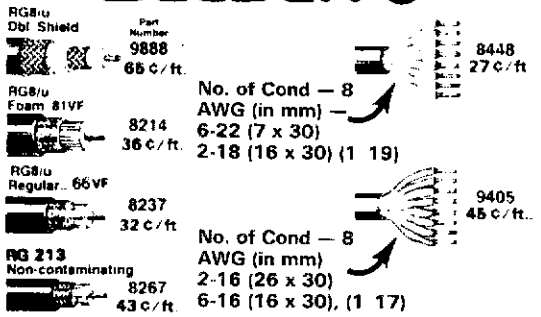

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Month" award. MDAAC is publishing new membership directory, complete with member's photos. Traffic: K6APW 25, WB6UZX 18, KA6ERF 4.

PACIFIC: SCM, Pat Corrigan, KH6DD — Highlight for our section this year was the visit in Oct. by ARRL prexy W2HD. Harry promised a visit to the Pacific which would wrap up visiting all sections during his presidency. Congrats to KH6JQM for all good work in liaison with NWS and as AEC for Honolulu County. KH6HIJ back at the key and PTN helm after visiting family on east coast. Jack still needs help on PTN traffic for anyone who might like to help and also sharpen up their cw. AH6C stopped briefly and phoned while on his way back to CONUS from Guam visit. Colin is regular on 15m from his Virginia QTH. KH6H continues running a good EC/ARES operation on Maui with 2 nets per week. KH6S, EC Kauai, doing yeoman work organization ARES on Kauai. Please lend your support and participation to these fine gentlemen and AH6K on Hawaii. Traffic: KH6HIJ 12, KH6H 5.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: N6AUB. ASCM: KI6T. Welcome to KE6EP the new EC for Butte and Glenn Counties. The First Annual Shasta Chapter QCWA Swapmeet was held in the Mt. Shasta City Park. The Radio Amateur Mobile Society held their 26th annual dinner and dance on Oct 10. KA6QYL now holds Tech ticket. WB6YRA is now KE6GY. WA6OWH has upgraded to Extra and has added a Kenwood monitor scope to his shack for OO work. N6JV is learning how to operate a TS-180S. K6ZY has rebuilt an old Super Pro. Remember, the Northern California Net meets nightly at 7 p.m. local time on 3630 kHz with a slow speed session at 8:30 and they always need more Sacto. section checkins. Traffic: W6RSP 7, WA6OWH 2.

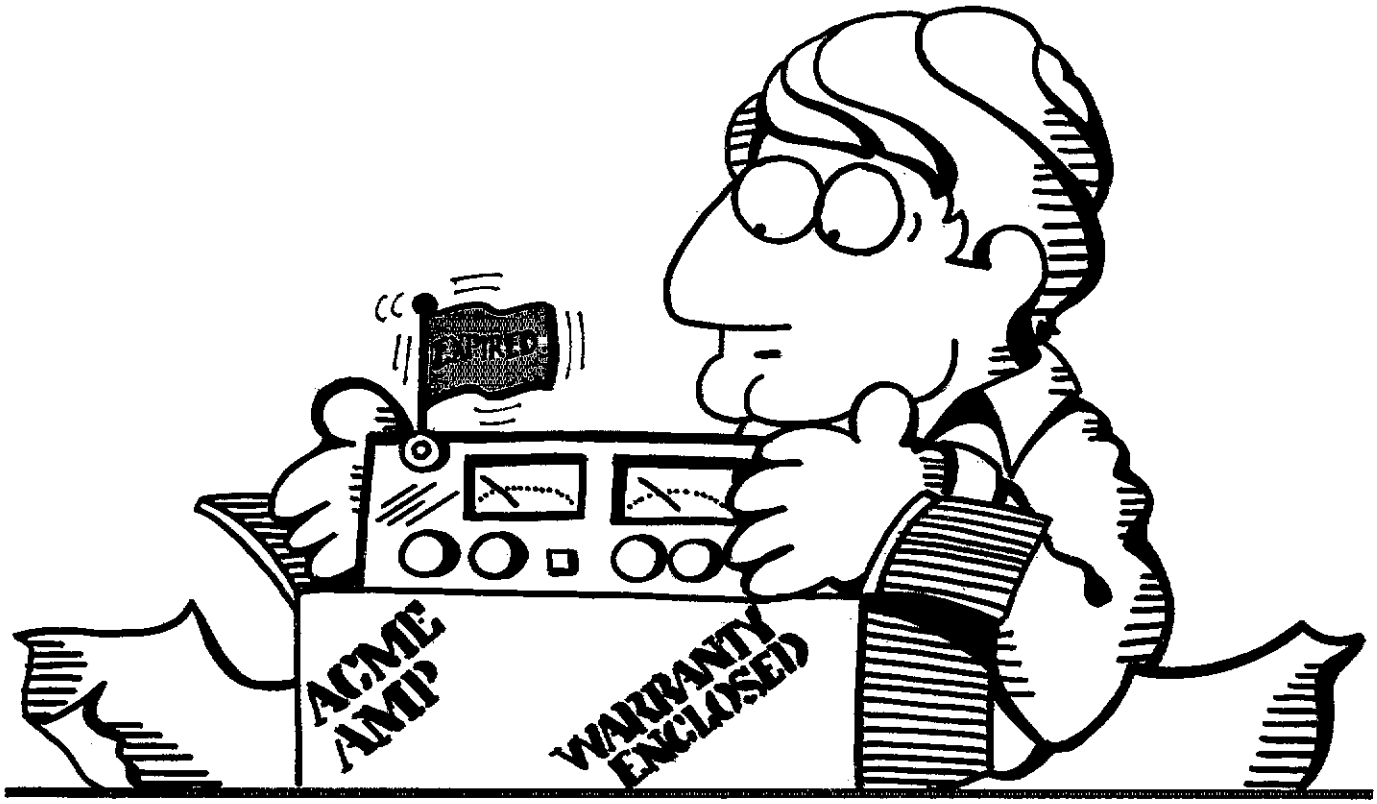
SAN FRANCISCO: Bob Smith, NA6T — SEC: KE6CD. STM: K6TP. SF Radio Club meeting 2nd Friday at VA Auditorium. SF Radio Club provided communications for Greenpeace Walkathon and SET on same weekend; good job. KS6G is Chief Steward on Pres. Hoover; see him on mm nets. Simplex is possible in SF, thanks to K8AT tests. Good to know when repeaters go down in SET. Tnx from FWRA to WB6TFX, a job well done for a long time. FWRA-HARC picnic fest rousing success. Sonoma Co. ARC meeting now 1st Wed. at EOC Room in Santa Rosa. DAT is Sebastopol very successful. MARC has found a new home, Hamilton Field Bldg. 549. Everyone get out and support the auction. Traffic: W6RNL W6IPL 139, K6TP 85, K6TWJ 79, W6GGR 8, WA6QXV 2, WB6RTE ? What happened?

SAN JOAQUIN VALLEY: Charles McConnell, W6DPD — SEC: WA6YAB. Appointment renewed: N6AYI, EC. A radio club is being formed in Pioneer, Amador County. W6YLO is a Silent Key. W6YO W6YK W6BVM K6DT W6GR W6KOE W6XP represent the SJV on the DXCC Honor Roll. Congrats to the following upgrades: General: N6DQE; Advanced: N6DBH KA6KWO WA6GQY; Extra: WA6YAK. WB6ZLQ has a FT-707. KA6ATU has FT-301D and FT225RD. KB6DI has pair of 2-meter beams. KA6ITM has Henry 2K. W6ILH has new amp. WA6NCA has rotor problems. Welcome N6QR to SJV. KA6OHI WA6GQY KA6CZR K6YK WA7PEI are hunting counties. Mark your calendar for the 40th annual Fresno Hamfest May 21-23, 1982. Merry Christmas and Happy New Year to all. Traffic: N6AWH 144, KB6CC 62, W6DPD 28, W6SX 14, WA6YAB 14, WD6FRS 12, WA6JDB 4, K9YBM 3.

SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF — SEC: WB6IZF. STM: W6RZJ. Santa Clara County ARA celebrated their 60th anniversary with dinner and "Old Timers Night". Several members of the 1920s were present. W6CFK and W6ZRJ reviewed the 60 years of the clubs history. They claim to be affiliated with ARRL longer than any other CA club. The Williams Hill ARRS put on another successful "Smoked Hamfest" in King City, with an excellent steak barbeque. OO reports rcvd from K6AYB N6NF. W6ZRJ working with ARES for NTS liaison and working NCN/vhf for the first time. New ORS is WB6OTS in Pacific Grove. KB6GV AI6D AA4RE K6LFZ and others reporting morning wx for NWS in aid of the Med Fly spraying. W6YBV still pounding out the tfc totals after all of these years on NCN RN6 and PAN. N6EVD N6EVL set sail for a six year cruise around the world. KA6MIQ now N6FAD with Advanced ticket. KA6MIP now N6FAC. SCCARC have KO6P K6SAS as new members. A program on the space telescope and space shuttle was presented to the SCVRS. They provided communications for Red Cross Medex and Sunnyvale Police on Halloween and participated in SET. West Valley ARAs new rptr should be on the air by now and they are accepting charter memberships. WA6FAK now Extra Class. PAARAs annual auction and flea market had good turnout and much equipment and parts changed hands. New members of NPSARC: WB6CDE NA6R. SLAC ARC handled 63 messages during their Family Day, and gave demo of ham radio to SLAC employees. Officers are WA6SHR, pres.; WA6GYD, v.p.; KA6QWA, secy.; K6ANN, treas. SMRC had annual picnic at SLAC. Traffic: W6YBV 252, W6RFF 65, W6ZRJ 19.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Ed Stephenson, AB4S — ASCM: N4UE. STM: NJ4L. SEC: NB4L. NMs: CN AB4V; CMN NJ4L; THEN WA4OBR; JFK WB4WII; NCSSB WB4CES. WB4HRR reports planning being done in Catawba Co. for SKYWARN Net, working with NWS. Congrats to W4OVK on 5BDXCC. N6DR/4 has new antenna system and is QRV for action. W4CH recovering from eye surgery, best wishes. Hopefully, when you read this WB4DAR will be out of hospital. Due to pressures of job and other activities, I am resigning as SCM, effective Oct. 1. I expect to be active on tfc nets and with local ARES group. New SCM is WD4CNR. Please give Ian the same cooperation and support you have given me. Thanks. This is my last chance to speak to you through this column and I have something to say which I feel is very important. Those of us in public service comms. have several things in common; one of them is we receive no pay. This being the case, we have to enjoy what we do to remain active. I sense some discontent among members of various nets. We all have a common goal, so let's all work together to accomplish that goal. See you on the nets. Traffic: WD4CNQ 251, WB4WII 221, W4PCN 167, AB4V 166, WD4CNR 151, W8PJS 141, NB4L 132, WA4SRD 124, AB4S 117, K4NLK 109, WA4UTC 109, WB4UJH 104, KD4PJ 99, W4EAT 77, N4CJJ 59, KU4W 52, K4FTB 49, WA4OBR 48, K4EVY 45, K4IWW 45, W4RVE 42, WD4EIQ 37, WB4CYN 34, KF4R 34, W4WXZ 34, WD4HTE 33, NE4J 28, N4CCK 27, NJ4L 27, KA4KJI 26, K4MC 26, W4PRQ 26, WD4JJK 24, WD4LRG 22, WD4LOO 21, WA4PID 21, W4ACY 20, KZ4A 19, N4AET 17, KC4AM



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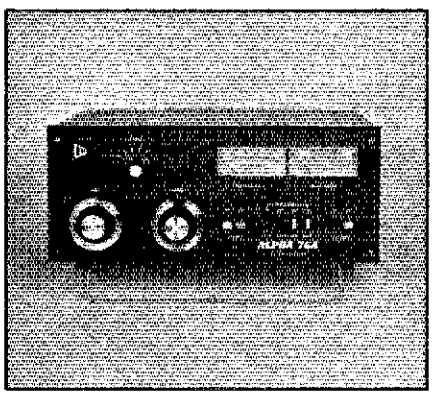

truly remarkable record; not one ALPHA built since 1975 has ever burned up a transformer under those brutally severe operating conditions?

When that other full-tilt linear is barely 91 days old, it's out of warranty and its owner is on his own. But you and your ALPHA are just becoming fast friends, still protected for a year and nine months to come by ETO's superb (limited) warranty.

So, if you're put out by warranties that expire before the equipment is broken in, get an ALPHA.

And get a warranty that won't run out on you for two full years.

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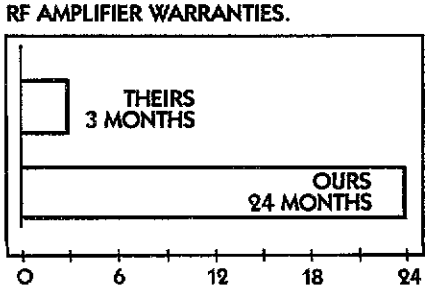

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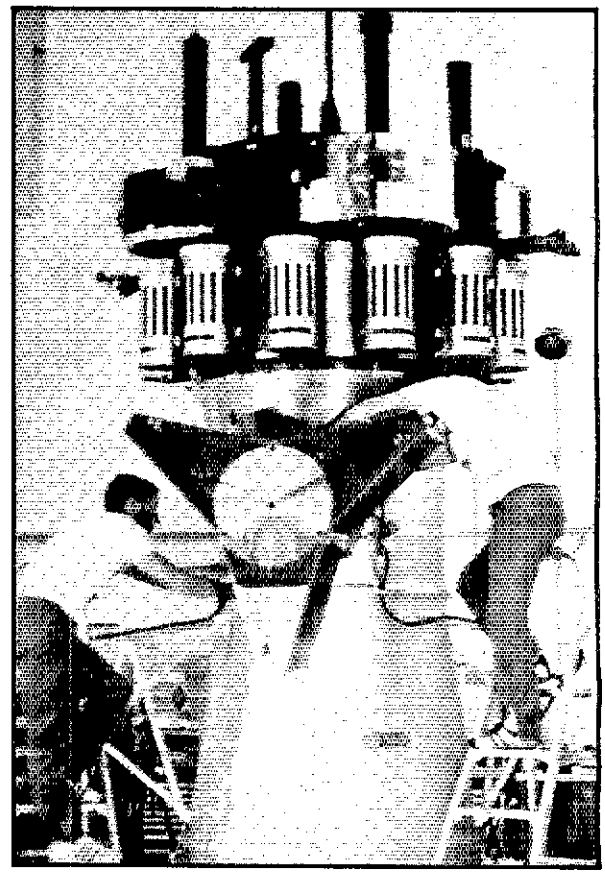
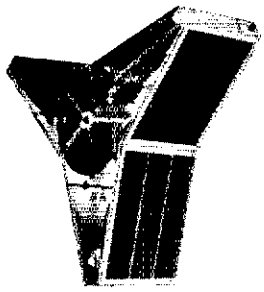
With *your* investment in the future of Amateur Radio, yesterday's dream of reliable, convenient, long-distance satellite communications will become tomorrow's reality. Please contribute what you can to the future of Amateur Radio satellites — that future is yours!

Mail your tax-deductible* donation to the ARRL Foundation Satellite Fund, 225 Main Street, Newington, CT 06111. The future success of the amateur space program depends on you!





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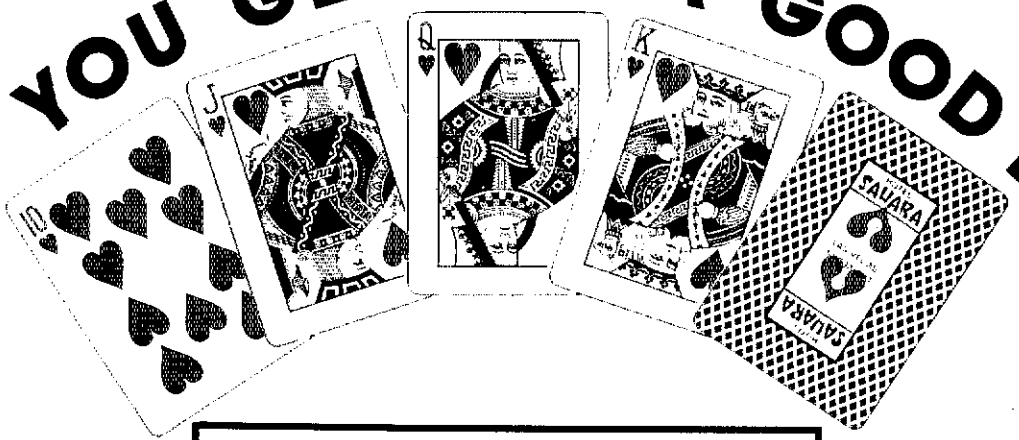

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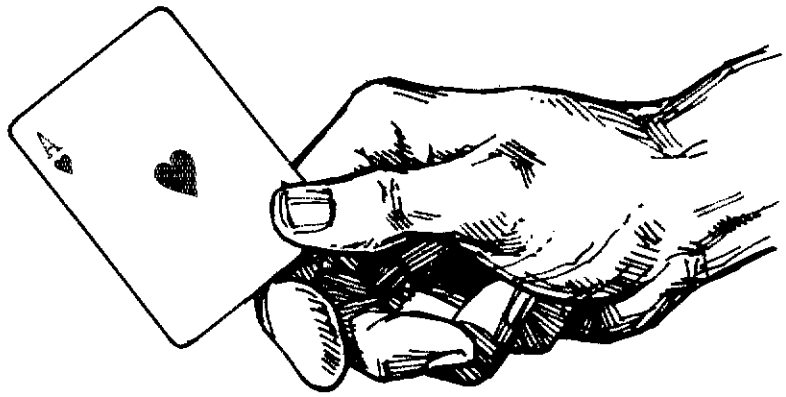

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17, W4EHF 11, W2JDB 11, WB4SLF 10, KA4ATK 9, N4EHM 9, N4UE 7, KA4KDD 4, WB4HRR 2.

SOUTH CAROLINA: SCM, Richard McAbee, W4MTK — ASCM: WB4UDK. SEC: WD4HLZ. STM: W4ANK. NMs: K4PFC KC4LA KA4AUR. Congrats to the following: K4LNO N4FGT KA4HJT for services rendered to Red Cross during large apt. house fire; WA4UKX WD4BJY for their services in helping find a lost girl. Belvedere ARC keeping busy with Aiken's Making. Trident ARC keeping busy putting a ham station at North Charleston City Hall. WA2FFY/4 elected pres. of Columbia ARC. WD4HLZ, SEC, getting ready for SET; won't you help him? QNI/QTC SC SSBN 1228/124, Blue Ridge 2M Net 2382/83, Anderson 2M Net 828/35, SCNTN 281/37, Lancaster Co. 2M Net 160/10, Western SC Emerg. Net 431/37, Newberry Co. ARES Net 106/9, Carolina State Line Net 66/70, Laurens Co. 2M Net 69/0, CNN 159/37, Trident ARC 2M Net 110/0, York Co. ARES Net (Aug) 247/36, 241/38, Spartanburg ARC 2M Net 432/19. Traffic: K4ZN 192, W4NTO 100, K4ZB 84, W4ANK 60, KA4AUR 45, K4FRX 45, W4FMZ 43, KC4LA 37, AF4E 29, W4FVV 26, W4MTK 23, NQ4N 19, WA4MIY 17, K4PFC 17, WA4JWS 16, K4LYU 15, WD4DOL 8, KA4LRM 8, W4DRF 4.

VIRGINIA: SCM, Luck Hurder, WA4STO — ASCM: K3RZR. STM: KY4K. SEC: KZ4K. Chief OO: W4HU. Chief OBS: K3RZR. Chief OVS: N4CD.

Net	Freq.	Time	QTC	QNI	NM
VSBN	3947	6:00	282	601	W4NWM
VSN	3705	6:30	131	271	WB4KSG
VN/E	3680	7:00	183	384	K4JST
VN/L	3680	10:00	120	245	W3ATQ
VLN	3947	10:15	190	497	WD4ALY
SVEN	22/82	7:15	58	426	N4EVV
WARC	3748	8:30 AM Sn	4	23	K4JST

Congrats to new Extras N4EVV and KD4FP! Both should have new calls to disguise themselves by the time you read this. Many thanks to the Dunnsville duet for a fine section picnic and to those who made the Virginia Beach convention such a great success. OOs WA4HHG KI4W KB4WT W4HU reporting violation activity. Are you interested in assisting your fellow amateurs? Contact your SCM or W4HU for info on becoming an OO. More OBS stations are needed in Virginia. Know of a repeater on which bulletins are not sent? Become an OBS! Kudos to NM W3ATQ for highest traffic total. Chief OO W4HU reports participation in last FMT within 2 hertz from umpire! Chief OVS N4CD sez erected triband beam. (Unusual for him in that it was hf rather than vhf/uhf.) — He's waiting for F2 skip to start on 6M again. WB4DBK sends greetings from Boston. K3THD, Winchester, making energetic plans for uhf/microwave relay site on his mountaintop property. W4FJ gave exciting talk on satellite program, while many of us await details on TV picture demodulation from Oscar 9. N4DYL in Toms Brook is proud owner of Robot RTTY system, while W4SUS is becoming more active on RTTY. KA4SSZ, EC Fauquier County is taking time out from EC duties to be proud new father! Traffic: W3ATQ 465, WB4PNY 385, WB4FDT 339, WA4LJI 240, K4JST 201, WA4STO 184, WA4CCK 173, KY4K 168, WD4ALY 162, WD4FTK 148, KZ4K 134, W4NWM 115, WB4KSG 114, K4JM 109, KA3DTE 105, W4UQ 79, WB4FLT 74, W3BBN 68, K4KDJ 64, KA4IUM 63, KB4WT 57, N4RF 48, K4JH 46, K3RZR 38, W3BBQ 35, WB4UHC 34, KA4ERP 33, WA4QWC 32, N4EVV 30, WA1VRL 30, KC4HN 25, K4LMB 25, WA4YIU 25, N4BFI 24, KB4PW 21, W4LXB 19, WA4RTS 19, K4VWK 19, KD4FP 18, N4YO 17, N4LE 16, K8LGA 16, WB4ODZ 16, NC4B 14, N4BJX 14, W4YVG 14, W4PVA 13, KI4W 13, WB4ZTJ 13, WB4DQZ 12, N4ENU 11, W4KXE 11, W4NFA 10, WD4KQJ 8, NN4I 7, W4OKN 6, WA4TVS 5, W4YE 5, W4DM 4, WB4RWY 4, WB2OMZ 3, WD4DUU 2, WA4EOW 1, WB4KIT 1, (Aug.) KB4PW 61, K4LMB 53, N4BFI 22, K4MTX 14, W4KX 4, W4TZC 2.

WEST VIRGINIA: SCM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. NMs: K8MHR W8FZP KD8X WB8LDY. Regret to report W8HIC is Silent Key. WV hams made excellent contribution to Oct 10 statewide CAP drill. K8BS organized and directed OES operation; K8QEW coordinated EC activity. WB8SLY and KA8CGU are now Adv. New Novices KA8NXF KA8NXS. New ham in Ritchie Co KA8LXN. New ECs are WB8WEZ KB8ZM.

Net	Freq.	Time	QNI	QTC	Sess.	NM
WVFN	3990	6:00	340	87	28	K8MHR
WVN	3567	7:00	140	40	28	KD8X
Midday	7235	Noon	358	28	30	W8FZP
WVNN	3730	6:15	119	22	25	WD8LDY
Hillbilly	14290	1600Z	151	39	4	W8YP
KFC 2M	87/47	8:30	176	10	4	KA8CGU
WV 6M	50150	8:00	111	11	24	KA8CGU

Traffic: KC8CS 75, KD8G 58, N8AJC 54, WD8DHC 52, K8QEW 28, N8CFX 27, W8FZP 27, K8KT 26, KD8X 26, W8JWX 23, W8CKX 17, KC8CR 16, WB8UDY 12, WA8YTM 1.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, L. E. Steimel, WØACD — SEC: K3PUR. STM: WBØMCL. NMs: WØHXB NØAXQ WDØAIT WØEJD WAØRYL KBØZ. The Colorado section was pleased to have the Pacific Area and TCC Staffs meet in Denver on Oct 3. Hope they had a successful meeting. The FCC has been in the process of deregulating the use of the frequency spectrum. Some of the deregulation has to do with the Amateur Radio Service, such as rewriting the amateur rules into plain language, along with many other items. However, the FCC does invite and encourage comments from the amateur population. So if you have strong feelings about any of the FCC proposed actions, be sure and reply to their comments. For some time there has been a controversy as to whether this "Section Activities" column along with traffic reports should be continued in the QST?** I would like to hear the reader's comments on this subject. Please feel free to make your comments known.** The reason for the concern is because of the ever increasing cost of publication. HNN 30 sess QNI 1642 QTC 121 Inf 269 QNF 1215. CWN 28 sess QNI 146 QTC 158 QNF 603. Columbine 26 sess QNI 1093 QTC 60 Inf 219 QNF 1022. Traffic: NØBQP 3051, WAØHJZ 1194, WDØAIT 344, WØFPT 342, WØEJD 214, KØDJ 205, KBØZ 173, WØACD 148, KØYBX 75, WØRE 59, WØLAE 56, WØGO 48, WØNFW 43, NØFB 17.

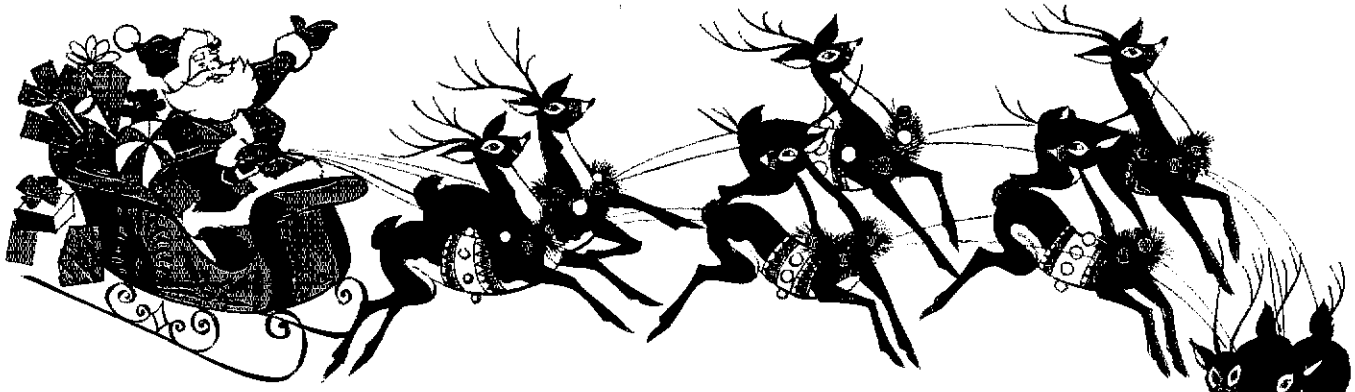
NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. NMs: WA5UNO KB5LI W5VFQ. Southwest Net (SWN) meets daily on 7083 at 1930 local and handled 191 msgs with 261 QNI. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 kHz at 0100Z and handled 171 msgs with 849 QNI. New Mexico Breakfast Club meets daily on 3940 at 0700 local and handled 71 msgs with 795 QNI. Yucca 2 Mtr Net, 146.01/61, handled 18 msgs with 656 QNI. Caravan Club 2 Mtr Net handled 6

FLASH NEWS

BULLETIN

HI! HI! HI!

Straight from... HEADQUARTERS



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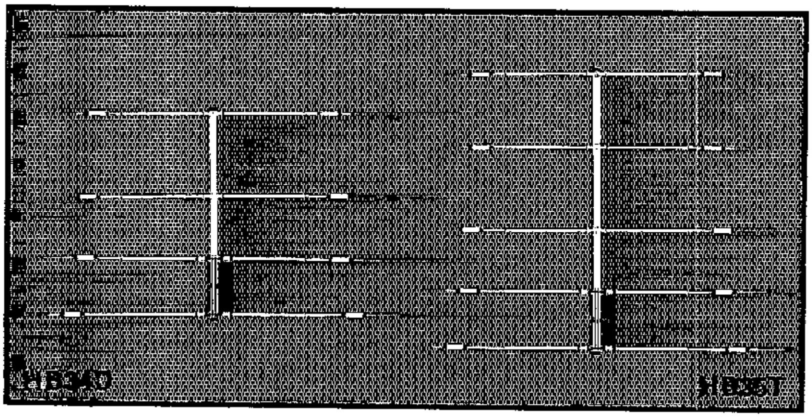
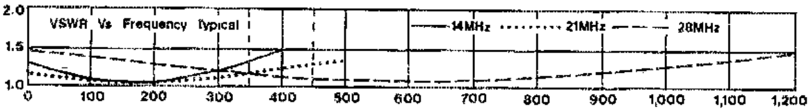
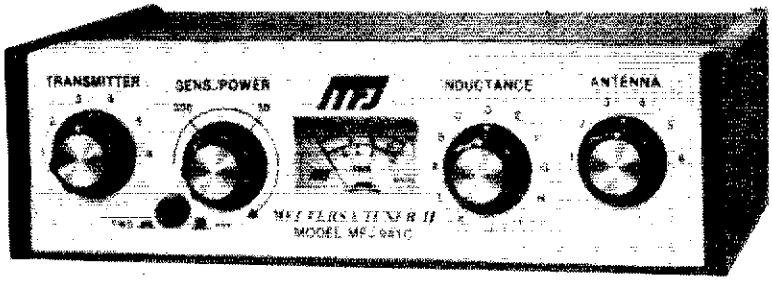




MFJ ANTENNA TUNERS 16 MODELS

MFJ-941C 300 Watt Versa Tuner II

Has SWR/Wattmeter, Antenna Switch, Balun. Matches everything 1.8-30 MHz: dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.



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Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.

Matches everything from 1.8-30MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.

Run up to 300 watts RF power output.

SWR and dual range wattmeter (300 & 30 watts full scale, forward/reflected power) Sensitive meter measures SWR to 5 watts.

Flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.

12 position efficient airwound inductor for lower losses, more watts out.

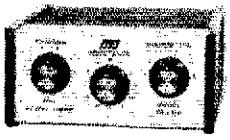
Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

Works with all solid state or tube rigs.

Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.

4 Other 300W Models: MFJ-940B, $79.95 (+ $4), like 941C less balun. **MFJ-945, $79.95** (+ $4), like 941C less antenna switch. **MFJ-944, $79.95** (+ $4), like 945, less SWR/Wattmeter. **MFJ-943, $69.95** (+ $4), like 944, less antenna switch. Optional mobile bracket for 941C, 940B, 945, 944, $3.00.

MFJ-900 VERSA TUNER



MFJ-900

$49.95 (+ $4)

Matches coax, random wires 1.8-30 MHz.

Handles up to 200 watts output; efficient airwound inductor gives more watts out. 5x2x6".

Use any transceiver, solid-state or tube.

Operate all bands with one antenna.

2 OTHER 200W MODELS:

MFJ-901, $59.95 (+ $4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $39.95 (+ $4), for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B VERSA TUNER II

MFJ-949B

$139.95 (+ $4)

MFJ's best 300 watt Versa Tuner II.

Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2-range wattmeter (300W & 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7".

MFJ-962 VERSA TUNER III

MFJ-962

$229.95 (+ $10)

Run up to 1.5 KW PEP, match any feed line from 1.8-30 MHz.

Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected.

6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines.

4:1 balun. 250 pf 6KV cap. 12 pos. inductor. Ceramic switches. Black cabinet, panel.

ANOTHER 1.5 KW MODEL: MFJ-961, $189.95 (+ $10), similar but less SWR/Wattmeter.

MFJ-10, 3 foot coax with connectors, $4.95.

MFJ-984 VERSA TUNER IV

MFJ-984

$329.95 (+ $10)

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min. SWR. SWR/Wattmeter, for./ref., 2000/200W.

18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV cap. 5x14x14".

300 watt dummy load. 4:1 ferrite balun.

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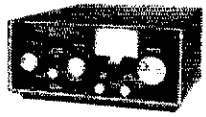
MFJ-989 VERSA TUNER V



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msgs with 135 QNI. Welcome to KB5LI and WA5UNO as new NMs. Many, many tnx to KG5L and WB5NNG for their wonderful support in net operations. Tnx also to W5JVX in assisting WA5UNO. KA5DDW doing FB job collecting tfc fm all nets. Traffic: KA5DDW 306, W5DAD 198, W5ENI 112, KB5LI 34, WA5MIY 28.

UTAH: SCM, Leonard M. Norman, W7PBV — SEC: WB7BZJ. STM: W7OCX. WB7SSS KA7IMV WB4NVO/7 upgraded their license. WB7TUR won the Rainbow Canyons ARC 2M Fox Hunt; he caught club president WA7HHE with a 2M antenna attached to Union Pacific railroad track. N7BUO heard wedding bells. W7CKD W7PBV WA7HHE WB7BZJ attended his reception and met the bride. N7BDZ new secretary for UARC. W7DED donated a tower to KA7GRW. K3FR/7 arranged a tour of EIMAC's plant in SLC for a group of hams. WA7HHE has his Hy-Gain tower out of the basement. KC7O chairman of updating UARC by-laws. WB7PXY conductor on UPRR and active on 2M. Rainbow Canyons ARC had a nice display and active station at the Iron County Fair. UCN 3710 kHz meets daily 1930 local time. KA7IMV provided emergency service to W6GRJ/m twice at same location same day. Traffic: K7HLR 246, WA7FER 153, WA7KHE 134, WA7MEL 75, WB4NVO/7 19, W7OCX 6, W7PBV 6, WB7SSS 6.

WYOMING: SCM, Dick Wunder, WA7WFC — SEC: WB7EIN. The Torrington club put on an excellent picnic at Fort Laramie and a good time was had by all. Thanks to the High Plains ARC for another fine picnic. With the additional power and new frequencies on 160 meters I have been approached about a 160M net. Anyone interested please contact me, especially net control volunteers. Congrats to KA7HCQ, upgraded to Tech. WB7NHR reports the Wyo. Cowboy Net held 22 sessions with 476 QNI and 14 QTC. WA0PFJ reports the Wyo. Jackalope Net held 23 sessions with 405 QNI and 7 QTC. Merry Christmas and Happy New Year to all from Sandy and myself.Traffic: WB7NHR 159, WA7GYQ 147, W0OGH 68, W7SQT 55, K7SLM 18.

SOUTHEASTERN DIVISION

ALABAMA: SCM, James M. Bonner, K4UMD — SEC: W4IBU. The Montgomery and Anniston Hamfest held in Sept was a great success. Talked at great length with W4RH, Southeastern Director. The election for SCM will have taken place by the time you read this. We have two good people running; either will make a good SCM. I want to thank all for their support. AENZ reports QNI 189. Their net is on 147.87/.27. AENB QNI 249 QTC 98. Mgr WA4JDH reports increase in check-ins. Net welcomes W8IM from Mobile. AENM reports QNI 2597, QTC 108. AEND reports QNI 212, QTC 97. KC4GS reports WAARS operated Sept. 28 - Oct. 3 at West Ala State Fair in Tuscaloosa. Operated all bands and 12 hams manned the station. KD4QK reports Mobile ARC held their SET Oct 3. at 9 AM with a simulated bus-train wreck with 35 injured and 400 had to be moved. DRN5 reports Ala 100% by W4CKS WA4JDH WA4PIZ W4IBU W4WJF. New manager of AENM net is N4BIT. SCARES new officers are WD4DJL pres.; N4YZ, vice pres.; WB4LCW, secy/treas . HARC started a Novice class on Sept 25th. It should run 10 to 12 weeks at Red Cross Blvd. MARC has Novice classes starting Sept. 8th at Southwest Technical College. Call KG4JJ for details. BARC classes are doing well. Ozark putting repeater on 144.530/145.130. Interprize ARC will hold elections for new officers. IARC new members K4LYY N4ANT. BARC new members N4FHR WA4TQZ W4EVY W4IQN WA4MRQ reinstated. Traffic: WA4JDH 964, W4CKS 137, WD4DHI 71, WA4LXP 61, WA4PIZ 57, K4AOZ 46, K4HFX 11, K4UMD 11, W4RNX 6, WB4TVU 6. (Aug.) WA4ZPZ 18, K4HJX 6.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — ASCM/SEC: K4VHC. ASEC/NVOAD: WA4PUP. STM: W4WXA. Chief OBS: W4BIA. Congrats to the efforts of devoted hams who have made Augusta and Lanier-land hamfests a real success. My personal tnx to both organizations for the courtesies and hospitality shown to me. Right now I don't know Santa Claus' sked for the youngsters but they will be announced on the various section nets. Sorry we had to change the SET to Oct 31 but there were hamfest conflicts. If your club is planning a hamfest in 1982 please inform me and ARRL ASAP. W4WXA still looking for an NM for GTN. We have many *cw ops in* the section who would more than qualify. Our new Novices need to learn proper operating procedures. Colquitt County HRS participated in Sunbelt Expo '81 doing great PR for the hobby. BGMRC will be celebrating their 19th anniversary on Dec. 15th. Congrats from all in the section. Officers for the club are: K4ERE, pres.; W7SCY, v.p.; WD4PIF, sec/treas.; WD4ODR, actg mgr; WD4PTH, finance chrm. WA4IQU honored with plaque at GCN annual meeting at Warner Robins. W4AAY honored with a testimonial for his almost 60 years in the hobby. I am looking for the oldest amateur in the Georgia section. Not in age but in years of service to ham radio. If you feel you qualify please write me with a synopsis of your experiences, etc. Congrats to the SE DX Club for the FB job done with DXPO '81. I know much hard work had to be done in preparation. We are still looking for more OBSs for the section. If you're interested, please write me for the necessary form. We still need a few more ECs to complete the ARES program in GA. I want to wish you all a very Merry Xmas and Happy New Year and hope Santa brings you that new gear you need. Traffic: W4WXA 202, K4EV 94, WB4NTW 80, WB4ZVX 48, K4JNL 41, KA4ATM 37, W4HON 32, W4FIZ 28, W4PIM 27, WB4WQL 22, WB4LBM 18, WA4PUP 16, W4BIA 12, K4BAI 8, N4UZ 3.

NORTHERN FLORIDA: SCM, Billy F. Williams, N4UF — SEC: WA2GIN. STM: WD4HIF. NMs: N4EC KF4U KC4MM WN4IIV. ASCM: WA4AXJ WB4QBB W4BSP N4EDH. WD4HIF is new section traffic manager. KC4MM appt. NM FMSN. EC for W. Pasco Co is KE8O. KC4CT's XYL recently upgraded and signs N4FJD. KA4TBI passed Extra Class. LMARS dismantling and selling tall towers to raise funds for new club rptr. WD4BMN W0RAO KR4Q are the mainstays. New A-1 Op Club members include W4MH AJ4L K4EFZ KW4V WA4DXL. NO4J prepared new computerized roster for OPARC. KA4EPQ working DX on 6 mtrs & active on 220 MHz. WD4JEJ has new rptr. on 444.1/449.1 MHz and presented ATV program for PARC in FWB. W4ODW on 1296 MHz. DBARA held club picnic at Daytona Bch City Island. WB4ESH presented meeting program on antennas. The Hernando Co ARA heard W4SIZ speak on xmsn lines at their meeting. Those interested in becoming RACES members in Hernando Co. contact WB4EVO. Weekly RACES net is held there. KC4N KD4XK teaching Novice class for TARS. RANGE rptr group has welcome tape and information tape going again on "73" and "79" punchup. KB4B WD4BIW KA4FGR WA4UKJ upgrading antenna mounts for the

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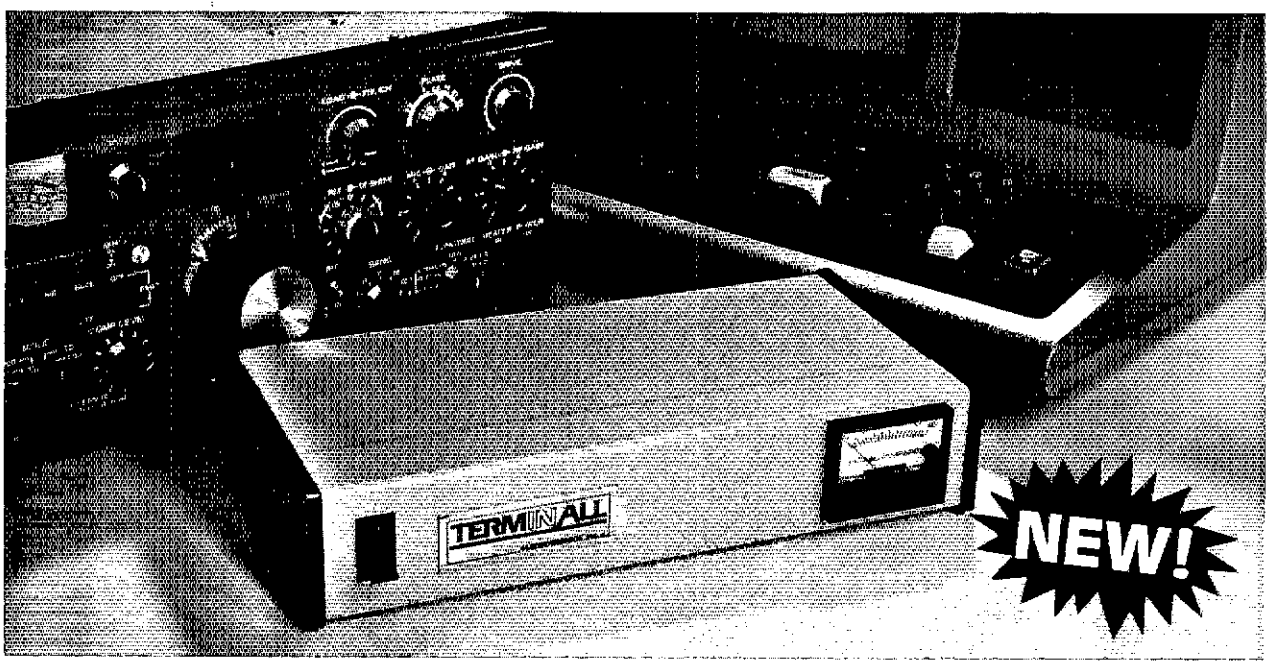

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16/76 and 28/88 machines on WTLV-TV tower. NOFARS meets at Ed White Comm. School on Old Middleburg Rd on 2nd Thurs each month. N4CPA won GCARC scholarship. Will be attending Stetson Univ. New licensees are urged to QNI QFNS dy at 2000 local time on 3715 kHz. A procedure sheet is available free from this office for those who are interested. Traffic: WD4HIF 804, N4PL 369, W4SIZ 294, WD4IIO 192, N4EDH 183, WA4EYU 173, W4JL 147, WA4QXT 138, N4EC 100, WB4TZR 89, W4MGO 84, W4KIX 39, N4BZH 34, WA4STZ 30, KA4MGO 28, N4UF 26, N4AXN 21, W4GUJ 18, WB4DTS 17, WB4GHU 16, W2QWC 15, W3IDO 11. (Aug.) N4EC 100. (July) N4EC 81. (June) N4EC 52.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — ASCM: W4KGJ. SEC: AA4WJ. STM: WA4PFK. W4DL continues to be our most active OBS with 31 transmissions reported in September. Sure wish I could get comebody to act as Chief OBS to plan and coordinate bulletin transmissions to ensure good section-wide coverage. Most applicants want an OBS appointment so they can receive bulletins in the mail — and that's the last I hear from them. It is not supposed to be that way. The OBS is supposed to copy bulletins off the air and send them on schedule so others can get easy copy. I would like to have a network of OBS organized so important information could be introduced into the system, whether it be ARRL bulletins or otherwise, and it would be passed throughout the network and transmitted on schedule so all active Radio Amateurs would have excellent opportunity to be informed on the latest goings-on. By the time you read this, the nation-wide SET will have come and gone. Hope you had fun. If you didn't, it's your own fault. There are always plenty of fun-things to do, but it is up to you to participate however much you like. For emergency communications evaluation, our section is considered in class II, having 20 to 29 ECs appointed. Last year we ranked first in our class. Not bad, huh? This rank is based on % of SEC monthly reports and EC annual reports received at Headquarters. No complaints on the SEC. He hasn't missed a monthly report in 29 years! But only 45% of our ECs made annual reports. I am appalled at this. Why can't we have 100%? It takes only 15 minutes once per year. And look at our 1980 section ranking for traffic handling. Fourth place among our 73 sections! Pretty good, huh? But it should have been much better. Look. We handled nearly twice as much traffic as any other section. But ranking is based not only on number of messages but also on number of stations making monthly reports. With 452 station reports in 1980, an average of 38 per month, and there being about 13000 Amateurs in our section, we have about 0.3% of them sending monthly reports to their SCM. Why do people bother to get ham licenses if they aren't going to be active. Do something. And help us plan the numbers game so we can impress the legislature, or whomever we need to impress. K4JM reports enjoying more hamming fully retired. KB4OW reports a Leukemia Society run Sept 19 & 20 with participating stations: K4SJG W4OPZ K4KWA WA4QFI WD4JNM W4BFQ W4HVU W4PRK W4DXZ WB4WYG W2HAE W4POL W4LVA KD4SF KA4PNZ K4SJC W4DBZ. KA4FHG upgraded to Advanced and has new call coming. He reports 3 new Techs in Hardee County: KA4VPB KA4NDB KA4REV. Congrats to all, including the Elmers. KA4GUS reports Dade Emergency Net held special ARES/RACES drill Sept 17. WD4COL is adding to his house a new Florida room and ham shack "first class all the way." Congrats. K4TH is back home safe after a weeks trip to New England. Traffic: W3CUL 2947, W3VR 591, WB4FVV 457, WD4COL 420, K4TH 332, K4SCL 315, WA4PFK 302, K4ZK 267, N2WX 183, WD4AWN 169, W4GPL 158, WA4EIC 152, KA4ASZ 113, WA4HXU 106, K4EUK 103, WB4WYG 103, KY4U 97, KA4LNA 89, W3TLV 86, W4DVO 85, KE4O 80, WB4PIB 79, KM4G 51, W4ESH 49, NJ4O 43, N4KB 35, W4KMN 33, WB4GCK 31, K5IHH 31, AA4WJ 27, KA4FZI 22, KA4BBA 20, W4SMK 19, KA4FHG 16, W4WYR 14, W1DLP 13, W4IRA 7, WB8VLR 6 (Aug.) K4TH 368, KA4FZI 38, KM4G 22. (July) K4TH 403, KA4FZI 43.

WEST INDIES: SCM, Julio Negroni, KP4CV — KP4FBT has received his regional net certificate from 4RN after a full year of consistent attendance. Sectional net activists under STM NP4D are planning participation in Oct. CD party. SCM KP4CV is new editor of PRARC Onda Terrestre. New Novice classes started Oct 6 at PRARC clubhouse in San Patricio. Instructors are KP4CA and KP4CV. PSHR: KP4DJ 74, WP4BDS 60. BPL: WP4BDS. Traffic: WP4BDS 269, KP4DJ 93, KP4FBT 21, NP4F 18.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Erich J. Holzer, N7EH — STM: W7EP. September signaled the end of the summer and the return of our kids to school. Preparations are under way for upcoming amateur public service activities. ARA is preparing for the Gila Bend Air Show. AAA5 is preparing for the Thunderbird Balloon Race and Fiesta Bowl Parade. ARA members W7LUQ K7ESA W7RSV along with KA7BCI did a fine job by providing communications when an area of Phoenix wound up without telephone service back in July. Heard from W7ME (ex-W7FKK), who reports having 291 countries confirmed and spending most of his time flying aerobatics. W7YS reports having a new antenna for 160/80/40 meters. New officers for AAA5 are: K7TJZ, pres.; W7KIV, v.p.; N7AOU, sec.; K8JOA, tres.; WA7GRW WA7UMH, board members. I regret to report that WA7PSK and K7TKA became Silent Keys. Congratulations to KA7HHJ on making PSHR. I would like to meet your club. Please contact me and maybe arrangements can be made. AC7D and KB7DV are back in AZ. Hope they had a fine summer in ME. ATEN: QNI 887 QTC 244. SWN: QNI 268 QTC 191. Traffic: W7AMM 298, W7EP 132, KA7HHJ 82, K7UXB 77, WA7KQE 51, K7NMQ 28, K7JKM 22, W7ME 22, W7LVB 21, KB7HA 20, K7NTG 19, W7LBW 16, WA7NXL 9, N7EH 8, KE7W 8, WA7YUL 4. (Aug.) W7EP 106, WB7QOM 9.

LOS ANGELES: SCM, Stan Broki, N2YQ — SEC: N6UK. STM: K5DY. Due to health reasons WB6FAK was forced to resign as SEC for Los Angeles. Dave has done an outstanding job the past 3 years and will be missed by all. Fortunately my ASCM N6UK has consented to carry on as SEC. John is an Army MARS member, RACES member and ARES member, and will be of great help as SEC. The ASCM position will be left vacant for the time being. The past month I've visited the United Radio Amateurs of Long Beach, the Lockheed ARC and attended the fall meeting of the Quarter Century Wireless Assoc. I was pleased to give these clubs an interesting

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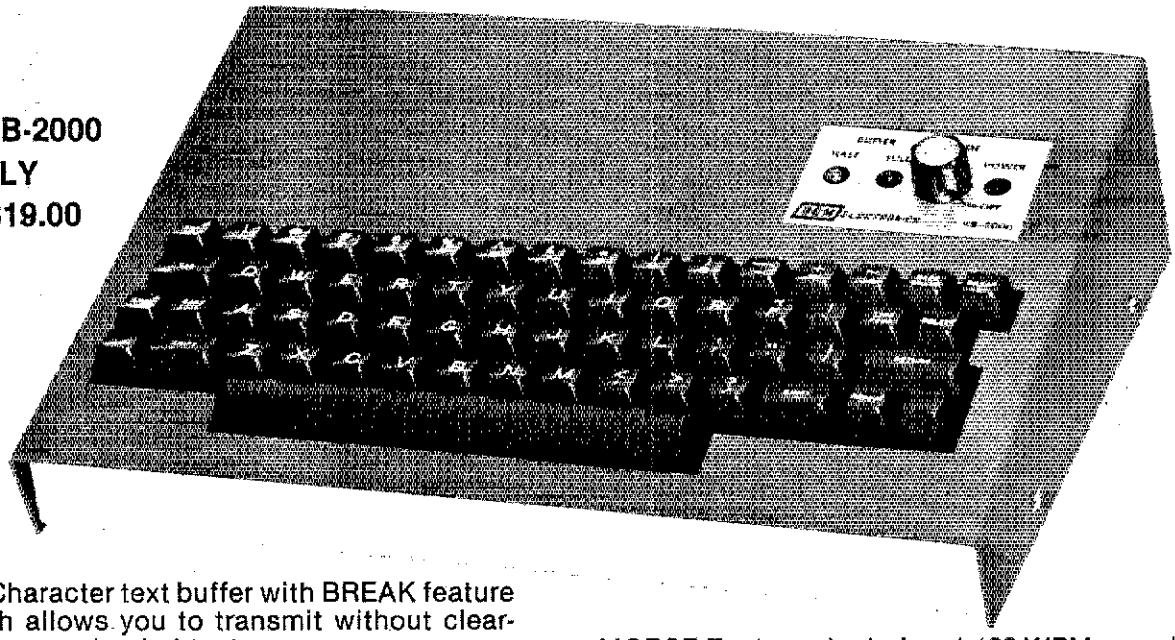

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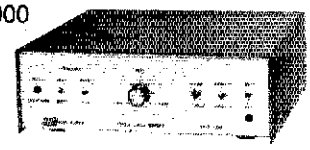

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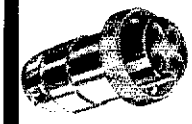

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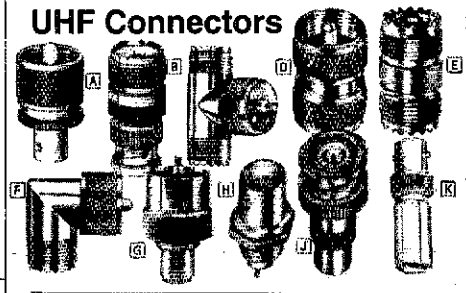

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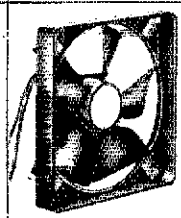

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273-241 ..... 15.95

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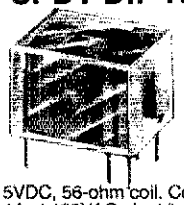

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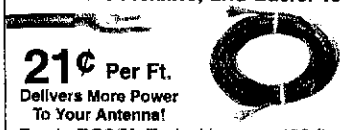

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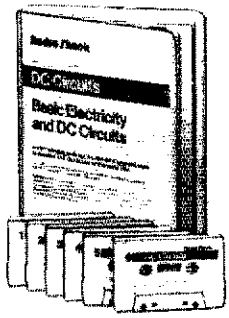

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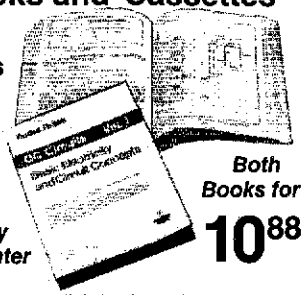

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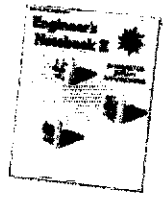

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with a net, whether traffic oriented or not, to drop him post card giving time and freq. 73. Traffic: WA6OCM 1 K6OWA 114, W6INH 108, N6BCY 58, KT6D 40, WA6L 39, K5DY 33, K6CL 16, W6NKE 13, W6BWG 5.

ORANGE: SCM, Fried Heyn, WA6WZO — ASC WA6WZN. SEC: W6UBQ. STM: KA6A. NMs:WB6A W6CPB K6JT WA6QCA WA6WZO. EC WA6TLE resig due to change in business. EC WD6CSL is moving out the section. N6BAW has been appointed EC for N Orange County and WD6AQK EC for So. Orange Coun WB6FRB appointed OES & AEC as CDF-VIP Red Cro liaison officer. WB6NSX active in new position in Coa Guard Aux and ARES as OES. Congrats to EC KS6T new So. Cal Coordinator for Navy-Marine MARS. C N6PE set new record for CA in WA QSO party. Congra to OESs WB6DCB & WB6DCC on receiving ARRL Na Cert. of Merit for their work with the Placent Neighborhood Radio Watch. New pres N6BEB Clairemont Rptr Assn. (145.22-1A WB6YNQ/R Santia Peak) announced the airing of Westlink on Tuesdays 7. EC W6WPP has started a new AR class with suppo of Lake Elsinore Valley ARC. Did you know DEC K6G was first appointed EC in 1957? ARES RTTY nets h Mondays 8 PM on WB6ZIR/R 144.52/.12 and Sundays PM on KA6EEG/R 223.22/4.82. SCATS holds RTTY n net Wednesdays 8 PM on W6IWO/R 146.10/.70. For int mation on Society for the Protection of Amateur Rad (SPAR) contact SCM. I would like to thank all t wonderful hams I've met on my recent meetings Barstow, Riverside, San Bernardino, Needles, Blyth Palm Springs and at the SW Division convention in A The NTS is great way to send seasons greetings to fa fy & friends over the holidays.

Net	Freq.	Time	QNI	QTC
SCN/1 (20)	3598	7 PM Dy	325	320
SCN/2 (13)	3598	815 PM	238	119
SCN/V (FM)	146.045/645	9 PM Dy	437	235
SCN/RTTY	3637.5	8 PM Dy		

Traffic: KS6T 738, KN6C 363, W6NTN 295, WB6QBZ 1 WB6BZZ 77, WA6QCA 58, W6CPB 45, K6ZCE 38, W6T 20, W6XD 16, K6WI 10, WA6WZO 9, KA6DZU 8, WB6V 6.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — ST N6GW. SEC: W6INI. Wanted: General or higher cla license to organize Novice traffic net. Also Novice p ticipants. Contact N6GW (222-5575) or W6INI (273-112 Appointments are available for Official Observer. H in self policing. Must be ARRL member and tour ye as Technician or above. Details from W6INI. N6CQW new EC for Eastern District of San Diego Cour Thanks to W6OGC, retiring EC. KM6I active on DR PAND SCN. New ARES members: AA6EE N6DYU N6E WB6IGP KA6MKW KA6NGS KA6PKJ K6PP K9R WB6YLH KS6Z. AA6EE placed first in CA in 1980 VK DX contest, and has added an SB-200 to his stati Upgraded: WA6BDW to Advanced. Congrats Pac Convair Club is upgrading station for use as alterna ARES control center in disasters. ARC of El Cajon h issued 100 WAMO certificates. Poway ARS h emergency drill with 24 stations participating under leadership of KA6IEN. North County Traffic Net held sessions, handled 66 msgs. Traffic: KT6A 444, W6H 288, N6GW 180, KM6I 123, KB6AI 58, N6AT 54, KU6D WA6UFY 11.

SANTA BARBARA: Robert N. Dyruff, W6POU — in sctn liaison initiated at Bakersfield meet of AR leaders and rptr trustees from SJV, SCV, SBar sectio WB6BWZ to lead sctn efforts for NWS as it curtails Maria Wx Stn-central coast. No. County Mon. nite net on 34/94 now an ARES net. W6RIC develops co puter data base for ARES section lists; WA6W WB6EIY named AECs. 220 rptr owners N6ZF and N6C offer digital data links to section. WB6QDS WB9K contruct/install ATV rptr; WB6RIJ creates 8-elem. quagis using pc board de & refls; dozen solar panel stallations now in sctn; Satellite ARC provided 4 launch net comms via W2KVA/6 for UoSAT. K6YD sta SCN-SBar sctn vhf ssb tfc net QNI nitely 2100 144.58/145.18. WB6RDV/R Santa Ynez Peak dedicated public svc. Lompoc loses AVERT & CAP leader KB6 to Tucson. WB6IYW/R adds PL 3B. Gold windbreak with ARES patches needed? Contact AB6S. OE W6ZRR K6SZS W1UUQ W6POE active with AR bulletins, news. W8JGS 111, W6ZRR 106, K6YD N6MA 8.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC ASCM: WA5QFD. SEC: W5GPO. STM: W5VMP. N AA5J AE5I WD5JYI KA5IWF. Four new Novices in Greenville area: KA5s MHF MHG MHK MHL. N5B upgraded to Extra. The Garland ARC club house go new paint job, just in time for fall classes to begin. Panhandle Tfc and Emergency Net continues to attr newcomers daily from a wide area. The net meets d on 3933 kHz at 1900L. The Top O'Texas Two Meter meets Wednesday at 2000L on the Pampa 146.28 machine. The Dallas Amateur Teleprinter Assn. (DA machine is back in service on 146.10/70 (60 wpm at shift) after a complete reconditioning. Thanks to "110%" effort by our SEC, W5GPO, we now have ARES units in place in our section, with a members near 1300! Nice going, Charlie! A new outlet for tf the Coppras Cove-Ft. Hood area is N5DKW, who me the TTN TSN GCHN 7290 D-RN5. When you retire f the Army next year, we will really put you to wo December is traditionally our heavy month for tfc ha ing; please report any and all activity so that we r receive proper credit for our hard work. Merry Christr to all, and much DX in 1982! PSHR: KC5FX KA5A N5BT KC5NN KB5UL KA5IWF WD5JYI W5VMP. Tra K5BNH 255, N5BT 206, WB5OXE 116, KA5AZK WD5JYI 105, KC5FX 92, KC5NN 84, W9OYL 57, AA5J W5VMP 48, K5QKM 40, KA5IWF 38, KC5Z 35, KB5UL K5SQR 19, W5ERT 17, K5PC 17, N5DKW 15, AJ5F K5HGX 11, WA5QFD 10.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — AS W5REC. SEC: W5ZTN. NMs K5CAY WA5OUV WA5Z W5UYH. With the appointments of W5ZTN WA5ZOC are again pretty well up to full strength in the leader column. We are very happy to have these fine gents the team and they deserve your full help and coop tion. Reports from 2 OOs and 23 ORSs this month. 3 report PSHR activities. K5WG working on CW-DX FB. Enid has satellite receiver on .94 machine fabulous coverage. Also working on 440 machine Enid ops, received PSA commendations recently reading club papers, I find many more people eligible these. The new ones really look nice in any station. not let me hear from you. Who, what, where, when, why. W5AA and WB5LUX on sick list. Traffic: KA5C 248. K5CXP 184, W5REC 182, W5RB 144, KB5EK

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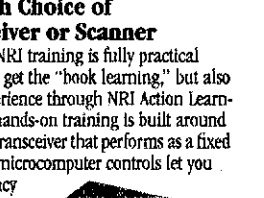

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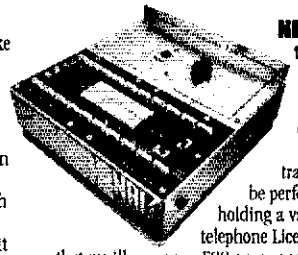

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SOUTHERN TEXAS: SCM, Art Ross W5KR — ASCM/STM: N5TC. SEC: AK5N. OO K5DL sent in his usual neat report. KA5GYJ upgraded to Extra. W5BGE upgraded to Advanced. Congratulations to both. EC WD5AAH reports special events station sponsored by Brazosport ARC in Clute, TX 12 Sept. made 260 contacts. Included 40 states plus DC, Puerto Rico and 3 Canadian provinces! Quite a busy day showing great teamwork! Houston Com-vention 81 a great success with more than 1900 registered. Zone 4 of South Texas Emergency Net looking for a new NCS. Traffic: W5KLV 478, WB5YDD 474, W5SHN 388, N5AMI 272, WD5AAH 159, W5CTZ 112, N5DAA 112, N5TC 110, KB5TC 73, WB5EFJ 61, KB5NX 61, WA5RVT 60, K5HZR 52, N5CRU 46, WB5MMI 41, KA5KRI 38, WD5KBK 33, WD5GKH 32, K5RG 31, K5ZC 21, AK5M 16.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION (Required by 39 U.S.C. 3685) (1) Title of Publication — QST; (1-A) Publication No. 00334812; (2) Date of filing — September 22, 1981; (3) Frequency of issue — Monthly; (3-A) No. of issues published annually — 12; (3-B) Annual Subscription Price — $25.00; (4) Location of known office of publication (Street, City, County, State and ZIP Code) (Not printers) — 225 Main Street, Newington (Hartford County), Connecticut 06111; (5) Location of the Headquarters or General Business Offices of the Publishers (Not printers) — 225 Main Street, Newington (Hartford County), Connecticut 06111; (6) Names and Complete Addresses of Publisher, Editor, and Managing Editor; Publisher (Name and Address) — The American Radio Relay League, Inc., 225 Main Street, Newington, Connecticut 06111; Editor (Name and Address) — Richard L. Baldwin, 26 Ridge Road, Simsbury, Connecticut 06070; Managing Editor (Name and Address) — E. Laird Campbell, 18 Mohawk Dr., Unionville, Connecticut 06085; (7) Owner (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding 1 percent or more of the total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a partnership or other unincorporated firm, its name and address, as well as that of each individual must be given.) — The American Radio Relay League, Inc. (an association without capital stock); 225 Main Street, Newington, Connecticut 06111; (8) Known Bondholders, Mortgagees, and Other Security Holders Owning or Holding 1 Percent or More of Total Amount of Bonds, Mortgages or Other Securities (If there are none, so state) Connecticut Bank and Trust Company, Hartford, Connecticut 06103; (9) For Completion by Nonprofit Organizations Authorized to Mail at Special Rates (Section 132.122, PSM) The purpose, function, and nonprofit status of this organization and the exempt status for Federal income tax purposes (Check one) — have not changed during the preceding 12 months; (10) Extent and Nature of Circulation — Average no. Copies Each Issue During Preceding 12 Months — (A) Total No. Copies Printed (Net Press Run) — 164,502, (B) Paid Circulation — 1. Sales Through Dealers and Carriers, Street Vendors, and Counter Sales — 6398, 2. Mail Subscriptions — 149,485, (C) Total Paid Circulation (Sum of 10B1 and 10B2) — 149,485, (D) Free Distribution by Mail, Carrier or Other Means, Samples, Complimentary, and Other Free Copies — 1589, (E) Total Distribution (Sum of C and D) — 157,472, (F) Copies Not Distributed — 1. Office Use, Left Over, Unaccounted, Spoiled after Printing — 6541, 2. Returns From News Agents — 489, (G) Total (Sum of E, F1 and 2 — should equal net press run shown in A) — 164,502; Actual No. Copies of Single Issue Published nearest to Filing Date — (A) Total No. Copies Printed (Net Press Run) — 163,518, (B) Paid Circulation — 1. Sales Through Dealers and Carriers, Street Vendors and Counter Sales — 6235, 2. Mail Subscriptions — 144,111, (C) Total paid Circulation (Sum of 10B1 and 10B2) — 150,346, (D) Free Distribution by Mail, Carrier or Other Means, Samples, Complimentary, and Other Free Copies — 894, (E) Total Distribution (Sum of C and D) — 151,240, (F) Copies Not Distributed — 1. Office Use, Left Over, Unaccounted, Spoiled after Printing — 11,778, 2. Returns From News Agents — 500, (G) Total (Sum of E, F1 and 2 — should equal net press run shown in A) — 163,518; (11) I certify that the statements made by me above are correct and complete. (signed) John H. Nelson, Circulation Manager.

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.

(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permited in *QST* advertising.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will respond appropriately to customer complaints and will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

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Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

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.

YAESU OWNERS — join your International Fox-Tango Club and help celebrate our tenth anniversary. Annual dues are still only $8 U.S., $9 Canada, $12 airmail elsewhere. While supplies last, 1982 members can purchase the 60-page looseleaf set of 1981 newsletters for only $6 upon joining. Don't miss out — get our top-quality FT Newsletter monthly, catalog of modifications, free advertisements, technical consultation, FT Net, more. Go Fox-Tango! Send cash, check, or MO to FT Club, Box 15944, W. Palm Beach FL 33406.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a nonprofit organization of communications people founded in 1925, invites your inquiries and application for membership. Write V.W.O.A., 118 River Drive — Bay Ridge, Annapolis, MD 21403.

CINCINNATI ARRL '82 — Hamilton County ARPSC invites all hams to participate in the second annual Ohio State Convention. Two full days of amateur activities; forums, meetings, exhibits, flea market, and more! This ALL INDOORS activity will take place on Saturday and Sunday, February 27 & 28. For further information contact Cincinnati ARRL '82, Committee for Amateur Radio, P.O. Box 46311, Cincinnati, OH 45246. Dealer and exhibitor inquiries invited. Registration $4, Flea Market $3.

PLAYBOY Club — Plan ahead now to attend the ARRL Hudson Division Convention October 30-31, 1982, at the Playboy Club, Great Gorge, McAfee, NJ. For info send s.a.s.e. to HARC, Box 528, Englewood, NJ 07631.

INDIANA: South Bend Swap & Shop January 3, 1982 at Century Center downtown on U.S. 33 Oneway North between St. Joseph Bank Building and river. Half acre on carpeted floor. Industrial history museum in same building. Four land highways to door from all directions. Talk-in: 52-52 & area Repeaters.

1982 SAROC Annual Prestige Convention, April 1-2-3-4, Aladdin Hotel. If you did not Advance Register for 80-81 SAROC send QSL card with s.a.s.e. for details. POB 14217, Las Vegas, NV 89114.

HAVE an interesting item you think would make a good Stray? Submit it to ARRL Hq. by the 10th of the second month preceding desired publication. If photos are included, use good quality, black-and-white ones. Above all, the material should be of interest to most *QST* readers!

ILLINOIS: Wheaton Community Radio Amateurs Hamfest will be held February 7, 1982 at Arlington Park Race Track Expo Center, Arlington Heights, IL Free flea market tables and expanded floor space. Large commercial area including the new "computer" section. For commercial info call WB9TTE at 312-766-1684; for general info call WB9PWM at 312-629-1427. Clear paved parking. Awards. Tickets $3. at entrance, $2.50 in advance. Send s.a.s.e. to WCRA, P.O. Box QSL, Wheaton, IL 60187. Talk-in on 146.01/61 and 146.94. Doors open 8 A.M. Be there! KA9KDC.

OVER THE river and thru the woods . . . everyone is coming to the Wheaton Community Radio Amateurs Hamfest. Date: February 7, 1982 Place: Arlington Park Race Track Expo Center, Arlington Heights, IL. Tickets: $3. at door $2. advanced (send s.a.s.e. to W.C.R.A., P.O. Box QSL, Wheaton, IL 60187) Commercial info: WB9TTE 312-766-1684. General info: WB9PWM 312-629-1427. Reserved flea market tables available. Clear paved parking!!! Awards!! Fun! Talk-in 146.94 MHz and 146.01/61.

SEE WORLD'S Fair while attending 1982 Knoxville Hamfest and ARRL Delta Division Convention, Memorial Day Weekend (May 22-23). DX, computer, and technical forums; air-conditioned exhibit area; and large indoor/outdoor flea market make this Tennessee's largest hamfest. More information? (Dealers, tickets, reservations) N4BAQ, 5833 Clinton Hwy., Suite 203, Knoxville, TN 37912.

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TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill NY 12198.

DELUXE QSLs, Samples 25c. Petty, W2HAZ, P. O. Box 5237, Trenton NJ 08638.

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General

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NEED: Books or diagrams for U.S. war surplus equipment: Power supply-modulator MD-145/URC7/298; Transmitter T298/URC7/298 and Receiver R413/URC7/298. Will agree to pay for these. Marcel Casenguay, VE8YH (VE2AMJ) Wx station Emw Canada, Clyde River, NWT, Canada XØA ØEØ.

TELETYPEWRITER parts, manuals, gears, tools, supplies. Toroids. S.a.s.e. list. Typetronics, Box 8873, Ft. Lauderdale FL 33310. Buy unused parts, cash or trade.

SERVICE by W9YKA. Professionnal grade lab, FCC 1st class license. Amateur and industrial ssb-fm equipment. Repairs, calibration, modifications, consultation. Reasonable rates. Write or call Robert J. Orwin, Communications Engineer, P. O. Box 1032, La Grange Park, IL 60525. 312-352-2333.

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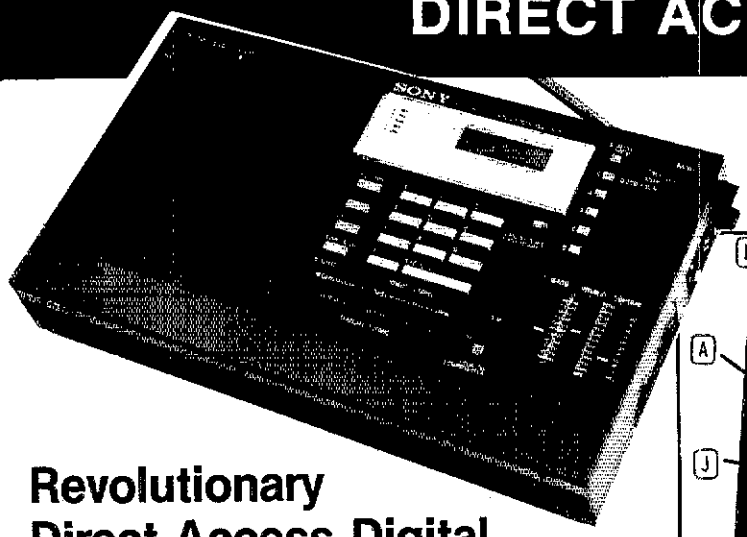

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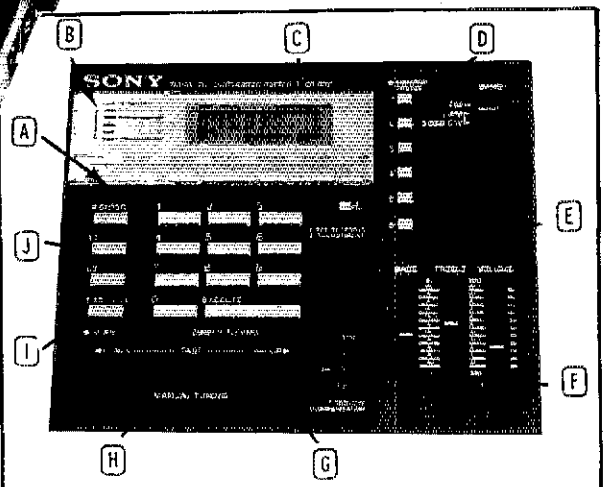

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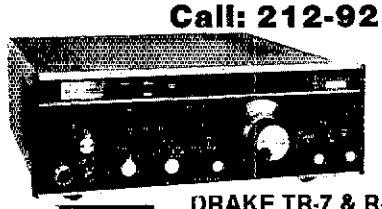

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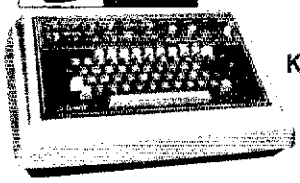

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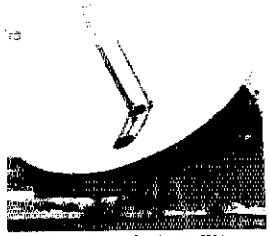

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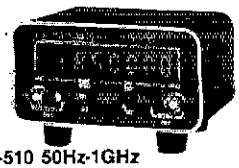

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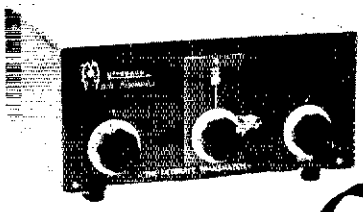
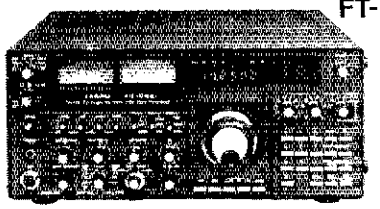
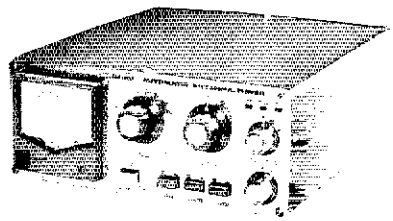


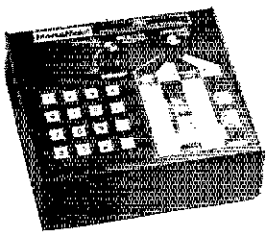
MURCH Model UT2000B



FT-101ZD MARK III, FT-480R, FT-707, FT-720RU, FT-720RVH, FT-902DM, YR-901-CW/RTTY



DAIWA CNA-1001



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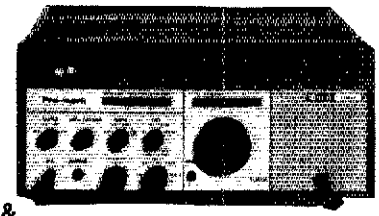
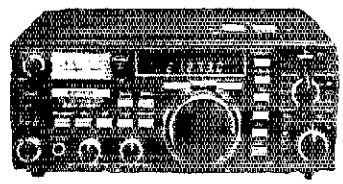
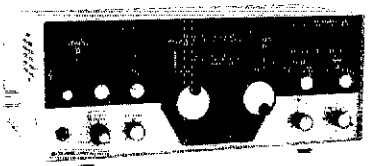


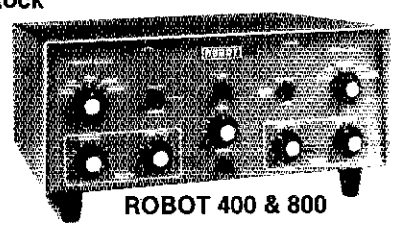
ROCKWELL/COLLINS
KWM-380



ICOM IC-720A, IC-730
IC-25A, IC-251A, IC-2KL, IC-451A



ASTRO 103 150A & 100 MXA
DIPLOMAT 150



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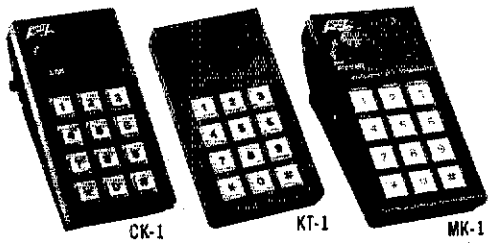

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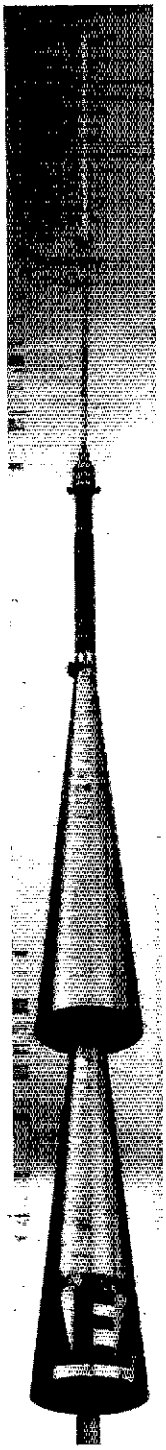

AEA MBA-RO Basic CW/ASCII/Baudot Reader. Reads and displays up to 99 wpm CW copy, 60-67-75-100 Baudot & ASCII at 110 baud (hand typed, 300 baud). 32 character flourescent display shows up to 5 words at one time. 12vdc.

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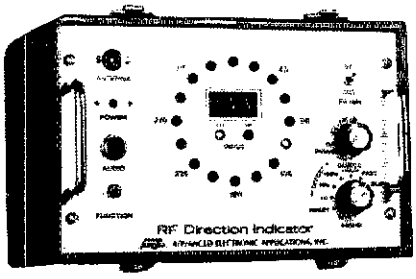

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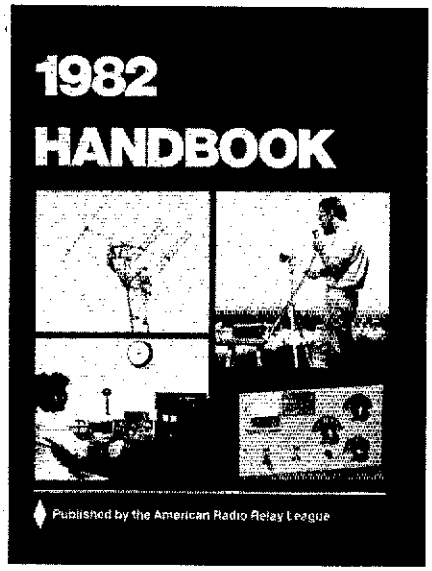

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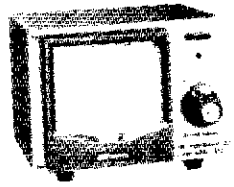

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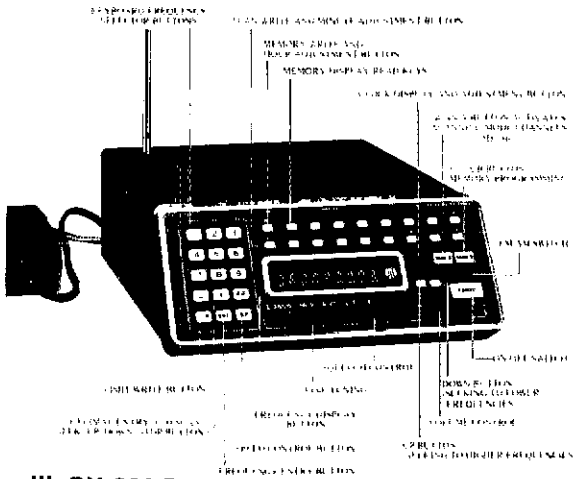

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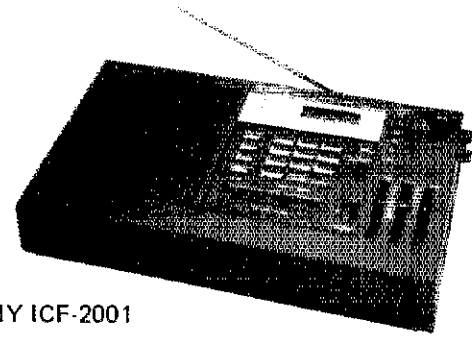

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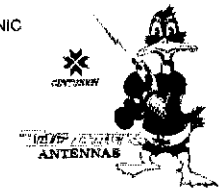

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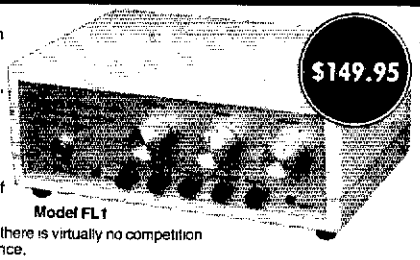

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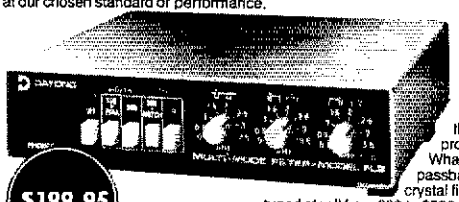

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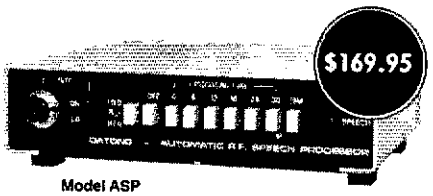

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Model ASP

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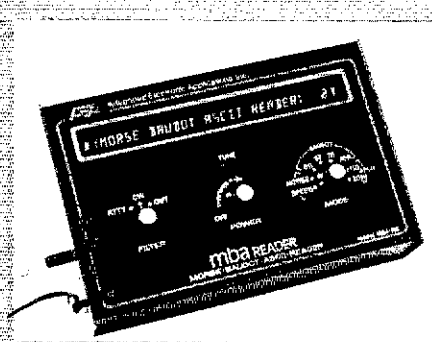

What does MBA mean? It stands for Morse-Baudot and ASCII. **What does the MBA Reader do?** The RO model (reader only) uses a 32 character alphanumeric vacuum fluorescent display and takes cw or tty audio from a receiver or tape recorder and visually presents it on the display.

The copy moves from right to left across the screen, much like the Times Square reader board. **Is the AEA model MBA Reader different from other readers?** It certainly is! It is the first to give the user 32 characters of copy (without a CRT), up to five words at one time. It can copy cw up to 99 wpm and Baudot at 60-67-75 and 100 wpm. Speeds in the ASCII mode are 110 and hand typed 300 baud. The expanded display allows easy copy even during high speed reception.

The AEA model MBA has an exclusive automatic speed tracking feature. If you are copying a signal at 3-5 wpm and tune to a new signal at 90 wpm, the MBA catches the increased speed without loss of copy.

The MBA Reader allows a visual display of your fist and improves your code proficiency. It is compact in size, and has an easily read vacuum fluorescent display.

The Reader operates from an external 12 VDC source. This allows for portable/mobile or fixed operation.

Check the AEA model MBA Reader at your favorite dealer and see all the features in this new equipment. If your dealer cannot supply you, contact
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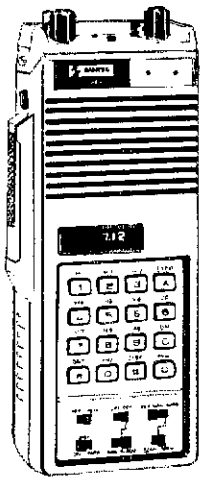

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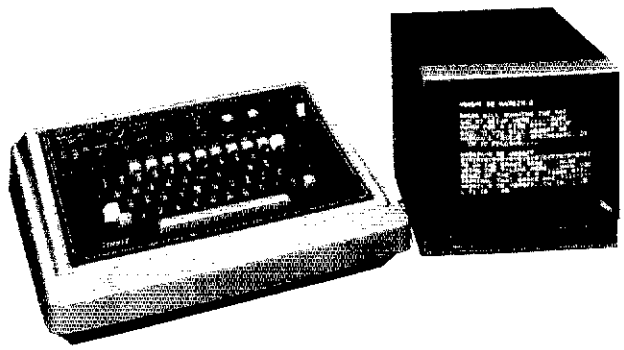

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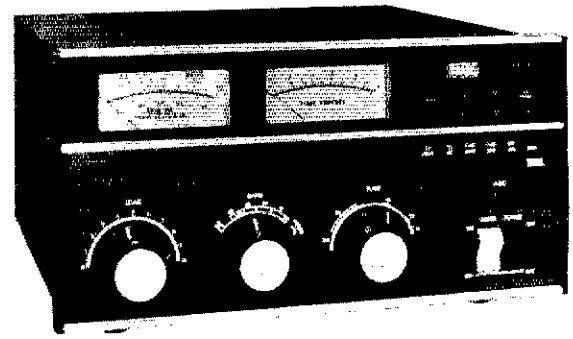

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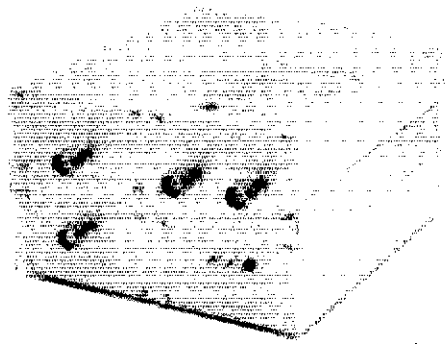

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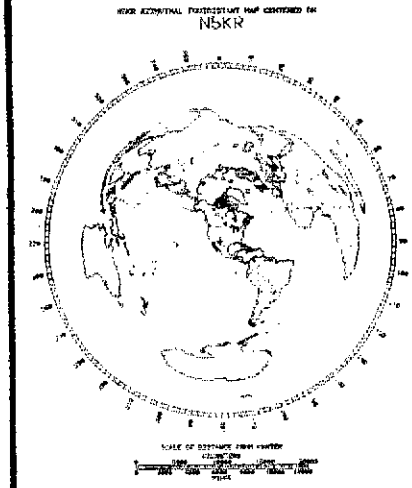

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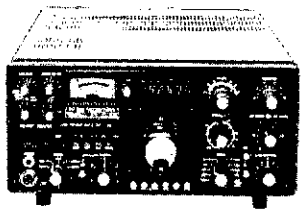

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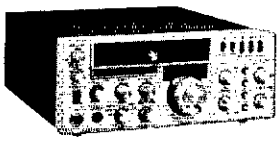

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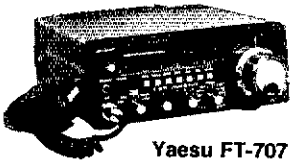

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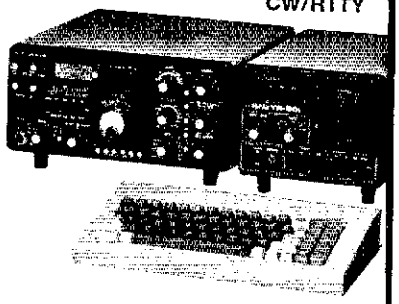

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CLEGG FM-28 w/T T encoder, manual & cables. Drake AC-10 ps Ringo Ranger Ant. Larsen Kulrod Mobil Ant. $300. Drake TR-3 w/mobil & fix ps, Hustler ant. Mic, cables & manuals all in mint cond. Will ship, you pay. $300. 5415 No. 57 Ave., Omaha, NE 68104 KØOQL.

ASTRO 103, PSU-6A sp/ps, c.w. filter, Shure 444, complete service manual. Immaculate condition, used very little. $975, 203-281-6038. K1YLV.

SELL: Dentron Jr. Monitor antenna tuner, mint! $50. MFJ Logarithmic Speech Processor, also mint $40. Stan WB2MJQ, Box 490, Chester NY 10918. 914-783-4988.

COLLINS 75A-4 (S.N.5561) with 2 filters & manual. $350 or B/O plus shipping. Ed Schmults, W2VNA, 4282 Mass Ave. N.W., Wash. DC 20016. 202-362-6113.

ICOM '720A, PS-15, cw and am filters mint $1299. Walt, K8CV, 313-549-1846.

WANTED: 117C p.s. or equivalent. WD5GZN, 713-693-6321.

BUY-SELL-TRADE. SEnd $1. for catalog. Give name address and call letters. Complete stock of major brands new and reconditoned Amateur Radio equipment. Call for best deals. We buy Collins, Drake, Swan, etc. Associated Radio Communications 8012 Conser, Overland Park, KS 66204 913-381-5900.

HEATHKIT SB-102 with deluxe AC P/S speaker $275. HQ-145 $150. Simpson Genescope Mod. 480 TV-FM generator $25. Precision RF Generator Mod E200C 90 kc to 240 MHz $25. Hickok sweep generator Mod. 610A $20. U-pay shipping K2LGO 516-878-1419.

CRYSTALS: Build something! Experiment. FT-243's General, Novice, any frequency .01%, 7000-8700 Kilocycles $1.75, minimum five $1.50 each. 3500-4000 $2.95, five $2.50. 160M $3.45, five $2.95. Sockets 50c. Air-mail 25c per crystal. Crystals Since 1933 WØLPS. Stamp for 1700-60000 kilocycles listings-circuits. C-W Crystals, Marshfield, MO 65706.

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PT-2 Xcvr preamp $ 59 v
ATLAS
350XL Xcvr $389 m
DMK-XL Mobile mt 29 w
210X 80-10m Xcvr 359 f
215X/NB 160-15m Xcvr 369 m
AR-200 Power supply 59 w
110L Xcvr (RX+TX) 199 mwf
PS-110H 12v ps 69 mw
CLEGG/SQUIRES-SANDERS
22"er FM series 25 $ 69 m
FM-27B 2m FM Xcvr 129 e
CLIFFORD INDUSTRIES
XXRD 20A power supply $ 69 m
XXXR 30A power supply 79 m
COLLINS
75S-1 Ham Rcvr $275 mwf
75S-3 Ham Rcvr 375 mf
75S-3B Ham Rcvr 450 wfc
F455FA08 800 Hz filter 99 w
F455FA31 3.1 KHz filter 79 w
51S-1 Rcvr (round) 1195 w
32S-1 Transmitter 275 wf
32S-3 Transmitter 425 mlc
32S-3 Xmtr (round) 475 m
516F-1 KWM-1 DC ps 69 mf
KWM-2 Xcvr 499 wv
KWM-2 Xcvr (round) 599 m
516F-2 AC supply 175 mfvc
MP-1 DC supply 49 m
CC-3 Carrying case 49 m
351D-2 KWM-2 mount 45 f
DENTRON
160-10AT Tuner $ 89 m
Jr. Monitor Tuner 39 w
MT-2000A Tuner 119 m
MT-3000A Tuner 269 ve
DTR-3KA Ant tuner 279 e
GLA-1000 Linear 249 v
DTR-1200L Linear 349 e
AF-1A Rcv audio proc 69 wf
DRAKE
SW-4A SWL Rcvr $169 f
SSR-1 SW Rcvr 189 m
2B Ham Rcvr 149 ce
2C Ham Rcvr 169 mw
2BS Speaker 9 c
R-4 Ham Rcvr 229 mfe
R-4A Ham Rcvr 249 mwf
R-4B Ham Rcvr 289 wfc
R-4C Ham Rcvr 389 fcve
MS-4 Speaker 19 fve
4NB Blanker 49 wve
FL-250 Filter 35 e
FL-500 Filter 35 w
FL-1500 Filter 35 w
R-7/DR-7 Rcvr 999 w
SC-2 2m rcv conv 69 w
CPS-1 Conv ps 19 w
T-4X Transmitter 249 mwfc
T-4XC Transmitter 399 wfcve
TR-4 Xcvr 299 mwe
TR-4/NB Xcvr 349 mv
TR-4C Xcvr 379 mwfc
TR-4CW/RIT Xcvr 489 w
34PNB Blanker 49 mw
TR-6/NB 6m Xcvr 499 e
AC-3 AC supply 59 mwfc
AC-4 AC supply 89 all
NB-7 Blanker 59 w
WH-7 Wattmeter 89 m
TR-22C 2m FM Xcvr 119 m
UV-3 (3-band) Xcvr 699 c
UMK-3 Remote tnk kit 39 w
ETO
Vomax Processor $129 m
ENCOMM
HT-1200 2m FM HT $239 mc
HALLICRAFTERS
HA-1 Keyer $ 49 m
HEATHKIT
SB-300 Ham Rcvr $169 c
SB-301 Ham Rcvr 199 e
GD-125 Q-mult 15 w
IRL
FSK-500 Demodulator $169 m
ICOM
IC-701 Xcvr $599 mwf
IC-701PS Power supply 99 mwf
EX-1 701 Y-interface 29 w
IC-720 Xcvr 895 w
PS-15 Power supply 99 w
IC-551 6m SSB Xcvr 319 m
IC-551/FM 6m Xcvr 399 m
IC-22S 2m FM Xcvr 149 mc
IC-211 2m FM Xcvr 399 m
IC-245 2m FM Xcvr 239 m
IC-245/SSB 2mFM/SSB 289 m
IC-280 2m FM Xcvr 239 wf
IC-202S 2m SSB port 189 m
IC-215/BC-20 2m FM 149 m
IC-30A 440 FM Xcvr 199 m
RM-2 Programmer 69 f
KDK
2015 2m FM/TTP mic $199 v
KLM
661 6m Xcvr $349 m
4-80BL 2m 4/80w amp 129 w
10-70B 2m 10/70w 89 e
15-80BL 2m 15/80w 119 w
KENWOOD
R-599 Ham Rcvr $199 fv
R-599A Ham Rcvr 229 m
R-599D Ham Rcvr 249 m
T-599D Transmitter 299 mtv
DS-900 DC supply 69 f
TS-120S Xcvr 479 w
VFO-120 Remote VFO 119 e
TS-180S/DFC Xcvr 599 m
AT-180 Ant tuner 129 m
TS-520 Xcvr 449 f
TS-520/CW filter 479 c
TS-520S Xcvr 449 wv
VFO-520 Remote VFO 99 c
TS-820/DG-1 digital 579 m
TS-820S/CW filter 629 m
SP-820 Speaker 49 f
VFO-240 Remote VFO 119 m
AT-230 Tuner 139 e
SP-230 Speaker 39 e
R-300 SW Rcvr 189 fc
TV-506 6m Xvtr 179 f
TS-700A 2m Xcvr 399 f
TR-7400A 2m FM Xcvr 239 wf
TR-7400A/CES scanner 269 m
TR-7500 2m FM Xcvr 149 f
TR-7625 2m FM/TTP mic 269 c
RM-76 Microprocessor 59 wc
TR-7800 2m FM Xcvr 279 we
TR-2200A 2m FM port 129 mw
TR-8300 440 FM Xcvr 199 v
KPS-7 Power supply 59 m
PS-20 Power supply 49 w
MFJ
721 SSB/CW filter $ 29 v
752B SSB/CW filter 59 f
MICROLOG
AVR-1 Demodulator $349 m
AVR-2 Demod/split screen 499 m
MIDLAND
13-510 2m FM Xcvr $229 f
13-510A 2m FM Xcvr 249 mc
J.W. MILLER (DAIWA)
RF-440 Speech proc $ 89 mw
NATIONAL HRO-60 Coils
AC hs 21-21.5 MHz $ 29 m
B gc 7-14.4/hs 14-14.4 29 m
E gc 900-2050 KHz 29 m
F gc 480-960 KHz 29 m
PALOMAR ENGINEERS
RX noise bridge $ 39 w
PANASONIC
RF-2900 SW Rcvr $169 f
RF-4900 SW Rcvr 279 f
ROBOT
61 Viewfinder $175 m
70 Monitor 175 w
80 Camera 179 w
SANYO
VM-4209 9" monitor $139 m
SILTRONIX
700R Custom Rcvr $199 m
SWAN/CUBIC
22 VFO adaptor $ 19 c
P-1215 AC supply 49 m
PSU-5 Supply 129 mw
Astro 103 Xcvr 959 m
PSU-6 AC supply 139 mf
PSU-6A AC supply 139 m
300B Cygnet Xcvr 329 mf
350 Xcvr 199 mv
350C Xcvr 289 m
500 Xcvr 249 f
500C Xcvr 269 w
HF-700S Xcvr 329 fc
117X Basic AC ps 59 mf
117XC AC ps/spkr 99 mfv
230XC 110/220 ps 95 m
PSU-3A Supply 119 fc
14-117 DC supply 99 f
14X DC module 49 m
14C DC module 49 m
410 VFO 69 c
410C VFO 89 c
600T Transmitter 249 f
VX-4 VOX 35 m
250 6m Xcvr 179 mf
250C 6m Xcvr 249 m
ST-2 Tuner 149 m
WM-1500 Wattmeter 45 m
WM-200A PEP meter 59 m
WM-6200 VHF meter 39 m
TPL
702 2m 10/70w amp $ 69 m
1202 2m 10/100w amp 89 m
3A13AD Nonreg ps 39 m
TEMPO
2020 Xcvr $499 mc
Tempo One Xcvr 289 mv
AC One AC supply 89 mv
S-1 2m FM HT 169 we
TEN-TEC
200 Novice VFO $ 49 m
505 Argonaut Xcvr 199 mv
206 Calibrator 19 m
208 Ext CW filter 19 m
570 Century/22 Xcvr 239 cv
276 Calibrator 19 f
540 Xcvr 399 mfe
540 w/CW filt/NB 419 m
544 Digital Xcvr 449 m
252G AC supply 99 w
262G PS/VOX/spkr 99 mwte
252M AC supply 99 m
262M AC supply 99 f
207 Ammeter 9 m
240 160m conv 79 m
241 Xtal osc 19 m
242 External VFO 99 w
244 Digital display 99 m
247 Ant tuner 49 mw
Omni-A series B Xcvr 589 f
Omni-D series B Xcvr 689 mfc
252M/O AC supply 99 mf
234 Speech processor 99 m
214 Microphone 25 m
285 CW filter 35 m
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YAESU
FLDX-400 Transmitter $249 e
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FT-101ZD Xcvr 599 mw
FT-301S 20w Xcvr 329 m
FT-301 DIG Xcvr 469 m
FP-301 AC supply 99 m
LL-301 Phone patch 35 m
FT-7 20w Xcvr 329 mc
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FT-901DE Xcvr 649 f
FR-901 RTTY/CW read 499 m
SP-107P Spkr/patch 49 v
FV-107 Remote VFO 99 ve
FT-707 Xcvr 549 m
FP-707 Power supply 115 m
FTV-650 6m Xvtr 149 c
FT-221 2m Xcvr 349 c
FT-221R 2m Xcvr 379 m
YC-221 Digital display 69 m
FT-225RD 2m Xcvr 499 e
FT-720RVH 2m FM Xcvr 279 m
CPU-2500R 2m FM Xcvr 249 c
CPU-2500RK 2m FM 289 m
FT-207R 2m FM HT 189 we
YC-355D Counter 99 m

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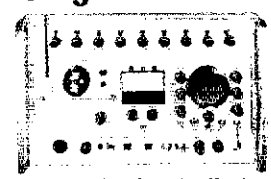

Communications Generator/Monitors We have a FM-10C w/RFM-10, FIM-3 & ODM-1 and a FM-10CS w/RFM-10A, FIM-3 & ODM-1. These units were used in our shops only and are in very good condition (never used for mobile or portable applications). **Call Paul Sirbinski at the Milwaukee Store for prices or to make an offer.**

(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) Sometimes used gear is serviced after we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment special, Closeouts, etc.

Closed for Inventory December 31st. 1981

ETO Linears - Inventory Reduction Sale

Boss ordered too many! - Limited Quantity at Sale Prices

Model	Reg.	Sale
Alpha 76A Linear amplifier (2-8874s)	1865.00	1465
Alpha 76A/lightweight xfmr (ltd qty/Milw)		1595
Alpha 76PA Linear amplifier (3-8874s)	2195.00	1695
Alpha 76CA As 76PA, w/lightweight xfmr	2395.00	1895
Alpha 374A No tune up linear (2-8874s)	2395.00	1895
Alpha 78 No tune, CW break-in (3-8874s)	3185.00	2485
Alpha 77DX CW break-in linear (8877) ..	A4945.00	3895

Location	Local Phone	Nationwide	In-State
m = Milwaukee, WI 53216; 4828 W. Fond du Lac Ave ...	(414) 442-4200	1-800-558-0411	1-800-242-5195
w = Wickliffe, OH 44092; 28940 Euclid Ave.....	(216) 585-7388	1-800-321-3594	1-800-362-0290
f = Orlando, FL 32803; 621 Commonwealth Ave	(305) 894-3238	1-800-327-1917	1-800-432-9424
c = Clearwater, FL 33515; 1898 Drew Street.....	(813) 461-4267		
v = Las Vegas, NV 89106; 1072 N. Rancho Drive.....	(702) 647-3114	1-800-634-6227	
e = Chicago, IL Erickson Communications (Associate)...	(312) 631-5181	1-800-621-5802	

MasterCard
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COLLINS KWM-2 516F2 winged, Waters Rejection Tuning $475 K5CJ. 305-967-5997.

FOR SALE: Swan 250C, TV-2C xvrtr, 117XC supply, excellent condition, WA7FSI, 208-774-3510.

SWAN 350D transceiver mint with VX-4 VOX $355. K7BHE, 215 East 7060 South, Midvale, UT 84047 801-255-1249.

WANTED: Clegg AB-144 Allbander Converter, also large ferrite rods. WB6WML, 102 Wreden, Fairfax, CA 94930. 415-456-5906.

SELL: ROBOT 70 $220, Regency K500 $200, RS Pro-3 receiver $50, Heathkit HW8 $90, Murch UT2000A $120, Heathkit keyer $45. WA1WED.

SWAN 250 6m ssb xcvr, 117XC p/s, VX-1 VOX, 500Kc xtal calibrator, Mint $200. prepaid shipping. WA4AEB."

WANT: 75A-4, 75A-1 with speaker, Viking Ranger II, must be clean units in good working condition. Sam Thompson, W6HDU, 1031 San Antonio Avenue, Alameda, CA 94501. 415-441-3247 until 6 P.M.

MICROLOG programmable keyboard. Random code, RTTY, ASCII, AFSK, brag tape; mint, new $550, sell $300, N7NF/2 609-652-8541.

SELL Century 21 Model 570 2 extra crystals $195. WB3EWB, 717-359-4508.

FOR SALE: Kenwood TS-520 with built in ac/dc supplies, Electro-Voice 600E microphone mint condition $450. Bill Hauser, WA4ZSB, 2435 Alexander Dr. Titusville, FL 32780 305-267-4089.

50%(OFF GE and Sylvania tubes. Send s.a.s.e. to Holman's P.O. Box 88, Parksville, KY 40464.

ATTN: collectors: Hallicratters SR500 and DC power supply for sale. Good condition. Last on air in June — frequent change in living conditions necessitates sale. B.O. over $350. Dr. David A. Silver, Hussey Farm Rd., Nantucket, MA 02554. 617-257-6298 after 5 P.M.

YAESU FT-707 and FP-707 speaker/ac supply. Mint $750. Heathkit HW-8, mint $110. Ten-Tec Model 234 speech processor, Mint $100. W3RWW 3922 MacAlpine Rd., Ellicott City, MD 21043. 301-465-2439.

WANTED: Collins KW-1 in clean original condition. Sam Thompson, W6HDU, 1133 Polk Street, San Francisco, CA 94109. 415-441-3247 until 8:00 P.M.

KENWOOD TS-520, cw filter, manuals, mint. $495. Tempo VHF-One synthesized 2 meter xcvr, manuals, excellent $195. 3367 Hewlett Avenue, Merrick, NY 11566 KE2N 516-221-3535.

WANTED: Collins 312B-4 station control. KD4LT 912-883-8375 evenings.

SELL: Absolutely mint TS180S/DFC, PS 30 supply, SP180, both cw and sideband filters, MC50 mic, manuals. Free shipping. $894 W8RV, Charles Ziegler, 23 Public Square, Medina, OH 44256. 216-722-4521.

COLLINS 32S3, $395. 516F2 $165. F455J05 (75A4) filter, $95. 30L1 $595, Schaaf, 807 Sunbeam, Oneida, WI 54155, 1-414-434-2938.

ICOM 701, p.s., EX-1, mobile and desk mics. $725. Will ship, K9BIL, 6379 Stockwell Dr., Marshall, WI 53559. 608-655-4367.

QUALITY Stainless "U" bolts; threaded, washer, hardware fasteners! Some guying accessories! Lists 25c. Walt, W8BLR, 29716 Briarbank Southfield, Mich. 48034.

HEATHKIT SB-104A, SB-644A, SP-604, PS-1144, 400Hz filter, noise blanker, mobile mount, spare PA board, Complete station — manuals. $550. Kenwood TR-2400 with battery beater — like new. $275. AIØG, 612-432-2033.

KV4 DXpeditions — Waterisle, pictures, information, reservations: WA2UZA, Island Vacations, RD4, Princeton NJ 08540. 201-329-6309.

REPLACE rusted antenna bolts with stainless steel. Small quantities, free catalog. Elwick, Dept. 433, 239 Woods Lane, Somerdale, NJ 08083.

DRAKE TR-22 with 18 watt solid state amp. and power supply $150. W2FAY 14 Capt Wing Rd., E. Sandwich, MA 02537.

COLLINS Wanted — mint SC-101 Station Control, SC-301 Antenna Console, 35 C-2 low pass, KWM-1 and spkr console, 180-S1, microphones, old catalogs, plse help tnx. WB6GIY Gary Goldsmith 213-431-8931 714-752-7855.

HAMMARLUND, PRO-310, receiver, 0.5-35 MHz, 10V, calibrator, excellent condition, re-tubed, re-aligned, $125, W6ULZ, 213-347-3058.

YAESU FT-401 500W ssb/cw, fan, cw filter. Top condition $325. Century-21, mint $225. W9OYL, 214-983-2473.

PALOMAR Noise Bridge, perfect, $45. Ham Radio 3/74 thru 3/75; CQ 8/72, 10/72 thru 1/73 and 3/73 thru 11/73; HRH complete 3/77 thru 12/80; 25c ea. KA1FYG, 1540 Highhawk, E. Greenwich, RI 02818.

DRAKE C-line, T-4XC, R-4C with NB and 0.5 and 1.5 filters, AC4, MS-4, MN-2000 matcher. Little use, $900. Carl W9JCB, 608-767-3610 evenings.

YAESU FC-107 antenna tuner; one year, mint, full featured. $85 postpaid and insured. WB3GUS, Steve Mottola, 662 7th Ave. Swarthmore, PA 19081.

FOR SALE: Yaesu FT 901-DM, Mike, extra 1.800 kHz-SSB filter, 500 Hz-cw filter. Yaesu FV-901 DM ext. VFO, SP-901-P speaker patch. Perfect working condition, spotless, used very little. Original boxes and operating manuals. Will ship, u pay UPS. Sell complete assembly only. Cash price $1175. Paul W. Kindy, W8UKT, phone 813-634-6198.

MAIL order business for sale. Contact W4OLI at Gotham Antennas 813-584-8489.

DENTRON GLA1000B linear, 1200 watts PEP, 80-10 M, $200 plus shipping. N6EFQ, 860 Hillcrest Drive, Pomona, CA 91768, 714-622-3248.

THE AMP-LETTER is starting soon. Why buy an overpriced amp when you can build your own? The Amp-Letter is devoted to the design, construction, and operation of Amateur amplifiers. Let the Amp-Letter and its readers help you find parts and information. For details write: Andy Thornburg, KB9WL, RR2 Box 39A, Thompsonville, IL 62890.

GOLD, silver! Find valuable coins, rings, jewelry with powerful metal detectors. Free catalog. Chuck's Amateur Radio Supply, P. O. Box 44, Madera, CA 93639 209-674-1435.

QRP operators — never used linear amplifier operates 10 to 80 MHz 5 watts in, gets between 250 and 300 out. Hank Samplin WB7AWA, 4432 W. Larkspur, Glendale AZ 85304, 602-938-8643.

SWAN 250 six meters $250. National NCX-5 ht $275. Will ship. KAØCIR, Bill 612-432-0438.

TS-530S, VFO-240, 500 kHz cw filter, $750. MFJ484 memory keyer, Bencher paddle, $110. MFJ949 Versa-Tuner, $85. All for $895. Equipment you'll be proud to own. Bud, N7BFN, 206-939-6899.

MINT, Heathkit DC, AC, Semiconductor devices, electronics circuits courses with assembled ET-3100 trainer, $200. shipped UPS insured, KA5JYE, 5704 Beaumont Place, El Paso, TX 79912.

HAL DS-3000 KSR Video Display Terminal w/instruction manuals & tech manuals. Estate sale. Equipment like new. Inquiries to 120 N. Cortez Prescott, AZ 86301, W. Dunn.

FACTORY overrun — coaxial cable — 1 million Ft. In stock, 96% shielding mill ends: RG-6A/U double shield $140/M', RG-11/U $145/M', RG-8X (Mini 8) $105/M', RG-58/U $68/M', RG-174/U mil spec $58/M', RG-213/U mil spec $289/M', Nemal Electronics, 5685 SW 80th Street, Miami, FL 33143 305-661-5534.

WANTED: Collins 30L1, 40 meter beam state prices and condition. WN3KER 1363 Hillcrest Ct., Johnstown, PA 15905 814-288-5293 eves.

YEAR-END specials: Icom IC2AT, accessories, Icom 730. Hustler HF & VHF antennas. Call or write for quote. ZZZ Electronics P.O. Box 306 Loganville, GA 30249. Phone 404-466-2595. Ask for Johnny W4WKP or Robin KA4LPT.

KENWOOD TS-520 in excellent condition. New final tubes. Will ship in original carton with manual, cables for 12V operation, etc. $375. Not available after December. W9ATS 901 Allen, Greenville, IL 62246. 618-664-3411.

COLLINS S-line round emblem, 1973 vintage 75S3B 32S3, 312B4, 516F2 DX Engineering processor, $1200. KWS1 Serial 1250, 75A4, serial 4410 with 800, 3.1, 6kc filters. SC101 station control includes 312A2 control speaker unit, 68Y-1 antenna selector 534A-1 cable harness and wiring duct, 35G2 low pass filter, will not sell SC101 separately, $1500,. shipping extra. Paul, W1CKA, 203-582-4885.

SELL: Drake R-4A mint $265, 14 extra crystals $5 each or $35 all. Jones Micromatch model 711-N $35. Measurements 560FM Sig. Gen. with pad, working but needs new switch, $135. Motorola SLN-1005A Deviation Meter with tone generator and charger $350. Heath W-3AM Williamson amplifier $50 or best offer. WA8EPM, 365 Kensington, Rocky River, OH 44116. 216-333-0076 after 6 P.M.

DRAKE L-7 linear, MN2000 tuner, both absolute mint condition WBØEYT, Bernie Chap, 2811 Bonnie St., Omaha, NE 68147 402-731-0128.

AZDEN PCS-300 and PCS-3000, KDK, AOR, Larsen, Kemtron. LCC is your VHF-FM headquarters. We'll beat any price in this issue. LCC Engineering, 116 Country Farms Rd., Box 140, Marlton NJ 08053. 609-983-8844 daily 6 P.M. midnight.

FOR SALE: SB303/SB600 $265. SB401 $250. SB610 $95. All mint. W2UGM, 66 Columbus Ave., Colster NJ 07624. 201-767-0123.

BOONTON RF Admittance Bridge 33 B/1 used/factory calibrated, warranteed. Capacitance: 0-150 p.f. (30 p.f. @ 100 MHz) Resolution: 0.02 p.f. ± 3% basic accuracy Conductance: 0-5 ms. Resolution 0.1 μS or better; basic accuracy ± 2%. Factory price $8000; ours $4800. Also Siemen's teletypes $200-$800. All items unclaimed freight. Legal title guaranteed. Commodities Recovery Corp., 212-924-9555.

DENTRON MT2000A tuner, like new, $150; RCA model ARG12 radio with tubes, speaker, $500; Atwater-Kent, (1925) #7570 model $20, complete, $400; Stewart-Warner (1927) Model #385, complete, $350. all table models, plus shipping, Cliff De Jong, WØPUR, 1248 C Ave East, Oskaloosa IA 52577.

SEACOAST Ldt. Great Abaco, Bahamas. 5 miles from Marsh Harbour International Airport. Trade for Alpha linear or ? Details s.a.s.e. N4BAK.

1982 CALLBOOKS DX/$14.05, US/$14.95 coax RG-213 28cft, RG-8'U 95% braid foam 24cft, RG-8X 95% braid foam 17cft. Our prices can't be beaten. MC/VISA send for flyer. Lacue Communications, 102 Village St. Johnstown, PA 15902 Open M-Sa 10-6, Tues and Fri till 9 Phone 814-536-5500.

SANTEC HT-1200, mint, leather case, speaker mike, mobile charger, ac charger, manual, etc. $275.; Mirage B-23 2-meter linear, new unused, $65. WA1ZVQ. 203-522-5457 eves.

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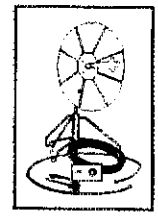

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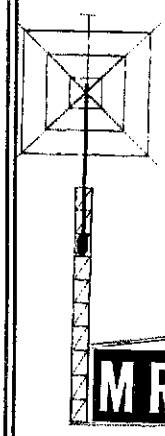

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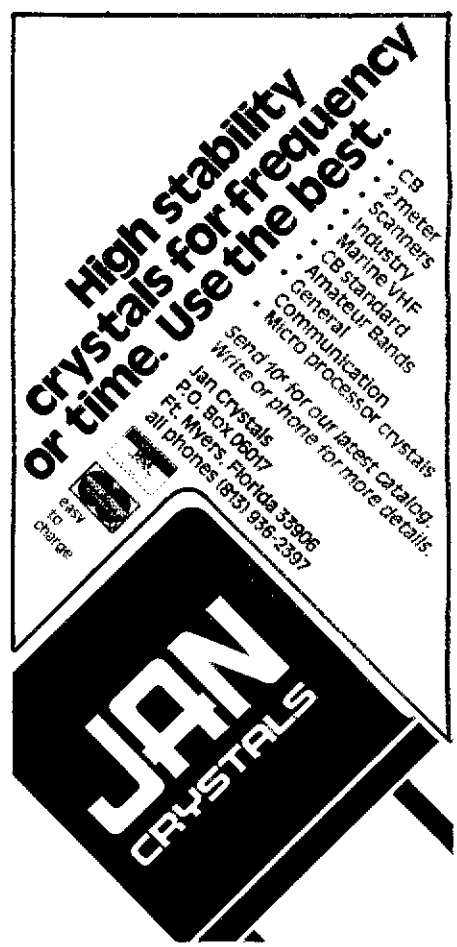

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WANTED: Mackay Marine 3021A or 3020 A receiver. Call collect 505-256-1162 or 505-881-5333. Don Davis, *WB5IUZ, 2929 Quincy St.*, N.E. Albuquerque, NM, 87110.

CANADIAN Marconi CH150, H.F. ssb transceiver 2-24 MHz built-in 150 watt PA-Max. 20 simplex ch. or 10 semi duplex (comes w/8 xtals). Factory price $4500 + options; ours $2900. General Electric MVP Personal Portable PY66YCWCHX with nicad & antenna VHF150-174 MHz 5 watt 3 ch. Factory price $1300; ours $800. Hewlett-Packard power supply 6260B 0-10 V, 0-100 A, 230 V ± 10%, 57-63 MHz. Factory price $1475; ours $850. Above units are new. Commodities Recovery Corp. 212-924-9555.

YAESU FT-227R synthesized, 2m, mobil. $165. Heath HW-7/PS $60. B&K 2050 hf rf signal generator (never used) $80. E&L MMD-1 microprocessor trainer based on 6080A. Bug books 5&6, $150. Jerry Fidel, 1365 W. 7th St., Brooklyn, NY 11204 212-331-0028.

TELREX TB6EM, 6 ele. tribander. 5 kW rated. 26' boom, b/w 59". Needs new Balun. Good condx. Pick up only. $250. Write K1LKI, 26 Sheridan St., Brockton, MA 02402.

KENWOOD TS820S w 250 Hz cw filter, bought as backup rig, little used. $675. David Sumner, K1ZZ, 661 Strong Rd., South Windsor, CT 06074. 203-289-2687.

HEATH HW-32, HP-23, SB-600, manuals. $150. WD5GCZ, 804-358-0887, evenings.

TWO Meter FM sale: Icom IC-230 transceiver, excellent condition. $125. WB2JXY, A.C. 212-224-2448.

ATWATER-KENT speaker, type E, $30; two Pace FM handhelds, 6 channel with charger, tone pad, $50 ea.; Johnson 540 VHF handheld, $20; QST, 180 issues 1952 to 1976, 25 cents each; Ken Larabee, W9EVR, 11216 Rich, Bloomington, MN 55437, 612-884-9511.

ASCII Terminal: GE Terminet 300. Many extras. $680. W3HII, 301-589-4171, 2002 Rookwood Rd., Silver Spring, MD 20910.

The VHF SHOP — prepaid specials 220 MHz package: MMT220-28 transverter + Lunar's 1.3M10-80P amplifier/preamp $435. Mast mount Your preamp with our new VHFMMKIT $155. Free UPS on KLM's Long Boomer KLM144-148-13LBA with balun $77.95 or, KLM-JV2 vertical $29.95. See our November Ham-ad for additional specials on: Lunar, Microwave Modules, KLM, Tama, and Astron. Call (after 6:00 P.M., weekends anytime) K3MKZ, Box 349, RD #4, Mountaintop, PA 18707. 717-868-6565 Send two stamps for catalog. MC/VISA.

1982 CALLBOOKS US $19, DX $18, both $32. Six or more any mix $15 ea UPSpd. Avatar Co. (W9JVF) 1147 N. Emerson Indianapolis, IN 46219.

SELLING: Hallicrafters: SX-101A, HT-37, $240; Heathkit: HW-100, HP-23A, $250; HW-2036, Micoder, $195, [G-62 colorbar, $55.; HD-1 distortion, $35; Gonset: GSB-100, GSB-101 linear, $390; National: NCX-500, ps, $245; NCX-3, $145; Johnson: kW Matchbox $120; Eico: 460 scope $75, WB2JDC, 212-423-4483.

VHF/UHF equipment: 890-960 MHz repeater; 144 MHz Lunar amp; Drake TR-6; TC-6/2, SC-6/2; Icom 502; etc; s.a.s.e. WA8OGS, 6381 Mullen Rd., Cincinnati, OH 45239.

10 METER ssb/am Cobra 148GTL, covers 28.540 to 28.980 and 29.160 to 29.600. $260 shipping paid. WB5OHH Robert Partain, P.O. Box 12023 Houston TX 77017. 713-644-9892.

CWFINALS! You've used the best to study for your theory exam, now use the best for the FCC Code Test. FCC-style QSOs in a graduated speed format. $5.95 with text and sample test! CWFINALS, 3623 Forest Dr. N.E., Bremerton, WA 98310.

WANTED: Two-way service test gear. Need signal generator and mod. monitor. Please state your price, what you have, what freq. range, condition, etc. WA4MIT, OK in C.B. 205-339-9677.

YAESU 2m FT-207R ht like new; factory carton; $195 shipping included. General coverage receiver Radio Shack DX-300 (digital); like new; carton; accessories; $190 shipping included. B + K 6-digit frequency counter; 100Hz to 30 MHz range; portable; $45 shipping included. KA4AIY, 8217 Holly Berry CT., Raleigh, NC 27609.

DRAKE vhf wanted: TR-6 transceiver, SC-2, SC-6 converters, CC-1 console w/ SCC-1, CPS-1, also TC-2, TC-6 transmitting converters. Contact K2AWA, P. O. Box 568 Boro Hall, Jamaica, NY 11424. Phone (AC) 212-224-2448.

TV ZOOM lens: Fujinon, 6:1, f 1.8, 17.5 - 105 mm, 1 inch "C" mount, color or black and white, brand new, from Hitachi GP 5A color TV camera. Several available at $160. Bank check or M.O. Ed Woodbridge, K6CPF, 3304 Silver Oak Lane, Vista, CA 92083. 714-727-3322 6-9 PM PST.

SELL Tri-X LM-354 tower w/Towtec winch $1,100., TH6 DXX $100. Tailtwister $135, TR7400A $250. Heath phone patch $35, 10 watt 2 mtr amp. $30. Henry 3kA $1300, K5CVI, 713-351-8888.

35ASR Teletype for sale, excellent condition, $175. AB1I, Granby, Conn. 203-653-6373.

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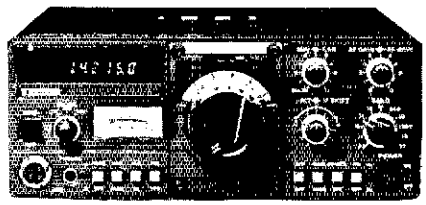

TS-130S 200w PEP 8-band digital Xcvr	$759.95
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PS-20 4.5A power supply for TS-130V	77.95
DFC-230 Digital frequency controller	289.95
SP-40 Compact mobile speaker	25.95
SP-120 External speaker	41.00
VFO-230 Digital remote VFO	309.95
VFO-120 Analog remote VFO	164.95
YK-88C/YK-88CW 500 Hz CW filter	62.95
YK-88CN 270 Hz CW filter	62.95
YK-88SN 1.8 KHz SSB filter	62.95
AT-130 8-band antenna tuner	144.95
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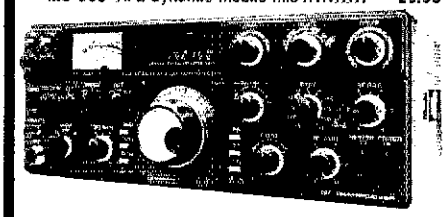
MC-30S Lo-Z dynamic mobile mic	29.95
MC-35S Hi-Z dynamic mobile mic	29.95



TS-530S 9-band digital Xcvr	$799.95
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YK-88SN 1.8 KHz SSB filter	62.95
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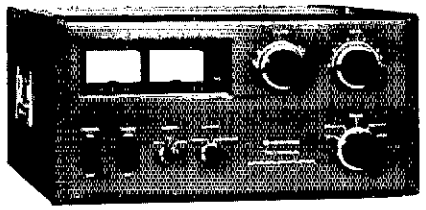

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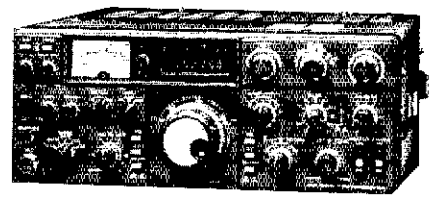
HS-6 Lightweight headphones	TBA
RD-20 50 ohm dummy load	TBA
KPS-21 21A (intermit.) DC power supply	$124.95



TS-830S 9-band digital Xcvr	$949.95
DFC-230 Digital frequency controller	289.95
SP-230 External spkr w/audio filters	71.95
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YK-88CN 270 Hz CW filter (1st IF)	62.95
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R-1000 200 KHz-30 MHz digital receiver	$499.95
SP-100 External speaker	47.95
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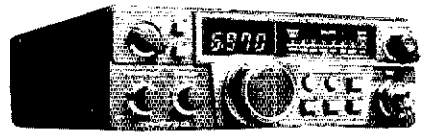
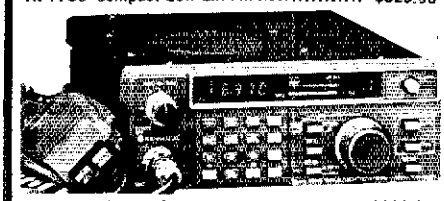
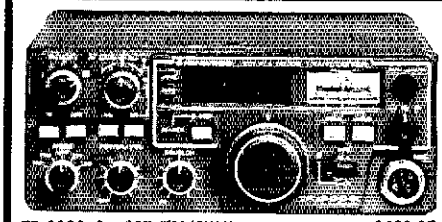


TR-7730 Compact 25w 2m FM Xcvr..... $329.95



TR-7800 25w 2m FM Xcvr	$399.95
TR-7850 40w 2m FM Xcvr	449.95
BC-1/TK-1 Memory back-up supply	20.00



TR-9000 2m SSB/FM/CW Xcvr	$499.95
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DRAKE R4C, T4XC, MS4, AC4, .5 & 1.5 filters, mint. $900. K4ZU 6013 Apex Dr., Louisville, KY 40219 502-969-4742.

HEATHKIT HW-100, power supply $300. Charles Plunk, 830 Butler, Bolivar, TN 38008 901-658-3443.

HEATH SB104A: EC with cw filter, HP1144A ps/skr, new Heath desk mike and dummy load factory aligned all manuals $575/offer 215-662-1218, Box 22, 3909 Spruce, Philadelphia, PA 19104, Graham Botha N8ADF.

WANTED: Drake FS-4 synthesizer and other C-line accessories. Rick Roderick, Rte. 2, Box 178-E, Russellville, AR 72801. 501-968-7373.

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TELREX 15M and 20M 5el duobander. Used 1 year, excellent condition. $250 including shipment. KB3PJ 302-875-4703.

50 QSTs 1930-45 $90. New RS12A 13.8 Vdc 7 amp power supply $55. Autek QF-1 $35. Kenwood YG-455C filter $75. U-ship. W7AM Box 8073 Sisters, OR 97759.

SELL new Heathkit HW-101 and PS-23 (Un-assembled) $425. Un-used Gonset G-28 50 watt 10 meter transceiver $135. KD4SDY, Carl Hines, 1309 Fikewood, Wilson, NC 27893 919-243-5388.

CAPACITORS 40ufd — 3.8 kv., tested and guaranteed $75. Heath HW-104 with cw filter, portable Ni-Cad battery, card extender, cables, manuals $375. SP600JX $100. Model 28 TTY, printer, keyboard and floor cabinet $150. I pay shipping for 1st two items Chris Wartes, K7II, 706 Harvest Rd., Bothell, WA, 98011, 206-481-8090.

KENWOOD TS-830S mint. $850 KB9SG 388 Belle Plaine Gurnee, IL 60031.

SATELLITE TV: Completed Howard/Coleman receiver $350, with metering, metal cabinet, CH-3 modulator and LNA/Mixer power supply. Complete Gillaspie diode mixer in Bud cabinet $200. Used GaAsFETs, new PCB and chip caps for two stage NEC-21889 LNA $100. U-ship. All for $600. W7AM Box 8073 Sisters, OR 97759.

WANTED: Kenwood MC-50; DG-5; WDØBVF, RR #1, Box 212C, Willard, Missouri, 65781.

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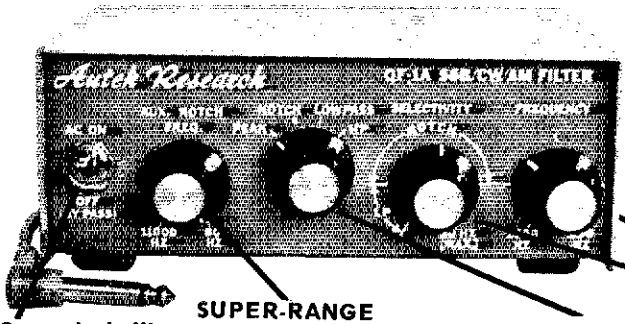


Add an Autek.

QF-1A Active Filter

For SSB & CW

PATENT PENDING

Only $73 ppd. U.S.A.

115 VAC supply built-in. Filter by-passed when off.

SUPER-RANGE Auxiliary Notch rejects 80 to 11,000 Hz! Covers signals other notches can't touch.

Four main filter modes for any QRM situation.

Continuously variable main selectivity (to an incredible 20 Hz!)

Continuously variable main frequency. (250 to 2500 Hz, all modes.)

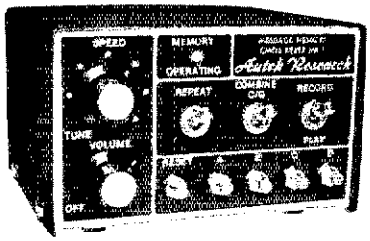
AUTEK pioneered the **ACTIVE AUDIO FILTER** way back in 1972. Today, we're still maintaining that engineering leadership. Our **QF-1A** evolved from suggestions from thousands of owners, and years of dedication to making the "ultimate" filter. No gimmicks — just something that really "works" like the ad says. You're in for a treat!

Autek filters gained their reputation by using a costly **INFINITELY VARIABLE** design. Yet, mass-production (we sell only **ONE MODEL** — the best) makes it a tremendous bargain. You're not limited by a few fixed positions. You vary selectivity 100:1, and vary frequency over the entire usable audio range. **PEAK CW** (or voice) with an incredible **20 HZ BANDWIDTH**, but also variable all the way to "flat." Imagine what the **NARROWEST CW FILTER MADE** will do to **QRM!** Reject whistles with the most flexible **NOTCH** you've heard. Wide or narrow. Depth to 70 dB. **LOWPASS** helps you cope with **SSB** hiss and splatter. Skirts exceed 80 dB. Most above features were in the popular QF-1 (See excellent review in March, 1977 **QST.**) The new "A" model is more selective, adds a **HIGHPASS** mode for **SSB**, and a great **AUXILIARY NOTCH** (35 to 60 dB) to give **TWO NOTCHES, NOTCH/PEAK, NOTCH/LOWPASS,** or **NOTCH/HIGHPASS!** If this doesn't convince you, please **ASK ON THE AIR.** Owners are our best salesmen!

Due to cost and panel-space limitations, even the latest rigs only include a fraction of the **QF-1A** features. We recommend you buy the best rig you can afford, spend $3,000 or more, then add a **QF-1A** and listen to the improvement! **WORKS WITH** Yaesu, Kenwood, Drake, Swan, Atlas, Tempo, Collins, Heath, S/1, etc., **ANY RIG!**

Hooks up in minutes. Plug into your rigs phone jack, or attach to speaker wires. Plug speaker or phones into **QF-1A** rear-panel jack. That's it! Filter supplies 1 watt to fill a room. No batteries rqd. (+12 VDC hookup possible.) 6½x5x2½". Handsome light/dark grey styling. Get yours today.!

CMOS PROGRAMMABLE KEYER MAKES CW FUN!



Calls CQ while you relax.
Also remembers name, QTH, contest exchanges.
Record anything you want in seconds!

Model MK-1 $104.50 ppd. U.S.A.

Our classic **MK-1** should make you wonder why anyone would buy an ordinary keyer, when memory costs so little! Records 4 messages. Just select "record," tap the A, B, C, or D message, and start sending at any speed! Record over old messages as easily. Playback by tapping the same button. Each message holds about 25 characters (letters, numbers). Total 100 characters. Handy repeat switch repeats message forever until reset. Very useful for **CQ's. YOU SIT BACK AND WAIT FOR A CALL!** Another switch combines two messages for 50 characters. "Memory-saver" feature standard.

This "state-of-the-art" keyer pleases beginners and CW "pros" alike. **DOT AND DASH MEMORIES. TRIGGERED CLOCK. IAMBIC. SELF COMPLETING. JAM PROOF.** 5 to 50+ **WPM. LATEST CMOS FOR LOW CURRENT.** Built-in monitor, speaker. Widely adjustable tone, volume. Perfect weighting at all times. No fiddling with an adjustment that varies with speed. **NEW: DUAL TRANSMITTER OUTPUTS** key **ANY** modern (post 1963) ham rig directly without a battery or relay, including difficult-to-key solid-state rigs. **115VAC** supply built in, or connect **9-14 VDC** to rear panel. Use with **ANY** paddle. 6x3½x5". Burned-in and tested. Sockets for IC's. Full instructions.

NOW AVAILABLE. 4096 BIT MEMORY EXPANDER (ME-1) allows 16 messages, 400 chars. & "combine" for longer messages. Plugs into memory socket of **ANY MK-1** ever made. Installs in 10 to 30 mins. Full instructions. Buy your **MK-1** now and easily add memory later if you wish!

FLASH! An MK-1 breaks its old world CW record! A single operator worked well over 4000 DX QSO's in 48 hours. And heard the weak ones through a QF-1. Second-place wasn't even close. Get the choice of champions — AUTEK!

ORDER BLANK (Or Use Separate Sheet of Paper)

Please Rush ppd. via Speedy UPS.

- ☐ QF-1A Filter at $73.00
- ☐ MK-1 Keyer at $104.50
- ☐ ME-1 Expander for MK-1 at $35 (factory installed)
- ☐ ME-1 Owner installed at $25 (save $10)

Add 4% tax in Fla. Add $3 each to Canada, Hawaii and Alaska. $3 for UPS air. Add $18 each elsewhere (shipped air).

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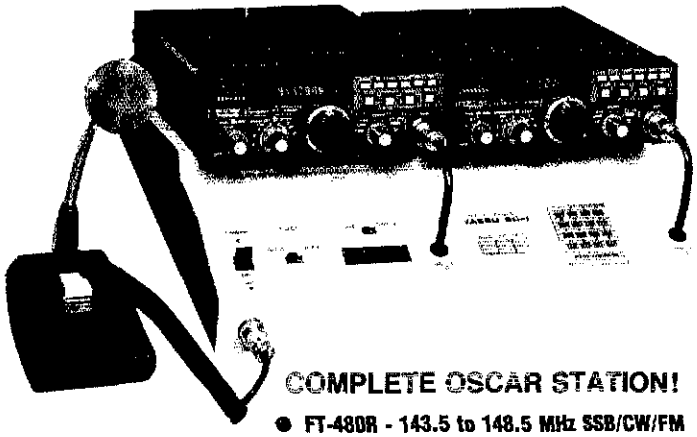
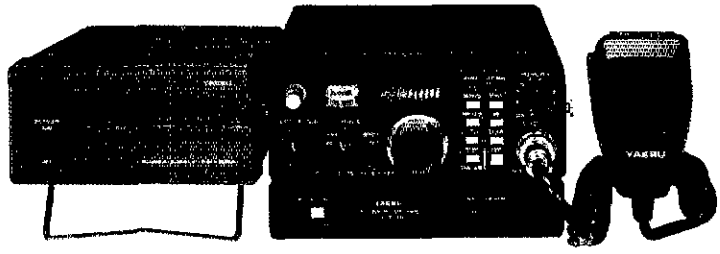
Yaesu is proud to introduce a new generation of computerized VHF and UHF equipment. With the features you have asked for and the quality you demand, these revolutionary transceivers are your passport to the newest frontiers in Amateur Radio!



COMPLETE OSCAR STATION!

- **FT-480R - 143.5 to 148.5 MHz SSB/CW/FM**
- **FT-780R - 430-440 MHz SSB/CW/FM**
- **SC-1 Station Console w/Digital Clock**

A complete microprocessor-based communication system with convenient switching of scanning and microphone controls, AC power supply, and 16 button tone pad.



FT-290R 2M MULTIMODE PORTABLE!

- **Battery Powered (NiCd C-Cells Optional)**
- **LCD Display with Night Light**
- **USB/LSB/CW/FM with 2.5W RF Output**

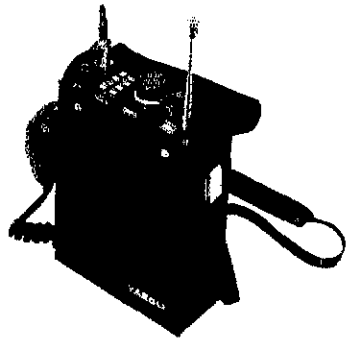
An entirely new concept in VHF operating! LCD display with full microprocessor control, 10 memories, two VFO's and multimode flexibility, all from a battery powered package. Telescoping antenna built in. Optional FL-2010 PA and FP-80A AC Supply.

FT-208R

2 METER FM HAND-HELD!

- **LCD Display with Lithium Backup Cell**
- **Selectable 5 kHz/10 kHz Scanning**
- **10 Memories with Auto/Resume Scan**
- **16 Button Tone Encoder**

Yaesu's latest thoroughbred for 2 FM is the FT-208R Hand-Held. Four digit LCD display, 10 memories, limited band scan, and priority channel make this the most versatile hand-held ever made available to the amateur fraternity.

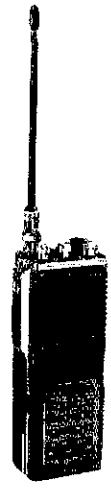


FT-690R

6M MULTIMODE PORTABLE!

- **USB/CW/AM/FM Battery Portable**
- **LCD Frequency Display with Night Light**
- **10 Memories with Lithium Backup Cell**

Catch those exciting DX openings with the new FT-690R 6 meter portable. Repeater shift (1 MHz), two scanning steps per mode, and dual VFO's for top flexibility.



FT-708R

70 CM FM HAND-HELD!

- **LCD Display with Lithium Backup Cell**
- **Selectable 25 kHz/50 kHz Scanning Steps**
- **440-450 MHz with 10 Memories**
- **Memory/Band Scan and Limited Band Scan**
- **Resume Scan**
- **16 Button Tone Encoder**

Yaesu leads the way with its pioneering microprocessor controlled 440 MHz hand-held. Priced competitively against much simpler units, the FT-708R system includes a full line of accessories, including CTCSS, NiCd chargers, and remote speaker/microphone options.

Sporting unmatched engineering and manufacturing know-how, Yaesu's technical staff is committed to pushing the state of the art. Yaesu products are backed by a nationwide dealer network and two factory service centers for your long-term service needs. So when it's time to upgrade your station equipment, join the thousands of hams that are tired of compromise – join them by investing in Yaesu!

Some accessories pictured above are extra-cost options. See your Yaesu dealer.

Price And Specifications Subject To Change Without Notice Or Obligation

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The radio.

881

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Dyna-"mite."

Photo shown is TR-7730 in 16-key autopatch UP/DOWN microphone version.

Miniaturized, 5 memories, memory/band scan

TR-7730

The TR-7730 is an incredibly compact, reasonably priced, 25-watt, 2-meter FM mobile transceiver with five memories, memory scan, automatic band scan, and other convenient operating features. The TR-7730 is available in two variations: a 16-key autopatch UP/DOWN microphone (MC-46) version, and a basic UP/DOWN microphone version.

TR-7730 FEATURES:

- **Smallest ever Kenwood mobile**
  Measures only 5-3/4 inches wide, 2 inches high, and 7-3/4 inches deep, and weighs only 3.3 pounds. Mounts even in the smallest subcompact car, and is an ideal combination with the equally compact TR-8400 synthesized 70-cm FM mobile transceiver.
- **25 watts RF output power**
  HI/LOW power switch selects 25-W or 5-W output.
- **Five memories**
  May be operated in simplex mode or repeater mode with the transmit frequency offset ±600 kHz. The fifth memory stores both receive and transmit frequency independently, to allow operation on repeaters with nonstandard splits. Memory backup terminal on rear panel.
- **Memory scan**
  Automatically locks on busy memory channel and resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **Automatic band scan**
  Scans entire band in 5-kHz or 10-kHz steps and locks on busy channel. Scan resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **Extended frequency coverage**
  Covers 143.900-148.995 MHz in switchable 5-kHz or 10-kHz steps.
- **UP/DOWN frequency control from microphone**
  Manual UP/DOWN scan of entire band in 5 kHz or 10 kHz steps is possible when using either autopatch or basic UP/DOWN microphone versions.
- **Offset switch**
  Allows VFO and four of five memory frequencies to be offset ±600 kHz for repeater access or simplex.
- **Four-digit LED frequency display**
  Indicates receive and transmit frequency.
- **S/RF bar meter and LED indicators**
  Bar meter of multicolor LEDs shows S/RF levels. Other LEDs indicate BUSY, ON AIR, and REPEATER offset.
- **Tone switch**

Optional accessories:

MC-46 16-key autopatch UP/DOWN microphone
SP-40 compact mobile speaker
KPS-7 fixed-station power supply

More information on the TR-7730 and TR-8400 is available from all authorized dealers of Trio-Kenwood Communications
1111 West Walnut Street
Compton, California 90220

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...pacesetter in amateur radio

Synthesized 70-cm FM mobile rig

TR-8400

- **Synthesized coverage of 440-450 MHz**
  Covers upper 10 MHz of 70-cm band in 25-kHz steps, with two VFOs.
- **Offset switch**
  For ±5 MHz transmit offset on both VFOs and four of five memories, as well as simplex operation. Fifth memory allows any other offset by memorizing receive and transmit frequencies independently.
- **DTMF autopatch terminal**
  On rear panel, for connecting DTMF (dual-tone multifrequency) touch pad (for accessing autopatches) or other tone-signaling device.
- **HI/LOW RF output power switch**
  Selects 10 watts or 1 watt output.
- **Virtually same size as TR-7730**
  Perfect companion for TR-7730 in a compact mobile arrangement.
- **Other features similar to TR-7730**
  Five memories, memory scan, automatic band scan (in 25-kHz steps), UP/DOWN manual scan, four-digit LED receive frequency display (also shows transmit frequency in memory 5), S/RF bar meter and LED indicators, tone switch, and same optional accessories.

Specifications and prices are subject to change without notice or obligation