QST

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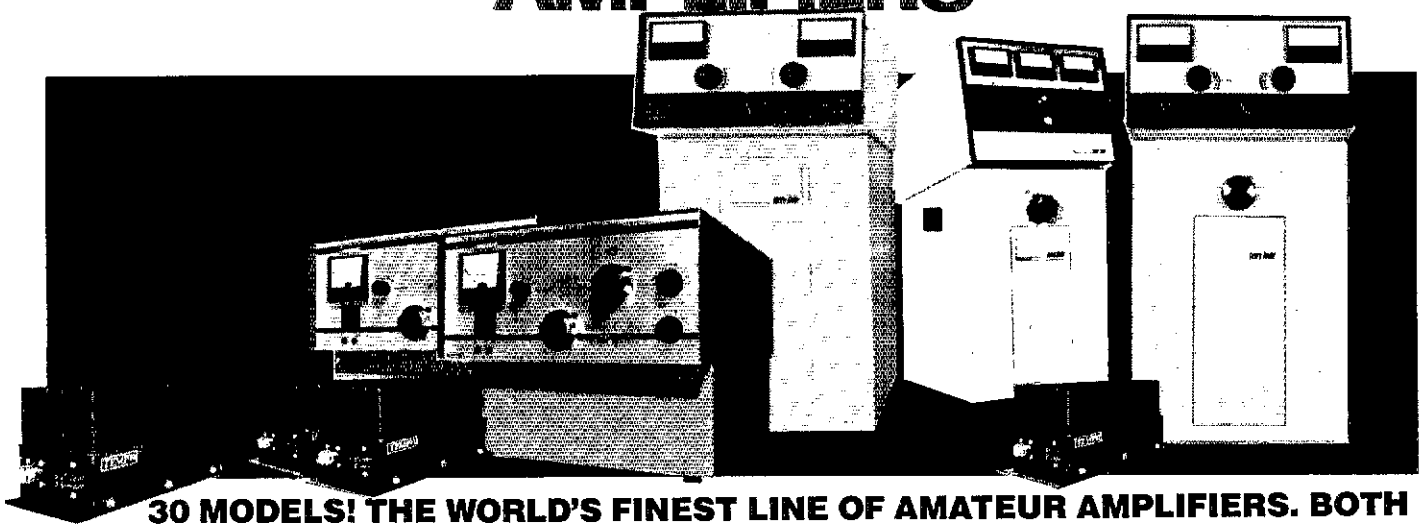
DECEMBER 1976 $1.50

Seasons Greetings!

ONLY HENRY RADIO OFFERS THE WORLD'S MOST COMPLETE LINE OF AMPLIFIERS



30 MODELS! THE WORLD'S FINEST LINE OF AMATEUR AMPLIFIERS. BOTH VACUUM TUBE AND SOLID STATE...FOR HF, VHF AND UHF...FIXED STATION AND MOBILE...LOW POWER AND HIGH POWER. NEVER BEFORE HAS ONE COMPANY MANUFACTURED SUCH A BROAD LINE OF AMATEUR AMPLIFIERS

2K-4...THE "WORKHORSE"
The 2K-4 linear amplifier offers engineering, construction and features second to none, and at a price that makes it the best amplifier value ever offered to the amateur. Constructed with a ruggedness guaranteed to provide a long life of reliable service, its heavy duty components allow it to loaf along even at full legal power. If you want to put that strong clear signal on the air that you've probably heard from other 2K users, now is the time. Operates on all amateur bands, 80 thru 10 meters Move up to the 2K-4. Floor console...$995.00

3K-A COMMERCIAL/MILITARY AMPLIFIER
A high quality linear amplifier designed for commercial and military uses. The 3K-A employs two rugged Eimac 3-500Z grounded grid triodes for superior linearity and provides a conservative three kilowatts PEP input on SSB with efficiencies in the range of 60%. This results in PEP output in excess of 2000 watts. It provides a heavy duty power supply capable of furnishing 2000 watts of continuous duty input for either RTTY or CW with 1200 watts output. 3.5-30 MHz ....$1395.

4K-ULTRA
Specifically designed for the most demanding commercial and military operation for SSB, CW, FSK or AM. Features general coverage operation from 3.0 to 30 MHz. Using the magnificent new Eimac 8877 grounded grid triodes, vacuum tune and load condensers, and a vacuum antenna relay, the 4K-ULTRA represents the last word in rugged, reliable, linear high power RF amplification. 100 watts drive delivers 4000 watts PEP input. Can be supplied modified for operation on frequencies up to about 100 MHz. ...$2950.00

TEMPO 6N2
The Tempo 6N2 brings the same high standards to the 6 meter and 2 meter bands. A pair of advanced design Eimac 8874 tubes provide 2,000 watts PEP input on SSB or 1,000 watts on FM or CW. The 6N2 is complete with self-contained solid state power supply, built-in blower and RF relative power indicator. ...$895.00

TEMPO 2002
The same fine specs and features as the 6N2, but for 2 meter operation only. ...$745.00

TEMPO 2006
Like the 2002, but for 6 meter operation. ...$795.00

TEMPO VHF/UHF AMPLIFIERS
Solid state power amplifiers for use in most land mobile applications. Increases the range, clarity, reliability and speed of two-way communications. FCC type accepted also.

Model	Drive Power	Output Power	Price	Model	Drive Power	Output Power	Price
LOW BAND VHF AMPLIFIERS (35 to 75 MHz)							
Tempo 100C30	30W	100W	$159.	Tempo 100C10	10W	100W	$149.
Tempo 100C02	2W	100W	$179.				
HIGH BAND VHF AMPLIFIERS (135 to 175 MHz)							
Tempo 130A30	30W	130W	$189.	Tempo 80A02	2W	80W	$159.
Tempo 130A10	10W	130W	$179.	Tempo 50A10	10W	50W	$ 99.
Tempo 130A02	2W	130W	$199.	Tempo 50A02	2W	50W	$119.
Tempo 80A30	30W	80W	$149.	Tempo 30A10	10W	30W	$ 69.
Tempo 80A10	10W	80W	$139.	Tempo 30A02	2W	30W	$ 89.
UHF AMPLIFIERS (400 to 512 MHz)							
Tempo 70D30	30W	70W	$210.	Tempo 40D01	1W	40W	$185.
Tempo 70D10	10W	70W	$240.	Tempo 25D02	2W	25W	$125.
Tempo 70D02	2W	70W	$270.	Tempo 10D02	2W	10W	$ 85.
Tempo 40D10	10W	40W	$145.	Tempo 10D01	1W	10W	$125.
Tempo 40D02	2W	40W	$165.	Linear UHF models also available			

TEMPO 100AL10 VHF LINEAR AMPLIFIER
Completely solid state, 144-148 MHz. Power output of 100 watts (nom.) with only 10 watts (nom.) in. Reliable and compact ...$199.00
TEMPO 100AL10/B BASE AMPLIFIER ...$349.00

please call or write for complete information.

Henry Radio

11240 W. Olympic Blvd., Los Angeles, Calif. 90064 213/477-6701
931 N. Euclid, Anaheim, Calif. 92801 714/772-9200
Butler, Missouri 64730 816/679-3127

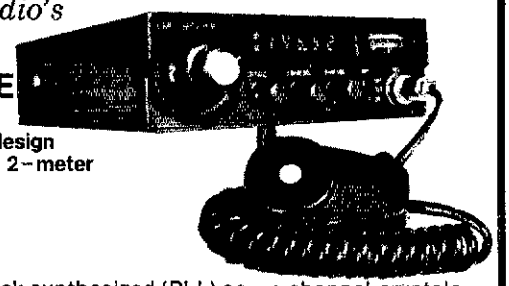
Prices subject to change without notice.

henry radio

a name that says it all

For over 40 years...dedicated to amateur radio...to offering the finest products...to dependable service.

Henry Radio's
TEMPO VHF/ONE

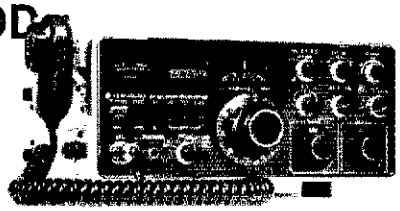


An advanced design synthesized 2-meter transceiver

Full phase lock synthesized (PLL) so o channel crystals are required • Solid-state • 5 digit LED receive frequency display • Full 2-meter band coverage (144 to 148MHz) for transmit and receive • Automatic repeater split (selectable up or down) • 2 built-in programmable channels • $495.00.

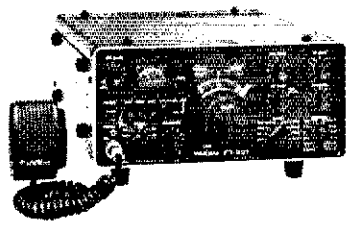
TEMPO SSB/ONE (SSB adapter for the VHF/ONE) • Selectable upper or lower sideband • Plugs directly into the VHF/ONE • Noise blanker built-in • VXO for full frequency coverage • $225.00.

KENWOOD TS-700A



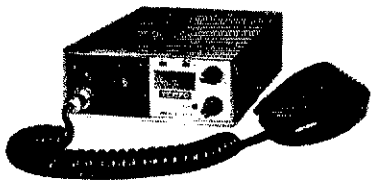
The promise of 2 meter operation...the Kenwood way. The TS-700A operates all modes: SSB (upper & lower) /FM/AM/CW and provides the dependability of solid state circuitry. Has tunable VFO and 4 MHz band coverage (144 to 148 MHz). Automatically switches transmit frequency 600 KHz for repeater operation. AC and DC capability through its built-in power supply. Outstanding frequency stability Complete with micro phone and built-in speaker..... $700.00

YAESU FT-221



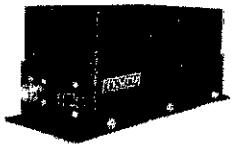
A compact, versatile transceiver designed for the active 2 meter enthusiast. Features all mode operation — SSB/FM/CW/AM — with repeater offset capability. Advanced phase lock loop circuitry, computer-type modular construction. Preset pass band tuning provides the optimun selectivity and performance needed on today's active 2 meter band. Complete 144-148 MHz coverage. Built-in AC and DC power supplies and speaker. $679.00

Henry Radio's
TEMPO CL 146A



...a VHF/FM mobile transceiver for the 2 meter amateur band. Compact, rugged and all solid state. One channel supplied plus two of your choice. 14 ł to 148 MHz. Multifrequency spread of 2 MHz. 12 channel possible. Internal speaker, dynamic mike, mounting bracket and power cord supplied. A Tempo "best buy" at $239.00.

TEMPO **VHF/UHF AMPLIFIERS**



Solid state power amplifies for use in most land mobile applications. Increase the range, clarity, reliability and speed of two way communications.

Now, meet Henry Radio...

Walt Henry
W6ZN
ANAHEIM

Ted Henry
W6UOU
LOS ANGELES

Bob Henry
WØARA
BUTLER

Plus a large staff of highly qualified sales and service personnel pledged to serve you. Henry Radio carries large stocks of all major brands. We take trade-ins, sell used equipment and offer better terms because we carry our own financing. Our reconditioned equipment carries a 15 day trial, 90 day warranty and may be traded back within 90 days for full credit toward the purchase of new equipment. Export inquiries solicited. Also, military, commercial, industrial, and scientific users...please write for information on our custom line of high power linear amplifiers and RF power generators.

Henry Radio

ICOM INTRODUCES THE REVOLUTION IN VFO TECHNOLOGY

Introducing the IC-245, 144-148 MHz FM Transceiver

The VFO Revolution goes mobile with the unique, ICOM developed LSI synthesizer with 4 digit LED readout. The **IC-245** offers the most for mobile on the market. The easy to use tuning knob moves accurately over 50 detent steps and assures excellent control as easily as steering the vehicle. With its optional adapter, the **IC-245** puts you into all mode operation on 12V DC power with a compact dash-mounted transceiver. In FM, the synthesizer command frequency is displayed in 5 KHz steps from 146 to 148 MHz, and with the side band adapter the step rate drops to 100Hz from 144 to 146 MHz. For maximum repeater flexibility, the transmit and receive frequencies are independently programable on any separation. The **IC-245** even comes equipped with a multiple pin Molex connector for remote control.

The **IC-245** is a product of the revolution in VFO design, from its new style front panel, to its excellent mechanical rigidity and Large Scale Integrated Circuitry. Your **IC-245** will give you the most for mobile.

SPECIFICATIONS

GENERAL	
Frequency Coverage	**144.00 to 148.00 MHz*
Modes	*FM (F3)*
	**SSB (A3J), CW (A1)*
Supply Voltage	*DC 13.8V±15%*
Size (mm)	*90H x 155W x 235D*
Weight (kg)	*2.7*
TRANSMITTER	
TX Output	*F3 10W*
	**A3J 10W (PEP), A1 10W*
Carrier Suppression	*40 dB or better*
Spurious Radiation	*−60 dB or less below carrier*
Maximum Frequency Deviation	*±5 KHz*
Microphone Impedance	*600 ohms*
RECEIVER:	
Sensitivity	**A3J, A1 0.5 microvolt input gives 10 dB S+N/N or better F3 0.6 microvolt or less for 20 dB quieting S+N+D/N at 1 microvolt input, 30 dB*
Squelch Threshold	*-8 dB or less (F3)*
Spurious Response	*- 60 dB or better*
SYNTHESIZER:	
Frequency Range	*144 MHz to 148 MHz*
Step Size	*5 KHz for FM*
	**100 Hz or 5 KHz for SSB*
Stability	*per C in the range of −10 to +60 C, ±0.0000145% per C*

* Valid with SSB Adapter only

THE BEGINNING OF THE ICOM VFO REVOLUTION!

VHF/UHF AMATEUR AND MARINE COMMUNICATION EQUIPMENT

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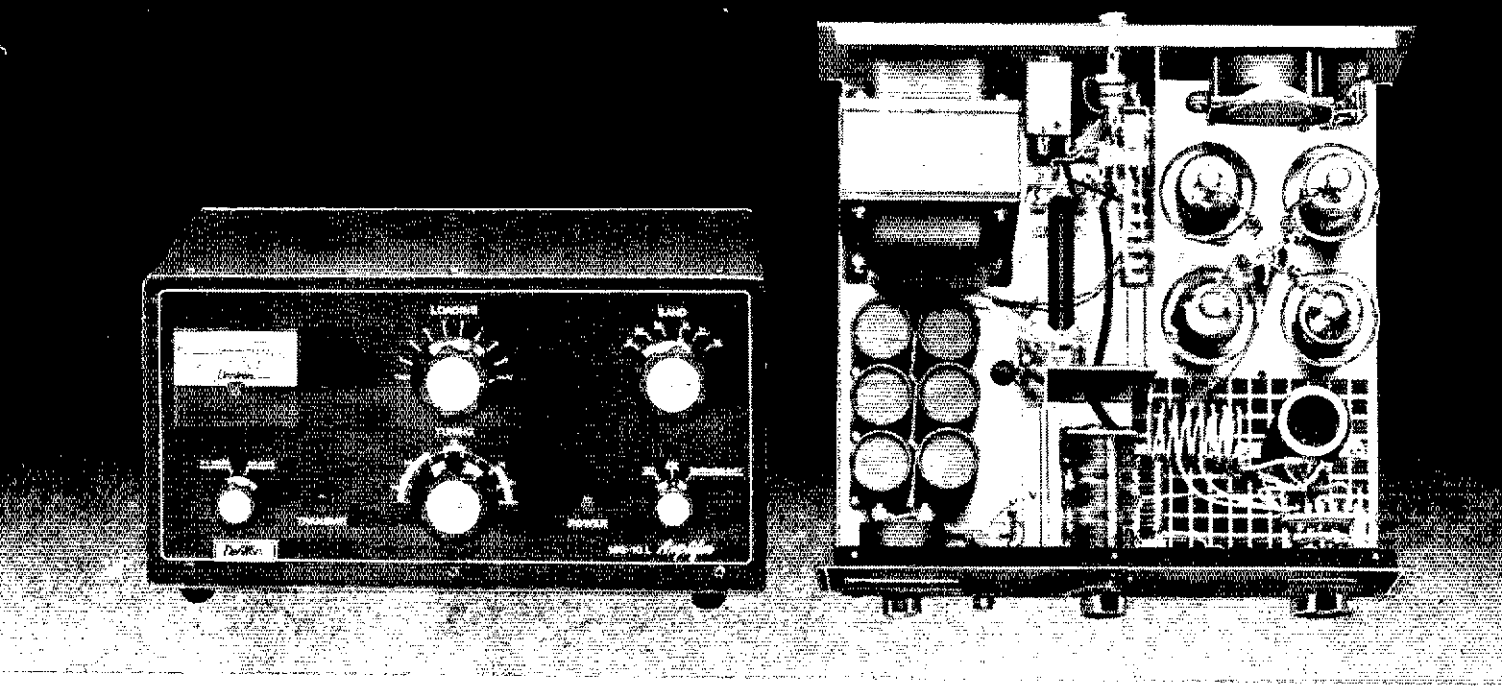
THE COVER

May you find your dreams in your stocking this Christmas morning.

Contents

Dentron Proudly Reveals the Secret of the New $574.50 Super Amp



If the amplifier you're thinking of buying doesn't deliver at least 1000 to 1200 watts output, to the antenna, you're buying the wrong amplifier.

Our New Super Amp is sweeping the country because hams have realized that the Dentron Amplifier will deliver to the antenna, (output power), what other manufacturers rate as input power.

The Super Amp runs a full 2000 watts P.E.P. input on SSB, and 1000 watts DC on CW, RTTY or SSTV 160 - 10 meters, the maximum legal power.

The Super Amp is compact, low profile, has a solid, one-piece cabinet assuring maximum TVI shielding.

The heart of our amplifier, the power supply, is a continuous duty, self-contained supply built for contest performance.

We mounted the four-572Bs, industrial workhorse tubes, in a cooling chamber featuring the on demand variable cooling system.

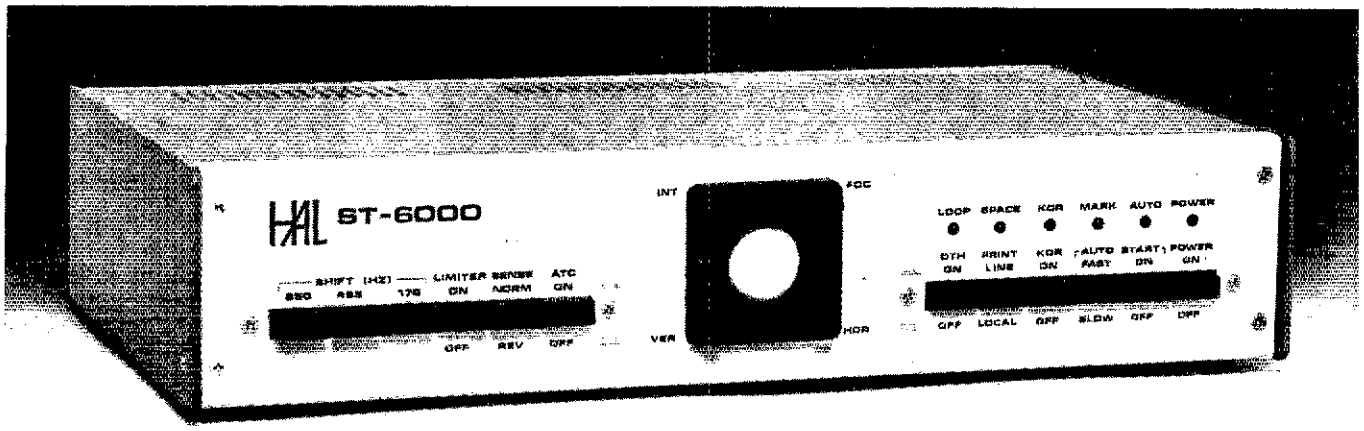
The Super Amp is now built with 572Bs because of customer preference.

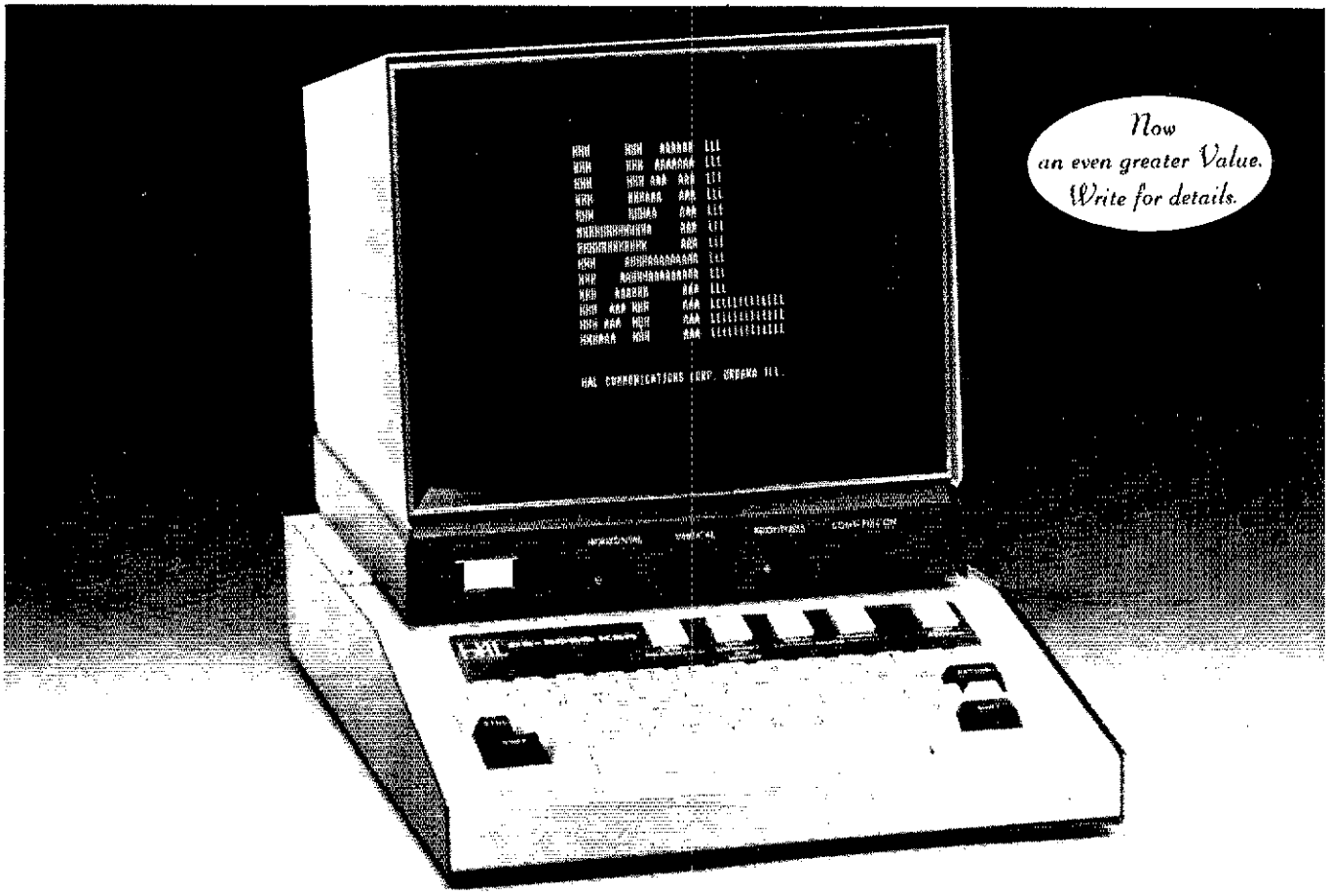
The hams at Dentron pride themselves on quality work and we fight to keep prices down. That's why the dynamic Dentron Linear Amplifier beats them all at **$574.50.**

The No-nonsense Amplifier at a No-Nonsense Price $574.50

Dentron
Radio Co., Inc.
2100 Enterprise Parkway
Twinsburg, Ohio 44087
(216)425-3173

Stay tuned for future programs.





The HAL ST-6000 demodulator /keyer and the DS-3000 and DS-4000 KSR/RO series of communications terminals are designed to give you superlative TTY performance today —and in the future. DS series terminals, for example, are re-programmable, assuring you freedom from obsolescence. Sophisticated systems all, these HAL products are attractively priced—for industry, government and serious amateur radio operators.

The HAL ST-6000 operates at standard shifts of 850, 425, and 170 Hz. The tone keyer is crystal-controlled. Loop supply is internal. Active filters allow flexibility in establishing different tone pairs. You can select AM or hard-limiting FM modes of operation to accommodate different operating conditions. An internal monitor scope (shown on model above) allows fast, accurate tuning. The ST-6000 has an outstandingly high dynamic range of operation. Data I/O can be RS-232C, MIL-188C or current loop.

The DS-3000 and DS-4000 series of KSR and RO terminals provide silent, reliable, all-electronic TTY transmission and reception, or read-only (RO) operation of different combinations of codes, including Baudot, ASCII and Morse. The powerful, programmable 8080A microprocessor is included in the circuitry to assure maximum flexibility for your present needs —and for the future. The KSR models offer you full editing capability. The video display is a convenient 16-line format, of 72 characters per line.

These are some of the highlights. The full range of features and specifications for the ST-6000 and the DS series of KSR and RO terminals is covered in comprehensive data sheets available on request. Write for them now—and tune in to the most sophisticated TTY operation you can have today...or in the future.

HAL Communications Corp., Box 365, 807 E. Green Street
Urbana, Illinois 61801 • Telephone: (217) 367-7373

ANNOUNCING AN EXCITING NEW 2-METER TRANSCEIVER FROM KENWOOD

AVAILABLE IN DECEMBER

the

TR-7400A

Featuring Kenwood's New and Unique CONTINUOUS TONE CODED SQUELCH SYSTEM

4 MHz BAND COVERAGE

25 WATT OUTPUT

FULLY SYNTHESIZED

UNIQUE SQUELCH SYSTEM
The TR-7400A may be used on your favorite repeater, no matter what type of squelch system is used. The continuous tone coded squelch (CTCS) may be used for both transmit and receive or for transmit only. Tone burst operation may also be used.

SYNTHESIZED, 800 CHANNELS
The phase-locked loop (PLL) frequency synthesizer in the TR-7400A divides the 4 MHz bandwidth into 400 channels at intervals of 10 KHz. The frequency may be offset 5 KHz higher with the push of a button, thus providing 800 discrete channels.

REPEATER OFFSET
A convenient front panel switch offsets the transmit frequency of the TR-7400A up OR down 600 KHz for standard repeater operation. This offset circuit uses digital technology to provide a highly stable offset frequency without spurious response. A dual color LED indicates the direction of offset from the displayed receive frequency.

OUTSTANDING RECEIVER PERFORMANCE
Large-sized helical resonators with high Q minimize undesirable interference from outside the 2-meter band. The large helical resonators, 2-pole 10.7 MHz monolithic crystal filter, and MOSFET front-end circuitry combine to give outstanding receiver performance.

TONE PAD CAPABILITY
A jack is provided to allow convenient connection of a tone pad to the TR-7400A.

FINAL PROTECTION CIRCUIT
The final transistor in the TR-7400A is protected from antenna impedance mismatch. Excessive reflected power reduces the amount of drive to the final transistor rather than turning off the final stage. This practical feature allows continued safe operation at a reduced power level whether the antenna system becomes opened or shorted.

Specifications TR-7400A

- Range: 144.00 MHz to 147.995 MHz
- Mode: FM
- 800 Channels: 5 KHz spaced
- Sensitivity: Better than 0.4 uV for 20 dB quieting
  Better than 1 uV for 30 dB S/N
- Squelch Sensitivity: Better than 0.25 uV
- Selectivity: 12 KHz at −6 dB down
  40 KHz at −70 dB down
- Image Rejection: Better than −70 dB
- Spurious Interference: Better than −60 dB
- Intermodulation: Better than 66 dB
- Receive System: Double conversion
- First IF: 10.7 MHz
- Second IF: 455 KHz
- Audio Output: More than 1.5 Watts (8 ohm load)
- RF Output Power: 25 Watts (High)
  5-15 Watts (Low-adjustable)
- Antenna Impedance: 50 ohms
- Frequency Deviation: ±5 KHz
- Spurious Response: Better than 60 dB
- Tone Pad Input Impedance: 600 ohms
- Tone Burst Duration: 0.5 to 1.0 sec
- CTCS Range: 88.5 Hz to 156.7 Hz
- Microphone: Dynamic with PTT switch, 500 ohms
- Voltage: 11.5 to 16.0V DC (13.8V DC nominal)
- Current Drain: Less than 1A in receive (no input signal)
- Current Drain: Less than 8A in transmit
- Polarity: Negative ground
- Temperature Range: −20 to +50 degrees C
- Dimensions: 182 mm (7-3/16") wide
  270 mm (10-5/8") deep
  74 mm (2-7/8") high
- Net Weight: Approximately 2.8 kg (6.2 lbs.)

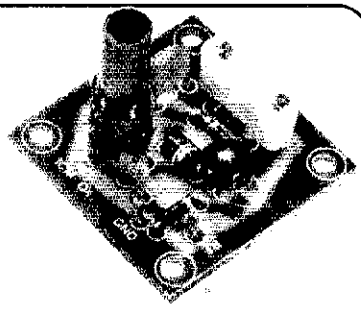
TRIO-KENWOOD COMMUNICATIONS INC.
116 EAST ALONDRA/GARDENA, CA 90248

KENWOOD
...pacesetter in amateur radio

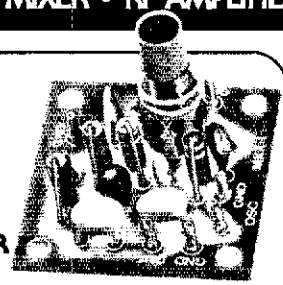
for the experimenter!

INTERNATIONAL CRYSTALS & KITS

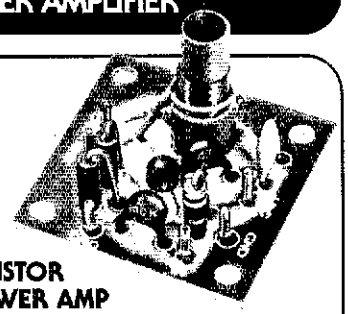
OSCILLATORS • RF MIXER • RF AMPLIFIER • POWER AMPLIFIER



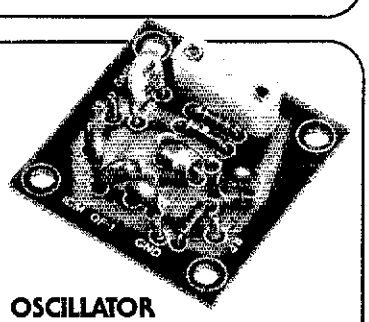
OX OSCILLATOR
Crystal controlled transistor type. 3 to 20 MHz, OX-Lo, Cat. No. 035100. 20 to 60 MHz, OX-Hi, Cat. No. 035101
Specify when ordering.
$3.95 ea.



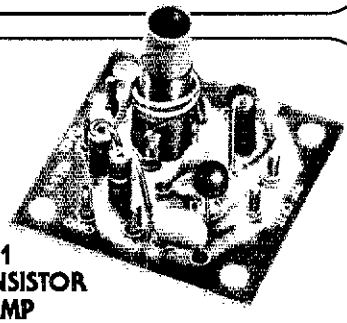
MXX-1
TRANSISTOR
RF MIXER
A single tuned circuit intended for signal conversion in the 30 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 179 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106
Specify when ordering.
$4.50 ea.



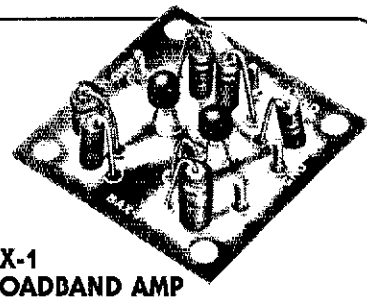
PAX-1
TRANSISTOR
RF POWER AMP
A single tuned output amplifier designed to follow the OX or OF-1 oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated. 3 to 30 MHz, Cat. No. 035104
Specify when ordering.
$4.75 ea.



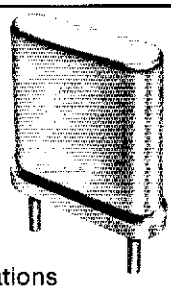
OF-1 OSCILLATOR
Resistor/capacitor circuit provides osc over a range of freq with the desired crystal. 2 to 22 MHz, OF-1 LO, Cat. No. 035108. 18 to 60 MHz, OF-1 HI, Cat. No. 035109
Specify when ordering.
$3.25 ea.



SAX-1
TRANSISTOR
RF AMP
A small signal amplifier to drive the MXX-1 Mixer. Single tuned input and link output. 3 to 20 MHz, Lo Kit, Cat. No. 035102. 20 to 170 MHz, Hi Kit, Cat. No. 035103.
Specify when ordering.
$4.50 ea.



BAX-1
BROADBAND AMP
General purpose amplifier which may be used as a tuned or untuned unit in RF and audio applications. 20 Hz to 150 MHz with 6 to 30 db gain. Cat No. 035107
Specify when ordering
$4.75 ea.



.02% Calibration Tolerance
EXPERIMENTER CRYSTALS
(HC 6/U Holder)

Cat. No.	Specifications	
031080	3 to 20 MHz — for use in OX OSC Lo *Specify when ordering*	$4.95 ea.
031081	20 to 60 MHz — For use in OX OSC Hi *Specify when ordering*	$4.95 ea.
031300	3 to 20 MHz — For use in OF-1L OSC *Specify when ordering*	$4.25 ea.
031310	20 to 60 MHz — For use in OF-1H OSC *Specify when ordering.*	$4.25 ea.

Shipping and postage (inside U.S., Canada and Mexico only) will be prepaid by International. Prices quoted for U.S., Canada and Mexico orders only. Orders for shipment to other countries will be quoted on request. Address orders to:
M/S Dept., P.O. Box 32497.
Oklahoma City, Oklahoma 73132.

ICM

International Crystal Mfg. Co., Inc.
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Oklahoma City, Oklahoma 73102

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Section Communications Managers of the ARRL

Reports Invited: All amateurs, especially League members, are invited to report station activities on the first of each month (for preceding month) direct to the SCM, the administrative ARRL official elected by members in each Section. Radio club reports are also desired by SCMs for inclusion in *QST*. ARRL Field Organization station appointments are available in areas shown to qualified League members. General or Conditional Class licensees or higher may be appointed ORS, OPS, OO and OBS. Technicians may be appointed OVS, OBS, or VHF PAM. Novices are eligible for ORS - II. SCMs desire application for the leadership posts of SEC, EC, RM and PAM where vacancies exist.

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*Official appointed to act temporarily in the absence of a regular official.

THE AMERICAN RADIO RELAY LEAGUE, INC.

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

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

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

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

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

"It Seems to Us..."

Portable/Mobile I-D: Deregulation or Dilution?

The latest in the series of FCC deregulations is effective as of November 26, 1976, and has to do with portable and mobile operating. The text and details are covered in "Happenings," but essentially it means that FCC-licensed amateurs no longer are required to give advance notice of portable operation, and when operating portable or mobile no longer have to identify as such. Also, when a permanent move is effected, the requirement to use portable identification procedure no longer exists.

In other words, the use of the slant bar on cw and indication of portable or mobile operation on phone is no longer required.

Many amateurs have protested that this will work a hardship, or at least an inconvenience, in daily operating. Instant identification of the general location of a heard station may not be something we *need*, but it most certainly is something that most of us *want*. Imagine you are a California amateur listening on 80-meter cw and you hear a strong WA3. "Oh boy," you enthuse, "the band must be open to long skip." But, as it turns out, this WA3 has just moved to California and is located not a hundred miles away. What a letdown! Or, say you are located in Texas monitoring one of their fine 2-meter repeaters and you hear a KP4 break in. Freak propagation? Nope, this particular KP4 is vacationing in Texas and is mobile down the road a piece. If the /6 or "mobile 5" had been part of the i-d, no such confusion would have existed. "So," many amateurs protest, "who needs this?"

Well, apparently FCC does, because it is engaged in a program of eliminating any rules and regulations which serve no useful purpose. For Commission purposes, the portable or mobile indicators are useless; they do not help identify the holder of the call. A simple transmission of call letters will do this adequately, enabling the Commission to know where the licensee can be reached. Where he is located at the instant of transmission is not useful information for FCC purposes.

However, it is perfectly okay, says FCC, for amateurs to continue using portable and mobile location identification procedures *if they want to.* It is the difference between a requirement and a prohibition. We are no longer required to do it, but we are not prohibited from doing it either. It's up to us. FCC, in defending its proposal, says, in part: ". . . While adoption of this proposal might ultimately cause a substantial dilution of the significance of amateur call sign areas, it would provide the Commission with important indicia of the extent to which the Service is capable of self-regulation and the extent to which our deregulatory program is likely to be successful."

Back up your eyeballs and read that quotation again. Do you agree with it? Many amateurs do not. The League does not, and said so in its comments. But whether you agree with it or not, the Commission's statement is tantamount to a challenge. We particularly like that word "indicia." It has class.

We amateurs use a lot of operating procedures not required of us in the regulations. Take CQ, for example. No FCC regulation requires that we send CQ when we want to make a contact with anyone; yet, nearly every amateur does so, because it's convenient and useful. In the future, no FCC regulation will require that we indicate the call area we are in when operating mobile or portable – but let's continue doing so, as standard amateur practice, not because it's required, but because we *want* to. We want stations hearing us to know our general location, and we want to know the general location of stations heard by us, because it makes operating sense. (Also, ARRL contests will *require* participants operating outside their home call areas to so indicate in signing.)

In this way we can give FCC "indicia" that we amateurs can operate responsibly in accordance with self-imposed procedures that we consider valuable, in addition to those imposed on us by regulation. – *W1NJM*

League Lines...

The Personal Communications Foundation, a legal research group, has been incorporated as a non-profit California corporation. It is anxious to have lawyers who are amateurs and CBers on its board to represent all ten call areas if possible. Write Jon Gallo, WA6PTM, Suite 2000, 1900 Avenue of the Stars, Los Angeles, CA 90067. More details next month.

Since July, the ARRL Intruder Watch has been receiving reports of a wideband pulse type signal that has been causing harmful interference on the amateur bands between 7 and 21 MHz. The signal can be from 30 to 300 kHz wide and can last anywhere from a few seconds to half an hour at a time. It can best be described as sounding like a "buzzsaw." Direction finding fixes indicate that the signal originates from the Soviet Union. At this writing the FCC has sent 4 telegrams to the Soviet Union and one telegram to the International Telecommunication Union asking for assistance in eliminating the interference. We hope the intruder is gone by the time you read this, but if it is not, please let us know. We will continue to press the FCC for further action until the interference is cleared up.

WWV transmissions on 2.5, 20 and 25 MHz are scheduled to be terminated February 1, 1977 to reduce operating costs. Users of the service may make comments to the National Bureau of Standards, Time and Frequency Service Section, Boulder, CO 80302.

ARRL Headquarters will be closed for the Christmas Holiday at noon on December 23, 1976 and reopen at 7:30 A-M December 27. Additionally, the office will be closed for business December 31.

What are the chances that a club's Field Day score will be incorrectly calculated by headquarters two years in a row, when the error rate is usually about three out of 1300 entries? Ask the Motorola Engineers, (W9NB/9), Schaumburg, IL, and they'll probably say the chances are 100%, since we goofed on them for the second year in a row. In Class 5A their score should have been 11,156 instead of 5953, moving them from thirteenth (!) place to second place. Make the change on page 86 of your November QST.

Although FCC no longer requires portable identification, entrants in all ARRL contests are required to sign portable when operating in a call area different than that indicated by their callsign. This is especially important in VHF work (to help spot band openings) and in working DX (to avoid multiplier confusion).

The east-coast UPS strike, which now threatens to spread westward, has thrust a load upon the U.S. Postal Service which it has been unable to handle. As a result, there are serious delays in the delivery of QST and other shipments of supplies and training materials from ARRL. We must once again ask our members to be patient during this period of degraded USPS service.

Applying for a 1X2 call come the New Year? ARRL will have the latest update of available 1X2 calls in late December. Sending the League a 24¢ S.A.S.E. marked "January 1X2 Call List" will get you yours.

Year end is a good time to organize your collection of QST's. We have and will continue to make available binders for the pre-1976 small-size QST's; these also fit other ham magazines. See page 172 for details on these and the larger QST binders.

France now has its first repeater in operation! Its 10-watt signal on European channel "R1" (145.025/145.625 MHz) has reportedly covered all of southern France. Unlike most of European machines, this one is carrier-accessed: no tones needed. Located in the Pyrenees, near Foix, it is a welcome addition to the growing interest in VHF.

Got your Amateur Radio placard? This new sign has black lettering and the ARRL logo on bright yellow stock, approximately 5 X 12". Tape it to your car window during public-safety communications activities. Display it at amateur radio exhibits and special stations. An addressed envelope larger than the placard containing 24¢ postage will bring it to you.

A Fast QSK System Using Reed Relays

Q. What do experienced cw operators have in common with burglars? A. They both use break-in. We think it's a crime that not all amateurs do. The system described in this article will help you get the message.

By Aegidius Pluess,* HB9ABH

I consider myself an experienced cw enthusiast and am a member of the High-Speed Club. I enjoy ragchewing with foreign amateurs and regret that only a small percentage of cw operators employ full break-in. The system described here provides full break-in rather simply, without adverse effect on the sensitivity or intermodulation characteristics of the receiver. It can be incorporated in existing rigs with a few changes, or in some instances, none at all. The advantages of full break-in cw are obvious. When calling DX, you hear other stations on the frequency and if the station called answers another station, you know it instantly and may stop calling him. If everyone used break-in, especially in contests, QRM would be greatly reduced and the time consumed in making a contact shortened. When ragchewing, the other fellow may break with a question or to report reception difficulties. Once you have used full break-in, you'll feel deaf without it.

Once you have used full break-in, you'll feel deaf without it.

Why Reed Relays?

Some cw operators solve the problem by using separate antennas for transmitting and receiving, but the disadvantage here is that two antennas may not have the same radiation angle and pattern. Modern manufacturers go to great lengths to rid their receivers of inter- and cross-modulation and it is difficult to install a nonlinear element (whether tube, diode or transistor) ahead of the receiver without degrading the performance, thus precluding use of an electronic T-R switch.

Good rf-handling relays are expensive and slow acting. Reed relays are capable of switching fast enough to permit the operator to hear signals even between high-speed dots, but they cannot switch large amounts of rf power. A timing circuit, to ensure the transmitter is not producing power when the relays open, allows the use of small, high-speed relays, since the contacts need only to *carry* the current, not *switch* it. The circuit described here has been in use for more than a year at this writing and no problems have arisen. Keying quality is not hard and the QSO partner may break between dots at 30 wpm if the receiver age is turned off.

If everyone used break-in . . . QRM would be greatly reduced, and the time consumed in making a contact shortened.

The author used perforated-board material for construction of the unit: Layout is not critical (see Fig. 2). Power for the circuit may be obtained from a small supply built within the receiver or transmitter. Commonly available reed relays may be used, with the exception of K5, which should have contacts capable of carrying 300-V ac, at 500

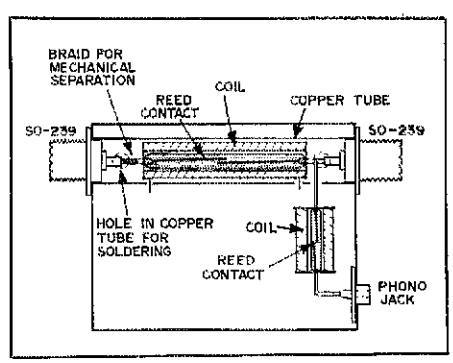

Fig. 1 — Relays K4 and K5 shown mounted in a shielded enclosure.

*Hochfeldstrasse 55, CH-3012, Berne, Switzerland

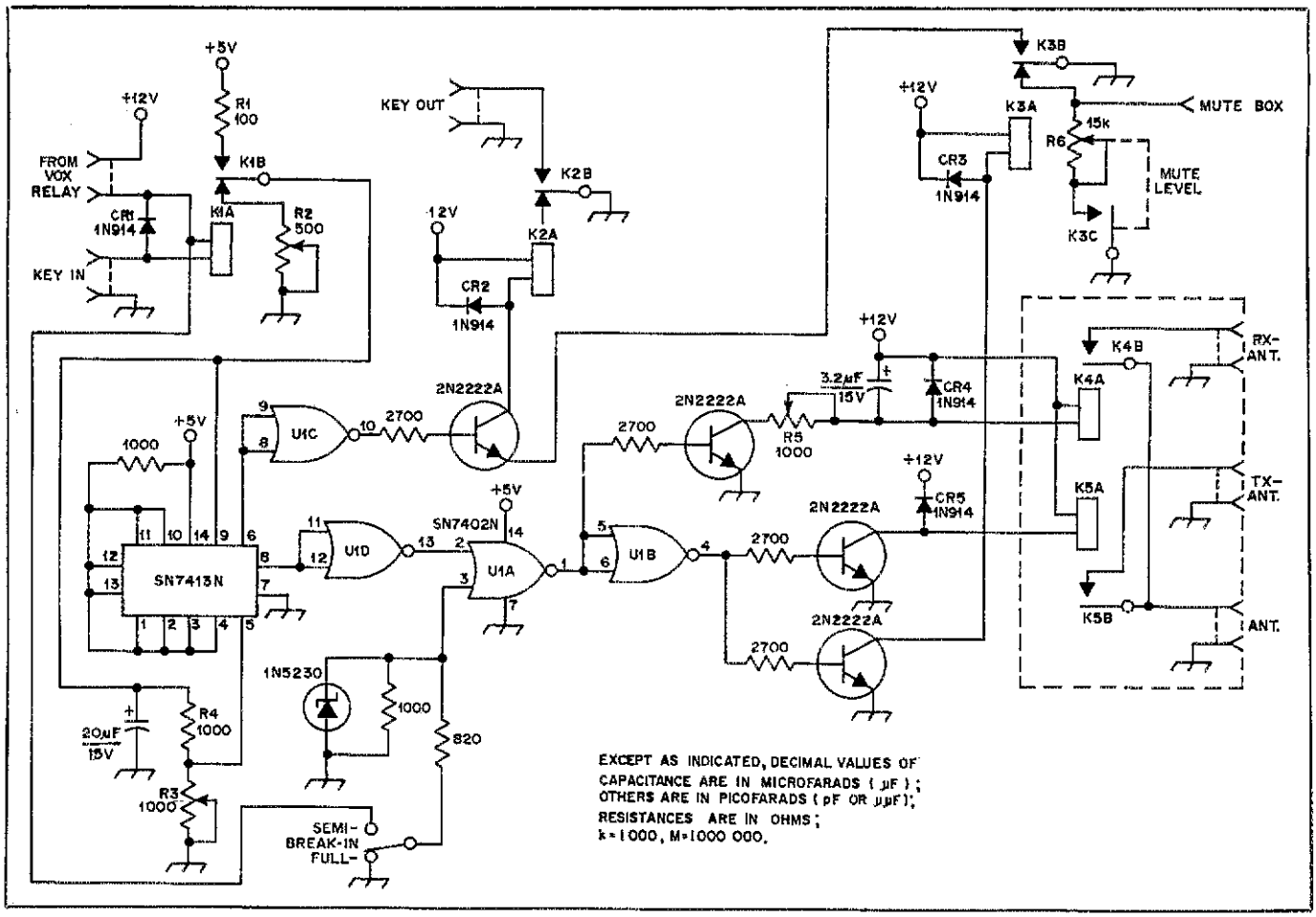

Fig. 2 — Schematic diagram of the rapid break-in system

mA. Fig. 1 shows the mounting of K4 and K5 in a shielded enclosure.

Adjustment

A dual-channel oscilloscope is useful for adjusting the circuit, although a single-channel 'scope may be used if its sweep can be triggered by the keyer. A nine-volt battery and 1000-ohm resistor should be connected in series across the KEY OUT and XMTR ANT jacks, and the voltage drop across each resistor monitored with the oscilloscope. Adjust the dot-to-space ratio of the keyer for a symmetrical waveform at the KEY OUT jack. Next, adjust R2 and R3 until the KEY OUT waveform is similar to that at the XMTR ANT jack, but is delayed 3-4 milliseconds. With the unit connected to the rig, adjust R5 for minimum clicks in the receiver. QST

[Editor's Note: The spacing between the contacts of K4 may not be sufficient to prevent damage to the receiver while transmitting. The builder may wish to use a relay having spdt contacts, allowing the receiver input to be shorted to ground when transmitting.]

Strays

□ Updates on FCC rules and regulations and the Denver convention were the focal points of special guest speaker Malcolm Keown, W5RUB, at a recent club meeting of the Twin City Hams ARC, W5EA. Shown left to right examining ARRL's latest Novice package are Ronald Kinard, WN5RKO; David Crockett, WN5RQJ; Malcolm Keown, W5RUB; Gordon B. Kenwright, WB5MHU; John C. Burdine, WB5IKT and P. G. Grambling, K5LVZ. In conjunction with its fall Novice licensing class, the Twin City club completed a 30-minute TV promotion on amateur radio. Publicity for the classes was also garnered through local newspapers.

ARRL LAB RECEIVES GIFT FT-101E

□ Deep and sincere thanks go to Duke Tamura, W6RJU, VP of Yaesu-Musen, Inc., who recently advised the ARRL staff that his company had donated an FT-101E to the Hq. staff for its use in lab work. The unit, along with the external VFO, will be used frequently during routine lab testing. The old "standby" lab exciter has been a KWM-2, which became worn out from frequent use and was retired from service a couple of years ago. The FT-101E will offer greater test flexibility than the KWM, as it includes the 160-meter band. The 500-Hz i-f filter it contains will be useful when the Hq. operators' club (W1INF) elects to put the '101E on some cw band for a noon-hour QSO! — *W1FB*

Optimum Ground Systems for Vertical Antennas

Sorting out the facts from the fallacies and old wives' tales about grounds for vertical-antenna systems often becomes difficult. What do you really need for an optimum ground system?

By John O. Stanley,* K4ERO/HC1

In recent years there has been a surge of interest in the use of vertical antennas for amateur communication, especially on the lower frequencies. This interest is not without foundation. As the frequency decreases, the low angles effective for DX work become very difficult to achieve with horizontal polarization. Vertical antennas are inherently low-angle antennas, regardless of height above ground. Early experience with compromise verticals using poor ground systems has turned many hams against verticals except as a last resort. However, recent articles in *QST* and other publications have renewed interest and broken down old prejudices. (See references at the end of this article.) Many are now trying verticals and are finding them to be excellent DX antennas, notably on 160 and 80 meters.

Perhaps more mystery and lack of information surround the ground system than any other aspect of vertical-antenna design. Many general statements such as "the more radials the better" and "lots of short radials are better than a few long ones" have served as rules of thumb to some, but many questions remain such as, "How much better?" "How long?" "How many?" "Where is the point of diminishing returns?" "What are the trade-offs?" Most of these questions boil down to one, namely, "How many radials, and how long, do I want for my antenna system?"

The purpose of this article is to provide guidelines for the potential builder of a vertical in answer to that question. Most will find the answer a pleasant one in terms of the trade-offs involved. Contrary to what some hams have feared, it is *not* necessary to copperplate your whole yard.

Probably one of the most authorita-

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K4ERO/HC1 checks the guys on his 10/15/20-meter vertical.

tive and best sources on ground-system design is the recent publication, *Radio Broadcast Ground Systems.*[1] Most of the data presented in Table 1 is taken from that source, or derived from the interpolation of data contained therein. The author of the present article accepts full responsibility for any inaccuracies resulting from the interpolations. They are believed to be essentially trustworthy, but are obviously not as accurate as the original data. Comparisons have also been made with data previously published in *QST* (see references) and no serious discrepancy discovered. The table presented here is, I believe, more readily useful to the amateur than the data contained in any of the above mentioned sources. In using the table the following factors are to be noted.

For each configuration, a number of radials and a corresponding length of radial are given. Using radials considerably longer than suggested for a given number or using a lot more radials than suggested for a given length, while not hurting performance, does not improve it significantly either, and thus represents a nonoptimum use of wire and construction time. Each suggested configuration represents an optimum relationship between length and number for a fixed amount of *total* radial wire. Obviously, the more total wire installed, the better the performance, *provided* the configuration remains optimum in terms of number versus length.

The loss figures are calculated for a radiating element of one-quarter wavelength. A very rough approximation of loss when using shorter antennas would be obtained by doubling the loss in dB each time the antenna height is halved. For longer antennas the losses decrease, approaching 2 dB for configuration A for a half-wave radiator. Other configurations are correspondingly reduced.

The loss figures in the table are for the ground wave and probably are fairly accurate for low angles of sky wave. For higher angles still useful for closer DX and other intermediate paths, the loss may be about half that shown.

The table is based on average ground conductivity. Variation of the loss values shown can be considerable, especially for the configurations using fewer radials. Those building antennas over dry, sandy or rocky ground should expect more loss. On the other hand, higher than average soil conductivity and wet soils would make the "compromise" configurations even more attractive.

It should also be remembered that the losses shown in Table 1 are significant only when transmitting. When receiving, the noise levels which are always present below 30 MHz, along with the received signal, are attenuated by ground losses, so that the signal-to-noise ratio is not affected. Hence, for reception, configuration A is just as good as F.

When antennas are combined into arrays, either of parasitic or all-driven types, mutual impedances can lower the radiation resistance of the elements, drastically increasing the effects of ground loss. Special precautions must be taken in such cases to achieve satisfactory operation. Generally speaking, a wide-spaced broadside array presents little problem, but a close-spaced endfire is to be avoided for transmission, unless the lower loss configurations are used or other precautions taken.

In cases where directivity is desirable or real estate dictates, longer, more closely spaced radials can be installed in one direction, and shorter, more widely spaced in another.

Multiband ground systems can be designed using different optimum configurations for different bands. Usually it is most convenient to start at the lowest frequency with fewer radials and add more short radials for better performance on the higher bands.

There is nothing sacred about the exact details of the configurations given, and slight changes in the number of radials and lengths will not cause problems. Thus, a "modified C" configuration could consist of 32 or 40 radials or use 0.14 or 0.16 wavelength.

It may surprise some hams to find that if less than 90 radials are contemplated, there is no need to make them a quarter-wave long. This differs rather dramatically from the case of a ground-plane antenna where *resonant* radials are installed *above* ground. For the ground plane, quarter-wave radials must be used and usually four or so are sufficient. However, for a ground-mounted antenna, four quarter-wave radials would be far from optimum. Since the radials of a ground-mounted vertical are actually on, if not in the ground, they are coupled by capacitance or conduction to the ground, and thus resonance effects are not important. Basically, the function of radials is to provide a low-loss return path for ground currents. The reason that short radials are sufficient when few are used is that at the perimeter of the circle to which the ground system extends, the few wires are so spread apart that most of the return currents are already in the ground between the wires rather than in the wires themselves. As more wires are added, the spaces between them are reduced and longer length helps to provide a path for currents still farther out. *Radio Broadcast Ground Systems* states, "Experiments show that the ground system consisting of only 15 radial wires need not be more than 0.1 wavelength long, while the system consisting of 113 radials is still effective out to 0.5 wavelength." Many graphs in the same publication confirm this statement.

[1] References appear on page 15.

Table 1

Optimum Ground-System Configurations

Configuration designation	*A*	*B*	*C*	*D*	*E*	*F*
Number of radials	16	24	36	60	90	120
Length of each radial in wavelengths	.1	.125	.15	.2	.25	.4
Spacing of radials in degrees	22.5	15	10	6	4	3
Total length of radial wire installed, in wavelengths	1.6	3	5.4	12	22.5	48
Power loss in dB at low angles with a quarter-wave radiating element	3	2	1.5	1	.5	0*
Feed-point impedance in ohms with a quarter-wave radiating element	52	46	43	40	37	35

*Reference. The loss of this configuration is negligible compared to a perfectly conducting ground.

Typical Design Examples

Ham A wishes to design a ground system for his 60-foot vertical radiator for 75 meters. His yard is small, allowing only 40-foot radials (which represent about 0.14 wavelength). He wants the strongest signal possible so he chooses configuration C (36 radials, 0.15 wavelength). This gives him about 1.5-dB loss. He feeds directly with 50-ohm line and sees an SWR of 1.16 to 1. He decides he wants more signal so he adds to the height of his antenna, including a series capacitor to tune out reactance. This reduces his ground losses, lowers his radiation angle and, incidently, improves his match slightly.

Ham B wishes to get the most signal per dollar on 160 meters. His 90-foot tower with triband beam is almost an

electrical quarter wave at 1.8 MHz. He calculates that by paying his son $2 an hour to dig in radials at a rate of 50 feet an hour, and paying two cents a foot for used No. 12 wire, he will have to pay six cents for each foot of radial installed. Since at 1.8 MHz a wavelength is 547 feet, this amounts to about $33 per wavelength. Configuration A will cost him $53, B will cost $99, C will cost $178, D will cost $396 and so on. He concludes that it is best for him to accept a total loss of 2 dB by selecting configuration B. With the $79 he saves by not going to C, he buys a new pair of finals and takes his XYL out to dinner.

Ham C keeps a nightly cw schedule with a station about 1000 miles away. He builds a 40-meter vertical using configuration A and is pleased with the result. He thinks about putting down more radials, but after studying the table decides that he would have to dig in lots of wire to really improve his signal. Instead, he installs another vertical broadside to the first, also using configuration A. This gives him nearly 5 dB of gain and the directivity helps a lot on receive. The work of putting in the second antenna was less than that of going to configuration C or D on his single antenna.

Ham D has a quarter-wave antenna with 12 quarter-wave radials. He studies the table and concludes that 24 eighth-wave radials would be better. He picks up about 1-1/2 dB of gain without buying more wire, by cutting his radials in two so as to double their number.

The above examples serve to point out that in most cases a "compromise" ground system actually turns out to be the "optimum" system when all factors are considered. Thus, any designer should (1) study the cost of various radial configurations versus the gain of each; (2) compare alternative means of improving transmitted signal and their cost (more power, speech processing, etc.); (3) consider increasing physical height or electrical length of the vertical radiator, instead of improving the ground system; and (4) use multiple-element arrays for directivity and gain, observing necessary precautions related to mutual impedances.

Actual Results

During the past two years, over half a dozen test antennas have been constructed using the "Optimum Ground System" table. The results have been gratifying. Among the more interesting antennas constructed were the following.

A triband vertical for 20 through 10 meters was built using configuration A for 20 meters with 16 additional shorter radials interlaced for 15 (modified C). On 20 meters, tests showed that on most contacts the vertical was one to two S units weaker than a 2-element quad at 40 feet, but that on about 20 percent of the contacts the vertical was better. Having both antennas was at times a real advantage. On 15 meters, many Novice contacts using only 10 watts input showed that as many contacts were lost due to loss of received signal as were lost due to the transmitted signal being too weak. The antenna system, being only 16 feet tall when set up for 20 meters, is about the ultimate in unobtrusiveness. It is also extremely easy to construct, even taking into account the effort involved in putting in radials.

An antenna was built for use in broadcast service on 690 kHz on a temporary basis while the permanent antenna was being moved. The temporary antenna used configuration C and was about 15 percent shorter than the permanent antenna. It was expected that it would be about 2 dB less efficient. However, it proved to be equal to, if not very slightly better than, the permanent antenna. The ground system of the permanent antenna, consisting of 120 quarter-wave radials, was dug up and found to be in excellent condition. The unexpectedly good performance of the temporary antenna was attributed to its more moist location, even though the two antennas were only about 500 yards apart.

A two-element 40-meter broadside array built by HC1JH was found to be noticeably better for DX than a sloping dipole or an inverted V. It also provided the ability to null out broadcast QRM by adjusting the phasing of the two elements. Both elements used configuration A.

The six-element 75-meter array in use at K4ERO/HC1 uses configuration A on all its elements. It shows an estimated 20-dB gain over an inverted V for DX work and has allowed a weekly schedule to be kept with eastern Tennessee, summer and winter, using less than 500 watts of power on ssb. It has also made contacts possible with stateside stations during the evenings when stateside QRM levels run 20 to 40 dB over S9. During the wee hours, QRP contacts have been made with most of the eastern call areas using one-watt PEP output on ssb. This antenna system is partly parasitic, partly driven, slewable over about 90°, and uses top loading of the driven elements to raise radiation resistance.

A 160-meter "T" about 60-feet high, using a modified configuration A (some radials only .05 wavelength) was almost as good as a full-size sloping dipole on a 240-foot tower.

Many questions related to ground-system design still remain. Further study could well be done in the following areas:

1) By how much should the figures in the table be modified because of different ground conductivities? How can a ham measure ground conductivity?

2) What are the optimum broadside and end-fire spacings for arrays of verticals when using "compromise" ground systems? How much are losses increased? How are patterns affected?

3) How much directivity can be had by putting all the radials in one general direction? What are the compromises?

4) What are the losses for electrically short antennas when using the various configurations? On what bands, and for what applications, would a very short antenna with a more extensive ground system, such as has been described by W2FMI, give more signal for less work and cost than a 1/4-wave radiator with fewer radials?

The author would welcome correspondence from anyone having information or opinions on any of the above or related subjects, or who has data which would serve to verify or modify the data presented. QST

References

[1] *Radio Broadcast Ground Systems*, available at the time of this publication from Smith Electronics, Inc., 8200 Snowville Rd., Cleveland, OH 44141, for $3 per copy.

[2] Sevick, "The Ground-Image Vertical Antenna," *QST*, July, 1971.

[3] Sevick, "The W2FMI 20-Meter Vertical Beam," *QST*, June, 1972.

[4] Sevick, "The W2FMI Ground-Mounted Short Vertical," *QST*, March, 1973.

[5] Jones, "A 7-MHz Vertical Parasitic Array," *QST*, Nov., 1973.

[6] Sevick, "A High Performance 20-, 40- and 80-Meter Vertical System," *QST*, Dec., 1973.

[7] Sevick, "The Constant-Impedance Trap Vertical," *QST*, March, 1974.

[8] Boothe, "The Minooka Special," *QST*, Dec., 1974.

Strays

□ It has come to our attention that some confusion exists about identifying safe filters for direct sun viewing – with the naked eye, telescope or through a camera-viewing device. A *neutral-density* filter is required. The degree of density is important, whatever the filter "number" may be.

Density ratings run from 0.3 (50-percent light transmission) on up. The lowest density that is termed safe for direct viewing is 3.5, which passes 0.03 percent of the impinging light. Even this is not recommended for continuous sun viewing. The standard solar filter, No. 4 density, passes 0.01 percent, or 1/10,000 of the impinging light. It can be used for long periods in complete safety, and is recommended.

It should be an *aperture* filter. Eye piece filters can be cracked by solar heat and are not recommended. – *W1HDQ*

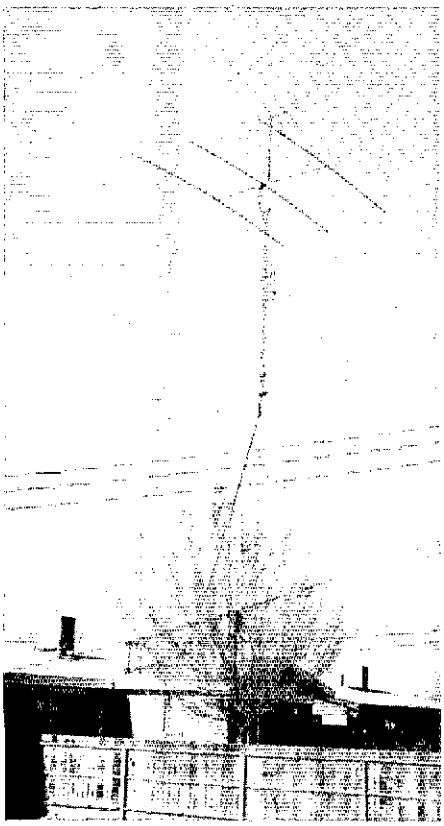
Improving Earth-Ground Characteristics

Do you live in an area where tons of fulgurite are all that's left in your backyard every time a storm passes through? Try this idea and gain some protection, too!

By Roger Hoestenbach,* W5EGS

Several years ago I moved to my present dry, desert QTH which has a rather unusual soil problem – *there is none!* The *terra firma* is solid rock upon which the builders have hauled in just enough soil to grow a few blades of grass. The trees and shrubs have to be planted in holes which have been drilled with jackhammers or dynamited. The resulting soil resistivity is in the vicinity of 12,000 ohm/cm. In discussing this problem with other hams, I've found that my situation is not as unique as one might imagine. Perhaps the grounding techniques described here may benefit you, if you're in similar circumstances.

*4707 Wilshire Drive, Midland, TX 79701



A neighbor's eye view of W5EGS' 70-foot "lightning" rod. Know what that little box on the roof of the house is? For those that don't live in an arid climate, that gadget is called a cooler, and it works, too!

My station location has a lot going for it from an amateur radio viewpoint. The highest point in the county is located a quarter-mile away. There are no large trees, few power lines, and low housing density. However, I was told the lightning-strike rate was high and damage from direct strikes quite common, due primarily to difficulties encountered in obtaining a satisfactory ground for lightning protection. The neighbors were amused when I announced that I was contemplating erecting a 70-foot tower in my backyard. The only ones that encouraged the installation were probably hoping it would act as a lightning rod to protect *their* property. I not only needed a good ground to aid in lightning protection, but I needed a good rf ground that would act as a conductor instead of a lossy dielectric. I am an avid DXer and, for me, a low controlled angle of radiation is a must. My research led me to the "ground screen" recommendation in the *ARRL Antenna Book*: Why not utilize a simplified, buried version of this technique with some method of effectively connecting it to earth ground? I hoped the resultant ground resistance would be in the vicinity of one ohm or less.

The Earth Ground

Resistance to current through an earth-ground path is based on three factors: (1) the actual resistance of the ground rod and the metallic connection to it, (2) the contact resistance between the ground rod and the adjacent earth, and (3) the resistance of the surrounding earth. The first factor should be almost negligible, since copper rod used for grounding purposes is of sufficient size and cross section that the resistance value is small. The second factor can be a problem if the earth isn't tamped properly around the ground rod or if the surface of the rod is contaminated with grease, paint, oxides or some other insulating cover. The third factor is the most critical and the one that deserves the major effort.

A ground rod driven into the earth radiates current in all directions. It can be thought of as being surrounded by layers of earth, all of equal thickness. The layer of earth nearest the ground rod has the smallest surface area so it has the greatest resistance. The next layer has a larger surface area and less resistance, and so on. Eventually a distance from the ground rod is reached where the inclusion of additional earth layers does not add significantly to the resistance of the earth surrounding the ground rod. Elaborate test equipment is available to measure analytically this optimum distance and the exact earth resistance, but the average radio amateur has neither access to this type of equipment nor the need to define these parameters to such an exacting degree. Instead, let's attack the basic problem: the conductance, or lack of it, of the earth layers within the critical distance. Public and private utilities have recognized this problem for years and use a method known as "soil treatment" for dry sand, dry soils, rock and other ground (soil) conditions. The soil treatment consists of mixing salt into the surrounding earth layers. I used this basic idea and expanded on it somewhat in order to improve its effectiveness.

As shown in Fig. 1, I started by

digging a hole with an 18-inch diameter and a depth of four feet. In the center of this hole I drove a 3/4-inch Copperweld ground rod as far into the earth as I could. A handy "driving" tool can be made from pipe that will barely pass over the rod. I took a threaded piece about 12 inches long and screwed a coupling and hex-head barstock plug onto the upper end. I placed this over the ground rod to prevent mushrooming the top while pounding on the pipe with a sledgehammer. After installing the ground rod in the hole, I inserted a plastic water pipe in the hole and filled the hole with a chemical mixture containing the following items: *bentonite*, a clay-like soil commonly used by farmers in earthen tanks to increase their ability to hold water without loss due to seepage (this material swells when wet and packs the mixture in the hole under adequate pressure to make up for poor tamping); *gypsum*, a popular product in the building industry which is used in the making of Sheetrock and plaster of Paris (this material gathers moisture and holds it in order to remain stable, and prevents loss of conductivity due to drying out); *rock salt*, the low resistance additive.

The mixture, as homogenous as possible, is tamped firmly into the hole and a 6-inch dirt cap placed over the top of the mixture so grass can grow over the spot where the hole was dug. The watering pipe is charged with a saturated solution of brine. The salt over a period of years leaches further into the surrounding earth, increasing the effective inclusion of the surrounding earth layers. Connecting several chemical vats in parallel to form a ground system can reduce the combined resistance to a fraction of an ohm.

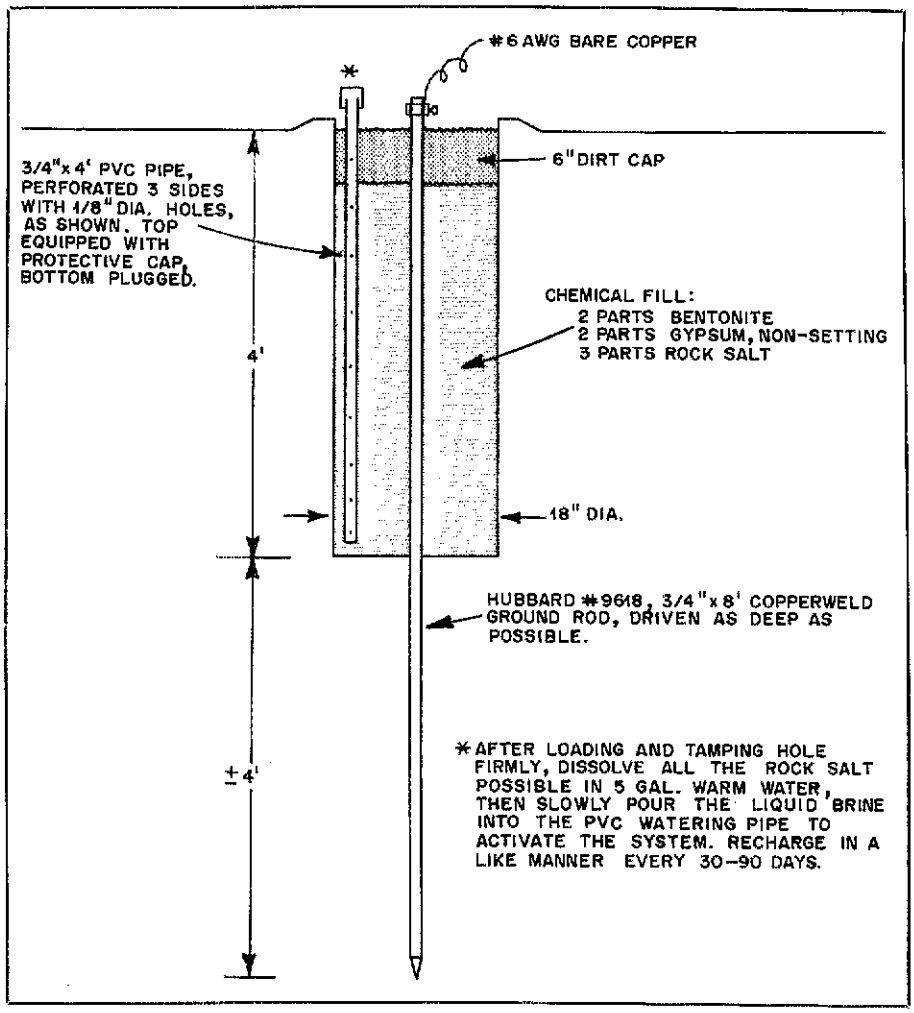


Fig. 1 — Drawing of a method for improving earth-ground characteristics. Dimensions are those used by W5EGS.

The Radial System

My house is located in the center of a 60- by 120-foot city lot which made it convenient to locate the tower near the midpoint of the lot and run sloping V-beams to the back corners of the yard for 40 and 80 meters. I think it is generally agreed that the ideal ground radial or screen system (at least for verticals) is about 120 wires, each at least 1/2 wavelength long, extending radially from the base of the antenna and spaced equally around a circle. Such a system should be the practical equivalent of a perfectly conducting ground and have negligible resistance. Assuming all this to be true, I slit the lawn with a Ditch-Witch trencher at roughly 3-degree intervals and installed as many radials of varying wavelength as I could. I used over 2600 feet of No. 6 AWG soft-drawn bare copper wire. I also ran one continuous wire around and bonded the water, gas, phone, electricity, sewer and radial ground systems all together. I then located seven chemical grounds as described above, at randomly selected spots in the network.

The Results

I have been using this installation for 12 years now with respectable reports. I run QRP cw and only 1000-watts PEP on ssb to a TH-3 tribander and the two V-beams. I've worked over 200 countries and garnered well over 80 awards, so the system does work! All the antennas are fed with grounded baluns and switched to ground in the shack when not in use. The tower has taken hundreds of direct hits from lightning and none of these has caused any damage to date. The strikes hit a steel pipe cap on the top of the mast and splatter horizontally in several directions, producing a spectacular display that is quite frightening the first few times it's observed. I have yet to observe even any little molten beads of metal on or near the pipe cap as a result of those hits. Additionally, during a thunderstorm the high levels of ionization in the atmosphere produce multiple flashes of corona discharge from the pipe cap edges at regularly recurring intervals. This phenomenon is also quite spectacular. QST

Strays

STOLEN EQUIPMENT

□ Stolen on Aug. 20 in San Francisco from auto, Tempo transceiver, serial no. 5728 and Western Electric T-T pad. Reward. Shel Kurtzmán, 19436 Topham Street, Tarzana, CA 91356, tel. 1-213-344-0878.

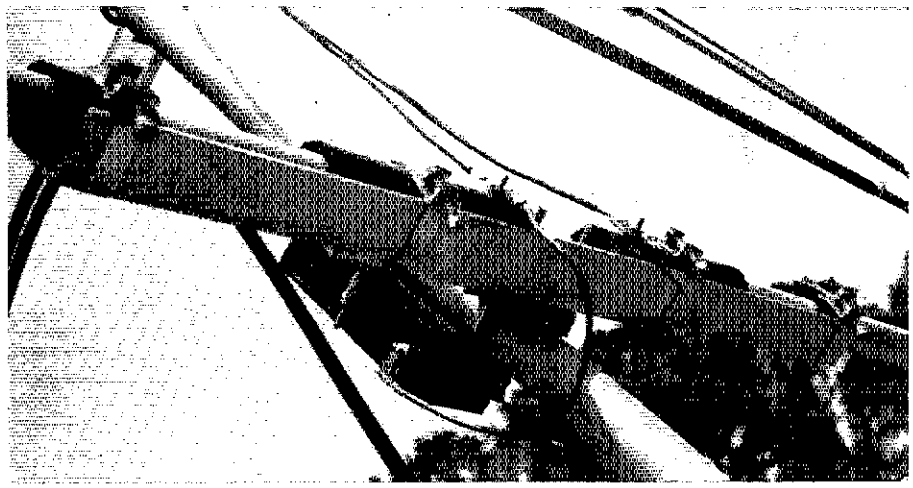
□ Taken during QTH break-in, Swan 500 C, serial no. I 486 739; Swan 117-XC, serial no. 0 16466 and Swan VX-2 VOX. Elmo V. Boswell, WØPXW, 443 S. Prince Lane, Springfield, MO 65802.

The Log-Yag Array

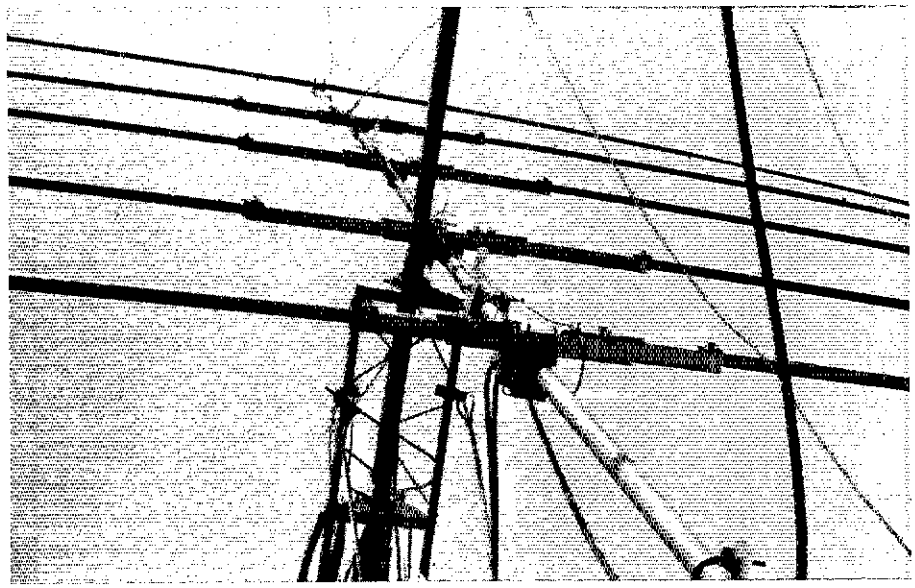
The Yagi antenna array has been around for years and years. A relative newcomer to hams is the log-periodic dipole array (LPDA), which offers nearly constant gain over a greater bandwidth than the Yagi. Guess what happens when you cross a Yagi with an LPDA . . .

By P. D. Rhodes,* K4EWG and J. R. Painter,** W4BBP

With the decline in sunspot activity, a number of amateurs have considered monoband Yagi arrays. The first problem encountered seems to be array length, that is, overall size for a desired gain and bandwidth. The Log-Yagi principle, as will be discussed shortly, has produced a system which will provide the amateur with another alternative to the long-boom Yagi, stacked Yagis, or loop-antenna systems. The L-P Yagi (Log-Yag) array is not a new system; many such arrays have been designed and developed by Oliver Swan[1] and others.[2] This article, however, will provide the basic theory of operation, design procedure, and the construction of a practical antenna.



The attachment of the elements to the boom.



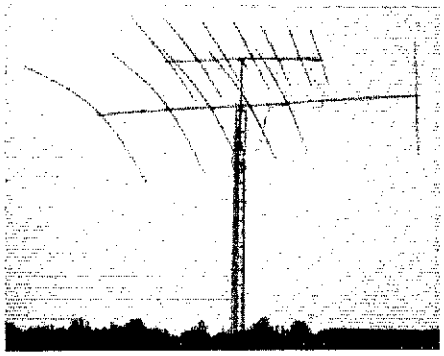
From the front to the back of the Log-Yag array. Note the truss provides lateral and vertical support.

Theory of Operation

The Log-Yag array utilizes an LPDA[3] driven group of elements, designed to cover a desired bandwidth, in conjunction with parasitic elements to achieve higher gains and greater directivity than would be realized with either the LPDA or Yagi array alone. The Yagi array requires a long boom and wide element spacing for wide bandwidth and high gain. This is because the Q of the Yagi system increases as the number of elements is increased and/or as the spacing between adjacent elements is decreased.[4,5] An increase in the Q of the Yagi array means that the total bandwidth of that array is decreased, and optimum gain, front-to-back ratio, and side lobe rejection are obtainable only over small portions of the band. Dr. I. L. Morris, using a high-speed digital computer, has completed exten-

*3125 Keenan Rd., College Park, GA 30349
**4243 Loveless Dr., Ellenwood, GA 30049

[1] References appear on page 21.



The completed Log-Yag array ready for use. The array mounted above the Log-Yag is a 7-element LPDA for 21 to 30 MHz.

sive research on four-, eight-, and ten-director Yagi-Uda arrays.[6] His work is comprehensive and is recommended reading for all technically minded amateurs. The parameters varied in his study were element length, spacing, radius and number. As can be seen in Fig. 1, the forward gain and front-to-back ratio deteriorate sharply as element spacings decrease. If the elements are closely spaced, then as the frequency is shifted either side of the array design frequency the electrical spacing between adjacent elements changes rapidly. This causes a higher SWR and a deterioration of forward gain and front-to-back ratio.

The Log-Yagi system overcomes this difficulty by using a multiple driven element "cell" designed in accordance with the principles of the log-periodic dipole array.[7,8] Since this log cell exhibits both gain and directivity by itself, it is a more effective radiator than a simple dipole driven element. The front-to-back ratio and gain of the log cell can be improved with the addition of a parasitic reflector and director. It is not necessary for the parasitic element spacings to be large with respect to wavelength, as in the Yagi array, since the log cell is the determining factor in the array bandwidth. In fact, the element spacings within the log cell may be small with respect to a wavelength without appreciable deterioration of the cell gain. For example, decreasing the relative spacing constant (σ) from 0.1 to 0.5 λ will decrease the gain by less than 1 dB. Hence, a further reduction in boom length. It can be seen that the Log-Yag array will exhibit high theoretical gain (11 dBd), high front-to-back ratio (30 dB), high cross polarization (front-to-side ratio – 45 dB), and a wideband response utilizing boom lengths approximately one half that of a Yagi with similar characteristics.[2]

The author has built many monoband 14-MHz Log-Yag arrays in an attempt to find an optimum combination of elements, while holding the boom length to that of a full-sized 3-element monobander Yagi. Relative radiation patterns for various element combinations are found in Fig. 2. The final array design takes the form of a 4-element log cell, parasitic reflector spaced at .085 λ_{max} and parasitic director spaced at 0.15 λ_{max} where λ_{max} is the longest free-space wavelength within the array passband. It has been found that array gain is almost unaffected with reflector spacings from .08 λ to 0.25 λ and the increase in boom length is not justified.[9] The function of the reflector is to improve the front-to-back ratio of the log cell while the director sharpens the forward lobe and decreases the half-power beamwidth. As the spacing between the parasitic elements and the log cell decreases, the parasitic elements must increase in length.[10]

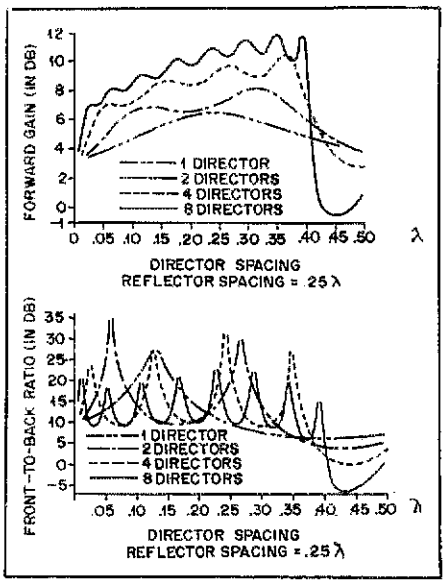


Fig. 1 — The effects of director spacing on various Yagi arrays. The change in gain and front-to-back ratio is plotted for the change in director spacing. The reflector spacing has been held constant.

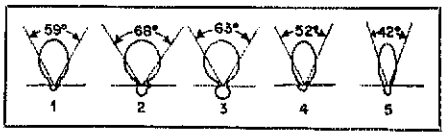


Fig. 2 — Beam patterns of 20-meter arrays.
No. 1 — 3-el. log cell, dir. @ 0.1λ, ref. @ 0.2λ.
No. 2 — 5-el. log periodic, σ = 0.1.
No. 3 — 3-el. log cell, 1st dir. @ 0.1λ, 2nd dir. @ 0.2λ.
No. 4 — 4-el. log cell, ref. @ 0.15λ.
No. 5 — 4-el. log cell, dir. @ 0.15λ, ref. @ 0.085λ (described in this article).

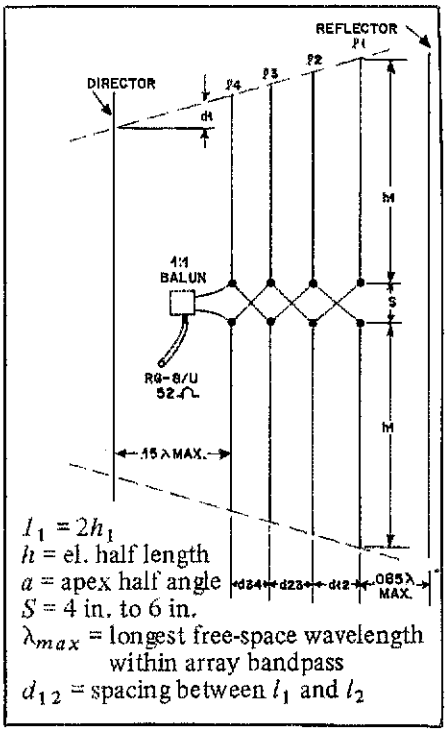


Fig. 3 — Layout of the Log-Yag array.

Table 1
Array Characteristics

1. Frequency range	14 – 14.35 MHz
2. Operating bandwidth	B = 1.025
3. Design parameter	τ = .946657
4. Apex half angle	a = 14.92°, cot = 3.753
5. Half-power beam width	42° (14-14.35 MHz)
6. Bandwidth of structure	B_s = 1.17875
7. Free-space wavelength	λ_{max} = 70.28 ft
8. Log cell boom length	L = 10.0 ft
9. Longest log element	l_1 = 35.14 ft (a tabulation of element lengths and spacings given in Table 2)
10. Forward gain over dipole	11.5 dB (theoretical)
11. Front-to-back ratio	32 dB (theoretical)
12. Front-to-side ratio	45 dB (theoretical)
13. Input impedance	Z_o = 37 ohms
14. SWR	1.3 to 1 (14 – 14.35 MHz)
15. Total weight	96 pounds
16. Wind-load area	8.5 sq. ft
17. Feed-point impedance,	Z_o = 37 ohms
18. Reflector length	36.4 ft @ 6.0 ft spacing
19. Director length	32.2 ft @ 10.5 ft spacing
20. Total boom length	26.5 ft

The mechanical construction of the log cell is identical to that described in *The ARRL Antenna Book*, except for the lengths and spacings.[3,7] Fig. 4 shows how the log cell is constructed as well as the addition of the parasitic elements.

Table 2
Array Dimensions

ELEMENT	LENGTH FEET	SPACING FEET
Reflector	36.4	6.0 (Ref. to l_1)
l_1	35.14	3.51 (d_{12})
l_2	33.27	3.32 (d_{23})
l_3	31.49	3.14 (d_{34})
l_4	29.81	10.57 (l_4 to dir.)
Director	32.2	

Table 3
Element Material Requirements

ELEMENT	1-IN. TUBING LTH. (FT)	QTY.	7/8-IN. TUBING LTH. (FT)	QTY.	3/4-IN. TUBING LTH. (FT)	QTY.	1-1/4-IN. ANGLE LTH. (FT)	1 X 1/4-IN. BAR LTH. (FT)
Reflector	12	1	6	2	8	2	None	None
l_1	6	2	6	2	8	2	3	1
l_2	6	2	6	2	8	2	3	1
l_3	6	2	6	2	6	2	3	1
l_4	6	2	6	2	6	2	3	1
Director	12	1	6	2	6	2	None	None

The log cell is designed to meet upper and lower band limits with σ = .05λ. The design parameter τ is dependent on the structure bandwidth, B_s. When the log-periodic design parameters have been found, the element length and spacings can be determined. A review of the "Log-Periodic Dipole Array" is recommended though not necessary for the design of the Log-Yag array.[3,7,8]

The method of feeding the antenna is identical to that of feeding the log-periodic dipole array without the parasitic elements. As shown in Fig. 3, a balanced feeder is required for each log-cell element, and all adjacent elements are fed with a 180° phase shift by alternating connections. Since the Log-Yag array will be covering a relatively small bandwidth, the radiation resistance of the narrow-band log cell will vary from 80 to 90 ohms (tubing elements) depending on the operating bandwidth. The addition of parasitic elements lowers the log-cell radiation resistance. Hence, it is recommended that a 1-to-1 balun be connected at the log-cell input terminals and 52-ohm coaxial cable be used for the feed line. The measured radiation resistance of the 14-MHz Log-Yag installed at the author's QTH is 37 ohms, 14.0 to 14.35 MHz. It is assumed that tubing elements will be used. However, if a wire array is used then the radiation resistance R_o and antenna-feeder input impedance Z_o must be calculated so that the proper balun and coax may be used. The procedure is outlined in detail in *The ARRL Antenna Book*.[3,7]

Design Procedure

The following step-by-step design procedure may be used to design any monoband Log-Yag for any desired bandwidth.

1) Determine the operating bandwidth, B, between f_1, lowest frequency (band edge), and f_n, highest frequency (band edge).

$$B = \frac{f_n}{f_1}$$

2) Determine the structure bandwidth (log-cell array) B_s.

$$B_s = 1.15B$$

3) Determine the design parameter τ (based on 4-element log cell, note 1).

$$\tau = \frac{1}{\sqrt[3]{B_s}}$$

Note 1. The design parameter τ is chosen for a four-element log cell since it provides the best bandpass for most amateur bands. For log cells with any number of elements

$$\tau = \frac{1}{\sqrt[(n-1)]{B_s}}$$

where n = number of elements within the log cell.

4) Determine the apex half-angle α: Since σ = .05 (relative spacing constant), then

$$\cot \alpha = \frac{0.2}{1-\tau}$$

5) Determine the longest free-space wavelength λ_{max}, log-cell boom length, L (ft) and longest element length within the log cell l_1 (ft.).

$$\lambda_{max} = \frac{984}{f_1 \text{ MHz}}$$

$$L = \left[\frac{1}{4}\left(1 - \frac{1}{B_s}\right)\cot \alpha\right]\lambda_{max}$$

and

$$l_1 = \frac{492}{f_1 \text{ MHz}}$$

$$l_2 = \tau l_1$$

$$l_3 = \tau l_2$$

$$l_4 = \tau l_3$$

6) Determine the element spacing (d_{12}), distance between elements l_1 and l_2 (ft.).

$$d_{12} = \frac{1}{2}\left(l_1 - l_2\right)\cot \alpha$$

and

$$d_{23} = \tau d_{12}$$

$$d_{34} = \tau d_{23}$$

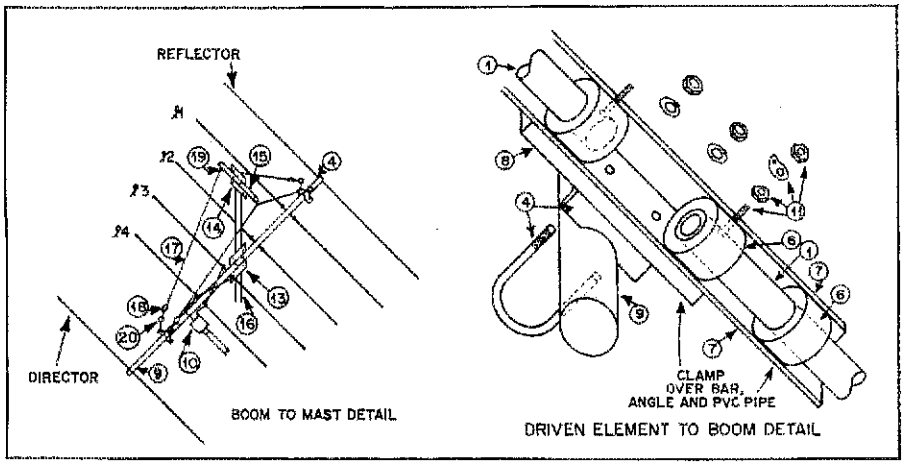


Fig. 4 — Assembly details. The numbered components refer to Table 4.

The connections between the balun and l_4.

Table 4
Materials List

1. Aluminum tubing — .047 in. wall thickness
   1 in. — 12 ft lengths, 24 lin. ft
   1 in. — 12 ft or 6 ft lengths, 48 lin. ft
   7/8 in. — 12 ft or 6 ft lengths, 72 lin. ft
   3/4 in. — 8 ft lengths, 48 lin. ft
   3/4 in. — 6 ft lengths, 36 lin. ft
2. Stainless steel hose clamps — 2 in. max., 8 ea.
3. Stainless steel hose clamps — 1-1/4 in. max., 24 ea.
4. TV-type U bolts — 1-1/2 in., 6 ea.
5. U bolts, galv. type: 5/16 in. X 1-1/2 in., 4 ea.
6. U bolts, galv. type: 1/4 in. X 1 in., 2 ea.
7. 1 in. ID water-service polyethylene pipe 160 lb/in.^{2} test, approx. 1-3/8 in. OD, 7 lin. ft
8. 1-1/4 in. X 1-1/4 in. X 1/8 in. aluminum angle — 6 ft lengths, 12 lin. ft
9. 1 in. X 1/4 in. aluminum bar — 6 ft lengths, 6 lin. ft
10. 1-1/4 in. top rail of chain-link fence, 26.5 lin. ft
11. 1:1 toroid balun, 1 ea.
12. No. 6-32 X 1 in. stainless steel screws, 8 ea.
    No. 6-32 stainless steel nuts, 16 ea.
    No. 6 solder lugs, 8 ea.
13. No. 12 copper feed wire, 22 lin. ft
14. 12 in. X 6 in. X 1/4 in. aluminum plate, 1 ea.
15. 6 in. X 4 in. X 1/4 in. aluminum plate, 1 ea.
16. 3/4 in. galv. pipe, 3 lin. ft
17. 1 in. galv. pipe — mast, 5 lin. ft
18. Galv. guy wire, 50 lin. ft
19. 1/4 in. X 2 in. turnbuckles, 4 ea.
20. 1/4 in. X 1-1/2 in. eye bolts, 2 ea.
21. TV guy clamps and eyebolts, 2 ea.

7) Determine the parasitic element lengths (ft) and spacings (ft).

$$l_{REF} = \frac{509.6}{f_1 \text{ MHz}}$$

$$d_{REF} = \frac{84}{f_1 \text{ MHz}}$$

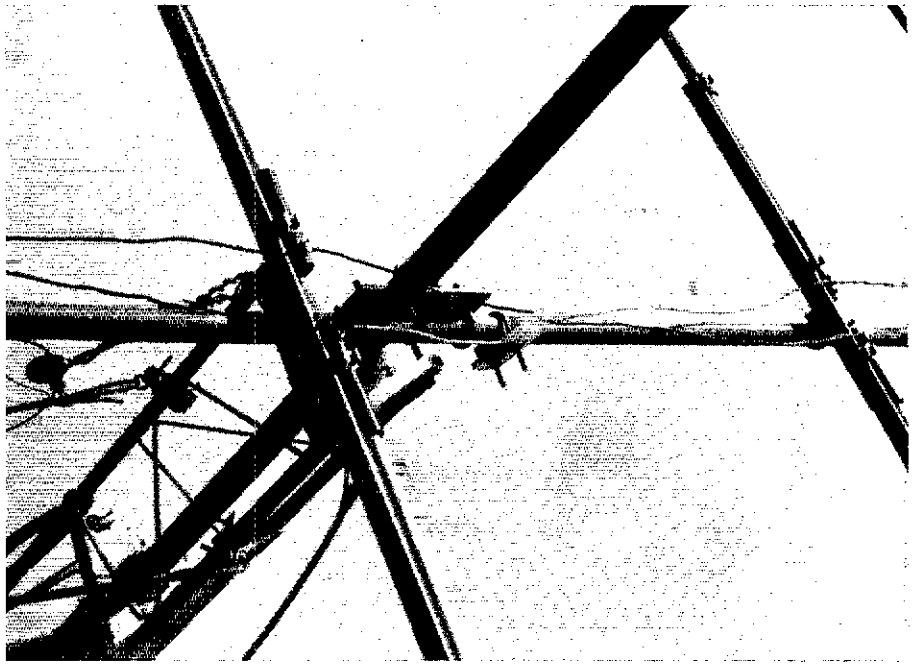
$$l_{DIR} = \frac{450.8}{f_1 \text{ MHz}}$$

$$d_{DIR} = \frac{148}{f_1 \text{ MHz}}$$

This completes the design.

The Finished Log-Yag

The proof is always to be found in the completed and operating product. The author's 14-MHz Log-Yag on-the-air performance on cw and ssb substantiates the theory. The characteristics of the array are given in Table 1.



The interconnection between the elements of the log cell changes sides between each element.

The materials needed are given in Table 3. In the construction diagram, Fig. 4, the materials are referenced by their respective material list number. The photographs show the overall construction picture, and the drawings show the details.

The materials should be available from most hardware and electronic stores. However, some have found difficulty in obtaining the aluminum tubing. This can be solved by writing to the manufacturer and asking for the name of their distributor nearest your locality. Commercial antenna manufacturers will sell their tubing, but the cost is at a premium.

This array is in operation at K4EWG and W4BBP. The results on the air are nothing short of fantastic! It will give the stacked Yagis and long-boom Yagis a run for their money.

It is the authors' hope that this antenna design will stimulate additional work and research by other amateurs. The field seems wide open, and Yagi-Log combinations are endless. The optimum design is by no means achieved in this article. It does seem, however, that a log cell of more than four elements would be necessary only where the array bandwidths, B, exceed 1.03 ($B = f_n/f_1$).

The authors wish to thank George Smith, W4AEO, for his work in substantiating a consideration for log-periodic gain.[8]

QEX

Bibliography References

[1] "The Swan Multidrive 2-Meter Antenna," *QST*, Oct., 1969.
[2] Orr, *Radio Handbook*, 18th edition, pp. 547-548.
[3] Rhodes, "The Log-Periodic Dipole Array," *QST*, November, 1973.
[4] *The ARRL Antenna Book*, 13th edition, p. 151.
[5] See ref. 2 above, p. 558.
[6] King, Mack and Sandler, "Arrays of Cylindrical Dipoles," *Yagi-Uda Programme Apdx. V*, 1968, pp. 218-232, 468-470.
[7] See ref. 4 above, pp. 160-164, 208-210, and Fig. 9-18.
[8] Smith, "Yes, I've Built Sixteen Log Periodic Antennas!" *73*, March, 1975. See pp. 98-99.
[9] Orr, "Antennas," *CQ*, March, 1975. See section headed "The KLM Antenna."
[10] See ref. 4 above, p. 204 and Fig. 9-5.

Strays

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□ Bernard Ostrofsky, W9HTF, on appointment as senior research associate in the Materials Research and Services Division of Standard Oil (Indiana), Naperville, IL.

Coils and the Beginner

Coils are pretty basic components, but knowing how to choose the proper one will lead to improved circuit performance.

By Doug DeMaw,* W1FB

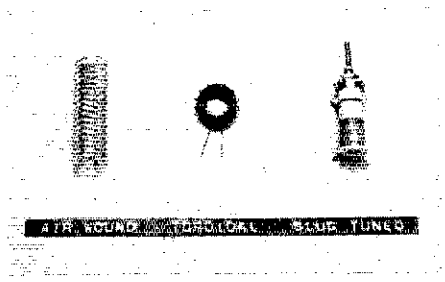
The *IEEE Standard Dictionary* defines the word "coil" as: *an assemblage of successive convolutions of a conductor.* Depending somewhat on the use to which a coil is put, it may be referred to as an inductor, a reactance, an impedance or a choke. When a coil is used in combination with a capacitor it might be called a tuned circuit, a tank circuit, a resonator or a trap. The proper nomenclature relates to the application.

Our discussion will concern some basic rules for determining the best kind of coil for a particular operating condition (parameter). That is, we will address ourselves specifically to the physical properties of coils rather than to circuit applications. This article is aimed at rf (radio-frequency) coils, although some of this discussion is valid with respect to audio-frequency applications.

Common Types of Coils

In the amateur world we find ourselves working mainly with air-wound, slug-tuned and toroidal coils. Each has its merits and limitations. Generally, air-wound coils are the largest in size (vhf and uhf excepted) and that makes them difficult to use in miniature equipment. However, in many instances it is possible to get a much higher Q (figure of merit) with these coils than when using the other two common varieties.[1] Moreover, in circuits where high-rf power is involved, air-wound coils can be made large enough to handle the current with ease. This is seldom true of slug-tuned or toroidal coils. Finally, air-wound coils are often more economical to employ.

Slug-tuned coils are found with a wide variety of core materials and insulating bodies. The cores may be made of brass, ferrite or powdered iron. Brass cores are used mainly for vhf and uhf applications, and the farther the core is inserted into the coil, the *lower* the inductance. This is the opposite effect one obtains when using ferrite or iron.



Most vhf and uhf slug-tuned coils have ceramic or steatite bodies – an aid to Q.

Coils which contain cores of ferrite or powdered iron are employed from audio up to vhf. Various recipes are used in the manufacture of core materials, thereby providing magnetic materials (cores) which are specially suited to various parts of the frequency spectrum. In simple terms, if an improper core material is chosen for a given operating frequency, the Q of the coil may be so poor that circuit performance is ruined, or the core may not have enough permeability (magnetic characteristic) to cause the desired change in inductance when the core is moved from outside the coil to its innermost position. Typically, slug-tuned coils are rated for a specific frequency range (i.e., 2 to 20 MHz, 50 to 100 MHz, etc.). It is for that reason that some amateurs encounter monumental difficulty when attempting to use surplus slug-tuned coils. The cores may be designed for optimum performance at, say, 300 kHz. The experimenter might remove the original winding and install a new one for some frequency in the 3- to 30-MHz range. The circuit may work poorly (or not at all) if that is done! A relative check of core properties versus operating frequency can be made by comparing the indication obtained on the meter of a dipper (grid-dip or base-dip meter) after checking the slug-tuned coil against an air-wound one of equivalent inductance (Fig. 1). Each coil must be placed in parallel with a capacitor of identical type and value and each of the tuned circuits thus formed should be on the same approximate frequency. The air-wound coil circuit will have high Q, and the dip indication will be quite deep. The shallower the dip, the lower the Q. It must be assumed that the dip meter is coupled tightly to each tuned circuit being tested.

Coil forms for iron and ferrite slug-tuned assemblies are made from a variety of materials: impregnated paper, resins, phenolic, steatite, or ceramic. The last three materials are preferred by many amateur builders. The farther into the coil winding a ferrite or iron core is inserted, the *greater* the inductance.

The *ARRL Electronics Data Book* provides considerable scope on the subject of coils and core materials. Also, the J. W. Miller Co. catalog (Box 5825, Compton, CA 90224) lists numerous prewound coils and specifies physical dimensions. Charts are contained in the catalog to identify the various core properties, suggesting the best type of iron or ferrite for a number of frequency ranges.

Toroids are coils which are wound in a toroidal helix or doughnut shape. They can be air-wound, self-supporting devices, but more commonly we find them wound on powdered-iron or ferrite cores. Coils of this variety offer the builder a number of practical advantages: greater miniaturization is possible (reduced mass); high values of Q are possible because fewer turns of wire are needed for a given inductance value when a magnetic-toroid core is used as the coil foundation; toroidal coils exhibit a self-shielding characteristic, often eliminating the need for metal shield cans or partitions (Fig. 2). Toroids are suitable in circuits designed for audio through the vhf range, provided the proper core material is employed.

As is the case with iron- or ferrite-slug cores, the greater the permeability of the toroid-core material, the higher the total inductance for a given number of turns. Practically speaking, the greater the permeability, the lower the re-

*QST Technical Editor
[1] Footnotes appear on page 24.

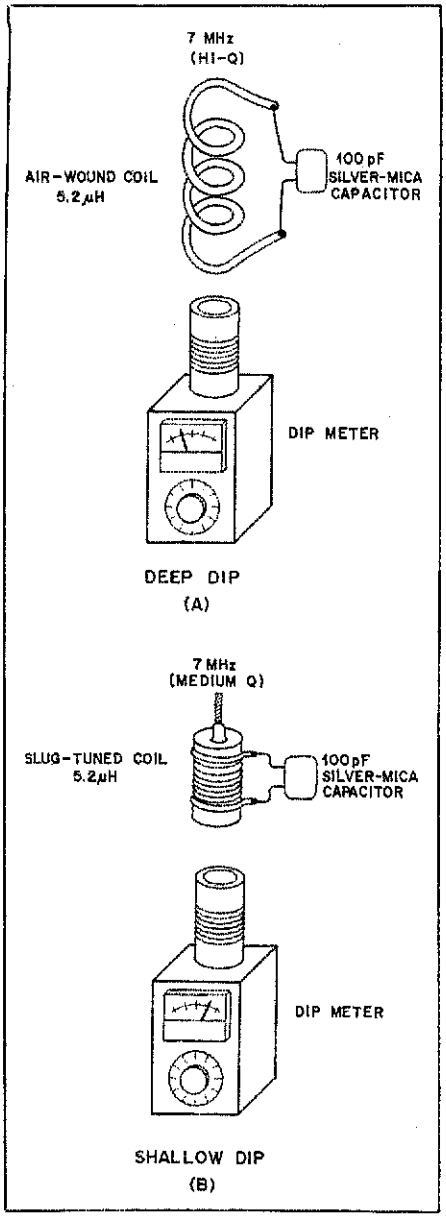


Fig. 1 — Illustration of how the relative *Q* of a tuned circuit can be determined with a dip meter. The air-wound coil and capacitor at A will have a high unloaded *Q* and can serve as a standard when comparing it to other tuned circuits. At B the dip in meter reading is less pronounced than with the test circuit at A, indicating a lower *Q* (see text).

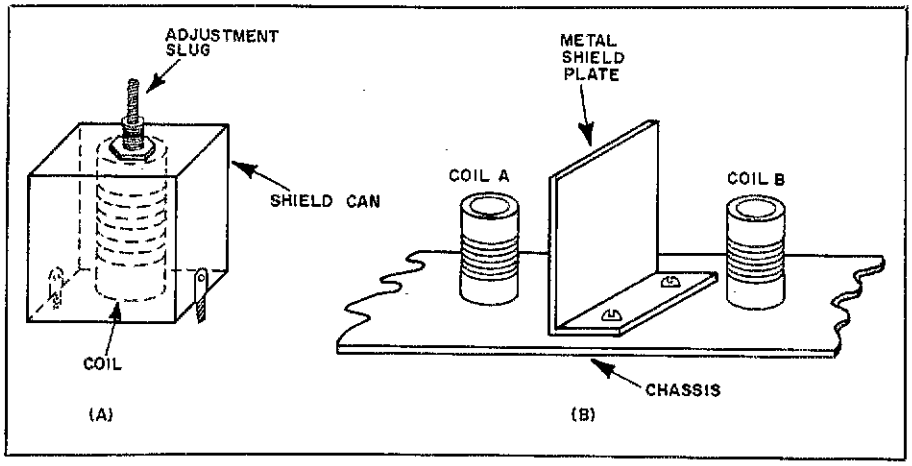


Fig. 2 — Examples of metallic shielding used with coils. The coil at A is contained in a rectangular can, but a cylindrical shield could be used as effectively. The inductor should be at least one coil diameter away from the nearest shield wall to assure minimum *Q* degradation. The same rule applies at B, where coils A and B are spaced well away from the vertical partition.

commended operating frequency. Each core "mix" or recipe is intended for a specific frequency range. The *ARRL Electronics Data Book* contains a wealth of information on the selection and application of toroid coils and transformers

Q and Form Factor of Coils

When one designs resonant circuits (VFO tanks, traps, rf-amplifier tuned circuits) and resonant networks in Transmatches (antenna tuners), it is desirable to shoot for a given *loaded Q*. The latter is the in-circuit value of *Q* with the circuit operating. Irrespective of the *unloaded Q* of a tuned circuit (*Q* value before the tuned circuit is installed in a piece of equipment), the circuit elements to which the tuned circuit is connected will, in most instances, determine the final, or loaded-*Q* characteristic. Therefore, if the loaded *Q* of a specified circuit should be 15, the unloaded *Q* of the coil and capacitor would be somewhat greater than that value, say, 50 or even 100. To assure a high value of unloaded *Q* it is necessary to follow a few simple rules: the correct core material is necessary; the largest practical wire size should be used; a good form factor (winding length-to-diameter ratio) is important. Concerning the latter, the most ideal form factor is 1:1, but good results can be had out to a ratio of 1.5:1 (Fig. 3). Thus, to obtain a 1:1 ratio when using a coil whose winding length is two inches, it will be necessary to assure a mean coil diameter of two inches (distance across one coil turn as measured from the geometric center of the wire). However, that kind of precision is not a practical necessity: The inner diameter of the coil will suffice. A close-wound coil (turns of insulated wire touching one another) will not yield as great an unloaded *Q* as will result when allowing a spacing of one wire thickness between turns.

The primary effects of circuit *Q* are important in terms of bandwidth and efficiency. In other words — assuming the tuned circuit is matched to the load when installed — the lower the *Q*, the greater the circuit bandwidth and the lower the efficiency. A perfect example of the bad effects of too low a *Q* can be seen when a transmitter PA tank has a very low *Q* (loaded). Let's suppose that a loaded *Q* of 12 has been chosen to aid in the reduction of unwanted harmonic currents in the transmitter output (TVI and radiation outside an amateur band). Through poor design procedures, the builder picks random values of inductance and capacitance to establish resonance and ends up with a low tank *Q* of three. Because of the increased bandwidth resulting from the low *Q*, rejection of harmonics dropped from, say, 40 dB to 25 dB.

Shielded Coils

When it is necessary to prevent unwanted coupling between coils which are physically close to one another, metallic shields are used. We are speaking of non-toroidal coils. The distance between the outer surface of the coil and the shield is important if the *Q* is to be preserved. Fig. 2 illustrates the principle. A suitable rule of thumb is to maintain a spacing of one coil diameter or greater between the coil and its shield.

The type of metal used for the shield is worth pondering, for various kinds of metal have different effects on the inductance of the coil. The closer the shielding is to the coil, the more pronounced the effect. Brass and aluminum shields will *decrease* the inductance of the coil. Iron shields will *increase* the inductance amount. Because of this magnetic reaction it is necessary to have a trimmer capacitor in the tuned circuit. Alternatively, a slug-tuned coil and a fixed-value capacitor can be used. Either approach will permit final tweaking of the tuned circuit after the shielding is in place.

RF Chokes

Another common type of coil is the rf choke. These inductors come in many sizes and shapes and have a host of electrical characteristics — all of which confuse some beginners. Rf chokes may be solenoidal (single layer of wire) in form, or they can be formed by compound winding the wire (turn upon

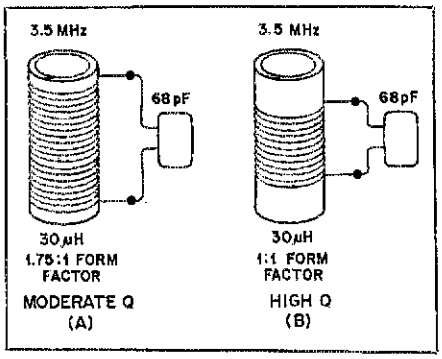


Fig. 3 — Form factor plays an important role in coil Q. The theoretical "ideal" is a ratio of 1:1 — diameter to winding length (see text), but slight departures from that proportion are not especially detrimental. A form factor of 1.75:1 is seen at A, while the idealized configuration is illustrated at B.

turn). Some of the latter are built with a single-compound winding, while other chokes contain two or more compound windings (pi wound) connected in series on a single form and with a space between the pi windings. In all but the most special of applications the style of winding is not too important. What is vital to proper circuit performance is the choke inductance and current-handling capacity.

One may ask, "How do I know the number of millihenries (mH) or microhenries (μH) required for a certain spot in the circuit?" Well, it is necessary to know the impedance of the circuit at the point where the choke will be used. Also, the current taken by the circuit must be considered. Finally, the operating frequency must be known, or in a multifrequency circuit — the *lowest* operating frequency. Fig. 4 will be used as our example in this part of the discussion.

The circuit shows a collector current of 307 mA. Therefore, RFC2 must be capable of passing that amount, so to stay on the safe side of things we will use a 500-mA choke. It can be seen that the collector impedance at peak-power level is 42 ohms. A reasonable rule of thumb for selecting a suitable choke inductance is to make the choke reactance (X_L) approximately four times the circuit impedance. In this example the choke reactance at 7 MHz (the operating frequency) will be roughly 168 ohms. To find the correct inductance

$$L_{(RFC2)} = \frac{X_L}{2\pi f} = \frac{168}{6.28 \times 7}$$

$$= 3.82\ \mu H \qquad \text{(Eq. 1)}$$

where L is in μH and f is in MHz. Slight departures from the calculated value will not hurt circuit performance, but it's smart to use the next higher standard value when in doubt. Too much inductance in a solid-state amplifier can lead to instability at low frequencies. Too little inductance will result in power loss. In the example shown at Fig. 4 a 3.9-μH choke would be satisfactory in place of the calculated one. It is a standard manufactured value.

As one more example of the topic under discussion, consider RFC1 of Fig. 4. There we are dealing with a base impedance of only five ohms, so the choke value will be lower than that of RFC2. Using Eq. 1 we obtain a value of 0.45 μH. The nearest standard commercial choke value is 1 μH and that will be fine.

Assume that we are feeding plate voltage through an rf choke in a tube amplifier and consider that the plate impedance is 5000 ohms. The operating frequency is 1.8 MHz and the plate current is 150 mA. Using Eq. 1 again, we find that the choke inductance is 1769 μH, or 1.76 mH. A standard 1.8-mH choke will suffice, or for that matter a 2.5-mH unit will work well. The choke should be able to safely pass 150 mA. Most rf chokes have a Q of 25 to 75 ohms. That value is ample for general circuit applications.

In power circuits one must make certain that the rf choke does not have a series-resonant characteristic at the operating frequency. A check of this can be made easily by shorting the choke leads together, then using a dip meter to find the series-resonant frequency. If you have ever had an rf choke go up in smoke while operating your rf-power amplifier, chances are that a series resonance existed at the operating frequency. In fact, if the power amount is great enough the pi windings on the choke can actually slam together with a loud bang, then emit smoke! Did we just solve a mystery?

How Many Coil Turns?

Knowing how many coil turns are necessary for a given value of inductance requires a knowledge of core properties and the diameter of the coil form. The ARRL L/C/F Calculator, Type A, is a valuable slide rule for the application. The scales on the front of the calculator indicate frequency, capacitance and inductance. On the reverse side of the unit are scales for calculating the number of turns for a given inductance versus coil diameter. Another scale tells how many turns per inch (close wound) are possible for a variety of enameled-wire sizes. The *ARRL Electronics Data Book* contains nomographs and equations for determining the required number of coil turns for a given inductance. There is information also on how to calculate the coil turns on powdered-iron and ferrite toroids. Information is given in the book respective to measuring unloaded Q with simple test equipment.

Summary Comments

Once a coil is wound and ready to install, the builder may want to add a coating of preservative on the winding. Polystyrene Q dope is the recommended agent for the job. Cement of that type will keep the turns in place on the form and will help prevent inductance changes brought on by variations in humidity. The builder can make his own coil dope by dissolving pieces of polystyrene (not Plexiglas) in carbon tetrachloride until a thick glue-like consistency is obtained. *BEWARE*: Fumes from carbon tetrachloride are harmful to one's health. Contact with the skin must be avoided also!

Now that you have some practical information about coils, better stock up at that next flea market! And, how about building that rig you've been thinking about? QST

Footnotes

[1] Q is the symbol for quantity of electric charge. It is a measure of the relationship between stored energy and the rate of dissipation in specific electric elements or materials. With reference to coils, the Q is the ratio of reactance to the series resistance of the coil at a specified frequency.

[2] Reactance is symbolized as X. It opposes the flow of ac. It is measured in ohms. The reactance presented by capacitance is known as X_C. Inductive reactance is expressed as X_L.

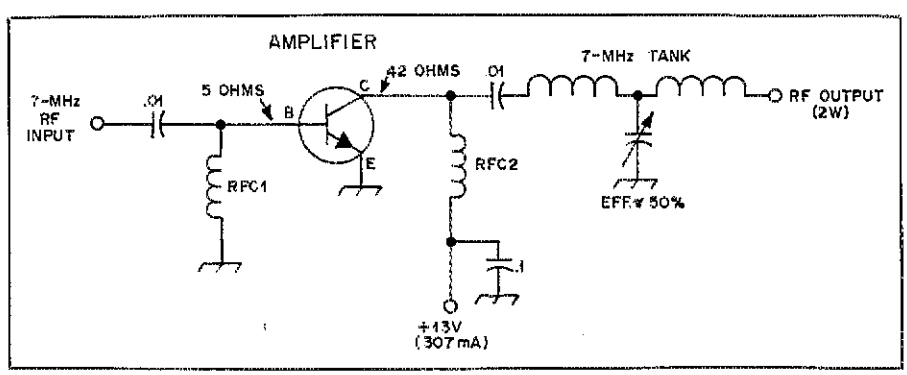


Fig. 4 — Reactance (see text) is a vital consideration when choosing the proper rf choke for a job. Another matter of importance is the current-handling capability of a coil or rf choke. RFC1 and RFC2 in this example are chosen to have approximately four times the reactance represented by the impedance of the circuit points to which they are connected.

A Simple TTL Test Panel

Are those bargain TTL ICs any good? Here's a simple, inexpensive test panel anyone can build. GO, or NO GO?

By J. S. Worthington*

This versatile test panel was designed and constructed primarily to effect simple go/no-go tests on surplus TTL ICs of the 7400 series in dual-in-line packages (DIP). The test setup will provide much information easily and quickly and in many cases save valuable time which would otherwise be spent in trouble-shooting completed equipment. The test-panel idea was born out of frustration while building a frequency counter with substandard ICs. It is *not* suitable for use with complementary MOS devices which require strict handling precautions against static charges. Basically, it provides static testing under dc conditions, but with certain interconnections it will permit limited dynamic testing. Information about frequency response is not available.

*34 Broadway Ave., Wallasey, England, L45 6TD

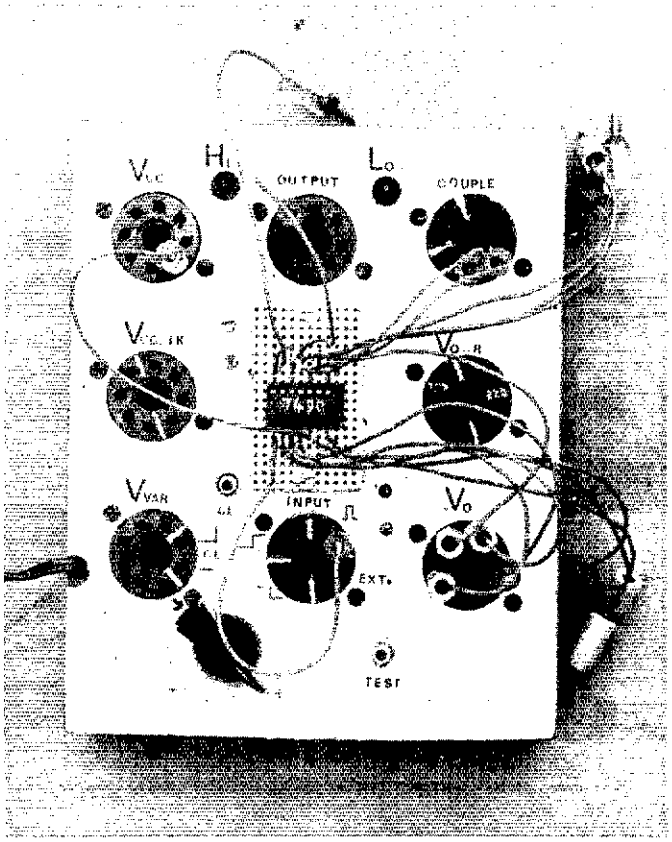
General Description

The test panel is a simple arrangement for patching the terminal pins of an IC, or part thereof, to permit various input, loading and switching conditions to be applied easily and quickly to each or any terminal. An indication of the resultant operation or nonoperation is given visually.

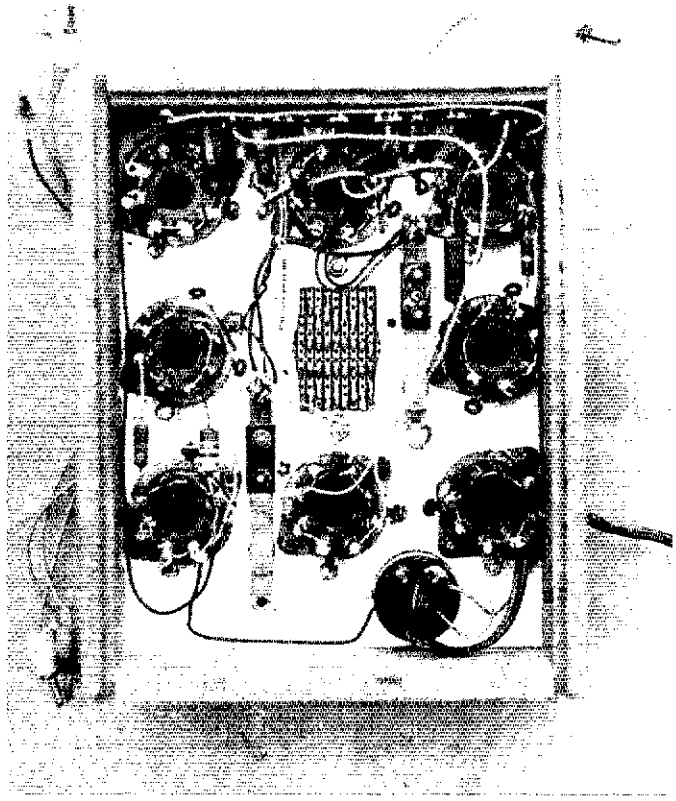
Each contact of a 16-pin DIP socket is supplied with its own "wander lead" terminated in a connector which can be plugged into sockets carrying the various supplies, loads, etc. Also, push switches are included in the circuit to provide pulses of input current for toggling or clocking, counting and resetting. Leads can also be made common to set up simple circuit configurations, such as cross coupling of gates to make a flip-flop, or for connecting the output of one section of an IC to the input of another section of the same IC (such as using a 7490 as a decade divider).

A manually controlled input voltage source is provided to allow the observation or plotting of transfer functions,

Top view of the test panel, set up to check operation of a 7490 as a decade divider.



Bottom view of the test panel.



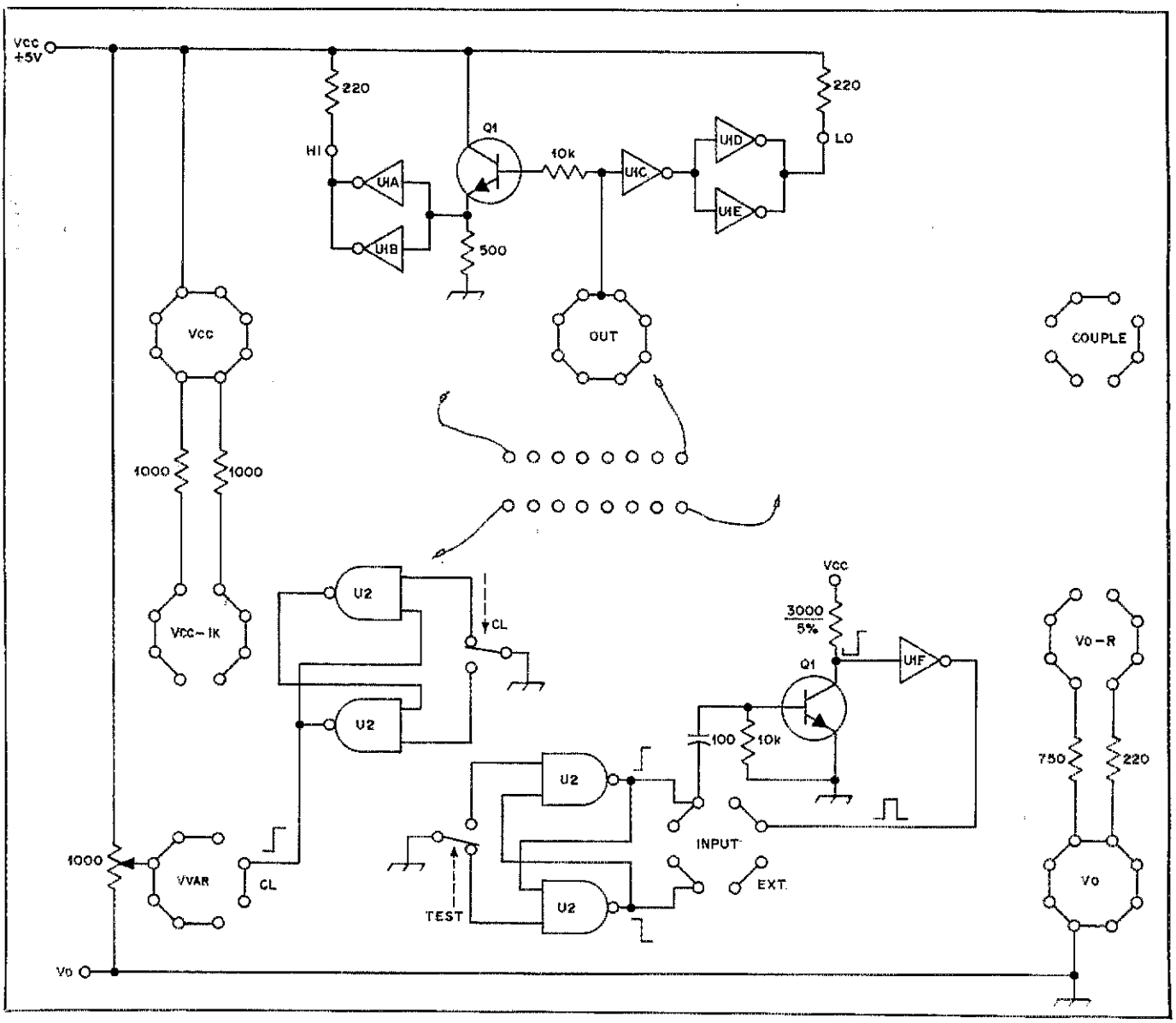


Fig. 1 – Diagram of the test circuit.
Q1,Q2 – General purpose npn, e.g., 2N2926.
U1 – Hex inverter, SN7404.
U2 – Quad 2-input NAND, SN7400.
Hi-Lo indicators, LEDs.

and also provides a controllable level of input, up to V_{cc}, to study operation of a circuit under different signal-level conditions. If an absolute, rather than a comparative, answer is required it is easy to connect a voltmeter to the appropriate part of the circuit.

The apparatus is constructed very simply and cheaply, using materials available to an experimenter. No meter is included, the author preferring to use an external test meter when necessary. No power supply is included for reasons of economy and because anyone working with TTL ICs is certain to have a regulated source of 5 volts already available, to which the supply leads can be attached.

A HI/LO state indicator using LEDs is included to show the condition of the terminal to which it is connected through the "output" socket. Those already having a logic probe may prefer to use it by plugging in to the output socket. The circuit diagram is laid out to conform closely to the physical construction. Both formats are readily adaptable to meet any special requirements.

Construction

All main components are carried on a piece of hardboard, which is easily worked, mounted on a simple wooden frame. At the voltages involved, insulation is not a problem. A large number of plugs and sockets are required, and a cheap and convenient supply was found in old octal-based tubes and sockets. Eight octal tube sockets are mounted around the 16-pin DIP socket which is mounted on a small subpanel of 0.1-inch matrix Vero board. Each pin is connected to a length of thin, insulated, flexible wire, long enough to reach easily to any socket, this lead being terminated by soldering into a tube pin. These pins are removed easily from the plastic bases of old tubes by squeezing the base in a vise until it splinters, and unsoldering the wire to free the pin. The pins can be used as they are, but are easier to handle if shrouded. A simple way to provide a grip for handling is to embed the pin in a piece of Plexiglas or similar tubing, melting the tube and moulding it firmly around the root of the pin. A convenient source of such tubing is the bodies of many ball-point pens which are commonly made of a thermoplastic material that softens when heated and hardens again on cooling. If enough old pens are available they give scope for color coding the plugs, e.g., by making odd numbers and even numbers different colors to facili-

tate identification when setting up a circuit. The plastic grips also help in preventing accidental short circuits between unused leads hanging over the edge of the panel. One or two double-ended jumpers are sometimes useful and also could be colored differently. Starting at the top left-hand socket and moving counterclockwise, the facilities available are

1) V_{cc} – The full supply voltage of +5 volt stabilized.

2) V_{cc} through 1 kΩ – Full positive voltage fed through a 1000-ohm resistor to supply "pull-up" voltage for unused gate inputs, input bias, etc. It also provides a load for an open collector device such as a 7401. This socket is divided into two groups of four contacts, each fed through a separate resistor in case more than one such supply is required at the same time.

3) V_{var} – Part of this socket is connected to the slider of a potentiometer across the supply to derive a variable voltage for plotting transfer functions, testing Schmitt triggers, etc. The other part of this socket, labeled "CL" is fed from a flip-flop actuated by the push button similarly marked and provides positive-going pulses for clocking or triggering, resetting counters, etc.

4) Input – This socket is wired in four groups of two, each group providing a different input signal namely (a) ⌊‾ A positive-going voltage step when the TEST button is pressed, returning to zero when the button is released. (b) ‾⌊_ A negative-going voltage, the reverse of a, above, useful if working with negative logic. (c) _⌊‾⌊_ A positive-going pulse of less than one-microsecond duration each time the TEST button is pressed. (d) EXT. Coupling point for injecting an external signal. The object of using cross-coupled gates (part 7400) to form a flip-flop circuit to generate changes in input voltage in place of a simple switch is to avoid contact bounce and the resulting multiple pulses. The flip-flop is triggered on the first impulse and remains set until the center contact of the switch returns to the normally closed contact, when it resets. A simple push contact would probably suffice for switch CL, but as there were two further gates available in the 7400, they were used. The switches themselves are formed from changeover contact sets taken from an old key switch and operated by plastic push buttons through the panel.

5) V_o – This is the negative side of the supply.

6) V_o through R – A choice of two values of hold-down resistor is provided.

7) Couple – The individual sockets are grouped 3-3-2 to allow interconnections or cross coupling.

8) Output – This couples the output pin of the IC in use to the internal HI-LO indicator and provides a connection point for an external indicator or meter if required. The indicator uses a hex inverter (7404) with a general-purpose npn transistor and two LEDs, the circuit, being taken from an article in *QST*.[1] Separate LEDs light to show a "high" or a "low" state and both remain out if the connection is open-circuit, but any suitable logic-probe-type circuit can be used.[2] On occasion it may be more convenient to plug in to the OUTPUT socket a lead with a probe tip and explore the terminals of the IC, e.g., if looking for A, B, C and D outputs on a counter chip such as a 7490 to check operation after a given number of input pulses.

The 7400 and 7404 with the associated components are mounted on a small subpanel of Vero board below the main panel. The only other items required are a small piece of thin, stiff celluloid to assist in inserting the ICs in the socket, and the odd resistor and capacitor are useful for extending the time constant of "one-shot" devices such as 74121 when testing, to render the operation slow enough to be visible on the indicator.

Operation

A data book, such as that published by Texas Instruments,[3] is very useful when setting up and testing, giving a top view of the internal "blocks" and pin connections, with truth tables where appropriate, and also giving many test circuit configurations. By way of illustration, brief details for testing a few common ICs of the "74" series are given below but it is easy to devise tests for other types from first principles.

NAND Gates – (e.g., 7400, 7410, 7420, etc.) Each gate and input can be tested separately by applying input voltages and observing the output change state. All inputs must be high to force the output low. Low at any input will result in a high at the output, but multi-input gates can be tested in pairs by coupling one input of each gate directly to the output of the other (use COUPLE socket for one connection and OUTPUT socket for the other) and applying a pulse to a free input of each gate alternately to toggle the resulting flip-flop (use INPUTS ⌊‾ and ‾⌊_). Any unused inputs should be held positive (V_{cc} through 1 kΩ). When testing open-collector gates such as 7401, etc., connect OUTPUT to "V_{cc} through 1 kΩ" to provide a load. Transfer functions can be observed by using V_{var} to provide a variable input voltage.

NOR Gates – (e.g., 7402) The same basic principles apply.

Hex Inverters – (e.g., 7404) Couple three sections in series; the output state should be the opposite of the input. Repeat for the other three sections.

Counters – (e.g., 7490, 7493, etc.) At least one of each pair of reset inputs of 7490 must be low for count to proceed, both of one pair taken high will reset to 0 or 9 as appropriate. A output will go high and low on alternate pulses applied to A input. D output will change state after 5 pulses applied to BD input. Check for appropriate levels at B and C outputs. Similar principles apply to 7492, 7493, etc., counting chips.

Latches – (e.g., 7475) While clock input is held high, the output follows the state of the input but freezes at the last state when the clock goes low, irrespective of the input state. Check each channel separately.

Decoders – (e.g., 74141) Apply appropriate voltages to A, B, C, D inputs as per truth table and check that only the correct output is low, the others being open circuit.

Flip-Flops – (e.g., 7470, 7472, 7473, etc.) With no input to J or K (for 7470 J and K should be held low) pulses applied to clock input change output state (Q) alternately (÷ 2). Any J input held low will hold Q high. Any K input held low will hold Q low. A low applied to "preset" forces Q high; a low applied to "clear" forces Q low. Note: For 7470, preset and clear function only when clock is high; for 7472, preset and clear are independent of clock. For 7473, clear is independent of clock.

One-Shot – (e.g., 74121) Additional timing components are necessary to slow down operation to render it visible on indicator. Connect 10-kΩ resistor between pins 11 and V_{cc} and 1-μF capacitor between pins 10 and 11. With inputs A_1 and A_2 held low, a pulse applied to input B will drive output Q high long enough for a flash to be seen at the high lamp. Test A_1 and A_2 as per truth table. QST

Footnotes

[1] Rogers, "Vest-Pocket Logic Probe," *QST*, Aug., 1972.

[2] Williamson, "Simple Logic Tester," Circuit Ideas, *Wireless World*, (issue unknown, p. 379).

[3] Texas Instruments Semiconductor Components, *Data Book Two*.

Strays

I would like to get in touch with . . .

□ anyone with information on the founding date of the Arctic Amateur Radio Club, KL7KC, Fairbanks, AK. Original club records were destroyed by fire many years ago and the group is trying to learn its history. Allen Barnett, KL7IGT, Arctic Amateur Radio Club, P. O. Box 81389, Fairbanks, AK 99708.

Adapting the KWM-2 for Radioteletype Operation

Operating RTTY with a commercial ssb transceiver results in a rats' nest of cables and patch cords which must be switched and swapped when changing modes. Send the rats packing! Owners of all makes of equipment will find the information valuable — it's not "for Collins only."

By J. Don Harris,* W9GUM

Like most ssb transceivers, the Collins KWM-2 was not designed for RTTY (radioteletype) operation. Although the transceiver may be used for RTTY without modification, doing so results in a substantial loss of operating convenience. It is necessary to change cables to and from the tuning unit when going from RTTY to either ssb or cw. This article describes a series of modifications that allow convenient RTTY operation, while retaining full normal operation. The ideas presented here will appeal to owners of other makes of transceivers as well.

The best starting point for any modification of this nature is to determine what recommendations the manufacturer may have. Manufacturer's suggestions need not be followed to the letter, but they may provide the owner with several "dos" and "don'ts" concerning the changes that the owner might not otherwise be aware of. For example, some transceivers may lack sufficient carrier and opposite-sideband suppression to permit use of the techniques advocated by Collins and used in this conversion.

The best starting point . . . is to determine what recommendations the manufacturer may have.

In essence, Collins' recommendations were as follows:

1) Use audio frequency-shift keying (afsk) for transmitting. The transceiver should be operated in the lower-sideband (lsb) mode, with the 1275-Hz mark and 2125-Hz space tones derived from a low-distortion audio oscillator.

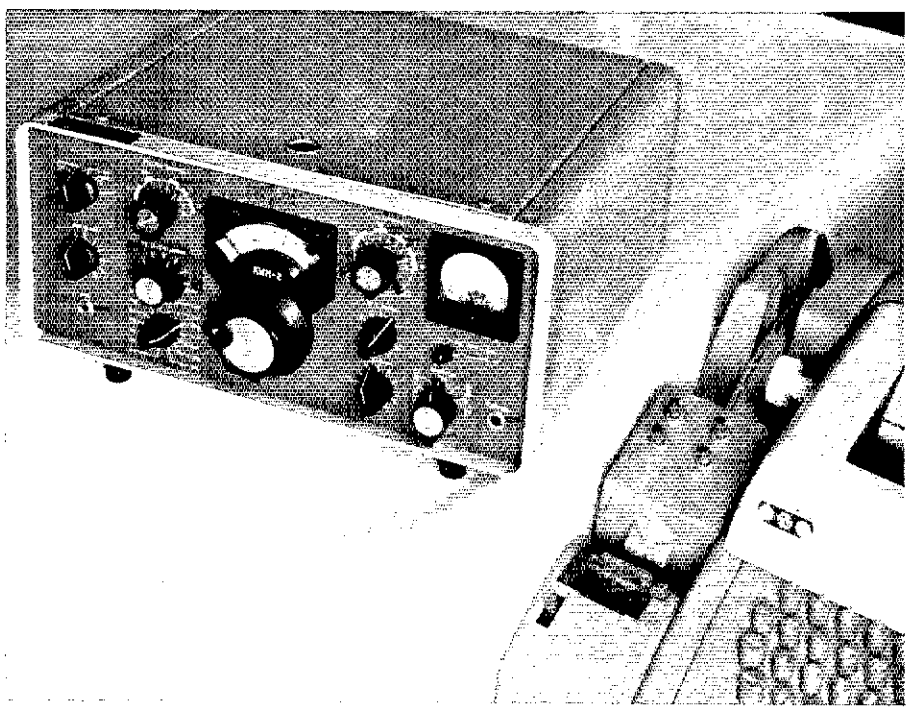
A fan should be used to cool the driver and PA tubes while transmitting, because of the continuous duty cycle of RTTY.

These so-called low tones are preferred over the standard mark and space frequencies of 2125 and 2975 Hz, because the narrow bandwidth of the mechanical filter used in the KWM-2 will attenuate the standard space frequency. Although shifting the VFO frequency to obtain fsk is suitable for Collins S-Line equipment, complex transmit-receive switching in the KWM-2 makes this method undesirable.

2) To assure the transmitted signal complies with FCC regulations specifying maximum bandwidth, carrier and opposite-sideband suppression should be adjusted for greatest attenuation.

3) The mark and space filters in the demodulator, or tuning unit, should also be adjusted to accept the lower audio frequencies.

4) A fan should be used to cool the driver and PA tubes while transmitting, because of the continuous duty-cycle of RTTY.[1]



*5051 W. Jackson Blvd., Chicago, IL 60644

[1] "RTTY Operation of the KWM-2/2A and S-Line Equipment," Collins Radio Co., Third edition, September, 1965.

All recommendations were followed except the one concerning shifting of the audio tones. Doing so would involve having separate afsk generators, since I also operated RTTY on vhf using the standard tones. Retuning the filters in the tuning unit was also undesirable. Further, the harmonic relationship between the standard audio tones allows better copy under poor receiving conditions than do the lower-frequency tones. If the lsb BFO crystal were replaced with another of frequency 1 kHz farther from the filter passband, this would effectively shift the audio response of the transceiver from 300-3200 Hz to 1300-3300 Hz and place the space frequency well within the passband of the mechanical filter.

While I had no intention of selling my KWM-2, I did not wish to reduce its resale value significantly, so any holes to be drilled would be small, and on the chassis only . . .

Frequencies below 1300 Hz are attenuated by the filter, a big help in rejecting interference.

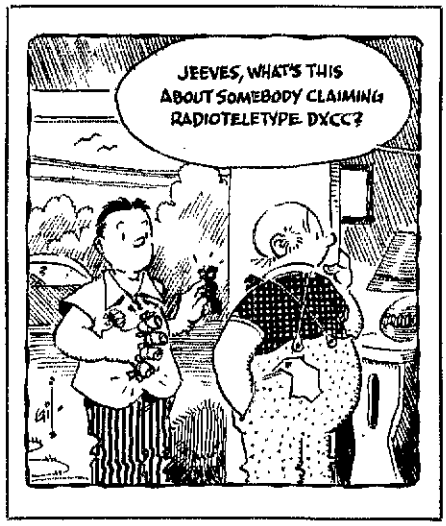
Physical Changes

While I had no intention of selling my KWM-2, I did not wish to reduce its resale value significantly, so any holes to be drilled would be small and on the chassis only, not on the front panel. Wishing to retain the normal features of the transceiver only complicated things. Because I wanted access to all the major operating controls, any switches added had to be on the front panel, not hidden inside.

The Waters Q-multiplier and Collins noise blanker were already installed, leaving few front-panel controls to which another function could be added.

Power . . . was derived from the receive-transmit 275-volt bus . . . allowing the use of any . . . power supply designed for use with the KWM-2.

The noise-blanker level control, formerly concentric with the receiver rf gain control, was moved to be concentric with the mic gain control. A new potentiometer incorporating a push-pull switch was used to replace the rf gain control; the switch is used to transfer the KWM-2 from normal lsb operation to RTTY. A 452.650-kHz crystal was installed to be the RTTY BFO crystal and selection between it and the original lsb BFO crystal was accomplished with a sensitive reed relay. A second reed



relay was used to switch the microphone amplifier input from the mic jack to a phono connector installed in the KWM-2, allowing the operator to change from ssb to RTTY without the nuisance of swapping cables. Power for the relays was derived from the receive-transmit 275-volt bus, rather than the filament line, allowing the use of any 6-, 12-, 24- or 115-volt power supply designed for use with the KWM-2. The switch on the new rf gain control actuates the relays. The wiring of the EMISSION switch was modified to allow RTTY operation only when the switch is in the LSB position.

The modified KWM-2 has proved to work very well in RTTY operation. The modifications were worth the time and expense involved. . .

This interlock feature allowed an additional operating convenience because the switch on the rf gain control selects a narrow audio filter with the EMISSION switch in the cw position. In this case, the switching was by means of a relay connected to the receiver B-plus line, so the filter is in the audio circuit only in receive and does not interfere with the sidetone oscillator while transmitting.

The frequency tolerance of the new crystal used for the RTTY BFO is not critical. A crystal having a frequency tolerance of .01 percent, mounted in an HC-6/U holder with wire leads was ordered, although a frequency tolerance of .02 percent would serve the purpose. The reed relays used were Magnecraft No. W-104-MX-4, with a coil resistance of 5000 ohms and require a pull-in current from 5 to 9 mA. Reed relays are preferred for crystal switching to minimize the effects of stray capacitance, but miniature crystal-can relays with similar coil specifications may be used for the audio switching.

Setting Up

Collins recommends that the final amplifier plate current not exceed 230 mA during continuous carrier operation. As previously noted, a fan should be used to cool the driver and final amplifier tubes. Before using the modified transceiver, the VFO sideband shift, carrier balance and first mixer balance should be checked and adjusted if necessary, with the transceiver in the ssb mode. These adjustments are detailed in section 4 of the KWM-2 manual.

Collins recommends that the final amplifier plate current not exceed 230 mA during continuous carrier operation.

When the EMISSION switch is in the LSB position, the unit is switched from ssb to RTTY operation by pulling out the rf gain-control knob, thus applying power to the changeover relays. During RTTY operation, receive-transmit switching is accomplished by means of a switch mounted on the teleprinter keyboard. This switch controls a relay which has contacts that ground the KWM-2 PTT line and control the operation of the tuning unit and afsk oscillator.

RTTY operation presents one problem with the transceiver that would not occur with a separate receiver and transmitter. A dual function tube, V11, serves as second microphone amplifier and BFO. Leakage from the amplifier into the BFO is enough that the afsk signal severely interferes with a received signal unless the afsk oscillator is turned off while receiving. During cw operation, the microphone amplifier stage is cut off with a high negative bias, but the low average power of a voice signal made this unnecessary during ssb operation.

One contact of the relay that switches the tuning unit and transceiver from transmit to receive is used to open the afsk output from the tuning unit when receiving. Disconnecting the afsk oscillator makes it unnecessary to disable the VOX when operating RTTY. I have found it convenient to monitor the afsk signal and rather than add another relay function, I use a separate audio amplifier and speaker.

The modified KWM-2 has proved to work very well in RTTY operation. The modifications were worth the time and expense involved, because they solve the problem of interfacing the transceiver with the tuning unit, and allow an easy transition from ssb and cw to RTTY operation. QST

PEP Wattmeter — à la Heath

See how much pep your transmitter really has. With the addition of this circuit, use your existing rf wattmeter for measuring peak power.

By George D. Rice,* W6OGR

Two amplitude values are associated with the modulation envelope of a single-sideband signal. One is the *maximum or peak amplitude* (PEP), the greatest amplitude reached by the envelope at any time. The other is the *average amplitude*, which is the average of all the amplitude values contained in the envelope over some significant period of time, such as the time of one word of speech.

Envelope peaks occur only sporadically during voice transmission, and have no direct relationship to meter readings. The meters respond to the amplitude (current or voltage) of the signal averaged over several cycles of the modulation envelope. This is true in practically all cases, even though the transmitter rf output meter may be "calibrated" in watts. Unfortunately, such a calibration means little in voice transmission since the meter can be calibrated in watts only by using a sine-wave signal — which a voice-modulated signal definitely is not!

But, have faith, readers, there is a way to modify your existing power meter to read PEP. Yes, it's true. With a few modifications incorporated into your station wattmeter, it is possible to read your transmitter peak-power output. I will confine my discussion to applying the modification to the Heath HM-102 wattmeter, but it should be possible to use this circuit in most any power meter.

*5001 Milton St., San Diego, CA 92110

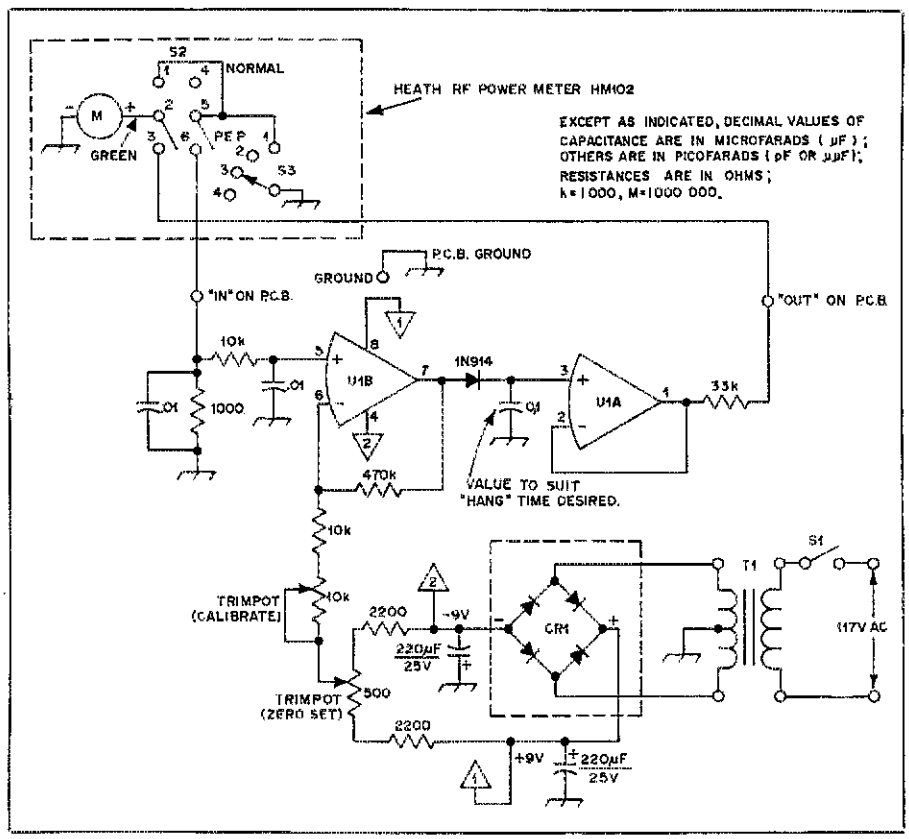


Fig. 1 — Schematic diagram of the amplifier/rectifier circuit added to the Heath HM-102 wattmeter. The upper left portion of the drawing indicates the location of normal/PEP read-select switch, S2, and wiring of the meter and function switch.

CR1 — 2-A, 50-PIV bridge rectifier, Radio Shack part number 276-1151 or equiv.
S1 — Spst toggle switch, Radio Shack part number 275-612 or equiv.
S2 — Dpdt toggle switch, Radio Shack part number 275-614 or equiv.
T1 — 117-V ac primary, 12.6-V ct, 100-mA secondary, Mouser Electronics part number 81FG100 or equiv.
U1 — Dual op-amp IC, type LM-1458 or equiv.

Design Objectives

One of the desired design features of the wattmeter modification circuit was not to impair the performance of the HM-102 as offered by Heath. This is accomplished by removing the wire from the positive terminal of the meter and terminal 1 of the function switch (S3 on the HM-102), and then installing the new pc board (see Fig. 1). A front-panel switch provides for returning the power meter to its original operating configuration (before modification).

Circuit Description

The circuit is designed around an LM-1458 IC. The IC requires a −9 and

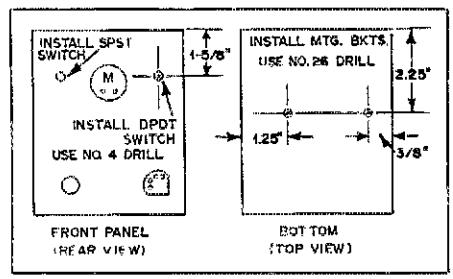


Fig. 2 — Hole-drilling template (not to scale) for mounting the spst and dpdt toggle switches on the HM-102 front panel, and for the pc-board mounting brackets on the rear panel of the wattmeter.

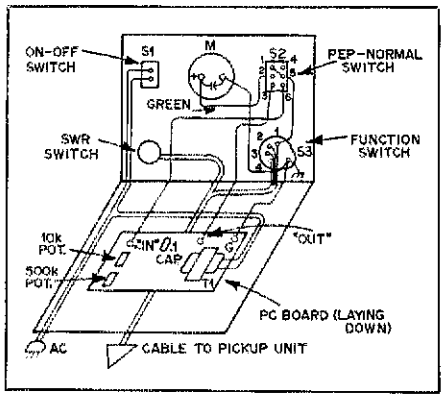


Fig. 3 — Guide for suggested installation of the amplifier/rectifier pc board into the HM-102.

+9-volt power supply for proper operation. Current passing through the diode (1N914) between pin 7 of U1B and pin 3 of U1A charges up the 0.1-μF capacitor at pin 3 on U1A, causing the meter to delay from returning to zero long enough for a reading at the peak-meter movement. The peak presentation falls off just slow enough so that between words the meter movement is just starting its downward excursion when the next spoken word "kicks" it back up to the peak-reading value.

Various values of capacitors were tried and one having a value of 0.1 μF provided a delay suitable for my purposes. However, if a longer or shorter delay is desired, a different value of capacitor can be substituted to obtain the delay time you want. It might also be worth mentioning here that I did find some noticeable differences in time delay from one LM-1458 to another. Most performed about the same with the 0.1-μF capacitor. I did find a few that required a 0.2-μF capacitor to give the time delay I liked.

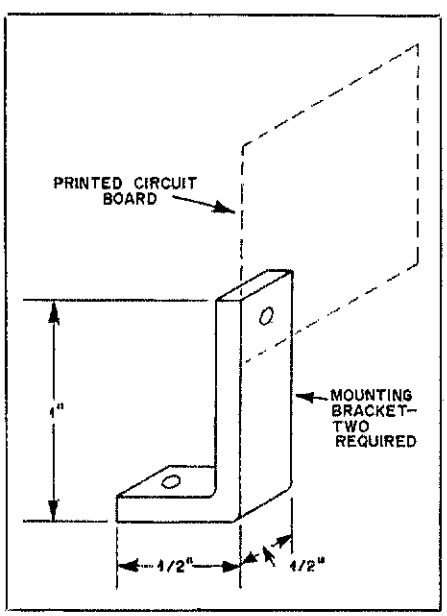


Fig. 4 — Dimensions of the mounting bracket for the pc board.

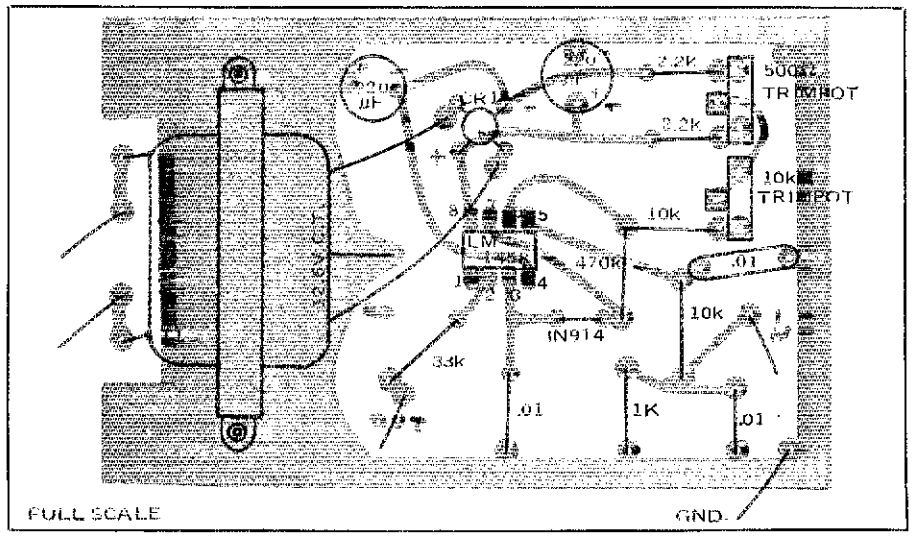


Fig. 5 — Foil-side, full-scale pattern of the pc board. Circuit board is single-side glass-epoxy material. Grey represents copper.

Modification

Proceed with the installation of the amplifier-delay circuit board in the HM-102 as follows:

The green wire running from function switch S3 to the meter should be removed from the function switch and rerouted to terminal 2 on S2 (see Fig. 1). A new wire should be installed from function switch S3 to terminals 5 and 1 of front-panel-mounted switch, S2. Install a wire from S2, terminal 6, to the "in" connection on the amplifier printed circuit board. Next, solder a wire from terminal 3 on S2 to the "out" connection on the pc board.

When S2 is in the up position the HM-102 functions in its "normal" fashion just as if no modification had taken place. With S2 in the down position, voltage to the amplifier is routed via terminals 5 and 6 on S2, and is returned through a 33-kΩ resistor to the meter via terminals 2 and 3 of switch S2.

Zeroing the Meter

Before soldering the 0.1-μF capacitor in the circuit, the 500-Ω trim pot (zero set control, Fig. 1) should be adjusted for a zero reading on the HM-102 meter. After the meter has been adjusted to read zero, the 0.1-μF capacitor may be soldered in place on the pc board and any fine adjustment, if required, can be made later. With the resulting delay times of this circuit, it is nearly impossible to make the initial zero adjustment with the 0.1-μF capacitor installed.

Calibration

Assuming your HM-102 was calibrated and in correct working order before the modification was started, only one additional adjustment is required to complete this modification.

The 10-kΩ pot is used for calibration of the wattmeter in the peak-power mode, and must be adjusted to make the peak reading (S2 in the PEP position) equal the normal reading (S2 in normal-reading position) while using the transmitter cw output as a test signal. To make this adjustment, put your transmitter in the cw mode. Place the power meter controls in the normal (up) position. Key the transmitter and read the power level indicated on the meter. Next, switch to the peak-reading mode (S2 in the down position). Key the transmitter again, and adjust the 10-kΩ calibration control until you obtain a meter reading equal to the meter reading you observed in the normal position. Check the meter zero and if necessary adjust the 500-ohm pot for zero on the meter. Repeat the calibration procedure as many times as necessary to obtain the correct reading.

One final note: I have a long-wire antenna. The L matching network for this antenna is located inside the shack, and when I use this antenna the rf field is too much for the IC amplifier to handle, causing the meter to malfunction. However, I have a few radio amateur friends who have built this modification into their HM-102 power meters and are more than delighted with the results. They have not experienced any rf problems to date (none of them use long-wire antennas).

I wish to give credit to Bob Peterson, K6YHJ, for providing the idea and designing the circuit for the unit described herein, and for answering hundreds of my questions, and for his help in debugging the circuit. Without his help and guidance this project would not have been possible. QST

Measuring Transmitter Power

Need to know more about measuring dc input and rf output powers of a transmitter PA stage? Use these practical methods and stay legal!

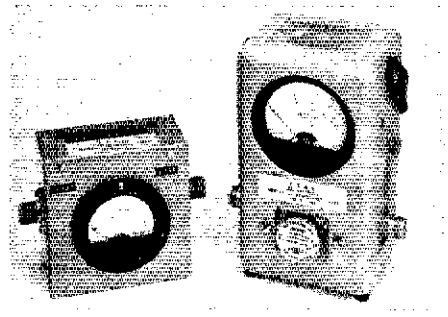
By Doug DeMaw,* W1FB

Some amateurs are confused by the technical terms and methods attendant to measuring transmitter power accurately. The matter of rms and peak power seems to be particularly troublesome when viewed by newcomers to our pastime. It is the purpose of this presentation to define the terms and illustrate how to make power measurements which will satisfy FCC regulations. But even if the amateur does not operate with full legal power capability, he is apt to be curious about the efficiency of his final amplifier stage, even at the QRP level. This discussion relates to all rf-power categories — milliwatts to megawatts.

DC Input Power

Although the FCC has required that the commercial services conform to

*QST Technical Editor



power-output standards over the years, we amateurs have been regulated by a rule which called for measuring the dc input power to the last stage of the transmitter. A paradox has existed because of that rule: Various classes of amplifier operation (AB, B and C) provide different efficiency profiles. This means that for 1 kW of dc input power ($P = E \times I$) we obtain various amounts of power output from the amplifier because the efficiencies aren't the same. In practical terms a Class C amplifier is 70 percent efficient (700-W output for 1 kW of dc input power). A Class B amplifier might deliver 600 W (60 percent) of output for the same dc input (1 kW) if it was operating at peak efficiency. But a Class AB stage, with its fairly poor efficiency, might deliver only 500 W (50 percent) of output.[1] Of course, other matters figure into the efficiency of the stage, such as the tank-circuit design and impedance-matching techniques, to say nothing of tube efficiency versus operating frequency. Nonetheless, the dc input-power rule can be regarded as somewhat restrictive when comparing the classes of amplifier operation. Conversely, power-output measurement would give all operators a similar break at maximum legal power amounts, irrespective of the operating class of the amplifiers being used.

The present rule we must follow calls for determining the maximum dc input power to the last stage of the transmitter by multiplying the resonant plate current in amperes by the plate voltage. Thus, for a pair of 3-500Z tubes operating at 1-kW dc input at 3000 plate volts, the plate current would be 0.333 A ($I = W/E$). The exception to this method is seen in the case of a grounded-grid final amplifier, where the dc input power to the driver stage must be included with that of the PA stage. That procedure is necessary because a substantial amount of the driving power appears in the output of the final amplifier.

Measurement of dc input power is perhaps the simplest and least expensive technique when compared to measuring rf output power. All that is required is a system for metering plate voltage and current at the last one or two amplifier stages. Cw power input is measured while simply holding the key closed.

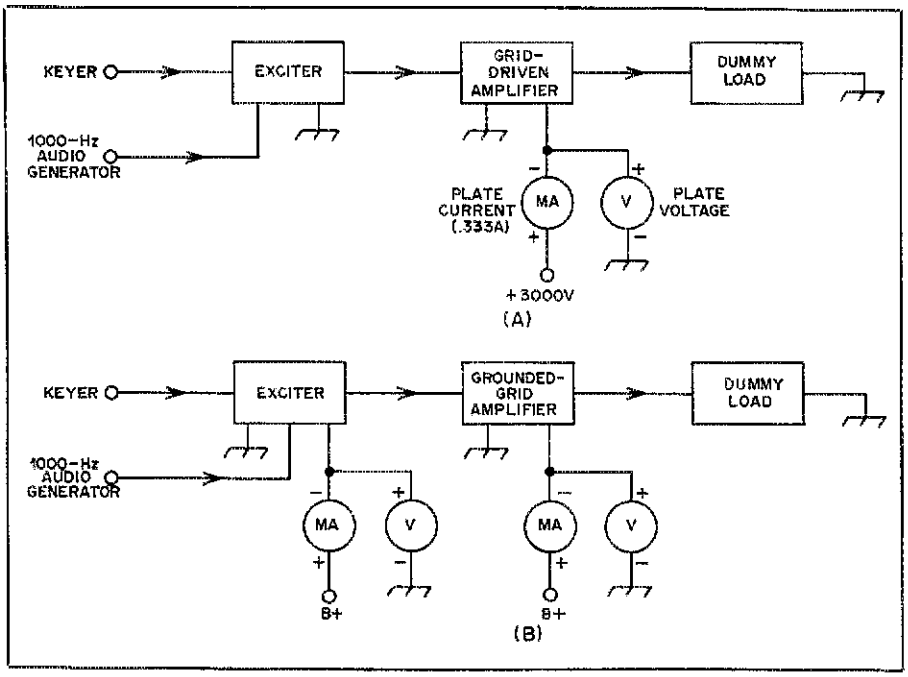


Fig. 1 — Measurement of dc input power to the last stage of a transmitter. A grid-driven PA stage is represented at A. A cathode-driven (grounded-grid) system is illustrated at B. Dc input power for the driver and final amplifier must be combined when calculating maximum permissible dc input power.

[1] Footnotes appear on page 34.

The situation changes somewhat when the amateur measures dc input power for ssb operation. Dc instruments do not respond quickly enough to record instantaneous peak levels of plate current, nor can they follow such rapid changes. Most dc meters used by amateurs have a time constant of 0.25 second or less, which satisfies Part 97.67 of the FCC regulations, but the instruments simply won't record and follow peak currents caused by voice modulation.

A rough approximation of correct amplifier adjustment can be effected by tuning for 1 kW of input power under steady carrier conditions, or by applying a single sine-wave tone of approximately 1000 Hz to the microphone input circuit. The procedure will simulate the *average* ssb input power, and with most human voices the PEP (peak-envelope power) will then be 2 kW (2:1 ratio). However, variations in voice characteristics can lead to ratios as great as 3:1 peak to average power. It can be seen from the foregoing that existing methods for power measurement are approximations, indeed.

Needless to say, all tuning adjustments should be made while the transmitter is delivering power to a dummy load. On-the-air testing can cause needless QRM. Fig. 1 illustrates the methods we have discussed for dc input-power measurements. It is assumed that all examples relate to amplifiers which contain tubes or transistors which are capable of the power amounts specified, thereby assuring normal tube life, minimum signal distortion and a bandwidth which conforms to FCC regulations.

Power-Output Measurements

The most common method for measuring PEP output is to determine the average power taken by the load, then multiply it by 2. It shall be assumed in this discussion that the signal-to-distortion ratio of the output energy is small. In the case of a properly designed linear amplifier which is operated well within its ratings, the distortion products should be well below one percent of the signal power. For this reason the measurement techniques to be treated here are suitably accurate for amateur work.

Industry recognizes the National Bureau of Standards power-measuring method as the accepted one (*NBS, Circ. 536,* March 16, 1953). This is called the calorimetric technique. While in operation the dummy load is cooled by a liquid which flows through it. Determination of average power is effected by measuring the rate of flow of the cooling agent while observing its temperature rise. It is necessary to know the specific heat and specific gravity of the liquid. When these factors are known, average power dissipated in the load can be computed by $W_p = 264QgS\ (T2 - T1)$, where W_p = average power dissipated in the dummy load, Q = the rate of coolant flow (U.S. gpm), g = specific gravity of coolant, X = specific heat of the coolant, $T2$ = outlet temperature of cooling agent in degrees C, and $T1$ = the inlet temperature of the cooling agent in degrees C.[2] Needless to say, the accuracy of this system is dependent upon the precision of the temperature-differential and rate-of-flow measuring apparatus. The calorimetric method is beyond the capability of most amateurs and is not recommended. However, the subject is worthy of mention to establish what the standard method is.

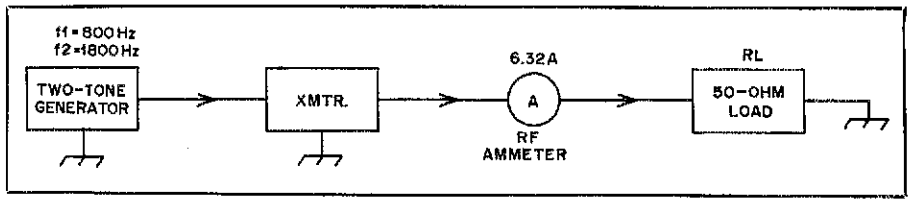


Fig. 2 — An rf ammeter can be used to determine rf power output.

RF Ammeters

Thermocouple types of rf ammeters provide one of the simplest means for measuring rf power output. They must be used with a load of known resistance and must be designed for accuracy over the frequency range of use. Most rf ammeters are unsuitable above 50 MHz. Notable among the problems encountered when using them at vhf is the matter of SWR. The instrument disturbs the line, causing an impedance "bump" which is not desirable. However, one of the useful features of the rf ammeter is that it responds to rms current for any envelope shape. Because of this it can be used to measure PEP when a two-tone test signal is applied to the ssb transmitter. Power output is computed in the standard manner, $W = I^2R$. Fig. 2 illustrates the technique just discussed.

Voltage-Resistance Measurements

Another method which can be used to measure output power is to determine the rf voltage across a dummy load of known resistance. An rf probe can be used in combination with a VTVM to measure the rms voltage present across the load resistance. In this instance $W = E^2R$. Accuracy will be within ±10 percent if the rf probe described in the measurements chapter of the *Handbook* is used with a VTVM which has a 10-megohm input characteristic. The waveform of the rf energy being measured must be pure if accuracy is to be expected. Cw power output can be measured by applying a steady carrier to the dummy load. For ssb power-output measurements, apply a 1000-Hz single audio tone to the modulator and measure the rf voltage across the load. Multiply the computed power (in watts) by 2 to obtain PEP.

An oscilloscope can be used to read pk-pk (peak-to-peak) rf voltage across

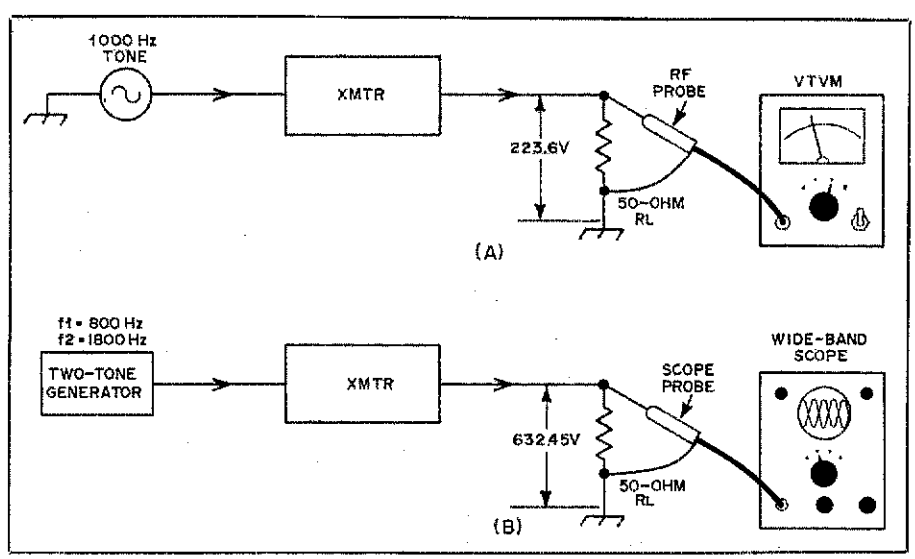


Fig. 3 — Rf power output can be measured by means of an rf probe, known-value resistive load, and VTVM (A). A scope, as shown at B, will provide a pk-pk voltage reading but suffers the limitations discussed in the text.

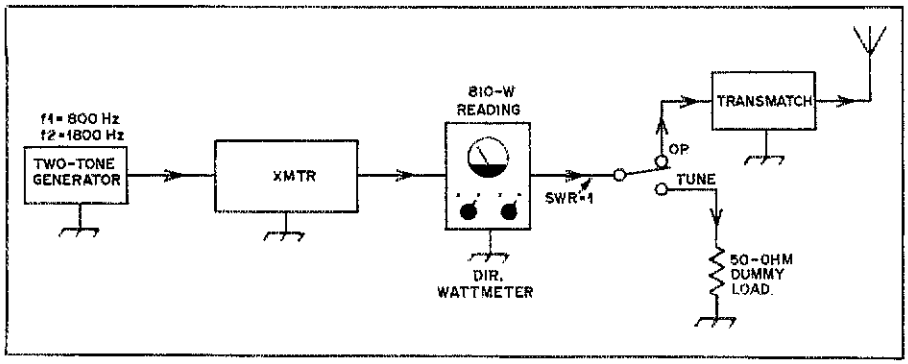


Fig. 4 — A directional wattmeter can be used to measure average output power. The equation permits calculation of PEP from the reading obtained during two-tone testing.

the load. However, the instrument must be capable of full response at the operating frequency of the transmitter (vertical amplifier bandwidth) and the instrument must be capable of being calibrated to read the displayed waveform in pk-pk voltage. A scope is able to respond to instantaneous voltage peaks (unlike a dc current or voltmeter), so PEP can be determined by the scope reading if the resistance of the dummy load is known. To obtain PEP in watts see Fig. 3. During this measurement a two-tone audio signal is supplied to the speech amplifier of the transmitter. The primary limitation in using a scope is that the display-tube face is too small to provide a well-defined voltage reading (resolution). As an example, a 2-kW PEP signal is applied to a 50-ohm load, resulting in a pk-pk voltage reading on the CR-tube face of 632.45. The accuracy of such a measurement would be rather absurd, thereby leading to possible unlawful operation. Furthermore, most scopes aren't set up to measure voltages of that magnitude. Fig. 3 shows the methods for voltage-resistance power measurement.

RF Wattmeters

When coaxial transmission lines are used to feed an antenna system or dummy load, directional wattmeters can be used to measure output power. Such instruments are available from Heath, Drake, Bird and others. It is not a difficult job to construct one's own rf wattmeter. Details for several versions were described in *QST* for December, 1969. A theoretical treatment of the subject was given by Bruene.[3,4]

These in-line instruments sample the forward and reflected power in a coaxial line. When an SWR (standing-wave ratio) condition exists, the power delivered to the load is determined by subtracting the reflected power from the forward power. The SWR is caused by a mismatch in the system *after* the wattmeter. Because some rf wattmeters do not have an expanded meter scale that enables the user to obtain accurate reflected-power readings (in watts) when the SWR is fairly low, best accuracy will be obtained when an SWR of 1 is established.

The in-line rf wattmeter should be designed for the characteristic impedance of the transmission line with which it will be used. That is, a 50-ohm instrument should not be used in a 75-ohm line and vice versa. Rf wattmeters of the foregoing variety can be purchased or built for either line impedance. The *ARRL Electronics Data Book* contains two nomographs for computing SWR when the forward- and reflected-power amounts are known (page 84). One chart is for 2-kW maximum. The other is for 20-watts maximum.

When a directional in-line wattmeter is used with a resonant load (antenna), harmonic energy in the transmitter output must be held to a very low value. The load will not accept harmonic energy, thereby causing a false reflected-power reading at the operating frequency, even though the actual SWR may be 1:1. Conversely, a resistive dummy load will accept all rf energy over the range of its characteristic resistance. It can be seen that for accurate power-output measurements into an antenna system, the harmonic, submultiple and spurious energy should be 40 dB or more below the peak power level of the desired signal.

A desirable feature of directional wattmeters is that they can be designed for use from low frequencies to well above the uhf spectrum.[5] An oscilloscope would have to be a complex and expensive instrument to be suitable over the same frequency range. As stated earlier, rf ammeters aren't suitable above 50 MHz.

The detection circuits in directional wattmeters provide an average-power readout in watts. The meter scale is calibrated in watts for whatever full-scale power amount the unit is designed to accommodate. These instruments are calibrated for single-frequency signals. If multifrequency signals are applied to them (two-tone or voice), the readout is proportional to the *average* voltage or current of the rf envelope. However, PEP output (two-tone test signal) can be determined by using a simple equation: $W_{PEP} = P_{AV} \cdot (\pi/2)^2$. The instrument is capable of reading out only 81 percent of the real power in a two-tone signal: $2(2/\pi)^2$. This is founded on the premise that the two-tone signal is not distorted.

It is possible to add time-constant networks to directional wattmeters for the purpose of approximating the PEP. Output from the detector circuit (dc) is applied to a capacitor which charges to the approximate peak-signal value, then discharges slowly. Fig. 4 illustrates the methods for power measurement related to directional wattmeters.

Summary Remarks

Based on this examination of the techniques available to the amateur for measuring transmitter output power, the directional wattmeter seems to emerge as the winner. When used in combination with a Transmatch (network for maintaining a matched condition between the transmitter and transmission line) the operator can maintain an SWR of 1, and depending upon the Transmatch design can reduce harmonic energy to the load (a low-pass or bandpass type of network reduces harmonics). Ideally, the match between the antenna and feeder should be perfect, for a Transmatch used at the transmitter can't correct a problem at the far end of the feed line.

Perhaps it is time for some manufacturer to develop a directional wattmeter which can be used to read both power characteristics — average and peak. Meter scales would be provided for both power characteristics and a switch could be located on the instrument to select an average or PEP response. All that would remain by way of necessary test equipment would be a dummy load and a two-tone audio generator.

Under the present FCC rules we must continue to establish legal maximum power limits on dc input power to the last stage or stages of the transmitter. Should the rules change at some future time, power output can be measured as outlined in this presentation.

QST

Footnotes

[1] The theoretical maximum efficiencies of the three amplifier classes are approximately 10 percent higher than the examples given in this text.

[2] Pappenfus, Bruene and Schoenike, *Single Sideband Principles and Circuits*, McGraw Hill.

[3] DeMaw, "In-Line RF Power Metering," *QST* for Dec., 1969.

[4] Bruene, "An Inside Picture of Directional Wattmeters," *QST* for April, 1959.

[5] McMullen, "The Line Sampler," *QST* for April, 1972.

FM-27B S-METER

Add one to your rig!

By Mitchell Stern,* WB2JSJ

The Clegg FM-27B has been one of the more popular two-meter fm rigs in the past few years. This undoubtedly stems from the desire of operators to have fully synthesized radios at their disposal. One feature which is included in almost every commercially made amateur rig except the FM-27B is a relative signal-strength meter. Many will say that they have no use for such a device while working through the local repeaters. However, it becomes a handy tool during transmitter hunts and is a necessity for tracking down the "rf pests" which abound in New York and other large areas. Although this information pertains directly to the FM-27B, you can use the idea for modern receivers of other manufacturers.

The problem in adding an S-meter to the FM-27B is that the entire rf amplifier, limiter and detector stages are all enclosed in two integrated circuits. The output of IC1 (CA3076) contains the i-f signal (455 kHz), fully amplified and already into hard limiting. The output of IC2 (CA3075) contains the recovered audio. Obviously, neither of these points would be the place to monitor relative signal strength. It seemed unwise to monitor any point before the i-f crystal filter due to the other mixing products found at these points. Therefore, it appeared that the only logical spot left was at the input to the i-f amplifier chip, IC1. An attempt to measure the rectified signal level at this input verified what was expected – there was not enough signal level to drive a sensitive meter movement.

Fortunately there are two solutions to the problem. One would be to use a CA3089 i-f amplifier IC, as used in the FM-DX, which has an output for a signal-strength meter. However, the drawback to this is that some major modifications are necessary to get this chip to work in the FM-27B. A second and easier method would be to construct an amplifier to bring the i-f signal up to a level suitable for driving a meter. The details of such a circuit follow.

*7409 Avenue V, Brooklyn, NY 11234

The Circuit

The circuit is a straightforward Class A amplifier design. CR1 and CR2 rectify the amplified i-f waveform to form a pulsating dc waveform. C4 and C5 form a filter to produce a pure dc voltage which is measured on the meter. This circuit could be used, as is, on other receivers, as long as a low-level monitoring point in the 455-MHz i-f stage is used. For use at another i-f (i.e., 10.7 or 11.7 MHz), the reactances of the capacitors would have to be changed accordingly.

Electrical layout and component values are not critical. For mobile use, however, the circuit should be constructed soundly. Each connection should be mechanically solid before soldering. The author's circuit was constructed on a 1-1/4 X 1-1/4 perforated board, using tie-point connectors. As far as components go, everything should be found in the standard junk box. Q1 is a small-signal rf transistor, available in any bargain pack. Any npn device with a beta of 30 or more at the i-f can be used. CR1 and CR2 can be any type of diode desired.

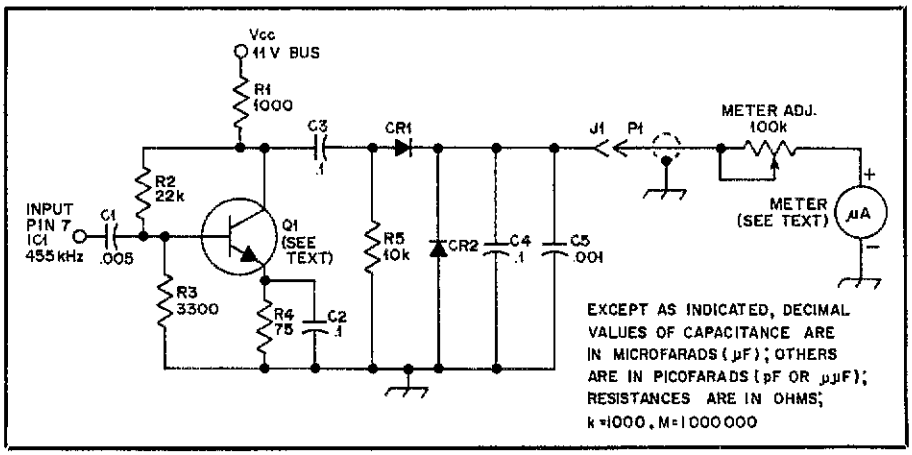


Fig. 1 — Amplifier and metering circuit for the FM-27B. See text for description of parts.

Installation

Mounting of the board inside of the rig was at first a bit perplexing. Mounting it on the back panel near the final amplifier did not seem to be a good idea, considering the strong rf fields at that point. A spot was finally located near the i-f IC on the receiver board. The board was positioned upright and mounted by using a small L bracket at the receiver-board mounting screw.

Voltage for the circuit can come from any of the tie points in the FM-27B that carries the 11-volt regulated voltage used in the receiver. The circuit can operate from as little as 7 volts up to 14 volts, but the voltage should be regulated to eliminate erroneous meter readings caused by fluctuating voltage. After the circuit was connected up to the radio, it was later found, by mistake, that the i-f signal also appeared on the Vcc (pin 7) of IC1 to some extent. Monitoring the signal at this point proved to be a better choice than at the input, where connection of the amplifier circuit caused some receiver degradation. Connection of the circuit to the Vcc pin caused no noticeable loss of sensitivity or increase of spurious signals in the receiver.

The choice of a meter is left to the individual. The output of the detector circuit will vary from 0 to 1 volt at a nominal impedance on the order of 20 kΩ. The impedance can be varied somewhat by means of R5. Hence, a high-sensitivity, high-internal-dc-resistance meter movement is necessary. For best results, a meter in the 20- to 50-μA range should be considered. The internal discriminator meter, unfortunately, will not work very well because of its low sensitivity and internal resistance (100 μA, 400 Ω). A large external meter connected through a jack added to the rear panel proved to be the best for signal-hunting purposes.

The dynamic signal range was excellent. The range from meter threshold to limiting was measured at 0.5 μV to 500 μV. A noisy signal just barely moved the meter whereas a 1-watt Handie-Talkie, 1/2-mile away, in the clear, just barely pinned it. Of course, the true ham will waste no time in calibrating the meter to some system of S units. QST

Product Review

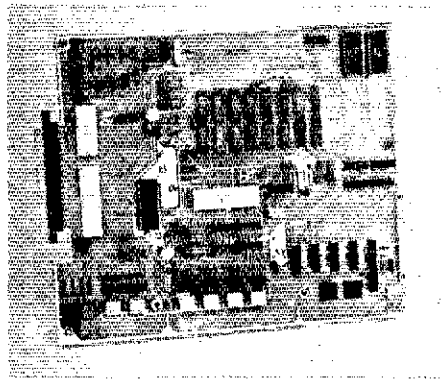
HAL MCEM-8080 Microcomputer

You rush past the wife and head straight for the ham shack; it's late and you've only got five minutes to get set up for your EME schedule with VK3A-. "Darn, I wish I'd left work a little earlier tonight," you grumble to yourself as you furiously search through a stack of computer printouts looking for the one with this week's information on where the moon will be lurking tonight. Time moves along and it's your turn to call, but you still haven't got the dish moved into place. In fact, you don't even know where "in place" is because you can't find the correct printout. "Eureka!" you shout. "I've found the printout!" As you quickly calculate the position of the moon, you realize *you've got the printout for last week*, and a quick glance at the chronograph indicates you won't be talking to VK3A- this week. And since it's the last time the moon will be in the right place for an EME path from your location to Australia until next summer – you're out of luck!

"Oh nuts, I wish I had my own computer so I wouldn't have this problem every time I'm running late for an EME schedule," you pine to yourself. Take heart, the time has come when you *can* have your own computer as an integral part of your ham station! And not only can it keep track of the moon, but it can even control the station antenna steering mechanism so you don't have to go looking for that old-fashioned printout (you still have to do some number crunching to find out the location of the moon, *after* you find the correct printout!).

The development of the large-scale integration (LSI) microprocessor IC has made the home computer a reality. And many experimenters, who up until now had to rely on sophisticated hand-held calculators to do the mathematics and the armstrong method for equipment (machine) control, can get both features in a microcomputer. With the development of the microprocessor chip, microcomputers began to appear in the electronics marketplace, at an unbelievable rate, and they did so in many different configurations and with many design concepts. One of the more popular microprocessor chips is the Intel 8080, and a look at microcomputer advertisements indicates that the 8080 is still the first choice of some microcomputer systems manufacturers.

HAL Communications has made the choice of the Intel 8080A for use in the MCEM-8080 microcomputer system. The 8080A (latest version of the LSI microprocessor IC) is an eight-bit microprocessor IC with a set of 73 instructions. The execution time of these instructions varies from 2 to 9 μs. Intel's 8080A microprocessor IC contains all of the circuitry necessary to address the memory, address input/output (I/O) devices, and manipulate data. The MCEM-8080 microcomputer system is contained on a single pc board (double-sided) and can be used for program development or for specific control applications (such as steering our EME enthusiast's



antenna system). The pc board contains the microprocessor IC, its timing and control circuitry, both read-only-memory (ROM) and random-access-memory (RAM) ICs, and timing and control for I/O interfacing.

Other System ICs

Several ICs are used to support the 8080A and provide some of the necessary circuit functions which make the processor usable as a computer. The type 8228 system controller IC is used both to decode signals from the 8080A and generate the required bus-control signals and to buffer the 8080A data-bus signals. It will also support a single vector interrupt. Timing signals are provided by the 8224 IC with an 18-MHz crystal used with the device to generate the 2-MHz processor timing signals, power-on reset signal and ready-line synchronization pulses.

The standard MCEM-8080 provides for either synchronous- or asynchronous-serial data interface. The software monitor supports asynchronous serial I/O in either Baudot (5-unit) or ASCII (8-unit) codes. A type 8251 universal synchronous/asynchronous receiver/transmitter (USART) IC is used to input and output serial data and a programmable communication interface IC, type 8255, provides parallel data interfacing. A type 555 timer IC is used to generate the serial-data baud rate. The data rate is screwdriver adjustable on the circuit board. The actual 555 clock frequency is four times the baud rate in the ASCII mode and 16 times the baud rate in the Baudot mode.

Two operational amplifiers (both halves of a type 1458 IC) are used as RS-232 drivers and receivers. The serial output of the 8251 USART is directly converted to a ±5-volt signal with –5 volts representing the mark signal condition and +5 volts as space. The output impedance of the circuit is approximately 400 ohms. For input data, an operational amplifier is used as a sense amplifier and level converter. Input voltages greater than +1.0 volt are interpreted to be in the space condition and those less than +1.0 volt as mark. The input impedance is approximately 2700 ohms. This input will properly sense TTL-level signals, as well as EIA RS-232C signals.

Current-loop signals with either 20- or 60-mA mark currents can also be connected to the MCEM-8080. Two optical-isolator integrated circuits are used to convert between the floating current-loop circuit and the RS-232 levels. These sensors are separated so that one can be used for data input and the other for output (separate current loops – full-duplex operation). The two circuits can also be series connected to provide both data input and output on a single current-loop circuit (half-duplex operation).

RAM, ROM or (E)PROM It

The basic MCEM-8080 circuit board is available with 1024 (1 k) bytes of random-access memory (RAM). This memory can be used by the user's programs, but the lower 64 bytes are required for the software monitor program. Additional RAM can be installed on the MCEM-8080 circuit board in the field, but the company recommends factory installation of the ICs. There is space on the circuit board for an additional 1-k RAM, extending the total on-board memory to 2 k. All RAM ICs should be type 8102A-4, a device featuring an access time of 450 ns or less. The use of slower RAM devices is not recommended in the MCEM-8080 microcomputer as they may cause improper operation of the system. Within the processor memory space, the standard 1-k bytes of RAM occupy locations 0 through 1023_{10} (0 through $3FF_{16}$ in hexadecimal). The optional 1-k bytes of RAM are at locations between 1024_{10} and 2047_{10} (400_{16} to $7FF_{16}$ hex). And the software monitor uses RAM locations between 0 and 63_{10} (0 to $3F_{16}$).

Several read-only-memory device options can be used in the MCEM-8080 microcomputer circuit. The system is provided with circuit-board space for 4-k bytes of erasable programmable read-only memory (EPROM) or 2-k bytes of bipolar programmable read-only memory. When the choice of device type to be used has been made, appropriate jumper connections have to be made on the MCEM-8080 pc board. Four socket locations are provided for the ROM – all four ROMs must be of the same type. The ROM occupies consecutive memory locations starting at $32,768_{10}$ (8000_{16}).

Either a type 8708 or 8704 EPROM IC or

HAL Communications MCEM-8080 Microcomputer

Power requirements: ±12-V dc and +5-V dc, available from HAL MCEM-PS power supply.
Programming format: Machine language (hexadecimal) for basic microcomputer.
Price class: $375 at the time of this review.
Manufacturer: HAL Communications Corp., Box 365, 807 East Green Street, Urbana, IL 61801.

3624 PROM ICs can be used on the MCEM-8080 pc board. The 3624 is a bipolar PROM with 512 × 8 organization and is the standard device furnished with the MCEM-8080 microcomputer system. Up to four 3624s can be used on the circuit board with production pc boards jumpered for use with this IC. An 8308 ROM can also be used in the HAL MCEM-8080. This is a mask-programmed version of the 8708 EPROM IC.

Bus Indicators and Control

A number of LED indicator lamps and switches are installed along the front edge of the MCEM-8080 pc board to permit evaluation and control of the processor operation. All of the 8080A microprocessor address buses are displayed on 16 LEDs with the lamps grouped in four-lamp sets, four sets total. Each group of LEDs represents a single hexadecimal (HEX) character, 0 through F_{16}. An illuminated lamp indicates a logic-1 condition. The least significant bit is represented by the right-hand lamp within any of the four-lamp clusters. In a like manner, the right-hand group of four LEDs represents the least significant HEX character.

Eight LEDs, in two, four-LED sets, are used to indicate the state of the processor data bus. And four more LEDs located on the far left end of the pc board indicate the state of I/O read, I/O write, memory-read and memory-write signals from the microprocessor. An illuminated LED indicates which of these operations is in progress.

If you're a glutton for punishment, you can use the manual-data switches and the break-point register switches to manually load programs into the computer (a tedious if not monumental task for even the most simple of programs). Run/stop, manual reset, single step and memory write and output-write switches are also located on the MCEM-8080 pc board.

Connectors for Peripheral and Accessory Interface

There are three connectors used on the basic MCEM-8080 circuit board. These connectors are used for I/O interface, power input, and connection to the universal processor bus. Mating connectors for each are furnished with the MCEM.

I/O connections to the MCEM-8080 are made through a 36-pin pc-board edge connector located on the left edge of the board. All three parallel I/O ports of the 8255 IC are available on this connector as well as connection for serial data. The form of serial data to be used can be selected with jumper wires on the circuit board.

Power connections to the MCEM are made through the 12-pin edge connector located in the upper right-hand corner of the circuit board. Power requirements for the MCEM-8080 are ±12 and +5 volts. And direct connection to the computer address, data and control lines can be made through the 40-pin, universal processor bus (UPB) connector located in the lower right-hand corner of the circuit board. A mating connector and attached ribbon cable are supplied for use of this feature. Connection of options such as additional memory and a keyboard/video display unit is made through the UPB connector.

Several months of using the MCEM-8080 have brought two factors to light for the review: (1) the HAL microcomputer is a versatile and useful accessory in the ham shack, and (2) unless you plan to use the MCEM for only one control or one function, opting for the recently announced BASIC program in EPROM (a review of this feature will appear in a future Product Review) is a must. Some applications of the HAL MCEM-8080 include, but are not limited to, contest logging, real-time tracking of the moon (or any other satellite for that matter), plotting propagation trends and most important of all, playing Star Trek! – *WA6GVC*

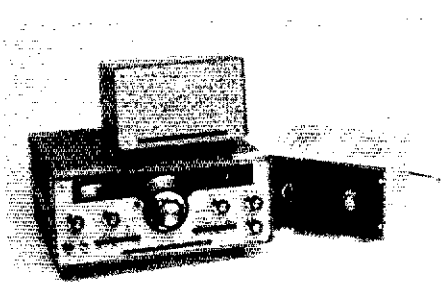
THE HEATH MODEL HW-104 SSB TRANSCEIVER

If you feel that there is something familiar about the designation HW-104, perhaps you are thinking of the "brother," SB-104. That model was reviewed in October, 1975, *QST*. While there are similarities, there are also some differences between the units – some are cosmetic, some are functional.

As for a basic description of the HW-104, it is a 100-watt, solid-state five-band transceiver. It will operate in either the ssb or cw modes, and may be powered from an external 12-V supply (HP-1141) or from a portable source such as an automobile battery.

Circuit Analysis Receiver

An examination of the circuitry of the HW-104 shows that the receiver is of the double-conversion type. Signals going into the front end of the unit must first pass through a band-pass filter before being applied to the first mixer. The lack of an rf amplifier stage ahead of the mixer helps to keep things from falling apart in the presence of very strong in-band signals. In practice this has been found to work quite well; 20-meter cw or sideband stations were copied from the ARRL laboratory, which is only a few dozen feet from W1AW antennas, and this was done while the Headquarters station was transmitting bulletins on all bands, including 20 meters. Stations that were S3 or better could be copied within five or six kHz of the W1AW transmitting frequency.



From the first mixer stage (a dual-gate MOSFET) the signal is routed through a filter at the high i-f of 8.65 MHz. The injection to the first mixer is crystal controlled, coming from an oscillator that involves diode switching to select the crystal corresponding to the band of interest. The second mixer (another dual-gate MOSFET) receives its injection from the VFO and produces an output at 3395 kHz. Crystal-filter circuitry follows next in the lineup. The normal filter offered with the transceiver is of the ssb variety, 2.1-kHz selectivity. An optional filter is offered as a kit that can be added either during initial construction or at a later date. This filter provides better cw selectivity, 400 Hz, and should be given serious consideration if you expect to do even a modicum of cw work with the transceiver. In this writer's opinion, the slight expense and small amount of time needed to install the cw filter and associated circuitry is amply repaid in operating convenience.

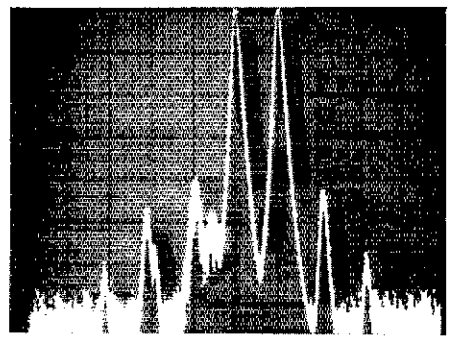


Fig. 1 – Two-tone test for IMD products. The 3rd-order products are approximately 40 dB down from full output. Calibration is 1-kHz/division horizontal, 0.1-kHz bandwidth filter and 10-dB/division vertical. Output frequency was 7 MHz and the power output was 100 watts.

I-f amplifier stages follow the filter, and here the circuitry involves both discrete devices (bipolar and MOSFET) and integrated circuits. Diodes are used in a product detector to translate the i-f signal into audible intelligence. The detector is followed by an IC that serves as an audio preamplifier with some built-in frequency-response shaping and by some husky bipolar transistors to drive a 4-ohm speaker with 4.5 watts (and that's loud!).

An agc detector, amplifier and associated circuitry come into the picture in the i-f stages, all of which makes the operation of the receiver quite smooth on either ssb or cw. The time constant of the agc has two ranges, fast or slow, selective from the front panel. The same switch has a position to disable the circuit for weak-signal work.

Transmitter

To follow the sequence of events through the transmitter, it is necessary to start with the audio board, which accepts the input from the microphone (or phone patch) and applies part of it to a balanced modulator, part to VOX and T-R control circuitry. For cw, a key will also activate the VOX and control circuits and a sidetone oscillator as well, thus enabling one to hear what is being sent. Output from the balanced modulator (diodes again) is then routed through the crystal filter and on to an i-f amplifier and buffer. The i-f at this point is the same as that of the receiver, 3395 kHz.

A balanced mixer (more diodes) is employed to heterodyne the i-f to the band that has been selected. For transmitter operation, the VFO output is mixed with the HFO signal, and the product of that action is applied to the aforementioned balanced mixer

as an injection signal. Between the mixer and the antenna terminal you'll find a bandpass filter, amplifier, another filter, another amplifier (driver) and another filter if the switch is in the low-power position. For high-power operation an additional amplifier is connected between the driver and the last band-pass filter. There is an alc detector in both the driver and the power-amplifier stages. The alc-voltage works through an amplifier and is applied to the transmitter i-f amplifier, resulting in very effective control of drive to the output stages.

Construction

No difficulties were encountered in constructing the HW-104, at least none that were not the fault of the writer. This is an advanced construction project, and should be treated with much respect. Instructions are very well thought out, and should be followed explicitly – even to the detail of which part of the kit to unpack first. In spite of the very detailed construction information and the procedure for checking each module or board as it is assembled, I managed to leave one resistor out of the VFO, and to get two diodes in backward on an oscillator board. Fortunately, the step-by-step troubleshooting procedure and the voltage test-point drawings helped to find the goofs in reasonably short order.

The tedious part of the assembly was the seemingly endless array of pc boards that make up the bulk of the circuitry for the HW-104. It was a welcome relief to be able to put the last board aside and start the mechanical assembly of the shields and framework of the transceiver. Once at that point, things seemed to happen much faster. An approximate total of hours spent on assembly and testing comes to 60. As we have done many times before, we'll point out, even emphasize, the importance of following the detail of the instructions, one step at a time. The drawings are excellent and they cover the assembly from all angles. If your electronic expertise is even mediocre, you have an excellent chance to assemble successfully a modern transceiver that can hold its own in the best of crowds.

Operation

This part of the review could be summed up in one word – comfortable. But there are many things that go into a concise description like that. The controls are in convenient locations and therefore make it easy to adapt oneself to their use. The dial, while not useful for hair-splitting like its digital brother, is accurate enough for all but the most demanding of operators. This writer had no trouble in finding the frequency of the 20-meter liaison station for the HK1TL uhf expedition,[1] for example, just by "eyeballing" the pointer after calibration at the nearest 25-kHz marker. Speaking of markers, the combination of 100-kHz and 25-kHz points makes it very easy to ascertain the band edge and to find a particular spot in between. A convenient WWV (15 MHz) position on the band switch makes it easy to check the accuracy of the crystal calibrator.

Frequency drift was never a problem on any mode or for any use (the receiver has been used as a tunable i-f for EME reception on 432 MHz). Similarly, sensitivity was found to be adequate, although the absolute numbers as indicated in the noise-floor measurement leave something to be desired. On-the-air reports have been good, both as to ssb quality and cw keying characteristic. In connection with cw, I could find but one fault with the unit: When using cw break-in (VOX) mode, the first closure of the key produces a very loud and annoying "blap" from the speaker or headphones. Time has not permitted an analysis of the circuit to see where this might be coming from, but it is high on my list of priorities to remove that particular noise.

A very useful feature, and one that is seen on more equipment of late, is a low-power output position from the transmitter. This is almost essential if one is to drive a transmitting converter to a vhf or uhf band, as many do for working through the OSCAR satellites. To see how this scheme would work with the somewhat common i-f of 28 MHz, the HW-104 was connected to a 2-meter transverter that provided 50-watts output, while at the same time I listened on the OSCAR part of 10 meters with another receiver (an SB-303). The proper antennas were connected to both sets of equipment, and there were no birdies evident from the transmitter, and no change in 10-meter noise level was noticed when the transmitter/transverter combination was turned on. The same sort of thing was tried in reverse, using an SB-401 transmitter (modified for 2-watts output) to drive the transverter, and utilizing the HW-104 transceiver to listen on 10 meters. The results were the same – indicating that it is indeed possible for a 28-MHz transmitter and a 29-MHz receiver to coexist in peaceful harmony (at least if the transmitter output is clean and at a low-power level). One important thing to note here, however: Neither the low-power output stage nor the high-power final stage of the HW-104 likes to "look" into a reactive load. If the antenna or transverter is not reasonably close to 50-ohms resistive, internal circuitry will hold the power output down to a level that is safe for the transistors, which might not be enough to do what you intended. For odd-ball antennas or weirdo transverter input circuitry, a matching device of some sort is definitely in order.

In discussions of the HW-104, two questions inevitably come up, "How do you like the rig?" and "Would you build another one?" The answers are short – "Great!" and "You bet!" – *W1SL*

The Heath HW-104 Solid-State SSB Transceiver

Dimensions (HWD): 7-1/4 × 14-1/2 × 16 inches.
Power requirements: 13.8-V dc, 2-A receive, 21-A transmit at 100-W output.*
Power output: In excess of 100 watts on all bands (cw), 100-watts PEP (ssb).*
Low-power output: 1.5 watts 40 through 10 meters, 1.0 watt on 80.*
Receiver sensitivity: Between 0.5 and 0.8 μV for 10 dB S+N/N ratio on all bands.
VFO stability: Drift approx. 90 Hz per hour after 30-minute warmup.*
Frequency coverage: 3.5 to 29 MHz (29.7 MHz with HWA-104-1 accessory) amateur bands, plus 15-MHz WWV (receive only).
Dial accuracy: Marked at 5-kHz intervals; can be calibrated at 100- and 25-kHz points.
Receiver noise floor: −125 dBm; blocking dynamic range, 94 dB; IMD dynamic range, 71 dB.*†
Manufacturer: Heath Company, Benton Harbor, MI 49022.
Price class: $490, kit form.
*Measured in ARRL laboratory.
†For testing methods see Hayward, "Defining and Measuring Receiver Dynamic Range," *QST* for July, 1975; also, DeMaw, "His Eminence – the Receiver," *QST* for June, 1976.

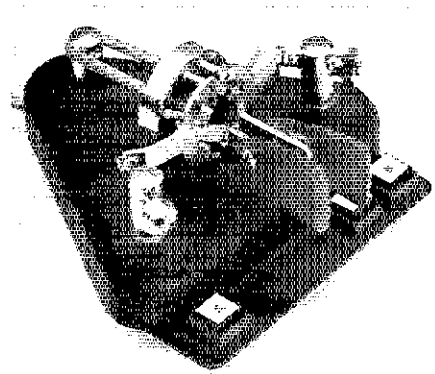
HAL FYO KEY

To a cw operator, his (her) keyer is a very personal thing. If the editor will forgive me for being rather personal in this product review, I hope you the reader will too. There just doesn't seem to be any other way to attack the subject.

When I was a *very* poor college student several years ago [We presume he means financially, not academically! – Ed.], my roommate, also a ham, and I scraped up a tankful of gasoline and wheeled off to the annual Cincinnati Hamfest (then a stag event). In the process of marching down lane after lane of flea market we became separated, neither of us paying any attention since we had no money to spend. The one exception to our poverty status was the fifty-dollar backup my roomie, K9FRZ, had stuffed behind his girl friend's picture. That was his beer money 'til Christmas, but would be used in case we found one single item at the flea market: an FYO paddle.

I found the FYO that day. Someone was peddling a keyer (the brand has long ago escaped me) along with a double-lever FYO model, and he wanted fifty bucks for both. I didn't have a cent to my name, and there were three or four other wandering hams around the table, all looking at the FYO I was sure. I couldn't find Jim, couldn't buy the paddle out from under the others, and I was paralyzed. Somehow I guaranteed that a sale was imminent, the unknowing FYO owner said he'd hold on to the device, and I took off looking for those fifty beer dollars. Jim and I returned shortly thereafter, he purchased the FYO, and we left. Anything after that would have been anti-climactic.

The original FYO paddle was designed by Joe Hills, W8FYO, in the early sixties. The



[1] Morris, "Tiera Luna para Colombia," *QST*, October, 1976.

QST review of the keyer paddle appeared in October, 1962. Limited production for only a few years guaranteed that the devices would become legendary, since those who owned them swore by them. This author came by his almost as ridiculously as K9FRZ; an answer to a *QST* Ham-Ad in 1968 got me an FYO for twenty-five dollars, several years after the last one had been made. When it came in the mail, it was in a sealed box – brand new! That's why, when I found one for my roomie, I was willing to let *him* have it!

It's unusual to find Ham-Ads for original FYO paddles anymore, except those that say "FYO wanted – will pay any price." They mean it, too. What was it about that FYO that inspired such reverence and, perhaps more importantly, does the new FYO made by HAL Communications stack up to the original? If you're a cw operator (there are still some left), these are very important questions.

As I said, keyer paddles are very personal things; like one's toothbrush maybe. Everybody has his favorite, and very few operators can say exactly what it is they look for or feel for in a keying mechanism. You just have to live with one for a while before you draw a conclusion. "Dogs" can be recognized in only a few minutes of sending, others require an hour before you realize that your wrist is becoming palsied from the effort. I can say for a fact, though, that I've never heard of an unhappy original FYO owner.

Although all the original FYO keyer paddles were of single-lever design (with a few double-lever prototype exceptions), the HAL models are double lever. That's the modern thing, y'know. The reviewer has spent several months with his original FYO and a HAL FYO side by side, for comparison. The final conclusion? They are different, but the HAL FYO is a very close performer. When one considers that I have lived with the original FYO for almost ten years, perhaps that is enough bias to indicate that a totally impartial observer would find no difference, or even vote in favor of the HAL. I never thought I'd find anything which would even come close to my beloved FYO from Joe Hills.

In appearance the two are similar, and in construction not too different, except for the double vs. single-lever design. The HAL is adjusted by changing spring tension, done with a tiny screwdriver, and the contact spacing is varied by screws tightened with Allen-type wrenches. The only operating problem noticed was that the apparatus, being necessarily rather delicate in construction, tends to spring apart if one accidentally smacks it smartly. This is usually done while lunging for the transmitter "spot" button and finding the FYO in the way. Nothing gets damaged, mind you. You simply put the two pivots on track, and you're ready to start sending again.

There are a few excuses for paddles on the market these days; the unwary will be sorely disappointed with them. The HAL FYO is solid (doesn't require taping down on the table), is of all-chrome construction for durability, and is reliable and smooth in its operation. You can get it with three push buttons to go with the HAL 2550 keyer or without them to go with your keyer. You can buy it from HAL Communications Corp., Box 365, Urbana, IL 61801 for under 50 bucks. – *WA1STN*

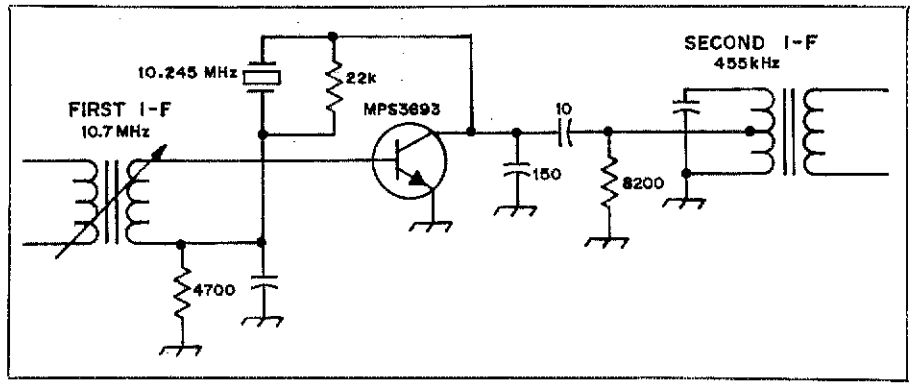


Fig. 1 – Basic circuit of the autodyne second mixer of the GTX-1. A single transistor serves as combined crystal oscillator and mixer.

GENAVE GTX-1 HAND-HELD 2-METER TRANSCEIVER

Another hand-held 2-meter portable rig? Ho-hum? Well, not quite – this one is different in several respects. It's American-made, and solidly. Performance rivals that of larger 2-meter fm packages, particularly in receiving. Circuit design shows evidence of careful planning for minimum complication and maximum effectiveness. Last, and certainly not least, it comes with an excellent instruction manual, with complete identification of all components and detailed trouble-shooting and alignment information.

Mechanical Features

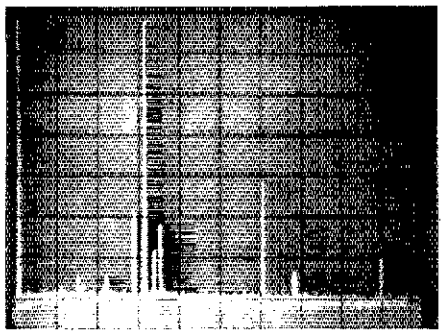
The GTX-1 is smaller than most units of its kind. Its battleship construction tends to make it heavier as well, but it is well-balanced and easily operated in either hand. The top end of the case carries a 6-channel selector switch, centrally located, flanked by the volume control (with on-off switch) and squelch-level control at the right, and the BNC antenna jack and a phone jack at the left. The send-receive switch is on the left side of the case. Under WA6GVC's thumb in the picture is a small slide switch for high or low power. The Touch-Tone pad Chuck is using is an optional feature.

The entire back cover can be lifted off, when hidden latches are released, by pressing two buttons on the bottom of the case together. This exposes the circuitry for service and permits removal of the battery pack for replacement or charging. The two principal circuit-board assemblies are removed easily for service, but they are mounted firmly in such a way that they are not susceptible to damage if the unit is operated with the back cover removed.

The battery pack (bottom portion of the case) can be 8 alkaline penlite cells, slipped into a convenient plastic case provided, or a rechargeable NiCad battery. The latter is a recommended option, as is the charger designed for it. The transceiver can be operated in the *receive* mode while resting in the charger, permitting continuous monitoring

Genave GTX-1 2-Meter FM Transceiver

Dimensions (HWD) and Weight: 8-1/2 X 3 X 1-5/8 inches, 2-1/4 lbs., with NiCad battery and antenna.
Power source: 8 alkaline or nickel-cadmium cells, 10 volts nominal (NiCad recommended).
Frequency range: 144 to 148 MHz, with suitable crystals.
Mode of operation: Fm, 7.5-kHz deviation, max.
Power output: 1 watt low; 3.5 watts high, at 10.3 volts.
Price class: $250 ($300 with Autopatch, as shown).
Options: PSI-18 NiCad battery pack, PS-2 charger, GLC-1 leather holster, TE-III tone encoder (shown in photograph), ED-34 subaudible tone encoder/decoder, remote speaker/microphone.
Manufacturer: General Aviation Electronics, Inc., 4141 Kingman Drive, Indianapolis, IN 46226.



Spectrum-analyzer view of the GTX-1 output. Pips closest to the main output frequency are 12.2-MHz crystal multiples. The second to the right is 10.7 MHz higher. All three are 50 dB or better below the carrier. The second harmonic, 293 MHz, is 40 dB down, and the third is about 70 dB down.

during charging periods. Charger shut-off is automatic when the unit is lifted out, for transmitting or carrying.

The vinyl-covered helically wound antenna supplied with the transceiver is equipped with a BNC fitting. This assures positive contact, yet permits quick removal for connecting an external antenna. The GTX-1 is thus readily adaptable to mobile service, using a properly installed car antenna. In this connection, we'd like to see provision for operation from the automobile electrical system. The transceiver capability for output up to 4 watts, and the exceptional receiver performance, would make it an eminently practical mobile setup.

Circuit Details

Interest in the GTX-1 circuitry begins at the antenna jack, with a filter that helps to keep down transmitter spurious radiation and unwanted-signal detection. The receiver front end is conventional through the first mixer, the first i-f output being 10.7 MHz. The second mixer uses a circuit that combines crystal oscillator and mixer functions in a single transistor, a practical simplification rarely seen in commercial equipment. The basic circuit is shown in Fig. 1. Integrated circuits handle limiting, detection, and audio amplification.

The transmitter uses 12-MHz fundamental crystals. The oscillator and two following stages operate on 5.7 volts, regulated, for optimum stability. A buffer-amplifier follows the crystal oscillator. Inductive coupling and band-pass design help to keep unwanted multiples of the crystal frequency from being passed on to the amplifier stages. The output of the GTX-1 is above average for hand-held units, in its freedom from unwanted-frequency outputs. Lab checks made here show it to be better than most in its suppression of harmonic TVI.

Performance

As originally supplied the GTX-1 had excessive attenuation of high-audio frequencies in its modulation circuitry. A factory-made modification took care of this satisfactorily. The receiver sensitivity and noise limiting were superior to any hand-held unit this writer has used. The threshold for complete quieting was so low, in fact, that it tended to give the user excessive confidence in the ability of the transmitter to hold repeaters satisfactorily in the outer fringes of their service areas. Practically any intelligible signal gives essentially full quieting, and the squelch can be set so that the receiver responds to any signal that can be copied solidly. Such near-complete quieting was a welcome relief, in a type of service where fm is supposed to give noise-free service, but rarely does, in practice.

The exceptional performance of the GENAVE receiver is also a plus in home-station monitoring of simplex channels, or the frequencies of distant repeaters not normally heard at readable levels. With a signal level as low as 0.2 μV being capable of breaking the squelch, the GTX-1 provides effective monitoring for tropospheric or E-layer openings, without disturbing the operator or other members of the household unduly. It was used frequently in this way at the reviewer's home station, and its near-total quieting in mobile service was also appreciated. — *W1HDQ*

DRAKE RCS-4 REMOTE COAX SWITCH

Coax started to get more expensive several years before the recent double-digit inflation hit. It all began with a copper shortage (which isn't going to go away) and with increased production costs for the rather complex cable. Drake's RCS-4 unit provides a method of getting away from buying coaxial cable.

An installation might consist of a triband beam, dipoles for 40 and 80, a beam or omni-directional antenna for 6 and/or 2 meters, and perhaps antennas for one or two other bands. The separate feed lines start to add up, and an installation can easily have a thousand feet of coaxial cable if the tower is typically fifty feet high and seventy-five feet from the radio station. Buying coax is not a one-time proposition, either. The coaxial cable ages, and what started out as not-particularly-low-loss transmission line when it was new (we're speaking of half-inch coax now) becomes definitely high-loss as the years roll by. These losses become especially critical at frequencies above 28 MHz and become absolutely intolerable at 50 MHz and above.

The solution to this problem is to buy high-quality cable, one length reaching from your radio to your tower, and to feed all your antennas with that one coaxial cable. All that's required is a remote switch, one which doesn't re-introduce the losses we're trying to avoid. Such switches have been available commercially from time to time, usually remade military types of one kind or another. R. L. Drake's RCS-4 is one commercially made unit specifically intended for the amateur market (and pocketbook). Actually, the switch has been included for several years in the C-4 station console, and Drake has now incorporated it into a separate unit.

The RCS-4 utilizes a six-position rotary switch, turned by a small 12-volt dc electric motor which is remotely controlled by another rotary switch located in the ham shack. The unit will switch five different antenna feed lines onto the main feed line; the sixth position on the switch grounds all feed lines to the tower (ground) at the remote switch box.

Construction of the RCS-4 is about as straightforward as it could possibly be. All control connections use terminal strips, 8-conductor control cable, and the feed-line connectors are type SO-239. Weatherproofing of the outdoor box is provided by having all metal seams pointing downward which reduces problems caused by water getting into the box, unless it rains upward in your neighborhood!

A few thoughts about installation of the outdoor unit come to mind. The eight screws for connecting the control cable are on two terminal strips on the remote unit (and also on the indoor control box). The individual wires from the cable should be tinned with solder before connecting the wires, to prevent stray strands of the wires from accidentally shorting to adjacent terminals. Cables from the antennas are terminated in PL-259 connectors and these should be waterproofed in a suitable fashion. The outdoor unit can be installed in any convenient location near the top of the tower, either inside or outside the tower itself. We recommend inside, to prevent climbers from inadvertently stepping on it. Feed lines plug into the bottom of the remote switch, and they should each be taped to the tower with drip loops to prevent water from running along the outside of the cables up to the switch box. The same applies to the control cable; a cable clamp is provided on the bottom of the box, but should not be relied on exclusively, especially if the box is hoisted up the tower by rope with the control cable already attached. Wrap the cable around the unit a couple of times and tape it securely; leave it taped until the unit is bolted to the tower. Then put a drip loop in the control cable and tape it securely to the tower, along with the various feed lines.

Operation of the remote switch takes a little getting used to, for one reason: The motor turning the remote rotary switch only goes in one direction. Thus, if you are switching from antenna no. 1 to antenna no. 2, the transfer is nearly instantaneous because the switch only goes through one position; however, if you switch back from antenna 2 to antenna 1, it takes a couple of seconds, because the motor topside turns the switch from antenna 2 through antennas 3, 4, 5 and ground, before getting to antenna 1. A little pre-planning on which antennas are plugged into which switch positions will pay off in versatility in antenna selection later. In its favor, the fact that the motor does not have a "reverse" means there is less to go wrong with it.

When the indoor unit is activated, a bright red light goes on, warning the operator to not transmit while the switch is turning. When the antenna selected has been connected, the red light goes off. Applying power to the feed line while the switch is switching is a no-no.

The thought comes to mind that two RCS-4 switches, hooked together on the tower, can switch nine antennas, still using only one main feed line. One can hang all manner of wire, aluminum, and fiberglass antennas on a tower and plug them in for quick evaluation. Gone are the days of drilling more holes in the windows and floors. And who hasn't had a coax switch at the operating desk fall off from sheer weight of too many pieces of RG-8 plugged into the back?

The RCS-4 looks like it will outlast many generations of coax. The RCS-4 is available from R. L. Drake Company, 540 Richard Street, Miamisburg, OH 45342. Price class is $120. — *WA1STN* QST

Hints and Kinks

TABLE SIMPLIFIES SELECTION OF PROPER DRILL BIT

A copy of this table, showing the nearest, numbered drill bit for the lead diameter of a component, when posted at the workbench, speeds the drilling of holes in printed-circuit boards. – *Charles E. Terry, W4FZX*

Correlation Table

PC drills — wire size — Molex pins — DP sockets, etc.

DIA. IN MILS

	10		No. 26 wire
		.016	
	.015		
			No. 24 wire
Tolerances 14-16 pin DP IC	20	.020	
	.023		No. 22 wire
No. 72 drill	.025		.025
	30		
			.032 No. 20 wire-Molex pin
No. 65 drill	.035		
			No. 18 wire
No. 60 drill	.040	40	.040
No. 58 drill	.042		.042 P pattern hole
No. 56 drill	.046		.045 DP socket pin
	50		.051
No. 55 drill	.052		No. 16 wire
			.062 "Flea" clips B, F, G & H pattern
	60		
1/16" drill	.0625		
			.064
No. 51 drill	.067		No. 14 wire
	70		

Paper capacitor small No. 21 .028
1/4-watt resistor No. 19 .036
1/2-watt resistor No. 18 .040
1- or 2-watt resistor No. 17 .045

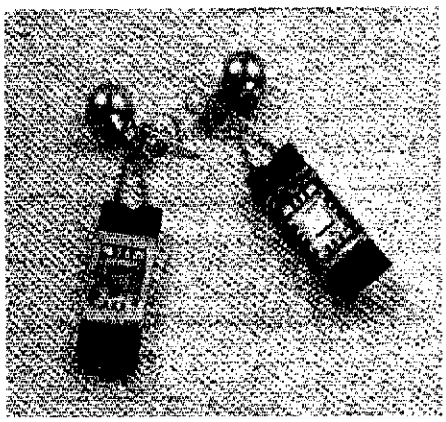
COLOR CODING CIRCUIT DIAGRAMS

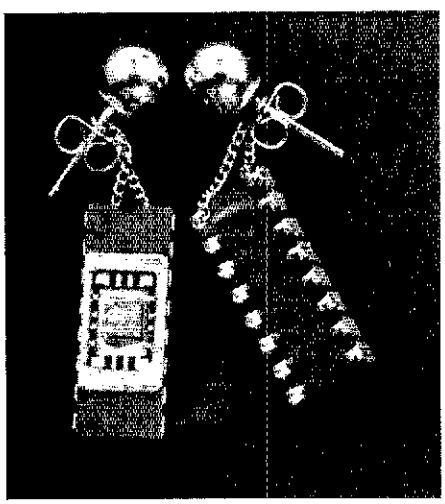
Numbered triangles showing connections between parts of a schematic clean up the diagram, but make it difficult to find the companion number of a pair. I color them around the outside, using a different color for each pair. – *Temple Nieter, W9YLD*

[Editor's Note: This is a handy hint for matching up sections of multifunction ICs.]

MEMORABLE GIFTS

The earrings shown in the photograph were made from discarded IC memories. After the tops were removed to expose the inner circuitry, a jeweler attached a chain to the top two pins of each chip, and joined the chains on one small gold ring. The rings may be slipped over the post of any pierced earring, or attached to a clip or screw-type earring. Other gift ideas include a pendant, bracelet charm, lapel pin or a tie tack and cuff links for the OM. – *Nancy Coffey, WA4DFV*





LOW-COST ETCH-RESISTANT PENS AND A NEW SLANT ON ETCHANT BATHS

Less-expensive etch-resistant pen substitutes are Sanford's Sharpie permanent ink marker for narrow lines, and Sanford's Impact with a wider tip.

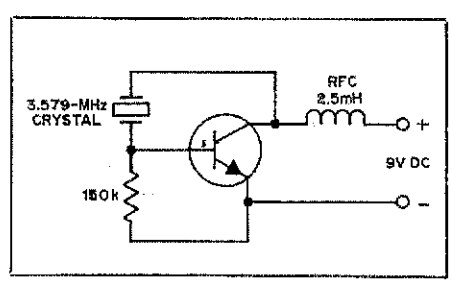
For etching printed-circuit boards, I use a one-gallon mayonnaise jar. Place the board to be etched face down on the inside of the jar, with the jar resting on its side in the sink. Pour in enough etchant solution to wet the surface of the board, and put the cover on the jar. A plastic grill reduces the chance of breakage and the irritating noise of the glass rolling in the sink as the etchant is agitated. The etching process may be hastened by placing the jar in hot water, keeping the water level below the mouth of the jar. By holding the jar up to the light, it is possible to determine when etching is completed; and when it is, the solution may be poured down the drain or back into the jug. The board may be rinsed while still in the jar. With this method, it is never necessary to handle the etchant directly, reducing greatly the chance of spills and stains. – *John H. Bordelon, K4JIU*

ADDING TIME WITH AN ELECTRONIC CALCULATOR

When adding columns of hours and minutes (for determining total hours of operation in a contest, or computing satellite equatorial-crossing time from the reference orbit) enter the hours, followed by a zero, then the minutes. For example, three hours, twenty-five minutes would be entered as "3025." When the last two digits displayed exceed 60 minutes, add 940 to the sum displayed, and the calculator will again indicate the correct total time. Simply reverse the procedure to subtract time. – *Donald A. Kasten, WB4SST*

COLOR-BURST OSCILLATOR CRYSTAL HELPS VISUALLY HANDICAPPED LOCATE W1AW

Even when using a 100-kHz calibrator, it is difficult to know what frequency a receiver is tuned to if you can't see the dial. The color-burst generator in a color television set operates on approximately 3.579 MHz, close to the W1AW bulletin and code practice frequency in the 80-meter band. A color-burst crystal was purchased from a local TV repairman for $2, and the circuit shown was constructed. Now my sightless friend can easily locate W1AW. – *Steven A. Licht, WB2CZC*



A-M WITH THE ECHO II

Owners of the Echo II, 2-meter ssb transceiver may transmit a-m by closing the key and operating in the ssb mode. A-m is received by zero beating the carrier. – *Mark H. Wittmer, WA6FXM*

RECYCLING CAMPAIGN BUTTONS

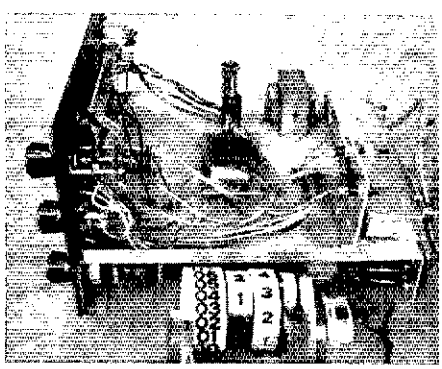
The riveted connection on a tubular electrolytic capacitor often breaks, making connection to the capacitor nearly impossible. The spring inside a campaign button may be coiled under the paper wrapper of the capacitor, making an emergency repair until a new capacitor may be obtained. – *Thomas F. Carten, WA1DJC*

CORRECTING METER-POINTER STICKING IN THE DRAKE TR-4

Both meters in the TR-4 tend to stick at the far left position when the pointer becomes wedged in the corner of the dial face. To prevent this, the meters are removed and a small wire or wooden peg is inserted in a .030-inch hole drilled in the meter face. Mark the position for the hole before removing the face. The bottom cover of the PA-meter and the top plate of the S-meter are held in place by two screws. Locate the peg about 1/4-inch behind the dial, in order that the pointer will hit the peg when the pointer is within 1/16- to 1/8-inch of the corner of the dial. If the drilled hole provides a snug fit for the peg, it won't be necessary to cement the peg. – *Jerry Lieb, WA6GSA*

DIGITAL-CLOCK MODIFICATION FOR THE HEATHKIT SB-630 STATION CONSOLE

The motor-driven clock in my Heath SB-630 station console became noisy after several years of operation. This simple modification provides a quiet and reliable substitute at less than the cost of a new mechanical clock. A 6-digit, 24-hour clock sold by S. D. Sales Co., P. O. Box 28810, Dallas, TX 75228, provides the components and circuit boards for the display. The display and its circuit board are sized for mounting in the original clock window. Two plastic spacers are fastened to the inside of the front panel of the console, and the readout board is cemented to the spacers. The clock board is mounted with spacers in the area formerly occupied by the mechanical clock, as may be seen in the photograph. A bracket mounted next to the SWR bridge supports the push-button switches used to adjust the clock. Power for the unit is drawn from the filament winding of the SB-630 power transformer. Although the readouts are not illuminated to full intensity when the clock is operated at 6.3 volts, this is not a problem in my station. – *Roger D. Kaul, W1FLM/3*



IMPROVED LOCAL-OSCILLATOR PERFORMANCE IN THE K9UIF 2-METER TRANSVERTER

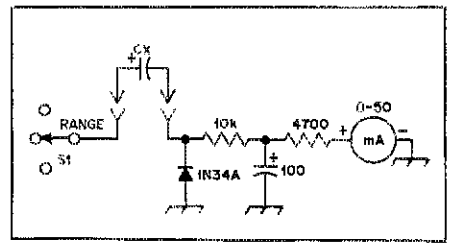
The K9UIF transverter, which appears in *The Radio Amateur's VHF Manual* is one of the most popular and effective designs in existence. One consistent difficulty has been the instability of the local oscillator. The oscillator may drift during warm-up, and its frequency will shift when the oscillator is tuned. The high drive levels required also may result in instability, as a result of the subsequent high crystal current. An OX oscillator module and EX crystal provide an excellent substitute for the oscillator. They are available from International Crystal Co., 10 N. Lee, Oklahoma City, OK 73102. The module is mounted in a small Minibox, and a 1000-pF ceramic feedthrough capacitor is used to bypass the 6-volt supply to the oscillator. The oscillator output is connected to a phono connector, and small diameter coaxial cable joins the output of the module to the grid of the tube formerly used as the oscillator. If the 100-kΩ grid resistor was connected across the crystal socket, it should now be connected directly from the grid pin of the tube to ground. Since the module requires a 6-volt supply, two 1000-ohm resistors are connected as a voltage divider across the 12-volt supply in the transverter. – *Dr. Ralph E. Taggart, WB8DQT*

STEEL PIPE SIZES AND STRENGTHS

In "Hints and Kinks," May, 1976, *QST*, page 36, W5LW describes a good fold-over tower he built from galvanized steel pipe. Hams wishing to duplicate the tower may misinterpret the pipe sizes. For example, standard pipe, referred to as being of 2-inch size, has an actual outside diameter of 2.375 inches (6 cm), and an inside diameter of 2.067 inches (5.25 cm). Standard 1-1/4-inch pipe is 1.66 inches (4.2 cm) in outside diameter, with an inside diameter of 1.38 inches (3.5 cm). Schedule 80 or extra-strong pipe may be used for added load-bearing capability and wind resistance. This heavier pipe has the same outside diameter as the standard grade, but has a thicker wall, resulting in inside diameters of 1.939 inches (4.9 cm) for 2-inch pipe, and 1.278 inches (3.25 cm) for 1-1/4-inch pipe. I also suggest that consideration be given to the pipe fittings. Cast-iron fittings often crack under stress, while malleable iron fittings have a tendency to stretch. A better choice would be cast steel or the more expensive forged-steel fittings. The fittings used should be the extra-heavy type, as opposed to the standard strength. Either size fitting will accept both standard and extra-strong pipe sizes. – *Henry Spang*

INTEGRATOR IMPROVES ACCURACY OF CAPACITANCE METER

After building the capacitance meter described in December, 1975, *QST* ("Read Capacitance with Your VOM"), I discovered the calibration was not constant on all ranges because of the nonlinear frequency response of the meter movement. An integrating circuit at the instrument input solved the problem. The circuit shown in the diagram is used in place of the two 1N34 diodes in the original meter. – *Elton W. Anderson, W9IVT*



HOMEMADE MAP HOLDER FOR PORTABLE AND MOBILE USE

A useful aid to mobile and portable operation, especially handy during public-service events, is a magnetic map holder. A piece of galvanized steel sheet may be cemented to a sheet of masonite and painted, if desired. Small fasteners with attached magnets, similar to those used on clipboards, will hold the map, as well as any message blanks and slips of note paper. – *Spencer L. McCarty, W2GTI*

REMOVING GROUND RODS

An easy way to remove a ground rod is to grasp the pipe or rod with a pipe wrench, then simultaneously twist and pull. Soaking the ground near the rod will also help loosen the ground rod. – *Bob Zavrel, Jr., WA9RAT/7*

GROUNDING STRAP SUBSTITUTE

Copper-plated pipe-clamping strips, sold in hardware stores, make cheap and sturdy ground straps for the shack. – *Leo Finkelstein, Jr., WA4AOL/WB4ONY*

CLEANING CAPACITANCE-ACTIVATED KEYER PADDLES

Capacitance-activated keyer paddles, such as the Data Engineering Electronic Feather Touch, become erratic in operation when dirt and oxide build up on the metal grid. The dirt may be removed with a soft cloth moistened with denatured alcohol. – *Wayne E. Whitman, W9HFR*

RESISTOR ADDED TO 5-CENT TRANSISTOR TESTER MAY SAVE THE LIFE OF AN FET

A 1000-ohm resistor in series with the battery of the 5-cent transistor tester (Brophy, "A 5¢ Transistor Tester," *QST* for November, 1975, page 24) may prevent accidental destruction of a field-effect transistor, should the battery leads be improperly polarized when connected to the transistor. – *Franklin Swan, W9SIA*

OSCAR Goes to Schools

Across the U.S. and Canada, students and teachers respond enthusiastically when OSCAR comes to visit — an update on the OSCAR Educational Program.

By Joel P. Kleinman,* WA1ZUY

Item: *Active radio amateurs are working with educators to set up an OSCAR station in the remote mountains of North Carolina to help Cherokee Indian children broaden their horizons and improve communications skills.*

Item: *An innovative inner-city high school for gifted students in Newark, NJ, will sponsor credit-bearing Novice license classes, and OSCAR will get them started.*

Item: *The science department chairman at a Long Island, NY, high school has been awarded a $2,100 grant to explore OSCAR's applications in science programs.*

OSCARs have been flying around Earth since 1961 and their use in the classroom goes back nearly that far.

There are thousands of satellites orbiting the earth, but only the two OSCARs (Orbiting Satellites Carrying Amateur Radio) can be used with relatively simple and inexpensive equipment. This makes them ideal for classroom use, and the OSCAR Educational Program has developed and expanded their practical applications to a wide variety of subject areas and grade levels. Teachers with no previous radio background can easily learn to tune them in, bringing the excitement of live satellite communications into their classrooms.

Several thousand educators have attended OSCAR Educational workshops or used the ARRL's curriculum supplement to apply the satellite's principles to their particular teaching situation. More than 100 volunteer amateurs across the U.S. and Canada are available to visit nearby schools to speak to groups of students and assist with demonstrations.

*OSCAR Educational Program Asst., ARRL

Designed for maximum educational value, both AMSAT-OSCAR 6 and A-O-7, the two OSCARs presently operational, pass within range of any point on earth twice a day. In North America, two morning orbits can be heard during school hours, making live classroom demonstrations of communication through the OSCARs easy to arrange.

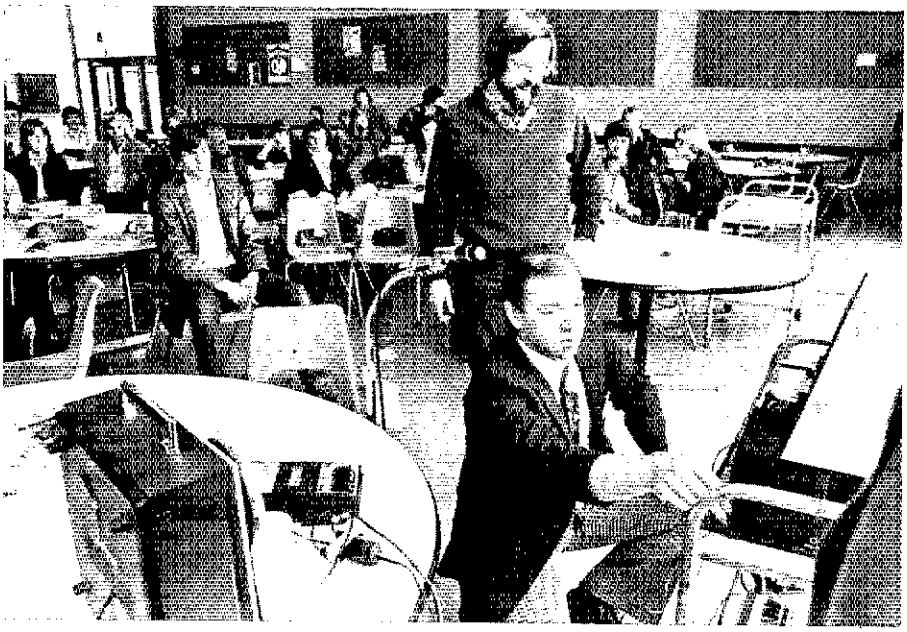
Each orbit is within range of any particular location for up to 25 minutes — plenty of time to catch the chatter of foreign and local stations trying to contact one another, the dit-dahs of the Morse code as well as voices fading in and out.

Live Demonstrations

There is no such thing as a typical demonstration. Some involve actual two-way conversations between stations up to 5,000 miles apart (a licensed ham is needed for this), some are receive-only and others focus on receiving the Morse code telemetry signals that transmit the satellites' vital lifesigns.

After hearing someone talk to them from Europe or Hawaii, elementary school children will discover that people aren't that different after all. In the meantime, they've learned some geography and discovered a common ground — someone in another part of the world can speak English or send Morse code which people here can understand. Anyone who has seen a classroom demonstration can tell you that language barriers tend to evaporate pretty quickly through the satellite. Younger children especially enjoy hearing their names mentioned over the radio, and this can be arranged through the ARRL. Special

A group of inquisitive students listens to a far-off station via OSCAR at the Ontario Science Centre near Toronto. VE3YY is the operator.



The Hillsboro (OR) High School cafeteria was the scene of a recent successful OSCAR demonstration. John David, W7KMB and Mike Metcalf, W7UDM (standing), members of the Tektronix Employees Radio Amateur Club, tuned in both OSCARs. "The cassette tape recorder was used to play the WABC OSCAR talk (available for loan from ARRL)," David reported. "The other tape recorders were used to record the telemetry and voice transmissions, which the physics classes subsequently analyzed with the help of the space science book supplied by ARRL. The two flag poles in the courtyard provided a convenient support for the 10-meter dipole." *(JoAnn Kirby photo)*

Educational Material Available from the ARRL

Space Science Involvement, a 63-page booklet that applies the principles of OSCAR's orbit and telemetry data to physics, mathematics, general science and social science classes and grade levels from elementary through college.

The "OSCARLOCATOR" consists of a North polar projection and an acetate sheet, and lets you determine just where and when each OSCAR satellite will be above your location. Free to participants in the Educational Program; $1 to others.

"Guidelines for Radio Amateur's Classroom Demonstration — OSCAR Satellites" is suitable for both teachers and experienced radio amateurs; includes a sample talk on OSCAR's basic principles.

Educational Bulletin schedule.

"OSCAR and the Ham," a 29-minute video cassette of an actual classroom demonstration of the OSCAR satellite, shows its educational potential.

OSCAR 6 and 7 slides, with accompanying printed text, provide a brief introduction to the components of the satellites.

WABC OSCAR Presentation is an audio tape cassette of a special program on the OSCAR satellites aired over WABC radio in New York.

educational bulletin stations regularly send useful information through OSCAR to teachers and their students; the bulletin schedule is available from the ARRL.

After experiencing live communication via satellite, students often are spurred on to further projects. An Indiana 12-year-old, Dave Vitkus, WN9RXV, built an OSCAR display that copped first place in two different science fairs. Others have gone on to study for their Novice licenses as a first step toward working the satellites themselves.

Using the *Space Science Involvement* curriculum supplement as a guide, teachers have applied the principles of OSCAR's orbit and components to such diverse subjects as electronics, geography, social science, general science, physics and space science. Junior high students, for example, can track the satellites easily with the aid of some basic orbital information. Their velocity and distance traveled in one orbit can be similarly computed. High-school math classes concentrate on interpreting the telemetry data that come from the satellites in Morse code numbers — which also teaches the rudiments of the code. By inserting the numbers into algebraic formulas, students can measure the spacecraft's temperature and check its batteries.

On the college level, electronics classes study the transponders aboard the satellites that beam Morse code, voice and slow-scan television to earth, while physics classes apply OSCAR's data to measuring Doppler shift and using Kepler's Third Law of Motion.

As the items mentioned at the beginning of this article indicate, there is virtually no limit to the creative uses people can make of the OSCAR satellites. Expanding on the many experiments described in the curriculum supplement, teachers have used the vast educational potential of the satellites to best meet the needs of their students.

Aside from its benefits to the people involved — teachers, students and hams — the Educational Program serves to emphasize the public service aspects of amateur radio, and encourages further participation in the hobby. Many schools have purchased equipment, started radio clubs and publicized their amateur radio activities in local media after holding OSCAR demonstrations. Many more have written to request regular visits from nearby hams.

In its broad sense, education extends far from the classroom. OSCAR exhibits at hamfests and exhibits for the general public bring the satellites before the public eye and spread word of the Educational Program. Educational conferences based on OSCAR, such as that held last year at the Goddard Space Flight Center near Washington, DC, bring large groups of teachers into contact with knowledgeable professionals who demonstrate OSCAR's educational potential. Another similar conference is planned for next year at Kennedy Space Center, FL.

New Ones on the Way

A large part of the justification for the launch of the OSCAR satellites was their educational value, and the enthusiastic response from teachers, students and amateurs is one measure of its success. Another is the steadily growing demand for the ARRL's educational materials (see list).

With plans for another OSCAR being formulated, and a precedent-setting Phase III satellite (whose elliptical orbit will keep it within range for up to 15 hours at a time) in the early planning stages, the Educational Program will continue to expand.

Teachers interested in holding a live OSCAR demonstration and amateurs who can be called upon to provide one should contact the ARRL, 225 Main St., Newington, CT 06111.

Epilogue

OSCAR demonstrations run the gamut from brief talks on the satellites within small groups to complete live demonstration/lectures before as many students and teachers as can be crammed into an auditorium. These often include a slide show and a good-

natured chat through OSCAR 7 with Fred Merry, W2GN/Mobile 1, near Albany, NY. One such event, which occurred earlier in the year, was reported by Ed Bizub, WA2CBB:

"Two very successful OSCAR educational demonstrations were held yesterday at the Chestnut St. School in Newark, NJ, using OSCAR 7 . . . equipment including antenna was set up at 8:45 A.M. Receiver was a Hallicrafters SX-101A. Antenna was a 10-meter dipole about 10 feet off the ground.

The first demonstration was held from 9:40-10:30 A.M. with six teachers and 20 students present. Results were excellent with good reception of W2GN's ssb transmission as well as the beacon. A talk by me was given prior to the pass, with additional discussions afterward. Pictures were taken by the Board of Education photographer.

The second demonstration from 11:40 to 12:25, was for teachers only with 13 present from various schools in the Newark School System. Several minutes of fair copy were obtained, giving the teachers an insight into satellite communications. My talks before and after the pass were geared to the educational value of OSCAR. Response from the teachers was good.

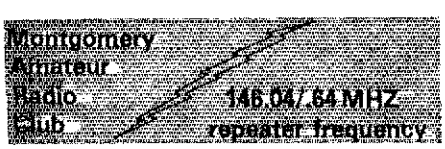
In summary, the demonstration was definitely worthwhile. One or two additional demonstrations will probably be arranged for the next school year. They also hope to receive approval of their request to purchase a suitable receiver for OSCAR." QST

Strays

□ Bob White, W1CW, "Mr. DXCC" for nearly a quarter century, was honored recently by the New England DX Century Club at its annual dinner in Waltham, MA. During the evening he was presented a plaque with the inscription: "New England DX Century Club Presents this Award to Robert L. White, W1CW, 'Mr. DXCC,' 1952-1976, with appreciation for your honesty, fairness, integrity and dedication, using one set of rules for all, which made DXCC the premier DX Achievement Award."

Shown in the photograph (left to right): W1HX, W1CW, W1JFL. *(Czajkowski photo)*

□ Each member of the Montgomery (MD) Amateur Radio Club recently received the club's new bumper sticker along with an application for Maryland call-sign car registration tags. Dave Boyd, W3IFY, club secretary, designed the stickers and Dave Halliburton, WA3ZOR, publicity chairman, produced them. Both items are part of the package presented to each new member of the club, whose present membership totals over one hundred.



WA3ZOR looks on as W3IFY attaches a Montgomery Amateur Radio Club sticker. It's small, but the bright orange color is anything but inconspicuous!

N6V SUCCESS

□ Public and amateur radio interest in the Mars Viking project has continued to increase, particularly through the efforts of the Jet Propulsion Laboratory Radio Club's N6V operation ("A Tip of the Hat," November, 1976, *QST*) in Pasadena, CA. High-quality slow-scan television pictures have produced the most excitement. Many media agencies around the world have been reproducing off-the-air pictures as received by amateurs, especially after seeing the high-through slow- to fast-scan converters. Through the loan of a model 400 from Robot Research, Hq. station W1AW achieved the pictures shown here.

Not only has the N6V crew been supplying a large variety of Viking pictures, they've met the demands of the amateur fraternity by surpassing their goal of 10,000 QSOs. The station has worked Novices and Extras alike; rag chews and repeaters as well as slow scan and OSCAR. Keeping the station on the air from midsummer to late fall was a team effort with everyone in the club helping – WA6MYJ K6YYQ WB6YMF K6SVP W6UM K6PGX K6BER K6BHJ K6YGN KDT6574 KNX8341 W6PAJ WB6DRH WA6KPW WA6VOG W6IUV WA6TBH W6MZR WB6MPM WA6FCE WB6JMP WA6QZY W6QWC W6EJJ W6HCD. – *KH6HQG*

Is It Like CB, Mrs. Johnson?

Only a few weeks of school are left and the second graders are restless. How can a teacher hold their attention? Introduce them to ham radio and open new worlds of personal communications for many.

By Deborah A. Johnson,* WN6LVC

It was the weekend. I sat in the ham shack while the OM was on his morning MARS net. Suddenly it came to me – the most important thing that people must learn is communication! Every day, both in the classroom and on the street, in all walks of life, people strive to communicate. What better way to show how well you can communicate than through a well-developed system like amateur radio?

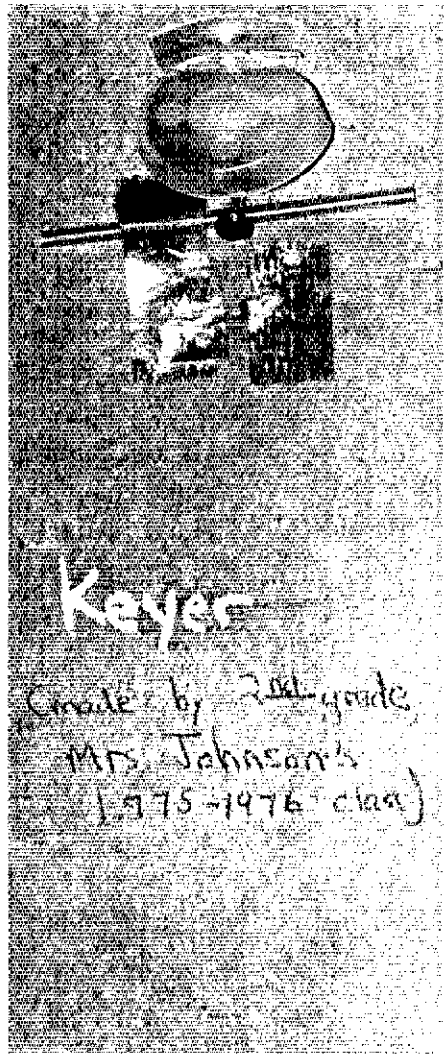
You see, I am an elementary schoolteacher.

The last few weeks of the school year were upon us and my second graders were getting very restless during the regular subjects. At the beginning of the week, I mentioned to the class that soon we would be starting a short study of communication. I told the children that we would investigate many areas of this subject and that we would end up with a few days on ham radio.

What better time to explain the differences and advantages of ham radio?

Their immediate response to this was, "Is that anything like CB, Mrs. Johnson?" I had a feeling that I would run into this type of question because of the rise of CB radio, particularly with the intensity that the TV-viewing public was presented with commercials on the subject. But I did not become upset. What better time to explain the differences and advantages of ham radio? At this early age all electronics are fascinating. So, we forged ahead!

We began the study with a definition of "communication." Then we listed various forms of communication that were fairly familiar to all of us. After a few days of discussion I ventured into the realm of ham radio. A few of the children had heard of it before or knew something about it because they had a friend or relative who was involved in it.



A lot of the talk was about the code. I told them that Morse code made it possible for all amateurs, no matter where they lived, to talk to each other. The OM helped me set up an oscillator and keyer to demonstrate exactly what the code sounded like. I also brought in some beginning practice tapes for them to listen to, and participate with if they wanted to. They were really getting excited! At the end of the session I told them that we would be making our own keyers. We used materials that were available at the school. They knew that it would not be exactly the same, because ours would not be using electricity. We attached a plastic popsicle stick to a square cardboard base. In front of the stick went a metal brad, raised up so that the stick would tap against it. In this way, the children were able to practice the code and also hear the sounds as they tapped them out on their "keyers."

. . . the children were able to practice the code . . . as they tapped on their "keyers."

During the session we also went into the other aspects of amateur radio. I explained that everyone has a special "name" or call sign. We went over what each part of the call meant. Also, I explained that if you want a license you have to study and take an FCC test. This impressed them. As students, they knew the value of study and tests. We looked at *QST*s, ARRL manuals and mementos from past ARRL conventions.

The students asked me if I had a place at home "with all that equipment" like they saw in the books. I said

*835 Fairview Ave., No. 5, Arcadia, CA 91006

that both my husband and I were ham radio operators and that we had lots of different equipment at home.

I stepped in from time to time to translate some of the language . . .

"Please bring it to school." I promised nothing. But later that week I asked my OM for his opinion. He thought it was a great idea, and as luck would have it he had some time off that week. So on the last day of school we transported the small majority of the shack to my classroom. In came the ssb transceiver. "Woos" and "aahs" filled the air. Next a Handie-Talkie appeared. "Can you talk to Mississippi? Can you get my father in L.A.? How the heck does that thing work?"

At this point, my OM tried to explain the intricacies of the ionosphere and skip. I stepped in from time to time to translate some of the language as best as I could to a simpler level. They were really intrigued by the voices and special language that were coming out of the box in the front of the room.

But the biggest treat was yet to come. Out we went to our Volkswagen bus where my OM had recently installed a 2-meter fm transceiver. We opened all the doors and the side panel, inviting

the children in for a closer look. They looked and listened intently. As soon as we had a good, clear contact, the OM asked for a demonstration. And what a response we got!

Suddenly, they knew what communication was all about.

At least 15 of you fellow hams came back with call and location. One fellow said he could hear the kids in the background and sent a big hello their way. They answered back with a hello that could have been heard even without a radio. Because they had just experienced it, they suddenly knew what communication was all about. That was the moment of thrill for me.

As the children left on that last day of school, I was almost certain that a lot of future hams were walking into a brighter, happier summer.

Summer was just about halfway through when a wave of fear, frustration and anxiety hit me. Soon I would start a new year with a new class. As I began to prepare for the school term I thought back over the subjects and areas of interest that I worked on last year. I remember clearly those areas that really interested my students, those special times of study that they took something from, and hopefully researched further.

. . . ARRL conventions at an elementary school?

I recalled with happy enthusiasm the unit I pulled out of the blue at the end of the school year. Because of the children's reaction to it, I intend to include the unit in my plans for this year. I hope that my voice on the subject will help to start a few potential hams on the road to this wonderful and satisfying hobby a little bit earlier.

At least I know that I haven't neglected my feelings on the subject by not teaching it. Who knows? Perhaps it will start a whole new trend in the communication art . . . a *QST* for the crowd under 12 . . . ARRL conventions at an elementary school? QST

Strays

□ Robert Howell, WA7QBV, of Tucson, AZ, just retired from the TV repair business and quite naturally will further pursue amateur radio. And his favorite phase of the hobby? Slow-scan television, of course, especially QRPp operation. During the past three years he and a few others among the 1300 present SSTVers have already made Worked All States on that mode: WB4OVX W8YEK W4MS W6EYY WA7QBV W8ATK K7NEQ WA9USE WB4ECE WA1NXR W9ZVT K4PRT WB5IXK KØALL K4IRQ K9ZUH W8KZM G3IAD WØAKT W8QZ K4GDN.

□ As part of the ARRL/Sister City International program, members of the Alexandria (VA) Radio Club exchanged Bicentennial greetings with the Amateur Radio Club of the Kingsway Technical College of Dundee, Scotland. In December, 1975, the Alexandria Sister City Committee asked the club to establish exchange with ham operators of

Dundee, Alexandria's sister city, as part of Alexandria's Bicentennial activities. The first contact was made in April, and exchanges have continued through the year. Above, Pete Hurd, K4NSS, holds a letter being sent from the Alexandria club to Dundee for a ham convention.

Besides the Sister City exchange project, the Alexandria Radio Club provided communications for the George Washington Bicentennial Parade, the Scottish Games, and other local activities.

□ Looking for a new operating challenge? The best part of the 160-meter season is here, now. For the states-chasers, a WAS net meets every Thursday at 0400Z (11 P.M. Eastern local, Wednesday night). – *K3IXD*

QST Congratulates . . .

□ Dr. Philip D. Smith, Jr., W3DZR, who has just been presented the Distinguished Faculty Award of West Chester State College, West Chester, PA, for excellence in teaching. Dr. Smith is a professor of Spanish and linguistics and director of the college's Language Research Center. He has also been named Commonwealth Teaching Fellow, an honor which carries with it a $2,500 stipend and allows him to be considered for the Pennsylvania State Distinguished Teaching Chair.

□ Charles H. Harpole, K4VUD, of Henderson, KY, who recently received a Doctor of Philosophy degree in Cinema Studies from New York University.

What's a Lysco Transmaster 600? or The First Nostalgia Radio Exchange

A good idea brings satisfying results to a group with a penchant for "The Way Things Were."

By Stu Stephens,* W8KAJ

It all started in the attic shack of K8RBV. Bob and I were spending hours reminiscing about our lost youth and ham radio: DX-35s, Globe Scouts, SX-99s, the days when a Novice with a Ranger and a 75A-4 was really something.

Bob and I are the same age and first licensed in the same year, 1959, smack in the middle of the heyday of American equipment manufacturing – the golden era of Harvey Wells, World Radio Labs, National, Johnson, Lysco, Lettine, Technical Materials, Gonset, Knight and Ameco.

Together we recalled the satisfying "cha-ching" of relays, the bright glow of 807s, receivers which could do everything but brew coffee – the days when it was real work to go from transmit to receive, and the sidetone monitor was really a turned-down rf gain. Sigh.

Then came my innocent proposition. "Wouldn't it be great to have a contest with the old gear?" I imagined hearing weird music like "2001 Space Odyssey." Bob's eyes turned glassy. The Idea was born.

We asked our Southeast Amateur Radio Club to officially sanction The Idea. They responded: "What?" "Why?" and finally, "Why not!" I got the feeling they really didn't think we were serious.

But The Idea grew. News releases went out to the radio magazines, and the attic talk became frighteningly and fantastically real.

*2386 Queenston Road, Cleveland Heights, OH 44118

The author at his NX transmitter and receiver, with a combined age (and multiplier!) of 45 years. That's *It*, Stu's Lysco Transmaster 600, 1951 vintage, on the lower right.

Into High Gear

The Idea eventually became The Nostalgia Radio Exchange, a weekend operating event, 20 hours total operating time. Anyone could work with any gear, but the contact score would be multiplied by the equipment's age, in years – a real premium for "nostalgia rigs." Complete emphasis was placed on the interest and enjoyment of the old gear – competition was to be minimized. We defined "nostalgia rigs" as equipment built since 1945 and at least 10 years old.

Preparations moved into high gear. I secured a DX-20, a model of my first rig, but soon ran into difficulty. The plate transformer shorted out and worse, the glass panel on the meter broke (where could I get another to keep it authentic?). Bob had an easier time. He brought home from a flea market a Harvey Wells TBS-50 Bandmaster (*his* first rig), an SW-54 and a prize Viking I for 10 bucks.

Panicking, I drove to Pete's radio store to pick up crystals or a cheap VFO. Then I saw *It* on the shelf, between the HX-50 and the NC-300. *It* was a Lysco Transmaster 600, surely the

Bob, K8RBV, operating in his attic shack, where the idea for NX Weekend originated.

neatest name ever for a 35-watt, 160- to 10-meter cw exciter. And best yet, it was built in 1951, a multiplier of 25 years! I was $39 poorer, but also infinitely richer.

The night before NX weekend, Bob began having problems with the Viking I. The dial was irreparably unstrung, three inches of dust hid the once-proud copper chassis, and tubes were missing. The whole project looked bleak indeed. Cleaning the rig, we decided we could tune it with pliers, bypassing the unstrung dial. We got a set of blown 6146s with a midnight call to neighbor WB8QVH. Any port in a storm.

Bob threw the switch. The pilot lamp lit. No smoke tendrils . . . yet! Barely controlling his wild emotions, Bob loaded it up, following the tattered manual. The wattmeter indicated 10 watts . . . 30 watts . . . 50 . . . *65 watts!* Bob captured the magic of the moment: "Geeee."

NX weekend dawned cloudy and cold. Ten and fifteen would be useless. Twenty was good only to Florida. Forty and eighty would have to do.

1900 UTC: My quivering hand flicked the toggle switch on the GPR-90 (Technical Materials general-coverage receiver, 1956) to "SEND," and snapped off the first CQ NX on 40 cw. WB8TTP, Jon, a Viking Challenger, answered! Then Bob, K8RBV, his Viking I on its third fuse. Out of the QRM, WA4DBG, Bob, a Collins 32V-3 from Tennessee. Then, nothing.

2000 UTC: A landline to K8RBV asking, "What gives?" Nothing there either. I swing the Lysco's lighted dial off the NX frequency and begin to answer regular CQs. Bob goes to 40 ssb with his Kenwood to see if anything lurks there.

2100 UTC: I landline Bob again. I'm talking to WA4DBG on 40 cw, who wants to know the age of his RME 69 (Bob has the official date book). Over the telephone, I hear him talking with W2MYA on 40 ssb. "Can he meet me on 80 cw?" "Sure, he'll fire up his DX-20 and try."

Meanwhile, I snag WB8QVH on 40 ssb with my NCX-500, relegated to auxiliary status by its late (1969) date. W2MYA QSYs to 80 where I can't hear him, but WA4DBG does and works him. Through it all, I don't think DBG ever got the age of his RME 69. NX is in full swing!

2300 UTC: A long distance call from WA4DBG. "Where is everybody?" Sigh. "I wish I knew." We comfort each other and vow to keep our chins up.

2330 UTC: A long distance call from Al, W5TTH. "Where is everybody?" Sigh again. He adds, "But I worked VE3FJH on 40 with my Harvey Wells Bandmaster (his first rig as KN9KHU)

Third place went to WA4DBG, whose multiplier of 70 certainly helped. Bob used a 1947 Collins 310B-1 xmtr and a 41-year-old RME-69 rcvr.

. . . it was as exciting as my first QSO!" I quickly excuse myself to comb 80 meters for that VE3 with a DX-20. And sure enough, there's VE3FJQ, 359 across the pond, *two* countries with my Lysco! Dreams of a Lysco DXCC dance in my head.

1977 Classic Radio Exchange
1800 Jan. 30-0100 Jan. 31 UTC

0501 UTC: NX ends, and I survey the scene. Thirty QSOs, 16 states and a nostalgia multiplier of 45, for 49,920 points. Gosh, one more QSO would have given me 50k.

In addition, we know that W2MYA, K4COR, WA8NEK, WB8s QVH and TTP, WB9SCX, VE3FJQ and some WA3 running an AT-1 were also in the Exchange but weren't able to send in their logs. If there were others, they're not admitting it. All participants received a pin engraved with their name, call and the affirmation, "*I was in the first Nostalgia Radio Exchange.*" Eat your hearts out. QST

The Results

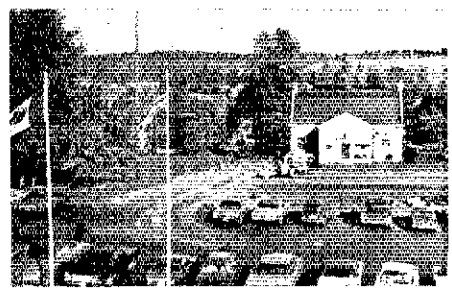
W8KAJ	49,920	AC7LNG	1,120
W5TTH	30,702	KH6BW	0
WA4DBG	27,260	WB2NGN	0
K8RBV	1,814		

Strays

□ An anniversary operating party will be conducted by the Rho Epsilon Amateur Radio Fraternity, W7YH, of Washington State University, complete with special QSO certificates on request. On December 11 the station will operate on 3930 and 14310 kHz from 1600-0300 UTC, and on December 12 they will be on 3730 and 7140 kHz, same hours.

The club was formed in the 1910-11 school year and held 7UL as its first station license.

□ Visited Headquarters lately? If so, you probably had difficulty finding a place to park. The reason is simple: The Headquarters staff has grown to just over 100 during the past few years and there are 54 parking places. Since the overflow of cars is creating a serious safety problem, some revisions are in order. As shown right, an area between the Headquarters office building and W1AW is being paved for parking as well as an area behind the existing facility. These changes will allow the parking of 103 cars at Headquarters. Additionally, three more parking slots are being set aside directly in front of the office building for use by handicapped visitors and employees. A special curb cut allows easy access to the building entrance by wheelchair.



The Rip-Off

How to check the rise of purloined gear? One possible solution to this definite problem comes from a ham/CBer who has personally experienced loss of a rig.

By Joseph F. Ratkiewicz,* WØIS/KZEØ957

"I want to be able to buy your unregistered stolen rig for peanuts and register it." Sound familiar?

Stolen, yes – almost every local QSO mentions some member having his equipment ripped off.

Registered, perhaps not – I'm proposing that all radio equipment, mobile and home stations, should be registered voluntarily.

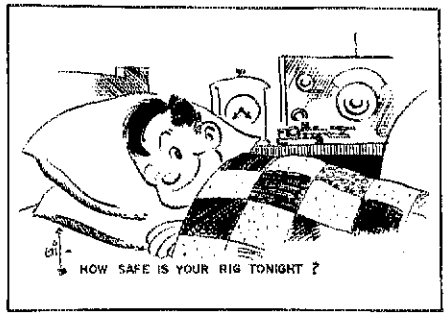
The Problem

Stolen equipment is one phase of our hobby that we share with CBers. In fact, the situation is really at the epidemic stage. Insurance companies have taken another look at their input versus output figures and found their losses up 40 dB. They have recalculated their rates such that it now costs about 10 percent of the radio's value to insure it, with a two-radio loss limit.

Many good articles have appeared about alarms and locks. These usually do a great job of keeping your friends honest. Yet the experienced thief will defeat them with no strain.

Law-enforcement people sometimes recommend etching a Social Security number on equipment. Many times I have tried to have various police departments tell me who 173-14-8367 belongs to. I know it is my Social Security number, but I have yet to get this information.

Now, I can just hear all you readers saying, "OK, Joe, you say alarms and Social Security numbers are useless so what do we do?" There are several solutions. My two-meter mobile comes out of my pickup truck whenever I get to my destination. The local hams have long since quit greeting me with laughter as I appear at the meeting with my commercial rig under my arm. Soon, I won't be taking it out. I'm fabricating a crude, shoddy-looking cabinet to house the rig. There's little market for a homebrew rig.



But these are only temporary solutions. I could get mugged while carrying my $400 box from the parking lot.

A Proposal

The solution, the real solution, lies in one place, fellows – the marketplace. To make it worthwhile to steal a rig from your car or house, the stealer has to have a buyer. Namely, he has to have a person waiting and glad to pay $150 for a $400 untraceable rig. Then, that can be stolen and the chain is endless.

Suppose all radio equipment, CB and ham, were titled by the state, like motor vehicles. They do it for $100 motorbikes, and rigs cost a lot more. Note, I'm talking about a radio, a box, a piece of personal property. This would be in the state's jurisdiction. Only when you connect it to power and an antenna are you under FCC authority.

Therefore, I propose this voluntary program:

1) Manufacturers would get together and place a very legible serial number on the case and chassis. The chassis number should be stamped in while the case would be embossed from underneath, causing the numbers to stand out. This would make altering difficult.

2) State inspectors would compare the bill of sale or other legal document with the serial numbers. If it only had a chassis number, the lid would be removed for embossing then and there.

3) A fee would be paid, say five dollars, for registration. This would be shown by a small sticker placed in a conspicuous, top rear corner. It would contain the serial number, date and place of registration, and a title.

4) If you sell or swap the equipment, you sign the title and the buyer processes it the same way you did.

Making It Work

If a duly registered piece of equipment is stolen, the police have a legal description and number. It's amazing what their computer can already do with the information. Their computer can talk to other computers and find cars four states distant from their owners. They can do the same for radios. Many radios now end up unclaimed in police property rooms because the ham forgot to record the serial number in his log.

A rig had actually been stolen from me and later recovered by a buddy ham who is also a police officer. When it was stolen, I gave the police all the numbers. A few weeks later, my friend spotted it in a hock shop. He verified the serial number and justice took place.

To implement this solution we have to get the manufacturers behind us for good serial numbers and we have to get to the state legislatures. This may take time as most legislative channels are slow, but the topic is hot and not too controversial.

We are asking for help. We are telling the state governments our problem and exactly what we need. Namely, we present them with a neat package that fits right into their existing machinery of vehicle inspection and registration along with the computer networks.

Please bear in mind that I'm saying this procedure would be voluntary. But, an unregistered stolen rig could be bought cheap, then registered.

Talk It Up

It does not help to write articles that motivate the reader only to turn pages and promptly forget the information. That is, unless we have the same problem described. So, the action to be taken here is to take this to your club. Cuss and discuss it. Modify it as you will. Send your finished version to your state senator. They want to pass bills that help people and bring in money.

This sounds like a rather involved procedure, but for a $400 to $1200 rig, I feel it is rather cheap insurance. No one wants to buy a ripped-off, registered, heavily serial-numbered, traceable rig. QST

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Marine Mobile Revisited

Anchor, plug the rig in and work the world! It's easy and fun. Here are more maritime hints and kinks from an extended Caribbean cruise.

By William H. Trayfors,* WA6CCA

In the wake of K6UJ's excellent article,[1] here are a few of my own recent experiences with marine mobile operation aboard a similarly small sailboat. These confirm much of what Brandon observed on his 27-foot sloop, *Flicka,* but I also encountered some variants and new wrinkles which may be of interest to others.

During the summer of 1975 my family and I chartered the 34-foot (10-meter) Pearson sloop, *Joker,* for a two-month, 1000-mile cruise through the eastern Caribbean. Though a fast boat, she is designed and equipped for comfortable cruising by owner Dick Avery in St. Thomas, U.S. Virgin Islands. Also, we learned, *Joker* is a most exquisite platform from which to hang a 20-meter dipole.

The Portable Installation

Because it was a chartered vessel I had no permanent ham shack on board. Instead, I had a brand new Atlas 210 that could be set up in five minutes. My sons and I always dismantled the whole lash-up before sailing, putting the little rig away safely in a heavy plastic bag. Later, at anchor, it was necessary only to snap two big alligator clips onto the boat's 12-volt storage battery, plug in the mic and antenna, check the SWR, and I was on the air. The usual placement was atop the chart table, but frequently we'd put the rig on the cockpit bridge deck.

I found that no ground other than the boat's was needed. The Atomic-4 inboard engine was grounded through the Monel shaft and bronze propeller. This was perfectly satisfactory when in salt water, confirming what I had heard from others and experiences on my 38-foot ketch, *Tradewinds.* Conclusion: No need to use a separate ground in salt water at these frequencies.

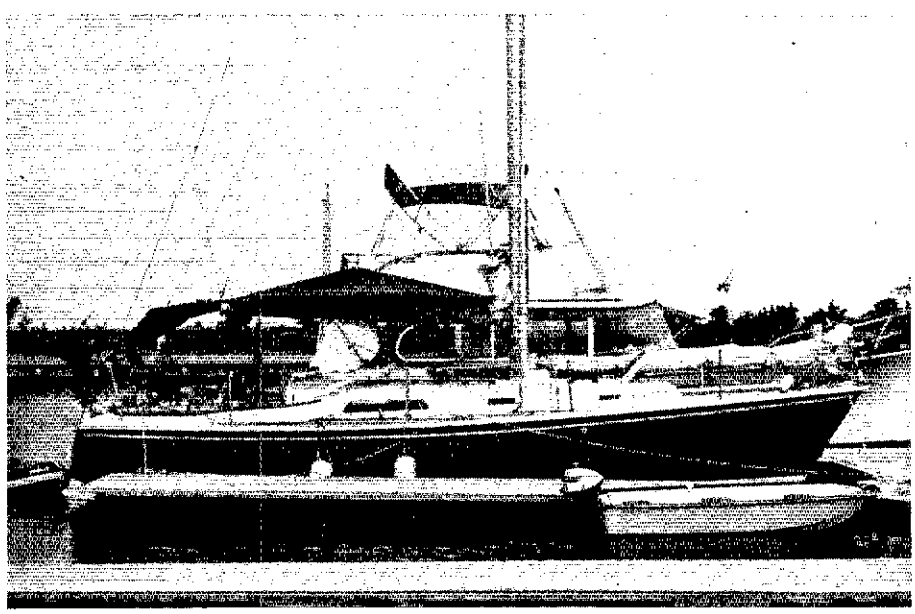
An Antenna That Really Works

On this trip I tried an idea first suggested to me by two round-the-world small-boat sailors, Cliff, VS9MOR, and C. A., HP9XCD. Both of these deep-water types have been using with great success a double-bazooka dipole constructed from RG8/U coax (*The Radio Amateur's Handbook,* 1975 edition). After hearing these antennas on the air, I was impressed enough to build one.

They related the details, but somehow I managed to lose the notes I had hastily jotted down. When it came time to build my bazooka all I could remember was that it was a type of dipole constructed from coax cable. So, without benefit of the *Handbook,* I cut two lengths of RG58C/U, soldered the center lead and braid together at one end of each, and connected those shorted ends to a balun with about 50 feet of lead-in. Of course, this configuration was just a plain dipole. I thought the main idea was to protect the radiating element from saltwater corrosion

Despite my construction goofs, I did remember how to correctly rig a dipole on a sloop. Merely attach one end to a spare halyard and hoist it to the top of the mast. Tie the other end on the stern pulpit and as far to the side as possible so as not to be too close to the standing backstay. Let the lead-in fall where it will and bring it belowdecks through any convenient opening.

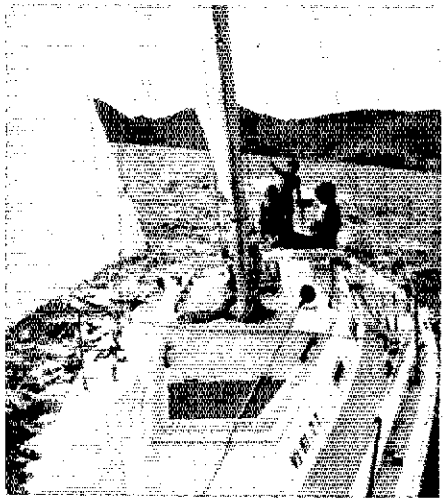
After a bit of trimming I got the



Balun and dipole are to the upper left of the main mast. Here, *Joker* is at Little Dix Marina, Virgin Gorda.

*Kathmandu (ID), Department of State, Washington, DC 20520

[1] Wentworth, "Marine Mobile Under Sail," *QST,* March, 1976.



The dipole extends from the mast to the sloop's stern pulpit while underway.

SWR down to 1.1:1 at 14.3 MHz. Although I had not built a real bazooka, the first CQ brought WA4ELW with a 59 report and 30-minute ragchew. I can guarantee you that you're certain to have more fun working 20 meters with a portable rig and vertical dipole over salt water than from any other QTH. Reception was fantastic and signal reports were truly stupendous. In one QSO after another, I was accused of running up to 10 kW and a 5-element beam. Signal reports sometimes run like fish stories, I admit, but you need not believe me; try it yourself. The gain of a plain dipole vertically strung, compared with a whip antenna, over salt water, has to be experienced to be believed.

There are, of course, drawbacks. This may be a neat arrangement for chatting on the rig while at anchorage or when you're on the same tack for hours or days during a long voyage, but it is not well-suited to the communications needs of the weekend sailor while underway. The lead-in gets in the way when you're tacking ship. I've thought about ways to overcome this problem, but have tentatively concluded that there may not be any simple answer.

An idea for a yawl or ketch might be to run the feed line up from the center insulator balun to a point near the truck of the mizzenmast, then down the mast to the rig. On a sloop or cutter it might work OK to tie the feed line somewhere up the standing backstay and lead it down the backstay.

Physical strength is another problem. Forget RG58 if you plan to make a bazooka dipole; it's not strong enough. A small boat is subjected to much roll, pitch, and yaw — all of which make such an antenna with a center insulator or balun strain mercilessly. Mine lasted about two weeks before it snapped. But Cliff's and C. A.'s, made from RG8, lasted halfway around the world.

In a later discussion with Cliff, I concluded that the best alternative is probably to construct a dipole from stainless-steel wire rope. This could be either a permanent installation set as a backstay using appropriate strain insulators or a portable rig with lighter, more flexible stainless-steel wire for easy storage and reduced windage.

About Other Bands

OK, you say, fine for 20 meters, but suppose I want to work 15 meters? After my original dipole busted, we used a spare Hy-Gain tape dipole that has stainless-steel elements and it performed great on both 15 and 20 meters.

Early in the cruise I made contact with my friends to meet at English Harbour, Antigua. As Cliff's 38-foot yawl, *Moriah*, neared the Caribbean, the skip on 20 became too long for good contact, so each night we relayed through Bob, K4MZU, in Miami and decided to try 40 meters.

With the help of John, KV4IF, I constructed a simple quarter-wave vertical from 12-gauge stranded wire. This was hoisted to the mast truck and at the lower end was terminated at an insulator that was tied to the stainless stern pulpit. We grounded the pulpit to the standing backstay, already grounded to the water and other standing rigging, fed the wire going up to the mast at its lower end, and used the pulpit-ground as a counterpoise. After some trimming, the SWR was a nearly flat 1:1. I had no problems making contact with Cliff after that. This arrangement, however, will only work well if you use stainless-steel fittings and wire rope for the radiating elements. The copper wire we used lasted only a few weeks before it was too corroded for service.

Operation in Port

When in the proximity of other sailing yachts you will probably find, as I did, that your SWR goes mad. Once, in a Roadtown, Tortola, marina I spent the better part of an afternoon checking, trimming, rechecking, and retrimming the antenna, and still could not get the reading below about 1.5:1. Fretting over a cold 807, it suddenly dawned on me that all the rigging nearby could be a problem. A quick move to a location away from most of the other boats brought the SWR down to a satisfactory 1.2:1.

If you go abroad, sometimes it pays to get a reciprocal license. While still in U.S. waters I inquired of a friendly VP2V about getting a British Virgin Islands call sign. He gave me excellent instructions and encouragement, which I promptly followed upon arrival in Roadtown. With the taxi literally waiting outside I went to apply for a call,

Keep your bearings! On the high seas it takes an able crew and the right gear to stay on course.

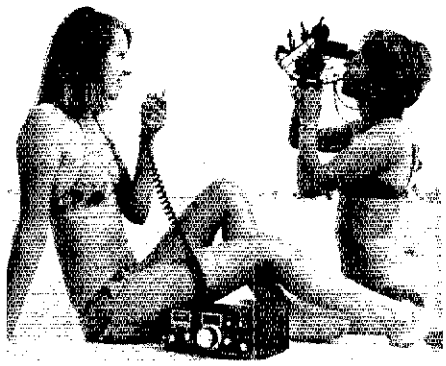
my U.S. license in hand, and exactly 11 minutes later had VP2VCS/mm. This call allowed me to stay on the air while in British waters and work 20-meter phone down to 14.1 MHz.†

My first contact with this new call was G4GI who gave me a generous 58 report. Friends in nearby boats were most impressed, particularly since they were unable to raise the St. Thomas marine operator, less than 20 miles away, on their vhf rigs.

Meeting Friends

In boating, they say it's the people you meet who make it all worthwhile. I found this to be doubly true when you move your ham rig aboard. We met dozens of ham friends all over the Caribbean, had eyeballs with five new-found ham friends, three of whom were MMers, and were generally made to feel a part of the local scene.

Most memorable, however, was our scheduled meeting with VS9MOR and



In times of distress your maritime crew has a choice of an ancient sextant or a modern amateur rig to provide aid.

family at English Harbour. Though we had talked many times before during their passages around the world, this was our first eyeball. While we spent four days together in a quiet Virgin Island anchorage, Cliff and I swapped lies about great voyages past and future. It ended all too soon with K4MZU's report that the developing hurricane in the eastern Caribbean had blown itself out. Taking advantage of the favorable weather report, we all said good-bye.

Our family returned *Joker* to Avery's and headed back home to the high Himalayas. Regrettably, there are no 9N1 tickets to be had there, but already we're planning our next marine mobile adventure. Try it; you'll be hooked in no time at all. And don't forget to take along that 20-meter dipole! QST

†[Editor's Note: When beyond the territorial limits of any government jurisdiction, FCC licensees may operate as provided by §97.95(b) (2), " . . . operation may be conducted within Region 2 on any amateur frequency between 7.0 MHz and 148 MHz, inclusive; and when not within Region 2, operation may be conducted only in the amateur bands 7.0-7.1 MHz, 14.00-14.35 MHz, 21.00-21.45 MHz, and 28.0-29.7 MHz." Generally, Region 2 includes North America, South America, and surrounding waters. Check the ARRL *License Manual* for details.]

Strays

□ Hams may have married hams before, but Derrick and Amanda King, VE7BFO and VE7AQS, also had a ham conduct their ceremony – Rev. Douglas Millar, WBØNST. The event took place at Silver Lake, ND, where Doug is pastor at Nordland Lutheran Church. All three had met during the summer while working on projects at a United Nations Conference in Vancouver, BC. From there, the couple went to the wedding site, selected "to please the relatives as it's quite close to halfway between Vancouver and Newfoundland." The newlyweds kept in touch with friends along the way with a 2-meter hand-held transceiver.

Derrick and Amanda King, VE7BFO and VE7AQS, with Rev. Douglas B. Millar, WBØNST, at their lakeside wedding. Ruth Millar, SWL, is looking on at the first all-ham wedding in that area.

□ The Hoosier Hills Ham Club of Lawrence County, Indiana, assisted officials of the Mitchell, Indiana, Chamber of Commerce by providing communications for the 30th annual Persimmon Festival Parade held September 25, 1976. The two-hour parade culminated the week-long celebration which attracted visitors from throughout Indiana. More than 10,000 spectators, including Indiana Governor Otis Bowen, viewed the parade, which contained over 50 units. Three separate stations operated on 146.94 MHz to link the reviewing stand of the parade with both the start and finish areas of the parade route. In addition, a parade entry operated as a mobile unit within the parade to inform the reviewing stand of progress and problems along the two-mile parade route. Parade officials sent and received in excess of fifty messages concerning changes in the order of parade units, and, more importantly, notifications of winning entries at the final check out. The club was called upon to assemble an impromptu public-address system at the reviewing stand when it was discovered speakers there had been removed the night before the parade. Participating in the club project were Larry Foster, WB9DNB; Joe Hall, WN9WBC; Bill Jenkins, W9WHL; Harold Lee, W9KWB; Stanley Mize, WB9CBX and Club President Butch Robison, K9ZRL.

NEW CONTEST CERTIFICATES

□ The very first of a new generation of contest certificates went to Arnie Freeman, W2YD, when he dropped by Hq. early in October. A particular contest will be identified by one of four colors – red, gold, blue or green – embossed on the ARRL diamond. Arnie won a red certificate, being presented here by Assistant Communication Manager WA1STN, for the 1976 DX Competition. The new wallpaper is now being awarded for all ARRL contests.

STOLEN EQUIPMENT

□ GTX-1T Handie-Talkie, serial no. 10-59, stolen from booth at Genave Radio Expo '76 in Chicago, Sept. 18-19. Claude L. Henderson, General Aviation Electronics, 4141 Kingman Dr., Indianapolis, IN 46226.

5-Band WAS, the Hard Way

The bands were fading away and two-letter calls were rare. W9JA put those together for a real operating adventure and came out with 5-Band Worked All States No. 250.

By Charles R. Pendl,* W9JA

I checked 10 meters regularly for an opening even though it was deader than a rusty horseshoe nail. In desperation I combed through my log books without much hope of finding some forgotten QSO that might fill the bill. But much to my delight there it was – a 10-meter QSO with WØPE, Kansas. Al's QSL card was in my hands shortly and on April 30, 1976, I received a nice letter from W1CKK advising that the sought-after award was mine.

Along about September, 1972, I had just about completed 5-Band DXCC and had already confirmed DXCC country number 300. Because the sunspot cycle was fast dropping toward a minimum and new countries were few and far between, I was casually, almost subconsciously, searching for some kind of an operating challenge. Quite a bit of my operating time had been spent on 80-meter cw and 75-meter phone in an effort to get those last few countries for 5BDXCC. I naturally stumbled into the Geritol Net, that now-famous group of old-timers dedicated to the proposition of working all states in the Extra portion of the 75-meter phone band with two-letter calls only. My interest aroused, I took up this challenge in earnest with the result of a brand-new WAS certificate for W9JA endorsed "No. 54 Two-Letter Extra-Class Portion of 75 Meters" on March 30, 1972 (ARRL No. 22,833).

My first WAS award, ARRL No. 1520, was issued to W9IHN on March 5, 1941. After 28 years of amateur activity, 21,313 awards show a general good interest in the WAS award at an average of 800 awards per year. A few weeks later, while in QSO with Bob, W5DS and Don, W7OK, we were discussing the possibility of some amateur organization, such as the Old Timers' Club or Quarter Century Wireless Association or Old-Old Timers' Club, sponsoring a special award for accomplishing WAS with two-letter calls only, or some sort of a contest, like working as many two-letter calls as possible.

The Challenge

The thought crossed my mind – here is a real challenge. Why not try 5-Band WAS with two-letter calls only? Quick in-head calculations indicated that this would be about 50 times more difficult than the ordinary. A more exact probability ratio I leave to you mathematicians and computer types. After mulling it over for a week or so, I decided to earnestly try 5-Band WAS with two-letter call signs only. At this particular period of the sunspot cycle, even old friend 20 meters could be very disappointing at times, not to mention the long periods of complete silence on 10 and 15 meters.

Chuck Pendl, W9JA, shows off 5BWAS No. 250, garnered entirely through contacts with other two-letter call stations.

Upon checking the rules I found that only QSOs made after January 1, 1969, count for 5-Band WAS. I dug back through my logs and started sending QSL cards for two-letter QSOs after that date.

During the first year almost all my operating time was spent cruising the bands looking for two-letter calls in states I needed and on the bands I needed. Sometimes a request to QSY to another band resulted in a quick QSO on two or three new bands. At other times, the particular station was ready only on one band, or else 10, 15 and even 20 meters would be dead. What a disappointment.

A rare state like South Dakota, with a good friend like Al, WØLX, might be all set to go to 10 meters only to find the band a complete washout, not even a whisper of back scatter with both ends beaming south! Speaking of being QRV on five bands, I suggest beams on 10, 15 and 20 meters, plus good general-coverage antennas for 40 and 80 meters.

Record keeping of the progress was a lot of fun and a review of my records

*Box 73, Suring, WI 54174

shows that by December, 1973, of the 250 required, only 83 more QSOs were needed. It went like this: December, 1973 – 83 to go. January, 1974 – 61 to go. March, 1974 – 41 to go. August, 1974 – 31 to go. December, 1974 – 27 to go. June, 1975 – 13 to go. August, 1975 – 8 to go. November, 1975 – 5 to go. January 11, 1976 – completed.

The Scheme

A check sheet was made listing call areas and states vertically and the five bands horizontally. As states were worked, a tiny dot was added in the appropriate square. When the QSL arrived, the call sign was entered. This sheet was especially helpful when 10 meters would be open to only a certain small area of the country. In early 1974 a card file was started to catalog all known two-letter call signs in the states needed and their locations. An individual card was made out for each known active station, noting as much detail as possible, including telephone number, equipment, operating hours and so on.

Study of *QST* contest results and operating activity often revealed a new two-letter call active in some rare state. Whenever I would work a two-letter station in some state that I had already confirmed on that band, I'd always inquire if he was ready on the other bands I needed him on, get his telephone number and so on. Contacts on 80 and 40 meters during hours of darkness often found the higher bands closed. The telephone number is always very handy for future reference.

This worked out great for a much-needed Wyoming QSO on 10 meters. During one evening, around 10 P.M. local, a casual check of 10 meters revealed only one station that I could hear. But it was Tom, WA7MAL, in Cheyenne, Wyoming. I gave him a quick call and requested that he give Doc, W7FT, a landline call to ask if he could get on the air. It worked out great and the three of us then tried for another half hour to raise any other station, but the band was completely dead otherwise.

The chase soon became much more interesting than a new DXCC country. The two-letter-call gang was really cooperative and helpful and in all cases eager to be of assistance. I must add that when I told them what I was trying, a few of them remarked that I was attempting the impossible or that I was out of my tree!

An Extra Class license helps but is not a prerequisite. Quite a few of the OTs with two-letter calls are not Extra Class but at the same time were very helpful in completing the effort.

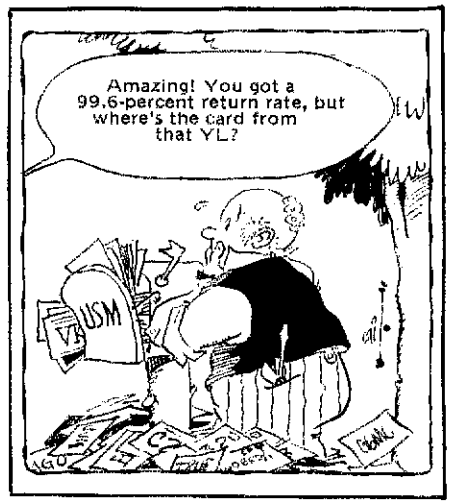
Amazingly, QSLs were returned at a 99.6-percent rate. All but one of the 250 QSLs were in response to my s.a.s.e. requests. The one that did not QSL was a fairly busy YL (the only YL QSO of the 250).

As time moved on the required number of QSO/QSLs became fewer, but farther apart. On November 15, 1975, I still needed five hard-to-find QSOs from this location, North Dakota on 15 meters and North Dakota, South Dakota, Minnesota and Idaho on 10 meters. Then Murphy stepped in.

A somewhat routine check with my family doctor indicated that I should go in for heart evaluation. An appointment was set for December 2, 1975, which resulted in an immediate check-in at the cardiac ward of my hospital. I checked out 25 days later and 30 pounds lighter. Any ham could guess that it was not many hours after returning home that the filaments were burning and the effort was again "go."

An Opportune Aurora

On January 9, 1976, 15 meters was quite active with good signals and a lucky QSO was made with Proff, WØDM. Only four more to go! Then, at about 2230 UTC on the next day, a check of 10 meters revealed a tremendous aurora effect. It was the most awesome aurora opening I have ever witnessed in more than 30 years of hamming. Pointing the beam north seemed to peak signals from all over the country; ssb signals had such a tremendous arctic flutter that they were difficult if not impossible to read, but the cw had a beautiful, raw ac that sounded more like spark gap than anything I have heard for many years. By 0105 UTC on January 11, contact had been made on 10 meters with Al, WØLX, in South Dakota, Charlie, WØHW, in Minnesota, Jeff, W7FL, in Idaho and Proff, WØDM, in North Dakota. What a tremendous thrill those last four QSOs were! By January 19 all of the QSLs were in hand. By the first week in March I had them started on their way for a 5-Band WAS application to ARRL hq.



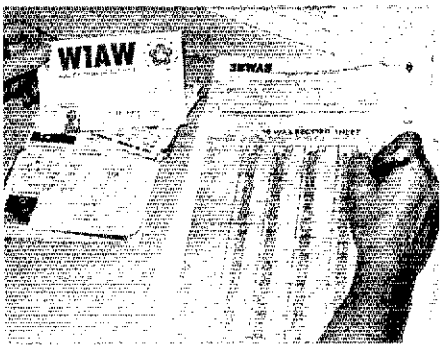
I thought I had it made. But a nice letter from Jean DeMaw, W1CKK, ARRL's "Award Giver-Outer" advised that the two cards from W2BO had omitted my call. Also, the 10-meter card from WØAY, Kansas, had misprinted my call, and on top of all that, the W9BG and W9JK QSLs for Wisconsin both indicated 21 MHz. No card for 7 MHz from my home state! A quick note to Mac, W2BO, brought an immediate reply and correction. Also, a search of my QSL files turned up a beautiful card from W9GA, Wisconsin, on 7 MHz. Still, I had no reply from my letter to WØAY. After several frustrating weeks of waiting, I noticed WØAY listed as a Silent Key in *QST*.

The Award

Finally, a recheck of my logs revealed the contact with WØPE. An s.a.s.e. quickly brought the last needed card. I had done it! And what a coincidence – 5-Band WAS No. 250 for 250 QSOs.

Reviewing the record shows that 157 different stations were worked for the 250 QSOs required. W1ST, W5DS, K4II and WØLX were worked on all five bands; KL7MF, KH6IJ, W4NG, WØLJ, W4GK, W1ZW and W8BT were worked on four bands; 13 stations were worked on three bands and 16 stations were worked on two bands.

Many of the gang had been interested in my efforts and progress and were very understanding and cooperative in sked-keeping and band-changing. Their support made me wish I was just embarking on this really challenging and great-fun operating adventure. Who said there are no new challenges in amateur radio? Try it; you'll like it! QST



ARRL "Award-Giver-Outer" Jean DeMaw, W1CKK, checks a card from the Hq. station that W9JA submitted along with 249 other QSLs for the first 5-Band Worked All States by two-letter calls. Of that group, four were worked on all five bands and seven made contact on four bands. Many of those were through quick band changes during optimum conditions.

Checking into Slow-Speed Nets

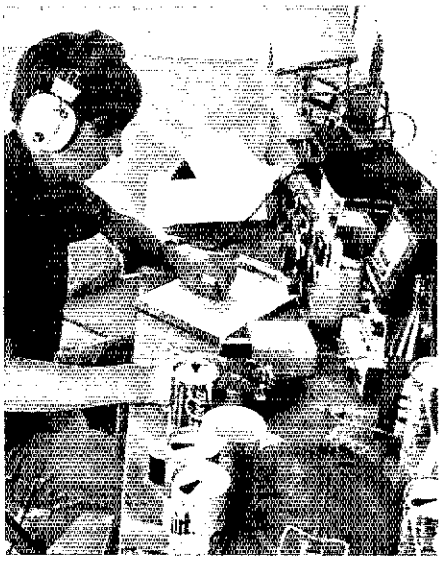
Tired of being plugged into a code cassette hour after hour? Then check this out.

By Peter Hills,* WØHXB and Robert Halprin,** WA1WEM

Take it from us, there's a good chance that you'll enjoy handling traffic (messages) more than listening to a code cassette over and over. While sojourning on slow nets, ham radio newcomers (Novices, Technicians and inactive upperclassmen) can QSO savvy cw operators, increase their code speed for those upperclass licenses and learn message-handling procedures. The other part of the equation involves the more experienced types. Their presence serves to introduce the newcomers to one of the public-service aspects of amateur radio as well as brushing up on their own operating skills. We now have more newcomers than ever before, so let's get going!

Most slow-speed traffic (message relaying) nets operate in the 80-meter Novice band with affiliation with the ARRL National Traffic System. They exist to train hams in proper network operation. We'll try to give you a general explanation of what you might hear on a slow net frequency. Keep in mind most of it is similar to the action on a regular cw net.

*2048 Hudson Street, Denver, CO 80207
**Assistant Communications Manager, ARRL



Well-known traffic man and contester WA3SWF got his start on training nets.

Checking In Is Easy!

The net control station (NCS) will call the net at about 10 words-per-minute. In the callup, he'll be using an accepted abbreviation of the net's name:

CWN (Colorado-Wyoming Net) *DE WØHXB QND* (the net is now in session) *pse QNZ* (please zero beat my signal) *CWN DE WØHXB QNI K* (stations wishing to check in, go ahead).

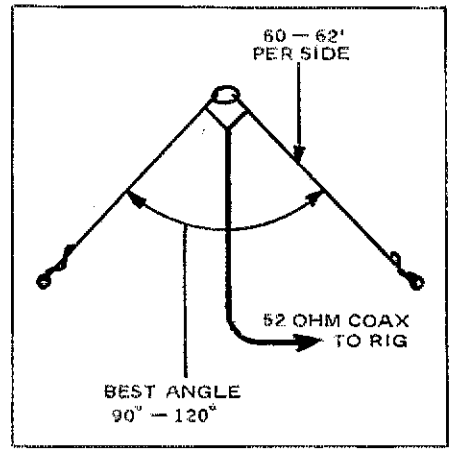
Wait a few minutes before checking in, since there will be an initial rush from the more experienced net members who have traffic to pass. After the busy period slackens, reply to the NCS's callup by simply sending a letter of the alphabet, such as *M*. When the NCS repeats that same letter, it means that he is standing by for you and YOU ONLY. He wants you to "Come on down!"

That's your cue. You send *DE WNØWEM QRU* (this is WNØWEM, I don't have any traffic). YOU DON'T NEED TO SEND THE NCS'S CALL WHEN CHECKING IN. Keep in mind that it's better to check in at a speed slightly slower than your maximum copying speed. The NCS should respond at your speed. This way you're sure of being able to understand what he's talking about!

WØHXB (the NCS) responds *WNØWEM GE R AS* (good evening, I acknowledge that you have no traffic, please stand by). Later on, he may ask you for your name, QTH and perhaps your street address so you can be added to the net roster and receive a net bulletin. He will "officially" welcome you to the net and ask you to check in as often as you can.

QRU, QTC, What Have We Here?

Listen to others checking in, the way they conduct themselves on the net, and practice copying the messages being sent. Before long, you'll get to know the procedures, abbreviations and Q signals. One you're sure to hear often is QTC,



A rig that offers break-in, a T-R switch, separate transmitting and receiving antennas, or a transceiver with fast VOX is a real help. While any efficient and resonant antenna will do, an inverted dipole with its center 35 feet or more (the higher, the better) above the ground is probably best and easiest to erect. Such an antenna will operate over all of the 80- and 75-meter cw, Novice and phone bands, with an SWR of less than 3 to 1 and will work very well on less than 250 watts (Novice power limit). Fold the ends back to allow precise adjustment of frequency. Useful (but not necessary) accessories include headphones (to increase concentration), an audio clipper (back-to-back diodes across the audio output to protect eardrums), an audio filter (to cut down on QRM and QRN), an SWR bridge (for antenna adjustments), or an electronic keyer (for precise keying at rapidly and widely variable speeds).

which basically means traffic. For example: *QTC 1 Denver* (I have one message for Denver).

Most of your questions concerning traffic handling will be answered by getting hold of the following ARRL operating aids (available for a large-size s.a.s.e.): *Operating an Amateur Radio Station, Public Service Communications,* and CD forms 3 and 218. The meeting times and frequencies of traffic nets can be found in the ARRL *Net Directory.* Get out your back copies of *QST* and read "A Beginner's Guide to Traffic Handling," July, 1976, *QST,* page 58. Don't forget the brand new *ARRL Ham Radio Operating Guide,* while you're at it.

The typical slow net will run about a half hour. Eventually you will be excused. The NCS will call you by sending the suffix of your call: *WEM.* You then send something to indicate that you're listening, such as a dot or a dash, or *K* or *HR* (here), or *C* (yes). The NCS will send *QRU QNX* (we have no traffic for your area, you are free to leave), *TNX QNI* (thanks for checking in), etc. If necessary, you can ask the NCS to excuse you early; *QNX?* However, never leave the net without the NCS's permission.

You have a choice of methods of signing out: *WØHXB DE WNØWEM GE* or *CWN DE WNØWEM GE.* To save time, the NCS may excuse everyone at once: *QNC* (everyone copy) *CWN QRU QNX TU GE CWN DE WØHXB QNF* (the net is over). Then individual stations take turns closing. Remember, you do not need to identify (your call sign) each time on brief exchanges, but only when you QNI, QNX and every ten minutes during lengthy transmissions.

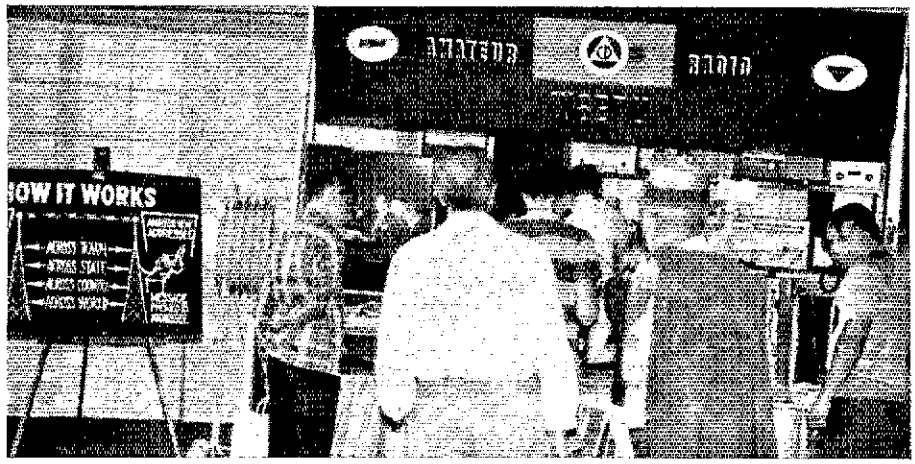
As you get more experienced and confident, you will start handling some messages. Most of the traffic will be handled off frequency. The NCS will send you and another station to a specific frequency: *WNØWEM KØTER up 3 Denver* (WNØWEM and KØTER QSY up three kHz and pass one message for Denver). Do something with your key to signify that you heard and you're moving. The RECEIVING station always calls the station who has the traffic. Most likely, you won't be asked to handle traffic until you've checked in a few times. Your first message may be a formal welcome from the net manager. Regardless, don't get nervous. Make contact with the station on the specific frequency. He will ask you if you are QRV (ready to copy). Answer yes, if you have a clean sheet of paper and a crayon in front of you. You may want to have your ARRL operating aids handy as well.

If you missed some things and need fills (repeats) don't hesitate to ask for them. For example, in the sample message, if you missed Pete Hills' call sign, you would ask: *WA Hills* (word after Hills). If you missed the number on Hudson Street, you might ask for *WB Hudson* (word before Hudson), so on and so forth. When you have it all down, you will be able to *QSL* the message with a clear conscience!

Remember, efficiency of receiving, not wild code speeds, is most important in traffic nets. When you're the one transmitting the message, there is no need to repeat anything unless it is a very unusual word or you are asked to repeat. You should also keep your calls short.

Regular participation will earn you a net certificate. Before long, you will be able to originate and deliver messages for your community and assist in emergencies. You will probably want to get your ARRL ORS (official relay station) appointment from your Section Communications Manager (see page 8, *QST*). The SCM can also provide information about nets in your section.

It won't take long for you to find that traffic handling is an exciting way to bring up your code speed and that it's fun to hang out with experienced operators. Your specific questions can be answered by the NCS or net manager, AFTER the net. We look forward to meeting you on the air soon. QST



The general public is quite fascinated with our free message-handling capability, as evidenced by the crowd around this booth at the Ohio State Fair.

WN6CZV seems to be enjoying the peaceful coexistence with the patrons of the Novice frequencies, of which traffic handlers are the cream of the crop.

Sample Message

27 R KØTER *ARL17* COLO SPRINGS CO JUN 9

PETE HILLS WØHXB — AA — End of first adr lines
2048 HUDSON ST — AA
DENVER CO 80207 — AA
TEL 979 7423 — BT — See CD Form 3 for ARL texts

WELCOME TO CWN X WE
NEED YOUR HELP AND HOPE
YOU COME OFTEN X ARL
FIFTEEN 73 — BT — Before and after text

MIKE — AR — End of msg

From: WBØQOT 6/9 0200z
To: WØHXB 6/9 0500z — Note for your files

Note in the sample message that *Xs* are used instead of periods and *NO* punctuation is used. It is *Number* 27 and the *Routine* text has *17* words in it, including an *ARL* text. (ARL FIFTEEN — Advise if you need help.)

W4OZF/4 on No-Name Key... Field Day in December

ARRL's 160-Meter Contest provided a Murphy-ridden Field Day in December for W4OZF and K4DBZ. Their story may make you glad you're staying home!

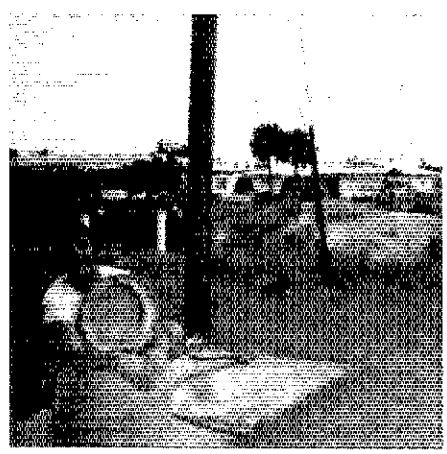
By Tim Cotton,* K4DBZ

Friday morning dawned clear and crisp as the sun came up out of the Gulf Stream off the southeast Florida coast. A blustery 20-knot "northeaster" was on the way and indicated that a cold front was blasting the W2s and W3s to the north — ideal conditions for our venture to the Florida Keys during the ARRL's 160-meter contest. We needed that wind to support our 5/8-wave vertical by means of a kite. Although the chill in the air might drive away the tourists, it suggested that the typical south Florida 160-meter static levels might drop to less than their usual brain-scrambling proportions.

My teenage son, Mike, and I packed our new camper with radio gear, fishing tackle, snorkeling equipment plus the usual assortment of food, beer, Band-Aids and mosquito repellant and headed off to the lair of W4OZF, south Florida's perennial contester. Bob had crammed his VW squareback with more of the same, including a generator and spares for the entire station. Following a brief "what-have-we-forgotten game," we set off for the Keys with high hopes, pitying those who had to be at work or in school on such a fine day. Huckleberry Finn couldn't have been happier slipping out into the Mississippi on a raft on a crisp autumn day.

Bob and I kept in touch via 15-meter sideband and interspersed our 150-mile mobile QSO with an occasional European or stateside contact. I also had a 2-meter fm rig in the van and chatted with the work-bound mobiles in the Miami area. Driving over the narrow Keys' bridges on a windy day in a camper gets to be a bit harrowing, but doing it *and* working two bands simultaneously is madness!

We had been anticipating this event for months and approached the whole thing with high spirits in spite of a disastrous trial run a few weeks earlier, when we managed to briefly run a kW from Bob's VW right in the middle of Miami's Rickenbacker Causeway. The wind had died that weekend and the kite was almost lost in the waters of Biscayne Bay after the first hour of the contest. In addition, the surplus weather balloon we had brought along, just in case the wind died, turned out to be full of leaks. That spelled the end of our first venture, but things had to be better this trip. The weatherman predicted high winds, small-craft flags were flying straight out, and the seas in the Gulf Stream were piling up from 8 to 10 feet.



K4DBZ poses with his trophy, the "Murphy Cup," another victim of the operation.

In the past Bob has experimented with 5/8-wave "slopers" and inverted Vs suspended from a 1000-foot Miami TV tower with generally poor results on 160. Like many city dwellers, we haven't had much success on the band from home due to small lots, poor ground systems and small antennas. Neither one of us is an antenna theorist, but it didn't take long to figure out the requirements of an effective 160-meter system: (1) good ground, (2) big antenna, (3) high antenna, and (4) no line noise. A kite-supported vertical on an uninhabited island surrounded by salt water with no power lines evolved as the solution to the problem.

Not a New Technique

The military has used kite-supported antennas for years. In his early wireless work, Marconi himself is said to have experimented with kite-supported antennas at the shore. Our idea was nothing new although it did have an up-to-date twist. More properly referred to as a Jalbert Parafoil, our kite is not a kite at all since it contains no rigid supporting members and when not in use folds into a size no larger than a pack of cigarettes. It weighs about six ounces and provides 7.5 square feet of very effective lifting surface. The Parafoil is made from the same lightweight material used in manufacturing spinnaker or balloon sails that sailboats use when on downwind legs. Wind pressure actually serves to inflate the Parafoil and gives it an efficient airfoil shape rather than the flat surfaces of a kite.

The antenna wire, which consisted of 320 feet of soft, drawn, enameled

*5680 Southwest 16th St., Plantation, FL 33317

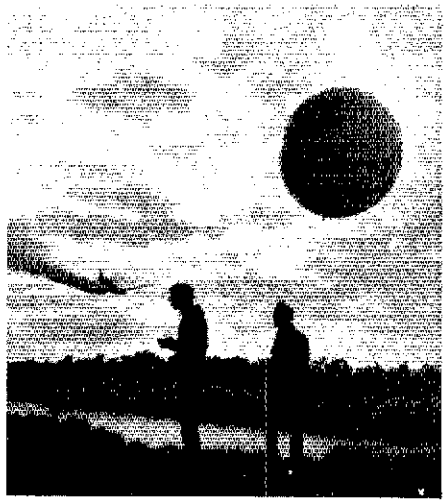
copper of approximately 20 gauge, was scrounged from the back lot of a local scrap-metal dealer. A surplus Collins tuning unit containing a rotary inductor and a vacuum-variable capacitor in an L network was used to tune the antenna. We brought along a 150-foot wire for use as a radial and also had a piece of 6-inch-wide copper flashing about 50 feet long to submerge in the salt water.

We had visited the Keys a month earlier in order to pick the ideal spot for the operation. "No-Name Key," a small uninhabited key south of the famous Seven Mile bridge, had everything we wanted — isolation, no power lines to generate line noise or lose the kite in, plenty of salt water, and few people to ask questions about why two grown men would be crazy enough to fly a kite at three o'clock in the morning. We picked out two spots on the island, which later turned out to be a good idea since our first choice was occupied upon our arrival by another group of people in a van also seeking isolation.

The antenna went up in less than five minutes. First we ran out about 300 feet of line; next, attached the antenna wire to the line with a swivel, and then played out the 320-foot wire plus another five or six hundred feet of line. Experience had taught us that the kite should fly several hundred feet higher than the top of the antenna in order to catch the stronger, less-turbulent winds aloft. The next five minutes were spent laying out the single radial and dropping the long piece of copper flashing into the salt water. Another five minutes were spent setting up the gear inside the camper and tuning the tuning unit for lowest SWR. Within 15 minutes we had the rig on the air and couldn't believe our ears. Here it was, three o'clock in the afternoon and we were copying signals from 1500 miles away on 160 meters hitting 20 or 30 dB over S9. We could hear stations everywhere in the country east of the Rockies and the contest hadn't started yet. The band sounded more like 20 meters than 160. Things were just going too well and we waited for Murphy to rise up from the Gulf of Mexico less than 4 feet away like the creature from the black lagoon. It was too good to last.

Out of the Lagoon Rises Murphy

Sure enough, it didn't. Bob developed a violent headache, stomach cramps, and a near-terminal case of "Montezuma's Revenge." He retired to the back seat of his VW and wasn't seen or heard from again until about 3 A.M. Saturday when a vicious line squawl hit the site, blew the tail off the kite, flooded the spark plugs on the generator and sent ice water pouring in through the open windows of the camper. The



DC-3 on strafing run over the W4OZF/4 contest site.

wrath of Murphy had only begun to be felt. The great quantity of baking soda I'd put in the camper's fresh-water tank to clean it out had not been thoroughly flushed and our fresh-water supply was practically undrinkable. Most of our food was of the condensed variety and the prospect of being without water for the weekend wasn't very appetizing. Thank God, we'd made an extra beer stop on Marathon.

Shortly before the contest started, I got a time check from one of the other stations waiting for things to get under way. Neither Bob nor I had a decent watch and at the last minute I had rummaged around in a drawer at home and found a beat-up timepiece with no crystal and bent hands. The thing ran sporadically and had to be thumped on the table from time to time. Finally, after much swearing and thumping, it settled down. At 2200Z the contest got under way with a bang.

The band exploded and sounded like 20 meters at the start of the Sweepstakes. After the first hour or two, the initial nervousness I always experience at the start of a contest left me and I began to settle down for the long night. My muscles began to get sore. The operating position, sitting sidewise in the front seat of the van, got cramped. At this rate, I'd need four chiropractors and a faith healer to straighten my spine in the morning! Fortunately, the generator required periodic refueling and I looked forward to these welcome interruptions as a chance to stretch my legs and rest my ears. Silence sounds funny.

Shortly before midnight the static levels, which never had been low, began building up to 20 and 30 over 9 with an occasional brain scrambler that put the needle on the peg. The wind started increasing and I began to feel like a modern-day Ben Franklin hanging onto the end of a 320-foot lightning rod. It looked like the chances of working any Europeans that night were shot. By 3 A.M. the camper was rocking back and forth in the blasts of wind like a boat and the ice water started pouring in the open windows. The rain doused the generator, which was enough to wake Bob, and, as they say in sea stories, all hands turned to to fight the storm. Getting thoroughly soaked in the process, we madly gathered up the miscellaneous gear we had scattered all over our little peninsula and put it under shelter. Bob climbed back into a wet sleeping bag to get some more sack time since he still felt as if he were in the third week of a 24-hour virus.

I opened another beer to get in the correct frame of mind for pondering our miserable fate. After a fine start it looked as if Mother Nature and the malevolent Murphy had teamed up to put us out of the running once again. Why couldn't I have picked a more sensible hobby like stamp collecting? I was sure no self-respecting stamp collector would ever find himself in such a situation. Drinking beer while freezing one's wet tail off on an uninhabited tropical island at three in the morning in the front seat of a truck just didn't seem like the kind of thing that should happen to anybody! The storm could last all weekend. Maybe we should just pack it up and play the time-honored, "wait-til-next-year" gambit. After about a half hour of these cheery thoughts, the wind backed off a bit and the rain stopped as though someone had turned off a giant spigot.

Once again, the reduction in noise woke Bob. He staggered over to the camper in the darkness, almost falling into the canal, and en route made a horrifying discovery. The antenna was gone! Since we had no antenna wire as a spare, we thought we were kaput for good. Fortunately, he was mistaken. The antenna was still with us. With the passing of the storm, the wind had shifted and the antenna had consequently moved about 90 degrees. Bob had simply looked in the wrong spot for the antenna, and seeing it wasn't there, assumed we'd lost it; a reasonable assumption in view of the wind velocity.

We were back in business even though the static levels on the band were high enough to produce physical pain. Bob returned to his wet sleeping bag as I put the headphones back on. I had come to regard the headphones as a fiendish sort of medieval torture device. They would have come in handy during the Spanish Inquisition. I continued to indulge my penchant for masochism for another few hours with only modest results and welcomed the sun climbing

slowly above the pine trees on the island.

Time Out to Tally and Plan

By 8 A.M. the only stations being heard were the "big guns" that we'd already worked the night before. I killed the generator and returned to the camper to survey the log. Naturally, the reduction in the noise level woke Bob. All he wanted to talk about was food; he hadn't been able to eat since the previous day and claimed that his stomach was rapidly digesting itself. In spite of this, we postponed breakfast to go over the logs. The results were encouraging, 206 contacts and a total multiplier of 62. Even with the enforced inactivity due to the storm and the high static levels, we'd done much better in one night than we'd ever been able to do in a whole contest. After breakfast, we sat around discussing plans for the new day.

Bob fired up the rig late Saturday afternoon and the pleasant roar of the generator lulled me to sleep. Like Bob, I seldom woke up, other than when he would shut down the generator for refueling. Bob woke me at approximately one or two in the morning to take my turn in the "Iron Maiden." I use the word *approximately* because our timepiece had stopped several times during the night and we lost an undetermined amount of time with each occurrence. The contest desk should have a lot of fun cross-checking our logs. Murphy still hadn't gone to sleep.

I stumbled up to the front of the van and tuned to the 1825-1830 DX window segment and immediately heard GM3YCB booming in with a fine signal. A quick call brought results and encouraged me to venture forth with a CQ DX. GD4BEG responded and my hopes briefly soared. Further listening and CQs brought no more Europeans however. Whatever sort of European opening we had on No-Name Key was short and sweet. I operated a little while longer and turned it back to Bob who continued to plug away, occasionally checking for Europeans with no success. The pace continued to drag since we had already worked most of the stations we were hearing. The thought that the ubiquitous KH6IJ and company might be sallying forth at the top end of the band struck me. Sure enough, KH6CHC was holding court at 1996 kHz and KH6IJ was about 2 kHz further up. A quick call brought forth a response from CHC and a second call netted a "probable" on IJ. A W9 who wasn't copying Nose very well insisted on calling him right on his own frequency even though Nose was listening about 20 kHz down the band. I put up with this display of lidsmanship as long as I could and returned to the lower band segment hoping that Nose had us in his log. The long night was drawing to a close as we scrambled for the rare W7 multipliers along with the rest of the East Coast gang and kept hoping for the KZ5 that never showed. Static levels continued to be high, and although many stations to the northwest seemed to be copying us, we had difficulty in hearing them. I suspect that the "one-way skip" we keep hearing about on this band is nothing more than high static levels at one end or other of a circuit.

The sun climbed through the pine trees again and we decided to call it a night. As the sun rose further the only stations heard continued to be the big guns just as occurred the day before. Naturally, Bob awoke when I shut down the generator. We replayed the scene from the morning before. The preliminary tally indicated a grand total of 66 ARRL sections, 10 foreign countries and 335 QSOs, netting us somewhere in the vicinity of 53,000 points. If the QRN had been a little kinder we might have improved our QSO total a bit but I think our multiplier would have remained about the same. All in all we were pretty satisfied with the respectable results for our first portable operation in the contest and began plotting a return engagement using my call for the CQ WW 160 test in the next month or so when the static levels would surely be lower.

Postscript

Six or seven weeks later we returned to the Keys for the CQ WW 160 contest. Mike, my son, wisely stayed behind on this one and we were joined by Jeff, WA4NFF, who was getting the bug for 160. We brought both a surplus weather balloon and a kite on this one. Murphy left us alone on this occasion except for a single and final stroke of revenge, just as we started the second day of the contest. Our 320-foot vertical broke right at the lower end where it was connected to the antenna coupler and the weather balloon did a fine job of lifting the whole 320 feet of wire high into the stratosphere as the sun set slowly in the west. Our first night's effort in this contest was practically a carbon copy of the ARRL contest although we had worked more countries and had a somewhat smaller contact total. Until the antenna took off for good, the only incident that caused us trouble had occurred when an ancient DC-3, employed in the ignominious mosquito-spraying trade popular and necessary in the Keys, had deliberately buzzed our balloon and nearly hit it. We had lowered the balloon when we saw him starting to fly his patterns in our area and put it back up when he had finished rousing the mosquitoes from their early morning slumber. He made an evasive wide circle over the Gulf of Mexico to lull us into a feeling of security and suddenly appeared out of nowhere skimming the tops of the pine trees at about one mile an hour over stalling speed. We watched in horror as he put the venerable DC-3 into a slight climb, made a few minor course corrections, and cleared the top of the balloon by no more than 5 or 10 feet. Murphy had warned us to get out that morning but had waited until the late afternoon to really send us packing.

Bob and I are both planning already for next year's 160 contests and hope to carry at least two antennas, two balloons, two kites and two of everything else. WAIT TILL NEXT YEAR!!! QST

Here are WA4NFF and W4OZF practicing for the next time out with the infamous foul-weather balloon.

Strays

STOLEN EQUIPMENT

□ Inoue Electronics, Model IC-2F, serial no. 3762, stolen from car, David Sudry, 435 Acalanes Drive, Sunnyvale, CA 94086.

I would like to get in touch with . . .

□ amateurs at University of Illinois Chicago Circle campus or other Chicago-area amateurs interested in setting up a new amateur radio club at UICC. Dave Boyd, WA9GEW, Dept. of Military Science, UICC.

□ amateurs in the Chicago area who would like to help with installation of a carrier-current radio station in 75 buildings of the University of Illinois Chicago Circle campus. It will involve extensive work off schematics and will sharpen soldering skills. John D. Wennstrom, general manager of WUIC-FM, UICC, or Dave Boyd, WA9GBW, Dept. of Military Science, UICC.

Lonely Island

Reach out. Ham radio has the special quality to cross human barriers and fill gaps among its three-quarters of a million operators. Communication fulfills life.

By Ken Johnson,* W6NKE

As a ham, you're part of the worldwide fraternity of amateur radio operators. You've probably heard those words countless times. But occasionally, a situation occurs wherein, via the airwaves, two strangers reach out to strike a common chord. And the message of brotherhood no longer rings simply as empty words.

Such is the experience behind the following poem. To quote the author, "As the result of a Christmas present, I am now active on 2 meters in addition to the hf bands. I do much more listening than I do talking, and my big, flapping ears have been giving me quite an education. . . .I have frequently heard Mrs. Jeannie Manoli, WB6FFR, on the air and later had several chats with her. She told me that she had just come out of the hospital after her tenth operation and has some type of hereditary disease. Some time ago, she was to the point of distraction and was completely hopeless as to her future and life in general. Then, she became interested in ham radio and received her license in November, 1975. She is just 29 years old, can never have any kids and is apparently bedridden. . . .All of this stirred my poetic instincts. . . .What is expressed might be an inspiration to someone else, the flint that might start the spark and the flame to help another such person become a ham, someone who is in dire need of an escape, in need of the friends that ham radio can provide, in need of something that can shed light in an otherwise hopeless world."

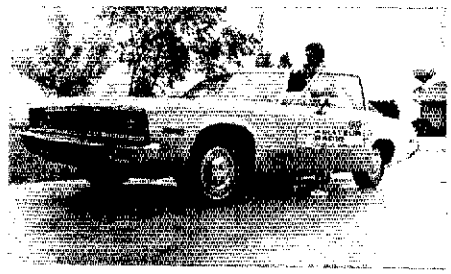
*20554 Hartland St., Canoga Park, CA 91306

Written for Jeannie of Lonely Island

Lonely Island is where I live.
Six feet by seven, take or give
The thickness of blankets, the coverlet of red.
Lonely Island is my bed.
On Lonely Island I was so alone.
My heart did cry, my lips did moan
For blessed escape, no matter where,
To Heaven or hell I didn't care.
Then, out of nowhere, one fine day
A voice came to me. I heard it say,
"Jeannie my dear! Jeannie my lamb!
Why not become a radio ham?"
The study, the work; the code and all
Seemed enough to make an Angel fall.
But, then it was over! My license was here
And I could operate my radio gear.
With joyous heart I left my Island behind,
Although I knew it was a "state of mind."
I had escaped! Up and away!
A new adventure for every new day.
There were Joe and Ginny, Mike and Pete
And a million others I could meet.
Happy voices, laughter and cheer.
Friends to become, Oh so dear!
Lonely Island's lonely no more!
I'm still in bed, but it's not like before!
My voice, like a feather, floats on the breeze.
Lets me travel about with the greatest of ease.
The pain is still there! So are the fears.
But, with it all I smile through the tears
And I couldn't tell how glad I am
That I became a radio ham. QST

Strays

□ Douglas County (KS) Amateur Radio Club members recently came up with a novel way to identify and promote amateur radio. They used magnetic signs on their vehicles during a local Bike-A-Thon and answered participants' inquiries with ARRL brochures. The club's information manager, Rick Link, WBØKDE, says the signs are homemade, relatively inexpensive, and resist rain and winds to 60 mph. For instructions, send a s.a.s.e. to him at 522 Arizona Dr., Lawrence, KS 66044.



□ L. Richard, ON4UF, of Brussels, Belgium, on the occasion of his 50th anniversary as a radio amateur. Not only does his list of accomplishments include activity in public service and on the air, but he has also organized Belgian hams and represented their viewpoint before the government. The OM is now 67 years old and still going strong.

□ The Scandanavian CW Activity Group formed in 1974 to support and encourage amateur radio cw-operating activity in Northern Europe. Information on SCAG and its programs is available from the Secretary Kurt Franzen, SM5TK, Box 13, S-15013 Trosa, Sweden.

□ Novice license classes are now being given both in English and in Spanish by the Quisqueya Radio Club at their headquarters in Bronx, NY. All who are interested in Novice preparation are welcome at the classes. Contact Mark Vargas, WB2SFF, Quisqueya Radio Club, P. O. Box 277, New York, NY 10032.

Happenings

Conducted By Perry F. Williams,* W1UED

HF "Bootleggers" Caught by FCC

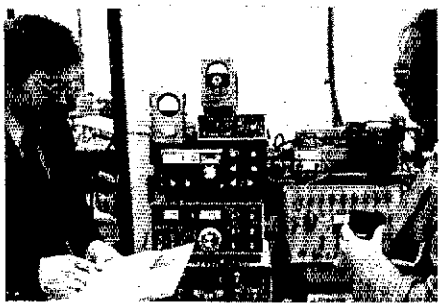
In what was termed the "largest simultaneous execution of search and seizure warrants against illegal radio operators in the country," United States marshals and FCC agents seized over $65,000 worth of allegedly illegally used amateur radio equipment in a crackdown the morning of October 27, 1976. This seizure culminated a two-month investigation initiated by the FCC after receiving complaints from legal CB users that their frequencies were being invaded and overpowered by stations using far more than the legal four-watts output allowed on the citizens band. Investigators also discovered that the illegal operators were using unassigned frequencies on both the citizens band and amateur radio bands. Many readers are well aware of the operators who occupy the region between 11 and 10 meters, and who sometimes operate in the amateur 10-meter band. Operation on 10 meters itself seems to be minimal, probably because the chance of being caught is too great — amateurs are very protective of their frequencies, and rightfully so! But there are several groups around the U.S. who frequent the "10-1/2-meter" band, and even assign their own call letters. Such operation is, of course, illegal, and while the FCC is inadequately staffed to enforce its rules as well as it might wish, it is determined to see that illegal operators do not go unpunished.

Here is $65,000 worth of rigs picked up by the U.S. marshals and FCC engineers.

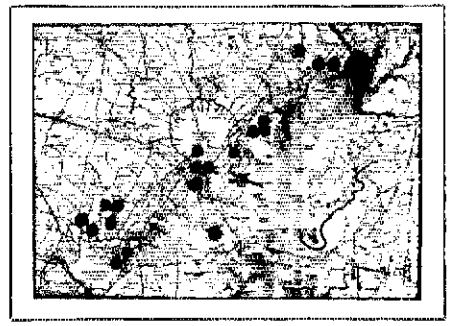
The $65,000 worth of equipment was seized in 19 locations in the Baltimore City and Baltimore, Anne Arundel, Montgomery, Prince Georges, and Harford County areas of Maryland. All the seizures involved United States marshals from Baltimore and Washington, and FCC agents from the Baltimore, Washington, Philadelphia and Norfolk field offices. U.S. Attorney Jervis S. Finney said that formal charges will be drawn up in about a month, and Charles Magin, electronics engineer, for the FCC, predicted that more than 300 persons may ultimately be arrested.

Aside from the outright illegality of the operation uncovered by the above crackdown, there is a more fundamental issue. Amateur radio equipment is freely available on the marketplace, and no amateur license is required to buy equipment which can be utilized on the amateur bands. While it is illegal for a CBer to run over four-watts output power, the equipment with which to do so can be readily obtained with no questions asked. There are also ham rigs made overseas which have 11 meters on the band selection dial. Although the 11-meter feature must be disabled before the rig can be sold in the U.S., it apparently isn't hard to reinstate the 11-meter capability. These rigs are often found for sale alongside normal CB equipment intended for legal operation on the citizens band.

The FCC knows that the easy availability of amateur equipment that can be easily converted to use on the citizens band, or "10-1/2 meters," poses a serious problem. What we, as amateurs, should be concerned with is that any regulation designed to alleviate the problem is likely to affect the availability of such equipment to amateurs, also. One possibility for consideration is a ban on all wide-band linear amplifiers capable of operating on the 11-meter band. It seems likely that most amateurs would oppose such a ban. Another possibility is a regulation to require the showing of a valid amateur radio license when purchasing amateur radio equipment. This might not meet so much resistance from the amateur community, but would be difficult to enforce, whereas an outright ban on the manufacture of certain types of equipment would be relatively easy to enforce. An additional possibility is type acceptance or approval of amateur gear; this, for example, might prohibit the sale in the U.S. of any amateur gear that could be used on 11 meters or just above. The problem will not be easy to solve and if any members have suggestions as to how to control the illegal use of amateur gear, without penalizing amateur operators, please let us know. — *K1FHN*



Robert M. Mroz, W3HAM, left, engineer-in-charge at Baltimore, and Donald W. Bogert, W3GOP, assistant EIC, catalog equipment confiscated during the sweep.



The area where the raids took place. *(FCC photo)*

BEHIND THE DIAMOND

In "Behind the Diamond" for February, 1976, we promised in a future column to tell you about *Ellen White, WIYL*, deputy communications manager of the ARRL. This month we fulfill that promise. Ellen is one of the most cheerful people to ever work at League hq., and always greets you with a smile, even at four o'clock in the afternoon when the only thing on most folk's minds is the dinner bell. Her presence makes the League a brighter place in which to work.

Ellen is joined at Hq. by OM Bob White, W1CW, who for years was in charge of the DX Century Club, and is now manager of the newly formed Overseas QSL Bureau. They came to the League in 1952; Ellen's title at that time was assistant communications manager for phone. She later became contest manager, and in 1967, when George Hart, W1NJM, became communications manager, Ellen was promoted to the position of deputy communications manager. In that post she has direct responsibility for the contest, awards, and administrative branches of the communications department, and assists the communications manager in supervising the public service and DX branches, and Hq. station W1AW. Most recently she was editorial coordinator for the new *ARRL Ham Radio Operating Guide*.

Ellen was first licensed in 1946 as W2RBU. She got her ticket more or less in self-defense after meeting Bob who was W2QPZ at the time. They were married in 1945. They went to San Diego for a spell, then over to Hawaii where they both worked as broadcast engineers at KPOA. After that it was back to San Diego where Ellen majored in

*Manager, Membership Services, ARRL

physics at San Diego State, worked as a broadcast engineer, and became Section Communications Manager for San Diego Section. In 1952 they read in *QST* that there were two openings at League hq., and it's obvious what happened after that.

Ellen's forte is cw operating. She is a member of FOC, DXCC (312 countries confirmed), and holds the WAC, WAS and WAZ awards. She is Extra Class, and also holds 1st class radiotelephone and 2nd class radiotelegraph commercial tickets.

On the personal side Ellen enjoys gardening, needlework, photography, science fiction, sewing and billiards. She also likes cats, but that is an understatement. As you walk into the White house you are overwhelmed by her penchant for cats; there is hardly a spot on the wall that does not have a feline presence of one sort or another. Have you ever looked closely at the heading for the "Strays" that appear throughout *QST*? Ellen had something to do with its design, I'm sure.

Sometimes Ellen gets a bit carried away with her fondness for cats. One day she went to the shopping center to buy a coffee percolator, and came back with a Siamese kitten instead. It's a frisky little critter, but still hasn't learned how to make a decent pot of coffee. – *K1FHN*

VE MEMBERS REPLY

In June, the Canadian Department of Communications proposed to create a new Novice Amateur Radio Operator's Certificate to enjoy 90-watts output power on the 3.675-3.725, 7.1-7.15, 21.1-21.15 and 28.15-28.25-MHz bands, cw only, along lines proposed by CRRL somewhat earlier. In addition, the Department proposed an Experimenter Amateur Radio Operator's Certificate with a stiff technical exam but no code requirements. For the first six months, the Experimenter would be confined to vhf frequencies, to gain experience, but after that, under the DOC proposal, he or she could operate in any amateur band, even including use of the A1 mode! Full information appeared on page 64, *QST* for August.

The League polled all its licensed Canadian members. Sensing that there would be considerable opposition to a codeless license carrying full hf privileges, the League's Canadian officials included in the survey a compromise Experimenter's certificate, with qualifications the same as proposed by DOC but with privileges limited to frequencies above 50 MHz. Of 4230 members queried, 2595 returned the cards by the tabulation deadline of September 30, 61 percent of the total. The tally:

NOVICE	Yes	2153 – 83%
	No	403 – 15.5%
	Abstain	39 – 1.5%
EXPERIMENTER PER DOC PROPOSAL	Yes	268 – 10.3%
	No	1979 – 76.2%
	Abstain	348 – 13.4%
EXPERIMENTER, IF LIMITED TO VHF	Yes	1180 – 45.5%
	No	1100 – 42.4%
	Abstain	315 – 12%

These figures have been sent on to DOC, along with the suggestion that the Novice frequencies on 80 meters should be 3700-3725 kHz, so as to avoid interference to existing traffic nets in Canada and the U.S. operating between 3675 and 3700 kHz. Also the League filing by Director Hesler requested that the 15- and 10-meter frequencies run 21,100-21,200 and 28,100-28,200 kHz so as to be compatible with U.S. Novices. For a similar reason, 200-watts input is asked for.

MINOR RACES CHANGE

Last February, FCC adopted new rules for the Radio Amateur Civil Emergency Service (page 49, *QST* for April, or send an s.a.s.e. asking for Docket 19723). Inadvertently, some frequencies authorized previously under certain conditions were omitted. An order released October 5 puts them back by amending Section 97.185 (b): In event of an emergency which necessitates the invoking of the President's War Emergency Powers under the provisions of § 606 of the Communications Act of 1934, as amended, unless otherwise modified or directed, RACES stations and amateur radio stations participating in RACES will be limited in operation to the following:

Frequency or Frequency Bands

kHz	*LIMITATIONS*
1975-2000	1
3500-3510	
3510-3516	4
3516-3550	2, 4
3984-4000	

[FR Doc. 76-29281 Filed 10-5-76; 8:45 A.M.]

Mike Conlon, WB2EHM (center), president, and Vice President Pete Froloff, W2SUM, of the Wantagh (LI) Radio Club present Joanne Flood, young adult librarian at the Wantagh Public Library, with a Bicentennial ARRL *Handbook*. Joanne organized a "Get Acquainted with Amateur Radio" night at the library and arranged for the library to host the new League pilot Novice training class last summer.

PORTABLE, MOBILE I-Ds GO

Just in time for these pages but too late for us to gather full detail we learn that FCC has essentially adopted its proposals in Docket 20686, concerning portable and mobile identification and notification (see Happenings, *QST* for April 1976, page 48). Effective November 26, all requirements for prior notification of extended portable operation are dropped. FCC-licensed amateurs operating their stations at portable or mobile locations within FCC jurisdiction no longer will be required to indicate their portable or mobile status when they identify. There are no changes in the identification requirements for reciprocal licensees, who are still required to observe Section 97.313, but advance notice is no longer required of these operators before beginning portable operation or changing a mobile itinerary. More info next month, or send a self-addressed stamped envelope (s.a.s.e.) to ARRL hq., asking for "Portable/Mobile Docket."

MORE TWO-LETTER CALLS

Effective November 2, FCC has made available calls in the series W1XA through WØXZ; K1XA through KØXZ; and N1AA through NØZZ. The calls are being issued to Extra Class licensees in accordance with the Report and Order in Docket 20092 as found on page 55 of June *QST*, or send an s.a.s.e. marked "Extra Class Calls" to ARRL hq. We expect to have an updated matrix of available 1 × 2 calls about mid-December, which will automatically be furnished in answer to requests with s.a.s.e. as above.

FIFTY-YEAR CLUBS

A half century is a long while in the life of a person. It's even longer in the life of a local volunteer radio club – not a very high percentage last that long.

It's a pleasure, therefore, to list the following clubs which were affiliated with the League fifty years ago (but were not in the list of December 1975): Amateur Transmitter Association of Western Pennsylvania, PA; Boston College Radio Club, MA; Campaign Logan Amateur Radio Club, OH; Findlay Radio Club, OH; Indianapolis Radio Club, IN; Kaw Valley Radio Club, KS; Order of Brasspounders No. 1 Radio Club of St. Louis, MO; Richmond Short Wave Club, VA; Staten Island Amateur Radio Association, NY. Each club receives a special charter honoring this important contribution to organized amateur radio. Our hearty congratulations!

Washington Mailbox

□ Q. Is it true that Novices are no longer being issued distinctive call signs?

A. Yes, it's true. As of October 1, 1976, Novices are no longer being issued call signs that would depict them as Novices.

□ Q. Does this mean that Novices are now being issued call signs that they would normally receive upon qualifying for a permanent class of license?

A. Yes.

□ Q. What if I held a Novice license prior to October 1, and it has an expiration date later than October 1. How do I know what my new call will be?

A. Novices with license expiration dates of October 1 or later have already been issued new Novice licenses, or will be issued new licenses in the near future. These new licenses will indicate the Novice's new call sign.

□ Q. I haven't received an updated license yet. What call sign should I use on the air?

A. You should use the call sign printed on the most current license in your possession. If you have not received a new license indicating your new "permanent" type call sign, continue to use your distinctive Novice call sign.

□ Q. Why is the FCC discontinuing distinctive call signs for Novices?

A. Issuing distinctive call signs to Novices has created some processing difficulties which are not easily resolved, and which slow down the processing time for all applicants. There have been cases where the same call sign was issued to two different stations, and where call signs in call-sign blocks such as "WC," which are not available for general amateur use, were issued.

□ Q. What does a "WC" call sign signify?

A. "WC" call signs are reserved for stations in the Radio Amateur Civil Emergency Service (RACES).

□ Q. Isn't the FCC concerned that if Novices now have "permanent" type call signs, they will stray from the Novice subbands?

A. The FCC does not believe the number of such violations will increase in the absence of distinctive call signs. There have been subbands based on license class for many years now (General, Advanced, Extra) with no distinctive call signs issued to the members of each license class. Cases of licensees of one license class using subbands reserved for another license class have not been frequent.

□ Q. By eliminating distinctive Novice call signs, the FCC has made it impossible to tell a Novice solely by his call sign. It's a fact that many Novices prefer to work other Novices, at least early in their amateur careers, and that many higher-class amateurs operate on the Novice subbands so they can work Novices. Won't these practices become impossible to carry on?

A. It is true that it is no longer possible to tell a Novice solely by his call sign, but this does not mean that a Novice cannot indicate his license class in some other fashion. A Novice could let others know he is a Novice by following his call sign with "/N." For example, WA1VMC/N. Conversely, an amateur who wishes to work only Novices could call "CQ N."

□ Q. A Novice can now retake the Novice exam immediately if he lets his license expire, rather than wait a year as under the old rules. In September "Washington Mailbox" I read that if a Novice retakes the Novice exam after his license expires he can obtain his old call sign upon payment of a $25 fee. Does this still hold true under the new call sign system?

A. No. So long as the licensee specifies his present call sign on the form 610, it will be reassigned to him without the $25 fee within the one-year grace period. After one year, the $25 will be required.

□ Q. Can a Novice retake the Novice exam before his license expires to avoid any lapse in activity?

A. Yes, but the new license will not be issued until the old one expires.

□ Q. Will he then be able to obtain his old call sign without paying a $25 fee.

A. Yes, so long as he specifies his present call sign on the form 610.

[Note: Send *your* FCC questions to Hal Steinman, K1FHN, ARRL, Newington, CT 06111. Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL, have been approved by FCC staff. Interpretations contained herein concur with those of the Amateur and Citizens Division of the FCC. Numbers in parentheses refer to specific sections of the FCC rules.] QST

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1CUN, Harry M. Stevenson, Newport, VT
W1KLZ, Edgar I. Pasho, Arlington, MA
W1OTP, Roland Thibault, Tiverton, RI
W1QYK, John F. Myers, Enfield, CT
W1SFI, John Seniowski, Orange CT
W2AOT, Clarence A. Roebling, Brooklyn, NY
WA2BEK, Frederick J. Bonville, Utica, NY
W2DCD, Harold A. Holmes, Jackson, NJ
W2DUQ, Winton C. Ellis, Hamburg, NY
W2EUY, Robert J. McGuckin, Staten Island, NY
WA2GQU, James A. Lundberg, Pleasantville, NJ
WA2JWK, Benjamin Ginsburg, Albany, NY
W2KFJ, Donald E. Watts, DeWitt, NY
WA2KZC, Fred J. Campbell, Sidney, NY
W2LZG, Joseph A. Franz, Jr., Brooklyn, NY
WA2NOP, John B. Watmore, Milford, NJ
WA2PBC, Earl C. O'Rourke, Brooklyn, NY
WB2PVI, William J. Shaw, Pitman, NJ
W2UA, Matthew L. Bergin, Moorestown, NJ
WA2WAU, Dr. Orin Q. Flint, Delhi, NY
W2YT, Douglas M. Sharp, Wyckoff, NJ
W2ZJJ, Elmer J. Bergstraser, Baldwin, NY
W3BVO, Harold H. Hooper, Lusby, MD
W3COR, Gordon K. Morton, Rockville, MD
W3DQE, R. Edward Kay, Jr., Broomall, PA
WA3JSW, Joseph F. Siemietkoski, Philadelphia, PA
W3QZA, Robert M. Kennedy, Newtown Square, PA
W3VQX, Charles L. Finley, Franklin, PA
Ex-W4AIB, Jesse W. Croach, Jr., Chatham, PA
WB4APO, Adolphus E. Owen, Jr., Birmingham, AL
W4BMA, Robert L. Garrison, Miami, FL
WB4HDF/WI AOI, George H. Herriott, Crystal River, FL
W4HFR, Elmer T. Huddleson, Orlando, FL
W4LOJ, Edwin P. White, New Port Richey, FL
K4PUD, Bernard R. Ellis, Petersburg, VA
K4VJL, Mary R. Campbell, Madison, AL
WB4WIW, Stanley C. Jackowski, Alexandria, VA
W4WMT, John M. Ewing, Nashville, TN
W4YOE, John Wall, Vienna, VA
W5ABI, Henry E. Velte, Conway, AR
W5DAU, John M. Shipman, Hobbs, NM
W5EBT, Charles L. Jeffers, San Antonio, TX
W5ENH, E. Leroy Hymel, Little Rock, AK
WB5FTL, James M. Teegarden, Pawnee, OK
W5HGC, George L. Bird, Midwest City, OK
WA5IQP, Raymond A. Cook, Houston, TX
K5KFW, John S. Lawrence, Springdale, AK
K5MVD, Ben B. Manuel, Houston, TX
K5PEN, Harold J. Lyon, Borger, TX
W5PZ, Arthur V. Ball, Ponca City, OK
W6CBQ, Ted B. Waterman, Long Beach, CA
W6EQZ, Harold W. Steinmeier, Ontario, CA
W6HRI, Ralph Paxton, Chula Vista, CA
K6HT, Kenneth A. Adams, Stockton, CA
W6KTB, Fred M. Sellstrom, Redding, CA
W7AYO, Stanley J. Belliveau, Seattle, WA
W7MD, Faz W. Salhaney, Great Falls, MT
W7PY, Robert B. Wilson, Seattle, WA
W7SSZ, J. Kent Duvall, Rock Springs, WY
K7VWT, John A. Sustauski, Scottsdale, AZ
W7VZL, Verl K. Reger, Tucson, AZ
W7YA, Joseph H. Hallock, Portland, OR
W8BNL, Arthur W. Brennan, Charleston, WV
W8CSM, Eugene B. Beckman, Cincinnati, OH
W8HGI, Clayton W. Gillies, Pontiac, MI
K8JAY, Raymond A. Lorant, Sr., Columbus, OH
W8JVN, Earl Holl, Cleveland, OH
W8KMN, Verdon L. Waggamon, Ruttman, OH
W8LVW, Willard L. Beechy, Sugar Creek, OH
W8ONV, William W. Bucey, Detroit, MI
W8PB, Arthur J. Borngen, Eastlake, OH
W8RHL, Joseph F. Harris, Columbus, OH
K8ZJR, Walter L. Leonard, Grosse Ile, MI
Ex-9EBW, Charles A. Luigs, Dayton, OH
W9EJT, Gilbert M. Allen, Auburn, IL
W9GYQ, George E. Merki, Appleton, WI
K9JKR, H. Lee Vanscoy, Manilla, IN
W9JN, George "Gus" Cook, Evanston, IL
W9LIP, Rex L. Munger, Lombard, IL
W9MIF, Edward Warshal, Gary, IN
W9PKQ, Harvey L. McConkey, Crete, IL
K9QHS, Glenn A. Mattes, Milwaukee, WI
K9SDV, William L. White, Jerseyville, IL
W9SQL, Joseph J. Dzidzan, Milwaukee, WI
WA9UWR, William J. Evans, Fond Du Lac, WI
W9VSX, William P. Berner, Monmouth, IL
W9VZB, Louis N. Heider, Jerseyville, IL
K9WFI, Russell E. Kinney, Hettick, IL
WØWR, Robert D. Burghardt, Battle Lake, MN
VE3BIP, C. H. Gosselin, Guelph, ON
VE7AID, Percy Hetherington, West Vancouver, BC
VE7ALP, E. A. McDonald, Creston, BC
G2QB, R. W. Bailey, Herts, England
GI3JM, A. J. Rourke, Down, N. Ireland

Strays

I would like to get in touch with . . .

□ any amateurs who are interested in the sport of crew (rowing). Robert A. Moss, Jr., W3GJQ, St. Andrew's School, Middletown, DE 19709.

□ amateurs in the United States and other countries who would like to exchange temperature and other weather conditions daily through a weather net. Thomas M. Meyer, Jr., WB5OLA, 3017 San Pablo, N.E., Albuquerque, NM 87110.

□ any amateurs in Alaska, Idaho or North Dakota for a WAS sked. Alan D. Kamman, WN1UWF, 454 Ward St., Newton, MA 02159.

□ any hams who operated from the Philippine Islands prior to Philippine independence (1946). James T. Pogue, WB9SXD, P. O. Box 972, Lafayette, IN 47902.

50 Years Ago

December, 1926

□ What makes our tube circuits work? Technical Editor Kruse commences a series on fundamentals, starting with the Hartley, and shows its evolvement from the plate-tickler system. An r.f. choke is troublesome, but necessary unless you can find a big enough condenser to handle the heavy circulating currents.

□ Again on basics, Lloyd Smith shows us how a vacuum tube detects, and means for getting the operating values at the best spot on the characteristics curve, with special attention to the grid leak.

□ The Editor says lots of hams consider themselves League members even though they buy *QST* on the newsstands, but their signatures on petitions for director nomination can't be accepted.

□ Shielding in receivers is getting more and more attention. McMurdo Silver has separate shields around each r.f. stage of his gang-tuned design. Fred Marco says shielding won't help selectivity in a typical regen receiver, but is worthwhile to reduce body capacity and interference from electrical noise — as well as our own rigs when break-in is desired.

□ No more dues to IARU in Hartford; with the accent now on national societies rather than individual members, Hq. is returning all funds in the kitty to societies whose members contributed.

□ 6BVG put a rig aboard the yacht *Poinsetta* for effective communication during the trans-Pacific race, and 2AZA did the same on the *Morrissey's* University of Michigan expedition to Greenland.

□ Lots of nostalgia in advertiser names — Cunningham, Radiotron, Grebe, Hammarlund, Sangamo, Thordarson, Crosley, Raytheon, Remler, Stromberg-Carlson, Amrad, Tobe Deutschmann, Cardwell, REL, Jewell, Weston, Burgess, Eveready . . .

25 Years Ago

December, 1951

□ To assist licensees in the new Novice Class to upgrade operating skills, ARRL announces a "Novice Roundup," with an invitation to OTs to take part and give the newcomers contacts.

□ Lots in this issue for the mobiler. W9FKC describes his 25-watt rig combined with a superhet receiver — c.w. only. W3MNR joins with W3DZZ to present some features of a bandswitching mobile converter — especially an easy-to-read dial. W1GAC packs a 3-band 2E26 output rig in a 3 X 4 X 6-inch chassis. And W5HGU shows that shunt feeding a 75-meter loaded whip can provide an excellent match.

□ Again with an eye toward Novices (but we all can learn), W1DX illustrates some fundamentals of good home construction which will provide a neat-looking end product. W5SCX adds to the general subject with a description of good station layout and control.

□ The Korean war has restricted parts availability, but hams are granted self-rated priorities for building and replacement; those enrolled in defense and security activities such as AREC, NTS, MARS, get a double quota.

□ The Editor attempts to straighten out confusion on the legality of foreign phone operation in the 7-Mc. band: above 7100, broadcasting is authorized outside this hemisphere; below, the voice signals we hear are mostly amateur (not BC), in countries permitting such emissions. ARRL's Planning Committee is currently studying a possible recommendation to FCC to open some portion of the band to U.S. phone.

□ The end-fed Hertz remains an "effective and simple" antenna, and W4ADE shows how to use it.

□ The Army and the Air Force express thanks for amateur cooperation in maintaining radio silence during military maneuvers using our bands. — *W1RW*

Seasons Greetings from the Hams of the ARRL/IARU Staff

Kathy Kearman	WB1AAE
Bill Jennings	WA1AHI
Jean DeMaw	W1CKK
Laird Campbell	W1CUT
Bob White	W1CW
Doug DeMaw	W1FB
Bob Myers	W1FBY
Hal Steinman	K1FHN
John Nelson	W1GNC
Ed Tilton	W1HDQ
Lewis McCoy	W1ICP
Stuart Leland	W1JEC
Clarke Greene	WA1JLD
J. A. Moskey	W1JMY
Jay Rusgrove	WA1LNQ
George Hart	W1NJM
Jerry Hall	K1PLP
Bruce Kampe	WA1POI
Dick Baldwin	W1RU
John Huntoon	W1RW
Jim Cain	WA1STN
Rosalie Cain	WA1STO
Perry F. Williams	W1UED
Dave Newkirk	WA1VCG
Arlene Bender	WA1VMC
Bob Halprin	WA1WEM
Rita Tilley	WA1WEV
Chuck Bender	W1WPR
Jim Kearman	WA1WVK
Ellen White	W1YL
Tony Dorbuck	W1YNC
Dave Sumner	K1ZND
Joel Kleinman	WA1ZUY
Chod Harris	WB2CHO
Ray Collins	WA2GBC
Bill Dunkerley	WA2INB
Bob Margolin	W2SDU
Chris Schenck	WB2SEZ
Al Bloom	WA3JSU
Bill Tynan	W3KMV
Louise Moreau	W3WRE
Stan Brindle	WB5KQJ
Chuck Watts	WA6GVC
Bruce Johnson	WA6IDN
John Troster	W6ISQ
George Barker	WB8PBC
Rod Newkirk	W9BRD
Jim Morris	KH6HQG
Maxim Memorial Station	W1AW

Hamfest Calendar

Arkansas: The Arkansas DX Assn.'s annual banquet is Saturday, December 11, at Little Rock. Keynote speaker is Sam Hutson, K5QHS, featuring slide and film presentations of his FL8, FH8 and D6A operations. Write Rick Roderick, WA5VDH, 209 South Quanah, Russellville, AR 72801.

Minnesota: The winter meeting of PICONET and the Handi-Ham System is at the Eagles Club in Faribault on Saturday, December 4. A dinner at noon with a program.

Nevada: The Southern Nevada Amateur Radio Club, Inc. of Boulder City's 12th SAROC convention is scheduled in Del Webb's Hotel Sahara, January 6-9. Exhibits, technical sessions, cocktail parties and Sunday brunch equal to any banquet, advance registration, $12.50 per person; with midnight show, $23 per person; with dinner show, $30 per person. Special airfare package from selected cities. Write SAROC, P. O. Box 945, Boulder City, NV 89005.

New York: The Kings County Repeater Assn.'s indoor flea market is Sunday, December 19, from 9 A.M. to 4 P.M. Located at 910 Union St., Brooklyn (at Grand Army Plaza). Sellers, $3; buyers, $1; children, free. Refreshments available. Talk-in on 146.43 and 146.52.

Coming Conventions

January 22-23, 1977
Florida State, Miami, FL

February 12-13
Southeastern Division, Orlando, FL

Note: Sponsors of large ham 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.

Strays

STOLEN EQUIPMENT

□ Collins 75A-3 receiver, serial no. 910, and Heathkit Apache transmitter. Bob Kelley, W5VZU, 3400 Brock Dr., Oklahoma City, OK 73119.

□ ICOM 230, serial no. 240-2915, stolen from a locked car in Fort Wayne, IN, Sept. 4. K. C. DeGroff, WB9OCW, 62322 Oak Rd., South Bend, IN 46614.

□ ICOM IC-22A, serial no. 3003322 and DV21, serial no. 3303062, stolen Sept. 15. Also Swan transceiver and power supply. David and Minnie Levine, WB4LAX and WA4RLS, 1212 N. Park Rd., Hollywood, FL 33021.

□ KDK FM-144, SXR-10, serial no. 5876. "Chip" Coundjeris, WA2TLS, 164-20 Cryders Ln., Whitestone, NY 11357.

Members of the Illinois Section Net (ILN) gathered in Peoria, IL, for their annual meeting.

YL News and Views

Conducted By Louise Moreau,* W3WRE

1977 YL Net Directory

YL nets . . . places to meet licensed gals . . . to chew the rag . . . to collect contacts for awards . . . where are they? *Daily:* YLISSB at 1600[1] on 14.332. *Monday:* Buckeye Belles at 1200 on 3.950; Honeybee at 2200 on 3.917; TASYL, 1st Mon. at 2300 on 3.930; PJYL at 2330 on 28.650; WARL (ZL Nets), 1st Mon., South Island, 2nd Mon., National Net, 3rd Mon., North Island at 0100 on 3.972. *Tuesday:* Buckeye Belles at 0100 on 3.972; YLISSB at 0030 on 7.280; CLARA, 4th Tues., at 0130 on 3.775; Floridora at 1400 on 3.933; Jayhawker at 1430 on 3.930; MINOW at 1630 on 3.670; Ironing Board at 1700 on 7.235; Georgia Peaches at 1800 on 7.125; CLARA at 1900 on 14.160. *Wednesday:* YLISSB at 0030 on 7.280; Yankee Lassies at 1330 on 3.910; The Harem at 1400 on 3.930; Buckeye Belles at 1500 on 50.335; GAYLARK at 1700 on 3.955; YL Open House at 1800 on 14.288; Brazil YLs at 2000 on 14.250; New Englanders at 1900 on 50.650. *Thursday:* YLISSB at 0100 on 28.673; West Virginia at 0100 on 3.978; PJYL at 0130 on 3.970; Working Girls' Net at 0500 on 3.935; TASYL at 1300 on 3.950; TYLRUN at 1400 on 3.940; Georgia Peaches at 1400 on 7.277; YLISSB at 1500 on 21.373; TYLRUN at 1600 on 7.280; Tangle Net at 1800 on 14.288. *Friday:* YLISSB at 0030 on 7.280; Midwest YL at 1400 on 7.270; MINOW at 1600 on 3.913; MINOW at 1830 on 14.313. *Saturday:* YLISSB at 0300 on 14.332 (VK/ZL System); Hawk Roost at 1400 on 3.910; Ontario Trilliums at 1600 on 14.140; Ontario Trilliums at 2000 on 3.770; *Sunday:* YLISSB at 0000 on 7.280; Western PA YL, 1st Sun., at 1330 on 3.990; YLISSB at 1800 on 28.673.

YL Open House and Tangle Net are the two major nationwide nets that often include DX YL check-ins. For those hunting YL certificates these nets are where YLs in almost every state and most of Canada are to be found.

CQ YL TO BE UPDATED

As in the past after each of the YLRL international conventions, Louisa Sando, W5RZJ, has updated her book *CQ-YL*, the history of YLRL and of the women amateur radio operators in this country. The final preparation of the 1976 supplement covering the past four years of YLRL activity will be released in the early part of 1977. Those who wish to receive this material should address requests to Louisa Sando, W5RZJ, 4417 11th St., N.W. Albuquerque, NM 87107, and include postage to cover the mailing expenses. The book *CQ-YL*, is also available from Louisa and is a must for any library on the women in amateur radio since 1915.

*YL Editor, *QST*. Please send all news notes to W3WRE's home address: 305 N. Llanwellyn Ave., Glenolden, PA 19036.

[1] All times UTC, all frequencies MHz.

Active on 80, 20 or 15 meters, Ilse, DU2UD, lists swimming, traveling and tapestry among her interests. Shown here with her OM Paul, DJ2YQ. Ilse indicates theirs is an active family with son Rolf also licensed as DK7QS.

L-r, Ellen White, W1YL, guest speaker at YLRL International Convention in Houston, Texas, with K5JKV, Annie Smith and WA6ISQ, Myrtle Cunningham, 1976 YLRL president. (*W2EEO photo*)

1977 YL OM

The 1977 YL OM Contest is scheduled for February 19-20 for the phone contest, and the cw contest will be March 5-6, 1977.

Reminder to Novices: The YLRL sponsors a special Novice award in all of its contests. So far no OMs have submitted Novice contest logs in the YL-OM. Remember that all Novice contest logs must show that the contest was worked in Novice frequencies and that a Novice call was used.

YLISSB MEMBERSHIP

In answer to the many requests that we have received regarding the YL International Single Sidebanders System, all requests for information about the System should be addressed to Dr. Fred Holzapfel, W0UUE, 422 Clover Leaf Drive, Golden Valley, MN 55422. Both YLs and OMs are eligible for membership in this global organization whose roster is nearing the 10,000 mark.

REMINDER – NEW *HARMONICS* EDITOR

The 1977 *YL Harmonics* will have a new editor, Marlene Martin, WA3UOC, beginning January 1, 1977. It has been requested that all inquiries regarding the magazine, or requests for information regarding YLRL, be sent to her.

1977 PJYL OFFICERS

The Penn Jersey YL Club announces the election of the following women to serve as club officers for 1977. President, Edna Sutton, WA3NGV; Vice President, Jane Jones, K3ZDN; Secretary, Mollie Silverstein, K3FYS; Treasurer, Dottie Scialdone, K3YPH. PJYL meets at the homes of various members. Membership is open to all licensed women amateur radio operators. QST

Truus, formerly licensed as PA0PHO and VE3IAA, is now VE3MRS. Truus is very active on all bands. (*VE3MR photo*)

FM Repeater News

Conducted By Lew McCoy,* W1ICP/WR1ABH

What's the Answer?

We are on the mailing list for many repeater clubs and organizations and from some frequency coordinators. One coordinator, Duke Harrison, who handles the TSARC (Tri-State Repeater Council) area covering New York City, Long Island, northern New Jersey and parts of Connecticut, keeps us informed as to his activities. For some time there have been no channels available on two meters (including splits), 450 MHz including 25-kHz splits is just about full, and 220 is quickly running out of allocations. The mail from Duke shows turn-down after turn-down on requests for channels. It is obvious that a real frequency crunch is developing. One thing for sure – we have to stay with coordination or fm and repeaters will become useless. In fact, one group of amateurs ignored all advice and recently put a repeater on 147.52 in, 146.52 out. Good grief! (We understand that they finally shut down.) One thing for sure, we do have to have viable answers – any ideas?

One Helpful Approach

One answer to tighter geographical repeater locations is the use of PL (Private Line). Using PL doesn't mean closed repeater systems – it does mean that amateurs using one repeater system cannot turn on a neighboring repeater on the same channel. Considerable detail on PL operation appeared in the Chicago FM Club bulletin *Squelch Tale* and later in the *Lake Erie ARC Newsletter*. We would like to reprint that information here.

The Great PL Mystery

PL or Private Line (Motorola), CG or Channel Guard (General Electric) and QC or Quiet Channel (RCA) are a form of tone squelch developed for commercial two-way radio almost twenty years ago. PL is now finding its way into amateur service in a big way. It is a continuous subaudible tone squelch. A continuous low-frequency tone is applied to a transmitter and is detected by an associated receiver: The presence of that tone operates the receiver squelch. Very simple. Yet many who have PL (or CG or QC) have little idea of how it works

The first thing to remember about PL is that it is supposed to be subaudible! Frequencies between 80 and 250 Hz are usually employed. Transmitter and receiver audio response on common radios usually begins about 300 Hz and extends to about 3 kHz for voice transmission and reception. In other words, PL frequencies are below the normal audio passband of your radio (but not so with some rigs).

Normally, PL squelch is just as sensitive as carrier squelch. In commercial service, tone squelch allows several cab companies, or police departments, to use the same frequency but without having to listen to conversation from other than their own dispatcher and cars; it can do the same for amateur repeaters where two or more groups share the frequency assignment. (Each group has its own PL frequency.)

Hams who install PL equipment on some of the newer transceivers invariably fall into one or more traps when it comes to making PL work properly. Here are a few common problems.

1) PL should be applied directly to the modulator, not the microphone input. The transmitter audio amplifier in most radios is designed to pass only the microphone audio. The PL tone will be attenuated. Worse than that, the transmitter deviation limiting will cause the PL applied at the microphone input to be reduced during voice peaks causing squelch clamping.

2) Phase modulators are usually high impedance, sensitive areas in most transceivers. PL signals applied at the modulator should be carefully decoupled and bypassed, or extraneous rf and other signals will enter the modulator at the PL input and cause noise or other garbage to be modulated.

3) The PL tone should be extremely clean and free of harmonics. Any distortion of the PL tone will result in harmonics which will fall in the normal audio band and will cause a buzz in your transmitted audio.

4) PL levels *cannot* be set by listening. Most receivers can't detect the fundamental of the PL tone, only the harmonics. If you set the level by ear, you are setting the level by listening to the *harmonics* of the PL tone while the reed used for reception of the tone is listening to the *fundamental* frequency. A PL tone with lots of harmonic content may sound loud on your receiver, but there may not be enough of the fundamental frequency to allow the receiver reed to operate properly. A scope on the receiver discriminator or a modulation monitor with a scope is the only sure way to set PL levels.

5) *Extra care should be used when connecting PL equipment to synthesized radios.* Most synthesizers have small instabilities of frequency as a result of their frequency generation scheme. The frequency instability, when a PL tone is applied, is added to the PL tone causing an apparent distortion and therefore harmonics of the PL tone to be present in the audio. Some phase-locked loop synthesizers actually sense the PL tone as deviation from the desired frequency which the synthesizer tries to correct causing additional PL fundamental attenuation and distortion. PL actually applied to the synthesizer seems to reduce these problems, but they are tricky at best.

Here are some common misconceptions about PL.

1) *PL will make the receiver more sensitive.* No way! It cannot improve receiver sensitivity *or* your signal to that receiver. It can, in some instances, sense signal presence better than carrier squelch but once the receiver opens, the signal is no more quiet. However, PL can allow a receiver in a noisy environment to be tuned more sensitively, because the PL will keep out some of the noise and intermod that would hold a carrier squelch open if it were tuned as sensitively.

2) *PL gives you priority on the repeater.* Sorry, but it doesn't. If a signal comes on the input to the repeater that captures your PL signal, both you and your PL will be gone.

3) *You must not be sending PL because I can't hear it.* Maybe the PL tone is very, very clean and your receiver does not hear the fundamental frequency.

How come some stations don't have squelch tails on the repeaters? What in the world is reverse-burst? In fact, what is a squelch tail? Have you ever stopped and thought about where that strange blast of noise at the end of transmissions comes from? Well, the squelch tail is receiver noise which you hear from the time a signal disappears until the receiver figures that it's gone and the receiver squelch closes. There has to be a delay incorporated in the receiver or a fluttery signal would open and close the receiver squelch and would become generally unreadable.

Now, if the squelch in a full PL system is controlled by the PL tone, why not take advantage of that fact and eliminate the annoying squelch tail? Well, that's exactly what happens. If you turn off *your* transmit PL tone when you let up on the microphone button and hold the transmitter on the air to keep the receiver that's listening to it quiet until the receiver PL reed stops, then the PL squelch has turned off the receiver and you can turn off your transmitter with no squelch tail in that receiver (its squelch is already closed). Easy! That's all there is to it. Sometime ask one of the fellows running a Motrac, Motran or Mastr (or several other commercial rigs) to let you listen to a full PL operation. You will envy the sense of being in conversation with someone who sounds as if he were sitting next to you in the car. The voices just come and go without distraction.

Motorola systems can do it with a little more sophistication – their units can send a burst of PL tone *out of phase* with the regular PL tone (reverse burst) to actually force the receiver reed to stop more quickly. Then the transmitter goes off. Silence, 'tis golden!

FEEDBACK

In "FM Repeater News" in *QST* for Oct., 1976, there were two errors in the time-out warning circuit. The LED should be reversed and the plus 12-V to 13.8-V dc terminal should be connected to the top of the 10k, 1M and 100k resistors, pin 8 of the first NE555 and pins 4 and 8 of the second NE555. QST

*VRAC Liaison, ARRL Hq.

Correspondence

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

CLOSER TO WARC

□ I read with interest and approval the comments in the excellent editorial, "Time for Another Breakthrough."

Since every ham would have to agree with the contention that more efficient use of the spectrum allotted to us is urgently in order, I suggest that many have the attitude of "We'll have to get organized . . . *tomorrow*."

But the fact of the matter is that we must get organized *today*; and even the most casual listener on the ham bands would have to admit to the shockingly inefficient, and frequently illegal, uses to which we are putting these precious bands.

I suggest that a wiser use of our privileges is urgently in order; and as a ham who has always done very well operating on low power, I suggest that hams be discouraged from the use of high power – however much this might dismay the manufacturers.

As government officials are finding that our energy future might not be as bleak as some imagine if we take intelligent steps to husband what we have, so too a more intelligent use by the ham fraternity of what they *now* possess could do much to make the future of hamming in this country and the world much brighter. – *Tom Synnott, W1SQI, Cambridge, MA*

□ Does unlicensed out-of-band operation really concern us, the legitimate amateurs? Bet your "hippy" it does. Foreign governments are calling them "those U.S. unlicensed amateurs!" They are heard all over the globe as they run full kW linears (and more). There can be no doubt that their existence will adversely affect any negotiations the U.S. will enter into with regard to new amateur frequency assignments – or even a bid to hold what we have, for that matter. – *J. Harvey Chase, W4TG, Gray, GA*

CARRY ON CONTESTS

□ In answer to W4ZBG ("Correspondence," October, 1976, *QST*), contests promote a very high degree of efficiency in operating habits and station design. A station that is efficient for contesting will also have the same qualities that are demanded by traffic handling and DXing.

The suggestion that separate band segments be established for "communications only" is unnecessary. Suggested operating frequencies are usually designated for each contest near the General/Advanced border line. This is so that the contesters will not take up an inordinate share of either band segments. A contest operator is generally wasting his time, trying to make contacts much more than ten-to-fifteen kHz away from the suggested operating frequencies. One can usually find clear frequencies outside these limits. I hope I have been of some help to those who do not desire to participate and that you will try contesting sometime. You might like it. – *Tom Brion, WA1MHJ/2, Governors Island, NY*

KEEP IT THAT WAY

□ I am writing to express my disagreement with OM Fleury ("Correspondence," October, 1976). The 25-kHz segment of Extra Class cw band is my most-prized possession.

I worked long and hard for the privilege to operate in that part of the spectrum, and cannot see giving it over to those who would want something for nothing. If one wants a privilege, as being a ham operator itself is, it has to be earned.

Of course we must fight to keep all the space possible for every class, but the removal of subbands would discourage anyone from trying to acquire more ability in the art of amateur radio. – *Rick Bibby, WB5JJT, Shreveport, LA*

□ I can't agree on giving back those 25 kHz on our cw bands. Already too much has been given away and promptly abused. Those 25 kHz were actually set aside to be used by those willing to work for them. I got my Extra ticket at age 62 for this very reason, and use this segment daily. I find the low end well occupied by the best cw ops on the band. Perhaps this is why the choice DX is found here. – *Bill Bonnell, W5TT, Ft. Worth, TX*

WHISKEY TANGO? YES!

□ In March, 1976, I decided to become an amateur radio operator. Six weeks later I traveled 300 miles to Portland, OR, and passed the General and Advanced class tests (not bad for a cow-town dentist). Unfortunately, my papers and several others were "lost" by the FCC. After four months of mental strain, over $50 worth of phone calls and numerous letters, I was issued a temporary license. Now I find that I must explain my "odd" call during every QSO and on many occasions I have been called a bootlegger, CBer and other derisive names.

Would you kindly explain that I am a legitimate operator (copy of license enclosed) and that I am more anxious than anyone else to receive a "normal" call.

Also, those turkeys that cut me off during a QSO won't get a WT QSL from Oregon. – *Bob Fulton, WT7AAC, Hines, OR*

NOVICE CHANGES

□ The Novice band segments used to be a relative haven for QRP operation. The 250-W Novice power limit *does* make it more difficult to operate satisfactorily at low power (e.g., less than 20 W). – *Edmund O. Schweitzer III, W7KOW, Pullman, WA*

□ I feel that the League is unwarranted in its concern about the new Novice power level as discussed in "Happenings," October, *QST*. It is a great incentive to become a Novice operator and then later to upgrade that license, knowing that the station put together as a Novice will be applicable to General class operation without an extensive and expensive overhaul. This aspect is one of the primary reasons for my renewed interest in amateur radio and my seeking to be relicensed.

Furthermore, RFI is a problem that every amateur must deal with and I don't feel that the Novice operator is any less qualified than anyone else to handle "public-relations problems."

Let's not underestimate anyone, not even the Novice. – *Gary C. Shorter, ex-WN8AKB, Holtsville, NY*

□ I can honestly say that I have not had an enjoyable QSO since the power was increased. The FCC stated that the increased power was to lower the hardship of buying a low-powered rig for Novice then moving into a higher-power one when he upgraded his license. Nonsense! I run the SB-303 and SB-401. I took the time to check with Heathkit and had to change one resistor to lower my power. Other rigs could be converted by probably some minor changes also.

The population of the Novice band has increased considerably in the last two months. I hear we are ready for the new growth expected in ham radio from the CBer and others. I have one question to ask. Where?

On the matter of nondistinctive calls for Novice, how are you going to tell Novice from the General, Advanced, etc.? I think this will promote "bootlegging" out of the proper bands. – *David I. Dean, WN8WZI, Bryan, OH*

□ I think it is advisable for "greenhorns" such as myself to have a distinctive call sign so that something other than our inexperienced fists will identify us. I do not know how the Official Observer Corps will know if a Novice has ventured beyond assigned Novice frequencies into cw bands reserved for higher-class licensees. I would also appreciate hearing suggestions as to what I am supposed to do with the 300 beautiful QSL cards, which I have optimistically ordered, bearing what I thought was to be my on-the-air signature. – *Larry Ramsey, WN4UMB, Dickson, TN*

PACK IT IN

□ FB on WA3YJG's foresight, bringing his rig to camp (Strays, p. 62, October, *QST*). That is standard practice for me – but with a difference.

I travel home in a full car; room is limited in the trunk. So I pull the tubes from my HW-100, pack my underwear inside, put the tubes between the layers, and replace the lid. The rig fits in a compact box; other clothes go in a small bag.

You'd be surprised how many sets of drawers you can get inside a 5-band rig. Do I qualify for 5B-BVD? – *Thomas F. Carten, WA1DJC/9, Notre Dame, IN*

GOOD BEGINNINGS

□ Three cheers to Doug DeMaw and Jay Rusgrove for their article, page 21, August *QST*.

As a rank amateur (licensed end of June, 1976 . . . and you can't get much more amateur than that!) it is most helpful to see a *circuit board* and a photo of the equipment to be built. I can just hear the old hands mutter, "Can't he read a diagram? If he can't, what's he doing in ham radio?" Well, the answer to that is, I have no *experience* other than building a kit keyer and a VTVM and that doesn't teach me much. On the other hand I do not want to buy all my equipment and simply operate mechanically. So, here you have someone who would like to learn to build equipment but who is quite confused by the diagrams in the ARRL *Handbook*.

In Canada there is a move afoot to make things easier for people to get into ham radio by lowering the exam standards – I think that this is a mistake. More people will surely get in but I feel that they will be lost to the ham principles. I feel that if *you*, ARRL, could offer very much more help in your articles to make building easier, then you would encourage beginners to try. This then would stimulate interest of a more permanent kind than the lowering of standards.

Of course, there has to be a balance, since I am sure that a majority of your readers are expert and would see space allocated to such elementary advice as "wasted" – but let there be a balance and not have it all for the experts! – *Eric Stabler, VE3ISD, Dunnville, ON*

International News

Conducted By David Sumner,* K1ZND

IARU Officers Visit Europe

During September 1976, IARU President Noel Eaton, VE3CJ and Vice President Vic Clark, W4KFC, visited a number of IARU member-societies in Eastern Europe. Conferences were held with officials of the Radio Sports Federation in Moscow, the Federatia Romana de Radioamatorism in Bucharest, the Bulgarian Federation of Radio Amateurs in Sofia, and the Magyar Radioamatorar Szovetseg in Budapest, Hungary. Wide-ranging discussions were held regarding plans for the 1979 general World Administrative Radio Conference, growth and development of the Amateur Radio Service worldwide, and means for achieving strengthened liaison among the IARU member-societies. Each of the four societies sent representatives to the Region I Triennial Conference held in Warsaw last year (*QST* for July, 1975, page 86) and each has indicated support of plans to seek exclusive and additional worldwide amateur frequency allocations. These views were reaffirmed during this series of meetings.

In addition to the highly satisfactory exchanges of views and ideas with society officials, opportunities were provided at various points for visits to society headquarters facilities, club and individual amateur stations, and QSL bureaus (including the renowned Box 88, Moscow!), and for meetings with administration officials responsible for amateur radio regulatory affairs.

Amateur radio was reported as thriving and growing in each of the countries visited, with government encouragement and support being provided in the form of electronic components and equipment, society and club station facilities, and national recognition of accomplishments in amateur radio activities and competitions. Characterized as "radiosport," amateur radio in the Eastern European countries is valued both for its technical training attributes and the opportunities which are provided for developing operational skills through on-the-air contests, foxhunts (*QST* for August and November, 1976, pages 53 and 43 respectively) and code-speed competitions. Popular international foxhunting contests are sponsored for which the entrants make elaborate preparations, and which attract numerous spectators. There is vigorous competition for the awards and recognition accorded the winners of these affairs. There has even been the suggestion that amateur radio foxhunting merits inclusion as a sport of Olympic stature!

The Amateur Radio Service is growing at a rate of six to ten percent per year in the countries visited by VE3CJ and W4KFC, with increasing interest being exhibited in the more exotic transmission modes such as slow-scan television and satellite operation. About 50 amateurs in the U.S.S.R. are reportedly equipped for OSCAR use, and one of the world's most advanced amateur satellite control stations is that of the Budapest Technical Institute Radio Club, HG5BME, through which the visitors made a number of OSCAR 7 Mode B contacts.

In Eastern Europe, newer amateurs are provided with supervised on-the-air training at numerous club stations. This use of club stations is quite effective in training new operators and in providing operating opportunities for others. A large part of the population lives in high-rise apartment buildings in which antenna possibilities are limited by the hundreds of TV receiving antennas that sprout from the roofs, so the ratio of club to individual stations tends to be much greater than in some countries. So also is the incidence of home construction of amateur equipment, both transmitting and receiving, partly as a result of programs designed to provide components for home-construction purposes. In certain countries, one prerequisite to becoming an amateur is to construct a station in a six-month period from parts provided for the purpose.

The Radio Sports Federation of the U.S.S.R. develops criteria and tests for radio amateurs and administers examinations to applicants. Prospective amateurs must first pass through an apprentice phase as shortwave listeners and must collect a specified number of confirmations (QSL cards) to be eligible to take the amateur examination.

In addition to their travels in Eastern Europe, Eaton and Clark met with officials of the Malta Amateur Radio League in Valletta and participated in WARC preparatory meetings with representatives of the three IARU regional divisions in Geneva, Switzerland, and with officials of the Radio Society of Great Britain in London. Officers of the Reseau des Emetteurs Francais made a special trip to Geneva to meet with the travelers from IARU headquarters, which resulted in a very useful meeting covering a number of WARC-related topics. The International Amateur Radio Club, 4U1ITU, sponsored a reception in honor of the IARU visitors which attracted scores of telecommunications officials from around the world who were in Geneva for a seminar at ITU headquarters. QST

*Assistant General Manager, ARRL

W4KFC and VE3CJ were shown through HG5BME by HA5KKK, secretary of the Magyar Radioamator Szovetseg, and HA5WH, trustee of the club station. (*Photo by HA5BT*)

Hosts at the headquarters of the Radio Sports Federation of the U.S.S.R. were RSF Vice President N. Kazansky, UA3AF (with briefcase), and President Viktor Ermakov.

The IARU regional representatives who gathered in Geneva in September included (l-r) G2BVN, Region I secretary; W4KFC, Region II president; VE3CJ, IARU president; F9FF, president, Reseau des Emetteurs Francais; and VK3KI, Region III director.

It's unusual for an IARU traveler to find time to operate, but his hosts in Hungary gave W4KFC the opportunity to make some OSCAR 7 Mode B satellite QSOs from the Budapest Technical University Radio Club station, HG5BME.

The World Above 50 MHz

Conducted By
William A. Tynan,* W3KMV

A Banner Year

The year of the nation's Bicentennial has been an outstanding one for the world above 50 MHz. The Alaskan EME DXpedition of K6YNB which enabled KØMQS to complete the first 2-meter WAS moved a number of other stations up a very difficult notch on the states-worked ladder. Another EME DXpedition, the Pack Rat's sojourn to Colombia, South America, made WAC on 70 cm a reality, with K2UYH the first to turn the trick. Another 70-cm operation from WA6LET once again provided a first taste of EME operation for a number of vhfers, most of whom will, if past performance is any criterion, stick with the mode from now on. The WA6LET operation as well as the two DXpeditions dramatize the worldwide nature of our bands above 50 MHz. As well as providing hard-to-get contacts for presently active moonbouncers, the two DXpeditions also demonstrated a technical principle which could well make EME more viable for other operators. Both K6YNB/KL7 and HK1TL employed antennas which could be rotated along their longitudinal axes as well as pointed in azimuth and elevation. The ability to steer for polarization is credited by both groups as contributing a great deal to the success of the two operations. Thus, we all have been shown a valuable lesson which may contribute to the overall level of moonbounce activity and effectiveness.

Not all the excitement and accomplishments of 1976 were produced by the moon. The first half of the year saw several very good aurora sessions, some of which reached into the deep South and boosted the 2-meter state total of many. The January 10 buzz session even produced a number of contacts on 1-1/4 meters and 70 cm and might even have linked 23-cm stations if there had been any activity on that band. The summer Es season made news for both 2 and 6 meters. On our lowest-frequency vhf band, the number of WAS certificates grew to 147; K6DYD accomplished his WAS in six weeks while a number of other stations came close. Those 49 states for the season for WA5HNK and the 48 in eight hours for K8III are prime examples of how good conditions were. DX was to be had on 6, thanks to the DXpeditions of WB4PXW to C6A early in January and to Grand Cayman as ZF1XW in June and the C6A operation of WA2HJF during the June VHF QSO Party. In addition, native operation by stations such as YV5ZZ, VP2LAW, XF1GE, TI2KJ and PJ2DW as well as increased activity from KL7 and KH6 provided a lively time. Perhaps the most interesting aspect of the year for many was the outbreak of 2-meter Es. Openings occurred on about a dozen days throughout the summer providing hundreds of contacts in all 10 continental U.S. call areas and in several parts of Canada.

The level of 6- and 2-meter activity increased noticeably in every part of the country during the year thanks mainly to the availability of commercial rigs. Nets sprang up in many areas and random QSOs are now commonplace. A barometer of the activity can be obtained by observing the membership records of the organizations devoted to promoting vhf activity. SMIRK, the principal 6-meter group, now boasts over 1500 members while SWOT, a similar organization for 2 meters, has about 180 signed up. This is despite the fact SWOT is only a little over a year old.

Interest and activity in the microwave portion of the spectrum were on the increase during 1976, with the Europeans taking the lead as illustrated by the 324-mile overwater 3-cm QSO accomplished by G4BRS and GM3OXX apparently utilizing a close-to-the-sea ducting mode. In this country, regular activity on 23 cm appears to be on the increase with nets and schedules reported from several areas. Even 13 cm is coming in for a share of regular operation with at least one net of a half-dozen stations meeting on a weekly basis.

With preseverance on our part and some help from Mother Nature, the years ahead will be even more exciting than this Bicentennial year. Who knows what we will be doing in the world above 50 MHz by the Tricentennial?

ON THE BANDS

6 Meters – In an OVS report, WA1OLK decries the phenomenon which causes 6-meter activity to decline sharply as soon as the Es season ends: Many others feel the same as Bob but where are they? Fall is not the doldrums everywhere that it appears to be in this part of the world. In a contact with YV5ZZ following the Amsat Net (1800 UTC Sun., 14280), Edgar informs me that he has been experiencing TE (transequatorial) to Argentina and Brazil. Beginning at about 0130 UTC October 2, he worked LU9HJW, LU7HCY, LU4HFY, LU6HDV, LU8HE, LU2HAK, LU4HFN, LU1HEH and LU6HJD. The next evening, many of the same stations were contacted again along with LU1HCT, LU3HFD, LU8MBL, LU1HAH, LU9HGG, LU8HBD, PY5GK, PY5AKB and PY2CSS. All but PY2CSS were on a-m and most ran quite low power (2 to 4 watts). Signals at YV5ZZ ran about S5 while he received mostly S7 reports. The rig at YV5ZZ is a FT-620B producing about 15-watts output. Also joining in on the fun from the northern end was PJ2DW. Possibly, the winter Es season which should be upon us about the time this appears may permit some U.S. stations to join in this activity. This has happened in past years when Sporadic E has linked up with TE to extend it to the north. To facilitate hearing the DX signals, the boys in South Florida are urging all of us to keep the slot from 50.1 to 50.110 clear for DX stations. They suggest that calls be made on 50.110, but as soon as contact is established, a move higher in the band should be made. According to WB4OSN, the South Florida gang holds a nightly "Insanity Net." If the band is dead, it meets on 50.110 but if anything is cooking, they QSY to 50.150. Speaking of nets, WA3NDQ informs us that the group around Bloomsburg, PA, meets Monday evenings at 2330 local time on 50.113. A new convert to 6 meters, VE1BBE of Halifax, NS, is looking for skeds. Any takers? QTH is 1441 S. Park St., B3J 2L1. Another 6-meter enthusiast looking for company is WØYWD of Omaha, NE. Russell says that he listens on the band frequently but seldom hears much. How about some of the gang around Omaha giving him someone to talk to? Address: Russell F. Crenshaw, 2406 S. 123rd St., Zip 68144.

In order to provide an indication of band openings, WA6MHZ is operating an attended beacon on 50.193. It sends the call followed by "San Diego, CA." Pat would appreciate a report from anyone hearing the beacon.

2 Meters – The gang is still buzzing about the tropo duct which resulted in the spanning of the Atlantic from Bermuda to the East Coast beginning about 0110 September 15. Both participants in the first QSO, W1NU/VP9 and K1HTV credit OSCAR 7's Mode B transponder for providing a reliable communications channel for setting up the schedule for a concerted attempt when tropo conditions looked particularly promising. Following a quick cw exchange with Rich, Vic went on to work K1WHS, W1AVV, K2OVS, K1PXE, K2BWR, WB2WIK, W2GRD, K2ZRJ, K2OWR, K2LYU, W1FIH, W3QNS, W2AZL, WA2SLY, WA1FFO, WA2BIT, K1ABR, K1NMS, W1FTX, WA2WOM, W2LFI, K2YFE and WA2KOK. A total of 32 stations went into Vic's log that night. Most were located near the coast but some of the better-equipped stations farther inland were able to make the grade. For those not near the coast, it helped to be at a high elevation, as witness W3QNS who is on a hill overlooking Coatsville, PA. K2OWR, in the hills of northwestern New Jersey is another prime example of this phenomenon. Apparently this was a duct similar to those which produced the California to Hawaii openings which also generally do not extend very far inland. Only on this one occasion did Vic work stations on 2 meters despite religiously maintaining schedules up until his departure October 1. He did hear WA2CJK/4 on one of the schedules with him but Jerry could not hear anything out of Vic's HA-2 and 7-element beam. One evening toward the end of his stay, Vic did hear an a-m station tuning up about 145.15 but was unable to attract attention. At any rate, the ice has been broken and there is a distinct possibility for resident activity as a number of VP9s have equipment for 2 meters. The HA-2 which W1NU/VP9 used was, in fact, borrowed from VP9BK. In addition to the help rendered by that gentleman, Vic says that the whole operation could not have come off without the assistance of VP9s HL, BY, GR, HP, EP and L. I am sure that those fortunate enough to have worked W1NU/VP9 are grateful to those hams for their part in a pioneering vhf effort. Incidentally, Vic tells me that there is a 10-meter beacon on the island. The call is VP9BA and it operates on 28.165. He suggests that it might be of help in watching for Es. Hopefully 6- and 2-meter beacons, as well as regular operation on both bands, will follow

*Send reports to Bill Tynan, W3KMV, P. O. Box 117, Burtonsville, MD 20730 or call 301-384-6736 and record your message.

now that Vic has shown that it can be done.

On the EME front, there is now another station in Virginia with 2-meter moonbounce capability. It's WA4GPM. Buzz's manually steerable 80-element collinear has accounted for three contacts and two new states. A not-so-new moonbouncer, WAØCHK needs Utah, Nevada and Hawaii in order to follow KØMQS into the record books. John says that he is willing to try any frequency in the band and any mode. Neck-and-neck with John is K5BXG. Leading both of them by a nose is W5ORH. Jay needs only Vermont and Hawaii for WAS.

W4SMU, Erlinger, KY, suggests a special states-worked box for simplex fm. He has now accumulated 15 states plus Ontario via the sideways mode. Can anyone top that? How about hearing from some of you fmers.

Want to work a new country on 2 meters? KG4FU is looking for stateside m.s. or tropo skeds. Interested stations write Jim Brooks, SATCOM Det. Box 9 FBPO, Norfolk, VA 23593.

70 Cm – New converts to the 70-cm band are appearing each month. One is K1FJM/4 in Elizabeth City, NC, who is relatively new even to 2 meters. Pete, who has been on 432 MHz for a month or so with 18 watts from a tripler and a 27-element KLM up 60 feet, already has 9 states, 4 call areas and best DX of 560 miles to show for his efforts. High-power amplifiers are in the works for both 2 meters and 70 cm. Another new occupant of the band is W4MPC/5 of Meridian, MS. John's first contact was WB5LUA in Dallas, TX, 400 miles away – a tough way to get started! Speaking of WB5LUA, Al writes that his array of 16, K2RIW beams seems to be working FB. He has been hearing his own echoes about 4 to 5 dB above the noise and has worked a number of stations via the moon, the latest being K3PGP PA and W1JAA MA. His state total now stands at 12. WB8MMF passes along the information that he and his father, W8OKF, are newly operational on 70 cm from Wickliffe, OH. They were working K8UQA about 30 miles away even when running only 160-mW output. John says that Dave has been a great help and encouragement. Need New Mexico on 70 cm? Get in touch with W5FF (ex-W5LO) at Box 73, Edgewood, Zip 87015. Fred and Lee, WA5MFZ, say that their 32-foot dish patterned after the WØEYE design is ready to go on this band as well as 2 and 1-1/4 meters. Lee is particularly interested in 1-1/4 meter EME skeds.

What is the record for ATV DX? WA9ZIG/8 near Columbus, OH, believes that it may be the 300 miles spanned the morning of October 3 on 439.25 MHz between himself as well as WA8RMC and W8DMR on the Columbus end and W9ZIH and W9SRR near Chicago. An attempt with K9KLM near Milwaukee resulted only in sync pulses. Dale's equipment consists of a single 4CX250 with 100-watts output and a 16-element homebrew Yagi while W9ZIH's setup is a pair of the same tubes and a 96-element array. Liaison was conducted on 145.24-MHz ssb.

OSCAR Doings – G3IOR writes that he is very upset over the all-too-many stations who use excessive power on the satellites. Pat goes as far as to urge that sanctions be imposed on repeated offenders. He suggests, for example, that they be denied awards by AMSAT or ARRL and in extreme cases, that their licensing authorities be informed of the transgressions. Speaking of power, AMSAT reminds us that all Mode B Mondays from now on are designated as QRP days during which OSCAR 7 users are asked to use no more than 10-watts erp. Note that this is 10-watts erp not 10-watts output from the transmitter and a gain antenna. The QRP tests conducted back in June demonstrated how effective OSCAR 7 Mode B can be with low power, if everyone cooperates. However, it only takes one high-power signal in the passband to depress the agc and render the satellite useless for weaker stations.

Most should know by now that the very popular Sunday morning orbits on OSCAR 6 have been restored. This move was made possible by the fact that the satellite, during this part of the year, is in sunlight a greater percent of the time than it is in the summer months. Let's make the most of the expanded schedule while we have it.

THE EME STANDING BOX

A year ago we made an attempt to get an EME standing box going. Its first publication reflected the information available at the time and therefore was rather sketchy. Since its November 1975 appearance, other moonbouncers have submitted the information called for: number of different stations QSOed, U.S. states contacted and number of countries worked. Still, there has not been sufficient response to make the box a true indication of the EME scene. This, after all, is the only real excuse for publishing any of the standing boxes. So, EMEers, please send in up-to-date status reports so your good efforts may serve as examples of what can be accomplished via the moon. When writing about your EME feats, remember to indicate totals, not merely that "you worked 3 new stations this month." Otherwise, it's very difficult to keep track of what each station has done. The same thing goes for the other boxes, by the way. Bear in mind that the EME standing box, like any other standing box, may well be used by prospective converts in making a decision as to whether or not to make the leap. So let's get those totals in. Data reflecting work on all bands are solicited to be included in the next publication of the EME standing.

EAST COAST VHF SOCIETY ANTENNA-GAIN-MEASURING CONTEST RESULTS

The 10th annual antenna-gain-measuring contest was held August 1 at Trenton State College, Trenton, NJ. As usual, a good crowd attended and quite an assortment of arrays were put to the test with the following results.

QST

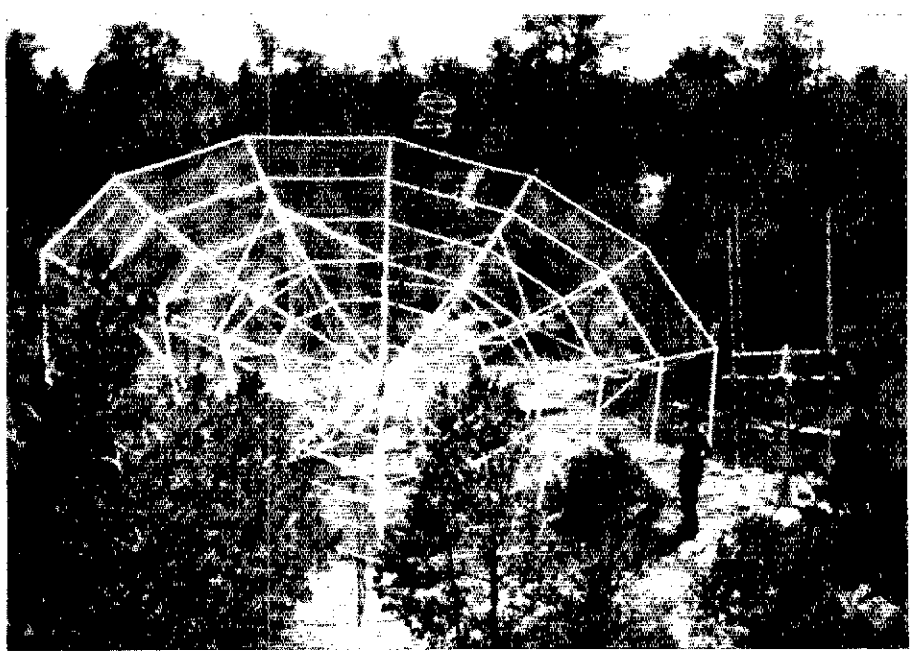
ANTENNA DESCRIPTION	*CALL*	*GAIN OVER A DIPOLE*
432 MHz		
8, 16-el. Yagis	K2CBA	16.1 dB
4, 13-el. wood boom Yagis	K2UYH	16.0
G3JBL 28-el. long quad loop Yagi	K1LOG	15.0
15-el. WØEYE Yagi	"	11.8
10-el WB6NMT Yagi	"	11.0
13-el. wood boom Yagi	K2UYH	11.0
27-el. Swan Yagi	K1PXE	10.0
11-el. Tilton Yagi	K1LOG	4.5
Big Wheel	K1PXE	−1.5
"Skewed Wheel"	K1VYU	−3.4
NBS/EIA Standard Gain Antenna	WA2ZZF	7.7
1296 MHz		
7-ft. dish	WA2FGK	24.3
G3JBL 28-el. long quad loop Yagi	K2UYH	17.1
Similar to above with "corrected spacings"	"	16.5
13-el. W2CQH Yagi	WA2ZZF	13.3
EIA standard	"	9.9
Reference horn	"	13.3
2304 MHz		
Short backfire 2.35 λ dia.	WA2ZZF	9.1
EIA standard	"	9.0
13-el. Yagi	"	6.7
"Can"	WA2EUS	5.6
Reference horn	WA2ZZF	10.9

1-1/4 Meter Standing

Figures are states, call areas and best DX in miles.

K1PXE	16	6	781	K5JL	6	4	1178
WA1MUG*	15	5	450	WA5MFZ	6	5	1100
W1HDQ	13	5	450	W5HN	4	2	1050
K1JIX	12	4	600	WB6NMT	10	6	2650
WA1FFO	11	5	420	W6WSQ	6	4	1178
W1AZK	10	3	375	W7CNK	6	3	923
K1BFA	10	3	225	W7JRG	5	3	959
K2CBA	19	7	2650	K7ICW	4	2	250
K2DWJ	15	5	740	W7HSJ	3	2	400
W2CRS	14	5	600	K8HWW	11	6	550
K2RTH	13	5	960	W8IDU	10	5	635
K2DNR	13	5	600	K9HMB	23	10	1816
W2SEU	13	5	325	WØPW	14	6	1600
W3UJG	14	5	460	WAØQLP	4	2	923
W3RUE	11	6	480	VE2YU	8	3	300
K3IUV	11	4	340	VE2HW	5	2	325
W4UCH	9	5	543	VE3ONT*	16	8	420
K4IXC	5	3	1115	VE3EMS	10	7	465
K4GL	4	2	485	VE3AIB	7	4	450
W5RCI	10	5	910				

*Club station



Lee Fish, WA5MFZ, surveys the new 32-foot dish ready to be raised. She and OM, W5FF, are now prepared for EME skeds on 144, 220 and 432 MHz.

Public Service

Conducted By Robert J. Halprin,* WA1WEM

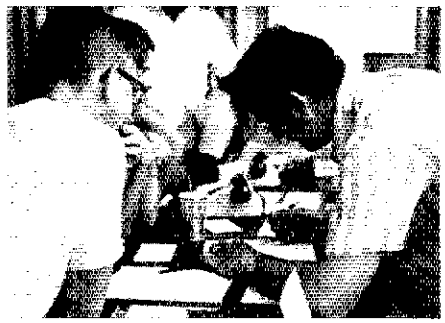
Technicians as Free Agents?

There has been much publicity given to those highly sought-after "free agents" in the world of sports. Now that Technicians have been granted Novice privileges, they may be considered ham radio's free agents. And one of the best ways for Technicians to reach the promised land of 13 words-per-minute is to work slow nets. This is the time for traffic devotees to recruit Technicians with some of the vigor that competing sports teams exhibit toward available players. The companion piece to this column is an article entitled "Checking into Slow-Speed Nets," which appears elsewhere in this issue. It's recommended reading, to say the least.

Obviously, the world of two-meter repeaters is one of never-ending expansion of technology, especially in the emergency communications area. But there are many operators on the band who are stuck there, not by choice, but because their upward mobility has been prevented by the lack of cw skills.

Those who get the most out of amateur radio are the versatile operators. The one-band, one-mode person is just cheating himself. But now, a Technician can supplement his vhf activities with a bit of 80-meter traffic handling. With some cw training, the Technician can upgrade and become the master of his own destiny! Think of all that dusty low-band gear in the average Tech's shack.

It's apparent that the time has come for traffickers, net managers, League officials and others, to sign up Techs for slow-speed traffic nets, one of the most constructive and educational activities that the Tech (and Novice) can get involved in. Keep in mind that while Technicians are in the enviable position of free-agentry, they are rookies when it comes to 80 through 10.



WA0WUY puts a message into proper form at KM0MO, Missouri State Fair. (*AB0LRX photo*)

How do you get them into camp? Spread around the information found in this issue's traffic-handling article. There's a wealth of information contained in those two pages and assorted references. Talk up slow nets on repeaters, at radio club meetings (perhaps even during licensing classes) and at repeater clubs (the hub of the fm "lifestyle"). Put a blurb about the net in club bulletins. And if your section doesn't have a slow net, by all means start one!

What do you leaders get out of it? First, the sense of accomplishment – that old Elmer feeling – that one gets from helping individuals qualify for higher-class licenses is tremendous. Just ask W0HXB, whose CWN has had an outstanding record along these lines.

Secondly, when your net members upgrade, and it won't take long, they may want to continue their involvement in traffic handling and assume higher-level responsibilities in NTS. Wouldn't it be nice to have more outlets on section nets and more qualified volunteers for those net-control and liaison functions?

Your Technician and Novice friends might be interested in traffic handling but need some message-origination ideas to really get them going. Relatives, Christmas greetings (it's that time again), clubs, organizations and friends are all good sources for message traffic. Moreover, any exemplary act or unusual accomplishment that one sees, hears or reads about may deserve congratulations or comment. Sending a radiogram is a good way to go about it.

Slow nets also serve during the SET (details this issue). Techs who can provide liaison between their local AREC group and the 80-meter section slow net would be helpful indeed, especially for groups who normally don't have anyone to carry out this function. This could lead to regular participation and liaison

The bottom line is that amateurs who will be the true *professionals* in crisis communications will be those who have experience in both local vhf communications and long-haul traffic handling on the low frequencies. With the unprecedented growth in the Novice ranks and 50,000 or so Technicians, there will be enough personnel to put slow nets permanently on the map in each ARRL section. Technicians should consider this an open invitation to join slow nets – just spare us the old cliche about too much QRM on the low bands.

PUBLIC SERVICE DIARY

□ Saskatchewan – June 3. Sixty amateurs provided communications for the Saskatchewan Power Company after a freak 100-mph windstorm cut a trail of destruction through the central part of the province. (VE5CU, SEC SK)

□ Central WI – June 13. WA9GJU conducted a severe-weather network which lasted approximately two hours and utilized seven repeaters. (WB9KZH)

□ San Rafael, CA – June 14. During a savage brush and tree fire on San Rafael Hill, WA6AUC and WB6CIE handled emergency medical requests and supplies. (WA6MGK, EC Marin Co.)

□ Pt. Reyes, CA – June 24-26. A severe forest fire knocked out telephone communication at the Pt. Reyes fire station. Twenty-five amateurs assisted in passing over 200 messages for the Red Cross and local officials. (WA6MGK, EC Marin Co.)

□ Northern AL – July. The Birmingham Amateur Radio Emergency Service took part in seven formal weather alerts with W4CUE as NCS. (WB4CXD)

□ Kingman, AZ – July 26. A storm hit Kingman with such force that a number of mobile homes were completely destroyed. Several amateurs patrolled the area to prevent looting. (W7KAX)

□ Anniston, AL – August 6. The Alabama Emergency Net *W* was activated when severe thunderstorms threatened eleven counties. (W4MHO)

□ Richmond, ME – August 7. WA1UVX broke a QSO between K1GUC and K1TEV to request a doctor and ambulance for a heart-attack victim at a local sportsmen's club. A rescue unit was on the scene in eight minutes. (WA1MUX, SCM ME)

□ Groton, CT – August 13. The SCRAMS 07/67 repeater was used to coordinate the search for a lost two-year-old child. (WA1IKN)

□ Mebane, NC – August 23-29. A unique opportunity for providing emergency communications developed as a result of a fire which destroyed the local telephone central office. All telephone service for the town of 3000 and the surrounding area was disrupted. The c.d. director contacted Alamance Co. EC WA4FFW for assistance. An emergency net was established and operating within 45 minutes to provide the public with immediate access to fire, rescue, police and other services. The network remained in session until August 29. A total of 161 amateurs participated and the 07/67 (Burlington) and 22/82 (Durham) repeaters were used extensively. (W4ACY, Director Roanoke Division)

□ Pacific Ocean – August 24. While tuning the 20-meter phone band, KJ6DL (Johnson Island) heard a distress call from HK3DI/mm. Upon responding, he discovered that the radio operator aboard the *Cuidad de Cali* had suffered a near-fatal heart attack. KJ6DL lost no time in alerting the Coast Guard and Naval medical facilities on Midway Island. Medical advice relayed by amateur radio kept the sick man alive until the ship docked at Midway Island the next morning. (KJ6DL)

□ Harris Co., TX – August 28. Amateurs assisted the Houston Fire Department and the volunteer fire department to prevent a potential outbreak of encephalitis. Thirty-six repeater users handled 250 pieces of traffic and received excellent local press coverage. (WA5FLC)

□ Bogota, Colombia – September 10. Members of the Quisqueya Radio Club, HI8AFC/W2 and HI8DCS/W2, were talking on 20 meters when a station from Bogota broke in with emergency traffic for New York City. Medicine was needed in Colombia for a seriously ill patient. They bought the prescription with their own funds and arranged for it to be hand-carried to HK3COU who arranged delivery. The patient was later reported in good condition. (Victor Cepeda)

□ Tulsa, OK – September 11. Members of

*Assistant Communications Manager, ARRL

the Tulsa Repeater Organization provided communications for a search for a man who had been missing nine days. W5KHA coordinated the activities. (WB5AXH)

□ Duluth, MN – September 13. Amateurs helped the Minnesota Department of Natural Resources handle traffic during a large forest fire in northeastern Minnesota. (S. Fink)

□ Alaska – September 14. A session of the Seventh Region (daytime) NTS traffic net was interrupted by WA7ZTL/KL7 who advised that he was stranded on an island off the coast of Alaska. VE6FS arranged for WA7UBC to get a charter flight to the island. (VE7DKY, RN7 Mgr.)

□ Tucson, AZ – September 23. W0YJX/7 lost all electrical power while flying a twin Cessna 25 miles NW of Tucson. He called for help on WR7AIM. K7CC, sitting in his office at the University of Arizona, answered the call with his *HT*. He immediately autopatched the FAA control-tower operator at Tucson International Airport with instructions for W0YJX. The plane managed to land safely. (K7CC)

□ *Repeater Log.* According to reports received to date, repeaters were used to report 98 traffic accidents and related occurrences, ten fires, five disturbances, three medical emergencies and two burglaries. Repeaters involved were WR2s AGH AMI, WR3s ACM ADG, WR4s ADZ AHJ, WR5s ABA ABY ADP AIB, WR6s ACJ ACS, WR7AEL, WR9s ABA ABY.

□ For September, 33 Section Emergency Coordinators reported a total AREC membership of 12,051. At this time in 1975, 36 reports were received, with a membership totaling 13,136. Sections reporting were Alaska, Alta, Ariz, Ark, Colo, Conn, Del, ENY, EMass, Ga, Ind, Ky, Mich, Miss, NLI, NC, NFla, NNJ, NTex, Ohio, Okla, Ont, Org, SDgo, SF, SCV, SFla, SNJ, Utah, Va, WVa, WMass, WPA.

NATIONAL TRAFFIC SYSTEM

That sudden pileup during FAN the other night wasn't caused by one of the European listeners finally checking in; it was the sound of net members saying *ARL FORTY SIX* to W2*Father Radio*. PAN is now back on 3675 kHz for the winter; 7082 reverts to alternate status. W2AIR, the U.S. Coast Guard station at Governor's Island, NYC, is now active on 2RN, with WA1MHJ at the helm. Certificates: W4LXB WB4WYG (4RNd); WB4GZF WB5NKD (RN5d); W0EJD (TWNd). Please recommend this month's traffic nets article to your non-traffic-oriented friends.

September Reports

1	2	3	4	5	6
EAN	30	1573	52.4	1.399	98.8
DEAN	60	544	9.1	.526	90.0
CAN	30	961	32.0	.871	99.4
DCAN	58	166	2.8	.182	87.7
PAN	30	1162	38.7	.788	99.4
DPAN	53	78	1.4	.127	76.7
CTN	30	266	8.9	.350	100.0
1RN	55	589	10.7	.524	89.7
1RNd	29	144	4.9	.320	77.6
2RN	90	558	6.2	.501	95.8
2RNd	60	297	4.9	.487	93.6
3RN	60	325	5.4	.381	98.3
3RNd	30	117	3.9	.470	95.5
4RN	58	503	8.6	.395	95.0
4RNd	60	189	3.1	.222	52.7
RN5	60	589	9.8	.415	96.0
RN5d	30	157	5.2	.215	94.1
RN6	56	457	8.1	.356	93.3
RN6d	30	162	5.4	.173	91.6
RN7	59	411	6.9	.443	83.0
RN7d	50	92	1.8	.144	45.4
8RN	51	213	4.1	.297	75.0
8RNd	30	107	3.6	.412	90.0
9RN	59	492	8.3	.393	93.3
DTRN	21	20	.9	.088	13.2
ECN	60	435	7.2	.510	97.0
TWN	58	446	7.6	.314	93.7
TWNd	17	22	1.2	.102	34.6

TCC Eastern	108[1]	639	
TCC Central	83[1]	554	
TCC Pacific	110[1]	751	
Sections[2]	4128	16711	4.0
Summary	5442	29730	5.4
Record	4971	27764	15.4

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVG.
5 — RATE
6 — %REP.

[1] TCC functions not counted as net sessions.
[2] Section and local nets reporting (115): BCEN (BC), MSN MTN (MB), WQV/UHF (PQ), AENB AEND AENJ AENM AENR AENW (AL), ASN (AK), ATEN HARC (AZ), AMBN APN ARN OZK (AR), NCN NEN SCN (CA), CWN (CO, WY), CN CPN NMVTN (CT), FAST FMTN FPTN GN NFPN QFN QFNS SPARC TPTN (FL), GAREC GSN GSSBN CVEN (GA), IMN (ID, MT), ILN (IL), IMO (IN), I75MN TLCN (IA), KPN KSBN KWN QKS QKS-SS (KS), KNTN KRN KTN KYN MKPN (KY), LAN LRN LSN LTN (LA), MSSN PTN SGN (ME), MDD (MDC), EMRIPN EM2MN GNBEN WMN WMPN (MA), HEN MACS MI6MN QMN WSBN (MI), MSN MSPN MSSN PAW (MN), MSLWN MSN MTN (MS), MON MOSSBN MSN (MO), MTN (MT), BARTEN NJN NJPN NJSN (NJ), SWN (NM), NLI NLS NYS RTN WDN (NY), BRMTN CFARS CN NCSSBN PX SCSSBN (NC, SC), BN COAREC-10 OSN OSSBN (OH), OAN OFON QLZ OPEN OTWN STN (OK), NSN OSN (OR), EPA PFN PTTN WPA (PA), TN TPN (TN), TEX TTN (TX), BUN UCN (UT), VFN VSBN (VA), WVN (WV), BWN WIN WNN WSBN (WI).

Transcontinental Corps

K5MAT writes that it's good to have W7KZ back on the TCC duty roster. He also reaffirms the desirability of using 160 meters for winter skeds.

1	2	3	4	5
Eastern	118	94.7	1728	639
Central	90	92.2	1062	554
Pacific	120	91.7	1530	751
Summary	328	92.8	4320	1944

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC roster (September): Eastern Area (W2FR, Dir.) — W1s NJM QYY, K1s EIR GMW, WA1s MSK UGJ WEM, W2s FR GKZ, K2s HI/VE2 SIL/1, WA2s ICB PJL UYK, WB2UBW, K3MVO, WA3VBM, W4UQ, K4KNP, W8s LTA PMJ, WB8ITT, VE3s AWE GOL 5B. Central Area (W5GHP, Dir.) — WB4s LCR SKI, W5s GHP MI RB UGE UJJ, K5s TFG TTC, WA5IQU, W9s CXY DND NXG, WA9EED, WB9s NOZ TWT, W0s AM HH HI LCX, K0CVD, WA0TNM, WB0HSP. Pacific Area (K5MAT, Dir.) — W5RE, K5MAT, WB5KSS, W6s BGF EOT MLF TYM VZT, K6HW, W7s DZX GHT KZ, K7s IWD NHL NHV QFG, WA7WXY, W0s IW LQ, K0s DRL TER, WA0KKR/7, WB0QOT, VE7ZK.

Independent Nets (September)

1	2	3	4
Clearing House	30	293	526
Hit & Bounce	60	998	481
Hit & Bounce Slow	16	37	130
IMRA	30	392	1005
Mike Farad	26	91	327
North American SSB	25	132	187
75 Meter ISSB	30	659	1316
7290 Traffic	41	345	1666

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll
September 1976

This listing is available to amateurs whose public service performance during the month indicated qualifies for 40 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. 10; (2) Checking into phone/RTTY nets, 1 point each, max. 10; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned liaison, 3 points each, max. 12; (6) Phone patches, 1 point each, max. 20; (7) Making BPL, 3 points regardless of traffic total; (8) Handling emergency traffic directly with a disaster area, 1 point each message; (9) Serving as net manager for entire month, 5 points.

64
WB2CST
W4OGG
WB5KGP
63
WB2VTT
62
W5KLV
61
WA1MSK
WA1UGJ
W2MTA
WB4OBZ
WA5ANV
WB5NKD
W7OCX
WB8JGW
K0CVD
60
K1PAD
58
WB6FTY
57
WA3SXU
WA3YJG
WA4FBI
56
WA1FCM
WA2ECO
WA2WKH
WB4ARJ
K4BKX
WB4IGX
W5GHP
W6RNL
WA0KKR/7
W0OTF
VE3GJG
55
WA6TVA
WB0HBM
52
WA4EPJ
W6RFF
51
WA2PJL
50
AA1VGP
WB5RXZ
49
W1RWG
WA2AIV
WB2LZN
K3YHR
WB4EKJ
K4FLR
K5MAT
W7GHT
WA7MEL
K9ZTV
K0MRI
WB0OCT
VE1AAQ
VE3FQZ
47
WB2RMK
WB6IBO
VE1BDT
VE3DZK
46
WB8PAV
K0EVH
WB0QOT
VE4UL
45
WA2SLF
WA5VBM
KL7AF
W0OYH
44
W1BVR
W1ERW
WA1TBY
WA2VEN/0
WA2ZJP
W3IPX
WA3VBM
WA3WPY
AA3YKK
WB4FHT
WB4GHU
WB4LCR
WB4SKI
K5ROZ
W7DAN
W7VSE
W9NXG
W9SFL
WB0LFY
WB0PGZ
K0RWL
VE1AVL
VE3GOL
VE3GT
43
WA1MJE
WA3OGM
K9LGU
42
W4ANK
W4MEE
WB6CWE
41
W2YJR
K3ORW
W8CUL
WB8III
WB0TAQ
40
AA1UDB
WA5JYH

Brass Pounders League September 1976

BPL Medallions (see December, 1973 *QST* p. 59) have been awarded to the following amateurs since last month's listings: WB5NKD

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.

Winners of BPL Certificates for Sept. Traffic

1	2	3	4	5	6
W3CUL	366	1183	1437	39	3025
W0WYX	46	862	390	472	1770
K3NSN	409	517	440	77	1443
WB4VHE	280	310	300	7	897
W3VR	260	210	359	15	844
K9CPM	1	400	36	193	630
WB6EIG	8	297	297		602
AB0HOX	11	290	294	4	599
AB2CST	13	273	249	42	577
WB4ARJ	20	228	253	6	507
W4MEE	3	264	224	16	507
WA2UYK (Aug.)		341	275	137	753

BPL for 100 or more originations-plus-deliveries

W1EQH	260	W9IOH	113
W7TZK	187	K4TH	110
WA3ATQ	168	WA3THT	106
VE1BDT	138	K1BCS	102
WA5VBM	134	WB8RVG (Aug.)	113
K7VWA	132	WA3YJG (July)	131
WA3YJG	127	WA7JRC (June)	108

1—CALL
2—ORIG.
3—RECD.
4—SENT
5—DEL.
6—TOTAL

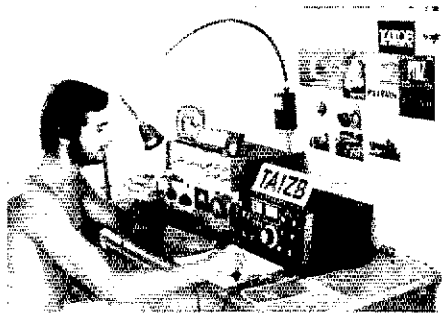
How's DX?

Conducted By Rod Newkirk,* W9BRD

Old Rocky Point Raises a Rare One

Riverhead and Rocky Point shutting down on shortwave? Additional proof that nothing lasts forever. That superstation's immense conglomeration of rf power and signal sensitivity soared toward furious wartime peak in 1942. Ham radio was just a tantalizing memory then, shelved for the duration. Amateurs suddenly found themselves deployed far and wide as Uncle Sam's WWII effort got up steam. Those darned kids in the attic who made all the static became the spirited nucleus of a growing gang of key military and civilian signal-slingers. One of them, a QSO-starved kid from Chicago, showed up for his usual night shift at the bustling War Department Signal Center on Washington's Constitution Avenue, call sign appropriately WAR.

This was Army Net Control with ancient transmitters at Fort Myer a few miles away, receivers at Battery Cove, and the work already tediously automated. "Rod, how would you like to work some high-power DX ham-style?" asked the noncom in charge of circuit assignments. "Right over there, OM." The displaced young W9 sat down at a freshly thrown-together operating position bearing the placard WVNA. "He's got a bushel of traffic if you can get him started." We straight-keyed WVNA WVNA V WAR WAR QSV. The most delicious polar flutter filled the cans with WAR WAR DE WVNA V V V. Our own signal on the local Super Pro monitor was juicy, too, wavery S6 scatter. "It's Karachi, India, coming through Riverhead on landline and you're keying forty kilowatts at Rocky Point." Hours of grueling five-letter code groups followed, high adventure all the way.



TA1ZB is in the forefront of an upsurge in Turkey amateur activity. Meti prefers the key and has his QSLing handled by W5QPX. *(W1DAL-W5QPX photo)*

The guy running RCA's Riverhead receiver, we now learn 34 years later, was W2LYH of last month's "How's" intro. Bob writes, "Yes, sometime in '42 I recall getting orders to pick up a signal signing WVNA and not to ask any questions about it. We put a three-set diversity and three 35-degree azimuth fishbones on frequency and there he was. We gave special attention to that circuit, trying to keep ahead of changing conditions and monitoring the outgoing 40-kW Rocky Point transmitter. Coincidentally, later in the war I found myself in Karachi on OSS assignment. Bumped into one of the OMs still operating WVNA. He showed me the original radio building they used in 1942, just a big airplane shipping crate."

Ah, small world as they say. Even then as now, especially in radio. And definitely a QSO to remember.

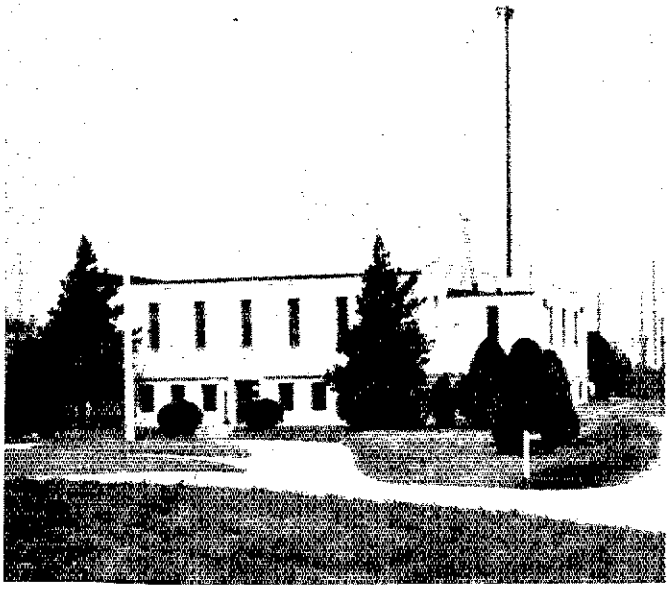
FROM *QST'S* DX MAILBAG

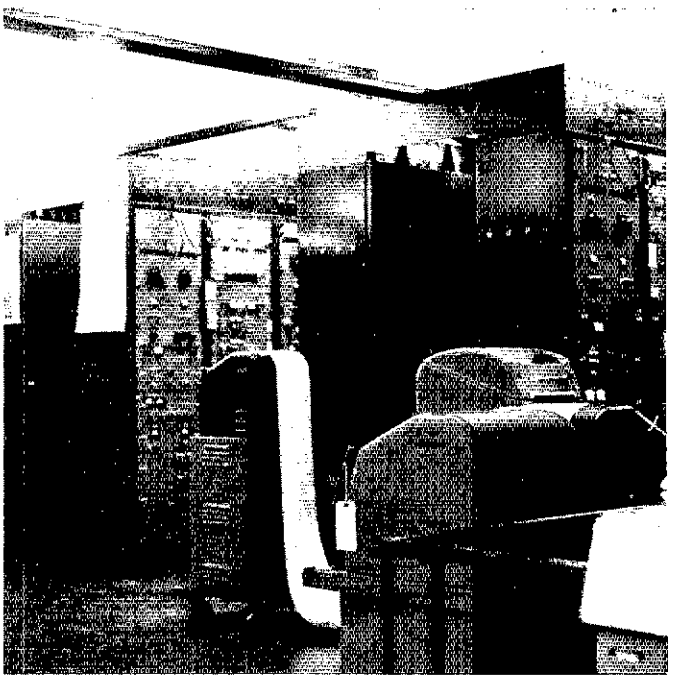
EUROPE: VERON's '76 Netherlands PACC DX Test was well attended in April with W3ARK, WA3DMH, W1OPJ and WB5IAL pacing U.S. entrants in that order. Other single-op leaders by country: DK8AX, DM3NKE, EAs 4BV 8IR, G3VTT, GI3JEX, GM3MZV, GW4DOO, HA0IG, HB9QA, I3DUU, JA6BSM, LZ2RF, OE1TKW, OH6UW, OK2BLG, ON6NL, OZ4LX, SM6EUZ, SP3GCT, UAs 2FBI 3QAQ 9JAA, UB5ZBB, UC2BA, UI8JAS, UL7GAA, UM8NN, UO5AP, UP2BAR, UQ2GCN, YO2QY, YU3TJA, ZS6CS and 9H4G. Please join us on the bands again in April! (PA0DIN) . . . REF received some 1200 logs for the '76 French DX Contest, not a bad showing for such generally sleazy conditions. Cw entries from our side in scoring order: W1PL, K4IEX, Ws 1FJJ 8VSK, WB4OGW, Ws 3ARK 9OHH, K5ETA, Ws 1OPJ 8DSO and WB4EDD, with VE3DMC winning Canada. Voice victors in sequence are F2YS/W2, Ws 4WSF and 8CFU with VE3BS, who topped all totals in either mode, the Canadian mic king. (F8TM) . . . Lively visit with CR9AK and CT4AT recently at the latter's dig. Fern was on a European business trip and Don is adding more DX QSOs to the vast total he has already collected as K7CBZ, HS3DR, XU1DX, XV5AC, 1S1A, etc. (K1ZND) . . . After many years of keyboard QSOs with G8LT, I was delighted to meet him personally while in London last summer. (VE3AYL, CARTG) . . . 4K1B of Mirny base on the Indian Ocean side of Antarctica offers rare contacts around 14,020 kHz at 0500 UTC. (W7YF) . . . Our August operation from the Channels as GC5s BTK BTN and BTP was limited by part-time generator facilities. (Fs 6ARC 6DLA 5GY) . . . We represented Guernsey Radio & Electronics Society as GC4DAA in last month's cw contest action. (Gs 3FXB 3MXJ 4BUE) . . . GW4ESL, recently licensed and very keen, is the newest member of our GW4ENT Contest Group. (GW4BLE) . . . Mail here is almost as slow as current DX conditions but I enjoy *QST* better late then never. (EI9J) . . . Enjoyed visiting G4UZ and XYL in Devon. Len likes W/K contacts near 14,200 kHz but suffers heavy QRM from UAs, DMs and other stations eastward. (WB0QON) . . . After steady weekly output for fifteen years I must reduce my *DX News-Sheet* efforts for reasons of health. Restricting mailings to United Kingdom readers only, an unfortunate necessity. Meanwhile I do welcome worldwide inquiries re my up-to-date fifteen-page prefix/country/zone index, a very handy tool for any DXer. (Geoff Watts, 62 Belmore Rd., Norwich, NR7 OPU, England) . . . Lower-frequency DXers should be interested in my 96-page computerized rundown of sunrise-sunset times for 384 global areas and all DXCC countries. (ON4UN) . . . Great to be back on the DX trail from Belgium with a Galaxy V and ground plane. (ON8VH-W2BTQ) . . . While inspecting Russian research vessel *Belogorsk*, anchored off Woods Hole and open to the public, I flashed a UA QSL to one of the ship's radiomen. Though they weren't amateurs this resulted in a most pleasant eyeball QSO over vodka, sardines, bread and preserves in the wireless room. (K5GOE/1) . . . Continental comment from the literary DX grapevine: JWs 7FD 7PD and 9WT keep Bear Island active on 20 sideband at 1200-1800 UTC. . . . Amateurs in Greece are fully enjoying their new 3500-3600-kHz operating privileges. . . . UK1ZAA/p radiated from Kildin isle near Murmansk in September, and UK1PAA does brisk biz from Franz Josefland on 14 MHz. . . . W7YTN credits Fs 3NB 8AH, SM3EAG, UK5MAF and UR2TAX with standout 7-MHz cw signals from Europe these days. . . . That big broadband blurp-blurp annoyance around 20's low end apparently originated somewhere east of the Baltic. Clean-up petitions spurred by IARU Intruder Watchers got an early start but gears grind slowly in diplomatic echelons involved.

ASIA: Grateful to be back in my own radio shack after months in Saudi Arabia where I was unable to obtain a license. Apparently there will be SMs assigned to the Sinai/4U buffer zone area for quite some time to come. (SM0KV) . . . Dozens of VU2 amateurs did an FB job providing 7030-kHz communications for a thousand-mile motor rallye in Karnataka state last August. (VU2JA) . . . Logged 151 countries during six months in Israel, enough QSLs for DXCC hopefully awaited. (WA2ZQY/4X) . . . 5B4CR, one of the growing crop of new hams on Cyprus, works through two-meter repeaters in Jordan

WA6EVX/KG6 nears 200 countries confirmed after two years on Guam but still lacks a couple of WAS states. Ray displays your Console of the Month, a slick mobile job that disappears into a closet during the XYL's housecleaning offensives.

*c/o ARRL, 225 Main St., Newington, CT 06111





RCA's mammoth Riverhead receiving station, the ears of Rocky Point, now retired from the shortwave scene. At right is a mere sample of equipment still filling the complex. Commercial competition with Mackay/ITT's Southampton site a few miles to the east resulted in one of the biggest continuous DX contests of all time. *(W2LYH-K2GMF photos)*

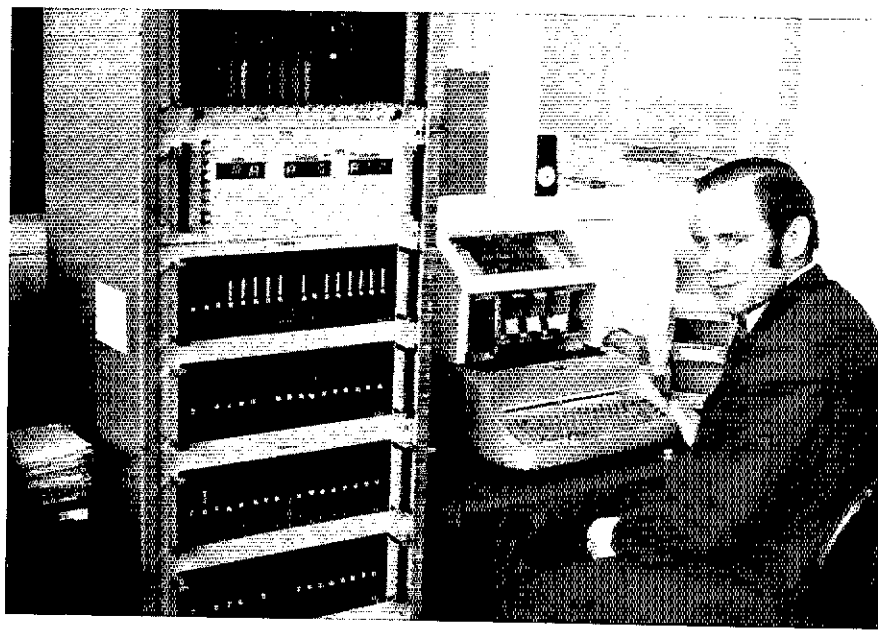
and Israel when lower-frequency DX slows down (K1ZND) . . . Ex-4S7AB-9J2AB signs G4FLD while studying at Loughborough Tech, and former VS6DD now radiates from WA5UKR/YV5. (W3HNK) . . . Our Amateur Rādio Society of Iran meets on the second Wednesday of each Iranian month. More than fifty EP2s are currently licensed. (EP2FT-DC6XT) . . . More Asian items courtesy the clubs' press: W7JXE/SU of the Sinai Field Mission appears near 21,290 at 0930 UTC or so, also 14 MHz. SMs 4ATE/4U, 4GDB/4U and YB2SV/4U aren't far away. . . . Japan DX Radio Club celebrated its 25th founding anniversary in September. . . . YK1KAH-YK5AAA goes back to OK1AAA shortly. . . . HZ1s AB SH and TA keep Saudi Arabia coming on 14-MHz ssb, mostly 1700-2000 UTC. . . . A4XVK replaced his dipole with a beam and expects to remain available through March. . . . ZC4IO installed an extensive underground garden sprinkler system which ought to go well with his 80/160-meter DX vertical this season. . . . W3ACE, formerly YI2AM, expresses scant hope for early Iraqi ham emanations. . . . SMØAGD hopes to be contemplating more juicy Asia-Africa activations just about now. . . . W6s SJQ and FZO now try the DX end as EP2s DE and SE. . . . 8J2HAM was operational from JARL's gala All-Japan Hamvention at the foot of Mt. Fuji in late September. . . . Despite all precautions BV2B lost his 204BA to an August typhoon. Tim still has a dipole on 14,225 kHz around 2300 UTC.

OCEANIA: After our successful Pacific work earlier in the year, we are resuming our worldwide DXpedition under Yasme Foundation auspices, adding to the 350,000 QSOs we have amassed under 56 calls on past journeys through 126 countries. XYL W6DOD, by the way, now signs W6QL. After a month in the Virgins as W6KG/AJ3 we'll start out for rare DX spots under the expert guidance of KV4AA. See you first from all available VP areas! (W6s KG QL) . . . DX conditions have been rather poor here on all bands but 40-meter skip gets hot now and then. Replaced my typhoon-battered 18AVT with a JA-type four-band vertical and raised old buddy KV4C1 first shot. A cw contact with I2AY in August was my first 21-MHz DX in months. Sure a long time since W/K/VEs rolled through en masse on 10 and 15! (KG6JAR) . . . Hope to sign portable-DU1 next March when I sentimentally revisit Bataan and Corregidor. (W7HPI) . . . Oceaniagrams from aft-credited periodicals: ZL4LR/a puts the Campbells on 80 cw with several crystals falling between 3550 and 3750 kHz. Ray should be there a year and requests QRS to 13 wpm or so. ZL3OG/c is mentioned as a multiband Chathams possibility. . . . VR4BT commences a two-year Solomons' tour favoring 14,260 kHz around 0800 UTC. . . . ZK1BA should be heading back to ZK1BA/p Manihiki status for a day or two next month . . . VR3AR plans to remain workable till May while attending to space project duties. . . . ZL4JP gets around to rare New Zealand counties, radiating same near 14,245 kHz with W6DMJ emceeing. . . . Now that it's summertime down under, VK DXpeditioners talk of possible Willis, Maldives and Laccadives ventures. . . . VE7IR says it took him five years to obtain hamming privileges in the Philippines. John understands that VE3FVY/DU4 also made the grade.

NORTH AMERICA: This year's Radio Society of Bermuda DX Contest radiotelephone division was enjoyed by USA participants in this scoring sequence: Ws 1HFB 4UPJ, K2BT, W1DO, Ks 3DH 4IRK, WB2VFT, W2FFQ, Ks 5OOU 8CSG, W2DTF, K4KFB, W6HX, K8PYD, Ws ØJIE 1OPJ, WB9HIP and K5DEC. VEs 1AGH 1EP 1QU 2ZH and 3EJK did it for Canada, G4GI was the U.K. winner, and VP9IB led all locals. Yank radiotelegraphers finished K2BT, WA2DIG, Ws ØOUE 9OHH 3ARK 8KTQ 8BDO, Ks 4NE 5ETA, WB8DTT, K8PYD and W1THV. VEs 1CD 3EJK 3CDK 1EP and 2DZE headed Canadian code types, G3FXB won U.K. honors and G4BKI/VP9 topped Bermuda key-thumpers. (RSB) . . . My 188/180 worked/confirmed countries total was earned the fun way with a barefoot TR4 and Argonaut. (WBØCGJ) . . . The DX gang seems to go big for Calvert Co., Maryland, where only a handful of hams gives me local QRM. I welcome cw or ssb schedules from my comfy, old, antique-filled farmhouse. (W3QW) . . . September and October came through with marvelous 21-MHz VK/ZL signals around 1800-1900 UTC plus numerous African goodies on east-west paths. (WA3KCY) . . . A new 35-foot-high vertical cracked 15 cw open for me in late September with a flock of South Americans and KC4AAC. Wish more DX ops would give modest-powered Generals a break. (WBØMAO) . . . Just hang on, fellows — the sunspot cycle should really bottom out this coming spring or summer. (W4UMF) . . . After sweating out a New England 115/86 record I'm starting over at Ann Arbor with a two-watt HW7 and sneaky dipole. A new Extra ticket should help on the low cw band edges. I'm watching for other QRP DX hounds. (WA1UIX/8) . . . VP1MPW will be more available on 160 when he finally debugs his old DX100. (W5QPX) . . . A miniDX-pedition with WB4IDX in mid-September netted us about 400 contacts as ZF1IK on Seven Mile Beach. (W4JIK) . . . Darned Montana is the last holdout in my quest for Bicentennial WAS. (CP1AT) . . . Struggled for two days to break through on 160 in July-August with an FT-101EE at PJ9CDC but QRN was just too much. Forty and 20 were DXcellent enough although Africa was scarce. Even 28 MHz came through with a logful of W/Ks. (W1CDC) . . . UA1AHZ was my 24,000th AJ3AA QSO in late September, so my new goal of thirty thousand Bicentennial contacts should be a cinch. A pleasant visit from W4UW was one of my 71st-birthday presents. (KV4AA) . . . College, cramped apartment dwelling, etc., interrupted my DX career in the early '60s. Glad to return with a secondhand HW-100 and multiband

SMØKV visited your QTH of the Month recently but had no chance to sign SMØKV/8Z4. It's Al Uquba in the Iraq-Saudi Arabia Neutral Zone, a location once made famous by Vic Crawford, now HZ3TYQ.

vertical, but what happened to all those sunspots? (K5GOE/1) . . . W4BPD calculates that he has visited 168 countries, used 169 call signs, made about 600,000 QSOs and snapped some 27,000 color slides. (DXNS) . . . WR7AIN is Western Washington DX Club's new 147.600-147.000-MHz repeater. . . . North Florida DX Association runs a 3895-kHz club net coordinated with WR4AQD repeater facilties each Wednesday evening. . . . K6SSJ bravely relieves VE3DXV/W6 in the Northern California DX Club *DXer* editorial slot. The first six winners of NCDXC's Bicentennial California Award are DJ6RX, JA6CNL, YU2QZ, OK3EA, DK7PE and F2YT in that order. (NCDXC) . . . A correspondence campaign goes forward in some circles to open 160 meters for amateur use in countries prohibiting same. W4BRB, now W4OO, watches for productive developments. (WCDXB) . . . CE9s BSA BSB BSG and BSH rack up QSOs list-style around 14,265 kHz at noon UTC. CE9s AT AV and AY are also workable. This South Shetlands boom may taper off next month. . . . Much of the preceding chatter should be credited to Canadian DX Association *Long Skip* (VE1AL/3), Columbus Amateur Radio Association *CARAscope* (W8ZCQ), *DX News-Sheet* (see preceding text), Japan DX Radio Club *Bulletin* (JR3BHW), Newark News Radio Club *Bulletin* (M. Witkowski, Rte. 6, Box 255, Stevens Point, Wisconsin 54481), Northern California DX Club *DXer* (K6SSJ), North Florida DX Association *News* (WA4UFW), Southern California DX Club *Bulletin* (WA6KZI), VERON's *DXpress* (PA0TO), West Coast *DX Bulletin* (WA6AUD) and Western Washington DX Club *Totem Tabloid* (WA7JCB). Keep those DX presses rollin'!



No, this is not a picture of DL3ZI at a keyboard keyer or RTTY machine. This is a picture o DL3ZI at the Deutschland Amateur Radio Club's machine for sorting QSLs. This Mark II version (Mark III is in the planning stage) was built especially for the DARC and has a memor with room for approximately 45,000 different call signs and corresponding DOKs of the DAF members. (The DOK is a code representing the local chapter of the DARC where the membe resides.)

The machine operator places the card in the machine and types the call on the card. The machine, then, automatically puts the DOK on the card and passes it to a bin corresponding to the letter in the DOK.

In four years of operation, the machines have (with two operating positions that can be used simultaneously) sorted some 10-million cards for German amateurs.

DXCC NOTES

DXCC Credits and DX Competition Logs. For many years it was tough for the rarer stations to QSL (today not so, what with bureaus and managers). The percentage of W/VEs who used the ARRL DX Competition logs for "credits" was small (just a few percent). They used log credits not because the cards were hard to get but, rather, because the applicants were mighty impatient.

Now, five years of DX Competition logs represent an awesome logistical problem. It has become just too inefficient to devote the time required to search the logs ("upstairs," in storage) to verify the credit. In fact, it requires at least 600-percent more staff time per credit than does the equivalent QSL.

What with the growing work load in DXCC matters there's only one logical answer – one we trust you'll concur with. Effective January 1, 1977, DX contest logs may no longer be used in lieu of QSLs for DXCC credit.

5BDXCC Awards issued in September, 1976. Beginning with no. 517: HB9AFI KV4AM WB4OGW.

Additional corrections for the September Honor Roll. JA8ADQ should have been shown in the Mixed HR at 312 with 325 before deletions. W6UQQ should have been shown in the Mixed HR at 313 with 338 before deletions. At 321 in the Mixed HR, W7MB's total before deletions should have been 358.

THE ARRL DX QSL BUREAU SYSTEM

The ARRL DX QSL bureau system distributes cards free of charge from DX stations to amateurs within the League membership area (see page 8). Every active DXer should keep several 5 X 7-inch envelopes on file with the bureau of his home district. Place your call sign in large block letters in the upper left corner, and attach a single first-class stamp, unless you normally receive more cards. Unclaimed cards are discarded after one year. For more details on the bureau system, write ARRL hq.

□ W1, K1, WA1, WN1* – Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

□ W2, K2, WA2, WB2, WN2* – North Jersey DX Assn., P. O. Box 8160, Haledon, NJ 07508.

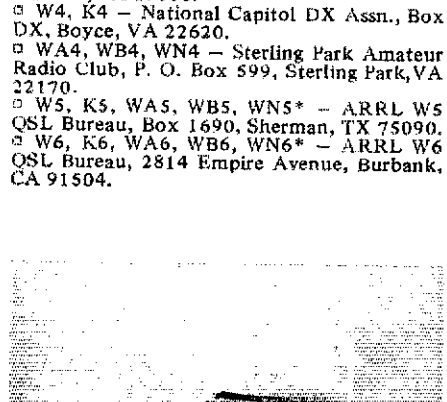
□ W3, K3, WA3, WN3* – Jesse Bieberman, W3KT, RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355.

□ W4, K4 – National Capitol DX Assn., Box DX, Boyce, VA 22620.

□ WA4, WB4, WN4 – Sterling Park Amateur Radio Club, P. O. Box 599, Sterling Park, VA 22170.

□ W5, K5, WA5, WB5, WN5* – ARRL W5 QSL Bureau, Box 1690, Sherman, TX 75090.

□ W6, K6, WA6, WB6, WN6* – ARRL W6 QSL Bureau, 2814 Empire Avenue, Burbank, CA 91504.



VE1 QSL Bureau manager since 1938, the most senior in time of all the ARRL QSL Bureau managers, L. J. Brit Fader, VE1FQ. Brit is active in the Halifax, NS, Amateur Radio Club and is currently editor of their paper, the *Bulletin*. He is also past president, vice president and activities manager. His past positions have also included tours of duty as EC, SEC, OPS and NCS.

□ W7, K7, WA7, WN7* – Willamette Vall DX Club, Inc., P. O. Box 555, Portland, C 97207.

□ W8, K8, WA8, WB8, WN8 – Columb Amateur Radio Assn., Radio Room, 280 Broad St., Columbus, OH 43215.

□ W9, K9, WA9, WN9 – Northern Illinois D Assn., Box 519, Elmhurst, IL 60126.

□ W0 K0 WA0 WB0 WN0 – W0 QSL Burea Ak-Sar-Ben Radio Club, P. O. Box 29 Omaha, NE 68101.

□ KP4, WP4* – Radio Club de Puerto Ric P. O. Box 1061, San Juan, PR 00902.

□ KV4 – Graciano Berlardo, P. O. Box 57 Christiansted, St. Croix, VI 00820.

□ KZ5* – KZ5 QSL Bureau, KZ5OD, Bo 407, Balboa, CZ.

□ KH6, WH6* – John H. Oka, KH6DQ, P. Box 101, Aiea, Oahu, HI 96701.

□ KL7, WL7 – Alaska QSL Bureau, St Route, Box 2401, Wasilla, AK 99687.

□ *QSL Cards for Canada (VE and VO) m be sent to: ARRL Central QSL Bureau, P. Box 396, Downsview, Ontario, Canada M3 3A8. Or, QSL cards may be sent to t individual bureaus.*

□ VE1* – L. J. Fader, VE1FQ, P. O. Bo 663, Halifax, NS.

□ VE2 – A. G. Daemen, VE2IJ, 296 Douglas Avenue, Montreal, Quebec H3R 2E

□ VE3 – The Ontario Trilliums, P. O. Bo 157, Downsview, ON, Canada M3M 3A3.

□ VE4 – D. E. McVittie, VE4QX, 64 Academy Road, Winnipeg, MB R3N 0E8.

□ VE5* – A. Lloyd Jones, VE5JI, 232 Grant Road, Regina, SK S4S 5E3.

□ VE6* – D. C. Davidson, VE6TK, 110 Trafford Dr., N. W., Calgary 47, AB.

□ VE7 – Howard Martin, VE7AFY, N 45-9960 Wilson Road, Ruskin, BC V0M 1R

□ VE8* – Al Sturko, VE8NS, P. O. Box 7 Fort Smith, NWT X0E 0P0.

□ *VO1, VO2 – William Coffen, VO1KM, O. Box 6, St. John's, NF.*

□ SWL – Leroy Waite, 39 Hannum St Ballston Spa, NY 12020.

*These bureaus sell envelopes or postag credits. Send an s.a.s.e. to the bureau fo further information.

□ QSL bureaus for other areas can be foun in the December, 1975, issue of *QST*, pag 64.

DX Century Club Awards

The DX Century Club certificate is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL Countries List. There are now 321 countries on the list, and the DXCC Honor Roll (published in the March and September issues) highlights those ops who are within 10 countries of that figure. Each DXCC certificate may be endorsed for additional countries over 100 — in increments of 20 up through 240, increments of 10 through 300, and increments of 5 over 300. This listing contains the call signs and exact country-totals of amateurs who've joined the DXCC or increased their country-totals during the period from October 1, 1974, through September 30, 1976. Think you may be ready to qualify for DXCC? Write Headquarters for details.

CW/F

359
W6AM W7MB W9BG

358
K6ZO LU6DJX W1BIH W2AGW W2BXA W4EX W8DAW W9LNM

357
W3KT W5KC W8GZ WØECA

356
W4OM W6HX W7KH W8EWS WØDU ZL1HY

355
OE1ER W1HX W3MP W5MMK W8BF WØBW

354
PY2CK W2CTO W3EVW W3LMA W4GXB

353
K6NA W2JVU W6BZE W7PHO W8JBI

352
G5VT K6OJ OH2NB W1DK W2LV W4AIT W6CYV W6GPB W8KIA W8LKH W8MPW 4X4DK

351
DL7AA G3FKM G3FXB ON4NC VK4QM W1HZ W2OKM W2QHH W3CGS W4BYU W4VPO W6ANN W6CHV W6PT W6ZO W8DMD W9FKC

350
DJ2BW DL1KB DL3RK IØAMU W2AO W2BOK W2CR W2CYS W2NUT W2SSC W3CWG W4ML W4QCW W4TM W5PQA W6EPZ W6ID W6KZL W6WWQ W8BT W9JUV

349
K2FL K6DC LA7Y W2GT W5IO W6TZD W8PHZ W9GIL WØMLY WØPGI WØQGI YV5AB

348
CE3AG DL6EN K2BK K4LNM VE2NV W1FZ W1NU W2QM W3WGH W6CAE W7ADS W7ENW W9RKP

347
IT9TAI K2BZT K2LWR K6AN K6EC W1JNV W2AX W2AYJ W5FFW W7SGN W8ZCQ W9SFR WØSYK 4X4JU

346
G2BOZ G2BVN GI3IVJ LU4DMG PAØFX W1MV W2DOD W2GLF W2HO W3NKM W4EO W7OF W9DWQ W9HB WØKF

345
DL9OH K6LGF LU5AQ SM3BIZ W2BHM W2FXA W4EEE W4LRN W5HDS W5NMA W6FOZ W6OSU W6RKP W7AQB W8OK W9RCJ

344
W1CBZ W3GRS W5FT W5GD W5UX W6NJU W8QJR

343
DL1JW K4PDV K6CH W2BMK W2GC W2TP W3LMO W5QK W5TIZ W6FF W6KG W8KPL W9WYB WØAIH

342
DL1BO G6TA IT9ZGY K3BW K6KII K6RQ K8IKB PY1HX W2CKY W2PDB W2SAW W4BQY W4IF W6PO W6ZM WØLWG

341
GI3JIM JA1DM KH6CD OK3MM ON4DM W1GYE W2IRV W5PWW W6ONZ W7CMO W9GFF W9TKV WØNVZ ZL3IS

340
DL1HH K8ONV K9ECE OK1FF PY7YS VE3BWY W2FZY W3AFM W4BJ W4MCM W4SSU W5KGX W6HYG W8KBT W8LY W9MQK WØGKL Y51O

339
DL7HU G3HCT HB9KB JA1BK K2TQC K4EZ K4RPK K6GA KP4RK OZ3Y WA2DIG W5LCI W6SQP W9IKD ZS6LW

338
JA2JW K2YXY K6LU K8LSG SMØAJU W3DJZ W5HJA W5OB W5QKZ W5WZQ W6UQQ W7QK

337
F3AT F9RM K4VW VE5RU W1CKA W2MJ W3GJY W5GC W5GJ W6ISQ W6KUT W6REH WØAUB WØBK YV5AIP

336
JA1AG K1IXG K2SHZ K6RN K6WR K7GCM W1WY W1IAS W2DXX W2YY W4BFR W4DQS W5NOP W5NW W8CUT W8DA W9CH W9HJ YV5BX

335
HB9MX JA3UI K6OM OK1ADM PAØLOU W4EEO W4NJF W5EJT W6ABA W9ZTD WØBN

334
K2PXX K4JC K4MQG K5BGB K6OW K8OHG VE3AAZ W1BPW W1DGJ W1MIJ W2CP W6EL W9ILW

333
JA1BN JA1BRK K6AHV SM7ANB UR2AR W2GKZ W2QK WA2RAU W6KTE WA6EPQ W8ARH W8KIT W9GB YV5BZ

332
OH2BH ON4QJ WA2RLQ W6MUR W6YMV W9NZM WØDEI

331
DL7AP HB9PL K6EV K6MA K6ZM K8WOT OE1FT ON4PA PY2PA SMØCCE W2AEB W2GK W5RDA W6FZJ W6KZS W6OF W6RGG W7QPK W8RT W9KXK W9LTR WØCJZ

330
DJ5DA G3IOR HB9MO JA1ADN K1SHN K2OO K4ID K4YYL K6GLC K6QH K8DYZ OE1FF OH2QQ PY2PE W1AXA W2PV WB2HXD W4IC W6EJ W6QNA W8CT WØCKC

329
DJØKQ K4SCT K5AAD K9BGM OH2QV W2GQN W2PN W6EUF WA6MWG W9QLD W9WNB YV5ANF YV5BBU ZS6YQ

328
I2KMG JA8AA K2LE VE3W1 W1HLQ W4HOS WA4WIP W9FD ZL1AH

327
DJ7ZG K1RQE K1YZW K4IKR K4MPE K8EHD PY2BKO PY2CQ PY2SO VE3MJ VE7CE WB2FMK W4DRK W4MGN W6DOO W6FW WA6GLD W7RS W8JQ W9NLJ YV5BPJ

326
K4IEX SM5RK SM6AEK UA9VB W4BRB W5UR WA6OET YV5AHR

325
DL7BK JA8ADQ K2YLM K4CFB K4CIA K4TWK K5GOT PY4AP SM5AZU SMØKV VE4OX W1FTX W4KFC W4ZXI W6FET W7DY W8BVF W8PR W9OHH

324
K2LGJ K4DJ K4MZU K6YRA PY2PC W3BWZ W3CS W9DH

323
DL1CF DL3OH DL8NU G3JEC I7ZPB JA1MIN K4ZCP K5LIL K5QHS SM6CKS W5LZZ W6KNH W6KYJ WA9NUQ YU2DX

322
DJ7CX JA1IBX JA7AO K6AO K6KA VE1VR W2MZV W9JQD

321
W6PN/DL JA1ZZ K4YFQ K9WEH OH2BC W1YRC WA2IDM WA3ATP WA4MUB W6ANB W8YGR W9OW WØPAH YU1BCO ZL3OY

320
DJ2AA HB9DX I3PRK JA1GC K1DRN K1GAX K2KER KV4FZ OZ3PO PY7APS W1AA W2AZX W2NIN WB2UKP W4BRE W4UKA W6BVM W7CSW WA8NYB W9BGX WA9IVL YV5BNW

319
JA2AAQ K1JHX K6BCE SM6CWK VE3OBT VK3YL W2PTM W4GTS WA5JSI W9AZP W9HZ WØBL

318
HB9AHA JA1MCU K4HJE LA1K OZ6MI W1OHA W3PVZ W8DCH WØOAQ WØTDR WAØOAH

317
F2IU I2DEZ I2SM OH4NS PY3APH W3LPF W5KGJ W6BUO W7MI W9LKJ WAØCPX YV5AE

316
DJ5LA JA8JL K1NOL K4BBF K4RTA K4THA K8VUR KØBUR KL7PI SM1CXE VE3CTX VE3NE W1MDO WA6DUG WB6UDC WA8ZOF WØSMV

315
I1RB K1IGO K4CEB K4GXO K8MFO K9YXA OH2VB OZ1LO PAØVO SM6CKU W1ELR W1VAH WB2YQH WA3KSQ W4OEL WA4FDR W6GMF W6MUM W8DX W8RCM W8ROC W9ABA W9TKR WØGNX

314
F8RU JA8ZO K1KDP K2AGZ OK1ADP SM6AFH W4AUH WA5LES WA5VDH W8GHN W9KB WA9LZA YU1AG ZL1AV

313
JA1OCA JA2HNP K2OUS K8IFF OH2BR W1JFL W1YL WB2EPG WA3IKK W4WSF WA4TSP WA9LOT

312
DJ4PI DK2BI K2BT W3AC WAØKDI

311
G6RC JA1UQP K4EEK OE2EGL PY2ELV SM6DHU W2LWI W6EYR W8CNL

310
G3JAG IT9SEZ K6ZXW OE1HGW OE1UZ OK1MP OZ5DX SM5WJ SM6CVX W1FJJ W1HGA W2AWK WA2HSU W3CRE W3DBT WA3HUP W4HHN W4NO WB4KZG W6AG W6BIL W6EJJ W6MI W6TCQ W8OA WA8MCR WB8EUN WB8HAT W9MR W9ZRX WØHZ

309
K6JR K6LAE WA5AUZ W6JKR W9JA

308
K8UDJ WB2VYA XE1KS

307
DJ6RX K7NEQ OH2BAD W2FPM WA3IUV W6AEM W6GC W8CFG

306
VE3AGC WA2BRI W4GYP WA5JMK

305
DL3ZI G5RP JA8MS K1KNQ K4CYU K4EKJ K4HPR K4RZK K6LQA K6PZ K9PPY K9TZH LA6U OH3NY W4WWG W4ZSH W6AAO W6BS W7ORH W7PK W9KNI WA9WJE YV5AK ZL1ARY ZS6IW ZS6RM

304
JA1FDU JH1JGX JR1JRK K5BXG K5EVK PY2CAB W3KV W4AAV

303
LA9CE K2HK SM6CJK

302
DJ4AX DL7CS JA2AN K1GUD K8PYD K9OTB OH5VT VE3KZ VK6HD W4AOU W4YUU WA6AUD W9HK WØLPA

301
DJ4LK DL6KG I7WL JH1CJQ JA2PJC JA7EHU K6OJO K6UFT OZ7BG W3KA W4BBP W4UF W5MCO W7BGH W7LZF W7YBX WA9JOT ZE4JS

300
DL1YA G3KDB G3XYP JA3AAW K4EWG K4MG K6HTM KH6GLU ON5KD PY2RW PY5ATL SM6EOC W1BFA W2AJR WA2HIN W3HNK W3LB W4ORT W4SYL W4UMF WA4DRU W5KKZ W5LJT W5LUJ W5NBI W5ZWX W7YQI W8KCJ W8LBM W8QXQ WA8PYL W9DE WØCAW WAØDUB ZP5EC

299
JA2KLT K6BTT YU3EY

298
K6SOK SM5CBN W1AM W5EDX W6CDJ W9LNQ W9LW

297
I7HH K5FVA W4JD WA5RTG

295
K4RA K8IDE WA1GUH WA2BLV

294
W5QN W6HJA W6VBI W7YTN

293
K3EH K4DXO VO1FB W3JXH W7MVC W8BQV

292
EP3AM K6UJS PY5UG SP6RT WB2NUU W9DDL WØHBH ZL1AMO

291
IT9AUA JA1AAT JA3DY K6SVL OH2SF W1DXB W1OR WA2BCK W4VJH W5IJW WA9VOL

290
DK1FW DK3GI JA1HHM JA2AH JA2IOD JA6GDG K3TUP K4CKA KP4DJE OZ8BZ W1AB W1EW W1GRE W1LQ WA1ABW W2BAI W3BRB W3NV W3QLW WA3ATX WB4SIJ W5HCJ WA5ZWC WB5BID W6WO WA6LLY W9LJU W9MYD WAØTLT

289
K4GSS K6GWN W1ESN WA1HFN W4AST

288
WA2EAH W4EJN W4QQN W5LPO W6BJI

287
SM2EKM W3BBO WA4HHW

286
OE1ZGA W1BGY

285
K2GBC K6DT K6IRO VE4SK W1DAL W9ZWH

284
CX1RY W5PAQ

283
K9KXA OH2SB VE5KG W2MB WB2AMO W7DQM

282
EA4CR JA3BG JA8KB K4GLA OH8SR W1EOA W2UBJ WA4NRE YU1EXY

281
JA3KWJ JA7HZ K9UQK W3AXW W7ETZ

280
F2NB I2YDX JA1WVK JA2HO K2DNL K3OTY K4FJC K4GFI K8UNG PAØTAU SM3RL SM6DBB W2GA W3BTX W4AFS W5TMN WA5WEY WB6WHM WA7RFH

279
KØIFL SM5WI VE3BMB W4KN W6ZYC WØYCR

278
I2FO W9LF

277
DL1LD W3HTW YU4EBL

276
JA1GTF K4TSJ K7RLS VE3IR W4GIW W5DJ

275
DK9WB VK6CT WB2QMU

274
DJ5JH HB9NL I3LLD KØGSV W7CNL W9VIN WA9QAM

273
F2VX K2QHL KØIEA KL7MF W5RO W7RVM WB9EBO WAØUFS

272
G3KAA HB9RX JA3OWT JA6BZI OH2BCV W2SJM WA9JCO ZL2ACP

271
EA6BN WA2FCA WA2UWA W4KNW WA4MSU W5QIX W8QBG W8UM W9ALI

270
DK9FB EA3NC HB9AIJ K4SGL OZ7JZ PY8JO WA1JMP W2CUC W4TK W6VD WA6CXK WA8TDY WB8ABN WA9IBT WA9UEK WB9GIT WØAO YV5BNR 4X4NJ 9H4AG

269
DL9DY JA1JAN OE1CP W3GL W6TC WA9ZCP YU1ODO

268
DJØMW DL1TA KØRTH OH2FS WØNAR

267
JA2BUR K3SEW K4ARP K4OMR W3AP WA9TVM

266
WA3DVO WA4CXR

265
JA1BLV W4EZ

264
K6KS W4MIA W8LAV W9NN WA9TXL

263
DL3AR JA3BRI OE1GHC SM5BFJ WA3MBQ WA9NHQ

262
VE3FFA WA5EEM W9VBV

261
DK5WL HB9AMO OK3HM W2HUG WA4LDM WB6ZUC

260
DK3LP EA2CR G3GIQ JA3ART K2AAC K4KJN K6TXA K6WD KØALL KP4DKZ OE1JRW OE3HOW SM6EQS W2BBK W2REH W2VYX WA2AUB W3YX WA3BGC W4HY W5KFN WA5UBV WA6JVD WB6WIW W7DH W7JWE W8CQ W8QFR W9MCR WA9EQG WA9LUD WØIBZ WAØOMA ZC4CB 9Q5QR

259
K8HLR VE3DXV/W6 W6UA W8OBI

258
K5YMY OZ7HT W3KVS W5ZSX

257
DA1XX HKØBKX K3GYD WB9LHI WØGKE

256
LA1H W4BAA WA6CMX

255
W6DKQ WA6FYC W8BDO

254
PY2DBU SM3BNV W1CMH W3ZSR W1WQC/4

253
G3VBL HB9KC JA3BQE JA3MF VE2AYY W7BE

252
G3NKQ K4JWD OZ1AJ W2BXY WB2HNO W3FSF W4DQD WA4DHO W6KQY W7TLG W9LJL

251
JA3EMU VE5NW W1QUS WA2CCF WA2DYK W3KJ W4HNW YU2CBM ZL1QW

250
CP1EU JA2DJH JA3MXR K3ZOL K4LR K4ON K4ZYU KØARS OH2VZ VE3MZ W3AX W3TVB W3YHR W4FZO W4UPJ WA4HPF WB4PUD W5HMM W5IRG W5LW WA6FTM W8FPM W8GIO W8SYR W9IY W9OEQ WØIU WØJS WØYZB YU1SJ YU2AKL

249
EA3NA YV5CWO

248
W4LBP

247
W5TWI WA6FIT W8JX

246
DL9NA JH1QOJ VE3DGX WØIUB

245
VE1AL W1RED W2DEO WB4JSV YV4AGP

244
JA1SJV JR3BHW JA8AQX PY5YC W1CNU W2BVN W4WRY W4WWD YU1NYP

243
CX3BH G3TOE K5DGI SM5BNZ SP7HT WA4CQD WB5EAZ WA6OIU WØBA

242
JA1XPQ VE3HD W1GTJ W1GVZ W4DSW W4KA WA7BPS YU4HA

241
DL1LZ JA1FHK K4TBN K9BWQ OH2LU VE3BS VE3GJH VE7BZC W5HIC W6LVN W6PQZ WB8BTU W9MLG YU2OB

240
DK3SF G3TXF K3LWM K5LMG K5TSR K6DG K6ELX K7PFU PY2BBO WB2AIO WB2CKO WB2VFT W3CDG WA3GNW W4WHK W5SBX W5UDK W7GYP W8MFW W9HMD WB9CBY WØAZT

239
CE6EZ W1MX W2BZL W6THR W7JUO

238
JH1VRQ JA8AYN K3AMI PAØKW WBØHAI YU2BHI

237
JA7ZF

236
K4ZA W6OAT WØNGJ

235
W4JAT

234
K1AWP W4PZV

233
PY1SJ VE2YU WA4EYR WØFHE

232
W2IYX WA2MBP W8IJQ

231
K1TZQ K8VRZ SM7DMN WØJMB WØJYE ZP5AL

230
IØZG SM7AVA WA1IJC WB4EDD W5RUB

229
I7TGT KØWKE WA5AWF WA6KZI

228
VE3DCI WA3HRV W5BE

227
YU2RTW

226
DJ1BV

225
F5TI WA2FLA W3VRT WA5LMG W6ZMX W7AWH W9QWM WØVIP

224
I3BLF K9KWK KØHGB SM5AYY WB5ESW W6SO W7KI WA9FWY

223
DJ1IK DJ3FW JA8JN W2QXA WA4DCP WB4SJG WA5LUM WB5DDI W6PTF

222
K6ZXS K9DTZ K9UWA W2PEV WA3DMH W6INH W6LV W6NTQ WA6GOR WØPRY YU3CM

221
DJ2MN DJ3NK IØZQ IT9WGI K4ACP K4FRM K5DUT K6RK K6TZX K7PJF OH2BMG VE3CEA DL2AA/W1 W4JUK WA4LPX WB4MHK WB4TDH WB9BGJ 5W1AU

220
DK5AD HI8LC IT9AZS JA1WSA K4RDU K5ETA K5KLA K5YUR K6AG K7AY K8YQW KA2PJ KH6CF VE3BHZ W1RL W1VV WA1JHQ WA1NZT W2AXZ W2GRR W2TO W3IXJ W3QZA WA3LJP WA3SWI W4CZU W4FLA W4LF W4SNR WB4JCV WB4VUP W6HEW W7GYF W7NP WB8FOS WAØTAS YU3ZV 9L1JT

219
DL2FV JA6EYD K9UIY K9UTN VE3DU

218
K9HMB W8KNH

217
F3IM JA2JSF PY1BDU

216
HR1RIS PY7VNY

215
VQ9M W7RUK W8KFL

214
DK5WS

213
K5BZU WB5HIH YU3DJK

212
W6DAB 4X4FU

211
DJ4UF K1DMG K5BZ WA1NSF W9JOE

210
F6CDJ HB9AQW IT9PUG OE3EVA W5OSJ WØNG YU2RKC

209
JA4BBN K4IRQ K7MKS

208
K4QIP K8HBN W2OPL W2RHE WH6ZHD

207
I7VCA JA2BP OH6ZH W3YT W7FR W9FXZ

206
HB9AFI IT9JLA SM5BRS SM6VY W6DOT WA8LTX

205
DJ4BE DJ6OZ IØDUD JA1QXY K3JYZ K9DJN WA7UWO WB8AAX YU2CAW YU3BU

204
DK3PL DK5EL K3PUI VO1HH W3NL WB4QNP YU3TDX

203
DK6FT I4CJW I7CZI JA6VA JA7GLB K8LUU VE3FLE W1JAA W6OKX WB8JEY YU3EJ

202
K4HLJ K9HQM VE3BZ W2GWT W2MIG WA2YJN W3FNV WA3NGS W6HJP W9IIL W9KM WA9EED WAØYLN

201
DL2QB G3IZJ G3JFF JA2JFQ JA8CDT JW5NM K1ASJ K4KA K7RSC K8YRV K9UKM W4WFL/1 WA2DHF WB4OGW WB4RUA W6AYD W7WMY WA7ZLC W8III W9MYG WA9RRN YU2LA YU3TFA

200
DK3GK DL9EM DL9YC IT9RAN JA1SKE JA1TNV JH1AGU JA2AHR K2JFE

K4BYN
K4UEE
K6RSY
KØMKD
KP4CRT
PY2CDN
SM5BMB
VE3DMC
VE5CJ
W1KLY
W1PEG
W1RYB
W2EQK
W2FPG
W2TKZ
WA2CZG
WB2FXK
W3HCW
WA3TZT
WA3VQP
W4DCW
WØYVA/4
WA4BIC
WA4ENJ
WA4UFW
WB4MAR
WB4MKB
WB4OXD
WB4PAB
WB4LUP
WA5EZQ
W6HJ
W6KYA
W6MJP
W7OK
W7VSE
W8CVU
WB8QFG
W9FPZ
WA9BWY
WØKH
WAØTKJ
WBØBQG
XE1FR

199
VE3KP
WA3AFQ
W4NG
WB5HVY
W6RQ

198
K3DR
SM6CST
W7FT

197
WB6AGP

196
K6BAZ
WB8GKG
WAØHMP

195
K9HLW
W4JVN
YU2RAZ

194
W2NZG
WB2FBF

193
DJ8EQ
JA2AIR
JA4FM
KA6DE
UV3GW

192
JA6SVP

191
W6GEB

190
WA1FBX
W6OWI

189
HB9RB
SM7ABL
W6ONV

188
W2SRZ
W3FCS
WA4GQJ
YBØABV

187
HS3AIG
I1FOX
KP4DPN
W9TQA

186
DJ4IT
K6JAN
W2CKR
W7IOG
WA8JUN
WAØVUX
YU1NSX

185
JA1VP
JA3BRB
K2KA
K6QHC
W4OWK
WB5IYB
W6YKS
WA6NBY
W7LR
YU1NZR

184
F6BEE
I3LAV
KØIKZ
W4YZC
WA6ETN
W7FF

183
DJ6WD
G3ZQW
HA5KKB
I3MQ
JH3DAE
SM5ACQ
W2OXR
W3BZN
YU2QK

182
DJ2IW
HB9AXQ
JA3JOR
SM6ARH
VO1EJ
WA1STN

181
DJ8CR
DK3NU
I1SBU
K7NTW
LA8CE
SM4AWC
SM6BZE
VE2AFU
VE3FCW
WA1NSJ
W6CQ
W6DZK
W8PBO
W9CRN
WA9ZWL

180
CT1BB
DJ4VP
DL2KI
DL7RT
K1WJB
K2IJ
K4HQJ
K6BUU
K6CBL
K6DQF
KØCML
LA8CJ
SM5CPC
SM5RH
VE2GS
VE3AER
VE3HBD
W1CYB
W1EWD
W1HM
WA1HAA
W2CML
WA2RJZ
WA2WBE
WB2GYD
WA3SRY
WA3SXH
W4JUJ
W4WXZ
WA4EWX
WB4LDT
W5CPI
WB5EAY
W6MJJ
WA6ONM
WA6EYK
WA6TLA
W7CU
W7GUR
WA7PEZ
WA8DXG
WB8KNZ
W9IWX
W9PBS
WA9MOE
WØQWS
WAØVKF

179
JA4XH
K4WVT
SM4EMO
VE2YM
W4FNS
WA6DQM
WAØWSQ

178
DL8DC

K4EN
K6DR
VE8OO
W1COI
WB6BKN
WB6KUC
WØBHC

177
K4NTS
W2MDM
W6RUV
WA8VHV
WB8JHQ

176
K8EJN
VE5RA

175
JA3BSD
KG6SW
W3HHV
WB9ELB

174
K1KPS
K5CWS
VE3ABP
W7TML/1
W7JAC
WA9SVZ

173
JA6RIL
K1PNS
PY4KB
W1AF
WA2FNY

172
JA8BFI
W1BMR
YU3TFB

171
VU2ABC

170
JA1QER
JA2CMM
K4UTE
K9KEV
OK1ATZ
VE5XV
WB9FKL

169
JA2ETQ
W3ACE
ZP5RL

168
UY5OQ
VE4SN
W3JSX
YU1NPG
YU2BOP

167
YU1ELM
YU2CBE
YU2RIO

166
K7LAY
WA1KRG
W6GBY
YU3EZ

165
CN8BO
JA3CHO
K9GSC
K9YBL
SMØFKD
W7FGY
WA4UPR

164
EA7OH
F8OP
K4EJI
K9BCK
K9HKJ
VE3AKG
VE3DOR
W4LVM
WØKMN
9M2CX

163
DL6GN
JA7BJS
K1LLU
K7KTD
SM7RS
WA1EOT
WØMHK

162
DL8BL
K3NYI
K5KEZ
K6SSJ
K8EDQ

K9PKQ
WA1NCK
W4JCH
W8KI
WA8KBL
W9KQB
WB9MSV
WØBWJ
WØJKF
WAØMLE

161
G3LMD
JA1WSK
JA2MYA
JA3ANW
K4JPD
K4PHY
K5BYV
KH6HC
VE1AMB
VE3CDK
W1REW
WA2FUE
WB2LOF
W5TFZ
WB5EWH
G3DPX/
W6
WB8IGU
W9CXD
W9LUH
WA9EZJ
YU3FP
YU3TJA

160
DJ2YE
DK4YG
I2VDX
I3MMM
K1RQF
K2HWF
K3OIO
K4QG
K4TP
K6DSK
K7NHV
K9DUA
K9UQN
KØRQF
OE2VEL
OK3JV
OZ1HX
PY1EMM
SMØBTS
VE3BVD
VE3WW
VK2BC
W1GNC
WA1COA
WA1JKJ
W2FYS
W2SEG
W2SLF
WA2GEZ
WB2FVO
WA3AXQ
W4BTZ
W4IMB
WA4CWU
WA4EPF
WA4ULL
WB4BAU
WB4MAI
WB4TBO
WA5STI
WA6DPQ
WA6WEI
W7BGG
W7DAZ
W7FCO
W7MCU
W7NJ
WA7GYR
WA7OBL
W8LF
W8WCW
WB8LVA
W9IVB
W9UDK
WA9FUD
WØII
YU3JS
YU3TKL
ZL1IB

159
JA8KSF
K1ALP
K3GJ
K8IFK
KØSVW
LA1FH
OK3BDE
W2BDE
W2HFW
WA3INW
WA4VTB
WA5TYB

158
EP2OD
G3JKY
IT9BWO
KP4BDL

VE7BBD
WA7GLU
W6FTR
W8GE

157
KA6WS
W8TBZ

156
KH6HML

155
YU2RMS/
X

154
G4BVH
I3FIN
W3OJS
WA4UAZ

153
JA7GIF
JAØCVC
KP4EAK
VE7KL
WA1LRQ
WA1OYK
W6HPB

152
EA3AEA
F9XL
JA2OJ
LA7FJ
VO1KE
W5CBT
WA9UCE/
6

151
DJ3GE
DJØYL
G3AEZ
JA8WY
W3KQD

150
F5RS
HB9EQ
I5XRR
WA6AIL
WB6VYU

149
K7YUR
VO1FX
WB2AFS

148
DJ8PA
I1KBZ
JH3JPM
JA8FBM
WA1UAD
WB6NSJ

147
K3FNB/1
UY5OO
WA3NAF

146
G3VIE
JA3BCC
JA8HQI
OH6KN
WA1PSK
WB4WFT
WAØWCR

145
DJ7UO
JA6WHS
K9DWK
W3LZX
WB2BXV
WB2FYS
WB4ZTI
WA7LMZ

144
JA7UIQ
VE3HBX
WA7FBP
XE2MX

143
DJ2MH
DK3JU
G3PVA
G3RYV
JR1JEG
K4YOE
KP4EAJ
OH5MJ
OZ7AN
WA2WLM
W4EDB
W4IML
WBØEZQ
YU1NFR

142
DK7NL

EA4KB
K2OT
K4GPX
KØHSC
SM3DMP
W1GME
W1GMF
W1SK
WA2EUQ
WA4UVG
W6NHX
WA6HCI
WB8MCR
YU2CBV

141
DJ9ER
JA1IZ
JA8BKI
K1BUR
K1FNU
OH1KF
WA1OFP
W2DUN
W4CBG
WB4RFZ
W6JOT
W8IEC
W9MTI
W9YH
WB9GUG
WBØGXU

140
CX6CT
HB9ASL
JA1ATF
JA2IU
K2GAT
K2GXP
K2IGW
K2MGM
K4SV
K5AZ
K5GOE
K6UGS
K7IWO
K9FRZ
K9KGA
K9TUS
OK1OAT
OZ6AQ
SM5EEP
VE3FZM
VE6CV
W1FYZ
W1OPJ
WA1UEO
W6USV/2
WA2FIJ
WA2KFN
WA2KWP
WB2GUB
WB2GCF
W3EEK
W3RAB
WA3BRW
W4DZZ
W4JIK
W4KEB
W4NZR
WA4OQO
WB4ASV
WB4QGN
W5ISF
W6RQZ
W6IPR
W7EEJ
W7ISG
W8CTR
W8EDU
W8WUT
WA8GGN
W9NGA
W9RJM
WB9AAQ
WA9LEY
WA9TAA
WA9WKA
WAØFBQ
WAØNBZ
WBØHOG
YU2RFK

139
CT1BY
EA6CE
I1SUI
JA3GLJ
K2GI
K2QOV
K4PR
W2JGR
WA2JLM
WA3SZV
WA5QNV
W6FL
YU2ARS

138
DJ7UB
JH1YDR
K4EJQ
PAØBE
UA6AAQ

WA2MVQ
W4CXG

137
DK6FA
JA1CMD
WA9ITB

136
DL9CJ
I8RFO
K8RMN
VE1RQ
WA2KJM
W8LT

135
DL1YK
DL2UH

134
KP4DEY
VE3ETM
WB9BQV

133
CT1VX
DL9TD
K4HHO
K4QJF
K5VL
W4HYY
WB4QPL
WB5MXS
YU2RBK

132
W1FMK

131
FA8CG
HC5EE
JA3UDR
JH6DVL
UB5UAL
W4BYM
WA6LHB
WB9HAD

130
F6CLH
K4KPH
SMØEVK

129
K9ZUH
UA9MS
WAØABU

128
DJ3BE
JH3SBC
W1PIV
W2YYF
WA2LUF
W3HAO
W8IJV
WA8JPX

127
F5ST
JA7YOJ
K9MFY
OH2AC
VE7ALB
W2RIJ
W6RBE/5
W9TWM

126
F6CDU
JA1EMX
JA7IF
K2UPR
K6OL
K9UBF
OH1AF

125
DJ8HL
GM3WIL
JAØBES
K7BFY
VE2GA
WA3RBN
W4BUW
W7GBL
W9NZS
ZS2EM

124
K4II/DL
HB9AXB
JR1VMC
JA3IBU
K4LRR
OK1WT
OZ3XS
W1ERW
WA1JZC
W2INF
WA3TOE
WB6RMG

123
JH1KIK

JA2SFF
K4HWW
K6LLE
WA2HQH
WA2NPQ
WA4TYZ
WB6PZW

122
HA5HA
HB9NO
JA1RUJ
K4DFI
KØVFN
OE2BZL
VO1HP
WA1NRF
W2FVJ
W2NSJ
WB2SXT
WB4DEL
W6NSK
WA6DEI
WA7IHN
WB8DFK

121
UK3SS
GC5AGA
HB9ANM
I6BZH
ISØAEW
JA1FGW
JR1JFO
K2ODZ
K5EJP
OZ6BF
W3FAE
WB4YFF
W5UFF
W8ZPX
WB9DDQ
WB9HHH
WB9IGB
WBØKWI

120
F6AZT
JA3QBM
JA7OXD
K2ER
K2OVS
K3JPW
K4BE
K4KFH
K4ZVS
K5TSQ
K6CKA
K6UNE
K7AOZ
K9IYT
KH6GHZ
KP4DLC
PAØUB
PAØUU
PY4BTK
VE3FWB
VE3HGM
VE3HLC
VE7AZV
VK2BAN
VP2LAW
W1VH
W1YNE
W2HKE
WA2AQG
WA2ERJ
WB2FKF
WB2FVX
WB2JJN
WB2SZS
WB2ZRQ
W3MIX
WA3ERG
WA3NHG
WA4HDU
WB4VKW
WA5TPO
W6LQO
WB6JOD
WA7DYH
WA7OBH
WA8AWH
WA8WIK
WB8NMP
W9VWV
WB9DDR
WB9KLB
XE1PE
YU3TFO
ZB2CJ
ZS6ADT

119
HB9AZO
JA1BMA
JH1CRF
K4EBY
OZ7JB
VE3SLC
WA2JZX
WA3FXJ
W4HBK
WB5IFY
W8VKU

W9GBS
WAØJYJ

118
CT1UM
F5IB
JA4FCV
K3OFN
KH6IGC
OH2BN
W1IJL
W1JHU
W2FHU
YU2ROZ

117
F3HK
JA2AO
K1NOK
K4KEW/Ø
VU7GV
WØUYL
YU2COO
9G1FF

116
DA1RA
OK2SS
F6DBX
HZ1AB
IØMOP
JA3YBF
JH3OTS
K1QFD
VP9HM
WB2EOO
WA7EQL

115
DJ6QL
DK6TP
DL2GK
I2CEX
IT9TGO
JA7QVI
JA7UIH
K4KWQ/6
WA1AHQ
W2JWX
WB6CUA
YU2AAY
YU3BL

114
DK6PW
DL3ZH
I2BJS
JA6EGL
JAØDWY
LA8KQ
PAØMAR
SM6BXV
W1EOR
WA6GGK
WA7GVM
WA7UQG
WA9WOP
YU1NTB
YU2CDX

113
I3MGN
IC8DAG
JA2BTE
K3BZ
SM4CTT
WA1JUY
WB4BER
WB5DTX
W6BE
WB6QBJ
YU3CY
YU5CYZ

112
DK1RV
DM2CPE
JA7CL
K3BGZ
K4BGF
KØGVG
PJ9JT
VE4IJM
W1IQ
WA2MBM
W9MYB
YU1WO
YU3UAR
YU4VKR

111
DK2UR
DK6NP
DK7AA
EP2MW
G5BGM
JA8LRG
OZ3TQ
W3EUJ
W4ET
WA5YFQ
YU2ACF
ZL1OB

110
DL7KL

FY7AQ
HB9AIB
IT9SDN
JH1DVZ
JH3EGD
JA6MBU
JA7KTY
K1HMQ
K5LZJ
K9QXY
OK3CIU
OK3KTR
VE3EJK
W1CDC
WB2CST
WB5NEO
W6OMM
WB6PYI
WB9KZS
WØQAV
ZL4PM

109
DK7PX
G3EZZ
GW3SB
I8MSY
JA2ANA
JA2RJV
JA6CM
JAØJR
JAØOE
JAØSC
K5KEZ/3
K3QIA
K4FIC
LZ2KAF
OE1KN
OE3FLA
UK3YCA
UN4JV
SVØWEE
VE3CDM
PAØEHF/
W1
WB5KWU
W4NBP
WB4CQC
WB4LWA
W6TJI
WA6DHS
WA6WZO
WA7YRP
W8LBU
WB9FRG
WB9IVC

108
G6UW
JA1SGU
JA3OSL
JR3EDN
JA7SPJ
K5DEC
K5SWW
KL7BVY
LZ2KSB
LZ2VP
W2DOE
WB2QAX
WA3IFQ
WA3WHL
WB9BXX/
3
WA4BIQ
WA7LAG
WØLNZ
YU5FGF
YU5XSX
ZL2AUS

107
DK9FY
DL8VJ
I3EGD
JR1TNE
JA2ALS
JA2PSV
JA3EY
JA6UYF
JA7JWF
JH7BRG
JA8CFR
JA8DWR
K7RSB
KØUTX
KX6LA
OZ2F
PY7BOS
VE2RO
W1DQJ
WA2YCQ
WA3WNU
WB6EGQ
WA7HRE
WA9IXF
YO6KAL
YU2REE
6Y5RM
9V1RF

106
DJ4OH
DJ5TH
DL1KS

DL8WX
EA4MV
G2HLU
G6RO
JA1HQ
JA4BLH
JA5NC
JA6WW
JA7SD
K1UJB
K4PHE
K6OZI
K8WSN
OH6XY
OK1XN
PAØLRA
UK3AAB
W2RRY
W4MVM
WB4TAF
W5FIB
WB6CKO
WB6HAR
WA7CNP
W8NZS
W8VZE
WA8ICZ
WB9HIP
YU3FOP

105
DJ6CK
DJ9UN
DM2CRJ
DM2FBL
G4BGY
GM4DKO
JA1BUI
JH1EYM
JA2DLM
JA2WAA
JH2FKV
JA6BMB
JA6LCJ
K2JFJ
K4TYU
KØKES
KØLIR
KH6GI
K4WLS/
KL7
KX6GS
LA8GK
OZ9VO
UB5PS
VE2JR
WA1UAC
W1DRN/2
WA2BJN
WA2FUL
WA2GUR
WA2JAB
WB2ABD
WB2BXL
WB2TSL
W4LBT
WA4LOF
W6LS
WA8ICQ
WA8PPF
WB8NVD
W9MOQ
WA9FXJ
WB9NOZ
WB9OUX
WAØIYY
YU2NFY
YU3DR
ZL4FT
9V1QD

104
DK2QI
DK5NL
EA3JJ
FG7AM
G3CPA
G4BGE
JA4BCW
JA4IYL
K3PNS
K4NV
K6YD
KØOAM
OH9TD
OK1MAW
OZ6JE
PAØJFH
SM5AKS
SMØGMG
UB5ZA
W1CQS
W2IFE
WA2TTJ
WA3UHJ
WA4BPM
WA4HHG
WB4DHQ
WB4KVM
WB4WBP
W5RKR
WA5SDV
WB6EQP
WB7DKV
WB8MVX
WB9MFC

WB9NIB
WBØCCF
YO3KBC
YU2EZA
WA8TFJ/
YV6
9H4L

103
DJ6FK
DK5VC
DK7GL
DK8SR
DL6VW
EA8JP
F6CZU
JA1KW
JE1HUT
JH3MOC
K1GBU
K1VCH
K2YGM
K4RD
K4TMR
K4KEW/5
K6MTN
K9SJJ
KG4FU
LA5BE
LA9LS
OK1KIR
OZ6ZS
SM6DSW
UA3PN
UAØPY
UY5EI
VE2DJ
VE3ADJ
VE4EW
VP2EEA
W1DYH
W1FYG
WA1RHA
W2HGN
WA2BIQ
WA2EYH
WB2SJG
W3BHE
W4JGE
WB4LFT
WB4LYU
WA5PQX
WB5FDV
DJ6RX/
W6
W7YS
WA7VDY
WB8JDA
WA9UMP
WØOXN
YU1AJF
YU1GMN
YU1NFT/
X
YU1NOT

102
A2CEW
C31GN
DA1QQ
DK5MP
DK8MA
DL3EO
DL6SC
DL6WF
DM2CJJ
DM2DXO
FY7AN
GM5BAZ
I2KLP
I5RWJ
JA3ARM
JA5HGC
JAØXD
K3EVI
K4FYM
K4LNC
K8CVJ
K9ARZ
K9DAF
K9GCX
KH6IAC
OK1DKR
OZ4LS
UA9AAP
UY5ZH
VE3DJF
VP2MIR
W1GPK
W1JWA
W1SPI
WA1AKS
WA1MYX
WA1NAE
W2JBG
W2NUV
WA2CLC
WA2NCF
WB2PMW
WA3OSJ
VE1BU/
W3
WA3JCF
W4QVG
W4RKV
W4UPV

W4VAB
W4WEG
WA4VCC
WB4EOW
W6NZX
W7CRC
WA7JBE
WA7JRL
WB8IOI
WB9EIW
WØQUE
YU3ZY
4Z4IB

101
DA1OR
UK3QY
OK7NX
DLØRCA
DM3QO
DU6RH
F6AIR
GC5AGA
W7MPZ/
HK3
JA1KJW
JH1LMG
JR1BMU
JA3AVO
JA6JNI
K2ZQC
K4GFH
K4LRD
K5LVZ
K8MLQ
K9BSO
KØZHD
LU1FCU
OK1CFH
OK1IBF
PY2AN
SM7BPM
SM7DYZ
SVØWX
UB5GBD
UI5HW
VE3DH
WA1RGP
WA1RGU
WA1TLL
W2IAO
W2MEI
W2TF
W2VAV
W2YKQ
WA2FIQ
WA2KDB
WA2URD
WB2FLF
WB2VEF
W3CAZ
WB4ADD
WB4OZX
WB4REB
WB4WDH
WB4YFC
WA5VUW
WB5FCO
W6KHI
W6PRJ
W6ROL
WA6IYN
WA6WZN
WB6DPV
W7VSS
WA7IOA
WA7TDZ
W8ZFW
W9NKC
WA9QQM
WA9YOO
WB9FGN
WB9JLL
WB9JOV
WØLS
WBØAEW
YU2BTU

100
DJ5AV
DJ7HL
DK4MC
DK5IZ
DL3GC
DL4AK
DL4KW
EA8ED
EA8HJ
F6KDT
F9UB
I8MUW
JA1SXH
JA3EQC
JH3AIU
JAØGPR
K1YXQ
K1YZT
K3AZ
K3HBP
K3UOC
K4FOK
K4IBP
K4IPO
K4JNM
K4JSG
K4KKJ

K4OAF
K4RSU
K5AQL
K5FKD
K5LXZ
K6IU
K5MHG/
6
K6QPG
K6WZ
K6YYQ
K8EEW
K8MKA
K8NIA
K8PFY
KØCVD
KØFZT
KH6BTH
KL7HDX
LZ1QR
LZ2KWR
TG4SR
UK5IAB
UT5IB
VE2BLW
VE2TH
VE3AHB
VE3DXO
VE3FIM
VE3GFN
VE3GGS
VE6FY
VE6KY
VE7AQL
VS6AW
VU2IJ
W1GBL
W1HDF
W1HGT
W1LF
WA1AHI
WA1QZH
WA1SCV
WA1STO
W2LL
WA2JOC
WA2LJM
WA2PAT
WB2KBH
WB2NOM
WB2YBK
W3AMF
W3CRQ
W3ODS
W3HDX
WA3HLH
WA3VBM
W4BV
W4TOM
W4UBE
W4VNQ
W4ZWZ
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WA4DBG
WA4GIT
WA4KFI
WA4MTZ
WB4BUL
WB4IWN
WB4OPG
WB4VMH
WB4WHF
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WB4ZNH
W5TBW
WB5DCY
WB5FZJ
W6PEU
WA6BWJ
WA6GSV
WA6RVR
WB6MWK
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W7RZY
W7YF
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WA7FAB
WA7URW
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WA8FRO
WB8FLE
WB8IQO
WB8LDH
WB8LWW
WB8MTR
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W9RR
W9VZL
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WB9KHK
WB9KTA
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WAØQZN
WAØVBW
WAØWNF
WAØZOL
WBØAFA
WBØCLS
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YO4KBJ
YU3TKI
YU4VAS
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ZE1CQ
4Z4RR
6Y5RS

PHONE

357
W6AM
W8GZ

356
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W4EX

355
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W8BF

354
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353
PY2CK

352
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5Z4ERR

351
G5VT

350
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W8BT

TI2HP

349
YV5AB

348
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W5IO
WØCM

347
W1JFG
W2OKM

346
LU4DMG
VK5MS
W2GLF
W3KT
W9RNX

345
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G3FKM
VE3QA
W4EEE
W4OM
W4QCW

344
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W8QJR
W3NKM
W9LNM

343
DJ2YI
PAØHBO
SM3BIZ
W5JWM
ZP5CF
4X4JU

342
W3DHM
W7AOS

341
G6TA
ON4DH
W3WGH
W8MPW

340
DJ2BW
K6LGF

W2CKY
W2TP
W5PQA
W6RKP
W9WHM

339
K5JEA
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W5LZW
W6CHV
WØGKL
ZL1KG

338
K2FL
K9ECE
W1HX
W4SKO
W5NMA
W9ILW
ZS6LW

337
F9RM
W5GC
W9HB
WØMLY

YV5AIP

336
DL1KB
K1IXG
PY7YS
W1MMV
W2LV
W6ZM

335
DL7HU
GI3JIM
VE5RU
W3DJZ
YV5AJK

334
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K6WR
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W4SSU
W5KGX
W6NJU

W7SGN
W9SFR
WØGAA

333
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WA2RAU
W9DWQ

332
JA1BK
SM5CZY
W4NJF
W6REH

331
EA2HX
K2BZT
PY2PA
W3AZD
W2NUT
W2YY
W3GRS
W6EL
W6YMV
W8BGU
W8CUO
W8ZOK
WØPGI

WØQGI
YS1O

330
KP4CL
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VE3MR
W2FGO
W2GK
W4UWC
W6HYG
W7QPK
WA8AJI
YV5AXQ

329
DL7FT
F2MU
PY2PE
K4AIM
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W2QK
W6PT
W6KTE
W9HPS
YV5ANF
YV5BBU

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K4JC
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WA4WIP
W7CMO

327
I5ARS
K4YYL
KH6OR
OK1ADM
VE3MJ
VE3WT
W2GKZ
W6EUF
W9JT
WØAAA

326
DJ7ZG
I2KMG
KP4CK
SM5RK
WA2EQQ
WB2HXD
W3JK
YV5AHR

YV5BPJ
ZS6YQ

325
I8AA
K2YLM
K5GOT
K8CFU
K8ONV
VE2NV
W3EVW
W7KH

324
K5AWR
W2GQN
W6FW
W6RGG

323
G3JEC
G3NLY
IT9GAI
IT9JT
K5QHS
UR2AR
VE2WY
W4IC

W5LZZ
WA9NUQ

322
DL7AA
K6YRA
K8DYZ
K8IKB
PY4KL
SM5AZU
VK4QM
ZL3NS

321
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K6EC
K6EV
KH6BB
W5RNG
WA6MWG
W9LIR
W9QLD

320
EA7GF
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I5WT
I8YRK
K1ORN
OZ3Y
PY2CK
PY2DYI
W1AA
W3FWD
WA3ATP
WA4MUB
W6KNH
W6MBD
W8VHY
W9JQD
W9IKD
YV5BNW

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IØLLZ
JA2JW
W1FZ
W6PTS
W8ARH
WØSFU
ZL3OY

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OE2EGL
W4DRK
W9KRU

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JA2AAQ
KV4FZ
W1SEB
W2PTM
WA6AHF
WAØOAH

316
K4RTA
VE3CTX
WB2UKP
W4QAW
W4QBK
YV4DA

315
I1RB
K3UZY

K4BBF
K4IKR
KØBUR
PY3BXW
W1BIH
W1FXD
WB2WOU
W3RX
W4BRE
W5NOP
W5QKZ
WA5IEV
W6CCB
W6KZS
W6ZKM
WB6UDC
W8JTD
WA8ZDF
W9BGX
W9WYB
6W8DY

314
G5AFA
OE1FF
K8VUR

313
DL3RK
EA8JJ
I2DEZ
WA4TSP
WØNVZ
YV1KZ

312
JA1IBX
JA1OCA
W4AUH
W9HZ

311
DJ5LA
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PY3APH
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W8GKM
W9DNE
YV5ANQ

310
DL1JW
F5IJ
FG7XL
G3WW
HB9AHA
HPIJC
K4BYM
K4CFB
VE3NE
WJ1HGA
W2GBC
WA3IKK
W4EGO
W6ARJ
W6QOG

309
K9LKA
W8GHN

308
F8RU
I4ZSQ
JA1BN
SM6AEK
WA9IVL

307
DK7BI
K6JR
SMØATN
WA2HSU
WA6WXP
XE1KS

306
K6AQV
K8IFF
SM6CKU
W6YO

305
DJ5DA
IT9SEZ
JA1UQP
K6SA
W3CRE
W6PWW
W6KYJ
W7QK
W9OHH

304
G2BOZ
JA1JRK
PY2CAB
W4WSF
W8CFG
ZL3QN

303
K6ZXW
VE3AAZ
W3AC
W4REZ
W6FET
W6KUT
W6LQC
WB8EUN
9M2DG

302
EA7IR
HB9AAA
JA1BWT
K4YFQ
W5UR
W6OBH
WØBK
WØBN
XE3EB

301
DJ9ZB
EA4DO
OH2BAD
WA2VEG
W3COR
WA4GUZ
W6ZC
WA9AUO
W9DH
W9MWO

300
CT1MW
DJ2AA
G3XYP
JA8ZO
K4MG
K6OJD
VE4OX
W1DO
WB2VEG
W3NIG
W4UMF
W4ELB
W4AOU
W5KGJ
WB6UJO
W8YEK
ZS6RM

299
K6BTT
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W9YRA

298
W8PR
W9BEK

297
DL6KG
F5JA

296
??HH
9H1JGX

JA2AH
JA7EHU
K1KNG
OK1MP
W6CDJ

295
JA1MCU
K7NEQ
K6HIM
OA4BS
SM6DHU
WA3IUV
WA4FDR
W6TCQ
W9CPD

294
I?SCA
OH2BR
W3ICQ

293
K1QMV
K2BH
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K6MA
OZ6RT
WB2VYA
WA5VDH
W6FZJ
W6HUR

292
K5FVA
W1YRC
W6MBV
WA6EPQ
W9ODL
W9NWE

291
JA1DM
K6SVL
SM6WJ
SP5BSV
WA6RTA

290
CR4BS
CR7IK
CT1UA
DK1FW
I1BGJ
I1UMR
JA1RWE
K2ANT
K6SOK
K8PYD
OE3SAA
OE3WWB
VE7WJ
W3NV
W4BKP
W4HOS
W5EDX
W5KKZ
W6AXH
W6TYS
W6USG
W7EKM
W9KB

289
K6MOO
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W8GUZ

288
EP3AM
WA4DRU

287
JA1AAT
JA2HNP
WA6OET

286
F5VU
W3HNK
WA8PYL
ZP5EC

285
K4DXO
K6IR
VE3AGC
W2FPM
WB4SIJ

284
W2GT

283
K3EH
K6RN
K7BCX
W2AWK
W7YBX

282
K2OUS
WA4NRE
W7OQM

281
CR7GJ
JA7HZ
K4CKA
K6RMM
W2RAD
W8COG

280
CT1ZW
F6AOI
JA1GC
JH1CJQ
JA3KWJ
K3OTY
K4GFT
K4HS
K6PZ
W2MPK
W2OVC
W2PBI
W9MIJ/4
W5KHP
W8AIJ
W9LAA
WA9SLD

279
DL3OH
VE3BSJ
WB4TPU
W5TMN

278
EA2CX
WA4ZLP

277
W8LBM

276
JA1EDU
KP4DJE
W4BQV
W6BJI

275
K5BXG
VK6CT
W6ZYC
WB6WHM
W9ZWH

274
DK9WB
SM2EKM
VE5KG
WA2EJS
W4GIW
W5LTY
WB5DJA
WA6FPB
WA8OGR
ZL1AV

273
W5NQN

272
CP1EW
OE1ZGA
PY2BU
W5RO

271
DL9SV
EA4JF
K2GBC
K2LGJ
WB4BAP
W5FFW
WA5AUZ
WA6LLY

270
DL9VS
EA6BN
I2YDX
I5FCK
W1BAB
W8GTL
W9HUA
WB9EBO
9H4G

269
F6BFH
W2EV
W2GA
W6EJ
W7FSE
XE1TX

268
K4IEX
K4LSP
W1FJJ

267
F5RV
WB4JLO

266
W1BFB
WA4DPW
WA6WEY
W7YTN

265
WB2QMU
WA4YJJ
W8QBG

264
K6BCE
K7RLS
VO1CU
LU1BAR/
W3
W9DF
W9MYD

263
I3ANE

F2VX
WA2FCA
W5SDR

262
W1RO
WØHBH

261
DL3VX
I3JR
K4II
K5FKD
K5UKN
PY4AKL
VE3FFA
WA3MBQ
W5HCJ
W5SZV
W9KXC
ZS1DC

260
DK3HL
DK3LP
DL7FP
G3ZBA
K4QPR
OZ3PZ
VK6HD
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WB6WIW
W8AQF
W8JXM
WA9YEW

259
JA1JAN
JA6GDG
OE1JRW
OE1PC
OE2GKL
W9RXC
9G1DY

257
W7LZF

256
I2LPA
W7YQI

255
C11FL
W6DKQ
W6KG
WA6FYC
WA9QAM

254
DJ6VM
W7MVC
WB8CGC

253
G3VBL
I8JN
K6AO
OH3NY

252
I3ZNG
I3ZOF
W3CDL
WA5RTG
YI1BL

251
JA3MF
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KZ5JM
OE1GHC
OK1AHZ
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W9JJV
ZL1AMN

250
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JA6BZI
LU8DB
OZ1AJ
SP5DZI
VK3MK
VP9GE
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WA2CCF
W3GL
W3YHR
W4DQD
W4ORT
W1WQC/4
W5HMM
W8SET
WA8TDY

249
CT1UD
I1ASM
W2SSC
W6DOD
YV5CWO

248
JA1BLV
K5YMY
W4HNW

246
OZ6GF
W5TWI

244
DK4YA

UW3IN
W3ATO
W7YR

243
EA3JNC
EA7EM
G3TOE
OZ7JZ
W1CMH
W1JFL
WA9JOU
WØBA

242
CX3BH
IC8TRA
K4FJC
K8SQE
W8GIO
YV4AGP

241
K2SHZ
KØRTH
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VF3GJH
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W2FCR
W2QEH
W4WRY
W6SUN

240
I1TBE
JA1XPQ
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K4MEZ
K6DG
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KØIFL
KH6BZF
KP4BBK
VE3RO
W3IF
WB4PXW
WA5SMM
W7JWE
W9MLQ
WAØHZP

239
CE6EZ
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W6EHA
W6THR

238
JH1VRQ
W3ZSR

237
K6AAB

235
DL7PH
K4ARP
LU8AJG
WA6OIU

234
WA3ATX

233
CT1BT
JA7ZF

232
F6BDS
W7BKR

231
DK5EZ
EA3OJ
KL7MF
W4FOD

230
DL2CQ
HC2TV
I8LEL
K4JWD
K8IDE
W4GQN
XE1CI

229
I7TGT
K2CJD
K6DT
W2IYX
WA2AUB
W6CYQ

228
DK2MO
DK3SF
IØZG

227
G3TXF
JA8BAR
K6AHV
W4BAA
WA7BPS

226
W7ILR
WØFHE

225
JA3BRI
W4EPZ

224
CT1RM

G4BUE
PY5YC
UC2BF
WA2FLA
W4KNW
W8DX

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LA4DM
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W8DFQ
W9OEQ

222
DJ3HJ
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HK3LT
K4UAS
KØWKE
W4DUP
W5RDA
W9LW
WØAUB

221
HP1KC
JH1QOJ
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PY2UY
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5W1AU

220
CX6AM
DL6SW
G3YBH
EA3JK
JA3ART
K6ZXS
OZ7BG
PY4AP
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W1VRK
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WA3EPR
WA4NIB
WB4JCV
WB5KXQ
W5LDH
WB5BID
W6HEW
W7KOI
W8PNC
WB9BGJ
WØUQD

219
IS0SHU
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ZL1ALE

218
W5UDK

216
JA8JN
W8KNH

214
DK5WS

213
SM5BNZ
W2PEV
W8LAV

212
JA2LHG
K9DTZ

211
DU1EJ
KH6HB
W86DO

210
EA3UU
JA2JSF
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WB4ECE
WØIBZ

209
VE6SB

208
HR1RTS
JA1WVK
W2PFQ

207
I3DHN
JA3LUK
W4PZV
W6NTQ

206
I7VCA
I8MBX
JR3BHW
JY3ZH
K8ALL
W9EGV

205
IØDUD
K9KWK
W5OSH
WA7UWO

204
LA7DB

DL2AA/
W1
W6EIF

203
CP1DN
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KL7HFQ
VE3FJE
YS1JWD

202
DJ8PH
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HB9QC
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PY1FI
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W7CUU
ZP5AN

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W7RCF
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W8JJK
WA8PJJ
ZL1AJL

200
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I2ADN
JA1ALX
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K6JWQ
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KØIUC
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WB2EZU
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W4LUN
W5DMM
WB9HGS
W6MFC
W7ZH
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W9DFS
W9WCE
WØKH
WØNGJ
WØWD
WØØLGW
WAØPVW
WB8NHG
YV4YC

199
W3WM
VE3DXV/
W6
W9PBY

198
I1CSP
WB5HIH

196
K8VRZ

195
WA3VQP

194
DK3PL
W3HCW
W4JVN
WAØHMP

192
DL7NC
WA8UUY

191
W6KYA
WB9HAK
YU2CAW

190
W4UL
WB4VUP
W6BWM

189
UV3GW
W1AB

188
DK6FT
K8YRV
YV5IZ

187
JW5NM
JA6SVP
KA6DE
WA5EZQ
W6ONV

186
JA3FD

W2UFS

185
CT1IC
I6AYS
WA1FBX
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W5ZV
W7BCT

184
K6TXA
WB4OXD
ZP5RS
6Y5AH

183
DJ4ZD
HB9RB
HK4DEG
I3KLF
W5EFA

182
DJ3EJ
JA3WBK
K6RSY
K8LUU
PY1BDU
WA2DHF
WB2FBF
WA6NBY
W8EXD

181
DK3NU
FA7EU
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JA3JOR
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W2CUC
W3GJW
W7FF

180
EA4LK
G3YJI
G4DJC
I2AKI
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JH1AGU
JA6MBU
K6SMF
K8GWM
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W2CML
WA2DVO
WB2GYD
WB2VHC
W3BLC
W3FCS
WA3TZT
WB4INC
WB6HVY
WB6AGP
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W9CRN
W9QEE
W9EVE
WBØQSJ
XE1YO
5U7BA

179
OZ7QP
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K6JT

178
HK3CLX
WB6BKN
WB6KUC
YU2OBB
YU2RAZ

177
JA2BUR
VE3AER
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W5LJT
WA8DXG
W9LPA

176
K4QIP
K6EDA
K7UXN
W7IOG

175
CT1BB
WA8LTX

174
JA1SKE
K3EUR
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K8HBN
KG6SW

173
DL8DC
I3RSK

VE2YU
VE3FCW
VK2ADX
W4KN

172
SM7ABL
W6OWL
WB9ELB

W9BG
WØBW

118
WB2ZRQ

115
WB2FMK

111
DJ5IO
IØWLS

110
DK5AD
K5KEZ
PAØWRS

SVØWTT
W1YG
W4EOB
WB8OBA

109
JA1CPZ
K5KEZ/3
WB8JEY

108
DL1LZ
F2IU
HP1AC
W1CMH
W9FD

171
DL2OW
PAØMOD
PY4KB
W7AAW

170
DK2WH
VE3ABP
W8KFL
WA9VZ
WØWAM

169
I4BNR
VE3CKP
VU2DK
W3ACE
W3HHV

168
W4DPS

167
JA6RIL
WB6BMW

166
I3GRX
OK1ADP
WA1STN

165
JH3DAE
OZ5EV
WA1SSH
W3KV
W9FXZ

164
DJ9RB
IT9KZW
K3NEZ
K9HKJ
WA6EVX/
KG6
W2FGY
W7RS

163
IØAG
IØGFP
JA7BJS
K2DA
WA2MBP

162
W2OXR
W4EBO
W6LV
W8KI
WØBWJ

161
I3DMU
IC8EGO
IT9IUS
JA3AEV
WB2EXK
WA4UFW
W8SDV

160
DA2QW
DK4YG
K3DH
KP4BDL
SM7RS
WA1PEL
W3FZE
WA3AFQ
W4AAA
WA4CWU
WB4PAB
W5SBX
W6IJ
W7GUR
W9LJL
W9LUH

159
DK1YP
I8TUS
JA8KSF
K2DPA
K6BAZ
WA5TYB
WØJF
4W1AF
9M2CJ

158
DK5XN
KIALP
OE2VEL
TU2DR
W6DAB
WBDOG

157
JA2UYS
K2YIY
VE3AXE

156
JA1WSK
K7LAY
PY1EMM

155
KH6HML

154
G4BYX
JA2ETQ
K4JPD

153
JA7GIF
P29FV

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WA9HRN

152
WA5TYX
Z55MQ

151
JA1FHK
JA8WY
WA1AGR
WB4QNP
ZD8KO
ZP5NH

150
FØAYV
I5XRR
JA1WSA
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PY8AOD
WØPRY
ZS1KZ

149
K7MKS
VO1BT
WB4VNG
WA8VHV

148
I1JS
K5BZ
KP4EAK
WB4TZA
WB9LHI
WAØPIJJ

147
JH1OCO
WB4VBL
WA6AIL

146
JA8HQI
K3JVZ
K4TBN
W5OSJ

145
VE2AYY
WA1IRN
W2CKR
W3NL
WA8ZCO
WØAKT
ZP5AO

144
DK8CO
JA1GTF
W3NB
WA4BTC

143
DL7SP
I2ARQ
JA4XH
K9UTN
WA1UAD
W4UW
WB4ZTI

142
DK5AL
DU1REX
G4DYO
W2HFW
W7WT
WB8MCR

141
DA2KD
DL6EC
I2OMF
W1MX
WA3HRV
WA4LPM
W6MOS
WA6ETN
ZP5HZ

140
ET3RS
I6ICD
VE2GS
VE3EFX
K1BUR
K2GAT
K6SF
W1JAA
W2FWK
W2NHV
WA4OQO
WB4OVX
W5SAA
WA5WMC
WA6BCD
WA6GPH
W7FCD
WIHNL
W7ISG
WA9BWY
WB9AAQ
WØJKM
WB9GXU
Z56BLK

139
K2KA
WB4QWM

YV4YG

138
JH1YDR
JA2HO
JH3JPM

137
K2UXW
K4AEA
KP4DPN
VE3AKG
VE7VT
VG9DC
WA6FZI

136
I6TIH
JR1JEG

W3KFJ
W2LZX
W3HYJ

135
IØRKK
WB2GUB
ZL1IO

134
WB6VYU
WB9BQV

133
DJ4GM
G3LMD
W4HYY
W6VDJ
W7FR

132
SM3DSP

131
I3MMM
JA3UDR
WA4DHO

130
K3JGI
K4QJF
KA6UA

129
DJ9JI
DJØVL
UK5IBM

128
EP2EJ
I1HAG
JH3SBC
KA2BL
ZL1BD

127
I3DGF
I4BKM
9X5AV

126
I6EFP
W2PQZ
WB4TIN
W5ORX

125
W8QGP/4
5W1AR

124
EA8CN
I4CHF
PY1ZBG
VE3BR
VK3AKZ

123
G3ZHC
HB9AXB
IØPSB
JA1LFR
JA1TNV
XE1DU

122
DL3RE
JH1LBR
JA2UYT
JA8IXM
K9UQN
OK1OAT
VE1AYE
WB6ECI
WA6HAV
YU1NPG

121
EA8IX
F5RC
IØZTG
K2GXP
K7DS
WA4AKU
WB4BWN
W6RBE/5
WA7GYR
WAØUAQ

120
CN8BF
HC2VL
I1ORT
JA7IF
K1ATL
K2QLY
K5EJP

K6LOP
K7CUZ
KØUBP
SP9EES
VP2VBH
VP2VBK
W2AND
W2MPI
WB2HTJ
WB2JJN
WB2SZH
WA4HDD
WA4OTA
WB4KTR
WB4QGI
W5ULN
WA5STI
WA6JKO
WA7UVO
WB8DFK
WB8HLI
W9QVY
W9TWM
W9VWV
WA9YOO
WB9DDQ
WAØTAM
YA1LM

119
DK2QL
G3JKY
VE3EZM
WA1JKJ
W2JGR
WB4ASV
WB6IMA
YBØAAN

118
DU1JMG

WA2OQO
WA4KZO
W5NVU

117
IC8FHC
WA1UEO
WA3TOE

116
JH3OTS
WB2ZQC
WAØVDX

115
I3LDP
I5ØBYR

114
DK4OG
DK8KF
K4APL/6
K9IYT
VE3GDO
WA7GVM
WA7UFS

113
DJ5CG
EA5TD
IR1BLX
JA4FCV
K9UWA

112
CT1QZ
I3BUG
IR1VMC
JA2AO
K2LQL
K4FZU
YU2ROZ

111
DJ2EE
K4II/DL
DL8JO
ISØNZA
LA2DR
VE6SL
VP9H
W1CRL
WA2HQH
W3EUU

110
DK7JH
EP2DB
F6AED
I2GGJ
I5ZSS
JH3EGO
W4WFL/1
WA6LHB
W9EVD
ZS2SG
4W1BC

109
DJ5FA
EA6BZ
EA7TV
FY7AG
I5BDE
I6VDB
LA3JQ
PAØHWM
SV9WKK
TU2EI
W3CDG
W3DQJ
W7JVG
WA6WZO

108
A9XBD

W3WK
WA6DNM
WA6ETN

102
JA2AAQ
JA8CFR
K5ETA
K6TZX
ON4QX
SM6CCM
WA8ZDF
YBØABV

102
F6DBX
JH1NMO
OZ3Y

VE3GPO
WA2KLQ
W3CGS
WB8DTT

101
G4BUE
I5BDE
IØZMI
JA1KSO
JA1QXY
JR1NRP
JH7BRG
K6CBL
K6DT
K6LLE
OZ6XT

SMØGMG
W1YN
W2JOC
W4LVM
W6TCQ
WA6TLA
W7LZF
W8RSW
W9KB
YV4AGP

100
DL1EV
EA8CR
IT9RAN
JH3AIU

K5FVA
K6KII
K9UY
SM5BHW
VE3DU
W2RSO
W2TO
W4BV
W4HOS
WA4EWX
WB4TDH
W6PN
W7WMY
WA9MOE

CW

243
W9KNI

233
K4YFQ

220
W1DAL

214
K6GA

197
W6PT

191
K9WEH

189
OZ1VY

184
W3KT

183
K9UTN

180
K2TQC

164
K2SHZ

162
W8ZCQ

161
DL8AN
W9LNM

160
F3AT
K4LRO
K4TBN

157
K1AGB

153
K9KEV
W1AB

151
DL6EN

150
K6VY
W4WSF

147
W9OHH

146
K8MFO

142
WB6ZUC

141
OE1ZGA
WA3ZJ
YU2RTW

140
OZ7BW
W4KN
WA4FDR

139
F6CRT

138
WØPRY

134
JA2BP

133
JA1EMX
SMØCCE

132
WA6MWG
W7LR

130
K9UKM
W6ID

128
K6MU
WØBN

127
K6EBH

125
WB9LHI

123
JA8AA

122
SM6CHH
W1JAA

121
JA1KWV
W9MR

120
JA1IBX
K2IJ
K6RLY
W4NBP
WA5VDH

W3WK
WA6DNM
WA6ETN

107
DK5JX
DL1ES
K4II

106
PAØCLN

105
K4DAS
OZ1LO
W3RAB

104
JA1UQP
K2JX
K6DSK
W9SZR/3

VE3GPO
WA2KLQ
W3CGS
WB8DTT

101
G4BUE
I5BDE
IØZMI
JA1KSO
JA1QXY
JR1NRP
JH7BRG
K6CBL
K6DT
K6LLE
OZ6XT

SMØGMG
W1YN
W2JOC
W4LVM
W6TCQ
WA6TLA
W7LZF
W8RSW
W9KB
YV4AGP

100
DL1EV
EA8CR
IT9RAN
JH3AIU

K5FVA
K6KII
K9UY
SM5BHW
VE3DU
W2RSO
W2TO
W4BV
W4HOS
WA4EWX
WB4TDH
W6PN
W7WMY
WA9MOE

Frequency Measuring Test

September 5 results of a favorite quarterly event. Did you qualify for OO?

By Ellen White,* W1YL

Conditions ranging from "worse than dreadful(?)" to "best signals on 20 from W1AW in ages" were reported as 144 participants made 1911 measurements, 49 making the Honor Roll tabulation. The "umpire" measured the transmitted frequencies for the early run at 14068.973, 7046.159 and 3546.082 kHz. The late run checked out at 7056.220 and 3537.109 kHz. No, I didn't miss noting the 20-meter frequency, the umpire (and just about everyone else!) did.

If you participated in the FMT on November 6, watch for results in the February issue of *QST*. The next upcoming FMT is scheduled for February 13, 1977, rules in "Operating Events," January. Mark your calendar likewise for May 14, the second scheduled 1977 FMT.

Special thanks to W1CKK and calculator for the following figures.

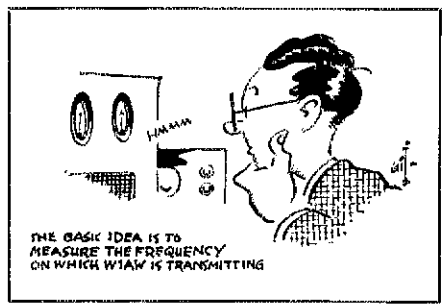
Honor Roll

This top listing is the standing of the frequency measuring leaders. In consideration of the minimum possible error due to Doppler (and other unavoidable factors), we accredit as of equal merit all those reports computing 4/10ths parts per million (or better) accuracy. Please note that a participant must submit a minimum of two measurements to qualify for this listing. Again, the following top achievers are of *equal* merit, most conveniently shown in an alphabetical listing by call area: W1BGW WA1JZC WA1NJG W1PLJ K1VHO K2EK K2HXG K4KA WB4KCL W4NTO W4RHZ WB5AWN K5DEG K5LAZ W5OS WB6AAL W6BXI W6CLM K6DBJ W6FZE W6JQR K6KA W6KT W6NKU W6OQI W6RQ K7EGA ex^2-7HM W8CUJ W8MDL W8OK W8OW WB8PGK WA9AAT W9HPG W9KO W9MNY W9VOX K9WGN WØBJ WAØDKA WØGUB WBØJGP WØKL WAØYCY VE2ARA VE2HN, Herr, Ireland.

*Deputy Communications Manager, ARRL

Better Than 35 Parts Per Million (Class I OO Qualification)

(.5) W2AO WB2WQA W5FMO WA6EJO WA6WXH WA8MSC, (.6) W1JH, (.7) W1JOT, (.8) W3AHZ, (.9) WA6MWG, (1.4) WB8STQ W9REC, (1.6) WA7ZDE, (1.7) W1AYG, (1.8) WBØDRV, (1.9) W6CDF, (2.1) K6HI, (2.3) WA5EIV, (2.8) W1AQS, (2.9) WØSS, (3.6) WØNEE, (3.7) WØGW, (4.1) W1IFL WØHBH KH6CZ, (5.0) W1QV,



(5.2) K9BGL, (5.5) WB4WDJ, (5.6) W2ND, (6.1) WA5WUJ, (7.1) K1EUM, (7.2) WA1SSH W4SHL, (7.8) W4HU, (7.9) K4CFV, (8.2) VE6BAF, (8.3) WA3SXU, (8.4) K7TQM/7, (8.6) W5YTN, (9.3) WBØFTU, (9.7) W6PRP, (9.8) WA3NDQ, (10.1) W8DPW, (10.2) W9AG, (10.4) W1DDO, (12.2) W6RNU, (12.4) KØETA, (12.6) WB8DTT, (13.0) VE6MJ, (13.6) WA6IPF, (14.2) WA8QBJ, (14.4) K6EC, (14.9) WA1TDR, (15.3) WA6INF/7, (16.2) W2MDM, (16.3) WB5EXI, (16.8) W2AIQ, (17.4) K1HRV, (18.3) WA1RFT, (19.4) W6CBX, (19.6) WB8UKX, (21.4) WA8CZS, (23.2) K5EVK, (23.5) W1EEF, (23.6) W9IQI, (24.9) W9SZR/3, (25.0) K6EPX, (25.1) W6SSB, (25.8) ABØPTB, (26.4) WA3JSZ, (30.0) K2RG, (30.7) WA4IDN, (31.4) WA1OLK, (32.5) W2JDK, (32.5) AA3UHJ.

Better Than 179 Parts Per Million (Class II OO Qualification)

(38.9) W4UCL, (41.7) W2KKT, (42.9) K1QBP, (46.0) W7JMS, (49.8) WA5NOM, (54.1) VE6XO, (57.9) WA6FCO, (59.0) WB8ESK, (62.4) WN9TSL, (65.8) WA1OHA, (67.2) WB8CND, (74.3) W4BK, (74.6) W2DW, (80.8) W4BUZ, (93.7) WB4DIU, (97.9) WA9GBW, (104.2) Ward, (106.7) WA4HCC, (106.8) W1VH, (136.5) K6QPG, (147.8) W5FFW, (168.8) WB5LDF.

HR Measuring Methods

Homebrew Meecham bridge osc. and multivibrators to 100 Hz. GR Interp. osc. (W1BGW). Added a pocket calculator to equipment for interpolating between checkpoints on the old LM-8, but did calculations longhand anyhow since I don't believe this little gadget yet! In this case one of the Lissajous "stops" on the scope was about 2.7 Hz away from the transmitted frequency. Not much handscribing error possible (W4NTO). My method is to use the receiver with the BFO turned off. I zero the W1AW signal using the BC-221 which is coupled into the receiver with a homemade unit. I can adjust the output of the BC-221 to the same amplitude as the incoming signal this way. The input for the counter is normally coupled into the BC-221 so that the counter reads whatever signal is present. In other words, I use the BC-221 to "capture" W1AW and then measure the insertion frequency. The output of the BC-221 is always on 80 meters so I must double the reading if I measure on 40. The BC-221 has one modification which I found necessary to get exactly zero beat with W1AW. I added a small variable capacitor for vernier action to get exactly zero beat by using the S-meter. It's not possible to use audio to achieve

zero beat as the human ear falls off below about 20 cycles but the S-meter will follow right on down to zero beat (W4RHZ). Used a Yaesu FR-101, modified proximity probes for coupling, MacLeish-design interface and Heath 1B-101 counter (W5OS). My first try and used a rather simple approach, I suspect. Drake R-4B, VAR audio osc. and 1-kHz markers derived from a 1-MHz crystal reference (W6NKU). Homebrew standard (5-kHz marks), Heath counter and scope (W6RQ). I zero beat my Rohde and Schwarz XUA frequency synthesizer against W1AW using my Drake R-4C and 500-Hz or 125-Hz cw filters (WBØJGP). Homebrew frequency counter with 1-Hz resolution. The 100-kHz crystal is set for zero beat with 15-MHz WWV. Using a separate VFO and a receiver with a-m capability (BFO off), the VFO is set for zero beat with W1AW. The counter is then used to ready the VFO frequency. Measurements were made on the 3020A ITT receiver using a crudely calibrated cardboard pointer and scale on the 100-Hz variable knob (Herr).

QRGee

My hair is just beginning to grow back after the HP-524B counter suddenly quit during a 9 A.M. check of the gear on the morning of the test (K2HXG). I was all set up and ready to go last time and knew I had blown it by 24 hours when W1AW started sending code practice instead of FMT transmissions. *This* time I read the instructions before the test rather than afterward (K4KA). I took time out from the ARRL convention at San Jose to come home and enter. W1AW was very strong on 20 on the early run (K6DBJ). The hf first plan is still working perfectly. Note: Those without WWV-receiving facilities can check their calibrators on VOA, Woofferton, England, 7200 kHz, 0300-0700Z daily. Like all BBC transmitters, the frequency is close – lately around 10-Hz accuracy. A morning signal is Radio Moscow up to about 1600 Hz on 7100. He was just 4 Hz off yesterday (K6KA). Conditions in general were good for a change. I can't remember an FMT during the past year that was as free of QRM, QSB, etc., as this one (K7EGA). Hope that you will tighten up. It is too easy now (W9MNY). Very interesting exercise (W1JOT). W1AW's big 80-meter signal sure attracted the flies (WØSS).

LDE

The following were reported in August *QST* in error: WØOO 1.6, W1DDO .7, KH6CZ 4.1; corrections should be noted to WØGW 1.6, W1DDO 3.7, KH6CZ 1.5. QST

Straight Key Night

Find some time during the new 24-hour period to greet friends old and new in a welcome to 1977. This trial may be a trial!

By Ellen White,* W1YL

Six years of Straight-Key Night have brought a special kind of fun to those who have found time to participate. On trial for this holiday evening is a 24-hour period to permit an hour here or there for just about anyone of a mind for a bit of nostalgia.

No, this isn't a contest or marathon operating event. It is a friendly meeting on the air, using straight keys. From 0000-2400Z January 1, 1977 is the specified time. Before, during or after your holiday evening take time for a few QSOs and rediscover some of the fun of the early days of operating. Suggested areas of operation on 80-40-20 are 060-080 kHz up from the bottom edge of the cw band; 10 kHz up from the bottom of each Novice segment. When participating, please use SKN in lieu of RST, preceding the 3-digit report. (This will clue in "tuners-by" to what is going on.)

Following SKN, send a list of the calls of the stations you worked plus your vote for the best fist heard that night (not necessarily one you've worked). This is *not* a contest. Vote, however, for the most interesting QSO of the evening in addition to the best fist heard. With your report send any appropriate photos for consideration. Catch a flavor of the last event (July 4, 1976) by reading pages 77-78 in October *QST*. The expanded period this year is to permit DX participation in this fun event. In particular look for Scandinavians who have expressed an interest in joining the fun.

In your report please comment on the time slot – whether it is more or less convenient for your operation. All together now, *CQ SKN!* QST

*Deputy Communications Manager, ARRL

Strays

□ Radio amateurs' service during the Teton Dam disaster (p. 53, *QST* November, 1976) was further acknowledged when the Idaho Society of Radio Amateurs received a "Certificate of Recognition for Distinguished Service" from Idaho Governor Cecil Andrus.

***QST* Congratulates . . .**

□ John G. Webb, W6RCW, who has been appointed legal department director at National Semiconductor, Santa Clara, CA.

□ Charles Kram, W5TFZ, who was ordained into the priesthood.

□ Dave Bell, W6BVN, winner of a bronze "Cindy" from the Informational Film Producers Association for producing the new ARRL film, *Moving Up to Amateur Radio.*

SET Announcement

Don't be a no-show. Participate on January 29-30, 1977.

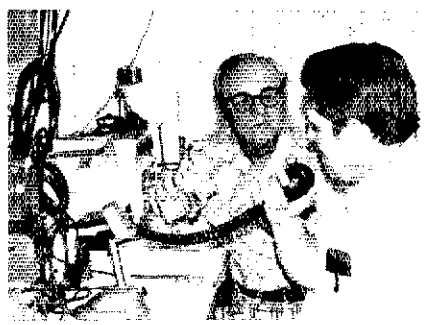
By Robert Halprin,* WA1WEM

The Simulated Emergency Test is held each year to raise the consciousness of amateur radio operators with regard to emergency preparedness. How efficient would our communications be in a crisis? Some of the operations during Hurricane Belle (which started out as the real thing but turned out to be a dramatic SET) were a little ragged. The annual SET is conducted in order to simulate realistic (don't expect any hurricanes) emergency conditions to enable amateurs from all subcultures of hamdom to gain experience in emergency communications. It's an attempt to bring up the level of training in time for the next potential disaster.

Our approach to maximizing activity will be basically the same as last year. The majority of the activity will center on January 29-30, 1977, the official weekend, but groups are free to hold their SET on any two-day period between January 1 and February 28. This will permit the SET to (hopefully) coincide with the time when amateur activity, public-service value and mass media exposure can be the greatest. All SETs held during the SET "period" will be included in the SET results article in *QST*.

Contact your local emergency coordinator to find out the exact date of the SET in your area. These emergency coordinators (ECs) will be coordinating plans for the local Amateur Radio Emergency Corps (AREC) and other interested amateurs. The National Traffic System (NTS) nets will hold extra and extended sessions as needed to facilitate the handling of formal message traffic from coast to coast.

How do *you* participate? Here's how. Most local activity will center on two meters. If you have a two-meter fm radio, you're in business. If the identity of your local EC is unknown to you, ask your section emergency coordinator (see opposite page) who your EC is. Advise your EC of your availability and he will tell you how you can help. He may ask you if you are interested in joining the local AREC group. This only requires you to complete a simple form denoting your band capabilities and your willingness to participate in AREC activities. Many AREC groups work closely with civil defense, Red Cross and other public-service agencies. If there is no EC assigned for your area, perhaps you or another amateur could volunteer to organize some emergency-preparedness activities. Contact your SEC or SCM (page 8, *QST*) for details.



Save aspirin this year — keep messages brief. *(W6LJU/4 photo)*

Another way to get in on the SET action is to participate in your local or section (or higher-level) National Traffic System net. Most every ARRL section has at least one net operating on the section level, meeting on 80 or 75 meters. Local nets are usually on two meters.

Familiarize yourself with traffic-handling procedures (see slow-nets article, this issue). In an emergency, it's imperative that all stations go about handling communications and messages according to a standard form and using maximum efficiency. If possible, report into net sessions before the SET to get to know the system. Many Novice nets play a big role in SET — Novice and Technicians take note!

Check with the net managers of the nets you are active in to determine when the net will meet for the SET. Both daytime and evening segments of NTS will be employed.

All amateurs are encouraged to initiate at least two messages during the SET period. One can be to your SEC (opposite page) and another to a friend or relative in a distant part of the country.

For the SET, all NON-ROUTINE test messages should carry the word "Test" before the precedence, e.g., Test Priority (Test P on cw) and, as a further step to insure test messages will not be construed as the real thing, use the words "TEST MESSAGE" in the first two words of the text. DO NOT use "Test" in the precedence or in the text of a routine message. A routine message is a routine message regardless of whether or not it was drafted for the SET. For improved efficiency, try to avoid using long words such as participating, communications, simulated, emergency, etc., in texts, whenever possible.

To prevent SET messages from "dragging out" beyond your SET period, the handling instruction HXB is used (after the precedence and before the station of origin in the preamble) on SET messages. Liberally interpreted, HXB means "Cancel message if not delivered within the SET period; service (send a service message to) originating station."

For SET messages sent during exer-

Everyone has a useful role in the SET. Logger Chip Wingate (left) assists WB8SFV in recounting a message on the Richland County (Ohio) MASER Net during last year's exercises. *(WB8FMW photo)*

*Assistant Communications Manager, ARRL

cises held on a date *other than* the primary SET weekend, use HXB followed by a number, e.g., HXB48 which means "Cancel message if not delivered within 48 hours of filing time; service originating station." If the message is not a test message, and you would like to have it delivered even after the SET is over, don't use HXB at all.

Some exercises and net sessions will operate on the assumption that commercial power has been disrupted. Would you be able to communicate if you suddenly discovered that your home was without commercial power? Equip yourself with some sort of emergency-power source or battery-operated rig, such as the compact two-meter transceiver. Be especially on the lookout for emergency-power-only net sessions on the low bands. You'll be needed!

Repeater public-service coordinators, net managers, radio officers, etc., who don't hold ARRL leadership appointments (such as EC, RM, PAM) should write Hq. for a copy of the 1977 SET Bulletin and reporting forms. The SET is open to all amateurs and public-service groups. 1976 was a record breaking year so let's keep on keepin' on! Don't forget to report your activities promptly to Hq. (by March 15).

Every amateur, regardless of his/her primary interest in the hobby, should be adequately trained in handling emergency communications. Are you? QST

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401 Carlisle, Lexington 40505

MICHIGAN
Stanley J. Briggs, W8MPD
1885 Pinetree Rd., Trenton 48183

OHIO
Ralph A. McDonough, WA8KPN
Box 240, RD 2, Adena 43901

Hudson Division

EASTERN NY
Wayne White, K2AYQ
10 Astoria Ave., So. Glens Falls 12801

NYC & LI
Charles Haubeil, K2HTX
205 8th Ave., E. Northport 11731

NORTHERN NJ
Paul R. Krugh, WB2PBO
208 S. Union Ave., Cranford 07016

Midwest Division

IOWA
Harold M. Rozenberg, WØIYW
104 Lincoln St., Bondurant 50035

KANSAS
W. D. Bemmels, WØKL
40 Rockwood Dr., Ottawa 66067

MISSOURI
Gary Wunder, WBØDBW
112 Sparks, Apt. 3, Warrensburg 64093

NEBRASKA
Stephen O. May, WAØASM
2830 So. 42nd St., Lincoln 68506

New England Division

CONNECTICUT
John F. Lindholm, W1DGL
Box 1695, Bristol 06010

EASTERN MA
Don F. Guptill, W1AOG
17 Park Street Ct., Medford 02155

MAINE
Edward Bristow, WA1MUX*
54 Lee Street, Lincoln 04457

NEW HAMPSHIRE
John Johnston, K1RSC
RFD 1, Lake Rd., Exeter 03833

RHODE ISLAND
Charles H. DiLuglio, K1YDA
Nun Ave., Jamestown 02385

VERMONT
H. A. Preston, W1VSA
RFD 1, Charlotte 05445

WESTERN MA
Robert H. Phoenix, WA1DNB
23 N. Washington St., Belchertown 01007

Northwestern Division

ALASKA
Tony P. Smaker, Jr., KL7JDO
Box 1614, Kodiak 99615

IDAHO
Lemuel Allen, W7JMH
1800 So. Atlantic, Boise 83705

MONTANA
Robert E. Leo, W7LR*
RFD 3, Box 104, Bozeman 59715

OREGON
Bill Day, WA7UHC
2177 Dalton Dr., Eugene 97404

WASHINGTON
Robert L. Klepper, W7IEU
7027 51st NE, Marysville 98270

Pacific Division

EAST BAY
Earl Appleby, W6IIH
2128 San Remo Ct., San Leandro 94578

NEVADA
Mike L. Blain, WA7BEU
863 Armada Pl., Boulder City 89005

PACIFIC
J. P. Corrigan, KH6GQW*
P.O. Box 698, Kaneohe 96744

SACRAMENTO VALLEY
Theodore W. Rast, W6SMU
7512 Winding Way, Fair Oaks 95628

SAN FRANCISCO
Kenneth McTaggart, K6SRM
272 4th St. East, Sonoma 95476

SAN JOAQUIN VALLEY
Joel L. Fream, WA6HNO
P.O. Box 6093, Bakersfield 93306

SANTA CLARA VALLEY
Ralph Michelson, WA6RXB
19150 Portos Dr., Saratoga 95070

Roanoke Division

NORTH CAROLINA
William C. Finch, W4EHF
818 Emeline Ave., Fayetteville 28303

SOUTH CAROLINA
Bill McCollum, WB4TNS
108 Timberlane, RFD 9, Greenville 29609

VIRGINIA
Cornell C. Bodensteiner, WB4DTG
1164 Reel St., Norfolk 23503

WEST VIRGINIA
Delf A. Norona, WA8NDY
Box 523, Buckhannon 26201

Rocky Mountain Division

COLORADO
Richard E. Schmidt, KØFLQ
13640 E. Center Ave., Aurora 80010

NEW MEXICO
R. B. Goodman, W5ALR
2532 La Charles NE, Albuquerque 87112

UTAH
Larry Jacobs, WA7ZBO
5655 So. 4060 W., Salt Lake City 84118

WYOMING
Joseph P. Ernst, W7VB*
502 Ryan St., Thermopolis 82443

Southeastern Division

ALABAMA
Raymond E. Ringer, W4DGH
Box 1, Valley Head 35989

CANAL ZONE
Oscar Leigh DuPre, KZ5OD
P.O. Box 284, Balboa Heights

GEORGIA
Douglas B. Horne, K4YRL
RFD 3, Rome 30161

NORTHERN FL.
Fred K. Marchman, WA4WBM
901 E. Missouri Ave., New Port Richey 33552

SOUTHERN FL
William Johnson, WB4ALH
1119 Lady Elaine Dr., Valrico 33594

WEST INDIES
Julio A. Negroni, KP4CV
269 Georgetown St., Rio Piedras 00927

Southwestern Division

ARIZONA
Marshall Lincoln, W7DQS*
Box 1490, Wickenburg 85358

LOS ANGELES
Eugene H. Violino, W6INH*
2839 Canada Blvd., Glendale 91208

ORANGE
Jim Varner, W6AQB
1504 Del Norte Dr., Corona 91720

SAN DIEGO
Arthur R. Smith, W6INI
4515 Melisa Way, San Diego 92117

SANTA BARBARA
Ernie Kapphahn, WB6HJW
Rte. 1, Box 55-A Suey Creek Rd., Santa Maria 93454

West Gulf Division

NORTHERN TEXAS
George Philip Clements, W5DWL
P.O. Box 622, Addison 75001

OKLAHOMA
Leonard Hollar, WA5FSN
RFD 1, 710 So. 10th St., Kingfisher 73750

SOUTHERN TEXAS
Kenneth Hazel, W5TQP
323 Elm, Portland 78374

*No appointed Section Emergency Coordinator. SCM listed.

5-Band WAS

Awards issued January 1, 1970 — September 30, 1976

1
1 W1AX
2 W4IC
3 K9LBQ/7
4 W6ISQ
5 W8YEK
6 KØGJD
7 KH6SP
8 K4GHR
9 W4YWX

10
10 XE1WS
11 K4IEX
12 WA1IHN
13 W3WGH
14 WØWLO
15 W8BT
16 W2PV
17 K1VTM
18 W8SET
19 WA9WJE

20
20 WØIS
21 PJ2VD
22 KH6HCM
23 W7OK
24 W5RUB
25 K4FN
26 W3LDD
27-A K5MAT
27-B WØBUA
28 WA3FGS
29 W8CJW

30
30 WA7LDZ
31 W5QNY
32 W7YBX
33 W2TP
34 K4LSP
35 VE3ACL
36 W2FXA
37 W4GK
38 WA3GUL
39 K2GPL

40
40 WA5IIS
41 WAØVKF
42 W4KEB
43 K4ELK
44 K4VBD/6
45 W6EYY
46 CEØAE
47 W4HHM
48 WA4ZLP
49 W4UF

50
50 K4IUV
51 K6SSN
52 WAØNYU
53 W6NJU
54 VE3GNM
55 K4HPR
56 WB2NRU
57 W6JKR
58 W2HO
59 K7NHV/8

60
60 W4OZF
61 W9EVD
62 K1TZD
63 WA8VRB
64 PJ2PS
65 WA5KPL
66 K4PUZ
67 KØZXE
68 WA2FLA
69 W1VBP/7

70
70 LAØAD
71 KH6HGP
72 WA5YMW
73 W6ITD
74 KØAYO
75 WA6CPP
76 K1OME
77 WØNQQ
78 W4WSF
79 W2PDB

80
80 WA8VWK
81 WA4FDR
82 WA9NYA
83 XE1J
84 WAØJZF
85 KG4CS
86 W3AXW
87 W6TTS
88 K5YRK
89 W4CRW

90
90 K4KQ
91 HR1KAS
92 WA3HGV
93 K2BK
94 K7LTV
95 W8SH
96 W4SYL
97 W4AZU
98 K4CIA
99 K4ZCP

100
100 W6EJ
101 WA6AAW
102 WA4LDM
103 W6CLM
104 WA9ZAK
105 WA2DZU
106 WB4OGW
107 W2FWK
108 K4CKA
109 VE3DXV/W6

110
110 WAØELW
111 K3HZL
112 WØAO
113 W2FBF
114 W3AZD
115 W4REZ
116 W5NCB
117 WB5AFW
118 W5PD
119 KZ5KN

120
120 KP4DLW
121 W2CUC
122 W8QXQ
123 W7VSE
124 KS6DH
125 W3JXH
126 K7AWB
127 W6EJJ
128 KZ5JF
129 WA1JZC

130
130 K4AGC
131 WAØPRS
132 W5UR
133 K6QPH
134 K4II
135 W5EIB
136 WA5WQF
137 WA5YSC
138 K4FAC
139 W7GHT

140
140 W3ZUH
141 WA6OGW
142 WA6HRS
143 WA5TYB
144 WB5BKT
145 K4MQG
146 WØII
147 WA6JVD
148 W4JVN
149 K4CBI

150
150 WBØCQJ
151 KH6GKD
152 W1NU
153 KØDEQ
154 WA4ULL
155 W2GUH
156 WA5VDH
157 WA4EYR
158 W5VJP
159 W4KA

160
160 WA5EEM
161 WAØUXN
162 WØGNX
163 WAØZOL
164 K2FJ
165 HKØBKX
166 W7VMF
167 KS6DY
168 WB4RUA
169 W9VBV

170
170 K7IVJ
171 WA1MQO
172 W2BXA
173 WAØTKJ
174 W9RQM
175 WB4JLO
176 WB4SPG
177 W5GTW
178 W5UUM
179 K4FJC

180
180 VA7WJ
181 W5UDK
182 HC2YL
183 WA1GPZ
184 WB8EUN
185 W1KSN
186 CP1EU
187 K4CQN
188 W5EL
189 K5SIN

190
190 WØINH
191 K8HWW
192 WB5DCY
193 W1UYL
194 WA4LPX
195 WBØEZQ
196 WB4JYX
197 K7RSC
198 WØIYP
199 WBØGZR

200
200 K4KA
201 W7WMY
202 WA7IJN
203 WB5HGS
204 K4KZP
205 YV4AGP

206 W7GBL
207 YV1KZ
208 K7ICW
209 WA7RFH

210
210 W4YZC
211 W7EEJ
212 W7YS
213 W8PBU
214 K2DT
215 WA6KZI
216 KH6RS
217 W4NXD
218 WB4ZNH
219 K7MOK

220
220 HC1CW
221 WB8HLI
222 WAØZON
223 K8DYZ
224 K7CLO
225 W9KB
226 WA6TLV
227 WA7PVU
228 WA6GHH
229 WB5HVY

230
230 K2GBC
231 W7WT
232 WB4QWM
233 K3EH
234 K4GRD
235 W6OKX
236 WØPRY
237 W4CZU
238 W5OB
239 WB4ASV

240
240 W3RFL
241 W5CPI
242 W1SP
243 K2SHZ
244 WB6ZVC
245 K5FVA
246 WB5HIH
247 W2EQK
248 WB8CGC
249 AA8TYF

250
250 W9JA
251 WB4VTM
252 KØTVJ
253 AD8HBN
254 W2MIG
255 K7RSB
256 K4BBF
257 WB8ECI
258 ZL3GQ
259 WB5FZJ

260
260 K2FL
261 K8OOK
262 VP9GE
263 W4WRY
264 WA7IHN
265 WA3PWL/Ø
266 WB4VBL
267 K5YWX/6
268 W4DQD
269 WB9CPT

1975 VE/W Contest Results

New scoring system makes for more interesting activity, as reported somewhat belatedly here.

By Court Broad,* VE2LZ

The Montreal Amateur Radio Club, Inc. is pleased to announce the results of the 1975 VE/W Contest, held Sept. 20-21, 1975. Just over 300 stations submitted results. Because of the rule changes instituted for the '75 contest to encourage more W activity, it was felt that there should have been an increase in participants over previous years. However, some enthusiasm may have been curbed by the Canadian postal strike which occurred during the period just prior to the contest. Many logs were returned to the senders at that time. It is a tribute to the persistence of the amateur spirit, since many of these returned logs were remailed for submission after the strike was over.

Top scores in the cw class went to VE7WJ (VE7ZZ, opr.) and K5PFL. Top ssb honors were won by VE7WJ (VE7BBQ, opr.) and W4YWX. All four stations receive from MARC a handsome plaque commemorating their efforts.

Soapbox

All those VE calls made me a bit homesick, but where was "my" province – Nova Scotia (WA1CUN)? Where do all the ops go for the rest of the year (K4JSG)? A delightful contest which I enjoyed considerably (W4LWP)! Enjoyed the contest very much but didn't hear one VO1 or VO2 (WA4KAM). My first attempt since 1972; conditions not optimal, especially on 20 meters and nothing heard on 15 & 10 (W5SOD). Real good contest in view of hf condx., no VOs or VE8s heard (W5BWM). Conditions were terrible on 80 meters and had difficulty in finding new VE calls to work on 40 and 20 (W4BTZ). Missed many VE sections – 78,000-volt line gave me S9 fits, as usual (W8YGR). Fun contest – would have won U.S. last year with this year's score (WB8UKX). Are there any hams in the Yukon or Northwest Territories (WB2FVT)? The contest was outrageous!!! – until I ran out of VEs to work (WB2WXS). Most certainly a well-run contest – whatever happened to the Yukon and Nova Scotia operators (K2JFJ)? Like the two separate contests much better – keep it this way (W4YWX). I was very surprised to find "rare" VE stations on 15 meters! Had a really great time (WA2YEI)! Complete bedlam and chaos but enjoyable (WA3VKZ). First time in contest for me and enjoyed it more than DX test (K5LZT/9). What a fine bunch of operators! Enjoyed myself immensely (W3GXF). My first contest. Next time there will be a better score (W1LF)! Good contest but missed VE8s (WB4ORF/3). I really enjoyed the contest. It was a great experience for me. This is the first time I participated in an individual contest (WB8OUN). 15 meters was kind to us for a short period, but 10 meters was out completely (W6ZT). 3.5 and 21 in good shape here – was happy to improve my first year's performance – lots of fun (WB6RWM)! Heartily agree with modernization of rules and separate cw/phone contests (W6PAA). Condx. on 40 and 80 were much improved over last year; 15, however, was much worse (KØGJD/6). I particularly enjoy running across the old-timers like myself who were licensed in the 1930s (W1PEG). Condx. were too good; whenever I got on 15 or 10 my sig. went right to Europe (WA1UPL). Great contest with lots of activity. Looking forward to next year (K4YEH). Never heard a VE5 – same happened last year. A VE8 and I spent 15 minutes thanking each other for the rare contact (WBØEVQ). This was my first VE/W contest, but I assure you that it won't be my last (WBØCRE). Could hear only one station on 15 meters – but 40 and 80 were very good here (VE4SW). Will be looking forward to next year with some better antennas (VE5DX). The W&Ks never stopped calling me for 15 hours (XJ5VK). With all the CB activity on 11 meters, why couldn't I raise one U.S. station on ten meters (VE7ZZ)? Having separate cw and phone contests allows a major effort in both (VE7BBQ). The new inverted V on seven was really worth the effort; it sure helped to make up the disappointment on the high bands (VE3FDC). True to the spirit of contests, I carried on with CQ/W when a 3B station was heard and thus lost a contact with Mauritius – oh well (VE3ECP). It was hard to find an unoccupied spot in the bands with so many VEs calling "CQ W" (VE3DMC). As usual, enjoyed the contest very much. Condx. were excellent (VE3MI). Enjoyable contest this year with much more activity than we've noticed in past three years (VE3DAC). Love the new format. Keep it like this (VE3ECP). It's a great and unusual feeling to be the object of a "pile-up" – like being rare DX (VE3JT)! Murphy dictated that 21 MHz was wide open with most of Europe calling me, but little W activity (VE2AH). First time in and is best contest ever! Really enjoyed the pile-ups (VE1AMN).

Top Ten Scores

CANADA		*U.S.A.*	
CW		*CW*	
VE7WJ*	361,660	K5PFL*	151,192
XJ7CC	339,360	W6PAA	133,320
XJ3BMV	295,680	W4YWX	132,000
VE3LUE	260,750	KØGJD/6	132,000
VE3HUM	203,992	WA3ATX	119,040
PHONE		*PHONE*	
XJ7WJ*	493,600	W4YWX*	135,330
VE3BMV	308,566	W4WSF	110,980
VE5DX	235,910	WB8UKX	79,500
XJ5RA	231,936	WØEEE	68,040
VE3FFA	224,460	WBØLLR	66,640

*Plaque Winner

*Contest chairman, Montreal Amateur Radio Club, Inc.

Scores, 1975 VE/W Contest

The station listed first in each section is the certificate winner for that section. Listings consist of call sign, score, total contacts and total multipliers.

VE CW

Newfoundland

XN1KE 97,622-367-133

Prince Edward Island

VE1AMN 10,608-102- 52

Nova Scotia

VE1ABR 1672- 38- 22

New Brunswick

VE1AXT(multiop) 66,100-350-123

Quebec

VE2AH 91,750-367-125
VE2GA 79,560-340-117
VE2WA 73,466-337-109
VE2DPP 13,206-127- 52
VE2RY 11,928-131- 44

Ontario

XJ3BMV 295,680-704-210
VE3LUE 260,750-745-175
VE3HUM 203,992-593-172
VE3IR 107,822-377-143
VE3EJK 102,336-416-123
VE3MI 75,936-339-112
VE3ACZ 75,710-325-113
VE3HMV 61,480-290-106
VE3ECP 57,424-296- 97
VE3DMR 43,990-265- 83
VE3DMC 36,366-209- 87
VE3AKG 24,552-198- 62
VE3DPP 15,480-129- 60
VE3DCT/3 15,200-152- 50
VE3HCN 13,632-142- 48
VE3BLY 9694-131- 37
VE3DH 7740- 90- 43
VE3FW (multiop) 18,352-148- 62

Manitoba

VE4SW 175,840-292- 57
VE4OY 40,290-237- 85
VE4VV 23,892-181- 66
VE4UO 12,784-136- 47

Saskatchewan

VE5SC 21,716-173- 61

Alberta

CY6AMR 36,480-228- 80
VE6AJI 29,952-192- 78
CY6AO 10,971-123- 45
CY6MD 640- 20- 16

British Columbia

VE7WJ 361,660-845-214
XJ7CC 339,360-840-202
VE7CE 88,330-365-121
VE7IQ 34,144-194- 88
VE7CMF 11,058- 97- 57

Yukon

VE8AN 630- 21- 15

U.S.A. CW

Alabama

WB4ASV 15,600- 52- 15

Arizona

K7AL 88,480-158- 28
W7AYY 57,000-114- 25
W7ZMD 41,800- 95- 22
WA7HRE 30,240- 72- 21

Arkansas

WA5RTG 96,880-173- 28
WB5NBC 21,000- 75- 14

Colorado

WBØLLR 11,160- 62- 9

Connecticut

WA1ACR 41,040-108- 19
W1VH 30,960- 86- 18
K1KRY 15,620- 71- 11
WA1CUN 13,520- 52- 13
W1WY 13,200- 44- 15

Delaware

WA3VKZ 1040- 13- 4

East Bay

K6ZM 82,160-158- 26
K6PJ 14,400- 45- 16
K6ARE 9760- 24- 12

Eastern Massachusetts

W1GDB 16,120- 62- 13
W1HFM 6,120- 62- 13
WA1PQY 14,300- 55- 13
W1LF 4680- 26- 9

Eastern Pennsylvania

WA3ATX 119,040-186- 32
W3OI (multiop) 47,880-114- 21

Georgia

W4YWX 132,000-200- 33
W4BTZ 83,700-155- 27
K4JSS 56,880-133- 21
K4LNC 37,620-198- 19
WA4DPL 14,880- 62- 12
K4LRO 3000- 25- 6
W4LDD 2940- 21- 7
K4KZP 2380- 17- 7

Hawaii

KH6IJ 29,160- 81- 18

Illinois

W9NU 31,960- 94- 17
WB9NOZ 28,560- 84- 17
W9UDK 13,260- 51- 13
WA9LUD 10,920- 42- 13
N9WR 7920- 44- 9
WA9QWN 4200- 21- 10

Indiana

WB9MDB 28,000- 70- 20
W9LKI 17,440- 69- 13
K9LZT/9 1280- 16- 4

Louisiana

W5WG 47,600-119- 20

Los Angeles

WA6EPQ 114,520-194- 29
W6DGH 3240- 27- 6
WA6GLC (multiop) 13,640- 62- 11

Maine

W1GKJ 19,200- 60- 16
W1OPJ 80- 2- 2

Maryland - D.C.

W3RAB 70,720-136- 26
WB4QRF/3 46,460-101- 23
W3GZQ 34,200- 90- 19
WA3UHJ 7800- 39- 10

Michigan

W8KRR 42,420-101- 21
WB8MTD 21,760- 64- 17
K8OOK 8400- 42- 10
W8KPK 6080- 38- 8
WB8OUW 3500- 25- 7
W3GN/8 1800- 18- 5

Minnesota

WBØANT 43,200-108- 20
WBØLDW 10,600- 53- 10

Mississippi

WB5FHA 4500- 29- 9

Missouri

WØEEE 97,440-174- 28
WA9ZQT/Ø 24,300- 81- 15

Nebraska

WØQNP 11,960- 46- 13

New Hampshire

WB6IPR/1 2380- 17- 7

New Mexico

WB5ORF 22,500- 75- 15
WA5YTX 1200- 15- 4

N.Y.C. - L.I.

WB2WXS 36,360-104- 17
WA2YEI 11,440- 52- 11

North Carolina

WB4SXX 25,200- 70- 18
WA4MWP 2040- 17- 6
WA4DWC 1500- 15- 5

Northern Florida

WA4KAM 12,800- 64- 10

Northern New Jersey

K2IFJ 41,800- 95- 22
W2HTR 38,000-100- 19
W2KHT 34,960- 92- 19
WA2EJZ 5400- 27- 10

Northern Texas

K5VTA 76,960-148- 26
W5ZSX 28,900- 85- 17
W5SOD 5600- 28- 10

Ohio

W8GDC 31,160- 82- 19
WB8UKX 29,820- 71- 21
W8DWP 20,160- 63- 16
W8YGR 17,920- 56- 16
WB8RKA 15,870- 66- 12
WA8NEK 5120- 32- 8

Oklahoma

K5LMG 56,660-121- 23

Orange

KØGJD/6 132,000-200- 33

W6UGT 20,280- 78- 13
WA6TMY 10,600- 53- 10
WA6LSL 5760- 32- 9

Oregon

WA7ZUQ 4640- 29- 8

Rhode Island

WA1UPL 25,200- 70- 18

Sacramento Valley

W6KYA 22,440- 66- 17

San Francisco

W6ZT 71,500-143- 25
W6BIP 39,420- 73- 27
K6JFY 880- 11- 4

Santa Barbara

K6QPH 81,000-150- 27
W6PRP 2660- 19- 7

Santa Clara Valley

W6PAA 133,320-202- 33
W6CLM 24,600- 82- 15
WB6HWQ 14,620- 43- 17
W6KZJ 7680- 32- 12

San Joaquin Valley

VE3DXV/W6 114,180-173- 33
WB6RWM 24,320- 64- 19
WB6TQS 21,200- 70- 15
WA6KMW 10,920- 42- 13

Southern Florida

K4HWN 40,040- 91- 22
WA4LWL 11,700- 45- 13

Southern Texas

K5PFL 151,192-211- 36
WA5TPO 37,060-109- 17
W5BWM 21,360- 89- 12

Tennessee

WA4MKU/4 18,200- 65- 14

Vermont

W1PEG 9000- 50- 9
W1GPM 1400- 14- 5

Virginia

K4IAF 109,440-171- 32
W4WSF 15,000- 50- 15
K4WVT 8600- 43- 10
W4KMS 8580- 39- 11

Washington

K7EFB 960- 12- 4

Western Pennsylvania

W3HDH 15,000- 50- 15

Wisconsin

W9HE 64,680-147- 22
W9YT 51,060-111- 24
WB9NME 11,760- 49- 12
K9DAF 2240- 28- 4

VE PHONE

Nova Scotia

VE1ABR 18,330-195- 47

New Brunswick

VE1ANH 35,724-229- 78

Quebec

VE2JQ 182,988-598-153
VE2GA 40,736-304- 67
XJ2QO 10,508-142- 37
VE2WA 8976- 88- 51

Ontario

VE3BMV 308,566-873-171
VE3FFA 224,466-774-145
VE3HUM 151,174-577-133
VE3BLK 131,826-519-127
VE3DAC 89,520-373-120
VE3ECP 55,536-312- 89
VE3AKG 19,886-163- 61
VE3DH 2560- 64- 20
VE3JT 2508- 66- 19
VE3ERH 918- 27- 17
VE3GSW 390- 15- 13

Manitoba

VE4MR 9792- 96- 51

Saskatchewan

VE5DX 235,910-761-155
XJ5RA 231,936-768-151
XJ5VK 195,440-698-140

Alberta

CY6AMR 83,720-455- 92
VE6ATT 72,720-360-101

VE6BEP 45,120-282- 80
VE6BS 33,440-209- 80
CY6MD 32,250-215- 75
VE6BAF 11,616-121- 48

British Columbia

XJ7WJ 493,600-1234-200
VE7IQ 39,246-211- 93

Yukon

VE8AN 8- 2- 2

U.S.A. PHONE

Alabama

WB4ASV 9020- 41- 11

Arizona

W7AYY 28,140- 67- 21

Arkansas

WA5RTG 39,840- 83- 24

Colorado

WBØLLR 66,640-119- 28

Connecticut

WA1SQB 28,120- 74- 19
WA1CUN 8320- 32- 13
W1DGL 3640- 26- 7

Delaware

WA3VKZ 6120- 34- 9
K3YBW 5220- 29- 9

East Bay

K6PJ 1280- 16- 4

Eastern Massachusetts

WA1PQY 4060- 29- 7

Eastern New York

W2PQZ 43,260-103- 21
K2ARO 20,100- 67- 15

Eastern Pennsylvania

K3CQR 65,500-131- 25
W3ETB 15,900- 53- 15
WA3UZD 8400- 42- 10

Georgia

W4YWX 135,330-205- 33
K4KZP 33,180- 79- 21
W4GKI 7680- 32- 12
WA4IYB 4860- 27- 9

Hawaii

KH6IJ 4140- 23- 9

Illinois

WB9HAD 47,520-108- 22
W9JAY 36,540- 87- 21
WB9MLY 13,000- 50- 13
WB9DVQ 4500- 25- 9
WA9LUD 1320- 11- 6

Indiana

WB9MDB 30,800- 70- 22
W9LKI 8880- 37- 12
W9AGH 5400- 30- 9

Kansas

WØAGN 26,880- 64- 21
WØIUB 19,520- 61- 16

Kentucky

WB4OSS 21,606- 54- 20
W4KFB 15,600- 60- 13

Louisiana

W5WG 45,560- 97- 24

Los Angeles

W6HX 61,021-113- 27

Maine

W1GKJ 13,500- 45- 15
W1CBQ 7000- 35- 10
VE2CK/W1 6380- 29- 11
W1OTQ 2380- 17- 7

Maryland - D.C.

WA3UHJ 34,440- 82- 21
W3YHR 28,520- 62- 23
W3HVM 25,840- 76- 17
K3IXD 17,340- 51- 17
LU1BAR/W3 13,440- 48- 14
WB4ORF/3 7540- 29- 13
W3GCQ/3 3600- 20- 9

Michigan

WB8RHJ 50,600-115- 22
W8WT 23,940- 63- 19
WB8CKW 12,480- 48- 13
W3GN/8 9240- 42- 11

Minnesota

WBØMAO 360- 6- 3

Mississippi

W5UCY 13,160- 47- 14

Missouri

WØEEE 68,040-126- 27
WA9ZQT/Ø 17,600- 55- 16

New Hampshire

WB6IPR/1 8600- 43- 10
W1ZPA 5400- 27- 10

New Mexico

WA5YTX 19,200- 48- 20
WB5HAE 5120- 32- 8
W9TIL 4500- 25- 9

N.Y.C. - L.I.

WB2HZH 30,400- 80- 19
WB2WXS 20,740- 61- 17
WA2SRH 5600- 28- 10
WB2NDR 5000- 25- 10

North Carolina

WA4MWP 6240- 24- 13
WA4BSN 3000- 15- 10
WA4DWC 400- 5- 4

Northern Florida

W4LWP 12,480- 48- 13

Northern New Jersey

WB2APO 30,260- 89- 17
W2FFQ 24,000- 75- 16
W2PCR 5760- 32- 9

Northern Texas

K5VTA 48,160- 86- 28
W5SOD 9520- 34- 14

Ohio

WB8UKX 79,500-159- 25
W8YGR 9840- 41- 12
W8KNZ 7920- 38- 11
WA8NFK 7480- 34- 11
W8MXO 5600- 35- 8

Orange

WA6MOK 24,120- 67- 18
WA6TMY 4680- 26- 9

Sacramento Valley

W6KYA 23,180- 61- 19

San Diego

W6JOT 52,800-110- 24
W6CHV 28,900- 85- 17

Santa Barbara

W6PRP 18,360- 51- 18

Santa Clara Valley

W6PAA 42,240- 88- 24
WB6HWQ 11,180- 43- 13

Southern Florida

WB4OSN 35,040- 73- 24
WB4OGW 9960- 43- 12
WB2GLT/4 8880- 37- 12

Southern Texas

K5OOU 41,500- 83- 25
W5OP 4400- 40- 11
K5BY 880- 11- 4

Tennessee

K4YEH 38,180- 83- 23
WB4DKM 22,420- 58- 19
WB4WHE/4 7260- 33- 11
WB4WFT 1320- 11- 6

Vermont

W1PEG 480- 12- 2

Virginia

W4WSF 110,980-179- 31
W4KMS 16,660- 49- 17
WA4BIX 9100- 35- 13

Washington

K7EFB 20- 1- 1

Western New York

WB2LEI 9680- 44- 11

Western Pennsylvania

W3QXF 90,600-115- 28
K3LVO 2500- 25- 5

Wisconsin

WB9NME 18,240- 57- 16
WB9LKC 880- 11- 4

30th VHF Sweepstakes

A shortened exchange this year and the traditional affiliated-club competition highlight this first operating activity of the new year.

The ARRL Contest Advisory Committee has, after considerable study, recommended the following change for the VHF SS, beginning in 1977: The exchange will consist of consecutive serial number (beginning with no. 1), signal report, and ARRL section. This is shorter than the exchange used in the past.

New log forms are available, reflecting the changes, fifty contacts per page. Send an s.a.s.e. for your logs now. Be sure to postmark your entry no later than February 9, 1977. – *WA1STN*

Rules

1) *Eligibility:* Amateur operators in any ARRL section (see page 8) operating at home, or mobile or portable *under one call,* on or above 50 MHz, are invited to take part. Yukon-N.W.T. (VE8) counts as a separate multiplier.

2) *Object:* Participants will attempt to contact as many other stations in as many ARRL sections as possible.

3) *Contest periods:* The contest starts at 2:00 P.M. your local time, Saturday, January 8, 1977, and ends at midnight, Sunday, January 9, 1977. Contacts between stations in different time zones can be counted only when the contest period is in progress in both of the zones concerned.

4) *Exchanges:* Contest exchanges, including all data shown in the sample, must be transmitted and receipted for as a basis for each scored point.

5) *Scoring:* (a) Contacts count *one point* when the required exchange information has been received and acknowledged, a *second point* when exchange has been completed in both directions. A section counts only once for multiplier credit regardless of band. (b) Foreign entries: All contacts with foreign countries (such as Mexico and the Bahamas) count for score. All foreign countries are grouped together as one, and a section multiplier of *no more than* one may be claimed for contacts with all foreign stations contacted. Foreign stations may only work stations in ARRL sections for contest credit. Foreign stations will give their country name in the exchange. (c) Final score is obtained by multiplying total contact points by the sum of the different ARRL sections worked (the number in each of which at least one SS point has been credited) plus 10.

6) *Conditions for valid contact:* (a) Repeat contacts on other bands confirmed by completed exchanges of *up to two points per band* may be counted for *each different station* worked. (Example: K6SSN works K7PXI on 50 and 144 MHz for complete exchanges of 2 points on each band, 2 × 2 = 4 points but only *one* section multiplier.) (b) Crossband work may not be counted. (c) Portable or mobile station operation under one call, from one location only, is permitted. (d) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest (with the exception of family stations, where more than one call is assigned to one location by FCC/DOC). (e) Contacts with aircraft mobiles cannot be counted for section multipliers. (f) Contacts made by retransmitting either or both stations do not count for contest purposes.

While no minimum distance is specified for contacts, equipment in use should be capable of real communications (i.e., able to communicate over at least a mile.)

7) *Awards:* Entries will be classified as single- or multi-operator, a single-operator station being defined as one manned by an amateur who neither receives nor gives assistance to any person during the contest period. Certificates will be awarded in each ARRL section to the top-scoring amateur in the single-operator classification. Multi-operator work will be grouped separately in the official report of results in *QST*; outstanding multi-op efforts will receive certificates.

8) *Conditions of entry:* Each entrant agrees to be bound by the provisions of this announcement, the regulations of his licensing authority, and the decisions of the ARRL Awards Committee.

9) *Reporting:* Reports must be postmarked no later than February 9, 1977, to be considered for awards.

10) *Information on affiliated club competition and disqualification criteria is on page 73 of QST for January, 1976.*

	NR	*CALL*	*REPORT*	*QTH*
EXCHANGES	Consecutive Serial Number	Your Call	Signal Report	Your ARRL Section
SAMPLE	NR 1	K9HMB	579	IL

43rd ARRL International DX Competition . . .

. . . featuring specialized categories of competition again this year, all-new handsome certificates, and more sunspots (we hope!).

Although FCC no longer requires portable identification, ARRL DX Competition entrants (and entrants in *all* future contests) are required to sign portable when they are *operating in a call area different than that indicated by their call sign*. Thus, WA1STN, licensed in Connecticut, *does not* have to sign portable if he is operating from New Hampshire, but *does* if he is operating from New York.

High- and low-band categories continue for one more trial year in 1977; a final recommendation will be made by the Contest Advisory Committee before the 1978 Test. Also, single-operator and multi-single entrants are reminded that logs must be submitted in chronological order, *not* band-by-band. Entries must be postmarked no later than April 18, 1977. Please include pictures and soapbox comments. Good luck! — *WA1STN*

Rules

1) *Eligibility:* Amateurs worldwide, operating fixed stations, are invited to participate.

2) *Object:* Amateurs in the 48 contiguous United States and Canada will try to work as many amateur stations in other parts of the world as possible. Other amateurs work W/VE.

3) *Conditions of entry:* Each entrant agrees to be bound by the provisions of this announcement, by regulations of his licensing authority, and the decisions of the ARRL Awards Committee. The ARRL Awards Committee will void or adjust entries as its interpretation of these rules may require. Its decisions will be final.

4) *Entry classifications:* Entries may be made in either or both the phone or cw sections. Cw scores are independent of phone scores. Entries will be further classified as single- or multi-operator stations. Single-operator stations are those at which one person performs all the operating, logging and spotting functions. Multiple-operator stations are those obtaining any assistance, such as from spotting or relief operators, or in keeping the station log and records. Single-transmitter, multi-operator entries will be recognized as a distinct category from multi-multi. The use of electronic or mechanical devices or any other methods of simultaneous operation on two or more bands is prohibited. Two transmitters simultaneously on one are prohibited. *The use of spotting nets (operator arrangements involving assistance through DX alerting nets, etc.) places an entry in the multi-operator category.*

Single-operator stations may enter in the all-band, high-band or low-band categories. The all-band class may use any combination of legal amateur bands; the high-band class is for those using only 20, 15 and 10; the low-band class is for those using only 160, 80 and 40. Single-operator stations may enter in only one class and that class must be clearly indicated on your summary sheet. Operation on a band not allowed in your class (i.e., operating on 20 while competing in the low-band class) is permitted although those points cannot count toward your score. For those competing in either the high-band or low-band class, it is recommended that a separate list of any QSOs made on a band(s) not within your class be submitted for checking purposes. Multi-operator stations may compete only in the all-band class.

A person(s) able to operate for only one of the two weekends (be it one cw or one phone or one of each) from a country different from that in which the operator(s) normally lives may submit a log in the "one-weekend EXpedition" class. Such logs will be listed separately in the results. Operation from the 48 contiguous United States or Canada is not valid for this class.

5) *Contest periods:* There are four weekends, each 48 hours long; two for phone work and two for cw.

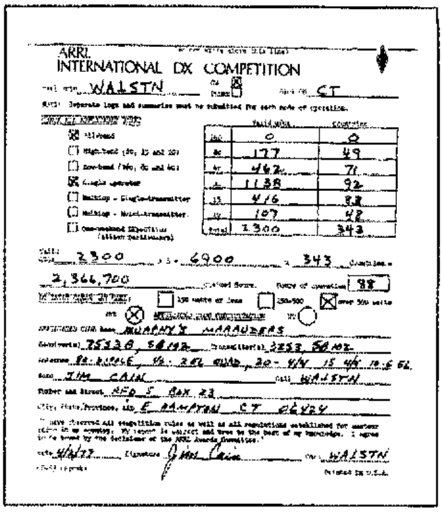
6) *Valid contacts:* In the phone section, all claimed credits must be made voice-to-voice. In the telegraphy section, only cw contacts count. Cross-band contacts may not be counted. Three points are earned for each completed two-way exchange. Incomplete QSOs will not count for contest points or multipliers. The same station may be worked again for additional points if the contact is made on a different frequency band.

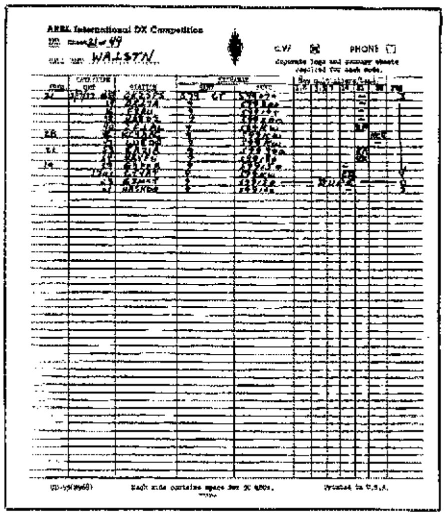
7) *Exchange:* (a) Amateurs in the 48 contiguous United States and Canada transmit a two- or three-figure number, representing the RS(T) report, plus state or province. (The latter may consist of an appropriate abbreviation.) Example: WA8VRB might transmit "579 MI" on cw, "57 Michigan" on phone. (b) Other amateurs will transmit five- or six-figure numbers, each consisting of the RS(T) report plus three "power" numbers. The power indicator will represent the approximate transmitter power input. Example: OZ1LO, with 150-watts input, might transmit "579150" on cw, "57150" on phone.

8) *Scoring:* W/K and VE/VO stations multiply total points earned under Rule 6 by the number of countries worked on one band plus the number of countries worked on each other band. All other stations multiply total points earned under Rule 6 by the sum of the number of continental states and VE/VO licensing areas worked on each band.

1977 Contest Periods

PHONE STARTS	ENDS	CW STARTS	ENDS
Feb. 5 0001 UTC	Feb. 6 2359 UTC	Feb. 19 0001 UTC	Feb. 20 2359 UTC
Mar. 5 0001 UTC	Mar. 6 2359 UTC	Mar. 19 0001 UTC	Mar. 20 2359 UTC


ARRL INTERNATIONAL DX COMPETITION


ARRL International DX Competition

There are 48 continental states plus VO and VE1-VE8, a possible total of 57 multipliers *per band.*

9) *Reporting:* A summary sheet, log sheets and a DX checkoff sheet for each band used (CD-175 or CD-175A or facsimile) are required from all W/VE/VO entrants (except KH6 and KL7). DX entrants (including KH6 and KL7) must submit log sheets and a summary sheet. Separate logs, summaries and check sheets (when required) are required for each mode used from all entrants. Single-operator and multi-single entries must submit logs arranged chronologically *not* on a by-band basis.

Contest reports must be postmarked no later than April 18, 1977, to be eligible for *QST* listings and awards. All DX competition logs become the property of the American Radio Relay League and none can be returned.

10) *Awards:* To document the performance of participants in the ARRL International DX Competition, a full report will be carried in *QST*. In addition, special recognition will be made as follows: (a) A personalized plaque will be awarded to the highest single-operator DX phone and cw station (non-W/VE) in each continent. (b) On both phone and cw, a certificate will be awarded to the highest-scoring single-operator station in the all-band, high-band and low-band categories in each country, in Alaska, Hawaii and in each of the contiguous U.S. and Canadian ARRL sections (see page 8 in any *QST*) from which a valid entry is received. In addition, a certificate will be awarded to the highest-scoring multi-single and the highest-scoring multi-multi station in each W/VE call area and DC country from which a valid entry is received. (c) A certificate will be awarded to each non-country winner DX entrant making 1000 or more QSOs on *either* mode.

11) Information on affiliated club competition and disqualification criteria is on page 73 of *QST* for January, 1976.

Strays

Rules for Life Membership

1) A paid-up Life Membership in the League shall be available to any Full or Associate Member, other than a Family Member, upon payment of a fee twenty times the annual dues rate and upon approval of the application by the League's Executive Committee.

2) The Life Membership fee for U.S. applicants is currently \$180, for Canadian applicants \$200, and for other applicants \$210, all in U.S. funds.

3) An applicant may choose an alternative time-payment plan of eight installments (\$22.50 for U.S. applicants, \$25.00 for Canadians, and \$26.25 for others) payable on an annual quarterly basis over a two-year span. In such instance, he will be provided an interim two-year Full Membership certificate. Upon completion of the payments, Life Membership will be granted.

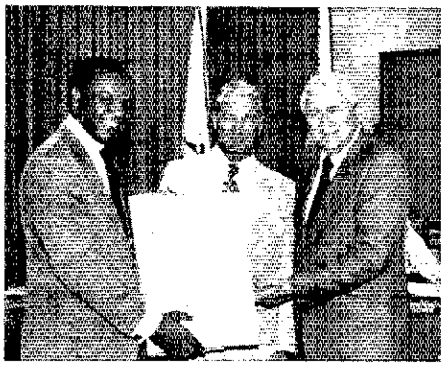
4) Life Memberships are nontransferable, and dues payments are nonrefundable. In the event an applicant is unable to complete payments on the installment plan within the two-year span, he will be given a term of membership, at the annual dues rate, commensurate with payments received.

5) Other licensed amateurs in the same family, and at the same address, of a Life Member may retain or obtain Family Membership upon payment of the annual dues of \$2, but without receipt of *QST*. The dues of the Family Member may be prepaid for any number of years in advance, but there is no special rate.

6) A paid-up Family Life Membership in the League shall include provision for regular Life Membership to be acquired upon the additional payment of the difference in dues normally required, if otherwise qualified, should the principal Life Member die, become divorced or separated from the family member concerned. Family Life Membership dues are currently \$40.00.

7) Life Membership is also available to blind amateurs upon payment of a fee of \$40, without the receipt of *QST*.

□ When it's easy to say "let somebody else help," retiree Howard Barnes, K6QWH, had no hesitation about getting involved. While handling crowd control for a television filming, a hostage situation developed nearby, so the former Los Angeles Police Department officer intervened and sustained a leg wound, but stopped the suspect. California Attorney General Evelle Younger presented him with a Certificate of Valor. Howard also received the Meritorious Award from Edward Davis, Los Angeles chief of police.



STOLEN EQUIPMENT

□ From car in Stamford, CT, area: Clegg FM-DX, serial no. HM262, Social Security no. on bezel, 055-18-2038. Jerome Goldman, K1NPE, 203-847-8778.

Results, 1976 ARRL Bicentennial Celebration

No, there's no waiting 100 years for another. Future operating events to be affected by lessons learned July 24-25, 1976.

By Jim Cain,* WA1STN

Ever notice how the past is often celebrated by trying to re-create it? Bicentennial beards, fife-and-drum corps, outlandish clothing, everything but 1776-style smallpox for reality's sake.

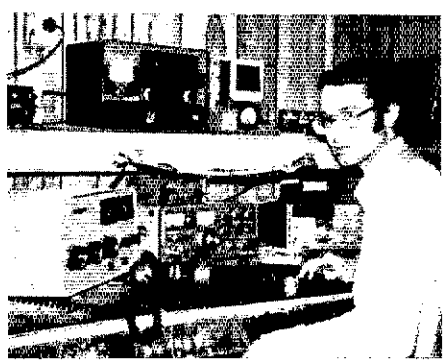
In the two hundredth anniversary year of the signing of the Declaration of Independence, radio is barely one-fourth as old as the Republic. The wireless age emerged early in the history of our bold experiment but late in the 5,000-year history of man if we assume that our time left is limited. Two-way communication via the ether is merely one of man's present fancies, undoubtedly destined to be replaced by some other mode. In 1976 millions can remember when there was no radio, and some of us may live to see a day when our Drake Lines and TS-820s are merely doorstops to the transporter rooms. Just putting things into perspective.

While much of the globe's population is concerned only with where its next spoonful of gruel is coming from, we sit at our radios talking to fellow citizens of the world.

While much of the globe's population is concerned only with where its next spoonful of gruel is coming from, we sit at our radios talking to fellow citizens of the world. Two hundred years of American technology have brought us instant personal communications as a leisure-time hobby, basically unencumbered by governmental regulation and restriction, all within the reach of even those of modest means. Since the same technological growth has also given the world nuclear overkill, our mission is to use our own small chunk of 20th-century magic to advance the causes of peace and understanding.

In the early days of the New World, colonists were burning each other at the stake for being "witches" – defined as those who disagreed with the status quo and who advocated something other than Puritan mores. Scientific discovery was not entirely abandoned, but imagine what those ancestors of ours, a mere dozen or so generations ago, would have thought of the prospect of any kind of communication at distances farther than that between which two people could shout at each other. Radio would have been viewed as witchcraft indeed! It was a full century after the Revolution before even the telephone was invented, and nearly a half-century after that before wireless became a tool of use to society. We've lived with it all our lives, yet radio is an infant.

Radio amateurs of the U.S. and the world joined in a 200th birthday celebration the fourth weekend of July, 1976. Considering the thousands of citizens with all manner of special interests it is significant that we as a group did anything special at all. It is also worthy of note that what we did was operate *on the air*; no Bicentennial technical forum, no 200th-birthday repeater-in-the-sky, no national moment of silence for dead and departed DXers. We celebrated by holding a contest, a 48-hour activity doing what we do best: communicating.



Top scorer K7NHV leaves the Contest Advisory Committee next month after serving as its chairperson.

We of the 20th century are here merely by accident and have the gift of radio by virtue entirely of our place on the meterstick of evolution.

Amateur radio as a celebration didn't start on July 24th and end the next day. Every time we use our radios we take advantage of a unique position in history. We have available something which was unknown to 99 percent of mankind to date. Our July extravaganza was special but it was still merely an extension of what we do every day by operating. The founding fathers would be astonished to see citizens, who are in their own homes, sit in front of metal boxes and speak to them as if they were human. But undoubtedly when they signed that declaration they *knew* some interesting things would be happening about which they could only dream.

We of the 20th century are here merely by accident and have the gift of radio by virtue entirely of our place on the meterstick of evolution. If instant communication has done nothing to bring the world closer together, if it has enhanced wars instead of preventing them, it cannot be blamed on us as hams, only on us as people. When most of the populace is moaning about being merely cogs on some giant unstoppable wheel, we have at our fingertips the ability to foster worldwide understanding. That is our *real* Bicentennial mes-

*Asst. Communications Mgr., ARRL

WA7WXY, aka WA1PID, aka WA8VRB, didn't use any of those calls in the celebration. Rick signed W7YB from Montana for the number-2 score.

sage, our real celebration, something we can be as proud of every day as we were on July 24 and 25, 1976.

The celebration worked. Obviously it was the biggest single weekend activity in amateur radio history. The big question now is how will everyone manage to live another 100 years for another one? The answer is that won't be necessary. July 9-10, 1977, has been set aside on the calendar for another event, details as yet not worked out. We're calling it the "Celebration Plus One," but probably that won't stick for long.

The Contest Advisory Committee, along with staff liaison W1YL hammered out the details for the 1976 event; footwork by the Headquarters contest branch insured adequate prior notice via *QST* and in foreign society journals. Input from interested contesters, never overwhelming, had a slight influence on the final form the celebration took, but primarily it was the CAC who took the ball and ran with it. They deserve to take a bow.

Logs received for the celebration were about the same quantity as for a November SS: around 2500. That is 2500 different stations though, so the number of individuals reporting activity was roughly 25-30 percent higher than any ARRL-sponsored event past. Entries from DX-types were disappointing but could have been predicted. The typical comment was that "the Ws were so busy working each other they didn't hear us." We'll try to encourage less of that next time, with some bonuses.

Top score boxes tell the story. There were good "runs" of DX contacts to be made if the beam was headed in the right direction. East Coasters were treated to one of the best 20-meter openings to Japan in recent memory. Overall conditions were excellent, with 15 and 10 sounding like they had a month earlier, during FD. Nobody ever ran out of stations to work!

Awards should be appearing in mailboxes about the same time as this issue of *QST*; we ran out and had to order an additional 500. We didn't figure on having about 80 percent of the entrants making at least one of the awards levels.

Speaking of awards, it seemed that much of the activity was spawned by the availability of certificates for not-to-difficult accomplishments. As a result, we have just completed a November Sweepstakes in which awards were available for making 200 contacts. If activity and log returns indicate that the added incentive helped pick up activity, then some serious thought will be given to an expanded awards structure in all ARRL operating events.

Keep your eyes on upcoming *QST*s for details on the July, 1977, event. The Open CD Parties will be held in October, 1977. The July CD Parties have been canceled in favor of the "Plus One."

If you haven't received your Bicentennial Celebration award by mid-December, let us know. See you next July.

Soapbox

With reference to the exchanges given in the March *QST*, to wit: "U.S. amateurs send signal report, state name and state entry number into the Union." Well, I gave the signal report faithfully, and to about my first 40 contacts, I *stated* my name, which happens to be Ed, and told them that Georgia was no. 4 into the Union. It took me that long to figure out that either I was messed up, or everyone else was. I might add that State when used in the context of the instructions, is a proper noun, and as I am fond of telling my older son, deserves recognition by

Table 1

DX QSOs by U.S. Participants

AB6YBL	867	WB9LHI	455
W6PAA	784	AH6GQW	453
K7RSC	711	AC7YTN	448
AC6RTT	668	W2GXD	446
K6OVJ	636	W6BVN	443
WA3HRV	610	WA1STN	441
WA6WZO	556	AD3GDJ	439
KH6IJ	532	W1BGD/2	436
W7TML	525	W1ZA	435
AB6DSV	502	WB6LXS	426
AD6KS	476	K7NHV	423
AD3EST	462	W5WZQ	420
AA6MQS	457	AL7HCN	403

being capitalized. In any case if was one helluva party for the United States of America (K4DJC). Why don't these guys use check sheets? I had the same stations call me as many as *five* different times. Finally I gave up trying to explain that it was a dupe contact and just worked 'em again, then crossed out the contact (WB8WHS). Casual operating on 7 MHz with a low dipole produced a contact about every 8 minutes, 13.043 seconds (WB9PPL). I think that we should thank all the DX stations, who helped make the celebration more interesting (AA9AKT). The overall manner in which the amateurs conducted themselves could only be termed superlative and I cannot think of a better way to celebrate our 200th anniversary than "CQ USA" (AD1LJS). I worked all colonies and got a clear view of U.S. history and enjoyed myself very much, but New Mexico didn't enter my shack. Hams of New Mexico, please call me or write me for a sked on 14 MHz (PAØATY). I averaged about 6 contacts, 6 cigarettes and 3 cups of coffee per hour. That ought to qualify me for something. Good thing the bathroom is

Howie; AD9UKM and Nancy, AB2HGN, both managed to earn certificates from this Lake Zurich, IL, shack. Two of the cutest youngsters you ever saw preclude much dual operation as pictured.

Table 2

CW QSOs by U.S. Participants

W7TML	1092	W5ZSX	834
WA3HRV	1065	W5MYA	789
AC6RTT	1045	AC4OZF	760
K6OVJ	1010	W7YB	755
K7NHV	996	W8FAW/4	733
AD3EST	994	W2GXD	708
AD4TIG	970	K5DGI	708
AC8CQN	969	AD3GJD	684
W5WZQ	960	WA2IYH	675
AD4BAI	943	AD5FVA	641
AC5RTX	894	AD8RMK	628
WA1STN	875	K7RSC	617
AA1LKX	866	AA8NYB	612
K5PFL	865	W3CRE	600

Band Breakdowns for W/VE over 1776 QSOs (VHF not inc.)

	Total PH/CW	*80 PH/CW*	*40 PH/CW*	*20 PH/CW*	*15 PH/CW*	*10 PH/CW*
K7NHV	2301/996	45/9	118/153	1772/799	269/31	97/4
W7YB	2279/755	94/1	111/62	1925/692	102/0	47/0
WBØDJY	2273/492	66/0	365/67	1509/425	268/0	65/0
K7RSC	2094/617	42/0	501/164	1385/437	135/16	31/0
AB6YBL	2262/360	6/0	278/81	1221/279	631/0	0/0
WA7NIN	2621/0	46/0	539/0	2020/0	16/0	0/0
W5WZQ	1582/960	0/3	377/251	892/699	256/7	57/0
W5MYA	1741/789	57/0	188/201	814/542	373/46	308/0
WA3WIK	1924/568	395/31	887/200	498/337	112/0	32/0
AD5FVA	1850/641	48/0	31/120	1031/479	536/42	190/0
W2GXD	1772/708	367/64	511/162	712/482	120/0	62/0
K4PUZ	1944/492	0/0	526/254	959/237	417/1	42/0
K6OVJ	1408/1010	34/2	242/258	950/744	95/0	0/0
K5PFL	1533/865	19/0	398/352	691/472	361/41	64/0
W6PAA	*					
AA8PLZ	2287/36	386/10	981/26	845/0	65/0	0/0
AC6RTT	1275/1045	1/0	88/236	1111/808	8/1	0/0
W7MRS	1702/578	52/0	92/235	1558/343	0/0	0/0
W8FAW/4	1519/731	106/12	473/206	687/478	250/35	3/0
KØGXR	1565/680	95/25	470/80	829/459	179/16	52/0
AC5RTX	1352/888	85/0	40/192	850/665	221/31	154/0
W5RUB	1753/486	115/14	390/158	711/308	317/4	214/2
AD4BAI	1294/943	41/9	89/270	622/661	367/3	175/0
WA2WMT/Ø	1952/250	69/0	335/70	1077/108	464/72	0/0
AD8RMK	1561/628	367/95	649/266	526/267	19/0	0/0
K9BGL	1682/504	251/5	374/174	818/314	11/11	228/0
AD3EST	1190/992	133/33	10/471	656/450	182/38	209/0
W3ABT	1673/430	479/24	580/158	611/248	3/0	0/0
W8LT	1708/393	331/68	1001/172	373/153	0/0	0/0
XJ7WJ	1943/143	0/0	252/0	1394/143	228/0	69/0
WB4FZQ	1541/541	170/0	387/199	826/326	158/16	0/0
WAØCPX	2057/0	1/0	512/0	1543/0	0/0	0/0
W7TML	950/1092	21/8	120/313	670/745	129/26	10/0
WA1STN	1140/875	91/24	518/346	416/505	24/0	91/0
AC5TMN	2015/0	41/0	216/0	1058/0	298/0	400/0
WA2IYH	1336/673	288/31	12/28	1021/599	15/15	0/0
AA1LKX	1140/866	140/95	125/125	568/624	306/22	1/0
W3CRE	1374/596	6/3	923/66	394/516	0/2	0/0
AD5YMY	1527/440	167/3	207/1	678/430	301/10	174/0
AA4LZR	*					
AC4OZF	1150/760	0/4	35/142	318/557	176/49	621/8
AA4KKP	1473/436	396/89	519/268	547/79	11/0	0/0
W1ZA	1659/244	214/47	38/12	1150/175	89/10	168/0
AC9YH	1614/278	352/0	664/109	478/169	61/0	36/0
AD3GJD	1204/679	191/27	251/268	739/384	23/0	0/0
W1AF	1354/526	232/36	280/253	784/237	58/0	0/0
W1BGD/2	1442/435	199/0	0/0	1011/435	0/0	232/0
AD4TIG	886/970	98/16	178/242	466/691	112/21	32/0
W6HX	1821/34	0/0	152/0	1652/34	16/0	1/0
WA3HRV	782/1065	94/51	22/408	417/571	115/35	134/0
WA4TYL	*					
AB2RJJ	*					
WA6WZO	1834/0	10/0	26/0	1535/0	219/0	3/0
WAØLKL	1539/295	95/0	179/201	982/94	322/0	0/0
AC9SZR/3	1393/435	234/40	1101/381	7/14	43/0	8/0
W1FLM/3	1449/371	365/55	702/177	277/133	105/6	0/0
AC8CQN	849/969	0/10	577/338	197/621	75/0	0/0
WA1QNF/1	1345/471	551/5	185/100	605/366	4/0	0/0
K5DGI	1106/708	0/0	77/117	704/553	325/38	0/0
AA2PJL	1065/724	249/66	217/127	598/531	0/0	0/0
KØSCM	1784/0	138/0	270/0	1028/0	176/0	172/0
W5ZSX	950/834	0/0	122/410	675/423	139/1	14/0
AA8NYB	1164/612	11/8	262/406	314/678	20/55	0/22
AC9MIJ/4	1776/0	14/0	763/0	746/0	162/0	91/0

*Breakdowns not supplied.

next to the shack (WN9UJM). Too bad the bands weren't open. Would have been a lot of fun (WA3ZXY). Propagation was great, everyone was 5NN (WA2BYX). Please, please, have more events like this one, where the average amateur has a chance of achieving something. Your other contests only award those people/clubs who have the time and money to specialize in contest operations. The rest of us just contribute to their success and come away with nothing to show for it (WB5UII). [Hope you were able to obtain the 200 QSO award in the November Sweepstakes. – Ed.] Fortunately, the contest coincided with my birthday, that slight edge allowed me to stay up nice and late, working JAs on 40 without having my parents screaming at me (AA6BFL)! This was one heck of a good operating activity. I haven't had this much fun since incentive licensing. . . . I sure do like contesting and you guys are going to see much more of me . . . look out Sweepstakes . . . FD . . . and any other contest I can get my grubby little hands on (WAØSWC). Making 50 VHF QSOs was complicated by the fact that the rf from the hf station kept blowing the vhf power supply. After the third supply went south, the battery was ripped from the car and pressed into service on 2 meters (WB2JSJ). Now I only need Alaska for WAS – what is the Alaskan area code (WA2QHN)? Worked a number of QRP stations, 3 watts around 14.300 MHz, gave a few Yanks a new country. The phonetics used were amusing. W7 Yogi Bear and W6 Kentucky Fried Worms, which gave Kathryn a hearty laugh (ZL1AGO). Because of a physical disability, I was not going to enter. Had intended to give out points. When I turned on the rig and found that my first QSO was AC1AW, the bug bit me. Went for the 200 QSOs and happy to have made it without neglecting my necessary rest (AA2WCW). Here I am at the deadline again. Sometimes I think my middle name is "JUSTBARELY" (WBØGQP/WØEEE). The distinction between this and a contest is that each station operated against a set of finite goals of varying degrees of difficulty. This allowed meaningful participation by the vast numbers of hams who, as I, are time-limited (W4OYI). The special call was a definite liability during the contest. No one ever got it the first time (N4V/W4PRO). Heard a comment later on 40 ssb that if all contests were held in the General portions of the bands, it would be an incentive for the Generals to get a higher grade of license to get out of the QRM. There might be some merit to that statement (W4OMW). After forty-odd years sitting on the sidelines watching, I decided to jump in

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Scores

States are listed according to entry number into the Union. Scores within each state are listed in descending order. Indicated are total contacts, and letters indicating award levels if appropriate. A for all 50 states, B for 50 or more vhf QSOs, C for 200 or more DX QSOs and D for all 13 original colonies. (Note 200 QSO award is apparent from score listed). DX entries listed by continent and country (alphabetically) with scores given in the same form as those for U.S. stations.

Delaware — 1

AA3LMY/3	1173-A
AD3HBP	524-A
WA3PCC	407
W3TCI	328
W4FRO/3	288
WA3QVJ	228-A
WA3GSM	220
W3WD	214
WA3UHV	65

Pennsylvania — 2

Eastern Pennsylvania

W3ABT (W3IFG,opr)	2103-AC
K3DPQ	946-AC
AA3KOZ	772
AC3HHV	711-AC
K3ONW	631
K3HXS	623
AA3ATX	608-AC
AC3ARK	589
K3MRG	494
WA3WQP	472
AA3YQW	446
WA3SXU	441
AA3ULD	427
WB3ANO	422
K3TEJ	415
AA3SZI	412
AA3YDZ	407
AD3UEI	404-A
W3ADE	319
WA3EUG	314
AA3TPF	312
WA3GJA	306-A
W3CJI	291
AC3EEK	281
K3CQY	270
AC3GWA	268
AA3VZM	255-A
K3EF	247-A
WA3RID	246
WA3RTY	237
K3DTD	234
K3NVO	231-A
AA3ABN	230
AA3WIM	229
WA3AJU	227-A
W3ATJ	226
W3GID	225-A
AA3REY	223
AA3VHV	219
K3RVC	216
AA3ZXY	215-A
AD3HTZ	213
AA3MVP	213
WN3AAL	208
AA3RKH	205
WA3VDQ	205
W3LMA	204-A
AD3MGQ	204
AA3JKU	204
AA3YVU	202
WB3ATA	202
AA3HLH	202
AA3QOZ	174
WA3ZRE	89-B
WN3ABH	71
WN3BGA	2

Western Pennsylvania

WA3WIK (WA3SZX,opr)	3492-AC
WA3TBW/3	1121
AC3HDH	541-A
WA3VJL	444
AC3NUM	400-A
AA3WYV	369-A
AA3JGY	351
K3HZL	349-A
WA3SWF	349
AA3GLG/3	329
AA3DET	289
W3ZX	285
AD3RXK	270-A
WA3WSC	264-A
AA3QJR	258
WA3ZDD	245
AA3PHY	244
WB3AHC	231
K3EXE	230
AC3VW	230
AA3VHY	224
WA3YTA	224
WB8OSM/3	217
WA3GSB	215
WA3VAR	213
W3GXF	211
WA3NOM	210
W3LP	207
AD3JZD	206
K3LVO	205
W3KRM	200
WA3HGW/3	200
WA3ESH	197
WN3AXN	150
WA3LJW	142
K3ZYK	65
AC3HGM	49
AA3WYW	17
WN3ZAH	15

New Jersey — 3

Northern New Jersey

W2GXD(WA2UOO,opr)	2480-AC
AC2MB	1758-A
WA2SZQ	1215-A
WB2SZO	932-A
AA2AJN	840-AC
AB2CST	840
AB2JVN	678
AB2FVO	588-AC
AA2SLF	524
AA2GE2	521-A
WA2DNY	418-C
AC2RAD	410-A
AB2FUE	406
AC2EQK	380-AC
AA2ZWH	369
AA2WXC	358
AC2BXA	352-A
WA2QHN	341
AB2ASD	326
WB2DFQ	307
AA2AYY	304
AB2ZGI	302
WA2PCF	299
AA2BSU	298
K2UFM	294
W2HL	287
K2KUR	269-A
WA2SAJ	265-A
WA2CDD	263
WB2ISX	258
AD2JFJ	254
AA9AEK/2	242
AA2LFK	238
W2BVE	237
WA2YNG	237
AB2KBH	235
WB2WZX	234
WA2NDI	232
WB2WTO	230
AB2MDR	228
AB2LPX	225
W2HN	223
AB2RTF	223
WB2UAM	223
AA2CCF	222
AA2EJZ	221
AA2WSM	221
WA2ZQB	220
AK2EAL	218-A
AA2TXY	218
AA1FBX/2	215
WA3LHA	214
WA2SZW	214
WB2UTO	213
AA2MYS	212
AB2VFT	211-A
AA2TZM	208
AB2GFO	207
W2OPE	206
AA2SBW	205
WB2FRH	204
AA2FZJ	203
WA2IRS	202
AB2YWQ	202
K2MFF	201
WA2QIO	201
AC2HTR	196
W2HFG	194-A
WB2POG	180
WA3ITR/2	106
WA2NYI	103
WN2EIU	72
WN2ASQ	65
WN2CMX	61
WB2BUR	50-B
WA2BYX	36
WB2CKE	31
W2LKH	22
WN2FSL	13

Southern New Jersey

AB2RJJ	1834
K2JOC	1532-C
W2HNQ	818-A
K5VNJ/2	654-A
WA2LBT	650-A
AB2BYU	606-A
AA2ZZX	504
WB2OSQ	502-A
AA2VYA	366
AC2ZG	364-A
AA2IFZ	308-B
WB2DEO	283
WA2VEE	265
AB2BWA	248-A
WA2AWO	243
WB2GPN	231-A
AB2LBT	231
W1DRN/2	230-A
WB9EBR/2	224
WA2WJL	216
AC2FGY	211-A
W2SUA	209-C
WA2AWU	206
WB4NXY/2	206
AB2FIU	205
WB5DBO/2	203
WN2DQM	202
AC2GTN	202
WA2JSG	185
AA2VKG	175
AK2FDV	153
WB2LCZ	115-B
AC2HAZ	60
WB2ALQ	52-B
WB2FFT	46
AK2YSA	29
K2AGB	18
AK2CCJ	14

Georgia — 4

AD4BAI	2237-C
K4DJC	1192-AC
W4RA	997-A
W4LVM	904-A
AB4SMZ	885-A
W4BTZ	802-A
AB4ZNH	588-AB
AC4WRY	557-A
AB4OCS	552
AB4TDH	543
K4BAM	513
WA4DGX	491-A
WB4EDD	473-A
K4BGF	456
W4GTS	420-A
W4MWT	392-A
WA4HVL	354-A
W4MGX	316
WB4HNC	309-A
AD4YI	308
WA4KQL	299-A
AA4CFI	292-A
WA4EVT	289-A
W4JM	280
AD4JSG	278
AA4DPL	275
WA4APG	274
AA4OQO	259-A
W4LDD	243
AD4FRM	240
K4GYH	238
AA4KXY	233-B
AC4ZYQ	229
WA4JTB	226-A
WB4AXZ	225-A
WB4ACV	225
AA4AKU	224
AA4LUC	223
K4LRO	220
WB4VAF/4	219
AC4GKI	216
K2JEK/4	210
WB4KHU	207
WN4OZT	207
AD4FYM	203
K4KSA	201
WB4KXW	200
AA4IYB	193
W4WDH	140
WN4SBT	127
K4CKS/4	109-B
WB4AEG	101-B
AK4DHC	81
WB4WXE	55-B
AA4AGD	51-B

Connecticut — 5

WA1STN	2015-AC
WA1QNF/1	1816-AC
WA1WEM	1534-AC
WA1ERP	1508-AC
WA1NNC	1044-A
K1JHX	1001-AC
AA1UWR	967-A
AA1WVK	858-C
AC1DGL	837
AA1KOC	708
AB2CKO/1	683
W1FBY	559-C
WA1UHN	545
WA1OCU	541
AC1GNR	540
K1ZND/1	492-BC
W1BIH	443-A
AA1TQO	439
K1DM	427-A
AA1UBX	407
WA1WYL	369
WA1TUH	361
WA1AHQ	354-A
WA1BCE	347
AD1WMQ	338
WA1PCN	304
K1TFA	301
W1WP	292
W1TCJ	284
WA1RYL	273
AA1STQ	241
AD1GUD	240
W1ZM (WA2CLQ,opr)	240
AA1RUR	236
AC1CKA	235
AC1WY	235
AC1VH	234
AC1EQ	230-A
WA1ASH	230
AA6IDN/1	230
AC1SP	229-A
W1AB	218
AD1WJB	217
WA1TPR	212
AA1UAX	212
WA1YKM	211
AA1SCV	210
AA1UOU	209
W1YY	208
WA1NDJ	208
AA3YRE/1	207
AA1LOU	204
W1DHT (WA1RYL,opr)	203
AA1SQB/1	203
W1VZ	201
AA1UAW	201
WB4HGD/1	201
AC1TEE	200
WN1WFQ	162
AC1CNU	132
W1KKF	61
WA1SHM	54
WA1UPF	54
WA1YFW	38

Massachusetts — 6

Eastern Massachusetts

AA1LKX	2006-AC
W1ZA (K1LPA,opr)	1903-AC
W1AF (WA1UIK,opr)	1880-AC
K1GSK	1721-A
W1FJI	967-A
K1LU	843-A
AC1PL	681-AC
WA1JHQ	435-A
AC1HWM	316
K1YHM	295
WJAQE	270
KSGQE/1	265
WA1SSX	262
K1ATY	254
WA1QYM	254
AD1OZS	249
AA1MYK	244
WA1NSF	241-A
F5VN/W1	234
AD1L	229
AC1GDB	224
AC1RL	219
AC1DYH	218
K1PTE	212
AC1ESN	212-A
AC1DAF	210
K1CEH	209
AC1EQH	208
W1IAS	208
W1HX	207-A
WA1HON	205
AA1KSF	180
WA1SCH	167
AC1YS	99
AA1IAC	65
AC1OPJ	62
WN1VHY	60
W1DKD	58-B
K1GAO	54-B
AK1UWF	52
AA1DFL	50-B
WA1NNW	50-B
AA1TCP	50
W1HST	34
AA1TWD	13

Western Massachusetts

K1RGF	1627—AC
W1UUK	741
AC1DKU	480
WA1PCJ	253
K1NWE	245
W1STR	222
W1EQO	203

Maryland — 7

AD3EST	2182-AC
W3CRE	1970-AC
AD3GJD	1883-AC
WA3HRV	1847-AC
AC9SZR/3	1828-A
W1FLM/3	1820
W3LPL (WA3ZAS,opr)	1551
AC3USS (WA1FEO,opr)	1427-AB
WA3EPT (WB2MZE,opr)	1120-A
AC3GZQ	1117-AB
CX1EK/AC3	1094-C
AA3TZT	933-AC
K3ZAW	885-A
AA3YMA	618
K2PLF/3	514
WB3MSW	513-B
AC3RAB	512-A
AA3UHJ	469
W3HVM	425-B
AA3RSK	412-A
AD3KSS	408-A
WB3AVN	392
AA3NGL	366
AC8KSB/3	360-A
AA3THD	336-A
AA3UPH	333-AB
K3HPG	326
WA3UYB	318-A
LU1BAF/W3	316
W3FAE	314
W3JPT	312-AB
AC3FCS	303
AB2HWH/3	295
WA4CZW/3	272-A
AD3IXD	265
AB2JYM/3	263-A
AA3PIC	255
K3UMV	249
AD3URZ	245
AA3SOR	245
K7KNM/3	239
AC3DKT	237
WA3VSG	237
W1NK/3	226
WB9NZY/3	222
AA3WRE	221
LU2OC/W3	221
WA3TAI	219-A
K3AZK	217
K3AW	216-A
AD3SDO	214
K3YDX	214
WA3RJS	214
AD3RFB	213
AA3YVN	213
WA3OYW	211-B
WA3NGG	210
AD3IMC	209
WA3VPL	209
W3HII	205
AC3IHM	204
AC3GIS	203
K3PZE	201
AA3YKK	196
WA3UJE	147
W3BXG	107-A
WB3BZU	103
WA3ZYS	75
WA3FSC	73
W3ZSR	72
WB3AGS	70-B
WB3AZH	70-B
AA3YMP	61
AC3KMV	58-B
WA3IKV	46

South Carolina — 8

K4FJC	751-AC
AD4II	593-AC
WA4FDE	589-A
WB4CAK	538
AA4YZC	407-A
AA4EWX	382
AA4DZG	339
WB4UGM	289-A
AD4HQU/4	266
AB4OKA	259-A
WB4QWM	249-A
WB4ZSC	248
WA4LOH	238
AB4IQI	230
K4BZD	226
WB4PAG	218-A
AA4JJZ	213
AB4TNN	213
WA4CSD	204
K4FPF	201-A
WB4JZT	200
K4KXO	122

New Hampshire — 9

WA1ABV	970-A
AD1ACL	351-A
AA1UIG	278
AA1FSZ	269
AC1LQQ	243-A
AC1PFA	237-A
AA1PHQ	228-A
K1HZN	219
AA1PEL	219-A
K1KPS/1	217
WA1NPZ	207
AC1RCC	205
AA1MZV	205
W1VBX	203
WN1VUL/1	122
WN1WJE	118
W1UDB	50
W2SKK/1	14

Virginia — 10

AA4KKP	1909-A
AC9MIJ/4	1776-AC
AD4PQL	1634
AA4TLB	1387
AC4CRW	1225-A
K4IAF	1163-AC
WB4VMB	904-A
WA3EUV/4	615
AA4FRJ	581
AC4CHK	555-A
AD4JM	550
WA4FMS	495-A
W4YZC	450
W4IBJ	448
W4NJF	445-A
W1FRF/4	414
W4EIS	409
AB4OXD	392-C
AA4JQX	388
AB4DLT	371
K4KDJ	363
K4KDN	362
AA4TZM	358-A
AB4QLK	354-AB
K4BMT	339-A
WA4QOC	328-A
AA4AJF	322
AC4FPW	316-A
AB4NFO	314
AA4CGX	312
K4KAA	306
K4EJG	297
AD4JTH	277
WA4DUS	274-A
WB4MJF	259
AA4RBO	256-A
K4BKX	255
W4KAS	249
AB4NWG	248
K4KJN	247-A
W4DM	246
K4DXO	245-AB
W4KFC	245
WB4BRC	244
AB4YDI	243
WB4DBK	242
AD5DZF/4	233
AA4SHL	232
AC4LMJ	231
AB4TBO	229
W4DYV	228
AB4KFB	227-B
AA4MNV	227-A
AB4LLZ/4	227
WA4KYR	226
WA4GPS	224
WB4FTU	224
AD4JNM	223
AC4NM	221
K4LEP	220
AB4AJB	218
AD4CFB	218
AC4KMS	215-A
AC4LGM	212
WB4CCT	211
K4BNI	210
N4V (W4PRO,opr)	209
AA4IOB	208
WB4MMW	208
WA4CMK	207
WA4PNS	207
AC4NQV	205
WN4AKM	203
AB4ZFK	203
AA4EPW	202
AB4AZY	202
AA4EVM	201
AA4GIT	200-A
AA4TRV	200
WB4EVH	188-B
W4HU	178
WA4NOB	121
AD4ADE	103
WB4EBV	85
K4JSI/4	74
WN4BYC	73
WB4WRE	66-B
WA4ABN	63-B
AC4WSF	58-B
W4JVN	54-B
AC4TMN	30
AD4MSG	24

New York — 11

Eastern New York

W1BGD/2	1877-AC
AA2PJL	1789-AC
WA2WSX	1009-A
AD2EQO	987
AB2BXL	882-A
W2NVB (WA2UUH,opr)	455
AA2LJM	445
W2FPG	441-AC
AB2WBD	402-A
AB2FMK	353-C
WB2RUZ	351
WB2RHQ	344
AB2EQO	289-A
AB2GOU	274
WA2UUH	264
K8BBC/2	261
W2HSF	247
AA2YZX	238-A
AA2AUB	226-A
WB2QOH	222
WA2VOR	219
WA2EJG	218
W2OOJ	217
AD2BK	215-A
WX2WJQ	208
AB2WAC	203
WB2FDP	202
WA2CJY	170
WB2WBS	147
WB2ZCM	130
W2YJR	128
W2CXC	55-B
WA2UKP	53-B

N.Y.C. - L.I.

WA2IYH (WB2FLF,opr)	2089-AC
NG2USA (WA2UWA,opr)	1508-AC
WB2PYM	1325-A
WB2JSJ	1108-AB
AC2FVS	1107-A
AB2WRT	1070-A
AB2SJG	1065-C
K2HWL	752-A
WA2YCQ	741
AA2YHK	468-AC
AB2OYV	426
AB2BXO	414
AA2LQO (W2DKM,opr)	352
WB2HZH	325
AA2ZBW	321
WB2MAO	314
AB2NDI	285-AB
AA2PKL	281-B
AB2WXS	278
VP2SM/W2	271-A
AC2MDM	263
AB2ONZ	261
AA2ZL	259-A
WB2PXA	254
K2JPM	244
AA2CIO	241
AB2FOV	239
W2WDD	227
AA2NWW	227
AB2TSB	226-A
W2DKM	226
W2UNS	225
AA2MXI	225
WA2YMX	224
AB2NFL	223
AA5VUW/2	223
AA2MAV	216
AC2UUN	213
WB2DAA/2	212
AA2VPA	211
WB2SZR	211
WA2KUX	209
WB2HDE	207
WA2KRD	206
WA2MGS	202
AA2ROD	202
WA2OVG	201
K2OV$	200
WB2CMF	163
W2GKZ	150
WA2GMD	148
WA2YEI	142
WB2MVS	139
AK2BMU	125
W2SKK	108

Western New York

WB2THS	1390-A
W2RR (WA2MPC,opr)	1014
WA2MBM	884-A
AC2MTA	792
AC2FHU	640
AA2MBP	524-A
WB2WCL	373
AA2HZR	365-A
AA2DRC	346
AA2EJS	300-A
AA2HZO	291
WA2SNE	288
AA2QKF	287
AB2QAX	277
WB9JBP/2	265
W2FTY	248
AB2ABD	248-A
W2GA	247
AC2IAM	246-A
W2KM	246-A
WB2EHF	241
AB2AHB	234
WA2AWX	230-B
AA2ASU	229
WA2IMG	229
WB2UNH	221
AA2CDV	212
W2TFL	212
K2UCJ	210
WA2ZJP	209
AB2H5H	208
WA3JJJ/2	206-A
WA2DKF	202
AC2GN/2	179
W2RFL	89-A
WA2YSJ	75
WN2EFB	53
AA2BPE	52-B
AA2BCK	42
K2KIR/2	35
WA2FAG	20

North Carolina — 12

AC4NQA	1475-AC
WB4MMK	960-AB
WB4DNB	900-A
AB4JYB	735-A
AB4KZG	546-A
K4JEX	503-A
W4HLL	448-A
WA4KCO	407-A
AB4ERM	389
AA4LWO	381
AC4OMW	360
AA4FKI	339-A
K4IZE	336-A
AA4GKR	307
K4JYS	295-A
AB4ZTI	291-A
AA4MWP	283
WA4APD	268-A
K4JO	256
WA4IXT	240-A
WA4INO	229
AC4GDQ	227-A
K4SBO	226
WB4GTP	226
AD4GHR	223-A
WA4DWC	212
WA4HRD	205
WN4JKP	205
K4KSO	204
W4FMN	201
K4NHO	116

WN4FKY 113
K4ZGP 97-A
AK4PSL 50
WN4DLA 40

Rhode Island — 13

K1HMO 776-A
AA1KIP/1 353
AA1MQO 311-A
K1AO (W1GMF,opr) 275
AA1ETM 263
AA1POJ 251
W1GMF 215
WA1KVM 213
AD1COW/1 202
WA1YKW 35

Vermont — 14

AD1IIK 713-A
AA1USM 562
WA1RMJ/1 287
AC1GPM 253
AC1COP/1 223
W1EXZ/m 131
AA1TDR 94
AA1MAG 50-B
WN1UXE 45
WB2MQI/1 23

Kentucky — 15

WA4DCP 743-AC
WA4QMQ 527-A
AB4SIJ 440-A
WB4ZXP 434-A
W4YDL 400
WB4HNH/4 394-A
WA4EBN 333-A
AB4FOT 319
W4OYI 313
AA4KQB 260-A
K4EMX 257
AB4NHO 252
WA4JDP 230
W4RHZ 221
W4YOK 218
WB4ASW 214
W4KFB 213
WN4QQV 211
AB4DCN 208-A
WA4UNJ 208
AB4KTR 205
AK4OWZ 204
WN4KYT 59
WH4YAB 55-B
AK4CMF 54

Tennessee — 16

K4PUZ 2436-AC
W4OMS 1114-AC
AB4WFI 541-A
AB4HZP 517-A
WA4HTB 470
WB4NDX 466-A
W4NBP 449
AB4WHE/4 405
WB4DKM 372
AA4IRH 322-A
WB4IQJ 320
AA4CTA 302-A
AA4LOF 279-A
WB4CHZ 268
WA4AHE 266
WA4CMS 266
WB4RJG 259
WA4IRG 252-A
AA4JVO/4 242
AC4RJC 241-A
WB4EBX 236
WB4NKO 235-A
AA4KGB 221
WA4EJX 220-A
AB4ORP 218-A
AB4GRI 215-A
WB4FNN 213
WB4MUZ 213
WB4ZPG 211
K4VZL 209
WA4GZT 208
AH4KAU 208
AC4EWR 207
W4RPU 207
WA4RNT 206
K4HVA 205
W4LUH 152
AB4PHW 145
WH4ASA 94-A
WB4AVE 50-B
WA4HKF 30
WN4TST 30

Ohio — 17

AA8PLZ (WB8AYC,opr) 2334-A
AD8RMK 2189-C
W8LT (WB8JXS,opr) 2101-AC
AA8NYB 1781-AC
WB8JBM/8 (WB8DQP,opr) 1544
AB8UKX 1246-AC
AB8WHS 933-A
AA8WXT 737-AB
AB8KKI 649
AA3BGE/8 647
AC8UMD (AA8TGX,opr) 516-A
W8QXQ 504-A
AC8ERD 498-AC
AC8BDO/8 495-AC
W8OIK 453-A
AB8JMV 451
AA8YWX 398-A
AB8HLI 388-A
AD8BPX 367
AD8HBN 357-AB
AC8GKM 345-A
AC8BVF 336
AC8GOC 325
WA8CZS 316
K8NEB 311
W8CBA 309-A
AB8SVN 309
AB8WDO 298-A
AB8PJR 297
AI8HKB 295
WB8OAR 289
WB8YZM 270
K8RMN 269-A
AB8AMI 268-B
AB8CLF 265
WB8TLF 264-A
WA8NNO 264
AD8MFQ 252-AC
AD8MLO 252
AB8URG 246-A
W8JXM 246-A
AB8NJJ 243
AB8SVK 243
AB8TFC 243
WB8AZN 243
WB8UNY 238-A
K8SIJ 235
W8LX 234-A
AD8SQE 233-A
AC8CSK 233
K8PYD 232-A
AD8CMO 232
AB8COA 229-AB
AC8IDM 229-A
WB8WMB 229
AA8LVH 228-A
AD8JPF 227-A
AC8LE 227
WB8KXV 226-B
WB8SBH 224-A
AB8VDL 224
W8KEL 222
WB8RVM 222
AD8CVJ 220
WB8TXG 217-A
WB8TZK 217
WB8MUA 216
WB8STO 215
AB8LKI 213
WB8PCN 211
AB8LEF 210
WA8KQF 209
AB8VJH 208
WB8KMC 208
AC8FDN 207
WB8TJS 206
AB8DGO 205
AB8WBO 205
W8LLY 205
AC8SMC 204
K8OCL 203
WB8SFO (WB8SFO,opr) 203
WB8RTY 202-A
W8LXH 202
WA8QWN/8 202
WN8YJF 200
AA8UNP 175
K8UFW 170
AB8ODW 152-A
AD8NMG 143-A
AK8YV! 138
W8EDU (WA3BGE,opr) 124
WN8ZAL 114
AK8VTA 110
AA8TX 102-B
WN8WTN 87
W8OEM 76-A
WB8RUW 63-B
WB8WCE 58-B
WB8WBS 58
WA8OQS 55-B
WN8UFO 55
WA8ZHE 54-B
K8SUB 52-B
AD8EIO 20
AB8HMG 1

Louisiana — 18

AD5FVA 2491-AC
AC5RTX 2240-AC
AD5YMY 1967-AC
K5DGI 1814
AB5NAL 1167-A
AB5TCI 796-A
WA5TEJ/5 495-A
WB5KAW 392
WB5OKW 370-A
AC5OB 348
AA5ZZA 271
WB5CKR 253
AA5KLF 245
KB5TTC 205
WB5GDN 204
K5EJO 202
WA5RIV 202
WB5NIS 197-B
K5CAV 167
WB5IKT 160
WB5MLH 136
WB5SFS 91-B
WA5UUD 80-B

Indiana — 19

W9NKI 1695-A
K9CVA/9 1507-A
AB9CER 1485
WB9LHI 1312-AC
K9TUS 1093-AC
AC9LT 988-AC
AD9CLO 811-A
W9NQW 807-AB
AB9QCP 718-A
W9OWZ 699-C
AA9ITB 668
W9NSO 648-A
AB9SKA 574-A
AB9FNR 368-AB
AD9KFS 360-A
AC9JOO 358
AC9EHU 350-B
WA9FUD 325
W9BWN 297
AB9QYU 286
WA9ZKN 278-A
AB9HVJ 273
W9KQD 270-AB
K9NSF 269-AB
W9CSL 266-A
W9HLN 265-A
AB9OYD 263
AB9QNB 257-A
AD9VQK 257
AC9ZTD 240
W9ZXN 229-A
WB9SEP 224
AA9GFR 219-A
WB9RFK 219
W9MDW 215
AA9SBR 211
WA9ASZ 206
WB9LXU 205
K9MMH 204-A
WB9MSJ 203
AD9HCK 202
K9MLK 201
K9GEL 200-A
WN9UJM 172
WB9JBH 151-A
WA9MEM 122-B
W9BS 122
WA9WZQ 120
WB9RRA 117
WN9TUR 112
WB9MDJ 82-B
WB9DRB 51-B
WB9GMC 51-B

Mississippi — 20

W5RUB 2239-A
WA5SEG 764-A
AB5NJZ 630
K5LUW 597
WA4KVR/5 363
WB5FHA 320
AC5PWW 314
AB5IRV (WB5KUJ,opr) 308
AB5GRI 272
W5NCB 247-A
AB5FML 220
K5WSC 218
WB5HVY 216
AB5KUJ 213
AD5VXV 207
WB5NEK 206
WA5SIM 29

Illinois — 21

K9BGL 2186-A
AC9YH (WB9NPB,opr) 1892-A
AB9CGL 1453-A
AB9IJV 1023-AB
WA9MGY 901-A
AD9UKM 884-AC
K9UIY 809-A
WA9TXL 776-A
WA9PBK 747-A
W9NLR 708-A
WB9ILW 706
WB9LFD 652-A
AD9UQN 604
AC9OHH 595-AC
W9UDK 546-A
AB9LOD 533-A
AB9MYN 510
WB9FON 498-A
W9JAY 484-A
AC9ACU 438
WA9LZA 423-ABC
WA9YOL 421-AB
AC9R8D 420-AB
AA9JCO 419-ABC
AC9BZW 408-ABC
AC9PNE 407
WB9JSR 402
WB9PUL 398
AC9DWQ 397-AB
W9NOV 395
AC9VBV 380-A
AB9KLB 367-AB
AB9TGB 358-A
WA9YLB 358-A
AB9GCQ 349
K9JMA 348-A
AA3KFR/9 343
AD9JUU 334
AA9WJS 328
W9KVF 322-A
AD9DWK 318
KL7IEG/9 302
W9QJE 300-B
AC9QWM 298-A
AA9BHH 297-A
AC9FVT 297
WB9IEE 291-A
W9MVL 287
AA9THM 280-A
AB9OCH 265-B
W9NU 264
WA9WHB 255-A
AA9NJR 253
K9IUD 245-A
AB9DVQ 245
W9ZHS 243-A
AB9DVV 242
K9EGH 240-A
AB9OJA 240-A
AB9MTF 239
W9DJZ 237
WB9AZS 235
WB9TXO/9 (WA9PBK,opr) 235
WN9SBD 235
AC9RKF 234
WA9LEY 232
AB9NUL 230-A
AB9BCR 228-A
AA9IXF 228
WA9QQI 226
AA9ETS 226-B
AC9LMI 224
AC9LBQ 217
K9TPC 214-A
WB9SBC 212
AA9AAT 211
AC9EVD 211
AD9DKJ 211
AD9TSV 211
WB9QKF 211
WB9IIS 211
W9NWE 210-A
WB8TVI 210
WN9TTE 209
WB9PTK 208
WB9QHV 208
WA9ZRP 206-A
WB9VJN 206
WA9RJP 205-B
W9IB 205
AA9LEF 204-AB
AA9AKT 202
W9JIU 200-A
WB9RZW 186-B
AK9TIY 179
WA9OBP 177
W9REC 171
AB9LVC 163
WN9QGU 158
W9NZS 136-A
WA9FIH 133-B
AC9WR 118
AB9UKN 116
AB9HGN 113-B
WB9PEA 112
W9TLU 108-A
AB9NXT 101
WB9SNA 101
AB9PPL 92
WN9SAO/9 91
K9FLT 73-B
W9AUD 53-B
W9NKQ 53-B
WA9SHH 53-B
WB9GPZ 53-B
K9MDY 52-B
WB9PSD 52-B
WB9QAH 52-B
AB9BIO 52
WB9RJQ 50-B
AB9SCX 50
WA9SKG 44
W9AXT 38
W9HPG 24
AB9MPX/9 11

Alabama — 22

W8FAW/4 2250-AC
WB4FZG 2082-A
AD4TIG 1856-C
AH4OXX 1071-A
AB4UNM 523
K4BBF 500-A
WA4MWF 420
AC4DZZ 410-A
WB4CLK 394
AB4ASV 375-AB
AA4BNU 318-A
WB4ZAG 308
W4RAL 301
WB4AZO 264
WB4UNY 261-A
WA4FMX 254
AB4KEA 251
K4ZGB 234
AB4SXG 216
AA4FHY 162-A
AA4VQD 109
WA4NAT 102-A
WN4NQS 100
AB4ZOG 83
WA4DYD 69

Maine — 23

K1OEY 940
AA1NXR 730
AA1EUO 726-AC
AD1SWK 649
K1ASJ/1 420
AC1GKJ 404-A
AA1PLD 392
K1ZMY 352
AA1FCM 294
W1ERW 271-A
K1RQE 230
AA1UFV 216
WA1SDQ 207
WA1RLI/1 129
WA1UVP 58-B
AA1NMW 30
AA1JCN 17

Missouri — 24

W@EEE (WB@GQP,opr) 1386-A
AC@HBH 520
AA@JJ 507-A
WB@KAP 367
WA@TCM 352
WA@YLB 351-A
W@RWH 348-A
AD@DYM 341
K@RTH 327-A
WB@QJG 325
WB@LFY 315
AB@EZG 309-A
W@CD 297-A
K@DPO 290-A
W@UYI 266
W@NKO 252
K@FNW 250-A
WB@GWW 250-A
WB@FCY 241
WA@CWH 232-A
AB@GRJ 228
AC@PUD 225-A
W@YZZ 225
AB@NJE 217
K2LKM/@ 212
AB@NOU 208
WB@QWP 208
AB@OAS 207
AB@ODF 206
W@CDC 206
WB@OQV 99
WA@QDA 88
WB@FTK 79
AB@RIR 57
W@QQK 51-A
WN@NSA 41
AA@EMX 27
WA@CFQ 25
W@BV 24

Arkansas — 25

WA5VDH 1535-A
WB5KED 1071-A
AA5WMC 1016-A
AB5NBC 402
W5FFY 383
WA5SOG 354
WB5LRP 341-B
WA5YON 305
WB5BJD 286-AB
W5MDP 269-A
WB5PUT 259
WN5STD 247
AA5VNV 229
AA5JAC 213
W65GVE 209
WA5VTW/8 204
W5UC 85-A
W5EIJ 34

Michigan — 26

AC8CQN 1818-AC
WA8ZDT 1250-A
WA8WWM 1189-A
AD8HLR 1017-AC
AD8PAO 720-A
AD8DYZ 599-AC
WA8AZB 595-A
AB8OCR 544
WB8QYU 540-A
W8BNF 490-A
AD8SIA 398-A
K8LUU 384-A
WB8TTK 380-A
AA8EDC 379
AC8CNL 374-A
AB8MTD 371
AB8IOT 357
K8BVY 352-A
AC8VSK 351-C
WA8LTX 327-A
AB8USG 317-A
WB8LZX 314
WB9DRE/8 309
AA8PPF 301-A
AC8JKU 301
AB8RFN 290-A
WB8RVG 278
W8WT 277-A
AD8MWB 277
K8JKK 269-A
AA1DXS/8 267-A
WB8GWB 265-A
AD8YQW 263
K8IWC 263
WA8FDH 262
AB8WQX 262
AA8AAE 255
WB8IDK 253
AB8SYA 249
AB8TKZ 244
WB8RMS 243
AB8OPW 241
WB8SNW 237
AD8GKT 235
AB8TNC 233
WB8THO 232
WA8TDY 230
WB8TUU 230
K8OOV 227
AB8TPH 221-A
AB8ZPE 221
AB8NSF 210
WB8ILV 215
WB8ZBD 215
W8JQ 214-A
W8QOI 213
W8VKU 212
WB8ZFV 212
AC8KPK 210
AC8TZZ 210
WB8QWQ 210
WB8SNX 207
AC8KUV 205
WA8MJY 205
WB8G8D 204
AA8TQF 203
AD8CFU 202-A
AB8AYW 201
AD8OOK/8 201
WN9SHL/8 201
AB8RVK 200
AD8CVV 196
AB8TOT 173
AA8VEB 154
AB8WUS 152
WA8WWS 119
WB8QYR 102
W8HR 85
LA8OH/W8 76
WB8WJZ 75
WN8UEH 75
WB8RNY 70-B
WB8KSB 67
WB8PFO 65
WN8VEF 56
AC8ABX 52-B
WA8IPJ 52-B
WN8YDR 51
WB8TQZ 35
AC8VSK/m 24
AB8FBG 22
WB8WGF 22
AB8RKF 20

Florida — 27

Northern Florida

WA4TYL 1845-AC
AA4UFW 1482-AB
AC4QCU 1293-A
WB4UZT 970-A
W4WHK 586-A
K4YEQ 516-AC
AA4OEM 426
AC4ZTW 396-A
WA4TNC 354
K4MAC 303-A
WB4FSO 300
AD4LAN 265
AB4EYX 250
AB4DTS 245
AB4CTI 240
AA4NID 211
WA4HOH 209
WB4OMB 209
K4HML 206-A
K4ISJ 205
W4UHC 205
WA4BQY 204
WB4WMR 204
K4QZD 203
AA4RXS 203
WN4MFK 168
WN4MQI 79

Southern Florida

AA4LZR (WA4FCT,opr) 1915-AC
AC4OZF 1910-AC
WA4DRU 791
K4HWW 705-A
AA4KKG 672-C
WB4CKW 608
W4JHF 537
K4FMA 488
WB4DFV 475
AA4LOX 431-B
W4EKK 397
AB4SSN 388-B
AA4QCX 354-A
WA4NFF 346-C
K4JPF 338
WA4JVN 331-A
W4BV 318
AA4FYZ 309
K4NE 305-A
WA4HWH 290-A
AA4UVG 273-A
AA4HXZ 269
W4PZV 263-A
W4UHO 260
K4FN 259
K4LQ 231
W4OVB 217
W4LQJ 208
WB4IBJ 208
WA4SNI 203
WA4ZSB 203
WN4AME 200
AC4MLA 163
W4HOS 130
K4SGR 122
AB4BND 66-B
AA4KOV 64
W4HVU 51
AD4EAL 16
AB4FLW 8
WN4BMY 6

Texas — 28

Northern Texas

W5MYA 2530-AC
AC5TMN 2015-AC
W5ZSX 1784-AC
AA5SWM/5 1514-A
AD5VTA 1506-A
AB5AZL 1275-A
W5ONL 1206-A
AB5QZF 1041
AA5QXO 903-A
AB5SBH 768
WA5UCT 750
WA5EHA 697-A
AA5RXT 565-A
AD5ETA 543-AC
WB5VHH 530-A
AB5SFX 507
AB5EBC 406
AA5BNL 364-A
K5ZJP 356-A
AB5MRB 320
WN5SDN 300
WB5OFB 281
WA5VQQ 272
WB5SMG 255
AB5KXA 249
AC5QWF 247
WB5MWZ 239
AA5FTP 237
K5ERJ 233
WB5RDV 232-A
WB5GVP 232
AA5GKC 231-A
W5KLB 231
AC5QGZ 229
WA5TYB 221-A
WA5RSC 219
WA5UBK 215
AD5SLG 214
AC5KHP 208
WB5NHL 203
WB5JDX 201
AK5ODN 170
K5EIS 147
WB5SFW 99
AC5QF 74
WB5QMZ 42
WN5THF 31
WB5PKH 25

Southern Texas

W5WZQ 2542-AC
K5PFL (WB5QUW,opr) 2398-AC
AB5QWX 1754-A
AA5CBT 1030-AB
AC5NMA 738-A
AA5DXI 619-A
AD5OOU 448-A
K5EWJ 397-A
K5ZSI 390
WB5GVO 374
AA5TPO 326
AA5UYH 316
WB5BWM 314
AA5ZWC 305
AA5KQD/5 274-A
WB5HRI 268-A
WB5OII 263
AB5MNR 251-A
WA5HBP 247
AB5NRH 239
WB5PJ 238-A
AD5LZJ 226
AA5LES 225
AK5RPU 224
WB5RGX 220
WA5IWA 219-A
WB5ODJ 218
WB5WYX 213-A
WB5KVF/5 212
WB5QAP 210
WH5OUE 205
WB5LDN 200-B
AC5IGU 119-A
AA5LTQ 116
AB5LTO 77
AD5ZMS 50-B
WA5IYX 50-B

Iowa — 29

K@GXR 2245-AC
WA@UIB 881-A
AC@MUH 818-A
AA@VKF 719-A
WA@CDK 708
W@GQ 707
WB@JEE 521
AC@FHE 501-A
AB@RWN 451-A
WB@NVB 441-A
AB@OLE 417
AA@VSW 332
WB@RWM 309-A
WB@SGP 282
W@MJN 274
K@HSC 262-A
W@PRY 262-A
AC@FJR 249
AB@IPH 248
AA@WCR 245-A
K@UJJ 235-A
WB@CQO 229
AC@MHK 223
AA@VDX 223
AD@FLY 221
WB@JLP 215
AC@HUP 207
W@AK/@ (WB@BCJ,opr) 203
WB@KUJ 203
AB@BPH 103
AB@CHP/@ 80

Wisconsin — 30

AD9KGA 1561-C
AD9DAF 1277-AC
WB9KZZ (WB9OEC,opr) 1005
WB9FRG 585-A
AC9MY 559
AD9EYA 555-A
WA9EHS/9 456-A
WB9KGO 449-A
WB9LAM 445-A
WB9PCQ 426-A
W9MVS 409-A
AB9QAO 398
K9OSC 345
K9QXY 337-A
AA9GJU 320-A
K9MKC 305
WA9AJW 290-A
AC9MSE 278
WB9NSI 271
WA9FZQ 265-A
AA9FFU 259
WB9HRP 250-A
AD9GTQ 237-A
K9DID 232-A
K9VER 223
WB9NDO 223
WB9KVS 222
AC9PU 220
AC9NHE 219-A
AB9RRV 218
WB9PGY 217-A
AB9MRF 213
WB9OAM 211
AB9GGD 209
AB9DWG 208
AB9IFG 207
WB9SHK 207
WB9KMW 206
AB9FKL 205-A
WA8YVY/9 205
AA9BPG 204
AB9QKU 200
W9LAA 200
AK9SAK 200
AC9JA 101
WB9KPX 80
WB9OPD 77-B
WA9DOI 61-B
WN9RNL 37
K9GDF 2

California — 31

East Bay

K6ACU (WA6DYZ,opr) 1322-ABC
K6EAG 994-ABC
WA6JUD 238-B
AA6PKN 222
AA6BFL 220-B
WA6CKQ 220
WA6VZN 220
AA6JVZ 218
WA6SLN 212
W6RQZ 207
AB6JIK 110
AC6EYC 101
WA6KOK 96
AD6CSL 90
WA6BMV/6 76-B
AA6DYZ/6 55-B
WB6ICN 54-B
W6OJW 38
WA6TML 34
W6EJA 26

Los Angeles

AH6YBL 2622-ABC
K6OVJ (WB6ZVC,opr) 2418-ABC
AC6RTT 2320-ABC
W6HX 1855-AC
W6BVN 1739-AC
AA6EPQ 1168-A
WA6TLV 1040
WB6CEI 1014-AC
WA6OTU 893
WB6VZI/6 862-BC
AA6DPQ 839-AC
WA6KFW 833
K6MP 632-A
K6VNX 612-A
AD6YUI 526-A
AA6PTM 484-AC
AA6LFZ 480-A
AB6KJI 431
W6UM 420
AA6HDG 414-BC
AB6OYN 405
AA6AWF 400
WB6OJB 358-B
AA6JGW 343
W6DGH 314
W6TZD 308
AC6QEO 295
WB6EYQ 295
W6SWM 293-A
W6ANB 290-A
AC6JPH 283
W6ORD 278-A
WA8WNK/6 263-A
WA6AYW 261
AA6FZI 261
W6RXD 258
AD6YYQ 258
TI3MO/W6 255-A
K6CAF 244
AD6BKU 242
WA6JKO 237-A
WB6ZWP 224
WB6VGA 220
AC6WDL 215
AA6HQQ 215
W6NHX 212
AA6CUM 209
WB6GFX 209
AA6ZKI 208
W6OJC 207
WA6JML 207
WA6TUB 206-B
AD6ASK 204
AA6MBY 203
WA6GGK 202
WB6KPZ 202-B
AB6AIT 201
W6RDS 200
AB6WDS 200
AB6VVS 187
AB6JFD 157
K6RF 111-A
AA6PXY 85
AA6BFK 80
AA6WVO 68-B
W6PYK 62-A
WA6MBL 58-B
K6YNB/6 57-B
WA6JLD 56-B
WB6SYN 56-B
AK6KWU 42

Orange

WA6WZO 1834-AC
W6SOR 1054-AC
AA6FIT 962-C
AD6KS 846-C
WB6HDK 554-A
AD6CYX 523
AA6LFF 496
WA6DRE 352
AB8RDG/6 258-A
WB6VOV 245
AC6YMV 228
WB6KRI 227
W9FHA/6 207
AA7HQU/6 206-B
AB6AJV 204
W@PZD/6 203-A
AA6TTY 200
W6RXR 114
WB6DFA 49

Santa Barbara

AD6QPH 424-A
AA6TMQ 398
AB6CWE 327
K6PWP 299
WA6VBS 293
WB6EGQ 257-A
AC6DKQ 223
AC6GEB 222
W6PRP 218
W6MUL 216
WB6EIF 212
WB6AGX 193
WB6IDK 58-B
WA6GHB 35

Santa Clara Valley

W6PAA 2375-AC
AA6MQS 1693-AC
AB6DSV 905-C
WB6PYI 756-AB
AB6GFJ 717-AC
AA6HCI 549-ABC
AC6OKK 509
W6ISQ 501-AC
K6AQ 476-C
W6UTV 472-C
AB2JYM/6 417-C
W6JQC 402-A
WA6OMA 316
VE3DXV/W6 310-AB
K6ZX 307-B
AA6PGB 300-A
AB6HBT 295
AC6KHS 274
AD6MO 256
W6RPK 254-A
AC6EYY 252
AB6JGS 250-A
K6OP 235
W6IKW 229
AB6SWH 227-AB
WA6HZO 223
WB6ESF 222
W6ASH 210
AB6MDF 205
K6ODK 204
K6WD 202
AB6EMR 201
AC6KOL 166
W6MVV 154-A
W6BKY/6 148
W6SUJ 125
K6UO 122-A
K6QIC 66
WA6HAD 33
WN6BTH 30

San Diego

AB6LXS 1300-AC
AA6ONM 1160-AC
WA6CXK 616
W6JOT 596-C
AA6VQX 440
AA6ELX 354-A
AB6DPV 255
AA6EJL 244
AG6JES/6 242
AA6OZS 239
W6RDF (WA6KWQ,opr) 214
AA6UFY 212-A
W6DFR 176
W6LON 150
AC6NZX 109
K6KDE 88
W6MAR 37
AC6KBD/m 13

San Francisco

W6BIP 978-AC
AB6AQP 827-AC
WB6NBR 517-C
W6KHI 309
AA6RAV 308-A
K6LJZ 299
WA6NSJ 270-A
W6UGP/6 244
AC6ZT 237-A
AA6WAE 227
AA6YFD 226
AA6VPB 222
WB6VGY 220
AA6HPF 219
WB6QBJ 208
WA6CAL 207

San Joaquin Valley

AC6PXG 1117-AC
WB6ITM 597-ABC
AC6YKS 573-C
AB6DEO 318
AA6UAA 268
W6MTJ 245
AD6DT 240-A
WB6IUK 220
W6DPD 213-A
AC6UZ 211
WA6KMW 207
K6EKH 206
WB6RWM 201
WB6ATJ 80
AA6FZF 75-A
W6RLG 52
AK6KTL 27

Sacramento Valley

K6RLY 629-AC
AA6JVD 544-AC
AA6GHH 271
W6GVM 266-A
AC6YMH 243-A
AC6KYA 242
WB6RQE 221
WA6JVR 35

Minnesota — 32

WA@LKL 1834-A
WB@TFJ 1450-A
AC@IYP 1164-AC
AA@UCU 1113-A
W@HW 921-C
W@OXN 780-A
AA@LMK 659-A
AB@OSS 659
AB@NJV 575-A
AB@BQA 416-A
WA@IDK 395-A
WB@PFT 386
AB@DCT 362
K@JFV 356-A
AB@LJH 345-A
K@IHG 328
AB@NIU 315
WB@QZT 304-A
WB@PZY 277-A
AA@QIT 253
AC@PSH 251-A
WA@KD1 245
WA@FPL 229
AB@NCJ 228
WB@NPB 222
WB@NCP 220
AB@MAE 218-A
AB@MAO 215
AC@KMH 211
WN@SNG 209
AB@OUH 207
AK@SID 203
AB@PTB 201
WB@OFQ 101
WB@PVM 62-B
K1WVE/@ 56-B
AK@POG 16

Oregon — 33

W7TML 2042-AC
WA7GOO 1377-AC
AA7JBE 1059-AC
AC7ULC 576-A
K7EXT 561-A
K7GGY 354
AA7HN 296
W7CPK 276
WA7WAR 255
AC7GPP 253
AB7CBA 250
W7IBL 224
WA7YDH 218
K7YCI 217
AC7LNG 216
W7VSE 211
WA7SOU 207
WB7AVB 200
W7KMB 196
AA7UGN 100
W7LT 82
AK7EBM 42

Kansas — 34

AC@IUB 1474-A
WA@SWC 1082-A
AB2GAV/@ 807
AA@TKJ 776-A
AA@GSG 637-A
AA@AGN 434
AA@PBQ 425-AB
WA@NLX 360-A
WB@NSQ 315-A
AB@KIG 292-AB
WB@KDE 292
AB5NMY/@ 274
W@INH 260-A
AB@JDK 256
WB@NLX 253
AA@SEV 250-A
AB@ISW 245
K@IEW 244-A
K@PFV 244
W@HIK 218
AB@FAQ 216-A
K@WGB 214
AH@AAQ 207
WB@NHZ 205
WB@NRV 129-B
W@MRI 103-A
AK@QHN 14
AB5OOW/@ 11

West Virginia — 35

AD8MBH 832-A
W8QIO 793-A
AB8IUW 587
WB8WNO 438-A
AB8BMV 435
WB8TEE 404
AC8BT 330-A
WB8SQX 286
AB8NMP 266-A
WB8HOG 266
AH8OSE 249
WB8WGB 235
AA8UUY 220-A
WB8DXF 218
AA8YCD 203
AC8KOI/m 202
W8CM 91-A
AC8JWX 59
AK9OWA/8 50
W8JM 43
AK8WEZ 7

Nevada — 36

WA7NIN 2621-AC
W7MRS 2280-AC
W7YKN 537
AA7YHP 379
AA7WYE 300-A
AA7KNK 296-A
AA7UGJ 249
AD7VYT 237
AB7CRZ 221
AC7ND 212-A
AA7LHZ 211
WA6WJV/7 205
AC7BKK 112
AD7ICW 54-B

Nebraska — 37

K@SCM 1784-A
W@PXO 562
W@OYW 513
AB9DEO/@ 502
WB@PUP 445-A
K@TVF 406-A
WB@MRV 385
AB@KDI 375
AB6FHK/@ 351
WB@QED 299
K@JBL 244-A
AC@EKB 240-A
WB@IUU 223
WB@RMJ/@ 217
K@ETA 211-A
AB@MNW 202
W@QNP 102
AA@MRH 76-B
K@VVO 65
WA@HAL 59

Colorado — 38

WB@DJY 2765-AC
WA2WMT/@ (WB@IKN,opr) 2202-AC
WB@IRJ 1764-AC
WB@MIV (WB@QHV,opr) 1200-A
WB@MRU 619
K@TIV 560-A
WB@IWL 541
WB@OHC 486
AB@IBG 435-A
WB@PEA 344-A
K@TER 293
AC@MCM 278-A
W@KFX 228
AB@NTB 214
W@QKY 203
K@PFV/@ 41
WB2SZV/m@ 20
AB@LOE 15
WB@MZI 7

North Dakota — 39

K@BJW 577-A
WB@NST 534-A
K@FRD 533-A
W@GWH 304-A
WA@OVW/@ 226

South Dakota — 40

WA@CPX 2056-AC
AB@EVQ 1024-AC
AB@DGA 1013-AC
AB@MWJ 607-A
AD@VKH 380
AA@ARZ 324-A
WB@PLP 226
K@RJL/@ 221
WB@STR 171
AK@PYL 168
AB@MVX 142-A

Montana — 41

W7YB (WA7WXY,opr) 3034-AC
AC7JYW 1302-AC
K7LTV 1042-A
W7LR 803-A
AD7ABV 776-AC
AA6OWM/7 511
AD7CPC 503
WB7BWZ 242
K7CHY 214

Washington — 42

K7RSC (K7JCA,opr) 2711-AC
AC7YTN 1725-AC
WA7OBL 1197-AC
WA7FOE 1005-C
K7DZ 646-AC
AA7LQQ 400
WA7UQG 358
AC7GYF 352
WB7COH 345
AC7WMY 319-A
AA7PVE 284
AA7JCB 277-C
K7IRD 272-A
WA7ZDE 254
K7YDD 244
K7LMY 238-A
AA7JMV 234
AA7YVP 217
K7MKS 216-A
WA7NOH 215
AC7JTS 211
WA7TMD 211
WB7CGN 206
AB7EBT 204
W7ZSL 204
AK7EME 203
AB7BNP 186
WA7ROJ 150
WA7UVJ 72
K7QFW 61-B
W7OKB 50
WN4OFW/7 25
AD7GCO 2

Idaho — 43

K7NHV 3297-AC
W7SUY 1089-A
W7GYG 601-A
AA7QQD 512
AC7CSJ 324
K7EA 234
AA7LCY 233-A
WB7CQK 229
AA7VMC 225-A
W7WVD 216-A

Wyoming — 44

WA7ZXL 376
W3IDT/7 306
WA7ZZY 278
W7SQT 88

Utah — 45

K7OXB 1239-AC
AC7ISY 569
AA7DYH 438-A
W7GXC 402
AC7UYH 236
K7HLR 228
WA7YTE (WA7ITZ,opr) 212

Oklahoma — 46

AD5LUR 1665
AA5MLT 643
K5PER 432-A
K2GKK/5 393-A
WA@JRZ/5 336-A
AB5HLR 274
AA5VAP 263
AD5LMG 257
WB5IMT/5 243
AC5UYT 205
WB5JJT 204
K5OCX 201

New Mexico — 47

AA5YTX 1098
WB5LZC 658-A
AB5KPN 526
AD5HIO 394-A
W5N2V 298-A
W5TIL 254-A
AB5HAE 223
AC5QVZ 215
WB5ORF 205-A
AC5QNQ 204
WB5CAG 66-B
AA5KLK/5 24

Arizona — 48

AD7NEQ 1327-A
AA7KPH 1035-A
WB7DKV 1011-A
AA7JRL 530-A
AA7KLK 515-A
AA7VTM 504-A
K9DKW/7 500-AB
WB7CYU 455-A
WA7TZO 435
W7KPL 430
AD7JVR 335
WB7CAG 269-A
AB7CIY 258-A
AB7BQN 250-A
K7BLU 228
AD7RZU 217
WA7ZWO 217
AD7RDH 215
WB7CTJ 212
AA7NWL 210
W7RUK 208-A
AA7YUL 198
W7AUX 159
WB7DPB 151
WB7BEY 43
WB7BRB 24

Alaska — 49

AL7HCN 1023-AC
AB6MRY/KL7 802-C
AL7GRP 348
AL7EWA 47

Hawaii — 50

AH6GQW 1571-AC
KH6IJ 1198-C
KH6GMP 976
AH6HSW 574-C
KH6HIG 315
AH6CPW 310
KH6RS (KH6BTH,opr) 303
KH6IKL 298
KH6HHN 284
KH6HAX 276
AH6IOZ 222
K9KIC/KH6 215
AH6IJA 177
KH6HC 22

Canada

Maritime—Nfld

XJ1AI 736-AD
VE1BDT 324-D
XJ1MX 223
VE1AJP (multiop) 210-D

Quebec

XJ2XL 352-D
XJ2MTA 276-AD
VE2QO 218-AD
VE2AOD 218-D
VE2GS 212-AD
VE2EGH 202-D
VE2YM 70-AD
VE2EGC 13-D

Ontario

VE3IXE 864-D
XJ3EJK 773-D
XJ3GCO 723-AD
XJ3DU 493-AD
VE3BTZ 406-AD
VE3BR 346-AD
VE3BFK 310-D
VE3GD 277-AD
VE3CDK 269-AD
VE3DMC 243-D
VE3FEA 211
VE3BMR 210-D
VE3FSV 204-D
VE3DH 165
VE3EZU 133-D
VE3IHF 125-D
VE3HWV 77
VE3EIB 58-D
VE3HCB 54
VE3AKG 50-AD
VE3AYP 3
VE3NCT (multiop) 1522-AD

Manitoba

VE4UL 410-AD
VE4UO 108
XJ4VV 90

Saskatchewan

VE5DX 1548-AD
XJ5RA 319-AD
VE5YA 224-AD

Alberta

XJ6AGV 588-AD
XJ6APN 350
VE6ATT 325
VE6BAF 235

British Columbia

XJ7WJ (VE7BBQ,opr) 2086-AD
VE7CAV 398-AD
VE7AVM 381-AD
VE7CE 268
VE7CNY 252
XJ7BZC 208
XJ7AZG 178
VE7DTA 135-D

Northwest Territories

XJ8RO 273-AD

DX

Africa

Liberia

EL2EB 133-D

Asia

Iran

EP2VW 29

Japan

JA1KSO 638-D
JA2JW 604-D
JA7SSB 423-AD
JA2HLX 354
JA1AON 328
JA1ELY 318
JR1HJS 283
JA8AA 280
JR1NRP 271
JA6CNL 269-D
JE1AFO 268
JH3HRW 256
JA1BWA 249
JA2MGE 244-D
JG1GDX 244
JH3DPB/1 234-D
JH3AIU 234
JA6BSM 234
JA1MCU 233
JA2HGA 232
JA1KJW 228
JA2VUP 228
JA4AXB 226
JA1CG 224
JA1GTF 223
JA1HVS 220
JA1RDW 219
JA2CMM 215
JA1SJG 213
JE1SSE 212
JH7FMJ 212
JA1IBX 211
JF1PJK 211
JH1PQS 211
JA1BK 210
JA1QER 209
JA1SKE 208
JA3DX 207
JA1CSB 206
JA1XFB 205
JA3IW 205
JA9FOR 205
JA@FSB/1 205
JA1CPZ 204
JA1ITS 204
JA1KF 204
JA7GDI 204
JA2EIV 203
JA3CHO 203
JA7DAH 203
JA2AYX 202
JH1EIG 201
JH1NRC 200
JH1QDB 188
JA4CTL 188
JF1FVW 185
JF1MYI 178
JA2DMO 173
JA6KAK 130
KA2WM 114
JA4BKL 94
JR6CF 92
JA2BI 88
JR2BDG 75
JA8SW 69
JA9SV 69
JR2BDF 68
JF1RBP 60
JA2BNN 60
JA1BNW 47
JA4AQZ 43
JA3ARM 42
JA6AKW 40
JF1DYY 38
JH2DVX 36
JA9DJH 35
JA8BLF 33
JA7NX 19
JA1AAT 18
JH1LKH 16
JA7LEX 7
JA@FMB 4
JH3BJN 2
JA2CGC 1
JA3YAQ (multiop) 203
JA3YKB (multiop) 172
JA3YOO (multiop) 108

Asiatic R.S.F.S.R.

UA@CBO 215
UA9IG 183
UA9OH 102

Israel

4X4FU 364-D

Europe

Portugal

CT4AT 1137-AD
CT1QZ 387-D
CT2SH 235-D
CT1OY 220-D

Fed. Republic of Germany

DJ6RX 500-D
DA1OR 265-D
DK5WV 237-D
DK7XS 236-D
DL6EN 236-D
DK6IS 224
DL1GN 113
DA2LJ 107
DL1JW 104-D
DJ5HL 56-D
DL1BV 32
DJ@DI 28-D
DJ2YE 21
DA1PQ 3
DK@TU (multiop) 654-D

Spain

EA2IA 270

Republic of Ireland

EI9CB 432-D

France

F6BOR 455
F6BFH 221
F2GL 216-D
F5RC 188
F8VJ 167-D
F8HE 136
F9OE 74
F6CCI 55

England

G3FXB 664-D
G4BUE 401-D
G3XYP 385-D
G3TJW 382-D
G3VPW 235-D
G3TXF 209
G3SXW 192-D
G3ESF 191
G3RUX 142-D
G3GGS 124-D
G3YBH 57
G4CUZ 51
G4FDC 10
G4DSE (+G3RZI) 276

Guernsey

GC3YIZ 50

Isle of Man

GD4AM 131-D

Northern Ireland

GI3KDR 239-D

Scotland

GM3CFS 158-D

Hungary

HA2KMB 121

HA5DE 67
HA7SQ 66
HA9KOZ 56
HA2MI 46
HAØKHW/7 (multiop) 216
HA8KVG (multiop) 170-D
HA7KPL (multiop) 72

Switzerland

HB9DX 126

Italy

I1GPK 714-D
I6NSR 253
I4VEQ 249-D
I4ZSQ 213
I4BNR 210-D
I3HL 53
ITMOL (+K3QDD) 673-D

Norway

LA7SP 32
LA8CJ 27
LA2B 13
LA2RR 13
LA2AD 4
LA1RN 1

Bulgaria

LZ1KPH 107

Austria

OE1ZGA 81

Finland

OH2LU 231
OH5PA 11

Czechoslovakia

OK1FAR 162-D
OK2PAE 151
OK2KFU 109
OK3BA 102
OK2BLG 100
OK3IF 97
OK2SGW 77
OK1DKR 72
OK3YCA 71
OK1MIN 64
OK1AVD 68
OK3TAB 53
OK3EA 51
OK3CAU 47
OK1JWA 45
OK1TW 32
OK1AEH 24
OK3KFO 23
OK3FON 21
OK1AJY 14
OK1MIZ 6

Belgium

ON5AZ 289-D
ON6MH 239-D
ON4GO 117-D

Faroe Islands

OY1A 4

Denmark

OZ1LQ 205
OZ6XT 174
OZ1VY 148
OZ2TY 109
OZ1W 100-D
OZ8EA 80-D
OZ2NV 42
OZ2E 30

Netherlands

PA@ATY 149-D
PA@UV 35
PA@KFF 25
PA@SMK (+PA9WRR PA@SPD) 200

Sweden

SMØCGE 230-D
SM5CMP 88
SM5DQC 63
SM7AAQ 33
SM4FIV 21
SM6FKF 18
SM5CAK 9
SMØKV/8 8
SM4AZD 5

Poland

SP6FER 44
SPØARY 40
SP2ASJ/2 22
SP2ADW 21

Iceland

TF3JB 122

European Russian S.F.S.R.

UA3GM 161
UK3AAC 152
UV3CE 74
UK2WAF 25
UA1DF 17

Ukraine

UB5WE 527-D
UB5MCS 149
UY5OO 133
UT5LE 102
UB5QAP 63

Lithuania

UP2SA 100

Romania

YO7DL 104
YO8FZ 68

Yugoslavia

YU2HDE 360-D

North America

Guadeloupe

FG7AS 637-D

Dominican Republic

HI8LC 294-D
HI8MOG 262-D
HI8EVA 55

Honduras

HR2GK 257-AD
HR1AT 111
WNØQFB/HR2 73

Puerto Rico

KJ4DPN 299-D

Greenland

OX3OA 151-D
OX3PN 72-D
OX3ZM 42

Costa Rica

TI2WX 276-D

Montserrat

VP2MFB 101

British Virgin Islands

VP2VL 921-AD

Mexico

XE1LLS 582
XE1RX 206
XE1EX 45

Nicaragua

YN1RWG 133

Cayman Islands

ZF1AK 314-AD

Barbados

8P6FV 73-D

Oceania

Philippines

DU6EG 32
DU1REX 26

Johnston Island

KJ6DL 343

Australia

VK3XB 83
VK5HP 21

New Zealand

ZL1BKX 466-AD
ZL1BOK 420-AD

ZL1AGO 244
ZL1AAS 176
ZL2ACP 175
ZL2HE 71
ZL4IJ 4

South America

Colombia

HK3LT 202

Argentina

LU2A 212-D
LU3HAK 159
LU8ADK 151

Peru

OA8V 71

Brazil

PY2EQO 210
PY2GAB (WZLEJ,ppr) 37
PY2ND 5

Surinam

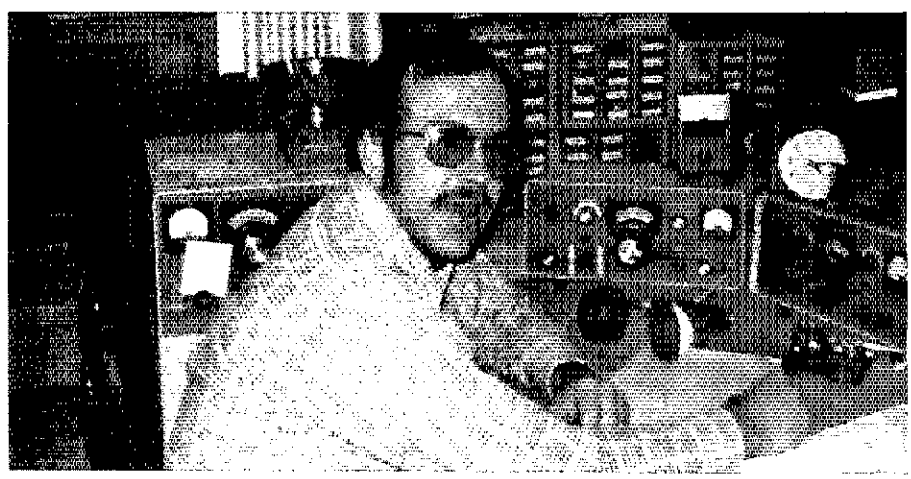
PZ1BK 21

Check Logs

AC1AW W2HRX/1 W2NCI AD3C R/m WA3USW K4HVN W6BYH W7BCS W7YS WB7AVQ W8VUV AD@YBV DJ9CJA EA4BV G6NK OK1DKW OK1JAR OK2SWD PA@PLM PA@WRS SM6DSS UA3QEA UA3VAD UB5MDL UB5TAM UA9VK UA@LJ YU2OS NL—4276

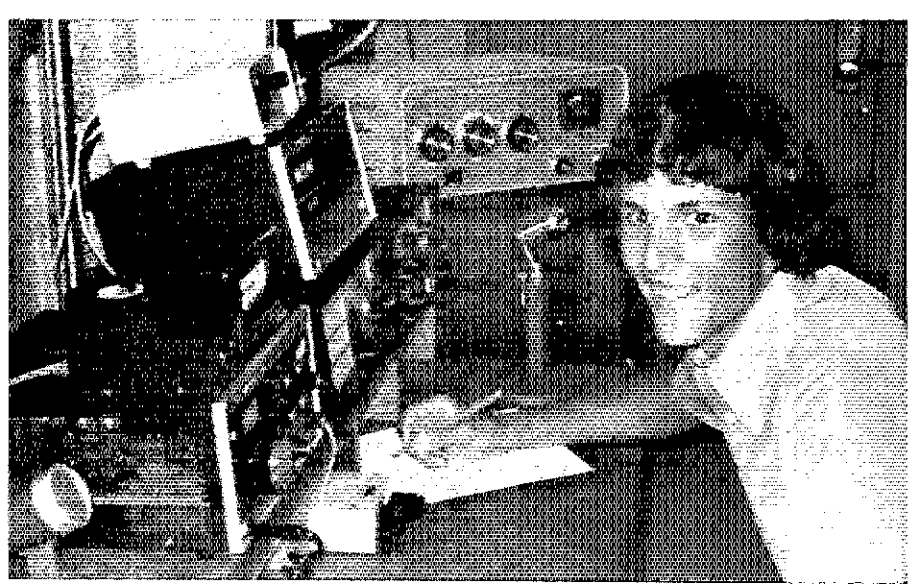
Continued from page 92

and get my feet wet. They got wet (W4NBP)! When the going gets tough and you are fighting to get just plain contacts, it's sure nice to live near a state with as many hams in it as California. Hi (WA7ITZ/WA7YTE)! Sorry about the summary sheet, but my son ate the original (AB5QWX). The Bicentennial Celebration was a BLAST. I had so much fun that I'm planning to live another hundred years to be around for the next one (W5ONL). Experienced the thrill of running JAs on the West Coast and then returned in time to the East Coast to work all fifty states from my new QTH! (AB2JYM/3/6). High

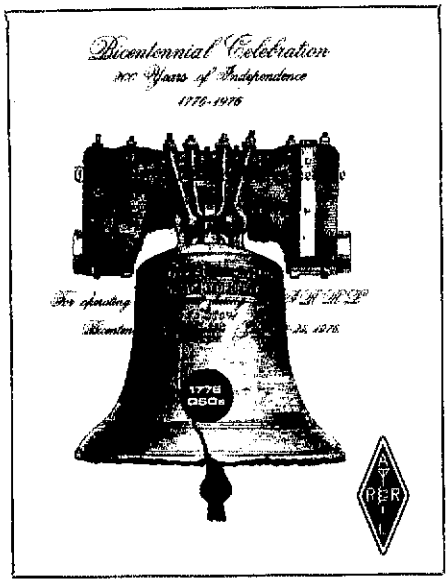


Contest Advisory Committee member W5MYA led a heavy north Texas contingent with 2530 contacts. Mike, a reformed ssb operator, had almost 800 code contacts.

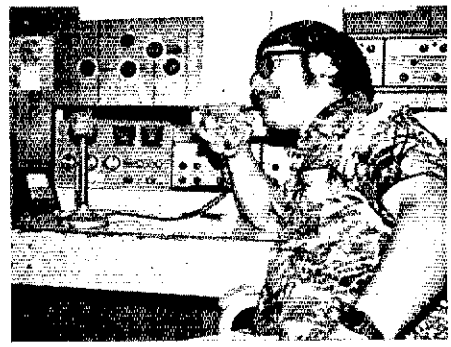
Top-ten man K7JCA operated K7RSC. Dan comes from the relaxed school of contesting.



If you worked all fifty states, chances are WA3LMY/3 provided the Delaware. Bruce's contacts from the first state of the Union put him first in our score listings.



point of the contest was working WA1STN (WB8ZBD)! [Aw shucks! – Ed.] I didn't set the world on fire with my score, but at least I was in there (W4RHZ). All of my operating was done in spurts and cut short as well, since I became engaged on the second night of the contest (WB5AOF). I'm sure about 2000 people have told you about the 98 QSO per page problem by now – make that 2001 (WBØDJY). I give him a 65-foot tower, help him build a wire and bamboo beam, loan him an amplifier and how does he show his appreciation? He goes all out in the Bicentennial Celebration and almost beats me! Congratulations to WB4FZQ (W8FAW/4). Still can't take the fone QRM. Biggest kick was when the very weak signal calling me on 20 cw turned out to be UH8DC. Been looking for one for 10 years (WA2DNY). It is my pleasure to submit these logs for the ARRL Bicentennial Celebration. Congratulations on the USA Bicentennial year (JF1MYI). Fun contest, challenging but obtainable awards (WB2FIU). How do you people do it without climbing the walls or something? Took longer for the paperwork and chasing down the 15 duplicates than time on the air (WA6ZKI)! [AMEN! – Ed.] Knowing my luck, you wouldn't print this (or part of it) anyway (WB5KPH). [Absolutely correct. – Ed.] Congratulations on the Bicentennial. God bless America (SM5DQC). QST



Famous *QST* author WB8JXS poses at Ohio State University Club Station W8LT; Jeff made 2101 QSO's in the celebration.

Strays

TECHNICAL INFO. SERVICE

Any member of the League is welcome to appropriate help from the Hq. technical staff in connection with equipment problems he may encounter. We ask that members observe the following guidelines so that we may provide the best possible service to the greatest number.

1) Before writing for technical assistance, search your files of *QST* and other ARRL publications. The answer you need is probably there. Consult the annual index of articles in each December issue.

2) All inquiries must relate to amateur radio. (We cannot respond to questions about CB, marine radio, hi-fi, etc., unless they concern TVI or RFI caused by amateur gear.) Please be reasonable in the number and kind of questions you ask. Limit the number of questions to three per letter.

3) Use a typewriter if possible; otherwise, write or print clearly on one side of each sheet. Circuit diagrams should be on separate sheets. Put your name and address (including Zip code) on each sheet, not just the call. Staple or clip the pages together. Include a self-addressed, stamped *business-size* envelope. (No stamp required for foreign inquiries.)

4) For practical reasons there are certain things we cannot do. Please do not ask for comparisons between commercial products or for advice on repairing in-warranty commercial equipment (write the manufacturer for assistance). Do not ask for advice or information on articles published in other magazines; write to the magazine editor or author of that article. Do not request custom designs for amateur gear.

5) We may refer you to a back issue of *QST*. If so, and if that issue is still available, you may purchase it. If not, photocopies of a particular article are available at 25 cents per page. Include payment with your order.

6) Address all technical questions to Technical Information Service, American Radio Relay League, 225 Main Street, Newington, CT 06111.

□ When corresponding about your ARRL membership or *QST* subscription, you can get fast response by enclosing a stamped self-addressed envelope or adhesive label along with your control number. It's the first character group of your *QST* mailing label and has seven digits followed by a single letter, such as 8000025G.

KENWOOD DONATES HAM GEAR

□ Members of the ARRL hq. technical staff were delighted to learn from Barry Copeland, sales manager for Trio-Kenwood Communications Inc., that a TS-820 transceiver had been donated to the Technical Department at Hq. The unit contains the digital display module as well as the cw i-f filter. The outboard VFO was included as part of the gift. No doubt it will be difficult for some of the staffers to keep their minds on lab testing when using the '820, as it will be a temptation to reach for the antenna feeder and make preparations for a few CQs! – *W1FB*

Members of the Port City Amateur Radio Club, Portsmouth, NH, participated in a fund-raising Pledge Night to benefit WENH-TV, New Hampshire's PBS station and its New Hampshire Network affiliates. Shown awaiting telephone pledges that totaled over $1000 are (front) Dudley Hardy, W1YSU/W1ATW; Bob Gardner, WA1WGH; Frank Gibson, WA1SJJ; (rear) John Merrill, WA1LZV; Dick Wilder, W1GGA; and Jim Andrews, WA1UTO.

Operating News

Conducted By Dave Newkirk,* WA1VCG

Toward Clearer Skies for DXCC

The DX Century Club Award has been called the true "yardstick" of devoted DX hounds who measure their pileup-prowess in the advancing lines of endorsement stickers that adorn the ole certificate. Those devotees have, since 1945, numbered over 23,000 – dividing their forces between mixed, phone and cw awards. They've made "pileup" synonymous with "dogfight" – but even Baron von Richtofen would've tried 40 cw one last time. Besides, those hash marks on the red triplane didn't really stand for "kills" – those were his deletions!

Up at the top end of DXCC are the Honor Rollers. The calls of these ops holding the top-ten numerical totals are listed in *QST* each March and September. It takes a long time to collect the whole set, though, and usually by the time you reach the top there's another "new one" on the air to help you melt the ice off the beam. What exactly counts as a new country is determined through application of the DXCC Countries Criteria. Right now there are 40 deletions – countries which, for various reasons, ceased to meet the criteria. How many of these are on *your* triplane?

Some ops think that everyone should be able to reach the top. Should they? Well, DXCC is not a competition in the true sense of the word. Only when all of the standings are listed side by side can you see how you rate with the pack. The competition in DXCC exists only when you're on the bands and in the pileups – so, really, on the way to the Honor Roll you're competing only with yourself: your patience, operating skill and perseverance. How quickly your self-improvement proceeds when you're close to the Honor Roll may be decided by current world affairs if some of the countries you need to make it aren't active right then. The ops way up on the Honor Roll didn't make it in five years, and *you* shouldn't expect to. Tomorrow's Honor Rollers? – they're in the pack *somewhere*, struggling up the endorsement ladder between 100 and 300 countries confirmed.

As important in the whole DXCC structure are the stations yet to join the DXCC ranks. They're everywhere – beating you to that ZM7 on their first call, signing one-too-many times, maybe taking a bit long to tweak the finals (even five minutes too long!). Easy now – they'll learn the ropes. There's enough fun to go around for everybody.

Well, you ask, what's in store for DXCCers these days? As of November 1 of this year, the DX armies may make as their next objectives the RTTY and 160-Meter DXCCs. Seems that life is tending toward specialization these days, and here are two awards right down that alley. By the time you read this, we'll have issued a good number of each, with more on the way. Good luck on these awards, chaps . . . sharpen that 160 skywire! Teleprinters at the ready!

Rule 9 has been considered by the DX Advisory Committee, and we may have a change to report soon. But there's a more-important change being considered that we'd like to draw your attention to: In the September meeting of the Executive Committee of the Board of Directors, one of the topics discussed was that of restarting DXCC *from scratch* after the WARC in 1979. Why? Well, it's likely that *some* changes in our bands and operating privileges will occur. If DXCC is really going to keep up with the times, then perhaps it too should change. And we've received comments to the effect that the present DXCC rules and Countries Criteria have grown too unwieldy. If we reshaped DXCC, a needed streamlining could be effected. We might add more awards to continue the trend toward specialization – 40 phone? . . . 80 FAX? Who knows? The DX Advisory Committee would like to have your comments on this as soon as possible, as the deadline for a coordinated proposal for a new DXCC is July 1, 1977, so that the Board can consider the matter at its July 1977 meeting.

Give some thought to a revamped DXCC program, won't you? There would be something new for *everybody* if the time comes for ordering a new band switch for the rig . . . and you might even stretch some new fabric over the bones of that hash-marked triplane.

W1AW OPERATING SCHEDULE

Operating-visiting hours are Monday through Friday 1 P.M. to 1 A.M., Saturday 7 P.M. to 1 A.M. and Sunday 3 P.M. to 11 P.M. (all local Eastern time). The station address is 225 Main St., Newington, CT 06111 (about 7 miles south of Hartford). Maps with local street details and the general contact schedule are available upon request. All frequencies shown are approximate. If you wish to operate, you must have your original operator's license with you. The station will be closed Dec. 24-25, Dec. 31, 1976; Jan. 1, Feb. 21, Apr. 8, 1977.

Staff: Chief Operator/ARRL Asst. Communications Mgr. C. R. Bender, W1WPR; Alan Bloom, WA3JSU; Chris Schenck, WB2SEZ.

In a communications emergency monitor W1AW for special bulletins as follows (times in UTC):

Phone: On the hour.
RTTY: At 15 minutes past the hour.
CW: On the half hour.

Code Practice

Approximate frequencies: 1.82 3.58 7.08 14.08 21.08 28.08 50.08 and 145.588 MHz. For practice purposes the order of words in each line may be reversed during the 5-13 wpm transmissions. Each tape carries checking references. Details on Qualifying Runs appear monthly in *QST* Operating Events. The 0230Z practice is omitted four times a year on designated nights when Frequency Measuring Tests are sent in this period.

Speeds	*EST*	*UTC*
5-7½-10-13-20-25		
	9 A.M. MWF	1400Z MWF
	9:30 P.M. TThSSu	0230Z MWFSu
10-13-15	4 P.M. M-F	2100Z M-F
	7:30 P.M. Dy	0030Z Dy
35-30-25-20-15		
	9:30 P.M. MWF	0230Z TThS
	9 A.M. TTh	1400Z TTh

To improve your fist by sending in step with W1AW (but not over the air!) and to allow checking the accuracy of your copy on certain tapes, note the UTC dates and *QST* text to be sent in the 0230Z practice from the issue of *QST* 2 calendar months past.

12/3	It Seems to Us	12/23	Public Service
12/7	Correspondence	12/27	World Above
12/15	League Lines	12/29	YL News

Bulletins

Columns indicate times in EST-PST-UTC(Z).

Phone Bulletins (1.82 3.99 7.29 14.29 21.39 28.59 50.19 145.588 MHz):

2100 Dy	1800 Dy	0200Z Dy
2330 M-S	2030 M-S	0430Z T-Su

CW Bulletins at 18 wpm (1.82 3.58 7.08 14.08 21.08 28.08 50.08 145.588 MHz):

1630 M-F	1330 M-F	2130Z M-F
2000 Dy	1700 Dy	0100Z Dy

CW Bulletins at 10 wpm (same frequencies as above):

0000 T-Su	2100 M-S	0500Z T-Su

RTTY Bulletins at 170-Hz shift are repeated at 850-Hz shift when time permits (3.625 7.095 14.095 21.095 28.095 MHz):

1730 M-F	1430 M-F	2230Z M-F
2300 M-S	2000 M-S	0400Z T-Su

OSCAR Bulletins (18 wpm on cw frequencies):

0840 M-F	0540 M-F	1340Z M-F
1400 M-F	1100 M-F	1900Z M-F
1600 Su	1300 Su	2100Z Su

OSCAR RTTY:

1700 Su	1400 Su	2200Z Su

NEW A-1 OPERATORS

K5BNH K8FVA W5HIC WA5JFZ K5YMY W7AYO DL7AD YU1FD.

5BWAS AWARD

(Updating the November listing, starting with number 263): W4WRY WA7IHN WA3PWL/0 WB4VBL K5YWX/6. Note: A previous listing inadvertently omitted No. 256 K4BBF and No. 257 WB8ECI. Check this issue for the master list of holders of 5BWAS.

SCM ELECTION RESULTS

Balloting: In the Wyoming Section, Mr. Leo A. Bush, WA7NHP and Mr. Chester C. Stanwaity, W7SDA, were nominated. Mr. Stanwaity received 92 votes and Mr. Bush received 32 votes. Mr. Stanwaity's term of office began November 19, 1976. QST

*Asst. Communications Manager, ARRL

Operating Events

DECEMBER

2: West Coast Qualifying Run, W6OWP prime, W6ZRJ alternate, 10-35 wpm at 0500Z (Universal Coordinated Time, abbreviated UTC, Z used as a designator), on approximately 3590/7090 kHz. This is 2100 PST the night of December 1. Please note that dates are always shown at least two months in advance and times are always the same local "clock time," i.e. 9 P.M. local Pacific time. Underline one minute of the highest speed copied, certify that the copy was made without aid and send to ARRL for grading. Please include your full name, call (if any), address. A large addressed stamped envelope would be helpful.

4-5: 160-Meter Contest, p. 94 Nov. North Carolina QSO Party, Telephone Pioneers QSO Party, p. 97 Oct.

11-12: 10-Meter Contest, p. 95 Nov. Spanish Contest cw, p. 97 Nov. HA-DX Competition, 1600Z Dec. 11 through 1600Z Dec. 12, sponsored by the Hungarian Radio Amateur Society and organized by the Radio Amateur League of Budapest. Categories: single op. single band, single op. multiband, multiop. multiband (club stations must participate in this section). Cw only, 80-10 meters. Call CQ TEST HA (HAs will call CQ TEST WW). Exchange RST and serial starting with 001. After their signal report HAs will transmit a two-letter code corresponding to their county as follows: BA BP BE BN BO CS FE GY HA HE KO NO PE SA SO SZ TO VA VE ZA. Each contact with an HA counts one point. The same station can be worked just once on the same band. Multipliers are each different HA county on each band. Scoring: contact points times the sum of the multipliers from each band. Logs must be made in the usual form with a signed summary and declaration. Mail within six weeks of the competition to the RAL of Budapest, H-1553 Budapest, P. O. Box 2, Hungary. Awards.

17: WIAW Qualifying Run, 10-40 wpm at 0230 UTC, transmitted simultaneously on 1.82 3.58 7.08 14.08 21.08 28.08 50.08 and 145,588 MHz. (Note, please, that this is 2130 EST, 9:30 P.M. local Eastern time, the night of Dec. 16.) Underline one minute of the highest speed you copied, certify that the copy was made without aid (use of a typewriter is, however, OK), send to ARRL for grading. Please include your name, call (if any) and complete mailing address. A large s.a.s.e. will help to expedite your award/endorsement.

18-19: SOWP Christmas QSO Party, the full period, sponsored by the Society of Wireless Pioneers for its membership; the first "voice" party so scheduled. No formal exchange requirements and no need to submit logs. All members with a phone capability are urged to participate; call CQ SOWP. Suggested frequencies are plus/minus 5 kHz of 25 kHz of the low end of each General class phone portion of the bands. EPA QSO Party, sponsored by the PTTN Traffickers ARC, open to all, from 2000Z Dec. 18 through 0200Z Dec. 20 (maximum of 20 hours operation). Exchange QSO no., RS(T), and county (EPA) or ARRL section or DX country. Frequencies: cw 50 kHz from bottom, ssb lower edge of the General bands, Novices use center of band. Also, use 1810 kHz and popular vhf frequencies (no repeater contacts). Stations may be worked once on cw and once on phone on each band. Score one point per phone QSO, two points per cw QSO, multiplied by the no. of ARRL sections and countries worked (EPA counties for others). Multiply by two for under 200 watts, or four for QRP (five watts). Add 250 bonus points for each or any of the following: working 10 Novices, using OSCAR, each county activated while portable or mobile, originating radiogram before January 1 to AA3SXU with score breakdown. A multitude of awards. Send log/summary, radiograms, and s.a.s.e. with comments to: Drew M. Smith, AA3SXU, 80 Briarfoot Ln., Levittown, PA 19054.

26: HA5-WW, p. 97 Nov.

29: WIAW Morning Qualifying Run, 10-35 wpm, at 1400 UTC. This is 9 A.M. EST. Same frequencies/details as under the Dec. 17 listing.

JANUARY

1: Straight-Key Night, full 24-hour period, UTC. See rules this issue.

5: West Coast Qualifying Run.

8-9: VHF SS, this issue. YU-DX Contest, sponsored by the YU Society, the SRJ, 80-meter cw only, 2100Z Jan. 8 through 2100Z Jan. 9. YUs will call CQ Test, others will call CQ YU. Exchange RST and QSO no. starting with 001. Points: contacts between stations in the same country one point, between stations on the same continent two points, between stations on different continents five points, contacts with YU stations ten points. (Only one contact with the same station is permitted.) Multiplier of one for each DXCC country (including your own) and each YU prefix. The final score will be the sum of points multiplied by the sum of multipliers. Categories are either single operator or multiop. (Club stations are considered multiop.) Awards. Logs must include date/time(Z), calls, exchanges, country/YU prefix, notation if new multiplier, and points. Summary must include the usual signed declaration. Disqualification criterion based on a three-percent dupe QSO figure. Contest Committee decisions final. Postmark logs by March 15 and send to the YU-DX Club SRJ, P. O. Box 48, 11001, Belgrade, Yugoslavia.

11: WIAW Qualifying Run.

15-16: "Hunting Lions in the Air Contest," sponsored by Lions International and coordinated by the Lions Club of Rio de Janeiro, Brazil. Open to all, Lions and non-Lions; starts 1200Z Jan. 15 and ends 1200Z Jan. 16. Use the top 25 kHz of the 40-20-15-10 meter phone and cw bands. Exchange name, QTH, no. of contacts and times. Participating Lions/Leos should identify their club name. Each QSO worth one point, no more than one contact with the same station. A bonus point if the QSO is with a Lion/Leo. Contacts made between countries will also earn a bonus point (if between Lions/Leos it becomes two bonus points). If the contact is made with a Lion from the Rio de Janeiro (Arpoador) Club or the Curitiba (Marumi) Club, additional points as follows: within Brazil three points total (includes one additional bonus point), outside Brazil five points (includes two additional bonus points). Only one contact may be counted with either or both of the clubs for the extra points. Awards. Postmark logs within 30 days of the contest and send to the Contest Committee, Lions Contes, Lions Club of Rio de Janeiro (Arpoador), Rua Souza Lima n. 310 – Apartamento 802, Rio de Janeiro – 20.000-ZC-37, Brazil.

15-17: CD Party, cw appointees only, starts 2300Z, ends 0500Z.

22-24: CD Party, phone.

29-30: Simulated Emergency Test, rules this issue. French Contest, cw, sponsored by the French society, the REF, starts 1400Z Jan. 29 and ends 2200Z Jan. 30. Transmit RST and consecutive QSO number. You earn three points for each QSO with stations of francophones countries: F and other DUF countries, ON HB LX VE2 OD HH 3B 9U 9Q and 9X, ten points for either F6REF or F8REF. Multipliers are one for each different F department, ON province, HB canton, and other different francophone country per band. Suffix for identification is given with the call (00 to 95) for F, ON and HB (two each). Scoring: total QSO points times total multiplier points. Send logs promptly to the REF traffic manager, Lucien Aubry F8TM, rue Marceau 53, 91120 Palaiseau, France. Note, the following military stations are good for both points and multipliers: DA1 or DA2/FFA (F), DA1 or DA2/FBA (ON). CQ 160 Meter DX Contest, sponsored by *CQ* magazine, starts 2200Z Friday, ends 1600Z Sunday, cw only; no cross mode. Exchange RST plus a three-digit serial starting with 001, and your state or VE province. (It is not necessary for DX to send their QTH; the prefix will identify them.) Scoring: For W/VE/VO, two points per QSO with other W/VE/VO stations. All DX contacts are worth 10 QSO points (DXCC country list). For all other countries, two points per QSO with stations in the same country, five points with stations in other countries; except for contacts with W/VE/VO which count ten points. A multiplier of one for each state, Canadian province and DX country worked (KH6 and KL7 are considered DX, the District of Columbia same as Maryland). VE1 is composed of the three provinces of New Brunswick, Nova Scotia, Prince Edward Island. VO1 and VO2 are separate. Final score equals total of QSO points multiplied by the sum of the multipliers. Usual disqualification criteria. Awards. Logs from CQ. Mailing deadline for logs is February 26. Send to CQ 160 Contest, 14 Vanderventer Ave., Port Washington, L.I., NY 11050.

FEBRUARY

3: West Coast Qualifying Run.

5-6: DX Competition, phone.

5-13: Novice Roundup.

13: Frequency Measuring Test.

16: WIAW Qualifying Run.

19-20: DX Competition cw, YL/OM Contest phone.

26-27: French Contest cw.

Mar. 5-6: DX Competition phone.

Mar. 19-20: DX Competition cw.

June 11-12: VHF QSO Party.

June 25-26: Field Day.

QST

Feedback

□ There is an error in the schematic diagram for the "Code Box" ("The Code Box," *QST* for September, 1976, page 11). Pins 20, 21, 22 and 23 of U7 and U8 should be connected together, instead of the way they are shown in the diagram. Pins 1, 8, 9, 11 and 12 of U5 should be connected to pins 20-23 of U7 and U8 respectively. This change is reflected in the templates available from ARRL, and in circuit boards available from Circuit Board Specialists. Templates are now available as mentioned in the article. We regret the delay experienced by those who ordered early.

□ In the article, "360° – Steerable Vertical Phased Arrays," *QST*, April, 1976, the connections shown in Fig. 3 will give directivity opposite to that shown in Fig. 1, page 28. The array will work properly otherwise. Unfortunately there was a typographical error in an attempted correction of this in *QST* for July, 1976. Directivity indications will be as described if the following changes are made in terminal identifications shown in Fig. 3:

Change K3 and Antenna 3 to K4 and Antenna 4.

Change K4 and Antenna 4 to K3 and Antenna 3.

Change B (in triangles) to C (two places).

Change C (in triangles) to B (two places).

The author points out a necessary correction in the text describing the 3-element version of the phased array. The last sentence under the heading "RF Power Dividers," page 28, should read as follows:

An alternative approach is to return each center conductor to an ungrounded common point, through 50-ohm noninductive resistors.

Station Activities

SCM ≶ AREC ≶ ORS ≶ OVS ≶ SEC ≶ OBS ≶ TCC ≶ OO ≶ NTS ≶ WAC ≶

CP ≶ A-1 OPR ≶ EC ≶ DXCC ≶ CLUBS ≶ RM ≶ OPS ≶ RCC ≶ PAM ≶ WAS

CANADIAN DIVISION

ALBERTA: SCM, Sydney T. Jones, VE6MJ — SEC: VE6XC. PAM: VE6AFO. OOs: VE6MJ VE6XO. VE6XD is handing out the cigars on the arrival of an addition to the family, congratulations. VE6VS and VE6PP have been in hospital but are reported to be doing well. VE7HW and XYL were visitors in Edmonton after a trip to eastern Canada. VE6AFO has moved but will be active as soon as antenna are erected. NARC will be holding code classes again this fall. VE6MJ and XYL enjoyed a trip to Eastern Canada and visit with VE3HC. Traffic: VE6FS 59, VE6AFO 12, VE6AMM 8, VE6WV 8, VE6BCZ 4, VE6CFE 4, VE6AFJ 4, VE6HO 3, VE6WN 2, VE6CHV 2, VE6QU 2, VE6BA 2, VE6JH 2, VE6AQJ 2, VE6AFW 2.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB — VE7AVW was VE7YI back in 1950 and active as ORS, he is back again as ORS. VE7DKY Net mgr. DRN-7 is looking for more on 7268 at 1800Z and 2000Z. Looks after nominations VE7DKY will be Net mgr. for British Columbia Public Service Phone Net 3755 at 0200Z. OO VE7TT is building up an antenna farm that should make him heard. VE7RQ 80 years young, commercial Spark Op on the White Empresses could have a record, never has driven a car! Traffic: VE7ZK 185, VE7DKY 82, VE7BLO 50, VE7SE 40, VE7MW 20, VE7CDF 16.

MANITOBA: SCM, Steve Fink, VE4FQ — RM: VE4PG. PAM: VE4JP. With fall now here, traffic net activity has gone way up with all nets reporting good participation with several new stations. The new Winnipeg Repeater VE4XK is working FB with increased coverage and autopatch scheduled shortly. New WARC executive: VE4KK, pres.; VE4SW, vice-pres.; VE4HU, secy.; VE4YM, treas.; VE4ND, membership chmn. Past pres. is VE4EW who is now QRV from a new QTH. The VE4UM gang is active for another season with new optrs. The new Net Directory is available for an sase from ARRL Hq. MTN: 30 sessions, 288 QNI, 190 QTC. MSN: 12 sessions, 54 QNI, 18 QTC. MEPN: 30 sessions, 930 QNI, 32 QTC. Traffic: VE4UL 158, VE4PG 100, VE4UO 73, VE4OW 42, VE4IX 31, VE4JP 20, VE4NU 12, VE4QU 12, VE4HR 11, VE4LB 8, VE4AAJ 7, VE4FK 7, VE4NM 4, VE4RO 4, VE4RW 2, VE4TE 2.

MARITIME & NFLD.: SCM, Aaron D. Solomon, VE1OC — Asst. SCM: Maurice Gladden, VO1FG. RM & APN Mgr.: VE1AAO. Nfld. Tfc. Mgr.: VO1GW. OTs on 2 meters are VE1SP and VE1BJK, ex-VE1JH. New amateurs are VE1ASM VE1AVO VE1AWH. VE1RO arranging phone patches for patients at V. G. Hosp. NSARA meeting 3765 kHz 1330Z Sun. CB Emer. Net 3735 kHz 1730Z Sun., NCS VE1AIJ VE1VR VE1AUY. APN 3654 kHz 0000Z Dy. NSVHF Assn. held well-attended meeting in Truro. VE1NQ gave 12 White Caners QSOs for RC Certs. VE1APV new promotion and transfer to Victoria. IR Group Executive: W1OCU, pres.; VE1CL, vice-pres.; VE1IN, secy.; VE1AIN, treas.; VE1HU, tech. dir. VE1AKT and VE1AJT attended Phila. Bicent. Conv. MAARC succesful Car Rally. SARC have 25 applicants for classes. HARC also planning classes; displays in shopping centres; new tower and beam for emergencies. VE1ALM VO2BD have new towers and beams. VE1HU VE1IN new 2-meter transceivers. VE1CU and XYL returned from trip. VE2FXT VE1AVL received newspaper publicity. Record number of amateurs from outside district attended recent Hamfest '76 in Halifax. Schooner "Norma & Gladys," VE0MEA returned. VO1CC VO1NP among those working VE0MEA. VO1JN and VO1MO attempting 6-meter contacts. Traffic: VE1BDT 340, VE1AAO 252, VE1ACU 107, VE1AVL 105, VE1AMN 54, VE1BFV 53, VE1ZH 19, VE1BEC 5.

ONTARIO: SCM, Larry Thivierge, VE3GT — Asst. SCM: Noreen Nimmons, VE3GOL. Congratulations are in order to Toronto EC VE3GFN and his AREC gang for their tremendous success with "Exercise Mayday" held in Toronto Sept. 16th. This simulated emergency was staged by the Ont. Hospital Assn. to test medical preparedness for a massive casualty situation. Police, fire, ambulance, airport, medical and Red Cross personnel participated. Local amateurs active included VE3s GFN GOL IDC ARV DHO EJW APZ BEA HCO PG DSA DPS EIQ FVX FJE FBI HUG DLS GXM ELF EBZ. We extend our sympathies to the families of VE3s OH and EVI who have become Silent Keys. New Life Member ARRL is VE3QB/VE3RMR. Our Canadian Dir. VE1SH is most grateful to all Canadian members who responded to recent poll taken in regard to the DOC new license class proposals. VE3OSC at the Ont. Science Center is off the air for the time being but hopes to be active again in a more favorable and larger location later. VE3s FAS and GSQ on the farm at Laurel. VE3ICD used 2 meters to help out the Hamilton Muscular Dystrophy Drive. VE3BVG in the hospital, our best wishes for a speedy recovery. Former WA1PLN and now VE3 ILN active with a TR33C. CK3UOT will be the 1977 call sign of the Hart House (U of T) ARC (VE3UOT). This is in honor of the University's sesquicentennial (150th anniversary). VE3VI active on 2 meters. OVMRC held a Show and Tell night with VE3s HDO HTJ CV SH AOE and HXP participating. Burlington repeater VE3RSB has added Autopatch facilities. VE3s DTQ HBX AND HLC active on both OSCAR 6 and 7. Former VE6AWW and RTTY/CW buff now active as VE3ILM. New appointments are VE3FGT as PAM and VE3s DZK and HTT as ORSs. VE3JA and XYL attended the IA State Ham Convention. VE3ATR received his OSN cert. We welcome the following new amateurs, VE3s IIA IIB IIC IID IIE IIF IIH and IIJ. New Advanced tickets for VE3s IIG, AZL and CQI. VE3GOL and I extend to all a very Merry Christmas and a Happy New Year. Traffic: (Sept.) VE3GOL 209, VE3CDK 226, VE3SB 203, VE3OZK 169, VE3DPO 146, VE3GFN 133, VE3AWE 112, VE3EKC 110, VE3GJG 105, VE3FQZ 92, VE3GT 90, VE3FRG 66, VE3ATR 36, VE3FGT 36, VE3HGJ 33, VE3GNW 19, VE3DH 12, VE3GEQ 9. (Aug.) VE3OVE 54, VE3ATR 11, VE3GNW 9, VE3GEQ 7, VE3FHQ 4.

SASKATCHEWAN: SCM, P. A. Crosthwaite, VE5RP — Saskatoon Amateur Radio Club has started with its presentation "The Lure of Amateur Radio" on CJUS FM Sat. mornings at 11:30 A.M. The club also put on a display at the Confederation Park Shopping Area. A weather traffic net will be in session this winter. Any queries on the net contact VE5XC or VE5LO on 3690 — "SATN." Traffic: VE5HP 34, VE5VK 32, VE5RP 12, VE5DN 4, VE5SM 4.

QUEBEC: SCM, Larry Dobby, VE2YU — Many thanks to VE2EC for his monthly report. The SCM is looking for an OBS for VE2RM nets Mon. and Thurs. Any person interested in filling the position is invited to contact VE2YU. In recent months there has been increased interest in RTTY on the Lakeshore sparked by the activity of VE2QO. Stations heard recently on the West Island VHF channel include VE2s QO DKK GV AXO AQO. The questionnaire sent around by ARRL and CARF in response to a DOC letter on licensing has sparked considerable comments from all and to judge by the response that the author has encountered most seem to be in favor or retention of cw as an integral part of the examination in Canada. A talk by well-known amateur VE3GK at the Sept. meeting of the MARC was very well attended. Gerry has spent considerable time and effort in building and testing various antenna arrays for 20 meters in an effort to be "first" in pikeups. It is the hard work in this and other areas of our hobby that keep the spirit of amateur radio alive. Merry Chrlatmas and Happy New Year to all and may our ranks continue to fill as we continue to publicize the good works and services of ham radio. Traffic: K2HI/VE2 195, VE2EC 75, VE2WT 55.

ATLANTIC DIVISION

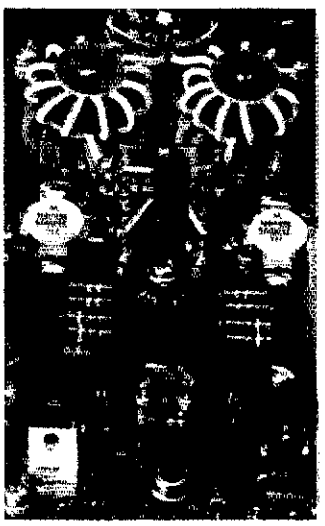
DELAWARE: SCM, Roger E. Cole, W3DKX — SEC: K3KAJ. RM: W3EEB. PAM: WA3DUM. Heavy rains and a Tornado watch caused low attendance at the Del. Ham Campout at W3EEB's A-OK Campground. K3NVV W3FEG and K3YHR had their vehicles and several hams visited the site. K3UHR came home from the Malaga Hamfest with the Swan 700-XC 1st prize. At press time, 7 prospective Novices have passed the code test and completed the written test as a result of the Delaware ARC classes. WA3QLS and WA3QPX gave an interesting demonstration and explanation of Repeater Autopatch operation at the First State ARC. PSHR: WA3WPY/3 44, K3YHR 49, K3KAJ 38. Traffic: (Sept.) WA3WPY/3 98, AC3EEB 93, K3KAJ 91, W3DKX 45, AD3YHR 45, WA3WIY 37, W3YAH 17, WA3UUN 12, WA3QFF 10, WN3ANL 4, W3WD 4. (Aug.) K3KAJ 79.

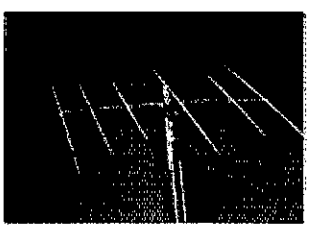
EASTERN PENNSYLVANIA: SCM, Geo. S. Van Dyke, Jr. W3HK — SEC: W3FBF. RMs: K3MVO WA3OGM WA3SXU. PAMs: W3AVJ WA3PZO. Net reports: EPA QNI 265, QTC 112; (July) QNI 270, QTC 108; (Aug.) QNI 318, QTC 184; (Aug.) PFN QNI 479, QTC 339; PTTN QNI 113, QTC 53, AREC(10) QNI 13, AREC(2) QNI 11. BPL: W3CUL W3VR K3NSN WA3YJG WA3THT WA3QTQ. PSHR: WA3OGM W3IPX WA3SXU WA3YJG. OVS: W3GOA W3CL WA3BJQ WA3BSV WA3ZRE. OBS: W3ID W3AVJ W3CL W3QRQ. OO: K3RDT AC3KEK K3NSN W3KCM. K3NSN acting as outlet for 4X4GV. WA3ATQ back in full swint. WA3OGM and WA3SXU report EPA and PTTN getting back to normal. Two new ORSs K3RVC and WA3YDZ. W3WRE says cold doesn't show on cw! WA3YHR back in school. W3BUT reports 40 General and 22 Novice students at North Penn Evening School. W3ZRQ reports TASBAR used 2fm for the Tamaqua Bicen celebration; W3LDV W3VA WA3BSV K3NYX WA3BJI WA3GNG and W3ZRQ did the job. Special QSLs to those contacted during the affair. W3GMK in the rebuilding stage again! W3EU toying with the idea of getting big E. W3OI repainted their shack; painters W3VQ K3RYZ WA3EWV WN3CJU W3BOP WB3CCV WA3MNT WA3NON W3JWX W3HYT and W3NCX. W3OK W3OI and WA3GYE worked at ARRL booth at CB Jamboree. WA3VUE, EC Berks Co. has developed a nice telephone alerting system. W3FEY & WA3UNS up to big E. WA3ULQ & WA3WPA now big A. WN3ABS now General. Lancaster 146.01/61 machine is out of commission, if you need assistance in the area use 52 ximplex. Hope you are all ready for the holiday Tfc and Santa is good to you. Traffic: (Sept.) W3CUL 3025, K3NSN 1443, W3VR 844, AA3SXU 278, WA3YJG 273, WA3THT 258, WA3ATQ 216, WA3OGM 216, W3IPX 84, K3GJL 54, W3AVJ 33, K3RFC 32, W3ID 30, AA3YDZ 30, W3ADE 19, W3CL 16, WA3QYY 11, W3WRE 11, WA3YMV 10, WA3YHR 8, WA3CKA 7, W3BUR 6, W3ZRQ 4, W3HK 3, K3HXS 3, WA3VUE 3, WA3BJQ 2, WA3BSV 1, W3EU 1, W3GMK 1, W3GOA 1, W3KCM 1, AC3KEK 1, WA3VDQ 1. (Aug.) WA3OGM 40, WA3CKA 18, AA3YDZ 12, WA3BSV 1. (July) WA3OGM 87.

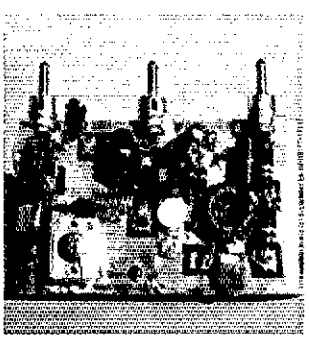
MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — Congrats to new SEC W3FCS. W3MWD became a Silent Key Sept. 11. The hierarchy at PVRC is W4WSF, pres.; K4CFB, veep; K4GKD, secy.; W3AZD, treas. Dir. W3BQV W3IN W4KFC W4BVV. W3ADT heads up the Repeater Assn., with W3EZT K3OAE K3WX and W4UGE. The Balto QCWA's annual picnic was hosted by W3EPR sez W3AC. The BARC Modulator is back, and the club has a full program for the new season. W3BHE and the Mountain ARC are in full gear with new classes. The Antietam ARA was surprised at 3 times expected turnout for beginners classes. Congrats to WB3AZW from WN to General, and WA3ZNJ new Extra. OO reports from WA3KCY AC8BZY/3 AA3UHJ WA3NSA and WA3JSZ. EC WA3ZCE has an AREC

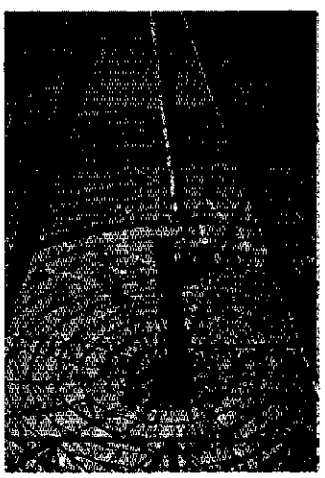
The Radio Amateur's Handbook

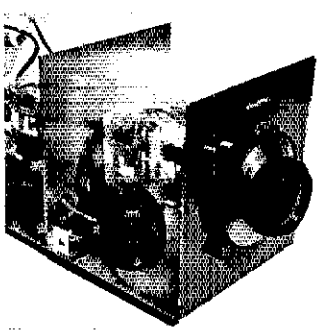
The Standard Manual of Amateur Radio Communication

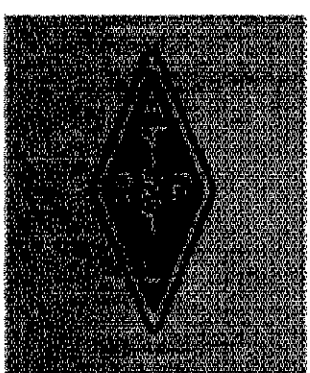












1977

PUBLISHED BY THE AMERICAN RADIO RELAY LEAGUE

net on 28/88 9 P.M. local Wed. nites, and 28.15 MHz 2 P.M. Sun. W3HJH reports St. Marys met 5 times with QNI avg., 8. FC W3ZNW is active in Charles. WA1VMV/3 been QRL school and work. His 2-mtr. rig ripped off as was WA3HKR's HF mobile antenna. WA3UYF is starting a school radio club. W3JPT sports a 2-mtr eight-element dual polarity beam readily changeable, and fourteen-element 432-MHz. W3EOV had fantastic trip to VE1, and VO with lots of 2-mtr. activity. WB3BUA about to join em on '2. W3ABC and W3CDQ made the national QCWA trip. WA3FYZ busy chasing presidential candidates as part of his VOA work. W3JZY getting RTTY paper poor on MARS. WB2TJR/3 planning a VK trip soon. W3DFW has a net of food lovers. W3FCI has a new antenna at 80 feet. ORS W3IHM and OPS W3IOF are new appointees. WA3SJS WB3BYT and WA3ZTW are hitting the traffic trail. WA3ZAS has new 2-mtr capability. WA3PRW has a new keyer and becomes NCM of the MEPN: Congrats. W3FZV was active in the MDC QSO party. WA3UYB hade the antenna stronger but the rig failed him. W3CWC moves to new QTH. AA3YKK has it all organized. With the nets, sessions/QTC/QNI avg. MDCTN 17/64/21.4. Top Honors to WA3UYB K3ORW W3ADQ WB3BUA and AA3YKK. MEPN 23/64/21.0 Topper W3ADQ, others WB3AUK W3DKX W3HWZ WA3IIV W3JQN W3LDD K3ORW and WA3PRW. MDD 60/207/7.3 Top Brass AC3EBB K3KAJ WB3BYT WA3WPY and AA3YKK. WR PON made it a 12/42/16.4 success. Traffic: (Sept.) AC8BZY/3 124, W3FA 122, WA3SJS 80, WB3BYT 75, W3FZV 71, WA3UYF 60, WA3UYB 55, WA3HKR 42, AA3YKK 42, WB3BUA 40, WA3ZIW 37, W3IHM 32, WA3EOP 27, WA3ZAS 24, K3ORW 16, WA3PRW 12, WB2TJR/3 10, W3EOV 7, W3ZNW 5. (Aug.) WA3UYB 76, WB2TJR/3 25, WB2BUA 16.

SOUTHERN NEW JERSEY: SCM, Raymond F. Clancy, WB2GTE — Stone HarborARC reports new tickets; WA2GZH WB2GWX WN2GXU WN2GYF WA2GWS. Congrats, good DXing. K2BG says Rancocos Valley ARC held annual dinner at Ft. Dix. SJRA's White elephant sale a success, W2OSD officiating. SJRA plans Christmas party. Salem Co. RC's code class of 45 meets Tue. at the Salem Co. Court house, Maple Shade ARC enjoyed a week end Field Day party in Chatsworth pines. WB2EYF of Shore Points ARC sez they have applied for affiliation with ARRL. They publish a paper SPARC GAP monthly. W2ORA describes the Navassa Expedition KC4NI again at DX PO '76 in VA. PAM WB2VFT details the NJPN activity in Belle. QNI 467 stations 260, in all counties and 5 call areas. W2TDS looking for phone patch to Machias, ME. W2KA plans Nov. trip to meet 4X4-Land hams. WN22DU went to General then Advanced has 40-ft. tower. WA2PCE a new tri-bander & 40-ft. tower. Thrifty signed up for Old Barney Novice class. W2EQK has 5BWAS, WAC plus DXCC. WB2VST has 240 level DXCC. K2JWG K2ARY K2QJD new rigs. K2ARY new OBS. W2UA passed away. Cumberlund Co. ARC invites you to meetings 1st Thur. each month at Friendship Hall, Buena NJ. WN2DPS got new rig — 101E. Burlington Co. ARC K2KED will have Christmas Dinner Dec. 10 at Vincentown NJ. Traffic: W2JI 27, WA2AWU 20, WA2LCC 16, K2BG 4, W2IU 2.

WESTERN NEW YORK: SCM, Joseph M. Hond, K2YAH — Asst. SCM: W. B. Thompson, W2MTA. SEC: WB2EDT. Season's Greetings. That simulated disaster drill held in Monroe Co. in Sept. resulted in discovering several ways to improve emergency communications both amateur and non amateur. A meeting held following the drill with the Monroe Co. Public Safety Radio Office and K2OIU WB2EDT and WB2ZFM resulted in increased responsibility for amateur radio in providing emergency hospital communications. RAWNY has been asked by several organizations to provide courses in amateur radio. RAWNY wants to work with STARS, BARRA, ARATS or any other club or individual interested in supporting classes. Speaking of classes, RaRa had a record 137 attend the first session of its Novice course which started Sept. 20. W2EBF K2EAW and WA2SDK are running a Novice course in Webster and have about 30 students. WB2ICE is planning a Novice course for RAGS. Congratulations to W2LZ member WB2AZW on his new General ticket. W2RKU is now W4NGT in sunny FL. New officers for the U of Buffalo ARS WA2NPQ are: WN2EQW, pres.; WA2SIS, vice-pres.; WA2ICU, secy.; WN2YUP, treas. WA2HSB renewed as OPS and EC. WB2KLD is now an OVS and Class V, OO. Regret to report that W2DUQ is a Silent Key. W2FR who is busy arranging the EAS meeting at Hartford for Oct. 23, 24 missed PSHR in Sept. by one point. Congratulations to WA2UYH who's BPL last month was her third BPL of the year. Finally, please do not place important correspondence inside club papers, meeting notices, etc. These routine mailings are usually not opened until the month following and as a result I will not see the correspondence as soon as necessary. Therefore, please send important items in a separate envelope to assure it will receive prompt attention. Traffic: W2MTA 174, W2OE 156, WA2TPC 129, W2FR 121, WA2ZJP 77, WA2SFT 56, WA2HSB 51, W2HYM 46, W2UIE 42, WA2ELO 35, W2FZK 30, WA2AIV 20, K2OFV 9.

WESTERN PENNSYLVANIA: SCM, Donald J. Myslewski, K3CHD — SEC: W3ZUH. Asst. SECs: K3SMB WA3LJW. PAM: K3SMB. RMs: W2KAT/3 W3NEM W3LOS W3KUN.

Net	kHz	Time/Days
WPA CW Traffic	3585.0	7:00 PM Dy
WPA Phone Traffic	3977.0	6:30 PM Dy
WPA RACES	3990.5	9:00 AM Su

New appointments: WA3FLR as EC for Butler County. Next month is the SET. Is your county ready to participate? The following counties DO NOT have an Emergency Coordinator: Bedford, Clearfield, Forest, Fulton, Jefferson, Potter, Somerset, Venango and Warren. Are there any amateurs in these counties? Contact W3ZUH or myself for details on the EC appointment. W3IBW is serving on the Committee for Westmoreland Civil Preparedness. The Tri-County AREC Net meets every Wed. at 9:00 PM on 50.150 MHz. If you have 6-meter gear, you are welcome to check in. The Penn State ARC K3CR is on the air after the summer recess. WA3BKD held a presentation on Amateur Radio for a local CB club. Washington Amateur Communications (WACOM) is conducting Novice classes. W3SW, Atlantic Division Dir. presented a plaque to the Amateur Transmitters Assn. (ATA) of Western Pa. for 50 years affiliation with the ARRL. WA3HHC returned from CA to WPA after two years leave. Crawford AR Society repeater WR3ABN is operational on 146.04/.64 MHz. New officers for the Two Rivers ARC for 1977: W3UST, pres.; K3CHD, vice-pres.; WA3NLE, treas.; WA3SOZ, secy.; WA3UHI, act. W3SIK upgraded to Advance and K3OTS to

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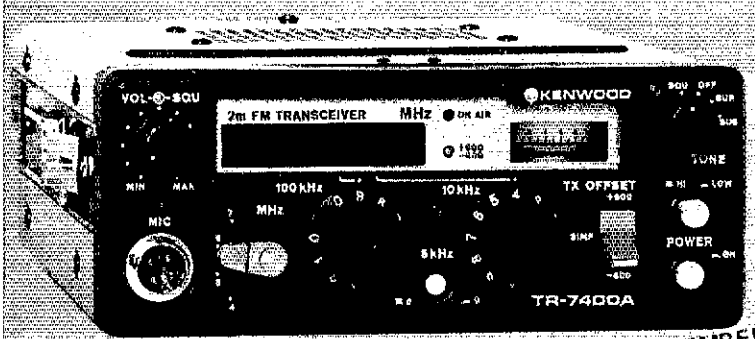
TS-700A

Discover the luxury of 4 MHz

Kenwood's TS-700A offers the ultimate promise of 2-meters . . . more channels, more versatility, tunable VFO, SSB-CW . . . and Kenwood quality.

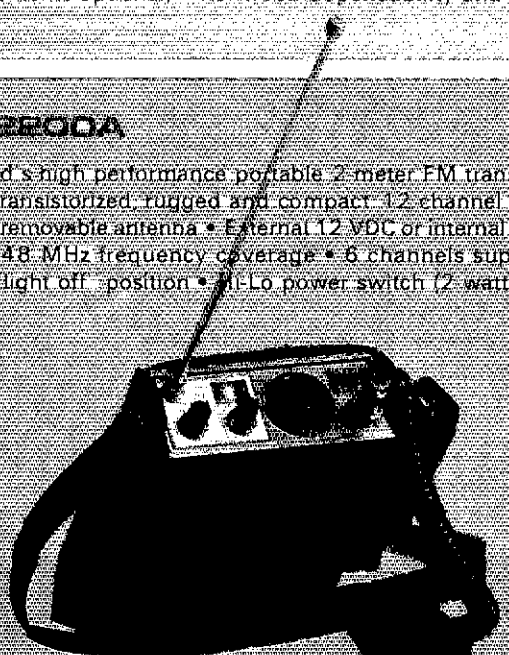
Operates all modes: SSB (upper & lower), FM, AM and CW • Completely solid state circuitry provides stable, long lasting, trouble-free operation • AC and DC capability (operate from your car, boat, or as a base station through its built-in power supply) • 4 MHz band coverage (144 to 148 MHz) • Automatically switches transmit frequency 600 KHz for repeater operation. Simply dial in your receive frequency and the radio does the rest . . . simplex repeater reverse • Or accomplish the same by plugging a single crystal into one of the 11 crystal positions for your favorite channel • Transmit / Receive capability on 44 channels with 11 crystals.



TR-7400A

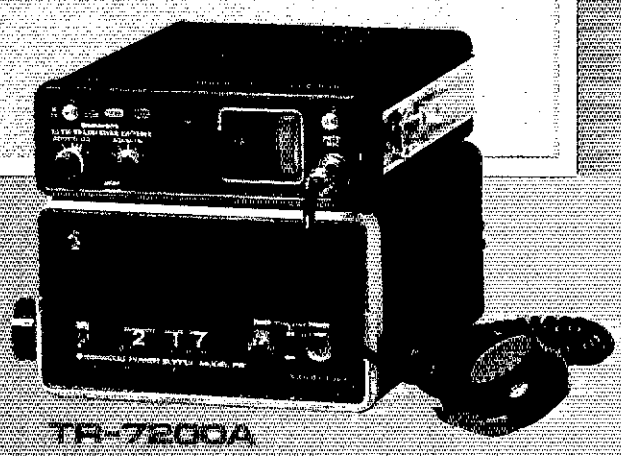
NEW...AVAILABLE IN DECEMBER

KENWOOD'S EXCITING NEW 2-METER MOBILE TRANSCEIVER • All solid state • Synthesized phase lock loop (PLL) • Power output: 25 or 10 watts (high or low selectable) • 6 digit LED frequency dislay • Full coverage 144-148 MHz, 800 channels in 5 KHz steps • 600 KHz repeater offset • Continuous tone-coded squelch (CTCS) for transmit and receive or transmit only with tone elements optional • Tone burst (tone elements optional) • Kenwood dependability and value built in.



TR-2600A

Kenwood's high performance portable 2-meter FM transceiver . . . completely transistorized, rugged and compact. 12 channel capacity • Telescoping removable antenna • External 12 VDC or internal ni-cad batteries • 146-148 MHz frequency coverage • 6 channels supplied • Battery saving "light off" position • Hi-Lo power switch (2 watts-400mW).



TR-7200A

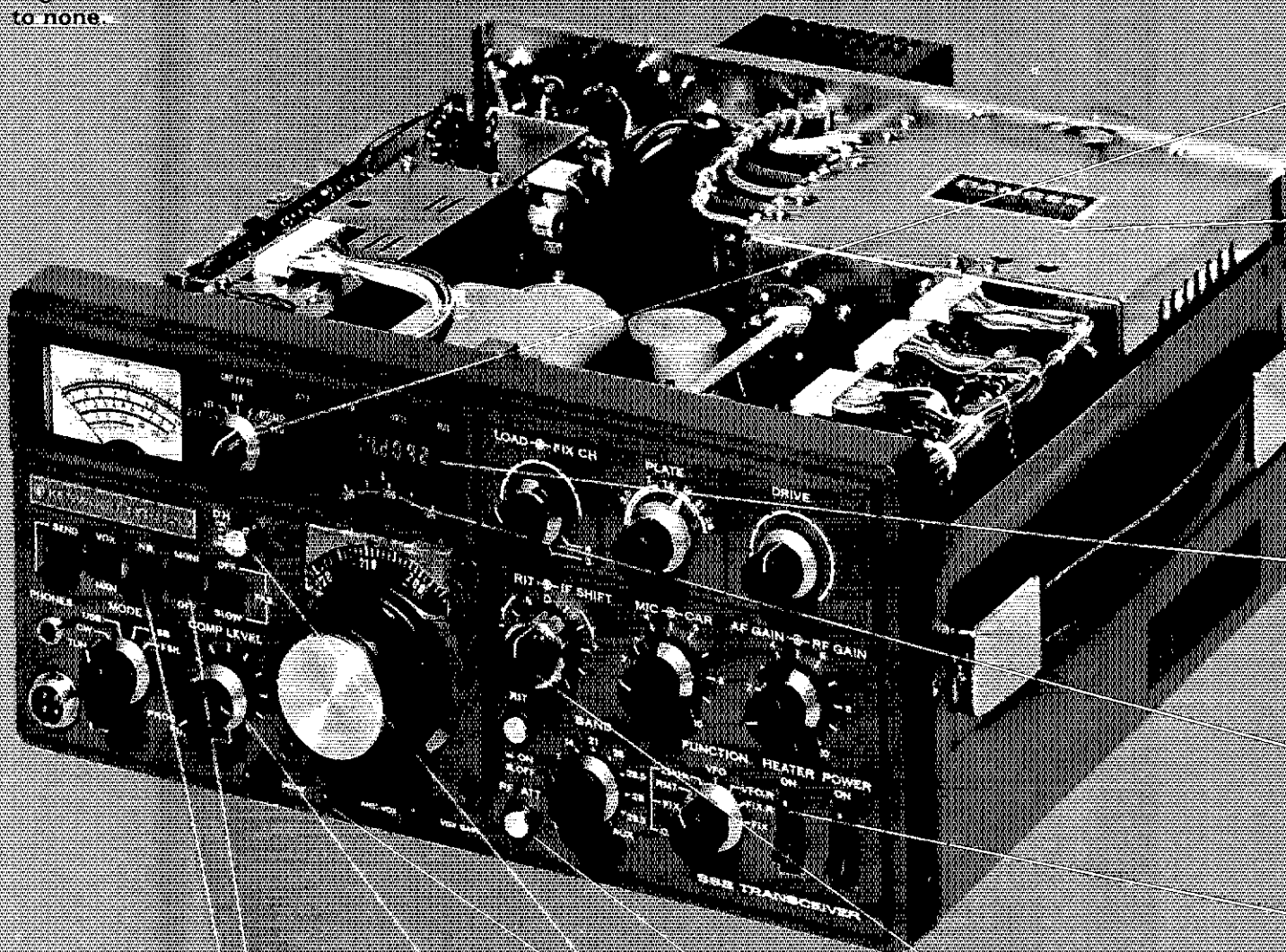
Kenwood's superb 2-meter FM mobile transceiver. Designed to withstand the most severe punishment while providing consistently excellent performance. Packed with features like the PRIORITY function . . . Put your favorite crystals in channel 7, and the 7200A switches there with the push of a button no matter what channel you are on. 146-148 MHz coverage, 22 channels, 6 supplied. Completely solid state.

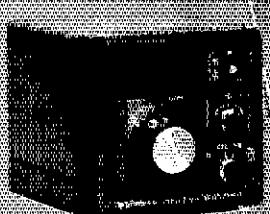
The perfect companion to the TR-7200A is the PS-5 AC / DC power supply. Together they provide an efficient and handsome base station. Complete with a digital clock and automatic time control feature built in.

KENWOOD'S TS-820 *the Pacesetter*

Kenwood's well deserved reputation for fine craftsmanship and superb performance has never been more evident than in the TS-820. As a result of a host of innovative features being brought together, the 820 offers a degree of versatility, performance and pleasure second to none.

The Kenwood TS-820 is destined to be the world's new standard of excellence in amateur radio for years t come . . . a true "Pacesetter".





VFO-820

The VFO-820 is a solid state remote VFO designed exclusively for use with the Kenwood TS-820 *Pacesetter*. The VFO-820 has its own RIT circuit and control switch. It is fully compatible with the optional digital display in the TS-820. *The perfect extra to any Pacesetter station.*

● **RF MONITOR** • Built-in monitor circuit allows you to hear your own voice by sampling the RF signal. Especially useful for adjusting the RF Processor.

● **NOISE BLANKER** • The TS-820 uses an efficient noise blanker circuit, another Kenwood exclusive. A special crystal filter assures unsurpassed efficiency in eliminating unwanted pulse noises.

● **DIGITAL HOLD** • A single pushbutton switch offers the operator unprecedented versatility. The digital hold circuit will lock the counter and display at any frequency, but will allow the VFO to function normally. Ever wanted to return to a certain spot on the band and forgotten the frequency? That won't happen again with the new digital hold feature on the Kenwood TS-820.

● **SPEECH PROCESSOR** • An RF circuit provides quick time constant compression using a true RF compressor as opposed to an IF clipper. Amount of compression is adjustable to the desired level by a convenient front panel control.

● **IF SHIFT** • The IF SHIFT control varies the IF passband without changing the receive frequency. This "IF shift" control is located on the front panel and provides excellent unwanted signal reject control or "pass band tuning." The 820 moves the signal across the IF pass band not the pass band across the signal.

● **RF ATTENUATOR** • Easy, one touch activation of the attenuator supplies 20 dB of padding on receive.

● **VOX** • A voice-activated microphone circuit is built into the TS-820 with VOX GAIN, ANTIVOX, and VOX DELAY controls placed on the front panel for convenient adjustment and time.

Features

160 METERS • Full band coverage

PLL • The TS-820 employs the latest phase lock loop circuitry. The single conversion receiver section performance offers superb protection against unwanted cross-modulation. And now, PLL allows the frequency to remain the same when switching sidebands (USB, LSB, CW) and eliminates having to recalibrate each time.

RF NEGATIVE FEEDBACK • The linearity of the TS-820's final amplifier stage is now one of the best on the air. Third order intermodulation products are 35 db or greater below the output signal. RF Negative Feedback from the PA plate circuit to the driver cathode permits a high degree of linearity at the high power level of the final tubes.

FULL METERING • During receive, an easy to read meter functions as an S-meter. The same meter displays ALC level, plate current, RF output, and plate voltage during transmit. Includes COMP setting for adjusting the compression level of the built-in speech processor.

FINAL AMPLIFIER • The TS-820 is completely solid state except for the driver (12BY7A) and the final tubes. Rather than substitute TV sweep tubes as final amplifier tubes in a state of the art amateur transceiver, Kenwood has employed two husky S-2001A (equivalent to 6146B) tubes. These rugged, time-proven tubes are known for their long life and superb linearity. The input power of the TS-820 is conservatively rated at 160 W DC, 200 W PEP. Tubes run cool with the aid of a noiseless fan (standard) mounted on the rear panel. The above tube and power combination minimizes the possibilities of TVI and helps to maintain the Kenwood reputation for excellent audio quality.

DIGITAL READOUT DG-1 • (optional) A digital counter display can be employed as an integral part of the VFO readout system. Counter mixes the carrier, VFO, and first heterodyne frequencies to give *exact* frequency. Figures the frequency down to 10 Hz and digital display reads out to 100 Hz. Both receive and transmit frequencies are displayed in easy to read, Kenwood Blue digits.

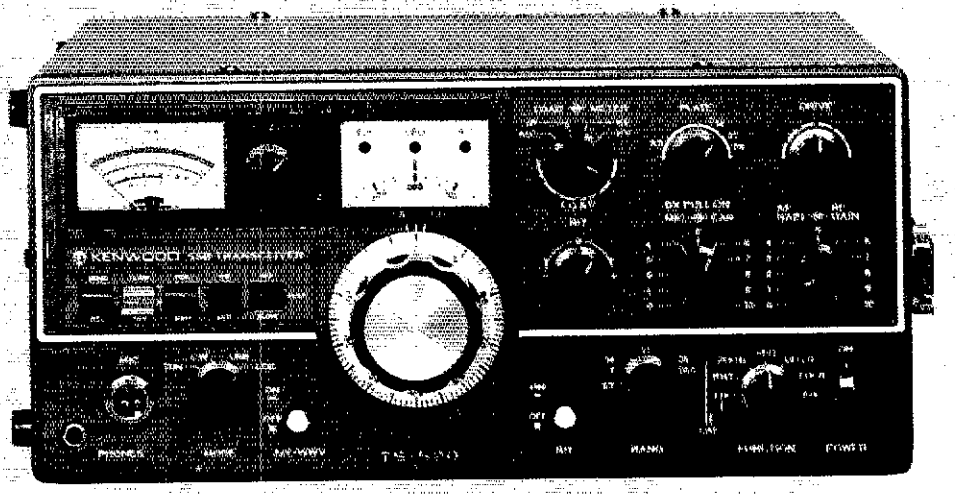
DRS DIAL • Includes the same satin-smooth planetary drive found on other fine Kenwood models plus special, high-precision gears to add a new "monoscale" feature for easier frequency readout. LSB, USB, and CW operating frequencies can be accurately read from the same pointer.

HEATER SWITCH • The filaments of the three vacuum tubes may be turned off during periods of "receive only".

CW AUDIO CHARACTERISTICS • During CW reception, a special filter is used to alter the audio frequency response to provide a more comfortable, easy to copy tone.

HIGH STABILITY VFO • The VFO, heart of any SSB transceiver, is an exclusive Kenwood design using FET technology.

Other features include:
- **Built-in 25 kHz calibrator**
- **Built-in speaker**
- **CW Sidetone and semi-break in**
- **Rear panel terminals for linear amplifier, IF OUT, RTTY, and XVTR**
- **Handy phone patch IN and OUT terminals**

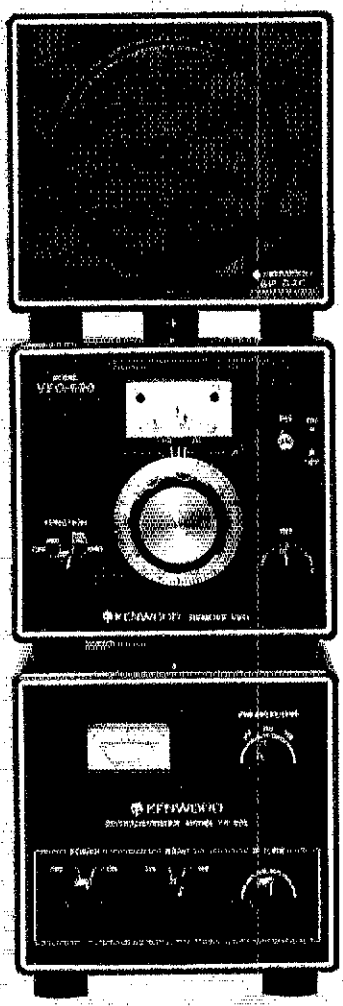


the TS-520

Why wait any longer for a rig that offers top performance, dependability and versatility . . . the TS-520 has proven itself in the shacks of thousands of discriminating amateurs, in field day sites, in DX and contest stations, and in countless mobile installations.

Superb craftsmanship is evident throughout . . . in its engineering concepts as well as its construction and styling . . . craftsmanship that is a Kenwood hallmark.

Maybe the Kenwood TS-520 is the one you have been waiting for.



Fine accessories designed to increase the versatility of your TS-520

SP-520

The SP-520 is an external speaker designed for use with the Kenwood TS-520. The SP-520 can be used in place of the tranceiver's built-in speaker for better readability. The speaker's cabinet matches the TS-520 front panel to provide a clean looking integrated station.

VFO-520

The VFO-520 is a solid state remote VFO designed to match the TS-520 perfectly. It allows VFO controlled cross channel operation when connected to the transceiver. A built-in RIT circuit, with an LED indicator, permits receiver incremental tuning.

TV-502

The TV-502 transverter puts you on 2-meters the easy way. Simply plug it in and you're on the air. Operates in the 144.0-145.7 MHz frequency range with a 145.0-146.0 MHz option. The TV-502 is completely compatible with the TS-520 and the TS-820.

KENWOOD'S

T-599D

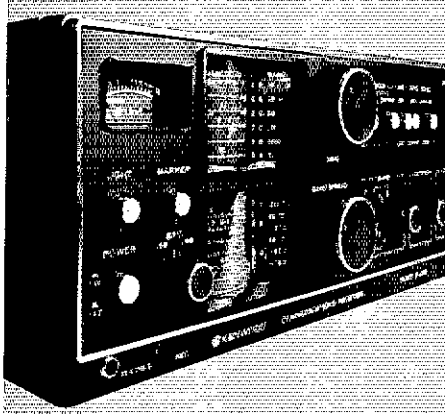
Kenwood developed the T-599D transmitter and R-599D receiver for the most discriminating amateur.

The R-599D is the most complete receiver ever offered. It is entirely solid-state, superbly reliable and compact. It covers the full amateur band, 10 through 160 meters. CW, LSB, USB, AM and FM.

The T-599D is solid-state with the exception of only three tubes, has built-in power supply and full metering. It operates CW, LSB, USB and AM and, of course, is a perfect match to the R-599D receiver.

If you have never considered the advantages of operating a receiver/transmitter combination . . . maybe you should. Because of the larger number of controls and dual VFOs, the combination offers flexibility impossible to duplicate with a transceiver.

Compare the specs of the R-599D and the T-599D with any other brand. Remember, the R-599D is all solid state (and includes four filters). Your choice will obviously be the Kenwood.



The newest and best in world listening

KENWOOD'S

R-300

Dependable operation, superior specifications and excellent features make the R-300 an unexcelled value for the shortwave listener. It offers full band coverage with a frequency range of 170 KHz to 30.0 MHz • Receives AM, SSB and CW • Features large, easy to read drum dials with fast smooth dial action • Band spread is calibrated for the 10 foreign broadcast bands, easily tuned with the use of a built in 500 KHz calibrator • Automatic noise limiter • 3-way power supply system (AC/Batteries/External DC) . . . take it anyplace • Automatically switches to battery power in the event of AC power failure

HS-4

The Kenwood HS-4 headphone set adds versatility to any Kenwood station. For extended periods of wear, the HS-4 is comfortably padded and is completely adjustable. The frequency response of the HS-4 is tailored specifically for amateur communication use. (300 to 3000 Hz, 8 ohms).

MC-50

The MC-50 dynamic microphone has been designed expressly for amateur radio operation as a splendid addition to any Kenwood shack. Complete with PTT and LOCK switches, and a microphone plug for instant hook-up to any Kenwood rig. Easily converted to high or low impedance. (600 or 50k ohm).

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The Swapfest Area Opens at 6 P.M. Fri. and 7 A.M. on Sat. and Sun.

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President ARRL
Larry Price - W4RA
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Advance registration $3 per adult, $4 at the door. Swapfest tables $5 per day. As a sellout of swap tables is expected, we strongly suggest that those interested pre-register with table request early. Do not send hotel registration remittance to the OARC but directly to the hotel as shown below.

For a complete hamfest information package including near-by hotel/motel rates and other detailed information which could not be included here, please send an SASE to:

Hamfest Secretary, Georgia Denman --- K4ZXS, 405 Enka Way, Orlando, Florida 32811

Make all checks for advanced registration and swapfest tables payable to: 'The Orlando Amateur Radio Club, Inc.' An info package will be included.

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* After 6 p.m. Friday, the swapfest area will be open to allow registration and setup of swap tables. Friday night swap activity is included in the Saturday table charge.

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- **Synthesizer and VFO.**
- **All modes: NBFM, WBFM, AM, SSB w/USB/LSB and CW.**
- **Frequency synthesizer (PLL)** 3 Knob, 600 channels, 10kHz steps.
- **VXO,** plus or minus 7kHz.
- **LED readout on synthesizer.**
- **Standard 600 kHz splits** plus.
- **Two "oddball" splits.**
- **OSCAR transceive 2 to 10 meter operation.**
- **OSCAR receiver built-in.**
- **Connectors on rear for separate 2 meter and 10 meter antennas.**
- **Built-in VFO** (continuous coverage, 144-148MHz in 1.3MHz segments. 1kHz readout).
- **8 pole SSB filter** plus **two FM filters.**
- **100kHz crystal calibrator.**
- **Voice operated relay** (VOX) or p-t-t.
- **Audio speech compression.**
- **Noise blanker.**
- **RIT,** plus or minus 5kHz.
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- **FM center deviation meter.**
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- **Built-in AC/DC power supply.**
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  FM: 0.5μV for 28db S/N.
  SSB/CW: 0.25μV for 14db S/N.
  AM: 2μV for 10db S/N.
- **50MHz or 432MHz converters** will be available. Interior space and terminals are provided.
- **Size:** Inches: 5H, 14.88W, 12D. MM: 128H, 378W, 305D.
- **Weight:** 28 lbs. (13KG).

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base and
portable
2 meter
trans-
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General. Thanks W3LDS and W3SFA for assisting WN3DMP with the Novice license. W3GJV, past SCM from 1957 to 1962 is retiring to AZ. I would like to take this opportunity to extend best holiday wishes to all of the WPA members and also the best of everything for the New Year. Thank you for your support during 1976. The WPA CW Traffic Net had 30 sessions in Sept., handled 147 messages with 342 QNI. PSHR credits WA3VBM 44. Traffic: WA3VBM 383, W2KAT/3 175, W3DGJ 166, WA3AHP 56, W3HDH 52, K3CHD 24, K3SMB 21, W3UT 21, WA3ZAO 20, W3KUN 15, W3IDO 12, W3SN 8, K3VQV 6, WA3MDY 5, W3YD 5, W3TTN 3, WA3UDZ 2, W3LOS 1, K3SJN 1.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst. SCM: Harry Studer, W9RYU. SEC: WA9AES. PAM: WA9KFK. RM: K9ZIV. Cook County EC: W9HPG.

Net — Freq.	GMT	Days	Tfc	Sess.
ILN — 3690	0030/0400	Dy	224	60
Ill Phone — 3915	2245	Dy	206	30
NCPN — 3915	1200/1700	M-S	244	52

W9GEG WB9TSE WA9AQN W9YCE WA9KRL and W9RZC are the new officers of the Sangamon Valley Radio Club, Inc. (Springfield). K9DDA won the award for the State for 1976 Conn. QSO party. K9MEA reports the traffic count for the 20-meter SSB net for Sept. was 179. W9MCH is back on the air after a business trip and vacation in Eastern Europe. The ILN held their annual get together in Peoria after the Hamfest and W9HPG and W9PRN were guests at their luncheon. WA9MMI is installing a new monoband of five elements for ten meters. W4BW, Prose Walker was guest speaker at the W9DXCC dinner held at Itasca on Sept. 11. Radio Expo and the Peoria Hamfest had capacity crowds. Many old acquaintances were held. WB9NEH is the new EC of Knox County. KC9WD was a special FCC call used for the Fourth Annual Knoxville Civil War Days, those participating were K9MEI WB9KHL WB9TEV WA9DPA WB9OYE WB9PVW WB9NEH WB9DDF WN9VFY. New calls in the Bloomington area are WN9WJA and WN9WJB. WA9MMI's code class of Steelville graduates were WN9VYE WN9VWT WN9ZVE WN9VZG WN9WBQ WN9WFZ WN9WLF and WN9WSN. Our sympathy to the families and friends of K9MDY W9ZRX and W9VSX who have recently joined the ranks of Silent Keys. The Chicago FM club is holding amateur radio beginners classes at Kemper Insurance in downtown Chicago under the leadership of WA9LRI. W9TAL has a new Kenwood TS-700A, and using it on two meters. WB9WYU has passed her Technician. WN9VLI WN9VLJ WN9VLK WN9VLL WN9VLM WN9VLN and WN9VWO are Novices in the Rockford area. Traffic: (Sept.) WB9TWT 225, W9NXG 206, K9ZTV 164, WA9BGW 146, WA9OBT 120, W9HOT 117, W9NJP 117, W9OK 90, W9KR 73, WA9KFK 84, WA9JJE 70, W9LNQ 55, AB9NOZ 51, WB9SNA 48, WA9AQN 41, WA9CJG 38, W9ZAV 38, W9OYL 29, AB9DED 28, W9PRN 22, W9HYU 16, WB9ELP 5, WB9NIU 4, K9DDA 2. (Aug.) WB9NIU 12, K9DDA 3.

INDIANA: SCM, M. P. Hunter, WA9EED — SEC: W9UMH. AA9ITB has been named as trustee for W9LJ. The contest season is now getting in full swing with much activity planned by various groups. Congrats to the Indy DXers for a fine finish in the '76 ARRL DX competition. Net activity is on the increase despite the changing skip conditions. W9QLW now has a new keyer but advises every manufacturer makes the same mistake in construction — it can't send his call properly. W9ZRX now has stacked full sized 40-meter beams with the top one at 140 feet. The warmer climates are beginning to attract several members of ITN. The fall session of IRCC was held at Indy Red Cross with W9HPG as guest. Be sure to contact your local club and offer to be of assistance in the several licensing classes being offered. Net Traffic (Sept.) QIN 284, ITN 582, Hoos. VHF 31. (Aug.) ITN 614, IPON 4, Hoos. VHF 18. Traffic: (Sept.) WB9KTR 266, W9IOH 233, W9GGW 179, W9QLW 149, WB9FOT 129, WB9OZW 124, K9DCX 111, W9YB 106, WB9SQH 102, W9HUF 90, WB9PIR 78, WB9OMX 71, WB9IHR 68, W9LTU 61, WA9JTS 54, WA9OKK 47, WB9NAQ 40, K9EQT 32, K9YBM 32, K9RWQ 29, W9DZC 24, W9ENU 20, WB9DIX 18, K9RPZ 18, WA9ITB 17, W9PMT 17, K9WWJ 16, WB9KGR 15, WA9QCF 12, W9RTH 12, W9DKP 10, W9ULF 10, K9LZN 10, WA9OHX 9, W9UEM 8, W9JU 7, W9EI 6, WB9ORM 6, K9RGF 6, WA9UXP 6, WB9SKA 5, WB9VKO 5, WB9IZL 5, K9DIY 3, W9BDP 1. (Aug.) W9LTU 91, W9GGW 85, K9WWJ 24, AA9ITB 13.

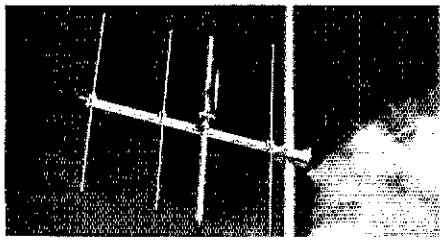
WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: K9PKQ. PAMs: W9AYK W9IEM K9UTQ. RMs: WB9ICH K9KSA W9MFG K9LGU. Nets, Freq, Time, QNI, QTC, Mgr.: BWN, 3985 kHz, 1145Z M-S, 478, 430, W9AYK; BEN, 3985 kHz, 1700Z Dy, 587, 93, W9IEM; WSBN, 3985 kHz, 2230Z, 1180, 260, K9UTQ; WNN, 3725 kHz, 2215Z Dy, 96, 18, WB9ICH; WSSN 3662 kHz, 2330Z M-W-F, Summer Vac., K9KSA; WIN-E, 3662 kHz, 0000Z Dy, 210, 142, W9MFG; WIN-L, 3662 kHz, 0300Z Dy, 238, 116, K9LGU; WIPXO, 3925 kHz, 1701Z M-F, 566, 37, WA9NIX. WA9SSH new pres. of Univ. of Wisconsin Stevens Point ARC, EC endorsed W9LQC. WSBN certificate to WB9SXX. WB9ROE passed Advanced, working 6-2 SSB. Sorry to see W9ERW and family including WB9MRF move to southern IN. I regret to report W9GYQ a Silent Key. 2 new Novices in Niagara WN9WCZ WN9WZW. YTARC has 12 students for Novice class. WB9EIW has 103 countries for W9DXCC. 4 new Novices in one family from Sheboygan Club WN9VSG WN9VSH WN9VSJ and WN9VSK, father and three sons. Ham Radio display at East Town Mall in Madison Sept. 21-26 put on by FLARC, MARA and YTARC, with movies "Hams Wide World" and "Moving Up to Amateur Radio." also had RTTY and Ham TV on display. K9CPM made BPL. WB9SEJ passed Advanced. ORS to WB9OEC. 12 new Novices in the Wisconsin Rapids area. WB9ICH has new beam for 10-20 meters 20 feet up works FB. WB9KMW new Life Member. Traffic: (Sept.) K9CPM 630, W9DND 235, WA9GJU 183, K9MZO 166, W9PVH 151, W9IEM 110, W9SFL 106, K9LGU 101, WB9ICH 93, K9FHI 75, W9AYK 74, WA9NDV 53, WB9RWZ/9 50, K9UTQ 45, WB9QKH 41, WB9RRV 34, WB9HLS 29, WB9JSW 29, W9MFG 29, K9JPS 27, WB9SHK 26, W9IHW 23, WB9OEC 21, W9AGW 20, WA9QVT 19, WB9SXX 16, K9ANV 13, WB9PYG 13, WB9LKC 12, WB9KMW 11, WB9VVA 2. (Aug.) W9MFG 59.

NORTHERN CALIFORNIA'S LARGEST INVENTORY OF NEW/USED HAM GEAR

BIG STOCKS

cushcraft

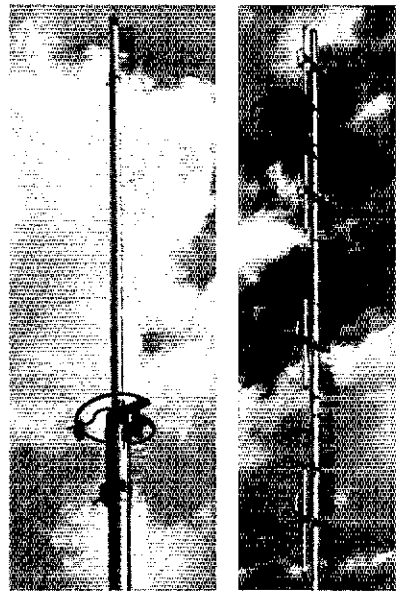
VHF/UHF ANTENNAS



4-6-11 element yagis: The standard of comparison in VHF/UHF communications, vertically polarized, cut for FM, rated at 1KW. 4 and 6 element models can be end mounted. Direct 52 ohm feed.

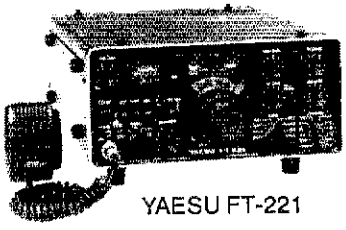
Famous **"Ringo"** 1/2 wave antenna has low radiation angle, 1.1 VSWR w/52 ohm line. Direct DC ground. 5 models. 135-175 MHz (100W), 135-175 (500W), 50-54 (100W), 220-225 (100W), 440-460 MHz (250W). Most antennas pre-assembled and ready to install. Most models take 1-1/4" diameter mast.

4 pole, gives very substantial gain over 1/2 wave dipole. Length 147MHz, 23' 220MHz, 15' 435 MHz, 8'. Includes 4 complete dipole assemblies on mtg., boom, harness, hardware. Less mast.

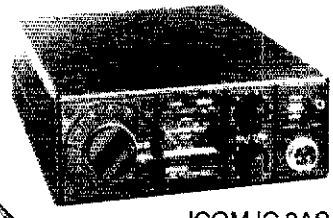


FULL STOCKS

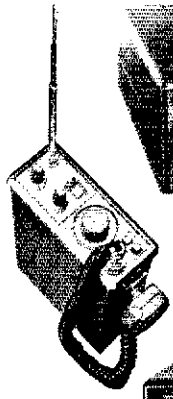
2 METER GEAR



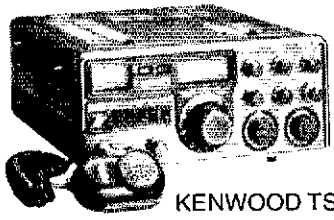
YAESU FT-221



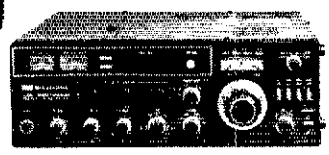
ICOM IC 2AS



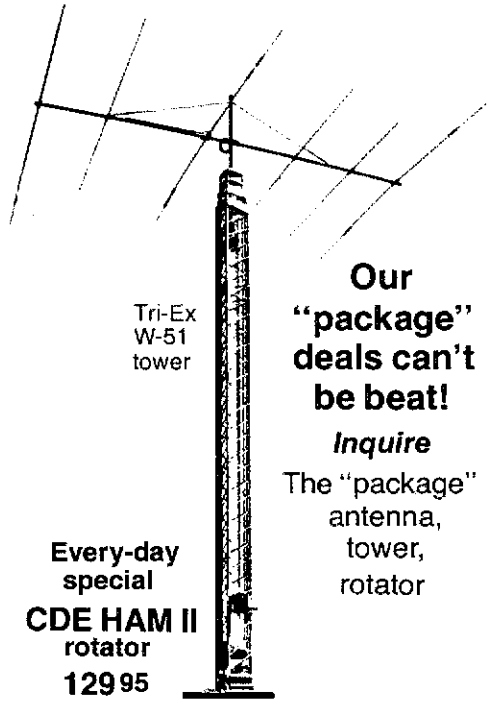
KENWOOD TR-2200A



KENWOOD TS-700A



KLM 2700



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Owner, Bob Ferrero, K6AHV, other well known hams, give you courteous, personalized service

The one You've Been Waiting for!

$269.95
with standard microphone

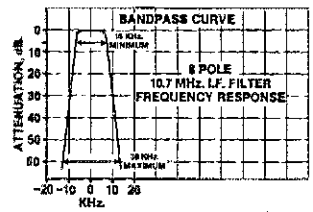
Shown with optional Micoder

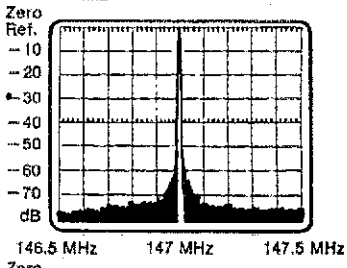
Just look at these photos and specifications. The HW-2036 gives you the kind of 2-meter performance you WANT!

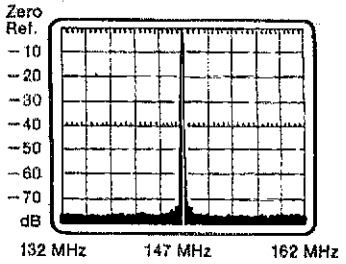
HW-2036 SPECIFICATIONS

Receiver: Sensitivity: 0.5 μV for 12 dB SINAD (or 15 dB of Quieting). Squelch Threshold: 0.3 μV or less. Audio Output: 1.5 watts at 10% T.H.D. typically 2 watts. (5 kHz deviation). Image Rejection: —45 dB or greater. Spurious Rejection: —50 dB or greater. IF Rejection: —80 dB or greater. Internally Generated Spurious: Below 1 μV equivalent. Bandwidth: 6 dB at 15 kHz min. and 60 dB at 30 kHz max. Modulation Acceptance: 7.5 kHz, min. Transmitter: Power Output: 10 watts min. at 25°C and 13.8 VDC, into a 50Ω load. Harmonic & Spurious Output: —70 dB within 20 MHz of carrier; —50 dB elsewhere, —40 dB harmonics. Modulation: FM, 0 to 7.5 kHz, adjustable. Duty Cycle: 100% with infinite VSWR. Tone Encoder: 3 tones, 70 to 200 Hz, approx. ±700 kHz deviation. Transmitter Offset: 0 (simplex), —600 kHz, +600 kHz with crystals supplied. Provision for one additional offset crystal. General: Frequency Coverage: Any 2 MHz segment from 143.5 to 148.5 MHz. Both receiver and transmitter must be aligned for the same 2 MHz segment. Frequency Increments: 5 kHz. Frequency Stability: ±.0015%. Operating Temperature Range: 15° to 125° F. (—10° to 50° C). Operating Voltage Range: 12.6 to 16 VDC (13.8 VDC nominal). Current Consumption: RX: 700 mA max. squelched, TX: 2.6 A max. at 13.8 volts. Dimensions: 2¾" high x 8¼" wide x 9⅞" deep. Weight: 6.25 lbs.

Actual spectrum analyzer photos of HW-2036 operating at 147 MHz. Spurs within 20 MHz of carrier are down a full 70 dB.







Heathkit Synthesized 2-meter Transceiver!

The new Heathkit 2-meter frequency-synthesized transceiver combines state-of-the-art technology with operating ease, convenience and versatility in an easy-to-build kit that's about HALF THE COST of comparable synthesized transceivers. It's the one to buy and build for real 2-meter PERFORMANCE!

Operation is easier than ever! The front panel lever switches select any frequency in any 2 MHz segment of the 143.5 to 148.5 operating frequency range. You select the last four digits, three with lever switches which display the frequency directly and the last with a 0/5 kHz toggle switch which makes ALL 2-meter frequencies in the band available. If you inadvertently dial up an out-of-band frequency, the transmitter simply will not key.

And the signal is solid! The HW-2036 puts out a minimum 10 watts at 25° C and 13.8 VDC. And it operates into an infinite VSWR without failure. The transmitter output is extremely clean, with spurious output greater than 70 dB below carrier. True FM circuitry means you transmit and receive with excellent audio quality too.

The receiver is hot! Sensitivity is an outstanding 0.5 μV for 12 dB SINAD. An 8-pole IF crystal filter provides an ideally shaped bandpass for excellent adjacent channel rejection and its superb selectivity makes it the one to have for crowded signal areas.

Complete operating versatility! A built-in continuous tone encoder with three customer-adjusted tones selectable on the front panel accesses most repeaters. The HW-2036 provides all the offset capability you'll ever need — built-in simplex, plus and minus 600 kHz offsets, and an Aux. position that lets you add a crystal for any other frequency. And, if you order the HW-2036 with the Heathkit Micoder microphone/auto patch encoder, you'll be able to make phone calls through repeaters equipped with auto patch input! (And save $19.95 in the bargain!) The HW-2036 operates mobile from your vehicle's 12 VDC battery, or you can use the optional HWA-2036-3 AC power supply for fixed station operation.

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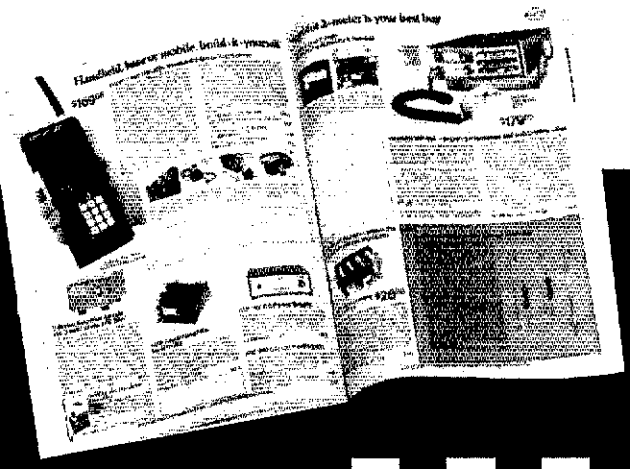

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SW-4A SWL Rcvr 225
SC-2 2m conv 69
SC-6 6m conv 59
CPS-1 Conv ps 12
SCC-1 VHF calibrator 19
CC-1 Conv console 39
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FF-1 Xtal adapt 34
RV-6 Remote VFO 69
T-4X Transmitter 339
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AC-3 AC supply 65
AC-4 AC supply 85
DC-3 DC supply 75
DC-4 DC supply 95
MN-4 Matcher 69
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HX-10 Transmitter 179
HX-30 6m Xmtr 149
SB-400 Transmitter 225
SB-401 Transmitter 249
HA-10 Linear 175
HW-10 6m Xcvr 99
HW-32 20m Xcvr 75
HW-32A 20m Xcvr 85
SB-100 Xcvr 299
SB-101 Xcvr 329
SB-650 Freq display 149
HW-17 2m AM Xcvr 89
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508 Remote VFO 159
600T Transmitter 369
600R Ham Rcvr 299
600S Speaker 19
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250C 6m Xcvr 339
210 Remote VFO 69
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FP-1 Phone patch 44

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FR-101S/VHF Ham Rcvr 450
FL-101 Transmitter 449
SP-400 Speaker 15
SP-560 Speaker 15
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FT-2 Auto 2m FM Xcvr 199
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10-25-76

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SS-100 80-10m Xcvr	699	489
SS-200 As above, 200w PEP	779	549
SS-208 Remote VFO	269	169
MB-80 80m Xcvr	299	225
MB-40 40m Xcvr	299	199
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FM-20BM As above, but AC	235	49
PA-50 Mk I 50w 2m amp	129	49
YAESU	reg.	NOW
FR-101S 160-10m Rcvr	489	425
FR-101 Digital Rcvr	629	575
FL-101 160-10m Xmtr	545	499

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DAKOTA DIVISION

MINNESOTA: SCM, Frank Leppa, KØZXE — The Mesabi Wireless and Duluth amateurs provided emergency communications for the Dept. of Natural Resources and the St. Louis Co. Civil Defense during the Tower forest fire. 500 pieces of emergency traffic were passed via 2M between two base stations and seven mobiles assigned to fire for men in the field. Participating stations were WØAME WØGIG WØUKI KØFZA KØFZG KØGNI KØMVJ KØZWU KØZXE WAØBJY WAØCEL WAØCQG WAØETR WAØJUK WAØKMR WAØLIS WAØLMT WAØTUC WAØUPD WAØWXL WBØCVY WBØIRL WBØKUG WBØNAA WBØNMR WBØSGR WAØUMW. Thanks was expressed by the St. Louis Co. board of commissioners for the much needed service AREC provided. Study and hard work by students and staff at the Handi-Ham Radio Week Camp produced upgradings to Tech: WNØJCK; Gen: WNØGDO WNØRPH WBØSPG; Adv: WAØIIB; Extra: KØGVW and WNØQWH. Other upgradings are Tech: WBØNGI WBØVPK; Gen: Ex-WØWYT; Adv: WAØWOV WBØIRL WBØOFQ. New Novices are WNØUII and WNØWCO. Best wishes to each of you. Interest in a MN contest and DX Club is forming. Send your ideas to WØAA. The ARRL Dakota Division was an interesting affair, with ARRL, FCC, VHF, CW, RTTY, and several other forums throughout the weekend plus a multitude of displays. Many thanks to the members of the St. Paul RC for such a fine event. BPL: ABØHOX. Traffic: (Sept.) ABØHOX 599, KØCVD 230, WAØTFC 149, WBØQNX 111, WAØYVT 105, KØZXE 104, WBØCPC 100, WBØJYT 82, ABØLDW 61, WBØOCT 60, WBØPQZ 58, KØZBI 57, KØPIZ 40, WBØNZB 27, AAØURW 26, WBØLSI 25, WBØPMZ 25, ABØMAO 24, WØRIQ 22, WBØOFQ 21, WAØCCA 20, WØHZU 20, AAØWOV 20, WBØSBO 18, WAØTGM 17, WAØLIS 16, WBØPKG 13, WØOPX 12, WAØJPR 9, WBØOUH 6, WBØPBN 6, KØRMX 3, KØGNI 2, KØFLT 2, WØUMX 2. (Aug.) WAØTGM 38, ABØHOX 28, WAØCCA 18. (Jul.) ABØHOX 304.

NORTH DAKOTA: SCM, Mark J. Worcester, WAØWLP — OBS: KØPVG. WAØAYL was elected pres. of the ND Broadcasters Assn. and also has a new harmonic. WAØWBU also has a new harmonic. The DATA net will run two sessions begging Nov. 1 at 1730 and 1830 CDT. The YL EX net will start Nov. 1 at 0730 CDT Mon.-Fri. WØDM's radio class doing good with about 12 reg. in attendance. Forks Amateur Radio Club repeater will soon have auto patch. G.F. area ham gathering planned for Dec. with Director WØKE planning to attend. WNØUCI on the air at G.F. with a gotham vertical.

Net — kHz	CDT/Days	Sess.	QNI	QTC
Manager				
DATA — 3996.5	2300/S-S	30	305	122
WAØSUF				

Traffic: WAØSUF 90, WØDM 10, WBØBMG 7.

SOUTH DAKOTA: SCM, Ed Gray, WAØCPX — WBØFWJ is the new pres. of the Sioux Valley Repeater Assn. of the Sioux Falls area. Attempts are being made in the Aberdeen area to increase the radio club activity and get a repeater in operation on 34/94 again. Persons interested should contact WBØSTQ of Aberdeen. A good deal of interest is being shown in licensing classes this fall with the clubs using the ARRL Novice Training program. If your club isn't using it you should look into it. Feel free to contact your SCM or ARRL Headquarters. We also all need to remember that we need to work with the Novices after they are licensed to help them over the rough spots. Just a reminder that during the colder months when we are not on Daylight time the evening phone net for SD meets at 6:00 PM on 3,955. Net reports: Morning Net: 519 QNI and 35 formals; NJQ: 731 QNI and 26 formals; Evening Phone Net: 424 QNI and 53 QTC. Traffic: WBØEVQ 141, WAØVRE 81, KØZBJ 76, WØHOJ 54, WØIG 46.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: WA5VNV. PAMs: W5POH WA5ZWZ. RM: W5MYZ. Nets, kHz, Time/Day, QNI, QTC, Mgr.: ARN 3995, 0030Z/Dy, 497, 46, K5FOY; OZK, 3760, 0100Z/Dy, 180, 51, W5MYZ; APN, 3937, 1200Z/M-S, 759, 40, W5POH; M-Bird, 3928, 2330Z/M-F, 537, 10, WA5ZWZ. Welcome to Ham Radio, WN5s UFV UGK UJE UJF UJQ UJT UKE UKP UKV UKW UKX ULE UNK UOP UPL UPJ UWP UWT UWU UWW UXO UYA; WB5s UEA UPP UQA UUD UUG UVM UVQ UVS. You are invited to the Ark. DX Assn.'s annual meeting/banquet to be held at Little Rock, Sat. Dec. 11. For details contact WA5VDH. Traffic: WA5HNN 84, WB5NBC 36, W5MYZ 35, W7UAU 28, WB5GWU 14, W5POH 12, W5EIJ 10, W5KL 8, WB5GVE 4, WB5GQH 1.

LOUISIANA: SCM, Robert P. Schmidt, W5GHP — Asst. SCM: John Souvestre, WA5NYY. SEC: WB5CIQ. RM: WA5PRI. PAM: WB5KFY. VHF PAM: W5VBX. New Extra licensees, all from the Delta DX Club are K5FVA, K5YMY K5EJP W5ORX W5HIC and W5KKC. The Baton Rouge Club working on a micro-processor control for their 28/88 repeater. New Novice Class at Twin Cities Club progressing, a new General and higher class to start early Dec. The Lafayette Club installing new antennas and autopatch on their repeater. Monroe Club very active in publicity work. Their Mini-Hamfest-Swapfest in mid Nov. well attended. W5EXI very active on the Delta Division QSO part. W5HGT club station at La. Tech, Ruston active in traffic work both on LTN and LAN, with operators WB5KFA and WB5LBV. New General license WB5VEE. New repeater in Bossier City activated on 34/94 with call WR5ANY. The Shreveport Club has ordered all new equipment for their 16/76 repeater WR5ACV. WB5NWO has new T5-520. K5ARH active on RTTY after vacation. WA5ZOO active on LTN. LSN Net cert. to WB5PTH.

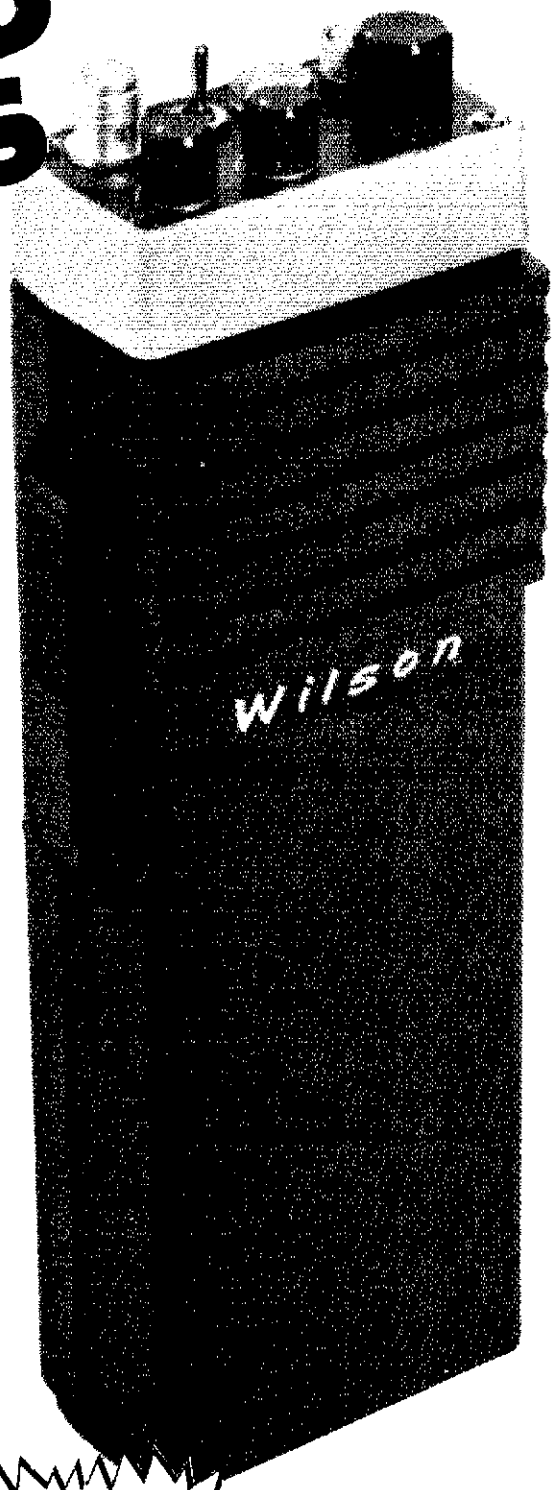
Net — Freq.	Time/Days	QNI	QTC	Mgr.
LAN — 3615	7 & 10 Dy	349	198	WA5PRI
LTN — 3910	6:45 PM Dy	287	41	WB5KFY
LSN — 3703	8:30 PM M-F	130	19	WA5ANV
LRN — 3587.5	7:00 PM	15	25	WB5FHU

Traffic: W5GHP 298, K5TFG 175, WB5PTH 167, WA5IQU 133, W5MI 102, WA5PRI 60, WA5ANV 48, WB5NVB 22, WB5LBR 19, W5YN 8.

TENNESSEE: SCM, O. D. Keaton, WA4GLS — SEC: WB4DYJ. PAM: WB4PRF. RM: WB4DJU.

Wilson Electronics Corp.

HAND HELDS



220

FREQUENCY RANGE 220 - 225 MHz

- 6 Channel Operation
- Individual Trimmers on all TX/RX Crystals
- All Crystals Plug In
- 12 KHz Ceramic Filter
- 10.7 and 455 KC IF
- .3 Microvolt Sensitivity for 20 dB Quieting
- Weight: 1 lb. 14 oz. less Battery
- Battery Indicator
- Size: 3 7/8 x 1 3/4 x 2 7/8
- Switchable 1 & 2.5 Watts Output @ 12 VDC
- Current Drain: RX 14 MA, TX 500 MA
- Microswitch Mike Button
- Unbreakable Lexan® Case

USES SAME ACCESSORIES AS 1405

INCLUDES

1. 2202 SM
2. Flex Antenna
3. 223.50 Simplex Installed

~~$239.95~~

XMAS SPECIAL
$219.95

450

FREQUENCY RANGE 420 - 450 MHz

- 6 Channel Operation
- Individual Trimmers on all TX/RX Crystals
- All Crystals Plug In
- 12 KHz Ceramic Filter
- 21.4 and 455 KC IF
- .3 Microvolt Sensitivity for 20 dB Quieting
- Weight: 1 lb. 14 oz. less Battery
- Battery Indicator
- Size: 3 7/8 x 1 3/4 x 2 7/8
- Switchable 1 & 1.8 Watts Output @ 12 VDC
- Current Drain: RX 14 MA, TX 500 MA
- Microswitch Mike Button
- Unbreakable Lexan® Case

USES SAME ACCESSORIES AS 1405

INCLUDES

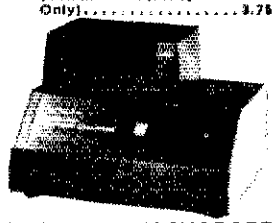
1. 4502 SM
2. Flex Antenna
3. 446.00 Simplex Installed

~~$279.95~~

XMAS SPECIAL
$269.95

ACCESSORY SPECIALS

	DESCRIPTION	SPECIAL PRICE
BC1	BATTERY CHARGER	$34.95
BP1	10 EA. AA GOULD NICAD BATTERIES	14.95
BT1	EXTRA BATTERY TRAY	6.00
LC1	LEATHER CASE 1402	12.95
LC2	LEATHER CASE 1405, 2202, 4502	12.95
SM1	SPEAKER MIKE FOR EARLY MODEL 1402 9 PIN CONNECTOR	24.95
SM2	SPEAKER MIKE FOR ALL NEW HAND HELDS WITH ROUND 6 PIN CONNECTOR	24.95
TS-1	SUB-AUDIBLE TONE ENCODER INSTALLED	34.95
TTP	TOUCH-TONE PAD	49.95
	INSTALLATION AT TIME OF RADIO PURCHASE	FREE
	INSTALLATION AT LATER DATE, ADD	15.00
XF-1	10.7 KC MONOLITHIC XTAL FILTER	9.95
CRYSTALS	TX or RX (Common Frequency Only)	3.75



BC-1 BATTERY CHARGER

XMAS SPECIAL

"FACTORY DIRECT ONLY"

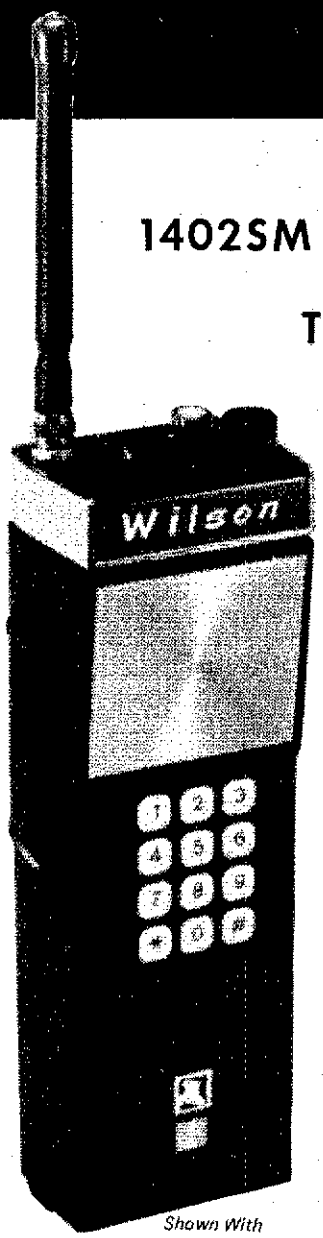
XMAS SPECIAL

1402SM HAND HELD 2.5 WATT TRANSCEIVER

144-148 MHz

~~$164.95~~

XMAS SPECIAL $159.95



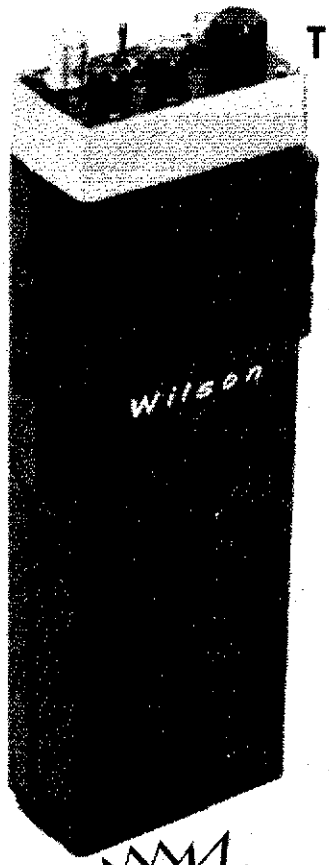
Shown With Optional Touch-Tone Pad

1405SM HAND HELD 5 WATT TRANSCEIVER

144-148 MHz

~~$239.95~~

XMAS SPECIAL $229.95



OVER 35,000 XTALS IN STOCK

FEATURES

1402 SM	1405 SM
• 6 Channel Operation	• 6 Channel Operation
• Individual Trimmers on all TX/RX Crystals	• Individual Trimmers on all TX/RX Crystals
• All Crystals Plug In	• All Crystals Plug In
• 12 KHz Ceramic Filter	• 12 KHz Ceramic Filter
• 10.7 IF and 455 KC IF	• 10.7 and 455 KC IF
• .3 Microvolt Sensitivity for 20 dB Quieting	• .3 Microvolt Sensitivity for 20 dB Quieting
• Weight: 1 lb. 14 oz. less Battery	• Weight: 1 lb. 14 oz. less Battery
• S-Meter/Battery Indicator	• Battery Indicator
• Size: 8 7/8 x 1 7/8 x 2 7/8	• Size: 8 7/8 x 1 3/4 x 2 7/8
• 2.5 Watts Minimum Output @ 12 VDC	• Switchable 1 & 5 Watts Minimum Output @ 12 VDC
• Current Drain RX 14 MA TX 500 MA	• Current Drain: RX 14 MA TX 400 MA (lw) 900 MA (5W)
• Microswitch Mike Button	• Microswitch Mike Button
• High Impact Plastic Case	• Unbreakable Lexan® Case

SPECIAL ON EACH RADIO INCLUDES:

Flex Antenna
52/52 Simplex Xtal

90 Day Warranty

10 Day Money Back Guarantee

Can be Modified for MARS or CAP

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XMAS SPECIAL DIRECT SALE ORDER BLANK

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(702) 739-1931

___ 1402SM @ $159.95
___ 1405SM @ $229.95
___ 2202SM @ $219.95
___ 4502SM @ $269.95
___ BC1 @ $34.95
___ BP1 @ $14.95
___ BT1 @ $6.00
___ LC1 @ $12.95
___ LC2 @ $12.95
___ SM1 @ $24.95
___ SM2 @ $24.95
___ TE1 @ $34.95
(SPECIFY FREQUENCY _____)

___ TTP @ $49.95
___ XF1 @ $9.95
___ TX or RX XTALS @ $3.75 ea. Common Frequencies Only.
___ FACTORY XTAL INSTALLATION/ NETTING @ $7.50/Radio
___ MARS or CAP XTALS @ $10.00 ea.

EQUIP TRANSCEIVER AS FOLLOWS:

	XTALS TX	RX		XTALS TX	RX
A.	52	52	G.		
B.			H.		
C.			I.		
D.			J.		
E.			K.		
F.			L.		

ENCLOSED IS _____ ☐CHECK ☐MONEY ORDER ☐MASTER CHARGE ☐BANKAMERICARD

CARD # _____

EXPIRATION DATE _____

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

SIGNATURE _____

SHIPPING & HANDLING PREPAID FOR XMAS SPECIAL
NEVADA RESIDENTS ADD SALES TAX
QST VALID ONLY NOV. 1 THRU DEC. 31, 1976

Net — Freq. Manager	Time(Z)	Days	Sess.	QNI	QTC
TPN — 3.980 WA4EWW	1040	M-F	82	3449	204
W4PFP	1145	M-F			
WB4YPO	0030 1400	M-S SSuH			
TN — 3.635 K4YFC	0030	Dy	29	144	66
ETVHFN — 50.4 WB4WZJ	1900	MWF	10	83	3
ETVHFN — 145.2 WB4DZG	1900	TTh	9	37	2
ETTMN — 28.7 WB4NFI	0100	WF	9	92	2
MTTMN — 28.8 W4EAY	0100	TF	9	59	0
WTVHFN 146.37 — 146.97 WA4VVX	0130	MF	10	281	6
TCDARCWN 146.16 — 146.76 W4CYL	0100	W	5	291	0

The Tenn. Council of Radio Clubs' new officers are: WA4COH, chmn.; WB4ZSZ, vice-chmn.; WB4WHE, secy-treas. The annual Amateur-of-the-Year Award went to W4OGG. The 1976 Memfest was a success as usual. We were honored to have Doug DeMaw from ARRL with us and want to welcome him back. Many clubs are either holding or getting ready to hold Novice classes this winter, seems most enthusiastic, all interested in taking this training call your nearest club member or contact your SCM for information. Traffic: WN4CNY 210, K4CNY 166, W4OGG 70, WB4GZF 62, WB4LCR 62, WA4DKC 54, K4JSF 47, W4RUW 34, WB4YPO 32, WA4GLS 30, WB4BKF 29, WB4ZSZ 22, K4KCK 21, WB4GBI 17, W4TYV 15, WB4MPJ 10, K4PUZ 8, K4UMW 8, WA4HTV 6, W4VJW 6, W4PSN 5, K4VVE 5, W4SGI 4, W4CK 3, WB4WHE 1.

GREAT LAKES DIVISION

KENTUCKY: SCM, Ted Huddle, W4CID — SEC: WA4GNQ. Sept. Nets:

Net	QNI	QTC	Net	QNI	QTC
KRN	269	23	KNTN	223	108
MKPN	986	61	6DAREC	89	11
KYN	1236	165	SEKEN	27	2
KYN	297	178			

Good hamfests in both Louisville and Lexington, well over a thousand in attendance at each. WB4AUN is resigning as Mgr. of Morning KY Phone Net. WA3JTE his successor. Don't forget the annual section meeting in Louisville on the 3rd weekend of Jan. Monitor the nets for location. W4BAZ reports growth in KNTN. By looks of QTC/QNI they will pass KYN soon! W6FU recently visited K4FU in Louisville. WA4AVV used 2M fm recently to locate K4JGB whose wife was suddenly ill. All ok now. Traffic: (Sept.) WB4IGX 239, W4BAZ 97, WB4EVR 65, WA4SAC 65, W4CID 55, WB4AUN 49, WA4IGS 48, K4UNW 46, K4HRP 44, WB4QVS 40, WB4ECB 33, WN4JJH 25, K4FUM 15, WA4FAF 15, W4IQZ 12, WA4AGH 6, K4AVX 5. (Aug.) K4HFD 8.

MICHIGAN: SCM, A. L. Baker, W8TZZ — SEC: W8MPD. RMs: W8JYA K8KMQ W8YIQ. PAMs: W8BJIX K8LNE. VHF PAM: WA8WVV.

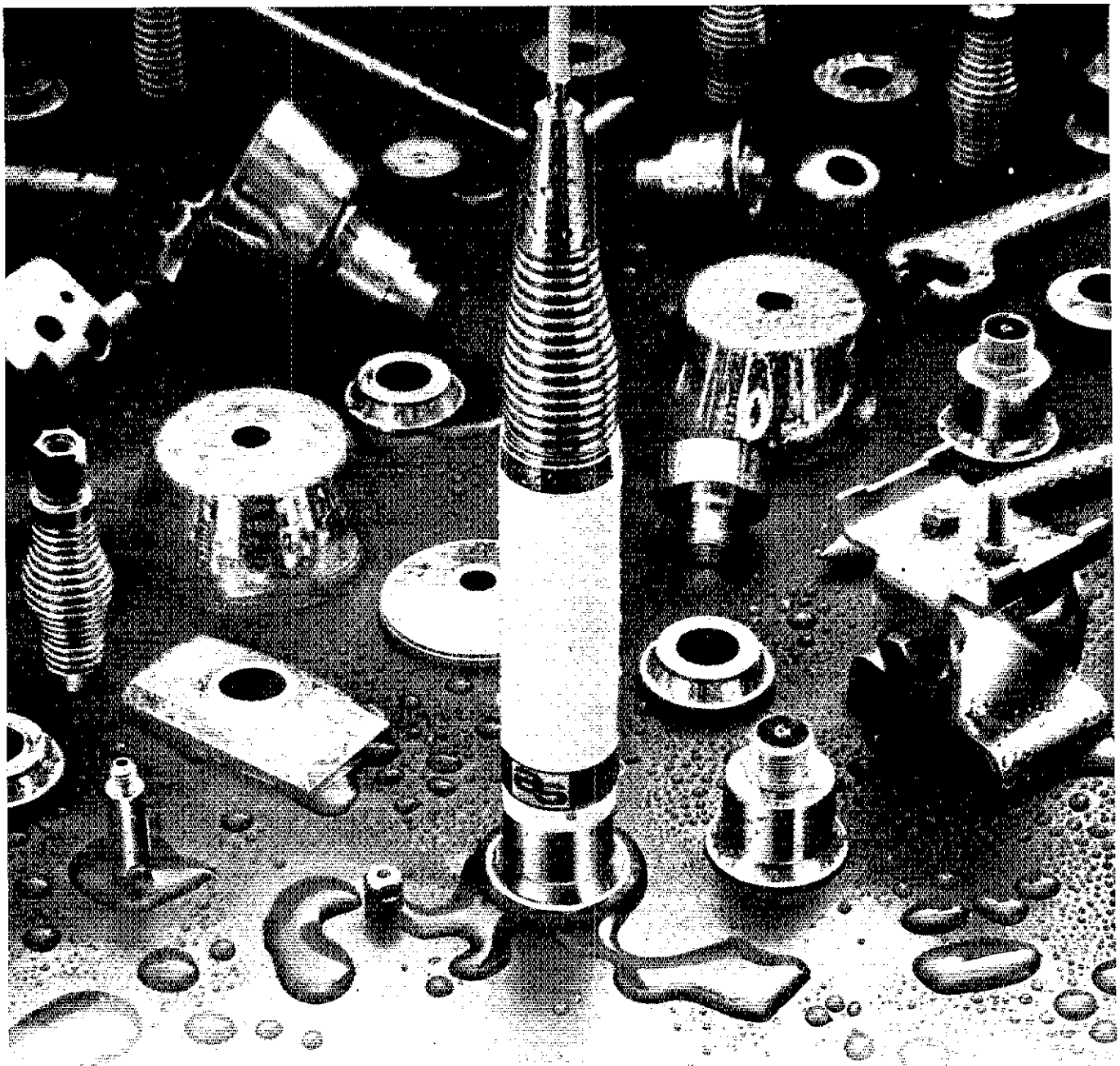
Net — Freq.	Time/Days	QNI	Tfc.	Sess.
MACS — 3953	1500 Dy	860	227	34
QMN — 3663	2200/0200 Dy	536	161	56
GLETN — 3952	0300 Dy	872	125	30
WSSBN — 3935	2301 Dy	397	90	30
VHF PAM report		619	83	27
BRMEN — 3930	2130 Dy	669	78	30
UPEN — 3922	2130 Dy	883	48	34
MI6M — 50.7	2300 Dy	300	30	26
MIAREC — 3932	2300 S	69	16	4

Hazel Park ARC has requested the call of the late W8JXU. Many Technicians have been heard on cw since new rules went into effect. Hope to see some Techs on MMN soon. W8UOQ advises he is QSL mgr. for EP2MO. Amateur Radio license classes reported in progress at all major clubs. ARRL training aids receiving mixed reviews. With 1000 counties confirmed, K8SWW will find it difficult to complete a Novice All Counties Award. The deletion of the "N" is viewed by Old Timers and Novices alike as an unfortunate turn of events. Motor City RC election results: WB8RVG, pres.; WB8PFO, vice-pres.; K8SIA, secy.; WB8RNY, treas. W8PYD, new EC. New licensees WN8s: ZQA ZQB ZQE BZP CBU CDC CGA CEG. WA8IOE received his Extra. Congratulations. Regretfully I report WB8OTV is a Silent Key. Traffic: (Sept.) WB8DKQ 399, WA8WZF 249, WB8ITT 244, K8KMQ 192, WB8POL 133, W8KQU/8 91, K8LNE 76, WA8OIE 67, W8GLC 65, W8MO 56, W8YIQ 52, W8RTN 50, K8DYI 49, W8UFS 49, W8OW 44, WB8RVG 42, WB8HNB 40, WA8DHB 37, WB8JIX 35, WD8CIQ 33, W8VPW 33, W8NOH 32, W8TZZ 31, WB8FBG 27, W8IHX 25, WB8GKB 23, WA8TBL 23, K8WRJ 23, W8SDB 16, WB8VAI 16, WB8DJS 15, K8DTG 15, K8JED 15, W8LOU 15, WA8FXR 14, KG6JED/8 14, K8GXV 13, K8PYN 13, W8POZ 12, K8SWW 12, K8ZJU 11, W8IUC 10, K8JHA 10, W8JUP 10, W8KWO 10, K8RNP 10, WA8WVV 10, W8DCN 9, WA8ENW 8, WB8KBZ 8, W8QBE 8, W8UOQ 8, W8BNF 7, W8VIZ 5, WN8VOM 5, W8WVL 5, W8BEZ 4, W8HKL 4, W8TBP 3, W8JLD 2, W8LUE 2, W8RNQ 2, WB8TTA 2, W8JAX 1. (Aug.) WB8RVG 254, W8LUE 8.

OHIO: SCM, Hank Greeb, AC8CHT — Asst. SCM: William K. Shaeffer, WA8MCR. SEC: WA8KPN. RMs: WB8KKI WB8JGW K8IKD. PAMs: W8DIL WA8SSI. Net reports.

Net — Freq.	Time(Z)	Sess.	QNI	QTC
O6mN — 50.16	0200	30	235	17
OSSBN — 3.9725	1530/2100/2345	90	2550	899
BN — 3.588	2345/0300	52	379	254
OSN — 3.577	2310	29	163	85
BNR — 3.605	2300	30	94	96
ONN — 3.708	2330	20	107	26
BRTN — 146.46	0200	30	150	11

WB8KKI is new RM and BN Mgr. Thanks to WA8WAK for years of dedicated service as RM. WA8TKW is new mgr. for BRTN. WN8YVI is boning up on General Class by being NCS of ONN. Treaty City ARC (Greenville) Talawanda HS ARC (Oxford), Dayton ARA, and others are conducting code/theory classes. K8TUT finally worked Delaware on 6. Traffic: W8PMJ 419, W8DIL 239, WA8MCR 217, WB8OZA 203, WB8MRL 202, WB8JGW 198, W8PTT 190, WB8PAV 168, WB8KKI 161, WB8CJU 130, W8LTA 123, AD8MLO 107, WB8OMQ 105, K8BYR 95, W8FB/8 82, W8JD 77, W8TH 74, WA8JPX 72,



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AA8TYF 65, K8LXA 55, WB8WTS 46, WA8VWH 44, WA8RQQ 38, WA8SED 37, WN8BCR 36, K8LGA 36, WA8SSI 33, W8CXM 32, WB8TRK 31, W8QCU 27, W8OE 19, W8WEG 19, WA8MAZ 17, W8LZE 16, W8DXC 15, WA8MHO 15, WN8YVI 14, K8BNL 13, WB8MZZ 13, WB8UNJ 12, W8BHL 11, W8PNP 11, AC8CHT 10, K8CKY 10, WA8QPD 10, AB8KQJ 9, WB8DQE 5, K8ONA 5, AA8TSX 5, W8ARW 4, K8BPX 4, W8IBX 4, WN8UJN 4, WB8VRX 4, WB8WEK 4, W8OUU 3, W8JBP 2.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Gary J. Ferdinand, AA2PJL — SEC: K2AYQ. Asst. SEC: WB2VUK. PAMs: WB2EMY WB2QEI. RMs: K2OYG (RTTY), WB2IXW (CW). New appointments: WA2UYL as OPS and WB2EMU as PAM (2RN). Regret to report that WA2MJE is now a Silent Key. K2DN reports a new EBC 144 to get him on 2 mtrs. A new FYO squeeze key at AA2YYM will add a new golden fist to ENY. Both K2OYG and WB2EKM report the AREC net on 146.66/06 on RTTY at 9:30 PM Thur. an enjoyable, going concern. K2OYG and K2KN have arranged a liaison between repeaters to get traffic delivered to the rare areas in Putnam, Rockland and Orange counties. Congrats to WB2TGL on his new 35 wpm code proficiency award! New Rochelle club reports W2OIT is now K2LV. The Schenectady ARA invited a police officer to speak to the meeting. Subject: personal protection and property safeguarding. Also, SARA reports that the 46/06 repeater will have autopatch late this fall. Ever wonder where information for this column comes from? That's probably because you never sent me any. Address is in the front of QST — let's hear your activities. Copy deadline is the eighth of the month. ENY could use a few new Class V Official Observers. This is a special VHF appointment. Technicians are eligible. Let me know if you are interested. Net totals: ENY VHF (QNI 19), NYS (QNI 611, QSP 243) RTN (QNI 39, QSP 11). Traffic: AA2PJL 292, W2YJR 165, WB2TGL 98, W1ACQ 64, WB2EKM 52, WA2UYL 36, WB2QOH 32, AA2YYM 29, K2OYG 23, W2WSS 20, K2OUA 17, WA2CJY 12, WB2CUC 14, AA2YXY 3.

NEW YORK CITY — LONG ISLAND: SCM, John H. Smale, WB2CHY — Asst. SCM: Art Malatzky, WB2WFJ. SEC: K2HTX. RM: WB2LZN. PAM: WA2ECO. The following are traffic nets in and around the section:

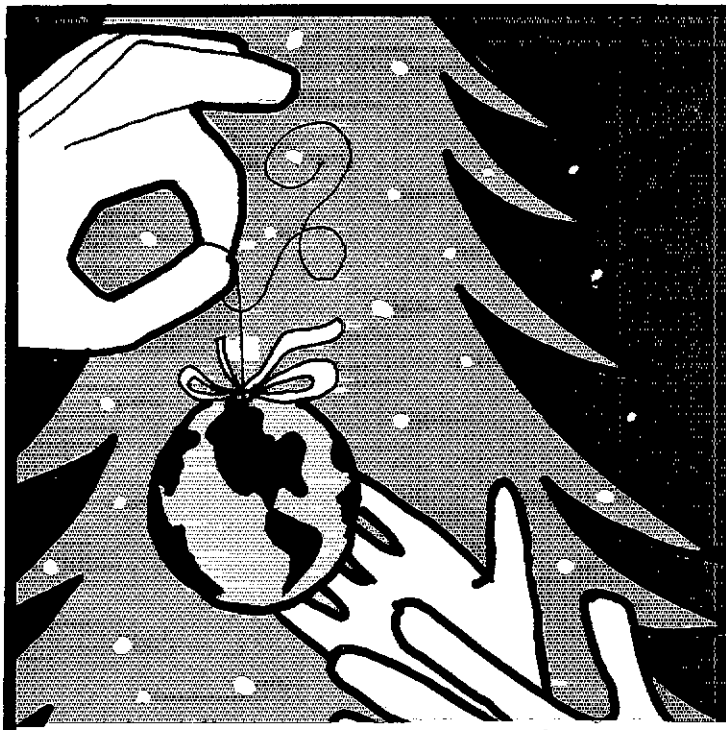
Net	kHz	Time/Day	Manager
NLI*	3630	1900/2200 Dy	WB2LZN
NLI Phone*	3928	1730 Dy	WA2ECO
NLS*	3730	1730 Dy	WB2YKG
Clear House	3935	1100 Dy	W1UX
Mic Farad	3925	1300 MTWThFS	W1DFT
ESS	3590	1800 Dy	K2UIR
NYSTPEN	3925	1800 Dy	WA2RSP

*Denotes section net, all times local. Thanks to W2EC for giving me various updates. And so comes to an end 1976. Lots of things to look back upon and a lot of things to look forward to in 1977. To all every where, Merry Christmas and Happy New Year from myself and the XYL and the two Jr. ops. Please take note of my new address, looks like this one should be permanent. At least for the next 30 years. Once again the Hudson ARC (HARC) put on a great convention, a good time was had by all. On Oct. 9, all the Phone and AREC ets were called to standby due to the issuance of a tornado watch, luckily the area was spared. Suffolk County ARC is starting Novice Classes. WB2FHN recovering nicely from heart attack. Hall of Science had a registration of 528 for their classes, 216 for Novice alone. Great South Bay ARC now has repeater working, 085/685 with WA2WHD as trustee. This repeater is set up primarily for AREC to cover the town of Babylon. Congratulations to W2PF and new XYL. Dave was married on Oct. 10. He will be moving to Bal Harbour, FL in Jan. WA2JZX now has his tower up along with a big "Bird Roost" beam. I am awaiting the screams of the neighbors as I put up my tower and beam which will be about 20-ft from Bob's. WA2YEI has added an HA460 and SX99 to his list of equipment. WA2EBJ let his dad, W2MDM use his new 2M rig and W2MDM is now happily in the process of rediscovering 2. He also has a secondary station license of W2DX. WB2LZN still looking for help filling the NCS and 2RN spots on NLI, why not give it a try at least once a night, please. NLS welcomes WN2AEO. W2DBQ is back on the air after a 2-year absence. W2LYH is having fun with his homebrew transverter on 160M. K2FV is now W2NN. Wantagh ARC started their fall classes with an FB turnout. LIMARC is involved in a 15 min. Radio Program every Fri. night at 2030 local on WBAU fm (190.3), they are also initiating an "Introduction to Ham Radio" program at local libraries. Congrats to WA2ECO who is the new PAM for NLI. Traffic: WA2WKH 266, WB2LZN 157, WA2ECO 143, W2HXT 54, K2GCF 19, K2JFE 10, W2PF 10, W2DBQ 6, WN2AEO 5, AD2GMF 3, WA2YEI 2, WN2ZPV 2.

NORTHERN NEW JERSEY: SCM, Louis J. Amoroso, W4ZZ —

Net — Freq. Manager	Time(PM)/Days	Sess.	QNI	QSP
NJN — 3695 WB2CST	7:00 Dy	30	325	152
NJN — 3695 WB2CST	10:00 Dy	30	150	63
NJSN — 3730 WA2WIW	8:15 Dy			
NJPN — 3950 WB2VTT	6:00 Dy	30	556	219
NJPN — 3950 WB2VTT	9:00 AM Su	4	59	8

SEC: WB2PBO. PAMs: WA2SLF and WB2VTT. RMs: WA2WIW and WB2CST. OVS report from AA2GEZ and DO reports from W2TPJ WB2CST W2NR and K2JFJ. WB2CST made BPL and WA2SLF WB2RMK WB2VTT WB2CST made PSHR. Appointment: WA2GKI as EC for Vernon & vicinity. Congratulations to WN2EIU on passing the General. We welcome both WN2GTT of Edison and WN2FYI of Tenafly into Ham Radio. Good luck to both and lets hear from you often. K2BHL expects his new SB-230 to help out in EAN. W2WOJ slowed down by business pressure. W2IIN an old NNJ SCM is finally on 2-meter fm. WA2WDT now operating at WA2MPP. WA2UOO started his antenna farm with a TH6DXX at 50-ft. K2EK will settle in W4-Land shortly. The WR2AHV group meet at Sussex County CD and are planning classes in the near future. K2JFJ enjoyed his visit to PA-Land and reports they have 6 repeaters on 2-meter fm that cover the entire country very well. On behalf of everyone in the section we say thank you to WB2VTT the outgoing mgr. of NJPN. It was a job well



THIS CHRISTMAS GIVE THE WORLD

Share the year around excitement and joy of amateur radio with friends and relatives of all ages. Give them the world of ham radio by giving the League's all-new *Tune in the World with Ham Radio* self-teaching package. It's the ideal gift - even for those not yet into technical things.

Tune in the World with Ham Radio is a completely self-contained guide to amateur radio. Consisting of a 138 page book and 60 minute cassette tape, it covers all the requirements for a Novice license. Then it guides the new ham in selecting equipment and assembling a station. And it even provides easy to follow "how to get on the air" instructions. Everything, in fact, that's needed to take them from ground zero to active amateur.

Best of all, the transition from ground zero to accomplished ham is painless. Morse code, always thought of as very difficult to learn is a snap with the widely acclaimed self-teaching cassette tape. Each step is explained in detail with frequent reviews by two instructors on the tape. It's just as if the instructors are right there in the room. And theory... it's step-by-step too! It's taught using easy to understand examples of things familiar to everyone...even those with absolutely no technical background. Only after the principle involved is thoroughly explained, and understood, is it translated into electronic terms.

Tune in the World with Ham Radio is by far the easiest and most successful approach to becoming an amateur radio operator available. And it's only $7.00 complete - including a multi-colored wall map showing all the U.S. call areas. Just the thing for the new ham. So, this Christmas, give the world of ham radio...Give *Tune in the World with Ham Radio!*

Yes, I want to give the world this Christmas. Please send me ____ copies of *Tune in the World.*

NAME _____ CALL _____

STREET _____

CITY _____ STATE _____ ZIP _____

Total enclosed or charge to Master Charge or BankAmericard Account: $_____

BankAmericard No. _____ Expires _____

Master Charge No. _____ Expires _____ Bank No. _____

American Radio Relay League, 225 Main Street, Newington, CT 06111

done. Good luck to WA2SLF the new Net. Mgr. and to WB2LCC who will be the Asst. Net Mgr. Please give them your help. It is with deep regret that we must note the passing of W2RF who was a real old timer in NJN and W2YT a member of NJDXA and a great contest operator. They will be missed by all. A special request. Please try to get your report in by the 5th. K2QBW enjoying the 75-meter Pacific DX in the AM. We wish everyone a Merry Christmas and a Happy New Year. We hope '77 brings the best to everyone and hope the FCC gives us a few more months of the A calls. Traffic: (Sept.) AB2CST 577, WB2VTT 153, WB2RMK 95, WB2RKK 85, WA2SLF 51, WA2PCF 44, WA2RMZ 44, W2CU 42, W2ZEP 42, WB2PBQ 38, WA2WXM 35, WA2BAW 32, K2ZFI 32, WA2MPP 28, WA2CQJ 20, WA2CAK 17, K2BHL 17, W2SWE 17, W2ZZ 16, WA2DIW 14, AA2CCF 13, WA2FLB 8, WB2TDI 6, WA2QJU 5, W2WHB 4, WB2ANI 2, W2WOJ 1. (Aug.) WA2CQJ 14, WA2WOT 12, WA2YWK 10, W2NKD 4.

MIDWEST DIVISION

IOWA: SCM, Max R. Otto, W0LFF — SEC: W0IYW. PAM/HF: WB0AVW. PAM/VHF: K0LKH. Congrats to WA0DFF K0PNZ and W0RAA for 20 wpm CP certificates. XYL of W0EMA now WN0VCC. Hiawatha welcomes WN0VDE. K0YLU gave the media a look-see of 2M aero mobile. Due to Novice classes by Iowa City ARC, new calls in the area: WN0VTI WN0VMW WN0VMO WN0VMN WN0VTB WN0VMU WN0VNN WN0VTG WN0VJG WN0VMX WN0VMR WN0VMT WN0VMP WN0VTH WN0VMQ WN0VMP WN0VMS WN0VRJ WN0VRK WN0VRL WN0VRN and WN0VRM (whew!). WB0OET put together a very successful display at a Cedar Rapids shopping mall. K0FLY with members of Cedar Valley ARC assisted with a walk-a-thon and a 100-mile bike ride. WR0AMF now on .04/.64 in Knoxville. Regret to announce K0OWW and WA0ZMJ are Silent Keys. W0HUP and his group had a very fine Cedar Rapids Hamfest. W0ZVY has new ICOM 230 plus stacked 11s. WA0ZJK has new FT-221 and W0BUA sporting new IC 225. WB0PYD and WA0LKM are new ORSs. AB0OET hosted the FCC examiners who gave about 90 exams. Congrats to W0ZNT on becoming Extra, WN0SEL General, and WB0VRQ and WN0SBT are new Techs. Have a Cool Yule, and Happy New Year to all. Iowa 75 Meter (1830Z) QNI 1669, QTC 101. (0000Z) QNI 1208, QTC 79. Tall Corn (0030/0400) QNI 364, QTC 105. Traffic: (Sept.) WA0AUX 504, K0EVH 234, W0SS 119, W0YLS 115, W0LFF 41, W0LJW 29, WA0LKW 27, W0MQQ 14, W0BQJ 8, AD0LKH 4, W0BW 4, WB0ENL 2, (Aug.) W0LJW 34.

KANSAS: SCM, Robert M. Summers, K0BXF — SEC: W0KL. PAMs: WA0SEV WB0BCL. RM: K0MRI. VHF PAM: WA0EDA. W0INH has now joined the group of two letter calls, he now is W0AM. Aug. net results: KSBN QNI 932, QTC 223. KWM 558/230. CSTN 687/41. KPN 159/9. QKS-SS 70/22. Glad to see W0HI back on the recovery list. This is the first zero traffic month for Dick in many a year. A hearty welcome to WB0OQX to the traffic nets. The time for club elections are upon us and the first to report is the gang from Hiawatha: WA0UQA, pres.; WA0KDO, vice-pres.; W0PB, secy-treas.; WA0UHW, act. mgr. WA0OMB our net mgr. for the Central States traffic net had a rather rough month during Aug. His XYL was quite ill in the hospital. KS was well represented at the Midwest Division Convention in Omaha. Sorry more of you could not be in attendance. Net reports for Sept. QKS: QNI 432, QTC 208. CTSN: 825/59. KWN: 624/242. QKS-SS 83/47. KPN 45/3 and KSBN 1113/237. Hope to have a quarterly report on MMM next month. Remember to monitor the KS frequencies when you are around the shack: 3920 3610 and 3735 kHz. You might be the one to help save a life. Traffic: (Sept.) W0FIR 393, WA2ENN/0 125, WB0HBM 125, W0OYH 114, W0AM 93, W0BWI 89, WB0 K0MRI 70, K0BXF 68, W0PB 53, WA0SEV 43, W0RFF 42, W0OCK 37, WA0KVP 33, WA0KDE 29, WB0LUN 22, W0FCL 21, WB0OQX 18, WA0GSG 14, WA0MLE 12, W0FDJ 9, K0FPC 7, WA0OWH 4, W0NYG 1, WA0TRO 1. (Aug.) K0FPC 28, W0HI 11.

MISSOURI: SCM, L. G. Wilson, K0RWL — Asst. SCM: Joe Flowers, W0OTF. SEC: WB0DBW. Congratulations to Novices, WN0TPK TPL TPM TPN TPO TPP TPQ UJG VPE and new Tech WB0WEF. Congratulations to new father WB0PSO and Grandpa WB0ILN. WN0RHR passed his General. Mid-Mo ARC and PHD ARC are conducting General theory classes. K0RPH has a new TH6DXX to work with this fall. W0PM is working OSCAR daily and has three countries to his credit.

Net	QNI	QTC	Net	QNI	QTC
Tri-Lake	18	2	Hmbtch	250	85
MSN	151	107	SCEN	56	5
PHD	39	8	SLAREC	85	4
MON	232	207	MON 2	131	49
MOSSBN	1164	199			

New officers for the Warrensburg ARC for the coming year are AB0LRX, pres.; WA0KDE, vice-pres.; WB0QLA, secy-treas.; K0YMB, pro. dir. Rumor has it that K0YMB's radar snooper was denied a Government patent due to the shoebox container design when placed on the dash of an automobile. The LEE's Summit WECO ARC conducted a successful bike-a-thon recently with the only disaster being that of a 2-meter antenna, courtesy of yours truly while operating motorcycle mobile. Traffic: W0HH 372, W0OTF 221, WB0LFY 155, WB0HSP 153, W0BV 148, WB0NXX 89, K0RWL 76, W0EEE 70, WB0FND 70, WB0ERI 63, WA0FMD 53, W0OUD 42, W0OQD 32, WB0LMW 29, WB0VL 28, AA0FKD 22, WB0FKY 11, AB0NIE 11, W0RTO 11, WB0NPC 9, WA0DCU 8, K0AHL 6, WA0KUH 6, WB0MEO 6, K0ENH 4.

NEBRASKA: SCM, Dick Dyas, W0JCP — Asst. SCMs: WB0GWR & WA0GHZ. SEC: WA0ASM. WA0BJG and W0LWS are Silent Keys. W0VYX recovering nicely from a heart disturbance. The Ak-Sar-Ben ARC gained 52 students for Novice class from the International SKIP talkers Jamboree. Midwest Dir. and Vice Dir. were guest speakers at Sept. meeting of the Hastings ARC. WB0GWR appointed as the primary asst. SCM. WA0GHZ will continue in a similar capacity. Nebr. Storm Net QNI 1157, QTC 61; Western Neb. Wx net QNI 407, QTC 4; Sandhills WX Net QNI 211, QTC 11; Nebr. Morn Phone Net QNI 1133, QTC 34; AREC Net QNI 160, QTC 2; QCWA QNI 64; PM Net QNI 122, QTC 4; 2-Meter AREC QNI 385, QTC 30. Cornhusker Net QNI 1292, QTC 84. Traffic: (Sept.) W0VEA 62, W0HOP 35, W0SGA 35, WA0CBJ 30, WA0QEX 28, W0GKK 24, W0JDJ 23, W0MW 22, W0FQB 16,

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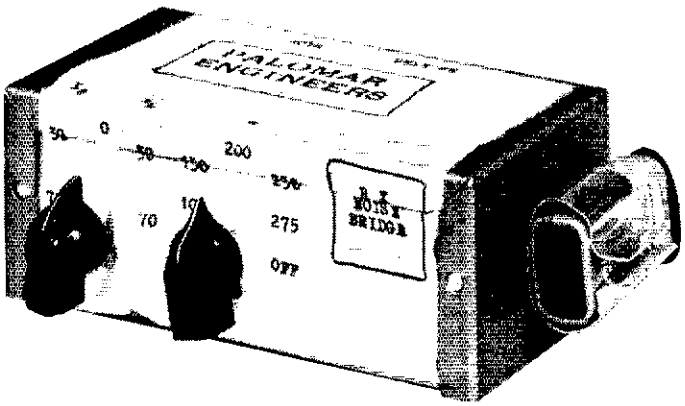

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AMPLIFIER Sell — Hallicrafter [illegible] $175. W2DPP.

SELL: Robot 70 monitor $200. Robot 80A camera, lens, tripod $250. Package $430 mint. WB2HSH 1145 Brinckerhoff Avenue Utica NY 13501. 315-724-6970.

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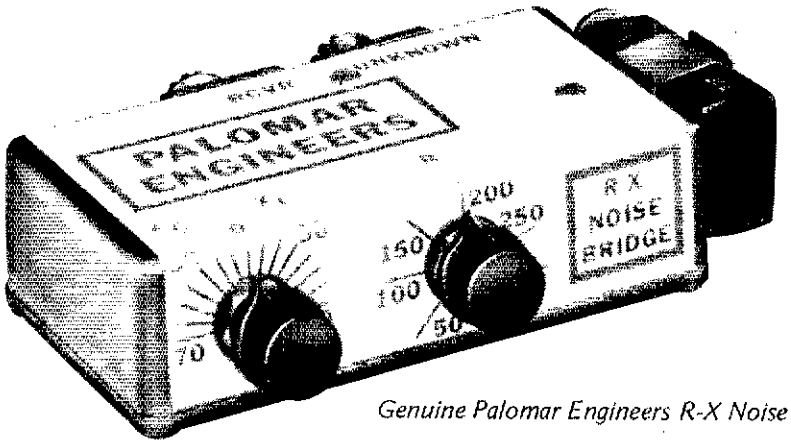

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NEW ENGLAND DIVISION

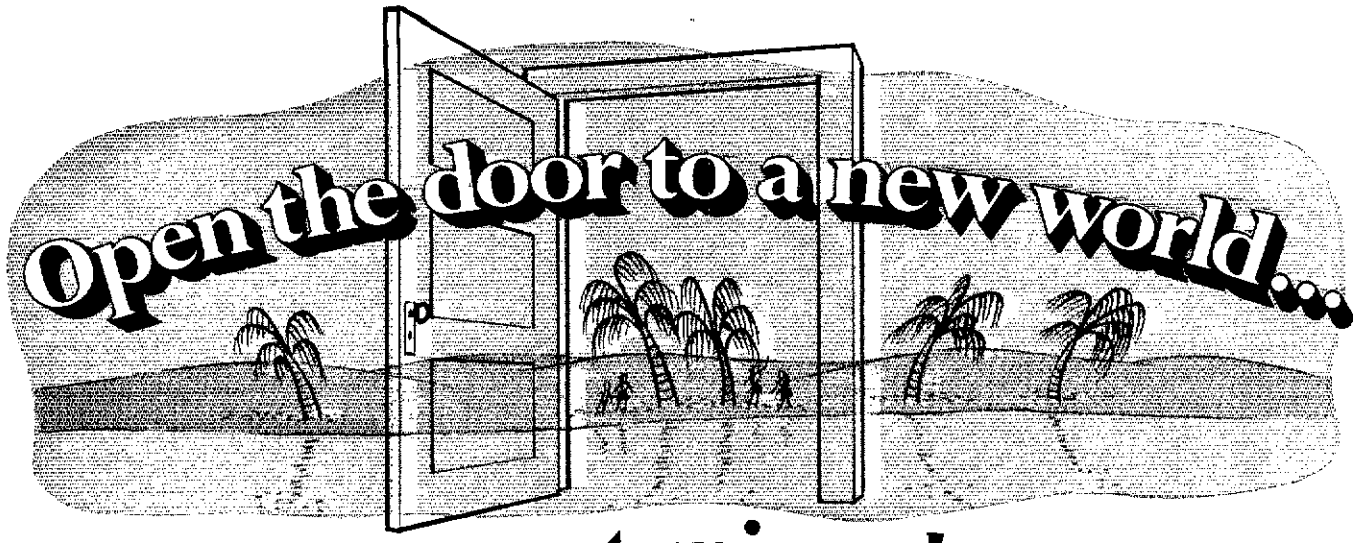
CONNECTICUT: SCM, John McNassor, W1GVT — SEC: W1DGL. RM: K1EIR. PAM: K1EIC. VHF PAM: WA1ELA.

Net — Freq.	Time/Days	Sess.	QNI	QTC
CN — 3640	1900/2200 DY	60	431	394
CPN — 3965	1800 MS 1000 S	29	404	144
VHF-2 — 28/88	2130 Dy	30	326	75

High QNI: CN — W1CTI WA1UAX and WA1URA. CPN — W1NQO. SEC, W1DGL would like copy of EC publicity or activities available — monthly reports always in order. Director W1HHR continues for another term and thanks all for cooperation. Contact him with comments and suggestions. IC RC adds 75/15 to their 28/88 repeater. Tech. Pub. Library via W1HCI & W1HAX now at New Britain Public Library. Tri-City ARC Class includes high speed cw for Extra Class students. New officers Manchester RC: WA1DOI, pres.; W1CDC, vice-pres.; K1AAF, secy.; WN1YVG, treas. Club reactivated, established 1912! Southington Novice Class under way via WA1ZQP. Shoreline ARC provided working Amateur Radio display at Shopping Center — successful and recommended to other clubs. Groton Area SCRAMS Group assisted local P.D. providing EC in search for lost child. Novice Training Program available from ARRL, also film "Moving Up To Amateur Radio," contact W1HHR. Volunteers for Oscar Demonstrations needed, contact ARRL. Congratulations to: K1WLX, pres. YL International SSB System; WN1ZEZ, for Novice Class; W1EFW High QTC VHF-2; and to Santa Claus! Sincere thanks to all for your help and continued activity, may your presents be many! A Very Merry Christmas to All! Traffic: W1EFW 270, WA1UAX 215, AA1VGP 207, WA1GFH 195, WA1URA 151, WA1WEM 110, WA1UHN 97, W1CTI 87, W1AW 66, WA1UOT 55, WA1UDB 51, W1BDN 38, W1GVT 35, W1DGL 28, WA1IKN 21, W1BDI 20, WA6IDN/1 20, W1BCG 18, WA1RUR 14, WA1STN 10, WA1JGA 7, W1KV 7, W1EJI 6, WA1VPE 6, W1CUH 5, W1QV 3.

EASTERN MASSACHUSETTS: SCM, Frank Baker, W1ALP — SEC W1AOG received reports from ECs: WA1RTR W1BAB W1BHD K1NFW W1UJF W1PEX WA1TJG W1EQH. W1UJF says they have a new antenna at C.D. Hq. for better coverage. WA6CQF here on a visit. W1ULW has this call back and now in Falmouth. K1WGU now in Randolph. W1ALT says his CD has call WC1AAF. W1UOH moving to Middletown, RI for a few months. W1KLZ W1DEL K1ZRZ W1HZR are Silent Keys. W1DMH made BPL in Aug. W1DMS on 2. Capeway RC met at W1AN's QTH. Many from this Section were up at the CNEN meeting in NH. WA1ZJJ on 2, also K1ZEH. WA1MZF home after a stay in Netherlands. WA1ZMU a YL related to W1MXC. W1JLQ here for a 50th anniversary party, now in ME. Ex-W1EJE now W4NOD. W1AY W1KO have new rigs for 2. W1LE in hospital. W1TPB has his Advance. K1UIW has 2 new antennas and on 1750 meters with a RI station. W1ANB now W1AN. South Shore ARC met. W1IHA is Secy. W1EPW on 160-10-15. WN1ZAZ is W1SR's son now 4 calls in the family. W1IGH has General. Chelmsford ARA having a Fox Hunt. Westford Group having an emergency exercise. New ECs: W1AGA W1UBC W1ZBF. W1PJ W1ALT endorsed as ECs, W1EIH as OO. W1EQ made BPL. New Club: Cape Ann ARA in Gloucester, WA@BYJ/1 is acting pres, and now having classes for general. W1KKD reports the NEEPN had 61 QNIs, 20 QTC. Bellingham AREC provided demo and traffic handling from Dean Jr. College. W1EQH K1DVX; WA1s SPA UQE VAM took part. WA1FNM is NCS on our EMRIPN and won a prize at the convention. W1IOA WA1WGE into RTTY. WA1KFA has another tower. WA1CRI WA1VXY won prizes at Convention. WA1CCM on 2. AA1VMU, B.U. ARC in our EMRI/EMRIPN. WA1QKD at Wentworth Inst. WA1SXU WA1KBE have IC-225s; WA1QAA/QAB have a new Drake C-4 console. W1JAA has a Bell & Howell handi-talkie on 2. WA1EMN is instructor of a Novice course in Westford Also "PART" is again active. WA1RTQ at Cornell Univ. Many Techs in the Lowell area working for higher licenses. Officers of Lexington ARC W1HWM, pres.; W1PEX, vice-pres.; WA1UIE, secy.; WA1MOP, treas. K1HRV says the Charles River Wireless Soc. meets once a month at a local restaurant. New officers of B.U. ARC: WA2OJK, pres.; WA1NNC, vice-pres.; WB2OYV secy.; WA1UZE, treas. WA1RWO at Northeastern. WN1ZAZ working on WAS. Officers of the Middlesex ARC: WA1YBS, pres.; WA1GXN, vice-pres.; WA1RVZ, secy.; W1LJO, treas. & trustee. W1LJO had heart attack but OK now. AF1AEM working on a new antenna. K1SOP on Air Guard duty busy at grad school and our sympathy on the death of his son. WA1DHM W1GRN won new 2M FM rigs. K1HHN transferred to GA. WA1PDM passed Extra. W1LA on 2. WA1TPC has Advanced, WN1UAF has General. EMRIPN had 684 QNIs, 269 QTC. EM2MN QNIs 67, QTC 28. WA1WFV new EC for Marblehead. EMRI: QTC 195, QNI 323. HHTN: QTC 58, QNI 295. Traffic: (Sept.) W1EQH 496, W1PEX 307, WA1MSK 256, K1PAD 222, W1UX 198, W1EIH 125, WA7ETN/1 122, WA1TBY 119, W1DMS 111, WA1UGJ 109, WA1EYY 74, WA1RVZ 55, W1DMH 23, WA1FNM 20, W1EJI 18, WA1IFE 9, K1LCQ 7, W1PJ 5, AA1VMU 1. (Aug.) WA1QKD 8.

MAINE: SCM, Ed Bristow, WA1MUX — Asst. SCM & PAM: K1GUP. RM: W1RWG. OBS renewed W1GKJ, bulletins on RTTY (146.70) 7 P.M. Mon. & Thurs. OBS W1GCM sked 10/70 7 P.M. fone Tue. MCW Wed. & Fri. Nets: MSSN QNI 26, QTC 9; PTN QNI 210, QTC 145. PSHR: W1ERW W1RWG WA1FCM. New in ME: WA1s YKL YLE YMC YMG Y5Y Y5Z YUZ YVB. WN1s YKI YLL YPS YQM YRE YRG YRR YRU Y5H Y5R YTH YVH YWO YYP. Welcome. Pine State ARC started code & theory classes with 15; Ellsworth ARC with 18 and much praise for ARRL new course; UM Portland-Gorham ARC (WA1ZBH) has class, is on air with Swan 500CX; Aroostook ARA has classes at SAD 1; Acadia Naval EAC (K1NAN) had Charter party Oct. 27, awaits new T4XC, R4C & SB220. WA5VQK left LAFB for TX. W8SWN/1 Classic 33 up 44-ft. Traffic: (Sept.) WA1FCM 200, W1RWG 128, W1ERW 103, K1PQS 72, WA1YUZ 72, WA2HSP/1 27, WA1MUX 24, W1GU 21, K1GDI 18, W1CTR 4, WA1JCN 4, K1NAN 4, WA1YYU 4. (Aug.) AD2ASD/1 203, WA1JHT 33, K1PQS 29, WA1YUZ 10, WA1NKE/1 3. (June) KH6IAC/1 30.



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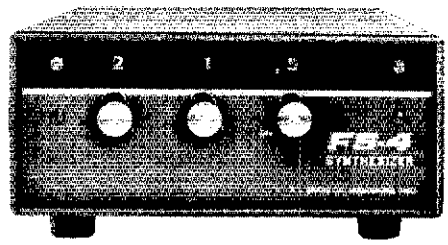

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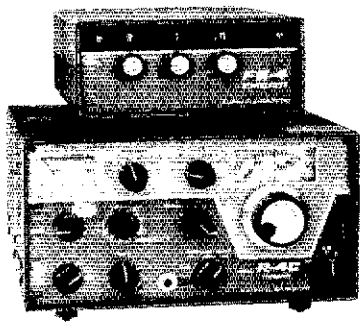

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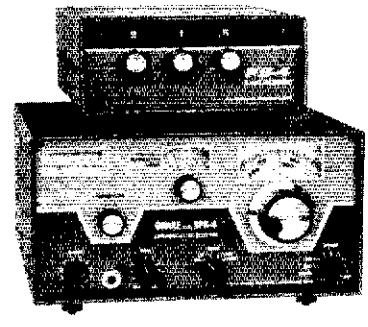

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NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1NH/W1SWX. SEC: K1RSC. RM: WA1GCE. PAM: Open. Watch QST for the planned NH QSO Party to be sponsored by the Concord Brasspounders, W1OC. Welcome new appointees WA1PEL as OPS and W1GUN as ORS. Endorsements: K1NH/K1LMS K1PWV K1AC K1ACL as ORS; W1BXM W1EUJ W1JY/K1QLZ as OVSs: W1EHT K1DQM ECs, plus WA1PSI as OO and K1RSC as SEC. Yours truly met the following representing NH at the ARRL convention; K1ACL WA1PEL K1RSC K1RSD W1GUI K1PCY W1JY/K1QLZ K1MIB W1IIB K1VBL K1NH/K1LMS WA1RGP WN1VLF W1ZQI W1FBG K1HZZ K1CEU W1MIV K1YGF. W1EHG report the NHEPN held 4 sessions with 38 check-ins and 10 traffic. W1TXY says that CBer Elwin Balla of Charlestown is now WN1SPU and is ready for General. Another successful get-together of the CHEN has passed. This net certainly lives up to its friendliest net reputation. Welcome new hams WN1YKJ WA1YUK WA1YTY WN1YTW WN1YSU WN1YRH WA1YPR WN1YPY WA1YQA WN1YRW WN1YSM WN1YWQ WN1YWR. The GSPN had 460 check-ins, 22 traffic. WA1QMT is now a Silent Key. Contact WA1PEL for membership in the Saddleback Repeater Assn. (Deerfield). Contrats to K1JFQ on the excellent article in the NH newspaper. Merry Christmas to all. Traffic: (Sept.) K1BCS 454, W1GUN 115, K1NH 90, WA1UAV 65, K1PQV 33, W1EHT 6, W1MHX 4, W1DXB 2. (Aug.) W1GUN 70.

RHODE ISLAND: SCM, Ron Simonton, K1GMW — Late report. SEC: K1YDA. RM: WA1POJ. PAM: WA1RFT. 16/76 Fleamarket Auction was scheduled for Oct. 30 at the Warwick YMCA. The auction began about 1 P.M. There was very good R.I. representation at the ARRL New England Convention in Boston. K1LPA is the Section coordinator for the Northeast Contest Club (NECC). NECC would like your participation either from your station or as an operator at one of the club multi-op stations. Several DX stations are also planned. Check with K1LPA for more details. The new ARRL "Tune in the World with Ham Radio" publication and code tape are excellent and should eliminate many of the problems encountered with the old series. On two meter fm? The following open repeaters are available in RI: 146.10/70, 16/76, 235/835, 28/88, 34/94, 147.96/36 and 765/165.

VERMONT: SCM, Joel Breakstone, WA1PSK. SEC: W1VSA. VTSSB, 511/95; VTRFD, 93/21; VT Fone, 91/3; Green Mt., 526/37; Carrier, 484/15. Welcome new amateurs WN1s YZQ ZBS ZBE ZBD ZCO ZDN ZGC ZDG ZIK ZGI ZGO ZHG ZMS ZLU ZLI ZLH; WA1s ZLD ZMN ZMF ZLW. New officers for Mt. Ascutney Repeater are W1VLL, pres.; WA1UJA, vice-pres.; WA1ELJ, treas.; WA1WEY, secy.; W1CMV, trustee. K1NIN now a Silent Key. Traffic: (Sept.) K1BQB 118. (Aug.) K1BQB 452, W1LMO 136.

WESTERN MASSACHUSETTS: SCM, Percy C. Noble, W1BVR — Members of NOBARC took active part in the Housatonic River clean-up and the N. Adams Fall Foliage affair. Also many WM 2-meter operators took part in the Hawk Watch. W1JTL is the new Worcester Co. Emerg. Coord. New ORS: WA1TTY. WA1FBE now using RTTY. W1IBZ building new keyboard keyer. W1DVW added an HW-16 to his Drake line. SEC WA1DNB; WMEN — 4 Sun. sessions, QNI 140 (including 78 thru 2-meter liaison). Total WM AREC membership now 105. PAM WA1MJE: WMPN — 22 sessions, QNI 184, traffic 38, different stations 53. CW RM W1DVW: WMN — 30 sessions, QNI 218, traffic 147, different statinns 19. Tri-county UHF/VHF PAM WA1PLS: WM AREC (Mt. Lincoln) — 22 sessions, QNI 98, different stations 15. Club bulletins sent me much appreciated, but many times no room for inclusion here. Congrats to the clubs offering code and theory classes. Traffic: W1TM 172, AA1MJE 110, W1KK 87, W1DVW 78, W1BVR 75, W1ZPB 57, W1UD 51, WA1FBE 32, WA1TTY 27, W1BBI 17, W1DOY 15, WA1DNB 6, WA1PLS 4, WN1YXL 2.

NORTHWESTERN DIVISION

ALASKA: SCM, Roy Davie, KL7CUK — It is with deep regret that I report the Silent Key of KL7HMJ. Burl will be remembered for his outstanding work on many projects involving amateur radio. He was also asst. EC for the Greater Anchorage area and a great booster for the League. KL7HOV, PAM for the ASN reports 769 ckins for this month. KL7AF still up to his neck in work, however; manages to meet all nets. KL7HIX reports the repeater in Kodiak going strong on 28/88 with new antennas on a 1700 foot mtn. KL7CFX reports the Fairbanks Club provided communications for a foot race resulting in over 1000 msgs being handled. Watch for the AKW Net on 3945 cw at 9:00 PM AK time Mon. thru Fri. This is a slow-speed net for training of all hands in handling traffic. KL7HCN is RM for this net. The 34/94 and 16/76 machines are in operation in Anchorage. The new repeater on 147.96 in and 146.01 MHz at Lake Minchumina providing reliable communications between Anchorage and Fairbanks by bouncing the signals off from Mt. McKinley. KL7IS and KL7BIL are the master minds behind this project. Traffic: KL7AF 13, KL7CUK 5.

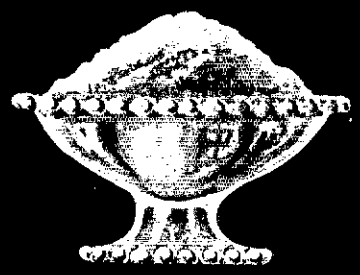
IDAHO: SCM, Dale A. Brack, WA7EWV — SEC: W7JMH. PAM: WA7HOS. RM: WA7KER/7.

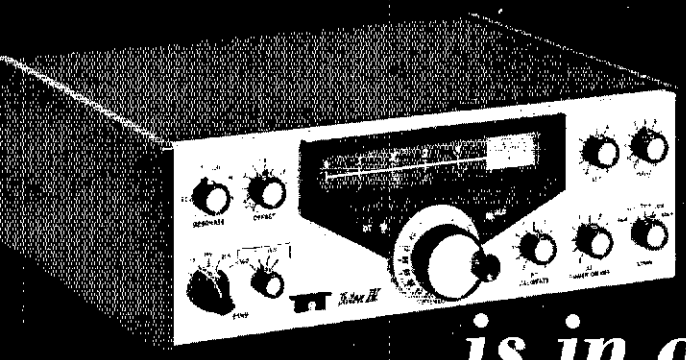
Net — Freq.	Time	QNI	QTC	Mgr.
FARM — 3.935	0200 Dy	1037	43	WA7RQI
IMN — 3.635	0230 M-F	179	98	W7GHT
RACES — 3.9905	1415 M-F	438	2	WA7WXI

K7NHV placed first in the ARRL Bicentennial QSO Party. WA7KKR/7, RM of ID, must now share the key with his XYL, WN7FDY. W7IY out of the hospital. Upon returning home, he found his 75 and 40 dipoles blown down; but W7IWU has promised to help replace them. W7WVD hosted a regional convention of the County Hunters in Aug. K7ZMP, an active member of the Lewiston-Clarkston ARC for many years, is now a Silent Key. Traffic: WA7KKR/7 321, W7GHT 152, W7GBO 45.

MONTANA: SCM, Robert Leo, W7LR — Your new SCM has visited Butte and Helena club meetings. K7CHY is the new RM. W7YB was No. 2 in the Bicentennial contest with 3034 QSOs by WA7WXY. I note more net and traffic activity, from: MTN, IMN, RN7, DRN7, RACES, AREC nets. The Sweetgrass repeater now on 04/64. WA7OBH planning an MT DX net. W7LR has a TS-820, and 214 countries. WA7ROJ W7KJA have new beams, towers. K7CHY a new

The proof of the pudding is in the eating.





The proof of Triton IV is in owner satisfaction.

Here's some of the proof . . .

K4EME — This is my second TRITON IV. They are excellent xceivers! **WA8ICK** — Luv it. Dynamite! **W9NXU** — I am very thrilled with this unit, it is great. I think you have scooped the field. **WA0AYA** — I like CW and full break-in. (Beautiful) **K3TFU** — I love the unit. **WA3VEZ** — Rig is just great. Combined with your service makes a super transceiver. **WN0SED** — Beautiful radio to use. Magnificent CW filter! Just a pure joy. **W8IIT** — I have had my TRITON IV for two months and am delighted with it. **YN1MBV** — It is a very nice rig. **W3GTX** — New features very welcome. **W0BYC** — Bought one of the first TRITON II, like it so well I updated it with a TRITON IV. **W2TBK** — It is absolutely fantastic. **WB0OPI** — I am pleased with the rig. **WA3GJA** — Very-very-very nice. Good audio quality. **W5ZBC** — The most outstanding rig I have ever used. **K8CJQ** — Excellent rig, Good filters. **W7BKK** — Very happy . . . getting excellent quality reports. **W2CET** — Power-signal reports good. **WB2UER** — I like the compactness and appearance. **VE3IBK** — An excellent rig with superior receiving quality. **K4IVM** — I think it is tops. **WA4LOG** — I've become so used to dip, peak and adjust, this TRITON is a beautiful new experience. **KL7IHW** — Easy to set up—works great. **K4JXD** — Seems to be very FB rig. **WA7KHE** — Fantastic performance. Thanks for a fine rig. **WB4BPG** — No problems—fine rig. **VE1BZ** — Good work. **W9HQT** — Receiver better than expected, CW break-in is super. **W0AP** — Tremendous transceiver. I appreciate your engineering. **WA2ZRO** — Wonderful. **K0SFV** — Real nice rig. You thought of almost every feature and built it in. **KQ9DQ** — Beautiful. **WB0JIQ** — Beautiful radio; however, your ads do not do justice to the radio. **WN5SOH** — Very sophisticated—Easiest tuning rig ever. Very glad I bought it. **K3OJV** — Very impressed. **W4LZP** — Very good results. Put out 100 watts as good as 300 watt rigs. **WA4DQY** — I think the TRITON IV is great. **W6QXN** — Appreciate full CW break-in. **WD1NH** — Enjoy light weight. **VE3CYK** — I am extremely pleased with the clarity of receiver and after putting rig on the air, received unsolicited compliments on the audio quality of the transmitter. **K4PHY** — Was 3rd in USA, first in fourth district in WWCQ contest. **W8RYU** — Own Argonaut. Both fine rigs. **W4CDA** — Compact, light weight, good engineering. **WB2WZG** — TRITON IV is the most versitile CW/SSB radio I have ever used. **WB2FMV** — Outstanding. Highly pleased with performance. **WA8ACZ** — A real nice rig. I have owned about every other make. **W5EGK** — Works nicely. **WB4ECO** — I tried this rig, a pleasure to operate. **WA4YRK** — Excellent reports on audio. **WB8NKB** — Wonderful. **W9QPQ** — An excellent rig. Love it. **W8SOP** — Makes running SSB nets a real breeze. Also good on CW nets. **WL7IRT** — Fantastic rig. **W4MDB** — Has rekindled my interest and enthusiasm in Amateur Radio to an extent I hadn't thought possible. It far out distances any competitive product at any price. **W6EYR** — Very nice. Been a ham for 45 years and now solid state perfection. **W2RPH** — Excellent rig. **WN0TDK** — TRITON IV is a fabulous piece of equipment. **W5VIW** — Very nice rig **WB2LQF** — Wow! **W9JCV** — Tnx for giving us a FB piece of equipment made in the USA. **W8GHO** — Very pleased. **K4KXB** — Seems to have everything desired. **W4SZ** — A pleasure to operate. **W2FKF** — Greatest rig I ever had. So far in a month 34 QSO's without one miss. Been a ham since 1922. **W4GVC** — Nothing but complements. **WB9EZE** — Well pleased with performance and simplicity of operation. **K4ETI** — Rig is great. **W8CNV** — Man—! what a rig. I've had this call since 1929. Never saw anything like it and I've seen them all! **WB2MZU** — Seems like everything the S - - - - - O - - was supposed to be at one third the price. **WN0VHE** — I think it is a very good rig. **WB9FTD** — Break-in CW is very impressive. **K0CBA** — I believe it is one of the finest HF transceivers on the market. I can't tell you how pleased I am with the noise blanker. I can get on the air from my home station again for the first time in a few years. Other rigs with noise blankers just didn't hack it. **WA7YHW** — I am very pleased with this equipment. It is certainly of high quality. **W7IIA** — Excellent equipment. **WB0RWA** — Couldn't be more pleased with it. It certainly has performed beautifully and is all I expected and more. **WB4QJT** — Like it very much — keep up the good work. **WN1YVX** — Really impressed with looks and performance. **W0NC** — Very FB rig. Performs up to specifications, an excellent design. **K8PBZ** — Already have TRITON II and IV. **W7KD** — This little "T-4" is smooth as silk . . . I've received some very flattering reports about transmitter voice quality and the CW operation is the greatest. **WN8TTO** — I found that the TRITON IV was the best rig on the market for around $800. I love it! **W2JBK** — It is absolutely fantastic. **W8FEI** — Am amazed at receiver performance. I thought I had a top notch receiver with the H- - - - - - - -! **W1FYM** — Your guarantee is refreshingly proper. **W8MOK** — Sure makes a guy look twice at his old tube type gear. **W1TFS** — Finest CW ever, CW selectivity very good. **WB6IVR** — Very satisfied with TRITON IV. Just what I was looking for to use on my yacht. Thanks. **WA8ONP** — Also have a TRITON II. I am pleased that Al Kahn and the **good guys** at TEN-TEC thought of the CW operator! **W2EMX** — Excellent Amateur gear meets and exceeds advertised claims. **W0AMJ** — It looks like there is nothing left to be desired. It is beautiful. **W6SE** — The receive function is outstanding. It is superb in transmit. **W1BV** — In love with this fantastic gem. It's so easy and a pleasure to operate. **W6ASH** — Very happy with performance. Particularly impressed with full break-in and light weight. **WA0IMS** — By far the best rig I have ever operated. I am glad I decided on the TRITON IV and not one of the other transceivers on the market. **WA8HQO** — Thank you gentlemen.

Add your name to the growing list. See your TEN-TEC dealer or write for full details.

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receiver. Anaconda, Butte, Missoula & Bozeman have large Novice classes going. K7OEK returned from KL7. W7TYN has 22 states via Oscar. W7CJB worked 40 stations in the VHF QSO party. The Butte repeater was used to assist in several car accidents. Traffic: (Sept.) K7CHY 25, WA7PZO 12, W7LR 8, WA7OBH 2. (Aug.) K7CHY 19. (July) K7CHY 83. (June) K7CHY 128.

OREGON: SCM, Dwight J. Albright, W7HLF — Asst. SCM: Daniel O'Connell, WA7TDZ. SEC: WA7UHC. PAM: K7RQZ. RM: K7OUF.

Net — Freq.	QNI	QTC	Sess.
Manager			
NSN — 3701	370	155	30
WA7UJO			
OSN — 3585	173	144	30
AREC — 3993.5	447	5	30
WA7NEQ			

The Oregon Emergency Net (OEN) continues to have good check-ins at the 6 PM session and 7 PM. The Beaver State Net has also a good cross state check-in BSN is a traffic net. OSN-CW also making progress. WA7TAE, mgr. Jackson Co. AREC net reports QNI 76, Tfc 18, Sess. 9. Many two-meter repeaters are used at local level to distribuate msgs. WB7CBA PDX now OPS showing up on AREC Net. WB7NPP received his Extra Class, is on OSN AREC. WN7FFG received 20 wpm certificate. WA7OFK moved to Grants Pass. W7ROM now K4OF. Several Novice classes going good. WA SCM and OR SCM W7HLF had tables at Milton Freewater for ARRL, WA7UJU helped with slide presentations. Turned 3 instructors to registration to ARRL, for Novice classes. "Emergency," a high priority word W7HLF had to use while near Caldwell, ID. W7ZQR reports OVS activity. The OR Region Porsche Club thanks WB7BDD WB7ARM K7VIT W7RPT WA7ZJN WA7UJQ WA7NTU W7ALG W7FVF WA7YVT WA7BQT WA6PQL WA7HAA for communications help. Lane Co. Hamfair in July 1977 at Eugene. Traffic: W7VSE 287, K8OUF 212, K7IWD 144, WA7TXV 126, K7NTS 108, W7DAN 64, W7IWN 57, W7HLF 30, WA7RKN 17, W7LT 15, WB7NPP 5.

WASHINGTON: SCM, Mary E. Lewis, W6QGP — Attendance at Walla Walla Hamfest was excellent as evident from overflowing parking lot. The newly redecorated room for the commercial exhibitors certainly helped offset the equipment displays, the door prizes were many. If you missed it be sure and put a circle on your calendar for '77. K7AJT gained a Son-in-Law and newlyweds left for Long Island, NY. The Radio Club of Tacoma booth at the Puyallup Fair received names and addresses of people interested in amateur radio, the names have been given to clubs in their home areas for follow up in licensing classes. K7MGA heard mobiling in NV. WA7GPW has sold his house and purchased a trailer home, they are off to see the US of A. WA7OMX teaching an amateur licensing class for Lower Columbia area. W7IEU has been appointed communications chmn. for Snohomish Island County Chapter of American Red Cross. Regret to note the sudden passing of W7AYO.

PACIFIC DIVISION

PACIFIC: SCM, Pat Corrigan, KH6GQW — RM: KH6JAC. ECs: Hawaii (Isl.), KH6HOU, Kauai, KH6FMT. Congrats to W8RIK KH6AFM KH6IDL and KH6EKQ who are all involved with instruction classes for amateurs and potential amateurs. Emerg. ARC has changed location of the .19/.79 repeater to Maunakapu. Machine is all new solid state with duplexer and is at about 2600 foot level. EARC also reminds of City Hall repeater on .37/.97 (WR6AGC/6). K1LNJ/KG6 was instrumental in helping summon fire dept. when KH6JCB's neighbor's house caught fire and no phone yet from Typhoon Pamela. KG6JAQ now residing on Big Isl. in KH6. All good wishes to KH6EKD in his new W6 QTH. His tower became property of KH6GJQ. Mike was big help in Section activities. KH6FMT active on Oscar. Nat. Weather Service solicits aid of hams in reporting on local storms that pop up. The Maui ARC again had a booth at Maui County Fair and did very well. Traffic: KH6CKJ 26, KH6JAC 16.

SACRAMENTO VALLEY: SCM, Norman Wilson, AA6JVD — SEC: W6SMU. New Novices produced by recent El Dorado Co. ARC class are: WN6s OTZ OZN OZO PAG and PAL. Congratulations. WA6POC rewarded his General Class effort with a new Triton IV transceiver. WA6HBI did likewise with a new Atlas 215K. W6KTB, a former RAMS member, joined Silent Keys on Sept. 15. Fred was retired in Redding. W6DEF has been originating traffic for the Auburn Chamber of Commerce. W6RSP now acts as RN6 liaison for NCN. The Tahoe ARA has started a licensing course at the South Tahoe Intermediate School. WB6FAA has 60-feet of Rohn 6 tower ready to go up. The Northern Amateur Relay Council held their Sept. meeting at the Sacramento Metro. Airport. AA6JVD has built an Accu-Keyer and now struggles to relearn the code from scratch. Traffic: W6RSP 96, W6DEF 56, K8RPN 10.

SAN FRANCISCO: SCM, Charles K. Epps, W6OAT — Good month for public service: MARC and ACS worked with federal and local agencies to test Marin City emergency services network; ACS provided communications for Marin swine flu vaccination program; HARC and FWRA provided communications for Eureka's March-of-Dimes Bike-a-thon. Congrats to new MARC officers: WA6MGK, pres.; WA6IME, vice-pres.; WB6KHO, treas.; WA6POR, secy. WB6LCN moved to Arcata. WB6AAR in England for year's sabbatical. W6NUT now K6BB. WB6UPV active on 2m ssb. Geo. Ladd PRC has the WR6ACI repeater retuned and back on the air. W6LLO successful in breaking WR6ACS (Mt. Tam.) from NV side of Lake Tahoe. Good turnout of SF Section counties in CA QSO Party. Anyone interested in formation of MARS stn at SF's Ft. Mason pse contact W6OAT for details. Traffic: W6IPL 179, W6RNL 160, W6NL 149, K6TP 117, WB6JEO 6, WB6ITN 2.

SAN JOAQUIN VALLEY: SCM, Charles McConnell, W6DPD — SEC: WA6HNO. ECs are needed in Amador Calaveras Medera Mariposa Merced San Joaquin and Stanislaus counties. Anyone interested contact the SCM or SEC. The Teen Net meets on 7.25 MHz phone on MWF and Sat. and 7.125 MHz cw on TTh and Su at 0000 UTC with WB6WFQ in control. RTTY net meets on Thur. at 2000 Pacific time on WR6ACR, 93/33. AA6CPP has Commonwealth DX Cert. No.

We thought you might be interested in a 2-meter, synthesized, VHF-FM transceiver featuring 800 frequencies in 5KHz steps, variable RF output from 1 to 25 watts, 4 front panel selectable splits, a signal/power meter, and a price tag below five hundred dollars.

TRANSMITTER SPECIFICATIONS

Frequency Range: 144 to 148MHz. **Front Panel Frequency Splits:** Simplex, +0.6MHz, —0.6MHz, +1MHz, —1MHz. **Frequencies:** 800 (5KHz separation). **Modulation:** 16F3 ±5KHz for 100% at 1,000Hz. **RF Power Output:** 1-25 Watts, variable. **Frequency Stability:** Within ±0.001% from —20°C. to +60°C. **Hum & Noise:** Better than —30dB 2/3 rated system deviation at 1,000Hz. **Antenna Impedance:** 50 Ohms. **Switching:** Solid-state type. **Spurious & Harmonic:** At least 60dB below rated carrier power. **Microphone:** Tumer, low impedance. **Audio Frequency Response:** 300Hz to 3,000Hz, referred to +1, —8dB of 6dB/Octave de-emphasis curve. **Audio Distortion:** Less than 7% at 1,000Hz, 2/3 system deviation. **Frequency Display:** 6 digit, 7 segment HP LED. **Optional Accessory:** Plug in touch-tone encoder $50. Face plate also available in black.

RECEIVER SPECIFICATIONS

Frequencies: 143 to 148.995MHz. **Usable Sensitivity (12dB sinad):** 0.35uV @ 50% audio. **Quieting Sensitivity (20dB):** 0.5uV minimum. **Squelch Threshold Sensitivity:** 0.25uV minimum. **Squelch Limit Sensitivity:** 2.0uV or less. **Modulation Acceptance Bandwidth:** ±7.5KHz minimum. **Adjacent Channel Selectivity:** 70dB minimum. **Spurious Response Attenuation:** 70dB minimum. **Intermodulation Attenuation:** 60dB minimum. **Local Oscillator Frequency Stability:** ±10 parts per million. **Audio Output Power:** 4.0 Watts into a 4 Ohm load @ less than 10% distortion. **Audio Frequency Response:** +2dB to —8dB from the standard 6dB per Octave de-emphasis from 300Hz to 3,000Hz. **Hum & Noise:** —50dB squelched and —30dB unsquelched. **Chassis Size:** 7⅛"W x 2⅝"H x 10". Specifications and prices subject to change without notice.

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146. W6DPD has WAC on ssb. The Fresno Hamfest will be May 6, 7 & 8, 1977. K6OZI and WB6ITM passed Extra Class and K6YDW and WB6LBR passed General Class exams. WB6RXA and WB6BDD are new Techs on Stockton. WN6BXG has new rig. WB6JDG W6KOC and WA6WXP worked OR on 2m ssb. WA6YAB has Drake AA22. K6BKZ and WA6JDB have new towers and beams. Thanks to W6APU for 20 plus years service as SCM. I wish everyone a Merry Christmas and a Happy New Year. WB6WFQ is ORS. Officers of Fresno ARC are WA6UQR, pres.; WA6SLS, vice-pres.; WA6YAK, secy.; W6YEB, treas. AC6YKS has Bicent. WAS. K6OZI 100 countries confirmed. Traffic: (Sept.) WA6KMW 34, WA6JDB 10, AA6CPP 1. (Aug.) WA6RXI 38, K6PSJ 4, AC6YKS 2.

SANTA CLARA VALLEY: SCM, J. Maxwell, W6CF — SEC: WA6RXB. The annual QCWA picnic was held at the QTH of W6CDJ. A good time was had by all as reported by W6AUC. WB6JNN now on 220 ssb/cw with 1/2 watt output. The new time for the Pacific Division Bulletins transmitted by W6ZRJ and W6VZT is the first and third Tue. of each month. CW is at 7:00 PM on 3590 kHz. SSB is at 8:00 PM on 3810 kHz. RTTY is at 8:30 on 3615 kHz. W6RFF now has 450 MHz mobile gear through WR6ABD and WR6ACI. Your SCM is on vacation this month and W6VZT was asked to do his report. I haven't done an SCM report since Jan. 1972. I also noticed that things haven't changed. The SCM still doesn't get much good information for print. I never could understand why clubs have not used this avenue to publicize what is going on. For example: how many new hams have you gotten. The fact that you have classes. What social events you are going to have or have had. Remember this column is not just for traffic, its for all activities whether they be individual or club activities. Club bulletin writers, here is your chance. Oh well, it was fun writing the column again. Traffic: W6YBV 253, W6RFF 170, W6NW 80, W6AUC 50, W6KZJ 46, W6QNB 7.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Chuck Brydges, W4WXZ — SEC: W4EHF. PAM: W4OFO. VHF PAM: K4GHR. RM: K4MC. EC of the Month is WA4FFW who recently spearheaded the effort by over 161 amateurs to provide commo to the town of Mebane which lost their telephone exchange due to fire. Watch QST for a detailed story. Mecklenburg ARS (nw 140 mbrs) scored over 26K with 551 contacts in Fall VHF Test, congrats to the W4BFB gang. Raleigh ARS in liaison with National Railway Historical Society operated on a steam train run recently with 91 QSOs and 17 QTC. WB4NXC now K4OF and enjoys oping with son WN4PXV and both rode Freedom Train fm Charlotte to Salisbury working 2M. WB4KZG attended DXPO-'76 along with WA4UXU K4CIA K4ZCP WA4LDM and W4OEL. Charlotte put our hobby in the public eye at eighth annual "Festival in the Park" (1.2 million attendance) and members of Mecklenburg ARS and Charlotte ARC manned the display tent. This demo signed up many new prospects sb look for similar events in your area and tell the public what we can do. WA4LWX and daughter WN4LUB upgraded at Shelby, congrats. The Crabtree Valley Mall demo (Raleigh) continues on a regular basis and WA4LYN (age 14) handled approx 50 pieces of traffic just after making Tech so there is nothing like jumping right in. New officers for Cary ARC are WA4OSS, pres.; WB4UBU, vice-pres.; WB2KTC/4, secy.; K4FBG, treas. New dir. for JFKN are WB4ICF and WA4ERN and WB4KHZ is now in 3rd term as Secy. Onslow ARC had a hidden transmitter hunt with prizes. Cape Fear ARS (Fayetteville) has 75 mbrs and daily net on 2M with abt 550 QNI per month. Traffic: (Sept.) WA9NEW/4 128, W4OF-O 109, WB4MXG 98, W4FMN 93, K4FTB 79, WA4LYN 60, K4EZH 53, WB4OXT 40, WA4TCR/4 39, W4WXZ 34, WA4PSL 30, W4ACY 26, WA4KSO/4 25, WB4UBA 21, W4WWR 19, WA4MUW 11, WB4CES 10, K4TTN 10, WB4FFX 9, K4GHR 8, W4EHF 6, WN5SRD 5, W4EA1/4 3. (Aug.) W4FMN 80, W4DW/4 22, WN4SRD 7, WB4CES 2.

SOUTH CAROLINA: SCM, Tom Lufkin, WA4DAX — Asst. SCM: Gary M. Barnette, WA4MDP. SEC: WB4TNS. Chief PAM: W4MTK. PAM: WA4DZG. Chief RM: WB4OBZ. RM: WA4UKU. Appointee of the month is W4MTK who has done an outstanding job as PAM and Net Mgr. of SCSSBN. He also edited the excellent Net Directory. Ander RC very active with new net (37/97.9:30 P.M. nightly). Amateur Radio Classes and Mall Publicity station. Congratulations to WB4ARJ on again making BPL. I will visit Piedmont Tech ARC Dec. 6. Hope to see you there. Rock Hill Hamfest enjoyed by many hams again this year. New amateurs in SC: WA4s JWC EWS JWR JWO and VZP; WN4s JWN JAU and VZA. These will probably be the last WN4s issued. Merry Christmas and Best 73 in '77 from all ARRL officials in your section. SCSSB 1245 QNI, 1/4 QTC; CNE 311 QNI, 158 QTC; CNL 231 QNI, 101 QTC; PX 207 QNI, 88 QTC; Blue Ridge 2-Mtr 1250 QNI, 62 QTC; Anderson 2-Mtr 382 QNI, 12 QTC. Traffic: WB4ARJ 507, WB4OBZ 278, W4MTK 89, W4NTO 81, W4ANK 77, WA4KXZ/4 48, WA4UKU 44, WA4DAX 35, WA4DZG 35, WA4ECJ 33, WB4UDK 30, W4FMZ 28, K4GGG 23, WB4JNE 16, WB4MOT 16, K4FRX 14, W4GL 8, WA4NIE 7, WA4MDP 6, WA4QWJ 6, WB4HNQ 3.

VIRGINIA: SCM, Robert L. Follmar, W4QDY — SEC: WB4DTG. PAM: K4VWK. Asst. PAM: WA4YIU. RMs: VN K4IAF, VSN WA4EPJ, 4RN W4SHJ. Your SCM had the pleasure of presenting the Portsmouth Radio Club with their Club Charter at a banquet in honor of the occasion. SEC WB4DTG is steadily building his EC gang. FB! EC WA4QQ appointed two assistants, W4WWD & WN4PGM for Cumberland Co. Club papers recd from following ARCs: Richmond, Portsmouth, HRRA, LARC. All vy FB especially LARC's "Ten-Miler" report by WB4MDC with participation of 19 amateur stations. K4VWK WA4YIU relayed for the 5 County Fair in Farmville. W4YZC recd his BPL Medallion also worked W4KFC as G3YPB/A while Vic was in London. K4BKX leads the tfc count for Sept. WA4EPJ in 2nd place. Traffic picking up says K4GR. W4LXG having problems with his transceiver. WA4RDI back in swing of things in high school W4SHJ sez too many trips to W6-Land! WA4AJF is pleased with his new HW8 and says it is a vast improvement over the HW7. He also has been "sitting in" on WARC working group meetings and says that it looks like the U.S. hams are going to have a fight on their hands until 1979. WB4FKJ moved again and took

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- **VXO,** plus or minus 7kHz.

★ **LED readout on synthesizer.**

- **Standard 600 kHz splits** plus...
- **Two "oddball" splits.**

★ **OSCAR transceive 2 to 10 meter operation.**

- **OSCAR receiver built-in.**
- **Connectors on rear for separate 2 meter and 10 meter antennas.**
- **Built-in VFO** (continuous coverage, 144-148MHz in 1.3MHz segments. 1kHz readout).
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  SSB/CW: 0.25μV for 14db S/N.
  AM: 2μV for 10db S/N.
- **50MHz or 432MHz converters** will be available. Interior space and terminals are provided.
- **Size:** Inches: 5H, 14.88W, 12D. MM: 128H, 378W, 305D
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himself off the air for a month, W4ZM spending 3 weeks in W6-Land. "Fox & Hounds" popular hunt on 2 mtrs in Chvl according to WB4DRB/4. K4LEF back on air after long absence and acquisition of a Drake T4XB. Worked 42 states in 9 days and qualified for 10-10 number on ten mtrs. W4KFC just returned from trip to 9H1/1/HB/UA/YO/LZ/HA/G with VE3CJ on IARU affairs and a pile of Mail! W4KXE blew balun, so off 40 until replaced. W4JUJ busy issuing VA VIBA Awards for Richmond Club. W4ZAU finally got the Ranger set for RTTY, also working on ST-6 conv. OVS W4WSF putting up 432 MHz ant for Oscar Mode B; was elected pres. of PVRC and attended Shelby Hamfest. John is our QSL Mgr. OVS WB4NTV on jaunt to W6- & KH6-Land. OO W4HU rpts 23 CBers out-of-band and 15 amateurs for various discrepancies. Traffic: (Sept.) K4BKX 364, WA4EPJ 254, WA4YIU 191, W4UQ 169, K4VWK 164, K4MLC 157, WB4FLT 143, K4GR 115, W4QDY 104, WB4STG 100, WA4QQI 100, WB4PNY 83, W4LXB 76, WA4RDI 69, WB4KIT 67, K4JM 55, W4SHJ 51, W4SUS 37, WB4ZNB 37, WA4AJF 35, WB4FJK 34, W4TMN 29, W4GOL 16, WA4CLK 14, WA4EQW 13, WA4FOM 11, W4YZC 10, W4ZM 10, W1ITG/4 8, W4MK 7, WB4DRB 6, K4LEF 5, W4YVG 5, W4KFC 2, W4KX 2, W4KXE 1. (Aug.) WA4AJF 37, W4MK 8.

WEST VIRGINIA: SCM, Kay C. Anderson, WB8DUV — State Amateur Radio Council held Fall meeting at Jacksons Mill. Representatives present from almost all active clubs in WV. The concensus of the group was that all future meetings should be scheduled at the Mill. The members voted to sponsor two boys for Boys State again in '77, and to continue other projects such as an annual QSO party, Outstanding Amateur award and Field Day award. Chmn. W8JM made several committee appointments but some jobs still need volunteers. In Huntington, WB8ELJ is teaching a class in Amateur Radio at the Career Center. Fairmont's repeater on 28/88 (WR8ABB) back on the air. AB8NQB passed General test on July 25, got married in Aug., moved to new home in Inwood, and is now a regular on the WV Fone net. Congrats on all! WB8TDA traveling to TN to participate in speech competition and swim event. Traffic: WB8TDA 91, WB8SAW 78, WB8DQX 73, WB8YMJ 45, W8CKX 37, W8CUL 28, WB8III 22, W8HZA 21, WA8RUZ 19, WB8TEE 18, K8QEW 17, W8DUV 13, WB8CNN 10, W8EUE 10, WA8POS 8, WN8ZBK 8, W8FZP 6, K8BCF 5, W8QEC 5, WB8PKF 4, WA8KCJ 1.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Clyde O. Penney, WA0HLQ — SEC: K0FLQ. RM: WB0HCK. PAMs: K0CNV WA0YGQ. A talk titled "VHF Propagation," given in Boulder on Sept. 28, by WA6GVC, Tech. Asst., QST, ARRL Hq., was very well received, both by Amateurs, and by the Public. Congratulations to WB0JGT who just received his Advanced Class ticket. A resounding WELL DONE to all of the many Amateurs who did such a superb job in handling traffic and emergency communications during the Big Thompson flood disaster. Net Tfc. for Sept.: Hi-Noon QNI 921, QTC 31, informals 121, 29 sessions, 1018 minutes.; Columbine QNI 1050, QTC 229, informals 227, 1415 min. Late Net Tfc. for Aug.: CWN QNI 284, QTC 309, 1225 min.; SSN QNI 18, QTC 11, 94 min. Late Net Tfc. for July: SSN QNI 38, QTC 14, 194 min. Late Net Tfc. for June: SSN QNI 44, QTC 26, 226 min. Traffic: (Sept.) W0WYX 1770, AB0QOT 265, W0EJD 185, WB0TAQ 181, WB0URU 91, W0HXB 82, W0RE 50, WB0BAL 36, WB0IZO 17, WA0YGQ 17, W0PT 16, WB0NHA 15, WA0YED 5, W0GW 2. (Aug.) WB0NOH 194, WB0JGT 130, W0LQ 129, W0HXB 122, WA0YGQ 86, W0EJD 59, WB0OSU 30, WA0TMA 18.

NEW MEXICO: SCM, Edward Hart, Jr., W5RE — Asst. SCM: Joe T. Knight, W5PDY. SEC: W5ALR. PAMs: W5PNY W5DMG. RMs: K5KPS W5VDH. Southwest Net (SWN) meets daily at 1915 local time on 3585 kHz. For Sept. had 250 check-ins and handled 221 msgs. New Mexico Road Runner Net meets daily at 1800 on 3940 kHz and reports 871 checking in and 54 msgs handled. Another net for the early risers is the Breakfast Coub Net, daily at 0700 on 3940 kHz. They ran up 550 check-ins and handled 11 msgs. The Pecos Valley ARC has been reactivated with W5BWV as pres. and WB5HQT as secy.-treas. Wonder if W5BWV was elected because he passed his Advanced Class Sept. 16? W5KFN reports his XYL is now WB5WGG, Tech., after watching Geo. on the air for 35 years. Traffic: W5DAD 568, W5JOV 270, K5MAT 228, W5UH 224, W5ENI 205, K5KPS 148, WB5K55 147, W5VDH 84, WA5YTX 29, W5RE 67, W5QNR 65, W5DMG 28, WB5OLA 18, WA5MIY 11.

UTAH: SCM, Ervin Greene, W7EU — New autopatch on .16-.76 proving to be extremely useful. K7HFV reported a fire at the Travelodge Motel in Orem, the system was accessed by W7ETR and info given directly to Fire Dept. W7YPC reported his new Metrim stolen and by means of the repeater and autopatch, an arrest was made. WA7UZO now in Columbus, CA. WA7ZBO has a new four-element tri-bander up on a new tower. He reports great results. The UT 2M SSB net now on Fri. night at 2000 MST on 145.10 USB. New Women's Auxiliary to UARC has been started. Sorry to hear about the XYL of WA7WKQ in the hospital. WA7ZBO put on an OSCAR AMSAT demo for Northern UT Science Teachers on Oct. 8th at the Salt Palace. Speaker was Gilbert Moore, Gen. Mgr. of Thiokol Corp. Good public relations with Utah Education Assn. Traffic: WA7MEL 97, WA7TEH 37, WA7JRC 36, WA7KHE 33, W7KHY 26, W7OCX 25, W7DKB 22, W7EU 5, W7UTM 3.

WYOMING: SCM, Joe Ernst, W7VB — The Sweetwater ARC beginning code practice, Oct. 12, once a week, Tue. nights. A ham picnic was held at Green River Sept. 26 with about 26 attending. Plans are still indefinite for next year's Hamfest, the 3rd weekend in July. It is hoped that the Rawlins Radio Club will sponsor. K7VWA returned from vacation to the west coast the last of Sept. WB7AHL keeps the repeater on Boysen busy with his trips from Lander to Cody. Look for the new WY SCM to be taking over about this time. Thank you all for your news stories and cooperation with W7VB, ex-SCM. Give the new SCM your best cooperation. Two-meter activity has increased in the Riverton area, with newcomer W7IRL moving into town, and father and son W7BKI and W7BKH with new two-meter rigs. W7SDA reports the Cowboy Net had 21 sessions, 544 QNIs, 14 QTCs. Traffic: W7TZK 420, K7VWA 275.

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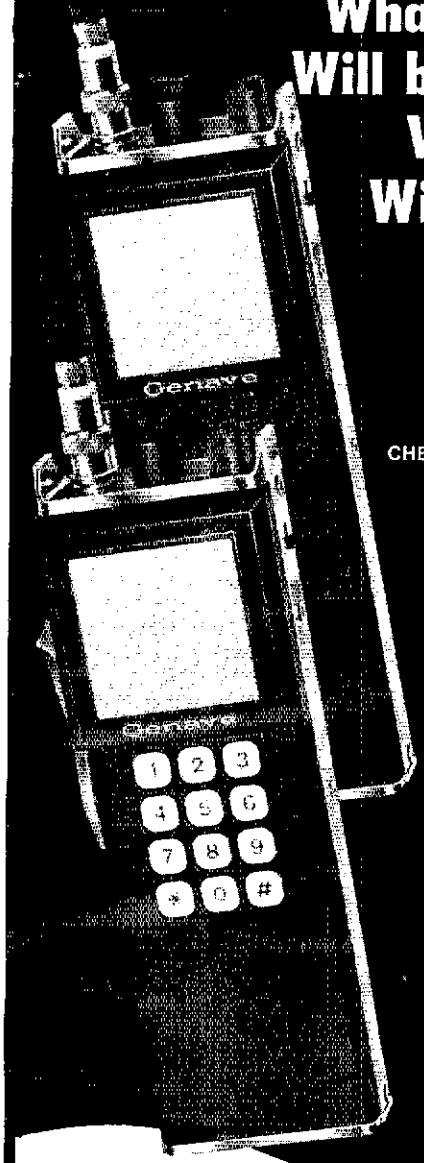

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SOUTHEASTERN DIVISION

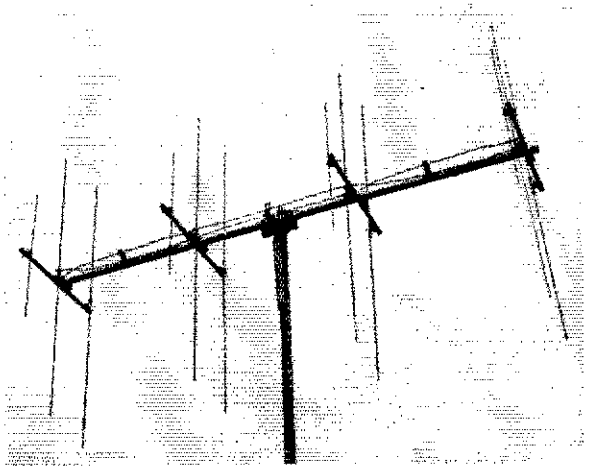
ALABAMA: SCM, Jim Brashear, WB4EKJ — PAM: W4TXM. EC: W4DGH. RM: WB4EKJ. It was a pleasure to attend the recent dinner-meeting of the Tenn Valley Chapter QCWA. W4MVM reports there were 12 present at the Florala Chapter QCWA at their Sept. meeting; W4MVM is secy. W4RQS is secy. of the Tenn Valley Chapter. Contact either secy. if you are interested in joining. The Birmingham ARC had an estimated 175 students at their fall license class first session. Muscle Shoals ARC now publishing a good Newsletter; K4CUU, Editor. K4UMD busy running phone patches. Imagine his shock and surprise when he talked to W4WLG on 75 recently. Calhoun Co. RA sponsored a weather watch seminar. 67 attended and Mr. J. Wheeler was the speaker for the Bureau. WN4OGA working on a new antenna. WB4CXD spent approx. 18 hours at W4CUE in routine weather watches and during Hurricane Belle. WN4RAJ heard on AENB. We desperately need help between AENB and RNB. Also need assistance with AL Section representation on DRN5. If you can serve as NCS/liaison on CAND, you are also needed. Contact me if you can give a hand in any of these nets. WB4NNA gave a program on RC flying to the Huntsville ARC. Appointed W2TPV/4 and WB2VYK/4 as ORSs. Traffic: (Sept.) WB4EKJ 333, W4RQS 309, WN4RND 84, WA4EUD 81, WA4JGG 42, K4UMD 12, W4MHO 10, K4CUU 8, WB4UHC/4 6, W2TPV/4 3, WN4RAJ 1, WA4RMP 1. (Aug.) WN4OGA 8, WB4CSD 7, WA4RMP 7, WB4TVY 4.

GEORGIA: SCM, A. H. Stakely, K4WC — SEC: K4YRL. RM: K4FLR. PAM: K4JNL. AREC net changes time and freq. to 1 P.M. EST Sun. on 3975. Please check in to this net. In 4 sessions 14 msgs. and 59 check-ins during Sept. WB4AEG now NCS for CVEN No. 2 Thur. Welcome to W4LGM. W4BTX trying to get RTTY going. WN4HHX becoming a real ttc. hound while creating a fine GTN which had QNI 125, QTC 52 in 28 sessions. W4IMQ also meeting lots of nets reports K4WJB new on 2 and W4ECE coming back on. QCWA had reorganization meet with K4VN, pres.; K4HYY, veep; W4JM secy.-treas. W4JM 40-mtr. quad wrkg FB. W4DQD now W4RA and W4MCM now W4HR. W4IO back on HF. WR4AAE going solid state. WA4USI ticket delayed in mail still waiting for Advanced. WB4AEG reports 6 & 2 very poor condx while he works on new 432 cw rig. W4LGM working cw nets with indoor antenna temporarily. Carrollton ARC has WA4BBF, pres. and new repeater on 146.04/64 with license class at West Ga. College. CVEN No. 1 QNI 60, QTC 20 in 4 sessions. CVEN No. 2 QNI 1125, QTC 98 in 30 sessions. K4YRL reports AREC members 522, 7 emerg. nets with 47 drills and tests. K4FLR issued a terrific cw net bulletin and GSN had fine breakfast at Augusta hamfest. GSN QNI 430, QTC 204, 59 sessions. WA4VMI and WA4VMJ new hams even if their tickets are lost! Traffic: W4FDE 140, K4FLR 98, K4NM 58, WN4HHX 53, WB4TEK 49, W4PIM 42, AC4HON 34, K4SF 18, K4YRL 16, WA4LLI 9, W4SHL 9, W4IMQ 8, W4BTX 6, W4LGM 6, AD4BAI 4, W4JM 4, K4WC 4.

NORTHERN FLORIDA: SCM, Frank M. Butler, Jr., W4RH — SEC: WA4WBM. RM: WA4FBI. PAM: WB4VDM/75, WB4BSZ/VHF. New/renewed appts.: WN4QBB as ORS-II; W4JL ORS, K4LAN OO. TPTN Net Certs. earned by WA4WBM and K4OER. WA4EYW earned Gator-of-the-Month award. FFARA held fish fry at W4ETE's QTH. Ham radio exhibits were a part of county fairs in PNS and FWB. Liberty Bible College ARC received W4AXP as a memorial call. President is WN4TCC, trustee, WB4EFP. WA4WKL looking for QSOs on FAX and thru OSCAR. WB4YRL is liaison between AF MARS and ham traffic nets. WB4OZF works bicycle/mobile on 2m. Playground ARC provided election coverage in Okaloosa Co. WB4HCD & WA4BYF joined NFPN from Niceville; also WA4IBZ WB4PGB from Wewahitchka. Tallahassee ARC had program on microcomputers by W4DKT WB4LOQ. WA4FBI built a new QSK box. WA4LCT WA4YPY upgraded to Advanced. WA4PWF's XYL now WA4FVD. W4VLK now W4IW. NOFARS/RANGE Fall Novice class has 55 students. Attendance up on RANGE 28/88 net, Tue. at 1930. WB4EEK preparing new ham roster. WA4LYQ WA4LYS do the tower climbing for RANGE repeaters. New officers of NFLA DX Assn. are WB4EYX K4UTF AA4UFW WB4QKE. K4DOY took over as pres. of NOFARS from WB4DAD. WA4HOL putting 6m/06 repeater on from Green Cove Springs. AD4BV was operated from Flagler Co. during 4-Land QSO Party. WB4GHU earned 25 wpm CP certificate. The Gulf Coast ARC Repeater Team making good progress under chmn. WB4TZR. WA4FBI and WB4s FHT GHU and SKI made PSHR. Traffic: (Sept.) WA4FBI 242, WB4SKI 168, WB4GHU 126, W4LDM 94, WB4VDM 65, WB4FHT 63, WA4WBM 62, WA4EYW 61, WB4DTS 59, K4BSS/4 52, W4KIX 52, WB4NJI 51, WB4FJY 42, W4JL 41, W4RH 39, K4DDY 30, W4IA 24, WN4HRG 23, WA4TNC 21, W4DTV 20, WN4QBB 16, WA4EYU 14, K4RNS 13, WA4HHC 11, WA4CRI 10, AB4DXN 9, K4OER 8, WB4VMP 8, K4IEX 8, K4CVO 7, WB4VAP 5, K4BV 2, WA4HOL 2. (Aug.) WB4GHU 230, WB4DTS 27, WN4HRG 12, W4DFP 9, WB4VMP 8.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — SEC: WB4ALH. Asst. SEC: W4WYR. RMs: K4EBN W4MEE. PAMs: WA4NBE W4OGX. New appointments this month is W4ZR OO IV and V. Endorsements: WA4KKE EC Broward Co., K4TF, ex-K4JPF, OO-IV reinstated with new call. A 3rd session of Pinellas Emergency Net (Pinellas County) is now operational on the Largo Repeater AF4AKV at 8:30 P.M. Thur. with W4APV as net mgr. WB4ALH and K4SCL talked on emergency operations and traffic handling at the Sept. 14 meeting of the Tampa Bay Repeater Assn. in Clearwater. Pinellas AREC had a drill with Civil Defense on Oct. 24, combined with transmitter hunt and family picnic. WA4MJT is coordinating drill; WA4TJG the picnic. K4NAN headed up a group from St. Petersburg ARC furnishing safety communications for boat races on Lake Maggiore Oct. 2 and 3. WA4GNI has new TA33/TR44 on 35-ft. pole. W4ZR is active with Antillas Emergency Net 2230Z 3802 kHz. Antillas has no cable or wireless service at night and gets frantic for NOAH storm warnings when hurricanes in area. W4ZR also has new IC230. W4IYT works 3-11 P.M. but manages to check in on GN and participate in Dade AREC Planning Committee. WA4UVG completed Bicentennial WAS and WAC, cw and ssb, for club station WA4GJJ. Traffic: (Sept.) WB4HVE 897, W4MEE 507, K4TH 325, K4SJH 242, K4SCL 238, WA4NBE 204, W4NFK 199, W4EH 131, WA4JPV 121, WA4SCK 121, WB4AID 109, WB4WYG 98, K4CFV 69, W4WYR 69,

VHF DX



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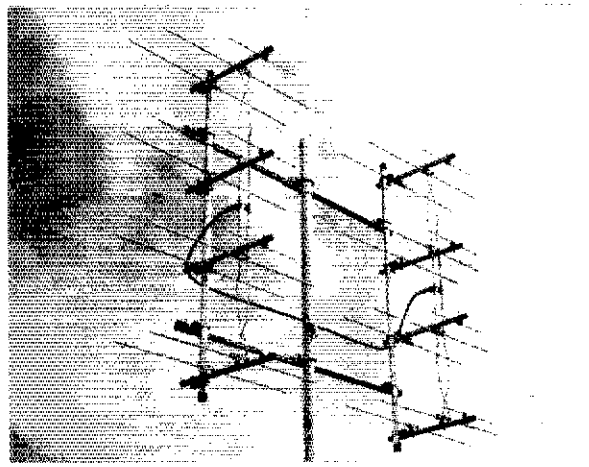

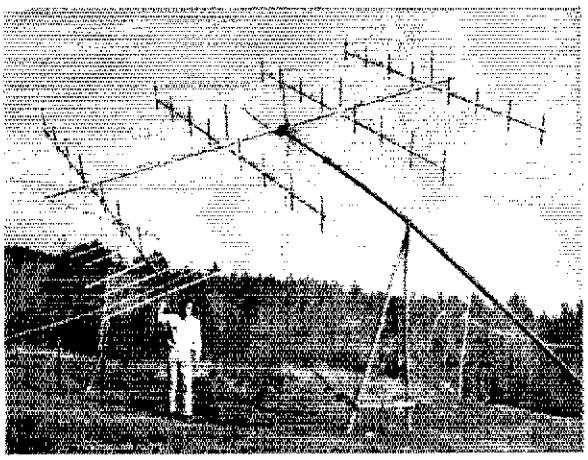

Dave Olean, K1WHS, with his 160 Element DX-Array and Polar Mount EME System

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Frame & Harness (80 El.)	DXK-180	$100.00	DXK-280	$85.00	DXK-480	$70.00
1-1.52-ohm Balun	DX-1BN	$10.95	DX-2BN	$10.95	DX-4BN	$10.95
Vert. Pol. Bracket (20 El.)	DX-VPB	$8.95	DX-VPB	$8.95	DX-VPB	$8.95

W4JHF 57, K4BLM 45, WA4KKE 44, W4DVO 41, W4IYT 40, W4IRA 39, WA4EIC 38, K4EUK 31, W4GDK 22, W4BK 15, W4QM 14, WA4KNX 8, W4NTE 8, AB5QDW/4 8, WA4UVG 8, WA4LGT 7, WB4HJW 6, W4SMK 6, K4DRH 2, W4LK 2. (Aug.) W4IYT 28, WA4GHI 4, W4MML 4.

WEST INDIES: SCM, David Novoa, KP4BDL — SEC: KP4CV. RM: KP4WL. PAM: KP4AOC. The Radio Club de Puerto Rico Novice and General Course began with 270 students. Great work by instructors KP4s EGO PQ CV LT BJ and others. The Club de Radio Aficionados Bambalanes is being organized by KP4HG, and was also planning to give code and theory classes. W6KG and W6QL visited San Juan in their way to a VP2-Land DXpedition. 10/70 repeater on La Marquesa Mt. working very fine tnx to KP4s BBK CK. DX continues to be one of the favorite topics on two meters. KP4RK doing FB job as editor of Onda Terrestre. This issue marks the end of our first year as SCM and 12th consecutive SA report. Tnx to all that have helped me, and keep your reports coming in. Happy New Year.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Marshall Lincoln, W7DQS — PAMs: WA7KQE W7UQQ. RM: K7NHD. When W@YJX lost his aircraft radio power while approaching Tucson, he used a 2M handi-talkie to request assistance, and was answered by K7CC, then used K7CC's repeater auto-patch (WR7AIM) to get landing instructions from a Tucson airport tower controller (possibly the first time a tower controller talked to a landing aircraft by telephone!). K7ZUY has been appointed EC for Yavapai County. Several clubs around the state are sponsoring training classes for would-be amateurs. Your SCM would appreciate having a current schedule of your present and anticipated new classes so inquiries from interested individuals can be answered. WA7NHQ reports two new Novices she trained in Snowflake are WN7NFX and WN7NFW. K7SWZ/6 reports he will be back in northwest Phoenix next spring when he completes schooling at the U of Southern Calif. WA7PDW has been appointed Class III OO. Cactus Net QNI 1,090, QTC 349; ATEN QNI 564, QTC 45, certificates to W7RQ K7NMQ K7NTG W7CAF; SWN QNI 250, QTC 221. Traffic: (Sept.) K7NHL 253, WB7CAG 93, K7UXB 72, K7NTG 32, WA7YKM 26, WA7VTM 23, K7RDH 22, W7DQ5 15, K7CC 8, WA7WEB 6, WB7CZL 4. (Aug.) WB7CZL 5.

LOS ANGELES: SCM, Eugene H. Violino, W6INH — Asst. SCM: Kevin A. Berasly, WB6OYN. RM: WB6KPA. Act. SEC: W6SPK. Recent bulletin of SCATS (Southern Counties Amateur Teleprinters Society) reports that it is in need of a permanent meeting place, preferably north or northeast of Los Angeles. They report their membership is blooming, so any info on a possible meeting place should be sent to WA6ZCQ. If you have PC boards you want negatives for contact W6KCW. W6DIG reports he is active on 75-40 and 20 meters, also in weekly contact with his two brothers W6HLB and W5HEE while getting ready for his Extra exam. JPL RC has been given a Model 300 Slow Scan TV converter by Robot Research, Inc. This will be a valuable piece of equipment for the club. Due to recent school activities many of the SCN group are leaving and it is becoming necessary to change many appointments to keep things moving. Open are several RM, ORS spots so those of you who can keep skeds please let me know and we will set up a test for those interested. The San Fernando RC is sponsoring Radio classes in the Valley at Fulton Junior High School at Kester & Saticoy, Mon. at 7 PM. The classes are for Novice, General and Advanced class license. Recent bulletin from the Mt. Lee Repeater Assn. describes the repeater and its two tones to tell the user if he is high or low in frequency. They also had a 20th anniversary picnic at the Buena Vista Park. Those interested in obtaining this fine bull. please send small domation to WR6ABN, P.O. Box 1544, Burbank, CA 91507. W6FU asst. chief engineer at local BC station KPCS, reports that W6FU had an interesting eyeball QSO with visiting K4FU recently, how's that for matching calls, Hi. WB6QFE WB6TVZ WB6WCV and K6YNQ recently deployed back in the foothills above Azusa with portable repeater helping the local forest service with communications during the first day of hunting season. Those of you who read the operating dept. of QST will notice that there is an Honor Roll column. On the back of your monthly report (Form 1) there is a place to put your totals. I notice that a very small percent of the cards have anything there, how about giving the info? W6NAA congrats, is now LA. Co. RACES staff officer of information. K6UYK is resigning his RM appointment, too busy with various projects. WA6DSN reports a total of 176 msgs and 323 check-ins for the Metro Net. Let's not forget that they have radio classes at the Lockheed RC for those interested. W6HUJ planning to move to WY soon. WA6CUM active chasing DX and working the CD party. W6KMC now sporting a new FT-202E and new vertical antenna. Traffic: W6HUJ 201, W6INH 176, W6OEO 114, WB6PKA 74, W5QAE 56, W6BRO 15, WA6EWY 13, K6CL 12, K6UYK 11, WB6AIT 4, WA6FWH 4, W6NKE 4, WA6ARP 2.

ORANGE: SCM, Wm. Heitritter, WB6AKR — Asst. SCM: Dick Birbeck, K6CID. SEC: W6AQB. RMs: WA6TVA WB6AKR. New SEC is W6AQB. RM for section and region level NTS is WA6TVA. New appointments: WA6IKH OO; WB6EIG OPS; W@TTG/6 OBS; WB6ARK OO; WB6HQV OVS. Congratulations to all. OBS W6WRJ is now W6RE. WA6TVA has moved to Santa Ana buying the former home of WB6VTK. Neighborhood is already conditioned for TVI; noise of R I I Y and beauty of numerous antennas. K6UZ has returned to Palm Desert for the winter. WB6EIG making BPL with traffic count of 602 reminds all of the 6-meter VHF Metropolitan Net at 8 P.M. daily except Sun. on 50.4. This is a good traffic net especially for technician class operators. Novice Emergency Net NEN on 3,730 at 5 P.M. Sun. provides training in CW NTS for all classes of licensees. WA6TVA and WB6AKR gave a traffic handling program at the Orange Co. Amateur Radio Club. Your new SCM has participated in all levels of NTS commencing as W@SQE in 1954. Presentation on traffic handling will be provided any club in the section upon request. The Sept. 10th flood struck W6WLU. WB6BJD WA6HUB W6BPI and WB6MGB assisted in clean-up operations. WA6HUB reports Ham Radio Licensing class at Palm Desert Campus is packed. WA6BJD advises 32 students in class in Yucca Valley. Remember the ARRL Club and Training Department has material to assist you with these

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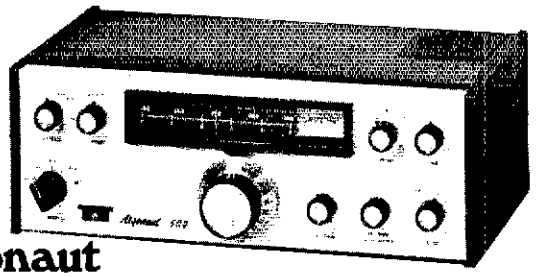

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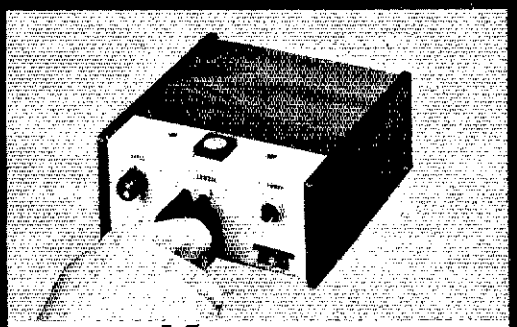

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classes. Please send me info. on the class in your area. W6BPI expects to have the Yucca Valley Repeater in operation by Christmas. Anaheim Amateur Radio Assn. advises WR6ACB repeater now operational with 222.9 in, 224.5 out. This is an open repeater. Traffic: WB6EIG 602, WA6IKH 75, WA6TVA 62, W6AQB 58, W6RE 54, WA6YWS 39, WB6AKR 33, W6QBD 20, W6CPB 6.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — Time to prepare for annual SET to be held early next year. If interested in AREC membership write me, address on page 8, or phone 273-1120. Clubs — contact me for info on AREC affiliation. AREC Nets (all MHz) HF — Sun. 0830 Novice/Tech., 0900 3.905, 0930 3.720, 1000 29.375; Mon. 2000 28.585. VHF — Sun. 0830 146.13/73 (fm), 0900 145.5 (am), 0930 50.25 (am), 1900 146.52 (fm); Tue. 1900 145.5 (am), 1930 147.63/03 (fm); Wed. 2000 50.25 (am). WB6PLZ sends code practice Mon.-Fri. 1715-1815 on 3.575 and 147.42 MHz. First ten minutes instruction for beginners, then 5-13 wpm. Other classes: Normal Hgts. United Meth. Church, 4650 Mansfield, Tue., Thur. 0900-1200, Novice thru Adv.; North Shores ARC, 7895 Clairemont Mesa Blvd., Fri. 1900-2100; Clairemont High 1830-2100 Tue. (Novice, Tech., Gen.), Wed. (Adv. Extra). Upgraded: WB6KUA to Gen., WB6QMD to Adv., WA6MHZ to Adv. Traffic: (Sept.) WB6FTY 144, KG6JES 88, W6BGF 85, W6PZU 41, WB6CFT 7, WA6EJL 8, K6PM 4. (Aug.) WA6EJL 4, WB6HCF 2.

SANTA BARBARA: SCM, D. Paul Gagnon, WA6DEI — W6PNM spoke on RTTY at the Poinsettia ARC in Ventura. W6JU is the new pres. and K6IT the new secy. of the QCWA. The Satellite club auction was a success. New officers of the Ventura County club are WB6DHW, pres.; WB6JKM, vice-pres.; WB6DPL, secy.; WA6WYD, treas. Over 200 attended the Santa Barbara picnic and WN6OGV won the ICOM 215. WN6JGK is featured in the new ARRL code course. WB6IBO has a new FT-101E. WA6VBS is new SCN asst. mgr. (3600 daily at 1830). WB5KPL is active from Vanderberg on SCN and RN6. W6IDU transmits bulletins on 7083 at 2000 Thur. and at 2030 on 3583 Wed. K6YNB completed extremely successful EME expedition at AK resulting in first ever WAS on 432 for a K5 station. Wayne also made a record score in the Sept. VHF contest. WA6WYD is back from vacation and active on Navy MARS handling 13 msgs. WB6CWE has been handling NCS on the Section Net (3935 Wed. at 2000). WN6MSN is now Advanced. Long time MTN member W6JE is a Silent Key. W6YCF K6YHK W6IXM and K6TOE have all seen the inside of the hospital lately. PSHR: WB6CWE 42, WA6VBS 25, WB5KPL 25, WB6IBO 47, WA6IDEI 25. Traffic: WB6CWE 173, WA6MBZ 156, WB5KPL 127, WA6VBS 68, WB6IBO 63, WA6DEI 11, W6JTA 10, WB6HJW 4, WA6WYD 1.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Ted Helthecker, W5EJ — Asst. SCM: Ruth Chance, WA5VJW. Change of office resulted in reports being sent to W5LR and W5EJ — confusion will end soon. All appointments will remain in effect until appointees can be contacted personally. We appreciate your help and cooperation. Plans are underway to revitalize the North Texas CW traffic net, if interested let us know. No applicants as yet for appointment OO, Class V, who'll be first? W5TI honored in Lions Club publication for his work in Eye Emergency Network. WB5AYY discusses the real problem of Club finances. W5ARV back from visit to LU PY CX YV 6Y and HR planning OO activity this winter. South West Amateur Tracking Team (SWAT) officially sanctioned by Dallas Police with Officer WB5PEW in liaison job making real progress in recovery of stolen equipment. 8557 thefts in Dallas throgh Aug. WB5SBH, 13 years old received Novice March 25 and Extra Class on July 20. Headquarters working on improving signal from W1AW, look for improvement soon. W5KNY bagged a WY antelope. Would like to have a letter from all clubs in NoTex Section listing address, officers, date of elections and so forth. Up to date info needed for mail records, can you help? WB5BFX moved with ORS appointment cancelled. Garland sponsored SKYWARN training class which was well attended. Want to congratulate clubs conducting license classes all through section. Hundreds of new hams being added each year, a bouquet to those who do the work. Thanks from all of us W5LR for his years of work in ARRL as SCM. WB2DXC/5 has ten-element 2-meter antenna working. Bell Emergency Net reported record 12 check-ins Aug. 18. OO activities picking up from all reports. What scalawag swiped the Jacksonville repeater? Traffic: (Sept.) W5TI 438, WB5GII 12, W5YK 10. (Aug.) W5TI 489, K5SOR 20, WB2DXC/5 16.

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — Three new repeaters being planned — Lawton, Beaver and Woodward. Also rumors of one in Calumet area. The Beaver and Woodward machines will fill a real hole in NW OK. K5KXL new EC Pottawatomie Co. WB5OCN now K6CKQ and upgraded. 15 new calls at Holdenville, 7 at Norman, 3 at Altus and 2 at Lawton. From the number of classes going on all over OK we really should have a fine group by spring. We should encourage these new operators to get acquainted with our cw nets and get in some good experience. OK tfc nets are alive and healthy but can always use more QNI. I feel that many of our operators are missing the boat in not reporting their PSHR activities. Also we need more reports of other Public Service activities. Had an excellent visit with the Lawton group in Sept. and have several more planned for Oct. By the time this is printed, Texoma will again be history. I would like to see 2000 Christmas messages originated in OK. It will be cheaper than postage. Traffic: WB5NKD 333, W5REC 237, WB5NKC 202, W5RB 134, WB5KGP 103, W5FKL 58, WB5RXZ 41, WB5AZS 38, W5SUG 37, WA5ESN 26, WB5ELG 14, W5PLM 12, WN5UCM 7, WB5OYU 5, WA5OUV 4, W5FFW 3.

SOUTHERN TEXAS: SCM, Arthur R. Ross, W5KR — Asst. SCM & PAM: WB5AMN. SEC: W5TQP. RM: W5UGE. OOs rprtg this month: WB5CIT WA5LTQ WB5FMA. OVS rprtg were WB5CIT K5LZJ WA5QCP. WB5BMZ and OVS K5LZJ licensing class has produced WN5s RUI RUJ UUH UUI UWG UYF VFH VFR VGX VNA VOH VPA VQV VQY and a "recapped" W5PDE, all in Cleveland area; also working on mobile/portable setup for field work, including mountain-topping. OVS WA5QCP working on transverter for TR-6. EC W5TFW says WN5 calls

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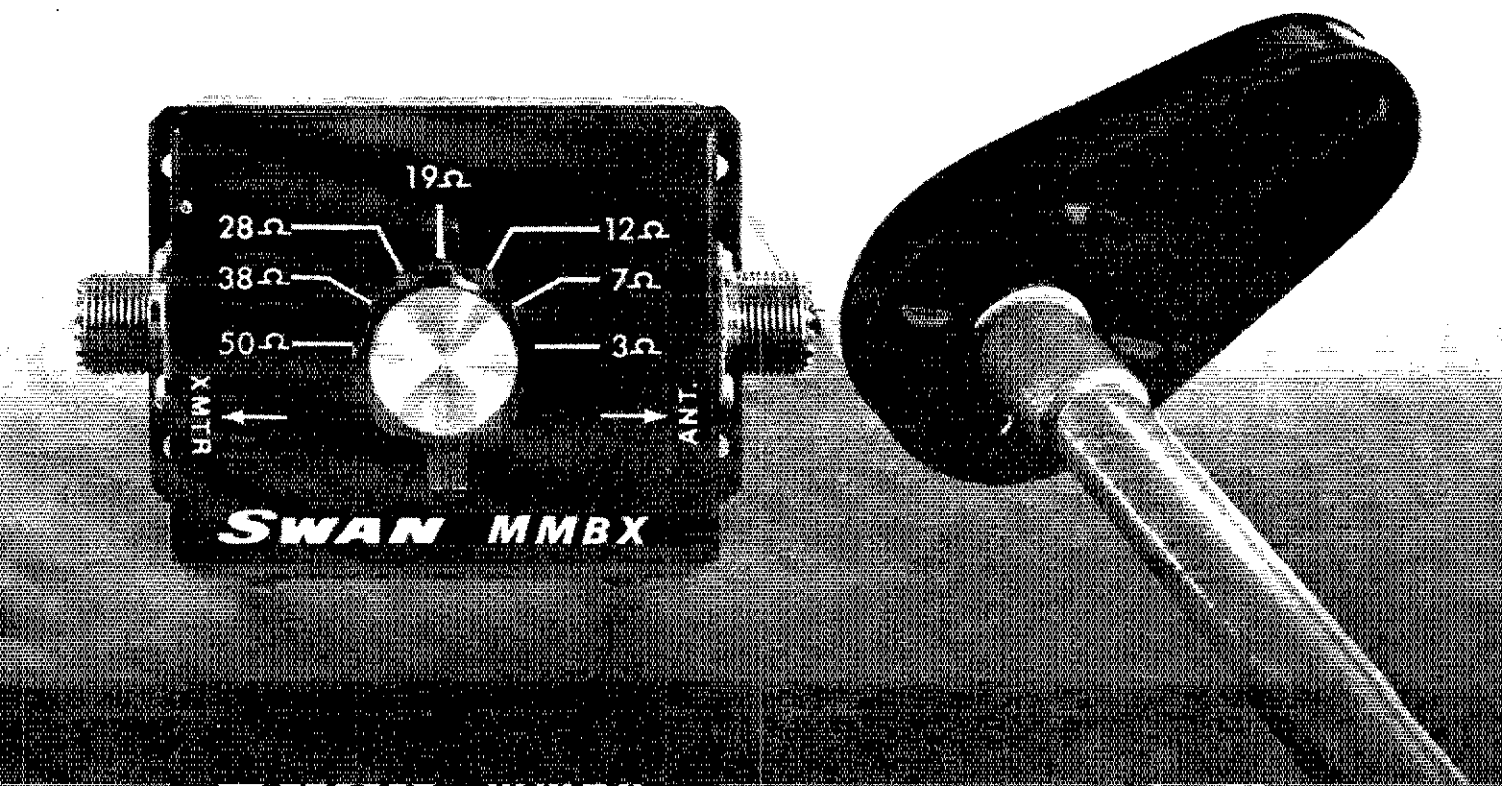

coming thru; has started another Novice class. OPS W8UX/5 back in Mercedes for winter. OVS/OO WB5CIT working on independent research project in History Dept. of Trinity U. OPS WA5VBM in the BPL column again; she's working on home-brew Delta loop. ORS WA5JYH has nearly 50 students in fall Novice class. EC/OO WB5FMA has new KWM-2A and 30L1 with Murch transmatch; rprts WB5VQZ with new HR2B has good simplex sigs to Georgetown; WB5VRA has new TR2200. Coastal Bend ARC Digest (Corpus Christi ARC) reports: WB5DOQ and WB5OLT licensing classes going great; ages from 9 to 60; WB5NWJ has new all-glass operating desk; WB5EUM and spouse celebrated 50th wedding anniversary. Asst. SCM WB5AMN and SCM W5KR helped Alvin Community College ARC celebrate its ARRL affiliation party; reported tornado sightings added spice to the proceedings. Traffic: (Sept.) WA5VBM 480, W5KLV 303, K5HZR 271, K5ZSI 70, WB5MAN 26, K5ROZ 27, W5BHO 18, WA5JYH 16, WB5LTW 7, W8UX/5 4, (Aug.) WA5JYH 27, K5ROZ 19, W5TFW 8, WB5LTW 7, WB5FMA 1.

STATEMENT OF OWNERSHIP

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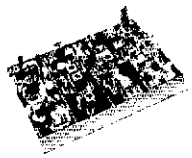

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RX50C Kit	30-60 MHz rcvr w/2 pole 10.7 MHz crystal filter	59.95
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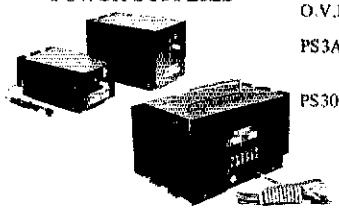

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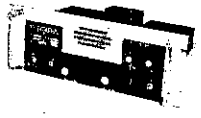

RPT28 Kit	repeater – 10 meter	TBA
RPT28	repeater – 10 meter, wired & tested	TBA
RPT50 Kit	repeater – 6 meter	TBA
RPT50	repeater – 6 meter, wired & tested	TBA
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CWID	wired and tested, not programmed	54.95
CWID	wired and tested, programmed	59.95
Microphone	2,000 ohm dynamic mike with P.T.T. and coil cord	9.95

master charge

VHF ENGINEERING

DIVISION OF BROWNIAN ELECTRONICS CORP.

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BANKAMERICARD

Introducing the 2-meter hand-held that gives you high performance. Without high cost.

It's the new Hy-Gain 3806 2-meter, 6-channel hand-held FM transceiver (144-148 MHz). The 2-meter hand-held that takes the high cost out of performance.

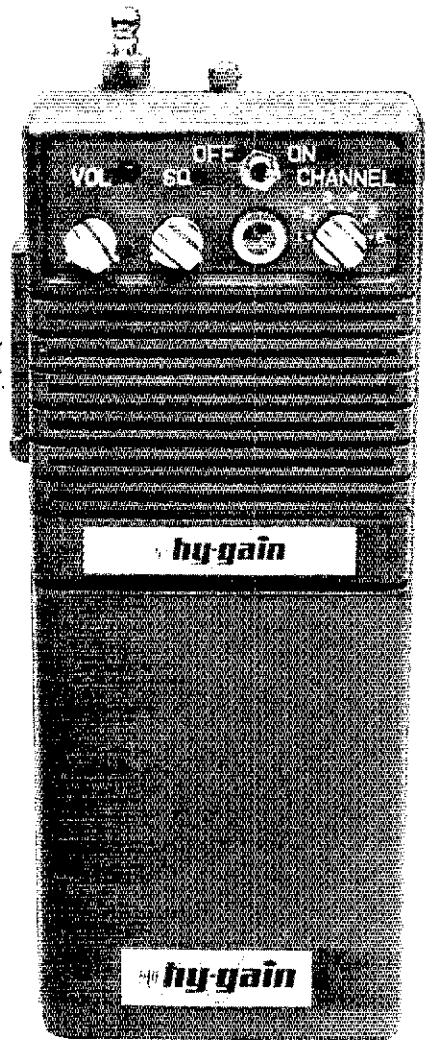
The Hy-Gain 3806 is built to out-perform. Outlast. And out-class every other 2-meter hand-held.

It's built tough. Water, dirt and corrosion are sealed out by the specially gasketed case. The speaker /microphone grill is engineered to prevent direct entrance by water. Even changing the power pack in the field won't diminish case integrity. The power section is separately sealed. So you never expose the circuitry.

The high-impact ABS case is extra tough. And ribbed for a sure, non-slip grip. The controls are up front. And easy to operate. There's volume. Squelch. 6-position channel selector. Transmit LED indicator. A meter that indicates battery condition on transmit, signal strength on receive. And a separate power switch for positive on-off.

There's a telescoping antenna that collapses completely into the case. Or you can use our 269 flexible antenna for extra convenience. And there are jacks for use with external antenna. Earphone. And external 12 VDC.

The 3806 has the kind of guts that have made Hy-Gain products famous throughout the world. Its receiver section is superior to everything else for the money. It has sharply tuned, on-frequency selectivity in the RF amplifier circuit. Two MOS-FET RF amplifier stages. Plus MOS-FET's in the 1st and 2nd mixers. They make the 3806 virtually immune to out-of-band signals. Intermodulation distortion. And cross-modulation. So you get truly incredible dynamic range. For superb adjacent channel rejection, the 1st mixer is followed by a monolithic crystal filter. And the 2nd mixer by an 8-pole ceramic filter.



A frequency multiplication factor of 12 allows you to use thicker, high stability crystals (one set of 146.52 simplex crystals supplied). Audio is enhanced through use of separate speaker and microphone elements. And there's an internally adjustable mic preamp. Something you won't find anywhere else.

The Hy-Gain 3806 hand-held is backed by a complete line of superb accessories. Including AC and DC chargers. Carrying case. External antenna adapter cable. And a Nicad power pack that's so over-engineered you won't over-extend it. Even in the most adverse conditions.

The pack is completely sealed in its own tough ABS case. Protected against over-charging. And contact shorting. It has 30-40% more in-use capacity than competitive units.

Soon we'll have a Touch-Tone®* pad available for the 3806. It'll fit flush in the back panel. Because we designed it specifically for the 3806.

The Hy-Gain 3806 2-meter, 6-channel FM hand-held. It gives you the performance you want. Without costing a lot. Available locally through your Hy-Gain dealer. See it and our more than 300 other fine products soon.

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We keep people talking.

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MAKE PROFESSIONAL LOOKING P.C. BOARDS FAST AND EASY

•SENSATIONAL
•REVOLUTIONARY
•FANTASTIC

STAMP-IT ETCH-IT

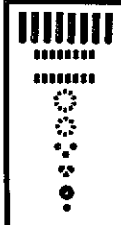
SEE MAY, 1975 QST (page 42) NEW PRODUCTS REVIEW

Reduces Printed Circuit Board Art Work From 2 Hours to 10 Min. . .

Simple as A.B.C.

A. Stamp Components on P.C. Board. B. Use Pen to Interconnect Lines. C. Etch Board.

SE-2 KIT CONTAINS:



- CONNECTOR FINGERS
- 16 PIN DUEL IN LINE IC SOCKET
- 10 PIN ROUND IC SOCKET
- 8 PIN ROUND IC SOCKET
- TO-5 TRANSISTOR SOCKET
- TO-18 TRANSISTOR SOCKET
- LARGE & SMALL DONUT PAD
- RESIST INK
- INK PAD
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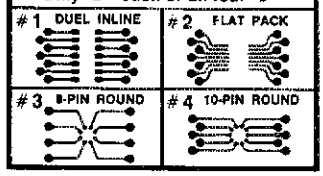
PLUS

ONLY **$9.95** PLUS 1 LB. POSTAGE

ADDITIONAL STAMPS:

Bread board stamps for all integrated circuits "Great" for experimenters.

Only $2.95 each or all four $9.95



- RESIST INK. . . .95c per bottle
- RESIST PEN ea. 95c
- INK PAD ea. $1.15
- Etching Containers. . 10 for 95c

Are you tired of the hours of small, detailed, eye-straining art work that goes into making printed circuit boards? "STAMP IT, ETCH IT" is introducing a NEW product called **"STAMP IT, ETCH IT" Kit.** This Kit will take the tedious art work and many tiresome hours out of printed circuit board preparation. In just a few short minutes you have a professional looking etched printed circuit board ready for drilling!

The "STAMP IT, ETCH IT" Kit is exactly as the name implies. Following the step by step simple instructions, you can have a printed circuit board and have saved hours of frustration. As easy as you use a rubber stamp to stamp messages on paper, you stamp your component connections on copper clad printed circuit boards.

In your "STAMP IT, ETCH IT" kit we supply all component stamps shown in SE-2 Kit. In the SE-2 kit we also have resist ink enough for months and months of experimenting, ink stamp pad, resist pen, and etching containers. The most revolutionary item in your "STAMP IT, ETCH IT" Kit is . . . The Fool Proof System of etching your printed circuit boards.

With our kits and our etching containers, you are able to etch a printed circuit board as fast as bubble etching machinery and the results are as good or better.

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SO 239	.50
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M 359 Right ANGLE	1.49
UG 175/U REDUCER (RG58/U)	.25
UG 176/U REDUCER (RG59/U)	.25
PL 259 P.O. (PUSH ON TYPE)	1.25
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PRINTED CIRCUIT BOARDS G-10 FIBERGLASS

Size	1 Side	2 Sided
2"x 4"	.25	.35
2"x 6"	.35	.45
3"x 6"	.50	.65
4"x 6"	.65	.90
6"x 6"	.90	1.35
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QUANTITY DISCOUNT (same size)

10 to 24	10%
25 to 99	15%
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$5.00 Minimum Order
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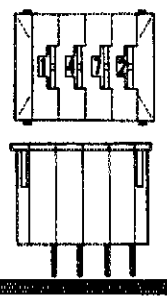
MODEL MF

FRONT MOUNTING SWITCH



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12	10 Pos. Decimal, 1 Pole	$3.25
12A	10 Pos. Decimal, Ext. Bd.	3.85
13	10 Pos. Decimal, 2 Pole	4.35
18	10 Pos. BCD Comp. Only	2.95
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21	10 Pos. BCD Only	2.70
21A	10 Pos. BCD, Ext. Bd.	3.15
22	10 Pos. BCD, + Comp.	4.45
22A	10 Pos. BCD, + Comp., Ext. Bd.	5.30
48	11 Pos. Decimal	4.10
S5	16 Pos. Decimal	N/A
S7	16 Pos. BCD + Comp.	N/A
S7A	16 Pos. BCD + Comp., Ext. Bd.	N/A

ACCESSORIES	
End Plates	1.00
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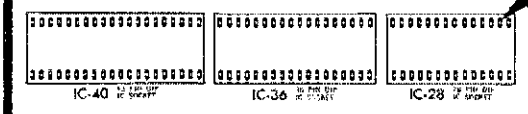
Blank Body	.50



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16	.22	1.98	18.70
18	.29	2.61	24.65
24	.38	3.42	32.30
28	.45	4.05	38.25
36	.63	5.67	53.55
40	.63	5.67	53.55

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	.44	$ 3.96	$ 38.90
	.52	4.68	44.20
	.58	5.22	49.30
	.60	5.40	51.00
	1.12	10.08	95.20
	1.26	11.34	107.10
	1.84	16.56	156.40
	2.19	19.71	186.15

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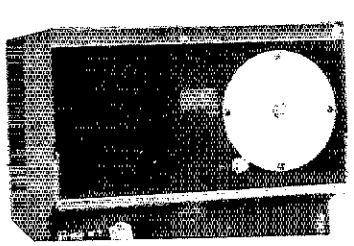

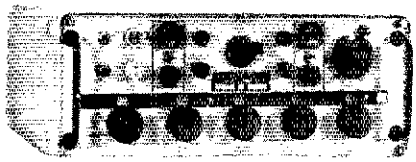

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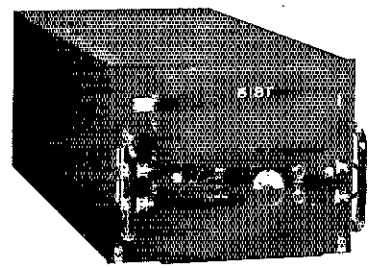

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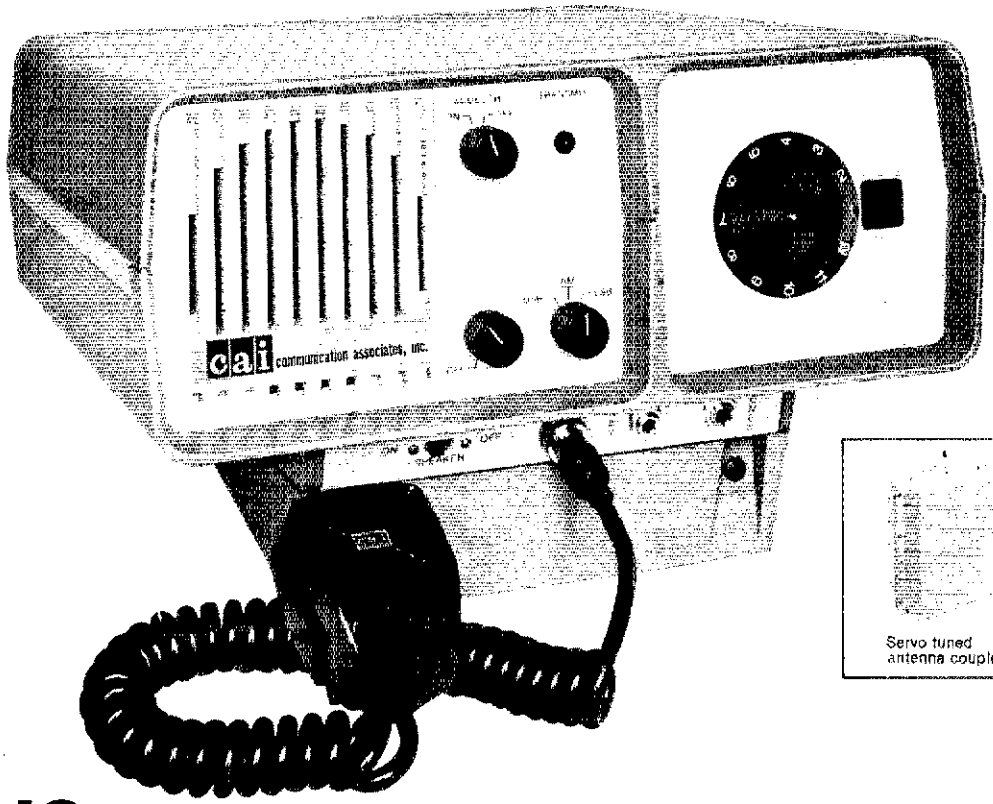

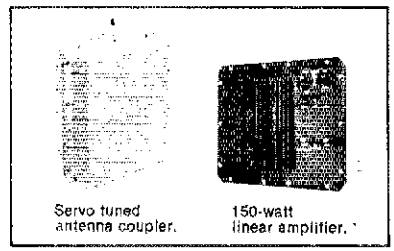

Servo tuned antenna coupler.

150-watt linear amplifier.

12 reasons why this 150-watt, automatically tuned, solid-state SSB system is the leader in its class:

1. More performance, more reliability. The new CA-38 SSB from CAI has highly innovative solid state circuitry that enables its 150-watt power to be used to utmost advantage. The system makes long distance SSB communication more dependable and far easier than ever before.

2. Pre-programmed channels. The fully solid state 20-watt transceiver has 12 pre-programmed channels. They can be spread across the entire 2-18 MHz frequency range, or grouped in any band without restriction. A back-lighted display window shows channel selected.

3. Operation is extremely simple. Turn it on and select a precisely tuned channel. The rest is automatic. There are no band selectors, no tuning knobs, meters, manual squelches or voice clarifiers. Channels can be programmed for SSB, compatible AM, or telegraph (CW) modes. In short, it doesn't require an experienced operator.

4. Expandable to 24 channels. The CA-38 is also available with 24 channels and semi-duplex capabilities. This may either be specified or installed in the field at a later date. Display window is easily changed to show the additional channels.

5. Amplifier protected against burnout. The separate 150-watt linear amplifier is solid state and completely broad-banded. It enables any 2-18 MHz frequency to be programmed without adjustments or modifications. Overload circuits protect it against high VSWR loads, excessive heat, and damaged antennas.

6. Continuously tuned in any environment. The companion servo tuned antenna coupler automatically and continuously fine-tunes the antenna to the exact frequency being used. It also compensates for changing weather conditions and movement of nearby metal objects.

7. Exceptional stability. Precisely controlled crystal ovens provide ±20 Hz or better frequency stability and optimum clarity of communication. Six automatically switched low pass filters provide -62dB harmonic suppression. It's also available with a highly effective automatic noise compensated squelch.

8. Easily re-tuned in the field. Most transceivers have separate coils for each channel, but the CA-38 uses electronically tuned circuits over its entire frequency range. This means channel frequencies can be re-tuned with minimal test equipment in a few minutes. Its integrated solid state circuitry means lower maintenance costs.

9. Obsolescence proof. Because channel changes are easily accomplished and its 12 channels can be placed anywhere on any band, the CA-38 cannot be made obsolete by changing frequency regulations. The system exceeds most international requirements.

10. Three power supplies available. The CA-38's separate amplifier/power supply unit is available for either 12 VDC, 24-32 VDC, or 115/230 VAC operation.

11. A rugged, go-anywhere system. Components are housed in tough, lightweight Lexan® Cabinets. The CA-38 is flexible. It's designed to be a base station, land mobile, marine, or portable SSB station. It provides dependable long distance communications in any environment. There's a 20-watt SSB—the CA-39—for applications that don't require 150-watts. The CA-39 (which is identical to the CA-38's transceiver) can function independently, or be part of a CA-38/39 network.

12. The SSB only CAI could build. The system was created by Communication Associates, Inc.—the world's most respected name in SSB. For performance, easy operation, simplified maintenance and reliability, the CA-38 establishes a new standard of comparison. Like all SSB from CAI it comes with a 3 year guarantee. For more information and the name of a nearby dealer, write:

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World leader in SSB communications

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OLD TESTAMENT

"Therefore the Lord himself shall give you a sign; Behold, a virgin shall conceive, and bear a son, and shall call his name Immanuel (which means God with us)."

Isaiah 7:14 740-687 BC

But thou Bethlehem, though thou be little among the thousands of Judah, from you shall come forth one who is to be ruler in Israel, whose origin is from old, from ancient days.

Micah 5:2 740 BC

NEW TESTAMENT

"... the angel Gabriel was sent from God to a city of Galilee, to a virgin betrothed to Joseph, of the house of David; and the virgin's name was Mary ... The angel said to her "Do not be afraid Mary, for you have found favor with God. And behold, you will conceive in your womb and bear a son, and you shall call his name Jesus."

Luke 1:27-31 70-90 AD

King Herod was troubled and inquired where the Christ was to be born. They told him in Bethlehem of Judea; for so it is written by the prophet (Micah).

Mathew 2:4-5 60-70 AD

Historical evidence clearly points to Jesus as the man God, who fulfills the literal prophecies of Isaiah and Micah within 800 years. The same God who chose the Virgin Mary to bear Jesus and who chose Bethlehem for the birthplace reveals himself in holy scripture today. We thank him for the birth of Christ this Christmas, 1976.

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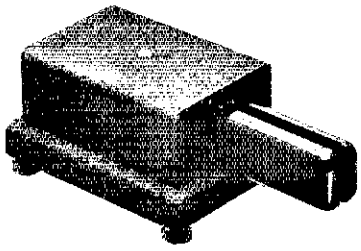
NYE VIKING SUPER SQUEEZE KEY

Fast, comfortable, easy ... and *fun!*



Extra-long, form-fitting molded paddles give you maximum operating flexibility! Adjustable spring tension and contact spacing. Knife-edge bearings! Heavy die cast base with non-skid feet. It's stable!

Model SSK-1 (shown) $23.95
Model SSK-3 has sub-base to hold any Nye Viking standard SPEED-X key $26.95
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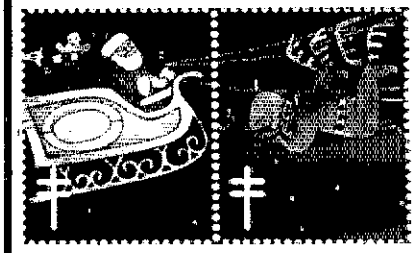

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Especially for General Class examination study. No instruction, just practice. ½ hour at 11 WPM, 1 hour at 14 WPM and ½ hour at 17 WPM. Includes coded groups and straight text

CM-2 ADVANCED (Extra-Class)
Mostly straight text, some coded groups. 1 hour at 20 WPM, ½ hour each at 25 and 30 WPM. For real QRQ, play this tape at twice speed!

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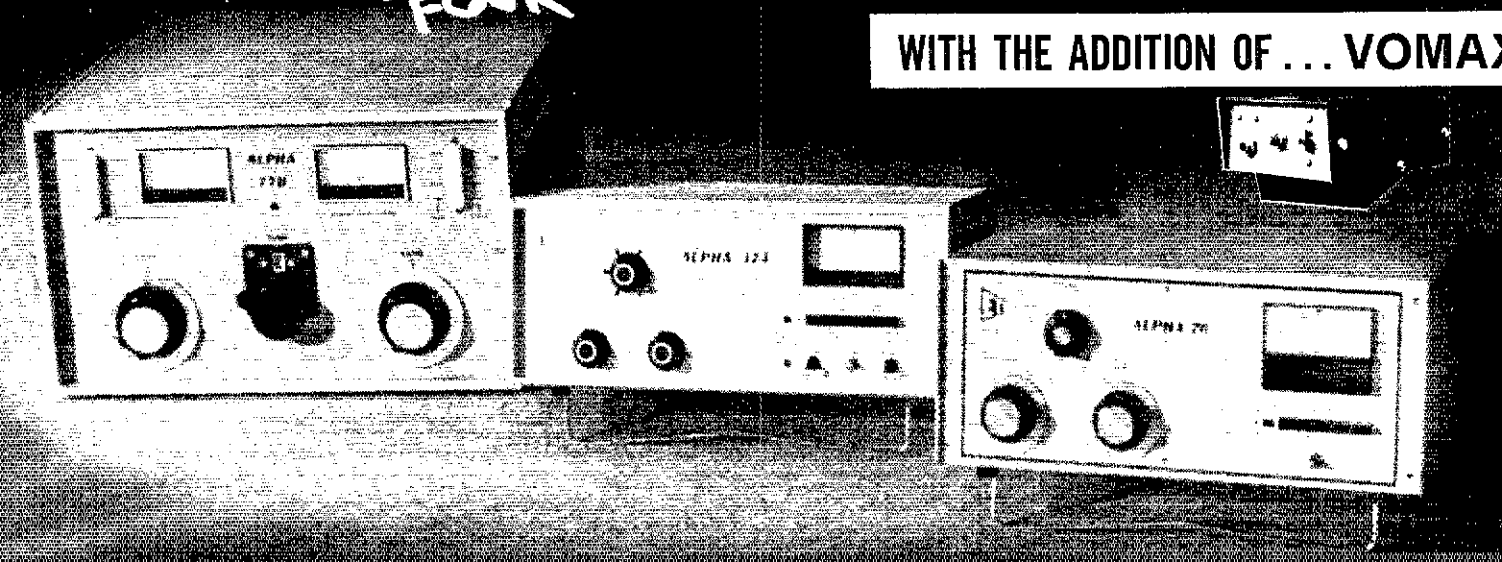

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- Full vacuum relay QSK (CW break-in) standard.
- Basic design [illegible]

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- The smallest and lightest of all true [NTL] kilowatts at only 0.9 cubic ft. and 52 pounds.
- No-tune-up operation 10-80 meters, thanks to factory-pretuned band[illegible] filters, yet built[illegible] many[illegible]

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- An honest, rock-crusher [NTL] kilo-watt in all modes, like the ALPHA 374. You can [illegible] kilo[illegible]

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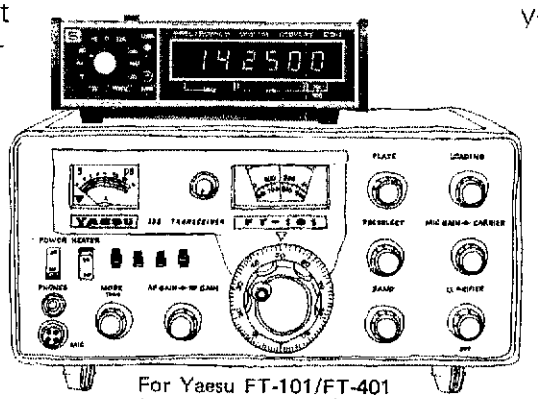
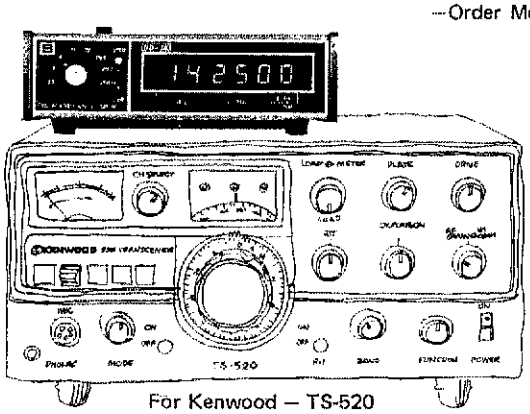
From turn-on , Spectronics crystal controlled readouts give you better than 100 Hz accuracy. From a cold start, they let you check a rig's VFO warm-up irregularity, as well as drift and linearity. The bright easily read display can be seen even from across a room. Just plug the unit into 117 VAC and connect the cable (supplied) to the VFO receptacle on your transceiver or receiver. It's a totally hassle-free hook-up.

In addition to these great displays, Spectronics offers a high-quality frequency counter for your test bench. Model SC-30 covers 5 Hz to 30 MHz; the SC-250 from 5 Hz to 250 MHz.

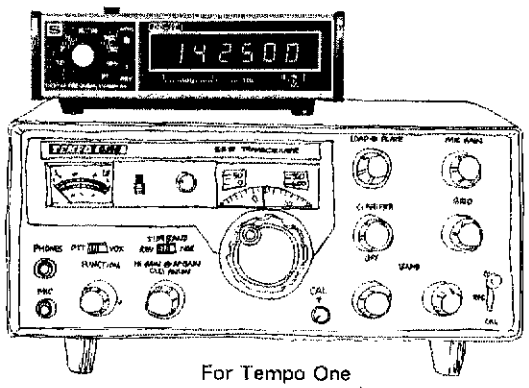
Until now, direct digital frequency read-out was incredibly expensive. But no more. So order the Spectronics unit that's right for your rig now. The Prices? Incredibly right. No matter how you count 'em.



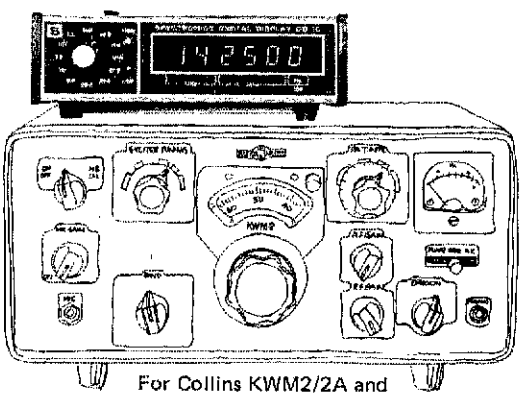
For Yaesu FT-101/FT-401
–Order Model DD-1–$169.95



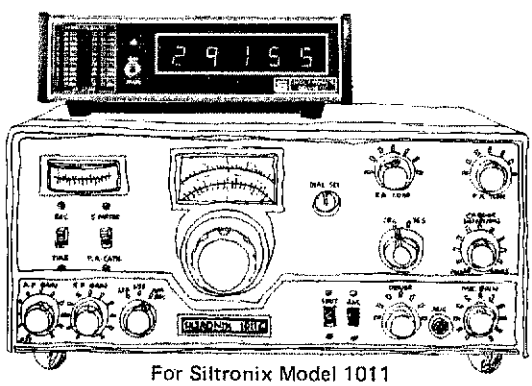
For Kenwood – TS-520
–Order Model DD-1-K–$169.95



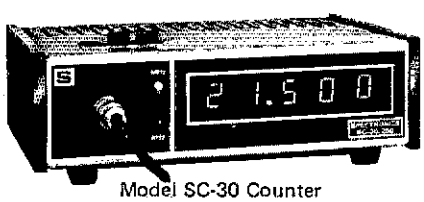
For Tempo One
– Order Model DD-IT–$169.95



For Collins KWM2/2A and
75S series–Order Model DD-1C–$169.95



For Siltronix Model 1011
–Order Model DD-10/11–$149.95



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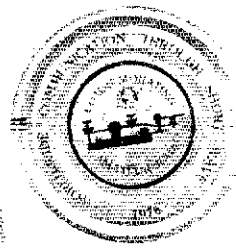


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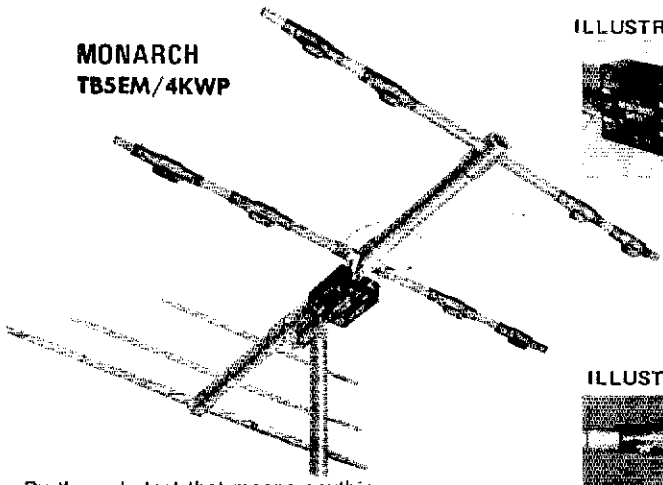


ILLUSTRATION BALUN

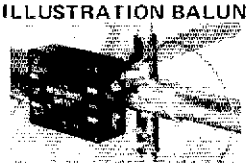
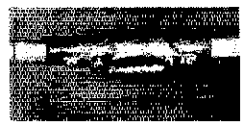


ILLUSTRATION TRAP



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Regency HR-212
Regency HR-2B
Regency HR-312
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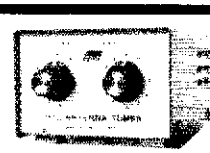

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Now you can operate all band — 160 thru 10 Meters — with a single random wire and run your full transceiver power output — up to 200 watts RF power OUTPUT.

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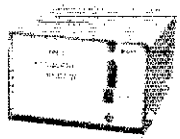

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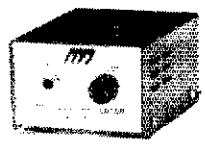

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to all our friends

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Straight forward Theory and Construction articles will spell things out so that everyone can follow just what the author has in mind. Continuing features will highlight the **FUN** of Amateur Radio, what we're doing and where we're going.

Ham Radio Horizons is written for the Beginner, but you'll find everyone reading, learning and enjoying this exciting new magazine.

SOME FEATURE ARTICLES IN OUR INTRODUCTORY ISSUE

The Far Horizon by W9KNI...who writes on DXing, "I listen an instant before calling him—it sounds like half the world is in there. I begin to call: A7XA DE W9KNI K. I listen again. He's in there..."

Taking the Mystery Out of SSB, by W1SL. Is SSB the cure all of all Times? "Well, maybe yes, maybe no; it depends on just how perfect a cure you are looking for." W1SL fills in the background and development of SSB and tells what SSB means to you.

The Not-So-Rocky Road from CB to Ham, by W2EUQ, "Radio amateurs, traditionally and with great pride, form the backbone of non-commercial communication in the world. All that's necessary for you to begin is to have the desire; there's a huge world of communication opportunities out there just waiting for you to take part..."

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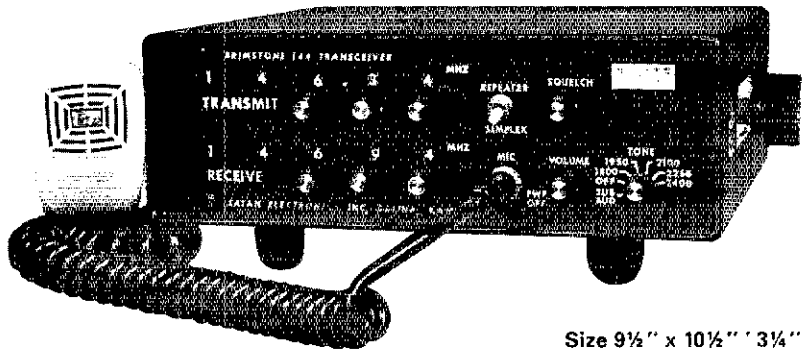
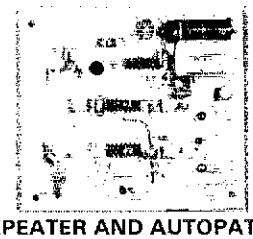


Size 9½" x 10½" ' 3¼"

- No crystals to buy.
- Complete band average 143 to 149.99 MHZ, 142 MHZ optional.
- Independent transmit/receive frequency control, yet simplex with the flip of a switch.
- Autopatch, tone burst and sub-audible tone capability by simply plugging in the desired module.
- Very low transmitter spurious output. Some manufacturers have demonstrated their inability to eliminate unwanted spurious outputs. The Brimstone has demonstrated that non-harmonic spurious output at least – 70Db below the rated power output is possible when the radio is properly designed and constructed.
- The Brimstone 144 is designed for an unprecedented degree of component accessibility and plug-in modularity.
- The only amateur 2 meter FM transceiver with a TWO YEAR WARRANTY.

We have changed our company name to TEC-KAN, Inc. and at this time we are offering a special Fall Sale Price on the Brimstone 144. Check with your dealer on the Fall Special and ask for the 6 page full color brochure.



REPEATER AND AUTOPATCH CONTROL MODULE RPT CM-4

If you are planning a repeater and need a control circuit, we have just what you need! Complete control of repeater as well as the autopatch. Local or remote control. If you are using telephone line control for your repeater the RPT CM is ideal because it uses an opti-coupler for complete line isolation and low voltage, low current control.

If you are using the TKI SCAP-3D, you can call your autopatch line number and the RPT CM will automatically answer and connect you allowing you to send tones over the phone to turn the repeater on or off, or access the autopatch and communicate through the repeater over the autopatch phone line.

When calling the repeater on the autopatch line, you have 20 seconds to either access the autopatch or turn the repeater off or on. If the proper codes are not sent within 20 seconds the RPT CM automatically disconnects.

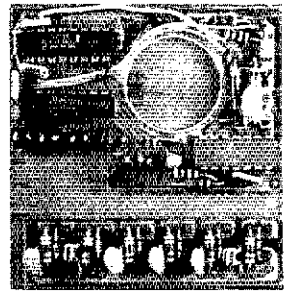
If you call the autopatch number, hang up, wait 30 seconds and call the number again, the repeater transmitter will be keyed and a tone sent each time the phone rings, thus signaling a mobile operator to access the autopatch. If there is no one available to access the patch, it will automatically disconnect after 30 seconds of ringing.

It also features a COR "Hold" circuit, which is adjustable from 1 to 5 seconds, and automatic "time out" timer, that resets each time the receiver COR drops. No need to wait for the repeater to drop out to reset the timer.

If you are planning a repeater, all you need is a good transmitter and receiver and the TKI RPT CM Control Module.

Price $79.95

HANDI-TALKIE SCANNER KIT SK1402



Six Channel Cmos Scanner Kit has provisions to include Mostek Touch-Tone Encoder Chip. Features dwell and normal operation. "Dwell" mode monitors each channel that has a signal on it for 8 seconds. "Normal" monitors in conventional manner. Manual operation locks out the scanner.

Includes LED channel indicators, schematic and installation instructions. Designed for Wilson 1402SM Talkie.

Scanner Kit Model SK1402	$49.95
Includes Touch-Tone Encoder Chip Model SK1402TE	$58.95
Digi-Tran Pad, when ordered with Scanner Kit	$7.50

Size 9 5/16 x 4 5/16

AUTOPATCH SCAP-3D FEATURES

- 3 Digit access, single digit disconnect.
- 4 sec. time limit on access.
- Anti-falsing tone decoders.
- AGC with 30 Db dynamic range on all inputs and outputs.
- 3 digit on-off control of repeater or other devices.
- Remote inhibit or disconnect of autopatch as well as remote "off" function.
- Monitor amplifier allows monitoring all signals going into and out of the repeater.
- Adjustable level controls on all inputs and outputs.
- Jumpers on circuit board and frequency control pots on tone decoders allow field programming of access codes
- Adjustable time out function. Patch will automatically disconnect in 30 to 90 seconds after it is accessed if no carrier is received
- 90 days warranty
- High quality tantalum and polyester capacitors used in tone decoder circuits to provide reliable low drift performance.
- Rugged G10 glass epoxy circuit board.
- High output level allows transmitter to be modulated through a dedicated phone line.
- Provisions for connecting LEDS for status indication at the local control point.
- Reverse polarity protection on supply line.
- Easily connected and adjusted.

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Tel. 913-823-2235

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Touch-Tone® interface	$28.95
Dial Tone (specify frequency)	$34.95

* SPECIAL SALE NO OPTION UNITS ONLY EXCEPT FOR ABOVE.

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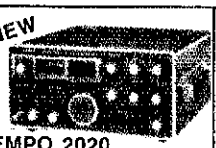

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NEW!! TOUCH TONE PAD COMPLETELY WIRED & READY TO PLUG IN $69.00 COMPLETE BACK ASSEMBLY

*NEW

$39.95

NEW!! ADD 5 CHANS (TOTAL 10) TO SRC-146A

- Simple 10 min. installation
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We wish to thank all of our customers for their support during the past year. Many new and exciting products will be introduced during the coming year and your continued suggestions and support will be deeply appreciated. Thank you.

NEW— CDR HAM II ROTATORS Reg. $159.95 $125.00

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NEW 2 METER FM TRANSCEIVERS
Model SRC 146A

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103RM 12 AMPS – DC AMP METER

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Line/Load Regulation	20 mV
Ripple/Noise	2 mV RMS
Transient Response	50 uSec
Current Limit	12 Amp
Current Foldback	5.5 Amp

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WEIGHT 9.5 lbs OUR PRICE $82.00

109R 25 AMPS – DUAL METERS

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Line/Load Regulation	20 mV
Ripple/Noise	2 mV RMS
Transient Response	50 uSec
Current Output	25 Amps Max REGULATED
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Atlas 210X

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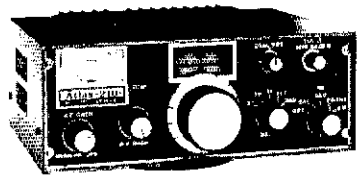

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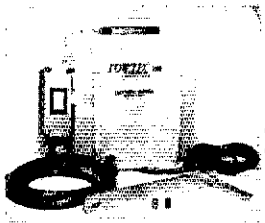

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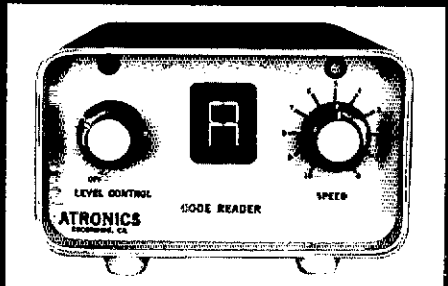
NEW! ATRONICS Visual Code Reader Kit $149



Model KCR101
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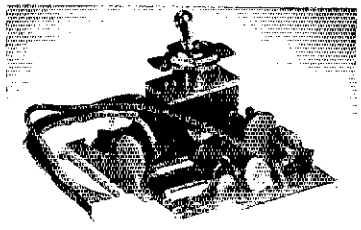

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NEW! 6 METER FM50-10SXRII

NEW! FM144-10SXRII

Same specifications as below except transmit/receive: 51.000-53.995 MHz. 600 channels
Introductory Price **$389.00**

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NEW!

TONE ENCODER/DECODER
SC-10 . . . 10 CHANNELS . . . DUAL TONE
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VALUE $599.00
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MODEL FMTP-1 . . . . . $59.00

All Solid State-PLL digital synthesized — No Crystals to buy! 5KHz steps — 144-148 MHz-LED digital readout.

Introducing the standard of comparison for years to come. No other unit begins to compare with the superb engineering and superior commercial avionics grade quality and construction of the FM144-10SXRII

- **FREQUENCY RANGE:** Receive: 144.00 to 148.995 MHz, 5KHz steps (1000 channels). Transmit: 144.00 to 147.995 MHz, 5KHz steps (800 channels).
- **FULL DIGITAL READOUT:** Six easy to read LED digits provide direct frequency readout assuring accurate and simple selection of operating frequency.
- **AIRCRAFT TYPE FREQUENCY SELECTOR:** Large and small coaxially mounted knobs select 100KHz and 10KHz steps respectively. Switches click-stopped with a home position facilitate frequency changing without need to view LED'S while driving and provides the sightless amateur with full Braille dial as standard equipment.
- **FULL AUTOMATIC TUNING OF RECEIVER FRONT END:** DC output of PLL fed to varactor diodes in all front end R-F tuned circuits provides full sensitivity and optimum intermodulation rejection over the entire band. **No other amateur unit at any price** has this feature which is found in only the most sophisticated and expensive aircraft and commercial transceivers.
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- **MONITOR LAMPS:** 2 LED'S on front panel indicate (1) incoming signal-channel busy, and (2) un-lock condition of phase locked loop.
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The Continuing Adventures Of

SPLATTER AND SPARKIE

Episode #3: Selling your gear the smart way.

Remember the last time you tried to sell a rig? First you tried a classified ad that you paid for in advance, waiting two months for it to appear. When that didn't work, you left it at the local ham shop (15-30% for consignment) where it sat gathering dust while you were off the air. Or maybe you were like Splatter here and dragged it to the hamfests, waiting around all day while people made you absurd offers . . . and remember the time it started to rain?

There is a better way

Buyers & Sellers is easy, safe, and doesn't cost you anything unless a sale is made. Sparkie tried it. He phoned in his listing, giving the make, model, age, condition, serial numbers an price he wanted for the rig. His gear was available for sale the instant he hung up. Buyers & Sellers found a buyer for Sparkie's rig, and called him with the good news, saying they'd send mailing labels and shipping instructions as soon as they received a certified check from the buyer. He packed up the rig, shipped it off, and as soon as the buyer sent his approval card, Sparkie received his check less the selling commission (12%).

We took care of the hassles for Sparkie, all he had to do was pack up the rig and ship it out. We can do it for you too. Here's how

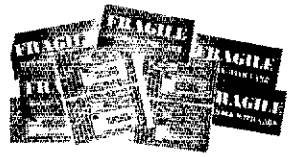
HOW TO SELL

Get the gear you want to sell together and complete the listing form below. Then mail or call your listing into us. Equipment listed over the phone becomes available for sale *as soon as you hang up!* Listing your gear with Buyers & Sellers is free, a 12% commission is charged only if a sale is made. Listings remain active in our files for 120 days from the last day of the month in which they were listed.

Listings over $100 will appear free in Buyers & Sellers weekly equipment summary until deleted or sold. A copy of our weekly summary is available for an SASE or by first class subscription at $1/month (4 issues) or $12/year (52 issues).

If you're selling commercial gear or test equipment be sure to classify and describe each piece fully (if there's not enough room below, use a separate sheet). Please include all information asked for, especially phone numbers where you can be reached during the day and night.

If we find a buyer for your rig, we'll be calling *you* with the good news. If a rig becomes unavailable for sale, the seller should notify us immediately. (Note: A unit found unavailable upon our calling the seller will result in a $10 default charge if we have a buyer). Once we receive a certified check from the buyer, we send the seller mailing labels and shipping instructions. Then, just pack it up and ship it off (buyer pays shipping charges C.O.D.).



Once the buyer returns to us his pre-stamped approval card (a maximum of 30 days from the initial receipt of payment) Buyers & Sellers sends the seller his check less 12% commission.

All equipment selling for under $100, buyers will be sent directly to sellers — commissions to be paid upon completion of the deal.

Remember the rig you gave away . . . and the problems you had doing it? Let us take care of the hassles, and sell *your* gear the smart way . . . all it takes is one phone call to BUYERS & SELLERS.

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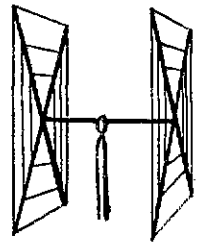

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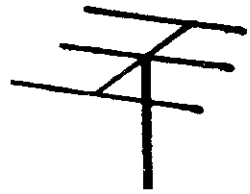

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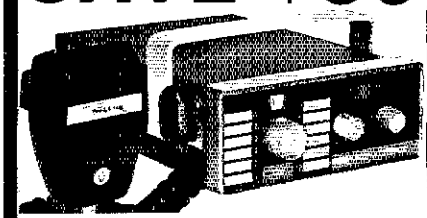
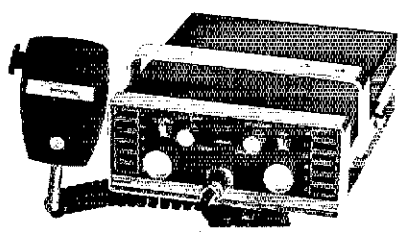


REGENCY HR-2B 2m Fm Xcvr - 15w, 12ch w/94 crystals, microphone & mount. **$229.00**



REGENCY HR-312 2m FM Xcvr - 30w, 12ch T/R w/94 crystals, microphone and mount. . **$269.00**

Purchase a HR-2B or HR-312 for the Regular Listed Price, without a trade and we'll give you **10 FREE CRYSTALS** of your choice. (1 Transmit and 1 Receive crystal are required per channel) Additional crystals - $5.00 ea. Order direct from this ad! Send check or use your Mastercharge or BankAmericard. Allow $5.00 extra for UPS shipping & handling

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PV-50	$ 9
CN-50	29
CN-144	39
TX-62	79
621 VFO	45

B&W Waters
Nuvertor 2+6 Conv.	$ 75
6100 SSB Xmitter	395
670 SSB Adaptor	39
Co-Dax Keyer	95

Central Electronics
100V Transmitter	325
MM-2 Scope	69
20-A SSB Adaptor	79

Clegg
22'er FM	$129
66'er 6M Xcvr	115
99'er 6M Xcvr	59
Interceptor BRCUR	275
Ant Pre Amp	22
All Bander	69
HT-146	125
2 Vess	259
FM-27-B Xcvr	325

Collins
75 A4 Receiver	$395
75S3B Receiver	695
75S1 Receiver	349
KWM-2 Xcvr	595
32S1 Xmitter	349
PM-2 AC Supply	95
516 F2 AC Supply	139
312B5 Console	425
361D2 Mount	29

Drake
2A Receiver	$149
2B Receiver	189
2AQ SPKR QMULT	29
R4 Receiver	289
R4-B Receiver	349
R4-C Receiver	399
MS-4 Speaker	19
2NT Transmitter	125
2NT Transitter	99
TR-6	695
TR-22 2 Meter	140
T-4X Transmitter	339
TR-72 2 Meter FM	225
AC-4 AC Supply	95
TR-4-C Transceiver	449
CC-1 Console	
CPS-1 Supply	
SC-2 Conv	
SC-6 Conv	
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730 Modulator	39

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AF-67 Transmitter	$ 45
PMR-8 Receiver	79

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GTX-200 2M FM	149

Globe/Galaxy
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GT-550 Xcvr	279
GT-500A Xcvr	329
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HT-32B Transmitter	269
SX-99 Receiver	79
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HT-37 Transmitter	159
HT-40 Transmitter	49
SX-99 Receiver	99
SX-117 Receiver	189
SR-150 Xcvr	259
SR-160 Xcvr	159
SX-146 Receiver	175
HT-44 Transmitter	159
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HQ-110AC Receiver	149
HQ-145X Receiver	169
HQ-170C Receiver	159
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HQ-215 Receiver	259
SP-600 Receiver	179
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SB-301 Receiver	229
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SB-303 Receiver	269
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SB-102 Trivcvr	379
DX-60B Transmitter	69
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HW-100 Transceiver	249
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SB-102 Xcvr	369
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QR-666	259
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NCX-5 Transceiver	279
NCX-5MKII Transcvr	299
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NCX-500 Transceiver	199
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NC-190 Receiver	149
NC-105 Receiver	69

Regency
HR-2B 2M FM	$169
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SBE
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SB-144 2M FM	175
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SRC-146 HT	$149
826 M Trnscvr	195
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Swan
700-CX Xcvr	$459
260 Cygnet	289
279 Cygnet	329
500 Xcvr	299
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117-XC AC Supply	95
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FM 2X2M Xcvr	169
FM-1210A 2M	249
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Yaesu
FT-401 Xcvr	$499
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regular $495, save $100; buy a Tempo VHF-1 for $495 (no trades) and take a $100 credit for another purchase.

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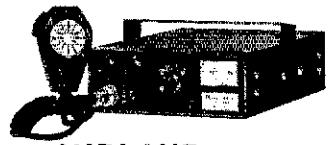
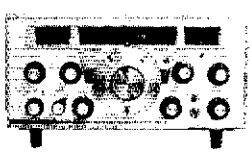
regular $229, save $30; buy a Kenwood TR-2200 for $229 (no trades) and take a $30 credit for another purchase.

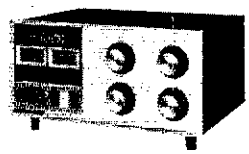


MIDLAND 13-509

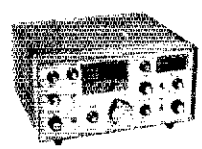
tired of 2 FM, try 220 Midland 13-509, 10 watts on 220 mc. FM. Reg. price $229.95. Special at $169.00.



NATIONAL REC.



NATIONAL AMP.



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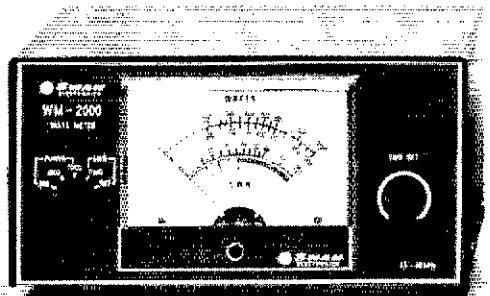

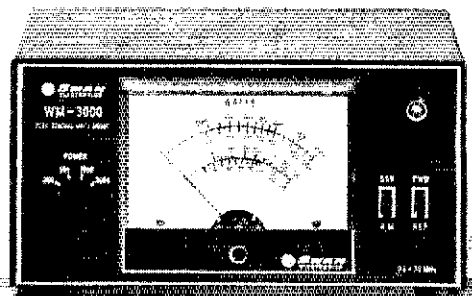

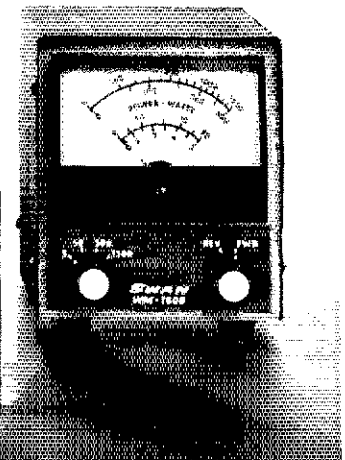

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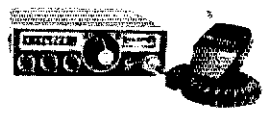

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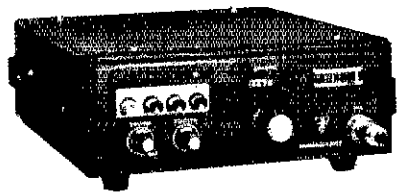
SAVE $150



YAESU Sigmasizer 200R 2m FM Transceiver. 1 or 10w. 200 Synthesized channels for Repeater and Simplex operation on 144 to 146 or 145 to 148 Mhz. in 10 Khz increments. (No crystals needed) Offsets + or - 600Khz. Hi - Low power switch. Priority channel. Adj. Tone Burst (1300 to 3000 Hz.) Rel. Out / Rec. Meter Mic incl.

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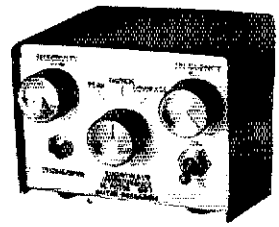

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AT LAST! An "infinitely-variable" active audio filter for operators who demand the best reception in all modes. • Adjust its frequency CONTINUOUSLY from 250 to 2500 Hz in all 3 positions. Instantly zero-in on signals or optimize response! • Peak CW, voice, etc. with selectivity variable from a super-narrow 50 Hz to flat! • Reject whistles, CW, etc. with a deep, adjustable-width notch. • Reject SSB, AM, FM hiss and splatter in the sharp-cutoff lowpass position. • Don't confuse the QF-1 with simple designs. It has 80 dB skirts, notch to 70 dB. 8 IC op amps and a 1 watt spkr. amp. No batteries to replace. Just plug into your phone jack! Ready to improve your Yaesu, Collins, Swan, Drake, S/1, Tempo, Atlas, Kenwood, etc.—any rcvr or xcvr made!

Model QF-1 "The Finest" 115 VAC. 5x4x3½". $52.95

Model QF-2. Basic filter board less pwr. amp., etc. 6 to 30 VDC. Install in rcvr. Instructions $32.95

SHIPPING: Add $1.70 in U.S., $2.70 in Canada. Add 10% outside N. Amer. (Airmailed). 1 yr warranty.

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6 Digit LED Clock Kit - 12/24 hr.

$9.95 ea. QTY. 12 OR MORE — $10.95 ea. QTY. 6-11 — $11.95 ea. QTY. 1-5

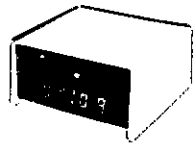
KIT INCLUDES
- INSTRUCTIONS
- QUALITY COMPONENTS
- 50 or 60 Hz OPERATION
- 12 or 24 HR OPERATION

6-LED Readouts(FND-359 Red, com. cathode)
1-MM5314 Clock Chip (24 pin)
13-Transistors
3-Switches
6-Capacitors
5-Diodes
9-Resistors
24-Molex pins for IC socket

LARGE .4" DIGITS!
ORDER KIT #850-4
AN INCREDIBLE VALUE!

"Kit #850-4 will furnish a complete set of clock components as listed. The only additional items required are a 7-12 VAC transformer, a circuit board and a cabinet, if desired."

Printed Circuit Board for kit # 850-4 (etched & drilled fiberglass) $2.95
Mini-Brite Red LED's (for colon in clock display) pkg. of 5 ..... 1.00
Molded Plug Transformer 115/10 VAC (with cord) 2.50
NOTE: Entire Clock may be assembled on one PC Board or Board may be cut to remote display.
Kit # 850-4 will fit Plexiglas Cabinet II.



CABINET I
3"H,6¼"W,5½"D
CABINET II
2½"H,5"W,4"D
ANY SIZE/COLOR

PLEXIGLAS CABINETS
Great for Clocks or any LED Digital project. Clear-Red Chassis serves as Bezel to increase contrast of digital displays.
Black, White or Clear Cover
$6.50 ea. 2/$12.

RED OR GREY PLEXIGLAS FOR DIGITAL BEZELS
3"x6"x1/8" **95¢ ea. 4/$3**

MOBILE LED CLOCK

12 OR 24-HOUR OPERATION
12 VOLT AC or DC POWERED FOR FIXED OR MOBILE OPERATION.
SIX JUMBO .4" DIGITS!
KIT OR ASSEMBLED

MODEL 2001

ACCURATE TIME WITH ADJUSTABLE XTAL TIME BASE

BATTERY BACK-UP FOR POWER FAILURE OR TRANSPORTING FROM HOUSE TO CAR, ETC.

Approx. Size:
1¾"H x 4"W x 4½"D

- 6 JUMBO .4" RED LED'S BEHIND RED FILTER LENS WITH CHROME RIM.
- SET TIME FROM FRONT VIA HIDDEN SWITCHES • 12/24-Hr. TIME FORMAT
- STYLISH CHARCOAL GRAY CASE OF MOULDED HIGH TEMP. PLASTIC
- BRIDGE POWER INPUT CIRCUITRY – TWO WIRE NO POLARITY HOOK-UP
- OPTIONAL CONNECTION TO BLANK DISPLAY (Use When Key Off in Car, Etc.)
- TOP QUALITY PC BOARDS & COMPONENTS - EXCELLENT INSTRUCTIONS

KIT #2001 COMPLETE KIT (Less 9V. Battery) **29.95** EA. — 3 OR MORE **$27.95** EA. — 115 VAC Power Pack #AC-1 **$2.50** EA.

ASSEMBLED UNITS ORDER #2001 WT — WIRED & TESTED (LESS 9V BATTERY) **$39.95** EA. — 3 OR MORE **$37.95** EA. — Assembled Units May Be Mixed With Kits for Qty. Price

JUMBO RED LED's 12/$1.00 50/$3.95

6 Digit-LED Clock-Calendar-Alarm Kit

This is a complete, top of the line, Kit for the person that wants the best. Some of the many features and options are: 12/24 time, 28-30-31 day calendar, alternates time (8 sec) and date (2 sec) or can display time only and date on demand, 24 hr alarm - 10 minute snooze, alarm set indicator, 50/60 HZ. line operation or use with Xtal time base (#TB-1), built in OSC for battery back-up / AC failure, Aux. timer. Large digits.

Kit #7001B 6 - .4" Digits Man-64 $39.95
Kit #7001C 4- .6" Digits & 2-.3" (seconds) $42.95

Kits are complete (less cabinet) including PC boards, power supply, IC socket, 9 switches, 16 transistors and all parts required for above features and options (Ideal fit in Cabinet I above).

60 HZ. XTAL TIME BASE KIT

Will enable Digital Clock or Clock-Cal. Kits to operate from 12VDC. Uses MM5369 and 3.58MHZ. XTAL. Req. 5-15VDC/2.5 MA. 1"x2" PC Board. Easy 3 wire hookup Accuracy: + - 2 PPM

#TB-1 [adjustable]
Complete kit $4.95 ea
Wired & Cal. $9.95 ea

PRINTED CIRCUIT BOARDS for CT-7001 Kits sold separately with assembly info. PC Boards are drilled Fiberglass, solder plated and screened with component layout. Specify for # 7001B or # 7001C (Set of 2) $7.95

JUMBO DIGIT CLOCK KIT

A complete Kit (less Cabinet) featuring: six .5" digits, MM5314 IC, 12/24 Hr. time, 50/60 HZ., Plug-Transformer, Line Cord, Switches, and all Parts.
[Ideal Fit in Cabinet II]
Kit #5314-5 ..... **$19.95 ea 2/$38.**

JUMBO DIGIT CONVERSION KIT

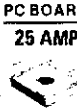
Convert small digit LED clock to large .5" displays. Kit includes 6-.5" LED's, Multiplex PC Board & easy hook-up info.
Kit #JD-1CC For common Cathode
Kit #JD-1CA For common Anode
$9.95 ea. 2/$19.

Fairchild Super Digit FND-359

.4" Char. Ht. 7 segment LED RED Com. Cath. Direct pin replacement for popular FND-70.
95¢ ea, 10/$8.50 100/$79.00

SET OF 6 FND-359 WITH MULTIPLEX PC BOARD $6.95

25 AMP BRIDGE $1.95 ea. 3/$5.00

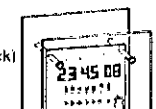


100 PIV

TELEPHONE FORMAT KEYBOARD
BY Chomerics

2-1/4"x3" 5/32" thick
$4.95
6/$28.

SEE THE WORKS Clock Kit Clear Plexiglas Stand



- 6Big .4" digits
- 12 or 24 hr. time
- 3 set switches (back)
- Plug transformer
- all parts included

Plexiglas is Pre-cut & drilled
Size: 6"H,4½"W,3"D

A SUPER LOOKING CLOCK!
Kit #850-4CP **$23.50 ea. 2/$45.**

7-SEG LED

COMMON CATHODE

	COLOR	HT. DEC PT.	PR EA.
FND-359	RED	.4" RHDP	$ .95
FND-503	RED	.5" RHDP	$1.35
DL-750	RED	.6" LHDP	$2.95
XAN-654	GREEN	.6" NDP	$2.95
XAN-664	RED	.6" NDP	$2.95

COMMON ANODE

DL-747	RED	.6" LHDP	$2.95
XAN-72	RED	.3" LHDP	$1.25
XAN-81	YELLOW	.3" RHDP	$1.75
XAN-351	GREEN	.3" RHDP	$1.50
XAN-361	RED	.3" RHDP	$1.50
XAN-362	RED	.3" LHDP	$1.50
XAN-662	RED	.6" NDP	$2.50
XAN-692	RED	.6" NDP	$2.50

SCHOTTKY TTL

74S00	$ .35
74S01	.40
74S04	.55
74S05	.60
74S09	.55
74S10	.40
74S15	.55
74S20	.50
74S22	.45
74S40	.45
74S50	.45
74S51	.55
74S60	.85
74S64	.55
74S73	1.25
74S74	.65
74S75	1.75
74S78	1.50
74S86	.95
74S107	.95
74S112	.95
74S113	1.40
74S114	.95
74S121	.95
74S133	.75
74S134	.75
74S138	1.75
74S139	1.50
74S151	1.95
74S153	1.95
74S155	1.95
74S156	1.95
74S157	1.80
74S158	2.50
74S174	2.50
74S175	2.50
74S181	2.95
74S182	1.95
74S251	2.75

DTL

930	$ .09
932	.09
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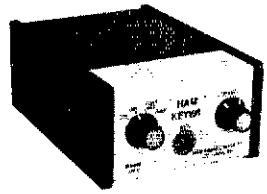

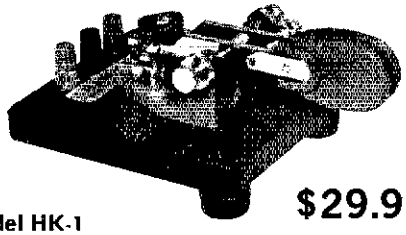

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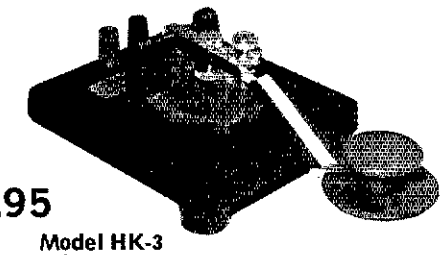

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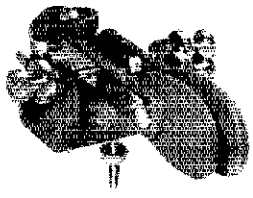

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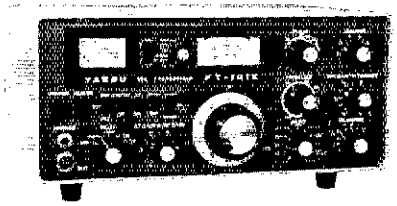

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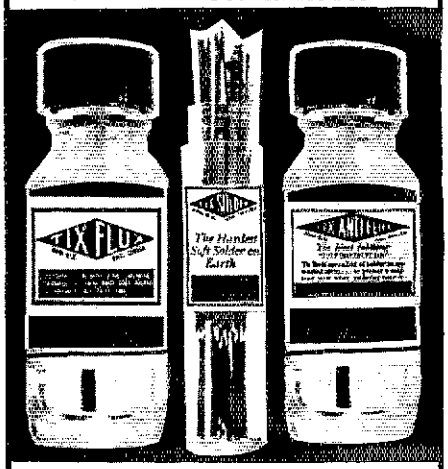

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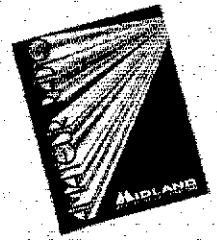

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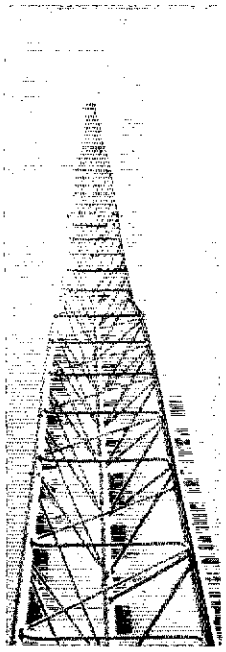

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W6ME still looking for R-390A parts. Bob Herbig, 4178 Chasin St., Oceanside CA 92054.

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WANTED: Pre-1928 QST magazines. W6RVB, 529 Kevin Way, Placentia CA 92670.

WANTED: HO-13, W4GBB.

RUBBER Stamp, Name/call/QTH $2.50 ppd. (CA residents add tax) LWM Press, Box 22161, San Diego, CA 92122.

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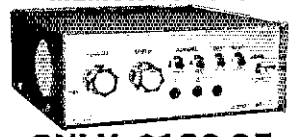

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P-10	C-10	10	
4P-12	4C-12	12,13,14	
P-14	C-14	14	
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310-003

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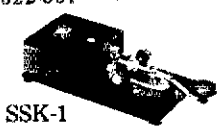

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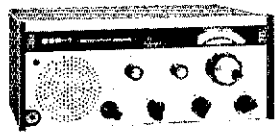

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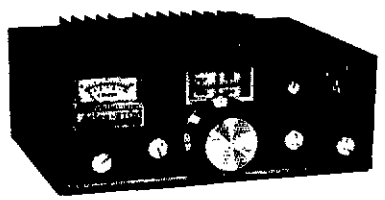
Vhf engineering



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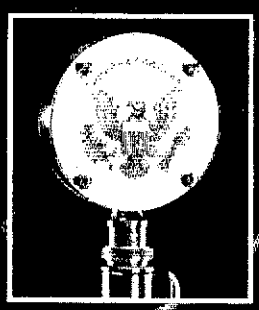

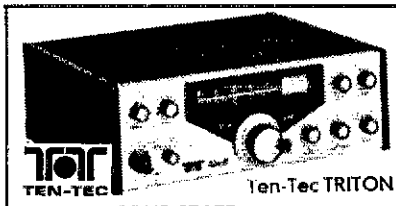

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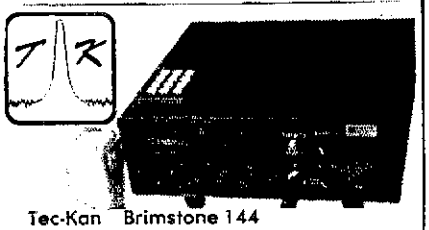

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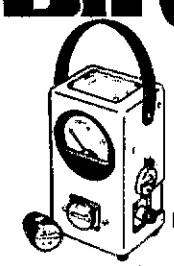

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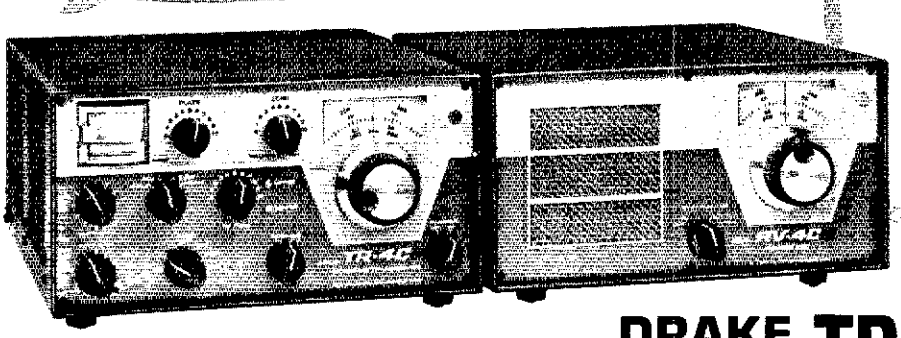

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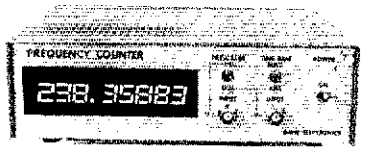

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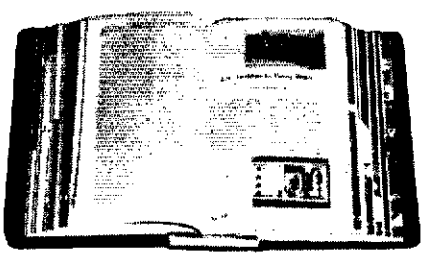

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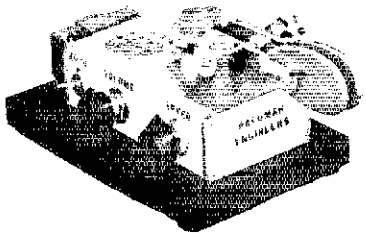

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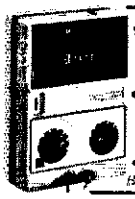

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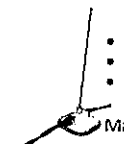

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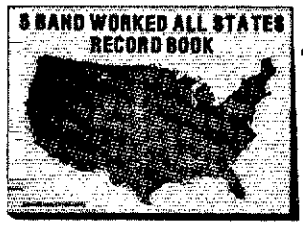

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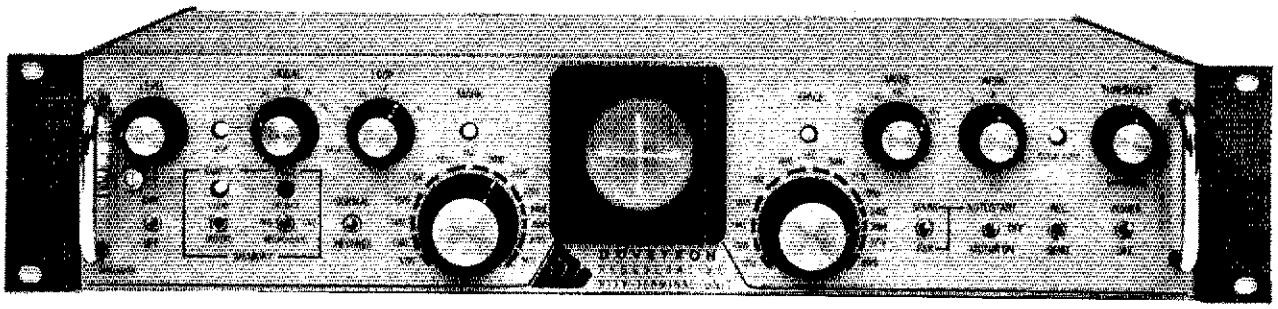

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Amateur: $745.00 CIA

MPC-1000R
Commercial: $995.00*

*OEM discounts available

Specifications and prices subject to change without notice.

NEWS

BULLETIN

HI! HI! HI!

We Fill SANTA'S ORDERS

DEAR OM: "SEASON'S GREETINGS" from the gang at BURGHARDT AMATEUR CENTER!!

Just in case you missed our previous ads run in this periodical during the course of 1976, or if you only scanned them over briefly, perhaps losing interest when you read our QTH was WATERTOWN, SOUTH DAKOTA — of all places — we still want you to know that we've got "GOOD NEWS" for you, and with the Holiday Season now upon us, our story is even more appropriate than ever!!

About this time every year, you see, there's a little, old jolly - fat man all dressed in red with white trimmings, and a long, flowing silvery-white beard, rosy cheeks, etc., who hitches up a team of eight, shiny reindeer and embarks on his annual journey around the world bringing gifts of joy to all the good little boys & girls (Hams & XYLs). Now, Mr. Claus, or just plain "SANTA" — if you prefer — is a wise, industrious old gentleman with hundreds of helpful elves aiding him in the production of toys all year long, but busy as he is and aiming to please as he does, he just can't find the time to get into HAM RADIO equipment. So, rather than leaving any empty stockings come Christmas Eve, ol' SANTA's been stopping at BURGHARDT AMATEUR CENTER for over 38 years now, and *checking his list* for all his favorite DX'ers, VHF'ers and "rag-chewers!!"

Watertown has always been SANTA's first stop on his tight schedule, because it is CONVENIENT, just SOUTH (Dakota) of his headquarters at the NORTH POLE. He likes our FAST DELIVERY, HONEST DEALING, TOP-DOLLAR TRADE ALLOWANCES, and our GOOD SELECTION of all the LATEST MODELS in new & used ham gear. Furthermore, he appreciates our FRIENDLY-PERSONAL approach in doing business, and he knows that he can DEPEND on us for PROMPT/RELIABLE SERVICE if he has any problems along his way. In short, SANTA'S CHOICE in ham radio outlets IS BURGHARDT AMATEUR CENTER!!

We have always held that there are TWO IMPORTANT FACTORS in any purchase of ham radio equipment — the PRODUCT and the DEALER, or in other words, WHAT you buy & WHERE or from WHOM you buy it!! At BURGHARDT AMATEUR CENTER, we stock & sell AND guarantee & SERVICE virtually every major quality product in the ham radio field today, but it's not so much WHAT we sell — rather HOW we sell it that's worth your consideration when you're in the market for a new or used piece of equipment. Your CONFIDENCE in us is our MOST important asset, and even if it may seem like we're out in the middle of NO MAN'S LAND — we'll go a long-long way to gain your trust & SATISFACTION!!

MERRY CHRISTMAS and a HAPPY-HEALTHY NEW YEAR!!

WE'RE FOR REAL!!

There's No Doubt About It!

73's

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NEW STORE HOURS:
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Watertown, S.D. 57201

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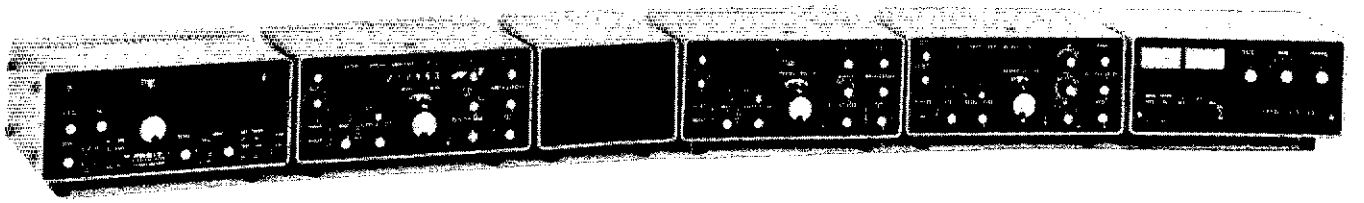
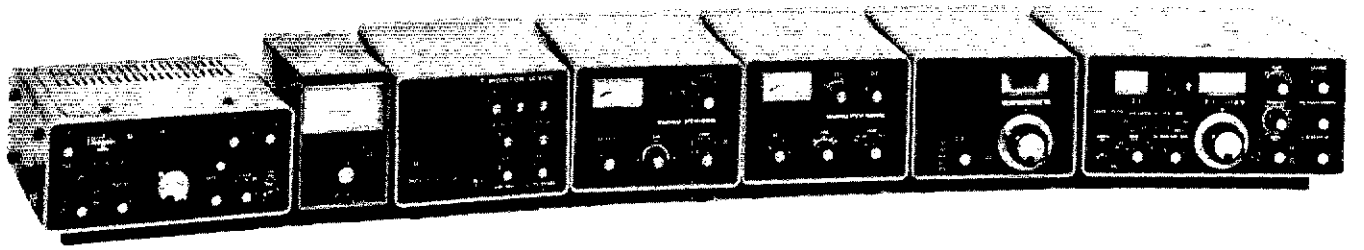
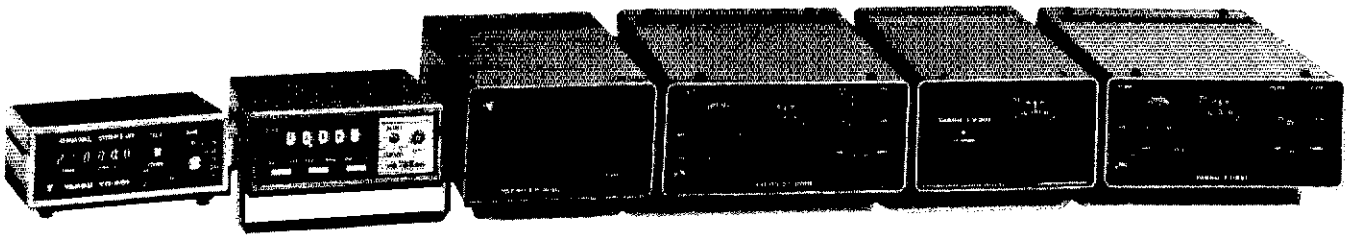


Left to right – FRG-7, Solid State Synthesized Communications Receiver • FR-101 Digital, Solid State Receiver • SP-101B, Speaker • FR-101, Digital Solid State Receiver • FL-101, 100 W Transmitter • FL-2100B, 1200 W PEP Input Linear Amplifier



Left to right – FT-620B, 6 Meter Transceiver • YP-150, Dummy Load Wattmeter • YO-100, Monitor Scope • FTV-250, 2 Meter Transverter • FTV-650, 6 Meter Transverter • FV-101B, External VFO • FT-101E 160-10 M Transceiver



Left to right – YC-601, Digital Frequency Display • YC-355D, Frequency Counter • FP-301, AC Power Supply • FT-301S Digital, All Solid State Transceiver • FV-301, External VFO • FT-221, 144-148 All Solid State All Mode Transceiver

YD-844
Dynamic Mike

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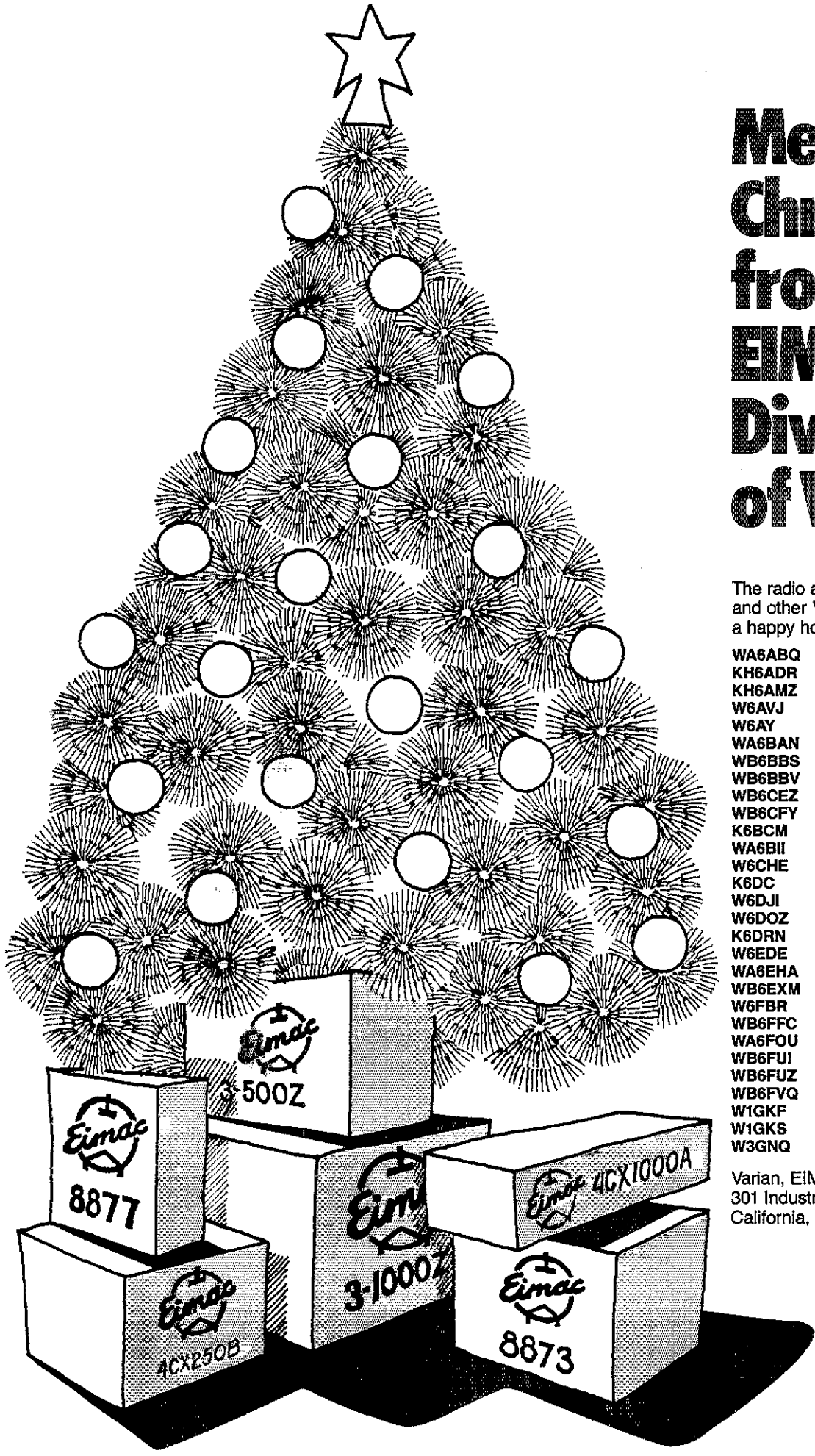

Merry Christmas from the EIMAC Division of Varian.

The radio amateurs of EIMAC, CTC, and other Varian Divisions wish you a happy holiday season.

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