Amateur Radio

CQ

Serving Amateur Radio Since 1945

September 1977

$1.25

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The Henry's, Meredith, W6WNE, and Ted, W6UOU, at the start of Odyssey "77", an amateur radio trip around the world...see page 22

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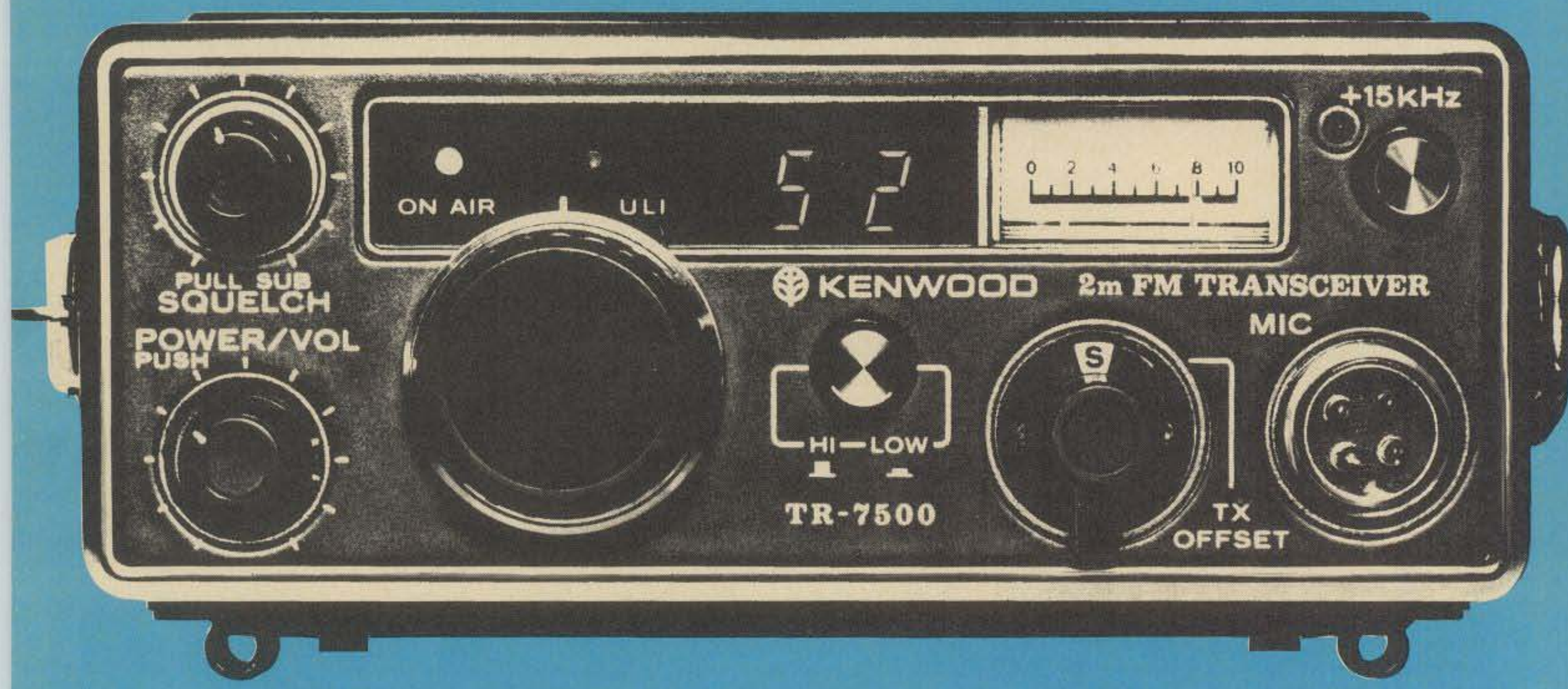
The Radio Amateur's Journal

TR-7500



There are a number of good 2 meter FM transceivers on the market. You may already own one. But, even if you do, we suggest that you put your radio to this test. And, if you're thinking of buying one, this test should be a helpful guide.

	NO	YES
Is it PLL synthesized?	☐	☐
Does it have 100 channels (88 pre-programmed)?	☐	☐
Does it have 12 extra diode programmable channels?	☐	☐
Does it have single knob channel selection?	☐	☐
Does it have a LED digital frequency display?	☐	☐
Dos it have a powered tone pad connection?	☐	☐
Does the receiver have helical resonators?	☐	☐

If your answer is NO to any of these, the TR-7500 is the radio that you should own. And, in addition to these important features, you get proven Kenwood quality, value and service.

Specifications TR-7500

Semiconductors: Transistors 41
FETs 8
ICs 7
Diodes 35

Frequency Range: 146.01 to 147.99 MHz
Mode: FM
No. of Channels: 100
Operating Temperature: —20 to +50 degrees C
Power Voltage: 11.5 to 16.0V DC (13.8V DC nominal)
Grounding Polarity: Negative ground
Antenna Impedance: 50 Ohms
Current drain: Less than 0.5A in receive with no input signal
Less than 3A in transmit (HI) Less than 1.5A in transmit (LOW) (at 13.8V DC)
Dimensions: 172 mm (6—3/4") wide
250 mm (9—7/8") deep
75 mm (2—15/16") high
Weight: Approximately 2.2 kg (4.8 lbs.)

TRANSMIT SECTION

RF Output Power: High: 10 Watts
Low: 1 Watt (approximately)
Modulation: Variable reactance frequency shift
Frequency Deviation: ±5 KHz
Spurious Radiation: Better than —60dB
Tone Pad Input Impedance: 600 Ohms
Microphone: Dynamic microphone with PTT switch, 500 Ohms

RECEIVE SECTION

Receive System: Double conversion superheterodyne
Intermediate Frequency: 1st IF: 10.7 MHz
2nd IF: 455 kHz
Sensitivity: Better than 0.4 uV for 20dB quieting Better than 1 uV for 30dB S/N
Squelch Sensitivity: Better than 0.25 uV
Selectivity: 12kHz at —6dB down
40 kHz at —70dB down
Image Rejection: Better than —70dB
Spurious Interference: Better than —60dB
Audio Output: More than 1.5 watts across 8 Ohms load 10% distortion
Intermodulation: Better than 66dB

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

KENWOOD
...pacesetter in amateur radio

This NEW MFJ Super Antenna Tuner . . .

matches <u>everything</u> from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines. Up to 200 watts RF <u>OUTPUT</u>. Built-in balun, too!

$69.95

With the NEW MFJ Super Antenna Tuner you can run your full transceiver power output — up to 200 watts RF power output — and match your transmitter to **any** feedline from 160 thru 10 Meters whether you have coax cable, balance line, or random wire.

You can tune out the SWR on your dipole, inverted vee, random wire, vertical, mobile whip, beam, quad, or whatever you have.

You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

Increase the usable bandwidth of your mobile whip by tuning out the SWR **from inside your car.** Works great with all solid state rigs (like the Atlas) and with all tube type rigs.

It travels well, too. Its ultra compact size 5x2x6 inches fits easily in a small corner of your suitcase.

The secret of this tiny, powerful tuner is a wide range 12 position variable inductor made from two stacked toroid cores and high quality capacitors manufactured especially for MFJ. For balanced lines a 1:4 (unbalanced to balanced) balun is built-in. Made in U.S.A. by MFJ Enterprises.

This beautiful little tuner is housed in a deluxe eggshell white Ten-Tec enclosure with walnut grain sides.

SO-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balance line inputs (2), random wire input (1), and ground (1).

Try it — no obligation. If not delighted, return it within 30 days for a refund (less shipping). This tuner is unconditionally guaranteed for one year.

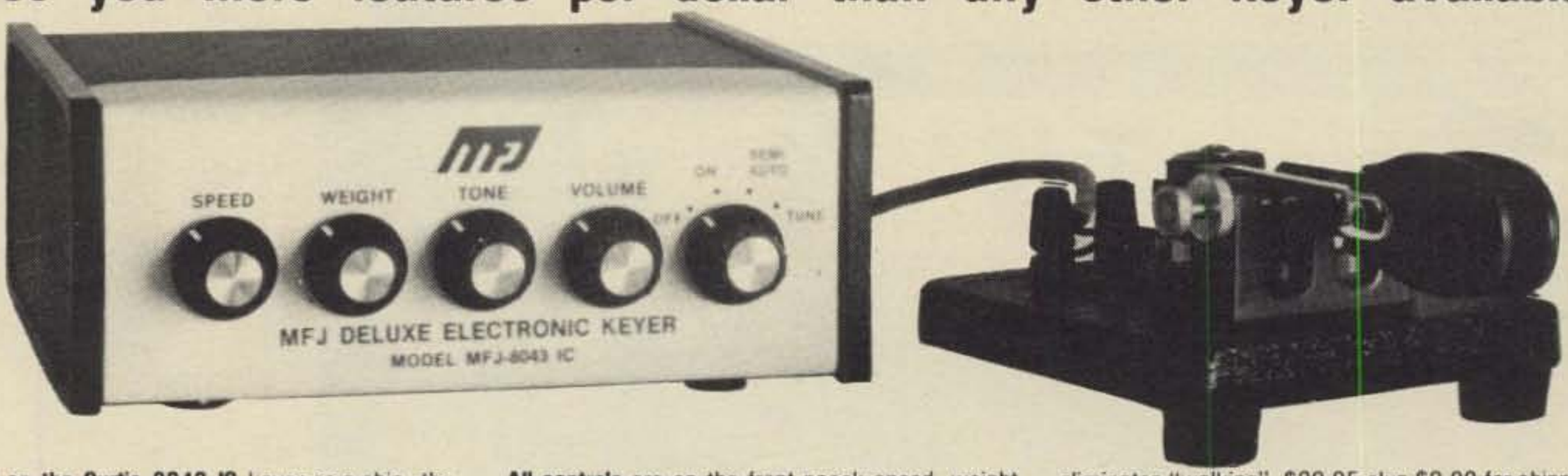
To order, simply call us **toll-free 800-647-8660** and charge it on your BankAmericard or Master Charge or mail us an order with a check or money order for $69.95 plus $2.00 shipping/handling for the MFJ-16010ST Super Antenna Tuner.

Don't wait any longer to tune out that SWR and enjoy solid QSO's. Order today.

MFJ ENTERPRISES
P. O. BOX 494
MISSISSIPPI STATE, MS. 39762
CALL TOLL FREE . . 800-647-8660

This NEW MFJ Deluxe Keyer at $69.95 . . .

gives you more features per dollar than any other keyer available.



Based on the Curtis 8043 IC keyer-on-a-chip, the new MFJ Deluxe Keyer gives you more features per dollar than any other keyer available.

Sends iambic, automatic, semi-automatic, manual. Use squeeze, single lever or straight key.

Iambic squeeze key operation with dot and dash insertion lets you form characters with minimal wrist movement for comfortable, fatique-free sending.

Semi-automatic "bug" operation provides automatic dots and manual dashes. Use a manual straight key to safely key your transmitter or to improve your fist.

Dot memory, self-completing dots and dashes, jam-proof spacing and instant start for accurate and precise CW.

Totally RF proof. No problems, whatever.

Ultra-reliable solid-state keying. Keys virtually any transmitter: grid block, −300V max., 10 ma, max.; cathode and solid state transmitters +300V max., 200 ma, max.

All controls are on the front panel: speed, weight, tone, volume, function switch. Smooth linear speed control. 8 to 50 WPM.

Weight control lets you adjust dot dash space ratio; makes your signal distinctive to penetrate thru heavy QRM for solid DX contacts.

Tone control. Room filling volume. Built-in speaker. Ideal for classroom teaching.

Function switch selects off, on, semi-automatic/manual, tune. Tune keys xmtr for tuning.

Completely portable. Take it anywhere. Operates up to a year on 4 C-cells. Miniature phone jack for external power (3 to 15 VDC).

Beautiful Ten Tec enclosure. Eggshell white, walnut sides. Compact 6x6x2 inches.

Three conductor quarter-inch phone jack for key, phono jacks for keying outputs.

Optional squeeze key. Dot and dash paddles have fully adjustable tension and spacing for the exact "feel" you like. Heavy base with non-slip rubber feet eliminates "walking". $29.95 plus $2.00 for shipping and handling.

Try it—no obligation. If not delighted, return it within 30 days for a refund (less shipping). This keyer is unconditionally guaranteed for one year.

To order, simply call us **toll-free 800-647-8660** and charge it on your BankAmericard or Master Charge or mail us an order with a check or money order for $69.95 plus $2.00 shipping/handling for the MFJ-8043 keyer and/or $29.95 plus $2.00 shipping/handling for the squeeze key.

Don't wait any longer to enjoy the pleasures of the new MFJ Deluxe Keyer. Order today.

MFJ ENTERPRISES
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MISSISSIPPI STATE, MS. 39762
CALL TOLL FREE . . 800-647-8660

Kenwood adds to your pleasure... wherever you go

TR-2200A

A 2-METER STATION THAT GOES WHERE YOU GO

The high performance portable 2-meter FM transceiver endowed with Kenwood's characteristic high level of quality. The TR-2200A provides superior performance for the active outdoorsman . . . portable, mobile or airborne . . . pleasure or emergency. 12 channel capacity (6 supplied). Built-in telescoping antenna can be easily replaced by a "rubber duck" antenna (RA-1 option). Connection for external antenna. External 12 VDC or internal ni-cad batteries. Battery-saving "light off" position. Hi-Lo power switch (2 watts-400 mW). Everything you need is included: batteries, charger, carrying case and microphone. Or mount it in your car as a mobile rig using an MB-1A mounting bracket (option).

TR-7400A

Featuring Kenwood's New and Unique CONTINUOUS TONE CODED SQUELCH SYSTEM • 4 MHz BAND COVERAGE • 25 WATT OUTPUT • FULLY SYNTHESIZED, 800 CHANNELS

Outstanding sensitivity, large-sized helical resonators with High Q to minimize undesirable out-of-band interference, and a 2-pole 10.7 MHz monolithic crystal filter combine to give your TR-7400A outstanding receiver performance. This compact 6.2 pound package measures only 7-3/16" wide, 10-5/8" deep, and 2-7/8" high and is designed to give you the kind of performance specifications you've always wanted to see in a 2-meter amateur rig. High performance specifications of: Intermodulation characteristics (Better than 66dB), spurious (Better than −60dB), image rejection (Better than −70dB), and a versatile squelch system make the TR-7400A tops in its class.

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

KENWOOD
...pacesetter in amateur radio

SEPTEMBER, 1977 VOL. 33, NO. 9

The Radio Amateur's Journal

FEATURES

DEPARTMENTS

Offices: 14 Vanderventer Avenue, Port Washington, L.I., N.Y. 11050. Telephone: 516-883-6200

CQ (Title registered U.S. Post Office) is published monthly by Cowan Publishing Corp. Second Class Postage paid at Port Washington, N.Y. and other points. Subscription Prices one year, $7.50; two years $13.00. Allow six weeks for change of address. Printed in the United States of America.

Postmaster: Please send form 3579 to CQ Magazine, 14 Vanderventer Ave., Port Washington, L.I., N.Y. 11050

the TEMPO 2020

...an accepted and proven performer

- Phase lock-loop (PLL) oscillator circuit minimizes unwanted spurious responses.
- Hybrid Digital Frequency Presentation.
- Advanced Solid-state design...only 3 tubes.
- Built-in AC and 12 VDC power supplies.
- CW filter standard equipment...not an accessory.
- Rugged 6146-B final amplifier tubes.
- Cooling fan standard equipment...not an accessory.
- High performance noise-blanker is standard equipment...not an accessory.
- Built-in VOX and semi-break in CW keying.
- Crystal Calibrator and WWV receiving capability.
- Microphone provided.
- Dual RIT control allows both broad and narrow tuning.
- All band 80 through 10 meter coverage.
- Multi-mode USB, LSB, CW and AM operation.
- Extraordinary receiver sensitivity (.3u S/N 10 db) and oscillator stability (100 Hz 30 min. after warm-up)
- Fixed channel crystal control on two available positions.
- RF Attenuator.
- Adjustable ALC action.
- Phone patch in and out jacks.
- Separate PTT jack for foot switch.
- Built-in speaker.
- The TEMPO 2020...$759.00.
- Model 8120 external speaker...$29.95. Model 8010 remote VFO...$139.00.

Send for descriptive information on this fine new transceiver, or on the time proven Tempo ONE transceiver which continues to offer reliable, low cost performance.

Henry Radio

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Butler, Missouri 64730 816/679-3127

Zero Bias

an editorial

Last month when I wrote an Open Letter To The President I had no way of telling what was about to happen at the FCC. Well, it went down to the wire at Gettysburg. The fairwell dinners and lunches, the goodbye parties that people have and all the sad trimmings of a group about to disband. Literally at the last moment a reprieve came through in the form of permanent positions for those about to depart that day. However the word temporary came through again in the form of a "review" to be held in the fall so that even though the positions are "permanent" they are only permanent until the fall. The net result to Gettysburg will be the loss of one employee position due to some reshuffling inorder to accomodate the "permanent" status of the rest. It is rumored that we owe this benevolence to someone with CB interests who put a "word" into the White House who inturn put the "word" to the OMB. Whatever the reason or whoever is responsible . . . we thank you.

As this is being written before the August issue reaches most of you, I cannot judge or measure the reaction to the Open Letter or to the report of the meeting we had at Gettysburg. On July 13, another meeting is scheduled to be held by the FCC in Washington. This meeting will also deal with the workings and problems of the FCC with afternoon sessions in an open forum format whereby interested parties can make presentations or present thoughts on areas of concern to amateur radio. I think that this meeting concept is a terrific idea whereby on a regular basis we can discuss what is happening in amateur radio and ways and means to make it more effective, efficient and meaningful to all of us. It brings the FCC and the entire system closer to the people concerned and gives everybody a clearer perspective on what is happening. I welcome the openness.

There are several other meetings to be held in Washington in July and early August by the FCC to gather other information presumably to file reports with various committees on updating or rewriting the Communications Act of 1934 to make it relavent to today's needs. This is the Act which regulates and sets down the rules and regulations for the amateur radio service and other users of the radio spectrum. Perhaps with this new Administration we will see more and more of the official bureaucracy peeled away and Government Agencies actually being able to serve the needs of the people who put them there. I hope all of these moves towards progress come to pass and that we can all benefit by them. We are facing a brand new and tremendous interest in amateur radio for the future, so let's all help it along and work together.

Progress in any area sometimes exacts a sad price as evidenced by a letter received here written by Jim Millen of Millen Mfg. Co. For a full story on Millen Mfg. Co. and its impact on amateur radio, I suggest you read "Designed For Application, The Story Of James Millen, W1HRX" in the July 1967 issue of CQ on page 26. Jim's letter speaks for itself:

The End Of An Era

Dear Alan, May 31, 1977

After 50 years in the Electronic Business in Malden, (May 1927) the Malden Redevelopment Authority has taken our present factory, which we have occupied since May 1939, by eminent domain.

As a result, certain plans had to be made for future operations from a new location. These plans proved impracticable. New and different plans are now in the process of implementation by which our line of "Designed for Application" products will be produced under license by three other fine companies:

COMPONENTS: Electronic Instruments & Specialty Co.
MAGNETIC SHIELDS: MuShield Division of BOMCO.
INSTRUMENTS & EQUIPMENT: Caywood Electronics Co.

They will use our tools, molds, dies, etc., under the supervision of a group of our longtime experienced personnel.

I will continue the James Millen Mfg., Co., Inc. with a small staff of longtime employees from new offices in Malden to handle and continue other non-manufacturing activities.

Personal mail should be addressed to me at Tarbox Lane, North Reading, Mass. 01864.

Regards, Jim

New Novice Editor

As most of you know by now Herb Brier, W9AD, passed away recently and this month we ran the last column he submitted. We will all miss Herb and his writing and the effects of all of his efforts to teach the newcomer.

Starting in October our new Novice Editor will be Bill Welsh, W6DBB. I knew of Bill by his reputation with the Lockheed Amateur Radio Club (W6LS) and when I asked him to join CQ he said yes. He has been extremely active in teaching programs for Novices for many years and in some circles he is known as "Mr. Novice". I am confident that Bill can provide a wealth of information, based on his vast experience, to the newcomer to amateur radio. I asked Bill to send me a little background material so that I could let you know something about him. Well it turns out that the highlights and accomplishments of Bill's career in amateur radio, public service and work took four single-spaced type-written pages (both sides) and spans over 28 years. The only thing I would like to know is when he found time to sleep or to keep up with his seven children.

Welcome to the CQ Team Bill we all look forward to reading your column and meeting you through the pages of CQ next month.

73, Alan, K2EEK

KENWOOD'S

NEW TS-520S

AND DG-5 DIGITAL FREQUENCY DISPLAY

A NEW STANDARD IN ECONOMY TRANSCEIVERS

The NEW TS-520S combines all of the fine, field-proven characteristics of the original TS-520 together with many of the ideas, comments, and suggestions for improvement from amateurs worldwide. Kenwood's ultimate objectives . . . to make quality equipment available at reasonable prices.

FULL COVERAGE TRANSCEIVER

The new TS-520S provides full coverage on all amateur bands from 1.8 to 29.7 MHz. Kenwood gives you 160 meter capability, WWV on 15.000 MHz., and an auxiliary band position for maximum flexibility. And with the addition of the TV-502 and TV-506 transverters, your TS-520S can cover 160 meters to 2 meters on SSB and CW.

DIGITAL DISPLAY DG-5 (option)

The new Kenwood DG-5 provides easy, accurate readout of your operating frequency while transmitting *and* receiving.

OUTSTANDING RECEIVER SENSITIVITY AND MINIMUM CROSS MODULATION

The new TS-520S incorporates a 3SK-35 dual gate MOSFET for outstanding cross modulation and spurious response characteristics. The 3SK35 has a low noise figure (3.5 dB typ.) and high gain (18 dB typ.) for excellent sensitivity.

NEW IMPROVED SPEECH PROCESSOR

A new audio compression amplifier gives you extra punch in the pile ups and when the going gets rough.

VERNIER TUNING FOR FINAL PLATE CONTROL

A new vernier tuning mechanism allows easy and accurate adjustment of the plate control during tune-up.

FINAL AMPLIFIER

The new TS-520S 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.

HIGHLY EFFECTIVE NOISE BLANKER

An effective noise blanking circuit developed by Kenwood that virtually eliminates ignition noise is built-in to the TS-520S.

RF ATTENUATOR

The new TS-520S has a built-in 20 dB attentuator that can be activated by a push button switch conveniently located on the front panel.

VFO-520 — NEW REMOTE VFO

The VFO-520 remote VFO has been designed to match the styling of the TS-520S and provide maximum operating flexibility on the band selected on your TS-520S.

AC POWER SUPPLY

The TS-520S is completely self-contained with a rugged AC power supply built-in. The addition of the DS-1A DC-DC converter (option) allows for mobile operation of the TS-520S.

EASY CONNECTION PHONE PATCH

The TS-520S has 2 convenient RCA phono jacks on the rear panel for PHONE PATCH IN and PHONE PATCH OUT.

CW-520 — CW FILTER (OPTION)

The CW-520 500 Hz filter can be easily installed and will provide improved operation on CW.

AMPLIFIED TYPE AGC CIRCUIT

The AGC circuit has 3 positions (OFF, FAST, SLOW) to enable the TS-520S to be operated in the optimum condition at all times whether operating CW or SSB.

The TS-520S retains all of the features of the original TS-520 that made it tops in its class: RIT control • 8-pole crystal filter • Built-in 25 KHz calibrator • Front panel carrier level control • Semi-break-in CW with sidetone • VOX/PTT/MOX • TUNE position for low power tune up • Built-in speaker • Built-in Cooling Fan • Provisions for 4 fixed frequency channels • Heater switch.

Specifications

Amateur Bands: 160-10 meters plus WWV (receive only)
Modes: USB, LSB, CW
Antenna Impedance: 50-75 Ohms
Frequency Stability: Within ±1 kHz during one hour after one minute of warm-up, and within 100 Hz during any 30 minute period thereafter
Tubes & Semiconductors:
Tubes ..... 3 (S2001A x 2, 12BY7A)
Transistors 52
FETs 19
Diodes 101
Power Requirements: 120/220 V AC, 50/60 Hz, 13.8 V DC (with optional DS-1A)
Power Consumption: Transmit: 280 Watts Receive: 26 Watts (with heater off)
Dimension: 333(13⅛) W x 153 (6-0) H x 335(13-(13-3/16) D mm(inch)
Weight: 16.0 kg(35.2 lbs)

TRANSMITTER
RF Input Power: SSB: 200 Watts PEP CW: 160 Watts DC
Carrier Suppression: Better than -40 dB
Sideband Suppression: Better than -50 dB
Spurious Radiation: Better than -40 dB
Microphone Impedance: 50k Ohms
AF Response: 400 to 2,600 Hz

RECEIVER
Sensitivity: 0.25 uV for 10 dB (S+N)/N
Selectivity: SSB:2.4 kHz/-6 dB, 4.4 kHz/-60 dB
Selectivity: CW: 0.5 kHz/-6 dB, 1.5 kHz/-60 dB (with optional CW-520 filter)
Image Ratio: Better than 50 dB
IF Rejection: Better than 50 dB
AF Output Power: 1.0 Watt (8 Ohm load, with less than 10% distortion)
AF Output Impedance: 4 to 16 Ohms

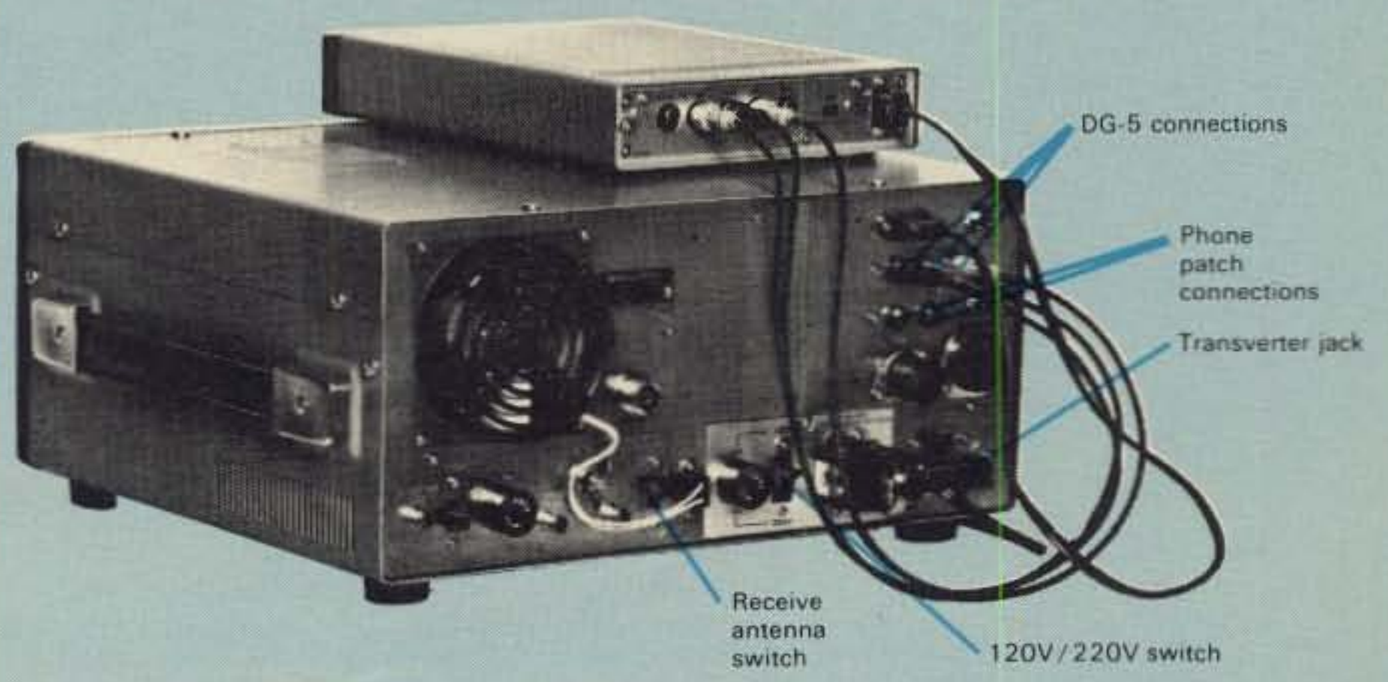
DG-5

SPECIFICATIONS
Measuring Range: 100 Hz to 40 MHz
Input Impedance: 5 k Ohms
Gate Time: 0.1 Sec.
Input Sensitivity: 100 Hz to 40 MHz . . . 200 mV rms or over, 10 kHz to 10 MHz . . 50 mV or over
Measuring Accuracy: Internal time base accuracy ±0.1 count
Time Base: 10 MHz
Operating Temperature: -10° to 50° C/14° 122° F
Power Requirement: Supplied from TS-520S or 12 to 16 VDC (nominal 13.8 VDC)
Dimensions: 167(6-9/16) W x 43(1-11/16) H x 268(10-9/16) D mm(inch)
Weight: 1.3 kg(2.9 lbs)

DG-5
(optional)

The luxury of digital readout is available on the TS-520S by connecting the new DG-5 readout (option). More than just the average readout circuit, this counter mixes the carrier, VFO, and heterodyne frequencies to give you your exact frequency. This handsomely-styled accessory can be set almost anyplace in your shack for easy to read operation . . . or set it on the dashboard during mobile operation for safety and convenience. Six bold digits display your operating frequency while you transmit and receive. Complete with DH (display hold) switch for frequency memory and 2 position intensity selector. The DG-5 can also be used as a normal frequency counter up to 40 MHz at the touch of a switch. (Input cable provided.)

NOTE: TS-520 owners can use the DG-5 with a DK-520 adapter kit.



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That's all, Folks!

All you need for All Mode Mobile, that is.

All Mode Mobile is now yours in a superior ICOM radio that is a generation ahead of all others. The new, fully synthesized **IC-245/SSB** puts you into FM, SSB and CW operation with a very compact dash-mounted transceiver like none you've ever seen.

- **Variable offset:** Any offset from 10 KHz through 4 MHz in multiples of 10 KHz can be programed with the LSI Synthesizer.
- **Remote programing:** The **IC-245/SSB** LSI chip provides for the input of programing digits from a remote key pad which can be combined with Touch Tone* circuitry to provide simultaneous remote program and tone. Computer control from a PIA interface is also possible.

  * a registered trademark of AT&T.
- **FM stability on SSB and CW:** The **IC-245/SSB** synthesis of 100 Hz steps make mobile SSB as stable as FM. This extended range of operation is attracting many FM'ers who have been operating on the direct channels and have discovered SSB.

The **IC-245/SSB** is the very best and most versatile mobile radio made: that's all. For more information and your own hands-on demonstration see your ICOM dealer. When you mount your **IC-245/SSB** you'll have all you need for All Mode Mobile.

SPECIFICATIONS

FREQUENCY COVERAGE	*144.00 to 148.00MHz	SPURIOUS RADIATION	-60 dB BELOW CARRIER	SQUELCH THRESHOLD	-6 dB OR LESS (FM)
MODES	FM (F3)	MAXIMUM FREQUENCY DEVIATION	±5KHz	SPURIOUS RESPONSE	-60 dB OR BETTER
	*SSB (A3J), CW (A1)	MICROPHONE IMPEDANCE	600 OHMS	SYNTHESIZER	
SUPPLY VOLTAGE	DC 13.8V ±15%			FREQUENCY RANGE	144 MHz to 148 MHz
SIZE (mm)	90H x 155W x 230D	RECEIVER SENSITIVITY	*A3J, A1 0.5 MICROVOLT INPUT GIVES 10 dB S+ N/N F3 0.6 MICROVOLT OR LESS FOR 20 dB QUIETING S+ N + D/N AT 1 MICROVOLT INPUT, 30 dB	STEP SIZE	5 KHz for FM *100 Hz or 5 KHz for SSB
WEIGHT	2.1			STABILITY	PER C IN THE RANGE OF -10 TO +60C, ±0.0002/45%
TRANSMITTER					
TX OUTPUT	F3 10W *A3J 10W (PEP), A1 10W			*VALID WITH SSB UNIT ONLY	
CARRIER SUPPRESSION	40 dB OR BETTER				

VHF/UHF AMATEUR AND MARINE COMMUNICATION EQUIPMENT

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DenTron amateur radio products have always been strikingly individual. This is the result, not of a compulsion to be different, but of a dedication to excellence in American craftsmanship. This dedication now extends to one of the worlds finest high performance military amateur amplifiers.

Luxury styling, however, would not be fully appreciated without an exceptional power source. The heart of the MLA-2500 is a heavy duty, self-contained power supply.

Compare the MLA-2500. It has the lowest profile of any high performance amplifier in the world. It's modular construction makes it unique, and at $799.50 it is an unprecedented value.

Very few things in life are absolutely uncompromising. We are proud to count the DenTron MLA-2500 among them. And so will you.

MLA-2500 FEATURES

- 160 thru 10 meters
- 2000+ watts PEP input on SSB
- 1000 watts DC input on CW, RTTY, or SSTV
- Variable forced air cooling system
- Self contained continuous duty power supply
- Two EIMAC 8875 external-anode ceramic/metal triodes operating in grounded grid.
- Covers MARS frequencies without modifications
- 50 ohm input and output impedance
- Built in RF watt meter
- 117 V or 234 V AC 50-60 hz
- Size: 5½" H x 14" W x 14" D.

All DenTron products are made in the U.S.A.

Introducing the new MLA-2500

The linear amplifier beyond compromise.

Amplifier in actual operation.

DenTron Radio Co., Inc.

2100 Enterprise Parkway
Twinsburg, Ohio 44087
(216) 425-3173

Announcing

• **New Brunswick, Canada** — The All Saints Maritime Amateur Radio Convention, Hamfest '77, will be held in St. Andrews, New Brunswick on Sept. 3rd, 4th, and 5th. Five hundred or more hams from Eastern Canada and the Eastern United States are expected to participate in the activities. For more info, contact Howard Mann, VE1RC, c/o All Saints Maritime Convention, R.R. 325-8, Rothesay, N.B., Canada E0G 2W0.

• **Horseheads, NY** — The Elmira Amateur Radio Association is sponsoring it's annual Hamfest to be held on Saturday, Sept. 24th, at the Chemung Co. Fairgrounds, from 10 AM to 5 PM. Fleamarket, Dealer displays, Tech. Talks. Advanced tickets are $2 and at the gate $2.50. Talk-in on 146.52. For further info, contact WA2SMM, 320 W. Ave., Elmira, NY 14904.

• **Erie, PA** — The Radio Association of Erie wish to announce their upcoming "Ham Jam '77" which will be held on Sunday, Sept. 25th from 9 AM to 6 PM at the Rainbow Gardens, Waldameer Park (on the shores of Lake Erie). Advance admission tickets are $1.50 and $2.00 at the gate. Fleamarket space is $1.00 per car. For further info, contact "Ham Jam '77", c/o the Radio Association of Erie, Inc., P.O. Box 844, Erie, PA 16512.

• **Oakwood, GA** — Lanierland A.R.C. will have it's 4th annual "Hamnic" at the Lanier Islands Dogwood Pavillion on Sept. 18th. Large parking area for swap shop and exhibits. No entry charge for Hamnic, however, Lanier Islands charges a $2.00 entry fee for each car. Picnic, hiking, and swimming for the kids. Talk-in on 3975 and .07/.67. For further info, contact Terry Jones, WB4FMJ, Rt. 1, Box 298, Oakwood, GA 30566.

• **Flint, MI** — The Greater Genesee Valley A.R.C. will hold a swap and shop on Sunday, Sept. 11th, from 8 AM to 4 PM at Southwestern High School. Tickets are $1 in advance, $1.50 at the door. Prizes, food, and large tables at reasonable prices for sellers. Talk-in on 31/91 and 52 Simplex. For further info, contact Jack Walters, WA8UXN, 1315 Butcher Road, Fenton, MI 48430.

• **Falls Church, VA** — The 1977 Technical Symposium will be held on Friday evening, Sept. 16th at the Tysons Corner Ramada Inn. This is in conjunction with the ARRL Virginia Station Convention on the 17th and the 18th of the same month. Both the convention and the technical symposium are sponsered by the Northern Virginia Amateur Radio Council (NOVARC). Areas of interest include: propagation, antennas, transmitting and receiving equipment, design and construction techniques, etc. For further info, write or call Paul Rinaldo, W4RI, 1524 Springvale Ave., McLean, VA 22101, (703) 356-8918 evenings or weekends.

• **Mt. Clemons, MI** — The L'Anse Creuse Amateur Radio Club presents it's fifth annual Swap and Shop on Sunday, Sept. 18, 1977. Hours are from 9 AM to 3 PM, at the L'Anse Creuse High School. Tickets are $1.00 in advance and $1.50 at the door. Talk-in on 146.52 and 146.94. For tickets and info, write Harold Price, WB8QFR, 32111 Harper, St. Claire Shores, MI 48082.

• **Falls Church, VA** — The Northern Virginia Amateur Radio Council is sponsoring the 1977 Virginia State Convention during Sept. 16-18 at the Tysons Corner Ramada Inn. It will be devoted entirely to "Getting Started in Amateur Radio" with a special invitation to CBers. There will be FCC exams, DXing, radioteletype, satellite communications, etc. For full details write: NOVARC, P.O. Box 682, McLean, VA 22101.

• **Newport, RI** — The Commerative Station (WSIACR) will be in operation at the Seaman's Church Institute starting Sept. 13th. The sailboats used in this race are 12 meter sailboats and will be the highlight of the sailboat racing this year—truly an international event. WSIACR will be operating 80-2 meters by members of the Newport County Radio Club, W1SYE. To get a QSL card, send a SASE to: Newport County Radio Club, Seaman's Church Institute Bldg., 18 Market Square, Newport , RI 02840.

• **Louisville, KY** — The seventh annual Greater Louisville Hamfest will be held Sunday, Sept. 25th, at the Kentucky State Fairgrounds. There will be indoor exhibits, indoor fleamarket, outdoor fleamarket, and hourly door prizes. Admission is $2 for adults, under 12 free. For more info or motel/camping info, contact Denny Schnurr, K4GOU, 2415 Concord Dr., Louisville, KY 40217, (502) 634-0619.

• **Mena, AR** — On Sept. 10-11, 1977, the Queen Wilhelmina Hamfest will be held atop Rich Mountain. Talk-in on 3995 ke., .52-.52, .19-.79. There will be door prizes, games, and exhibits for everyone. For more info, contact Steven W. Myers, WB5MFI, Rt. 1, Box 204, Hatfield, AR 71945, (501) 389-6791.

• **Parma, OH** — The 1977 Cleveland Hamfest will be held Saturday, Sept. 10th, at the German Central Farms, 7863 York Road from 6 AM to 5 PM. There will be a family picnic, YL activities, commercial displays, and door prizes. Early tickets are $1.50 before August 27th and $2.00 at the gate. Check-in on 146.52 from 0600 to 1200.

• **Kenner, LA** — The Jefferson Amateur Radio Club and the Crescent City Computer Club would like to announce the New Orleans Hamfest/Computerfest which will be held at the Hilton Inn Sept. 24th and 25th. There will be 2 days of commercial exhibits, fleamarkets, and forums. Information on tickets and room reservations will be furnished upon request by contacting the New Orleans Hamfest/Computerfest, P.O. Box 10111, Jefferson, LA 70181.

Our Readers Say

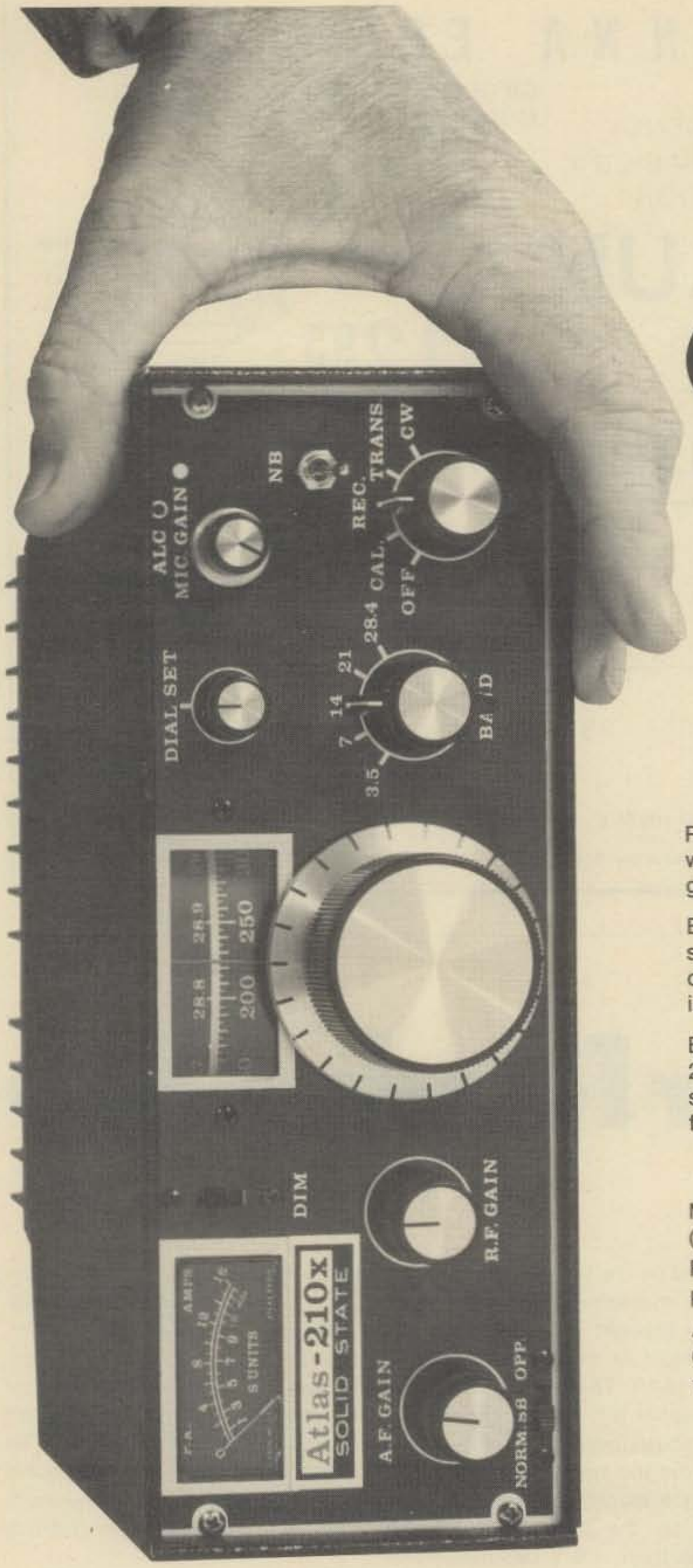
What More Could An Amateur Want!

Editor, CQ:

It all started back in October. I was cheerfully walking out to my mailbox one morning only to be greeted by a scraggly little thing of a magazine, with CQ printed in the upper left hand corner. I walked back into the house and started reading it. Believe me, one can't judge a book, (or magazine in this case) by its cover! It had to be one of the most informative magazines I had ever read, excepting QST. There was a whole section on SSTV, a section on QRP, and best yet, a column set aside just for us novices. Well, the latter part is still true, but the former part, stating about the scraggly little magazine isn't. The other day I walked out to my mailbox and was almost blinded by the beautiful brilliant cover of a magazine about 100 pages thick. I thought to myself, "Hummm, QST must of decided to get a nice cover, at last." Then I saw the word CQ in the upper left hand corner. I raced into the house and started reading what had to be the finest articles I have ever read in a magazine. I am of course referring to the July issue. I opened it up, and there was a real nice touch control keyer. Then I came across a new section – Basic Radio! Again I thought to myself, "Boy, these brand spankin' new hams sure are getting it easy, with all this beautifully written, understandable literature." Then I came across a section on how to build a SSTV camera. Then came a product review. Boy, the magazine is getting better all the time as I move along through it. Next was a well written article on Coherent C.W. Then I came onto an excellent article on ratings of DX countries. I'd been wanting to take a DXpedition, and this gave me some good ideas. Monaco . . . right by France is fairly rare and what a beautiful country it must be with no unemployment, no taxes, coastline and a great oceanographic museum. On it goes, into some really terrific articles.

What I am trying to say is that I really think that you have a great magazine and I hope you keep up the good work. CQ together with QST – what more could an amateur ask for?

Terry Anderson, WB0WNG
Gypsum, KS



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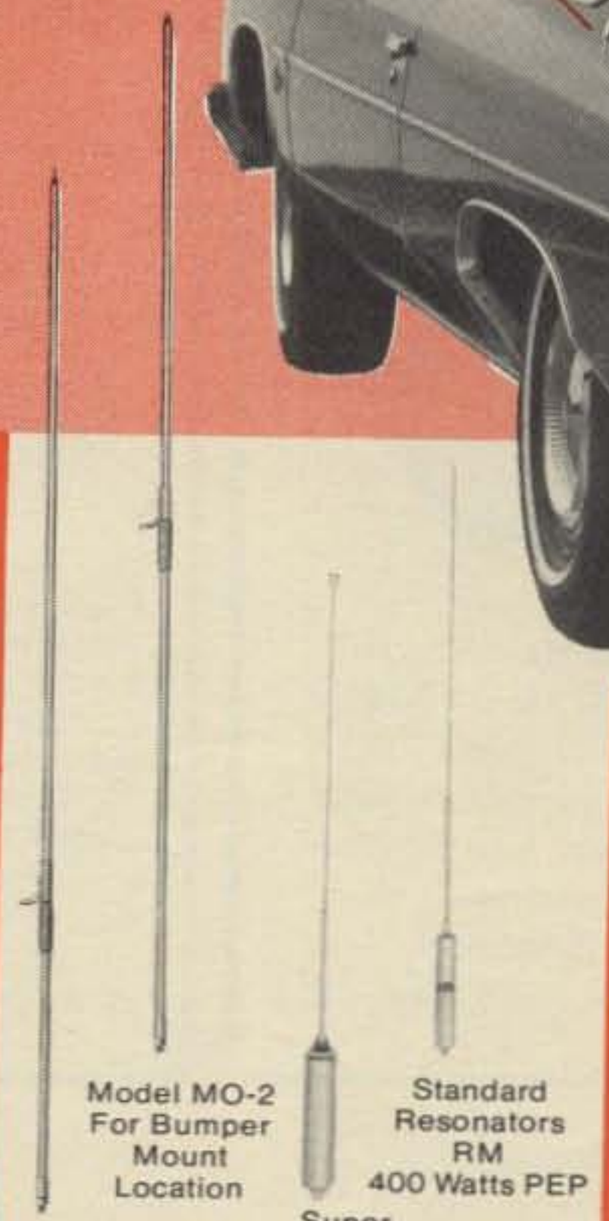

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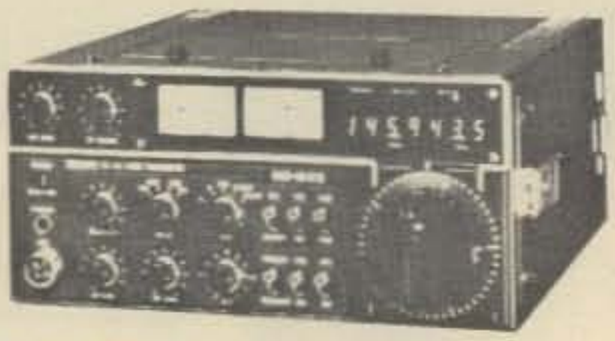

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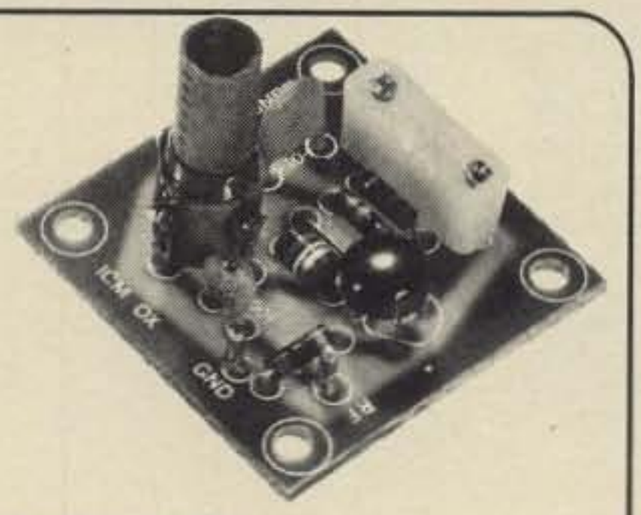

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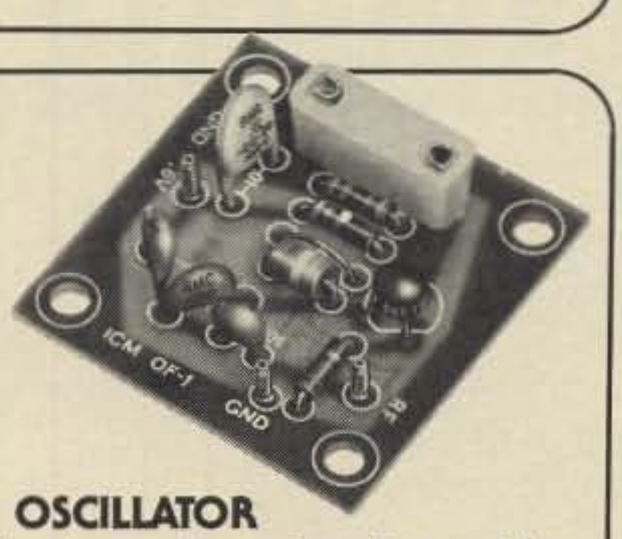

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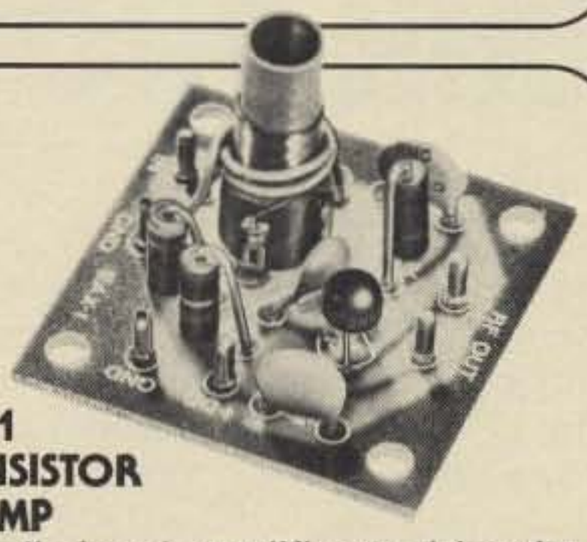

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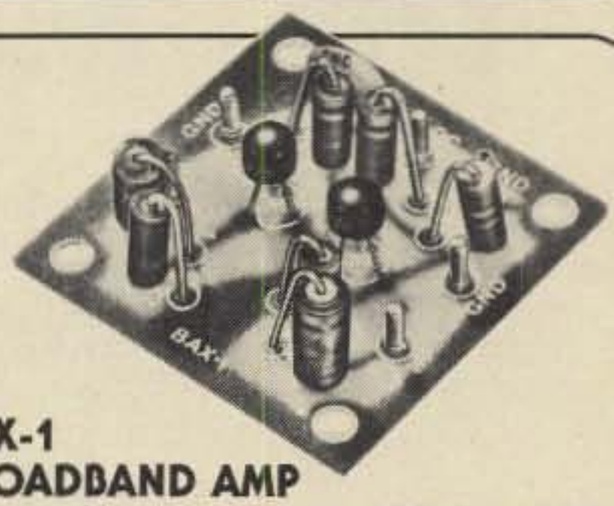

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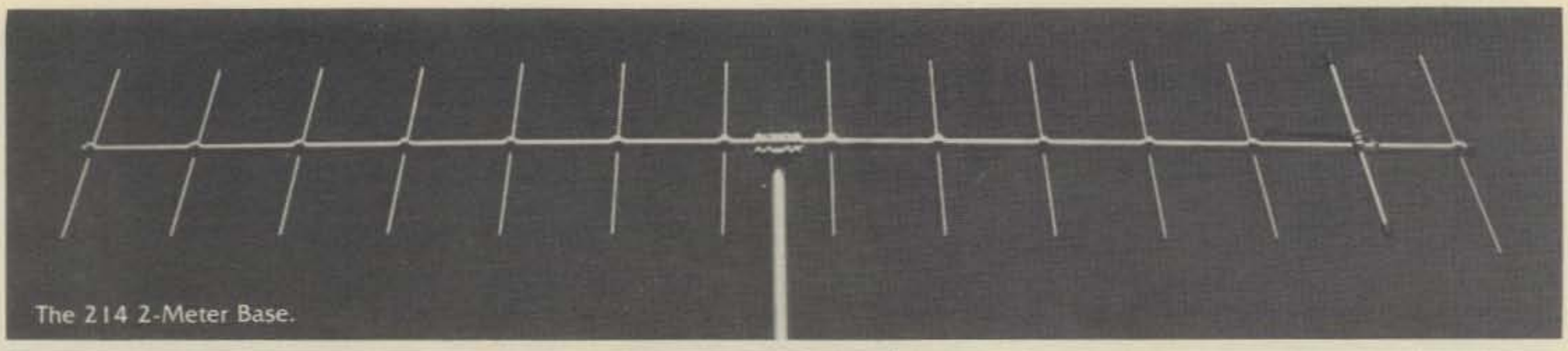

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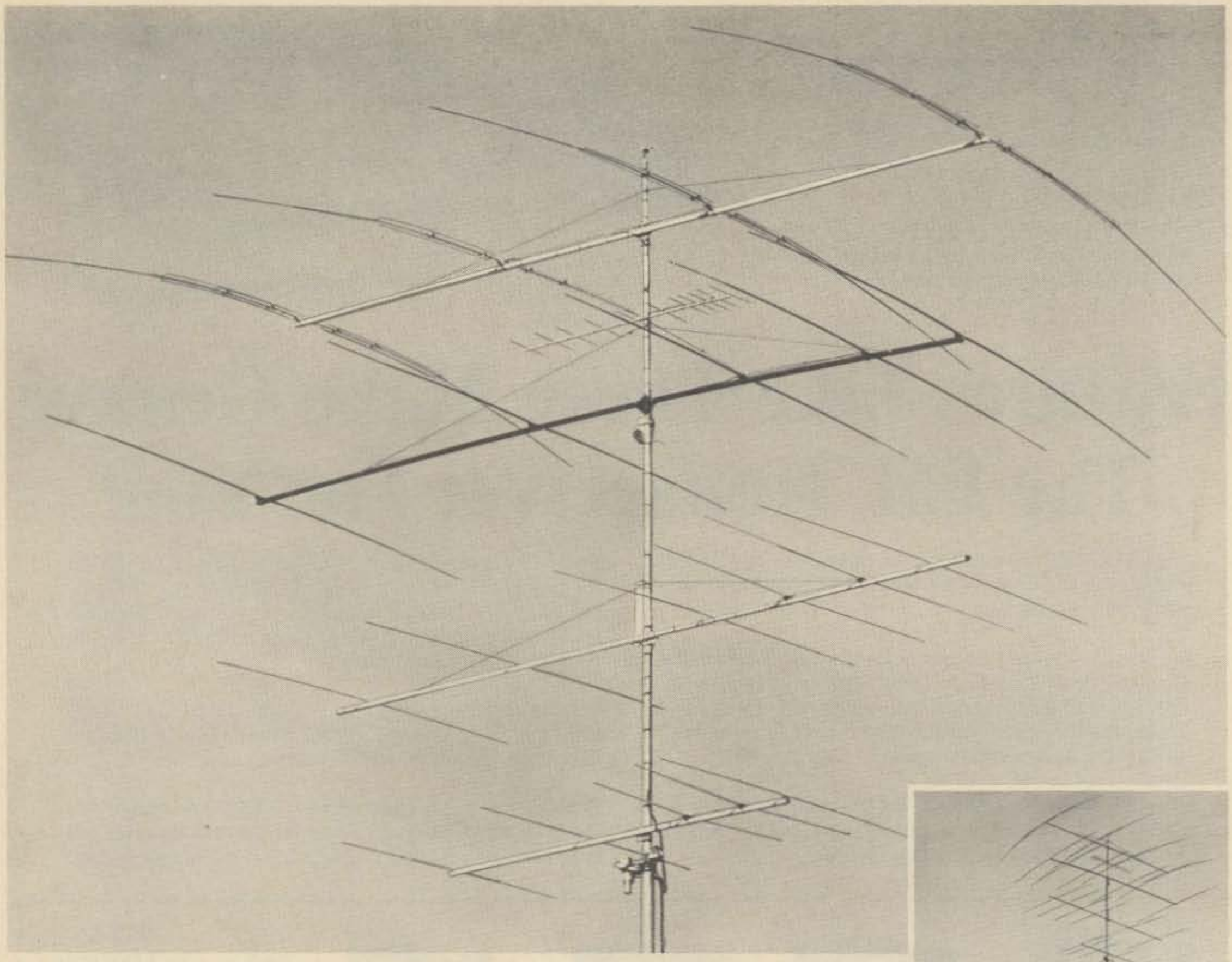

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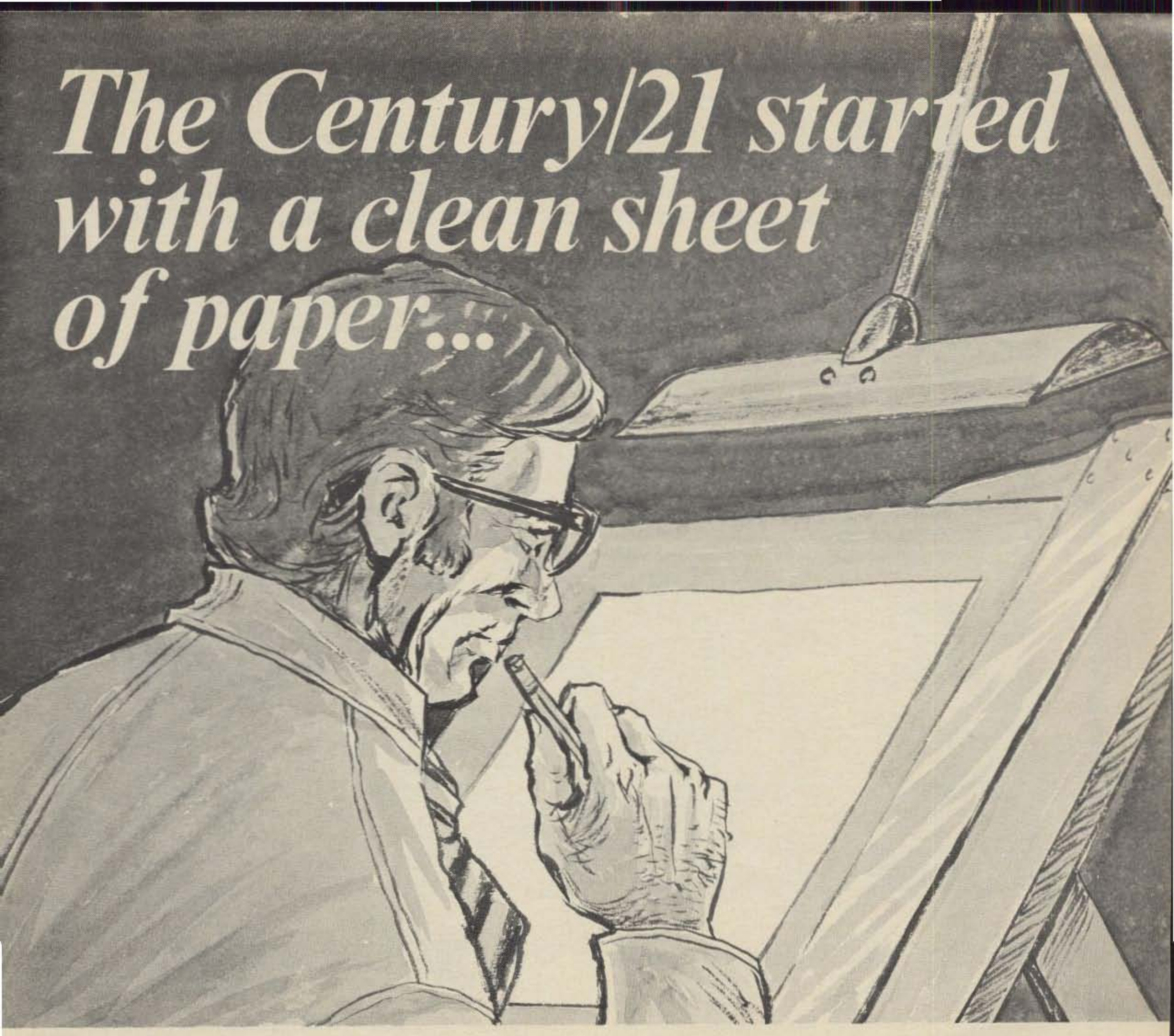

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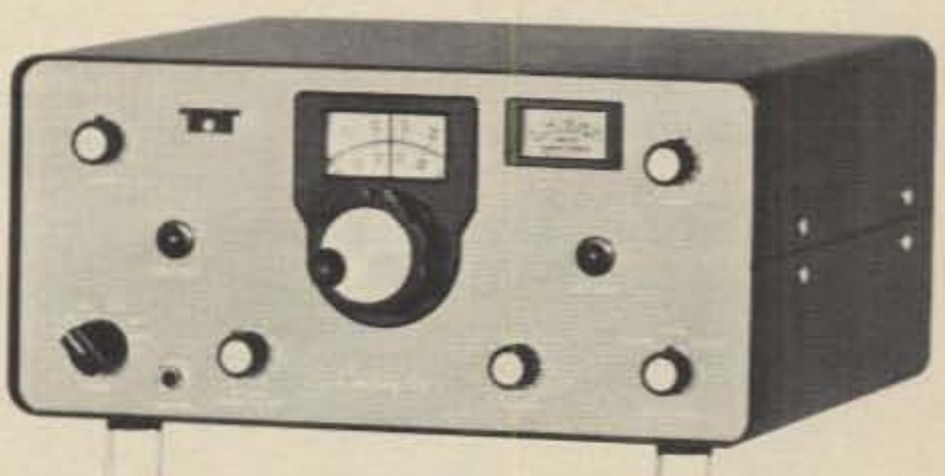

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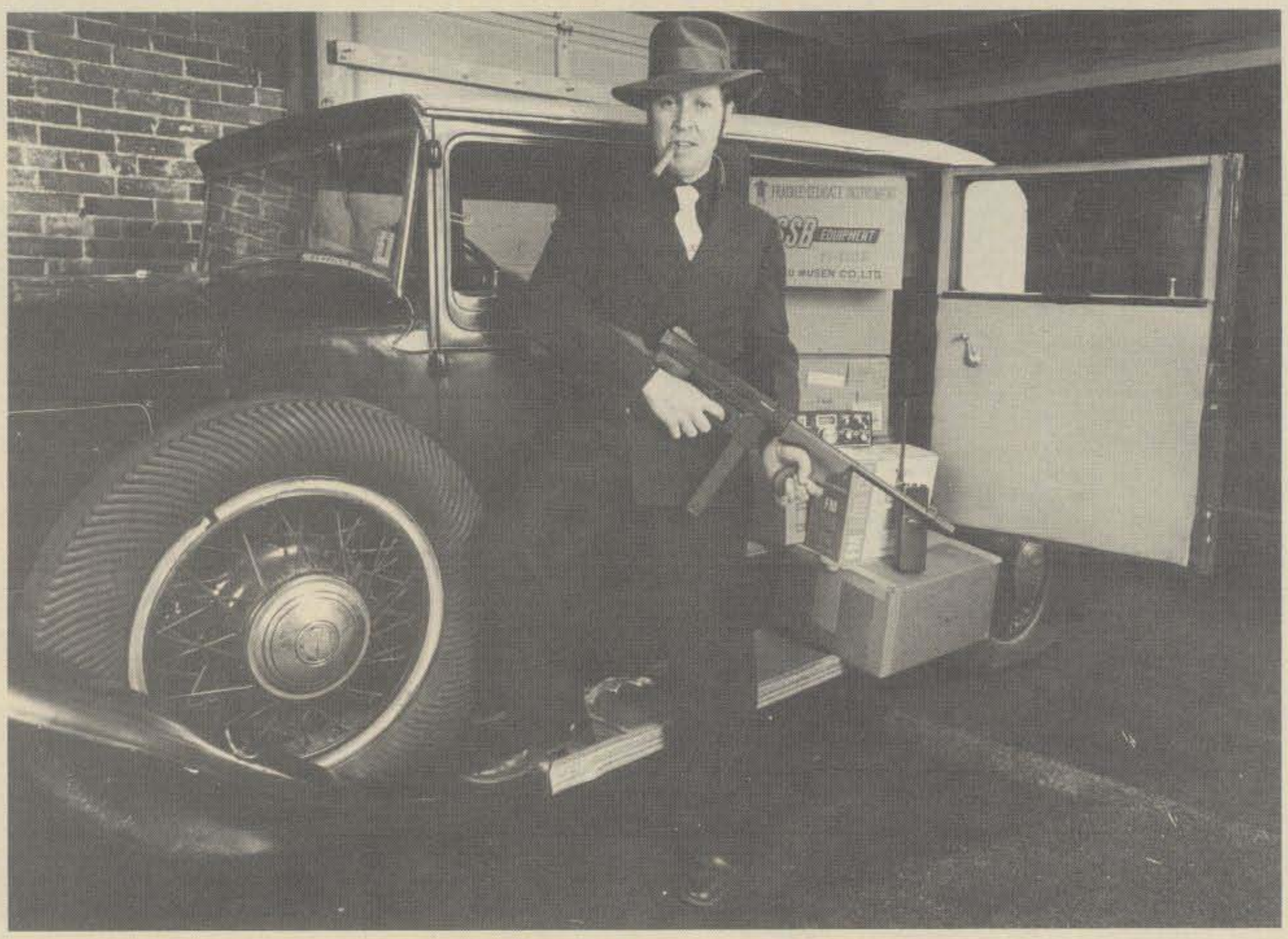


Big John's Minding the Store

If youse recall in our last epissoad, we showed how Big John's rite hand man, name of Alan D'Ape, and his left handed lady, Millie de Moll, by name, provide the hams wit an outstandin' team at CW Electronics. Dere de people wat make poichisun ham gear fun and etc.

Only dis munt Alan is attendin' a bunch of big ham tipe convenshuns so he keeps busy on da road. It's a grate oportunitee to get out an' meet up wit other ham fokes from other areeas. Alan's a reel poisanable fellow and all dat.

Now, Millie, and boy aint she a doll?!,; well she's bin so busy keepin in a fresh new stock of all dat ham ekwipment she's been travelin' back an' fort to dose manufactoorers to make shoor we got plenty goodys in stock all da time. All dem Yaesus an' Kenwoods an' Drakes an' Swans an Atlasas an Dentrons an' evrything, you know how it is. So iffen you don't find Millie in de store dis week you'll ketch her nex week.

Anyhow, da message from Big John is dat dere's always someone at CW all da time to give youse grate poisanal soivice on dose ham radio products. What we lack in cultoor an' refinment we make up in dedikated effort to please de customers. An if youse come in we are goin' to make youse an offer what you won't ever want to refoos. Dat's cauz we're da CW gang what makes buyin' ham gear a pleasoor.

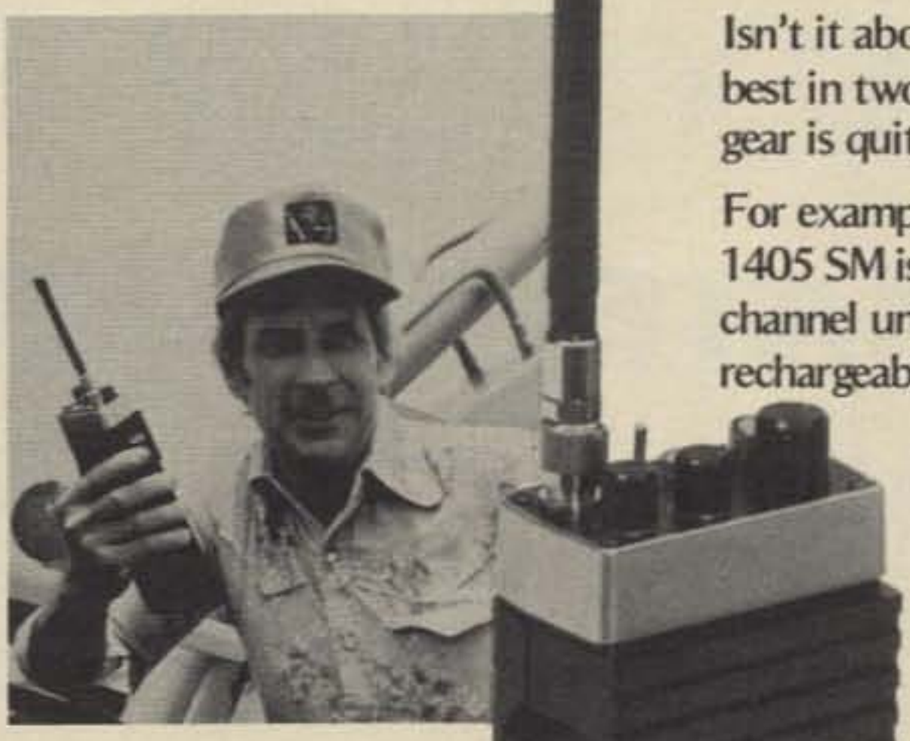
THESE TWO WORDS SHOULD ALWAYS BE USED TOGETHER:

Wilson ... and 2-Meter!

The newest and hottest 2-Meter rig, is the Wilson WE-800 . . .

It is totally portable, powered by internal rechargeable Ni-Cad batteries, and weighs less than 4 lbs.

The C-MOS synthesizer allows 800 channel selections, and the unit has the feature of a Hi/Lo 1 or 12 watt power option switch (when used as a mobile or base).



Isn't it about time you afford yourself the best in two-meter equipment? The Wilson gear is quite affordable.

For example, the 2-Meter Hand-Held Model 1405 SM is a switchable 1 and 5 watt, six channel unit powered by 10 "AA" rechargeable nickel cadmium batteries.

Tough? You bet . . . the Lexan® outer housing will allow rough and rugged use. 500 milliwatts of audio power will get the signal through even in high noise areas.

Additional features include 600 KHz offset up or down. 2 additional offsets available for non-standard repeaters, and five channel pre-programmed matrix selector.

The WE-800 is truly the ideal equipment for the discriminating amateur who wants a "go anywhere" radio. The Wilson WE-800 is priced under $400.00.

1405 SM

WE-800

Portable 800 Channel Synthesized 2 Meter Radio

Through efficient engineering, the unit provides 60 dB intermodulation protection in heavy RF traffic areas. Separate speaker and microphone are built into the design of the radio.

Wilson 2-Meter Hand-Helds are priced from $192.95 and a complete line of accessories and tone options are available.

Join the thousands of Hams now on the air world-wide with the affordable Wilson portables.

Other Quality Amateur Equipment from Wilson includes Antennas, Rotors, Towers

Want more information and specifications on these products? Contact:

Your Local Dealer or the Consumer Products Division,

Wilson Electronics Corp.

4288 SO. POLARIS • P. O. BOX 19000 • LAS VEGAS • NEVADA • 89119

(702) 739-1931 • TELEX 684-522

Ted and Meredith Henry team up for another DXpedition across the Pacific. Read about their travels in the coming months of CQ and better yet work them as they travel along Odyssey "77".

ODYSSEY "77"

AN AMATEUR RADIO TRIP AROUND THE WORLD

BY TED HENRY*, W6UOU

DX is the magic word in amateur radio. No single aspect of our hobby so excites the imagination or more fully illuminates the essence of its appeal for amateurs all over the world. During forty years this salient fact has been as impelling for me as it still is for DX'ers everywhere. It is for this reason that my wife, Meredith W6WNE, and I are so pleased that *CQ* Magazine is joining us in documenting the ultimate radio thrill, a DXpedition right around the world. We are calling it our "Odyssey 77".

*11240 West Olympic Blvd., Los Angeles, Calif. 90064

Ted, W6UOU, and Meredith, W6WNE, are very happy contemplating their trip with the map in the background and their new amplifier just waiting to bust through the pile-ups.

Our trip will, we hope, celebrate the arrival of number 21 in the modern series of sunspot cycles. Long distance communicators have impatiently awaited the arrival of the new cycle remembering all too vividly the non-stop 24 hour propagation bonanza that prevailed during the historic highs of cycle 20.

The question has been asked, "why would anyone want to endure a radio DXpedition?". It's a fair question and a flip answer would be the mountaineer's reply, "because it is there". But the real explanation is not quite so simple and is considerably more basic than that.

Having experienced two previous radio trips to the South Pacific, I can affirm that radio offers no greater thrill. The emotional impact one feels when the calls start flooding in from all over the world, the sudden wonderment of communicating across time and space, the babel of voices from all the continents, messages floating from my sunset to their dawn, signal reports (the common world language of amateur radio) passing from culture to culture, these things are the "why" of a DXpedition. So finally the answer to the question is if you have to ask "why", then probably you will never understand "why".

Because we are among the initiate who understand "why", on about August 15th, Meredith and I will depart Los Angeles flying west to Oceania. In the baggage compartment will be the latest in amateur s.s.b. transceivers chosen especially for its maximum adaptability and efficiency in split-channel DX operation. Also flying along with us will be a prototype of our newest full power Desk Model Amplifier. Finally we will be carrying a two element

tri-band beam modified for portability so that it can be transported in the baggage compartment of any commercial aircraft. Hopefully with equipment of this quality, we will be heard in the U.S. whenever there are band openings. It will be interesting indeed to observe the level of the signal we can develop as we proceed from continent to continent to continent.

In all we plan to operate from five or six different locations. The first stop will be in the far Pacific for a period of about four days around August 16th to the 20th. The next one or two stops will be in Asia and the final two or three will be in Africa. In so far as possible, we'll try to schedule operations during weekends in the U.S. and traveling times during the middle of the week in this way exposing ourselves to the maximum number of contacts. If all goes well, the last operation will be about October 1st.

Making up the itinerary for this kind of expedition is more than challenging. The first chore is compiling a potential list of rare countries that are in demand. During this phase we have relied heavily on John Irvin's "How Rare Is That Country?" in July *CQ* and on the "1977 Needed Country Survey" of the WCDXB.

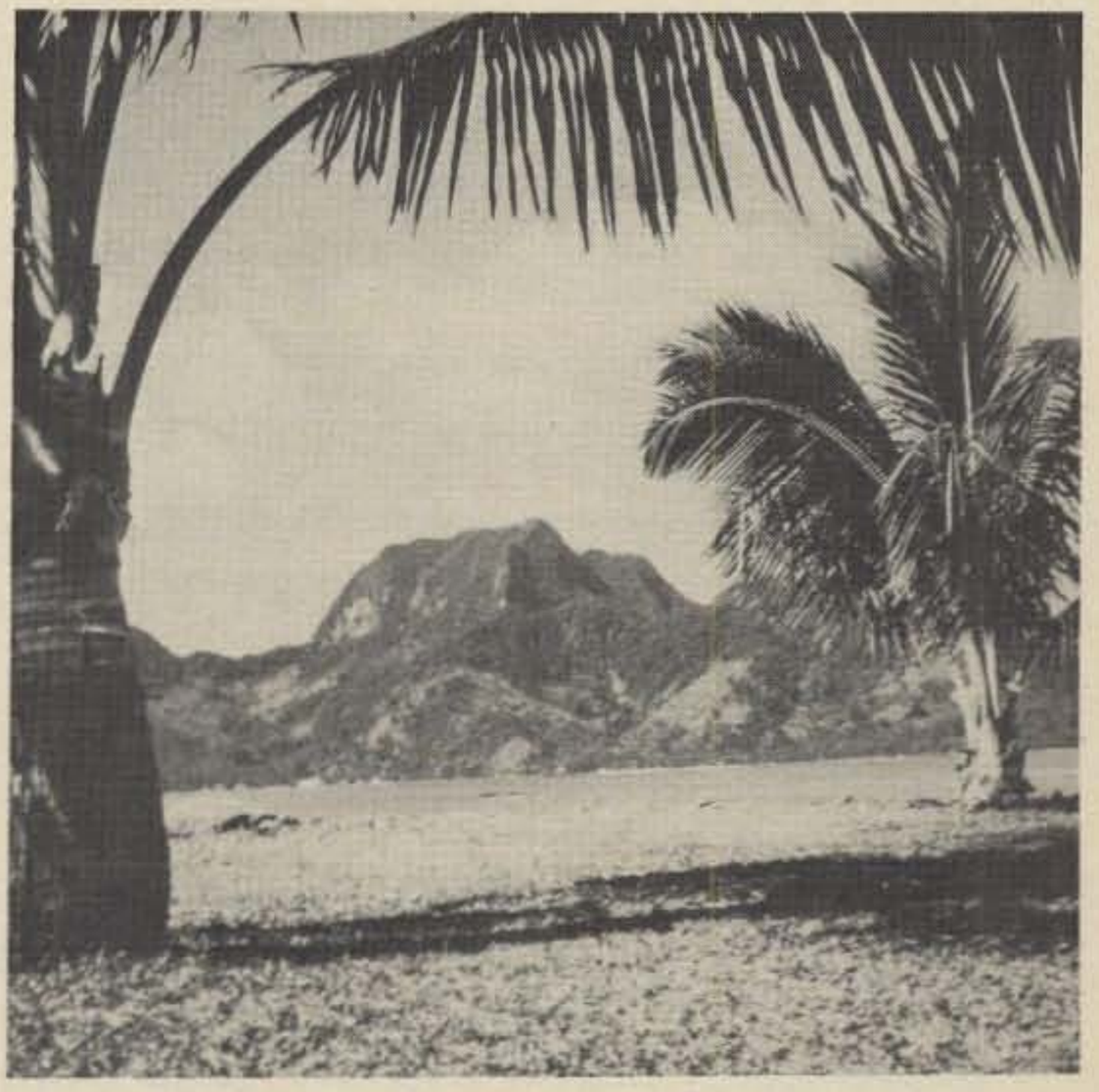
After a tentative list of prospects is compiled, then begins the weeding out process. One country can't be reached by normal means of transportation as part of a necessarily tight schedule. The next country has an unsympathetic government which doesn't understand ham radio and doesn't want to understand. Some locations are unfavorable for radio propagation to the U.S. during the time period involved. A number are doubtful because of possible bad weather. Typhoons and monsoon storms are not included in our plans. Finally a group is excluded because we would not be welcome there.

So one by one the prospects fall and finally, after a seemingly endless river of letters and cablegrams have floated back and forth, the list comes down to a precious few. These furnish the rationale for our radio experience of a lifetime.

We are ready. The equipment is ready. Special QSL cards are being printed for each location. If you want a QSL, all we ask is a stamped self-addressed envelope to match a valid two-way exchange of reports. For any station which QSO's us at all locations, we are even preparing a deluxe certificate of confirmation. Our address is P.O. Box 64398, Los Angeles, Calif. 90064. For ourselves we will be trying for WAS and DXCC from every spot we visit. Can we do it? Only if amateurs all over the world help us.

By the time you read this we will be travelling, eager for the opportunity once again to say "hello" to our thousands of radio friends. Join with us in welcoming the new "DX" cycle. Join us on our "Odyssey '77". ■

SEND IN EARLY FOR ALL CQ CONTEST LOG AND SUMMARY SHEETS



The Pacific offers many delightful spots for a DXpedition. Tropical climate, beautiful surroundings and great band openings to the U.S.A. The above scene was the operating position at W6UOU/KS6 in 1958.

1977 CQ World-Wide DX Contest

Phone: October 29-30 & C.W.: November 26-27
Starts 0000 GMT Sat. Ends 2400 GMT Sun.

I. OBJECTIVE: For amateurs around the world to contact other amateurs in as many zones and countries as possible.

II. BANDS: All bands, 1.8 thru 28 MHz.

III. TYPE OF COMPETITION:

1. Single Operator (Single band and all band). Single operator stations are those at which one person performs all of the operating, logging, and spotting functions. The use of DX spotting nets or any other form of DX alerting assistance places the station in the Multi-Operator category.

2. Multi-Operator (all band operation only).

a. Single Transmitter, only one transmitter and one band permitted during the same time period (defined as 10 minutes). *Exception:* One—and only one—other band may be used during the same time period if—and only if—the station worked is a new multiplier.

b. Multi Transmitter (no limit to transmitters but only one signal per band permitted).

IV. NUMBER EXCHANGE: Phone: RS report plus zone (i.e.: 5705). C.W.: RST report plus zone (i.e.: 57905).

A station in a call area different than that indicated by its call sign is required to sign portable.

V. MULTIPLIER: Two types of multiplier will be used.

1. A multiplier of one (1) for each different zone contacted on each band.

2. A multiplier of one (1) for each different country contacted on each band.

Stations are permitted to contact their own country and zone for multiplier credit. The *CQ* Zone Map, DXCC country list, WAE country list and WAC boundaries are standards.

VI. POINTS: 1. Contacts between stations on different continents are worth three (3) points.

2. Contacts between stations on the same continent but different countries, one (1) point. *Exception:* For North American stations *only*, contacts between stations within the North American boundaries count two (2) points.

3. Contacts between stations in the same country are permitted for zone or country multiplier credit but have zero (0) point value.

VII. SCORING: All stations: the final score is the result of the total QSO points multiplied by the sum of your zone and country multiplier.

Example: 1000 QSO points × 100 multiplier (30 Zones + 70 Countries) = 100,000 (final score).

VII. AWARDS: First place certificates will be awarded in each category listed under Sec. III in every participating country and in each call area of the United States, Canada, Australia and Asiatic USSR.

All scores will be published. To be eligible for an award a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must operate a minimum of 24 hours. A single-band log is eligible for a single-band award *only*. If a log contains more than one band it will be judged as an all-band entry, unless specified otherwise.

In countries or sections where the returns justify, 2nd and 3rd place awards will be made.

All certificates will be issued to the licensee of the station used.

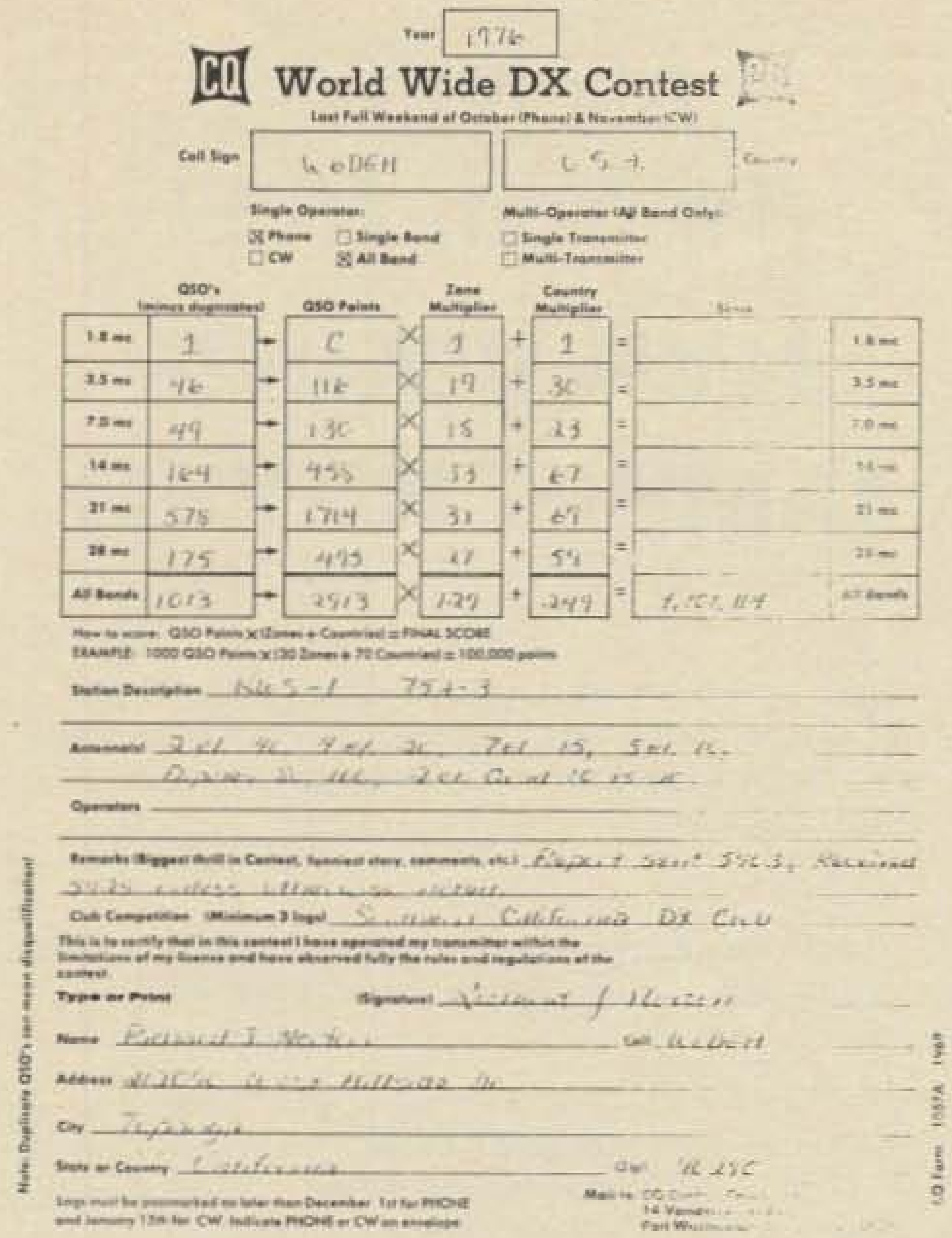
IX. TROPHIES & PLAQUES: Handsome awards will be made to the highest scoring stations in the following categories.

Single Operator, All Band Trophy Donors

World—Phone. (Bill Leonard, W2SKE)
World—C.W. (Larry LeKashman, W2AB)
USA—Phone. (Potomac Valley Radio Club)
USA—C.W. (Frankford Radio Club)
Canada—Phone. (Jack Baldwin, VE3BS)
Canada—C.W. (Canadian DX Association)
Europe—Phone. (W4BVV Operators)
Europe—C.W. (W3AU Operators)
Carib./C.A.—Phone. (Don Wallace, W6AM)
Carib./C.A.—C.W. (Don Wallace, W6AM)
Africa—Phone. (Gordon Marshall, W6RR)
Africa—C.W. (Gordon Marshall, W6RR)
Asia—Phone. (Japan CQ Magazine)
Asia—C.W. (Japan CQ Magazine)
Oceania—Phone. (No. Calif. DX Club)
Oceania—C.W. (Maui Amateur Radio Club)

Single Operator, Single Band Trophy Donors.

World—Phone. K2HLB Memorial Trophy. (North Jersey DX Assoc.)
World—C.W. W2JT Memorial Trophy. (North Jersey DX Assoc.)
World—3.5 MHz Phone. (Fred Capossela) (K6XX/K6SSS)
World—3.5 MHz C.W. (Fred Capossela) (K6XX/K6SSS)
Canada—Phone. (Gene Krehbiel, VE7KB)
Carib./C.A.—Phone. (Pedro Piza, Jr. KP4AST)
So. America—Phone. (Brazil DXers)
Oceania—14 MHz Phone. VK3JW Memorial. (International Pacific DX Net)
Europe—14 MHz C.W. G2LB Memorial. (From His Friends)



Year 1976

World Wide DX Contest

Last Full Weekend of October (Phone) & November (CW)

Call Sign: W6DEH — Country: U.S.A.

Single Operator: ☒ Phone ☐ CW ☐ Single Band ☒ All Band

Multi-Operator (All Band Only): ☐ Single Transmitter ☐ Multi-Transmitter

Band	QSO's (minus duplicates)		QSO Points		Zone Multiplier		Country Multiplier		Score	Band
1.8 mc	1	→	0	×	1	+	1	=		1.8 mc
3.5 mc	46	→	116	×	19	+	30	=		3.5 mc
7.0 mc	49	→	130	×	15	+	23	=		7.0 mc
14 mc	164	→	455	×	33	+	67	=		14 mc
21 mc	578	→	1714	×	31	+	69	=		21 mc
28 mc	175	→	495	×	27	+	59	=		28 mc
All Bands	1013	→	2913	×	129	+	249	=	1,101,114	All Bands

How to score: QSO Points × (Zones + Countries) = FINAL SCORE

EXAMPLE: 1000 QSO Points × (30 Zones + 70 Countries) = 100,000 points

Station Description: [illegible]

Antenna(s): [illegible]

Operators:

Remarks (Biggest thrill in Contest, funniest story, comments, etc.): [illegible]

Club Competition (Minimum 3 logs): Southern California DX Club

This is to certify that in this contest I have operated my transmitter within the limitations of my license and have observed fully the rules and regulations of the contest.

Type or Print — (Signature) [illegible]

Name [illegible] — Call W6DEH

Address [illegible]

City [illegible]

State or Country California

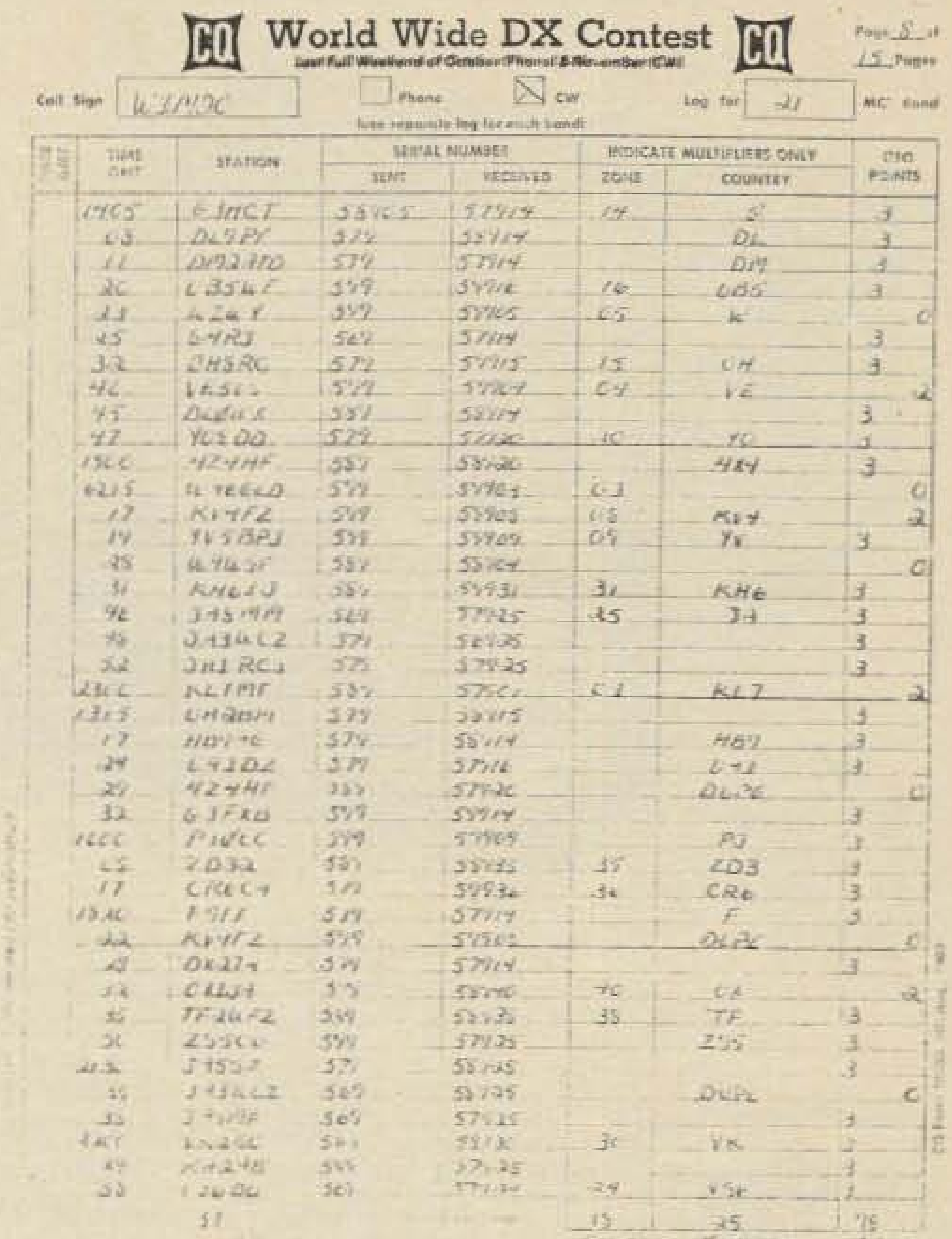
Logs must be postmarked no later than December 1st for PHONE and January 15th for CW. Indicate PHONE or CW on envelope.

Mail to: CQ [illegible]

Note: Duplicate QSO's can mean disqualification!

CQ Form 1057A 1969

Sample Summary Sheet



World Wide DX Contest

Last Full Weekend of October (Phone) & November (CW)

Page 8 of 15 Pages

Call Sign: W3MDC — ☐ Phone ☒ CW — Log for 21 MC Band

(use separate log for each band)

Time GMT	Station	Serial Number Sent	Serial Number Received	Zone	Country	QSO Points
1405	KJ4CT	58905	57914	14	[illegible]	3
08	DL9PY	579	55914		DL	3
11	DM2AHO	579	57914		DM	3
20	UB5WE	579	54916	16	UB5	3
23	W2[illegible]	579	59905	05	W	0
25	G4RJ	569	57914			3
32	OH5RC	579	57915	15	OH	3
40	VE3[illegible]	579	57904	04	VE	2
45	DL6[illegible]	559	58914			3
47	YO3DQ	579	57920	20	YO	3
1500	4Z4HF	559	58920		4X4	3
1515	[illegible]	579	59903	03		0
17	KV4FZ	579	55908	08	KV4	2
19	YV5BPJ	579	55909	09	YV	3
25	[illegible]	559	55904			0
31	KH6IJ	559	55931	31	KH6	3
42	JA5[illegible]	569	57925	25	JA	3
45	JA3[illegible]	579	56925			3
52	JH1RCJ	579	57925			3
1600	KL7[illegible]	589	57501	01	KL7	2
1615	[illegible]	579	55915			3
17	HB9[illegible]	579	55914		HB9	3
24	[illegible]	579	57916		[illegible]	3
29	4Z4HF	559	57920		DUPE	0
32	G3FXB	579	55914			3
1700	PJ2CC	579	57909		PJ	3
05	ZD3X	559	55935	35	ZD3	3
17	CR6[illegible]	579	59936	36	CR6	3
1830	F9[illegible]	579	57914		F	3
32	KV4FZ	579	57902		DUPE	0
38	OK2[illegible]	579	57914			3
38	CX[illegible]	579	55940	40	CX	2
45	TF2WFZ	559	55935	35	TF	3
50	ZS5[illegible]	579	57935		ZS5	3
2035	JA5[illegible]	579	58935			3
35	JA3[illegible]	569	55925		DUPE	0
35	JA7[illegible]	569	57925			3
2407	VK2[illegible]	589	55930	30	VK	3
49	KA2[illegible]	559	57925			3
53	[illegible]	569	57924	24	VS6	3
	51			15	25	75

Sample Log Sheet

USA—Phone. (Southern Calif. DX Club)

USA—C.W. (Northern Illinois DX Assoc.

Multi-Operator, Single Trans. Trophy Donors

World—Phone. (John Knight, W6YY)

World—C.W. (Anthony Susen, W3AOH)

Canada—Phone (Calgary A. R. A.)

Multi-Operator, Multi Transmitter Donors

World—Phone. (Radio Club Venezolano)

World—C.W. (Hazard Reeves, K2GL)

USA—Phone. (Dale Hoppe, K6UA)

USA—C.W. (Rush Drake, W7RM)

Contest Expedition Trophy Donors

World—Phone, Single Operator. (Stuart Meyer, W2GHK)

World—C.W., Single Operator. K2HLB Memorial. (Don Miller, W9WNV)

World—Phone, Multi-Operator. (Bill Schneider, K2TT/K2UYG)

World—C.W., Multi-Operator. (Bill Schneider, K2TT/K2UYG)

Trophy winners may win the same trophy only once within a three year period. (This does not apply to any of the CQ Special Awards.)

The Canadian, Carib./C.A. and the African awards are for residents *only*.

A resident is defined as one living in that country with an established Post Office address.

X. CLUB COMPETITION: *CQ* will award a handsome plaque to the club submitting the highest aggregate score of the phone and c.w. scores submitted by its members.

1. The club must be a local group and not a national organization.

2. Participation is limited to members operating within a local geographic area, (except for DX-peditions especially organized for operation in the contest and manned by members.)

3. To be listed, a minimum of 3 logs must be received from a club and an officer of the club must submit a list of participating members and their scores, both on phone and c.w.

XI. LOG INSTRUCTIONS:

1. All times must be in GMT.

2. Indicate zone and country multiplier only the FIRST TIME it is worked on each band.

3. Logs must be checked for duplicate contacts, correct QSO points and multipliers, and recopied logs must be in their original form with corrections clearly shown.

4. Use a separate sheet for each band.

5. Each entry must be accompanied by a Summary Sheet showing all scoring information, category of competition, contestant's name and address in BLOCK LETTERS and a signed declaration that all contest rules and regulations for amateur radio in the country of operation have been observed.

6. Official log and summary sheets and zone maps are available from *CQ*. A *large* self-addressed envelope with sufficient postage or IRC's must accompany your request.

If official forms are not available, make up your own by following the samples shown, 40 contacts to the page on 8½"x11" paper.

7. All entrants are required to submit cross-check (dupe) sheets for each band on which 200 or more QSO's were made. All other entrants are encouraged to submit dupe sheets.

8. *For each duplicate contact that is removed from a log by the committee, a penalty of three additional contacts will be exacted.*

XII. DISQUALIFICATION: Violation of amateur radio regulations in the country of the contestant, or the rules of the contest, unsportsmanlike conduct; taking credit for excessive duplicate contacts; unverifiable QSO's or unverifiable multipliers will be deemed sufficient cause for disqualification. (In-correctly logged calls will be counted as unverifiable contacts.

Disqualification can also result in the disqualified operator(s) being barred from competition in all *CQ* contests for a period of up to three years.

Actions and decisions of the *CQ* Contest Committee are official and final.

XIII. DEADLINE: All entries must be postmarked NO LATER than December 1, 1977 for the Phone section and January 15, 1978 for the C.W. section. Indicate phone or c.w. on envelope. Logs go to:

CQ WW Contest Committee
14 Vanderventer Avenue
Port Washington, L.I., N.Y. USA 11050

CQ Reviews:

The Heathkit GH-17A Soldering Iron Kit

BY ALAN M. DORHOFFER*, K2EEK

What can you say that is glamorous or exciting about a soldering iron. It works or it doesn't work? It looks nice and is easy to use? Well the same could be said for many other irons on the market but I don't recall any irons that come in kit form. That's right a soldering iron kit.

The Heathkit GH-17A soldering iron kit is also unique in that you can use the kit to build the kit, as you go along. Obviously if you didn't have a soldering iron before, you'd need something to solder the connections in building this kit. Under the "Special Soldering Instructions" section in the manual they explain how to complete the soldering iron kit using the kit itself.

The kit is quite simple to wire and assemble and takes about an hour from the time you open the box to the time you can solder your first connection.

The iron operates off of a 6 volt transformer and has a nominally rated 25 watt element. A front panel switch selects three heat ranges; Low (2 watts), Med. (22 watts), and High (24 watts), plus an Off position. A neon indicator glows at different intensities for the three ranges. There is a heavy-duty six foot cord attached to the iron and a heavy-duty six foot three-wire power cord.

The iron heats up in about a minute or so and can be stored in a bracket on top of the cabinet between soldering jobs. A hood (see photo) over the cabinet protects you and other burnable objects from the iron while it is not in actual use. The bracket also has a cut-out that will hold the iron-handle stationary, with the tip extended from the rear of the hood, so that you can bring work to the iron and in effect have a "third hand" at the ready.

The cabinet measures 5⅛"x3⅝"x5½" and the completed unit weighs 3 pounds. Four rubber feet keep the iron assembly from sliding over the bench when in use.

The GH-17A is really an ideal little tool that does a big job. It comes with a small chisel tip (two other styles are available) that can do just about any soldering job you have in mind from simple repairs to building any solid-state device. You can put your old soldering gun to rest now.

The Heathkit GH-17A soldering iron kit sells for $24.95 (plus shipping) and is available from Heathkit Company, Benton Harbor, Michigan 49022. They'll also send you their catalog of other kits that you can build now that you have your soldering iron. ■

The Heathkit GH-17A Soldering Iron

*Editor, CQ

Over the next few months, Herb Friedman will ease us over the hurdles into the realm of computers. This first installment goes into some of the language used and problems that can be solved with computers.

I Think I'll Just Pass By The Computers

BY HERB FRIEDMAN*, W2ZLF

Like many other amateurs and electronics experimenters I had just about decided I could get along very nicely without getting into what has been termed *personal computing*. As a somewhat active amateur for 30 years, an amateur photographer well into color printing (with electronic color controls I home-brewed), a *Saturday auto mechanic* (as I'm called in *Popular Mechanix),* and the father of two children with similarly expensive tastes in hobbies, the very last thing in the world I needed was computer equipment. To be perfectly honest, I strongly objected to computer articles in amateur radio publications on the basis that I paid for a subscription to what professed to be an "amateur radio publication," and I expected to get amateur radio articles for my money.

*588 Hewlett St., Franklin Square, N.Y. 11010

WB2AHN ready to open the station and clearing the computer for logging. The computer, a SWTP 6800 is tucked away in the basement and remote controlled from the terminal system which is a Micro-Term ACT II. The acoustic coupler on top of the ACT II keyboard is part of an internal modem that permits the terminal to talk with a rental time-share computer system via the telephone.

Fact is, if I had any serious problems in life they were all the result of a computer: My being hounded to pay a traffic fine because a computer snafued my license number with the guy who actually jumped the light; my local utility insisting I use more power in 30 days than the city of Syracuse, N.Y. uses in a year; my paycheck getting delayed 30 days — all the result of a *computer error*. (Actually, I've come to learn computer errors are generally human errors caused by the boss hiring $2.50/hr unskilled labor to replace someone having a moderate degree of intelligence earning $5/hr.)

Even when the Jr. Op got hooked by the high school's computer installation I resisted all entreaties for "our very own personal computer." I always had the out: (A) "If you need to use a computer so badly stay after school." (B) "I'm your father and we're not starting any new hobbies in this house."

Unfortunately, one day the Jr. Op announces he is now a *General,* and "as one amateur to another we are on an equal footing." (I will forever stop using the line "Everyone's the same age behind a telegraph key.") Even worse, he says "There's no reason for two sets of equipment and antennas. Let's share, starting with a multiband antenna."

Five pages of matching section calculations later I'm no closer to an antenna system because I'm using formulas and math I haven't used in some twenty years when the Jr. Op whips out a T.I. SR-52 calculator, pops a small magnetic card into a slot, touches a few buttons, and gives me a full set of values for OUR antenna system.

"Great calculator," I say.

"No. Great computer," he says. (At this point I had not smelled the rat.) A short, but heated discussion over what constitutes a computer (it can make a decision, a calculator cannot make a decision) led to an evening spent loading every electronic and photographic formula I knew onto mag-

netic cards. I had entered the computer age. Yes, I was kicking and screaming all the way, but I was being pulled into modern technology—I would compromise on a "programmable calculator."

Some two weeks after WE erected OUR multiband antenna the Jr. Op suggested we computerize our logbooks. "After all," he says with an absolutely straight face, "Many times we QSO a station we worked a while back; forget who, what, and where, and rehash the same info. If we loaded the highlights of the contact into a computer we could instantly call up the station's previous QSOs and have a decent discussion on problems, equipment, vacations, and the like, that we covered on earlier contacts." (Still, I don't smell a rat.)

"How are we going to get all that info on a programmable calculator's magnetic card. I doubt it could even handle that type of input," I say with absolute stupidity.

"No sweat OM. I'll borrow a TV terminal and we'll store the info in my school's time-share computer. All it will cost each time we use the computer is the price of a telephone call."

Two days later the Jr. Op has what looks like a typewriter keyboard and a small TV set on the control desk. The phone is plugged into what he calls a *modem*, and each time he punches up a call we've previously worked the TV indicates the call, dates of contact, reports, WX, and just about anything that junior has transferred from the logs to the computer. As we work each new contact we simply type in the appropriate or desired info and it's all there when we write up the weekly QSLs. We also get back from the computer who did and did not QSL.

This is really living. Fact is, I'm looking forward to the next contest (and I have never been a contester). I'll simply punch in the required info to the computer and the Jr. Op can get a printout at the school.

Think of it. A contester's dream come true. Almost an *instant log* alphabetically organized by call areas and call, or any way you want it.

Then came the denouement. "Pop (notice, now I'm no longer the OM), *YOUR* logs are tying up all *MY* authorized computer storage and I can't work my school problems. *YOUR* logs have got to be destroyed." Panic! I even forget to ask how come it's my logs that must be destroyed, not his.

"Destroy our logs (notice, to me it's still *our* logs)? Are you insane? I'm getting back my old enthusiasm for DXing. Can't you get more storage?" (I still haven't seen what's coming.)

'No way," says Junior, who suddenly stops conversing in c.w. abbreviations. "The only way to go is with our own *personal computer.* Now I happen to have a few catalogs here . . ."

The first thing one learns from the catalogs (actually advertising in computer and amateur publications) is that personal computers are cheap. Rock bottom costs. For less than the price of a small 2-meter beam or a frequency counter anyone can own a personal computer. Luckily, I have a Jr. Op who knows what it's all about and he quickly points out I can blow a fast $500 and wind up with a computer that might add 2+2. Even if I went to a grand I couldn't keep logs, or even a fast moving checkbook. Actually, I'd get a "black" box that would wink and blink and require I learn a whole new language called "programming." And if I couldn't speak *programming* all that black box would do is wink and blink.

High speed c.w. roundtables don't leave much time for notes. Instead, WB2AHN punches in times, calls and handles as they are received and he gets a continuous readout of all desired info during the QSO. After the closing he punches in the time and the computer logs all the info for future reference. The computer then stands by for input about the next contact. If there's no reason to save the info for future use the computer can be cleared without storing any information.

And if I couldn't do anything worthwhile — from my point of view — with $500 to $1000 of computer gear, just imagine how much less I'd do with those "under $300," or "under $100" computer kits.

"Okay, Junior. What will we need so I can talk to the damn thing in english like I see them do at the airline ticket counters? Like we did when you had our logs stored in your school's time-share computer?"

"Basically, OM (hey, I'm the OM again), we need computing equipment that already contains something we call a *higher language,* something which accepts and responds to commands typed or otherwise entered in the English language. Since we're interested in handling electronic problems and data (our logs), we need a computer loaded with a language called BASIC. There are actually several versions of BASIC; since electronic formulas involve exponentiation and trig functions we will need a computer capable of handling what is known as 8K BASIC."

If you have no idea what I'm talking about take heart, because I felt the same way after Junior finished. I hadn't the vaguest knowledge of what

BASIC was, let alone 8K BASIC. As I've come to learn, there are many BASICs: Micro BASIC, Mini BASIC, 4K BASIC, 8K BASIC, 12K BASIC, DEC Extended BASIC, etc., etc. There's also languages called FORTRAN, COBOL, PL/1, APL, etc., etc., etc. I've got enough trouble handling BASIC, and since it handles just about everything for the electronics hobbyist it's the one to use. Also, many hobby computers assume you're a flaming programming genius and provide no higher language for their system. A few computers, from the larger outfits, provide some form of BASIC, so BASIC it is.

Anyway, Junior has led me down a tortuous, twisted trail of personal computer equipment. Each time I faltered and fell back on the routine "I've had it. I got along for 30 years in electronics and amateur radio without computers and can do so for another 30 years," Junior simply smiled and came back with, "Remember, that 1978 car you want with the *lean burn* engine will have an 8080 or 6800 microprocessor to run it, so you might as well know what it's all about or you're going to pay a lot of loot for a simple tune-up you could do yourself in about 15 minutes IF YOU KNEW HOW A MICROPROCESSOR (microcomputer) WORKED." (And to think, they teach all this in High School. In my day I was only allowed to build a crystal set in the "Radio Course," which required physics as a prerequisite.)

Now many of you who have read this far might also feel it is possible to get along in amateur radio without computers, and I would not be likely to argue if it weren't for a news release that came in today. According to this release, Texas Instruments has introduced a $300+ a.m./s.s.b. CB transceiver that uses a *microprocessor* for s.s.b. tracking. No more "clarifier" or RIT. The received signal can drift up and down the band and the receiving station automatically tracks the signal. Also, microprocessor control is used for digital bandwidth processing. No matter how you look at it this CB rig has a built in computer, and anyone who doesn't see these features as part of the next generation of amateur gear is missing the handwriting on the wall.

The computer, personal or otherwise, is upon amateur radio and it is quite likely your next rig will come complete with a *data terminal.*

So when you start to see *computer* articles in CQ don't feel you're not getting 100% amateur value for your dollar. As a matter of fact, when phone first came along many *brass pounders* protested its coverage in the pioneer radio magazines, and when s.s.b. arrived on the bands many a.mers similarly protested space given it by the modern amateur publications.

Each new technology has become an important and significant part of amateur radio, *personal computers* is simply the latest in a long chain that stretches back to a lucky spark transmission across the *big pond.* ■

CQ Reviews:

The Radio Shack 12-159 Timekube®

BY ALAN M. DORHOFFER*, K2EEK

Suppose your receiver doesn't cover WWV. What if WWV had been only an afterthought when your receiver was designed or you can only receive WWV when the moon is right . . . sometimes. Well cheer up, Radio Shack has the answer in a small, battery operated receiver just for WWV.

The 12-159 Timekube® is actually a small receiver covering three crystal controlled frequencies; 5, 10 and 15 MHz. It has a built in 10 section 41" telescoping antenna (there is also an external antenna terminal on the back), making the receiver completely self-contained.

To turn the receiver on just select the WWV frequency you desire and simply push the appropriate tone-bar switch. You can switch from one frequency to the other or by pushing the last bar on the left, you can shut it off. There is a volume control located on top adjacent to the antenna.

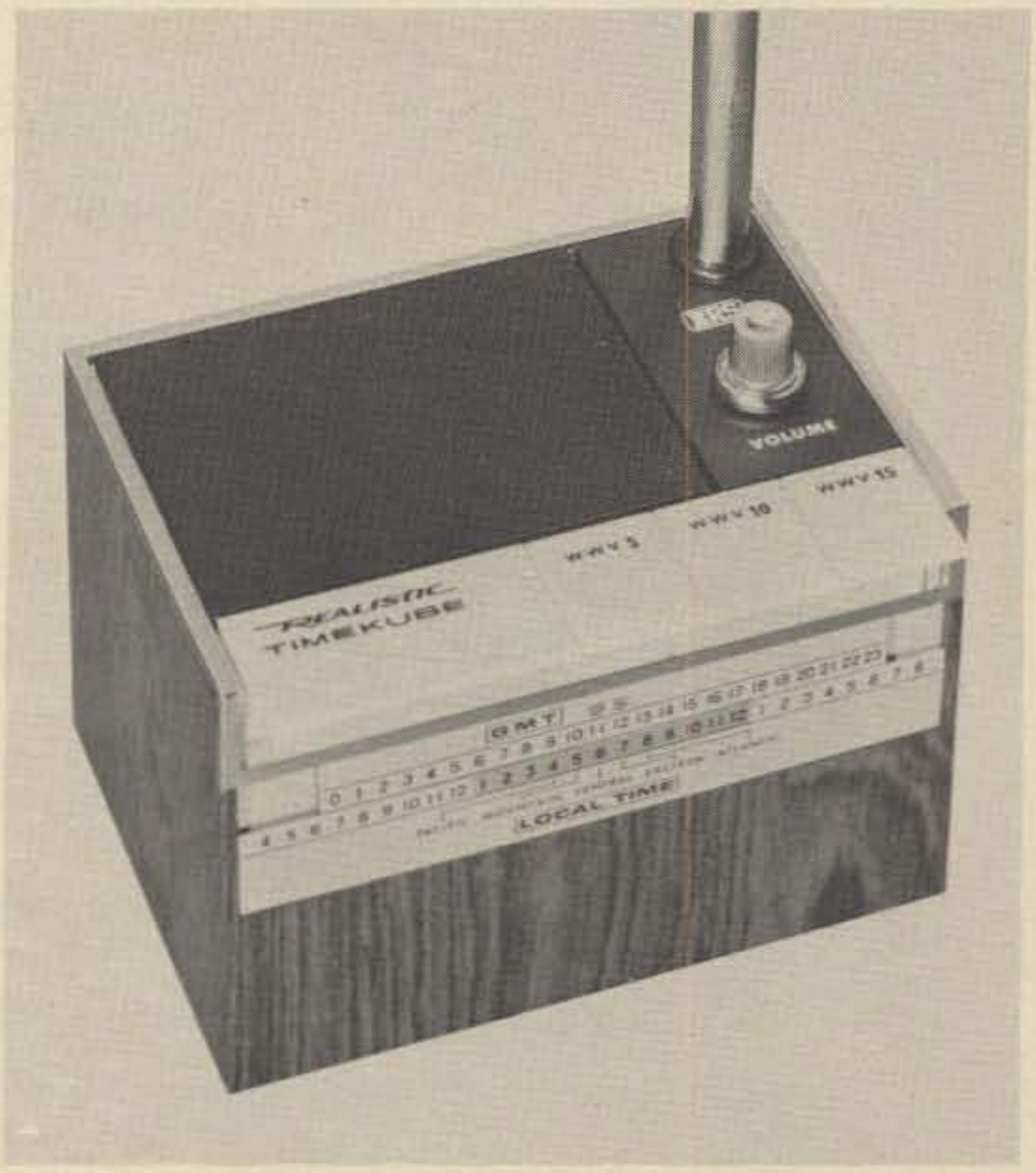
Reception is quite good here on 15 MHz with the telescoping antenna and no attempt was made to use an external antenna. WWV comes through loud and clear. It's quite a nice addition to the shack.

The 12-159 Timekube® comes complete with crystals, battery and manual. The front panel has a sliding time scale which you can set up for converting GMT to your particular local time. The attractive cabinet is finished in simulated rosewood. The receiver measures 3⅛" x 4½" x 3½". There is also a CHV version available in the Northeastern USA and Canada (12-158).

Both units are priced at $31.95 and could find many uses in the shack and other activities where exact time is needed such as sports car ralleys, s.w.l.s., astronomy and even in setting your new digital watch.

*Editor, CQ

The Radio Shack Timekube® should be available at most of your local Radio Shack stores. If not, write to them at: Radio Shack, 2617 West 7th Street, Fort Worth, Texas 76107. It may be a radio with only three stations (and the programming is rather repetitious) but it's well worth the investment if you consider the time you save. ■



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BIRD THRULINE® WATTMETER

MODEL 43

- BUY ONLY THE ELEMENTS YOU NEED AND ADD EXTRA RANGES AT ANY TIME
- READ RF WATTS DIRECTLY

Table 1
STANDARD ELEMENTS

Power Range	Frequency Bands (MHz) 2-30	25-60	50-125	100-250	200-500	400-1000
5 watts	—	5A	5B	5C	5D	5E
10 watts	—	10A	10B	10C	10D	10E
25 watts	—	25A	25B	25C	25D	25E
50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
1000 watts	1000H	1000A	1000B	1000C	1000D	1000E
2500 watts	2500H					
5000 watts	5000H					

Table 2
LOW-POWER ELEMENTS

1 watt	Cat. No.	2.5 watts	Cat. No.
60-80 MHz	060-1	60-80 MHz	060-2
80-95 MHz	080-1	80-95 MHz	080-2
95-125 MHz	095-1	95-150 MHz	095-2
110-160 MHz	110-1	150-250 MHz	150-2
150-250 MHz	150-1	200-300 MHz	200-2
200-300 MHz	200-1	250-450 MHz	250-2
275-450 MHz	275-1	400-850 MHz	400-2
425-850 MHz	425-1	800-950 MHz	800-2
800-950 MHz	800-1		

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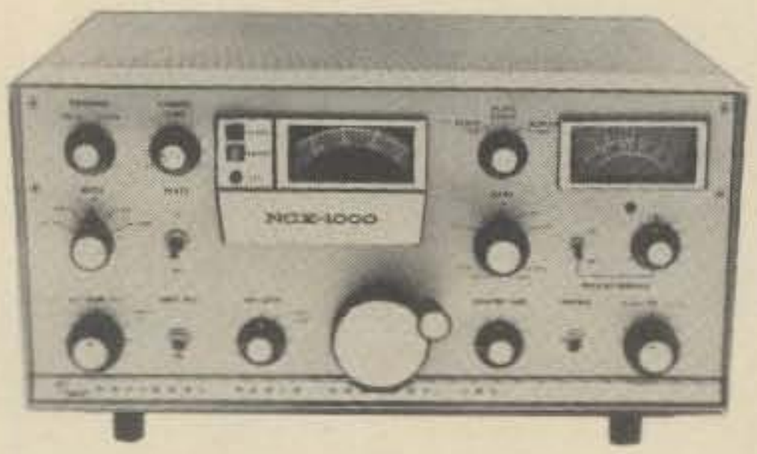
NRCI



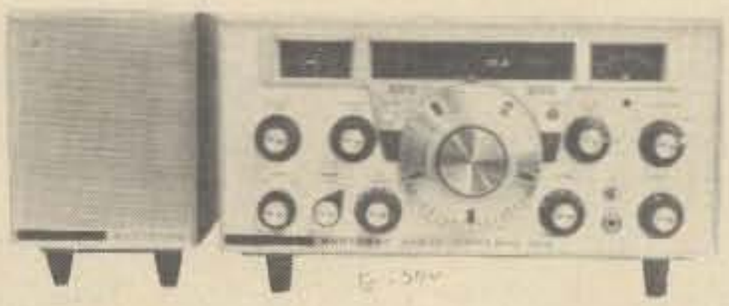
NCX-1000

The only 1000 watt, "single package" transceiver. Heavy duty design . . . results of 50 years of design leadership in amateur equipment. State of the art speech processing, linear amplifier, power supply, all in one package. Nothing extra to buy. Covers all amateur bands in the HF spectrum . . . AM, SS' CW' **$1,600**

NCL-2000

Linear Amplifier. A full 10 dB gain. 20 watts in 2000 watts out. Can be driven with one watt. Continuous duty design utilizes two 8122 ceramic tetrode output tubes, designed for both AM and SSB operation. The industry standard for 12 years. Thousands in use all over the world.

$1,200



HRO-500

The ultimate short wave receiver. This synthesized (phase lock loop) receiver incorporates all facilities for AM, Single Side Band (SSB), and CW receiption in all frequencies from the bottom of the very low frequency band (VLF) to the top of the high frequency band (HF). National's "dead accurate" dial means no searching for transmissions. Dial up the frequency and it's there: aeronautical, marine, CB, amateur, military, etc. Continuous coverage.

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VHF/UHF AMATEUR & MARINE EQUIPMENT

IC-245. 146 MHz FM 10W XCVR. LSI synthesizer with 4 digit LED readout. Xmit & Rcv frequencies independently programmable. 60 dB spurious attenuation.
$499.00

IC-215. 2 METER FM PORTABLE. Three narrow filters for superb performance. 3W or 400 mW. 15 CH. capacity. MOS FET RF Amp & 5 tuned ckts. S-meter front panel.
$229.00

$249.00

IC-502. 6 METER SSB & CW PORTABLE.XCVR. Includes antenna & battery pack. 3W PEP & stable VFO for fun & FB QSO's. Covers first 800 KHz of 6M band, where most activity is.

IC-211. 4 MEG, MULTI-MODE 2M XCVR. 144-145 MHz on SSB & CW, plus 146-147 MHz on FM. Work AMAT OSCAR six or seven. LSI synthesizer with 7 digit LED. MOS FET RF Amp, 5 helical cavities, FET mixer & 3 I.F. filters.
$749.00

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IC-22S. 145 MHz FM 10W XCVR. CMOS synthesizer can be set to any 15 KHz ch. between 146 & 148 MHz by diode matrix board. Spurious attenuation far better than FCC spec. 10W or 1W. IDC modulation control.

IC-21A. 146 MHz FM 10W XCVR. MOS FET RF Amp & 5 helical resonator filter, plus 3 I.F. filters. IDC modulation control. Variable output pwr: 500 MW to 10W Front panel discriminator meter. SWR bridge. 117 VAC and 13.6 VDC pwr supplies.
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1000 to 1200 WATTS OUTPUT TO YOUR ANTENNA

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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 sheilding.

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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 $499.50.

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SKYMASTER

A fully developed and tested 27 foot vertical antenna covers entire 10, 15, 20, and 40 meter bands using only one cleverly applied wave trap. A full 1/4 wave antenna on 20 meters. Constructed of heavy seamless aluminum with a factory tuned and sealed HQ Trap, SKYMASTER is weatherproof and withstands winds up to 80 mph. Handles 2 KW power level and is for ground, roof or tower mounting. Radials included in our low price of

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160	50
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Tuning is easy and reliable. Rugged construction assures that this self-supporting unit is weatherproof and survives nicely in 100 mph winds.. Handles full legal power limit.

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The DenTron EX-1 Vertical Antenna is designed for the performance minded antenna experimenter. The EX-1 is a full 40 meter, ¼ wave, 33', self-supporting vertical. The EX-1 is the ideal vertical for phasing.

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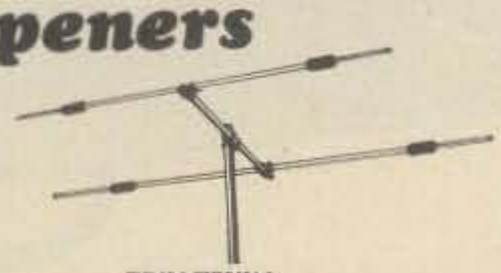

TRIM-TENNA

The antenna your neighbors will love. The new DenTron Trim-Tenna with 20 meter beam is designed for the discriminating amateur who wants fantastic performance in an environmentally appealing beam. It's really loaded! Up front there's a 13 foot 6 inch director with precision Hy-Q coils. And, 7 feet behind is a 16 foot driven element fed directly with 52 ohm coax. The Trim-Tenna mounts easily and what a difference in on-the-air performance between the Trim-Tenna and that dipole, long wire or inverted Vee you've been using. 4 & 6 Forward Gain Over Dipole.

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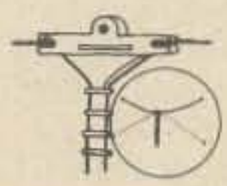

ALL BAND DOUBLET

This All Band Doublet or inverted Type Antenna covers 160 thru 10 meters. Has total length of 130 feet (14 ga. stranded copper) although it may be made shorter if necessary. This tuned Doublet is center fed through 100 feet of 450 ohm PVC covered balanced transmission line. The assembly is complete. Add rope to the ends and pull up into position. Tune with the DenTron Super Tuner and you're on 10 through 160 meters with one antenna! Now just for the DenTron All Band Doublet.

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Here's an antenna tuner for 80 through 10 meters, handles 500 w P.E.P. and matches your 52 ohm transceiver to a random wire antenna.

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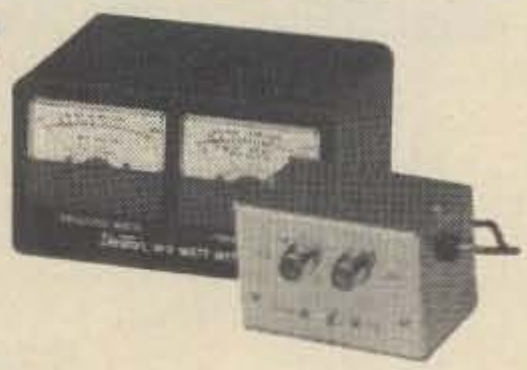
- "L" network
- Ceramic 12 position rotary switch
- SO—239 receptional to transmitter
- Random wire tuner
- 3000 volt capacitor spacing
- Tapped inductor
- Ceramic antenna feed thru
- 7" W. 5" H. 8" D., Weight: 5 lbs.

$59.50

DenTron **W-2 PAD INLINE WATTMASTER**

Read forward and reflected watts at the same time



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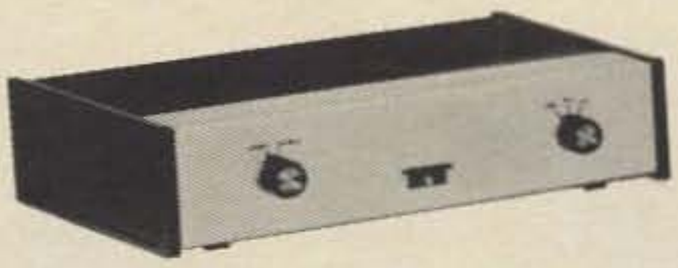

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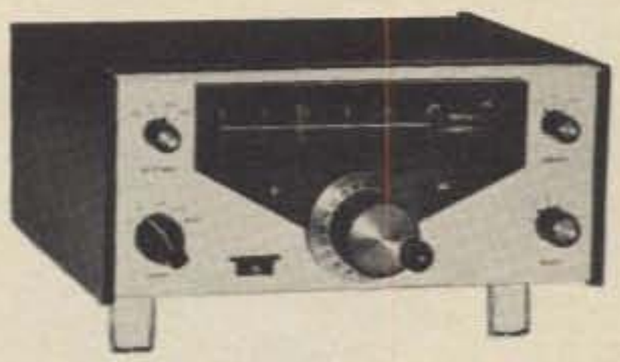

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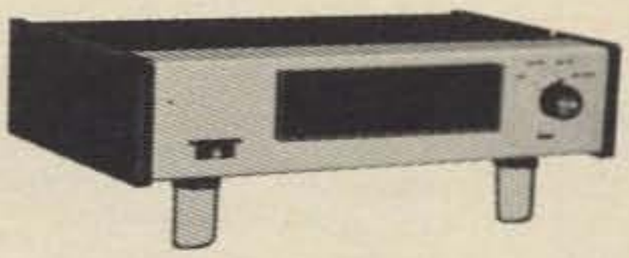

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100W, 3.5 - 30 MHz

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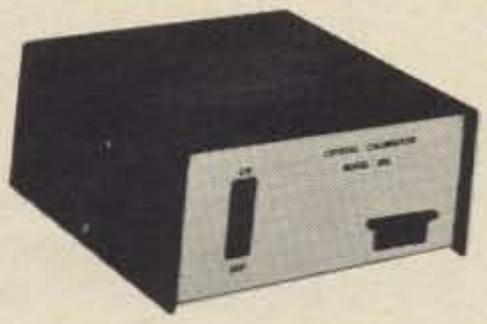
207 $14.00



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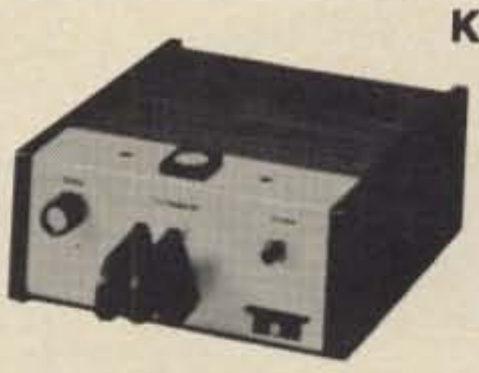

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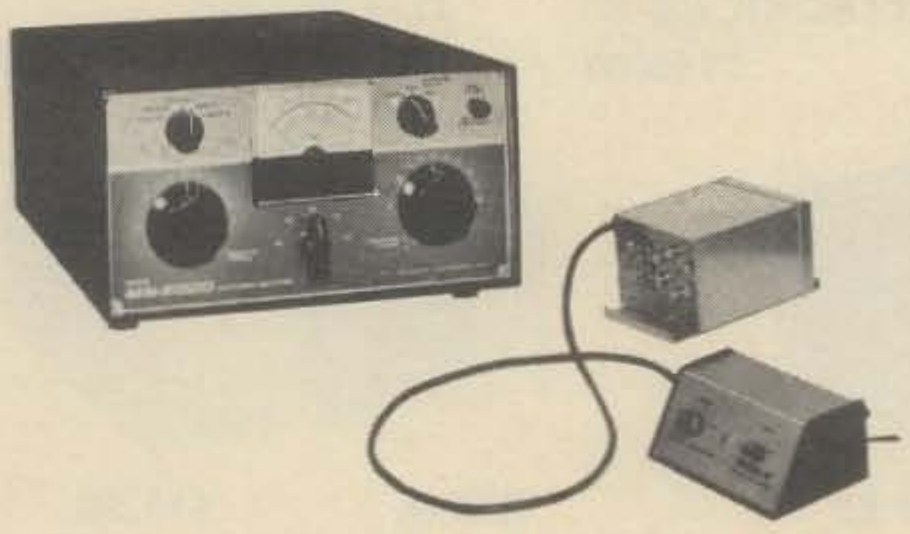

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SSR-1	General Coverage, .5 to 300 MHz	$350.00
SPR-4	Programmable, Solid State	$629.00
DSR-2	VLF-HF Digital Synthesized SSB, AM, CW, ISB, RTTY	$2950.00
R-4C	C-Line. HF. 160-10M	$599.00
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7075	Desk Top Microphone	$39.00
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AA-10	10W, 2M Amplifier	$49.95
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TV-75-HP	75 ohm High Pass TV Set Filter	$13.25
TV-42-LP	Transmitter Low Pass Filter. 100W	$14.60
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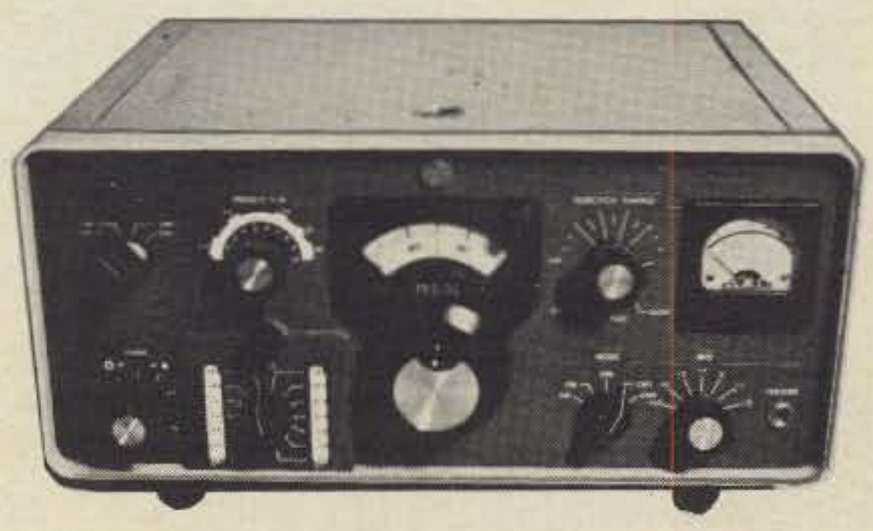
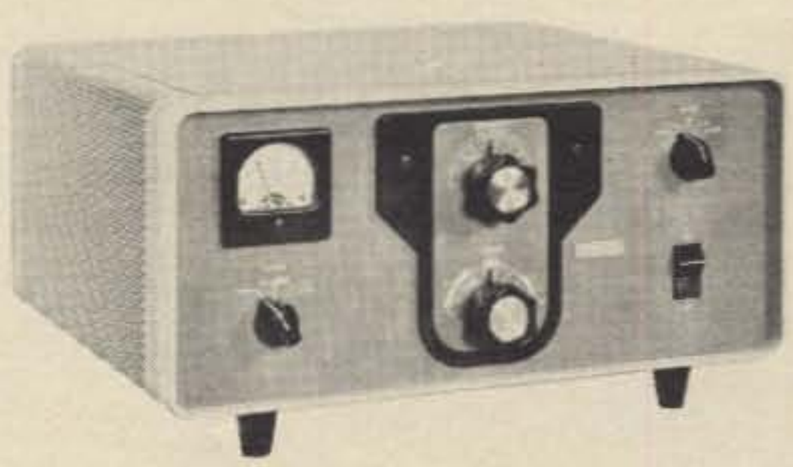


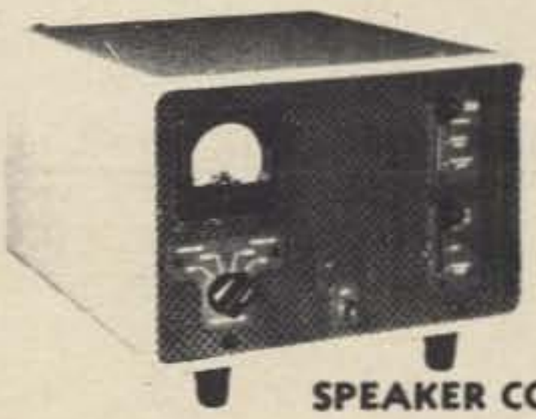
75S-3C RECEIVER **$2504.00**
Sharp selectivity. SSB, CW and RTTY. Single control rejection tuning. Variable BFO. Optional mechanical filters for CW, RTTY and AM. 2.1 KHz mechanical filter. Zener regulated oscillators. 3-position AGC.

32S-3A TRANSMITTER **$2597.00**
Covers all ham bands between 3.4 MHz and 30 MHz. Nominal output of 100W. 175W, SSB and 160W CW. Dual conversion. Automatic load control. RF inverse feedback. CW spotting control. Collins mechanical filter.



30L-1 LINEAR AMPLIFIER **$1536.00**
1000 watts PEP on SSB and 1000 Average on CW. Single control rejection tuning (50 dB). Variable BFO. 2.1 kHz Mechanical filter. Zener regulated oscillators. 3 position AGC. Exclusive comparator circuit.

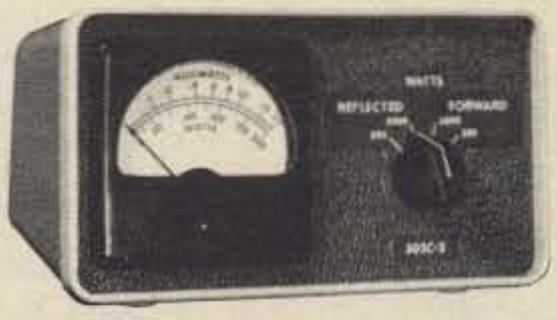
312B-3 SPEAKER
$80.00



312B-4
SPEAKER CONSOLE
$546.00

312B-5 VFO CONSOLE
$1212.00

516F-2 AC POWER SUPPLY
$440.00



302C-3 DIRECTIONAL WATT METER
$360.00

DL-1 DUMMY LOAD
$270.00

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TEMPO VHF/ONE	Transceiver. 2M. 144 yo 148 MHz. PLL	399.00
TEMPO SSB/ONE	SSB Adapter for TEMPO VHF/ONE	199.00
TEMPO 2020	Transceiver. 80-10M. USB, LSB, CW and AM. PLL. Digital	759.00
FMH	2W, VHF/FM, 6 Ch. Hand Held. 144-148 MHz	199.00
RBF-1	Wattmeter & SWR Bridge	42.95
DM-20	Desk Mike. 600 or 50K ohm. PTT & Lock Switches	39.00
MS-2	4 Ch. Pocket Scanning Rcvr.	99.00

ATLAS

210X	Transceiver. 10-80M. 200W	679.00
215X	Transceiver. 15-160M. 200W	679.00
OMK	Deluxe Mtg. Kit for 210X & 215X	48.00
220CS	AC Console for 210X & 215X	149.00
350-XL	Transceiver. SSB. Solid State. 10-160M. 350W.	995.00
DD6-XL	Digital Dial Readout for 350-XL	195.00
305	Plug-In Auxiliary VFO. For 350-XL	155.00
311	Plug-In Auxiliary Crystal Oscillator for 350-XL	135.00
350-PS	AC Pwr Supply w/Spkr & Phone Jack for 350-XL	195.00
DMK-XL	Mobile Mounting Bracket for 350-XL. Easy Plug-In	65.00

SWAN

700 CX	Transceiver. 700W PEP. SSB. 80-10M. USB, LSB or CW	649.95
VX-2	Plug-In VOX for 700 CX	44.95
SS-16B	Super Selective IF Filter for 700 CX	99.95
MARK II	Linear Amplifiere Full Legal Power. W/100W input. 80-10 M.	849.95
1200 X	Portable Linear Amplifier. 1200W PEP. SSB. 700W, Ch. 300W, AM. 80-10M.	349.95
FP-1	Hybrid Telephone Patch. Connect Rcvr/Xmitter to Phone lines	64.95

FC-76	Frequency Counter. 5 Digit LED	169.95
WM6200	In-Line Presicion Wattmater for 2M. 2 Scales to 200W. Reads SWR.	59.95
FS-2	SWR & Field Strength Meter	15.95
SWR-3	Pocket SWR Meter	12.95
SWR-1A	Relative Power Meter & SWR Bridge	25.95
W2000	In-Line Wattmeter. 3 Scales to 2000W. 3.5 to 30 MHz	59.95
WM-3000	Peak/RMS Wattmeter. Tells The Truth About SSB	79.95
FS-1	Pocket Field Strength Meter	10.95
WM1500	In-Line Wattmeter. 4 Scales to 1500W. 2 to 50 MHz	74.95
MARK II	Linear Amplifier. Full Legal Power. W/100W input. 80-10 M.	849.95
1200 X	Portable Linear Amplifier. 1200W PEP. SSB. 700W, CW. 300W, AM. 80-10M.	349.95

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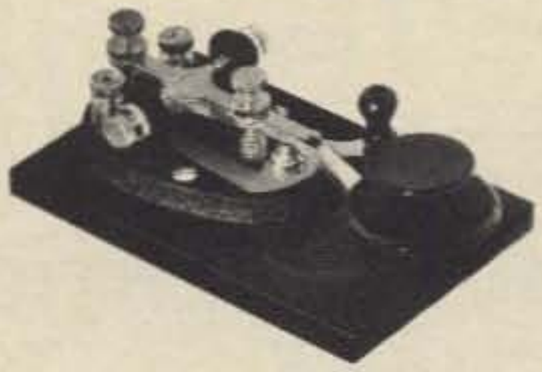
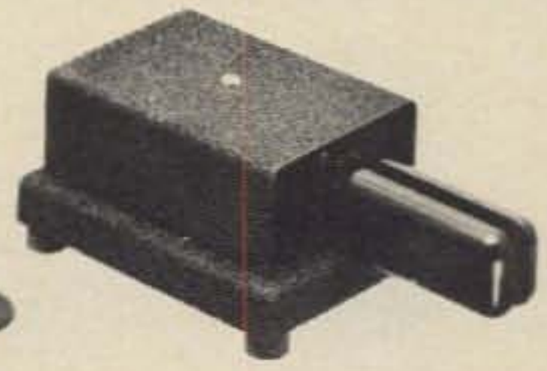
No. 114-310-003 $8.25



No. 114-310-004GP $50.00

No. 114-404-002 $18.50



No. SSK-1 $23.95

No. 250-46-1 $36.50

No. 250-46-3 $44.50

No. 250-20-1 $19.95

No. 250-0025-003 $212

NPC

2.5 AMP

12CB4 29.95

4 AMP

103R 39.95

6 AMP

104R 49.95

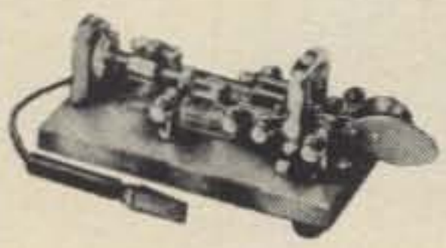
12 AMP

108 RM
99.95

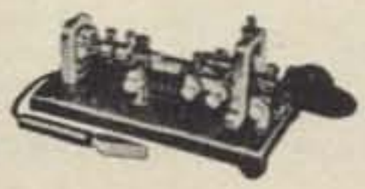
25 AMP

109R 149.95

VIBROPLEX

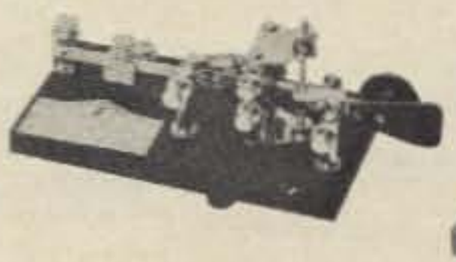


"PRESENTATION"
66.00

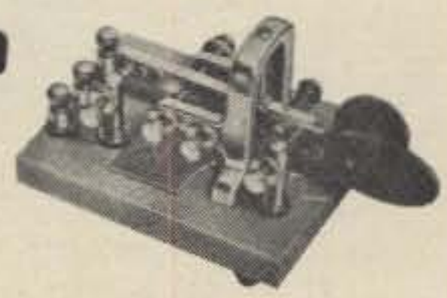


"ORIGINAL"
39.95

"LIGHTNING BUG"
39.95



"CHAMPION"
31.50



VIBRO-KEYER
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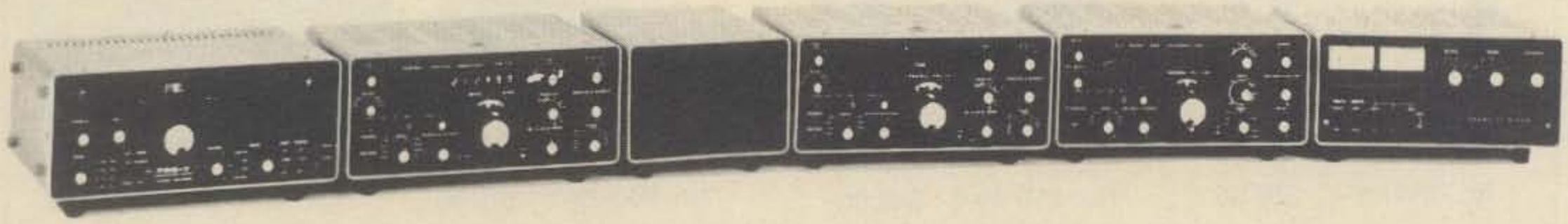
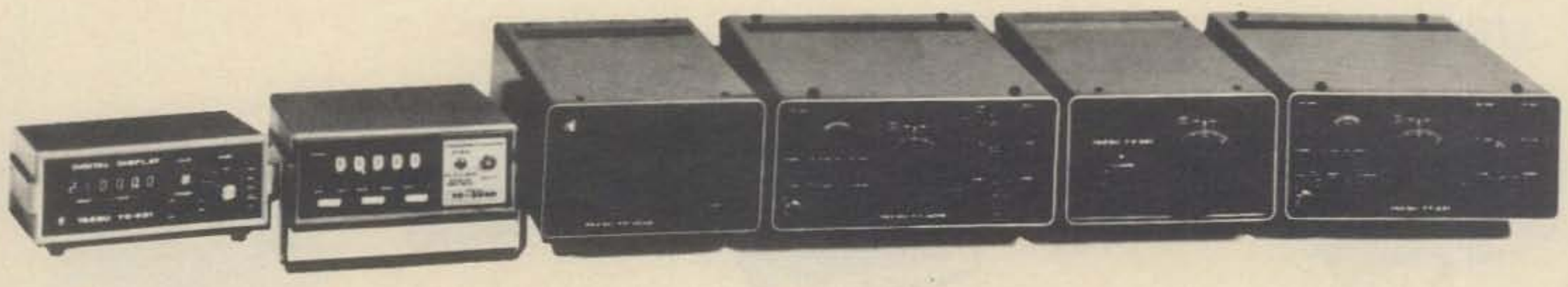
ADVANCED COMMUNICATION EQUIPMENT

QTR-24
World Clock



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

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TS-700A **$599.00**

2M ALL MODE BASE/MOBILE TRANSCEIVER. SSB (upper and lower), FM, AM and CW. AC and DC. 4 MHz band coverage (144 to 148 MHz). Dial in receiver frequency and TS-700A automatically switches xmitter freq. 600 KHz for repeater operation. Xmit, Rcv capability on 44 Ch. with 11 xtals.

TR-7400A **$399.00**

2M MOBILE TRANSCEIVER. Synthesized PLL. Selectable output, 25 watts or 10 watts. 6 Digit LED freq. display. 144-148 MHz, 800 CH. in 5 KHz steps. 600 KHz repeater offset. Continuous tone-coded squelch (CTSC). Tone Burst.

TS-820 **$830.00**

SSB TRANSCEIVER. PLL RF Monitor Noise Blanker. Digital hold locks counter & display at any frequency, but allows VFO to tune normally. True RF compressor adjustable speech processor. IF shift control. RF attenuator. VOX, GAIN, ANTIVOX and VOX delay controls. RF negative feedback. Optional digital readout. DRS Dial. High stability FET VFO.

TS-520 **$629.00**

SSB TRANSCEIVER. Proven in the shacks of thousands of discriminating hams, field day sites, DX and contest stations and mobile installations. Superb engineering and styling.

SP-520 **$22.95**

Optional external speaker for better readability.

TV-502 **$249.00**

TRANSVERTER. Puts you on 2M the easy way. 144-145.7 MHz or optional 145-146 MHz.

PS-5 **$79.00**

DYNAMIC MICROPHONE. Designed especially for homes. PTT and lock switches. 600 or 50K ohm.

TR-7200A **$229.00**

2M MOBILE/BASE FM TRANSCEIVER. Ignition interference control. 2 pole Xtal filter in IF rcvr. Protection for final stage transistor & reverse polarity connections. Priority Ch. switch. Quick release mount. LED CH. indicators. Switchable 10W or 1W output.

MC-50 **$39.50**

Dynamic microphone designed expressly for amateur radio operation. Complete with PTT and LOCK switches, and a microphone plug. (600 or 50k ohm)

COMMUNICATIONS RECEIVER. 1.8 to 29.7 MHz, WWV and CB band. 50 MHz, 144 MHz converter optional. Stable VFO & oscillator for 5 fixed channels. 1 KHz dial readout. Xtal filters (SSB/8 pole, CW/8 pole, AM/6 pole). Squelch. S meter. Noise blanker.

S-599-$19.94 R-599A-$459.00 T599D-$479.00

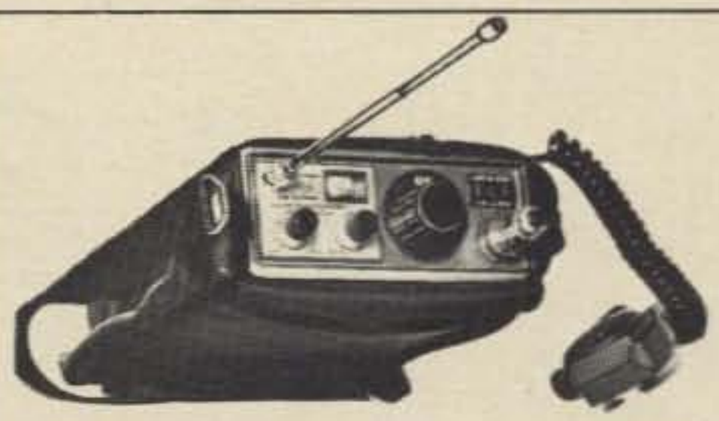
SSB TRANSMITTER. 3.5 to 29.7 MHz. Stable VFO. 1 KHz dial readout. 8 pole Xtal filter. AM Xmission available. Built-in AC pwr supply. Split frequency control available.

VFO-820 **$139.00**

Designed exclusively for use with TS-820. RIT circuit and control switch. Fully compatible with optional digital display.

VFO-520 **(Not Shown)** **$116.00**

Solid State Remote VFO. RIT circuit with LED indicator.



TR-2200A **$227.00**

PORTABLE 2M FM TRANSCEIVER. 12 Ch. capacity. Removable telescoping antenna. External 12 VDC or internal NI-CAD batteries. 146-148 MHz. 6 CH. supplied. Switchable 2W or 400mW output.

R-300 **$239.00**

ALL BAND COMMUNICATIONS RECEIVER. AC, batteries or external DC. 170 KHz to 30 MHz in 6 bands. Foreign broadcasts or ham radio in AM, SSB and CW. Dual gate MOS/FET transistors & double conversion. Band spread dial. 500 KHz marker.

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1976 CQ World-Wide DX Contest C.W. Results

BY LARRY BROCKMAN*, N6AR (ex WA6EPQ) AND BOB COX†, K3EST

CQ's yearly Thanksgiving present to c.w. DXers and contesters alike seems to have been welcomed with the usual overwhelming enthusiasm. A record 2060 logs were received for this years event, up 6% over last year. Even more astounding. a phenomenal 2 world records, 17 continental records, and 6 USA records were set, more than twice the number set last year, despite generally mediocre band conditions. As one contester wrote to us, "The contest seems to open the bands each year". Indeed it does, and even the ten meter band showed signs of real life, as evidenced in C5AZ's 28 MHz log. Although an all band entry, Ville racked up 293 contacts and 49 countries on the band everyone thought was dead. We all better take a careful look down there next year to catch those fleeting openings and elusive multipliers.

All Band Honors

The 3.7M top world-wide single operator effort by KP4AST (operated by Chip, K7VPF), set a new world record in one of the hottest competitions in WW test history. Breathing right down his neck were C5AZ, operated by Ville, OH2MM, at 3.6 M, and 9Y4VT, operated by Dick, W6DGH (now N6AA) at 3.45M. But cheer up Ville, a consolation prize awaits—the new African continental record, and the knowledge that your score also bested the old world record, one set by your old friend OH2BH at ZD3X.

Even closer was the battle for this years Multi-Single top honors, with the three top stations finishing within only 46,000 points out of almost 4 Million. By just a whisker (15,000 points) PJ9MM, operated by W1GNC, W3ZZ, WB3GSV, and W8FAW, a joint venture of the PVRC and Murphy's Marauders, edged 9Y4A, operated by W2DXL, W2AX, W2ER, W2GC, W2GGE, and K2LE representing the Royal Order of Boiled Owls. Third in the competition was ZD8W, operated by WA4 TLB, KP4EAJ, and KP4EKI, who trailed second place by just 31,000 points. PJ9MM pulled it out with a few extra contacts, as 9Y4A had the multiplier edge by virtue of their 160 Meter band score. ZD8W's incredible 15 meter contact total (1808 contacts) wasn't enough to compensate for the overall balance in the other two efforts.

Our congratulations to UK9AAN, operated by Sam, UA9AN, and fellow Chelyabinsk Institute Club members UA9ABA, UA9ACZ, UA9AEN, UV9AX, and UW9BY, in their first ever officially sanctioned USSR Multi-Multi effort. The boys from the Urals racked up a new Asian Multi-Multi record of 4.9M to top a close pack of US entrants led by W3WJD, W3AU, and W4BVV in that order. It looks like the stage is now set for some fierce but friendly East/West Multi-Multi competitions in the future.

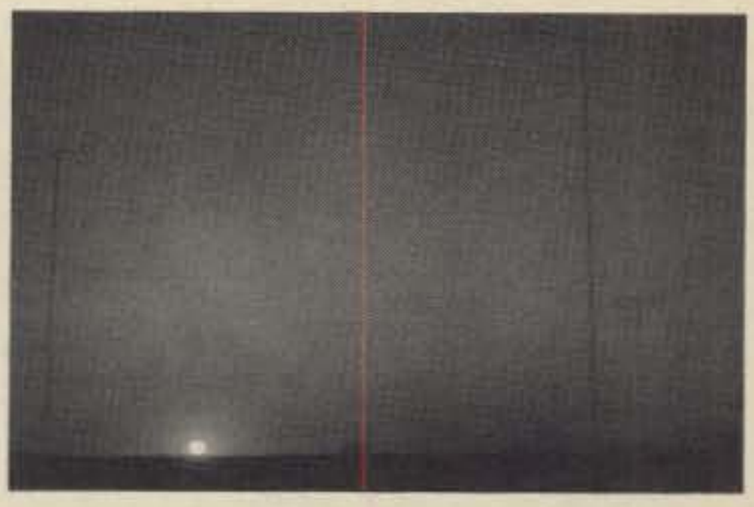
The USA top all band score was that of W3LPL, Frank, who did it for the second year in a row. This time PVRC club member Frank captured the all time USA record from arch-rival Frankford Radio Club member W3WJD. Could this entice Sigge to abandon the Multi-Multi category for a new try at his old record?

One of the up and coming superstations, AA5LES, operated by WA5LES, K5LWL, WB5IZN, WB5OOW WA5ZNY, WA5WCT and KL7IDH, captured this year's USA Multi-Single category with a fine 2.2 M point score, an all time USA record. Multi-Multi honors went to W3WJD, operated by Sigge himself and K3YUA, WA3LRU, and W3IFG.

The Frankford Radio Clubs joy over this victory was no consolation in the face of the club competition results. This year the PVRC ran away with it with a whopping 58 M points, an 18 M point edge over the runner up Frankford contingent. In the DX Club category the Rhein-Ruhr Club finished first once again with 23 million points.

CQ WW DX Contest Directors
*7164 Rock Ridge Terrace, Canoga Park, CA 91307.
†RFD 1, Box 700, Accokeek, MD 20607.

FB8XO's QSL manager Bob, F6CRT sends along this photo of one of the juiciest multipliers to show up in the contest.



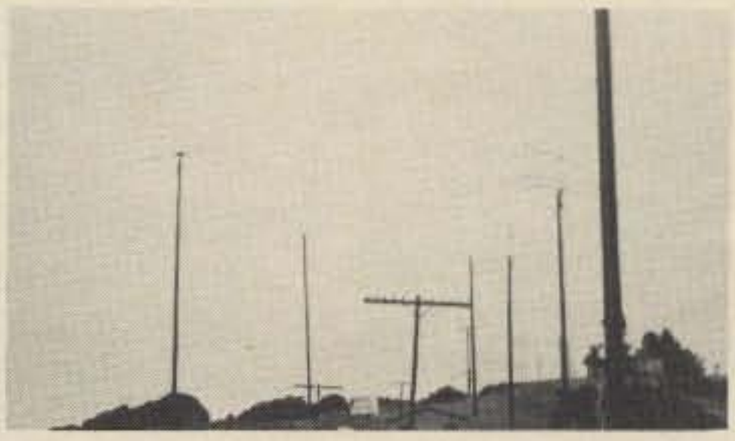
K5LWL and AA5LES, the brand new owners of the USA Multi-Single record are seen here seated at the operating position of the station they jointly own (right) with their antennas shown on the left.

Low power enthusiast OA8V shows us how he relaxes after the contest deep in the Peruvian jungles.

Luis Matho, CX1EK/W4 operating CW3BR during the CQ WW CW Contest.

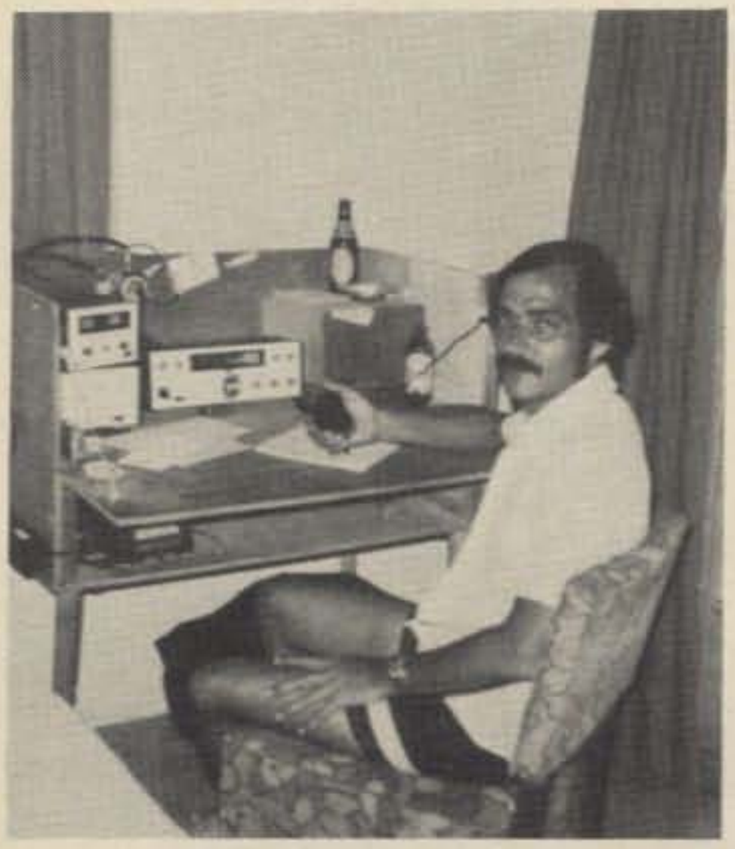
Dave Goldstein, 4X4UH, decides to do a little SSB operation after that single band 14 MHz entry in the CW contest.

Charlie (6W8FP) and Ville (C5AZ) are shown in the shack of 6W8A discussing propagation from West Africa.



Some of K6BCE's antennas are shown here but shortly before the big wind of November, 1976.

The crew at HB0AZD shows why the alpine location can help on propagation.



QRP contester WA6VNR put VP2MNR on this year, and ZF1JH in 1974.

One of the most active South American contesters, OA4AHA, shown at his rig.

The QTH used by Ville at C5AZ- what a score on 28MHz with that setup, Ville.

JA2HLX used this fine 5 element yagi to take 14 MHz honors in Japan.

BAND-BY-BAND BREAKDOWN — TOP ALL BAND SCORES

Number groups indicate: QSO's//Countries on each band.

WORLD TOP SINGLE OPERATOR — ALL BAND

Station	160	80	40	20	15	10
KP4AST	66/11/21	331/16/59	814/27/ 75	1083/27/ 81	981/23/77	70/14/21
C5AZ	27/ 8/15	110/12/37	464/16/ 44	859/21/ 70	1331/25/75	293/18/49
9Y4VT	71/ 5/ 6	340/15/52	606/16/ 49	1163/26/ 65	1072/20/61	147/11/15
CT4AT		421/16/61	1045/26/ 81	686/25/ 86	712/22/74	17/ 8/10
VP2M	60/ 6/ 8	34/12/36	871/10/ 50	1057/22/ 62	805/18/52	33/ 9/11
OA4AHA		50/11/11	237/16/ 26	790/24/ 56	958/22/58	97/ 9/17
W3LPL	20/ 8/17	111/18/58	273/27/ 70	475/30/108	248/23/81	22/11/17
JA1KSO		97/19/31	562/32/ 73	700/32/ 79	120/26/42	17/ 9/12
EA2IA		694/11/48	636/14/ 41	996/22/ 61	509/16/45	1/ 1/ 1
ZE1JV		7/ 4/ 6	123/14/ 27	495/27/ 67	921/23/68	97/13/34

USA TOP SINGLE OPERATOR — ALL BAND

Station	160	80	40	20	15	10
W3LPL	20/ 8/17	111/18/58	273/27/ 70	475/30/108	248/23/81	22/11/17
W1ZM	18/ 7/11	224/19/67	185/19/ 55	509/26/ 72	261/24/71	3/ 3/ 3
W2GXD	13/ 4/ 8	124/17/54	204/25/ 69	562/27/ 81	266/21/61	6/ 5/ 6
W6OUN	5/ 4/ 4	67/14/22	512/27/ 44	334/27/ 61	425/23/49	37/14/18
K1GQ	10/ 4/ 7	82/14/43	288/24/ 68	542/25/ 83	200/19/64	8/ 5/ 6
K4VX	6/ 5/ 4	118/18/53	207/26/ 67	401/28/ 88	234/24/70	17/11/13
K6NA	11/ 7/ 9	74/14/20	487/26/ 55	316/24/ 57	354/20/41	52/14/17
W4RX	11/ 7/ 9	135/19/58	156/27/ 68	439/30/ 90	221/23/67	5/ 5/ 5
K3ZO	4/ 3/ 3	158/13/53	244/22/ 59	528/27/ 83	208/15/54	4/ 3/ 3
W1YK		113/15/50	188/23/ 64	506/26/ 76	209/18/61	5/ 4/ 4

WORLD TOP MULTI-OPERATOR — SINGLE TRANSMITTER

PJ9MM		412/13/52	814/19/ 55	1047/27/ 77	994/21/66	157/15/20
9Y4A	46/ 7/12	390/14/48	673/21/ 58	1121/24/ 75	874/23/71	135/12/20
ZD8W	13/ 5/ 5	140/16/28	508/10/ 44	805/26/ 89	1808/24/78	111/13/16
5W1AZ	3/ 3/ 3	135/12/13	577/24/ 29	961/31/ 68	1282/25/45	85/13/18
GC4DAA	84/ 4/14	580/13/55	321/16/ 59	1120/25/ 72	596/27/76	6/ 4/ 6
PJ1AA	15/ 4/ 6	247/11/37	396/14/ 43	952/23/ 58	945/20/58	107/ 7/ 8

USA TOP MULTI-OPERATOR — SINGLE TRANSMITTER

AA5LES	20/ 9/20	130/19/50	633/30/ 80	566/30/ 96	292/27/75	29/15/28
WA8ZDF	15/ 8/14	101/18/60	222/27/ 79	711/29/102	181/23/73	15/12/14
W1ZA	10/ 6/10	219/15/62	110/23/ 55	809/27/ 91	279/22/78	4/ 4/ 4
W2YD	3/ 2/ 2	178/14/55	262/26/ 70	726/27/ 92	218/20/57	7/ 4/ 6
W7FU	17/ 9/11	129/13/20	613/24/ 46	635/31/ 83	229/19/40	12/ 7/ 7
W3BWZ	15/ 7/13	109/18/57	173/27/ 74	607/32/103	117/24/73	14/11/13

WORLD TOP MULTI-OPERATOR — MULTI-TRANSMITTER

UK9AAN		830/28/86	1203/33/ 88	1165/33/ 97	797/28/85	
W3WJD	91/13/29	290/22/73	637/31/100	1107/33/115	419/25/95	41/12/19
W3AU	62/10/25	218/21/64	646/32/101	961/32/114	465/25/90	46/15/25
W4BVV	47/11/28	338/26/84	597/29/ 91	888/31/108	422/25/98	27/12/17
K2GM	42/10/20	200/17/62	583/31/ 94	1038/35/116	334/24/90	23/10/13
W2PV	58/10/22	256/22/68	532/27/ 89	1066/27/101	400/23/87	11/ 7/ 8

USA TOP MULTI-OPERATOR — MULTI-TRANSMITTER

W3WJD	91/13/29	290/22/73	637/31/100	1107/33/115	419/25/95	41/12/19
W3AU	62/10/25	218/21/64	646/32/101	961/32/114	465/25/90	46/15/25
W4BVV	47/11/28	338/26/84	597/29/ 91	888/31/108	422/25/98	27/12/17
K2GM	42/10/20	200/17/62	583/31/ 94	1038/35/116	334/24/90	23/10/13
W2PV	58/10/22	256/22/68	532/27/ 89	1066/27/101	400/23/87	11/ 7/ 8
W7RM	71/11/20	317/19/35	866/30/ 74	932/33/100	307/23/50	22/ 7/ 8

Single Band Honors

The world wide high single band score was contributed by CW3BR, a great 753K 14 MHZ effort. Yet some of the thunder was stolen away by Herb, KV4FZ, who set a new World High 1.8 MHZ record of 42,800, almost doubling his own previous record. Our congratulations to runnerups VE3BMV and K1PBW who also broke the old 1.8 MHZ world record. A fierce competition developed for top 7 MHZ world honors between W5WZQ and WB5DTX (operated by W5BJA), who both smashed the old USA record held by Dave, W5WZQ. Dave came out on top by 40K with a fine 322K score. Other top world wide single band scores were YV4CB—28 MHZ, 5Z4NI—21 MHz, and VR3AH—3.5 MHz. In the USA competition, single band winners included K5FVA —28 MHZ; W4WSF (now N4MM)—21 MHZ; K3MBF —14 MHZ; and W1MX—3.5 MHZ. W1MX, K1PBW and W5WZQ all broke old USA high single band records which they themselves previously held.

Continental Records

Besides those records already cited, many new continental records were set: EA8CR—African 1.8 MHZ record; UA9DN — Asian 14 MHZ record; PA0IHP—European 1.8 MHZ record; UA6LO—European 7 MHZ record; DJ6RX—European 14 MHZ record; KH6CHC—Oceania 1.8 MHZ record; VR3AH—Oceania 3.5 MHZ record; VK6HD—Oceania 7 MHZ record; 9Y4VT—South American single-op all band record; CT4AT—European single-op all band record; ZD8W—African multi-single record; GC4DAA—European multi-single record; and 5W1AZ—Oceania multi-single record. He who says that the sunspots have to be at peak to put in a record effort better look twice at this impressive list.

Low Point Record

Our heart goes out to those devoted operators who send in their scores each year knowing they fall well down in the competition. Without those operations, the high scores wouldn't be possible. Yet this year in both the Phone and CW Contest, this devotion seems to have reached a new high. Two zero, yes zero, point logs were received by the committee—to our knowledge the first such entrants ever. A special word of thanks to EA2LY, CW and OX3AB, Phone who now share the record for lowest ever score for honest competition participants with 5 contacts each, but zero points.

Duplicates and Busted Callsigns

As mentioned in last month's issue with the phone results, some new rule changes are being made effective this year, the most important of which is a requirement for check sheets (dupe sheets) from all entrants for each band on which they make 200 or more QSO's. This change is a result of continued problems with busted callsigns and duplicates in the logs received by the committee—not by everyone, but by enough of the entrants to slow down log checking to a halt at times. One entrant and an incredible unremoved 20% dupe rate last year, with as many as 3 appearances of the same call on the same page! Some have suggested that we allow entrants the option of submitting their logs without dupe checking with the understanding that they are to be assessed a fixed 10% or so reduction in score to compensate. But this places the burden on the committee of checking to see who's dupe rate exceeds the fixed percent, which would still require a lot of extra work by the committee. It would also lead to ambiguities about who really won when some scores are close.

The committee feels that the burden for removing dupes rests with the entrant himself, and that to be eligible for an award, the log should be carefully checked accordingly. If one can find the time to operate the contest, surely enough time exists to check the log for dupes. It astounds us that some

One of Europe's most active contesters, Inaki, EA2IA, shows his fine shack and one of the trophies from a previous contest.

Here's the operating position at EA4BV, an all band entry from Spain this year.

G3MXJ and G3FXB helped put the GC4DAA activity together and racked up a new European Multi-Single record.

Living proof that the 9M2's are still active, Eshee, 9M2FK proudly displays his shack.

New European 14MHz single band record holder Klaus, DJ6RX, takes a quick look at the camera during the contest.

Fourth in the all band category for Sweden, SM5VB displays a neat rig and resolves to move up in the standings next year.

entrants will carefully take the time to rewrite their entire log or to computerize it, yet they do not take the time to check the log. The new dupe sheet rule becomes more and more important in the face of the significant increase in log submissions each year and in light of recent changes in the *CQ* publication schedule.

Requests to the CQ WW Contest Committee

We urge all of you who plan to submit requests to the committee for logs, summary sheets, and rules to do so well in advance of the contest each year—the earlier the better. Delays in response to your requests are inevitable, due to the procedure used. The requests are first bundled up and then sent to the contest directors for a response. One way to shortcut some of the delay is to mail your requests regarding the WW contest directly to one of the directors (N6AR or K3EST). Lastly, all requests must be accompanied by an adequate amount of return postage. On this last point, we urge the overseas requesters to think twice before marking their SASE's "Airmail", because not very many log sheets (only about 3 or so) can be sent overseas for the first unit air mail rate.

Credit Where Credit Is Due

The tireless efforts of the 12 *CQ* WW Contest Committee members should not go unrecognized. Burning the midnight oil this year over heaps of logs of all sizes, shapes and shades were: K3ZO, Fred Laun; K6NA, Glen Rattmann; N2AA, Gene Walsh; N4MM, John Kanode; N6ZZ, Phil Goetz; W3GRF, Len Chertock; N6CW, Terry Baxter; W3ZZ, Gene Zimmerman; W6BHY, Jim Neiger; W6PVB, Fred Morris; W6JPH, Larry Weaver; and WB2SQN, Dave Donnelly. Again, thanks for a job well done. A word of thanks also to our *CQ* Contest Chairman, Frank Anzalone, who kept us on the straight and narrow this year and provided excellent suggestions and guidance.

1977 CQ WW Contest

The rules for the 1977 *CQ* WW Contest and the official announcement appear in this issue. We are sure that it will prove to be the big contest event of the year. With the sunspot minimum behind us now, conditions will be on the upswing. Hope to see you all in the pileup.

73, Larry, N6AR and Bob, K3EST

C.W. TROPHY WINNERS AND DONORS

Single Operator Single Band

World 14 MHz

CW3BR (Opr. Luis D. Matho, CX1EK/W4)

Donor: No. Jersey DX Assoc. (W2JT Memorial)

Europe 14 MHz

Klaus Heintzenberg, DJ6RX

Donor: G2LB Memorial from Friends

U. S. A.

J. Dawson Ransome, K3MBF (14 MHz)

Donor: No. Illinois DX Club

Single Operator All Band

World

KP4AST (Opr. Charles H. Margelli, K7VPF)

U.S.A.

Francis J. Donovan, Jr. W3LPL

Donor: Frankford Radio Club

Europe

CT4AT (Opr. Carl G. Kratzer, WA3HRV)

Donor: W3AU Operators

Carib./C.A.

John R. Alday, KP4DKX

Donor: Don Wallace, W6AM

Canada

M. W. Muench, VO1KE

Donor: Canadian DX Association

Africa

6W8A (Opr. Charles Jones, 6W8FP)

Donor: Gordon Marshall, W6RR

Asia

Nobuyasu Itoh, JA1KSO

Donor: Japan CQ Magazine

Oceania

Peter W. Watson, ZL3GQ

Donor: Maui Amateur Radio Club

Multi-Operator Single Transmitter

World

PJ9MM (Oprs. W1GNC, W3ZZ, WB3GSV, W8FAW)

Donor: Anthony Susen, W3AOH

Multi-Operator Multi-Transmitter

World

UK9AAN (Oprs. UA9AN, UA9ABA, UA9ACZ, UA9AEN, UV9AX, UW9BY)

Donor: Hazard Reeves, K2GL

Contest Expedition Trophy

World

C5AZ (Opr. Ville Hiilesmaa, OH2MM)

Donor: K2HLB Memorial Trophy (by Don Miller, W9WNV)

WORLD TOP SCORES

Single-Op. All Band	KP4AST	3,725,836	OA4AHA	1,564,250
	C5AZ	3,580,980	W3LPL	1,538,784
	9Y4VT	3,438,644	JA1KSO	1,473,605
	CT4AT	2,809,421	EA2IA	1,444,560
	VP2M	2,151,165	ZE1JV	1,375,946
Single-Op. Single Band	**28 MHz**		**7 MHz**	
	YV4CB	19,272	W5WZQ	322,383
	ZL2ACP	13,432	WB5DTX	284,900
	K5FVA	13,052	VK6HD	266,750
	AG6JFY	12,474	CX1BBL	212,139
	WB4OSN	5,964	UA6LO	205,082
	LU3DSI	4,746	4M4NQ	187,180
	21 MHz		**3.5 MHz**	
	5Z4NI	474,894	VR3AH	178,560
	VR1AA	252,408	OH1XX	120,365
	YU3ZV	184,926	DL6KB	114,240
	CX2AQ	172,126	W1MX	108,288
	IØMGM	151,011	YU4FDE	108,270
	UG6GAF	141,930	I3GNQ	107,016
	14 MHz		**1.8 MHz**	
	CW3BR	753,228	KV4FZ	42,800
	8PØA	639,756	VE3BMV	30,258
	DJ6RX	420,512	K1PBW	22,626
	FC9UC	415,740	PAØIHP	14,105
	PY7AKQ/8	375,180	G3UBR	11,376
	DJ2BW	358,800	OK1ATP	9,792
Multi-Op. Single Trans.	PJ9MM	3,698,545	5W1AZ	2,534,416
	9Y4A	3,683,295	GC4DAA	2,300,942
	ZD8W	3,652,143	PJ1AA	2,282,233
Multi-Op. Multi-Trans.	UK9AAN	4,859,348	W4BVV	3,704,400
	W3WJD	4,165,749	K2GM	3,290,688
	W3AU	3,796,562	W2PV	3,237,654

USA TOP SCORES

Single-Op. All Band	W3LPL	1,538,284	K4VX	1,151,403
	W1ZM	1,298,388	K6NA	1,130,880
	W2GXD	1,261,764	W4RX	1,119,144
	W6OUN	1,208,966	K3ZO	1,107,964
	K1GQ	1,167,450	W1YK	1,000,838
Single-Op. Single Band	**28 MHz**		**7 MHz**	
	K5FVA	13,052	W5WZQ	322,383
	WB4OSN	5,964	WB5DTX	284,900
	K5EWJ	4,520	WA7WXY	174,720
	W8WPC	4,280	W9VNE	144,440
	WA4EWX	1,586	K2LWR	115,050
	21 MHz		W7YTN	112,398
	W4WSF	113,634	**3.5 MHz**	
	W5MYA	102,816	W1MX	108,288
	WA8KCX	77,900	W7KW	29,580
	AC9LT	71,904	WA8JUN	28,471
	W4WHK	67,517	K5YMY	25,312
	K9BGL	67,465	K9OTB	23,940
			K6EBH	21,783
	14 MHz		**1.8 MHz**	
	K3MBF	297,084	K1PBW	22,626
	WB9LHI	279,342	W8LRL	6,660
	W8KFL	278,664	W4QCW	3,996
	K8HLR	267,150	W5USM	3,420
	WA1NKK	235,175	K4YFQ	3,344
	WB2RWY	230,956	W1BB/1	2,375
Multi-Op. Single Trans.	AA5LES	2,246,989	W2YD	1,487,250
	WA8ZDF	1,616,139	W7FU	1,460,410
	W1ZA	1,611,026	W3BWZ	1,328,880
Multi-Op. Multi-Trans.	W3WJD	4,165,749	K2GM	3,290,688
	W3AU	3,796,562	W2PV	3,237,654
	W4BVV	3,704,400	W7RM	3,000,380

USA QRM

I hate c.w. . . . W5TMN. When a Rhodesian contester said 'Sorry for the delay chaps, some bush pigs were outside in the garden', I knew why I like DX . . . WA5YTX. Had to work Thursday night and spend all day Friday setting up. Sunday night I had been up 78 hours . . . W5WMU. My biggest thrill was when I turned the rig on—it worked! . . . AA4MFK. First time I ever worked a c.w. contest without a c.w. filter. Good thing there was no stateside QRM . . . WB4OSN. Sure wish I could get through the WB9's to Europe . . . WA3SWF. Rough sliding with the heater in the house not working and 9 year old son getting first tooth . . . WB2GFE. Have separate kw hr meter for shack, used 9½ Kw hrs. Cost me about 50 cents for the juice . . . AC1CNU. I have more elements on my ten meter beam than I had contacts on that band . . . WA1STN. After 40,000 QSOs the dial drive broke on my R4C. Had to finish the contest with the T4X PTO . . . W2YD. A thrill to hear USSR stations on 3.5 MHz before sunset . . . WA8ZDF. We greatly enjoyed our contest challenge with the gang at W0HZ in the twin cities—especially since we won . . . WA0CPX. Now I'm convinced I need a rotary beam for 40 . . . WA1NRF. Our club's first DX Contest; we had a thrill . . . WB2RLO. My assistant operator, WA3YHT, just 16 years old, helped me beat his old man, WA3YGH, in our Frankford intra-club competition . . . W3BGN. Our fourth stunning upset—we got whipped again . . . WA3YGH. The tension rises when I get into the same pileup with my neighbor, W3FCS, where there's only a dits worth of difference . . . W3FCI. Tough in the Novice bands . . . WA4RVC. Operating on generator power in the Santa Cruz mountains, we averaged 57 QSO's per gallon of gas . . . K6QZ. My loyal second op WA6DJI handled most of the load since I was busy with a medical emergency in the family . . . W6BIP. For a newly licensed General class, all that high speed c.w. was really something . . . WA6JUD. Started late and stopped early—but wait till next year . . . K6LY. Linear blew—had to go low power during the entire test. Had more QSOs than with high power in '75 . . . AC0IUB. Where were the JA's on 15? . . . AC9LT. My first JA run on 40—new 3 element beam helped out . . . WA9BWY. Trying to catch the East Coast is tough—may have to move back to Florida . . . K9DX (ex WB4YLG, W9MEM). Heard about 25 JA's, but antenna to the west was not working on 3.5 MHz . . . WA8JUN. Never even heard Europe on 15 . . . WA7HRE. Cobwebs, dust and old boxes of gear dating back to WWII gave the shack an atmosphere which matches the conditions on 80 meters very well. . . . K6EBH

DX QRM

Not as well organized as for the Phone Contest, but watch our smoke next year . . . VE3DU. Enjoyed the first official multi-multi job from the Soviet Union. KP4AST was 10 over 9 on 80 . . . UK9AAN. Eighty meter antenna supported by two 365 ft. towers . . . SK5AJ. Thanks to the JA's and Europeans. Who said it couldn't be done from North America . . . KP4AST (op K7VPF). My first CQ WW CW Contest . . . UC2ABT. Straight key! Ouch! . . . VE1BHA. All I want for Christmas is a two letter call and a ten meter opening . . . WA1RFM/VP9. Worked 6 new countries for a total of 129 countries with 5 watts; worked 20 new band countries! . . . OA8V. Again had a great thrill operating FP0BG, thanks to FP8DX for such wonderful hospitality . . . VE1AIH. Pileups unbelievable —40 watts output sure got out . . . VP2MNR. It was very difficult to work Asia and the Pacific—bad conditions . . . CX2AQ. My first experience on 14 MHz band—W/K signals were very strong, 599 + 60 . . . YV1OB. There was a lot of activity, but very poor conditions for Africa, Europe and Oceana . . . PT2JB. After a few hours my rotor wouldn't work; then a relay in the rig failed; finally, an earthquake on Saturday night. All in all, a great contest . . . OA4AHA. Great opening on 160 to Europe—too bad KV4FZ was around again . . . VE3BMV. Had planned for 40 meters. Chip, K7VPF and Jim, W6BHY helped with the beam, but it failed at the beginning of the contest. As I jumped down to 160 I found Yuri, VE3BMV gobbling up my world record, which he had done the year before on 160 s.s.b. . . . KV4FZ (Look carefully at *the results again, Herb—ed.).*

U.S.A. Club Scores

Potomac Valley Radio Club	58,759,204
Frankford Radio Club	40,327,168
Northeast Contest Club	26,176,943
Western Washington DX Club	24,323,176
Murphy's Marauders	22,755,575
Northern California DX Club	21,253,224
Texas Association of Contest Operators	15,200,312
Southeast DX Club	12,911,035
Northern Florida DX Association	11,851,366
Southern California DX Club	9,223,679
San Diego DX Club	7,344,617
Southern California Contest Club	5,782,638
Wireless Institute of the Northeast	4,922,309
Southern Florida DX Club	3,950,576
Northern California Contest Club	3,879,698
Indy DXers	3,850,050
Arizona DX Club	3,133,200
Northern Illinois DX Association	2,824,219
Central Virginia Contest Club	2,823,552
Texas DX Society	2,690,212
Michigan DX Association	2,329,904
Virginia Century Club	1,253,951
Delta DX Association	1,011,986
Four Lakes Amateur Radio Club	715,158
Eastern Iowa DX Association	688,835
Mad River Radio Club	677,983
McDonald Douglas Radio Club	527,364
Bluegrass Amateur Radio Club	467,733
River Rats Amateur Radio Club	320,816
CW Contest Conspiracy	281,704
South Jersey Radio Association	268,937
Intercity Radio Club	173,348
Alamo DX Club	133,988

DX Club Scores

Rhein-Ruhr DX Association	23,095,211
Kaunas Polytechnic Institute Radio Club	11,298,518
Saar/Pfalz DX Club	9,068,284
South German DX Group	8,359,640
Toronto DX Club	8,054,633
Voroshilovgrad Radio Club	5,229,601
Channel Contest Group	3,589,537
Lvov Radio Club	3,344,936
Far East DX Ploiters	3,095,205
OA4 DX Hunters	2,305,771
SP DX Club	703,560
Uruguay DX Club	609,576
Winnipeg DX Club	523,524
Kiev Radio Club	518,472
Honolulu DX Club	471,403
Tallinn Radio Club	426,272
Worcester District Amateur Radio Club	274,239
CW YV Club	230,923
Danish DX Group	184,917
Nagaokakyo DX Club	50,967

Number groups after call letters denote following Band (A-all), Final Score, Number of QSOs, Zones and Countries. Certificate winners are listed in Bold Face.

ALL BAND NORTH AMERICA SINGLE OPERATOR

United States

W1ZM	**A**	**1,298,388**	**1,200**	**98**	**279**	
			(Opr. WA2CLQ)			
K1GQ	"	**1,167,450**	**1,130**	**91**	**271**	
W1YK	"	**1,000,835**	**1,021**	**86**	**255**	
			(Opr. WA1JLD)			
WA1STN	"	892,852	881	89	269	
W1RR	"	783-941	876	86	231	
W1DAL	"	688,744	712	85	258	
W1YN	"	611,826	678	82	239	
WA1NZT	"	463,797	638	75	186	
W1YG	"	408,672	590	74	184	
W1BIH	"	353,274	438	77	214	
K1RQE	"	332,322	411	84	207	
W1HFB	"	250,594	415	59	155	
W1OR	"	199,448	300	64	169	
W1HCO	"	192,085	336	60	145	
WA1WEM	"	187,944	352	57	134	
W1HX	"	132,086	232	63	148	
W1GPK	"	122,808	251	53	119	
W1FJJ	"	103,680	213	57	123	
W1HUY	"	91,800	270	34	86	
W1JAA	"	89,110	176	56	134	
W1SD	"	80,152	171	51	121	
W1WY	"	79,632	179	53	115	
W1PL	"	72,850	174	51	104	
AA1UAC	"	71,883	173	49	114	
W1DK	"	58,890	167	45	106	
W1CDC	"	57,810	173	40	83	
AC1CNU	"	52,924	157	44	87	
W1JFL	"	52,404	147	38	94	
K1NH	"	45,045	141	36	81	
K1RQF	"	43,407	143	32	85	
WA1JZC	"	42,229	128	38	83	
WA1HXH	"	32,857	119	32	71	
W1YZL	"	27,170	106	43	67	
K1IIK	"	25,272	115	19	59	
W1OPJ	"	8,262	56	14	37	
W1PLJ	"	6,321	47	17	32	
W1PWK	"	4,888	36	17	35	
AA1POJ	"	2,442	24	14	23	
K1GAX	"	2,065	24	15	20	
WA1FCN	21	3,360	41	11	21	
WA1NKK	**14**	**235,175**	**719**	**27**	**88**	
WA1RGW	"	108,225	487	17	58	
WA1UWR	"	27,158	129	18	56	
W1ZIY	"	20,824	100	19	57	
K1WJL	"	20,230	103	17	53	
K1NOL	**7**	**102,816**	**335**	**26**	**82**	
K1TZQ	"	22,648	116	22	54	
W1MX	**3.5**	**108,288**	**403**	**21**	**75**	
			(Opr. WA8WNU)			
WA1YUZ	"	1,755	32	9	65	
K1PBW	**1.8**	**22,626**	**157**	**15**	**39**	
W1BB/1	"	2,375	32	8	17	
W2GXD	**A**	**1,261,764**	**1175**	**99**	**279**	
K2BMI	"	**876,026**	**853**	**95**	**263**	
K2SB	"	**590,240**	**746**	**74**	**206**	
W2HMH	"	415,777	533	73	204	
WA2JEK	"	378,000	506	76	194	
			(Opr. WA2UOO)			
WB2RJJ	"	353,466	561	62	157	
W2LYL	"	329,364	476	73	179	
K2FL	"	267,376	362	76	196	
WA2VYA	"	199,800	363	62	138	
K2TD	"	150,692	282	58	144	
WB2HZH	"	124,100	276	47	123	
WA2AEJ	"	122,820	260	53	125	
W2EUO	"	78,067	202	40	111	
W2HUG	"	46,550	140	41	92	
WA2ZBW	"	37,120	126	37	79	
W2SGK	"	26,260	95	31	70	
WA2YPF	"	22,260	91	27	57	
AA2AUB	"	19,136	77	38	66	
W2DF	"	16,992	70	34	62	
W2LKH	"	16,037	71	23	56	
WA2CXQ	"	10,812	61	26	42	
W2HBT	**21**	**65,170**	**244**	**23**	**72**	
AA2HZR	"	26,904	130	20	56	
WA2PAT	"	2,028	29	9	17	
WB2RWY	**14**	**230,956**	**685**	**27**	**89**	
K2IGW	"	192,456	615	26	82	
W2BA	"	127,124	363	26	96	
W2NY	"	85,902	289	24	79	
			(Opr. WA2YCQ)			
AA2ZWH	"	28,656	139	20	52	
WB2GFE	"	20,760	126	17	43	
WB2SZO	"	11,220	73	18	37	
W2FTY	"	8,190	57	16	37	
W2MPP	"	760	14	7	13	
K2LWR	**7**	**115,050**	**345**	**30**	**88**	
K2RR	**3.5**	**17,516**	**109**	**12**	**46**	
W3LPL	**A**	**1,538,784**	**1149**	**117**	**351**	
K3ZO	"	**1,107,964**	**1146**	**83**	**255**	
K3GJD	"	**944,820**	**954**	**90**	**258**	
W3GRF	"	822,952	919	85	243	
W3AP	"	721,112	812	87	229	
AA3KOC	"	571,320	867	66	164	
W3KWB	"	507,200	587	90	227	
			(Opr. WB3AJQ)			
K3II	"	389,844	514	73	200	
W3OV	"	353,256	498	66	180	
W3AZ	"	343,156	504	67	175	
K3ZOL	"	302,940	427	68	187	
W3PZW	"	277,680	420	71	169	
W3NZ	"	274,309	391	73	190	
W3JSX	"	262,911	374	69	188	
WA3SZI	"	247,292	419	60	151	
AC3GID	"	210,572	319	67	177	
K3AV	"	201,586	315	61	177	
W3KV	"	195,661	385	56	125	
WA3WRO	"	194,181	404	53	116	
W3GRS	"	189,588	306	64	158	
W3KFQ	"	164,560	330	56	120	
WB2JYM/3		158,470	267	69	161	
K3KS	"	151,206	299	54	120	
W3BB	"	102,582	285	33	90	
AC3HDH	"	94,326	220	47	111	
W3KT	"	92,536	206	52	120	
W3GU	"	84,972	210	44	102	
K2PLF/3	"	55,211	160	43	94	
WB3AVN	"	51,940	145	43	97	
W3GL	"	48,576	137	46	92	
W3CV	"	47,190	124	48	95	
W3HVM	"	31,209	112	36	65	
WB3AOP	"	31,137	117	29	68	
WA3RSK	"	19,110	84	35	56	
K3WX	"	18,615	78	32	53	
W3EVW	"	18,318	82	26	60	
K3HWL	"	14,555	72	24	47	
W3YFV	"	13,400	73	25	42	
W3TN	"	12,060	65	27	40	
K3BSY	"	10,860	62	19	41	
W3KA	"	10,260	63	17	40	
WB3BKD	"	10,248	67	18	43	
WA3GVP	"	9,804	48	29	47	
W3DRD	"	495	12	6	9	
K3JGJ	21	9,020	61	17	38	
WA3ARX	"	2,492	36	9	19	
K3MBF	**14**	**297,094**	**890**	**28**	**86**	
WA3SWF	"	**221,130**	**651**	**28**	**89**	
W3IGQ	"	211,423	647	27	86	
W3HW	"	69,625	197	29	96	
W3GK	**7**	**43,808**	**169**	**26**	**67**	
W3GZQ	3.5	4,860	60	8	28	
K4VX	**A**	**1,151,403**	**983**	**112**	**295**	
W4RX	"	**1,119,144**	**967**	**111**	**297**	
WB4AEX	"	**851,200**	**860**	**99**	**251**	
K4PQL	"	850,896	970	85	226	
W4YWX	"	747,656	810	93	245	
K4LRO	"	675,454	781	89	224	
W4QQN	"	633,736	741	89	207	
AD4BAI	"	518,058	617	87	219	
W3ZKH/4	"	500,938	594	78	220	
W4KFC	"	492,336	578	85	227	
K4SB	"	425,880	464	96	242	
K4TBN	"	386,100	443	96	234	
W4YZC	"	309,024	471	62	170	
K4JWD	"	270,556	416	72	170	
K4CL	"	267,794	381	84	173	
K4DTD	"	236,307	387	66	161	
W4BV	"	227,076	353	76	178	
K4EZ	"	223,510	399	59	147	
W4DM	"	170,355	298	57	148	
W4EI	"	151,488	297	53	139	
WB4DHO	"	150,735	290	63	132	
K4VT	"	150,280	316	49	121	
AD4JGI	"	133,584	266	48	136	
W4KNW	"	132,800	252	61	139	
W4HOS	"	129,168	230	68	140	
AA4SHL	"	110,783	281	40	99	
WA4GQJ	"	89,430	198	55	110	
WA4IAR	"	88,270	186	66	116	
W4ZM	"	87,165	216	49	100	
K4KZP	"	81,829	185	58	115	
K4JM	"	81,530	191	48	107	
AA4UFW	"	77,252	226	34	90	
W4RW	"	69,010	187	40	94	
K4UEE	"	62,034	153	57	90	
AC4EDB	"	49,046	130	47	90	
AA4WYN	"	36,782	128	33	73	
W4MWT	"	35,581	116	39	80	
K4EF	"	26,040	96	39	66	
K4KA	"	24,465	88	37	68	
W4EZ	"	24,416	91	39	70	
W4GF	"	20,056	95	29	59	
WA4LWO	"	21,939	86	35	68	
AB4FOT	"	21,331	97	28	55	
K4FOK	"	17,860	81	25	51	
AB4WHE	"	7,475	54	30	35	
WA4MSX	"	5,311	47	18	29	
AA4MFK	"	4,715	43	15	26	
W4GTS	"	4,067	34	19	30	
W4BTZ	"	777	14	10	11	
WB4OSN	**28**	**5,964**	**67**	**15**	**27**	
WA4EWX	"	1,586	24	11	15	
W4WSF	**21**	**113,634**	**370**	**23**	**84**	
W4WHK	"	67,517	227	24	83	
WA4DRU	"	36,960	162	20	64	
WA4OAE	"	24,336	120	20	52	
WA4HPF	"	23,058	128	20	43	
WA4CTA	"	17,732	105	17	45	
WB4KTR	"	2,856	35	13	21	
W4AAV	**14**	**191,520**	**523**	**30**	**96**	
WB4DIU	"	188,890	509	28	102	
K4OLQ	"	40,704	156	23	73	
K4WLS/4	"	16,488	91	18	54	
W4ZWZ	"	4,284	43	12	24	
W4EEO	"	1,830	21	9	21	
WB4OGW	**7**	**87,575**	**283**	**28**	**85**	
WB4QKE	"	60,700	220	26	74	
WA4APG	"	14,136	92	19	38	
WA5FZG/4						
	3.5	54	3	3	3	
W4QCW	**1.8**	**3,996**	**46**	**11**	**26**	
K4YFQ	"	3,344	38	12	26	
K4QMQ	"	2,340	35	9	21	
WA4SGF/M4		946	42	8	14	
W4BAA	"	612	17	6	12	
AC4WRY	"	384	13	6	10	
W5WMU	**A**	**711,075**	**887**	**92**	**193**	
			(Opr. W5RTX)			
W5ZSX	"	234,900	338	87	174	
W5SBX	"	233,825	378	82	153	
K5TSQ	"	142,020	289	63	117	
WA5UCT	"	119,232	232	67	125	
W5UO	"	98,102	212	65	116	
W5TMN	"	94,010	289	49	70	
K5ET4	"	90,420	304	61	104	
W5OB	"	71,736	188	49	98	
W5VIW	"	64,690	146	63	107	
W5RRR	"	23,760	82	40	68	
W5JC	"	21,948	92	36	57	
K5RRG	"	12,312	75	35	46	
K5DB	"	960	18	10	10	
K5FVA	**28**	**13,052**	**133**	**17**	**35**	
K5EWJ	"	4,520	47	15	25	
W5MYA	**21**	**102,816**	**362**	**24**	**78**	
AB5DDI	"	24,830	144	19	46	
W5EIJ	"	620	12	9	11	
K5BGB	**14**	**200,561**	**554**	**30**	**101**	
WA5RTG	"	176,229	592	27	80	
W0PCO/5	"	132,093	416	26	91	
WA5YMW	"	54,050	212	24	70	
W5WZQ	**7**	**322,383**	**907**	**33**	**90**	
WB5DTX	"	**284,900**	**903**	**31**	**79**	
			(Opr. W5BJA)			
WA5YTX	"	14,260	87	23	39	
K5YMY	**3.5**	**25,312**	**166**	**14**	**42**	
WA5VDH	"	18,830	130	18	52	
K5VTA	"	13,878	101	16	38	
W5USM	**1.8**	**3,420**	**42**	**12**	**24**	
K5JVF	"	779	23	6	13	
K5QHS	"	558	17	7	11	
W6OUN	**A**	**1,208,966**	**1,380**	**109**	**189**	
			(Opr. WB6OLD)			
K6NA	"	**1,130,880**	**1,294**	**105**	**199**	
K6PU	"	**868,395**	**1,095**	**101**	**176**	
W6PLH	"	789,225	1,087	99	156	
K6SE	"	507,150	768	91	154	
W6RR	"	486,288	667	90	174	
K6DC	"	480,960	700	79	161	
W6OKK	"	448,448	755	76	132	
AD6SDR	"	442,011	622	88	163	
K6AO	"	402,480	604	86	154	
K6RU	"	390,980	775	68	105	
W6CF	"	297,414	561	77	109	
W6EYY	"	227,088	530	60	92	
W6NKR	"	223,437	371	82	131	
K6DR	"	177,722	457	62	85	
W6US	"	160,599	388	58	83	
W6MUR	"	136,458	285	61	110	
K6YK	"	130,508	311	62	96	
K6LLE	"	129,184	272	71	106	
AA6EPQ	"	121,520	341	53	71	
K6HIH	"	112,240	427	34	58	
W6SC	"	110,088	279	59	80	
W7CB/6	"	96,424	255	53	83	
WA6AHF	"	91,195	278	45	70	
W6BA	"	87,291	193	53	106	
W6PN	"	81,486	185	59	103	
K6OC	"	63,246	173	52	75	
W6BZE	"	61,585	199	43	70	
W6ABT	"	59,160	138	57	79	
WB6CQY	"	58,813	214	46	57	
WA6TLA	"	58,240	196	41	71	
AC6CLM	"	53,000	184	44	62	
K6MA	"	50,779	183	47	56	
K6YGS	"	47,565	168	42	63	
W6PRP	"	47,125	140	53	72	
K6RK	"	41,496	144	48	66	
W6ISQ	"	36,308	112	41	75	
AA6LBP	"	29,400	108	46	52	
W6MTJ	"	27,639	138	37	46	
W6BJH	"	25,615	187	21	26	
K6CN	"	24,817	115	38	45	
K6OZI	"	24,472	113	31	45	
K6CYX	"	19,206	110	30	36	
K6IXS	"	16,502	93	32	42	
K6TZX	"	12,580	72	27	41	
W6IA	"	7,584	59	25	23	
WA6UAV	"	4,343	47	22	21	
AA6ORJ/6		3,828	41	22	22	
W6QDE	"	2,726	32	11	18	
K6TG	"	1,701	24	14	13	
WB6FCE	"	1,595	20	14	15	
W6EJA	"	1,386	26	9	9	
AA6PGB	**21**	**65,712**	**311**	**24**	**50**	
W6KNE	**14**	**27,140**	**173**	**20**	**39**	
W6FF	"	24,090	119	24	49	
W5TES/6	"	23,042	197	18	23	
K6EBH	**3.5**	**21,783**	**153**	**18**	**35**	
AA6MQS	"	9,604	140	12	16	
K6BCE	**1.8**	**1,485**	**42**	**10**	**17**	
W7IR	**A**	**843,865**	**891**	**107**	**228**	
K7RSC	"	**477,714**	**800**	**73**	**133**	
K7DZ	"	**413,205**	**878**	**65**	**104**	
K7HOZ	"	260,190	631	52	95	
W7YBX	"	190,320	512	54	76	
W7WMY	"	180,752	413	66	92	
W7HAD	"	152,874	476	47	67	
AA7JCB	"	109,779	348	46	65	
W7ZMD	"	101,996	256	70	102	
W7LZF	"	88,320	232	60	78	
W7LR	"	56,592	189	40	68	
K7MOK	"	17,280	133	25	29	
W7NP	"	14,271	75	33	34	
WA7RKJ	"	10,340	124	12	32	
W7MCU	"	7,168	42	31	33	
AB7ALT	"	6,120	50	20	25	
W7JEG	"	4,125	49	17	16	
AA7OBL	"	1,485	21	14	13	
K7EFB	"	1,045	20	9	10	
WA7HRE	**21**	**38,610**	**213**	**22**	**44**	
W7AYY	"	16,032	117	18	30	
WA7TIM	**14**	**106,571**	**473**	**26**	**53**	
W7DAZ	"	97,740	393	26	64	
W7DNU	"	80,080	333	26	62	
K7CHT	"	1,584	35	8	8	
WA7WXY	**7**	**174,720**	**713**	**28**	**56**	
W7YTN	"	112,398	495	26	52	
W7KW	**3.5**	**29,580**	**193**	**20**	**40**	
			(Opr. WA7YRP)			
W7JLU	"	18,788	159	16	28	
W7YN	**1.8**	**540**	**24**	**7**	**8**	
WB6NRK/7						
	"	391	13	7	10	
K8MFO	**A**	**452,568**	**506**	**86**	**241**	
K8ETO	"	**287,268**	**462**	**70**	**152**	
WA8CZH	"	172,144	288	75	157	
WB8FOS	"	147,018	230	56	158	
W8TWA	"	111,540	246	51	114	
AB8IJW	"	91,815	200	56	128	
WA8KME	"	71,448	174	50	106	
W8DSO	"	65,893	179	36	95	
AC8GOC	"	57,652	155	50	92	
W8YGR	"	33,000	102	38	82	
W8WVU	"	29,321	119	41	68	
WB8WHS	"	19,608	93	25	51	
AD8JPF	"	12,400	69	35	45	
W3GN/8	"	3,960	42	18	27	
K8PYD	"	1,025	15	11	14	
W8WPC	**28**	**4,280**	**43**	**16**	**2**	
WA8KCX	**21**	**77,900**	**290**	**24**	**71**	
W8VSK	"	17,000	91	18	50	
W8KFL	**14**	**278,664**	**745**	**30**	**98**	
K8HLR	"	**267,150**	**719**	**31**	**99**	
K8UQA	"	177,057	598	25	78	
AC8BDO	"	160,688	472	27	94	
WA8GLY	"	154,098	434	28	98	
AB8UKX	"	91,665	305	28	77	
K8YQW	"	41,340	186	21	57	
K8LUU	**7**	**28,798**	**163**	**23**	**54**	
WA8JUN	**3.5**	**28,471**	**158**	**15**	**56**	
W8LRL	**1.8**	**6,660**	**59**	**15**	**30**	
K8WOT	"	1,430	30	9	17	
K9DX	**A**	**806,958**	**816**	**96**	**257**	
WA9BWY	"	**470,820**	**609**	**83**	**212**	
K9KGA	"	293,632	443	80	168	
W9OHH	"	251,968	383	76	172	
W9RX	"	233,580	322	71	184	
W9PJT	"	145,080	296	59	121	
K9UTN	"	133,406	274	62	120	
K9QXY	"	87,376	190	62	111	
AB9CGL	"	69,696	187	50	94	
AD9UIY	"	59,250	194	43	82	
W9HR	"	20,832	84	36	60	
W9NA	"	18,292	93	20	48	
W9YYG	"	8,122	55	24	38	
W9UDK	"	2,432	24	16	22	
AC9LT	**21**	**71,904**	**273**	**23**	**73**	
K9BGL	"	**67,465**	**241**	**26**	**77**	
WA9LZA	"	35,112	151	23	65	
AC9ZTD	"	33,930	164	21	57	
WB9KLB	"	31,668	155	21	57	
W9OWZ	"	28,397	142	20	53	
W9GIL	"	26,300	132	18	57	
WB9LHI	**14**	**279,342**	**766**	**28**	**98**	
W9KNI	"	160,128	440	31	97	
WA9PBK	"	159,720	476	31	89	
K9CLO	"	90,842	305	26	80	
K9DAF	"	51,801	199	22	71	
K9AB	"	49,049	191	22	69	
K9TZH	"	35,690	156	24	57	
W9VNE	**7**	**144,440**	**468**	**29**	**86**	
W9CH	"	30,554	142	25	58	
WA9EJD	"	16,128	99	22	42	
W9HLY	"	15,407	80	21	50	
K9OTB	**3.5**	**23,940**	**113**	**21**	**55**	
AC9PNE	"	3,036	41	10	23	
AD9UKM	"	2,349	38	9	20	
W9DL	**1.8**	**720**	**22**	**6**	**14**	
AC0IUB	**A**	**115,204**	**262**	**59**	**107**	
WA0TAS	"	73,628	181	57	101	
W0FHE	"	54,880	155	51	89	
AC0MHK	"	53,040	148	48	88	
WA0FBQ	"	50,270	176	37	71	
WA0GSG	"	39,528	125	48	74	
AB0IPH	"	22,504	90	32	65	
WA0YEF	"	17,010	70	32	58	
W0PRY	**21**	**12,852**	**70**	**20**	**48**	
K0FLY	**14**	**97,800**	**347**	**25**	**75**	
WA2WMT/0		48,921	260	19	50	
W0HBH	"	8,424	60	17	35	
AA0UBW	7	1,197	24	9	12	

(Continued on page 86)

CQ looks at some of the latest equipment and accessories of interest to amateurs.

New Amateur Products

Heath's New Personal Computer Line

Heath Company, the world's largest manufacturer of electronic kits, has introduced their new line of personal computing products for hobby, home, educational and small business applications.

The new product line, according to company spokesman, is designed around two new computers, the H8 and the H11. The H8 is an 8-bit computer based on the popular 8080A microprocessor.

It features an intelligent front panel with octal data entry and display, and a resident monitor with built-in bootstrap for one-button program loading or storing. The H11 is a 16-bit computer using the digital Equipment Corporation (DEC) LSI-11 with 4k memory, a built-in backplane and regulated switching power supply. System compatible peripherals include a CRT terminal, paper-tape reader/punch, serial and parallel interfaces, a hard-copy printing terminal and a cassette player/recorder. Input/output interfaces, additional memory and supplementary software package complete the initial product offerings.

Heath Company will back up their computer systems with complete documentation and service support, self-instructional programming courses, and a Heath User's Group (HUG). Heathkit H11 owners are also eligible for DECUS, the DEC user's organization.

Shipping of all new computer products is scheduled for the fall. For further information, write for the "Computer Information Package"–Heath Company, Department 360-26, Benton Harbor, MI 49022.

Nye Iambic Keyer

Featuring a combination of the fast, comfortable Nye Viking Super Squeeze Key and the reliable Curtis 8043 keyer chip, Wm. M. Nye Company's new Iambic Keyer is designed to give the amateur faster, surer sending.

The super Squeeze Key, with extra-long, form-fitting molded paddles and gold plated silver contacts, adjustable-to-your-fist spring tension and contact spacing, gives faster, tireless, more accurate sending.

Powered by internal 9 VDC or 115 VAC supply, the unit will key transmitters (either negative or positive-keyed) up to 200 mA at 240 volts.

Other features include a Nye Viking 404 audio oscillator and speaker with on-off switch and volume control for monitoring and practice keying, and a "manual" switch to allow slow-speed hand keying and "tune-up" using the dash paddle. In the test, or manual position, it also simulates the old-fashioned bug key. Keyer output is terminated in a shielded cable with standard 1/4-inch phone plug.

The unit's 1.2 kilogram weight plus nonskid feet lend stability for right or left-hand operation. Made in the U.S. and priced at $98.00 (less battery), the Iambic Keyer is available from dealers nationwide, or circle no. 36 on the Reader Service Card.

Telco SWR/Wattmeter

Telco Products Corporation have announced a new SWR/wattmeter, the swattmeter, model 10-10. The meter provides three separate laboratory calibrated scales, 10, 100, and 1000 watts, adjusted to within 3 percent accuracy to provide the user with a professional laboratory standard of measurement. Ideal

for continuous duty operation in monitoring the SWR and power output of any system. The model 10-10 is packaged in a compact 8 x 4 x 5 inch chrome steel case. Price is $59.95. Delivery from stock. For additional information, contact Telco Products Corporation, 44 Seacliff Ave., Glen Cove, NY 11542 (516) 759-0300, or circle no. 37 on the Reader Service Card.

CQ Reviews:
The Dentron MLA-2500 Linear Amplifier

BY HUGH R. PAUL*, W6POK

Over the years many amateur operators have approached the purchase of a new linear amplifier with the philosophy that "big is better." If the amplifier stood three feet off the floor and required two men and a boy to maneuver it into position next to the operating position, it was considered a reliable "power house." Until recently there was some justification for that philosophy; then along came the new Dentron MLA-2500 linear amplifier.

The MLA-2500 covers all bands from 160 meters through 10 meters, and is rated at 2000+ watts p.e.p. on s.s.b. and 1000 watts d.c. input on c.w. with a continuous duty cycle. The real grabber is its size—only 5½" high, 14" wide and 14" deep. Half of its 47-pound weight is composed of the power transformer.

Dentron has given special consideration to MARS operators and the possibility of band expansion after WARC 79 by designing in extended tuning ranges for the 80, 40, 20 and 15 meter segments. The amplifier will cover 3.4 to 4.6 MHz, 6.0 to 9.0 MHz, 11.0 to 16.0 MHz and 16.0 MHz to 22.0 MHz.

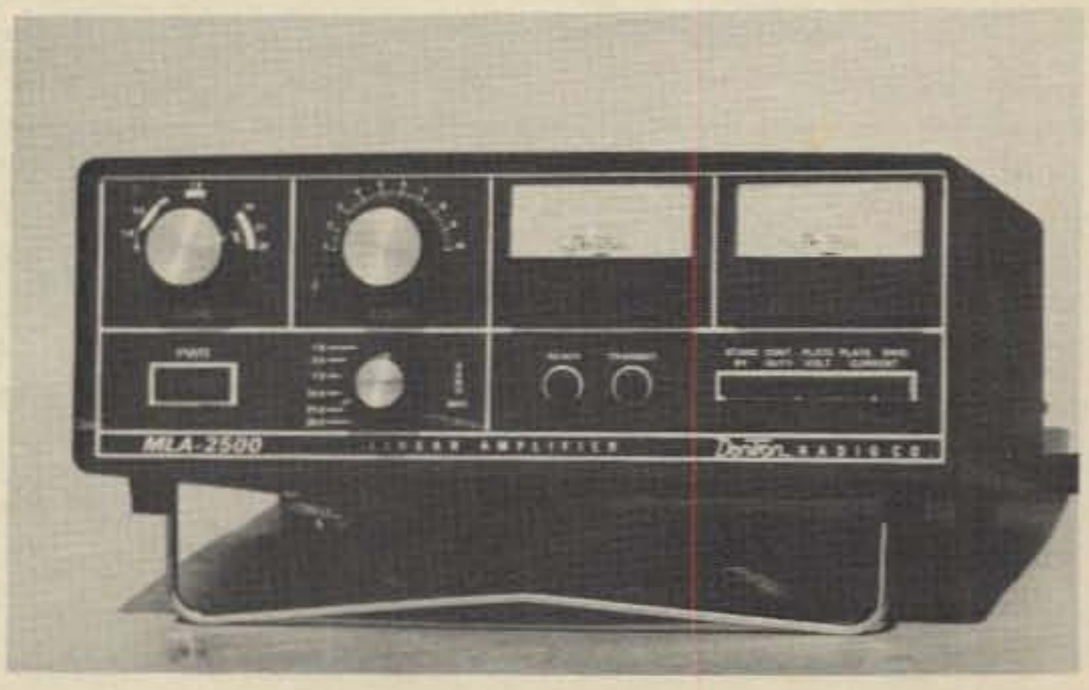
Other design features include a time delay relay to allow full warmup of the tubes before drive can be applied and a thermal switch that senses a 10 degree increase above normal operating temperature of the Eimac 8875 triodes. When the switch cuts in, the Rotron fan operates at high speed to increase air flow, thus maintaining tube temperature at a safe level. At high speed the fan is a bit noisy, but other stations reported hearing it only during pauses in speech.

The Eimac 8875 ceramic triodes are rugged little tubes, but as with all tubes with external anodes their dissipation rating is dependent primarily on the amount of air circulating past the cooling fans. At the power levels the MLA-2500 is capable of, a lot of air is necessary if long tube life is to be achieved.

The main power switch is an illuminated type that glows red when primary power has been applied. A green "ready" light indicates that the tube filaments have reached proper operating temperature. The time delay is about one minute. The transmit condition is indicated by a second red indicator light just to the right of the "ready" light.

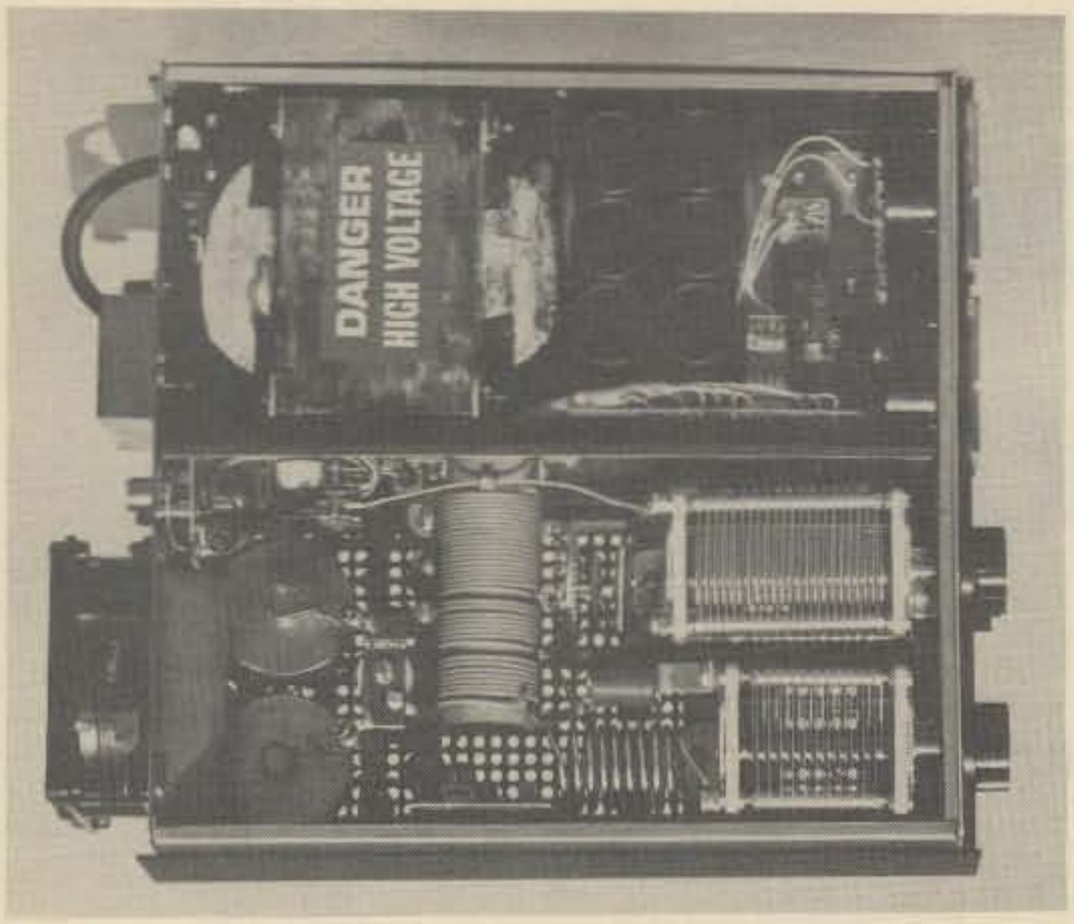
The meter on the right reads plate voltage, plate current and grid current as selected by push button switches located directly below the meter. Additional push type switches place the amplifier in a standby mode when one desires to use only the exciter and to bypass the thermal switch and place the blower on high speed at all times when operating RTTY or slow scan TV.

The meter to the left reads RF Watts output. The accuracy is within plus or minus 10% at the higher



Front view of the Dentron MLA-2500 linear amplifier. (Photo by Sandra R. Paul)

*291 Macalester Dr., Walnut, CA 91789



Interior view of the MLA-2500 linear amplifier. (Photo by Sandra R. Paul)

power levels, provided the s.w.r. is low. At higher s.w.r. levels or at lower power levels the accuracy can vary by as much as plus or minus 25%. In most cases the r.f. wattmeter was reading low when compared to a Bird thruline wattmeter. The power measuring circuitry has adjustment which will allow you to calibrate the output indication against a standard such as a Bird.

The components used in the MLA-2500 have been selected to provide good safety margins with regard to power ratings, etc. The large inductor visible in the interior photograph is made by Dentron and is teflon coated. The variable capacitors are heavy duty transmitting types. The final PI network has been carefully designed with enough fixed capacity inserted where required, that the output is at a nominal 50 ohms impedance with the variable loading control at the #1 position. Only slight tuning of the variable loading control is required to achieve full output on each band. The result is that you won't experience arc overs during the tuning process. The final is capable of loading impedances of as much as 100 ohms. With 52 ohm coax and a v.s.w.r. of 2 to 1 or less, tuning the amplifier is a "piece of cake."

During lab testing of the MLA-2500 we found that 1 k.w. d.c. input could be achieved with from 35 to 40 watts of drive applied. Efficiency at 1 k.w. input averaged 62% across the various bands. At 2 k.w. d.c. input the efficiency increased to an average of 66%. These efficiency factors were calculated after subtracting the drive power, which averaged about 95 watts at maximum input. Maximum d.c. input power achieved with 220 v.a.c. applied to the primary of the power transformer, and with 95 watts of drive power was just over 2200 watts.

Dentron rates their amplifier at 1 k.w. d.c. input on a continuous duty basis. I'm sure that by continuous duty they mean hour after hour operation. We ran the unit under test at 1 k.w. d.c. OUTPUT for extended periods of time with no ill effects. The power transformer is extremely rugged and does not overheat like those used in many table top amplifiers.

Dentron recommends that the amplifier be operated from a 234 v.a.c. primary circuit, but it can also be operated from a 117 v.a.c. circuit by merely switching a jumper and adding a second jumper on a barrier strip located behind a protective cover on the back of the amplifier. At my home QTH I don't have 234 v.a.c. in the shack so "on the air" tests were made while operating on 117 v.a.c. primary power. High voltage regulation is not as good as it was with 220 v.a.c. in the lab, but I was still able to load the amplifier to almost 1.9 k.w. d.c. input. I might add that I have a separate 30 amp. service without any other load on it just for this purpose. I would not nor would your insurance company recommend using a standard lighting circuit for powering this amplifier.

The final test of a linear amplifier is not just how much power it will put out, but how clean is the output. This is especially true in light of the new FCC regulations concerning spurious emissions. The Dentron MLA-2500 is clean if the transmitter used to drive it is clean. Dentron claims third order products at least 30 db down. My TS-520 has third order products just under 30 db down from the single tone of a two tone test and that's what we found when looking at the output of the amplifier with a spectrum analyzer. The second harmonic was about 43 db down.

Performance of the a.l.c. circuitry in the MLA-2500 is excellent. Adjustment procedure for this circuit is outlined briefly in the owner's manual in case you should have some difficulty with a particular exciter. No adjustment was required for use with the TS-520 and it required a deliberate effort to overdrive the amplifier and achieve flattopping.

The instruction book is fairly good, but did lack some basic information such as how much grid current you should read under normal operating conditions (about 50 ma at full load). A few more details concerning the control circuitry could prove helpful in the event of trouble in this area. In the photograph you can see a wire bail that serves to elevate the front of the amplifier. This bail is a flip up type, which the manufacturer recommends you use to insure maximum flow of cooling air underneath the unit.

The Dentron MLA-2500 has been designed and built with integrity. The MLA-2500 is priced at $799.50. It represents good dollar value in today's market. For more information contact Dentron Radio Co., Inc., 2100 Enterprise Parkway, Twinsburg, Ohio 44087. ■

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BASIC RADIO

BY IRVING TEPPER*

Chapter 3: Dynamic Electricity

STATIC electricity can produce a flow of negative charges for a short period of time only. If we have two charged bodies as shown in Fig. 1.10A, one charged positively (missing electrons) and one charged negatively (an excess of electrons) and we place them close to each other, the electrons in Charge 1 will be attracted to Charge 2. A force is developed between the two charges but no movement of electrons occurs between them. This force is called a *pressure*, a *potential*, a *difference of potential*, or an *electromotive force* (EMF) and is caused by the accumulation of electrons on Charge 1 trying to force their way to Charge 2. The more excess electrons in Charge 1, the greater the difference of potential between the two charges.

Flow of Charges—When a copper wire is connected between the two charges, as shown in Fig. 1.10B, all the excess electrons on Charge 1 will move through the wire to Charge 2. At Charge 2 these electrons will fill in for the missing valence electrons and both charges will become neutral—there will no longer be a difference of potential.

But what happened when the wire was connected? For a brief moment we had a movement of electrons from the negative charge to the positive charge. This is called an *electric current flow* or an *electron flow*.

*19 Woodland Road, Valley Stream, NY 11581

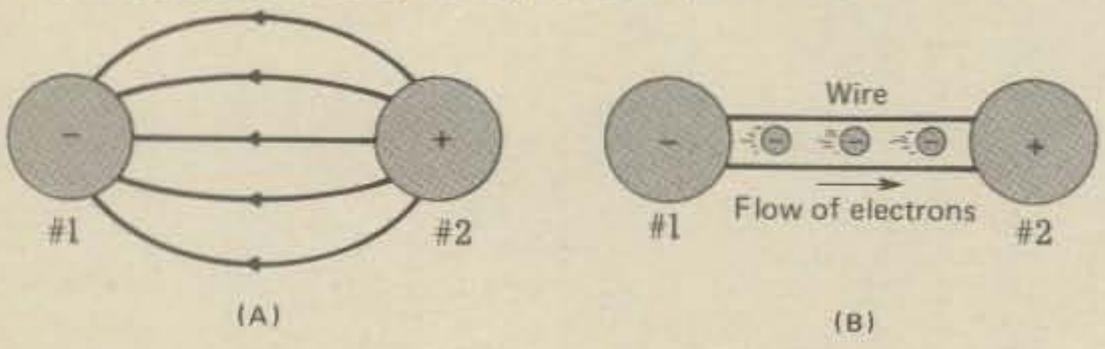


Fig. 1.10 (A)—Charge 1 is negative because it contains more than normal amount of electrons and Charge 2 is positive because it is missing electrons. (B) When a conductor (a wire) is connected between the two charged bodies, the electrons move from Charge 1 to Charge 2 and both become neutral.

The greater the difference of potential the greater would be the number of electrons flowing from Charge 1 to Charge 2. Since it is normal to generate different strengths of charges, there must be a method to define that strength. In electronics, the difference of potential is measured in *volts*. Some static charges develop only a fraction of a volt whereas lightning, also a form of static electricity, can develop differences of potential as high as several million volts.

Dynamic Electron Flow—The example of electron flow shown in Fig. 1.10 lasted only a fraction of a second, only the time needed to equalize the two charges. The flow of electrons did not last long enough to do any useful work. To accomplish work with an electric current it *must be continuous*. It is necessary, therefore, to create a form of electricity that is continuous or dynamic, and friction is not a practical method.

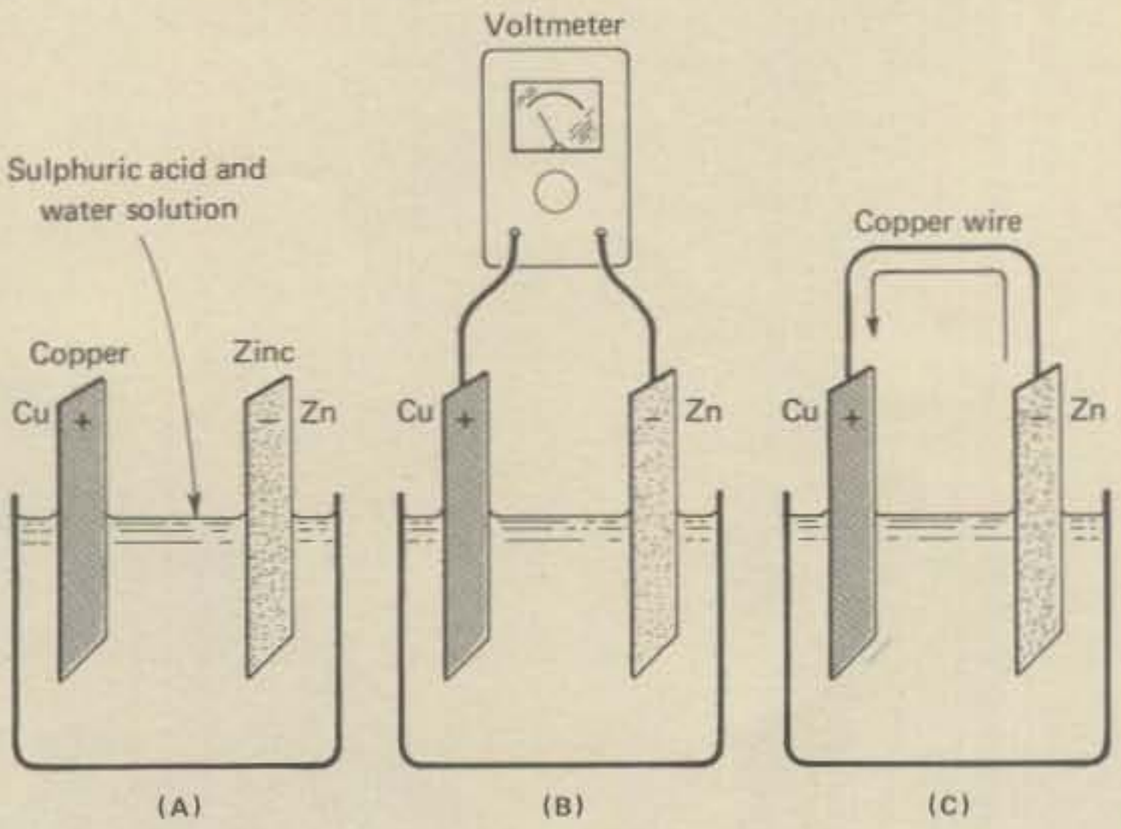


Fig. 1.11 (A)—Construction of a basic wet cell. A difference of potential is produced between the copper and zinc elements. (B) The difference of potential developed by the cell can be measured by a device called a "voltmeter." (C) When a wire is connected between the elements a constant flow of electrons moves from the zinc to the copper until the cell is exhausted.

INFORMATION SHEET #3: HOW TO USE THE VOLTMETER PORTION OF THE VOM

A volt-ohm-milliammeter, abbreviated VOM, is a multipurpose test instrument designed to measure DC voltage, AC voltage, resistance and current using a single meter to indicate all readings. The VOMs are rated in several ways such as the number of ranges, number of functions and their sensitivity. The sensitivity of a VOM is indicated by its ohms-per-volt rating; the higher the ohms-per-volt, the better. The meters recommended by the author are both rated at 20,000 ohms-per-volt. There are less expensive units rated at 1,000 ohms-per-volt but they are not satisfactory for our purposes. There are more expensive units rated at 30,000 and 50,000 ohms-per-volt but they do not serve our purposes any better than the 20,000 ohms-per-volt units.

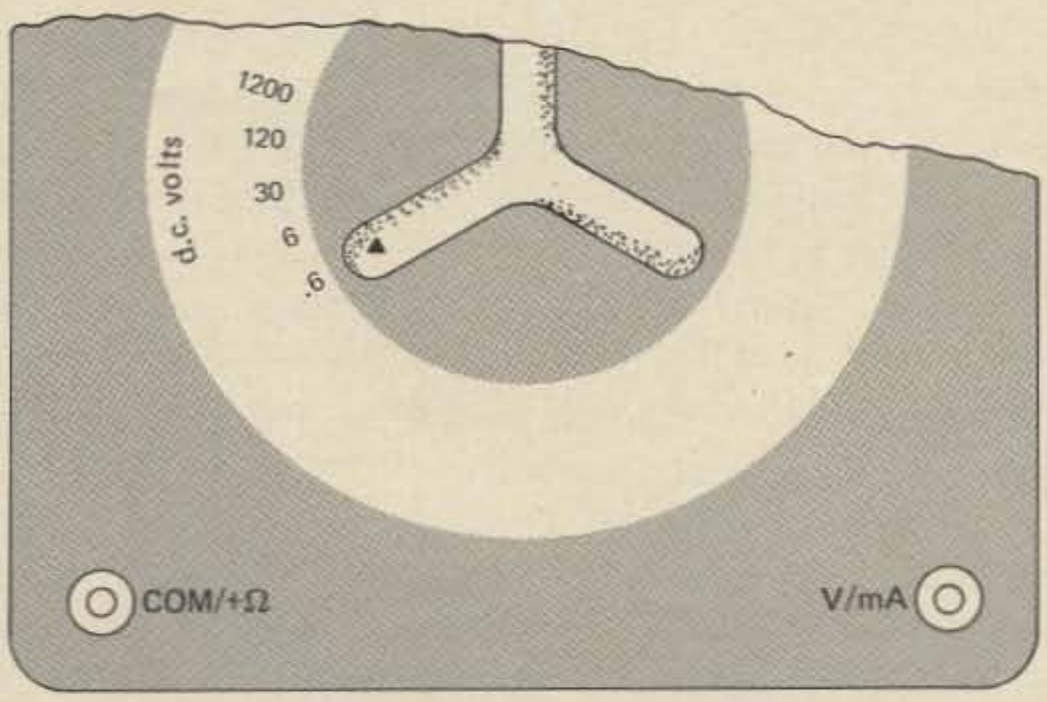


Fig. 1—Connection jacks and range selector switch for a typical VOM.

The use of the VOM in Experiment #2 is limited to the measurement of voltage. Therefore, we will only discuss this function. Do not use the meter for any other function until instructed how to do so or refer to the instructions that come with the meter.

The author recommends the Radio Shack #22-203 or the Lafayette #99R50734 VOMs. The meters are virtually identical in cost and performance. Any other equivalent brand will do, however.

The meter has the following DC voltage ranges: 0-0.6V, 3V, 30V, 120V, 600V and 1200V. To make connection to the VOM a black test lead is plugged into the left hand jack marked COM/+Ω and the red test lead is plugged into the right hand jack marked VmA (See Figs. 1 and 2) The desired voltage range is then selected by the main center knob.

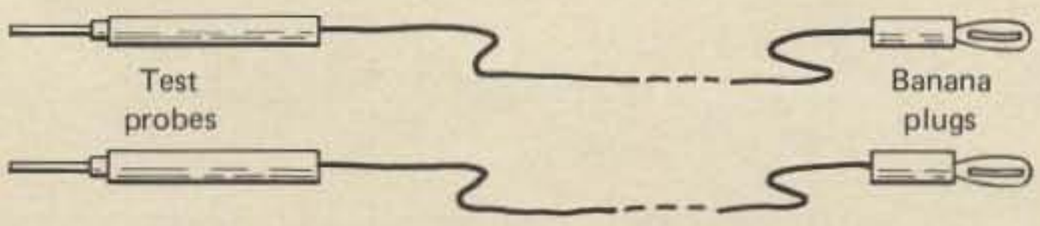
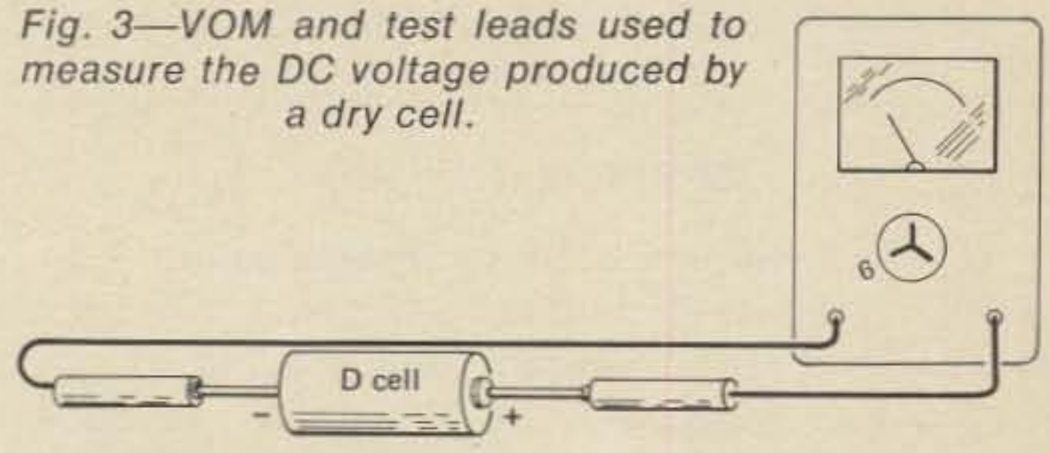


Fig. 4—Calibration of the 0-6V meter scale shows a 1.6V reading.

Fig. 3—VOM and test leads used to measure the DC voltage produced by a dry cell.



The pointer of the knob (marked with the white dot) is set to one of the five DC voltage ranges.

To measure a voltage, proceed as follows:

1. Estimate the amount of voltage you are going to measure and set the voltage range to one higher than the expected voltage.

2. If you do not know what voltage to expect, start with the 600V range.

3. Connect the test leads to the voltage source, placing the black lead on the negative terminal and the red lead on the positive terminal.

4. If the pointer deflection on the meter face is reversed the polarity being applied is wrong and the test leads should be reversed.

5. When the meter indication is very low, remove one test lead and reduce the voltage range to the next lower range and then reconnect the test lead.

6. Repeat the above step until a reading is obtained in the middle of the scale, or at least, as high as possible.

If, for example, you wished to measure the voltage developed by a dry cell as shown in Fig. 3, you would first try to determine the voltage expected. It is common knowledge that a dry cell develops about 1.5 volts. The choice of the 6V scale would be ideal because a higher range (30V) would produce a low reading and a lower range (0.6V) could burn out the meter or damage it severely.

To read the voltage you have to observe the position of the pointer on the scale selected, in this case 6V. On the 6V scale each division has a value of 0.1V. The position shown in Fig. 4 represents 1.6V, the reading obtained from the D cell in Fig. 3.

Test Leads—While a pair of leads always comes with any VOM when purchased, the author recommends the purchase of the Radio Shack Test Lead Kit #270-332. It enables you to convert your test leads to alligator clip leads when necessary; this helps free your hands for the various experiments.

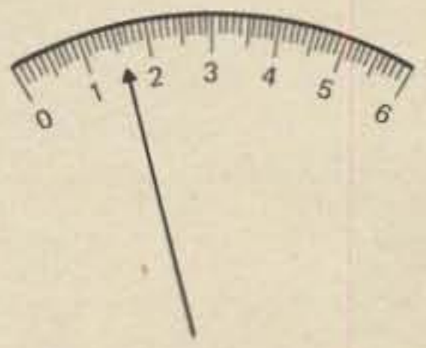


Fig. 2—Typical set of test leads, one red, one black.

There are at least five methods of generating *dynamic* electricity or voltage. These are chemical, magnetic, thermal, pressure and light.

EXPERIMENT #2:

Generating Electricity Dynamically

Each of the five methods of developing electricity, chemical, magnetic, thermal, pressure and light, will be tried experimentally. To keep the experiment orderly, we will list the materials required for each part separately.

EXPERIMENT #2(A):

Generating Electricity Chemically

Material: *VOM; Quarter; Penny; Lemon.*

Procedure:

1—Cut two short slits ¼" apart in a fresh lemon as shown in Fig. 1.

2—Force a quarter into one slit and a penny into the other.

3—Measure the difference of potential using the voltmeter portion of the VOM as shown in Fig. 1. Enter the voltage reading in Chart 1.

4—Measure the voltage generated using different coins such as nickels and dimes in combination with the quarter and penny.

Fig. 1—Two coins inserted into a lemon creates a cell and generates a difference of potential.

Coins		Voltage
Penny	Quarter	V
Penny	Nickel	V
		V
		V

Chart 1

Chemical Generators—Typical chemical generators of electricity are called *cells*. When two or more cells are combined, they are called *batteries*. A cell is formed by placing two different metal elements in a solution called an *electrolyte*. A combination of copper and zinc elements in a sulphuric acid and water electrolyte is shown in Fig. 1.11A. Because of the chemical activity of the acid electrolyte, the zinc gives up positive ions to the solution and thus assumes a negative charge. The copper gives up electrons to the solution and so assumes a positive charge. Each element continues to give up particles which lock into the molecular structure of the electrolyte until a balance is reached. This means that the zinc cannot release any more positive ions to the electrolyte because of the repelling effect of the positive ions suspended in the electrolyte. The copper cannot release any more electrons into the solution because of the repelling effect of the electrons suspended in the electrolyte. A potential difference has been developed between the copper and zinc elements that will remain *constant* for a long period of time. If measured with a device called a *voltmeter* (Fig. 1.11B) it will show slightly more than 1 volt.

If a wire is connected between the copper and zinc elements as shown in Fig. 1.11C, electrons will leave the zinc element, flow through the wire and move into the copper element in which there is a shortage of electrons. As the electrons move out of the zinc, the balance is upset and the zinc can now accept electrons from the solution. One electron is accepted from the solution for each electron that leaves the zinc. As the electrons enter the copper element, they are fed back into the solution replaceing those picked up by the zinc element.

Unlike static electricity this chemical generator of electricity will produce a continuous flow of negative charges until the elements or electrolyte fail chemically. When this occurs the cell is said to be *discharged* or *dead*.

There are a variety of cells such as just described, called wet cells and there are also dry cells. The various types will be covered later in greater detail.

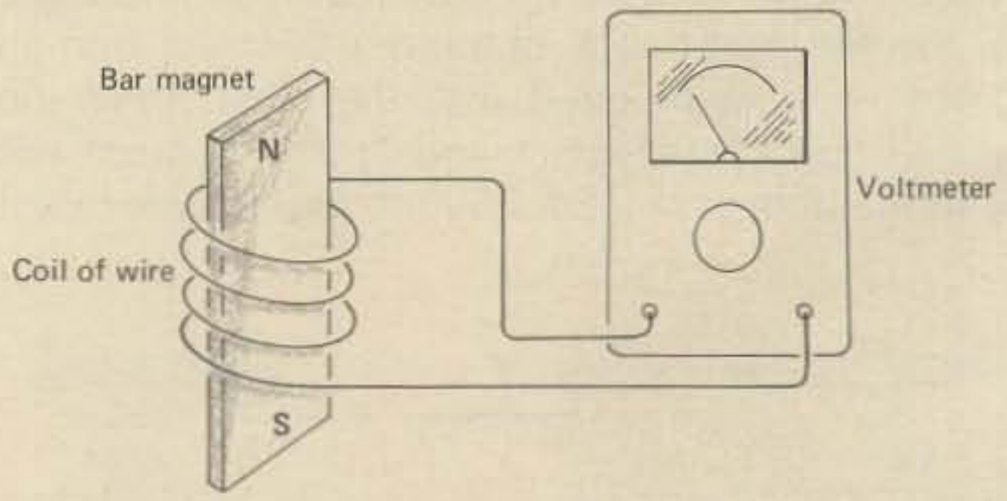


Fig. 1.12—A difference of potential can be generated magnetically by passing a bar magnet through a coil of wire. The voltage generated is shown by the reading of the voltmeter.

Magnetic Generators—One of the most common methods of generating electricity is by the use of magnetism. How this may be done experimentally is shown in Fig. 1.12. A winding of wire called a *coil* is connected to a sensitive voltmeter which will show the presence of a difference of potential. When a bar magnet is lowered into the coil, the magnetic lines of force cutting through the wire conductors will generate a difference of potential. This difference of potential will be indicated by the voltmeter.

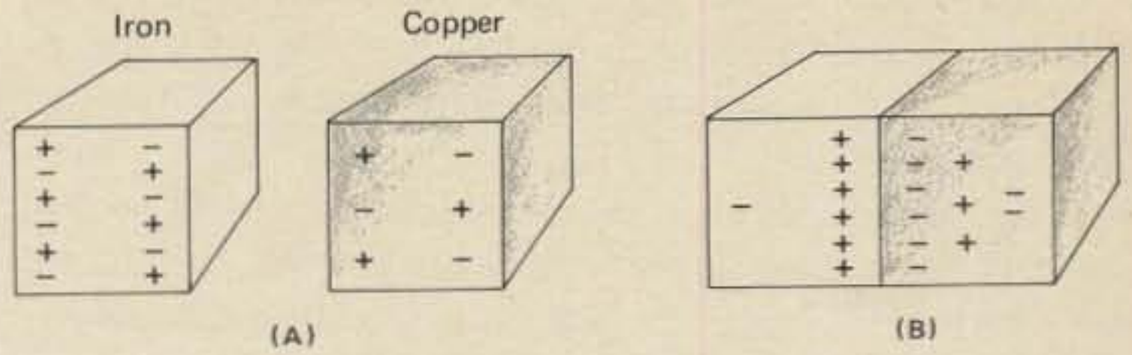


Fig. 1.13 (A)—The blocks of copper and iron are neutral until placed together as in (B), when they then develop a difference of potential because of the movement of electrons from the iron to the copper.

EXPERIMENT #2(B):

Generating Electricity Magnetically

Material: *VOM; Bar Magnet; Coil of Wire (See parts list at end of experiment); Test Lead Kit, Radio Shack #270-332.*

Procedure:

1—Using fine sandpaper or a sharp knife remove the enamel coating from the ends of the two wires sticking out of the spool (Fig. 2). Clean a ¾" length so that it is bright and shiny.

2—Set the meter to the 0.6 range on DC Volts.

3—Connect the voltmeter to the coil of wire as shown in Fig. 3. Use the alligator clip leads to make connection to the coil in order to have your hands free for the experiment.

4—Mark one end of the bar magnet with a crayon or chalk so you can tell when you have reversed it.

Lower the marked end of the magnet into the coil *rapidly* and note the movement of the meter pointer. It should show a rapid rise and then drop back to zero. If the pointer moves backwards (to the left) reverse the magnet and lower the unmarked end into the coil. Observe the highest voltage reading and enter the voltage in Chart II.

5—With the magnet completely in the coil, withdraw it rapidly and note the effect; the meter reads backwards because the voltage generated is of the reversed polarity.

#	Directions	Voltage
1	Magnet lowered rapidly	_____V.
2	Magnet raised rapidly	Reversed reading
3	Magnet lowered slowly	_____V.
	Reversed Magnet	
4	Magnet lowered rapidly	Reversed reading
5	Magnet raised rapidly	_____V.

Chart II

6—Lower the magnet into the coil *slowly*. Note the reading and enter the value of voltage in Chart II, line 3.

7—Reverse the magnet and perform steps 4 and 5 of Chart II and enter the readings.

Conclusion: From the above we see that electricity can be generated magnetically. We further observed that:

1—The faster the magnet moves the more voltage generated.

2—The polarity of the voltage reversed when the direction of movement was reversed.

3—The polarity of the voltage reverses when the polarity of the magnet is reversed.

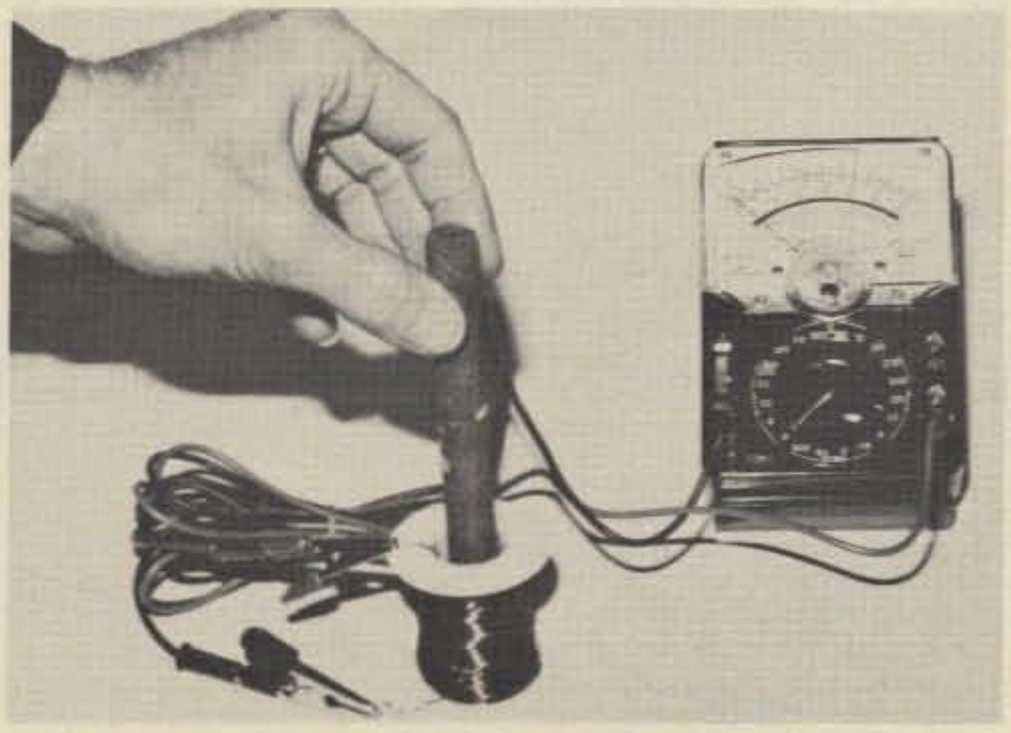


Fig. 2—Spool of wire showing the two connections to be made. Be sure the inside wire, #2, is long enough to make good electrical connection.

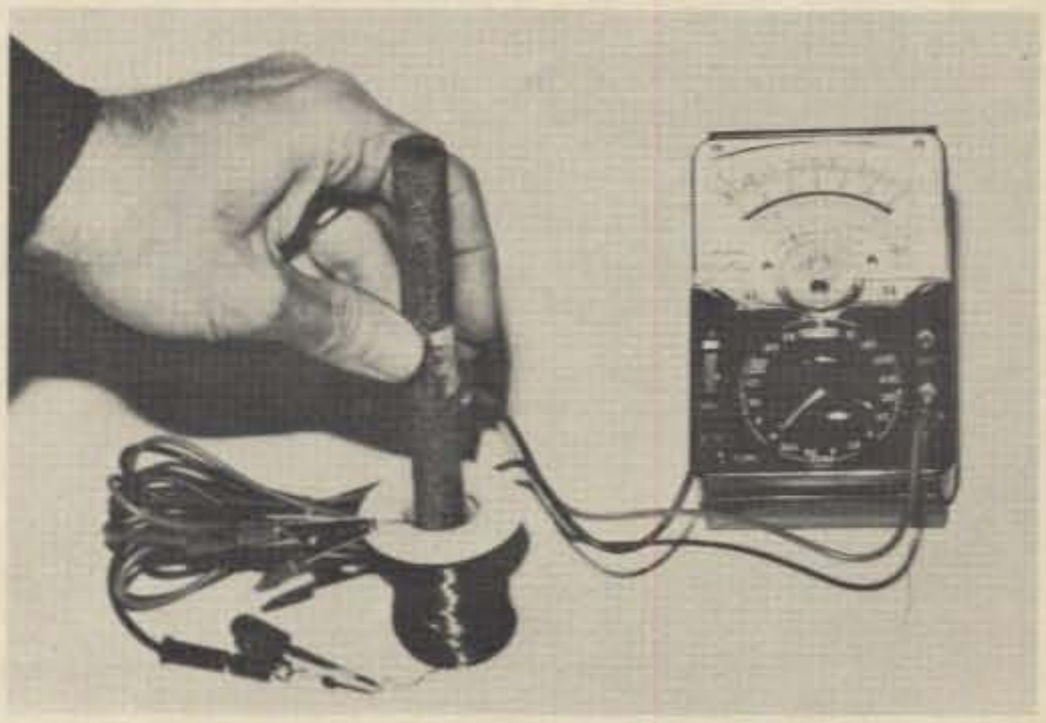


Fig. 3—Dropping the magnet gently into the coil will generate a voltage that will show on the meter.

The amount of voltage developed will depend on the strength of the magnet, the number of turns of wire in the coil and the speed at which the magnet is moved.

Magnetic generators of electricity are used by the large power companies as well as for the small generators in cars. In fact, this method of generating electricity is so important much more time will be devoted to it later when we study magnetism and generators.

Thermal Electricity—Electricity generated by the thermal method has very few applications in the electronics field. At present its use is for measurements rather than the generation of power. This is more fully explained below.

Five methods of producing electricity, from left to right: chemical (battery); light (solar cell); magnetic coil and bar magnet); heat (thermocouple); an experimental battery consisting of two coins and a lemon.

When two different metals such as iron (Fe) and Copper (Cu), as shown in Fig. 1.13, are placed in physical contact, the iron, which is most dense and whose electrons have the highest energy level, will move its free electrons into the copper. The copper

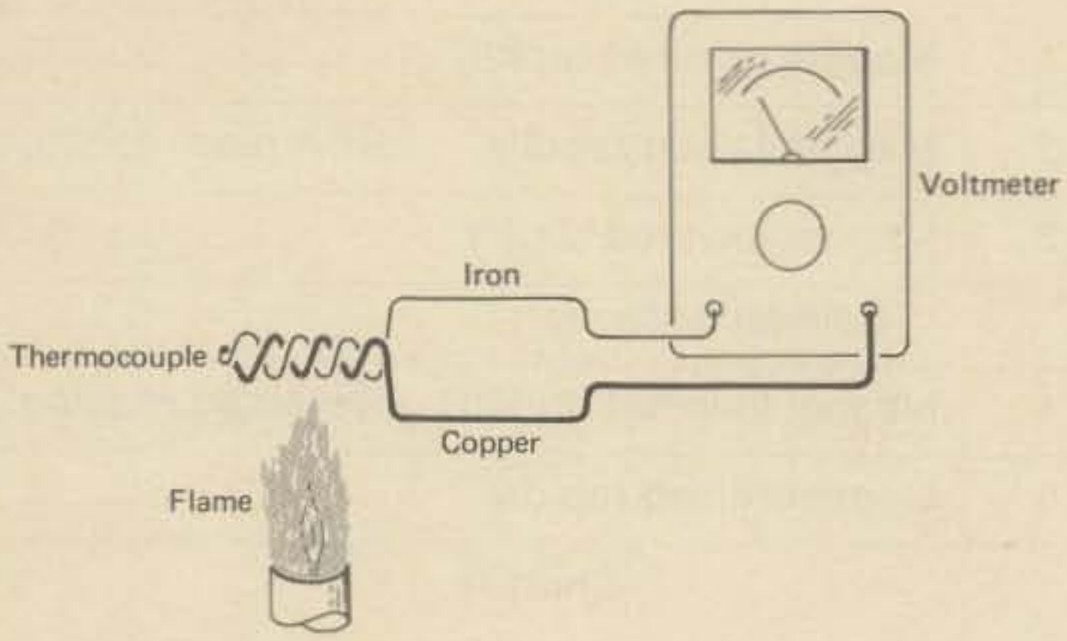


Fig. 1.14—A thermocouple formed by iron and copper wire generates enough voltage to produce a reading on the meter. The more heat the higher the voltage output of the Thermocouple.

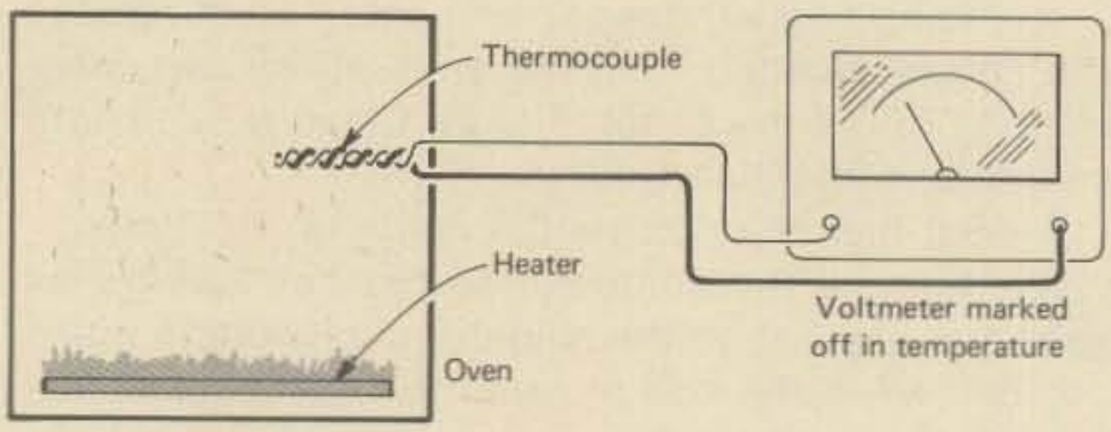


Fig. 1.15—A thermocouple and meter combination forms a pyrometer used to measure high temperatures at remote and difficult to reach places.

EXPERIMENT #2(C):

Generating Electricity Thermally

Material: *VOM; 8" Lengths of Each—Aluminum, Copper and Iron Wire; Perforated Board, 6⅞"x9¾"; Fahnestock clips (2); 1-Package 4/40 Round Head Screws, Radio Shack #64-3011; 1-Package 4/40 Hexagon Nuts, Radio Shack #64-3018.*

Procedure:

1—Mount two Fahnestock clips on the perforated board 3" apart as shown in Fig. 4.

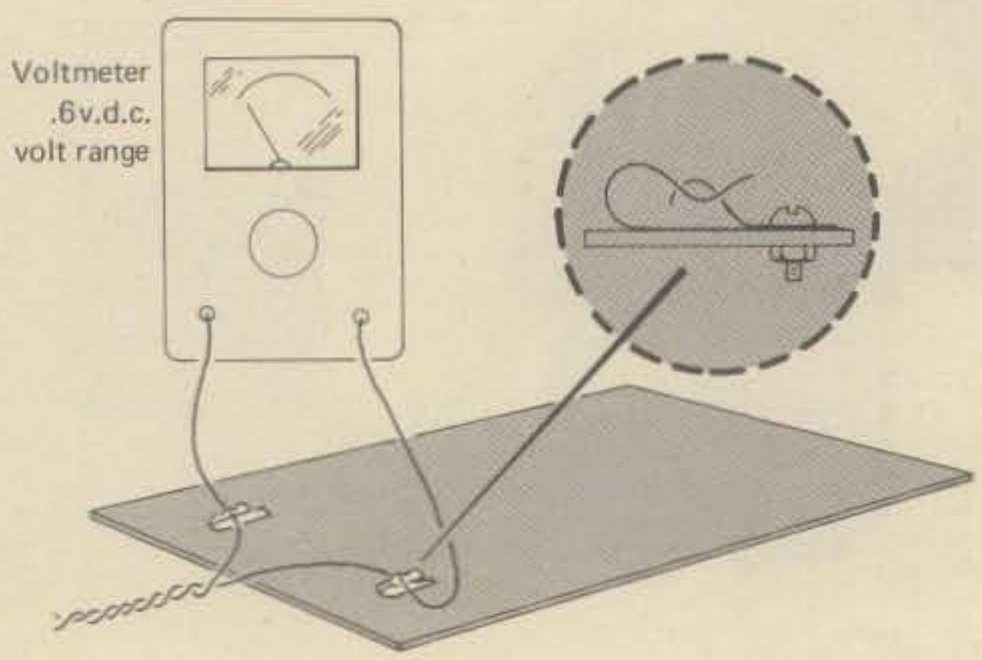


Fig. 4—Thermocouple set up on perforated board using Fahnestock clips.

2—Take an 8" length of bare copper wire and bare iron wire; place them alongside each other and twist one set of ends *very tightly* together for a length of 1".

3—Spread the two wires at the other end and slip them under the clips as shown in Fig. 4.

4—Connect the meter to the clips with the positive lead to the copper wire side.

5—Apply heat to the junction and observe the reading on the voltmeter. Enter the voltage reading in Chart III. NOTE: The amounts of voltage generated by this method are very small, in the range of 0.05 volts. In order to get even this small reading, it is necessary to heat the junction over the gas flame on a kitchen stove. Be careful.

6—Repeat the above procedure with copper and aluminum wires and then with copper and brass wire.

Wire Types	Voltage
Copper and Iron	_____V.
Copper and Brass	_____V.
Copper and Aluminum	_____V.

Chart III

is less dense and its electrons have a lower energy level than those of the iron. This effect creates a shortage of electrons in the iron (a positive charge) and an excess of electrons in the copper (a negative charge). This causes a difference of potential between the two metals referred to as a *contact difference of potential*.

If the arrangement in Fig. 1.13(B) is heated, additional free electrons will be generated in the iron and cross over into the copper. This results in an increase in the voltage generated. As the temperature is increased the voltage generated increases and if the temperature is held constant, the voltage remains constant.

A more practical method of creating voltages thermally is shown in Fig. 1.14. Iron and copper wires are used to form a loop with a junction at one end and a voltmeter at the opposite end. When the twisted junction (called a *thermocouple*) is heated it produces a continuous flow of electrons from the iron to the copper at the junction. From the copper, the electrons flow around the outside wires and back to the iron. On the way, the electrons pass through the meter, indicating the strength of the difference of potential.

The thermocouple and meter combination can be used as a temperature indicator. This combination is called a *pyrometer* and is shown in Fig. 1.15. The higher the oven temperature, the greater the difference of potential generated by the thermocouple and the higher the meter reading. If the meter scale

EXPERIMENT #2(D):

Generating Electricity by Pressure

Material: *VOM, Crystal Microphone or Crystal Phonograph Cartridge.*

Procedure:

1—Set the VOM for 6 volts on the AC voltage range.

2—Using the alligator clips, connect to the microphone plug as shown in Fig. 5.

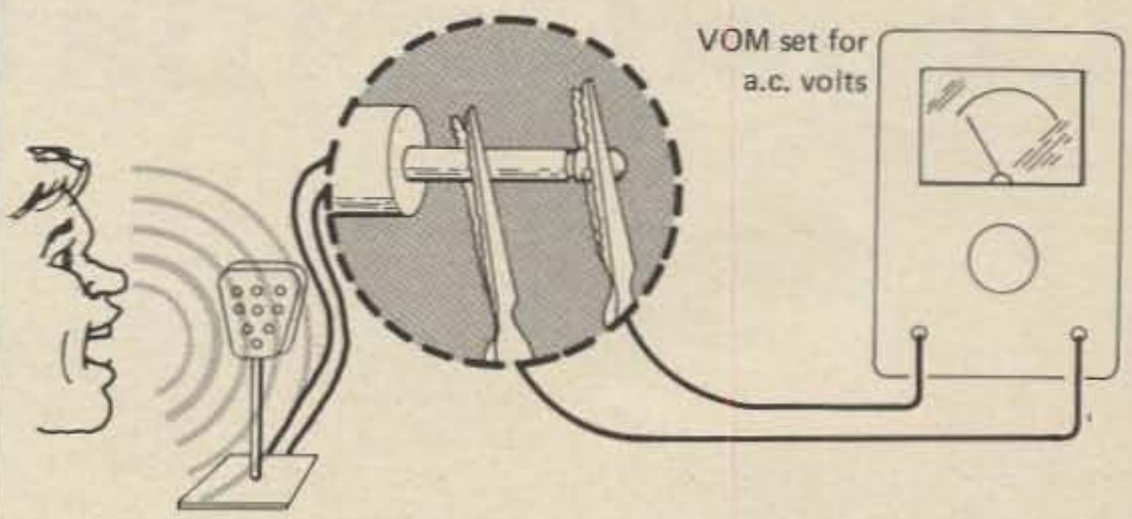


Fig. 5—Connecting the microphone to the voltmeter.

3—Shout, whistle or blow into the microphone and note the meter reading.

The pressure of the sound waves on the crystal element in the microphone generates the voltage.

4—If you have a crystal phonograph cartridge connect that to the VOM, flick the needle with the tip of your finger and note the meter reading.

(Continued on page 95)

EXPERIMENT #2(E):

Generating Electricity with Light

Material: *VOM, Selenium Cell or Silicon Solar Cell.*

Procedure:

1—Mount the selenium light cell between the two Fahnestock clips on the perforated board as shown in Fig. 6.

2—Connect the VOM also as shown in Fig. 6. Set the VOM for 60 VDC.

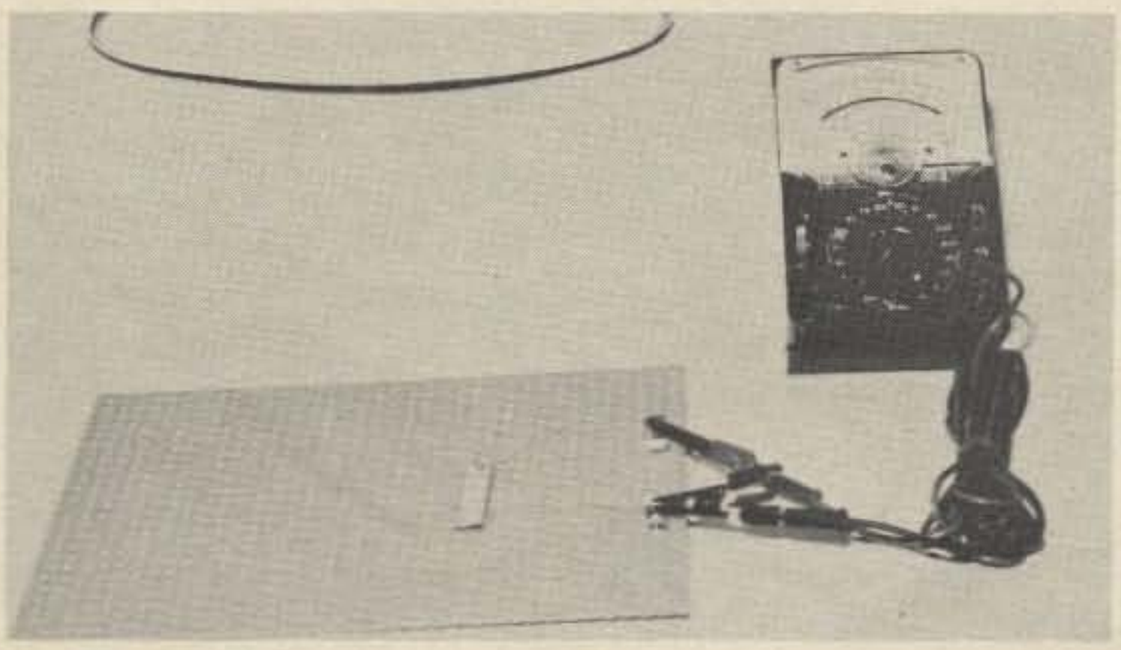


Fig. 6—How to connect the selenium light cell to the voltmeter.

3—Place the selenium cell under a strong light and gradually reduce the meter range until a good reading is obtained.

4—Vary the light intensity and note the effect on the meter reading.

SELF CHECK QUESTIONS, EXPERIMENT #2

1—What must you do if, when measuring a voltage, the meter reads backwards?

2—When generating a voltage using a magnet and a coil, how would you move the magnet to increase the voltage?

3—What causes a voltage to be produced from a crystal microphone when you speak into it?

4—How does the voltage output of the selenium cell relate to the light intensity?

ANSWER KEY: EXPERIMENT #2

1—Reverse the test lead connections.
2—Move the magnet more rapidly.
3—The pressure of the sound waves causes piezoelectric effect.
4—Directly; as you increase the light intensity you increase the voltage output of the cell.

CQ Reviews:

The Heathkit HD-1416 Code Oscillator

BY KIM SMITH*

Recently I decided to go for my Novice license. Being the Assistant Editor of CQ I am constantly dealing with amateur radio and therefore was interested in learning more. Especially in the operating end. My first priority, of course, was deciding on a practical method of learning. I've always preferred learning on my own at my own pace and therefore Heath's new Individual Learning Program kit (ER-3701) was ideal. My next step was to obtain a code oscillator for practice. Since I had the desire but no experience in construction, the Heath HD-1416 Oscillator made a perfect companion piece for the amateur radio course. As a matter of fact if you buy both at the same time there is a $4.95 savings in the purchase price.

On examining the kit I found that regardless of my inexperience it was presented in such a clear and simple manner that I was able to assemble it with little difficulty. Every piece was clearly marked leaving no guess work. Everything is connected on one circuit board with full instructions on proper soldering techniques. There are three transistors in the circuit, two are a astable multivibrator and the third is the amplifier.

The kit took approximately 3 hours to construct. Upon completion I hooked it up to a 9 volt battery (not included) and to my surprise it worked! In the case of it not working, Heath has a section in the manual on the most likely places to check for mistakes. The styling of the cabinet is compatible with the SB series of Heath amateur radio equipment, with a dark green front panel and a grey wrinkle finish cabinet. Four rubber feet prevent slipping.

The front panel features a volume control, earphone jack and binding posts for hooking up the key. There is a built in speaker and the tone control is located on the circuit board. It can vary the tone from 200-850 Hz. The external phone jack makes private listening possible. The key is external, lightweight and adjustable and should be mounted to a board or even a desk top for ease in keying. The cabinet measures 4⅛" wide x 2⅝" high x 4⅜" deep and weighs 12 ounces.

The Heath HD-1416 Code Oscillator kit sells for $9.95 (plus shipping). Their ER-3701 Novice Course sells for $24.95 (plus shipping). Remember if you buy both at the same time the cost is $29.95 (plus shipping).

In a future issue I will evaluate the Heath (ER-3701) Novice kit and let you know the results. Heath must be pretty confident because they guarantee results. If you don't pass the Novice exam you get a full refund.

For the true beginner in amateur radio these kits will prove to be an invaluable aid. ■

*Assistant Editor, CQ

The Heathkit HD-1416 Code Oscillator

a monthly feature by

WILLIAM I. ORR, W6SAI

Antennas

Design, construction, fact, and even some fiction

"I still can't get over the idea of using an underground receiving antenna," exclaimed Pendergast. He slipped the earphones off his head and rubbed his ears, which were still ringing from the rifle-shot QRM that filled the 160 meter band during the warm, daylight hours. "And I don't understand how anybody can hear anything through this summer QRM," he added.

"It should be dropping off by now," I replied. "Wait until October. Things will be better by then.

"By the way, here's W1BB's 160 meter newsletter. It has some information on underground antennas. And they're not a joke. According to the newsletter, K7LFY uses one, and has done so for over two years. According to K7LFY they improve the signal-to-noise ratio, eliminate a lot of vertically polarized noise and reduce local ground wave signals. All of this makes the underground antenna a good receiving antenna for weak DX signals. Bob uses buried dipoles which are about one to four feet below the surface. The optimum length works out to be only about 0.33 of the free space length. Thus, for 1825 kHz, the underground dipole is only about 85 feet long overall. And, interestingly enough, the dipole seems to be directional off the ends. What do you think about that?"

"From what I hear, the whole idea of underground receiving antennas seems controversial. Some fellows have had no luck with them. Maybe it depends upon soil conductivity. In any event, they're cheap and easy to install. It may be interesting to try one out for 80 or 160 meters this coming winter DX season."

"Right," I replied. "I understand that W7QID has had good results with an underground receiving antenna for trans-pacific DX. So we have a lot to look forward to. The last word hasn't been said yet about these funny antennas.

"Before we leave 160 meters, you might be interested in these two antennas recommended by W1BB," I said. "The first one is a simple Beverage wire for receiving. It was used by Paul Godley at Androssan, Scotland in 1921 for the very first reception of trans-atlantic amateur signals. And some 160 Meter DX enthusiasts still use it today (fig. 1). It is directional off the far end. Basically, it is a terminated long wire. The terminating

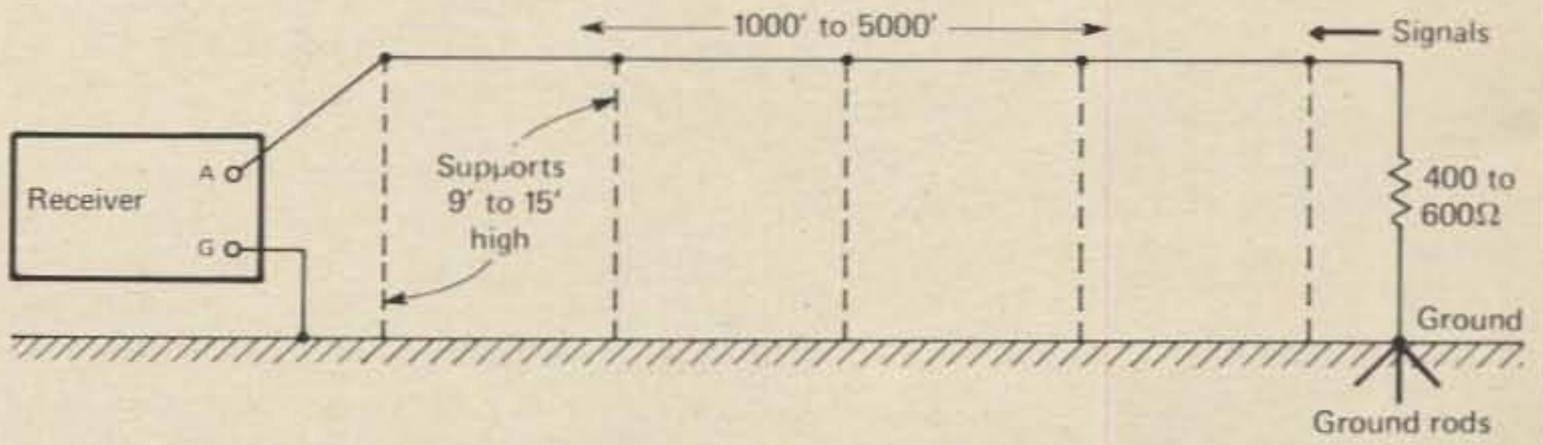


Fig. 1—The single wire Beverage antenna is useful for 160 meter DX. The directivity is from the far end towards the receiver. The antenna is terminated with a non-inductive resistor whose value can be varied to provide the best front-to-back reception ratio.

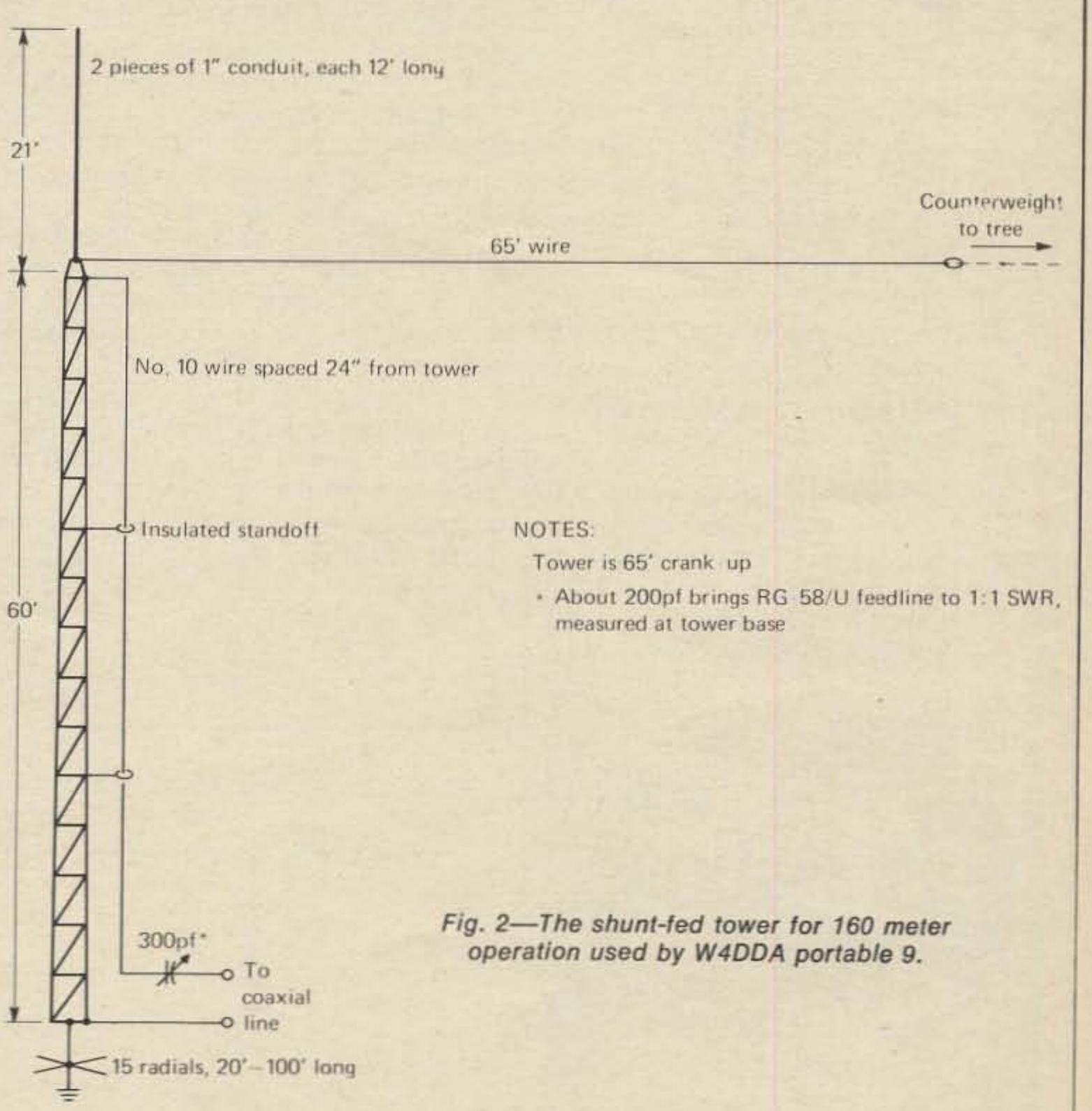


Fig. 2—The shunt-fed tower for 160 meter operation used by W4DDA portable 9.

*48 Campbell Lane, Menlo Park, CA 94025

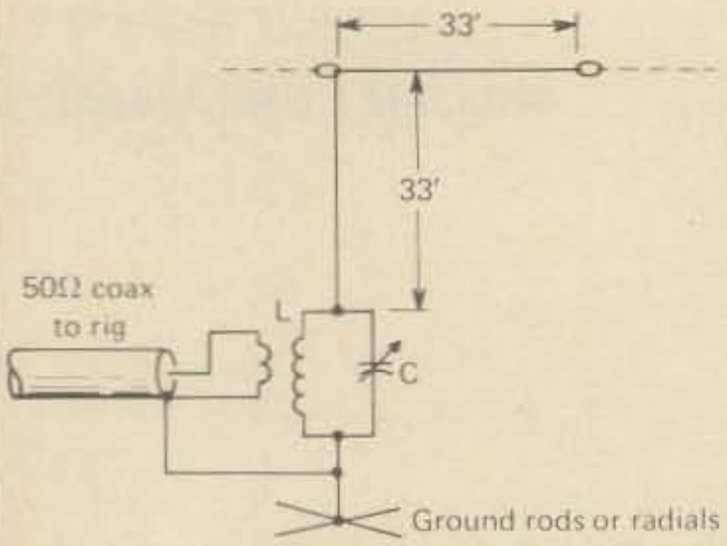


Fig. 3—The 40 meter antenna of W5AG. The L-C circuit resonates to 40 meters. W5AG suggests the use of an old pre-war Barker and Williamson end-link 75 watt plug-in coil.

resistor can be varied for best front-to-back ratio. It takes a lot of space, but it could be run along a fence, or something like that.

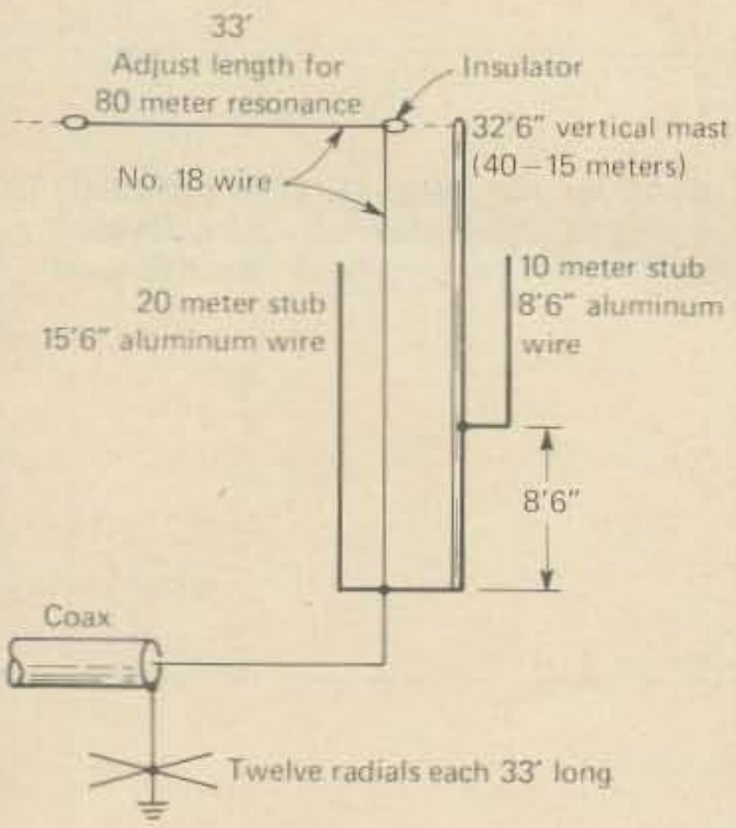


Fig. 4—The new multiband antenna at WA3GJA for 80 thru 10 meter operation.

"The second antenna probably appeals to more DXers as it can be erected on a small lot. Basically, it is a shunt-fed tower, with a top loading wire (fig 2). This antenna is used for 160 meter DX by W4DAA/9 who

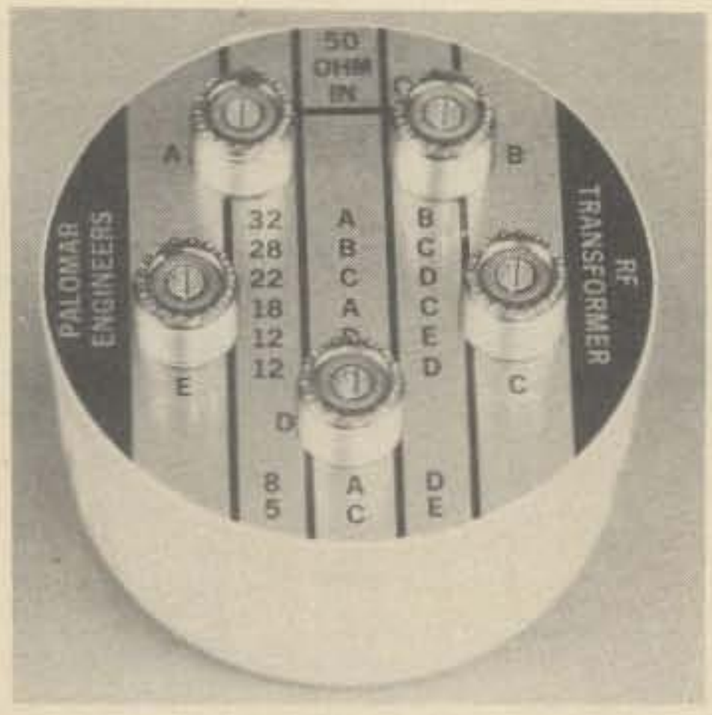


Fig. 5—The Palomar balun matches a coaxial line to load impedances of 5, 8, 12, 18, 22, 28 or 32 ohms.

really puts out a potent signal on that band."

My friend sighed. "It seems to me that 160 meter DX antennas are a formidable undertaking."

"They can be," I agreed. "Ernie, K1PBW, has two 110-foot, phased vertical antennas over an extensive ground plane. He can switch the phasing and gets a front-to-back ratio of nearly 18 db. And Earl, K6SE, uses a similar setup. They use lots of radials. Plenty of height. And plenty of DX-know-how."

"Well, how about the rest of us?", demanded Pendergast. "How about the feller with a poor ground, and not much space in the back yard?"

I looked at the mail on the desk. "Here's a letter from Sam, W5AG. He's got a very simple antenna for 40 meters. He says it is a variation of the old "30 up and 30 out" used by DXers in the "thirties." It gets the current point up in the air and has very low ground loss. Basically, it is a full-wavelength L-antenna, fed at the bottom (fig. 3). Sam says a superground is not needed, as the ground current is very low. He uses three ground rods. The tuned circuit is resonant at the operating frequency and antenna dimensions are not critical. It should work well for either 40, 80 or 160 meters."

"Nice," exclaimed Pendergast. "I can understand this!"

"And here's a simple antenna for 40 and 15 meters," I remarked, drawing a quick sketch in my logbook. A 40 meter dipole really doesn't work very well on 15 meters, even though it is supposed to. This design, shown in the Japanese magazine, *CQ-Ham Radio* is claimed to provide good results on both bands. Note that it is a loaded dipole for 40 meters, wih the a tip section electrically disconnected for 21 MHz operation by the inductor. The s.w.r. is less than 1.6-to-1 over both bands. I would think that this would make a nice DX antenna for Novices.

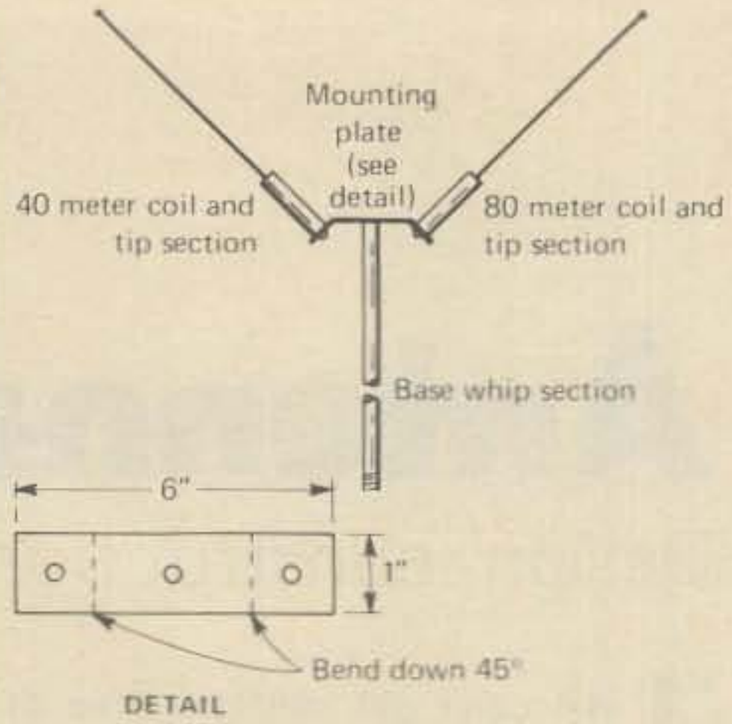
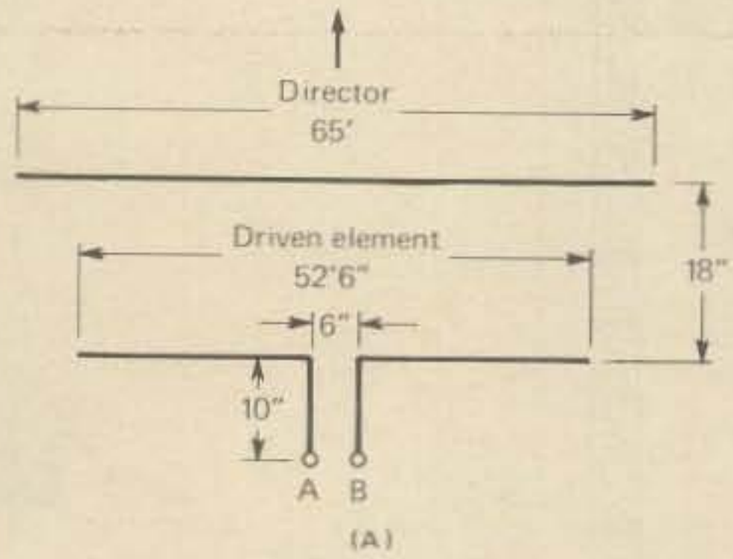


Fig. 6—Two band operation with a modified mobile whip antenna. Separate antenna tips and loading coils are mounted to a base whip section by means of an aluminum mounting plate. The plate measures 6" x 1". The tip sections are adjusted for proper resonance.

"I also received a note from Mike, WA3GJA, who comments on his antenna, which I discussed in the August, 1976 column. Since then, Mike has been doing more work on his installation, and has ended up with the antenna shown in fig. 4. This antenna works on all bands between 80 and 10 meters with no traps or loading coils. It uses tuning stubs, much in the manner of the Hy-Gain "Hi-tower" antenna system. Basically, Mike's antenna is a 40 meter vertical, which also operates on the third harmonic for 15 meter work. Connected in parallel with it is a quarter-wave wire for 80 meters. The wire runs up the 40 meter antenna,



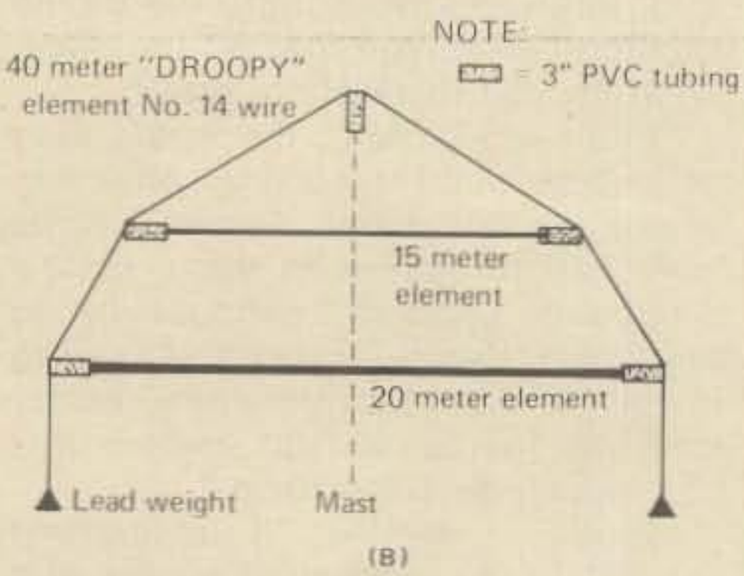


Fig. 7—The W6RRT "droopy beam" antenna for 40 meters (Courtesy of The National Contest Journal). (A)—Length of wire elements. (B)—Physical layout of the beam. (C)—Feed system.

which is made of three sections of aluminum TV mast. The wire is held free of the mast by means of TV-type "eye" insulators which are strapped to the mast. The wire then runs from the top of the mast to a nearby tree.

"Separate stubs are attached to the mast at the appropriate points to provide resonant elements for 10 and 20 meters. The stubs are made of wire and are held in position by the TV "eye" insulators. Mike uses aluminum TV ground wire for the stubs and makes sure that the top of the stubs—which are "hot"—are in the clear and that the TV stand-off insulators are placed a foot or two down from the top of the stub. Stub length is trimmed for best s.w.r. on the individual band.

"At the bottom of the antenna, Mike has laid out twelve radials, each 33 feet long, on the ground. He feeds it at the base with a 50 ohm coaxial line through an s.w.r. meter."

"I wonder if he gets a good match on each band?", murmured my friend, as he sketched the antenna in his notebook.

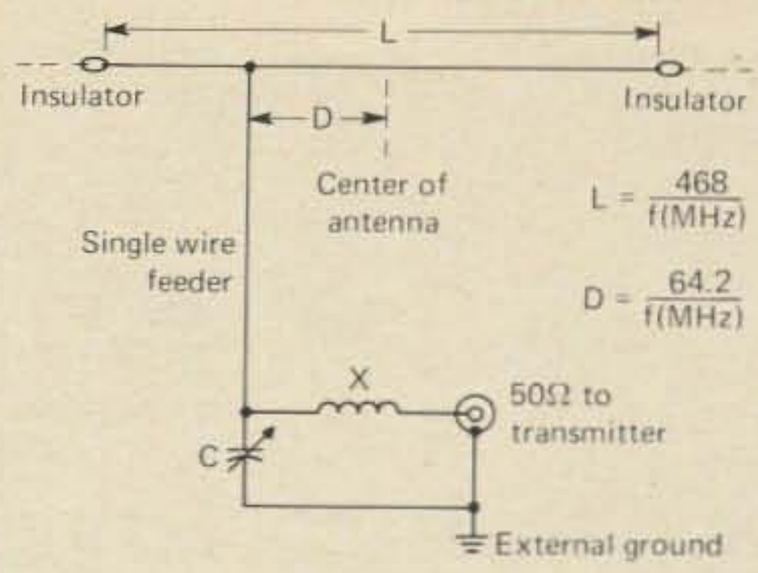
"I don't know", I replied. "But in any case, impedance matching on any multi-band antenna can turn out to be a problem. Its not bad on this type of antenna, but can get tricky with more exotic designs. You'll be interested in this new wideband transformer (fig. 5). It will match a 50 ohm line to load impedances of 5, 8, 12, 18, 22, 28 or 32 ohms, unbalanced. Now, that's not a bad deal at all! It will handle full power over the frequency range of one to 30 MHz. And its only about 3½" in diameter. And it is made by Palomar Engineers."

"It should be good for matching a mobile whip antenna, too", observed my friend.

"Yes, and that reminds me of a stunt that can be used for portable operation", I replied. "Some amateurs use a mobile whip antenna for portable operation when they are away from home, in a motel, or whatever. And this idea can work in a mobile home or in an apartment house where the landlord frowns on amateur antennas.

"Briefly, the idea is to mount two or more mobile loading coils and top sections on one whip base for multiband operation (fig. 6). The loading coil and top section for each band are mounted on an aluminum plate which is bolted to the top of the base section of the antenna. Each top section, in combination with the appropriate coil and base section makes up a resonant circuit which operates over a range of frequencies in a

(Continued on page 91)



Band	L	D	X	C
1.8MHz	160'0"	35'6"	16.0μh	480pf
3.7MHz	126'6"	18'0"	8.0μh	240pf
40 meters	66'0"	9'0"	4.0μh	120pf
20 meters	33'0"	4'6"	2.0μh	60pf
15 meters	22'3"	3'0"	1.5μh	45pf
10 meters	16'0"	2'3"	1.0μh	30pf

Fig. 8—The single-wire fed antenna of 1929 adapted to a modern 50 ohm feed system. This antenna also works well on the second harmonic.

a monthly feature by

A. EDWARD HOPPER, W2GT

Awards

News of certificate and award collecting

Here is the September "Story of The Month" as told by Ed:

Ed. Schellenberg, VE4EL
All Counties #157, 9-22-760

"April 11th, 1931 was my birth date and I grew up on a "mixed" farm near Steinbach, Manitoba. Very early in life, I discovered that I was not cut out to be a farmer. It had always appeared to me that teachers had an easy time of it, what with two months holiday in the summer and all, so I tried it. The authorities first assigned me to a snake infested area in the wilderness where I almost came down with cabin fever. My next school was located even further North where I did contact cabin fever. Anyway, I learned that I had misjudged the teaching profession very badly and I continued my search for an easy career.

"*Playboy* magazine would not accept me as a staff photographer. You wouldn't believe the letters I got in reply to my application as a male model.

"Eventually, an opening as a Public Health Inspector in the Civil Service caught my eye, and with visions of all those good looking waitresses looking at me in awe while carrying out restaurant inspections, I applied and was accepted.

"My girl chasing days ended when I met Ruth, my WIFE. We have two beautiful daughters who have brought us unlimited pleasure.

"The work has taken us throughout Manitoba and Ontario. In 1965 we were transferred to Brandon. We did not know anyone in this City so Ruth enrolled in an adult-education course for something to do. I thought this was a good idea and I enrolled in a radio class which turned out to be a course in amateur radio. In 1966 I received my license and became thoroughly hooked on this hobby.

"There was no lack of friends once I became an amateur. Among these friends was one VE4QZ, who introduced me to County Hunting. My first check-in on the County Hunters' Net was on December 24th, 1970 and my first mobile was W4MEA in Tennessee.

"On February 18th, 1973 I went on my first mobile trip. Since then I have given out counties in North Dakota, Washington, Idaho, Montana, Minnesota, South Dakota and Wyoming.

"In 1973 I was invited to become a 'Lion'. In 1975 the Club honored me with the Presidency and County Hunting took second place. This was the only reason VE4QZ beat me to the USA-CA All Counties Award! (ATTENTION LIONS everywhere: I am very interested in exchanging Lions Pins and/or Banners).

"Ruth and I hope to repay many of you who helped us to obtain #157 by giving out many counties on future trips."

*P.O. Box 73, Rochelle Park, N.J. 07662.

Ed. Schellenberg, VE4EL.

Special Honor Roll
All Counties

#167 Rudolph E. Veverka, WØFBB 5-31-77

Awards Issued

Rudy Veverka, WØFBB made the big climb for USA-CA-3000 and All Counties.

George Dunn, WBØJYB acquired USA-CA-2500 endorsed All SSB.

Bob McCarthy, WA1UVX found time to apply for USA-CA-500 and USA-CA-1000 endorsed All SSB; All Mobiles and All 14MHz; also USA-CA-1500.

Ron Toller, W4MNZ obtained USA-CA-1500 endorsed All SSB.

Richard Peterson, W4KFA was issued USA-CA-500 endorsed All SSB.

Ivo Sarcevic, YU2OB received #4 USA-CA-500 to Yugoslavia, the others were YU1AG, YU1BCD and YU2QZ.

Jim Navary, WA4TZM qualified for USA-CA-500.

Awards

THE 49 MHz RADIO CLUB has two new Awards for Radio Operators:

Award For Public Service (APS): to be issued to those using two-way radio to perform a public service. Public service includes communications for community activities, sporting events, motor racing, traffic handling, etc.

The certificate is about 8½x11 inches, blue with black printing, suitable for framing. Send data on event, name, address, and $2.00 for each AWARD to: 49 MHz Radio Club, P.O. Box 1400, Downey, California 90240.

Emergency Communications Award (ECA): to be issued to those using two-way radio communications during an emergency. This includes accidents, search and rescue, fires, floods, earthquakes, aircraft crashes, etc. The certificate is about 8½x11 inches, orange and black printing, suitable for framing. Send data on event, name, address and $2.00 for each Award. These Awards should

Ivo Sarcevic, YU2OB.

Public Service Award (APC) of 49'er Radio Club

make great gifts and club prizes. Apply to: 49 MHz Radio Club, P.O. Box 1400, Downey, California 90240.

Ten American Districts Award (TAD): The Lockheed E.R.C. Amateur Radio Club (W6LS) is pleased to offer the TAD Award as recognition of operating achievement. The information regarding this popular AWARD is:

1. All correspondence should be sent to W6LS, 2814 Empire Avenue, Burbank, California 91504, U.S.A.
2. The TAD Award is available to all licensed Amateurs and Amateur Radio clubs.
3. American (USA) Amateurs must submit postmarked QSL cards as proof of two-way contacts with Amateurs in all ten (1 through 0) USA districts.
4. The postmarked envelope may be sent with a card which is not postmarked.
5. Cards from W6LS and W6LS members (who use club cards) do not have to be postmarked.
6. DX Amateurs can have their cards or logs verified by their local Amateur Radio clubs. The signed and verified list is acceptable in lieu of postmarked cards or envelopes.
7. QSL cards (if provided) are returned to you at no extra cost. The cards and Award are mailed separately at the same time. The cards are usually received before the Award.
8. All ten contacts must have been made from the same callsign area, such as W6, G3, VU2, etc. However, these contacts do not have to be from one location in the callsign area.
9. Contacts can be to or from fixed, mobile, portable, or fixed-portable stations. Contacts count for the callsign area in which they are made.
10. If your callsign has changed, your previous contacts still count if they were made from your present callsign area.
11. Cross-band and cross-mode contacts are accepted.
12. Contacts do not have to be after any specific beginning date nor before any closing date.
13. Hawaii (KH6) counts for the 6th district and Alaska (KL7) is in the 7th USA district.
14. Hand-printed endorsements will be added (at your request) for operating distinctions such as Bicentennial, Code, One-band, Oscar, QCWA, QRP, RTTY, SOWP, SSTV, and YL. Naturally, the cards you submit must support your operating achievement request. one can request separate TAD Awards for each operating achievement.

USA-CA Honor Roll

3000	1500	500
WØFBB .186	WA1UVX .322	W4FKA .1174
2500	W4MNZ .323	WA1UVX 1175
WBØJYB .236	1000	YU2OB .1176
	WA1UVX .436	WA4TZM 1177

15. Application must be accompanied by one dollar (USA) to pay award costs and postage. Payment can be by IRCs, cash, check, or USA stamps.

The TAD Award is in memory of Tadpole, a Beagle dog who considered himself a W6LS club member. Tad liked the sound of code and he spent more time at W6LS than most members. Tad belonged to Marie (W6JEP) and Bill (W6DDB) Welsh and his full name was Tadpole, which was also the name of President Abraham Lincoln's youngest son. A tadpole is a baby frog (pollywog) with a large tail for a body and Tad had a tail which he whirled around like an airplane propeller. Tad was born in 1961 and he died in 1974, he was an extremely intelligent animal with real Class. (Thanks to Tom Sundstrom, WB2AYA for the data on the TAD Award).

Ten-Ten International Net, Inc.: As mentioned the past two months, this organization was organized to keep

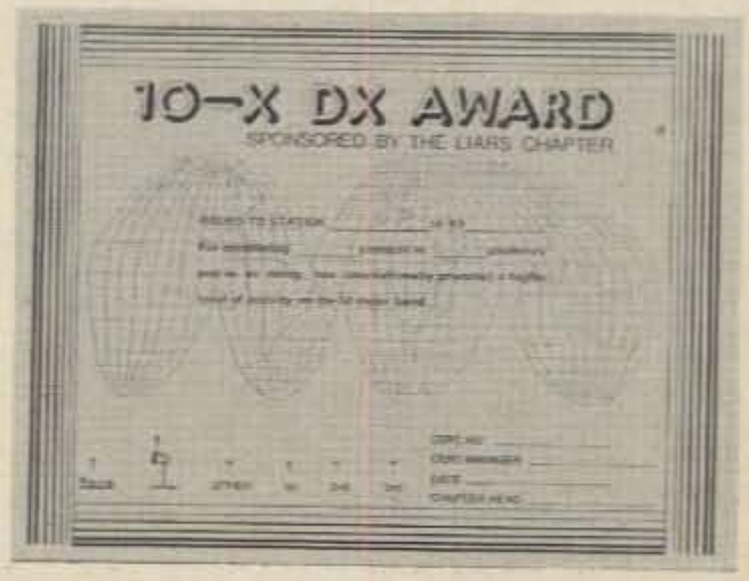
Emergency Communications Award (ECA) of the 49'er Radio Club.

10-X Senior Liars Award

10 meters alive, and they issue some 110 10-X Awards to **Members:** If interested, read either of my last two columns for data or joining **Senior Liars Award:** This Award is sponsored by the Liars Chapter of the 10-X International which meets each Thursday at 8:00 P.M. Eastern Time on 28.620 SSB. To qualify, collect a total of 60 points of Liars Certificate holders. Point system: Liars Award number followed by an "A" = 1 point; Super Liars number = 2 points; Local Liars number (no "A") = 3 points; Senior Liars number = 4 points. Cost is $1.00 send requests to Jack Banzer, W2KDI, 15 Langdon Blvd., Rockville Centre, New York 11570.

Liars 10-X DX Award: This Award is also sponsored by the Liars Chapter of the 10-X International. To qualify, list 15 confirmed contacts with 15 different 10-X stations in 15 different countries (ARRL List) made on or after July 1, 1973. Cards need not be sent, but must be in the possession of the applicant. A statement signed by 2 other licensed amateurs to that effect must be included. Cards may be sent with sufficient postage for their return. Alternate: List 50 10-X DX contacts with log information. Cost is $1.00. Award Manager: M. R. Condon, K9EGA/2, 519 Franklin Terrace, Wyckoff, New Jersey 07481. Endorsements at 50, 75 and 100.

(Continued on page 94)



Liars 10-X DX Award.

a monthly feature by

ADHIAN WEISS, K8EEG

QRP

The art of very low power operating

Operatings News and Misc.

I've done it again! Several fellows at Dayton pointed out that I've been grinding out all this technical stuff for some time now, and that a few columns written by the fellows would certainly perk up interest in the human side of QRPp. I couldn't agree more. I suppose I just get all wrapped up in working on the technical side of things and forget that it can turn into rather stuffy reading month after month. So, here goes with odds and ends from the QRPp gang.

WB4ZOJ (Warren Flynn, 17-A Atlanta View, Lithia Springs, GA 30057): I've been waiting to write until I had some meaningful data for you. Well OM, the results are in—QRPp does have its place, if for no other reason than the performance of small miracles! I got my Novice ticket last December, and just got my General one week ago (March). During my short amateur career, me and my HW-8 have racked up 37 states (27 confirmed) and four countries. I first tried feeding a Gotham V-160 vertical. I got my WAS-QRPP-20 award with this multiband stick and a junkbox QRP transmatch (from the *ARRL* Handbook, 1976 ed, p. 350). I initially mounted the vertical on a 40 ft. mast. Then I tried working it against my mobile-home roof, with no noticeable improvement. But the fact remained that peanut power could not light up a short vertical. So now I have a 400 ft. endfed longwire strung up in the woods and DX is no longer a myth at this station. Read your recent article about QRPp mobile work (actually, I read all your columns) and may give that a try soon. But I sometimes get so excited running QRPp QSO's that I may become a traffic hazard—HI! ! Well OM, I have a full-size 80 meter vertical outside waiting to be completed, so I'll QRT and wish you 73."

WB8VMF (Jan Kemp, 1916 Malvern Ave., Dayton, OH 45406): I talked to you at Dayton last year about QRPp, and at that time I hadn't been in QRPp very long. I'm still a Novice and work QRPp about 90% of my operating time. My rig is a Heath HW-8 and I just love it. QRPp is a bit rough since there is a 250 watt power limit in the Novice bands. My best contact so far is KV4CK, St. Croix, on 15 meters using my 40 meter Inverted Vee at 37 ft., with about 2.5 watts output. Doc gave me an RST of 549. He was also QRPp with an Argonaut and a beam antenna. That's about 1875 miles. I gave him a 569. Just had to tell you about it, as I am very proud of that QSL! Enjoy your column very much. Best 73."

WB5YHN (Frank Olson, 12506 Overcup, Houston, TX 77024). As a new subscriber to *CQ* and a reborn amateur (formerly K5IGA), I have really enjoyed your articles on QRPp. It is a column unique to *CQ* and I hope the ranks of QRPp'rs will swell. I know I do everything I can to interest people in QRPp. I happened upon QRPp quite by chance. After being out of amateur radio for 15 years, I got interested in it again. All I could scrounge up from my old gear was an old rock-bound DX-35. A friend of mine sold me his used HW-7 (3 watts) which I got for the receiver portion of the unit. When the power transformer melted in the DX-35, I decided to try the HW-7 transmitter. I was amazed. By following Heath's suggestion of doing more listening than calling, and working after about 10 p.m. and early in the morning, I began to make about one QSO for every three calls. In addition, the reports I received were almost as good as those I sent. And were all my reports 2's and 3's? No, as I've had my share of 57-599's as far as 2000 miles away! I do most of my operating on 40 meters but have built a homebrew 15 meter, 4 element beam (that works sometimes!) and when it works I've had some great results. In three months I've worked about 30 states and four countries and I have every confidence that I can work WAS and do my share of DX on QRPp. I've received letters from guys who have said they have an old QRPp rig collecting dust or on a shelf, but after QSO'ing me, they've broken out the QRPp rig and started using it again. Some have made their first QSO's with QRPp after talking to me. It seems that the main problem with guys trying to use QRPp is that they do a lot of calling and not enough listening. Sometimes when there isn't much action, I decide to call CQ, but never seem to get much response (1 to 10 ratio QSO/CQ call) as opposed to 1 in 3 when listening and calling. I was particularly interested in your Oct./Nov. articles on DX and propagation. Unfortunately, I did not receive my copies until near the end of December (too late for the CQ WW DX Test), but it will come in handy in the future I'm sure. I've experienced the pipeline effect that you speak of and was fascinated by your comments on it. Keep up the good work and 73."

KA6DX/N1DX (Jack Corson, PSC Box 25913, APO S.F. 96230). After many years of high-power DX'ing, I have discovered the joys (and frustrations) of QRPp. I built the Heath HW-8 and have been using it for several weeks now from my QTH here on Okinawa. I was amazed to work 18 countries in my first 3 weeks of

*83 Suburban Estates, Vermillion, SD 57069

Skip Westrich, WB8OWM, shown at his QRPp operating position, apparently very happy about working a new one. Skip has recently taken to playing the harmonica while listening for KL7 and KH6, the last two states needed to complete his WAS-QRPp.

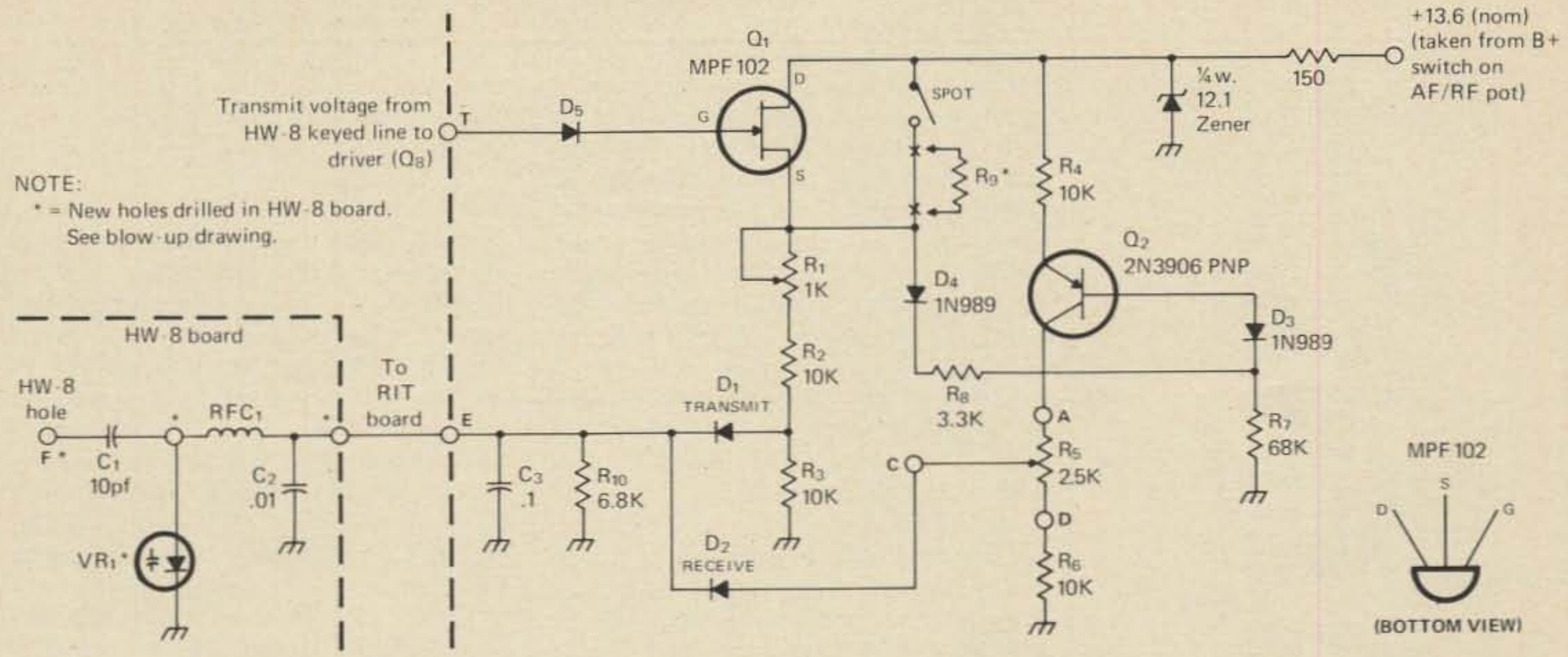


Fig. 1—The K4COR 12 v.d.c. 1 amp regulated power supply.

D1, D2—Diode 1N4001, Radio Shack #276-1101
F1—Fuse, ½ amp, Radio Shack #270-1271
S1—Switch, SPST, Radio Shack #275-324
Fuse Holder—Radio Shack #270-739
AC Line Cord—6' Long, Radio Shack #278-1255
Output Posts—Radio Shack #274-661
Cabinet—3¼" x 2⅜" x 4", Radio Shack #270-251
T1—Transformer, Standard, 12.6v CT, 1.2a. Radio Shack #273-1505
VR1—Voltage Regulator IC, 12v., 1 amp. Radio Shack #276-1771
C1, C2—Capacitor 1000 µf, 35v., Radio Shack #272-1032
C3—Capacitor, 100 µf, 35v. Radio Shack #272-1028
C4—Capacitor, .1 µf Disc Ceramic, Radio Shack #272-135

QRP'ing with just a 4-band trapped vertical. Looking for South America and Africa to complete my WAC-QRPp. Best DX to date is DL on 15 m and W6 on 40 m. Several other good DX stations have answered my calls, but I was unable to log them as they either had my call incorrect or were unable to confirm a 2-way exchange of signal reports. One does have to learn to adjust his operating techniques when pushing only 2 watts out. Replies to CQ's are almost non-existent. Adding a "/QRP" to my callsign helps with certain stations, but it is a waste of time with others. Timing is very important. I wish the big contests would add a QRPp category (*Good news — see announcement at end of this column —Ed.*) I am anxious to try it, but hate to see my score listed with the KW's!! The HW-8 is a fine rig for the price, but I wish Heath had included a 10 m band rather than 80 m. One can work DX easily on 10 m with low power when propagation is favorable.

I packed along my HW-8 when I went to Guam last week for a few days. I worked W6 easily using WA6EVX/KG6's triband yagi and my new N1 call. I plan to take the rig with me to the states this summer for a few weeks and get on the air from motels with a dipole. I enjoy your column. Hope more people will try QRPp. It's lots of fun. 73."

WB8OWM (Skip Westrich, 1309 24th St. NW, Canton, OH 44709):

My first exposure to live amateur radio was back in the mid-60's while stationed with the USAF in G-land. I managed to learn Morse Code at the base MARS station, but never got a ticket—was too busy chasing G-land YL's! Finally got the ticket in 1970. The QRPp flea bit one evening upon completion of a two transistor v.f.o. I worked WB8LKC with it—with no antenna attached, no less! And to think that as a Novice I once wondered if anyone could even hear my HT-40! The HT-40 is now gone, as is the SX-117. My only gear is an HW-7 and Hustler 4-BTV vertical. I've managed to work all the states except KL7 and KH6. Snagged a KL7 during the Novice Round-up and was told very nicely, "SRI OM, WORKING NOVICES ONLY . . ." It was then that I decided to take up the Hohner harmonica! I've learned to play about six songs on it while listening for KL7 and KH6 . . . 73."

VE5TI (Gary Shannon, Box 237, Wapella, SASK SOG4ZO):

In regard to my QRPp experimentation, it has been somewhat lengthy to put into a short letter. However, I shall describe to you my latest findings on the best antenna that I have used to date. I call my current project "The Well Crib Ground." I have a well here for my water supply. It uses a steel cribbing, 30 inches in diameter, and 22 feet in length, of #18 gauge steels. The well is 20 ft. deep, so 2 ft. of crib is above ground and it contains 12 ft. of very soft water. I bolted a 5 ft. length of 4"×4" post vertically to this crib. I then cut an old aluminum TV mast to 16 ft. 4 in. for a quarter-wave on 20 m. I bolted the TV mast vertically to the beam-post so that the bottom of the mast is at the same level as the top of the crib 2 ft. above ground. I connected 100 ft. of RG-58U coax to the mast and bolted the shield to the crib. The s.w.r. is 1.1:1 over the entire c.w. portion of 20 m and 1.3:1 for c.w. on 15 m. I use an unmodified old HW-7 powered by a 12 V. car battery. With 2.5 watts input, this antenna has worked most of the states and some Canada with 539-599 reports. I had been using this same vertical with radials at a height of 15 ft. prior to this experiment. I've noticed a great improvement in signal reports and in reception of signals.

My next experiment is going to be the use of a ⅝ wave vertical, well-crib ground, and a 1:1 balun at the base. The transmatch will be used for 40-20-15 meter operation. This vertical will be a 50 ft. pop-up mast extended to 41'6" for ⅝ wavelength on 20 m. The HW-7 receiver is quite poor. However, it is a fun rig. I get

great delight from a 579 report from a kw station in FLA using a quad at 75 ft.! I must note that my main station is the SB-401 and SB-313. Come summer, I will have an a.c. power source and it will be interesting to see if 170 watts input can work DX on my well-crib vertical. I use no radials with the vertical, and my conclusion is that the water itself is a massive radial system beneath the surface at many different levels. I've been somewhat brief in this note. The two problems up here are lightning and much wind, so this antenna is to be ideal so far. It's a glorified ground rod! 73."

Radio Shack Power Supply

An old QRPp buff and friend K4COR and I hooked up in January while I was testing out the HW-8 on 40 m. First time in about two years due to my inactivity. It was a nice long ragchew with two-way QRPp. Pike sends in the following circuit and comments.

K4COR (Alan Pike, 689 Rollingwood Dr., Stone Mountain, GA 30087): "Sure was great to run into you again today after such a long "dry spell." Your HW-8 sounds first-rate and I envy you—hope to eventually end up with one myself someday. I've accumulated quite an assortment of QRPp gear now: my trusty MFJ-40T, a PM-3A, an antique Hallicrafters HT-18 v.f.o. (circa 1950) claiming 4 watts output, a copy of the MFJ-40T plus built-in power supply, and my original 6T9 "one-lunger" tube rig. A majority of my QRPp operating time is on 40 m around 7040 kHz. I've even attempted some 200 mw stuff with moderate success.

Here's an ultra simple 12 v.d.c. supply capable of furnishing up to 1 amp with excellent regulation. This supply fully accommodates my MFJ-40T or PM-3A. I've also built this supply into the same cabinet as a copy of the MFJ-40T circuit, giving me a nifty package. The supply goes together easily, and, to avoid the hassle of hunting parts, everything can be found at the local Radio Shack or similar parts emporium.

Parts placement is not critical. I've used the bottom of the chassis for a heat sink and dropped a screw thru the tab of the voltage regulator IC (7812) and secured it with a nut. I did find the 7812 in the TO-220 type case (tab at the end instead of a hole in the center of the IC package) performs more reliably. A dab of heatsink compound between the IC and chassis is a good idea! Approximate cost is $15.00 including cabinet. Fig. 1 shows the circuit, and the caption gives the parts list. If you can use this in your column or shack, you are welcome to it. Hope to hear your QRPp signals again soon!"

W1EXZ (Bob Curtis, 17 Cobbleview Dr. Colchester, VT 05446): "Enjoyed reading your QRPp column in the February *CQ*. I was particularly pleased to read about the QRPp mobile operations by some of the gang. I have also done some QRPp mobile operation with my Argonaut, although not as much as I had intended to do. Actually worked out quite well when I have tried it. On 20 s.s.b. I have worked FG7XA in Guadaloupe from the car, also a new country for me. I have also worked a VE7 on 20 s.s.b. mobile. One point in favor of QRPp mobile is that, when parked, one does not have to keep the engine running. I found this makes QRPp mobile operation sheer enjoyment, particularly if one picks a good quiet location to do some operating from. My regular mobile rig is a KWM-1, a permanent fixture in my car. It draws 25 amps on transmit and 15 on receive! Besides that, it suffers from more motor noise than I like to admit. Imagine the joy of operating mobile with no noise, which one can do with the low-drain QRPp set-up. 73 for now."

"It's hard to believe you worked coast to coast with that!"

News

Good news for those of you who have been writing asking for a QRPp section in *CQ*-sponsored contests! W8IMZ has assured me that we'll have a QRPp section this season in the WPX Contest. Scoring will be the same as for QRO, but with a 5-watts output limit and separate listing section in the results. Awards and other details have yet to be worked out, but I hope it becomes a reality this time!

Watch for the forthcoming announcement of the first-ever *DXCC MILLIWATT* — about 120 countries have been worked on 1 watt, but about 6 cards remain to be collected for this break-thru!

Many of you have inquired about QRPp awards and the QRP-ARC-I QRP club. This organization underwent some serious staff difficulty during the past two years, but is now getting underway again. *It defines "QRP" as 100 watts* and does not specifically apply to real QRPp. However, it does offer several QRPp awards: 1.) *WAS-QRPp* certificate with endorsements at 20, 30, 40, and WAS states; 2.) *KM/W*, or the "kilomiles per watt" award; 3.) *WAC-QRPp*, or "worked all continents". Details on the awards from WA8CNN, Hugh Aeiker, 929 S. Park Rd., Charleston, WVA 25304.

The *G-QRP-C*, however, is a real QRPp club (5 watts) and is based in England, but welcomes members from the U.S.A. It publishes a newsletter *SPRAT* which includes useful data. Not quite in *The Milliwatt's* league, but good. A number of awards as well as operating activities are sponsored by the *G-QRP-C*. U.S. QRPp'ers are encouraged to join up by sending $3.00 check or money order to the U.S. *G-QRP-C* representative W1EXZ, Bob Curtis, 17 Cobbleview Dr., Colchester, VT. 05446; the fee covers membership and the subscription to *SPRAT*, which is airmailed quarterly to U.S. members. New members are requested to include in their application their full name, QTH, and a brief outline of QRPp interests, for use in the membership list. I fully support the *G-QRP-C* and am very pleased at the great success it has had in England and elsewhere on the continent.

QRPp Calling Frequencies: c.w.—

(Continued on page 91)

a monthly feature by

HERBERT S. BRIER, W9EGQ

Novice

"How to" for the newcomer to Amateur radio

This is the last column submitted by Herb Brier just prior to his passing away last May. Next month Bill Welsh W6DDB, will take over as Editor of the Novice Column. Bill is very active with the Lockheed Amateur Radio Club (W6LS) and has helped countless people in getting their licenses. Bill says that he will carry on in the same tradition and format for the Novice Column as did Herb. You can start sending any Novice info and pictures to Bill at: 2814 Empire Ave., Burbank, California 91520.—Ed.

Sending and Receiving Code Signals in the Amateur Station

In a transmitter, an oscillator converts d.c. power into high-frequency a.c. power at the resonant frequency of its frequency-determining circuits. The a.c. signal is then amplified and fed to an antenna to be radiated. In simple code transmitters, the oscillator is often keyed directly. But keyed oscillators have two fundamental defects. Their signals chirp as the applied voltage rapidly rises and decays at the beginning and end of each dot and dash. The signals also click as the result of the rapid changes of voltage. The clicks can be controlled readily with capacitive-resistive filters in the keying circuit which introduce approximate 5-millisecond delays in the lines. The delay accentuates oscillator chirp, however.

In spite of its defects, oscillator keying is very popular in low power transmitters, especially on 3.5 and 7 MHz. When a low-power transmitter using oscillator keying is operated in conjunction with a separate receiver, each with its own antenna, the combination makes full "break-in" operation possible. Space the antennas far apart and run them at right angles to each other.

When the key is pressed, the receiver next to the transmitter will probably emit a squawk from its loudspeaker. But by turning the receiver AGC/AVC knob to "Off" and carefully juggling its audio and r.f. gain controls, the receiver will not overreact to the transmitter signal, and sensitivity to outside signals will bounce back as soon as the key is released. This type of "break-in" operation[1] is quite usable on 80 and 40 meters, if the two antennas are well separated and the transmitter power is not too high. On the other hand, there is always a chance of damaging the receiver, if the transmitter power is too high. And on the higher frequencies, the operator may often wish he was sending and receiving on a common antenna. Fortunately, there is no law preventing an operator with two antennas from sending and receiving on the better one.

The Antenna Relay

An antenna changeover relay is usually required when the same antenna is used for sending and receiving. A few years ago, a suitable relay was big with large contacts. Today, however, almost any modern multicontact relay with contacts capable of handling five amperes of current will do the job. By choosing a relay with several sets of contacts, several circuits can be switched simultaneously with the antenna, as is done in transceivers. See fig. 1.

Mount the relay in a small aluminum box with three SO-259 coaxial connectors mounted on the sides of the box near the set of contacts selected to switch the antenna. One coaxial connector accommodates the antenna—the movable relay contact. The second connector accommodates the receiver—fixed relay contact—and the third connector accommodates the transmitter output — normally-open relay contact. Phono type connectors may be substituted for the coaxial connectors for economy and compactness. It is a good idea to use shielded conductors to the other relay contacts and bypass the contacts to the shield braid with miniature .001-μF ceramic capacitors. Choose the relay coil voltage to match your control circuit. Other things being equal, d.c. relays are quieter than a.c. types.

Fig. 2 illustrates a simple differential keying circuit for improving keyed-oscillator transmitters. When the key is pressed, the oscillator comes on immediately and stays on while

Hoppy Hopkins, WB5UJO, 111 Gift St., Marlin, Texas, 76661, has been a Novice almost two years, and has 821 contacts in five continents to prove it. Africa is the hold-out. His tools are a Drake T4C transmitter and R-4C receiver, a Hy-Gain TH-6-DXX, Tribander, and a 67-foot "trap" vertical. "My back yard looks like a spider web," says Hoppy, who also says that he prefers ragchewing on his Ten-tec KR-20 keyer than phone. We are sending WB5UJO a one-year subscription to CQ Magazine for sending us this winning station photo. If you would like to try your luck, send us a clear photo of yourself at the controls of your station and some details of your radio career.

[1]By definition, "full break-in" means that two operators on the opposite ends of a radio contact can instantly interrupt each other's transmissions to get repeats and fills by sending a couple of "T's" or other letters, because they can hear each other between the dots and dashes of their own transmissions; therefore, their contacts are conversations, not alternate monologues.

"Semi-break-in" means when the operator actuates his key, all transmit and receive circuits automatically switch to "transmit" and stay there until he pauses a programmed length of time, after which the circuits switch back to "receive."

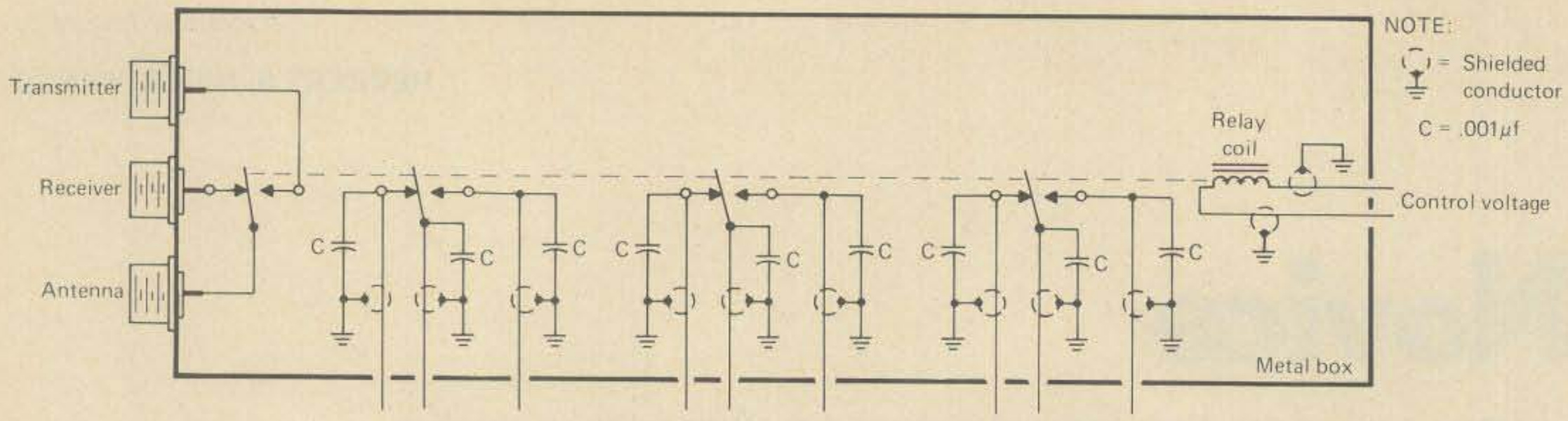
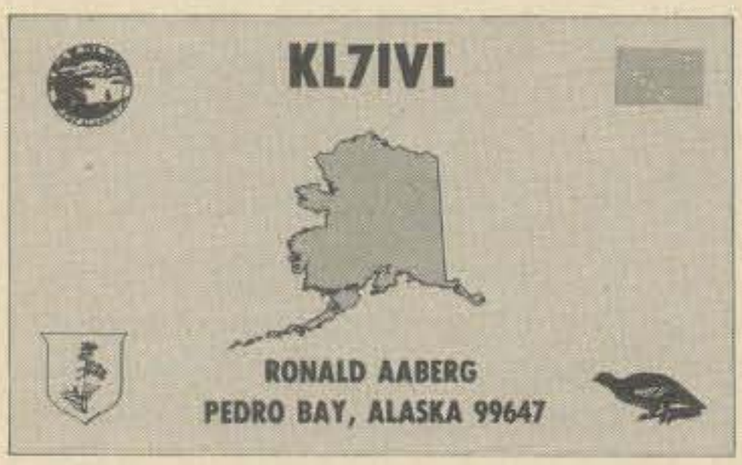


Fig. 1—A standard multi-pole miniature relay (Allied Electronics KN-522-4C or equivalent) may be used to switch the antenna and other circuits when switching from "receive" to "transmit."

the amplifier keys normally. When there is a pause in the keying, the oscillator shuts off. The major difference in the oscillator is that the grid resistor R_1 is connected to the oscillator cathode terminal, rather than to B—, as is done for normal "cathode" keying.

Capacitor C_1 and resistor R_2 affects keying characteristics. Increase the value of C_1 towards 10 μF to soften



If you work KL7IVL in the 80-meter Novice band, you will get a QSL card like this confirming the event.

the "makes," and increase the value of R_1 towards 100 ohms or so to soften both "makes" and "breaks." Capacitor C_3 and resistor R_3 right across the key terminals eliminate clicks that otherwise would be heard in your own receiver. Caution: Do not attempt to juggle the position of the grid resistor of a v.f.o. to try this system.

C.W. Operation with S.S.B./C.W. Transceiver

Seemingly, no two s.s.b./c.w. transceivers work exactly the same on c.w. But as a general guide, while letting the unit warm up, find the place in the instruction manual that instructs how to adjust the idling current on s.s.b. and c.w. operation. Carefully make the adjustment. Next, tune up to the desired power input on c.w. on the desired band—preferrably to a dummy antenna, of course. Turn the c.w. drive control to minimum. While making slow dashes on the key, advance the "VOX" gain control until the transceiver switches from "receive" every time the key is pressed. At the same time, the c.w. monitoring signal should be heard from the phones or speaker. Next, while still sending slow dashes, adjust the "VOX Delay" control until there is a definite pause after the key is released until the transceiver returns to "receive" operation. At this point of adjustment, as soon as you press the key, your sending should be heard on the c.w. monitor. After a pause in your sending, the transceiver should revert to "receive." Tune the transceiver dial where the interference is heavy, and press the key to test whether the interfering signals are upsetting the "VOX" circuits. If they are, adjust the transceiver "Anti-Vox" ("Anti-Trip") and "VOX" controls; so that the transceiver keys smoothly. There is usually a limited range of speeds that one set of adjustments of these controls will handle. Therefore, if the "VOX" relay tends to drop out prematurely at very slow speeds, it may be easier to set the transceiver "Function" control to "Push to talk," "PTT," "MOX," or "Manual" (They al mean the same thing) when operating on slow-speed c.w.

News And Views

Lloyd, Box 209, Scotland Neck, N.C. 27874, asks what is the best book for getting his Technician License in the very shortest time. He wants to operate 2-meter repeaters. As a study guide, the ARRL *License Manual*, $1.50; belongs in any would-be amateur's library. ARRL's *FM And Repeaters For the Radio Amateur*, $4.00, is good. The *VHF Handbook For Radio Amateurs*, by Herb Brier, W9EKQ/AD and Bill Orr, W6SAI, $5.95, Radio Publications, Inc. Box 149, Wilton, Conn. 06897, is also good. Also enroll in a General Class Study Course sponsored by the nearest amateur radio club.

Curtis Brown, WB4KZL, 3541 Marvin St., Annandale, Va. 22003, in ten months on the air as a Novice has worked 40 countries in all continents in 180 DX contacts. Also WAS. Curt averages about 80 per cent on his QSL cards without the use of IRC's, dollar bills, etc. He simply encloses a photo of himself and station and a friendly note in the envelope when he sends his card.

Curt works 60 hours a week and spends extra hours coaching Youth Soccer; so he doesn't get as much

(Continued on page 94)

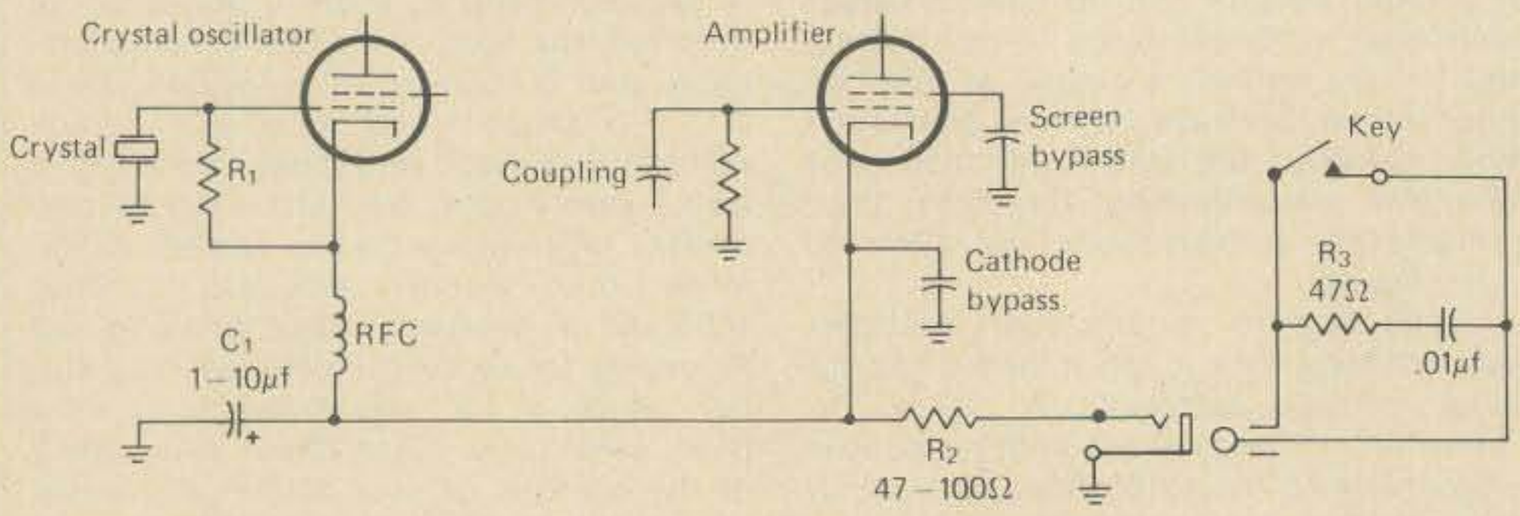


Fig. 2—Differentially keyed, crystal-controlled transmitter. When key is pressed, the oscillator starts immediately and hangs on longer than the amplifier, because the oscillator grid resistor is returned to the cathode, rather than to ground. Amplifier keying is shaped by resistor R2 and capacitor C1.

a monthly feature by

GEORGE JACOBS, W3ASK

Propagation

The science of predicting radio conditions

The new sunspot cycle remains pretty much at a standstill. The Swiss Federal Observatory at Zurich reports a monthly mean sunspot number of 18.4 for May. This results in a smoothed sunspot number of 13.3, centered on November, 1976. The sunspot cycle is measured by the value of smoothed sunspot number, and the level for November was the same as observed during October, 1976.

The new cycle is expected to pick up slowly, and a smoothed sunspot number of 21 is forecast for September, 1977.

During most of September and early October expect variable propagation conditions on the h.f. bands. On some days conditions should continue to be much the same as they were earlier in the summer, but on other days the first signs of wintertime conditions should be noticeable. For this reason, this month's column contains *DX Propagation Charts* for the one month period September 15-October 15, rather than the usual two month span. This month's column also contains *Short-Skip Propagation Charts* for September and October.

During September and early October expect an increase in **10 meter** DX possibilities. While the sunspot cycle is still too low to expect worldwide openings on this band, look for some fairly good openings to the Caribbean and Central and South America, particularly during the afternoon hours. When conditions are HIGH NORMAL or better, some openings may also be possible to the South Pacific and Africa.

A seasonal improvement is expected for DX conditions on **15 meters,** and with increased solar activity, a greater number of DX openings should occur this year compared to the past several years. The best time for DX openings should be from a few hours before noon through the afternoon hours. Expect good openings towards the Caribbean, Central and South America, with openings often possible to Africa, the South Pacific and Europe as well.

During September and early October, **20 meters** should continue to be the best band for worldwide DX propagation. The band should open in almost all directions for a few hours after sunrise, and remain open to many areas of the world throughout most of the day and into the early evening, with peak conditions expected during the afternoon. At times signals will be noticeably stronger than they were during July and August, but the band will close an hour or two earlier because of the shorter period of daylight.

Look for an improvement in nighttime DX conditions on **40, 80 and 160 meters**, which should result from the increasing hours of darkness and a seasonal decline in the static level. *Forty* should be best for worldwide DX from sunset through the sunrise period. Check *80* and *160* meters during the hours of darkness, and particularly for an hour or so before local sunrise.

From mid-September through mid-October, for *short-skip* openings less than *250* miles, use *80* meters during the day and either *80* or *160* meters at night. For distances between *250* and *750* miles try *40* meters during the day and *80* meters at night. For openings between *750* and *1300* miles, best bet should be *20* meters during the day, *40* meters from sundown to Midnight and *80* meters from Midnight to sunrise. For openings beyond *1300* miles, *20* meters should be most reliable during most of the daylight period, with *40* meters optimum during the hours of darkness. Check *15* meters for some good openings beyond 1300 miles during the afternoon hours.

Equinoctial Propagation

It's that time of year again when the sun is almost directly overhead at the equator. This happens twice a year, in the spring and fall, and is called an equinox.

The fall equinoctial period marks the time that the sun crosses the equator on its apparent travel into southern skies. During this period the hours of daylight and darkness are just about equal in length throughout the world. Sunrise should take place at approximately 6 a.m. local time (7 a.m. daylight) and sunset at about 6 p.m. local time (7 p.m. daylight), no matter where you are in the world.

This results in an ionosphere of almost similar characteristics over large areas of the world, and is usually the best time of year for long DX openings between the temperate regions of the northern and southern hemispheres, on all h.f. bands. Expect considerably more frequent openings from mid-September through mid-October between the

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For Sept. 1977

Propagation Index	Expected Signal Quality (4)	(3)	(2)	(1)
Day				
Above Normal: 27	A	A	B	C
High Normal: 6, 17, 21-22, 25, 28	B	B	C	D
Low Normal: 1-3, 5, 9-10, 14, 16, 19-20, 23, 24, 29, 30	B	C	D	E
Below Normal: 4, 7-8, 11, 13, 15, 18, 26	C	D	E	E
Disturbed: 12	D-E	E	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals greater than S9+30 dB.

B—Good opening, moderately strong signals varying between S9 and S9+30 dB, with little fading or noise.

C—Fair opening, signals between moderately strong and weak, varying between S3 and S9, with some fading and noise.

D—Poor opening, with weak signals varying between S1 and S3, and with considerable fading and noise.

E—No opening expected.

HOW TO USE THIS FORECAST

1. Find *propagation index* associated with particular band opening from Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the band opening for any day of the month. For example, an opening shown in the charts with a *propagation index* of (3) will be fair (C) on September 1-3; poor (D) on the 4th; fair (C) again on the 5th; good (B) on the 6th etc.

For updated information dial Area Code 516-883-6223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 86, Northport, NY 11768.

*11307 Clara St., Silver Spring, MD 20902.

HOW TO USE THE SHORT-SKIP CHARTS

1. In the Short-Skip Chart, the predicted times of openings can be found under the appropriate distance column of a particular Meter band (10 through 160 Meters), as shown in the left hand column of the Chart. For the Alaska and Hawaii Charts the predicted times of openings are found under the appropriate Meter band column (15 through 80 Meters) for a particular geographical region of the continental USA, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

2. The *propagation index* is the number that appears in ( ) after the time of each predicted opening. On the Short-Skip Chart, where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. The index indicates the number of *days* during the month on which the opening is expected to take place, as follows:

(4) Opening should occur on more than 22 days
(3) " " " between 14 and 22 days
(2) " " " between 7 and 13 days
(1) " " " on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

3. Times shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. On the Short-Skip Chart appropriate *daylight* time is used at the *path midpoint*. For example, on a circuit between Maine and Florida, the time shown would be EDT; on a circuit between N.Y. and Texas, the time at the midpoint would be CDT, etc. Times shown in the Hawaii Chart are in HST. To convert to daylight time in other USA time zones, *add* 3 hours in the PDT zone; 4 hours in the MDT zone; 5 hours in CDT zone, and 6 hours in the EDT zone. *Add* 10 hours to convert from HST to GMT. For example, when it is 12 noon in Honolulu, it is 15 or 3 P.M. in Los Angeles; 18 or 6 P.M. in Washington, D.C.; and 22 GMT. Time shown in the Alaska Chart is given in GMT. To convert to *daylight* time in other areas of the USA, *subtract* 7 hours in the PDT zone; 6 hours in the MDT zone; 5 hours in the CDT zone and 4 hours in the EDT zone. For example, at 20 GMT it is 16 or 4 P.M. in N.Y.C.

4. The Short-Skip Chart is based upon a transmitted power of 75 watts c.w. or 300 watts p.e.p. on sideband; The Alaska and Hawaii Charts are based upon a transmitter power of 250 watts cw or 1 kw p.e.p. on sideband. A dipole antenna a quarter-wavelength above ground is assumed for 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level; for each 10db loss, it will lower by one level.

5. Propagation data contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

USA and South America, South Pacific, South Asia and southern Africa, particularly on *20* meters for a few hours after sunrise and again during the sunset period.

Long-path openings also improve considerably during the equinoctial period. In western states look for long-path openings to Europe and Africa on *20* meters shortly after sunrise and again during the early evening. Stations in eastern states can expect some long-path openings to the South Pacific during the late afternoon and early evening, and to parts of eastern Africa and Asia just after sunrise. Long path openings should also be possible on *40* meters, and at times on *80* meters, for an hour or so *before* sunrise, and just *before* sunset.

V.H.F. Ionospheric Openings

Although summertime sporadic-E ionization is expected to fall off considerably during September and early October, an occasional *6* meter short-skip opening may still be possible over distances ranging between approximately 1000 and 1300 miles. Best time to check is before noon and during the early evening.

There is usually an *increase* in auroral activity during an equinoctial period, so look for some fairly frequent *6* and *2* meter auroral-type openings. The best times for such openings are when conditions on the h.f. bands are BELOW NORMAL or DISTURBED. Check the "Last Minute Forecast" at the beginning of this column for those days likely to be in these categories during September.

No major meteor showers are expected during September, so few, if any, meteor-scatter type openings are likely on the v.h.f. bands this month.

CQ DX Contest Special

This year's *CQ* Worldwide DX Contest will be held on the following dates:

October 29-30 — Phone Section
November 26-27—C.w. Section

As for the past 26 years, next month's *Propagation* column will be devoted to a special, comprehensive forecast which will focus on both Sections of the Contest.

73, George, W3ASK

CQ Short-Skip Prpagation Chart
September & October, 1977
Local Daylight Savings Time At Path Mid-Point

Band (Meters)	Distance Between Stations (Miles)			
	50-250	*250-750*	*750-1300*	*1300-2300*
10	*Nil*	10-21 (0-1)	08-10 (1) 10-15 (1-2) 15-22 (1)	08-10 (1-0) 10-14 (2-0) 14-18 (1) 18-22 (1-0)
15	*Nil*	08-10 (0-1) 10-14 (0-2) 14-22 (0-1)	08-10 (1) 10-14 (2) 14-17 (1-3) 17-18 (1-2) 18-22 (1) 22-00 (0-1)	08-10 (1) 10-14 (2) 14-17 (3) 17-18 (2-1) 18-20 (1) 20-00 (1-0)
20	12-20 (0-1)	08-10 (0-1) 10-12 (0-2) 12-15 (1-4) 15-17 (1-3) 17-20 (1-2) 20-07 (0-1)	08-10 (1-2) 10-12 (2-4) 12-15 (4) 15-17 (3-4) 17-19 (2-4) 19-20 (2-3) 20-21 (1-3) 21-23 (1-2) 23-08 (1)	08-09 (2-1) 09-10 (2) 10-14 (4-2) 14-16 (4-3) 16-19 (4) 19-21 (3) 21-23 (2) 23-01 (1) 01-06 (1-0) 06-08 (1)
40	08-10 (0-2) 10-12 (2-4) 12-16 (3-4) 16-18 (2-3) 18-20 (1-2) 20-22 (0-1)	08-10 (2-3) 10-12 (4-3) 12-16 (4-2) 16-18 (3) 18-20 (2-4) 20-22 (1-4) 22-00 (0-3) 00-03 (0-2) 03-06 (0-1) 06-08 (0-2)	08-10 (3-2) 10-12 (3-1) 12-16 (2-1) 16-18 (3-2) 18-20 (4-3) 20-22 (4) 22-00 (3-4) 00-03 (2-3) 03-06 (1-2) 06-08 (2-4)	08-10 (2-1) 10-16 (1-0) 16-18 (2-1) 18-20 (3-2) 20-21 (4-3) 21-00 (4) 00-03 (3-4) 03-06 (2-3) 06-08 (4-2)
80	07-09 (3-4) 09-12 (4) 12-19 (4-3) 19-22 (4) 22-04 (3-4) 04-07 (2-3)	07-09 (4-2) 09-12 (4-1) 12-17 (3-1) 17-19 (3-2) 19-21 (4-3) 21-04 (4) 04-06 (3-4) 06-07 (3)	07-09 (2-1) 09-17 (1-0) 17-19 (2-1) 19-21 (3-2) 21-22 (4-3) 22-04 (4) 04-06 (4-2) 06-07 (3-2)	07-09 (1) 09-17 (0) 17-19 (1) 19-21 (2) 21-22 (3-2) 22-04 (4-3) 04-06 (2) 06-07 (2-1)
160	17-19 (1-0) 19-21 (2-1) 21-06 (4) 06-08 (3-2) 08-10 (2-1) 10-12 (1-0)	18-20 (1-0) 20-21 (1) 21-03 (4-3) 03-06 (3-2) 06-08 (2-1) 08-10 (1-0)	20-21 (1-0) 21-23 (3-1) 23-03 (3) 03-06 (2-1) 06-08 (1)	21-23 (1-0) 23-03 (3-2) 03-06 (1) 06-08 (1-0)

See explanation in "How To Use Short-Skip Charts" in box at the beginning of this column.

ALASKA
Openings Given In GMT

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40-80 Meters*
Eastern States	*Nil*	21-23 (1)	12-14 (1) 18-21 (1) 21-00 (2) 00-02 (1)	08-12 (1)
Central States	*Nil*	21-01 (1)	13-15 (1) 19-22 (1) 22-01 (2) 01-03 (1)	08-13 (1)
Western States	*Nil*	20-21 (1) 21-23 (2) 23-01 (1)	17-18 (1) 18-22 (2) 22-01 (3) 01-03 (2) 03-05 (1)	08-11 (1) 11-14 (2) 14-16 (1) 11-14 (1)*

HAWAII
Openings Given In HST

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40-80 Meters*
Eastern States	*Nil*	07-12 (1) 12-15 (2) 15-16 (1)	11-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-19 (1) 03-05 (1) 05-07 (2) 07-08 (1)	17-19 (1) 19-21 (2) 21-00 (3) 00-02 (2) 02-03 (1) 19-20 (1)* 20-23 (2)* 23-01 (1)*
Central States	09-13 (1)	07-11 (1) 11-12 (2) 12-14 (3) 14-15 (2) 15-17 (1)	05-06 (1) 06-09 (2) 09-13 (1) 13-15 (2) 15-17 (4) 17-18 (2) 18-20 (1)	17-19 (1) 19-21 (2) 21-02 (3) 02-04 (2) 04-05 (1) 19-20 (1)* 20-00 (2)* 00-02 (1)*
Western States	10-15 (1)	07-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-18 (1)	06-07 (1) 07-10 (3) 10-12 (2) 12-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-21 (1)	17-18 (1) 18-19 (2) 19-01 (4) 01-03 (3) 03-06 (2) 06-07 (1) 19-20 (1)* 20-22 (2)* 22-03 (3)* 03-04 (2)* 04-06 (1)*

September 15-October 15, 1977
Time Zone: EDT (24-Hour Time)
EASTERN USA TO:

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40-80 Meters*
Western & Central Europe & North Africa	*Nil*	10-11 (1) 11-15 (2) 15-16 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	18-19 (1) 19-21 (2) 21-23 (3) 23-02 (4) 02-03 (3) 03-04 (2) 04-05 (1) 20-22 (1)* 22-01 (2)* 01-04 (1)*
Northern Europe & European USSR	*Nil*	10-13 (1)	07-08 (1) 08-10 (3) 10-12 (2) 12-14 (1) 14-16 (2) 16-18 (1)	18-20 (1) 20-04 (2) 04-05 (1) 21-04 (1)*
Eastern Mediterranean & Middle East	*Nil*	10-11 (1) 11-13 (2) 13-15 (1)	07-08 (1) 08-09 (2) 09-14 (1) 14-16 (2) 16-17 (3) 17-18 (2) 18-19 (1) 22-00 (1)	19-21 (1) 21-00 (2) 00-01 (1) 22-00 (1)*
Western Africa	14-16 (1)	09-11 (1) 11-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)	08-10 (1) 13-15 (1) 15-16 (2) 16-17 (3) 17-18 (4) 18-20 (3) 20-21 (2) 21-23 (1)	20-23 (1) 23-02 (2) 02-04 (1) 01-03 (1)*

Note: The Alaska and Hawaii Propagation Charts are intended for distances *greater* than 1300 miles. For shorter distances, use the preceding Short-Skip Propagation Chart.

*Indicates best time to listen for 80 Meter openings. Openings on 160 Meters are also likely to occur during those times when 80 Meter openings are shown with a forecast rating of (2), or higher.

Eastern & Central Africa	*Nil*	11-13 (1) 13-15 (2) 15-16 (1)	13-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-21 (1)	21-02 (1)
Southern Africa	11-14 (1)	09-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	08-10 (1) 13-15 (1) 15-18 (2) 18-19 (3) 19-20 (2) 20-21 (1) 23-01 (1)	19-22 (1) 22-00 (2) 00-02 (1) 23-01 (1)*
Central & South Asia	*Nil*	09-11 (1) 18-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 19-22 (1)	05-07 (1) 20-23 (1)
South-east Asia	*Nil*	10-12 (1) 14-16 (1) 18-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 16-18 (1) 20-22 (1)	06-08 (1)
Far East		18-20 (1)	09-10 (2) 10-12 (1) 17-19 (1) 19-21 (2) 21-23 (1)	
South Pacific & New Zealand	15-18 (1)	11-15 (1) 15-17 (2) 17-18 (3) 18-19 (2) 19-20 (1)	07-08 (1) 08-11 (2) 11-14 (1) 16-20 (1) 20-00 (2) 00-04 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-09 (2) 03-04 (1)* 04-06 (2)* 06-07 (1)*
Austral-asia	17-19 (1)	14-17 (1) 17-19 (2) 19-20 (1)	07-08 (1) 08-10 (2) 10-12 (1) 14-16 (1) 16-18 (2) 18-21 (1) 21-00 (2) 00-02 (1)	02-04 (1) 04-06 (2) 06-07 (3) 07-08 (2) 08-09 (1) 04-05 (1)* 05-06 (2)* 06-07 (1)*
Carib-bean, Central America & Northern Countries of South America	11-14 (1) 14-17 (2) 17-18 (1)	09-10 (1) 10-13 (2) 13-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-09 (3) 09-10 (4) 10-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-22 (2) 22-00 (1)	19-20 (1) 20-21 (2) 21-04 (4) 04-06 (3) 06-07 (2) 07-08 (1) 21-23 (1)* 23-04 (2)* 04-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina and Uruguay	14-15 (1) 15-17 (2) 17-18 (1)	09-10 (1) 10-11 (2) 11-14 (1) 14-16 (2) 16-18 (3) 18-19 (1)	07-08 (1) 08-10 (2) 10-11 (1) 14-16 (1) 16-18 (2) 18-19 (3) 19-20 (4) 20-21 (3) 21-23 (2) 23-00 (1)	21-00 (1) 00-05 (2) 05-07 (1) 01-06 (1)*
McMurdo Sound, Antarc-tica	*Nil*	16-18 (1)	18-20 (1) 20-23 (2) 23-01 (1) 08-09 (1)	00-03 (1) 03-05 (2) 05-07 (1) 04-06 (1)*

Time Zones: CDT and MDT (24-Hour Time) CENTRAL USA TO:

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40-80 Meters*
Western & Central Europe & North Africa	*Nil*	10-14 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	18-20 (1) 20-23 (2) 23-01 (3) 01-02 (2) 02-03 (1) 21-23 (1)* 23-01 (2)* 01-02 (1)*
Northern Europe & European USSR	*Nil*	10-13 (1)	07-08 (1) 08-10 (2) 10-12 (1) 12-15 (2) 15-17 (1) 21-23 (1)	20-23 (1) 23-01 (2) 01-02 (1) 22-01 (1)*
Eastern Mediter-ranean & Middle East	*Nil*	10-13 (1)	07-08 (1) 08-09 (2) 09-15 (1) 15-17 (2) 17-18 (1) 21-23 (1)	20-23 (1) 21-23 (1)*
Western Africa	12-14 (1)	09-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	07-09 (1) 13-15 (1) 15-16 (2) 16-19 (3) 19-20 (2) 20-22 (1)	20-23 (1) 23-01 (2) 01-02 (1) 23-01 (1)*
Eastern & Central Africa	*Nil*	12-16 (1)	07-09 (1) 13-16 (1) 16-19 (2) 19-20 (1)	21-00 (1)
Southern Africa	11-13 (1)	09-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	07-09 (1) 12-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-01 (1) 21-23 (1)*
Central & South Asia	*Nil*	18-21 (1)	07-08 (1) 08-10 (2) 10-12 (1) 18-21 (1)	06-08 (1) 19-21 (1)
South-east Asia	*Nil*	17-19 (1)	07-08 (1) 08-10 (2) 10-13 (1) 18-22 (1)	05-08 (1)
Far East	*Nil*	15-17 (1) 17-19 (2) 19-20 (1)	07-08 (1) 08-10 (3) 10-11 (2) 11-13 (1) 17-19 (1) 19-22 (2) 22-00 (1)	03-05 (1) 05-07 (2) 07-09 (1) 06-08 (1)*
South Pacific & New Zealand	14-18 (1)	10-13 (1) 13-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	06-08 (1) 08-10 (3) 10-12 (2) 12-18 (1) 18-20 (2) 20-22 (3) 22-00 (2) 00-02 (1)	00-01 (1) 01-07 (3) 07-08 (2) 08-09 (1) 02-04 (1)* 04-07 (2)* 07-08 (1)*
Austral-asia	16-18 (1)	13-16 (1) 16-19 (2) 19-21 (1)	05-07 (1) 07-08 (2) 08-10 (3) 10-13 (2) 13-17 (1) 17-18 (2) 18-20 (1) 20-23 (2) 23-01 (1)	02-03 (1) 03-05 (2) 05-07 (3) 07-08 (2) 08-09 (1) 05-06 (1)* 06-07 (2)* 07-08 (1)*
Carib-bean, Central America & Northern Countries of South America	11-13 (1) 13-16 (2) 16-18 (1)	09-10 (1) 10-11 (2) 11-13 (3) 13-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-08 (3) 07-10 (4) 10-12 (3) 12-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-22 (2) 22-00 (1)	19-20 (1) 20-21 (2) 21-01 (3) 01-05 (4) 05-06 (3) 06-07 (2) 07-08 (1) 20-23 (1)* 23-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, and Uruguay	14-15 (1) 15-17 (2) 17-18 (1)	09-10 (1) 10-11 (2) 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	07-08 (1) 08-09 (2) 09-11 (1) 13-16 (1) 16-18 (2) 18-19 (3) 19-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	21-00 (1) 00-04 (2) 04-06 (1) 01-05 (1)*
McMurdo Sound, Antarc-tica	*Nil*	16-18 (1)	17-20 (1) 20-23 (2) 23-01 (1) 08-10 (1)	00-03 (1) 03-05 (2) 05-07 (1) 04-06 (1)*

Time Zone: PDT (24- Hour Time) WESTERN USA TO:

To:	*10 Meters*	*15 Meters*	*20 Meters*	*40-80 Meters*
Western Europe & North Africa	*Nil*	10-12 (1)	07-08 (1) 08-10 (2) 10-13 (1) 13-15 (2) 15-16 (1) 22-00 (1)	20-21 (1) 21-23 (2) 23-00 (1) 21-23 (1)*
Central & Northern Europe & European USSR	*Nil*	10-12 (1)	08-09 (1) 09-10 (2) 10-12 (1) 12-14 (2) 14-16 (1) 22-00 (1)	20-00 (1)
Eastern Mediter-ranean & Middle East	*Nil*	10-12 (1)	08-12 (1) 12-14 (2) 14-16 (1) 20-22 (1)	20-23 (1)
Western & Central Africa	12-14 (1)	10-13 (1) 13-15 (2) 15-16 (1)	07-08 (1) 08-09 (2) 09-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	21-00 (1)
Eastern Africa	*Nil*	13-15 (1)	07-09 (1) 13-15 (1) 15-17 (2) 17-19 (1) 21-23 (1)	20-22 (1)
Southern Africa	*Nil*	11-15 (1)	07-09 (1) 12-14 (1) 14-18 (2) 18-19 (1) 22-00 (1)	19-22 (1)
Central & South Asia	*Nil*	17-19 (1)	08-09 (1) 09-11 (2) 11-13 (1) 17-19 (1) 19-21 (2) 21-22 (1)	06-08 (1) 19-21 (1)
South-east Asia	*Nil*	16-19 (1)	07-08 (1) 08-10 (3) 10-11 (2) 11-12 (1) 21-22 (1) 22-00 (2) 00-01 (1)	01-03 (1) 03-06 (2) 06-08 (1) 03-06 (1)*
Far East	*Nil*	14-16 (1) 16-19 (2) 19-20 (1)	07-08 (1) 08-10 (3) 10-13 (2) 13-20 (1) 20-21 (2) 21-22 (3) 22-23 (2) 23-01 (1)	01-03 (1) 03-08 (2) 08-09 (1) 03-07 (1)*
South Pacific & New Zealand	13-15 (1) 15-17 (2) 17-18 (1)	11-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	14-18 (2) 18-20 (3) 20-22 (4) 22-23 (3) 23-01 (2) 01-07 (1) 07-08 (2) 08-10 (3) 10-11 (2) 11-14 (1)	21-22 (1) 22-23 (2) 23-00 (3) 00-05 (4) 05-07 (3) 07-08 (2) 08-09 (1) 23-02 (1)* 02-06 (2)* 06-07 (1)*
Austral-asia	15-17 (1)	13-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	17-19 (1) 19-20 (2) 20-00 (3) 00-03 (2) 03-07 (1) 07-08 (2) 08-10 (3) 10-12 (2) 12-13 (1)	01-02 (1) 02-03 (2) 03-06 (3) 06-08 (2) 08-09 (1) 02-04 (1)* 04-06 (2)* 06-07 (1)*
Carib-bean, Central America & Northern Countries of South America	11-13 (1) 13-15 (2) 15-17 (1)	08-09 (1) 09-12 (2) 12-14 (3) 14-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	19-21 (1) 21-02 (3) 02-04 (2) 04-07 (1) 20-22 (1)* 22-03 (2)* 03-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina, & Uruguay	13-14 (1) 14-16 (2) 16-17 (1)	09-10 (1) 10-11 (2) 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	08-10 (1) 13-15 (1) 15-17 (2) 17-20 (4) 20-21 (3) 21-22 (2) 22-00 (1)	21-23 (1) 23-02 (2) 02-04 (1) 00-03 (1)*
McMurdo Sound, Antarc-tica	*Nil*	16-19 (1)	07-10 (1) 17-19 (1) 19-20 (2) 20-22 (3) 22-00 (2) 00-01 (1)	01-03 (1) 03-05 (2) 05-07 (1) 03-06 (1)*

HOW TO USE THE DX PROPAGATION CHARTS

1. Use Chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4 and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9 and 0 areas; the Western USA Chart in the 6 and 7 areas, and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (15 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. A ** indicates the best time to listen for 10 meter openings; * best times for 160 meter openings.

3. The *propagation Index* is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of *days* during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this Propagation column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. Time shown in the Charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M., 13 is 1 P.M., etc. Appropriate *daylight* time is used, *not* GMT. To convert to GMT, add to the times shown in the appropriate chart 7 hours in PDT Zone, 6 hours in MDT Zone, 5 hours in CDT Zone, and 4 hours in EDT Zone. For example, 14 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 03 GMT, etc.

5. The charts are based upon a transmitter power of 250 watts c.w., or 1 kw, p.e.p. on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 db gain above these reference levels, the *propagation index* will increase by one level: for each 10 db loss, it will lower by one level.

6. Propagation data, contained in the Charts has been prepared from basic data published by the Institute For Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado, 80302.

a monthly feature by

BILL DEWITT, W2DD

In Focus

Television on the Amateur bands

Slow Scan Station Of The Month, W6VLH—Super Screen Size SSTV!

One of SSTV's best known operators has recently added a "really BIG show" at the receiving end of his slow scan equipment. Mel Shavelson, W6VLH decided to go "large screen" on his SSTV monitoring. By large screen, Mel means a picture approximately FIVE FEET square displayed on a six foot diagonal screen! As you can see in figs. 1 and 2, the picture quality is amazingly good. Here's how Mel described what he's doing in portions of a letter to yours truly:

"Enclosed are some photographs of what I believe is the largest SSTV monitor in the world—the six foot (diagonal) screen of my Advent 750 Projection Television set. The Advent is ideal for the purpose because it has a video and audio input, and of course the quality of the receiver itself—it has 6 MHz bandwidth—is slightly more than necessary! However, it allows me to feed the output of my Robot 300 directly in, by-passing the TV front end and allowing for the quality you see in the photos. (A frame I snatched of myself holding my station call letters, using an RCA fast scan surveillance camera.)

"The room with the projection TV set up is in my house, some 70 feet from the study in which the shack is located. A combination of RG8U and RG58U feed-line goes from the Robot 300 output to the Advent input via a hi-fi closet which serves as a distribution center in the house for various antennas, stereo sound, motion picture sound and tape recorders used for mixing sound tracks to dub onto my home movies.

"This whole operation is sort of a busman's holiday, as I am a motion picture director and writer—and the equipment is part of the projection room set up which also includes a 12' by 10' beaded screen which pulls down from a concealed panel! Rounding out the facilities are a soda fountain, bar, tape and film editing facilities, and 8, 16, and 35 mm sound projectors. *(Note from W2DD, I'm eating my heart out!)*

"The Advent will accept any signal coming from the Robot 300, including on-the-air pictures, pictures from tape and memory, closed circuit fast scan pictures from an RCA camera and a Javelin camera—both of which can be switched automatically by a Javelin Automatic Sequential Switcher.

"There is also two-way audio, so I can go live fast scan from the shack to the audience in the projection room and risk having my audience talking back to me! I do not yet have two-way video, but that is quite possible with the present equipment as soon as I install another coax line.

"The Advent projection TV uses three projection tubes and a screen which has 8 times the reflecting capacity of a beaded screen, so the pictures are perfectly visible in full daylight. Also, the three tube projection system seems to minimize the line structure in the TV picture so that it is almost invisible. This can be seen in the photos.

"Additional SSTV equipment in the shack includes a Robot 70 monitor, Robot 80 Camera, an RCA 12" monitor, an RCA 21" TV set, audio tape recorders, and a Sony TCV 160 fast scan video tape recorder.

"If I have any time left, the shack is also equipped for RTTY, 2 meter f.m., and hold onto your hat, CB. 73, Mel."

Thanks to Mel for the pictures and description of a "first" in SSTV! And as for that "ham shack"—it's hard to imagine a more complete and elegant place to operate amateur radio/SSTV!

The dramatic photographs of Mel and his large screen SSTV display were taken by his daughter, Lynne Joiner. She's a top-notch professional photographer and Channel 5 news anchor-person at KPIX-TV in San Francisco. If you have ever tried to photograph a person next to a TV screen, you can appreciate the excellence of Ms. Joiner's pictures.

Famous writer and film director-producer, photographer, amateur radio operator (30 years), SSTV innovator—all of these titles fit Mel Shavelson. One of Mel's books, *How To Make A Jewish Movie* describes his attempts to establish contact with K6DXK, Ernie Lehman in Hollywood while Mel was in Tel Aviv (operating as 4X4UT). This was during the making of the movie, "Cast A Giant Shadow." The book jacket says that he was "trying to make a movie with Kirk Douglas, John Wayne, Frank Sinatra, Yul Brunner, Angie Dickinson, Senta Berger, FIVE MILLION DOLLARS, and the Israeli Army!"

The photograph of Mel at the mike in his "shack" shows why he has that big signal. See fig 3. The Henry 2K linear and a tri-bander at 70 feet help.

Point your beam at Studio City, CA. sometime for a slow scan contact par excellence with W6VLH—and maybe a short chat with your favorite movie star.

Big Screens — Perspective

As readers of "In Focus" well know, I have been a strong proponent of small screens for SSTV, but Mel's demonstration provides some fascinating food for thought. One of these days, someone's going to come up with an amateur oriented design that will "put it all together" and the kind of picture we'll see on our screens will be orders of magnitude better. You can do just so much with a given number of bits of information and what you can pack into a given bandwidth is obviously limited.

Here's a prediction: Five years from now image-processing techniques will be used in conjunction

*2112 Turk Hill Road, Fairport, N.Y. 14450

Fig. 1—A "First" in SSTV! Mel Shavelson, W6VLH, stands next to his station ID picture displayed super-size, FIVE FEET square! Photo by Ms. Joiner.

Fig. 2—At close range Mel is further dwarfed by his own image. As mentioned in the text, the three gun projection system seems to minimize the appearance of TV lines. Photo by Ms. Joiner.

Fig. 3—W6VLH relaxing at the mike. Note the prism arrangement on the Robot 80 camera for televising desk-top copy.

Fig. 4—Len Butsch, K4CNP and Les Reinhart, W8ATK, use artful persuasion to get Len's scan converter working after a 1500 mile trip by car.

Fig. 6—Starting from the left, Phil Howlett, W9XX, Jim Young, K4TGC, and Ron, W8GZM, looked happy after a visit to the flea market.

Fig. 7—From the left. Bob McMillen, W3ATV, Russ Sievert, W8OZA, and Warren Weldon, W5DFU, were on hand for the Friday night SSTV Seminar.

Fig. 5—Bill Wells, W4CVS, demonstrated all kinds of program material for SSTV "programs."

with microprocessor hardware and some operation at increased bandwidths will be used to demonstrate vastly superior picture quality in the slow scan mode.

What are YOUR thoughts on this subject?

Echoes Of Dayton '77

As promised last month, here are some more photos of Dayton attendees. fig. 4 shows Len Butsch, K4-CNP, rejuvenating his scan converter with the help of Les Reinhart, W8-ATK. The 1500 mile trip to Dayton in the trunk of Len's car left the converter feeling a bit cranky. *(It recovered OK and performed beautifully!)*

Bill Wells, W4CVS, shown in fig. 5 was one of the featured speakers at the SSTV Seminar.

Perhaps the happy smiles on the faces of Phil Howlett, W9XX, Jim Young, K4TGC, and Ron, W8GZM, indicate a successful tour of the world's largest flea market. Shown from the left in fig. 6.

If you're a regular on the Saturday afternoon SSTV nets, you've already met these fellows. From the left in fig. 7, Bob McMillen, W3ATV, Russ Sievert, W8OZA, and Warren Weldon, W5DFU, famous for his lofty-lookie weather camera.

SSTV Frequencies — Again

From time to time I have asked for comments regarding the frequencies used for SSTV. I have made some proposals regarding the 3.8 and 14 MHz bands and asked the question, "What do YOU propose?" The flood of answers (!) totals two letters, one of which follows. It's from one of SSTV's earliest birds, Robert "Gervie" Gervenack, W7FEN of Duvall,

Fig. 8—Jim Herteen, WA0NAA has one of the neatest amateur stations ever pictured in this column. This picture was part of a well written newspaper article telling how Jim uses SSTV to swap pictures with amateurs all over the globe.

Washington.

"I had intended to write to you earlier regarding SSTV on 14230 and 3845 kHz and am pleased that you brought it to our attention in the April issue of *CQ* again.

"First off, I will take the responsibility for the selection of 14230 and 3845. This happened many years ago when SSTV was getting started and the group at that time felt there was a need for a CALLING FREQUENCY. I was asked to name the frequencies, so that is where we landed.

"If you recall at Dayton in 1973, we suggested changing the 7220 kHz frequency to 7171. This has caused confusion and there is too little activity on 40. I believe it is because the frequency change was too drastic. *(See note from W2DD below.)*

"My suggestion is to move higher in frequency by 5 or 10 kHz., not more than 15 kHz. on 20 or 75. On the West Coast, 3845 kHz. is not bothered by teletype.

"I had hoped to make it to Dayton this year. Please pass along my regards to everyone. See you on ISB" —Gervie, W7FEN.

Another Request For Comments!

What do YOU think of Gervie's proposals? Do you think that more than one or two daring slow scanners would risk the horrific possibility of not getting a contact on some frequency other than QRM-laden 14230?

Gervie, I'm all for your idea—but the groove is so easy to follow—I just wonder if the present "stacked up SSTV" can ever be changed. It appears that collectively we slow scanners are a bunch of sheep. (NOW I'll get some comments!)

Note: In regard to Gervie's thoughts on the 7171 kHz frequency. There has been a fair amount of mid-morning activity on this frequency in the Eastern and Mid-Western parts of the country. However, there seems to be a great reluctance on the part of slow scanners to use 10 meters, 15 meters, or 40 meters.

There used to be lots of SSTV action on 21340 kHz. Not now. Why not "live it up a little?" Get off of 14230 at least ONCE A WEEK and CALL CQ SSTV on some other band. You might just possibly have some fun!

Good SSTV PR In Newton, Iowa

Jim Herteen, WAØNAA, and his SSTV station were recently the subject of a fine public relations article in the local newspaper under the headline, "Local ham radio operator sends and receives pictures." The article explained in layman's language how slow scan is transmitted and received. As shown in fig. 8, Jim's very complete station includes a Robot Model 400 scan converter, plus a fast scan camera and monitors. A neat and efficient set up.

New Book on SSTV

Since up to now there has been one (U.S.) book on SSTV available, the appearance of a second is news! *The Complete Handbook of Slow Scan TV* by Dave Ingram, K4TWJ, has finally hit the bookstands.

Dave has done a fine job of organizing and presenting a wealth of material on SSTV. I thought that the chapters on "Understanding SSTV Gear," "Digital Scan Converters," and "SSTV Satellite Communications" were especially well done. If you're looking for an up-to-date book on SSTV, this is it. Published by TAB, it's priced at $9.95, paperback only.

Final — Final

Many thanks to those who have written to me and submitted pictures for publication in this column. I do appreciate your help. Please keep those letters coming my way. Address: 2112 Turk Hill Road, Fairport, N.Y. 14450. Regards, Bill W2DD

a monthly feature by
JOHN A. ATTAWAY, K4IIF

DX

News of communications around the world

Two premier DX events, the *CQ* Worldwide Phone Contest and the *CQ* Worldwide CW Contest, are coming up. See the complete rules elsewhere in this issue.

These two contests are widely regarded as the best opportunity of the year to build up a country, prefix and zone total. This does not guarantee activity from extremely rare DX countries such as Iraq or Clipperton Island. No way! However, it is the time when more semi-rare countries are active. Those such as the VP2 islands, the Canaries, Azores and Madeira Islands, the little European states such as LX, C31 and HB0, and of course many of the Pacific Islands.

Reserve Your Island

In an earlier issue we advised the importance of "staking out your claim" early if you plan a DXpedition during the CQ contests. The time is now! And as a result of the great interest in the earlier article we will attempt to make a few suggestions.

*P.O. Box 205, Winter Haven, FL 33880.

Rick Roderick, WA5VDH, is our new Committeeman representing the Arkansas DX Association. Rick is past President of ADXA and the Arkansas Valley Amateur Radio Club. He was one of the first group to qualify for the WPX Award of Excellence, is a member of the WPX Honor Roll and has 316 countries confirmed. He also has earned 3, WAZ certificates, c.w.—phone, s.s.b. and #7 on 20 meter single band c.w.

VP1 and VP5

A possible new contest spot is the Paradise House Hotel, San Pedro, Belize, formerly known as British Honduras. VP1 is as good a prefix as you can get for contest operation, and Jerry McDermott, owner and operator of the hotel can obtain a permit from the Belizian authorities allowing an amateur operator to temporarily bring equipment into the country free of Custom's duties, and to operate in Belize on his U.S. license. Reservations are handled through an office at 9225 Katy Freeway, #302, Houston, Texas 77024, phone (713) 461-2027.

The favorite spot for many southeastern DXers is VP5-land, the Turks and Caicos Islands, which now boast scheduled air service. The Third Turtle Inn on the island of Providenciales is a long time favorite of many, and the Admiral's Arms on South Caicos Island has welcomed amateurs in past years. Licenses must be obtained through the Administrator on Grand Turk, and you should accompany your application with a copy of your U.S. license. The fee varies from time to time, based on the Jamaican dollar. Reservations at the Third Turtle Inn can be made by writing to the Inn at 2633 Lantana Road, Lantana, FL 33462, phone (305) 967-2261. Contact the Admiral's Arms via the Caicos Company, Ltd., South Caicos, Turks and Caicos Islands, West Indies.

Zone 2

You don't think of Canada as a rare country, but during the CQ Contests Labrador is in greater demand than many island countries because it is in Zone 2 and everyone needs the multiplier. Unfortunately, Labrador has no balmy beaches or tourist hotels, but Eastern Provincial Airways will get you there, and Canada will give you a reciprocal license.

6Y5 and VP9

Jamaica is a beautiful spot and reciprocal licenses can be obtained. If interested, contact Mr. Ken Penchoen, 6Y5BF, Shangrila Villa, P.O. Box 92, Montego Bay. Ken is happy to rent a villa to visiting amateurs and can advise you on licensing procedures. Reciprocity is also practiced in Bermuda, VP9. Contact The Colonial Secretariat, Hamilton, Bermuda, advising proposed length of stay, license held (enclose copy), reason for operation and proposed station location.

ZF—Grand Cayman

Another very popular QTH is Grand Cayman. However, be advised that authorities are giving U.S. licensees a careful look because of attempts to use ZF calls improperly. Application blanks should be requested from the Postmistress, General Post Office, Grand Cayman, British West Indies, and should include a clear copy of your U.S. license and a Bank Draft for $25.00. *Personal checks will not be accepted.* Among the ZF-hotels welcoming amateur visitors is the Spanish Bay Reef, Box 800, Grand Cayman.

VP2

The British Virgin Islands are another favorite. A copy of your U.S. license and $5.00 should get you a VP2V ticket from the Public Works Department, Government of the British Virgin Islands, Tortola, BVI. However, *go in person* as the authorities are much too busy to handle a lot of queries by mail.

Excellent Contestpedition facilities are available on Montserrat, complete with antennas, from the Beversteins, a well-known Canadian amateur radio family. Write Mrs. Hope Bever-

stein at 60 Amsterdam Ave., Toronto, M4B 2C2, Canada. She can help you secure a VP2M license.

If St. Lucia strikes your fancy, the Planter's Inn, 35 Brazil Street, Castries, St. Lucia, W.I., has a hamshack on the premises. Contact Mrs. Gay Gardner-Hobbs, VP2LYL, and if the time is short enclose a copy of your U.S. license plus $5.00 for a VP2L ticket.

FG7/FS7

For info on Guadaloupe and St. Martin, see the article by W5SJS on pg. 19 of the December, 1976 issue of *CQ*. The title is *Caribbean DX Vacation* and it covers these French islands very well.

Power

Observe the laws of the country you visit should be the first commandment for good international relations. Power limits vary considerably from country to country. For example, in leafing through some of the licenses we have obtained over the years we find that on Montserrat our VP2MIF ticket specifies "Power —1 kilowatt," while our K4IIF/C6A ticket states that in the Bahamas maximum allowable power is "100 watts p.e.p." Our VP5JA ticket for the Turks and Caicos Islands says: "The power will not exceed 100 watts." A friend in W6-land once chided us for our weak signal from the Bahamas on 20 meters. So be it! The rules say 100 watts so the linear stays at home. It isn't necessary to run roughshod over another country's customs in order to enjoy a DXpedition.

Observing the power limit is important to you personally as well. On your CQ Worldwide DX Contest summary sheet you must sign a statement that "I have operated my transmitter within the limitations of my license." It would be tragic to have a great score wiped out because you were ignorant of the rules and regulations of the country in which you were a guest.

As of this writing, K4IIF plans to be out there somewhere in DX land for one or both of the contest weekends. Hope I can give you a new one. See you in the pileups.

DXer of the Month

It has been many moons since we recognized a DXer of the Month. This situation should be corrected, and with one in our midst who deeply deserves the honor, it shall be corrected forthwith.

The nominee is John Kanode, W4WSF, and although he is a member of the *CQ* DX Awards Advisory Committee the nomination was made by Leland "Buddy" Smith, W4YZC/W4YE, of the Potomac Valley Radio Club.

W4WSF has played a major role on the *CQ* DX Awards Advisory Committee. The WPX Award of Excellence was first suggested by John. He has served the Potomac Valley Radio Club as President, Vice President and Treasurer, and he is also a member of the National Capitol DX Association, the Shenandoah Valley Amateur Radio Club, the First Class Operators, ARRL (Life Member) and AMSAT (Life Member).

Among John's many DXing accomplishments are Single Band WAZ on both 14 MHz phone and c.w., over 300 countries worked, over 1000 prefixes confirmed by mixed mode, over 1000 prefixes on s.s.b. and over 900 on c.w., and 5-Band DXCC. He is a member of the *CQ* 2-Way S.S.B. Honor Roll plus the mixed, c.w. and s.s.b. WPX Honor Rolls. In total, W4WSF has over 500 amateur radio operating awards. He has been an active contester for 23 years and has earned over 100 contest trophies and certificates including several from the *CQ* Worldwide DX Contests. He was a member of the Potomac Valley group which made over 10,000 QSO's and 19,000,000 points from PJ9JR in the October, 1974 *CQ* Worldwide Phone Contest.

Two of the most outstanding DXers in Italy are Luis Ladi, I3LLD (left) and Angelo Cipolato, I3DHN (right) both of Venice. Using the Drake T4XC and R4C, a Sommerkamp linear and a Hy-Gain beam, Angelo qualified for WAZ s.s.b. #1327, plus DXCC, AAA, WAA, DUF, WSA and AJD. Luis also uses Drake gear and a Hy-Gain beam and earned single band WAZ #17 on 20 meter phone. Among his other awards are DXCC, WAPN, WAA, ADXA, WA-UK-CA, DUF DTA and others.

CQ DX Honor Roll

The CQ DX Honor Roll recognizes those DXers who have submitted proof of confirmation with 275 or more countries for the mode indicated. The top SSTV DXers are also listed. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. Total number of current countries on the DXCC list as of this listing is 319. Honor Roll listing is automatic when submitting application or endorsement for 275 or more countries. To remain on the CQ DX Honor Roll, annual updates are required. Honor Roll updates may be submitted anytime.

CW

W6PT 317	W4YWX 308	W4IC 301	W4BQY 296	WA6EPQ ...282
ON4QX 314	W2GT 307	W6ISQ 301	K6JG 295	K9MM 279
K6EC 313	W8LY 305	K6LEB 298	VK3AHQ ...292	W6SDO 279
W6ID 312	W9DWQ 303	WØAUB 298	WA8DXA ...287	DJ7CX 276
W8KPL 309	N6AV 302	DL3RK 297	W6NJU 284	

SSB

W2TP 318	K4RTA 310	K6WR 304	OZ3SK 296	W6HUR 286
DL9OH 316	W2QK 310	K6YRA 303	WØSFU 296	DJ7CX 285
K2FL 316	W3DJZ 310	VE2WY 303	W2CNQ 295	OE3WWB ...285
W4EEE 316	W6EL 310	VE3GMT 303	WØSD 295	G3KYF 284
WA2RAU 316	W6KTE 310	WA3IKK 303	K6XP 294	W6SDO 284
TI2HP 315	SM6CKS 309	K4MQG 302	W4WSF 294	N6AW 282
G3FKM 314	WA2EOQ 309	ZL1AGO 302	DJ9ZB 293	WB2RLK 282
IØAMU 314	W4DPS 308	K9LKA 301	I5WT 293	YV1LA 282
W3CWG 314	W6YMV 308	OE2EGL 301	VE7WJ 293	SP5BSV 281
W3NKM 314	WA6AHF 308	W6NJU 301	K6AQV 292	WA4WTG ...281
W6RKP 314	I8YRK 307	ZS6LW 301	K8PYD 292	WAØKDI 281
VE3MR 313	IØZV 307	W3GG 300	WA2HSX 292	XE2YP 281
W3AZD 313	K6JG 307	I4ZSQ 299	VE7CE 291	N2SS 280
W9ILW 313	K8DYZ 307	VE3GCO 299	WØYDB 291	W9QQ 280
I8KDB 312	K9WEH 307	W6KZS 299	W9YRA 290	DL1MD 279
W4SSU 312	ZL3NS 307	W9OHH 299	DL6KG 289	K4SB 279
W4UG 312	F2MO 306	YV1KZ 299	G3WW 289	OK1MP 279
W6EUF 312	I6FLD 306	EA4LH 298	OE1FF 289	WB4SIJ 279
W6REH 312	K6EC 306	W9QLD 298	W6FW 289	VE7HP 277
W9DWQ 312	SM5SB 306	WB6DXU 298	K4HJE 288	W7OM 276
F9RM 311	SM6CWK 306	F9MS 297	YS1O 288	XE1KS 276
I8AA 311	W9JT 306	G3DO 296	DK2BI 287	DK1FW 275
VE3MJ 311	W9KRU 306	G3TJW 296	W6FET 287	
XE1AE 311	KH6BB 305	HP1JC 296	C3RWQ 286	
IT9JT 310	W4IC 305	N6AV 296	K1KNQ 286	

SSTV

W8YEK 108

Jim Ray, WB5HIH, of Waco, Texas is another U.S. winner of the WAZ Award. Jim qualified for CW—Phone certificate #4038.

One of John's most important contributions has been the modernization of the W4/K4 QSL Bureau which is reputed to be the best of the U.S. Bureaus in terms of short delivery time and low backlog of cards. He spends several hours each week at the Bureau, and has gone to many hamfests and conventions at his own expense to promote the Bureau.

In operations from Panama and the Canal Zone, John earned DXCC and 43 other awards using a 100 watt rig and low wire antennas. He confirmed KZ5 and HP on all bands for many early 5-band DXers. Other calls he has held include: K5UYF, KZ5II, WA4LDI, PJ9KK, HP1XWS, WA3LYH, KK4ITU and KJ4ITU.

The antennas at W4WSF include 6 elements on 20 meters at 75 feet, 5 elements on 15 meters at 85 feet, a TH6DXX at 55 feet, a Quad loop on 40 plus dipoles on 80 and 160. He uses a Drake T4XC and R4C and a Henry 2-K linear. (See pg. 59 of the June, 1977 issue of *CQ* for John's photo.)

Congratulations to a very deserving DXer of the Month.

Here and There

Arkansas Committeeman—The *CQ* DX Awards Advisory Committee is pleased to have Rick Roderick, WA5VDH, as a Member representing the Arkansas DX Association (ADXA). Rick was President of ADXA during 1976 and saw the group grow to the 80 member level with 2300 check-ins to the DX Net. Rick's home QTH is Russellville, AR, but he is presently located at Apt. 16, 515 Brookside Drive, Little Rock, AR 72205, where he has been a student for the past 4 years.

Delta DX Association—New officers are Russ Guidry, K5YMY, President; Wondy Wondergem, K5KR, Vice President; Howard de Laneuville, WA5AWF, Secretary; Ralph Rusca, W5CB, Treasurer; and Lowell Otto, W5NO, Board Member. Russ Guidry is also a Member of the *CQ* DX Awards Advisory Committee.

N4, K4, W4, QSL Bureau—If you have more than one call in the 4th Call Area, you should keep an envelope at the Bureau for *each* separate call. You cannot have more than one call per envelope. If you wish to have your cards sent monthly, regardless of how few have been received, write *monthly* in the lower left hand corner of the envelope. If you prefer to use all of the postage on each envelope, write *fill* in the lower left hand corner. If you are a QSL Manager and plan to have cards for the stations you handle routed via the Bureau, keep an envelope on file for each callsign. Do *NOT* send outgoing cards to the incoming Bureau. The outgoing Bureau is in Newington, CT.

CW—Phone WAZ #4086 went to Sherman Harrison, WB4FJO, of Kingsport, Tennessee. His roughest zones to work were 24 and 26, and he finally got both on the same day. Sherm is a Jr. High School Principal and holds an Advanced Class License.

From the Mailbag

de Don, G2GM—"I am disappointed to learn that the FCC is unable to issue special prefixes this year to commemorate the I.T.U. Perhaps those stations unable to operate with a special prefix this year will use the time to QSL contacts made in previous years. After fighting the pileups to work the following I still don't have a confirmation: KD2, KD4, KG2, KH2, KI1, KI2, KJ4, KK1, KL2, KM4, KO1, KP2, KQ2, KR2, KS2, KU2, KV2, KV8, KY1, KZ4, WD2, WD8, WE2, WO5, WQ2, WT4, WV4, WV8, WX2, WY1, WY4, NA6, NU4, and NZ1."
(G2GM is a keen prefix hunter with over 1000 confirmed. He is listed in the WPX Honor Roll.—K4IIF)

de Dick, W7VRO—"Must clear up the confusion re the QSL route for D2AAI. Although he sends a log to SM0GMG for European QSLing, I handle all U.S. and other non-European cards. I also handle cards for ZS1XR, but the logs are slow in ar-

Ray Ault, WA6EVX/KG6, is back in .the states now after 3 years of delightful DXing from Guam. Ray made SSB WAZ #1356 and also won a certificate during the CQ WPX Contest for 1976.

The CQ DX Awards Program

S.S.B.

484...G4CVZ
499...K9LKA
500...WA6EVX/KG6
501...PAØJFH
502...WA2AOG
503...K4PHE
504...W5DMM
505...UK4WAB
506...DK5WQ
507...UB5GBD
508...UWØMF
509...UQ2AN
510...UT5HP
511...VE3GCO

C.W.

260...W8ILC
261...UR2RCU
262...DK4HD
263...GI5UR
264...UK1APA
265...UK6AAJ
266...UR2RDQ
267...UA6PK
268...UQ2AN
269...UT5HP

S.S.B. Endorsements

150...K9LKA, VE3GCO, W4LVM, W5DMM, WA6-EVX/KG6
200...K9LKA, VE3GCO
250...K9LKA, VE3GCO
275...K9LKA, VE3GCO
300...K9LKA

C.W. Endorsements

150...UT5HP, W4LVM, W8ILC
200...UT5HP, W8ILC
275...K9MM
QRPp...W8ILC

Complete rules and application forms for the CQ DX Awards program can be obtained by sending a business size, No. 10 envelope, self-addressed and stamped to: "CQ DX Awards," 5632 47th Avenue S.W., Seattle, Washington 98136 U.S.A.

The WAZ Program

Single Band WAZ

40 Meter C.W.

2...W1DA

20 Meter C.W.

21...I1TLA
22...JH3JEX

20 Meter Phone

45...JA7BJS
46...W7OK
47...JA1BN
48...IØAMU
49...K7LAY

S.S.B. WAZ

1377...OZ5VT
1378...DL1YA
1379...DK3VJ
1380...JA1VNA
1381...I3ZMG

C.W.—Phone WAZ

4093...I6AYS
4094...K4CDZ
4095...DJ1YH
4096...DJ7ZZ
4097...DJ5VH
4098...DK8FS
4099...UL7GG
4100...UR2CW
4101...JH1XHO
4102...N4CC
4103...JA1AFF
4104...W7ETZ
4105...JA1OHD
4106...JA1HQ

The complete rules for all WAZ awards are found in the May, 1976 issue of *CQ*. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.

riving. My address is P.O. Box 981, Bellingham, WA 98225."

de John, W6YY—"Have just returned from a month's visit to East Africa. In Kenya I found that about 40 amateurs are active, but mostly on 2 meters. Robbie, 5Z4ERR, has sold his pharmacy and is not very active in amateur radio any longer. Bob, 5Z4LW, is quite active, as is Herman, 5Z4RT/DK8RT, who has a lovely spider quad. There is no house delivery of mail in Nairobi, so cards for 5Z4LW should be sent to P.O. Box 47872, and for 5Z4RT to P.O. Box 14425.

Ibrahim, SU1IM, is recovering from an operation with the help of his daughter, SU1MI, who is a physician. He has the Swan 500 loaned by the Northern California DX Foundation, but certain difficulties are preventing him from using it. SU1MA is active at times, but is quite busy with real estate.

In Uganda, only 5X5NK is on the air and then only spasmodically. QSL to DL1YW. Frank, ET3FF, is the only active, licensed amateur in Ethiopia and his license may not be renewed next year. He is purposely keeping a low profile with a 14AVQ and a small Yagi at roof level. QSL to P.O. Box 1365, Addis Ababa, Ethiopia."

de Bill, VE4BJ—"Just a note for info on the Winnipeg DX Club. Our president is M. Pura, VE4MP and I am the secretary-treasurer. Correspondence may be directed to me at 578 Oxford St., Winnipeg, MB, Canada R3M 3J9. Our 2-meter frequency is 147.45 MHz."

de Bob, N5RM—"Re your list of 20 most needed on c.w., I operated W9DD/KG6S from Saipan and worked 1000 stations in 2 days on c.w. However, very few U.S. stations, despite tremendous signal reports from the states and frequent CQ W/VE only calls. Hope to be /HB again in the future and also active from the Eastern Carolines. Have moved back to Texas."

Fred, W5UTT, is Executive Director of the American Radio Council, the group which secured withdrawal of a bill from the Texas Legislature which would have fined hams $100 for TVI. Thanks to the Council, a new bill has been introduced requiring manufacturers to install adequate high pass filters. Fred is an enthusiastic c.w. DXer, running an S-Line to a 4-element quad. He holds an Extra Class license.

The father/son DX duo of Jim, WA3IIX (seated) and Bill, WA3UKY (standing), who operate from Dover, Delaware on 10-160 meters. Delaware is Considered DX by many overseas amateurs.

GC4DAA—c/o G3ZWQ, B. J. Barrington, 59 Beatty Ave., Coldean, Brighton, Sussex BN1 9EP England
HC1WW/OA4—Via E. S. Gamble, K1ALP, 25 White Oak Road, Trumbull, CT 06611
HM1KE—To C.P.O. Box 3481, Seoul, Korea
HP1MH—c/o P.O. Box 3398, Panama 4, Republic of Panama
HS1ALD—Via Hans-Ulrich Kurt, ex-HB9-AZX, G.P.O. Box 821, Bangkok, Thailand
HW2ITU—To F6BFH, 21 Rue de la Republique, F-76420 Bihorel, France
HW6NFI (Nantes International Fair)—c/o F9AE, 63 rue Albert-Calmette, F-44000 Nantes, France
JY9EK—c/o WA5LMG, 8410 Gladwood Lane, Dallas, TX 75231
KC6KU—Via WA2EOQ
KG4AN—To C. S. Johnson, WA4MQJ, 2601-G Cashwell Dr., Goldsboro, N.C. 27530
KP6AL—c/o KH6CHC
N9MM/KP6—Via K9ECE
OA4SS—To G. A. Guy, WA6DVE, 5249 W. 138th Place, Hawthorne, CA 90250
OD5HU—c/o SM4CIV
OY1A—Via Bob Huntington, K6XP, 5014 Mindora Drive, Torrance, CA 90505
OY1AT—To K6XP, see OY1A
OY1M—c/o K6XP, see OY1A
PJ8CO (1977 only)—To James Capps, W8AEB, 6158 Wilson Mills Rd., Cleveland, OH 44124
U28WRW—Via Central Radio Club, P.O. Box 88, Moscow, USSR
UR2QD—c/o N6HR
VE3DIY/SU—To VE1APY
VK9RH—c/o P.O. Box 97, Norfolk Island, via Australia
VP1PG—c/o WB9TOU, Paul Gavin, 4900 Louise, Skokie, IL 60076
VP2LDU—U.S. stations QSL to WA7OTT, 10610 19th St., S.W. Seattle, WA 98146
VP2SJ—Via R. L. Scott, WB8JEY, 1310 Cheshire Rd., Delaware, Ohio 43015
VR4DH—To P.O. Box 654, Honiara, Solomon Islands
VS5PM—c/o P.O. Box 969, Brunei
W9ABA/ZF1—Via Leo Haijsman, 1044 S.E. 43rd St., Cape Coral, FL 33904
WA3FYL/5N2—To A. J. Maggitti, K3UZY, 33 Beverly Ave., E. Lansdowne, PA 19050
WA7OTT/VP2D—c/o WA7PTT (see VP2LDU)
WB9BZL/TI8—Via W. P. Corcoran, WA9UNR, 4336 Mozart St., Chicago, IL 60618
WB9SYA/5N2—To J. B. Forbing, 1416 Lakewood Dr., Ft. Wayne, IN 46819

(Continued on page 85)

The WPX Program

Mixed

578...PT2JB
579...UA3RH

SSB

977...DF4FX
978...TR8DG
979...I3ZNG
980...I8KCI
981...UA3IAM
982...UK5IBM
983...UQ2CR

CW

1583...JA3VOV
1584...K9QVB
1585...OK3YCA
1586...W4TYE
1587...K4SB
1588...JA2RGH
1589...K4OAF
1590...UA3RH
1591...UA3TAE
1592...UA6APP
1593...UA9CCE
1594...UA9CGL
1595...UA9FAR
1596...UA9YAQ
1597...UA9YAR
1598...UC2CZ
1599...UK2PAT
1600...UK9FER
1601...UL7GAC
1602...UL7JAA
1603...UP2BF

WPNX

97...WA4RVC

VPX

122...JA1-4876
123...UA4-095-171
124...UA9-145-47
125...UA0-1035
125...UC2-009-357

Endorsements

Mixed: 1275 W9FD, 905 UA3FT, 836 YU1ODS, 757 W2KE, 633 UA3RH, 598 PT2JB, 509 VE7DP.
SSB: 1205 I8KDB, 1110 I4ZSQ, 1090 HP1JC, 900 WA5VDH, WB4KZG, 652 TR8DG, 648 YU1ODS, 550 JH1VRQ, 528 UK5IBM, 450 I3ZNG, 410 ISØMVE, 353 UA3IAM, 330 DF4FX.
CW: 1161 W9FD, 954 YU1AG, 792 G3OCA, 749 VE1MF, 666 K9QVB, 639 YU1ODS, 500 UK5VAA, 550 UA3RH, 467 WB4SIJ, 363 K4SB, 360 GW3-SB, 350 OK3YCA, 323 UL7JAA, 320 W4TYE, 310 UA9YAR, 309 UA9CCE, UA9FAR, UA9YAQ, UK9FER, 304 UL7GAC, 302 UA6APP, 301 UA9-CGL, UC2CZ, UK2PAT, 300 JA3VOV, JA2RGH, K4OAF, UA3TAE, UP2BF.
10 Mtrs: W1CHA, UA3FT.
15 Mtrs: JA1-4876, W1CHA, UK4WAB, UA3FT.
20 Mtrs: JA1-4876, W1CHA, YS1JWD, JA2RGH, UK4WAB, UA3FT, UA3RH.
40 Mtrs: WB4SIJ, UK4WAB, UD6BW, UA3FT.
80 Mtrs: G3OCA, OK3YCA, UK4WAB, UA3FT, UA3RH.
Africa: UA3FT.
Asia: JA1-4876, YU1OCV, VK3WU, UA3FT, UK5-IBM, UA3RH.
Europe: JA1-4876, YU1OCV, OK3YCA, VK3WU, UQ2CR, UA3FT, UA3RH.
No. Am: YS1JWD, UA3FT, K2UPR.
Oceania: JA1-4876, VK3WU.

Complete rules and application forms for the *CQ* WPX Awards program may be obtained by sending a business size, self-addressed, stamped envelope to "CQ WPX AWARDS," 5014 Mindora Dr., Torrance, CA 90505

QSL Information

Over the years, several readers have requested that QSL Information include complete addresses rather than just the callsigns of QSL Managers. Beginning with the June, 1977 issue we are complying with this request wherever possible.

A4XGX—Via P.O. Box 8656, Salalah, Oman
A51RG—To Rinchhen Gyeltshen, Amateur Radio Station, c/o Postmaster, Thimphu, Bhutan
A35CR—c/o 4Z4TT
A7XA—Via DJ9ZB
EL2AR—To WA5ZWC, D. M. Peddie, 5027 Braesheather, Houston, TX 77035
EL7E—c/o A. Hetzenegger, DK5RL, Proelerstr. 5-A, D-8630 Deggendorf, Germany
EL8N—Via B.L.O. Johansson, SM4CWY Borresveg. 4, S-67100 Arvika, Sweden
F6BBJ/A (Abu Ail)—To J. Billaud, F6BBJ, 11 rue R. Champenier, F-58000 Nevers, France
FO8DF—P.O. Box 5225, Pirae, Tahiti, French Polynesia
FO8EY—P.O. Box 5444, Pirae, Tahiti, French Polynesia
FG7AR/FS7 (March 16 & 17, 1977 only)—Via Bill Jacobs, K3-RYA, 208 Sleepy Hollow Rd., Pntts-burgh, PA 15216

DK3SN, operated by Ladislav Holanda, ex-OK1AJX, is one of the top DX and contest stations of central Europe, as evidenced by the wall full of DX and contest awards. He also operates mobile using an Atlas 210. A recent trip included /HB9, /HB0 and /OE. Ladislav earned his WAZ from his home QTH near Stuttgart using only a dipole antenna. Making WAZ without a beam is a rare achievement.

a monthly feature by

IRWIN MATH, WA2NDM

Math's Notes

A look at the technical side of things

Last month, you will recall, we spoke about simple filter circuitry. This month we will continue the discussion with filters that are just a bit more complex but, with much sharper filter action.

As you will recall, we covered both low pass and high pass configurations and gave examples of the implementation of those devices with op-amps to reduce gain losses. To sharpen up these simple circuits even further we refer to fig. 1.

Here we have taken two low pass filters (R and C) and isolated them by means of two op-amps or dual op-amp. Each filter acts independently on its input and, of course, the input to the second stage has already been filtered once. This results in a sharper low pass characteristic as shown on the accompanying graph. The gain of the op amps in this circuit must be adjusted to just restore the losses in the actual filter elements.

The same procedure can be used with high pass filter elements to achieve a sharper response. In fig. 2, we have a simple modification of fig. 1 that eliminates many of the problems associated with fig. 1. In this circuit, both op-amps are connected as unity gain-non inverting amplifiers. Operation of the center section is as in the previous case. Output of the second amplifier is fed back, through a capacitor to the first stage and overall gain is a function of the reactance of the feed-back capacitor. The primary advantage here is, that since the gains are only unity, offset voltages etc. have very little effect. Also, the high input impedances of the unity gain op-amp configuration allow high value resistors and small value capacitors to be employed.

When it is desired to pass only a band of frequencies, the circuitry changes. One could use a scheme such as fig. 3 where A_1 is a low pass filter element, A_2 a high pass filter element and A_3 a summing amplifier, combining the outputs of the two filter elements.

This system will work but a better configuration is the one shown in fig. 4. The feedback network to the op-amp is called a twin-t bridge. In a certain sense, it is similar to the

(Continued on page 85)

*5 Melville Lane, Great Neck, NY 11020

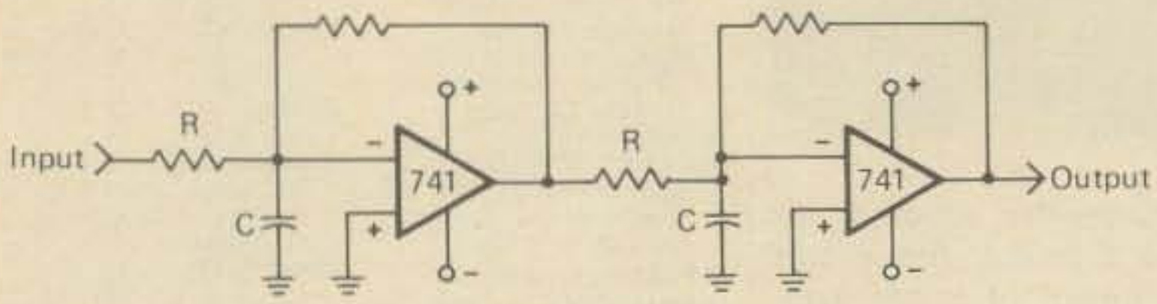


Fig. 1—A two stage low pass filter. The d.c. offsets have not been considered in this circuit.

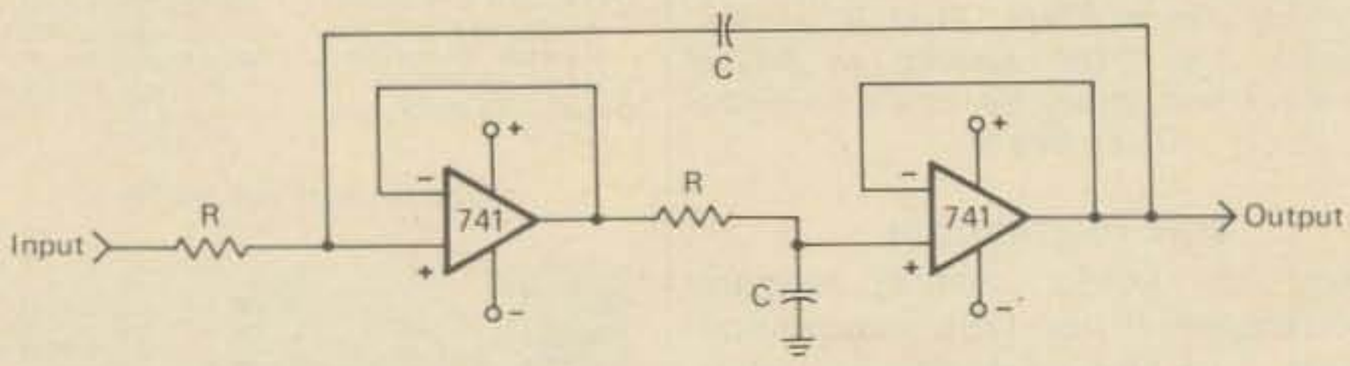


Fig. 2—A modified version of fig. 1. This unity gain configuration eliminates most of the undesirable characteristics of fig. 1.

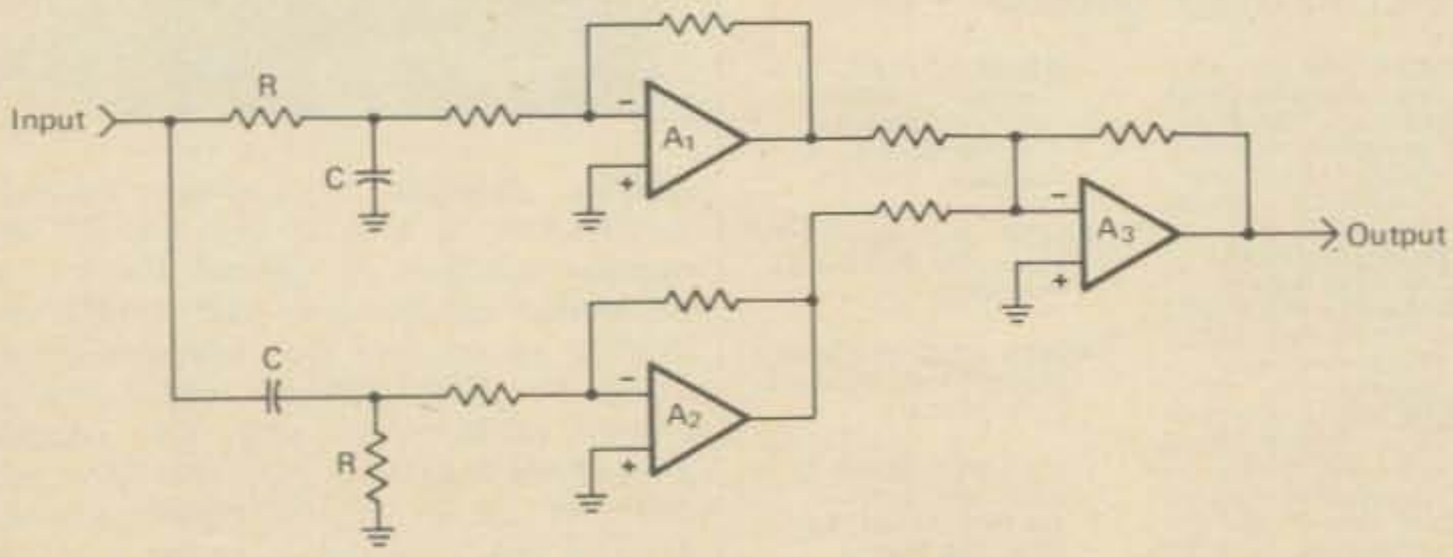


Fig. 3—A bandpass filter constructed of high and low pass elements.

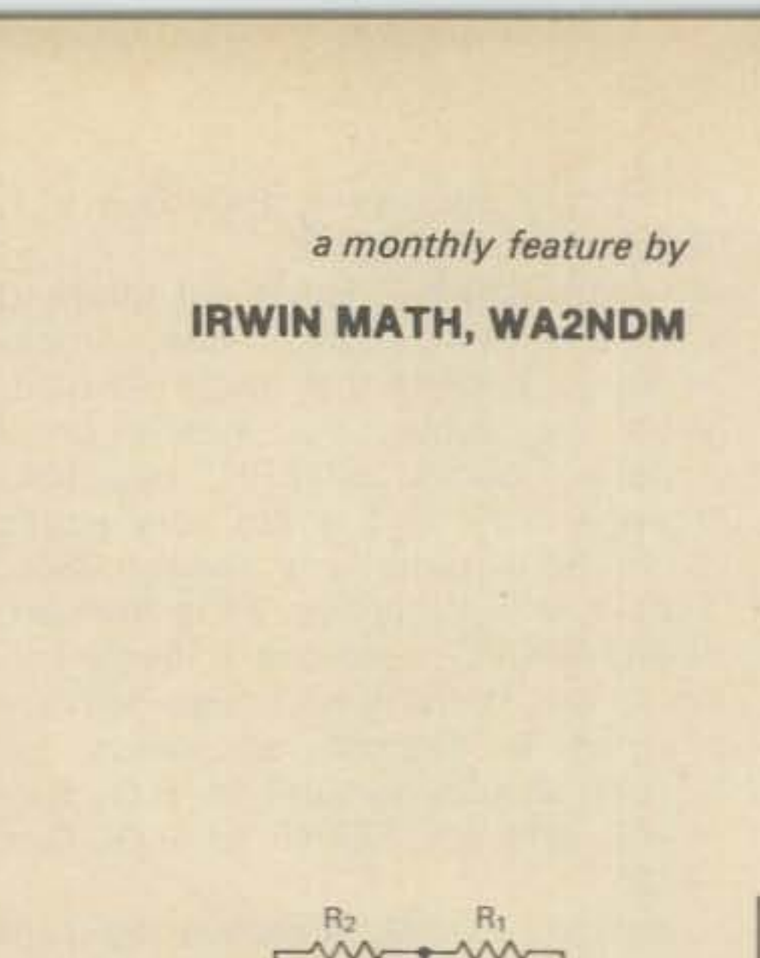


Fig. 4—A bandpass filter using a twin-t network.

a monthly feature by

FRANK ANZALONE, W1WY

Contest Calendar

News/views of on-the-air competition

The announcement for this year's *CQ* World Wide Contest appears on page 24 of this issue. Several rule modifications have been made so I advise you to carefully read the rules. The changes appear in *italic* print for ease of identification and they are also summarized below.

Starting with this year's contest, check sheets (dupe sheets) will be required for all bands on which an entrant contacts 200 or more stations.

Also, for each duplicate not deleted in a log a penalty of 3 contacts will be deducted from the score by the committee.

In the area of determining single operator criteria, the use of a spotting net is now prohibited to all who wish to enter as a single operator. (Such as a 2 meter repeater).

And lastly, stations not operating thru their licensed location and outside of their home call area will be required to sign portable.

Under Par. IX, Trophies and Plaques, you will note that 8 additional awards have been made for Canada, Oceania, USA and the World, making a total of 38 now awarded. We have also spelled out the interpretation of the residency clause.

On 80 meters the JA's are confined to a narrow band between 3793 and 3802 kHz. It is obvious that calling CQ and on frequency operation by stateside stations in this narrow 9 kHz will make it almost impossible to work the JA's. It is therefore suggested that the 160 "DX Window" technique be used and let the JA's indicate where they are listening, in a split frequency operation.

The Ohio Buckeye Belles will operate their Memorial station W8MBI and individually during the Ohio QSO Party, Aug. 27th and 28th. The YL's are awarding certificates to Ohio stations working 12 "Belles". Requirements for other states are 8 contacts, and 4 for DX stations. Logs should include the number of the Belle worked and go to: Certificate Custodian

*Sherwood Rd., Stamford, Conn. 06905

Calendar of Events

* Sept.	3-5	Four Land QSO Party
Sept.	10	North American Sprint
** Sept.	10-11	European Phone Contest
* Sept.	10-11	Wash. State QSO Party
* Sept.	10-11	Pennsylvania QSO Party
* Sept.	10-11	Albatross SSTV Contest
Sept.	10-11	ARRL VHF QSO Party
Sept.	14-16	YLRL "Howdy Days"
Sept.	17-18	VE/W Contest
Sept.	17-19	Maryland/DC QSO Party
Sept.	17-18	Scandinavian C.W.
Sept.	24-25	Scandinavian Phone
Sept.	24-25	Delta QSO Party
Sept.	25-26	Classic Radio Exchange
Oct.	1-2	California QSO Party
† Oct.	1-2	VK/ZL/Oceania Phone
Oct.	8-9	VK/ZL/Oceania C.W.
Oct.	8-9	RSGB 21/28 MHz Phone
Oct.	12-13	YLRL Anniv. C.W. Party
Oct.	14-16	Boy Scouts Jamboree
Oct.	15-16	WADM Contest
Oct.	15-16	Manitoba QSO Party
Oct.	15-16	RSGB 7 MHz Phone
Oct.	**29-30**	**CQ WW DX Phone Contest**
Nov.	3-4	YLRL Anniv. Phone Party
Nov.	5-6	ARRL C.W. Sweepstakes
Nov.	5-6	RSGB 7 MHz. C.W. Contest
Nov.	12-13	European RTTY Contest
Nov.	12-13	Int. Police Assoc. Party
Nov.	19-20	ARRL Phone Sweepstakes
Nov.	19-20	WWDXA C.W. Contest
Nov.	**26-27**	**CQ WW DX C.W. Contest**

* Covered last month
** See July Issue
† Not Official

Marge, K8ITF, 1608 Rangeley Ave., Dayton, Ohio 45403. Include 50c for mailing costs.

73 for now, Frank, W1WY

North American Sprint

From 7:00 P.M. to 11:00 P.M. Pacific Daylight Time, Saturday September 10th. (0200 GMT)

Organized by the National Contest Journal this contest is a real shorty, 4 hours and on c.w. only. Contacts can be made between North American stations and between stations in other continents and North Americans. (WAC boundries used as standard).

Classes: Single operator and multi-operator, both single and multi-transmitter.

Exchange: Your call, QSO no., name and QTH. (State, VE province or country).

Scoring: For No. American stations —Multiply total QSO's by sum of states, VE call areas and DX countries worked. For others—Multiply total QSO's by states, VE call areas and No. American countries worked. (KH6 not counted as a state). (VE1, VO1, VO2 one call area).

Frequencies: 1800—1820, 3530—3550, 7030—7050, 14030—14050. (4 bands only). Same station may be worked on each band for QSO credit.

Awards: Appropriate certificates and trophies will be awarded.

Special Rule: No. American stations calling CQ NA and making a contact are not permitted to call CQ or QRZ on the same frequency again but must move at least 5 kHz before calling CQ again. He can however answer if called by another station.

Club competition is limited to a total of 15 operators as a single entry unit. A club may enter more than one unit. To qualify each operator in the unit must be registered with contest coordinator W6OAT no later than 6.30 P.M. Sept. 10th.

Use a separate sheet for each band, indicate each multiplier the first time it is worked, and include a summary and check sheet with your entry. A signed declaration is also requested.

Logs go to: Rusty Epps, W6OAT, 39 Belcher Street, San Francisco, CA 94114.

(I would suggest checking the National Contest Journal for more details).

YLRL "Howdy Days"

Starts: 1800 GMT Wed. September 14
Ends: 1800 GMT Fri. September 16

This activity is for YL's and scores will be based on contacts between YL's only. All bands and modes may be used, but cross-band and Net contacts do not count.

Score 2 points for each YLRL member worked and 1 point if its with a non-member. Only one contact with the same station is permitted regardless of the band. There is no multiplier, just add the QSO points.

The top scoring YLRL member will receive her choice of a YLRL pin, a charm or stationery. The highest scoring non-member receives a one year membership in the YLRL.

Logs must be received before October 17th and go to: Carol Bourne, WA9NEJ, 362 Hawthorne St., Glen Ellyn, Ill. 60137.

VE/W Contest

C.W.: 0001-2400 GMT Sat. Sept. 17
Phone: 0001-2400 GMT Sun. Sept. 18

Its the VE/VO's and W/K's exchanging contacts in the "General" portions of the US bands in this one.

Like last year the contest will be divided into c.w. and phone, with separate operating times for each. Separate logs are therefore required.

Only 18 hours total operating time may be used in the 24 hour period of each contest. The minimum time off period is 15 mins. which must be indicated on the log.

The same station may be worked on each band for QSO and multiplier credit. And there are two classes of entries, single and multi-operator.

Exchange: RS(T) plus a progressive QSO no. starting with 001 and QTH. ARRL section for W/K, geographical areas for VE/VO. (9 provinces plus Nfld., Lab., Yukon and N.W.T.)

Scoring: Two points per QSO. VE/VO use ARRL sections worked on each band for their multiplier, W/K use VE areas, max. of 13 on each band. In addition a multiplier of 10 has been instituted for W/K's to equalize the W/VE scores. (QSL's × area multiplier × 10 = Final Score).

Awards: Certificates to the top scorers in each class in each section with at least two entries. (min. of 25 QSO's). The Montreal A.R.C. is also donating Plaques to the top scoring over-all entry, c.w. and phone, in the U.S. and Canada.

Official log sheets are not necessary, a reasonable facsimile is acceptable. However summary and check sheets for entries with 200 or more contacts are a must. A signed declaration that rules and regulations have been observed is also requested.

Mailing deadline is October 31st to: Montreal A.R.C., P.O. Box 2206, Dorval, Quebec, H9S 3K9 Canada.

Maryland/D.C. QSO Party

Starts: 2300 GMT Saturday, Sept. 17
Ends: 0100 GMT Monday, Sept. 19

This is the 11th annual party sponsored by the Maydale A.R.S. The same station may be worked on each band and mode for QSO points as well as band multiplier.

Exchange: QSO no., RS(T) and QTH. County for Maryland, ARRL sections for others. Baltimore and Washington are independent cities.

Scoring: Two points for each QSO. MD/DC use ARRL sections and countries for their multiplier. Others use Maryland counties and Independent cities. (max. of 24 for each band).

Frequencies: On c.w. 75 kHz from low end of each band on even hours. On phone 25 kHz from top of each band on odd hours. Try 10 and 15 on the half hour. And 6, 2 and 220 may be worked through repeaters.

Awards: Certificates to the top scorers in each ARRL section, MD county and D.C., and in each country, both phone and c.w. A Plaque to the Top Scorer with a combined total from all bands and all modes.

Use a separate log sheet for each band and mode as well as a check sheet for each band and mode with over 100 contacts.

A summary sheet showing the scoring, name and address in Block Letters, and a signed declaration that all rules and regulations were observed is also requested.

Mailing deadline is November 1st to: Maydale A.R.S., c/o C. E. Andersen, W3XE/W5TWT, 1406 Claude Lane, Silver Spring, MD 20904.

Scandinavian Activity Contest

C.W. Sept. 17-18 Phone—Sept. 24-25
Starts: 1500 GMT Saturday
Ends: 1800 GMT Sunday

Major changes have been made in the scoring so check the Points and Multiplier paragraphs closely.

It's the world working the Scandinavians in this the 19th S.A.C. The same station may be worked on each band, 3.5 thru 28 MHz, for QSO and multiplier credit. Phone and c.w. are separate contests.

The prefixes used in Scandinavia are: LA/LB/LG/LJ, Norway. JW, Svalbard. JX, Jan Mayen. OF/OG/OH/OI, Finland. OH0, Aland Is. OJ0, Market Reef. OX, Greenland. OY, Faroe Is. OZ, Denmark. SJ/SK/SL/SM, Sweden.

Classes: Single operator and multi-operator, single and multi transmitter. Multi transmitter stations must use separate series of serial numbers for each band. Club stations are considered multi-operator.

Exchange: RS(T) and QSO number starting with 001.

Points: *For European stations:* 1 point for each QSO on any band.

For non-European: 1 point per QSO on 14, 21, 28 MHz. 3 points if its on 7 or 3.5 MHz.

Multiplier: Each *call area* in the above list of Scandinavian countries worked on each band. (LA1, LB1, LJ1 are in same call area, as are SM3, SK3, SL3.) Portable stations in Denmark or Norway count as the 10th area. OH0 is the 10th area for Finland. And OJ0 counts as a separate area.

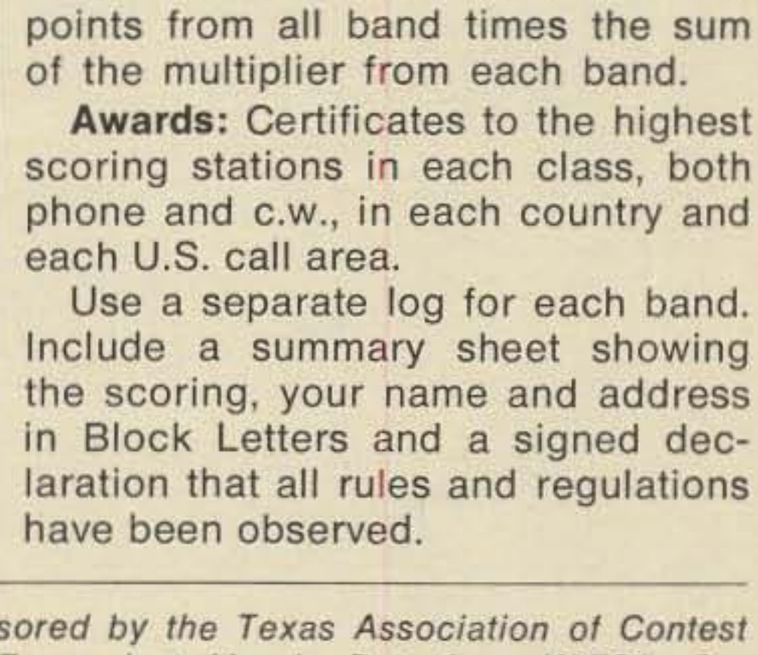
Final Score: The sum of QSO points from all band times the sum of the multiplier from each band.

Awards: Certificates to the highest scoring stations in each class, both phone and c.w., in each country and each U.S. call area.

Use a separate log for each band. Include a summary sheet showing the scoring, your name and address in Block Letters and a signed declaration that all rules and regulations have been observed.

The First Annual Contesters Roundup sponsored by the Texas Association of Contest Operators (TACO) was held in Houston, Texas last March. Bob Cox, K3EST, Co-Director of our World Wide DX Contest was one of the speakers on the program and presented two awards won in CQ DX Contests.

Dave Blaschke, W5WZQ winner of the Northern Illinois DX Assoc. 1975 W.W. C.W. Single Band Plaque for the U.S.A. Dave did it on 7 MHz.



Mike Badolato, W5MYA winner of the North Florida DX Assoc. 1976 WPX SSB Contest World Trophy for his operation from VP2G.

Mailing deadline is Oct. 15th. This year your logs go to: The NRRL Contest Committee, P.O. Box 21, Refstad, Oslo 5, Norway.

Delta QSO Party

Starts: 1800 GMT Sat., September 24
Ends: 2400 GMT Sun., September 25

This is the 8th annual QSO Party sponsored by the Delta Division of the ARRL. Delta stations (Ark., La., Miss., Tenn.) may work stations both in and outside their boundries, others only Delta stations. The same station may be worked on each band and mode, and portables and mobiles each county change.

Exchange: QSO. no., RS(T) and QTH. County and state for Delta stations. ARRL section for all others.

Scoring: *For Delta* — Total QSOs times ARRL sections worked. (max. of 75)

Outside Delta—QSOs times Delta counties worked. (max. of 316) DX stations may be worked but for QSO points only.

Frequencies: C.W. — 3550, 7050, 14050, 21050, 28050, SSB-3990, 7290, 14290, 21390, 28590. Novice — 3775, 7175, 21125, 28125.

Certificate Awards:

A. Achievement: All stations contacting 5 or more stations in each of the 4 Delta states.

B. Delta: To the 3 highest scoring stations in each of the 4 Delta states, 4th and 5th if warranted.

C. Others: To the highest scoring station in each ARRL section and each country, 2nd and 3rd if warranted.

D. Plaques: Top scorers in and outside the Delta division. Top portable and mobile Delta stations. Highest scoring Delta Club station.

Mailing deadline Oct. 21st to Malcolm P. Keown, W5RUB, 213 Moonmist, Vicksburg, Miss. 39180.

Classic Radio Exchange

Starts: 1800 GMT Sunday, Sept. 25
Ends: 0100 GMT Monday, Sept. 26

This is the Fall edition of this unusual activity sponsored by the Southeast A. R. C.

Object is to restore, operate and enjoy older equipment with like-minded hams. A Classic Radio is any piece of equipment built since 1945 but at least 10 years old. (An advantage but not required to enter).

The same station may be worked on each band and mode and with different equipment combinations, but no a.m. phone below 21 MHz. (Non-contestants may also be worked).

Exchange: Name, RS(T), state, province or DX country, receiver and transmitter type. (i.e.: home brew, 807 final and etc.) Also any other interesting information.

Scoring: Add the number of different transmitters and receivers, states, provinces and DX countries worked on each band. Multiply by number of QSO's made. Multiply that total by the Classic multiplier. (Total years old of all transmitters and receivers used. Minimum of 3 QSO's per unit.) Multiply years old by 2 if its a transceiver.

Frequencies: C.W.—60 kHz from low edge of each band. Phone — 3910, 7280, 14280, 21380, 28580. Novice/Technicians—3720, 7120, 21120, 28120.

Awards: Certificates to the highest scorers, longest DX, most equipment combinations, oldest equipment, and "unusual achievement."

Send logs with comments, pictures, anecdotes and etc. to: Stu Stephens, K8SJ/W8KAJ, 2386 Queenston Road, Cleveland Heights, OH 44118. Include s.a.s.e. for Newsletter.

California QSO Party

Starts: 1800 GMT Saturday, Oct. 1
Ends: 2400 GMT Sunday, Oct. 2

This year's party is again sponsored by the Northern California Contest Club. Last year there were 112 Cal. entries from 50 counties. They expect to exceed that total this year.

Operating time is limited to 24 out of the 30 hour contest period. Off time must be at least 15 minutes and shown on log.

The same station may be worked once per band and mode, portables and mobiles each county change. Cal. stations may work each other for QSO points but only one multiplier. DX stations for QSO points only.

Exchange: QSO no., and QTH. County for Cal., state, province or country for others.

Scoring: Two points per QSO. The multiplier for Cal. is the number of different states and VE call areas worked. (VE max. of 8). Others use Cal. counties for their multiplier. (max. of 58)

Frequencies: c.w. — 1805, 3560, 7060, 14060, 21060, 28060, s.s.b. — 1815, 3895, 7230, 14280, 21355, 28560. Try 10 on the hour, 15 on the half hour between 1800 and 2200 GMT.

Awards: Certificates to the top scorers in each Cal. county, state, VE province and country, 2nd and 3rd place if justified. Also to the top scoring mobile, portable, multi-single, multi-multi and club submitting the highest aggregate score. (min. of 20 QSO for portables)

Indicate each new multiplier as worked. Include a summary sheet with your entry showing the scoring, type of entry and etc. A large s.a.s.e. will get you the results.

Mailing deadline is Oct. 31st to: Northern Cal. Contest Club, c/o Lew Jenkins, N6VV, 1750 Eucalyptus Ct., Concord, CA 94521.

VK/ZL/Oceania DX Contest

Phone: Oct. 1-2 C.W.: Oct. 8-9
Starts: 1000 GMT Saturday
Ends: 1000 GMT Sunday

Stations in the rest of the world will concentrate on working stations in Oceania, with the emphasis on VK/ZL for their multiplier.

Rules apply to stations other than VK/ZL.

Exchange: RS(T) plus a progressive QSO number starting with 001.

Scoring: *For Oceania:* 2 points for VK/ZL contacts, 1 point with rest of world.

Outside Oceania: 2 points for VK/ZL contacts, 1 point for other Oceania contacts.

Final Score: Total QSO points multiplied by the sum total of VK/ZL call areas worked on each band. (Single band logs also accepted).

Awards: Attractive certificates to the top all band scorers, phone and c.w., in each country and call areas of JA, W/K and the USSR. Single band awards if returns warrant.

Logs: Date/time in GMT, station worked, number sent/rec'd. band, QSO points. Underline each new VK/ZL call area worked on each band. Use a separate sheet for each band. A summary sheet showing the scoring, name and address in Block Letters and a signed declaration that all rules and regulations have been observed.

There is also a s.w.l. section. Only VK/ZL stations are to be logged. Include call of station being worked and serial number sent.

Logs must be in the hands of the Committee no later than Jan. 31, 1978. This year they go to: Wireless Institute of Australia, P.O. Box 67, East Melbourne, 3002 Victoria, Australia.

Math's Notes *(from page 80)*

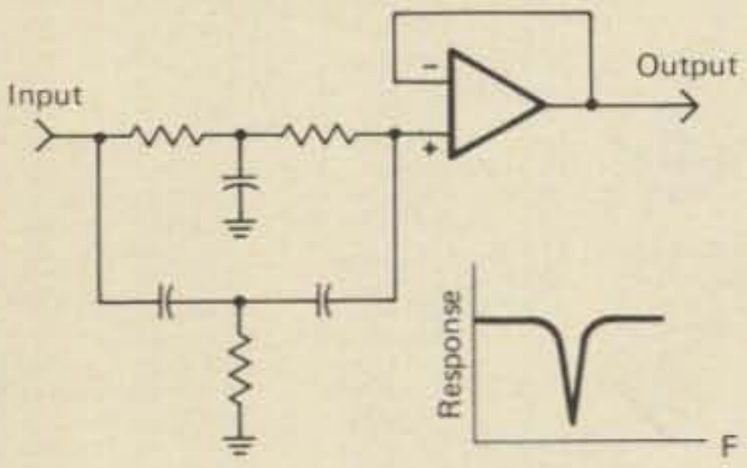


Fig. 5—The twin-t connected as a notch filter.

circuit in fig. 3 in that R_1C_3 could be thought of as a low pass filter while C_1R_3 could be a high pass filter. What actually happens however, is that frequencies applied to the input are phase-shifted by the upper and lower network but only at one frequency (depending on the values of R and C) is the phase-shift such that the input and output cancel. As a result, for all other frequencies, the network has a low impedance and the op amp, low gain. At the "resonant" frequency the feedback becomes very high and the amplifier exhibits considerable gain. A graph of the type of response is given in the *figure* as are typical selection criteria for component values. For best response, R and C values should be closely matched.

If this same network is now moved to the input, as shown in fig. 5, we gain a notch filter with a response as shown. This type of circuit is useful to reject unwanted frequencies such as 60 Hz hum since the notch can be made quite deep.

73, IRWIN, WA2NDM

DX *(from page 79)*

YB7HB—c/o H. Sasaki, JA8BMK, P.O. Box 150, Asahigawa, Hokkaido 070-91, Japan
YO0ITU—Via G. Cralu, YO3RF, P.O. Box 1395, Bucaresti 5, Romania
YS10—To K. K. Miller, W2KF, 309 Cherry Hill Blvd., Cherry Hill, N.J. 08034
ZL3OG/C—c/o Don Scott, Radio Station, Chatham Islands, via New Zealand
ZV0ITU—Via J. B. Franco, PT2JB, Sqn. 113, BI D/607, Asa Norte Comercial, 70000 Brasilia
3A0GP—To J. J. Goddard, F6BFJ, 46 Ave du Cap d'Ail, F-06 La Turbie, France
4J8F—c/o UF6HS, E. A. Melnik, Central Radio Club, P.O. Box 88, Moscow, USSR
4K1D—Via UA3AEL, Central Radio Club, P.O. Box 88, Moscow, USSR
4K1F—To UA3AEL (See 4K1D)
4M2YV—c/o B. M. Espinoza, YV2YV, P.O. Box 456, Merida, Merida, Venezuela
4X4BL—Via C. L. Kelsey, WB2EDV, RFD-2, W. Lake Rd., Mayville, NY 14757
4Z4BG—To A. P. Stein, WB4FSV, Thunderbird Trail, Maitland, FL 32751
4Z4EV—c/o WB4FSY (See 4Z4BG)
4Z4PG—Via Joe Arcure, Jr., W3HNK, P.O. Box 73, Edgemont, PA 19028
5B4BK—To J. Schatzberger, OE2SJL, Kaserne Siezenheim, A-5071 Wals, Austria
5H3KS—c/o K. Schmidt, DK5EC, Am Erlensteg 31, D-6350 Nieder Moerlen, Germany
5Z4OM—Via Fumio Kaneko-Bun, JA1BUY, 365-1 Rokku, Maebashi Gunma. 371, Japan
5Z4PV—To K. Nakamura, JA1BGS, 2-12-205 Tamagawa Bldg., Komaie, Tokyo, 182, Japan
5Z4PZ—c/o F6EAO, J. M. Chapron, 6 rue Robert-Ayle, F-92600 Asnieres, France
9J2SJ, 9J2TN, & 9J2WK—Via R. W. Schlagheck, W3HHV, RFD-1, Fairfield, PA 17320

(Continued from page 47)

Alaska					
AL7HIK	A	394,160	1,172	45	85
KL7HCN	"	370,128	1,077	53	79
AL7HRP	"	89,542	804	46	72
KL7IRN	14	60,501	573	14	29
KL7GN	"	28,652	426	13	13
Barbados					
8PØA	14	639,756	2,308	30	87
(Opr. WA4CWH)					
Belize					
VP1MPW	A	24,682	286	20	23
Bermuda					
WA1RFM/VP9	A	506,890	1,355	50	123
Canada					
VO1KE	A	663,924	1,168	58	186
VO1AW	"	840	14	11	13
VE1BHA	A	31,020	213	24	42
VE1EK	"	1,211	34	13	28
VE2AYU	A	253,866	637	51	123
VE2BP	"	109,760	458	41	71
(Opr. WA1TAI)					
VE2WA	14	48,312	200	21	67
VE3KZ	A	561,825	837	75	200
VE3IXE	"	157,092	472	61	98
VE3EJK	"	52,598	174	34	85
VE3IR	"	24,856	109	39	65
VE3ENM	14	108,944	500	21	67
VE3DUS	7	8,474	100	13	25
VE3BMV	1.8	30,258	358	12	29
VE4XJ	A	205,335	489	54	115
VE4MP	"	100,695	258	50	97
VE5BX	A	359,226	1363	51	75
VE5YA	14	37,468	185	23	53
VE6APN	14	19,422	213	15	24
VE7DAJ	A	312,828	843	49	82
VE7IQ	"	17,720	204	22	18
VE7DTA	"	2,700	41	13	12
VE7IG	7	104,790	663	27	43
VE7AV	3.5	5,876	109	12	14
Cuba					
CM2HB	A	63,070	562	20	33
CO2OM	"	30,858	402	13	24
CO2JA	1.8	400	25	4	4
Dominican Republic					
HI8MOG	A	81,216	528	28	44
HI8LC	21	1,376	85	5	3
Grand Cayman					
ZF1AL	A	27,000	282	30	24
(Opr. WB4TAF)					
Greenland					
OX3AB	A	151,262	690	38	68
OX3RA	"	119,804	405	35	87
OX3NB	14	23,636	282	10	28
Guadeloupe					
FG7AS	A	430,032	1,372	44	92
Guatemala					
VE2AQS/TG9	A	99,810	519	41	49
Honduras					
HR1AT	14	19,600	185	16	33
Mexico					
XE1DDP	A	141,265	695	41	54
Montserrat					
VP2M	A	2,151,165	3,166	86	219
(Opr. WA7OTT)					
VP2MNR	21	8,300	160	10	15
(Opr. WA6VNR)					
Panama					
HP1AC	A	62,080	280	32	65
Puerto Rico					
KP4AST	A	3,725,836	3,348	118	334
(Opr. K7VPF)					
KP4DKX	"	434,250	1,000	60	133
KP4RK	14	15,939	78	21	56
St. Kitts					
VP2KA	14	4,480	122	8	8
St. Pierre et Miquelon					
FPØBG	A	477,576	1,000	51	150
(Opr. VE1AIH)					
Virgin Islands					
KV4JY	A	301,986	787	46	68
KV4FZ	1.8	42,800	390	13	37

AFRICA

Canary Islands					
EA8BF	A	50,184	246	21	47
EA8CR	1.8	7,696	100	8	18
Gambia					
C5AZ	A	3,580,980	3084	100	290
Kenya					
5Z4NI	21	474,894	1,266	32	94
Kerguelen Island					
FB8XO	14	15,080	104	19	33
Liberia					
EL2T	14	37,587	248	17	34
Mauritania					
5T5CJ	A	187,050	430	45	105
Rhodesia					
ZE1JV	A	1,375,946	1,643	81	202
ZE1BL	"	599,820	1,281	45	111
ZE2JH	"	349,965	717	47	118
Senegal					
6W8A	A	862,650	1,234	71	172
South Africa					
ZS6ME	A	572,355	934	62	145
ZS2CW	"	10,704	101	27	45
ZS5KI	21	56,842	198	32	65
ZS1HF	7	5,040	62	13	17

ASIA

India					
VU2GO	A	113,053	327	41	90
VU2BK	"	82,425	297	35	70
VU2ACD	14	106,920	425	32	78
VU2GW	7	17,108	140	16	31
Iran					
9D5B	A	368,188	818	41	125
EP2VW	21	107,600	504	23	57
Israel					
4Z4NKX	21	69,060	402	17	43
4X4UH	14	226,950	905	23	62
Japan					
JA1KSO	A	1,473,605	1,496	118	237
JA2JW	"	1,181,768	1,288	115	214
JE1SSE	"	412,653	728	80	121
JE1JKL	"	336,840	592	83	127
KA6DX	"	222,095	410	88	127
JA7DAH	"	218,638	505	67	94
JH7BRG	"	179,237	449	62	89
JA2HO	"	144,579	365	62	82
JA1NLX	"	137,768	384	61	75
JA1AFF	"	113,652	330	57	75
JG1CDM	"	96,291	311	52	65
JA2BNN	"	79,785	240	58	77
JA7ARW	"	79,414	268	52	66
JA1AYO	"	74,900	254	47	60
JA8DIM	"	73,062	284	43	56
JA5HCV	"	55,536	195	39	65
JA3BRB	"	51,750	195	56	59
JA1EMX	"	49,680	153	50	65
JA1CFJ	"	47,628	180	44	54
JA2JXI	"	46,806	195	45	42
JAØDCQ/1	"	41,958	205	34	40
JA5MOU	"	41,678	172	41	50
JE1YTF	"	40,211	188	38	41
JA7CPW	"	34,675	170	34	39
JE1GCI	"	34,188	192	31	35
JR3COZ	"	29,341	195	27	34
JA9LX	"	25,916	151	25	37
JA6ZF4	"	24,080	123	38	42
JA1SGU	"	23,579	131	34	39
JA7GAX	"	22,883	157	15	34
JA1BSU	"	22,168	124	33	35
JH1HTK	"	21,560	116	34	36
JA3PYC/1	"	20,979	123	25	38
JA4UDP	"	18,270	118	26	37
JA9JBK	"	18,176	96	34	37
JR1QML	"	17,925	96	37	38
JA7JNF/1	"	17,493	125	22	27
JA1RUJ	"	16,524	111	27	27
JA1ZIK	"	16,224	138	25	27
JA1BNW	"	14,446	83	26	36
JG1GJB	"	13,892	130	20	26
JA2XSG	"	12,597	75	25	32
JA1SVP	"	12,393	95	27	24
JA2EG	"	9,751	71	21	28
JH2JEV	"	9,120	86	23	25
JA1YJF	"	8,624	74	22	22
JA1BFR	"	8,300	56	26	24
JE3SEN	"	8,160	67	26	25
JE3UET	"	7,998	74	22	21
JR6CF	"	7,128	49	24	30
JA9FT	"	5,432	71	6	22
JA6QKI	"	4,676	61	16	12
JA2BI	"	4,664	40	19	25
JA9CWJ	"	4,488	52	13	20
JA4AQR/3	"	3,930	56	16	14
JH1ESR/2	"	3,822	40	20	19
JR1LEV	"	3,381	57	11	10
JH2IIH	"	2,430	31	14	13
JA1BZM	"	2,299	43	10	9
JA7JT	"	2,144	23	16	16
JAØVFM	"	1,632	44	11	6
JA3OEA	"	1,540	31	11	9
JAØVOW	"	1,216	31	11	8
JH1OEL	"	1,056	18	12	12
JF1NCT	"	1,025	15	12	13
JE1HAU	"	714	19	5	8
JHØBQX	"	443	17	9	8
JAØBOP	"	441	18	8	5
JG1FJT	28	2,288	33	11	15
JH3FQF	"	1,610	27	10	13
JA6AKW	21	57,456	278	29	47
JR6RRD	"	51,246	247	27	51
JA2YEF	"	37,985	206	28	43
JR1XFT	"	25,976	145	26	42
JG1EIQ	"	24,244	149	23	35
JA8GQ	"	17,505	138	19	26
JA7HMZ	"	14,496	105	21	27
JE3REU	"	12,744	85	19	35
JH3JTD	"	12,688	91	22	30
JE3UES	"	9,840	93	18	23
JI1KUV	"	8,680	86	15	20
JE3MWB	"	7,486	72	15	23
JE2BPJ	"	6,120	58	17	23
JA7ECI	"	3,770	46	14	15
JA5BLF	"	3,268	62	9	10
JA7BIJ	"	818	47	7	6
JA1UDI	"	702	16	7	6
JH4MVA	"	660	13	9	11
JE3UER	"	486	12	8	10
JAØNCE	"	350	11	5	9
JA6YVF	"	52	4	4	4
JA2HLX	14	252,969	813	34	77
JA1IBX	"	222,687	750	33	76
JA2MGE	"	220,134	694	32	82
JAØCUV/1	"	196,140	674	30	74
JR1JFO	"	184,149	593	33	78
JA1BWA	"	173,436	637	31	66
JA2CMM	"	160,474	704	26	56
JA4AXB	"	126,524	491	28	66
JA8SW	"	111,090	579	23	47
JA2EIV	"	109,319	420	31	66
JA2BY	"	108,270	428	30	60
JH3KCA	"	69,111	395	24	39
JR1RCQ	"	45,695	263	21	44
JA4CTL	"	43,533	258	21	42
JA2IU	"	39,612	213	22	46
JA1CSB	"	38,400	274	18	32
JA2AJA	"	36,680	231	19	37
JR1XFS	"	32,234	176	24	47
JA4ZU	"	28,615	188	22	37
JH1MTR	"	28,461	137	18	35
JA1CMD	"	27,612	176	22	37
JG1RVR	"	27,028	185	21	37
JA2HGA	"	21,760	117	26	42
JF1UKJ	"	21,280	151	21	35
JA9AQE	"	21,063	166	19	32
JH1QDB	"	19,565	168	18	25
JA9FV	"	19,040	133	22	34
JAØOZ	14	16,432	127	20	28
JR2IEG	"	15,666	144	15	27
JA7BAL	"	12,240	90	18	33
JA2UA	"	11,938	96	20	27
JG1MTJ	"	10,810	79	17	30
JA4GXS	"	9,657	101	15	22
JH3BRC	"	6,536	72	19	19
JA2WZ	"	4,224	66	11	13
JA5SIX	"	3,648	51	15	17
JR2AQP	"	2,697	33	15	16
JE1EL	"	2,117	37	12	17
JAØGZ	"	1,950	36	12	13
JA5UI	"	1,890	46	12	9
JA5FDG	"	690	25	6	4
JA1AAT	"	273	9	7	6
JA1BUI	"	242	10	6	5
JA2DOU	"	180	6	6	6
JH3YCJ/3	"	10	2	2	2
JA2INO	7	128,140	531	29	57
JA1CWZ	"	104,328	414	29	63
JH1RFM	"	64,448	313	25	51
JA2EKR/3	"	57,456	285	27	49
JA1ISA	"	29,202	177	25	37
JA1JIO	"	16,632	111	25	31
JA6GPR	"	10,120	103	17	23
JH4ADF	"	5,177	62	13	18
JA2RER	"	4,100	61	14	11
JA2HAY	"	154	8	3	4
JA6BSM	3.5	30,485	198	21	44
JA6BZI	"	27,199	146	24	47
JA1YFL	"	23,632	175	20	36
JA8DNV	"	22,506	148	23	39
JA3IW	"	11,978	82	20	33
JA1DUH	"	10,028	79	18	28
JA3BCT	"	16	2	2	2
JA3DNB	1.8	1,610	40	7	7
JA3BDB	"	310	12	5	5
JA1CUW	"	156	10	6	6
JA3AHQ	"	128	7	4	4
JH1LKH	"	60	4	3	3
JA9BOH	"	45	3	2	3
JH2IRH	"	42	4	3	3
Korea					
HM2JN	A	111,936	356	54	78
Macao					
CR9AJ	A	478,380	1199	74	127
Malaysia					
9M2FK	A	29,852	345	33	35
Mongolia					
JT1KAA	A	4,000	66	18	22
JTØOAQ	"	182	13	6	8
Oman (Masirah Is.)					
A4XVK	A	151,932	418	43	94

ASIATIC USSR

Asiatic Russia					
UW9WL	A	692,967	995	62	188
UA9ND	"	507,129	849	58	161
UA9AED	"	229,658	579	37	106
UA9OO	"	206,078	526	46	121
UA9QE	"	132,300	411	35	92
UA9GF	"	48,048	187	31	73
UA9XS	"	42,152	201	27	61
UA9FBM	"	14,612	125	14	38
UA9HM	"	7,874	51	28	34
UW9PT	"	4,183	35	18	29
UA9CAL	21	61,671	407	18	43
UA9JH	"	42,405	273	15	40
UA9LBM	"	28,938	246	15	38
UA9QD	"	27,189	208	16	37
UA9MQ	"	18,755	155	16	39
UA9DN	14	344,520	1176	26	82
UA9JAA	"	88,622	477	19	54
UA9OBU	"	75,454	551	18	48
UA9OS	"	73,950	372	24	61
UW9VH	"	39,780	328	17	43
UA9ODA	"	6,400	71	11	29
UA9UOZ	"	4,012	126	8	19
UA9MK	"	2,739	45	12	21
UA9UF	"	2,070	66	10	13
UA9NN	7	87,980	473	26	57
UA9WS	"	45,604	318	13	39
UA9AAP	"	39,636	269	15	39
UA9YAQ	3.5	2,576	48	10	18
UWØAF	A	568,515	950	74	177
UAØAG	"	89,277	274	45	94
UAØLS	"	22,192	199	31	42
UAØCAW	"	13,312	330	13	19
UAØCCR	"	2,968	59	13	13
UAØZBU	"	845	71	7	6
RAØSER	28	32	6	2	2
UAØCBL	21	260	8	5	8
UWØLT	14	111,099	514	27	60
UAØSAU	"	104,710	578	19	55
UWØIX	"	82,005	524	26	44
UAØML	"	8,200	76	16	25
UWØLI	"	8,134	60	17	32
UKØSAR	"	1,872	39	8	16
UAØBAC	"	270	18	3	2
UAØOAS	"	260	26	4	6
UAØCBW	7	16,968	244	14	28
UAØGF	"	54	3	3	3
UAØCBH	"	8	4	1	1
UAØLH	3.5	20,629	278	17	32
UAØABB	"	20,451	204	14	37
UAØACM	"	9,288	124	11	25
UAØUBA	"	5,952	117	10	22
UWØFB	"	5,481	139	13	14
UAØJCA	"	882	59	8	6
Azerbaijan					
UD6DLA	A	406,630	1003	35	122
UD6CN	"	9,114	81	20	69
Armenia					
UG6GAG	A	93,408	414	19	65
UG6AW	"	828	17	12	11
UG6GAF	21	141,930	630	23	60
Georgia					
UF6DZ	A	120,612	1058	34	80
UF6BD	21	92,952	455	18	54
UF6VAG	14	115,154	489	24	62
UF6FCR	"	27,640	213	10	35
Kazakh					
UL7LAW	A	446,886	746	63	159
UL7OAQ	"	41,496	456	27	64
UL7LCQ	"	39,188	404	29	68
UL7HV	"	28,243	175	16	45
UL7EAM	"	12,744	93	30	42
UL7CBD	"	3,567	37	13	22
UL7TA	21	1,944	36	12	15
UL7WI	"	1,475	25	10	15
UL7EAJ	14	155,168	602	28	76
UL7QH	"	137,069	543	30	83
UL7PBY	"	41,808	220	25	53
UL7CT	"	32,148	233	16	42
UL7PA	"	26,460	343	10	26
UL7PCN	"	14,080	159	12	30
UL7PBI	"	11,224	112	12	34
UL7QF	"	5,152	48	19	27
UL7GAU	"	2,380	34	13	21
UL7YP	"	1,394	27	5	12
UL7JAW	7	38,232	307	14	40
UL7CAD	"	16,464	329	10	42
UL7IBC	"	9,827	112	8	23
UL7RAV	3.5	40,200	350	12	38
UL7EAH	"	23,703	199	13	38
Kirghiz					
UM8FM	A	659,490	1,141	72	175
UM8NNN	"	204,561	724	33	86
UM8MAO	14	170,685	637	29	78
UM8MBA	7	16,765	184	9	26
Tadzhik					
UJ8JAS	14	133,664	595	24	68
UJ8AQ	7	18,400	204	10	33
UJ8JCL	3.5	544	32	8	9
UJ8JBR	"	416	16	4	9
Turkoman					
UH8DC	A	585,984	987	62	162
UH8CS	21	22,230	198	10	29
UH8HBR	14	7,667	79	14	27
Uzbek					
UI8ACZ	A	49,006	185	30	77
UI8GAJ	"	11,960	105	13	33
UI8ADO	28	6	1	3	2
UI8ACC	14	97,504	501	23	65

EUROPE

Austria					
OE5CWL	A	135,140	557	40	105
OE6HZG	A	74,880	313	36	92
OE1AKA	14	149,951	614	30	83
Belgium					
ON6VN	A	531,409	1,235	63	160
ON4XG	"	190,993	545	49	130
ON8VB	"	85,125	393	32	93
ON8HF	"	33,060	183	30	65
ON5IA	"	12,650	267	10	36
ON6NL	21	3,900	65	10	16
ON5WL	3.5	9,614	187	9	29
ON6NA	"	9,204	193	7	32
Bulgaria					
LZ1QO	A	201,773	435	67	154
LZ1AG	"	115,818	318	53	146
LZ2KMB	"	58,938	365	26	88
LZ2GS	"	53,098	223	40	99
LZ2VP	"	26,746	199	27	59
LZ2YJ	"	19,355	171	20	59
LZ1XL	"	17,722	102	32	47
LZ1WI	21	13,845	85	23	48
LZ1GX	"	2,755	36	11	18
LZ1FJ	14	9,213	131	10	27
LZ2PP	7	16,650	324	8	37
LZ1VQ	"	8,349	208	8	25
LZ2RF	3.5	55,440	600	14	72
LZ2XW	"	8,588	216	6	32
Corsica					
FC9UC	14	415,740	1,622	32	91
Czechoslavakia					
OK2RZ	A	1,174,445	1,742	85	252
OK3EA	"	622,790	1,093	78	232
OK2BLG	"	378,576	1,002	57	182
OK2BHV	"	308,729	733	62	134
OK3CEG	"	161,968	451	58	154
OK1MIN	"	107,568	308	47	115
OK2ZU	"	83,326	122	36	86
OK2BEC	"	68,508	316	33	99
OK3CEE	"	58,926	192	42	96
OK1EP	"	57,304	207	40	112
OK1DAV	"	34,848	142	34	87
OK1AMI	"	34,580	299	25	66
OK1DVK	"	33,448	160	28	85
OK1FJS	"	33,432	261	19	65
OK1AWF	"	32,775	221	24	71
OK1MWN	"	28,566	239	16	53
OK2SGW	"	25,400	152	25	75
OK2BEF	"	24,750	204	21	69
OK1KZ	"	24,115	217	23	68
OK3CAU	"	23,023	157	20	57
OK1MSP	"	19,982	101	32	65
OK3TCK	"	17,415	159	21	60
OK3TAO	"	15,000	209	15	45
OK3YCV	"	14,118	128	22	56
OK1FCA	"	14,046	128	23	55
OK1MAA	"	9,240	166	12	43
OK1AEH	"	8,625	80	20	49
OK1AIA	"	8,127	98	20	43
OK2BDH	"	4,968	114	12	34
OK2PDD	"	3,828	49	13	16
OK1ABF	"	3,813	58	13	28
OK3TDN	"	3,440	33	16	24
OK1OA	"	3,192	26	19	23
OK3RRC	"	2,688	67	8	24
OK1HCH	"	1,400	55	5	23
OK1KWN	"	1,092	30	11	15
OK2BCI	"	999	17	12	15
OK3TFH	"	20	4	3	2
OK3UQ	21	79,299	323	26	73
OK3OM	"	66,231	275	25	74
OK3IR	"	27,054	125	26	55
OK1TW	"	25,600	155	19	45
OK3PQ	"	12,083	98	16	27
OK3IF	"	9,430	81	18	28
OK3FON	"	8,730	75	17	28
OK2YAX	"	8,405	78	16	25
OK2BPK	"	7,080	64	17	23
OK3AS	"	3,726	48	12	15
OK2BJU	"	1,357	23	11	12
OK1ASQ	"	459	12	8	9
OK1JVT	"	420	14	5	5
OK2BJR	"	224	10	4	4
OK1FV	14	98,770	500	23	62
OK2PFQ	"	75,810	329	22	83
OK2PAE	"	61,424	315	22	66
OK1MPP	"	43,335	196	24	59
OK3ZFB	"	35,711	240	18	49
OK2SPS	"	15,533	195	15	34
OK2UD	"	9,592	108	13	31
OK2BPF	"	7,800	92	11	28
OK3BA	"	7,560	94	13	23
OK2TBC	"	5,214	74	14	19
OK1PCL	"	4,200	53	11	31
OK2PBG	"	4,032	65	9	27
OK1DK	"	3,502	39	13	21
OK3CWU	"	2,880	42	12	18
OK3YCP	"	2,800	63	8	17
OK3YCP	"	2,025	31	9	18
OK1MDK	7	140,580	789	26	84
OK1TA	"	121,128	721	23	80
OK1ALW	"	113,469	592	27	82
OK1XJ	"	21,980	284	13	42
OK3CFA	"	21,300	243	13	47
OK2LN	"	19,314	253	12	48
OK3CKY	"	8,554	175	7	36
OK3CIU	"	7,007	143	23	26
OK1BBJ	"	2,175	37	11	18
OK1FAR	"	1,176	17	9	15
OK2KMB	"	110	11	2	8
OK1DIM	3.5	75,738	743	14	64
OK2QX	"	54,905	540	15	64
OK1AWZ	"	41,316	626	12	54
OK1DKW	"	30,415	500	9	46
OK2HI	"	28,770	324	12	58
OK1DIT	"	27,786	324	12	54
OK1DKR	"	25,344	256	14	58
OK1GO	"	21,600	396	8	42
OK1NR	"	20,591	305	8	51
OK1AGA	"	18,179	346	8	45
OK1AJY	"	11,424	243	6	36
OK1DMM	"	10,976	94	19	37
OK2SRA	"	10,086	217	6	35
OK3TDO	"	6,345	119	6	41
OK3ZBU	"	6,006	183	6	27
OK1DMJ	"	5,910	205	4	26
OK3CJK	"	4,633	95	6	35
OK1AZI	"	4,526	144	5	26
OK1MIZ	"	4,200	119	6	29
OK3ZWX	"	2,929	102	5	24
OK2BKT	"	2,120	43	6	34
OK2KOO	"	1,875	76	5	20
OK1AYQ	"	1,824	80	4	20
OK1MZO	"	1,690	64	5	21
OK3TAY	"	1,653	48	5	24
OK2BBQ	"	1,625	65	5	20
OK2SAT	"	1,586	62	4	22
OK1DFB	"	1,242	51	5	20
OK1MRA	"	1,242	54	5	18
OK3CDF	"	1,200	52	5	19
OK1XR	"	1,037	60	4	13
OL1ADZ	"	924	32	5	16
OK2SWD	"	800	31	5	20
OK1KMP	"	528	34	3	16
OK2BNN	"	518	39	4	10
OK1ATP	1.8	9,792	197	9	27
OK2PGE	"	8,190	193	10	29
OK1FCW	"	4,228	154	6	17
OL5ATG	"	3,484	131	6	20
OL4ATY	"	2,678	89	6	20
OK1AXD	"	2,662	122	3	19
OK1DJK	"	1,936	79	4	18
OL9CEI	"	1,794	48	3	13
OL0CFI	"	1,562	67	5	17
OL9CGL	"	1,482	52	6	20
OK2BTW	"	1,440	58	5	19

OK3CWS	"	1,254	55	5	17
OL5ATZ	"	833	50	2	15
OK2PAW	"	816	49	3	13
OK1MNW	"	800	38	2	14
OK2BQL	"	728	52	2	12
OL8CGI	"	700	54	2	12
OK3CEI	"	660	48	2	13
OL9CFE	"	546	42	2	12
OL6AUL	"	494	41	2	11
OK2PDL	"	378	27	2	12
OK1JER	"	252	33	2	7
OK1AYY	"	180	13	3	9
OK3CAA	"	165	16	2	9
OL8CHI	"	63	12	2	5
OK3CFT	"	18	4	2	4
Denmark					
OZ1VY	**A**	**322,560**	**619**	**64**	**160**
OZ6XT	"	51,168	174	45	78
OZ6XR	"	42,344	508	15	64
OZ5QU	"	34,485	165	34	61
OZ2NU	"	19,392	140	25	76
OZ7LF	"	16,368	172	16	15
OZ8E	"	13,823	63	7	17
OZ1AJL	"	4,968	90	11	25
OZ7SG	"	3,800	52	15	38
OZ5DP	"	1,924	44	11	26
OZ7JZ	"	1,118	17	10	16
OZ5WQ	"	798	17	11	8
OZ8XO	"	238	14	5	12
OZ1LO	**14**	**209,196**	**818**	**26**	**82**
OZ8XW	"	3,780	60	11	24
OZ1BCI	"	2,760	54	9	21
OZ7YL	**7**	**55,514**	**271**	**24**	**58**
OZ2E	"	38,192	244	20	57
OZ7HT	**3.5**	**58,752**	**654**	**14**	**54**
OZ7BQ/4	"	5,922	129	6	36
England					
G3DYY	**A**	**184,800**	**497**	**61**	**139**
G4EHF	**"**	**129,624**	**542**	**34**	**98**
G3YBH	"	121,344	477	38	90
G3XBN	"	82,320	422	36	111
G2AJB	"	66,740	303	38	104
G8DI	"	46,330	320	27	86
G3MWZ	"	10,990	97	21	49
G3ILO	"	13,082	118	20	42
G6NK	"	8,512	122	15	23
G3RZI	**21**	**100,674**	**511**	**27**	**75**
G4CNY	"	67,396	360	23	60
G3DOG	"	6,840	59	17	28
G3HCT	**14**	**286,552**	**1,081**	**30**	**89**
G3KDB	**"**	**238,875**	**1,022**	**26**	**79**
G3TXF	"	183,872	840	26	78
G3PVA	"	73,834	491	20	47
G3GRL	**7**	**114,456**	**578**	**28**	**86**
G3XKR	"	39,072	348	16	58
G3HTA	"	35,360	282	18	62
G3TVW	"	31,752	298	15	57
G4DBW	"	648	36	4	14
G3HZL	**3.5**	**20,678**	**268**	**10**	**39**
G4BBA	"	6,072	87	10	34
G3UBR	**1.8**	**11,376**	**197**	**9**	**27**
G3YMC	"	3,575	122	5	20
Finland					
OH1VR	**A**	**307,582**	**698**	**62**	**180**
OH8PE	**"**	**105,798**	**485**	**36**	**118**
OH6MM	"	92,316	364	37	120
OH7UE	"	74,947	288	43	106
OH2BME	"	50,924	222	37	79
OH7NW	"	35,056	192	27	85
OH2KP	"	25,397	147	33	76
OH2PQ	"	21,311	129	29	72
OH3FW	"	20,938	142	27	67
OH2VZ	"	16,560	125	23	57
OH9TD	"	11,481	81	24	65
OH1FM	"	3,520	66	11	33
OH6RA	"	1,296	20	12	12
OH6RF	"	975	25	8	17
OH4SL	**21**	**33,600**	**171**	**26**	**74**
OH1WF	"	13,232	95	21	46
OH2BAH	"	13,148	71	22	54
OH6UJ	"	4,704	47	14	34
OH3PF	"	168	6	6	6
OH3TA	"	24	2	2	2
OH3GG	"	1	1	1	6
OH6KN	**14**	**274,184**	**1,029**	**29**	**83**
OH2BJH	**"**	**122,304**	**553**	**23**	**75**
OH3TQ	"	76,000	408	22	73
OH6ID	"	39,130	309	17	53
OH2JQ	"	30,003	194	17	56
OH7QU	"	30,000	294	14	46
OH5RZ	"	28,215	280	14	41
OH5PA	"	23,100	165	15	45
OH2BCD	"	17,343	196	15	32
OH2PW	"	11,270	93	15	34
OH2BQT	"	6,747	88	11	28
OH1MQ	"	5,733	58	13	26
OH3NM	"	5,000	52	14	36
OH1PG	"	4,154	63	9	22
OH3ZH	"	2,706	40	9	24
OH2LU	"	2,318	56	6	13
OH6VV	"	540	15	7	13
OH1IJ	**7**	**101,365**	**587**	**24**	**73**
OH1PS/2	"	83,482	540	23	66
OH1IG	"	58,090	506	20	54
OH8OB	"	14,326	177	12	46
OH9NV	"	11,024	142	14	39
OH2BPA	"	2,310	67	5	28
OH4AB	"	108	10	4	5
OH1XX	**3.5**	**120,365**	**824**	**22**	**73**
OH1VQ	"	56,429	543	16	57
OH2BCI	"	51,604	448	17	59
OH6RC	"	16,632	238	10	46
OH7OK	"	15,288	234	12	40
OH6TI	"	9,699	112	11	42
OH7UV	"	72	7	4	4
OH1VA	**1.8**	**2,289**	**106**	**5**	**16**

France					
F6EID	**A**	**389,844**	**955**	**60**	**161**
F6ARC	**"**	**369,344**	**1,000**	**54**	**145**
F8VJ	"	270,837	573	55	134
F6BFN	"	185,706	552	49	122
F8NL	"	137,751	535	33	78
F6ERZ	"	71,173	308	36	67
F9BB	"	70,485	268	35	92
F6EBN	"	61,798	361	31	75
F8TM	"	56,492	258	32	84
F2VO	"	51,072	295	28	84
F6API	"	42,583	225	28	69
F6DNR	"	38,106	213	29	58
F2PC	"	32,476	205	27	65
F5RS	"	13,384	91	20	36
F6BQJ	"	6,732	57	19	25
F6EQI	"	5,859	87	18	17
F6CRT	**21**	**26,400**	**184**	**19**	**31**
F6DIM	"	21,428	203	15	29
F5UL	**14**	**39,440**	**273**	**16**	**52**
F6BFH	"	12,321	154	13	24
Germany (FRG)					
DK3GI	**A**	**1,200,457**	**1,617**	**80**	**277**
DL7AV	**"**	**890,590**	**1,032**	**99**	**271**
DJ5JH	**"**	**705,640**	**1,000**	**77**	**222**
DJ9MH	"	494,172	1,008	70	189
DK4PH	"	403,357	815	65	186
DL7BQ	"	353,106	765	68	166
DJ0XT	"	316,436	599	68	171
DL3LU	"	265,823	522	64	177
DJ4ZR	"	237,300	599	49	126
DJ4US	"	221,400	521	56	149
DJ6BW	"	201,240	649	44	156
DK3KD	"	195,228	538	61	143
DJ2TI	"	181,940	455	63	157
DK5AD	"	155,736	512	48	120
DL1JF	"	137,922	356	50	131
DJ6QL	"	118,424	474	40	91
DL2HQ	"	101,794	332	44	110
DL9PQ	"	96,280	343	44	101
DL1YA	"	93,219	292	45	116
DK5MP	"	85,371	332	35	108
DF2RQ	"	81,648	330	44	82
DL4TJ	"	71,220	333	27	85
DL8BU	"	67,340	309	41	99
DJ4AN	"	66,092	374	30	94
DK8KC	"	64,325	305	31	84
DJ4EJ	"	59,272	262	38	86
DL1MD	"	56,115	211	37	92
DJ1LD	"	50,540	198	41	92
DL8YR	"	48,768	214	40	88
DJ6OZ	"	41,148	210	30	78
DJ1YH	"	38,304	154	27	69
DL8DF	"	31,295	163	36	83
DJ2UU	"	30,528	169	30	64
DF3QN	"	26,544	183	17	62
DL8TV	"	22,704	162	26	60
DL3CW	"	20,475	140	22	53
DK6CS	"	12,939	92	22	35
DK9NH	"	8,525	76	18	37
DJ4PT	"	3,050	59	18	32
DF2RG	"	195	11	6	9
DL7AA	**28**	**1,029**	**30**	**6**	**15**
DK1VN	**21**	**78,676**	**373**	**25**	**66**
DJ6RX	**14**	**420,512**	**1,240**	**32**	**104**
DJ2BW	**"**	**358,800**	**1,004**	**31**	**99**
DJ7RJ	"	92,824	432	22	60
DJ5PA	"	91,078	529	20	42
DK1FQ	"	85,905	537	25	58
DL1RB	"	30,124	234	19	49
DF4FR	"	28,182	184	21	40
DJØVO	"	11,760	131	10	25
DJØUJ	**7**	**127,182**	**756**	**23**	**71**
DK6PY	"	64,220	609	19	57
DL7RV	"	1,738	259	10	45
DL6KB	**3.5**	**114,240**	**849**	**20**	**64**
DLØKL	"	73,036	670	14	62
DJ2AA	"	69,600	562	15	65
DJ3KR	"	50,743	453	15	62
DK8NG	"	36,432	419	12	57
DK5LH	"	18,150	346	7	43
DK8AX	"	2,541	78	5	28
DJ8FRA	**1.8**	**5,628**	**169**	**6**	**22**
DJ6TK	"	2,142	126	3	5
DK6AJ	"	1,173	67	3	14
Germany (GDR)					
DM2AYK	**A**	**891,863**	**1,614**	**75**	**226**
DM3YSO	**"**	**324,918**	**920**	**54**	**144**
DM3XBF	**"**	**144,088**	**535**	**44**	**122**
DM2CUJ	"	133,419	500	41	102
DM4TEK	"	127,764	454	37	119
DM3NKF	"	91,205	444	30	115
DM5IG	"	84,594	490	29	109
DM2BPF	"	64,800	203	39	105
DM3VAA	"	59,658	331	29	93
DM3ZC	"	57,566	329	27	80
DM2DEO	"	50,895	137	52	83
DM5UUL	"	43,688	140	53	74
DM4NJJ	"	43,228	285	25	82
DM3EA	"	40,656	119	48	73
DM2CHM	"	34,560	109	43	77
DM2BTO	"	30,044	150	33	83
DM4ZEL	"	25,501	147	35	64
DM2BGC	"	25,122	161	27	52
DM2CJJ	"	23,408	151	25	51
DM2AXC	"	19,522	181	19	67
DM3CJ	"	16,985	132	25	54
DM4NEE	"	12,986	94	28	58
DM3XCJ	"	9,362	77	17	45
DM4ZBK	"	7,560	66	23	47
DM2CMM	"	6,497	65	17	56
DM2CRJ	"	4,100	72	12	29
DM3XMJ	"	2,490	47	13	17
DM2YLO	"	2,450	38	13	22
DM2CMA	"	2,255	51	11	30

DM3DE	"	1,856	29	10	22
DM3ZIM	"	1,075	33	9	16
DM4ZUJ	"	700	25	9	19
DM4RDA	**21**	**26,492**	**147**	**20**	**54**
DM2BLE	"	9,996	81	16	33
DM3UE	"	3,939	37	15	24
DM2BML	"	2,139	34	11	20
DM4VUG	**14**	**37,554**	**260**	**18**	**48**
DM2CYE	"	13,715	99	19	46
DM3VMJ	"	12,342	130	14	37
DM2FIL	"	11,931	117	14	27
DM2CKJ	"	6,149	84	11	32
DM3XUE/A	"	6,027	54	16	33
DM2FDO	"	4,644	68	12	24
DM2BUB	"	3,584	47	12	20
DM3CF	"	1,944	42	8	10
DM2FBM	"	946	19	10	12
DM2CTD	"	560	29	5	9
DM3WMJ	**7**	**22,100**	**227**	**15**	**53**
DM2FDM	"	13,662	228	9	45
DM2FFL	"	5,016	114	9	29
DM2YVL	"	3,115	70	8	27
DM2DXO	"	1,860	40	6	25
DM2DZG	"	1,540	29	9	19
DM2FEH	"	860	43	4	16
DM5PBN	**3.5**	**10,480**	**249**	**5**	**35**
DM4SL	"	6,976	236	5	27
DM3WPL	"	3,052	112	4	24
DM4WPF	"	2,976	98	5	26
DM3TKL	"	2,178	101	4	18
DM2CYO	"	1,540	62	4	21
DM6PAF	"	1,308	60	5	15
DM3VGC	"	1,224	53	4	20
DM3YPE	"	840	18	7	13
DM2FHH	"	817	43	3	16
DM3UFF	"	684	38	4	14
DM2CUA	"	528	18	6	16
DM2CJF	"	360	23	4	11
DM2CDD	"	240	20	2	10
DM5UNH	"	210	30	2	5
DM2BUF	"	12	4	1	2
Greece					
SV0WTT	**3.5**	**9,350**	**148**	**9**	**41**
Hungary					
HA5KF	**A**	**88,312**	**347**	**40**	**93**
HA7SQ	**"**	**74,724**	**237**	**48**	**108**
HA6ZV/P	"	74,266	351	38	104
HA5JK	"	45,024	264	32	80
HA1ZU	"	41,470	267	37	79
HA5MD	"	32,422	258	28	58
HA7SU	"	12,415	169	13	52
HA5BA	"	12,006	175	15	43
HA2MG	"	9,504	87	20	52
HA8VG	21	1,320	31	7	8
HA8KCP	**14**	**174,608**	**778**	**28**	**84**
HA5LZ	"	54,055	240	25	70
HA8CH	"	11,252	115	15	43
HA5NG	**7**	**38,033**	**405**	**16**	**57**
HAØLJ	**"**	**26,605**	**343**	**13**	**44**
HA3GJ	"	13,750	186	11	39
HA3GD	"	4,000	83	8	32
HA1YA	**3.5**	**82,417**	**1,171**	**14**	**59**
HAØKLE	**"**	**72,380**	**723**	**16**	**67**
HA3PT	"	9,246	186	8	38
HA5HM	"	5,184	144	6	30
HA9RO	"	2,376	136	5	19
HA8DC	"	1,955	88	5	18
Iceland					
TF3AW	**A**	**122,760**	**506**	**28**	**82**
TF3JB	**14**	**43,836**	**450**	**12**	**40**
Isle of Man					
GD5AGA	**A**	**192,975**	**734**	**36**	**119**
Italy					
I5ARS	**A**	**305,490**	**927**	**40**	**130**
I2FGP	"	205,632	590	55	134
IC8CQF	"	98,029	625	35	126
I3DUU	"	29,848	203	24	67
I6POY	**28**	**720**	**19**	**6**	**12**
I1GXR	"	504	14	6	8
IØMGM	**21**	**151,011**	**548**	**30**	**89**
I1BAY	"	84,105	336	32	73
I4DVT	"	70,136	313	28	60
IØDYB	"	42,160	206	27	53
I4KRF	"	19,712	130	23	41
I2XXG	**14**	**204,905**	**876**	**27**	**80**
I1QJC	"	37,752	225	21	59
I1EIS	"	18,819	253	13	38
I3AWW	**7**	**82,834**	**563**	**17**	**66**
I3LID	**"**	**82,388**	**632**	**20**	**66**
I5ZUF	"	39,054	421	15	64
I2BVS	"	37,584	365	17	55
I1WIJ	"	27,885	292	13	52
I3GNQ	**3.5**	**107,016**	**986**	**16**	**62**
I1SOP	"	25,542	403	8	46
Malta					
9H1EJ	**A**	**152,523**	**581**	**48**	**141**
9H1CH	**21**	**57,348**	**395**	**20**	**61**
Netherlands					
PAØTAU	**A**	**200,801**	**479**	**58**	**157**
PAØCIC	**"**	**157,400**	**396**	**48**	**152**
PAØMBD	"	95,535	357	47	118
PAØATY	"	75,544	187	39	103
PAØVB	"	19,197	139	23	58
PAØINA	"	17,360	137	25	45
PAØUV	"	16,900	109	31	69
PAØCLN	21	9,202	311	9	26
PI1ARS	**14**	**28,950**	**240**	**17**	**58**
PAØEHF	7	336	14	4	10
PAØIHP	**1.8**	**14,105**	**311**	**9**	**26**
Northern Ireland					
GI3JEX	**A**	**160,461**	**547**	**49**	**140**

Norway					
LA9JM	**A**	**69,255**	**253**	**37**	**98**
LA7QQ	"	52,426	265	30	86
LA5IH	"	35,638	212	25	78
LA6XI	"	5,040	55	17	25
LA3UG	"	3,740	77	10	34
LA7MU	"	1,230	41	8	22
LA6NI	14	9,282	120	12	30
LA2Q	"	588	18	6	15
LA8WG	**3.5**	**3,600**	**121**	**4**	**26**
Poland					
SP7CTY	**A**	**325,638**	**812**	**57**	**180**
SP4DCS	**"**	**178,363**	**702**	**43**	**138**
SP9CDA	**"**	**168,392**	**552**	**54**	**140**
SP5AFL	"	66,300	288	42	108
SP2BIK	"	40,828	175	36	82
SP8EMO	"	36,612	206	30	78
SP6FER	"	34,375	156	29	96
SP1ALK	"	25,991	116	36	46
SP2ZHB/2	"	25,480	160	30	74
SP8GUV	"	24,975	124	28	59
SP6DB	"	17,376	102	32	64
SP6AEG	"	13,585	74	28	37
SP2GUC	"	13,542	116	22	52
SP9EIJ	"	12,506	81	29	45
SP2JGY	"	7,408	97	16	39
SP5DED	"	5,952	96	19	43
SP9CSU	"	5,346	67	19	35
SP9IHP	"	5,292	79	14	49
SP2ADW	"	4,410	44	17	25
SP3AGE	"	4,185	31	18	27
SP1EVW	"	4,004	49	22	22
SP3FYX	"	3,936	73	15	33
SP7ITK	"	1,392	51	6	23
SP9FEW	"	280	10	5	5
SP5DDJ	28	99	7	3	6
SP5GH	"	20	3	2	3
SP9DH	"	494	26	5	14
(QSOs via Oscar 6 and 7)					
SP2FWC	**21**	**7,920**	**77**	**11**	**37**
SP1ADM	"	7,654	72	14	29
SP6BFK	"	5,313	67	11	22
SP9BPF	"	5,100	51	14	25
SP9ADU	"	5,040	50	16	29
SP6DNS	"	3,465	42	14	19
SP2ANE	"	3,330	38	14	23
SP3DOI	"	1,860	22	12	18
SP2AVE	**14**	**97,416**	**497**	**24**	**75**
SP2DVH	**"**	**67,200**	**306**	**28**	**72**
SP2FAP	"	40,937	326	17	50
SP5GOR	"	25,254	171	18	51
SP8AWL	"	24,060	189	17	43
SP5FLA	"	23,584	169	16	51
SP3CB	"	20,303	113	22	57
SP3HC	"	17,685	234	10	35
SP3JJC	"	16,060	195	13	42
SP8GWI/8		15,529	169	14	39
SP6ANY	"	15,051	112	18	45
SP8GTS	"	12,816	125	12	36
SP8FNA	"	12,264	107	16	40
SP9BBH	"	12,195	128	12	33
SP2HGG	"	6,678	55	16	26
SP6AZT	"	6,493	80	11	32
SP8HZZ	"	5,772	75	11	28
SP9AMH	"	4,719	96	8	25
SP9ERC	"	4,521	70	9	24
SP6ATG	"	3,708	72	8	28
SP8AWP	"	3,312	68	8	15
SP9IGY	"	3,056	68	7	16
SP6PH	"	2,280	74	7	17
SP7JJE	"	2,144	46	9	23
SP6JLN	"	1,612	39	8	15
SP6PAV	"	352	18	5	6
SP3BLG	"	70	5	2	2
SP5ARN	**7**	**57,152**	**414**	**24**	**70**
SP4CLX	**"**	**46,875**	**454**	**18**	**57**
SP1BHX	"	28,950	302	20	55
SP9AKD	"	15,657	228	10	41
SP3IPB	"	13,362	210	10	41
SP4INT	"	11,616	226	8	36
SP5IVT	"	8,960	132	11	45
SP2ASJ/2	"	7,667	166	7	37
SP5FLB	"	3,720	107	7	24
SP7EUO	"	3,520	103	6	26
SP7EJS	"	3,198	43	9	32
SP9JBE	"	2,128	69	6	22
SP6FZA	"	1,222	39	11	15
SP2UU	"	726	28	5	17
SP4HHQ	"	54	3	3	3
SP7KLJ	**3.5**	**14,433**	**245**	**10**	**41**
SP5FTH	**"**	**10,836**	**280**	**10**	**33**
SP5IWA	"	6,450	224	5	25
SP8EOT	"	6,440	167	7	28
SP9BOR	"	6,120	217	4	26
SP3BLP	"	5,280	160	5	28
SP9EMI	"	5,184	156	6	26
SP9AAB	"	4,935	139	5	30
SP2AYC	"	4,914	181	5	22
SP9DTH	"	3,276	125	4	24
SP9GKM	"	2,940	99	5	25
SP3EJJ	"	2,349	81	5	24
SP9BRP	"	1,848	85	4	18
SP8HOR/5	"	1,540	81	4	16
SP6SD	"	1,431	54	4	23
SP2GHL/9	"	1,250	50	5	18
SP6PHO	"	1,092	55	4	17
SP2JEM	"	420	24	5	10
SP8KGQ	"	280	21	3	11
SP8GFG	"	210	18	5	10
SP8IOD	"	24	4	2	4

Portugal					
CT4AT	**A**	**2,809,421**	**2,881**	**97**	**312**
(Opr. WA3HRV)					
CT1QN	**7**	**24,492**	**299**	**11**	**41**
Romania					
YO7DL	**A**	**207,999**	**599**	**53**	**138**
YO3CR	**"**	**133,732**	**551**	**50**	**143**
YO8DD	"	53,170	237	38	92
YO2QY	"	44,880	262	27	97
YO4ATW	"	32,663	204	28	61
YO7ARZ	"	25,296	176	30	82
YO2ARV	"	21,837	193	21	66
YO4ASG	"	10,512	94	21	51
YO9YE	"	6,490	81	19	40
YO8BDT	"	6,360	159	8	32
YO7NA	"	5,700	50	20	37
YO2KHN	"	2,859	81	8	23
YO7BGA	"	2,556	38	13	23
YO5AIR	21	280	10	4	6
YO4KCZ	**14**	**270,178**	**1,193**	**25**	**76**
YO2BEO	"	7,296	124	10	27
YO8GP	"	4,403	73	11	26
YO3BEJ	**7**	**74,907**	**670**	**21**	**66**
YO4BOX	"	3,328	92	8	24
YO8GF	"	1,575	59	4	17
YO6EX	**3.5**	**54,458**	**624**	**16**	**57**
YO5BRG	"	8,360	229	6	32
YO8KGQ	"	3,984	206	5	19
YO6BLU	"	1,738	81	4	18
YO6AFR	"	518	37	4	10
YO7APA	"	36	6	2	4
Sardinia					
ISØFPH	**14**	**32,897**	**391**	**17**	**50**
Scotland					
GM3MZV	**A**	**144,007**	**552**	**46**	**151**
GM3CFS	**3.5**	**86,022**	**666**	**16**	**65**
Shetland Islands					
GM3KLA	**14**	**25,140**	**305**	**15**	**45**
Sicily					
IT9LMK	**21**	**18,972**	**196**	**20**	**42**
Spain					
EA2IA	**A**	**1,444,560**	**2,836**	**64**	**196**
EA4BV	"	5,859	83	10	21
EA1MG	"	2,011	70	15	22
EA2LY	"	0	5	5	5
Svalbird					
JW9WT	**A**	**8,580**	**108**	**17**	**38**
JW1SB	14	3,192	70	8	16
Sweden					
SM5AOE	**A**	**581,400**	**1,021**	**76**	**209**
SM3DNI	**"**	**178,555**	**510**	**58**	**147**
SMØDJZ	"	117,888	396	43	149
SM5VB	"	112,882	545	36	118
SMØBYD	"	85,251	396	40	117
SMØBDS	"	83,433	376	34	103
SMØGMG	"	64,020	211	42	68
SM5CIL	"	58,590	284	32	94
SM5EKC	"	34,944	226	29	75
SMØCGO	"	28,449	169	28	81
SM5AKT	"	25,764	160	30	84
SM4AZD	"	24,354	170	26	73
SMØCMM	"	20,895	117	34	71
SMØGNU	"	20,500	105	24	58
SM5RE	"	20,025	205	23	52
SM7CZC	"	10,872	82	24	48
SM3DXC	"	10,593	109	14	19
SM7AAQ	"	4,165	63	15	34
SM6FKF	"	3,996	41	16	20
SM7FSV	"	2,850	35	13	17
SMØGMZ	"	2,205	21	17	18
SMØFY	"	1,836	25	14	20
SM5DRW	**21**	**16,104**	**106**	**20**	**46**
SM5TA	"	9,120	75	17	40
SM5ERK	"	2,160	39	10	20
SM6BXX	"	1,120	22	11	17
SM3VE	**14**	**146,046**	**763**	**24**	**77**
SM5BRS	"	89,424	449	23	69
SM2GET	"	74,418	452	22	57
SM5CMP	"	44,992	323	18	56
SM2DMU	"	40,868	438	14	54
SM5UQ	"	6,802	123	11	27
SM7FYM	"	6,636	68	14	28
SM6JY	"	2,106	53	7	19
SM3BP	"	768	28	6	10
SMØAJU	**7**	**43,180**	**305**	**21**	**63**
SM5CLE	"	14,945	225	14	47
SM4CAN	"	13,176	127	17	44
SM5CSS	"	2,144	55	9	23
SMØDKH	**3.5**	**52,268**	**533**	**12**	**61**
SM5BRG	"	27,590	344	12	50
SM5EOS	"	26,730	350	10	45
SM5BKI	"	21,112	314	11	45
SM3FWK	"	437	21	5	14
Switzerland					
HB9ZE	**A**	**258,720**	**577**	**59**	**172**
HB9AJY	"	173,667	565	52	131
HB9AYZ	"	131,784	499	46	106
HB9RX	"	13,570	103	22	37
HB9QA	"	2,829	49	15	26
HB9DX	21	7,906	47	23	44
HB9KC	**3.5**	**28,840**	**308**	**10**	**46**
Wales					
GW3MPB	**A**	**62,926**	**278**	**40**	**106**
Yugoslavia					
YU1NGO	**A**	**148,601**	**459**	**45**	**136**
YU2RTC	"	90,750	339	39	82

YU1NZW	"	64,960	277	36	124
YU3BUV	"	11,658	103	22	45
YU2RJQ	"	450	15	5	5
YU3ER	28	1,104	48	7	16
YU3ZV	21	184,926	586	32	87
YU2CRS	"	57,785	635	27	64
YU2RRL	"	49,210	240	24	71
YU1OIQ/4	"	14,912	100	23	41
YU3NP	"	7,742	55	18	31
YU2CDS	14	323,561	1,222	33	86
YU2OB	"	205,382	862	25	78
YU2ACD	"	64,042	436	19	52
YU1SF	"	5,624	110	8	30
YU3TYX	7	119,520	631	23	73
YU4VBR	"	78,474	608	17	70
YU3TAA	"	50,163	542	17	52
YU3DRM	"	7,720	165	8	32
YU4FDE	3.5	108,270	919	23	67
YU1EXY	"	83,895	705	17	68

EUROPEAN USSR

Byelo Russia

UC2WAN	A	161,280	723	34	126
UC2OBV	"	2,046	60	8	25
UC2WAW	"	1,770	48	8	22
UC2WP	14	11,550	200	14	33
UC2CED	"	1,426	34	6	17
UC2AAQ	7	18,720	153	18	62
UC2ACA	3.5	95,996	789	20	71
UC2ABT	"	71,574	626	13	66
UC2OBC	"	4,628	168	6	20
UC2OAJ	"	3,333	123	6	27

Estonia

UR2QD	A	225,840	538	61	179
UR2AW	"	73,500	266	42	133
UR2RCU	28	231	15	4	7
UR2JL	"	198	13	4	7
UR2REN	21	15,145	110	19	46
UR2QI	14	171,760	832	26	87
UR2TAB	"	93,810	431	26	80
UR2QA	"	56,468	397	21	55
UR2RAF	"	35,020	281	18	50
UR2JW	"	407	15	5	6
UR2REC	7	25,636	441	11	41
UR2RGH	"	23,540	364	12	43
UR2RWA	"	4,026	102	6	27
UR2RJ	3.5	59,500	500	20	65
UR2RER	"	19,708	328	9	43
UR2RCN	"	18,297	245	13	44
UR2REO	"	11,152	245	7	34
UR2OI	"	6,012	141	6	30
UR2CR	"	3,510	106	5	25
UK2TAD	"	2,484	86	6	21
UR2RBI	"	182	13	3	10

European Russia

UA4HAL	A	591,800	1,340	67	202
UA6APP	"	247,820	790	60	160
UA3EAL	"	90,855	412	34	101
UA4CK	"	68,364	395	26	82
UA4MX	"	66,804	586	31	83
UA3ST	"	63,998	265	31	84
UW6DR	"	59,813	260	29	78
UV3DN	"	56,925	225	30	80
UA3DDF	"	55,575	376	23	72
UA3MT	"	33,700	185	31	69
UW6CD	"	32,887	181	30	49
UA1TAJ	"	22,144	176	19	45
UA3ECR	"	20,846	121	22	51
UA3DEA	"	20,698	154	18	46
UA3TAM	"	18,630	108	14	61
UW3WZ	"	16,588	130	17	41
UA1TAL	"	15,931	105	26	63
UA1AAU	"	14,472	90	20	47
UA4CAW	"	12,406	93	18	40
UA1AJ	"	10,340	120	13	42
UA3DLK	"	7,839	71	14	34
UA6PBQ	"	6,278	61	14	35
UA1ADG	"	5,893	46	20	41
UA3RO	"	5,856	81	12	36
UA3GO	"	5,472	59	15	23
UA3AAU	"	5,437	68	21	34
UA3IAK	"	4,347	45	12	30
UA3MBD	"	4,168	94	9	25
UA3PBZ	"	3,950	49	10	21
UA4BI	"	3,230	34	15	23
UA6AJG	"	2,970	36	13	20
UA4HGG	"	532	14	5	14
UW3EH	21	25,280	171	21	58
UA6HGG	"	11,515	191	15	32
UA3VB	"	10,285	101	15	40
UA4HEJ	"	8,601	126	19	42
UW1YY	"	4,572	112	8	28
UA3BK	"	1,508	26	10	16
UA1MA	"	1,120	26	6	22
UA6HAN	"	312	10	6	6
UA3UAA	"	304	11	7	9
UW3UG	14	133,926	626	28	74
UA3IBR	"	82,416	362	26	75
UA6LLT	"	66,406	432	21	58
UW6CV	"	65,520	499	19	53
UA1AAP	"	65,016	390	19	68
UA3QBG	"	57,196	354	21	58
UA3GM	"	56,950	300	23	62
UA1ZEX	"	53,780	403	17	53
UA3EZ	"	45,870	391	16	50
UA3AFL	"	42,444	239	20	61
UA3WBO	"	40,880	348	16	54
UA4CH	"	34,338	270	17	42
UA6YBH	"	20,020	385	13	39
UA3NB	"	19,170	142	15	39
UA4ADY	"	14,950	143	16	34
UA3IAT	"	14,429	156	12	35
UA1QBM	"	12,696	120	13	33
UA3TA	"	9,152	88	15	37
UA1CAQ	"	8,748	82	17	25
UA1FJ	"	8,019	97	11	28
UA3WAQ	"	6,420	113	10	20
UA6HV	"	5,904	84	13	35
UA1ZWW	"	5,175	69	10	20
UA3ICA	"	4,154	74	8	23
UA3DJH	"	3,046	47	12	15
UA3IAR	"	2,367	49	10	11
UA4CAM	"	2,093	31	11	16
UA3DDN	"	1,674	28	8	15
UA4QK	"	1,573	26	7	18
UA3IBH	"	1,080	24	6	12
UW3DR	"	1,045	19	10	12
UA4FAT	"	918	19	6	13
UA3IBS	"	387	15	5	4
UA1AOO	"	324	18	3	3
UA3ADC	"	240	16	3	2
UA3VAD	"	198	11	3	3
UA6LXZ	"	117	7	4	5
UA6LO	7	205,082	854	31	91
UA1ALZ	"	171,760	829	29	84
UA3XJ	"	51,414	417	19	63
UA3QAQ	"	32,670	315	16	51
UA1QBE	"	25,917	357	13	40
UA6PAT	"	23,265	317	15	40
UA4FAR	"	16,450	272	10	37
UA3VDS	"	10,401	252	12	27
UA6AVD	"	7,095	138	9	34
UA3DKP	"	2,880	92	6	26
UA3NAK	"	2,810	47	5	21
UA4ACD	"	2,016	44	6	22
UA3MCI	"	1,170	27	9	15
UA4YAU	"	180	9	5	7
UA3DL	"	108	12	3	6
UA4PNW	3.5	62,601	540	16	61
UA6CQ	"	30,988	375	11	50
UA4FCM	"	30,894	384	10	47
UA4SM	"	24,180	241	15	50
UV3CQ	"	16,120	200	14	48
UA1CAI	"	5,654	152	10	21
UV3XX	"	3,103	97	5	24
UA1FV	"	1,404	52	6	12

Kaliningrad

UA2DM	A	219,988	552	54	160
UA2FAT	"	87,368	386	32	102
UA2DP	14	58,520	339	22	55
UA2FBA	"	8,436	117	12	22
UA2FCW	7	13,524	89	6	23
UA2EC	3.5	32,112	329	13	59

Latvia

UQ2GDQ	A	309,115	900	39	156
UQ2IL	"	6,446	68	18	38
UQ2HO	21	7,544	72	14	32
UQ2PP	14	40,176	310	19	62
UQ2GFN	"	12,596	157	12	36
UQ2GEY	"	2,996	57	20	81
UQ2GCN	7	23,499	325	13	50
UQ2GEC	"	6,909	113	8	39
UQ2GDW	3.5	70,044	725	17	61
UQ2GCO	"	7,182	174	6	32

Lithuania

UP2NK	A	1,159,869	1,827	86	241
UP2CY	"	410,020	884	63	192
UP2OM	"	348,084	960	47	151
UP2BAT	"	237,354	666	56	165
UP2PCW	"	119,815	511	32	123
UP2OO	"	107,310	543	34	113
UP2BDO	"	41,511	365	21	80
UP2DV	"	26,487	146	28	81
UP2NX	"	20,667	173	22	61
UP2PBM	"	10,700	207	11	39
UP2BCX	"	8,670	158	9	42
UP2PBW	"	3,015	52	14	67
UP2PAP	"	2,535	94	11	21
UP2SA	21	26,918	143	21	65
UP2BCS	7	10,508	266	7	30
UP2BEA	"	5,740	161	7	28
UP2BAO	"	2,400	70	8	22
UP2OU	3.5	31,980	410	13	52
UP2BDV	"	3,120	98	5	25

Moldavia

UO5AP	A	164,580	542	51	144
UO5GR	21	651	13	8	13
UO5OGU	7	25,422	351	10	47
UO5OBD	"	13,816	247	9	35
UO5ODA	"	4,470	140	6	24

Ukraine

UB5WE	A	903,684	1,386	80	252
UY5OO	"	500,344	840	71	212
UY5DP	"	492,654	991	72	210
UB5BAZ	"	234,675	624	63	162
UB5MCS	"	197,395	513	47	138
UB5AAQ	"	160,857	581	44	139
UB5MFC	"	149,868	682	39	99
UY5TE	"	141,556	592	40	132
UB5ML	"	103,695	389	42	113
UB5KAK	"	100,704	344	44	124
UB5ICS	"	99,600	324	39	127
UB5WK	"	85,725	304	36	91
UB5WL	"	70,933	491	23	66
UB5UAH	"	57,658	264	27	77
UB5MDD	"	56,964	264	35	106
UB5EAX	"	44,436	300	26	66
UB5TAO	"	44,290	262	24	62
UB5ZBF	"	30,975	233	21	84
UB5TAG	"	30,674	168	28	70
UB5AAL	"	25,840	224	22	73
UB5UAL	"	20,648	111	20	68
UB5AAF	"	17,314	85	26	71
UB5LAY	"	16,976	86	24	70
UB5IF	"	15,868	224	26	61
UB5ABC	"	14,329	70	21	68
UY5UV	"	14,240	80	20	69
UT5HP	"	7,134	49	24	34
UT5SI	"	4,488	83	11	33
UB5UBU	"	4,270	54	22	43
UB5WAG	"	3,227	92	13	38
UB5WAB	"	3,028	35	16	25
UY5YB	"	2,134	29	11	21
UB5TAM	"	1,424	26	12	25
UK5SAA	"	1,320	59	7	17
UB5UCH	"	1,080	16	12	15
UB5CBB	"	1,050	21	11	19
UB5JFX	"	680	16	9	11
UY5GG	"	192	6	6	6
UB5GBD	28	90	5	4	5
UB5VAW	21	10,738	76	18	41
UB5RS	"	9,964	82	16	37
UB5FAQ	"	9,450	65	20	34
UB5IAM	"	6,710	60	18	37
UK5JAX	"	2,176	26	20	14
UT5BN	"	903	15	9	12
UB5IIA	14	158,470	723	29	86
UT5BB	"	156,782	822	27	87
UB5NU	"	132,516	625	28	80
UB5ZAL	"	108,576	604	24	72
UB5QAP	"	92,070	482	24	69
UB5UAW	"	44,022	249	25	62
UY5ZP	"	38,220	273	20	50
UB5KAM	"	37,575	228	18	57
UT5BW	"	31,602	218	17	52
UB5MBN	"	14,076	189	13	33
UT5QA	"	8,720	128	12	28
UB5KAT	"	6,300	48	16	34
UB5LYL	"	4,970	100	8	27
UB5OD	"	4,224	64	10	12
UB5JBK	"	616	18	7	15
UB5LL	7	105,866	750	23	63
UB5ZBB	"	93,780	686	23	67
UB5MOU	"	78,376	524	24	73
UT5QG	"	54,741	599	23	48
UT5XW	"	40,800	327	19	56
UB5IDL	"	38,700	329	18	57
UB5WAL	"	20,247	191	12	39
UY5DV	"	17,604	230	11	43
UB5HBT	"	8,977	121	11	36
UB5EEH	"	8,235	134	7	38
UB5LAL	"	4,712	56	14	24
UB5FCE	"	4,674	52	7	31
UB5EFC	"	2,346	68	6	17
UB5LAW	3.5	40,809	533	14	47
UK5WRG	"	38,684	379	15	61
UB5IHF	"	36,850	401	13	54
UB5GBN	"	29,673	310	12	51
UB5QK	"	5,889	110	9	30
UB5QCR	"	2,250	68	6	24
UB5LT	"	98	6	2	5

OCEANIA

Australia

VK2BOQ	A	238,483	540	60	97
VK2GW	"	172,341	511	50	67
VK6RU	"	148,149	292	57	120
VK4XA	21	28,082	266	15	23
VK3RJ	"	22,427	192	19	22
VK4DO	"	15,662	130	16	25
VK5SW	"	15,225	146	16	19
VK3MR	14	180,120	642	29	66
VK5HP	"	52,371	273	22	47
VK6HD	7	266,750	934	29	68
VK3APN	"	87,354	425	22	47

Gilbert Islands

VR1AA	21	252,408	1,108	30	48

Guam

KG6JAR	A	262,499	795	56	57
AG6JFY	28	12,474	238	9	9
KG6JIH	3.5	103,131	558	20	43

Hawaii

KH6IJ	A	1,297,440	2,130	87	117
KH6AKX	"	136,206	330	61	77
KH6HGL	21	33,670	311	16	21
KH6BYG	14	101,850	680	20	30
AH6DX	7	31,488	335	16	16
KH6CHC	1.8	3,630	82	7	8

Indonesia

YB3AB	A	168,912	447	51	87

Johnston Island

KJ6DL	A	135,997	440	54	53

Line Island

VR3AH	3.5	178,560	956	24	40

Marshall Islands

KX6DC	A	464,121	1,113	67	72

New Zealand

ZL3GQ	A	603,900	1,037	67	131
ZL3BK	"	413,307	829	68	103
ZL2BR	"	219,620	487	60	98
ZL1AFW	"	87,736	341	39	49
ZL2ACP	28	13,432	204	12	11
ZL2BCO	14	167,315	522	29	80
ZL1AMO	7	164,933	787	23	48

SOUTH AMERICA

Argentina

LU8BAO	A	627,412	1,054	71	131
LU3FG	"	388,125	974	61	74
LU3DSI	28	4,746	179	9	12

Brazil

PY1BOA	A	171,171	599	25	74
PY7AZQ	"	98,898	319	29	77
PY7BXC	"	82,944	352	32	49
PT2JB	"	22,050	351	10	11
PY3APH	"	15,283	167	16	15
PY7VJD	"	11,928	96	17	25
PY2RG	"	2,736	26	16	22
PY1TC	21	5,382	102	9	9
PY2GWF	"	288	10	6	6
PY7AKQ/8	14	375,180	1,257	27	84
PY7VJZ	"	7,344	106	11	13
PY5AHW	"	2,760	37	15	15

Colombia

HK3BAE	7	32,452	256	13	25

Easter Island

CEØAE	A	31,815	175	29	34

Peru

OA4AHA	A	1,564,250	2,132	82	168
OA8V	"	118,491	326	48	79

Surinam

PZ1AH	A	79,779	208	46	85

Trinidad & Tobago

9Y4VT	A	3,438,644	3,400	93	248

(Opr. W6DGH)

Uruguay

CX2AQ	21	172,126	648	26	63
CW3BR	14	753,228	2,012	31	95

(Opr. CX1EK/W4)

CX1BBL	7	212,139	889	24	57

Venezuela

YV4CB	28	19,272	204	12	21
YV1OB	14	73,645	248	25	78
YV5AAZ	"	31,020	355	11	19
4M4NQ	7	187,180	901	19	51
4M4OY	"	101,460	596	14	43
4M5CET	"	27,615	267	12	23
YV7PF	"	16,128	134	13	29

Multi-Op., Single Xmtr.

NORTH AMERICA

United States

W1ZA	1,611,026	1431	97	300
WA1NRF	1,136,124	1164	88	254
W1NJL	47,600	150	33	86
W2YD	1,487,250	1394	93	282
K2BT	832,727	829	91	262
W2UI	179,080	309	60	160
WB2RLO	145,600	283	56	144
W3BWZ	1,328,880	1035	119	333
W3BGN	998,526	966	92	269
WA3YGH	694,180	813	80	225
WA3VQP	394,240	640	60	160
W3FCI	154,176	287	57	135
AC4MYA	632,244	799	77	205
W4KXV	453,710	553	80	215
AA4LZR	377,533	527	75	182
W4JD	310,440	445	73	187
AA4BTQ	297,134	488	66	152
AA4LXV	168,702	348	54	132
W4BFB	52,164	162	46	80
WA4RVC	4,136	44	23	24
AA5LES	2,246,989	1670	130	349
WA6NGG	973,552	1192	103	181
K6UD	963,424	1426	86	152
K6QZ	527,810	794	90	145
K6ZM	516,664	786	83	149
W6BIP	261,105	503	71	124
W6OAT	257,472	472	77	115
W6UA	188,652	297	83	154
WA6JUD	40,425	197	36	39
K6LY	27,946	136	37	52
W7FU	1,460,410	1635	103	207
K3MNT/7	1,044,856	1377	91	171
W7FR	532,800	926	74	126
WA8ZDF	1,616,139	1245	117	342
W8HBK	248,465	388	66	163
WAØCPX	891,028	933	104	233
WØHZ	634,452	788	91	203

Bahama Islands

K4DBZ/C6A	1,952,496	2860	91	221

Bermuda

VP9DX	620,140	1388	63	139

Canada

VE1AI	678,528	1033	75	204
VE3AKG	779,612	1225	75	193

Guantanamo Bay

KG4JS	226,950	1296	35	50

Puerto Rico

KP4ECH	1,435,218	2543	76	175

Sint Maarten

PJ8CM	660,222	1145	74	184

Virgin Islands (Br.)

VP2VDJ	1,015,289	1819	74	179

AFRICA

Ascension Island

ZD8W	3,652,143	3385	103	260

ASIA

India

VU2TI	182,780	579	50	98

Iran

9D5A	1,854,212	2335	80	233

Japan

JA8YAU	270,916	598	73	105
JA6YDH	166,430	405	71	99
JA7YFB	157,052	427	63	79
JA3YKB	102,672	298	60	78
JA2ZAP	22,680	121	33	37

Kuwait

9K2EP	803,682	1247	67	175

ASIATIC USSR

Asiatic Russia

UK9FER	793,184	1298	53	171
UK9WAP	789,624	1068	65	199
UK9SAY	676,644	1192	55	171
UK9CBD	638,252	1076	63	169
UKØFAA	427,634	1099	82	120
UK9QAA	409,070	734	51	139
UK9LAE	230,750	619	38	104
UK9AAA	218,010	548	51	98
UKØCBE	198,202	916	43	70
UKØYAA	181,076	832	36	81
UKØLAB	158,895	513	55	80
UK9HAC	147,018	267	65	164
UKØZAF	100,536	796	22	25
UK9AAQ	50,310	250	21	65
UK9WBD	31,239	167	26	63
UKØKAA	14,858	123	16	30
UKØFAN	13,266	402	17	17
UKØQAN	1,386	56	9	12

Armenia

4J6A	2,279,941	2613	79	232

Kazakh

UK7AAF	187,758	645	32	82
UK7CAI	173,228	578	31	93
UK7CAA	147,112	436	38	112
UK7LAF	69,377	354	21	56
UK7LAA	64,944	315	22	60
UK7FAR	41,625	243	28	47

Turkoman

UK8HAA	291,720	707	53	117

Uzbek

UK8AAC	300,664	763	48	134
UK8AAI	121,518	446	40	89

EUROPE

Austria

OE3GSA	490,656	1128	72	197

Bulgaria

LZ2KKK	471,954	1200	65	173
LZ2KSU	241,755	636	58	155
LZ2KBA	133,104	499	46	132
LZ1KSZ	125,349	666	33	108
LZ1KCP	103,680	547	29	106
LZ1KVF	55,278	516	24	50
LZ1KDB	48,138	492	17	54
LZ1KSD	28,408	360	16	51
LZ1KSM	27,719	475	9	44
LZ1KHB	18,483	239	14	47
LZ1KAU	6,384	50	23	34

Czechoslavakia

OK1KSO	932,640	1339	86	262
OK1KYS	438,084	803	77	187
OK1KTL	358,416	748	70	158
OK1KSL	255,375	605	60	167
OK3RKA	196,667	540	50	143
OK1KPU	166,203	593	51	126
OK3KVL	143,104	424	55	117
OK1ONF	86,984	460	33	98
OK3RJB	76,704	361	37	104
OK3KFO	49,266	200	32	87
OK3KTD	30,396	199	26	76
OK1KRY	26,496	213	28	64
OK1KUR	25,840	126	27	58
OK1OFK	22,016	174	27	59
OK2KNN	3,090	53	11	19
OK2KTE	777	35	5	16
OK1KCF	375	21	5	13
OK3KAP	135	16	2	7

Denmark

OZ1SC	211,869	707	48	129

England

G3VPW	502,495	950	63	182
G3GJL	274,239	788	56	133
G3KMI	154,128	543	48	121

Faeros Islands

OY6FRA	337,120	1254	47	168

Finland

OH3AG	416,798	919	69	202
OH3EW	269,658	770	55	157
OH2AA	147,768	421	51	137

France

F6CZN	181,125	383	58	149

Germany (FRG)

DLØWU	1,768,810	1905	96	299
DKØTU	1,275,876	1851	78	254
DLØKF	1,059,072	1396	95	299
DKØMS	202,400	666	50	134

Germany (GDR)

DM3RF	169,452	776	39	123
DM2ADC	119,822	412	49	132
DM3GM	103,545	487	35	102
DM4CM	38,064	241	27	71

Guernsey Island

GC4DAA	2,300,942	2760	89	282

Hungary

HG8U	509,065	1226	72	193
HA1KSA	492,532	1146	60	176
HA9KPU	413,656	1019	60	172
HA7KLG	340,326	825	62	160
HA4KYH	326,268	701	65	163
HA6KNB	321,840	1002	55	161
HA6KVB	279,734	951	53	150
HA8KUC	274,835	881	56	153
HA3KMK	253,424	916	48	140
HAØKHW	248,919	723	51	158
HA5KJC	198,168	744	48	136
HA1KZZ	156,450	695	41	109
HA5KBM	123,116	609	40	114
HA9KOL	120,640	529	34	111
HA7KMS	112,480	551	37	115
HA8KWG	104,632	346	47	117
HA3KHB	59,653	330	31	90
HA5KFL	57,408	360	27	77
HA8KUA	15,870	214	16	53
HA5KHT	3,652	85	12	32

Luxembourg

DL7ON/LX	741,675	1771	73	202

Poland

SP5PWK	438,016	798	68	188
SP9KRT	396,270	1096	55	170

(Continued on page 90)

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(Continued from page 88)

SP3KTC	285,735	813	51	164
SP9PTC	125,615	478	52	185
SP5PSL	73,843	490	34	103
SP9KMQ	37,884	388	22	62
SP5KOH	25,896	266	20	63
SP5PTR	17,928	135	28	55
SP9KCB	17,360	236	15	55
SP7KTE	5,250	48	19	31
Scotland				
GM3ZRC	**65,720**	**401**	**26**	**98**
Sweden				
SK7CE	**567,386**	**1338**	**65**	**174**
SK5DB	208,150	606	45	136
Yugoslavia				
YU2CBM	**407,162**	**1171**	**60**	**169**
YU1AJQ	322,260	702	65	197
YU1EJC	245,255	834	48	133
YU1GMN	242,256	588	61	135
YU2CBV	233,244	717	53	133
YU4JLM	10,872	136	18	58

EUROPEAN USSR

Byelo Russia				
UK2ABC	**460,356**	**1071**	**51**	**176**
UK2WAF	270,396	924	53	155
UK2AAP	262,150	993	43	132
UK2AAG	238,607	855	41	138
UK2AAB	62,361	407	33	90
UK2IAJ	50,787	399	22	77
UK2AAX	20,550	200	21	59
Estonia				
UK2RAX	**205,326**	**698**	**40**	**147**
European Russia				
UK4HBB	**704,704**	**1225**	**84**	**224**
UK4WAB	**632,400**	**1287**	**69**	**203**
UK3XAB	**420,784**	**995**	**65**	**207**
UK3AAI	373,996	935	69	197
UK3DBG	363,792	937	51	157
UK4LAC	304,072	774	53	146
UK4AAB	298,220	879	50	135
UK3ACW	254,388	805	39	135
UK3UAA	237,452	740	49	129
UK3AAH	188,400	743	41	116
UK3TBF	180,032	489	49	145
UK3EAK	174,798	715	38	130
UK6AJA	166,498	591	51	115
UK3XMC	130,849	486	53	126
UK6AAJ	129,843	263	66	163
UK1ZAO	128,960	483	32	98
UK3TAU	115,951	600	29	98
UK3IBA	101,375	531	31	94
UK4LAD	85,305	395	32	89
UK1TAA	60,696	400	27	81
UK3ACR	48,069	172	43	66
UK1ABC	31,696	210	34	78
UK1ZAS	25,704	234	21	42
UK3XAM	22,560	186	22	58
UK4YAN	17,344	161	19	45
UK3DCF	13,594	165	18	51
UK1TAB	11,200	144	17	47
UK1QAA	8,874	84	19	39
UK4YYY	7,224	101	16	42
UK3TAC	1,148	75	10	18
UK3DDE	966	40	7	16
Kaliningrad				
UK2FAS	**107,136**	**662**	**31**	**93**
Latvia				
UK2GKW	**1,032,344**	**1468**	**89**	**255**
UK2GCF	309,132	1032	43	143
UK2GAX	198,240	849	36	104
UK2GBN	128,436	572	28	116
UK2GAG	103,768	572	30	89
Lithuania				
UK2BHS	**1,354,736**	**1932**	**89**	**284**
UK2BBB	1,030,806	1401	88	290
UK2PAP	1,015,644	1592	85	254
UK2PAF	992,344	1692	79	247
UK2BAG	329,451	1080	40	153
UK2PAO	232,470	795	45	144
UK2BAB	113,152	547	32	104
UK2PAT	110,838	514	35	112
UK2PAQ	71,864	560	24	80
UK2BBE	66,690	488	27	90
Ukraine				
UK5JAA	**1,528,569**	**2090**	**104**	**295**
UK5IAZ	**922,032**	**1283**	**83**	**259**
UK5MAA	822,035	1301	81	242
UK5MAG	646,204	1244	76	213
UK5OBE	362,695	735	63	188
UK5UBO	310,536	649	62	165
UK5IBM	301,860	674	62	172
UK5UAC	232,370	550	47	143
UK5WAZ	202,400	689	48	136
UK5LAA	149,435	463	34	109
UK5JAO	135,992	439	43	135
UK5CQ	127,093	552	35	103
UK5HAB	99,520	332	40	120
UK5QAC	95,424	439	38	104
UK5EAK	93,420	462	29	82
UK5MBP	87,468	276	34	88
UK5WAG	74,664	465	37	101

OCEANIA

Western Samoa				
5W1AZ	**2,534,416**	**3043**	**108**	**176**

SOUTH AMERICA

Colombia				
HK4AOY	**747,824**	**1436**	**69**	**107**
Netherlands Antilles				
PJ9MM	**3,698,545**	**3424**	**95**	**270**
PJ1AA	**2,282,233**	**2662**	**79**	**210**
Trinidad				
SY4A	**3,683,295**	**3239**	**101**	**284**
Venezuela				
YV5RT	**975,800**	**1395**	**72**	**166**

Multi-Op., Multi Xmtr.

NORTH AMERICA

W3WJD	**4,165,749**	**2585**	**136**	**431**
W3AU	**3,796,562**	**2398**	**135**	**419**
W4BVV	**3,704,400**	**2319**	**134**	**426**
K2GM	**3,290,688**	**2220**	**127**	**395**
W2PV	3,237,654	2323	116	375
W7RM	**3,000,380**	**2515**	**123**	**287**
W3FRY	2,842,290	1890	127	395
K6RR	**2,635,423**	**2753**	**723**	**260**
WA1RHA	**2,250,734**	**1895**	**103**	**330**
W3GM	1,898,822	1526	120	347
VE3DU	**1,335,928**	**1760**	**85**	**238**
K4CG	1,223,673	1189	89	274
W3TV	1,019,560	1013	101	258
AA3ATX	987,712	952	94	274
K2CW	959,582	1007	93	245
W3FA	781,450	813	80	235
W3NX	375,250	538	70	180
K3TGM	123,717	275	44	119

ASIA

UK9AAN	**4,859,348**	**3995**	**122**	**356**
JA3YKC	**1,054,238**	**1303**	**110**	**197**
JA3YBF	690,626	1042	100	154
JA1YXP	481,536	790	91	137
JH1YDT	449,568	757	82	141
JA7YAA	410,817	755	88	123
JA9YAV	187,995	487	65	86
JA1ZLO	75,040	260	47	64

EUROPE

YU1BCD	**3,185,980**	**3323**	**116**	**374**
OH2AW	**2,623,596**	**3120**	**110**	**334**
OH1AA	2,586,600	2785	109	341
DLØPG	**2,552,458**	**2731**	**102**	**344**
SK5AJ	**1,956,555**	**2705**	**100**	**305**
HBØAZD	**1,320,330**	**2351**	**83**	**247**
HA5KFN/5	**1,287,654**	**1925**	**79**	**238**
DK5VD	1,178,018	1704	85	249
DA2AS	339,600	1031	58	142
DLØII	273,625	823	56	143
LZ1KBG	**257,607**	**919**	**51**	**152**

CHECK LOGS

Our deepest thanks to the following stations who sent in Check Logs.

DJ7SN, DK5OS, DL7HU, DM2AFA, DM2BJD, DM2BUI, DM2CBB, DM2CBF, DM2CKD, DM2CLM, DM2CMF, DM2COJ, DM2DHN, DM2DPD, DM2DGN, DM2EXH, DM2FQN, DM2GDL, DM3IM, DM3SIC, DM3UE, DM3WYJ, DM3XBB, DM3XM, DM4KE/3FYA, DM4OLG, DM4PXH, DM4QMM, DM4SXH, DM4ZFM, DM5PUL, F8EX, FE4580, LA2IE, LA2KD, LA8O, LA8OM, LZ1GX, LZ1KDP, LZ1XX, LZ1KRD, LZ2RB, OH3XS, OH5YX, OH6UJ, OK1IAR, OK1DCW, OK2BON, OK2BNK, OK2BPL, OK2BQU, OK2PGU, OK3BT, OK3CWY, OK3EQ, OL9CGE, OX3OA, OZ7YY, SM1CXE, SM4FIV, SM5GFK, SM5HRP, SM7ASN, SM7T, SP1AFU, SP1CQN, SP1DFZ, SP1ETC, SP2AJO, SP2ASJ/2, SP2BLC, SP2GUB, SP2JIN, SP3CQP, SP3KEY, SP4ETO, SP4GHT, SP5GX, SP5LM, SP5AOK, SP5BAK, SP5FLC, SP5GBT, SP5GXL, SP5IFU, SP6RT, SP6DMJ, SP6FEK, SP6JLL, SP7BFC, SP7CVW, SP7EUO, SP7FMG, SP7HT, SP8ALC, SP8EOT, SP9CAV, SP9ERC, SP9PT, SP9PRO, UK9CAN, UK9-165-694, UAØBAK, UAØBBR, UA9OBW, UKØFAD, UKØSAL, YO8BAV, YO8MH, YU2CDO.

STATION OPERATORS

Multi-Operator, Multi-Transmitter

AA3ATX + WA3COJ.
DA2AS + DA1UD, DA1NJ, DA1DJ, DA1KA, DA1GW, DA1GX, DA4AM. **DK5VD** + DL8AN, DL8FD, DL8CH, DL8CM, DL8FR, DL8BL, DL8HA. **DLØII** + DJ2YE, DK8EY, DF1EA, DJ5PC, DJ8JP, DJ4TJ. **DLØPG** + DK2QL, DK3BJ, DJ9IE, DK3HA, DK5JI, DJ1FC, DJ9TQ, DK1QV, DF3QG, DF1QQ. **HA5KFN/5:** HA5GF, HA5FN, Szecsi Istran, Horrath Jozsef. **HBØAZD:** OH1TV, OH1VP, OH2BH. **JH1YDT:** 16 Operators. **JA1YXP:** 9 Operators. **JA1ZLO:** 5 Operators. **JA3YBF:** 13 Operators. **JA3YKC:** 26 Operators. **JA7YAA:** 8 Operators. **JA9YAV:** 6 Operators. **K2CW:** W2DA, W2ZA, K2LP, K2BPP, WB2BY, K2JAO, K2JQR, WA2EMG. **K2GM** + W1MDO, W1GYE, K2BQO, K2GL, K2KUR, K2TT, K6SSS, WA2FCA, WB2SQN, WB2VYA, R. Walsh. **K4CG** + K3WUW, WB4BGX, K4EBY, K5OGU, K4YEP. **K6RR** + W6RTT, K6LL, WB6KJI, KØGJD, WA6CXK, WB4BGY, WA6OTU, K6OZL, K6PDA. **K3TGM** + W3DOB. **LZ1KBG:** 8 Operators. **OH1AA:** 13 Operators. **OH2AW:** 16 Operators. **SK5AJ:** SM5AD, SM5AYY, SM5BNZ, SM5CAK, SM5CBN, SM5CNQ, SM5DPS, SM5EXE, WB4DNR, 4X4KK. **UK9AAN:** UA9AN, UA9ABA, UA9ACZ, UA9AEN, UV9AX, UW9BY. **VE3DU:** VE3BBH, VE1AL, VE2YU, VE3BUV. **WA1RHA** + K1VBL, W5UDK, WA1LKX. **W2PV** + WA1ABW, K1GMW, WA1NNC, WA1POJ, WA1QKD, WA1YER, K1YKT, K1ZND, WB2CKO, WB2OEU, WA2SPL. **W3AU** + K3EST, WA2LKZ, WA3IAQ, W3ZDK, W3IN. **W3FA** + K3ANA, W3ABC, WA3TOE, WB3BUU. **W3FRY** + K3HTZ, K3DZB, WA3LNM, W3HXK, K4JYP, W3GLR. **W3GM** + K3WJV, K3JLT, WA3WIM, K3CY, W2HEU, W3BUR, WA3JYB. **W3NX** + W3DRD, K3NEZ. **W3TV** + W3AOH, W3VW. **W3WJD** + K3YUA, K3OIO, WA3LRO, W3IFG. **W4BVV** + K3NPV, K3OAE, K3ZNV, WA3AMH, K4GKD, WB4UKA, KØDDA. **W7RM** + W7TML, K7JCA, K7HTZ, W5QQQ, K7RA, WB7ABK, WA8OCG. **YU1BCD** + YU1NQW, YU1NZV, YU1ODO, YU1ODS, YU1PCF, YU1QBC.

Multi-Operator, Single-Transmitter

AA4BTQ + LOGGER. **AA4LXV** + AA4TZM. **AA4LZR:** W4LBT, W4LKG, WA4LOZ, WB4QLN, K8RDE, WA0ACF. **AA5LES** + K5LWL, K5TSR, WA5WCT, WA5ZNY, WB5IZN, WB5OOW, KL7IDH, AC4MYA + W4LDF, K4ZRX, WB4RVY. **K4DBZ/C6A** + W4OZF, WA4NFF. **DLØWV** + DJ4AX, DJ8SW, DK4TP, DK4EM, DK5EZ, DL9DY, DA1UM. **DKØTU:** DJ9NX, DK2VQ, DK5GB, DK6QI, DK5HH, DLØSI, DJØIP, 2 SWL's. **DLØKF** + DJ4FZ, DJ7SW, DJ5AV, DK7LN, DK8LD, DK8LE, DL2ZT, DL7OY, DK5TI. **DKØMS** + DK3XS, DK8QA, DF5XA, DK9JL, DJØMP, DJ7QM, DF9QW. **DM3RF** + DM3WF, DM4WFF. **DM2ADC** + DM2BHC, DM3SIC. **DM3GM:** DM3LGM, DM3KGM, DK3MGM. **DM4CM** + DM2FHM. **G3VPW** + G3UKS, G3SJJ. **G3KMI:** G3WIE, G3ZER, G3YOZ, G4BIX, G4CXT. **GC4DAA:** G3FXB, G3MXJ. **GM3ZAC:** GM3LYI, GM3XNJ. **HA1KSA:** HA1SB, HA1SV, HA1TJ, Berecz. **HA1KZZ:** Keller, Nemeth, Czoponc, Bullogh, HA-XU. **HA3KMK:** HA3MK, HA3MX, HA3434, HA3435, Járó. **HA3KHB:** HA3GO, Takács, Gelengser. **HA4KYH:** HA4YO, HA4YQ, HA4YL, Istvan. **HA5KBM:** HA5HF, HA5KZ, HA5230. **HA5KFL:** Olah, Soket, Gondocs. **HA5KHT:** Tóth, Pavoy, Krarznai. **HA5KJC:** HA5LN, Molnar, Matyus, Holman. **HA6KNB:** Lakatos, Foldi, Hollandi, Nagya, Czipo. **HA6KVB:** Kulcsar, Suszter, Simon, Pap, Istvan. **HA7KLG:** HA7-015, HA7-079, HA7-012, Imre, Edit. **HA7KMS:** Bakos, Levai, Pap, Szabo, Varga. **HA8KUA:** HA8-075, HA8-119, HA8-120, HA8-083. **HA8KUC:** HA8ZW, HA8VL, HA8BE, HA8VC. **HA8KWG:** Kulich, Jakeb, Mazen, Vantus. **HA9KOL:** Zrolenski, Bohoczki, Makrai, Csotai. **HA9KPU:** Laub, Mihaly, Lakatos, Weisz. **HAØKHW:** HAØIF, HAØIG, HAØHW, Kuklis, Paz, Piandi. **HK4AOY** + HK4ALE. **HG8U:** HA8UP, HA8UI, HA8-069, HA8-011, HA8-041. **JA3YKB:** JR3LOO, JE3TNH, JF3GFH, JH3HRW, JA3AJ. **JA6YDH:** Club. **JA7YFB:** JA7LPX, JA7PHV, JA7IBJ. **JA2ZAP:** Club. **JA8YAU:** JA8UXL, JA8KWG, JK3KDY, JA4RAJ, JA8JTZ. **K2BT** + K2CJD, W2NIN. **K6LY:** K4TRJ, K6RZU, WB6TJC, WB6CAM, WA6YGR, WA6TIJ. **K6QZ** + K6QX. **K6UD** + WA6TLV, WA1KID. **K6ZM** + K6RM. **K3MNT/7** + WA1KKM. **KG4JS** + WA4MQJ. **KP4ECH** + KP4EAS, KP4EBV, KP4EDX, WB5DLW. **DL7ON/LX/p:** DL7ON, DL7QU. **LZ1KAU:** Nedelcho, Pavlov. **LZ1KCP:** Schabanov, Pejchinor. **LZ1KHB:** Ivanov, Raikor, Pamykov. **LZ1KSD:** Sergyev, Hrystov, Mylarov. **LZ1KSM:** Yankov, Borisov, Petrov. **LZ1KSZ:** Club. **LZ2KBA:** Iliev, Karalakov, LZ2F8. **LZ2KKK:** Dimitrov, Dimov. **LZ2KSU:** Petkov, Wesko. **OE3GSA** + OE4SZW. **OH2AA** + OH2CG, OH2HI, OH2BAQ, OH2BNP. **OH3AG:** OH3HC, OH3MK. **OH3EW:** OH2DS, OH2VQ, OH2ZA. **OK1KCF:** OK1KZ, OG1XC, OK1DZM. **OK1KPU:** OK1AUN, OK1AXA, OK1MUF, OK1JDX, OK1KRY, OK1AQG, OK1AQO. **OK1KSL:** OK1FAK, OK1AHG. **OK1KSO:** OK1WT, OK1JCW. OK1SF, OK1AMF, OK1AII, OK1AAU, OK1AOC. **OK-KTL:** OK1DA, OK1SB, OK1TY, OK1AAL, OK1AQT, OK1ATW, OK1AWC, OK1VWA, OK1HBB, OK1AO, OK1DWA, OK1FCA. **OK1KUR:** OK3CID, OK1DDT, OK3CLF, OK3CMR, OK1DLO. **OK1KYS:** Club. **OK1OFK:** OK1MX, OK117419, OK12038. **OK1ONF:** Club. **OK2KNN:** Soupal, Vyskov, Hranicky. **OK2KTE:** Club. **OK3KAP:** OL8CCS, OK3CGI. **OK3KFO:** Club. **OK3KTD:** OK3CES, OK3TCV. **OK3KVL:** OK3ALE, OK3CGC, OK3TZL, OK3TNZ, OK3TGS. **OK3RJB:** OK3TCL, OK3TFI, OK326376, OK326312, OK326190, OK326685. **OK3RKA:** OK3TAM, OK3TDP, OK3TCJ, OK326016, OK326515. **OZ1SC** + OZ1HX, OZ7BW. **PJ1AA:** PJ2ARI, PJ2LA, PJ2MP, PJ2VD. **PJ8CM:** W5AT, W5NUT, W4YCQ. **PJ9MM:** W1GNC, W3ZZ, WB3BSV, W8FAW. **SK7CE:** SM7DXX, SM7EBC, SM7ECM, SM7EQL, SM7GQR. **SP3KTC:** SP3AAG, SP3CCT, SP3JIH. **SP5KOH:** SP5BKA, SP5GNQ, SP5IXE, SP5IVK. **SP5PSL:** SP4ELO, SP1FUN, SP4IRA, SP3HBW, SP5ZKO. **SP5PTR:** SP5FVI, SP5GMW. **SP5PWK:** SP5AIG, SP5DQX, SP5SIP, SP5BUD, SP5AUC, SP5AWV. **SP7KTE:** SP7IFM, SP7IIT. **SP9KCB:** Club. **SP9KMQ:** Club. **SP9KRT:** SP9HMF, SP9KFQ, SP9HNB. **SP9PTC:** SP9AQY, SP9EFP, SP9EHL, SP9EYV. **UK1ABC:** UA169872, UA116938. **UK1QAA:** Club. **UK1TAA:** UA1TAP, UA1TAU, UA1TAC. **UK1TAB:** Shamanma, Ivanov, Bogdanov. **UK1ZAO:** Osenkov, Synkov, Pavlenko. **UK1ZAS:** Kuzin, Yeremeev, Chalyh. **UK2AAB:** Konopelko, Pilosian, Krushininsky. **UK2AAG:** UC2LAR, UC2AAK, UC2009105. **UK2AAP:** Panchenko, Kalmaeva, Zolotoj. **UK2AAX:** UC2DS, UC2009389, UC2009381. **UK2ABC:** Gursky, Lavrinowich, Monko. **UK2BAB:** UP2BDK, UP2BBF, UP2038725. **UP2BAG:** UP2BAA, UP2BAE, UP2BZ, UP2DT, UP2MC. **UK2BAS:** UP2BAR, UP2BCI, UC2PAJ, UP2PAO, UP2038609. **UK2BBB:** UP2BC, UP2BAV, UP2MB, UP2038517. **UK2BBE:** Rahauskas, Matulaitis, Kavpavius. **UK2FAS:** UA212562, UA2125221, UA2DC. **UK2GAG:** UQ203-71024, UQ20371028, UQ20371025. **UK2GAX:** UQ2IF, UQ2GBD, UQ2GBR, UQ2GN, UK2GGN + UQ2OE, UQ2GCP, UQ2GGP. **UK2GCF:** UQ2GGB, RQ2GEE, UQ203-776. **UK2GKW:** UQ2ON, UQ2OC, UQ2PJ, UQ203783. **UK2IAJ:** UC2ICK, UC200-850, UC200852. **UK2PAF:** UP2BBT, UP2BCR, UP2BCT, UP2BCU, UP2PAQ. **UK2PAO:** UP2BEJ, RAØADC, UP2038574. **UK2PAP:** UP2OX, UP2PAX, UP2PX, UP2PCN. **UK2PAQ:** UP2NL, UP2PBW, UP2038606, UP2038599. **UK2PAT:** UP203-8521, UP2038603, UP20381512. **UK2RAX:** UR2FU, UR2REE, Tom, Neil. **UK2WAF:** UC2XWY, UC2WJ, UC2WAZ, UC200612, UC200627, UC200628. **UK3AAH:** Gukow, Kulechow, Kazwinowsky, **UK3AAI:** UA3AFQ, UA3ACY, UA31701091, UA3170389. **UK3ACR:** Motyakov, Pugach, Kashin. **UK3ACW:** UA3AEZ, UA3ABD, UA3ADY. **UK3DBG:** Bzuk, Voronin, Tereschenko. **UK3DCF:** UA3142881, UA3142891, UA3142268. **UK3DDE:** Club. **UK3EAK:** Efremov, Semenenko, Okulov, Livshits. **UK3IBA:** Berezkin, Martynov, Tarakanov, Wasiliev. **UK3TAC:** Sherhakov, Boltalov, Batrokov. **UA3TAU:** UA312240, UA3TCI, UA312218. **UK3TBF:** Letkov, Fedosee, Kuznetzov. **UK3UAA:** UW3UO, UA3UAY, UA3123246, UA3123228. **UK3XAB:** UA3XAC, UA3127348, UA3127347. **UK3XAM:** UA3127363, UA3127364, UA3127321. **UK3XMC:** Taratin, Mosin, Shapkin. **UK4AAB:** Club. **UK4HBB:** UA4HBW, UA4HCW, UA4HAG, UA4HFG, UA413332. **UK4LAC:** UA4LN, UA4164175, UA4164184, UA4164200. **UK4LAD:** UA4164117, UA4164163, Staitsev. **UK4WAB:** Baranov, Konusov, Krylov, Kychanov, Sakerin. **UK4YAN:** UA4YAW, UA407793, UA409791. **UK4YYY:** Leontyev, Danilov, Drjablov. **UK5EAK:** UB5060203, UB5060805. **UK5HAB:** Gmyrko, Grigorev, Bezklinsky. **UK5IAZ:** UT5AA, UB5073202, UB5073313, UB5073342. **UK5IBM:** UB507376, UB5IHL. **UK5ICD:** UB50731365, UB5IHO, UB50731428. **UK5JAA:** Prozorov, Prozorov, Gerosimov. **UK5JAO:** Stroken, Verhotina, Dolotovski. **UK5LAA:** Grunyov, Savinoy, Marikutsa. **UK5MAA:** UB5MCI, UB5EC, UB5MDA, UB5MET. **UK5MAG:** UB5MDL, UT5HP, UB5MDP, UB5MBP. **UK5MBP:** Sunarokov, Sisoew, Shatalow. **UK5QAC:** Larin, Sardak, Vjunichenko. **UK5QBE:** Club. **UK5UAC:** Usoltsev, Shevchok, Gaj. **UK5UBO:** Club. UK5WAG: UY5XB, Alexeyev, Vitiv. **UK5WAZ:** UB5068392, UB507480, UB5068395. **UK6AAJ:** UK6ADU, UA610160, UA61011150, UA61011152. **UK6AJA:** Club. **UK7AAF:** Alexandr, Vacheslav, Vladimir, Nick. **UK7CAA:** Oleg, Micha, Victor, Alexandr. **UK7CAI:** Alex, Alex, Grigory. **UK7FAR:** UL7FBB, UL7FP, UL70271. **UK7LAA:** UL7026199, UL7026232. **UK7LAF:** UL7026207, UL7026203, UL7026232. **UK8AAC:** UI8AAG, UI8ADR, RI8AJW. **UK8AAI:** UI8ACI, UI8BI. **UK8HAA:** UH8BA, UH8BY, UH8DH. **UK9AAA:** UA9AGI, UW9AI, UV9BA, UA9165608, UA91651005. **UK9AAQ:** UA9AAT, UA9AAZ, UV9BK. **UK9CBD:** UA9CBM, UA9CDJ, UA9CT, UV9DD, UA9DU, UW9DW, UA91541162. **UK9FER:** UA9FAJ, UA9FAL, UA9FAR, 303. **UK9LAE:** UA9LAX, UA9LBI, UA9LBJ, UA9LBK, UA9LBO, UA9161124. **UK9QAA:** UA9QAX, UA9QDX, UA9RQ, UA9RR, UA913411, Pawluckih. **UK9SAY:** UA9FBA, UV9FN, UA940005. **UK9HAD:** UA9HBH, UA9HBQ, UA915898, UA9158-UA9SAX, UA9SBF, UA9SCE, UA9SCJ, UA9SCT, UA9TS. **UK9WAP:** UA9WAC, UA9-WBY, UA9WCC, UV9WF, UA908432, UA90843621. **UK9WBD:** Nil, Andrey, Korpachev, Boris. **UKØCBE:** UAØCAF, UAØCBR, UAØCDC, UAØCDT. **UKØFAA:** UVØED, UAØFAM, UWØFM, UWØFZ, UA01531, UA015379. **UKØFAN:** UAØFAV, UA015399, UA0153103. **UKØKAA:** Alexandr, Yuri, Valeri. **UKØQAN:** Donskoy, Utkin. **UKØYAA:** UAØYAD, V. Zolotuhin, S. Yunikov. **UKØZAF:** Valerij, Victor, Valertiu. **VE1AI** + VE1MX, VE1AJP, VE1BJQ. **VE3AKG** + VE3BVD. **VP2VDJ:** W6KG, W6QL. **VP9DX:** Club. **VU2TI** + VU2TS. **W1NJL** + WA1QJU. **W1ZA** + K1DIR, K1EA, K1LPA. **WA1NRF** + WA1MAO, WA1OCU, WA1QNF. **W2UI** + WA3KRD. **W2YD** + W2HZY, W2FVS, WA2SRQ, WB2RKK. **WB2RLO:** WA2ESH, WA2AJN, WA2BYX, WA2HDD, WB2ELF, W2TIW. **W3BGN** + WA3YHT. **W3BWZ**

Antennas *(from page 61)*

single amateur band. If two assemblies are used, the antenna combination will work on two bands. Some amateurs have used as many as four top sections.

"Best operation, of course, will occur when a good ground and a good match to the transmission line are achieved. Radial ground wires for each band can be made up of insulated hookup wire. The radial is a quarter wavelength long for the band in use. In a mobile home, the antenna can be mounted on the roof and the radial wire run down the outside of the home. The far end of the radial is "hot" with r.f. and should be insulated from ground and protected so that no one can touch it. It should also be held clear of nearby metallic surfaces, such as the siding of a recreation vehicle".

"The Palomar *balun* should work just fine with one of these antenna installations", observer Pendergast.

"That's right", I replied. "Sometimes you'll be surprised what a mobile whip will do in a semi-permanent installation, especially when a radial ground wire or two is used".

Pendergast reached in his pocket and pulled out a letter. "I've been meaning to give this to you for a couple of days", he said. "It is from Guy, WA4HVL, in Georgia. Guy read the remarks of Mike, W5IOB, in the April antenna column where he compared the DX results of a low Quad Loop to a ground plane antenna. Mike concluded that in the best direction for the loop, the ground plane outperformed it on DX contacts. This was on 40 meters. The ground plane base was about 28 feet in the air and the top of the Quad loop was supported on a 70 foot tower. And Mike ended up taking the Quad loop down.

"Well, Guy was mostly interested in stateside contacts on 40 meters. So he compared his Quad loop with his vertical ground plane antenna. The top of Guy's loop was about 45 feet in the air, and the base of his ground plane was about 5 feet clear of the ground. Now, out of 36 tests that Guy ran, switching back and forth between the two antennas, 28 stateside stations preferred the Quad Loop by as much as three S-units. Four stations preferred the vertical antenna, and four stations said the antennas were equal in performance."

"Very interesting", I replied. It all hangs together. W5IOB tested the two antennas and found the ground plane best for DX. And the ground plane has considerable low angle radiation, suitable for DX. WA4HVL tested the two antennas on stateside contacts, which are mostly high angle skip. And he found that the Quad loop, horizontally polarized, was best. This antenna, of course, provides fairly high angle radiation. So it should be better for stateside contacts".

"Yes", Pendergast agreed. "Some time ago I compared a 40 meter dipole against a 40 meter ground plane. During the day, the dipole ran rings around the ground plane on contacts within, say, 1000 miles. At night, beyond 1000 miles, the ground plane was much the better antenna."

"I had much the same experience on 80 meters when I was running a sked from San Francisco to Los Angeles", I replied. "The 80 meter ground plane was worthless on this hop, but a low dipole—about 25 feet off the ground was just perfect. The distance was about 420 miles."

I took a small pamphlet off the desk and tossed it to my friend.

"Have you ever seen this?", I asked. "Its the *National Conest Journal* sponsored by the Southern California Contest Club. It costs four dollars a year in the USA. The editor is Pete Grillo, W6RTT (Box 3762, Glendale, CA 91201).

"Well this little publication has a lot of good feedback from contest operators on operating techniques, contest news and—of course—contest antennas. The January-February issue has a short article on quick and dirty contest antennas that makes very interesting reading. For example, there's a write-up of the 40 meter "droopy beam" thrown up by W6RRT for 40 meter work. Pete had a 15 over 20 meter stack, but nothing for 40 meters. So he put plastic plugs made of PVC tubing in the ends of the beam directors and reflectors (fig. 7) and spread a 40 meter wire beam over the two regular beams. He had a crank-up tower and could reach the tips of the beams from the ground, using an extension ladder. He strung the 40 meter wires over the existing beams, making a two element 40 meter beam that drooped over the aluminum beams. The lengths of PVC tubing separated the beams. And the wire elements were held in position with 3 ounce lead weights. How does that grab you?"

"Pretty clever", remarked Pendergast. "I see he used a quarter-wave matching transformer and a balun to match the 40 meter wire beam".

"That's right", I replied. "The feed point impedance of such a contraption probably is quite low."

"I wonder how it worked?", mused Pendergast as he sketched the "droopy beam" into his notebook.

"Have you ever heard the rock-crusher of Pete's on 40 meters?", I countered.

"No", replied my friend. "And I don't want to run across him in a pile-up". He gathered up his notebook as he prepared to leave.

"By the way", he remarked. "In your July column, the drawing of the single-wire fed antenna was all screwed up. Anybody who works from that picture will be in a heap of trouble".

"I know", I replied. "I got several hot letters about it. So here's the correct drawing (I hope), maybe it will be right this time (fig 8).

Station Operators *(from page 90)*

+ W3RRX, K4BEO, K4CFB, K4WVT. **W3FCI** + WA3ZAS. **WA3VQP** + W3CRE. WA3YGH + W3DQG. **W4BFB:** WA4FKY, WA4CJA, WA4APD, K4GHR, WA4VKW, Teresa. **W4JD** + WA4HHW. **W4KXV** + K4AW. WA4RVC + K4IIF. **W6BIP** + WA6DJI. **W6OAT** + WA6DIL. **W6UA** + W6UM. **WA6JUD** + K6LCC. **WA6NGG** + WA6FWJ. WB6HDH, K6PJY. **W7FR:** W7PHO, WA7TLK, WA7UQG. **W7FU** + W7RX, W7APN, VE7ZZ/W7. **W8HBK** + W8KPL, K8LJR. **WA8ZDF** + W8QXQ, WB8AKU, WB8AKW, K8EHU, K8RMK, WA8RWU, WB8RIJ. **W0HZ** + W0AW, W0YCR, K0IEA, W0HP, WA0YLN, WB0ANT, W0IR, W0NAR. **WA0CPX** + WA0ONL, WB0DGA, K0HUD, W0GKE, W0SMV. **YV1AJQ:** Branislav, Rastislav, Mravik, Sifel, Severini. **YU1GMN:** YU1PEF, YU1QEF, YU1QEH, YU4RS-606. **YU2CBM:** Zdeslac, Bozenko, Goran. **YU2CBV:** YU2RPY, YU2RTG, Zeljan, Miro. **YU4EJC:** YU4RS-3552. YU4RS-3456, YU4RS-3554, YU4RS-3555. **YU4JLM:** YU4RS-2105, YU4RS-2121, YU4RS-2135, **YV5RT:** YV5FKW, YV5FEZ, YV6OV, YV3BJ, YV5AV, YV1TO, YV5AGS, YV5FFH, YV5AW. **ZD8W:** WA4TLB, KP4EAJ, KP4EKI. **4J6A:** UW3HV, UW6FZ, UA6HZ. **5WIAZ:** WB6OOL, WB6DSV, W6RGG. **9D5A:** K6KM, W7CFJ. **9K2EP:** SM0OS, SM2CXV. **9Y4A:** W2DXL, W2AX, W2ER, W2GC, W2GGE, K2LE.

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QRP *(from page 66)*

3040 kHz, 7040 kHz, 14065 kHz, 21040 kHz, 28040 kHz; s.s.b.—3990 kHz, 7290 kHz, 14340 kHz. When using these frequencies, call "CQ QRP" periodically. If everyone listens, no one will make a QSO! Quite a few QRPp'rs have become frustrated about these calling frequencies since they never find anyone there. My own experience is that I've generally worked a lot of QRPp guys on these spots—very often as a result of calling "CQ QRP." So, keep at it over a period of time and you should drag

(Continued on page 94)

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MINT DRAKE TR-22C with 8 sets of crystals also rubber duck and 12 VDC supply. All for $225, UPS Paid. Scott Sweeney, WB0UJM, 1576 NW 96th, Des Moines, Iowa, (515) 225-9541.

CQ BUMPER STICKERS reads "dahdidahdit-dahdahdidah." Send $1 to: D. Mollan, WB7FDE, 7805 NE 147th Ave., Vancouver, WA 98662.

SELL: Heath SB-102 xcvr, AC power supply and speaker, sta. control, mike, exc. condx., w/manuals, $450. 805 and 813 tubes, new/make offer. Ron Hughes, WA6WTF, 2990 Irwindale Dr., San Jose, CA 95122.

SELL OR TRADE: Hallicrafters SX140, S38D, and Motorola Solid State dispatcher D-23 Den 3100 AV with PL. Want CW xcvr. Best offer. Jimmie Stephens, WB5LJM, P.O. Box 125, Fulton, MS 38843.

TRADE: RTTY equipment for Tri-band beam and rotator. Lester Basham, 735 Caves hwy., Cave Junction, OR 97523.

SELL, BUY OR TRADE: ARRL Handbooks, W9DDL, 5006 N. Second St., Loves Park, IL 61111.

TV TEST SETS, video tape, reel and cartrivision, amateur gear excess my needs; list sent for large self-addressed stamped envelope. W4API, Box 4095, Arlington, VA 22204.

WANTED: NF-105/TA Empire/Singer; HP-IL5/1L10/1L20; HP-419A; any condition, preferably good working order, but priced accordingly. Also Collins 312B5/noise blanker for KWM-2A. Houston, Box 8233, APO San Francisco, CA 96328.

YAESU - FT101B, fan, 160 and 11 meter xtals for xmit - good condition, price $575. All manuals, you ship. Warren E. Cann, W1HSC, Box 264, Hampton Beach, NH 03842.

WANTED: Information on how autopatches work and how I could set up my own autopatch. Steve Ciura, HHC 3/325 Inf., Fort Bragg, NC 28307.

FERRITE BEADS: Lowest price in the country. 20 for $1.00 w/specs. On orders under $5.00 please add 25 cents for postage. Please specify month. Tobar, P.O. Box 7438, Hollywood, FL 33021.

SWAP OR BEST OFFER: National NCX-500 and matching AC power supply. Swan MB-40A and matching Swan AC power supply. D. Hardacker, W7TO, 1745 S. Thurmond, Sheridan, WY 80201.

WANTED: Turner plus three - B mike. Will trade W. Union No. 103 teletype; 1000 ft. RG-6U 1000 ft. RG-59 (dual w/ messenger), or Jerrold AM/FM receiver. You ship mine, I'll ship your's. Frederick R. Vobbe, 227 East Saint Claire, Aumont, MI 48003.

QSL's - SOMETHING COMPLETELY DIFFERENT! Nothing even close to it on the market! The "Cadillac" of QSLs! Samples: $1 (Refundable). W5UTT; Box no. 1171-E, Garland, Texas 75040.

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EQUIPMENT FOR SALE: Textronix 513-D oscilliscope, good to 30 MHz $195. Kay Mega - sweep, 0-900 MHz, $50. Berkeley frequency counter, 100 KHz 5 column neon read-out, $50. General Radio 804-C signal generator, 8-330 MHz, $100. RCA teletype converter CV-57URR, $100. BC-221-T frequency meter with power supply, $50. Rack mounted power supply, input 115 volts 60 Hz, output 1420 volts DC 450 ma, $75. Hallicrafter S-36 receiver 28-144 MHz, AM-FM $100. S.S. White air abrasive unit Model D, dual nozzles and controls. Good operating condition $250. Also one in non-operating condition, good for spare parts $50. All items shipped freight collect. Andre Calatayud, 196-23 Jamaica Ave., Hollis, NY 11423.

YAESU FT dx 560 TRANSCEIVER: 80-10M, 550 watts SSB/CW with matching speaker, CW filter, new and spare finals, manual. Mint condition. Ship in original cartons. $415 F.O.B. Jordan, 1012 Olmo, San Jose, CA 95129.

SALE: SRR-13A receiver $275.00, URM-25F $165.00, TS-186D $60.00, URM-32 $65.00, TS-510A $300.00, HP-170A $300.00, Stamp for catalog. E. French, 10 Afton, Aurora, IL 60538.

BUY-SELL-TRADE. Write for free mailer. Give name, address, and call letters. Complete stock of major brands new and reconditioned equipment. Call for best deals. We buy Collins, Drake, Swan, etc. SSB & FM. Associated Radio, 8012 Conser, Overland Park, Kansas 66204. (913) 381-5901.

AWARD CERTIFICATES for Public Service and Emergency Radio operations. Send $2.00 each, name, address, and event. Information FREE. 49'er Radio Club, Box 1400-CQ, Downey, CA 90240.

WANTED: Surplus BC-221 Frequency Meter or equivalent. Darcy Brownrigg, Chelsea, Quebec, J0X 1N0 CANADA.

WPX'ers: Now available, the most complete PX'ers record book. 33 pages of prefixes for quick easy reference. A must for prefix chasers. $4.95 U.S.A., $5.95 foreign. K6ZDL Publishers, Box 1351C, Torrance, CA 90505.

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KRON-HITE Audio Oscillator, .001 Hz to 100 kHz, Square and sine wave. Excellent condition. Billy E. Maddox, WB3HSG, 2595 Washington Ave., Fort Meade, MD 20755.

WANTED: Still require coax relays and switches w/"N" conn. Relays DPDT, switches, manual and electric SP4T and SP6T. Charlie Huth, 1233 1/2 W. State, Fremont, OH 43420.

WANTED: A operations manual for Knight Linear Amp. Model T-175 10 meters, pay up to $10. John V. Grogan, 14708 Harold, Taylor, MI 48180.

TRADE: Regency AR2-2 m FM 80 watt amplifier for mint SB610 scope. Sell: Drake T4X xmtr and Hustler mast with 80-40 and 20 resonators. F.H. Kauppi, Rt. 1, Box 171, Gilbert, MN.

SELL: Hallicrafter model CRX-2, 152-147 MHz, mint condition, pick-up only. Joseph Schwartz, K2VGV, 43-34 Union St., Flushing, NY 11355.

MAGAZINES FOR SALE: CQ/73/QST/HAM RADIO, issues at 20 cents each (including USA shipping) from Lockheed Ham Club, 2814 Empire, Burbank, CA 91504. Send list and check. Available issues and any refund due will be sent promptly.

LOOKING FOR old Lionel trains. Interested only in "O" guage, excellent to like-new condition. Primary interest is locomotives prior to 1952, but will consider complete sets or more recent models. Am willing to buy outright for cash or swap radio gear to meet your needs. Write Dick Cowan, WA2LRO, c/o CQ Magazine, or call 516/883-6200.

MEDICAL: Any licensed amateur radio operator in the medical or paramedical field should join MARCO (Medical Radio Council). Contact: Stan Carp, M.D., K1EEG, 44 Main St., Saugus, MA 01906, (617) 233-1234.

WANTED: Extra coils for SW-3 receiver. I have odd-ball coils and need your single extras to make up complete set. Buy or trade. Bill Orr, W6SAI, c/o Eimac, 301 Industrial Way, San Carlos, CA 94070.

SALE: Atlas 210B complete with 110/220 V AC console. Excellent condition. $550 PP. With mods (R.I.T., etc.) as per my Feb CQ article and latest factory updates. Great rig. Only reason for sale is that am now in CN8 and CN8 will not issue license. Schultz, K3EZ, Box "L", FPO New York 09544.

SELL: 4-1000 A used, $30; Raytrack kw plate tank coil for 80 & 40 plus kw bandswitch, $16; UTC S-50 kv c.t. 300 ma, new, pick-up only, $75; small (2 kw) $20. R. Ross, 95 Norwood Ave., Northport, NY 11768.

SALE: Heath IM-28 VTVM kit. New, perfect. Ordered by mistake, $40. Schultz, Box "L", FPO New York 09544.

The book "CQ YL" has been updated again with a new supplement bringing the YLRL Officers section up to date through 1977, plus a report on the 7th International YLRL Convention held in Houston in June '76. If you have a copy of "CQ YL" and would like to add the new supplement (the pages are "slotted" so they can be inserted directly into the book's spiral backbone), drop a note with your request to author/publisher W5RZJ, Louisa Sando, 9412 Rio Grande Blvd., N.W., Albuquerque, NM 87114. Please enclose $1 to cover cost of printing and mailing. The one and only book about YLs in ham radio, "CQ YL" contains 23 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.50 postpaid.

WANTED: Antique Glass - Looking for old milkglass - purple, slag, carmel, and greentown. Tell me what you have. I pay the highest prices. Write: Jack Schneider, c/o Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, NY 11050.

FOR SALE: Three G.E. Bound volumes plus issues of G.E. Ham News, from Vol. 1, No. 1, to Vol. 15, No. 6. This is from May-June 1946 to Nov.-Dec. 1960 and includes index and supplemental information, $30. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

SSTV AND PHOTOGRAPHERS - Make offer: 1 each, like new, Fujitar lenses, 135 mm, f 4.5, telephoto 35 mm, f 3.5, wide angle. Cary Cowan, c/o CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050, or call (516) 883-6200.

SELL: Gonset 90w 2 meter linear, plugs into 120 VAC, F.B. for Oscar, $65; Ces touchtone pad for KDK, new, $50; 10 ft. tripod, new, $30. Wanted: 6-meter Yaesu transverter, 432 MHz, SSB rig, microwave devices wattmeter/coupler. Denis Allen, K9GMT, A1002-4750 N. Clarenoon, Chicago, IL 60640, (312) 728-3737.

SELL: Drake 34 PNB Noise Blanke, DC-4 DC Supply, $125 or best offer. James K. Ramsey, 4 Gregg St., Graniteville, SC 29829.

WANTED: Copies/originals SWL club bull's, SCDX, TDXN, R. Japan News, etc. Don Erickson, 6059 Essex, Riverside, CA 92504, (714) 687-5910.

WANTED: High band or high/VHF "Digi-Scan" scanning monitor. Must be in good condtion and reasonably priced. Bill Merdeith, Route 1, Kensington, GA 30727.

WANTED: Schematic and manual for Gonset G-77 xmtr, G-66 B rec. W.W. Dollnig, WA6RQO, 1984 Continental St., Costa Mesa, CA 92627.

SELL: Collins KWS-1 with console; Howard converter 800-170;teletype machine with spare parts (15-19); KWM-1 and 2, power supplies, car holder; Johnson 1KW Matchbox - all in good operational order. K2KKU, day (914) 668-3534; nite (914) 337-8773.

LOOKING for Schematic and alignment info to photo copy for a Heathkit AR-3 and a Bendix MRT-6fb, a converted commercial FM unit to 2-meters. Robert D. Houlihan, WB9WPE, 497 E. Second St., Galesburg, IL 61401.

FOR SALE: Drake T4X w/AC3 power supply, $350; Eico 717 keyer, $20; R390A rcvr, $300; Johnson-Viking II (as is), $40; Swan SWR-3, $10. Joe Land, 6511 Asnes, No. Hollywood, CA 91606, (213) 763-0257.

WILL TRADE: Lafayette tube rcvr HE-90 or HA-460 6M transceiver (both mint) for Knight R-100. Also want J-38 key. Will answer all letters. Allen N. Purcell, 10476 Akron Rd., Marshallville, OH 44645.

WANTED: 6B8 tube. Used in SX23 rcvr. 1939 vintage still going strong. KL7AVX, 1928 E. Dimond Blvd., Anchorage, Alaska 99507.

WANTED: VFO for low bands, self powered. Want FT-243 crystals 80 meters (general). Robert F. Voelker, 101-23 Lefferts Blvd., Richmond Hills, NY 11419.

FOR SALE: Ham License Plates Saskatchewan VE5 XH and VE5 XJ. Doug Rittinger, 2150 Hillcrest Drive, Swift Current, Saskatchewan, Canada.

Trade: Pair of 255 KHz (21 KHz Band pass), Collins Mech filters for Eddy Stone Dial. Jess W. Speer, W5SQJ, 1400 Melrose Dr., Norman, OK 73069.

WANTED: Spare parts, connectors, cables, etc., for AN/WRR-3A rcvr. J.A. Call, W7KSG, 1876 E. 2990 So., Salt Lake City, UT 84106.

FOR SALE: Ham Magazines, manuals, and handbooks, (1940-1970). SASE for list. R. Hallen, WA7NEV, P.O. Box 73, Tombstone, AZ 85638.

FOR SALE: Third class commercial posf check, $3.00 P.P. Phone (703) 530-7578. J.S. Looney, Rt. 1, Box 260-A, Grundy, VA 24614.

SELL: HW7 w/DeMaw front end, RIT, FET Preamp and AC supply, $75. W2ECW, 225 Seymour Rd., Rochester, NY 14609.

WANTED: 40-60 foot freestanding tower, Ham II rotator, 40 meter beam, 3-4 element tribander. Will Roberts, WA4PSL, P.O. Box 907, Roseboro, NC (919) 525-4431.

WANTED: National SW-3 receiver in good condx and Johnson VFO model 122. D. Sheehan, 15 Arcadia Rd., Andover, MA 01810.

SELL: All new parts for WA4DSY synthesizer, $75, shipped. John Teles, 10511 Tenneco, Houston, TX 77099.

WANTED: First class equipment. Please state price and condition. Jim New,WA4DHD, Box 1000, Griffin, GA 30224.

WANTED: Operation manual schematic and calibration information for model 1000 Mercury Electronics Tube Tester. Alan Mark, P.O. Box 372, Pembroke, Mass 02359.

QSL CARDS, FULL COLOR, The finest available anywhere. Send for your FREE COLOR BROCHURE TODAY. Para-Graphics, P.O. Box 268, Whitehall, PA 18052, Dept. AR.

ANTENNA SPECIALISTS M-103 c/b - AM Antenna, $9.50; Marsh HW-6 6 meter mobile Antenna, $6.00; Telrex 20 element 2 meter Beam, $20.00. Master Mobile Matcher 10-75 meter, $15.00. All FOB and in mint condition. T.K. Brown, W3CUH, RD 1, Box 102, Forksville, PA 18616.

WANTED: HBR receiver (Ted Crosby's) complete, incomplete or parts for same - Eddystone Dial No. 898 - Any British ham handbook or mag. 1965 to now. Owen Laughlin, 1310 Pinecrest Dr., Ferndale, MI 48220.

IC-21A with the DV-21 digital VFO mint condition, $500 firm. J.P. Johnson, WB4BYO, 135 W. 9th St., Jacksonville, FL 32206.

US & DX QSLs forwarded for 5 cents or less per card. Send SASE for details. W7IZH QSL SERVICE, Box 17987-C, Tuson, AZ 85731.

TYMETER 24 hour clock, $7.00 postpaid. Bob Craig, WB6RWE, 4950 Sunshine Ave., Santa Rosa, CA 95405.

DXers! Ham sentences in 54 languages on your card get DX QSLs. Just choose and copy. K3CHP's DX QSL Guide, $3.95. Joe Mikuckis, 6913 Furman Pkwy., Riverdale, MD 20840.

JERROLD Super Powermate model 132 TV amplifier, used but good. $40.00 postpaid. L.G. Basham, 735 Caves Hwy., Caves Junction, OR 97523.

TS-820 (digital) $900. Standard 2M FM H/T-case, nicads, $190. J. Holmes, 17 High Field, Madison, CT 06443.

4 1/4" Astronomical Telescope, equatorial mount and electric clock drive. Sell at $100 or trade for 20 or 80 meter mobile rig. David Miller, P.O. Box 6113, Hilton Head, SC 29928.

WANTED: Old ARRL Radio Amateur's Handbooks. Quote W9DDL, 5006 N. 2nd St., Loves Park, IL 61111.

QRP *(from page 91)*

some weak QRPp'ers out of the mud!

The c.c.w. articles have apparently aroused some interest in practical attempts at constructing the necessary gear. Those of you who fit into this category can get in touch with each other through me. Just drop me a line, letting me know how far along your work has progressed. Also, a net has been formed for the exchange of c.c.w. information by experimenters. NCS is usually VE3DPB, Monday & Friday, 0745 est., 3850 kHz.

Well gang, that's it for this month. If you enjoy this kind of column, you can make more possible by sending in an operating news report, pictures, circuits, or whatever else you can come up with. Poems are also acceptable (I say this with tongue-in-cheek!). Cartoons are out of the ordinary, and perhaps WBØCZE will continue to come up with more QRPp cartoons like the ones included in this issue! Excellent job Lou! So, for now, 73 and good QRPp'ing.

Ade, K8EEG

Awards *(from page 63)*

Notes

Sorry to hear, via W9ZD (ex-W9ZHD) that his friend, Ralph Duke, W9IWJ became a silent key.

Always happy to get data and copies of Awards to use in my column. How was your month?

73, Ed., W2GT.

Novice *(from page 68)*

time on the air as he would like, but he is fairly well satisfied with his record using an old Johnson Ranger transmitter running 30 to 50 watts driving a homebrew, 4-element beam, 20 feet high. But his brother Greg, WBØRTK, worked WAC and WAS and 40 countries ahead of Curt with 30 watts! . . . **Ronald Aaberg, KL7IVL,** Pedro Bay, Alaska 99647, has no TVI! Pedro Bay has a population of 20, Ron's nearest neighbor is two miles away, and no TV for over 100 miles. In his first two months on the air as a Novice, KL7IVL's HW-104 transceiver worked 10 states on the 80-meter Novice band. His antenna is an 80-foot Rohn 25-G tower on top of a 40-foot hill fed through a home-built antenna coupler. He now has the tower working as a 40-meter vertical, too. Ron is a commercial salmon fisherman in the summer and is a trapper in the winter. He is 33 years old.

73, Herb, W9AD

ADVERTISER'S INDEX

New Reader Service System

To speed information to you on products shown in CQ advertising, a new computerized Reader Service System has been designed. For additional information on a particular ad in this issue, tear out the Reader Service postcard bound between pages 72 and 73, and circle the numbers on the card which correspond with the Reader Service numbers listed in the advertiser's index below. DON'T CIRCLE THE PAGE NUMBERS! Fill in your name and address, and mail. We'll have your information on the way in short order.

Basic Radio *(from page 57)*

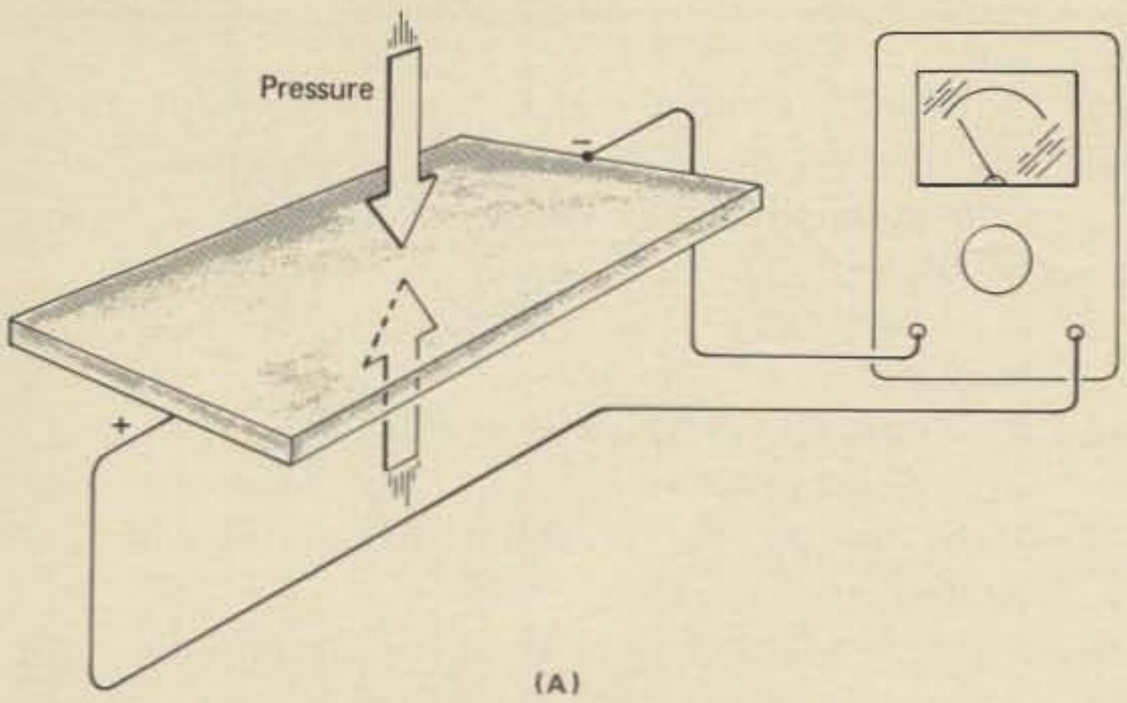

Fig. 1.16 (A)—When pressure is applied to a crystal substance a voltage is generated between opposite faces. (B) When the pressure is released and the crystal expands a second voltage is generated but of opposite polarity.

is calibrated in temperature, we have a direct reading pyrometer.

Pressure Generators—Another method of generating a difference of potential makes use of the ability of some natural materials to generate a voltage when pressure is applied. This is called the *Piezoelectric Effect*. The materials are tourmaline. Rochelle salts and quartz are all crystal structures similar to carbon or diamonds. They do, however, contain positive and negative ions whereas diamonds and carbon do not. Because they contain these ions they are capable of generating voltages whereas diamonds or carbon cannot. Only ionic crystals are Piezoelectric.

A piece of quartz crystal has the appearance of opaque or frosted glass and is as fragile. A quartz crystal (Fig. 1.16A) will generate a voltage between its opposing faces when a pressure is applied to it. When the pressure is removed and the crystal expands, a second voltage will appear but the polarity will be reversed (Fig. 1.16B).

Devices that use piezoelectric crystals are microphones, phonograph cartridges and oscillator circuits used for transmitter and receiver circuits and other amateur radio applications.

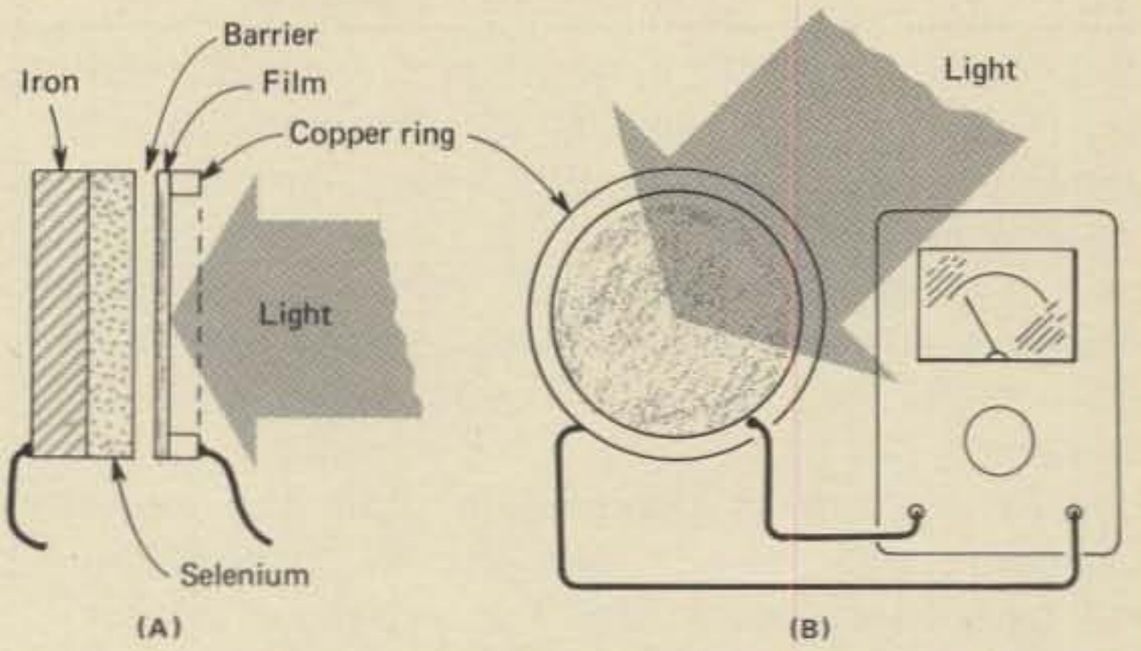

Fig. 1.17 (A)—Construction of a selenium type photoelectric cell. (B) Photoelectric cell combined with voltmeter produces a photographer"s light meter.

Five different methods of producing electricity.

Light Generated Electricity—It was pointed out earlier that electrons can break free from the valence ring of an atom if they picked up enough energy. The example given earlier was energy developed by friction, but there are other forms of energy that the electrons will accept. One of these forms is light. Certain types of material will actually release electrons from the atom's valence rings when struck by light. As the electrons are freed and leave, the material assumes a positive charge and thus a difference of potential has been developed. This is known as the *Photoelectric Effect* and the device as a *Photoelectric cell*.

WHERE TO BUY PARTS

	Catalog Page No.
VOLT-OHMMETER (VOM)	
Radio Shack #22-202	106
Lafayette #99P50734V	134
BAR MAGNETS	
Edmund Scientific Co., Barrington, New Jersey 08007	
Cylinder Magnet Pair 5"x⅜"	
Alnico II #P-60, 131	
ROLL OF #22 MAGNET WIRE	
Lafayette #32P02819V	132
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4-40 Nuts, Radio Shack #64-3018	115
Fahnestock Clips, Lafayette #33P71028	128
MICROPHONE	
Radio Shack #33-100	54
Lafayette #99P45106	59
SELENIUM CELL	
Radio Shack #276-115	93
TEST LEAD KIT	
Radio Shack #270-332	85

The construction of a typical photoelectric cell using selenium is shown in Fig. 1.17A. There is a metal base, usually iron, on which a layer of selenium is placed. The next layer, selenium oxide, is placed over the selenium; it is a very thin layer and called a *barrier*. Next, there is a very thin layer of gold or silver, so thin in fact, that it passes light. Finally, there is a copper ring around the outer edge of the gold layer that acts as an electrical connector.

When the cell is exposed to light, the energy passes through the gold film and the oxide barrier and falls on the selenium. The selenium releases electrons in accordance with the strength of light; the more light the more electrons released. The electrons pass through the barrier and collect on the gold film. The film becomes negatively charged and the selenium positively charged because the electrons cannot pass back through the barrier.

If a voltmeter is connected to a photoelectric cell as in Fig. 1.17B, the difference of potential causes electrons to flow through the wires and produce a reading on the meter. If the meter is calibrated in light intensity, the combination of the two become a photographer's light meter. Another application for the photoelectric cell is to power electronic equipment in space satellites using solar energy. These units are called solar cells and usually are made from silicon in preference to selenium, as silicon is more efficient and develops more power.

SELF CHECK QUESTIONS #3

1—The more electrons piled up on the left charge and the more electrons missing from the right charge in Fig. 1.10, the greater the difference of potential. T or F

2—When two charged bodies are connected together with a wire, electrons from the stronger charge will flow through the wire to the weaker charge. T or F

3—Difference of potential is measured in the number of electrons moving between charges. T or F

4—The strength of an electrical charge is measured in _____.

5—A battery generates electricity by the _____ method.

6—A battery is made up of several _____ connected together.

7—Most commercial power in this country is generated _____.

8—Thermal electricity is ideal for generating large quantities of power. T or F

9—A thermocouple and meter combined form a _____ used to measure heat.

10—Any crystal type material can develop a voltage using the piezoelectric effect. T or F

11—Enough electricity can be developed by light to power some electronic equipment. T or F

12—A photoelectric cell combined with a meter forms a _____ _____ _____.

SELF CHECK ANSWER KEY #3

1—T
2—T
3—F
4—volts
5—chemical
6—cells
7—magnetically
8—F
9—pyrometer
10—F, only ionic crystals
11—T
12—photographer's light meter.

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