

# Amateur Radio

Serving Amateur Radio Since 1945

CD 08240

# CQ

July 1977  
\$1.25

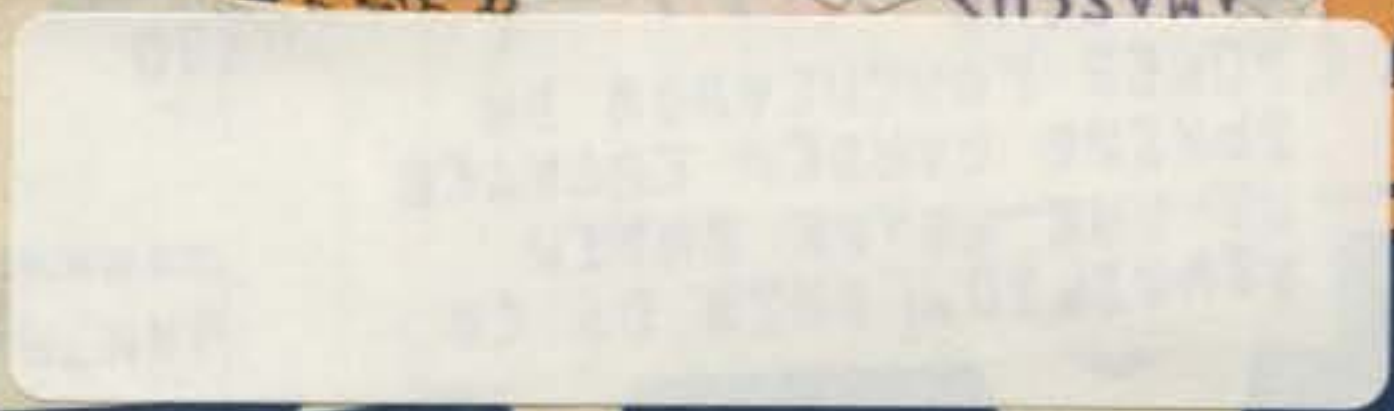


£

HAPPY BIRTHDAY AMERICA



Amateur's Journal





**KENWOOD** ..the Pacesetter in



There's excitement on the 2-meter band and Kenwood's TS-700A is the number one way to get there. There's more than just FM repeaters. SSB DX, OSCAR Satellite, CW... and do it all with the TS-700A.

4 MHz band coverage (144 to 148 MHz), completely solid state, AC and DC capability, automatically switches transmit frequency 600 KHz for repeater operation (146-148 MHz).

All this at a very attractive price.

# TS-700A



## SP-70

This companion external speaker provides outstanding audio characteristics for your TS-700A and TS-600.



2 METERS

2

6 METERS

TS-600





The Radio Amateur's Journal

EDITORIAL STAFF

Alan M. Dorhoffer, K2EEK
Editor
Morgan Godwin, W4WFL
Managing Editor
Kim Smith
Assistant Editor
Chris Kelly
Editorial Assistant

CONTRIBUTING STAFF

Frank Anzalone, W1WY
Contest Chairman
John A. Attaway, K4IIF
DX Editor
Herbert S. Brier, W9AD
Novice Editor
Robert Cox, K3EST
Larry Brockman, N6AR
W.W. Contest Directors
Rod Linkous, W7OM
Assistant DX Editor
William DeWitt, W2DD
SSTV Editor
A. Edward Hopper, W2GT
USA-CA Director
Robert Huntington, K6XP
WPX Award Manager
George Jacobs, W3ASK
Propagation Editor
Irwin Math, WA2NDM
Math's Notes
Donald McClenon, W3IN
160 M. Contest Director
Hugh R. Paul, W6POK
Technical Evaluations
William I. Orr, W6SAI
Antennas
Adrian Weiss, K8EEG/Ø
QRPp Editor
Bernie Welch, W8IMZ
WPX Contest Director

BUSINESS STAFF

Sanford R. Cowan
President
Richard A. Cowan, WA2LRO
Publisher/Advertising Sales
Jack Gutzeit, W2LZX
Advertising Sales Manager
Richard A. Ross, K2MGA
Assoc. Publisher
Cary L. Cowan
Accounts
Sarah Greenberg
Controller
Gloria Forsyth
Circulation Manager

PRODUCTION STAFF

Alan M. Dorhoffer, K2EEK
Production Manager
William H. Travis
Art Director
Liz Beener
Assistant Art Director
Sheryl Stern
Harold Perry
Art Staff
K & S Graphics
Illustrations

FEATURES

TOUCH CONTROL FOR THE CURTIS CHIP KEYERS
Albert H. Jackson, VE3QQ 17
CQ WORLD-WIDE WPX/SSB CONTEST ALL-TIME RECORDS
Bernie Welch, W8IMZ 22
BASIC RADIO: A NEW SERIES DESIGNED TO TEACH
ELECTRONICS FROM THE GROUND UP
Irving Tepper, WB2FUZ 24
THE WB2DCX PLUMBICON SSTV CAMERA, PART II
James E. McKeown, WB2DCX 29
NEW AMATEUR PRODUCTS 35
COHERENT C.W.—THE C.W OF THE FUTURE, PART II
Adrian Weiss, K8EEG/Ø 48
HOW RARE IS THAT COUNTRY?
John B. Irwin, K6SE/2 55
NEW LIFE FOR OLD METERS
Peter Jennings, VE3GEJ 58
REPLY TO A YL: "FB OM, UR SOLID COPY"
Ellen Marks, WA9ACO 60
IN FOCUS: THE PRACTICAL USES FOR SSTV
Bill DeWitt, W2DD 61
ANTENNAS: MULTIBAND ANTENNAS AND AN UNUSUAL
40 METER BEAM
William I. Orr, W6SAI 64
MATH'S NOTES: OPTICAL FIBERS CONTINUED
Irwin Math, WA2NDM 67
NOVICE: AMATEUR RADIO SIGNAL REPORTS
Herbert S. Brier, W9AD 69
THE 1977 CALIFORNIA DX CONVENTION
Jerry Hagen, N6AV 71

DEPARTMENTS

DX: RARE PREFIX AND ZONE NEWS
John A. Attaway, K4IIF 74
PROPAGATION: SHORT SKIP CHARTS FOR JULY AND AUG.
George Jacobs, W3ASK 78
AWARDS: STORY OF THE MONTH—
DAVID E. MANESCU, W6CCM
A. Edward Hopper, W2GT 80
CONTEST CALENDAR: CONTESTS FOR JULY AND
EARLY AUG.
Frank Anzalone, W1WY 82
ANNOUNCEMENTS . . . . . 9
OUR READERS SAY . . . . . 14
HAM SHOP . . . . . 92
ZERO BIAS . . . . . 5

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. Entire contents copyrighted Cowan Publishing Corp. 1977. CQ does not assume responsibility for unsolicited manuscripts. 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



# This NEW MFJ Super Antenna Tuner . . .

matches everything from 160 thru 10 Meters: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balance lines, coax lines.

Up to 200 watts RF OUTPUT. Built-in balun, too!



# \$69<sup>95</sup>

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, fatigue-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

P. O. BOX 494

MISSISSIPPI STATE, MS. 39762

CALL TOLL FREE . . 800-647-8660



# Zero Bias

an editorial

Our cover this month seems to depict the ideal way to enjoy amateur radio. A little dip in the pool, a light lunch perhaps at that comfortable chair pool-side and then maybe an hour or so at the rig. Idyllic? Well...maybe so but it's nice to dream now and then about the good life.

Actually, our cover photo was sent in by Jim Wise, W4PRO, and was taken by Don Johnson, WA4DUS. Jim and Don along with Terry Appleton, W4GSM, spent three weeks here at Marigot, French St. Martin, operating FG0CXV/FS7 last October as a DXpedition for our **CQ** DX Contest. I can only guess at the hardships they endured placing amateur radio on the map. During the three weeks they managed to make about 8,500 contacts on 160 through 10 meters, c.w. and s.s.b. Jim pointed out that several contacts were actually made through the Oscar satellite and these should constitute the first ever Oscar contacts from St. Martin. No word however, on where the picture was taken.

## **CQ Staff Burgeoning**

During April, the **CQ** staff was enlarged by two new members who many of you had the chance to meet at Dayton. Joining **CQ** as Managing Editor is Morgan Godwin, W4WFL. Morgan originally comes from Florida and comes to **CQ** via Davis Publishing in New York. He also spent some time up at Newington as Assistant Secretary handling membership, award and convention duties for QST. Along about the same time as Morgan accepted our offer, Jack Gutzeit, W2LZX, called me and asked if I could check some of his QSL's for one of our awards. He came into the office, I checked the cards and Jack was not only on his way to the award but also left that day as Advertising Sales Manager for **CQ**. A very happy coincidence. Jack has been a sales rep for a number of the major amateur manufacturers through the years and brings to **CQ** the benefit of his varied experiences in the field. As a matter of fact, I first met Jack about twenty years ago when I worked at a small, local distributor. Jack came in to say hello and left with an order. It also turned out that we were neighbors, living only several blocks apart.

Both Morgan and Jack are avid DXers and fishermen with Jack taking the leading edge on chasing DX. We at **CQ** welcome both Morgan and Jack to the team.

## **Pelee Island Expedition**

The following item was received kind of late to include in our Contest Calendar or Announcement sections and so I am including it here. It seems interesting and a lot of fun.

"In the minds of most people, the very mention of Canada usually conjures up two words; north and cold. After an unusually nasty winter, members of The Stratford Amateur Radio Club and The Palmerston & District Amateur Radio Club, put their thoughts together and decided that for at least a few weeks this summer, the two magic words should be south and warm. The result of this thinking is The Pelee Island Expedition. On July 21, a small Danish built sailing vessel 'Cherie' will leave Port Franks on Lake Huron and sail the 130 or so miles to the south end of Pelee Island on Lake Erie and establish the 'Southernmost Amateur Radio Station in Canada at Latitude N 41° 44.5'. The idea of this is to give members of both clubs a chance to have a little 'fun in the sun' at an unusual location and to give radio amateurs and SWL's a chance to work a station that offers something a little bit different. The Dept. of Communications has kindly granted us a special station license and the call sign is VE3PEL for this event. The station will be on the air from July 24 to August 4 and will be using both c.w. and Fone modes on 80, 40, and 20 meters. Although it is difficult to set down any particular operating schedule, we will do our utmost to give good coverage and insure everyone a contact. We have had a special QSL card run off on pale blue paper, using a reduction of the nautical chart covering the area of Lake Erie from Detroit River to Pelee Island. Our QSL address is Box 541, Federal Bldg., Stratford, Ontario, Canada.

## **Dayton Roundup**

Well another Dayton Hamvention is behind us and we're all back and almost all recuperated. Every year it seems to get bigger and bigger and pretty soon they'll have to find a larger place to hold it. This year was no exception with wall to wall people and exhibitors packing the arena all vying for the available air. Prizes, displays, flea markets, new goodies to buy or save for, make this event one of the best in amateur radio. They should give an

*(Continued on page 88)*



# the FCC, harmonics, spurious radiation, 40 dB, **and you.**

The First Report and Order, in docket 20777, requires that harmonic and spurious radiation from most hf amateur radio equipment must be attenuated by at least 40 dB. Can YOUR equipment meet this new regulation?



Drake MN-4



Drake MN-2000



Drake TR-4Cw



Drake T-4XC

#### It can...if it was made by R. L. Drake

R. L. Drake has been making equipment to meet these new regulations for the last 13 years. We didn't wait to be "forced" to produce quality equipment by FCC regulations.

#### It can...if you use a Drake Matching Network (tunable low-pass filter)

If you don't own Drake equipment, you can still use your present gear by adding a Drake MN-4 or MN-2000 Matching Network. Drake's Matching Networks, unlike most other networks, utilize the tunable low-pass filter type of matching (similar to a TVI filter) to provide 20 to 25 dB of harmonic attenuation in addition to producing a perfect impedance match. This, plus a direct reading SWR and forward rf power meter and built-in antenna selector provide the ultimate answer to the new FCC rules.

The Drake design philosophy has been meeting FCC radiation specifications before there were any! Think about it.

To receive a FREE Drake Full Line Catalog, please send name and date of this publication to:

**R. L. DRAKE COMPANY**



540 Richard St., Miamisburg, Ohio 45342  
Phone: (513) 866-2421 • Telex: 288-017

Western Sales and Service Center, 2020 Western Street, Las Vegas, Nevada 89102 • 702/382-9470



# think of yourself as an antenna expert! —you select your components!

**1** Get optimum performance band for band. Choose from medium or high power resonators for your favorite bands.

**2** Fold over, 360° swivel mast for quick band change or easy garaging. Select from two versions, fender/deck or bumper mount location.

**3** Stainless steel ball mount, 180° adjustable, commercial duty for superior mechanical and electrical performance.

**4** Get exceptional reports, broadest bandwidth, lowest SWR. Use with any convenient length 50 ohm coax. Matching devices not required.

**5** For convenience, use the Hustler stainless steel resonator spring, and special design quick disconnect.

...and you'll mobile  
with the experts' foremost  
choice... **HUSTLER**

Get fixed station reports from your mobile—operate 6-10-15-20-40-75 or 80 meters with the experts and join the vast majority using Hustler for nearly two decades.



Model SSM-2 Ball Mount



Model BM-1 Bumper Mount



Model QD-1 Quick Disconnect



Model RSS-2 Resonator Spring



Model L-14-240 Mil Spec 50 Ohm Feedline



Model MO-1 For Deck or Fender Location



Model MO-2 For Bumper Mount Location



Super Resonators RM(S) 2 KW PEP Greatest Coverage



Standard Resonators RM 400 Watts PEP

"the home of originals"

**HUSTLER**

Available from  
all distributors  
who recognize the best.

**new-tronics  
corporation**

15800 Commerce Park Drive  
Brookpark, Ohio 44142  
(216) 267-3150

HUSTLER ANTENNA PRODUCTS—for sixteen years—original designs—created and manufactured by American ingenuity, labor and materials—used by communicators throughout the world.

Hustler designs are patented under one or more of the following assigned to New-Tronics Corporation 3287732, 3513472, 3419869, 3873985, 3327311, 3599214, 3582951.



# Look closely at the new MT-3000A. You've never seen anything like it.



Times have changed since DenTron introduced its first tuner. With rapid growth in condominiums and housing developments, we have new problems that require new solutions.

DenTron decided to rethink the tuner and what its total capabilities should be.

The MT-3000A is a capsulized solution to many problems. It incorporates 4 unique features to give you the most versatile antenna tuner ever built.

First, as a rugged antenna tuner the MT-3000A easily handles a full 3KW pep. It is continuous tuning 1.8-30mc. It matches everything between 160 and 10 meters.

Second, the MT-3000A has built-in dual watt meters.

Third, it has a built-in 50 ohm dummy load for proper exciter adjustment.

Fourth, the antenna selector switch; (a) enables you to by-pass the tuner direct; (b) select the dummy load or 5 other antenna systems, including random wire or balanced feed.

The compact size alone of the MT-3000A (5½" x 14" x 14") makes it revolutionary. Combine that with its four built-in accessories and we're sure you'll agree that the MT-3000A is one of the most innovative and exciting instruments offered for amateur use.

At **\$349.50** the MT-3000A is not inexpensive. But it is less than you'd expect to pay for each of these accessories separately.

As unique as this tuner is, there are many things it shares with all DenTron products. It is built with the same meticulous attention to detail and American craftsmanship that is synonymous with DenTron.

After seeing the outstanding MT-3000A, wouldn't you rather have your problems solved by DenTron?

**DenTron**  
Radio Co., Inc.

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



# Announcing

• **Allentown, PA** — The tri-club Hamfest will be held July 17, 1977 from 8 a.m. to 5 p.m. at Allentown Police Academy pistol range in scenic Lehigh Parkway South at Allentown, PA. Admission is \$1.00 to all including sellers while children are free. Talk in is .34-.94 and .52.

• **Bowling Green, OH** — The wood County Arc annual Ham-A-Rama is Sunday, July 17, from 8 a.m. to 5 p.m., at the county fairgrounds in Bowling Green (about 25 miles south of Toledo). Free parking and admission. Donation \$1.00 advance, \$2.00 at the door. Table \$2.00. Talk-in on 146.52. Refreshments available. Write WCARC, 7929 Rudolph Rd., Rudolph, OH 43462.

• **Slater, MO** — The second annual Hamfest and Communications Show will be held on Sunday, July 24, 1977 at the Slater Park with fly-in facilities. Registration \$1.00 in advance; \$1.50 at the door. Sunday noon meal for a nominal fee. Flea markets, XYL activities. For information and advance tickets write Dale Beilsmith, W0KNF, Box 74, Slater, MO 65349, (816) 529-2173.

• **Oak Creek, WI** — The South Milwaukee Amateur Radio Club Swapfest '77' will be held on Saturday, July 9, 1977 at Shepard Park (American Legion Post no.434), 9327 South Shepard Ave., Oak Creek, WI. Activities begin at 7 a.m. and will run till about 5 p.m. Parking, picnic area, hot and cold sandwiches and liquid refreshments will be available on the grounds. Overnite camping is available. Admission is \$1 and includes a "Happy Hour" with free beverages. Prizes will be awarded. Talk-in on 146.94 MHz, F.M. More details: South Milwaukee Amateur Radio Club, Inc., S.F. Schreiter, W9AKF, Sec., 104 Brookdale Dr., South Milwaukee, WI 53172.

• **McKeesport, PA** — The Two Rivers Amateur Radio Club of McKeesport will hold its annual Hamfest on Sunday, July 17, 1977 at the Green Valley Fire Dept. grounds off U.S. Rt. 30 near East McKeesport. Check-in on 52/52 and 22/82. For information write Andrew Salit-

ros, W3OFM, 2901 Stewart St., McKeesport, PA 15132.

• **Harrisburg, PA** — The Harrisburg Radio Amateur Club's annual hamfest is scheduled for Monday, July 4, 1977 at the Indian Echo Caverns, located between Harrisburg and Hershey, PA; just off routes 422-322. Registration is \$2. Free tailgate space.

• **Indianapolis, IN** — The sixth annual Indianapolis Hamfest will be held on Sunday, July 10, 1977 at the Marion County fairgrounds. Our gate admission is still \$2, just as it has been for the past four years. This includes in and out privileges, hourly prize drawings, plus at the end of the day all the ticket stubs are put back into the prize barrel for the main prize drawing. Also, we have a large indoor flea market. A large outdoor flea market area is also available. In interest to you, flea marketeers, we have over 2,000 in attendance. As of last year, door prizes will be given away at the forums. For you campers, come down early. Over 100 campsites are available. If you are not already on our mailing list, please drop us a line at our address, Indianapolis Hamfest, P.O. Box 1002, Indianapolis, IN 46206.

• **Saratoga, UT** — The Utah Amateur Radio Club will hold it's annual hamfest and steak fry on July 16th at Saratoga resort. Saratoga is located between Salt Lake City and Provo on Utah Lake. The bill of fare will include swap tables, c.w. contest, homebrew contest, oscar demo, womens activities, steak fry and many more. On grounds, camping is available. Registration is \$2 for UARC members, \$5 for non-members and \$1 for children under twelve. Events commence at 9 a.m. and run until after dark. Talk in will be on the clubs 16/76 repeater. For more info contact: John Dehnel, c/o the Utah Amateur Radio Club, 1547 Redondo, Salt Lake City, UT 84105.

• **Flushing, NY** — The Flushing Radio Amateur Technical Society is sponsoring free licensing classes. They will be held at the Forest Hills High School, 67-

01 110th St., Room 351, 7:30 p.m. Inquiries should be sent to. FRATS, 62-26 Boelsen Crescent, Rego Park, NY 11374.

• **Charleston, SC** — On July 10th, 1977, the 4th annual Charles Towne Hamfest will be held. Again this year, we are making available space to selected firms for exhibits of their products. Last year attendance at the swapfest was 573. There are approximately 150 others who did not attend the swapfest but were present for other Hamfest events. Our mailing list will exceed 2500 active amateur radio operators. We plan to advertise and gain the attendance of Citizen Band operators to introduce them to amateur radio. For further info contact B.E. Myers, Jr., WA4QWL, 4470 Mixedwood Drive, Ladson, SC 29456, 803/873-0646.

• **Mrs. Cecile J. Gibbs** has retired on May 31, 1977, after serving thirty-two years with the Federal Communications Commission. Mrs. Gibbs, better known by the amateur radio operators, commercial communications companies, and shipping interests, as "Granny Gibbs", is held in the highest esteem for her genial manner and unflinching assistance to the public. During her thirty-two years of service, Mrs. Gibbs has served with the following engineers: L.L. McCabe, J.H. McKinney, E.H. Marshall, C.R. Williams, and lastly, Daniel A. Cantrell.

• **Norfolk, VA** — The annual Division Convention of the ARRL will be held on July 9th and 10th, in the SCOPE Cultural and Convention Center in Norfolk, VA. Advanced tickets are \$2.50, \$3.50 at the gate. Tables are \$10 per day per car space which includes one admission ticket. Booth rental for a single is \$75 for two days and \$125 for the double for the two days. For reservations in the Holiday Inn SCOPE call 800/238-5400 or the new OMNI International 800/241-5500. Mention the ARRL Convention for lower rates. For further info contact Vernon H. Fix, W4THN, Tidewater Radio Conventions, Inc., Box 9371, Norfolk, VA 23505.



# 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*

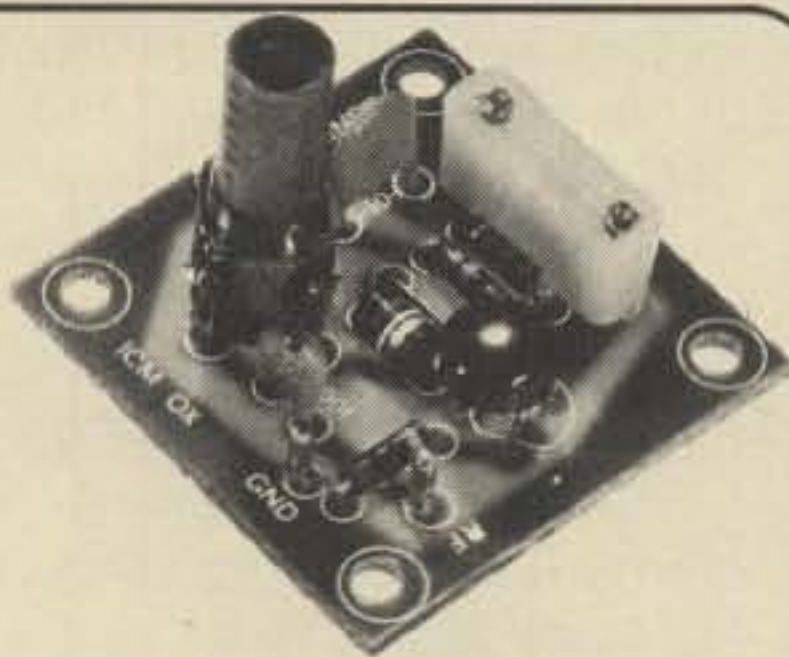
11240 W. Olympic Blvd., Los Angeles, Calif. 90064 213/477-6701  
 931 N. Euclid, Anaheim, Calif. 92801 714/772-9200  
 Butler, Missouri 64730 816/679-3127

Prices subject to change without notice.



# for the experimenter!

INTERNATIONAL CRYSTALS & KITS  
OSCILLATORS • RF MIXER • RF AMPLIFIER • POWER AMPLIFIER



### OX OSCILLATOR

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

\$3.95 ea.



### MXX-1 TRANSISTOR RF MIXER

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

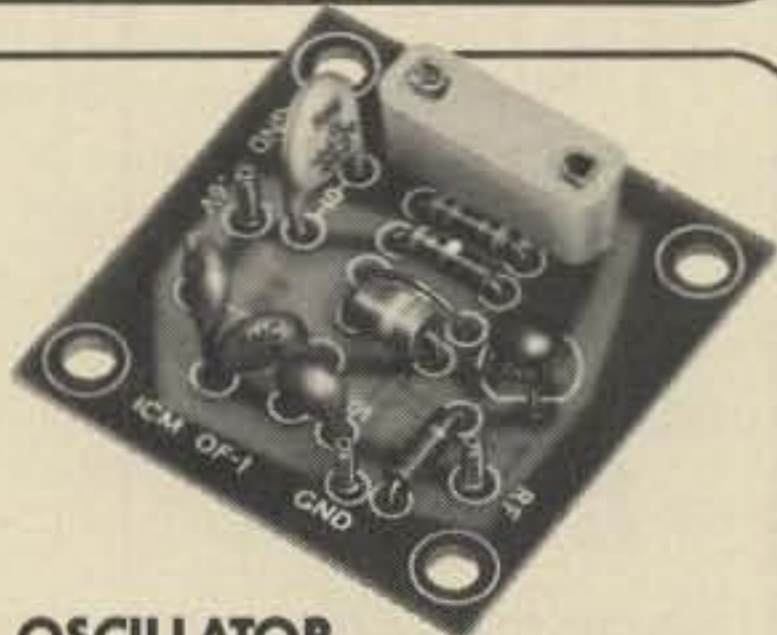
\$4.50 ea.



### PAX-1 TRANSISTOR RF POWER AMP

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

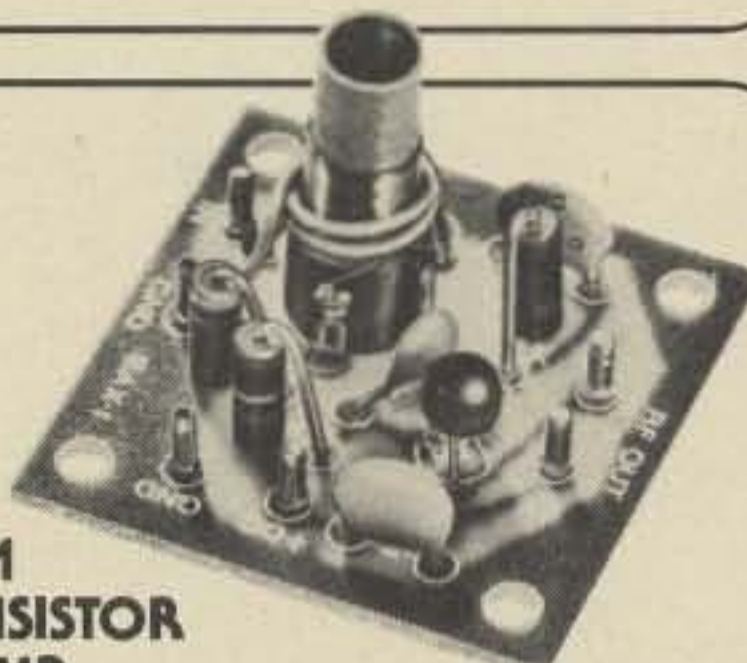
\$4.75 ea.



### OF-1 OSCILLATOR

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

\$3.25 ea.



### SAX-1 TRANSISTOR RF AMP

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

\$4.50 ea.



### BAX-1 BROADBAND AMP

General purpose amplifier which may be used as a tuned or untuned unit in RF and audio applications. 20 Hz to 150 MHz with 6 to 30 db gain. Cat No. 035107  
*Specify when ordering*

\$4.75 ea.



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

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

Shipping and postage (inside U.S., Canada and Mexico only) will be prepaid by International. Prices quoted for U.S., Canada and Mexico orders only. Orders for shipment to other countries will be quoted on request. Address orders to:

M/S Dept., P.O. Box 32497,  
Oklahoma City, Oklahoma 73132.



International Crystal Mfg. Co., Inc.

10 North Lee  
Oklahoma City, Oklahoma 73102



# NEW FROM HY-GAIN 2-METER BEAMS THAT LAST LONGER. WORK HARDER. AND COST LESS.

Introducing a whole new generation of Hy-Gain 2-Meter beams.

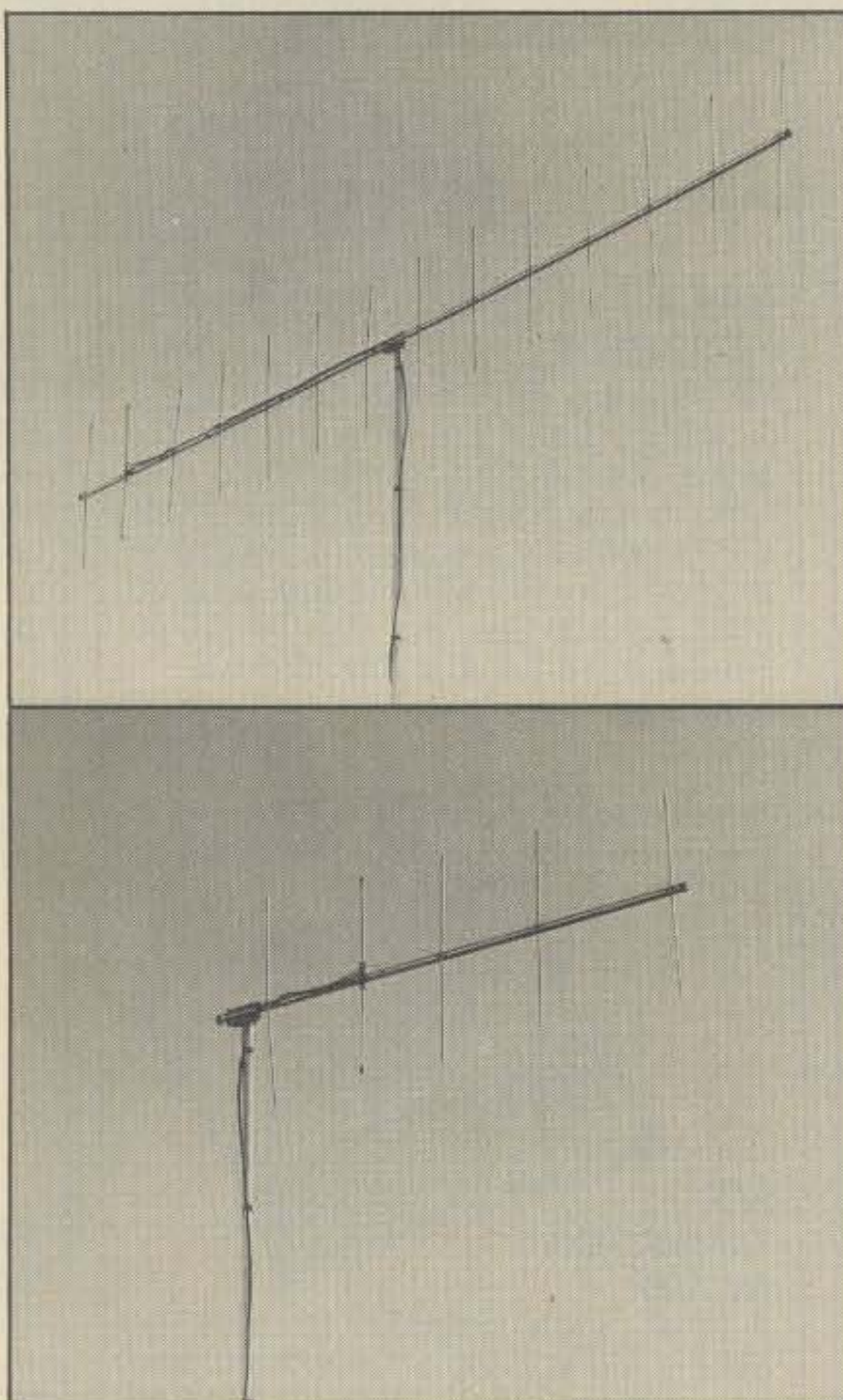
Completely redesigned for greater strength and corrosion resistance. So they last longer.

Newly engineered for greater performance and maximum efficiency. So they work harder, your transceiver works better.

And built better. So you pay less for the performance you want.

Our new 2-Meter beams give you the kind of performance you expect from the world's largest manufacturer of quality antennas. Yet, thanks to Hy-Gain technology, they weigh less, have lower wind loading and are UPS shippable.

They use an exclusive new element to boom mounting system that's mechanically stronger and electrically more efficient. All can be



vertically or horizontally polarized. And all are constructed of the finest aluminum and ZMI hardware.

**Hy-Gain 214** 14-element close spaced beam with extremely high forward gain and narrow beam width. **\$26.95**

Also available with 8-element optimum spacing, **Hy-Gain 208. \$19.95**

**Hy-Gain 205** 5-element optimum spaced end mount beam with high forward gain and broad frequency response. **\$16.95**

Also available with 3 elements, **Hy-Gain 203. \$12.95**

See the new generation of Hy-Gain 2-Meter beams at your amateur radio dealer. Or write Hy-Gain; 8601 Northeast Highway Six; Lincoln, NE 68505.

**hy-gain**

**WE KEEP PEOPLE TALKING.**

Hy-Gain reserves the right to change prices, designs and/or specifications at any time without notice.

SPECIFICATIONS	214	208	205	203
<b>Mechanical</b>				
Boom length	186"	148 3/4"	75"	43 1/2"
Longest element	39 1/2"	40 1/4"	39 5/8"	40 1/4"
Turning radius	95"	75 1/8"	73"	43 1/2"
Wind survival	80 mph	80 mph	80 mph	80 mph
Mast diameter	1 1/4"-1 5/8" O.D.	1 1/4"-1 5/8" O.D.	1 1/4"-1 5/8" O.D.	1 1/4"-1 5/8" O.D.
Boom diameter	1 1/4" O.D.	1 1/4" O.D.	1 1/4" O.D.	1 1/4" O.D.
Wind load area	1.65 ft <sup>2</sup> max.	1.26 ft <sup>2</sup> max.	.740 ft <sup>2</sup> max.	.496 ft <sup>2</sup> max.
Net weight	5.5 lbs	4.1 lbs	2.9 lbs	2.2 lbs
<b>Electrical</b>				
Forward gain	13.0 dBd*	11.8 dBd*	9.1 dBd*	6.1 dBd*
Front-to-back ratio	20 dB	20 dB	20 dB	20 dB
Maximum SWR	2:1	2:1	2:1	2:1
Band width	2 MHz	2 MHz	4 MHz	4 MHz
Maximum power	250/500 PEP	250/500 PEP	250/500 PEP	250/500 PEP
Impedance w/balun	52 ohms	52 ohms	52 ohms	52 ohms
1/2 power beam width	35° vertical	43° vertical	60° vertical	95° vertical
	35° horizontal	36° horizontal	45° horizontal	60° horizontal
Stacking distance	82" min.	82" min.	82" min.	82" min.

\*Hy-Gain antennas are gain rated against a standard dipole antenna (dBd) instead of a theoretical isotropic source (dBi). This is a more honest and realistic means of comparing forward gain.



# WHFF



The hottest 2-meter mobile rig on the market. Features a brand new and unique squelch system with continuous tone coded squelch, tone burst, or carrier squelch. Full 4 MHz band coverage and 25 watt output. It's phase-locked loop (PLL) frequency synthesizer provides operation on 800 channels. The TR-7400A's list of features goes on and on, but even more important is its superb performance and dependability... and all at a surprisingly low price.

## TR-7400A



## TR-7200A

Kenwood's other 2-meter FM mobile transceiver... compact, rugged and packed with features like a priority channel for your favorite frequency, 146-148 MHz coverage, 22 channels (6 supplied), completely solid state, and 10 watt output. Shown with the PS-5 AC power supply for home operation.



## TV-502

An easy way to get on the 2-meter band with your TS-520, TS-820, (and most other transceivers.) Simply plug it in and you're on... SSB and CW.

## TR-2200A



A high performance portable 2-meter FM transceiver that's Kenwood throughout. 146-148 frequency coverage, 12 channels (6 supplied), 2 watts or 400 mW RF output, and provisions for external 12 VDC operation.



## TV-506

Discover the excitement of 6-meters with your TS-520, TS-820, (and most other transceivers) together with the TV-506 transverter. Its 10 watt output will provide you with many hours of enjoyable 6 meter operation.

Want more information? See this fine equipment at an authorized Kenwood dealer or write for detailed specifications.

Kenwood has opened the 6-meter band to the amateur who wants to go first class without paying an arm and a leg. Behind its pretty face is a ruggedly built, versatile performer offering full 4 MHz coverage (50-54), all modes (SSB, FM, CW, and AM), and 10 watts out.







# WHO ELSE BUT KENWOOD

WHO ELSE BUT KENWOOD CARES ENOUGH TO OFFER FINE AMATEUR RADIO GEAR IN ALL THREE SEGMENTS OF THE RF SPECTRUM... *HF, VHF, AND NOW UHF*. EQUIPMENT FOR THE NOVICE JUST COMING UP FROM CB TO THE EXTRA CLASS "OLD TIMER", PORTABLE, MOBILE OR BASE STATION, 2 METER OR 6 METER OR EVEN THE SPECIAL INTEREST OPERATOR WHO WANTS A "KENWOOD" QUALITY 450 MHz RIG LIKE THE *TR-8300*\*. A DEDICATION TO DESIGNING AND BUILDING THE VERY FINEST EQUIPMENT POSSIBLE... A DEDICATION TO INNOVATIVE ENGINEERING BACKED BY A SOLID SERVICE POLICY... A DEDICATION TO EVERY DOLLAR YOU SPEND... WHO GIVING YOU MORE SATISFACTION FOR ELSE BUT KENWOOD... *THE PACE-SETTER IN AMATEUR RADIO.*



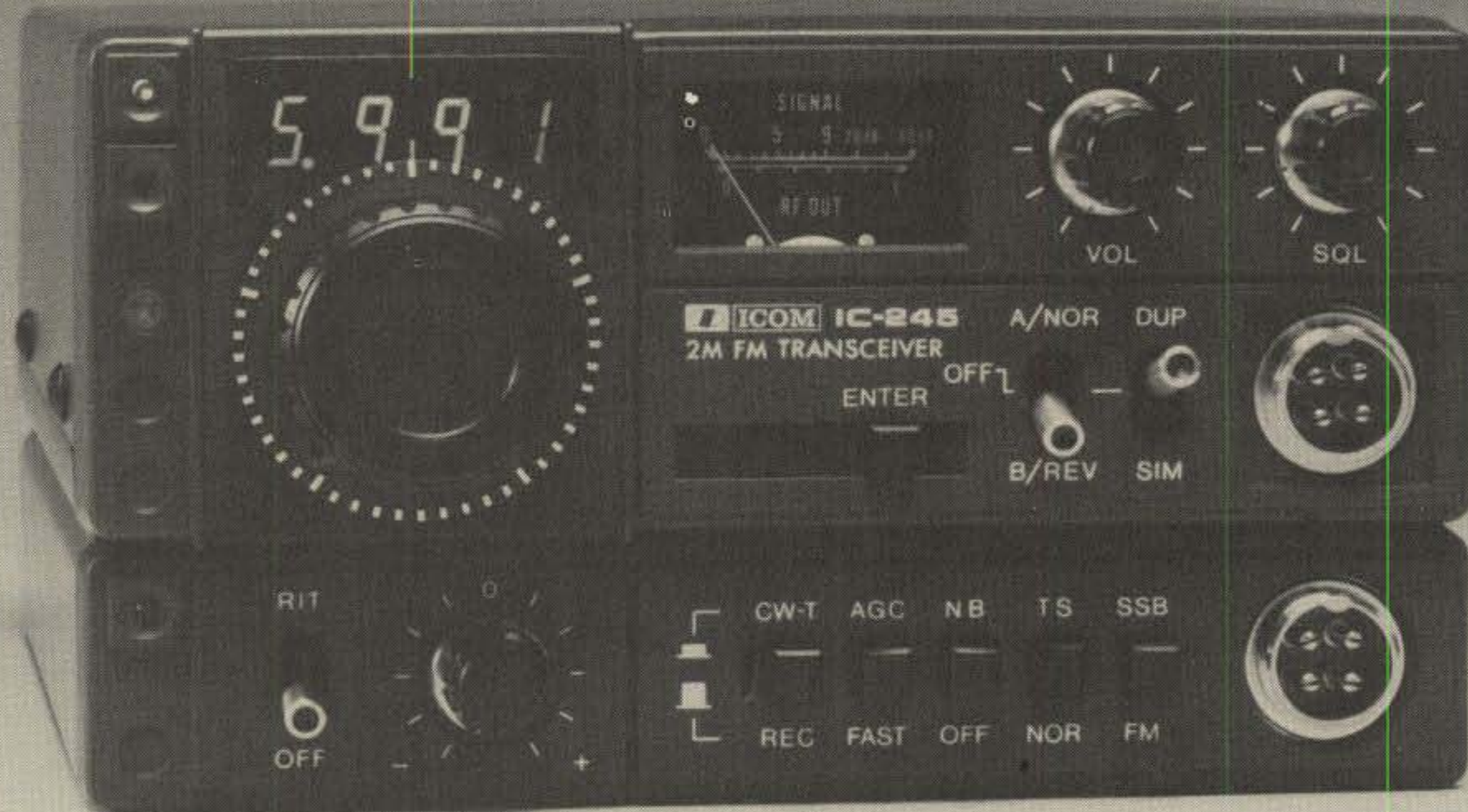
\*THE TR-8300 IS KENWOOD'S NEWEST OFFERING... A 450 MHz MOBILE/BASE STATION RUNNING 10 WATTS WITH 22 CHANNEL CAPABILITY. AVAILABLE IN JUNE. (SUBJECT TO FCC CERTIFICATION.)



 **KENWOOD**  
...pacesetter in amateur radio

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





# 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 programmed with the LSI Synthesizer.
- **Remote programming:** The **IC-245/SSB** LSI chip provides for the input of programming 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  
MODES

\*144.00 to 148.00 MHz  
FM (F3)

\*\*SSB (A3J), CW (A1)

DC 13.6V ± 15%

90° x 135W x 238D

2.7

SUPPLY VOLTAGE  
SIZE (mm)  
WEIGHT

TRANSMITTER  
TX OUTPUT

F3 10W

\*A3J 10W (PEP), A1 10W

CARRIER SUPPRESSION

40 dB OR BETTER

SPURIOUS RADIATION  
MAXIMUM FREQUENCY  
DEVIATION  
MICROPHONE IMPEDANCE

-80 dB BELOW CARRIER

±5KHz

600 OHMS

RECEIVER  
SENSITIVITY

\*A3J, A1 0.5 MICROVOLT

INPUT GIVES 10 dB S+N/N

±3 DB MICROVOLT OR LESS

FOR 20 dB QUIETING

S+N + DN AT 1 MICROVOLT

INPUT 30 dB

SQUELCH THRESHOLD  
SPURIOUS RESPONSE

-8 dB OR LESS (F3)

-60 dB OR BETTER

SYNTHESIZER  
FREQUENCY RANGE  
STEP SIZE

144 MHz to 148 MHz

5 KHz for FM

\*100 Hz or 5 KHz for SSB

PER C IN THE RANGE OF -10

TO +69C ±0.0000145%

STABILITY

\*VALID WITH SSB UNIT ONLY

VHF/UHF AMATEUR AND MARINE COMMUNICATION EQUIPMENT

Distributed by:



# ICOM

**ICOM WEST, INC.**  
Suite 3  
13256 Northrup Way  
Bellevue, Wash. 98005  
(206) 747-9020

**ICOM EAST, INC.**  
Suite 307  
3331 Towerwood Drive  
Dallas, Texas 75234  
(214) 620-2780

**ICOM CANADA**  
7087 Victoria Drive  
Vancouver B.C. V5P 3Y9  
Canada  
(604) 321-1833



# Our Readers Say

## Amateurs Strike Back

Editor, CQ:

This letter is in reference to my article in the April 1975 issue of CQ. I hope that this will answer some of the questions for you nice readers who have been expressing interest and asking for more information. I appreciate your interest and know you are trying to find ways to help others by my ideas. Here are a few answers to the questions asked so far. Perhaps they will help you.

The audio transducer is a speaker in itself. Instead of the deaf and deaf-blind using a regular P.M. speaker, they use the audio transducer. It is possible to take a transistor radio cassette recorder that is no good and remove the little speaker which can be used for a miniature transducer. I have a tiny 1 inch speaker in my telephone device so that I don't have to use the big audio transducer when calling someone on the phone.

The transducer that was featured in CQ is three inches from the cone but it is inside a heavy steel chassis. This was built around it to protect the fragile cone from damage. Therefore, it is too heavy to carry around with me and it is easier to carry a tiny one. It is also possible to connect a small speaker to a hearing aid and use earphones at the same time. However, this must only be done by using a double adapter so that the speaker is on one side and the headset is on the other side. I have done this successfully and have even connected two transducers. That way it works very well.

One must remember it takes into the picture the problem of connecting two impedances in parallel. This is not as bad as it seems. If the impedance is low, there should be no problem. Also, the impedances should be the same instead of two different ones. I use 8 ohm speakers, and they are connected in par-

allel, the total impedance is 4 ohms. That really gives great effect, try it!

I do not have the address of the company in New Zealand that makes path-sounders. However, I know Mr. Lindsay Russell, Sensory Aids and Evaluation Development Center, Massachusetts Institute of Technology, Cambridge, MA, is the sole manufacturer of them. So contact him for further information. I was a trainee of the pathsounder after he gave it to my teacher and the training is very involved. The construction is not released to students of the program. I was and still am in the program.

Gayle Sabonaitis, WA1OPN  
Worcester, MA

Editor, CQ:

The article by Jack Anderson printed April 4, in many local papers, is an attack on amateur radio. Like many hams, I'm fighting mad that such garbage can be printed. But to get to the root of the matter, we have got to get beyond Jack Anderson the individual and see what he really represents. Jack Anderson is acting as the mouthpiece of the "CB industry". That is, all the electronics firms that have made a real killing in the "CB Boom" of 1976. By demanding that hams, "the elite", turn over the higher frequencies to public and CB use, he is putting out the position of these firms. They see the potential for a new market here, just as they saw for CB. And no matter what Mr. Anderson says about 'hams in high places' in the FCC, the fact of the matter is that the change from 23 to 40 channels, under the cover of serving the public, was a move to open the CB market up even wider to these electronic firms. Every action of the FCC in the last year has been with this purpose. From instituting the 'Temporary Permit' to conceding to the dropping of license fees until they can work out a

'new schedule'. In 1975, 4 million CBs were sold for \$1 billion. The price to make these CBs was \$440 million. That's a whopping 127% profit. In 1976, 7.5 million sets were sold. You can imagine what was made off of those sets. It is this interest that Mr. Jack Anderson is speaking for. The thought to these firms of all these amateur bands being "wasted" on people who make up such a small share of the market, and in fact can build their own sets without having to buy them, is making them go crazy. Mr. Jack Anderson is trying to set up public opinion against hams and divide the users of the two radio services against one another. I am a "CBER" still. It was through CB that I became a ham, as many have. But I am opposed to giving up any amateur bands to CB or public use to serve the money interests of profit hungry electronics firms! I can tell by your recent editorials that CQ is not a run of the mill ham mag.

Mike Beck, WD9AQM  
Chicago, IL

Editor, CQ:

I think it appropriate that Messrs. Anderson and Whitten's column "FCC Stifles Millions of CB Users", which appeared in the Post's comic section (April 4, 1977), for the column is so lacking in accuracy that it certainly cannot pass for news.

I am particularly concerned with the statement that the "...hams now control more frequencies than all the nation's police and fire departments combined, plus all commercial and educational FM broadcasters, plus all the TV stations on the VHF channels in Los Angeles and New York City". Using as a reference the latest edition of the Broadcasting Year Book, and ignoring the frequencies used by the police and fire departments, the "confidential re-



# IS YOUR ANTENNA EFFICIENT?

EVERY BALANCED ANTENNA NEEDS  
A BALUN FOR

- ♦ MAXIMUM EFFICIENCY
- ♦ FULL POWER CAPABILITY
- ♦ LOW TVI RADIATION

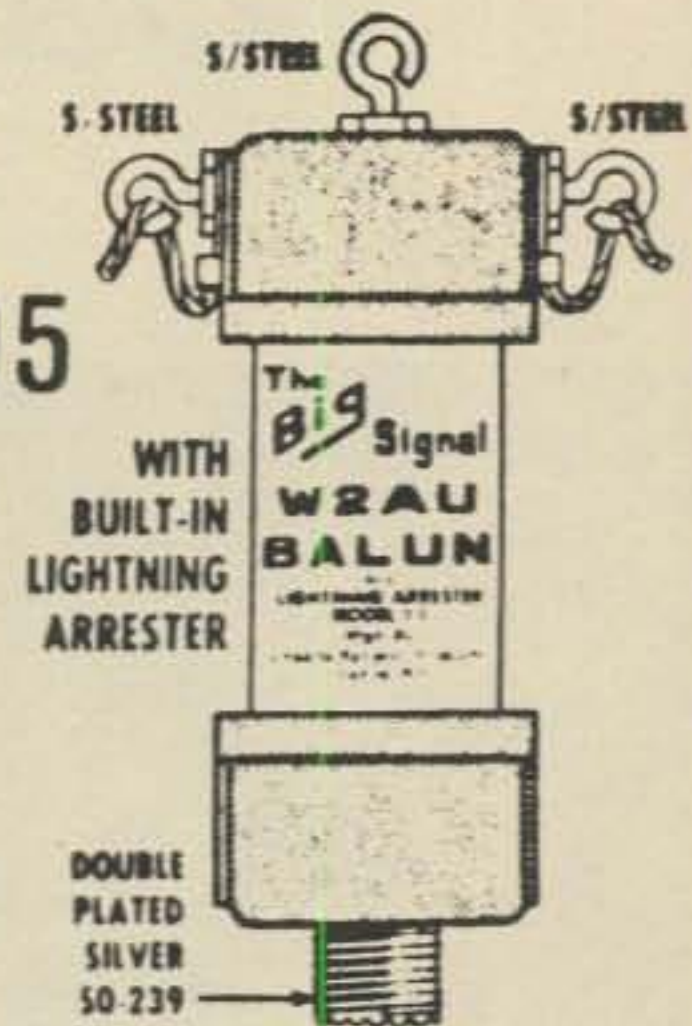
DIPOLE, FOLDED DIPOLE, INVERTED V  
MULTI-BANK, BEAM OR QUAD

## "W2AU" BALUN THE BIG SIGNAL

FOR  
10 YEARS  
JUST -

# \$12<sup>95</sup>

Postpaid



WRITE FOR FREE CATALOG OF THE W2AU BALUN

Send  'W2AU' BALUNS 1:1  4:1   
I enclose: Check  M.O.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_

Zip \_\_\_\_\_

UNADILLA RADIATION PRODUCTS DIVISION

**M**ICROWAVE  
FILTER  
**FC**OMPANY, INC.

CALL TOLL FREE - 800-448-1667 (IN N Y - 800-962-7965)

6743 Kinne Street, East Syracuse, New York 13057

At your local  
dealer or  
**ORDER DIRECT.**

port" to which reference is made in the column of more than 104 MHz of the spectrum (20 MHz for the FM band, 42 MHz for VHF channels in Los Angeles, and 42 MHz for VHF channels in New York City). Excluding the bands which the amateurs share with the Government Radio Positioning Service (which has priority over the use of these bands) the amateurs have only 11.3 MHz of spectrum space. Further, some of this spectrum space is shared with the Broadcast Service and with various commercial and government (foreign) radio services. This hardly represents the wholesale control of the radio frequency spectrum, which is implied by the comments of Anderson and Whitten!

How important are the bands allocated to the Amateur Service? By virtue of its access to the radio frequency spectrum, the Service can be: a provider of emergency communications resources; a teacher of electronics theory and practice; a teacher of communications principles and practices; a developer of electronic design and techniques; a developer of spectrum conservation techniques; a source of technically-trained personnel for industry and the military; a medium for international friendship

and understanding; and an outlet for the retired and the handicapped.

The above are but 8 reasons why spectrum space should be allocated to the Amateur Service. Should Anderson and Whitten require more, I would be pleased to discuss the matter with them.

Finally, the column on CB users is so blatantly misleading as to suggest that all of Anderson and Whitten's work is open to question.

Theodore J. Cohen, PhD, N4XX  
Alexandria, VA

### Someone does care

Editor, CQ:

I would like to bring it to your attention that my wife and her twin sister were disappointed to see that only 2 pints of blood were donated for Sam. I cannot myself donate blood but would if I could. These girls have common O-positive blood but they are rare because they are identical Albino twins. Although O-positive blood is common, it is much needed because so many people have it also. They gave through the Syracuse Red Cross on December 23, 1976. 2 pints in Sam's name. They just gave blood a week ago so they will have to

wait another 56 days and then they will donate another 2 pints for Sam. They are Sheila Greene and Sharon Thompson. Some people at the Federal Building donated blood. Sheila gave them Sam's name. We hope this in some way proves that people do care.

Charles G. Thompson  
Syracuse, NY

### Writers Take Note

Editor, CQ:

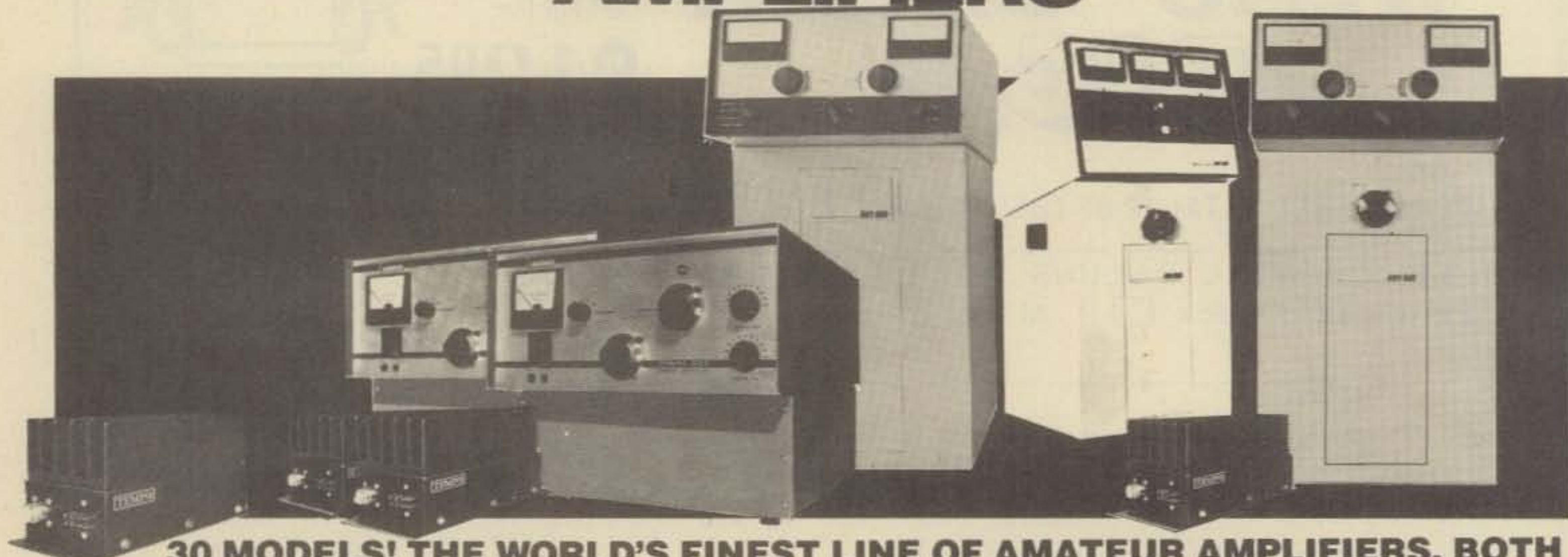
I am writing this letter to you and to those who submit construction articles to you in the future. I would like to think that I am speaking for several thousand newcomers to amateur radio as well.

Most of us cannot read schematics. Most of us do not have "junk boxes" stuffed with scrap suitable for use in construction projects. And many of us do not have a fully equipped machine shop at our disposal. The nearest electronic parts supplier is usually a Radio Shack store. If a picture is worth a thousand words, then many of the construction projects could be shortened

(Continued on page 90)



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



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

## 2K-4...THE "WORKHORSE"

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

## 3K-A COMMERCIAL/MILITARY AMPLIFIER

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

## 4K-ULTRA

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

## TEMPO 6N2

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

## TEMPO 2002

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

## TEMPO 2006

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

## TEMPO VHF/UHF AMPLIFIERS

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

Model	Drive Power	Output Power	Price	Model	Drive Power	Output Power	Price
<b>LOW BAND VHF AMPLIFIERS (35 to 75 MHz)</b>							
Tempo 100C30	30W	100W	\$159.	Tempo 100C10	10W	100W	\$149.
Tempo 100C02	2W	100W	\$179.				
<b>HIGH BAND VHF AMPLIFIERS (135 to 175 MHz)</b>							
Tempo 130A30	30W	130W	\$189.	Tempo 80A02	2W	80W	\$159.
Tempo 130A10	10W	130W	\$179.	Tempo 50A10	10W	50W	\$ 99.
Tempo 130A02	2W	130W	\$199.	Tempo 50A02	2W	50W	\$119.
Tempo 80A30	30W	80W	\$149.	Tempo 30A10	10W	30W	\$ 69.
Tempo 80A10	10W	80W	\$139.	Tempo 30A02	2W	30W	\$ 89.

## UHF AMPLIFIERS (400 to 512 MHz)

Tempo 70D30	30W	70W	\$210.	Tempo 40D01	1W	40W	\$185.
Tempo 70D10	10W	70W	\$240.	Tempo 25D02	2W	25W	\$125.
Tempo 70D02	2W	70W	\$270.	Tempo 10D02	2W	10W	\$ 85.
Tempo 40D10	10W	40W	\$145.	Tempo 10D01	1W	10W	\$125.
Tempo 40D02	2W	40W	\$165.				

Linear UHF models also available

## TEMPO 100AL10 VHF LINEAR AMPLIFIER

Completely solid state, 144-148 MHz. Power output of 100 watts (nom.) with only 10 watts (nom.) in. Reliable and compact ...\$199.00

TEMPO 100AL10/B BASE AMPLIFIER ...\$349.00

please call or write for complete information.

# Henry Radio

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

Prices subject to change without notice.



**Here's something to whet the appetite of most of us. Albert Jackson's construction techniques have inspired many CQ readers over the years.**

# Touch Control For The Curtis Chip Keyers

BY ALBERT H. JACKSON\*, VE3QQ

**W**ith the Curtis solid-state electronic key-on-a-chip, semi-automatic c.w. has at last entered the space age. The very compact 8043-2 and 8044-2 kits are easy to assemble and make excellent keyers. Price-wise, they compare well with other devices requiring considerably more space. The company also markets its unique 16-pin dual-in-line IC chips in finished keyers of varying complexity.<sup>1</sup> What's needed to complete this modern concept is an up-to-date interfacing hand control, such as the "touch" unit described here.

## A State-of-the-Art Paddle Key

Though the solid-state touch-operated key was introduced in *CQ* a number of years ago,<sup>2</sup> an updated version of this not very complicated gadget provides a nearly ideal match for the present-day Curtis keys, without any moving parts or sacrifice of features. Interested? Read on.

In case you've forgotten, a true touch-key is body-capacity actuated, and its *stationary* paddle section responds to very light contact with finger or thumb. Its lack of required motion can aid high-speed sending, and there are no springs, bearings or contacts to adjust or service.

Normally the Curtis chips, when connected for negative (blocked grid) output, place the frames of ordinary paddle keys at the keyer supply voltage above ground. Not so with this one: its case and touch-plates remain d.c. grounded at all times.

\*90 Fox St., Penetanguishene, Ontario, Canada LOK1PO.

<sup>1</sup>"A Close Look at the Curtis 8043 Keyer Chip," *CQ*, Feb. 1975, p. 39.

"Curtis EK-430 Keyer and 8044-2 Keyer Kit," *QST*, Feb. 1976, p. 43.

"Curtis IK-440 Instructokeyer," *QST*, Mar. 1976, p. 39.

<sup>2</sup>Jackson, A. H., "The Touch-Key," *CQ*, Nov. 1964, p. 28.

## Operation

In the new circuit, more stable silicon transistors replace the original germanium types, and only one d.c. source is needed instead of two. Both dot and dash sides contain a Hartley oscillator, this time operating at a power input slightly over half a milliwatt, each followed by one or two switching transistors as necessary for negative or positive output selection. Touching either touch-plate stops the oscillator on that side causing it to draw several times its running current, and this closes the following transistor switch(es) across the keyer dot/dash input.

Oscillator frequencies are set near, and may shift just above the high end of the broadcast band. Interference is possible if a receiver is close enough,



*Here is the touch-control in the operating position. The cover is a paint-can top, and the unit works equally well with the 8044 chip.*



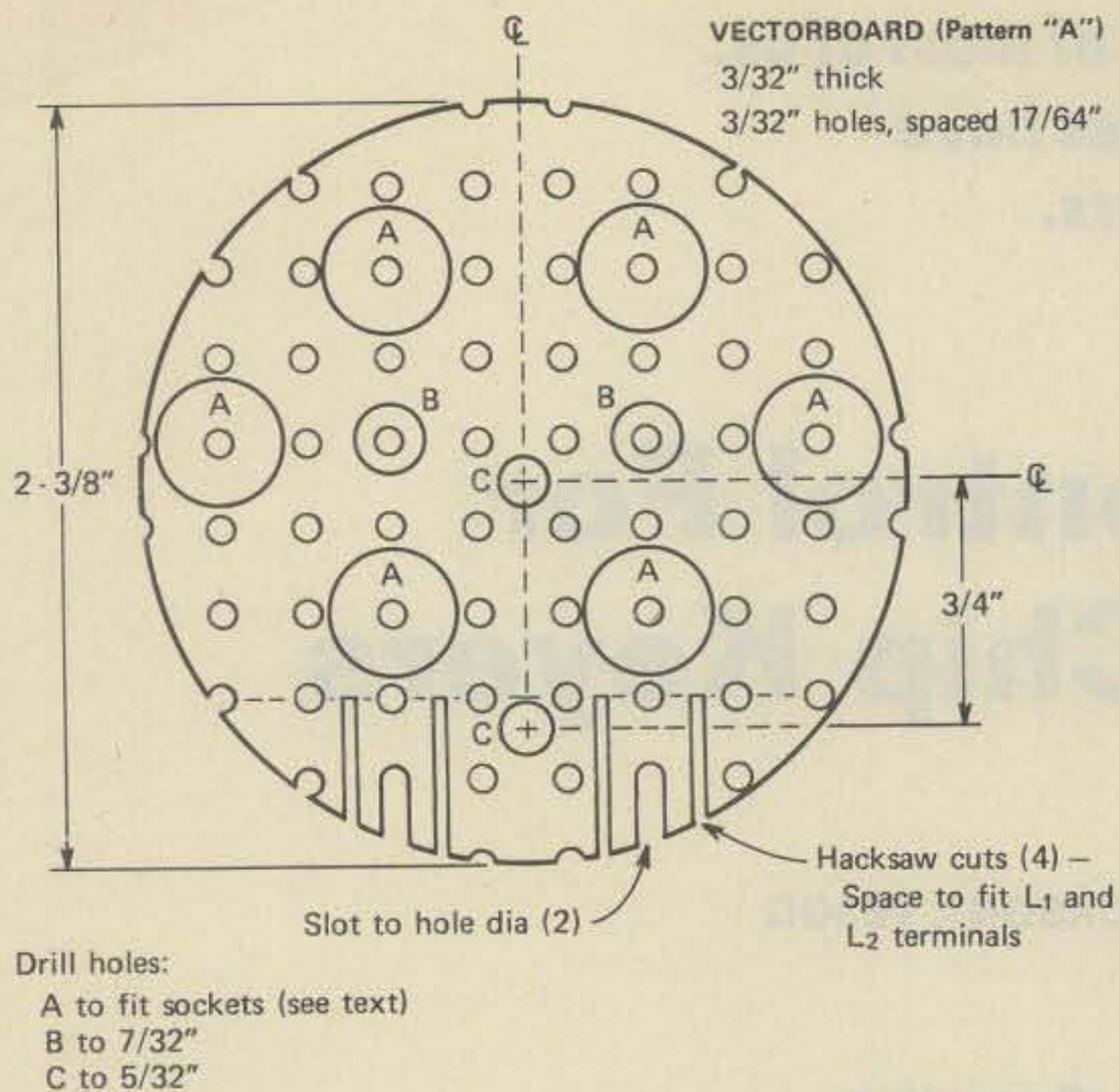


Fig. 1—Here are details of the symmetrical circuit board. The pre-punched holes are used wherever possible to center drills, mount parts, etc.

but it's unlikely to be serious at such minimal power levels.

Current requirements are low, and the unit is designed to operate from the same supply as the Curtis. A 9-volt source is recommended, but values from 7½ to 12 can be used. An a.c. power supply

may require an r.f. filter at the 115-volt input to prevent false triggering of the touch circuits.

### Negative or Positive Keying

The Curtis keyers use plug-in jumpers to set for negative (blocked grid) or positive (cathode, etc.) output, and the same system is followed in this model of the touch-key. Jumpers are shifted and transistors interchanged, and sockets are therefore a necessity. Construction can be simplified and sockets eliminated, if a single polarity configuration will fill your needs. You then could revise the layout, perhaps using printed circuit techniques to further reduce its size.

### Circuit Board

Begin building by marking and drilling a stock piece of 3/32" unclad pattern "A" Vectorbord, as shown in fig. 1, then cut to the size and shape indicated. In most cases, direct use of the pre-punched holes makes further dimensioning unnecessary. To prevent grabbing and chipping, drill the socket holes part way from each surface with a not-too-sharp drill. If necessary, grind small axis-aligned flats on the cutting edges and resharpen the bit later for regular work.

### Touch-Plate Assembly

This consists of two chrome-plated snap-button hole plugs cemented to opposite sides of a piece of insulating board, cut and drilled as indicated in

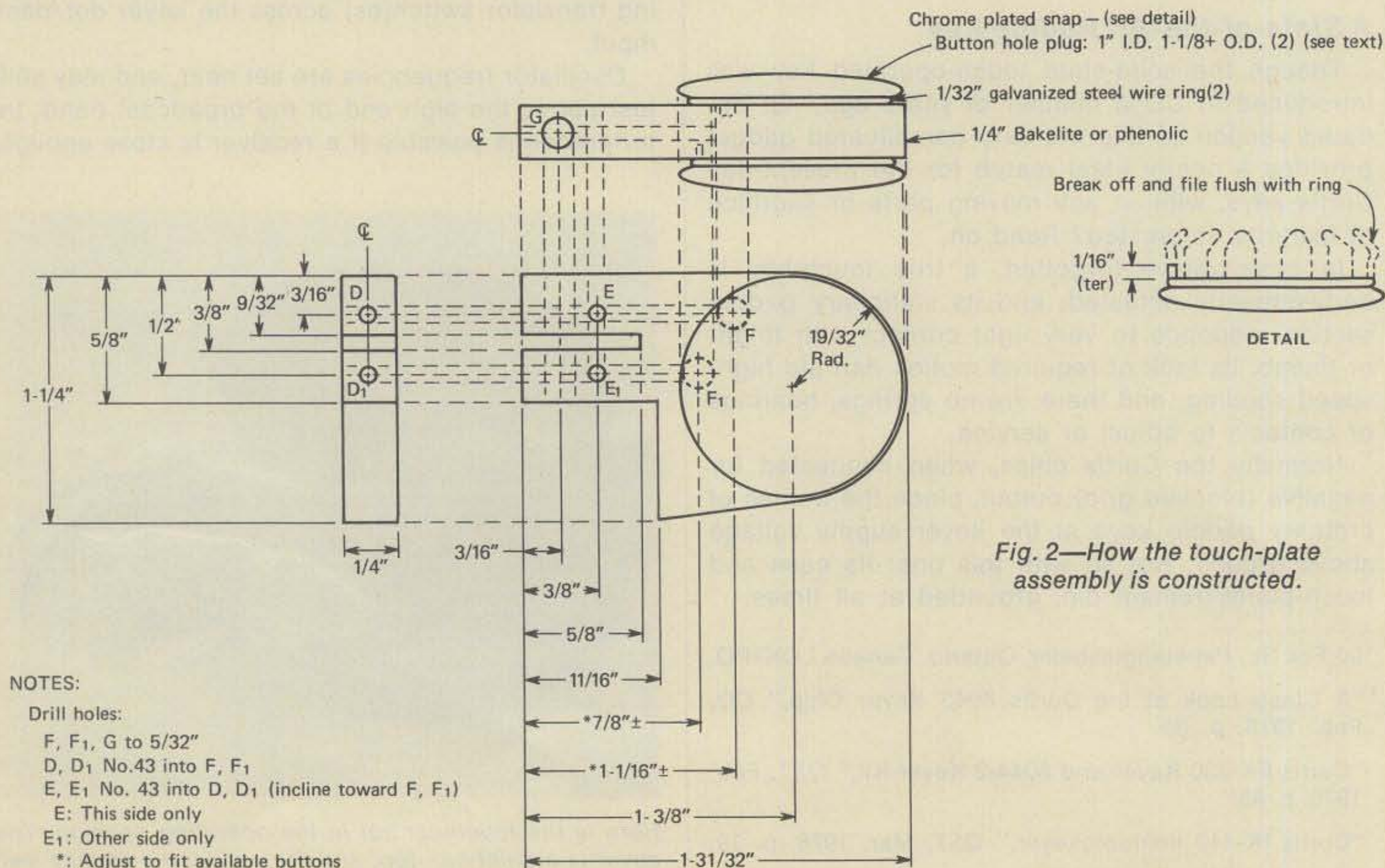


Fig. 2—How the touch-plate assembly is constructed.



fig. 2. Referring to the detail, bend a wire ring to make a spring-tight fit around each set of fingers. Using long-nosed pliers, break off all but one of these at the surface of the ring on each disc. File the stubs flush with the rings and cut the single remaining fingers to form longer terminal lugs as shown. The rings prevent filing through and possible peeling of the plating at the outer edges.

Roughen the insulating material with sandpaper inside the mounting positions, then solder a short piece of #30 bare wire to the inside of each protruding terminal lug. Thread one lead through holes F, D, E, and apply liberal amounts of 5-minute epoxy cement to the inside center of the associated button and insulation surface. Pull the wire and lug into hole F, making sure the facing epoxy blobs merge. Center the metal plate on the insulation and hold in place until the cement has set; alternately tipping face up and face down will ensure its more even distribution. Assemble the opposite side in the same way, using holes F1, D1, and E1. Seal the wire rings at the button rims with clear nail polish, and clean off any excess with solvent. A brightening strip of fluorescent vinyl tape can be run around the edge of the assembly as indicated in the photos, if you wish.

### Base Weight

Melt a  $\frac{5}{8}$ " depth of lead into a  $2\frac{1}{2}$ " diameter steel cover taken from a pressure-spray paint can and allow it to cool in a level position, first skimming impurities from the surface with a bent sheet-metal "spoon." Handle with care, and keep moisture away until the lead has solidified.

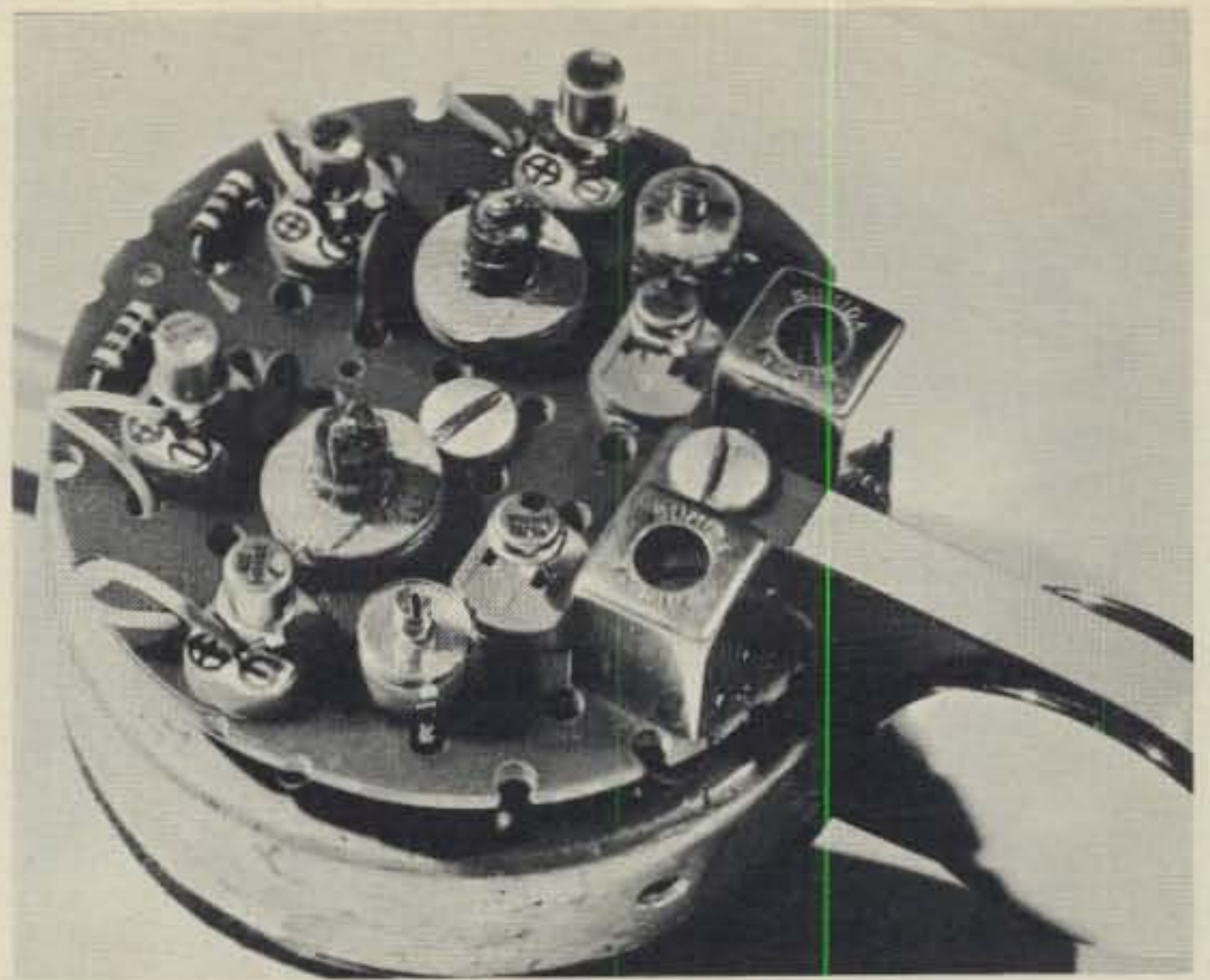
When cold, remove the tin, file any roughness from the casting and proceed according to fig. 3. Use a little oil and clear the small drills and tap frequently to prevent jamming in the soft metal.

### Case

The case is another paint-can cover, trimmed to a height of  $1\frac{9}{16}$ " and slotted to take the touch-plate assembly and control cable. File or grind off the rolled edge to avoid warping while cutting, and attach the case with four machine screws tapped into the base weight. Allow a  $\frac{1}{32}$ " overlap at the bottom, and press a cushioning length of self-sticking  $\frac{1}{8}$ " by  $\frac{3}{8}$ " sponge rubber weatherstripping against the weight behind it, to eliminate slippage on the operating table. Clean the completed case with a powdered kitchen cleanser, then apply your choice of spray base and finish paints according to directions.

### Assembly and Writing

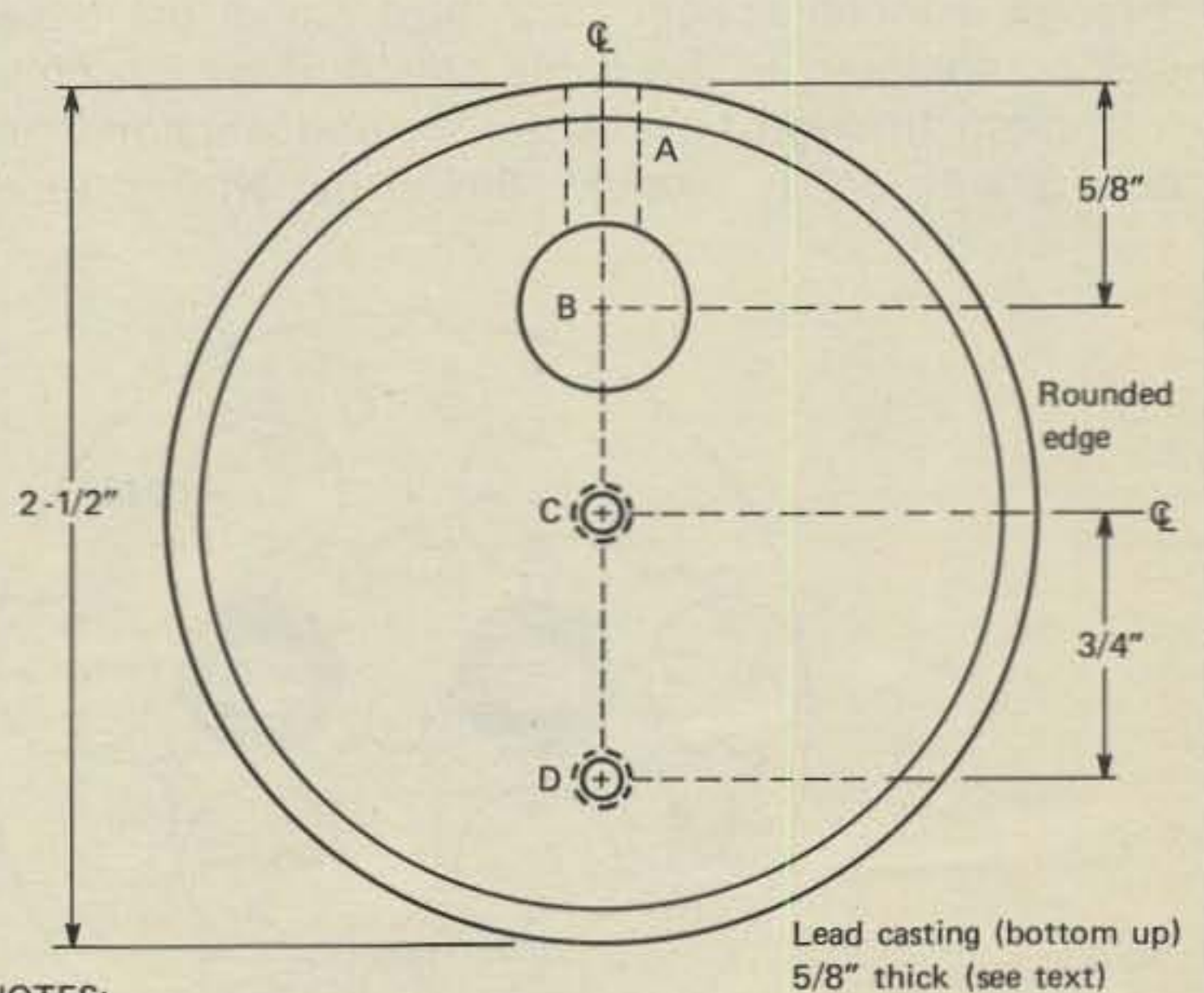
Referring to fig. 4 and the photos, attach components to the circuit board with 5-minute epoxy, mixing small amounts as required. Slip the board into the touch-plate assembly slot, true up and run



This is the Vectorbord layout. The polarity changing jumpers can be seen at the left and right, near the edges.

a bead of epoxy around the slot edges, top and bottom. Pass the dot touch-plate wire through hole G. Mount the oscillator coils, three-terminal sides inwards, and close the open ends of the saw slots with epoxy. Physically smaller, lower current chokes would be easier to install than the 125 ma types pictured for RFC<sub>1</sub>, RFC<sub>2</sub>, if available. If not, use the large ones, clip the leads to the utmost and connect with fine wire.

Since currents and spaces are limited, "tack" solder the circuit, fig. 5, with bare #30 wire (a single



#### NOTES:

Drill holes:

A to fit control cable

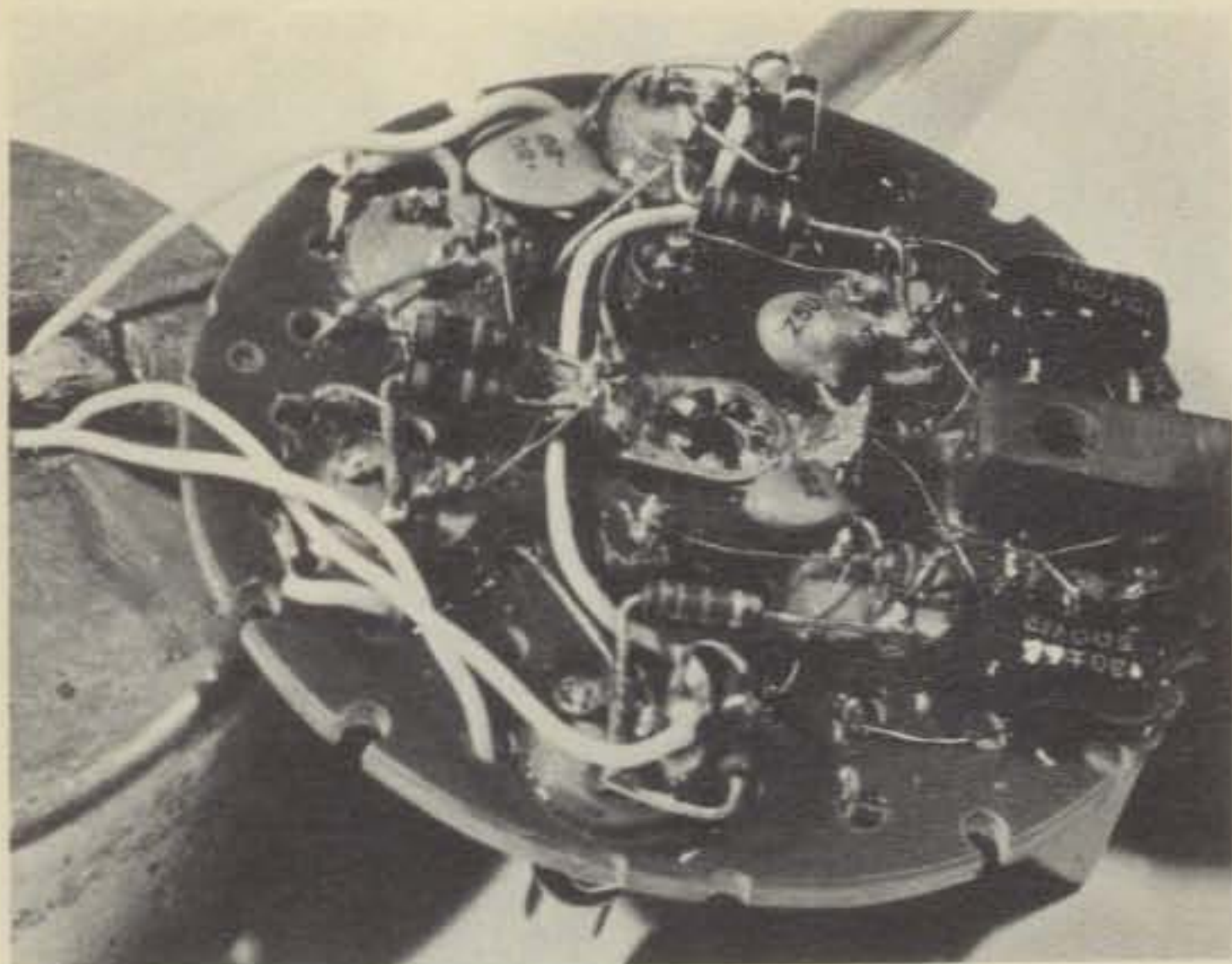
B to 1/2" dia, 9/16" deep

C, D No. 36 to 9/16" deep, tap 6-32

TOP VIEW

Fig. 3—This casting and the weatherstripping mentioned in the text keep the touch-key from "walking" on the table.



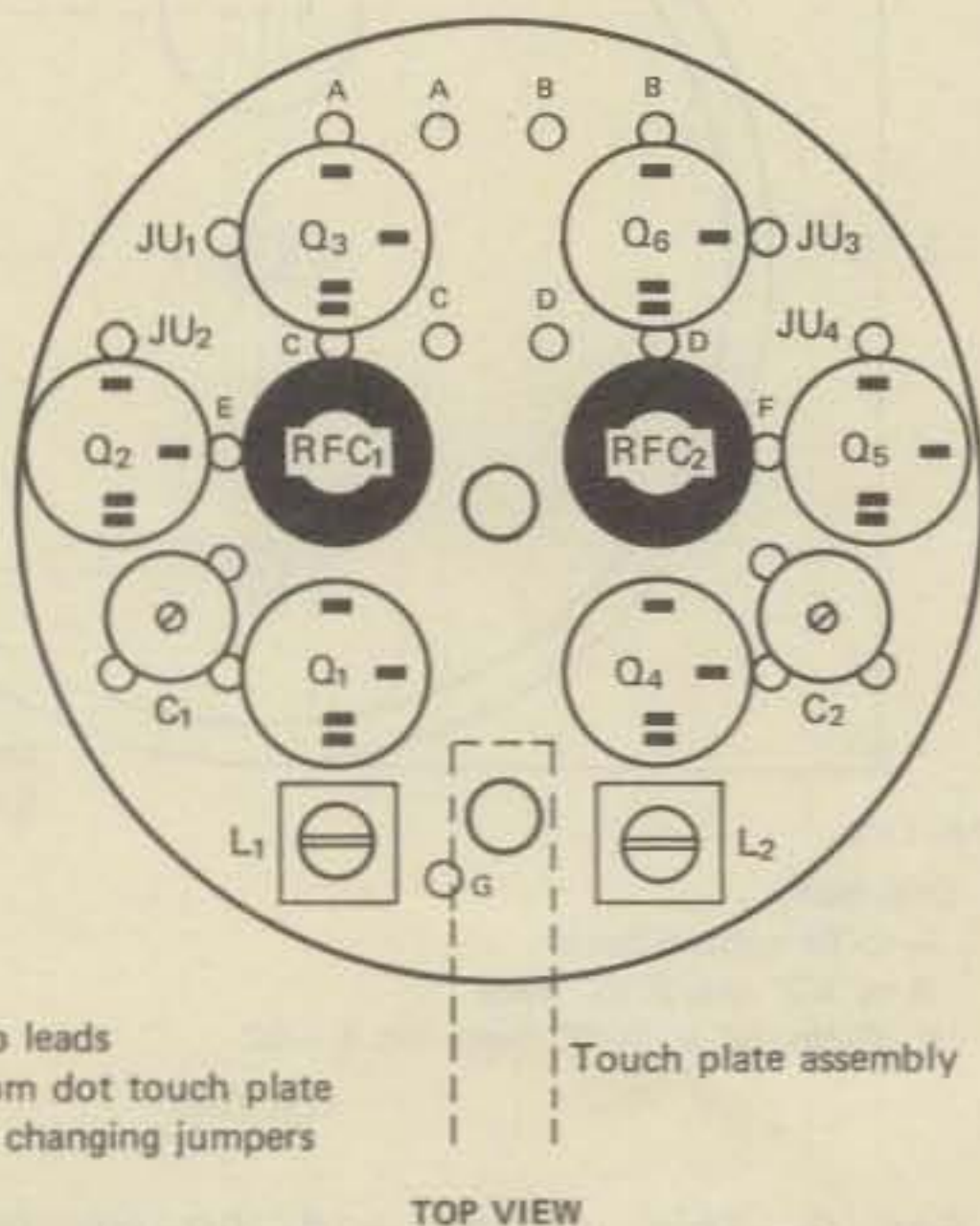


Though some careful wiring is needed, there is plenty of room for under-the-board components.

strand from ten-strand #20 is just right) and separate all cross-points with epoxy. Clip the socket lugs short after soldering, and be sure all under-board connections will clear the base weight in the  $\frac{1}{4}$ " space allotted. Also make certain the case will miss the tops of the r.f. chokes and the transistors.

The jumpers, JU1, 2, 3, 4, made from #28 stranded insulated wire, protrude  $1\frac{1}{4}$ " and are soldered to the heads of soft, straight pins cut and bent to fit the extra socket holes without touching the transistor leads. Mark the sockets and transistors to facilitate polarity changing when required.

All board grounds go to a pair of center lugs as shown in the underneath photo, and these bolt through a metal spacer to a third lug at the base weight, soldered to the cable shield. Pass the control cable through hole A, fig. 3, and anchor it in hole B with epoxy cement. Finish the wiring, then



NOTES:

- A-A: R<sub>1</sub>
- B-B: R<sub>2</sub>
- C-C: C<sub>3</sub>
- D-D: C<sub>4</sub>
- E, F: RFC top leads
- G: Lead from dot touch plate
- JU<sub>1, 2, 3, 4</sub>: Polarity changing jumpers

Fig. 4—Flat-on view of the layout. Note the orientation of the transistor sockets and capacitors C<sub>1</sub>, C<sub>2</sub>.

trim a #6 spacer to fit between the board and base ground lugs and assemble the sections with 6-32 screws. Cut the transistor leads to  $\frac{3}{8}$ " and bend for insertion in the appropriate sockets. Though small, the added touch-key current drain will necessitate an OFF-ON switch if your d.c. supply is a battery.

### Final adjustment

For reliable performance and cleanest oscillator output, always ground the key and keyer—proper procedure with a transmitter in any case. The coil slugs, capacitors C<sub>1</sub>, C<sub>2</sub>, different transistors even of the same type, and proximity one to the other all affect oscillator frequencies. To avoid confusion, proceed as follows:

Remove JU2, JU4, and set control and keyer for negative Curtis output. With C<sub>1</sub> and C<sub>2</sub> about one-quarter meshed, turn the L<sub>1</sub> and L<sub>2</sub> slugs all the way in. Using a broadcast receiver, remove either Q<sub>1</sub> or Q<sub>4</sub> and back off the remaining oscillator slug to give a 1600 kHz signal. Similarly tune the other oscillator, with its own transistor, to about 1550 kHz. Actual frequencies are unimportant and shift considerably during operation, but an initial set-up difference of at least 25 kHz is needed to minimize stray coupling interaction.

With Q<sub>1</sub>, Q<sub>4</sub>, JU2, JU4 in place and the keyer in operation, set C<sub>1</sub>, C<sub>2</sub> to your liking; decreasing capacities by small amounts increases touch sensitivity, and vice versa. Disregard the changes in frequency: at this power level, no problems should result.

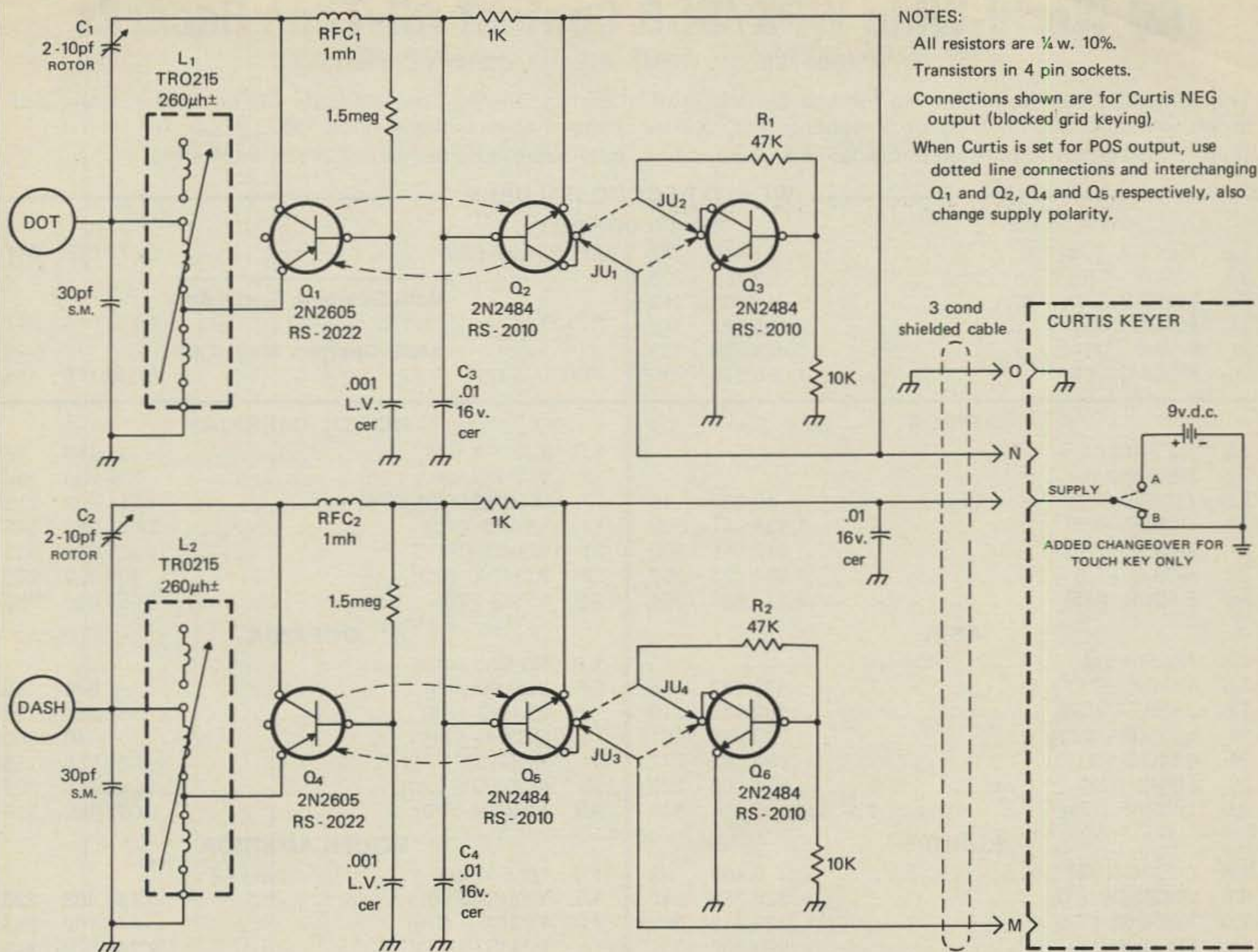
As the schematic illustrates, both oscillators are shunt (choke) fed to keep the touch-buttons at d.c. ground potential. Since this arrangement tends to produce parasitic hash around the operating frequency, listen on the b.c. receiver and try your hand in various positions near and gently touching the buttons. Re-adjust C<sub>1</sub>, C<sub>2</sub> slightly to eliminate the noise if it appears. Finally, check your touch-control and keyer in the position output mode; few, if any, alterations should be needed.

In case you're wondering what happens to the touch-key supply return during polarity change, this is taken care of by jumper Z3 on the Curtis circuit board. Note that their schematic uses two ground symbols; you'll find things simpler if you remember this one ( $\text{⏏}$ ) as actual ground, and visualize the other ( $\text{⏏}$ ) merely as the negative power supply line.

### Other Transistors

Other medium gain silicon transistors can be substituted experimentally, but you may encounter variation problems especially when interchanging PNP and NPN types in the oscillators. For the most part, the Radio Shack transistors specified had consistently similar characteristics in this application.





NOTES:  
 All resistors are 1/4 w. 10%.  
 Transistors in 4 pin sockets.  
 Connections shown are for Curtis NEG output (blocked grid keying).  
 When Curtis is set for POS output, use dotted line connections and interchanging Q<sub>1</sub> and Q<sub>2</sub>, Q<sub>4</sub> and Q<sub>5</sub> respectively, also change supply polarity.

Fig. 5—Touch-key circuit. The extra coil terminals at L1, L2 are left blank, and transistors Q3, Q6 are used only when required for Curtis positive output.

- C1, C2: 2—10 pF sub-miniature plastic dielectric trimmers (Philips 010EA/10E)
- L1, L2: 260 uH miniature transistor broadcast oscillator coils 13/32" square, 1/2" high (Armaco TR0215)
- Q1, Q4: 2N2605 silicon transistors (Radio Shack RS-2022)

- Q2, Q3, Q5, Q6: 2N2484 silicon transistors (Radio Shack RS-2010)
- RFC1, RFC2: 1. mH powdered iron core, 125 mA or less (Hammond 1500)

### Supply Voltage and Currents

Currents will vary with stock transistors, but the following touch-key measurements should serve as a guide:

Curtis Output	Volts	Idling (2-oscs)	Milliamperes	
			Dots OR Dashes	Dots AND Dashes
Positive	9	.13	2.8	5.5
Negative	9	.12	1.4	2.6

In operation, the normal c. w. duty-cycle substantially reduces average current requirements.

### Conclusion

The non-moving key may seem "dead" to start

with, but this feeling quickly vanishes with practice. Once used to it, you'll no longer appreciate the others—they're much too loose!

Perhaps one day some manufacturer will finally free us from the horse-and-buggy paddle keys we've kept so long, by adding touch ability to the IC chip itself, thereby approaching the ultimate in miniaturization and sensitive control. Well, why not?

Editors Note—Albert Jackson, VE3QQ has several other interesting projects in the works which will be featured in the pages of CQ in the coming months.



# CQ World-Wide WPX/SSB Contest All-Time Records

By BERNIE WELCH, W8IMZ, Director, CQ WPX Contest

The contest is held each year on the last full weekend of March. The All-Time Records will be up-dated and published annually. The method of computing final scores changed several times since 1957.

Data following the calls listed below is: year of operation, total score, and number of prefix multipliers.

## WORLD RECORD HOLDERS

### Single Operator

1.8	XJ3FFA ('76)	31,416	77	AB PJ9JR ('70)	2,972,826	317
3.5	YY4YC ('76)	739,468	223	<b>Multi-Operator Single Xmtr</b>		
7.0	W4BRB/C6A ('76)	911,302	213	PJ9JR ('74)	4,543,618	347
14	PJ9JR ('71)	2,385,192	348	<b>Multi-Operator Multi-Xmtr</b>		
21	W3AU ('71)	1,435,230	333	4X4GV ('72)	6,036,175	415
28	KG6AQY ('70)	1,096,275	235			

### AFRICA

1.8	No Entrant		
3.5	No Entrant		
7.0	ZD8CS ('72)	40,230	45
14	CQ6LF ('73)	1,138,047	309
21	XX6OZ ('75)	1,247,145	305
28	5Z4LS ('70)	1,059,723	267
AB	EA8CR ('75)	2,173,824	384

### ASIA

1.8	No Entrant		
3.5	4X4DK ('71)	478,950	155
7.0	JA2BET ('75)	102,960	110
14	UK9ABA ('71)	1,740,020	361
21	4Z4OC ('71)	889,592	242
28	5B4IS ('72)	511,100	220
AB	UW9AF ('75)	2,580,626	389

### EUROPE

1.8	DL8PC ('75)	6,468	33
3.5	DM2DUK ('76)	526,750	245
7.0	YU3EYZ ('76)	333,318	219
14	IT1JT ('71)	923,508	306
21	OH2BR ('71)	695,520	207
28	IR0ZV ('70)	338,829	159
AB	GC3UML ('70)	1,628,556	339

### Multi-Op Single Xmtr

AF	CR4BC ('70)	2,100,526	331
AS	UK9AAN ('76)	4,158,929	437
EU	CT4AT ('76)	3,250,544	484
NA	W4IZ/KV4 ('72)	2,903,094	333
O	5W1AZ ('76)	3,114,315	295
SA	PJ9JR ('74)	4,543,618	347

### NORTH AMERICA

1.8	XJ3FFA ('76)	31,416	77
3.5	W4EPO/C6A ('76)	325,200	150
7.0	W4BRB/C6A ('76)	911,302	213
14	KV4FZ ('70)	2,031,246	343
21	W3AU ('71)	1,435,230	333
28	K5MDX ('70)	493,929	280
AB	VP2G ('76)	2,654,308	388

### OCEANIA

1.8	No Entrant		
3.5	VK3XB ('75)	540	10
7.0	ZL4BO ('73)	187,884	102
14	DU1FH ('71)	1,264,640	260
21	KG6AQY ('71)	930,936	158
28	KG6AQY ('70)	1,096,275	235
AB	VK9GN ('70)	2,057,160	316

### SOUTH AMERICA

1.8	No Entrant		
3.5	YY4YC ('76)	739,468	223
7.0	YV5CVE ('76)	671,160	255
14	PJ9JR ('71)	2,385,192	348
21	PT2ZBS ('75)	1,283,840	256
28	ZV2DFR ('70)	1,010,814	246
AB	PJ9JR ('70)	2,972,826	317

### Multi-Op Multi-Xmtr

AF	9E3USA ('69)	2,398,192	296
AS	4X4GV ('72)	6,036,175	415
EU	4J3A ('76)	3,971,781	473
NA	VP5B ('75)	4,431,301	329
O	KH6GLU ('68)	394,869	129
SA	CE6CA ('69)	3,341,180	340

## WPX (Prefix) RECORD

DK2BI ('76) 517

## CLUB RECORD

(Beginning with the 1978 WPX Contest)

## CQ WORLD-WIDE WPX/SSB CONTEST ALL-TIME

### U.S.A. RECORD HOLDERS

#### Single Operator

1.8	W8LRL ('76)	2,080	80	14	K4VX ('75)	943,824	336
3.5	AC1CF ('76)	232,630	215	21	W3AU ('71)	1,435,230	333
7.0	K6JAN ('75)	270,972	117	28	K5MDX ('70)	493,929	280
	AB W5QQQ/7 ('72)					1,741,285	301

#### Multi-Op Single Xmtr

WA3HRV ('72)	2,359,816	388
--------------	-----------	-----

#### Multi-Op Multi-Xmtr

WB6GFJ/6 ('72)	1,745,272	269
----------------	-----------	-----



We've always maintained that a good way to get that dream rig is to start with our 700CX transceiver and grow into it.

Because you get more watts and more transceiver for your dollar plus easy-to-add-on-later capability like our brand new DD76 Digital Dial.

The DD76 gives you a big, bright digital display of your dial setting with 1 KHz resolution.

Whenever you're ready for it, just plug it into your 700CX.

When you're ready for more, you can add accessories like a crystal oscillator, VOX or phone patch just about as easily.

And you can make the big jump to 2000 watts with a linear amp that was designed to look right and work right

with the 700CX.

The DD76 Digital Dial's diode matrix programming lets you use it with other transceivers, too. You can use it with IF frequencies of 5175, 5500 and 5520 KHz.

And you can plug it directly into the Swan 500CX, 500C or 500 transceivers. Or you can use it with other Swan transceivers with slight modifications.

See the 700CX and DD76 together at your Swan dealer and you'll see why the 700CX is the way to grow. Or order direct from the factory. Use your Swan credit card. Applications at your dealer or write to us.

700CX Champion Transceiver \$649.95  
 DD76 Digital Dial ..... \$169.95\*  
 117-XC 110V AC Power Supply \$173.95  
 (includes Speaker and Cabinet)

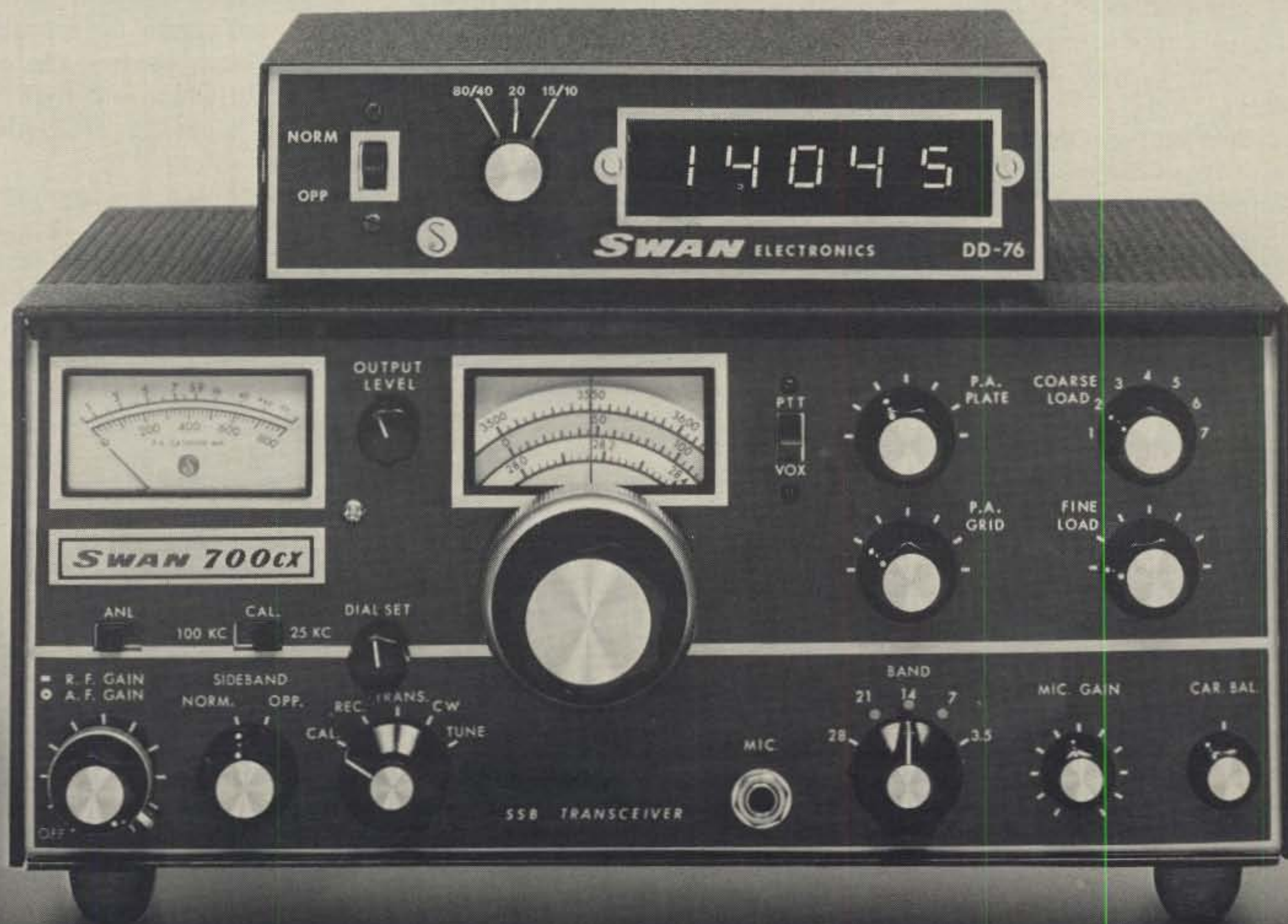
117-X 110V AC Power Supply . \$127.95  
 (less Speaker and Cabinet)  
 510-X Crystal Oscillator ..... \$ 67.95  
 VX-2 Plug-in VOX ..... \$ 44.95  
 FP-1 Telephone Patch ..... \$ 64.95  
 Mark II Linear Amplifier ..... \$849.95  
 (complete with 110/220 VAC power supply and tubes)

(prices FOB Oceanside, CA except for DD76)

\*Specify Swan transceiver model number. Add \$2.00 for handling and shipping.

 **SWAN**<sup>®</sup>  
**ELECTRONICS**  
 A subsidiary of Cubic Corporation  
 305 Airport Road, Oceanside, CA 92054  
 (714) 757-7525

# NEW WAY TO GROW: SWAN 700CX WITH DIGITAL DIAL.





A new monthly CQ series...

# BASIC RADIO

BY IRVING TEPPER\*, WB2FUZ

## Chapter 1: Introduction to Electricity

*In response to requests by our readers, newcomers and oldtimers alike, the Editors of CQ are pleased to introduce the first in a series of articles, written by Irving Tepper, WB2FUZ, professional electronics instructor and author, designed to teach you electronics—from the ground up. The intent is to help the reader understand what goes on inside his equipment and just about every other electrically-operated device there is. We don't want to turn you into an engineer. But we would like to make you a well informed and knowledgeable amateur.*

*To help you test yourself on what you've learned from each article, Irv will include a set of self-check questions at the end of each lesson. As the series progresses, we'll have actual experiments you can perform using inexpensive parts available from your local Radio Shack or Lafayette store.*

**W**HAT is electricity? While this is a simple question, the answer is complex. You can't see electricity, or taste it or hear it. You can only determine its presence by what it does. For example, looking at a lighted bulb, you see the glow caused by the flow of an electric current through the filament, but you don't see the electricity itself. This also holds true for an electric heater. You feel electricity's effect—heat—but you don't see or feel the electricity.

While we can't see electricity, we *do* know what it is and how to use it. To understand what electricity is and how to use it we must begin with a study of the properties and structure of matter.

### STRUCTURE OF MATTER

Matter may be defined as any substance that has weight and occupies space. Matter may be a gas, a liquid or a solid. Typical examples are air, water or steel. Everything in our world is made of matter.

**Elements**—Matter is the substance from which all objects are made and matter is composed of one or more basic substances called *elements*. An element is defined as a substance that can neither be broken up into another substance nor created by chemical means. To date science has discovered over 100 elements, some of which are man made. Some examples of natural elements are hydrogen, aluminum, silicon and germanium.

**Compounds**—A substance that is composed of a combination of two or more elements is called a compound. An example of a compound is *water*. Chemically it is identified as  $H_2O$ ; this means that water is made of two parts hydrogen ( $H_2$ ) and one part Oxygen (O) both of which are elements.

**Molecules**—If we take a drop of water and reduce it to the smallest quantity possible, we will have a single drop consisting of two hydrogen particles and one oxygen particle as shown in Fig. 1. This is a *molecule* of water. If the molecule of water were reduced any further it would no longer be water but bits of hydrogen and oxygen. Thus, a molecule is the smallest unit to which a compound can be reduced and *still retain all its original properties and characteristics*.

**Atoms**—An atom is the smallest particle into which an element can be divided and still keep its identity as an element. The English word "atom" is from the Greek word, "*atomos*," which means indivisible. Thus you can realize that when the atom was named, it was thought to be the smallest

\*19 Woodland Road, Valley Stream, NY 11581



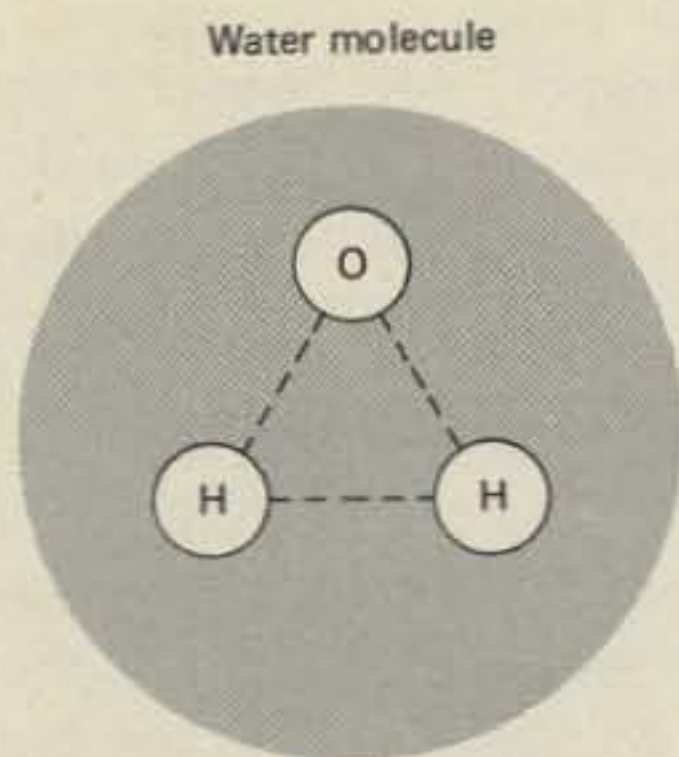


Fig. 1—A single molecule of water contains two parts Hydrogen and one part Oxygen,  $H_2O$ .

particle in the universe. Today we know that the atom is composed of still smaller units called *subatomic particles*.

**Subatomic Particles**—The only two subatomic particles that we will discuss are *protons* and *electrons*. Protons are positively charged and electrons are negatively charged, both charges being equal in strength.

The particles in all atoms are arranged in the same manner as shown in Fig. 2. This illustrates the simplest atom, Hydrogen, which has one proton (+) and one electron (-). The proton forms the nucleus and the electron orbits around the nucleus continuously in an elliptical path.

Figure 3 shows the arrangement of particles in more complex atoms. Helium atoms contain two orbiting electrons and two protons in the nucleus. The sodium atom has eleven protons and eleven electrons. Notice that the electrons are orbiting the nucleus in three groups called *rings* or *shells*. The inner ring contains two electrons, the maximum number for the inner or #1 ring. The #2 ring contains eight orbiting electrons, the maximum for that ring. The remaining electron is in the #3 ring.

Complex atoms may have as many as five rings. The outer ring whether it is the #1 or #5 is called the *valence* ring and is most important to our understanding of electricity. More will be said about the valence ring later.

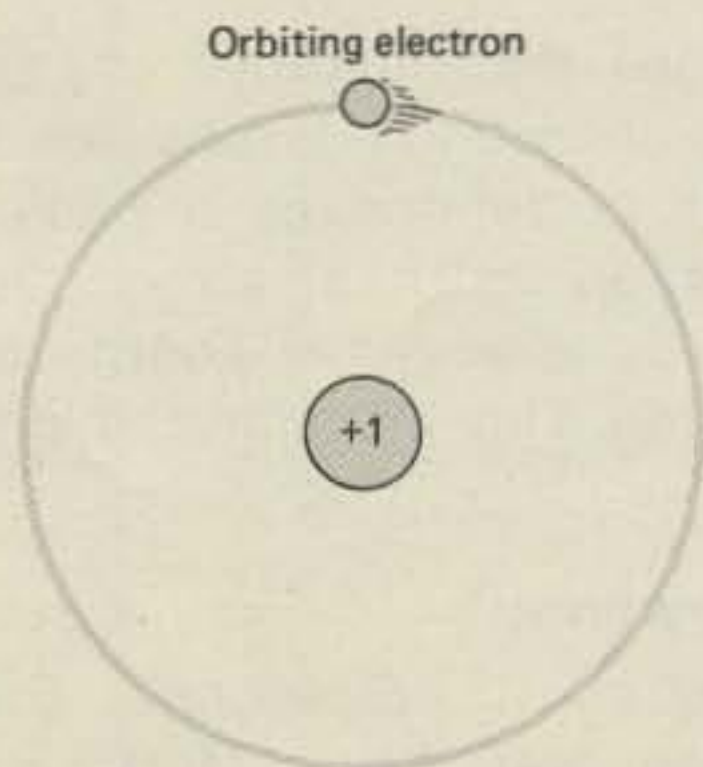


Fig. 2—An atom of Hydrogen has one positive charge, the proton, in the nucleus and one orbiting negative charge, the electron.

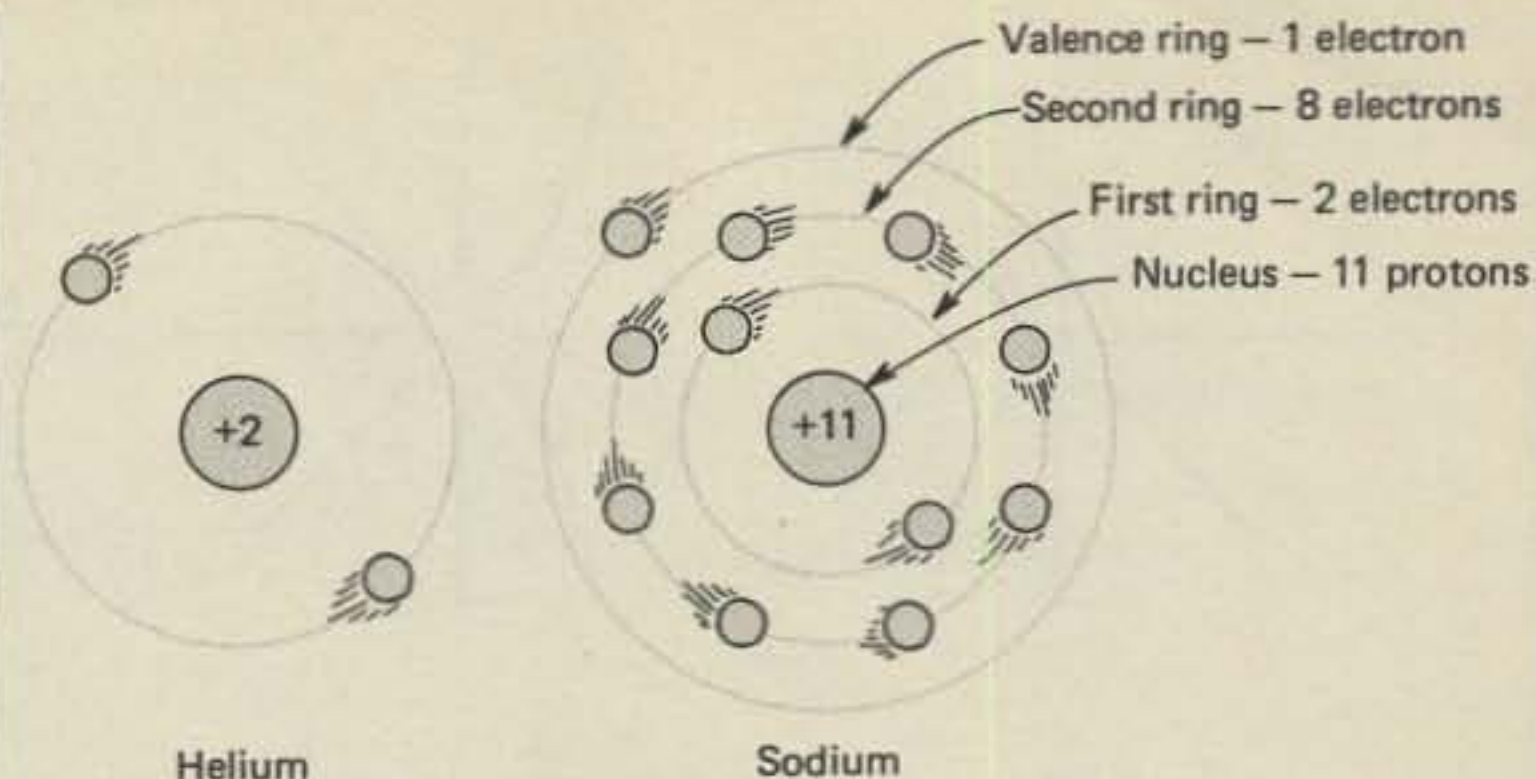


Fig. 3—Arrangements of the protons and electrons in the more complex atoms. The total number of electrons orbiting the nucleus equals the number of protons in the nucleus.

**Space and Weight**—Many readers will find it hard to believe that there are large spaces involved in the structure of the atom. Visualize an atom so greatly enlarged that a proton in the nucleus measures 1 inch in diameter. The first ring containing an electron would be approximately 500 miles from the nucleus. Actually, then, you can see that the atom consists mainly of space between its particles.

**Charges**—It was noted earlier that protons have a positive charge and electrons a negative charge and that the charges have equal strength. Since positive and negative charges are opposite quantities, they cancel each other and thus it may be seen that the charges of a proton-electron pair cancel and the pair is neutral. It can also be seen from the three atoms shown in Figs. 2 and 3 that each atom contains as many electrons in the rings as it has protons in the nucleus. The obvious conclusion is that *each atom is electrically neutral*. This is a most important point and it will come up several times in other areas of this series. To follow this train of thought further, since atoms are neutral and all matter is made up of atoms, all matter is neutral *in its normal state*.

A proton possessing a positive charge is surrounded by an electric field. This field is represented by the lines shown in Fig. 4A. The lines are

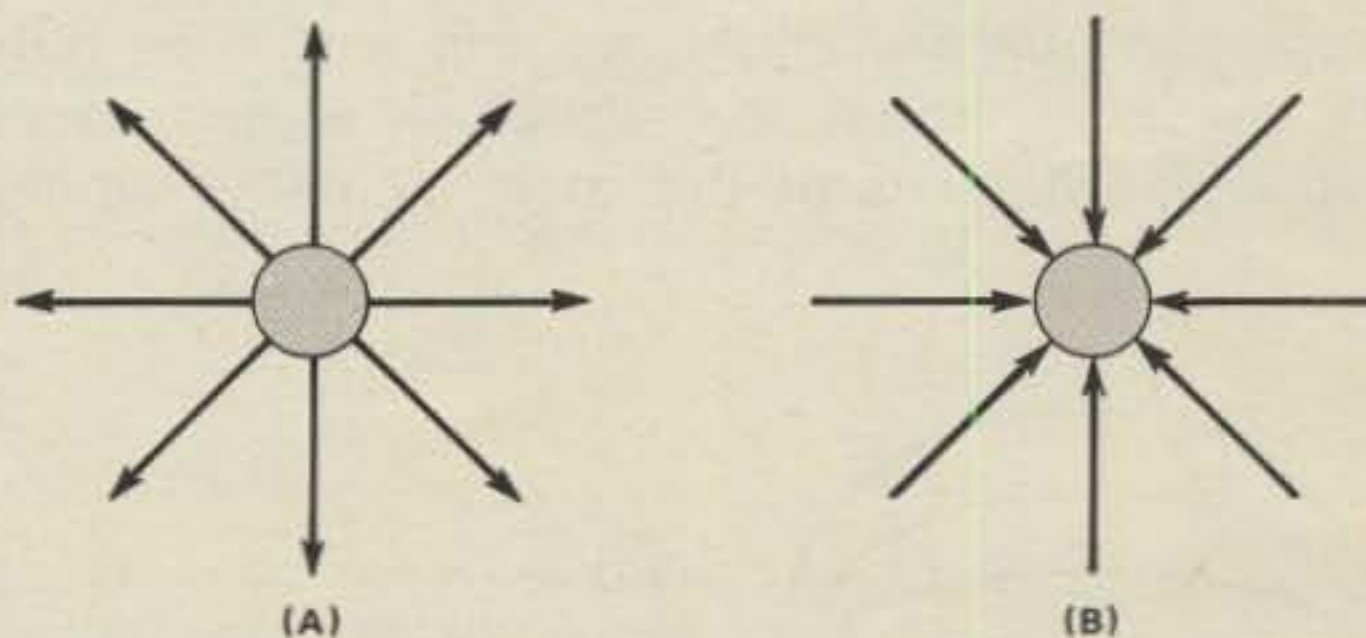


Fig. 4-A—Imaginary positive lines of force around the proton. B—Imaginary negative lines of force around the electron. The strength of the fields are equal.



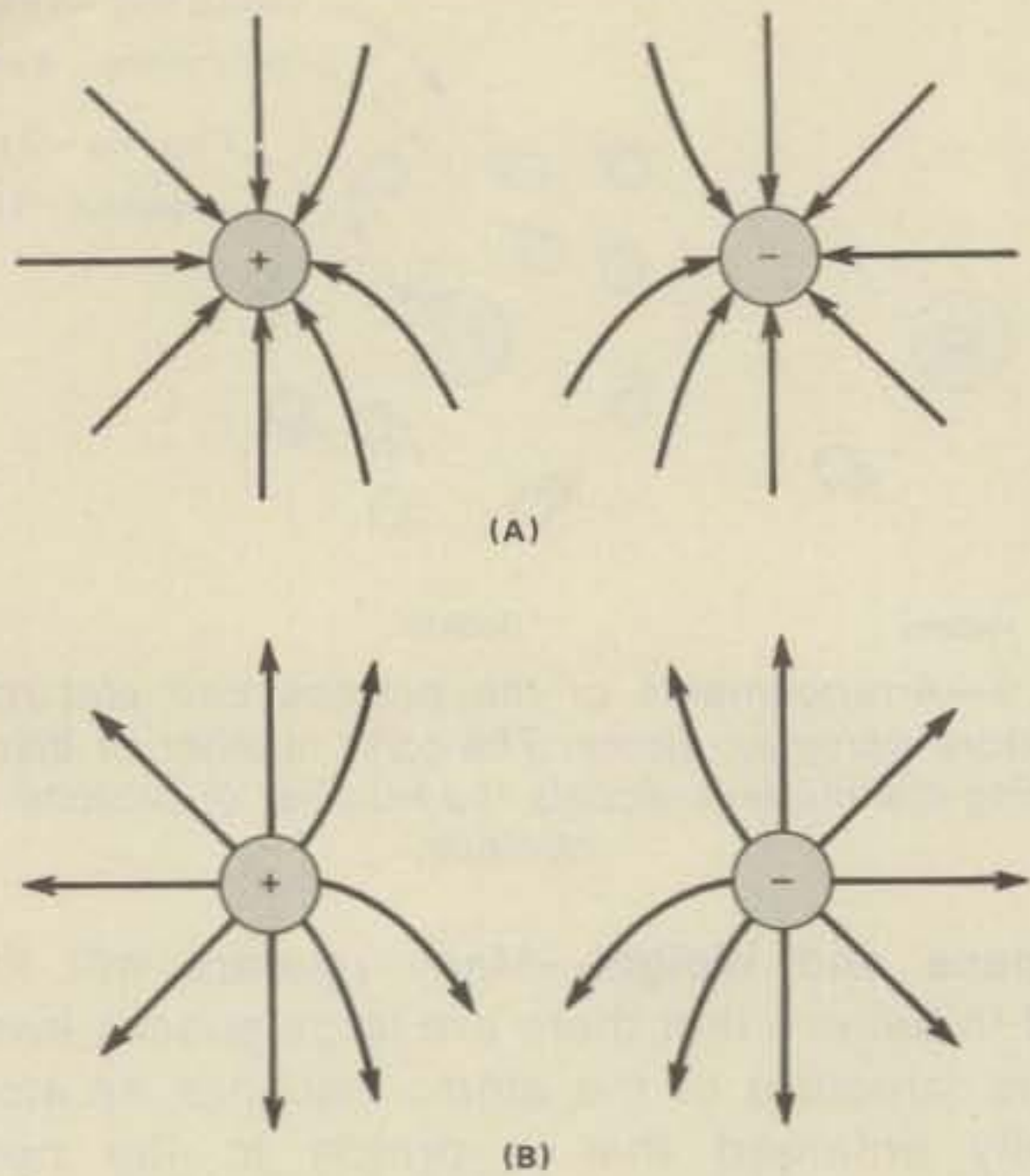


Fig. 5-A—Repelling effects of two electrons placed in close proximity. B—Repelling effects of two protons placed in close proximity.

imaginary and are only used in illustrations to show the presence of the field. For positive charges the lines are usually shown pointing *outward*.

Electrons too have an electric field about them, also represented by lines as illustrated in Fig. 4B. Note, however, that the lines of force are represented as pointing *inward* because the field charge is negative. Since the charges on the electron and proton are equal in strength the number of electric lines of force on each are considered to be equal as well as opposite in direction.

When two electrons are close together, their negative lines of force will repel each other. When two positively charged bodies, protons, are brought close together, their lines of force will also repel as shown in Fig. 5. From this we can conclude that *like charges repel*.

When two dissimilar charges are brought together their lines of force interlock as shown in Fig. 6 and the two bodies are attracted. From this we can conclude that *unlike charges attract*.

**Binding Forces in the Atom**—Considering all the information just presented, we can ask some difficult questions about the structure of the atom. First, if the nucleus of the atom contains all the

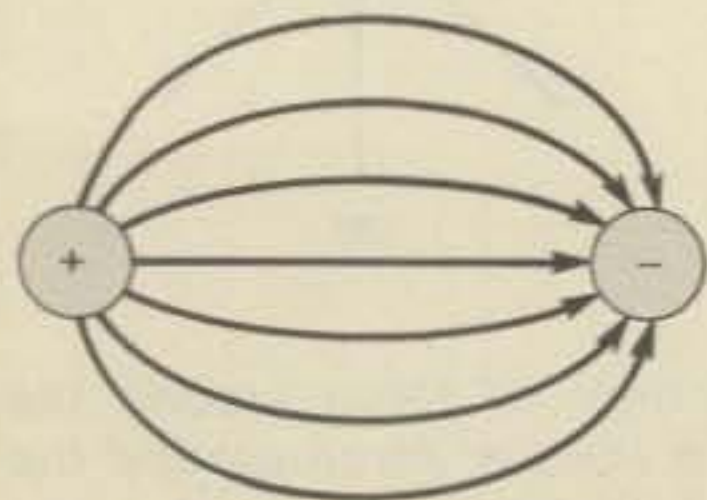


Fig. 6—When opposite polarity charges are brought close together, their imaginary lines of force combine to produce attraction.

protons and all protons are positively charged and like charges repel, why doesn't the nucleus fly apart? The answer is simple—we don't know. It is theorized that the repelling force in the nucleus is cancelled by another force that is not electric in nature.

Second, if the nucleus is positive and the orbiting electrons negative and unlike charges attract, why aren't the orbiting electrons drawn into the nucleus? The centrifugal force of the orbiting electrons wanting to spin off from the nucleus just cancels the attraction of the positive nucleus. Thus, the atom neither collapses nor flies apart but is stable.

**Charges and Ions**—Because protons and electrons are equal in number and strength of charge in an atom, the atom has a neutral charge or is electrically balanced. It is possible, however, to transfer valence electrons from one atom to another under certain conditions. When this happens, the atom that has given up the electron has more

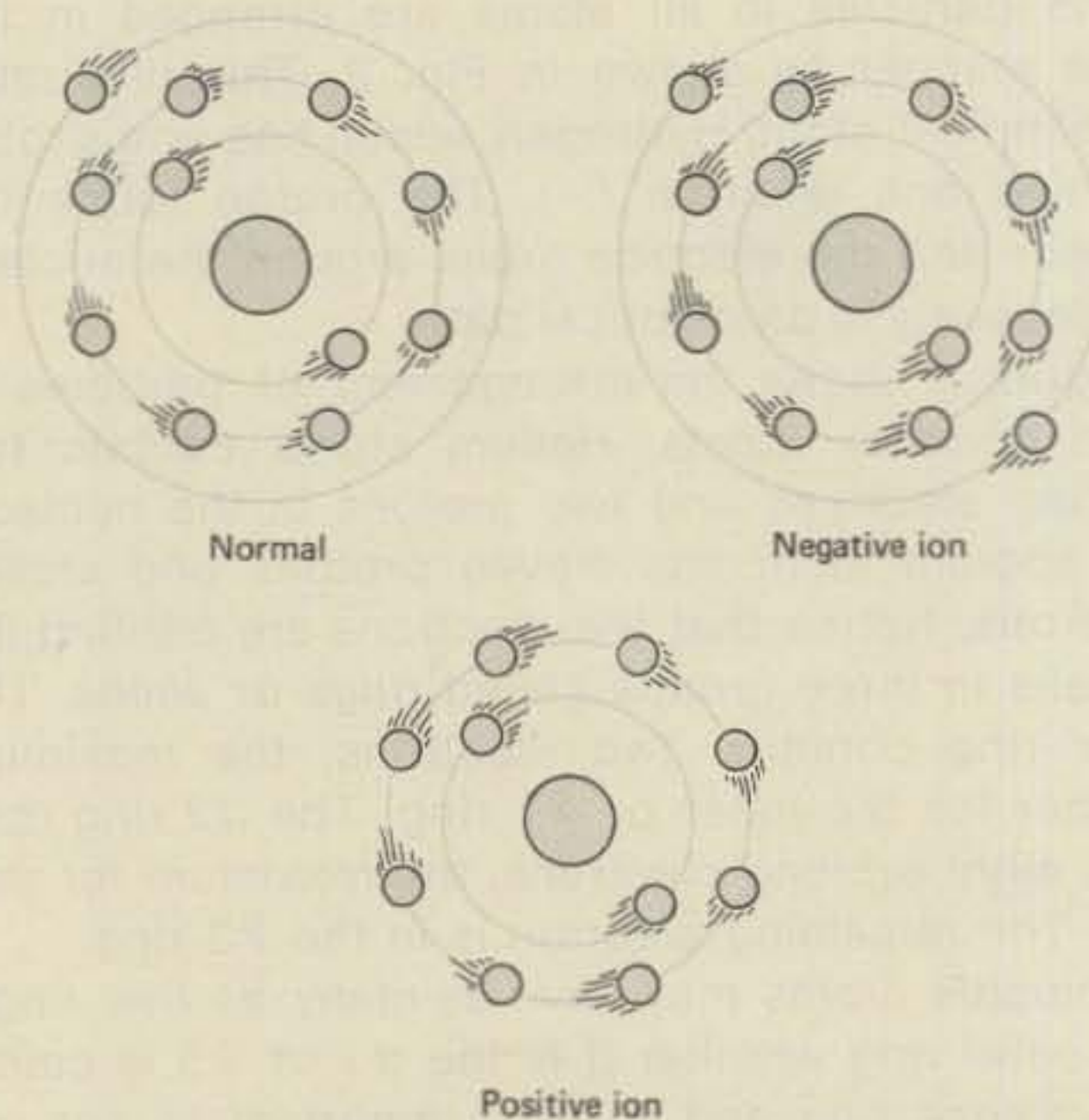


Fig. 7—Normal and ionized sodium atoms.

positive charges than negative charges and it assumes a total charge that is positive. An atom with a plus charge is defined as a *positive ion*. If an atom accepts an extra electron into its valence ring, it assumes a negative charge and is defined as a *negative ion*. This is illustrated in Fig. 7.

#### Suggested Reading:

Schrader, Robert L. *Electronic Communication*, Third Edition, New York: McGraw Hill, pp. 1-5.  
Tepper, Marvin, *Basic Radio*, Vol. 1, New Jersey: Hayden Publishing Co., pp. 1 to 12.

(turn page for Self-Test Questions)



Clip out the coupon and subscribe today. Get in on some of the most exciting reading in Amateur Radio.



- NOVICE • ANTENNAS • AWARDS • QRP • MATH'S NOTES •
- IN FOCUS • DX • CONTEST CALENDAR • PROPOGATION •
- GREAT FEATURE ARTICLES • CQ REVIEWS •
- AND FREE CLASSIFIED ADS FOR CQ SUBSCRIBERS •



**CQ**

14 Vanderventer Avenue  
Port Washington, New York 11050

Dear OM,

Enclosed please find \$.....for .....Year's Subscription to CQ, The Radio Amateur's Journal.

- NEW: Start with .....issue
- RENEWAL

- |  |                                  |                                  |
|--|----------------------------------|----------------------------------|
|  | Domestic                         | Foreign                          |
| <input type="checkbox"/> One year .....  | <input type="checkbox"/> \$ 7.50 | <input type="checkbox"/> \$ 8.00 |
| <input type="checkbox"/> Two years ..... | <input type="checkbox"/> 13.00   | <input type="checkbox"/> 15.00   |

Name .....Call.....  
Address .....  
City .....State .....Zip .....

**SELF-CHECK QUESTIONS #1**

1. When you see lightning, you are seeing electricity. True\_\_\_\_\_ False\_\_\_\_\_
2. When you see a spark in an electric circuit, you are seeing electricity. True\_\_\_\_\_ False\_\_\_\_\_
3. Material that can be divided into atoms without having its characteristics changed is called \_\_\_\_\_.
4. A substance that is composed of two or more elements is called \_\_\_\_\_.
5. When the smallest unit of a compound is obtained, that still has all the characteristics of a compound, it is called a \_\_\_\_\_.
6. The smallest unit an element can be broken down into and still remain an element is \_\_\_\_\_.
7. The small particles that spin around the nucleus of an atom are called \_\_\_\_\_.
8. The particles that form the nucleus of the atom are called \_\_\_\_\_.
9. Electrons have a \_\_\_\_\_ charge.
10. Protons have a \_\_\_\_\_ charge.

11. The orbital path of electrons around the nucleus is called \_\_\_\_\_.
12. The outer shell or ring of an atom is called the \_\_\_\_\_.
13. The total charge of an atom in its normal state is electrically \_\_\_\_\_.
14. Like charges \_\_\_\_\_, unlike charges \_\_\_\_\_.
15. Orbiting electrons are not drawn into the nucleus because of their \_\_\_\_\_.
16. The reason the nucleus does not fly apart is \_\_\_\_\_.
17. When an electron is removed or added to the valence ring of the atom \_\_\_\_\_ is created.

**ANSWER KEY #1**

1. F 2. F 3. Element 4. Compound 5. Molecule 6. Atom 7. Electrons 8. Protons 9. Negative 10. Positive 11. Ring or shell 12. Valence ring. 13. Neutral 14. Repel, Attract 15. Centrifugal force 16. Unknown 17. Ion



LATEST LISTING  
MAY 1977

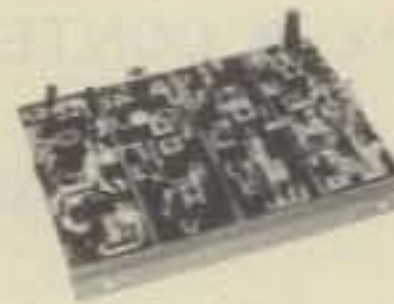
# Vhf engineering

36 NEW PRODUCTS

THE WORLD'S MOST COMPLETE LINE OF VHF-FM KITS AND EQUIPMENT

- RX28C . . . . . 28-35 MHz FM receiver with 2 pole 10.7 MHz crystal filter . . . \$ 59.95
- RX28C W/T . . . same as above-wired & tested . . . 104.95
- RX50C Kit . . . 30-60 MHz rcvr w/2 pole 10.7 MHz crystal filter . . . . . 59.95
- RX50C W/T . . . same as above-wired & tested . . . 104.95
- RX144C Kit . . . 140-170 MHz rcvr w/2 pole 10.7 MHz crystal filter . . . . . 69.95
- RX144C W/T . . . same as above-wired & tested . . . 114.95
- RX220C Kit . . . 210-240 MHz rcvr w/2 pole 10.7 MHz crystal filter . . . . . 69.95
- RX220C W/T . . . same as above-wired & tested . . . 114.95
- RX432C Kit . . . 432 MHz rcvr w/2 pole 10.7 MHz crystal filter . . . . . 79.95
- RX432C W/T . . . same as above-wired & tested . . . 124.95

## RECEIVERS



- RXCF . . . . . accessory filter for above receiver kits gives 70 dB adjacent channel rejection . . . . . 8.50
- RF28 Kit . . . . 10 mtr RF front end 10.7 MHz out . . . 12.50
- RF50 Kit . . . . 6 mtr RF front end 10.7 MHz out . . . 12.50
- RF144D Kit . . . 2 mtr RF front end 10.7 MHz out . . . 17.50
- RF220D Kit . . . 220 MHz RF front end 10.7 MHz out . . . . . 17.50
- RF432 Kit . . . . 432 MHz RF front end 10.7 MHz out . . . . . 27.50
- IF 10.7F Kit . . . 10.7 MHz IF module includes 2 pole crystal filter . . . . . 27.50
- FM455 Kit . . . . 455 KHz IF stage plus FM detector . . . 17.50
- AS2 Kit . . . . . audio and squelch board . . . . . 15.00

- TX50 . . . . . transmitter exciter, 1 watt, 6 mtr. . . 39.95
- TX50 W/T . . . . same as above-wired & tested . . . 59.95
- TX144B Kit . . . transmitter exciter-1 watt-2 mtrs . . . 29.95
- TX144B W/T . . . same as above-wired & tested . . . 49.95
- TX220B Kit . . . transmitter exciter-1watt-220 MHz . . . . . 29.95

## TRANSMITTERS



- TX220B W/T . . . same as above-wired & tested . . . 49.95
- TX432B Kit . . . transmitter exciter 432 MHz . . . 39.95
- TX432B W/T . . . same as above-wired & tested . . . 59.95
- TX150 Kit . . . . 300 milliwatt, 2 mtr transmitter . . . 19.95
- TX150 W/T . . . same as above-wired & tested . . . 29.95

- PA2501H Kit . . . 2 mtr power amp-kit 1w in-25w out with solid state switching, case, connectors . . . . . 59.95
- PA2501H W/T . . . same as above-wired & tested . . . 74.95
- PA4010H Kit . . . 2 mtr power amp-10w in-40w out-relay switching . . . . . 59.95
- PA4010H W/T . . . same as above-wired & tested . . . 74.95
- PA50/25 Kit . . . 6 mtr power amp, 1w in, 25w out, less case, connectors & switching . . . 49.95
- PA50/25 W/T . . . same as above, wired & tested . . . 69.95
- PA144/15 Kit . . . 2 mtr power amp-1w in-15w out-less case, connectors and switching . . . . . 39.95
- PA144/25 Kit . . . same as PA144/15 kit but 25w . . . 49.95
- PA220/15 Kit . . . similar to PA144/15 for 220 MHz . . . 39.95
- PA432/10 Kit . . . power amp-similar to PA144/15 except 10w and 432 MHz . . . . . 49.95
- PA140/10 W/T . . . 10w in-140w out-2 mtr amp . . . 179.95
- PA140/30 W/T . . . 30w in-140w out-2 mtr amp . . . 159.95

## POWER AMPLIFIERS



- Blue Line . . . . RF power amp, wired & tested, emission-CW-FM-SSB/AM
- | Model      | Frequency  | Power Input | Power Output |        |
|------------|------------|-------------|--------------|--------|
| BLB 3/150  | 45- 55MHz  | 3W          | 150W         | TBA    |
| BLC 10/70  | 140-160MHz | 10W         | 70W          | 139.95 |
| BLC 2/70   | 140-160MHz | 2W          | 70W          | 159.95 |
| BLC 10/150 | 140-160MHz | 10W         | 150W         | 259.95 |
| BLC 30/150 | 140-160MHz | 30W         | 150W         | 239.95 |
| BLD 2/60   | 220-230MHz | 2W          | 60W          | 159.95 |
| BLD 10/60  | 220-230MHz | 10W         | 60W          | 139.95 |
| BLD 10/120 | 220-230MHz | 10W         | 120W         | 259.95 |
| BLE 10/40  | 420-470MHz | 10W         | 40W          | 139.95 |
| BLE 2/40   | 420-470MHz | 2W          | 40W          | 159.95 |
| BLE 30/80  | 420-470MHz | 30W         | 80W          | 259.95 |
| BLE 10/80  | 420-470MHz | 10W         | 80W          | 289.95 |

- PS15C Kit . . . . 15 amp-12 volt regulated power supply w/case, w/fold-back current limiting and overvoltage protection . . . 79.95
- PS15C W/T . . . . same as above-wired & tested . . . 94.95
- PS25C Kit . . . . 25 amp-12 volt regulated power supply w/case, w/fold-back current limiting and ovp . . . . . 129.95
- PS25C W/T . . . . same as above-wired & tested . . . 149.95
- PS25M Kit . . . . same as PS25C with meters . . . . 149.95
- PS25M W/T . . . . same as above-wired & tested . . . 169.95

## POWER SUPPLIES



- O.V.P. . . . . adds over voltage protection to your power supplies, 15 VDC max. . . . . 9.95
- PS3A Kit . . . . 12 volt-power supply regulator card with fold-back current limiting . . . 8.95
- PS3012 W/T . . . new commercial duty 30 amp 12 VDC regulated power supply w/case, w/fold-back current limiting and overvoltage protection . . . . . 239.95

- RPT50 Kit . . . . repeater-6 meter . . . . . 465.95
- RPT50 . . . . . repeater-6 meter, wired & tested . . . 695.95
- RPT144 Kit . . . . repeater-2 mtr-15w-complete (less crystals) . . . . . 465.95
- RPT220 Kit . . . . repeater-220 MHz-15w-complete (less crystals) . . . . . 465.95
- RPT432 Kit . . . . repeater-10 watt-432 MHz (less crystals) . . . . . 515.95
- RPT144 W/T . . . . repeater-15 watt-2 mtr . . . . . 695.95
- RPT220 W/T . . . . repeater-15 watt-220 MHz . . . . . 695.95
- RPT432 W/T . . . . repeater-10 watt-432 MHz . . . . . 749.95
- DPLA50 . . . . . 6 mtr close spaced duplexer . . . . 575.00

## REPEATERS



- DPLA144 . . . . 2 mtr, 600 KHz spaced duplexer, wired and tuned to frequency . . . 379.95
- DPLA220 . . . . 220 MHz duplexer, wired and tuned to frequency . . . . . 379.95
- DPLA432 . . . . rack mount duplexer . . . . . 319.95
- DSC-U . . . . . double shielded duplexer cables with PL259 connectors (pr.) . . . 25.00
- DSC-N . . . . . same as above with type N connectors (pr.) . . . . . 25.00

- TRX50 Kit . . . . Complete 6 mtr FM transceiver kit, 20w out, 10 channel scan with case (less mike and crystals) . . . . . 249.95
- TRX144 Kit . . . . same as above, but 2 mtr & 15w out . . . 219.95
- TRX220 Kit . . . . same as above except for 220 MHz . . . 219.95
- TRX432 Kit . . . . same as above except 10 watt and 432MHz . . . . . 254.95
- TRC-1 . . . . . transceiver case only . . . . . 19.95
- TRC-2 . . . . . transceiver case and accessories . . . 39.95

## TRANSCEIVERS



## OTHER PRODUCTS BY VHF ENGINEERING

- CD1 Kit . . . . . 10 channel receive xtal deck w/diode switching . . . . . \$ 6.95
- CD2 Kit . . . . . 10 channel xmit deck w/switch and trimmers . . . . . 14.95
- CD3 Kit . . . . . UHF version of CD1 deck, needed for 432 multi-channel operation . . . 12.95
- COR2 Kit . . . . . carrier operated relay . . . . . 19.95
- SC3 Kit . . . . . 10 channel auto-scan adapter for RX with priority . . . . . 19.95
- Crystals . . . . . we stock most repeater and simplex pairs from 146.0-147.0 (each) . . . 5.00
- CWID Kit . . . . . 159 bit, field programmable, code identifier with built-in squelch tail and ID timers . . . . . 39.95
- CWID . . . . . wired and tested, not programmed . . . 54.95
- CWID . . . . . wired and tested, programmed . . . 59.95
- MIC1 . . . . . 2,000 ohm dynamic mike with P.T.T. and coil cord . . . . . 12.95
- TS1 W/T . . . . . tone squelch decoder . . . . . 59.95
- TS1 W/T . . . . . installed in repeater, including interface accessories . . . . . 89.95
- TD3 Kit . . . . . 2 tone decoder . . . . . 29.95
- TD3 W/T . . . . . same as above-wired & tested . . . 39.95
- HL144 W/T . . . . 4 pole helical resonator, wired & tested, swept tuned to 144 MHz ban . . . 24.95
- HL220 W/T . . . . same as above tuned to 220 MHz ban . . 24.95
- HL432 W/T . . . . same as above tuned to 432 MHz ban . . 24.95

- SYN II Kit . . . . 2 mtr synthesizer, transmitt offsets programmable from 100 KHz-10 MHz, (Mars offsets with optional adapters) . . . . . 169.95
- SYN II W/T . . . . same as above-wired & tested . . . 239.95
- MO-1 Kit . . . . . Mars/cap offset optional . . . . . 2.50
- TO-1 Kit . . . . . 18 MHz optional tripler . . . . . 2.50

## SYNTHESIZERS



## WALKIE-TALKIES

- HT 144B Kit . . . . 2 mtr, 2w, 4 channel, hand held receiver with crystals for 146.52 simplex . . . 129.95
- NICAD . . . . . battery pack, 12 VDC, 1/2 amp. . . . 29.95
- BC12 . . . . . battery charger for above . . . . . 5.95
- Rubber Duck . . . 2 mtr, with male BNC connector . . 8.95



VHF ENGINEERING  
DIVISION OF BROWNIAN ELECTRONICS CORP.  
Box C / 320 WATER ST. / BINGHAMTON, N.Y. 13901 / Phone 607-723-9574





**In the concluding part of this two part article we get into the circuitry and wind up with some terrific pictures you can take with your completed Plumbicon SSTV camera.**

# The WB2DCX Plumbicon SSTV Camera

Part II

BY JAMES E. McKEOWN\*, WB2DCX

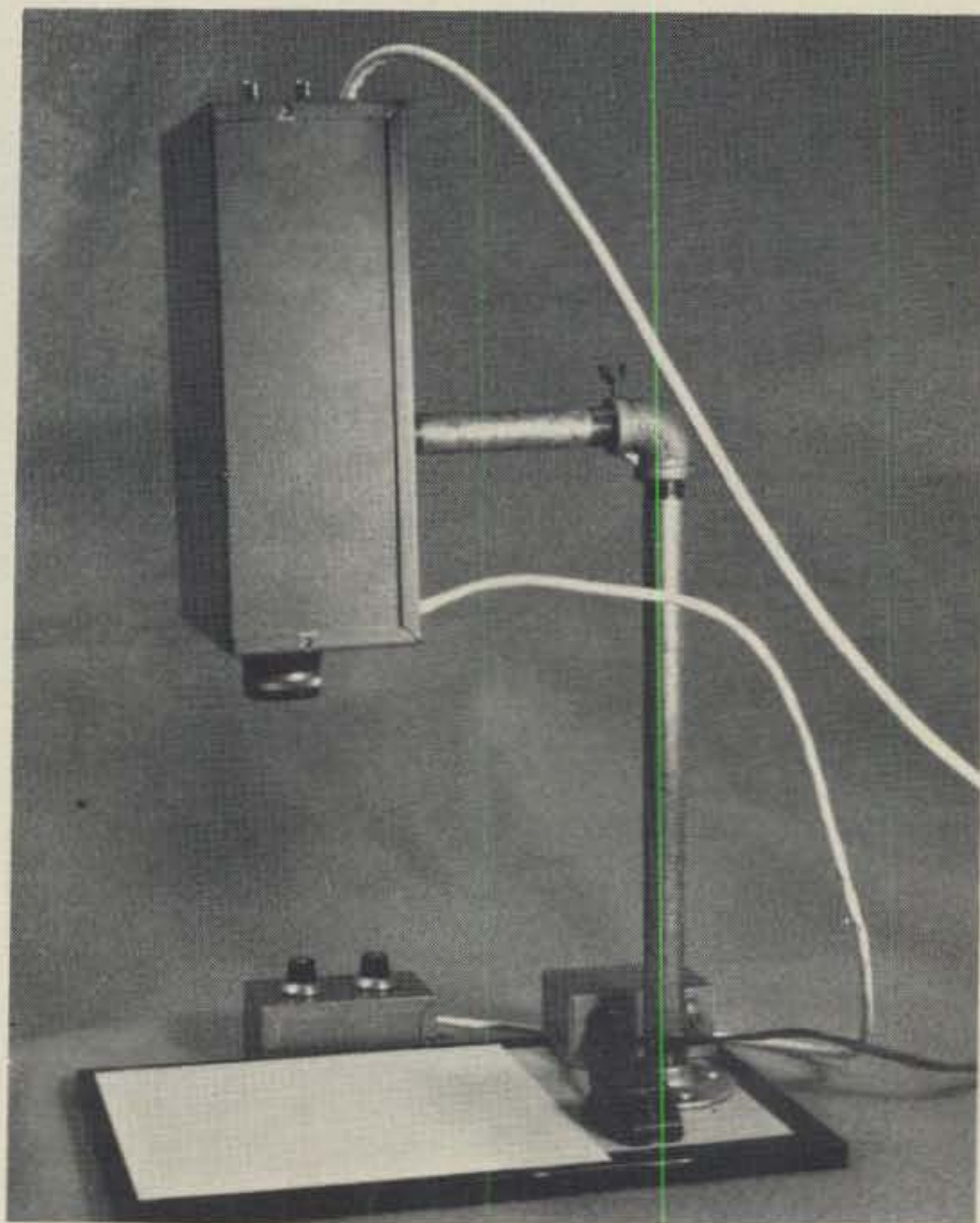
Last month we ended Part I at the point where most of the hardware was discussed. We now get into the circuitry, parts lists and assembly of the Plumbicon SSTV camera.

## Circuit Boards:

The assembly of the circuit boards is quite straightforward and is best done by referring to the circuit board layouts, figs. 3, 4, and 5. It is highly recommended that some provision be made for removal of integrated circuits, Molex pins are excellent for this purpose. The full schematic for the camera is shown in fig. 6.

## Main Camera:

The remainder of the camera is wired point to point. In the prototype model, the contrast and black level controls were mounted in a separate minibox from the camera to allow remote control. It is important that connections to and from the video amplifier be adequately shielded, and that the video amplifier itself be shielded in a minibox. The overall hookup circuitry can be seen by referring to the wiring diagram, fig. 5.



## Power Supply:

The power supply is relatively straightforward, and the circuit diagram, fig. 7, is self-explanatory. Note that the filament and d.c. supply grounds must be kept separate to avoid noise (hum) generation at the video amplifier inputs.

## Procurement of Parts:

Most of the parts for this camera can be purchased at electronic supply outlets. The aircraft grade plywood can be purchased at any hobby shop. The Plumbicon tube is obtained from a local television station. Some commercial color TV cameras use three of these tubes, and when one tube goes bad all three are replaced leaving two good tubes. Most TV station engineers are sensitive to an amateur's needs.

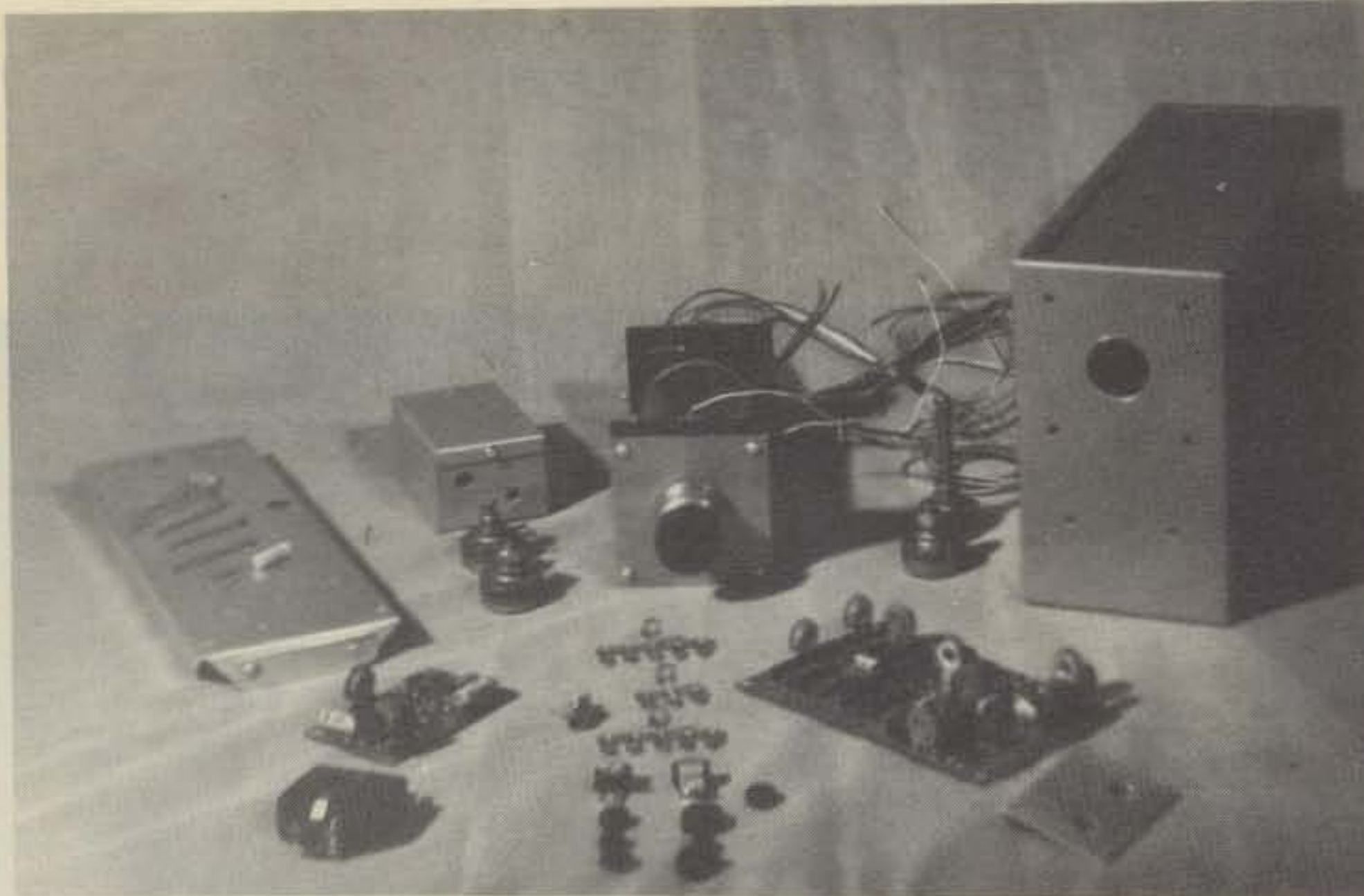
## Alignment

- Set the trim pots and controls as follows:

Black Level	Wiper at ground
Contrast	Maximum resistance
Black Clamp	Wiper at ground end of pot
DC Balance	Minimum resistance
Video Freq. (R15)	Mid range
Vert. Size	Minimum resistance

\*17 Seneca St., Sidney, N.Y. 13838





The camera immediately prior to final assembly.

Horiz. Size	Minimum resistance
Vert. Center (R22)	Mid range
Horiz. Center (R21)	Mid range
Video Output (R11)	Wiper at high end of pot
5ms Pulse (R9)	Mid range
30ms Pulse (R8)	Mid range
Sync. Freq. (R3)	Mid range
Beam Current	-100v end of pot
Focus	+150v end of pot

**II. With tube removed,**

- 1) Switch on
- 2) Look for smoke
- 3) Check:  $\pm 12v$  at Sync Timing Board and Video Amplifier Board,  $+5v$  on Sync Timing Board,

6.3 v.a.c. on Sync Timing Board, -100v on pin 6 of tube socket, +300v on pin 7 of tube socket, +150v on pin 3 of tube socket, 6.3 v.a.c. on pin 4 of tube socket.

4) Switch off

**III.** Install IC's 1 through 5 (565, (3  $\times$  7493), 7490), attach scope probe to pin 5 of IC1. Adjust sync. freq. pot (R3) to produce a 60 Hz square wave. As sync pot is rotated, this pulse will jitter and settle on 60 Hz. If setting is wrong, pulse will continue to jitter. Check: pin 1 of IC3—1200 Hz., pin 1 of IC4—15 Hz, and pin 12 of IC5— $\frac{1}{8}$  Hz.

**IV.** Install IC6 and IC7. Adjust 5 ms sync pulse control to produce exactly 6 complete pulses at pin 11 of IC7, adjust 30 ms pulse until

it takes up about half the space between the 5 ms pulses as viewed on pin 10 of IC7.

**V.** Install IC9. Connect scope across horizontal scan coils. Adjust horizontal centering to produce an equal plus and minus swing. This should be about  $\pm 1v$ . Similarly adjust vertical centering to produce  $\pm 1v$  across vertical coil.

**VI.** Install IC10 and IC11. Adjust offset to produce a minimum of 0v (i.e. slightly positive) at pin 1 of IC10 as contrast pot is rotated through its range.

**VII.** Measure voltage at pin 7 of IC10. This should be very nearly zero volts and go negative by several volts as black level is rotated through its range. Adjust black clamp to produce -0.5v at pin 5 of

Fig. 5—Parts layout of the two boards and their interconnections.

**Component Parts List**

**$\frac{1}{2}$  watt, 10% Carbon resistors:**

Resistance (ohms)	Quantity
330	2
820	4
1 K	1
4.7 K	2
10 K	2
15 K	2
100 K	2
1 M	4

**Trim Pots (Radio Shack):**

Resistance (ohms)	Quantity
5 K	2
10 K	5
50 K	2
500 K	1

**Control Pots:**

Resistance (ohms)	Quantity
2.5 K	1
20 K	1

**Diodes:**

Type	Quantity
1N914	7
Germanium	2
6v, $\frac{1}{2}$ w, Zener	2

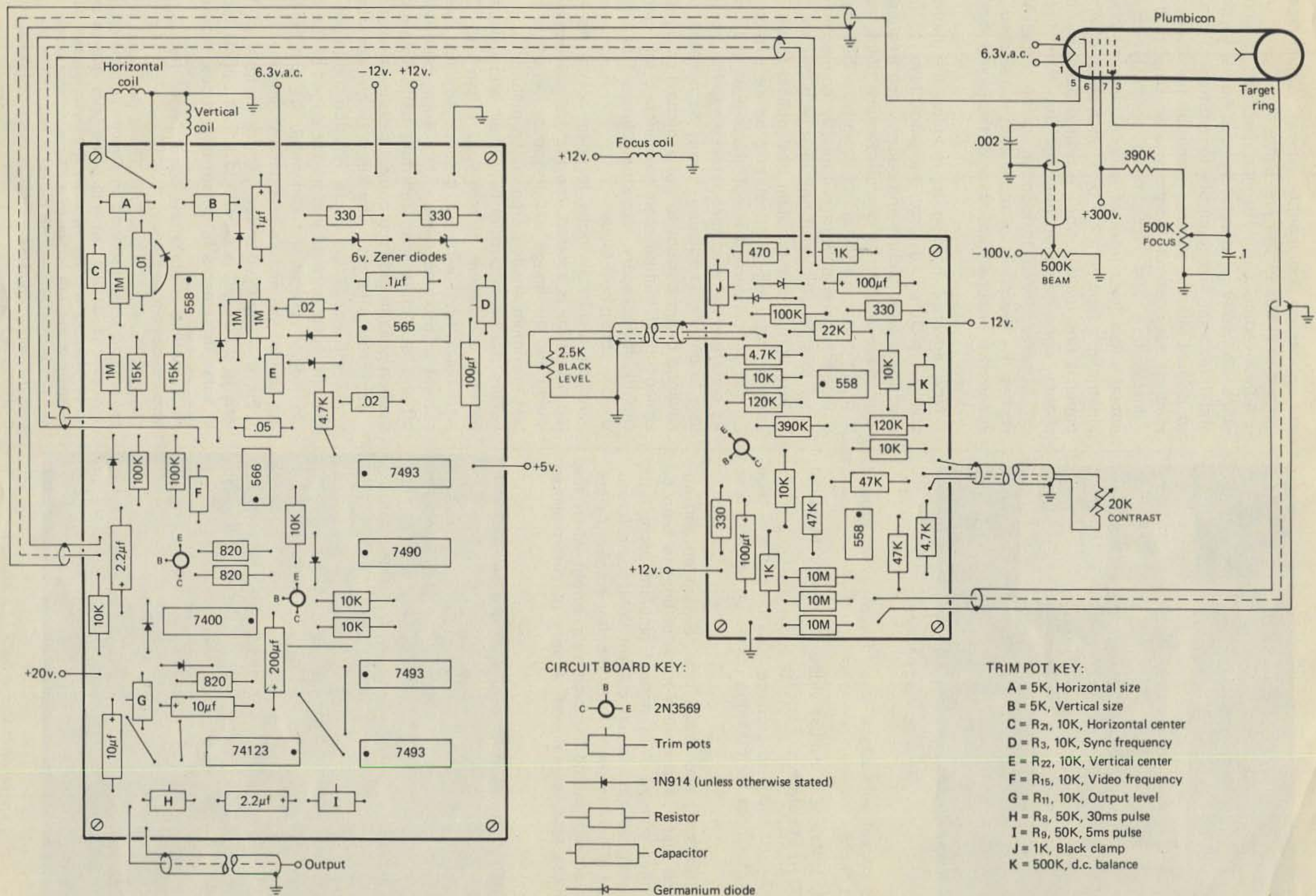
**Capacitors:**

Type	Capacitance (uf)	Voltage	Quantity
Ceramic	0.01	50	3
Ceramic	0.02	50	2
Tantulum	2	15	3
Tantulum	10	15	3
Tantulum	47	15	1

**Integrated Circuits:**

Type	Quantity
565	1
566	1
7400	1
7490	1
7493	3
74123	1
1458	3





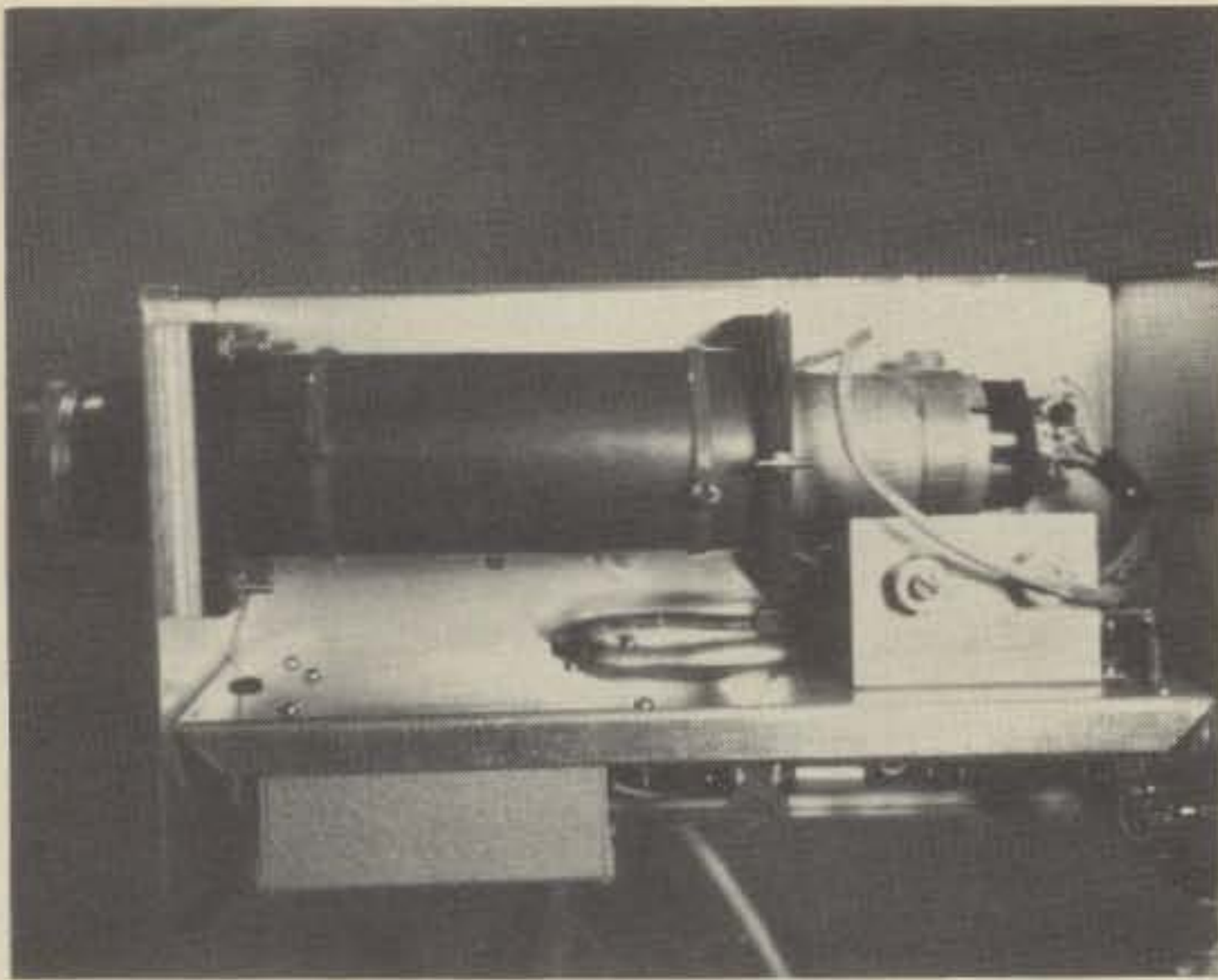
**CIRCUIT BOARD KEY:**

- 2N3569
- Trim pots
- 1N914 (unless otherwise stated)
- Resistor
- Capacitor
- Germanium diode

**TRIM POT KEY:**

- A = 5K, Horizontal size
- B = 5K, Vertical size
- C = R<sub>21</sub>, 10K, Horizontal center
- D = R<sub>3</sub>, 10K, Sync frequency
- E = R<sub>22</sub>, 10K, Vertical center
- F = R<sub>15</sub>, 10K, Video frequency
- G = R<sub>11</sub>, 10K, Output level
- H = R<sub>8</sub>, 50K, 30ms pulse
- I = R<sub>9</sub>, 50K, 5ms pulse
- J = 1K, Black clamp
- K = 500K, d.c. balance





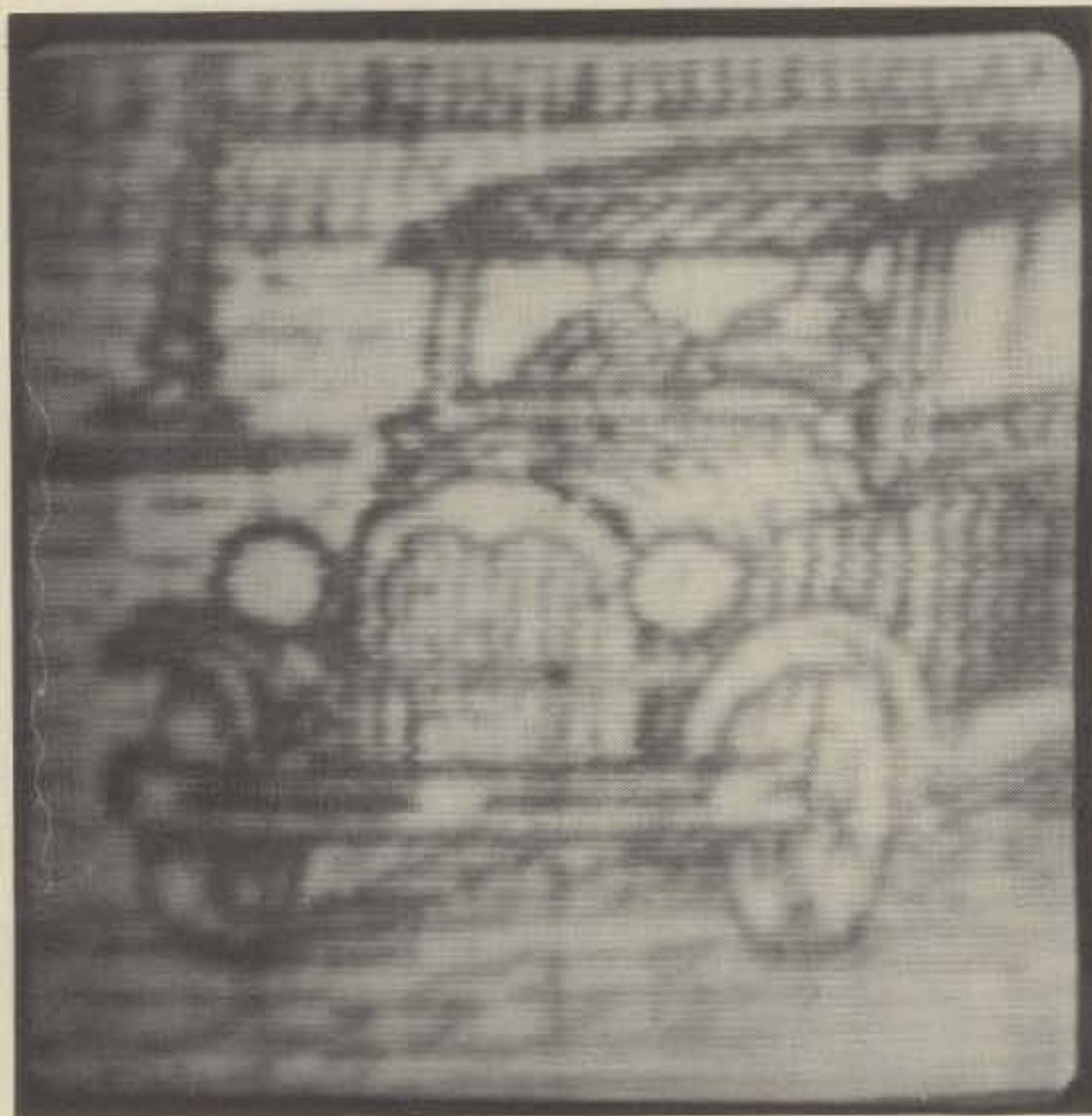
*The completed camera.*

IC8 socket with black level pot wiper at ground end of pot.

**VIII.** Install IC8. Adjust video frequency to about 1400 Hz at output.

**IX.** Adjust focus to produce 100v on pin 3 of tube socket. Check for blanking pulses on pin 5 of tube socket.

**X.** Switch off and install tube. Switch on and advance black level until a trace of light is seen on monitor screen. With normal ambient room light present, advance beam current until some further trace of light is seen on the monitor screen. As set, the screen should become very bright when the camera lens is removed. A very distorted ellipse



*Picture taken from the back of a \$10 bill.*

will appear on the monitor screen. Adjust beam current until this ellipse just lights up.

Adjust vertical and horizontal centering to locate ellipse in center of monitor screen. Adjust vertical and horizontal size controls to produce a circle which just fills the screen. It may be necessary to readjust the centering controls to accomplish this.

Install lens and place some contrasty object about 1 foot from front of lens. A piece of black electrician's tape on a 8½ by 11 inch sheet of white paper is fine for this work. Advance beam current slightly, open lens stop fully and turn room lights off. Observe sweep on monitor screen for several frames. As the effect of room light is removed by successive sweeps some trace of the image should be seen.

Now advance lighting to produce the highest contrast picture. Advance the black level to just produce a white picture and adjust video frequency to produce 2400 Hz at output<sup>1</sup>. Reduce black level to again produce a picture of some type. Determine if the deflection coils are correctly connected in order to scan picture. If not, reverse either set.

Turn lights up and obtain best optical focus. To assist in this, adjust offset to produce a picture. Do not be concerned about shading at this time. As picture is being scanned, place hand in front of lens to ensure no sticking. It may be necessary to advance beam current to get a picture as light is turned up. If picture tears, advance black clamp slightly. If necessary, move tube forward or backward to obtain best focus.

Adjust electrical focus for best focus. As the focus control is rotated, the picture will begin to shade and the image will disappear. Adjust to obtain maximum shaded area of the picture.

Turn the beam current fully down and reset the offset to a minimum of zero volts at pin 1 of IC10 with black level wiper at ground. Advance beam current to produce picture ring. Turn room lights off and let picture scan until fully dark. Rotate deflection coils to produce correct picture orientation.

Construct a target using black electrician's tape which will just fill the circle. Position the target so that the outer corners just fill the edges of the circle. Adjust vertical and horizontal size and centering so that the picture just fills the screen.

Place a highly detailed picture in front of the lens (a dollar bill is nice) and adjust optical focus in small increments to obtain best focus. Increase

<sup>1</sup>It is possible to obtain the correct video frequencies from the camera as follows:

The 1200 Hz. signal is 0.833 ms. This is generated in the camera and when displayed on a scope with the camera lens capped, a faint tail with some jitter due to sync pulse phasing will be seen as the sync pulses come through. If this tail is set to 8.33 cm on the scope, the remaining frequencies can be set very close to the correct frequency. 1500 Hz.—0.667 ms (6.7 cm), 2400 Hz.—0.416 ms (4.2 cm).



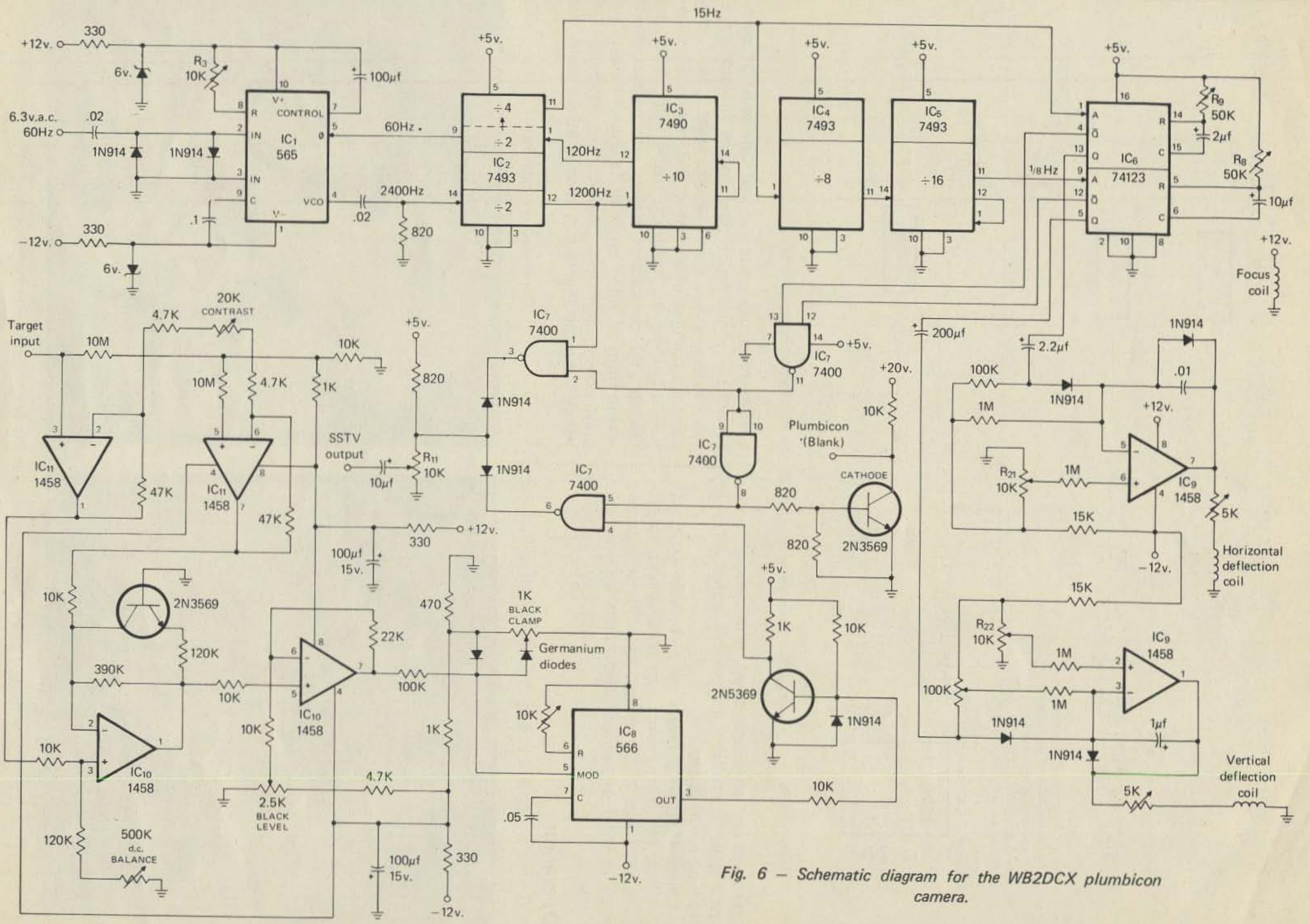


Fig. 6 - Schematic diagram for the WB2DCX plumbicon camera.

July 1977



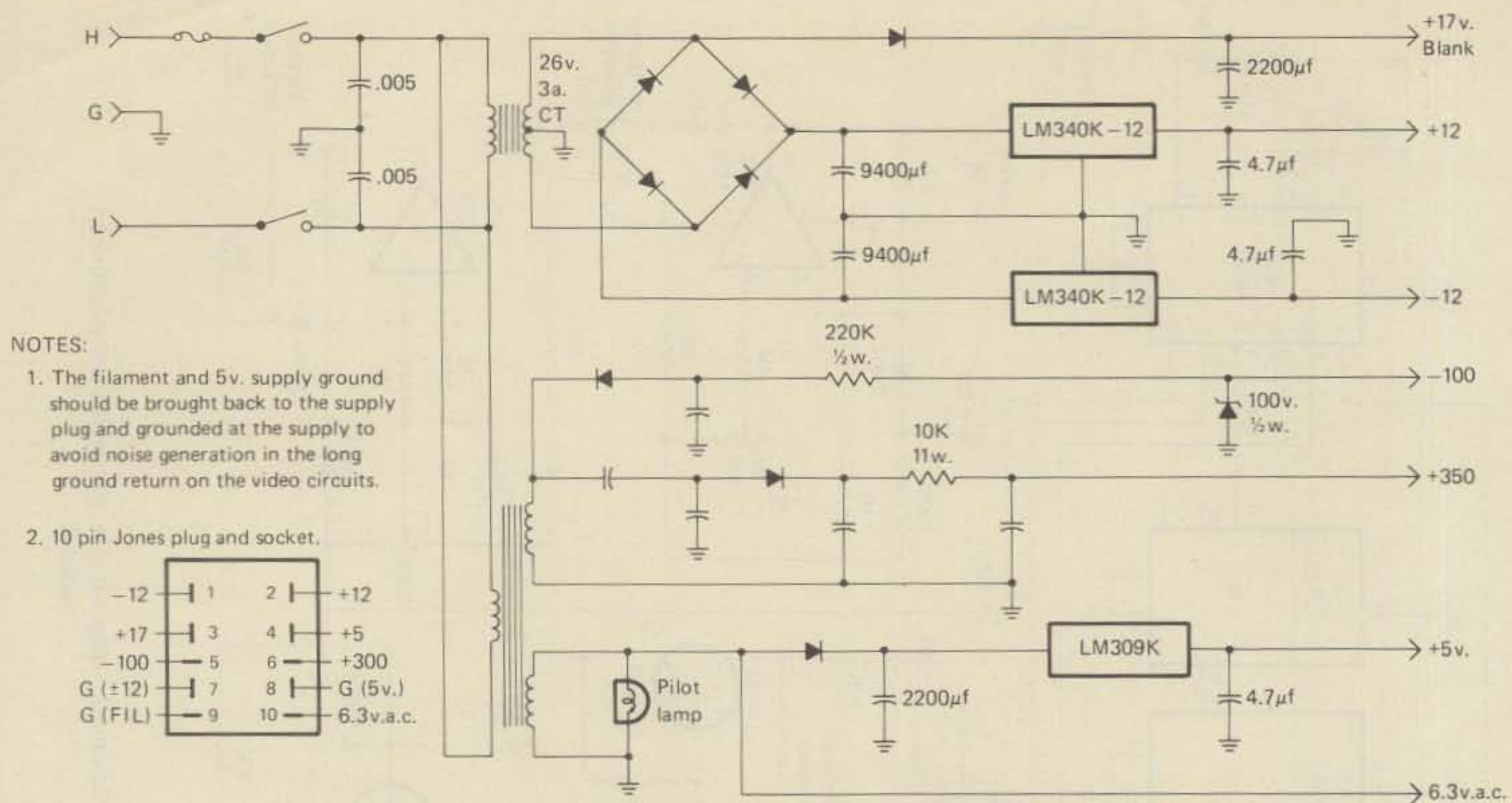


Fig. 7—Schematic diagram of the Plumbicon power supply.

light level and stop lens down. If necessary to obtain a better black level adjustment, adjust offset to produce a darker picture.

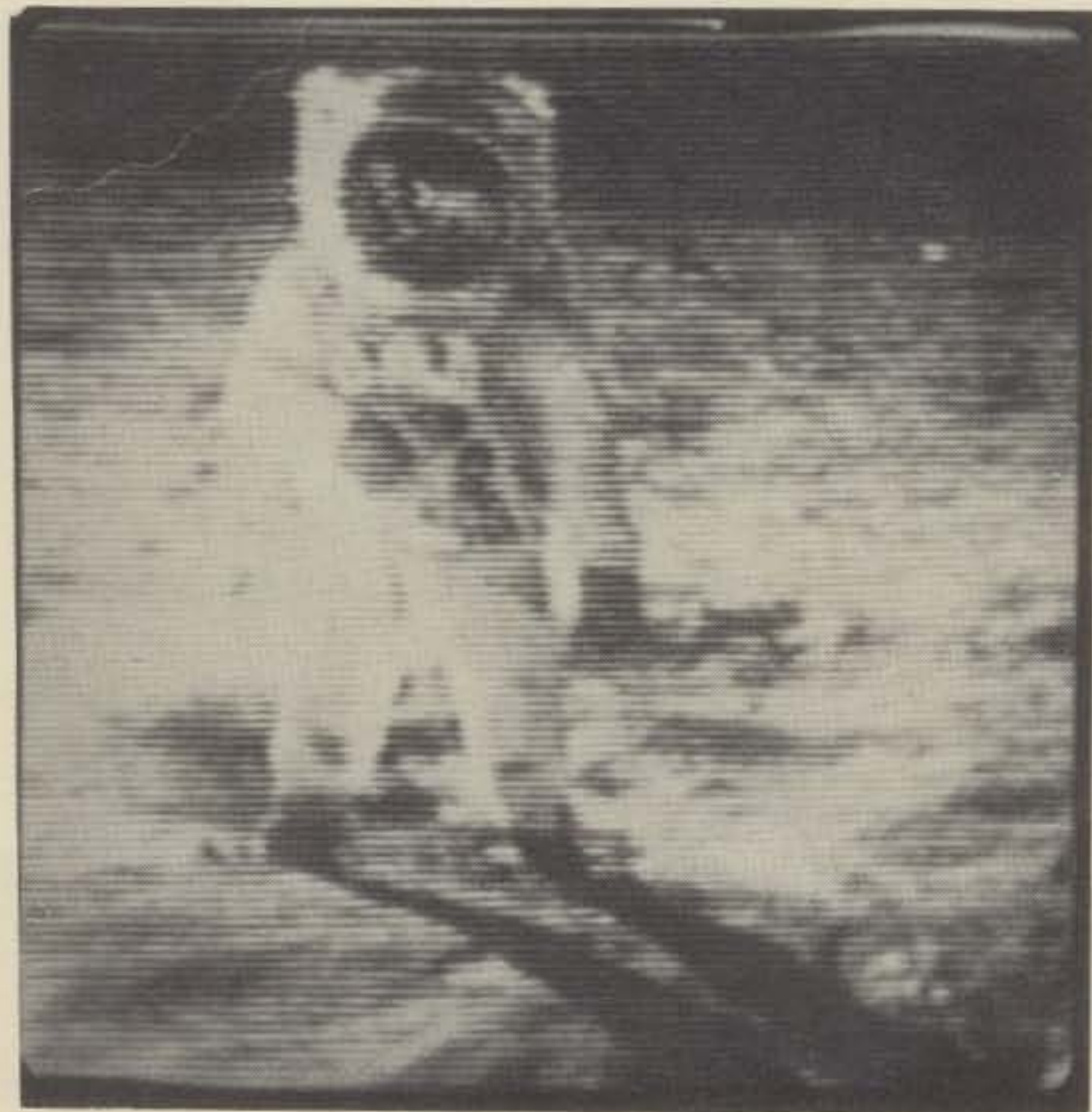
Check frequency levels as picture is scanned<sup>1</sup>. Readjust video frequency and black clamp to produce 1500 and 2300 Hz. at output. Place a printed page in front of camera and touch up electrical focus.

### Operation

Once the camera is aligned, one will find that the

camera produces good images. One must be careful not to get too much light on the subject, since this camera is very sensitive and with a "fast" lens can take pictures in almost total darkness. By carefully adjusting the contrast, black level, and lens "f-stop", the contrast or "swing" can be maximized (some form of video analyser is useful here). One may notice that this camera has tendency to "stick", but the Plumbicon specifications state that

(Continued on page 85)



Typical SSTV pictures taken with the WB2DCX plumbicon camera.



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

# New Amateur Products

## Telco Communications Console

A brand new, uniquely designed communications console, known as the Comm-Sol Model CS-50, has been introduced by Telco Products Corporation. The Comm-Sol is the answer to the space problem for the communications enthusiast. It provides the user with a completely self-contained area for all of his equipment and, at the same time, serves as an attractive piece of furniture that blends with the home decor. The console completely conceals all equipment when not in use and prevents unauthorized use.



Comm-Sol's modular concept and construction allows additional units to be arranged attractively to provide all the work, storage and functional space you desire. All holes are predrilled and areas of stress are reinforced with metal. No special tools are required, and, in fact, the console can be assembled using only a dime. The easy to operate front disappearing tilt panel slides down instantly to conceal all equipment.

Finished in rich walnut veneer sides, top, bottom sliding doors and front disappearing tilt panel. Easy care black vinyl desk top. The back panel has pass-thru holes for all cables, eliminating unsightly wires. Size is 44 x 20 x 45 inches.

The Comm-Sol CS-50 is available from stock. Price is \$139.95. For additional information write or call Telco Products Corporation, 44 Seacliff Ave., Glen Cove, NY 11542, (516) 759-0330, or circle no. 33 on Reader Service Card.

## Omega-T Tri-Band Vertical

Omega-T HV-3 is a 30-foot self-supporting, top-loaded vertical monopole antenna for the 80, 40 and 20 meter bands. Matching is accomplished by a unique plug-in base matching unit; the full height is utilized on each band, resulting in greater gain and bandwidth and a lower angle of radiation. The HV-3 handles full legal power for SSB or



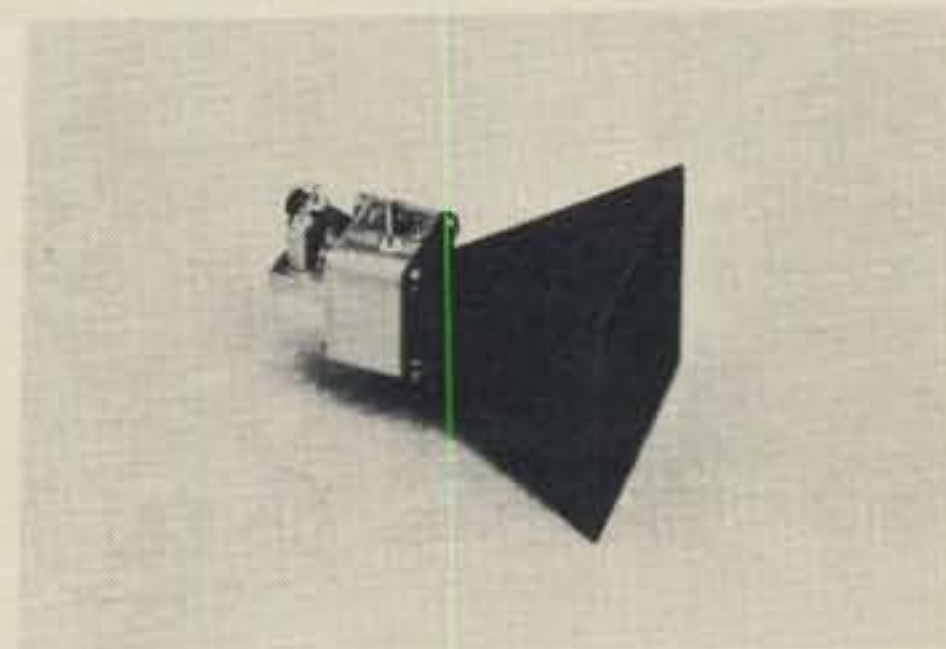
CW. Model HP-2 matching unit is available for 160 meter operation. The matching units feature continuously variable tuning and matching adjustments; tuning within a band or changeout of matching units can be accomplished in seconds. Construction is of heavy-wall extruded 6061T-6 pipe; hardware and top-loading rods are stainless steel. A tilt-up base mounts on a pipe or 4 x 4 post for easy one-man installation.

The HV-3 (with matching unit) sells for \$169.90. The antenna and matching unit are available separately for \$124.95 and \$44.95 respectively. The HP-2 matching unit for 160 meters is \$39.95. For additional information, contact D. E. Heitzman, Electrospace Systems, Inc., P.O. Box 1359, Richardson, TX 75080, (214) 231-9303, or circle no. 34 on Reader Service Card.

## Transceiver Front End For 10-GHz

Microwave Associates have introduced the MA-87127, a frequency modulated transceiver "front end" using a Gunn oscillator and Schottky diode and specially designed to operate in the 10.0 to 10.5 GHz amateur band.

The rear portion of the unit consists of a Gunn oscillator which directly converts DC to 20 mW of RF energy. The oscillator, unless otherwise specified, is delivered preset at 10.250 GHz (oscillators set to other frequencies are available on request). Mechanical tuning is available to shift the center frequency  $\pm 100$  MHz. A tuning varactor is mount-



ed close to the Gunn diode which will deviate the fundamental frequency typically 60 MHz when the tuning voltage is applied. FM, including both audio and video can be applied to the tuning varactor input. In the front of the transceiver, a Schottky diode mixer is provided.



The Gunn diode acts simultaneously as a transmitter and local oscillator with a portion of its energy (approximately 0.5 mW) being coupled to the mixer diode. The receiver noise figure is approximately 12 dB depending on auxiliary equipment used. A ferrite circulator has been integrated into the waveguide mount to isolate the transmitter and receiver functions.

For price and further information contact Microwave Associates, Inc., Burlington, MA 08103, or circle no. 35 on Reader Service Card.

### Lightweight Headset by Telex

The model CB-88, lightweight headset features a noise-cancelling power microphone that delivers clear, crisp voice transmission even in a moving vehicle where wind, traffic, and engine noise normally interfere with sound quality. The mike has a variable-gain amplifier and is mounted on a pivoting boom so that it can be positioned close to the lips and moved aside when not in use. A push-to-talk switch has a clip for convenient attachment to shirt or blouse.



Weighing less than three ounces, the headset closely follows the design of pilots' headsets, of which Telex is the leading manufacturer. Incoming signals are carried directly to the ear by means of a soft eartip allowing even weak signals to come in clearly. The unit can be used with either the left or right ear, and—if desired—can be worn without the headset. An adapter is furnished which allows the earpiece to be clipped to the user's eyeglasses.

The CB-88 headset is under \$70. For more information contact Telex Communications, 9600 Aldrich Avenue South, Minneapolis, Minnesota 55420, or circle no. 36 on Reader Service Card.

### New Heath Novice Course

The Heath Company has introduced the new ER-3701 Amateur Radio Novice License Course. According to Heath, the course contains everything an individual needs to know in order to obtain an FCC Novice license. Heath also states that if anyone completing the course fails to pass the FCC exam, they will refund the price of the course.



The course contains programmed text, cassette tapes to support the text and to provide helpful Morse code practice, and sample license exams. There are also operating aids to help in setting up a station, colorful wall posters covering the radio frequency spectrum and call letter map of the U.S., glossaries, operating tips, and more.

The Amateur Radio Novice Course is said to use the same proven, programmed step-by-step learning method as the four basic electronics courses and the digital techniques course in the Heath Continuing Education Series.

For more information about Heath's learn-at-home courses, and their line of kit-form electronic products, write for their catalog to: Heath Company, Dept. 350-15, Benton Harbor, MI 49022, or circle no. 37 on Reader Service Card.

### Wilson Synthesized 2-Meter Portable

The Wilson WE800, an 800-channel 2-meter synthesized portable, may be operated from your automobile as a 12-watt mobile rig or as a 2-watt portable using the internal NiCad battery pack, shoulder strap and rubber duck antenna. The unit has a CMOS low drain synthesizer, with 45 mA on receive, and 450 mA in the 2-watt transmit position.



Frequency range covered by the WE 800 is 144 through 148 MHz in 5 kHz steps, with 600 kHz offset up or down. Subaudible tones are available as an option. The unit weighs 31 ounces and measures 8-1/4 x 6-3/4 x 1-7/8 inches. For further information write to Wilson Electronic Corporation, 4288 South Polaris, Las Vegas, NV 89103, or circle no. 38 on Reader Service Card.

### CDE Big Talk Antenna Rotator

The Cornell-Dubilier communications rotor system, the Big Talk, combines accuracy, ease of operation, quietness, and attractive styling in a deluxe rotor motor, control box package. The stained wood cabinet control box enables the operator to preset four rotor positions for instant selection with pushbuttons. The four most used positions can be identified by the snap-off, etched button cover. The settings and identification can be changed at the operator's discretion. A dial control offers a 360-degree scale for rotation to zero in on a signal from any direction. Both dial and preset buttons are activated by a start button that positions the rotor to the selected direction and automatically shuts off all power. A neon lamp glows when the power is on and the antenna is turning.



The Big Talk rotor is encased in a bell housing of cast aluminum for complete weather protection. The motor provides 800 inch-pounds of stall torque to turn heavy antennas even under severe wind and ice conditions. A disc brake holds the antenna securely in a stopped position, and 50 ball bearings help rotate up to 500 pounds of balanced weight. The unit can be mounted in-line on a mast or tower mounted, and requires 115 VAC, 50/60 Hz power. The Big Talk weighs 17.5 pounds.

For further information contact Mr. Douglas Graham, Cornell-Dubilier Electric Corporation, 150 Avenue L, Newark, New Jersey 07101, or circle no. 39 on Reader Service Card.



## Bird RF Absorption Wattmeter

The Bird model 6104 Terminal RF absorption wattmeter is a four-range unit with a 60-watt meter and internal 80-watt load. The four ranges are 2, 6, 20 and 60 watts, designed to fulfill servicing requirements from handheld portables to avionics gear. Accuracy is  $\pm 5$  percent of full scale. The frequency

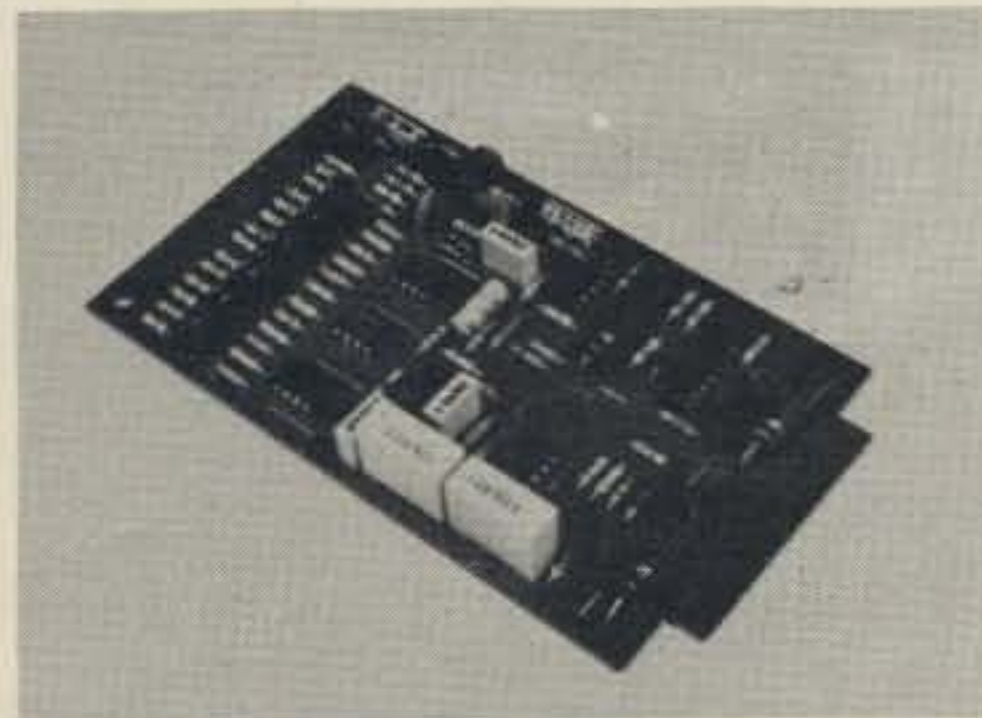


range is 25 to 512 MHz to enable CB servicing at the low end and land mobile maintenance at the high end, plus aircraft, airport, FAA air/ground, marine, amateur and other RF power measurements. Load VSWR is 1:1 from DC to 512 MHz and the meter case can be detached for convenient readout.

Priced at \$249.00, the model 6104 is available from Bird Electronic Corporation, 30303 Aurora Road, Cleveland, (Salon), OH 44139, or circle no. 40 on Reader Service Card.

## DM-170 RTTY Demodulator

The DM-170 demodulator is the latest addition to a growing family of solid state RTTY products offered by the Flesher Corporation. Designed for 170 Hz shift, the unit includes anti-space circuitry, and autostart output with adjustable threshold and programmable start and stop delays. Available in kit



form or assembled, quality components are used throughout to insure easy assembly and alignment. All components are mounted on a 2.95 x 5.25 inch photo-etched, plated glass-epoxy circuit

board, notched for a 12-pin edge connector. Provisions have been made for hard-wiring the board into external circuits if the edge connector is not used.

High sensitivity, high Q filters are achieved with cascaded low sensitivity, Low Q stages to provide good stability and ease of tuning. A lowpass filter and a hysteresis slicer are used to improve copy under marginal conditions. High current switching transistors are used for both loop-keying and the autostart relay driver. Outputs are available for the standard "+" scope display, along with tuning meter output. Typical power requirements are  $\pm 15$  V, 1.3 watts. The power supply is not included.

The DM-170 demodulator is \$39.95 in kit form, \$59.95 assembled and aligned. Prices include first class postage. Bank Americard, Master Charge, phone orders accepted. Accessories available include: PS-170 bandpass pre-selector, \$11.95 12-pin edge connector, \$2.00; and a solid state autostart relay, \$11.95. Other solid state RTTY products offered are: FS-1 170/850 Hz AFSK; ST-6 CW identifier, and the TMT 10-minute station timer.

Requests for additional information and orders to: Flesher Corporation, P.O. Box 902, Topeka, Kansas 66601, Telephone (913) 234-0198, or circle no. 41 on Reader Service Card.

## Yaesu FT-301D Transceiver

Yaesu Electronics Corporation's newest addition to its line of amateur equipment, the FT-301D all solid state digital transceiver, covers the 160 through 10 meter bands with provision for WWV/JJY reception for time signals. Frequency readout to six places is accomplished by large red-colored LEDs. Yaesu states that the FT-301D is the first completely solid state transceiver available with 200 watt SSB power input, 200 watts CW, and 50 watts AM and FSK. The FSK provision accepts keyboard contacts with shifts of 170 or 850 Hz, depending on the operator's desires.

The transmitter audio response has been tailored to voice frequencies, 300 Hz to 2700 Hz at -6 dB. Distortion products are less than -31 dB. Frequency stability during any 30 minute period is better than 100 Hz. Receiver sensitivity is 0.25 mV at A/N 10 dB. Selectivity is variable: 2.4 kHz at -6 dB; 4.0 kHz at -60 dB; 0.6 kHz at -6 dB 1.2 kHz at -60 dB, 6 kHz at -6 dB; and 12 kHz at -60 dB.

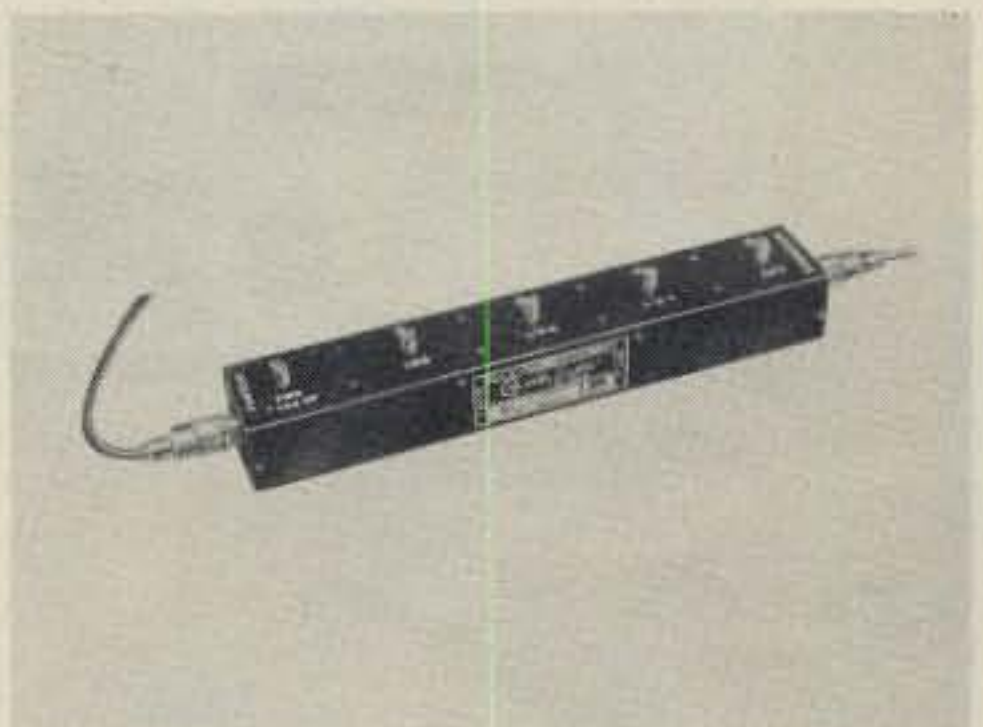


Entirely solid state, the FT-301D may be directly powered by a 13.8 VDC battery source, negative ground, at 21 amperes in transmit, 0.9 amperes receive. A Matching AC supply, model FP-301D with self contained speaker is available. A series of transformer taps enable the unit to operate from 100, 110, 117, 200, 220 or 234 VAC, 50/60 Hz. Compact and lightweight, the transceiver measures 280 x 125 x 195 mm, and weighs 9 kg. The matching AC supply measures 212 x 125 x 195 mm, and weighs 10 kg.

Full details on the FT-301D transceiver and FP-301 AC supply may be obtained from any authorized Yaesu dealer, or by writing Yaesu Electronics Corporation, 15954 Downey Ave., P.O. Box 498, Paramount, CA 90723 or circle no. 42 on Reader Service Card.

## Adjustable TVI Filter

With Telco Products Corporation's Channel Guard XL-1000, the amateur or CBer can eliminate unwanted harmonic radiation at the source. Utilizing a five-section tunable in-line, low-pass filter designed for negligible insertion loss, the XL-1000 will handle up to 1-kW PEP and attenuate all frequencies



below 40 MHz by 100 dB. The filter measures 1-1/2 x 2-1/4 x 12 inches. Price is \$34.95. For further information on the Channel Guard XL-1000 low-pass filter, contact Telco Products Corporation, 44 Seacliff Ave., Glen Cove, NY 11542, (516) 759-0330, or circle no. 43 on Reader Service Card.



# WE HAVE WHAT YOU NEED AT...

## BIRD THRULINE® WATTMETER



MODEL 43

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

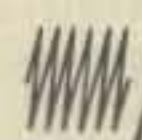
Table 1  
STANDARD  
ELEMENTS

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		

WE HAVE A COMPLETE STOCK OF ALL BIRD WATTMETERS AND SLUGS



**NATIONAL RADIO COMPANY, INC.**

**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 reception 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.

**\$3,000**

USED GEAR • TRADE UP • FREE UPS SHIPPING ON PREPAID ORDERS

**\$2,000,000 HAM INVENTORY**

HAMTRONICS-WHERE THE HAM IS KING



# THE LOWEST POSSIBLE PRICES



## VHF/UHF AMATEUR & MARINE EQUIPMENT



### 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 ckt. S-meter front panel. **\$229.00**



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. **\$249.00**



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**



**\$299.00**

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. **\$399.00**

DV-21. DIGITAL VFO. Use with IC-21A to complete 2M band. **\$299.00**

IC-202. 2 METER SSB PORTABLE XCVR. Puts sideband in your hand! Internal C batteries or external 12 VDC. 3W PEP. True I.F. noise blanker. 144.0, 144.2 on two other 200 KHz bands, selectable. Hamtronics stocks 145.2 and 145.8 - 146.0 MHz for calling frequency & satellite band. **\$259.00**



IC-30A. 450 MHz FM LOW XCVR. 1W or 10W. Low noise MOS-FET RF Amp & 5 section helical filter. 22 CH. capacity. S-meter & relative power output meter. IDC modulation control. **\$399.00**

MASTERCHARGE & BANKAMERICARD ACCEPTED

# HAMTRONICS

DIVISION OF TREVOSE ELECTRONICS  
4033 Brownsville Rd • Trevose, Pa. 19047

THE BIG 'H' FOR ALL YOUR HAM NEEDS!



# WE HAVE WHAT YOU NEED AT...

HAMTRONICS - WHERE THE HAM IS KING

## Dentron 3 Kilowatt Tuner Matches Everything From 160 to 10

**160-10 MAT**

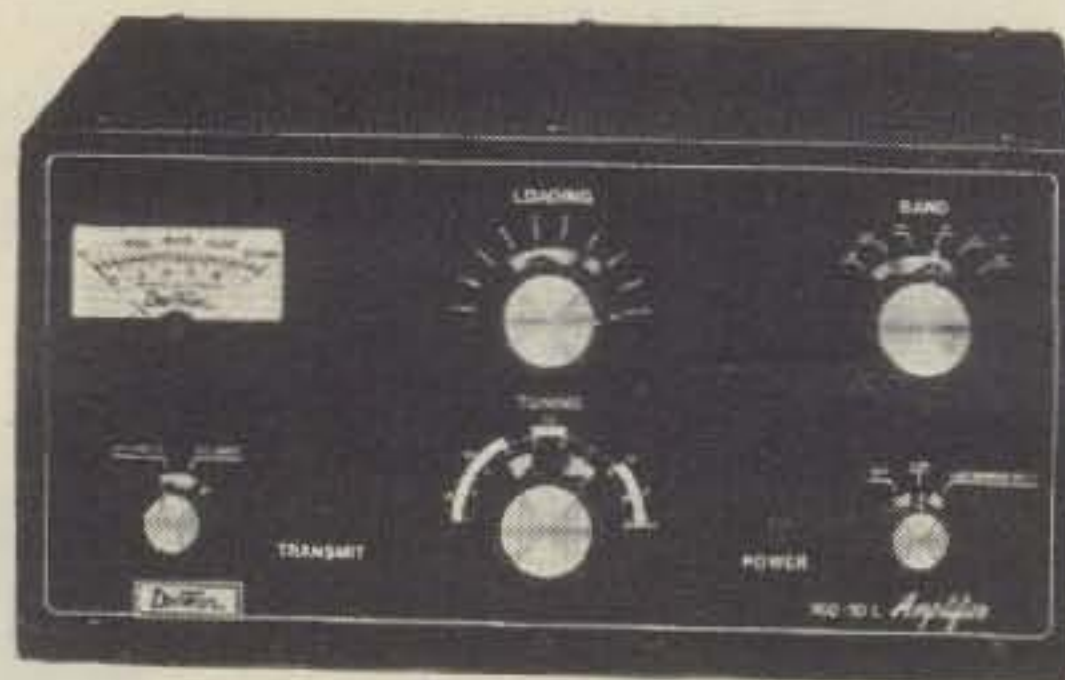
Built-In  
Wattmeter  
Front Panel Antenna  
Selector for  
Coax, Balanced  
Line and Random  
Wire.



**only \$229.50**

## 1000 to 1200 WATTS OUTPUT TO YOUR ANTENNA

## Dentron SUPERAMP



**\$499.50**

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

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

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

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

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

We mounted the 4 - 811 A's, industrial workhorse tubes, in a cooling chamber featuring the on-demand variable cooling system.

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.

NOW AVAILABLE WITH 572 B<sup>+</sup> FOR **\$574.50**



## Dentron Super Tuner

160-10 Meters  
Balanced Line,  
Coax, Random  
or Long Wire

Maximum Power Transfer, Xmitter to Antenna.

1 KW Model \$129.50

3 KW Model \$229.50

## Dentron ANTENNAS The Sky Openers

### 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

**\$84.50**

Also 80 m resonator for top mounting on SKYMASTER.

**\$29.50**

### SKYCLAW

A tunable monoband high performance vertical antenna, designed for 40, 80, 160 meter operation. SKYCLAW gives you the following spectrum coverage:

BAND (Meters)	BANDWIDTH (kHz)
160	50
80	200
40	entire band

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.

**\$79.50**

### EX-1

The DenTron EX-1 Vertical Antenna is designed for the performance minded antenna experimenter. The EX-1 is a full 40 meter, 1/4 wave, 33', self-supporting vertical. The EX-1 is the ideal vertical for phasing.

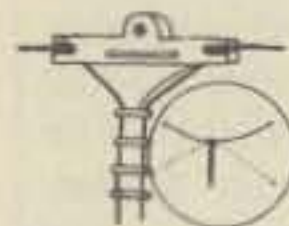
**\$59.50**



### 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 8 inch director with precision Hy-Q coils. And, 7 feet behind is a 18 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.

**\$129.50**



### 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.

**\$24.50**

## Dentron ANTENNA TUNER

## The 80-10 Skymatcher

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.



- Continuous tuning 3.2 - 30 mc
- "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**



Tired of constant switching and guesswork?

Every serious ham knows he must read both forward and reverse wattage simultaneously for that perfect match. So upgrade with the DenTron W-2 Dual in line Wattmeter.

**\$99.50**

USED GEAR • TRADE UP • FREE UPS SHIPPING ON PREPAID ORDERS

# \$2,000,000 HAM INVENTORY



# THE LOWEST POSSIBLE PRICES

## TEN-TEC INC.

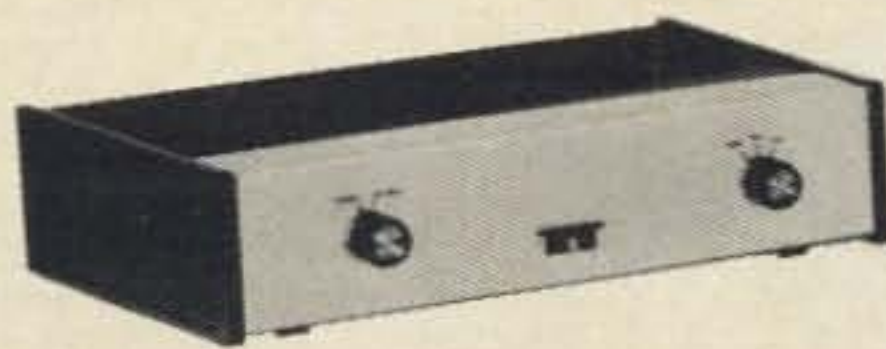
### TRITON IV EQUIPMENT



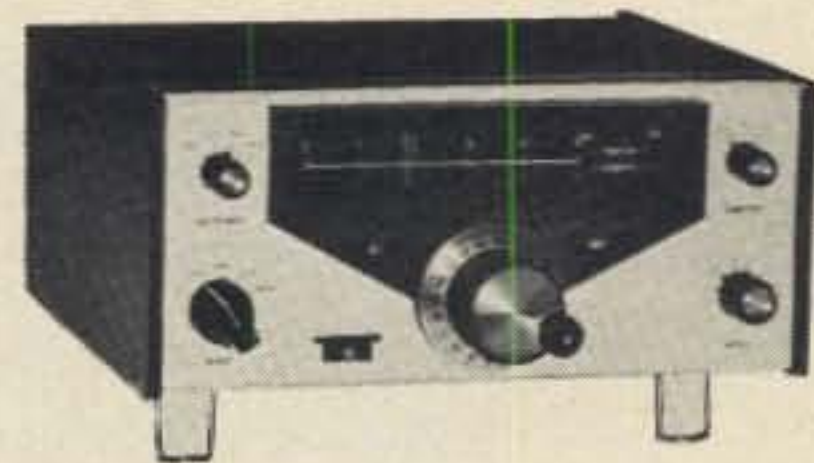
#### TRANSCEIVERS

MODEL 540-200W, SSB/CW  
3.5 - 30 MHz \$699.00

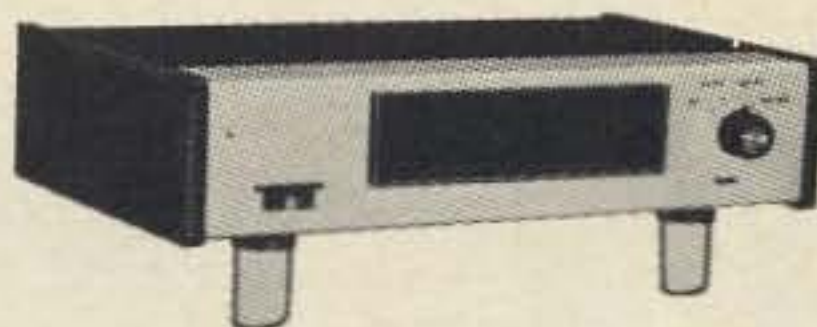
MODEL 544- DIGITAL, 200W  
SSB/CW, 3.5 - 30 MHz  
\$869.00



MODEL 240 \$97.00  
ONE - SIXTY CONVERTER



MODEL 242 \$169.00  
REMOTE VFO



MODEL 244 \$197.00  
DIGITAL READ OUT/COUNTER



MODEL 262-G \$129.00  
DELUXE POWER SUPPLY

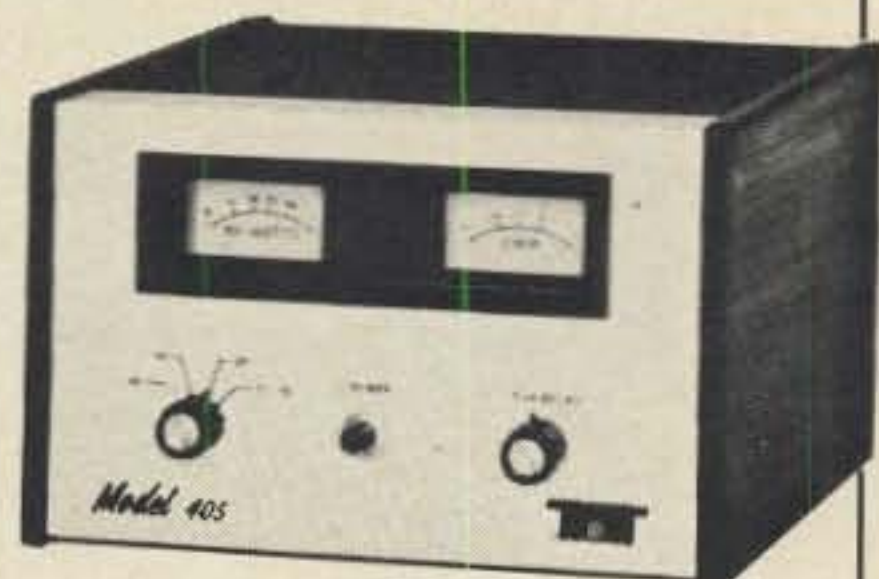


#### ARGONAUT

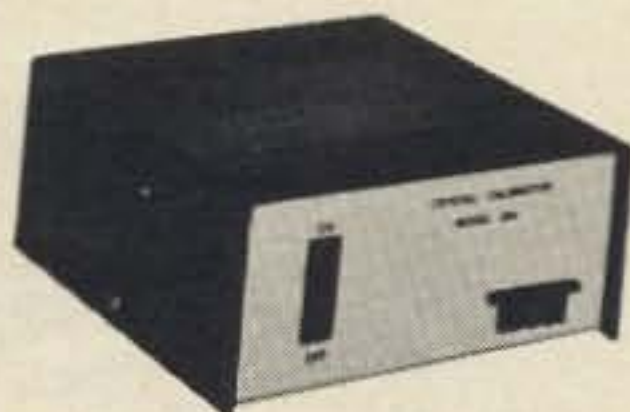
MODEL 509 \$329.00  
SW, SSB/CW, 3.5-30 MHz

#### LINEAR AMPLIFIER

MODEL 405 \$159.00  
100W, 3.5 - 30 MHz



AMMETER  
207 \$14.00



XTAL CALIBRATOR  
206 \$26.95

#### KEYERS



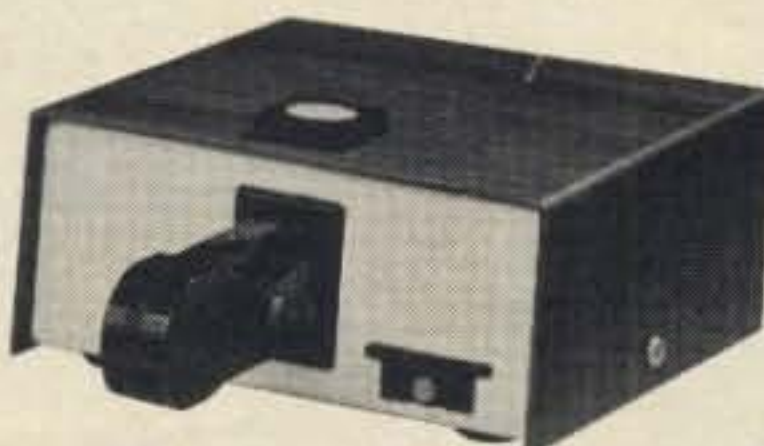
ELECTRONIC KR-50  
\$110.00



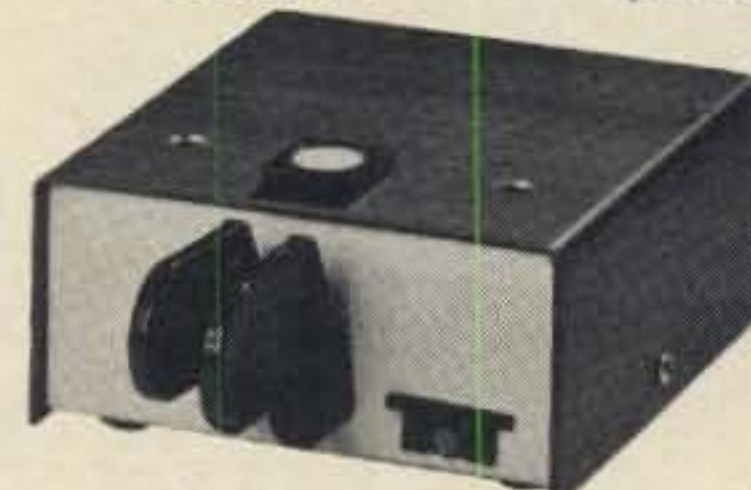
ELECTRONIC  
KR20-A \$67.00



ELECTRONIC KR-5A  
\$38.50



KR-2A \$15.00



KR1-A \$35.00

MASTERCHARGE & BANKAMERICARD ACCEPTED

# HAMTRONICS

DIVISION OF TREVISE ELECTRONICS  
4033 Brownsville Rd • Treviso, Pa. 19047  
(610) 257-1400 / (610) 757-5000

THE BIG 'H' FOR ALL YOUR HAM NEEDS!



# WE HAVE WHAT YOU NEED AT...



## DRAKE®

### KNOWN FOR QUALITY THROUGHOUT THE WORLD



#### RECEIVERS

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
4NB	Noise Blanker for R-4C	\$52.00
5NB	Noise Blanker for SPR-4	\$70.00

#### TRANSMITTER

T-4XC	C-Line. HF. 160-10M	\$599.00
-------	---------------------	----------

#### TRANSCEIVERS

TR-4CW	80-10M. SSB, AM, CW	\$649.00
TR-33C	2M, FM, 12 CH. Portable	\$229.95
MMK-33	Mobile/Dash/Desk Mount for TR-33C	\$12.95
34PNB	Plug-In Noise Blanker for TR-4 Series	\$100.00
MMK-3	Mobile Mount for TR-4	\$7.00
RV-4C	Remote VFO for TR-4 CW	\$120.00
FF-1	Crystal Control for TR-4	\$46.95

#### SYNTHESIZER

FS-4	General Coverage for 4-Line and SPR-4	\$250.00
------	---------------------------------------	----------

#### LINEAR AMPLIFIER

L-4B	Linear and w/power supply & tubes	\$895.00
------	-----------------------------------	----------

#### MATCHING NETWORKS

MN-4	Antenna Matching Network. 200W	\$110.00
MN-2000	Antenna Matching Network. 1000W	\$220.00
RCS-4	Remote Control Antenna Switch	\$120.00

W-4	RF Wattmeter, 1.8 to 54 MHz	\$72.00
WV-4	RF Wattmeter, 20 to 200 MHz	\$84.00
7072	Hand Held Microphone	\$19.00
7075	Desk Top Microphone	\$39.00
1525EM	Pushbutton Encoding Microphone	\$49.95
HS-1	Head Phones	\$10.00
AA-10	10W, 2M Amplifier	\$49.95
TV-300-HP	300 ohm High Pass TV Set Filter	\$10.60
TV-75-HP	75 ohm High Pass TV Set Filter	\$13.25
TV-42-LP	Transmitter Low Pass Filter. 100W	\$14.60
TV-3300-LP	Transmitter Low Pass Filter. 1000W	\$26.60
TV-5200-LP	Transmitter Low Pass Filter. 1000W. 100W, 6M	\$26.60

USED GEAR • TRADE UP • FREE UPS SHIPPING ON PREPAID ORDERS

# \$2,000,000 HAM INVENTORY

HAMTRONICS - WHERE THE HAM IS KING



# THE LOWEST POSSIBLE PRICES

## COLLINS AMATEUR EQUIPMENT



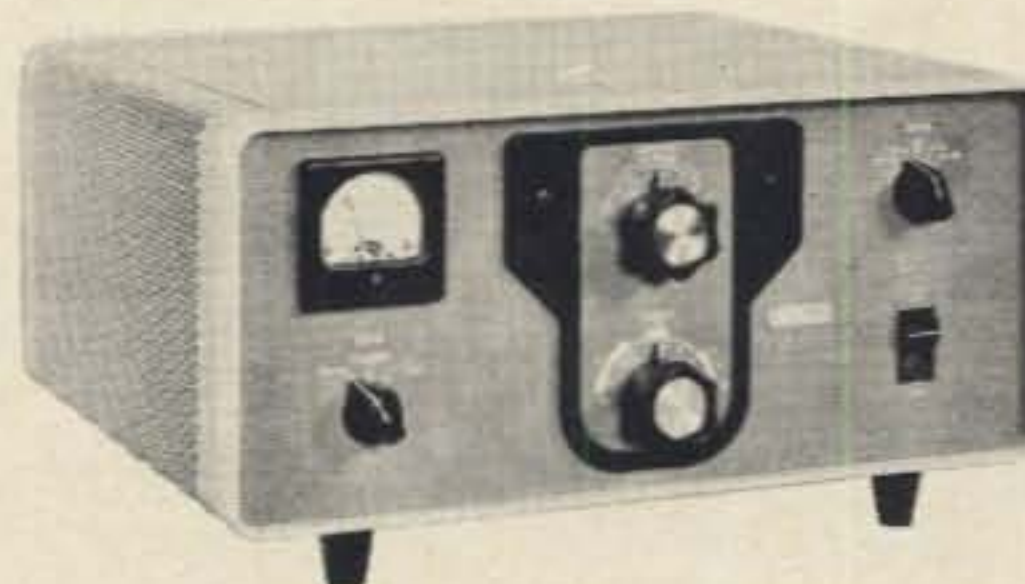
**KWM-2A TRANSCEIVER** **\$3533.00**  
Unmatched for mobile and fixed station applications. 175W on SSB, 160W on CW. Switch select up to 14 optional Xtals. Can be used for RTTY. Filter type SSB generation. Automatic load control. Inverse RF feedback. Reimability-tuned variable oscillator.



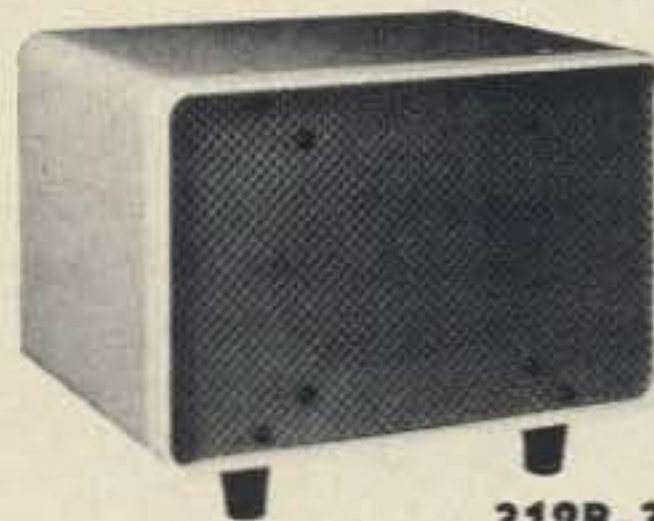
**75S-3C RECEIVER** **\$2504.00**  
Sharp selectivity. SSB, CW and RTTY. Single control rejection tuning. Variable BFO. Optional mechanical filters for CW, RTTY and AM. 2.1 KHz mechanical filter. Zener regulated oscillators. 3-position AGC.



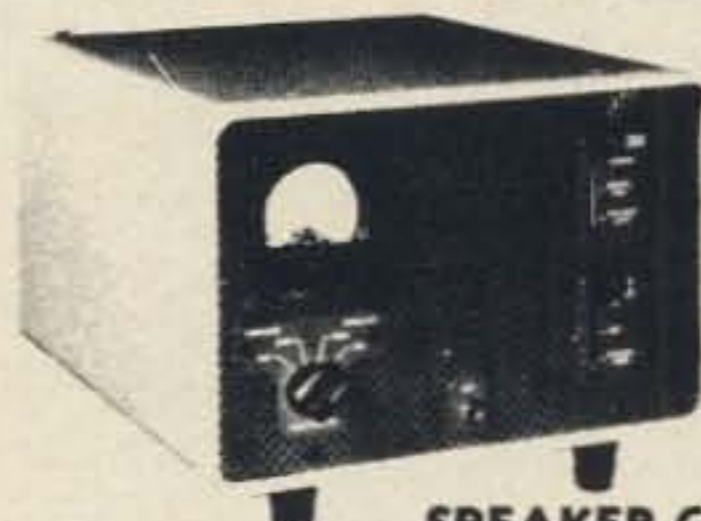
**32S-3A TRANSMITTER** **\$2597.00**  
Covers all ham bands between 3.4 MHz and 30 MHz. Nominal output of 100W. 175W, SSB and 160W CW. Dual conversion. Automatic load control. RF inverse feedback. CW spotting control. Collins mechanical filter.



**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**



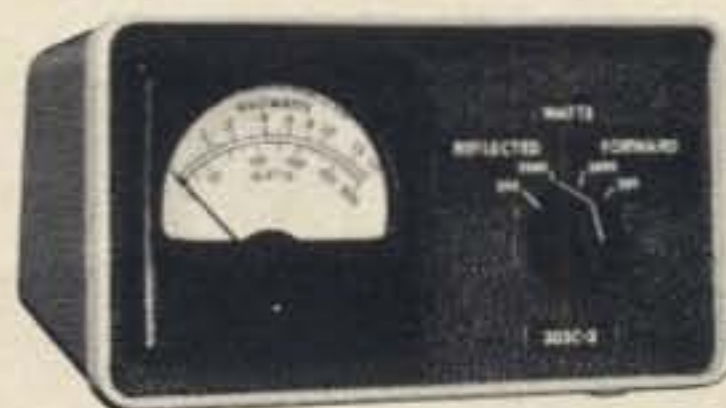
**312B-4 SPEAKER CONSOLE**  
**\$546.00**



**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**

**MASTERCHARGE & BANKAMERICARD ACCEPTED**

# HAMTRONICS

DIVISION OF TREVISE ELECTRONICS  
4033 Brownsville Rd • Trevose, Pa. 19047  
(215) 357-1400 / (215) 757-5300

THE BIG 'H' FOR ALL YOUR HAM NEEDS!



## TEMPO



TEMPO ONE	HF Transceiver. 80-10M. USB, CW & AM	399.00
AC/ONE	Power Supply for TEMPO ONE	99.00
VF/ONE	External VFO for TEMPO ONE	109.00
TEMPO VHF/ONE	Transceiver. 2M. 144 to 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

## 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 Amplifier 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

## 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



FC-76	Frequency Counter. 5 Digit LED	169.95
WM6200	In-Line Precision Wattmeter 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

USED GEAR • TRADE UP • FREE UPS SHIPPING ON PREPAID ORDERS

# \$2,000,000 HAM INVENTORY



**WE HAVE WHAT YOU NEED AT...**



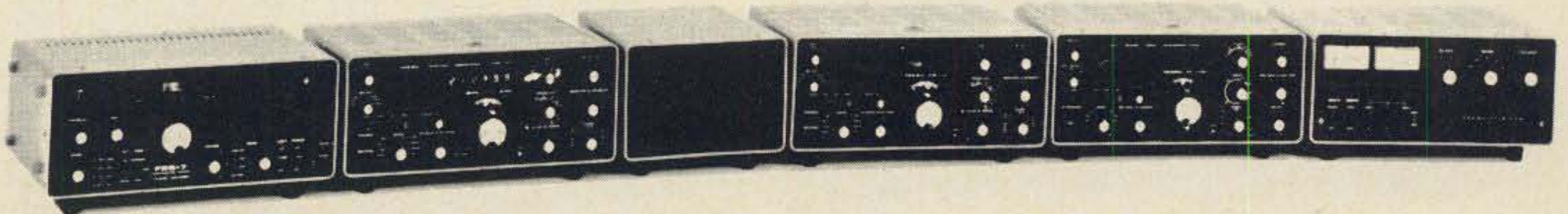
YD-844  
Dynamic Mike

# YAESU

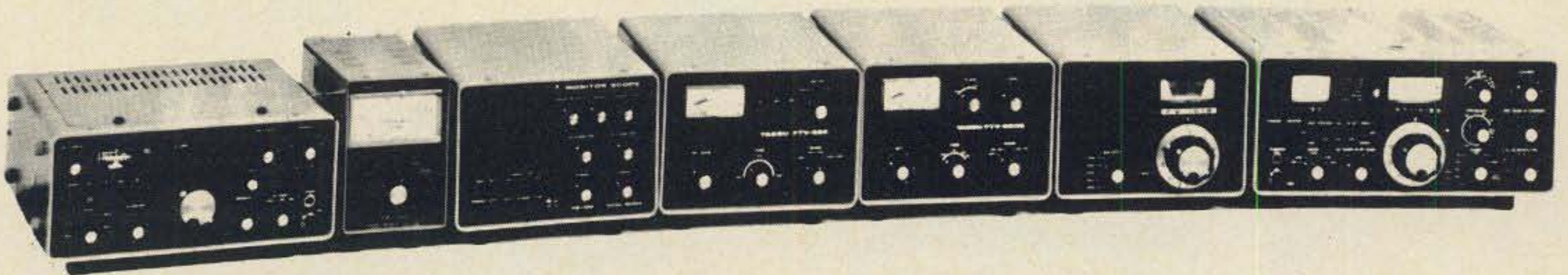
## ADVANCED COMMUNICATION EQUIPMENT



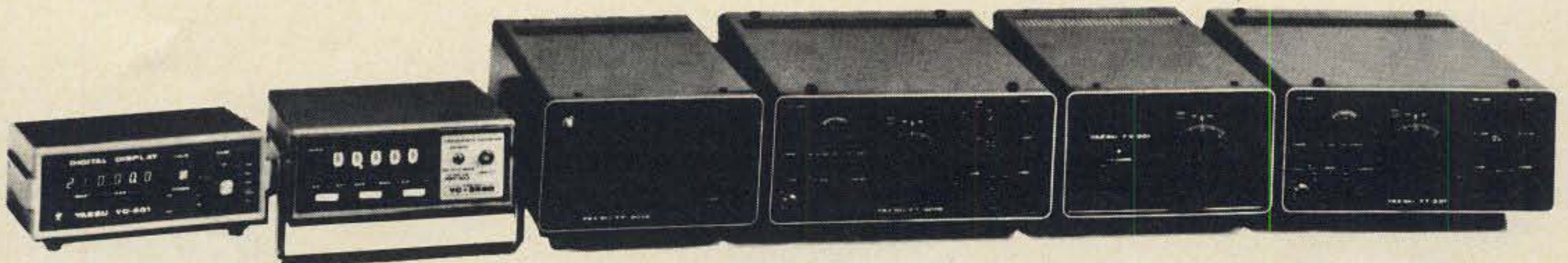
QTR-24  
World Clock



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

**USED GEAR • TRADE UP • FREE UPS SHIPPING ON PREPAID ORDERS**

# \$2,000,000 HAM INVENTORY

**HAMTRONICS-WHERE THE HAM IS KING**

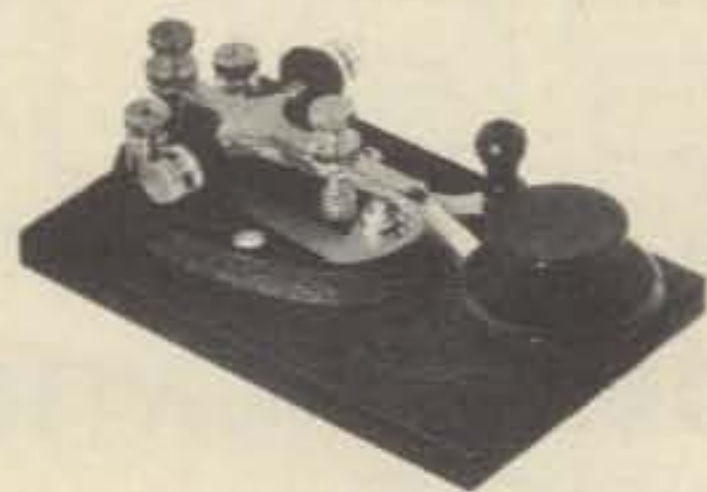


# THE LOWEST POSSIBLE PRICES

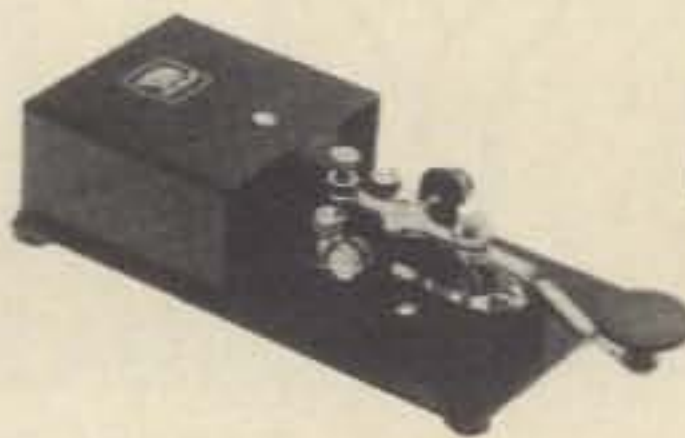
## NYE VIKING



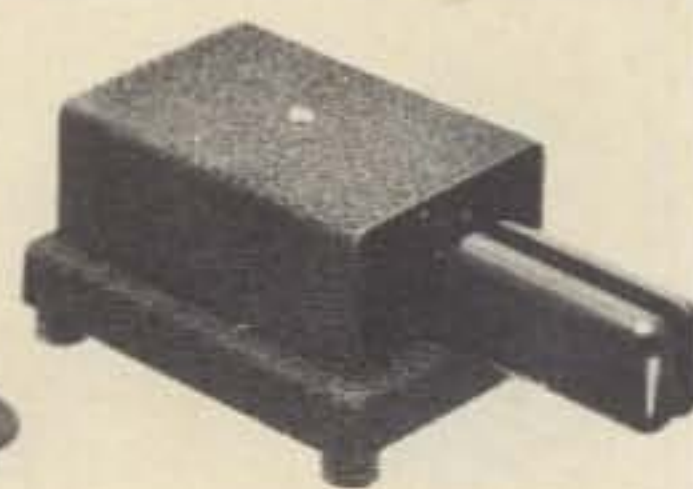
No. 114-310-003 \$8.25



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



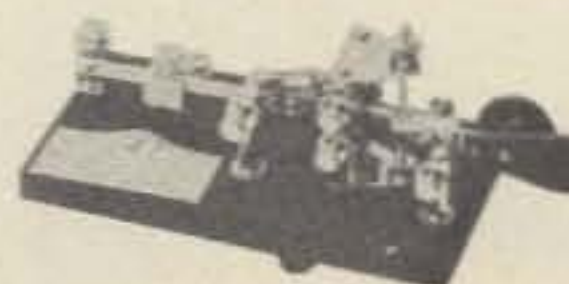
"PRESENTATION"  
66.00



"ORIGINAL"  
39.95



"LIGHTNING BUG"  
39.95



"CHAMPION"  
31.50



VIBRO-KEYER  
33.00

MASTERCHARGE & BANKAMERICARD ACCEPTED

# HAMTRONICS

DIVISION OF TREVISE ELECTRONICS  
4033 Brownsville Rd • Trevose, Pa. 19047  
(215) 357-1400 / (215) 757-5300

THE BIG 'H' FOR ALL YOUR HAM NEEDS!



# THE LOWEST POSSIBLE PRICES


**KENWOOD**

## THE PACESETTER IN AMATEUR RADIO



**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

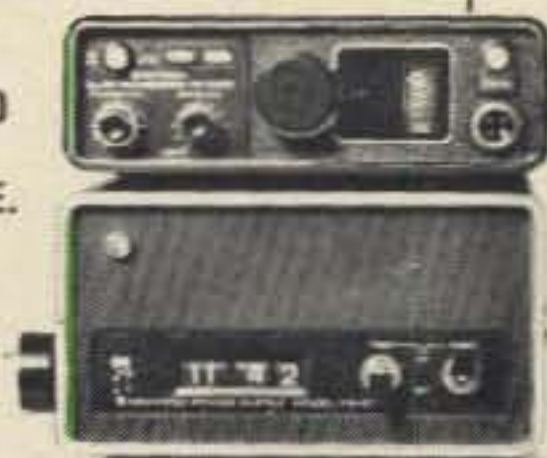
**SSB TRANSCEIVER.** Proven in the shacks of thousands of discriminating hams, field day sites, DX and contest stations and mobile installations. Superb engineering and styling.

**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**

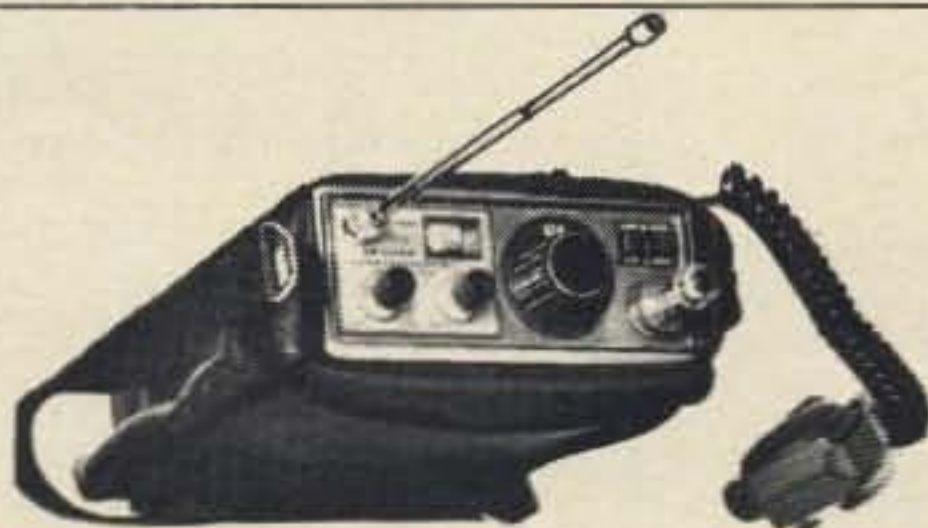
**SSB TRANSMITTER.** 3.5 to 29.7 MHz. Stable VFO. 1 KHz dial readout. 8 pole Xtal filter. AM Xmission available. Built-in AC pwr supply. Split frequency control available.



**VFO-820** \$139.00

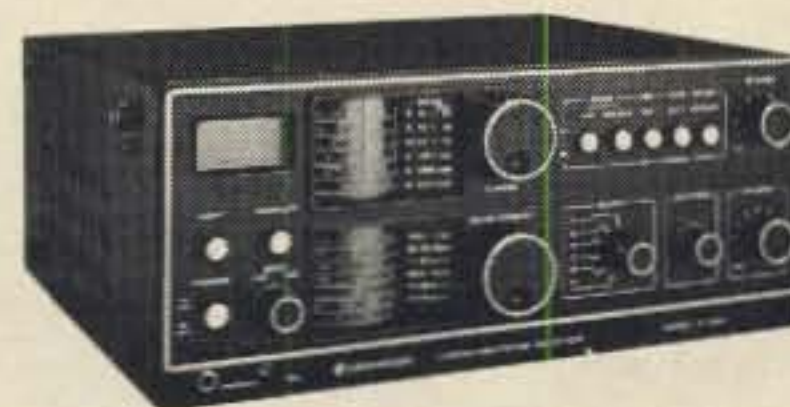
Designed exclusively for use with TS-820. RIT circuit and control switch. Fully compatible with optional digital display.

**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.

**THE BIG 'H' FOR ALL YOUR HAM NEEDS!**

**MASTERCHARGE & BANKAMERICARD ACCEPTED**

# HAMTRONICS

DIVISION OF TREVISE ELECTRONICS  
4033 Brownsville Rd • Trevose, Pa. 19047



**Here's the concluding part on how to get much more out of less. Follow Ade Weiss through Part II to get in on the communications mode of the future.**

# Coherent C.W. -- The C.W. Of The Future Part II

BY ADRIAN WEISS\*, K8EEG/Ø

In the first part of this paper, I discussed the basic concepts of Coherent c.w., the c.c.w. keyer, master frequency standard, and receiver/transmitter stabilization techniques. In this section, let us continue our discussion of receiver/transmitter stabilization techniques, and proceed to a description of the Petit c.c.w. Filter, the heart of the c.c.w. system.

**2.) W6NEY SB303 Stabilization System.** Fig. 7 shows

\*83 Suburban Estates, Vermillion, SD 57069

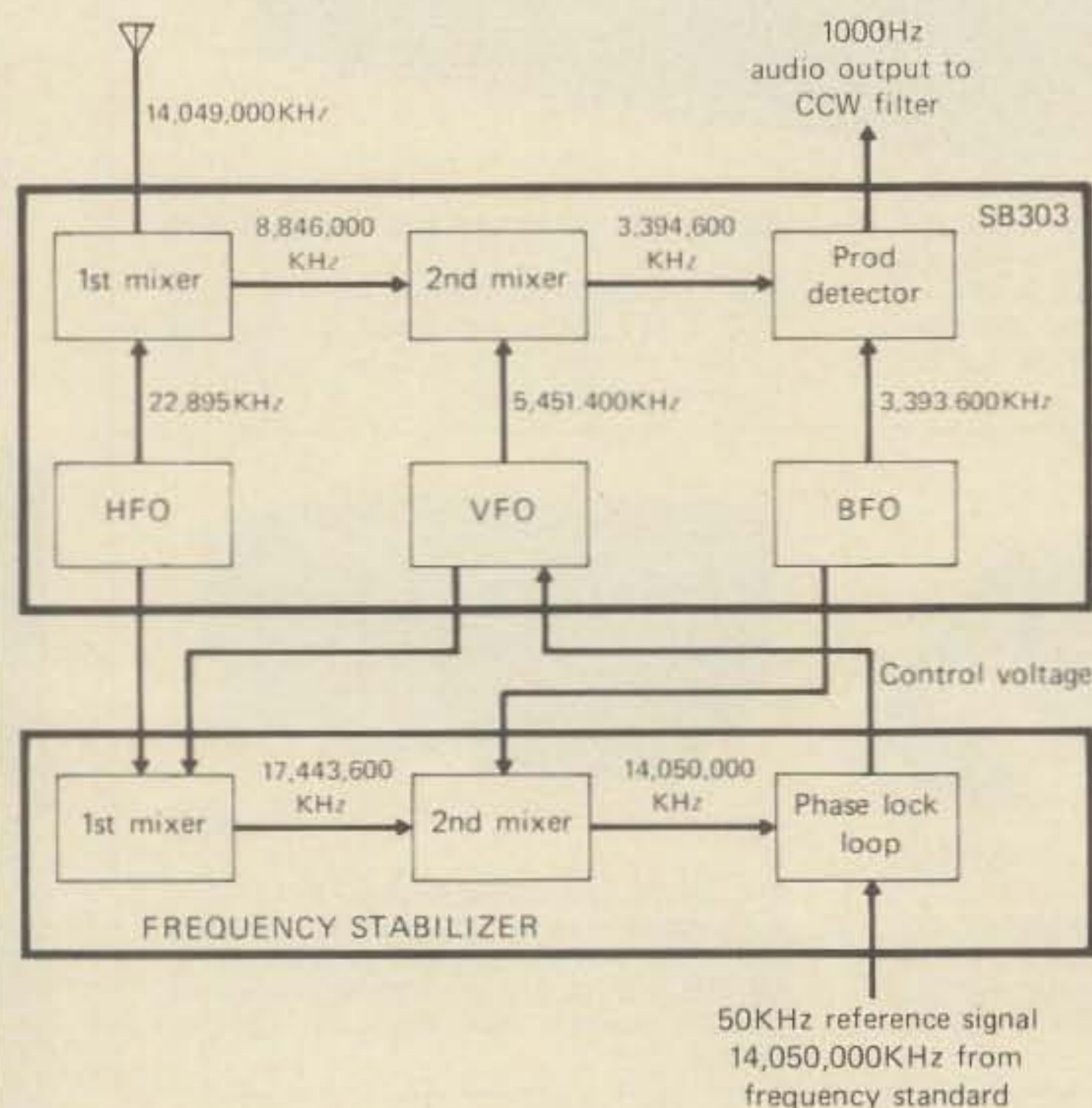


Fig. 7—The W6NEY stabilizer system for 14,050,000 kHz c.c.w. reception.

W6NEY's approach to stabilizing the Heath SB-303. It can be applied to most modern-design receivers or transceivers with attention to oscillator and mixing frequencies. In fig. 7, for reception of a c.c.w. signal at 14050.00 kHz, the receiver h.f.o., v.f.o., and b.f.o. signals are mixed in the stabilizer unit to achieve a receiving frequency 1000 Hz above or below the c.c.w. signal frequency. This receiver-derived signal is phase-locked to a reference signal from the master frequency standard in order to produce a control voltage to the varactor tuning diode in the receiver v.f.o. Fortunately, the SB-303 has this varactor built in, and made accessible through a rear panel connection. If the h.f.o., v.f.o., or b.f.o. drift, the v.f.o. is automatically shifted in frequency to compensate for that drift and keeps the receiver tuned to the desired frequency. The basic approach is similar to that used by WA7ZVC.

Fig. 8 shows the circuit of the phase-lock loop used by W6NEY. Two methods can be used to obtain the reference signal upon which to lock the receiver. First, a harmonic from the frequency standard can be fed to point A (B not used) to provide lockup. For example, a 100.000 kHz signal from the standard will provide lockup points at 14,000.000 kHz, 14,100.000 kHz etc., a 50.000 kHz reference signal at 14,000.000 kHz, 14,050.000 kHz, 14,100.000 kHz etc. This method will work with harmonics from the K4EEU standard down to the 5000 Hz output. A faulty IC in W6NEY's unit required the harmonic booster shown in fig. 8; replacement of the faulty IC permitted operation without the booster. The second method uses a summed signal from two of the frequency standard outputs. A comparatively



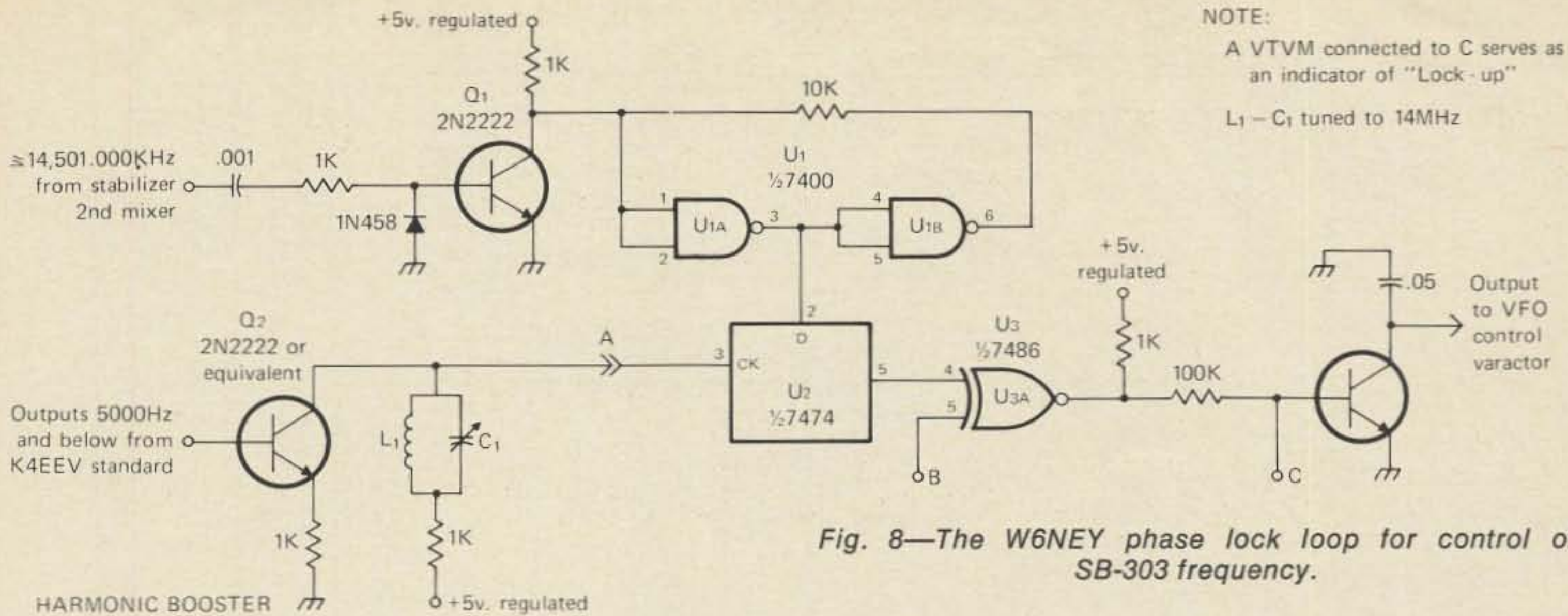


Fig. 8—The W6NEY phase lock loop for control of SB-303 frequency.

high frequency output is fed to point A to establish the primary frequency, and a comparatively lower frequency signal is fed to point B to establish a desired offset from the primary frequency. For example, a 50.000 kHz signal to A will cause lockup as noted above. If a 1000 Hz signal from the standard is fed to point B, the summed signals will be at 14,051.000 kHz and 14,049.000 kHz. These will produce the desired 1 kHz offset in either the l.s.b. or u.s.b. mode, delivering the required 1 kHz audio output to the c.c.w. filter. However, very careful shielding is an absolute must so that the harmonic of the 1000 Hz mixing signal from the standard does not interfere with the incoming c.c.w. signal. W6NEY reports that with his system, the lockup range at 14 MHz is about 400 Hz wide, making possible lockup points every 1 kHz or so, and possibly even closer. Further refinements will permit operation of c.c.w. stations as close together as 10 Hz in W6NEY's estimation.

### The Petit CCW Filter

The Petit c.c.w. Filter consists of two filter chains operated 90° out of phase as shown in fig. 9. Input to the c.c.w. filter is a 1000 Hz signal from the audio output of a conventional c.w. receiver, or from the product detector of a c.c.w. receiver. Filter output is a reconstructed 1000 Hz audio signal. The 4 kHz timing signal to the c.c.w. filter is derived from the master frequency standard, and subdivided within the "filter driver" to provide the driving pulses for switches U2, U3, and U5. U9 varies the phase of the driving pulses to U3 in 0.01 second steps through switch SW1 in order to permit time synchronization with the distant keyer pulse-phase. The c.c.w. filter is the heart of the system, and an understanding of its operation is essential to an understanding of c.c.w. As can be seen from fig. 9, each filter chain consists of an input mixer, and integrator, a sample/hold stage, and a balanced modulator. The operation of the filter can best be explained by analyzing

the function of each of these stages.

**1.) Input Balanced Mixers.** The function of the input balanced mixers is to convert the a.c. voltage audio input signal to a d.c. voltage which drives the integrator stage. Its operation can be explained by analogy with the center-tapped transformer, s.p.d.t. switch, and ripple filter of fig. 10. If we apply a switching signal which causes the switch to change polarity at exactly the same frequency as the a.c. input signal (1 kHz), traces a.c. show what happens relative to the phase between the input and switching signals. If the phase between these signals is 0 degrees, the switch will always be connected to the side of the transformer which is swinging in the positive direction, producing an output that looks like the familiar fullwave rectifier output (a). Filtering produces a constant d.c. voltage which is an average of the output. In the opposite case (c), where the switching signal is 180 degrees out of phase with the input signal, the switch will always connect to the side of the transformer which is swinging negative, producing a mirror image of the positive output. However, if the input and switching signals exhibit a 90 degree phase difference (b), then the switch will connect to the opposite side of the transformer at quarter-cycle peaks, causing a cancellation and zero output after filtering. Finally, if the switching signal is drifting out of phase with the input signal, the output will not be a d.c. voltage, but an a.c. voltage or "beat note". A 1 cycle or 360 degree drift is shown in (d), with the average output after filtering zero volts. In the case of the Petit c.c.w. Filter, with its 0.1 Hz integrating interval, a signal which is 10 Hz from zerobeat will go through one complete cycle every 0.1 Hz and will produce no output (e). In short, the filter produces its greatest output for input and switching signals exhibiting a zero-phase relationship, or precisely at zerobeat, and rejects signals in proportion to their distance from zerobeat. Fig. 2 shows the frequency response of the Petit 0.1 Hz filter and a comparison of it with



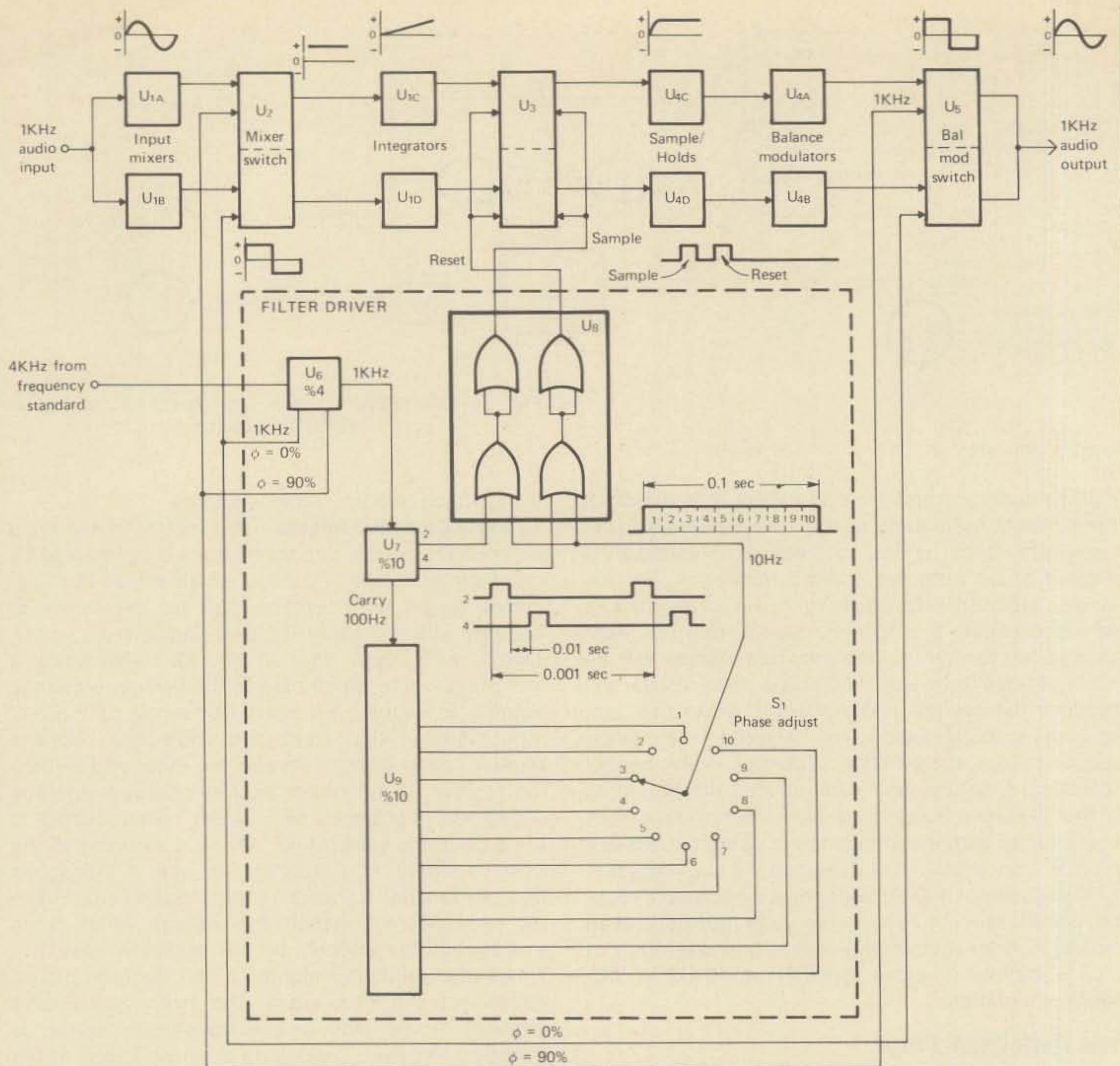


Fig. 9—A Petit 0.1 Hz c.c.w. filter block.

conventional filter bandwidths.

**2.) Integrators.** The output from the balanced mixers are fed to the integrator and sample/hold stages, which are the heart of the c.c.w. filter and perform the time-averaging task. The integrator sums or averages the signal strength at its input during the integrating period (pulse length); it does not respond to short term changes in the amplitude of a signal, but averages them. The integrator is similar in function to the familiar "charging capacitor." During a charging period, its charge rises to the level of the input, but unlike the capacitor, which charges along the familiar exponential curve, the integrator's charge rate is linear. Second, like the capacitor, the integrator can remain charged at a constant value

during the charging period, or portion of a charging period. Third, the integrator differs from the capacitor in that it can be "dumped" or reset to zero charge almost instantaneously. Fig. 11 shows integrator behavior. Graph (a) shows a constant d.c. voltage as the input to the integrator. For each of the four inputs signals, the integrator will charge linearly and proportionally. The summed voltage present at the end of the integrating period is the only voltage of interest, and drives the sample/hold stage, as will be noted below. Graph (b) shows integrator response to a square wave input. Graph (c) shows integrator output when the input signal goes through one complete cycle during one integrating period. The integrator sums the input voltage



and shows zero output. Graph (d) shows a multiple-cycle per integrating period condition. Two observations should be made. First, in the multiple-cycle case, the amplitude of the integrator response diminishes in proportion to the number of cycles. Second, only the average of the voltage of the uncompleted cycle will appear in the integrator output. So, four basic cases describe all integrator behavior: 1.) constant d.c. input; 2.) square wave less than complete cycle; 3.) square wave, complete cycle; 4.) multiple of complete cycle, and multiple of "complete cycle plus incomplete cycle." As can be seen, cases 2 and 4 are variations.

Fig. 12 shows the c.c.w. Filter and Driver circuits. Examination of U3 will clarify integrator switching. As can be seen, U3<sub>sw</sub>1(E) and U3<sub>sw</sub>3(F) short out U1c/U1d integrators when the "dump" or reset pulse is applied to terminals E/F. This ends one integrating period and begins the next. In other words, the integrator is left to charge during the integrating period, and the reset pulse "discharges" the integrator at the end of the period.

With this understanding of the integrator in mind, it can be put back into the signal flow through the filter to this point. When the mixer input signal (1 kHz audio) and the mixer switching signal (1 kHz) are exactly in phase or zerobeat, the highest value of d.c. output will appear at the output of the mixer and drive the integrator, as in fig. 5a. If the mixer input and switching signals are not exactly in phase, then the output to the integrator will be a number of a.c. cycles, as in fig. 10d or fig. 11d. If this a.c. drive signal is a number of complete cycles plus an incomplete cycle, integrator output will only be the sum of the voltage of that final, incomplete cycle. It will be proportionally smaller in magnitude as its frequency increases.

These principles of integrator operation allow us to understand how the filter can operate at such a narrow bandwidth of 10 Hz. With a 12 w.p.m. and 0.1 second pulse length, the filter is analyzing signal inputs in blocks of 0.1 second. Thus, a 10 Hz input signal to the integrator will go through one complete cycle every 0.1 second, as shown in fig. 10e, and integrator output will be zero. If, however, we apply a 5 Hz signal, it will go through one complete cycle every 0.2 seconds, or two integrating intervals, or one-half cycle every 0.1 second integrating period, and hence, the filter response will be 6dB down. To put this in a practical context, a signal at 14,050.005 kHz will be 6dB down from a signal at 14,050.000 kHz, where the desired c.c.w. signal is located.

**3.) Sample/Hold Stages.** The sample/hold stage is simply a switch, capacitor, and voltage follower. Its operation is quite simple. At the end of an integrating period, it samples the voltage present at the integrator output, quickly charges to that level, and passes this voltage on as a drive signal to the bal-

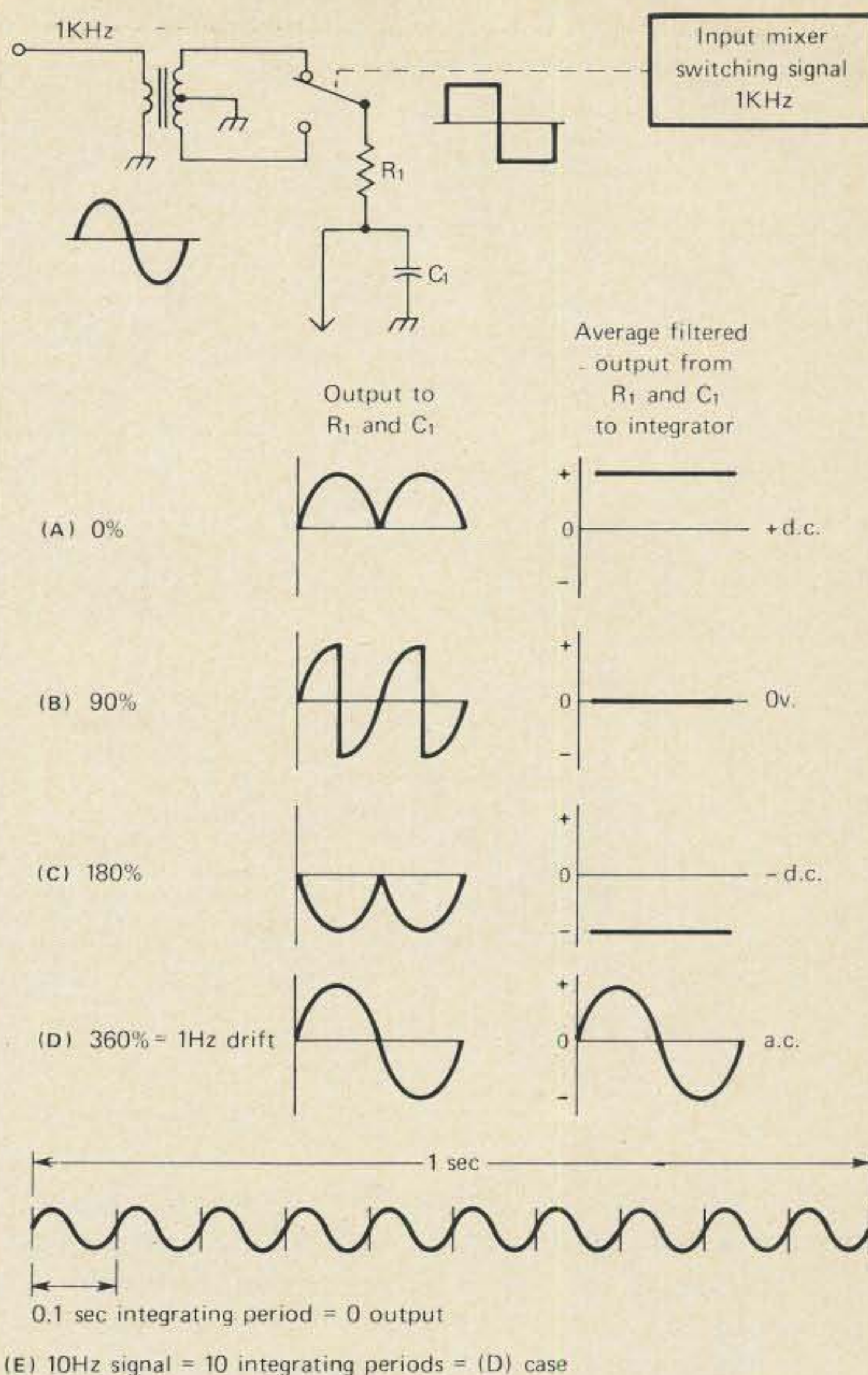


Fig. 10—An input mixer model.

anced modulators. The only integrator voltage that the sample/hold is concerned with is that which is present at the end of an integrating period. The sample/hold stage switch is closed by a .01 second pulse and samples during that duration, which is one-tenth of the integrating period. The output of the sample/hold stage which drives the balanced modulator and produces the reconstructed c.w. audio note, then, is telling us what the output of the integrator was *at the end of the previous integrating period*. In other words, the output from the filter lags behind the input by one integrating period, or 0.1 second. The switching relationship between the integrator and sample/hold will be noted in describing the "filter driver" below.

**4.) Balanced Modulators.** The function of the balanced modulator is to convert the d.c. drive voltage of the sample/hold stage to an audio tone which reconstructs the desired c.c.w. signal. The amplitude of its output is directly proportional to the d.c. input voltage.

**5.) Filter Driver.** The Filter Driver unit is driven by a 4 kHz signal from the master frequency standard,



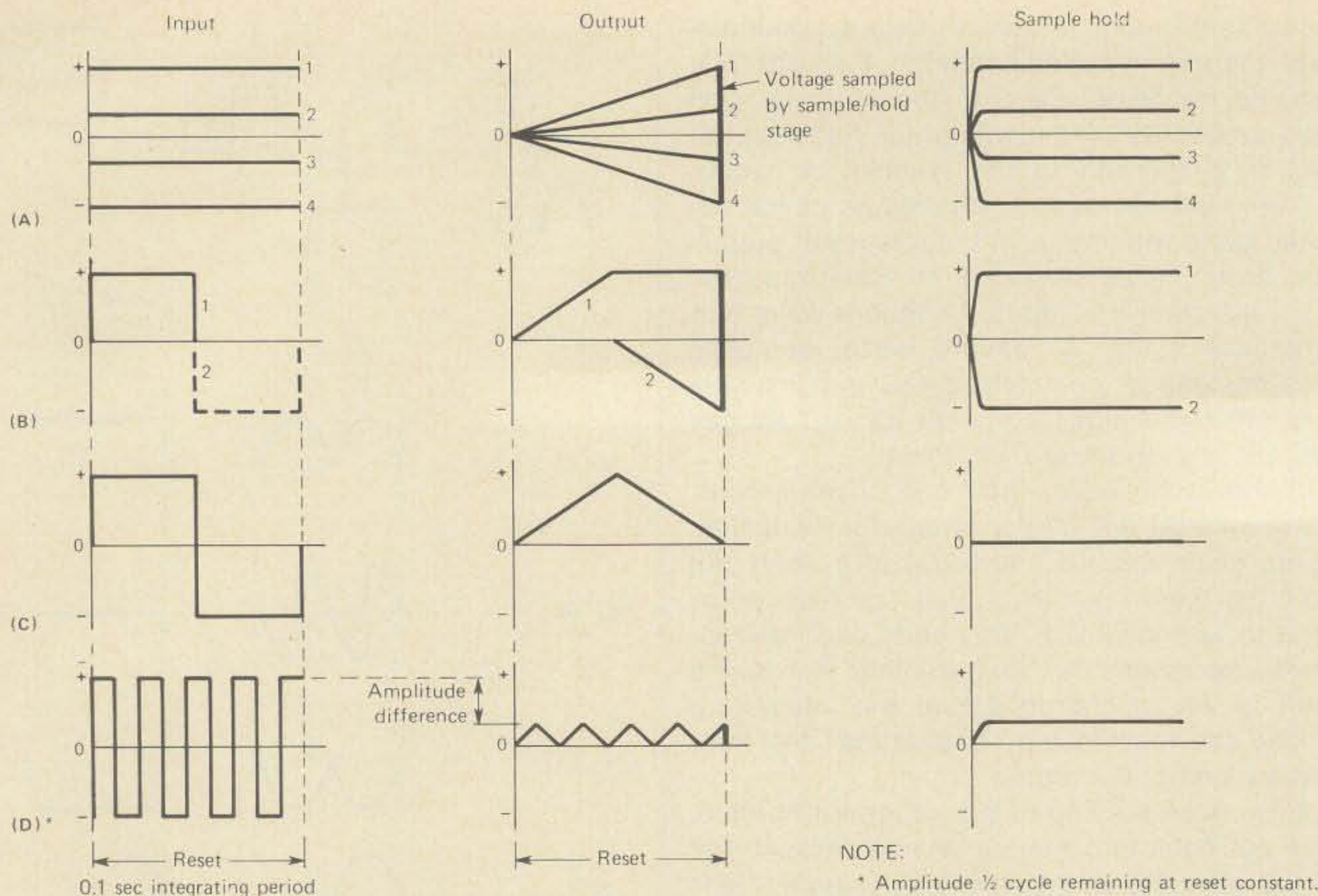


Fig. 11—Integrator input versus output.

and subdivides and phases that signal for the required switching signals in the filter. The derivation and operation of these signals can be seen by reference to fig. 9.

U6 divides the 4 kHz input by four and produces 1 kHz outputs exhibiting a 90 degree phase difference which are used to switch, first, the input mixers via U2, and secondly, the balanced modulators via U5, to provide the output to the integrators and the audio output from the balanced modulators respectively.

A third 1 kHz output from U6 is divided by ten in U7, and outputs to U8 are taken from the "2" and "4" decoded decimal terminals of U7. The string of pulses from U7 from the "2" and from the "4" decoded decimal terminals will be separated by the duration of the missing "3" pulse, which establishes the time difference between the "sample" pulse (from "2") and the "reset" pulse (from "4") which eventually reach integrator and sample/hold switches in U3. The outputs from "2" and from "4", then, each consist of a string of pulses, 10 per 0.1 second integrating period, the sample pulses occurring at .002-.012-.022—.092 seconds, the reset pulses at .004-.014-.024—.094 seconds, thereby establishing the "units" sequence.

Next, a 100 Hz signal is fed from the "carry" terminal of U7 to U9 and divided by ten to produce one pulse of .01 second duration per 0.1 second integrating period. This pulse may be selected from

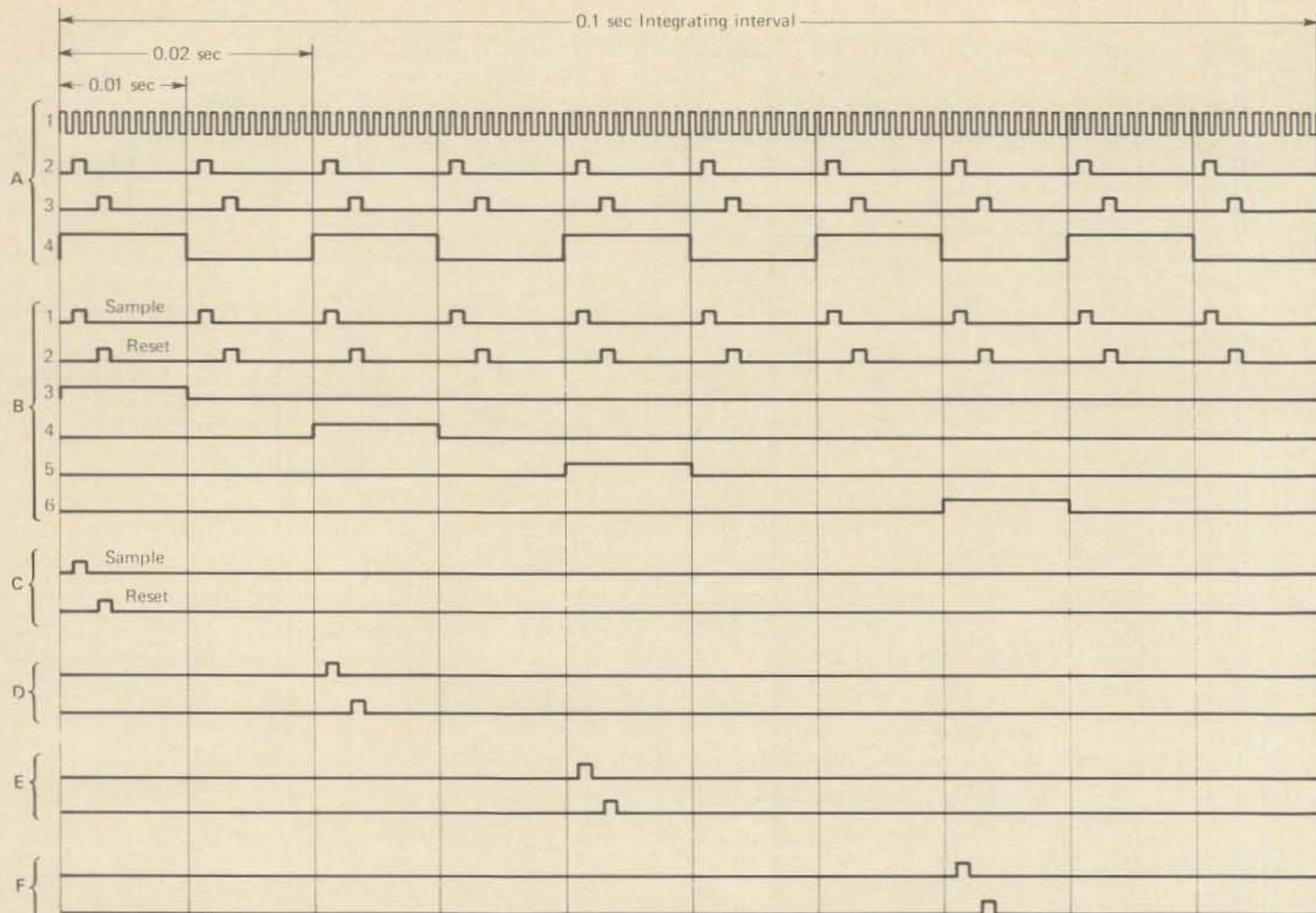
any of the ten decoded decimal terminals of U9 and establishes the "tens" sequence of pulses, with one pulse occurring every 0.1 second, but selectable as to which .01 pulse position in the 0.1 second period is used. For example, with the phase-adjust switch SW1 in the "4" position, the "tens" pulse will occur at the .04 second position, and will choose the sample pulse at 0.042 and the reset pulse at 0.044 seconds coming from U7; with SW1 at position 8, the sample pulse at .082 and reset pulse at 0.084 will be selected. This selection occurs in U8, which consists of a pair of cascaded dual-input NAND-gates which fire only when the decade pulse from U9 and "units" pulses from U7 appear at its inputs coincidentally. Fig. 13 should make this timing operation clearer. In short, the phase-adjust switch establishes: 1.) the length of the integrating period at 0.1 second; 2.) the precise instant at which the integrating period will begin in increments of .01 second. Finally, it should be clear that sample and reset pulses last only one-tenth of the integrating interval—the sample pulse closes the sample/hold switch of U3 while that stage charges for 0.01 second, another 0.01 second elapses, and then the reset pulse, which lasts another 0.01 second, shorts out and discharges the integrator. The next integrating period then begins.

**6.) Filter Specs.** The prototype c.c.w. filter by Petit operated with a 50 kHz input signal and slightly different timing than the filter shown. It required an









NOTES:

- A 1 = 1KHz input to  $U_7$
- 2 =  $U_7$  output from 2
- 3 =  $U_7$  output from 4
- 4 =  $U_7$  output "CARRY"
- B 1 = Input to NAND gates  $U_8$  from  $U_7$
- 2 = Input to NAND gates  $U_8$  from  $U_7$
- 3 = Input to NAND gates from  $U_9$ , Pin 1
- 4 = Input to NAND gates from  $U_9$ , Pin 3
- 5 = Input to NAND gates from  $U_9$ , Pin 5
- 6 = Input to NAND gates from  $U_9$ , Pin 8, decimal decoded terminals

- C 1 = Output from  $U_8$  to  $U_3$  from combination of B1, B2, and B3
- D  $U_8$  output to  $U_3$  from 1, 2, and 4
- E From 1, 2 and 5
- F From 1, 2 and 6

Fig. 13—A c.c.w. filter driver timing scheme.

size and which avoid such interference. Close attention is being given to receiver design, since the c.c.w. concept pushes receiver technology to its limits. Practical efforts at present include the design of a receiver specifically for c.c.w. use. It will include phase-locked HFO and BFO, 9 Mhz IF with sharp filter, front-end overload protection, an integral c.c.w. filter, and a product detector for conventional c.w. A similar transmitter design is being worked out.

The need to limit operations at this point to single net frequencies within each band (80 & 20 meters) has been eliminated by the design and construction of a 5-5.5 MHz frequency synthesizer by W7GDM which delivers outputs of about 1Vrms in 100 Hz steps across the range. A 1 kHz TTL reference signal derived from the c.c.w. station standard provides stabilization. With this synthesizer, a 100 kHz wide hamband will allow 1000 c.c.w. channels! Further improvements in the basic Petit Filter and

receiver schemes will enhance the flexibility and practicality of c.c.w. operation.

### The Future of CCW and Amateur Radio

C.c.w. appears to offer an obvious solution to the problem of crowded amateur bands. First, by requiring such a narrow bandwidth, a far greater number of c.c.w. stations can occupy each frequency segment. Secondly, because of the great improvement in signal-noise ratio offered by c.c.w., stations will require far less power to maintain communications. With c.c.w., a permissible reduction of about 20dB in radiated power could make the QRM-less situation a "dream come true." Finally, with dark clouds gathering on the horizon in the form of the upcoming WARC in 1979 and prognostications of the possible loss of large chunks of the amateur bands to other interests, radio amateurs

(Continued on page 85)



**Looking for just the right spot for that vacation / DXpedition?  
John Irwin rates the rare ones for DXers.**

# HOW RARE IS THAT COUNTRY?

BY JOHN B. IRWIN\*, K6SE/2

**C**ountry collecting is a painfully inefficient and haphazard business at best. If this were the best of all possible worlds one could send out a short CQ and a few hours later the 324th country would have been racked up! Reality is something else again—and perhaps it should be. It is an exciting thing to stalk and then to bag that rare and elusive DX country. The complete DXer not only needs a good location, a 4 (or more)—element beam on a very high tower, the legal power limit and a knowledge of what frequencies are open to where at what times; he also needs a weekly or bi-weekly DX Bulletin, a good alarm clock and, like Maxwell's Demon, he must be able to instantly recognize a hot one when he sees (hears) it.

Various polls of top DXers are taken from time to time and the most difficult (rarest) 40 or 50 countries are pretty well known, in order of difficulty. DXpeditions costing thousands of dollars each are all too infrequently sent to such non-radioactive spots. However, before one can work his (or her) 300th country one must first work his 100th country; and it is a useful thing to know just how the countries rank in degree of difficulty—if only to know which pile-up to join. More to the point, an ever-increasing number of hams are combining vacations with hamming and it would be informative for them to know, for example, just how much rarer French St. Martin is than Dutch Sint Maarten, or Dominica and Martinique are as compared to Trinidad and Curacao, or Rhodes and Monaco are as compared to Greece and Luxembourg, so as to direct both their attention and footsteps to the more sought-after spots.

With these thoughts in mind I have recently taken a poll of U.S.-Canadian DXCCers who have been listed in QST and who have less than 120 officially confirmed countries on SSB. 201 usable returns (of

320 sent out) were analyzed and the results are tabulated in Table 1, where the countries are listed in order of decreasing difficulty. 40 common countries were omitted from the questionnaire, namely: CE, CP, CT, CX, DL, EA, F, G, HC, HK, HP, HR, I, JA, K/W, KH6, KL7, KP4, KZ5, LA, LU, OA, OH, ON, OZ, PA, PY, PZ, SM, TG, TI, VE, VK, XE, YN, YS, YV, ZL, ZP and ZS. KG6R,S,T (Marianas) was inadvertently omitted; in addition, Okinawa, Mellish Reef and Maria Theresa (now put at 2850 fathoms deep—a mite difficult!) were also omitted.

The 201 respondees were subdivided into East Coast (85), Middle West (87) and West Coast (29) DXCCers. The difficulty of a country is defined as follows: difficulty 9, 0—10 percent of the respondees had worked it on SSB either confirmed or unconfirmed; difficulty 8, 10-20 percent, and so on down to difficulty 0 (zero), in which case more than 90 percent had worked the country. There are 55 countries of difficulty 9 on the list and 15 countries of difficulty 0. The unlisted 40 commonest countries as listed above are presumably difficulty 0 or 1.

The first two (or three) digits in the Table are the number of amateurs—out of the 201—who have worked the country on SSB, whether confirmed or unconfirmed. The last four digits in the number after each country in Table 1 indicate the difficulty of that country for respondees from the East Coast, for the Middle West and for the West Coast, respectively. The easiest (!) 100 countries are the 60 on the list in Table 1, starting with Lebanon, plus the 40 unlisted common countries. For the West Coast this easiest 100 would be somewhat different, including—in order of decreasing difficulty—Thailand, French Oceania, Western Samoa, Hong Kong, Fiji, Kure I., Galapagos, Western Malaysia, New Guinea, Asiatic Russia, Western Carolines, Eastern Carolines, Gilbert I., Wake, Singapore, Korea, Midway, Philippines, and (presumably) Saipan. These 19 countries would replace Lebanon, Sint Maarten,

\*578 Morris Avenue, Apt. A-6, Elizabeth, NJ 07208



Lithuania, Tanzania, Kenya, Ghana, Zambia, Canary I., Cuba, Turks and Caicos, Guyana, Barbados, Iceland, Morocco, North Ireland, Luxembourg, Greece, Hungary and Jamaica on the "easiest 100" list for West Coast hams. As an example of the use of the Table, Singapore 676871 means that 67 of the 201 DXers worked Singapore on SSB, establishing a difficulty rating of 6 (30-40 percent have worked it), an East Coast difficulty of 8 (only 10-20 percent have worked it), a Middle West difficulty of 7 (20-30 percent have worked it) and a West Coast difficulty of 1 (80-90 percent have worked it).

The average respondee worked 154 countries with 135, or 88 percent, of them confirmed. If the 18 Soviet countries are separated out from the others, one gets a percentage of only 11 percent unconfirmed for the non-Soviet countries and 42 percent unconfirmed for the Soviet countries, bespeaking the extreme effectiveness of Moscow's Box 88 (the USSR's QSL bureau) in delaying or negating confirmations. There were a number of pithy comments about this frustrating situation, perhaps best summed up by stating how thrilling it is NOT to receive a card for a QSO made back in high school days.

The six most difficult countries for each continent are as follows:

Asia	Africa	Oceania
Spratly	Bouvet	Minerva Reefs
Tibet	Blenheim Reef	Timor
China	Rep. of Guinea	Palmyra
Kamaron	Geyser Reef	Cocos-Keeling
Iraq	Crozet	Heard
Saudi Arabia/ Iraq Neutral Zone	Agalega	Fanning

So. America	Europe	No. America
Malpelo	Albania	Clipperton
So. Sandwich	Dodecanese	Bajo Nuevo
So. Shetland	Jan Mayen	Cocos Island
Aves Island	Armenia	Revilla Gigedo
So. Georgia	Monaco	Serrana Bank
Juan Fernandez	Azerbaijan	Fr. St. Martin

It should be remembered that the above results refer to a modern W/VE DXer with about 150 countries on SSB. CW was excluded to cut down the expense of both money and time in taking this poll; also, because any modern DXpedition would emphasize SSB much more strongly and perhaps to the exclusion of CW. Further, with a few notable exceptions, one would expect about the same results for a CW survey.

The DX banquet table is an ever-changing feast with ever-changing customers and waiters. If the DXCC Honor Roll had been polled, most of the countries would have been difficulty 0 or 1. If the poll had been taken 25 years ago *all* countries would have been difficulty 9—no SSB! If a similar poll were taken today of South African or Australian DXers the relative order of difficulty would be considerably scrambled—after all, nothing propinks like propinquity. One need only look, for example, at the great difference in difficulty between east and west coast for Greece and Singapore. However, most of the top 50 countries should still be very difficult; amateur activity within them is minimal. Finally, a number of countries of low difficulty are easy only because of the efforts of one or two

(Continued on page 85)

## Table I—Results of K6SE's DXers Poll

Spratly Island	009999	East Pakistan	099999	Abu Ail; Jabal at Tair	169989
Bouvet Island	009999	Laccadives	109998	Chagos Island	179899
Tibet	019999	Cambodia	109998	Tadzhik	189989
China	019999	Glorioso	119999	Fanning and Christmas Islands	189997
Kamaron Island	029999	Yemen	119998	So. Georgia	199988
Iraq	029999	Port Timor	129999	Somali Rep.	199899
Minerva Reef	029999	Palmyra Island	129997	Rio de Oro	209899
Saudi Arabia/Iraq	029999	Chad	129999	Prince Edward & Marion Islands	218988
Blenheim Reef	029999	Formosa	139998	Central African Rep.	228889
Sikkim	039999	Ceuta, Melilla	139999	Turkoman	228889
Burma	039999	Clipperton	139998	Manihiki Islands	228987
Rep. of Guinea	039999	Juan de Nova	139999	Oman	238898
Bhutan	059999	Cocos Island (VK9Y)	139998	Mali	238889
Malpelo Island	059999	Syria	139999	Equatorial Guinea	238888
South Sandwich Island	059999	Macao	149997	Juan Fernandez	248988
Geyser Reef	059999	Egypt	149999	Comoro Islands	248888
Crozet Island	069999	Andaman and Nicobar Islands	149998	Kirghiz	248987
Agalega	069999	Albania	149999	Qatar	258799
Des Roches	069999	South Shetland	159988	Trinidad & Martim Vaz Is.	258889
Aldabra	079999	Aves I	159999	The Sudan	258988
Farquahar	079999	Amsterdam Island	169999	St. Peter & St. Paul's Rocks	268889
Vietnam	079998	Mongolia	169989		
Tromelin	089999	Heard Island	169997		
South Yemen	089999	Zanzibar	169998		



Tokelau	268986	Gilbert	626871	Sardinia	1243237
Pakistan	288988	Togo Rep.	646757	India	1243333
Dodecanese	288889	Cook Islands	676764	Korea	1253431
Kazakh	288888	Singapore	676871	Anguilla	1253335
Voltaic Rep.	288888	Ogasawara	686664	Wake Island	1263431
Chatham Islands	288995	West Malaysia	686862	Bulgaria	1263335
Kermadec Islands	288986	Reunion Island	696757	Galapagos Islands	1303332
Kerguelen	298887	Serrana Bank	696667	St. Lucia	1303332
Uzbek	298888	Kaliningrad	706666	Swan Island	1313325
Rodriguez	298888	Papua	706764	Romania	1333234
Annobon	298889	Andorra	716667	Lebanon	1343136
Maldive Islands	298888	Georgia	716577	S. W. Africa	1373323
Congo Rep.	308888	Falklands	716666	Dutch Sint Maarten	1383224
Lord Howe	308986	Nepal	716756	Ukraine	1393232
Niue	308885	French Somaliland	726566	Johnston Island	1403321
San Felix	318887	St. Helena	726567	Lithuania	1422134
Macquarie Island	318886	Western Samoa	726762	Tanzania	1432224
Willis Island	338886	Swaziland	746566	Belize	1452323
Brunei	338985	Market Reef	756655	Kenya	1452215
Turkey	348879	Fiji	756762	Ghana	1452223
South Orkney	358887	Indonesia	776753	Easter Island	1472222
East Malaysia	358986	Kure Island	786762	Cape Verde	1472313
Tristan da Cunha	368887	French Saint Martin	806557	Zambia	1472224
Jan Mayen	378878	Hong Kong	806662	Canary Islands	1482223
Armenia	378888	White Russia	815565	Cuba	1502214
Ceylon	378887	Dominica	835557	Turks & Caicos Is.	1502223
Kuwait	378788	Pitcairn	835653	Guyana	1512223
Guinea (Bissau)	388788	Seychelles	845557	Cayman Islands	1522312
Bajo Nuevo	388878	Lesotho	855555	Barbados	1542114
Fernando de Noronha	388877	The Gambia	865558	Iceland	1562114
Monaco	388788	Iran	875466	San Andres & Providencia	1572123
Azerbaijan	398878	Mauritius	875547	ITU Geneva	1572122
Cocos Island (T19)	408788	Bahrein	895466	Morocco	1592114
British Phoenix	427876	French Oceania	905743	Antigua	1592122
Principe, Sao Thome	437778	Thailand	915653	Antarctica	1602212
Wallis & Futuna Islands	437875	Tunisia	925457	Northern Ireland	1602114
Christmas Island (VK9)	437885	Western Carolines	935652	Luxemburg	1602124
American Phoenix	447885	Aland Islands	945554	Greece	1611115
Solomon Islands	447976	Gibraltar	945548	American Samoa	1631220
Afghanistan	457778	San Marino	945448	Montserrat	1631112
Revilla Gigedo	467877	Latvia	965455	Hungary	1651113
Mauritania	477779	Nigeria	975456	Bahamas	1661202
New Hebrides	487784	Sierra Leone	975547	Jamaica	1661113
New Caledonia	497873	Ivory Coast	995447	Ethiopia	1691112
Minami Torishima	497875	Martinique	1024546	Poland	1691112
Niger Rep.	497779	Estonia	1024553	Russia	1691110
Nauru Rep.	507776	St. Kitts	1024445	Guadaloupe	1701112
Crete	507778	Senegal	1024445	Mozambique	1721112
Malagasy Rep.	507775	Navassa Island	1034445	Guam	1721110
Jordan	517688	Vatican	1054446	Israel	1731013
Norfolk Island	537874	Cameroun	1074346	Rhodesia	1751111
Saudi Arabia	547677	Jersey	1084256	Azores	1771013
Tonga	547963	Fr. Guiana	1094446	Greenland	1771100
Cyprus	547678	St. Vincent	1094436	Marshall	1791110
Laos	557874	Balearic Islands	1104437	Bermuda	1801102
Algeria	557678	Philippines	1124630	Ireland	1810101
Svalbard	577767	British Virgin Islands	1124445	Czechoslovakia	1810001
Dahomey	577767	Liechtenstein	1144346	Yugoslavia	1810011
Franz Josef Land	577766	St. Pierre & Miquelon Islands	1164336	Scotland	1820001
Uganda	577768	Eastern Carolines	1164442	Austria	1830002
Burundi	577777	Malawi	1164436	Netherlands Antilles	1830010
Libya	587676	Midway Island	1174540	Ascension Island	1830001
Gabon	597768	Haiti	1184335	Trinidad	1860001
Moldavia	597776	Asiatic Russia	1194442	Angola	1900000
Auckland Island & Campbell Island	597863	Rwanda	1194338	Dominican Rep.	1900000
Madeira	607668	Zaire	1213334	U.S. Virgin Islands	1900000
Corsica	607677	Isle of Man	1233245	Wales	1910001
Botswana	626677	Grenada	1233335	Liberia	1920001
Faroe Islands	626676	Malta	1233238	Guantanamo Bay	1920001
		Guernsey	1243337	Switzerland	1930001



**The author describes how to rebuild inexpensive surplus meters by changing the ranges and recalibrating the meter scales.**

# New Life For Old Meters

BY PETER JENNINGS\*, VE3GEJ

If there is one thing that more homebrewers leave out of their equipment than anything else, it is the meter. This happens because good meters are usually quite expensive and difficult to get hold of at a reasonable price. Although there are a large number of surplus and bargain priced meters on the market they are never the type required for the project being worked on. If there ever were any of these they did not last long.

However, look again at those surplus meters. So, you didn't want a 225 volt meter. You want a 100 ma meter. They don't look too different from the outside. Let's find out what the difference is inside.

All meters have in common a movement which operates a pointer. Almost all of these are of the D'Arsonval moving coil type, illustrated in fig. 1. This consists of a horseshoe magnet with a coil of fine wire mounted between its poles. When a current flows through the wire a torque is exerted and the coil tends to rotate. A spring mounted on the coil exerts a restoring torque proportional to the displacement. Thus the amount of rotation is directly proportional to the current flowing through the coil. A pointer indicates the amount of rotation on a calibrated scale. Hence, we find that the heart of all meters is a current measuring device.

\*4600 Peach Ave., Niagara Falls, Ont., Canada.

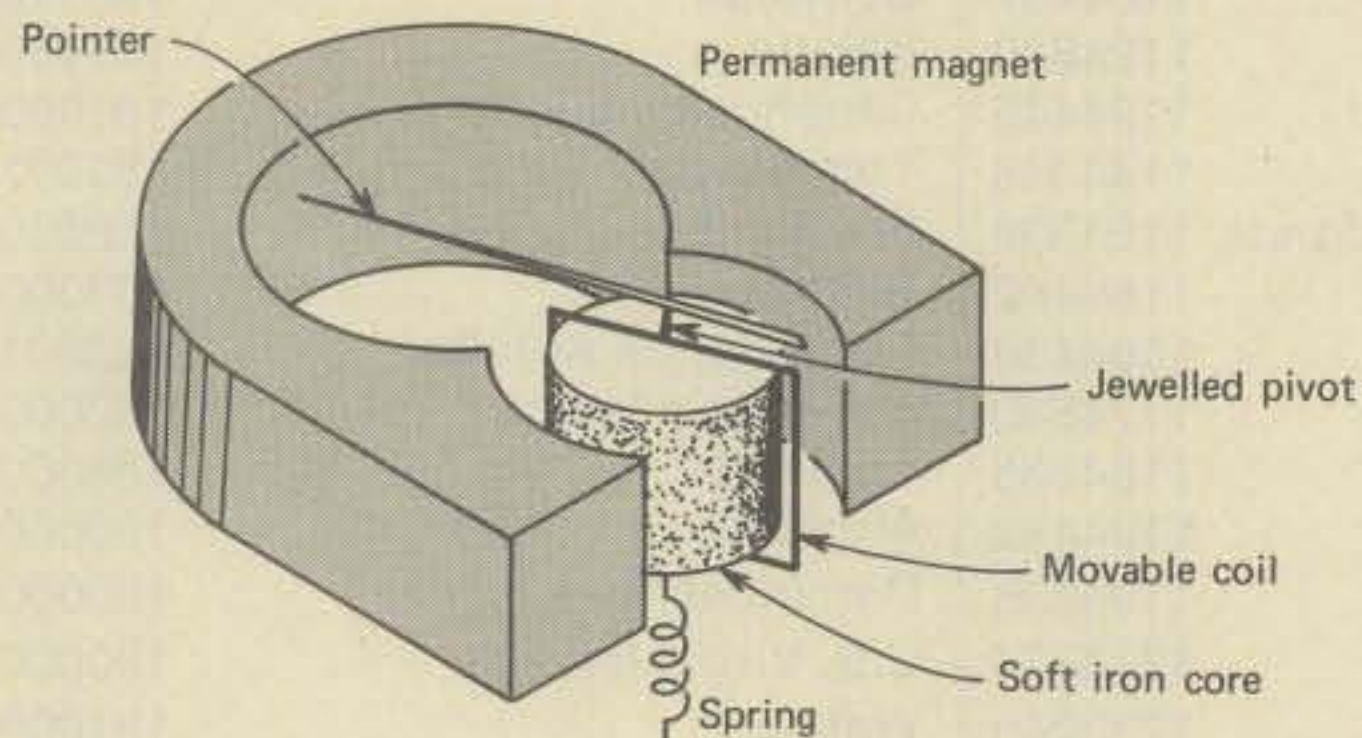


Fig. 1—Basic construction of the D'Arsonval moving coil meter movement.

The characteristics of the meter movement derive from the mechanical construction. The strength of the magnet, the strength of the spring, the number of turns of wire on the coil, and the friction of the bearings all affect the characteristics. These are the sensitivity, (milliamperes full scale), the internal resistance, (the d.c. resistance of the coil), and the accuracy, (how close the meter reading is to the actual value.) Most meter movements are within a fairly small range of sensitivities. Sensitive movements, found in late-model v.o.m.'s etc. are generally in the 25-250 microampere range. Most of the surplus voltmeters and milliammeters I have used are in the 1-20 milliamperes range. Thus, it seems that meters have more in common than the case, so how do you make them measure volts and milliamperes and stuff like that?

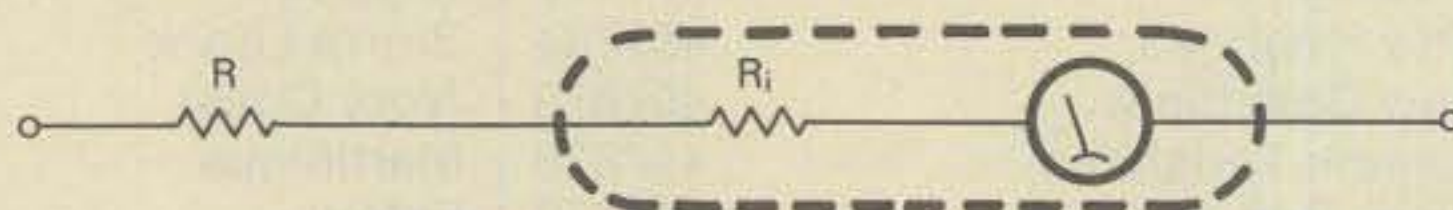


Fig. 2—Circuit of a simple voltmeter.  $R_i$  represents the internal resistance of the meter coil.

## Voltmeters

To measure voltage a resistor is added in series with the meter as shown in fig. 2. The meter measures the current flowing through the circuit, which according to Ohm's law is proportional to the voltage between the terminals. The meter movement is thought of as a resistance  $R_i$  in series with an ideal meter of zero ohms and known sensitivity, (I) milliamperes full scale.  $R_i$  is the d.c. resistance of the coil of the meter movement. If the desired voltmeter has a full-scale sensitivity of (E) volts, then by ohms law the required additional series resistor  $R=(E/I)-R_i$ . The accuracy of a meter reading is dependent on the effect of the meter on the circuit being tested. If the total resistance  $R+R_i$  is too small the voltage between two points will be reduced by the loading effect of the meter.



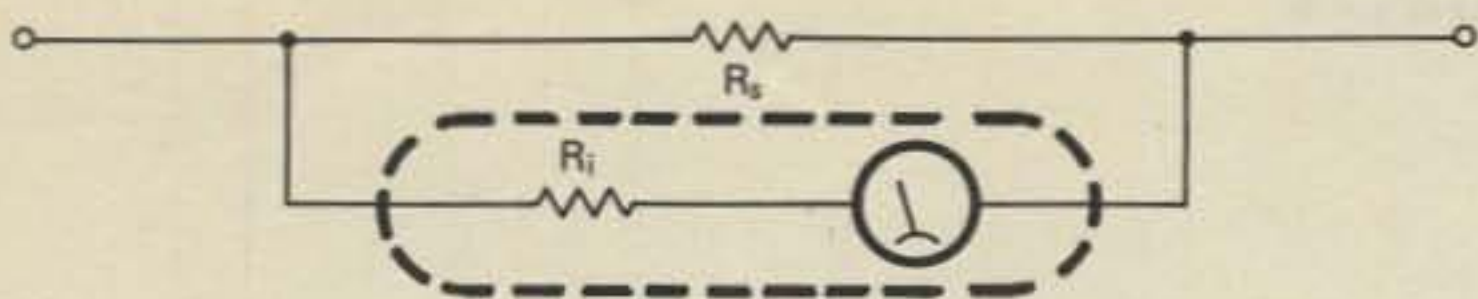


Fig. 3—Circuit of a simple millimeter with a shunt to increase the basic range.

This characteristic is usually expressed in ohms per volt, and in this case is equal to  $(R_s + R_i)/E$ . For comparison's sake the average v.o.m. has a resistance of 20K ohms per volt and a v.t.v.m. is about 11 megohms per volt. Most panel meters are far less sensitive than this and may have as low a resistance as 100 ohms per volt. This does not present a great problem where the meter is permanently installed, and the circuit adjusted for proper performance including the resistance of the meter.

### Millimeters

In order to use a meter to measure currents greater than that which would produce a full scale reading of the meter it is necessary to use a shunt resistor. This is a resistor connected in parallel with the meter movement, as shown in fig. 3.  $R_i$  represents the internal resistance of the meter movement. The currents through the individual branches are inversely proportional to the resistance of the branch, and the sum of the currents must equal the total current in the circuit. If the meter movement reads (I) ma full scale and has an internal resistance  $R_i$ , and we wish to construct a meter to read X ma full scale, the current through the shunt must be  $X - I = I_s$ . The voltage across the shunt and the meter are equal so  $I_s R_s = I R_i$ , so  $R_s = I R_i / I_s = I R_i / (X - I)$ .

The total resistance of the meter in the circuit is then  $R_s R_i / (R_s + R_i)$ . This must be considered when measuring current because the resistance of the meter will reduce the actual current in the circuit. For this reason the most sensitive meters should be used in order to have a very low shunt resistance. Again, this is not so important if the meter is permanently connected into the circuit.

### Rebuild a Meter

Now, how can we put this information to good use? The moral of the story is that the cheap meters

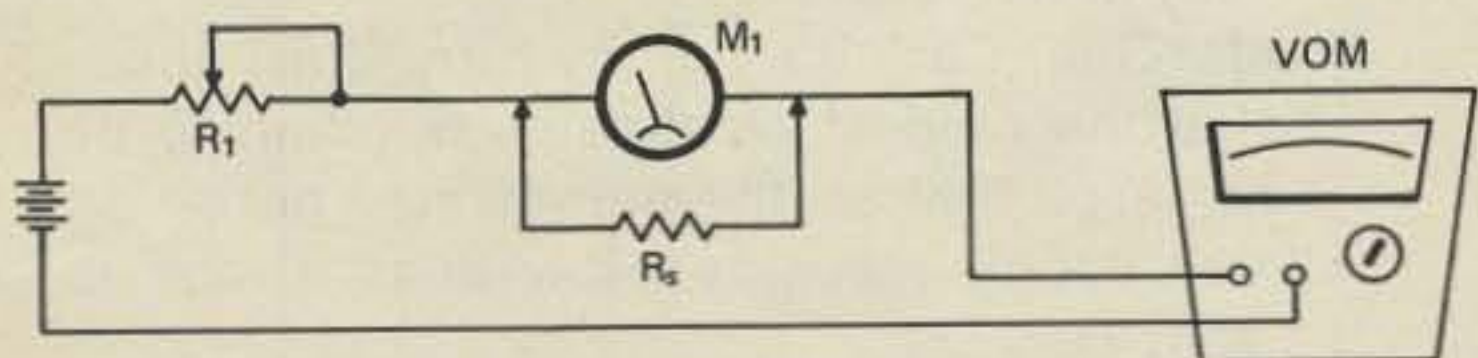


Fig. 4—A circuit used to calibrate millimeters. Control  $R_1$  is adjusted for full scale reading on  $M_1$  and the current flow is measured on the v.o.m.

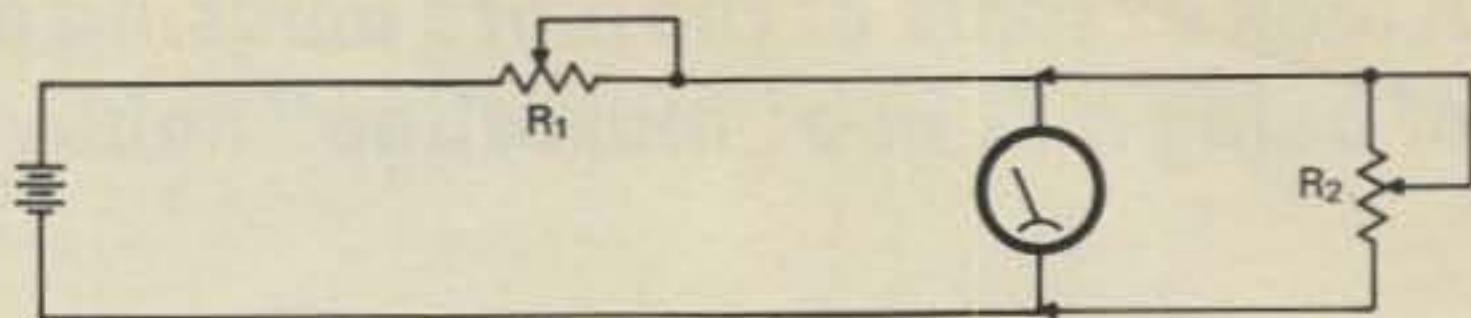


Fig. 5—A method of measuring the internal resistance of the meter coil. With  $R_2$  disconnected  $R_1$  is adjusted to give a full scale reading on the meter. Control  $R_2$  is then connected and adjusted to produce one half scale reading. The resistance of  $R_2$  is now equal to that of the meter movement and can be measured with an ohmmeter.

available are all current measuring meter movements with a shunt or a series resistance added. Thus, in many cases you can remove the extra resistor, determine the characteristics of the meter movement, and add an appropriate resistor to construct the meter you desire.

In order to illustrate best the complete procedure to follow in rebuilding a meter I shall use as an example the following problem. I required a 500 ma millimeter for my new linear. Searching through the junk box I came across a 150 v voltmeter. Marked on the scale was  $100 \Omega/V$ . This told me that the d.c. resistance of the meter is  $150 \times 100 = 15K$  ohms. Assuming that the resistance of the meter movement is negligible there must be a 15K resistor in series with the movement. The sensitivity of the movement must then be, by Ohm's law  $E/R = 150/15000 = 10$  ma.

Opening the meter case and removing the series resistor I began to check out these theories. I connected the meter in series with a battery, a pot, and my v.o.m. in the milliamp scale as shown in fig. 4. Then I adjusted the pot to give a full scale reading on the unknown meter. The actual current in the circuit is then indicated on the v.o.m. It was exactly 10 ma, within the accuracy of the v.o.m.

Next it was necessary to measure the d.c. resistance of the meter movement. It is not possible to do this using an ohmmeter because the current flowing will pin the meter and may cause damage to the movement or even burn out the coil. Even using a bridge circuit may develop too much current through the meter in some cases. The best method of measuring the resistance is shown in fig. 5. The current in the circuit is adjusted by pot  $R_1$  to give full-scale reading without  $R_2$  connected.

(Continued on page 86)

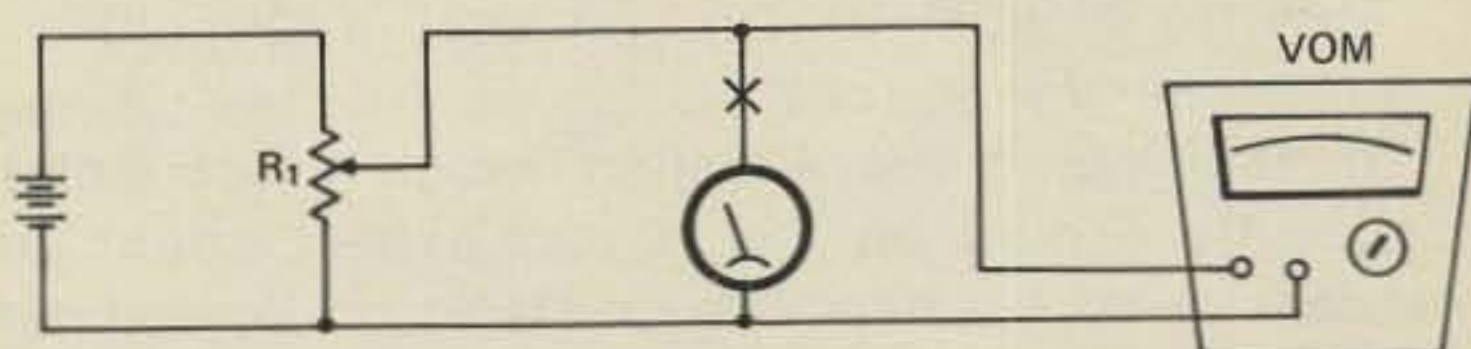


Fig. 6—A circuit used to check the calibration of a voltmeter. Series resistors are placed at point "X".



**A look at some of the more amusing aspects of being a YL in a "masculine" hobby.**

# Reply to a YL: "FB OM, Ur Solid Copy"

BY ELLEN MARKS\*, WA9ACO

I guess that it's really not necessary to tell you how few in number are the active female amateur radio operators. It's usually quite nice to be part of such a minority, both on-the-air and off-the-air. Some of the nicest aspects are finding so many obliging gentlemen to a) put up rooftop antennas, b) carry heavy transmitters from room-to-room (or even apartment-to-apartment), and c) be available on short notice to help me trouble-shoot malfunctioning equipment.

But there's another side to the story, too—a rather humorous one that only a YL could explain or experience. I certainly speak only for myself and my own experiences, but it's easy to picture other female amateur operators finding themselves in similar situations. I suppose the most characteristic experiences occur at hamfests. If this type of experience happened only once, I would write it off as coincidence—but it happens time and time again.

To illustrate, the setting is swappers row at the Santa Fe Park Hamfest near Chicago. A card table displays a microphone, an old receiver, two stereo speakers and a box of junk parts. Two folding chairs flank the table. I sit on one. My friend Al sits on the other. A middle-aged man stops at our table:

**Man** (to Al): "How much for this receiver?"

**Al**: "I'm not sure. Ask Ellen." (points to me)

**Man** (ignoring Al's suggestion): "Does it work?"

**Al**: "I'm not sure. It's not mine. Ask the lady." (points to me again)

**Man** (to Al again): "Do you have a Q-multiplier for it, too?" . . . .

Another humorous situation which I encounter frequently occurs on CW. I can expect about 20 percent of all my new CW QSOs to go something like this:

" . . . K9XDR de WA9ACO. Tnx fer call. Ur

RST 599 in Chicago. Name Is Ellen . . . Ellen. How Copy?"

"WA9ACO de K9XDR . . . R R R . . . FB Allen. Solid copy. Ur FB sig in Milwaukee is 599. Name is Bruce. So hw copy OM?"

" . . . R R R . . . I cpy U FB Bruce. But U hv my handle wrong. Name hr is Ellen . . . E l l e n . . . wx hr is cold, abt zero. Hw cpy nw Bruce? . . . ."

" . . . R R R . . . FB OM . . . Solid cpy ALLEN . . . Our wx hr is cold too. . . ."

I've learned to put up with the operators who can copy me "solid" on CW, but I can't quite understand the interesting situation which occurs during many of my low band contacts. No matter how many stations are in the QSO, it's *always* my turn. These QSOs are not nets; just pleasant evening roundtables on 20 meters. For example:

**Paul**: "The city election is coming soon, and it's going to be a real doozy. Ellen, what do you think about it? WA9ACO from W9LC."

**Ellen**: "This is WA9ACO with the group. You're probably right, Paul. There are so many candidates for each office that I can barely keep track of all of them. How does it look to you, Carl?"

**Carl**: "Well, Ellen. I think you stated it correctly. There are already six hats in the ring for mayor. I even heard that my alderman is a possible candidate. What do you think about that, Ellen? WA9ACO from WB9OXV."

**Ellen**: "Gee, Carl. It's not my turn. But I guess that the field of candidates is going to be so large that all the names may not fit on one voting machine. How does it look to you, Bob?"

**Bob**: "Yeah, Ellen, I can just see it now. The voters will be so confused that it will be

\*6643 North Maplewood, Chicago, IL 60645

(Continued on page 86)



# In Focus

## Television on the Amateur bands

### SSTV Through Another Looking Glass

**F**or several years it has been my habit to carry a few photographs of my SSTV gear and "off-the-air" pictures around in my pocket. With this evidence of slow scan's existence in hand, I've been able to show non-amateur friends what this mysterious (to them) phase of amateur radio looks like, and to some extent, what it can do.

The reaction I get is generally a "Gee whiz, I didn't know this kind of thing was possible—you mean you can REALLY get pictures from all over the world?"—And then, the question, "Do amateurs make any practical use of this system?" Perhaps this is followed by, "Is this type of thing used commercially?"

My answer to the first and last of these questions is an easy "Yes"—but that middle question always bothers me! This may be due to my long exposure to the Puritan ethic (IF YOU'VE SPENT ALL THAT MONEY ON IT, YOU SHOULD BE ABLE TO DO SOMETHING USEFUL WITH IT). Or perhaps its a guilt complex caused by over exposure to the "AMATEUR RADIO IS A PUBLIC SERVICE" credo! I'm not sure which!

### What Is The Practical Usefulness Of Amateur SSTV?

This is a reasonable question for which there should be an answer as Cop MacDonald's system approaches its twentieth birthday.

OK, so what CAN the system do? It can transmit line drawings such as maps or diagrams, alpha-numeric information, and pictures. It does all of this within the restrictions imposed by a nominal 128 line picture structure. (256 line pix may not be dead, but they aren't being heard from these days!!)

### Diagrams, Charts, And Maps Via SSTV?

Although it is exceptional, some amateurs do occasionally exchange

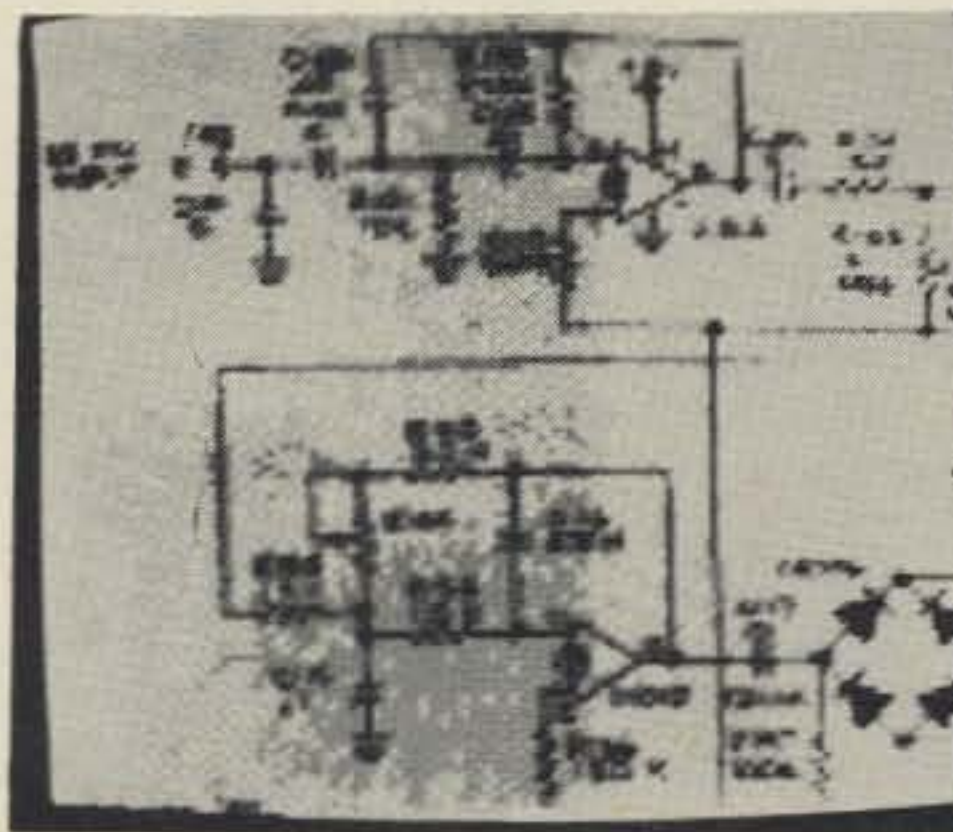


Fig. 1—The limited definition of SSTV makes it impossible to use for transmitting large portions of schematic diagrams.

schematic diagrams via their SSTV screens. K4TWJ's column in *World Radio News* carried a neat review of his experiences in this respect. But this use of SSTV is uncommon. As you can see in figs 1 and 2, the restricted definition of our system makes it necessary to transmit only a small portion of a diagram per frame. This same restriction applies to weather maps, road maps, etc. as illustrated in figs 3 and 4. (I have seen some frame-grabbed broadcast TV weather maps that showed up pretty well on slow scan.) So, it seems fair to say that SSTV has a limited capability for the transmission of diagrammatic information.

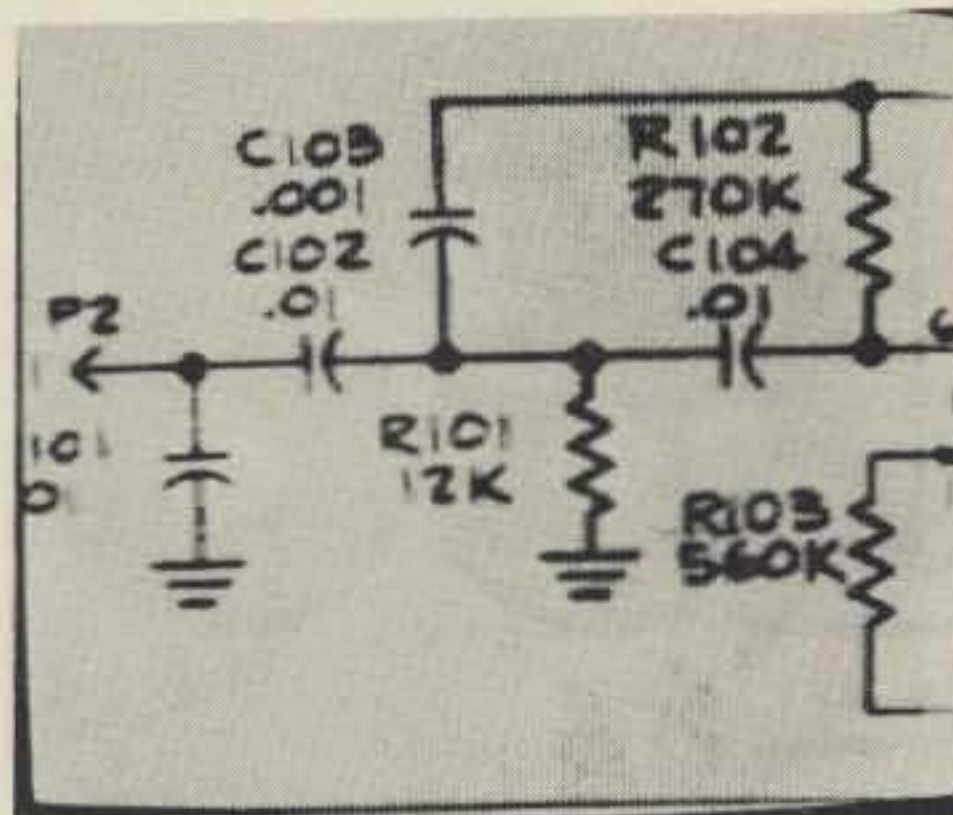


Fig. 2—SSTV can be used successfully to transmit simple diagrams or parts of large schematics. Shown here is the upper left area of fig. 1.

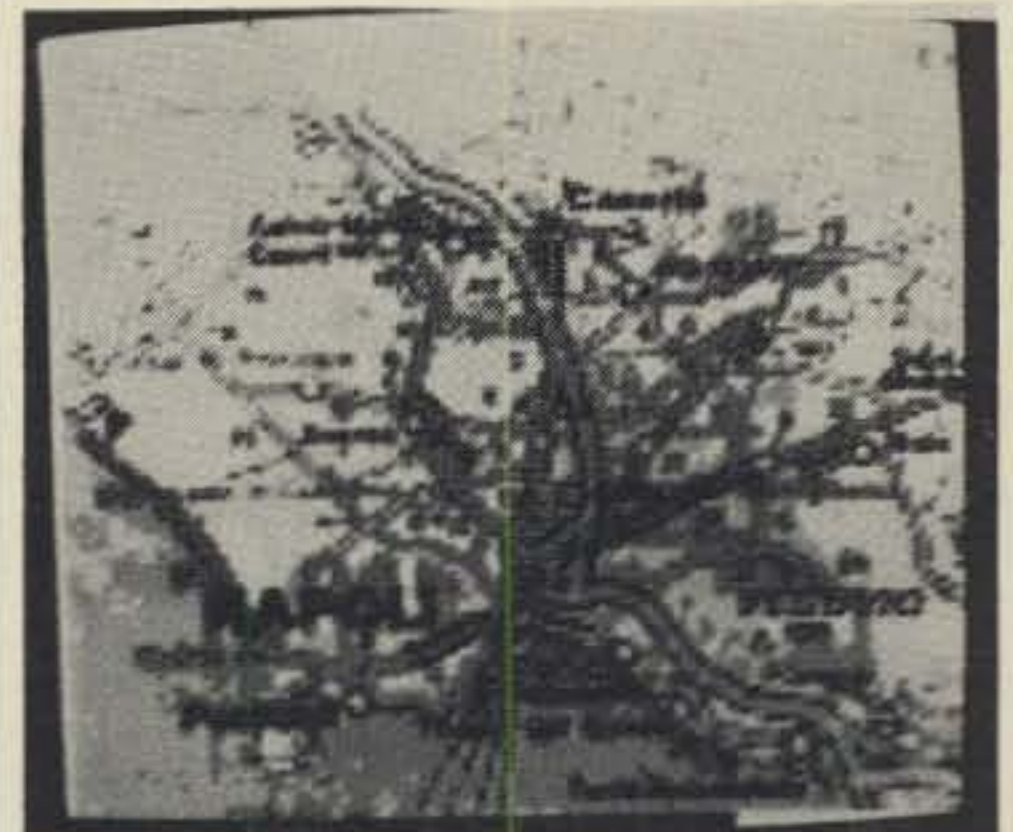


Fig. 3—The limitations of SSTV in reproducing fine detail are obvious in this map picture.

### Alpha Numeric Displays— Message Traffic Via SSTV?

What about alpha-numeric displays? Could SSTV be used for message traffic? Using SSTV keyboards to convey name/QTH/rig information can be regarded as a form of message exchange.

With "normal size" letters (30 characters per frame, allowing for spacing) one could transmit approximately 35 words per minute UNDER CLOSED CIRCUIT CONDITIONS. This rate could obviously be more than doubled with a keyboard capable of generating one-half size characters. That's not too shabby,



Fig. 4—"Zeroing in" on a smaller area makes it possible to understand more of the map details.





Fig. 5—Identical images of different sizes are shown here to drive home the point that on SSTV, BIGGER IS BETTER!



Fig. 6—The advantage of a further increase in image size is illustrated by this closer view.



Fig. 7—In a real close-up, details around the eyes and teeth become visible—giving you a more favorable impression of what SSTV can do.

but then, why not use RTTY with its far greater immunity to noise (and hard copy print-out if desired)? So far, I've heard of no SSTV traffic nets, and I don't think I ever will.

### **Pictures—Ah—Pictures Via SSTV**

It seems to me that it is in the transmission of PICTURES that SSTV does the best job. Part of this may be due to the subjective aspects of say, viewing a luscious YL! You can verbally describe the inter-connection of a few components at a time, and you can easily convert alpha-numeric information to the spoken word (I do it every day!)—BUT, the true nature of a person's appearance, the form or composition of objects or scenes can only be understood without possible ambiguity when the original subject or its image can be seen. It is for this reason that I feel that PICTURE TRANSMISSION is where SSTV has its greatest practical value.

Even with its 128 line image structure, SSTV can indeed present useful

pictorial information. Those restrictive factors of definition and resolution are still there, but hundreds (maybe thousands) of pictures transmitted by SSTV are viewed and understood by amateurs all over the world every day.

Some examples of how the present SSTV system handles the varying degrees of detail in pictorial subjects are shown in figs 5, 6, and 7. Still, it is very apparent that you can cram just so much information into a 65000 bit picture. The knowledgeable SSTV operator recognizes this fact and uses "medium distance" to "close-up" pictures to the greatest extent possible.

### **Back To The Beginning!**

Getting back to that question about the practical usefulness of SSTV and having reviewed what SSTV CAN do—let's ask a few more questions.

Can/Will we go beyond the exchange of personal and family pic-

tures? Will amateurs find some really practical uses for SSTV? Does slow scan offer a useful communications tool for emergencies?

SSTV has been used commercially in conjunction with scan converters for the transmission of photos, fingerprints, electrocardiograms, and many other purposes.

It is not my intent to say that we amateurs SHOULD make a more serious use of SSTV, but I am wondering if we COULD do this to a greater extent than has occurred in the nearly twenty years of slow scan's existence.

W5DFU's work in providing lightning-strike pictures for the local weather service and the N6V Mars photos are stand-out examples of what can be done.

### **What Do You Suggest?**

Do YOU have any thoughts on this subject? For the best letter on this subject received by September 1st I am offering a three years' subscription to CQ.

### **Slow Scanner Of The Month, Dr. John H. Woodruff Of Durham, N.H.**

Just received a nifty-newsy letter from my long-time correspondent, Dr. John H. Woodruff. John who is not a licensed amateur, has been "fooling around" with SSTV for nearly six years. Among his achievements are the reception of color SSTV pictures from F6BDJ, closed circuit transmission of color SSTV, logging pictures from all continents and nearly one hundred countries. This 52 year old political science (Ph.D.) professor keeps his global interests active via slow scan!

John has a fine array of equipment and he uses it to great advantage. Alongside of John in fig. 8 is a TEAC Model 3300S Two channel reel-to-reel tape recorder which is SUPER for simultaneous recording of sound and SSTV frames grabbed from broadcast TV. More on that later.



Fig. 8—Dr. John Woodruff looks pleased as he monitors some of his two-channel audio/video recordings. See text for details.



As shown in fig. 9 John now has a Robot Model 300 Scan Converter and a GBC monitor in addition to the Robot Model 70 Monitor he acquired several years ago. His receiver is the Galaxy R-530. (John says that if the table in the picture looks funny to you, don't fight it. It really IS sway-backed!)

Perhaps with the combined efforts of Richard Thurlow, G3WW, another correspondence friend of John's—and myself, we can someday get John to appear at the Candy Company for a ticket. Meantime, he's having a lot of fun and doing a great job of receiving and recording SSTV. He has many useful thoughts on this subject. For a good example, read on.

### **The Why Didn't I Think Of That (?) Department**

John has a suggestion for slow scanners having a scan converter and frame-grabbing capability. He says in effect, "Why not assign a reel or cassette of tape for the recording of special events as they are shown on broadcast TV. When something like the presidential inauguration, a holiday parade, or some other big event occurs, you just drop in your Special Events Cassette and start grabbing frames as you see fit."

This sounds like a darned good idea to me—having a TV pictorial record of happenings that you can use as "program material" or just keep to look at as time goes by.

Using his stereo tape recorder, John has recorded both video and audio on the left and right channels so that he has both the sight and sound of events he's taped. Very clever!

If you don't have a stereo tape recorder, you can still produce a worthwhile video record of news happenings over a period of time. Even a once-a-week record of the local weather map would be fun to look at a few months later!

Figuring 3 frames per scene, one could store about 140 pictures on a 60 minute cassette (30 minutes per side). Now that's a nice compact way to store a lot of pictures, plus sound effects if you have a stereo tape machine.

I'm sure that many SSTVers have recorded special events from time to time. W3YAH has over an hour of frames grabbed at the time of President Carter's inauguration. But John's suggestion of assigning ONE tape for news and special events is a good one. Thanks John, for the pix and the suggestion!

### **OSCAR 7 Activity**

From Rolph Van Jindelt, WB6JKW, comes word that he has had two-way



Fig. 9—Dr. Woodruff stored a "station ID" from his old friend G3WW on the screen for this picture of his short wave "viewing post."

SSTV QSOs with WB5SAJ and KH6-HJF via Oscar 7. Rolph was using a 50 cent Navy surplus fiberglass vertical on 2 meters! If any other slow scanners are active on Oscar 7, I sure would like to hear from you. Off the screen photos of these contacts are of great interest to fellow slow scanners!

### **Heard On The Bands**

An outfit called VAMP Inc. is offering kits to convert TV sets to monitors and an r.f. modulator for channels 2 through 5. Sounds interesting. Their address is P.O. Box 29315, Los Angeles, CA 90027.

### **Photographing Fast Scan Monitor Displays**

If you decide to photograph your fast scan monitor screen, be sure to use a shutter speed of 1/30th of a second or slower. I prefer to use 1/10th or 1/15th of a second. Of course it is necessary at these slower speeds to use a tripod or some other means of holding the camera steady. The reason for the slow shutter speeds is to avoid dark bands caused by getting only part of one field or a blanking pulse.

Incidentally, if you want to get good color pictures (of your color TV screen), use a Kodak Color Compensating Filter, CC40R over your camera lens. For Kodachrome X or Ektachrome X, the exposure time should be 1/4 sec. at f2. Cut the exposure time to 1/8 second without the CC40R filter.

Eastman Kodak still has their free pamphlet, "Photographing Television

Images, AC-10" available. Write to Consumer Markets Division, Eastman Kodak Co., Rochester, N.Y. 14650. This pamphlet is really worth having since it covers all amateur type Kodak films and both B&W and color TV pictures.

It should be obvious, but DON'T use a flash bulb or electronic flash when photographing a TV screen! If you do, the screen will appear all washed out and there will probably be a big reflection of the flash on the screen.

### **Wanted For Trophy Grabbing!**

Although the picture is a bit dark, I hope that someone can identify the mustachioed chap shown in fig. 10. He is wanted by the Slow Scanners of The World for Trophy Grabbing. He is rumored to frequent the Houston, Tex. area and 14230 kHz on the

(Continued on page 90)



Fig. 10—Wanted For Trophy Grabbing! See details in text and stay alert at all times.



# Antennas

Design, construction, fact, and even some fiction

I thought Pendergast was going to bust a gut laughing. He dropped the paper he was reading and curled up on the sofa, howling with glee.

"What's so funny?" I asked, as I dropped a pile of mail on the desk.

He picked up the paper and showed it to me. "Well," he replied, "Somebody mailed me a description of your CQ antenna column. Want to hear it?"

"Sure," I replied. "Go ahead."

Pendergast composed himself and read solemnly from the letter.

"W6SAI is an exacting expert on the basis of being able to turn out, after innumerable de-bugging sessions, an infinite series of incomprehensible antennas calculated with micrometric precision from vague assumptions based upon debatable figures taken from inconclusive experiments of problematical accuracy by persons of dubious mentality for the purpose of confounding a defenseless group of amateurs unfortunate enough to have asked for the information in the first place."

"Well, that seems to cover the subject pretty thoroughly," I replied. "I'll just pack my bag and leave quietly."

\*48 Campbell Lane, Menlo Park, CA 94025

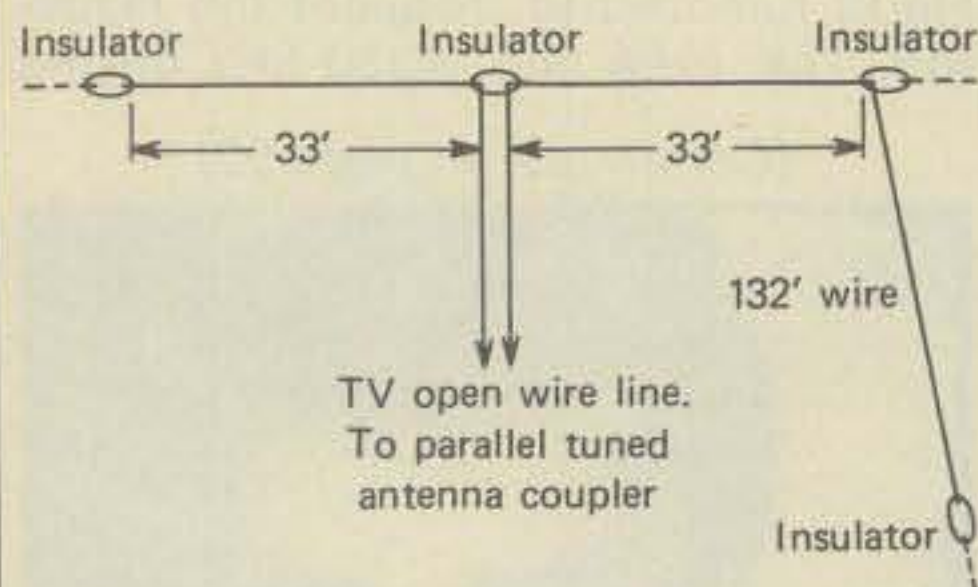


Fig. 1—The ZL2AKW multiband antenna. A 66 foot center-fed antenna works on 40, 20 and 15 meters. For 80 and 160 meters, a 132 foot wire is attached permanently to one end of the dipole and brought off at right angles to the dipole. On 160 meters, the feeders are tied together and the antenna is operated as a Marconi against ground. The transmission line should be between 35 and 45 feet long.

"No, no!" said my friend. "Let's look at the mail instead and try and find another gem like this one."

"Alright," I replied. "Here's the first letter and it is from ZL2AKW, down under in New Zealand. Trevor describes a multiband antenna that has worked well for him (fig. 1). Basically, it is a center-fed antenna, sixty-six feet long. The feeder is TV-style open wire line and he uses a parallel-tuned antenna coupler at the station. The feedline, by the way should be 35 to 45 feet long for best results on 80 meters.

"This antenna acts as a center-fed dipole on 40 meters, two half-waves in phase on 20 meters and as a center-fed long wire on 15 and 10 meters.

"Now, for 80 and 160 meters, Trevor has attached a 132 foot wire to one end of the center-fed antenna. This runs at right angles to the smaller antenna and provides low-band operation. On 160 meters, the feeders are tied together and the antenna is worked against ground as a Marconi. He says the addition of the long wire doesn't seem to upset the balance or the operation of the center-fed antenna on the higher bands. And he also says the long wire is very thin and almost invisible, which is very helpful if it happens to run across somebody else's property!"

"Very good," exclaimed Pendergast. "I'll write this one up in my notebook. "And it looks as if you have another letter from "down under," judging from the stamp."

"No, it's from Canada," I replied. "From Glenn, VE3CGU, to be precise. He reminds me of an antenna that I've never discussed in CQ, namely, the loaded dipole. However, I did write something about this interesting antenna in the June, 1975 Antenna Column. However, Glenn's antenna is something like the K1PLP design shown in September, 1974 QST. That article is a "must" for anybody interested in compact dipole antennas for the low

bands. Anyway, Glenn's antenna is shown in fig. 2. Basically, it is a 40 meter dipole with loading coils and end extensions to make it resonate on 80 meters as well. This is a slightly different design than the one shown in QST. The QST design is a good one, but it is single band. This arrangement works on several bands. On 40 meters the loading coils act as r-f chokes and effectively decouple the tip sections. On 80 meters, the coils act as true loading coils. And the 40 meter portion works well on the third harmonic, which is 15 meters."

"Seems to me I remember an antenna of this type described by W4-JRW some years ago," remarked Pendergast.

"That's right," I replied. "This design is very effective as it works on three Novice bands. The only critical sections of the antenna are the tip lengths. The operator should run a SWR curve on 80 meters and then trim the tip sections for lowest SWR at a chosen frequency, as the bandwidth of the antenna on 80 meters is only about 50 kHz. Of course, bandwidth is very good on 40 and 15 meters, the whole band is covered in each instance with no sweat."

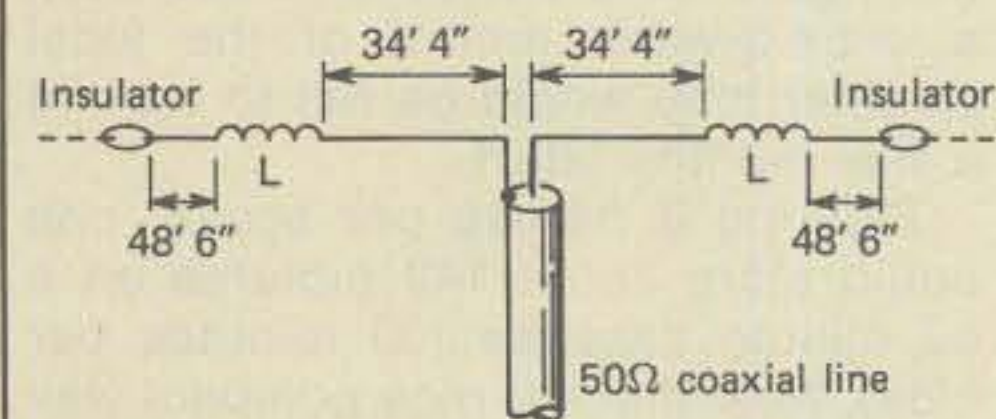


Fig. 2—The VE3CGU Novice antenna for 80, 40 and 15 meters. The center section of the antenna works on 40 and 15 meters while the coils (L) act as r-f chokes, isolating the end sections. On 80 meters, the coils act as loading coils so that the overall antenna is resonant in the 80 meter band. Each coil consists of about 50 feet of #18 enamel coated wire close-wound on a piece of PVC plastic pipe, 1¼ inches in diameter. Tip lengths are adjusted about ½ inch at a time (equally) to bring resonant frequency to chosen spot in the 80 meter band. Bandwidth at 80 meters is about 50 kHz.



Pendergast peered over my shoulder at VE3CGU's letter. "Glenn says the coils are made up of 50 feet of #18 enamel wire closewound on a 1¼ inch (outside diameter) piece of PVC plastic pipe. He feeds the dipole directly with 50 ohm coaxial line: RG-58/U to be exact."

"It's a good antenna," I said. "You can work three bands and you don't have to fiddle with traps, which can get to be pretty tricky."

Pendergast thought a moment, then said, "You know, there's another good antenna that has just about disappeared from the world of amateur radio. And it's a pity, because it is a good antenna. Too bad more fellows don't use it."

I guessed what he was driving at. "You mean the single-wire fed antenna?"

"That's right," he replied. "I've used one for years, as you know, and it really works!"

"The single-wire fed antenna was first described by Everitt and Byrne in the October, 1929 issue of *Proceedings of the IRE*. The work was done at Ohio State University, which seems to have more than its share of antenna experts," I remarked.

"A modern version of the single-wire fed antenna is shown in fig. 3. This employs a simple L-network to match the approximate feeder impedance of 700 ohms to a 50 ohm termination. Since the antenna feed impedance is so high, ground losses are quite low and the antenna is much more efficient than a Marconi antenna when it comes to ground losses."

Pendergast asked, "How do you keep the single-wire feeder from radiating?"

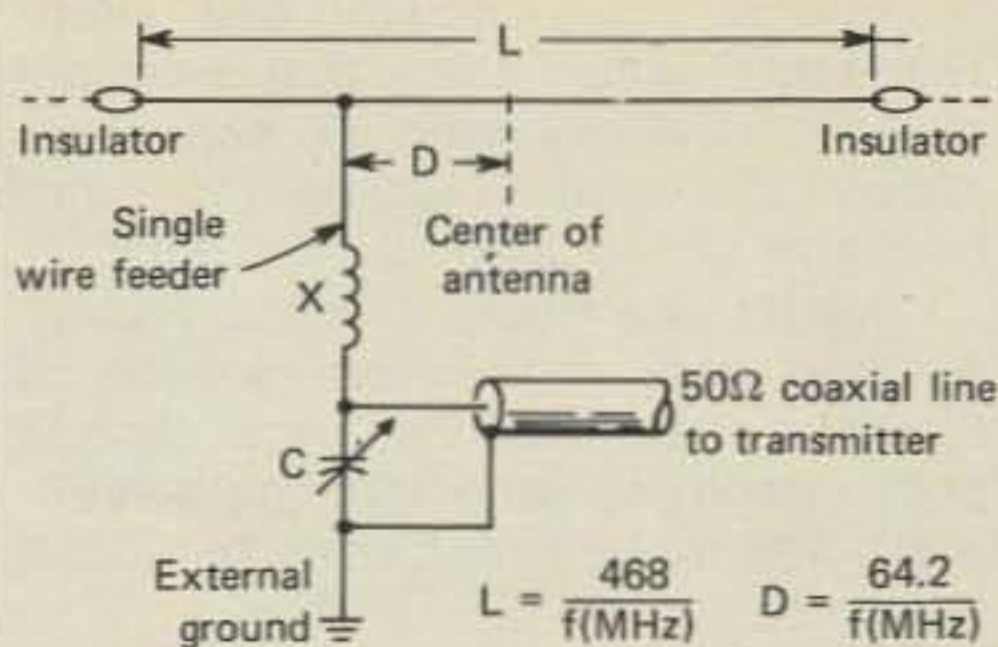
"That's an interesting point," I replied. "In the 1929 article feeder radiation was discussed extensively and the conclusion was reached that if the feeder was properly terminated at the antenna, there would be no radiation from the feeder."

"Wait a minute!" exclaimed my friend. "How can a single wire, carrying r-f current, not radiate? That's impossible!"

I reached up on the shelf and brought down the 1929 issue of the *Proceedings*. It was a thin, gray volume, about half the size of the present *I.E.E.E.* magazine.

"Let me read to you from the article," I said. "I'll omit the double quotation marks, which are messy and confusing."

"When a single electron is moving at a constant velocity, no radiation occurs. If the electron is accelerated or decelerated, radiation will take



BAND	L	D	X	C
1.8MHz	260' 0"	35' 6"	16.0μH	480pf
3.7MHz	126' 6"	18' 0"	8.0μH	240pf
40.0MHz	66' 0"	9' 0"	4.0μH	120pf
20.0MHz	33' 0"	4' 6"	2.0μH	60pf
15.0MHz	22' 3"	3' 0"	1.5μH	45pf
10.0MHz	16' 0"	2' 3"	1.0μH	30pf

Fig. 3—The single-wire fed antenna of 1929 adapted to modern 50 ohm feed system. This antenna also works well on the second harmonic.

place. However, the radiation is due, not to the acceleration or deceleration of the electron itself, but to the acceleration of a portion of the field, although it is realized that the two cannot be separated in the case of the single charge.

"Similarly if a series of doublets along a transmission line are so arranged in phase that the field is propagated along the line with a constant velocity, no radiation will take place. This constant velocity occurs when there is a continuous shift in phase of the doublets, so that even though the electrons flow first in one direction and then the other, the resultant field moves with constant speed. This condition is produced on a transmission line when there is no reflection and therefore no returning wave.

"By application of the reciprocity theorem and a study of wave antennas it will be concluded that there will be a small radiation in the direction of the transmission line.

"Hence this theory is postulated: Radiation is largely due to reflection.

"In the previous discussion it has been shown that reflection always produces standing waves, and consequently the test for the absence of radiation on a transmission line is the absence of standing waves."

There was a long silence then Pendergast said flatly, "I don't believe it."

"What do you mean you don't believe it?" I demanded.

"I don't believe it," he said again. "It's impossible for a single wire carrying r.f. current not to radiate! Look! How about the rhombic an-

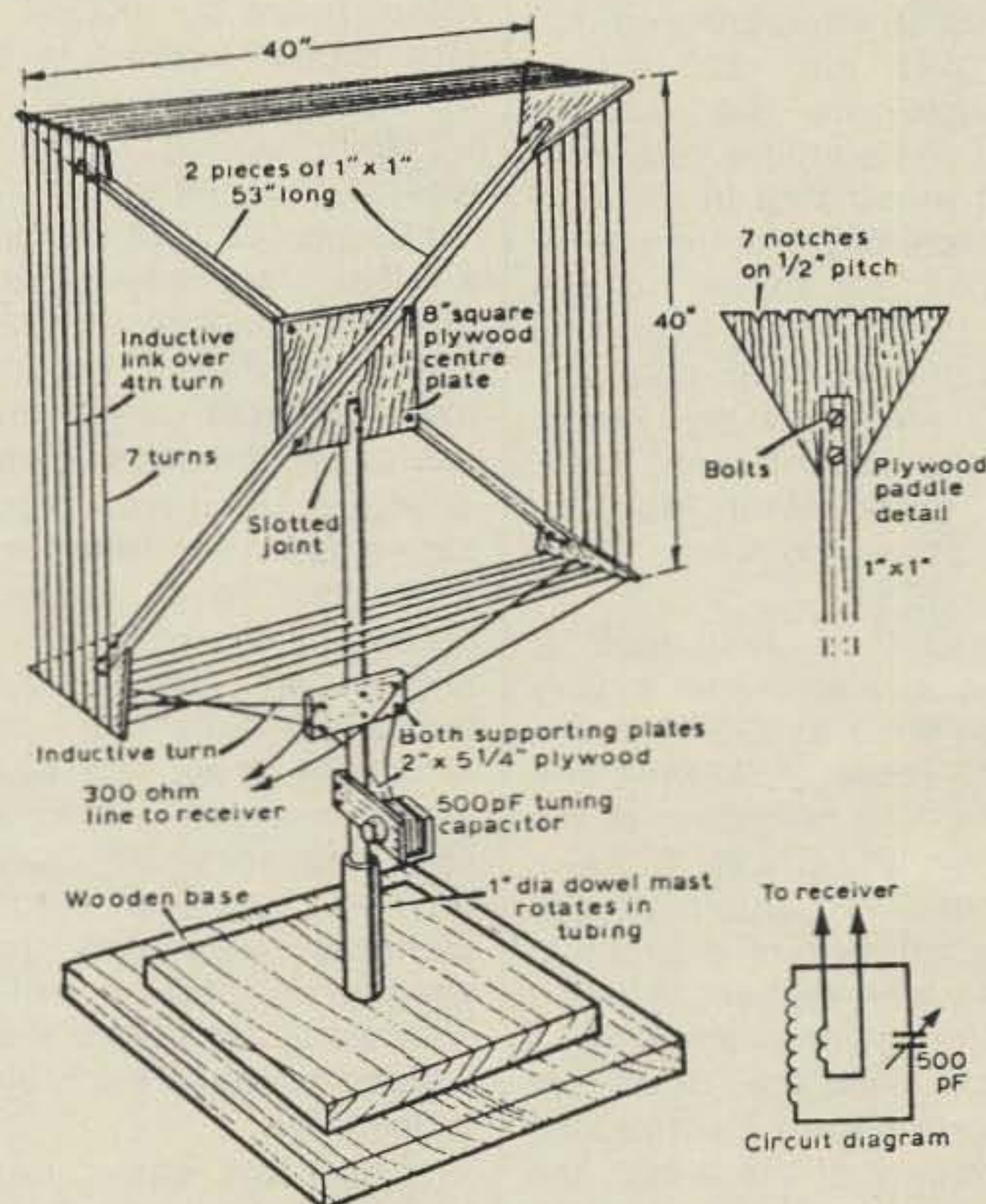


Fig. 4—Construction details of a loop antenna for operation on 160 meters or the broadcast band and capable of providing a deep null on interfering signals. (*Electronics Australia* via *Radio Communication* journal).



## 2 METER CRYSTALS IN STOCK

FOR THESE RADIOS ON  
STANDARD ARRL  
REPEATER FREQUENCIES

Clegg HT-146  
Drake TR-22  
Drake TR-33 (rec only)  
Drake TR-72  
Genave  
Heathkit HW-2021 (rec only)  
Heathkit HW-202  
Icom/VHF Eng  
Ken/Wilson  
Lafayette HA-146  
Midland 13-505  
Regency HR-2  
Regency HR-212  
Regency HR-2B  
Regency HR-312  
Regency HR-2MS  
S.B.E.  
Sonar 1802-3-4, 3601  
Standard 146/826  
Standard Horizon  
Swan FM 2X  
Tempo FMH  
Trio/Kenwood  
Trio/Kenwood TR2200  
Trio/Kenwood TR7200

\$3.50 each

in quantities of 10 or more, \$3.25 each

Certified check or money order  
only... NO COD's

Rolin Distributors

P.O. Box 436, Dunellen, N.J. 08846

— LIMITED OFFER —

tenna? That's terminated and has no standing waves on it, and yet it radiates! How about that?"

"You bring up an interesting point," I admitted. "Was the 1929 article about the single-wire fed antenna correct? Does the single-wire feeder radiate if it is terminated in the correct load impedance? Maybe one of our readers has the answer to this puzzler. If so, I'll be happy to put his remarks in a forthcoming column."

"Very well," rejoined my friend. "I'll reserve my opinion until later. I'll bet your friend Walt Maxwell, W2DU, could solve the whole thing instantly!"

"In the mean time, let's look at the mail once again. I see a very interesting comment by G6XN in the February, 1977 issue of *Radio Communication*, the fine magazine of the Radio Society of Great Britain. Speaking about Quad antennas, G6XN warns the readers of a problem that has arisen with respect to using untreated bamboo crossarms in a Quad. He says that the Quad antenna has a very strong electrostatic field in the vicinity of the arms, and that bamboo is a very poor insulator when wet. G6XN uses polyethylene line to tie his Quad wire to his bamboo crossarms in such a way that the wire does not touch the bamboo."

"Interesting," commented Pendergast. "I would think that a couple of good coats of varnish, especially around the wire holes on the bamboo arm would also do the job."

"Well, I like *fiberglas* arms myself. A good and inexpensive source of fiberglas poles is the local sports shop. Used, or defective, pole-vaulting poles make great arms for Quad antennas."

Pendergast smiled and picked up the copy of *Radio Communication*.

"Look here!" he exclaimed. "Here's just the ticket for the forthcoming fall and winter 160 meter DX work. An inexpensive receiving loop (fig. 4) is a great device for nulling out local Loran interference or strong local signals."

"The loop has 100 feet of #22 insulated wire, and the frame is 40 inches on a side. This works out to 7 turns. The loop is tuned with a 500 pF capacitor and covers the broadcast range as well as 160 meters. The pickup loop is one turn coupled to the receiver with a short length of TV ribbon line."

"The tuning capacitor on the loop is resonated for maximum signal then the loop is turned about, either for maximum signal or for a null."

"Well, now is the time to get ready for next winter's DX season for the low frequency bands," I replied. "By the way, did I ever show you the article on a home-made 40 meter rotary beam by VK3BM in the *Amateur Radio Journal* of the Wireless Institute of Australia?"

"No," replied my friend. "What was so unusual about it?"

"Bruce, VK3BM, decided to build a full-size 40 meter rotary beam. His problem was how to adjust and tune the beast when it was atop a 90 foot tower without using the motorized ladder of the local Fire Brigade!"

"His solution was to use untapered elements and a tuned feed line. Experiments have shown that when tapered elements are used, especially on 40 meters, where the elements are quite large and the taper is usually great, the beam may end up as much as 400 kHz off the design frequency. So VK3BM used untapered elements made of 2-inch diameter aluminum tubing. Light weight tip sections of telescoping size were used, and the joints were *welded* to make each element a one piece affair."

"The boom was made of triangular lattice steel construction and was 40 feet long. This gave 20 foot spacing between elements. The reflector was 70'3" long, the driven element 66'7" long and the director was 61'5" long

—all cut to a design frequency of 7020 kHz."

"How did he feed this monster?", asked Pendergast, as he copied the dimensions into his notebook.

"Bruce said that he couldn't envision himself adjusting a matching device while he was hanging by his heels 86 feet up in the air. So he split the driven conductor of one of a pair of 50 ohm coaxial lines. The outer, braided conductors of the line were grounded together and to the frame of the beam."

"The element halves were supported by slipping short lengths of polyethylene tubing over the inner ends and clamping them to a short length of hardwood, which served as a crossarm."

"The feedline, then, is a side-by-side pair of 50 ohm coaxial cables, which form a shielded, 100 ohm balanced line. This is a low-loss arrangement that does not radiate. The radiation resistance of the beam is about 35 ohms, and this shows up as a s.w.r. of about 3-to-1 on the line. At 7 MHz, this value of s.w.r. does not contribute significantly to feedline loss, which is very low."

"And then he used an antenna tuner at the bottom end of the line so he could match up to a 50 ohm coaxial line", exclaimed my friend.

"That is correct", I said. "On the first day the antenna was up, VK3BM worked a group of W5 stations and got reports ranging up to S9 plus 50 dB! That's a real potent signal for only 200 watts PEP input on 40 meters!"

"This design is a good example of trade-offs. VK3BM didn't want to have to adjust the antenna once it was atop the tower. To achieve this goal, he used untapered elements which he could cut to formula and then used a feed system which required no adjustment at the antenna. Thus, he could assemble the beam on the ground and place it atop the tower with the assurance that it would work right off the bat."

"To achieve this end, he had to use large elements, fairly wide spacing and a heavy support structure. The beam must have been quite heavy, but if it is properly built, and the tower and rotator can stand the load, that's no big problem".

"Its an interesting concept", agreed Pendergast. "I have heard that tapered elements have to be longer than untapered ones, but nobody seems to know the amount of lengthening that is required for a given taper. It looks as if VK3BM neatly sidestepped this problem". ■



# Math's Notes

A look at the technical side of things

In the April installment of this column, we explained a little about the new, growing field of optical fibers. Since that time, we have received numerous requests asking for more information on the subject of communications with these fibers. This month, we will try to answer some of the questions that were asked and explain in somewhat more detail, digital LED driving methods as well as a simple f.m. modulating scheme for experimenters.

Fig. 1 is the optical communications link described in the April column. As can be seen in this example, sound waves enter a microphone, are converted into electrical signals, and modulate the light emitting from an LED. This modulated light is then focussed on the end of an optical fiber. By means of a phenomenon known as total internal reflection, the light propagates down the fiber and eventually reaches the far end. At this point, the light at the end of the fiber is focussed onto a photodetector. Here it is converted back into electrical signals, amplified, and fed to a loudspeaker where the original sound is reproduced.

While this example is for audio signals, it should be pointed out that by employing fast rise-time LEDs and detectors, video signals and digital signals up into the high megaHertz region can be transmitted. One company we know of is manufacturing a 1.2GHz (1200 MHz) *standard* optical link, and indicates that a 3GHz link is eminent in the near future!

In the April column we also gave an example of an amplitude modulated "transmitter" for use with a common LED. It should be pointed out here that this is not the only way to modulate the device. In industry, particularly for data transmission, the LEDs are almost always pulse modulated. This full-on or full-off method allows an increase in sensitivity and

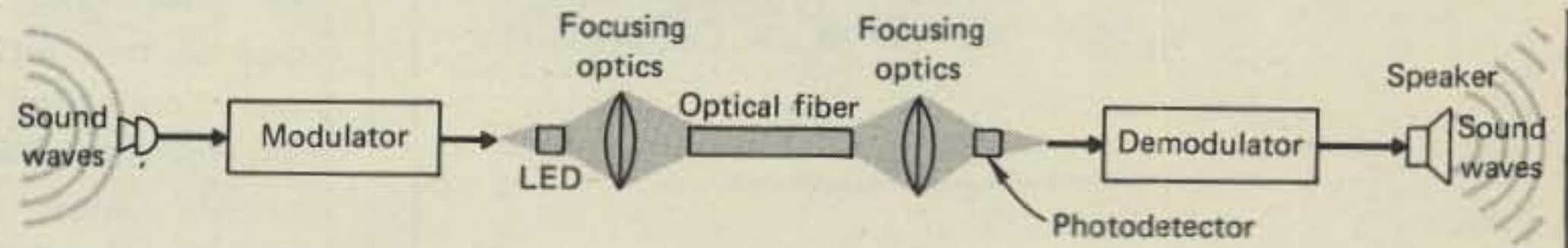


Fig. 1—An elementary optical fiber data link.

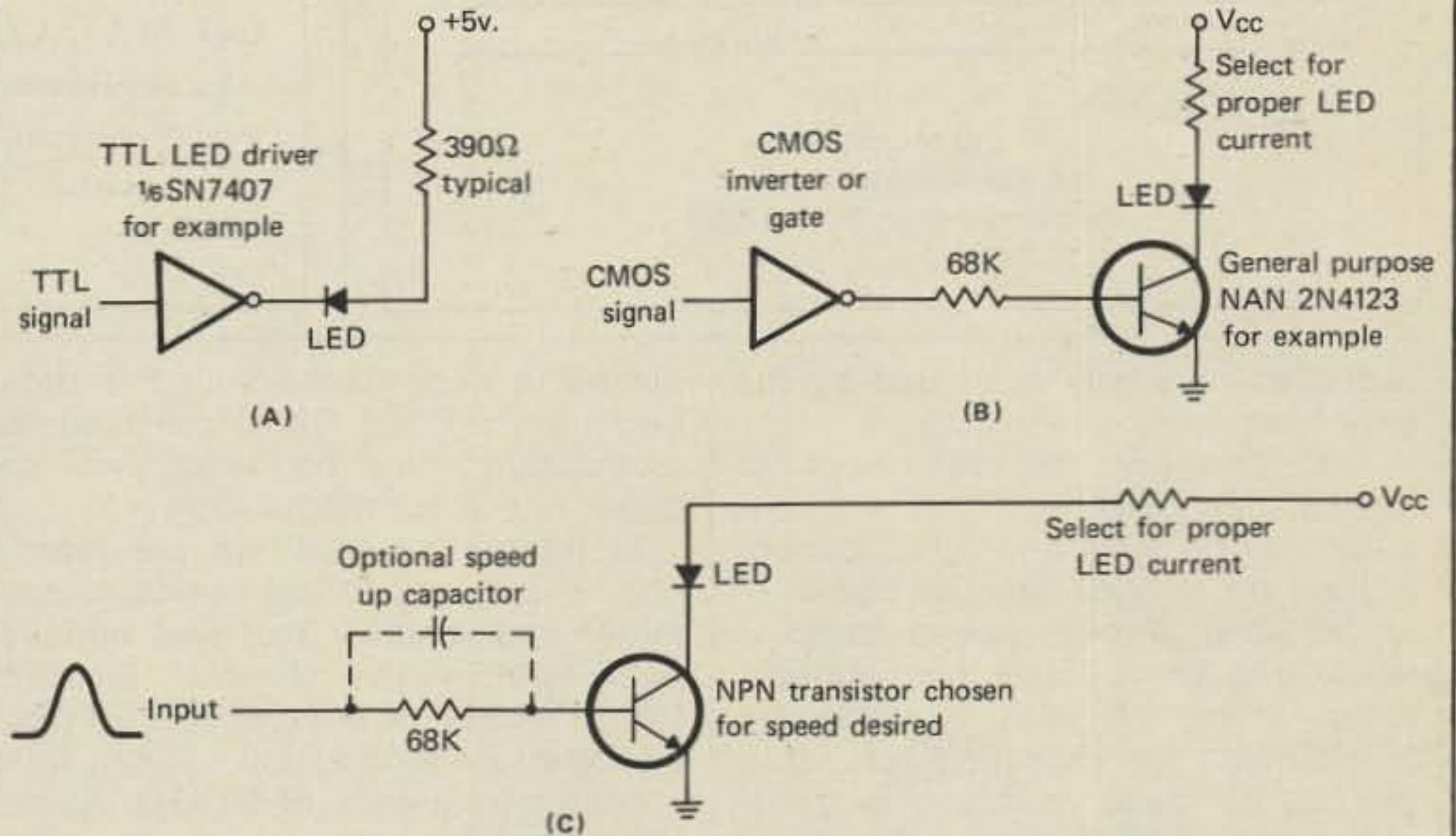


Fig. 2—Three simple ways to drive LEDs digitally.

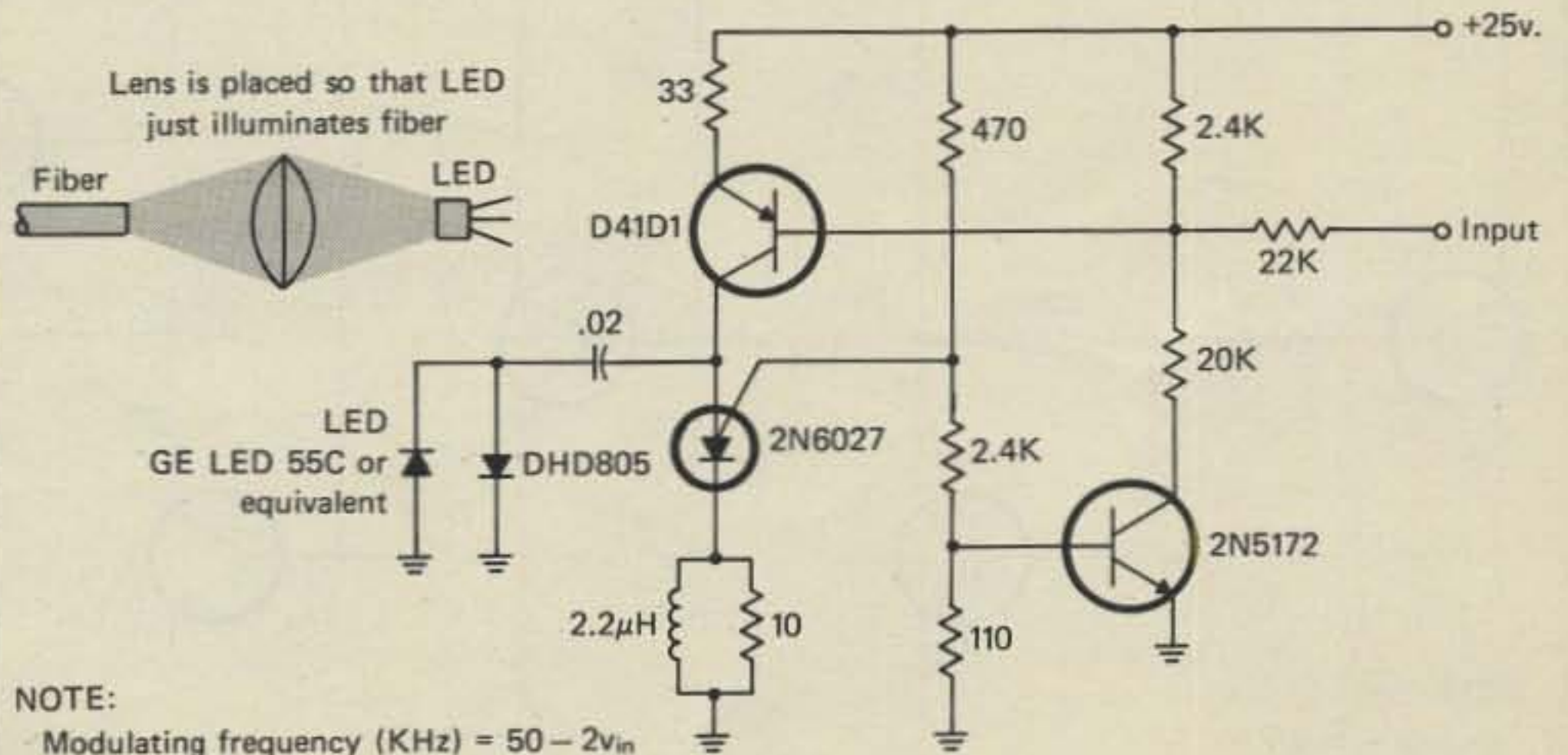


Fig. 3—A 50 kHz f.m. optical transmitter. All part numbers are G.E.

\*5 Melville Lane, Great Neck, NY 11020



# VERTICAL ANTENNA HANDBOOK

Compiles 22-years worth of material from the pages of CQ on vertical antenna theory, design, installation, construction. Covers verticals arrays, feeding and matching, short verticals, ground effects, multi-band and single-band verticals, answers the most common questions about vertical antennas. 6" X 9" 136 pages. **\$5.00**



Please send me \_\_\_\_\_ copies.

Name \_\_\_\_\_ Call \_\_\_\_\_  
 Address \_\_\_\_\_  
 City \_\_\_\_\_  
 State \_\_\_\_\_ Zip Code \_\_\_\_\_

CQ Magazine  
 14 Vanderventer Avenue  
 Port Washington, N.Y. 11050

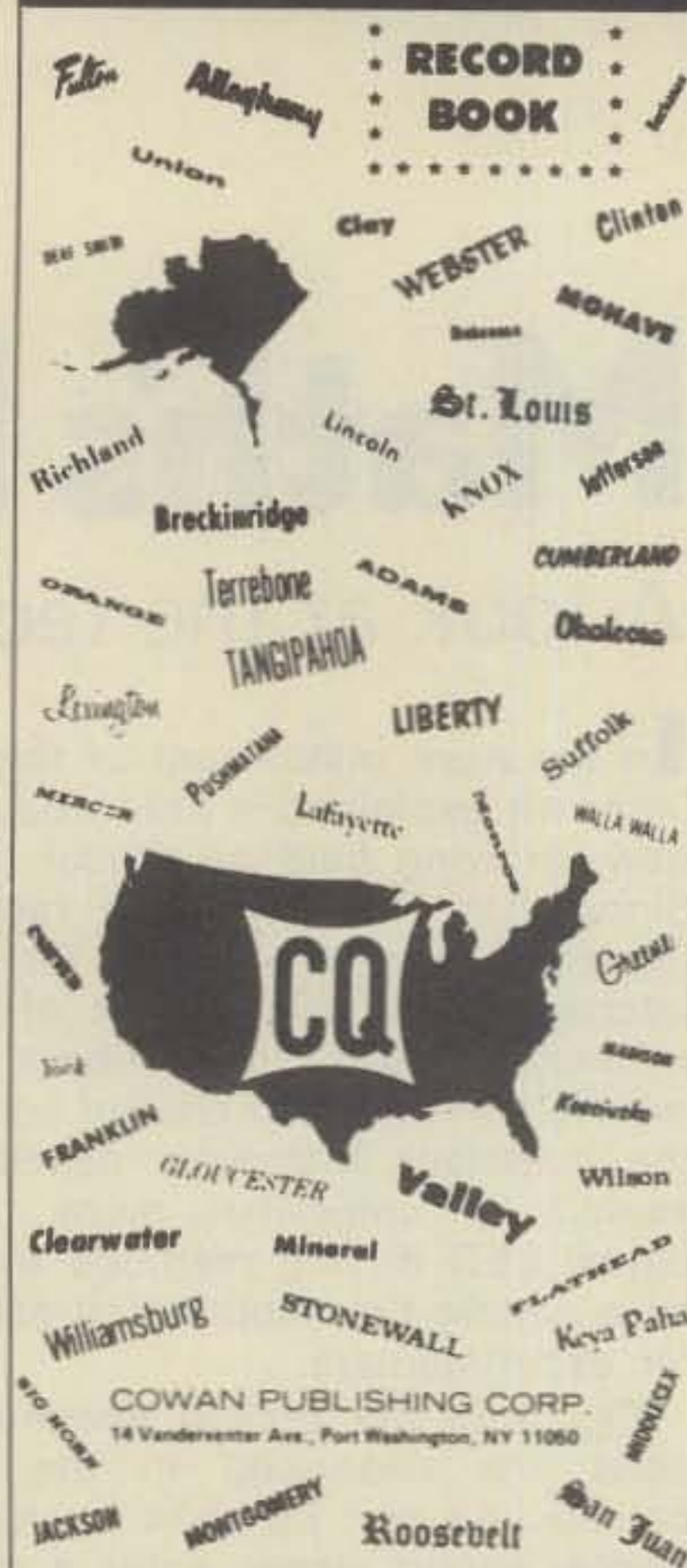
# \$1

That's all it takes to get a copy of the USA-CA Record Book delivered to your door. Order one or two today and start collecting counties for one of amateur radio's most prized awards, USA-CA.

## CQ MAGAZINE

14 Vanderventer Ave.  
 Port Washington, N.Y.  
 11050

### THE UNITED STATES OF AMERICA COUNTIES AWARD



may also be easily evaluated by the experimenter.

Fig. 2 shows several ways to "pulse" an LED. Common TTL circuits may be used and will allow operation up to their limit of about 20 to 30 MHz. If high speed logic is used, and the LED is fast enough, rates up to 100 MHz or more are feasible for the experimenter. Information, by these methods, is transmitted by simply varying the input

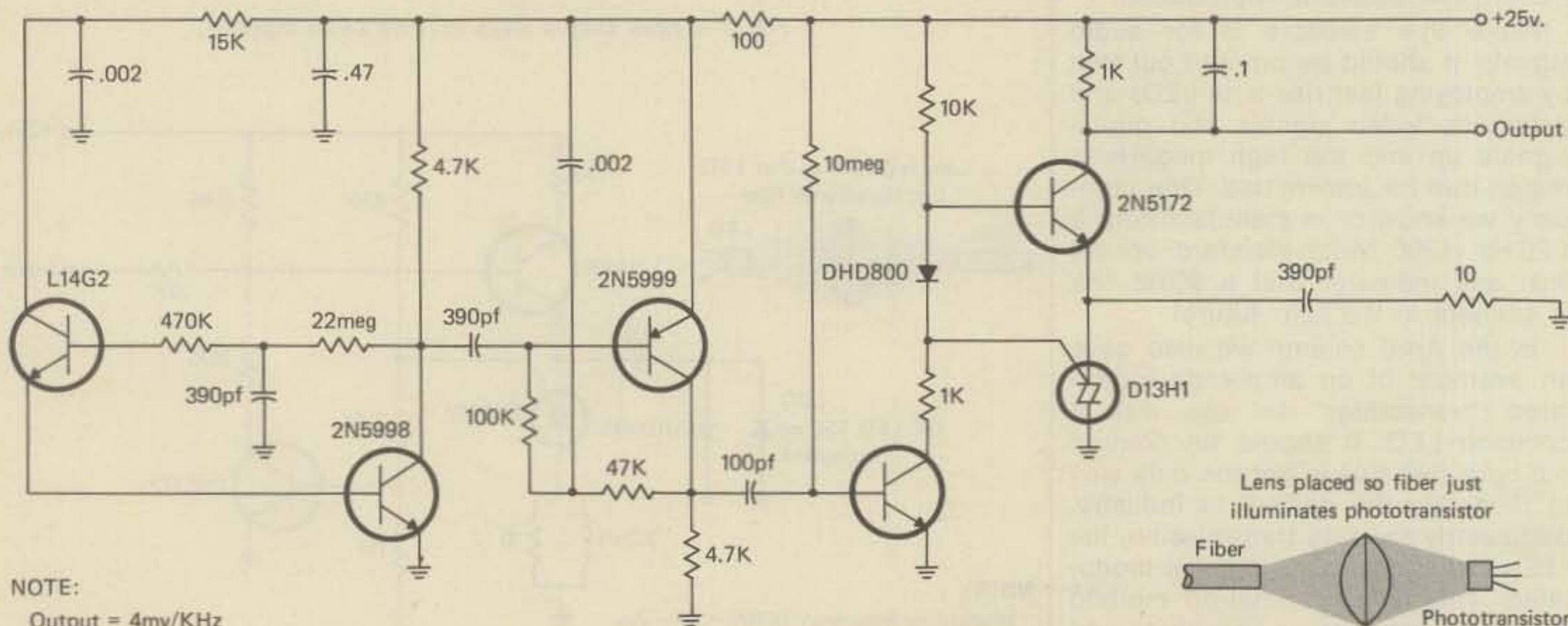
pulses in accordance with the data being transmitted. Either pulse width modulation may be employed, or pulse rate (f.m.) modulation.

In figures 3 and 4, we are reproducing a circuit for an optical transmitter and receiver that was initially published in the *General Electric Opto-Electronics Manual*. It is an f.m., or pulse rate modulation system, with a center frequency of 50 kHz. Audio fed to the transmitter varies the pulse

rate which is then used to drive an LED coupled to an optical fiber. On the other end of the fiber a phototransistor receives the modulated 50 kHz signal, demodulates it, and reconstructs the audio.

This system, together with the information given in the April column should allow those interested to design and construct an optical fiber

(Continued on page 90)



NOTE:  
 Output = 4mv/KHz

Fig. 4—A 50 kHz f.m. optical receiver. All part numbers are G.E.



# Novice

## "How to" for the newcomer to Amateur radio

### Amateur Signal Reports

**T**he standard Amateur RST method of evaluating signals heard over the air is based on the following definitions: Readability (R): R1—Unreadable. R2—Partially readable. R3—Readable with considerable difficulty. R4—Readable with practically no difficulty. R5—Perfectly readable.

Strength (S): S1—Faint signals, barely perceptible. S2—Very weak signals. S3—Weak signals. S4—Fair signals. S5—Fairly good signals. S6—Good signals. S7—Moderately strong signals. S8—Strong signals. S9—Extremely strong signals.

Tone (T): T1—extremely rough, heavily-modulated note to T9—Pure, single-frequency note.

Practically nobody complains about the "R" and "T" parts of the RST report, but many amateurs—beginners and old timers alike—have trouble reconciling the "S" reports they give and receive with the reports they hear other amateurs send and receive. How often do you strain your ears to hear a DX station that is receiving RST58N and RST5NN from stations all around you? Do you question the accuracy of your reports or of their reports? Only if the other stations are using antennas similar to yours at the same approximate height feeding receivers whose S-meters indicate the same signal strength as yours for equal-strength signals and all reports are based on the actual meter readings, your answer to that question would be just a guess. Remember that the other operators can also hear the reports that their peers are giving to the DX station. As a result, they may add a fixed number of "S" units to the actual reading of the meter to compensate for its "scotchness," compared to the S meters of their competitors. Also, operators trying to run up a big score in the big operating contests, such as the CQ WPX-SSB Contest, March 26-27, 1977, tend to send every station they work the same, good report to make friends and-simplify logging.

### "S" Units, $\mu$ V's, and DB's

Forty-some years ago when the RST signal reporting system was first introduced, "S1" was the weakest signal that could be detected on the receivers of that day. From "S1," then, signal strengths were conceived as building up in minimum detectable increments to "S9," an "extremely strong signal." It was already known that it required a power change of 4:1 to detect an unmistakable change of signal strength by ear. A 4:1 power change, in turn, is the equivalent of just under 6 dB, calculated:  $DB = 10 \text{ Log } P2/P1$ , where  $P1$  is the power before the power change, and  $P2$  is the power after the change. As there are eight intervals between S1 and S9, the total change is assumed to be 50 dB. Finally, as reasonably accurately calibrated radio-frequency signal generators became available, it became possible to measure the strength of the signals fed into the receiver antenna terminals. Thus, it became known that a c.w. signal with an amplitude of less than 0.2  $\mu$ V at the antenna terminal of a sensitive Amateur 1.8 to 30-MHz receiver is readable in the absence of interference. A 0.35-0.4  $\mu$ V volt signal is readable on s.s.b.

These figures lead naturally to specifying the signal in microvolts ( $\mu$ V) at the antenna terminal to produce an "S9" reading on the receiver S meter. 0.2  $\mu$ V for S1 corresponds to 50  $\mu$ V for S9; and 0.4  $\mu$ V corresponds to 100  $\mu$ V for S9. In practical terms, the less-generous S meter will indicate "S8" when the liberal meter indicates "S9."

### Stronger W1AW Code-Practice Transmissions

To provide stronger signals on the west coast from the Headquarters station, W1AW, Newington, Connecticut, while W1AW is transmitting code practice, new 120-foot high 7 and 14 MHz rotary beams are being installed and are probably in operation as you read this item. While accumulating the test data, many west-coast amateurs were asked which antenna

setup transmitted the strongest signals to their locations from Connecticut without knowing which antenna was being used. It is hoped that the new W1AW 7 and 14 MHz antennas will improve W1AW's west-coast signals by at least 10 DB.

### No FCC Amateur License Fees

As a result of a federal court order, the Federal Communications Commission suspended the collection of all license fees, effective January 1, 1977, and until further notice. Although all licensees welcome not having to pay license fees, it is feared that all other FCC business will be delayed while the FCC staff tries to solve the fee problem.

The most-obvious change in mobile and portable operation as the result of the FCC no longer requiring prior notice of operation for periods of 48 hours or more from the home loca-



Paul A. Flamm, WA4SCL/N, 1410 Fairidge Drive, Kingsport, Tennessee 37664, worked the 50 states in 3½ months on the air and now has over 60 countries worked. He uses a Yaesu FT-101EE transceiver driving a small beam on 10 meters and simple antennas on the other Novice bands. We are sending WA4SCL a 1-year subscription to CQ for this entry in our Monthly Photo Contest. If you wish to try your luck, send a clear photo (preferably black and white) showing you at the controls of your station and some details about your Amateur career to: Photo Contest, c/o Herbert S. Brier, W9AD, 409 So. 14th St., Chesterton, Ind. 46304.

\*409 So. 14th St., Chesterton, Ind. 46304





**GREGORY ELECTRONICS**  
*The FM Used  
Equipment People.*

## 6 METER F.M. SPECIALS

G.E. MA/E13, 40-50 MHz, 6/12 volt, 30 watts, vibrator power supply, transmitter narrow band, receiver wide band. A complete unit, not operationally checked-out, less accessories, shipping weight 45 lbs.



W 14", H 6½", D 15"

**\$28<sup>00</sup>**

MOTOROLA T51G series, 40-50 MHz, 6/12 volt, 50 watts, vibrator power supply, transmitter narrow band, receiver wide band. A complete unit, not operationally checked-out, less accessories, shipping weight 60 lbs.



W 15", H 6", D 18"

**\$18<sup>00</sup>**



**GREGORY ELECTRONICS CORP.**

243 Rt. 46, Saddle Brook, N.J. 07662  
Phone: (201) 489-9000

# MORSE CODE COURSES

*Specially designed for  
Beginners*

OUR 2 NOVICE COURSES TAKE YOU FROM DAY 1 (NO KNOWLEDGE OF ANY CODE) THRU 6 OR 8 WORDS PER MINUTE.

## NO CLASSES - LEARN AT HOME

THIS NEW METHOD SUCCESSFULLY USED BY PEOPLE FROM 10 THRU 65 YEARS OLD.

INCLUDES EXCLUSIVE NOVICE TRAINING SCHEDULE ALL REFERENCE MATERIALS, CHECKING SHEETS TO VERIFY ACCURACY, INFO ON OTHER HAM LICENSE REQUIREMENTS.

STANDARD 2 TRACK MONAURAL CASSETTES PROVIDE 60 MINUTES EACH OF SCIENTIFICALLY PREPARED CODE PRACTICE (LETTERS, NUMBERS, PUNCTUATION, CODE GROUPS, WORDS) CASSETTES ARE DESIGNED TO MINIMIZE LEARNING PLATEAUS, EMPHASIZE NEW MATERIAL

SET 1	0-6 WPM (Novice License)	6 CASSETTES	\$15.95
SET 2	0-8 WPM (Novice License)	7 CASSETTES	17.95
SET 3	7-14 WPM (General Class License)	3 CASSETTES	8.95
	First class postage required per CASSETTE		0.40

SPECIALISTS -- OUR ONLY PRODUCTS ARE TAPE COURSES

**THE HERRMAN CO.**

DEPT F, BOX 1101, LARGO, FLA. 33540

CLUBS - GROUPS ANY 10 OR MORE SETS  
5% OFF + 25¢ PER CASSETTE 1<sup>ST</sup> CLASS SHIPPING

tion is the reduced paper work. But the relaxed portable rules does not reduce your responsibility to notify the FCC within four months when you move. In fact, you must apply for your change of address before you may legally operate from your new location. Get the Amateur Radio License Form 610 used for all new, renewed, and modified Amateur licenses from any FCC office.

### CQ WPX Award

The CQ WPX Award recognizes the accomplishment of confirmed QSO with many prefixes used by Amateurs throughout the world. Separate awards are available for SSB and CW or mixed and for shortwave listeners (VPX), and U.S. Amateurs (WPNX). The WPNX Award can be earned by U.S.A. Novices who work 100 different prefixes prior to receiving a higher class license. The application may be submitted after receiving the higher license providing the actual contacts were made as a Novice. Prefixes worked for the WPNX Award may later be used for credit toward the WPX Award. The rules for the WPNX Award are the same as for WPX except that only 100 prefixes must be confirmed, rather than 300. See last month's column.

Send an 8½" x 11" envelope for a copy of the official rules to: WPX Manager Bob Huntington, W6TCQ, 5014 Mindora Dr., Torrance, Calif. 90505. One dollar or eight International Postal Reply coupons (for foreign applicants) must accompany the actual application for the award.

### News And Views

Have you ever worked VP1MPW? Do you want his QSL card? If you do, send your card to Mark's QSL Manager, G. L. Baker, W5QPX, 101 Rita Blanca Trail, Amarillo, Texas 79108, with a stamped return envelope (13-cent stamp) for your return QSL. Chances are that, if you worked VP1MPW as a WN, your confirmation is waiting for that return envelope, because Mark wants you to have it. Also, Gil Baker, the QSL Manager will appreciate any suggestions as to what to do with the VP1MPW QSL cards he is holding for WN's now that they have new call letters.

Paul A. Flamm, WA4SCL (Novice) 1410 Fairidge Dr., Kingsport, Tenn. 37664, has been a busy Novice since getting his license last August. He started out with a Heathkit HW-16 CW transceiver and then got a Yaesu FT-101EE s.s.b./c.w. transceiver and a Ten-Tec KR-20A keyer. Paul also has a Kenwood QR-666 receiver for

s.w.l'ing. He was surprised to work all states (WAS) in three and a half months. He also has 60 countries worked! Antennas are dipoles for 80 and 40, a Delta loop for 15 meters, and a small beam for 10 meters. Obviously, Paul likes to operate—to work in contests, ragchew, and chase DX. Finally, he thinks Amateur Radio is a key to World peace and understanding.

How long does it take between endorsements on your Code Proficiency certificate? Nick Cominos, WN9JKO, Griffith, Ind., took five years to earn the last endorsement. The first speed copied was 35 w.p.m. The last speed was 40 w.p.m.! Nick copies with a pencil using his own form of "shorthand" and rewrites what he copies before anybody else can read it.

Chester A. Charles, Sea Girt, N.J., K2VN, is not only a 78-year old Novice. He is also the country's only Novice with a 2 letter call! He was 2VN in 1914, which makes him eligible for a 2-letter call.

We are at the bottom of the page again. Send comments, pictures, and News And Views to: Herbert S. Brier, W9AD, Novice Editor, CQ, 409 So. 14th St., Chesterton, Indiana 46304.

73, Herb, W9AD



**Did you wonder why you could suddenly work some of the rare ones the first weekend in April. Didn't you expect the big guns to jump all over you and they didn't. Where were they?**

# THE 1977 CALIFORNIA DX CONVENTION

BY JERRY HAGEN\*, N6AV (ex-WA6GLD)

**T**he California DX Convention originally began as a Joint Northern California/Southern California DX Club Meeting and has been a West Coast DX Highlight for over a quarter of a century. The 1977 affair was no exception. This year's meeting was sponsored by the Northern California DX Club and headed by the enthusiastic K6SSJ. Attendees began arriving in Fresno on Thursday, March 31, a full 2 days before official activities began. By Thursday afternoon the Hilton was adorned by a KLM "Big Stick" 5 element yagi on a Tri-Ex tower, which was excited by a number of Kenwood, Yaesu and ETO products! On Friday afternoon a terrific pileup was heard on the local 34/94 repeater with callsigns such as W7KW, W6RR, W6NJU, W7FU, W6RGG, W6GW, WA6AHF, N6RR, N6DD, W6VPH and W6YK maneuvering for position. By the time the smoke cleared on Sunday visiting DXers such as KC6TC, 5W1AU, W3KT, W5RG, W0HP, JA1ELY, JA1KSO, JE1FFW, W7AO, VE3FXT, W7KAR, KH6IJ, K0DQI/XE1IJ, WA7NIN, W0SIP, W7OK, JA1ETQ, VE7WJ, WB7ABK, VE7ZZ, TI2WX, W0MLY, K3ZO and W7YU had participated in the convention activities. Total attendance was over 400 which tops the all time mark by over 100 DXers.

Activities began with the Saturday afternoon DX forum which was delayed due to the large crowd registering and late arrival of the NCDXC Bus (it was rumored that refreshments ran low, so an additional re-fueling stop was made!). After the DX Forum, a Contest Forum was Chaired by W6OAT which included comments by CQ WW DX Contest Co-Director Larry Brockman, N6AR (Ex-WA6EPQ). The hospitality hour was sponsored by Bob, K6AHV/

W6RJ of contest and DXpedition fame who is the proprietor of the Ham Radio Outlets. At the hospitality hour much of the conversation centered on "who is who" with the recent 2 letter call authorization. Many opinions were voiced on the proper combination of suffix letters for c.w. or phone and whether double letters were an advantage in DX and Contest pileups. One DXer remarked that after hearing a friend on with his new 2 letter call, he made his XYL help sift thru the trash-can to be sure an FCC ticket had not been inadvertently discarded.

As if the hospitality hour did not suffice, Larry-K6RPH of Webster Radio provided California's famous grape beverage to accompany the fine steak banquet dinner. Following the meal various contest awards were presented to members of the NCDXC and SCDXC. The Northern California DX Club selected Pete, WB6OOL/5W1AZ as their DXer of the year while in the South, Irv-W6GC was honored as the outstanding DXer for 1976. Following the awards, the featured speaker, Bill Rindone, WB7ABK (Ex-WA6SBO) gave a highly interesting rundown of his trip through the Pacific, Asia and Africa. A good portion of his presentation were slides of his operation from VK9XX which was featured in CQ for May of this year. It was obvious that Bill was as skilled with a camera as he is with a key, as the slides were outstanding in quality and subject matter. To keep the night young, a "beer bust" was conducted after the program—who knows what time some of the informal gatherings ended!

The Sunday morning breakfast program began with a 6 minute CW DX Test conducted by W6BHY which included calls of 98 DX and USA stations under various conditions of QRM. The clear-cut winner with 63 correct and only 4 errors, was none

\*1914 E. Heath Terrace, West Covina, CA 91791





Visiting on the Demonstration Terrace were Ken, WB6VFJ, Fred-W0HP with pipe and Dick-N6AA (Ex-W6DGH, K2PHF).



NCDXCers Jim, W6CF (Ex-W6CUF) (l.) Tom, N6RA (Ex-W6NUT) and SCDXCer Jack N6UC, (Ex-WB6UDC) enjoying the festivities.



That's the way it was in Africa explains Dick, W0MLY to Jack W6BK (Ex-W6ABA) and W6VVB.



This group of "Big Guns" includes (l. to r.) Bud-W6VPH, Homer-K6ND (Ex-W6-GFE), Dick-W6BZE and Ken-W6YK (Ex-W6FOZ).



One of the Demonstration rigs with unidentified Operator! The NCDXC Call—W6TI was used at three demonstration stations.



Part of the Arizona representation was provided by Glen, W7AO who is Ex-W6-ADP. Orin, W6DZ (Ex-W6DZK) is on the right.



Featured speakers Lloyd and Iris had just returned from operating as VP2MAQ.



A familiar voice and fist on the left, Nose-KH6IJ exchanging contest tips with Norm, N6GG (Ex-K6QZ).



Dale, K6UA, winner of the 75 Meter WAZ Award with Jack, N6UC on the left and W0SIP on the right.



Active DXers JA1ELY (l.) and JA1ETQ enjoyed the Convention while on a 2 week visit to the West Coast.

other than Fred Laun, K3ZO who graciously accepted the half-gallon prize! Lloyd and Iris then presented a highly informative and well organized program on their travels through the Pacific and the Caribbean. The highlight of their travel was the stay at Tuvalu where they witnessed the inauguration of a new nation. Iris noted that the hotel had only 5 rooms and thus the rig was set up in the bathroom so that 24-hour operation would not disturb the other guests! That's real DXpedition spirit!

The convention was closed by presentation of 1975 CQ World Wide DX Test awards by Larry Brockman N6AR. The USA Single Operator winner





Much of the credit for efficient administration of the Convention goes to Ferne, XYL of WA6AHF. Ferne also handles QSL manager duties for a multitude of DX stations.



On the left is Alan K6YRA, (Ex-W9YRA) who has been on the CQ SSB DX Honor Roll from both "6" and "9" land. On the right is Gunnar, W6YB who formerly signed K9WTS, and SM3BZD.



At the registration line were (l. to r.) Gordon-W6RR, John-W6RTN, Larry-N6AR (Ex-WA6EPQ and CQ WW Contest Director), and Bob-W6RJ/K6AHV.



The Northern California Contest Club complete with bright orange shirts! On the left is Bob, W6RGG/N6KB and on the right is Doug, WA6DQM. The back side of Doug's shirt was most distinctive!



OM Ruben, WA6AHF—a "Ghost" QSL Manager! Ruben and Ferne are now assisting the YASME Foundation in handling Lloyd and Iris' QSL's.



One of the Pacific's biggest signals is provided by Phil, 5W1AU. His antennas include 2 El on 40, 4 Elements on 20 and 3 Elements on 15 and 10.



Glen, K6NA (Ex-W6MAR) and Bob, WA6TLV engaged in a serious contest discussion. W6MAR was presented the 1975 CQ WW CW USA Winner plaque at the Convention.



Well known DX personality Fred Laun, K3ZO (Ex-W9SZR) was the winner of the CW DX copy contest. On Fred's right is Stan, W6XP (Ex-WA6WXP) and to his left is Mike, WB6FCE (Ex-Op at I1DFA and HV3SJ).



Scott, K0DQI/XE1IJ of contest fame. Remember those 6D1, 4C5, 4C9, 6G1 and 6J9 prefixes? Scott also operated as CX-3BBD back in the sixties.

for the phone section was Chip, K7VPF who operated W7RM and the CW USA Winner was Glen, W6MAR who now signs K6NA. The World High Multi-Operator Single Transmitter Trophy was presented to operators K7JCA, VE7BD, VE7SV, and W7EXM for their operation as VP2M. Nose, KH6IJ was presented the Oceania Phone Trophy. Also present was Jim, TI2WX, the Caribbean Phone Trophy winner, but he was not expected at the convention so the trophy was not present!

So it was back to home QTH's with new enthusiasm and high expectations for the next years convention. ■



Nob, JA1KSO is one of Japan's best known DXers and enjoyed working JA on the 15 meter demonstration Station. Nob was accompanied by JA1ELY, JE1FFW and JA1ETQ.



# DX

## News of communications around the world

A few days ago we had a very pleasant experience for a CQ writer when we opened our postoffice box and found that QST and CQ had arrived on exactly the same day. This was particularly interesting as it was the April issue of QST and the May issue of CQ.

" 'Tis well an old age is out, and time to begin a new."

—John Dryden

### De Extra

Many DXers have expressed concern and frustration over phone patch traffic in the low end of the 20 meter phone band. While there are no formal frequency allocations for DX, traffic handling, rag-chewing or any other amateur activity, it is recognized by convention that the lower edge of the band, just above 14200, is normally the "DX Sub-band." Consequently, DXers have been understandably upset when weak stations from Africa, Asia and Oceania are repeatedly taken out by phone patch traffic within our own hemisphere.

The International Amateur Radio Union (I.A.R.U.) discussed this problem at the I.A.R.U. Region 2 Meeting, Miami, Florida, in April, 1976, and

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



Iris, W6QL, and Lloyd, W6KG, Colvin were inducted into the CQ DX Hall of Fame at the Fresno DX Convention in April. This photo was taken after their successful W6QL/VP2A operation by Antigua photographer VP2AC who manages the Antigua QSL Bureau.



Jim Wilson, W4MWT, of Kennesaw, Georgia, snared 20 meter, single band phone WAZ No. 36. Single Band WAZ is rapidly becoming the #1 challenge for DXers.

unanimously agreed on the following statement which was subsequently published in *Region 2 News* for August, 1976:

"Third Party Traffic—It was agreed that in order to minimize interference with other international communications, the handling of third party traffic should be conducted in the upper part of the 14200 -

14350 kHz band and the lower part of the 14100 - 14200 kHz band."

Unfortunately, this agreement has not been well publicized in the U.S., and some patches are still heard in the low end of the U.S. phone band. Hopefully, this will be cleared up as everyone becomes aware of the I.A.-R.U. position.

### Here and There

Lloyd and Iris Colvin logged 10,000 QSO's as W6QL/VP2A, Antigua, an all-time record for a single stop. On Feb. 21, 1977 they worked all continents in 30 min. on 20 meter s.s.b. The stations worked were UF6VAG, VK4AK, YV4YC, IK7RNH, XE1PDE and ZS6DN.

V.E.R.O.N., the Netherland's Amateur Radio Society, suffered a severe fire at their Central Bureau in Arnhem on March 29, 1977. Printing equipment and files for *DX 'press* and the *VHF Bulletin* were lost at a total cost of \$600,000.

Virginia Century Club officers for 1977 are Victor I. Culver, K4JNM, President; C. Edgar Koontz, W4OW, Vice President; and E. J. (Ed) Daigre, WA4ZYU/W5ILR, Secretary/Treasurer. Correspondence should be directed to WA4ZYU at 4421 Templar Drive, Portsmouth, VA 23703.



Wilmer, WA4OPW, is another recent WAZ winner. Wilmer is past president of the Virginia Amateur Radio Association and edits the Association's news letter the Short Path. He has been licensed for 14 years and is about 45 countries away from the DXCC Honor Roll.

### The WAZ Program

#### Single Band WAZ

##### 20 Meter C.W.

17...YU2RTW	19...W7LR
18...W4RSZ	20...JH7BRG

##### 20 Meter Phone

40...W1GKN	41...JA7UIQ
------------	-------------

##### S.S.B. WAZ

1364...KG6SW	1367...I1UW
1365...JA2LHG	1368...IT9PUG
1366...I1HAG	1369...K4SMX

##### C.W.—Phone WAZ

4070...YU3DJK	4074...WA4JT1
4071...OK1DVK	4075...W2LZX
4072...W8ZNO	4076...VE1CD
4073...JA5NC	

##### Phone WAZ

527...LA2ZN

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 business-size, self-addressed, stamped envelope to the DX Editor, P.O. Box 205, Winter Haven, FL 33880.



**Outgoing QSL Bureaus.** In response to information printed in the April, 1977 DX Column, W7LLC of the *World Wide DX QSL Bureau* writes as follows: "You stated in your article that the most economical way for A.R.R.L. members to send their outgoing DX QSLs was via the A.R.R.L. Bureau. This is not correct! They charge a flat fee of \$1.00/month for all cards sent to them during that month, one mailing. My Bureau charges \$11.00/year for ALL cards sent at any time, plus providing a special stateside managers service wherein cards are sent directly back to the originator. No other Bureau has ever provided such a service. Preaddressed envelopes are provided FREE of charge by my Bureau and mailed to the member from the Manager. My Bureau has been in operation for 15 years and will continue to function despite the new League Bureau."

If you would like more information on the *World Wide DX QSL Bureau*, the address is John F. Wojtkiewicz, 10316 Aztec Drive, Sun City, Arizona 85351.

**WA6AUD** advises that the circulation of the *West Coast DX Bulletin* has reached 1,850. Putting out the weekly Bulletin has become a non-stop job.

**HZ1AB** is not a "Silent Key" despite reports published in another magazine, according to Bill Gary, K8CSG/5. One amateur who occasionally operated the station was killed in a helicopter crash in Arabia, but he was not an assigned operator at HZ1AB which is licensed to the U.S. Military Training Mission at Dhahran and operates on both MARS and amateur frequencies. As an oil company employee, Bill hopes to be back at HZ1AB during the summer with a new antenna, new rotator and new SB-220 to give more stateside DXers a shot at the station. During January and February, he and W5UJF made about 500 contacts from HZ1AB.

**IY4FGM** is the Guglielmo Marconi Memorial Station located at Pontecchio Marconi in the house where the Italian inventor conducted his first experiments in the radio field. IY4FGM made 2000 contacts during the CQ Worldwide WPX Contest in March. QSL to I4BFY, Roberto Borhy, 133 Via Toscana, 40141 San Ruffillo, Bologna, Italy.

**Need a QSL Manager?**—Dick Lust, WB9DWG and his XYL Mary Ann, WB9DWF, would like to be stateside QSL Managers for an overseas DXer.

**FOORS** QSLs for the period March 4-15, 1977 only, go to W6MAR, Glenn R. Rattmann, 1144 Highland Heights Lane, Escondido, CA 92025.

## 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 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	W6NJU ..... 284
K6EC ..... 313	W2GT ..... 307	W6ISQ ..... 301	K6JG ..... 295	WA6EPQ ..... 282
ON4QX ..... 312	W8LY ..... 305	K6LEB ..... 298	VK3AHQ ..... 292	W6SDO ..... 279
W6ID ..... 312	W9DWQ ..... 303	W0AUB ..... 298	WA8DXA ..... 287	DJ7CX ..... 276
W8KPL ..... 309	N6AV ..... 302	DL3RK ..... 297		

### SSB

W2TP ..... 318	K4RTA ..... 310	KH6BB ..... 305	OZ3SK ..... 296	W6FET ..... 287
DL9OH ..... 316	W2QK ..... 310	W4IC ..... 305	W0SFU ..... 296	G3RWQ ..... 286
K2FL ..... 316	W3DJZ ..... 310	K6WR ..... 304	W2CNQ ..... 295	K1KNQ ..... 286
W4EEE ..... 316	W6EL ..... 310	K6YRA ..... 303	W7SD ..... 295	W6HUR ..... 286
WA2RAU ..... 316	W6KTE ..... 310	VE2WY ..... 303	W4WSF ..... 294	DJ7CX ..... 285
T12HP ..... 315	F9RM ..... 309	VE3GMT ..... 303	W6TCQ ..... 294	OE3WWB ..... 285
G3FKM ..... 314	SM6CKS ..... 309	WA3IKK ..... 303	DJ97B ..... 293	G3KYF ..... 284
I4AMU ..... 314	WA2EOQ ..... 309	K4MQG ..... 302	ISWT ..... 293	W6SDO ..... 284
W3CWG ..... 314	W4DPS ..... 308	ZL1AGO ..... 302	VE7WJ ..... 293	WB2RLK ..... 282
W3NKM ..... 314	W6YMV ..... 308	OE2EGL ..... 301	K6AQV ..... 292	YV1LA ..... 282
W6RKP ..... 314	WA6AHF ..... 308	W6NJU ..... 301	WA2HSX ..... 292	SP5BSV ..... 281
VE3MR ..... 313	I8YRK ..... 307	ZS6LW ..... 301	WB6DXU ..... 292	WA4WTG ..... 281
W3AZD ..... 313	I9ZV ..... 307	I4ZSQ ..... 299	HP1JC ..... 291	WA0KDI ..... 281
W9ILW ..... 313	K6JG ..... 307	W6K7S ..... 299	K8PYD ..... 291	WB6PNB ..... 281
W4SSU ..... 312	K8DYZ ..... 307	YV1KZ ..... 299	W0YDB ..... 291	XE2YP ..... 281
W4UG ..... 312	K9WEH ..... 307	EA4LH ..... 298	W9YRA ..... 290	OE1FF ..... 280
W6EUF ..... 312	ZL3NS ..... 307	W9OHH ..... 298	DL6KG ..... 289	DL1MD ..... 279
W6REH ..... 312	F2MO ..... 306	W9QLD ..... 298	G3WW ..... 289	OK1MP ..... 279
W9DWQ ..... 312	I6FLD ..... 306	F9MS ..... 297	VE7CE ..... 289	WB4SIJ ..... 279
I8AA ..... 311	K6EC ..... 306	G3DO ..... 296	W6FW ..... 289	W3CRE ..... 278
VE3MJ ..... 311	SM5SB ..... 306	G3TJW ..... 296	K4HJE ..... 288	VE7HP ..... 277
XE1AE ..... 311	SM6CWK ..... 306	K8DYZ ..... 296	YS1O ..... 288	XE1KS ..... 277
I8KDB ..... 310	W9JT ..... 306	N6AV ..... 296	DK2BI ..... 287	N2SS ..... 275
IT9JT ..... 310	W9KRU ..... 306			

W8YEK ..... 108

### SSTV

**Comments** reportedly heard during the recent HK0TU DXpedition to Malpelo: "What's your QTH?" Answer, "The island of Malpelo." Reply, "Yeah, I know that but what city?" And in a later QSO, "Hey, I have a friend there! Do you have a phone patch?"

### Rare Prefix and Zone News

**AX**—This prefix was used by Australians during the visit of Queen Elizabeth. Among other locations it saw service from rare Lord Howe Island, activated by AX4AAU, AX4UA, AX4AK and AX4FJ. The stateside QSL Manager for AX4FJ is W7OK.

**AX9**—AX9ZM on 20 meter s.s.b. (14265) was on rare Willis Island.

**E10**—E10AB was a DXpedition to the Aran Islands, June 4-6, 1977, by the Limerick Radio Club. QSL to J. Casey,

E15BX, 10 Derravarragh Road, Caherdavin, Limerick City, Ireland. (Tks EI3AU)

**HB4**—This very rare Swiss prefix was activated in the 1977 CQ WPX Contest by HB9AAA, HB9AAH and HB9AOO using the call HB4FF. QSLs are being sent to all contacts via the Bureau. If you prefer a direct card, the QSL Manager is HB9AAA, P.O. Box 17, CH 2500, Bienne 4, Switzerland.

**HK0**—QSL the L.C.R.A. DXpedition to Malpelo, HK0TU, via P.O. Box 584, Bogota, Columbia.

**JT and UA0Y**—Stations recently active from Zone 23 on 20 meter c.w. include JT1BF (14031/0310GMT), JT1KAA (14030/0205GMT) and UA0YAD (14012/0150GMT). JT1KAA is occasionally heard on s.s.b. JT0ICB on



CQ's WPX Award is very popular in Europe and these 2 DXers are among the best. On the left is Lazlo, HA0HW, operating from club station HA0KHW, and on the right is Clay, I4VEQ, passing out new prefixes as IK4VEQ.





The winner of 20 meter, single band WAZ No. 35 was Dr. Roland R. Suran, VE3FJE, of Toronto, Ontario, Canada.

3502 kHz is a great catch for those working toward WAZ on 80 meter c.w.

**ST2**—Rare prefix, zone and country. Sudan in Zone 34! Sid, ST2SA, is periodically active on the low end of 20 meter c.w., 14024, around 2200 GMT, and on 15 meter c.w. earlier at 1840 GMT. He is on 20 meter s.s.b., 14250, at 0600 GMT every Friday. QSL to DJ9ZB.

**T19**—Rare prefix and country—Cocos Island. T19CF and T19BY in April, 1977 were operated by T12CF and T12BY. QSL to the T12 addresses.

**5A**—Rare prefix, zone and country. Libya in Zone 34! By 6W8DF/5A, said to be operating from a trailer van. QSL to Jacques Crete, 5T5CJ.

**8Q0**—An Italian group has reportedly used this prefix, with QSLs to go to I2AXC.

### The Trials, Tribulations & Problems of Bouvet

One of the rarest of the very, very rare countries for DXCC and the CQ DX Awards is Bouvet Island, isolated deep in the antarctic waters of the far south Atlantic. If our DX history is correct, Bouvet was first activated by Gus Browning, W4BPD, first recipient of the CQ DX Hall of Fame Award, during his major worldwide DXpedition back in the early 60's, using an LH0 call as Bouvet is a Norwegian possession. More recent amateur activity has mostly been the



No pile-ups to battle for this QSO. On the left is Mamkyu Lee, HM1DK and on the right is CQ staff member Jack Gutzeit, W2LZX. (photo by W2JGR)

result of efforts by Norwegians in their country's antarctic exploratory group. The following information from Marty Laine, OH2BH, also a member of the CQ DX Hall of Fame, illustrates the great difficulties encountered in reaching, landing and operating from Bouvet, as a result of isolation and extreme weather.

"I just spoke with John, LA1VC, who was with LA3CC aboard the Norwegian ten week END-Antarctica survey starting from South America, coming all the way back to Bouvet and up to Capetown, South Africa.

"John, who is an electronic engineer at Norwegian Posts and Telecommunications, was responsible for all the electronic equipment and for radio communications during the expedition. He knew exactly the demand for Bouvet and just for that reason took the Atlas transceiver



Left to right are Rick, HC5EE/WB8ABN and Fernando, OA4ABO, at the QTH of HC5EE in Cuenca, Ecuador. Both of these calls are in the logs of many DXers in the U.S. and around the world.

and the other necessary gear to operate from Bouvet if possible. The only reason for this expedition to stop at Bouvet was to leave a radio beacon on the island. In case of poor weather, they would just continue on to Capetown.

"The schedule was to be in the vicinity of Bouvet around Feb. 24 or 25, but they arrived on Feb. 23 and landed during the afternoon on the northwest part of the island at a place called 'Westwind Beach.' The landing was done with a small, rubber raft. Some ten people went ashore and started work on the beacon installation. When the work was almost completed, the Atlas and a 20 meter dipole were set up for the amateur operation. However, the weather was worsening and the group was ordered to return to the ship immediately, as there was no helicopter aboard and it was not

possible to remain on the island after darkness at 1900 GMT.

"On Feb. 24, the weather was not as good as on the 23rd and it was necessary to shift to the other of 2 possible landing sites, a place called 'Blacksand Beach.' The landing was made at 1300 GMT with plans for a 5 hour stay. The station was ready for operation at 1500, but 20 meters was dead. The first contact was made at 1545 with ZS5WT in South Africa, followed by JR6RRD on Okinawa. After calling CQ many times, a contact was made with W6ID at 1609 GMT for the only stateside exchange. At 1630 the band opened to Europe long enough for 26 QSO's, the last of which was with OH2BGD and his 14AVQ vertical. At 1740 an order was received to return to the ship immediately.

"The landing planned for Feb. 25 was abandoned because of poor weather, but the overall weather was pretty good for Bouvet as 2 landings had been possible. The over-riding concern was the safety of the people involved and risks had to be kept to a minimum. Everyone in the amateur community owes a thanks to John, LA1VC/3Y1VC for his efforts in securing space in the rubber boat for the Atlas and storage battery. Most will understand the need to leave the island when the log sheets are getting wet.

"Another Norwegian survey has been announced for 2 years hence, and they plan to have a helicopter aboard in order to build up the facilities on Bouvet and spend more time on the island. John is hoping to again be along and to make more DXers happy with a Bouvet contact."

### Top 20 In Atlanta

The Southeastern DX Club in Atlanta recently polled their membership to determine the countries most desired by DXers in the center of the W4 area. Prospective DXpeditioners with lots of nerve and money please note:

1. YI—Iraq
2. BY—China
3. F08C—Clipperton Island
4. XU—Khmer Republic (Cambodia)
5. 3Y—Bouvet Island
6. VK0—Heard Island
7. XZ—Saudi Arabia/Iraq Neutral Zone
8. 8Z—Burma
9. D6A—Comoro Islands
10. VP8—South Sandwich Island
11. ZA—Albania
12. 1S—Spratly Island
13. 7J—Okino Torishima
14. VS9K—Kamaran Island
15. A51—Bhutan



## The CQ DX Awards Program

### S.S.B.

480...W4ILVM 483...OK1AVU 486...WA4UVG  
481...N2SS 484...G3CVZ 487...H18LC  
482...OK1AGN 485...W2LZX 488...W7OK

### C.W.

255...W4LVM 256...IØWL 257...K8PYD

### S.S.B. Endorsements

310...W2QK 250...N2SS 150...N2SS  
310...XE1AE 200...N2SS 150...W4LZX  
300...K8DYZ 200...W4LZX 150...W7OK  
300...XE1AE 200...WB4OXD 3.5/7 MHz...H18LC  
275...N2SS 200...W7OK 3.5/7 MHz...W7OK

### C.W. Endorsement

150...K8PYD

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.

16. VU—Laccadive Islands
17. S2—Bangladesh
18. VK9Y—Cocos-Keeling Island
19. 3CØ—Annobon Island
20. 1G(?)—Geysir Reef

Also high on the list in the Gate City were the Andaman Islands, Qatar, the Central African Republic, Chad, Marion Island, Campbell Island, Malpelo, Aldabra Island, Willis Island and Mellish Reef.

### QSL Information

QSLs for each of the following stations may be obtained by sending a self-addressed, stamped envelope to John Kroll, WA8TDY, 3528 Craig Drive, Flint, MI 48506. John is a member of the CQ DX Awards Advisory Committee.

DU1FH, for 1971 & '72

WPX Test only	KS4KZ
FC2CH	KT8ITU
FG7TD	KZ5JF
FM7AA	KZØWPX
FPØTD	TF2KJ
HC1EE	VP2AR
HC1MM	VP2AYL
HC5EE	VP2MB
HDØEE	WA6JZL/TI2
HDØQRC	WB8ABN/HC5
HL9WC	WB8ABN/HC0
HU2CEN	WC8ITU
HUØA	YNØHSM
KE8ITU	YS2CEN

AY8CW (LU8CW)—To P. Morton, 10743 Harding Road, Laurel, Md. 20810	FB8WE—To F6APG, M. Bontemps, Le Bois aux Lievres, F-27 Prey par St. Andre-de-L'Eure, France
CP1AT—Via WØGX, L. W. Knaust, RFD-1, Cassville, MO 65625	FC9UC—c/o DL7FT, F. Turek, Petunienweg 99, D-1000 Berlin 47, Germany
D6AC—To F6BBJ, J. Billaud, 11 rue R. Champenier, F-58000 Nevers, France	FG7AR/FS7 (for March 16, 1977)—Via K3RYA, W. P. Jacobs, 208 Sleepy Hollow Road, Pittsburgh, PA 19028
EABCR—c/o K9KXA, M. Seo, 6430 N. Lakewood Ave., Chicago, IL 60626	FH8BKZ—To F6BBJ, J. Billaud, 11 rue R. Champenier, F-58000 Nevers, France
EL2EB—Via K8DIU, D. G. Brewer, 26630 Mill Rd., Frazeyburg, Ohio 43822	

FL8KP (from Nov. 7, 1976)—c/o Joe Arcure, Jr., W3HNC, P.O. Box 73, Edgemont, PA 15216	JA1PIG/PZ—Via JA1PIG, G. Usul, 1-6 Nishluraga, Yokosuka, Kanagawa, Japan
FM7WS—Via P.O. Box 632, Fort-de-France, Martinique, French West Indies	JE1TWG/S21—To JA0CUV/1, T. Kumagai, P.O. Box 22, Tokyo 181, Japan
FO8DP—To VE3EZM, J. I. Ridpath, 289 Poyntz Ave., Willowdale, Ont. M2N 1J8 Canada	KA6DX—Via N1DX KM6EB/KH6 (Kure Island)—c/o KM6EB, Sam G. Kibler, Box 14, USNS, FPO, San Francisco, CA 96614
FOØRS—Via Robert Savery, B.P. 2891, Papiete Tahiti, French Oceania	KV4JY—Via WA6AHF, Rubin Hughes, 17494 Via Alamitos, San Lorenzo, CA 94580
FR7ZL—c/o Guy P. de la Rhodiere, Les Alizes, 97417 La Montagne, Reunion Island	N5RM/HBØ—To W9DD, R. H. Mitchell, RFD-2, Box 62, Huntington, IN 46750
IY4FGM—Via I4BFY, Roberto Borhy, 133 Via Toscana, 40141 San Ruffillo, Bologna, Italy	OA8V—c/o W9GFF, E. P. Frohardt, Jr., 3520 N. Oleander Ave. Chicago, IL 60634
ISØAEW—To WA1VSJ, H. W. Beisheim, Box 569, Southwest Harbor, Maine 04679	OY1R—Via W2KF, K. K. Miller, 309 Cherry Hill Blvd., Cherry Hill, NJ 08034
ISØLYN—c/o WA1VSJ (see above)	P29BB—To W2VIA, B. Fein, 80 Garden Rd., Scarsdale, NJ 10583

## The CQ WPX Program

### Mixed

572...WB2SZS 574...ON4XG  
573...WB2CKO

### S.S.B.

970...F6BVY

### C.W.

1571...WB2CKO 1574...WB5DDI  
1572...OE1TKW 1575...W6ZGM  
1573...JA8FXO 1576...OZ2QF

### VPX

119...YU2-RS-392 120...JA6-9330

### Endorsements

Mixed: 1050 N2AC, 902 W2MB, 759 JA1BN, 754 W2FLD, 750 WA8TDY, 733 WA2AUB, 730 ON4XG, 658 JH1VRQ, 500 HI8MOG, 450 WB2CKO.  
SSB: 1183 I8KDB, 850 OE2EGL, 354 I1DWH, 304 F6BV  
CW: 553 JA2IU, 450 K8YQW, 400 K8LJG, 350 I2DMK, 323 OK2QF, 305 WB5DDI, 300 WB2CKO, JA8FXO JH1VRQ, OE1TKW, 323 OK2QF, 305 WB5DDI, 300 WB2CKO, JA8FXO.  
10 Meters: W3NB  
15 Meters: W3NB  
20 Meters: WA6EVX/KG6, W3NB, HI8MOG  
40 Meters: W3NB  
80 Meters: W3NB  
Africa: W3NB  
Asia: W3NB  
Europe: WA6EVX/KG6, WB8HVY, WB2CKO  
No. America: JH1VRQ

Complete rules for WPX can be found in the May, 1976 issue of CQ Magazine. Application forms may be obtained by sending a business size, self-addressed, stamped envelope to "CQ WPX Awards," 5014 Mindora Dr., Torrance, CA 90505, U.S.A.

P29BN—c/o W3LPF, J. M. Moore, 3708 W. Seventh Ave., Beaver Falls, PA 15010	VP2KF—Via VE2MS, B. H. Leblanc, 8900 Lacordaire, St. Leonard, Montreal, Quebec H1R 2B3
PZ1DR—Via W3GXF, M. E. Ellis, 208 Willett Rd., Pittsburgh, PA 15116	VP2KT—To WB2TSL, K. W. Jarvis, 210-15 89th Ave., Bellaire Gardens, NY 11427
T19BY—To TI2BY, Box 4702, San Jose, Costa Rica	VP2LDQ—c/o Ted Schmidt, 651½ University Ave., St. Paul, MN 55104
T19CY—c/o TI2CY, Box 4300, San Jose, Costa Rica	VP2MNR—Via WA6VNR, J. F. Hynarowski, 3785 Mt. Blackburn Ave., San Diego, CA 92111
VKØAC—Via VK3AZQ	WA6YOU/DU2—To WA6YOU, R. C. Payne, 3843 California Way, Livermore, CA 94550
VKØKH—To VK5WV, W. D. Verrall, 7 Lilac Ave., Flinders Park, South Australia 5025	
VP1RS—c/o P.O. Box 826, Belize City, Belize, Central America	



Yugoslavian Club station YU4JHI received C.W.-Phone WAZ #3855. Pictured above are station awards manager Eno, YU4VMA, and his YL, Sendi.

XE1FR—c/o W5QK, C. S. Blood, 7435 Dillon St., Houston, TX 77017	6V8DF/5U7—Via 5T5CJ, J. Crete P.O. Box 202, Nouakchott, Mauritania
YBØAAG—Via DJ2JB, H. Geerken, Galgenbergstrasse 51, D-7400 Tuebingen, Germany	6W8DF/5A (Libya, Zone 34)—To 5T5CJ, see above
3B8DS—To P. O. Box 44, Port Louis, Mauritius	9J2WS—c/o W4LF, E. B. Vordermark, 721 Second St., Neptune Beach, FL 32233
4W7KM—c/o P.O. Box 551, Sana'a, Yemen Arab Republic	9M2GV—Via K6LAE, R. S. Mannheimer, 650 Westholme Ave., Los Angeles, CA 90024
4X4JS—Via WA2KWP, D. B. Ellenberg, 17 Orchard Rd., Middlesex, N.J. 08846	9Q5BG—To P.O. Box 9824, Kinshasa, Republic of Zaire
4Z4DZ—To W7TE, E. W. Farley, 1418 Federal Way, Salt Lake City, Utah 84102	
5W1BC—c/o WB4ZNH, C. D. Henson, 8280 Chesnut Drive, Jonesboro, GA 30236	

73, John K4IIF

### Spread The Word

An eye-catching bumper sticker encouraging the man in the street to "Talk to the World - Become A Ham Operator" is available from CQ for 25 cents plus a legal-size s.a.s.e. Quantity prices upon request. Write to: CQ, 14 Vanderventer Ave., Port Washington, NY 11050.



Armando Ardila, HK3MD, on a visit to K4SMX's QTH just prior to the Malpelo DXpedition. Armando is an official of Liga Colombiana De Radio Aficionados, and operates from Bogota. (Photo by K4SMX).

**SEND IN EARLY FOR ALL CQ CONTEST FORMS AND LOG SHEETS**



# Propagation

The science of predicting radio conditions

**C**ycle 21, the latest sunspot cycle, which seems to have begun during June, 1976, is off to a slow start. This could be the first confirming sign that this will be a low cycle<sup>1</sup>.

The Swiss Federal Observatory at Zurich reports a monthly mean number of 8 for March, 1977. This results in a 12-month running smoothed sunspot number of 14.1, centered on September, 1976. This represents an increase of less than 2 sunspot numbers during the first four months of the new cycle.

A smoothed sunspot number of about 20 is forecast for July, 1977.

## July DX Conditions

With longer hours of daylight and the sun high in the northern sky, h.f. propagation conditions should be considerably more stable during July than they were during the past winter.

**Twenty meters** should continue to be the best band for DX propagation during the month. When conditions are LOW NORMAL, expect the band to remain open to one area of the world or another from sunrise through the early evening. Peak conditions should occur during a two-to-three hour window just after sunrise, and again during the late afternoon and early evening. During these peak periods, worldwide DX should often be possible.

During July and the summer months, nighttime openings to as late as Midnight should be possible, particularly when conditions are HIGH NORMAL, or better. While these nighttime openings usually favor southern and tropical areas, openings to Europe and the Far East may at times also be possible.

Considerably fewer DX openings are expected on **15 meters**, as a result of seasonal changes in propagation. When conditions are at least LOW NORMAL, however, 15 should

<sup>1</sup>11307 Clara St., Silver Spring, MD 20902.

<sup>1</sup>Cohen, T. J. and Jacobs, G. "Solar Activity Update: The Transition Years", CQ, Jan. 1976, p. 18.

## LAST MINUTE FORECAST

Day-to-Day Conditions Expected For July, 1977

Propagation Index .....	Expected Signal Quality			
	(4)	(3)	(2)	(1)
Day				
Above Normal: 5, 18	A	A	B	C
High Normal: 2, 13, 17, 29	B	B	C	D
Low Normal: 1, 3-4, 6-8, 11-12, 14-16, 19-21, 23, 27-28, 30-31	B	C	D	E
Below Normal: 9-10, 22, 24, 26	C	D	E	E
Disturbed: 25	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 July 1st; good (B) on July 2nd; fair (2) on the 3rd and 4th; excellent (A) on July 5th, etc.

For updated information dial Area Code 516-883-8223 for DIAL-A-PROP, subscribe to bi-weekly MAIL-A-PROP, P.O. Box 86, Northport, NY 11768.

open fairly regularly towards southern and tropical areas. Look for openings to the Caribbean and Central America as early as 10 a.m., with a peak expected towards Latin America between 3 and 5 p.m. When conditions are HIGH NORMAL or better, the band may also open during the late afternoon from the eastern half of the country to Africa, and from the western half to Australia and the South Pacific.

Don't expect too much DX on **10 meters** during July, but some should be there. Short-skip openings to the Caribbean and Central America should be possible from time-to-time as a result of sporadic-E propagation, particularly from the central and southern tier of states. Multi-hop sporadic-E openings may also account for an occasional QSO from

the northeastern states to western Europe. When conditions are HIGH NORMAL or better, an occasional F-layer opening into deep South America may also be possible, especially during the afternoon hours.

From an hour or two before sunset and through the hours of darkness, **40 meters** should open to most areas of the world, but seasonally high static levels may at times make DX reception difficult. Higher static levels are also expected to hinder DX on **80 meters**, but the band should open to many areas of the world during the hours of darkness. Not many DX openings are expected on **160 meters** during July, as a result of higher static levels and the longer hours of daylight. Best bet for 40, 80 and 160 meter DX openings is an hour or two before Midnight for openings towards the north and east, and just before local sunrise for openings towards the south and west.

DX PROPAGATION CHARTS for July appeared in last month's column. For an assessment of day-to-day conditions expected during the month, see the "Last Minute Forecast", which appears at the beginning of this column. This month's column contains a SHORT-SKIP PROPAGATION CHART for July and August, as well as Charts centered on Hawaii and Alaska. The SHORT-SKIP CHART contains band opening predictions for one-hop propagation between distances of approximately 50 and 2300 miles from your location.

## Peak Sporadic-E Propagation

Sporadic-E propagation generally peaks during July, resulting in optimum short-skip conditions on the h.f. amateur bands. During the daylight hours expect fairly regular short-skip openings on 10 and 15 meters, over distances ranging between approximately 400 and 1300 miles. Around-the-clock short-skip openings should be possible on most days on 20 meters, with skip often



as short as 300 miles. Conditions on 20 should peak during the late afternoon and early evening, with one-hop F-layer openings out to 2300 miles, and sporadic-E openings up to 1300 miles.

Good daytime short-skip conditions are expected on 40 meters, with openings ranging between 100 and 750 miles. During the hours of darkness, expect longer skip, with openings between 250 and 2300 miles. Conditions on 80 meters are also expected to be good during the daylight hours, with openings up to approximately 300 miles. During the hours of darkness, good openings should be possible on 80 up to the one-hop F-layer limit of 2300 miles. While no short-skip openings are likely on 160 meters during the daylight hours, some should be possible up to a distance of about 1300 miles during the hours of darkness, and occasionally longer. Seasonally higher static levels will at times make openings difficult on 40, 80 and 160 meters.

During periods of very widespread sporadic-E propagation, it may be possible for multi-hop openings to occur over distances of several thousand miles, particularly on the 10 and 15 meter bands. This won't happen very often, but it was responsible for a small number of openings from the northeastern states into western Europe last summer.

### V.H.F. Ionospheric Openings

The best bet for ionospheric openings on 6 and 2 meters during July should be during periods of very intense sporadic-E propagation. Fairly frequent 6 meter openings should be possible over distances ranging between approximately 600 and 1300 miles, with some openings extending out to about 2000 miles, and possibly beyond. Few 2 meter openings are expected, but some could take place between 1000 and 1300 miles as a result of sporadic-E ionization. While sporadic-E openings can take place at just about any time, statistics indicate that conditions for 6 and 2 meter openings peak for a few hours before noon and again during the late afternoon and early evening. During July, you can expect openings on 6 meters on three out of four days. Openings may last from a few minutes up to several hours. Considerably fewer openings are expected on 2 meters.

Some v.h.f. meteor activity should take place during the Delta Aquarids shower. This is a major shower which should occur between July 28

and 30, peaking at 2 a.m. EDT of the 29th, with a meteor count of about 20 an hour.

While little auroral activity is expected during July, from time-to-time intense displays do occur. Check the "Last Minute Forecast" at the beginning of this column for those days during the month that are expected to be either BELOW NORMAL or DISTURBED. These would be the best days upon which to check the v.h.f. bands for auroral-type openings.

#### 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.

### GEOS/ESA Scientific Satellite

With the ever increasing importance associated with microwave and satellite communications, its good to see that scientists are still interested in unlocking secrets that might affect h.f. and v.h.f. radio propagation.

During May, NASA planned to launch a spacecraft fitted with ex-

tremely sensitive instruments, which would continuously measure magnetic and electric fields at 22,300 miles above the equator, as well as radiation from the sun. Called GEOA/ESA, this satellite was built collectively by several European countries, and is the first European satellite to be placed into a stationary orbit.

At the same time that the satellite is observing conditions 22,300 miles over the equator, sounding rockets will be launched into the ionosphere at the same geomagnetic longitude, and results will be correlated with those made by the spacecraft, balloons, aircraft, ground stations and other satellites. These measurements—including those from polar expeditions to the Arctic and Antarctic—are part of an international research effort to learn more about the earth's electric and magnetic fields, radiation from the sun, and effects upon the ionosphere.

The results of this worldwide scientific effort are almost certain to increase man's knowledge of those factors which are responsible for h.f. propagation, particularly the anomalies that occur during periods of geomagnetic storms.

73, George, W3ASK

### CQ Short-Skip Propagation Chart July & August, 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	08-10 (0-1) 10-14 (0-3) 14-18 (0-1) 18-22 (0-2) 22-08 (0-1)	08-10 (1) 10-14 (3) 14-18 (1-2) 18-22 (2-3) 22-08 (1)	08-10 (1-0) 10-14 (3-0) 14-18 (2-0) 18-22 (3-0) 22-08 (1-0)
15	Nil	08-10 (0-2) 10-14 (0-3) 14-18 (0-2) 18-20 (0-3) 20-22 (0-2) 22-08 (0-1)	08-10 (2) 10-14 (3) 14-18 (2) 18-20 (3) 20-22 (2) 22-00 (1-2) 00-08 (1)	08-10 (2-0) 10-14 (3-0) 14-16 (2-0) 16-18 (2-1) 18-20 (3-1) 20-21 (2-1) 21-00 (2-0) 00-08 (1-0)
20	10-00 (0-1)	07-10 (0-2) 10-16 (1-4) 16-21 (1-3) 21-00 (1-2) 00-07 (0-1)	07-10 (2) 10-16 (4) 16-19 (3) 19-21 (3-4) 21-00 (2-3) 00-07 (1-2)	07-10 (2) 10-16 (4-2) 16-19 (3) 19-21 (4) 21-23 (3-2) 23-00 (3-1) 00-05 (2-0) 05-07 (2-1)
40	08-12 (1-2) 12-16 (1-4) 16-20 (2-4) 20-23 (1-2) 23-08 (0-1)	08-10 (2-3) 10-12 (2) 12-16 (4-2) 16-18 (4-3) 18-20 (4) 20-23 (2-4) 23-08 (1-3)	08-10 (3-1) 10-16 (2-0) 16-18 (3-1) 18-21 (4-3) 21-23 (4) 23-06 (3-4) 06-08 (3)	08-10 (1-0) 10-16 (0) 16-18 (1-0) 18-21 (3-2) 21-06 (4) 06-08 (3-1)
80	07-12 (3-4) 12-17 (4-3) 17-22 (4) 22-05 (3-4) 05-07 (3)	08-10 (4-1) 10-12 (4-0) 12-17 (3-0) 17-19 (4-1) 19-21 (4-2) 21-23 (4-3) 23-05 (4) 05-07 (3) 07-08 (4-2)	08-10 (1-0) 10-17 (0) 17-19 (0-1) 19-21 (2-1) 21-23 (3-2) 23-05 (4) 05-07 (3) 07-08 (2-1)	08-19 (0) 19-21 (1-0) 21-23 (2-1) 23-04 (4-3) 04-05 (4-2) 05-06 (3-1) 06-07 (3-0) 07-08 (1-0)
160	18-19 (1-0) 19-20 (1) 20-22 (3-2) 22-00 (4-3) 00-06 (4) 06-08 (3-2) 08-09 (1) 09-10 (1-0)	19-20 (1-0) 20-21 (2-0) 21-22 (2-1) 22-00 (3-2) 00-04 (4-2) 04-06 (4-3) 06-08 (2-1) 08-09 (0-1)	21-22 (1) 22-01 (2-1) 01-04 (2) 04-06 (3-2) 06-07 (1) 07-08 (1-0)	21-23 (1-0) 23-01 (1) 01-06 (2-1) 06-07 (1-0)

(Continued on page 91)



# Awards

## News of certificate and award collecting

The "Story of The Month" for July, as told by Dave is:

### David E. Manescu, W6CCM

All Counties #141, 2-12-76

"Jersey City, N.J. became Dave's birthplace 31 May 1930. At a very early age, the family moved to Pennsylvania where Dave grew to manhood. In 1941 he moved to New York and remained there until 1947 when he enlisted in the U.S. Marine Corps. After receiving his discharge from the Marine Corps in 1950, he settled down in Bethlehem, Pennsylvania where he married Barbara Brodt.

"Dave received his Novice license, KN3SXY in 1956 and his General in 1957. The family moved to California in 1965 after a very cold winter and a very hot summer in Pennsylvania.

"In 1969, Dave became interested in County Hunting and was Amateur Radio Coordinator for the San Diego 200th Anniversary Celebration. In 1970 he created the Mobile QSL Bureau which has become a very im-

\*P.O. Box 73, Rochelle Park, NJ 07662

### USA-CA Honor Roll

1500	1000	500
WB7AYN ..319	W0RP .....434	W0RP .....1162
WA3QNT ..320	K2UVG/6 ..435	WA7JBE ..1163
K7CLO ....321		OK1-15835 1164
		K6CR ....1165
		OK1MIN ..1166
		YO3AC ...1167
		AA5ALB ..1168
		H18LC ...1169

portant facet of his life as well as Barbara's. Barbara does all the envelope stuffing and licking while Dave oversees and makes the decisions as to 'Was This You' types. Dave also published a very fine Book for County Hunters, which has all the data needed for keeping track of your accomplishments and is much like the original *USA-CA Record Book* with State maps, etc. As you know, the original *USA-CA Record Book* is long since out of print. Dave will also soon have a Book published on 'Who's Who In County Hunting.'

"Dave lists among his many Awards, All USA-CA Counties #141, MARAC Net Control of the year 1972, Outstanding County Hunter 1975. He gave out 48 states while

Mobile, and he was El Cajon Amateur Radio Club Ham of the Year 1972.

"He is the father of five, one girl and four boys, three still live at home. He is a one-time grandfather, but hopes for changes in that category.

"Dave works for the Navy as a Firefighter at one of the Naval Air Stations. His 24 hour on duty, 24 hour off duty schedule gives him almost enough time to handle the QSL Bureau, take care of the necessary house repairs, and get on the nets from time to time.

He is presently working on All Counties the second time around and as well as with YL operators. One of the greatest satisfactions about County Hunting is the chance to meet so many fine people at the Annual Conventions as well as the Minis and One on One". (Ed. Note: Dave has done so many more things for the County Hunters and continues to do them, so THANKS Dave).

### Awards Issued

Larry Sitton, WB7AYN added USA-CA-1500 to his collection.

Bob Lamberton, WA3QNT applied for USA-CA-1500.

Mike Gilmore, K7CLO claimed USA-CA-1500.

Loren Tate, W0RP (ex W0BHC) acquired USA-CA-500 endorsed All S.S.B. and USA-CA-1000.

Hank Kahrs, K2UVG/6 picked up USA-CA-1000.

Ernest Gutermann, K6CR had me send him USA-CA-500 endorsed All A-1.

Pavel Henzel, OK1MIN obtained USA-CA-500 endorsed All 2 x C.W.

John Dyer, as AA5ALB won USA-CA-500 endorsed All 2 x S.S.B., All 1976 Bicentennial Year—#1, so endorsed.

USA-CA-500 Certificates endorsed Mixed, went to:

Bill Matsukado, WA7JBE.

Karel Sokol, OK1-15835, #2 such Award to an OK s.w.l. and #2 to an s.w.l. not USA/Canada.



Dave Manescu, W6CCM



Andrei Guirgea, YO3AC, #2 Romania.

Luis P. Caamano M., HI8LC and this is #1 to the Dominican Republic.

### Awards

**The Worked Delaware Award (W-DEL):** Correction, Custodian is: John R. Low, K3YHR, 11 Scottfield Drive, Newark, Delaware 19713 (NOT K3-AMC). This Certificate of Achievement is issued by courtesy of the Delaware Amateur Radio Club and is available to amateurs and s.w.l.s for confirmed QSOs or heard the three Delaware counties: Kent, New Castle and Sussex. QSOs (and heard) after May 1956 are valid. Send QSLs, sufficient postage to cover return of your cards and to cover postage of the Award to: John R. Low, K3YHR, 11 Scottfield Drive, Newark, Delaware 19713.

**NJDXA Achievement Certificates:** New Custodian is: Ed. Berzin, W2-MIG, 47 Palisades Road, Elizabeth, N.J. 07208. These are issued by the North Jersey DX Association under the following rules: To NON-USA stations for working 5 NJDXA members via OSCARS; to NON-USA stations for working 15 NJDXA members. Send log data and at least postage to cover mailing Certificate or Certificates, to: W2MIG.

**WAGI Certificate:** This Worked All GI Certificate is issued by the Northern Ireland Group of The Radio Society of Great Britain under the following rules:

1. Stations outside Europe to submit *Five* cards in all; One from Co. Antrim, Co. Armagh, Co. Derry, Co. Down and *One* from either Co. Tyrone or Co. Fermanagh. (At the moment there are only five amateurs residing in Co. Fermanagh, so activity is a little sparse, so one has the choice of Fermanagh or Tyrone).

2. European stations to submit *Ten* cards in all: Two from each of the aforementioned areas.

3. Belfast is divided by the River Lagan into Counties Down and Antrim.

4. Operation may be on any band and/or mode of transmission.

5. Certificates will be endorsed for one band and/or one mode of transmission. Unendorsed certificates will indicate mixed operation.

6. Cards are valid for contacts made on or after 1 January 1959.

7. The cost which must be included with each application is: UK applicants, 1 pound or 20 IRCs; Overseas applicants, U.S. \$2.00 or 20 IRCs.

8. All applications and inquiries to be addressed to: Mr. L. M. Lyske,

GI3CDF, "Erinbrook," 204 Belfast Road, Newtownards, N. Ireland.

**The Carey Moraine Award:** Sponsored by The Lincoln Amateur Wireless Society of Wisconsin, this award is available to all of hamdom for the confirmed contacts with Wisconsin Counties through which the Carey Moraine Line lies. The award is issued in five classes and the County requirements are:

	Stations in 8-9-0 and VE3 Call Areas Need	All others worldwide Need
Class D	7 Counties	5 Counties
Class C	14	11
Class B	21	17
Class A	28	24
Class AA	28	28

Plus The Lincoln Amateur Wireless Society Club Station WB9ACU for a total of *Two* Lincoln County stations. (K9GTQ may be used in lieu of the Club station).

The Carey Moraine Counties are: Adams, Barron, Brown, Chippewa, Columbia, Dane, Door, Fond Du Lac, Kewaunee, Langlade, Lincoln (2), Manitowoc, Marathon, Milwaukee, Oneida, Polk, Portage, Price, Rock, Rusk, St. Croix, Sauk, Sheboygan, Taylor, Walworth, Washington, Waushara.

Applications should be alphabetical list of Counties, with call, date, time, band and mode of the station worked in each County. An s.a.s.e. to K9GTQ will get you a copy of the application form, ask for extra copies if you desire them for your own records.

Fee is \$1.00 or 10 IRCs, with later endorsements for s.a.s.e. or 1 IRC. The award is free to B/P, and normal fee to s.w.l.s. It may be endorsed AOMB, TCR; GCR required.

Send application and fee to: The Lincoln Amateur Wireless Society Awards Custodian: Tom Ross, K9-GTQ, Route 1, Box 137-A1, Irma, Wisconsin 54442.

Of particular interest to those who have "Worked Them All," send your Cliff Corne number with proof of confirmation for the second Lincoln County contact (The QSL will be fine proof and will be returned with your award). The Club will issue the award without need of the Counties list. Ten-Ten International Net, Inc.: Organized to keep 10 alive, issue some 110 10-X Awards to members and have some 100 10-X Nets active.

**Prospective Members:** On 10 meters, contact 10 present members (DX need 5), logging date, time, call, 10-X number, name and QTH. Send this list to your call area Vice President, along with \$2.00 for dues and \$1.00 for a roster. You will receive a



WAGI Certificate

certificate and be assigned a Ten-Ten number that belongs to you personally for life.

### Vice Presidents: U.S. Call Areas

1. Earl F. White, W1NC, 117 Brattle St., Arlington, Mass. 02174.
2. Richard Levy, WB2MAN, 30-A Arleigh Rd., Great Neck, N.Y. 11021.
3. Jim Duppins, WA3RBQ, 2317 Windsor Ave., Baltimore, Md. 21216.
4. Clint Paine, K4EKX, 309 3rd Ave., New Port Richey, Fla. 33552.
5. Grace Dunlap, K5MRU, Box 445, La Feria, Tex. 78559. During summer months—Box 13, Rand, Colo. 80473.
6. Leroy Pasewalk, WB6MGM, 18815 Yukon Ave., Torrance, Calif. 90504.
7. Ed Mernagh, WA7DCO, 26 S. 67th Ave., Phoenix, Ariz. 85043.
8. Robert Hurd, WB8FCX, 3126 Athens Rd., Cuyahoga Falls, Ohio 44224.
9. Del Rowe, W9BPU, RR-4, Bloomington, Ill. 61701.
10. Rollie Hall, W0IST, 72 Walden, Burnsville, Minn. 55337.

### Vice Presidents: DX Call Areas

VK/ZL: Pete Williams, ZL1BEB, RD-1, Kaihere, Ngatea, New Zealand. All other DX Call areas: Claude Martin, W6LRY, 3603 Syracuse, Baldwin Park, Calif. 91706.

**How To Operate 10-10, Exchange Numbers And Get Awards:** First become a member and use your Roster. Log all 10-10 contacts as noted above. Circle the call in your Roster,

(Continued on page 90)



The Carey Moraine Award



# Contest Calendar

News/views of on-the-air competition

**R**esults of our 1976 World Wide Phone Contest should appear in the next issue, August. The September issue should have the C.W. Results.

This may seem a bit late but actually you will be receiving them about the same time as last year, now that CQ has established an earlier publishing date.

For the information of those inquiring about donating Trophies. All inquiries should be addressed to me personally. I will advise you as to the availability and the necessary requirements.

And while on the subject of Trophies. This is directed to you fellows who do a bit of globe traveling. We would be happy to have you personally deliver and present these awards to overseas winners. It's a rewarding experience and much appreciated by the fellows.

Just check the list of winners and let me know what particular area you are visiting. By the same token, state-side winners could let me know if they expect to attend a particular Convention, and if possible we will have your award there for presentation. Of course allow sufficient time for me to make the necessary arrangements.

You will note the 1977 160 Contest "Claimed Scores" in this column. Keep in mind these are only claimed scores. There may be some adjustments in the final standings. Don, N4IN/3 is doing a very thorough checking job this year.

Now its off to Dayton and another exciting "get-together" with worldwide Contesters and DXers. Will possibly be seeing some of you fellows there. 73 for now, Frank, W1WY

## IARU Radiosport Championship

Starts: 0000 GMT Saturday, July 9  
Ends: 2400 GMT Sunday, July 10

This one was covered in last month's Calendar. More complete details and the ITU Zone map appeared in the May issue of QST.

\*14 Sherwood Rd., Stamford, Conn. 06905

## Calendar of Events

* July	2-3	Venezuelan Phone Contest
* July	2-3	DL Activity QRP Contest
* July	9-10	IARU Radiosport Champ.
† July	9-10	SEANET C.W. Contest
† July	16-17	Colombian Contest
July	16-17	VHF Space Net Contest
July	16-17	10-10 Net QSO Party
July	23-24	County Hunters CW Contest
* July	30-31	Venezuelan CW Contest
Aug.	6-7	Illinois QSO Party
Aug.	13-14	European CW Contest
Aug.	20-21	Canadian-U.S.A. Contest
Aug.	20-21	SARTG RTTY Contest
† Aug.	20-21	SEANET Phone Contest
Aug.	20-21	New Jersey QSO Party
Aug.	20-22	New Jersey QSO Party
* Aug.	27-28	All Asian CW Contest
Sept.	10-11	European Phone Contest
Sept.	10-12	Wash. State QSO Party
Sept.	17-18	Scandinavian CW Contest
Sept.	24-25	Scandinavian Phone
Sept.	24-25	Delta QSO Party
Oct.	1-2	VK/ZL/Oceania Phone
Oct.	8-9	VK/ZL/Oceania C.W.
Oct.	15-16	Manitoba QSO Party
Oct.	29-30	<b>CQ WW DX Phone Contest</b>
Nov.	5-6	ARRL C.W. Sweepstakes
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	<b>CQ WW DX C.W. Contest</b>

\* Covered last month  
† Not official

A clarification on the Single Operator category. There will be three divisions. 1. C.W. only. 2. Phone only. 3. Mixed phone and c.w. Awards for each of the three categories.

And keep in mind that single operator entries are limited to 36 hours operation out of the 48 hour contest period.

## 1976 VK/ZL/Oceania North America

Phone		C.W.	
K2CW	227	W1EVT	4416
W2GXD	24	W2GXD	2240
LU1BAR/W3	243	K2CW	1834
W3TV	147	W9SZR/3	5859
AC4WSF	9	W3TV	1672
K50OU	848	AC4WSF	486
W5HX	11880	W5SOD	168
W6DGH	210	WA6KZI	5760
K3MNT/7	396	W6DGH	819
WB0LLR	6272	K3MNT/7	1245
WA2WMT/0	4966	K9DX	5220
TI2CF	2343	AC8MHK	225
VE7DTO	60	VE7IQ	1200
XE1LLS	500	VE3GCO	14
XE1DU	252	XE1FL	88

All U.S. and Canadian entrants *must* use official log forms and summary sheets. Same may be obtained from IARU Headquarters.

All logs, both stateside and foreign, and requests for official forms go to: IARU Headquarters, Box AAA, Newington, CT 06111

## SEANET Contest

C.W.: July 9-10 Phone: Aug. 20-21  
Starts: 0001 GMT Saturday  
Ends: 2359 GMT Sunday

No official announcement has been received on this one but the West Coast DX Bulletin gave us the dates, and I assume the format is the same as in previous years.

The objective being to work stations in the Southeast Asia areas. The usual exchange, signal report plus a progressive contact number starting with 001.

I'm afraid however that the c.w. section will run into some stiff competition from the highly publicized IARU Radiosport Championship.

Sorry I cannot give you more details but a quick note to the Contest Mgr. 9M2FK will not only get you the necessary information but log and summary sheets too. That's Ismail Razak, 281-C Jalan Pekeliling, Bukit Glugor, Penang, Malaysia.

## Colombian Contest

Starts: 0001 GMT Saturday, July 16  
Ends: 2359 GMT Sunday, July 17

This year's contest commemorates the 167th Anniversary of Colombia's Independence. Exchange will be on a world wide basis.

All bands, 3.5 thru 28 MHz, phone and c.w. Three classes, single operator, single band and all band; multi-operator single transmitter.

**Exchange:** RS(T) plus a 3 figure QSO number starting with 001.

**Scoring:** QSOs with HK's 5 points with stations in North America 3 points, other countries 2 points, and with same country 1 point. The multiplier is determined by the sum of DX countries worked on each band.



**Final Score:** Sum of QSO points from all bands multiplied by the sum of different countries worked on each band.

**Awards:** A silver cup to the world winner. There are nine plaques, six to the continental winners and three to the top scoring station in each category. Certificates will be issued to the top scoring station in each country.

A minimum of 50 QSOs must be shown by all awards winners.

Use separate log sheet for each band, indicate the country only the first time it is worked and include a summary sheet showing the scoring, a signed declaration and etc. The usual rules of disqualification will be observed.

Mailing deadline is September 30th to: L.C.R.A. Concurso Independencia, Apartado Postal 584, Bogota, Colombia.

### VHF Space Net Contest

From 6 P.M. Saturday, July 16 to 9 P.M. Sunday, July 17. (Local Time)

Like previous VHF Space Net activities this one is also in commemoration of an event in the Space Program. This one honors the 8th Anniversary of Apollo II, "Man's first landing and walk on the Moon."

Activity will be on 50, 144 and 220 MHz bands, all modes, but no repeater contacts.

**Exchange:** Signal report and Zip code or P.O. location.

**Points:** Each contact is worth 2 points. The same station may be reworked in a different mode for 2 additional points. And 2 more points if worked on a different band.

**Multiplier:** Each different Zip code worked is a multiplier of one (1). Out of state stations use P.O. location.

**Score:** Total QSO points from all bands times the number of Zip or P.O. locations worked. (counted once only)

**Awards:** In four classes. I. 100 to 300 watts input. II. 25 to 100 watts. III. 5 to 25 watts. IV. 5 watts or less. Also XYL and Club classes. Awards will be in the form of plaques. Certificates to 2nd and 3rd place winners in all classifications.

Mailing deadline for logs is August 10 to: VHF Space Center, Att: A. W. Slapkowski, K4AWS, P.O. Box 15, Sumterville, Fla. 33585

### Ten—Ten Net QSO Party

Starts: 0000 GMT Saturday, July 16

Ends: 2400 GMT Sunday, July 17

This is the summer edition of the Ten-Ten International Net of Southern California QSO Party. Activity is on 10 meters only, any mode. It is

open to all amateurs but non-members are not eligible for awards. They are however encouraged to submit a log.

**Exchange:** Name, QTH and 10-10 membership number for Net members.

**Scoring:** Score 1 point per contact, add an additional point if QSO is with a 10-10 member. Total QSO points is your score, there is no multiplier. Indicate name of your Chapter for Chapter credit.

**Awards:** 1st and 2nd place certificates in each U.S. call areas, KH6, KL7, and each Canadian call district. And to 11 continental and sub-continental areas over the world.

If 10 or more logs from Novice members are received, 1st, 2nd and 3rd place certificates will be also awarded.

There will be a c.w. section during the same contest period, with same exchange and scoring, but contacts must be made below 28.5 MHz. 1st, 2nd and 3rd place certificates will be awarded in this division.

Mailing deadline for logs is August 31st to: Grace Dunlap, K5MRU/Ø, P.O. Box 13, Rand, Colorado 80473

### County Hunters C.W. Contest

Starts: 0000 GMT Saturday, July 23

Ends: 0600 GMT Monday, July 25

The County Hunters Net encourages and invites mobile and portable operation from the less active counties during this contest.

The same station may be worked on each band for QSO points. Portable and mobiles changing counties may also have repeat QSOs. Stations on county lines exchange only one number but each county is counted as a multiplier.

**Exchange:** QSO no., category, (F—fixer, P—portable, M—mobile) RST, state, province or country, and county for US stations.

**Scoring:** QSO's with a fixed station 1 point, 3 points if its a portable or mobile. Multiply total QSO points by number of US counties worked. Mobile and portables calculate their score for contacts made within a state.

**Frequencies:** 3575, 7055, 14070, 21070, 28070.

**Awards:** Certificates in three categories.

F—Top fixed or fixed portable in each state, province or country, 1000 or more points.

P—Top score in each state by a portable operating from a county other than its normal location, 1000 or more points.

M—Top scoring mobile in each state operating from 3 or more coun-

## Claimed Scores 1977 CQ 160 Contest Single Operator

Top 10 DX	Top 10 W/K
KV4FZ .....270,648	K1PBW .....180,432
WA1RFM/VP9 124,816	W3IN .....88,160
YV1OB .....94,320	W2DXL .....80,106
G3UBR .....87,850	K6SE .....77,040
DJ5PN .....83,700	W7RM .....75,686
YV4BK .....79,420	W4YWX .....70,832
KH6CHC .....62,651	K9CCV .....66,378
PJ2VD .....60,260	WA5LES .....62,308
F8DB .....50,349	K5PFL .....58,800
VP2DD .....46,060	W3HXK .....57,652

### Top 10 Multi-Operator

WA2SPL .....113,444	W4PRO .....49,790
G3VMW/A .....90,780	WA5RXT .....49,000
K4CQM .....69,552	W1MX .....48,800
GM3IGW/A .....67,650	OK5TLG/p .....42,624
K8IA .....51,912	W7DG .....32,130

ties, with a minimum of 15 QSOs from each county.

There are Trophies for the Top single operator Portable and Mobile in the United States.

Stations with 100 or more QSOs must include a check sheet of counties worked.

Mailing deadline is Sept. 1st to: C.W. County Hunters Net, c/o Jeffrey P. Bechner, W9MSE, 673 Bruce Street, Fond de Lac, Wisc. 54935.

### Illinois QSO Party

Two Periods GMT

1800 Sat. Aug. 6 to 0500 Sun. Aug. 7

1200 Sun. Aug. 7 to 2300 Sun. Aug. 7

This is the 15th annual party sponsored by the Radio Amateur Megacycle Society. The same station may be worked on each band and mode.

**Exchange:** QSO no., RS(T) and QTH. County for Ill., state, province or country for others.

**Scoring:** One point per contact, 2 points if QSO is with a Novice or Technician in a novice band. Ill. stations multiply total QSO points by sum of states (max. 50), VE/VO call areas (max. 10) and no more than one DX country worked. (DX may be worked for QSO points but only one multiplier is allowed.)

Non-Illinois stations multiply total QSO points by Ill. counties worked. (max. 102)

Ill. mobiles or portables away from normal QTH may add 200 to final score for each county of operation from which 10 or more contacts were made.

There is a bonus for non-Ill. stations, a multiplier of one for each group of 8 contacts with the same county.

**Frequencies:** C.W.—About 60 kHz from low end of each c.w. band. Phone—3975, 7275, 14275, 21375, 28675. And 25 kHz from low end of each Novice band on the half hour.

**Awards:** Certificates to the top scorers in the following categories: Single operator, Multi-Opr., mobile, portable, Novice and c.w. Technician.



## 1976 S.A.R.T.G. RTTY North America

W6HX and W9SZR/3 were Plaque winners for North America.

K4GMH	215,760	VE2QO	32,220
WB4VUP/8	126,795	K3RVC	27,105
K7BV	119,160	K4GJW	21,504
W3JSX	114,120	WA2OQO	8,050
W9OEQ	94,720	K4JAF	6,175
XE1AFU	90,720	K5OYZ	6,095
VE5BX	87,580	VE2DKK	1,800
WA0TAS	68,115	VE7BDQ	1,440
K6WZ	68,100		
K8JUG	55,680	Multi Opr.	
K0JWX/6	50,400	W1MX	156,040
W3KV	44,580	W9HHX	91,080

K4GMH placed 4th World High (over 100 w.)  
K8JUG placed 5th World High (under 100 w.)  
W1MX was World High in Multi group.

In each state, VE/VO province, DX country and first 3 places in Illinois. Also Club awards.

A summary sheet is requested showing the scoring and other essential information. Include a large s.a.s.e. for copy of results.

Mailing deadline is Sept. 15th to: RAMS, K9CJU, 3620 N. Oleander Ave., Chicago, ILL 60634

### Canadian—U.S.A. Contest

Two Periods GMT

Phone: 0200 to 2400 Saturday,  
August 20

C.W.: 0400 to 0200 Sun./Mon.,  
August 21/22

This is a new one being organized by a group of Canadian (Toronto) contesters to promote communications and friendship between amateurs in the two countries.

Competition will be in single operator, multi-operator and club categories.

The exchange will be not only between VE and W but also W to W and VE to VE. So it could stir up quite a bit of activity.

The QSO exchange will follow the usual pattern, signal report, contact number and QTH. (States, Provinces, U.S. possessions and Canadian territories). This will constitute the multiplier.

There will be a wide selection of awards, including certificates for each multiplier area and trophies for each of 8 operating categories.

Potentially this could become one of the most popular domestic contests. We will have complete details in next month's Calendar.

### European DX Contest

C.W.: Aug. 13-14

Phone: Sept. 10-11

Starts: 0000 GMT Saturday

Ends: 2400 GMT Sunday

This is the 23rd annual contest sponsored by the DARC. The activity will be between the European countries and the rest of the world.

Use all bands 3.5 thru 28 MHz. There are two classes, Single operator, All Band, and Multi-operator, Single Transmitter.

Only 36 hours out of the 48 hour contest period may be used by single operator stations. The 12 hour rest period may be taken in one but not more than three periods any time in the contest.

**Exchange:** RS(T) plus a QSO number starting with 001.

**Scoring:** One point per QSO and one point for each QTC reported.

**Multiplier:** For non-Europeans, number of EU stations worked on each band. Europeans will use the ARRL list and call areas as follows: JA, PY, VE/VO, VK, W/K, ZL, ZS, UA9/UA0. In addition the multiplier on 3.5 may be multiplied by 4, on 7 MHz by 3, and on 14/21/28 by 2.

**Final Score:** Total QSO points, plus QTC points, times the sum total multiplier from all bands.

**QTC Traffic:** Additional QSO points may be realized by reporting a QTC. This is a report of a QSO you have made earlier in the contest and later sent back to a European station.

The general idea being that after a number of EU stations have been worked a list of these can be reported back to another EU station. One point may be earned for each QSO reported. A QTC can only be sent from a non-European to a European station.

A QTC contains the time, call and QSO number of the station being reported. i.e.: 1300/DK2BI/134. This means that at 1300 GMT you worked DK2BI and received his number 134. It may be reported only once and not back to the originating station.

A maximum of 10 QTC's to the same station are permitted, and the same station worked several times to complete this quota. Only the original contact however has QSO point value.

Keep a uniform list of QTC's sent. QTC 3/7 indicates that this is the 3rd series and that 7 QSO's are now being reported.

**Awards:** Certificates to the highest scoring stations in each country and call areas listed in the multiplier. Continental leaders and stations have at least half the score of the continental leaders will also be awarded.

**Disqualification:** Violation of the rules of the contest, or unsportsmanlike conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed cause for disqualification. Decision of the Committee is final.

It is suggested that you use the official log and summary forms. A s.a.s.e. with sufficient IRC's to the DARC will get you a supply. (W/K and VE stations can send their request to WA3KWD, Hartwin E. Weiss,

323 North Street, Millersburg, PA 17061. Figure 40 contacts to the page if you make your own, and use a separate sheet for each band.

North American entries can also send their logs to WA3KWD.

Mailing deadline for logs is Sept. 15th for C.W. and Oct. 15th for Phone. To the DARC Contest Committee, D-895 Kaufbeuren, P.O. Box 262, West Germany.

### European Country List

C31 — CT1 — CT2 — DL, DM — EA — EA6 — EI — F — FC — G — GC — Guer — GC Jer — GD — GI — GM — GM Shetland — GW — HA — HB9 — HBO — HV — I — IS — IT — JW Baer — JW — JX — LA — LX — LZ — M1 — OE — OH — OHO — OJO — OK — ON — OY — OZ — PA — SM — SV — SV Crete — SV Rhodes — TA1 — TF — UA1346 — UA2 — UB5 — UC2 — UO5 — UN1 — UP2 — UQ2 — UR2 — UA Franz Josef Land — YO — YU — ZA — ZB2 — 3A — 4U1 — 9H1.

### S.A.R.T.G. RTTY Contest

Three Periods GMT

0000-0800 and 1600-2400 Sat. Aug. 20  
0800-1600 Sunday, August 21

This is the 7th annual contest sponsored by the Scandinavian Amateur Radio Teletype Group. Use all bands 3.5 thru 28 MHz. The same station may be worked on each band for QSO and multiplier credit.

**Classes:** Single Operator, Multi-operator Single transmitter and s.w.l.s.

**Exchange:** QSO no., and signal report.

**Points:** QSOs with own country, 5 points. With other countries on same continent, 10 points. With other continents, 15 points. The U.S., Canada and Australia call areas count as separate countries for scoring.

**Multiplier:** Each DXCC country and each W/K, VE/VO and VK call areas.

**Final Score:** Sum of QSO points from all bands times the multiplier from each band.

S.w.l.s. use same scoring but based on stations and messages copied.

**Awards:** Certificates to top scoring stations in each class in each country and U.S., Canada and Australia call areas.

Use a separate sheet for each band and include a summary sheet showing the scoring and other essential information. And your name and address in Block Letters.

Logs must be received by Oct. 10th and go to: SARTG Contest Mgr., C. J. Jensen, OZ2CJ, Meisnersgade 5, 8900 Randers, Denmark. ■



### **Plumbicon Camera** (from page 34)

it takes three frames to get within ten percent of the final brightness level, and ten frames to reach it exactly. In operation this is not too objectionable, the camera can be set up so that there is no sticking but the resolution is impaired and shading is observed.

One way of using the camera is to mount it vertically at a fixed distance from a fixed focal plane, and slide photographs underneath the camera for transmission. Live camera pictures have better resolution than taped pictures since the effects of wow and flutter are eliminated.

### **Conclusion**

This camera offers an inexpensive alternative to the potential slow scan enthusiast who does not want to spend a lot of money on equipment. The camera produces good quality pictures, and is very sensitive.

### **Acknowledgements**

WB2DCX extends his thanks to the many SSTV amateurs who have been extremely helpful and patient with him over the past year and a half during the development of this camera. Particularly his thanks are extended to Bill DeWitt, W2DD and Walt Bedia, W2ELF for the encouragement received during the blackest hours. The following is a list of most of the long suffering individuals associated with help and comments: WA1NXX, W2AI, W2FJT, WB2MFF, W2SZF, W2VDE, W3ATV, W3EAI, W3EFG, W3FAK, W3LDS, W3LY, WB4HCV, W4MS, K4QPR, WA2EVH, W0LMD, W8ATK, W9ATV, W8KZM, K2-OSP, W8OZA, WA9UHV, G4EDY, G3WW. Grateful thanks are extended to WBNG-TV without whom this project would not have risen above ground level. ■

### **C.C.W. Part II** (from page 54)

may be forced to turn to c.c.w. to utilize the space that is left—if a loss of spectrum is inevitable at WARC.

At present, c.c.w. is just getting off the ground, with stations in operation at W6NEY, W7GHM, and WA7ZVC, and activity preparing on the East Coast, Europe, and Japan, and hopefully, elsewhere after the appearance of this paper, but theoretical planning and work on future c.c.w. systems is underway. The major thrust of this work is to increase the flexibility of the c.c.w. concept to where it is no less flexible than conventional c.w. The necessary technology exists and only requires application. W6NEY is working on a conversion of an HW-8, a superb piece of gear, to c.c.w. and envisions an entire c.c.w. station, minus frequency standard, inside the cabinet. Next, perhaps, comes a digitally synthesized c.c.w. transceiver (output 5 watts or less—

who will need more?) capable of operating at 100 Hz points through the amateur bands and literally working the world from a lantern battery supply and simple antenna under even poor propagation conditions. C.c.w. is the mode of the future!

### **Conclusion**

In closing, I must emphasize my complete debt to W6NEY, W7GHM, WA7ZVC, and the *CCW Newsletter*, for the information included in this paper. Time has prevented them from writing such a paper, and it is my judgment that knowledge of c.c.w. is in the best interests of amateur radio. I would like to thank W6NEY for reading and making corrections to this paper. Further information can be found in the *Coherent CW Newsletter (CCWN)*, edited by Chas. Woodson, W6NEY, 2301 Oak St., Berkeley, CA 94708. The complete 1975 and 1976 *CCWN* (64pp) is available for \$5 each, and the 1977 subscription price is \$10. A free subscription is offered to anyone who will build his own c.c.w. station. Also, a p.c. board and kit of parts for the Petit CCW Filter is available through Petit Logic Systems, Box 51, Oak Harbor, WA 98277.

Finally, I encourage readers to familiarize themselves with the contents of this paper at least, and at best, to begin work on a c.c.w. station. If this paper serves to motivate several of you to get into c.c.w. work, the effort expended in writing it will have been worthwhile. Amateur radio has thrived in the past on the spirit of attacking new frontiers and conquering them, and at present, c.c.w. is *the* frontier for that spirit. Let's rise to the occasion and once again reclaim that reputation that came from radio amateurs converting a futuristic idea into a present reality! ■

### **How Rare Is That Country?** (from page 56)

operators or stations, e.g. Easter Island and San Andres.

A comparison with a Geoff Watts survey (144 top DXers) that listed the 50 most difficult countries is instructive. Thanks mostly to recent DXpeditions, six countries on that list are now out of the first 100, namely: Cocos Island (T19), Revilla Gigedo, Auckland and Campbell Islands, Serrana Bank, Kure Island and Navassa Island. These countries would be expected to move slowly upward in the list unless periodically reactivated. Undoubtedly the most effective time to activate a rare country is during a DX Contest. I am always surprised at how few rare countries are so activated and I hope that this article will help to generate just a bit more of such activity.

My questionnaire also listed the 7 rarer Canadian provinces and the 16 least amateur-populated States. The results, from 157 usable returns and using the same presentation as in the Table, are as follows:



Prince Edward Island	0844535	Maine	1411002
NWT-Yukon	1252211	New Hampshire	1411001
New Brunswick	1261113	No. Dakota	1411011
Labrador	1301112	So. Dakota	1420001
Nova Scotia	1351102	Idaho	1420000
Delaware	1361111	Mississippi	1430001
Newfoundland	1381012	Nevada	1460000
Rhode Island	1391101	Utah	1470001
Vermont	1401011	Wyoming	1470001
Quebec	1411101	Montana	1480000

The difficulty of Prince Edward Island (on SSB) is most noteworthy. Delaware is the most difficult state. More meaningful results would probably have been accomplished from a poll of less accomplished DXers.

The results presented here should help you to decide which pileup to join and which QSL cards to brag about. The primary purpose of this survey however is to point out a host of countries that are not only lovely vacation spots and easy and cheap to get to, but which also present an opportunity of making thousands of amateurs very happy. ■

#### Reply to a YL (from page 60)

easier to just aim blindly at a name than to read all the media stuff ahead of time. How's that grab ya, Ellen? WA9ACO from WB9HDX."

**Ellen:** "Gee, Bob, it's really not my turn. But I think you've got a good point. Many voters will get tired of trying to make a logical choice when there will be so much to read in advance and so many speeches to listen to. But it's not my turn . . . so, Len, what's your opinion?"

**Len:** "That pretty well sums it up, Ellen. But you know that no one pays much attention to speeches anyhow. It's mostly the outward appearance a guy makes—like being friendly and smiling a lot, things like that. Lots of people notice that stuff. Whadya say, Ellen? WA9ACO from WA9-EEB. . . ."

You get the picture. This happens quite often, but as someone once pointed out to me, it sure beats being shuffled out of a QSO.

Another amusing situation is when I find myself being subjected to stereotypes of what is or is not part of a "woman's world." Many times on the air, men have asked me questions about my cooking ability, or guessed my occupation as "being a secretary somewhere." Yet, some of these same males who stereotype me as a secretary and cook because I am a woman are amazed that I am not interested in sports and mechanics because I am involved in a "masculine" hobby. Gee, fellows, must one be a sports enthusiast or auto mechanic in order to get an amateur radio license? Are all of you football stars or kings of the carburetor?

One of the most memorable (?) personal en-

counters I've had with stereotyping in amateur radio was a situation involving a non-amateur. It also involved my friend George, WA9MTC. This experience occurred last year when my low-band rig was out of commission. Needless to say, after about two weeks of being confined to two-meter FM operation, and knowing it would be at least another two weeks till my low-band rig was fixed, I was climbing the walls to get on 20 or 40 CW.

Aha! George to the rescue! "Hey, Ellen, come on over here tomorrow and use my station—all day if you want." What an offer! I drove over right after dinner the next day. I went directly to the shack. George even had the rig warmed up and tuned to 7035 by the time I got there. I sat down to operate, and George sat across the room to read a magazine. My CQ got an immediate answer and I worked five stations in the next hour. I was wearing one earphone and using George's straight key (his right-handed keyer is a pain to use lefty), and really having a good time. Then George's father walked in.

Mr. Rosenthal stared at me for a second, and, face wrinkled with amazement, pronounced, in his usual Hungarian accent, "She can do THAT?"

So, what else is new?

#### New Life For Old Meters (from page 59)

$R_2$  is then placed in parallel with the meter and adjusted to give a reading of one half of the original reading.  $R_2$  is now equal to the resistance of the meter winding and can be disconnected and measured with an ohmmeter.

The meter I was using had a resistance of about one ohm. At this point we are ready to calculate the shunt resistance necessary to change the 10 ma meter into a 500 ma meter. Using the equation developed above  $R_s = I R_m / (X - I) = (10 \times 1) / (500 - 1) = 0.02$  ohm. Although resistors of this size are available it is easier to make your own out of copper wire. Use a Copper Wire Table that can be found in any electrical or electronic handbook to determine the length and size of wire to use. Using a design figure of 500 c.m. per amp. leads us to use #26 wire or larger in order to carry the current. Number 26 wire has a resistance of 0.04 ohms per foot, so about six inches of wire is required for the shunt. The easiest way to get the most accurate calibration is to set up the circuit of fig. 4. Connect one end of the wire permanently, and gradually trim the wire until satisfactory calibration is obtained. The wire can then be wound onto a resistor of some value which is high enough not to affect the calibration, and permanently connected. Be certain that all joints are carefully constructed or there will be more resistance in the joint than in the shunt resistor. Recheck the meter calibration before installing it.



# Tired of being Ripped Off?



## Kindly stand by for a message from the Boss!

We mean the tough lookin' gent on the left. He's Big John Capone, top cat at the CW mob in Denver. Dat's the outfit what's causin' so much havoc wit the other ham retail entrepranoors.

Seems like some stoolie squealed about Big John's great soivice and stoopendus deals, and the voids out dat CW is de place to shop for amatoor goodies. Little tings like dem.

Now, ya got to get da picher strat see. The other fella on the right, he's John's lootenant, name of Allen Da Ape. He told John dat he woodn't stan for no foolishness from the gang wit customers. Dose

guys at CW treat evry guy what comes trough the door like he's the man, see. Dat means real soivice and great poisanal treatment. When you hambones come to visit at CW, you know you've been there. Even if you don't buy nuttin. Cause we aim to make ya feel like CW's your home on the road. Sooner or later, like dat Cigar guy on TV says, we're gonna getja.

So when you're reddy to make dat next big plunge give ol' John or Allen a call. Tell 'em what ya need and make dem an offer they can't turn down. Big John's such a softy he'll probably go even better.

**CW. The Capone mob what makes Hams happy.**

**CW** ELECTRONIC SALES COMPANY  
1401 Blake Street Denver, Colorado 80202 (303) 893-5525



## Constructing a Voltmeter

The construction of a voltmeter is very similar to the construction of a milliammeter. First, measure the sensitivity of the meter and the resistance of the coil as outlined above. Then, using the equation  $R = (E/I) - R_i$ , determine the appropriate series resistor. Use the circuit shown in fig. 6 to check the calibration of the meter with the series resistor installed. When you have found a resistor which gives good calibration accuracy permanently install it in the case.

The only thing left to do now is to change the scale markings. An easy way to do a professional looking job is to paint over the old numbers with white ink, and then, put new numbers in with india ink and a fine pen. The rub-on type of numbers could also be used to do this job. Leave the scale as it is, just change the numbers.

You now have a new meter with as accurate a calibration as the meter you used to calibrate it, and likely at no cost at all if your junk-box is well stocked. Now you can help curb pollution by recycling wastes, and fight inflation by stretching your dollar a bit farther. ■

## Zero Bias (from page 5)

award like some of the operating awards for endurance and perseverance for those who tried to hear all the forums, see all the exhibits, take in the whole flea market and say hello to old friends. An impossible task you say...well wait until next year.

### Jack Anderson, Jack Anderson

Norman Lear notwithstanding, there appears to be a new comedy star on the horizon. It talks, it writes, and even appears regularly on television. The program is called Jack Anderson, Jack Anderson. In amateur radio circles it has become the source of an immediate response, generally negative with vituperative comments on its content. **CQ** has received countless copies of letters, articles, and club bulletins devoted to answering or informing Jack Anderson as to the errors in his writings. Let us keep in mind that Robert Young is not Dr. Welby and really doesn't perform operations, and that Raymond Burr in real life is not Perry Mason, super lawyer or that James Arness was not actually Matt Dillon or even a cowboy. Why should we believe that Jack Anderson, Jack Anderson is really an investigative reporter doing or saying the things an investigative reporter does. Think of him as an actor or performer saying lines and reciting a script he didn't write, doesn't understand and gave very little thought to. If anything, the basic inaccuracies and fallacies of this one episode of Jack Anderson, Jack Anderson, should give you some idea as to the credibility of the rest of his programming.

## Basic Radio?

Starting with the July issue, **CQ** introduces a new series called Basic Radio. Why, you ask? Well it's very simple...in fact if you pardon the pun, it's elementary. We are experiencing the result of our efforts in putting **CQ** on the newsstands. Letters reaching **CQ** now are asking for basic information on radio, equipment, licensing procedures and many questions which make it obviously clear that a new crop of readers are joining us in amateur radio.

While many of you may scoff (I hope not too many) at the concept, try reading it each month and test yourself with the exam following each installment. The series will be quite extensive and include experiments that can be performed with readily available components. Learning can be fun and not a chore. It should also be fun to see if what you think you know corresponds to the text.

## Scientific American

The **Scientific American** magazine doesn't really need a plug from us but their upcoming September issue looks like it might be very interesting reading for all of you. According to a press release I received today, their September issue is devoted to a single topic, Microelectronics. The list of articles looks very impressive and this issue should be a saver.

## What's New Department

Starting this month we've reinstated our "New Amateur Products" department. This will cover any and all things that could possibly be of interest to the amateur, or just interesting in and of themselves. We'll try to run several pages each month, so be sure to use the Reader Service page at the back of the magazine to get more information. Some of the literature we receive here at **CQ** each month can appear to be quite esoteric but perhaps some fledgling inovator out there can come up with some applications that the rest of us can understand. We also would like to know how you are using some of these new items, what your experience has been in corresponding to these companies and how their customer relations are working.

## Contest Scores

If all goes well, the results of the **CQ** WW DX Phone Contest will appear in the August issue. Bob Cox assures me that he and his group will have them ready for the August **CQ**. Just one more month to wait to find out how you did in amateur radio's biggest and best contest ever. We're hoping for a record turnout. By the way, send in early for cover sheets and logs so you will be set to enter the next one.

73, Alan, K2EEK



## 5 KW PEP INPUT

WITH THIS NEW BALUN



On all bands 160 to 10 meters.

Runs cool as a cucumber at its CCS rating of 2 KW (Continuous output power through the balun at matched load).

4" dia. Wt. 24 oz. \$32.50 PPD.

AND FOR FULL LEGAL POWER

the time tested Model 1K balun is still available. Rated at 1 KW CCS (3 KW PEP input).

2 1/4" dia. Wt. 9 oz. \$16.95 PPD.

ONLY PALOMAR BALUNS HAVE ALL THESE FEATURES

- Toroidal core for highest efficiency.
- Teflon insulated wire to prevent arc-over. OK for tuned feeders.
- Stainless steel eyebolts take antenna tension. Won't rust, won't pull apart.
- Epoxy filled case. Absolutely waterproof.
- Lightning protection built-in.
- Wideband 1.7 to 30 MHz.
- Hang-up hook provided.
- Now available in either 1:1 or 4:1 ratio. 1:1 ratio matches 50 or 75 ohm coax to 50 or 75 ohm balanced load (dipoles and inverted Vees). 4:1 ratio matches 50 or 75 ohm coax to 200 to 300 ohm balanced load.

Free descriptive brochure on request.  
Order direct.

Model 2K \$32.50 Model 1K \$16.95

Center insulator without balun \$7.95

Postpaid U.S. & Canada.

Specify ratio 1:1 or 4:1

California residents add 6% tax.

Send check or money order to:

# PALOMAR ENGINEERS

BOX 455, ESCONDIDO, CA 92025

Phone: (714) 747-3343

## This MFJ Antenna Tuner...

lets you operate all bands — 160 thru 10 Meters — with a simple random wire. Use virtually any transceiver — up to 200 watts RF power OUTPUT.



\$ **39**<sup>95</sup>

Imagine being able to operate all bands — anywhere, with virtually any transceiver — using a simple random wire and an antenna tuner small enough to carry in your hip pocket. Size is only 2-3/16 x 3-1/4 x 4 inches.

Operate from your apartment with a makeshift wall to wall antenna. Tune a simple vertical for low angle, DX operation. Operate from your motel room with a wire dropped from a window. Tune out the SWR on your mobile whip. Enjoy ham radio on a camping or backpack trip with a wire thrown over a tree. Prepare for an emergency. Take it on a DX expedition or use it for Field Day.

Match both high and low impedances by interchanging input and output. SO-239 coaxial connectors are used.

The secret of this tiny, powerful tuner is a 12 position variable inductor

made from two stacked toroid cores, and a quality capacitor manufactured especially for MFJ.

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 a check or money order for \$39.95 plus \$2.00 for shipping and handling.

Don't wait any longer to operate on all bands. Order today.

### MFJ ENTERPRISES

P. O. Box 494

Mississippi State, MS 39762

Call Toll Free . . . 800-647-8660

## Changing QTH?

Moving is often exciting, hectic and confusing. It's packing, shipping, saying goodbye to friends and leaving them behind. Don't say goodbye to CQ and leave us behind for the new folks to read. Give us about 6 weeks notice and CQ will be there about the same time you get the last carton unpacked. You won't miss a single great issue.

Attach Current Mailing Label

New Address

Name \_\_\_\_\_ Call \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip Code \_\_\_\_\_

cut out, paste on post card and mail to:

CQ MAGAZINE  
14 Vanderventer Avenue  
Port Washington, N.Y. 11050

## 2 METER CRYSTALS IN STOCK

FOR THESE RADIOS ON STANDARD ARRL REPEATER FREQUENCIES

Clegg HT-146  
Drake TR-22  
Drake TR-33 rec only  
Drake TR-72  
Genave  
Heathkit HW-202  
Heathkit HW-2021 rec only  
Icom/VHF Eng  
Ken/Wilson  
Lafayette HA-146  
Midland 13-505  
Regency HR-2A  
Regency HR-212  
Regency HR-2B  
Regency HR-312  
Regency HR-2MS  
S.B.E.  
Sonar 1802-3-4, 3601  
Standard 146/826  
Standard Horizon  
Tempo FMH  
Trio/Kenwood TR2200  
Trio/Kenwood TR7200

Send for free frequency list and order blank to:

### KENSCO COMMUNICATIONS

Dept. C77

Box 469  
Quincy, MA 02169  
(617) 471-6427





# BITS, BYTES & BALONEY!

For all of you non-aficionados of the Computer Art. . .

**BIT** — an electrical signal or logic level (like the zero or one of the Binary numbering system) — Motorola's M6800 is an 8-bit MPU.

**BYTE** — a set of eight electrical signals, or logic levels (bits) — The M6800 is capable of addressing 65,000 bytes of memory.

**BALONEY** — the state-of-the-MPU-art that says that you must be a trained computer expert to use a Microprocessor in a practical manner. More and more "Individuals" are becoming self-styled computer 'experts' at home, with their own MPU kits. They are doing things that others said, "couldn't be done," (just because they forgot to ask).

**NOW'S YOUR CHANCE** — for only \$235.00 (plus \$5.00 postage and handling) you can order your MOTOROLA M6800 MICROPROCESSOR EVALUATION DESIGN KIT, directly from Motorola.

**IT'S A COMPLETE KIT** — the MEK6800D2 Kit has all the parts necessary to complete the system and get "On The Air," except for the Power Supply. It includes:

- o (1) MC6800 Microprocessing Unit
- o (2) MCM6810 — 128 x 8 Static RAMs
- o (2) MC6820L — PIA's
- o (1) MC6830L — Program ROM
- o (1) MC6850L — ACIA
- o (2) Printed Circuit Boards
- o (1) MC6871 — Clock
- o (1) 6-Digit Seven Segment Display
- o (1) 24-key Keyboard
- o Complete kit of resistors, capacitors, sockets, circuits, etc. All the parts necessary to the system, but the Power Supply.

## THE M6800 MPU KIT FEATURES

- o 24-key Keyboard
- o 7 Segment Display
- o Cassette Interface
- o EROM Expandable
- o RAM Expandable
- o Wire Wrap Capability
- o Parallel & Serial
- o Interface Capability
- o Single 5-Volt Supply Required
- o Layout on Boards
- o Documentation

**IF YOU'RE READY FOR A MICROPROCESSOR — THE M6800 IS READY FOR YOU!**

Send your order in today for one of the most powerful MPU Kits on the market. Fill in the order form below and mail it with your check to:

**MOTOROLA MPU KIT SALES**  
Department Q  
P.O. Box 27605  
Tempe, AZ. 85282



I have enclosed \$235.00 plus \$5.00 (shipping & handling) in check or money order for each MEK6800D2 Microprocessor Design Kit II. Please send \_\_\_\_\_ Kit(s).

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_

STATE \_\_\_\_\_ ZIP \_\_\_\_\_

Please print clearly — Make checks payable to Motorola Inc.



## Our Readers Say (from page 15)

with the insertion of pictures showing the parts layout.

So please help us gain the expertise you have by submitting and publishing complete photos of your projects, parts list, and suppliers of parts. Please be accurate in your details. I heard a ham on 2M FM say he had built his last construction project as it did not work and when a correction was published a month or two later, he did not see it. This can be very discouraging.

Think back to when you were a new amateur and help us get off to the right start.

John A. Magness, III, WD4BVU  
Murray, KY

## Vienna Youth Centre

Editor, CQ:

For the past 10 years we have been actively engaged in ham p.r. and novice activities, our sole task. We try to hook young people with BC-DXing, continue with SWL seminars and end up with a full-scale license course. Our shack is in a Vienna youth centre, and we have built it ourselves from scrap. Same holds for an old double-decker bus which we rescued from the city dump and miraculously converted into a mobile shack, proudly displayed at youth summer camps (we offer ham information to 1,800 young people every summer).

Wolf Harranth, OE1WHC  
Vienna, Austria

## In Focus (from page 63)

wireless. If you recognize this desperado, please contact me at once.

## A Plea To Letter Writers!

I am very grateful for the letters of inquiry I receive every month. Most of these letters are from amateurs who want to get started in SSTV. The three-part article "Slow Scan Television, Overview '77" (CQ, Jan., Feb., and Apr. '77) by yours truly was written in response to this need.

For the quickest answer from me, please include a self-addressed stamped envelope. I have received TWO letters of inquiry which were not signed! If anyone can tell me the name of the chap who lives at Chelsea, Quebec, JOXINO, Canada, I would appreciate it very much! He's probably wondering why I haven't answered his letter. (I DID answer it but the Canadian P.O. sent my letter

back requesting the surname of the person!)

## Final-Final

At this writing, the Dayton Ham-vention is just three weeks away. Each year new developments in SSTV are revealed at this 'vention as leaders in slow scan's technology present both informal and formal talks on the subject. Yours truly will be on hand to find out what's new and take pictures for next month's "In Focus" column. But don't forget, your amateur friends want to know what YOU are doing with slow scan too. So, please keep those letters and photos coming my way; 2112 Turk Hill Road, Fairport, N.Y. 14450. Regards, Bill, W2DD

## Math's Notes (from page 68)

communications link using either f.m. or a.m., and to evaluate both methods in this type of service. In addition, if one has the facilities, the fiber can be dispensed with and, by the use of lenses, mirrors, or a small telescope, an optical communications link could be set up in free air.

If you do experiment with optical communications or use these methods for some sort of data transmission, we would be most happy to hear from you and be glad to pass along your results to our readers. This entire field is certainly one of the most exciting and rapidly growing areas in the communications industry today. 73, Irwin, WA2NDM

## Propagation (from page 79)

### HAWAII

Openings Given In  
Hawaiian Standard Time #

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

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

\* Indicates best time for 160 Meter openings.

\*\* Indicates best time for 10 Meter openings.

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.



**Propagation (from page 90)**

**ALASKA**

**Openings Given In GMT #**

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

**Awards (from page 81)**

this will avoid duplicates. Keep a running account of the total 10-10 numbers at the top of each log sheet. When you have a total of 100 (including the first 10 allowed for membership) immediately apply for your first Bar Award. You should check mark the 10-10 numbers in your complete roster to avoid repeat reporting. The 10 initial contacts are allowed but all others counted shall be bona-fide Number Exchanges as in a "full friendship handshake." List all information as required for membership (do not send log books). Send your list to the Awards Manager, Frank Orcutt, W4JO, 2752 SW 3rd St., Miami, Florida 33135. Identify your call and 10-10 number, and state the Bar you are requesting each time. There are Bars for each 100. There are special Plaques for 1,000, 2,500, and 5,000. QSL cards are required for WAS 10-10. Important: Send in each 100 immediately (no extras and never less than 100). Forget about those early uncounted "one-way" contacts as the Awards are for bona-fide number exchanges; one point only allowed for each number exchanged.

Note: As space permits, I will tell about more 10-10 AWARDS, but in the meantime, become a member and then, send s.a.s.e. (9" x 4") to Chuck Albrecht, WA0YNQ, 2653 S. Cook St., Denver, Colo. 80210 for the new updated 10-X Certificate/Net Directory.

**CW County Hunter Net Awards:** Having run out of space, may I ask you to send s.a.s.e. to Jim Hoffman, K1-ZFQ, 42 Gresham St., Milford, Conn. 06460 for data on their Awards. Remember their Contest 0000 GMT July 23 to 0600 GMT July 25, 1977. Look on 3575, 7055, 14070, 21070 and 28070.

How was your month?

73, Ed., W2GT

# STEP UP TO TELREX

WITH A

TELREX "BALUN" FED—"INVERTED-VEE" KIT

THE IDEAL HI-PERFORMANCE

INEXPENSIVE AND PRACTICAL TO INSTALL LOW-FREQUENCY

MONO OR MULTIPLE BAND, 52 OHM ANTENNA SYSTEM



Telrex "Monarch" (Trapped) I.V. Kit  
Duo-Band / 4 KWP I.V. Kit \$62.50  
Post Paid Continental U.S.

Optimum, full-size doublet performance, independent of ground conditions!  
"Balanced-Pattern", low radiation angle, high signal to noise, and signal to interference ratio!

Minimal support costs, (existing tower, house, tree).

A technician can resonate a Telrex "Inverted-Vee" to frequency within the hour!

Minimal S/W/R is possible if installed and resonated to frequency as directed!

Pattern primarily low-angle, Omni-directional, approx. 6 DB null at ends!

Costly, lossy, antenna tuners not required!

Complete simplified installation and resonating to frequency instructions supplied with each kit.

For technical data and prices on complete Telrex line, write for Catalog PL 7



*CQ's Ham Shop is a good source of antique and hard to get items. It's a free service for CQ subscribers. Why not start collecting now?*

**IMMEDIATE OPENING** for the position of Counter Salesman: Must be a mature individual holding a currently valid Amateur Radio License with a diverse background in all areas of Amateur Radio. Please Call Area (212) 925-7000, or send resume to: Barry Electronics Corp., 512 Broadway, New York, N.Y. 10012.

**GOING LF?**

NOW you can LISTEN right DOWN TO 100 KHz - on YOUR RECEIVER. 100-600 KHz CONVERTER has 20dB gain, antenna tuner and 3.5-4 MHz output. ALL parts, coils, printed circuit, 1 1/2" x 3" x 5" case, battery etc, instructions, airmail, send ONLY \$19.80. **CAMBRIDGE KITS** 45(CT) Old School Lane, Milton, Cambridge, U.K.

**MILITARY SURPLUS WANTED**

Space buys more and pays more. Highest prices ever on U.S. Military surplus, especially on Collins equipment or parts. We pay freight. Call collect now for our high offer. 201 440-8787. **SPACE ELECTRONICS CO.** div. of Military Electronics Corp. 35 Ruta Court, S. Hackensack, N.J. 07606



with **JAN QUARTZ CRYSTALS** for

- CB Synthesized • CB Standard
- General Communications
- Industry • Two-Meter
- Monitor • Scanners
- Marine VHF • Amateur Bands

Dependable USA Mfg. for

- Frequency Control
- Frequency Stability
- High Performance

Write or phone for more details Send 10¢ for our latest catalog



2400 Crystal Drive  
Ft. Myers, Florida 33901  
all Phones (813) 936-2397



# HAM SHOP

FREE TO CQ SUBSCRIBERS

**Advertising Rates:** Non-commercial ads are 10 cents per word including abbreviations and addresses. Commercial and organization ads are 35 cents per word. Minimum charge \$1.00. No ad (non-subscriber) will be printed unless accompanied by full remittance. Free to CQ subscribers (maximum 3 lines per month). Recent CQ mailing label must accompany ad.

**Closing Date:** The 10th day in the third month preceding date of publication. Because the advertisers and equipment contained in Ham Shop have not been investigated, the Publisher of CQ cannot vouch for the merchandise listed therein. Direct all correspondence and ad copy to: CQ Ham Shop, 14 Vanderventer Ave., Port Washington, New York 11050.

DXpedition to Montserrat W.I. House and ham equipment \$90 weekly. Doc. 60 Amsterdam, Toronto M4B 2C2. Tel. (416) 755-2117.

QSL Cards: Printed Sample 20 cents. Print Shop, P.O. Box 13, La Grange, Illinois 60525.

TECH MANUALS for Govt. surplus gear—\$6.50 each: SP-600JX, URM-25D, OS-8A/U. Thousands more available. Send 50 cents (coin) for 22-page list. W3IHD, 7218 Roanne Drive, Washington, DC 20021.

CUSTOM EMBROIDERED EMBLEMS, your design, low minimum, Emblems, Dept. 10, Littleton, New Hampshire 03561.

QSL's - SOMETHING COMPLETELY DIFFERENT! Nothing even close to it on the market! The "Cadillac" of QSLs! 50 cents (Refundable). W5UTT; Box no.1171-E; Garland, Texas 75040.

PERSONALIZED BADGES - \$1.50 Send Name and Call. 4-Line Rubber Stamps — \$2.95. W5UTT; Box no.1171-E; Garland, Texas 75040.

2-METER CRYSTALS, \$3.50 each, for all popular rigs. In stock. Immediate delivery. Send cash or money order, we pay postage. ROLIN DISTRIBUTORS, P.O. Box 436, Dunellen, NJ 08812.

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 and FM. Associated Radio, 8012 Conser, Overland Park, Kansas 66204. (913) 381-5901.

300 MHz B&K counter, and prescaler. Price breakthrough! \$191 postpaid. Portable. Factory built. Details, catalog free. Spacetrone-K, 948 Prospect, Elmhurst, IL 60126.

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.

FOR SALE, Lafayette HE-45A 6 Meter Rig. Good Condition. Less Crystals. Sent prepaid for best offer. L.R. Devore, 1839 Burbank Rd., Wooster, OH 44691.

WANTED: Service manual for Motorola U43HHT low band FM Radio. Ken Woods, Box 276, Helena, AR 72342.

FOR SALE: Rare collectors item. VX-101 deluxe VFO xmtr, all bands, 807 output, \$30. Harold Smith, 26 Linden St., Bayonne, NJ 07002.

MINT Jerrold TV Remote Control, cost \$100, works any set w/out mod, \$50. List excess equip, SASE. W4API, Box 4095, Arlington, VA 22204.

SELL: DX-engr. R.F. Processor, TR4 series. Like new, \$100. Includes air-mail. R. Huntington, 5014 Mindora Dr., Torrance, CA 90505.

FREQUENCY METER 20-480 MHz, TS-323-UR, \$60; Motorola Police/fire monitor receiver 30-50 MHz, 110v, \$30; All like new. W. Davis, 2255 Alexander Ave., Los Osos, CA 93401.

WANTED: Workable Johnson 275 matchbox. Will refund postage, and pay shipping. M.F. Tehan, K6HFY, 1960 Mission Ridge Rd., Santa Barbara, CA 93103.

SELL: Heath HW-18 & HWA-71 power sup., \$135.00 or trade for HW-16 or similar xcvr. Brian Swanick, 609 McKinley Ave., Mundelein, IL 60060.

NOVICE All-American certificate: Work a novice in all 10 call areas. Send list and \$1. WB6QBJ, 25 Rudnick Ave., Novato, CA 94947.

WANTED: Manual/Schematic for Hallicrafters S-36A receiver. Buy or borrow, copy and return. W2IDA, A. Bielenda, 43 Chestnut Ridge Rd., Saddle River, NJ 07458.

RUBBER STAMPS: For hams, call, name, QHT, etc., \$2. Sent prepaid anywhere. L.C. Belyea, Box 327, Belgrade, MT 59714.

WANTED: R390 and/or parts. K4JFZ, Roy, 114 Pine Street, Carrboro, NC 27510. (919) 967-8379, call after 6 p.m.

COLLECTORS: I have a 75A-1 and 32V-2 Collins. Good condition with matching speaker and book. Old QST, CQ and Ham Radio Magazines. Forrest Bryant, 607 S. 6th St., Princeton, MN 55371.

WANTED: Will trade Genave GTX-2 with full crystals for 22S etc. Also want Autek QF-1 CW/SSB filter. Will Roberts, WA4PSL, P.O. Box 907, Roseboro, NC 28382.

TRANSMITTING TUBES: HV and filament xfms, rotary inductors, transmitting capacitors, send stamp for flyer. T.S. Marinich Electronics, 102 Bell St., Weirton, W. VA 26062.

TRANSCIEVER SPECIAL: SBE-33 recent factory overhaul, spare finals, AC supply, mobile mount, mike, \$159. Heinlein, 107 Wyoming, Boulder City, NV 89005.

ATTENTION: Wouldbe freelance writers, writing but not selling? Send for my \$2 pamphlet—Helpful Hints. They worked for me. R.G. Ahlefeld, WA6TCB/7, 405 Whittier St., Silverton, OR 97381.

HAM Sentences in 54 languages on your card get DX QSL's! K3CHP's DX QSL Guide, still \$3.95. Joe Mikuckis, 6913 Furman Pkwy., Riverdale, MD 20840.

SELL: 28ASR, \$450. 28KSR, \$350. R392 with p/s and converter, \$200. 32V3, \$125. Joe Schwartz, 43-34 Union St., Flushing, NY 11355.

WANTED: Adapters etc for GR 1601A bridge 1610-204 coax extension, 874WN and 874 WM 50, 874 Q1. Also DF by Keen '38 or later. Shore Adcock and Wullenweber manuals. W4AFM, Paul Rockwell, 5800 Hillburne Way, Clievy Chase, MD 20015.

SELL: Poly-Comm "2", mint condition. Reasonably priced. Joseph Schwartz, 43-34 Union St., Flushing, NY 11355.

SELL: K-Enterprises FM Channel Marker. Brand new, costs \$27.50, will sell for \$20, or best offer. Todd Gorlin, 4829 Buchana St., Hollywood, FL 33021.

SWAP: SP600 (JX mod) and TMC sideband converter in cabinet for TS7400A. Also have FR4U freqmeter and Beckman 7350C Counter. Offer? L.G. Basham, 735 Caves Hwy., Cave Junction, OR 97523.

WANTED: Top and bottom covers for Heath HW-17A. State price and condx. WALLBG, A.R. Marote, 267 Austin St., New Bedford, MA 02740.

SELL OR SWAP: Two T-282/GR Transmitters. Large collection of surplus power transformers. Send SASE for list or requirements. Fred Van Pala, 70-64 45 Ave., Woodside, NY 11377.

YAESU FTdx-560, 80-10 meter SSB/CW receiver, new finals, \$400. FOB Boulder. Jim Simmons, WB0IPL, 660 South 45th St., Boulder, CO 80303.

SELL: National HRO 500 receiver with LF-10 preselector, mint condition, manuals incl., best offer. C.F. Killmon, WB3AFQ, 2108 Barr Rd., Wilm, Del. 19808.

WANTED: Coaxial relays and switches w/'N' type connectors. Need SPPT, DPDT, transfer, and SP4T, C. Hoth, 1233 1/2 W. State St., Fremont, OH 43420.

SELL: Complete "S" Line 75S3, 516-F2, 32S3, 312B4, 30L1 DX eng. R.F. Clipper, all round emblems. Can be heard on 20 meters daily, \$1750. W.E. Cann, W1HSC, Box 264, Hampton Beach, NH 03842.

SELL: Heath HR10B receiver, factory aligned with crystal calibrator, \$60, you ship. Chris Fite, WB4OAW, 1675 Carter Rd., Decatur, GA 30032.

CODE OSCILLATORS, \$5.95 plus postage. Includes key and speaker, runs on 9v battery. Tobar, P.O. Box 7438, Hollywood, FL 33021.

SWL's: Southern California; let's exchange DX tips. Don, 6059 Essex, Riverside, CA 92504. (714) 687-5910.

TRADE: Drake DC-4 power supply for Heath SB-610. Wanted: Webster Bandspanner mobile antenna, Johnson roller inductor and transmitting capacitors. F.H. Kauppi, Rt. 1, Box 171, Gilbert, MN 55741.

SELL: Mini quads by Mini Products, 6-10-15-20 meters. Only 1 month old. Must sell. Going overseas, \$75. Larry Frisk, WB0ZJC, 602 W. 14th Lot 9, Junction City, KS (913) 238-4335.

COLLINS 75A1, speaker, \$120; Murch transmatch, \$120; Turner new + transistorized desk mike, \$25; Electrovoice mike 611 w/stand \$20. FOB, Art Ford, 56 Gildare Dr., East Northport, NY 11731.

WANTED: Hallicrafter "Sky-buddy" rec. State price and condition. Leonard Alsing, Star 118, Middletown, CA 95461.

WANTED: 160 meter low power c.w. rig. Cash or trade. Eric Palmer, W2RD, 1602 Mermaid Ave., Brooklyn, NY 11224.

WANTED: Barker & Williamson HDVL coils, base and link. Bill Orr, 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. 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 band-switch \$16. UTC S-50 kv c.t. 300 ma, new, pick-up only, \$75. small (2kw) \$20. R. Ross, 95 Norwood Ave., Northport, NY 11768.

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.





# Gift Horse Bonanza!



You've followed the signs for years, but we're here to tell you that there is a pony out there just waiting for you. Hitch your wagon to CQ's Gift Horse (but don't look in his mouth) and cash in on our FREE CLASSIFIED ADS.

CQ subscribers can place ads in HAM SHOP on a noncommercial basis absolutely FREE. Here's your chance to buy, sell or swap your way into that ultimate station or just pick up some spending money. Why spend \$5 to sell a \$10 item somewhere else when there isn't enough room to describe the item in the first place and about \$2 of the \$5 just goes for your name and address.

Just follow those hoof prints today and get in on the greatest deal amateur radio has to offer.

**CQ HAM SHOP**  
14 Vanderventer Ave.  
Port Washington, N.Y. 11050



Please run this in the next available issue of CQ: \_\_\_\_\_

Name \_\_\_\_\_ Zip \_\_\_\_\_

Address \_\_\_\_\_ City \_\_\_\_\_ State \_\_\_\_\_

**For Sale.** Heath HW-16 novice band transmitter & HG-10B VFO both in excellent condition - \$140.; Hallicrafters HA-1 TO Keyer & Autronic Paddle to be sold as a set only, \$60.; Collins KWM-2 with 516F2 Power Supply & Speaker, excellent condition - \$650.; Collins PM-2 Portable Supply - \$75.; Hammerlund SP-600 Receiver - \$100. K4IIF, Box 205, Winter Haven, FL 33880 (813) 324-4122.

**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" gauge, 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.

**Keyers:** New Micro-TO Mk II Keyers \$28, Accu-Keyers \$38, Accu-memories \$128, write for availability. Robert Patten, N4BP, 2311 Nassau Dr., Miramar, FL 33023.

**Johnson 275 Watt Matchbox** with Built in S.W.R. Meter \$75. Postpaid. Bob Craig, 4950 Sunshine Ave., Santa Rosa, CA 95405 (707) 539-1007.

**Heath:** DX-60B, 100wt. Modified/Processor Built-in. Excellent Audio. SSB'ers can't believe what I'm running. Also, HG-10B VFO. Mint. \$100 takes all plus Dow-Key Relay and all Cables. Al Goldstein, WA2VAK, 32 Godfrey Rd., Upper Montclair, N.J. 07043 (201) 744-5449.

**WANTED:** Johnson KW and 275 W. Matchbox with meter. Sell: Plate Xfmr 3600-0-3600 at 1 A, \$50. 1.7 amp, \$75. With 110/220 Pri and fob. W0AIH, Paul Bittner, 304 W. 17th, Grand Island, NE 68801.

**SALE:** Heath IM-28 VTVM kit. New, perfect. Ordered by mistake. \$40. Schultz, Box "L", FPO New York 09544.

**SSTV an Photographers:** Make offer, 1 each, like new, Fujitar Lenses, 135 mm, f4.5, telephoto. 35 mm f3.5, wide angle. Cary Cowan, c/o CQ Magazine or call 516/883-6200.

**WANTED:** Antique Glass-Looking for old milkglass-purple, slag, carmel, and green-town. Tell me what you have. I pay the highest prices. Write: Jack Schneider, c/o Cowan Publishing, 14 Vanderventer Ave., Port Washington, NY 11050.

**FOR SALE:** Hardbound edition of the 1947 ARRL Radio Amateur's Handbook, \$10.00. A. Dorhoffer, K2EEK, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

**SELL:** Kenwood TS520 with c.w. filter. Used less than 1 hour, \$575. W6RLB, 24 Devonshire Dr., Novato, CA 94947.

**AUTEK:** Will pay \$30 for Auttek QF-1 audio filter. R390A parts needed. Donald, 6059 Essex, Riverside, CA 92504.

**FINCO VHF & UHF amplifiers** for MATV or in-house distribution systems. Send self-addressed envelope with postage attached for detailed listings. G. Alfred Dodds, Jr., 874 Pepperwood Lane, Brunswick, OH 44212.

**REPLACE** lossy ant relays in ur 2 meter rigs, etc. Few new coaxial SPDT relays, \$5. each. List my excess gear, SASE. W4API, Box 4095 Arlington, VA 22204.

**WANTED:** College student needs HG-10B VFO in working condition for under \$35. Tom Mydosh, WA2FWE, 99 Glann Rd., Apalachin, NY 13732.

**COLLINS:** 32S-3, 755-3C, 30L-1 all round; 312-B4 and 516F-2 winged. Package only \$2500. Bill Fulcher, 217 Bluegrass Dr., Hendersonville, TN 37075.

**W0CVU FOR SALE:** Collins KWS-1 and A-4 in excellent shape. All Collins factory modified. Price, \$875. OOF0B. Charles W. Boegel, Jr., 1500 Center Point Rd., NE, Cedar Rapids, Iowa 52402.

**SELL:** Swan 14-117 A.C. D.C. P.S. Mint condition, \$69.50. Hustler, 2 KW P.E.P. resonators 15 and 20 Meters, \$15. each. W4MGL, 7010 SW 16th St., Plantation, FL 33317.

**WANTED:** RME/Electro Voice Model 4301 Sideband Selector or copy of owners manual with circuitry. Edmund P. Henke, Jr., RR 1, Box 515 AA, Lake Geneva, WI 53147.

**FOR SALE:** Two Sperry Gyroscope Co. Klystron Power Supplies 0-4000V, 0-150ma. regulated. Models no. 555 and 62A1, \$25. each. Pickup only. F. Vanpala, 70-64 45th Ave., Woodside, NY 11377.

**YAESU FTDX-100 5 band Transceiver.** 100 W pep. AC/DC Power supply. \$300 UPS paid. Matching speaker included. WA8MLV, 1008 Englewood Dr., Parma, OH 44134.

**WANTED:** Surplus gear of all types. Need not be in working order. James Wood, 7304 Dixon Ave., Tampa, FL 33604.

**BORROW** Beg, Buy, or Hire Instruction Manual Nems Clark Model 1306 Receiver. Harris, 4 Branksome Hill Rd., Bournemouth, Bk4 9LD. Dorset, England.

**TWO TONE GENERATOR** Panoramic Model TTG-2, \$100. Elden Meyer, 4116 N. 72 St., Milwaukee, WI 53216.

**WANTED:** Hammarlund HQ-140 or HQ-180 in exc. condx. Also Heathkit SB-620, Auttek QF-1. Donald, 6059 Essex, Riverside, CA 92504. 714/687-5910.



WANTED: Early radio and wireless magazines as well as old receivers, transmitters parts early Vacuum tubes, Handbooks, Radio books. Will pay cash or trade tubes, call books, radio books and magazines. Erv Rasmussen, 164 Lowell, Redwood City, CA 94062.

WANTED: TS511 complete, pay \$355 received UPS. A. Ford, 56 Gildare Dr., East Northport, NY 11731.

WANTED: Regency short-wave converter model ATC-1, any condition. Phil Pichette, VE7ADW, Box 183, Salmo, BC, Canada V0G 1Z0.

YAESU 355D Freq. Counter, 200 MHz, like new, \$175; Linear System, D.C. Sup. model 250, \$35. (213) 346-5871, Harold Tarallo, WB6VNR, 7104 Deneron Ridge, Canoga Park, CA 91307.

WANTED: B & W Coaxial Switch; KW Low-pass filter. Larry Kleber, K9LKA/W9CPD, 922 Whitney Blvd., Belvidere, IL 61008.

WANTED: Heath HW-17 or 17A. Preferably not in working condition, state price. Alan R. Marote, WA1LBG, 267 Austin St., New Bedford, MA 02740.

SELL: Collins 753C, 3253A, 312B-3, 516F-2, 500 Hz filter, 19 months olds, \$4500, firm! Mint condx. WA4IRE, (813) 985-7080.

HAM RADIO MAGAZINE: 1970 and 1971. \$5 postpaid. Art Johnson, K2POA, 29 Bonne St., Bethpage, NY 11714.

YAESU 200R synthesized 2m FM xcvr with mike, NPC 104 power supply, 2-1/4 wave whips, trunk and magnetic mounts. Mint, \$400. R. Hajdak, 1834 Paisley St., Apt. 12, Youngstown, OH 44511.

FOR SALE: B & W 52 ohm Matchmaster Model 650, dummy load-SWR bridge and RF watt meter all in one. \$32 prepaid. W8FLA, A.A. Polityka, 248 Western, Allegan, MI 49010.

G.E. MOBILE MONITOR Rec. fire/police 30-50 mc, 12VDC, \$12; Motorola 30-50 mc monitor rec. 110VAC, \$30. W. Davis, 2255 Alexander Ave., Los Osos, CA 93401.

MCELROY looking for Mac-Key bug on chrome flat iron base as remembrance. State price and condition. H.M. McElroy, WB4PPV, Amembaay Tokyo, APO San Fran, CA 96503.

SINGER Company employee net meets Sunday 1300 Eastern time 7290 KHz, DX Singer employees write for info or special sked. Philip J. Freed, K3LVO, 436 Nimitz Ave., State College, PA 16801.

CLEANING HOUSE: 150 item list of ham gear, test equipment, computers, photographic and Hi-Fi gear. SASE please. K2DCY, 11 Squire Hill Rd., N. Caldwell, NJ 07006.

WANTED: Drake or Collins, clean gear. Cosmophone 35, \$175. N4LX, 251 Collier Ave., Nashville, TN 37211, (615) 833-2724.

ANNOUNCING: NLS, the New York City, Long Island slow speed c.w. section net. For all hams in the NLI section. 3.730 MHz at 1800 EST or write, WA2BMI, 6 Terrace Dr., Great Neck, NY 11021.

WANTED: CW Keyboard Keyer any make or model. Clem, K8HWW, 33727 Brownlea, Sterling Hgts., MI 48077.

MURDOCK Items pre 1925 wanted. Condenser, detector, etc. Also, early radios and Bunel Telegraph gear. D. Spence, D. 203, Argonne, IL 60439.

FOR SALE: First edition (May 1935) of the Radio (magazine) Handbook, \$10, Three G.E. Bound volumes plus spare 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 Vanderverter Ave., Port Washington, NY 11050.

SALE: Regency HR-2B EW 34/94, 16/76, 28/88, 37/97, 52/52, 01/61, \$175. GLB Channelizer set up for regency w/illumination, \$90. Earl T. Nicholas Jr., P.O. Box 4478, Columbia, SC 29204, (803) 754-7061.

WANTED: Mint condition Hal FYO Paddle. Must be late model and flawless. Also need Autek programmable Keyer. Paul L. Reiter, WA7RKJ, 3607 40th W., Seattle, WA 98199.

RADIO Spectrum Chart, large wall display, \$500. W7UD, 3637 W. Grandview, Tacoma, WA 98466.

WANTED: US Signal Corps, directories, TM11-487, TM11-487C, TM11-487J. Also, Navy Communications equipment directory, Navships 94200-1. G. Mant, G8AVJ, 28 Welbourne Road, Liverpool, Great Britain L16 6AJ.

WANTED: HG-10B VFO in working condx for \$30. By destitute student. T. Mydosh, WA2FWE, 99 Glann Rd., Apalachin, NY 13732.

WANTED: Good used ICOM 2M FM transceiver, model IC225. Mark Steffen, P. 121, RRI, Hudson, IL 61748.

SIMPSON Model 380 Wave meter and Modulation Indicator, like new, \$12. L.G. Basam, 735 Caves Hwy., Cave Junction, OR 97523.

FOR SALE: Realistic DX-160, \$90; Heathkit HW-8W/HD-1410 Keyer, \$120. HW-8 not working but easily repairable. Dale Nicholson, WA6MVG, 910 W. Clay, Ukiah, CA 95482.

SELL: TV Camera, G.E. with videcon lens, untested, \$25. Ruggedized underground RG-58, \$8/100 ft. Half inch hard line, \$15/100 ft. Joe Ottinger, 9149 Rosedale Dr., Spring Valley, CA 92077, (714) 462-6316.

FOR SALE: Robot SSTV; 70B monitor (factory mod), 80A camera with Macro lens, extras, \$500. Mike Ludkiewicz, 143 Richmond Road, Ludlow, MA 01056.

CALL LETTER License Plates wanted for collection. Will pay shipping. Art Phillips, WA7NXL, Route 4, Box 720, Flagstaff, AZ 86001.

SALE: KSR no.28 RTTY with CV-89A converter. Must sell. (212) 461-3632, Joseph Schwartz, 43-34 Union St., Flushing, NY 11355.

# 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.

R.S. No.	Page
1 Barry Electronics Corp. . . . .	91
2 C.W. Electronics . . . . .	87
3 Cambridge Kits . . . . .	91
4 Dentron . . . . .	8
5 R.L. Drake Co. . . . .	6
6 Eimac, Div. of Varian . . . . .	Cov. IV
Gregory Electronics Corp. . . . .	70
7 Hamtronics . . . . .	38-47
8 Henry Radio . . . . .	10
9 Henry Radio . . . . .	16
10 Herrman Co. . . . .	70
11 Hy-Gain Electronics Corp. . . . .	12

R.S. No.	Page
12 Icom . . . . .	13
13 International Crystal Mfg. Co. . . . .	11
14 Jan Crystals . . . . .	91
15 Kensco . . . . .	89
16 Kenwood . . . . .	Cov. II
17 Kenwood . . . . .	1
18 Kenwood . . . . .	2
19 MFJ . . . . .	4
20 MFJ . . . . .	89
21 Motorola . . . . .	90
22 New-Tronics Corp. . . . .	7
23 Palomar Engineers . . . . .	89
24 Rollin Distributors . . . . .	66
25 Space Electronics Co. . . . .	91
26 Swan . . . . .	23
27 Telrex . . . . .	91
28 Tri-Ex . . . . .	96
29 Unadilla Radiation . . . . .	15
30 Unarco-Rohn . . . . .	95
31 VHF Engineering . . . . .	28
32 Yaesu Musen USA Inc. . . . .	Cov. III



YAESU FTDX-100 AC/DC ps built in. 80-10 M. With matching speaker \$300. WA8MLV, Tim Colbert, 6509 Marsol Apt. 123, Mayfield Hgts., OH 44124.

WANTED: Radio & electronics magazines & Callbooks from 30's and 40's. Don, 6059 Essex, Riverside, CA 92504. 714/687-5910.

WANTED Hammarlund MCD-35SX Variable Condenser. Will pay reasonable price. Elmer H. Melvin, WA8DJY, 5050 New Market Rd., Hillsboro, OH 45133.

WANTED One million Q.S.L. Cards needed, Send Q.S.L. Cards to: Philip Steven Kurkland, 357 East 201 St., Bronx, NY 10458.

SWAP OR BEST OFFER: NCX-500 xcvr with matching National power supply. Works fine 80/15/10. Needs work 40/20. Dave Hardacker, W7TO, 1745 S. Thurmond, Sheridan, Wyo. 82801.

NATIONAL Mod. 188 Gen. s.w. \$40. Hallcrafters S-20 R Gen. s.w. and ham \$35. John, WB9OEQ, 6050 North Oakley, Chicago, IL 60659.

SALE: Towers - 2 - 47ft. sections cut from 95' commercial tower, sell as one unit, \$500, or lower section \$300. Upper section \$250. Ed Lubowicki, WA2LRQ, 543 Middlesex Ave., Metuchen, NJ 08840. 201/594-2222.

CQ 1970 through 1976. 84 issues, \$20.00. K3AQR, P.O. Box Y, Conneautville, PA 16406.

WANTED: Lafayette HA-350 with manual; must be clean and reasonable. Also, TS5115, FTDX 560 or similar. WA2IBE, Box 215, Ironia, NJ 07845.

R4B - with extra crystals, \$315 plus shipping, or trade for Argonaut 509 + \$100. cash. David B. Rogers, WA7ZYQ, 210 Lauder Ave., Moscow, Idaho 83843. 208/882-7951.

FOR SALE: QST Jan 1952 to Dec 1975. \$60 or best offer plus shipping CQ Aug 1972 to date. Make offer. Ev Thatcher, K6EC, 3803 Liggett Dr., San Diego, CA 92106.

SELL: Recorders, circ. chart L & N, 3 1/2 inch strip chart Honeywell & Taylor. Xmtr pwr supply, 5 cent/watt or trade 2M gear. Robert L. Ludlum, W6NHT, 1700 Pine St., Martinez, CA 94553.

WANTED: FTDX 400 for spare rig if mint and priced right. K5ENL, Ed Block, Rt. 4, Box 127, Grandview, TX 76050.

NEW HALLET: Johnson Eliminoise kit for V-8 Engine. In original package, \$25. postpaid. L.G. Basham, W7TCT, 735 Caves Hwy., Cave Junction, OR 97523.

SELL: Hundreds of Motorola manuals 1940's, 50's, 60's, 70's. Also many other mfr's manuals. Inquire your needs one or all. Bob Farmer, 3113 No. Columbia, Plainview, TX 79072.

WANTED: Inexpensive 6m s.s.b. equipment for beginner. Contact: Phil McIntosh, Box 139, Harrisville, NY 13648.

WANTED: 0-400 dc Multimeter for Henry 2K. Advise condx and price. Carl Smith, 1070 Locust St., Denver, CO 80220.

CLEGG FM-27B, late model 4 pos., switch, Hi-low and intermod switches, heat sink, A.C. power supply, bracket, manual, \$285. Lafayette HA-350 AM C.W., s.s.b., \$95, rcvr. All excellent condx. Jerry Macari, WA2KDB, 3 Robin Ct., Coram, NY 11727.

FOR SALE: Drake R4C receiver with MS4 spkr., brand new, \$509. Drake TR4, mint condition, \$405. Thor 6-6 meter transceiver VFO, AC supply & modulator. AM/CW unit, \$105. Bearcat 210 Scanner, push bottom, new, no crystals required, \$275. K3UKW, 215/271-8898.

WANTED: CQ's 1945: 2,3,4,5, - 1946: 1,3,6. I have 1945: 1 & 12 to trade. Harold L. Hasbrouck, 1157 Palms Blvd., Venice, CA 90291.

# GET TO THE TOP FAST!

**NOW YOU CAN CHANGE, ADJUST OR JUST PLAIN WORK ON YOUR ANTENNA AND NEVER LEAVE THE GROUND!**

Rohn manufactures towers that are designed and engineered to do specific jobs and that is why we have the FOLD-OVER TOWER... designed for the amateur. When you need to "get at" your antenna just turn the handle and there it is. Rohn "fold-over" towers offer unbeatable safety. These towers let you work completely on the ground for antenna and rotator installation and servicing. This eliminates the hazard of climbing the tower and trying to work at heights that could mean serious injury in a fall. So use the tower that reduces the risks of physical danger to an absolute minimum... the Rohn "fold-over"!

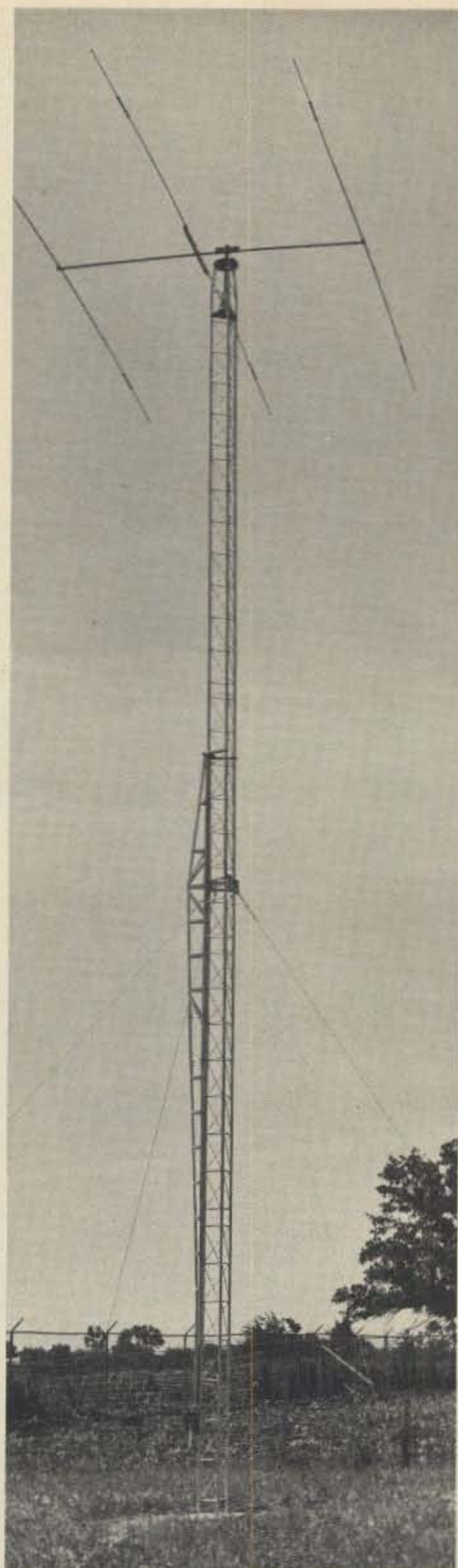
Like other Rohn big communication towers, they're hot dip galvanized after fabrication to provide a maintenance free, long lived and attractive installation. Rohn towers are known and used throughout the world... for almost a quarter century... in most every type of operation. You'll be in good company. Why not check with your distributor today?



**Unarco-Rohn**

Division of Unarco Industries, Inc.  
P.O. Box 2000, Peoria, Illinois 61601

**Do not attempt to raise antenna or antenna support near power lines— You can be KILLED.**





WANTED: Kenwood TS-700A, SP-70, Swan WM-3000, Swan WM-6200, TV-502, SP-520, B. Benningfield, Rt. 1, Eikhorn, KY 42733.

SELL OR TRADE: G.E. Progress Line Mobil Telephone Base Station, 150-174 MH. Complete unit with transmitter, receiver duplexer's, telephone line equipment and power supplies. Would make good repeater. T. Clearwater, 912 S. 6th St., Mattoon, IL 61938.

WANTED: 100 to 160 watt-2 meter amplifier, Rohn 25G tower or sections, Swan 45 mobile antenna and Drake T4XC, or T4XB. F.H. Kauppi, Rt. 1, Box 171, Gilbert, MN 55741.

ANTIQUA Tubes for Sale, warranty label attached, Sparton 485, 483, Tung-50L, no.27, E.F. Johnson Telegraph Key/sounder, brass on wooden base. Make offer. Dean Galitsis, WA2CXQ, 28-28 Utopia Pkwy., Flushing, NY 11358, (212) 352-0139.

WANTED: Johnson Navigator and telegraph sounder, sever, 147 Wise SE, North Canton, OH 44720.

MATRIC DIGITAL DIAL kHz and tenths, set for Yaesu FR-dx-400 change xtal for Drake, cost \$195, want \$125 List excess gear SASE. W4API, Box 4095, Arlington, VA 22204.

SELL All new parts for WA4DSY Synthesizer, \$75, shipped. John Teles, 10511 Teneco, Houston, TX 77099.

POLAROID Scope Camera for "S" scopes, ASR-33 manuals, new. Drake SW-4 programmable receiver, offers. A.J. Parker, 314 S. Western Ave., Springfield, OH 45506.

HELP: Resurrect an old HRO. Tubes needed, 2 type 58, 1 type 2B7. Price to: John Martin, WB7DFR, 212 154th Pl. SE, Bellevue, WA 98007.

SELL: Sonar 3601, 2 Meter, 8 Channel, mint, fully xtal'd with Sonar 2923 A.C. P.S. \$225. W4MGL, 7010 S.W. 16th, Plantation, FL 33317, (305) 792-4600.

TWO ROTATABLE ALUMINUM TOWERS: 66 feet, \$299 each. Complete with all hardware. WA2AJN, 0-147 Blue Hill Ave., Fair Lawn, NJ 07410, (201) 794-0089.

JOHNSON 275 watt matchbox with s.w.r. meter \$75 postpaid. Heathkit modified for 20 meters. HG 10B VFO, both for \$140 postpaid. Bob Craig, 4950 Sunshine Ave., Santa Rosa, CA 95405.

NEED: Keyer, trade 30 MHz dig freq. ctr, ctr. tester/rejuv (new) 3" O'scope, or offer cash. Dave Miller, Box 6113, Hilton Head Island, SC 29928.

TUBES: 5678's, 5676's, 1007's, \$2.00 each. 211's, 800's, 810's, 811's, \$6.00 each. All unused/boxed. Many others, send needs. Ken Meyer, WB9YUY, Route 3, Sturgiscon Bay, WI 54235.

SELL: HR 10-B rec. w/xtl cal., \$75. DX-60 B and HG 10-B VFO, \$95, mint w/manuals and extras. Ken Meyer, WB9YUY, Route 3, Sturgiscon Bay, WI 54235.

HEATH: SB303 w/NB, \$295, SB614 monitor, \$135, SB634 console, \$150. All prof. built, in unused, mint condx, will ship. V.M. Faulkner, RR2 Box 294A, Yorktown, IN 47396.

VLF receiver 14-600 kc WRR-3B like new, \$285. Simplex Time Stamp mod. HA-2F, great for traffic met opr., \$45. K6KZT, 2255 Alexander Ave., Los Osos, CA 93402.

SELL: Heath DX-60B xmtr, \$85, HG-10B VFO, \$50, HD-10 Keyer, \$30. All mint, includes manuals and 3 novice xtals. J. Conery, WA1ZVA, 8 Thompson Rd., Beverly, MA 01915.

TRADE: excel. condx R-390 for FT-401B xcvr. w/FV-401 VFO. Prefer local, will ship to 500 mi. Gerald Myers, WB7AVO, 4417 E. Ash Ave., Las Vegas, NV 89110.

CASH for Heathkit Model 610 Monitor Scope and National SW-3 rcvr. W1LMS, 15 Arcadia Rd., Andover, MA 01810.

COLLINS 51S-1, near mint, \$1100 PPD. KLM ECHO II, mint, USB/LSB, preamp, Oscar range, \$235 PPD. Parts for 51J/R388 and Apache. K6SDE (408) 867-9533.

NO DX QSL's? Try ham sentences in 54 languages on your card. It works. K3CHP's DX QSL Guide, \$3.95. Joe Mikuckis, 6913 Furman Pkwy, Riverdale, MD 20840.

CLEGG: FM 22'er continuous tune rcvr 143.4 to 148.3 MHz. Nine xmitting freq channels all crystallized. AC & DC supply 32 watts out. xcellent condx, \$190. Max Sherr, W2TQP, (212) 380-3826.

WANTED: Narco VTLR-2 Manual (s) and antenna information. Carl Demmin, RR2, Sheboygan, WI 53081.

WANTED: Collins KWM-2 or S-line. UHF watt meter. J.W. Maver, 1049 N. Holliston Ave., Pasadena, CA 91104.

WANTED: Receiver for 160 to 190 KHz or general coverage VLF-LF receiver like SRR-11 in good working condition. J. Pilgram, 6123 Premiere Ave., Lakewood, CA 90712.

SIGNAL ONE CX7A mint condx, CW2 filter plus RIT, warranty and manual, \$1155. R.D. Mace, 8600 Skyline Dr., Los Angeles, CA 90046.

SELL: SB-303, good to excellent condx, for 280. Also DX-100 fair to good condx, for 150. Will bargain for price. Neil D. Fox, 4927 Birch Lane, Alexandria, VA 22312.

WANTED: Old wireless, radios, xmtrs, parts, tubes, literature, etc. Troe, 111 Skyline, Morristown, NJ 07960.

SELL: QST/CQ/73, s.a.s.e. for list. Guimares, Atwood Ave., Middleboro, MA 02346.



# Speak up.

We know all about up. In fact, we're number one from the ground up...when it comes to amateur communications towers. We've been building them for HAMS for more than two decades.

Whether you're thinking crank-up, guyed or free-standing, check with us first. We're Tri-Ex. Reliable, dependable.

When we say number one from the ground up, we're talking about towers like Tri-Ex's new "Big W" shown here. It's a free-standing crank-up with a height of 80-ft, providing good DX capability at low cost. Ideal for serious HAMS.

Write today. We'll help you speak up. As high as you want to go. Act now.



**Tri-Ex**  
TOWER CORPORATION  
7182 Rasmussen Ave.  
Visalia, Calif. 93277



# YAESU—The “Something For Everyone” Line Of Quality Ham Gear!



**FT-301S or FT-301SD**  
Analog or digital dial, 40 watts PEP  
all solid state, broadbanded output!  
160-10 meters



**FT-301 or FT-301D**  
Analog or digital dial, 240W PEP, all  
solid state, broadbanded output!  
160-10 meters



**FT-221R Transceiver**  
All mode 144-148 MHz, 20 watts  
input, standard repeater shifts + 1  
non-standard shift



**FT-101 Series**  
3 models, 260W PEP, 160-10M + 2  
and 6M with our transverters.



**FT-620B Transceiver**  
SSB, CW, AM, 50-54 MHz  
20 watts input

*Everything Is Stacked In  
Your Favor At Yaesu*

**QRP  
BASE KW  
RTTY  
MOBILE  
MARS  
CAP**

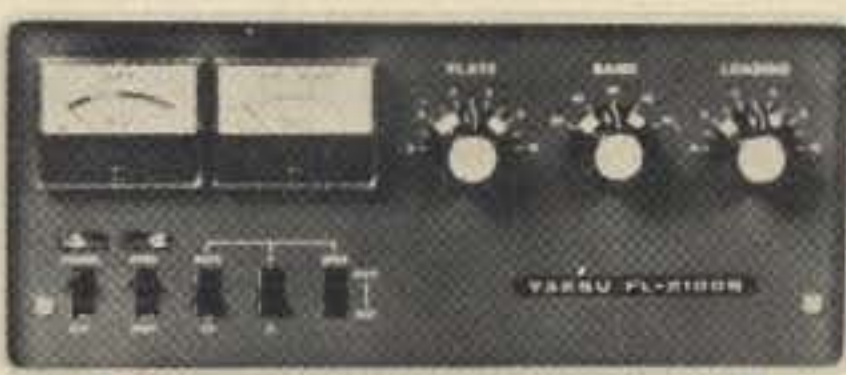
**160-2 MTRS.  
USB-LSB  
CW-FM  
DIGITAL DIAL  
ANALOG DIAL  
SWL**



**FR-101 or FR-101D**  
Analog or digital readout receiver, all  
ham bands + SW frequencies with  
accessory crystals



**FL-101 Transmitter**  
160-10 M, 200W PEP, matches the  
FR-101 receiver—“The Yaesu Twins!”



**FL-2100B Linear**  
Matches the 101 series—80-10 me-  
ters, 1200 watts PEP, 1 KW CW.  
Self contained power supply



**FRG-7 Receiver**  
Solid state, triple conversion, 500  
KHz to 29.9 MHz, continuous tuning

... plus a full line of accessories—2 and 6 meter  
transverters, counters, world clock, VFO's, micro-  
phones, phone patch, wattmeters, monitor scopes  
and much more! Send us your name, address and  
ham call for our new 1977 full line catalog.

101 OWNERS: New 226 page service and  
maintenance manual now available. Write for  
information. Soon to come—FT-221 series  
service and maintenance manual!

**YAESU**  
**The radio.**



777

YAESU ELECTRONICS CORP., 15954 Downey Ave., Paramount, CA 90723 (213) 633-4007  
YAESU ELECTRONICS CORP., Eastern Service Ctr., 613 Redna Ter., Cincinnati, OH 45215



# You've never seen a four tube, 2 megawatt amplifier.

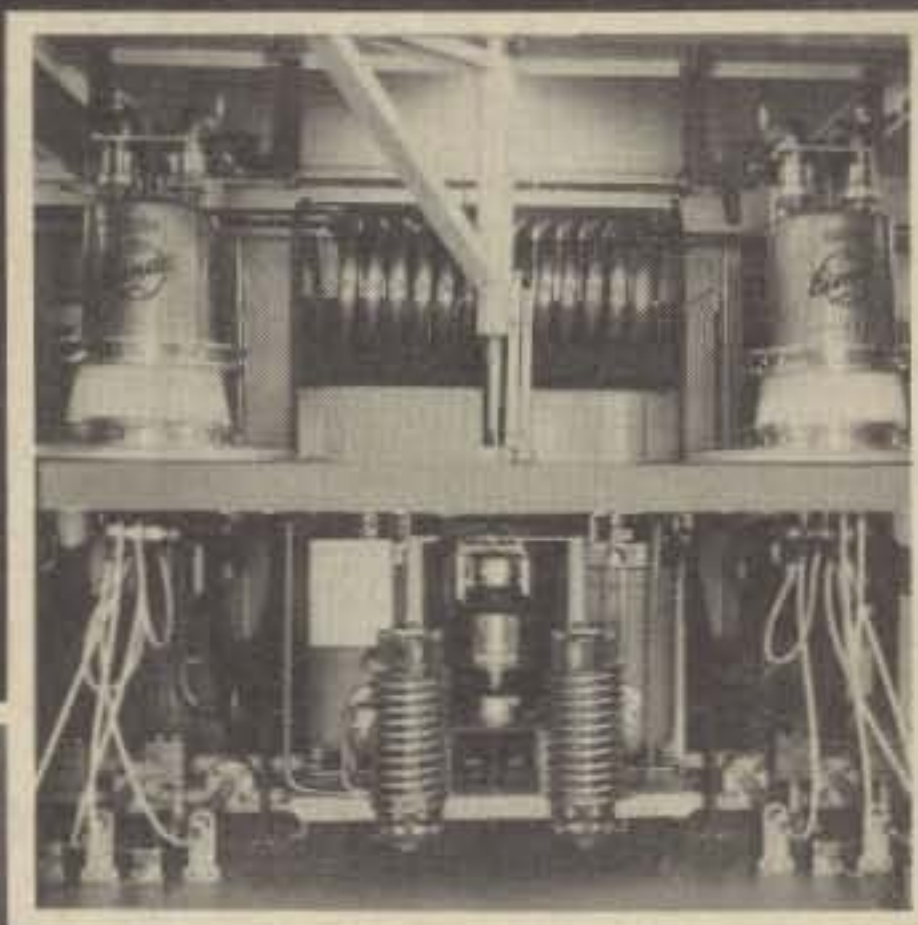
## Until Now.

Look at this new generation Continental Electronics 323C medium wave broadcast transmitter. You'll see two EIMAC X-2159 tetrodes are used in each amplifier section, one as a carrier tube and the other as a peak tube. The two Doherty-type screen impedance modulated (SIM) amplifier sections are combined to provide a 2 megawatt carrier, 100 percent modulated.

This is the first of 12 amplifier sections built for three Saudi Arabia locations. They will be used as building blocks for 1 or 2 megawatt transmitters in the

broadcast service. Similar approaches are planned for other locations in Saudi Arabia.

For information about power tubes for your transmitter, contact Varian, EIMAC Division, 301 Industrial Way, San Carlos, California 94070. Telephone (415) 592-1221. Or call any of the more than 30 Varian Electron Device Group Sales Offices throughout the world.



varian

