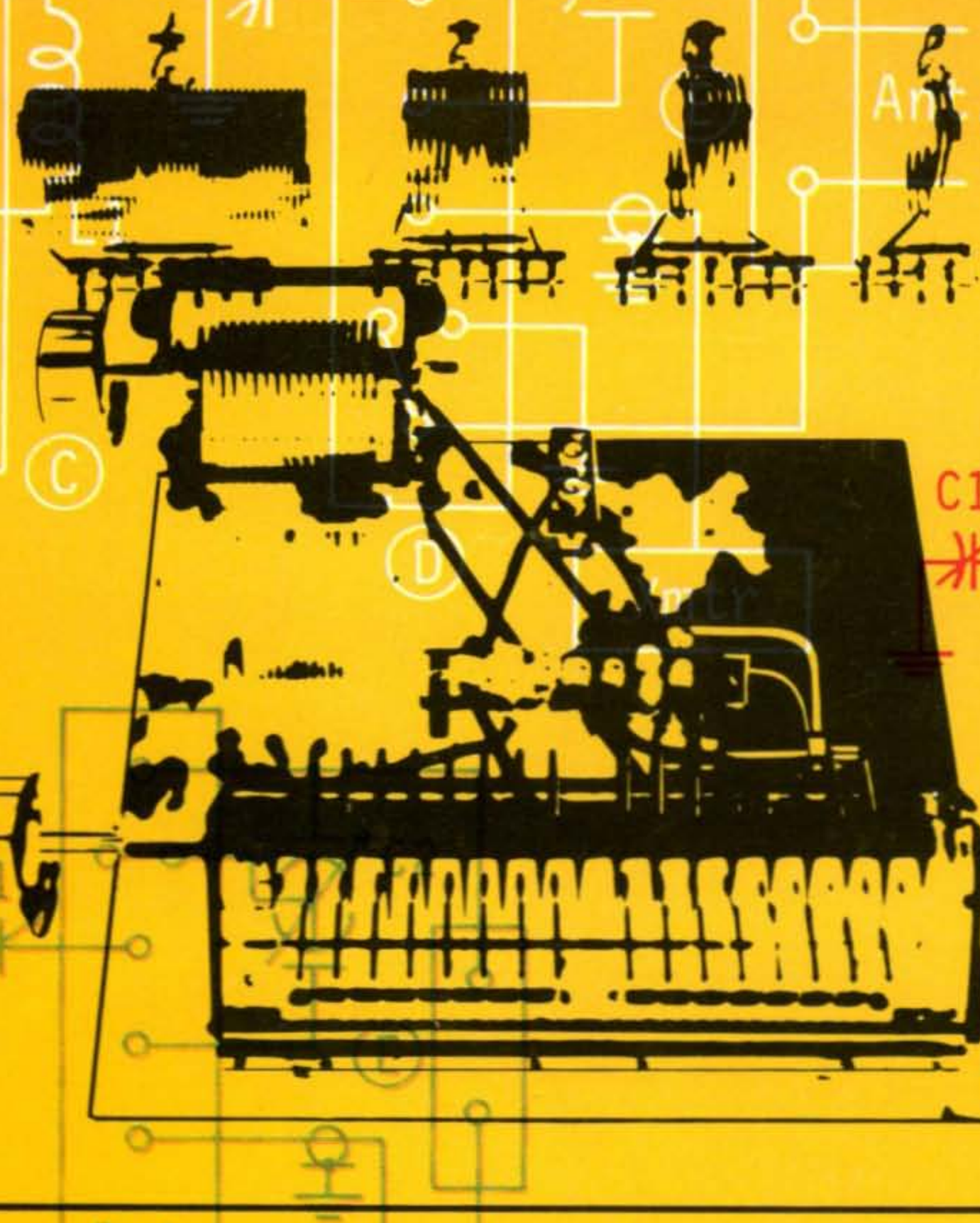
CQ

April 1973

$1.00

Converting FAX Machines for Ham Use
page 33

A 2KW NO-COMPROMISE ANTENNA TUNER



The Radio Amateur's Journal

3240

More power to you, with

Power to get you to the pole — Heathkit SB-220 2 kW Linear... 369.95*

The SB-220 uses a pair of conservatively rated Eimac 3-500Z's in grounded grid circuitry to provide up to 2000 watts PEP SSB input. And it can be loaded to a full 1 kW input on both CW and RTTY. A broadband pre-tuned pi-input delivers maximum efficiency with low distortion over 80 thru 10 meters. Requires only 100 watts drive. Built-in solid-state power supply can be wired for either 120 or 240 VAC. Built-in circuit-breaker protection. Zener diode regulated operating bias reduces idling current for cooler running, extended tube life. A large quiet fan is another plus feature. Other features include ALC to the driving unit to prevent overdriving; front panel switch-selected monitoring of grid current, relative power and high voltage; easy, enjoyable 20 hour assembly. **Kit SB-220,** 69 lbs.

SB-220 SPECIFICATIONS — Band coverage: 80, 40, 20, 15 and 10 meters. **Driving power:** 100 W. **Max. power input:** SSB, 2000 W. PEP; CW, 1000 W.; RTTY, 1000 W. **Duty cycle:** SSB, Continuous voice modulation. CW, Continuous (maximum key-down 10 minutes). RTTY, 50% (maximum transit time 10 minutes). **Third order distortion:** —30 dB or better. **Input impedance:** 52 ohm unbalanced. **Output impedance:** 50 ohm unbalanced; SWR 2:1 or less. **Front panel controls:** Tune, Load, Band, Sensitivity Meter Switch, Power, CW/Tune — SSB, Plate meter, Multi-meter (Grid mA, Relative Power and High Voltage). **Rear panel:** Line cord, circuit breakers (two 10 A). Antenna Relay (phono). ALC (phono). RF Input (SO-239). Ground post. RF Output (SO-239). **Tubes:** Two Eimac 3-500Z. **Power required:** 120 VAC, 50/60 Hz at 20 amp. max. 240 VAC, 50/60 cycles, at 10 amp. max. **Cabinet size:** 8¼" H x 14⅞" W x 14½" D.

Power up with 1200 watts SSB, 1 kW CW — Heathkit SB-200... 229.95*

Provides 1200 W PEP SSB input, 1000 W CW. Built-in solid-state power supply with circuit breaker protection. Metering for SWR grid current, plate current, relative power, plate voltage. ALC output. Shielded, fan-cooled amplifier compartment. Pre-tuned cathode input circuit for maximum efficiency and low distortion.

The sturdy, yet lightweight construction of the SB-200 is achieved through the use of a heavy-gauge one-piece aluminum chassis that is partitioned for extra strength and isolation of components and circuitry. This clean, open lay-out makes assembly extra easy, too. **Kit SB-200** 50 lbs.

SB-200 SPECIFICATIONS — Band coverage: 80, 40, 20, 15 and 10 meters. **Maximum power input:** 1200 W P.E.P. SSB, 1000 W CW. **Driving power required:** 100 W. **Duty cycle:** SSB, continuous voice modulation; CW, 50% (key down time not to exceed 5 min.) **Third order distortion:** 30 dB or better at 1000 W P.E.P. **Output impedance:** 50-75 ohm unbalanced; variable pi-output circuit SWR not to exceed 2:1. **Input impedance:** 52 ohm unbalanced broad-band pretuned input circuit requires no tuning. **Meter functions:** 0-100 mA grid current, 0-1000 mA plate current, 0-1000 relative power, 1:1-3:1 SWR, 1500-3000 volts high voltage. **Front panel controls:** Load; Tune; Band; Relative Power Sensitivity; Meter Switch, Grid-Plate-Rel. Power-SWR-HV; and Power Switch, on/off. **Tube complement:** Two 572B/T-160-L (in parallel). **Power requirements:** 120 VAC @ 16 A (max.), 240 VAC @ 8 A (max.). **Cabinet size:** 6⅝" H x 14⅞" W x 13⅜" D.

NEW Heathkit RF Absorption Wattmeter... 59.95*

Great for tuning up off the air. Features 50-ohm non-inductive, air cooler load with less than 1.2:1 SWR for frequencies of 1.8 to 30 MHz; 0-200 & 0-1000 wattmeter range ±10% full-scale accuracy; power rating, 175 watts cont., 1000 watts max; overload indicator lamp with built-in test circuit; 6" H x 5⅜" W x 13¾" D. **Kit HM-2103,** 6 lbs.

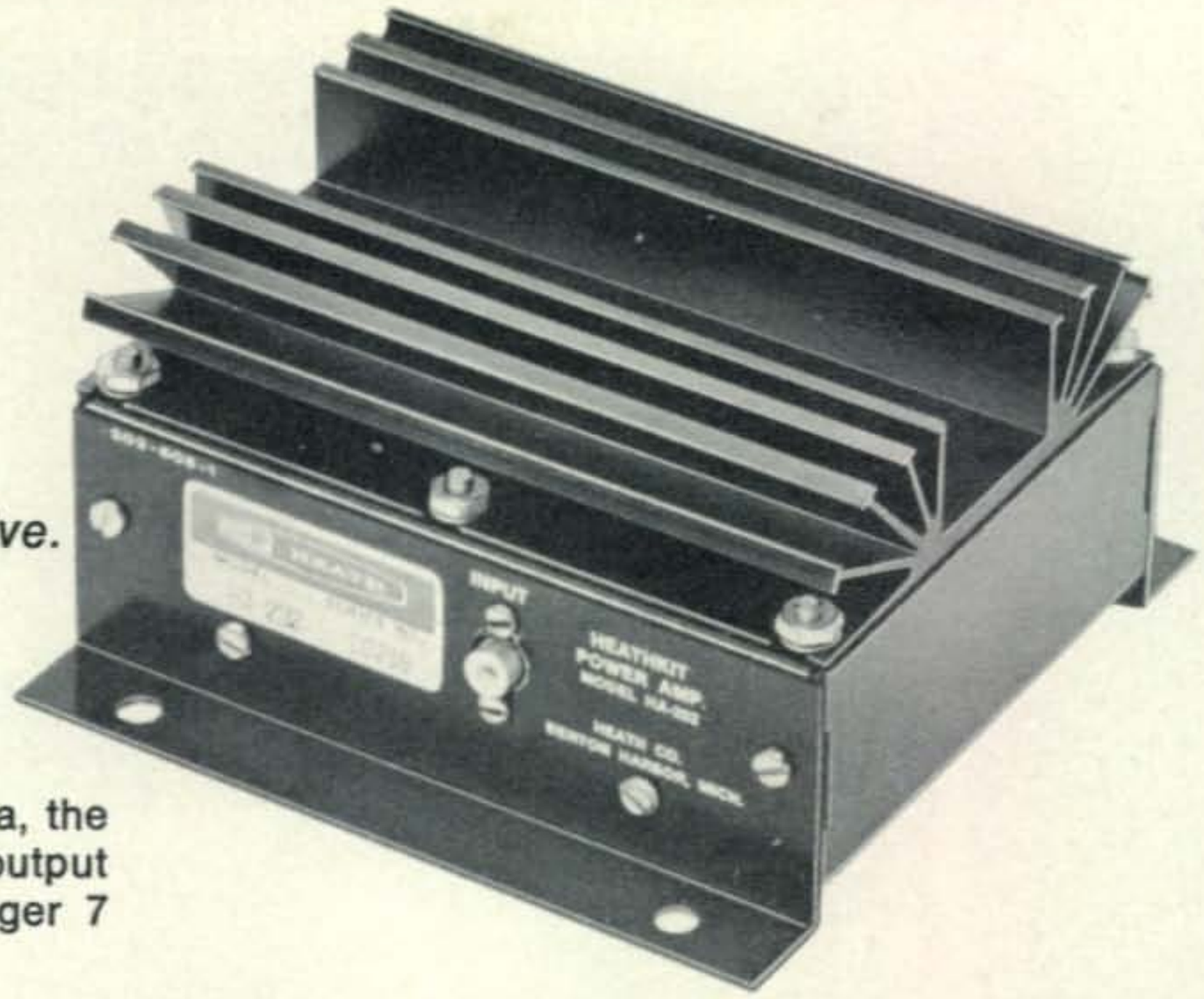
Heathkit Wattmeter/ SWR Bridge... 29.95*

Two switch-selected ranges measure RF output from 10-200 and 100-2000 W.. built-in SWR capability for proper tune-up, transmission line to antenna Z matching. Negligible loss for permanent insertion into 50 ohm line. Remote detector permits placement of meter in any convenient location. (6 ft. of cable supplied.) **Kit HM-102,** 4 lbs.

HM-102 SPECIFICATIONS — Frequency range: 1.8 to 30 MHz. **Wattmeter accuracy:** ±10% of full-scale reading. **Power capability:** 10 to 2000 watts. **Impedance:** 50 ohm nominal. **Connectors:** UHF type SO-239. **Dimensions:** 5⅛" H x 5¼" W x 6½" D.

Heathkit® SSB, CW & NEW FM amps

NEW Heathkit 2-Meter Amplifier for cleaner FM copy on the fringe... 69.95*



40 watts nominal out for 10 watts in — *requires only 12 VDC supply.*

Fully automatic operation — *with any 2-meter exciter delivering 5-15 watts drive.*

Solid-state design — *all components mount on single board for fast, easy assembly.*

If you're regularly working from a fringe area, the new Heathkit HA-202 can boost your mobile output to 40 watts (nominal), while pulling a meager 7 amps from your car's 12-volt battery.

Install it anywhere...in the trunk, under the hood or dashboard. Use it with any 2-meter exciter delivering 5-15 watts drive. Features fully automatic operation. An internal relay automatically switches the antenna from transmit to receiver mode when you release the mike button.

All solid-state design features rugged, emitter-ballasted transistors, combined with a highly efficient heat sink, permitting high VSWR loads. Tuned input-output circuits offer low spurious output to cover the 1.5 MHz segment of the 2-meter band without periodic readjustment. All components mount on a single printed circuit board for easy, 4-hour assembly. Manual shows exact alignment procedures using either a VOM or VTVM. And installation is just as simple.

Kit includes transceiver connecting cable, antenna connector. Operates from any 12 VDC system — additional power supplies are not required. Add HA-202 power to your mobile 2-meter rig, and boom out of the fringe. **Kit HA-202,** 3 lbs.

HA-202 SPECIFICATIONS — Frequency range: 143-149 MHz. **Power output:** 20W @ 5 W in, 30W @ 7.5W in, 40W @ 10 W in, 50W @ 15 W in. **Power input (rf drive):** 5 to 15W. **Input/output impedance:** 50 ohms, nominal. **Input VSWR:** 1.5:1 max. **Load VSWR:** 3:1 max. **Power supply requirements:** 12 to 16 VDC, 7 amps max. **Operating temperature range:** −30° F. to +140° F. **Dimensions:** 3″ H x 4¼″ W x 5½″ D.

New Heathkit VHF Wattmeter/SWR Bridge... 29.95*

Perfect tune-up tool for your 2-meter gear. Tests transmitter output in power ranges of 1 to 25 watts and 10 to 250 watts ±10% of full scale. 50 ohm nominal impedance permits placement in transmission line permanently with little or no loss. Built-in SWR bridge for tuning 2-meter antenna for proper match, has less than 10-watt sensitivity. **Kit HM-2102,** 4 lbs.

HM-2102 SPECIFICATIONS — Frequency range: 50 MHz to 160 MHz. **Wattmeter accuracy:** ±10% of full-scale reading.* **Power capability:** To 250 W. **SWR sensitivity:** less than 10 W. **Impedance:** 50 ohms nominal. **SWR bridge:** Continuous to 250 W. **Connectors:** UHF type SO-239. **Dimensions:** 5¼″ W, 5⅛″ H and 6½″ D, assembled as one unit.
*Using a 50 Ω noninductive load.

See them at your Heathkit Electronic Center — or fill out coupon for FREE Heathkit catalog

HEATHKIT ELECTRONIC CENTERS

ARIZ.: Phoenix, 2727 W. Indian School Rd.; **CALIF.: Anaheim,** 330 E. Ball Rd.; **El Cerrito,** 6000 Potrero Ave.; **Los Angeles,** 2309 S. Flower St.; **Pomona,** 1555 Orange Grove Ave. N.; **Redwood City,** 2001 Middlefield Rd.; **San Diego (La Mesa),** 8363 Center Dr.; **Woodland Hills,** 22504 Ventura Blvd.; **COLO.: Denver,** 5940 W. 38th Ave.; **CONN.: Hartford (Avon),** 395 W. Main St. (Rte. 44); **FLA.: Miami (Hialeah),** 4705 W. 16th Ave.; **GA.: Atlanta,** 5285 Roswell Rd.; **ILL.: Chicago,** 3462-66 W. Devon Ave.; **Downers Grove,** 224 Ogden Ave.; **IND.: Indianapolis,** 2112 E. 62nd Ave.; **KANSAS: Kansas City (Mission),** 5960 Lamar Ave.; **MD.: Baltimore,** 1713 E. Joppa Rd.; **Rockville,** 5542 Nicholson Lane; **MASS.: Boston (Wellesley),** 165 Worcester St.; **MICH.: Detroit,** 18645 W. Eight Mile Rd. & 18149 E. Eight Mile Rd.; **MINN.: Minneapolis (Hopkins),** 101 Shady Oak Rd.; **MO.: St. Louis,** 9296 Gravois Ave.; **N.J.: Fair Lawn,** 35-07 Broadway (Rte. 4); **N.Y.: Buffalo (Amherst),** 3476 Sheridan Dr.; **New York City,** 35 W. 45th St.; **Jericho, L.I.,** 15 Jericho Turnpike; **Rochester,** Long Ridge Plaza; **OHIO: Cincinnati (Woodlawn),** 10133 Springfield Pike; **Cleveland,** 5444 Pearl Rd.; **PA.: Philadelphia,** 6318 Roosevelt Blvd.; **Pittsburgh,** 3482 Wm. Penn Hwy.; **TEXAS: Dallas,** 2715 Ross Ave.; **Houston,** 3705 Westheimer; **WASH.: Seattle,** 221 Third Ave.; **WIS.: Milwaukee,** 5215 Fond du Lac.

HEATH
Schlumberger

HEATH COMPANY, Dept. 12-4
Benton Harbor, Michigan 49022

☐ Please send FREE Heathkit Catalog.

Enclosed is $_____, plus shipping.

☐ Please send model(s)_____

Name_____

Address_____

City_____ State_____ Zip_____

Prices & specifications subject to change without notice.
*Mail order prices; F.O.B. factory AM-279

New FPM-300, a low-priced, versatile, compact SSB/CW transceiver with latest high performance FET and integrated circuits plus extended coverage.

This new radio, with built-in AC-DC power supply, is compactly designed with modular construction techniques for effective and reliable service in fixed, portable and mobile use for amateur, Civil Defense, CAP, MARS, RACES and other utility HF Communications Services.

The new transceiver has premium type glass epoxy printed circuit board construction for greater reliability, routine maintenance and features the latest state-of-the-art solid state devices throughout. The All-American made radio, priced at only $595, is also equipped with a unique integrated circuit speech compressor design for extended "talk power" plus many other built-in features—all good reasons why you should be talking with a Hallicrafters.

For additional data see your Hallicrafters distributor or write or phone:

The Hallicrafters Co., 600 Hicks Road, Rolling Meadows, Ill., 60008 U.S.A.
Phone: 312/259-9600

You should be talking with a Hallicrafters.

APRIL, 1973 VOL. 29, NO. 4

The Radio Amateur's Journal

FEATURES

DEPARTMENTS

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

CQ (Title registered U.S. Post Office) is published monthly by Cowan Publishing Corp. Second Class postage paid at Port Washington and Phillipsburg, N.J. Subscription Prices: one year, $6.00; two years, $11.00; three years, $15.00. Allow six weeks for change of address. Printed in the United States of America.

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

STEP UP TO TELREX
Professionally Engineered Antenna Systems

Single transmission line "TRI-BAND® ARRAY"

By the only test that means anything . . . on the air comparison . . . this array continues to outperform all competition . . . and has for two decades. Here's why . . . Telrex uses a unique trap design employing 20 HiQ 7500V ceramic condensers per antenna. Telrex uses 3 optimum-spaced, optimum-tuned reflectors to provide maximum gain and true F/B Tri-band performance.

ONLY TELREX GIVES YOU ALL THESE FEATURES . . .

- Power rating 4 KW PEP . . . rain or shine
- Wind rating survival 110 MPH
- Patented broad-band coaxial Balun
- Heavy-duty steel gusset mounting plate
- Aluminum boom 2 in., 2½ in. O.D. x 18 ft.
- Large diameter, .058 wall taper-swaged dural elements for minimum weight and exceptional strength to weight ratio
- Stainless steel electrical hardware

With a Telrex Tri-band Array you get 49 lbs. of educated aluminum engineered and built to provide many, many years of performance unmatched around the world by any other make. Longest element 36 ft. Turning radius 20 ft. Shipping weight 65 lbs. Shipping container 13 in. x 5 in. x 13 ft.

Note: If not available from your dealer, order direct. You'll get fast, personal service.

Telrex Labs are design engineers, innovators and manufacturers of the world's finest ¾ to 160 meter communication systems and accessories priced from $25 to $25,000.

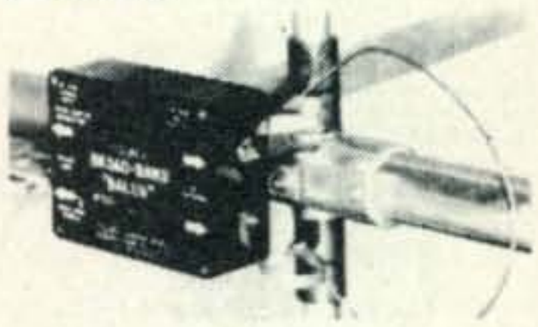
For technical data and prices on complete Telrex line, write for Catalog PL 70.

MONARCH
TB5EM/4KWP **$395.00**
FOB Asbury Park, N.J.

OTHER MULTI-BAND ARRAYS AVAILABLE

Elements shortened to show details.

BALUN



TRAP

TYPICAL TELREX MONOBAND ANTENNAS

Mod. 15M317-	15 mtr. 3 el. rotary, 10 DB gain, 4 KWP pow. rat., 2½" O.D. x 17' boom	$175.00
Mod. 20M326-	20 mtr. 3 el. rotary, 10 DB gain, 8 KWP pow. rat., 3½" O.D. x 26' boom	355.00
Mod. 2M609-	2 mtr. 6 el. array, 14 DB gain, 300 W pow. rat., 1" x 9' boom	39.95
Mod. 2M814C-	2 mtr. 8 el. array, 16.5 DB gain, 300 W pow. rat., 1.375" x 14' boom	59.00
Mod. 6M516-	6 mtr. 5 el. array, 13 DB gain, 400 W pow. rat., 1.5" x 16' boom	63.95

SINCE 1921 telrex Communications and TV Antennas LABORATORIES

Asbury Park, New Jersey 07712 201-775-7252

ZERO BIAS

Our February Zero Bias voiced our discontent and alarm with the increasing abuse of high power by US amateurs, and took a step in the direction of censuring those who, for whatever reason, choose to operate outside the law. The editorial has evoked strong response from readers both favorable (the great majority) and unfavorable (thankfully, a minority, but one blessed with a seaman's vocabulary!). A has been hit.

We're surprised at the righteous indignation expressed by the dissidants. It baffles us how intelligent amateurs can so distort a wrong as to make it come out right. One particular writer thought sure that the new *CQ* contest policy aimed at discouraging super power operations was a direct indictment of him and his fellow W6 DXers! Not so! We know that the BIG linear is fairly common on the West Coast, but it's as common among W5's, W9's, W3's, and W2's. If our condemnation of super power makes you squirm then we've reached the right man.

One argument expressed by some midwestern and far western operators is that the high power is necessary to be able to compete effectively with east coast stations. This may sound like a bit of East Coast chauvinism, but where is it stipulated that all things must be equalized for all areas, and who's got the pipeline to the Orient and South Pacific. No, that argument holds little water.

A new (for the US) approach to the problem has been suggested: If the power limit for amateurs was based not on input power, but on the manufacturer's rated plate dissipation for the final tube or tubes, then a competent amateur would strive to build an amplifier with superior efficiency, rather than the brute force approach to power now used. Let's say that the power limit for amateurs was defined as a total c.w. plate dissipation capability of 1000 watts for the final tube or tubes. How much power can *you* get out of a 4-1000A or a pair of 3-500Z's? How much are you getting out now, or doesn't that really concern you? It might, if you knew that your neighbor had retired his 4CX5000A final and was figuring ways to wring an extra 500 watts out of his kw bottle

Maybe that's a more manageable approach to the problems of high power. What do you think?

Dial-A-Prop

Our new automatic telephone answering system, providing up-to-date propagation predictions revised weekly, has been doing a remarkably good business, especially considering that the announcement of the new service in the March issue is only beginning to be read as this is being written. The special telephone number, 516 883-6223 is being dialed at a rate of up to 75 times a day, and this is only the beginning!

As a further service to amateurs, special Contest Weekend Predictions are being prepared by W3ASK giving detailed and last-minute propagation predictions for major DX contest weekends. For example, special reports were taped for the ARRL Phone and CW DX contests, and the 4X4 International DX Contest during the first month of Dial-A-Prop. These special reports are recorded on Friday afternoons.

A hint for Dial-A-Prop users: be sure to have paper and pencil handy before dialing, or better still be prepared with your cassette tape recorder to tape the 2-minute-plus prediction. It plays only once and then disconnects, so if you miss something, you'll have to dial again.

We've received comments from out-of-town users, asking if there were plans afoot to set up Dial-A-Prop numbers in other parts of the US. The answer is no, not at the moment, although we welcome inquiries from highly responsible amateur organizations. Should the demand be great enough, we'll certainly consider extending the service to other geographic areas. Bear in mind, however, that even though Port Washington, N.Y. is a long distance call away from most places in the US, night and weekend rates from anywhere in the US are only $1 for a three-minute call.

Incidentally, in the first month of operation, W3ASK's predictions have been wrong only once!

73, Dick, K2MGA

Problem-solving handbooks

Highly popular Editors and Engineers books from Sams give amateurs everything they need to know about radio operation and technology. They're authoritative, clear, and easy to follow. You'll want them for your library.

Famous E&E RADIO HANDBOOK—19th Edition
By William I. Orr, W6SAI
The completely updated electronics industry standard for engineers, technicians, and advanced amateurs. Shows how to design and build all types of radio-communications equipment. Includes ssb design and equipment, RTTY circuits, latest semiconductor circuits, IC's, and special circuitry. **No. 24030—$14.95**

SINGLE SIDEBAND: THEORY & PRACTICE
By Harry D. Hooton, W6TYH
A basic text covering the origin of ssb, derivation of signals, sideband selection, ssb generators, carrier-suppression techniques, carrier generators, speech amplifiers and filters, balanced mixers and converters, low-power ssb transmitters, linear r-f power amplifiers, and much more. **No. 24014—$6.95**

SEMICONDUCTOR AMATEUR PROJECTS
By Louis M. Dezettel, W5REZ
For the ham who still takes pride in using his hands and head, here are projects for 16 useful, money-saving accessories, using easy-to-build semiconductor circuitry. Units are for measuring equipment, increasing power and adding convenience, etc. **No. 24025—$4.95**

MARINE SINGLE SIDEBAND
By Donald M. Stoner and Pierre B. Goral
Covers the why and how of single sideband; interpreting specifications, alignment tests and measurements, installations, securing a limited coastal license, high-seas telephone service, and marine radio terminology. **No. 24029—$5.95**

RADIO AMATEUR OPERATING HANDBOOK
By Marshall Lincoln, W7DQS
This single-source working guide is a practical aid for improving the operating methods and techniques of hams. **No. 24028—$4.95**

SOLID-STATE QRP PROJECTS
By Edward M. Noll, W3FQJ
By building QRP equipment you learn solid-state technology, since these rigs include transistors and/or integrated circuits. The low-cost units described have power ratings from less than 100 milliwatts up to about 20 watts. Both cw and phone rigs are included. **No. 24024—$4.25**

73 DIPOLE AND LONG-WIRE ANTENNAS
By Edward M. Noll, W3FQJ
Detailed construction data for 73 different types of wire antennas. Appendices describe construction of noise bridges and line tuners, plus data on measuring resonant frequency, velocity factor, and SWR. **No. 24006—$4.50**

73 VERTICAL, BEAM, AND TRIANGLE ANTENNAS
By Edward M. Noll, W3FQJ
Design and construction of 73 different antennas used by amateurs, each built and air-tested by the author. Also construction of noise bridges, transmission-line tuners, and measurement methods. **No. 24021—$4.95**

ELECTRONICS FOR THE AMATEUR
By Louis M. Dezettel, W5REZ
Covers radio-wave propagation as it applies to amateur band frequencies, reception and transmission pertaining to ham equipment, and the special field of antennas and how to feed them. Provides you with everything needed to pass the theory sections of the FCC exams. **No. 24022—$7.95**

RADIO AMATEUR'S F-M REPEATER HANDBOOK
By Ken W. Sessions, Jr., K6MVH
The definitive work on amateur f-m repeaters. Includes: Preparing and obtaining sites for repeaters; How to build a repeater; Repeater applications; and an f-m repeater directory. **No. 24008—$6.95**

AMATEUR TESTS AND MEASUREMENTS
By Louis M. Dezettel, W5REZ
Shows how to accomplish virtually all performance tests on amateur transmitters, receivers, and antennas, and how to make required adjustments. **No. 24007—$5.50**

HAM AND CB ANTENNA DIMENSION CHARTS
By Edward M. Noll, W3FQJ
Tabulates dimension data in feet and inches for all popular antenna configurations. With this data, an antenna can be dimensioned for a specific frequency range according to license class and mode of operation. **No. 24023—$1.95**

Order from your electronic parts distributor or send coupon below.

EDITORS AND ENGINEERS

Howard W. Sams & Co., Inc. CQ043
4300 W. 62nd St., Indianapolis, Ind. 46268

Send me the following books. Nos. _____

_____ $_____ encl

Please include sales tax where applicable

☐ Send FREE 1973 Sams Book Catalog

Name_____
PLEASE PRINT
Address_____

City_____ State_____ Zip_____

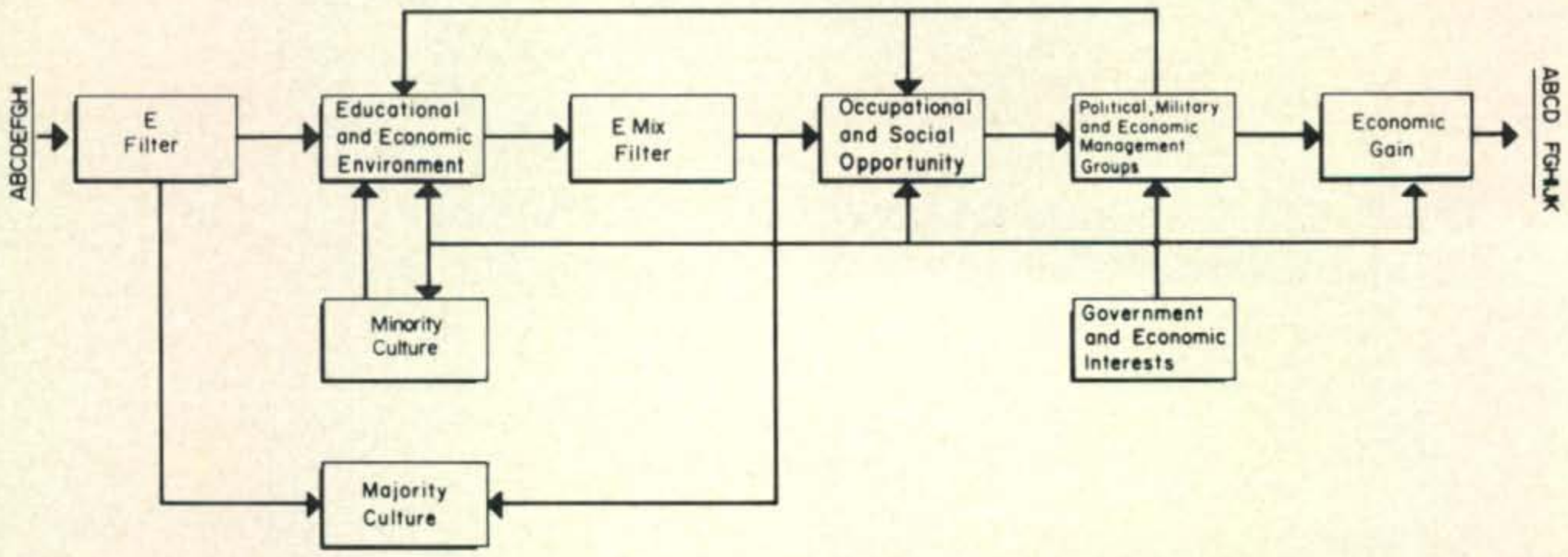
OUR READERS SAY

The Social Receiver

Editor, *CQ:*

Congratulations to Vernon Dawson, K6RRC, for his fine article on the Social Receiver in the January issue of *CQ*. His analogy is quite interesting; however, many people believe the receiver has been modified. Many Americans are inclined to agree and assume that Vern used an outdated block diagram. I present this modified block diagram which I believe is the most widely accepted.

The receiver has been modified with a selective E filter at the Input to reduce the E factor (average white American male) and a second E Mixed filter which is just ahead of the IF Stage to eliminate any E factor that might leak through returning it to a majority culture. Therefore, the receiver accepts ABCD-FGHI. The majority culture (tuning oscillator) has also been modified to minority cultures. E and possible E Mixed is returned to the majority culture which accomplishes nothing. Therefore, the resultant economic gain is ABCD-FGHI.



I present this modified block diagram as what the average American sees today. This could be due to the fact that the average American may suffer from "Tunnel Vision." This possible lack of peripheral vision may preclude his seeing the injustices to others.

Embert D. Walker
El Paso, Texas

Editor, *CQ:*

As further proof that there is nothing new under the sunspot, I refer you to the article entitled, "The Social Receiver," on page 62, January *CQ*.

Mr. Dawson's analogy is well-drawn, and his specifications are quite valid. His front end design principle, however, is far from original. The first example, to the best of my recollection, to be published of a receiver front end capable of selecting E out of the economic-socio-cultural spectrum from A to I, was introduced in *QST* for June, 1929, on page 75. (I refer to the first published practical solution to a social problem which had existed since the formation of societies.)

Produced by the Pilot Electric Mfg. Co., it was designated the Pilot Super WASP!

Lest my observation be misconstrued as any derogation of Mr. Dawson's views, I would comment that the principles involved in the design of the Super WASP fell far behind the State of the Art, many years ago.

H. Eddy, W2BU
Oneonta, New York

Editor, *CQ:*

Referring to your article, "The Social Receiver" (January issue), I thought I might add that most modern models of this receiver come completely equipped with a police bands squelch, usually in the far right corner!

R.C. Rajkumar-Maharaj, VE1ABK
Dartmouth, Nova Scotia

Editor, *CQ:*

After nearly 40 years a Ham, I just recently subscribed to *CQ*, thinking I would find at last a magazine truly devoted to Ham Radio and the fast moving technical field. My first issue to be received was January 1973 and what am I treated to? "The Social Receiver," a diatribe of more of this race baiting, socialistic, left wing drivel with which I am fed up to here. If Vernon Dawson, K6RRC, is lit off on this subject, maybe he should take to preaching or politics, and stay the Hell out of the technical field.

If there are more of his articles planned for the future issues of *CQ*, please consider this an order for cancellation of my new subscription.

J.H. Griscom, Jr., W3GGV
Annapolis, Maryland

Super-Power

Editor, *CQ:*

I agree 100% about disqualification of those idiots using illegal power. I have a single 3-1000Z GG amp that gets buried by many signals from the illegal elite (also 3 el. wide 20 m. spaced yagi @ 65 ft.). It's discouraging to keep clean and legal but end up at the bottom of pile-ups or last in line. Anything you can do to restore some competitive

Galaxy R-530

Communications Receiver

The General Coverage Leader

The R-530 is still the 0.5 to 30 MHz general coverage leader. Compare it to the competition...*if you can find any.*

HERE'S WHY:

- Has many features found only on military receivers costing over $3,000 yet is still priced less than $1,000.
- Phase-lock frequency conversion for exceptional stability and trouble-free operation.
- Variable RF attenuation at antenna terminals for positive control against overload.
- Mounting versatility—table top or standard 19-inch rack.
- 117/230 VAC for fixed operation or 18 VDC batteries for portable field monitoring.

EASY FINANCING • 10% DOWN OR TRADE-IN DOWN • NO FINANCE CHARGE IF PAID IN 90 DAYS • GOOD RECONDITIONED EQUIPMENT • Nearly all makes and models. Our reconditioned equipment carries a 15 day trial, 90 day warranty and may be traded back within 90 days for full credit toward the purchase of NEW equipment. Write for bulletin. Export inquiries invited.

TED HENRY (W6UOU) **BOB HENRY** (W0ARA) **WALT HENRY** (W6ZN)

Henry Radio

"World's Largest Distributor of Amateur Radio Equipment"

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

sanity into those self-centered "Big Guns" is certainly appreciated by the rest of us high power non-QRP types.

Maybe you can get *QST* (I doubt if *73* would go along with any sane proposal) could refuse to advertise any product line of a company which willingly sells illegal power amplifiers to its clients. In this way, the violators would be forced to build their own amps, and 70% wouldn't have the technical ability plus another 20% would do themselves bodily injury (shock, hernia, etc.) and never get them on the air. So only 10% would ever be active on the bands. Thus, those 10% would be easy for the FCC to detect and squash.

Maybe if you really wanted to start controversy in your editorials you might propose that one KW PEP or higher be limited to the classes of licenses on the lower bands (80-40) that demonstrate the technical responsibility to operate the equipment cleanly and legally -- this means Advanced and Extra only!

Your editorial is like the visible part of an iceberg, i.e. much more of the problem exists than just what is readily visible. The crime of the high power imbeciles is even more unforgiveable because the lower powered stations trying to stay competitive makes them push their equipment to and beyond its limits resulting in splatter, spurious emissions, distortion, and associated garbage. Then frustration appears with those brave Casper Milquetoasts hiding behind the anonymity of their microphones sounding like 2 year old babies wailing, catcalling, and jeering. And in the middle of this is some poor slob who keeps on calling the DX station when he's transmitting, simply because he can't hear the DX station due to all the crud on the frequency.

There has got to be a better way, and if I can help you achieve it, let me know.

Wes Bolin, K4APL/6
Lancaster, California

Editor, *CQ:*

Congratulations on your stand!

Elimination of high-power law-breakers from contests will be a very effective and to-the-point remedy indeed!

In addition, it should also be possible to exclude the selfish group of individuals and improperly operated stations who cause +15 kHz splatter when a peanut-whistle coupled with properly functioning brains would frequently be sufficient.

If we don't clean up this mess ourselves, we won't have a thing to say when the FCC does it!

Keep up the good work!

Ulo Vilms, K4OV
Warner Robins, Georgia

Announcements

Johnson City, New York

The 14th Annual Hamfest, sponsored by the Southern Tier Amateur Radio Clubs, is scheduled for 2 p.m., April 14, at St. John's Ukranian Hall, Johnson City. Admission to lectures and flea market is free, awards, dinner $5. For tickets or further info write STARC, P.O. Box 11, Endicott, NY13760

Natchez, Mississippi

The Old Natchez ARC will hold their Hamfest on April 8 in Natchez. Direct inquiries to ONARC, P.O. Box 599, Natchez, Miss. 39120.

Evansville, Indiana

TARS Hamfest will be held Sunday, May 6 at the 4H grounds, highway 41 north 3 miles. Auction overnight camping, Ladies' bingo, flea market. Advanced registration. Contact: Robby, W9MKZ, 502 S. Lincoln Park Dr., Evansville, IN 47714.

Towson, Maryland

The Greater Baltimore Hamboree will be held at Calvert Hall College, Putty Hill and Goucher Blvd., Towson, Md. (one mile south of Exit 28 of Beltway-Interstate 695) on April 8 at 10 a.m. Food service, flea market, prizes. Registration $2. No table or percentage charges. Info: Joe Lochte, 5400 Roland Ave., Baltimore, MD 21210.

Dayton, Ohio

The 1973 Dayton Hamvention sponsored by the Dayton Amateur Radio Association will be held on April 28 at the Dayton Hara Arena & Exhibition Center. Tickets are $2.50, $3 at door. Free parking, flea market, forums. For info: Dayton Hamvention, P.O. Box 44, Dayton, OH 45401.

Amboy, Illinois

The Rock River Radio Club will held their 7th Annual Hamfest on April 8 at the Lee County 4-H Center, Amboy, IL. Tickets are $1.50, $2 at door. Rain or shine. For info: RRRC Hamfest, Carl Karlson, W9ECF, P.O. Box 99, Nachusa, IL 61057.

Raleigh, North Carolina

The Raleigh Amateur Radio Society will hold its 1st Annual Hamfest on April 15 at the North Carolina State Fairgrounds. All indoors, parking, buffet, free pepsi & coffee all day. For info: RARS Hamfest, P.O. Box 17124, Raleigh, NC 27609.

Dekalb, Illinois

The Kishwaukee Amateur Radio Club will hold their Hamfest on May 6 from 8-3 at the Notre Dame Center. Tickets are $1.50, $2 at door. For info: Box 473, Dekalb, IL 60115.

Stolen Equipment

The following equipment was stolen from Edward W. Voightman, W9GSS, 4050 Crestwood Ct., Wisconsin Rapids, WI 54494 on February 12:

Item: Regency HR-2A, Ser. No. 04-07148

Acces: Topeka FM 6-chan. add-on transmit deck

Transmit Crystals: 146.13, 146.22, 146.38, 146.46, 146.94, 148.01 mHz.

Receiver Crystals: 146.34, 146.73, 146.76, 146.82, 146.88, 146.94, 148.01 mHz.

[*Continued on page 90*]

Q AND A

BY CHARLES J. SCHAUERS, W6QLV*

Most manufacturers of electronic (and amateur equipment) usually suggest that when trouble-shooting, resistance and voltage measurements should be made with a vacuum tube voltmeter (v.t.v.m.). There are valid reasons for this.

Volt-ohmmeters (v.o.m's) are not uniform in sensitivity and they range from as low as 1000 ohms per volt to as high as 30,000 ohms per volt or more. But the v.t.v.m. (no matter the type) has a sensitivity in the megohm(s) range—the usual unit having an input resistance of 10 or more megohms. What does this mean?

First of all, accuracy. Why? Because the circuits to which the v.t.v.m. is connected are not heavily loaded down.

Try and measure a.g.c. voltages for example with a 1000 ohm per volt v.o.m.! The measurements you get (if any) will certainly not agree with the manufacturer's!

So when you do troubleshooting on critical circuits where *low* voltages are encountered *do* use a v.t.v.m. Then too, do remember to use a v.t.v.m. in low current circuits where high resistance values are encountered.

Checking Surplus Tubes For Shorts

"I was recently given a large number of surplus vacuum tubes some of which I can use in my surplus equipment acquired over the years. What is a good easy way to check these tubes for shorts between elements? I do not have access to a tube checker."

An ohmmeter can be used providing you have a pin connection guide you can refer to when you make the checks.

Q & A is a free technical assistance program offered by **CQ** to its readers. We ask your cooperation to enable us to assist as many amateurs each month as possible. Always include a self-addressed stamped envelope with your question. Only one question per letter, please. Before writing to ask where a published article appeared, try to find it yourself by consulting the annual indexes of the various amateur magazines. Mail questions to: **CQ** Q & A, 14 Vanderventer Ave., Port Washington, N.Y. 11050.

the TELEX PROFESSIONALS

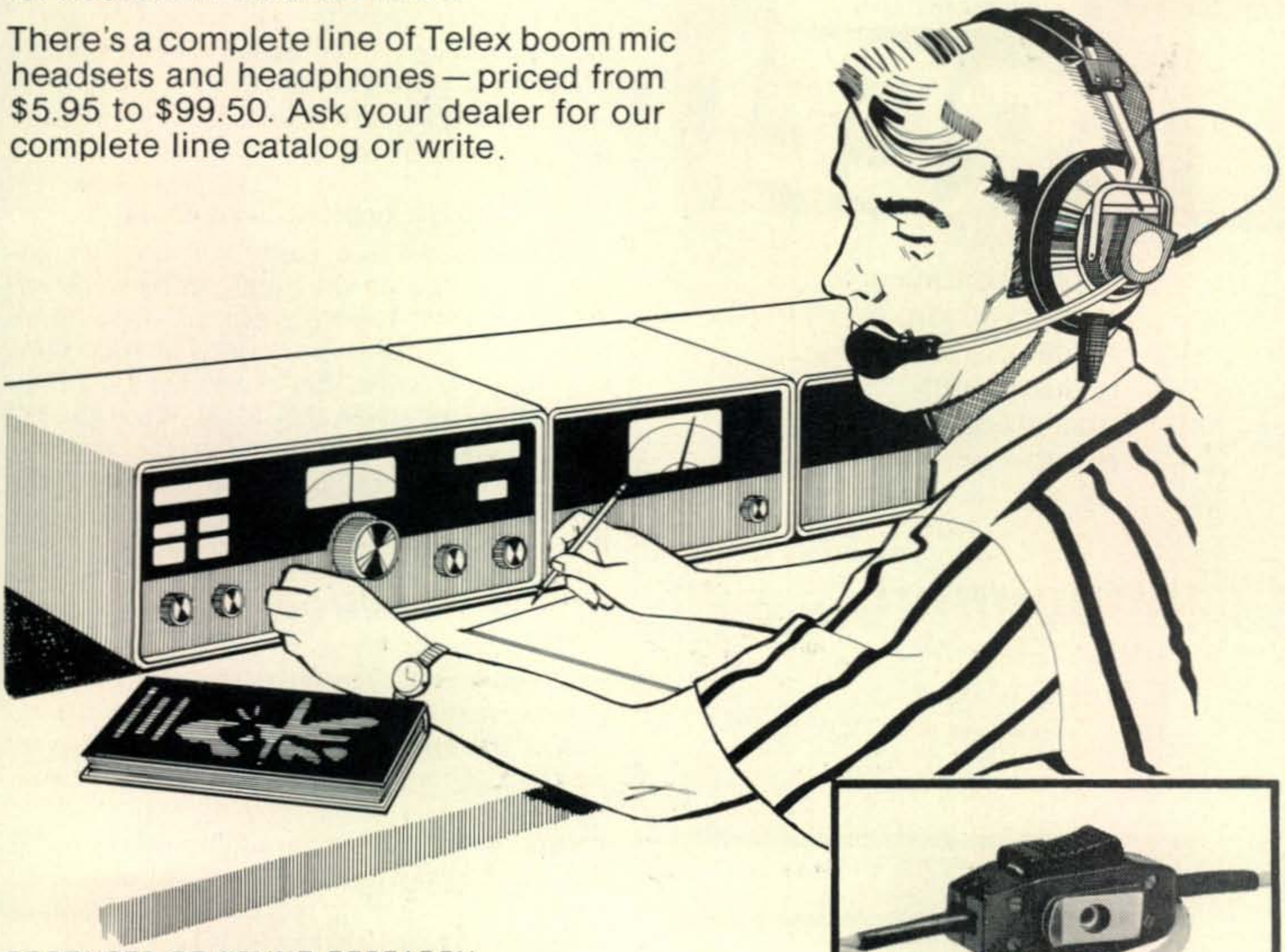
for "hands free" radio communications

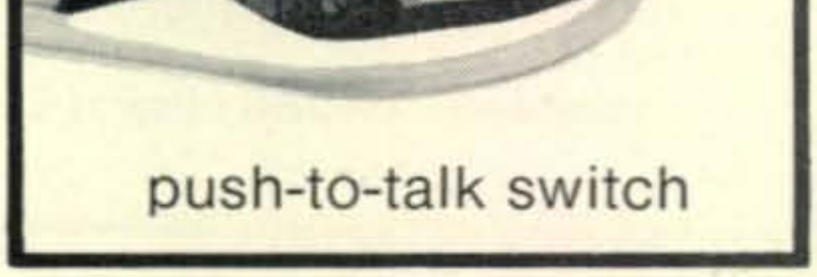
Telex boom mic headsets provide you with the ultimate convenience in radio communications. The adjustable boom mic gives you "hands free" operation for logging or frequency adjustments, plus added mobility. And the mic is always properly positioned for instant, intelligible voice transmission.

Telex headsets feature an easy to reach, inline push-to-talk switch, which can also be wired for voice operated transmission.

Boom microphones are especially designed for "close-talking" use to limit outside noise pick-up. Both Telex boom-mic headsets and headphones seal out ambient noises, concentrate the signal at your ear, and add to the effectiveness of your rig. Adjustable and lightweight, they can be worn for hours without discomfort.

There's a complete line of Telex boom mic headsets and headphones — priced from $5.95 to $99.50. Ask your dealer for our complete line catalog or write.





push-to-talk switch

PRODUCTS OF SOUND RESEARCH

TELEX®

COMMUNICATIONS DIVISION

9600 ALDRICH AVENUE SOUTH
MINNEAPOLIS, MINNESOTA 55420

CANADA: Double Diamond Electronics, Ltd., 34 Progress Avenue, Scarborough 4, Ontario
INTERNATIONAL: Telex Export Dept., 9600 Aldrich Ave. So., Minneapolis, Minn. 55420 U.S.A.; telex: 29-7053

Rhombic Installation

"Since becoming an amateur a few years ago I have heard many discussions on the merits of various antennas; I have also done a great deal of reading. It seems to me that the rhombic antenna would be a good bet if one has the space (which I have). What do you think?"

The rhombic is a good antenna but it does have high levels of side lobe radiation and it is really not as broadband as some of its advocates think. By arraying rhombics side lobe radiation can be reduced but few amateurs can do this. My choice would be a good broadband log periodic.

TX-599 VOX Adustment

"I recently bought a TX-599 from Henry Radio but am having a little trouble with the VOX adjustment. It does not seem to cut in when I think it should. Any help?"

See page 12 of your instruction book. The term "watch (having the second finger)" means a sweep second hand! When the relay clicks in, it should reset after *1* second *after* an applied af signal—a little hard to measure with a second hand!

Diode Rectifier Blow-Outs

"As you will see from the diagram enclosed, I have a power supply using semiconductor diodes. I have replaced these three times now. The diodes are rated at 1000 volts at 400 ma. It seems that everytime I load my final a little too much they blow. What gives?"

First, instantaneous peak current, and you have no resistors (47 ohms) in series with the diodes, nor .001 mf ceramics shunting them. Resistors are cheaper than diodes.

Tower Damage

"In a recent wind strom my aluminum tower collapsed. However the main bottom section is still intact. Any suggestions for repairing the upper sections? The tower was 40 feet tall. Of course, my three element beam is a total'."

Any tower, steel or aluminum after it is hit with a strong wind is nearly impossible to repair. The only thing you can do is to replace damaged sections (if available).

R-390A TO S.S.B.

"I acquired an R-390A receiver but it doesn't seem to work on s.s.b. too well—too much distortion—no matter how I turn the controls. Any information on improving this

BIG PUSH!

HUSTLER

GET SUPER GAIN PERFORMANCE!

Two Meter—5.2 db Power Gain
Colinear Mobile Antenna

- ! 5.2 db gain over 1/4 wave ground plane
- ! SWR at resonance . . . typically 1.1:1
- ! Bandwidth . . . 7 MHz for 1.5:1 or better SWR
- ! Power Rating . . . 200 watts FM
- ! Height, including mount . . . 78"
- ! Radiator . . . 17-7 PH stainless steel
- ! Field adjustable for lowest SWR

CHOOSE FROM TWO VERSIONS

MODEL CGT-144 (illustrated) antenna complete with trunk lip mount for easy, no holes installation on side or edge of trunk lip. 180° swivel included for adjustment of antenna to absolute vertical. Supplied operational with 17′ MIL spec RG-58-U and PL-259 transceiver connector factory attached. Antenna is removable from mount. Shpg. Wt. 3.34 lbs. **$36.95**

MODEL CG-144 — Antenna only with 3/8"-24 base to fit all standard mobile ball mounts. Shpg. Wt. 1.84 lbs. **$24.95**

give your mobile signal the big push! this large aperature, two meter antenna will create a new dimension in amateur mobile communications. —where action counts, get the decisive advantage of colinear power gain performance; transmitting and receiving!

Available From All Distributors who Recognize the Best!

NEW-TRONICS CORP.

15800 COMMERCE PARK DRIVE
BROOK PARK, OHIO 44142

excellent set for s.s.b. reception?"

Yes. See the fine article on this on page 55 of January 1968 *CQ*. The distortion you mention is caused by the a.m. diode detector. Lee tells you how to overcome this.

Antenna Tuning Unit Performance

"I'm a young amateur and I understand that an antenna tuning unit (ATU) used with any transmitter can improve its performance. Is this true? Also how does an ATU affect antenna performance?"

Most modern transmitters and transceivers use pi-L networks which make the use of the ATU superfluous.

An ATU does not affect antenna performance, but the unit is a matching device which will match most antenna loads (up to 500 ohms or so). It is true that an ATU will aid in the attenuation of harmonics and spurious signals, but with modern final amplifier output network design, these are seldom encountered.

The ATU incorporating an s.w.r. meter, power meter etc., is a good investment.

Slow Blow Fuses

"The plate on my power supply (above the fuse socket) for my transceiver states that a 3 ampere 'slow blow' fuse should be used. Why not a fast blow type?"

Power applied to a cold set using a fast blow fuse can knock out the fuse. The slow blow type has enough delay so that surges will not immediately blow them. Both types of fuses protect but over the long run the slow blows are the least expensive.

Chatter Splatter

"I have been told a number of times by locals when operating on 20 meter s.s.b. that I splatter. When talking to distant stations I seldom get splatter reports. What is the solution?"

Splatter can result from over-driving the final. Also, an improperly operating linear can splatter. First try turning down your mike gain. If this doesn't work then check the final amplifier. Matched tubes (if two are used in the linear) are important. Check all voltages including the driver's. Check the final tubes' bias voltages carefully.

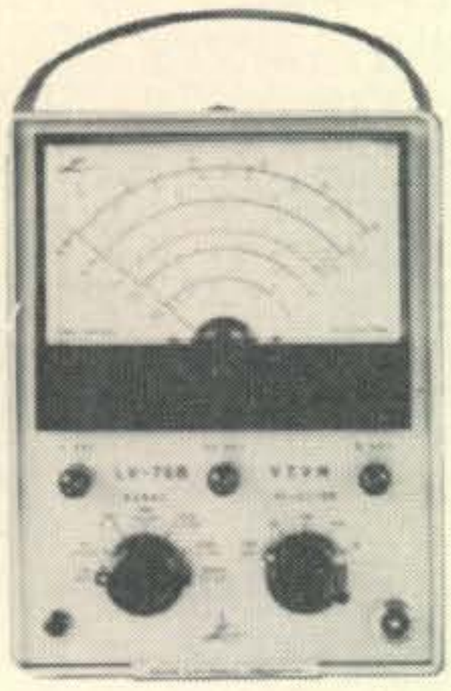
GT-550 Power Output Fall-Off

"I have a GT-550 Galaxy transceiver which has given me excellent service since 1970. I have had no problems not even a tube replacement. However, lately, the output has

We uncomplicate your log time.

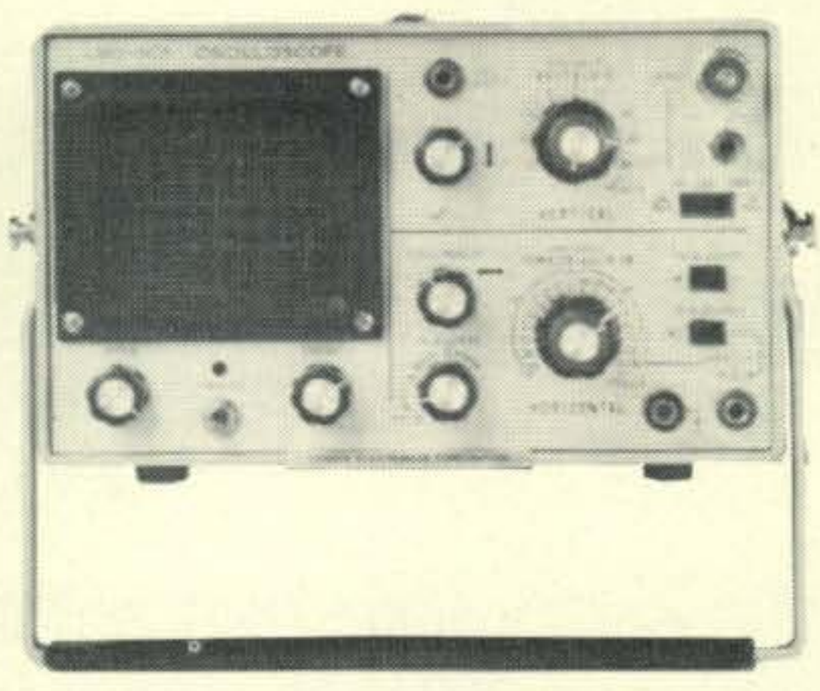
Leader

TEST INSTRUMENTS



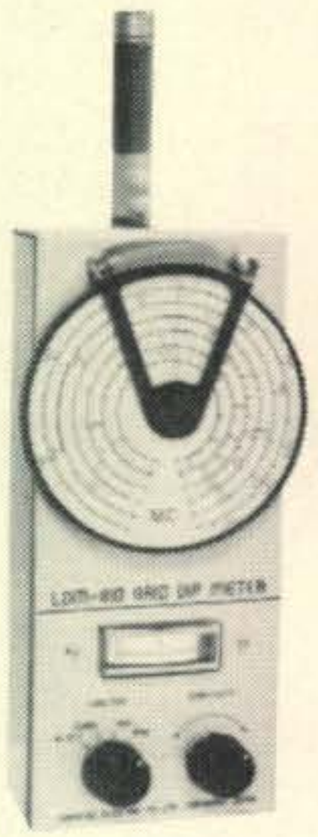
LV-76B
VACUUM TUBE VOLTMETER

Unusually stable, highly sensitive, with 11MΩ impedance to minimize load effects. Performs all measurements with one probe. AC or DC may be changed by switching rather than lead changing. AC range to 4MHz. $69.95



LBO-301-3" PORTABLE
TRIGGERED SCOPE

The only one with vert. and horiz. calibration! A solid state performer with DC to 7MHz bandwidth. Has 5X mag. and 0.2μsec. to 50ms/div (15 ranges) sweeptime. With easy-to-use horiz. panel. An unmatched leader. $374.95



LDM-810
GRID DIP METER

Determine resonant frequency of LC networks with this versatile, AC operated meter. Has 6 coils covering 2-250MHz range; and modulation monitor earphone. Use to align receivers, adjust wave traps, find parasitic oscillations. $54.95

The more you see... the more you believe... the more you save

Write for details. See your distributor.

Leader Instruments Corp. 37-27 Twenty-Seventh St. L.I.C., N.Y. 11101 (212) 729-7401

fallen off. I am not a good troubleshooter. What should I do?"

First, check all of the tubes on a good *mutual conductance* tube tester. Replace those that are defective. Try to obtain "matched" 6LB6 final tubes. Then check your antenna system and make sure that your set is feeding a good load.

SB-200 Linear Problem

"I have a second-hand Heathkit linear SB-10 SSB adapter is available all over the citer. I know that the a.l.c. is r.f. derived and so I constructed my exciter accordingly. Now the a.l.c. does not work as it did before. What do I look for?"

A bad rectifier diode (D_1).

SB-10 S.S.B. Adapter Information

"I'm sure that you know that the Heathkit SB10 SSB adapter is available all over the country through various radio-electronics stores . . . at very low prices.

"When I got my license in 1970 I bought one and 'married' it to the popular DX-100, the latter converted for linear operation.

"Any information available on improving the SB-10 (other than that) included in the HAM CLINIC series?"

Yes. See the article in the May 1970 *CQ* (page 22).

The SB-10 was and still is a good adapter.

RTTY Info

"I am now interested in RTTY after being in amateur radio for nearly 5 years. Can you direct me to a publication that will help me understand it better?"

I'm no RTTY expert although I have worked in stations where 50 or more operators were on duty. I'd suggest that you start by getting the book *RTTY from A to Z* by Durward J. Tucker, W5VU. The book costs only five bucks and has 16 chapters. It can be obtained from the book department of Cowan Publishing, same address as *CQ*.

Paralleling Antennas

"I only want to use one coaxial cable from two antennas. My problem is that one is a vertical while the other is a horizontal dipole. Can this be done effectively?"

No. The average horizontal has an impedance of 72 ohms, while the vertical may vary from 33 to 57 ohms.

vy 73, Chuck

TRANSMIT THE CLEANEST SIGNAL ON THE AIR

. . . with a New SWAN Fully Solid-State Transceiver!

You'll appreciate the comments about your signal. You'll get outstanding reports on your readability, strength and tone. Be a proud owner of a truly reliable all solid-state rig . . . at a price you can afford!

SWAN ELECTRONICS offers you superb craftsmanship you can see, feel, and hear. Inside, these units are uniquely designed. Progressive, proven engineering state-of-the-art techniques are enriched by the most practical advanced components available. Externally, Swan has designed these new transceivers to be appreciated by every ham, and the XYL, because it was hams who told us what they wanted. It's all here . . . up-to-the-minute in styling and convenience . . . easy to operate.

ENJOY CLEAR, CLEAN TRANSMISSIONS – The finest quality on the air. Signals are strong, stable and easy to read. Select from your choice of 3 models:

80-10 Meters, SSB, CW, VOX, NOISE BLANKER and a whole lot more!!

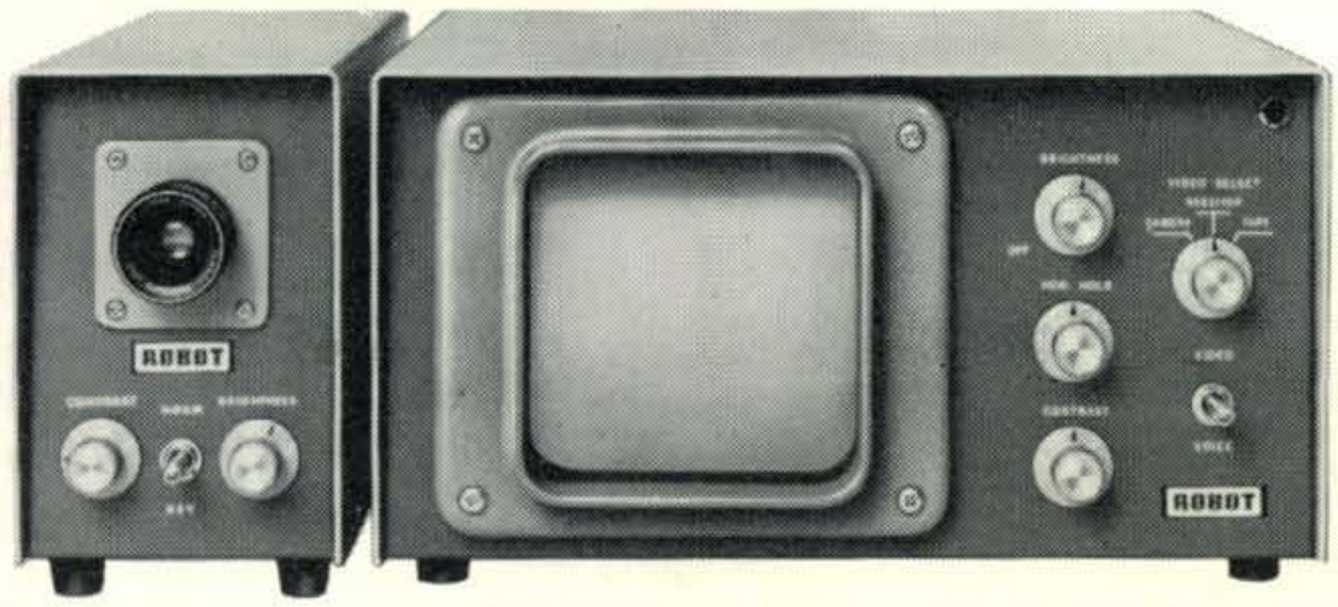
SWAN SS-15 (15 Watts P.E.P.) $579.00
SWAN SS-100 (100 Watts P.E.P.) $699.00
SWAN SS-200 (200 Watts P.E.P.) $779.00

ACCESSORIES INCLUDE:

SWAN PS-10 (115V AC power supply for SS-15/SS-100)	$ 89.00
SWAN PS-20 (115V AC power supply for SS-200/SS-100/SS-15)	$139.00
SWAN SS-1200 (1200 Watt P.E.P., tube type, Linear Amplifier)	$299.00
SWAN SS-208 (External VFO)	$159.00
SWAN SS-16B (Super Selective Filter)	$ 79.95
SWAN 610X (Crystal Controlled Oscillator)	$ 53.95

Just 10% down is all that is needed, if you use your Swan Credit Service account, to put an all-solid-state rig in your ham shack. Why wait? Order yours now!!

SWAN ELECTRONICS
A subsidiary of Cubic Corporation
305 Airport Road • Oceanside, CA 92054 • Phone (714) 757-7525



Operating SSTV is easy.

☐ True or ☐ False

How much do you really know about the newest activity in amateur radio? Take this 3 minute TRUE-FALSE quiz and see.

		T	F
1	A slow scan television picture is similar to that projected on TV.	☐	☐
2	Motion can be portrayed on slow scan television.	☐	☐
3	To broadcast slow scan television just add a Robot monitor and camera to your present station. No other equipment is necessary.	☐	☐
4	Slow scan occupies no more space on the band than an audio signal.	☐	☐
5	Any licensed amateur radio operator, except Novice, may operate SSTV.	☐	☐
6	$295 each for a Robot SSTV monitor and camera is the lowest price in the world for SSTV equipment.	☐	☐
7	Robot guarantees your satisfaction with all Robot equipment, or your money will be refunded.	☐	☐
8	New SSTV operators all suffer from lack of sleep.	☐	☐

ANSWERS:

1. False. The slow scan television picture is a greenish-yellow color which takes 8 seconds to transmit. Like radar, the image should be viewed in a darkened room for best results. Also like radar, as the picture progresses it has the appearance of being painted onto the screen by a bright writing line except that the line moves from top to bottom. **2. False.** Motion results in a blurred picture. **3. True.** Robot equipment is compatible with all brands of amateur radio equipment and antenna systems. **4. True.** The SSTV signal contains frequencies ranging from 1200 Hz to 2300 Hz. Therefore, it is comparable to an audio signal. **5. True. 6. True,** as far as we can determine. **7. True. 8. True.** New SSTV operators are so enthusiastic about the fun of operating slow scan television, they hate to quit.

ROBOT

☐ Please send your new factory direct price list.

☐ Enclosed $_____ Please send the following equipment via AIR ☐ or SURFACE ☐

☐ Instruction Books $2

☐ Model 70 Monitor $295

☐ Model 80 Camera $295

☐ 25mm F1.4 Macro Lens $54

Name_____ Call_____

Address_____

City_____ State_____ Zip_____

California residents add 5% sales tax. Prices do not include shipping.

ROBOT RESEARCH, INC. 7591 CONVOY COURT, SAN DIEGO, CA 92111 (714) 279-9430

Savoy

HIGH ACCURACY CRYSTALS

FOR OVER 30 YEARS

$3.75

Postpaid in U.S.A.

TYPE 900

TYPE 901

Either type for amateur VHF in Regency, Swan, Standard, Drake, Varitronics, Tempo, Yaesu, Galaxy, Trio, Sonar, Clegg, SBE, transmitter or receiver. GE, Motorola, RCA or Oven use $4.95. Quotes on others.

Specify crystal type, frequency, make of equipment and whether transmit or receive when ordering.

BASSETT VACUUM TRAP ANTENNA SYSTEM

Complete packaged multi-band antenna systems employing the famous Bassett Sealed Resonators and Balun from which air has been removed and replaced with pure helium at one atmosphere. Operating bands are indicated by model designation.

MODEL DGA-4075	$59.50
MODEL DGA-204075 . .	$79.50
MODEL DGA-2040	$59.50
MODEL DGA-152040 . .	$79.50

BASSETT VACUUM BALUN

The famous sealed helium filled Balun . . . employed with the DGA Series Antenna Systems. Solderless center insulator and easily handles more than full legal power while reducing unwanted coax radiation. Equipped with a special SO-239 type coax connector and available either 1:1 or 4:1.

MODEL DGA-2000-B . . . $12.95

Postpaid in U.S.A.

CONTACT YOUR DISTRIBUTOR OR WRITE FOR DATA

Savoy Electronics, Inc.

P.O. Box 7127 - Fort Lauderdale, Florida - 33304

Tel: 305-566-8416 or 305-947-1191

JOIN THE MOBILE BUNCH on 2 Meter FM!

It's easy with the "Performables" from Swan Electronics.

Your choice of two value-packed performers is now available for mobile operation without the need to buy an AC power supply. Choose the 12 channel FM-2X or the more versatile 144 channel combination model FM1210-A. Simply hook up either of these superior quality transceivers to a 12V DC battery and your mobile antenna — then you're ready for the excitement of ham mobile performance at its best.

FM-2X

FM1210-A

SWAN FM-2X — 12 channels. Crystals installed for Channel 1 to transmit and receive on 146.94 MHz, Channel 2 to transmit on 146.34 and receive on 146.94 MHz, and Channel 3 to transmit on 146.34 and receive on 146.76 MHz $259.00

SWAN FM-2X — AC Power Supply, Accessory . . . . . $ 39.95

SWAN FM1210-A — Independent switching of 12 transmit and 12 receive frequencies with eight crystals installed: Transmit on 146.22, 146.34, 146.76 and 146.94 MHz; Receive on 146.28, 146.76, 146.88 and 146.94 . . . . . $319.00

SWAN FM1210-A — AC Power Supply, Accessory . . . . . $ 49.95

Common features include: Frequency coverage from 144 to 148 MHz; a nominal 10 watts RF power output; a fully solid-state transmitter with automatic protection of the output transistor from improper-load damage; phase type frequency modulation for exceptional clarity; push-to-talk dynamic microphone; frequency stability of ± .001%; spurious radiation is held to -60 dB below carrier; and both units have a 0.5 microvolt sensitivity for 20 dB quieting.

SWAN ELECTRONICS
A subsidiary of Cubic Corporation

305 Airport Road
Oceanside, CA 92054
Phone (714) 757-7525

Gentlemen:

I'm interested in joining the "Mobile Bunch" with Swan!

Please send me: ☐ An FM-2X ☐ An FM1210-A
☐ More Information

Name _____ Call _____

Address _____

City _____ State _____ Zip _____

☐ Full payment enclosed (I understand I'll be billed for any shipping charges and applicable taxes.)

☐ Charge my Swan Account #_____ (Down payment enclosed)

☐ Please send an application for Swan's Revolving Credit Service.

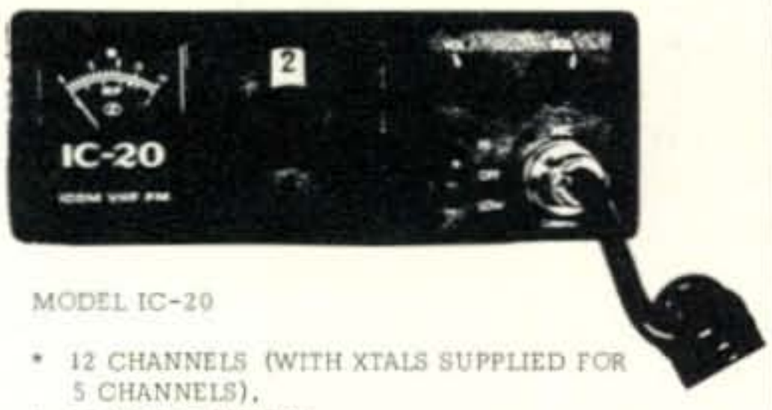
NEW and SURPLUS ELECTRONICS FOR THE HAM and EXPERIMENTER

2 METER FM TRANSCEIVERS

MODEL IC-21

- 24 CHANNELS (WITH XTALS SUPPLIED FOR 7 CHANNELS).
- 10 WATTS OUTPUT.
- DYNAMIC MIKE.
- AC - DC OPERATION.

$379.95



MODEL IC-20

- 12 CHANNELS (WITH XTALS SUPPLIED FOR 5 CHANNELS).
- 10 WATTS OUTPUT.
- DYNAMIC MIKE.
- 12 VDC OPERATION.

$289.95

$25.00 WORTH OF CATALOG MERCHANDISE WITH ALL CASH ORDERS.

ALPHA-NUMERIC KEYBOARD

$50.00

MICRO SWITCH

MODEL SW-10639 contains 61 #1SW11 Solid-State switches including key tops, ROM encoded into EBCDIC.

MODEL RW-01135 contains 56 #7A1MS Reed switches including key tops, diode encoded into EBCDIC.

"DIP CLIP" I.C. TEST CLIP

POMONA ELECTRONICS

MODEL 3916

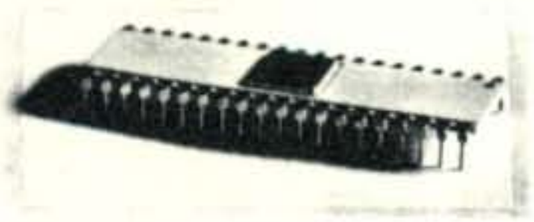
4.95

FOR 14 OR 16 DUAL-IN-LINE PACKAGES

The "Dip-Clip" is specially designed to allow the attachment of test probes to 14 or 16 lead DIPS. The unique design greatly reduces the possibility of accidental shorting while testing live circuits. Numerous test probes may be quickly connected for hands-free testing.

MOS DIGITAL CLOCK CHIP

$14.95



Four digit electronic clock LSI circuit in 40 pin DIP. Designed for direct output to Liquid Crystal Display. Internal options include: Alarm, Snooze, Seconds Display, Reset, and 24 hour operation.

CREST POWER STRIPS

WITH: FUSE, SWITCH, AND LAMP

$9.30

MODEL 11

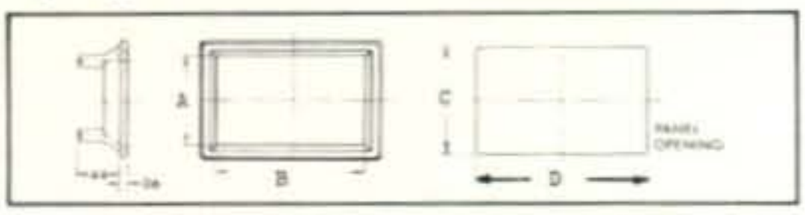
Other Models Available

$14.70

MODEL 12

NOBEX DIGIBEZEL

alpha-numeric display bezels



MODEL	DIMENSION 'A'	'B'	'C'	'D'	PRICE 1-24	25-99	100-UP
905-XX	.80	1.37	1.172	1.74	$2.25	2.07	1.91
910-XX	.80	2.00	1.172	2.37	2.30	2.12	1.95
915-XX	.80	3.00	1.172	3.37	2.40	2.21	2.04
920-XX	.80	4.00	1.172	4.37	2.45	2.25	2.08
930-XX	1.38	5.00	1.750	5.37	2.75	2.53	2.33
940-XX	.80	5.58	1.172	5.95	2.65	2.43	2.25
950-XX	1.38	6.50	1.750	6.87	3.15	2.89	2.67

WHEN ORDERING REPLACE XX WITH FILTER COLOR CODE:

NEUTRAL = 15, RED = 60, AMBER = 70, GREEN = 90

example: 930-60 (Model 930 with RED Filter)

DOSY BOXS

Deluxe Electronic Equipment Enclosures

MODEL	DIMENSIONS W. H. DEPTH	Screen Vented	RESALE NET
"A"	5¼ x 2½ x 3	no	3.75
"B"	5¼ x 3¾ x 3¼	no	4.95
"C"	7¼ x 3¼ x 5	yes	6.95
"D"	8 x 2½ x 8 (mobile mtg. avail.)	yes	8.75
"E"	6½ x 3⅛ x 7¾	yes	8.25
"F"	7½ x 4½ x 10	yes	9.95
"G"	10¾ x 3⅝ x 9	yes	9.95
"H"	4½ x 6¼ x 4	no	8.95
"D1"	Mtg. bracket set for "D"		.35
"H1"	"H" Panel with mounted Wide Vue meter, 3½" 0-1 ma DC & 2 Rocker switches		19.95
"HA"	5 1/8 x 5 1/2 x 4 (Blank Panel)		8.95
"J"	5 x 3 1/2 x 5 3/4 (Sloping Panel)		7.45
"K"	4 3/4 x 7 3/8 x 11 W/Handle		13.50
"L"	11 1/8 x 6 1/8 x 12 3/4		20.50
"M"	11 1/8 x 6 1/8 x 16 3/4		21.80

OTHER DISTRIBUTOR LINES:

ESSEX — STANCOR

TAB BOOKS — J.W.MILLER Co.

LUMINETICS — Vector Electronic Company

projects unlimited — WAHL

HUNTER TOOLS — A Division of Marshall Industries

EMICO

BUD RADIO, INC.

SW — STEWART-WARNER MICROCIRCUITS DIVISION — STEWART-WARNER CORPORATION

KA ELECTRONIC SALES
1312 SLOCUM STREET · DALLAS, TEXAS 75207
(214) 747-3230
747-1662

WRITE FOR FREE CATALOG.

VISIT OUR STORE SATURDAY FROM 9AM to 5PM. LOCATED OFF STEMMONS FREEWAY NEAR OAKLAWN.

BANKAMERICARD — master charge — PRESTO

Drake gear keeps getting better and better...

NOW, OUR FINEST... THE NEW

Drake C-Line

NEW FEATURES:

• 1 kHz Dual Concentric Dial Readout • Receiver and transmitter lock together in transceive operation • No side controls • Iridited cadmium-plated chassis • Compatible with all previous Drake lines

R-4C Receiver

The receiver hams have dreamed of . . .

NEW R-4C FEATURES:

- 8-pole crystal filter combined with passband tuning, SSB filter supplied
- Provision for 15 additional accessory 500 kHz ranges
- Transistorized audio
- Optional high-performance noise blanker
- AVC with 3 selectable time constants
- Optional 8 pole filters available for CW, AM, RTTY
- $499.95

T-4XC Transmitter

The one worthy of the R-4C

NEW T-4XC FEATURES:

- Plug-in relay
- More flexible VOC operation; Including separate delay controls for phone and CW
- Crystal control from front panel for amateur, Mars, commercial uses
- Provision for AFSK RTTY operation
- $529.95

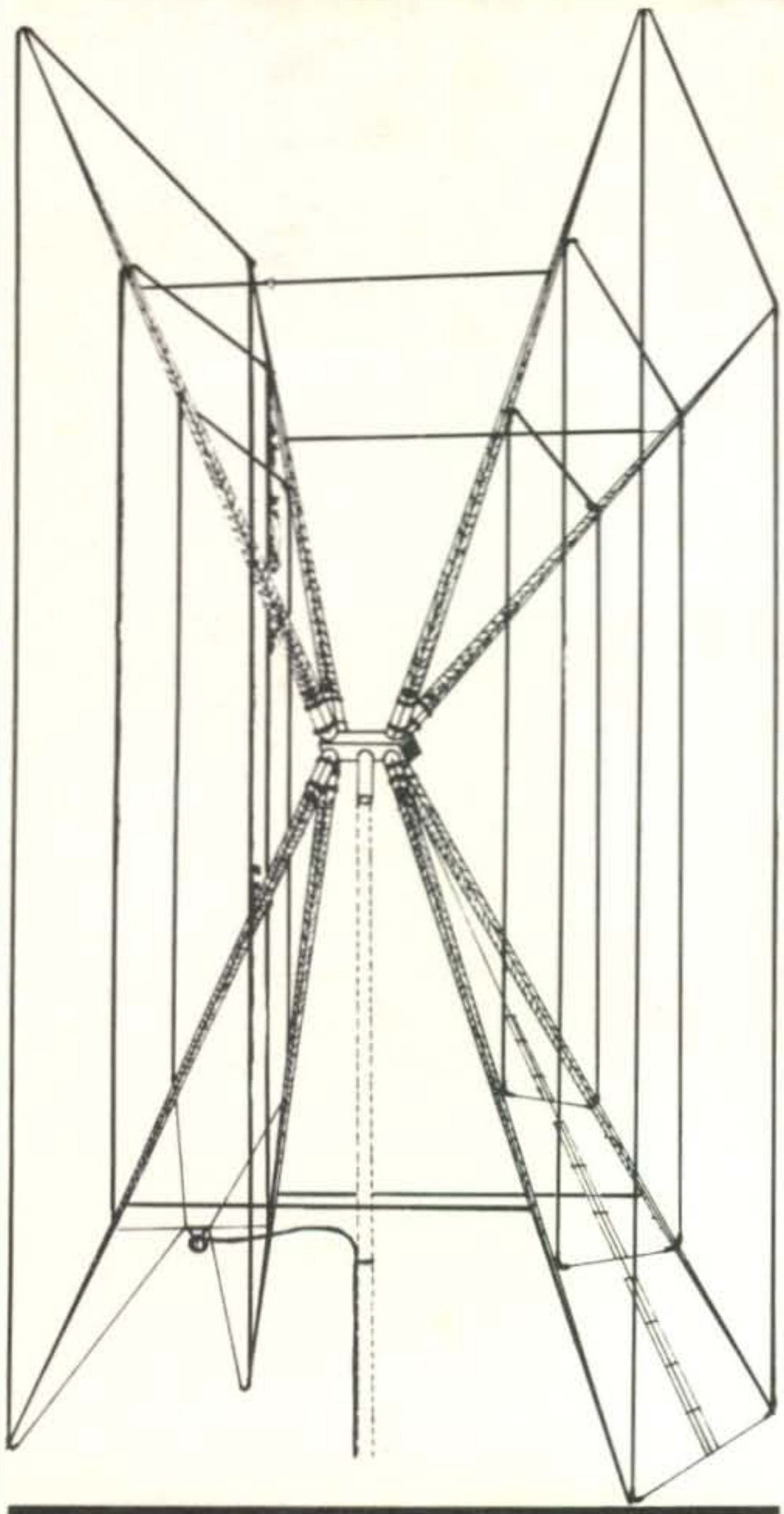
See for yourself—at your dealer's.

R. L. DRAKE COMPANY

DRAKE®

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

IT TOOK TWENTY YEARS. . . .



To convince hams that quad antennas will perform as well or better than most beams. Now that you're sold on the quad principle, we want you to have the best quad available.

And the GEM QUAD IS BY FAR THE BEST QUAD in existence.

- better in structural design
- better in quality of materials
- better in over-all performance.

That's why more hams have bought GEM QUADS than any other brand, and probably more than any two or three other brands combined. The specs tell you why. So if you're ready to go the quad route, why not go first class?

And first class means GEM QUAD, of course.

- The GEM QUAD is a 2, 3, or 4 element antenna for 10, 15, and 20 meters.
- Nylon tension tubes create an anti-wire breaking device.
- Two element GEM QUAD gives maximum forward gain "where it counts."
- Optional third element gives optimum forward gain with narrow excellent rejection of unwanted signals.
- Toroid balun for single 52 ohm feed line matching. Handles the legal limit.
- Mounting spider of heavy duty aluminum alloy. 1 ½ inch o.d. stub; easy mounting.
- Hollow spider allows insertion of boom for additional element.
- Fiberglass arms have withstood 100 m.p.h. winds. (2.5 sq. ft. windload area).
- Tridetic arm design (air passes through the arm).
- Simple assembly and tuning instructions supplied. Takes only minutes.
- Double "Cone-shaped" design reists change in critical measurements under severe weather conditions. Weather resistant.
- Complete antenna weighs 22 lbs., 3 element 35 lbs. TV rotator is adequate.

WORLD WIDE DEALER INQUIRES INVITED

$107.00 Two Element Quad — **$60.00** Extra Element

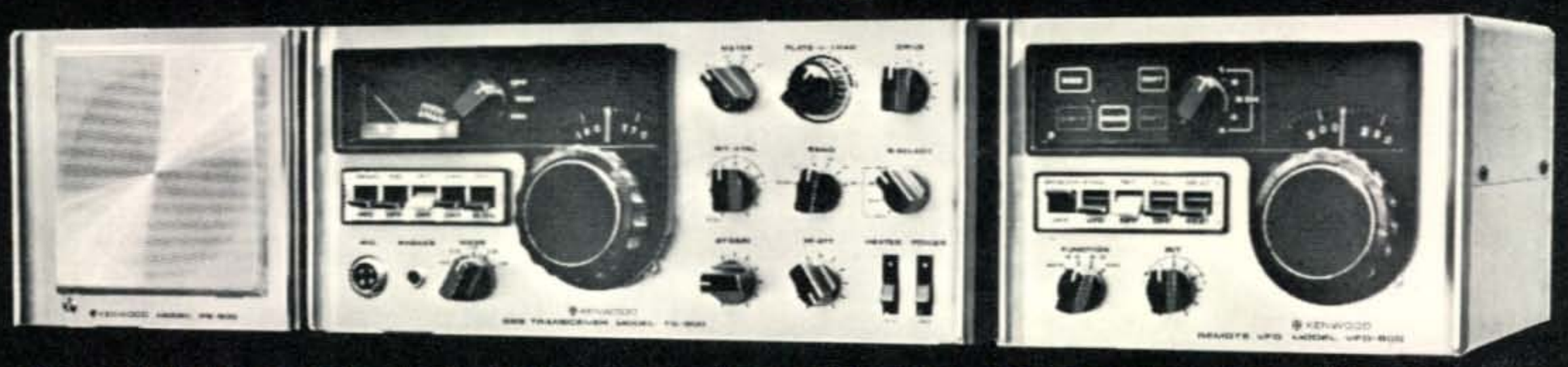
Includes U.S. Customs Import Duty or Canadian Federal Sales Tax
Shipped Collect
Please include check or money order with your order

Canadian Patent No. 794506
U. S. Patent No. 3532315

Structural Glass LIMITED

20 Burnett Ave., Winnipeg, Manitoba, Canada

a new standard of comparison



KENWOOD'S SUPERB NEW SOLID STATE SSB TRANSCEIVER

TS-900

FEATURES: • Break - in CW with sidetone • Built - in 100 KHz and 25 KHz crystal oscillator • Built - in RIT and RIT indicator light • Built - in RTTY frequency shift for FSK • Built - in noise blanker • Built - in VOX • Modular construction — repair in or out of equipment • RF AGC to prevent front end overload to strong signals • Completely solid state except final section • 1 KHz readout

GENERAL SPECIFICATIONS: • Frequency Range: 2 - 30 MHz Amatuer Bands and WWV • Mode: SSB, CW, or FSK • Power Output: 150 watts PEP nominal into 50 ohms for SSB, 100 watts nominal into 50 ohms for CW, 50 watts nominal into 50 ohms for FSK • Frequency Stability: Within 100 Hz during any 15 minute period after warmup. Within ± 2 KHz during the first hour after 1 minute of warmup • Receiver Sensitivity: 0.5 microvolts for a 10 db (signal + noise)/noise ratio • Receiver Selectivity: SSB and FSK — 2.2 KHz bandwidth (6 db down), 4.4 KHz bandwidth (60 db down), CW — 0.5 KHz bandwidth (6db down), 1.5 KHz bandwidth (60 db down), (with optional CW filter installed) • Dimensions: 12.6" wide × 5.5" high × 12.6" deep • Weight: 26.5 pounds (32.5 pounds shipping weight) • Price: TS - 900 $745.00, PS - 900 (AC Supply) $110.00, DS - 900 (DC Supply) $130.00, VFO - 900 (Remote VFO) $195.00.

THE KENWOOD R-599 RECEIVER . . . 1.8 to 29.7 MHz (Amateur Bands) • Dial readout to ½ KHz • Special detectors for SSB, AM, and FM • Transceive operation with T-599 • Built-in 100 KHz and 25 KHz calibrators • Built-in 500 cycle CW filter • Provision for 2 meter and 6 meter coverage with accessory self-contained converters • 120/240 VAC or 12 VDC operation • All solid state • R-599 — $345.00 Converters — $31.00 S-599 — $16.00.

THE KENWOOD T-599 TRANSMITTER . . . Clear, stable, selectable sideband, AM and CW • 4-way VFO flexibility plus RIT when used with the R-599 • Amplified ALC • Built-in VOX • Full metering • Built-in CW sidetone monitor and semi-automatic break-in CW • Built-in power supply for 120/240 VAC operation • Only 3 vacuum tubes • 200 watts PEP input nominal • Full amateur band coverage (3.5 to 30 MHz). T-599 — $395.00

THE KENWOOD TS-511S TRANSCEIVER . . . a powerful five band transceiver (3.5 to 30 MHz, amateur bands) for operation on SSB and CW • Built-in VOX • Built-in crystal calibrator • Built-in noise blanker • Receiver Incremental Tuning (RIT) • 1 KHz frequency readout • Eight pole filter • Exceptional stability • Provisions for installation of an accessory high selectivity CW filter • 500 watts PEP input for SSB • .5 μv sensitivity nominal • Full metering — Cathode current (IP), plate voltage (HV), ALC, and relative power output (RF) as well as an S-meter • Amplified ALC • Heavy duty 120/240 VAC external power supply. TS-511S — $415.00 PS-511S — $105.00 VFO-5SS — $105.00 CW-1 — $39.00

You can see the Kenwood line at the following Kenwood dealers: **CALIFORNIA** Ham Radio Outlet, Burlingame • Henry Radio, Anaheim • Henry Radio, Los Angeles • Webster Radio, Fresno • **COLORADO** Radio Communication Co., Arvada • **FLORIDA** Amatuer - Wholsale Electronics, Miami • Slep Electronics Co., Ellenton • **ILLINOIS** Erickson Communications, Chicago • Klaus Radio Inc., Peoria • Spectrosonics Inc., Chicago • **INDIANA** Graham Electronics, Indianapolis • Radio Distributing Co., South Bend • **IOWA** Hobby Industry, Council Bluffs • **KANSAS** Associated Radio Communications, Overland Park • **LOUISIANA** Electronic Exchange Co., Metairio • Trionics Inc., New Orleans • **MAINE** Down East Ham Shack, Lewiston • **MICHIGAN** Electronic Distributors, Muskegon • Radio Supply & Engineering Co., Detroit • **MINNESOTA** Electronic Center, Minneapolis • **MISSOURI** Ham Radio Center, St. Louis • Henry Radio, Butler • **MONTANA** Conley Radio Supply, Billings • **NEW YORK** Adirondack Radio Supply, Amsterdam • Harrison Radio, Farmingdale • Harrison Radio, New York City • **NORTH CAROLINA** Freck Radio & Supply, Asheville • Vickers Electronics, Durham • **OHIO** Amatuer Electronic Supply, Cleveland • Communications World, Cleveland • Queen City Electronics, Cincinnati • **OKLAHOMA** Derrick Electronics, Broken Arrow • Radio Inc., Tulsa • **OREGON** Portland Radio Supply, Portland • **PENNSYLVANIA** JRS Distributors, York • Kass Electronics, Drexel Hill • **SOUTH DAKOTA** Burghardt Supply Inc., Watertown • **TEXAS** Douglas Electronics, Corpus Christi • Industrial Distributors, Dallas • Ed Juge Electronics Inc., Fort Worth • Ed Juge Electronics Inc. Dallas • Madison Electronics, Houston • **UTAH** Manwill Supply Co., Salt Lake City • **WASHINGTON** Amatuer Radio Supply, Seattle • **WISCONSIN** Amatuer Electronic Supply, Milwaukee •

Prices subject to change without notice

NEW DRAKE TR-72

2-Meter FM Transceiver

- **23 Channels**
- **Superior Selectivity**
- **Completely Solid State**

$299.95

Including dynamic microphone, DC power cord, mobile mount and desk mount brackets, microphone hanger, auxiliary connector, and external speaker plug

GENERAL: • **Frequency coverage:** 144-148 MHz • **23 channels,** 2 supplied (.52/.52 and .34/.94) • **Completely solid state** • **Current drain:** Rcv 0.4 A, Xmit 2.7 A (Hi power) or 1.2 A (Lo power) • **Voltage required:** 13.8 VDC • **Antenna impedance:** 50 ohms • **Frequency adjusting trimmers** on every crystal • **Size:** 7 1/16"W x 2 3/8"H x 9 7/16"D (18 x 6 x 24 cm) • **Weight:** 5½ lbs. (2.5 kg).

TRANSMITTER: • **RF output power:** 10 W min. (Hi power) or 1 W (Lo power) at 13.8 VDC • **Frequency deviation:** adjustable to ±15 kHz max., factory set to ±6.5 kHz • **Automatic VSWR protection**

RECEIVER: • **Crystal-controlled, double conversion superhet** • **Sensitivity:** Less than .35μV for 20 dB quieting • **Selectivity:** 20 kHz at -6 dB (±30 kHz and adjacent channel rejection at least 80 dB down) • **Audio output:** 1 W • **Audio output impedance:** 8 ohms • **Modulation acceptance:** ±7 kHz • **Image rejection:** -65 dB • **Intermodulation and other spurious responses:** at least 70 dB down.

DRAKE®

AC-10 POWER SUPPLY
for 115 VAC operation
$39.95

For complete details contact:

R. L. DRAKE COMPANY
540 Richard St., Miamisburg, Ohio 45342
Phone: (513) 866-2421 Telex: 288-017

what is an antenna noise bridge?

Antenna Noise Bridge (an-'ten-a noiz brij), n. Omega-t's name for a specialized testing device that checks your antenna system for resonant frequency and coaxial impedance.

Obtain maximum efficiency by determining the resonant frequency for any type of antenna with the solid state, self-contained Antenna Noise Bridge...

Two models...TE7-01 for 1-100 MHz range, $29.95...the TE7-02 for 1-300 MHz range, $39.95.

Sold through amateur radio dealers or direct from the factory.

omega-t systems incorporated®

320 TERRACE VILLAGE • RICHARDSON, TEXAS 75080 • (214) 231-5121

FM YOUR GONSET

(or your Clegg 22'er, Poly-Comm 2, PC-62, Johnson 6N2, Aerotron 500, HA-460, TX-62 or VHF-1)

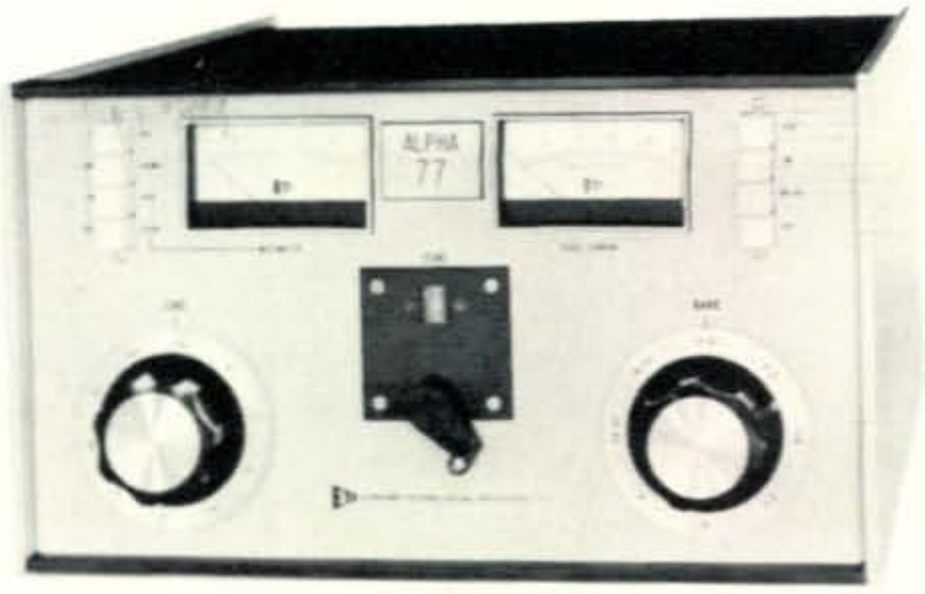
- New! Plug-in modulator puts the Communicator transmitter on FM.
- No modification or rewiring on your Communicator. Just plug into mike jack and crystal socket.
- Compact self-contained modulator measures 4" x 3" x1½".

- Works with Communicator I, II, III, IV and GC-105, and other rigs listed.
- FM at a tenth the cost of a new rig.
- Frequency adjust for netting built in.
- $34.50 postpaid U.S.A. $36.50 for PC-2, PC-62, HA-460. Specify transmitter model. California residents add 5% sales tax. (HC-6/U crystal and 9 volt transistor battery not supplied.)
- Send for free descriptive brochure.

PALOMAR ENGINEERS

BOX 455, ESCONDIDO, CA 92025

The Incomparable



ALPHA 77

Featuring the new giant from Eimac, the 8877, grounded-grid triode with a conservative 1500 watts of plate disipation.

Volume production now allows a new low price

$ 1495.

Unexcelled quality and reliability is the basis of our new warranty: All parts and labor—one year, power transformer and oil-filled filter capacitor—two years.

If you want to move up to the finest, the 77, phone/write **Don Payne, K4ID**, for a brochure, personalized service, and a King-size trade-in on any gear you have.

PAYNE RADIO

Box 525
Springfield, Tenn. 37172

Phone
Six Days
(615) 384-5573

Phone
Nites-Sundays
(615) 384-5643

Converting The Western Union Telefax Machine For Amateur Use

BY IRWIN MATH,* WA2NDM

Part I—Description and Preparation

FROM time to time various surplus items become available to amateurs which introduce, in an inexpensive way, new means for enjoying and developing the hobby which were previously reserved for hams with highly developed technical skills and/or budgets.

At the end of World War II, it was the surplus market that "modernized" the ham shack with the ARC-5 series Later, the higher frequencies were opened up with BC-645's (420 mHz band), APX-6's (1215 mHz) and the like. Recently, the wave of readily available obsolete commercial f.m. gear stimulated this mode to a degree unprecedented in amateur history.

It is this author's feeling that another such item has now made its appearance. This device is the Western Union Telefax Machine shown in the photo. Up to this point, amateur facsimile transmissions were accomplished with highly sophisticated homebrew or expensive military surplus equipment. Now, a low cost commercial facsimile unit is available to the amateur fraternity. This series of articles will attempt to explain how to fully convert the unit for either amateur radio use or machine-to-machine use, over a wire link. The result will be a good quality 72-line-per-inch resolution facsimile transceiver that will send and receive a 4½ × 6½ inch message or picture for a total cost of substantially less than $50, including machine, components, paper, etc.

Before beginning we would like to indicate two sources for the basic machines and suggest that those interested in learning about "FAX" first-hand, obtain a unit. We have inspected machines supplied by both sources and are pleased to say that they are complete and in perfectly good condition for the conversion that will follow.

Our first source is R & R Electronics, 311 East South St., Indianapolis, Indiana 46225. They tell us that at present they have over 400 machines in stock as well as paper. The second source, Van's Electronics, 302 Passaic Street, Stirling, N.J. 07980, has over 300 machines in stock. He also has paper, stylii, etc. I am sure that other sources will become available, but we have only had the time to find and evaluate these two at present. We will also not quote prices for machines as they have been varying somewhat and we would suggest either watching the ads in a *CQ* or writing directly to either dealer, mentioning *CQ* and this conversion.

Description

The Western Union Telefax Machine is a unit that was originally used for the reception of frequent telegrams by customers who did not quite need actual teleprinters. The instrument is only 12″ × 13″ × 7″ and will fit on an operating bench very nicely. In the cover are compartments for transmitting and receiving blanks and paper loading information is given right on the cover. The particular models we will be concerned with are the 6500A and 7100A "Desk Fax" units which

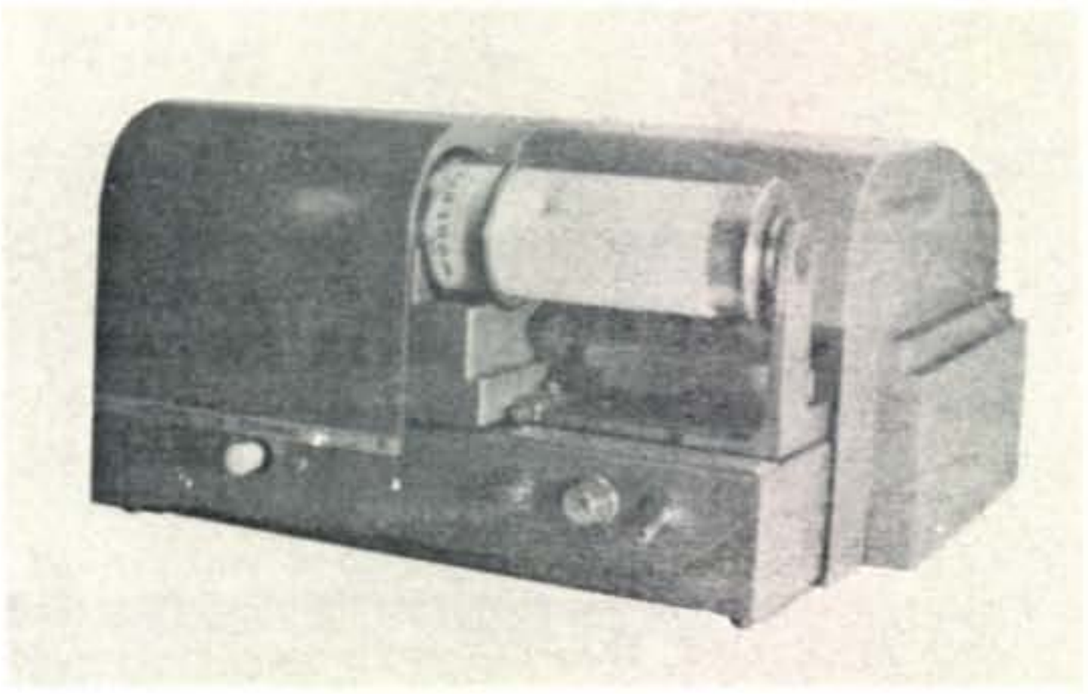
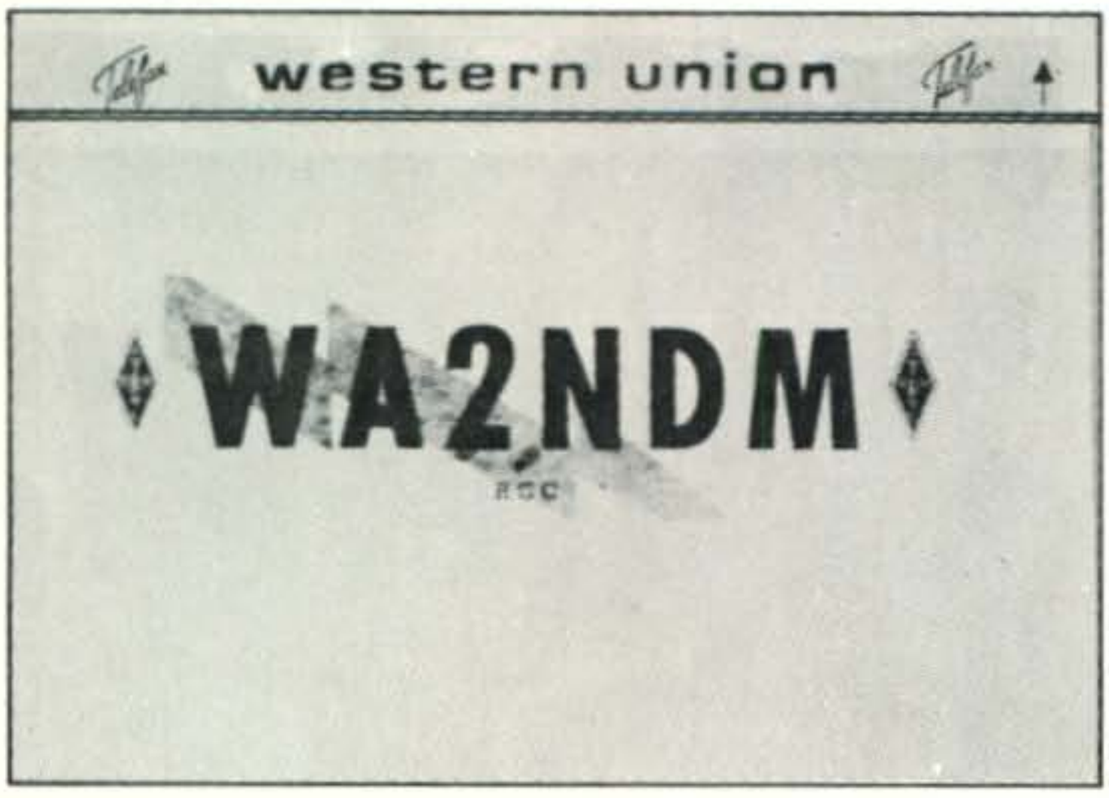


Photo of the Western Union Telefax machine.

* 5 Melville Lane, Great Neck, N.Y. 11023.



Typical received message transmitted over a noisy path. Received signals were about S4 on 6 meters with 100% modulation on a.m. The original was part of a glossy multi-colored QSL card.

are also the most readily available. All following information will refer to units converted to operate in the amateur service.

In operation, a message is typed or written on a 4½ " × 6½" sheet of ordinary paper or, any other type of printed matter trimmed to fit the 4½" × 6½" format. This paper is then wrapped around the unit's drum and aligned with specific drum markings. A toggle switch is activated which applies power to the unit, and when the tubes are all warmed up and ready to go, a front panel READY light comes on.

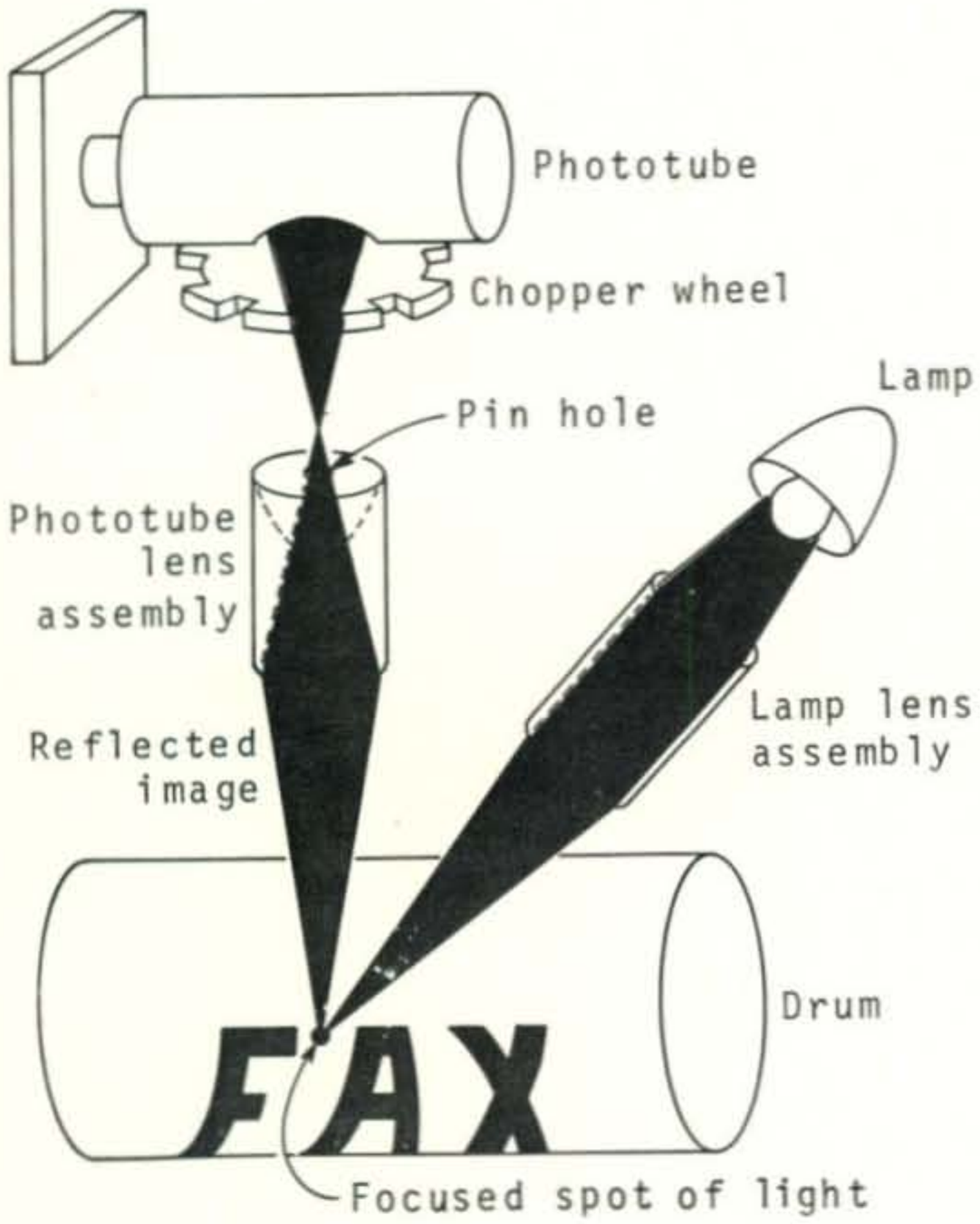


Fig. 1--Diagram of the conversion of picture material to a 2500 Hz amplitude modulated signal for transmission over wire or radio circuits.

The operator then pushes an OUTGOING button and the drum begins rotating. At the same time, synchronizing pulses are produced and transmitted to a receiving unit through either a two-wire link, or a radio link.

The receiving operator, during this interval, would have applied power to his unit, and when ready, pushed an INCOMING button. The received transmitter sync pulses would then have exactly synchronized the drum on his machine, which was previously loaded with special current sensitive receiving paper. After about 10-15 seconds, the transmitting and receiving drums will have synchronized with each other. At that time the transmitting operator merely presses a START button on his unit which causes the transmission of a START sync pulse and causes the message to begin being scanned by a focussed spot of light and a photocell. Details of this action are shown in fig. 1.

The spot of light, as it scans the information being transmitted, is reflected into the pickup lens assembly where it is focussed on a gas-filled phototube through a rotating chopper wheel. The action of the chopper wheel on the reflected spot of light produces an amplitude modulated light signal on the phototube at the frequency of the chopper wheel which is approximately 2500 Hz. Light areas in the picture cause a lot of light to be reflected and result in a high amplitude 2500 Hz signal, while dark areas only allow small amounts of light to be reflected and result in low amplitude signals.

When this modulated signal is fed to the receiver, it is amplified and applied to a small diameter stylus in contact with the receiving paper. This paper is current sensitive—that is, the greater the current through the stylus, the darker the paper becomes under the stylus.

The START sync pulse produced by the transmitter starts the feed mechanism of the receiving drum and causes the stylus to now contact the paper in the exact spot that the transmitting spot of light is scanning the original message. Then the entire transmitting blank is scanned in exact synchronism with the receiving paper and the message is faithfully reproduced.

After either the transmitter or receiver is finished, a limit switch is activated and the unit shuts itself off.

The conversion that follows will be done in several stages. The first will be the mechanical modifications and removal of all unused wires and components. The next stage

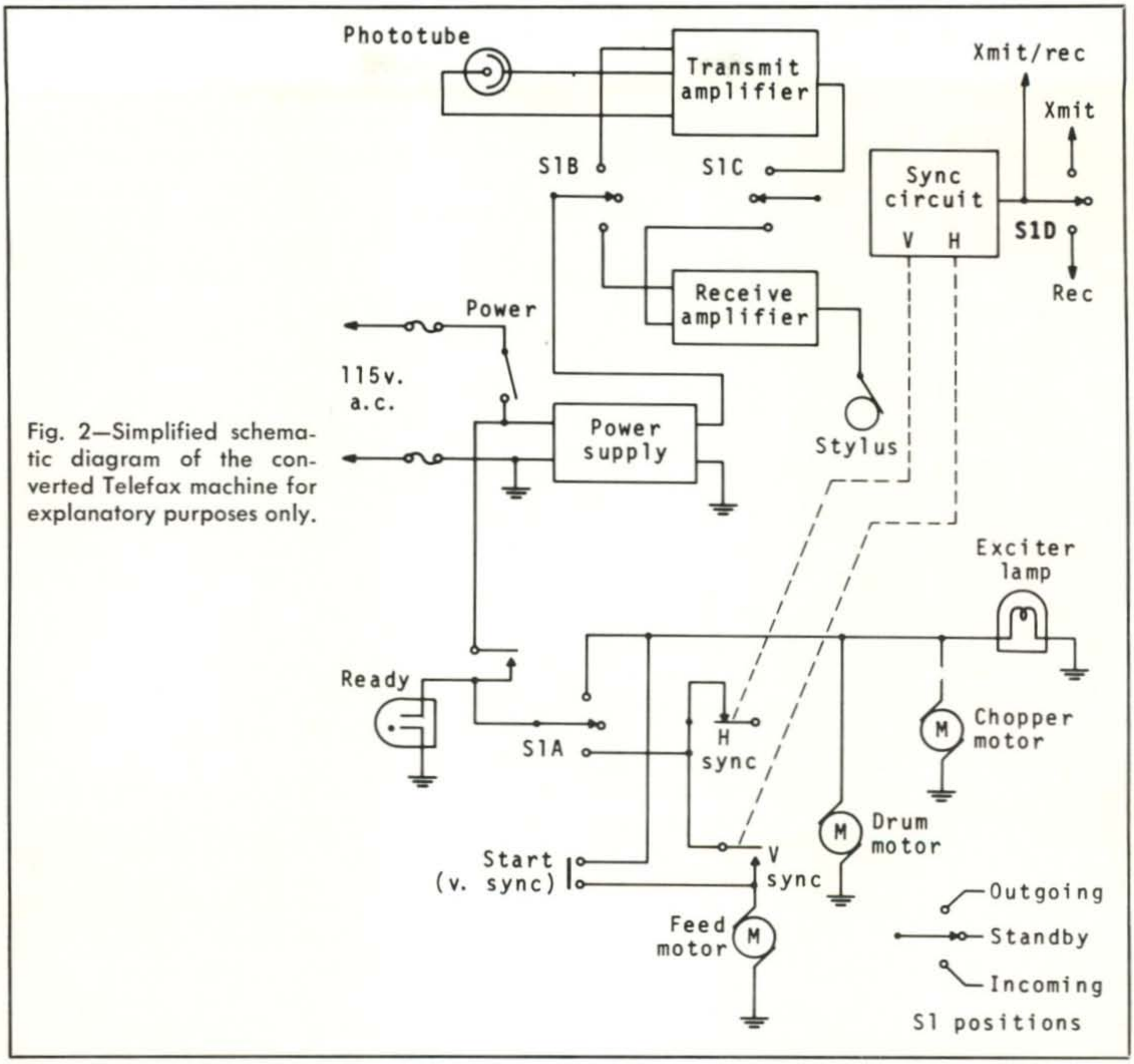


Fig. 2—Simplified schematic diagram of the converted Telefax machine for explanatory purposes only.

will cover all preliminary wiring and testing to assure that no errors have been made. Finally, the last stage will result in the fully automatic machine.

Technical Description

Figure 2 is a simplified schematic diagram of the Telefax machine, as it will be when finally converted. When power is first applied, the tubes in the amplifiers begin warming up. When the tubes have reached proper operating conditions, the READY relay pulls in, lighting the READY light. Since this relay is in series with all of the control motors, nothing will operate prior to warmup.

There are four motors in the Telefax machines. A 60 Hz synchronous motor is used to turn the drum, thereby synchronizing its rotation to the a.c. line. Another synchronous motor is used as a horizontal feed and this is also locked to the a.c. line. Two additional motors serve to turn the chopper wheel when transmitting, and press the stylus to the message blank when receiving.

After the unit has warmed up, if the operator wishes to transmit a picture, he pushes the appropriate button which causes S_1 to move to the OUTGOING position. This applies power to the drum motor and chopper motor through S_1A, and the transmit amplified through S_1B. It also connects the sync circuit between the output of the transmit amplifier and the transmitter and applies power to the exciter lamp. The drum now rotates but does not move horizontally since the feed motor is not operating. The photocell scans the edge of the message and the reflected light passing through the chopper produces a 2500 Hz tone. This tone is amplified and passed to the sync circuitry where a mechanical switch, mounted on the drum motor shaft, momen-

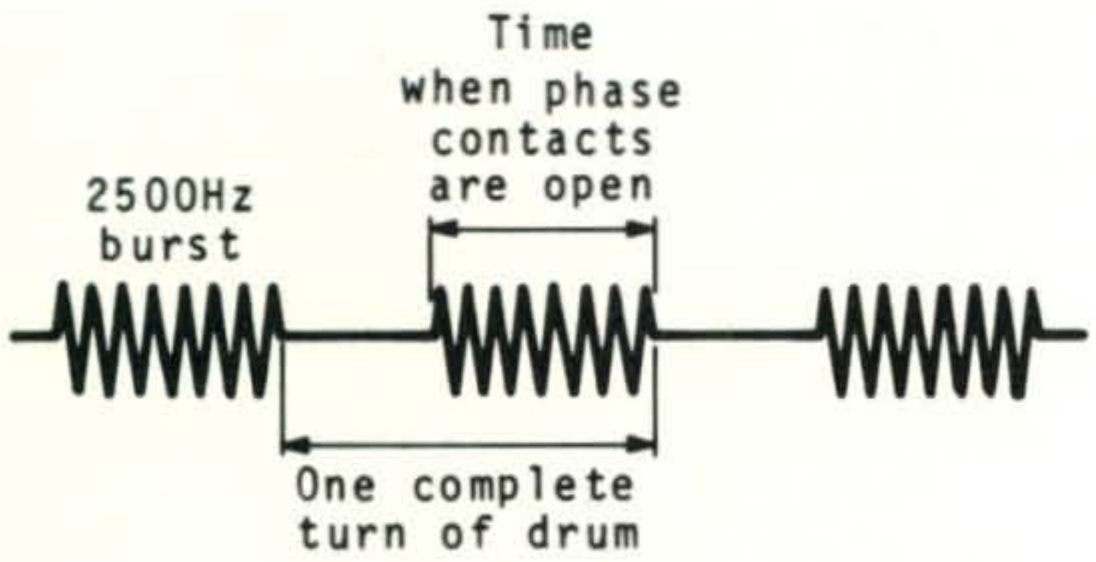


Fig. 3—2500 Hz sync pulse.

tarily allows pulses of signal to pass. Figure 3 shows what these pulses look like.

At the receiver, the INCOMING switch would have been depressed by the receiving operator and S_1 would be in the INCOMING position. This applies power to the drum motor through the H sync relay. Power is also applied to the receiver amplifier and stylus motor at this time.

The H sync relay opens as each 2500 Hz sync pulse is received by the receiving unit. Not shown in fig. 2 is an inhibit circuit that prevents the H sync relay from opening when the receiving drum is exactly in phase with the transmitting drum. Therefore, the drum motor constantly slows until it is exactly in phase with the transmitting drum. This synchronizing procedure is usually accomplished in about 10-15 seconds after which the 60 Hz line retains the synchronism.

At .this point the transmititng operator presses his START button. This causes a start pulse (625 Hz) to be transmitted and his feed motor to start. At the receiving end, the start pulse is received and used to start the receiving unit's feed motor. The delay in feed between both units is negligible and the entire picture is now processed. At the end of the scan, a mechanical arm is activated which returns S_1 to the STANDBY position.

At the completion of the conversions we will explain the function of all major components as well as various pointers in maintaining and operating the equipment. Now, let's get to work!

Conversion

Be sure to carefully follow all of the following steps in the order shown, and check your work after each step. We have converted several machines by the method outlined here and have had no trouble—but we did find several errors which were traced to missing a step or simple misreading. Also, when unpacking your machine, be sure to go through the packing material to be sure you did not inadvertently lose some small part.

A. Preliminary Chassis Preparation (fig. 4)

1. Remove top and bottom covers by removing the 8 screws around unit and on the bottom.

2. Remove exciter lamp by carefully grasping the bulb, and slightly twisting in a counterclockwise direction. Save this lamp as it is quite difficult to replace. Also, remove the tubes at this time to prevent accidental breakage.

3. Cut the wires to the selenium rectifier and remove the rectifier.

4. Cut the wires to the 600 ohm, 5 watt resistor and remove the resistor.

5. Cut the wires to the top of the two fuse holders. Do not cut the a.c. input wires from the power connector.

6. Cut the leads to the ACKNOWLEDGE button and remove button.

7. Cut the leads to the 500 ohm, 5 watt resistor and remove the resistor.

8. Cut the leads to the drum service switch and remove the switch.

9. Locate the stylus motor lead going to the microswitch on the top of the chassis. Cut all leads at this switch and remove. Also remove the ink roller and printing wheel by loosening the single screw. This item is located in line with the phototube bracket.

10. Remove thethree telephone wire leads (output) and caleb clamp. Do not remove the terminal strip or other wires.

11. Cut the leads to the 51 ohm resistor located on the incoming (green) push button and remove it. Cut the remaining 10 leads on this button also.

12. Cut the 2 leads on the STOP switch.

13. Cut the 17 leads on the OUTGOING switch and remove any loose jumpers.

14. Cut the center lead of the line transformer.

15. Cut the leads going to the ACKNOWLEDGE lamp.

16. Cut the leads going to the ACK relay and remove the relay. Also remove the black lead going to the nearby terminal strip.

17. Cut the leads going to the LR relay and remove the 25mf electrolytic capacitor shunting the coil—do not remove the relay. Remove any loose jumpers.

18. Cut the leads going to the buzzer (top of chassis). Remove the buzzer.

19. Cut the leads going to the BR relay. Do not remove the relay.

20. Cut the leads going to the PWR relay. Do not remove the relay.

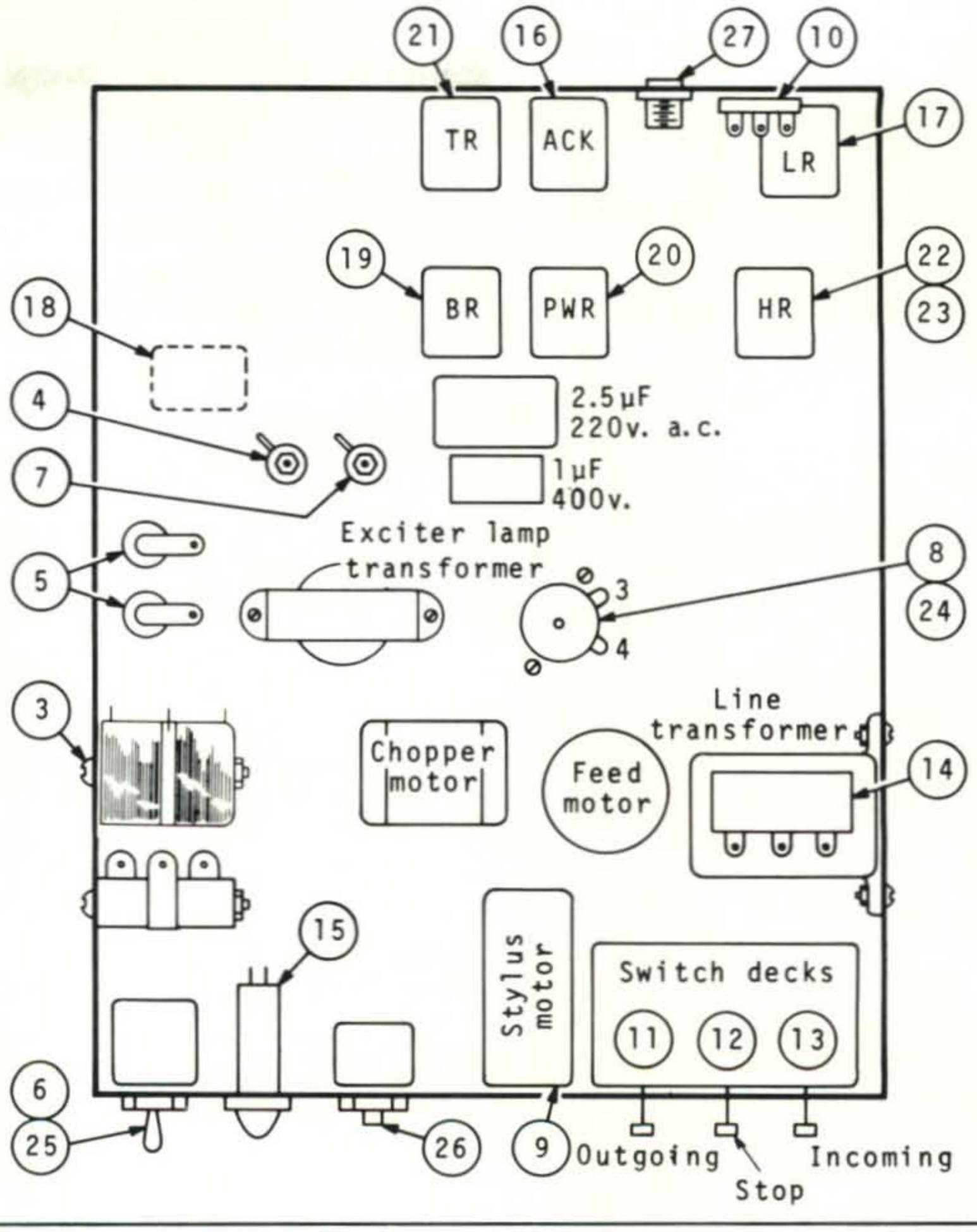


Fig. 4—Bottom view of Telefax unit showing locations of most major surgery. Circled numbers refer to numbered steps in the text.

21. Cut the leads going to the TR relay. Do not remove the relay.

22. Cut the leads going to the contacts of the HR relay only.

23. Cut the two black wires from the HR relay coil. Remove the shorter black wire.

24. Enlarge the hole remaining from the previously removed drum switch to accept a 9 pin miniature tube socket. A ¾" diameter chassis punch is perfect for this job. Mount a socket in this hole and align so that pin 3 of the socket faces the two nearby terminal strips.

25. Mount a s.p.s.t. toggle switch in the hole formerly used for the push-button switch —you may have to re-position the nearby power resistor for adequate clearance. You may also use the previously removed drum service switch in this position if you cut the shaft to fit a standard knob.

26. Drill or punch a ⅜" hole to the left of the pilot lamp on the front panel and install a s.p.s.t. normally open push button.

27. You may now select connectors of your choice for input and output terminations and mount them on the rear panel. Use the existing holes or drill new ones. Good choices are RCA phonojacks or the Amphenol 80-PC series.

28. Remove or reverse the "Push this button . . ." plate on the top of the chassis.

29. Cut the lacing cord ties along the entire main cable harness and remove all unconnected wires. Do not disconnect any components or wires that are connected to any other points in the circuitry. Also remove the long green wire coming from ground at the electrolytic capacitor.

This completes the major "surgery" to the Telefax unit. The newly installed toggle switch will now become the power switch, the neon lamp the READY light, and the newly installed push button, the START button for initiating transmission. The main harness

[*Continued on page 87*]

The Gigohmer

An inexpensive gigaohm adapter for your multimeter.

BY R. JAYARAMAN,* VU2JN

THIS article describes a highly sensitive adapter which extends the range of any inexpensive multimeter to as high as 1 gigaohm (1000 megohms). The only components used in the "Gigohmer" are two transistors, and while the unit enables one to measure very high resistances, its total "impedance" is as low as 3 "ohms"!

The Gigohmer can be used with any multimeter of 4,000 to 20,000 ohms-per-volt sensitivity, put in the high-resistance range. For reliable operation and safety of the transistors, the internal battery voltage of the multimeter should be not less than 3 and not more than 6 volts.

The Circuit

There is not much circuitry involved in the unit. Two Darlington-connected transistors are placed across the multimeter terminals and the resistor to be measured is placed across the collector and base of the input transistor (fig. 1). The minute current through the resistor is amplified by the transistors which present a corresponding virtual resistance at the multimeter terminals. A calibration chart showing the test resistance versus percentage meter deflection enables direct estimation of the value of the resistor. The chief merits of the unit are: 1. low cost and simplicity; 2. No need for an external high or low voltage supply; 3. The multimeter or the adapter cannot be damaged by any wrong connection.

Electronic circuit-designers may scoff at the use of a non-compensated nanoampere d.c. amplifier and the operation of the transistors under near-starvation conditions. But repeated tests made by the author confirm the reliability of the unit. It may be noted that the voltage across the transistors drops as the current increases, thereby providing some measure of automatic drift-compensation. Meter readings are quite repeatable, and the maximum day-to-day spread (for a variation of about 10°C in the ambient temperature) is about 2% f.s.d. in the mid-scale region. Part of this drift may be due to changes in the values of the calibration resistors themselves.

If the calibration chart is prepared for the mean readings, the maximum likely error in the meter indication is only 1% f.s.d. in the mid-scale region. Up to 100 megohms, resistances may be read to an accuracy of 10% and up to 1000 megohms, to an accuracy of 20%. However, because of the low-voltage operation, the Gigohmer may not give reliable readings in observations in which contact-potentials exist.

The choice of the transistor Q_1 is rather critical. It should have extremely low collector leakage and a respectable current-gain at very low collector currents. The writer is using a SG840 NPN silicon planar transistor,[1] now being made in India. This transistor, specially developed for low-level low-drift d.c. amplifier applications, has a collector

* Research Scholar, Department of Civil Engineering, Indian Institute of Technology, Madras-36, India.

The Gigohmer connected to the author's inexpensive multi-meter. Note that terminals A and B simply pass through holes in the aluminum box.

[1] Made by Semiconductors Ltd., Poona-14, India.

leakage of less than 10 nanoamperes at 6 volts and a minimum current-gain of 30 at a current of 1 microampere, 100 at 10 microamperes, and 300 at 1 milliampere. Q_2 can be any high-gain NPN silicon transistor with a collector leakage of not more than 0.1 microampere at 6 volts and a current-gain of not less than 400 at a collector current of 1 milliampere.

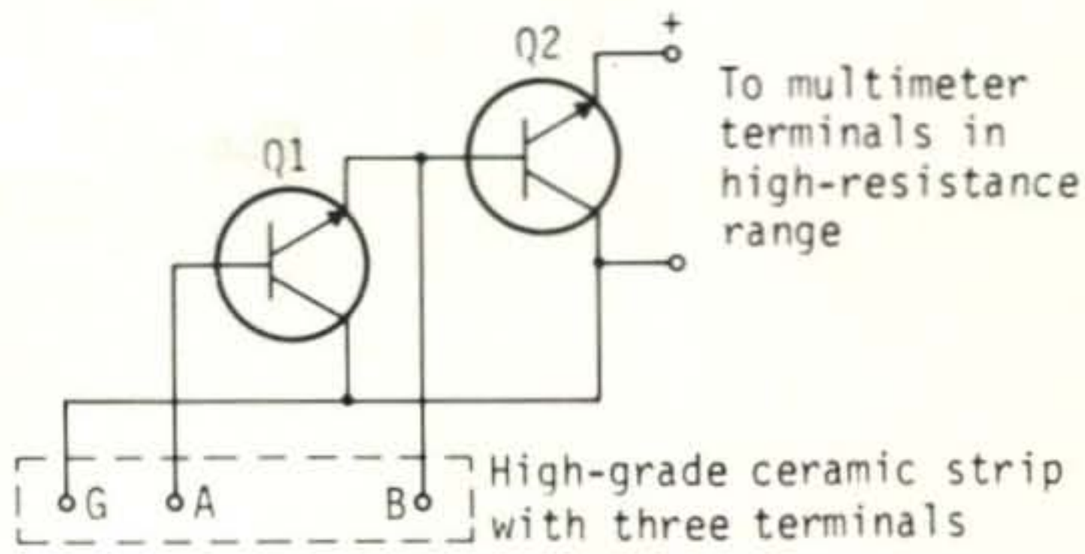


Fig. 1—Circuit of the Gigohmer, a simple adapter for the vom permitting resistance measurements to 1000 megohms. Q_1 is a low-level low-leakage NPN transistor. Q_2 is a high gain NPN silicon transistor. See text for more details.

Construction

The Gigohmer is built inside a small aluminum box. Wiring is critical in one respect. The two transistors should be mounted on a really good ceramic strip with three terminals G, A and B. No other tie-point or circuit-board should be used, except for the output leads. The writer is using a $1\frac{7}{8}" \times \frac{3}{8}" \times \frac{3}{16}"$ ceramic strip which, fortunately, had holes in the right positions. $\frac{5}{32}"$ brass bolts form the three terminals. In order to safeguard against degradation of insulation, the ceramic strip is supported at one point only, namely the ground terminal G which is fixed to the box, leaving a clear gap between the ceramic strip and the box. The other terminals A and B simply pass through holes in the box with a small circumferential clearance.

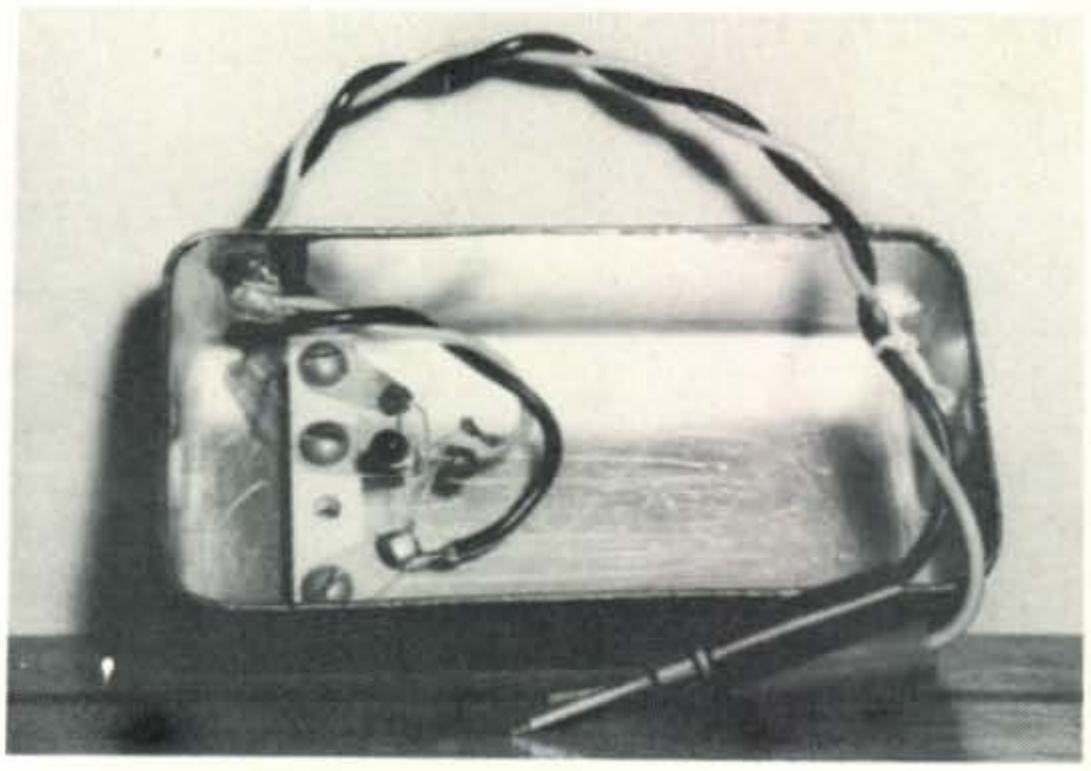
Testing

The zero-adjustment of the multimeter in the high-resistance range is first carried out carefully. Before coupling the Gigohmer to the multimeter, the polarity of the multimeter leads in the resistance range should be checked. Usually the black lead will be the positive one.

With the unit coupled to the multimeter, there should be little or no deflection of the meter. If the meter deflects by more than 0.5% f.s.d. in the case of a 20,000 ohms-per-volt multimeter, the ceramic strip and the transistors should be checked. Two measuring ranges are available. In range A of the instrument in which the test resistor is connected between the terminals G and A, the Darlington pair comes into action, while in range B in which the resistor is connected between the terminals G and B, only the second transistor comes into action. With a 4,000 ohms-per-volt multimeter, range A is suitable for measuring 15 to 1000 megohms, while range B is suitable for 0.5 to 15 megohms. While measuring body-to-ground resistances etc., the terminal G should be connected to a good ground.

Calibration

For calibrating the Gigohmer, a set of precision resistors of the following values are desirable: 1M, 3M, 10M, 30M, 100M, 300M, and 1000M. It will be found that when the test resistance is zero, the meter will not show f.s.d. because of the saturation voltage across the transistors. A graph prepared on semi-logarithmic graph-paper, as in fig. 2, enables direct readout of the resistance. With the author's multimeter, a 1000-megohm resistor, representing a 3-nanoampere input current, produces a meter deflection of 2% of full-scale, representing a 5-microampere output current. For resistance values of 100 to 500 megohms, the author was able to verify experimentally an inverse relationship between the resistance and the meter deflection. In this region, the product of the test resistance in megohms and the percentage meter deflection is 3200 with the writer's multimeter. The calibration chart prepared for one multimeter may not apply to others of the same sensitiviy.



Inside view of the Gigohmer is sure to catch an approving look even from amateurs who usually "don't have time to build anything!"

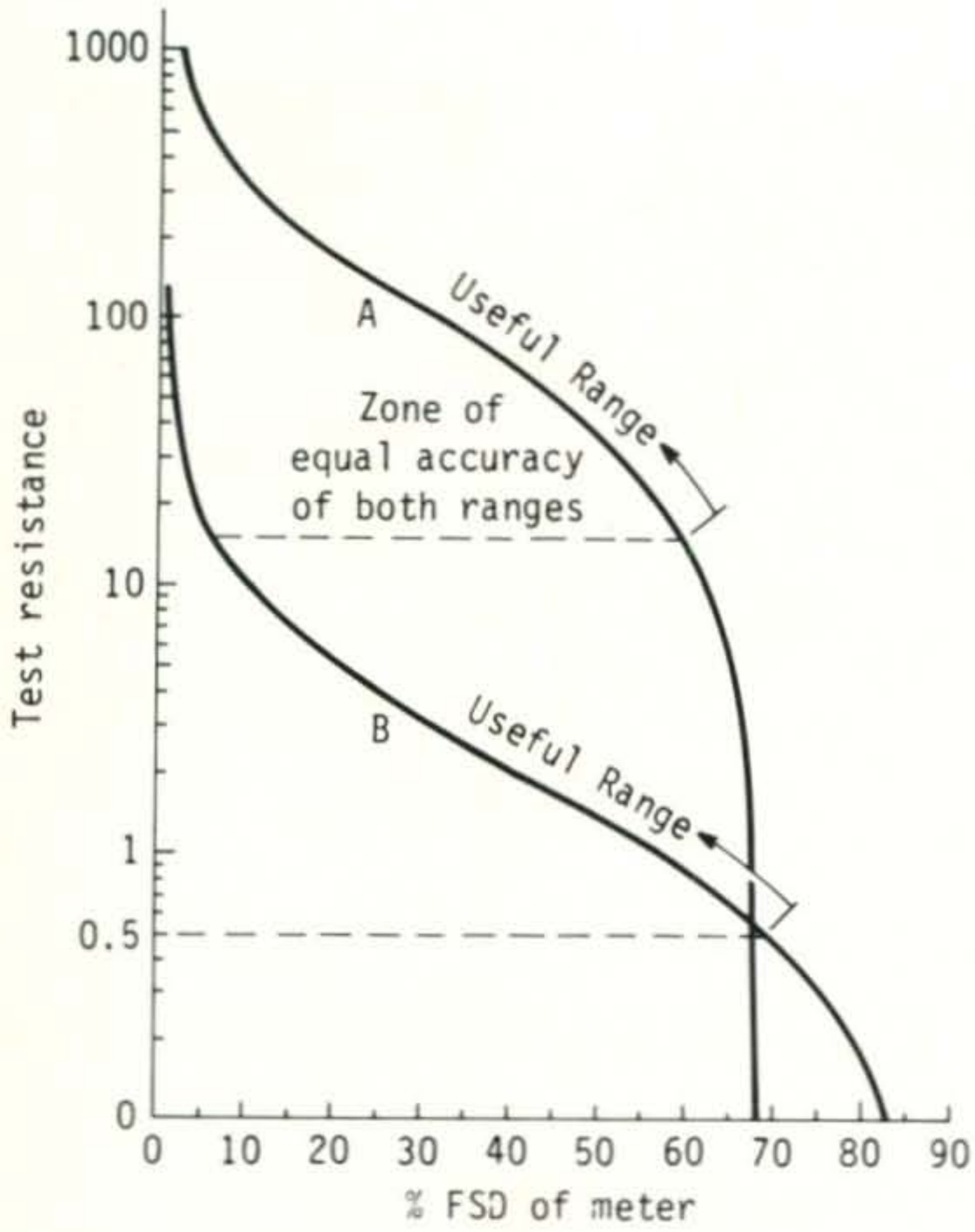


Fig. 2—Calibration chart of the Gigohmer when used with the author's 4000 ohms per volt vom in the high resistance range. Internal batteries are two 1.5 v. cells. Note that the useful portion of each range is shown. This chart is correct for the author's meter and not necessarily correct with other instruments, which must be calibrated as described in the text.

In spite of its simplicity, the Gigohmer is an ultra-sensitive instrument. It should preferably be stored in a closed box so as to prevent moisture and colloidal dust particles from settling on the ceramic strip and playing havoc with the readings (If you just blow your breath on the ceramic strip, you will get a meter deflection equivalent to about 300-M!). In humid climates, the Gigohmer should, before use, be warmed up under a lamp till the meter deflection drops to zero.

Uses

The Gigohmer will find a hundred-and-one uses in the shack of a ham; to mention a few—checking the insulation resistance of all electrical equipment, checking power transformer insulation, checking grid leak resistors, checking paper capacitors, checking the reverse resistance of silicon diodes and transistor junctions, checking the gate resistance of FET's, etc. Good silicon transistor junctions and FET gates will produce little or no meter deflection, indicating a reverse resistance of over 5,000 megohms!

Only after using a gadget like this, one gets the "feel" for high resistances. If after using this gadget, you happen to read about a v.t.v.m. amplifier, its input impedance of 10 gigaohms will no longer appear to you as an abstract incomprehensible quantity like the distance of the Andromeda galaxy! If you have not used similar instruments before, you may have to shed some of your notions about high resistances! For example, you will realize that while many of the substances used as insulators in household electrical articles do not give even 10-megohm insulation, really good insulators can give more than 1000-megohm insulation. You will start appreciating the superiority of Teflon and polyethylene over many other insulators such as bakelite, PVC, rubber and mica. If you check a few old paper capacitors with the Gigohmer, you will, most probably, decide to replace immediately all the paper capacitors in your "good-old" receiver!

You can demonstrate the sensitivity of the Gigohmer by an interesting experiment. Connect terminal G of the unit to the house ground connection. Spread a thin polyethylene sheet over the floor of the shack (assum-

[*Continued on page 87*]

SPECIAL OFFER FOR CQ SUBSCRIBERS ONLY

Our circulation department has made an exhaustive study of the costs involved in processing renewal subscriptions. This study indicates that the average short term subscription renewal costs approximately $2.00, taking into account postage, printing of renewal forms, labor, etc.

We feel that this is an extreme waste, and that the money would be far better in the pockets of our subscribers. Since CQ enjoys a renewal percentage of about 80% each year, the savings will be substantial for the amateur fraternity as a whole.

Thus, we offer present subscribers only, the opportunity to place low-cost, long term subscriptions, while the present subscription is still in effect.

The cost of these subscriptions will be $12.00 for the first three years extension, and $3.75 for each additional year thereafter. Not only will the CQ long-term sub save you substantial money, but it will reduce drastically the possiblity of computer errors on future renewals.

This offer may be made only on the special post card printed on the magazine mailing wrapper which is used for subscriber copies only. We may have to withdraw this offer at any time, so prompt action is suggested.

Dick Cowan, WA2LRO
Publisher of CQ

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

FCC 72-1104
69733

In the Matter of	)	
	)	
Amendment of Part 97 of the	)	Docket No. 18803
Commission's Rules concerning	)	RM-388, RM-1087
the licensing and operation	)	RM-1209, RM-1542,
of Repeater stations in the	)	RM-1725
Amateur Radio Service	)	

MEMORANDUM OPINION AND ORDER

Adopted: December 20, 1972 Released: January 2, 1973

By the Commission: Commissioner Johnson concurring in the result.

1. The Commission has under consideration its Report and Order (FCC 72-757) released September 8, 1972, in the above-entitled proceeding, the petitions for reconsideration, and/or stay, and other petitions requesting changes to the rules adopted in the Report and Order, filed by The Northern Berkshire Amateur Radio Club, Inc.; Wayne Green (2 petitions)1/; 73 Magazine for Radio Amateurs (4 petitions)1/; The Texas VHF-FM Society; the Fort Worth Chapter of the Texas VHF-FM Society; Fort Worth-Tarrant County Office of Civil Defense; Fort Worth-Tarrant County RACES; North Central Texas Six-Meter Repeater Association; Repeater Committee of the Arlington (Texas) Radio Club; VHF Advisory Committee of Montana; The Engineers Repeater Group; American Radio Relay League (ARRL); Naval Communications Command; Ben F. Meyers, Jr.; Michael F. Troy, et al; James L. Hudson; Roy L. Albright; Robert S. Levy; P. Miller; H. L. Watkins; and the Northeast Repeater Association. In addition to these petitions, which were timely filed, there were a number of informal letters and petitions received by the Commission after the time for filing petitions for reconsideration had expired, 2/ both in support and in opposition to the amendments to Part 97 as adopted in the Report and Order.

2. Briefly summarized, the petitioners request reconsideration of the Report and Order, and seek either additions, deletions, modifications or a combination of these to the amendments adopted therein, or a stay in the date the amendments become effective. The petition of the Northeast Repeater Association, requests neither a petition for reconsideration nor a petition for review, but merely requests an extension of 30 days in which to file a petition for reconsideration. 2/

1/ One of the Wayne Green petitions, and the four 73 Magazine petitions were not petitions for reconsideration and/or stay. Since they do request amendments to the rules adopted in the Report and Order, they are included in this proceeding.

2/ Section 405 of the Communications Act of 1934, as amended, requires petitions for reconsideration to be filed within 30 days from the date which public notice is given of the order, decision, report, or action complained of. Among the late filed petitions were those filed on behalf of the Interstate Repeater Society, the Amateur Radio Caravan Club of New Mexico, and the Trenton Radio Club. The Commission has no authority to extend the time during which petitions for reconsideration may be filed.

3. The majority of the petitions address the matter of supervisory control of a repeater station, and the nature of the responsibility of a repeater station control operator. Indeed, from the remarks of the petitioners, it appears some misunderstanding existed about the need for a control operator under the rules in force prior to the adoption of Report and Order 18803. Then, as now, when in operation every amateur radio station must have a control operator at an authorized control point. Unattended operation of an amateur radio station is not provided for in the rules. The petition of the Fort Worth-Tarrant County Office of Civil Defense, requests amended rules to permit repeater stations to operate without a control operator on duty. Petitioner Albright requests additional rules for special unattended repeater stations equipped for tone-coded access on the input frequency. Petitioner Hudson requests another class of repeater station be established in order to accomplish the same purpose. The Engineers Repeater Group petition requests tone-coded access be a requirement for all repeater stations, and the user-operator transmitting the access signal be made responsible for the proper use of the repeater station. The Texas VHF-FM Society petition requests tone-coded access be permitted as an alternative to continuous monitoring.

4. Seven petitioners request that the rules place the burden for proper use of repeater station only upon the user station operator transmitting on the input frequency of the repeater station. They further request that the rules limit the responsibility of a repeater station control operator to properly maintaining the technical operation of the station. Of these petitions, several would require the control operator to have the means to remove the repeater station from service upon notification that the station was being used improperly. Although not specified, the notification would presumably come from user operators. Petitioners would allow 15 minutes or more after the notification for the control operator to terminate the repeater station transmissions.

5. Seven petitioners request rules for repeater stations having wide regional coverage. The petitions request deletions of the provisions of §97.89(c) and §97.69(c) which effectively limit the service area of repeater stations to intra-community coverage. Some of these also request an increase in the maximum authorized power limits for repeater stations, in one or more amateur frequency bands.

6. The Fort Worth-Tarrant County Office of Civil Defense petition requests, in effect, that repeater stations in RACES be permitted to operate in the entire 220-225 MHz frequency band. Petitioner Harris requests the same provisions and would also allow RACES repeater stations operating on frequency bands 50.35-50.75 MHz and 145.17-145.71 MHz to also be used for non-RACES purposes. A 73 Magazine for Radio Amateurs petition requests the entire frequency band 220-225 MHz, and an additional 2 MHz from 440 to 442 MHz, also be made available for repeater station operation. Additionally, petitioner 73 Magazine, requests rules permitting crossbanding of repeater stations.

7. The Northern Berkshire Amateur Radio Club petition requests the deletion of the requirement for certain of the showings specified in §97.41 for repeater stations. The Repeater Committee of the Arlington Radio Club petition requests additional rules providing for temporary, experimental repeater stations.

F. M.

BY GLEN E. ZOOK,* K9STH/5

ALL f.m. operators are quite familiar with the Report and Order on Docket 18803. Also, some operators are acquainted with the fact that several requests for reconsideration were submitted to amend or delete certain portions of the Report and Order. Unfortunately many f.m. operators were not aware that a request for reconsideration can be filed within 30 days of the issuance of a Report and Order. Therefore, only a relative few requests were received. These were primarily from the Dallas-Ft. Worth, Texas area and from Wayne Green, W2NSD, of *73* magazine. The ARRL filed a petition requesting that the effective date of the new and amended rules regarding repeaters be stayed until February 19, 1973. No other request was made by the ARRL. Most of the other requests were for provision for unattended repeater operations, usually with tone coded access. Also, the effective radiated power restrictions were requested to be modified in certain petitions.

The West Gulf Division Director of the ARRL, Roy Albright, W5-EYB, filed a petition on his own which was not supported by the ARRL. Wonder why?

The actual text of the Commission's Memorandum Opinion and Order on the requests for re-

* 410 Lawndale Drive, Richardson, Texaxs 75080

Pages 1 (top) and 2 (bottom of the F.C.C. text.

consideration are reproduced a bit later in this column. However, there will be a few bits of opinion from this columnist before getting into the actual FCC wording. First of all, several sources have said that a request for reconsideration is like a "slap-in-the-face" to the FCC. This may be true, but such were necessary due to the far reaching effects of the original Report and Order on Docket 18803. The prohibition of unattended repeaters is quite unfair to amateur operators. Other services are allowed such, and without the technical ability required of the operators. One of the reasons given against amateur unattended repeaters was the fact that commercial operations are channelized by law and amateur operations are not. This is true, but the vast majority of f.m. operators adhere to the nationally accepted 30 kHz channels including those set aside for simplex, repeater outputs, and repeater inputs. It seems that the FCC thinks 146.340 mHz simplex is the "in" thing and must be protected.

Arguments for unattended repeaters allowed for tone coded access. In paragraph 11 the statement is made: "The use of widely-known audio tones, such as those used in public telephone dialing systems, for remotely controlling an amateur radio station, is also not good amateur practice. A basic principle of radio control is that there be a reasonable probability the remote station will not be activated by unauthorized persons, and the control operator can indeed effect supervisory control of the station from the remote control point just as well as if the control point was located at the station." Well, just what is a "reasonable possibility"? Using the standard 12 button "Touchtone" dial there are 144 possible combinations using 2-digit control, 1728 combinations using 3 digits, and so on. Using the 16 but-

Pages 3 and 4 of the F.C.C. text.

8. The information submitted in the petitions adds nothing new to that available and considered by the Commission in adopting the Report and Order. While the Texas VHF-FM Society petition puts forth the argument that amateurs have demonstrated the means to generate stable, distortion-free, audio tones required for accurately coding and decoding control signals, through the use of a recently available, inexpensive, hybrid integrated circuit, tone stability alone was not a major consideration in the decision to confine the use of such signals on a repeater station input frequency to secondary control purposes only.

9. Operation of a repeater station in the Amateur Radio Service can present unique problems not comparable to other radio services such as Land Mobile or Citizens Class A, where control operators are not required at repeater stations. For instance, specific frequencies are not assigned to amateur radio stations, as they are in other radio services. An amateur radio station operating frequency must be selected by the control operator. Good amateur practice requires that he monitor his selected frequency prior to transmitting, in order to insure that the transmission will not interfere with radiocommunication already in progress on that frequency. Repeater stations are no more exempt from this requirement than are any other type of amateur radio station. Indeed, with over 90% of the licensed amateurs in the Country alone having access to all of the frequencies where repeater stations are permitted to operate, supervisory control is very necessary. Moreover, these frequencies are not limited to voice operation. All of the types of emissions authorized for amateurs may be used on most of the frequencies where repeater stations are also permitted to operate.

10. Good amateur practice also requires the control operator of a repeater station to monitor the input receiving frequency prior to activating the repeater transmitter. A repeater station, as with any amateur station, may not retransmit signals not intended for retransmission. Again supervisory control is necessary since there could be radiocommunication already in progress on the input frequency not intended for retransmission. Also, if a repeater station retransmitted a simplex radiocommunication between stations on the input frequency, it would be violating the rules prohibiting one-way transmissions.

11. Several petitioners recognize these problems and propose to overcome them through a tone-access system. Users would activate the repeater station by transmitting a certain combination of tones on the repeater station input communication frequency channel. Such a technique is inadequate to provide supervisory control over a remote station. It will not prevent the activation of the station by unauthorized persons, nor will it assure that the control operator can de-activate the station when there are interfering stations on the same input frequency channel. Controlling an amateur radio station by radio remote control with a control link that uses a widely-known frequency, such as the input communication channel of a repeater station, is not good amateur practice. The use of widely-known audio tones, such as those used in public telephone dialing systems, for remotely controlling an amateur radio station, is also not good amateur practice. A basic principle of radio control is that there be a reasonable probability the remote station will not be activated by unauthorized persons, and the control operator can indeed effect supervisory control of the station from the remote control point just as well as if the control point was located at the station.

12. We believe the ingenuity of amateurs can eventually develop the techniques, technical and operational, that will permit the adoption of rules for automatically controlled repeater stations. It is conceivable that automatic and reliable means can be developed that will perform all of the supervisory functions of a repeater station control operator under certain specific conditions. The Commission urged knowledgable persons to submit information on this approach. Several amateur have already responded and although their ideas show promise, it is clear that provisions for automatic control are not warranted at this time.

13. The ARRL petition requests the effective date of the new and amended rules relating primarily to repeater stations be stayed until February 19, 1973. The Levy petition requests the rules be implemented after a minimum of ninety days. One of the Green petitions requests a delay of one year in the effective date of the amendments. The Troy petition would stay and put aside selected portions of the new rules. Inasmuch as the policy established for transition to the new rules announced in a Public Notice (90785) dated October 6, 1972, does provide a reasonable time for existing stations affected by the new rules to make the appropriate modification necessary for compliance, for the most part the objectives of the petitioners are already achieved. For instance, a station operating as a repeater station, and/or one authorized for remote control, whose license was granted as a result of an application filed prior to October 17, 1972, the effective date of the new rules, should comply with the new rules to the extent possible after that date, but must fully comply by no later than June 30, 1973. In view of the time and effort already expended in studies, evaluations and discussions in this matter, there should not be any further delay, with consequent postponment of the substantial public benefits the new rules promise.

14. The petition by the Naval Communications Command would delete military recreation stations from the types of amateur radio stations prohibited from portable or mobile operation by §97.95(a)(1). Petitioner cites three examples of portable operation by military recreation stations; K4NAA at the Armed Forces Communications and Electronics Association Annual Convention; Navy or Marine Corps sponsored military recreation /MARS station exhibit at the Southern Nevada Amateur Radio Club, Inc. Annual Convention; and the field day and emergency communications provided by K3USN. Since non-amateurs may be the license trustee of a military recreation station, they are not required to be familiar with our rules. These stations are principally intended for the recreational use of amateur radio operators serving in the Armed Forces, and the few instances where portable or mobile operation of a military recreation station is warranted can be best handled on a case-by-case basis.

15. After reconsideration of all factors raised in the several petitions, we conclude that the amendments to the Amateur Radio Service Rules as adopted by the Report and Order, FCC 72-757, on August 29, 1972, in Docket 18803 are reasonable and in the public interest. Therefore, in view of the foregoing, IT IS ORDERED, that the petitions for reconsideration and/or stay listed in paragraph 1 ARE DENIED and that the amendments to the Amateur Radio Service Rules, Part 97 adopted on August 29, 1972, ARE AFFIRMED.

FEDERAL COMMUNICATIONS COMMISSION

Ben F. Waple
Secretary

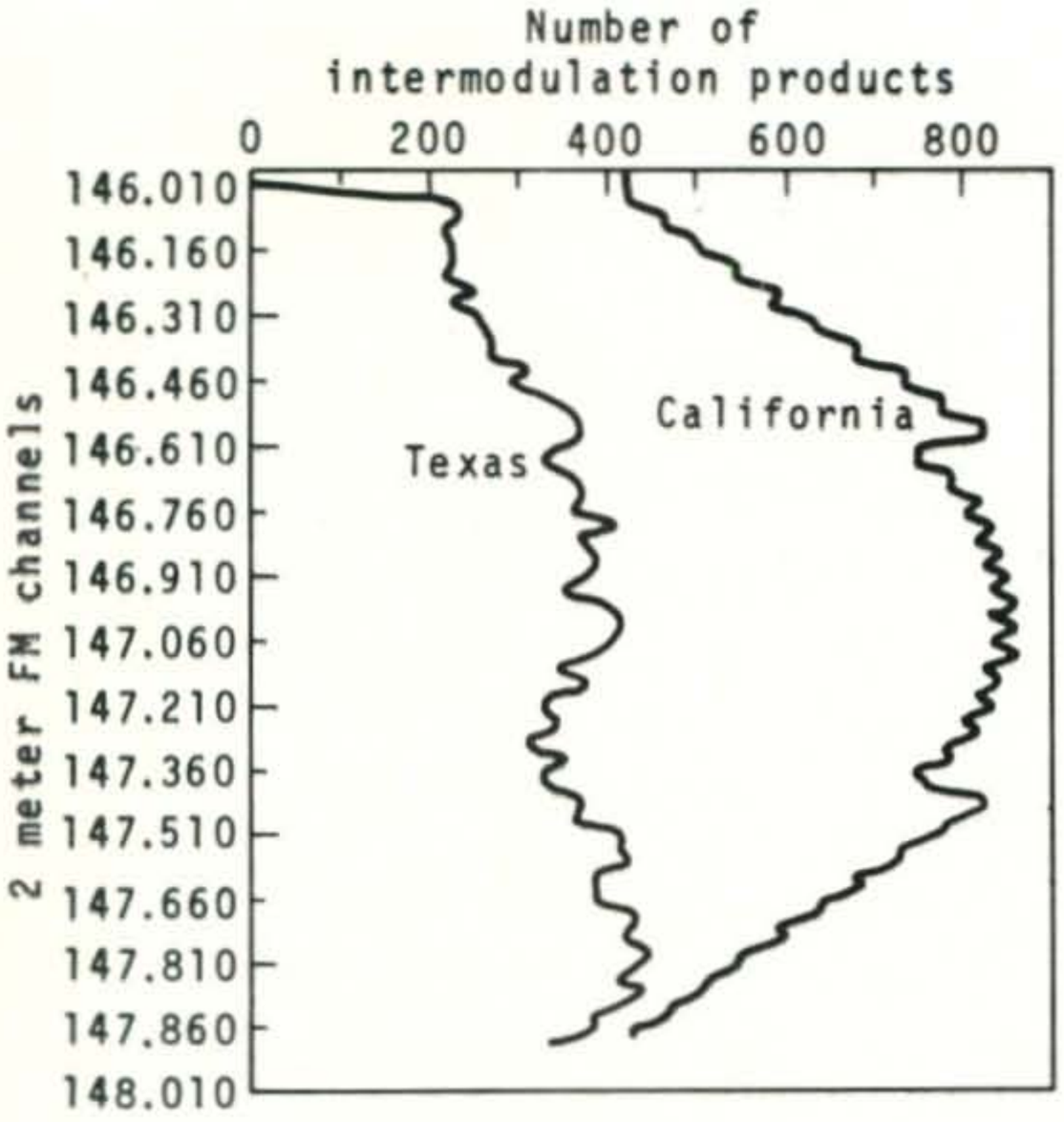


Fig. 1—Comparison between the total numbers of intermod products produced in the 146-148 mHz range with the Texas and California repeater plans.

ton series there are 256 combinations using 2 digits, 4096 combinations using 3 digits, and so on. The chances of an "unauthorized" station coming up with the required coding are not very great. It sounds like the Commission was groping for some excuse rather than a sound technical argument. If tone coding is fine for commercial and industrial uses, why is it not suitable for amateur use? I just don't understand.

Amateurs in some parts of the country are reportedly happy with the regulations. Great! However, unattended repeaters should not be forced on those amateurs who are cooperating with each other and can use an unattended repeater in mature manner. If an attended repeater is your bag, then have it, but don't force such on those who can get along without a local "policeman." Most areas of the United States have developed state or regional coordination committees to work out problems in repeater operations. Some of these committees were set up after long, hard fought repeater wars, and other committees were formed by persons with a bit of foresight and have averted repeater wars. This is the solution, not enforced local control stations with power to deactivate the repeater. Well, it is just running the subject into the ground to continue. To sum things up, the FCC said not only no, but Hell No!

Technical Talk

The standardization of a nationwide two meter band plan is presently down to two versions: The Texas Plan using low-in and high-out in both mHz of the band; and the California Plan which uses low-in and high-out in the 1st mHz (146-147 mHz) and high-in and low-out in the second mHz (147-148 mHz). The reasoning behind the California plan was to keep the receiver frequencies close together to reduce sensitivity problems in older commercial gear. The transmitters in these units will often split farther than the

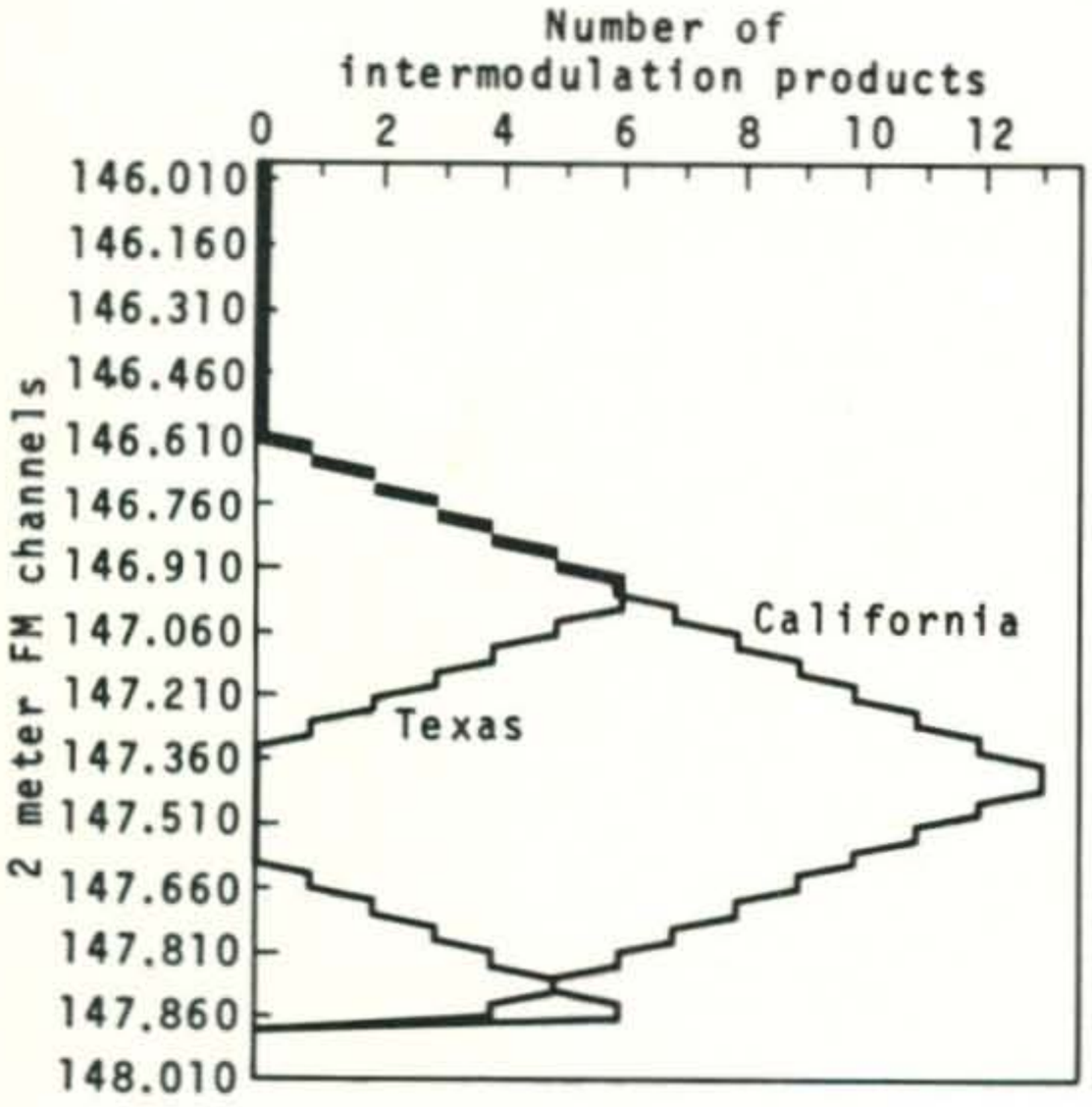


Fig. 2—Comparison of 2nd order intermod products.

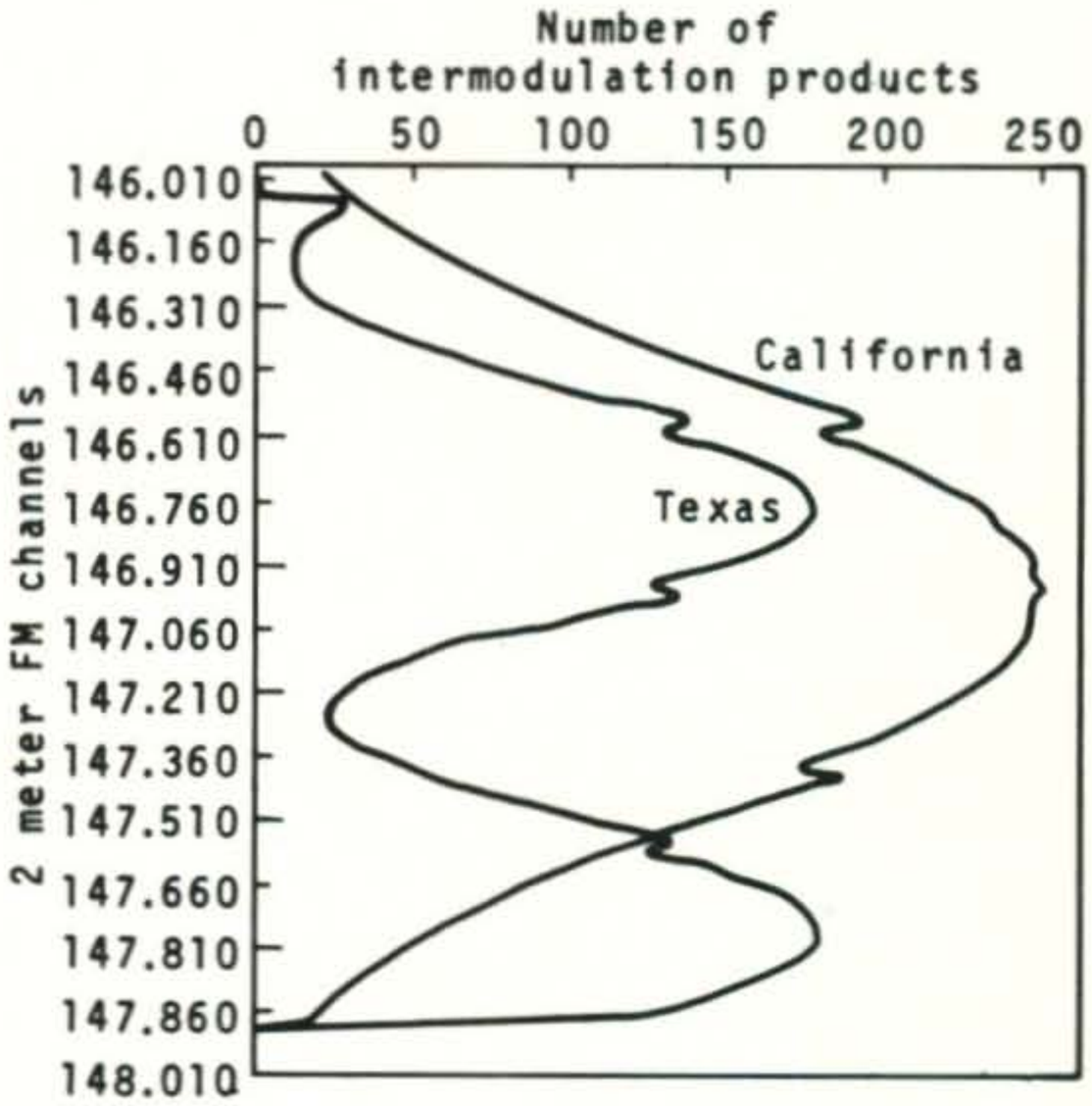


Fig. 3—Comparison of 3rd order intermod products.

receivers. On the other hand, the equipment built for amateur use will split the entire 2 mHz on both transmit and receive, and often a bit more. Another argument has been made in terms of intermod products from the fixed repeater transmitters. Along these lines a computer study has been made by Jack Mason, W5NSQ, the author of the very thorough article in the May, 1972, issue of *QST* entitled "Towards a National Plan for 2-Meter FM Channels." This computer study used both the Texas and the California plans to see just where the intermod products fell. All possibilities from 1st through 9th order were caluculated, tabulated, and those falling within the amateur 2 meter f.m. repeater band were printed out and graphed by the repeater. Jack has graciously provided copies of the graphs and permission to use them in this column.

Experience has shown that the odd orders (1st, 3rd, 5th, 7th, and 9th) are the strongest and cause the most problems. Therefore, comparison graphs are provided for the odd orders only. However, a table is also provided giving the total picture in terms of products on a plan by plan basis. In terms of the 146-148 mHz region the Texas Plan produces 25,698 intermod products or 8.090% of its total products (through 9th order) in the amateur repeater band. The California plan produces 47,642 intermod products in the same region or 15.509% of its total products. Of course just where the remainder of the products fall is also to be considered. The

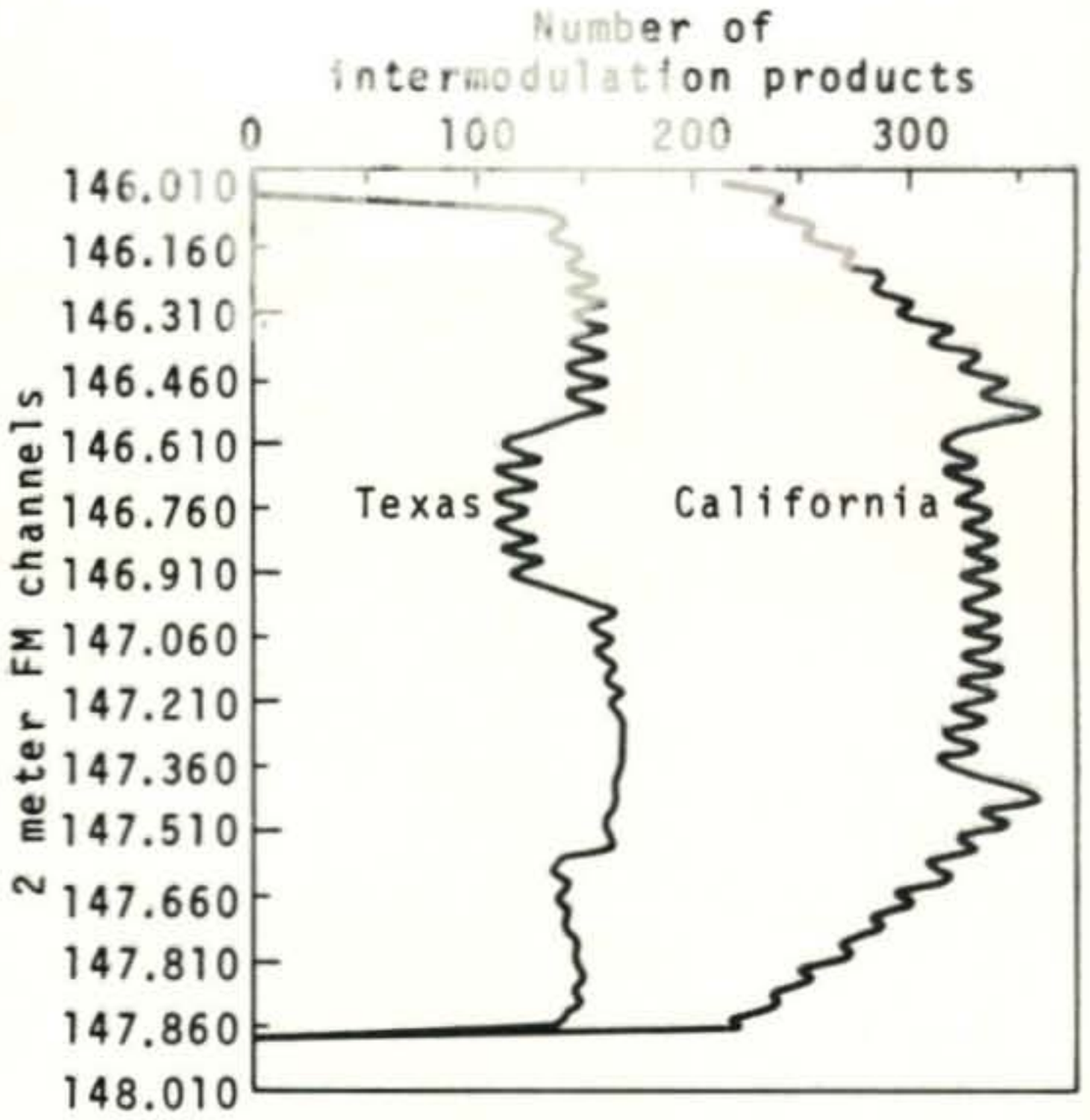


Fig. 5—Comparison of 5th order intermod products.

exact graphs are not available as this is being written (they are being re-run and plotted when computer time is available), however, a look at the tabulation of frequencies indicates that the Texas Plan intermod products fall below 152.800 mHz, primarily within the lower portions of 2 meters and the MARS/CAP frequencies just above 2 meters. The California Plan seems to produce more products well into the commercial highband frequencies. When the final graphs are available they will tell a more accurate story. However, it is much easier to live with fellow hams and communications hobbiests like MARS and CAP than with the commercial services.

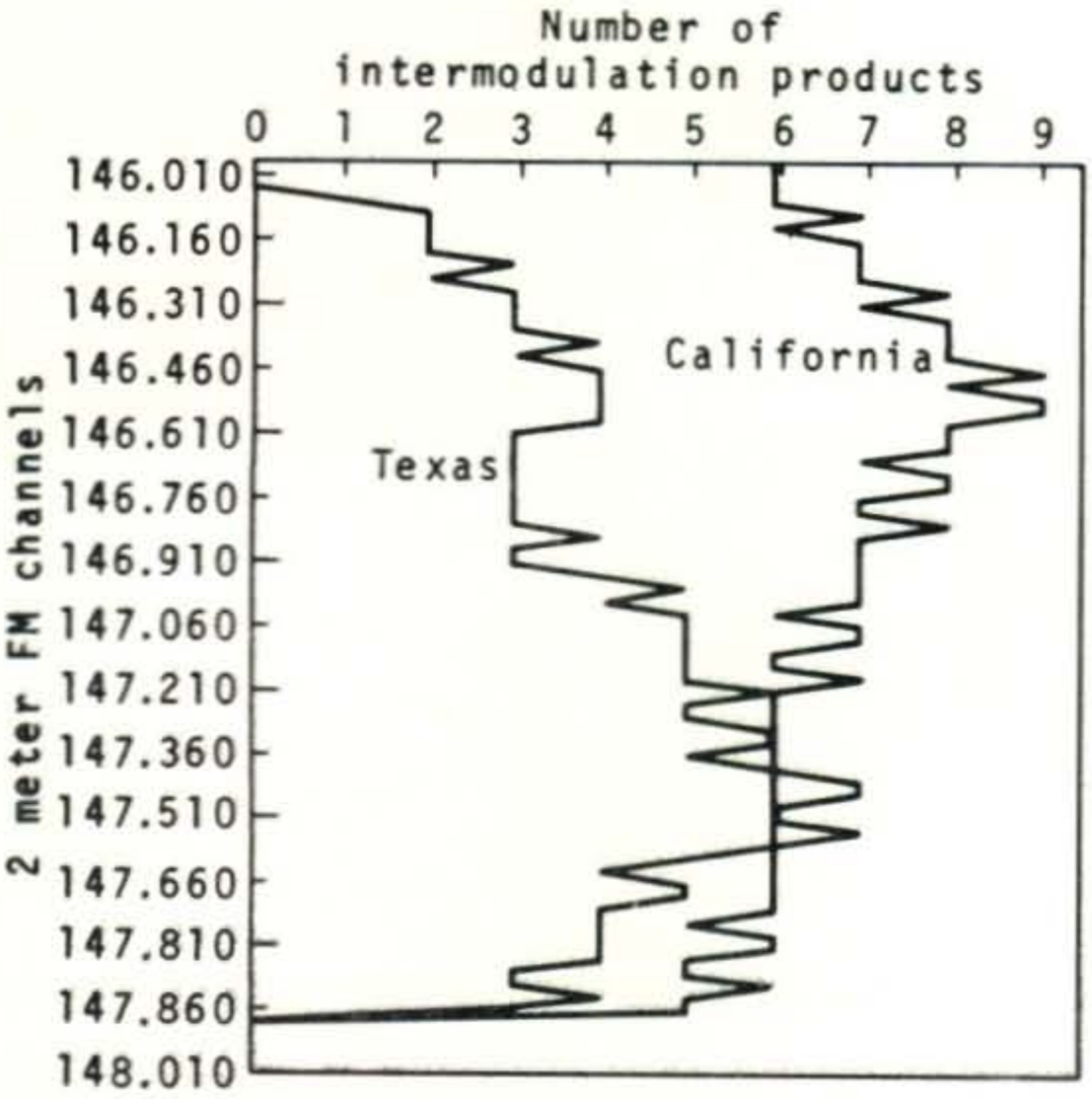


Fig. 4—Comparison of 4th order intermod products.

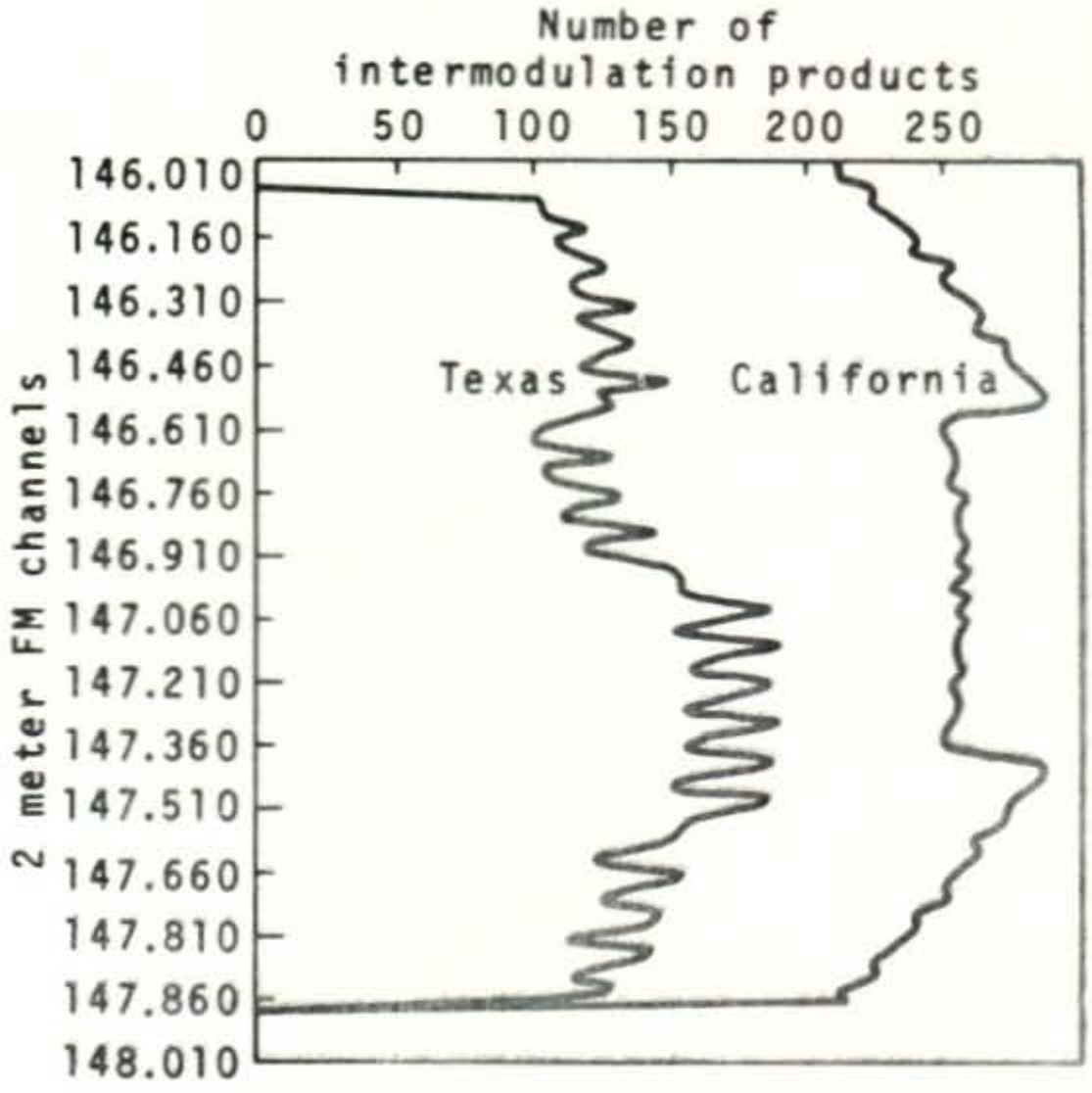


Fig. 6—Comparison of 7th order intermod products.

	Texas Plan		California Plan	
Order	146-148 mHz	Outside	146-148 mHz	Outside
1st	0	0	0	0
2nd	120	700	339	390
3rd	6,614	7,843	9,876	4,567
4th	261	34,657	452	30,452
5th	9,969	62,775	20,985	51,357
6th	0	76,978	0	70,643
7th	8,734	61,268	16,258	53,385
8th	0	35,100	0	35,100
9th	0	11,700	0	11,700
Totals	25,698	291,021	47,642	257,309

Table I—Comparison of 2-meter intermod products for Texas and California plans. Frequencies considered: Texas—146.610 mHz to 146.970 mHz, 147.600 mHz to 147.990 mHz. Total of 27 repeater output frequencies. Calif.—146.610 mHz to 147.390 mHz. Total of 27 repeater output frequencies. All based on standard 30 kHz channel spacings.

So, until the total picture is available, it is suggested that no society adopt either the Texas Plan or the California Plan. W5NSQ has been in contact with the California Amateur Relay Council about the intermod products, and they are reportedly taking a second look.

Mid-Oklahoma Repeater, Inc.

This columnist has received a bit of information from the Mid-Oklahoma Repeater group in Oklahoma City. They are going great guns with publicity, gimmicks, and the like. For example, the repeater organization has a repeator information recording that can be dialed on any telephone in the Oklahoma City area (737-7388). Also, attractive bumper stickers with the two repeater frequencies, 07/67 and 34/94, are supplied. W5OJZ provided this columnist with a photograph of the mascot of the organization. Unfortunately it is attached to a calendar and cannot be reproduced herein. The format of the calendar lists the officers, trustee, and repeater information with local telephone numbers. That is, if one ever looks below the photograph!

SAROC

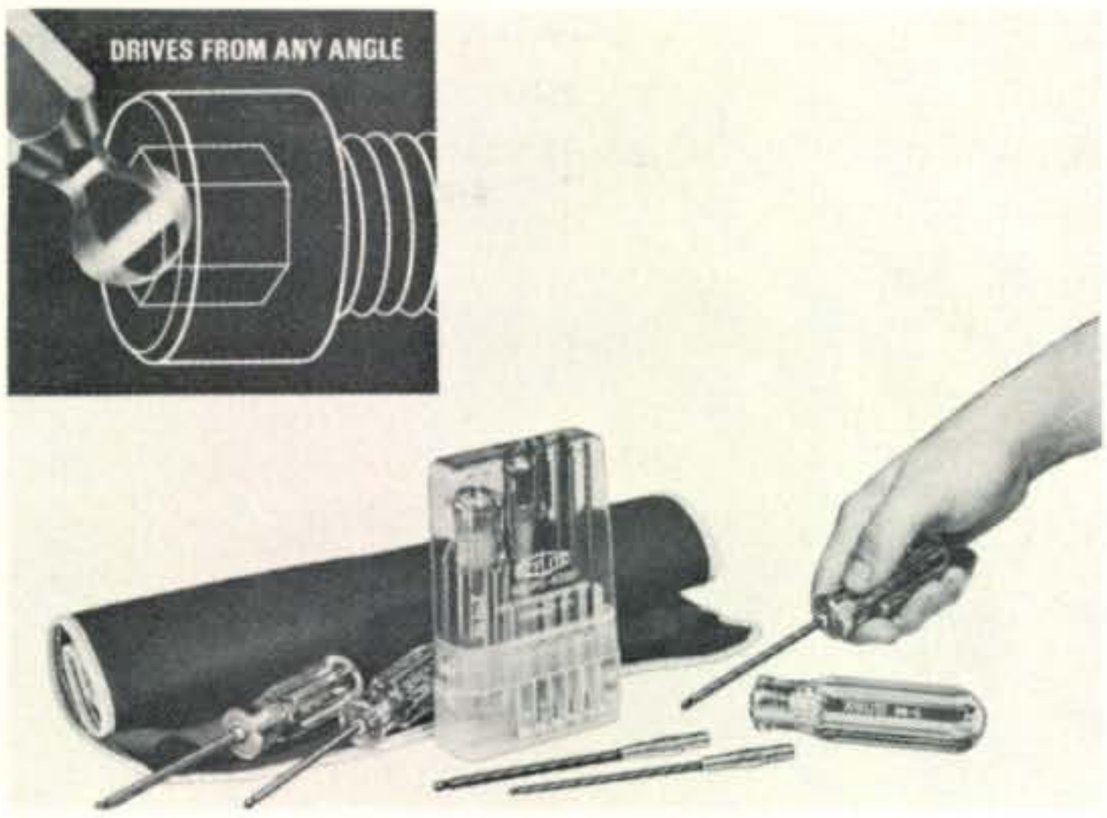
I wish to apologize to those amateurs who were expecting my attendance at SAROC in January. Unfortunately it was one of those weekends that only happen to someone else. Two serious illnesses within 48 hours (daughter and father) forced cancellation of plans for SAROC. Fortunately daughter's illness subsided within short time and father doing fine after heart surgery. Sorry that I couldn't make it this year. Hope to make it next time.

Finale

Too much on FCC regulations to allow much more in this column. Please excuse me for getting emotional about the Opinion and Order. However, just too many things have been happening in amateur regulations that have far reaching possibilities. It's time to fall-back, re-group, and start things all over again with a new request for rule-making. Things are warming up a bit outside, so it's time to start all those changes required to meet the new regulations. Best of luck and see you next month.

73, Glen, K9STH

New Amateur Products



Xcelite Ballpoint Hex Drivers

Always in the lead with unique hand tools for the electronics man, Xcelite has now introduced a set of hex drivers able to handle allen-type screws. The drivers work from any angle up to about 45° which should be a boon to amateurs involved in equipment servicing where even a simple job such as loosening knob set screws in an awkward location sometimes turns into a knuckle-skinning, panel scratching affair. Nine sizes from.050 to 3/16" are available in handle styles compatible with other Xcelite drivers. For further information circle A on page 110.

Heath R.F. Absorption Wattmeter

Heath has begun marketing a new absorption-type wattmeter (frequently referred to as a dummy load/wattmeter) which is rated at 175 watts continuous and 1000 watts maximum. Two power meter scales maximize the meter's usefulness in the 0-200 and 0-1000 watt ranges with a center scale reading of 50 and 500 watts respectively. An accuracy of +10% of full scale is claimed from 1.8 to 30 mHz. The 50 ohm load resistor is air cooled and is coupled through a thermal switch to an overload indicator. The indicator is powered from a 9-volt transistor radio battery; battery and indicator test provisions are provided. The HM-2103 kit is priced at $59.95 from the Heath Company.

Curtis Flea-Power Keyer and Memory

Curtis Electro Devices once again introduces a new electronic keyer. This one, the EK-420, is set apart from others by virtue of its super-low power consumption achieved by using the new C-MOS integrated circuits. Power can be supplied by the built-in a.c. power supply or a 9-volt transistor radio battery which can be snapped-in inside. Power consumption is 180 mw, key down. QRPers take note!

The EK-420 is designed to accept a new 100 character programmable memory unit, the KM-420, a matching companion unit which gives extremely flexible access to the 1024-bit memory. Addition of a second (optional) plug-in 1024-bit memory yields a 200 character capacity recallable in total, in half and quarters, and in quarters, giving maximum flexibility for the contester or traffic man. The EK-420 is priced at $139.95; the KM-420 at $299.95 (additional memory $34.95). Circle B on page 110 for more information.

MATH'S NOTES

BY IRWIN MATH,* WA2NDM

WE have received some information from a new (to us) source of several items that will be of interest to experimenters and we would like to pass the details along to you this month.

Mills Electronics, Box 851 STN A, Scarboro, Ontario, Canada, is the company and they have three items at present. First of these is an AMP 30 pin edge connector of the type used to make contact with P/C boards. The connector is the AMP 1-582762-2 unit with wire-wrap or P/C terminals, and in absolutely brand new condition. The second item is also a brand new AMP connector. This time it is a single row 22 pin connector with wire-wrap or P/C leads. As with the first connector, this one #582767-6 is ideal for use with 1/16" P/C boards. Mills' final offer is a set of four nylon alignment tools (brand new) which look like they will fit just about any slug or core made. The 11 inch long one looks extremely interesting for getting into those tight places. Price for any of the above items is $1.25 each which includes all first class postage. Because of the international nature of your order, Mills requests that you

* 5 Melville Lane, Great Neck, N. Y. 11023.

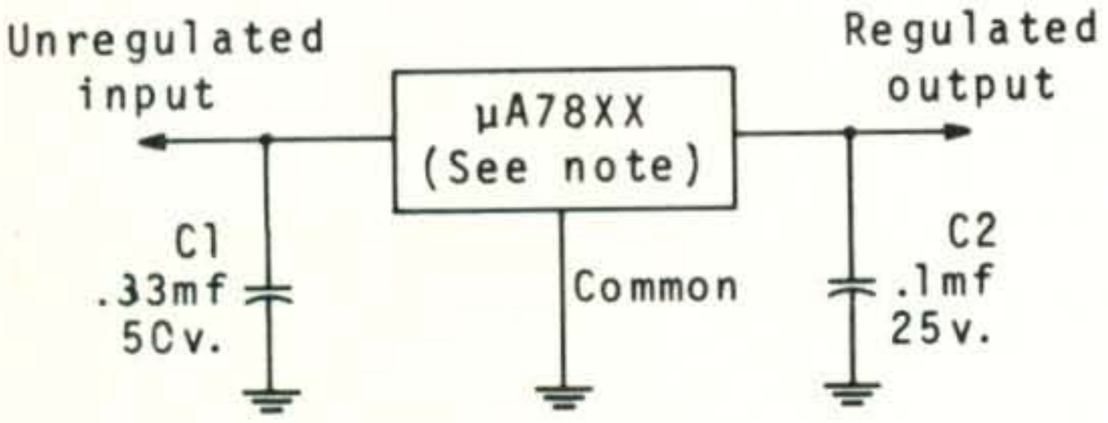
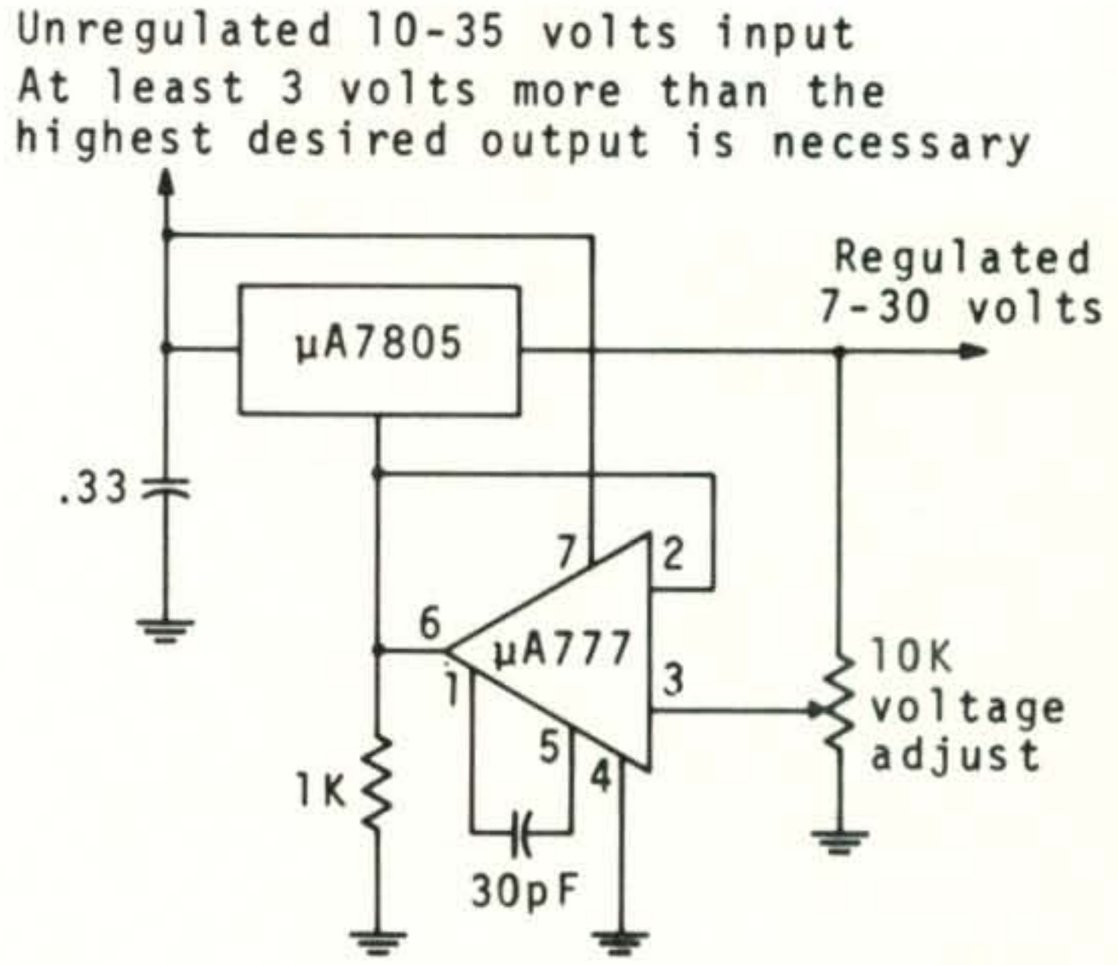


Fig. 1—Hookup for the μA 7800 series of IC voltage regulators. Note: To specify a voltage, substitute the voltage value for "XX". C_1 is only required if the regulator is an appreciable distance from the unregulated power supply filter. C_2 is only required to improve transient response. For steady state loads it can be left out. (1) Voltage output tolerance ± 5%. (2) Minimum input/output voltage difference 2.0 volts. (3) Output resistance less than 0.2 ohms. (4) Power dissipation at 75°C, with adequate heat sink—15 watts.

Specific Parameters

Chip	Output Voltage	Worst Case Regulation	Short Circuit Current
μA 7805	5 v.	100 mv	750 ma
μA 7806	6 v.	120 mv	550 ma
μA 7808	8 v.	160 mv	450 ma
μA 7812	12 v.	240 mv	350 ma
μA 7815	15 v.	300 mv	230 ma
μA 7818	18 v.	360 mv	200 ma
μA 7824	24 v.	480 mv	150 ma

Fig. 2—Common parameters for the μA 7800 series.



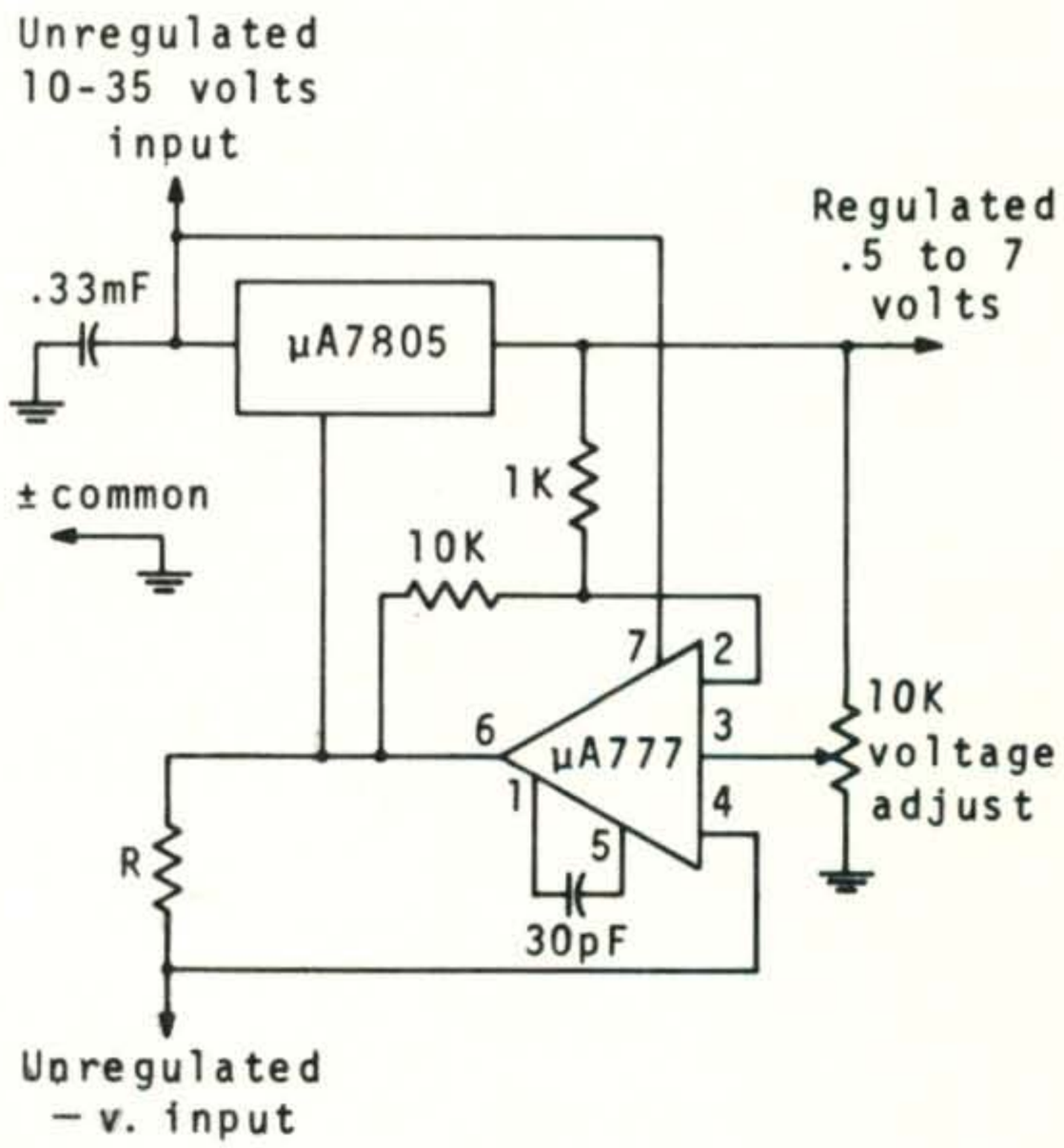


Fig. 3—Variable output supplies. In 3B, the -V supply voltage as well as R are to be determined experimentally and will be a function of the exact output voltage and current required.

send a postal money order available at any post office.

With the growing interest in higher and higher frequencies Hewlett Packard has announced what is said to be the lowest noise transistor produced to date. Although the device is very expensive ($90 at the 100 quantity level) we just thought you'd like to see a glimpse of things to come. Guaranteed maximum noise figure at 2 gHz is 2.3 db and, at 4 gHz it is 3.3 db. Typical figures are 2 db and 3 db respectively. Gain at 2 gHz is 14.8 db, at 4 gHz it is 9.6 db, andat 6 gHz it is 6.4 db. Maximum frequency of oscillation is 14 gHz for this neat NPN device. How about an amateur $5 version!

More in line wth amateur prices however, is a new u.h.f. diode, the Hewlett Packard 5082-2800 beam lead device that is fine for

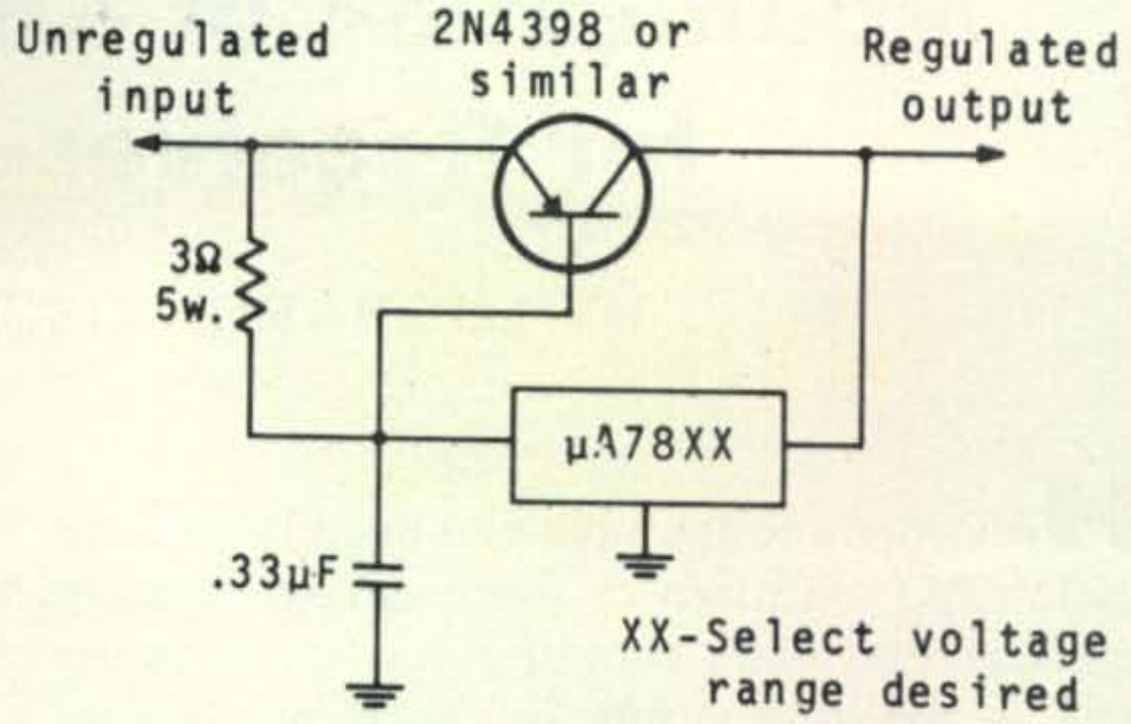
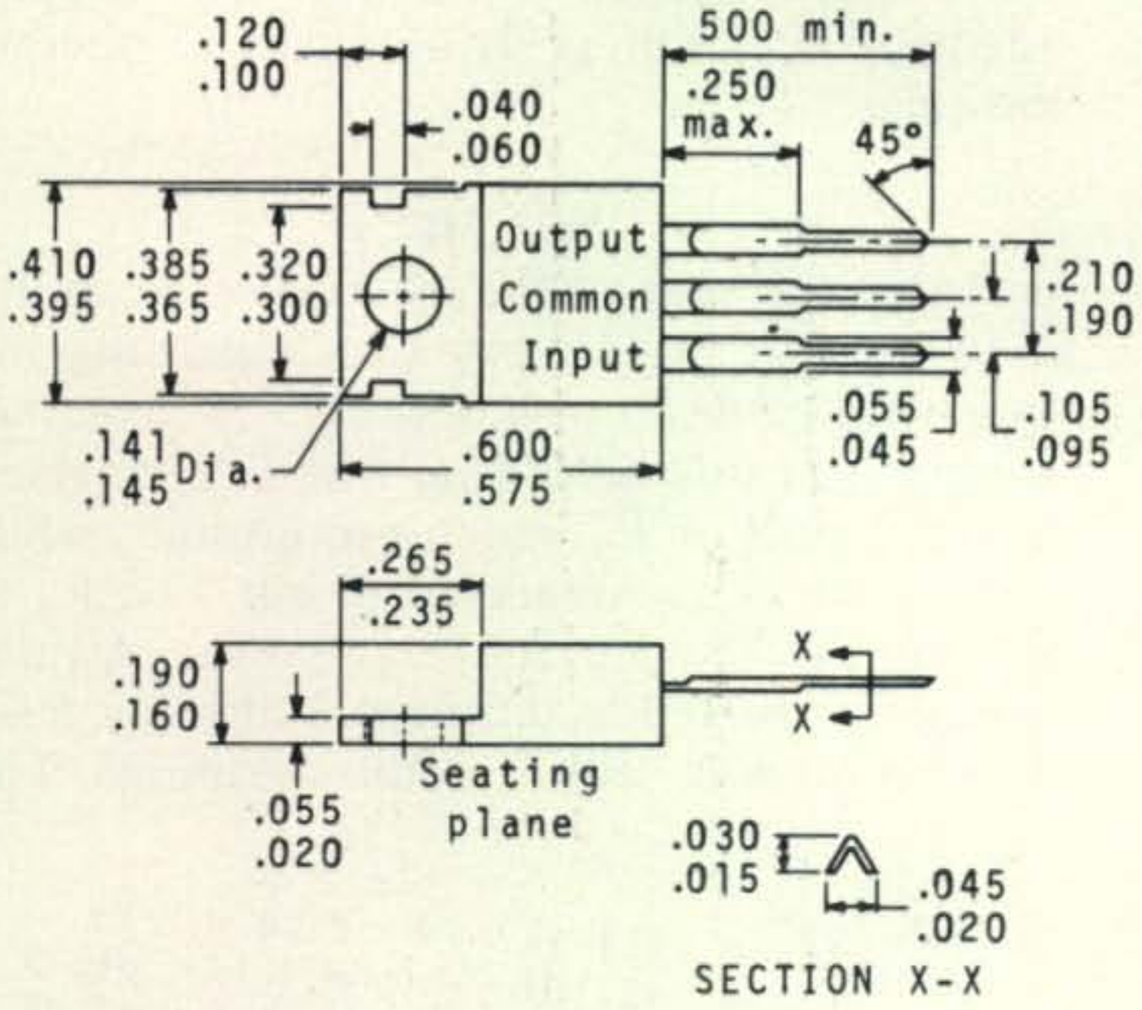


Fig. 4—A simple high current version of Fig. 1.

high level detection, switching, gating, sampling and the like. Breakdown voltage is 70 volts, reverse leakage 200 nanoamperes and

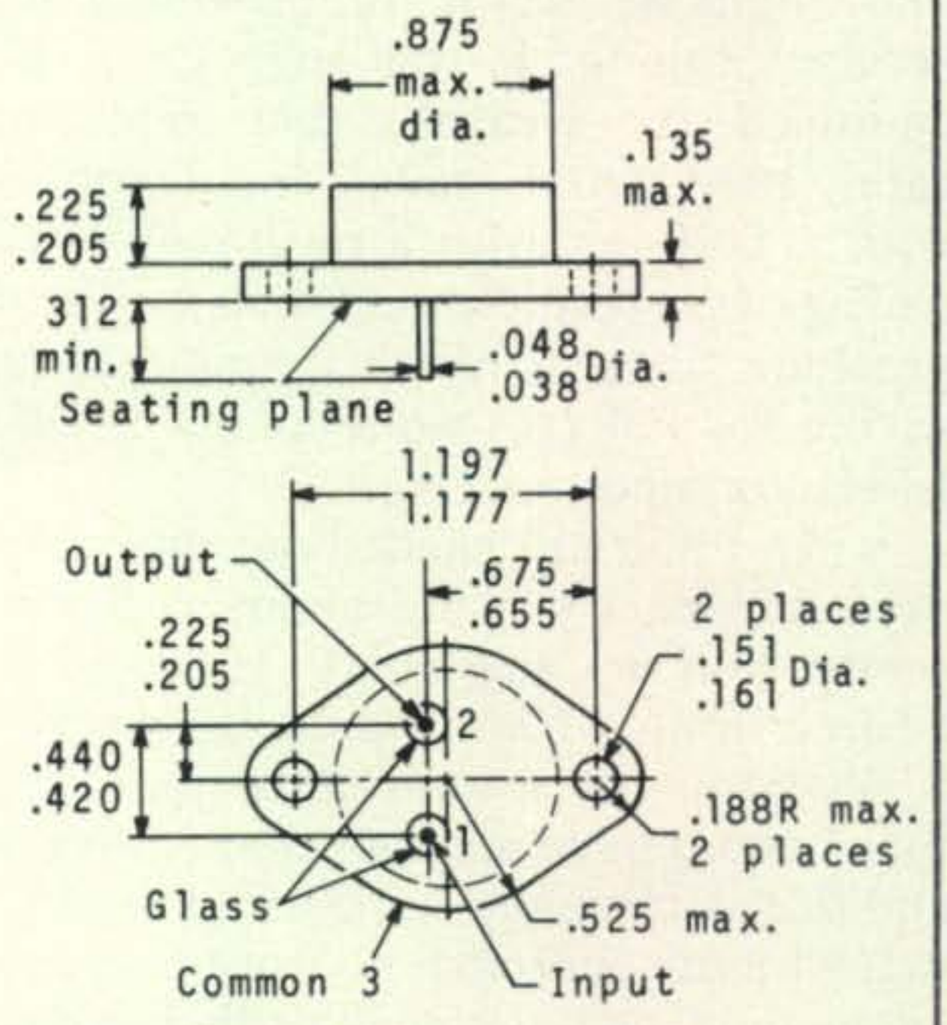
[*continued on page 86*]



Note:
Mounting tab is electrically connected to Common

TO-220 PLASTIC POWER PACKAGE
(TOP VIEW)

μA7805----- 5v.
μA7806----- 6v.
μA7808----- 8v.
μA7812-----12v.
μA7815-----15v.
μA7818-----18v.
μA7824-----24v.



Notes:
Leads 1 and 2 electrically isolated from case.
Case is third electrical connection (Common)

TO-3 PACKAGE
(TOP VIEW)

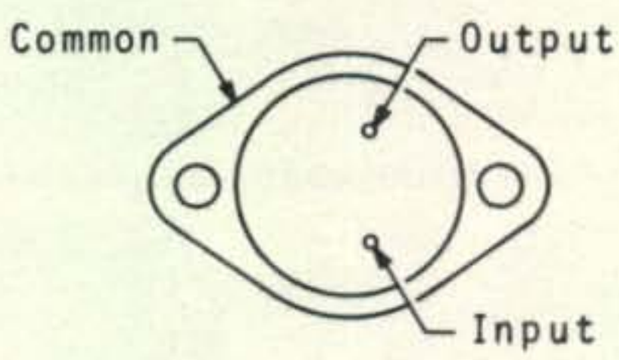


Fig. 5—Physical characteristics of the μA 7800 series.

Modification of SB-102 Transceiver for Receiver-Only Tuning

BY LEONARD DUSCHENCHUK,* WA2KHK

How many times have you been in a round table QSO with two or more amateurs using transceivers when retuning your transceiver was necessary to tune in the other fellows which in turn required the other fellows to retune when you transmitted? This usually amounts to each fellow retuning at each exchange and chasing each other up and down the band.

While building my SB-102 recently I noted the unused FSK terminal on the transistorized LMO and wondered if this unused terminal might be useful for providing separate receiver tuning. It was suggested, (but not endorsed by Heath), that replacing the rarely-used front panel frequency control with a 10K pot with a push-pull switch, rewiring of certain relay contacts (which would preclude using a linear amplifier), and rewiring B+ voltages would allow ±500 Hz of LMO tuning on receive.

Since I had just shelled out over four hundred dollars, I was not about to butcher my pretty unit as suggested. However, I still desired limited LMO tuning on receive.

Studying the circuit it became apparent that I could have my cake and eat it too. The additional circuitry appears in fig. 1. Note that with my approach no front panel changes were made, no holes were drilled or modifications made other than connecting four wires.

A small open-sided chassis was formed from soft aluminum approximately as shown in fig. 2. The only critical dimension is the height. This chassis is placed under the sloping SB-102 front panel, below the LMO tuning control and is held between the transceiver and the table. Two small grommets in the top of the chassis increase friction to avoid movement. The transceiver rests lightly on the chassis to hold it in place.

A small "crystal can" relay is sued to supply the addition al contacts needed. A simple half-wave rectifier supplies power for the relay. Since capacitor *C* charges to peak value from the 12 v.a.c. filament supply, adequate d.c. valtage is obtained to operate the relay.

Wiring

At the left rear of the transceiver is an unused hole in the chassis which permits the four-wire cable to pass through. A grommet is placed in this hole. One wire is connected to pin 7 or 8 of V_9 which are ground, while a second wire is connected to pin 7 of V_8 to pick up the 12 v.a.c. for relay power. A third wire is connected to terminal 6 of relay RL_1. A wire already exists at this terminal. The

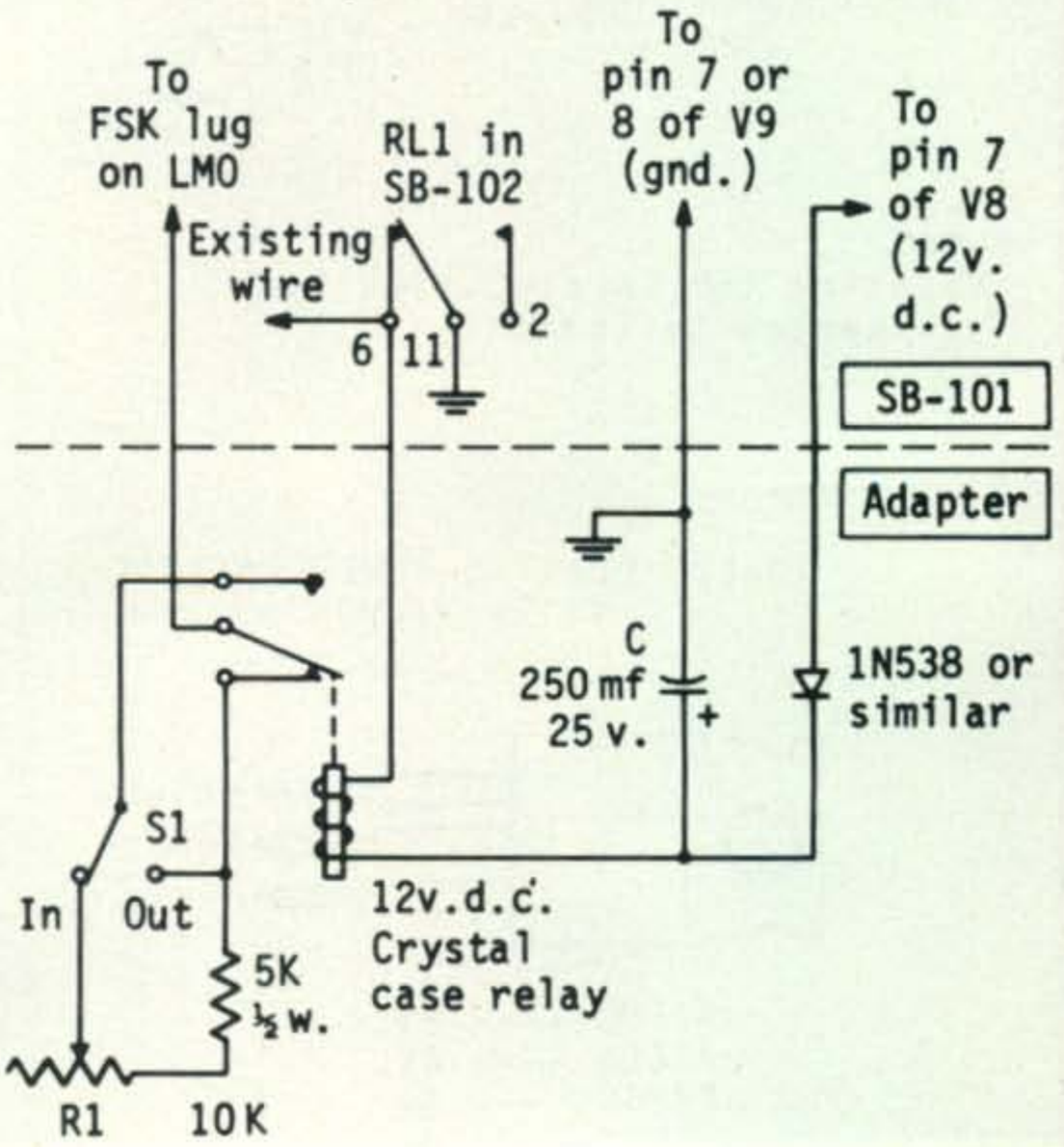


Fig. 1—Circuit of the "Receiver-Only-Tuning" adapter for the SB102 transceiver showing connections to the transceiver.

* 255 Stewart Ave., Bethpage, N.Y. 11714.

The receiver-only tuning adapter is held beneath the SB-102 and requires no permanent changes in the transceiver.

fourth wire is routed along the rear of the chassis to the middle then up towards the front and through a hole coming up just to the rear of the LMO unit and connected to the terminal marked FSK. Removal of the four wires completely restores the unit to its original condition.

Operation

Operation is straightforward. When in the RECEIVE mode either increasing or decreasing the potentiometer will vary the frequency of the LMO either higher or lower by approximately 500 Hz. In normal operation, at the start of the QSO, the switch is left in the OUT position and the transceiver is tuned normally. When receiving a signal which is slightly off frequency—don't touch the LMO dial—instead, switch to the IN position and rotate the pot to obtain maximum clarity and leave it there. The ±500 Hz variation has been found to be more than enough control. Keying the transmitter now removes the adjusted

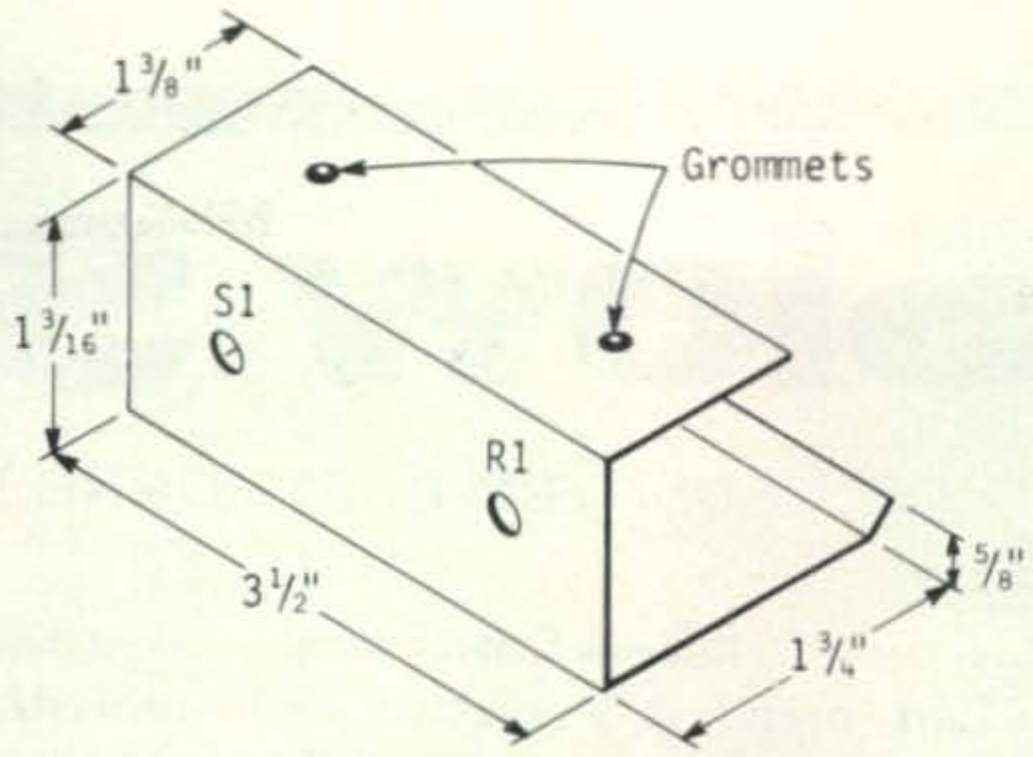


Fig. 2—A small aluminum chassis is bent up from soft sheet aluminum to enclose the "in-out" switch, receiver offset pot, relay and other components. Two small rubber grommets in the top lip help hold the adapter in position beneath the SB-102.

potentiometer from the circuit and replaces it with a fixed 5K resistor and thus re-establishes your previous transmitting frequency.

Connection of the unit to the LMO causes an initial frequency shift of approximately

[*Continued on page 87*]

Hum Reduction in the Heathkit SB-102 Transceiver

BY LEONARD DUSCHENCHUK,* WA2KHK

My station layout is such that the speaker for my Heathkit SB-102 Transceiver was about three feet from my head causing some hum to be extremely annoying. The hum was fixed in amplitude for any position of the r.f. or a.f. controls, even at full off. We suspected the power supply for the SB-102's transistorized LMO since it uses half-wave rectification of the 12 volt a.c. heater line. The rectified voltage is filtered by a simple pi filter and zener regulated at ten volts. Power to the LMO is controlled by gating a pass transistor either on or off as required by the FREQ. CONT. switch. A type 1815 pilot lamp is used as the series load for the 10 volt zener regulator.

A simple check confirmed our suspicions: Turning the AF GAIN control to zero, we made a mental check of the hum level. We removed the pilot lamp (the zener load) at the rear of the LMO subassembly and noted the difference. The hum level dropped to zero indicating that the hum was coming from the LMO power supply.

At first thought, it appeared that merely increasing the size of the filter capacitors would reduce the hum level. The filters were increased from 500 to 2000 mf. However, to the author's surprise, this did not accomplish anything. Bypassing the base of the pass transistor did nothing either.

Without resorting to a separate power supply, the author modified his unit as shown in fig. 1. This change does not involve drilling any new holes or disassembling the LMO power supply subassembly or dial mechanism. All parts were assembled on a 4-lug-plus-ground terminal strip as shown in fig. 2. The rear screw on the right side of the LMO

(Continue don page 87)

* 255 Stewart Ave., Bethpage, N.Y. 11714

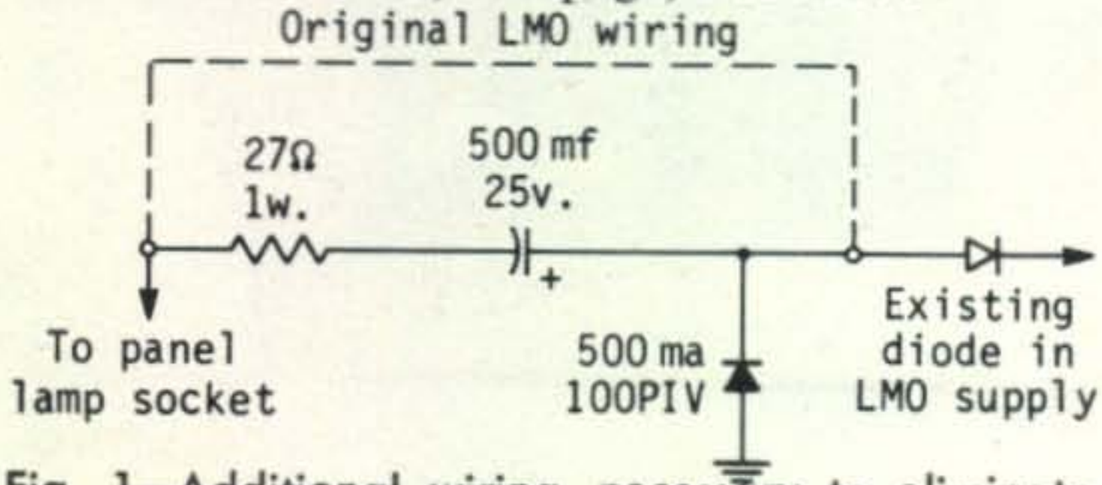


Fig. 1—Additional wiring necessary to eliminate hum emanating from SB-102 LMO power supply.

Slow Scan TV

BY COPTHORNE MacDONALD,* WØORX

ISB—A Case Study

Last month I suggested that interested slow-scanners get together on the air to share thoughtfully prepared "programs" with each other, using simultaneous SSTV/voice. This month we'll explore some of the hardware problems involved in going i.s.b. There are many approaches to adding independent sideband capability to a station. The more economical ones involve building i.s.b. adapter units to add the extra sideband channel to an existing transmitter and receiver. Since each case is unique, I'll start by going into some detail about how I did it. I would also like to devote future column space to telling how others have done it, if you'll send the details on to me.

I built the adapter shown on these pages ten years ago. SSTV was still 5 years away from getting the FCC nod, and the possibility existed that the second sideband would never be used. Its first use came during the 1966 SSTV tests in a very successful QSO with Bob Gervenack, W7FEN, that involved a lengthy audio-visual ham shack tour. (This is a commentary on the originality of hams—or at least my originality. Morse sent "What hath God wrought?" The first astronaut to step on the moon spoke of a ". . . giant step for mankind." We settled for a tour of the shack for our "first".)

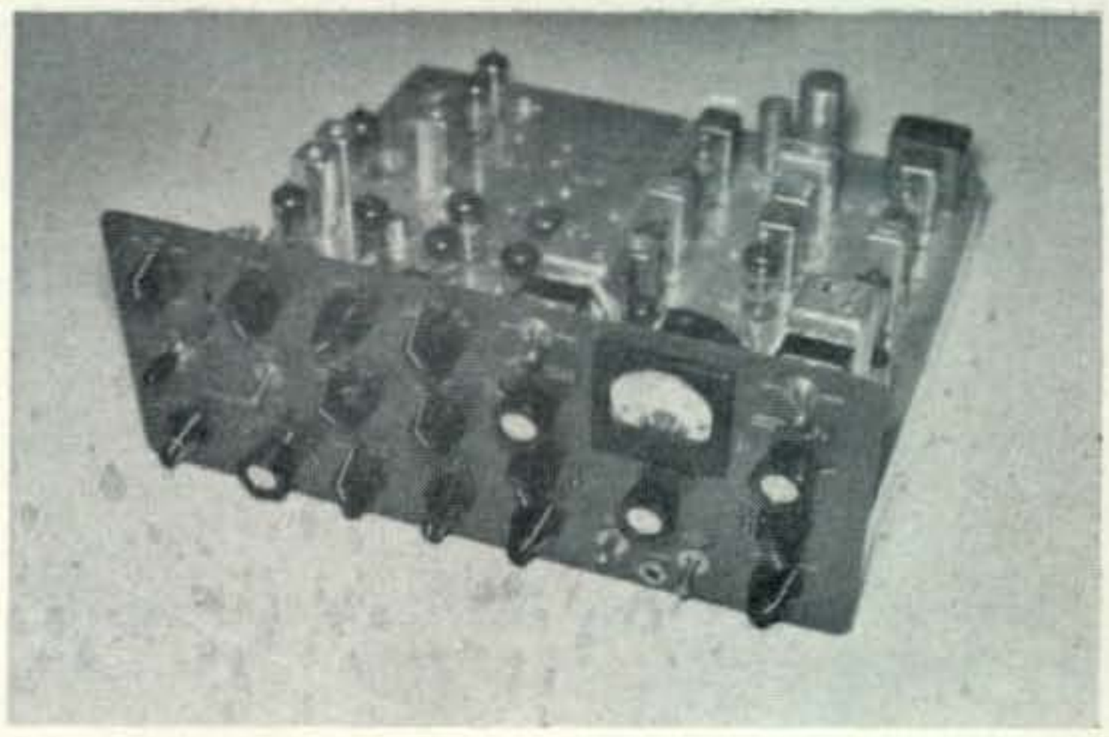
My situation had been this. I owned a Collins 32S-1 transmitter, but no receiver or power supply. The idea of building a companion unit for the 32S-1 that would convert it into an independent sideband transceiver gradually took form. The basic idea was to use the 32S-1 v.f.o., b.f.o., and h.f. crystal oscillators in the receive function also, and to use a single pair of Collins 455 kHz upper and lower sideband filters for both transmitting and receiving. (The adapter I built was, therefore, a much more complicated piece of gear than would have been necessary if my shack had been blessed with a receiver. It's an example from the complex/expensive end of the i.s.b. adapter spectrum.)

Theory of Operation

The adapter unit block diagram is shown in fig. 1. A received i.s.b. signal is amplified by V_2 and converted to a 2.955 to 3.155 mHz in V_3 by heterodyning against the 32S-1 h.f. crystal oscillator output. This signal is mixed with the 32S-1 v.f.o. output in V_4, to create an i.s.b. signal centered on 455.000 kHz. This signal passes through V_5 and V_6 which drive the l.s.b. and u.s.b. filters. The incoming i.s.b. signal has now been separated into individual l.s.b. and u.s.b. components. These components are kept separate and are amplified in V_7 and V_8, and then fed to two separate i.f./detector/audio strips: V_{11}-V_{15}, and V_{16}-V_{20}. Low level audio u.s.b. and l.s.b. output signals are available at this point. An audio power amplifier, V_{21} -V_{22}, allows speaker monitoring of either channel.

A word about the "Channel A" and "Channel B" designations. For a number of reasons (VOX operation, c.w. operation, a.l.c. problems, etc.) it made sense to use the 32S-1 audio and balanced modulator section for voice in i.s.b. operation; and as the only channel in use during s.s.b., SSTV only, or c.w. operation. I called this "Channel A." The other channel, fed with SSTV during i.s.b. operation, and unused at other times is "Channel B."

The "Channel B" audio amp and balanced modulator (V_{23}-V_{25}) are located on the adapter chassis. The circuitry was patterned closely after the 32S-1, except that V_{25} oper-



Top/Front view of the i.s.b. adapter.

* P.O. Box 483, Rochester, Minn. 55901

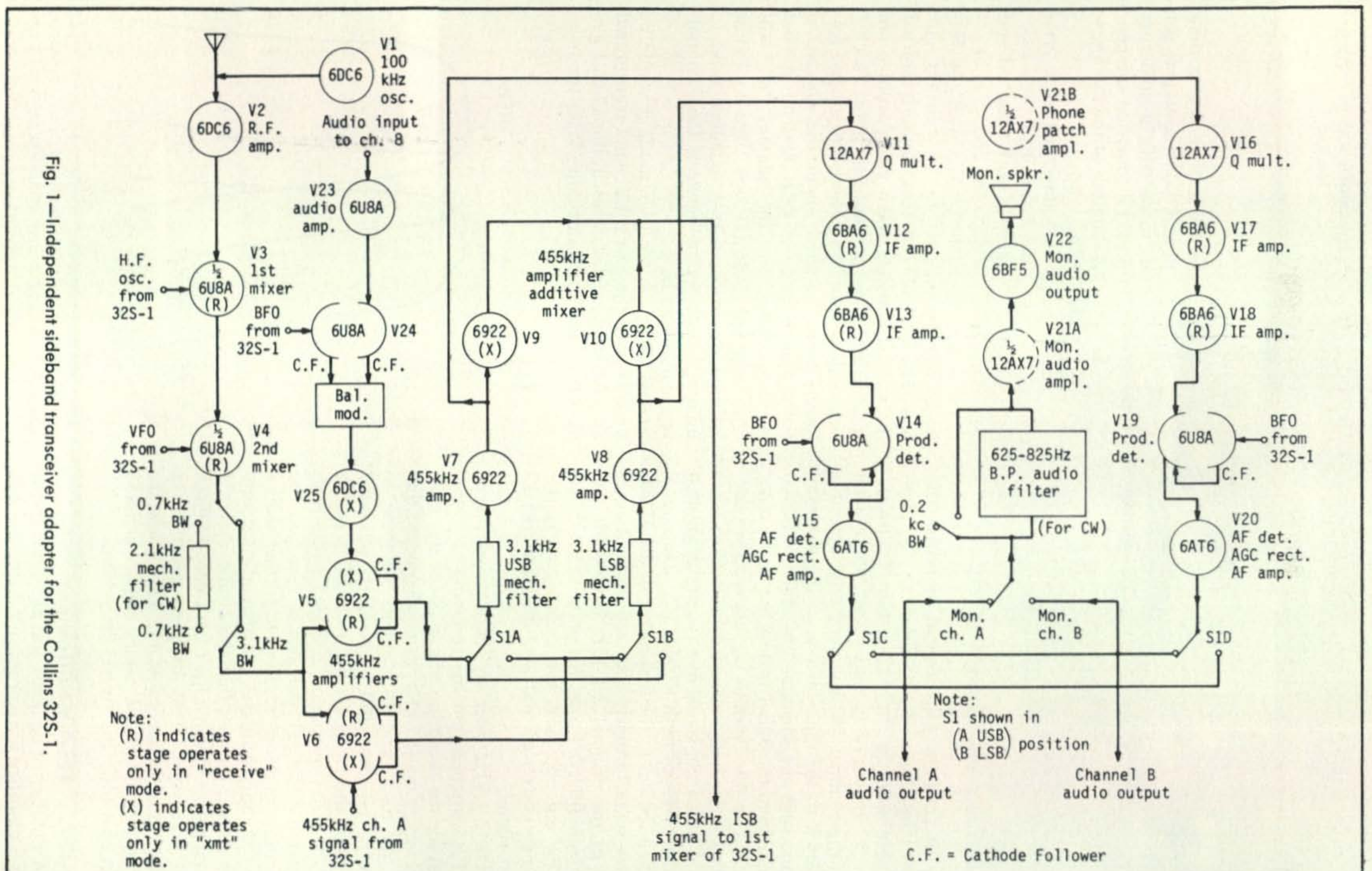
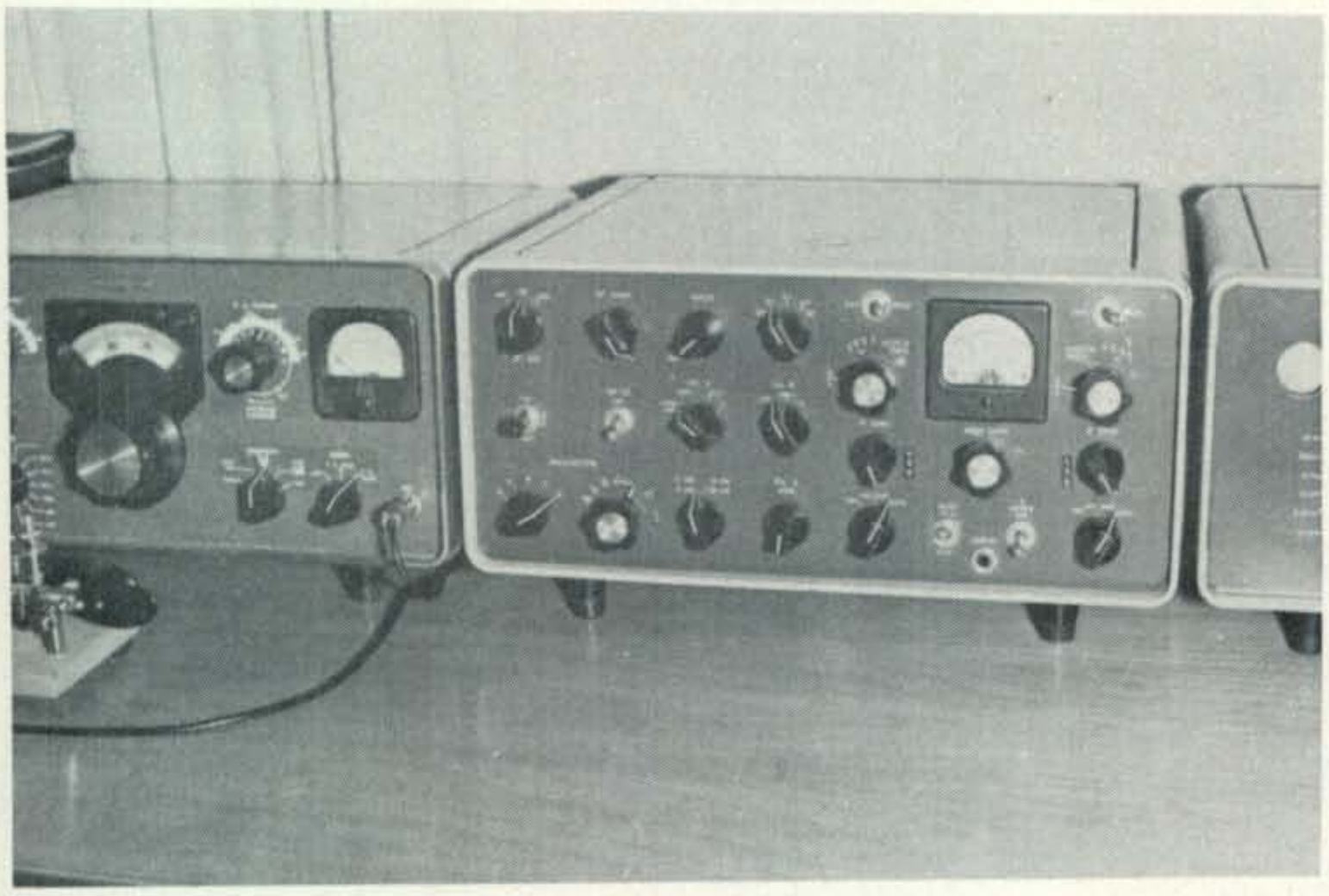


Fig. 1—Independent sideband transceiver adapter for the Collins 32S-1.



l.s.b. adapter with its companion 32S-1.

ates at constant gain instead of being controlled by the a.l.c. voltage as in the comparable stage in the 32S-1. On "transmit," the "X" halves of V_5 and V_6 are operational and the channel "B" balanced mod output is directed to the input of one of the sideband filters, and the channel "A" balanced mod signal from the 32S-1 is directed to the other filter. The filter output signals are then amplified in V_7 and V_8, and combined to form a 455 kHz i.s.b. signal in a resistor connected to the plates of both V_9 and V_{10}. This signal is then fed out to the first mixer in the 32S-1. (This stage formerly received the s.s.b. output of the original 2.1 kHz bandwidth mechanical filter.) From this point in the 32S-1 to the antenna jack, the i.s.b. signal is frequency converted and amplified just like an s.s.b. signal.

The 2.1 kHz filter, by the way, was saved and is switched into the receiving i.f. signal path for the reception of c.w. Since this filter is *centered* on 455 kHz, its passband and that of the u.s.b. and l.s.b. filters combine to give an effective 300 to 1000 Hz passband whether the rig is set on u.s.b. or l.s.b. See fig. 2. A narrow-band (200 Hz) audio filter centered on 735 Hz can also be switched into the audio path on "receive" to further reduce the c.w. bandwidth. A bit of confusion centers around the fact that the on-the-air u.s.b. signal passes through the l.s.b. sideband filter, and vice versa. This happens because the 32S-1 v.f.o. frequency is 455 kHz *below* the first mixer output frequency rather than 455 kHz *above* it. This inverts the sidebands.

32S-1 Modifications

A number of changes and additions to the 32S-1 circuitry were necessary. Since this was to be my rig for a *long* time, I didn't hesitate to get in there with a soldering iron. I'll touch on the general nature of the modifications.

OSCILLATORS: The original b.f.o. u.s.b. and l.s.b. crystals were removed and a 455.000 kHz crystal installed. All oscillator B+ leads were connected to an "always on" bus. The control lead that formerly shifted the v.f.o. frequency when going from u.s.b. to l.s.b. was wired permanently in the "u.s.b." connection. Two 7586 Nuvistor cathode followers were installed under the chassis to buffer and isolate the v.f.o. and h.f. crystal oscillator outputs to the adapter unit. Another cathode follower was used to buffer b.f.o. drive to the 32S-1 balanced mod to minimize interaction between the two balanced modulators.

ALC: When in the i.s.b. mode it would be nice to have the SSTV sideband transmitted at a constant level, but retain the a.l.c./a.g.c. action on the voice sideband. With the orig-

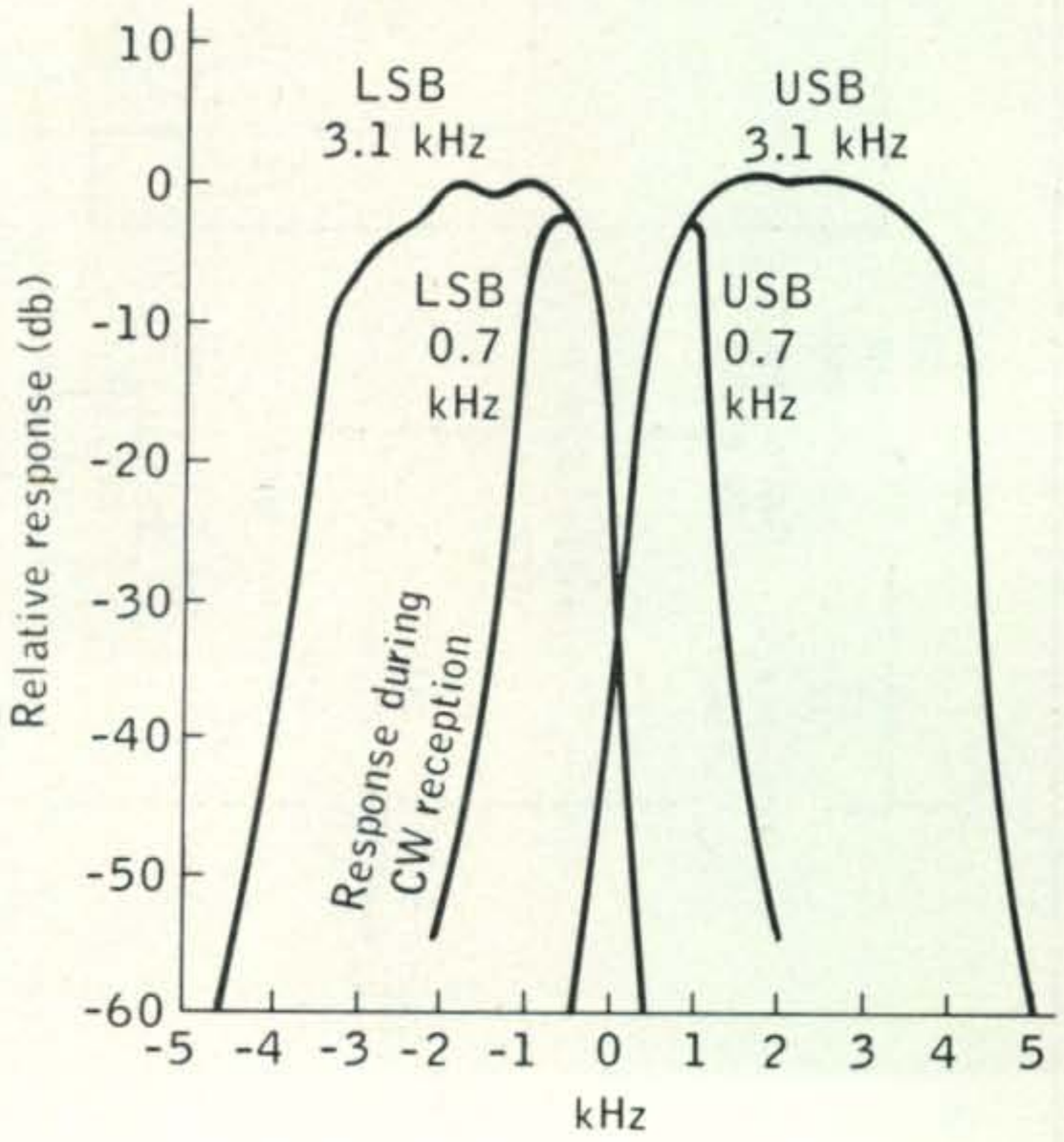


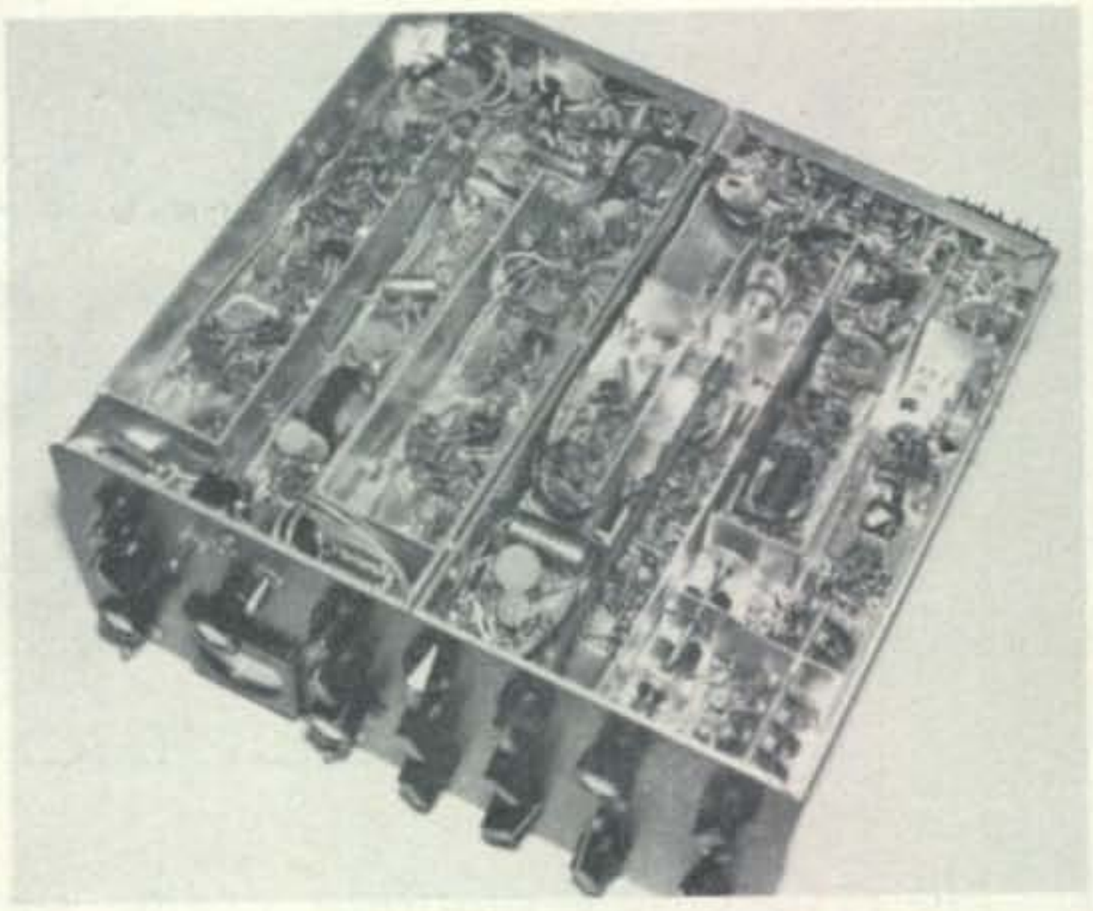
Fig. 2—Mechanical filter response, i.s.b. adapter, using Collins 455Z-4 and 455Z-5 u.s.b. and l.s.b. filters.

inal a.l.c. circuit the SSTV level builds up to full r.f. output during voice pauses, and can be made to almost disappear on loud voice peaks. To solve the problem the EMISSION switch was rewired and relabeled. The old USB and LSB designations became CH A and CH A+B. In the first position the a.l.c. control voltage is fed in the original way to the i.f. amplifier that follows the 32S-1 balanced mod, and to a pre-final r.f. amp. In the CH A+B position a fixed bias is applied to the r.f. amp, but the a.l.c. voltage still controls the i.f. amp and thus the 455 kHz voice level. In this way the channel "B" SSTV signal can be set anywhere between zero and full output and it will remain constant since the gain in the r.f. stages does not vary. The voice signal adds additional power but cannot overdrive the rig because the a.l.c. will reduce the i.f. voice level when full (voice plus SSTV) output is reached.

FINAL: The number one game with any final used for SSTV is to run it in a way that does not burn the tubes up. In i.s.b. operation it must also operate as linearly as possible to minimize the intermodulation distortion that puts picture hash in the audio sideband and audio crud in the picture. My approach was to switch to 6146B/8298A tubes which have 35 watts plate dissipation each, and to reduce screen voltage to the RCA recommended 200 volts, obtained from a stiff zener regulated supply. I set the bias for a no-signal plate current of 50 ma total for the two tubes in i.s.b. use; 40 ma otherwise. I also take care not to load the final beyond 200 ma. Check the plates every now and then during an SSTV transmission. If the plates show color, recheck your tuning, loading, and bias. If all is OK, the tubes may be registering a complaint against prior abuse, having gone gassy. A small fan to stir the air in that final amp cage would probably extend the tube life even further.

Problem Areas

Suppressing the carrier is a little tougher with i.s.b. This is because there are *two* balanced modulators to balance. To avoid a very critical and unstable "false balance," it is important to balance the first of the two modulators alone. One could, for example, pull V_{25} out of the socket while one balanced the 32S-1 balanced modulator for minimum carrier, then replace V_{25} and balance the modulator in the adapter unit. I was able to achieve carrier suppression of 45 db using this approach.



Bottom view of i.s.b. adapter showing liberal use of shielding partitions.

Sideband switching and general isolation of one 455 kHz signal from another is another problem area. Transmit/receive switching was done by turning the plate voltage of various tubes on and off. The rotary u.s.b./l.s.b. switch, S_1 of fig. 1, was actually more complex than shown. A number of sections were used with provision for grounding switch terminals adjacent to active ones, etc., to minimize capacitive coupling between the l.s.b. and u.s.b. signals. The V_5 and V_6 cathode followers help reduce coupling because their output impedance is quite low. A further precaution was the liberal use of shielding partitions between sections of the adapter unit as shown in the bottom view photo. Designing a solid state version of the unit today, I would probably switch only d.c. with a mechanical switch, and investigate such components as the RCA CD4016A COS/MOS transmission gate and the Motorola MC1445 gated video amplifier for use in actually switching the 455 kHz signals. Using a double sided P.C. board with one side used as a ground plane would eliminate the need for shields in most, if not all places.

Something of a disappointment is the relatively wide bandwidth of the 455Z4 and 455Z5 mechanical filters. They are certainly wider than optimum for amateur use, but were the only filters readily available at the time. Does anyone know of a source of pairs of 2.1 kHz u.s.b. and l.s.b. filters? I am presently using an outboard 2.5 kHz LPF to narrow the effective audio bandwidth, but it is not a substitute for a narrower i.f. filter.

The comments pertaining to the linearity of the 32S-1 final naturally apply to any

[*Continued on page 90*]

A "No Compromise" 2000 Watt PEP Antenna Tuner

BY RICHARD JAMES,* W4DQU

No respectable amateur station should be without a good antenna tuner. Here's a high-efficiency tuner using a novel plug-in coil arrangement to achieve a matching range of from 25 to 5000 ohms.

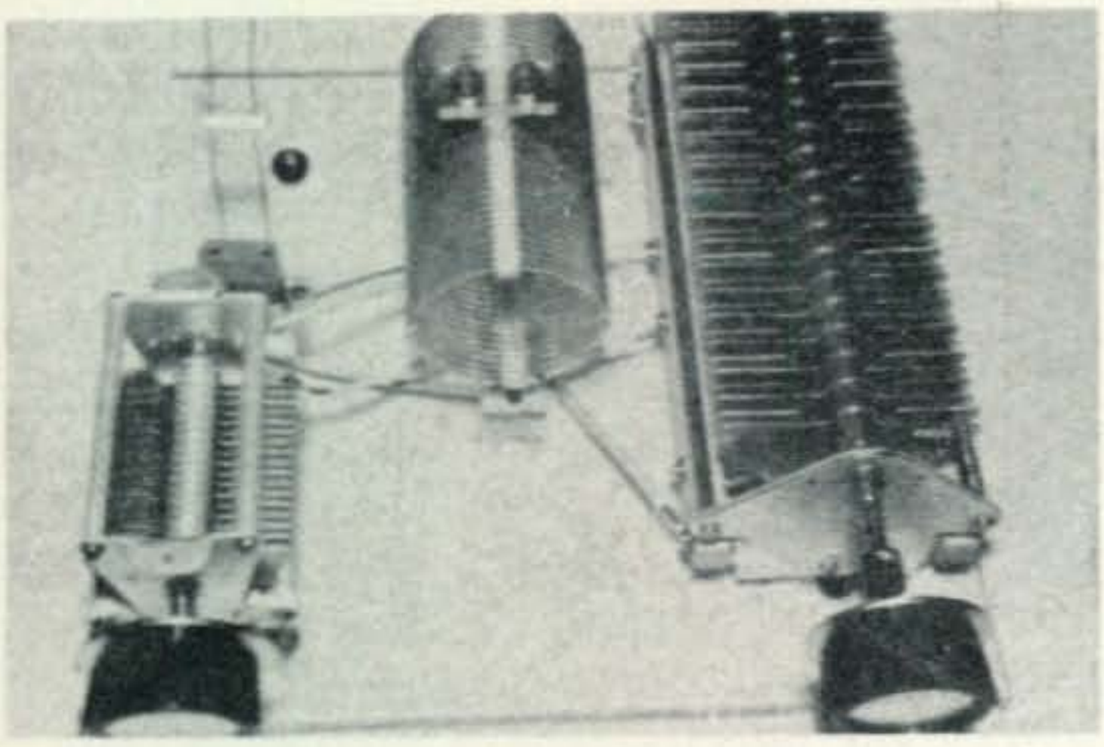
THE reasons for using an antenna tuner or transmatch have been covered extensively by Lew McCoy, W1ICP in "Why a Transmatch" (*QST* Jan. 1968). Three of the best reasons are:

1. To reduce feed line losses.
2. To enable one antenna to be used in all portions of several bands.
3. To permit the transmitter to "see" 50 ohms at all times.

The No Compromise tuner described here achieves high efficiency by using separate coils instead of one or two tapped coils (tapped coils are lossy). Plug-in coils eliminate interaction between coils, switching problems, switching losses, and the expense of high quality, high power switches. The unique design of this tuner which allows changing the type of tuning by changing the components are plugged-in. This eliminates loose wires and clips, keeps wiring short and efficient, and, of course, simplifies changing the type of tuning. The ability to tune Parallel low C, Parallel high C, Series low C, and Series high C enables the tuner to cover a wider range of antenna impedance than any commercially available tuner.

The impedance range of this tuner is from a

*3653 Crestside Rd., Birmingham, Ala. 35223.



The No Compromise antenna tuner is constructed on a large sheet of plexiglass. It is shown here with a coil plugged in and shorting bar B in place atop the coil. In this parallel-tuned configuration, the open wire feedline is plugged into A as in fig. 1.

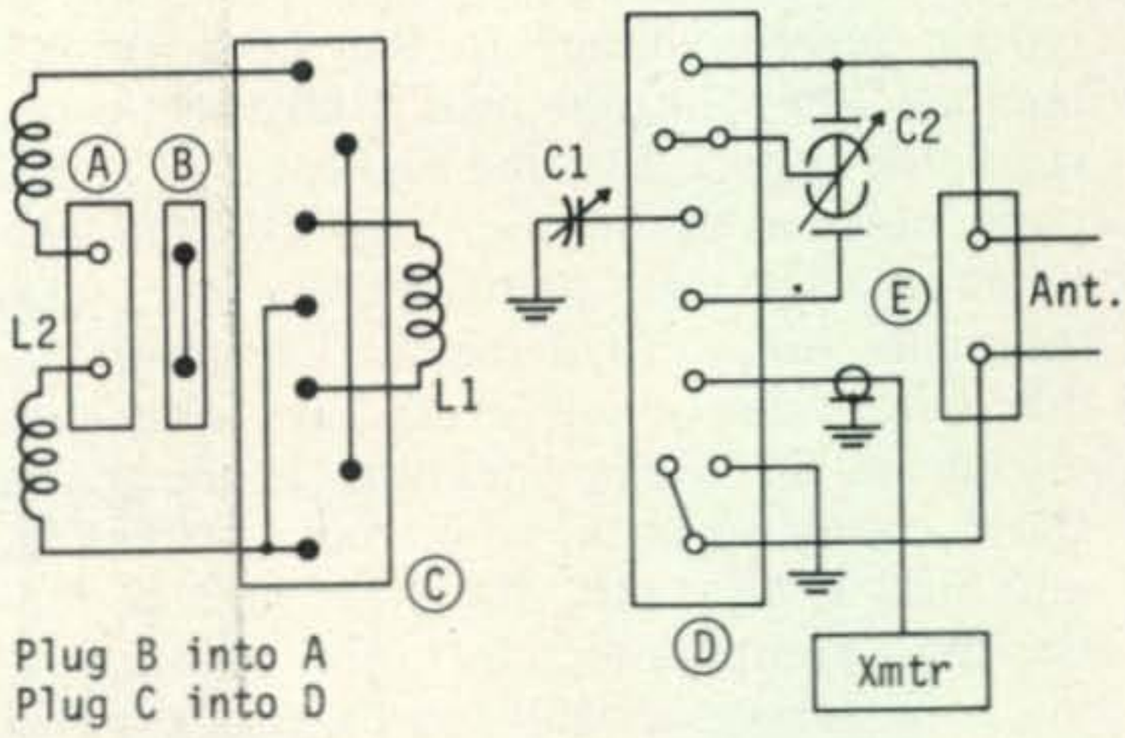


Fig. 1—Schematic of the No Compromise antenna tuner and plug-in coil, set up for Low C Parallel Tuning.

Parts List

C_1—13-353 pf variable, 1 kv spacing. Johnson 154-2 or equivalent.

C_2—Dual 100 pf transmitting variable, 5 kv spacing or more. Millen O4100,14100, or equivalent.

Jacks—H.H. Smith 1508 or 1509 Nylon banana jacks. 11 required for basic tuner. 2 required for each coil.

Plugs—H.H. Smith 462 banana plugs. 9 required for each coil and shorting bar.
H.H. Smith 1672 double banana plug. 1 required for antenna feedline connection.

Coils—See Table I for all coil information.

Table 1—Coil Table

Band (mHz)	L_1		L_2	
	Turns	Coil Stock	Turns	Coil Stock
1.8- 2.0	24	1	79	2
3.5- 4.0	12	1	39	2
7.0- 7.3	6	1	13	3
14.0-14.35	3	1	7	3
21.0-21.45	3	1	5	3
28.0-29.7	2	1	3	3
50.0-54.0	1	1	1	3

Coil Stock:

1—2" dia. #16 tinned, 10 t.p.i. (B & W 3907-1 or equivalent).
2—2½" dia. #14 tinned, 8 t.p.i. (B & W 3906-1 or equivalent).
3—2½" dia. #12 tinned, 6 t.p.i. (B & W 3905-1 or equivalent).

low of about 25 to 50 ohms to a high of about 4000 to 5000 ohms. One commercially built tuner goes to only 1200 ohms, and uses a tapped coil and switches—two lossy items.

An excellent all-band antenna for use with this tuner is a dipole or Inverted V 135 feet long, fed with 600-ohm open-wire line (or even 450-ohm or 300-ohm open-wire line—even the television type will work). If space is limited, you can use a dipole or Inverted V as short as 50 feet on 80 through 10 meters; however, make it as long as you can to improve your 80-meter signal. Besides these antennas, you can use this tuner to feed beams and quads, fed with either twin-lead or open-wire line.

If you work 160 meters, you will find you can load a dipole or inverted V as short as 130 feet—or perhaps even shorter. Theoretically, the antenna should be about 260-feet long, a half wavelength on 160 meters. Try

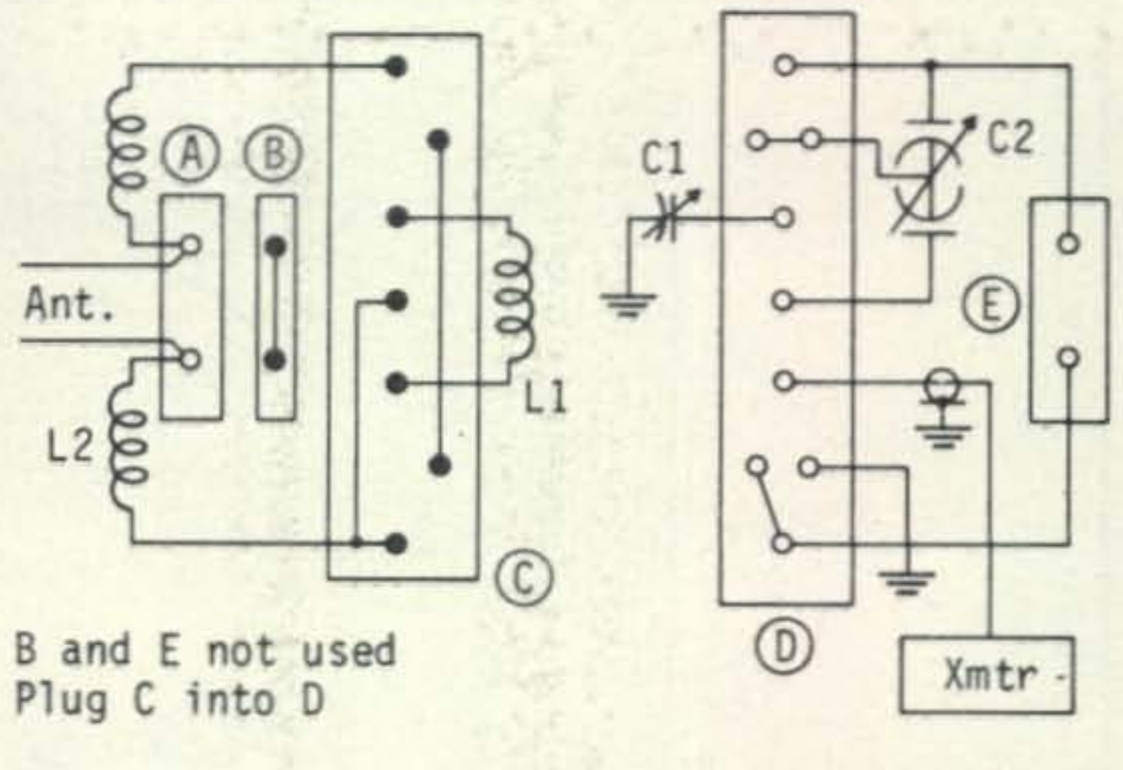


Fig. 3—With the plug-in coil in the same position as at fig. 1, but with shorting bar B not used and the antenna plugged into A, a Low C Series Tuned circuit results.

to make the antenna as long as it should be, but if you can't, just make it as long as you can, and leave the rest to the tuner.

You will note in figure 1 through 4 that the four different types of tuning are accomplished first by the way the coils are plugged into receptacle D, and second by plugging the antenna into either receptacle E or receptacle A. (Never plug anything but the antenna into E. Shorting bar B is plugged into A when the antenna is plugged into E, but is not used when the antenna is plugged into A.) Receptacles D and E are each mounted on two stand-off insulators.

Operation

Using an s.w.r. meter between the transmitter and the antenna tuner, tune the transmitter to very low power, set up the tuner for parallel low C tuning. Adjust the two capacitors alternately for minimum reflected power. If the reflected power can not be reduced to zero while you still have some forward power, first change from low C to high C by remov-

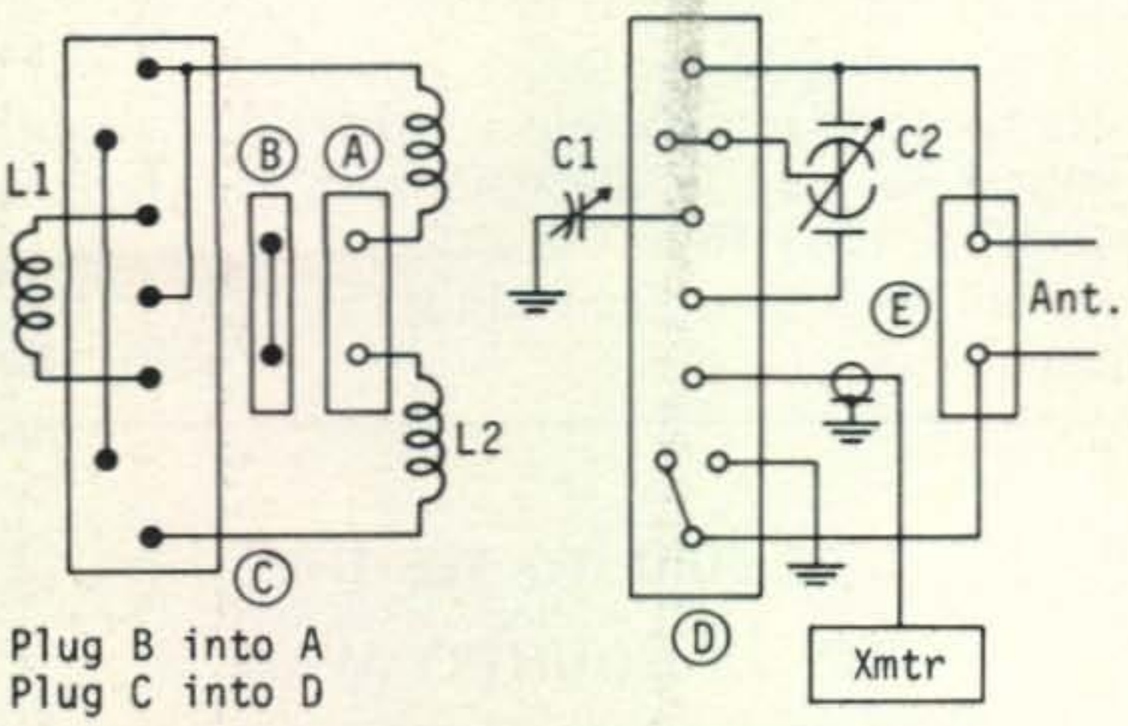


Fig. 2—Rotating the plug-in coil 180° and plugging it in again changes the circuit of fig. 1 to a High C Parallel-Tuned antenna tuner.

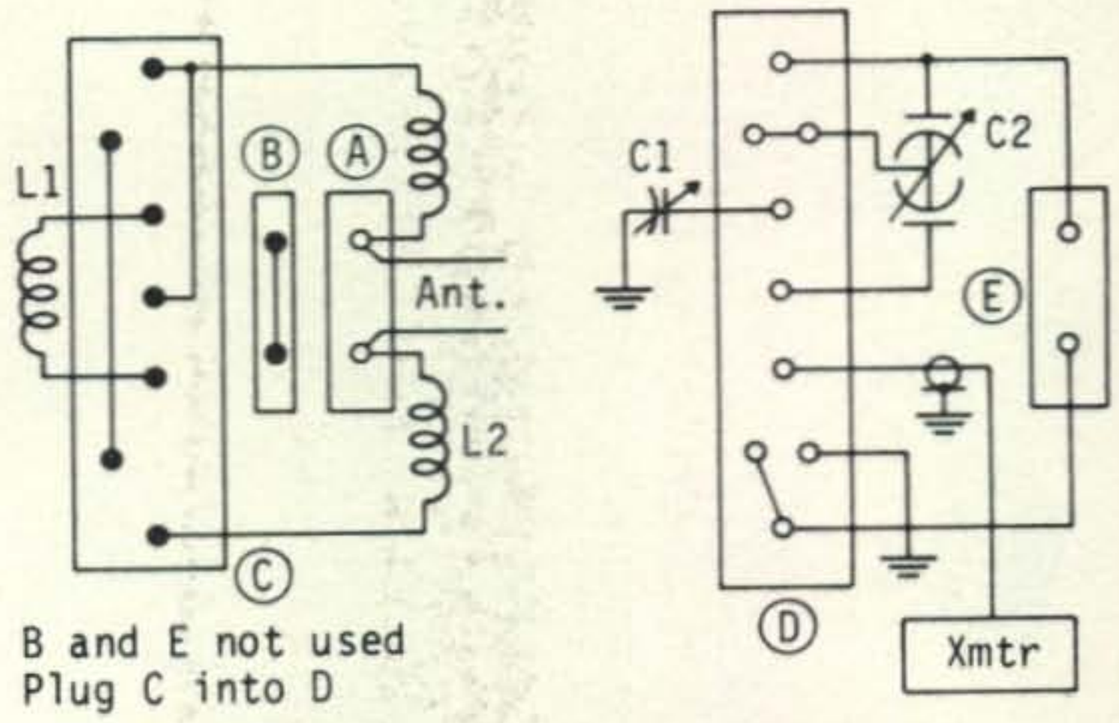


Fig. 4—Rotating the coil 180°, with the antenna still connected to A yields a High C Series Tuned antenna tuner. Shorting bar B is not used here.

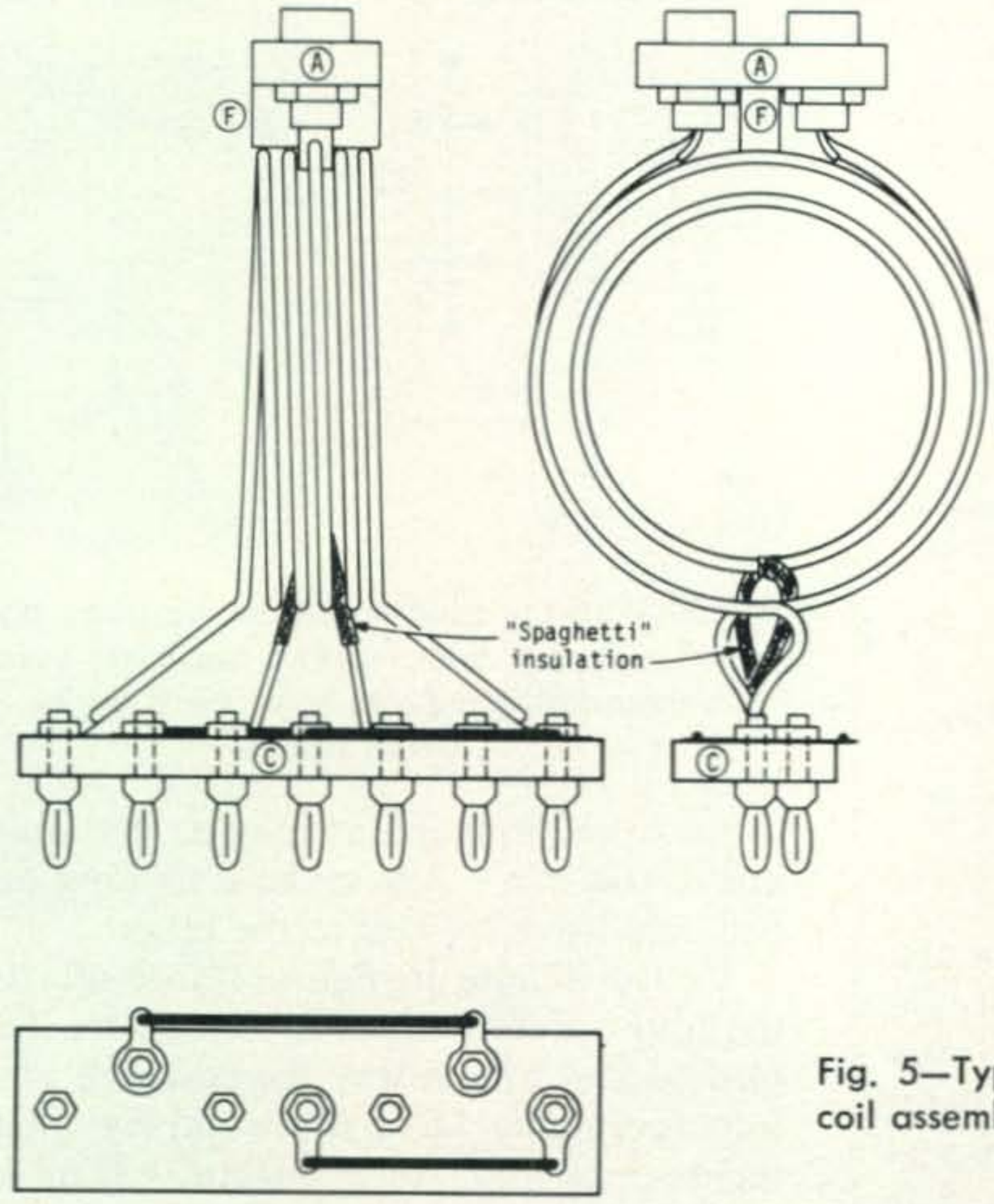
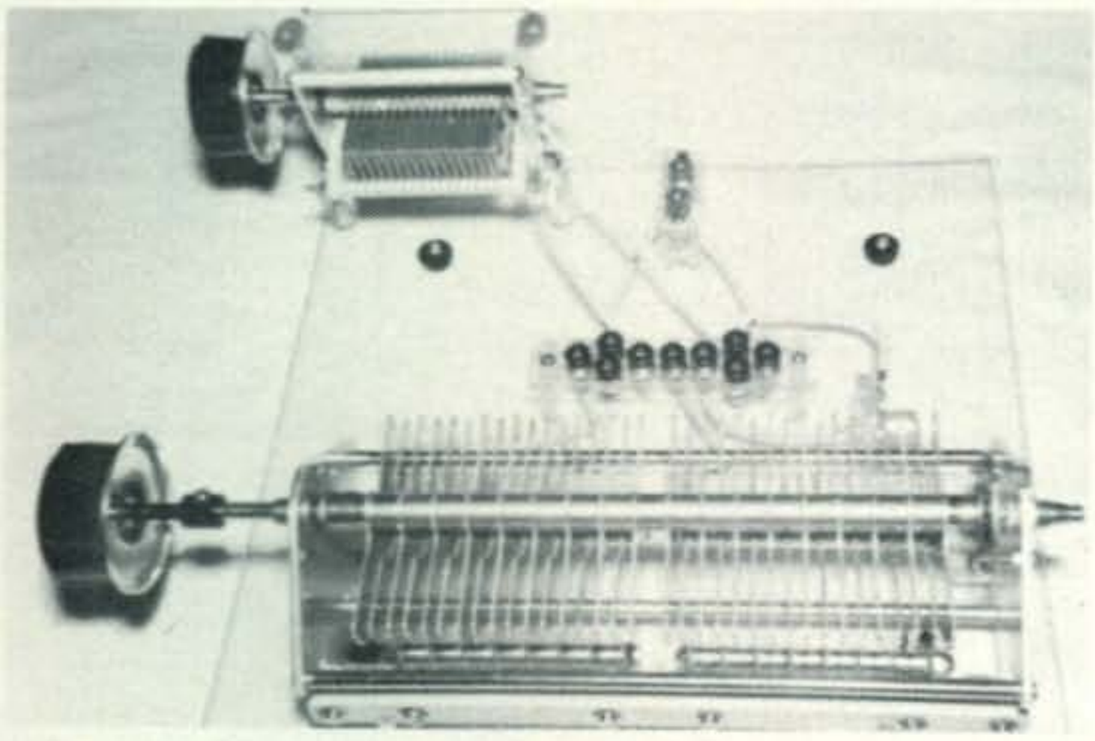


Fig. 5—Typical construction of one of the plug-in coil assemblies. The plexiglass supporting bars for the coil turns are not shown.

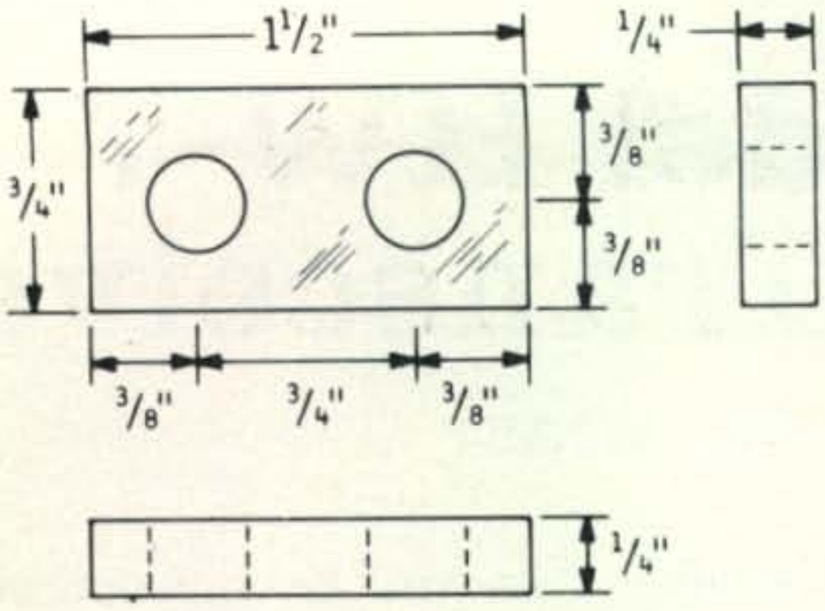
ing coil, rotating it 180 degrees and plugging it back into D. If you still cannot get zero reflected power change the antenna from E to A and try both series low C and series high C tuning. One of the four types of tuning will be correct and thereafter you can use that type of tuning for that antenna and band.

To use the tuner with a coax-fed antenna (as when you have a high s.w.r. and don't want your transmitter to see it or when you want to feed a long wire antenna), use just one side of the coil. Although you can plug the center pin of a coax cable fitting into a banana jack (if you do this, be sure to run a wire from the outside of the fitting or coax braid to ground), a better way would be to mount an S0239 coax receptacle near the rear of the tuner—making sure that the body of the receptacle is grounded—and to solder a short length of wire to the center pin of the S0239. To the other end of the wire, attach a banana plug. With this arrangement, you can now plug the banana plug into whichever receptacle you wish, and adjust the tuner in the normal way.

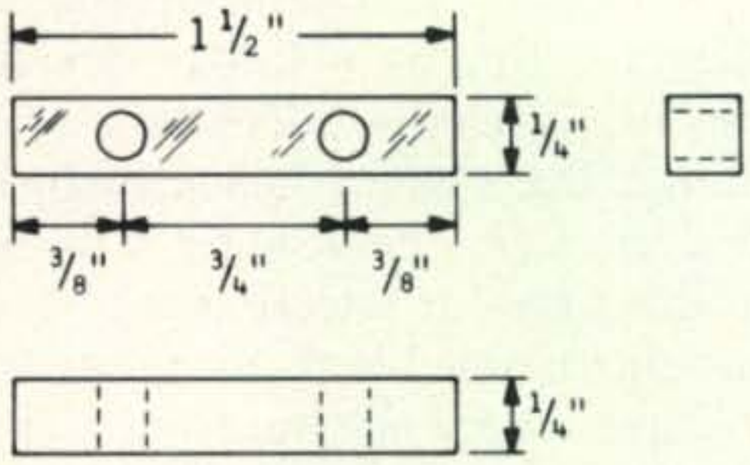
If you have a balun, it can be used for the same purpose by attaching two short wires to the antenna terminals of the balun. Attach a banana plug to the other end of each wire for plugging into the tuner (where you would otherwise plug in the open-wire lines). Attach the coax from the antenna to the coax end of the balun. Then adjust the tuner in the usual way. ■



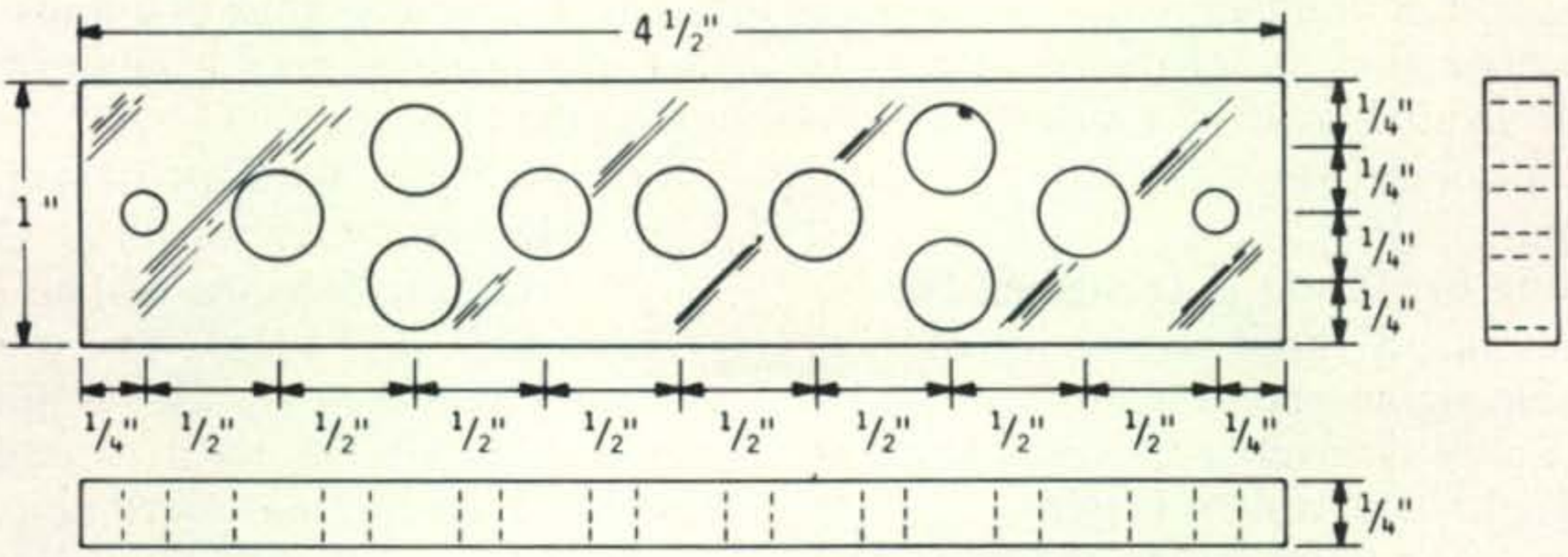
With no coil in place the construction of socket D is visible.



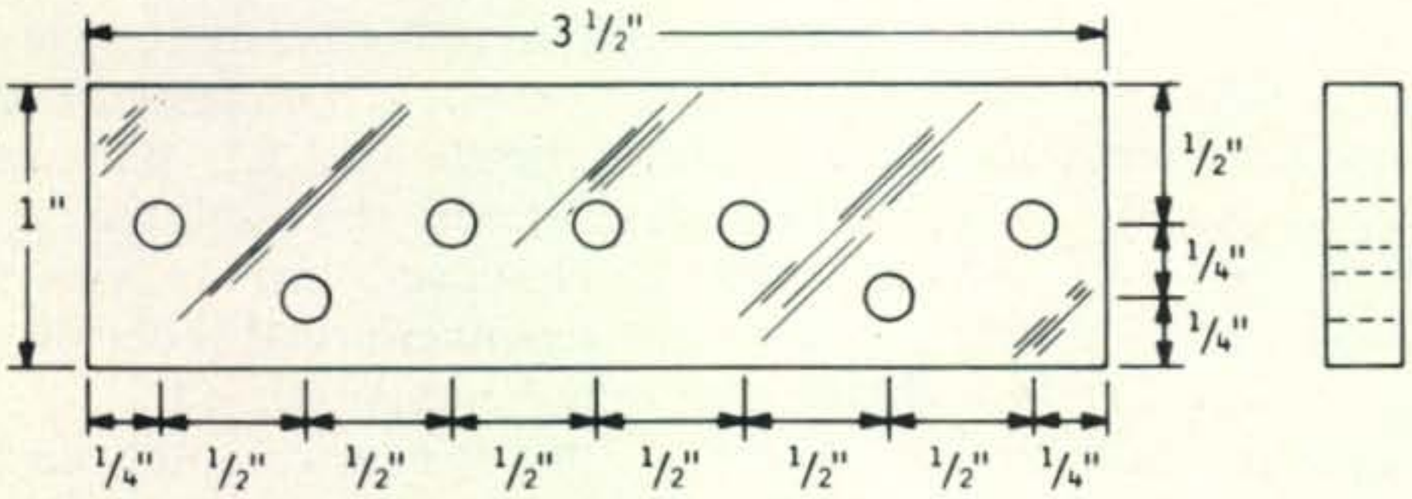
Ⓐ 1 per band required

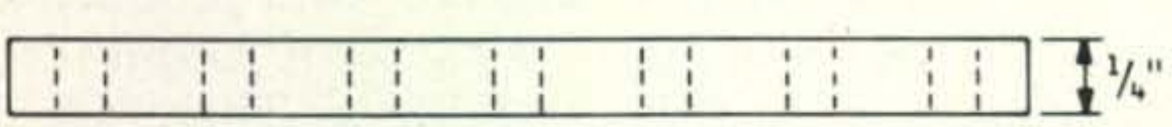


Ⓑ 1 required

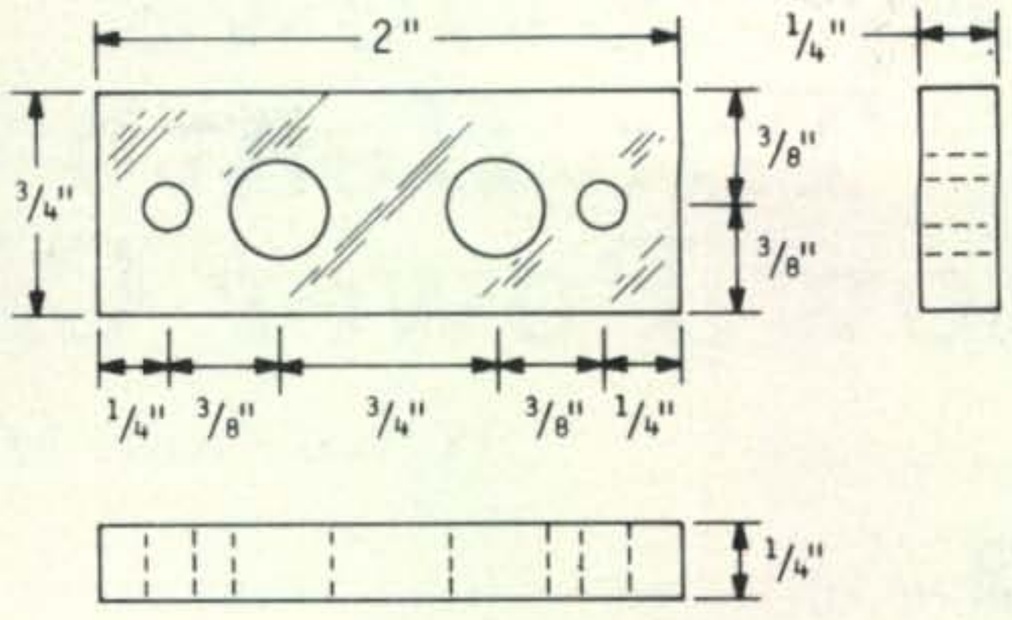


Ⓓ 1 required

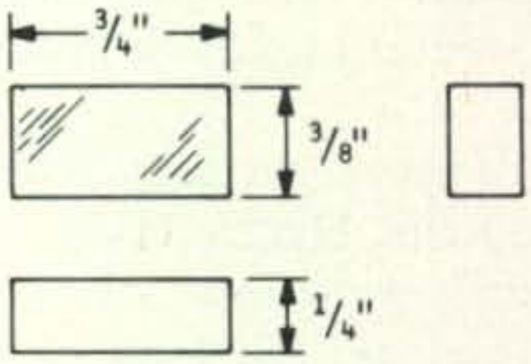




Ⓒ 1 per band required



Ⓔ 1 required



Ⓕ 1 per band required

All small holes 9/64" dia.
All large holes 5/16" dia.

Fig. 6—Layout and dimensions of the plexiglass parts with letters corresponding to those in the schematics and fig. 5. In all cases, the material is ¼" thick plexiglass sheet.

NOTE:
The author drilled and tapped the plexiglass components to construct the antenna tuner. The plexiglass parts can also be joined by gluing using various commercial products. If you use any of the popular epoxy type cements be sure to read the directions carefully and avoid any possible contact with your eyes.

CQ Reviews: The Heath Model HW-7 Low-Power C.W. Transceiver

BY WILFRED M. SCHERER,* W2AEF

ONE of the newer trends with amateur-radio operation is that of low-power (QRP) c.w. work using solid-state gear. Those who have engaged in such operation have found it a thrilling and challenging diversion from high-power operation for both local and DX QSO's.

A piece of gear recently introduced for such work is the Heath HW-7 Low-Power C.W. Transceiver, a low-cost unit designed for use on the c.w. portions of the 40-, 20- and 15-meter amateur bands with power inputs rated at 3, 2.5 and 2 watts on the respective bands. Either built-in v.f.o. or crystal-controlled operation is provided. Break-in operation is available as is a sidetone oscillator and a meter for indicating relative-power output.

Headphone operation is furnished for the receiver that has a rated sensitivity of 1 μv for a readable signal and selectivity of 1 kHz @ 6 db.[1] The transceiver is powered from an external 12-14 v.d.c. source originating from batteries or an a.c.-operated power-supply accessory.

Details

One thing that makes it possible to produce the HW-7 at low cost is the extreme simplicity of the receiver, known as a synchrodyne type.[2] The principle of operation is one that converts the r.f.-input signal directly to an audio frequency by means of the synchrodyne detector that is a linear device which functions like a product detector.

Although the system has previously been described in *CQ*, the details will be again given at this time for latecomers.

Referring to the block diagram at fig. 1, the c.w.-input signal is heterodyned in a mixer (FET Q_1, the synchrodyne detector (with a v.f.o. signal the frequency of which is the signal frequency plus-or-minus an amount that will produce an a.f. beatnote at the output of the detector.

For example: with an r.f.-input signal of 3745 kHz and a v.f.o. signal of 3746 kHz, the output from the detector will be 1 kHz (3746 − 3745 kHz = 1 kHz). The performance is the same as where an a.f. output tone is obtained with a b.f.o. used to convert the i.f. signal in conventional receivers.

The a.f. output from the detector is then passed on to a high-gain a.f. amplifier (IC_1), raising the signal to a usable headphone level. A low-pass filter between the detector and the a.f. amplifier limits the a.f. passband, which thus determines the selectivity as shown at fig. 2. However, just as with the use of a b.f.o. in a conventional receiver, an a.f. image also may be experienced.

For example: for the case in point, an r.f. signal of 3747 kHz also will produce a beatnote with the v.f.o. signal of 3746 kHz (3747 − 3746 kHz = 1 kHz). Therefore, in the presence of an adjacent-channel signal in the

---

* Technical Consultant, *CQ*.

[1]Earlier units had a 2 kHz bandpass. Present models are modified with 1 kHz bandwidth for more desirable c.w. selectivity.

The Heath Hodel HW-7 low-power solid-state c.w. transceiver.

[2]D. G. Tucker, "The Synchrodyne—A New Type of Receiver for A.M. Signals," *Electronic Engineering*, March 1947, page 75.

"Synchrodyne Receiver," *Radiotron Designer's Handbook*, Fourth Edition, Page 1226.

NOTE: The term "synchrodyne" receiver was denoted, because for a.m. reception the receiver is tuned to zero beat with the signal or synchronized with its frequency. For other applications "direct-conversion" receiver is often used.

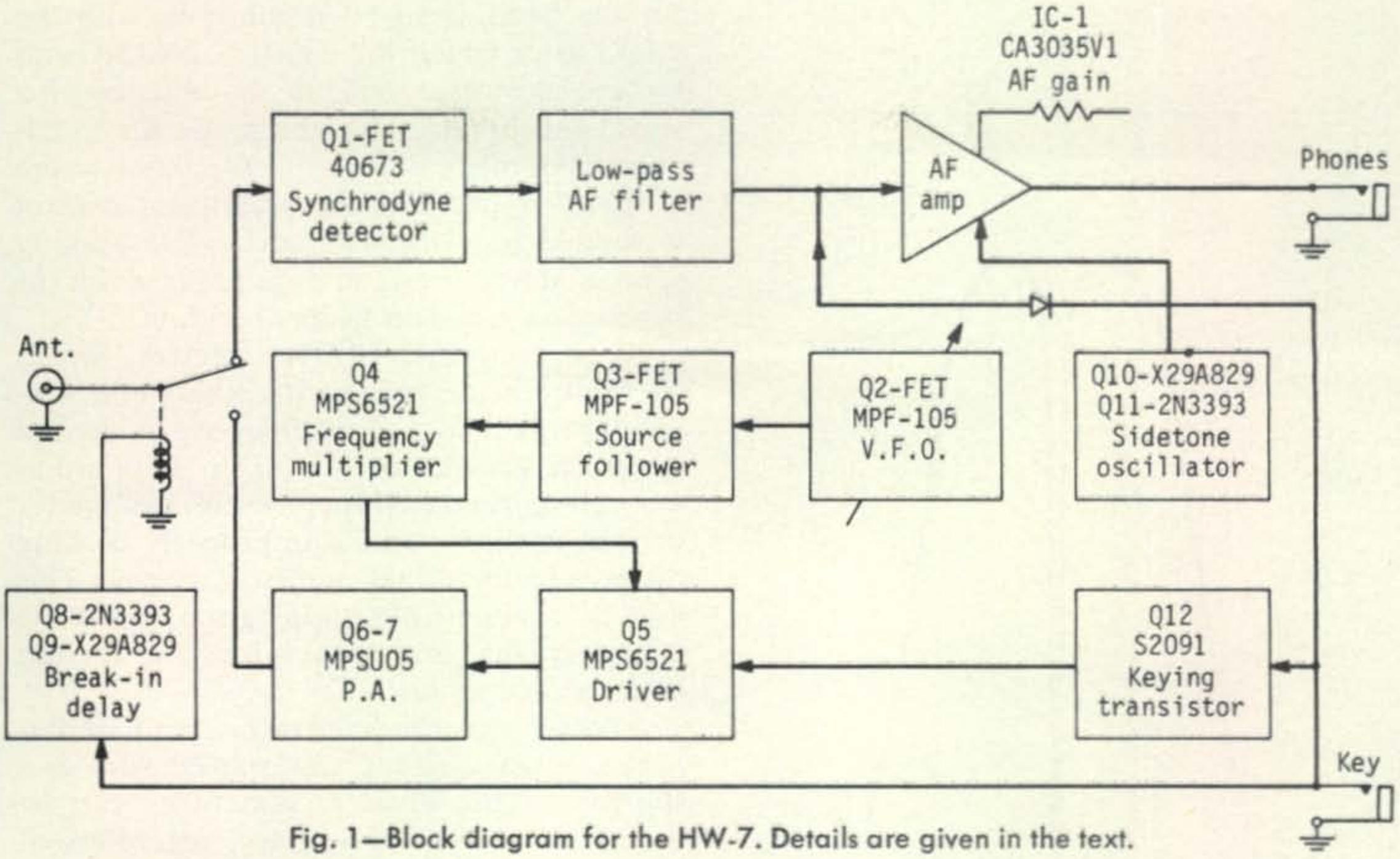


Fig. 1—Block diagram for the HW-7. Details are given in the text.

image range, the effective overall selectivity will appear broader.

Q_1 is a diode-protected dual-gate FET with the signal fed to one gate, the v.f.o. to the other gate. The high-Q input circuit consists of a toroid-wound 1.6 μh inductor tapped for a 50-ohm input impedance and shunted by a 365 pf variable capacitor that tunes the circuit through all three bands. The low-pass a.f. filter employs a high-Q ferrite-core inductor in an M-derived Pi configuration. The IC a.f. simplifier has a gain of approximately 100 db.

V.F.O.

The v.f.o. employs a single gate FET in a Colpitts circuit using another FET as a source-follower output that drives a bipolar-transistor frequency multiplier. For 40-meter use, the oscillator functions on 80 meters with the signal doubled at the multiplier to 40 meters. For 20 and 15 meters the oscillator functions on 40 meters with the output doubled to 20 meters or tripled to 15 meters as the need requires. The setup thus minimizes the possibility of frequency pulling which might occur if the fundamental frequency of the oscillator otherwise were the same as that used for heterodyning or that of the transmitter output (when the v.f.o. is used for the latter).

Transmitter

On transmit, the v.f.o.-multiplier output is applied to an r.f.-driver stage that also may be switched to function as a Pierce crystal-controlled oscillator. Individual circuits at the output here are fixed-tuned to the required band. The p.a. consists of two parallel-connected transistors with a dual-Pi network output circuit with individual toroid inductors for each band. Output loading in each case is fixed for a 50-ohm antenna impedance. Resonance is obtained by a variable capacitor at the mid-section of the nework.

Keying

Keying is accomplished through a transistor used as an electronic switch that turns on the supply potential for the sidetone oscillator and r.f. driver. The key also actuates the antenna relay and causes the receiver a.f. amplifier to be muted by shorting its input with a conducting diode. Included in the keying circuit for the antenna relay is an adjustable delay system that can be set for relay-holding times of a few milliseconds to about one second after each character is transmitted.

Construction

Five and a half hours were consumed in assembling our HW-7 which is built on a printed-circuit board that is then mounted on a metal frame. The case consists of top and bottom U-shaped halves. Heath's traditional HW- Line colors and styling are used. The v.f.o. is operated by a 6:1-ratio planetary drive that has a dial with individual scales for

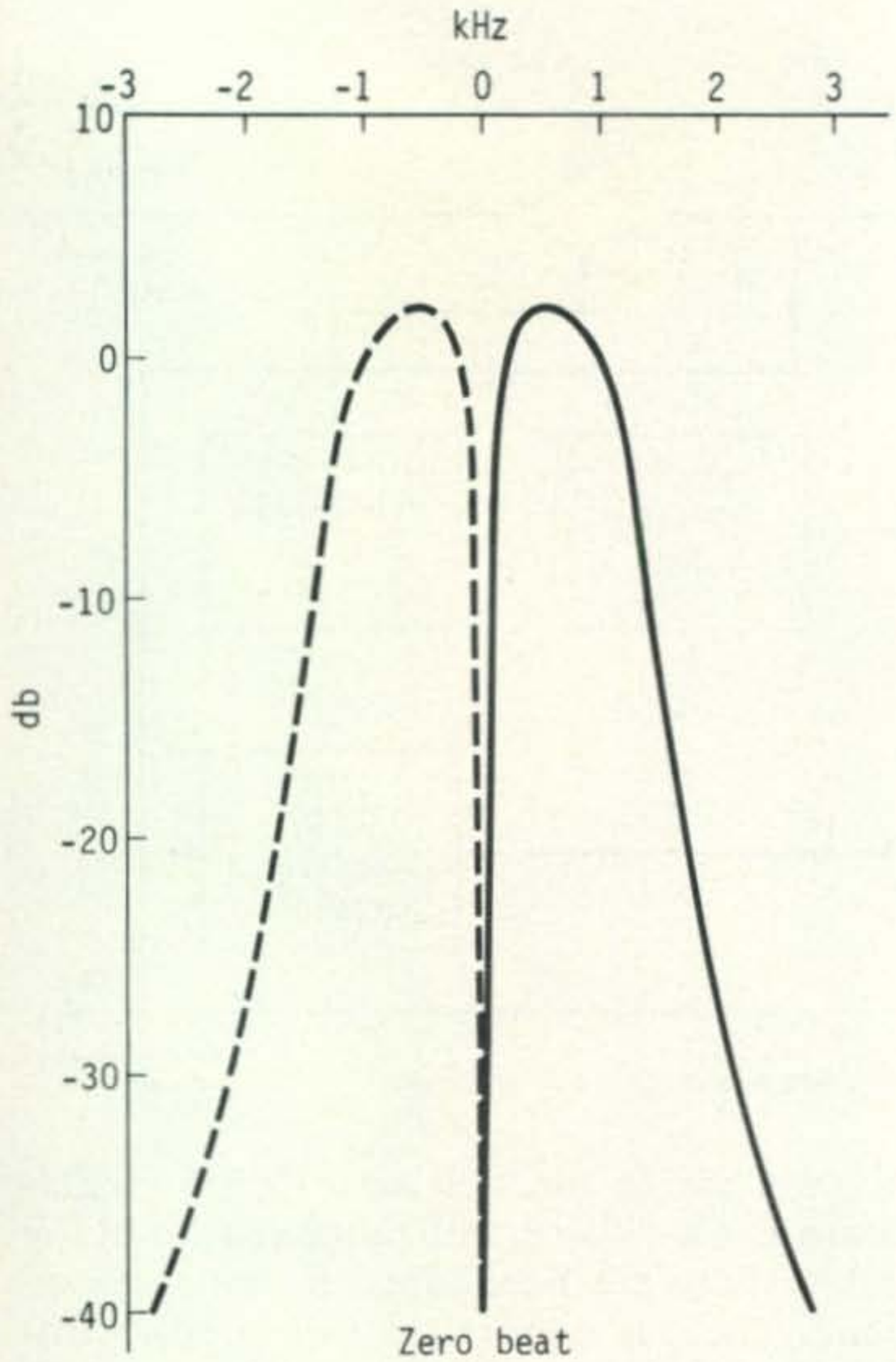


Fig. 2—A.f. response curve for the HW-7, indicative of the receiver's selectivity. It is drawn to a linear base to conform with normal i.f.-selectivity curves. The solid trace represents the response as the receiver is tuned toward the high-frequency side of the signal. The dashed trace similarly shows the response toward the low side. Both traces together indicate what the over-all picture would look like when the receiver is tuned through the signal.

each band calibrated in 5 kHz steps. The ranges are 7.0-7.2, 14.0-14.2 and 21.0-21.3 mHz. There are three other controls: PA Tune; Receiver Preselector; A.F. Gain with On-Off switch. The meter is an edgewise-mounted type.

Also on the panel is a socket for a transmitting crystal. The selection of the transceiver bands is made with a four-position inter-locking pushbutton switch that also sets up either v.f.o.- or crystal-controlled operation. At the rear are a 13 v.d.c. power connector, standard jacks for headphones and key plus a phono jack for the antenna.

Operation and Performance

The unit is simple to operate. With the pushbutton for the desired band depressed and the preselector set at the designated spot for the band, a signal is tuned in with the v.f.o.; after which the signal is peaked with the preselector control. In the absence of a signal the peaking may be made for maximum man-made noise or at the point where a "plop" is heard as the preselector control is rotated near the bandpoint. The peaking spot is quite sharp and requires a bit of practice to catch on to its operation.

A characteristic of the receiver, which we've also experienced with others of a similar type, is that microphonics are evidenced when the preselector is peaked. This ordinarily presents no adverse problem; as a matter of fact, it can be an aid in properly peaking the preselector in the absence of a signal. This may be conducted by tapping the case while adjusting the preselector for the loudest microphonic noises!

Another experience with receivers of this nature is that a strong a.m. signal[3], such as a short-wave broadcaster, sometimes can be tuned in with the preselector, regardless of where the v.f.o. is set. In this case, overload with rectification apparently takes place at the input FET.

As for sensitivity, which is rated at a "readable" degree, as given earlier, on our unit measured 1 μv for 3 db S+N/N on 40 meters, 1 μv for 8 db S+N/N on 20 and 1 μv for 8 db S+N/N on 15. Selectivity is shown at fig. 2.

Transmitting

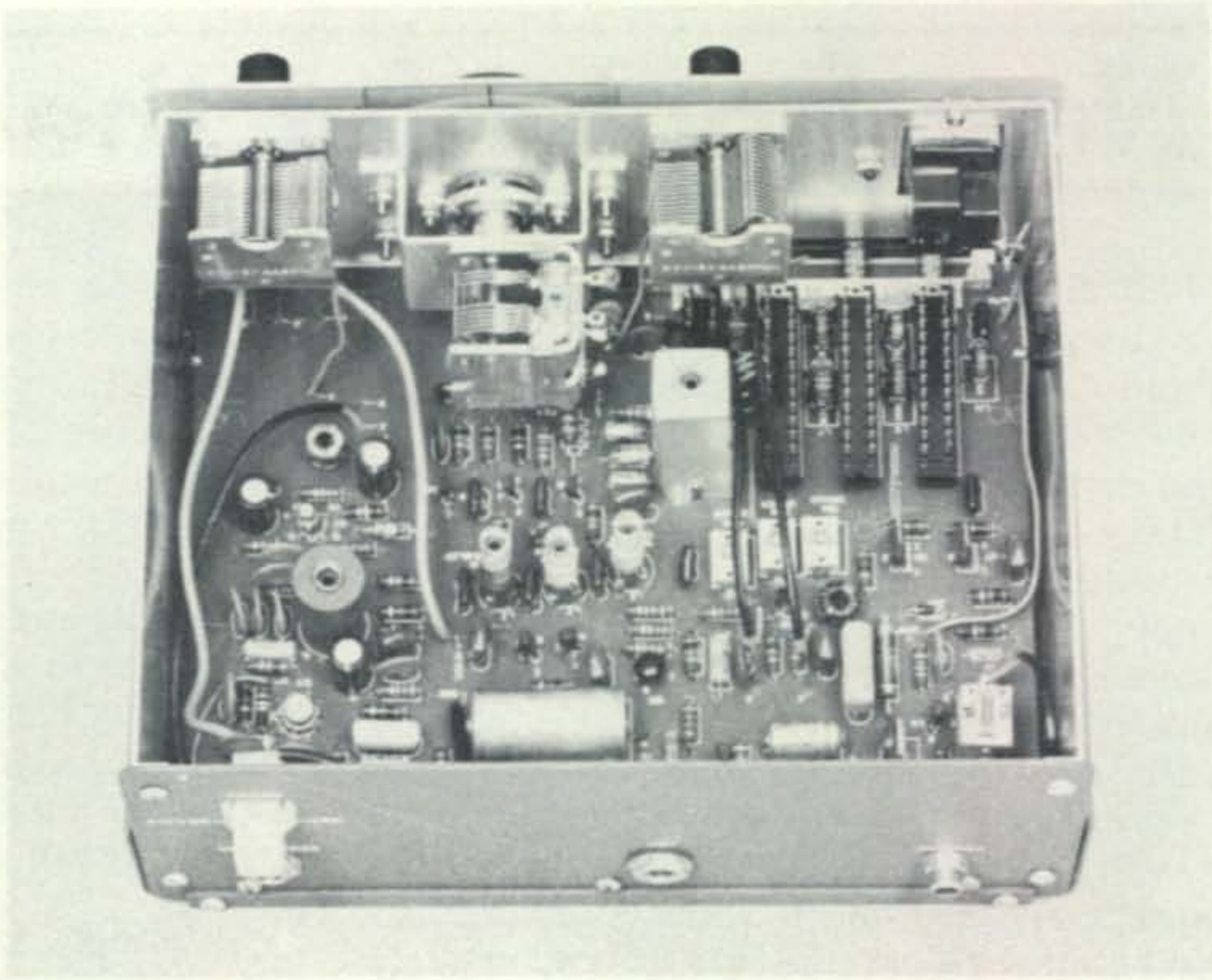
Besides setting the band, the transmitter must be arranged for v.f.o.- or crystal-control use by pressing one of the pushbuttons.[4] With the c.w. key depressed, the transmitter TUNE control is adjusted for maximum r.f. output as indicated by the panel meter. In this respect, however, it was noted that on 20 and 15 meters the output at a dummy load peaked up broadly at one point of the tuning control and sharply at a slightly higher tuning-capacitor setting; while the output meter indicated a broad peak at the first point and a *dip* at the second. Proper adjustment appears to be where the output meter peaks broadly.[5]

Operating from the specified source of 13 v.d.c., the power input was 4.1 watts on 40 and 20, 3.6 watts on 15; with outputs of 3,

[3]Signals of 750 μv or more.

[4]40, 20, 15-meter crystals are required for these respective bands.

[5]Subsequent investigation revealed that the sharp output-power peak responds to the second harmonic. An addition to the manual now includes instructions on proper peaking of the p.a.



Interior view of the HW-7. Most of the set is assembled on a circuit board. At the panel at the top are, left-to-right, the preselector-, v.f.o.- and transmitter-tuning capacitors.

2.75 and 2.25 watts on the respective bands. Power inputs with 12 volts (such as may be the case with batteries) were approximately 3.2 watts with outputs accordingly lower.

Keying is clean without chirp, but in this respect it must be kept in mind that a well-regulated power source (with a.c.-operated supplies) must be employed if chirp is to be avoided, inasmuch as the v.f.o. is quite sensitive to voltage variations. If chirp is experienced with battery operation, it is a sign of weak batteries.

No transmit-receive switching is required, since this is accomplished automatically as the unit is keyed, making good break-in performance possible. The sidetone level varies with the setting of the a.f. gain control.

Frequency Control

The v.f.o. must be aligned against a calibrated receiver, after which the scale calibrations will hold to within a few kHz over the entire range.

The frequency stability was such that after a 10-minute warmup drift of 600 Hz (averaged over the three bands) the frequency held to Heath's rating of 100 Hz or less per hour thereafter.

A consideration is that when the receiver is tuned on the high side of the received signal for the desired beatnote and the v.f.o. is used for transmit, the signal transmitted by the HW-7 will be higher in frequency by an amount equal to the beat-note frequency. Similarly, tuning on the low side of the signal will cause the transmitter frequency to be lower than the received signal.[6] Operation between similar units can be carried out without difficulties no matter to which side of the signal the receivers are tuned. In cases where the other station is employing a conventional transceiver, compatible frequency relations between both stations may depend on which side of the signal the HW-7 is tuned and on the sideband position and direction of c.w. frequency shift engaged at the other transceiver or on whether or not incremental tuning is used thereat.[7]

Antennas

The HW-7 is designed to work into 50-ohm unbalanced loads. Largely divergent or balanced loads will require an antenna-matching coupler of a balun. Use with a random-length antenna or others working against ground is possible with a coupler; however, in cases where the supply potential is obtained from an a.c.-operated source, it was found that quite a bit of a.c. hum can be evidenced on receive when the preselector is peaked. This condition can vary with different bands and various type power-supply units. As far as could be determined, the apparent cause for the hum is due to an additional r.f.-ground return through the power cord of the a.c. supply. The situation was not experienced with battery operation and usually not with antennas fed with coax at a low s.w.r.

[*Continued on page 90*]

[6]With our unit, regardless of which side of the signal the receiver was tuned, the transmitter frequency dropped 1100 Hz on 20 meters and 500 Hz on 15. Heath advises this is about normal. Only a 10 Hz change was noted on 40.

[7]For operation in conjunction with most transceivers, such as the Heath Line, tuning of the HW-7 on the high-side of the signal is required.

New Books for the Amateur

F.M. And Repeaters for the Radio Amateur

Over the past few years, the American Radio Relay League has published several new special-interest books for the amateur, the newest being "FM and Repeaters for the Radio Amateur," a 232 page volume, bargain priced at $3.00. While primarily a technical book, Editor Tom McMullen, W1SL, has done an excellent job of balancing theory and construction with f.m. history and discussion of operating techniques and rules. In a departure from general ARRL practice, heavy emphasis is placed on the surplus commercial equipment which still forms the backbone of f.m. and particularly repeater activity in most areas of the US.

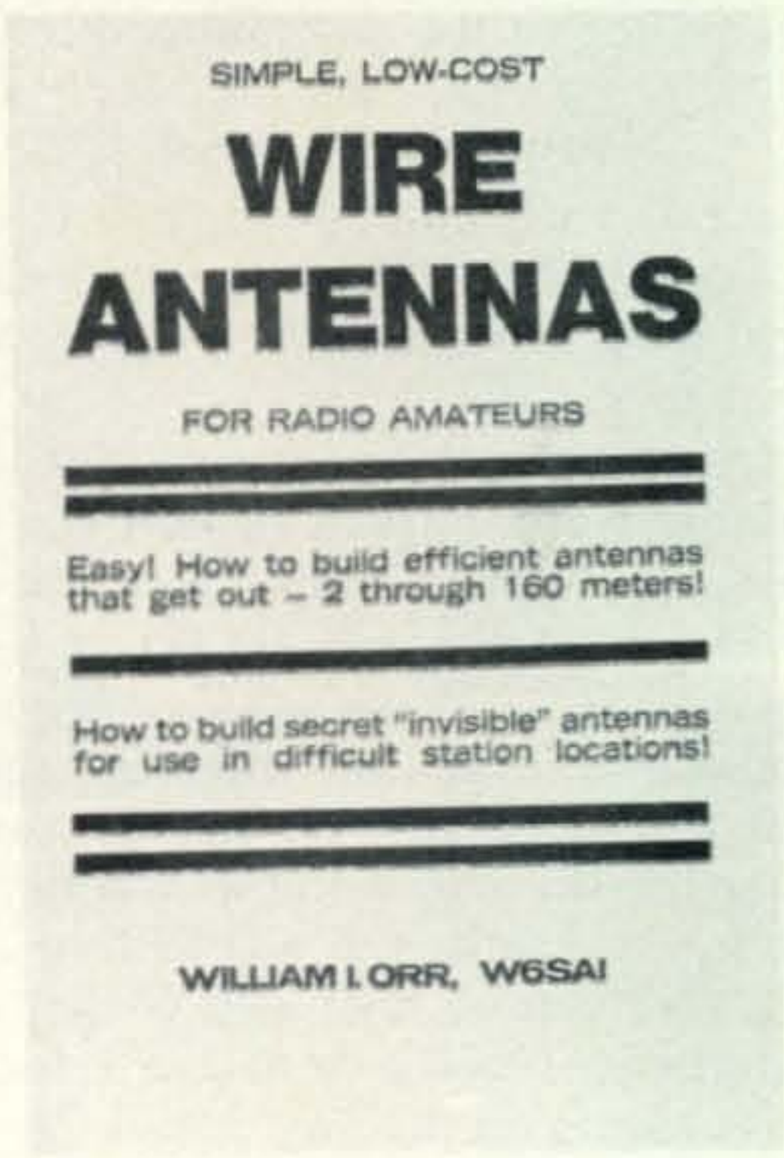
In addition, are chapters discussing f.m. transmitter and receiver theory and construction, mobile and portable operation, antennas, repeater design and construction, Touch-Tone and automatic I.D. and control accessories for repeaters, repeater problems, and testing f.m. equipment. Many of the construction projects are from QST.

Unfortunately, as with much of the ARRL-published material, the emphasis is on the nuts and bolts of constructing devices and equipment with only passing mention of how these devices inter-relate—how do you properly use something you've built? And how does it actually work? We feel that where possible a book like "FM and Repeaters" should provide the raw knowledge from which the enterprising amateur can build what he needs, and give some examples of how that knowledge can be applied. The trend seems to be, however, to give exhaustive treatment to how to build the gear and only cursory treatment to why it was built that way.

Despite our basic philosophical differences as to how such a book should be written, we feel that "FM and Repeaters for the Radio Amateur" is the best and most comprehensive book published to date for the f.m.er, and we recommend it highly.

Simple, Low-Cost Wire Antennas

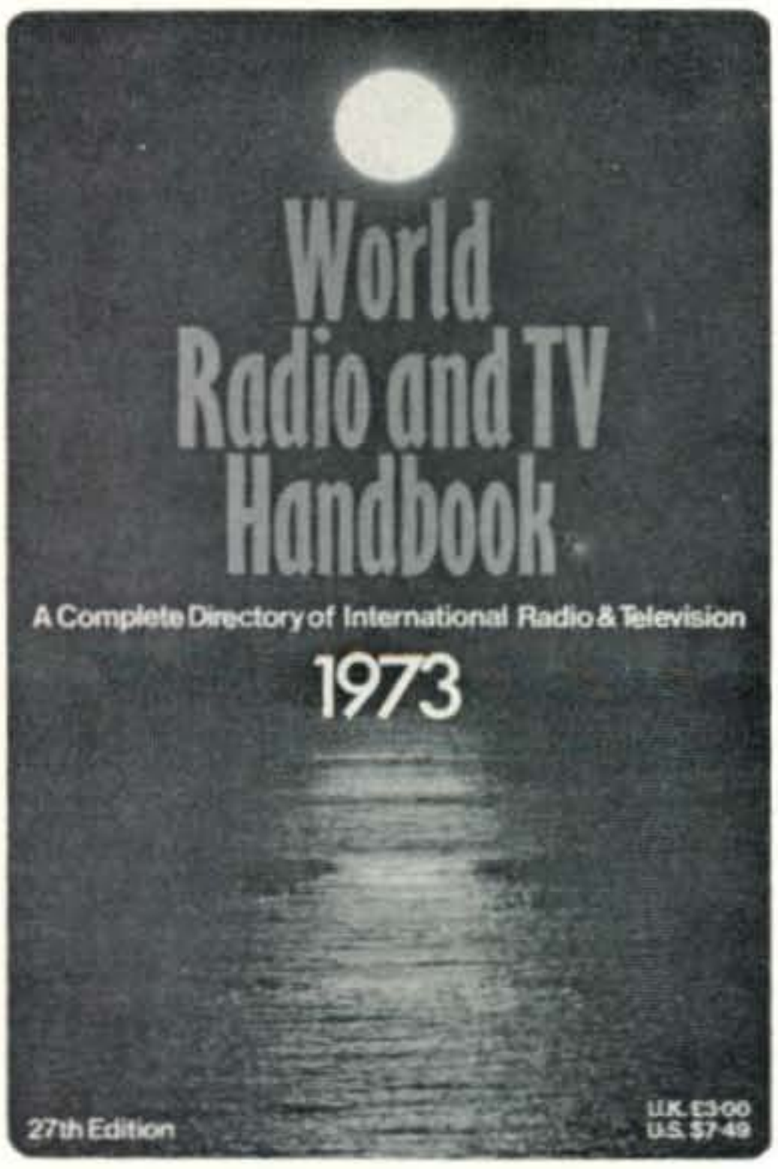
While hundreds of books have been published on the subject of antennas, it's a rare one that zeros right in on the problems of John Q. Average ham whose bank account matches his real estate - small. While Bill Orr's new Wire Antenna book isn't restricted to limited space sky-wires, it seems to approach the subject with the understanding that although the amateur wants his signal to be heard he can't always invest great gobs of money in fancy aluminum.



Written in a light, easy-to-understand style, the first six chapters cover the fundamentals of antennas and how they work, feedlines and s.w.r., and delve into the characteristics of dipoles and various vertical antennas. From there, the book jumps off into dozens of

time-tested wire antennas - beams, dipoles, verticals, quads, and v.h.f. arrays, along with simple antenna tuner designs. Included in this portion is a chapter entitled, "Work DX With An 'Invisible' Antenna," which is worth the price of the book if you've really got neighbor problems. Five "Case Histories" of amateurs with "invisible" antennas may sound, let us say, imaginative, but they make the point that no antenna situation is hopeless. The book winds up with some solid practical advice on getting the antennas up and keeping them up.

"Simple, Low-Cost Wire Antennas for Radio Amateurs" by W6SAI, 192 pages, is published by Radio Publications, Inc., Box 149, Wilton, Conn. 06897 and is priced at $3.95.



World Radio and TV Handbook

For years the only comprehensive reference book available for the avid shortwave listener has been the World Radio and TV Handbook, published in recent years by Billboard Publications, Inc. of London and New York. The 1973 edition is now out, and at 400 pages, is the biggest and best in the book's 27 year history. The featured item is an exhaustive 200-page-plus listing of radio broadcasting in 208 countries throughout the world including such interesting details such as the Interval Signal (musical identification) used by government broadcasting stations, names and addresses of key personel responsible for broadcasting in each country, languages used, frequencies and power of home services, frequencies and languages of overseas broadcasts, and more.

Also, Television stations and long, medium and shortwave radio stations world-wide are listed by frequency for easy identification of unknown broadcasts. Listings of DX clubs, international B.C. organizations, propagation predictions, solar activity for 1973, standard frequency and time signals, time charts and 11 maps of the world round out the book.

We feel that at $6.95, the World Radio and TV Handbook is a worthwhile addition to the library of any amateur or radio hobbyist, and an absolute must for the SWL. In the US the book is available from Gilfer Associates, Inc., Box 239, Park Ridge, NJ 07656 and other distributors.

Phase Locked Loop Handbook

A free 80-page book has recently been released by Signetics, entitled "Signetics Linear Phase Locked Loops Applications Book." Phase locked loops are among the newer "toys" finding increasing application in tone decoders, f.m., a.m. and RTTY detectors, test equipment, sawtooth generators, tone burst generators and power inverters. The Signetics book moves from basic PLL definitions to PLL principles and general applications. A third section describes loop setup, trade-offs and PLL measurements, and gives detailed information on Signetics PLLs. Also in this section is information on expanding the capabilities of PLLs beyond normal parameters. Probably the most interesting section for the amateur is Section 4:Specific Applications, a mind expanding 25-page idea bank of PLL applications. Any experimenter deserves to have a copy of this gem of a freebie on his bookshelf. Write directly to Roy L. Twitty, Public Relations Manager, Signetics, 811 East Arques Ave., Sunnyvale, CA 94086 for your copy.

DX

BY JOHN A. ATTAWAY,* K4IIF

LET's hope the gear and antenna system is tuned to perfection for the *CQ* Worldwide WPX Contest which comes up the weekend of March 24 and 25, 1973, about the time you should be receiving this column. The WPX Contest is the last major worldwide fling until October, and gives amateurs the world over a golden opportunity to add a lot of zones to their Single Band WAZ Award totals. Many top operators will work 35 zones or more during this weekend on the hotter bands. It is a s.s.b. only affair, however, so you c.w. specialists will have to wait till fall.

As we enter the fourth month since the kickoff of the single band awards, the DX Committee is interested in progress reports from some of you active zone chasers. With both the ARRL Phone and C.W. DX Contests just about over, U.S. and Canadian DXers should have made significant progress on both modes. We wouldn't be surprised to hear that several operators have completed WAZ on 15 or 20 meters. Of course there will be a time lag between making the contacts and receiving the QSLs to confirm the award. Unless you're playing it cool to surprise your favorite rival, let us know how you are coming and which zones are giving you the most trouble. Remember, if you are competing for one of the plaques to be awarded to the first phone must be checked personally by the DX cards must be checked personally by the DX Editor and the earliest postmark will determine the winner.

It has been suggested that we offer a mixed mode award in addition to the c.w. and phone certificates. Great difficulty is anticipated in working the 40 zones on the 3.5 and 7 mHz bands, and certainly on the 28 mHz band during the low end of the sunspot cycle. An 80 meter specialist has indicated that some zones have only one really active station on the lower bands, and that this station frequently concentrates on one mode. His pessimistic assessment is that it will take many years to work a single mode WAZ on 80 meters. Be assured that your Committee will watch this situation closely and take action if it proves impossible to work a zone on 80 in a reasonable length of time. For now we prefer to think that many difficulties will be overcome through DXpedition activity and that Single Band WAZ will become a premier DX award, particularly on 80 meters.

Complete rules for the Single Band WAZ program are shown on page 57 of the December, 1972 issue.

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

The CQ DX Award Program

C.W. DX

109.....WA5EEM

S.S.B. DX

248.....W9OEQ	250.....SV1GA
249.....KZ5JF	251.....RB5EDU

Endorsements

S.S.B.: I1AA—310, W5QBM—250, KZ5JF—250, SV1GA—200, G5GH—150 and W9OEQ—150.

28 mHz: RB5EDU

Complete rules for the *CQ* DX Award Program may be found on pg. 58 of the January, 1971 issue of *CQ*. Application blanks and copies of the rules may be obtained by sending a business size, self-addressed, stamped envelope to Award Manager, P.O. Box 1271, Covina, CA 91722 or to the DX Editor.

De Extra

Should Swan Island Be Removed From The Country List? There is a precedent which says not.

When the requirement that islands be separated from the mainland of their governing country by 225 miles of open water was introduced by ARRL in April, 1960, some island countries were allowed to remain on the list as a matter of tradition even though they did not conform to the new rules. Examples are the Balearic Islands, a province of Spain located about 60 miles from the mainland, and Corsica, a department of metropolitan France located about 100 miles from the mainland.

As Swan Island was on the country list for many, many years, it can be argued that an equally strong case can be made for retaining it on the basis of tradition. However, with the return of the island to Honduran jurisdiction by the U.S., Swan, 110 miles off the coast, was stricken from the list. Perhaps this wasn't

WPX HONOR ROLL

The WPX Honor Roll is based on confirmed current prefixes which are submitted by separate application in strict conformance with the *CQ* Master Prefix List. Scores are based on the current prefix total regardless of an operators all-time count.

MIXED

W4LRN	1197	YU1AG	851	K8UDJ	750
VE3GCO	1001	W4IC	850	CT1LN	749
W2NUT	967	W4CRW	849	WA5LOB	749
W8LY	932	W4BQY	818	K2AAC	743
F9RM	921	I6SF	814	KØBLT	733
ON4QX	916	W4WSF	811	PY4AP	715
W3PVZ	902	W9WHM	811	WA6EPQ	709
DJ7CX	895	G3DO	810	K2ZRO	708
WA6MWG	886	W6TCQ	804	W6NJU	706
PAØSNG	882	W3GJY	797	W9ZTD	700
W8ROC	882	WØAUB	785	K6SDR	686
DL1CF	872	W6ISQ	758	W8GMK	683
K1SHN	867	SM7TV	752	WAØCPX	656
DL1MD	866	WB4KZG	750	WA2EAH	650

C.W.

W8LY	928	DJ7CX	730	W4IC	652
W8KPL	910	K7ABV	716	WA6MWG	644
DL1QT	844	G2GM	707	W6ISQ	638
W2HO	825	K1SHN	696	K1LWI	629
ON4QX	823	OK2DB	693	W8GMK	628
W2AIW	813	YU1AG	680	K2ZRO	612
VK3AHQ	809	K2AAC	666	VO1AW	605
WB2FMK	740	I6SF	658	VE4OX	600
W9FD	740	SM5BNX	652	OK2QX	598

S.S.B.

W4NJF	1031	DL1MD	774	W3DJZ	694
CT1PK	930	PAØSNG	758	ZL3NS	685
IØAMU	863	WA5LOB	747	W6RKP	678
DL9OH	841	F2MO	730	I4ZSQ	669
K2POA	833	G3DO	719	I8YRK	662
W9DWQ	826	I1ZV	716	WB6DXU	631
HP1JC	800	IT9JT	710	I4LCK	608
I8KDB	790	W4IC	702		
WØYDB	784	K1SHN	697		

the best decision. If you have an opinion one way or the other, drop a line to the ARRL DXCC Committee member nearest you. That Committee wishes their decisions to reflect the wishes of the membership. Give them a hand.

New CQ DX Award Endorsements

Your *CQ* DX Awards Advisory Committee has been busy in recent weeks reviewing requests by our readers for new endorsements for our country awards. Effective immediately, the Committee has approved endorsements for working 50 countries on 160 meters, 50 countries from a mobile station and 50 countries while operating QRPp (5 watts input or less).

Other endorsements available in the program include the SSTV endorsement (50 countries), the OSCAR endorsement (50 countries), the Low Band (3.5/7 mHz) endorsement (100 countries) and the 28 mHz endorsement (100 countries). Contacts back to November, 1945 can be counted for these endorsements. (Be advised that any cards submitted for the SSTV or OSCAR endorsements showing a QSO in the 1940's or early 1950's will be carefully scruitinized, HI!)

Bill, ET3GK, has one of the official ET3 stations in Addis Ababa. His QSL Manager is W2BCU.

Nob, JA1KSO, operates one of the most active DX stations in Japan. *(Photo via WA6AUD)*

Here and There

Reports published in various amateur DX newsletters have erroneously listed DX Hall of Famer Jack Cummings, W2CTN as a Silent Key. We are pleased to report that Jack is still very much alive, though ill, but has suspended his mammoth QSL Manager duties.

Islands-On-The-Air Award: Although not sponsored by a major amateur magazine or national society, the IOTA Awards have joined the elite list of top world DX awards. An 18 page Directory-of-Islands, listing all islands accepted for IOTA and giving full information on the Awards and the IOTA Silver Cup, can be obtained by sending 6 IRC's to Geoff Watts, 62 Belmore Road, Norwich, NOR. 72-T, England.

CQ Committeeman Elected by ARRL: Congratulations to Gary Stillwell, W6NJU, *CQ* DX Awards Advisory Committee representative from the Southern California DX Club for 3 years, who was recently elected Vice Director for the Southwestern Division of the ARRL. A friendly wag has suggested that Gary is better qualified than anyone to direct vice in the Southwestern Division. However, the term is not used in that sense of course. As he wishes to devote full energies to ARRL programs, Gary has resigned from the *CQ* Committee.

New Southern California DX Club Committeeman: With great pleasure we announce the appointment of Jay A. Hollaway, W6EJJ, 5128 Jessen Drive, La Canada, CA 91011, to replace W6NJU as *CQ* DX Committeeman from the SCDXC. Jay is an enthusiastic and knowledgable DXer and presently serves as Editor of the *Southern California DX Club Bulletin.*

160 News: W1BB sends the following list of Worked All Continent awards issued to 160 Meter DXers through November, 1972. They are listed in order of issuance.

1. W1BB, June 20, 1953
2. G6GM, Oct. 16, 1953
3. G3PU, Oct. 1, 1955
4. W8GDQ March 13, 1961
5. G3OQT, May 22, 1962
6. DL1FF, Sept. 28, 1962
7. W1PPN, March 8, 1963
8. G3PQA, Oct. 2, 1963
9. W2KQT, Nov. 8, 1963
10. W6KIP, Jan. 10, 1964
11. G3RBP, Feb. 23, 1964
12. W2IU, March 12, 1964
13. G3FPQ, March 6, 1965
14. G3LIQ, March 14, 1965
15. K6DZC, March 11, 1966
16. WØVXO, Feb. 19, 1968
17. DL9KRA, Feb. 19, 1968
18. WØNWX, March 8, 1968
19. GI6TK, March 8, 1968
20. W9PNE, Jan. 21, 1971
21. W1HGT, May 26, 1971
22. KV4FZ, Aug. 27, 1971
23. OK2PDN, Oct. 1, 1971
24. GM3YCB, Dec. 23, 1971
25. HB9NL, March 24, 1972
26. HB9CM, April 6, 1972

The WAZ Program

S.S.B. WAZ

1052.....K3GZE
1053.....JA1BWD
1054.....K6SSN
1055.....JH1EIG
1056.....G3TJW
1057.....VK4UA
1058.....DL3FC
1059.....DJ3DJ
1060.....UB5WE
1061.....DJ9KR

C.W.—Phone WAZ

3476.....W3FNV
3477.....K8MFO
3478.....WØGKE
3479.....K5GUZ
3480.....DM3SBM
3481.....DM2BYE
3482.....K2KGB
3483.....W9OEQ
3484.....VK4KX
3485.....VE3CVZ
3486.....PY2BZD
3487.....JA1NPV
3488.....DJ6OZ
3489.....DK1BP
3490.....UA4BP
3491.....UW3UO
3492.....LA8CE
3493.....DJ9NA
3494.....OH7AA
3495.....OE3ARW
3496.....LA7FJ

Phone WAZ

481.....W2YYL
482.....K6SSN

Complete WAZ rules are shown on pages 64-66 of the June, 1970 issue. Application blanks and reprints of the rules may be obtained by sending a self-addressed, stamped envelope to DX Editor, P.O. Box 205, Winter Haven, Florida 33880.

27. OK1ATP, April 6, 1972
28. W2EQS, July 23, 1972
29. W6RW, Aug. 10, 1972
30. WA4PXP, Nov. 17, 1972
31. GM3WDF, Nov. 17 ,1972

Was anyone missed?

North Jersey DX Association 1973 Officers: The new NJDXA officers are Jack Lee, W2RGV, President; Charles Moraller, WB2-UKP, Vice President; Brother Pat Dowd, W2ZTV, Secretary; and Bob Crawford, W2-JLH, Treasurer. *(Tnx W2GT)*

Chasing DX On The Low Bands

Single Band WAZ on either 80 or 40 meters will be a real challenge, so periodically we will list some of the stations active in the more difficult zones. The following is a general assessment of overall prospects.

Zone 1: Numerous KL7 stations are active including KL7GDO and KL7AIZ on 80 meter c.w., KL7HIY on 80 meter s.s.b., and KL7MF and KL7AIZ on 40. This zone should present few problems.

Zone 2: There is usually at least 1, VO2 station active in the major contests so this zone should be routine for western hemisphere and European amateurs. Stations in Asia, Africa and Oceania may have trouble.

Zones 3-6: Should be no problem.

Zone 7: HKØBKX, KZ5PW, TG9BY, VP1-BH and others are active on s.s.b. C.w. skeds should not be too difficult to arrange.

Zone 8: With KV4FZ, KV4AA and KP4AST around, nuff said!

Zone 9: Plenty of HK and YV stations. HK3-CEX is on 80 s.s.b. and YV5AW on 80 c.w. Certainly no problem for anyone during contest weekends.

Zone 10: An abundance of active stations including CP1EU, CP1EW, OA6NCT, OA8V, HC2YL, HC8FN and HCØHM.

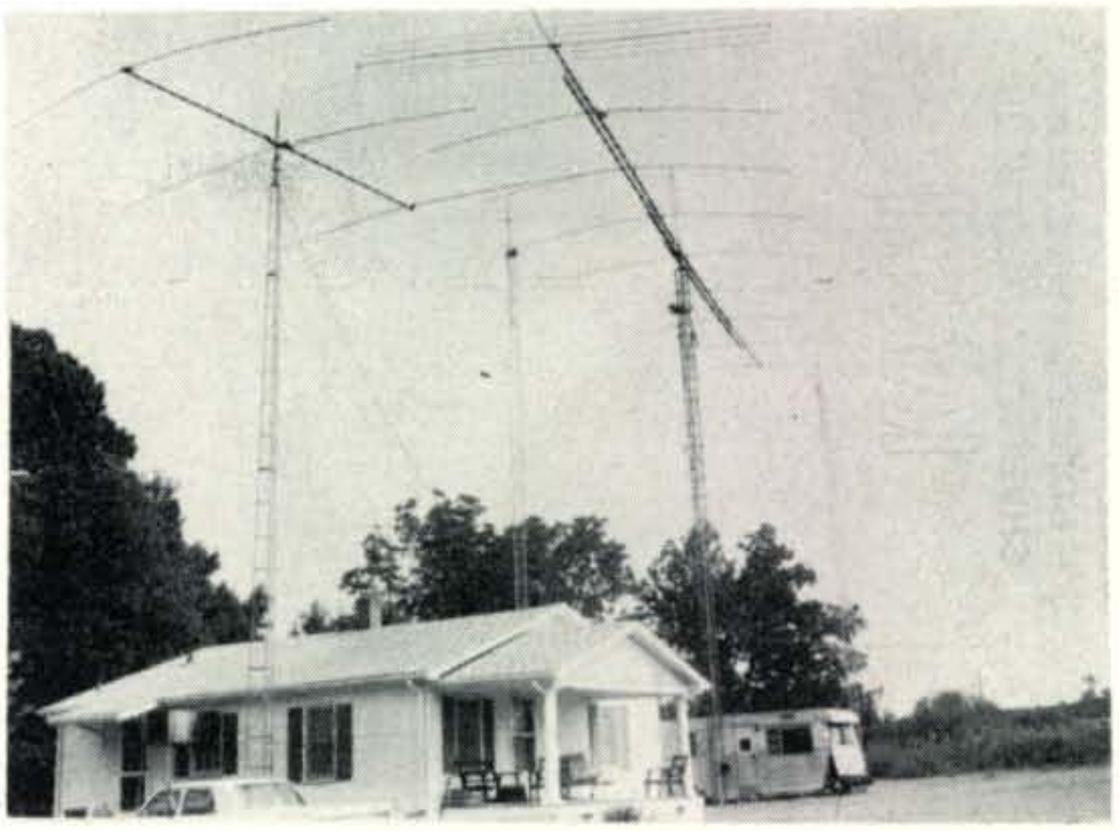
Zone 11: Loads of PY's, particularly in the *CQ* Worldwide WPX Contest.

Zone 12: CE activity is down a bit, but DL7-ZG/CEØA and SM2AGD/CEØ have been on quite a bit.

Zone 13: CX and LU stations are abundant. CW3AA, CX1BBL, LU6DKX, LU6JAX, LU8AJG, VP8LR and VP8ME are good low band prospects.

Zones 14 & 15: Among the most active.

Zone 16: Should be easy. UK1ABA, UA2-FAI, UY5EX, UK1AAA and UB5LL are just a few we have heard on the low bands.



The QTH and antenna farm at K4SKI. The 14 mHz array has 9 elements on a 124 ft. boom with 14 ft. spacing between elements. On 21 mHz there are 14 elements on a 120 ft. boom and on 28 mHz, 7 elements of the 15 meter array are used. The "toy" in the foreground is 3 full-sized elements on 7 mHz. *(Photo via W2GT)*

Zone 17: Not an easy zone from North America on the low bands, but there is substantial activity. In recent weeks we have heard UA9FAD, UH8CS, UI8LL, UM8EM, UM8FM and UL7GW on 80 meter c.w., while on 40 we have heard UL7JG, UK9-ABA, UL7GW, UI8IZ, UM8MAG and UH8BY.

Zone 18: Will be one of the 3 most difficult zones to work from the U.S. UK9HAD on 3507 kHz is the only station we have copied recently on the low bands.

Zone 19: Another real toughie. We've heard UWØFB on 3505.

Zone 20: Easy on the high frequencies, but a challenge on 40 and 80. 4X4NJ and many other active Israeli stations frequent 80 meter

"It's a raw deal being on the Honor Roll at W4CKB. 3 o'clock in the morning and no new countries to work!"

THE SATISFIERS

INOUE'S 2-METER FM GEAR

IC-20

12 Ch.

10 W.

$289.00 With 5 Channels Supplied

IC-21

24 Ch.

10 W.

$389.00 With 7 Channels Supplied

ENJOY THE DIFFERENCE OF A HOT RECEIVER

You'll be copying signals the others miss. The Inoue IC-20 and IC-21 MOS FET front end provides better than .4UV/20DB sensitivity.

Cross channel interference is virtually eliminated in the IC-20 and IC-21. Inoue features 5 helical resonators in the RF amplifier to eliminated intermod couple with 2 i.f. filters.

VERSATILITY

High/Low power switch offers variable power output ranges of .1 to 10 watts. This makes the Inoue IC-20 and IC-21 ideal for mobile and portable use.

ON FREQUENCY ASSURANCE

Trimmer caps on both Rx and Tx for all channels provide on frequency assurance.

UNIQUE INOUE FEATURES THAT MEAN MORE SATISFACTION TO YOU

MODULAR CONSTRUCTION – A REAL INOUE PLUS

Each hand-assembled section is enclosed in a metal module.

DEPENDABILITY

The Inoue IC-20 and IC-21 are engineered to stand up under extreme stress. Metal encased plug in modules eliminate the hazzards of single board construction.

WARRANTY AND SERVICING

Each unit is covered by a 90 day warranty. Service problems are quickly solved and down time is minimized by our Module Replacement Program.

INOUE DEALERS

See the Inoue line at your local Dealer or write ICOM for information.

ARIZONA

Ell Dee Enterprises
1342-A E. Indian School Rd.
Phoenix, Arizona 85014
602-942-9715

CALIFORNIA

ICOM FM Sales
6234A Fountain Avenue
Hollywood, California 90028
213-225-6620

Sequoia Stereo
773 8th St.
Arcata, California 95521
707-822-328

NEW MEXICO

Robert Foster Sales
Box 198 Escevosa Star Route
Tieheras, New Mexico 87059
505-281-3975

OKLAHOMA

Blacks Radio Company
413 N.E. 38th Terrace
Oklahoma City, Oklahoma 73105
405-528-0193

Devlin Electronics
4817 E. 35th Ct.
Tulsa, Oklahoma
918-742-7246

TEXAS

Bellaire Electronics Supply
5204 Bellaire Blvd.
Bellaire, Texas 77401
713-667-4294

Electronics Center Inc.
3939 N. Haskell
Dallas, Texas
214-526-2023

Trimble Electronics
2810 Alexandria
Tyler, Texas 75701
214-593-1123

WASHINGTON

NHE Communications
15112 S.E. 44th
Bellevue, Washington 98006
206-747-8421

DISTRIBUTED BY:

ICOM

EAST Box 331, Richardson, Texas 75080
A Division of A.C.S.

ICOM

WEST 1251 170th N.E., Bellevue, Washington 98008
Dealer Inquiries Invited

phone and c.w. LZ1KPG, LZ2KBS, OD5CU, OD5ER and 5B4CZ are also active.

Zone 21: When propagation is good listen for 9K2AL, YAØCDRC, 4W1AF, UF6LY, and the EP stations.

Zone 22: Very difficult from the standpoint of propagation. VU25BX has been on 80 meter s.s.b. VU2FBZ and VU3BU are good c.w. catches on the low bands.

Zone 23: Traditionally the most difficult zone to work from the western hemisphere. JT1-AL, JT1AN and JT1AS have been reported on 40 meter c.w. The latter is also on s.s.b. Another good catch is JTØAE, and the zone is frequently activated by the UAØY—stations in Tana Tuva.

Zone 24: This is another hard one from the Americas, but VS6FB, VS6DO and other Hong Kong stations work 40 and 80 meters on both modes.

Zone 25: Beaucoup activity from JA-land.

Zone 26: Listen for the HS and XW8 stations. HS4AGN, HS4AFX and XW8EV work the low bands.

Zone 27: KC6SK, KG6JBO, KG6JBS, DU1-EJ and several others have been reported.

Zone 28: There are a number of active Indonesian stations, but we haven't heard them on 40 or 80 recently. A VK9 on New Guinea may be the best bet.

Zone 29: VK6CT and VK6AO frequent the lower bands.

Zone 30: Lots of VK's on 40 and 80. VK2EO, VK2NS, VK2DO and VK3XB to name a few.

Zone 31: With KH6IJ in the contests you've probably already worked it. If not, VR1, KX6 and KB6 are also in this zone.

Zone 32: Many strong New Zealand stations operate on 40. ZL2BT, ZM3RK and ZM1-AIZ were recently logged on 80, and FO8BX, FO8DF, KS6DH and KS6BY on 40.

Zone 33: EA8AH, EA8FF, EA8HJ, EA9EU and CN8CG are good possibilities, and contest activity is frequently generated from Pantelleria and the Pelagic Islands.

Zone 34: The most active stations are SU1-AM, SU1IM, SU1MA and ST2SA, but they aren't often heard on the low bands. You may have to schedule Zone 34.

Zone 35: 6W8DY has been very active on s.s.b. on both 40 and 80 meters. EL2DG, EL2DO, 9L1GC, 9L1JT and 5T5CJ are strong on 7 mHz c.w. 9G1HE and 9L1GC are on 80 meter c.w.

The WPX Program

S.S.B. WPX

726.....UV3GW
727.....UA9MP
728.....PY2BZD
729.....WØBWJ
730.....CX2CS
731.....I1CRW

C.W. WPX

1221.....UV3GW
1222.....UY5OQ
1223.....UW3TR
1224.....UA4WAE
1225.....UB5AX
1226.....UV3GE
1227.....WA6HMT
1228.....VK4KX

Mixed WPX

372.....LA3UF
373.....I1ASM
374.....UV3GW
375.....WB4INE

VPX

49.....WDX5FEB
50.....SM5-2735

WPX Endorsements

S.S.B.: OK1MP—700, I1AA—700, DL9XN—500, K6SSN—450, UV3GW—400, PY2-BZD—400 and W4UPJ—350.

C.W.: SP3DOI—600, K8MFO—550, W6-NJU—550, UA3GO—550, UA6AAB—550, DJ4VP—500 and VK4KX—450.

Mixed: VE3GCO—1000, W4IC—900, W6-TCQ—800, W9ZTD—750, WB4KZG—750, LA3UF—600, WA5VDH—550, WA9VGY—500 and K6SSN—450.

20 Meters: I1ASM

15 Meters: DJ4VP

10 Meters: WB4SIJ

Africa: K8MFO

Asia: VO1AW, UA3GO and W9ZTD

Europe: WA4LDM, I1ASM and K8MFO

North America: W9EVD and W9ZTD

Oceania: W4WSF and W9ZTD

WPNX: WN5ZNY of the famous DXing Busick family has received his 200 sticker and has confirmed 228 prefixes, highest total of any Novice to date. Close behind is WN1JMP with 210 prefixes.

Complete rules for WPX, WPNX and VPX may be found on pg. 67 of the February, 1972 issue of *CQ*. Application blanks and reprints of the rules may be obtained by sending a business size, self-addressed, stamped envelope to Award Manager, P.O. Box 1271, Covina, CA 91722 or to the DX Editor.

Zone 36: TZ2AC has been on both low bands s.s.b. CR6AL, 9J2NC and ZE5JJ are good.

Zone 37: 5X5NK used both modes on the low bands. 5X5NW is also active and CR7IC and CR7IZ make many 40 meter contacts. FL8-OM is a good catch on 80 s.s.b.

Zone 38: Many ZS stations are active and this zone shouldn't be too hard. ZS2HI, ZS2AG and ZS6ARS were recently logged on the low bands, also 3D6AX.

[*Continued on page 94*]

Propagation

BY GEORGE JACOBS,* W3ASK

CHALK up another first for *CQ*. This time it's DIAL-A-PROP, a new way for radio amateurs to receive updated shortwave propagation forecasts.

Simply by dialing Area Code 615-883-6223, a two minute recorded message prepared by the Editor of this column will bring you the latest propagation data for the amateur bands, at any time of the day or night.

The DIAL-A-PROP forecast is prepared each Monday, and covers day-by-day a period of a week. If significant changes develop during the week, the message will be updated to reflect the change.

Given in simple language in a manner similar to a weather report, day-to-day conditions are rated as *above normal, normal, below normal,* or *disturbed*. Conditions on the various bands are described as *excellent, good, fair* or *poor*.

The announcement will also contain the latest assessment of solar activity, band-by-band DX tips, and a forecast for ionospheric openings on the v.h.f. bands.

If you want a more updated propagation forecast than appears in this column, give DIAL-A-PROP a call. The only charge involved is the cost of the call.

April Propagation

While fewer DX openings are forecast for the 10 and 15 meter bands, DX conditions are expected to improve on 20 meters during April. Seasonably favorable conditions for long DX openings between the northern and southern hemispheres should continue through the month, and a considerable improvement is expected for *short-skip* openings on all of the h.f. bands. A major meteor shower is expected during April which should enhance v.h.f. propagation.

During April, 20 meters is expected to be the optimum band for DX propagation conditions during most of the daylight hours, and into the evening hours as well. Some fairly good 15 meter openings are also forecast, especially during the late afternoon hours, but conditions are expected to be considerably below those observed during the past winter months. Very few good 10 meter DX openings are expected, but some may occur during the daylight hours on paths to South America and other southerly regions.

After sunset optimum DX propagation conditions should be shared between both 20 and 40 meters. Good openings to many parts of the world are forecast for both bands between the sunset and sunrise periods.

Some fairly good 80 meter DX openings should also be possible during the hours of darkness and the sunrise period, and there is also a chance for an occasional DX opening on 160 meters during the same time period.

Seasonally favorable propagation conditions over long circuits between the northern and southern hemispheres, for example, to Australasia, South America, southern Africa, etc., should continue during April on all h.f. bands.

Static levels are expected to increase in the northern hemisphere during April, as thunder-storms become more numerous. This result in somewhat higher noise levels, especially on 40, 80 and 160 meters.

* 11307 Clara Street, Silver Spring, Md. 20902.

LAST MINUTE FORECAST

Day-to-Day Conditions Expected For April, 1973

Propagation Index	*Rating & Forecast Quality* (4)	(3)	(2)	(1)
Above Normal: 8-9, 15-16, 24, 28	A	A	C	C
Normal: 1-2, 5-7, 10, 14, 17, 21-23, 25-27, 29	B	C	D	E
Below Normal: 3-4, 11-13 18, 20, 30	C	D	E	E
Disturbed: 19	D	D	E	E

Where *expected signal quality is:*

A—Excellent opening, exceptionally strong, steady signals.

B—Good opening, moderately strong signals with little fading and noise.

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

D—Poor opening, signals weak 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 particular opening for any day of the month. For example, all openings shown in the Charts with a propagation index of (3) will be fair on April 1, excellent on April 8, poor on April 11.

Sunspot Cycle

The Zurich Solar Observatory reports a monthly mean sunspot number of 43 for December, 1972. This results in a smoothed sunspot number of 70, centered on June, 1972.

The sunspot cycle is declining again; and a smoothed sunspot number of 43 is forecast for April, 1973.

V.H.F. Ionospheric Openings

Fairly good v.h.f. ionospheric openings are forecast for April, with seasonal improvements in sporadic-E propagation, trans-equatorial scatter propagation and meteor scatter.

Sporadic-E propagation begins to increase during April, and continues to do so through the spring and summer months. This should result in an increased number of short-skip openings on the 10 and 6 meter bands during the month. Most openings will likely fall between the 750 and 1300 mile range, but some may extend out to approximately 2400 miles. During periods of intense sporadic-E ionization, openings on 2 meters may also be possible over distances between approximately 1200 to 1400 miles. While sporadic-E propagation may occur at any time of the day or night (hence its name), there is a tendency for it to peak between 8 A.M. and noon and again between 5 and 8 P.M., local time.

Trans-equatorial (TE) openings on 6 meters should improve during April. TE openings usually occur between 8 and 11 P.M. local time, on long north-south paths which cross the geomagnetic equator at approximately a right angle. TE openings favor locations in the southern third of the USA, with progressively fewer openings in the central and northern sectors.

Lyrids, a major meteor shower is due between April 21-23. It should peak during the evening hours of April 22, when an average of 15 good-sized meteors are expected to enter the earths' atmosphere every hour. This should considerably increase the chances for v.h.f. meteor scatter-type openings.

Some auroral-type ionospheric openings may also be possible during April, especially when the ionosphere may be disturbed for h.f. signals. Check the "Last Minute Forecast" at the beginning of this column for those days that are forecast to be below normal or disturbed during the month. These are the days on which auroral-type v.h.f. openings are most likely to occur.

HOW TO USE THE DX PROPAGATION CHARTS

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

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 Meters) for a particular DX region, as shown in the left hand column of the Charts. An * indicates 80 Meter openings. Openings on 160 meters are likely to occur during those times when 80 meter openings are shown with a *propagation index* of (2), or higher.

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

(4) Opening should occur on more than 22 days
(3) " " " 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 Propagation column for the actual *dates* on which an opening with a specific propagation index is likely to occur, and the signal quality that can be expected.

4. 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. Appropriate *standard* time is used, *not* GMT. To convert to GMT, *add* to the times shown in the appropriate Chart 8 hours in the PST Zone, 7 in the MST Zone, 6 in the CST Zone and 5 in the EST Zone. For example, 14 in Washington, D.C. is 19 GMT and 20 in Los Angeles is 04 GMT, etc.

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

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

DX propagation forecasts for each amateur band between 10 and 160 meters for the period April 15 through June 15, 1973 appear in the *DX Charts* on the following pages. For predictions of short-skip openings between distances of 50 and 2400 miles expected during April, refer to the *Short-Skip Charts* which appeared in last month's column.

73, George, W3ASK

April 15 — June 15, 1973

Time Zone: EST (24-Hour Time)

EASTERN USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	*Nil*	08-13 (1) 13-17 (2) 17-18 (2)	04-05 (1) 05-09 (2) 09-11 (1) 11-13 (2) 13-16 (3) 16-19 (4) 19-20 (3) 20-21 (2) 21-00 (1)	18-20 (1) 20-21 (2) 21-23 (3) 23-01 (2) 01-03 (1) 20-22 (1)* 22-23 (2)* 23-01 (1)*

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

Time Zone: CST & MST (24-Hour Time)

CENTRAL USA TO:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	*Nil*	13-17 (1)	05-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-17 (3) 17-18 (2) 18-20 (1)	19-20 (1) 20-22 (2) 22-01 (1) 21-23 (1)*
Northern Europe & European USSR	*Nil*	12-14 (1)	05-06 (1) 06-08 (2) 08-14 (1) 14-16 (2) 16-18 (1) 21-23 (1)	19-23 (1)
Eastern Mediter-ranean & Middle East	*Nil*	14-16 (1)	06-08 (1) 13-15 (1) 16-21 (2) 21-23 (1)	19-23 (1)
West & Central Africa	12-16 (1)	12-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	04-05 (1) 05-07 (2) 07-09 (1) 12-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-20 (3) 20-22 (2) 22-00 (1)	20-00 (1)
South Africa	*Nil*	08-11 (1) 11-13 (2) 13-14 (1)	13-14 (1) 14-17 (2) 17-18 (1) 21-22 (1) 22-00 (2) 00-02 (1)	19-21 (1) 21-23 (2) 23-00 (1)
East Africa	13-16 (1)	09-13 (1) 13-15 (2) 15-17 (1)	05-07 (1) 12-15 (1) 15-16 (2) 16-18 (3) 18-20 (2) 20-22 (1)	20-23 (1)
Central & South Asia	*Nil*	08-10 (1) 18-21 (1)	06-09 (1) 17-19 (1) 19-21 (2) 21-22 (1)	18-20 (1) 04-06 (1)
South-east Asia	*Nil*	18-21 (1)	05-06 (1) 06-08 (2) 08-10 (1) 22-01 (1)	04-07 (1)
Far East	*Nil*	18-21 (1)	22-00 (1) 00-02 (2) 02-04 (1) 06-07 (1) 07-09 (2) 09-11 (1)	03-07 (1)
South Pacific & New Zealand	14-16 (1) 16-18 (2) 18-20 (1)	06-08 (1) 11-13 (1) 13-17 (2) 17-19 (3) 19-20 (2) 20-22 (1)	16-18 (1) 18-20 (2) 20-22 (3) 22-00 (4) 00-02 (3) 02-06 (2) 06-08 (3) 08-09 (2) 09-11 (1)	00-02 (1) 02-05 (2) 05-07 (1) 02-05 (1)*
Austral-asia	17-20 (1)	08-10 (1) 15-18 (1) 18-20 (2) 20-22 (1)	06-07 (2) 07-09 (3) 09-11 (2) 11-14 (1) 14-16 (2) 16-20 (1) 20-22 (2) 22-00 (3) 00-02 (2) 02-06 (1)	01-03 (1) 03-05 (2) 05-07 (1) 04-06 (1)*
Northern & Central South America	11-14 (1) 14-16 (2) 16-18 (1)	06-08 (1) 08-10 (2) 10-14 (3) 14-16 (4) 16-18 (3) 18-19 (2) 19-21 (1)	03-05 (1) 05-07 (2) 07-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-21 (4) 21-00 (3) 00-03 (2)	18-20 (1) 20-03 (3) 03-04 (2) 04-06 (1) 20-22 (1)* 22-01 (2)* 01-05 (1)*

[*continued on page 86*]

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Apr.	1	WAB LF Phone Contest
Apr.	7-8	SP DX C.W. Contest
Apr.	7-8	Florida QSO Party
Apr.	8	WAB LF C.W. Contest
Apr.	13-16	County Hunters SSB Contest
Apr.	14-15	Space Net VHF Contest
Apr.	21-22	Bermuda Phone Contest
Apr.	22-24	QRP ARC Spring Party
Apr.	28-29	PACC DX Contest
Apr.	28-29	WAEDC RTTY Contest
May	5-6	Bermuda C.W. Contest
May	5-6	Helvetia 22 Contest
May	12-13	U.S.S.R. C.W. DX Contest
May	13	YL ISSBers C.W. Party
May	19-20	YL ISSBers Phone Party
May	19-20	Five Flags VHF Contest
May	19-20	Tennessee QSO Party
June	1-4	CHC/FHC/HTH QSO Party
June	17	WAB VHF Phone Contest
June 25-July 15		NRL 50th Anniversary
Aug.	18-19	New Jersey QSO Party
Sept.	29-30	Delta QSO Party

SP DX C.W. Contest

Starts: 1500 GMT Saturday, April 7
Ends: 2400 GMT Sunday, April 8

It's the world working the SP's in as many Polish powiats as possible, on all bands 3.5 thru 28 mHz. There are three categories; single operator, single and all band; multi-operator, all band only; and s.w.l.

Exchange: RST plus a 3 figure QSO number starting with 001 for foreign stations. Polish stations send RST plus their powiat letters (ie: 579 WA and etc.).

Scoring: Each QSO with a Polish station counts 3 points. Score a multiplier for each different powiat worked.

Final Score: Multiply the total QSO points by the number of different powiats worked. The same station may be worked on each band for QSO points, but a powiat may be counted only *once* as a multiplier.

Awards: Certificates to the top scorer in each category, in each country, with 2nd and 3rd place awards where returns justify.

Contest contacts may be credited for the PZK 100 Powiat award in lieu of QSL cards, provided they are verified in the logs of the SP stations. Make your application with your contest log, include a fee of 7 IRCs.

Use a separate sheet for each band and include a summary sheet with all the scoring information and a signed declaration. The usual disqualification rules will be observed, including excessive duplicate contacts.

Mialing deadline is May 1st to: PZK Contest Committee, P.O. Box 320, Warszawa 1, Poland.

County Hunters SSB Contest

Starts: 2200 GMT Friday, April 13
Ends: 0500 GMT Monday, April 16

The Mobile Amateur Radio Awards Club is sponsoring this contest to activate U.S. counties for the County Awards Program.

A fixed station may be worked only once regardless of the band. Portable stations that change counties may be worked again for QSO points and multiplier credit. Mobiles may also be worked once from each new county or county line. Stations worked on a county line count for one contact but two or more multipliers.

D Xto DX contacts do not count. Mixed mode permitted providing one station is on s.s.b.

Exchange: QSO no., RS, county and state, country for DX stations.

Points: Contacts with a fixed US station, 1 point. With fixed No./So. Amer. DX (Zone 1-13) 3 points. All other DX, 5 points. Contacts with mobiles 14 mHz and up, 5 points; 10 points if on 7 mHz or lower.

Multiplier: For fixed stations: US counties plus DX countries worked. For mobile stations: US counties worked, plus US counties given out, plux DX countries worked.

Final Score: Total QSO points from all bands times the county/country multiplier.

Frequencies: Low end of General phone section of each band. (Avoid 14336 & 3943 net freq.)

Awards: Plaques to the highest scoring fixed, mobile and DX station. Certificates to the top ten mobile and fixed stations, and highest scorer in each DX country. Only single operator stations eligible. Multi-operator awards may be made if merited. A station may enter as both fixed and mobile, but submit separate logs.

Log Data: Time in GMT, QSO no., call, RS, county, state, band and points. Indicate each new multiplier as worked. It is recommended you use MARAC log sheets or duplicate of the same. These are available free by sending a large

* 14 Sherwood Road, Stamford, Conn. 06905.

So you think a DX-pedition is a fun jaunt to some exotic spot? Well consider this. The ZD3X expedition to Gambia in the CQ WW Phone Contest was manned by a crew of four operators from Finland. OH2BC, ON2BH, OH2MM and OH2BCP. The 450 lbs. of equipment was transported as hand luggage the whole 5000 mile trip, which included 11 landings and several plane changes. And a change of climate from 30°F. to 105°F. Ville, OH2MM stayed over for the C.W. Contest and put ZD3Z on the air. After it was all over it was his job to disassemble everything, pack it in this huge box and ship it back to Finland. (Martey, OH2BH will then change the label and ship it to the next exotic spot, we hope.)

s.a.s.e. or IRC's) to WAØZCQ.

All entries must be received by June 1st and go to: Olin Munger, WAØZCQ, 6004 N.W. 68th Terr., Kansas City, Mo. 64151.

Florida QSO Party

Three Periods: (GMT)
1500 to 2000 Saturday, April 7
0000 to 0500 Sunday, April 8
1400 to 2359 Sunday, April 8

This is the 9th annual QSO Party for the amateur radio publication *Florida Skip*.

Phone and c.w. are separate contests. The same station may be worked on each band for QSO points. Floridians may work in-state stations but for QSO points only.

Exchange: RS(T) and QTH. County for Florida; state, province or country for others.

Scoring: 1 point per QSO. Fla. stations use states (49), provinces (12) and DX countries (12) for their multiplier. (Max. mult. of 73. No more than 12 DX countries may be used.) Out-of-state stations use Fla. counties. (Max. of 67)

Frequencies: C.W.—1807, 3573, 7073, 14073, 21073, 28073. Phone—1817, 3973, 7273, 14317, 21373, 28573.

Awards: Certificates, phone and c.w., to the top single operator scorer in each state, province and DX country, and in each Florida county. There are also 5 Trophies as follows: High single operator station, c.w. and phone, in Florida and out-of-state. And to the Club having the highest aggregate score in the contest.

A summary sheet is requested showing the scoring and other pertinent information, name and address in BLOCK LETTERS, and a signed declaration that all rules and regulations have been observed. Include an 8¢ stamp for issue with the results.

Mailing deadline is April 30th to: *Florida Skip* Contest Committee, P.O. Box 501, Miami Springs, Florida 33166.

Space Net VHF Contest

Starts: 6:00 P.M. Saturday, April 14
Ends: 6:00 P.M. Sunday, April 15
(Your local time)

This is another in the series of the popular Space Net VHF activities. This one is in commemoration of Apollo 13, the unsuccessful lunar mission, April 1970 that was aborted because of service module oxygen tank failure. And Apollo 16, the 5th manned exploration of the Moon in April 1972.

Rules same as in the past. Use any v.h.f. band, 50, 144, 220 and 432 mHz, but no repeaters.

Exchange: RS(T) and Zip Code Number. Stations outside US use Post Office Name.

Scoring: Two points per QSO on each band. Multiplier is sum of different Zip Code areas worked. (Counted only once) There is also a bonus of 10 you add to your multiplier.

Final Score: Zip codes + 10 × QSO points. Same station may be worked on each band for QSO points but multiplier is counted only once.

Awards: To 1st and 2nd place winners in three classes based on power used. 1-25, 25-100 and over 100 watts input. There are also awards for multi-operator stations, club participation and Novices. All stations submitting a log will receive an attractive participating certificate. (Its in color and very attractive, take my word for it.)

Logs and requests for additional information go to: Space Net VHF Contest, Att: A.W. Slapkowski, WB2MTU, Box 909, Sicklerville, N.J. 08081. Mailing deadline May 15th.

Bermuda Contest

Phone: April 21-22 C.W.: May 5-6
Starts: 0001 GMT Saturday
Ends: 0200 GMT Sunday

The popularity of this contest has increased considerably now that the United Kingdom has been included, and permanent dates have been established. And of course the presentation arrangements for the Trophy winners is no small factor in making this a popular event.

Stations in the U.S. and Canada may work the U.K. and VP9s only. While U.K. stations work W/K, VE and VP9s. Phone and c.w. are separate contests with separate awards, and participation is for single operator only.

Exchange: RS/RST report and QTH. State for W/Ks, province for VEs, county for the U.K. and Parish for the VP9s.

Scoring: Each completed QSO counts 3 points. The multiplier is determined by the number of Bermuda Parishes worked on each band. (A

max. of 9 per band, 3.5 thru 28 mHz.)

Parish abbreviations: Dev, Ham, Pag, Pem, San, Smi, Sou, Stg, War.

Awards: Certificates signed by His Excellency, The Governor of Bermuda, will be awarded to the highest scoring station in each call area of the U.S. and Canada, and each U.K. country.

A Trophy will be presented to the overall winner in each section of the contest, for North America and the United Kingdom. Presentation of the Trophies will be made at the Radio Society of Bermuda's Annual Banquet to be held on October 18th. Transportation and accommodations for a week's stay at one of Bermuda's leading hotels will be provided by the Society.

Trophy winners are ineligible for a period of two years, regardless of the section won.

Winners in the 1972 contest were W1DO with 11,088 and G3KTJ with 51,243 points on phone, and W1BPW with 12,948 and G3KMO with 23,208 points on c.w.

Contestants are expected to compute their own score, check logs for duplicates and sign a declaration that all rules and regulations have been observed.

Logs go to: The Radio Society of Bermuda, P.O. Box 275, Hamilton, Bermuda. And must be received no later than June 30th, 1973.

PACC DX Contest

Starts: 1200 GMT Saturday, April 28
Ends: 1800 GMT Sunday, April 29

Here is your chance to add to your total of PA/PI/PE contacts for the PACC Award in which 100 confirmations are needed. Use all bands, 1.8 thru 28 mHz both c.w. and phone. The same station may be worked only once per band, either c.w. or phone, for QSO and multiplier credit. (c.w. only on 160)

Exchange: RS(T) plus a QSO number starting with 001. PA/PI/PE stations will include their province. (579001/GR)

Multiplier: Is determined by the provinces worked on each band. There are 12 provinces, DR, FR, GD, GR, LB, NB, NH, OV, UT, YP, ZH, ZL.

Final Score: Total QSO points × sum of provinces from all bands. (max. of 72)

Awards: Certificates to top scorers in each country and call areas in W/K, VE/VO, CE, JA, PY, VK, ZL, ZS. (also s.w.l. awards)

Logs: Date/time in GMT, station worked, serial number sent/received, multiplier column for each band and QSO points. (Indicate multiplier only first time worked.)

Include a summary sheet showing the scoring and other pertinent information, and your name and address in BLOCK LETTERS. Include a signed declaration that all rules and regulations have been observed.

Contest contacts may be credited for the PACC 100 Award in lieu of QSL cards, provided the log of the station claimed is also received. Send application with 5 IRC's to VERON Traffic Bureau, P.O. Box 1166, Arnhem, Netherlands.

Mailing deadline for logs June 30 to: Mr. L.v.d. Nadort, PAØLOU, Contest Mgr., Bospolderstraat 15, Nieuwerkerk a/d IJssel, The Netherlands.

1972 SP DX Contest Results

Canada

VE1AE	14	2,100	VE3DEB	14	147
VE3SLC	"	1,140	VE3LUE	"	300

U.S.A.

W1PL	A	27,010	WA1POD	14	2,025
WA3ENM	"	2,929	W9LKI	"	1,875
W3ARK	"	1,140	W4KMS	"	1,428
WØBMM	"	704	W9OHH	"	1,024
WB2JYM	7	960	WA1PID	"	676
WA1NRV	14	2,916	WØBK	"	444
W8VSK	"	2,871	W6ISQ	21	48
K4IEX	"	2,835			

QRP ARC Spring QSO Party

Starts: 2000 GMT Sunday, April 22
Ends: 0200 GMT Tuesday, April 24

Power limitations are higher than those allowed in the QRP party last winter, and both modes can be used in this one.

Exchange: RS(T) and state, province or country. Members give their QRP number, non-members their power.

Scoring: For members, 3 points per QSO, 4 points if non-W/VE. Non-members 2 points per QSO, 3 points if non-W/VE.

Multiplier: Total of states, provinces and countries worked on each band. A station may be worked once per band.

There is also a power multiplier: 1.5 for 25-100 watts, 2 for 5-25 watts, 3 for 1-5 watts and 4 if under 1 watt.

Final Score: QSO points × Area multiplier × Power multiplier.

Frequencies: C.W.—3540, 7040, 14065, 21040, 28040. SSB—3980, 7280, 14330, 21430, 28600. Novice—3720, 7160, 21120.

Awards: Certificates to all reporting participants in each state, province and country. Also to the highest over-all scores and the lowest power station showing at least three genuine skip contacts.

Report the equipment used and a declaration that all rules have been observed.

Logs go to: Jim Hadlock, K7JRE, 210 Herrick Road, Newton Center, Mass. Deadline May 13th.

WAEDC RTTY Contest

Starts: 0000 GMT Saturday, April 28
Ends: 2400 GMT Sunday, April 29

This year's contest, the 5th annual, is sponsored by the DARC and DAFG. Only 36 hours out of the 48 hour contest period are permitted for single operator stations. The 12 hour rest

[*Continued on page 84*]

the proven 'ONE'

a transceiver by Tempo

MORE THAN A YEAR AGO THE TEMPO 'ONE' WAS INTRODUCED TO THE AMATEUR WORLD AS THE NEW 'ONE'. NOW WITH THOUSANDS IN USE IT'S THE PROVEN 'ONE'. LOOK AT ITS PRICE AND THEN LOOK AT ITS SPECIFICATIONS. ADD TO THIS ITS RECORD OF RELIABILITY AND THE RESULT CAN BE SUMMED UP IN ONE WORD . . . VALUE.

SPECIFICATIONS

FREQUENCY RANGE: All amateur bands 80 through 10 meters, in five 500 khz. ranges: 3.5-4 mhz., 7-7.5 mhz., 14-14.5 mhz., 21-21.5 mhz., 28.5-29 mhz. (Crystals optionally available for ranges 28-28.5, 29-29.5, 29.5-30 mhz.)

SOLID STATE VFO: Very stable Colpitts circuit with transistor buffer provides linear tuning over the range 5-5.5 mhz. A passband filter at output is tuned to pass the 5-5.5 mhz. range.

RECEIVER OFFSET TUNING (CLARIFIER): Provides ±5 khz. variation of receiver tuning when switched ON.

DIAL CALIBRATION: Vernier scale marked with one kilohertz divisions. Main tuning dial calibrated 0-500 with 50 khz. points.

FREQUENCY STABILITY: Less than 100 cycles after warm-up, and less than 100 cycles for plus or minus 10% line voltage change.

MODES OF OPERATION: SSB upper and lower sideband, CW and AM.

INPUT POWER: 300 watts PEP, 240 watts CW

ANTENNA IMPEDANCE: 50-75 ohms

CARRIER SUPPRESSION: -40 dB or better

SIDEBAND SUPPRESSION: -50 dB at 1000 CPS

THIRD ORDER INTERMODULATION PRODUCTS: -30 dB (PEP)

AF BANDWIDTH: 300-2700 cps

RECEIVER SENSITIVITY: 1/2 μv input S/N 10 dB

AGC: Fast attack slow decay for SSB and CW.

SELECTIVITY: 2.3 khz. (-6 dB), 4 khz. (-60 dB)

IMAGE REJECTION: More than 50 dB.

AUDIO OUTPUT: 1 watt at 10% distortion.

AUDIO OUTPUT IMPEDANCE: 8 ohms and 600 ohms

POWER SUPPLY: Separate AC or DC required. See AC "ONE" and DC "ONE" below.

TUBES AND SEMICONDUCTORS: 16 tubes, 15 diodes, 7 transistors

TEMPO "ONE" TRANSCEIVER	$319.00
AC/ONE POWER SUPPLY	
117/230 volt 50/60 cycle . . .	$ 99.00
DC/1-A POWER SUPPLY 12 volts DC	$110.00

Prices subject to change without notice

THE awards PROGRAM

BY ED HOPPER,* W2GT

Special Honor Roll
All Counties

#90—James M. Farris, Jr., WA4MGC, 12-22-72.
#91—George Allison, WB6EXT, 12-30-72.
#92—Lester A. Jeffery, W8WT, 1-3-73.

THE "Story of The Month" for April is:

Cecil R. Pryor, WA4YQC
(All Counties #41, 10-6-70)

Cecil is 57 years young and has his own T.V. Sales & Service. But his *big* job is his Church work, being a Church of Christ Minister—which in itself is a full time job!

He is married to a wonderful young lady and they have one daughter and 3 grandchildren who live in Anchorage, Alaska.

Cecil got interested in amateur radio about 12 years ago and has used a variety of equipment. At present the equipment is Heath, a 3 element Mosley beam, and diploes for 40/75. A home built linear using 3-813s is part of the fixed station equipment.

It was on December 17, 1968 that he first checked into the Independent County Hunters Net with K3AER acting as Net Control. His last county came in September 1970 from Skip, WAØWOB who was mobile in Santa Cruz, Arizona.

Cecil insists he never enjoyed amateur radio so much as when he became a County Hunter and has many such hunters visit with him as they passed through Gallatin, Tennessee.

He is unable to check into the Net as often as he would like *(this applies to many of us)* but he still manages to go mobile frequently, and greatly enjoys passing out counties. He is most grateful to *all* who helped him make All Counties and will be happy to help out any who need counties in middle Tennessee.

Our records show that he waited until he had them *all* and then applied for them *all* on October 6, 1970. We all wish him good success with both of his jobs!

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

USA-CA HONOR ROLL

3000		2000		1000	
WA4MGC	110	WB6EXT	167		
WA6OTV	111	W8WT	168	WB6EXT	284
WB6EXT	112	W1DIT	169	W1DIT	285
W8WT	113	KØARS	170	KØARS	286
2500		**1500**			
W6CLM	142	K2VGR	205		
WB6EXT	143	WB6EXT	206	**500**	
W8WT	144	W8WT	207		
W1DIT	145	W1DIT	208	WB6EXT	933
KØARS	146	KØARS	209	W1DIT	934

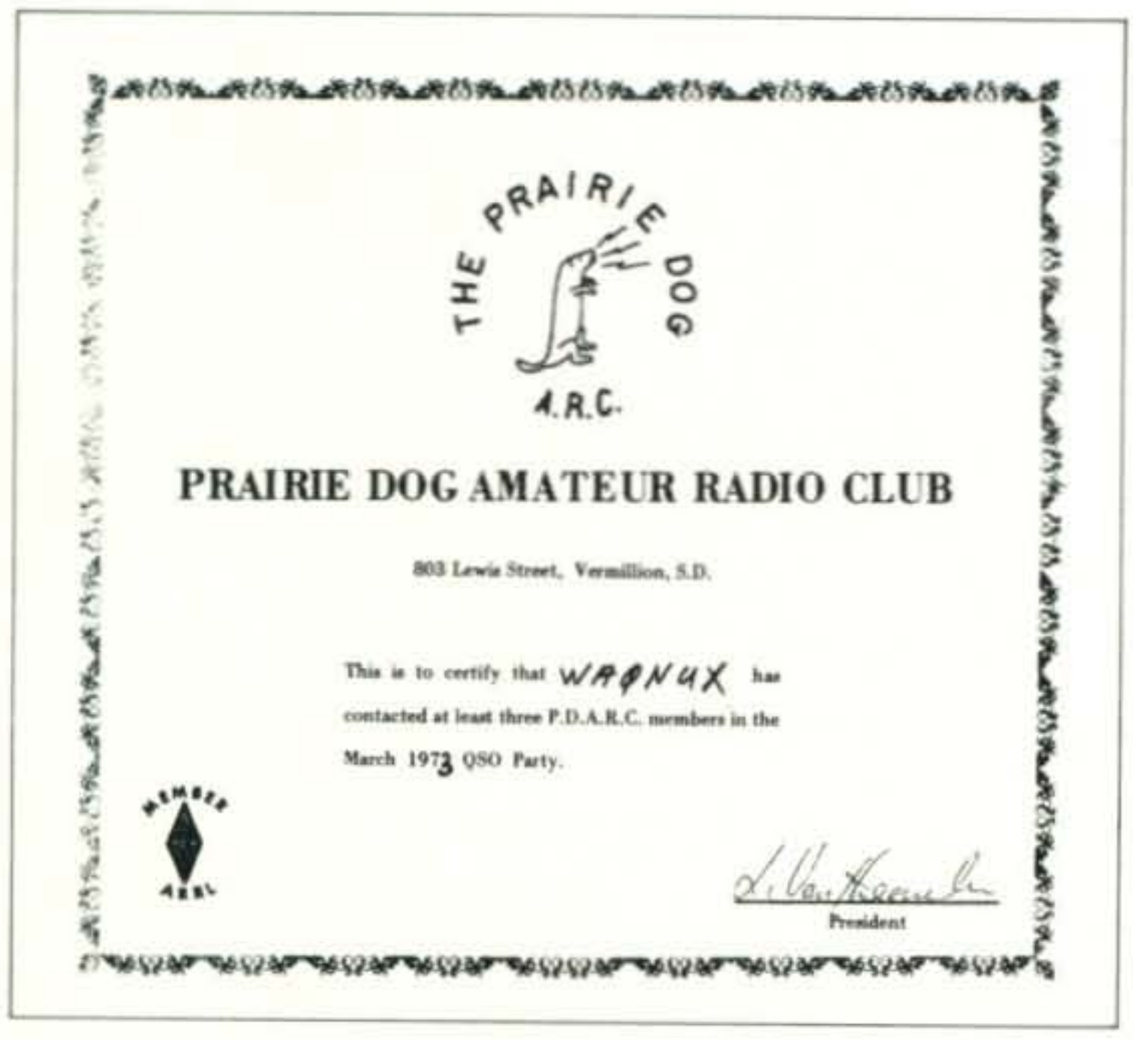
Awards Issued

The Special Honor Roll for *All Counties* again lists 3 new members.

Jim Farris, WA4MGC made All Counties endorsed All S.S.B. and USA-CA-3000 also endorsed All S.S.B.

George Allison, WB6EXT waited until he had them *all* before applying and got endorse- of All 14, All S.S.B., All Mobiles for 500, through 2500 and All S.S.B. for USA-CA-3000 and All Counties.

Cecil Pryor, WA4YQC, Minister & T.V. Sales & Service.



The Prairie Dog ARC Award.

Les Jeffery, W8WT, who received USA-CA-500-#1-Q, September 24, 1961 and USA-CA-1000-#50, July 22, 1964, got busy and received USA-CA-1500, 2000, 2500 and 3000 endorsed All S.S.B., and All Counties endorsed Mixed.

Wilbur Wilhelm, WA6OTV acquired USA-CA-3000.

Bill Winnegar, W6CLM keeps chipping away and qualified for USA-CA-2500.

Clet Dunn, W1DIT took time out from mobiling and applied for USA-CA-500, 1000, 1500 and 3000 endorsed All 14, All S.S.B., All Mobiles; and USA-CA-2500-Mixed.

Jim Willingham, KØARS won USA-CA-2500, 2000, 1500 and 1000.

Rick Lobdell, K2VGR, who used to edit the *CW County Hunter Bulletin* (with the help of Dick, K2UFT) has moved, married and is now a papa, found time to make USA-CA-1500 endorsed All A-1. (Oh yes, the *CW County Hunter Bulletin* is now published by Jim Hoffman, K1ZFQ.)

Awards

VK7 Golden Jubilee Award: Radio amateurs outside Australia and New Zealand need to contact five (5) Tasmanian stations (VK7) during the period 1 January to 31 December 1973. Any amateur band, any amateur mode, even cross mode, is ok. Send copy of all log data signed by the operator and two other licensed amateurs or signed by the operator and the Secretary of his Radio Club. Isolated operators who are unable to so comply, may request that their logs be subject to check by the organizers of the award. A suitable certificate will be issued. Apply to: VK7 Golden Jubilee Award, Box 851J, G.P.O., Hobart, Tasmania 7001, Australia. Send 3-IRCs for the award via sea mail or 6-IRCs for the award via air mail.

Saltminer's Net Award: Issued for having reported into the Net five consecutive working days at home, enroute to the salt mine, or being retired from same. The Net meets everyday around 7.285 mHz beginning around 1100Z until around 1400Z with Mel, WA4FAG as M/C. Checkins sometimes include KH6, KL7, HR2 and maritime mobiles. Send data and $1.00 to: Robert Bell, WA3HOS, 505 Southern Drive, West Chester, Pa. 19380.

The 73 Trophy: Sponsored by the Freebooters Radio Club of Sweden. To celebrate the year 1973 with hope to make it the year of really good wishes, and at the same time commemorate the 30th anniversary of the Freebooters Radio Club's foundation, the club has decided to create the 73 Trophy. The Trophy, a sculpture, is in the form of a young childs head, made in stone by the famous Swedish artist Stan Fasthe and is only given out once this century. That licensed shortwave amateur in the world who during 1973 reaches the highest score counting points, as follows, will get the Trophy free of charge.

Amateurs in	Contact SM7, SM3	Contact Members Freebooters R.C.
Sweden	1 point	5 points
Europe	3 points	15 points
DX	5 points	25 points

Each station may be contacted only once on each amateur band. Send confirmed log extracts to: Freebooters Radio Club, Awards Manager, P.O. Box 150, Hassleholm, S-28101 Sweden. Applications will close on June 30, 1974.

Members of Freebooters Radio Club as of October 1972: SK7BK; SK7FT; SL7CA; SM5WI; and SM7s-ER, TE, VO, ABO, ALI, ANL, ASN, BAH, BBV, BDU, BJB, CRW, DGC, DHK, DJG, DMN, DMT, DRQ, DUH, EBN, ECI, EEB, EHI, EHO, EMI, EUG and SM7FPI.

Awards Issued By The Central Radio Club Of Czechoslovakia:

100 OK award: For working 100 different OK (OL or OM) stations since 1 January 1954 on any band, c.w., phone or mixed. Endorsement stickers for 200, 300, 400, and 500 contacts with different OK (OL or OM) stations.

P-100 OK Award. For s.w.l., for hearing 100 different OK (OL or OM) stations since

January 1, 1954 on any band, c.w., phone or mixed. Endorsement stickers for 200, 300, 400 and 500 reports.

S 6 S Award: For working six continents—Europe, Asia, Africa, North America, South America and Oceania—on any band, c.w., (all), or phone (all). Endorsement sticker for working all continents on 3.5, 7, 14, 21 or 28 mHz.

P 75 Award: For working 75 Zones (ITU geographical broadcasting zones) since January 1, 1960. Class 3: 50 different zones. Class 2: 60 different zones. Class 1: 70 different zones.

OK-SSB Award: For working different OK stations on any band 2 × SSB. Each OK station counts one point on 28, 21, 14 mHz, and two points on 7 and 3.5 mHz. Required: 25 points and endorsement stamps for additional 25 points.

VKV 100 OK Awards: For working 100 different stations, all on 145 mHz or all on 433 mHz. Endorsement stickers for 200, 300, 400, and 500 different stations on 145 or 433 mHz.

Note: All applications must contain a list of contacts and reports, QSLs and a fee of 5 IRCs. P75 P AWARD requires 10 IRCs.

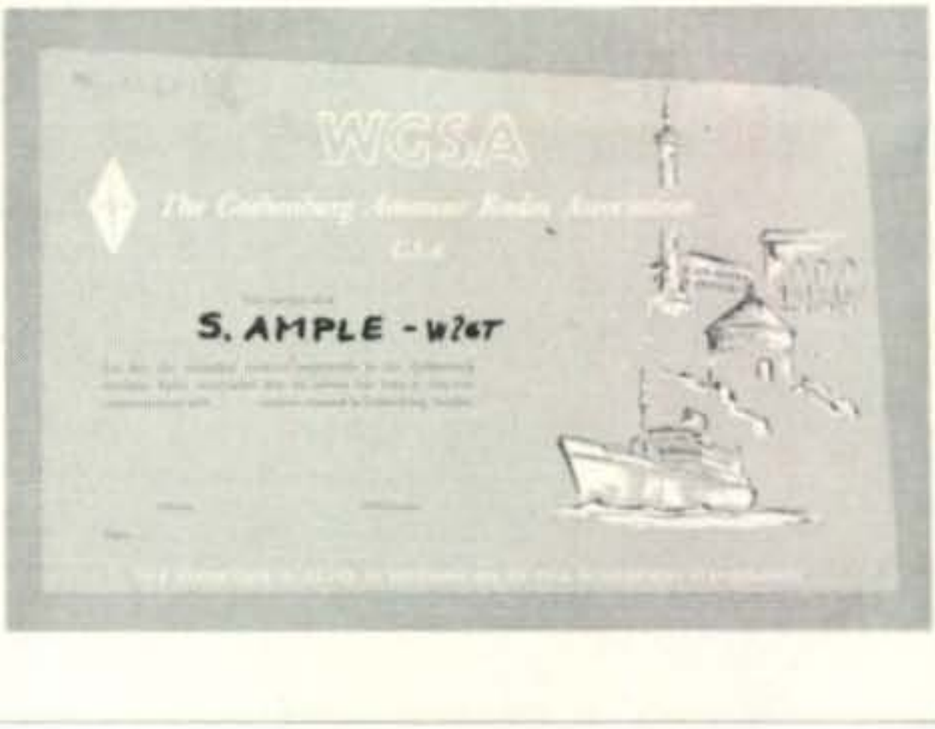
QSLs need not be sent: If the National Radio Society confirms the possession of listed QSLs (for P 75 P all QTHs must be listed too). *or* when all contacts were made during OK-DX Contest and the log was sent to CRC (for 100-OK and S 6 S only).

When applying for additional endorsements, be sure to list the number of the fundamental (main) award also.

All applications should be sent to: Central Radio Club, Box 69, Praha 1, Czechoslovakia. (Thanks for data to Karel, OK1-15835).

WGSA Award: Sponsored by the Gothenburg Radio Amateur Society, "GSA", based on contacts with amateurs in Gothenburg after December 31, 1952. Contacts on 3.5, 7, 14, 21 and 28 mHz count *one* point. Contacts on frequencies above 30 mHz count *two* points. Applicants outside Europe (DX) require *two* points. Applicants in Europe require *ten* points. Applicants in SM, OZ and LA require *twenty* points.

Applications must include QSLs or written confirmations for the claimed contacts and a list of them showing calls, frequency, date and mode. Send with 5-IRCs to: WGSA Manager, Goteborge Sandare Amatorer, Box



WGSA Award.

6009, 400 60 Gothenburg 6, Sweden. (Remember that Gothenburg calls include SM6, SK6 and SL6, but all SM6, SK6 and SL6 stations are not in Gothenburg.)

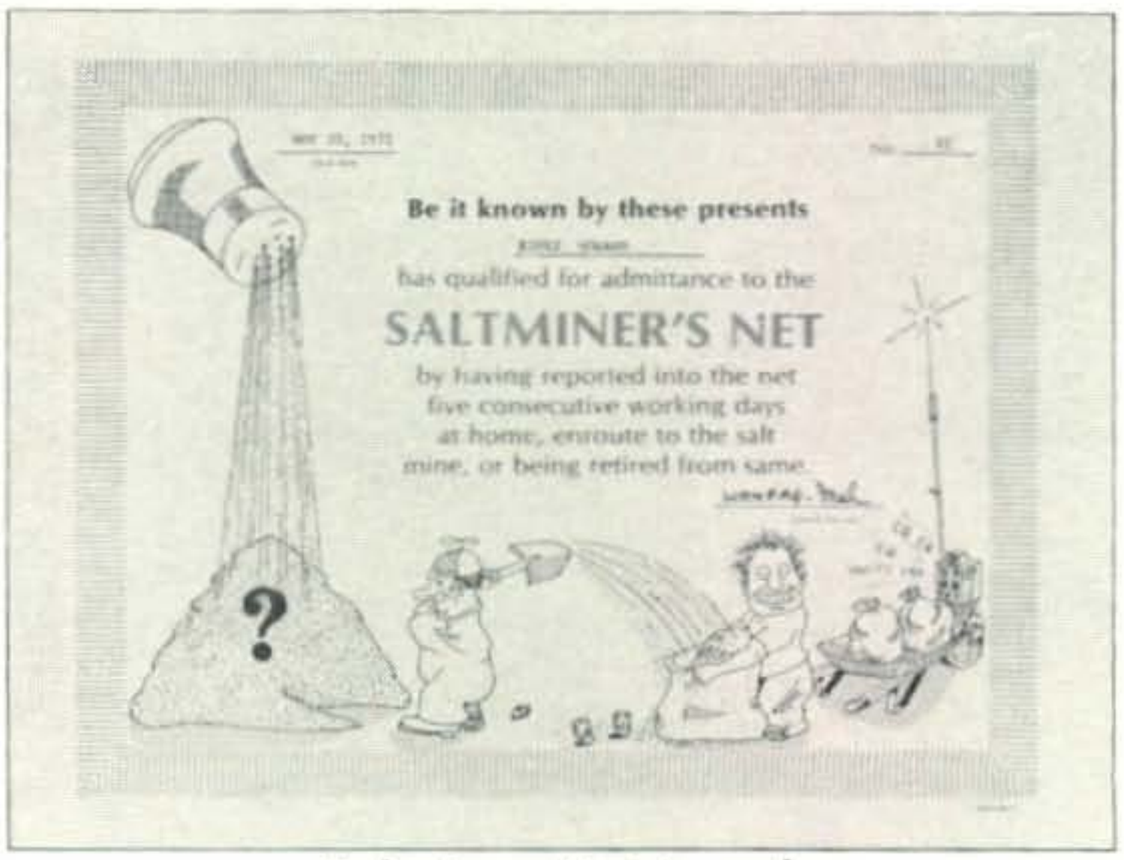
The Prairie Dog ARC Award: Sponsored by The Prairie Dog Amateur Radio Club of Vermillion, S. Dakota. Issued for contacting any three (3) of the 17 members of the club during the month of March, 1973. The frequencies to check are: 3950, 7275, 14275, 21360 and 28666, especially on weekends. Apply with log data of contacts with 3 or more members worked and include 25¢ in stamps or 2 IRCs to WBØEVQ, Box 493, Springfield, South Dakota 57062.

Notes

Again many thanks for all the help from Bertha, WA4BMC, including getting material for my monthly "Stories."

Rick Lobdell, K2VGR has moved to Putnam County, N.Y. and would be very happy to schedule anyone needing Putnam on any

[*Continued on page 84*]



Saltminers Net Award.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

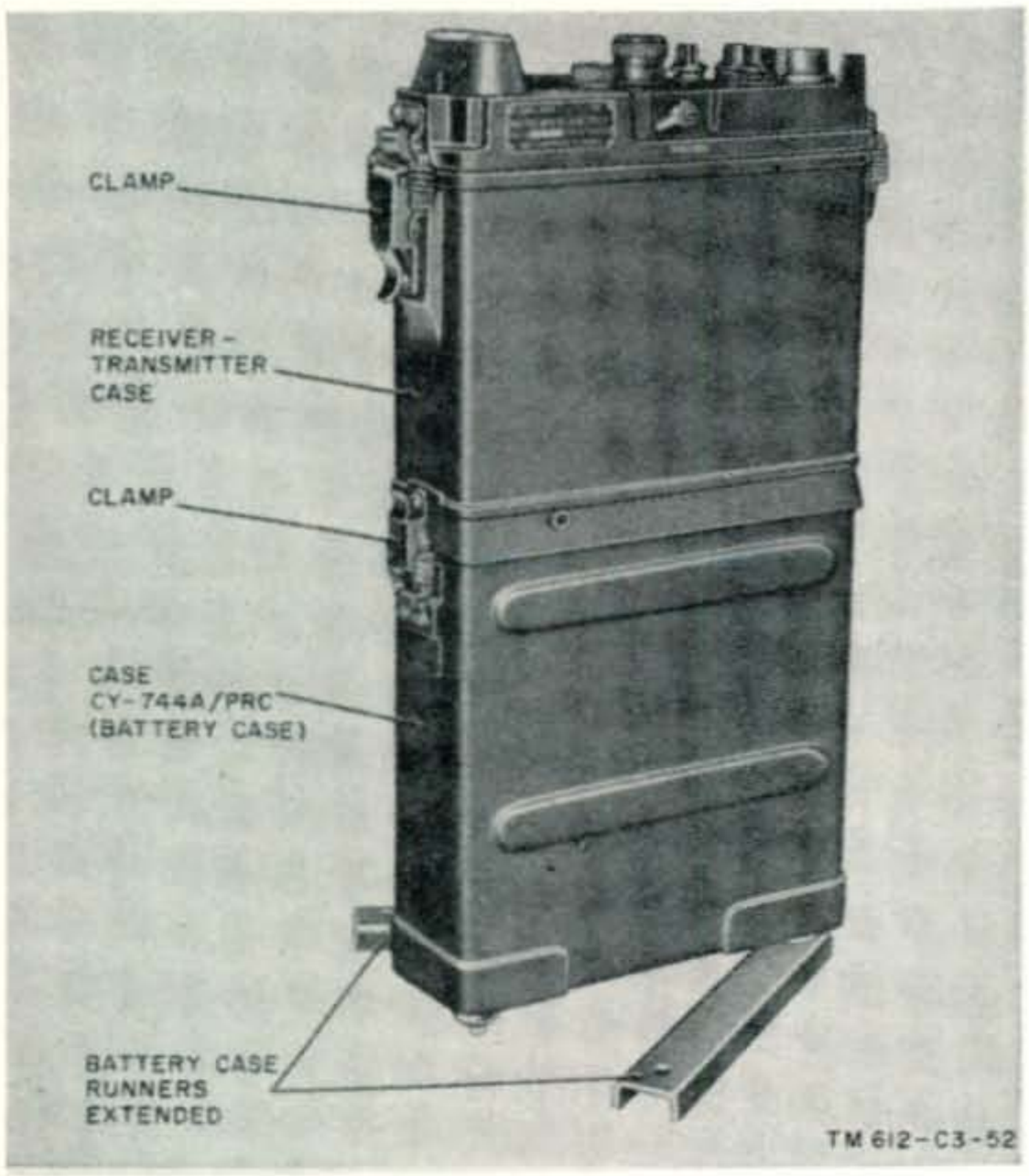
THE early Army PRC-series f.m. transceivers have been around a long time now, almost 20 years, and are finally getting out into surplus markets. They have given long military service, and have not been much seen outside the Army. To judge from my mail however, a good number have been sold in recent months.

I am seeing the AN/PRC-8, -9 and -10 sets, which were produced in Chicago by the Admiral Corporation, in 1951-54. Subsequent PRC- sets now run into much higher numbers. A popular air-sea rescue set for example, is the AN/PRC-90, and there are several other solid-state, pack-of-cigarettes sized sets in the military such as the PRC-100, etc.

In this column I will cover the PRC-8, -9 and -10's, and I will mention the later units as they become available.

These sets are described by Army manual *TM 11-612* and Air Force tech order *TO 31R2-2PRC-101*.

* 1502 Stonewall Rd., Alexandria, Va. 22302



The PRC-8, -9 or -10 set, arranged with battery pack for back pack operation.

First, the basics: the PRC-8, 9, 10 sets measure 9½ × 3 × 10½ inches and weigh nine pounds. The units are designed for back pack operation, and cover the frequency ranges 20-27.9, 27-38.9 and 38-54.9 mHz respectively. Aside from frequency, they are identical.

When used as a back pack, the transceivers operate from battery power supplied by BA-279/U. When operated from a vehicle, they used amplifier-Power supply AM-598/U, which was powered by the 24 volt system in the jeep or truck.

I don't have power and sensitivity specs, but the range under combat conditions was rated as three miles.

When man-carried the sets used a short 36.5" whip, AT-272A/PRC. The longer 115" vehicle whip is AT-271A/PRC.

These are tube-type sets, using 14 or 16 tubes, depending whether the set is a -A model or not.

Each transceiver is normally coupled to a battery case which roughly doubles the length and weight, and is the CY-744A/PRC. Voltages required are 135 volts, d.c., 67.5 d.c., 1.5 volts, and 6 volts.

Differences between the -A and the -() models are, first, that the later versions have only 14 tubes, and are provided calibration points at 2.15 mHz points rather than at 1.0 mHz divisions.

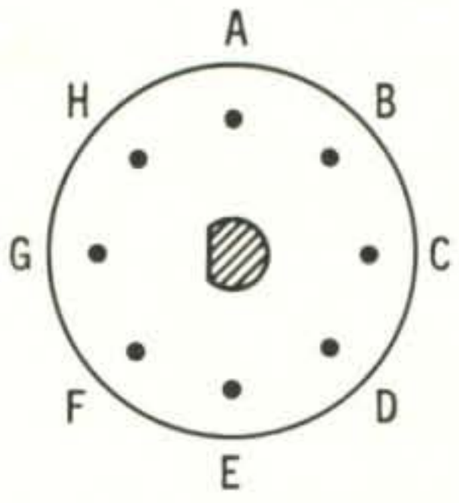
The later sets characteristically "motorboated" for a fraction of a second on transmit after the mike button was pushed. Sidetone, i.e. the transmitting signal, was heard in the headsets in the late models, but not in the earlier ones.

The -A sets have four i.f. amplifying sections, though the cans are interchangeable with those in the five-stage early units.

The discriminator plug-in is not interchangeable between models. Later model modulators are 6286, and the earlier sets used 5676 tubes.

Fig. 1 shows the power connections. There are also accessories such as the AT-339/PRC and AT-340/PRC homing "loop" antennas, the C-433/GRC remote control, and various straps, brackets, and so forth.

The receiver section has two r.f. amplifier sections with 5678 subminiature tubes, followed by another 5678 mixer and five more in i.f. stages, with a 5672 audio amplifier. The local oscillator is tuneable, but a crystal-controlled calibrator is provided at 1 mHz and 4.3 mHz points.



A-1.5v.
B-n/c
C-B+135v.
D-67.5v.
E-B—
F-6v.neg
G-6v.pos
H-1.5v.

Fig. 1—Power connections to the PRC series transceivers.

The transmitter uses a 5676 as an f.m. modulator, with automatic frequency control circuits using another 5672. The transmitter oscillator is a 5A6 tube, and it is controlled by the ganged tuning capacitor which sets the receiver tuning. There is no power amplifier in the circuit, and the output is taken directly from a modulator tube.

For readers interested in other handie-talkie or walkie-talkie data, see *CQ* for February 1971 and Nov. 1970. ■

Awards [*from page 81*]

band 1.8 through 28 mHz, c.w. only. New QTH is Rte. 1, E. Branch Road, Patterson, N.Y. 12563.

Last month we introduced Rev. Terence Koch, S.J. as K6HZT. His call should have read K6HZI.

Please excuse me for failing to mention the passing, some time ago, of another County Hunter, Jack Abel, VE3DTO, MARAC #17.

Tab Books, Blue Ridge Summit, Pa. 17214, has recently released its new 1972-1973 catalogue. It describes over 235 current and forthcoming books, plus 10 of the firm's unique new Electronic Book/Kits. This catalog is available free upon request to Tab.

Sure plenty of activity on the County Hunter Nets, hope you are catching the ones you need. Write and tell me, How was your month? 73, Ed., W2GT

Contest Calendar [*from page 77*]

period may be taken in one but not more than 3 periods anytime in the contest.

Both single and multi-operator stations permitted, all bands 3.5 thru 28 mHz.

Exchange: QSO no. and RST report.

Points: Contacts within ones' own continent 1 point, with other continents 3 points. Non-Europeans however get 5 points for each EU QSO, but count only 3 points for Europeans.

Like the phone/c.w. contest the QTC feature is also used. Each QTC exchange is worth 1 additional point. (See July 1972 CALENDAR for details and European country list.)

Multiplier: Is determined by number of countries worked on each band. The WAE and ARRL lists are the standards. In addition the call areas in the following countries will also count as a multiplier. JA, PY, VE/VO, VK, W/K, ZL, ZS, UA9, UAØ.

Final Score: Total QSO points, plus QTC points multiplied by the sum total countries from all bands.

Awards: Will be made in 3 classifications: 200 watts input or less, over 200 watts and s.w.l.'s. In each country and each call area shown above. Continental leaders will also be honored and additional certificates where warranted.

Mailing deadline for logs is June 10th to: WAEDC Contest Committee, D-8950 Kaufbeuren, Postbox 262, West Germany.

Helvetia 22 Contest

Starts: 1500 GMT Saturday, May 5
Ends: 1700 GMT Sunday, May 6

Dates of this activity have been fixed at 2 weeks after Easter each year therefore will vary from year to year. Many of the rare Cantons are activated so this offers an excellent opportunity to build up your total for the very attractive H 22 Certificate.

Contacts may be made on all bands, 1.8 thru 28 mHz. The same station may be worked on each band and mode for QSO and multiplier credit.

Exchange: The RS(T) report plus a contact number starting with 001. Swiss stations will also include their Canton. (579001/ZH)

The 22 Cantons are: AG, AR, BE, BS, FR, GE, GL, GR, LU, NE, NW, SG, SH, SO, SZ, TG, TI, UR, VD, VS, ZG, ZH.

Scoring: Each QSO counts 3 points. The multiplier is the sum of Cantons worked on each band, a possible 22 from each band.

Final Score: Total QSO points multiplied by the sum of Cantons from all bands.

Awards: Certificates to the top scorers in each country and VE and W/K call areas.

Logs: Indicate a Canton in a separate column the first time it is worked on each band. Check your log for duplicates and include a summary sheet showing the scoring and other information. Your name and address in BLOCK LETTERS and the usual declaration is also requested.

Mail your log within 30 days to: USKA Traffic Mgr., HB9AHA, im Moos, 5707 Seengen, Switzerland.

Editor's Notes

Anne (Mrs. A) and I spent the Christmas Holidays visiting WB4VQO in Florida, and by a coincident the Sun Coasters Chapter of the QCWA had their monthly meeting during our stay in Sarasota. I don't think my short talk on what contests are all about converted any of the Old Timers, they seemed more amused with the story of the trials and tribulations of the poor

Contest Editor, but it was sure good seeing a lot of the boys again.

Just a reminder for the W/K's who took part in our WPX SSB Contest. Don't forget the two new Trophies that have been added, both in memory of "Joe" Hiller, W4OPM. Joe was king of the WPXers and also founder of the Virginia Century Club, so it is quite fitting that these memorials be donated by those with whom he was so closely associated. Both awards are for high USA scorers in the Contest. The All Band Trophy is donated by Jerry Hagen, WA6GLD curator of the WPX program, and the Single Band Trophy by the Virginia Century Club.

So make sure you send in your log. Mailing deadline is May 1st.

73 for now, Frank, W1WY

Propagation [*from page 74*]

Brazil, Argentina, Chile, Uruguay	11-14 (1) 14-17 (2) 17-18 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-15 (2) 15-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	12-15 (1) 15-17 (2) 17-19 (3) 19-22 (4) 22-00 (3) 00-02 (2) 02-04 (1) 04-06 (2) 06-08 (1)	20-22 (1) 22-00 (2) 00-02 (1) 02-04 (2) 04-06 (1) 00-04 (1)*
McMurdo Sound, Antarctica	*Nil*	12-14 (1) 14-17 (2) 17-18 (1)	10-12 (1) 17-18 (1) 18-19 (2) 19-21 (3) 21-22 (2) 22-00 (1) 04-06 (1)	00-06 (1)

Time Zone: PST (24-Hour Time)

WESTERN USA TO:

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

Math's Notes [*from page 49*]

capacitance only 2 pF. Cost is only 99¢ in small quantities.

Our topic of discussion this month is a very low cost, extremely simple to use, IC voltage regulator that will enable you to regulate almost all voltages in the shack at or below 24 volts. The Fairchild Semiconductor μA 7800 family are three lead devices available in 7 pre-set voltage ranges, and employ internal current limiting thermal shutdown circuitry and safe-area compensation making them virtually blow-out proof. If adequate heat sinking is provided, they can deliver over one ampere of output current alone or almost any

amount with an external pass transistor. The μA7800 series can also be used with external components to obtain variable voltages.

Figure 1 shows the schematic of the basic hookup. Simple isn't it? Also shown are the part numbers for the 7 voltages available. Figure 2 shows several parameters necessary for proper operation as well as regulation details. Figure 3 is the schematic for two variable voltage versions of the regulator. Use whichever circuit is best for your needs.

A high current version of figure 1 is shown in figure 4. Maximum current obtained from this configuration is equal to the h_{fe} of the pass transistor multiplied by the maximum output current of the μA7800 used.

The μA7800 units are available in two package styles. The numbers given in figure 2 are for the TO-220 package. Also available is a more efficient thermal package, the TO-3 which requires half the heat sink area of the TO-220. Both packages and pin designations as well as actual part numbers are shown in figure 5. For TO-3 units, substitute the letter J for the letter H in the part number.

Cost for the μA7800 series is only $2.75 in 1-24 quantities so go to it and regulate everything.

With this column, MATH'S NOTES will be exactly one year old. I would like to thank all of those readers who have written to me on various occasions, commenting on the topics presented both favorable and otherwise It is through your comments that the column has moved in the general direction it is in now, and I sincerely hope to continue making you aware of the techniques and components that are being used in our modern-day electronics industry.

73, Irv, WA2NDM

Fax Conversion [*from page 37*]

was removed as most of its wires were used in the old control circuitry and simply served to confuse the conversion. These removed wires are quite nice to work with and can be used for the new connections if so desired.

Next month we will cover the rewiring of the unit. For that stage the following items will be needed:

One .01 mf 400 v. disk ceramic capacitor.

Four 1N4004 or 1N2070 silicon diodes.

Two 390 ohm ½ watt 10% resistors.

Three feet of small diameter two conductor shielded cable or two three-foot lengths of small diameter single conductor shielded cable.

We will also cover preliminary testing of the work done up to that point. The following month, we will complete the sync circuits and be ready to begin transmitting messages. ■

Gigohmer [*from page 40*]

ing it to be a cement or timber floor without any high-insulation carpeting). Standing with your bare feet over the sheet, touch the terminal A of the unit. The meter will kick to more than 25% f.s.d. and come back to a perfect zero, indicating that you and the polyethylene sheet are acting as a capacitor with respect to ground. You can "discharge" yourself by just touching any of the usual objects in the room, or by placing a foot on the floor! Comparison with a good mica capacitor will indicate a body-to-ground capacitance of more or less 2000 pf, depending on the thickness of the sheet and the size of your feet!

The writer hopes that many among the readers of *CQ* will decide straightaway to construct this useful and interesting gadget! ■

Receiver-Only Tuning [*from page 51*]

500 Hz when either in the transmit position or the receive position with the potentiometer in mid-position. This variation is corrected by a slight movement of the dial corrector knob. Note, this fixed frequency variation occurs only when in the TRANSMIT mode.

Another fallout of this device is that while in the c.w. mode a variable pitch can be obtained on the received signal. Note that the frequency variation is limited by the pass band of the c.w. filter. ■

Hum Reduction [*from page 51*]

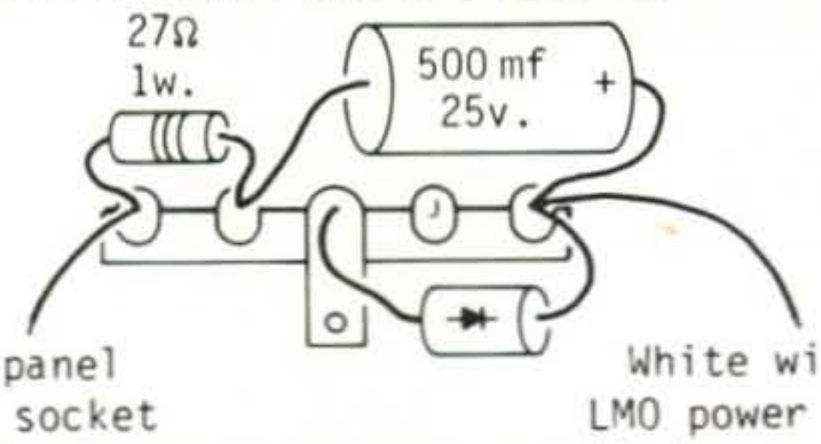


Fig. 2—Components are assembled on a 4-lug-plus-ground terminal strip.

power supply was removed and the terminal strip mounted with the same screw. The 12 volt heater line to the LMO power supply can be disconnected at the right dial pilot lamp socket (white wire). This wire was long enough and was connected to the terminal strip output line. A new wire was added from the pilot lamp socket to the input line of the terminal strip. ■

The most powerful signals under the sun!

hy-gain

550A
The Total Communication System

The Hy-Gain 550A is the complete amateur system. Designed from the ground up to work together for total performance. Each element is matched to the system, for simple, plug-in expansion of your capabilities.

GT-550A Transceiver The matchless heart of the 550A System. No other transceiver can give you this performance for the price. Operating fixed station or mobile, the GT-550A is guaranteed to have top frequency stability after warm-up. A graph showing stability during final check-out is included with each unit. 25 KHz calibrator and VOX, optional.

Frequency Coverage – 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-29.0 MHz crystals supplied. Other 10 meter coverage optional. Power Output – 300 watts PEP (nominal) on SSB, 180 watts on CW and RTTY, into 50 ohm resistive load.

Harmonic and Spurious Radiation – Carrier suppression in excess of 45 db down, unwanted side bands minus 55 db oscillator feed through and mixer spurious products down 50 db. Second harmonic minus 40 db and third order distortion in excess of minus 45 db.

Noise Level – In excess of 40 db below single tone carrier.

Audio Frequency Response – Minus 6 db approximately 300/2400 Hz determined by side band filter.

RF Compression Characteristics – Up to 10 db RF compression without distortion.

Receiver Sensitivity – Better than .5 uv for 10 db S+N/n ratio.

Receiver Selectivity – 2.1 KHz with 1.8 shape factor for SSB or 300 Hz sharp selectivity with optional CW filter.

Receiver Spurious Response – Image rejection better than 40 db down. Internal spurious below 1 uv equivalent input.

Frequency Calibration – Interpolation to 1 KHz in 5 KHz increments.

Frequency Stability – Within 10 Hz during any 30 minute warm-up period, less than 100 Hz in any 15 minute warm-up period, not more than 100 Hz with a plus or minus 10% line voltage variation.

Calibration Accuracy – Interpolation to 1 KHz after calibration.

Back Lash – Not more than 50 Hz.

Output Impedance – Variable 50 ohms nominal capable of matching up to 2-1 SWR (30-100 Ohms).

Automatic Volume Control – Fast attack, slow release on all receiver modes.

Order No. 855 Ham Net $595.00

RF550A contains high accuracy watt meter; calibrated in 400 and 4,000 watt scales; switch for forward or selected power; switch to select 5 antennas or dummy load. Order No. 857 Ham Net $75.00

RV550A is a solid state VFO. Function switch selects the remote unit to control Receive-Transceive-Transmit frequency independently. Order No. 856 Ham Net $95.00

SC550A Speaker Console with headphone jack. AC400 power supply will mount inside. Order No. 858 Ham Net $29.95

AC400 Power Supply is heavy duty solid state to operate GT-550A at full power, on SSB or CW, and with switch selection of 115/230 VAC, 50/60 Hz input voltages. Order No. 801 Ham Net $99.95

G-1000 12V D C Mobile power supply with cables. Order No. 802 Ham Net $129.95

HY-GAIN ELECTRONICS CORPORATION

Box 5407-FD Lincoln, Nebraska 68505

CQ Reviews HW-7 [*from page 63*]

On-The-Air Results

In reviewing a piece of gear it has not been our custom to talk about what can be heard or worked with it, inasmuch as such should be obvious. Nevertheless, due to the simplicity of the HW-7's receiver, we cannot help but comment on the world-wide signals that were copied with it using a dipole antenna. Due to the low power of the transmitter, it also might be mentioned how surprising it can be to work DX with it, especially on 15 meters.

In addition to the fun of low-power operation and the possibility of minimizing QRM with it for local rag chews, the HW-7 makes a fine little job for vacation contacts and for emergency operations, particularly where only battery power is available.

At 13 v.d.c. the receiver draws only 35 ma and on transmit the drain is 450 ma. The size of the unit is 4¼" × 9¼" × 8½" (H.W.D.), including knobs and feet and it weighs 4½ lbs.

The HW-7 QRP C.W. Transceiver is priced at $69.95 (kit). The optional Model HWA-7-1 A.C. Power Supply accessory is $14.95 (kit). These are products of the Heath Company, Benton Harbor, Michigan 49022. —W2AEF

SSTV [*from page 55*]

Kw final also. I built a final using a pair of grounded grid 3-400Z's. Built into it is a 1" scope. The scope tube presents a trapezoidal pattern. (Output r.f. is applied to the vertical plates, and rectified input r.f. is applied to the horizontal plates.) I find it invaluable for adjusting tuning, loading, and drive for maximum output and optimum linearity.

I hope that this "case study" has started you thinking about approaches to i.s.b. that fit in with your particular equipment situation. Let me hear about your successes and problems, and I'll pass the word along.

British SSTV Rule Change

From Richard Thurlow, G3WW, comes some news about the regulatory situation in Britain. SSTV licenses are apparently granted upon individual application and permit operation on 7.0-7.1, 14.0-14.35, 21.0-21.45, 28.0-29.7, and 144-146 mHz. Unlike the U.S. where SSTV standards are not specified by the FCC (except for overall bandwidth), the Ministry of Posts and Telecommunications in Britain does specify the standards. Originally tied strictly to the traditional 50 Hz SSTV standards (7.2 sec, 120 lines, etc.) the rules have now been relaxed to permit the slight departures designed into the Robot equipment. Present British standards are:

Lines per picture:	128 ± 8
Aspect Ratio:	1 : 1
Horizontal Frequency:	16⅔ ± 1 Hz
Vertical Time:	6.79 to 8.68 Sec.
Horiz Sync Pulse:	5 Millisec. (Nominally)
Vertical Sync Pulse:	30 Millisec. (Nominally)
FM Subcarrier	
Sync:	1200Hz
Black:	1500Hz
White:	2300Hz

Vy 73, Cop, WØORX

Announcements [*from page 9*]

Westminster, Maryland

The Potomac area Hamfest will be held at Westminster, Sunday, April 29th, 9 to 5. Registration of $2 also includes flea market or tail-gate sales. Professional food and beverage catering. Parking for 400 cars. Information from K3DUA or K4LHB per callbook.

Sharon, Massachusetts

The Sharon Amateur Radio Association will hold an auction on April 29 at 1 p.m. at the home of David Fisher, WA1LXE, 30 Ames Ct., Sharon, MA. Free coffee and donuts will be served. For info contact Robert Linsky, WN1OWI, 21 Harold St., Sharon, MA 02067.

Sullivan, Illinois

The Moultrie Amateur Radio Klub announces its 12th Annual Hamfest at the American Legion Pavilion in Wyman Park, Sullivan, IL on April 29. Ample space for indoor and outdoor markets. For info contact: Robert Boyer, WB9AAV, Moultrie Amateur Radio Klub, P.O. Box 327, Mattoon, IL

THIS MONTH'S BEST BUY FROM ARROW

BIG PUSH!

HUSTLER

GET SUPER GAIN PERFORMANCE!

Two Meter—5.2 db Power Gain Colinear Mobile Antenna

- ! 5.2 db gain over 1/4 wave ground plane
- ! SWR at resonance . . . typically 1.1:1
- ! Bandwidth . . . 7 MHz for 1.5:1 or better SWR
- ! Power Rating . . . 200 watts FM
- ! Height, including mount . . . 78"
- ! Radiator . . . 17-7 PH stainless steel
- ! Field adjustable for lowest SWR

CHOOSE FROM TWO VERSIONS

MODEL CGT-144 (illustrated) antenna complete with trunk lip mount for easy, no holes installation on side or edge of trunk lip. 180° swivel included for adjustment of antenna to absolute vertical. Supplied operational with 17' MIL spec RG-58-U and PL-259 transceiver connector factory attached. Antenna is removable from mount. Shpg. Wt. 3.34 lbs. **$36.95**

MODEL CG-144 — Antenna only with 3/8"-24 base to fit all standard mobile ball mounts. Shpg. Wt. 1.84 lbs. **$24.95**

give your mobile signal the big push! this large aperature, two meter antenna will create a new dimension in amateur mobile communications. —where action counts, get the decisive advantage of colinear power gain performance; transmitting and receiving!

ARROW ELECTRONICS, INC.

Fairfield County Connecticut Hams - Visit our Norwalk Store for Great Local Service.

NEW YORK CITY, N.Y. 10007, 97 Chambers Street, 212-349-4411, Between Broadway and Church Street
BAYSIDE, QUEENS, N.Y. 11361 207-02 Northern Blvd., 212-423-0910, Half Block East of Clearview Expressway
NANUET, N.Y. 10954 195 West Route 59, Half Mile East of Thruway Exit 14
FARMINGDALE, L.I., N.Y. 11735 900 Route 110, One Mile South of Republic Aviation
MINEOLA, N.Y. 11501 525 Jericho Turnpike, One Half Block East of Herricks Road
TOTOWA, N.J. 07511 225 Route 46, 201-256-8555
NORWALK, CONN. 06850 18 Isaac Street, Shopping Pl., 203-838-4877

Galaxy R-530

The General Coverage Leader

The R-530 is still the 0.5 to 30 MHz general coverage leader.

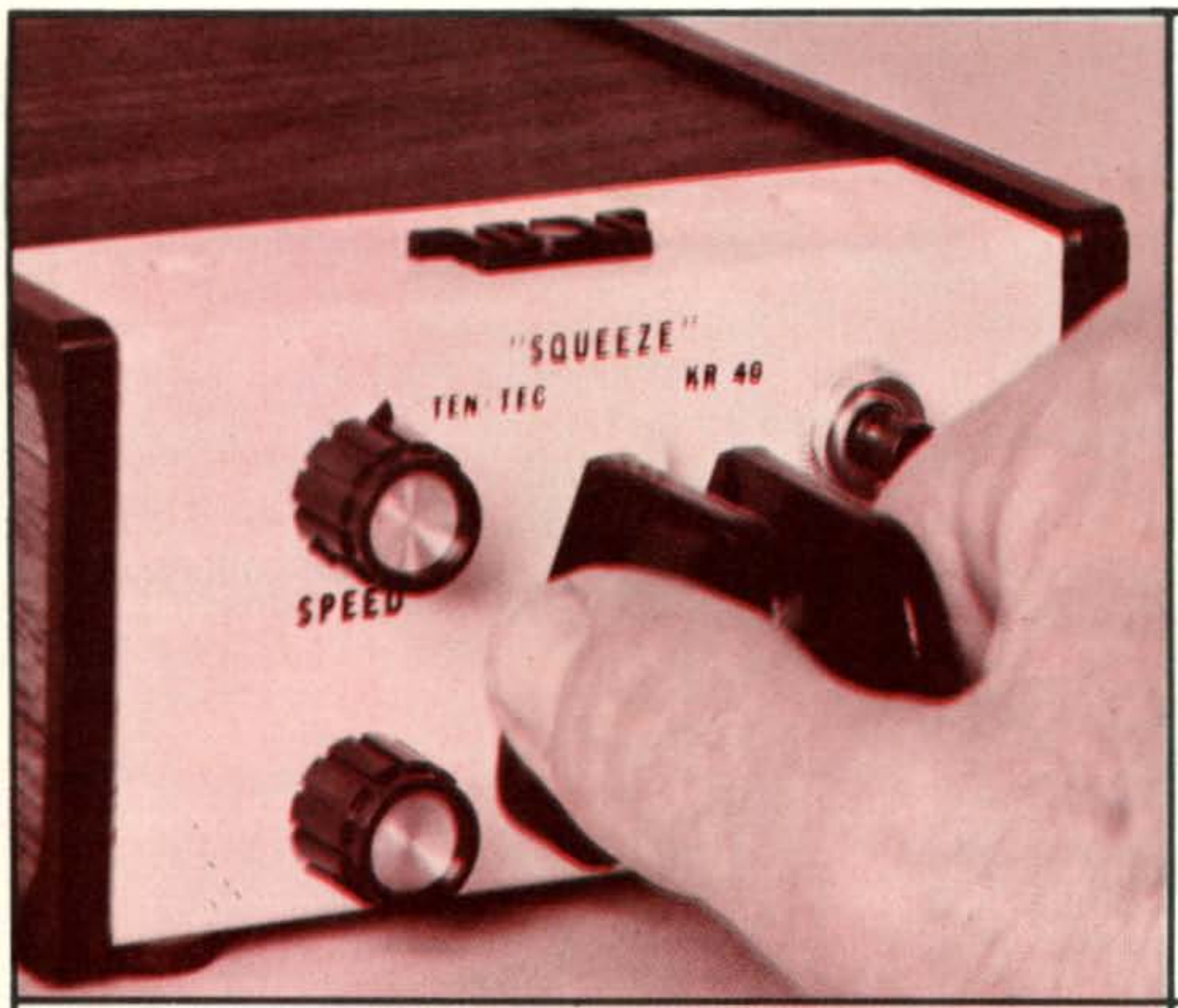
HERE'S WHY:

- Has many features found only on military receivers costing over $3,000 yet is still priced less than $1,000.
- Phase-lock frequency conversion for exceptional stability and trouble-free operation.
- Variable RF attenuation at antenna terminals for positive control against overload.
- Mounting versatility—table top or standard 19-inch rack.
- 117/230 VAC for fixed operation or 18 VDC batteries for portable field monitoring.

Write for our new R-530 brochure and compare it to the competition...
if you can find any.

HY-GAIN ELECTRONICS CORPORATION

8601 Northeast Highway 6 • Lincoln, Nebraska 68507 402—434-9151 Telex 48-6424



SOFT TOUCH

A smooth rhythmic feel — a slight but definite "break" — these are among the highly desirable features that make the operation of a Ten-Tec keyer a delightful experience. The KR40 and KR20 paddle suspensions employ magnetic forces to achieve the unique "soft touch" that means smoother, more articulate and relaxing QSOs for you.

KR5

Single paddle straight keyer. Self-completing characters. Pre-set weighting, alterable. Excellent "feel". For 6 or 12 volts, DC.

Price $34.95

KR20

Dual paddle straight keyer. Self-completing characters. Two position weight switch and monitor oscillator. AC operation.

Price $59.95

KR40

Top - of - the - line Squeeze keyer. Iambic sequence. Full dit and dah memories, weight control and monitor oscillator. AC operation.

Price $89.95

TEN-TEC
INCORPORATED
SEVIERVILLE, TENNESSEE 37862

TEN-TEC DEALERS

The dealers listed below are participating authorized retailers for all Ten-Tec products and are dedicated to making Amateur Radio more enjoyable for you.

ALABAMA
James W. Clary Co.
Birmingham

ALASKA
Yucon Radio Supply
Anchorage
Fairbanks

CALIFORNIA
L. A. Electronix Sales
Torrance
Communication Headquarters
San Diego
Quemont Electronics
San Jose

FLORIDA
Amateur Electronic Supply
Orlando

GEORGIA
Johnson Electric Sales
Griffin

ILLINOIS
Trigger Electronics
River Forrest
G. Sochor Sales
Arlington Heights

INDIANA
Graham Electronics
Indianapolis

MICHIGAN
Electronic Distributors
Muskegon
Niles Radio & TV Supply
Niles
RSE Electronics
Clawson

MISSOURI
Ham Radio Center, Inc.
St. Louis

NEW MEXICO
Lektronik Supply
Farmington

NEW YORK
Arrow Electronics
Bayside
Harrison Radio Corp.
Farmingdale

NORTH CAROLINA
Freck Radio & Supply Co.
Asheville

OHIO
Amateur Electronic Supply
Cleveland
Queen City Electronics
Cincinnati

OKLAHOMA
Radio, Inc.
Tulsa

PENNSYLVANIA
Ham Buerger, Inc.
Willow Grove
Hamtronics Div. of Trevose
Trevose
Kass Electronics Distributors
Drexel Hill

TEXAS
Douglas Electronics
Corpus Christi
Ed Juge Electronics, Inc.
Dallas
Ed Juge Electronics, Inc.
Fort Worth
Madison Electronics Supply
Houston

VIRGINIA
Arcade Electronics, Inc.
Annandale

WASHINGTON
Amateur Radio Supply Co.
Seattle

WISCONSIN
Amateur Electronic Supply
Milwaukee

CANADA
C. M. Peterson Co. Ltd.
London, Ontario
Ray Hunter & Associate
Toronto, Ontario
Payette Radio, Ltd.
Montreal, Quebec

EXPORT
E. D. Magnus Co.
Chicago, Illinois

DX [*from page 71*]

Zone 39. This zone won't be easy. FB8XX is the only station we've heard on the low bands recently.

Zone 40: Not the hardest zone. WAØOTH/TF and other Icelandic stations can be heard on 80 metter s.s.b. OX3YY is active on 7 mHz c.w.

QSL Information

DX stations or expeditions needing a QSL Manager may contact Warren Croke, WA4-DWR, P.O. Box 575, Windermere, FL 32786. Warren is temporarily off the air and would like to handle cards to keep up with DX activities.

A4FA—Via G3ZBA
A51PN—To H.N. Pradhan, Wireless Communictions, Deschentshi, Thimphy, Bhutan
CR7GJ—c/o W3HNK
CT2AZ—Via W0JHY
CX2CO—To W2GHK
DX4ØPAR—c/o DU1EJ
EL2DT—Via W2DNV 1018 Woodburn Rd., Spartanburg, S.C. 29302
FB8XX—Via F2MO
FL8BC—P.O. Box 4, Djibouti, French Somaliland
FL8OR—B.P. 1279, Djibouti, French Somaliland
FY7AG—B.P. 229, Lourou, French Guiana
GC5AGA—To K4II
GW5AGA—c/o K4II
HS3AET—Via W0YZB, HS3AFB—To WA2-WMT, HS4AGN—c/o W5LUJ, HS4AGY—Via WA4PUC
HS4AGZ—to Box 125, APO, San Francisco, CA 96386, HS4AHQ Box 844, APO San Francisco, CA 96386, HS4AHV—c/o W6-NYG, and HS5AFJ—Via U.S. Embassy, APO, San Francisco, CA 96272
HTØV—To YN1VMD
JD1ACF—c/o JA1OAF
JT1AA—Box 708, Ulan Bator, Mongolia
JTØAE—Via OK1AQW
JY3BZ—To WA3HUP
JY6UNM—c/o I1ZLB
KC6JC—Via W2GC, 419 Maple St., West Hempstead, N.Y.
KC6SK—Box 55, Colonia, Yap Island, Western Caroline Islands 96943
KG6JBD—To K6PNX, KG6JBO—c/o K1JHX, and KG6JBS—Via W1DXB
MP4MBC—c/o G3XEC, MP4MBP—Via G3LQP, MP4TDM—To K1DRN and MP4TEE—c/o G3LQP
OJØSUF—Via OHØMA
PJ7ARI—To PJ2ARI, Box 659, Curacao, Netherlands Antilles
PJ7VD—c/o PJ2VD, Box 879, Curacao, Netherlands Antilles
PY7ZAH/PYØ—P.O. Box 91, Recife, Brazil
PQØMI—Via PY2PE
PYØWH—To PY2WH
PZ2AB—c/o W2KF
PZ9AC—P.O. Box 1021, Albina, Surinam
SV7GE—Via K4SKI
TI9C—To TI2GI
TJ1BG—c/o K4WQS and TJ1DX—Via W6KTE
TL8LI—To 9Q5LI
TN8NK—c/o JA4BLY
TU2AA—Via WA6EJI
TY3ABS—To DL8OA and TY5ABK—c/o W8CNL
VK9FS—P.O. Box 49, Kavieng, New Guinea
VP1LEY—c/o WA2LEY
VP8ME—Via WA5FWC and VP8MS—To K4MZU
VQ9HCS—c/o WA1HAA
VR1AC and **VR3AC**—Via K3RLY, Box 125, Simpsonville, Md. 21150
VR4AA—To ZL4NH
VR4CC—c/o P.O. Box 1, Honaira, Soloman Islands
WA1RDH/VQ9—ATCU #4, FPO, New York, N.Y. 09530
WG3SFC—Via WA3NAN
YA1DX—To PA0GMM, YA1BYS—c/o W2RHK, YA1GTZ—Via K2GTZ, YA1RA—To K2GTZ, and YA1TCA—c/o PA0TCA
YB5AAQ—Via W5ADZ, YB9AAT—To W4YUU and YB0ABE—c/o K5GUZ
YVØAA—To Box 2285, Caracas, Venezuela
YX5AJ—c/o YV5AJ
ZD3Z—Via OH2NB
3D2DI—To VE6IK
4M4AGP—c/o WØYVA/4, Box 6226, Shirlington Station, Arlington, VA 22206
4W1AF—Via DJ9ZB and 4W1BC—To G3SUW
5R8AG—c/o Box 60, Ivato Airport, Tananarive, Malagasy Republic
5U7AZ—P.O. Box 309, Naimey, Niger Republic
5V4AH—Via DL1HH
5X5NK—To DJ3JV
6W8DY—c/o VE4SK
7Q7AF—Via DJ4IJA
8R1M—To WA3HUP
8R1UGF—Box 841, Georgetown, Guyana
9H5C—c/o 9H1DL
9K2BQ—Via JA1ZZ and 9K2CA—To W5KKZ
9Q5RN—c/o WA6CEB
9Q5RW—NOT via WA6CEB

73, John, K4IIF

Fully Solid-State

MONO

BANDERS from SWAN

You've asked for them and we've got 'em! Now . . . with the price down where you'll like it . . . you can work your favorite band with reliable simplicity. And why not? These single sideband transceivers are a naturally new follow-on development from SWAN's recent breakthrough to fully solid-state-of-the-art multi-band rigs.

Containing FET's, IC's, Operational Amplifiers, and *NO* tubes, these All-American transceivers were engineered especially for the mobile ham with the XYL in mind. The refreshingly new panel styling of these units blend handsomely with most car interiors.

- ✓ Operates directly from 12V DC
- ✓ SSB and CW modes
- ✓ Transmit ALC
- ✓ No tune-up time required
- ✓ 15 Watts P.E.P. Input
- ✓ S-Meter
- ✓ Smooth AGC
- ✓ No transmitter tuning

. . . Just flip on the power and you're on the air with . . . virtual elimination of front-end overload, distortion and cross-modulation . . . AND . . . infinite VSWR protection from an open to a short circuit!

Brighten up any day you're on the road by enjoying the "extra-pleasure" mileage a SWAN Mono-Bander can give. Whether you're on the way to or from the daily grind, travelling cross-country, or just cruising around . . . be sure your everyday companion is a Mono-Bander from SWAN ELECTRONICS.

These models available:

SWAN MB40 (7.0 to 7.3 MHz) $249.95
SWAN MB80 (3.5 to 4.0 MHz) $249.95

Accessories include:

SWAN MB100 (100 Watt P.E.P. solid-state Amplifier usable from 3 to 30 MHz with appropriate filter. Provided with one filter. Please specify band when ordering.) $139.95
SWAN MB200 (200 Watt P.E.P. solid-state Amplifier usable from 3 to 30 MHz with appropriate filter. Provided with one filter. Please specify band when ordering.) $209.95
Additional filters available.
SWAN SS-1200 (1200 Watt P.E.P., tube type, Linear Amplifier) $299.00

Financing is available. $25.00 down puts a SWAN Mono-Bander in your car if you take advantage of Swan's Credit Service. Write directly to us for details on how easily you can qualify for this service.

SWAN ELECTRONICS
A subsidiary of Cubic Corporation

305 Airport Road • Oceanside, CA 92054 • Phone (714) 757-7525

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 Publishers 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.**

Rubber address stamps. Free catalog. 45 type styles. Jackson's, Box 443F, Franklin Park, IL 60131.

TECH MANUALS for Govt surplus gear only $6.50 each; R-388/URR, R-390/URR, R-389/URR, R-220/URR, TT-63A/FGC, TS-497B/URR, CV-591A/URR, R-274/FRR. Hundreds more. Send 50 cents (coin) for 21-page list. W3IHD, 4905 Roanne Drive, Washington, DC 20021.

QSLs. Second to none. Same day service. Samples 25 cents. Ray, K7HLR, Box 331, Clearfield, Utah 84015.

QSL'S "Brownie," W3CJI, 3111 Lehigh, Allentown, PA 18103. Catalog 25 cents.

QSL, SWL, WPE cards. Samples 25 cents. Log books, file cards, decals. Malgo Press, Box 375, Toledo, OH 43601.

CREATIVE QSL cards. Personal attention. Imaginative new designs. Send 25c. Receive catalog, samples and refund coupon. Wilkins Printing, Box 787-1, Atascadero, CA 93422.

Moultrie Amateur Radio Klub, 12th Annual Hamfest. Wyman Park, Sullivan, Illinois, April 29, 1973 Indoor-outdoor market. Ticket donation $1 in advance - $1.50 at the gate. For information write M.A.R.K. Inc., P.O. Box 327, Mattoon, IL 61938

WANTED: A Hewlett Packard 410B meter and Sams AR Manuals to complete a set. P.L. Williams, 106 S. Jefferson St., Lewisburg, W.Va. 24901.

Linear Builders send SASE for Lo-Priced List of Hi-Power parts. MACE, 8600 Skyline Dr., Hollywood, CA 90046.

Drake 2-C rcvr like new w/ orig. crtn & man. $190. Johnson Adventurer trx & Heath VF-1 $33. WB2-CPH, 216 Winding Way, Morrestown, NJ (609) 234-0116.

SELL: Drake 2A $125. K8AAB, 4994 State Rt. 59, Ravenna, OH 44266 or phone CLev. 486-2521.

WANTED: 4CX250B's or 4CX250R's. State the manufacturers name and price and age. WB5GMY, Gary, Rt. 1, Box 162, Weimar, TX 78962.

TRADE: Mint SR-2000 for SR400 and $300 or HT-44, SX-117 and $350 or Substitute 30L-1, SB-220 for cash. W5RKT, 900A Spring Valley Plaza, Richardson, TX 75080.

SELL: Apache and SB10, Perfect cond. Perfect HQ170 Best Reasonable Offer. K2ODZ, Audubon, NJ 08106.

HT-200 Motorola Handi-Talkie 16-76 34-95 charger case $350.00 or best offer. WAØWVK, 10017 Diamond Dr., Riverview, MO 63136.

SELL: Hammarlund HQ-150, $125 and Viking Valiant, $100. Going mobile. K4JXP, Box 3836 ACS, Gastonia, NC 28052.

KWM-2, 516F-2, excellent condition. Will ship. $550. R. Doege, 3421 N. Paiute, Phoenix 85251.

MODERNIZE FOR PEANUTS! Frame and display QSL's with 20 pocket plastic holders. Two for $1, 7 for $3. Prepaid, guaranteed, Universally used and approved. Order now. TEPABCO, Box 198Q, Gallatin, TN 37066.

ANTIQUE radio equipment sale and swap session, dinner and program, A.W.A. Spring Meet, April 7, Canandaigua, N. Y. Write for details: Lincoln Cundall, W2QY, 69 Boulevard Parkway, Rochester, NY 14612.

SAFETY BELTS Tower Climbing, Nylong (new), Lanyard/snap (used), $23.50. Link, Rt. 111, Monroe, CT 06468.

1973 Hobby Electronics Directory. Hundreds of companies, products, and services. Parts, surplus, test equipment, plans, kits and more. $1.50. Newcal Enterprises, Box 323K, El Segundo, Ca. 90245.

WE would like to correspond with many radio amateur operators in the United States. The purpose of our club is to make friends through radio and by mail. Please give us letters to the following address. THE GREEN CLUB, Z.C.—591 I-25, Shinonome, Sakai, Osaka, Japan. Club Manager, Masuo Inoue, JH3BCZ.

NOVICE GEAR for sale: Eico 720 xmtr, Heath - HR-10 recvr, xtal calibrator. With manuals. Will ship. Wayne Goldsmith, WA2MZR, 72-35 Little Neck Pkwy, Glen Oaks, NY 11004.

Swan 350, xtal calib., selectable sideband, ext. Mars osc., Hy-Gain all band HF coublet Ant., AC & DC power supplies $395. Drake W4 wattmeter $39. SX101 receiver $99. Globe King 500B xmtr (idle since 1966) $75. New Variacs superior 15A and Gen. Radio 20A $39 each. You ship. R.O. Davis, W9KK, RR 1, Colfax, IN 46035 (317) 324-2442.

WANT: 1930 vintage xmitter coil forms, variable and mica capacitors, sockets, etc. Building W6SAI 1934 rig. CQ Nov.'71. Cohen, OLAA, Det. No. 3, Box 1512, APO, S.F., 96525.

FOR SALE: 5 band Heath HW101 w/PS and SB 600 new, complete, excellant, for cash or will take Heath Freq. Counter. Art Streeter, 1619 Holiday Pl., Bossier City, LA 71010.

HAMFEST - Waisash County ARC Fifth Annual Hamfest, Sunday, May 20, rain or shine. Admission is still only $1. Flea market, food, tech talks, and much more. For information, write Bob Mitting, 663 Spring, Wabash, IN 46992.

Will sell or swap SB-101 w/power supplies, speaker, and mobile bracket for 2 meter station. Going VHF WB4LJT/5, 1115 Waller, Bossier, LA 71010.

WANTED: HX-50, HT-32 or HT-37. W8KBN, 5657 N. Portsmouth Rd., Saginaw, Mich. 48601.

WANTED: Pre-war National NC-101X. Pre-war Hammarlund Comet Pro. Pre-war Collins transmitter. Write Bill Orr, W6SAI, care of EIMAC, 301 Industrial Way, San Carlos, CA 94070.

TRADE: 8 MM Movie outfit, mint; for Mint SB-200; SB220; 30L1 Linear. Replies Answered. WAØGYX, George, 1422 So. Pearl, Independence, MO 64055.

Electronics Equipment; Test Equipment; Panel Meters; Connectors; Capacitors; Tubes; Transistors; etc. Inquiries Invited. B.F. Williams, P.O. Box 7057 Norfolk, VA 23509.

Speech amplifier for Heath SB400 and SB401 plug in module AU3, no wiring necessary. $14.50. American Sales Company, 5358 Floria Drive, Swartz Creek, Michigan 48473.

FOR SALE: Atwater-Kent home broadcast receiver, needs speaker and repairs. Taking offers. Deane Neitzel, Rt 3, Watertown, Wisc. 53094. Phone 414-261-2915.

Lafayette S.W. Radio, Md HA230, 550 kc. to 30 MC. on 4 bands. L/N $40. R. Garcia Rt. 1, Off Continental Rd., Napanoch, NY 12458.

QSL SERVICE-for stateside amateurs. Our charge 2-1/2 cents per card. For information contact: Q-AIDE, 321 Main St., Watertown, MA 01272.

Mix pleasure with pleasure. 1973 Hamburg International Hamfest on Sept. 15 only 45 minutes from fabulous Niagara Falls. RV parking for weekend only $2.50 with hook-up. Details: Valerie Orgera, K2KQC, 187 Main, Hamburg, NY 14075.

Evansville, Indiana TARS Hamfest Sunday, May 6, 1973. 4H grounds, highway 41 north 3 miles. Auction, overnight camping, Ladies' bingo, reserved flea market booths, airconditioned. Advanced registration. For flyer contact Robby W9MKZ, 502 S. Lincoln Park Drive, Evansville, IN 47714.

WANT OLD RADIO TRANSCRIPTION DISCS. Any size or speed. Send full details to W7FIZ, Larry, 7554 132nd Ave. N.E., Kirkland, Wash. 98033.

22nd ANNUAL Dayton Hamvention will be held on April 28, 1973 at Wampler's Dayton Hara Arena. Technical sessions, exhibits, hidden transmitter hunt flea market, and special program for the XYL. For info write Dayton Hamvention, Dept. C, Box 44, Dayton, OH 45401.

BRAILLE DIALS for the blind (at cost) on Drake Transceivers and Drake twins and VFO's. Remove knob, slip on Braille dial and replace knob, that's all. Please state model type. $2.00 ea. P.Pd. Vernon Page, W8EXJ, 1969 Manz St., Muskegon, MI 49442.

MAGAZINES FOR SALE: CQ/73/QST/HAM RADIO issues at 10 cents each (plus shipping) from Lockheed Ham Club, 2814 Empire, Burbank, CA 91504. Send list and check. Available issues and any refund due will be sent promptly.

Did you know that new supplements to the book, "CQ YL," are now available? They bring the book up to date with YLRL Officers through 1973 and the 6th YLRL Convention, held at Long Beach in May '72. If you have a copy of "CQ YL" and would like to add the new supplements (the pages are "slotted" so they fit directly into the "CQ YL" spiral backbone), drop a note with your request to author/publisher, W5RZJ, Louisa Sando, 4417 - 11th St., NW, Albuquerque, NM 87107. Please enclose two 8 cent stamps to cover cost of mailing. The one and only book about YLs in ham radio. "CQ YL," contains 21 chapters, over 600 photographs. Order your autographed copy, or a gift copy, from W5RZJ, $3.00 postpaid.

ATTENTION: SW3 Fans rebuilders: I have tubes for all models Price $5.00 ea. Postpaid U.S.A. WAØTUD, P.O. Box 158, Hopkins, Minn. 55343.

SIDEWALK SALE-Every first Saturday-now in its fourth year. Turn your surplus electronics into cash at the Southwest's leading ham store-it's FREE! Electronics Center, Inc., Dallas, TX 75204.

FOR SALE: Hallicrafter-S-95, high band receiver with squelch. Very good condition. $40-will ship in US. WB5FLS-817-872-5237.

WANTED: Hallicrafters Model WR-3000 receiver. Fred Haines, 132 Rural Ave., Lewisburg, PA 17837

Thunderbolt Linear with two 4-400 and three PL-175A tubes-$200.00; Johnson KW Matchbox with coupler-$90.00; Central Electronics 200V-$325.00; Central Electronics MM 2-$40.00; 20M 5el Telrex Model 20M536-$200.00; Telrex Rotator Model TS 435-RIS-$150.00; 70 ft. 3 post Aermotor Tower-$100.00. W9UZC, Southwest Acres, RR 2, Harrisburg, IL 62946 (618) 252-7064.

SELL: Heath SB-200; Expert wiring, very little use. $200. WB6WAD, 17019 Ardmore, Bellflower, CA 90706.

SALE: Antique BC receiver 1929 vintage. Unknown mfg. Tube line up 26, 27, 26, 71A-80. Make offer. K7HGZ, 6410 W. Sells Dr., Phoenix, AZ 85033.

Twenty years CQ, QST, magazines for sale cheap. Want vernier dial for 75A4, repairable Eico 753 transceiver. W7DI, 6633 E. Palo Verde, Scottsdale, AZ 85253.

Ameco Converter Model EN144-30.5, 34.5 and a P.S1. Power supply and 5-6DS4 tubes $45. PPaid. W8FOX, 2837, Goddard Rd., Toledo, OH 43606.

SELL: Super Hustlers. Excellent shape. 3 mo old. 20m $12. 80m $16. Will ship. WB8CEB, 140 Spauldins Pl., Jacksonville, IL 62650 (217) 245-7742.

SELL: Motorola Portable Test Set TU546 excellent condition complete $150. WA6EDQ, 19725 Ave. 300, Exeter, CA 93221.

TRADE: 8mm Movie outfit, mint; for Mint SB200 SB220, 30L1 Linear. Replies answered. WAØGYX, George, 1422 So. Pearl, Independence, MO 64055.

WANT: SB-401 or other SSB xmitter or xceiver. Have gear, parts, tubes, etc. to trade w/cash. Adams 1402 West 13th St., Panama City, FL 32401.

WANTED: Mint SRR-12 receiver also a Johnson 250-42-1 "T" pad attenuator (2). J. Gysan, 53 Lothrop St., Beverly, MA 01915.

P.C.'s from your artwork, or from construction articles in Ham Periodicals which contain a full size lay-out. Write: D.L. McClaren, W8URX, 19721 Maplewood Ave., Cleveland, OH 44135.

SELL: NC-270, SSB 6-ham band receiver, mint cond. $110. Globe VHF 62,50 watt 6&2 m. xmtr, excellent $50. Both with manuals. FOB. K3PRE Ed Kowalski, 3300 Chesterfield, Philadelphia, PA

WANTED: Police & Fire receiver with auto. scanner Reasonable. Mint desired. Jeff Krueger, WN9IHB, 8864 Hillside, Hickory Hill, IL 60457.

ORLANDO HAMFEST and SOUTHEASTERN FM CONVENTION, June 2, 3. The "Big One" -25,000 sq. ft. air-conditioned exhibition and flea market at Orlando Exposition Park. All major equipment on display and for sale by leading manufacturers and dealers. Prizes galore! Fun for all! Bring the family along - enjoy Disney World, Cape Kennedy, Cypress Gardens, Atlantic, Gulf Beaches. FM Repeater meetings, ARRL Forum, FCC representatives, QCWA, AWA, MARS, OOTC gatherings! Preregister entire family $1.00 - send to Orlando ARC, 8024 Charlin Parkway, Orlando, Florida 32807. Validated ticket return mail. Reservations, rates, single to twin double $13 - $30, Chamber of Commerce, Convention Department, P.O. Box 1913, Orlando, Florida 32802.

VHF-UHF construction articles and available low cost parts kits described in VHF Communications Magazine. Let us know your needs so we can quote prices and send other information. Special offer to new subscribers, 1969 through 1972 with binder includes subscription for 1973, all for $20.25. Same offer with 1973 by air mail for $21.50. 1973 only $4.50, by air $5.75. Sample copy, 50 cents. VHF Communications, Bob Eide, WØENC, 53 St. Andrew, Rapid City, SD 57701.

The Rockaway Amateur Radio Club Annual Spring Auction will be held Friday evening, April 27 at 8 P.M. at the Hall of Science Building, World's Fair Grounds, Flushing, NY. Doors will be open at 6 P.M. to accept items for the sale. $1.00 donation accepted at the door.

WANTED: A copy of the March 1972 issue of CQ to complete my collection. Please contact Anders Rosengren, Sexmansvagen 3, S-230 30 OXIE, Sweden. Thank you.

CANADIANS Free 120 page Electronics Catalog. ETCO, 464A McGill, Montreal.

WANTED: Drake R4-A, T4-X, MS-4, AC-3 in very good electrical and mechanical condx. Can pay $550. Al Shrago, WB4KQV/4, Box 4814, D.S., Durham, N.C. 27706.

Johnson 1 KW lowpass filter $10. HB ARRL SWR bridge 1 KW $6. I ship both. WA3 LPK, 2300 Louise Ave., Baltimore, MD 21214.

SELL: Sonar 2305, walkie talkie 28/88 with ni-cad batteries, complete manual, can be multi freq. readilty. First $150 gets it. W2 LXC, BA9-7982.

T43 GGV three frequencies. Heath counter & scaler many other goodies. WA5 CMC, 2309 Bullington, Wichita Falls, TX

Motorola P33 BAM 8 W fm with Nicads, ant, charger, PL, manual, spares, acces. $160 R. Dewey, 7 Caroline Dr., Bennington, VT 05201.

WANTED: Drake T4 X/R4 A. Sell 3600-0-3600 xfmr at 1 amp with 110/220 pri. $25, 1.8 amp $40 FOB Paul Bittner, 814 4th St., S., Virginia, MN

WANTED: Dec. 65 Popular Electronics & Jan. thru Sept. 67 Electronics Illustrated. Can pay reasonable amount. Bob, 5227 Royal Dr., Mechanicsburg, PA

FOR SALE: Swan 14-117 DC power supply, $100 Swan 508 VFO, $110. WA6 HYI, (213) 324-1227.

WANTED: Copy of Instructions on Hallicrafter Reveiver model SX-88. Write: F. Crowley, 278 Caroline, Derby, CT 06418.

FOR SALE: KWS-1, 75A-4, $700. SB-401, xtal pack, $235. B&W 6100, $150. OTHERS. James W. Craig, 29 Sherburne Ave., Portsmouth, NH 03801.

28 ASR and KSR Teletype floor console cabinets for sale or trade. RO Base and LESO. D.C. Harrington, 1620 Gardena Ave., Fridley, MN 55432.

SELL: Motorola HT-200 Handie-Talkie. T-146.34 and 146.94 mHz, R-146.94. SASE for details. W4 JGO, 643 Diamond Rd., Salem, VA 24153.

FOR SALE: Collins KWM2 in mint condition. $625 Government Mutual Conductance tube tester with adapter $35. Cash no trades. UPS freight Collect. Shapiro, 1138 Boxwood, Jenkintown, PA.

Heath HW-12, HW-32, HP23 supply and century mobile supply $185. R.P. Turner, Box 98 Marshallville, GA 31057.

SELL: SX140 & Matching HT-40 transmitter, 80-6 Meters. Both $85. Russell, 19680 Mountville, Maple Hts, OH 44137.

WANTED: Collins mech. filter in good condition. 455 kc, 3.1 kc bandwidth, p/n F455 D-21. State price in letter. J. Stoughton, RCA, GBI Xmtrs, Box 4608, PAFB, FL 32925.

TR-6 w/NB-MS5-PS Ser. No. 419 full x-tals mint. cond. Make offer. WB5 CWB, 2624 S.W. 69th, Oklahoma City, OK 73159.

WANTED: ARC-5 Receiver, mica terminal strips, W6 BLZ, 528 Colima St., La Jolla, CA 92037.

FOR SALE: Swan 350, AC & DC supplies, Excellent condition. Best offer. U ship. WA1 EUF, 78 Delaware Ave., Manchester, NH 03104.

SBE-33: Complete, Exc. Cond. $125. 9118 Kilbride Rd., Baltimore, MD 21236. (301) 661-5588.

FOR SALE: Galaxy GT550 with vox and p/s. Excellent condx. G. Reser, WA5 WCK, Rt. 1, Snyder, OK 73566.

WANTED: Old radios of the early 1920's, crystal sets and battery operated. Need not be in working condition. State model number or name and price. D. McKenzie, 1200 W. Euclid, Indianola, IA 50125

SELL: HQ110 rcvr with clock, matching spkr and manual R. Oras, W9 ZEW, 3636 S. 59th Ave., Cicero IL 60650.

KWM2-AC/DC-P.S. Mobile mount, blanker, Qfiltr, Manuals $795. NC300 $95. Free list: Perera, 410 Riverside Dr., N.Y.C. 10025.

WANTED: Heathkit SB640 external VFO in any condition. State price & cond. in first letter, R. McClure, P.O. Box 520, FPO, Seattle 98766.

SELL: Drake TR-4, fact N.B., AC power, MS4, FF1.2 yrs tlc. excellent. $425. WA2NYV, 34 Larch, Hicksville, NY 11801.

WANTED: Heath wattmeter, digital clock station console. Tom Dornback, K9MKZ, 2515 College Road, Downers Grove, IL 60515.

SWAP: Good Gonset 6 meter Communicator II or Harvey-Wells TBS-50D. W9EOA, Rt. 3, Box 200, La Crosse, Wisc. 54601.

FOR SALE: Have just one left. Deluxe variable 0 to 32 kilovolt DC power supply made by Voltronics. Cost $1000, special at $200 FOB. Sly, 217 Santa Mariana, La Puente, CA 91746.

WANTED: Manuals for following equipment: Heath Signal Tracer, National SW4 rcvr, National NC100 ASD. rcvr, and others. Will buy borrow or copy Can you help? W2GHF, 45 Allen Dr., Woodstock NY.

NCX-500 scvr, $250, Lab Test Equip., send for list, 540 Stony Brook Dr., Somerville, NJ 08876.

SELL: Waters Wide Range Attenator Model 37-1. DC to 220Mc. $12. W2ASI, 15 Kensington Oval, New Rochelle, NY 10805.

SELL: Swan 400, 420, 406, VOX, and pow. sup. $425. Heath twoer $30. All excel. Pick up preferred K9BQL, 206 Sweetbriar, Plano, IL 60545 312-522-8668.

Heath Factory aligned H. W. 16 and VFO HG10B $150 or best offer. C. Robertson, 1147 Harbor Hills, Santa Barbara, CA 93109.

WANTED: Comdel CSP-11. State price and condx including shipping. W5TJE, 5007 Blanchard, Dallas TX 75227.

WANTED: Magnum six speech processor for Collins and Robot 80 camera. Mike Ludkiewicz, 143 Richmond Rd., Ludlow, MA 01056.

WANTED: 2-meter schedules, 145.0-145.2, AM/CW/SSB. Sell: SP-600-J11, SB-620. K4MSG, Box 2606, Avon, NC 27915.

What Can you work with 1 watt? Ask W4VNE--he's worked 76 countries! Read about it in the Milliwatt: National Journal of QRPp, Ade Weiss, 213 Forest, Vermillion, SD 57069.

DRAKE 2NT, year old, manual. 12 xtals $125. Xmtr, HT-44, w/ps, manual, $200. R. Motta, Kentucky Ave., Warwick, RI 02888.

WANT To buy Mini-products 20-15-10 miniature beam. Have SP600JX7 rec-also TMC mode. SEL. REC. Make offer. P. Patterson, 6003 Bryan Pkwy., Dallas, TX 75206.

Heath SB303 with matching spkr and CW filter $280. NCX5 MK2 with matching NCXA $330. Gonset Comm IV (6 meters) $120. SASE gets complete list. Colella, 105-18 131st St., Richmond Hill, NY 11419 (212) 641-2559.

WANT: Old or antique telegraph gear, stock ticker, QST's. D. Spence, Bld. 203, Argonne Nat. Lab., Argonne, IL 60439.

SELL OR TRADE: Like new Tunaverter Model 18288 118-128 mcs. K8OUQ, 268 Annis Ct., Chillicothe, OH 45601.

WANT: Link xformer 6248, Antenna connector plug for ASB-5 receiver. Robert Clark, 1644 Reece Rd., Salem, VA 24153.

SELL OR TRADE: HQ-180A $225, Heath 10-18 $65, Remington 700 BDL 300 MAG with Redfiled 4-12 x scope $210. Need KWS-1 and good test equipment. Winstead, Rt. 3, Box 396, Phil., Miss.

WANTED: Radio receivers and wireless gear of 1920 and older. Also, Breadboard Atwatter-Kent msc., parts. Joe Horvath, W6GPB, 522-third St., San Rafael, CA 94901.

WANTED: 4CX1000 tube, new or equal condx. K6DR, 1800 Lambeth Way, Carmichael, CA 95608

Wanted: 80 meter cw skeds. K5MHG/6, 419 Westbourne Dr., L.A., CA 90048.

For sale: HW-12A, also HP-23A, ac supply, manuals included, very few hours air time, both only $150. WA3FSL, 215/777-9378.

Computer logic modules (NOR, F.F., Inv., etc), 4 cents each ppd. Spec sheet w/100 or more. Wanted: 2M FM transceiver. K5BCQ, 5114 Geneva, Friendswood, TX 77546.

Collins 32V, very good condx. Sell $100. Swap metered 1 KVA Matchbox, W1SO, Box 453, Bristol, CT 06010.

Send me any and all news items showing good things hams are doing. WA1GFJ, 17 Whitney, Hartford, CT 06118.

Needed: tuning knob assembly for Model 4350 RME rcvr. Gerald von Klein, 7 Ursula Ct., Halifax, NS, Canada. WA9GYF/VE1.

Trade or sell: 2KW HB linear, tubes 813, 810, 829B, Turner Plus 2 mike, my list for yours. Write D. DeCobert, 609 Henrietta, Gillespie, IL 62033.

Sell: excellent R-388 w/built in product detector. Built by Collins $325 FOB. W4AIS, 300 Thornwood Dr., Taylors, SC 29687.

For sale: SR160/DC complete $200. May trade - wanted to buy Johnson 6&2 converter. Write Duane, 17100 14-mile Rd., Battle Creek, MI 49017.

Wanted: Drake MN-2000, up to 500 feet, RG8U, Magnum 6 for T4XB. Dave Bell, W6BVN, Box 73, Altadena, CA 91001.

Want: antique radios, hobby bks. CQ-QST at $1.20 per year plus UPS. ARC-5 - $5. 15M skeds, xtals, teleg. mill, pen pals. Jim Gunn, WN1QNK, Ossipee, NH 03864.

Sell or swap: SSB receiving conv. CV-591A/URR complete & incomplete units unchecked. Clem, K8-HWW, 313/268-2467.

For sale: Heath PS Model 1P-17 $65. Heath oscilloscope Model 10-12 $65. WA0GON, 3734 S. Poplar St., Denver, CO 80237.

Sell: Heath HA-10 linear 1000 watts PEP, mint condition and coax relay for transceiver $160. Schwartz, 1183 Southeast St., Amherst, MA 01002.

CE10B, RX1 Mohawk recv, will ship. C.L. Barker, R 3, Bloomfield, Iowa 52537.

Wanted: Two 4E27A/5 tubes. Also need Heath HA-14 linear only. Need not work. WA3GQL, 606 Patterson, Willow Grove, PA 19090

WANTED: Presentation series Vibroplex Key, W8-AST, Hank Mirtic, 13808 Lakeshore Dr., Cleveland, OH 44110.

Ham Transformers rewound, Jess Price, W4CLJ, 507 Raehn St., Orlando, FL 32806.

SELL: Hallicrafters SR-160 with AC and DC supplies. Mint. $250. Jim Fleming, K9FRZ, 6N705 Harvey Rd., Medinah, IL 60157.

WANTED: Collins 500 kc filter for 75S-1. Jim Rafferty, VP2LAT, 529 Buckingham Pl, Libertyville, IL 60048.

CANADIANS: For sale-KW low pass filter $15. Codax keyer Model 361 w/mercury cells, mint $50 VE3CKU, 45 Paisley West No. 1008, Cooksville, Ontario. 416-270-3092.

SELL: Drake 2C, 2CQ, 2AC, excellent condx. $210. W8CUT, 1776 Walnut St., Coshocton, OH 43812.

WANTED: QST magazine for the years 1916, 1917 1919, 1920, 1921, and January 1922. W3QII, 5899 Barnes Ave., Bethel Park, PA 15102.

FLA: Retirement DX QTH, House 4 BR 1 Bath plus Mobile Home, 50' Windmill. 16 Acres w/creek $22,000. K4TIG, Rt. 2, Box 57, Hawthorne, FL

Why not a few extra stamped envelopes to the Bureau to help a fellow ham? K6ARE.

Will buy or trade for old radio & Wireless gear, magazines, books, catalogs. Have old mags, book & sets to trade. E. Rasmussen, 164 Lowell St., Redwood City, CA 94062.

HT-44, PS150 - $200. Also 75A1 that needs xtal osc - $100. Will ship. K2TQC, 36 Woodhall, Rd 1, Rexford, NY 12148.

Sell or trade for Valiant II, Johnson SB adaptor & 100 ft tower: BC-610 plus many spares 800W AM or CW 160 to 20M: $300. Globe King 500A & CE-20A, 510W, AM or CW and 750w PEP 160 to 10M $300. No Shipping. Dick, K8CCV, 5471 Norquest Blvd., Youngstown, OH 44515. 216/799-5686.

Trade excellent Drake 2B, 2BQ, 2AC for good general coverage recv. Norm Dick, WB2EHB, 212/884-9694. Bronx, NY.

PL-172 or 8295A tube needed. New or slightly used. Send price & information to W2FDE, Sid Deitz, 14 Wickford Ave., Trenton, NJ 08618.

For sale: Motorola U51GGT 6 meter FM transceiver 2 freq., w/manual $80 PP. K.A. Schwieker, 1124 Opelika Rd., Auburn, AL 36830.

Need spreaders for tri-band boomless quad. Prefer fiber glass. Open for suggestions. H. Lowry, K4VFA, 915 Madison St., Manchester, TN 37355.

Sale: HQ-145 (extras) mint condition $125. Techtronix scope, best offer, write details, W7WE, 1740 Fairfield, Reno, NV 89502.

Trade SR-200 plus AC for SR-400, AC plus? W5-RKT, 900A Spring Valley Plaza, Richardson, TX.

SELL/TRADE: Heath SB101, SB600, & HP23 PS, excel condx. Package deal. A Emerald, 8956 Swallow Ave., Fountain Vly, CA 92708.

SALE: Heath HW-16 new $90, Johnson Phone Patch new $15, Ameco CN-50 Nuvistor converter $15. WB2DOA, PO Box 797, Metuchen, NJ 201-678-7166.

SELL: Drake TR3 $275. AC3 supply $55. WB6-VNR, 7104 Devron Ridge, Canoga Pk., CA 91304.

WANTED: Heath SB-10, manual & cables. no junk. G.M. Moddrush, Jr., W8GIV, 600 Beechmont Dr., Dearborn Hills, MI 48124.

STOLEN: Galaxy 300, serial No. 4505 M 484. Substantial reward. Joseph Schwartz, K2VGV, 43-34 Union Street, Flushing, NY 11355.

Collins KWM2, 516F2 supply. Good condition. $550 FOB. Keith O'Brien, 8401 N. Atlantic L-15 Cape Canaveral, FL 32920.

WANTED: Pre-1940 radio test equipment, need not be working. James Fred, RR 1, Cutler, IN 46920.

WANTED: Info and/or schematics and service info on link FM xmtr type 1906 and FM rcvr type 1905 WA9VBG, 6675 E. 19th St., Indianapolis, IND

SWAP: HW32 and HP23 power supply for 2 meter FM rig. Garrison, Box 604 VHFS, Warrenton, VA 22106.

Heath Balun coil model B-1 $5.00. D. Renwick, 2420 Eastview, Saskatoon, Sask. Canada.

Heath HW-17 with FM adapter factory aligned. Never used. Curt Jensen, 1529 Happiness Dr., Colorado Springs, Colorado.

WANTED: 160 meter coils and crystal for 100V or 200V. W.E. Waldschmidt, PO Box 163, Cannelton, Ind. 47520.

WANTED: Old Catholic Latin Language missals or prayer books. WA7NSO, National Catholic Latin, Historical Society, 501 S. Ash St., Centralia, WA

WANTED: Info on improving SSB reception on a Gonset G-66B rcvr. D. Simonsen, WA7NSO, 501 So. Ash St., Centralia, WA 98531.

SWAP: Two Each: Blonder-Tongue TV camera, ITT monitor chassis, camera control. Fully transistorized, rack mounted. For Swan cygnet, 270B in working condition. Oberstein, 55 Knolls Crescent, Bronx 10463.

WANTED: Collins gear for cash, state condx and lowest price prepaid to my QTH, W8GIV, 600 Beechmont Dr., Dearborn Hills, MI 48124.

WANT: Yaesu SP560 speaker box. No spkr neces. Price including shipping. W5TJE, 5007 Blanchard, Dallas, TX 75227.

Good BC-221 AA with built in AC supply and calib. chart also mint TS-352/U VOM $20 ea plus shipping. K8OUQ, 268 Annis Court, Chillicothe, OH

10 meter skeds wanted with Vermont, Delaware, South Dakota and Wyoming. Gerry, WB2FJX, 158-14 85 St., Howard Beach, NY 11414.

Will Trade for Slow Scan equip. Swan 270 for Robot Monitor. Joe Braun, 7725A, Nelson, Ft. Meade MD 20755.

SELL: Heath HW12 with PS, mike, excel cond. $90 plus shipping. B. Ostrofsky, W9HTF, 670 N. Tippecanoe, Gary, IN 46403.

Late model Robot SSTV monitor and late model Robot SSTV camera. Complete with acces. Mint cond. M. Marsley, 2242 Stevens Ave., Kalamazoo, MI 49008. 616-342-8838.

Attention Morse telegraph club members. Would you be interested in a M.T.C. net? Railroad, Western Union or ?? Operators join in on a CW net 7.04mHz 0200GMT each Mon. and Thurs. nite with W9LHL, the new MTC president as NCS. Also there is a membership drive in progress.

Morrow converter Model 2BR6 6 or 12 V 50 and 10 meters. Like new, Instruction Manual, cables, etc. $10. V.P. Ternullo, W6PZX, 549 Valverde Dr., So. San Francisco, CA 94080.

HW19-A Sixer $40. AC and mobile supply. G.E. 30 2 meter base $125. WA5HYA, 120 Noble Ave., Roanoke, VA 24012.

SELL: H-P 525A also 526A plug-in $28, 2 antique radio's AK model 33 & Sonora 3 tube both need work. Robert Ireland, Pleasant Valley, NY 12569.

FOR SALE: RTTY model 19 composite, roll paper tape, one tube converter $125. Polycomm PC-2, 2M AM xcvr with manual $50. W4OZF.

FOR SALE: LM21 cal. book, AC power $35. Dumont 404 pulse gen. $65. General radio RF bridge mdl 916AL $135. H.P. Slot line Mdl 805A $70. (516) 822-4769.

Swan 250 w/117 AC PS $180. Swan TV-2 $120.U pay shipping. WB6NKM, 2534 El Tonas Way, Carmichael, CA 95608.

SELL: SB101 with CW filter, SB-600, HP-23A mint and all manuals $350. No trades. WA6FTV, 6727 Killdee, Longbeach, CA 90808.

100 Complete Novice Station HR10B rcvr. Knight xmtr, gud condx, all misc. included $135. SASE to H. Linzer, 12 Crafton Ct., Malverne, NY 11565.

SELL: Allied xcvr 2517 with AC/spkr, $345. Bob Dufon, 4114 Northcote Ave., East Chicago, IN 46312.

Signal/one CX-7A, excel. $1395, 3ZS-3, 516F-Z, $625, Monitor scope, $20. Mosley CM-1 rcvr. K1-VTM (203) 244-4581.

SELL: Raytrack Horizon VI 6m 2kw linear $345. or best offer Gonset 903A 500w 2m amplifier $175. R. Delaney, 223 Lee, Ellsworth, MD 57706.

Ameco TX-62, 621VFO, $125. Clegg 22, 2m transceiver, $135. Swan 512 DC supply $70. Collins 351D-2, $35. WA3HMQ, Box 2775, Harrisburg, PA

SELL: MCX-3 NCX-A NCX-D $225. SX-115 $225 New in boxs. Ameco CN50W PS-1 $25. CAL Model UCX-303. K1NLQ.

NEED: Broadcast Band Coils for Old HRO 500 to 1000 and 900 to 2050 KC. Jim Higgins, W2CWK, R. D. 1, Box 189-3, Jamesburg, NJ

SWAN 240 and adapted Galaxy DC supply - good mobile - both for $155. W7HWL, Charles Pranger, 1932 Bonita Ave., Las Vegas, NV 89105.

Brand New Collins mechanical filter, F455 N 20 $20, Calrad DM-5 Dynamic Mobile Mic. $5, Turner 22x crystal Mic with stand $10, Certified Check or Money order, Richardson, K5EFW, 1109 Dakota SE, Albu., MN 87108.

SELL: Less than year old HW16 $80 and HG10B $35. Also NC183D $60, H.B.El. Keyer $10. U ship. Taylor, 900 W. River Dr., Stevens Point, WI

FOR SALE: Swan 350 with 410 VFO-117 XC power supply-VOX all for $350. Gonset11 $50. R. Simons, 9 Lamprey Terr., Hampton, NH 603-926-2375 after 5 PM.

SELL: Tempo 2000 Linear, excellent condition $275. Bill Blaha, 1170 So. Ridgeland Ave., Oak Park, IL 60304.

Grid-Dipper, Heath GD-1B, with coils and manual. Excellent condx., $23. W1JSS, 9 Winter Terr., Westwood, MA 02090.

FOR SALE: Drake DC Supply $85. Need KWM2 or KWM2A, 312B4 or B5, 30L1. Will pay cash. Serial numbers and all info pse. Shapiro, 1138 Boxwood Rd., Jenkintown, PA 19046.

SWAP: New unused 4CX1000A for new unused 3-1000Z. Ialso have several vacuum variables (also new and unused) that I will swap or sell outright. W9LOA, 366 Behm Dr., Grayslake, IL 60030. PH 312-223-5139.

Advance copy-send $.16 SASE to Int. AR Society for copy petition to FCC that will bring law and order. P.O. Box 385, Bonita, CA 92002.

SALE: Heath DC sup. HP-14 needs power transistor $35, Heath Compact Linear HA-14 and AC supply $100, Conar Scope No. 250 new with probes $80. F. Miller, 210 Spruce, Clarkson, NB 68629.

WANTED: Hammarlund HQ-180A mint condition. Box 1557, Corsicana, TX 75110.

SELL: Gonset GSB-100 xmtr. Hammarlund HQ-110C and HQ-170C, A-1, Manuals: Want SB-610, Swan 406B, CE20A., H.M. Peery, Box 313, Trenton, MO 64683.

WANTED: Heath HM102 Wattmeter/SWR, IT-17 tube checker, IM103 line voltage monitor, HD-20 xtal calibrator, also used call books, 305 pos coax switch, and old Heath catalog (1963-65) T. Coddington, WB6AWC, 7825 Scotts Valley Rd., Lakeport, CA 95453.

Touch Tone pads, decoders, tone burst kits-write for list. Autopatch systems ltd., Box 291, Western Springs, IL 60558.

WANTED: lafayette HA-46 Bob K6GEV, 11 Wool, San Francisco, CA 94110.

WANTED: Eico electronic keyer, state price and condx in 1st letter, I pay shipping. WBØFKL, G.L. Gardner, R.R. 2, Vinton, IA 52349.

Worked South America certificate: Work all 13 countries. Send list and $1. HC1TH, 4805 Willowbend Blvd., Houston, TX 77035.

Washington DC QTH for sale on Beltway. Convenient to Andrews AFB. Sase for details. K3RCF.

Sell: Clegg 22'er MK II, 40 watts AM, Galaxy FM-210, 2 meter, 10 watts FM, AC/DC, xtals, mic. Local deal. WA2KOK, 5 Douglas Ter., Marlton, NJ.

Sell: new deluxe Vibrokeyer $20. New Brown double lever $12. Combs, W9LHL, 547 W. Jackson St., Chicago, IL 60606.

Sears automatic slide projector $45. 55X telescope $15. Need old QST's. WN4UCC, 96 Hallmark Estates, Athens, GA 30601.

R.F. wattmeter, Drake, new, WV4 0-100-1000w, 10-200 mc $40. W2ASI, 15 Kensington Oval, New Rochelle, NY 10805. 914/ NE 3-7077.

SB310, SX101, SX101A, Valiant, Viking 500, NC-303, 2-B and 2-BQ, C.E. 100-V and all accessories. Write for prices. R. Conley, 37 Wyoming Ave., Billings, MT 59102.

J.H.S. Radio Club has just started, and needs donations of equipment, especially novice. Surface postage refunded. Write E. Whitman, K2MFY, Lawrence Rd. J.H.S., Uniondale, NY 11550.

Wanted: copy of book by George Everson, title, Story of Television and Story of Filo T. Farnsworth. H.P. Westler, 596 Fletcher Dr., Atherton, CA 94025

Wanted: Pre-war Collins xmttr - 4A, 32B, 32G types. Or have you handbooks? All letters answd airmail. Jock ZL2GX, 152 Lytton, Gisborne, N.Z.

For sale: Two Jan 813 tubes; two Jan 811 tubes. Make offer. W6DOU, 3154 Stony Point Rd., Santa Rose, CA 95401.

WANTED: Dow-Key 78 series manual coax switches, all types. Ron Sibbitt, VE3CKU, 45 Paisley Blvd. W. No. 1008, Cooksville, Ont.

Regency Hi/Lo Scanner TMR-8 H/L in factory sealed carton. $139 plus COD. G.R. Cartledge, K4-FGX, Rt. 4, Noble Dr., Abbeville, SC 803-446-2131.

Swan 350 Late 117XC VOX New finals mint $235 FOB. W9ORU, OS286 Church St., Winfield, IL 60190.

SALE: Rcvr HQ110 w/clock Ham Bands 6-160M $100. Xmtr DX60 10-8M $65. VFO HG10B2 2-80 M $30. WA1PNQ, 5 Cook Close, Ridgefield, CT

Sweep Generator, Eico 369, cables, manual. $40. W9OEQ, 20035 Burr Oak Lane, Mokena, IL 60448

Christian EnListing Amateur's & Gift Each Month. Send QSL incl Birthday, operating freqs/times to K4CLA GEM 5/111-A Oak Dr., Lexington, SC

Homebrew linear-4 811As in GG w/ separate HD power supply. First $75. FOB Dallas. Gaston, 2117 Westlake Dr., Plano, TX 75074.

Collins mech filters F455Y-21 (2.1kHz) F455JOS (500Hz) with LSB and USB crystals $25 ea or both $40. PPD. Steve Pursley, 135 Sioux Dr., Greensburg, PA 15601.

SELL: ARRL Handbooks '57, '60, '61, '64, '65, '67, '68, '69 good cond. $2.50 ea PPD. K8OUQ, 268 Annis Ct., Chillicothe, OH 45601.

WANTED: Old battery radios of the early 1920's Need not be in working cond. Also want old toys State Model numbers and price. McKenzie, 1200 W. Euclid, Indianola, IA 50125.

Many CQ & QST your price Heath SWR new Dow-Key Speed Graphic 35mm 16mm cameras 4x5 enlarger, Want HW12/32 antenna linear. KØTQH.

WANTED: T4X, R4A, Telrex 40, 20 Mtr beams. Quote your lowest price. WØAIH, Paul Bittner, 814 4th St. S., Virginia, MN.

FOR SALE: 24 V 50 A Sola DC power supply, 7" VTVM, TDQ 2mtr xmtr, 14" Conrac Monitor Time delay relays. Karl H. Paquee, 53 Jerome Ave., Trumbull, CT 06611.

Instructograph cod machine with tapes, manual and AC oscillator $40 cash. FOB. W5LGY, 1501 Monroe, Commerce, TX 75428.

SELL: Clegg Venus xcvr and Clegg Appollo Linear, with spare finals. $350, WA2SVD (201) 341-4159.

BC-221M with calibration book. Like new. Best offer. John Springer, 5731 Cannon Ln, Alexandria, VA 22303.

Dow-Key Coax Relay, 110 VAC Coil. $10 Postpaid Anderson, 639 No. Wahsatch, Colo. Springs, CO 80903.

HW-16 (built for Nephew, didn't get ticket, used once) $85. WA2RYC.

Low freq DX antenna cost $7200 will sell $350. Collins 237-W1 X conical monopole high gain on 80-40. WA0EMS, P.O. Box 11, Liberty, MD 64068.

Wanted: Collins 75A4 very reasonably priced. OK if it needs repair. Sell SB-300, SB-400 & 500 watt linear - $300. W. Small, 27828 E. 15th St., Hayward, CA 94544.

Wanted: manual for NC-100 National recv. Will buy or copy. Also want old receivers regardless of condition. Want old radio mags, parts, etc from 1920's. State price first letter. W2GHF, 45 Allen Dr., Woodstock, NY 12498.

Scare TN-2B/APR-1 tuner for sale, 76-300MHz in 30 MHz out, w/part copy manual, $55. R. Dewey, 7 Caroline Dr., Bennington, VT 05201.

Prop pitch and selysns, modified including compass rose and drive circuits $65. P. Butler, W1BPW, 3 Elizabeth Dr., Merrimack, NH 03054.

Want: Unimat or small drill press. Sell or swap. Ultrasonic cleaner. WB2FKA, 28 Bridlemere, Interlaken, NJ 07712.

Sell: Heath VFO HG-10B w/manual, like new $25. Ameco pre amp Model PCL-P, $25. U pay shipping. WA2DNY, 17 Clauss Av., Paramus, NJ 07652.

Sell: 1 watt, 76/76 Unimetrics FM walkie-talkie & 2 meter AM Knight TR-108 & V-107, make offer. Pat Sheedy, WA2DHB, Box 89, Groveland, NY.

Sale: Knight V-44 VFO, T-60 xmtr w/4 xtals, TR-108, 2 meter AM xcvr w/4 xtals. All w/manuals. Excellent conditon. R. Butler, WA3OID, 202/ 584-0935.

Drake 2B rcvr, 2BQ Q-Multiplier spkr, 2AC xtal calibrator, w/manual, original owner, excellent. Gerry, WB2FJX, 158-14 85th St., Howard Beach, NY 11414. 212/ 641-4573.

Mechanical filters: 455 kHz. 2.1 kHz $18.95. 300 Hz $22.95. J.A. Fredricks, 314 S. 13th Ave., Yakima, WA 98902.

Call letter license plates, all states, prov., years, wanted for collection. I'll pay postage. Art Phillips, WA7NXL, 3401 N. Columbus, Apt. 5-O, Tucson, AZ 85712.

Swan 1200W linear, excellent, recently checked out at factory. $149. WB6KWM, Star Rt. 1, Box 105-B, Rosamond, CA 93560.

Motorola motorcycle unit (1w), 12VDC, converted to 2m, in good condx w/mike, $125 or best offer. A. LaBella, 1100 Clove Rd., Staten Isl., NY 10301.

Wanted: Drake R4 and T4 A or B model, AC4, MS-4, L4B. Will pay freight if in factory cartons. W. Croke, WA4DWR, POB 575, Windermere, FL.

For sale: Signal generator Triplett 2432, $15. 5" scope RCA W078, $30. 455 khz mechanical filter, Lafayette MF455-10-Z $10. P. Turillon, F3VN/W2, 38 Skytop Dr., Ramsey, NJ 07446.

GE Prog-Line, 150mc, 4 freq w/control $130. Gonset 151A on 146.94, 12/110V $75. BC-312 rec, like BC-348 $30. Davis, K6KZT, 4434 Josie Ave., Lakewood, CA 90713.

FT-243 type of xtal holders or out of band of same w/mounted blanks. In terested in amounts of at least 1,000. W6DOR, 2921 Loyola Dr., Davis, CA.

Sell: Kenwood TS511S, PS & VFO, perfect condx. Best offer. W4GFZ, Box 5103, Columbia, SC 29250

Wanted: Hammarlund comet pro receiver. E.F. Diehl, W7AMM, Box R136, Page Comm Engrs, APO New York 09205.

Sell: Dycom PSU-13 scaler, excellent. $60. V. Fitzpatrick, WA8OIK, McLain Pk., M203, Hancock, MI

For sale: Motorola 41V, 12 VDC, rear mount $75. 34-94. WB4MTE, 1612 Stone Av., Crossville, TN.

Wanted: A H.P. 410 B or C meter in excellent condition. Have 2 Atwater Kent electric radios for sale or trade. P. Williams, 106 S. Jefferson, Lewisburg, W. VA 24901.

Osteopathic Physicians - Hams please contact student w/great interest for correspondence/sched. Stan Johnson, 279 Hawkeye Cts., Iowa City, Iowa.

Join the Radio QSL Club of Greater New York. Details: Mitchell Rakoff, 64-33 98th Street, Rego Park, NY 11374.

Wanted: 3-500z. Rod, W7YBX, 5632-47 S.W., Seattle, WA 98136.

Sell: complete NRI amateur radio course w/CW receiver, transmitter, code record, key, w/answers to all lessons and exam. $110 postpaid. Parker, Box 546, Vista, CA 92083.

Wanted: Used Swan linear 1200X. WA8RIS, 13625 Leroy Ave., Cleveland, OH 44135.

For sale: Used, good lab test equip, including scopes records, tube testers, pow supplies, nuclear equip, signal gen, and more. Write: E. Weiss, 168 Kirch Rd York, PA 17402.

For sale: NCX-200 w/matching NCX-A supply/spkr $260. Heath balun coil B-1 $5. K1MWF, Plainville, Conn.

Wanted: H.V. transformer, 1500-0-1500 at 500 ma. Give size, weight and price. A.S. Gillespie, K4TP. 618 Hillcrest Av., Gastonia, NC 28052.

For sale: Midland TV camera, Model 15-520. $200 or best offer. Ross Hansen, WN7TZU, Preston, Idaho 83263.

Surplus components: Hammarlund MC capacitor 6-35 pf - 80 cents. R.C. dual capacitor 260 pf, 1600-vdc - 95 cents. Millen 2-3/4" dial - 30 cents w/vernier - 42 cents. Add postage. Ken Maas, Burlington, Wisc. 53105.

For sale: KWM2-A, 516F-2, $850. KWS-1 No. 13-65, 75A-4 No. 5831 (0.5, 3.1, 6.0), spkr, $1095. 200-V, $250. BW-6100, $150. SB-620, $95. Craig, 29 Sherburne Av., Portsmouth, NH 03801.

Hallicrafters PS-150-12 pwr sply, no cables, $50 or trade for HP-23. Don, WA6ENG, 7621 El Lobo, La Palma, CA 90623. 213/860-8676.

Must sell for college - Heath DX-60 and HR-10B, both like new. WB2DZK, 110 Buttercup Lane, Hunting, NY 11743.

Sell: Globe DSB-100 ten thru 80M. AM-DSB CW 200 watts DSB, 150 AM, top condx, make offer. Kelley, W8ZLU, 7204 Clovernook, Cincinnati, OH.

FT-101 "B" technical/op manual $2.50 PPD. S. Yates, Box 8, Seattle, WA 98762.

Tube sale: 813's $25 pair, 416B's $9, 6161's $15. 6146W's $3.75, 1Q23 $1, 807's or 1625's $1.50, 5V4 or 5R4 75 cents ea. J. Schrenk, 2707 McDivitt Rd., Madison, WI 53713.

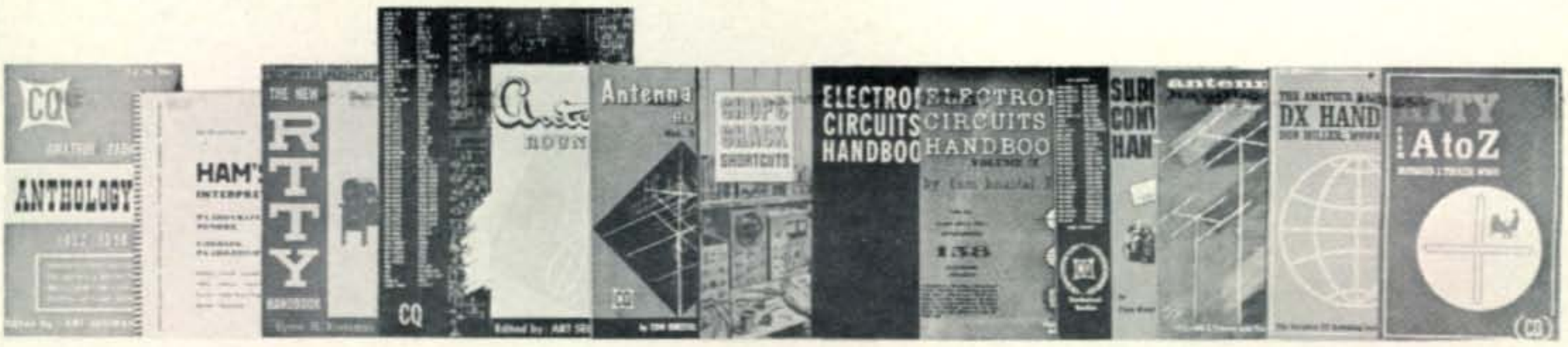
Wanted: Gonset 2 meter sidewinder. Sell or trade Collins R390, gud condx. WA4AEM, 3523 N. Druid Hills, Decatur, GA 30033.

For sale: RTTY demodulators. ST-6 complete w/separate boards for both 170 & 850 shift. Also includes AK-1 AFSK unit. Excellent condx, now on the air. ST-5 terminal unit, complete, is available also. Marlington H.S. Amateur Radio Club, 10450 Moulin Ave., Alliance, OH 44601.

Heath SB650, SB401, Twoer, Magnum Six for Heath gear. C. Secrest, WA8ASV, 4245 Meadowlark, Flint, MI 48504. 313/732-4235.

Wanted: Collins 51J3-4 or R-390. Have new Regency 212 & cash. L.I. Schmidtke, Box 462, Faribault, MN 55021.

Drake R4A, T4X, MS4, AC-3, complete all manuals and cables, new condx $600. K2TKE, Melville H.S. Old Town Rd., Setauket, NY 11733, W2AAF, Trustee.



CQ BOOK SHOP

Ham's Interpreter

This valuable book is imported from Germany and written by DL1CU. It contains a collection of phrases and expressions designed to assist those amateurs who wish to enlarge their knowledge of various languages for use on amateur radio. It is a must for every DX'er. $1.50

CQ Binders

Convenient and economical are the words for CQ's beautiful maroon and gold binders. Individual issues can be removed quickly and easily without damage to the magazine. Save precious time as reference copies are within immediate reach in this handy binder. $5.00

The New RTTY Handbook

A treasury of vital and "hard-to-get" information, this book is loaded with valuable equipment schematics, adjustment procedures, etc. A boon to beginner and pro. A special section on getting started, written by Byron Kretzman, W2JTP, a well-known authority in the field. $3.95

Surplus Schematics

Ken Grayson has loaded this book with schematics for currently popular pieces of conversion gear, making it invaluable to amateurs as a guide to surplus gear. $2.50

Antenna Roundup I

Edited by Art Seidman, a 160 page mass of antenna information directed at answering a multitude of questions surrounding the mysterious antenna. $3.00

Antenna Roundup II

Ten big theory articles backed up by 82 detailed and illustrated construction projects from VLF to microwave, long wires to 17 element beams and Sterba Curtain arrays. $4.00

Shop & Shack Shortcuts

A volume packed with hundreds of hints & shortcuts collected by Don Stoner, this will help anyone to dress up his shack, improve shop techniques and increase efficiency and equipment. $3.95

CQ Anthology II

1952-1959 250 pages of more recent but still hard-to-get important articles from glorious yesteryear. $3.00

Electronic Circuit Handbook I

Written by Tom Kneitel, WB2AAI, this details 150 of the most often needed circuits in 11 great chapters. Invaluable for beginners and old-timers alike. $3.00

Electronic Circuit Handbook II

Tom Kneitel's own sequel to Vol 1, this volume delivers 159 additional circuits that will appeal to all amateurs. Each circuit is fully described in text with complete schematics. $3.00

Surplus Conversion Handbook

Compiled by Tom Kneitel, WB2AAI, this contains 192 pages of conversion articles, covering almost every piece of surplus gear worth the effort to convert to ham use. $3.00

Antenna Handbook I

All new information on transmission line theory, Attenuation, Impedance, Standing waves, Resonant and nonresonant lines, current distribution, free space 3 dimensional patterns of long wires of all practical length and much, much more by Ken Glanzer. $4.00

The New DX Handbook

Don Miller's 200 pages of valuable technical information and operating aids, most of which has never been published before and can be found in no other volume contains Great Circle Bearing Charts. $5.00

RTTY From A To Z

This new RTTY Classic has been produced to fill the gaps in RTTY knowledge among amateurs and professionals alike. 16 chapters and 224 pages. This book is a must in your technical library. $5.00

103 - Simple Transistor Projects

The aim of this book is to familiarize the beginner and advanced experimenter with the handy source of reference circuits. **$3.45**

☐ CQ Anthology II	$3.00	☐ Shop & Shack Shortcuts	$3.95
☐ Ham's Interpreter	$1.50	☐ Electronic Circuits Handbook I	$3.00
☐ CQ Binders	$5.00	☐ Electronic Circuits Handbook II	$3.00
☐ New RTTY Handbook	$3.95	☐ Surplus Conversion Handbook	$3.00
☐ Surplus Schematics	$2.50	☐ Antenna Handbook I	$4.00
☐ Antenna Roundup I	$3.00	☐ New DX Handbook	$5.00
☐ Antenna Roundup II	$4.00	☐ RTTY From A To Z	$5.00

☐ 103 - Simple Transistor Projects ... $3.45

NAME _____

ADDRESS _____

CITY _____

STATE _____ **ZIP** _____

New York City and State residents must add sales tax applicable to your area.

COWAN PUBLISHING CORP. Book Div.
14 Vanderventer Avenue • Port Washington, L.I., N.Y. 11050

READER SERVICE

To obtain literature from advertisers, simply check the box to the name of each advertiser listed below whose product or service is of interest to you.

APRIL, 1973

1 ☐ Arrow Electronics, Inc.
2 ☐ Barker & Williamson, Inc.
3 ☐ Barry Electronics
4 ☐ Bomar Crystal Co.
5 ☐ Columbia Electronic Sales, Inc.
6 ☐ Command Productions
7 ☐ Communication Technology Group (Bitcil)
8 ☐ Crystek
9 ☐ Cush-Craft
10 ☐ Data Engineering Inc.
11 ☐ Datak Corp.
12 ☐ Dayton Hamvention
13 ☐ Drake, R. L., Co.
14 ☐ DX Engineering Co.
15 ☐ DYCOMM
16 ☐ E-Z Way Products, Inc.
17 ☐ Eimac, Div. of Varian
18 ☐ Fair Radio Sales
19 ☐ G & G Radio Electronics Co.
20 ☐ Goodheart, R. E., Co.
21 ☐ Gregory Electronics Corp.
22 ☐ Hallicrafters Co., The
23 ☐ Ham Buerger, Inc.
24 ☐ Heath Company
25 ☐ Henry Radio
26 ☐ Hobby Industry
27 ☐ Hy-Gain Electronics Corp.
28 ☐ Icom East/West
29 ☐ International Crystal Mfg. Co.
30 ☐ Jan Crystals
31 ☐ Juge Electronics, Inc.
32 ☐ KA Sales
33 ☐ KW Electronics
34 ☐ Leader Instrument Corp.
35 ☐ Liberty Electronics, Inc.
36 ☐ Linear Systems, Inc.
37 ☐ Lunar Communications
38 ☐ Midland Electronics Company
39 ☐ Millen, James, Mfg. Co., Inc.
40 ☐ Mosley Electronics Inc.
41 ☐ National Radio Institute
42 ☐ New-Tronics Corp.
43 ☐ Omega-T Systems Inc.
44 ☐ Palomar Engineers
45 ☐ Payne Radio
46 ☐ Polygon Company
47 ☐ Regency Electronics, Inc.
48 ☐ Robot Research, Inc.
49 ☐ Sams, Howard W.
50 ☐ Savoy Electronics, Inc.
51 ☐ Space Electronics
52 ☐ Stewart Electronics
53 ☐ Structural Glass Ltd.
54 ☐ Swan Electronics
55 ☐ Telex Communications Division
56 ☐ Telrex Communications Engineering Laboratories
57 ☐ Ten-Tec, Inc.
58 ☐ Thomas Electronics & Eng. Co.
59 ☐ Unadilla Radiation Products
60 ☐ Van W2DLT
61 ☐ World QSL Bureau
62 ☐ Yaesu Musen USA, Inc.

A	B	C	D	E	F
63	64	65	66	67	68

CQ Reader Service Department
Box 509
Mount Kisco, NY 10549

Name .....**Call**.....

Street Address .....

City .....**State**.....**Zip**.....

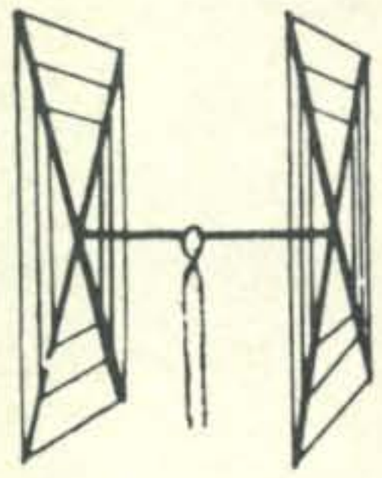
ADVERTISER'S INDEX

WHICH ANTENNA WINS THE CONTEST ?

In open competition against thousands of commercial and home-brew antennas, WA1JFG won the New England championship with a Gotham beam, by a margin of 5,982 points! WB2JAM won the sectional award for the Sweepstake contest in 1969 and 1970 with a Gotham 4-element 15 meter beam! Hundreds of unsolicited testimonials from grateful hams are our proof that Gotham antennas give you the best design, and the best materials. Forget our low prices - rely on the results of open, competitive contests. Ask yourself: Why do Gotham antennas win?

QUADS

Worked 42 countries in two weeks with my Gotham Quad and only 75 watts . . .



W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount: uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16' square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10' long x 1¼" O.D.: 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Each framework consists of two 12' sections of 1" OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞" tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished): 52 ohm coaxial cable

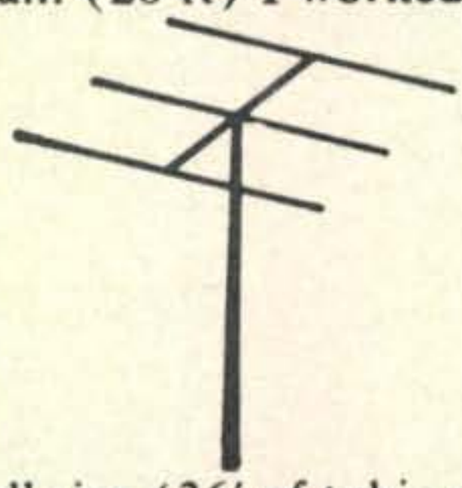
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$41.00
10-15 CUBICAL QUAD	36.00
15-20 CUBICAL QUAD	38.00
TWENTY METER CUBICAL QUAD	31.00
FIFTEEN METER CUBICAL QUAD	30.00
TEN METER CUBICAL QUAD	29.00

(all use single coax feedline)

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9-ADQ, and 4U1ITU THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history!



Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 EL 20	$25	4 EL 10	24
3 EL 20	31*	7 EL 10	38*
4 EL 20	38*	4 EL 6	24
2 EL 15	21	8 EL 6	34*
3 EL 15	25	12 EL 2	31*
4 EL 15	31*		
5 EL 15	34*		

*20' Boom

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2-ODH, WA3DJT, WB2FCB, W2YHH, VE3-FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1-MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3-KT. Moral: It's the antenna that counts!
FLASH! Switched to 15 c.w. and worked KZ5-IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5-CLK. OZ4H. and over a thousand other stations!

V40 vertical for 40, 20, 15, 10, 6 meters	$18.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$20.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$22.95

GOTHAM
1805 Purdy, Dept. CQ,
Miami Beach, Fla. 33139

"HOW TO ORDER: Send money order (bank, store, or United States) in full. We ship immediately by best way, charges collect. DEALERS WRITE."

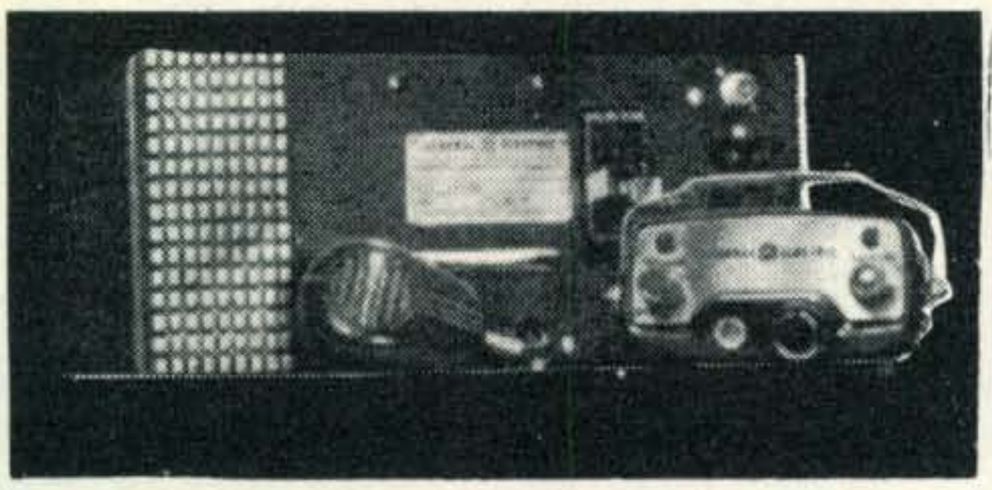
FM 2 Meter UHF 6 Meter USED

GENERAL ELECTRIC . . . RCA . . . MOTOROLA

General-Electric Progress Line

2 Meter Mobile Units

14" case (less accessories & ovens)



MT/33

12 volts, 30 watts, transistor power supply **$128.**

MA/E33

6/12 volts, 30 watts, vibrator power supply **$58.**

Accessories available for each above units..... $30.

Just Arrived! General-Electric "Message Mates" High Band Receivers with SEL-CALL

G.E. PROGRESS LINE STRIPS physically complete, sold on air as-is basis only.

	LOW BAND		VHF		UHF
	MA/E13	MA/E16	MA/E33	MA/E36	MA/E42
Power supply, 30W, less vibrator	$20	—	$20	—	$20
Power supply, 60W, less vibrator	—	$25	—	$25	—
TX narrow band, less final tubes Note: MA/E42 wide band	$18	$25	$25	$30	$12
RX wide band, less ovens	$18	$18	$18	$18	$12

14" Progress Line Case, consisting of front basket and front plate with lock ..... $10.

Low band dual front end, 2 freq. strip ..... $20.

Hi-Band TPL RX with TX exciter strips less speaker, as is, missing parts $25

15,000 2-way FM mobile units in stock! Send for new '73½ catalog.

GREGORY ELECTRONICS CORP.

The FM Used Equipment People

249 Route 46, Dept. CQ, Saddle Brook, N. J. 07662

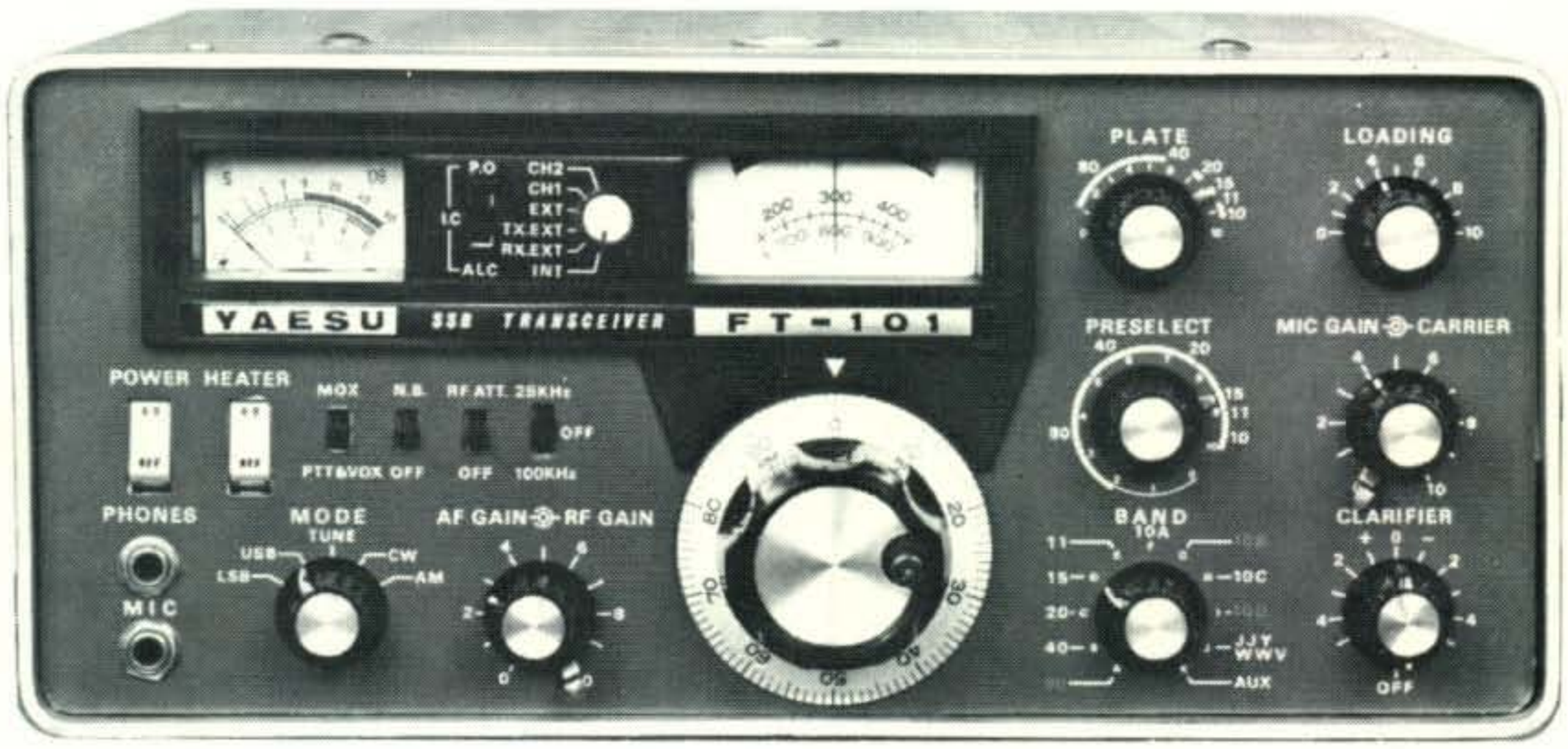
Phone (201) 489-9000

Announcing

The formation of **YAESU MUSEN USA, Inc.**

as the official factory service representative in the Western hemisphere for the sale and service of all YAESU amateur radio equipment. The YAESU line will now be offered for sale through highly reputable servicing dealers, providing an uninterrupted flow of the very popular YAESU amateur line.

For the name and address of our franchised YAESU dealers, write



YAESU MUSEN USA, Inc.

7625 East Rosecrans Ave., Suite 29, Paramount, CA 90723 / (213) 633-4007

This is the world's most powerful shortwave transmitter.

This compact, single tube amplifier, located in the EIMAC facility, develops over 1300 kilowatts of 100% modulated carrier. It is quickly and easily tunable over the range of 15 to 30 MHz. Drive power at the grid of the tube is less than 5 kilowatts.

Using a single EIMAC X-2159 super-power tetrode in a Continental Electronics transmission line-cavity configuration, this amplifier combines high power gain with excellent operating stability and complete freedom from circuit parasitics.

A single amplifier stage using two EIMAC X-2159 tubes is capable of over 2.5 megawatts of 100% modulated carrier. Two amplifiers combined would make a 5 megawatt transmitter a practical reality.

The EIMAC X-2159 super-power tetrode is designed for MF and HF broadcast service, VLF communications, SSB linear service and extremely high power pulse modulator applications.

The X-2159 is another example of tomorrow's tube that's ready today at EIMAC. For complete information, contact EIMAC Division of Varian, 301 Industrial Way, San Carlos, California 94070. Or any of the more than 30 Varian/EIMAC Electron Tube and Device Group Sales Offices throughout the world.

Eimac
division
varian