

COQ

March 1972
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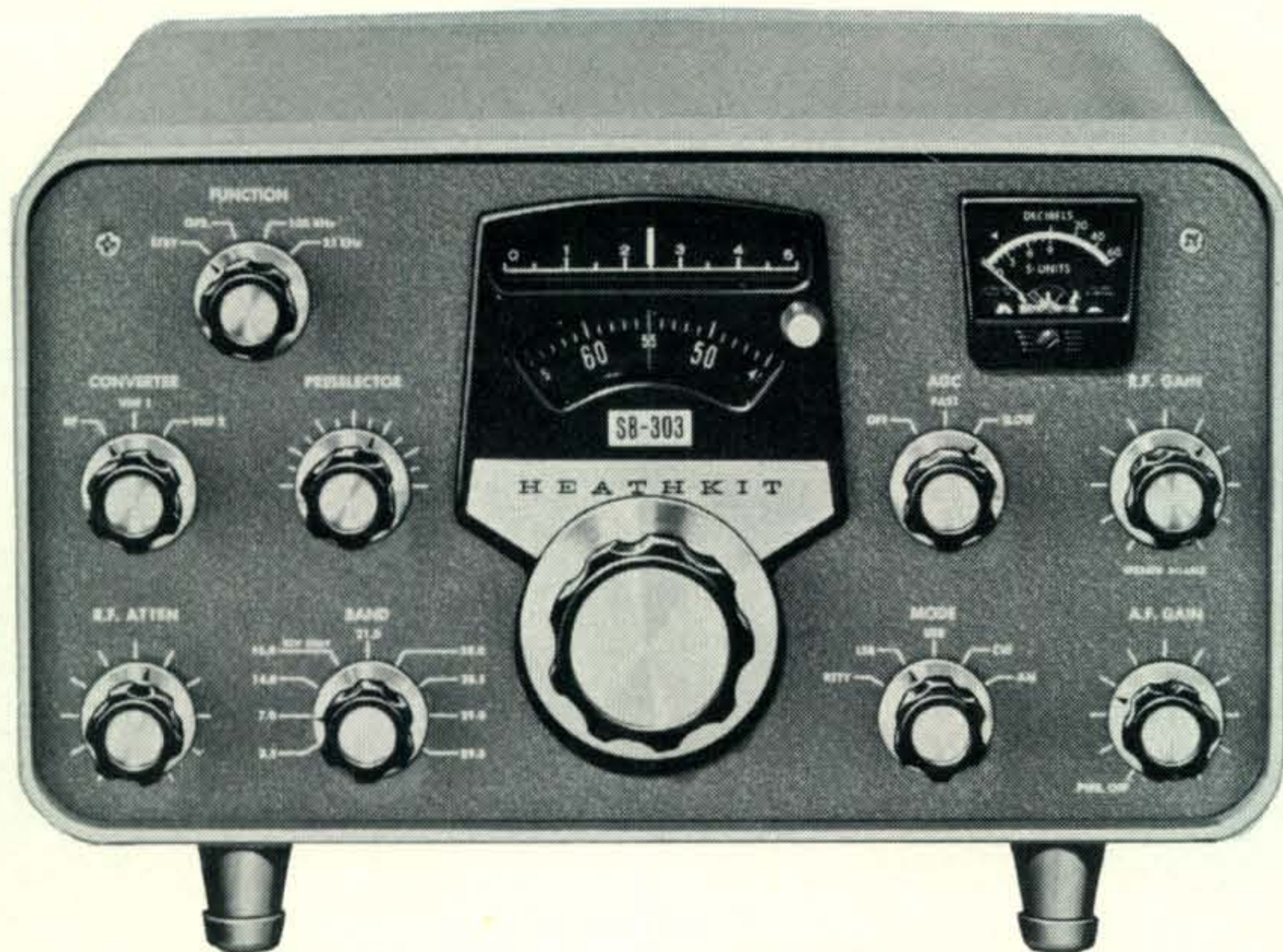
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The Radio Amateur's Journal

08240

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SB-303 SPECIFICATIONS — **Frequency Range:** (MHz) — 3.5 to 4.0, 7.0 to 7.3, 14.0 to 14.5, 15.0 to 15.3, 21.0 to 21.5, 28.0 to 30. **Intermediate Frequency:** (IF) — 3.395 MHz. **Frequency Stability:** Less than 100 Hz drift per hour after 10 minutes warmup under ambient conditions. Less than 100 Hz drift for ±10% line voltage variation. **Frequency Selection:** Built-in Linear Master Oscillator. **Modes of Operation:** SSB — Single sideband (suppressed carrier, with selectable upper or lower sideband). CW — Keyed continuous wave. AM — Amplitude modulated continuous wave. RTTY — Radio teletype (frequency-shift keyed continuous wave). **Sensitivity:** Less than 0.25 uV for 10 dB S+N/N for SSB operation. **Overall Gain:** Less than 1.5 uV input for 0.5 audio output (single tone SSB). **AGC Characteristics:** Blocking — Greater than 3.0 V CW/SSB/RTTY. **Dynamic Range** — Greater than 150 dB CW/SSB. **RF Attenuator:** Variable 0-40 dB nominal. **Selectivity:** SSB — 2.1 kHz @ 6 dB down, 5.0 kHz maximum @ 60 dB down (crystal filter supplied). CW — 400 Hz at 6 dB down, 2.0 kHz maximum at 60 dB down (crystal filter available as an accessory). AM — 3.75 kHz at 6 dB down, 10 kHz maximum at 60 dB down (crystal filter available as an accessory). RTTY — 2.1 kHz at 6 dB down, 5.0 kHz maximum at 60 dB down (uses SSB crystal filter). **Image Rejection:** 60 dB or better. **IF Rejection:** 3.395 — greater than 55 dB. 8.595 — greater than 50 dB. **Spurious Response:** All below 1 uV equivalent signal input. **Temperature Range:** 10° C ambient. **Dial Accuracy:** Electrical — Within 400 Hz after calibration at nearest 100 kHz or 25 kHz point. Visual — Within 200 Hz. **Calibration:** Every 100 kHz or 25 kHz. **Dial Backlash:** No more than 50 Hz. **Antenna Input Impedance:** 50 ohm nominal unbalanced. **Power Requirements:** 105 to 125 or 210 to 250 VAC, 40 W max. **Dimensions (with knobs & feet installed):** 12¼" W x 7½" H x 14" D. **Net Weight:** 15¾ lbs.

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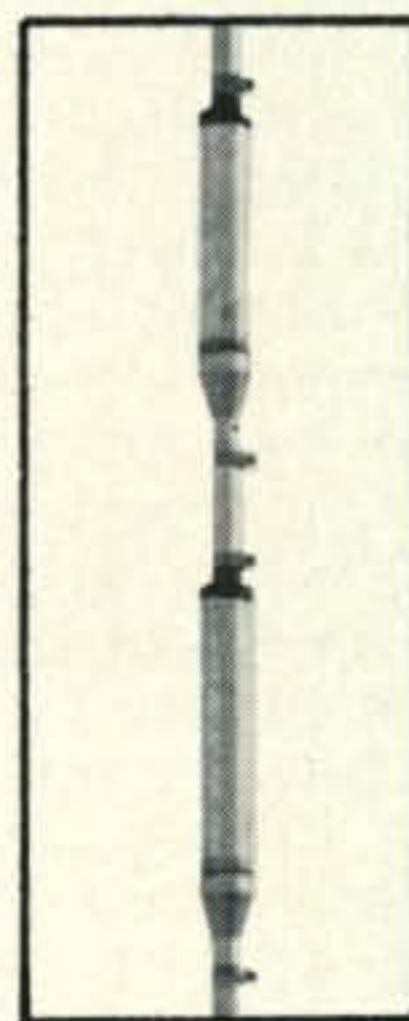
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TABLE OF CONTENTS

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EDITORIAL

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ANTENNA BASICS.....	<i>J. L. Smith, W5LLE</i>	16
THE K7GCO DXer 20 METER VERTICAL	<i>Ken "Judge" Glanzer, K7GCO</i>	22
IMPROVED 20 METER PERFORMANCE FROM THE EICO 753 TRANSCEIVER....	<i>J. W. Herbert, ZL2BDB</i>	27
A HAM VACATION IN EUROPE? Swissair and the Top Tour Ham Club make it possible.....	<i>Richard A. Ross, K2MGA</i>	30
FM: F.M. Repeater Directory.....	<i>Glen E. Zook, K9STH/5</i>	35
RULES FOR 1972 CQ WW WPX SSB CONTEST.....		41
TIPS FOR INCREASING C.W. COPYING SPEED.....	<i>Al D'Onofrio, W2PRO</i>	45
NEW PRODUCTS.....		46
CRYSTAL STABLE TUNABILITY IN TWO-METER MOBILE.....	<i>Dave Milton, K6HWN</i>	47
A HAM'S VACATION GUIDE TO THE CARIBBEAN Part II.....	<i>George Pataki, WB2AQC</i>	51
CQ REVIEWS: A HEATHKIT COLOR TV SET.....	<i>Wilfred M. Scherer, W2AEF</i>	57

DEPARTMENTS

ANNOUNCEMENTS	10	PROPAGATION	68
CONTEST CALENDAR	75	Q & A	12
DX	63	USA-CA	73
OUR READERS SAY	7	SURPLUS SIDELIGHTS	77
ZERO BIAS	5		

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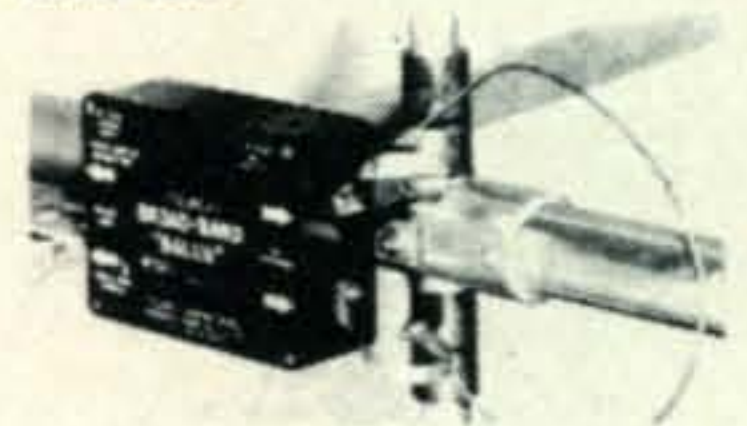
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ZERO BIAS

For several months the folks at the CQ office have been kicking around ideas on what we might personally do to further the technical knowledge and operating skills of the thousands of eager new amateurs joining our ranks each year and to encourage still more prospective amateurs to join them. The objective is to fill areas not already being served by existing groups. Try as we could, we haven't been able to think of anything drastically new and different that some group or another hasn't already tried.

That being the case, why not lend our services, money and time to aid groups that have already embarked on the job of training hams through the ranks. With that in mind, we began scanning the horizon to find the best possible group to work with. Conversations with many knowledgeable hams across the country led us almost universally to one man, Bill Welsh, W6DDB. Some years ago, Bill won the coveted Edison Award for his contributions towards aiding newcomers and old timers alike toward license upgrading. Since that award, Bill has worked with thousands of additional hams in that area, all told having trained or helped to train more than 20,000 amateurs.

Bill met our offer for assistance with eager acceptance. Together, we formulated an idea for a brand new, non-profit ham organization whose sole purpose will be to educate and aid hams through the ranks. This organization, which we'll refer to as ARIBA will attempt to accomplish numerous objective -- many of these aims are already being achieved by Bill; our goal is to provide him with the opportunity to spread his work out on a much larger scale. Basically, the goals are these:

1. To provide amateurs with assistance to upgrade their technical knowledge of radio and to improve their operating skills as well.
2. To prepare teaching aids for clubs throughout the country who are similarly working in this general area.
3. To provide a liaison between new amateurs seeking help with clubs or individuals in their local area who are geared to offer the assistance required.

CQ will provide all necessary financial support to underwrite this project. No donations or solicitations will be made from any outside source, either individual or group. What's more, CQ will be made available to all newly licensed amateurs at our expense to be certain that these amateurs are exposed to the material being made available to them.

ARIBA is now in action ready to help all individuals or clubs who'd like our assistance. All materials, training aids, etc., will be made available free of charge.

The organization is eager to hear from old timers across the country who'd like to devote time to assisting newcomers. We'd also like to hear from hams at any level who'd like assistance to upgrade their licenses; these hams will be contacted by other local hams prepared to lend a hand.

If you're interested in any phase of this program, get in touch immediately with Bill, W6DDB at 234 South Orchard Drive, Burbank, CA 91506. He'll get the ball rolling to bring together potential students and instructors. We hope this organization will make ham radio a stronger and more enjoyable hobby. If that can be accomplished, we'll consider our task a successful one.

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OUR READERS SAY

Quick and Easy QRP

Editor, *CQ*:

Enclosed is the errata on K4AUN's and my article "Quick and Easy QRP." Except for one minor error, all of the mistakes in the schematics are my fault. Please accept my deepest apologies.

Fig. 1, p. 38: Pin K of the TX-1 should be connected to the common junction of the cathode of CR_1 and the key. The spot switch, the anode of CR_1 and the end away from the base of Q_1 of the 10K resistor should be common. This error may be best understood in the correction of the next error, this time in . . .

Fig. 2, p. 39: Pins A (AC-7), K (TX-1) and B (AC-6) should not be common with P (VO-1), but rather common to the key and cathode of CR_1 . Also the A portion of the relay of the AC-7 module is shown in the wrong position.

Fig. 4, p. 40: Resistors R_3 and R_4 have their values switches, as have capacitors C_1 and C_2 . R_5 should be 47 ohms, not 47K.

I hope you can get this in the next issue of *CQ* as I'd hate to see anyone end up frustrated by following the schematics and the units not working.

Thanks and 73,
Alex M. Clarke, K4JYM
Richmond, VA.

Bring Back 1934?

Editor, *CQ*:

I appreciate the excellent articles by William Orr, W6SAI, on the SW-3 receiver and the 1934-style transmitter. Surely this brings back fond memories to many old timers who were active in that era, and may serve to introduce some of today's amateurs to the joys of home constructing. However, I find in these articles implications that go beyond merely rehabilitating old ham gear and putting it back on the air.

The greatest difficulty in building replicas of antique transmitters is finding the parts. But this applies equally well to almost any construction article taken from the 1971 handbook. It is a fact that most electronics distributors in the country have entirely eliminated or severely cut back their stocks of small parts. Instead you find loads of factory-built ham gear, CB transceivers and hi-fi stereo equipment. Some parts are simply non-available except from the surplus dealers, the flea markets of hamfests and from a few well-stocked junk boxes.

Most present-day amateur equipment is unnecessarily complicated and difficult to service but we are told that we must pay the exorbitant prices for such gear in order to "stay modern." Most present-day amateurs feel that constructing and servicing their own rigs is beyond their ability, a feat reserved for the relatively few "experts" within the ranks of amateur radio. Yet

the fact is, a simple homebrew fifty-watt crystal controlled transmitter is capable of working just as much DX in 1971 as it was back in 1934.

Although the 1931-34 era of amateur radio was a bit before my time, I have used construction techniques similar to those described in the article for years in building my own transmitters and I find it so satisfying that I would hesitate to say that I would consider doing it any other way. In my shack one will still find push-pull r.f. stages, neutralize triodes and plug-in coils with swinging links. My antennas are fed with open-wire resonant lines and a tuner, instead of the less efficient coax cable. True, I may use a piece of sheet metal or possibly a metal chassis in place of the wooden breadboard. I will often use a 6L6 or an 807 instead of a 47 or a 210 (unless I find more of the latter in my junkbox). Some, but not all of my transmitters have had front panels. I may even replace the trusty crystal with a modern highly stable v.f.o.

It is unlikely that any of my equipment would win the Old Time Transmitter Contest, but more important than the material on hand is the spirit that went into setting up a ham station. That spirit is what distinguishes a genuine amateur from a plug-in appliance operator.

By continuing to publish articles of this nature, you could possibly instill the real spirit of amateur radio into some of today's newcomers.

Donald Chester, K4KYV
Woodlawn, TN

Editor, *CQ*:

The article by Bill Orr in November *CQ* brought back fond memories and I am trying to round up parts to duplicate.

I have wanted to get on 160 for some time and this would be a natural.

Except for one thing: as shown in the article, the darn thing won't work. At least the amplifier won't until it's driven.

There is one little connection missing. I'm sure by this time others have also so informed you—hi!

Expect to get Christmas present of subscription to *CQ*. Early season's greetings to you and all the staff.

Walt Knight, W6GB
Garden Grove, CA

Bootleggers

Editor, *CQ*:

In August of this year I received the two-letter call, K4SF. Envelopes sent to the W4 QSL Bureau in anticipation of future operation were returned almost immediately—with cards from the 1969 and 1970 DX contests.

A check revealed that the call had *not* been assigned during that period. So I have a pile of cards for what appears to be a bootlegger—they're

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K4SF, ex-W4VFP, HS1ADX
Hampton, VA.

Editor, CQ:

I have been receiving QSL cards which indicate that I have been listed as QSL Manager for the 5th call area. I am presently on duty with the 7th Fleet and therefore I am not in a position to properly discharge the duty of a QSL manager. I did not send in my name, so I would appreciate it if you could print a correction in your magazine.

At the present time I have received many cards from various parts of the world. I have also received QSL cards personally which indicate someone has been "bootlegging" my call sign. I have not operated on the ham bands for about a year and will probably not have the opportunity until around July '72. When I return to the states I look forward to being active on the ham bands again.

My address is listed in the *Callbook* as Victoria, Texas which was my last stateside address. This address is no longer valid.

I have enjoyed your magazine for nearly twenty years and have found the construction articles especially helpful in some of my homebrew projects.

RMC Weldon Rye Jr., USN WA5HUR
TACRON 11, FPO San Francisco 96601

CB's Problems Their Own

Editor, CQ:

I am a Novice, 14 years old, and I feel I have been sitting in the background long enough.

First off, I feel the code test speeds are fair enough as they are. Take in mind how long these speeds have been in use for FCC examinations. Then check all the QRM on our high frequency bands, especially 80-40-20 meters. Think of all the fun we would have with 500,000 licensed hams all trying to work at the same time. I say keep it like it is.

Also, I feel the only thing we have to say about the CBers is keep them off 220. We haven't the right to talk about what is happening on 27 MHz, because it is there, and we can't do a thing about it. Oh, some people I talk to say the FCC should close up the band. This is not a solution. Even if the band were closed up, we would still hear the same garble we always hear on channel 20. More than one million CB sets have been sold, and we don't expect those sets not to be used, legal or not, now do we? Like many of the converted ones (CB to Novice) say, they deserve what they get.

Doug Melvin, WN6GGR
El Cerrito, CA

OUR READERS SAY welcomes letters about nearly anything of interest to amateurs, whether about CQ itself, the state of the hobby, or whatever else you have on your mind. The most interesting letters will be selected for publication each month; just keep them legible.



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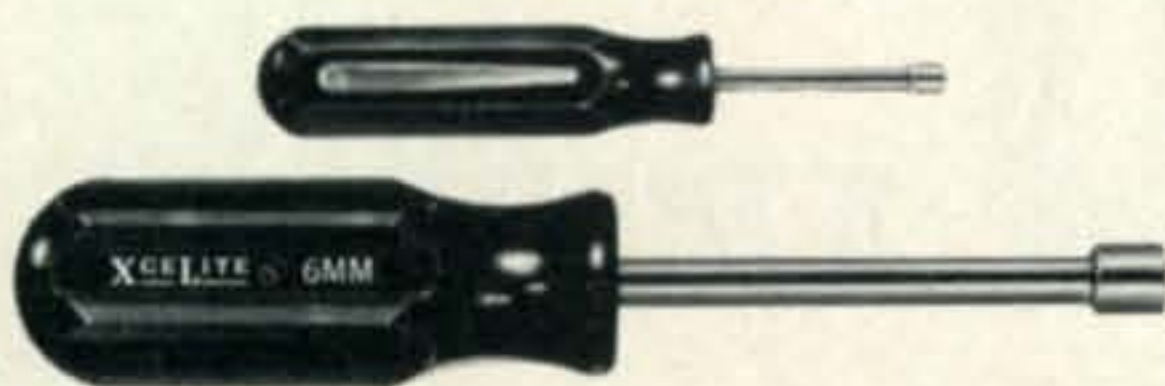
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Announcements

Wheaton, Illinois

The Wheaton Community Radio Amateur Club will hold their tenth annual mid-winter swap and shop on Sunday, Feb. 20, at the Dupage County Fairgrounds, Wheaton, Ill. Hours will be from 8:00 A.M. to 5:00 P.M. The Fairgrounds are west of Wheaton on Manchester Road just east of County Farm Road. Plenty of free parking is available. For complete details write to L. O. Shaw, W9OKI, 433 S. Villa Ave., Villa Park, Ill. 60181.

Davenport, Iowa

The Davenport Radio Amateur Club will sponsor a Hamfest on Sunday, February 27, 1972. Place Danceland Ballroom 4th and Scott Sts., Davenport, Iowa. Plenty of parking, lunch, swap tables, dealers exhibits, prizes, and eyeball QSO's. Registration, \$2.00 at gate \$1.50 in advance. For further information contact Ken Caldwell, WA0OEV, 1412 West 14 St., Davenport, Iowa 52804.

Erie, Pennsylvania

The Radio Assoc. of Erie annual Ham Auction starts at 2 P.M. Saturday, April 8 (doors open at noon), at St. George's Gym, 1-1/2 miles north of I-90 on US Rt. 19. Bring your goodies. Ample free parking. All indoors—no stairs. Refreshments available on premises. For free map and further details: RAE Auction, Box 844, Erie, Pa. 16512.

Whitewater, Wisconsin

The Tri-County Amateur Radio Club will hold their Mid-Winter Swapfest on March 5 from 9 A.M. to 5 P.M. at the National Guard Armory. Snow date: March 12. Refreshments on sale. Everything indoors. Plenty of free parking. \$1.00 advance cost; \$1.50 at the door. An extra \$1.00 reserves display table. Talk-In: 3.985 MHz. For further info: WB9DWG, R. O. Lust, R.R. 4, Box 235, Ft. Atkinson, WI 53538.

St. Joseph, Michigan

Blossomland Amateur Radio Association presents it's annual Ham Auction, Sunday, March 12, 1972, at the Shadowland Ballroom, St. Joseph, Michigan. Doors open 7:00 A.M. Admission \$2. Auctioning free. Display tables available with one-half acre under roof. For additional information write: BARA, P. O. Box 175, St. Joseph, Michigan 49085.

Johnson City, N.Y.

The thirteenth Annual Hamfest, planned and sponsored by the Southern Tier Radio Clubs is scheduled to be held at St. Johns Ukrainian Hall, Johnson City, N.Y. on April 15th at 2:00 P.M. For ticket and other information write to John

[Continued on page 90]

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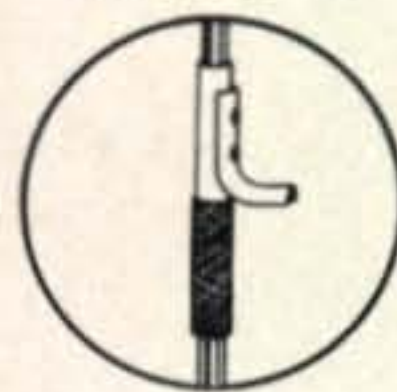
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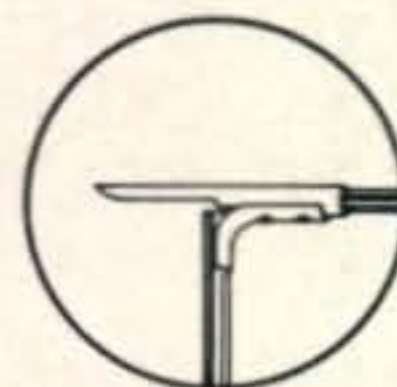
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Q & A

WILFRED M. SCHERER, W2AEF

SB-620 Scanalyzer With 75A-4

QUESTION: I'm using the Heath SB-620 Scanalyzer with a Collins 75A-4 receiver, but it takes a hefty S9 signal to put a readable pip on the c.r.t. screen. Do you have any data on increasing the gain of the SB-620 for use with the 455 kHz i.f. of the 75A-4?

ANSWER: It is understood from others that the following modifications should provide some additional gain for the 455 kHz setup in the SB-620:

1. Disconnect from Terminal 1 of TS-M the 1000-ohm resistor that goes to Terminal 6 of TS-2. Do *not* disconnect the Terminal-6 end of the resistor.

2. Locate Terminal 4 of TS-F and use a piece of hookup wire to connect the free end of the 1K resistor to Terminal 4 of TS-F.

3. Referring to Pictorial 9, remove the 10K resistor that goes from Terminal 6 to tube V₁ to ground lug FL. Replace this resistor with 100K, 1/2 watt.

The only other suggestion we have is to add a 455 kHz amplifier ahead of the SB-620. Also, see discussion on operation of the SB-620 in the Q & A Column for October 1969, p. 72.

Bandswitch Shaft

QUESTION: The bandswitch shaft for the Hammarlund HQ-140-X receiver is made of fiber material. As a result it has a tendency to twist somewhat when changing bands. Because of this, the rear wafers of the bandswitch to not revolve enough to make contact

[Continued on page 89]

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, NY 11050.



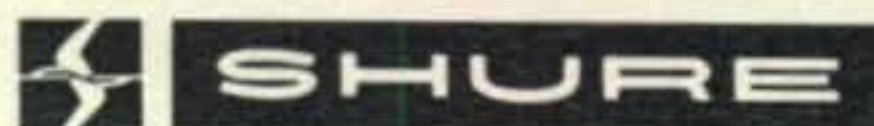
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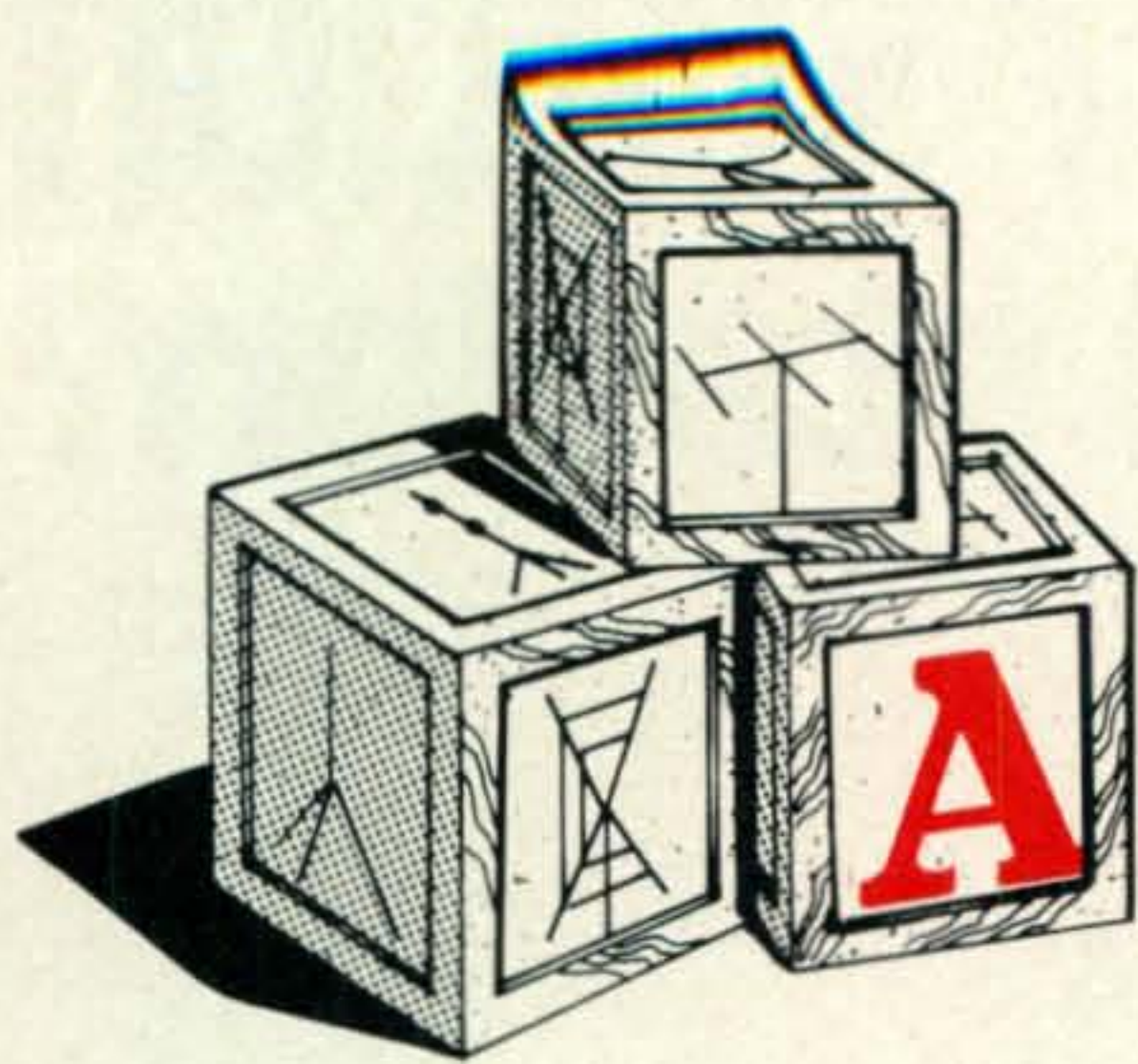
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Antenna basics

BY J. L. SMITH,* W5LLE

OF the various equipments necessary for an amateur radio station, perhaps the antenna is the most mysterious. Like most other mysteries, this one has come about through a lack of knowledge and understanding of the operating principles of the antenna. We understand best those things that we can evaluate by measurements. Unfortunately, detailed antenna measurements cannot be made using only the v.s.w.r. indicators that make up the antenna instrumentation available to most of us. By necessity then, the antenna is usually cut to length by formula and pruned a bit to reduce the v.s.w.r. The user is then left to wonder about the results and he is often subjected to a host of problems, many of which are self-created by simple "not knowing."

This article collects some of the basic information about the horizontal dipole antenna and applies it to the non-ideal situations that exist for most of us. Hopefully, it will explain relevant and interesting statements like:

- (1) Pruning an antenna is necessary, not because the formula for the length is inexact, but because of the effects on the antenna of its surroundings.
- (2) Pruning a transmission line may improve the way a transmitter loads, not because the v.s.w.r. is reduced, but be-

cause the line impedance is transformed to a more compatible value.

- (3) No matter how much an antenna length is pruned, the transmission line v.s.w.r. may never equal 1:1, not because the antenna does not reach the correct length, but because the radiation resistance of the antenna never equals the characteristic impedance of the transmission line.

An understanding of the few basics outlined in this article may save the heartbreaks that usually accompany the back-breaking task of trying to achieve the impossible.

The Antenna Proper

Those who have the real estate to place an antenna in the ideal location and at the ideal height represent a very select minority. Most of us must string our antenna between existing supports that predetermine the antenna height, direction and length. From the telephone pole in the backyard to the house gable, or from the chimney to the far eaves are much more likely supports for the majority of us. The object then is to learn how we can make the best of these supports and effectively use what we have available to us.

If the antenna is intended for use on a particular band, try to make it as near the resonant length as possible. If it is not possible to make the antenna long enough to be resonant at the desired frequency, a few extra feet can be picked up at the center with an open wire line, as shown in fig. 1. The total electrical length is the sum of L_1 through L_4 , however, the lengths L_2 and L_3 do not radiate because the antenna currents are flowing in opposite directions through L_2 and L_3 . These two lengths are so close together that the radiation of one cancels the other. Only L_1 and L_4 con-

*2405 Mesa Drive, Richardson, Tex. 75080

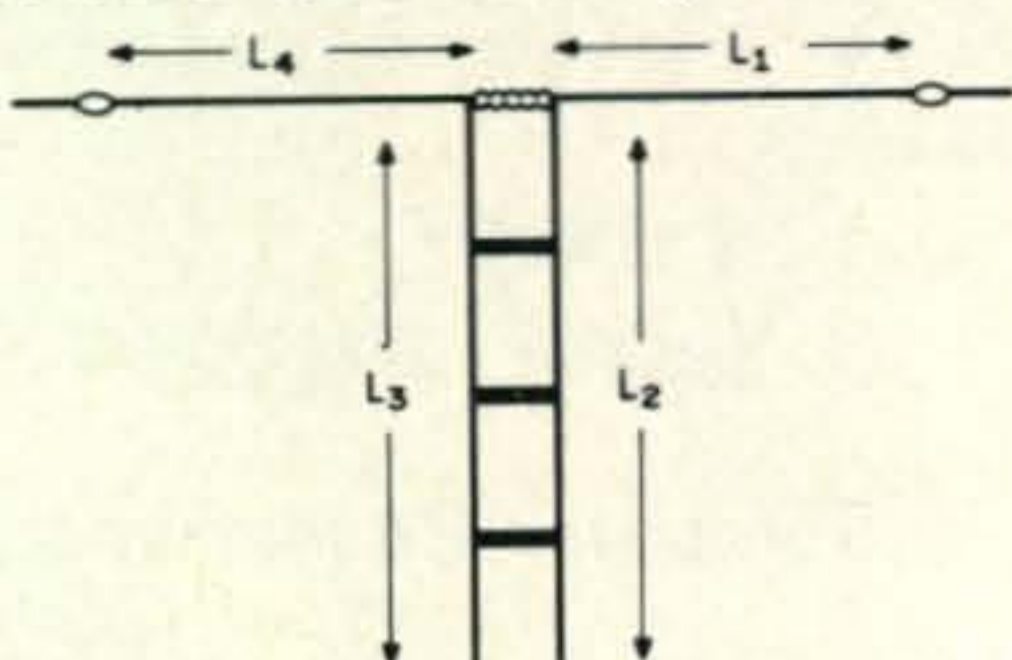


Fig. 1—Dipole antenna with open wire feed section.

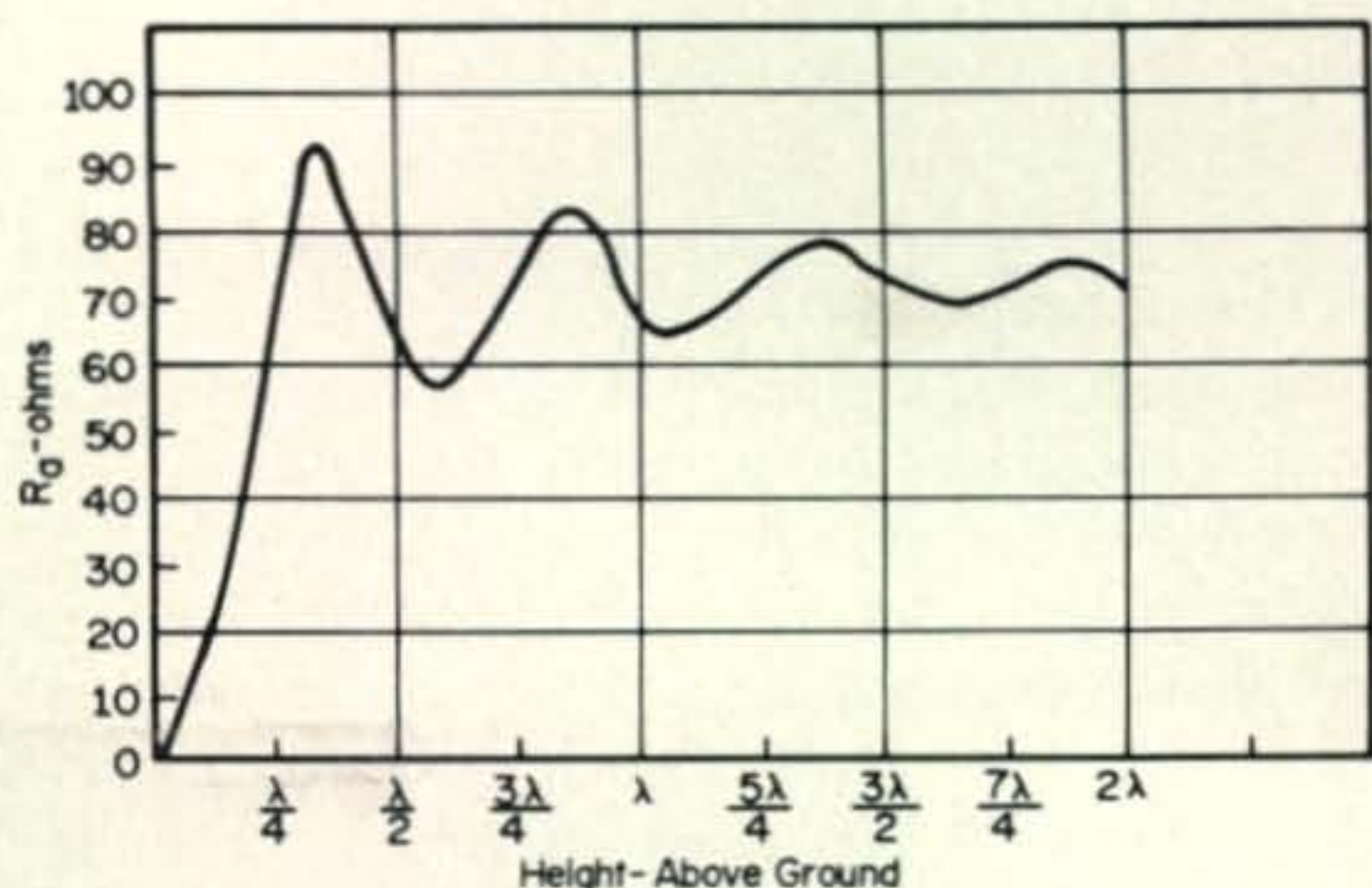


Fig. 2—Plot of theoretical radiation resistance versus antenna height in wavelengths for a resonant dipole.

stitute the radiator, but all four lengths affect the antenna tuning.

If it is not possible to achieve enough length even with the open wire lines, then empirically add a little inductance in series with the antenna until resonance is reached.

If a coaxial feed line is planned, then it is recommended that a balun be used to transform the unbalanced coaxial line to the balanced dipole or open wire feed line section. The balun is good for several reasons. It makes it easier to add the inductance mentioned earlier since the inductance can be added in only the hot leg on the unbalanced side. (Otherwise, the inductance should be inserted such that half of the total is placed in each side of the open wire feeder and this is somewhat difficult to adjust empirically.) The balun also reduces the pickup and radiation from the transmission line with the result that the receiver picks up less noise and there is less r.f. floating around the shack.

An antenna may be considered to be a series LCR resonant circuit where *R* is the radiation resistance. Above the resonant frequency the antenna looks like an inductive reactance in series with *R* and below the resonant frequency, the antenna looks like a capacitive reactance in series with *R*. At resonance, of course, the antenna looks resistive and this is usually the condition of lowest v.s.w.r. and the greatest power transfer.

The usual method of evaluating an antenna is to measure the v.s.w.r. at several frequencies in the band where resonance is sought. If the minimum v.s.w.r. occurs at a frequency lower than desired, the antenna length should be shortened and the v.s.w.r. vs. frequency data taken again. If the minimum v.s.w.r. occurs at a frequency higher than desired, the antenna should be lengthened before retaking

the data. This more or less "cut and try" method is continued until the minimum v.s.w.r. is obtained at the desired frequency.

Effect of Antenna Height

The mere fact that the antenna length has been adjusted such that the antenna drive point is purely resistive does not insure that the v.s.w.r. will be 1:1. Figure 2 is the familiar plot of antenna resistance vs. antenna height for a resonant horizontal dipole antenna. Notice that the impedance varies greatly, especially at the lower heights. Unfortunately, most of us must use the lower heights when we try to use a set of existing supports and, therefore, seldom do we achieve a perfect match to the transmission line.

The variation of radiation resistance with antenna height is caused by the current flow that is induced in the antenna by the wave reflected from the ground. For a given voltage impressed across the antenna, the normal *E/R* current flow is augmented by the induced current and this gives a net effect of a resistance change. Different antenna heights affect the magnitude and phase of this induced current and thus affect the antenna reactance and radiation resistance. Because the radiation resistance terminates the transmission line, a v.s.w.r. other than 1:1 will result unless the radiation resistance and characteristic impedance of the line are equal. Since most of us use standard transmission lines, then the minimum v.s.w.r. on these lines is determined by the radiation resistance of the antenna. Figure 3 is a plot of v.s.w.r. vs. the height of a resonant dipole for 50 and 75-ohm transmission lines. The v.s.w.r. shown in figure 3 is the absolute minimum that will be observed when the antenna is resonant. At a given frequency, for example, as a slightly long antenna is pruned through resonance, a

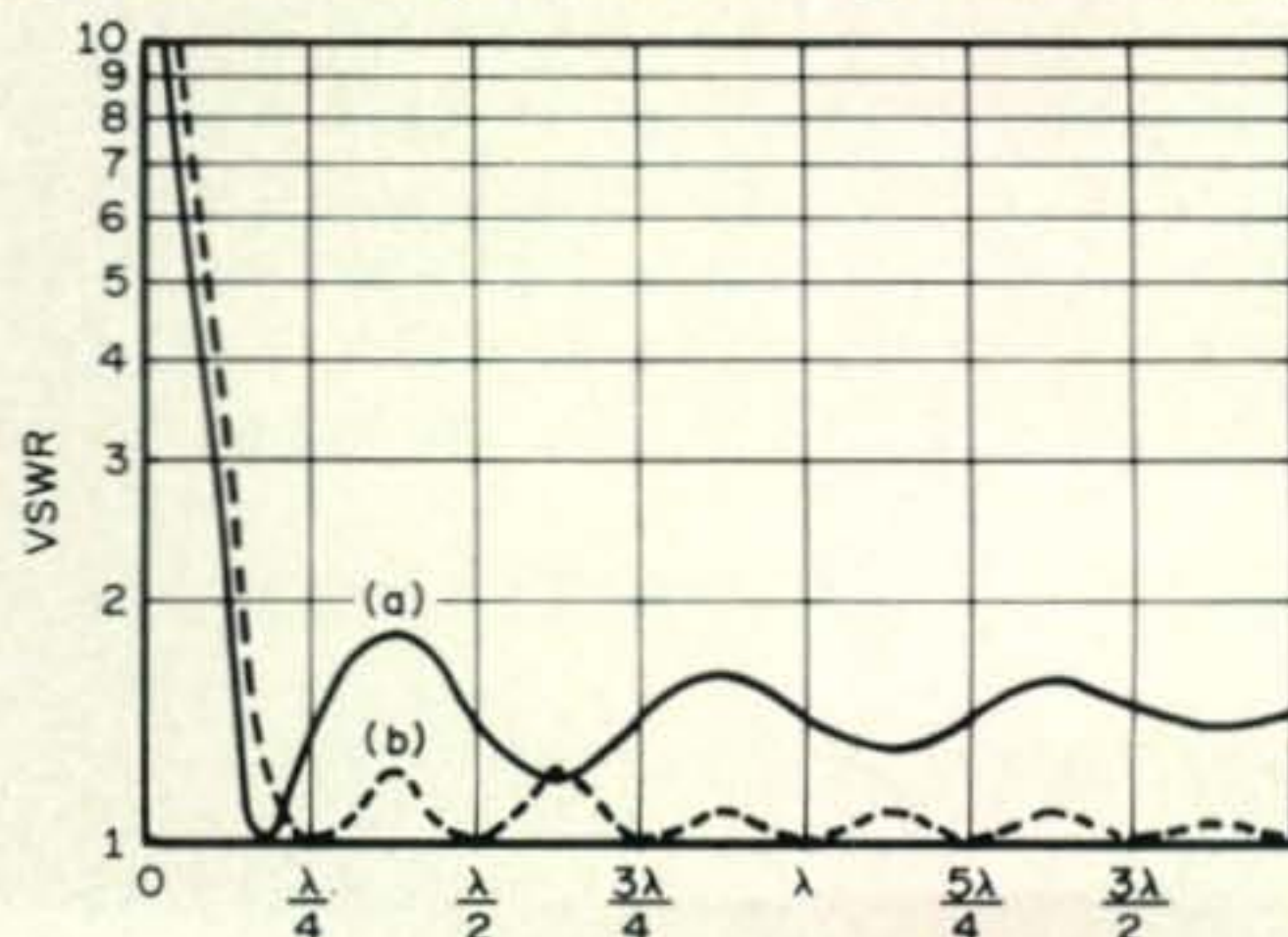


Fig. 3—V.s.w.r. vs. antenna height for a horizontal resonant dipole.

minimum v.s.w.r. will be observed and this minimum will not be less than that determined by the relation of the radiation resistance to the characteristic impedance of the transmission line. Figure 3A is a plot of antenna height vs. minimum v.s.w.r. for a resonant horizontal dipole used with a 50-ohm line. Figure 3B is a similar plot for a 75-ohm transmission line.

The fact that the v.s.w.r. does not go to 1:1 does not constitute a major disaster. However, the v.s.w.r. does effect transmitter loading and power transfer, so it is usually made as low as practical considerations permit.

In addition to the radiation resistance, the height of the antenna affects the radiation angle and the angle of the main radiation lobe affects the local and DX performance of the antenna system. While it is not intended that this article concern itself greatly with the pros and cons of the angle of radiation, fig. 4 is presented to show how the height of a horizontal antenna influences this angle. The portion of the radiated signal that gets reflected from the ground appears to originate from an "image antenna" that is apparently located below the surface of the ground similar to a mirror image.

The real and image antennas function similar to the elements of an antenna array in which the image antenna is fed with a phase difference of 180° .

Notice that at low antenna heights, *i.e.*, $1/8$ wavelength, the vertical radiation pattern is practically circular. This means that the strongest signal is being radiated straight up where it does the least good. As the antenna height is increased, however, the circular pattern begins to flatten on top as shown at the quarter wavelength height. Additional increase in antenna height causes a depression to develop at the zenith in the vertical radiation pattern and this depression grows until at an antenna height of a half wavelength, minimum signal is radiated upward. If the antenna height is beyond a half wavelength, then a third lobe begins to develop vertically as shown in the $5/8$ wavelength pattern. This third lobe grows with antenna height (See $3/4\lambda$), develops a depression (see $7/8\lambda$), and

eventually splits into two lobes with minimum radiation to the zenith when the antenna height is a full wavelength.

This process of developing the vertical lobe, its splitting, etc. continues as the antenna height continues to increase. At multiples of a half wavelength, there will be minimum signal radiated to the zenith, but the number of lobes will increase such that there are two lobes for each half wavelength of height. Consequently, the more practical antenna height appears to be a half wavelength for at this height, the signal radiation is concentrated in only two vertical lobes and fortunately they have a desirable vertical radiation angle. Also, at this height, the radiation to the zenith is at a minimum.

VSWR and the Transmission Line

A radio wave on a transmission line continually travels forward and away from the source until it reaches an impedance discontinuity on the transmission line. At the discontinuity, some or all of the wave is reflected back toward the source. A discontinuity is anything that has an impedance that differs from the characteristic impedance of the transmission line. If a transmission line is terminated in an impedance equal to its characteristic impedance, then all the energy of the radio wave is absorbed by the termination and none is reflected. The result is as though the transmission line were infinitely long because a wave started at the source never returns. A short circuit or an open circuit on the transmission line are the extremes in discontinuities and all the energy of an incident radio wave is reflected from either of these terminations.

The radio wave reflected from a discontinuity travels back toward the source and during its journey the reflected wave meets the forward traveling wave at various phase angles relative to each other. At some points along the transmission line, the forward and reflected waves add in phase and the voltage or currents reinforce each other. At other points along the transmission line, they add in opposition and the voltages or currents reduce each other. It is conceivable, then, if



Fig. 4—Vertical patterns of resonant dipole for various heights above perfectly conducting ground.

100% of the wave were reflected, there would be locations on the transmission line where the voltages were as much as twice the normal voltage and other points where the voltages were zero. If less than 100% of the wave were reflected, then the maximums and minimums would be intermediate between double and zero.

The Voltage Standing Wave Ratio (v.s.w.r.) describes the degree of match between the characteristic impedance of a transmission line and its termination by relating the forward traveling voltage and the reflected voltage.

An important concept to note is that the v.s.w.r. is the same no matter where along the line it is measured. The voltage, however, may vary as described above.

The impedance seen looking into a transmission line at a given point is the ratio of the voltage present at the given point and the current at that particular point. Assuming a lossless line, power cannot be created or destroyed by the transmission line, so the product of E and I must be constant at any point along the line. If the voltage varies due to the standing wave, then the current must also vary in the opposite direction to keep the EI product constant. The impedance of the line, or the ratio of E/I , will therefore vary considerably with a given v.s.w.r. depending where along the line it is viewed. For example, a 50-ohm line terminated with 25 ohms resistive will have a 2:1 v.s.w.r. caused by this discontinuity no matter where along the line it is measured. The impedance, however, will be 100-ohms resistive if it is measured a quarter wavelength from the termination and it will be some difference and complex impedance if it is measured at intermediate distances. The complex impedances result because the phase of the reflected wave causes a phase difference between the voltage and current except at points which are multiples of a quarter wave along the line. If the impedance were measured at a distance a half wave from the discontinuity, it would measure 25 ohms resistive and the impedance would repeat during the next half wave.

This impedance transformation effect of transmission lines is the reason that transmitters are able to load into some lengths of transmission line better than others. If the transmission line has a v.s.w.r. resulting from a resistive termination, such as a resonant antenna), the impedance seen at various

points along the line varies from the terminating resistance as one limit to as much as or as little as the terminating resistance multiplied or divided by the v.s.w.r. squared. This means that a 50-ohm line with a 5:1 v.s.w.r. may require loading into impedances as low as 10 ohms or as high as 250 ohms, or complex impedances in-between, depending upon the length of the transmission line. The impedance presented by a certain length of transmission line may not be compatible with the loading scheme of a particular transmitter so pruning the transmission line until a more palatable impedance is seen allows the transmitter to load—the v.s.w.r. is not changed by pruning the line, however.

A transmission line which is a half-wavelength long appears as a transformer with a 1:1 impedance transformation ratio. For this reason, it is usually better to make the transmission line length a half wave or a multiple thereof and therefore avoid the (v.s.w.r.)² transformation ratio that may cause difficulty in loading the transmitter.

Antenna Tuners

An antenna tuner is capable of accepting a complex impedance from the antenna or transmission line and transforming that impedance into a resistance that matches the transmission line or transmitter. Figure 5 illustrates the fact that the v.s.w.r. is reduced by an antenna tuner between the source and the tuner but the v.s.w.r. is unchanged between the tuner and the load. This means that any detrimental effects caused by the v.s.w.r. will continue to exist in that portion of transmission line beyond the tuner. If the tuner is located in the shack, then the entire transmission line is exposed to the high v.s.w.r. If the antenna tuner is located at the antenna, then none of the transmission line is exposed to the high v.s.w.r.

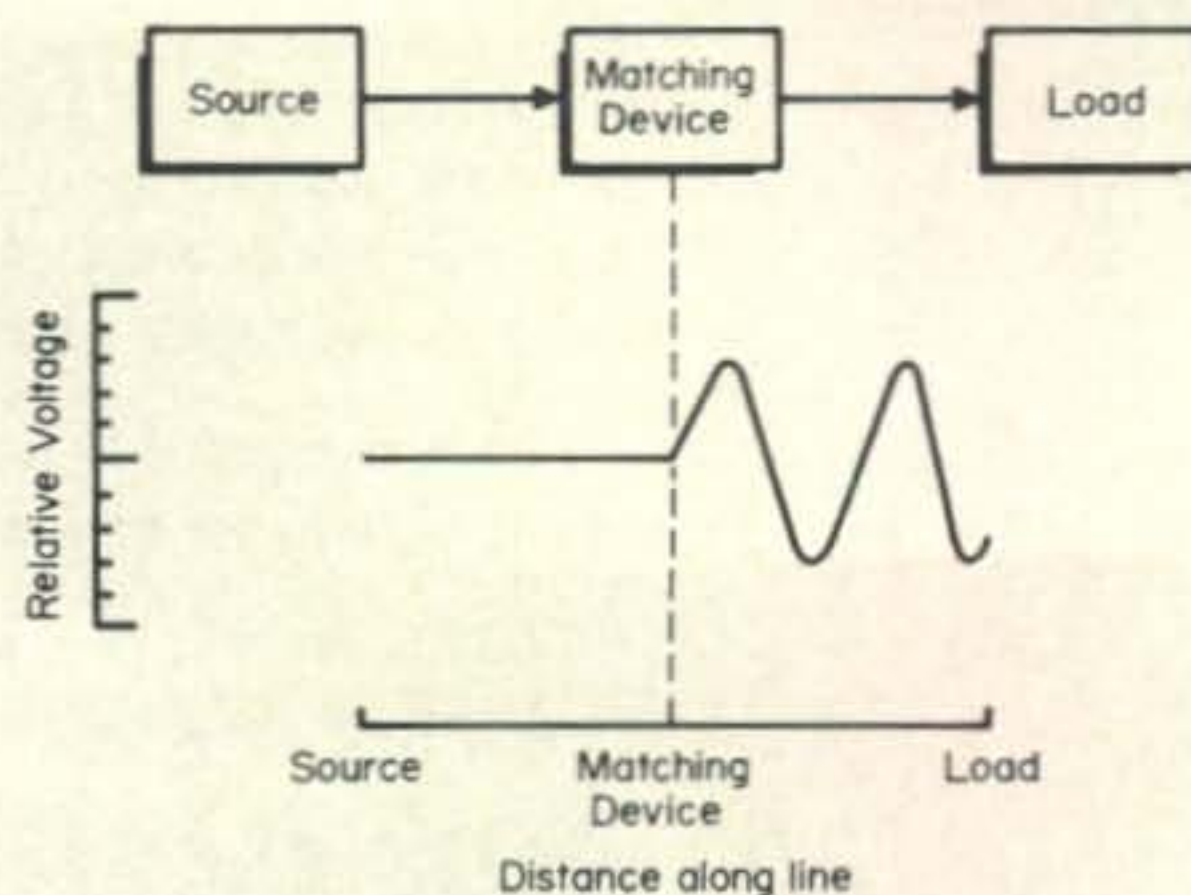


Fig. 5—Effect of impedance matching on v.s.w.r.

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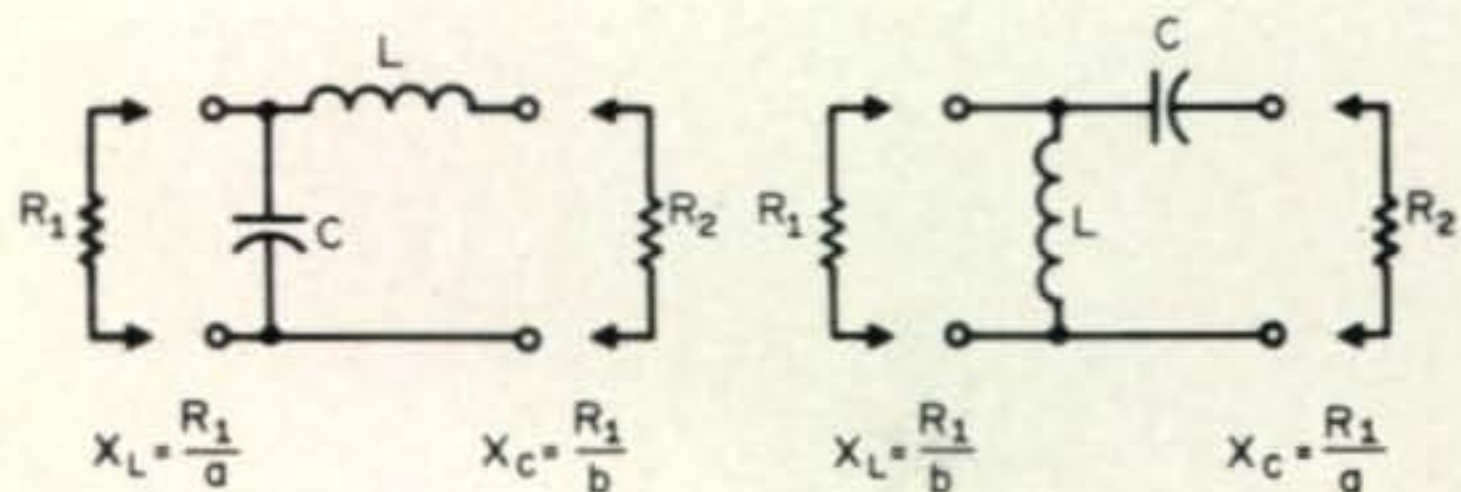
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Fig. 6—L-Section impedance matching networks.

A high v.s.w.r. affects power loss more in solid dielectric lines than it does in air dielectric lines because the solid dielectric dissipates power in the form of heat. As a matter of fact, very little power is lost in an air dielectric line due to high v.s.w.r. because only the extra Ohmic loss due to the higher v.s.w.r. current is present. In view of this, if for some reason the antenna tuner cannot be located at the antenna end of the transmission line, then open wire transmission line should be used between the tuner and the antenna. Solid dielectric coax line may be used between the tuner and the transmitter.

When an open wire line is used, the antenna tuner will be simplified if a balun is used between the tuner and open wire line. The tuner simplifies to a simple "L" section between the balun and coax line if the mismatch is non-reactive or perhaps to a "T" if the load is reactive.

Designing Simple Matching Networks

Two resistances can be matched with the "L" sections shown in fig. 6. The values for X_L and X_C are determined from the relations listed in the figure.

If the antenna contains a reactive part, *i.e.*, it is $R + jX$, then the reactive part may be eliminated by placing a reactance of opposite sign in series with the antenna.

Unfortunately, most amateurs have no bridge to measure the impedance of the antenna. An alternate is to prune the antenna for minimum v.s.w.r. and assume that it is then non-reactive. The v.s.w.r. remaining will be the result of a difference between the transmission line characteristic impedance and the radiation resistance of the antenna. If the antenna height is low, *i.e.*, less than a half wave above ground, then the radiation resist-

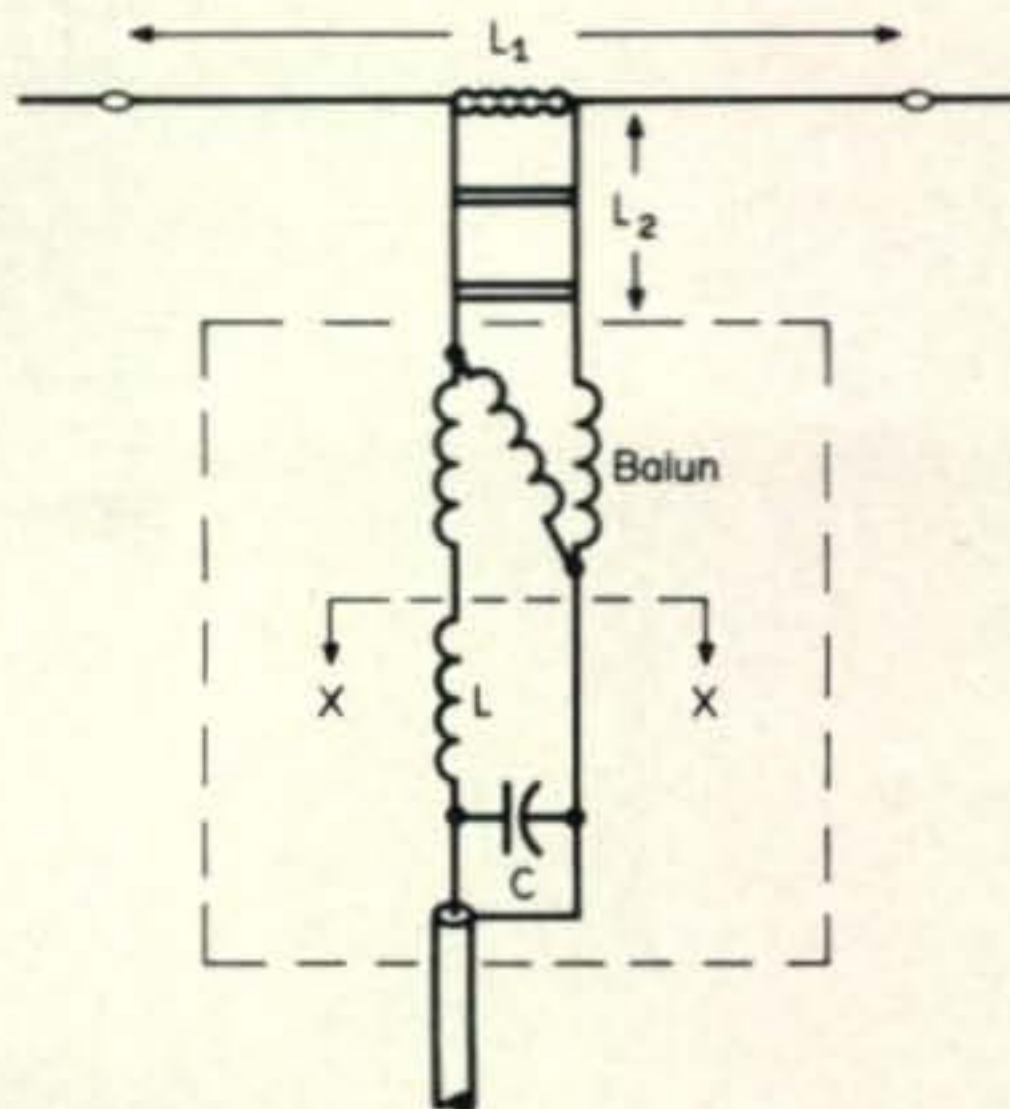


Fig. 7—Schematic of 40 meter antenna.

ance will be less than the common 72 ohms for a dipole. In that case, a fair estimate of the radiation resistance of a low dipole that has been pruned to minimum v.s.w.r. is:

$$R_a = \frac{R_o}{\text{VSWR}}$$

With this estimate of the antenna resistance, a matching section may be calculated from fig. 6.

Applying the Basics

Figure 7 is a schematic of an antenna system for the 40 meter band that has employed the basics outlined earlier. The radiator length, L_1 , has been augmented by a short section of open wire transmission line, L_2 . The electrical length of the antenna is $L_1 + 2L_2$. The balun is used to transform the balanced open wire feeder to an unbalanced arrangement compatible with the coaxial transmission line. The v.s.w.r. looking at the output of the balun (section x-x) is shown in fig. 8A. The matching section, L and C , transform the resistance of section x-x to the characteristic impedance of the transmission line. The resulting v.s.w.r. is shown in fig. 8B.

In Conclusion

Perhaps the greatest factor that promotes a more content attitude toward the ham an-

[Continued on page 83]

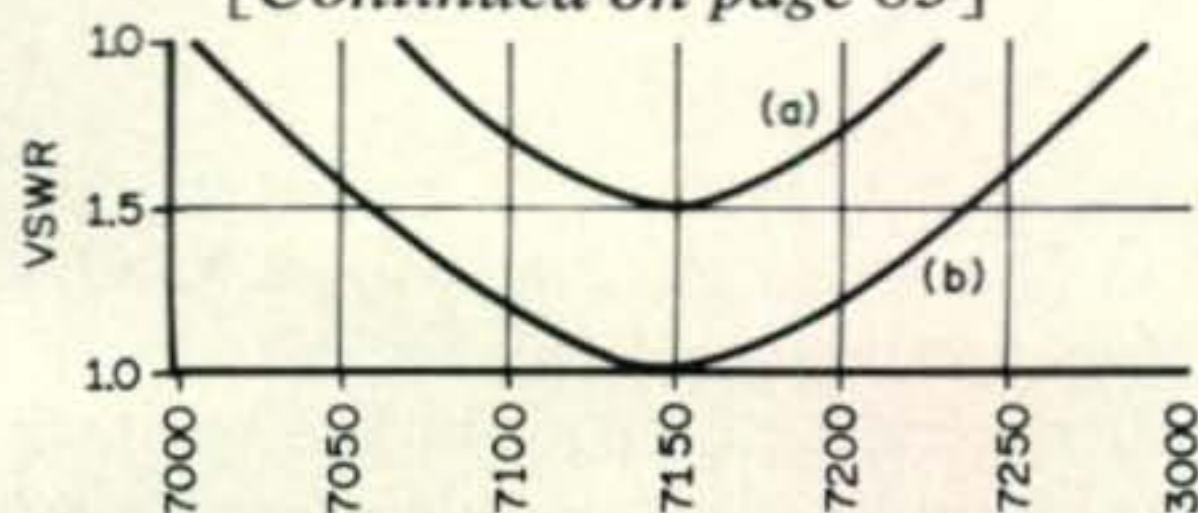


Fig. 8—V.s.w.r. of 40 meter antenna (A) before adding matching circuit; (B) after adding matching circuit.



Half-wave antennas for 15 and 20 meters are mounted at opposite ends of a sun deck with minimum interference to each other or to the beam.

The K7GCO DXer 20 Meter Vertical

BY KEN "JUDGE" GLANZER,* K7GCO

Using simple construction techniques the author erects a high-performance 1/2 wavelength vertical antenna for 20 meters. Radials are not required for its operation, although they may be used in lieu of the decoupling stub described. The strong, lightweight design is suited for home station or portable applications.

THE antenna described here is one of the most practical and effective single band verticals that can be built for the h.f. bands. It is a half wavelength long, voltage fed with an L network and uses a couple of radials or a decoupling stub (or both) to "cool" the coax.

*212 South 124 Street, Seattle, Wash. 98166

The design requires no guy wires although a guyed configuration can be used. It gives the lowest possible angle of radiation without an extensive radial system and compares to a 5/8 wave vertical for gain. Mount it on a sun deck post, drop it in vent pipe on the roof, mount it on a chimney or stick it in the

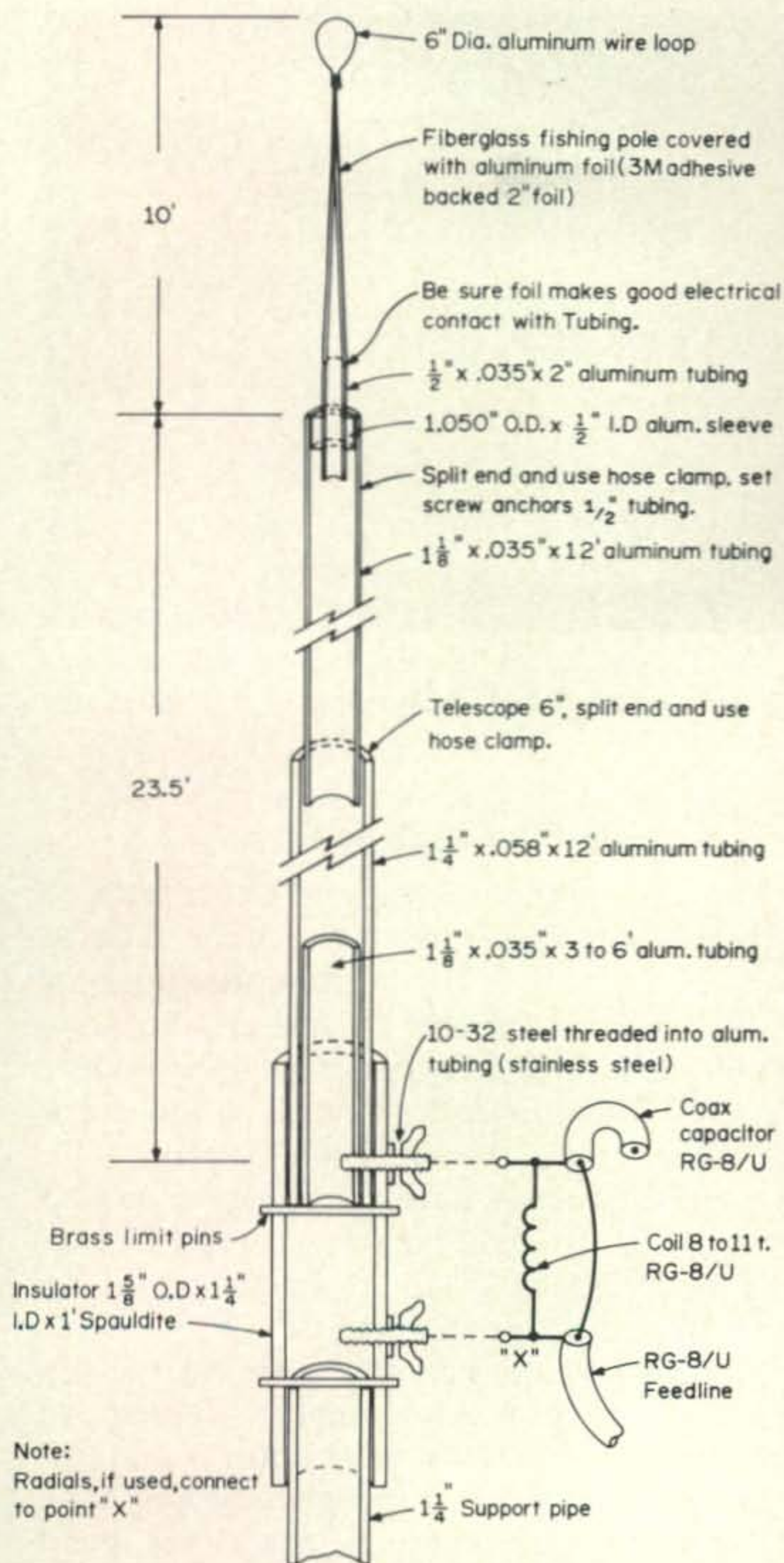


Fig. 1—Construction details of the self-supporting 1/2 wave 20 meter vertical antenna.

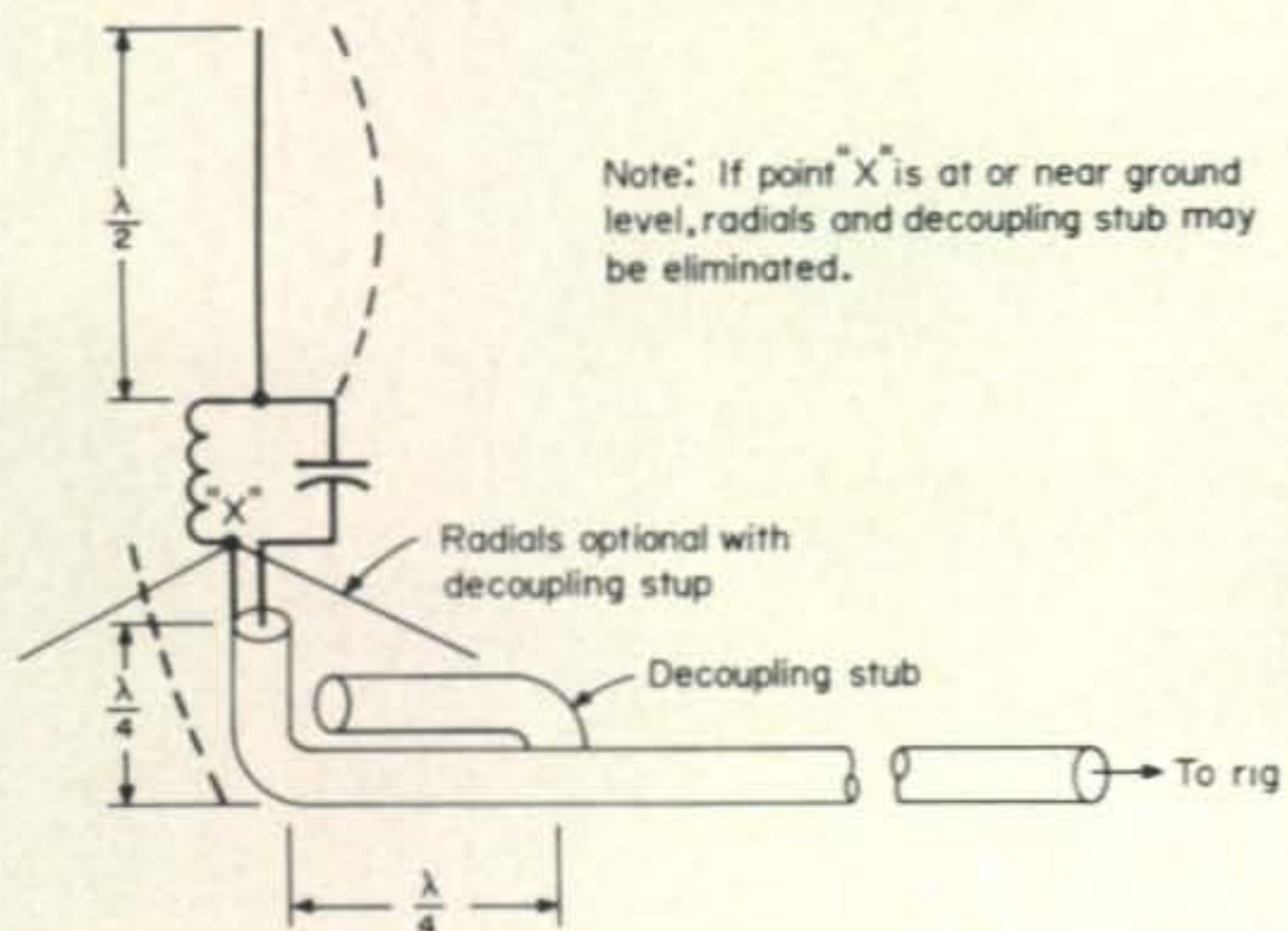


Fig. 2—Schematic of 1/2 wave vertical antenna. Be sure to make feedline some half-wave multiple.

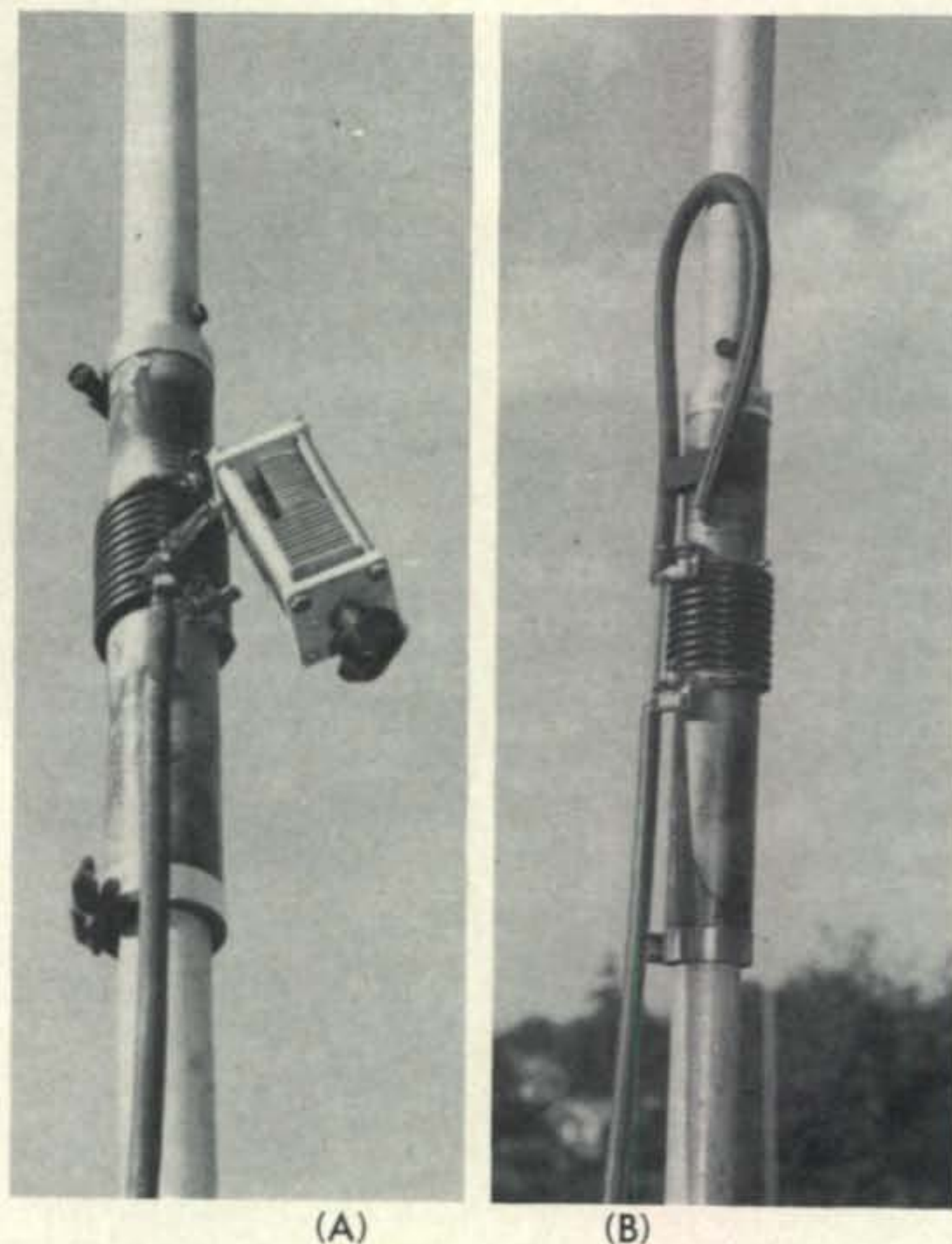


Fig. 3—(A) Initial tuneup of the L network is made with a 50 mmf variable capacitor while adjusting the inductance of the coil. (B) Once a 1:1 s.w.r. is achieved, replace the variable capacitor with a length of coaxial cable having the same capacity. Start with a length longer than needed and trim 1/2" at a time. As the s.w.r. starts to dip, take 1/4" cuts, and finally 1/8" cuts until the 1:1 s.w.r. is again achieved. After the correct length has been determined, the coax capacitor may be fabricated again from a continuous length of feedline. Spray the open coax and seal with RTV silicone rubber and tape. By using lugs and wing nuts, feedline can be quickly removed when necessary.

ground. One man can handle it easily and it is ideal for field day, camping or cabin. This basic design is usable on 15, 11 or 10 meters or on 40 meters as a quarter wave with radials. Also the vertical can be mounted close to horizontal beams with minimum pattern interference.

Construction

Figure 1 illustrates the basic construction which is light, simple and self-supporting. Two of these elements back to back make excellent 40 meter beam elements.

The special insulator I used in the base is called Micarta (Westinghouse Trade name) or Spaldite (Spaulding trade name) Grade C. Do not get the paper base type which is

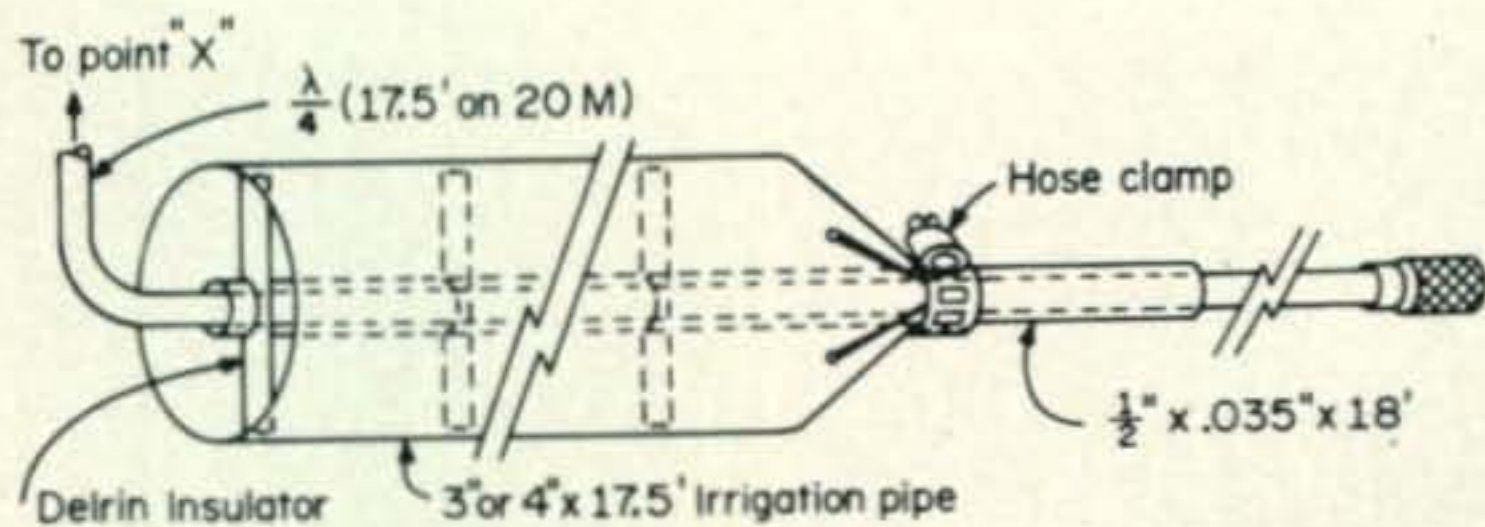


Fig. 4—The ultimate decoupling stub for "cooling" coax shield. The sleeve slips over the coax feedline.

black. Suppliers can be found in the yellow pages under industrial plastics.

The L network matches the high end impedance of the half wave antenna to 50 ohms and also forms a phase inverter for the bottom quarter wave (producing a half wave and quarter wave in-phase). See figure 2. Radials can be used but if they are, it is suggested that a 45° slope be used where possible. The exact length of the radiator is not critical as the L network will match the antenna regardless. Bandwidth is excellent.

The L network inductor is made from either RG-58 or RG-8 coax using the shield and outside insulation. Other insulated wire may be used, however. The capacitor is also made from coax. Tune up is accomplished by using a 50 mmf variable capacitor temporarily installed as illustrated in fig. 3(A). Tapping down the coil in 1/2 turn steps, rotate the variable capacitor through its range while watching the s.w.r. meter. At the correct tap point the s.w.r. will dip to 1 to 1, or zero reflected power, at a certain setting of capacitor. At this point finalize this value of inductor and substitute an RG-8 coax capacitor for the variable. Remove and estimate or measure the capacity of the variable and substitute a coax length longer than the equivalent capacity. Install the coax capacitor, apply power to the antenna and check the s.w.r. Start trimming the coax end 1/2" at a time until the reflected power starts to dip. Then cut 1/4", then 1/8" snips until zero reflected power is obtained. If you pass the 1:1 s.w.r. point, start over with another length of coax. Finally, peel the shield back 1/8" to prevent arc-over from center conductor to shield. Now that the exact length of coax capacitor is known, you can substitute a continuous length of coax from the feed-point and use solder lugs, etc., as illustrated in fig. 3(B). Spray the open coax heavily, and seal with RTV silicone rubber and tape. Make it a couple of inches longer than needed and repeat the tuning process.

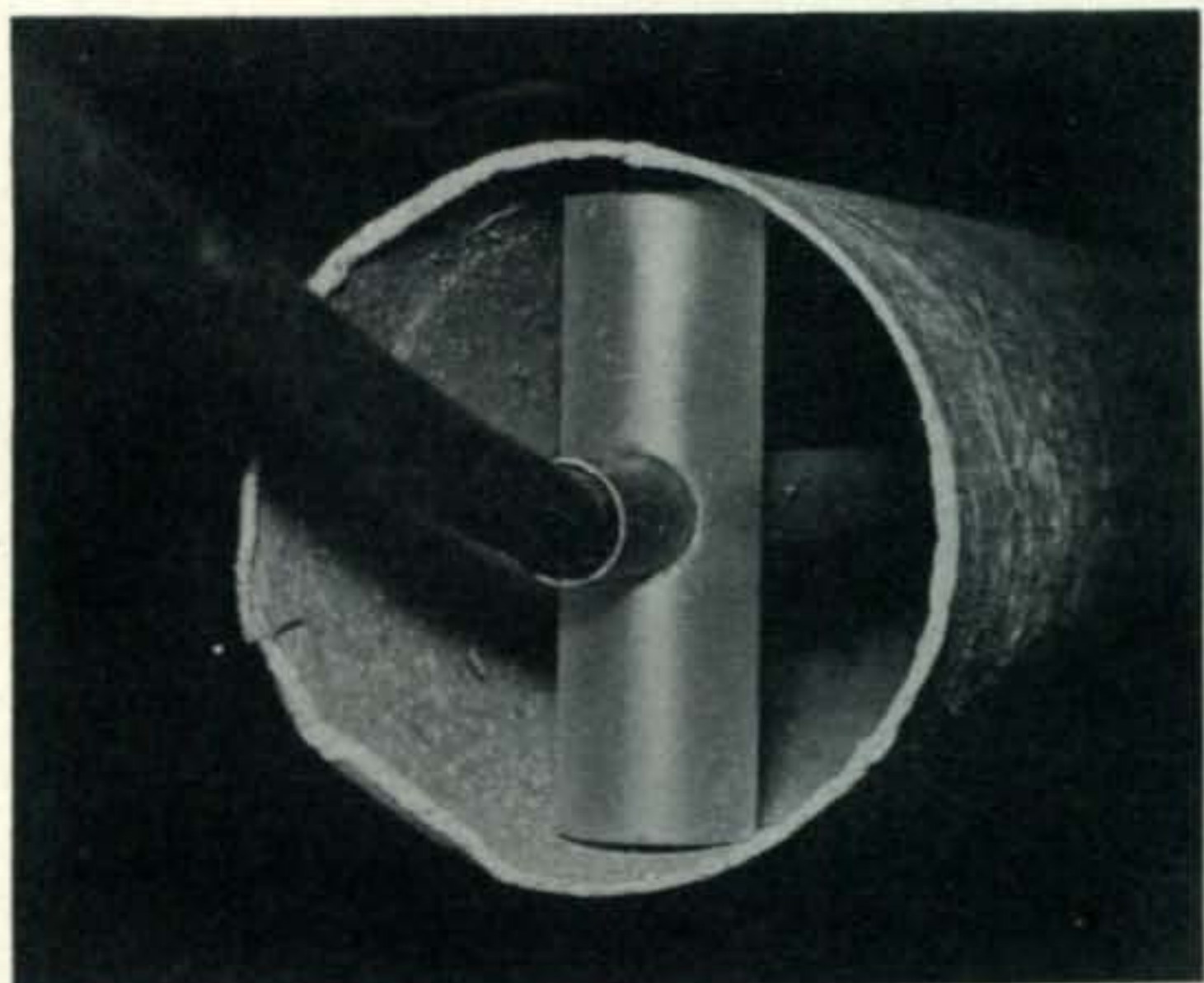


Fig. 5—Open end of the decoupling sleeve showing Delrin insulator supporting 1/2" diameter tubing.

The Decoupling Stub

The decoupling stub is used either with or without the radials. One or the other must be used. Its purpose is to end the radiating part of the antenna on the outside of the coax shield at the high impedance or open end of the stub. This prevents stray r.f. in the shack and helps retain the radiation pattern.

A most effective decoupling sleeve can be made which is ideal for this purpose from a 16.5 ft. length of 3" or 4" irrigation tubing as illustrated in figs. 4, 5 and 6.

A similar design antenna made out of wire and coax, hung in a tree, makes an effective antenna also. This half wave DXer is an ideal secondary antenna or supplementary antenna for a horizontal beam to check for band openings or by itself, as at times it will outperform a beam and any of the multiband quarter wave verticals. ■

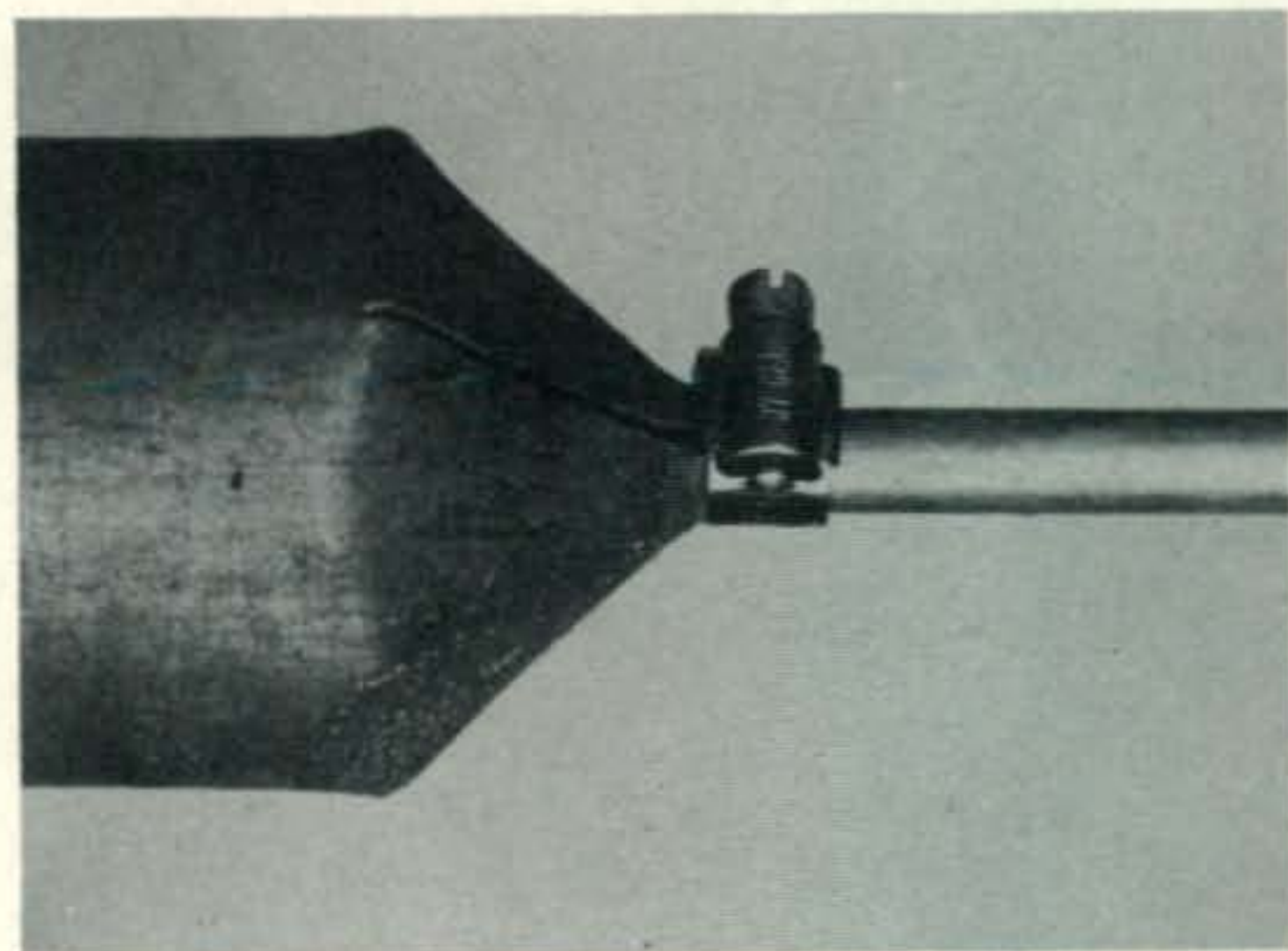


Fig. 6—Closed end of the decoupling sleeve. 60° segments are cut from the end of the irrigation tubing and bent in. Hose clamp grounds tips to center tubing.

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Swissair "Ham Tours" are under the supervision of Dr. Erwin Huber, HB9AG. About the only thing Erwin can't help you with is sending out your European QSL cards—you can do that when you get back home.

For complete information, send for a free brochure. Write: "Swissair Ham Tours",
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Improved 20 Meter Performance from the EICO 753 Transceiver

BY J. W. HERBERT,* ZL2BDB

RECENTLY the author purchased an EICO 753 three band s.s.b. transceiver kit and set about assembling the rig following the detailed instructions supplied.

Considerable care was taken with the construction and after assembly no difficulty was experienced commissioning the rig. However, after several weeks use on all three bands (*i.e.* 80, 40 and 20 meters) it was observed that the receive performance was poor on 20 meters. After working several other stations on the bands who were also using 753's it became apparent that the poor receive performance on 20 meters was general for this rig and a number of solutions to the problem were reported by these other stations. Some employed an external 20 meter pre-amplifier ahead of the receiver; another had increased the overall receiver gain by reducing the cathode bias resistor on the i.f. amp (R_{75}) but perhaps the most staggering approach was that adopted by a VK who was experiencing the problem; he had disposed of his 20 meter dipole, erected a 60 ft. tower and installed a 5 element yagi! Nevertheless he still complained that his S meter was "Scotch" and he usually added two "S" units to any report he gave on 20 meters. This was also the case with the author's 753. Using a 20 meter dipole and matched feedline system, the strongest 20 meter signals (other than those from a neighboring ham) would only push the S meter up to about S6. Performance on 40 meters and 80 meters receive was generally satisfactory with the stronger signals pushing the S meter into the S9+ region.

The rig also exhibited a tendency towards instability of the final P.A. on 20 meters transmit and an unusual characteristic in the S meter circuit. This last aspect came to notice when the rig was turned on to operate before the heaters had warmed up properly. Under

these conditions (using a solid state power supply) the S meter swung hard over onto its stop and it was decided that some form of protection should be provided to prevent damage to the meter. The various modifications introduced will now be covered in detail and reference should be made to the EICO circuit diagram and wiring layouts where applicable.

Receiver Sensitivity

This posed the greatest problem since it was thought originally that any attempt to increase the sensitivity on 20 meters would also increase the gain on 80m. and 40m. Fortunately this aspect did not turn out to be a problem at all. On 80m. and 40m. it turned out that the a.g.c. system had to work a bit harder to cope with the increased signal levels, while on 20m. a considerable increase in gain is apparent.

Three modifications were carried out to increase the receiver gain as follows:

- (1) Delaying effective a.g.c. action in the r.f. stage:
 - (a) Remove the ground wire between r.f. amplifier valve (V_{16}) pin 2 and ground.
 - (b) Remove resistor R_{16} from pin 1 of V_{16} and connect it to pin 2 of V_{16} .
 - (c) Wire a .02mf disc ceramic capacitor from pin 2 of V_{16} to ground.
 - (d) Wire a 1 meg ohm resistor between pin 1 of V_{16} and ground.

Note that this modification removes the a.g.c. voltage from grid 1 of the r.f. stage and applies it to grid 3 (*i.e.*, the suppressor grid). Under weak signal conditions the small a.g.c. voltage has a negligible effect on the r.f. stage gain but with strong signal, a.g.c. action becomes quite effective.

- (2) Increasing the working Q of the r.f. tuned circuit:

*91 Haldsworth Ave., Upper Hutt, New Zealand.

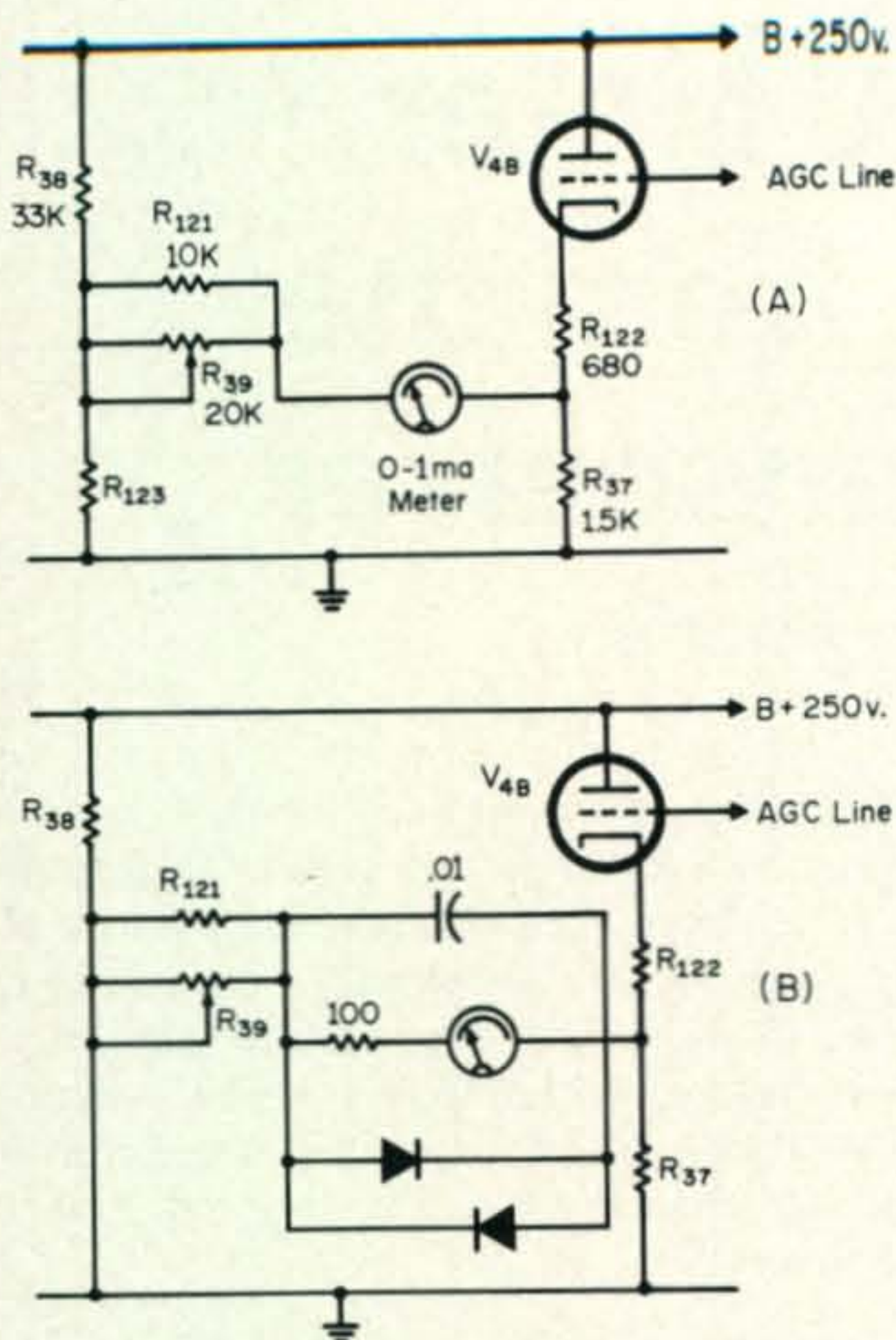


Fig. 1—(A) Basic unmodified S-meter circuit for the EICO 753 transceiver. (B) Modified circuit including meter overload protection.

- (a) Remove the 100mmf capacitor (C₉₇) between V₁₂ and V₁₄ and V₁₅.
- (b) Replace with a 33mmf tubular ceramic capacitor with 500 volts working rating.
- (c) Re-align the signal frequency tuned circuits L₁₀, L₁₁ and L₁₂ in accordance with EICO instructions.

Reducing the value of the coupling capacitor (C₉₇) reduces the loading across the tuned circuits and enables a higher Q to be obtained on all bands thereby increasing r.f. stage sensitivity. It also reduces coupling to the mixer on 80 and 40 meters relative to that on 20 meters resulting in a more even distribution of receiver gain between bands.

(3) Increasing the mixer conversion gain:

- (a) On the tag strips associated with the wiring for V₁₁, remove the 27K ohm resistor R₅₆ and replace with a small 1mh r.f. choke.
- (b) Remove the 47K ohm resistor R₅₃ and replace with a 4.7K ohm resistor.

It should be noted that V₁₁ obtains grid bias by rectifying the v.f.o. voltage applied to pin 1. Normally about 8 volts of bias exist on pin

1 but the modification will reduce this to about 2 volts. The voltage can be set to that desired by adjusting R₅₃ if necessary.

P.A. Instability on 20 meters

Investigation revealed that the instability was due to inadequate bypassing of the grid bias line feeding V₁₄ and V₁₅. The 27K ohm grid leak resistor (R₁₁₀) is connected back to the BIAS ADJ potentiometer with a long unbypassed wire which introduces the undesirable feedback. The problem was overcome as follows.

At the junction of R₁₁₀ and the long connecting wire connect a .01mf disc ceramic capacitor between the terminal lug and ground.

"S" Meter Circuit

The basic 753 S meter circuit is shown in fig. 1A. From this circuit it can be seen that if the B+ 250 volts is applied before V₄ has reached operating temperature, current will flow through R₃₈, R₃₉, through the meter and R₃₇ to ground. Summing up the values of resistance in this circuit and by applying Ohms law it figures out that up to 7 ma can flow through the S meter. This represents a 700% overload in the meter and would quickly wreck the movement. This problem was overcome by fitting a diode limiter circuit across the meter.

Figure 1B shows the final S meter circuit while fig. 2 shows how the components are mounted.

Obtain two small single-post-plus-ground terminal strips and mount one under each of the two terminal screws for the S meter. Wire up the components as shown in fig. 2. The 100 ohm resistor in series with the meter has a negligible effect on the meter accuracy but is required to develop sufficient voltage across the diodes for satisfactory limiting action. The point at which the limiting occurs can be

[Continued on page 80]

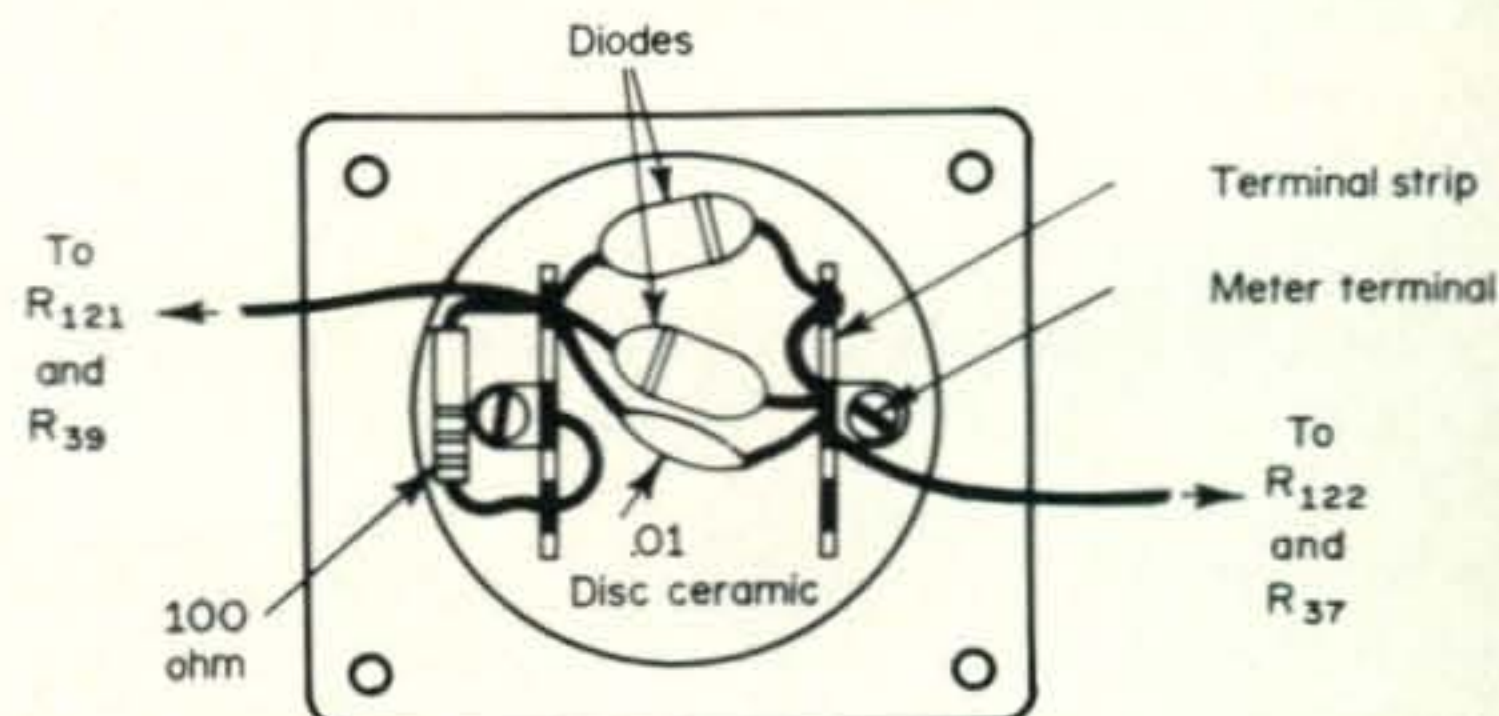


Fig. 2—Component mounting and wiring for the S-meter modification.

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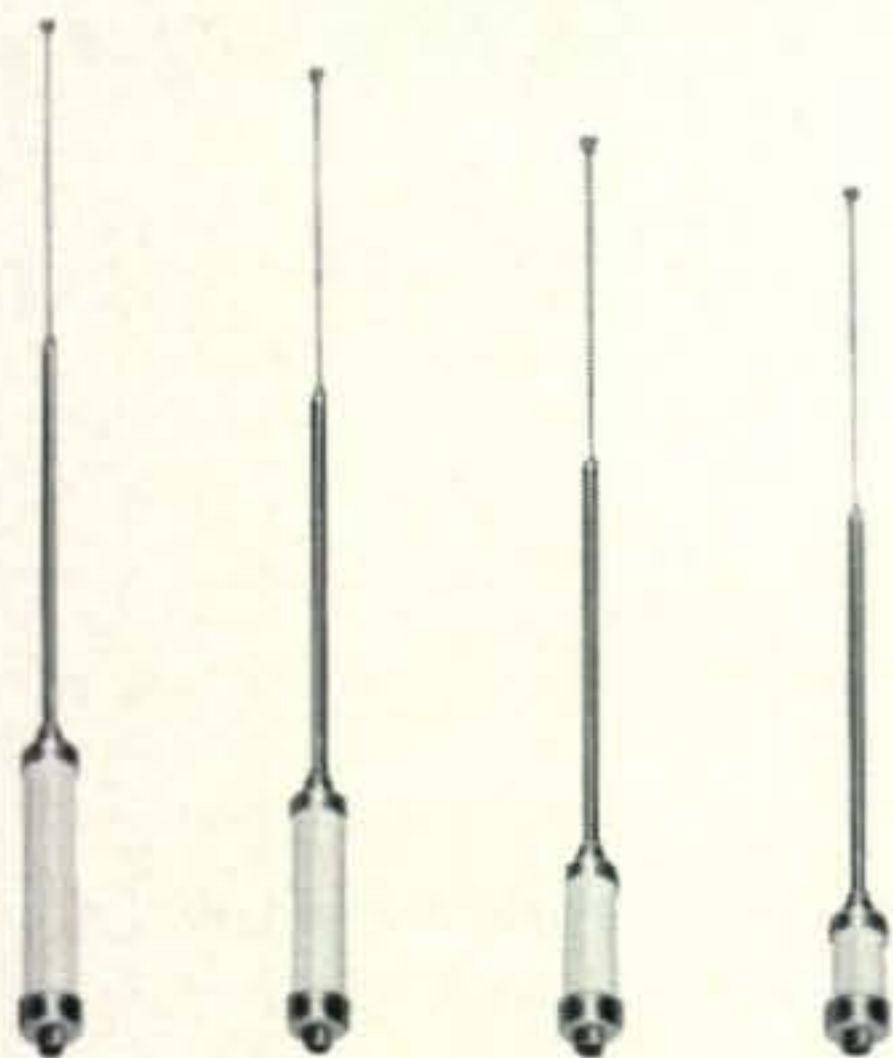
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The Top Tour VW camper bus is equipped with a Yaesu FT-101 and antennas for 80 through 10 meters.

A Ham Vacation In Europe?

Swissair and the Top Tour Ham Club
make it practical.

BY RICHARD A. ROSS,* K2MGA

FOR years it's been the policy of *CQ* to examine and report on products offered to the amateur public in a sort of "Consumer's Union" manner. But all products are not of the nuts and bolts genre. Some, like the subject of this report, are more difficult to apply traditional standards to, and therefore must be evaluated from the standpoint of personal feelings and experience.

During the summer of 1971 *CQ* was approached by Mr. Paul Minolfo, Director of Tours for Swissair, the Airline of Switzerland, for guidance in developing and promoting a series of European vacation tours

*Editor, *CQ*

specifically designed for radio amateurs. The tour described here is the result.

Tours for hams are not new, and have been organized for several years by various enterprising US amateurs, but the notable difference in the Swissair offering is that European amateurs had laid the foundation for the tours by forming a small but vigorous group called the Top Tour Ham Club. The functions of this group are many, but the essence of all their functions is captured in their stated goal, "for international meeting and friendship."

Here, then, is something different. Here are active European amateurs extending an

invitation to amateurs all over the world to visit their countries, do all the things tourists do, and as icing on an already attractive cake, be licensed to operate first class rigs placed at their complete disposal!

Where does Swissair fit in? They naturally get people to and from Europe, and ensure that suitable accommodations and tourist arrangements are available, but from the amateur radio standpoint, it's all Top Tour's show.

The idea for Top Tour was born in many QSO's between HB9AG, Dr. Erwin Huber, and LU2AHI, Fritz Lederman, who by interesting coincidence is Manager of Swissair, Buenos Aires, Argentina. Fritz is a Swiss native who has spent at least a few decades traveling and residing in places far from his home, and having done so, is all the more appreciative of the beauty and tranquility of the Alps. A desire to share these qualities with other amateurs spurred Fritz and Erwin to found the Top Tour Ham Club. The President of the club is Fred Tinner, HB9AAQ, a truly warm and delightful amateur.

Top Tour, then, is a club made up of Swiss, German and Austrian amateurs which is dedicated to promoting international friendship and understanding through amateur radio. It has established first rate stations for the use of club members in five mountain resort locations in Spitzingsee, Germany (in the Bavarian Alps), Bregenz, Austria (on Lake Constance), Zweisimmen, Switzerland (in the heart of some of the finest Swiss ski country), Bad Ragaz, Switzerland (a luxury hot springs spa), and as a special treat, Gamprin, Leichtenstein (HB0), for a taste of



Dr. Erwin Huber, HB9AG, is a warm fatherly gentleman who apparently knows everyone and everything in Switzerland. He is personally responsible for the installation and layout of all the Top Tour stations, as the club's Technical Director.



At Bregenz Austria, seated l. to r., Top Tour co-founders LU2AHI and HB9AG, and HB9ABM, President of the Swiss Union of Radio Amateurs (almost missed by the camera). Standing, l. to r. OE9JKI, the local Top Tour representative, and K2MGA with XYL Carol.

being a rare country for a change). Top Tour also expedites licensing for the ham tourist by handling all license applications locally, for all four countries at once. Tour participants become Guest Members of Top Tour Ham Club and are thus able to operate the club stations.

The most appealing thing about the Swiss-air ham tour is that it enables an amateur to take a really fantastic vacation at a reasonable price and at the same time let him get in some great hamming from a DX location.

Vacationing in the Alps is something that can never be described, but must be lived. Craggy mountains, snow capped we'll into the early summer, lush valleys, storybook villages, sailing on crystal clear lakes, cable cars, gourmet food and great shopping make this area of southern Europe the high point of European vacations. No matter if you want to just look, or drive the fine mountain roads, or lose yourself in an endless stream of things to do, you can do it, and enjoy every minute of it.

But being a ham it's nice to know that any time, day or night, you can drop by the shack in your hotel to see what's happening on the bands. Top Tour has arranged with five top resort hotels to set aside a special room as a



At the operating position of the Top Tour station at Motel Waldek in Liechtenstein, Top Tour co-founder Fritz Lederman, LU2AHI demonstrates to K2MGA what 15 meters sounds like from HBØ.

shack. They've equipped each shack with a Yeasu FTDX-560 transceiver and 5-element tri-band beam for 20, 15 and 10, and wire antennas for 80 and 40, plus the accessories to make operating pleasant like electronic keyers and custom designed operating desks. One hotel in the Bavarian Alps is equipped with an S-line and 2 kw linear along with an impressive array of vertical, beam and wire antennas which somehow work a little better at 4,000 feet than they do in the stone canyons of New York.

If you're the type who likes to get to know the place he's visiting, there's no better way for a ham to do it by meeting other hams. At each of the five resort locations is an English speaking Top Tour club member ready to help you. He can have a mini-hamfest brewing in a few hours, or help you discover what to do and where to go to make the most of your vacation.

The Tour

So much for generalities for the moment; let's examine specifically what the Swissair ham tour has to offer.

Basically, the tour provides round trip jet economy air fare from New York to Zurich, Switzerland, and "half pension" hotel accommodations at any of the five Top Tour locations. "Half pension" means that the daily rate for the hotel includes continental breakfast and one other meal per day. "Full pension" includes all meals. Beverages are always extra.

The minimum time you can spend in Europe on the Swissair tour is two weeks; the maximum is three weeks. The cost of the trip can vary widely depending upon where you stay and for how long, how you decide to travel from place to place, and of course how much you spend on outside meals, shopping and entertainment. We'll look at some actual costs later.

The thing to remember about the Swissair tour is that it is *not* a guided tour using a pre-planned itinerary to hustle a dozen or so tourists through all the local travel agency-type highlights. On the contrary, you plan your Swissair ham tour with complete flexibility to come and go as you please as if you never heard of the word tour. At your option, you can cover all of the Top Tour locations equally, or start at one end and work your way across until you find one at which you'd like to spend a week or more.

Another possibility is to pick a place like Gamprin, Leichtenstein as a base of operations, and plan one-day excursions to Germany, Switzerland, Austria or Italy which are all only a few hours drive away, at most.

For the man who really likes to travel and operate mobile at the same time, Top Tour even has something for him: a Volkswagen camper bus fully outfitted to accommodate 3 or 4 adults, and fully equipped with a Yeasu FT-101 transceiver and Newtronics Hustler antenna for 80-10 meters! The station is installed and ready to operate. The rate for the rental of the bus is a little steep, but considering that it precludes hotel and car rental charges, it's a pretty fair deal, and worth consideration for groups of 2 or 3 people where the rental cost can be divided. The orange VW bus is probably going to be in



The President of Top Tour Ham Club is Fred Tinner, HB9AAQ, here at his home QTH.

great demand, so be sure it will be available before planning a vacation around it.

Accommodations

To give a better idea of what will be found at each of the Top Tour locations, the following capsule description has been prepared for each spot.

Spitzingsee, Upper Bavaria, Germany: Spitzingsee is a village in the Bavarian Alps a short distance from the German-Austria border. The drive to Spitzingsee is an easy one from the nearest big city, Munich, with the last few miles of the drive winding up a narrow mountain road through forests of breathtaking beauty. The hotel to be found here is Forsthaus Valepp which is a 180 year old hunters' mountain lodge largely preserved in its original state. Forsthaus is leased from the German government by Christian Simon, DL2LH, the innkeeper and master chef. Christian and his wife run the inn themselves with minimal help. The Top Tour club station here is Christian's own S-line and 2 kw linear, with antennas consisting of vertical, beam and several wire antennas.

The character of Forsthaus is patently rustic. It's like stepping into a different era, with antique tools, guns, furniture, hunting trophies and the like so plentiful that you could spend days just exploring this magnificent inn. Be forewarned, however, that it's not like staying at the Hilton. The toilets and bathroom are down the hall in the old European manner. It's definitely a "get away from it all" place up in the mountains, so beautifully Bavarian that it's worth visiting just to see it. But the food is magnificent (try Christian's bach forelle if you like trout), and the setting even more so. If you hunt, fish, hike or just love clean, sweet mountain air, spend a day or two at Forsthaus Valepp. And while you're there sample some "Valepper-Kräutertropfen," a family-secret liquer, so good you won't mind the hangover! The price for a full week including *all* meals is \$84. In addition to Christian, Top Tours is represented by Wolfgang Brehm, DL3WM.

Bregenz, Austria: Bregenz is a vacation town on the eastern tip of Lake Constance, one of the largest lakes in Europe. It is easily reached by car or train. In winter, skiing is the order of the day, with sightseeing and theater being the most common summer tourist activities. Bregenz boasts the world's largest floating



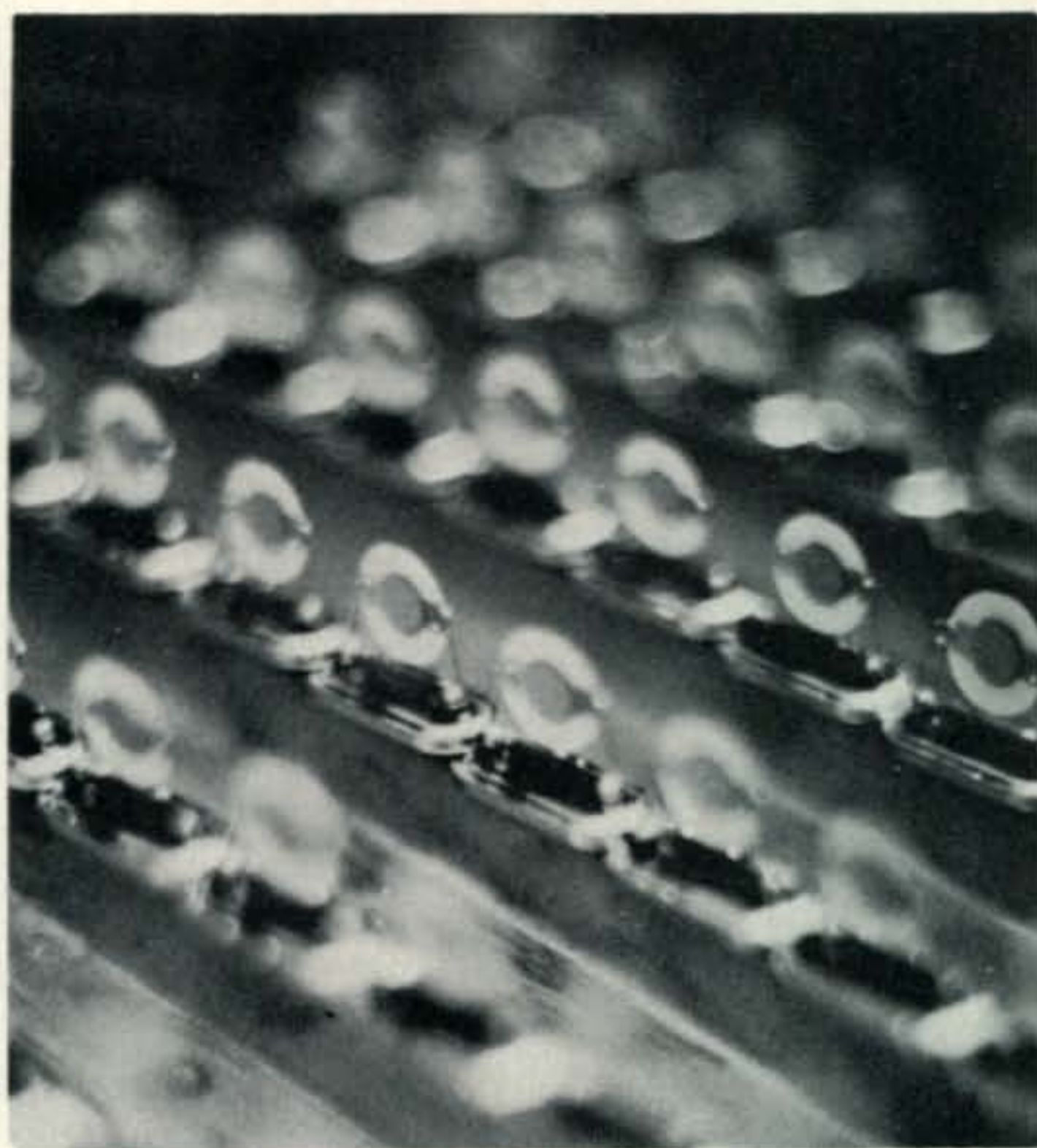
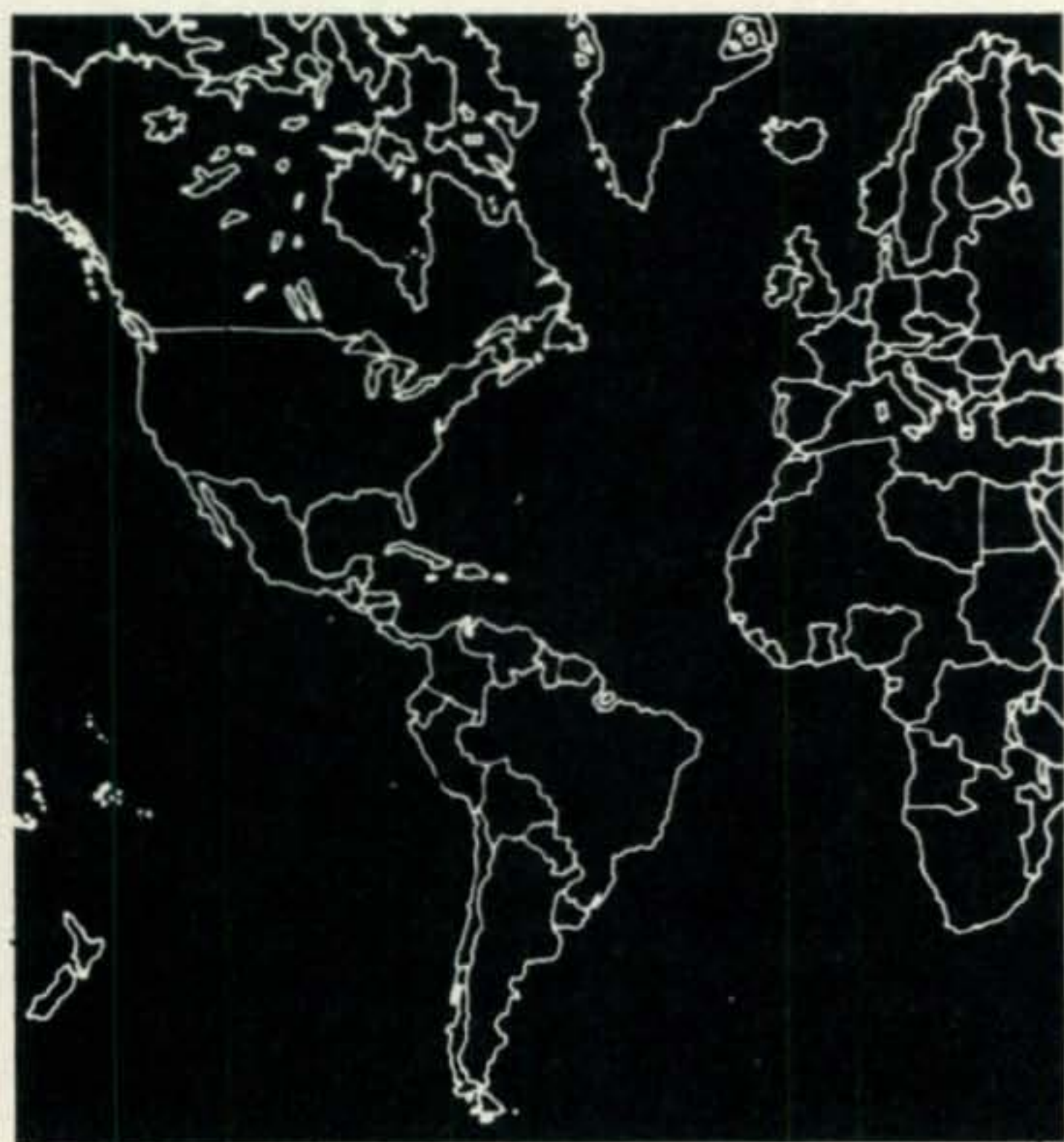
At Forsthaus Valepp, l. to r., XYL K2MGA; Christian Simon, DL2LH; Wolfgang Brehm, DL3WM; Mrs. Simon, and Mrs. Brehm.

stage on which are produced popular and classical plays and operas during the summer months, particularly during the Bregenz Music Festival in July and August. The Hotel Weisses Kreuz in the center of town is a comfortable, immaculately clean place serving excellent food. The shack is in a handsomely appointed private room on the ground floor, and consists of an FTDX-560 and accessories, with a 5-element tri-band beam for 20, 15 and 10, with a Windom for 80 and 40. The price is \$90 a week with half pension. The local Top Tour representative is Joseph Kuehs, OE9JKI.

Zweisimmen, Switzerland: This is ski country. In the summer it's beautiful as is all of Switzerland, with farms, villages, mountains and all the lovely things one expects in Switzerland, but in the winter the area comes alive with skiers. Ernst Hodel, the Director of Tourist Information there claims there are 41 different ski lifts operating in the immediate area in the winter. The Top Tour hotel here is the Hotel Krone, in the center of town. It's a fair-sized place with comfortable rooms

[continued on page 84]

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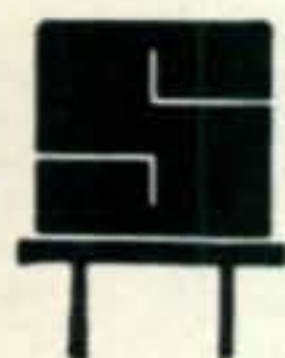
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F.M.

BY GLEN E. ZOQK,* K9STH/5

WELL, here it is. The first great, grand, and glorious *CQ* f.m. directory. The information is as accurate as possible. Inputs are from three principle sources, repeater directory cards returned by interested persons, letters and announcements from repeater groups, and information supplied by state and regional f.m. societies. In addition a few listings are the result of calls and personal contracts with amateurs in the given area.

The return of the post-paid repeater directory cards was most gratifying with about a 40% return from a general mailing list. Also, many state and regional groups sent along many listings as the result of the cards being mailed. It is interesting to note that some of the bigger, well known repeater groups like Tulsa and Chicago did not send any information. Since the post-paid cards could not be sent postage free in Canada it is not surprising that there was not a great amount of returns from there. However, the computer printout provided by VE3AZY helped fill in many voids in both Canada and the Northern USA.

Since much of the information was obtained from the actual area served by the repeaters the information should be accurate. However, especially where second hand information had to be used, there is always the possibility of errors. If your group did not forward any information and either is not included in the listings or if there is any error you have only yourself to blame. There is still salvation, for updating of this directory will be a continuous process.

Now, for the pencil jockey's, here are some of the breakdowns: Total repeater entries, 362, of which 310 are in the United States and 52 are in Canada. The US entries are the result of 177 cards and letters (some with more than one repeater) and information from 6 state or regional groups. The Can-

adian entries are based on information from the British Columbia FM Communications Association and from the VE3AZY printout. A comparison of other factors are in the following tables:

Band	10	6	2	450	Cross	Total
US Rptrs	2	19	269	18	2	310
VE Rptrs	0	0	52	0	0	52
Totals	2	19	321	18	2	362

US Repeaters

Feature	No. of Repeaters	% of total
Auto-patch	29	9.3
Tone Control	39	12.6
RTTY	4	1.3
Non-standard 2m. freq.	10	3.2
600 kHz input/output spacing	193	62.3
.34/.94	108	35.0
.34/.76	25	8.1

Canadian Repeaters

Feature	No. of Repeaters	% of total
RTTY	1	1.9
.34/.94	7	13.5
600 kHz input/output spacing	15	28.8
.46/.94	18	34.6
Non-standard 2m. freq.	2	3.8

Symbols Used In Directory

The letters appearing after the location of a repeater designate the source of published information as follows:

B—Information from club or group bulletin.

C—Information from *CQ* Repeater Directory Card.

D—Information from group or association.

L—Information from letter.

Q—Information from QSO, personal contact or phone call. Letters appearing elsewhere in this directory denote the following:

P—Applies to primary frequency only.

R—RTTY repeater (AFSK).

S—Applies to secondary frequency only.

T—Touch Tone.

W—"Whistle-Up"

N—No information received.

Repeaters having Autopatch or requiring user to provide "time on" are so indicated by and X in the appropriate column.

*818 Brentwood Lane, Richardson, Texas 75080.

UNITED STATES FM REPEATERS

LOCATION	CALL	PRIMARY		SECONDARY		TONE	AUTO PATCH	OPR. TIME	NOTES	LOCATION	CALL	PRIMARY		SECONDARY		TONE	AUTO PATCH	OPR. TIME	NOTES	
		Input	Output	Input	Output							Input	Output	Input	Output					
ALABAMA																				
Albertville C	WA4AHX	146.200	146.760	146.340	146.940					HAWAII										
Birmingham L	WB4QEX	146.340	146.940					X		Four Major Is. D	KH6EQK	146.340	146.940	444.150	449.150				8	
Decatur C	W4JNB	146.340	146.940							Honolulu D	KH6EQF	146.200	146.800	449.150	444.150				8	
Dothan L	-	146.340	146.760							Waikiki D	KH6FOX	146.160	146.760							
Huntsville C	K4IQU	146.460	146.940			2150				IDAHO										
Mobile L	WB4QEV	146.340	146.940							Boise C	W7ZRQ	146.340	146.940							
Montgomery L	-	146.340	146.940							Boise C	W7ZRQ	146.580	52.525				X			
Scottsboro C	-	146.220	146.820						1	ILLINOIS										
Troy L	-	146.340	146.940						2	Chicago C	W9NGI	147.450	147.750	147.500						
ALASKA																				
Anchorage C	KL7USA	146.340	146.940							Chicago Q	WA9ORC	146.340	146.760	146.160					X	
ARIZONA																				
Phoenix C	WA7CEM	146.340	146.940	146.160	146.760			X		Rock Island C	W9UCZ	146.340	146.940		146.760	1800				
ARKANSAS																				
Ft. Smith C	WA5YUT	146.340	146.940							Waukegan Q	-	146.340	146.760	146.160						
Hot Springs C	W5ZF	146.280	146.880							INDIANA										
Little Rock C	W5DI	146.340	146.940							Elkhart C	WA9WVC	146.220	146.820				X	X	9	
Springdale C	WA5SNO	52.550	53.020					X		Ft. Wayne D	K9HDH	146.160	146.760			1800	X			
CALIFORNIA																				
Anaheim D	K6SYU	146.520	146.190		145.620				3	Ft. Wayne D	WA9EAU	146.340	146.760				X			
Covina C	W6FNO	146.820	146.700			W				Ft. Wayne D	W9INX	146.280	146.880				X			
Danville D	W6CV	147.800	147.060							Ft. Wayne D	W9INX	52.640	52.880							
Exeter D	WB6OPG	145.220	146.880			2200				Freemont D	WB9FHD	52.640	52.525							
Exeter D	WB6OPG	146.160	146.760			1800				Indianapolis C	K9LEH	146.340	146.760							
Eureka D	WB6DGJ	146.340	146.940							Indianapolis C	K9LEH	146.280	146.880						10	
Fresno D	WB6HYL	146.340	146.940							La Porte C	K9JSI	146.220	146.820				X			
Grass Valley D	WA6UGS	146.340	146.940			2250				Michigan City L	-	146.310	146.970							
Hayward D	WB6AAE	146.200	146.800	449.500	444.500					IOWA										
Los Angeles C	WA6TIC	146.580	52.600		146.700	RTTY			4	Des Moines C	WQAK/Q	146.340	146.940	146.160	146.760				X	
Los Angeles C	WB6ZDI	146.610	147.330						5	Des Moines C	K9IXR	146.340	146.940			W		X		
Monterey D	K6LY	146.370	146.970							Cedar Rapids C	WA9VVA	146.340	146.940			2000				
Oakland D	WB6NDJ	51.700	51.075	146.940						KANSAS										
Oakland D	K6SWS	146.340	146.940			1800				Hutchinson C	W0DKU	146.340	146.940				X			
Oroville D	K6YVY	146.340	146.940			1950				Pittsburg C	WA0VVW	146.340	146.940							
Palmdale D	WB6GUA	146.340	146.940			1800				Salina L	WA0CJQ	146.340	146.940							
Pine Cove D	W6AOE	147.150	147.750							Walina L	W0IPB	146.220	146.820	52.525	52.525				11	
Redlands C	WA6ALV	146.340	146.850			1800				Wichita L	W0DKU	146.340	146.940							
Riverside D	WA6XRI/6	52.760	52.525							KENTUCKY										
Sacramento D	WB6ZOI	146.160	146.760							Covington D	W4YWH	146.190	146.790	146.130	146.730					
San Diego D	WB6WLV	146.340	146.850			2100				Lexington D	WB4UQF	146.340	146.760							
San Luis Obispo C	WB6TSO	146.200	146.800							Louisville D	W4MOP	146.340	146.940							
San Rafael D	K6GWE	146.100	146.700	448.250	443.250				6	Owensboro D	K4UCS	146.340	146.940							
Santa Barbara D	K6SJF	146.160	146.995							LOUISIANA										
Santa Clara C	WB6OQS	146.160	146.760	444.600	449.600	2400			6	Alexandria C	K5URH	146.340	146.940							
Santa Monica D	WA6FLH	146.220	147.390			1950				Baton Rouge C	WA5ZHD	146.340	146.940							
Ventura C	WA6SIN	146.280	146.880							Lake Charles L	-	146.340	146.940							
COLORADO																				
Alpine Rescue D	-	146.100	146.700							Monroe C	WB5CDP	52.827	52.525			1950				
Boulder D	W0IA	444.550	449.550							Morgan City L	W5MLE	146.340	146.940							
Broomfield D	WA0FTM	444.400	449.400							Shreveport L	-	146.220	146.820							
Buckhorn Mtn. D	-	146.250	146.850							MASSACHUSETTS										
Castle Rock D	W0JGL	146.070	146.670							Falmouth D	W1VAK	146.340	146.940							
Colo. Springs C	WA0VTV	146.160	146.760							Holyoke D	K1ZJH	146.340	146.940							
Denver D	K0OVQ	146.820	147.300							Lennox D	WA1KGT	146.250	146.760							
Denver C	WA0VVC	444.350	449.350							Marlboro D	WA1KFY	146.220	146.820							
Denver C	W0WYX	146.340	146.940	444.450	449.450	RTTY			X	Reading C	WA1KFW	146.220	146.820							
Denver D	-	146.100	146.700							Williamstown C	K1FFK	146.040	146.910							
Ft. Collins C	-	146.010	146.610							Williamstown C	WA1KFZ	146.100	146.700							
Grand Junction D	W0RRZ	145.320	146.940							MICHIGAN										
Pueblo D	W0ENA	53.000	52.525							Bangor D	WB8CRH	52.640	52.525							
Pueblo D	WA0SNO	146.280	146.880							Benton Harbor C	W8MAI	146.220	146.820			1800			12	
Pueblo D	WA0SNO	146.340	146.940							Benton Harbor Q	K8JKI	146.340	146.940		146.760					
Squaw Mtn. D	W0WYX	53.000	52.525							Benton Harbor Q	K8JKI	146.940	146.760		146.820				13	
Squaw Mtn. D	W0WYX	444.450	449.450							Detroit D	WB8CQS	146.340	146.760							
CONNECTICUT																				
Bridgeport D	WA1KGK	146.220	146.760							Detroit D	W8SDZ	146.460	146.640							
Hartford D	K1HIG	146.280	146.880							Kalamazoo C	K8TIW	146.340	146.940			2100		X		
DISTRICT of COLUMBIA																				
Washington L	WB4QFP	146.310	146.910							Muskegon L	K8WNJ	146.220	146.820							
FLORIDA																				
Ft. Walton Beach L	WB4EQU	29.440	29.600			1800				MINNESOTA										
Ft. Walton Beach C	WB4KLT	146.340	146.760			1800	X	X	7	Minneapolis C	W0PZT	146.985	146.460	53.640	53.640				X	
Melbourne C	WB4KNQ	146.340	146.760				X	X	7	Rochester C	-	146.940	146.460						14	
Pensacola C	WB4QEQ	146.340	146.760			2200	X	X	7	MISSISSIPPI										
Silver Springs C	-	146.340	146.940							Keesler AFB C	K5TYP	146.340	146.940							
Tampa B	WB4HAE	146.340	146.760							Pascagoula C	WA5RMS	146.340	146.940			2400				
Orlando C	WB4QEL	146.340	146.760	449.600	448.600				7	MISSOURI										
GEORGIA																				
Atlanta C	W4BOC	146.160	146.760	146.340		1800S				Kansas City C	WA0VUN	146.220	146.820			2805		X		
Atlanta L	W4DOC	146.280	146.880							Kansas City C	WA0AMR	146.340	146.940					X		
Atlanta L	W4RRW	146.220	146.820							Springfield C	WA0VVV	146.340	146.940							
Dallas L	-	146.250	146.850							St. Joseph L	W0OKB	146.100	146.940	146.340						
Griffin L	-	146.310	146.910							St. Louis C	W0AIU	146.160	146.760							
Rome L	W4VO	146.460	146.940	146.340		2100S	X			St. Louis Q	-	146.340	146.940							

- Not operational when data received.
- May change to .22/.82.
- Secondary input is a.m.
- RTTY Repeater.
- Operational from 7 A.M. to Midnight.
- V.h.f. and u.h.f. interconnected.
- Planning on 600 kHz spacing retaining .34 input with tone coding.

- V.h.f. and u.h.f. interconnected. KH6EQK and KH6EQF are interconnected by UHF.
- Autopatch for members only.
- Going to 600 kHz spacing .16 input.
- System interface with 52.525. Simultaneous 2 and 6 m. output with 2m. input and 2 m. output with 6 m. input.
- Destroyed by fire 19 Nov. '71. Call WB0QQ applied for.
- Destroyers' most used frequencies useless. All outputs have same signal.

LOCATION	CALL	PRIMARY		SECONDARY		TONE	AUTO PATCH	OPR. TIME	NOTES	LOCATION	CALL	PRIMARY		SECONDARY		TONE	AUTO PATCH	OPR. TIME	NOTES	
		Input	Output	Input	Output							Input	Output	Input	Output					
NEBRASKA										PENNSYLVANIA										
North Platte C	KØYRL	146.340	146.940							Bethlehem C	W3OK	146.160	146.700						X	
Omaha C	WAØVVD	146.220	146.820							Erie D	W3ZLO	146.340	146.940							
NEVADA										RHODE ISLAND										
Reno D	K7UGT	146.340	146.940	146.940	147.480	2400P				Bristol C	K1OHE	146.340	146.940	146.940	448.000				X	
Virginia City C	K7VJZ	52.525	146.940							Pawtucket C	K1ABR	146.100	146.700	146.700				X	9	
NEW HAMPSHIRE										SOUTH CAROLINA										
Concord D	WIALE	146.340	146.940							Charleston L	WB4QGK	146.340	146.940			1477				
NEW JERSEY										SOUTH DAKOTA										
Lakewood C		146.310	146.910							Brookings L	-	146.340	146.940							
Paramus C	WA2UYS	146.115	146.610	146.610	146.115		X			Rapid City C	KØMZN	146.340	146.940							
NEW MEXICO										TENNESSEE										
Albuquerque C	WA5YUG	53.725	52.525		52.575	T	X	X		Knoxville C	K4HXD	146.340	146.940							
Los Alamos C	W5PDD	146.340	146.940				X	X		Knoxville C	-	146.280	146.880							
Roswell C	WA5DMQ	146.340	146.940							Lenoir City C	K4RSV	146.460	147.060							
NEW YORK										TEXAS										
Bath D	W2DRZ	146.340	146.940	146.190	146.790					Amarillo C	W5CBT	146.340	146.940							
Buffalo D	K2LDT	146.310	146.910							Arlington C	-	449.200	444.200						X	
NYC B	WA2SUR	146.190	146.730							Austin C	WA5YTO	146.340	146.940							
NYC C	WA2UWK	146.280	146.880	146.340	146.940					Corpus Christi C	WA5YTJ	146.340	146.940						X	
NYC C	WA2YYQ	146.250	146.880	444.250	449.250			X		Dallas C	WA5VKV	146.220	146.820						X	
NYC C	WA2YZZ	146.100	146.700				R			Dallas C	WA5VKV	449.000	444.000						X	
Lockport D	W2RUI	146.250	146.820							Dallas D	WA5VKW	146.280	146.880							
Poughkeepsie D	W2CVT	146.310	146.760							Dallas Q	-	146.190	146.790						1	
Steuben County C	WA2ARI	146.340	146.940		145.340			X		Ft. Worth C	WA5YTM	146.340	146.940							
Rochester D	WA2UWQ	146.280	146.880							Ft. Worth C	WA5KTO	146.160	146.760							
Rome D	WA2UWS	146.280	146.880							Ft. Worth C	-	53.050	53.150			52.560				
Schenectady C	K2AE	146.460	146.940							Houston C	WA5QLA	146.280	146.880							
Syracuse D	WA2UWF	146.460	146.940							Irving D	-	146.130	146.730						X	
Troy C	WB2NNZ	146.340	146.940							Mineral Wells C	W5KVI	146.040	146.640						X	
Utica D	K2GVI	146.340	146.940							Mt. Pleasant C	-	146.340	146.940							
Western NY C	W2SB	146.340	146.940	146.250	146.850			X	X	Nederland C	WA5YUS	146.340	146.940							
Whiteface D	WA2UYJ	146.220	146.820							Pecos C	WA5YUU	146.340	146.940							
NORTH CAROLINA										UTAH										
Charlotte D	W4BFB	146.340	146.940							Salt Lake City C	WA7AKI	146.340	146.940	444.900	449.900				X	25
Durham D	K4RUQ	146.340	146.940							VERMONT										
Elizabeth City C	WA4VTX	146.280	146.880	146.940		T S	X	X		Bennington D	WA1KFX	146.310	146.880							
Greensboro D	W4GG	146.160	146.760							Mt. Ascutney D	WA1KGM	146.160	146.760							
Raleigh D	-	146.280	146.940							Mt. Mansfield D	WIKOO	146.340	146.940							
High Point D	K4VUG	146.340	146.940							Shelburne D	WIABI	146.340	146.940	146.280	146.880					
Lexington D	-	146.310	146.910							VIRGINIA										
Roaring Gap L	WB4PPS	146.220	146.940	146.940	145.500					Charleston C	WB4KNX	146.280	146.940							
North Wilkesboro D	W4DCD	52.780	52.525	146.420						Danville D	WB4QEP	146.280	146.880							
Salisbury D	W4EXU	146.280	146.880							Lynchburg C	WB4HCX	146.340	146.940							
Shelby C	W4NYR	146.280	146.880							Richmond C	WB4QEO	146.340	146.940						W	
OHIO										WASHINGTON										
Ashtabula D	K8HRS	146.340	146.760							Castle Rock L	-	146.340	146.940			146.760			1875	
Athens D	K8TQK	146.340	146.760							Seattle D	W7DBF	146.340	146.580	146.760						
Canfield D	WA8VWH	146.280	146.880							Spokane C	WA7KYY	146.340	146.940							
Cincinnati C	WB8CRS	146.340	146.760			1800		X		Wenatchee C	W7TD	146.340	146.940							
Cincinnati D	W8QID	52.920	53.050							WEST VIRGINIA										
Cleveland C	WB8CQR	146.340	146.760	146.370		110.9S		X		Huntington D	WB8ARY	146.340	146.760	52.760	52.525					
Cleveland D	WB8CQR	449.950	447.950							New Martinsville D	WB8ART	146.340	146.940							
Cleveland D	WB8CRV	146.280	146.880	146.400				X		Parkersburg C	K8BOT	146.340	146.760						X	
Cleveland D	WA8TTO	146.220	146.820	146.460						Weirton D	WA8AGC	146.340	146.940							
Columbus C	W8AIC	146.340	146.760				T	X	X	Wheeling D	W8JDJ	146.340	146.760							
Columbus D	W8TQA	52.760	52.525							WYOMING										
Columbus C	W8ERD	29.500	146.820	50.540				X	16	Casper Mtn. C	K7KMT	146.340	146.940	444.550	449.550				X	
Dayton C	WB8CQK	146.160	146.760	146.040	146.640	2000P			17	Laramie C	WA7EGK	146.340	146.940	146.760				X	X	
Dayton D	WA8PIA	448.750	443.750							South East Wyo. C	WA7KZC	146.160	146.760						X	
Delaware D	W8QLS	146.370	146.970							South East Wyo. C	WA7KZC	146.100	146.700						R	
Fletcher D	WB8CRL	146.460	146.880																	
Galion L	WA8KJJ	146.340	146.760																	
Hamilton D	WA8WMH	146.370	146.970					X												
Marietta D	W8HH	146.280	146.880																	
Miamisburg D	WA8PLZ	146.220	146.820	448.600																
Newark D	-	146.280	146.880																	
Newcomerstown C	WB8CRU	146.340	146.760																	
Ottawa D	K8JHG	52.760	52.525	53.360	53.540															
Toledo D	WB8CQO	146.340	146.760																	
Toledo D	WB8CQO	146.200	146.800																	
Toledo D	WB8CQO	52.680	52.525																	
Toledo D	K8MXV	146.100	146.850																	
Youngstown D	W8IIO	146.340	146.760	146.310					19											
OKLAHOMA																				
Ardmore C	WA5YUF	146.460	146.940																	
Central Okla. C	WA5YTI	146.340	146.940																	
Durant Q	-	146.340	146.940																	
Enid C	WA5QYE	146.340	146.940					X												
Tulsa N	WA5LVT	146.340	146.940					X												
Tulsa N	WA5KWH	146.220	146.820																	
OREGON																				
Portland C	W7VS	146.340	146.940																	

- 15. System reverts from .34/.94 to .28/.88 when .34 input signal exceeds 1 minute.
- 16. Inputs are a.m.; output is f.m.
- 17. Secondary combination for members only.
- 18. Going to 146.250 input and 146.850 output.
- 19. Secondary input for base stations.

- 20. Presently a.m. with plans for f.m.
- 21. V.h.f. and u.h.f. interconnected. Also has 146.310 input.
- 22. Temporary call sign.
- 23. Operational from 6 A.M. to 11 P.M.
- 24. Autopatch compatible with 2805 and TouchTone.
- 25. V.h.f. and u.h.f. are separate systems.

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CANADIAN FM REPEATERS

LOCATION	CALL	PRIMARY		SECONDARY		TONE	AUTO PATCH	OPR. TIME	NOTES
		Input	Output	Input	Output				
ALBERTA									
Calgary L	VE6AUY	146.460	147.000						
Edmonton L	VE6WQ	146.460	147.000						
Grand Prairie L	VE6OL	146.460	147.000						
BRITISH COLUMBIA									
Chilliwack D	VE7ELK	146.460	147.000						
Cranbrook D	VE7CAP	146.340	146.940						
Kamloops D	-	146.340	146.940						
Nelson D	VE7BTU	146.460	147.330						
Penticton D	-	146.340	146.940						
Prince George D	VE7AFG	146.580	147.330						
Trail D	VE7CAQ	146.340	146.940						
Vancouver D	VE7RPT	146.340	146.940						
Victoria D	VE7BEL	146.220	147.540						
MANITOBA									
Winnipeg D	VE4XK	146.460	146.940						
NEW BRUNSWICK									
Moncton D	VE1VHF	146.460	146.940						
Saint John D	VE1KI	146.460	146.940						
NEWFOUNDLAND									
Grand Falls D	VO1AV	146.460	146.940						
Saint Johns D	VO1GT	146.460	146.940						
NOVA SCOTIA									
Halifax D	VE1ARC	146.460	146.940						
Sydney D	VE1JD	146.460	146.940						
Truro D	VE1XK	146.460	146.940						
ONTARIO									
Belleville D	VE3KBR	146.460	146.940						
Chatham D	VE3KCR	146.460	146.940						
Grimby D	VE3LCR	146.490	147.090						
Hamilton D	VE3DRW	146.160	146.760						
Kitchener D	VE3KSR	146.370	146.970						
London D	VE3LAC	146.460	147.060						
Niagara Falls D	VE3BER	146.070	146.700						
Oshawa D	VE3OSH	146.400	147.120						
Ottawa D	VE3STP	146.340	147.060						
Peterboro D	VE3PBO	146.340	146.940						
St. Catharines D	VE3NRS	146.220	147.240						
Sault Sainte Marie D	VE3SSM	146.340	146.940	146.460					
Sudbury D	VE3SRS	146.460	146.940						
Toronto D	VE3RPT	146.460	147.060				146.940		
Toronto D	VE3MOT	156.580	147.180						
Toronto D	VE3SSS	146.640	147.300						
QUEBEC									
Chicoutami D	VE2CRS	146.460	146.940						
Matane D	VE2CSL	146.460	146.940						
Montreal D	VE2CAT	146.180	146.640						
Montreal D	VE2PY	146.280	146.880						
Montreal D	VE2RM	146.400	147.180						
Montreal D	VE2MT	146.460	147.060						
Montreal D	VE2TA	146.520	147.500						
Montreal D	VE2XW	146.700	147.600						
Ottawa D	VE2CRA	146.460	146.940						
Quebec City D	VE2OM	146.460	146.940						
Quebec City D	VE2VD	146.520	147.500						
Riviere Du Loup D	VE2NY	146.460	146.940						
St. Foy D	VE2LB	146.640	147.140						
Sherbrooke D	VE2FZ	146.460	146.940						
Trois Rivieres D	VE2AT	146.460	146.940						
SASKATCHEWAN									
Regina D	VE5SS	146.460	147.330						

SIMPLEX FREQUENCIES OTHER THAN NATIONAL OR REPEATER OUTPUT

ALABAMA		KANSAS		TENNESSEE	
State CD Freq.	53.400	Chanute	146.760	Memphis	52.580
				Oakridge	146.760
ARKANSAS		LOUISIANA		TEXAS	
Springdale	146.760	Statewide - old CD	147.300	Arlington	146.550
				Dallas	146.430
CALIFORNIA		MINNESOTA		Fort Worth	146.400
Placer County	51.000	Stanchfield	146.640	Statewide	146.520
Sacramento	51.100			Statewide	146.640
Statewide	51.300	MONTANA		Statewide	449.100
Bay Area	146.650	Great Falls	146.760		
Statewide	146.460	Missoula	146.760	VIRGINIA	
Statewide	446.000	Ryegate	146.760	Arlington	147.000
ILLINOIS				Arlington	146.880
Chicago	147.300	NORTH CAROLINA		Arlington	146.760
		Burlington	147.780		
IOWA		OREGON		WASHINGTON	
Ames	52.640	Portland	146.760	Blaine AFS	146.760
Des Moines	146.880			Spokane	146.760
Des Moines	146.760	PENNSYLVANIA		N.W. Washington	146.760
Des Moines	146.460	Philadelphia	146.430		
Des Moines	446.000				

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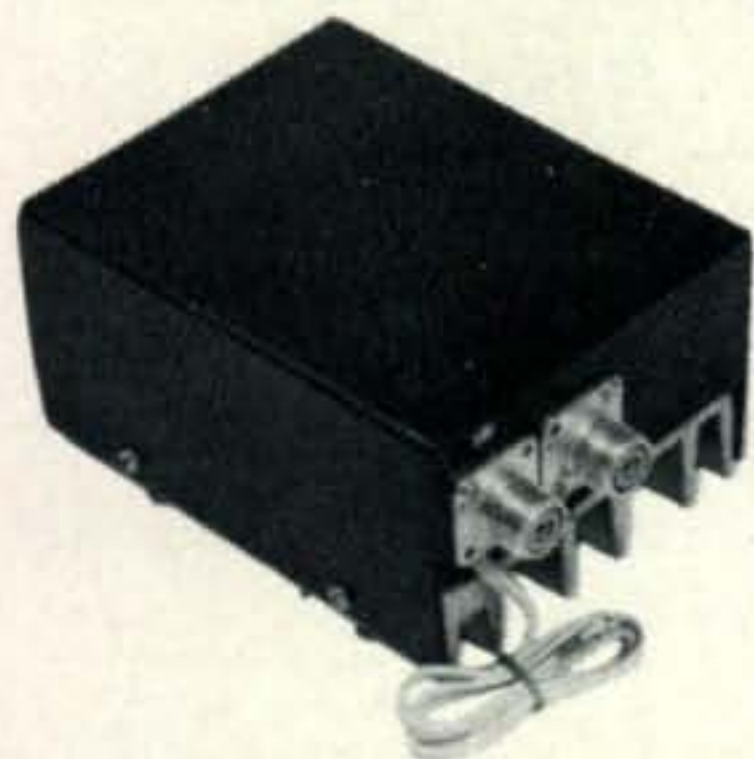
"...If you ever have a problem with your booster, take it to any DYCOMM dealer and he will replace it free of charge; if it is out of warranty, he will give you another booster and we will bill you for repairs if it seems appropriate...."



10-0 The ultimate in solid state power 8-15 watts input will put out 80 watts minimum, 125 watts maximum. Typically 100 watts output for 10 watts input. **\$195.00**



E "Brick" or TR22 Booster, one of the most popular, your 1-2W HT can push out 20-25W **\$79.95**



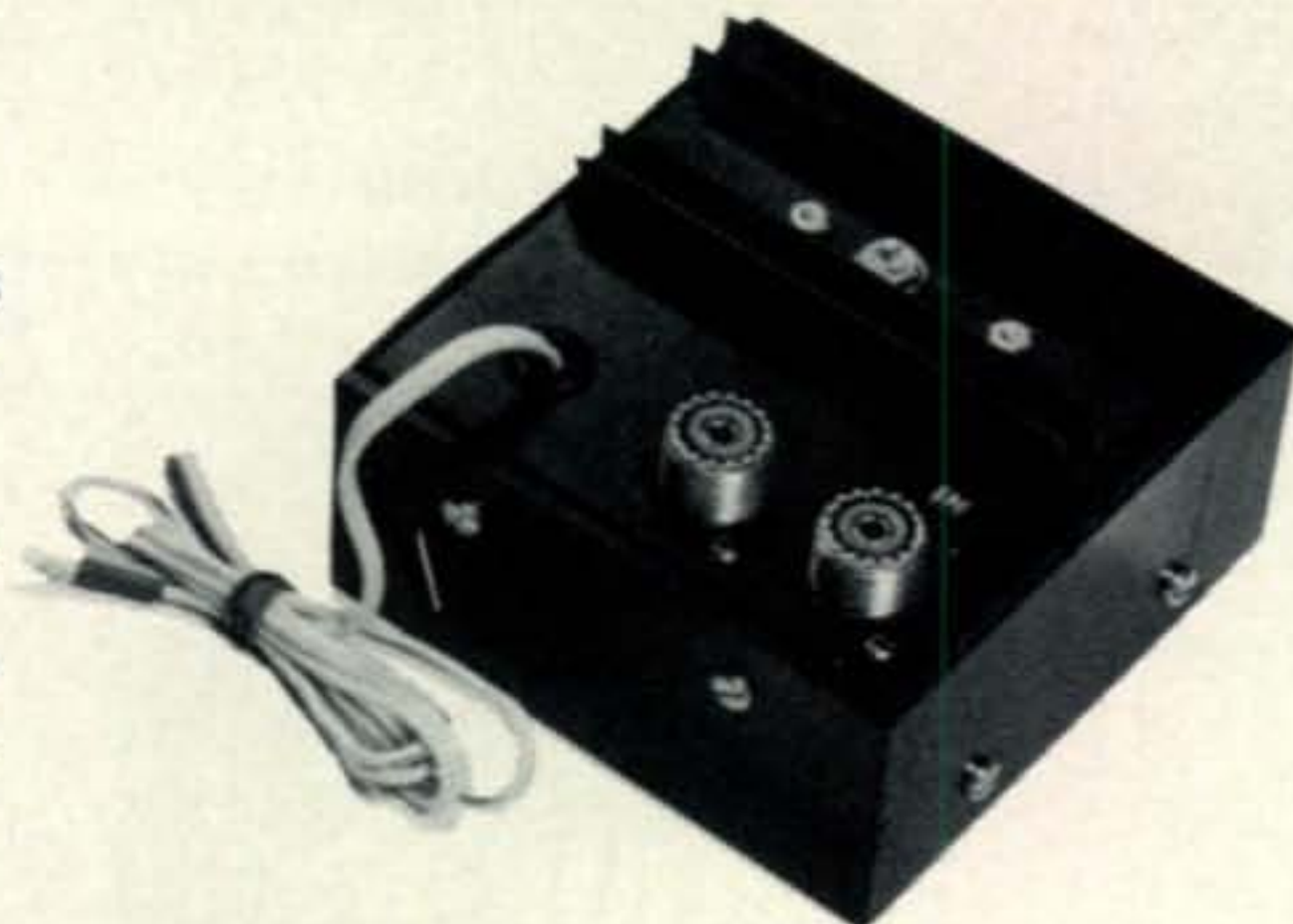
D "Block Booster", 8-12W in, 40-55W output. Your HR-2A will typically put out 55-60W. **\$99.95**

ES "Super Brick/TR22 Booster", now you can have from 35-45W for .8-2 watts input. Typically 38W output/1W input **\$ 99.95**

All boosters have automatic low insertion loss in/out switching. All operate from 12-15V DC. Isn't it time you also went DYCOMM??

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To order: See your nearest DYCOMM dealer, if none near you, order direct and add \$1.55 for shipment.



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A new all band SSB/CW transceiver featuring digital frequency read-out and 500 W. PEP SSB input. This sophisticated hybrid transceiver uses 49 silicon transistors, 6 FET's, 42 diodes, 30 IC's and 6 tubes to provide smooth, high quality performance over all of the 3.5, 7.0, 14.0, 21.0 and 28.0 MHz bands. The Digital 500 measures only 13¼" x 7" x 12½" deep; power supply/speaker measures 6" x 7" x 12½".

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Announcing

THE CQ WORLD WIDE WPX SSB CONTEST

March 25-26, 1972

I Contest Period: Starts: 0000 GMT Saturday. Ends: 2400 GMT Sunday. Only 30 hours of the 48 hour contest period permitted for Single Operator stations. The 18 hours of non-operating time may be taken in up to 5 periods anytime during the contest, and must be clearly indicated on the log. Multi-operator stations may operate the full 48 hours.

II Objective: Object of the contest is for amateurs around the world to contact as many amateurs in other parts of the world as possible during the contest period.

III Bands: All bands, 1.8 thru 28 mc may be used, but operation is confined to two-way single sideband *only*.

IV Type of Competition: 1. Single Operator (a) All Band, (b) Single Band. 2. Multi-operator, All Band, *only*. (a) Single Transmitter, (only one signal permitted) (b) Multi-Transmitter, (one signal per band permitted).

V Exchange: Five figure serial number, RS report plus a progressive three digit contact number starting with 001 for the first contact. (Continue to four digits if past a 1000) (Multi-Transmitter stations use separate numbers for each band.)

VI Points: 1. Contacts between stations on different continents; count 3 points on the 14, 21 and 28 mc bands, and 6 points on the 7, 3.5 and 1.8 mc bands.

2. Contacts between stations in the same continent but not in the same country; count 1 point on 14, 21 and 28 mc, and 2 points on 7, 3.5 and 1.8 mc. (Exception: Contacts between different North American countries count 2 points on 14, 21 and 28 mc, and 4 points on 7, 3.5 and 1.8 mc. This applies to North American countries *only*.)

3. Contacts are permitted between stations in the same country for the purpose of obtaining a Prefix multiplier, but have no QSO point value.

VII Multiplier: The multiplier is determined by the number of different prefixes worked.

A "prefix" is considered to be the two or three letter/number combination which forms the first part of an amateur call. (W1, W2, WA2, DL1, DJ, 4X4, 5A1 and etc. See WPX rules.)

Each prefix may be counted only *once* during the contest.

VIII Scoring: 1. Single Operator (a) All Band score, total QSO points from all bands multiplied by the number of different Prefixes worked. (b) Single Band score, QSO points on that band multiplied by the number of different Prefixes worked.

2. Multi-Operated stations. Scoring in both these categories is the same as the All Band scoring for Single Operator.

3. A station may be worked once on each band for QSO point credit. However, prefix credit can be taken only *once* regardless of the band.

IX Awards: Certificates will be awarded to the highest scoring station in each category listed under Sec. IV.

1. In every participating country.

2. In each call area of the United States, Canada and Australia.

All scores will be published. However to be eligible for an award, a Single Operator station must show a minimum of 12 hours of operation. Multi-operator stations must show a minimum of 24 hours.

A single band log is eligible for a single band award *only*. If a log contains more than one band it will be judged as an all band entry, unless specified otherwise. However a 12 hour minimum is required on the single band.

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

X Special Awards: 1. WORLD—Single Operator, Single Band. A Trophy donated by Jack Reichert, W3ZKH.

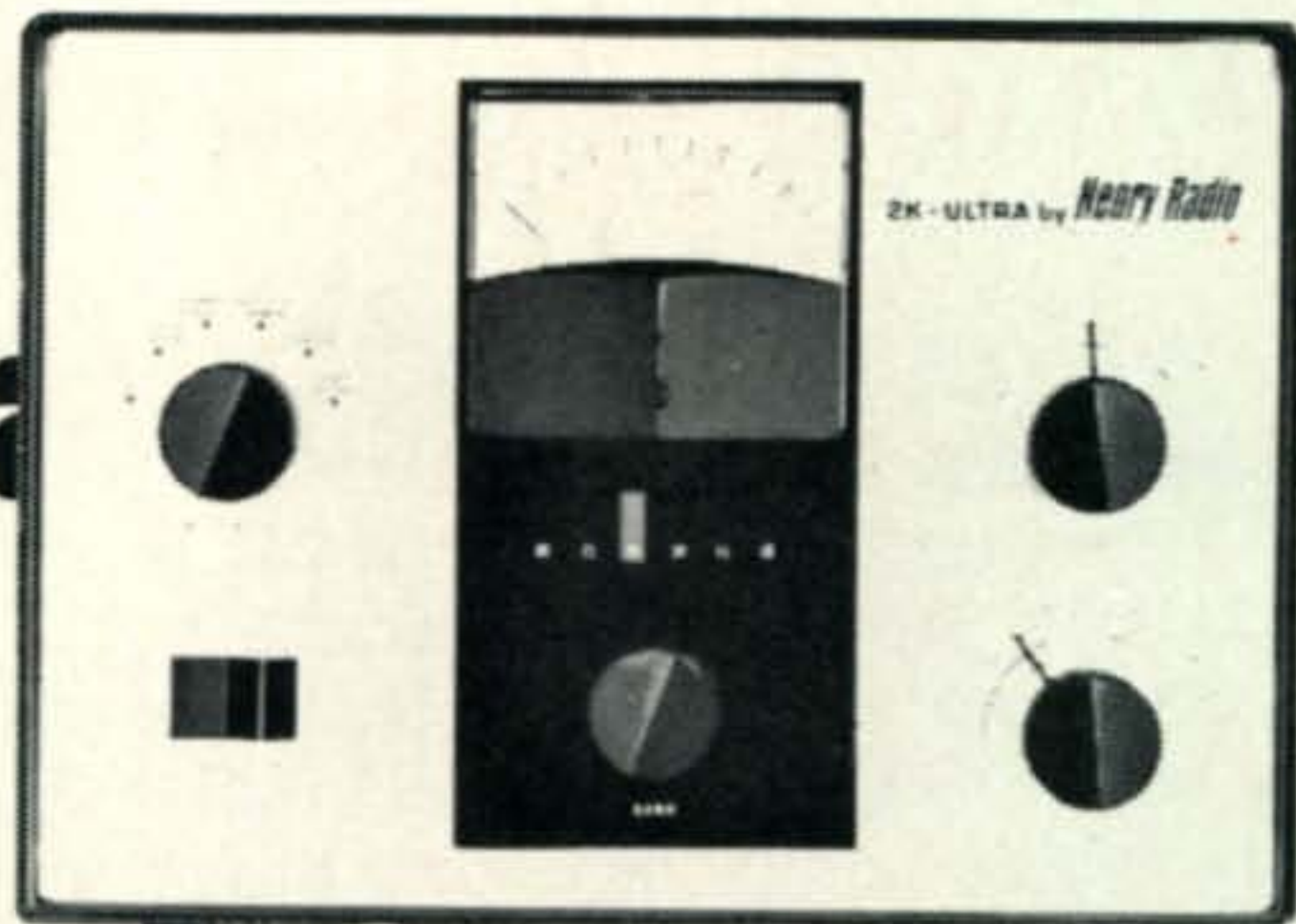
2. WORLD—Single Operator, All Band. A Trophy donated by Don Murray, K4FMA.

3. WORLD—Multi-operator, single transmitter. The Ted Thorpe, ZL2AWJ Memorial Award, donated by Don Miller, W9WNV.

4. WORLD—Multi-operator, multi-transmitter. The Chuck Swain, K7LMU. Memorial Award, donated by Don Miller, W9WNV.

5. CANADA—Single Operator, Single Band. A Trophy donated by Gene Krehbiel, VE6TP.

The Henry Family of Fine Amplifiers Grows and Grows



2K-ULTRA

There has never been an amateur linear amplifier like the new 2K ULTRA. Small and lightweight, yet rugged and reliable... all that the name implies. The ULTRA is destined to establish the standard for comparison for the 70's as the earlier Henry 2K series did in the 60's. It offers all of the fine quality, engineering and construction of its big brother, the 2K-4, condensed into a miniature powerhouse of radio frequency energy.

SPECIFICATIONS: Maximum legal amateur input in all modes: 2KW PEP SSB, 1 KW CW-FSK Continuous duty performance Frequency range: 3.5 to 30* MHz. Tube Complement: Two Eimac 8873 tubes, conductively cooled grounded grid triodes Power requirements: 115/230 VAC, 50/60Hz. Drive power required: SSB-CW; 50 to 100 watts. ALC Circuit: prevents overdrive from today's high power exciters and boosts average talk power. Output impedance: 52 ohms unbalanced with SWR not to exceed 2 to 1. Input impedance: 52 ohms. Harmonic and other spurious emissions: Second Harmonic: -50db. Third Order Distortion: -35 db at full power output. Noise level: -40 db or better below one tone carrier at 1 KW. The price: \$845.00

*Amateur Bands

2K-4



True to its heritage, the 2K-4 is destined for a future of even greater achievements than its predecessor 2K's. Its rugged construction guarantees a long life of reliable performance. The 2K-4's heavy-duty components allows it to loaf along even at full legal power. You can spend more for an amateur linear, but you can't buy better. The 2K-4, the big signal amplifier... floor console or desk model: \$795.00

3K-A

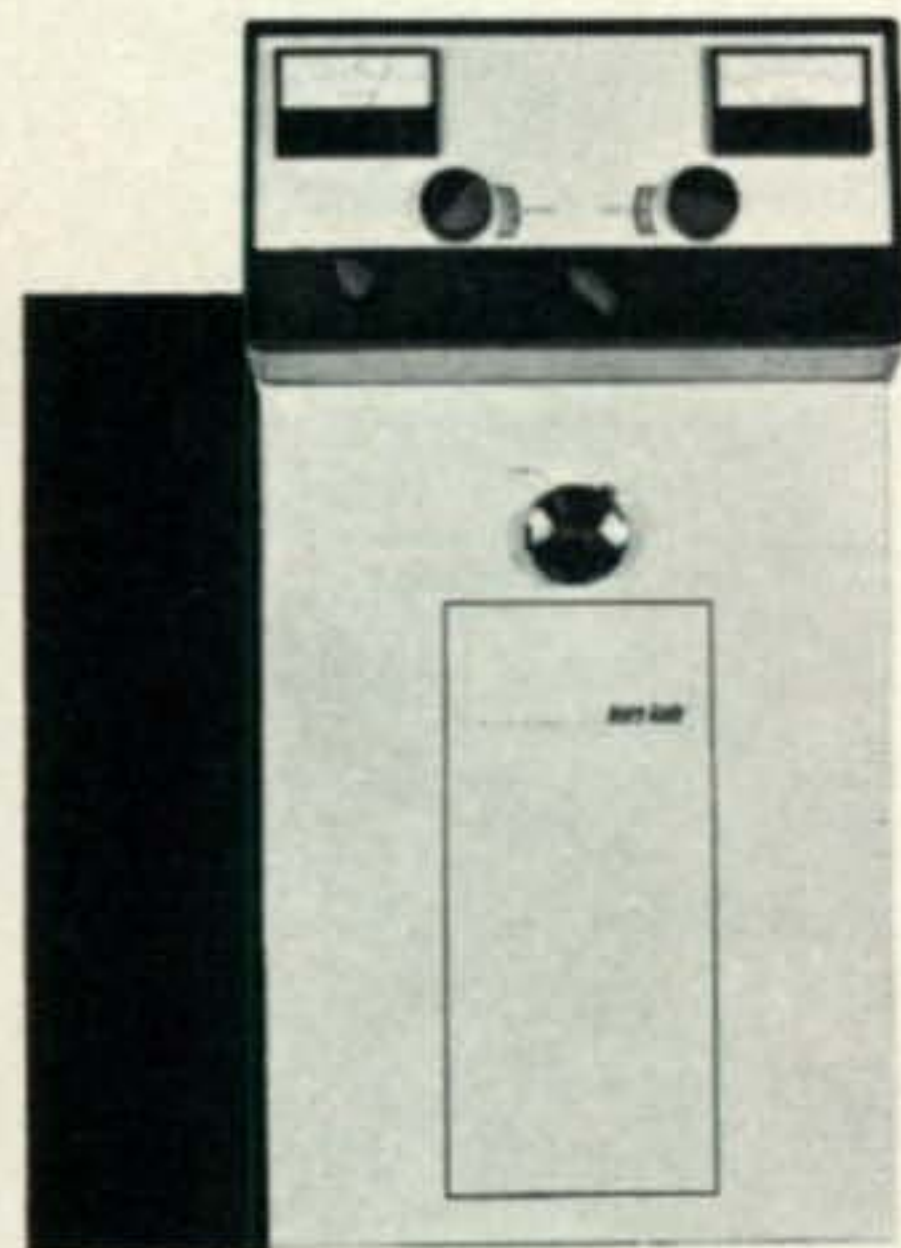
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The 3K-A employs two rugged Eimac 3-500Z grounded grid triodes for superior linearity and provides a conservative three kilowatts PEP input on SSB with efficiencies in the range of 60%. This results in PEP output in excess of 2000 watts. In addition, the 3K-A provides a heavy duty power supply capable of furnishing 2000 watts of continuous duty input for either RTTY or CW with 1200 watts output. Price: \$995.00

the 4K-A

The 4K-A is specifically designed for the most demanding commercial and military operation for SSB-CW-FSK or AM. Using the magnificent new Eimac 8877 grounded-grid triode and vacuum tune and load condensers, the 4K-A represents the last word in rugged, reliable, linear high power RF amplification. One hundred watts drive for 4000 watts PEP input. PRICE: \$1675.00



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WORLD-WIDE WPX SSB
CONTEST



Page 1 of 5 Pages

CALL 4U1ITV Log For 14 Mc Band COUNTRY I.T.U.

(Use separate log for each band.)

DATE Time GMT	STATION	SERIAL NUMBER		PREFIX	Points
		Sent	Received		
APRIL 11	0003 WIMDO	59001	59002	W1	3
	05 W2PV	59002	59004	W2	
	06 VO1NI	58003	57001	VO1	
	09 KV4FF	57004	58009	KV4	
	10 KV4AA	56005	57001		
	12 VE6TP	57006	56005	VE6	
	15 W4AXE	58007	57010	W4	
	24 W2TA	56008	56003		
	36 W8IMZ	55009	55005	W8	
	48 W3AU	44010	45012	W3	
OFF 0100 - 0400	- 3Hrs.				
APRIL 12	0405 YV5BJ	58011	59038	YV5	3
	09 YV5AGD	58012	59037		
	12 ZV7AP5	59013	59047	ZV7	
	13 PY250	59014	59039	PY2	
	20 HK3RQ	57015	57033	HK3	
	26 HC1TH	57016	57032	HC1	
	36 PJ9JR	59017	58069	PJ9	
	38 PZ1AH	57018	56091	PZ1	
	40 PY2CK	56019	55045		
	OFF 0500 - 1000	- 5Hrs.			
2001 G3NMH	57020	57125	G3	1	
03 DL4RM	56021	56205	DL4		
05 DJ6QT	56022	56230	DJ6		
12 DL4CQ	55023	55090			
14 IL8AF	55024	55301	IL		
15 ILFLD	55025	55259			
21 OH2BN	57026	57405	OH2		
33 OH2AM	58027	57991			
46 UA1DZ	59028	58426	UA1		
DEF 1100 - 2100	- 10Hrs				
2102 W1WDO	59029	59495	W1	0	
05 VP2MK	58030	59026	VP2	3	
07 VP2YL	58031	59086			
10 KP4CL	59032	59623	KP4		
12 WA4MMO/KP4	58033	58536			
15 F2VN/WX	57034	57123			
20 W8JMF	56035	55223	W8	0	
23 W8JN/VE3	57036	56098	VE3	3	
25 W1GYE	59037	59001		3	
TOTAL POINTS THIS SHEET				24	87

CQ Form 1069 eff. Feb. 1968

A sample log sheet already filled out. Official log sheets are available from CQ, see (7.) below.

country of the contestant, have been observed.

7. Official log and summary sheets are available from CQ. A large self-addressed envelope with sufficient postage or IRCs must accompany your request.

XI Club Competition: No club award is planned at this time, however one may be given if sufficient interest is shown.

XII Log Instructions: 1. All times must be in GMT. The 18 hour non-operating periods must be clearly shown.

2. Use a separate sheet for each band.

3. Prefix multipliers should be entered only the FIRST TIME they are contacted.

4. Logs must be checked for duplicate contacts and prefix multipliers. Recopied logs must be in their original form, with corrections clearly indicated.

5. A prefix check list is not only desirable but a *must* for proper contest operation. (It is recommended that you also send it along with your contest log.)

6. Each entry must be accompanied by a Summary Sheet listing all scoring information, the category of competition and the contestant's name and mailing address in BLOCK LETTERS.

Also a signed declaration that all contest rules and regulations for amateur radio in the

If official forms are not available you can make your own by following the attached sample, with 40 contacts to the page.

(Daystrom Limited has made an International Log Form which is available to Canadian amateurs. We will supply them with Summary Sheets. Write to: 1480 Dundas Highway East, Cooksville, Ontario.)

XIII Disqualification: Violation of the regulations of amateur radio in the country of the contestant, or unsportsmanlike conduct, or taking credit for incorrect QSO's or Prefixes, or duplicate contacts in excess of 3% of the total made, will be deemed sufficient cause for disqualification.

Actions and decisions of the Committee are official and final.

XIV Deadline: All entries must be post-marked *no later* than May 1, 1972. In rare isolated areas the deadline will be made more flexible.

Logs go to: CQ WPX SSB Contest Committee, 14 Vandeventer Avenue, Port Washington, L.I., N.Y. 11050.

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SEND QSL FOR COMPLETE SPECIFICATIONS.

QRQ?

Tips for Increasing C.W. Copying Speed

BY AL D'ONOFRIO,* W2PRO

WOULD you like to increase your c.w. copying ability, to zip up those tortoise-like QSO's, to conquer that solid 20 w.p.m. you need for that Extra ticket? Don't you wish you had a sure-fire system to show you the way to QRQ land? Take heart, for such a do-it-yourself system does exist—really.

It was this system, incidentally, that Ted McElroy was using at that tournament in Asheville, North Carolina, on July 2, 1939, when he officially copied the highest recorded c.w. speed—75.2 words per minute. To this day, his record still stands; ever challenged, but never beaten.

Back in the thirties, this system was the heart of a well-known correspondence course aimed at the would-be commercial c.w. operator who yearned for big pay, travel, and adventure aboard ship. There were others besides McElroy, of course, who had mastered the system of QRQ; old timers will remember with affection that petite YL of twelve (or was it nine) who, instead of playing house, was walking away with honors at 35 w.p.m. Any system that turns out champions is certainly worth a second look—especially if you have been locked in at a solid twelve (or is it nine) for the past . . . well, let's not dwell on that.

Heart of the system being discussed—as simple as it may sound—is training yourself to copy a second or more behind the letter being sent. In “copying behind,” you consciously and deliberately delay writing down the letter until the subsequent letter or letters have been sent. Champion McElroy is reported to have copied up to 40 letters, and even more, before actually hitting the keys of his typewriter.

A poor habit that plagues many is that of copying in-step with the letter being sent, afraid to relax their guard for an instant. Copying this way—on top of every letter—keeps you too keyed up; tension builds to the

point where you start anticipating the next letter before it is even sent. It's a viciously uncomfortable way to copy, and one that will not help you become a good c.w. operator.

The right habit—copying behind—immediately relaxes those tensed muscles and buoys up your spirit; it puts the whole business of copying in proper perspective. But whatever the psychology of copying behind is, one thing is sure: it works.

Copying behind is a relaxing way to copy. One Old Timer vividly remembered McElroy—with a twinkle in his eye—pour himself a glass of water with one hand, while hitting the mill at over 50 w.p.m. with the other. Now, how relaxed can a guy get!

Try dividing your copying time between copying behind, using pen or pencil, and finger writing—a transitional technique that you may find helpful. With finger writing, you assume the same writing posture, but deliberately refrain from writing down any letters. This motionless copying—copying “in-one's head”—is a great QRQ confidence builder. Once you get the habit of copying behind and copying without writing, you are on your way down that yellow-brick road.

The system of copying we are discussing leads to your copying of word-clusters. You will begin to pick out these word-clusters easily, like the words *the, of, and, to a, in, that, I,* and the suffixes like *tion* and *ing*. You will be copying these clusters without difficulty, almost as a reflex action.

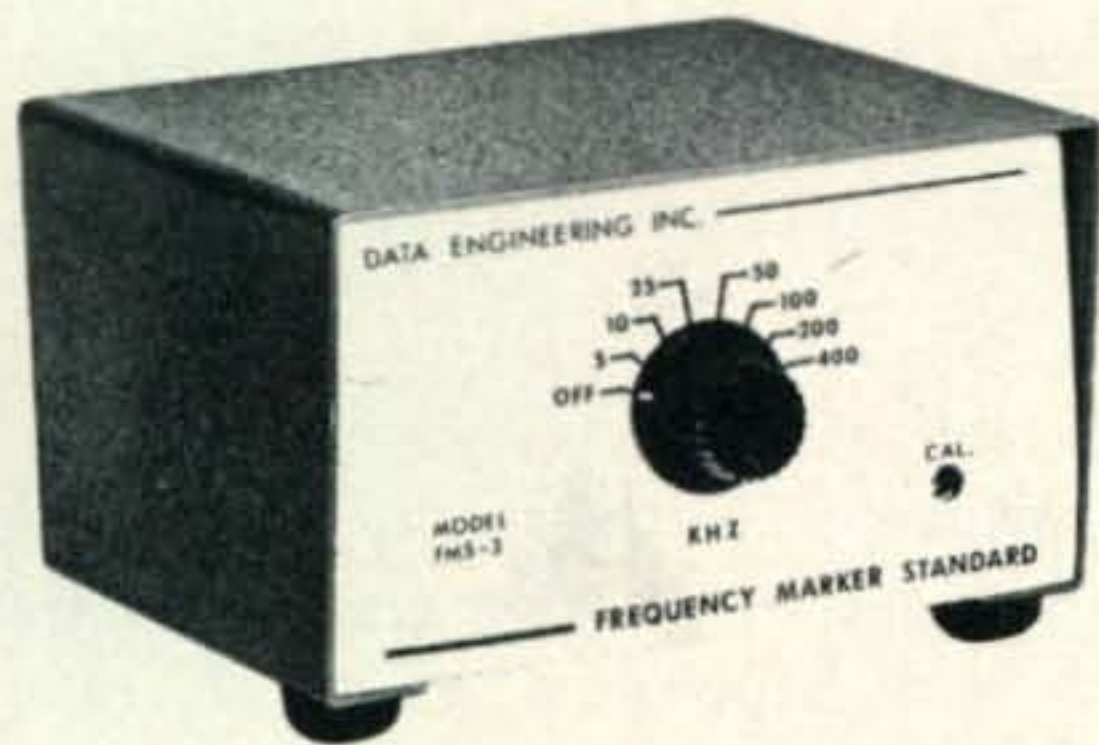
Learning to copy behind is easier said than done: it takes a good deal of controlled discipline on your part to “hold back” writing down each letter the instant you hear it. As you acquire more and more copying time, the technique will get easier.

Having taught c.w. in the military, I recommend that you spend no more than 30 minutes a session copying c.w.—half writing it down; half copying without writing. And

[Continued on page 83]

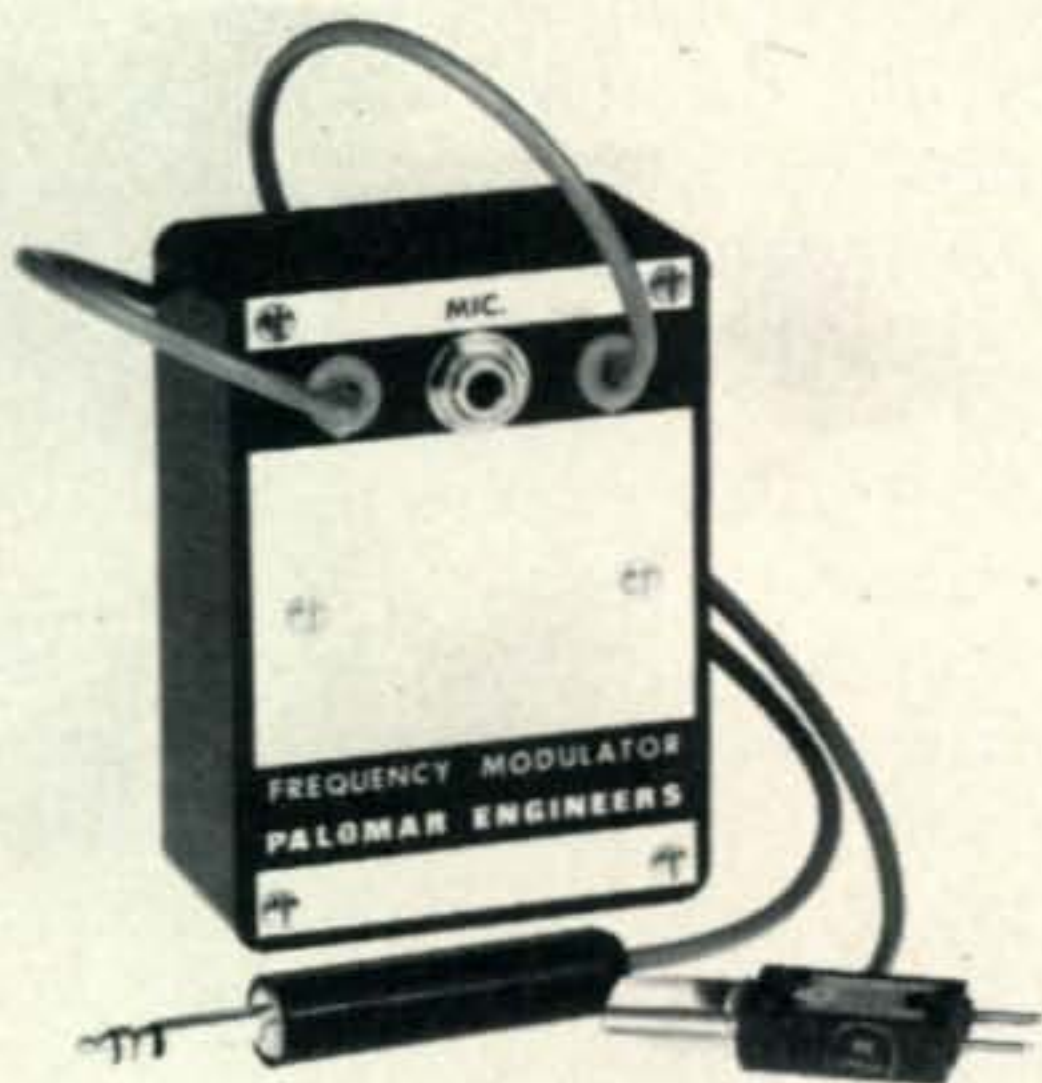
*1537 Central Park Ave., Yonkers, N.Y. 10710

New Amateur Products



Data Engineering

THE FMS-3 Frequency Marker Standard developed by Data Engineering uses new Fairchild low power integrated circuits and a precision 400 kHz crystal to produce markers at 5, 10, 25, 50, 100, 200 or 400 kHz. Front panel adjustment allows precise zero beat calibration with WWV/WWVH. The unit comes calibrated to WWV. High frequency phono jack provides 3.8v. P-P square wave. Price complete as illustrated is \$32.95. The unit less cabinet, switch, and battery holder is \$22.95, and in kit form is \$19.95. For further information write: Data Engineering Inc., Box 1245, Springfield, Va. 22151 or circle A on Reader Service card.

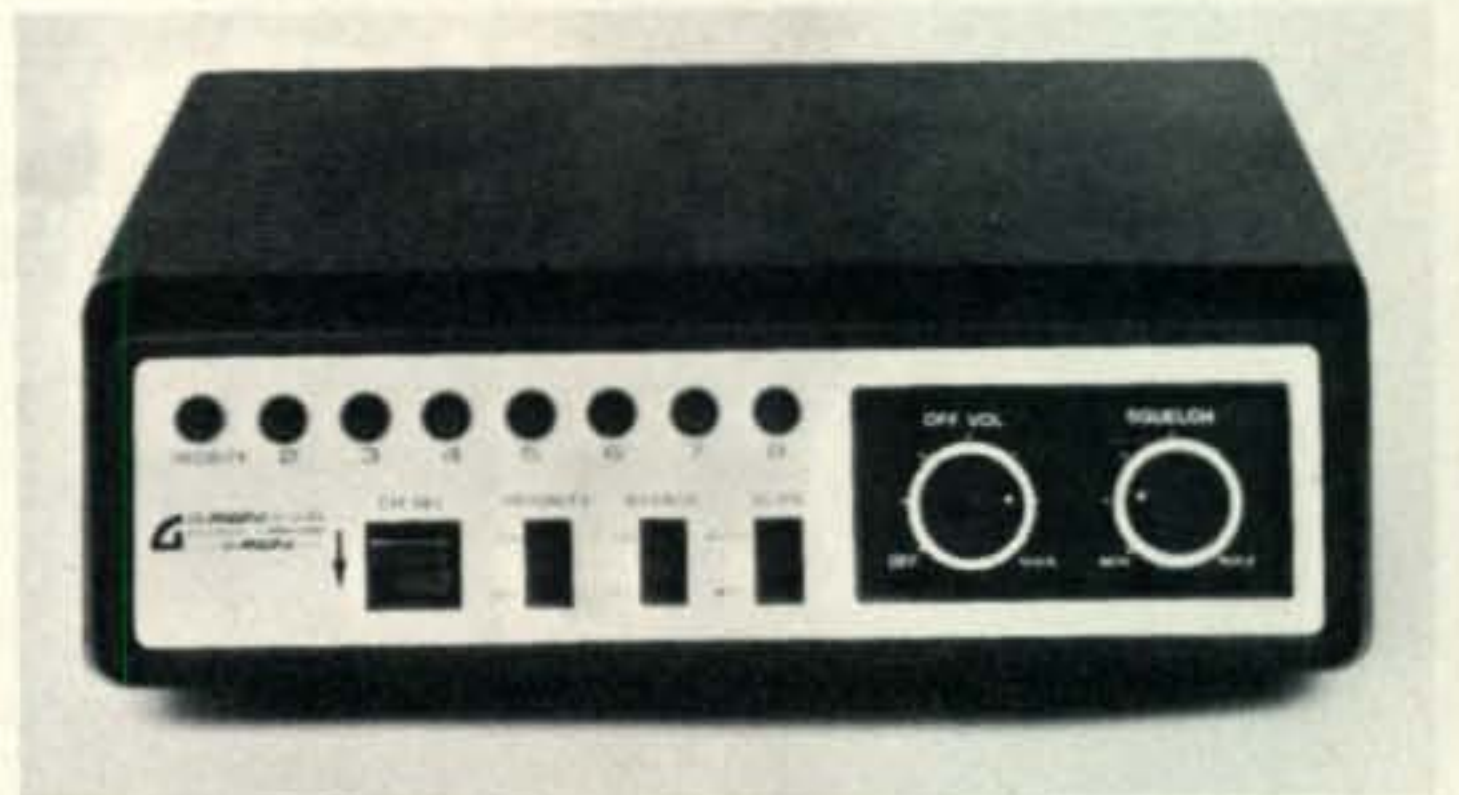


Palomar Engineers

A FREQUENCY modulator for use with the Gonset Communicator has been developed by Palomar Engineers. The plug-in modulator puts the Communicator I, II, III, IV or GC-105 on F.M. with no modification or rewiring. Cables from the modulator plug into the microphone jack for push-to-talk and into one of the crystal sockets where a variable capacitance diode frequency modulates the crystal. The frequency modulator sells for \$34.50 postpaid, and built-in tone burst is available for \$10. For detailed information write: Palomar Engineers, Box 455, Escondido, Calif. 92025 or circle B on the Reader Service card.

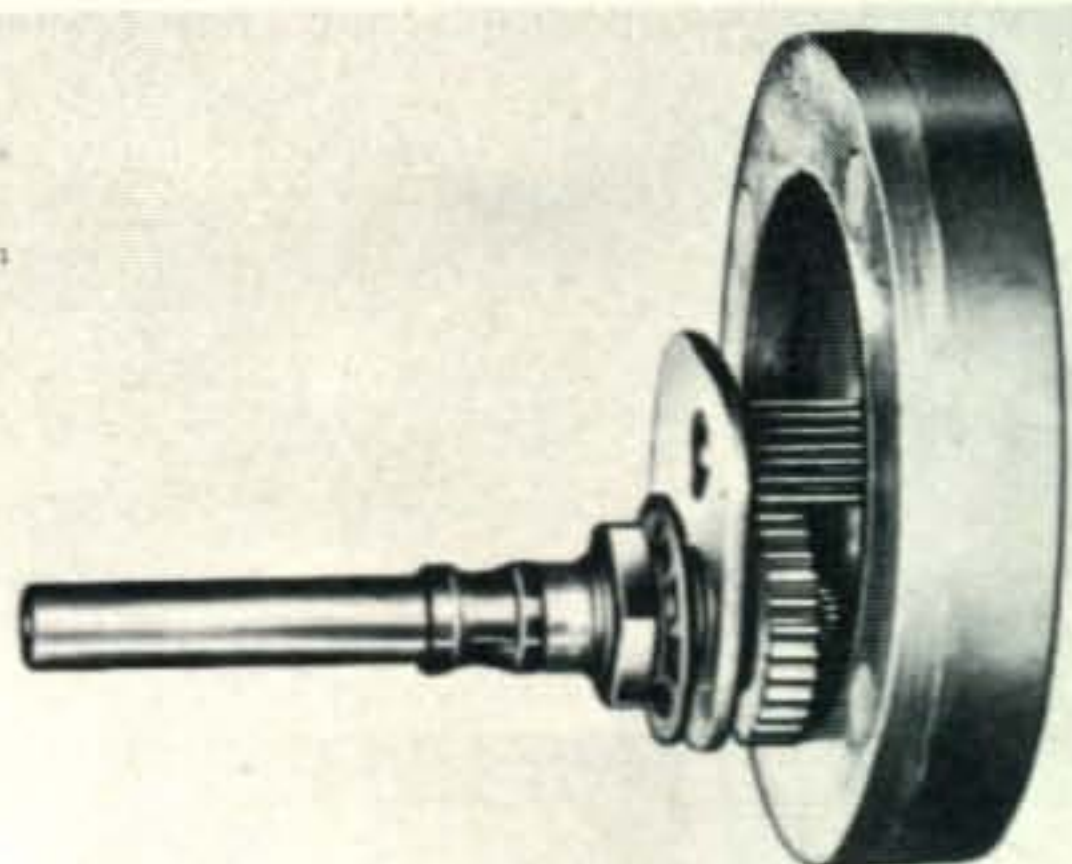
Gladding Corporation

THE Gladding HiScan is a new v.h.f. monitor developed by the Pearce-Simpson Division of Gladding Corp. The monitor automatically scans eight crystal controlled channels, or it may be manually switched from channel to channel. HiScan covers the 144-175 MHz band for listening on police, fire, amateur and marine calls. The monitor will automatically revert to a priority channel if desired, regardless of reception on other channels. Additional features are: a bypass channel, built-in 115 v.a.c./12 v.d.c. power supply, and "trap door" crystal installation. Suggested price is \$114.95. For more information write: Gladding Corp., Pearce-Simpson Div., P.O. Box 800, Biscayne Annex, Miami, Fla. 33152 or circle C on Reader Service card.



Jackson Brothers

AN Accelerator Spinwheel Drive, developed by Jackson Brothers (London) Ltd., is a cord drive unit intended for radio receivers with extra-long scales. It incorporates a 2¼ inch diameter zinc alloy flywheel driven through nylon-to-brass step-up gears at more than twice the speed of the drive shaft. While the unit weighs only 6-oz., it provides an inertial effect equivalent to a much larger flywheel. Shaft lengths, thread types, and mounting arrangements can be varied to meet individual requirements. For further information write: Jackson Brothers (London) Ltd., c/o M. Swedgal, 258 Broadway, New York, N.Y. 10007 or circle D on Reader Service card.



Crystal-Stable Tunability in Two-Meter Mobile

BY DAVE MILTON,* K6HWN

This novel n.b.f.m. homebrew mobile rig uses a heterodyne v.f.o. transmitter and triple-conversion wide-band i.f. strip receiver to give the equivalent of crystal-controlled operation anywhere in the 2m. band. Only the design approach is described, with circuitry and construction left to the ingenuity of the experimenter.

THE two-meter transceiver described here achieves the almost impossible marriage of the best of both crystal control and v.f.o. operation. This was accomplished by using fool-proof design rather than critical circuits.

The Receiver

The receiver has a dual conversion front end which lowers the two-meter band to the frequency range tunable by an ordinary a.m. automobile radio, which normally will have more than enough stability. The first conversion lowers the 144-148 MHz two-meter band to 15-19 MHz via a crystal-controlled 129 MHz injection oscillator. A 4-mHz-wide i.f. strip amplifies this signal before the second crystal-controlled conversion which provides injection of either 16.5 or 17.5 MHz. The 16.5

mHz injection places both 15-16 MHz and 17-18 MHz within the 0.5-1.5 MHz tuning range of the auto radio. Likewise, 16-17 MHz and 18-19 MHz are covered by the 17.5 MHz injection which is centered between these two ranges. Since each megahertz in this 15-19 MHz range represents one megahertz in the two-meter band, the entire band is covered by either the 16.5 or 17.5 MHz crystal.

Note that every setting of the a.m. receiver dial therefore receives two separate two-meter frequencies. This is a small price to pay for the simplicity of using only two second-conversion crystals. Of course, a 1 MHz instead of 4 MHz wide i.f. strip and four first-conversion crystals instead of one could be used. A small 3 db noise figure improvement would also result. Or, in the unlikely event

* 6039 Claremont Ave., Oakland, Cal. 94618

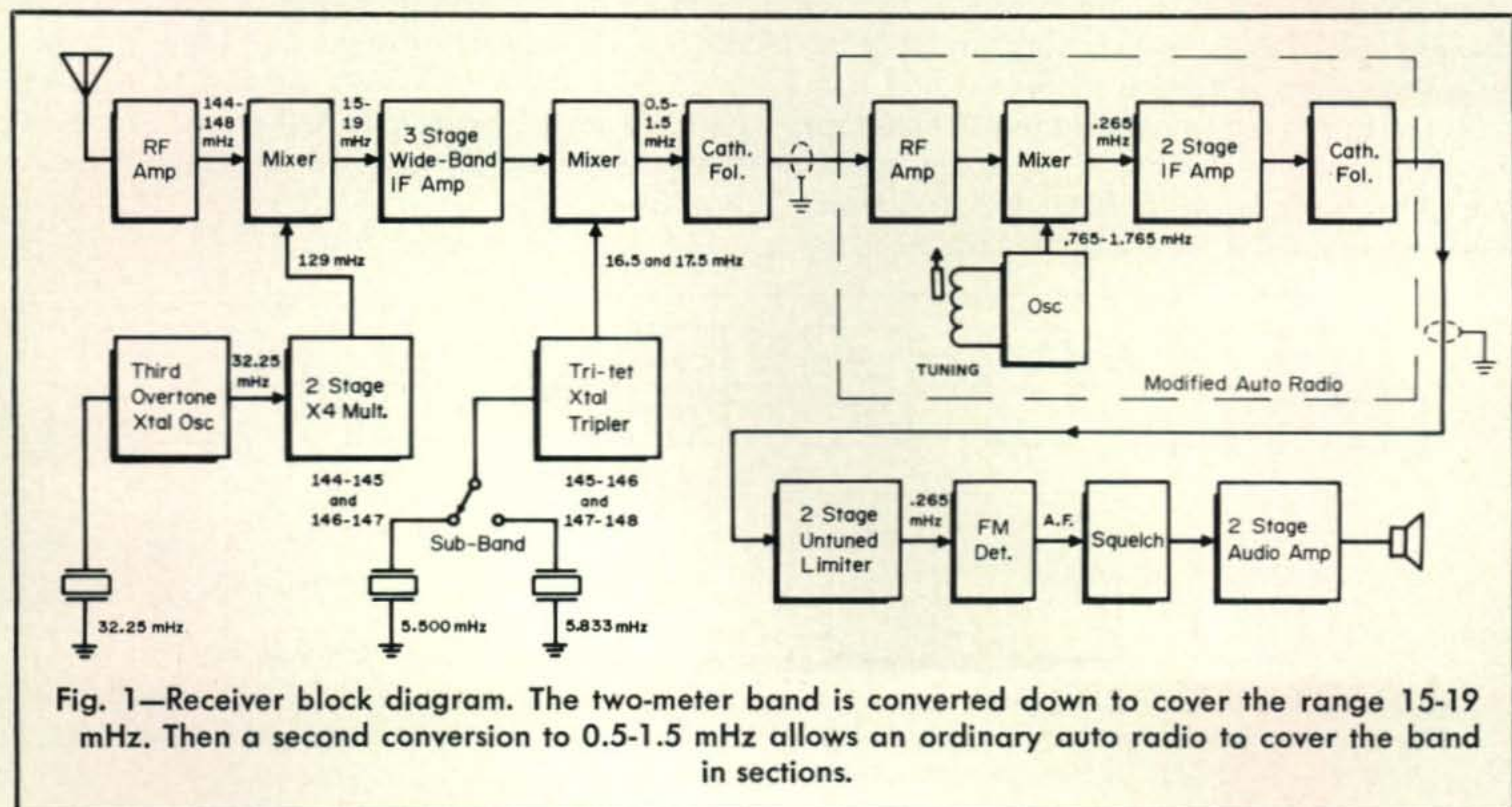


Fig. 1—Receiver block diagram. The two-meter band is converted down to cover the range 15-19 MHz. Then a second conversion to 0.5-1.5 MHz allows an ordinary auto radio to cover the band in sections.

that two stations were interfering due to this double reception, switching in a third second-conversion crystal would separate them. However, the double reception has never caused me any practical problems.

Since the block diagram of the receiver shown in fig. 1 is fairly conventional, only a few points will be discussed. The choice of first-conversion local oscillator and i.f. frequency puts the commercial f.m. band a good 2 MHz outside the receiver's 110-114 MHz image band. I keep the gain of the three-stage wideband i.f. amplifier low and have not had any intermodulation problems from unwanted signals. The only purpose of the cathode followers is to drive the coax to and from the auto radio. The auto radio has mechanical-link push buttons and an r.f. stage. The two-stage i.f. amplifier helps get the wider bandwidth for the ± 15 kHz deviation stations. Absolutely all a.m. is taken out by the two-stage untuned limiter which makes a perfect square wave out of the signal. I have never heard ignition noise on this rig.

The Transmitter

The heart of the transmitter is a low-frequency tunable oscillator whose output beats with a crystal-controlled oscillator to cover the range 8.000 to 8.222 MHz. After multiplication by 18, this is the whole two-meter band. The variable oscillator tunes from 275 to 497 kHz and the crystal-controlled one is at 7.725 MHz. This means that only about 4 per cent of the resulting frequency of 8 MHz is determined by the variable oscillator, so its high stability requirements are not hard to meet.

Referring to the transmitter block diagram, fig. 2, the conventional three-stage speech amplifier directly modulates the frequency modulated v.f.o. This eliminates the need for

p.m. pre-emphasis as well as allowing the deviation per volt of audio to be measured easily by substituting d.c. for the audio. I have received many compliments on the audio quality, and this while using a telephone earpiece as a dynamic mike! The frequency modulated v.f.o. operates class A and is tuned by a 10:1 geared-down capacitor. It is solid state and powered by pen-lite cells mounted inside the unit. The v.f.o. runs continuously without being heard during reception because the transmitter heterodyne circuits are then turned off. A crystal calibration system is provided to correct for the slight drift of the v.f.o. at widely different temperatures. With these stability precautions I have operated mobile-in-motion on the narrowest of repeaters with no problems.

Good sine-wave quality is preserved in the three-stage untuned buffer following the frequency modulated v.f.o. The v.f.o. and crystal signals are then mixed and fed to the 8.000-8.222 MHz bandpass filter. This filter, plus the tuned circuits, in the following r.f. stages, rejects the 7.725 MHz crystal frequency and the lower sideband from the mixer at 7.450 MHz. An untuned amplifier follows the bandpass filter rather than being part of it to simplify stabilization. The rest of the r.f. stages are straightforward.

The v.f.o. calibration system uses the 7.725 MHz crystal-controlled signal as a standard. Harmonics of the 275 to 497 kHz oscillator are generated when the three-stage untuned buffer is switched to non-linear operation by the CALIBRATE switch. The 28th through 16th harmonics pass 7.725 kHz as the v.f.o. is tuned through its range, providing 13 calibration points in the two-meter band. The calibration zero beat is heard in the receiver when it is tuned near that calibration frequency.

[Continued on page 83]

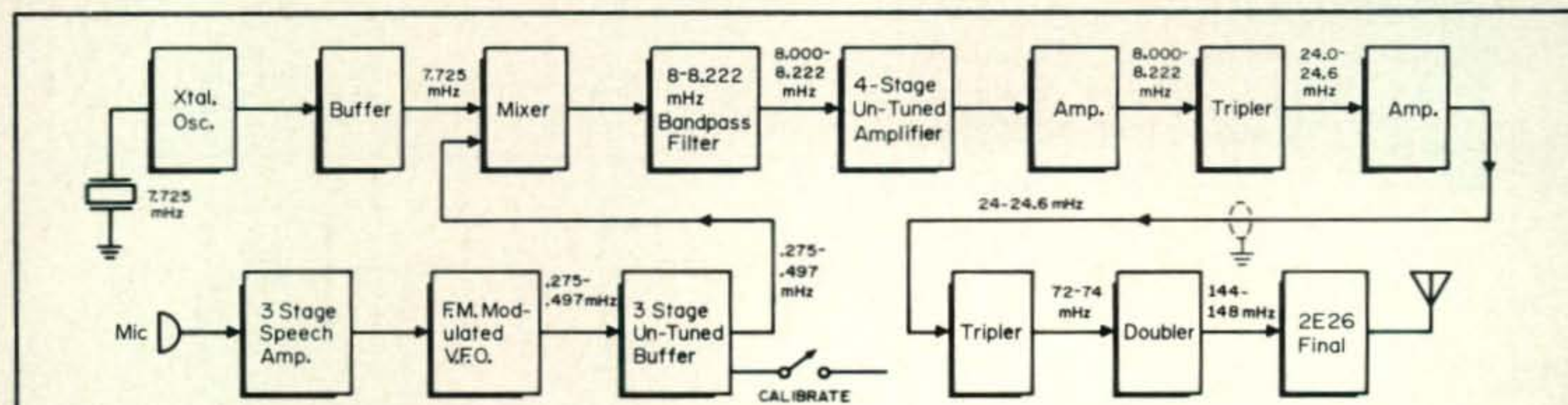


Fig. 2—Block diagram of the transmitter. The audio frequency modulates a low frequency v.f.o. This signal is heterodyned in the mixer up to the 8 MHz range by a crystal-controlled signal and then multiplied to produce the output signal.

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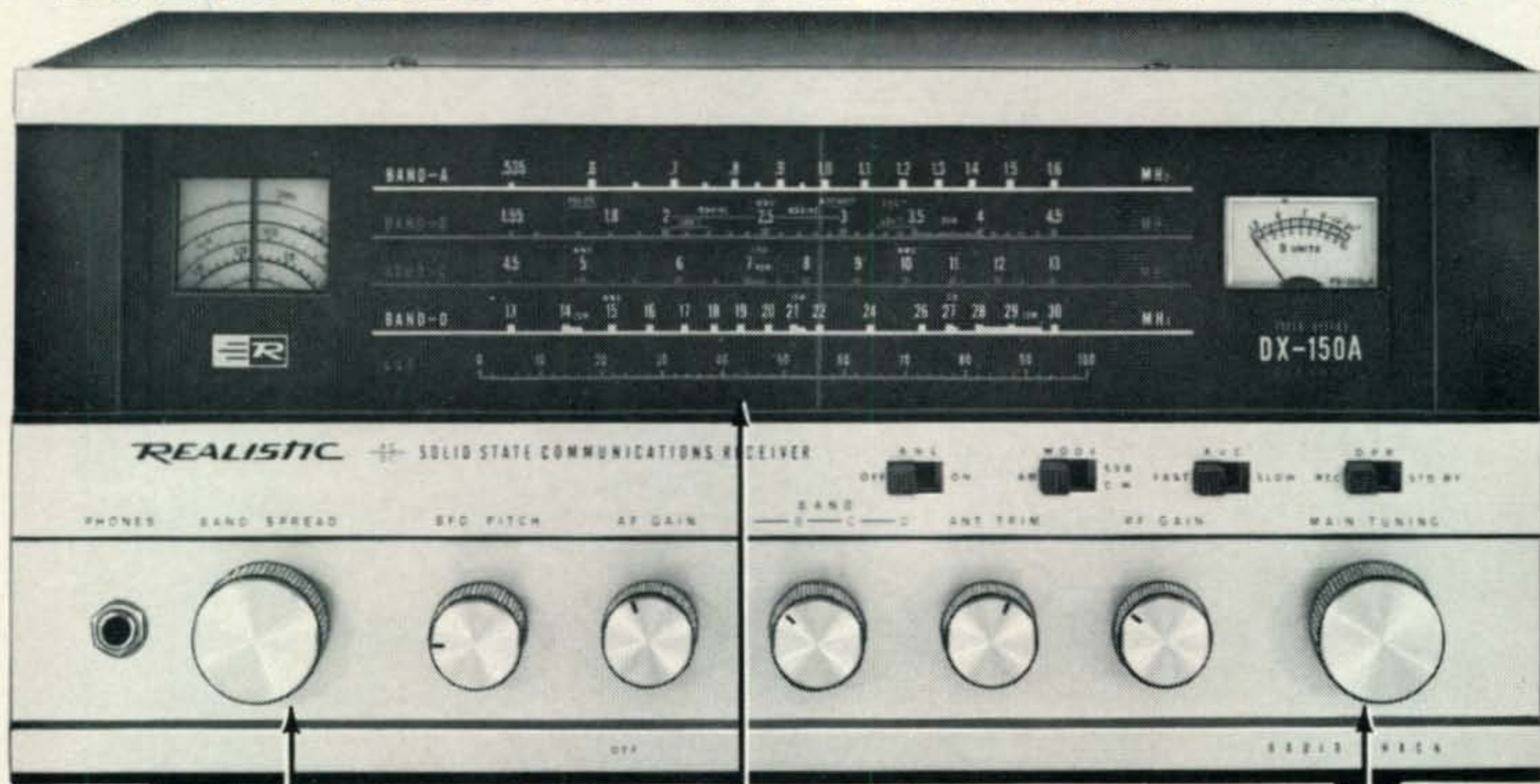
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A Ham's Vacation Guide to the Caribbean

Part II

BY GEORGE PATAKI,* WB2AQC, ex-YO2BO

Concluding the most recent travelogue by George Pataki, this month's installment describes his visits to amateurs in Trinidad, Tobago, St. Lucia, Guadeloupe, St. Maarten, St. Thomas and Puerto Rico.

REPARING this trip, I picked a 9Y4 amateur from the *Callbook* and sent him a letter. After four weeks, not getting any answer, I wrote to another 9YA who's photo I saw in *QST*. Still no answer. Then ARRL suggested Mac, 9Y4MM, and as a last try, I mailed him my standard letter, letting him know when I am coming and that I would like to meet local hams. Very shortly after, I received an enthusiastic letter; in the name of the Trinidad and Tobago Amateur Radio Society. 9Y4-MM wrote, "The Trinidad and Tobago Amateur Radio Society will be pleased if you and your XYL, and any friends whom you think would be interested, can attend our regular meeting (Tea, coffee, rum, snacks). I received your letter yesterday and immediately arranged with our Secretary to shift the date to that of your visit here. . . ."

Now here is the big day; the *Meteor* arrives in Port of Spain. The first passengers leaving the ship are Jim, W1KIB, my wife Eva, and me. We had to find Mac. "Let's go to the police headquarters where Mac is in charge of maintenance of the communications gear" was my suggestion. After asking directions and fighting ourselves through the groups of aggressive taxi drivers, we headed toward Frederik Street. After 3 or 4 blocks, we heard a car blowing its horn loudly: "CQ CQ CQ de 9Y4MM." Automatically, all three of us turned around. "This must be Mac" was the thought in our minds and we tried to find the right car in the flow of the morning traffic. Finally one of the cars pulled to the curb and the driver waved to us. Approaching him, I saw on the front seat the ARRL *Radio Amateurs Handbook*. Ok, that's the right car. Mac came out of the car and we shook hands like

*34-24 76 St., Jackson Heights, N.Y. 11372.

old friends. "How did you recognize us?" I asked Mac. "Some angry taxi drivers described you."

Around noon time we returned to the ship for lunch, but at 2 P.M. Mac was waiting for us in front of the *Meteor*. Jim, his wife, Eva and I got in Mac's car and headed to see Trinidad Omega, one of the four stations in a new worldwide navigational system. 9Y4-CRV, also KH6CRV, is the "chief" here but he was not on duty.

We left for some more sightseeing, then to Mac's house. For the first time in my life, I tasted the coconut. It was getting late, so we left for the club. Arriving there we found a bunch of noisy amateurs, arguing about everything. Many hams came with their wives; it was also a social gathering. We met Frank, 9Y4VU; Cyril, 9Y4VT; Arnim, 9Y4-AR; Ken, 9Y4KR; Tek, 9Y4LP; Bill, 9Y4-HR (also W7QHR); Russel, 9Y4RB; Frank, 9Y4TS, and others.



When George, WB2AQC—standing first on the left—attended the radio club meeting in Port of Spain, he was elected "Honorary Member of the Trinidad & Tobago Amateur Radio Society."



Joseph, 9Y4JC, in Tobago is always happy to meet visiting foreign amateurs.



Allan, VP2GW, in Grenada is a broadcast technician working for WIBS.



Timothy, VP2LT, is the man who knows everything and everybody in St. Lucia.

At the proposal of Mac, 9Y4MM, the club offered me an Honorary Membership in the Trinidad and Tobago Amateur Radio Society. This impressed me. I remembered that three weeks before, I was not allowed to enter the radio club in my home town of Timisoara, Romania, supposedly because I am a "foreigner." As they say: "Nobody can be a Prophet in his own country."

What I like most in Trinidad is the variety of the people. In the radio club I met amateurs who were descendents of Africans, Europeans, Chinese, West Indians, Indians (from VU), Americans, and a mixture of them in various proportions.

I checked some prices in a "duty free" camera store; they were higher than in New York. So, I recommend being careful with your shopping.

I don't recommend missing a radio club meeting.



Lionel, VP2LS, in St. Lucia puts out an excellent signal, but I don't know if he QSLs.

Tobago

In Trinidad I was told to look for Joseph, 9Y4JC, as soon as I get to Tobago. There are not too many amateurs in Tobago and just a few of them are active. But Joseph, using an HW-22 and an inverted V antenna, is often on the air, mostly in the evenings. He is a technician for the local radio station. Joseph showed us around, and took us to the old Fort James.

I recommend the beaches and perhaps a visit to the Buccoo Reef where sea gardens and colorful fishes can be seen in the crystal clear water.

I don't recommend taking a taxi without establishing first firmly where you want to go and how much you will have to pay. And this goes for most of the other islands, too.

Grenada

I did not get any answer to two of my letters written to the Amateur Radio Club of Grenada but this did not discourage me. As soon as we landed in St. George's, we took one of the very unique buses and went to visit WIBS (Windward Islands Broadcasting Service) radio station. There we met Claude, VP2GC, (also VP2SAT in St. Vincent), Mike, VP2GAE, Allan, VP2GW and Cally, VP2GD. It looked like every member on the staff also had an amateur radio license.

Grenada, the Spice Island, is a very nice place indeed; many North Americans have retired here.

I recommend a tour with the bus. Its sides are half open, has wooden benches and the



Monique in Guadeloupe, the second operator of FG7XL, is as charming in person as she is on the air.



Jose, PJ7JC, on the Dutch St. Maarten and FG7TI/FS7 on French Saint Martin, can really create a pile-up.



In St. Thomas, Bud, KV4FR, is in charge of KV4FL, the club station of the Boy Scouts of America.

ride is not too smooth. At the destination, the passenger gets off and comes back to the conductor to pay the fare. It is not fancy, but is a lot of fun.

I cannot recommend the luxury hotels; they are too expensive. Better try private arrangements.

St. Lucia

Timothy, VP2LT, answered my letter giving all kinds of useful information. He promised to wait for us at the docks and he wrote about Owen, VP2LO, who is working in the harbor as a custom officer.

As soon as we docked in Castries, the capital city, Timothy and Owen showed up and we all went to see Owen's station; VP2LØ.

Timothy must have a lot of free time because all day long we were together. And he knows everybody on the island, especially the girls.

We visited quite a large number of amateurs: Lee, VP2LK, is a missionary, Greg, VP2LG, is a bank manager. Lionel, VP2LS, is an electrician. We met also many "foreigners" like Bob, VP2LY, who is from Canada, Dick, VP2LX, who is also G3FGP, reverend Whyte, VE3BWY, who received the VP2-LAH call one hour after he got off the plane, and 30 minutes later he was on the air.

It is very easy to get a VP2L call. All you need is a photostat of your U.S. license and a \$2.50 fee.

You should not miss the "drive-in-volcano" at Sulphur Spring.

Guadeloupe

I did not hope for too much in Guadeloupe because neither the Radio Club, nor a private amateur answered my letter. But I had pleasant surprises.

As soon as we arrived to Pointe-a-Pitre, we went to see Pierre, FG7XL—whose house is very close to the harbor. Pierre wasn't on the island but his charming wife Monique—the second operator of FG7XL—invited us in. When she heard that I intended to write a travelogue, she accepted with enthusiasm to be photographed. I tried to place her near the station, at an operating position, but every time, in the last second before the photo was taken, she turned her head around. After I ruined about 6 shots, I found out that she does not want to be photographed from the side.

But I have to tell you, she is very pretty from every angle. Ironically, the photos did not come out because there was not enough light. Fortunately, the color photos did.

We went to see John, FG7XT, who impressed me more than any other amateur I met in the last couple of years. He is an unusually talented man in many different fields. His underwater adventures with Jacques Cousteau, his travels around the world, but most of all his tremendous and various amateur radio activities are quite impressive. And he knows his stuff.

Jean took us sightseeing and we went to see the old fort. Every island has an old fort, and every fort looks the same.



Dick, KV4AA, of St. Thomas gave a new country to tens of thousands of amateurs around the world.

You can't do too much shopping in Guadeloupe so you shouldn't waste time in the stores. And don't go to the fort.

St. Maarten

This little island, only 37 sq. miles, is an excellent example for the whole world. About half of the island is Dutch, the other half is French, and there is absolute freedom of movement between the two parts.

We landed in Philipsburg, the capital of the Dutch section and immediately went to see Jose, PJ7JC, who was working for Lands Radio, a communications company. Jose took us around the island. I told him we would like to also see the French side and I checked to make sure that we had our passports with us. After a few minutes of driving through the countryside, I asked Jose when we would reach the border.

"We just passed it," said Jose, "we are now in the FS7-land."

"But I did not see the border guards and the custom house."

"We don't have and we don't need border guards," answered Jose, "on our way back I shall show it to you."

Indeed, I saw that border absolutely unattended and I can tell you that I know a country in Europe, where if there would be a border point like this one, it would be the busiest place on earth.

We went to see Jose's station, PJ7JC. I tried to make a few QSOs but those who really needed this rare country, did not let me give it to them. If you listen to an s.s.b. pile-up on 15 or 20m., you'll know what I mean. There were so many W stations on the frequency, continuously repeating their callsign, without giving me a chance to answer. I bet half of the people did not even know who is the station they are calling.

I recommend operating on this island, so you can see how it is on the other end. I hope this will make you a better amateur.

If you are already in Philipsburg, don't miss the chance to see Marigot, the capital of the French St. Martin.

St. Thomas

Dick, KV4AA, was the first amateur who answered my letter, inviting us to visit him. I worked Dick many years ago from YO2KAC club station and I could not dream then that I would ever have a chance to visit the U.S. Virgin Islands and meet him personally.

After we docked in Charlotte Amalie, we took a taxi to the shopping center, which is a very long street with stores serving mostly the tourists.

Almost at the end of this street is Dick's store with electrical appliances. There I met Herb, KV4GB (also W2EMN), who stays part of the year on this island and is quite active.

I was anxious to see the famous KV4AA station, so Dick took us to his home. I took a few photos using a brand new automatic flash bought in St. Thomas and not knowing how to use it, as I found out later, I ruined all the black and white shots. Dick has two stations, in two separate rooms; one for phone, the other for c.w. I could operate the station but I was very tired.

Leaving the center of the city, on our way back to the ship, I saw a 3 element beam antenna. Checking further, we found KV4FL, the club station of the Boy Scouts of America. We met Bud, KV4FR, who is in charge of this station and later his pretty XYL Lee, KV4FS. Finally we had to end this unscheduled but pleasant eyeball QSO and to return to *Meteor*.

I recommend to do all your "duty free" shopping here, where you can get the most honest prices in all the Caribbean.

Don't take the glass bottom boat which is supposed to take you to see the sea gardens and the colorful fishes. We took the boat and saw only cloudy water, nothing else.

Puerto Rico

In the last morning of our trip we returned to Puerto Rico. If I would have to choose to live on one of the Caribbean islands, I would choose Puerto Rico. It is a beautiful island with active and very nice people.

[Continued on page 82]

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Spurious Response:	less than -60 dB
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Receiver	
Receiving System:	Double Super Heterodyne
Intermediate Frequency:	1st. 10.7 MHz 2nd. 455 KHz
1st Osc. Frequency Stability:	0.002%
Band Width:	28 KHz at 6 dB down (Thru Mechanical Filter)
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CQ Reviews:

A Heathkit Color TV Set

BY WILFRED M. SCHERER,* W2AEF

ON a recent visit to our local Heath Electronics Center to look over their newer models of amateur and test gear, we wandered into a demonstration room where a full line of Heath's color TV sets was in operation. Here was some of the finest picture quality and color reproduction we've ever run across. This indeed was a welcome sight inasmuch as we had not been impressed with color TV previously seen elsewhere.

And this is not all, as closer examination of the solid-state models revealed some interesting construction techniques and procedures to simplify assembly. In addition, the kits are supplied with all the test facilities needed for adjustment, while servicing is further aided by elaborate go-no-go test procedures and trouble-shooting data in the manuals. You don't have to buy a lot of test gear to service these sets; as a matter of fact, getting one of these kits together provides a pretty good elementary foundation of color TV principles that will not only make it easy to take care of one's own set, but also will make it possible to adjust many others as well. In this respect it also might be noted that the Heath color TV kits are often used as a training aid by electronic schools.

Many radio amateurs have shown interest in putting together gear other than that related directly to amateur radio. Besides, our personal contacts have found quite a few amateurs who have enjoyed assembling a Heath color TV and who have reported excellent performance.

It would seem appropriate, then, that we present this review on such a project in place of our customary amateur-gear report.

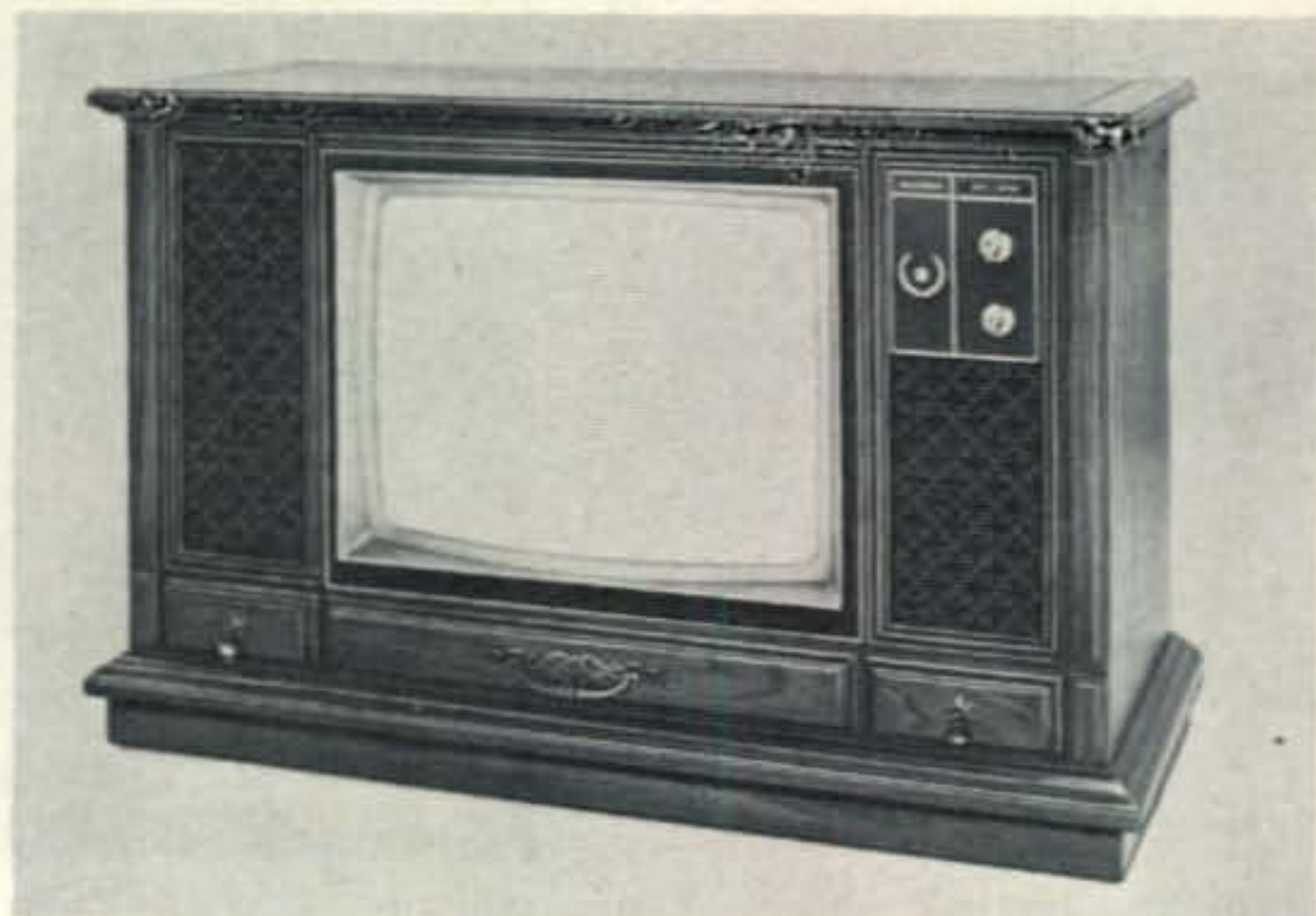
The unit chosen for this discussion is the Model GR-371 MX which is the largest Heath color TV kit available. The set is a solid-state job that produces a 25" square-

cornered ultra-rectangular picture using the MTX-5 matrix picture tube with a 315 square-inch viewing area. This tube has an etched non-glare face with a matrix around phosphor dots on the screen, plus a new type electron gun, all of which aid in providing excellent sharpness, better color fidelity and high contrast.

The set covers the v.h.f. and u.h.f. channels. The former are scanned or selected by operating a pushbutton, as is any one of the u.h.f. channels to which a tuning dial has been preset.¹ Included is "instant-on" operation whereby the heater for the picture tube is left on continuously at a low level until normal operating voltage is required when the TV-set on-off switch is activated. This feature also lengthens tube life. On the other hand, if so desired (such as during long periods of non-operation of the set) this system may be defeated for normal type on-off operation.

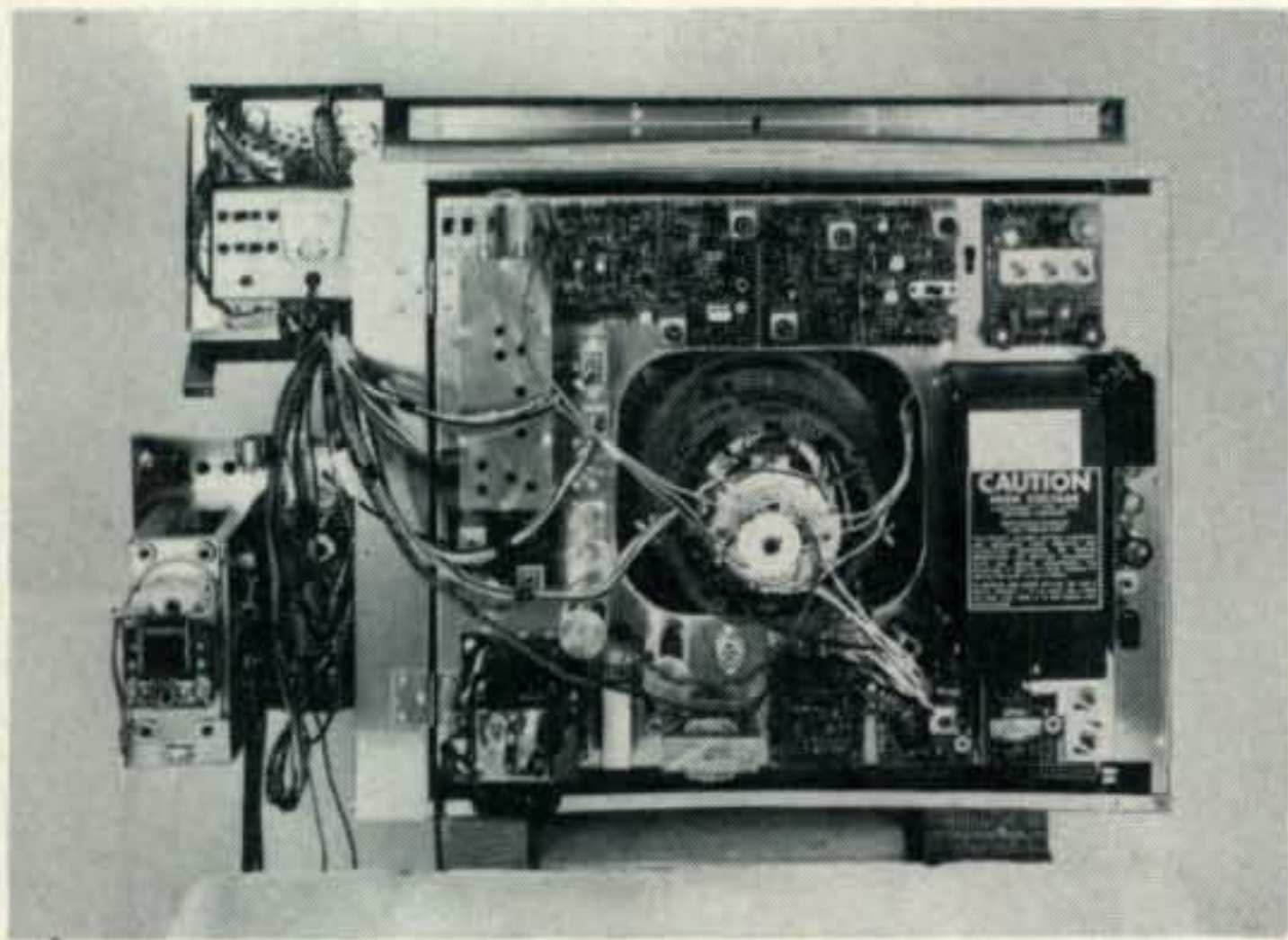
Other features are: automatic fine tuning (AFT); automatic chroma control that maintains constant color under various sig-

¹An optional remote-control accessory also is available.



The Heath GR-371MX Color TV Set installed in the Heath Mediterranean cabinet.

* Technical Director, CQ.



Rear view of the Heath GR-371MX color TV set. The picture tube is near the center with a plastic yoke mount around its neck which also holds the convergence pole-pieces. Five plug-in circuit-board modules are located across the top of the main chassis. The box with the holes in it located at the left of the picture tube contains the pre-assembled i.f. section. Another plug-in board is below it. Along the lower-right edge are three more plug-in boards. The v.o.m. tester, the convergence panel, and the Master-Control panel are shown in their temporary mounting positions, hanging from the left side of the set.

nal conditions; automatic vertical linearity; automatic degaussing to maintain uniform color purity; adjustable noise limiter and gated a.g.c. for minimizing impulse-noise interference and providing uniform signal levels; handy video-peaking control with circuitry for high resolution; adjustable a.f. tone control; 6" x 9" twin-cone speaker for good fidelity; a.f. output jack for reproduction through external hi-fi gear; factory-assembled and pre-aligned MOSFET r.f. tuner and 3-stage i.f. section plus assembled picture-tube h.v. power supply.

Adjustment and servicing are facilitated by a built-in dot generator along with a handy v.o.m. tester and comprehensive adjustment and trouble-shooting manuals. Special assembly tools also are furnished.

The set may be book-case or wall-mounted, installed in an existing cabinet on hand or in a choice of three different console-type Heath cabinets.

Construction

Modular type of construction is employed using nine individual plug-in type glass-epoxy circuit boards for various functions. These are labelled: AGC/Sync; 3.58 MHz Oscillator; Chroma; Luminance; Video Output; Sound; Vertical Oscillator; Horizontal

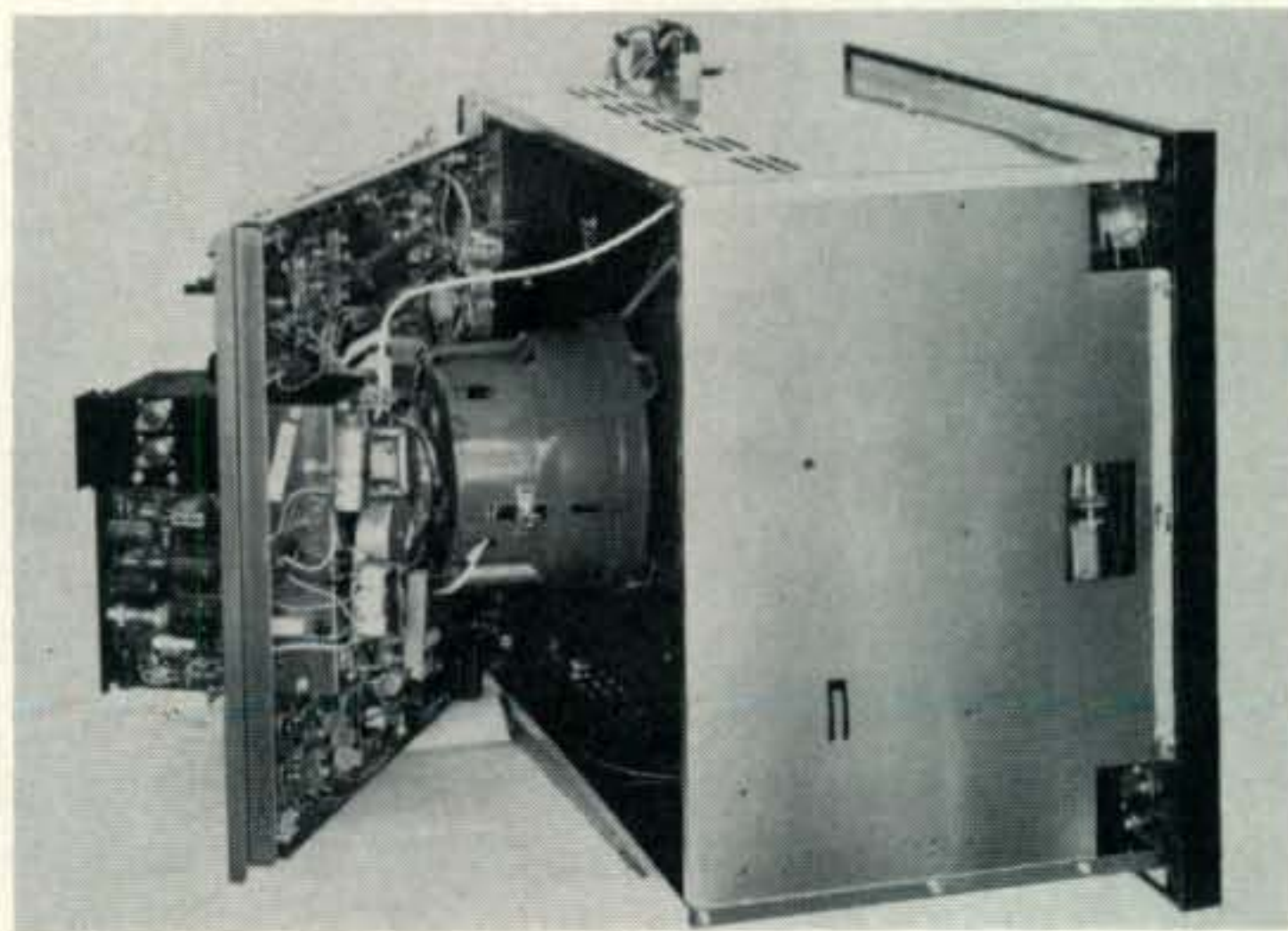
Oscillator; Pincushion. The boards plug into connectors and lock in place on a main chassis. Transistors are not soldered directly to the boards, but instead plug into sockets on the boards. This makes testing, servicing or replacement easily possible.

Permanently installed on the main chassis is the factory-assembled i.f. section and the picture-tube h.v. supply unit along with components for the normal operating power supply. The setup may be visualized at the accompanying photographs which should be consulted for other constructional features.

The main-chassis work is a point-to-point wiring job conducted between tie strips, circuit-board connecting plugs and power-supply components. A large wiring harness and several cable harnesses with factory-attached plugs, where needed, also are involved. Identification of the terminals for the circuit-board connectors is easily had by a strip of numerals applied to the chassis along the body of each connector strip.

The picture tube is installed with a degaussing coil around it in a shield enclosure made of heavy-gauge metal. The main chassis is supported on hinges at the rear of this box, enabling it to swing out for easy accessibility to its rear for testing and servicing. The arrangement also facilitates the initial assembly at which time the chassis may be placed on a bench.

A separate front panel holds the pre-assembled r.f. tuner, a drive motor for push-



View showing the shielded enclosure for the picture tube of the Heath Color TV set. Also shown is the main chassis swung out on hinges which allows easy accessibility for servicing. At the extreme left is a circuit board which is part of the pre-assembled picture-tube h.v. supply. At the center may be seen the yoke and convergence pole-pieces mounted around the neck of the picture tube.

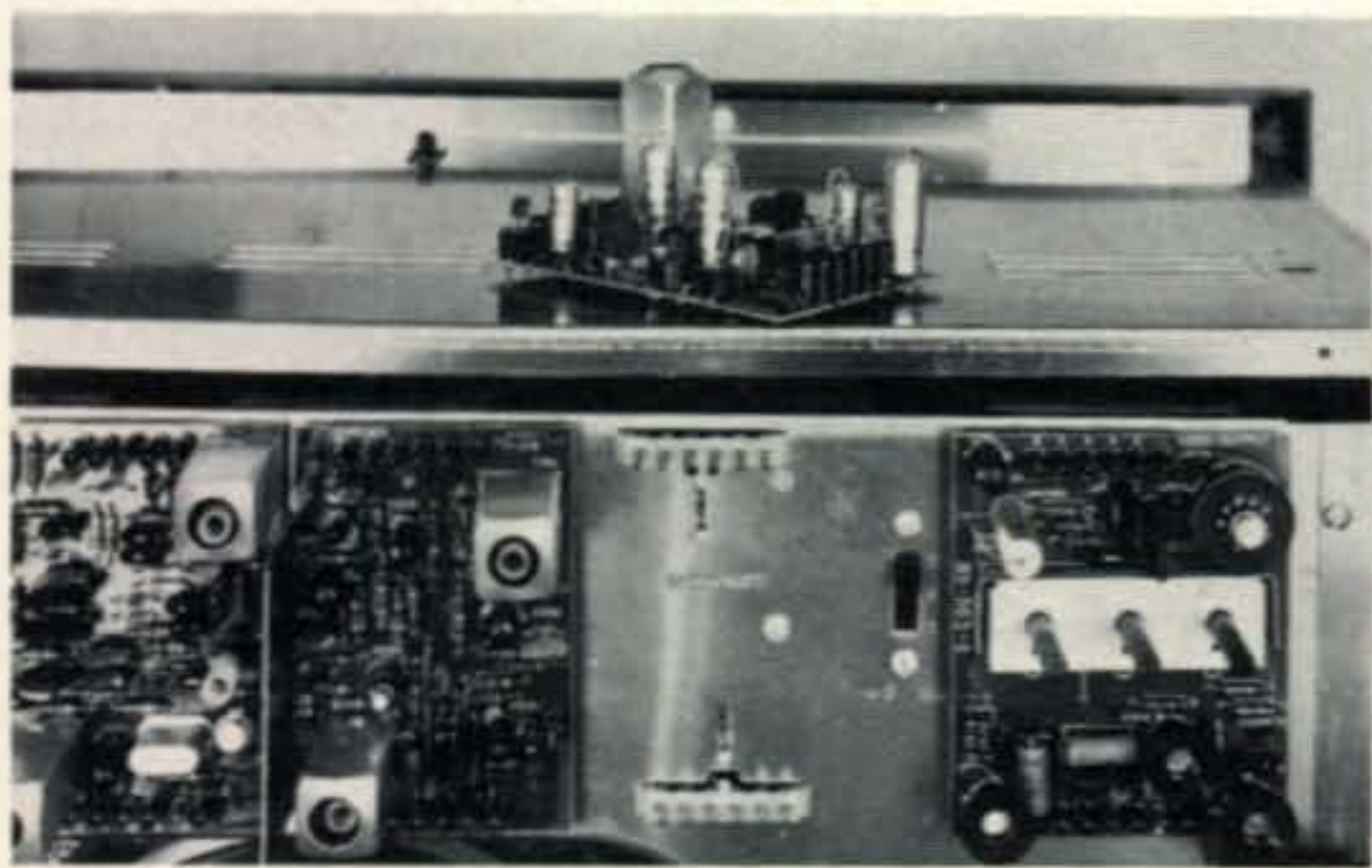
button channel-scanning or selection plus the normal operating controls. Another unit is the convergence panel which involves a circuit board mounted on a tilt-up frame along with secondary controls. These two units are temporarily hung on the side of the picture-tube cabinet, until initial testing and adjustments have been completed; after which they may be removed and placed as needed with the particular type of installation for the set.

Interconnecting cables from these units and from the picture-tube base are furnished with connectors already attached that plug into sockets on the main chassis. One cable setup has convergence pole-piece assemblies that clip into a plastic yoke mount around the neck of the picture tube. The v.o.m. trouble-shooting tester also may be hung on the side of the tube cabinet.

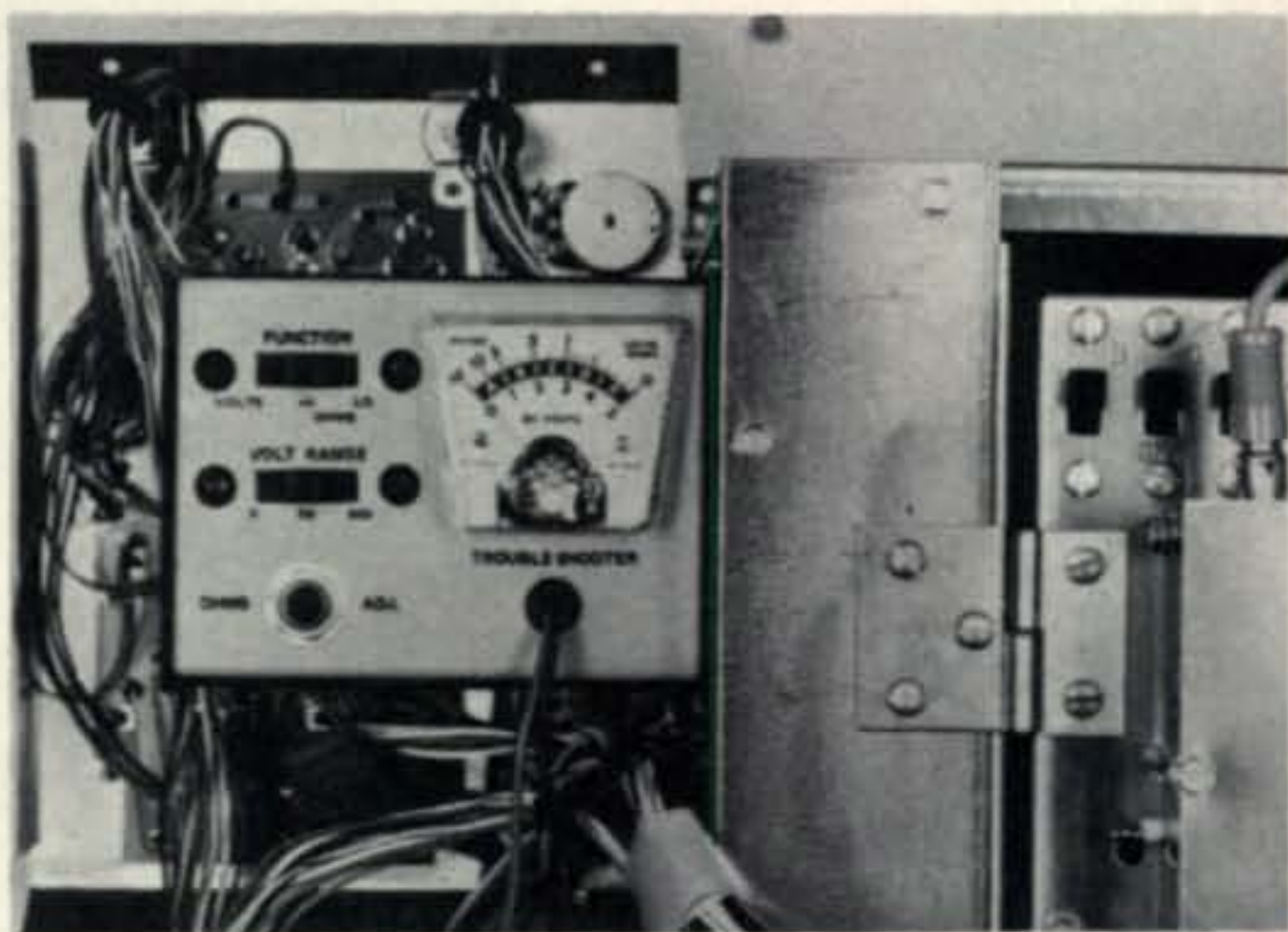
Assembly

All told there are five separate manuals devoted to various aspects of the assembly and adjustments required. (An additional manual covers cabinet installation).

A new type of aid to wiring procedures is that when the instructions specify the number of leads to be soldered at one point, this is also indicated on the pictorial wiring diagram by a red-circled numeral corresponding to the related number of soldered connections at the specified point. This provision is an excellent system that not only better ensures correct wiring, but which also is particularly



A portion of the Heath Color TV set showing some of the plug-in modules, one of which has been removed from the open space below where it normally engages the connector studs at the top and bottom of this space. The video module is at the right with three accessible control shafts for adjusting the green, red and blue drive.



The v.o.m. trouble-shooting tester supplied with the Heath Color TV kit. Two of the gun-shorting switches may be seen above the chassis hinge at the right.

helpful when a check of proper wiring may later be desired.

A whole book takes care of adjustment and operation with eight pages devoted to resistance and voltage measurements using the v.o.m. trouble-shooting tester which is first assembled by the kit builder. These tests are set up in such a way that if a correct reading is obtained, one is directed to the next test; otherwise one is directed to trouble-shooting tests some of which are similarly lined up in a go-no-go fashion.

Operational tests are subsequently made followed by 34 pages of easily-conducted adjustment procedures supplemented with color illustrations of proper or improper performance.

The final book is a 160-page one devoted to detailed trouble shooting, alignment and adjustment of the various modules or sections (additional test gear is required for some of these), color-TV theory, a circuit description for the related set, oscillograms for various functions, circuit-board views with component locations plus voltage and resistance readings.

40-60 hours are required to get the set together and working. Because of the weight involved, help may be needed for mounting the picture tube and certainly for installing the set in a cabinet (the whole set weighs a bit over 100 lbs.) During this job, however, the weight can be lessened by temporarily disconnecting the interconnecting cables from the chassis and picture tube and unhooking the chassis from the hinges; then reinstalling the chassis and cables after the set has been put in place. If this is done, some readjust-

ment of the convergence pole-pieces and controls may subsequently be required.

Although our unit was put together by an experienced kit builder with operation right off the bat, the manual instructions are so precise, clear and complete that there appears to be no reason why even one with little experience should not be able to perform the job if such instructions are carefully followed and meticulously carried out.

Furthermore, should unsolved difficulties arise, personnel at the Heath factory or Electronic Centers are available by phone or letter for assistance. Besides this, Heath provides an excellent service policy that in addition to their standard 90-day kit warranty, any of the circuit-board modules that require servicing may be returned to a Heath Service Facility and either be repaired or replaced with no charge for labor or parts. After the 90-day

warranty expires, modules requiring service will be handled or replaced at a fixed charge of \$5.00 per module, including labor and parts; however, this price may be adjusted upward after two years or more after original purchase date of the kit. The picture tube is guaranteed for 2 years.

This appears to be a liberal deal which along with the superb performance, the self-servicing features, the fun of assembling one of these kits and the knowledge gained thereby are all well worth the initial cost plus the time invested in doing the work.

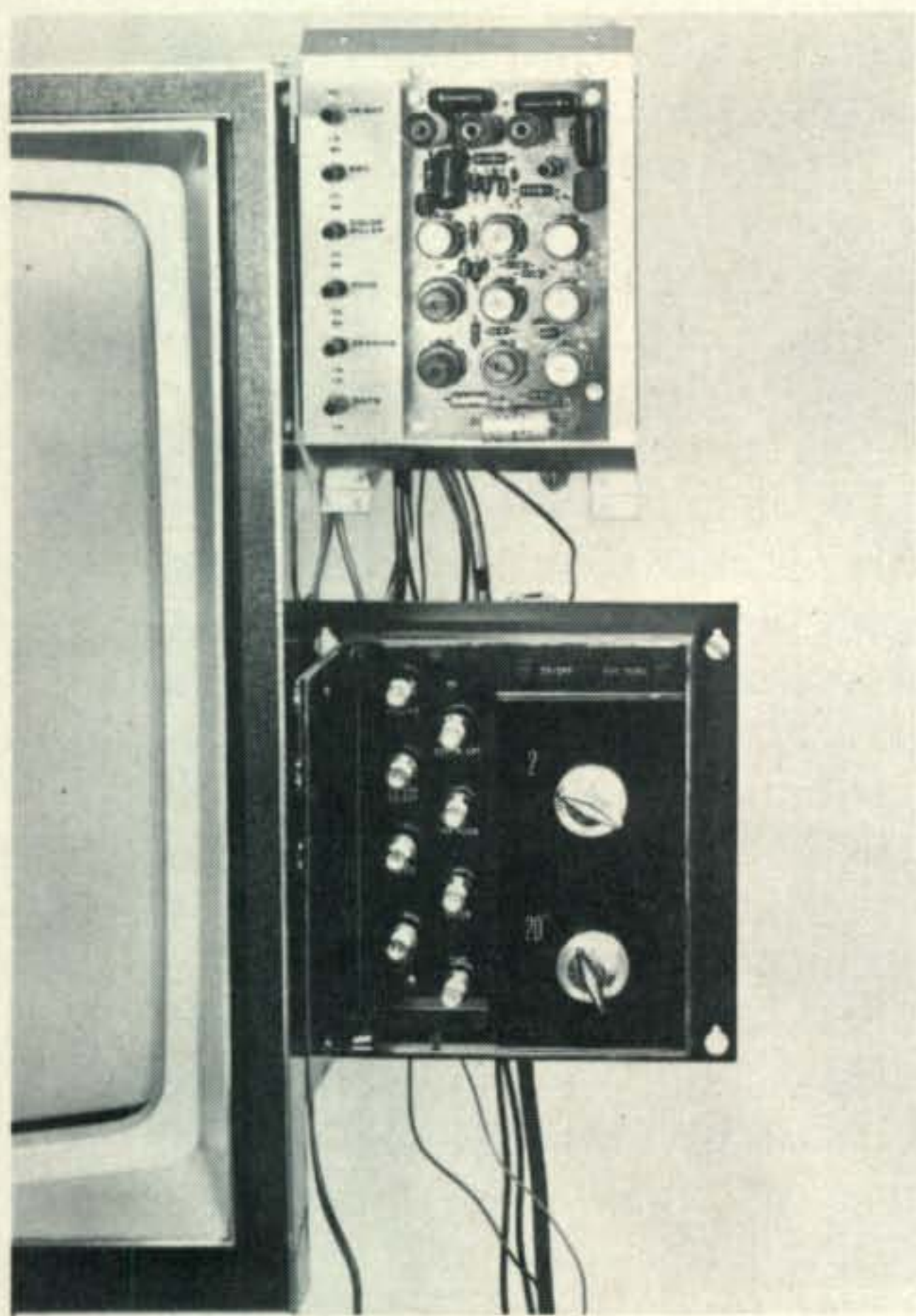
Interference

Many radio-amateur operators have encountered RFI or TXI with solid-state appliances where induced r.f. is rectified by transistors, either raising havoc with normal video operation (on any channel) or producing a.f. output from the radio transmissions (see discussions on TXI in the Q & A Columns of *CQ* for August, November, December 1969 and January 1970).

It is therefore well worth noting that such difficulties were not encountered with this Heath TV set as indicated by tests conducted using a 200-watt s.s.b. transmitter near it and with an indoor transmitting antenna in close proximity to it. The only interference observed was with transmitter operation on 28 MHz in which case the 2nd harmonic kicked up Channel 2 as normally could be the case with any TV set and as found with a vacuum-tube one during the same tests. Reports from two other amateur operators confirmed this apparent TXI immunity of the Heath job, since their on-the-air operation with 1 kw does not cause TXI to it.

The Heath Model GR-371MX Color TV Kit is priced at \$579.95, less cabinet. The Mediterranean cabinet shown here is \$134.95. Other styles start at \$79.95. Also available are four other solid-state color TV kits ranging from a complete 14" portable job (with console-type performance) priced at \$349.95 to a 23" console type at \$539.95, less cabinet.² For further information we suggest a visit to a Heath Electronics Center or procurement of a catalogue from the Heath Company, Benton Harbor, Michigan 49022.

—W2AEF

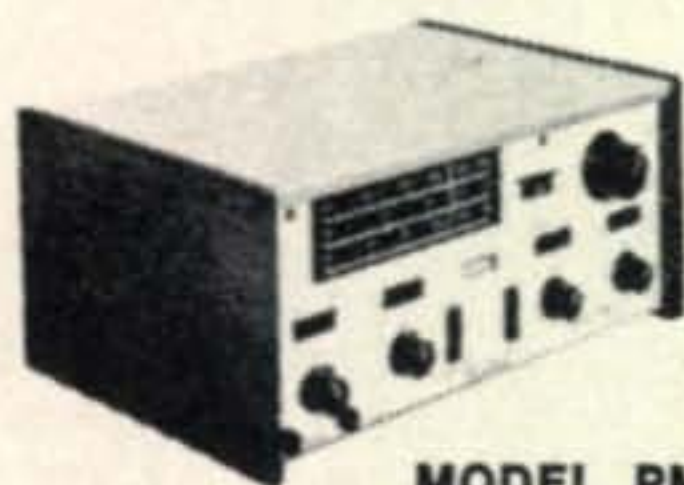


Temporarily hanging on the side near the top of the shielded case for the picture tube of the Heath Color TV set is the convergence panel which at its left has several secondary controls that seldom need attention once the set has been adjusted. When installed in a Heath cabinet, it mounts on the rear of the speaker baffle that swings outward and downward for easy accessibility from the front of the cabinet. At the bottom is the Master-Control panel with the standard operating controls. A small hinged door covers the controls at the left and the whole panel is later installed at the front of the cabinet.

²These sets also have the self-service features and construction techniques similar to those described here. The picture tube is a standard "bright" type.

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MODEL PM3A. Advanced 5 watt CW transceiver. Operates on 40-20 meters. Side-tone. Push pull final. Pi Network. Break-in keying. Size 10 $\frac{3}{8}$ " W X 4 $\frac{1}{2}$ " H X 6 $\frac{1}{8}$ " D. Weight 3 lbs. Price \$79.95.

■ ANTENNA TUNER

MODEL AC5. Matches 52 ohm output of Power-Mites to open wire on random length antennas. Maximum power 10 watts. Size 4" W X 2" H X 4" D. Weight 1 lb. 4 oz. Price \$8.95.

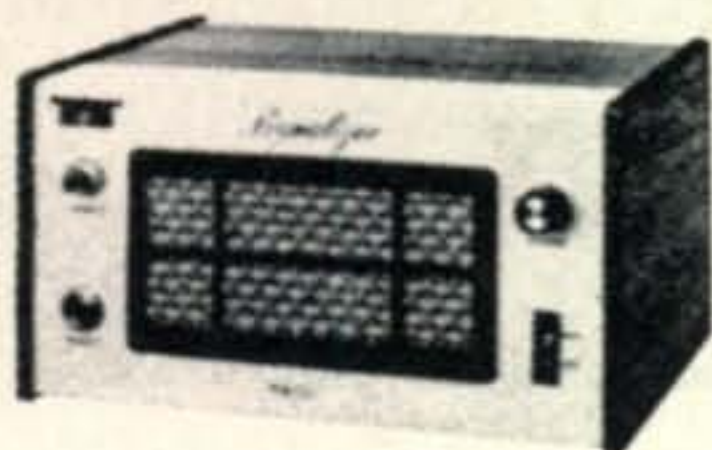
■ SWR BRIDGE



AC4

MODEL AC4. Favorite for QRP. Measures from $\frac{1}{4}$ watt to 200 watts. Size 4" W X 2" H X 4" D. Weight 1 lb. 4 oz. Price \$14.95.

■ SIGNALIZER

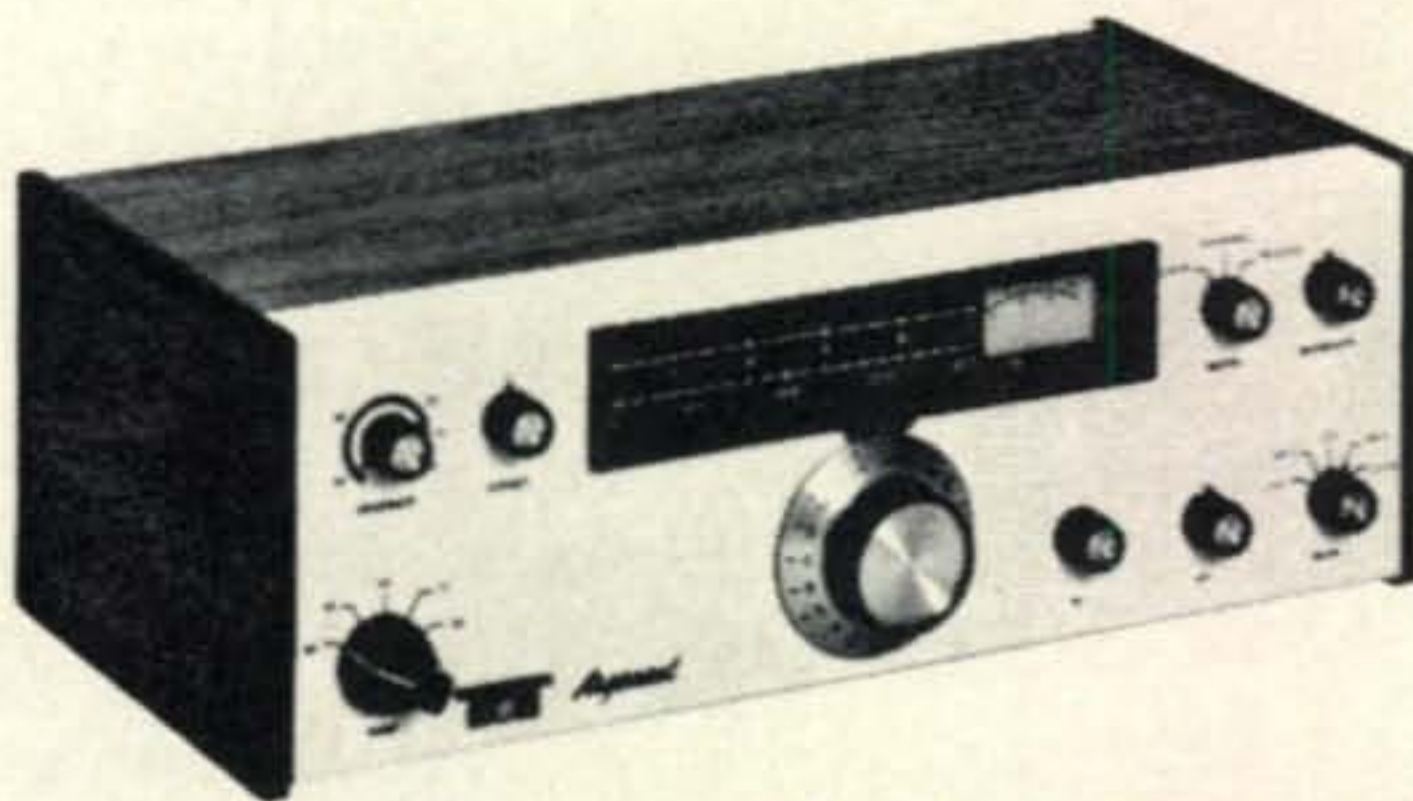


S20

MODEL S20. Complete audio and speaker system for receivers/transceivers. Plugs into headphone jack. Provides maximum AGC to keep all signals constant level. Front panel headphone jack. Size 8 $\frac{1}{4}$ " W X 4 $\frac{1}{2}$ " H X 6 $\frac{1}{2}$ " D. Weight 3 $\frac{1}{2}$ lbs. Price \$39.95.

MODEL S30. Similar to S20 but has built in FR4 CW filter; switchable. Size 8 $\frac{1}{4}$ " W X 4 $\frac{1}{2}$ " H X 6 $\frac{1}{2}$ " D. Weight 4 lbs. Price \$49.95.

Argonaut

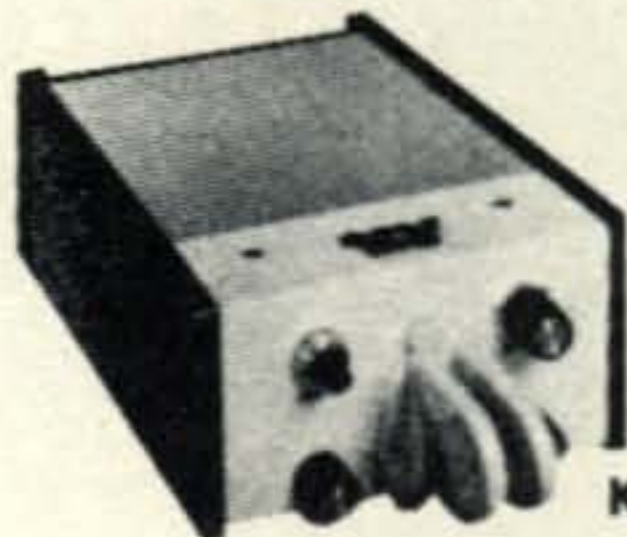


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Argonaut price	\$288.00
Power supply	\$24.95
Microphone	\$17.00

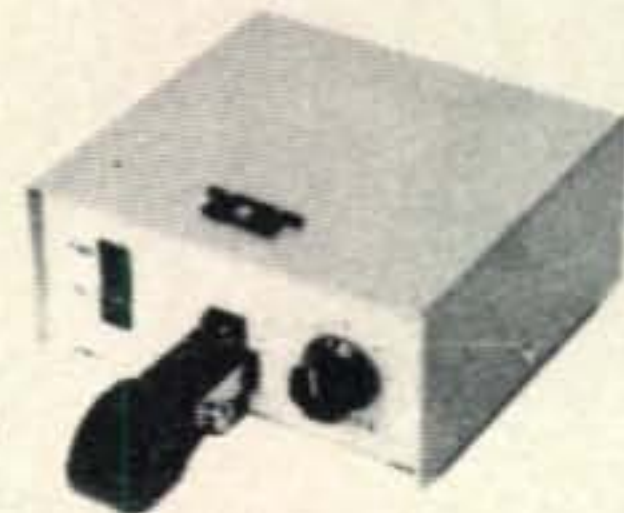
■ KEYERS AND KEYSER PADDLES



KR40

MODEL KR40. Squeeze keyer. Iambic sequence. Full memories. Variable weighting. With dual paddles. Speeds from 6-60 wpm. 115 volt AC operation. Side tone. Size 4 $\frac{3}{4}$ " W X 2 $\frac{1}{2}$ " H X 8" D. Weight 4 lbs. Price \$89.95.

MODEL KR20. Keyer. Self-completing. On/off weighting. With dual paddles. Speed 6-60 wpm. Monitor side tone. 115 V AC operation. Size 4 $\frac{3}{4}$ " W X 2 $\frac{1}{2}$ " H X 8" D. Weight 4 lbs. Price \$59.95.



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MODEL KR1. Paddles as used in KR40 and KR20. Mounted in formed aluminum case. Size 4 $\frac{1}{4}$ " W X 2" H X 6" D. Weight 1 lb. Price \$18.95.

MODEL KR2. Paddle as used in KR5. Mounted in formed aluminum case. Size 4 $\frac{1}{4}$ " W X 2" H X 6" D. Weight 1 $\frac{1}{2}$ lbs. Price \$12.95.

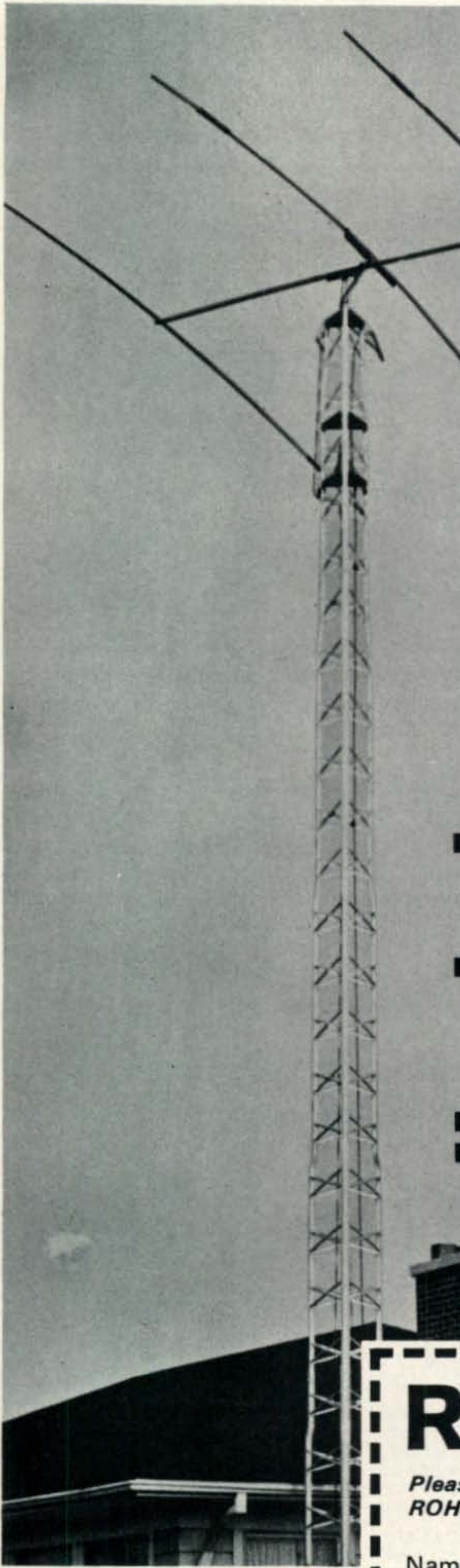
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BY JERRY HAGEN,* WA6GLD

Dx Editor K4IIF is taking the month off and perhaps will find time to put his new Drake line on 160 meters before the winter is completely finished.

As March arrives DX on the higher bands should be improving with longer openings and the ARRL contest season will be in full bloom with the WPX contest wrapping up the major contest calendar for the spring. It should be interesting to speculate on the number of special prefixes that will show up in the WPX contest—during the past years it has become quite a tradition, especially with the PY's. In checking the ITU prefix allocation, it appears that Brazilian boys have exhausted the use of available prefixes and may have to use the PQ, PR, PS, PT, and PU prefixes used in the 1969 WPX Test. Perhaps they have new plans for 72!

Operating from the Other Side

During the 1971 CQ WW Phone Contest, WA6GLD was given a first opportunity to operate from the "other side" with the reciprocal call WA6GLD/6Y5L granted by the Jamaican Posts and Telegraphs Department. Operation was conducted from the Shrangri-La Apartments with help, encouragement and logistics support provided by Ken Penchoen, 6Y5BF. Upon arriving one quickly gained respect for the accomplishments of DXpeditioners such as W4BPD, W9WNV, OH2BH, DL7FT and others, as explaining the presence of Heathkit amateur gear stuffed in suitcases to customs officials was not as easy as one might think. After spending considerable time solving that problem even the 40/80 meter antenna project was made difficult by a tropical downpour with good mid-west lightning. But in the true tradition of the aforementioned DXpeditioners all was ready for the beginning of the CQ Phone Test.

*Assistant DX Editor, P.O. Box 1271, Covina, CA. 91722.

Silent Key

Ernst Krenkel, RAEM, President of the Soviet Federation of Radio Amateurs, dead at the age of 68 on December 8, 1971.

Being a great follower of DXpeditions including list and call area operation techniques, particular attention was paid to tactics of W/K operators. The results were a compliment to the USA amateur, as virtually all operators were snappy and courteous. On 10 meters contacts were made at the rate of 160 per hour with no difficulty and even on 3.8 & 7 MHz a rate of over 100 contacts per hour was obtained. In view of the excellent W/K operation little was to be gained by list, split frequency, or call area operation. It is certain that split frequency operation would be necessary if the pileup reached a level such as for the 3CØAN operation last July. For the most part, East coast signals were ear-shattering on *all* bands with the second layer midwest right behind. Quite a few stations were worked on all 5 bands and the QSL influx produced lots of 5BDXCC requests. However, the fun soon ended and the tropical weather, food and drink became a business trip to W2 land.

Time in New Jersey produced Eyeball QSO's with CQ County Award Chairman, W2GT, Top CQ SSB DX Award Honor Roll member W2TP and active DXers WB2UKP, K2BZT and K2OJD. The highlight was attendance at the North Jersey DX Club meeting held at the home of W2OEH. A weekend trip to visit W1RAN was most enjoyable including on evening and delicious dinner at the home of Bob and Ellen White (W1CW and W1YL). Listening to the strength and number of European signals on all bands was amazing, however it was quickly realized that Europe was essentially the same distance from W1 land as is Los Angeles.

In all, the trip was a small example of the fellowship which can be gained from amateur radio and in particular from DXing.

The Mailbag

A nice note was received from Fernando, XE1AE, who is the CQ checkpoint in Mexico. Fernando is an ardent DXer but feels that there is some undesirable inflation of the country list. He favors limiting the DXCC list to actual countries and islands with permanent inhabitants. His general opinion is

The WAZ Program

This is an unusual month for WAZ in that more stations qualified on s.s.b. than qualified on c.w.-phone.

S.S.B. WAZ

936.....DK3LP	944.....4M1A
937.....LA1ZF	945.....JA1WTZ
938.....WA9SVY	946.....W7YBX
939.....JA1AFI	947.....DK1DL
940.....KR6IX	948.....DK1FW
941.....DJ9NW	949.....DJ4XA
942.....WB2NYM	950.....DJ1PN
943.....JA1HBC	951.....ZL1TY

C.W.—Phone WAZ

3291.....DL7NE	3296.....G2BJY
3292.....W3RF	3297.....OH5PA
3293.....W2EGI	3298.....G3HRY
3294.....OK2BMH	3299.....DK3EQ
3295.....JA1AFQ	3300.....HV3SJ

Phone WAZ

467.....OZ8BZ	468.....W3EVW
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Complete WAZ rules are shown on pgs. 64-66 of the June, 1970 issue of *CQ*. 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, FL 33880.

very close to that expressed by Fred Laun, HS5ABD in the June, 1971 issue of *CQ*.

Jerry, WA8DXA, suggests that we have a special endorsement for *CQ* DX Awards and WPX awards for those running QRP (150 watts or less). He thinks this might provide a challenge for many operators and feels that there is great satisfaction gained by QRP DXing. Jerry has worked over 300 countries and has just joined the *CQ* CW DX Honor Roll using 150 watts and modest antennas.

Colin, G3WRN, writes to say that the 5R8AB reported on 7004 kHz at 1300Z in October *CQ* must have been a phoney as he (Colin) is issued the call 5R8AB for the year of 1971 and did *not* operate 40 meters while in the Malagasy Republic.

A note from Carl (WA9SXQ) states that KG4EQ is now on 160 meters with a Drake T4X/R4B and dipole at 75 feet and schedules are welcome. KG4EQ was active in both section of the *CQ* WW Test and the *CQ* 160 meter test. The station address is:

2ND BN 8TH Marines W/W
Fleet Branch Post Office
Norfolk, VA. 23593

Eric, HS3AFB, has returned stateside after

making about 6,000 QSO's including 163 countries and all 40 zones from Thailand.

It is possible that Signal One may sponsor some DXpeditions to some *very* rare spots in 1972. Possibilities are: YI (Iraq), AC3 (Sikkim), AC5 (Bhutan), CEØX (San Felix) and hopefully others.

Special station JA8IOC was operated for the 11th Olympic Winter Games in Sapporo, Japan.

Alex, 3B8DA (ex-3B7DA), is active daily on 14040 at 1500 looking for Nev-Utah-Wyo-Mont and Dakotas to wrap up WAS.

Outstanding DX Achievements

This month's outstanding DX achievement goes to Gordon Marshall, W6RR, for posting the high USA score in the 1970 *CQ* World Wide DX Contest. Not only was W6RR the USA high station, but he scored a USA single operator record of 1,837,600 points consisting of 1561 QSO's, 130 zones and 285 countries. This achievement also marked the *first* time in over 15 years that a W6 station scored the USA high. The number one position didn't come easily, however, as Gordon had placed second in the 1967, 1968, and 1969 *CQ* Tests. As the European multipliers are not easily obtainable on the West Coast, great emphasis is placed upon working a multitude of JA's which put Gordon almost 300 QSO's over east coast competition, compensating for

The *CQ* DX Award Program

C.W. DX

77.....WA8DXA	79.....K1DEK
78.....W8LY	

S.S.B. DX

173.....EL2CH	177.....KP4DIW
174.....WA3KEG	178.....G3WW
175.....G3DO	179.....CN8HD
176.....G3TLV	

CQ DX Endorsements

C.W.: W8LY—310, WA8DXA—275

S.S.B.: DL90H, TI2HP, WA2RAU—320, VE2WY, W6EUF—310, G3DO, W6KZS, ZL3NS—300, G3WW, K9LUI—275, W2-BHK—200

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

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CQ DX Award Honor Roll

The CQ DX Award Honor Roll recognizes those DXers who have submitted proof of confirmations with 275 or more countries for the mode indicated. The ARRL DXCC Country List, LESS DELETED COUNTRIES, is used as the country standard. Effective with this listing credit has been allowed for Annon-bon Is. (3C0AN)

2XSSB

TI2HP	321	W6FW	302
DL9OH	320	W9QLD	302
WA2RAU	320	K4HJE	301
W2TP	320	IT9JT	300
K6LGF	319	OZ3SK	300
WA2IZS	318	K1SHN	300
W3NKM	318	W6KZS	300
K6YRA	318	YS1O	300
W9ILW	318	ZL3NS	300
I0AMU	316	F9MS	299
G3FKM	315	K6EC	298
W3DJZ	315	KH6BB	296
W6EUF	315	K4RTA	294
W6KTE	314	XE2YP	294
W40OPM	313	WA6MWG	292
WA2EOQ	312	WB2RLK	289
W4IC	312	ZL1AGO	286
W6NJU	312	G3RWQ	285
ZS6LW	312	HP1JC	285
I8KDB	311	W9KRU	284
K9JT	311	W0YDB	284
XE1AE	311	WA0KDI	282
VE2WY	310	OE2EGL	280
W9DWQ	310	K8GQG	280
G3DO	309	WA0CPX	278
VE3ACD	308	WA3IKK	276
I1AA	307	G3WW	275
F2MO	305	K9LUI	275

CW

W6ID	318	ON4QX	296
K6EC	316	WA6EPQ	294
W8LY	310	W6NJU	291
VK3AHQ	308	K1SHN	286
W4IC	306	W4BQY	286
W4OPM	304	W6ISQ	285
DL3RK	300	WA8DXA	279

a country total of 50 less than east coast stations. W6RR's station is almost the ultimate for a single operator station with 3 transmitter/receiver positions with Henry 2K linears. The antenna farm consists of 3 el. on 40, 5 el. on 20, 6 el. on 15 and 8 el. on 10 meters all mounted on a 75 foot tower with HyGain Verticals for 75 meters. Congratulations to W6RR for an outstanding accomplishment.

WPX News

Those interested in applying for the WPX award should be sure to note the revised rules

printed in the February issue of CQ, page 67. The major change was increasing the s.s.b. requirement to 300 prefixes confirmed and the elimination of the Phone award. When the WPX award was initiated (1958) single sideband was in its infancy and only 150 prefixes were required for the SB certificate. Subsequently, the requirement was increased to 200 prefixes as s.s.b. became more popular. As one knows, virtually all phone DX communication is s.s.b. today, so the requirement has been raised to 300 prefixes, identical to that for the c.w. mode.

Questions are often received about the Master Worldwide Prefix List which was compiled in 1969 by Howard Kelley, K4DSN. This list contained over 1,500 prefixes which had been used by the world's amateurs over the years. To provide an equitable WPX Honor Roll basis, prefixes obsolete by government or ITU action for more than 5 years were considered deleted and not valid for the WPX Honor Roll. In the spring of 1971 a revised list was initiated, however by the time it was ready for printing it was outdated due to many new prefixes used for the 1971 CQ WPX Contest and for ITU Week in May. Thus, it has been decided to prepare a list of deleted prefixes which will *not* be valid for the WPX Honor Roll. Prefixes *not* listed on this deletion list will be automatically acceptable for the WPX as issued by the world's licensing authorities. This list will be published in the summer of 1972 and Honor Roll scores will be adjusted to conform to the new deletion list.

Far East DX Activity

Efforts by VE7IR and others to provide activity from Cambodia have been success-



The West's Top CQ Multi-Multi DX Test scores the past two years have been from the crew at W7RM on Puget Sound, Washington. This photo was taken from the air by K7MWC and WA7HVB.



One of the Pacific's most active DXers in the past few years has been Bob, VR1L. Bob has been transferred and is now signing YJ8BL on 3.8 thru 28 MHz. QSL's for VR1L and YJ8BL are handled by W6NJU. (Photo courtesy W6NJU).

ful as XU1AA has been active on several bands. As of this writing, operating success to the East Coast USA has *not* been good due to gear and operating time limitations. However it hoped that better gear including Japanese s.s.b. equipment and a tri-band beam will be in operation shortly. Ham radio literature including handbooks and the ARRL film "Hams Wide World" as well as equipment have been donated by many individuals and organizations through the world. XU1AA has been heard on 21.030 c.w. on the west coast about 2330 GMT during the winter and 20 and 40 meter operation has also been reported.

As reported in the December issue, Bhutan is being represented on the amateur bands by Thuji Yonten who has been using the call AC5TY. At press time we have learned that the prefix A5 has been assigned by ITU. (Thanks to K4ZA and Gus' bulletin for the info.) There is the possibility of additional amateurs being licensed. At this time AC5TY has been heard on 14205 s.s.b. and 14030 c.w., however signals are reported to be marginal as low power and only a dipole antenna is being used. There is also some question as



Ken, 6Y5BF, and WA6GLD/6Y5L on the terrace of Shrangri-La Villa overlooking Montego Bay.

The WPX Program

S.S.B. WPX

652.....LZ2EE	656.....WB2NYM
653.....WA4DRU	657.....W4GIW
654.....WA5ALB	658.....EL2CH
655.....WA2RQH	659.....W5KHP

C.W. WPX

1137.....SP3CDD	1138.....LU9FAZ
-----------------	-----------------

Mixed WPX

311.....PY1FH	314.....WA2DHF
312.....K2USA	315.....K2AAC
313.....WA8EDC	

WPNX

39.....WN2PWS	40.....WN6AIU
---------------	---------------

VPX

38.....WPE6BJD	39.....OK110896
----------------	-----------------

WPX Endorsements

S.S.B.: WØYDB, G3DO—700, WA6TAX—550, WB2NYM—500, LA6RL, WA1KYW, WA5ALB, K2JFE, W3YHR, WA2EAH—400, W2BHK, LZ2EE—350, WA4DRU, WA4TMP—300.

C.W.: WØAUB, W9FD—800, VE2IJ—600, WØTDR—500.

Mixed: W8LY—950, DN4QX, W9DY—900, G3DO—850, W4BQY—800, WA6MWG—750, W4WSF—700, K2AAC—650, K7NHG—550.

Phone: G3DO—800, W8PQD—550, CR7FR—500.

VPX: OK110896—450.

20 Meters: WB4KZG, LU9FAZ

15 Meters: WB4KZG

Africa: W4CRW, W8GKM

Asia: W4CRW

Europe: LA6RL, LU9FAZ, WB2NYM, WA2DHF, WA3HRV

North America: WB4KZG, K8UDJ, WA6JVD, WA6TAX

Oceania: JH1HWN

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

to whether the Hallicrafters SR-150 transceiver is functioning properly and another transceiver has been offered in an effort to make AC5 more workable!

QSL Information

Edmond Dubois, F9IL offers his services as QSL Manager for a DX station. His address is:
[Continued on page 83]



BY GEORGE JACOBS,* W3ASK

SPRINGTIME propagation conditions begin in the northern hemisphere during March. These are typified by fewer east-west openings on the 10 and 15 meter bands; more hours in which DX openings can occur on 15 and 20 meters as the hours of daylight increase; fewer hours for DX openings on 40, 80 and 160 meters as the hours of darkness shorten, and a seasonal increase in the static level on all bands.

During March and continuing into April, relatively similar h.f. radio propagation conditions exist in the temperate regions of both the northern hemisphere (where it is spring) and the southern hemisphere (where it is fall), as compared to the more extreme conditions that exist when it is summer in one hemisphere and winter in the other. As a result, DX openings between both hemispheres are usually at their best during March and April. Good inter-hemisphere openings are forecast this month on all amateur bands between 15 and 40 meters, with some openings possible on 10, 80 and 160 meters as well. Typical of these openings are the paths between the United States and South America, Australasia and the central and southern regions of Africa.

The following is a brief summary of h.f. amateur band propagation conditions forecast for March, 1972. For more specific information, refer to the *DX Propagation Charts* which appeared in last month's column. This month's column contains *Short-Skip Propagation Charts* valid during March and April, as well as *Propagation Charts* centered on Alaska and Hawaii. The Short-Skip Charts contain band opening forecasts for predominantly *one-hop* openings over distances varying between 50 and 2300 miles.

For day-to-day propagation conditions expected during March, see the "Last Minute Forecast," which appears at the beginning of this column.

10 Meters: Considerably fewer DX openings are forecast for March, but a few good ones should be possible during the daylight hours between the northern and southern hemispheres. Some fairly good short-skip openings should also

* 11307 Clara Street, Silver Spring, Md. 20902

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for
March, 1972

Days	Rating & Forecast Quality			
	(4)	(3)	(2)	(1)
Above Normal: 1, 3, 16-17, 24, 28, 31	A	A	B	C
Normal: 2, 4-5, 10-11, 14-15, 18-19, 22-23, 25, 27, 29-30	A	B	C	D
Below Normal: 6, 9, 12-13, 21, 26	C	D	D	E
Disturbed: 7-8, 20	D	D	E	E

HOW TO USE THESE CHARTS

The following is an explanation of the symbols shown above, and instructions for the use of the CQ propagation predictions:

1—Enter Propagation Charts on following pages under appropriate band and distance or geographical area columns. Read predicted times of band openings at intersection of both columns.

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 2 and 13 days; (1) less than 7 days.

On the "Short-Skip" Chart where two numerals are shown within a single set of parenthesis, the first applies to the shorter distance for which the forecast is made, and the second to the greater distance. Note the forecast rating for later use.

3—With the forecast rating noted above, start with the numbers in parenthesis at the top of the "Last Minute Forecast" appearing above. Read down the table for a day-to-day forecast of propagation conditions in terms of Above Normal (WWV rating high than 6); Normal (WWV rating 5-6); Below Normal (WWV rating 4); Disturbed (WWV rating less than 4). The letter symbols (A-E) describe reception conditions (signal quality, noise and fading levels) expected for each day of the month and have the following meaning: (A)—excellent opening with strong, steady signals; (B)—good opening, moderately strong signals, little fading and noise; (C)—fair opening, signals fluctuating between moderately strong and weak; (D)—poor opening, signals generally weak and considerable fading and noise; (E)—poor opening, or none at all.

4—This month's short skip Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 800 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss reception will become poorer by one level.

5—Local standard Time for these predictions is based on the 24-hour system.

6—The short skip Charts are valid through April 1972. These Charts are prepared from basic propagation data published monthly by the Institute for Telecommunication Sciences of the U.S. Dept. of Commerce, Boulder, Colorado.

be possible during the daylight hours over distances between approximately 1000 and 2300 miles. Conditions are expected to peak on this band during the afternoon hours.

15 Meters: This should be the best band for DX propagation during most of the daylight hours. While considerably fewer openings are forecast on east-west paths, the band should open to most areas of the world during the day, with conditions peaking during the afternoon hours. Some openings to southern and tropical areas may also be possible during the early evening

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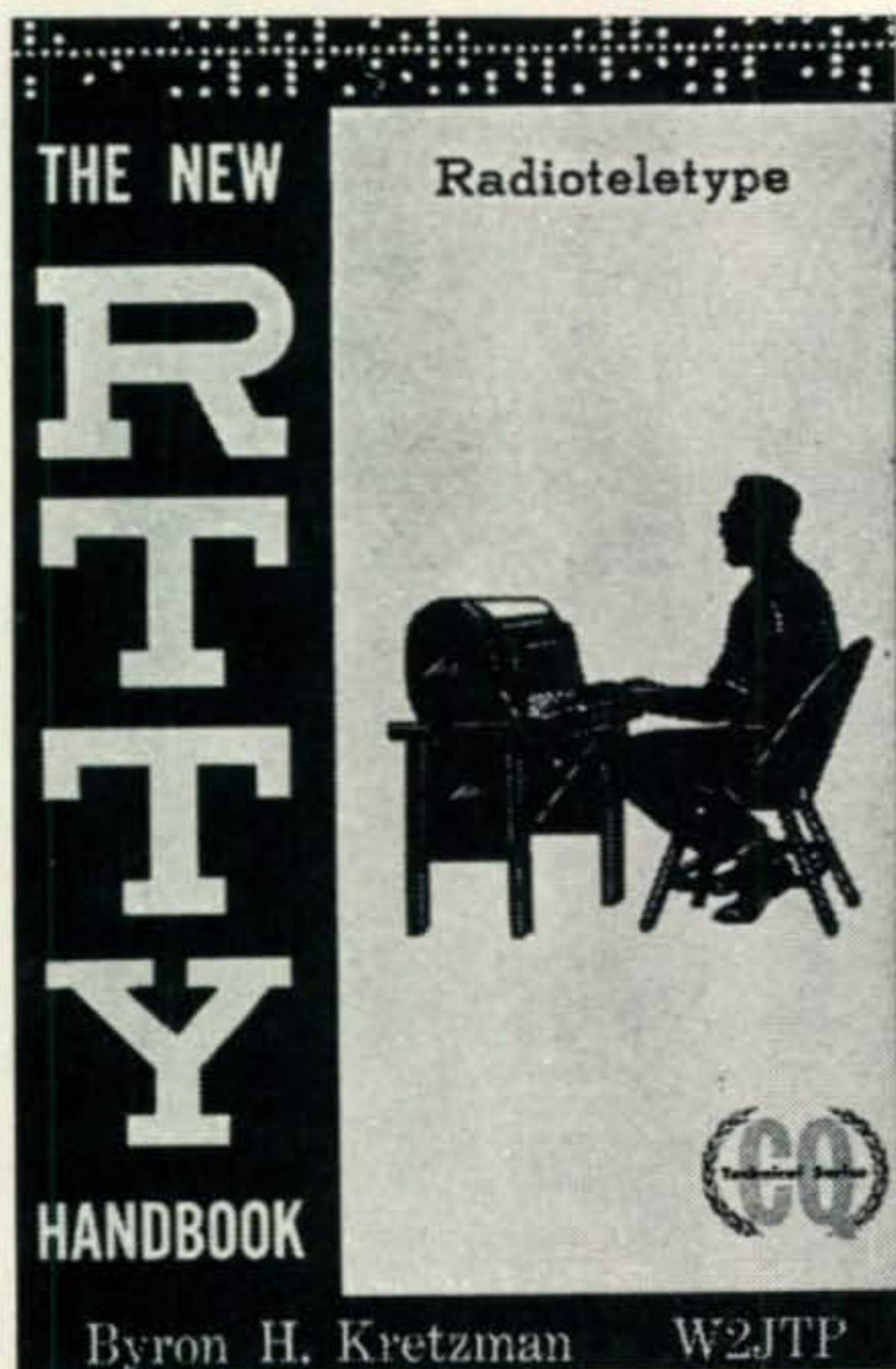
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hours. Excellent short-skip openings are forecast for this band during most of the daylight hours, for distances between approximately 1000 and 2300 miles.

20 Meters: With longer hours of daylight, 20 meters is expected to remain open longer for DX than during the winter months. This should be the optimum band for DX openings during the sunrise period, and again during sunset and the early evening hours. The band is also likely to remain open well into the hours of darkness on paths to southern and tropical regions. Excellent short-skip conditions are expected during the daylight hours for openings between approximately 750 and 2300 miles, with many openings continuing through the evening hours as well.

40 Meters: Fairly good DX openings are forecast to many areas of the world from sundown through sunrise, with conditions peaking during the hours of darkness. Excellent short-skip openings are expected over distances varying between approximately 100 and 600 miles during the daylight hours, and between 600 and 2300 miles at night.

80 Meters: Some fairly good DX openings should be possible during the hours of darkness and the sunrise period. Static levels are expected to be higher, however, and the band noticeably noisier than during the winter months. Excellent daytime short-skip openings should be possible between 50 and 250 miles, with the distance increasing to between approximately 400 and 2300 miles during the hours of darkness. DX conditions usually peak on this band when it is dark at the westernmost terminal and sunrise at the easternmost terminal of a path.

160 Meters: No openings on this band are expected during the hours of daylight, but short-skip openings up to a distance of 2300 miles, and an occasional DX opening should be possible during the hours of darkness and the sunrise period.

Sunspot Cycle

The Swiss Federal Solar Observatory at Zurich reports a mean monthly sunspot number of 61 for November, 1971. This results in a 12-month smoothed sunspot number of 66 centered on May, 1971. A smoothed sunspot number of 47 is forecast for March, 1972, as the cycle continues to decline.

V.H.F. Ionospheric Openings

Trans-equatorial scatter propagation (TE) usually picks up during March and the spring months, and some 6 meter openings should be possible by way of this mode during the month. TE openings must cross the magnetic equator at or near a right angle, and the optimum time for such openings is between 8 and 11 P.M., local time. Conditions favor openings between the southern third of the USA, and the southernmost countries of South America, but some openings

may be possible between other areas as well.

A seasonal increase in short-skip openings due to sporadic-E propagation also usually begins during March, and an occasional 6 meter opening may be possible by this mode during the month. Short-skip openings of this type generally occur during the daylight hours, over distances between approximately 1000 and 1300 miles.

Auroral activity also tends to increase during March, and there is a good chance that a number of v.h.f. ionospheric short-skip openings should be possible by means of auroral-scatter propagation. Check the "Last Minute Forecast" at the beginning of this column for those days that are expected to be disturbed or below normal, since these are the days on which v.h.f. auroral openings are most likely to occur during March.

Not much meteor activity expected during the month, although some v.h.f. meteor-type openings may be possible when minor meteor showers peak on March 16 and 26.

CQ Short-Skip Propagation Chart March & April, 1972

Band Openings Given In Local Standard Time
At Path Mid-Point Using 24-Hour Time System

Band (Meters)	Distance From Transmitter (Miles)			
	50-250	250-750	750-1300	1300-2300
10	Nil	Nil	08-09 (0-1) 09-12 (0-2) 12-14 (0-3) 14-16 (0-2) 16-18 (0-1)	08-09 (1-0) 09-12 (2-1) 12-14 (3-2) 14-16 (2-3) 16-17 (1-2) 17-18 (1) 18-20 (0-1)
15	Nil	08-09 (1) 09-15 (0-2) 15-17 (0-1)	07-08 (0-1) 08-09 (1) 09-10 (2) 10-15 (2-4) 15-17 (1-3) 17-18 (0-2) 18-20 (0-1)	07-08 (1-0) 08-09 (1) 09-10 (2-3) 10-15 (4) 15-17 (3) 17-18 (2-3) 18-20 (1-2) 20-21 (0-1)
20	11-13 (0-1) 13-15 (0-2) 15-16 (0-1)	07-10 (0-1) 10-11 (0-2) 11-13 (1-3) 13-15 (2-4) 15-16 (1-3) 16-18 (0-3) 18-20 (0-2) 20-07 (0-1)	06-08 (1-2) 08-10 (1-3) 10-13 (3-4) 13-15 (4) 15-18 (3-4) 18-20 (2-3) 20-22 (1-2) 22-06 (1)	06-07 (2-1) 07-08 (2) 08-10 (3) 10-15 (4-3) 15-18 (4) 18-20 (3-4) 20-22 (2-3) 22-02 (1-2) 02-06 (1)
40	06-07 (1-2) 07-09 (2-3) 09-18 (3-4) 18-19 (2-3) 19-21 (1-2) 21-00 (0-1)	06-07 (2-3) 07-09 (3-4) 09-11 (4-3) 11-13 (4-2) 13-15 (4-3) 15-18 (4) 18-19 (3-4) 19-20 (2-4) 20-21 (2-3) 21-00 (1-2) 00-06 (0-1)	06-07 (3-2) 07-08 (4-2) 08-09 (4-1) 09-11 (3-1) 11-13 (2-1) 13-15 (3-1) 15-17 (4-2) 17-19 (4-3) 19-20 (4) 20-21 (3-4) 21-00 (2-3) 00-02 (1-3) 02-06 (1-2)	06-08 (2-1) 08-15 (1-0) 15-16 (2-0) 16-17 (2-1) 17-19 (3-2) 19-21 (4-3) 21-22 (4) 22-00 (3-4) 00-02 (3) 02-05 (2-3) 05-06 (2)
80	07-08 (2-3) 08-11 (3-4) 11-18 (4-3) 18-20 (3-4) 20-22 (2-3)	07-08 (3-2) 08-11 (4-1) 11-16 (3-0) 16-18 (3-2) 18-20 (4-3)	07-08 (2-1) 08-11 (1-0) 11-16 (0) 16-18 (2-1) 18-20 (3-2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-2)

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

	22-02 (1-2) 02-05 (1) 05-07 (1-2)	20-22 (3-4) 22-02 (2-4) 02-05 (1-2) 05-07 (2)	20-02 (4) 02-05 (2-3) 05-07 (2)	22-02 (4-3) 02-05 (3-2) 05-07 (2-1)
160	05-07 (4-2) 07-09 (3-1) 09-17 (2-0) 17-19 (3-1) 19-20 (4-2) 20-05 (4)	05-06 (2-1) 06-07 (2-0) 07-09 (1-0) 09-17 (0) 17-19 (1-0) 19-20 (2) 20-22 (4-3) 22-03 (4) 03-05 (4-3)	05-06 (1) 06-19 (0) 19-20 (2-1) 20-22 (3-2) 22-03 (4-2) 03-05 (3-2)	05-06 (1) 06-19 (0) 19-20 (1-0) 20-22 (2-1) 22-03 (2) 03-05 (2-1)

ALASKA

Openings Given in GMT†

TO:	10 Meters	15 Meters	20 Meters	40/80 Meters
Eastern USA	21-23 (1)	20-21 (1) 21-23 (2) 23-01 (1)	20-23 (1) 23-02 (2) 02-05 (1)	06-13 (1) 07-12 (1)*
Central USA	21-00 (1)	20-22 (1) 22-00 (2) 00-02 (1)	20-00 (1) 00-02 (2) 02-04 (3) 04-05 (2) 05-06 (1)	07-09 (1) 09-12 (2) 12-14 (1) 08-12 (1)*
Western USA	21-01 (1)	20-22 (1) 22-00 (2) 00-02 (3) 02-03 (2) 03-04 (1)	18-21 (1) 21-00 (2) 00-03 (3) 03-05 (2) 05-07 (1)	06-08 (1) 08-09 (2) 09-12 (3) 12-13 (2) 13-15 (1) 09-10 (1)* 10-12 (2)* 12-13 (1)*

HAWAII

Openings Given in Hawaiian Standard Time‡

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

†To convert to Local Standard Time in Alaska, subtract 8 hours from the GMT times shown in the Chart in the PST Zone of Alaska; subtract 9 hours in the Yukon Zone and 10 hours in the Alaskan Standard Time Zone. In other USA time zones, subtract 5 hours from GMT to obtain EST; 6 hours to obtain CST, 7 hours to obtain MST and 8 hours to obtain PST. For example, 18 GMT is the same as 13, or 1 P.M. EST; noon CST; 10 A.M. in Los Angeles and in the PST Zone of Alaska, etc.

‡To convert from HST shown in the Chart to Local Standard Time in other USA Time Zones, add 2 hours in the PST Zone; 3 hours in the MST Zone; 4 hours in the CST Zone; and 5 hours in the EST Zone. Add 10 hours to convert from HST to GMT. For example, when it is 12 Noon in Honolulu, it is 14 or 2 P.M. in Los Angeles; 17 or 5 P.M. in Washington, D.C., and 22 GMT.



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The aim of this book is to familiarize the beginner and advanced experimenter with the handy source of reference circuits. \$3.45

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THE awards PROGRAM



BY ED HOPPER,* W2GT

USA-CA HONOR ROLL

3000		2000		K7CUY	255
WB2TWM	86	WA0WOB	145	W2RPZ	256
K4WVX	87			WA0WOB	257
WA0WOB	88	1500			
WA1CXE	89	WA0WOB	178		
2500		1000		500	
WB2TWM	121	K1BOM	252	HB9AGH	874
WA0WOB	122	W7BBX	253	YN1HSM	875
WA1CXE	123	WA0RKQ	254	WA0WOB	876

Special Honor Roll All Counties

- #66 John M. Coe, WB2TWM, 11-13-71
- #67 J. S. Skaptason, WA0WOB, 12-1-71
- #68 Frank Gerratana, WA1CXE, 12-2-71
- #69 James J. Slattery, W9DRL, 12-2-71

THE March, "Story of The Month" is:

John M. Coe, WB2TWM (All Counties #66, 11-13-71)

Born in Newark, N.J. on November 28, 1919, John graduated from N.Y.U. College of Engineering with a B of AE (Aeronautical Eng.) in 1941 and started work for Grumman Aircraft (Eng. Corp.) in June 1941. His first work was to calculate applied loads and do stress analyses on the F6F Hellcat. In September 1943 he started in structural testing. The corporation name was changed to Grumman Aerospace Corporation and John became Manager of Engineering Test.

"Lucille" and John were married in June 1944 and they have two sons, Donald, 24 and Roger (WB2TWK), age 19.

Due to his interest in instrumentation and automatic load controls, John started to construct transistorized amplifiers and receivers. Roger got the bug too, and built test equipment and receivers from kits. Soon it was suggested that he get started in amateur radio. So John drove him to Lafayette Radio for courses. After a number of weeks they both earned Novice licenses in 1965, at which time, Roger was only 12 years old. John passed the General test that same year and after a little work, Roger passed it the following spring.

Operations were started on 2 meters with a converted SCR-522 transmitter and a Hammarlund Super-Pro receiver. Then they built a Heath

DX-60A transmitter and Lafayette KT-320 receiver so they could get on the other bands and operate c.w. and a.m. This combination worked fairly well and most states were contacted. However a Swan 350 was brought in August 1967 to take to Maine so they could work more DX while on vacation. The DX-60A is still a good reserve xmtr for c.w. and much fun was had with it, experimenting with all kinds of wire antennas and feed lines.

In May 1968 a 20 meter dipole was erected and John soon ran across the Independent County Hunters.

The rest of this "Story" is in Johns exact words:

"They sounded like a very fine bunch of Guys and Gals and ran a very well controlled Net. They sure get to be a good bunch of friends.



John Coe, WB2TWM.

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

"When you get ALL COUNTIES you sure wish you could thank each one for helping out. Of course the last one is the most memorable and that was Charles Mix, South Dakota, provided by Ed., WAØSBR. On the other hand, Floyd, K7WQJ gave me all Oregon and Arnie, K9DCJ gave me all Wisconsin, while several others gave me over 100 counties each. One really appreciates the long trips the mobileers make to give out those hard to get counties.

"May I say *thanks* to all the County Hunters and that includes You, Ed., for the very fine column you put out and the work you do in issuing the Awards."

Awards Issued

John Coe, WB2TWM made All Counties endorsed All S.S.B. and USA-CA-3000 and 2500 endorsed All 20 S.S.B.

J. S. "Skip" Skaptason, WAØWOB waited until he had them all before applying and received them endorsed All 20, All S.S.B., All Mobiles 500 through 2500, and USA-CA-3000 and All Counties endorsed All S.S.B.

Frank Gerratana, WA1CXE in addition to acquiring USA-CA-2500 through All Counties endorsed All S.S.B.; raised his other endorsements like USA-CA-500 All 14, All 3.9, All S.S.B. Also USA-CA-1000 through USA-CA-2000 endorsed All 14, All S.S.B.

Joe Slattery, W9DRL won Mixed All Counties and upped other endorsements to read All 14, All S.S.B., All Mobiles USA-CA-500 through USA-CA-2500 and USA-CA-3000 All Phone.

Jim Perry, K4WVX (ex HR3JP) was issued USA-CA-3000.

Sam Smallidge, K1BOM qualified for All A-1, USA-CA-1000.

USA-CA-1000 Mixed Awards went to: Howard Batie, W7BBX and to "Mac" McGinnis, WAØRKQ.

Ray McGrath, K7CUY applied for USA-CA-1000 All Phone.

Edgar Newman, W2RPZ was sent USA-CA-1000 All A-1.

Ambrosi Flutsch, HB9AGH became the first HB station to acquire USA-CA-500 which was endorsed All A-1, but was delayed due to the dock strikes.

Athuro Henriques H., YN1HSM became the recipient of the first USA-CA-500 to YN and it was endorsed All S.S.B.

Awards

See first item under **Notes** regarding poor service on WAVE/WACAN awards.

Worked Westchester County, New York: This WWCNY AWARD that was issued by the Rye Neck Radio Club has apparently been discontinued.

The 10 x 10 Award: The Radio Club de Quebec, Canada, issues the 10 x 10 Award to any licensed amateur for QSOs, since 1948, on 10 meters, with 10 VE2 stations. Send list and 10 IRCs to: Radio Club de Quebec, P. O. Box 382, Quebec 4, Quebec, Canada, attention Award Manager, VE2AFC, Alex Desmeules.

One Hundred Nations Award: This Worldradio One Hundred Nations Award will be issued to licensed radio amateurs who communicate via shortwave radio with the citizens of 100 different nations. The contacts must be with recognized self-governed countries and with a national of these countries. All 100 contacts need not be made from the same location. For example, an amateur who had contacted 75 different nations from his home in California might contact 25 others while he was vacationing in Germany, and qualify for the award. Contacts must take place after 0000 GMT on 1 August 1971. The application must show date and time (GMT) of contact, band, mode, station contacted, first and last name of operator contacted and city and country of contact. A charge of \$2.00 will be made for processing and postage. Any excess over actual printing and postage costs will be donated to the *Worldradio* Foundation. Apply to: *Worldradio*, 2509 Donner Way, Sacramento, California 95818. A trophy will be awarded to the first recipient, you are invited to advise *Worldradio* of your progress. (*Worldradio* is printed every three weeks—17 issues cost \$5.00 in USA, Canada and Mexico. Other countries \$6.00 or equivalent-mint stamps ok, or 46 IRCs).

Space Net Award: The VHF Space Net is dedicated to world-wide space activity, its basic purpose is the dissemination of current and future space information, which in many instances is not brought forward in our daily news media, except for spectaculars.

The Net meets every Tuesday evening, 9:00 P.M. EST on 145.2 MHz, and the consistent check-ins are numerous. Each participant to the Net is awarded a typical certificate (no cost) as well as special Certificates during actual Moon or Space Missions which may be in progress during a Net meeting night.

[Continued on page 88]



Space Net Award.



Contest Calendar

BY FRANK ANZALONE,* WIWY

Calendar of Events

Feb. 26-28	Vermont QSO Party
Feb. 26-27	French Phone Contest
Feb. 26-27	YL-OM Phone Contest
Mar. 4-5	ARRL DX Phone Contest
Mar. 11-12	YL-OM C.W. Contest
Mar. 11-13	World Wide VHF Activity
Mar. 11-12	Virginia QSO Party
Mar. 14-16	Old, Old, Timers QSO Party
Mar. 18-19	ARRL DX C.W. Contest
Mar. 25-26	CQ WW WPX SSB Contest
Mar. 25-27	BARTG Spring RTTY Contest
Mar. 25-26	Rocky Mountain QSO Party
Mr. 25-Apr. 2	IARC Propagation Phone
Apr. 1-2	SP DX C.W. Contest
Apr. 1-2	Florida QSO Party
Apr. 7-10	SSB County Hunters Contest
Apr. 15-16	Helvetia 22 Contest
Apr. 29-30	PACC DX Contest
Apr. 29-30	WAE RTTY Contest
*May 6-7	USSR DX Contest
May 20-21	YL ISSBers C.W. QSO Party
May 27-29	YL ISSBers Phone QSO Party

*Not officially announced

YL-OM Contest

Phone: Feb: 26-27 C.W.: Mar. 11-12

1800 GMT Saturday to 1800 GMT Sunday

It's the YL's working the OM's in this one. Complete rules in last month's CALENDAR.

Mailing deadline is April 2nd and logs go to: Betty Marsh, KL7FJW, 2411 King Road, Fairbanks, Alaska 99701.

ARRL DX Contest

Phone: 0001 GMT Mar. 4 to 2359 GMT Mar. 5

C.W.: 0001 GMT Mar. 18 to 2359 GMT Mar. 19

This is the second half, the first section was run last month. There were some minor rule modifications which were covered in the December issue of QST.

Logs must be received no later than May 1st and go to: ARRL Communications Dept., 225 Main Street, Newington, Conn. 06111.

Virginia QSO Party

Starts: 1200 GMT Saturday, March 11

Ends: 1800 GMT Sunday, March 12

Important: Note change of dates from those

*14 Sherwood Road, Stamford, Conn. 06905.

listed in last month's CALENDAR. This change was made after we went to press last month.

Rules and other data remain the same.

Logs must be received by April 30th and go to: Roanoke Valley ARC, c/o Charles Towles, K4BJM/4, 3007 Pebble Dr., Roanoke, Va. 24014.

IARC Propagation Phone

0001 GMT March 25 to 2400 GMT April 2

Complete rules in last month's CALENDAR.

Logs go to: L. M. Rundlett, 2001 Eye Street, N.W., Washington, D.C. 20006.

Vermont QSO Party

Starts: 2300 GMT Saturday, February 26

Ends: 0300 GMT Monday, February 28

The Central Vermont ARC is again sponsoring this party, making some of the rare counties in this rare state available for the certificate chasers.

Exchange: QSO nr., RS(T) and QTH; county for Vermont, ARRL section for others.

Scoring: For Vermont, 1 point per QSO multiplied by number of ARRL sections and DX countries worked. Others, 3 points per QSO multiplied by number of Vermont counties worked on each band. (The same station may be worked on each band and mode for QSO and multiplier credit.)

Frequencies: 3685, 3932, 3909, 7060, 7265,



The DKØWA crew celebrating their Trophy won in the 1970 World Wide Phone Contest. Its the Radio Club Venezolano, Multi-operator, Multi Transmitter award for highest score in that category. L. to R. — DF1WA, DK2BI, DJ2BW, DJ4VV, DJ1ER, DL9OH, DJ2HH.

Claimed Scores 1971 CQ WW DX C.W. Contest

<p>Single Operator All Band</p> <p>KH6RS2,382,520 KH6IJ1,267,801 W1BPW1,166,158 KR6AY1,075,728 W6MAR1,051,072 K3HTZ1,047,572 K6SDR883,086 W1FEG808,852 WA6IVN790,993 W6DGH784,320</p> <p style="text-align: center;">28 mHz</p> <p>9H1CH35,313 KV4AM24,725 K5ABV19,460 WA7CGR18,309</p> <p style="text-align: center;">21 mHz</p> <p>OB4PF241,491 W5WMU/5165,880 DL7AV154,923 K1HVV137,312 WA8QIY129,720 W4AAV118,292 W4ORT107,910</p> <p style="text-align: center;">14 mHz</p> <p>PY4AP836,250 ET3DS399,007 SM4CMG381,095</p>	<p>5H3LV359,196 OH2BW230,560</p> <p style="text-align: center;">7 mHz</p> <p>KV4FZ420,546 LA#AD177,450 OH2QV131,868 K2LWR116,160 W5WZQ111,510</p> <p style="text-align: center;">3.5 mHz</p> <p>W3MFW63,732 YV5AW52,608 K1DIR52,184 W4CRW28,804</p> <p style="text-align: center;">1.8 mHz</p> <p>KG4CS7,884 K1PBW3,100 GM3YOR/A1,582 VE5XU1,218</p> <p style="text-align: center;">Multi Operator Single Transmitter</p> <p>W7SAF969,960 HA5KDQ756,141</p> <p style="text-align: center;">Multi-Operator Multi-Transmitter</p> <p>W3GPE1,663,875 K3JYZ1,231,186 PA#PJS1,187,259 W3TV1,098,170</p>
---	---

7290, 14060, 14290, 14325, 21060, 21375, 28100, 28600, 50260, 50360, 144-144.5, 145.8 and novice frequencies.

Awards: Certificates to the high scorer in each ARRL section, and the top 4 places in Vermont. And two Trophies to the top station in Vermont and out-of-state. The W-VT certificate is also available to all stations working 13 out of the 14 Vermont counties, provided it has not been previously issued. Also awards to multi-operator stations.

Mailing deadline for your logs is March 31st to: CVARC, c/o Ansel R. Carnahan, P.O. Box 3, Montpelier, Vermont 05602.

World Wide V.H.F. Activity

Starts: 1900 GMT Saturday, March 11
Ends: 0300 GMT Monday, March 13

This activity has a two fold purpose, first to keep our v.h.f. bands active, and secondly to provide an opportunity for stations to check out new gear and antenna systems. And to create a little competition.

Exchange: Area location; state for W/Ks, province for VEs and country for others.

Scoring: One point per contact, multiplied by sum of states/provinces/countries worked. The same station may be worked on each band for QSO and multiplier credit.

Awards: A certificate to each station submitting a log and meeting following requirements: 50 contacts below 2 meters, or 25 contacts on 2 meters, or 10 contacts on any band higher than 2 meters. A special endorsement to stations top in each call area or country.

Mailing deadline is April 15th to: Itchycoo Park VHF ARS, Att.: WA3NUL, Box 1062, Hagerstown, Maryland 21740.

Old, Old Timers QSO Party

Starts: 2300 GMT Tuesday, March 14
Ends: 2300 GMT Thursday, March 16

This one is for members of the Old, Old Timers Club only.

Exchange: QSO nr., RS/RST, state, province or country, name and OOTC number.

Scoring: One point per QSO between stations in the US or Canada, 5 points if its with a DX station. And a multiplier of one for each state, province or country worked.

Frequencies: C.W.—3530, 7030, 14030, 21030, 28030. Phone—3930, 7265, 14285, 21360, 28560.

Awards: Certificates to top scorers in each state, province and country.

Logs go to: Graham MaConomy, W6BUK, Space 45, 36770 Florida Ave., Hemet, Calif. 92343.

B.A.R.T.G. Spring RTTY Contest

Starts: 0200 GMT Saturday, March 25
Ends: 0200 GMT Monday, March 27

The British Amateur Radio Teleprinter Group is sponsoring this one. All bands may be used, 3.5 thru 28 mHz. Not more than 36 hours out of the 48 hour contest period may be used for scoring. The non-operating period may be taken at any time but not less than in two hour periods. Indicate time on/off in your log.

Exchange: Time in GMT, QSO nr., and RST.

Points: Contacts within one's own country are worth 2 points. Contacts with other countries 10 points. A bonus of 200 points will be earned for each new country worked on each band. The same station may be worked on each band for QSO and multiplier credit.

Multiplier: Is the total sum of countries worked from each band. And the number of continents worked. (counted only once, max. of 6)

Final score: (a) QSO points x country multiplier. (b) Bonus points x continents. (c) Add totals from (a) and (b) for final score. The ARRL country list plus VO will be the standard.

Awards: Certificates to the leading scorers, and also s.w.l. RTTYers. Scores made in this contest are also valid entries in the "World Champion of RTTY" competition.

Logs must be received by May 31st and go to: Ted Double, G8CDW, 89 Linden Gardens, Enfield, Middlesex, England.

Rocky Mountain QSO Party

Three Periods (GMT)
2200 March 25 to 0100 March 26
0200 to 0600 and 1800 to 2200 March 26

Taking into consideration that the amateur
[Continued on page 80]

SURPLUS sidelights

BY GORDON ELIOT WHITE*

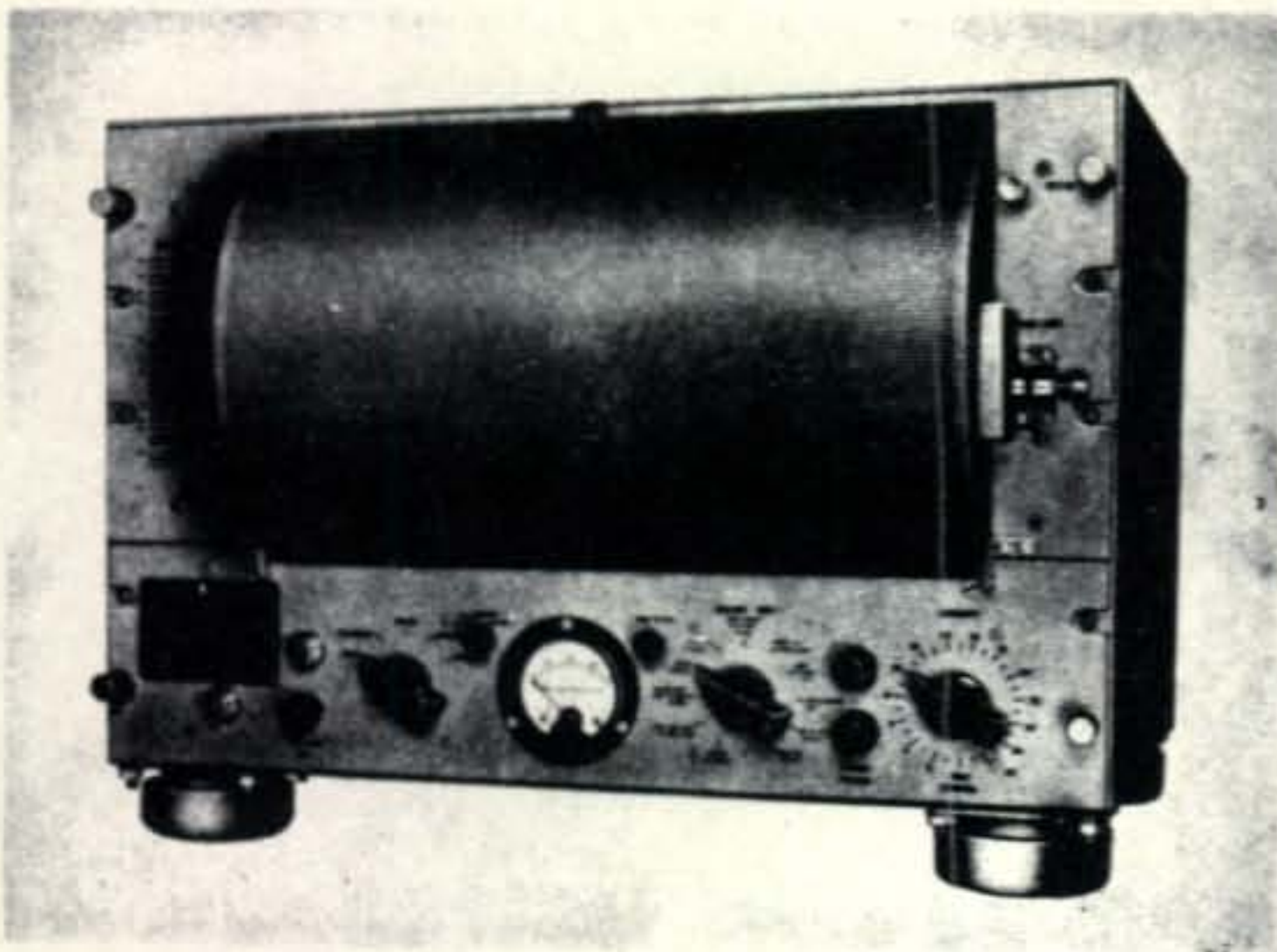
FACSIMILE equipment is coming on the military surplus market again, after a five-year hiatus apparently caused by the Viet Nam War. Some of the old TXC and slightly more modern RD-92A/UX sets have turned up on the West Coast, making the mode once more of interest to surplus hounds.

Bill Tyrell and I discussed facsimile in detail in *CQ* in September, 1966, and we like to think we generated some interest in fax, which has since blossomed in three distinct areas: *broadcast* or high-frequency use including some two-way transmissions between the U.S. and the Operation Deepfreeze stations in the Antarctic; *satellite facsimile*, notably from the TIROS and other weather satellites. (See article by W3ASK, *CQ* September 1968 p. 33); v.h.f. fax, particularly on two meters using such recorders as the Western Union "deskfax." (See my column, April 1968 p. 86). Other articles in *CQ* to look for were by J. B. Tuke, Aug. 1966, p. 25 and W. G. Anderson in Nov. 1965, p. 11.

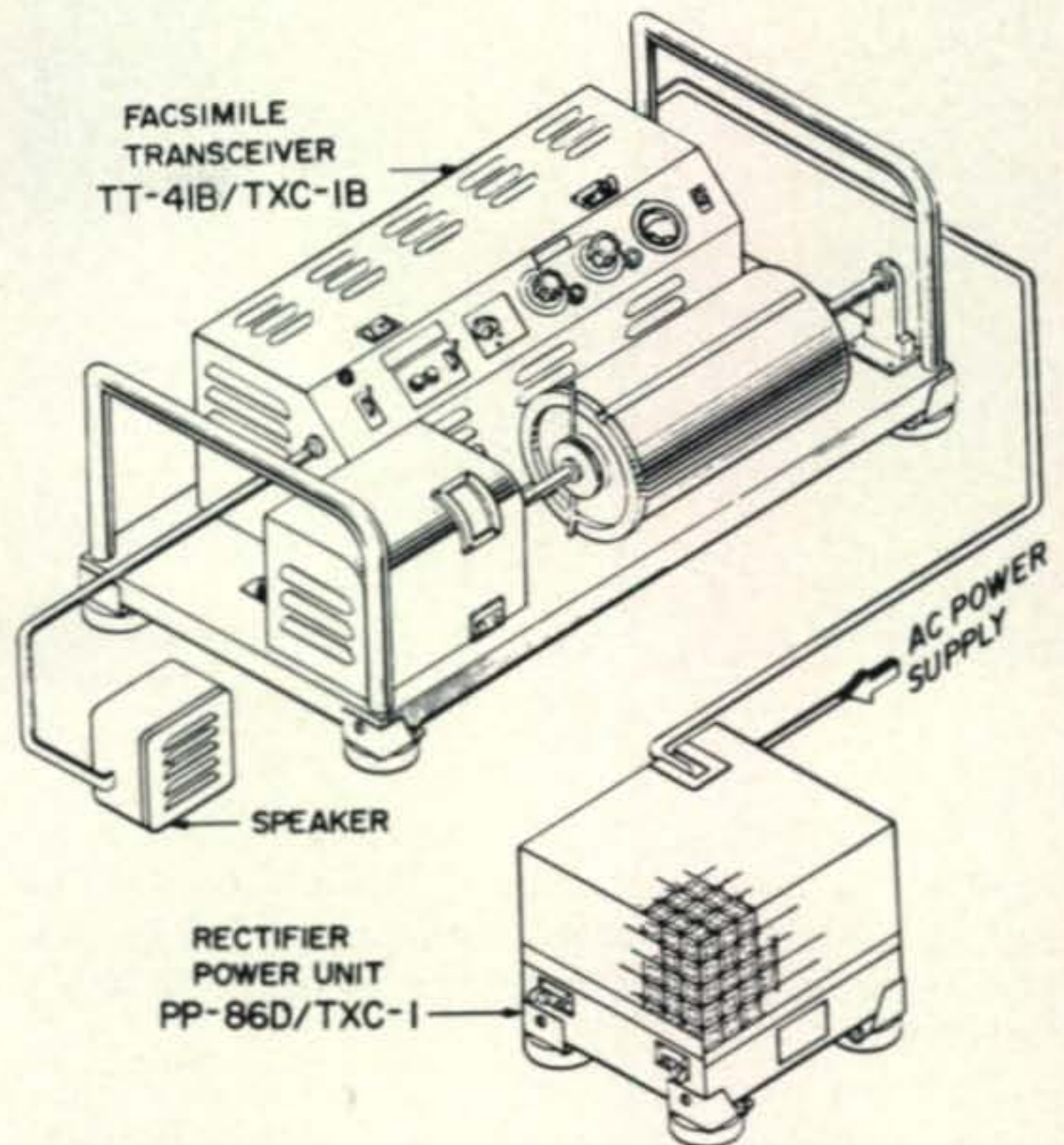
Right now the TXC and RD-92 and the Desk-Fax units are available from several sources, one of which is Van's Electronics, 302 Passaic Ave., Stirling, N.J.

The TXC is representative of several military sets of World War II and the immediate postwar years. It was used by the Navy and the Army, and there were several similar units with other nomenclature, all made by the Times Facsimile Corporation, which has evolved now into LitCom

* 1502 Stonewall Rd., Alexandria, Va. 22302.



Facsimile recorder RD-92A/UX.



The facsimile transceiver TT-41B/TXC-1B and rectifier power unit PP-86D/TXC-1.

Industries of Mamaroneck, New York, a subsidiary of the Litton Industries conglomerate empire.

The TXC is one of the very few fax *transceivers* currently available. It will send or receive over wire lines, h.f. or v.h.f. radio channels.

The RD-92A/UX is a receive-only set, made chiefly for use aboard ship to receive weather maps sent from the Navy's weather central at Suitland, Maryland, or from other government stations operated by the major maritime nations.

Both sets operate from 117 volt a.c. 60 Hz power. Both operate at the standard 60 revolutions-per-minute speed, although the TXC can run at 30 r.p.m. (a few primitive stations in the smaller countries send at 30-speed) and some RD-92 units offer 90 or 120 r.p.m. options via gear-shift modifications. The 120 speed is commonly used for weather work by a number of countries, and by the U.S. Air Force station in Washington, KWAS.

There are a number of Associated Press and United Press International news photo transmissions via "radiophoto" FAX, sent at 60 r.p.m., but these are generally beamed at Latin America, and are hard to pick up in the eastern U.S. because of propagation problems.

The 120 r.p.m. speed offers the possibility of picking up dual-image copy of the satellite photos, since the satellites send at 240 r.p.m., exactly double the highest speed of the modified RD-92 receivers. Properly synchronized, you can get two 240 photos while receiving on a 120 r.p.m. drum. This works at 60 r.p.m. too, but you get four images, and the loss of "lines" becomes great enough to seriously degrade the image.

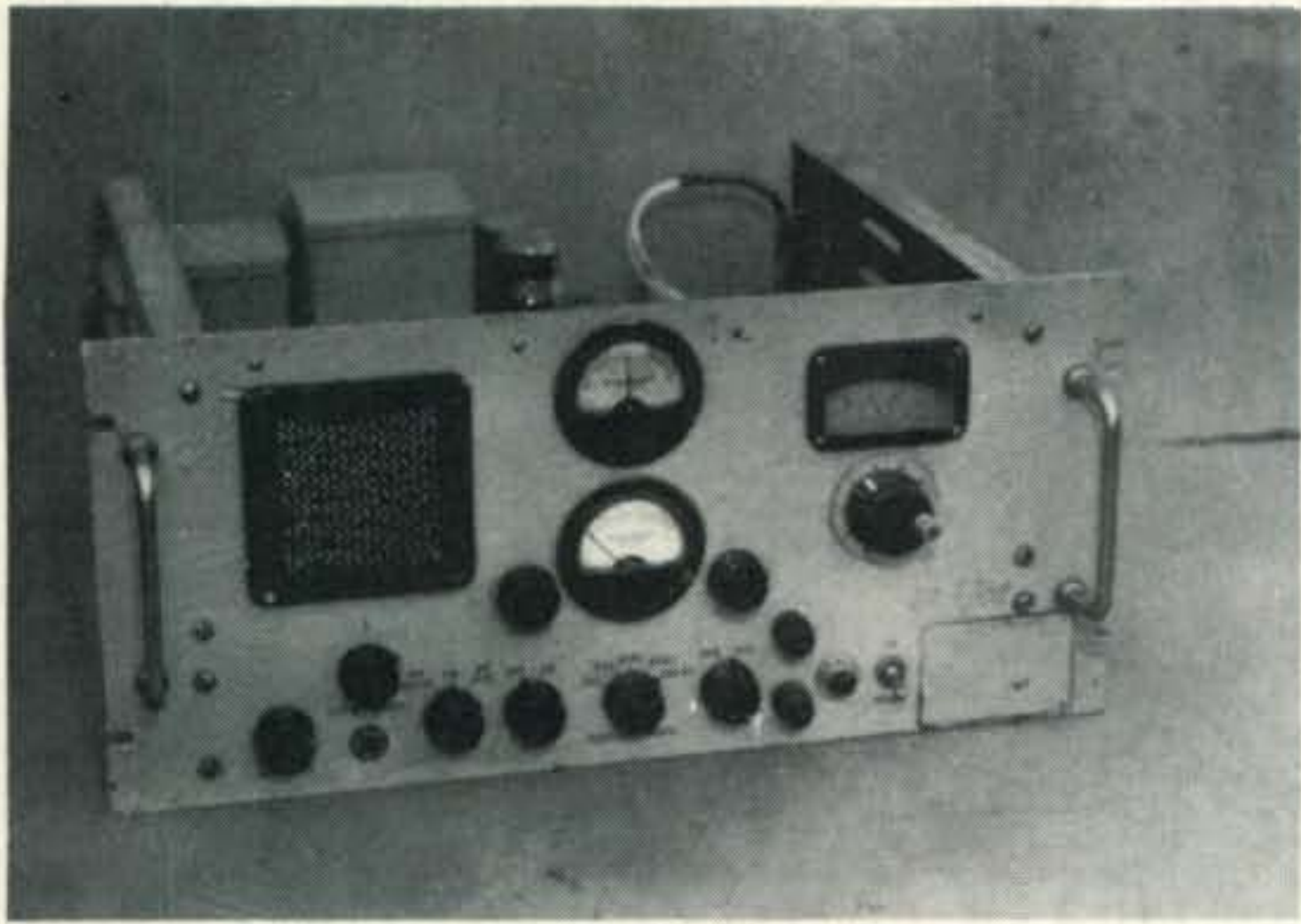


Fig. 1—Nems-Clark 1302 receiver.

As the drawing indicates, the TXC requires an associated power supply, PP-86D, containing power and some modulation circuits. It is not easily "built up" if you get a unit that is missing its PP-86.

For reception of an amplitude-modulated facsimile signal, the TXC can be simply hooked to the audio line. Standard h.f. transmissions however use frequency-shift (f.m.) modulation, not unlike RTTY FSK. The chief difference is that RTTY is a quasi-binary signal, either "mark" or "space," with, ideally, a square waveform. A fax FSK signal is a form of sine wave, with the shift dependent upon the density of the image.

Under standard usage, the fax shift is from 1500 Hz to 2300 Hz, black to white (800 Hz total shift). A mid-gray tone might be indicated by, say, 1900 Hz.

The TXC does not reproduce gray tones well in its most common recording mode, using a hot stylus, but when used photographically, with a light to trace the image on a sheet of photographic film, good gray-scale rendition is possible. Either mode is available on the unit.

The stylus reception is easier to use for experimenting because it can be watched as the copy comes in, and adjustments made at the receiver if a poor image is being recorded. The TXC offers either type of recording.

To convert the FSK signal to the a.m. signal needed by the recorder, the standard demodulator is the CV-172/U, a small rack-mount unit containing a tuning eye to help in receiver ad-

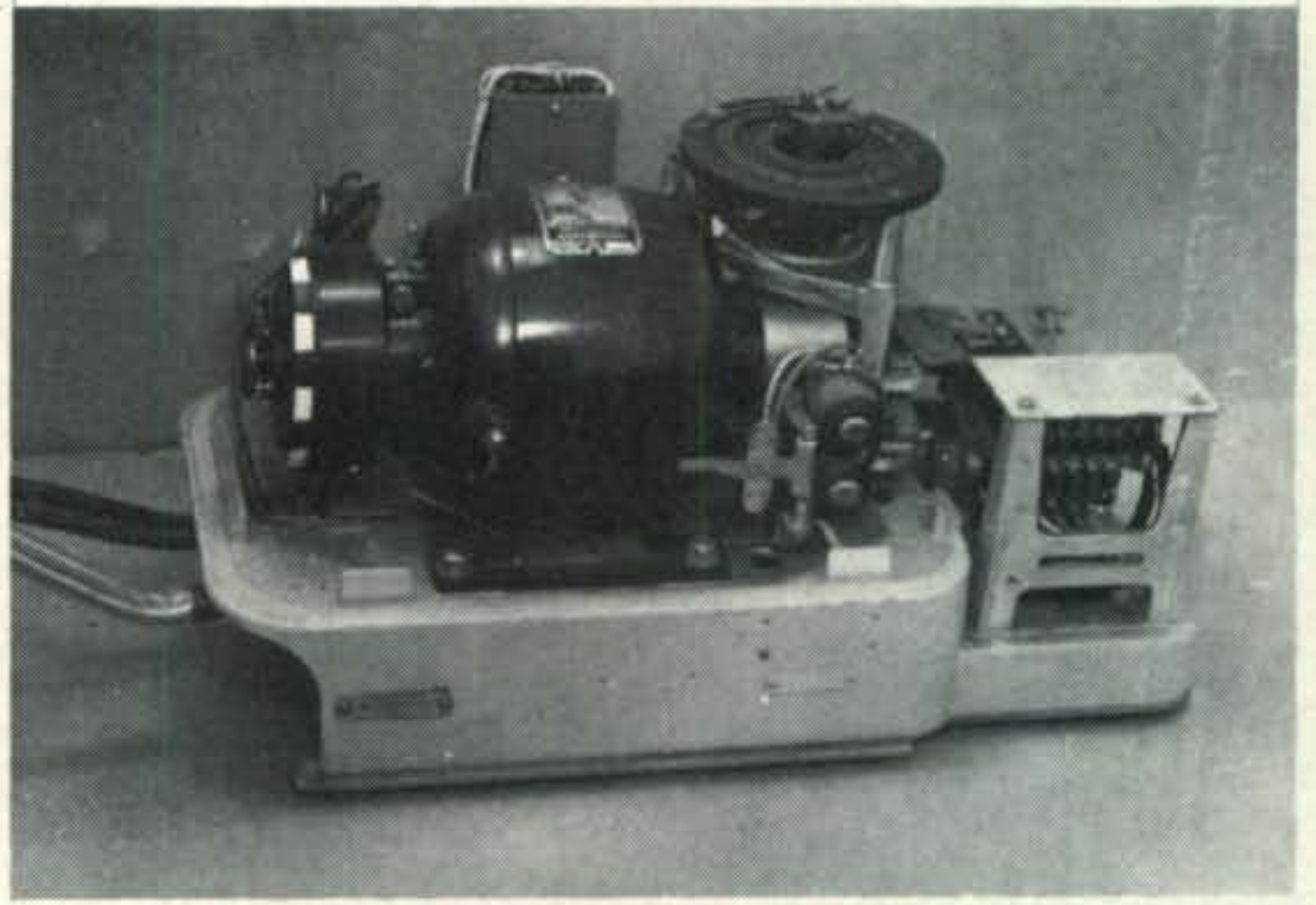


Fig. 3—The model 14 transmitter-distributor multiplex receiving converter.

justment. The CV-172/U is essentially a filter, with maximum attenuation at 2300 Hz and minimum at 1500 Hz. The frequency-shifted signal becomes an a.m. signal which is given a little amplification for proper drive of the recorder. In addition, 1500 and 2300 Hz filters are used in the dual eye-tube circuit so that when properly tuned, the top and bottom segments open equally as a fax transmission is received.

A simple filter tuned to pass 1500 Hz can be used as a rough demodulator for either the TXC or RD-92, if the CV-172/U is not available.

A little comment upon the recording with a stylus machine is in order. The signal is amplified and used to drive a high-voltage current through the stylus and the specially treated paper. The current burns away the white coating, leaving a dark mark. Light areas are represented by low-current, and dark images high current. A more modern method is the electrolytic recording which passes a current through a silver bar, leaving a dark image where there is current, and a light, or no image, where the current is minimum. Instead of a stylus, the electrolytic method uses a helically-wound wire on a drum. One disadvantage is that the paper must be kept moist.

The basic drive system of a facsimile recorder consists of a drum upon which the recording paper is fastened, and a specially-cut "lead screw" which moves the recording head along the drum lengthwise. Precise frequency control of the drive motor is required to avoid drift or jitter of the image. The TXC and RD-92 sets use costly tuning fork frequency standards, while the Desk Fax relies upon power line synchronization (good only over an area with a common power company interconnection).

Last Month's Photos

We had some troubles with the photographs for last month's column. Fig. 1 is the Nems-Clark 1302 receiver, a sensitive telemetry unit, using a 417A triode front end.

Figure 2 is the accompanying "range extender" which allows the 1302 to cover up to 475 mc.

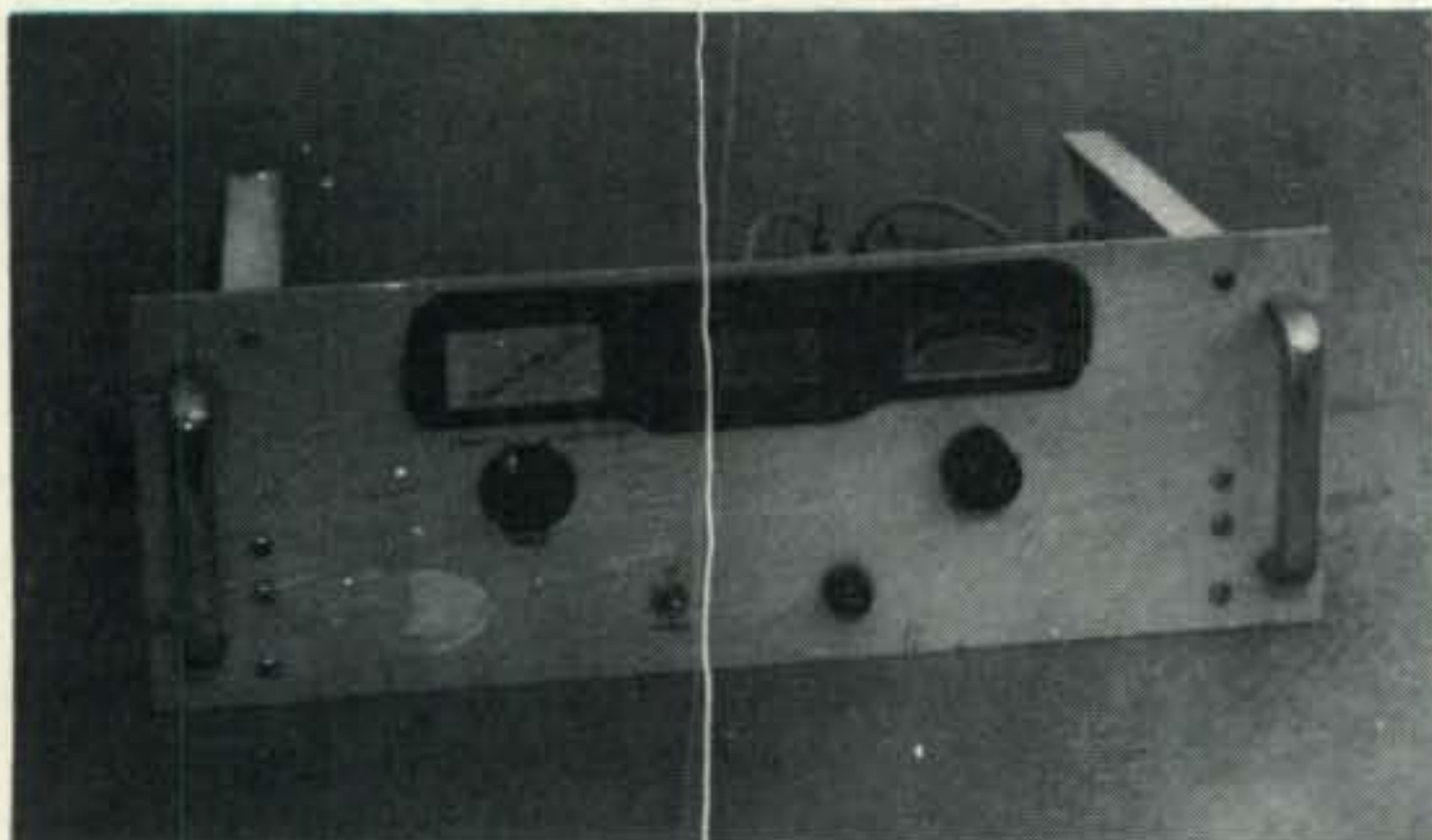


Fig. 2—The 1302 "range extender."

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REPERFORATOR-TRANSMITTER

Model TT179/FG Mfg by Kleinschmidt used with Model TT-117/FG teletypewriter Tape printing & punching, also transmitter-distributor. 115 volts, 60 cyc, shpg. wt. 90 lbs. used, excellent cond., (gov't. cost \$2,000 \$59.50)

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Ferris 32B complete (later version)	150.00
Empire Devices NF-114: 0.15 to 80 MHz	295.00
NM-50A complete: 375-1000 MHz	395.00
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The model 14 transmitter-distributor in Fig. 3 is the "multiplex" receiving converter, described in the February column. Note the odd distributor disk. Although this looks like a model 14 T.D., it is difficult to convert it to use as an amateur sending unit without extensive modifications.

Eico 753 [from page 28]

set by adjusting the value of the series 100 ohm resistor but the circuit as shown should limit the meter pointer travel to approximately full scale deflection.

Conclusion

Upon completion of these modifications the most noticeable change observed will be a marked improvement in the receive performance on 20m. In the author's case 20m. signals that sounded like S9 were found to be pushing the S meter up to S9+ accordingly. There will also be a marked improvement in the reception of weak DX signals because the r.f. stage is running "flat out" at these signal levels and the reduced bias on the mixer not only increases the conversion gain but reduces mixer noise. On 40m. and 80m. the receiver is really lively but quite stable. Overall, the 753 should now exhibit equally lively performance on all bands. The S meter responds satisfactorily and cannot be damaged by incorrect operation of the rig, or overload. On 20 meters the transmitter P.A. is quite stable under any load conditions.

Don't forget to mark-up the EICO schematic and wiring diagrams to show the modifications for future reference. ■

Contest Calendar [from page 76]

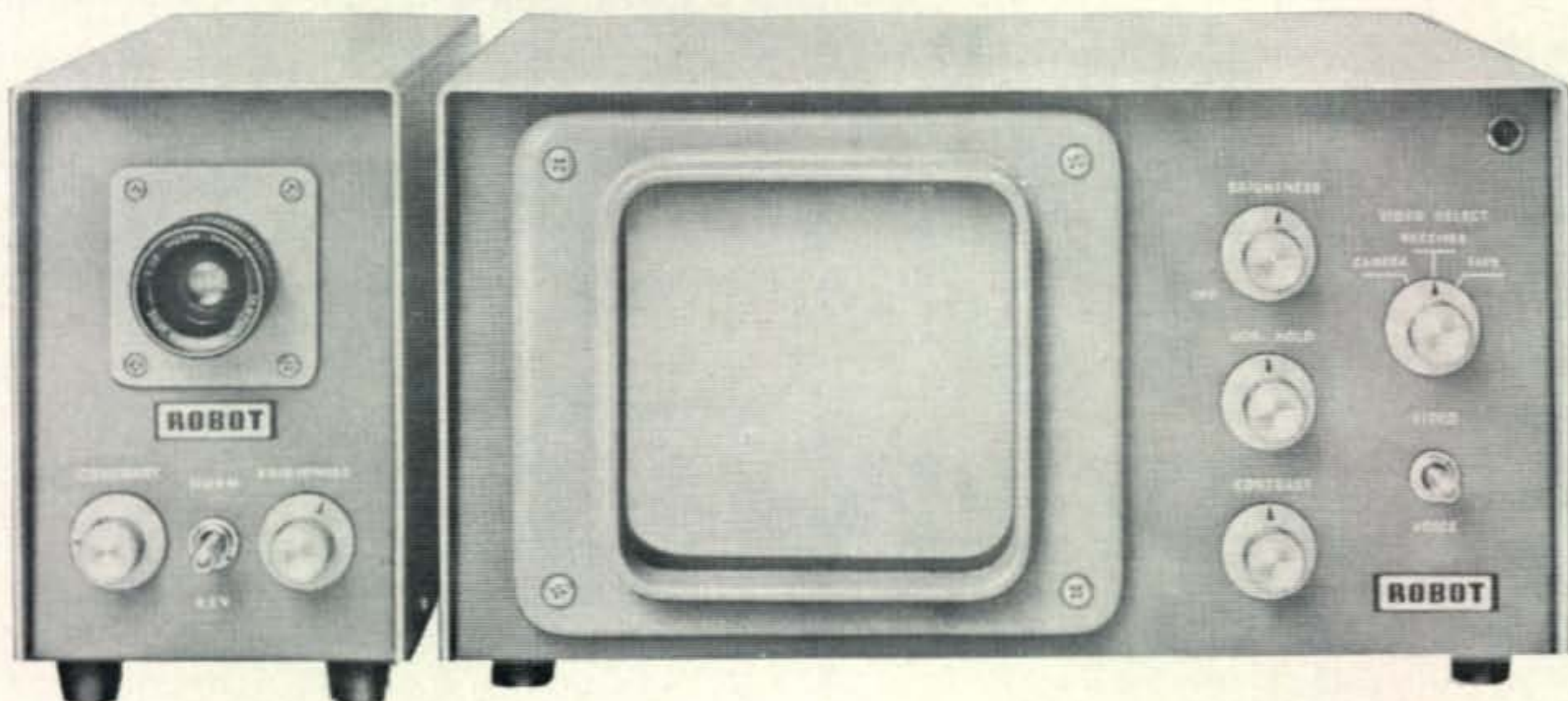
population in each state individually could not generate sufficient activity, the radio clubs of Denver, Colo., New Mexico and Wyoming have pooled their resources and are running their QSO Parties at the same time.

The same station may be contacted on each band and again if the location has been changed to another county. Phone and c.w. however are separate contests. Intraregion and intrastate contacts are permitted.

Exchange: QSO nr., RS(T), state and county for stations in the Rocky Mt. area, others just give their state or province for their QTH.

Scoring: One point per QSO. The multiplier for stations in the Rocky Mt. region will be the sum of state, VE provinces, countries and Rocky Mt. counties worked. The multiplier for stations outside the region is the number of counties worked in the state in whose party he is participating.

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 HALLICRAFTERS S-108 general coverage receiver with ham bandspread, very good condition \$89.95
 HAMMARLUND HQ-100 general coverage receiver with ham bandspread, good condition \$95.00
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It is therefore possible to have three separate scores, one for each state in the Rocky Mt. region.

Out-of-state stations: Don't let it confuse you. Take the sum of all Rocky Mt. QSOs and multiply each separately by the counties in each of the Rocky Mt. states. (I would suggest a separate summary sheet for each state.)

Frequencies: On c.w. 65 kHz up from the low end of each band. On phone near the edge between general and advanced. Novices in the middle of their band.

Awards: Appropriate awards will be given by the sponsoring club in each state and will therefore vary.

All logs go to: Bill Wageman, K5MAT, 35 San Juan, Los Alamos, N.M. 87544, no later than May 1st. Include an s.a.s.e. for awards and/or copies of results. Extra postage is suggested if you submit log for more than one state.

Editor's Notes

Received too late to include in the QCWA rules last month is the following addition to the scoring.

Contacts with any of the officers or board members are worth extra *multiplier* credit, as follows: With the President K7UGA (or W3USS) 4 points, with Vice President W6ATC 3 points, and the rest of the officers W2HX, W2JE, W2KH, W2KW, W3RE, W4YK and W8KW, 2 points.

Remember these are multiplier points (like states, provinces and etc.) and can be used only once. If you have not already done so correct your score accordingly.

Let me once again emphasize, that all material must be received at least three months before the date of the event if it is to be published in an appropriate issue.

Rules for the WPX SSB Contest the last weekend of this month, will be found on page 41. Rules same as last year, with rest periods and double QSO points on 40, 80 and 160. Keep in mind that the prefix multiplier is counted only *once*, and not once on each band. And we again admonish you to note the total number of valid QSO's on your summary sheet.

73 for now, Frank, W1WY

Caribbean Trip [from page 54]

We went sightseeing again in the Old San Juan, then we went to see a double feature movie. After we saw the first feature we were invited to return after dinner, because the projectionist had to go to eat.

Later in the evening, after we checked in at the airport for a late night flight to New York, we met Elliot, KP4BSH. Elliot took us to Felix, KP4CK, and his wife Alicia, KP4CL.

I really envy these people. They have a beautiful house on the top of a hill, a few hundred feet above the sea level, overlooking San Juan. Two huge towers, a 4 el. triband Quad, a 5 el. full sized beam for 20m., a dipole for 80m., and they were just installing a 3 el. beam for 40m.

They have two separate stations; his and hers. The gear is mostly Collins and the attractive call signs starting with KP4, are just adding to the ingredients of a successful station.

How could I not envy them? I have to share my rig, my antenna even my microphone with my wife Eva, WA2BAV, and then listen to the reports she gets, always 2 S units higher than mine! ■

Antenna Basics [from page 21]

Antenna is a better understanding of the basic principles of operation. If we know why antennas behave as they do, then we are less likely to expect the impossible. Hopefully, this article has made some small contribution to a better understanding of antennas and feed lines. Perhaps we will hear less frequently the erroneous story of how some OM "pruned his transmission line until he got a 1:1 v.s.w.r." ■

C.W. Speed [from page 45]

the kind of copying I have in mind is tape c.w., or the kind sent by an electronic keyer. Shun copying lids and Lake Erie swingers; replace them, for the time being, with the best c.w. you can find on the band, including W1AW's practice sessions. If you can afford it, buy or rent a tape machine.

Try to copy at a speed just slightly higher than your solid speed. Once a copying speed becomes too comfortable, your learning curve takes a rest, too. In short, it's like any other skill: if you want to improve your copying speed, keep trying to better your own best time. And keep this in mind, too—McElroy, at one time, must have thought that even 20 w.p.m. was pretty racy stuff. ■

2M. Mobile [from page 48]

Conclusion

Although the design concepts described above can be put to work in many different ways, the author's practical set-up may be of interest. The whole receiver uses vacuum tubes which are powered by the transistorized

auto radio supply, beefed-up. Its buttons are pre-set to five monitor frequencies—the closest to actual crystal switching you can get. The transmitter, up to the 24 mc stage, is solid state, and fits into the dashboard between the auto radio and the converter. The 24 MHz is fed to dynamotor-powered vacuum tube multipliers and final located behind the driver's seat. A rooftop antenna for reception is separate from the rear-mounted transmitting antenna. I installed a second battery in the trunk which saves the starting battery for that function, as well as providing a pure source of d.c. for the solid state first part of the transmitter. This puts the uncritical receiver and dynamotor power supplies together with the noisy charging and ignition circuits on the rear battery. A flexible knife-switch patch panel, which allows any other power routing combinations, completes the mobile installation. ■

DX [from page 67]

23 rue de Fressies, Aubencheul Au Bac, 56 265 Aubigny-an Bac, France.

A2CAB—Via W2RHK

AP2AD—Via POB 94, Lyallpus, West Pakistan

DL4VA—Via Vandegrift, Matcom-DSO, APO N.Y. 09052

DU7MC—Via POB 273, Bacolod City, Philippines

F9UG—Via DL4VA

F0ACO—Via K11XG

FM0IX—Via W7VRO

FY7AE—Via WA4WTG

FY7AF—Via K3RLY

FY0NA—Via F0NA

HB9XID—Via DL4VA

HB0XHS—Via DK3SF

HB0XID—Via DL4VA

HB0XVN—Via DK3ST

HS3AFB—Via WA2WMT

JD1ABO—Via JA1BA

K4CSY/KC4—Via W4 Bureau

KC6RS—Via W6MMG

KF4SJ—Via KP4AST

KY4CD—Via W4DQD

KY6PMR (c.w.)—Via WA6GFE

KY6PMR (s.s.b.)—Via WA6WWC

PJ6JT—Via W1BIH

TE0A—Via T12J

TU4AA—Via VE7BWG

TY0ABD—Via DJ6QT

VK9JV—Via JA2KLT

VP1EK—Via DL1JW

VP2AAC—Via WB4GGA

VP2DAE—Via K3RLY

VP2ES—Via W2BBK

VR1AB—Via K3RLY

VR1W—Via W6CUF

VR3C—Via K3RLY

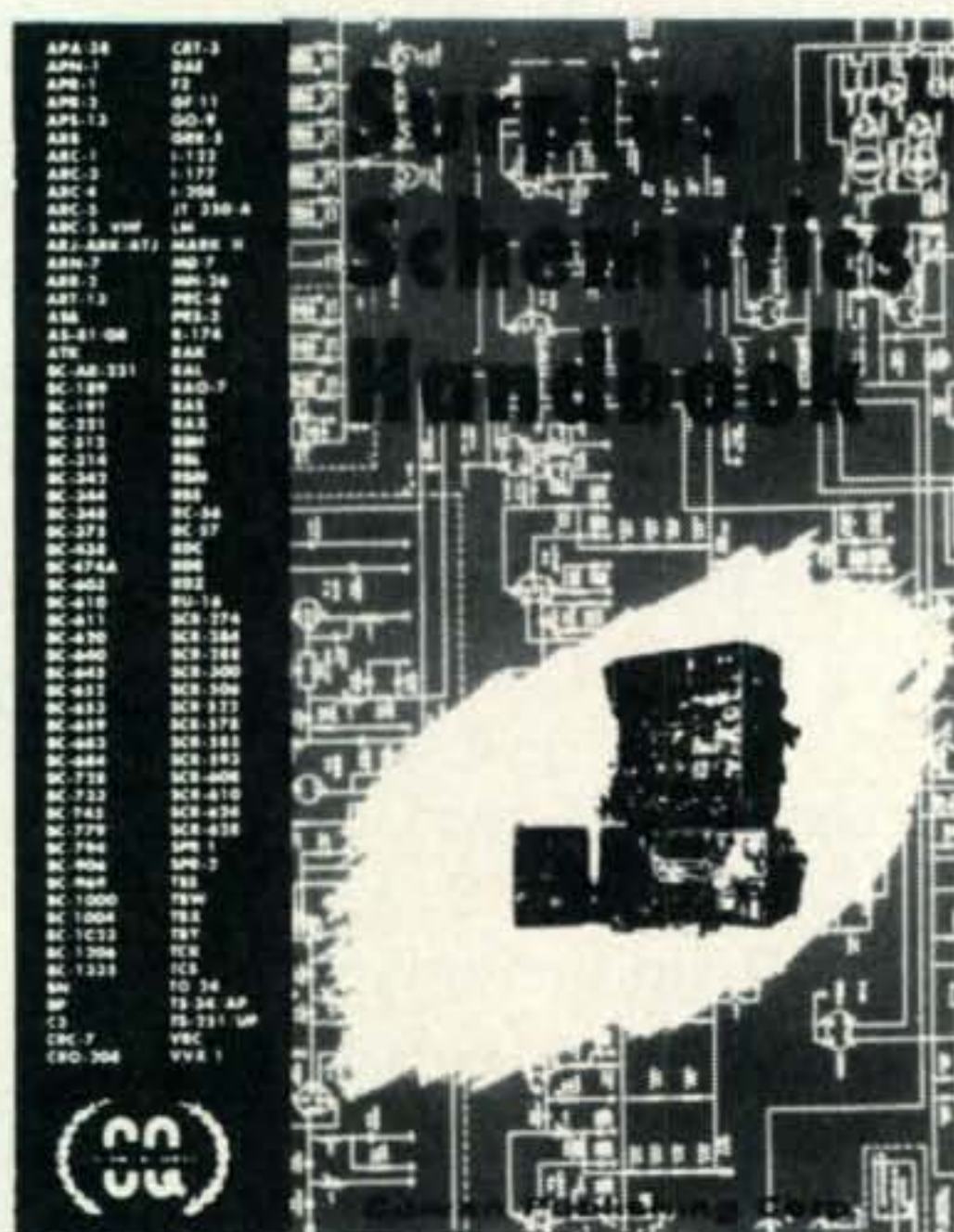
VR2FO—Via W4FXA

WA4WME/LX—Via DL4VA

WA6GLD/6Y5—Via W6ANN

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ARC5	BC344	RAX	SPR2
ARC7	BC610A	SCR274	TBW

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- YB0AAO—Via DJ0RR
- YB0AAU—Via Box 2932, Djakarta, Indonesia
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- 9Q5HP—Via K5HWO
- 9Y4OT—Via K2PSK
- 9X5VA—Via P.O. Box 30, Butare, Rwanda

Top Tour [from page 33]

and private baths, but was in the process of being expanded and renovated as of November 1971, so it should be first rate by now. The food is served home-style and is generally cooked by the wife of the owner, a delightful English-speaking lady. The Top Tour station here is also on FTDX-560, with a 5-element beam for 20, 15 and 10 and a Windom for 40 and 80. It is located in a garrett room in the hotel, away from the busy hotel atmosphere. The price here is \$115 per week, half pension. The Top Tour representative is Ernst, HB9MN.

Gamprin, Liechtenstein: Liechtenstein is sandwiched between the eastern end of Switzerland and the western end of Austria, and is noted, among other things, for its tiny proportions: 17 miles long and 5½ miles wide. Gamprin is a small mountain village overlooking the Rhine Valley, and is about 5 to 10 minutes drive from the capital city, Vaduz. Skiing, sightseeing, mountain climbing and shopping are the prime tourist activities, with excellent restaurants and hotels providing the essentials. The Top Tour hotel in Gamprin

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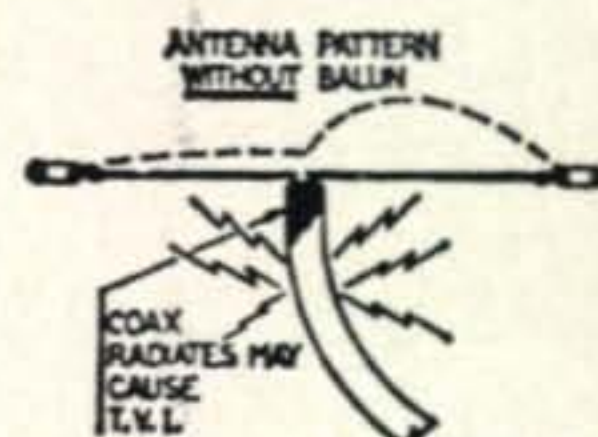
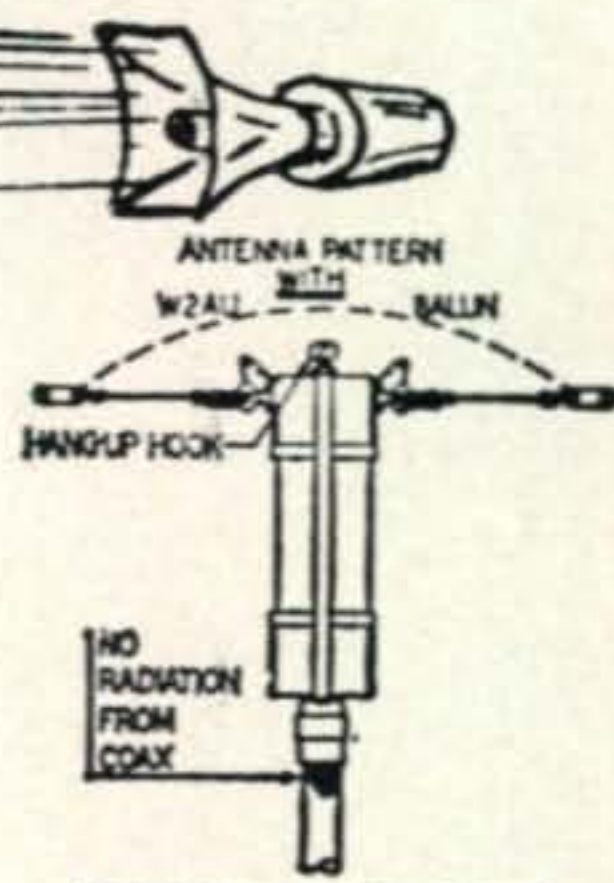
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See Bill Scherer's review on similar EK-402, January '71 CQ.

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In Zweisimmen, Switzerland, the Top Tour rep is Ernst Nafzger, HB9MN, who climbs mountains like the average person walks on level ground.

is actually a modern motel offering an excellent hamming location, superb service and meals, and lively entertainment with two working bars, live music and bowling alleys. Herr Walsdorf, the young owner of the Motel Waldek, though not an amateur, is very enthusiastic about hamming and has gone out of his way to provide as beautiful a ham shack as anyone could ask. The shack is located in the main building, and is equipped with the standard FTDX-560/5-element beam/Windom combination. A short drive puts you in the world famous Malbun ski resort or in Buchs, Switzerland, just across the Rhine, with its restored 13th century Swiss village. It's well worth visiting, especially for photo buffs. The rates at Motel Waldek are extremely reasonable at \$90 for a full week.

Bad Ragaz, Switzerland: Rounding out the Top Tour locations is the most luxurious spot of all, Bad Ragaz, which is a famous and popular hot springs spa only a few hours drive from Liechtenstein. The Top Tour hotel there is the Hotel Crystal, a beautifully modern Swiss luxury hotel with everything the decadent American tourist could desire. There's an indoor heated swimming pool, sauna, balcony on each room, color TV, safe and liquor-stocked refrigerator in each room, bar and a gourmet restaurant that is guaranteed to add a few inches to anyone's waistline. There are reserved parking spots, an 18-hole golf course nearby, tennis courts, horseback riding, fishing, sport flying, and of course the ever-present skiing. Bad Ragaz is the place to

wind up your trip, in our opinion. The whole village seems dedicated to the goal of either spoiling you silly or making you feel like your name was Onassis, but the rate for the Hotel Crystal is a reasonable \$115 per full week, half pension. It's quite a bargain at that.

The station is located a few doors from the entrance to the swimming pool and contains the standard FTDX-560 station and antennas.

If you're a ski-buff, you're within easy driving distance of the most elegant ski villages in the world: Davos, St. Moritz, Pontresina, Arosa and Klosters.

Those are the Top Tour Ham Club locations at present, with more to be added regularly. (Portugal is next on the agenda.)

Ground Travel

Swissair's travel responsibility ends when you are delivered to the railroad terminal in Zurich, or to the car rental agency at the airport, and resumes at the same points just prior to your flight home. In between, travel arrangements are up to you. Rail travel in this part of Europe is excellent and inexpensive, and should be considered for at least part of your ground travel.

Top Tour Ham Club has negotiated special auto rental agreements with a fine agency with offices at Zurich Airport, Ambassador Service International. Ambassador's Manager, Mr. Sprenger will put at your disposal a new Simca 1100 GLS economy sedan at rates well below other rental agencies. These little cars are rather toy-like in appearance, but a few thousand miles driving convinced this writer that there's a lot more car there than meets the eye. They'll do 100 m.p.h. on level ground with utter nonchalance, and brake and handle in a way that should make



The Simca 1100 GLS rental cars provided by Ambassador Service in Zurich don't look too sporty, but they provide fast, safe, economical transportation.

FOR THE PROFESSIONAL AMATEUR

SONAR (2 meters) TRANSMITTER RECEIVERS (from 144 to 148 MHz)

COMPLETE FLEXIBILITY FOR
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model FM3601 10 watts

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\$299⁹⁵

Complete with microphone, mobile mounting tray and 2 pair of crystals, (146.94T/146.94R and 146.34T/146.94R)
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22 APRIL 1972

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most Detroit iron hide its face in shame. They're also roomy and will give 35 m.p.g. under all but the most abusive situations, an important point when gasoline costs 60-80 cents per gallon.

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So that's what those Swissair ads in *CQ* are all about.

Just to eliminate any misunderstanding, let

me state that the information presented here has not been culled from travel brochures, but from the writer's personal experience. The flight, the hotels, the food, the stations, the cars—they've all been thoroughly evaluated first-hand, as is every product which receives the *CQ* endorsement. And we most heartily endorse the Swissair/Top Tour Ham Club ham vacation packages. For the amateur who harbors the dream of being DX, for the ham who had almost made up his mind to see Europe, or for the OM whose wife is complaining that "you never take me anywhere," here's the way to go. ■

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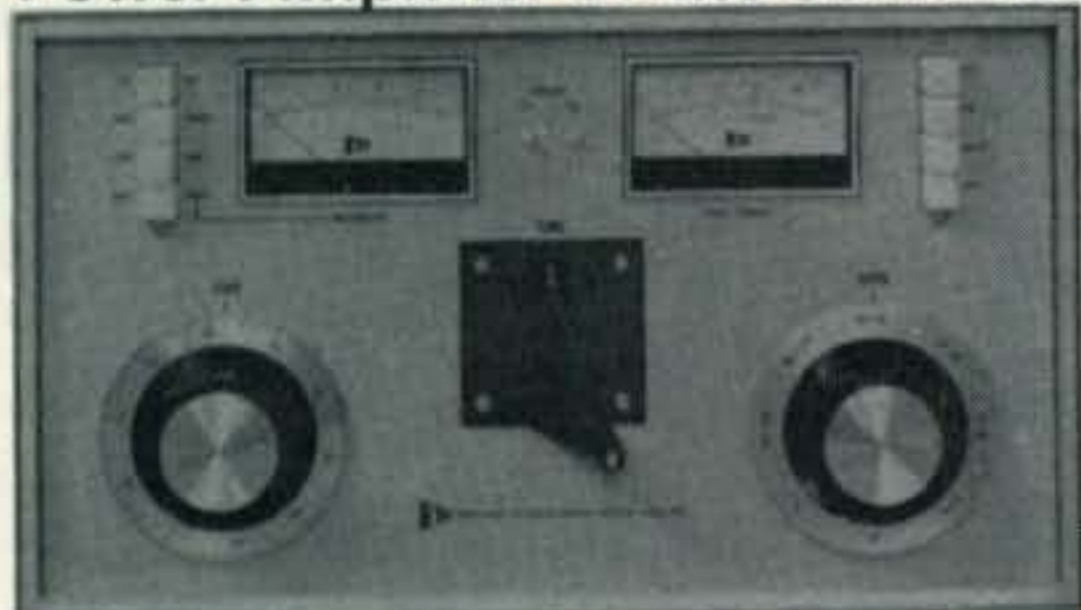
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NOW in the USA

USA-CA [from page 74]

Space Net contests are sponsored to coincide with past moon missions, future contest are Apollo 9, March 4, 5, 1972 and Apollo 11, July 15, 16, 1972.

Additionally, if WB2MTU is contacted by any station beyond the 300 mile range (on 50, 145, 220 and 432) they are issued a Space Net Award as Honorary Members. VHF Space Net, A. W. Slapkowski, WB2MTU, Director, Box 909, Sicklerville, N.J. 08081.

W*SM*M Award: Issued for working 80 SM on 80 meters, or 40 SM on 40, or 20 SM on 20, or 15 SM on 15, or 10 SM on 10 meters. The W*SM*M is issued on 5 different bands in all modes, c.w., s.s.b. or Mixed. Contacts are valid after January 1, 1970. Each application must include SM1-7 & SM0. Send log extracts and 6 IRCs to: Gotland DX Gang, P. O. Box 336, Visby, Sweden.



W*SM*M Award.

The Freebooters Statuette: Issued by The Freebooters Radio Club, P. O. Box 150, S-281 01 Hesselholm, Sweden for working the club-station, SK7BK and 5 (for SM-stations 10 are required) members of the club. The contact with SK7BK will be confirmed with a special QSL card and an invitation to hunt for the statuette. Each QSL will also give the data/history of the statuette. Each statuette will be engraved with your call-sign on a silver plate. When the requirements have been fulfilled, send a list of the Freebooters contacted and 5 U.S. dollars (25 Sw cr) and you will receive your statuette and you will also become a Member of Honour for life in the Freebooters Radio Club. Members include: SM7ALI, ANL, ASN, BJB, BAH, BBU, BDU, BBV, CFF, CPL, CRW, DGC, DJG, DUH, DHK, DRQ, DMT, DLV, ER, EUG, EHI, EMI, TE, VO, and ZJ.

Notes

Sorry to hear about the loss of another County Hunter, WA8SOF who was a Charter member of MARAC.

Thanks for note from Bertha, WA4BMC regarding ECARS being offered our Net (meaning County Hunters on 14336) in an *Emergency*.

Thanks to Gil Baker, W5QPX for finding all those used POD 26s and sending them to oversea

County Hunters. Gil has a new QTH, 101 Rita Blanca Trail, Amarillo, Texas 79108.

Also thanks for the get-well cards from the County Hunters to my wife, Helenmae, who had two operations and spent 5 weeks in the hospital over those bad leg ulcers that have troubled her for the past few years.

Don't forget the SSB County Hunters Contest sponsored by MARAC, 2200 GMT 7 April to 0500 GMT 10 April, see CONTEST CALENDAR by Frank, W1WY or send s.a.s.e. for full details to K1OME.

Now that Helenmae is home, my month was fine, how was your month? 73, Ed., W2GT.

Q & A [from page 12]

at times. Can this shaft be replaced with one made of brass or steel without affecting the performance of the receiver?

ANSWER: We do not recommend a metal shaft for the bandswitch in the HQ-140-X, as the fiber one probably is required to avoid feedback and instability that might otherwise be caused through a metal shaft. Your problem, however, might otherwise be alleviated by loosening the switch assembly and realigning the wafers for more positive action in both directions. Also check for wear at the center aligning hole of the switch wafers and on the fiber shaft itself. Use of a good contact cleaner may also help.

Johnson Transmitters on SSB

From time to time inquiries are received about using the various Johnson transmitters on s.s.b., particularly with the Heath SB-10 S.S.B. Adapter. Some related articles on the subject may be found as follows:

"Ranger and SB-10" (HAM CLINIC), *CQ*, March 1961, p. 67.

"Upgrading the SB-10," *CQ*, May 1970, p. 22.

"Ranger and SB-10 on SSB," *CQ*, Sept. 1959, p. 41.

"Adding SSB to Viking," *CQ*, Oct. 1954, p. 14.

"Viking II as a Linear," *QST*, Jan. 1954, p. 46.

"Using SB-10 with Viking Valiant," *QST*, Aug. 1960, p. 48.

QUESTION: Some time ago I believe *CQ* had a construction article about an s.s.b. product detector. It was to be used with older receivers which had a 6H6 detector. The 6H6 was re-

moved and a remote product detector plugged into the empty socket. Where can I find this article?

ANSWER: The product detector in which you are interested probably is the one described on page 34 of the July 1965 issue of *CQ* under the title, "A Product Detector for the Super-Pro." Another one that might be of interest is the "Tubeless Product Detector" described on page 41 of the March 1965 issue of *CQ*. In this case the 6H6 could be used in place of the solid-state diodes specified.

Battery-Voltage-Dropping Scheme for Mobile Installations

Here is an interesting solution to reducing excessive battery voltage applied to equipment in mobile installations. It was submitted by Howard F. Batie, W7BBX/4, 2912 Johnson Road, Falls Church, Va. 22042. His report in essence is as follows:

"I purchased a new Chevrolet Vega in which I installed my Heathkit SB-102, HP-13A power supply and Hustler whip. This car needed absolutely no ignition suppression additions or modifications, since the background ignition and noise levels were very close to S-1 on 75 through 20 meters. However, it was found that the overload thermal relays in the HP-13A tripped after about 10-minutes operation. The h.v. meter on the SB-102 was reading about 950 volts instead of the recommended 800-825 volts. It was then found that with the motor running, the battery terminal potential was +14.7 v. The first thought was to reduce the alternator voltage, but this was out since my new car warranty would be voided if the electrical system were modified.

"A dropping resistor to the power supply was considered but since the voltage drop therewith is dependent on the current, the regulation would be poor.

"What was then really needed was a current-independent voltage dropper of about 1-1.5 v. for the battery-line input to the HP-13A power supply that could handle a current range of between about 5 a. (receive) to

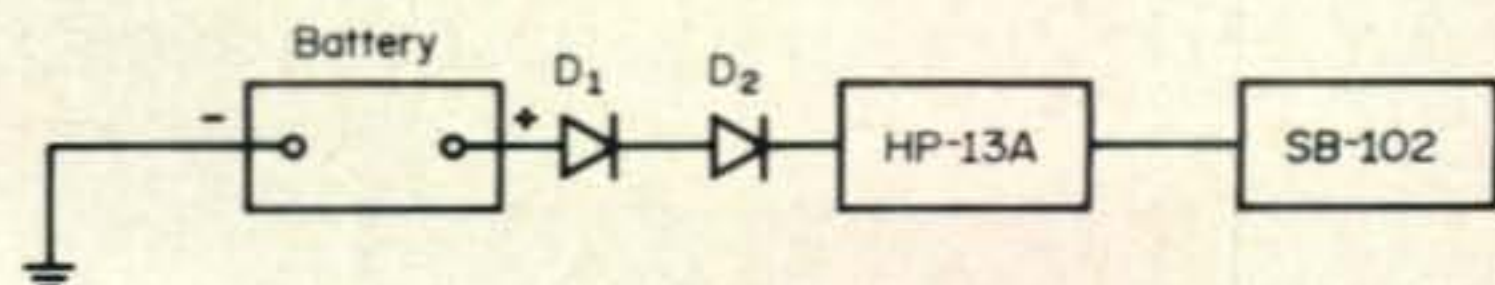


Fig. 1—Well regulated Voltage-Dropping system for mobile installations obtained using 50 a. silicon diodes (D₁-D₂) mounted with heat sinks on insulated board and connected in series with positive side of battery-supply line to mobile power supply.

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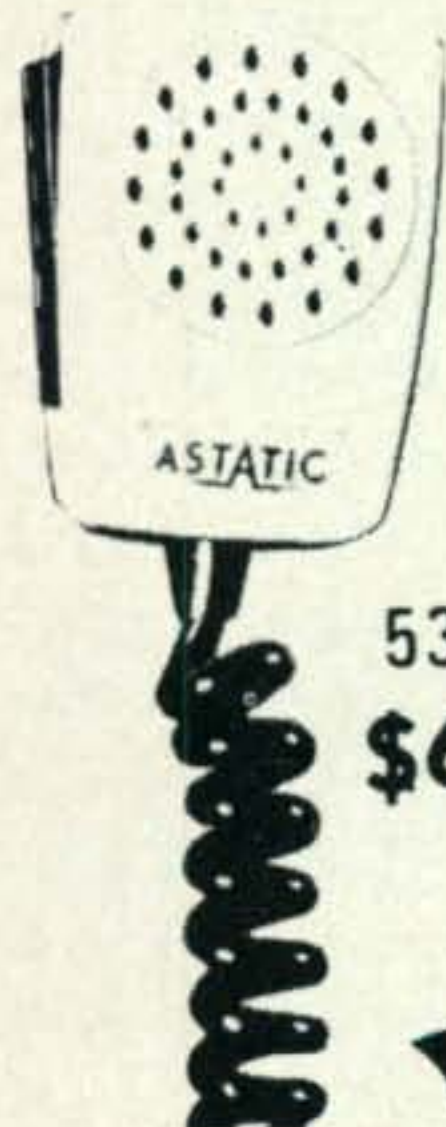
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SEND CHECK OR MONEY ORDER.....NO C.O.D.	

25 a. (full load on transmit). This was solved with two inexpensive 50-ampere silicon stud-mounted diodes and two 3" x 4" heat sinks. Since a silicon diode has a voltage off-set of about 0.5-0.7 volts across its terminals, and this voltage is essentially current-independent because of the very low internal impedance of the diode, a series installation of the diodes gives the required voltage drop with good regulation.

"A mounting board was fashioned for the heat sinks and diodes from a handy piece of plexiglass with the set up as shown at fig. 1. With this arrangement the h.v. reading held to 810 v.

"Note that the bias adjustment for the SB-102 should be checked whenever a change is made from fixed a.c. operation to mobile d.c. use.

"With this installation I have had many trouble and noise-free QSO's."

Many thanks, Howard. We'd like to add that connections involved on the plexiglass should be real tight to avoid overheating that could soften the plastic and thus cause a loose connection. A more heat-resistant insulating material might be more desirable for this application.

Product Detector for HRO-50

QUESTION: Have you any data on a product detector for the HRO-50?

ANSWER: The HRO series of receivers employ a b.f.o. using a tube such as the 6SJ7, in which case helpful data on product detector installations will be found in the Q & A Column for September 1970, p. 77.

Announcements [from page 10]

Pike, WA2UKS, 635 Lacey Drive, Endwell, N.Y. 13760.

La Mesa, New Mexico

The Mesilla Valley Amateur Radio Club will hold its Annual Beanfeed & Swapfest, Sunday, April 30, 1972 at La Mesa, New Mexico, Fireman's Park. Call in Frequencies are 135.30/94 & 34/94 MHz. f.m. and 39.40. For further information write WA5RGI, Box 3576, Las Cruces, New Mexico 88001.

Stolen Equipment

A Regency HR-2A f.m. transceiver, serial number 04-05896 was stolen from the automobile of John Crosby, K4GBL, 4041 Compton Circle, Powder Springs, Ga. 30073, while he was in Atlanta, Ga. Anyone with information about the stolen transceiver is urged to contact John at the above address.

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It's amazing! The new Cobra PF-1 monitors government AM and FM VHF channels and lots more. Does it better than any other radio. All at a price you can afford.

Unlike other monitors, you receive all frequencies on both high and low bands as easy as tuning a radio. And in addition to manual tuning, push button crystal control is available at a preselected frequency of your choice on each band — a feature usually offered only in the most expensive radios. Crystals available from all electronics distributors.

So why settle for less? Exclusive noise limiting circuits reduce ignition interference and insure quiet operation. And the ultimate in new solid state circuit design gives you top reach, selectivity and dependability.

Even the exterior is modern . . . perfect for any decor or auto interior.

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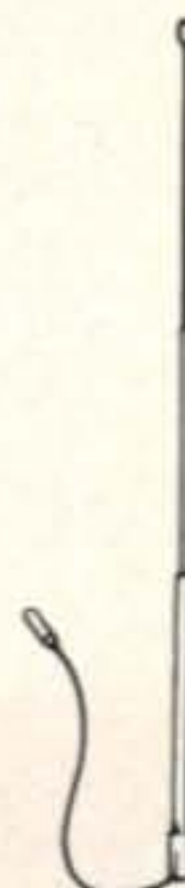
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Direct all Correspondence & Copy to: **CQ Ham Shop, 14 Vanderventer Ave., Port Washington, L. I., New York. 11050.**

CHESS ANYONE? By mail, or radio. Interested? Sase to J.D. Andrews, 24 Cottage St., Melrose, MA 02176.

KNIGHT R100A recv w/S-mtr, crystal calibrator and product detector as per CQ Jul 69 - \$65. W2AEF, CQ Mag., 14 Vanderventer Ave., Port Washington, New York 11050.

SELL: Drake T-4X, R-4A, AC-4, MS-4: Complete station, will pay shipping - \$650. WA7PDT' 1187 Ash, Provo, Utah 84601.

MODEL 28 typing reperforator LPR3ARZ & transmitter distributor LRXB27, each unit with 60-75-100 three speed gear shift on 3 foot high tape handling stand, 2 tape reels, and synchronous motor. Used, excellent - \$150. Atlantic Surplus Sales, 580 Third Ave., Brooklyn, NY 11215.

KNIGHT T-150 transmitter - \$50. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, New York 11050.

6M Utica 650A xciver VFO and Aces - \$95. Stehen Chisarick, RD 1, Dallas, PA 18612.

SELL: several unused antique 1922 black bakelite dials. 3 and 4" diameters. White letters. A.B. Moore 32 Morton Pl., No. Arlington, NJ 07032.

AUDIO FILTERS: Knock down that background noise. KOJO SSB, AM, and CW filters do the job. Write for free brochure and see how serious DX boys hear them. KOJO, Box 7774, 741 E. Highland Ave., Phoenix, Arizona 85011.

KNIGHT T-175, 6-10-11 mtr linear amp - \$50. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, New York 11050.

SEND a SASE if you wish to come to the bi-annual Don C. Wallace, W6AM, Rhombic Farm, stag visitor's day. 28503 Highridge Rd., Palos Verdes Peninsula, CA 90274.

YOUR HAM CALL in 3" plastic letters - \$1.25 per set P/P any basic color. Mount on any surface. Eshelman Products, P.O. Box 487, Cave Junction, Oregon 97523.

QSL's: Quality and Economy. Samples. K2IQH, Box V, Sherburne, New York 13460.

WANTED: R390, R390A, R389, R220, 51S1, Rascal. SWRC, P.O. Box 10048, Kansas City, MO 64111.

RF COAXIAL SWITCHES - DC-1 GHZ, 2kw-500W, Electrically operated, free literature. Link, 1000 Monroe Tpk., Monroe, CT 06468.

DX-100 fine operating condition, no chirp - \$45. Adams, 136 Aztec, Los Alamos, NM 87544.

3 Audion tubes double filament, no base. Best offer. D. Hill, Box 42, Weslaco, TX 78596.

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SO—What's a subscription to CQ worth? Well, maybe twelve months of great reading, maybe twelve months of free classified ads, maybe both. That's up to you. In any case, at \$6.00 a year, CQ is a steal. Do we have your sub yet? If not, why not?

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MICROPHONES: Shure 404C mobile controlled magnetic - \$12.50; 201 mobile ceramic - \$8; 245S Uniplex unidirectional - \$15; 448 A noise cancelling \$34; 440SL w/stand - \$20; EV 674 variable-D Hi-Z Dynamic Cardiod - \$45; 630 Hi-Z dynamic - \$25; 619 Hi-Z and one Lo-Z Dynamic - \$20 ea; 600E mobile Dynamic - \$16. W2AEF, CQ Mag., 14 Vanderventer Ave., Port Washington, NY 11050.

21st ANNUAL Dayton Hamvention will be held on April 22, 1972 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, Ohio 45401.

FOR SALE: Heath HR-10 rcv, w/speaker & headphones, mint condx - \$50. WA7EMM, 79 Newcomer, Richland, Wash. 99352.

Munston "Nassau" marine radio telephone with 5 marine channels installed, manual included - \$60. Western Electric push-to-talk telephone-type handsets, brand new, original price was \$35 each, will sell \$15 each. Marine Electronics, 76 New York Ave Halesite, L.I., NY 11743. 516/427-7199.

HEATH HW-18 160m crystal-controlled SSB transceiver - \$75. W2AEF, CQ Mag., 14 Vanderventer Ave., Port Washington, NY 11050.

SCHOENIG marine German-type frequency meter, all bands - \$100. Box 8352, Savannah, GA 31402.

Join QRP ARC Int.: Send sase for info. Corresponding Secy, Earl R. Lawler, W5JLY, Rt. 2, Box 24K, Burnet, TX 78611.

MARINE ELECTRONICS of HALESITE: Sales & Service - Pearce Simpson, Konel, Sonar, Citizens Band. 76 New York Ave., Halesite, L.I., New York 11743. (516) 427-7199.

FOR SALE: 40' Rohn tower - \$125; triband fiberglass quad - \$75; RCA Sr. volt ohm - \$20; Hickok VOM - \$30; Triplett tube tester - \$30; 1966 LeMans superb condx, wired & shielded for Swan xcvr - \$1200. J. Williams, Apt 202, 1404 Iverson St., Oxon Hill, MD 20021.

SWAN TV-2 xverter. 14 MHz if, brand new - \$199. W2ERV, 14 Bernice Dr., Freehold, NJ (201) 431-2367.

SELL: GR distortion mtr 732B; DC PS 24v50A reg; German DL-QTC magazines; Conrac 14" TV monitor; Beckman DCU 705 & 707; IEE digital readouts. K. Paquee, 53 Jerome Ave., Trumbull, CT 06611.

No. Dak. School of Science has just started an AR club. We have no funds for equip. and funds cannot be appropriated for us, so we must turn to the public, the amateur who has an old piece of equip just lying around - this would help get us on the air. The postage will be paid for by us. Send all letters to WB0BIN, Robert Dablow, Box 1073, No. Dak. State School of Science, Wahpeton, ND 58075.

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WANTED: Ten to 100 inexpensive solar cells. Hutchison, 305 Washington St., Cambridge, MA 02139.

Regency, Galaxy, Hy-Gain, Rohn, SBE, Hallicrafters Hammarlund, Barker & Williamson, CAI, Scientific Radio Systems, Simpson, Dycomm, Gladding, Harman-Kardon, Midland, Scott, Sherwood, Altec, Ampex, RCA, GE, Zenith, Kodak, Polaroid, Bell-Howell, Argus, GAF, Pentax, Gruen, Lucien Piccard Jules Jurgensen. Write Steven Kullmer, Evergreen, Inc., Dysart, Iowa 52224.

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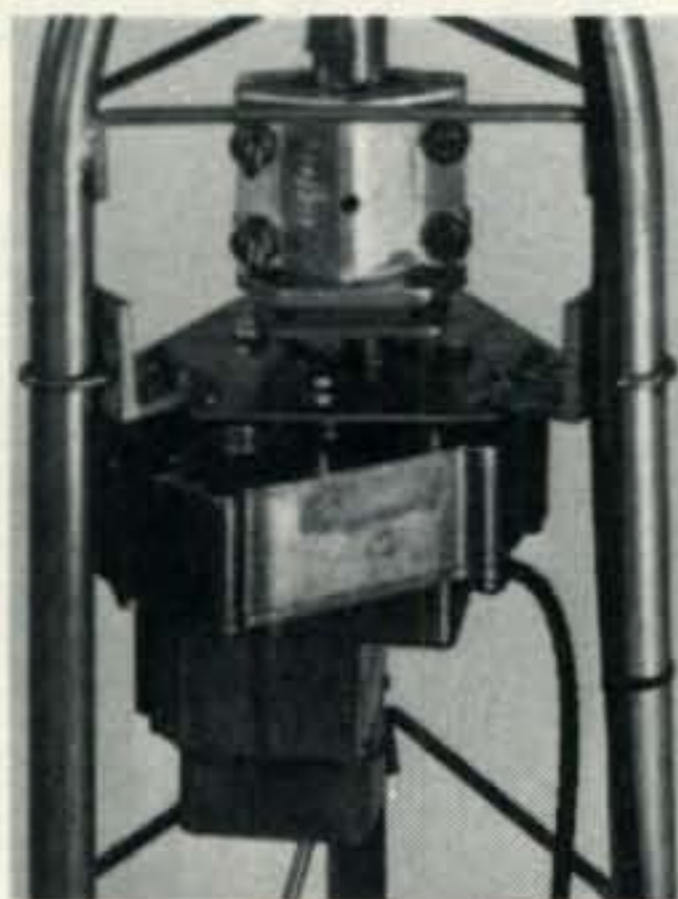
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Any amateur band crystal in FT-243 holders (except 80 — 160 meters)	1.50
80 meter crystals in FT-243 holders	4 for 5.00 2.50

ATTENTION NYC HAMS: Put your know-how of communications to work to help prevent and stop crime in your neighborhood. JOIN THE NYC AUXILIARY POLICE: For info write: WB2FJO, A. Schur, P.O. Box 238, Ryder Stat., Brooklyn, N.Y. 11234.

FOR SALE: Knight KG-630 wideband oscilloscope \$40. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, New York 11050.

WANT ANTIQUE telegraph equipment. Antique radios, parts and stock tickers. D. Spence, 10 South 771 Clarendon Hills Rd., Apt. 201, Hinsdale, IL 60521.

INSTANT NOISE LIMITER MODULE - Easy 20-minute installation for Heathkit, Galaxy, Swan and most other amateur equipment. \$8.95 postpaid. WELBORN Electronics, 133 Linden Street, Henderson, Nevada 89015.

MANUALS for govt surplus \$6.50 each: URM-25 D R-274/FRR, OS-8 C/U; following manuals \$7.50 ea. R-388/URR, R-389/URR, R-220/URR, 51J4. Hundreds more available. W3IHD, 4905 Roanne Drive, Washington, DC 20021.

FOR SALE: Linear Amplifier, Par 4-250A's. In 53" cabinet on wheels. 1 KW input. Pictures and description w/sase. \$150. Wm. McFadden, 29 Vernon Av, Wheeling, W.VA 26003. 304/242-3655.

ROCHESTER, N.Y. is again Hamfest, VHF meet & flea market headquarters for the largest event in the northeast, May 13th. Write WNY Hamfest, Box 1388, Rochester, New York 14603.

LAMPKIN TYPE 105-B micrometer. Frequency meter w/engineering data sheets, like new, hardly used, in original carton - \$150. Hallicrafters HT-37, mint condx - \$200. Hallicrafters SX-111 - \$145.00 Marine Electronics, 76 New York Ave., Halesite, L.I., New York 11743. 516/427-7199.

HALLICRAFTERS SX-24 general coverage rcv modified w/product detector - \$50 including match speaker. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Collins 75 A-1. Please state condition & price in first letter. Ken Hesler, 602 Taft Ave., Charleston, IL 61920.

WANTED: 2 M equipment: Pawnee, Communicator IV w/matching VFO, and Gonset linear, model 903 A or 3211 (white case). Excellent condx only, w/manuals. Ron K6 RQT, 213/751-4191. Fone or write.

FOR SALE: SBE-34, mint condx - \$250. Heath phone-patch, new, \$15. To settle estate. Write WA4 FAQ, Rt 4, Box 270, Mobile, Ala. 36609.

COLLEGE RADIO CLUB needs donation of back issues of CQ for club library. Your donation will be appreciated. Surface postage refunded. Larry Price, W4DQD, Box 2067, Georgia Southern, Statesboro, GA 30458.

SELL: Geiger counters, Navy AN/PDR-10, clean. \$7.95 ea. W4JGO, 643 Diamond Rd., Salem, VA 24153.

COLLINS 32S-3, like new. 75S-3C rcvr, 30L-1 linear, Millen 2 kw transmatch. Selling out. Webb, Box 6, Morganton, NC 28655.

ELEXCO largest exclusive ham dealer in the Gulf South. All major product lines in stock. New and re-conditioned equipment. Before you buy, sell, or trade, check our high trades and low prices. ELEXCO, 608 Papworth Ave., Metairie, LA 70005. 504/834-9000.

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GALAXY V AC35 ps w/voltmeter & ammeter. EV 719 mike. Halli HK-1B keyer w/ps & vibrokeyer. Knight P2 swr mtr. Superex headphones. Mint, complete w/manuals & orig cartons. 379 Adams Ave., W. Hempstead, NY 11552. 516/489-5899.

QSLs: Second to none. Same day service. Samples-25 cents. Ray, K7HLR, Box 331, Clearfield, Utah 84015.

RUBBER ADDRESS Stamps \$2.00. Signature \$3.50 Free catalog. Jackson's, Box 443F, Franklin Park, Illinois 60131.

AMPEX VTR Owners: Write for free list of new Ampex printed circuit boards at bargain prices. Denson Electronics Corp., Rockville, Conn. 06066.

HEATH HW-16 CW transceiver - \$80. Heath HG-10B VFO - \$30. Both for \$100. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050

FCC "TESTS-ANSWERS"...Original exam manual for FCC first and second class license. Plus - "Self-Study Ability Test." Proven! \$9.95. Satisfaction Guaranteed. Command, Box 26348-H, San Francisco, CA 94126.

MARCONI IF rca 881f, sw3 navigator tbs 50, globe 90, dx 60, xd100, sx100, bc348, hw32, eico 753, arc 5, bc221. Box 8352, Savannah, GA 31402.

HT-44, SX-117 w/sideband mic and vertical, all in good condx - \$350. R. Rheinheimer, Sterck School, Newark, Del. 19711.

WESTON Model 489 meter 0-8 and 0-200 v.d.c. - \$10 each. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, New York 11050.

Buying? Selling? Trading? Don't make a move until you've seen our new publication! Free sample copy Six issues - \$1.00. Ham Ads, P.O. Box 46-653, L.A. Cal. 90046 D.

NEED: SSB-10, schematic for HQ-110. Name price WN5EMX, Box 248, W. Memphis, Ark. 72301.

NU SIGMA ALPHA international amateur radio fraternity. Memberships now available. Includes wall certificate, ID card, newsletter, and more. Send for free brochure. Box 310, Dept. C, Boston, MA 02101.

FOR SALE: WATERS clipreamp - \$10. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: for unique collection. Original rigs per QST, CQ, HAM RADIO articles. Close copies also desired. Rigs will remain unmodified and will be kept on the air. K1ETU, Charles J. King, 100 Laura Lane, Rocky Hill, CT 06067.

TOUCHTONE PAD WANTED. State condition & price. W4SHL.

FOR SALE: Vibroplex - \$8.00. W2AEF, CQ Magazine, 14 Vanderventer Ave., Port Washington, NY 11050.

WANTED: Paragon DA-2 Det. 2 stage amp., coils for DeForest D-10, Atwater-Kent parts of all kinds. Grebe rheostats, other old radios, msc., parts, books and magazines. Joe Horvath, 522 Third St., San Rafael, CA 94901.

ITS SUNNY IN JAMAICA - The Shangri-La Villa and Apts cater to those wanting a real Caribbean Holiday! Reasonable weekly rates with special facilities for small groups. For information, write to Ken Penchoen, 6 Y5BF, P.O. Box 92, Montego Bay, Jamaica, W.I.

COMPACT GLOBE HG-303 transmitter, 75 watts, crystals, filter, Dow-key relay included - \$55. Gross, WB2 ZQE, Box 659, SUNY' Binghamton, NY 13901

VOLKSPHONE German amateur transceiver phone CW 100w - \$100. Box 8352, Savannah, GA 31402.

FOR SALE: FOB, 4 sets Trimm regulars. 1 Murlock light weight; 3 Telephonics TH37. \$5 per set. 1 Trimm acme. 1 dictograph 39/U - \$3 per set. Douglas, 2254 Pepper Dr., Concord, CA 94520.

RADIO-TELESCOPE, professionally made, in cabinet, 110 VAC power supply, chart recorder, antenna components, accessories. Dearborn, Rt. 2, Bx 481, Alexander, Ark. 72002.

COMPLETE STATION: Includes HT-32B transmitter, HT-33B KW linear amp., SX-115 recv, Shure 440 mike, Multiphase RF analyzer, low pass filter, all connecting cables. First \$600. takes it all. You pay shipping. K9PEN, Bob Vlk, 3040 Forest Ave., Brookfield, IL 60513. 312/485-8698.

RTTY Model 15 Printer Stand, PS CV 89A freq shift converter. Mint condx. Best offer. Will not ship. I. Jacobson, 21010 Anza Av., Torrance, CA 90503.

DRAKE R4B with MS4 speaker & five xtals. Hardly used, excellent condition. \$380 or best offer. W-N2 RXV, Ken Newman, 38 Rolling Ridge Rd., Saddle River, New Jersey. 07458.

SECODE tone encoder, plugs, manual, excellent condition, \$15.00 ppd. WA4ZYU, 1904 114th Avenue, Tampa, Fla. 33612.

HEATH TWO'er, Scope, VTVM, etc. Davco DR-30, SASE. Jurow, Box 183, Olympia Fields, Il. 60461.

WANTED: Central Electronics 600L Amplifier Hy-Gain 18HT Hy-Tower vertical. James Shank, 21 Terrace Lane, Elizabethtown, Penna. 17022.

WANTED: Heath HD-10 Keyer, IT-28 Cap Checker and 20M Hustler mobile tip. WB6AWC, T. Coddington, 7825 Scotts Valley Rd., Lakeport, Ca. 95453.

DRAKE 2B with Q-Mult. Factory-aligned \$150. Ship ur xpense. 3 ham sigs. Verify operability when shipped. Burl Tackett, 3424 7th E Lewiston, Id. 83501.

FOR SALE: Rack mounting adaptor for HQ-180 & HQ-170 type rec. Best offer W8 QCU, 2008 Maiden Lane, Springfield, Ohio 45504.

W9 LZC of Grafton Wisc., is now W8 KOI, Stan Head Jr. 151 Edgewood, Perrysburgh OH 43551.

FOR SALE: Collins Mechanical filter 455 kcs, 500, cy BW type F-455 Eo5 12R 56-9321-00 \$10 pp. W6BLZ 528 Colima St, La Jolla, CA 92037.

TRADE: SB-620, EICO 460W, 232 BC-348 R need Matchbox, G.D.O. traps. T. Gosman 143 Roxton Rd. Plainview, NY 11803.

QSL MGR VOLUNTEER: will volunteer to be QSL Mgr for an DX ham. Tom Dornback K9MKX 2515 College Road. Downers Grove IL 60515.

FOR SALE: Heath HW-16 XCVR. mint cond. factory tuned \$90. Ron WA6IFU 3051 Kelton LA. , 90034 (213) 475-3365).

WANTED: Manual for Lafayette Gen. coverage receiver model KT200-Bob WB2YEE 1017 Westmoreland Av Syracuse NY 13210

RITTY INFORMATION for the Amateur interested in RTTY. F'DeMotte, POB 6047, Daytona Bch FLA. 32022.

LINEAR Bldg, I have B&W 851 inductor for \$10.. K2POA BX132 Bethpage, NY 11714 516/931-3374

SELL or Swap: Nc-190, BC-348, BC,312, Knight K6-650 RF Gen. SASE for list. E.A.Sjolander Jr. Box 262 Ashland WI 54806.

WANTED: tower, 50' up Alu/galv, Crank-up/Tilt Stan Talago Rt 3 Bx 130A Bridgeport, WV 26330

WANTED: No195145 Gearshift for model 28 ASR Larry Lkeber, K9LKA/CPD, Belvidered, IL618008.

WANTED: QST binder mint. ron sibbitt, VE3CKU. 139 Floradale Dr Cooksville, Ont. Canada.

AMECO TYPE CN 144 Mhz converter 14-18 Mhz IF Power Supply \$30. All units excellent condition K6AAK-2036 Grandview Dr Camarillo CA., 93010. 805/482-4127.

WANTED: Info on Amateur TV. Larry Langevin, K1GXU, 42 Prospect St., Ludlow, MA01056.

FOR SALE: RTTY, misc gear, realistic prices. Call 914/SC3-7598 evenings.

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FOR SALE: SBE-34 perfect w/manual and mike. \$185. G. Vilardi, 14 Oakwood Terr., Spring Valley New York 10977.

FOR SALE: Gonset IV - \$150. Clegg 22'er - \$150. TX62 and VFO - \$150. Heath SB630 - \$70. Waters Codax Key - \$50. K2ABQ, 3469 Major Drive, Wantagh, New York 11793. 516/781-3996.

WANTED: Info or source where used B&K TV test equip is sold. Analyst, scope, etc. J. Wegner, Jr., Box 262, Glendale, CA 91209.

TRANSFORMERS REWOUND - Jess Price, W4-CLJ, 507 Raehn St., Orlando, FL 32806.

FOR SALE: HW-32 w/mic, spkr & PS - \$110. Less PS - \$80. Will ship. W6NFQ, 5874 Sagebrush, La Jolla, CA 92037.

FOR SALE: new Lafayette No. 38-0101 VTVM - \$30. Toshiba 6T-115P tape recorder - \$35. Robt. Haase, 417 Old Jesup Rd., Brunswick, GA 31520.

FOR SALE: HQ-160 rec - \$125. DX100 xmit - \$75. 150W Balun - \$5. D104 mic and stand - \$7.50. Waters clipreamp Model 375 - \$15. Spkr - \$3.00. Fob, H. S. Lowry, K4VFA, 915 Madison St., Manchester, Tenn. 37355.

SELL: 2M FM dispatcher, D33, 10W, 12V DC - \$50. Prog. Line, 50W, T supply, 2 chan - \$150. Harrison, 36 Irene Ln. E., Plainview, NY 11803.

WANTED: Heathkit SB-610, Drake R-4B, T-4XB, MS-4, AC-4. Bob Fournier, Box 339, Winter Harbor, Maine 04693.

FOR SALE: Hallicrafters HA-1 & Ten Tec KR-1 keyer - \$70. Hy-Gain HT-18 antenna, never unpacked - \$135. Chas. Kaufman, 3734 S Poplar St., Denver, Colo. 80237.

FOR SALE: mint 500W, 160M, 10M-AM, CW, SSB Stn-Globe King 500A, spare final, CE-20A, 3 Vfo's - \$325. R. Shelar, 5471 Norquest, Youngstown, OH.

FOR SALE: Parks 6 Mt. Nuvisor Conv. IF-28-32 - \$25. Ameco 2M conv. IF-7-11 - \$35. 2M FM Amp - 180W mint - \$135. J. Gysan, 53 Lothrop St., Beverly, MA 01915.

SELL: Micromatch Mod. 263.3, SWR pwr meter 0-10-100-1000 W ranges. FWD & reflected. Like new \$25. ppd. W2ASI, 15 Kensington Oval, New Rochelle, NY 10805. 914/NE3-7077.

WANT: Drake R4-B revc & T4X-B transmitter or TR-4 trans. State cond & Price. A. Emerald, 8956 Swallow Av., Fountain Valley, CA 92708.

FOR SALE: Apr. Elec. Inst. A200 sig gen - \$20. Superior TV bar/lin gen - \$20. Triplet 650 port VTVM w/leather case - \$65. All fob. R. Wendel, 160-20 Grand Central Pky., Jamaica, NY 11432.

MOTOROLA HT-200 w/Nicad & HB chgr now on .34/.94 & .94/.94 - \$250. No trades. R. Vaceluke, 17 W 540 Hillcrest, Wood Dale, IL 60191.

5 MC SCOPE: Heath ID-17 3" hi perf scope - \$55 pp K7CPW, 2115 Wolfe Pl. W., Seattle, WA 98199.

WANTED: Navy surplus VHF recv R-516/URR-27. Ed Alves, 275 So. Marengo Ave 30, Pasadena, CA. 91106.

TRADE: new, compitee set golf clubs, bag, cart for 4-channel RC eqpt. Prefer 53 mc gear. W9KAA, Box, 85, Butler, IN 46721.

WANTED: mint SB200, SELL; pair of new, compact, collapsible, 6 element, 6 mtr Yagis - \$40. Tim Colbert, 1008 Englewood Dr., Parma, OH 44134.

WANTED: Collins mech filter F-455C-08 for 75 A-3 recv (part no.522-9040-002) W3ECp, 3711 McKinley St., N.W. Washington, DC 20015.

QRM: FILTER (active), audio, 2 pole, variable band-pass. Simple to make; Schematic & all info - \$2 K3CHP, 6913 Furman Pky., Riverdale, MD 20840.

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QST 1931-64 all perfect. All in 1 lot - 20 cents each plus ship. E. Shook, W5IT, 227 W Woodin Blvd., Dallas, Texas 75224.

SS SCOPE: Heath IO-102 5", 5 mc, mint - \$85 pp. K7CPW, 2115 Wolfe Pl W., Seattle, WA 98199.

SELL: DX60 - \$60. HW22 - \$100. Buy unfinished kits, nonworking gear. WA5BFN, 1003 Electra St., Longview, TX 75601.

WANTED: Aircraft Nav/com radios, Lysco 600S. Joe Turkal, K8EKG, 1020 4th St., SW, Massilon, Ohio 44646.

AMECO TX62 certified check - \$80 prepaid. Les Maune, Washington, Missouri 63090.

JAN 2BP1 cr tube - \$4.70. Shield - 90 cents. Socket .35. HP RMS VM class 57, 3 scales - \$7.50 add postage. K. Maas, Burlington, Wisc. 53105.

FOR SALE: Collins 516E1 DC supply for KWM2. \$60. W0BGK, 717 Crest Av., Ft. Dodge, Iowa 50501

FOR SALE: recv Realistic DX150A, practically new \$80. Joe Petix, 3 Salem Ct., Syosset, NY 11791. 516/921-5758.

WANT: 2 6000A tubes (new), also TT-253/ug perforator-reperforator typing or units from same. W4-AIS, 300 Thornwood, Taylors, SC 29687.

SWAN 350 w/117XC ps, xtal cal & vox unit, late model - \$285. Heath SB301 rec - \$225. Heath SB-610 mon scope - \$80. Heath HA-10 warrior amp - \$95. J.S. McConaughay, Griffithville, Ark 72060

FOR SALE: Set low freq xtals 79 in set, FT 241 holders 370 KC to 514 KC \$35. W8 KZO Spring field, Ohio 45504.

WANT Grid Dip Oscillator and Antennascope. A. Emerald, 8956 Swallow Ave., Fountain Valley, CA. 92708.

WANTED: Ft-243 ham band surplus crystals. C/-W bands for 80 and 40 meters. No lot so small. Send information to W6DOR, 4100 Worthington, Dr., North Highlands, CA 95660.

WANTED: General Radio 916, 1602, 1606 or 1650 Please state price and condition. B Hunter 255 Rose Ave., Mill Valley, CA 94941.

WANTED: Manual or Xerox copy for HRO 5T and S Meter for HRO. Jock White, ZL2GX 152 Lytton Rd., Gisborne, New Zealand.

FOR SALE: Parks 6 MT Nuvisor Conv. IF-28-32-\$25 Ameco. ZMTR conv. IF-7-11 \$35. ZMTR.FM AM plifier 180w mint - \$135. Jim W1VYB.

SELL: Lampkin Micrometer freq mtr 105-B w/data & graphs - \$150. W6DOU, 3154 Stony Pt Rd., Santa Rosa, CA 95401.

FOR SALE: SBE-34 - \$250. HT-32 - \$200. SX-111 \$125. Herb Adler, WB5DJA, 110 Sheraton, Denton Texas 76201.

WANTED: Inoperative Collins S-line access. Also heavy duty ant rotor. Mike Ludkiewicz, 143 Richmond Rd., Ludlow, MA 01056.

WANTED: freq counter, must cover thru 148 Mhz. L. Briggs, 5108 Boulder, Oxon Hill, MD 20021.

WANT: audio gen distortion meter. No kits. WA2-FZ, 335 Boulevard, Pitman, NJ 08071.

FOR TRADE: Eico 760 CB unit, Eico 730 modulator-driver unit, Clegg 99 w/4 xtals, Laf tube type FM tuner. WANT Senior volt ohm, stable 6&2 vfo good in-circuit transistor tester, 2 - 24 hour wall clocks. C. Gray, 422 Cottonwood NW, Ardmore, TX.

SONAR FR-104 low band 6-chan xtal contd monitor recv, like new - \$80. Heath IM-25 SS VOM - \$50 Heath IM-28 VTVM - \$25. J. Hardman, 50 Mountain Road, Verona, NJ 07044.

HEATH SB-300, SB-600 like new - \$195. SX-71 Halli revr - \$75. Wyman, 4453 Via Pinzon, Palos Verdes Est., CA 90274.

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Coax connectors wanted: UG-492 double female BNC panel mount type. Robert Dixon, W8ERD, 311 E. Kelso Rd., Columbus, OH 43202

SELL: 813 GG amp & PS - \$50. 1kw, 20m, 3el beam - \$25. M.A. George, W1BKG, 35 Ridgeway, Av., Pittsfield, MA 01201

GR Freq measuring eqpt type 1105A. W/manual & all GR connectors, mint. \$750. VE2BWK, Box 699 Senneterre, P.Q., Canada.

SELL: GE 2m, FM Progress line HN-31, w/ni-cad supply and 94/94 and 34/94 xtals - \$100. K2JMU, Box 1122, Rome, NY 13440.

XMTR: Johnson challenger, 70w AM, 120w CW, 80-6 mtrs, xtal or ext. VFO. Mint. \$58. 4061 Portland Ave., White Bear, MN 55110. 612-429-3897

HI-FI stereo recv Heathkit AR-15 wired, like new, factory aligned - \$350. Walnut cab - \$25. F. Breidbart, 405 B. 122 St., Rockaway Pk., NY 11694.

Heath HR-10 recv, just overhauled. Speaker and phone - \$50. WA7EMM, 79 Newcomer Rd., Richland, WA 99352.

FOR SALE: Johnson 6n2 w/book - \$50. National RBJ series BFO coil 456 khz - \$2. K1MBI, 21 Freestone Ave., Portland, CT 06480.

RTTY paper 12 rolls per case double copy - \$4.00 a case, plus shipping. Sase to WA0PYW, W. Schler, 5345 N. Woodland, Kansas City, MO 64118.

LAFAYETTE HA-600 recv, mint condx, 2 yrs old. \$50. Pick-up only. WB2PCM, 136 Milford St., Brooklyn, NY 11208

FOR SALE: Heath Apache, good condx, w/manual \$60. Will ship collect. E.H. Ayers, 726 S. Lexington Pkwy, St. Paul, MN 55102.

WANTED: Old battery radios of the early 1920's. Need not work. Also want old iron or tin toys. Good or broken for parts, state your price. McKenzie, 1200 W. Euclid, Indianola, Iowa 50125.

WANTED: Johnson 275 w Matchbox w/o SWR in reasonably good cond. Send quote: S. Antosh, WB5BNM, 1524 N. Okla., Shawnee OK 74801

HELP: Urgently need schematic - Browning oscilloscope OL23A, serial 245. F. McCullough, W4W, WH, Rt. A2, Box 236, Dunnellon, FL 32630.

MOVING send stamp for list. Meters, test eqpt., tubes, books, etc. G. Samkofsky, W2YSF, 201 Eastern Pky., Brooklyn, N.Y. 11238.

SELL or trade: 75A4, 75A2 - good. Navigator 40w CW160 thru 10, 14AVQ, 4BTV. Want Swan 270B. Huffman, 145 Price St., Kingston, PA 18704.

Linear builders - send sase for list of parts and goodies. W6RW, 8600 Skyline Dr., Hollywood, CA 90046.

Have new Motorola xtal 28.2880 mhz for 80D recv. Need 6-9 mhz BC-455 rcvr. WA0UVX, 5408 Gray Plaza, Scott AFB, IL 62225.

SALE: SB-101, HP23A & SB600. 400 hz xtal filter \$375. I ship. Make offer on 4X150A or 4X150G tubes. T. Fitzpatrick, Box 219, APO, NY 09845

NY chapter thanks CQ for their cooperation to help make this a great club. J. Schwartz, K2VGV, Pres.

FOR SALE: Audio osc TS 382F/U, 17N-200 Khz 1 uv-12 volt, metered, w/freq mtr check pts & os heater - \$75. W2YCW, Hicksville, NY 822-4769.

FOR SALE: FT-200 AC/DC sup - \$350. New 30LI power xformer - \$30. HQ-129 - \$75. W.E. Cann, Box 264, Hampton Beach, NH 926-2359.

CASH for KWM2 or Sig-One. Write W0BNF Box 105, Kearney, Nebr. 68847.

WANTED: SX-88, GPR 90, 91, 92, 51-S1 receiver. J. Callan, 65 Beechcroft St., Brighton, MA 02135.

WANT: BW 5100 xmtr. SELL 150 W, great shape Price negotiable. Don Falk, Johnson house, Oberlin Ohio 44074.

TEKTRONIX 545 CA2 trace & scopemobile - \$1200. HP counters, printers, test gear, teletype, computer list free. T. Perera, 410 Riverside Dr., NYC 10025.

WANTED: Gonset G-66 B recv, good condx, W7HA P.O. Box 1042, Pendleton, OR 97801.

SELL: Telrex beam w/balun 20M321B - \$100. pick up. Like new. W3ADF, 215/446-1776.

COLLECTORS ITEM Rider radio manuals 1 thru 18. Make offer. W3FGE.

SELL: Johnson Valiant 1, fac wired, excel condx - \$100. Will deliver S Calif area. W6DJZ, 3748, Florista Way, Los Angeles, CA 90043. 213/294-0284.

WANTED: Man or diagram for Navy OS-4 scope, RBW-2 panadaptor & Potter Inst Co. Mod 830 freq counter. P. Greenway, 234 Elden Dr NE, Atlanta, GA 30342.

HALLI SX-100 dual conv all bands, new - \$125. Eico 723 60W CW xmtr, fac wired, w/xtals - \$35. WB2BCY, 10 Williamsburg N., Colts Neck, NJ 07722

DX STATIONS: Let K5TVC be your QSL mgr. Write 801 E. 23rd St., Farmington, NM 87401.

WANTED: Open wire type DPDT relays w/Myclax or ceramic insulation, PL-259A's w/Teflon dielectric. D. Hoffman, R1, Mt. Horeb, WI 53572.

SELL: 2200 mfd at 250 vdc cap - \$1 ea pp. P. Greespm. 720 Gentain Dr., Pensacola, FL 32503.

FOR SALE: NC300 spkr & sideband slicer - \$150. Link 30w FM vib pow, 12v, 6mtr, on freq. E.W. Green, 3383 Stewart Av., Hapeville, GA 30354.

FOR SALE: Collins 75A-4, perf condx - \$395. Galaxie 5 w/AC DC PS - \$250. E.C. Casey, 500 Norway Ave., Cincinnati, OH 45229.

FOR SALE: Prop pitch mot w/clutch, 2 selsyns w/compass, 28V remote PS - \$90. W. McFadden, 29 Vernon Av., Wheeling, WV 26003.

WANT: Yaesu FRDX400 rcvr. 7289 tubes. Sell Sbe-34 perfect \$195. DX150A rcvr, new \$80. G. Vilardi 14 Oakwood Terr., Spring Valley, NY 10977.

WANTED: I need several old battery radio tubes (preferably w/brass bases) to make my 1923 radio play. L. Gibbs, 701 Brookfield Rd., Dayton, OH.

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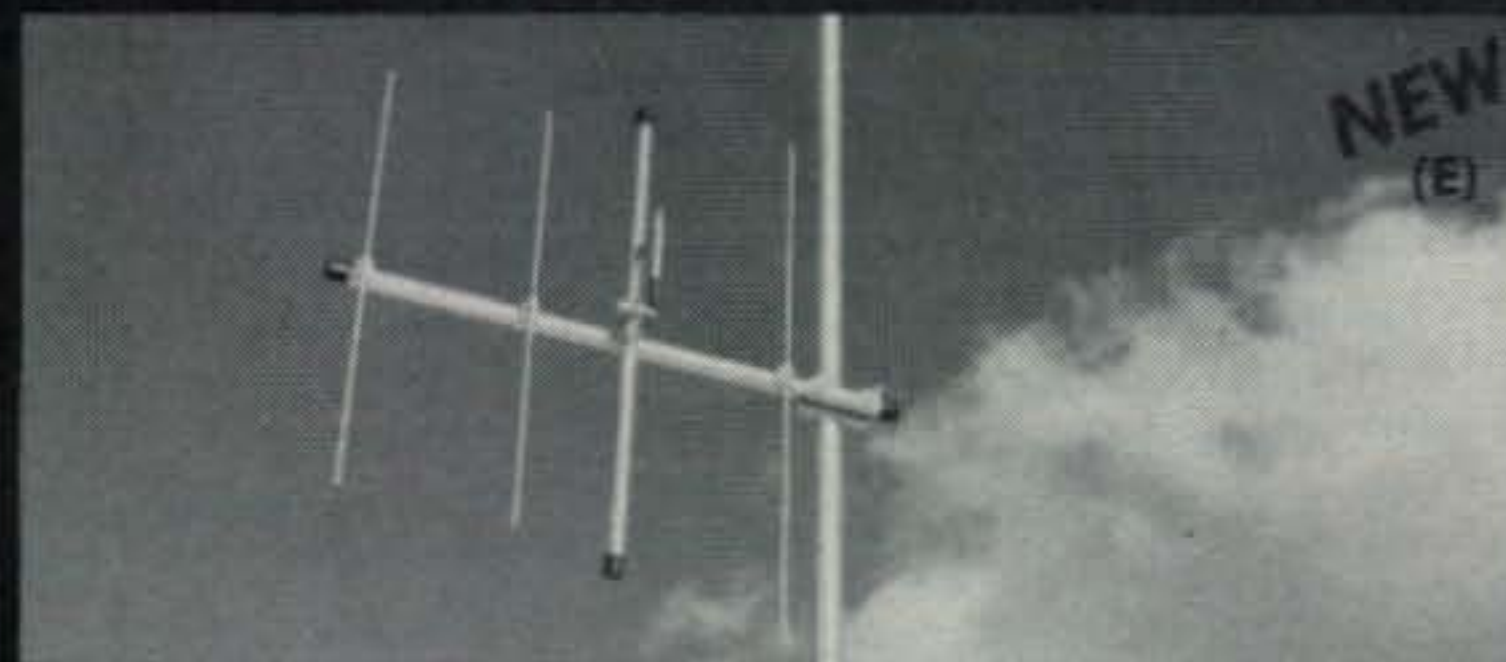
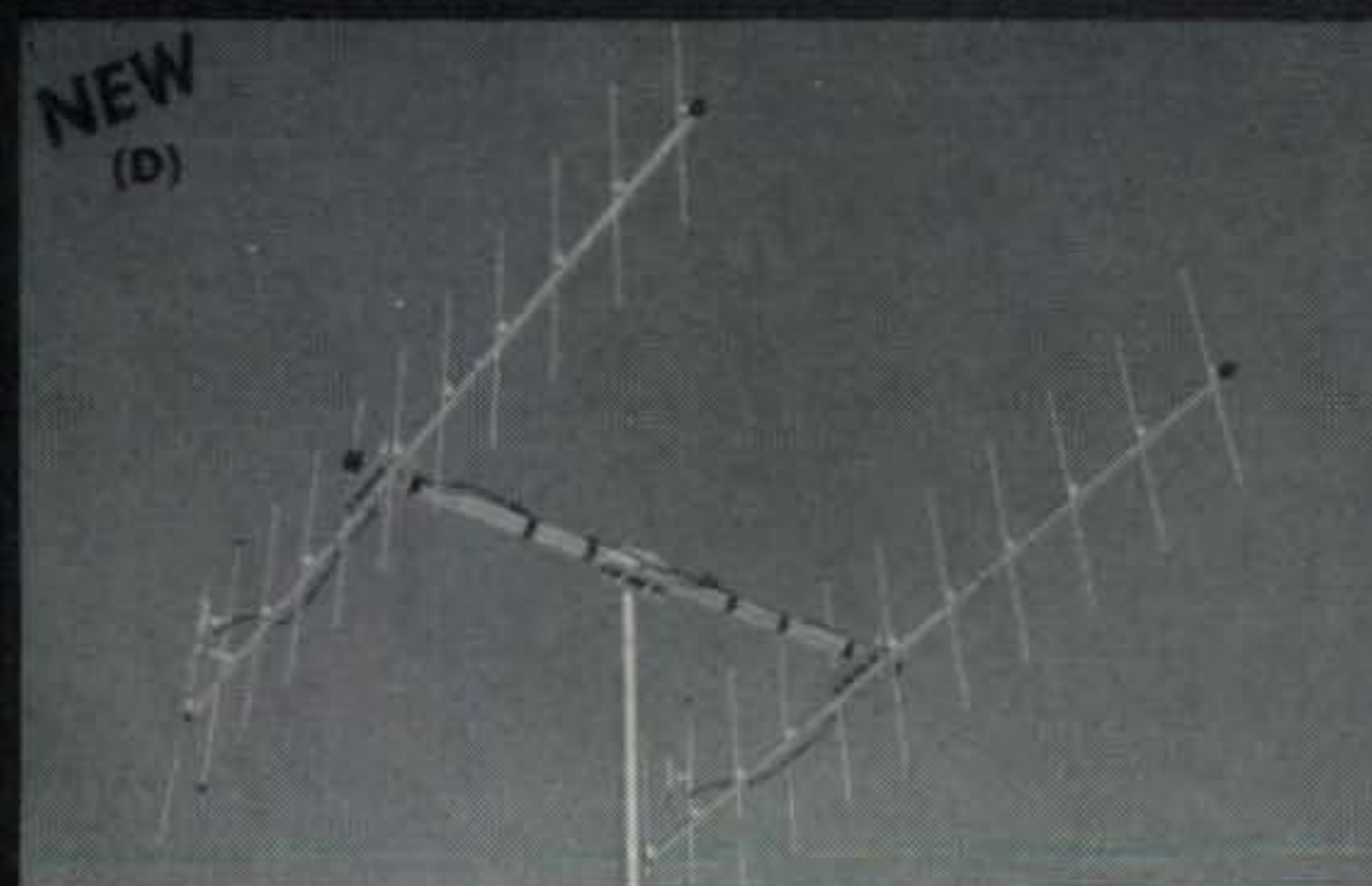
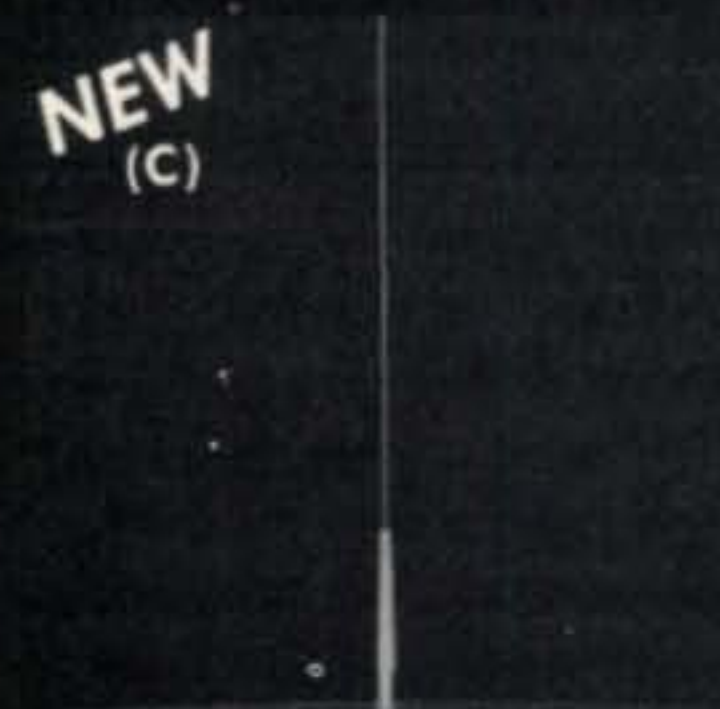
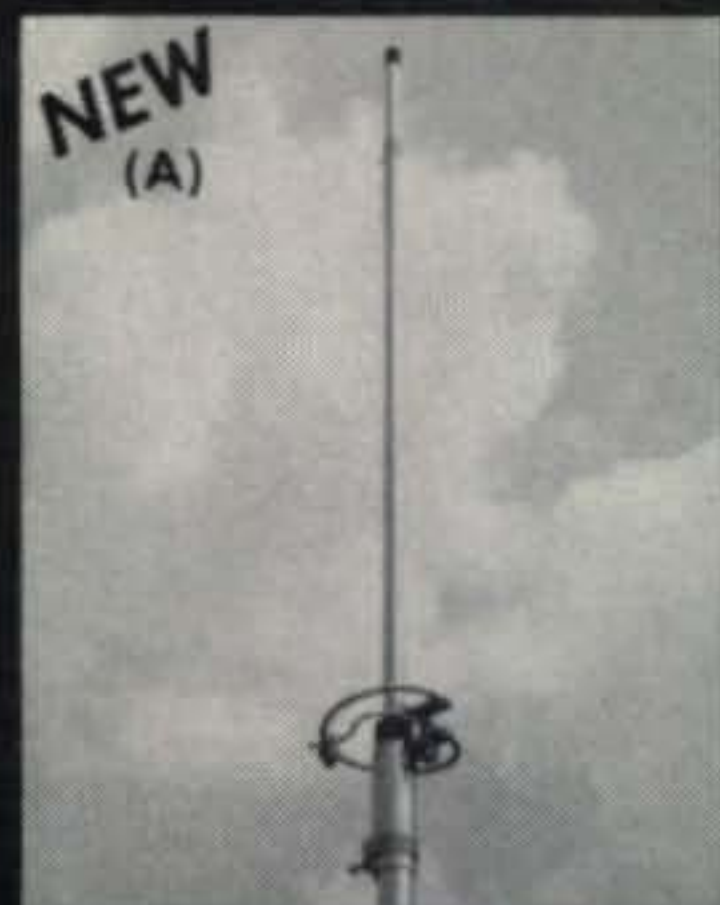
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ADVERTISER'S INDEX

Allied Radio Shack	50
Amrad Supply	85
Arnold Engraving	88
Arrow Electronics	101
Barker & Williamson	93
Barry Electronics	81
Comcraft Company	26
Crystek (Master Mobile)	38
Cush-Craft, Inc.	96
DX Engineering	38
Dale Electronics	82
Data Engineering, Inc.	88
Dayton Hamvention	87
Drake, R. L., Co.	6
Dynamic Communications, Inc.	39
Eimac, Div. of Varian	Cov. IV
Erickson Communications	44
Goodheart, R. E.	80
Gotham	104
Greenlee Tool Co.	97
Gregory Electronics Corp.	103
HAL Devices	100
H&L Associates	99
Ham Buerger, Inc.	90
Heath Company	Cov. II, I, insert
Henry Radio	42, 69
House of Power	82, 91
Hy-Gain Electronics Corp.	2, 20, 29, 93, 94, 97, 99
Jan Crystals	94
Jaross, R. & Co.	79
KW Electronics	88
Liberty Electronics	79
Millen, James, Mfg. Co., Inc.	8
Mosley Electronics	12
New-Tronics Corp.	11
Palomar Engineers	96
Payne Radio	88
Pennwood Numechron Corp.	80, 100
Robyn International	40
Rohn Manufacturing	62
Ross & White Co.	56
Sams, Howard W.	55
Sentry Mfg. Co.	34
Shure Brothers	13
Signal/One-Computer Measurements Inc.	14, 15
Slep	100
Sonar Radio	87
Spectronics, Inc.	Cov. III
Star-Tronics	100
Swan Electronics	9
Swissair	25
Telrex Communication Engineering Laboratories	4
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Ten-Tec, Inc.	61
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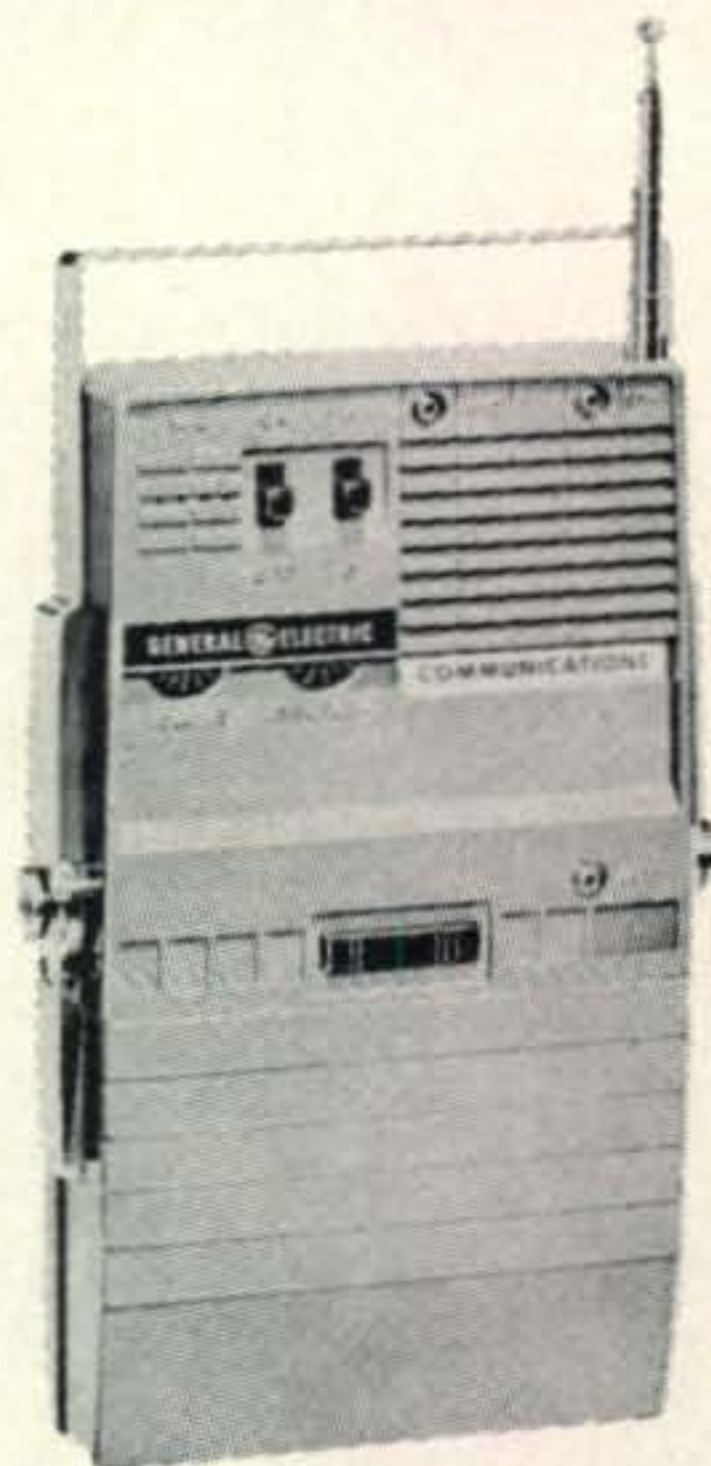
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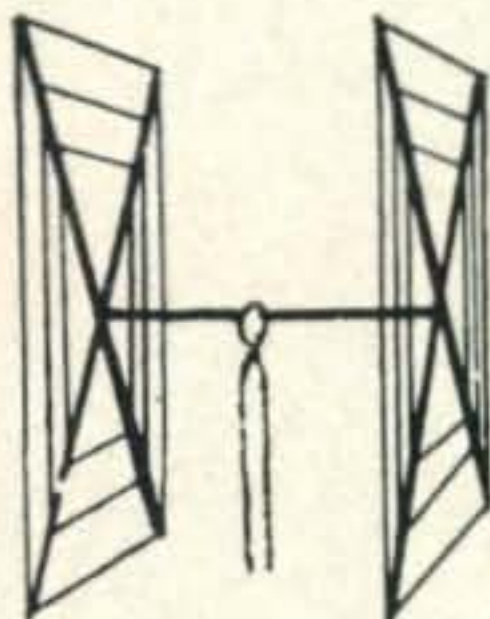
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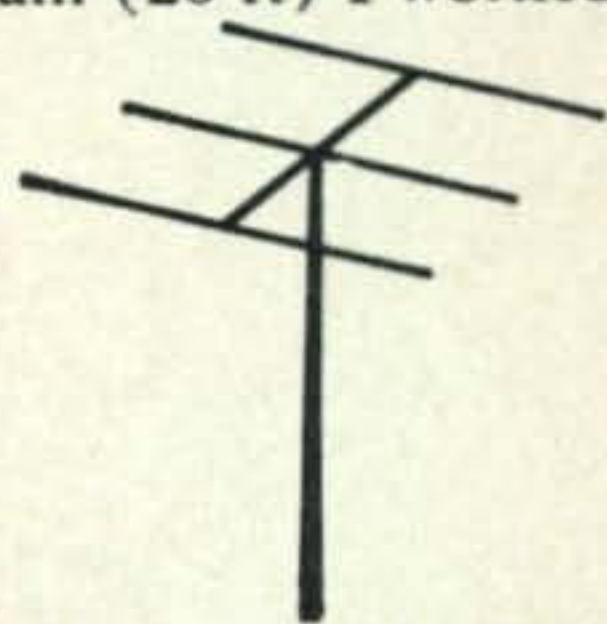
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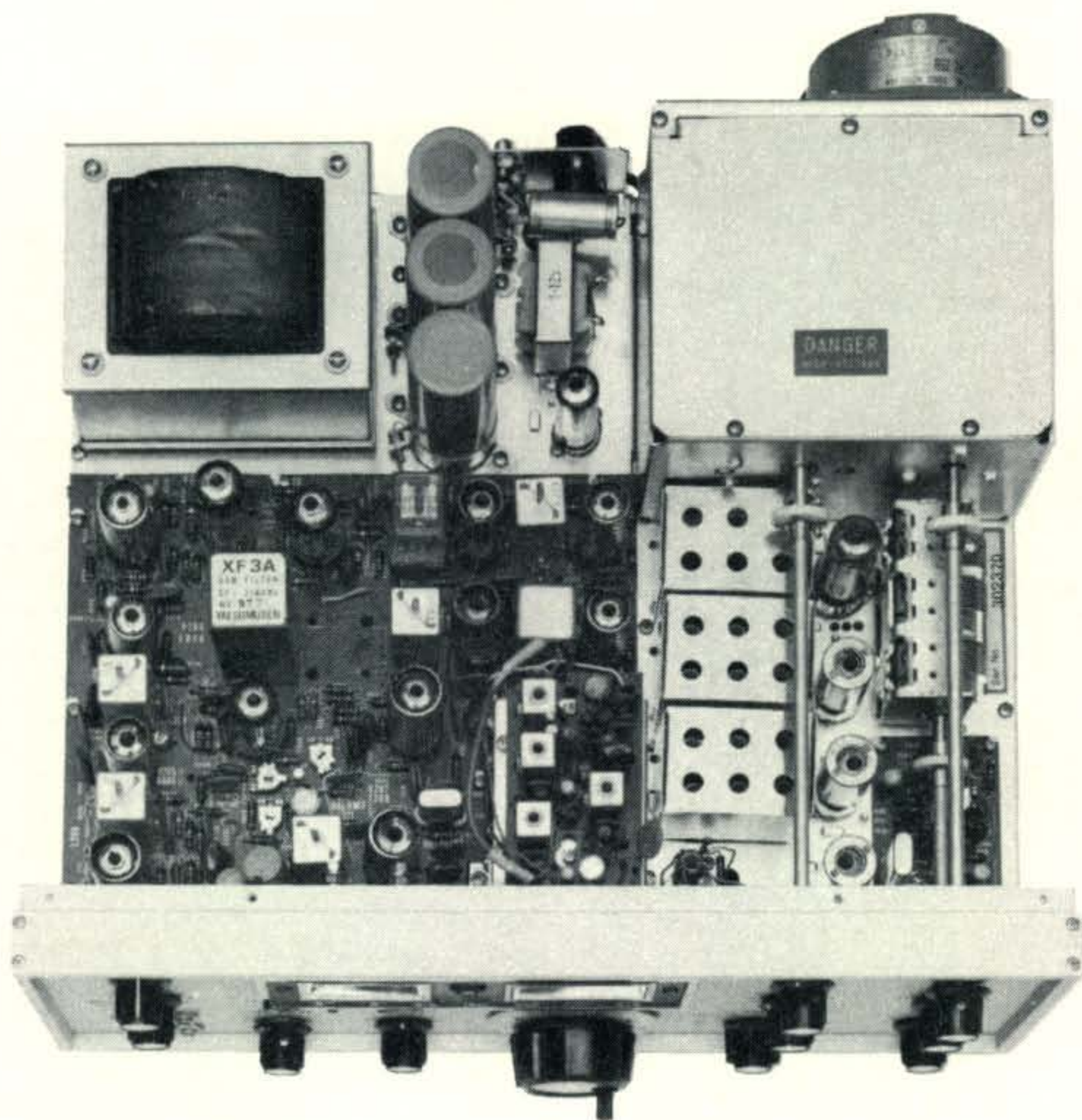
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