October 1967
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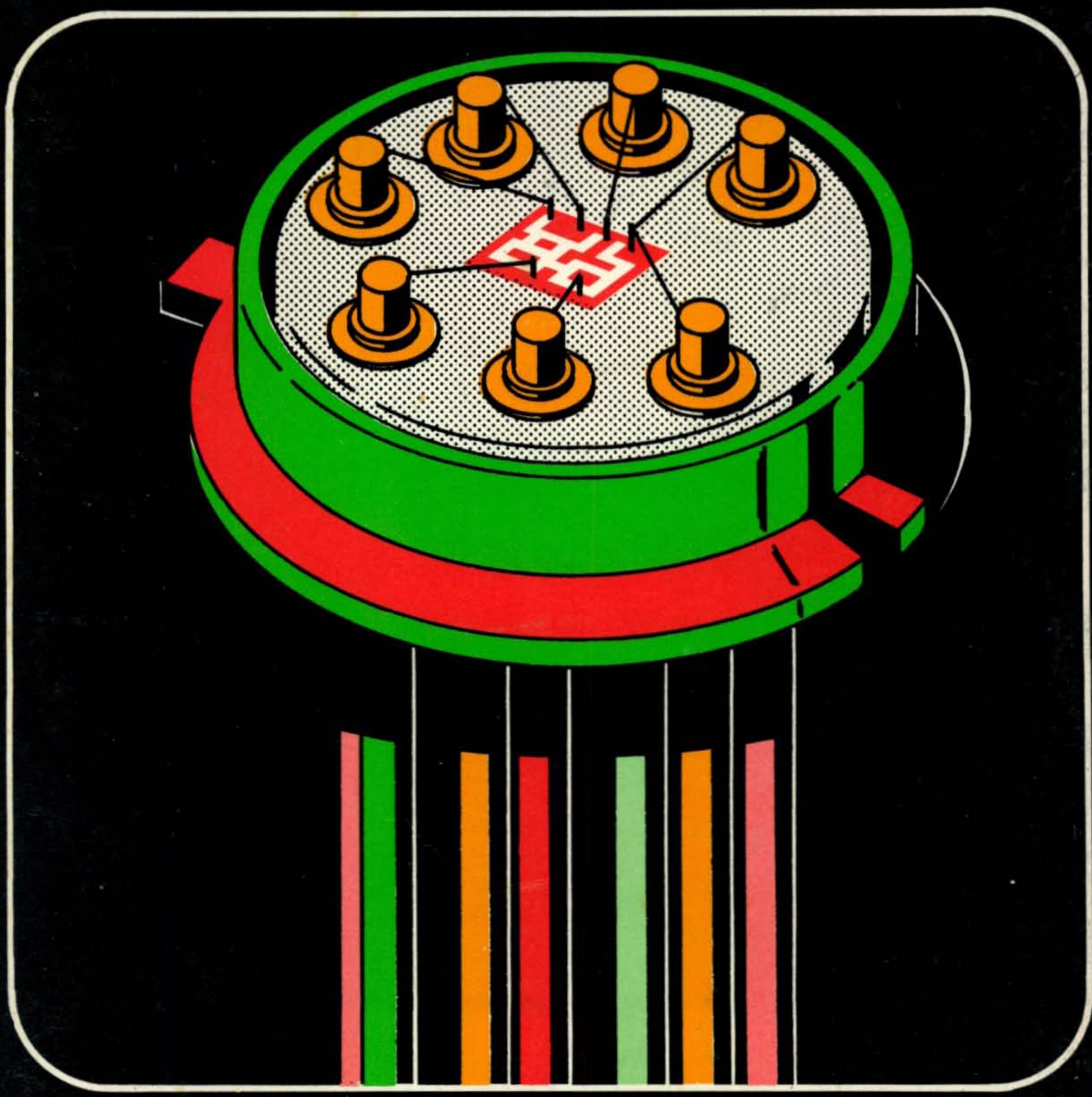

The Radio Amateur's Journal

Collector's Item

It's a mobile transceiver *and* a fixed station. It reaches out — SSB and CW — to collect QSL's. The KWM-2 lets you work all the 80- to 10-meter amateur bands. Like all Collins equipment, the KWM-2 is designed for system use. Put a 62S-1 VHF Converter on the table next to a KWM-2 and you are up on the 6- and 2-meter bands. Add a 30L-1 Linear Amplifier to the system for a full-powered fixed station. That's only part of the KWM-2 story. Ask your Collins distributor about the rest.

For further information, check number 25, on page 126

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The Model 6000 Modular Frequency Meter will measure frequencies 10 KHz to 600 MHz with .000125% accuracy. Special plug-in modules allow the instrument to be used as an audio frequency meter from 500 Hz to 20 KHz full scale and in addition to be used as a dc voltmeter (10,000 ohms/volt).

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Model 6000 with 601A charger, less plug-in modules.....$195.00

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measures frequencies 10 khz to 600 mhz with accuracy as close as .000125%

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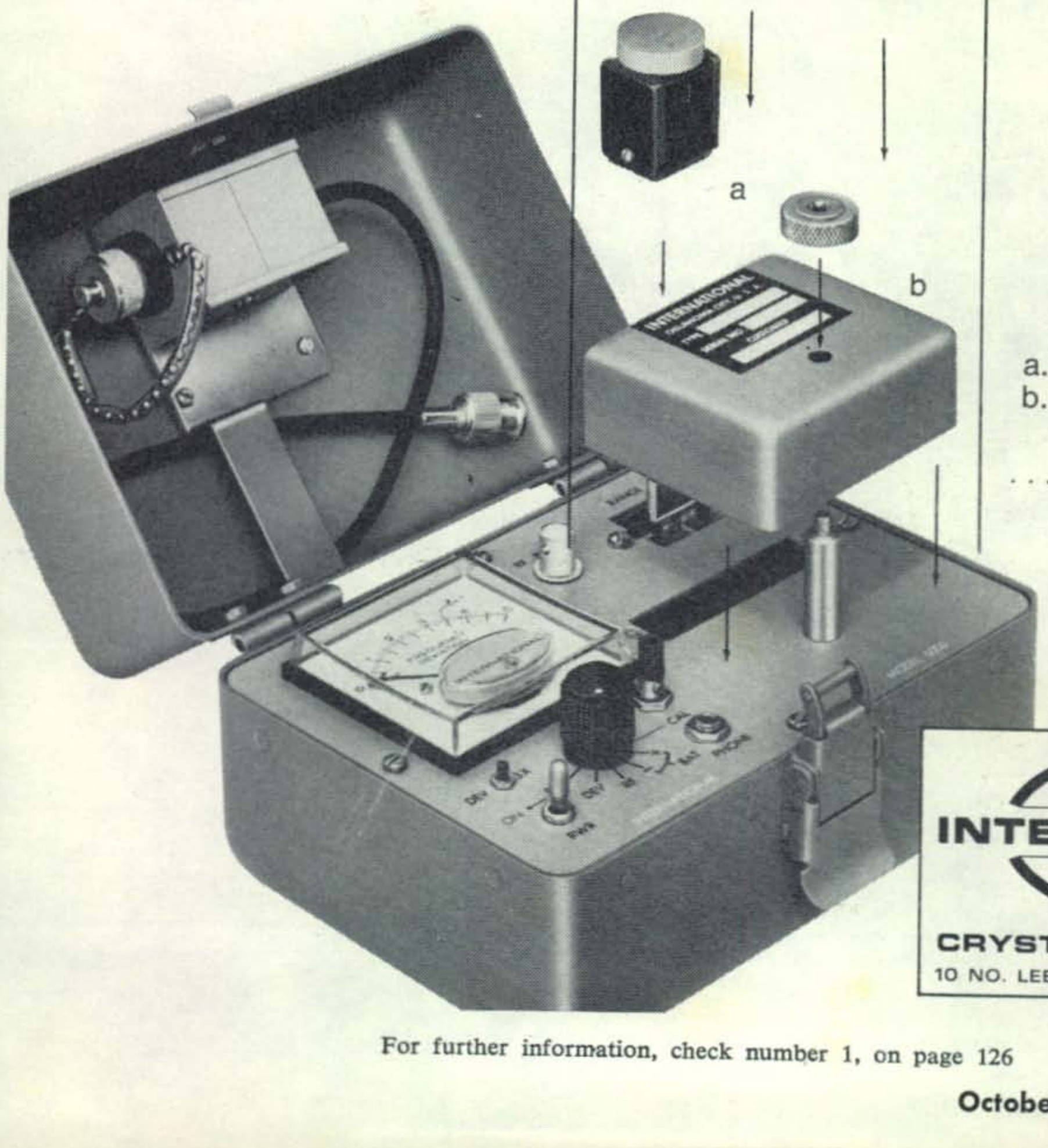

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For further information, check number 1, on page 126

OCTOBER 1967 VOL. 23, No. 10

CQ

The Radio Amateur's Journal

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DEPARTMENTS

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Get more "talk power" into your signal with a Compreamp! Solid state, self-powered and compact it installs in a jiffy in the mike line of either fixed or mobile rig. Great for that added punch when QRM and band conditions are tough.

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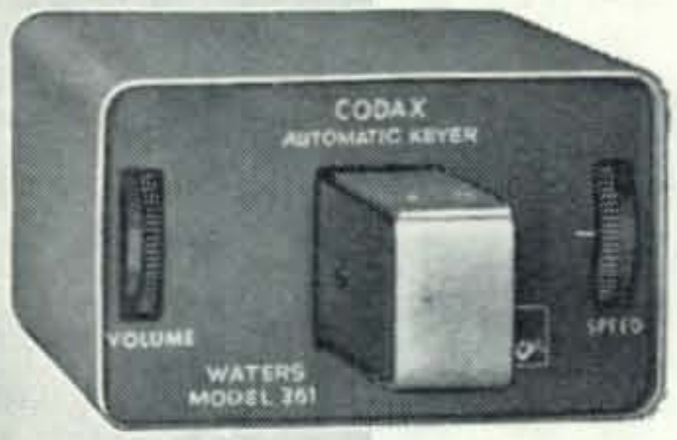

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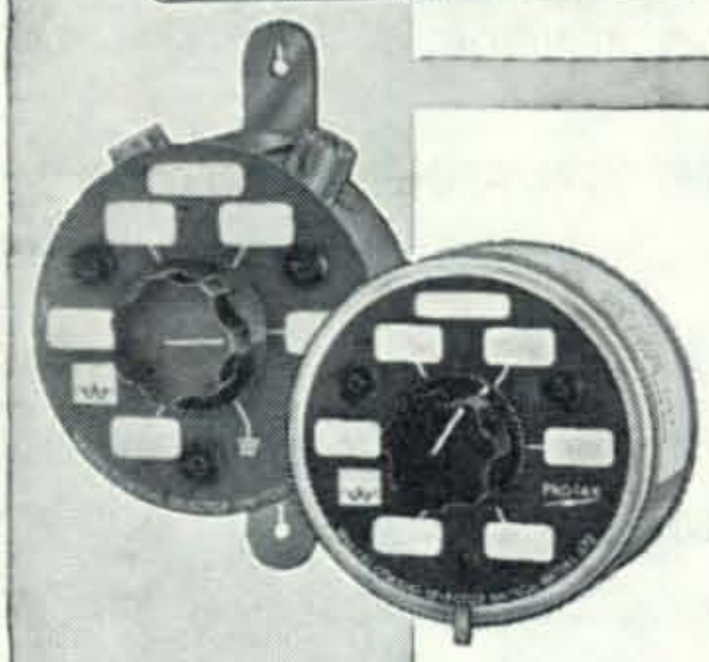

Waters PROTAX™

A must! Brand new Coaxial Antenna Switch that automatically grounds the antenna system when the shack is shut down. Handles a full 1000 watts . . . comes complete with knob, escutcheon plate with erasable marking panels and mounting bracket on Model 376.

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6-position rear axial connectors $13.95
Model 376.
5-position side radial connectors $12.50

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WAYLAND, MASSACHUSETTS

For further information, check number 26, on page 126

ZERO BIAS

INCENTIVE licensing is now official, for better or worse. One thing is for sure, the certainty of the rules is a huge relief for most amateurs. Already, distributors across the country report an upsurge of ham buying, now that amateurs know what they can and can't use.

For the most part, the final rules are similar to the original rules proposed by the FCC almost two years ago. The most significant change is the dropping of the separate call signs for each class, an idea that brought forth a wave of protest from thousands of hams who didn't want their calls changed. Also of major importance is the extension of the novice license to two years and the discontinuation of phone privileges for novices on v.h.f.

One thing that occurs to us is the rather ridiculous rule that no one who has ever held any class of amateur or commercial license previously may apply for a novice license. This has been on the books since the novice license was introduced back in the forties. We feel that many technicians, commercial license holders, and hams who might have dropped their calls sometime in the past, all could benefit from c.w. operation on the HF frequencies. What's more, we see absolutely no benefit from the rule as it now stands. If we're truly out to improve our ranks, let's give everyone a chance to improve the code speed; the best way, in our eyes, is lots of practice where it counts—on the air.

Getting back to the incentive licensing regulations, we don't think they're too severe or any real hardship for any active ham who wants to retain all the frequencies he can now use. Granted, the amateur extra is pretty tough, but anyone not wanting to make the effort still has plenty of space in which to operate to his heart's content.

Probably the worst effect of the entire incentive program was the mass of confusion in the minds of most hams as to what it really meant, and more specifically, how it would affect them as individuals. The misinformation and rumors spread across the air and through club bulletins and even some commercial radio publications was enough to cause havoc within the ranks. This might not have been the only factor in causing the industry to drop from $30 million a year business to less than half that figure, but it was surely a major contributing cause.

Anyway, the rules are here, and they're easy to interpret. Now let's try to live with them and return hamming to the fun it used to be.

There's A Definite Difference In Ham Magazines!

All three amateur radio magazines run good technical articles and construction projects . . .

BUT . . . CQ runs more and better ones because CQ has the top writers in the field.

All three magazines have classified advertising sections . . .

BUT . . . Only CQ subscribers can run classified ads throughout the year ABSOLUTELY FREE OF CHARGE!

All three publications have attractive layouts . . .

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All three ham magazines are good . . .

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The best reading!
The most authoritative!
The most interesting!
The best buy for the dollar!

Shouldn't you have a subscription to CQ?

Random Thoughts

From the Boys in the Back Room

HAVE you ever noticed that throughout the year the various ham magazines carry ads from brand new companies you never heard of before? Quite often these ads are small, quarter page or less, and they usually have a Post Office Box for an address. More often than not, the product advertised is some handy little accessory which sells for less than $100.00.

Most of these ads are placed by amateurs who have built something, found it to be quite useful, and wish to start a little business on the side. They operate from their garage or basement on a conservative basis until such time as the business expands to justify a larger-scale operation. This is a perfect example of American free enterprise at its best.

Now, the ham who goes into such a venture has several places in which to advertise. He may choose one magazine over another based on price, a hunch, or his own personal reading habits. We'd like to state our case why *CQ* is the logical first choice in case you're thinking of running an ad on some new product for your fellow hams.

To begin with, *CQ* offers the new advertiser more active ham readership than either of the other publications, at the lowest cost per reader for his ad dollar. In addition, the *CQ* art department is always ready to help the newcomer with a handsome ad layout. There's no charge for this service.

But *CQ* also has many other exclusive features. We run new product announcements for the advertiser, and we also maintain a full time lab in order to run tests and evaluation reports on equipment. This lab, headed up by Bill Scherer W2AEF, is by far the most accurate and thorough one of its kind. Compare *CQ*'s lab reports with those in the other magazines and you'll see that this is no exaggerated claim. And *CQ* ads pull like crazy. Hams that try *CQ* first usually stay with us for years to come. Those that try the others are often discouraged with the results and lose interest in selling their brainchildren to the ham populous. So if you have something to sell to hams, try *CQ* first.

OUR MOST POPULAR HANDBOOK!

PRICE: $3.00

The most popular handbook ever to be presented in the CQ Technical Series was the venerable old "Command Sets." Countless signals on the air today are there because of the information contained in "Command Sets," which went on to become the standard reference guide and definitive work on the topic. It went through 5 sellout printings, and when the last book of the final printing was stripped from our stock room we decided that the next printing would be an even bigger, newer, expanded, revitalized version of "Command Sets."

Our new book is called "Surplus Conversion Handbook," it's 192 pages BIG (that's 58 pages more than its predecessor). We kicked out all of the space-taking ads which cluttered up the old book and replaced them with more conversions — conversions of surplus gear other than just "command sets" alone. So the new book contains all of the best command set conversions of the original edition, plus complete conversion details on a whole slew of the most popular military surplus gear available today, including such winners as: SCR-522, ART-13, BC-603, BC-620, BC-624, BC-659, BC-779, ARC-1, ARC-3, ARC-4, and many more. Actually, it covers just about every piece of surplus gear which is worth the time and effort to convert for ham use.

"Surplus Conversion Handbook," Edited by Tom Kneitel, K3FLL/WB2AAI, is a book which every ham will find to be a valuable and interesting addition to the shack. It's available for immediate delivery.

COWAN PUBLISHING CORP., BOOK DIVISION
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Gentlemen: Enclosed is $_____ for ____ copy(ies) of the brand new SURPLUS CONVERSION HANDBOOK.

Name _____, Call _____

Address _____

City _____ State _____ Zip _____

hold your ears... hallicrafters has unleashed another brute

SR-2000 "Hurricane"

5-band amateur transceiver

SPECIAL FEATURES: Patented Receiver Offset Control (RIT) permits ±2 ks adjustment of receiver frequency, independent of transmitter, for round-table, net or CW operation. Hallicrafters exclusive Amplified Automatic Level Control.

FREQUENCY COVERAGE: Full coverage provided for 80, 40, 20, 15 and 10 meters. All crystals provided for 28.0 to 30.0 mcs.

GENERAL: Dial cal., 1 kc. Linear gear drive with less than 1 kc readout. Adjustable IF noise blanker. Provision for plug-in external VFO/DX adapter. Built-in VOX plus break-in CW and PTT. Built-in CW sidetone. Hi-Low power switch useable in CW or SSB.* 2.1 kc crystal lattice filter. S-meter-RFO-AALC and final screen metering.* Two-speed blower, 100 kc crystal cal. VFO covers 500 kc.

TRANSMITTER SECTION: Two 8122 output tubes. Variable Pi network. Power input, 2000 watts P.E.P. SSB; 1000 watts CW. Carrier and unwanted SB suppression, 50db; distortion products, 30db. Audio: 500-2600 cps @ 6 db.

RECEIVER SECTION: Sensitivity less than 1 μv for 20 db S/N. Audio output, 2W.; overall gain, 1 μv for ½ W. output.

*Meters for final plate current and voltage built into P-2000AC power supply. Also Hi-Lo power switch.

amateur net:

$995.00

less power supply

For further information, check number 2, on page 126

5TH & KOSTNER AVES., CHICAGO, ILL. 60624

EXPORT: INTERNATIONAL DIV.—CANADA: GOULD SALES CO.

SCRATCHI

Feenix, Ariz.

Deer Hon. Ed:

Have you noticing resently all the grumbling and complaining on the air about the QRMsityouayshun? Hokendoke!! it seeming everybuddy are threatening to giving up amchoor radio on acct. QRM are so feerce.

Ha! what kind peeples we having for amchoors these days? Where are the Hon. Ham Pioneering Spirit? Where are the Hon. Grate Geenyuses who pushing back fronteers of science and single-handed slaying the fiery dragon of QRM?

You thinking maybe Scratchi riting you with 1/c solushun to QRM problems? No indeedy, Hon. Ed., although Scratchi hot under collar on acct. everybuddy complaining about QRM and nobuddy doing anything about it.

So, I thinking hard for cupple days, and coming up with one idea. It not practical yet, but maybe if you telling the reeders of your Hon. Mag. about it, sumbuddy getting bolt-of-lightning idea on how to using it.

OK—let's analyzing problem. You having three dimensions to work in—space, geography and time. Sounds complicated alreddy, doesn't it, Hon. Ed!

Take space in spectrum. If everybuddy used up one-half as much spectrum space with his signal, the QRM would be cut in half. Howsumever, most everybuddy using single sideband or see-w now, so Scratchi not seeing how can doing much with space problem.

Unless, of course, the FCC outlawing fone and everybuddy having to go on see-w. If all else fails, maybe that what we coming to!

Next we have dimension of geography. This depending on which amchoor band we discussing. Likesame nobuddys getting much QRM from VK's on two-meter band, except other VK's. Howsumever, when skip coming

For further information, check number 10, on page 126

in on lower freakwency bands, most parts of world are being heard in most parts of the world, and everybuddy QRMing everybuddy.

Scratchi not seeing any solushun in geography aspect of QRM, except maybe if FCC restricting use of lower freakwency bands to amchoors who holding their license at least twenny years. Boy oh boys, would that cause a lot of letter riting!

Last dimension are time. If each amchoor spending only half as much time on the air, QRM being cut in half. Or, if amchoor send see-w twice as fast, or talk on fone twice as fast, he be on air only half as much time, but he still saying as much as though he on air twice as long.

Sound complicated? It not reely. To making simple understanding, follow this. Suppose amchoor makes a tape recording of a five minute QSO, and when he contacts another station, that other station records it at a high speed. Then he also sends back his tape recording to first station, who records it also at a high speed. Now both sign off, and air is clear of those two amchoors.

You see, they not on air on acct. they listening to what are on tape they just recording. Of course, they have to slowing it way down to read it. Maybe it sent at ten times normal speed. If so, that is a saving of ten to one in spectrum space. What took one-half minute to send over air taking five minutes to listening to.

You thinking that is fast? Hah. Hon. Ed., things are going on rite now that curling your hair.

For examples, computers have to talk to each other and there is no sense in talking slow, on acct. time is money. So, one computer talks to another through special black boxes which translate bits of information into tone signals. How fast?

Hon. Ed., would you buleeving, they talk at speeds as high as 250,000 bits per second? That's per second, Hon. Ed., per second! When computers talking they not chit-chatting, they reely going at it.

Now, 250,000 bits per second is roughly equal to 25,000 characters per second, so at five characters per word, this meening computers talk at a speed of 5,000 words per second—or 300,000 WPM.

Talk about reducing QRM! Like taking amchoor getting on air for a hole day of

[*Continued on page 112*]

COLLECTOR'S ITEM

SWAN 500

5 BAND — 480 WATT SSB TRANSCEIVER
FOR MOBILE — PORTABLE — HOME STATION

Whether working a station across the country or around the world, Swan 500 owners know that solid contacts are the rule, not the exception. With its unbeatable combination of high power and crisp, clean audio, the Swan 500 will literally punch holes through the QRM.

At the top of the Swan line, the 500 offers many extra features: Automatic noise limiter, selectable upper and lower sideband, 100 kc crystal calibrator, and provision for installation of an internal speaker.

The new 500 is equipped with the finest sideband filter used in any transceiver today. With a shape factor of 1.7, ultimate rejection better than 100 db, and a carefully selected bandwidth of 2.7 kc, this superior crystal filter combines good channel separation with the excellent audio quality for which Swan transceivers are so well known.

Frequency coverage of the five bands is complete: 3.5-4.0 mc, 7.0-7.5 mc, 13.85-14.35 mc, 21-21.5 mc, 28-29.7 mc. (In addition, the 500 covers Mars frequencies with the 405X accessory crystal oscillator.)

If you are a QSL collector, then the new Swan 500 is the item for you. **$495**

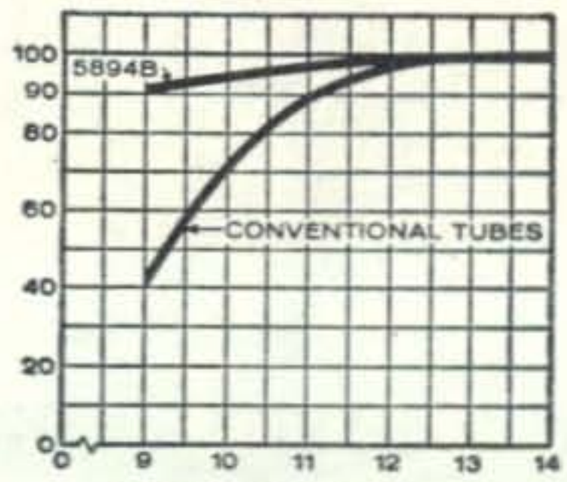
ACCESSORIES:

12 Volt DC Supply, for mobile operation. Model 14-117.	$130
Matching AC Supply. Model 117XC	$ 95
Plug-in VOX Unit. Model VX-1	$ 35
Full Coverage External VFO. Model 410	$ 95
Miniature Phone Band VFO. Model 406B	$ 75
Crystal Controlled Mars Oscillator. Model 405X	$ 45
Dual VFO Adaptor. Model 22	$ 25

SWAN ELECTRONICS Oceanside, California

For further information, check number 14, on page 126

insensitive to heater-voltage variations



POWER PERFORMANCE vs. CATHODE VOLTAGE

It's the new version of the Amperex 5894, that famous old workhorse, now with the WIDE-RANGE CATHODE that we developed specifically for vehicular communciations equipment.

Today's 5894's are being designed into transmitters for mobile vehicles that have modern alternator electrical systems. Alternators are just fine but they do create heater-voltage-regulation problems. So . . . the 5894B/8737, with the wide-range cathode was created.

5894B/8737 cathode emission is essentially independent of heater voltage over a wide range. While a conventional twin tetrode produces 60% less than its rated output at 9 volts, the new tube, with its wide range cathode, puts out more than 90%. Above 13 volts, conventional cathode materials sublimate, damaging the tube; the 5894B/8737 is immune to sublimation with as much as 16 volts on the heater.

Whether the alternator is idling or turning at full rpm, the Amperex 5894B/8737 gives the kind of performance that has made the 5894 the standard of the mobile vehicular communications industry.

As a 174 MHz push-pull amplifier, the 5894B/8737 delivers 96 watts ICAS; operating PTTS*, it delivers 111 watts with 5.5 watts drive, with a tube efficiency of 69%. And all this at any heater voltage from 10 to 16.

**PTTS: Push-To-Talk Service; for vehicular communications systems. Maximum duty cycle: 1 minute ON/4 minutes OFF.*

For complete data on the new 5894B/8737 and other Amperex twin tetrodes for mobile applications, write: Amperex Electronic Corporation, Tube Division, Hicksville, L. I., New York 11802.

Amperex®

TOMORROW'S THINKING IN TODAY'S PRODUCTS

For further information, check number 7, on page 126

SOLID STATE CWX

Front view of the CWX control unit shows control function and placement.

BY HARRY R. HYDER,* K7HQN

A few hours spent in last year's CW Sweepstakes contest convinced me that I had to do something to speed up station operation, throwing switches just took too long. Full break-in, of course, is ideal, but no completely satisfactory single-antenna system has yet been developed.

CWX[1], the c.w. man's equivalent of the sidebander's vox system is the next best thing. CWX is a fast make - slow break system. When the key is first depressed, the antenna relay switches to transmit rapidly, but the relay does not drop out immediately when the key is released. There is a controllable time delay before dropout. The delay can be adjusted to make the relay hold in between characters and words, and drop out a fraction of a second after the last character has been sent. The system has been in use for at least thirty years in one form or another. Most of the units I have seen described use an intermediate relay to control the antenna relay. This is

* 2523 N. 57th Street, Scottsdale, Arizona, 85257
[1]The acronym "CWX" was coined by Dale Fisher, W4VQK, for a Feb. 1966 QST article.

undesirable, since it introduces an additional delay on make, causing the first transmitted character to be somewhat clipped. The one described here uses no relays but the antenna relay itself. Also, it is all solid-state, since in these days using vacuum tubes is almost unthinkable. (There was a time when I thought I would never say that!)

Other features of this unit are:

1. It is designed to be used as a station control box, too. Switches and indicator lights are included for controlling the transmitter's heater and high voltage supplies. The switches shown will control a low-power rig directly; for high power, they may operate relays.

2. It is arranged for cathode keying of a low-power buffer stage.

3. A control for receiver muting is provided (R_3).

4. A switch is included for v.f.o. frequency spotting; also a "manual-automatic" switch.

Rear view of the CWX control unit shows the various connectors needed for (from l. to r.) Receiver, Oscillator, Transmitter (Buffer), Key, Antenna Relay, Transmitter Power, and A.C. Power Input.

Theory of Operation

I already had on hand a Dow-Key DK-60G2 Coaxial antenna relay. This relay has a 115 v.a.c. coil and auxilliary d.p.d.t. contacts. A little experimentation indicated that this relay would operate very well on about 20 v.d.c. at 55 ma. A 24 v.d.c. model of this relay is also available, and if you do not already have a relay, you might buy that model instead.

This is how the circuit works. When the key is up, the cathode of the transmitter's buffer stage is clamped to +50V through CR_2. Fifty volts is more than enough to cut off most small pentodes used as buffers. Capacitor C_1 has charged to +20 volts through R_1 and R_2. The source of Q_1, a field-effect transistor, is held at +20 volts by zener diode CR_4. The gate of Q_1 can not go above 20.6 volts because at that point the gate-channel junction diode conducts and clamps it there. Because Q_1 is then forward biased, the channel resistance of Q_1 is very low; the voltage to ground at the drain terminal is only about 22 volts. Therefore CR_3, a 36 volt zener diode cannot conduct, and the base of Q_2 is open causing its collector current to be zero. Transistor Q_2 is merely a current amplifier for Q_3, which under these conditions is also cut

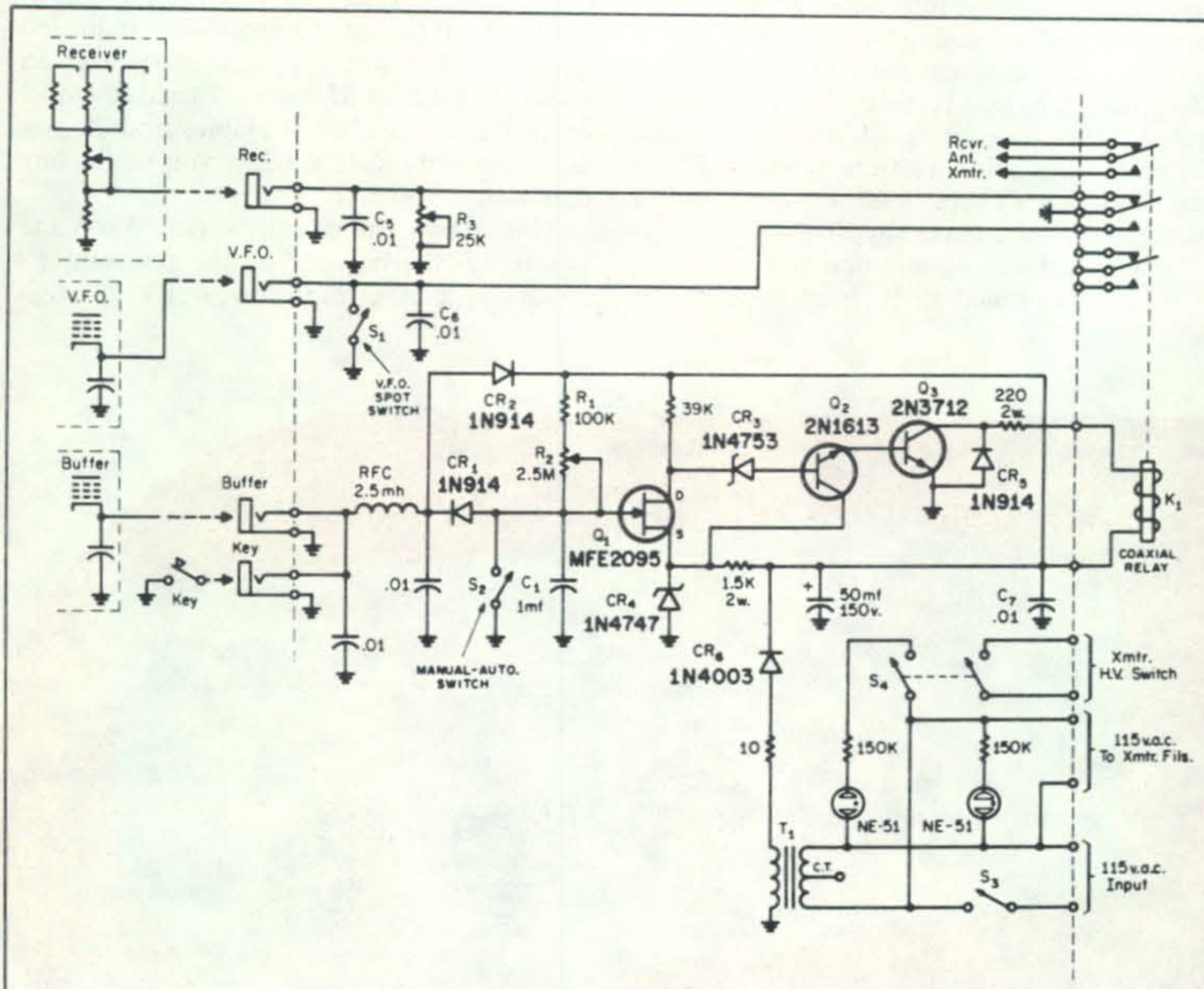


Fig. 1—Circuit of the CWX solid state break-in and control center. All capacitors are in mf and all. 0.01 capacitors are disc ceramic types. Resistors are ½ watt except where otherwise noted. Control R_2 has a linear taper and control R_3 has a log taper. Transformer T_1 can be a Chicago PS-8416, a Thordarson 22R39, or any suitable type as explained in the text.

off. The antenna relay is therefore in its receive position, and the auxilliary contacts cause the v.f.o. cathode circuit to be open and the muting bias on the receiver to be short-circuited.

When the key is pressed the buffer cathode circuit is grounded and C_1 is immediately discharged through CR_1. The gate of Q_1 is at −20 volts referred to its source; this cuts off Q_1. The voltage at the drain of Q_1 rises until it reaches +36 volts. At this point, CR_3 conducts feeding current to the base of Q_2 which, in turn, supplies current to the base of Q_3. Transistor Q_3 then conducts heavily, energizing the antenna relay, K_1.

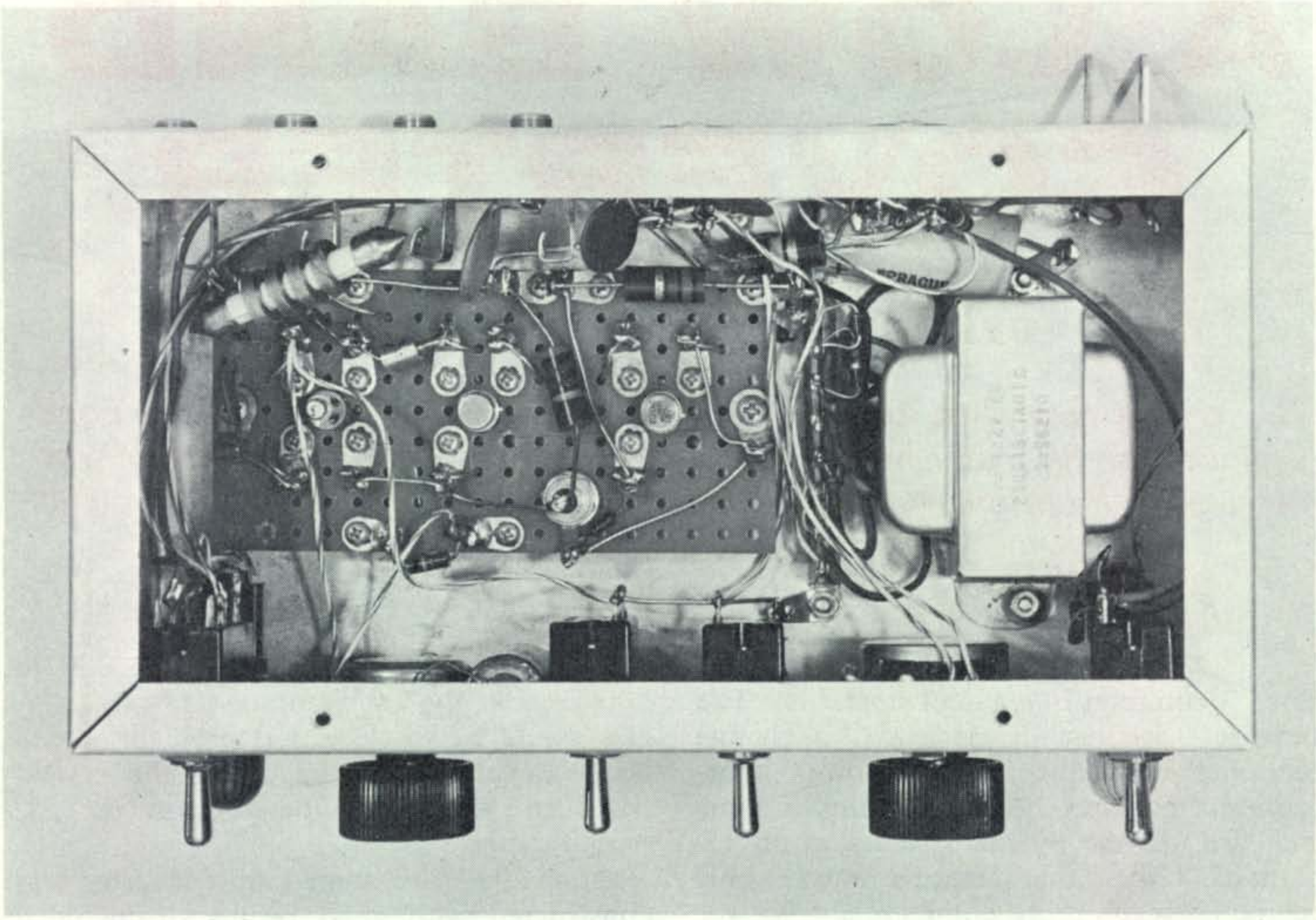
When the key is released C_1 must charge slowly through R_1 and R_2. The voltage across C_1 must rise to about 18 volts before Q_1 can conduct sufficiently to make CR_3 nonconducting, thus causing the relay to drop out. The delay is adjustable from about 0.1 to 2.5 seconds.

Power Supply

The power supply delivers about 40 volts under full load. The transformer used has a 250 volt center-tapped secondary, but it is used backwards, that is, the 250 volt winding used as the primary, and the 115 volt primary is used as the secondary. The particular one used in this unit was picked up on a surplus counter, and is of unknown manufacture. A standard unit of similar characteristics is shown in the parts list.

Semiconductors

The semiconductors used in the CWX are all inexpensive types; some effort was spent in finding the cheapest units that would do the job. Total current cost of all diodes and



Bottom view of the CWX unit showing the power supply on the right and the perforated board containing the amplifier on the left. Photos by Ted Stites.

transistors used is $11.07, ham prices. The twenty-volt stud-mounted zener diode seen in the photograph is a ten-watt unit, used because it was on hand. A one-watt pigtail diode is more than adequate, and is so listed in the parts list.

Construction

The unit is built in a standard 5" × 9½" × 3" aluminum chassis, to which a bottom plate and rubber feet have been added. The semiconductors and most of the components are mounted on a small plastic terminal board. A chassis-mounted male a.c. socket brings power to the unit; octal sockets are used for connections to the transmitter power supply and relay. Phone jacks are provided for the key and connections to the transmitter and receiver.

Installation

Connections to the oscillator and buffer are shown in fig. 1. The muting connection to the receiver may require a slight modification to your set. The receiver in use here (SX-101) has provision for this type of muting, as do a number of others.

Conclusion

Since the installation of the CWX, operating convenience and pleasure have increased greatly. The delay is easily set to match the keying speed; for moderately fast keying, I can set the delay to a couple of tenths of a second and work full break-in equipped station without the other station suspecting that I am not similarly equipped.

Only one problem showed up in operation of the unit. In my transmitter, the power amplifier is not cut off when the key is up; it uses a screen grid clamp to hold the plate current down in the absence of excitation. With the key up, I could detect a small amount of grid current in the amplifier, and r.f. in the plate tank. Apparently, there was enough coupling between the relay's r.f. contacts and its auxilliary contacts to produce a feedback loop via the keying lead to the transmitter. The r.f. choke and bypass capacitors shown in the schematic seemed to eliminate the problem, which may have been peculiar to my particular transmitter. ■

A LOW BAND COVERTER

BY CALVIN SONDGEROTH,* W9ZTK

This crystal controlled converter raises the frequency of broadcast band signal to the 80 meter band to permit reception on a ham-band-only type receiver. With proper tuning and crystal it can also be used for 160 meter coverage.

THE use of crystal controlled converter is common in amateur operation. The converters are usually designed to change some higher frequency to a lower intermediate frequency. As an example, some amateurs use the 80 meter band as an i.f. to tune all the other amateur bands. This technique is used in commercial receiver design since the advent of single side band because image rejection and the tuning rate are enhanced by using the converter scheme.

In the conversion process, an oscillator, usually crystal controlled, is used to generate a signal which is removed from the frequency to be received by an amount equal to the intermediate frequency. A frequency either above or below that desired may be used since the difference between the two frequencies determines the i.f. The sum of the two frequencies is also generated, but this sum frequency is far removed from the i.f amplifier/detector which has sufficient selectivity to reject it.

Backward Converter

This article describes a converter which works "backwards" from the usual scheme. It takes a lower frequency and moves it up to a higher intermediate frequency. It can be used to tune the broadcast band and 160 meters on ham band only receivers. Only 500 kc of the band can be covered in this way, but the entire b.c. band and 160 meters can be tuned by using additional crystals. Usually a limited segment is of interest, and one crystal will do the job. Theoretically it would be possible to use this sort of converter to tune the v.l.f. range from 200 to 500 kc, but the oscillator and i.f. frequencies would be so close that problems could arise. In such an arrangement the crystal oscillator would be operating in the i.f. tuning range.

Originally, a vacuum tube converter was constructed with good results. It included an r.f. stage and used double tuned circuits to flatten the response over the i.f. band. This was used for some time, but the inconvenience of borrowing power from the receiver and the size of the unit prompted construction of a solid state converter.

The transistorized version does not have an r.f. stage and is quite straightforward. For general listening on the bc band it is quite adequate, but it will not match the tube model in digging for DX. The addition of an r.f. stage would be easy, but this didn't seem worth the trouble since I only use it for the broadcast band. The small size and elimination of the interconnecting cable to the receiver accessory socket overshadow any lack of weak signal sensitivity.

Circuit and Operation

The schematic of the converter is shown in Fig. 1. Transistor Q_2 is used in a Pierce oscillator circuit, and the output is taken from a capacitive tap (junction of the 68 and 330 mmf capacitors) on the collector lead.

Transistor Q_1 is used as the mixer and the oscillator signal is injected at the emitter of this stage. The tank circuit formed by L_1 and its associated capacitors is broadly resonant over the broadcast band and

* 715 N. Elm Street, Sandwich, Illinois 60548.

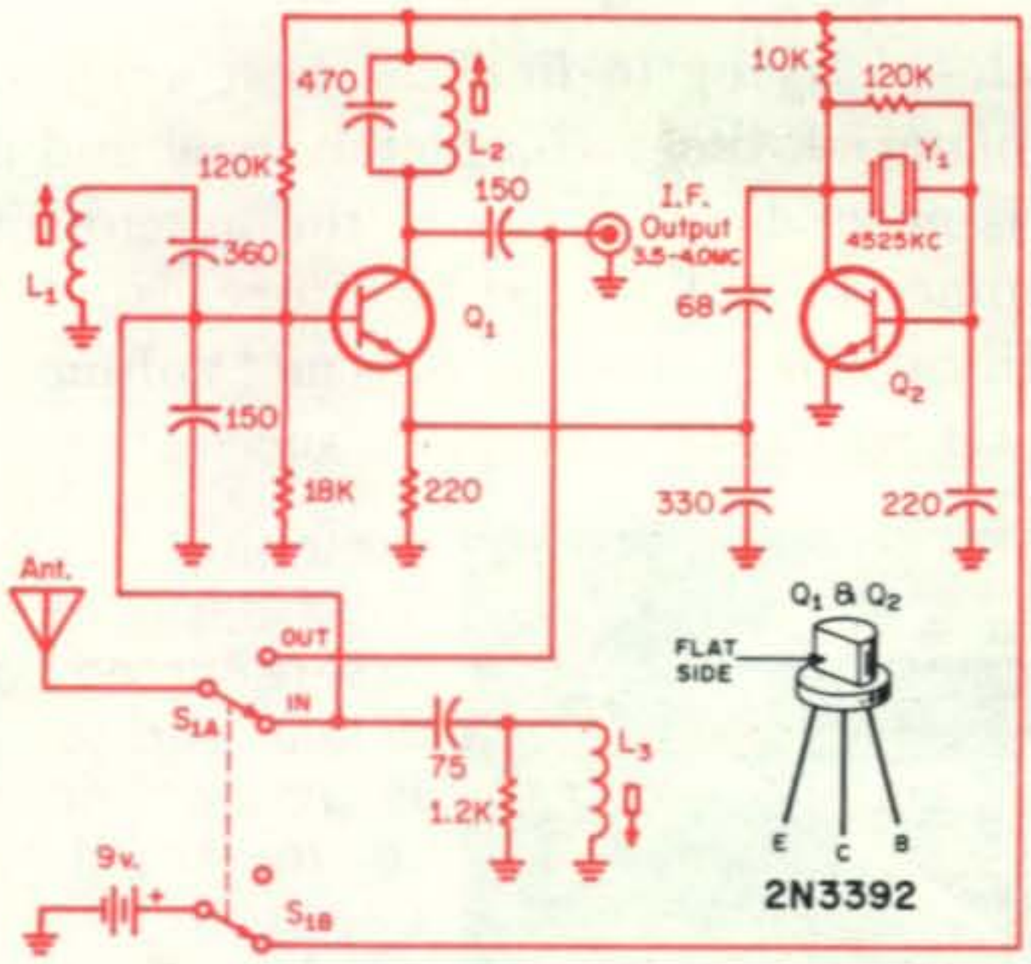


Fig. 1—Circuit of the W9ZTK broadcast band converter. With the proper crystal and tuning of L_1 it will also cover 160 meters.

L_1—190-330 microh. Miller 4513 or equiv.

L_2—35 t #28 e. on a ¼" slug tuned form. (Close wound.)

L_3—15-31 microh. Miller 4407 or equiv.

should also cover the 160 meter band if tuned to the high end. The tank circuit in the collector lead of Q_1 is tuned to resonate in the center of the 80 meter band. The i.f. output is taken directly from the collector of the mixer through a 150 mmf capacitor.

The 3.5 mc trap (L_3) at the base lead of Q_1 was added to lower feedthrough from 80 meter amateur stations when tuning rather weak broadcast stations. The 1.2K resistor across L_3 lowers the Q of the coil to prevent spurious oscillations. Without the resistor the mixer had a tendency to self-oscillate which generated spurious responses in the converter.

Construction

The unit was built on perforated Vector board with holes on alternate 0.200" centers. Layout is not critical, and the schematic may be used as a guide to part positioning. In fact the converter was built on the perforated board in breadboard fashion and then mounted in the case when all the cut and try was finished.

The transistors specified are General Electric type 2N3392's. These are industrial types intended for general small signal use from audio to 30mc, and are available for about 50¢ in small quantities. Other types may be substituted such as 2N706's or 2N697's. The 2N3392 is an epoxy encapsulated unit, and the lead connections are rather unconventional. Lead identification is shown on the schematic, fig. 1.

The crystal frequency shown in fig. 1 will provide broadcast coverage from 525 to 1025kc. A second crystal at 5025kc would give coverage from 1025 to 1525kc, almost the top end of the broadcast band. If the entire band must be covered, a switch can be added to select the desired crystal. For 160 meter coverage a 5750kc crystal can be used.

The converter is mounted in a brass enclosure available from Hudson Tool and Die Company.[1] It measures 2-3/8" × 4-3/8" × 2" high. A small Mini-box could be used or the case may be ordered from Hudson. Their part number for it is HU-7180-2-BR and the matching inside fitting cover is HU-7180CA-BR. These enclosures have round corners and are very nice for use in ham construction. The case was painted with gray spray enamel. Before painting it was rubbed with sandpaper to provide a good surface.

Figure 2 shows the mechanical construction used. The circuit board is mounted on spacers with #4-40 screws with the crystal projecting down from the circuit board. The in-out switch is mounted on top of the case toward the front, and a banana jack for the antenna and a BNC output connector are

[*continued on page 120*]

[1] Hudson Tool and Die Co. 18 Malvern Street, Newark, New Jersey 07105.

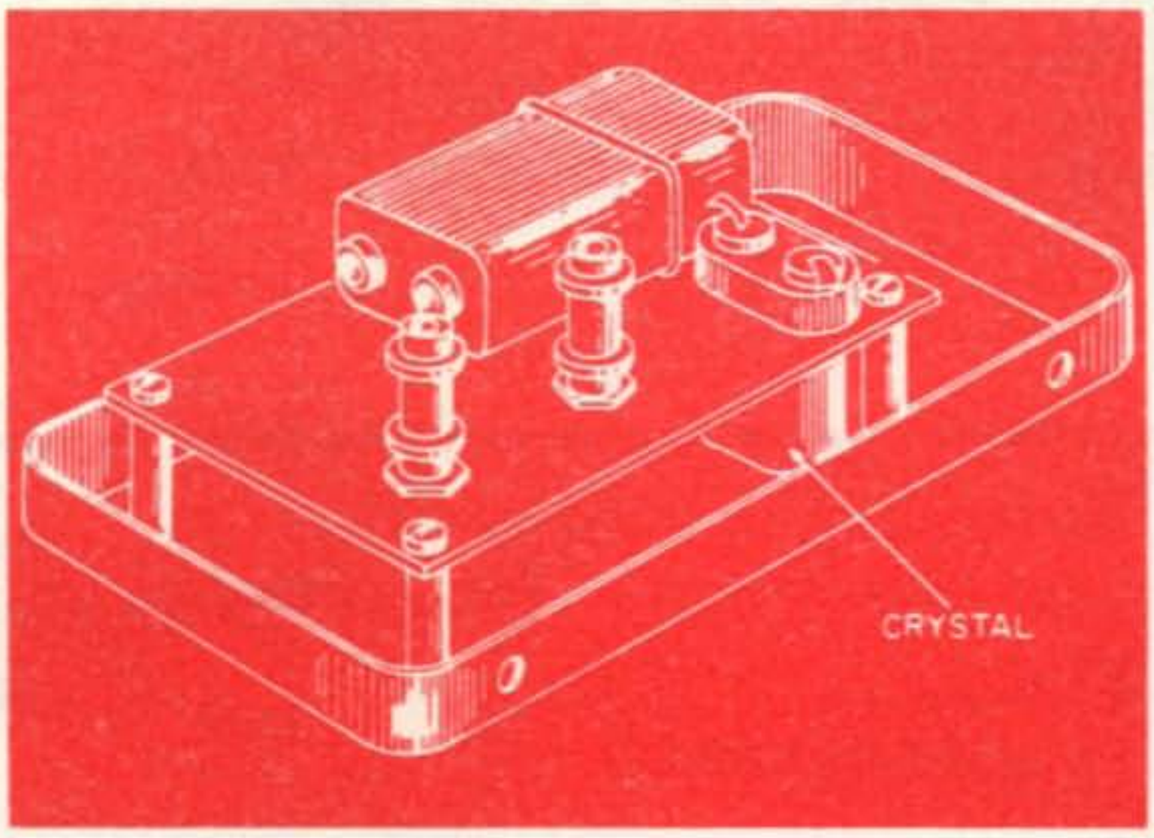


Fig. 2—Mechanical layout of the broadcast band converter in a 2⅜" × 4⅜" ×2" case described in the text. The holes in the sides, tapped for 6-32 screws, are used to secure the cover. All capacitors are silver micas in mmf and all resistors are ¼ watt.

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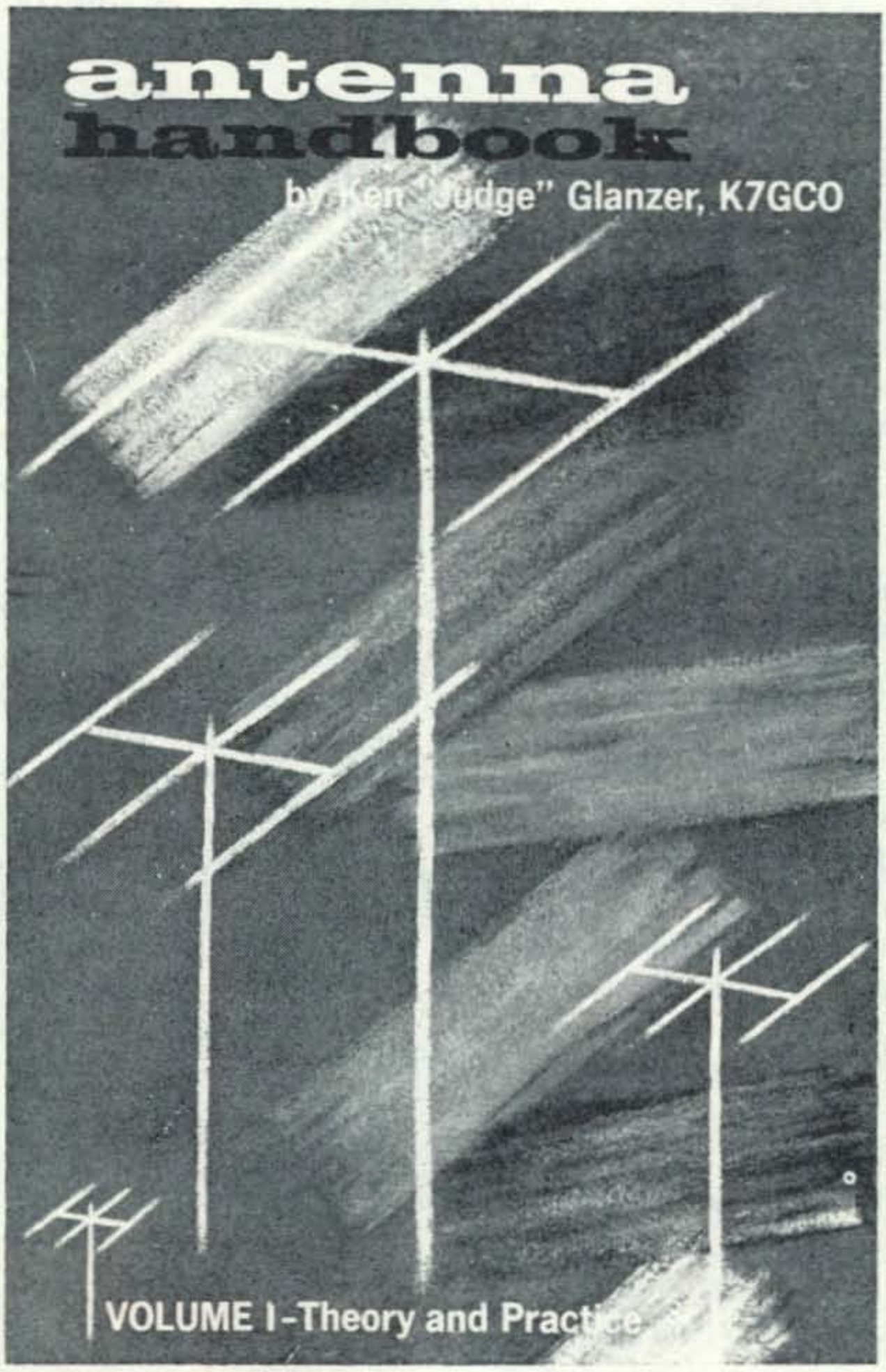

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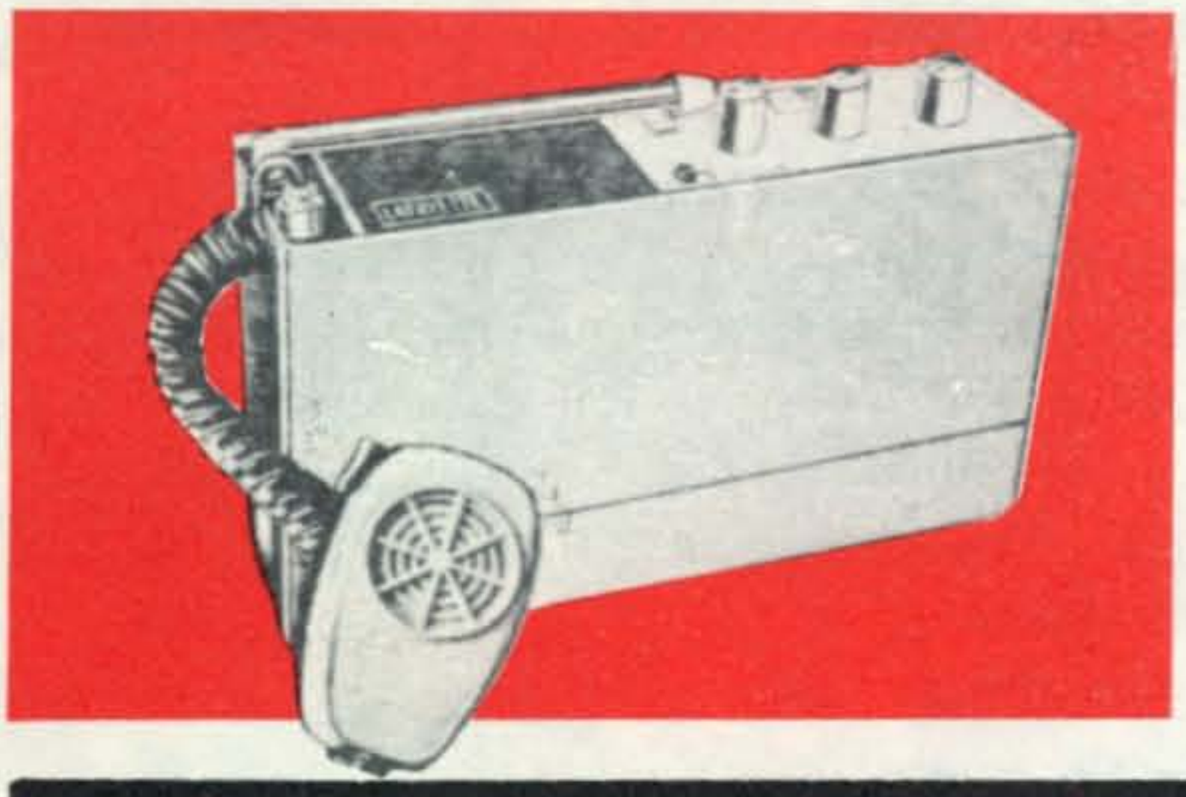

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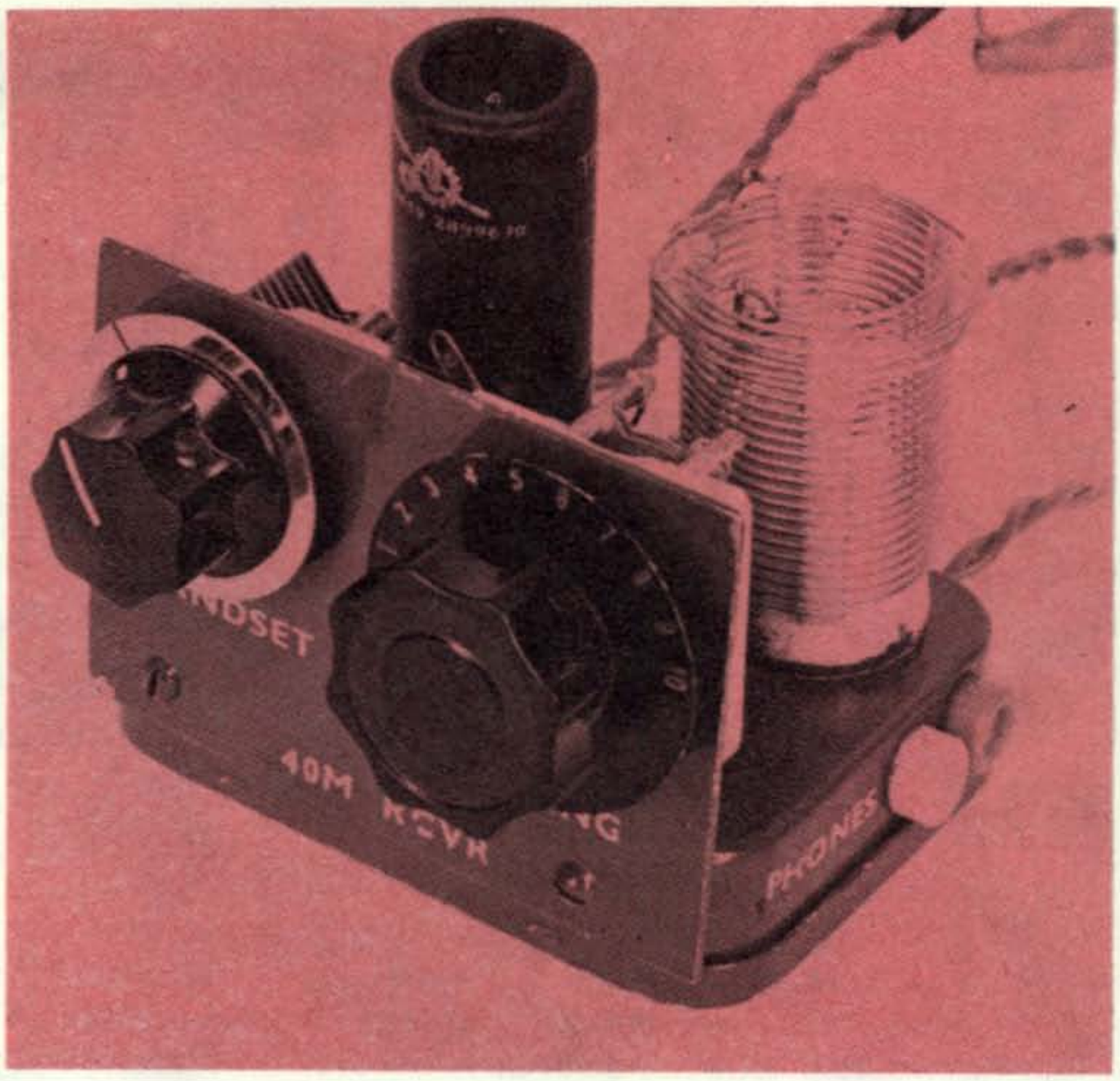


Front view of the 40 meter QRP receiver shows the coil mounted on the stand-off insulator and the 3V4 to the left, under the shield. The bandset capacitor is on the left and the bandspread capacitor (two stator and one rotor plates) provides smooth tuning requiring no vernier dial. Phone jacks are on the side of the Sucrets chassis.

A 40 METER "WEE-CEIVER"

BY BYRON C. WEAVER,* WB2HAL

This 40 meter QRP receiver, the "Wee-Ceiver," is battery operated and built into a Sucrets box. It is a regenerative job that tunes from 5.5 to 12.5 mc and is ideal for Field Day or emergency work.

WAIT! Don't let my size and simplicity fool ya! I'll pull in a signal loud enough to make your eyes squint, tune 5.5 mc to 12.5 mc, operate over 100 hours continuous on inexpensive batteries, won't cost ya a fortune to build, and because of my size you'll want to take me with you on a field trip or just a picnic outing!

Having promised myself and others many times that I would write on some of my small projects, I've finally brought myself up to it. The receiver shown in the pictures is simple to construct, utilizes a Sucrets pill box for the chassis and is very comparable in signal reception to the "Novice Special" [1] without taking up the room, expense, or the current. Although primarily designed for 40 meters, it should not be difficult to change the coil for other bands.

The receiver performs extremely well even though no vernier dial is used and the

*15 Lake Ave., Hazlet, New Jersey 07730.

[1] Mix, D., "The Novice Special," *QST*, June 1956, p. 34.

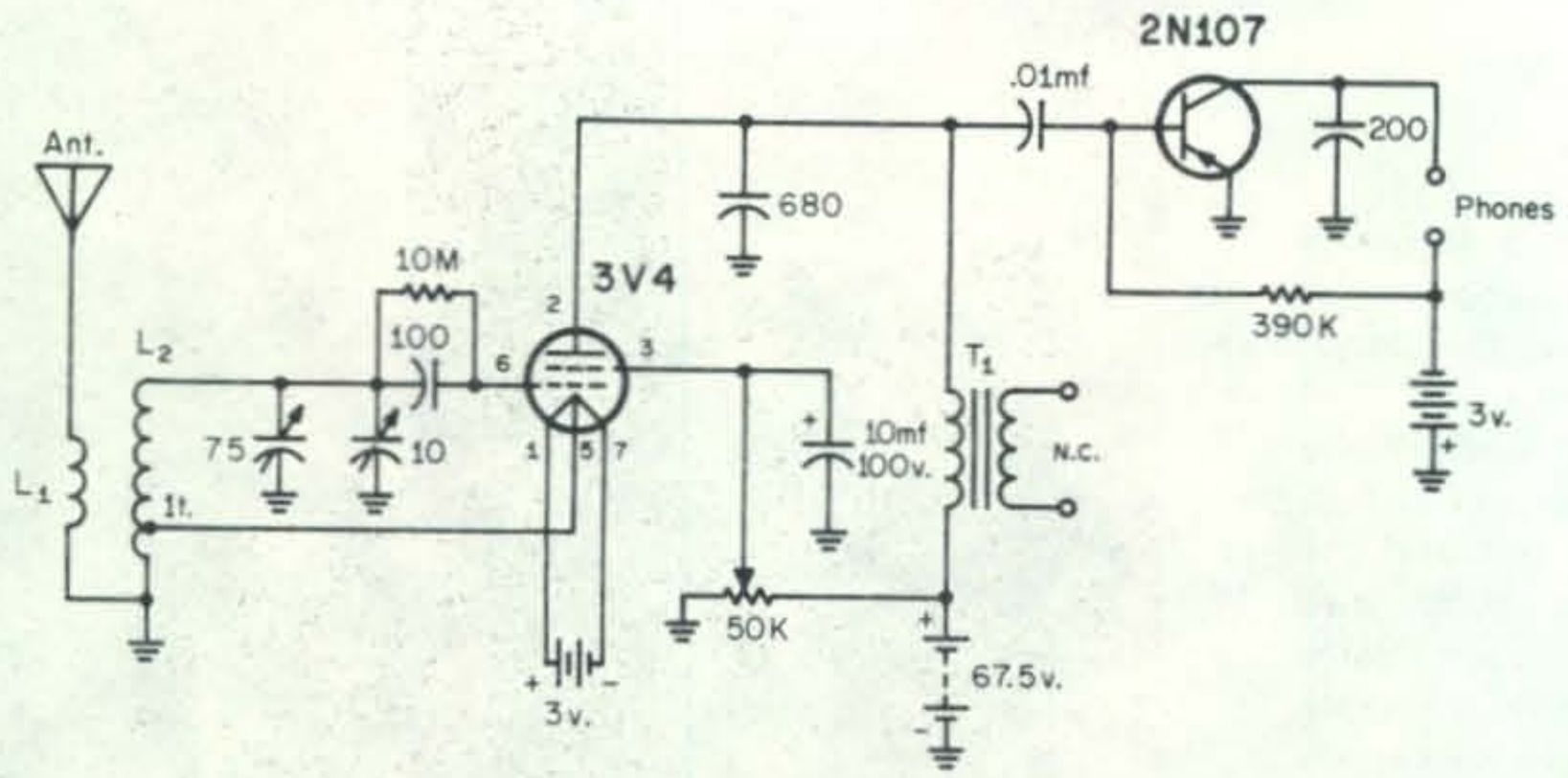


Fig. 1—Circuit of the QRP 40 meter receiver. Transformer T_1 is a miniature unit with a 15K primary (UTC 0-5 or equivalent). The coil construction is described in the text. All capacitors are in mmf unless otherwise noted and all resistors are ¼ watt.

antenna wire is only 18 feet long. There are no effects of hand capacity and the stability is very good if the antenna is unable to swing. Microphonics have not been noticed. There is ample room in the chassis so that with suitable parts even the beginner should encounter little or no difficulty in building the receiver.

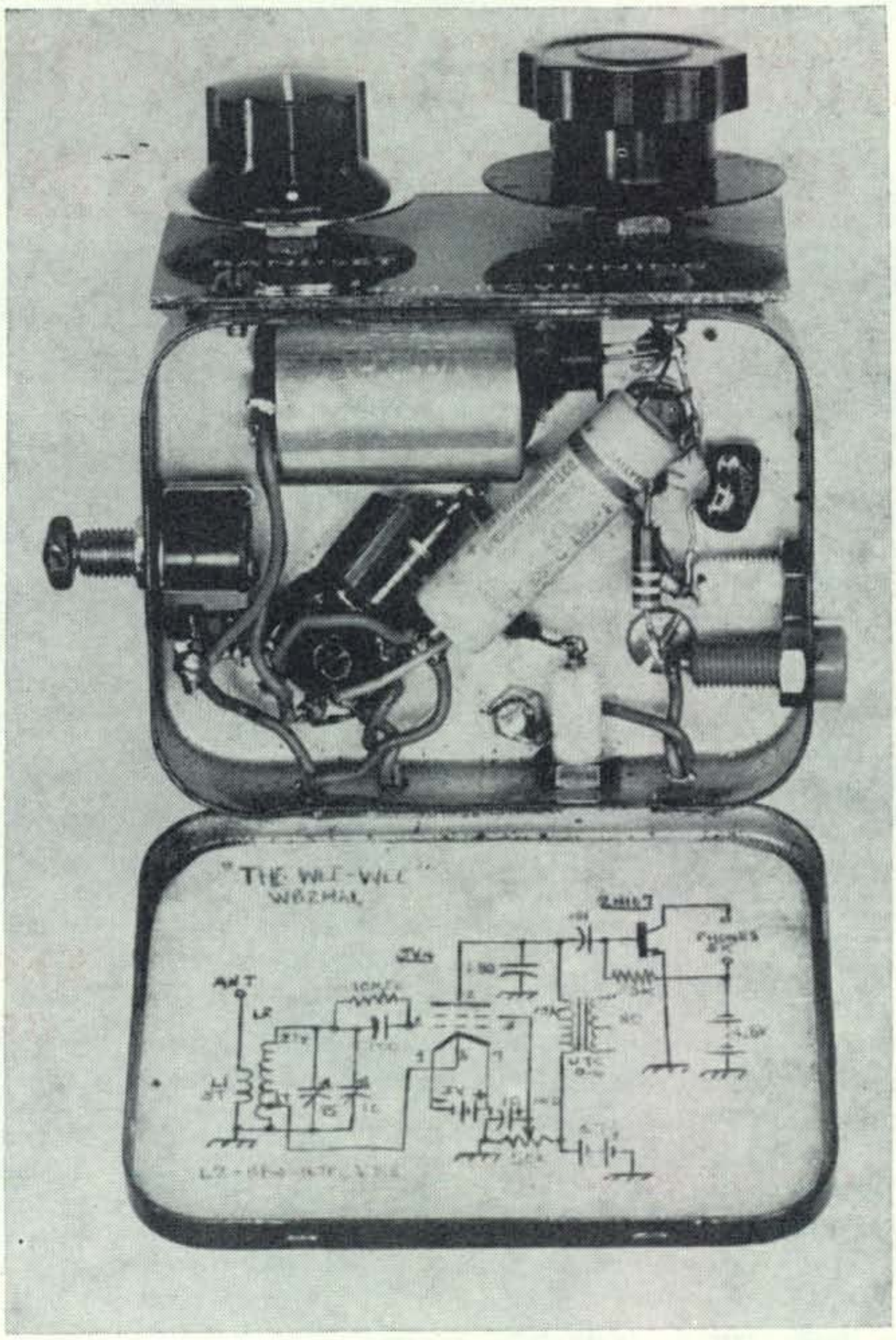
Circuit

Looking at the schematic, a 3V4 is used as the regenerative detector because of its low current drain and power output capabilities. Two regular size flashlight batteries in series will heat it for well over 50 hours and by using four, and paralleling two, well over 100 hours continuous operation can be expected. Burgess battery No. XX45 is used for the plate supply although any battery between 45 and 90 volts will work well. The tube draws only about 4 ma depending on the point of regeneration. A 2N107 is used as an audio amplifier and draws 0.5 ma from two flashlight batteries in series. A 4.5 volt battery has been used with the 2N107 with no appreciable gain in audio output. A battery pack can be made taping the batteries together which takes up a minimum amount of room.

Rear view of the receiver.

Inductor L_2 is 22 turns of B&W coil stock #3015 (1" dia., 16 tpi). To make L_1, proceed as follows: Assuming you had a 3 inch length of coil to start with, strip off about 8 turns of wire from the left-over portion of the remaining coil stock after making L_2. Cut off the four plastic support strips you have just removed the wire from and glue them to L_2 as shown in the photographs. Next, straighten the wire that you have striped off the coil and rewind 3 turns on the glued strips of plastic, placing a coat of glue on top of the strips, after you have wound L_2, to hold it in place. Coils L_1 and L_2 are mounted on a stand off insulator but could be modified for plug-in coils if preferred. The tap for the cathode is one turn from the ground side (top in photo) of L_2. (The top of both coils are ground as shown in the photograph.)

The 75 mmf bandset capacitor was originally 100 mmf with several rotors and stators removed until it fitted in place without hitting the tube behind it. The tuning capacitor is only about 10 mmf (two



Bottom view of the receiver shows the regeneration control on the left and transformer T_1 up at the top. A spare transistor is taped to the end of T_1.

stators and a rotor) and spreads so well that no vernier drive is used. Small size components were used throughout.

A large value resistor (10 meg) is used in the grid for a noticeable increase in sensitivity. The signal handling capabilities for strong signals could be improved by a smaller value resistor but I am interested in receiving the weaker signals (QRP stations) anyway.

The transformer, in the plate circuit of the 3V4, was originally an 18K ohm resistor which worked fine but I decided to try the small transformer that I had in my junk box. This increased the output so much that I decided to mount the transformer underneath the chassis, cutting a hole large enough to permit it to protrude through the top of the chassis. This component is quite expensive ($6.50) but was given to me in some surplus equipment. It has a primary impedance of 15K, and therefore any small transformer or audio choke with a high audio reactance should work equally well. The secondary is not used.

Operation

Any high impedance magnetic earphones may be used, the author using a pair with a 5K ohm impedance. An earth ground connection may be made at the negative side of the 67½ volt battery or to the positive side of the transistor battery. Small alligator clips are connected to all external leads for convenience in making connections. The other construction details can be seen in the photographs.

Needless to say, I am very satisfied with the receiver and it was well worth the time to build. It is also ideal for foreign broadcast reception (loud!), the traveling bag, or as a portable receiver for the home station. Although it appears a novelty, the Wee-Ceiver performance will definitely surprise you. ■

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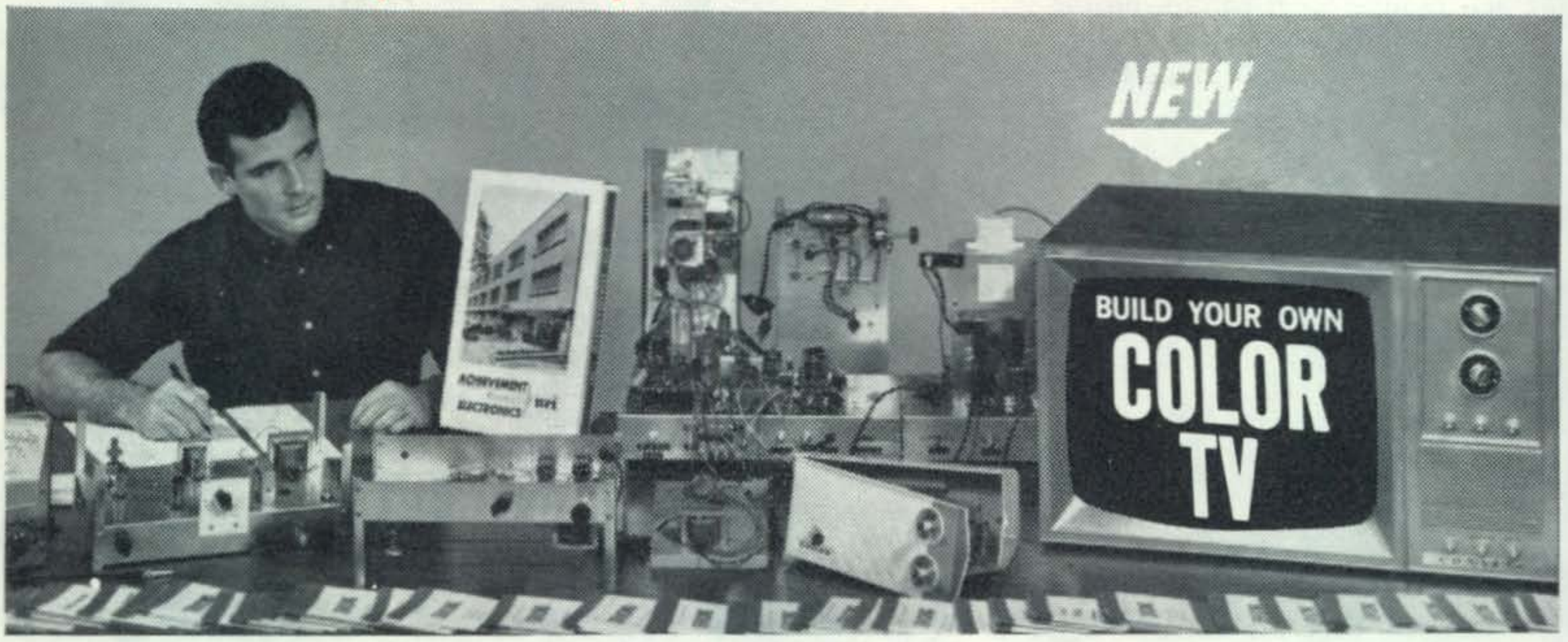

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Text of F.C.C.'s Decision on Incentive Licensing

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

In the Matter of	Docket No. 15928
Amendment of the Amateur Radio Service Rules to provide for Incentive licensing and Distinctive Call Signs.	RM-378, 455, 470, 474, 480, 481, 499, 516, 517, 538, 577, also, 385, 389, 464, 773, 775, 805

REPORT AND ORDER

Adopted August 24, 1967; Released August 29, 1967 By the Commission: Commissioner Bartley not participating; Commissioner Cox absent.

1. On April 1, 1965, the Commission released a Notice of Proposed Rule Making to amend its rules to provide for incentive licensing and distinctive call signs in the Amateur Radio Service. The Notice was duly published in the Federal Register on April 7, 1965 (30 FR 4496). By Order released July 15, 1965, the Commission extended the time for filing original comments and reply comments in response to the Notice until September 1, 1965 and October 1, 1965, respectively. This Order was duly published in the Federal Register on July 22, 1965 (30 FR 9175).

2. In addition to those filed by organized amateur groups, over 1700 formal comments representing the views of about 4000 licensees were received in response to the Notice. Each of these comments has been considered by the Commission. Almost without exception, the comments were set forth in an intelligent and thoughtful manner and, as a result, they have been very helpful to the Commission.

3. The proposals in this proceeding were extensive and provided for higher classes of licenses with reserved frequency operating privileges as an incentive to the general "upgrading" of licensees, the revision of the privileges and term of the Novice Class license, the modification of a basis of eligibility for the Conditional Class license, and distinctive station call signs.

4. The primary purpose of this proceeding is to consider the establishment of an incentive licensing program. A program of this nature was endorsed in two out of every three of the comments. Essentially, these favorable comments concurred in the Commission's view that, in order to justify the continued allocation to the Amateur Radio Service of a substantial portion of the spectrum in the face of incessant and important demands by other radio services, there must be a continuing movement towards the goals set forth in Section 97.1 of the Rules. The most frequently presented argument against incentive licensing was not based upon disagreement with the Commission's view but, instead, was predicated upon the contention that an incentive licensing program would have no long range effect. It was felt that licensees who trained and educated themselves to obtain the higher classes of licenses would merely fall back to their present level of competence after achieving the higher status. This view cannot be accepted by the Commission for it is our belief that the education and training processes in any field of endeavor lead naturally to permanent improvement and progress in some measurable degree. Thus, we cannot reasonably conclude that a licensee who develops his skills and increases his knowledge to the extent required to successfully pass higher amateur radio examination requirements would then fail to retain a significant measure of that proficiency and learning.

5. To support its proposal for an incentive licensing program, the Commission stated in the Notice its opinion that revision of the present license operating privilege structure is an appropriate and desirable step to take at this time to insure progress and to place a proper emphasis upon the quality of the service as well as upon its mere numerical growth and activity. It is apparent from the comments that the large majority of amateur licensees support the Commission's view and that the factors which prompted this proceeding remain valid. Accordingly, the Commission concludes that a program providing for licensees with special privileges as an incentive to the general "upgrading" of licensees is in the public interest and should be adopted.

6. The Commission proposed two higher classes of licenses for the incentive licensing program which would include the present amateur Extra Class license and a new license to be designated the Amateur First Class license. Eligibility for the Amateur First Class license was proposed to be limited to an Advanced, General or Conditional Class licensee who has held such license for at least one year. The examination for the new Amateur First Class license was to comprise a 16 word per minute code test and a written examination of a difficulty level between the present General and Amateur Extra Class license examinations. Incident to the foregoing, it was also proposed that the present Advanced Class license would no longer be renewed as such and that present holders of this license would be issued the General Class license upon renewal.

7. The proposal for creation of a new higher class of license to be known as the Amateur First Class license was very favorably received. The purpose of this license was to provide an intermediate advanced license as a "stepping-stone" to the highest license attainable, the Amateur Extra Class license. A large number of comments recommended that the Advanced Class licensees be granted "grandfather" privileges to the new higher class license. Typical of these comments were the following:

"In most fields of technical endeavor, long experience and demonstrated technical ability are generally accepted as standard measures of com-

examination. All written examinations will be

petence in the particular field. I believe both of these apply directly to the measurement of competence in the amateur radio field and it is my belief that the present Advanced Class licensees rate very highly on both measures. The Advanced Class, in addition to the Amateur Extra Class, licensees are believed to be the most competent and experienced amateur operators at the present time. Since no new Advanced Class licenses have been issued since 1952, all Advanced Class licensees have a minimum of 13½ years (including a minimum of one year as a Class B licensee) of amateur radio experience in addition to having successfully passed a higher level of examination to obtain the incentive privileges which existed prior to 1953. It would, therefore, appear that there should be no doubt as to the competence of the Advanced Class licensees to have the proposed new incentive privileges, since all of the licensees are the relative 'Old-Timers' of amateur radio in terms of amateur experience and all have previously demonstrated their higher level of competence by already having passed a higher level examination to earn incentive privileges within the amateur bands. . . ."

"I believe you do an unjust disservice to this Advanced Class amateur group. These amateurs at one time or other did qualify for a more advanced technical knowledge than was required for an Amateur Radio Operators License. These operators have had many years of additional experience and it would normally be expected that they have advanced their technical skills with the development of the art. This is usually presumed in the case of all the professions. . . ."

"If the Commission will refer back to the 1946 issues . . . they will note the magazines carried almost nothing in their advertisements pertaining to the sale of kits or complete units such as transmitters or transceivers. They were virtually nonexistent in 1946 and for some years to come. This would point to another important fact favoring the advanced licensee. Specifically, we had to build everything except receivers from scratch. This included no small amount of designing, testing, layout, learning new and better ways, and above all furthering our ability technically as well as an amateur. Isn't this one of the Commission's requirements in Section 97.1? . . ."

The American Radio Relay League stated that . . .

"With no new Advanced Class licenses issued since 1952, it is readily apparent that the 40,000 Advanced Class licensees constitute the largest group of 'old timers' which has contributed so significantly to the amateur radio service and the communications field generally. Almost without exception, the Advanced Class licensees sincerely believe that the Commission will 'break faith' with them if their licenses are down-graded once again to the General Class. . . ."

We believe that these arguments have considerable merit. The Advanced Class licensees, who qualified by examination for the incentive privileges in effect prior to 1952, have operating experience of at least fifteen years and presumably have qualities which it is the purpose of this proceeding to foster. Accordingly, the recommendation for "grandfather" rights to the new license will be adopted and will apply to present holders of the Advanced Class license.

8. Many comments in favor of the new license suggested that it be made available to any lower class licensee without a one year waiting period. They contended that, although the primary purpose of the incentive licensing program was to encourage licensees by imposing license tenure and waiting time requirements. It was also frequently recommended that the proposed 16 word per minute code test requirement for the new license be reduced to 13 words per minute, the requirement for the present General and Conditional Class licenses. Usually, the basis for this suggestion was that an increased code speed bears little relationship to the telephony frequency privileges which are proposed to be reserved to holders of the new license and that such a requirement would, therefore, present an unwarranted deterrent to obtaining the new license. Both of these suggestions, for the reasons presented, are considered valid and will be adopted herein.

9. In the light of the foregoing, the Commission concludes that its proposal for a new higher class of license should be adopted with the following modifications. The present Advanced Class license shall be retained as the new higher class of license instead of creating the Amateur First Class license. Present holders of the Advanced Class license will be renewed as such with all the privileges and status appertaining to the new Advanced Class license. The Advanced Class license shall be available to any eligible applicant who successfully passes the examination requirements which include code test of 13 words per minute and a written examination comprising elements 3 and 4 (A) as set forth in Section 97.21 of the Commission's Rules, as amended herein. Since the code test for this license is being reduced to 13 words per minute, code test credit as well as credit for other elements, in accordance with Section 97.25 of the Commission's Rules, will be given to those applicants for the Advanced Class license who hold the General Class license.

10. In its Notice, the Commission specifically invited comments as to whether there was sufficient interest and utility in the retention of the Amateur Extra Class license in view of the establishment of a new higher class of license. Most of the comments in this regard urged continuation of the Amateur Extra Class license for reasons typified by the following:

"Great need exists for a license class that encompasses the operating and technical requirements of the Extra Class license. Continued sophistication of electronic communications systems and techniques requires parallel achievement on the part of the individual operator. The Extra Class license provides the avenues to this achievement, requiring as it does, a broad knowledge of most modern communications techniques. Its utility is logical with respect to the proposed Amateur First Class license in that it offers further opportunity for individual maturation . . ."

"The continuance of the Amateur Extra Class license is desirable in any case. Given the incentives, the majority of currently licensed amateurs are capable of acquiring the qualifications for that class of license. For some, the effort required will be greater than for others, and comments submitted on this Docket will undoubtedly provide profuse evidence of the natural resistance of human nature to make such an effort if any other way of achieving the same benefits exists. But the fact remains, the requirements are reasonable and represent a reasonable standard of competence for the reservoir of trained personnel which is one of the purposes of the Amateur Radio Service. . . ."

"Retention of the Extra Class as the pinnacle of the amateur licensing system is strongly urged. If the qualification of the Extra Class was desirable in 1952, at the time of creating the Extra Class, it is much more so in 1965, with tremendous advances in radio techniques, all of which should see corresponding advance in the technical level of amateur radio. . . ."

In addition to the comments, we note renewed interest in the Amateur Extra Class license since the inception of this proceeding. The number of holders of this license has increased over 25% in little more than one year. On the basis of these factors, the Commission concludes that the continued issuance of the Amateur Extra Class license as part of the incentive licensing program is appropriate and warranted.

11. As the incentive for the upgrading of licenses, the Commission proposed the reservation of frequency segments in the 2, 6, 15, 20, 40 and 80 meter bands for the exclusive use of the higher class licensees. Exclusive frequency operating privileges were endorsed in the majority of comments as the most meaningful incentive which could be offered to licensees. A small number of comments recommended instead a reduction of power for lower licensee classes with the maximum authorized power reserved to the higher classes of licensees. The proposal for operating power privileges has been previously considered by the Commission but was not regarded as feasible for a number of reasons. These include the likelihood that power limitations would present numerous enforcement difficulties. Also, the Commission has noted that a great many licensees do not need or utilize more than about 200 watts of power so that, apparently, power limitations are not particularly meaningful to at least these licensees. With regard to the reservation of frequency segments, the majority of the comments favored the proposal as adequately representing those frequencies which are attractive and useful to licensees. An important exception related to the fact that there was no provision for any exclusive telephony segments for holders of the Amateur Extra Class license. This it was felt resulted in a total lack of incentive for amateurs who are primarily interested in radiotelephony to advance to this license class. The Commission believes that some exclusive telephony operating privileges as an incentive for the Amateur Extra Class license are appropriate. The other exception related to the proposal for reserved frequency space in the 2 meter band. Many licensees maintained that since this band is very useful for experimental operations, it should continue to be available to all licensees. The Commission agrees and will delete reservation of the proposed 144-155 Mc/s segment. In light of the foregoing, the Commission concludes that the proposal for the reservation of frequency segments for the exclusive use of higher class licensees as the incentive for licensee upgrading should be adopted. With regard to the particular frequency segments proposed in the Notice of Proposed Rule Making, it is determined that they should also be adopted with the Modifications that Amateur Extra Class licensees shall be additionally exclusively entitled to operation in the segments 3800-3825 kc/s and 21250-21275 kc/s and the proposal for reservation of frequencies in the 2 meter band will be deleted. A time schedule, which provides that the reservation of about one half of the frequency segments will be implemented in one year and the other half one year later, was proposed and will be adopted as modified to include, in the first year, the segments additionally reserved for the Amateur Extra Class license. Notwithstanding this schedule, the Commission intends careful review and if it is determined that there is insufficient occupancy of any part of the reserved frequency segments then the effective date of the implementation schedule will necessarily be stayed in whole or in part, as appropriate.

12. The Commission proposed that the Conditional Class license would no longer be available to new applicants who claim eligibility solely by virtue of active duty in the armed forces. With the recent increases in the armed forces, it is apparent that adoption of this proposal may adversely affect numerous persons on active duty. Accordingly, the Commission has determined that this proposal should not be adopted at this time.

13. The commission also proposed that new holders of the Novice Class license shall be given a two year non-renewable license term in lieu of the present one year non-renewable term. It was further proposed that, effective one year after adoption of these rule changes, telephony privileges for the Novice Class licensees in the frequency segment 145-147 Mc/s shall be deleted. Extension of the Novice Class term was intended to afford licensees an additional period for the development of their proficiency and knowledge before attempting to advance to higher classes of licenses. Deletion of Novice Class telephony privileges was designed to foster the code proficiency of these licensees. Almost without exception, the few comments on these proposals supported these rule amendments. The Commission concludes that the considerations which prompted these proposals remain valid and that, therefore, these rule changes should be adopted.

14. The Commission proposed that amateur stations would be assigned distinctive call signs to denote the licensee's class of operator privileges. The proposed schedule for assignment of distinctive call signs provided that call signs of most lower class licensees would have three letter suffixes and a license class identifier in the prefix and that higher class licensees would have new call signs consisting of single or double letter prefixes and double letter suffixes. Essentially, therefore, the proposal contemplated that most present station call signs would be changed to some extent. As stated in our Notice, the primary purpose of a distinctive call sign schedule was to enable the Commission's monitoring personnel to readily determine whether licensees are operating within the range of their privileges. A very large percentage of the licensees who commented objected to this proposal usually for the reason that they had become both attached to and widely associated with their call signs. In its comment, the American Radio Relay League, Inc., sums up this attitude as follows:

"Most amateur radio operators regard their call signs as next in importance to their names. The suffix, in particular, has assumed the character of a person's last name. For many amateurs, years of effort and operating proficiency have earned awards recognized by other amateurs and amateur organizations throughout the world".

The Commission is sympathetic to the importance which the majority of amateurs appear to attach to their present call signs. For this reason, we have carefully re-examined the basis for this proposal to determine if the interests of the effective administration and enforcement of the Amateur Radio

Service can otherwise be served. We have concluded that there are two factors which warrant at least the postponement of a distinctive call sign schedule. First, we believe that in the future, as in the past, the Commission can rely upon the proven ability of most amateur licensees to operate within the limits of prescribed authority and to largely regulate their own radio service. Second, automatic data processing now makes available listings of amateur licensees with their classes of operator licenses which can be utilized by monitoring personnel for reasonably prompt identification purposes provided that enforcement requirements remain minimal. In view of the foregoing, the Commission has decided not to adopt the proposal for distinctive call signs at this time.

15. One aspect of the proposed distinctive call sign schedule related to the assignment of call signs with a single letter prefix and a double letter suffix (e.g. W2AB, K1AA). These call signs are popularly referred to as "two letter" call signs and are cherished as the mark of an "old timer". At the present time the Commission has about 8,000 of these call signs available for assignment and it is our finding that the proposal for their disposition remains essentially appropriate. Accordingly, the following rule changes relating to the assignment of two letter call signs are adopted. To reflect both longevity and/or attainment in amateur licensing, the available two letter call signs will continue to be assigned to previous holders and will also be assigned to holders of the Amateur Extra Class license who submit proof of having held an amateur radio station license issued by the United States Government 25 years or more prior to the date of application therefor. Present holders of two letter call signs can continue to hold them even if they do not meet this criteria. The $20.00 special call sign request fee will be applicable to these requests. Applicants will not be permitted to select specific two letter call signs. However, a former holder of a specific two letter call sign may regain such call sign if it is available in accordance with Section 97.51(a) (1) and (2). Finally, new holders of these call signs will be limited to one such assignment since there are so few available.

16. A number of alternative and counter proposals relating to incentive licensing are reflected in the following formal petitions which have been considered but must be denied for the reasons stated. RM-775, submitted by Mr. Joseph L. Kofron (K7VUI) of Las Vegas, Nevada, proposes that in order to afford youngsters a longer opportunity to gain amateur operating experience the Novice Class license be made renewable by licensees twelve years of age or younger. The Novice Class License term will be extended in this proceeding to two years for all licensees, thus obviating the basic purpose for this proposal. In RM-389, Mr. Martin K. Barrack (WA2ZKR) of Bronx, New York, proposes the deletion of telephony privileges for Novice Class licensees, a proposal already adopted herein. He also proposes the reduction of frequency operating privileges for the Technician Class License. This proposal, to the extent feasible and necessary at this time, has been partially adopted herein. In the other direction, Mr. Alex S. Labounsky (WA2MTB) of Oyster Bay, New York, submitted RM-464, proposing extension of Technician Class privileges to the entire 144-148 Mc/s frequency band. This proposal is, of course, inconsistent with the reduction of Technician Class privileges adopted herein. Mr. Labounsky also submitted RM-771 in which he proposes a new "Engineer" Class amateur license with examination to exceed the difficulty of that for the Amateur Extra Class license. An "Intermediate Class" license is suggested in RM-385 by Mr. Chester L. Smith (K1CCL) of Bedford, Massachusetts, to serve as a "stepping stone" between the Technician Class and higher classes of licenses. Finally, in RM-805, Lt. Col. Irving B. Mickey (W2LCB) of Schenectady, New York, would like only three classes of amateur licenses with new operating limitations. All of these proposals for new or limited classes of licenses are contrary to the license class structure adopted herein.

17. Docket 12912, entitled "Inquiry into the status of the Extra Class Amateur Radio license set forth in Part 12 of the Commission's Rules", has not yet been terminated. The Notice in that proceeding requested comments as to whether or not special privileges should be given to holders of the Amateur Extra Class license. The issues raised in Docket 12912 have been considered and resolved herein, and, accordingly, that proceeding will be terminated in a separate Order.

18. The foregoing determinations represent the Commission's disposition of each of the proposals and counter proposals in this proceeding. In reaching its conclusions, the Commission has made every reasonable effort to provide an opportunity for the remodeling and revitalization of the Amateur Radio Service without changing its basic character and spirit and without depriving any amateur licensee of the major portion of his present operating privileges. It remains only for a licensee to prove himself and to improve the Amateur Radio Service by voluntarily upgrading his license to the highest level of achievement of which he is capable. We are confident that we can rely upon the amateurs in this regard and that, therefore, this incentive licensing program will result in a radio service which will be a source of pride to both amateur licensees and the Commission.

19. In view of the foregoing, the Commission finds that the amendments to Part 97, Amateur Radio Service, as set forth in the attached Appendix are in the public interest, convenience and necessity. The authority for such amendments is contained in Section 4 (i) and 303 of the Communications Act of 1934, as amended.

20. Accordingly, IT IS ORDERED, That effective November 22, 1967, Part 97 of the Commission's Rules IS AMENDED as set forth in the attached Appendix.

21. IT IS FURTHER ORDERED, That, in addition to the eleven petitions set forth in the heading to this proceeding, the pending petitions of Lt. Col. Irving B. Mickey (RM-805) filed June 14, 1965, Mr. Joseph L. Kofron, (RM-775) filed April 28, 1965, Mr. Alex S. Labounsky (RM-773 and RM-464), filed April 27, 1965 and July 10, 1963, respectively, Mr. Martin K. Barrack (RM-389), filed December 12, 1962, have been fully considered and, to the extent that they are at variance with the rule changes adopted herein, they ARE DENIED.

22. IT IS FURTHER ORDERED, That this proceeding IS TERMINATED.

FEDERAL COMMUNICATIONS COMMISSION

Ben F. Waple
Secretary

Attachment:
Appendix

NOTE: Rules changes herein will be covered by T.S. VI(66)-4.

APPENDIX

Part 97 of the Commission's Rules is amended as follows:

1. Section 97.7 is amended to read as follows:

S 97.7 Privileges of operator licenses.

(a) *Amateur Extra Class and Advanced Class.* All authorized amateur privileges including exclusive frequency operating authority in accordance with the following table, effective on the dates shown:

Frequencies	Class of license authorized	Effective Date
3500-3525 kc/s 3800-3825 kc/s 7000-7025 kc/s 14000-14025 kc/s 21000-21025 kc/s 21250-21275 kc/s	Amateur Extra only	November 22, 1968
3500-3550 kc/s 7000-7050 kc/s 14000-14050 kc/s 21000-21050 kc/s	Amateur Extra only	November 22, 1969
3825-3850 kc/s 7200-7225 kc/s 14200-14235 kc/s 21275-21300 kc/s 50-50.1 Mc/s	Amateur Extra and Advanced	November 22, 1968
3825-3900 kc/s 7200-7250 kc/s 14200-14275 kc/s 21275-21350 kc/s 50-50.25 Mc/s	Amateur Extra and Advanced	November 22, 1969

(b) *General Class and Conditional Class.* All authorized amateur privileges except those exclusive frequency operating privileges which are reserved to the Advanced Class and/or the Amateur Extra Class.

(c) *Technician Class.* All authorized amateur privileges on the frequencies 50.25-54 Mc/s and 145-147 Mc/s and in the amateur frequency bands above 220 Mc/s.

Note: Technician Class licensees may additionally operate on the frequencies 50-50.1 Mc/s until November 22, 1968, and 50.1 to 50.25 Mc/s until November 22, 1969.

(d) *Novice Class.* Those amateur privileges designated and limited as follows:

(1) The d.c. plate power input to the vacuum tube or tubes supplying power to the antenna shall not exceed 75 watts, and the transmitter shall be crystal controlled.

(2) Operation on the frequency bands 3700-3750 kc/s, 7150-7200 kc/s, 21.10 to 21.25 Mc/s, and 145-147 Mc/s is authorized for radiotelegraphy using only type A-1 emission.

Note: Novice Class licensees may additionally operate until November 22, 1968, on 145-147 Mc/s for radiotelephony using types of emission as set forth in S 97.61.

2. Section 97.9(b) is amended to read as follows:

S 97.9 Eligibility for new operator license.

* * * * *

(b) *Advanced Class.* Any citizen or national of the United States.

3. Section 97.21 is amended to read as follows:

S 97.21 Examination elements.

Examinations for amateur operator privileges will comprise one or more of the following examination elements:

(a) Element 1(A): Beginner's code test at five (5) words per minute;

(b) Element 1(B): General code test at thirteen (13) words per minute;

(c) Element 1(C): Expert's code test at twenty (20) words per minute;

(d) Element 2: Basic law comprising rules and regulations essential to beginners' operation, including sufficient elementary radio theory for the understanding of those rules;

(e) Element 3: General amateur practice and regulations involving radio operation and apparatus and provisions of treaties, statutes, and rules affecting amateur stations and operators;

(f) Element 4(A): Intermediate amateur practice involving intermediate level radio theory and operation as applicable to modern amateur techniques, including, but not limited to, radiotelephony and radiotelegraphy;

(g) Elements 4(B): Advanced amateur practice involving advanced radio theory and operation as applicable to modern amateur techniques, including, but not limited to, radiotelephony, radiotelegraphy, and transmissions of energy for measurements and observations applied to propagation, for the radio control of remote objects and for similar experimental purposes.

4. Section 97.23 is amended to read as follows:

S 97.23 Examination requirements.

Applicants for original licenses will be required to pass the following examination elements:

(a) Amateur Extra Class: Elements 1(C), e, 4(A), and 4(B);

(b) Advanced Class: Elements 1(B), 3, and 4(A);

(c) General Class and Conditional Class: Elements 1(B) and 3;

(d) Technician Class: Elements 1(A) and 3;

(e) Novice Class: Elements 1(A) and 2.

5. Section 97.25(c) is amended to read as follows:

S 97.25 Examination credit.

* * * * *

(c) An applicant for the Amateur Extra Class operator license will be given credit for examination elements 1(C), 4(A), and 4(B), if he so requests and submits evidence of having held valid amateur radio station or operator license issued by any agency of the United States Government during or prior to April 1917, and qualifies for or currently holds a valid amateur operator license of the General or Advanced Class.

* * * * *

6. Section 97.29(a) is amended to read as follows:

S 97.29 Manner of conducting examinations.

(a) The examination for Amateur Extra, Advanced, and General Classes of amateur operator licenses will be conducted by an authorized Commission employee or representative at locations and at times specified by the Commission.

* * * * *

7. Section 97.31(b) is amended to read as follows:

S 97.31 Grading of examinations.

* * * * *

(b) Seventy-four percent (74%) is the passing grade for written examinations. For the purpose of grading, each element required in qualifying for a particular license will be considered as a separate

[*Continued on page 125*]

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Electronics Careers

Is There One In Your Future?

BY HOWARD S. PYLE, W7OE

Part II: OPPORTUNITIES UNLIMITED

In our initial installment we discussed the wide areas of opportunity which the radio *operating* field offered to the aspirant to an electronics career. This time we shall examine many more of the diversified applications of this fascinating profession in all of which the door to opportunity is swinging wide. Again the radio amateur with his far-from-sketchy background acquired through his self-training, has a tremendous advantage. To what he already knows of the basic theory and practice of the electronics art, add concentrated, directed training in a recognized school specializing in the subject and his professional progress can well be unlimited.

Suppose we first examine what can be probably classed as the fastest growing specialty in the field . . . electronic data processing. To the man on the street the equipment required for this intricate art is casually referred to as 'computers' or, more facetiously, 'electronic brains.' It is hardly necessary to mention the extent to which such so-called computers have invaded the business world. From relatively modest devices suitable for small business operations up to their big brothers costing into the several millions, their impact on modern living has been tremendous. Computers have even found a place for themselves in our social lives; witness the 'marriage computers' which with but a few 'clicks, clacks and whirs' produce in a few short minutes a matching mate with whom to share a lifetime of marital bliss!

As a radio amateur, where do the computers fit *your* picture? Man . . . they are a *natural* for you if a career in this field holds appeal! The mere fact that you *are* a ham, gives you two strikes on them right off the bat! You are *already* familiar with practically *all* of the components entering into the fabrication of one of these scientific monsters. Resistors, capacitors, vacuum tubes, silicon and germanium recitifiers, transistors, relays . . . ad infinitum; the terms roll off your tongue as smoothly as honey dripping from a comb! Schematic diagrams you take in stride . . . interpreting wavy patterns on oscilloscopes are as simple for you as reading time from a clock! So, what *more* do you need to take your place in this fast growing, well paying and challenging field? Just *one* thing will place your feet on the road to success in this complex industry . . . *specialized* training! Expansion of the excellent basic knowledge gained through your amateur radio experience will reward you handsomely. There are many commercial schools today which offer such training . . .

If your leaning is toward retail merchandising, a shop of your own can be a reality rather than an idle dream if you have acquired the electronic 'know-how.'

in a succeeding installment we'll tell you more about them.

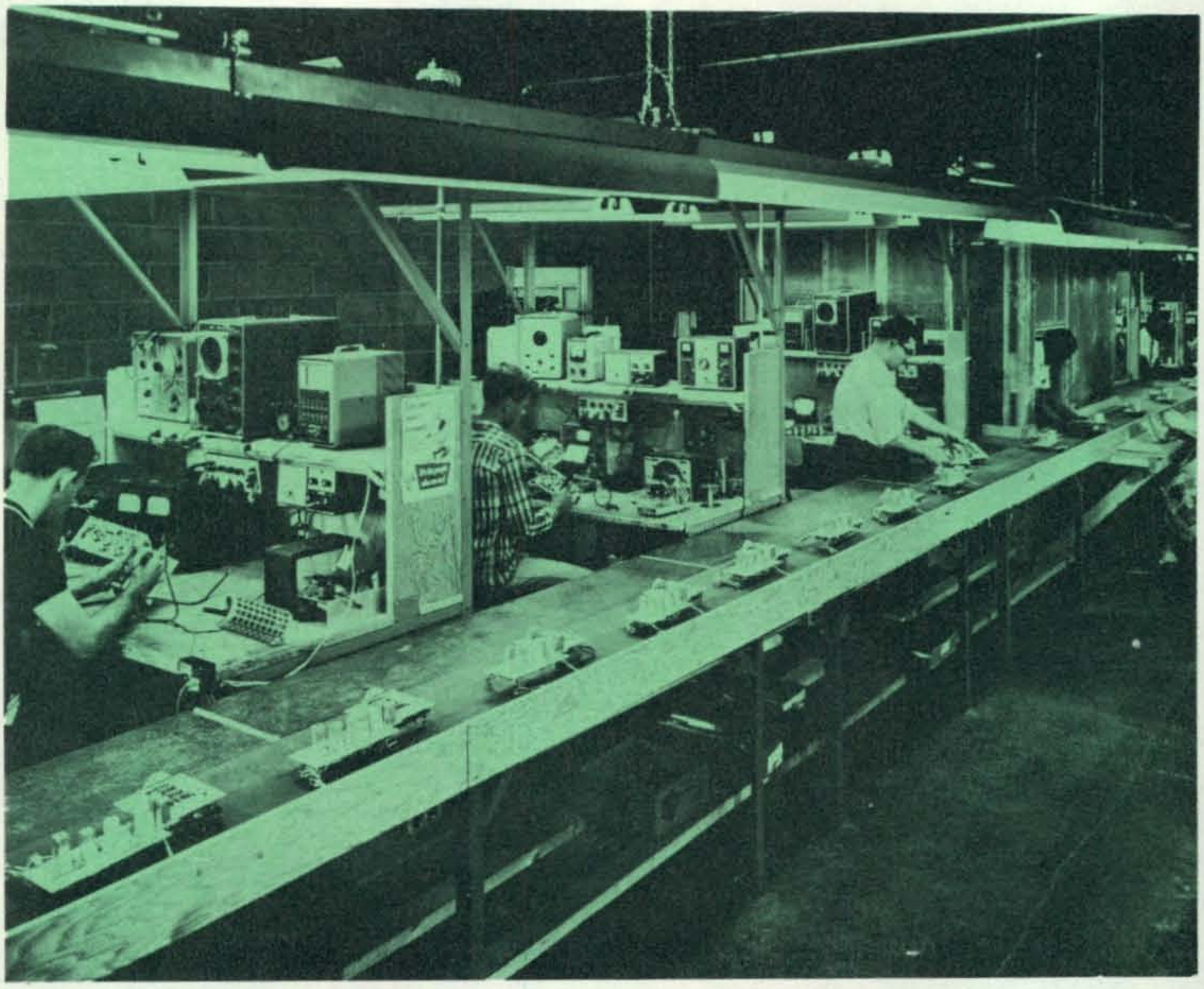
Suppose though, fascinating as it is, data processing does not have as much appeal for you as some other branch of electronics. Could be you're an aviation enthusiast maybe; perhaps do a bit of flying on your own; have always rather leaned toward finding a place in the aviation field somewhere. Why not? Obviously, ham radio also holds a fascination for you; what more delightful prospect could you find than *combining* the two into a most rewarding career? Again your ham activities have given you the basic electronic training; your enthusiasm for aviation has doubtless taught you some of the words if not the 'music' of aviation techniques. Get yourself a bit of *specialized* training through a good school offering aviation electronics in its curriculum and you'll find the personnel manager of just about any airline or aircraft factory pushing a job application at you before you can blink an eye!

You say that we *still* haven't rung the right bell? All right how about this? You've always been a 'cloud-gazer'; like to lie on your back in the shade of a tree and watch the summer cirrus and nimbus drift lazily above you. An occasional glance at the weather cock on your home-brewed weather vane confirms the direction of cloud movement. In inclement weather, the 'dip stick' in your home-made stove pipe rain gauge, tells the dampening story and the mules' tail on your cardboard barometer changes color with the whims of Mother Nature. In other words, a study of the over-all weather picture, viewed from a laymans' standpoint, has always had a fascination for you. Add your ham radio interest to it, take a course in meteorological electronics and you're well on your way to a fascinating future! And, by no means discard the thought that the U. S. Weather Bureau is the *only* prospect for remunerative, pleasant employment as a meterological electronics engineer or technician. All of the major airlines maintain intricate weather observing and forecast equipment . . . marine interests and others have vital need for this information and have provided themselves with equipment with which to get it. The major part of such

Electronic data processing equipment such as shown, incorporating thousands of intricate components, offers a wide field of opportunity for skilled electronic engineers and technicians.

equipment makes use of hundreds of electronic components where your dual skills can well be a part of an exciting field of endeavor.

With as many facets as an exquisite precious stone, it would be most difficult to cover all of the myriad diversified branches of the electronics science. We have touched on but a few which offer exciting careers for the technically inclined. For those whose amateur ambitions have run more to operating techniques, minimizing technical attainments, many doors are open to them in the electronics industry as well. To be a licensed amateur at all calls for at least a fundamental knowledge of electronics and more is bound to 'rub off' even though ham activity is confined mainly to microphone and key. An amazing number of amateurs are employed in stores catering to the ham trade and in the electronics mail order houses. If you have an interest in merchandising there are many opportunities here where your knowledge of component parts, acquired during your ham career, is a valuable asset to prospective employers. Even though you may be of the younger group, just recently out of school and casting about for a gainful career, you can find it in many such merchandising outlets. Even as a stock boy initially, later a counter clerk, followed perhaps by travelling sales assignments, can all lead to department manager positions and eventually, if you have what it takes, to top-level executive positions. For the ham who chooses to make his start in electronics through the merchandising field, we would strongly urge that he augment his knowledge of the technical aspects through enrollment in one of the many excellent electronics trade schools. Whether resident or home study training is undertaken is immaterial; if you live in a city where such a school exists, very likely they are offering evening classes. At points where such schools are non-existent, the equivalent training is readily available by mail. Whichever method of increasing your knowledge you choose will increase your value to your employer and it naturally follows that your opportunity for advancement will follow suit.



The alignment and quality control instrument test area at the Knight Electronics Corporation. The exacting procedures involved demand a high degree of skill and provide a rewarding return for well-trained electronics personnel.

Closely allied to merchandising is electronics manufacturing. Before merchandise can be offered for sale through conventional channels, it must first be fabricated. An awesome number of U. S. factories are devoted exclusively to the manufacture of electronics devices for Government and commercial customers as well as for the general public. Huge work forces ranging through a score or more of trades and professions, are regularly employed by these plants. Unbounded opportunities exist here for the professionally trained electronics engineer, preferably with a scholastic degree. As great a demand exists for the skilled electronics technician. Engineers are mainly used in the design and testing laboratories of major manufacturers; often their services are utilized in exacting and intricate inspection assignments, as well. Many technicians occupy important posts in the inspection departments; others are engaged in intricate assembly and wiring operations.

Employment opportunities for women in a wide range are probably greater in the manufacturing and merchandising branches than in any other electronics group. Hundreds of female employes are used by most of the prominent manufacturing plants, in a variety of occupations. Assembly, wiring, component packing, shipping, sorting, inspection duties and, of course, clerical capacities account for most of these. An intelligent knowledge of electronics components, acquired either through amateur radio activity or schooling or perhaps both, is a valuable asset here as well and favorably affects advancement.

By no means should we overlook the numerous opportunities existing in practically all branches of electronics in various Federal agencies and in state, county and municipal fields. Federal employment can run the gamut from operating and maintenance duties through research, design, space exploration applications, inspection, testing

. . . you name it. Civic agencies such as police and fire departments, state patrols, highway department communications . . . all offer a wide variety of opportunity in both operation and maintenance of electronics equipment. Once more the *trained* individual takes high priority over his lesser brother with a smattering of electronics knowledge gained through High School physics plus what has 'rubbed off' by casual contact with the subject.

We would be remiss in these pages were we not to mention the Radio-TV dealers. Every one of these thousands of 'entertainment merchandisers' must provide a technical service for their customers. Antennas must be installed, equipment properly connected thereto; trouble or total failure of radio or TV sets must receive technical attention. Obviously, even though such dealership is but a one man operation, technical know-how is a must. Larger shops employ from one to sometimes dozens of *trained* technicians. With amateur background and specialized training in the location and repair of electronics faults, such shops are an open market for your services. Many a technician has started on the service bench in such a shop and not too long later become the successful proprietor of an establishment of his own. The radio technician 'trouble-shooter' is the 'Doctor' of the electronics age and his services are in constant demand.

As we have previously pointed out, it is impossible in a series such as this, to even begin to cover the splendid opportunities and the rewarding careers to be attained in the field of electronics. Reams have been published covering the subject . . . they would make several sizeable volumes. It is significant that almost unanimously they stress *training* as the most valuable adjunct to a successful career in this most rapidly expanding field. And, as we have also emphasized, basic electronics knowledge acquired as a licensed radio amateur, plays a very large part in preparation for formal, guided pursuit of an electronics education. In our final installment we shall discuss the facilities available to you as a radio amateur to increase your understanding of theory and principles as well as the practical application of the science of electronics. If you are seriously interested in an electronics career, you will find it most rewarding to pay close attention to the material which we will offer in the closing installment of this series. ■

TEST MODELS FOR H.F. ANTENNAS

BY DAVID P. SMITH *

Trying new antenna designs is one of the most fascinating aspects of amateur radio for many. The author discusses how time, energy and often money can be saved by the antenna experimenter by following a logical sequence in testing out a new design and, particularly, by first constructing a test model.

THE author, like many amateurs, takes a particular interest in the field of antennas and, like most amateurs of similar interest, has erected a number of antennas which looked fine on paper but proved very disappointing in performance. Perhaps some designs didn't prove worthwhile because a basic technical error was made or because the antenna was simply installed improperly. But, whatever the cause, a great deal of time and often some money for materials was lost.

It was decided to solve this problem by taking a hint from the professionals and follow a more logical sequence in building antennas than simply going from sketch to full-scale installation. The ideas in this article are simply offered as such, based on the experiences of the author, to derive more pleasure and eliminate unnecessary expense in antenna experimentation.

Mathematical Analysis

Almost all formal laboratory studies on an antenna idea begin with a mathematical analysis of a proposed design. The analysis might indicate the worth of the design or highlight any special factors to be considered in constructing the physical array. The mathematics, on the other hand, might be incapable of fully describing some array with constructed physical parameters except to indicate its general expected performance. With this information, a model antenna operating in the v.h.f. or u.h.f. range is usually constructed and tested. Parameters are varied to study their effect upon performance. Finally, if these steps indicate some worthwhile design can develop, one or more h.f. prototypes are built and tested as the final proof of the design.

Most amateurs are not equipped to conduct any extensive mathematical analysis of an antenna. However, even a simple picturing of the current flow in the various sections of a directly fed array to see whether the fields produced add or cancel, or the comparison of a proposed design to similar ones in textbooks or handbooks, can yield a great deal of useful information. Even the most complex arrays are combinations of simpler basic forms and by appreciating the performance of the simpler forms, at least some predictions can be made as to the performance of a combination array. Some basis should be established for expecting an antenna design to work other than the power of hope.

Test Models

In any case, even if one can't perform much of a theoretical analysis of a design, a test model can certainly be constructed. This is where the big saving in work as well as materials really appear anyway. A v.h.f. or u.h.f. test model is constructed, basic performance of the antenna checked and changes made to optimize the design. It almost certainly would be impossible to do the latter on most h.f. large size antennas without the test model.

* P.O. Box 188, N. Stonington Village, Conn.

Frequency Scaling

The construction of a v.h.f. or u.h.f. test model antenna can, in most cases, be done simply using self-supporting elements of solid wire or tubing. Care must be taken as far as the scaling of frequency is concerned and the different end effects on the higher frequencies must be considered. Generally, $5900/f$ (mc) will give, in inches, the correct length of a dipole element made from #12 or #14 wire.

One factor that is frequently forgotten when constructing models is that the length/diameter ratio should approximate that of the actual h.f. antenna. For instance, a 40 meter dipole made from #12 or #14 wire has a length diameter ratio of 10,000 to 1. A model antenna, on about 400 mc, constructed of the same size wire, would have a length/diameter ratio of about 150. The reduced ratio may not have any really noticeable effects until it is 100 or less but it should be remembered that smaller ratios will decrease the physical length necessary for resonance and broaden the frequency response of the test antenna beyond what the actual antenna will exhibit. Model antennas can, of course, be constructed of very thin wire to simulate actual length/diameter ratios but then require a model supporting structure. If one were studying a board-band antenna design such model construction might have to be used to gain any realistic picture of actual antenna performance. However, for single-band antennas where it is mainly desired to study the gain and directivity, these factors will generally not be affected by moderate length/diameter ratios (above 100 to 1).

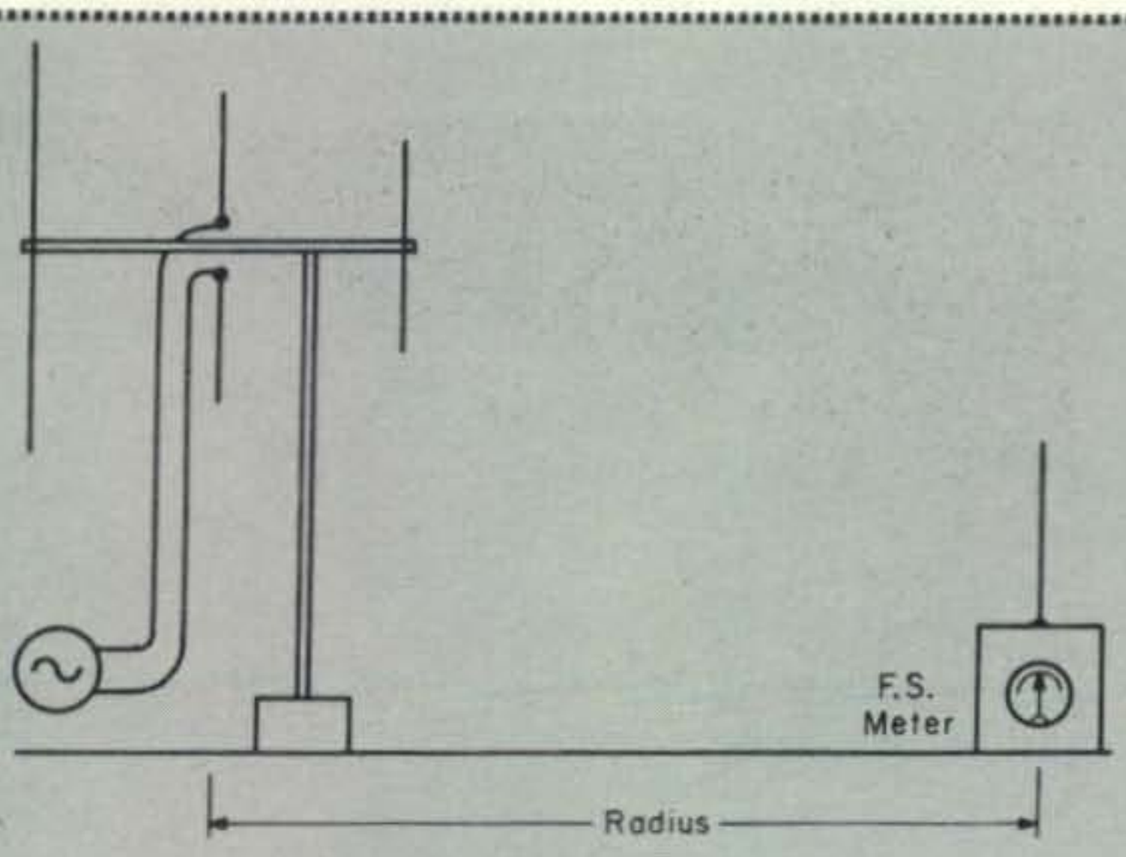


Fig. 1—Simple test set-up to check model antenna characteristics. The test antenna may be pivoted on its stand or the field strength meter may be rotated about the antenna, always maintaining the same radius.

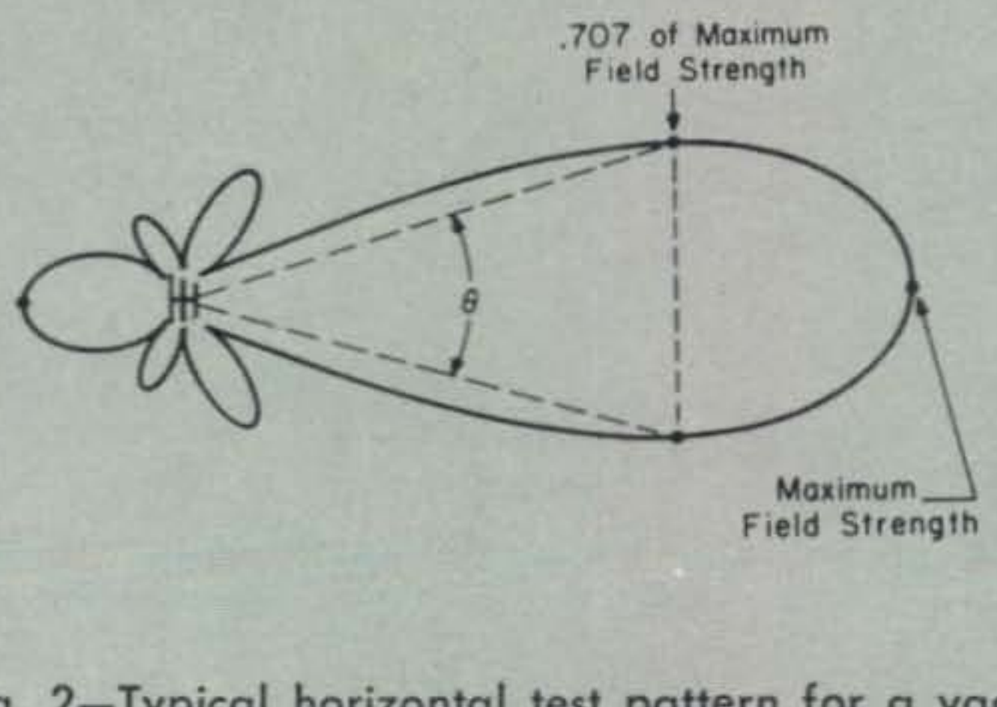


Fig. 2—Typical horizontal test pattern for a yagi type parasitic array. From this pattern we can determine the directivity by measuring the angle between the two half power points and the front to back ratio by measuring the maximum forward power and maximum reverse power.

Testing

It is not possible to simulate every h.f. antenna by a model. Antennas employing complicated stub arrangements and lumped constant loading generally become too tricky to model exactly unless one has various laboratory instruments available. However, models can be constructed for almost all other h.f. antennas commonly used. When checking gain, directivity or frequency response, it must also be remembered that model heights and surfaces, such as a flat metal sheet, are involved. No model can duplicate the involved terrain encountered in many actual situations (not only the form but composition). Nonetheless, one can often come up with a good estimate of whether a complicated array will really perform much better than a simpler array and whether the space and constructional effort involved in an array justifies the probable results.

For purposes of tests, the model antenna can either be energized with a signal and a remote field strength device rotated about the antenna to study its pattern or a signal can be radiated from a remote source and a signal strength measuring device attached to the model antenna which is then rotated to explore its radiation pattern. (See fig. 1.) If the former method is used, a signal generator which extends up to a few hundred

megacycles can be used or even a grid-dip oscillator, if accurate frequency calibration is not required. Alternatively, if only one test frequency is used, 500 megacycles for instance, a simple oscillator can be constructed having a few hundred milliwatts output. Various types of surplus signal generators covering only restricted frequency bands, such as the various radar bands, are available at fairly low prices and make an excellent signal source.

S.W.R. Measurements

The measurement of s.w.r. on the transmission line to a v.h.f. or u.h.f. test antenna is more critical than at h.f. frequencies. Some of the better constructed h.f. s.w.r. bridges may be usable up to frequencies of about 400 mc. Most, however, extend down to only the 6 or 2 meter bands. The construction of accurate s.w.r. measuring devices usable above a few hundred megacycles can become very time consuming for the amateur who does not have good u.h.f. test equipment. Probably the easiest solution for someone who wants to make s.w.r. measurements on a test antenna is to obtain a surplus directional coupler which corresponds to the frequency range of the test generator being used. If calibration information is not available with the coupler, it can be roughly calibrated by using ½ watt carbon composition resistors to simulate various s.w.r.'s.

The accurate measurement of s.w.r. versus bandwidth is probably one of the most difficult things to accomplish in a simple test situation. When an antenna configuration with multiple direct feed points is involved, the phasing or matching conditions can drastically alter the radiation pattern of the antenna. With a single feed point antenna, this is not so and one can still learn many things about the radiation pattern without having a matched transmission line condition. In fact, as long as the transmission line is relatively short so that its losses are low, even though the s.w.r. may be high, one can even obtain reasonably good indication of antenna gain as compared to a reference dipole antenna.

Field Strength Measurements

The radiated field from a test antenna can be measured by a conventional field-strength type meter with an input circuit tuned to the test generator frequency for maximum sensitivity. A dipole can be constructed for use as a reference antenna and optimized by adjusting its length for maximum indication on a field-strength meter placed as far as possible from the dipole in an unobstructed direction which still gives a usable meter indication. Then, if the reference dipole is removed and the test antenna model substituted in its place while maintaining the same generator output, a reasonable gain comparison between the antennas can be obtained. If the field-strength meter is rotated about the test antenna while maintaining the same radius, a plot of the horizontal radiation pattern can be obtained as shown in fig. 2. The pickup meter can be rotated about the test antenna in other planes also, as practicable, to study

[*Continued on page 114*]

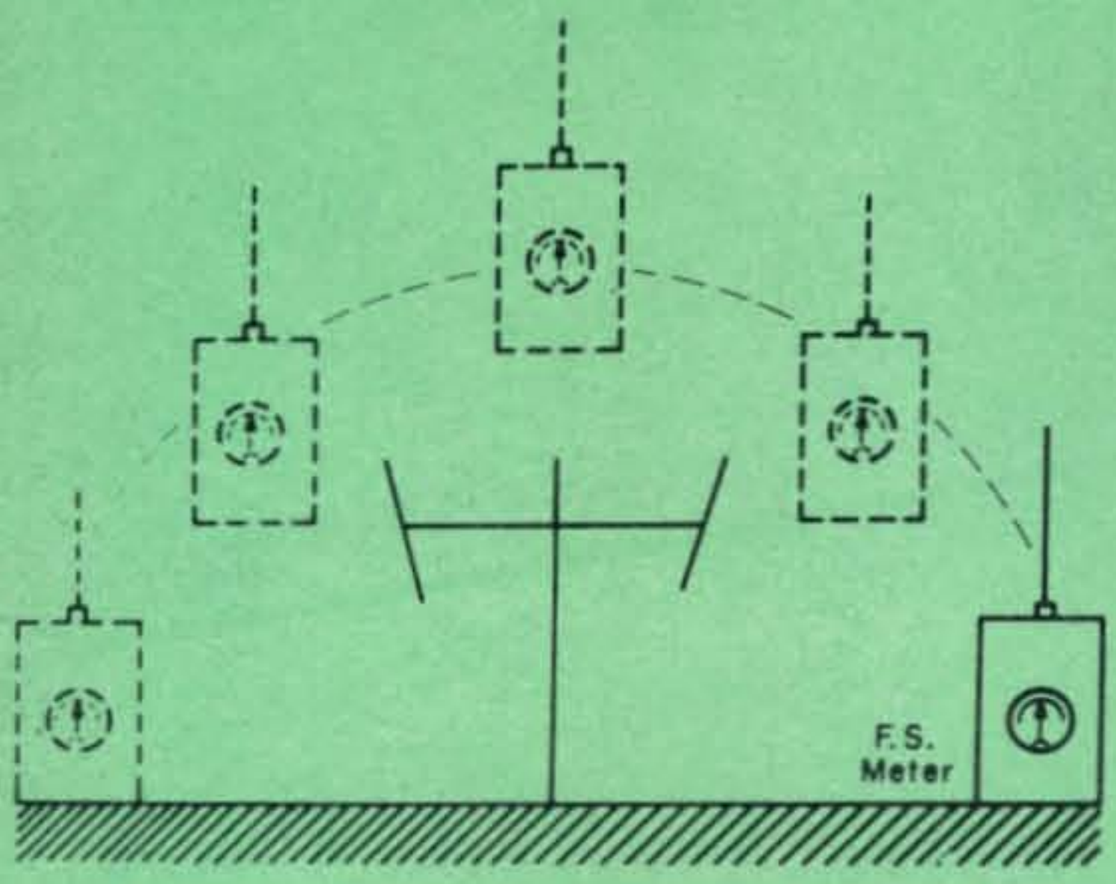


Fig. 3—By swinging the field strength meter in a 180° arc over the antenna the angle of radiation can be determined with fair accuracy.

An example of a simple model constructed from stiff wire to study a yagi configuration. This test antenna was cut for 700 mc.

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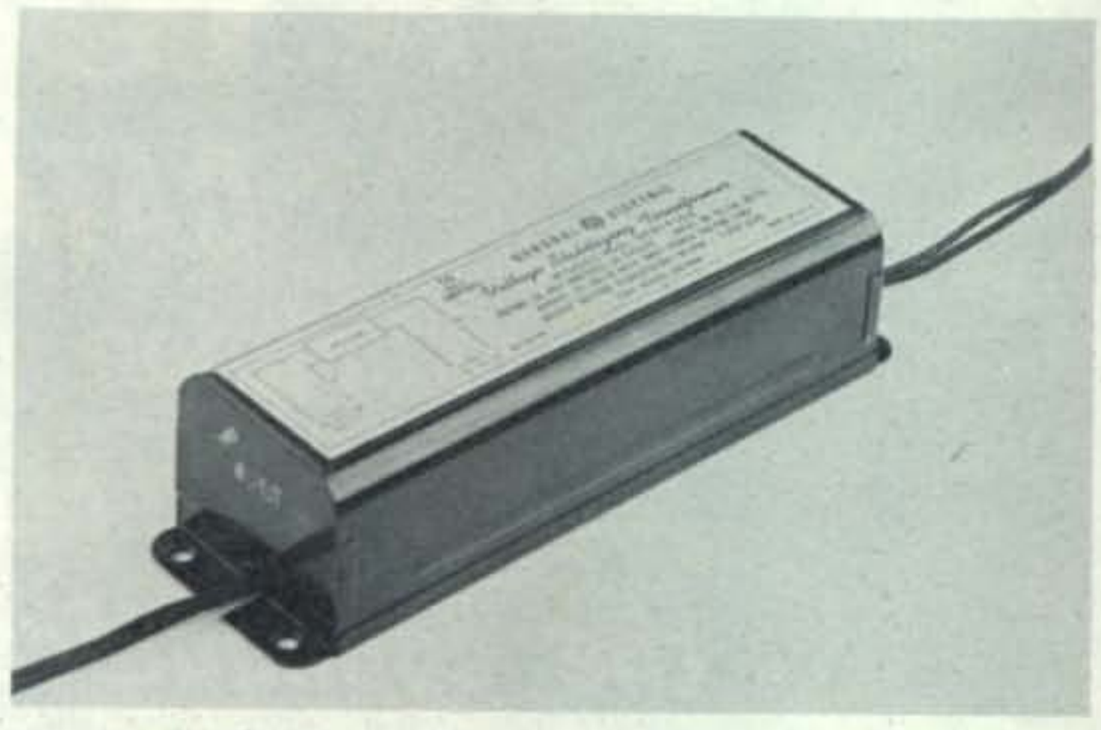
The Importance of
Line Voltage Regulation



General Electric voltage stabilizer (#9T91Y100) is of the series resonant type and has a 50 volt ampere capability.

BY DEVERE E. LOGAN, WB2FBF

IF YOUR rock-stable v.f.o. suddenly casts adrift and the XYL complains that the late show is shrinking, there may be some downright nasty things happening to your a.c. line voltage.

Recently we were running some frequency checks on a v.f.o. and decided to run a parallel check on our a.c. line voltage. We got quite a jolt when our voltmeter did a nosedive from 118 down to 90 volts and back again. We began to wonder how many other unsuspecting hams have been placing too much faith in what we all take for granted: stable a.c. line voltage.

While most power companies supply a generally-constant frequency of 60 cycles, there can be wide ranges of voltage according to location, and it's a good idea to take steps to guarantee top performance from your communications equipment by insuring stable a.c.

* 21 Judith Street, Nanuet, New York 10954.

Poor Voltage Regulation

Fluctuating voltage has a deteriorating effect upon electronic gear in addition to incandescent lamps, television sets, and numerous other a.c. operated devices.

Improper voltage control can cause computers to give wrong answers and radar sets to fail. Tungsten tube life is reduced by half for each five percent increase in emitter voltage due to the higher rate of evaporation of the cathode material. Gas filled tubes such as thyratrons react violently to slight undervoltages as the gas molecules bombard the cathode and may destroy the tube in minutes.

Capacitors are also unlikely to take kindly to fluctuations in line voltages. Since the corrective capacity of capacitors varies with the square of the impressed voltage, a drop of ten per cent in supply voltage reduces the corrective capacity by almost 20 per cent.

Last, and far from least, is the stability of transmitters and the many voltage-sensitive circuits critical to proper operating parameters.

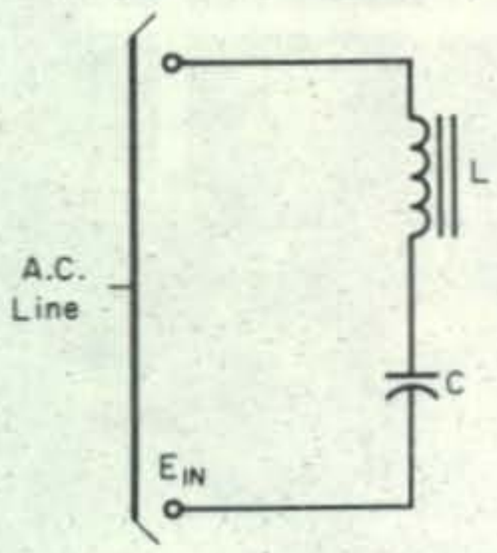


Fig. 1—Basic series resonant circuit on which the function of a line voltage regulator is based.

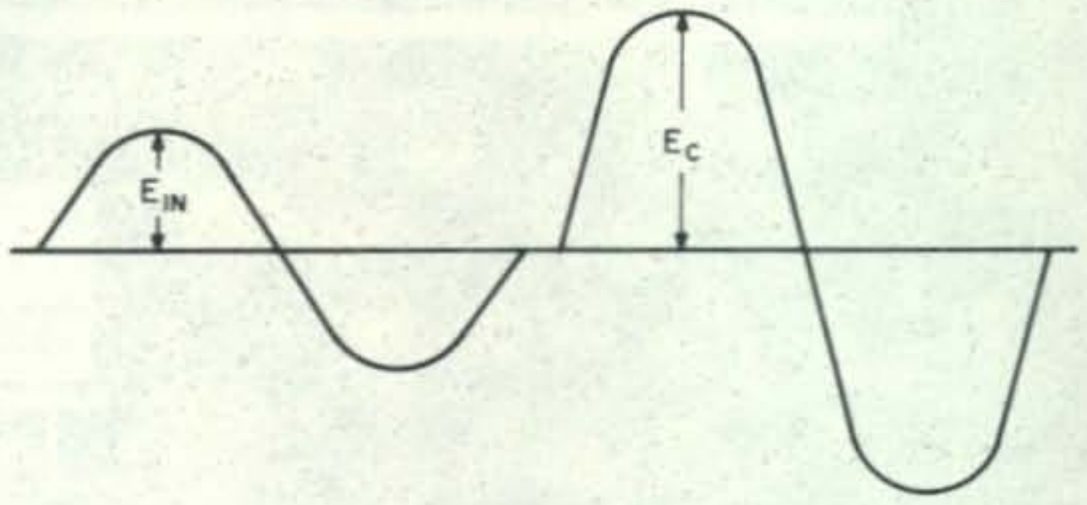


Fig. 2—Comparison of the input voltage and voltage across the capacitor in fig. 1 when f_r is slightly higher than the line frequency.

A.C. Line Voltage Stabilizers

One solution to the problem of fluctuating line voltage in the ham shack is to use a voltage stabilizer. There are commercially available types listed by the major electronic supply houses and various bargain buys can be found hidden away at surplus stores.

A common design of these units employs combinations of inductance and capacitance to maintain the a.c. line voltage to within plus or minus one per cent even though the input fluctuates 15 per cent either way.

Theory of Operation

Figure 1 shows an inductor and a capacitor across an a.c. line. Their resonant frequency is selected at slightly higher than 60 cycles to allow a capacitive reactance higher than the inductive reactance at 60 cycles. This allows a voltage buildup across the capacitor, E_c, that's higher than the line voltage, E_{in} (fig. 2).

To smooth the voltage to a predetermined amplitude, a magnetic switch sensitive to voltage amplitude is used. This limiting action is accomplished by using a self-saturating inductor which has a high impedance until a certain flux density level is reached. At that point the high impedance inductor becomes a low impedance path that prevents additional voltage buildup across the capacitor.

Figure 3 shows a typical basic circuit. The limiting action produces a voltage wave form that has a fairly flat top characteristic. A harmonic filter can be added to the circuit to produce an output waveform having very low harmonic content.

Induction Voltage Regulators

Another type of regulator, used in conjunction with radar systems and computers, is the induction voltage regulator.

Basically, the induction type unit consists of a laminated steel stator on which the regulator winding is placed, and a laminated steel rotor containing the exciter winding. Construction is similar to an electric motor, except that the rotor doesn't rotate beyond 180 degrees.

Figure 4 shows the wiring arrangement of an induction type unit. The regulating (stator) winding is connected in series with the load, while the exciter (rotor) winding is shunted across the line.

In operation, the automatic control circuit senses the need for voltage correction and actuates a reversible electric motor which drives the rotor through a heavy-duty worm gear. As the motor moves the rotor in either direction it changes the position of the rotor winding with respect to the stator winding. This causes an increase or decrease in the induced voltage of the series winding, thus adding to or subtracting from the supply voltage to produce the desired output.

Typical Commercial Unit

One manufacturer of commercial a.c. line voltage stabilizers is General Electric. They manufacture units with various ratings from 15 volt-amp output capacity right on up to 15,000 va. A standard 30 volt-amp unit (9T91Y4090) measures $10 \times 3 \times 2$ inches, provides a stabilized output of 115 volts for an input voltage range of from 95 to 130 volts, and carries a suggested retail price of $16.80. A 15 volt-amp unit is $14.70. ■

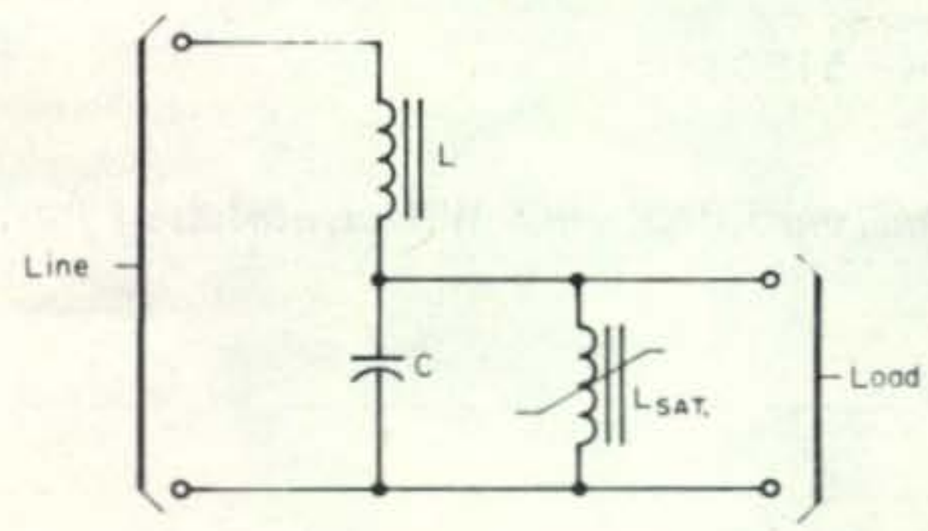


Fig. 3—Basic circuit of an LC type voltage stabilizer.

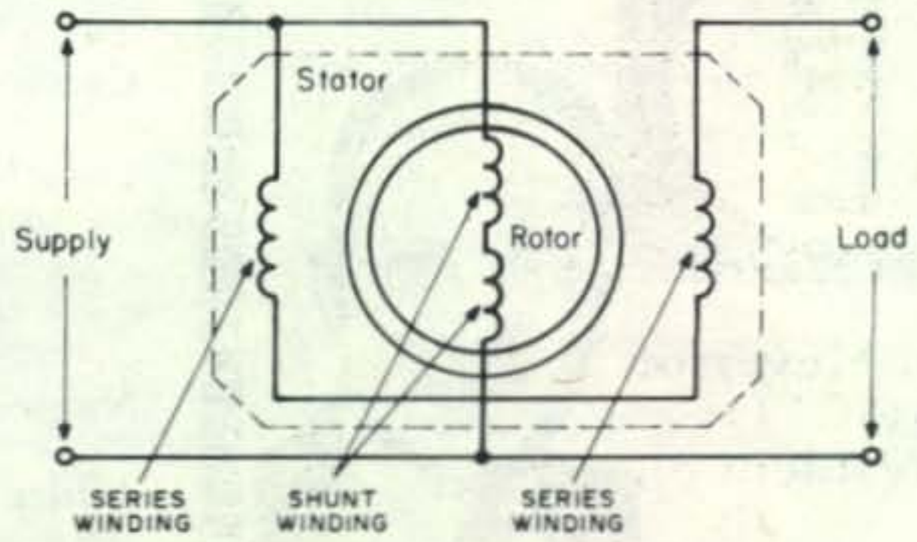


Fig. 4—Circuit of an induction type of voltage regulator. The rotor is driven by a reversible motor controlled by a voltage sensing circuit.

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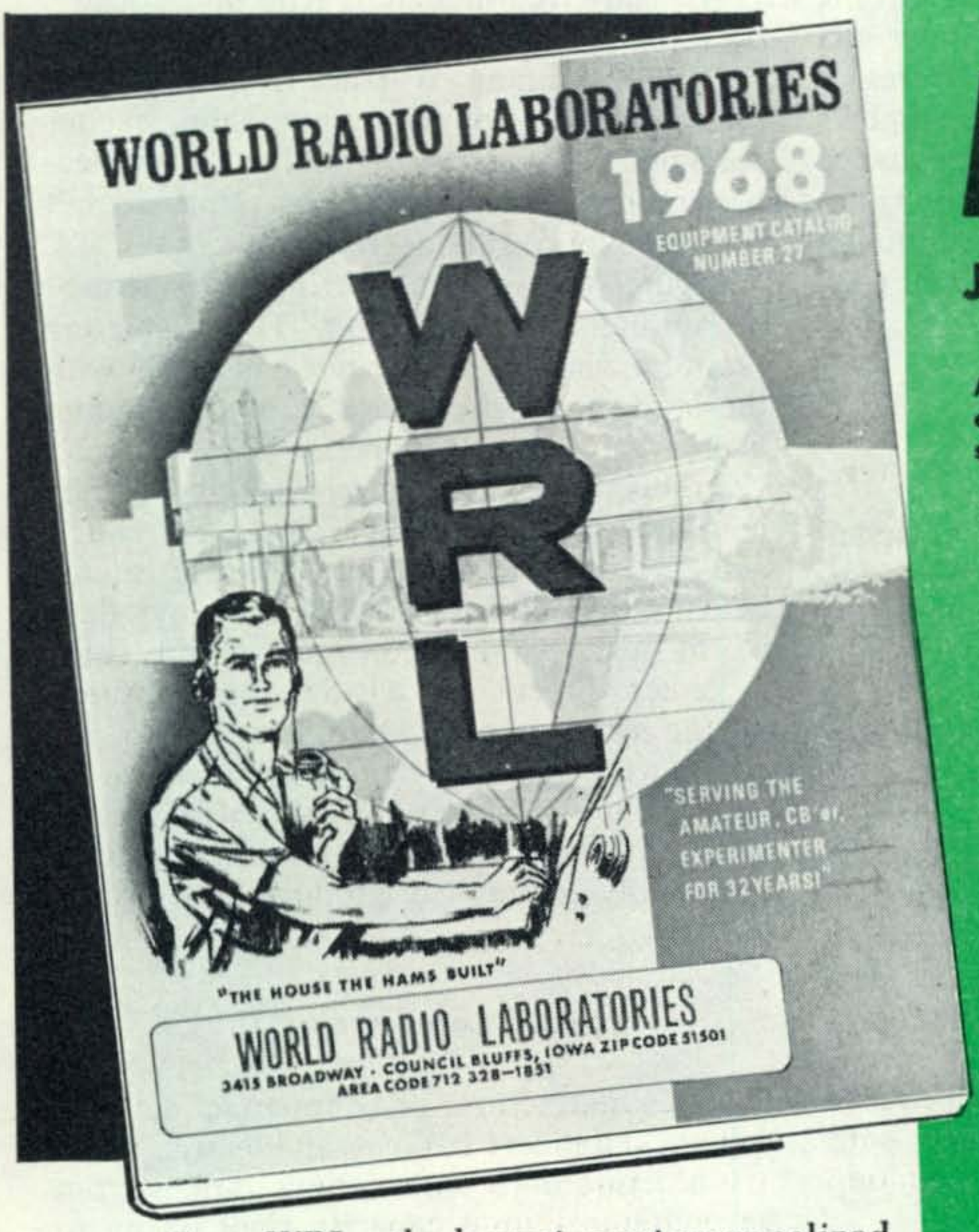

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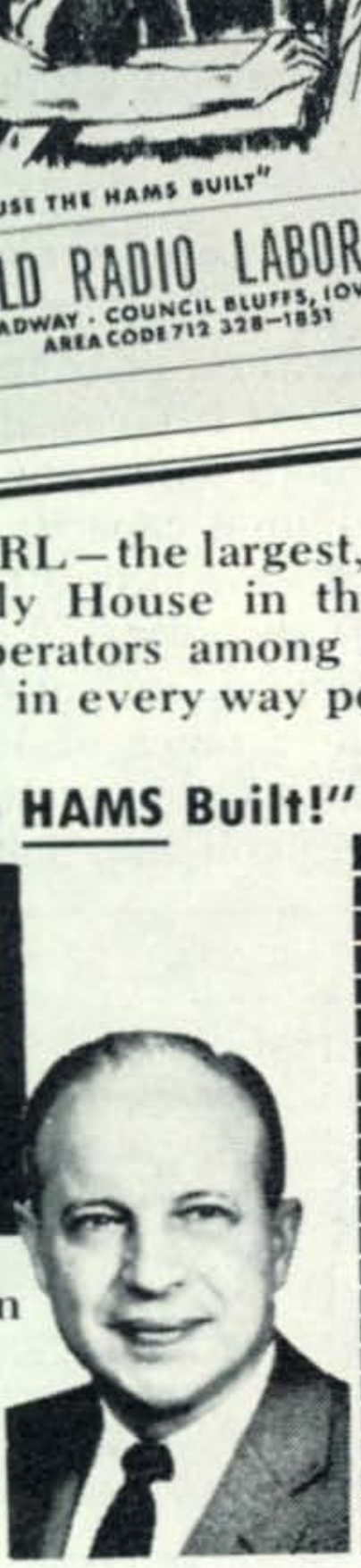

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Front view of the Swan SW-240 transceiver with increment tuning added.

BY LOU DEZETTEL,* W9SFW

A TRANSCEIVER by virtue of its dual function and common use of circuits for transmit and receiver results in savings in space, weight and cost. An additional important advantage is single dial tuning for spot transmit and receive operation which puts both parties in QSO on the same frequency.

There is, however, one problem with single frequency operation. In a QSO, any oscillator drift results in a "follow-the-leader game in which one fellow keeps retuning to follow the other's drift. This can be twice as bad if both drift in the same direction.

The solution to the follow-the-leader game is for the transceiver to be equipped with *increment tuning* on RECEIVE. This is sometimes called delta tuning and is often built into the more expensive ham transceiver. It consists of a control that permits manual shift of frequency slightly on receive only. However, even though you tune the increment control to clean up the received signal the transmit frequency is not altered.

Another advantage of increment tuning is in operating c.w. with a transceiver. It permits you to adjust the received tone without affecting the transmit frequency.

If your transceiver doesn't have increment tuning, you can easily add it. The secret of increment tuning is in a little semiconductor device called a varactor diode or Varicap.

The Varicap

The Varicap is a diode designed for application as a variable capacitor. By connecting a Varicap in the h.f. oscillator circuit you can vary the frequency by varying the voltage to the Varicap. And the most wonderful part is, you can do it remotely. The voltage control potentiometer may be located anywhere, on the front panel for example, because the connecting leads carry only d.c. to the Varicap, which must be located near the oscillator circuit.

The Circuit

Let's take a look at the schematic shown in fig. 1. There are two areas. One is an adjustable voltage divider to supply a desired value of d.c. to the Varicap, and the

* 10034 Luella Ave., Chicago, Ill. 60617.

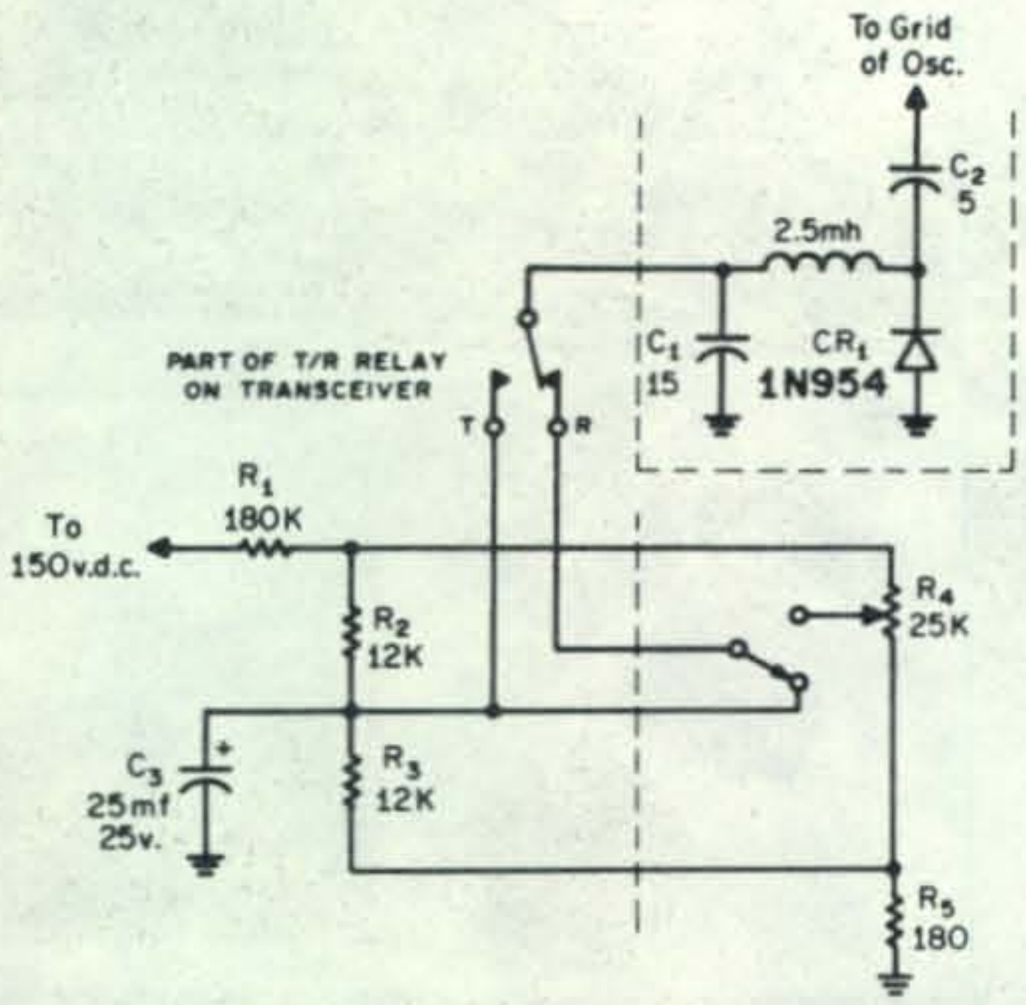

Fig. 1—Circuit of the increment tuning addition. The components in the dotted enclosure must be located close to the h.f. oscillator and the wiring kept short and rigid. The capacitors in the dotted enclosure are in mmf and should be high quality silver mica types. The diode, CR_1, is made by Hughes and is listed in the Allied catalog. The 25K pot should have a linear taper.

other is the Varicap circuit. The voltage divider is in two parts; one is the series string R_1, R_2, R_3 and R_5. The second divider consists of R_1, the potentiometer R_4 and R_5. The first, or fixed value, divider provides a constant voltage for the Varicap when in TRANSMIT. The other divider has a nearly equivalent total value, but R_2 and R_3 are replaced by the potentiometer R_4 and provides a variable voltage to the Varicap for RECEIVE operation. Note that the junction of R_2 and R_3 is about equal to the center point on the pot, R_4.

There is one hitch; you must have an extra set of contacts on the T/R relay in your transceiver for switching the voltage dividers. Most transceivers have extra relay contacts for switching a following linear amplifier. If you do not have the extra set of contacts, or it's being used for a linear amplifier, of course you will have to add a relay.

Operation

The s.p.d.t. switch in the circuit selects normal transceive operation or increment tuning on receive. In the shown position the fixed divider is in the circuit whether on transmit or receive. In the alternate position, the potentiometer is in the circuit on receive and the fixed divider on transmit.

The Varicap selected is a Hughes, 1N954. It varies in capacitance between 14 mmf and 88 mmf when the voltage applied to it is varied from 25 to 0.1 d.c. That's a lot of capactity change to be used directly across a h.f. resonant circuit, so its effect is reduced by the selection of series capacitor, C_2, which in this case is only 5 mmf. The larger the value of C_2 the greater the effect of the Varicap, of course. The 5 mc h.f. oscillator in the Swan SW-240, to which this circuit was added, has about 180 mmf of total effective capacitance across the inductor in the resonant circuit. The 1N954 and the 5 mmf capacitor will vary the frequency about 1500 cycles, which I find quite adequate. If any greater change is needed it is time for one party or the other to the QSO to retune his transceiver.

Correcting Calibration

Of course, adding the Varicap in series with C_2 across the oscillator adds a little overall capacitance and lowers the oscillator frequency. This effect must be compensated for by reducing the value of the parallel trimmer in the oscillator about 4 mmf to maintain dial tracking. The adjustment should be made by beating the receiver against a known fixed frequency such as from a 100 kc oscillator. Retrim the oscillator with the panel switch in the NORMAL position.

Overall frequency stability does not seem to be affected by the addition of this increment tuning circuit. The Swan SW-240 has excellent frequency stability, and it con-

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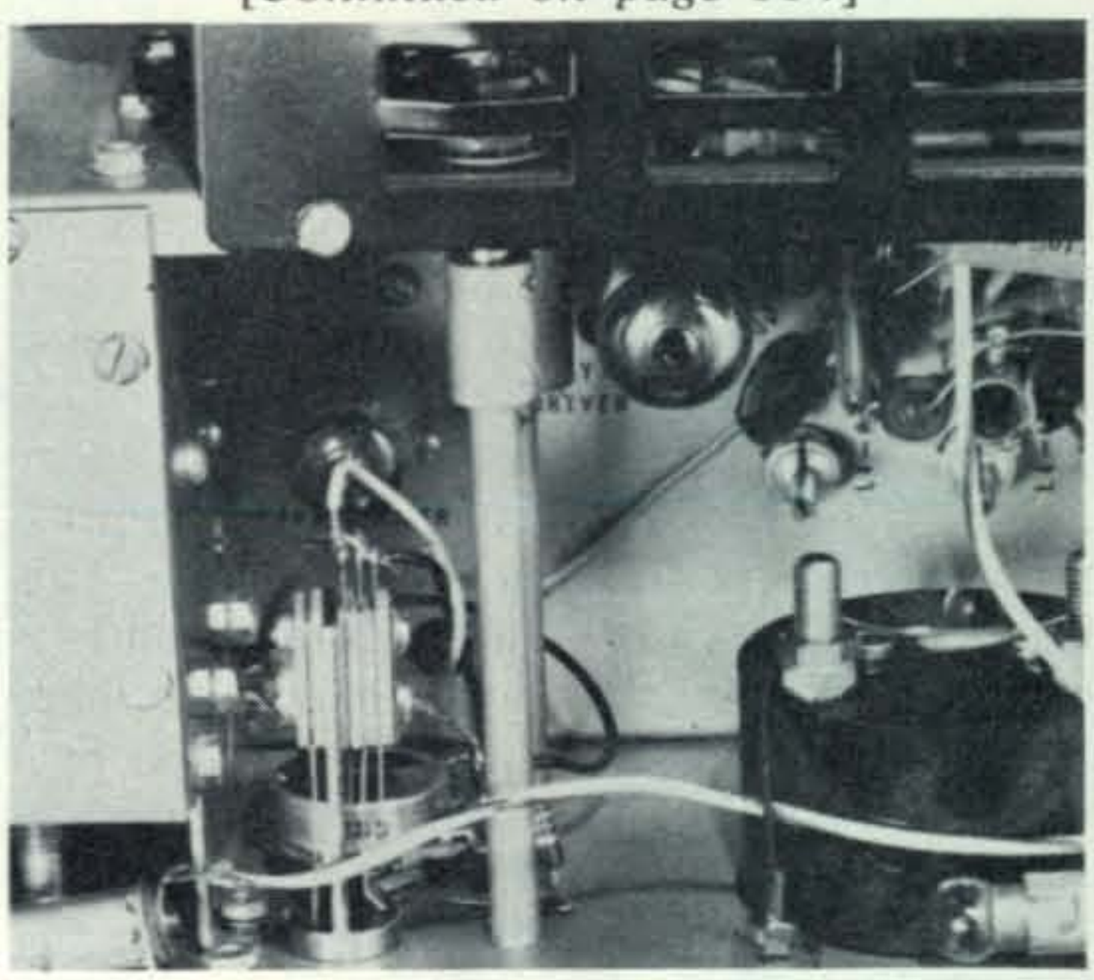

Behind-the-panel view shows lever-type switch and pot located beside the v.f.o. shield compartment.

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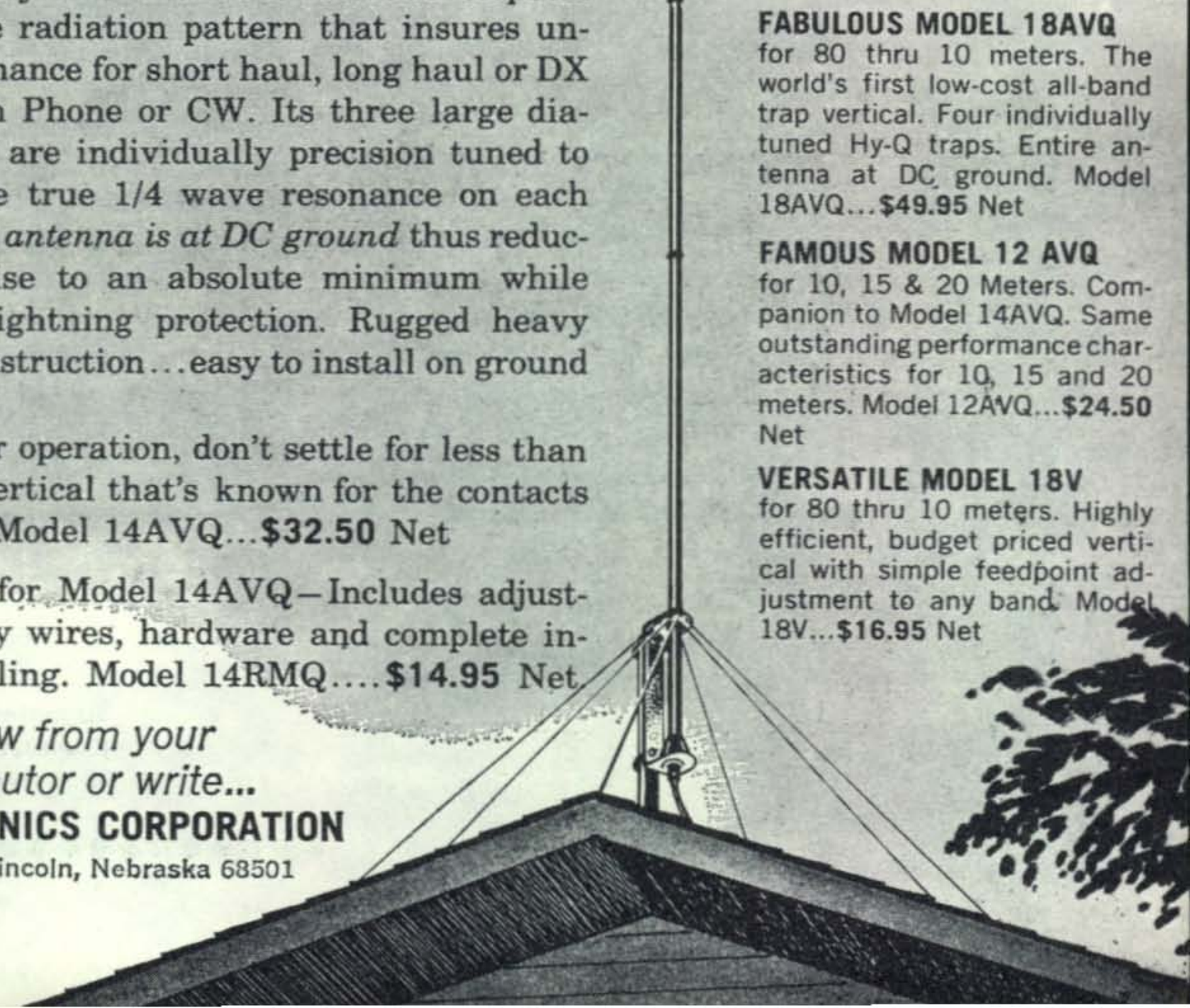


A Feedline Tuning-Unit for 80, 40 and 20 Meters

BY ED MARRINER,* W6BLZ

Described below is an 80-40-20 meter antenna tuner for 300 ohm to 600 ohm open wire tuned lines. The use of a duo-differential tuning capacitor in the antenna tuner permits simple and rapid adjustment.

WHEN I was operating in the 3800-4000 kc portion of the 80 meter band with a coax fed dipole and wanted to shift to 3500 kc, the antenna simply would not tune. The desire to correct this situation was strong enough to result in the creation of the antenna tuner described below. With this tuner I can now operate anywhere in the 80-40-20 meter amateur bands by the simple expedient of switching bands and tuning two capacitors. The tuner can be made to operate on the 15 and 10 meter bands if smaller coils are used.

This 80-40-20 meter tuner can be used to tune 300 to 600 ohm open wire line as used with a center fed antenna system, or it can be used to tune random lengths of wire. The flexibility of the tuner is the use of a duo-differential capacitor that capacitively matches the feeders to the proper impedance match across the coil.

Antenna tuners often appear in radio journals, but they seldom ever mention using the duo-differential capacitor to replace the fussing around with clips to find the minimum s.w.r. spot to attach the feedline. The capacitor is a neglected component probably because it is never found in the junk box, and the Johnson type 169-25 is probably the only one on the market. Several amateurs have assembled this type of capacitor by using pulleys and other mechani-

* 528 Colima Street, La Jolla, California 92037.

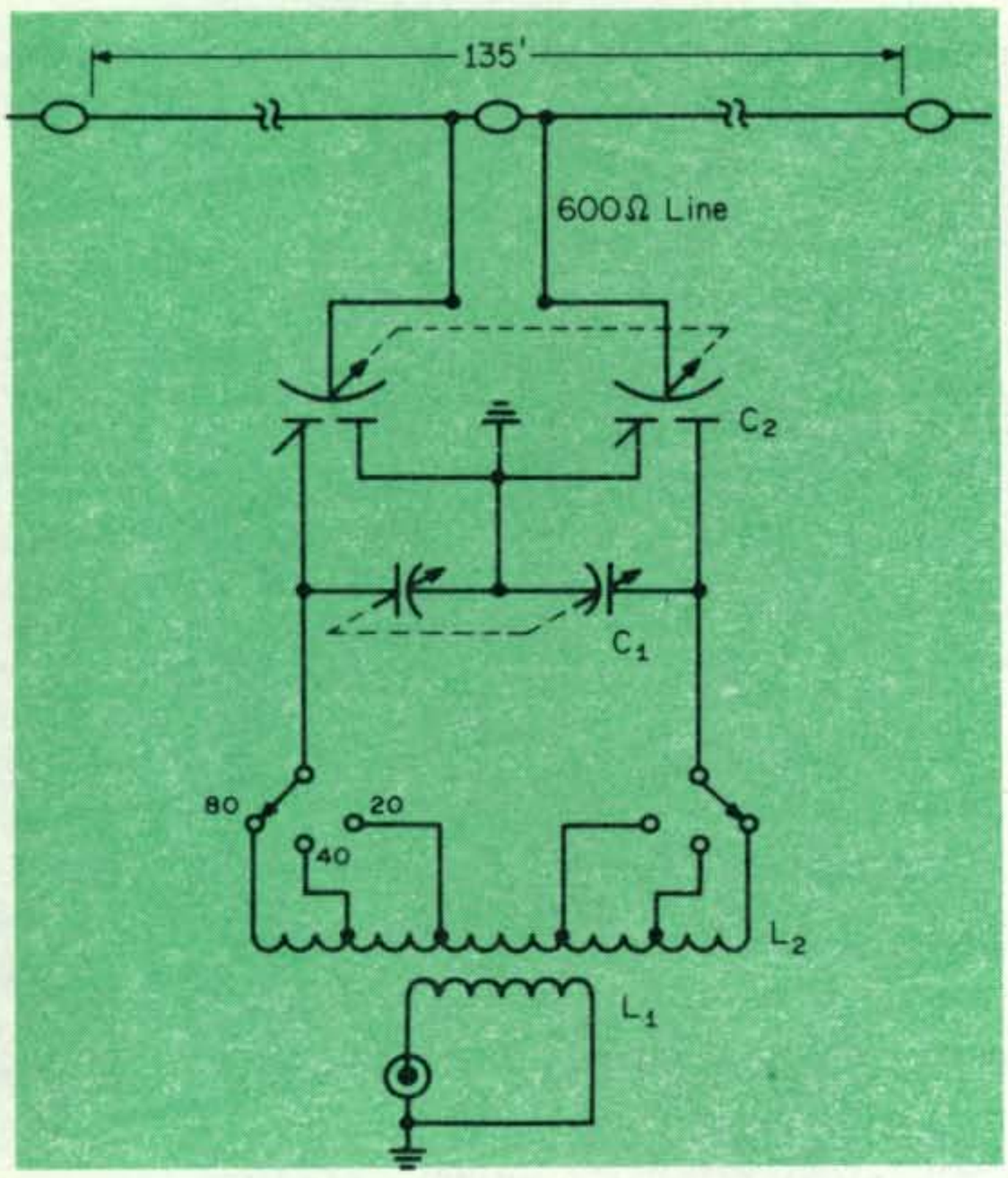


Fig. 1—Circuit of a simple 80-40-20 meter antenna tuner. The 600 ohm line is spaced 6 inches.

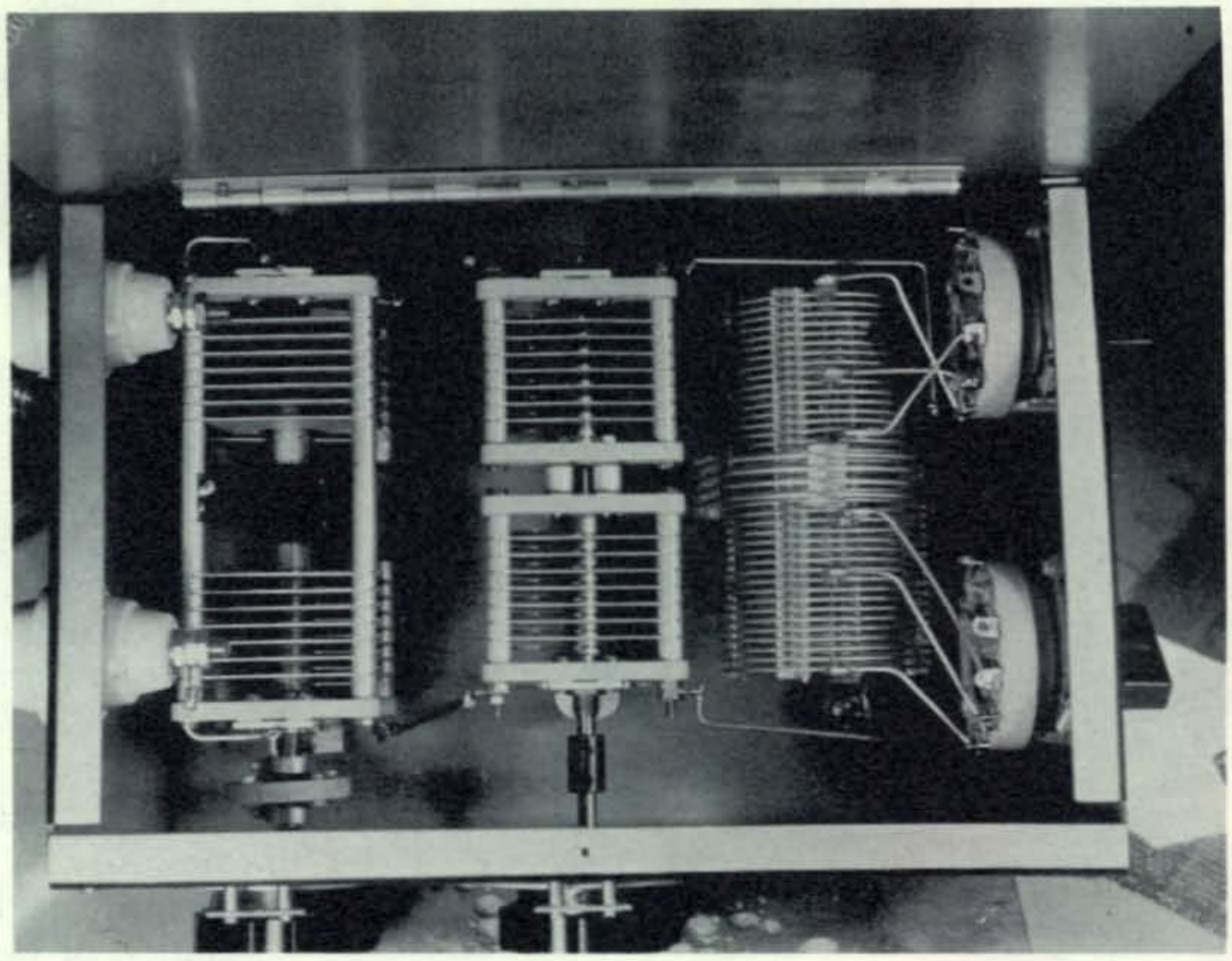
C_1—50-50 mmf dual variable. Johnson 154-505 or equiv.

C_2—100 mmf duo differential variable. Johnson 169-25 or equiv. See text.

L_1—4 t. #12, 3" dia., t.p.i. Air Dux #2406 or equiv.

L_2—40 t. #14, 2½" dia., 8 t.p.i. Air-Dux #2008 or equiv.

80 meters, full coil.
40 meters, 20 turns.
20 meters, 9 turns.



Top view of the antenna tuner shows the dual differential capacitor on the left close to the 600-ohm feedthrough insulators. Note the insulated coupling that isolates the two rotor sections of the differential capacitor and the insulated flexible coupling to the shaft of the tuning knob. The two surplus switches are mounted on the right wall of the enclosure.

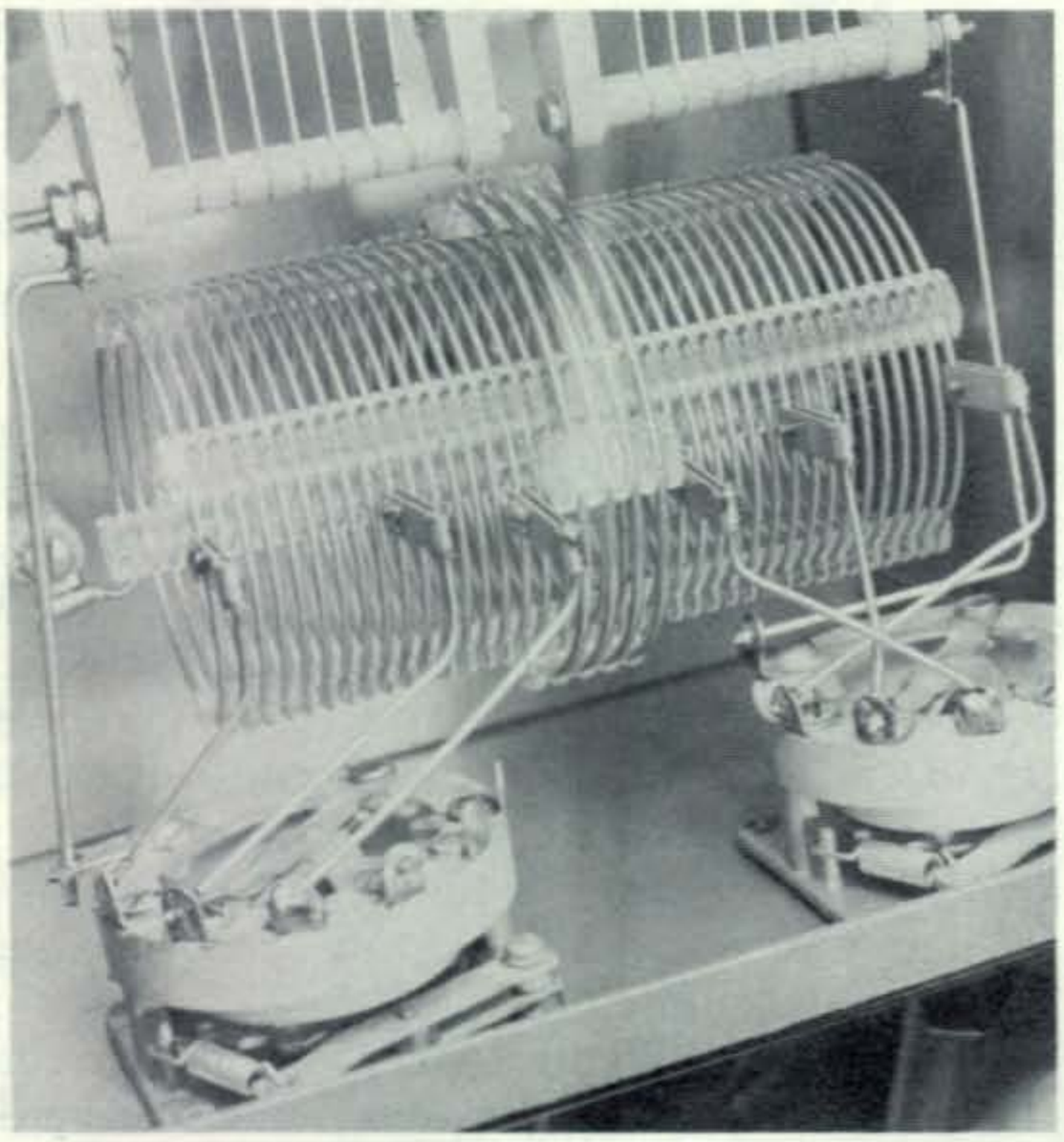
cal means but it is not easy. Whatever the investment or time taken to build this tuner, the ease of tuning when it is finished will be appreciated.

Circuit Description

The circuit of the antenna tuner is shown in fig. 1. Note the simplicity of the arrangement. This could actually have been further simplified had not surplus switches been used for S_1. These switches are gotten from the BC-375E tuning units and are heavy duty r.f. types. If you purchase your switch, a two pole three position unit can be used instead of two one pole types thus eliminating one front panel control.

A high capacity variable was tried in series with the four turn link and the coax to the transmitter. It was found that it did not help cut down the s.w.r. and the tuning dials could not be calibrated. Just using the four turn link, operation on the three bands was satisfactory and the dials could be calibrated for any one antenna set-up.

The dual 50 mmf tuning capacitor (C_1) is conventional and needs no description. The



Close up view of the coil and switches showing how taps are made using clips. The position of the taps are not critical.

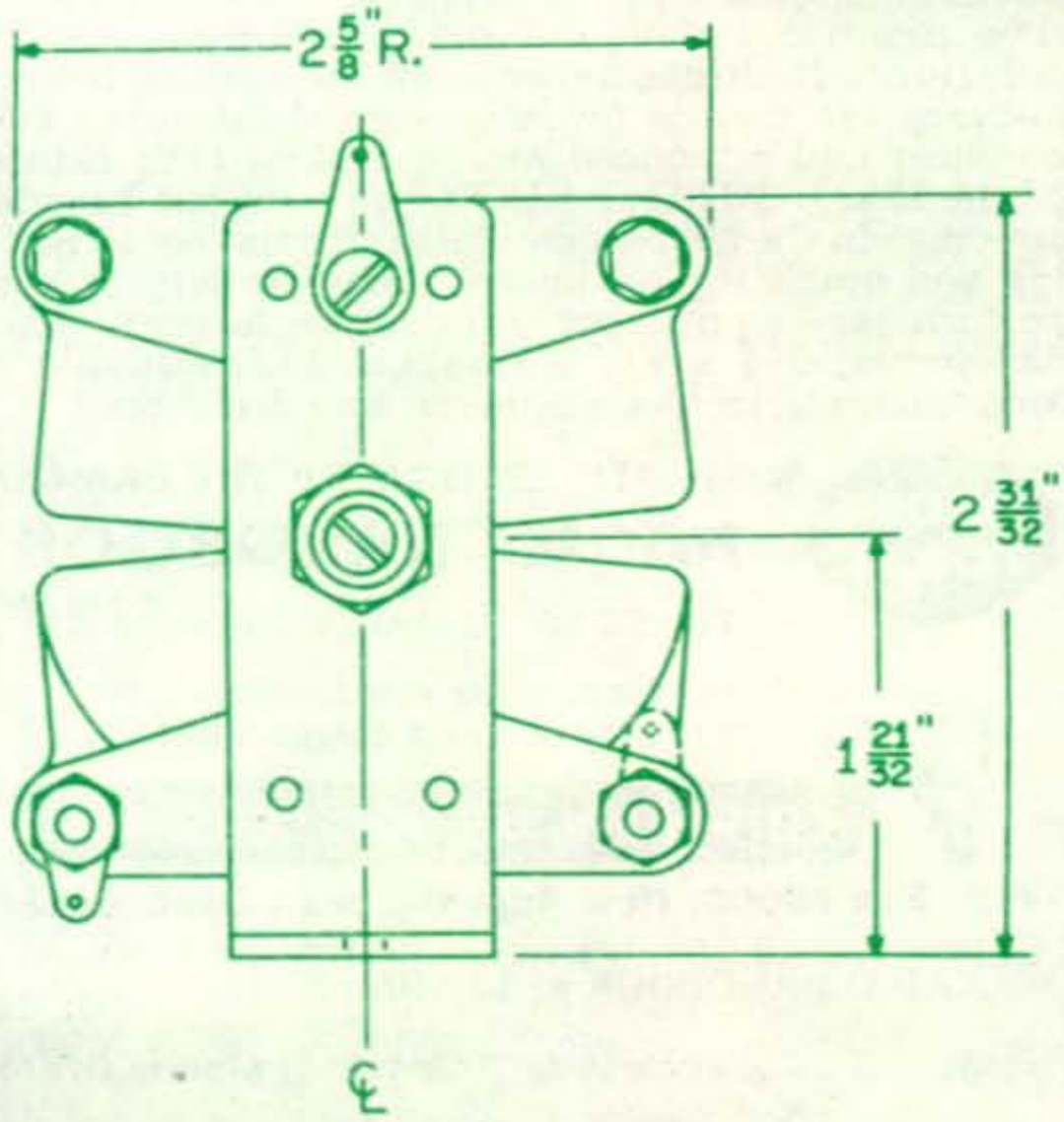
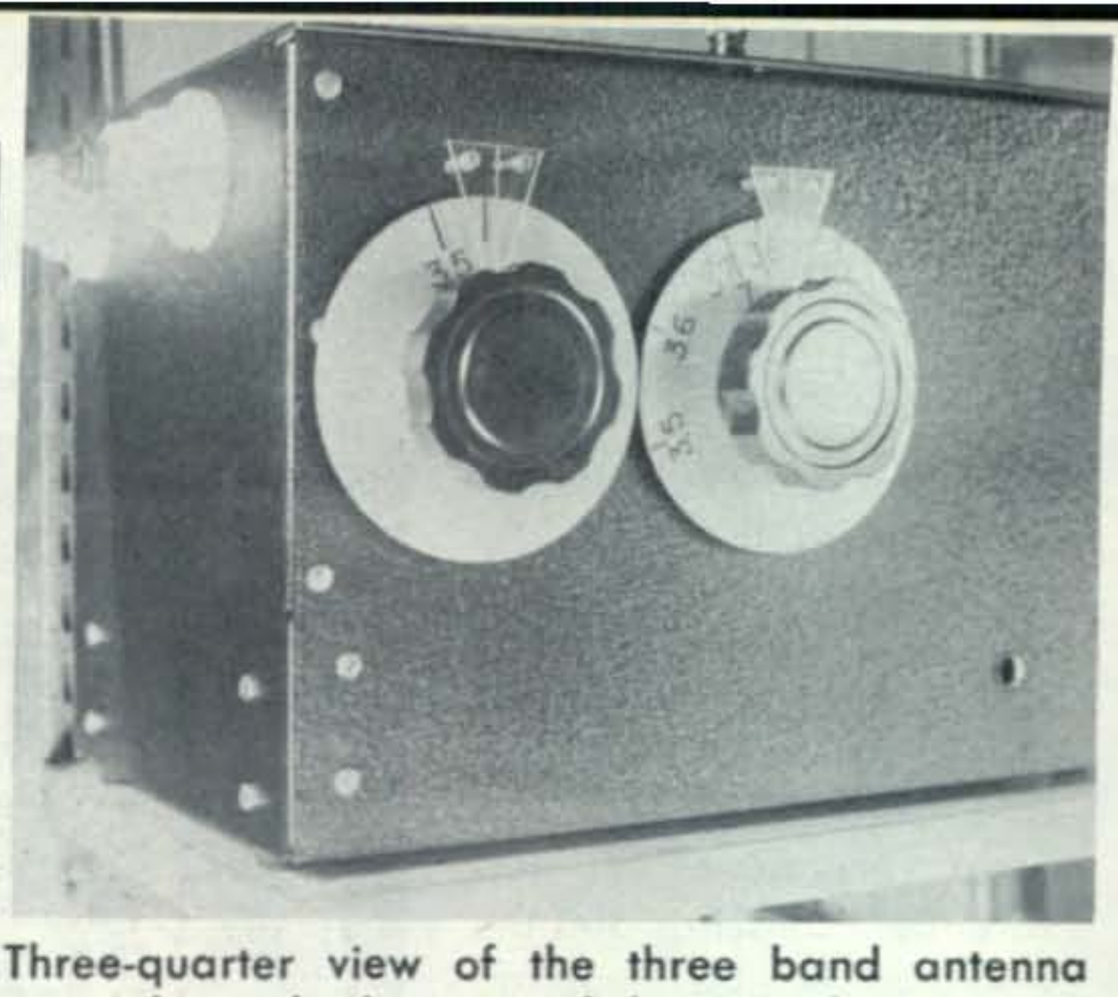


Fig. 2—Drawing of the front view of the duo differential capacitor showing construction and dimensions. A top view of this capacitor may be seen in the accompanying photos.



Three-quarter view of the three band antenna tuner shows the location of the 600 ohm antenna terminals and the two tuning controls.

duo-differential capacitor (C_2) is a bit unusual and a front view is shown in fig. 2. A top view of the capacitor is shown in the interior view of the antenna tuner.

Rotation of the duo differential capacitor will automatically match the transmission line impedance (if it is within range) to the high impedance of the L_2-C_1 tank circuit. It does this by forming a capacitive reactance divider across the tank circuit. The use of the duo-differential capacitor eliminates the juggling of two dual variables to get the lowest s.w.r. The duo differential capacitor used has a range of 10 to 100 mmf per section, a peak voltage rating of 3,000 volts and a straight line capacity characteristic.

Construction

All of the components are mounted on a 8 × 12 × 2½ inch California Chassis type #147. A box was put around the chassis for appearance and is not necessary except to mount the feedline insulators and the surplus BC-375E tuner switches.

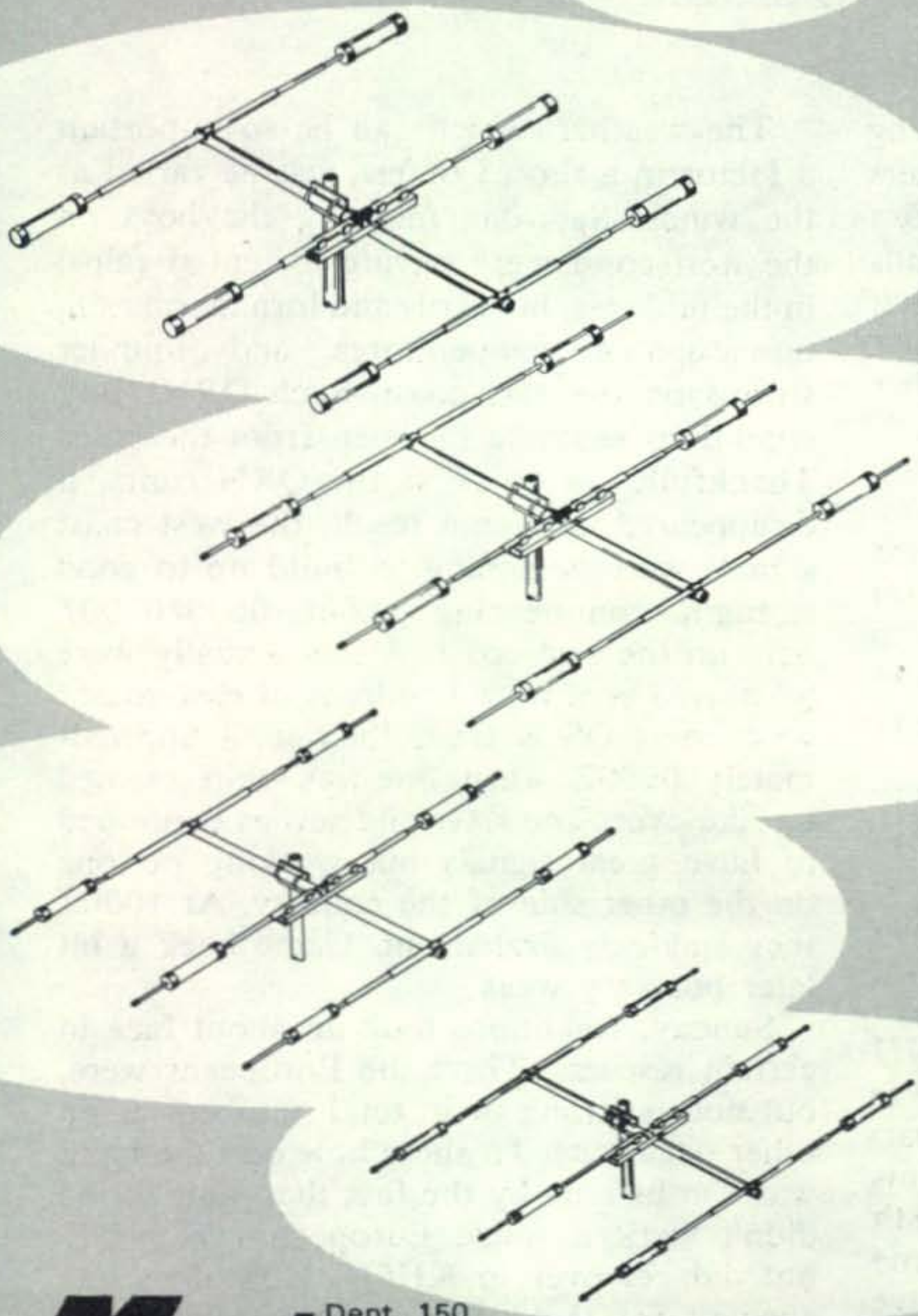
Tuning

It is best to tune the transmitter into a 50 ohm non-inductive load before attaching its output to the tuner. The transmitter controls will not have to be changed from the 50 ohm setting when coupled to the tuner. The tuner is tuned by switching to the operating band and then adjusting both controls until a minimum of s.w.r. is noted on the s.w.r. indicator between the tuner and the transmitter. The s.w.r. will drop as each variable is alternately tuned.

There are some instances of odd length feedlines, especially on ten meters where the s.w.r. will not go down to one to one, and a series type tuner will have to be used. ■

TRAP MASTER

Select Quality.... ...Specify Mosley



Classic 10–15

A new beam for 10 and 15 meters. Revolutionary broad band capacitive matching.* Full power rated. Weatherproof metal encased traps. Lightweight: 27.5 lbs. assembled. May be stacked with 20 and/or 40 meter beams. *(Pat. Pend.)

Classic 33

Hard working for extra gain on 10, 15 and 20 meters. Wider element spacing and improved clamping. Broad band capacitive match.* Full power rating. Weatherproof traps for constant frequency stability. *(Pat. Pend.)

TA-33

Excellent results for full ham bandwidth. Full power rated for 10, 15, and 20 meters. Strengthened center sections of the 28' maximum length elements. Weatherproof traps for constant frequency stability. May be converted to 40 meters.

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A low power beam with "authority." Rated at 300 watts AM/CW, and 1000 watts P.E.P. on SSB. May be converted to MP-33 for higher power rating. Max. element length is 26' 8".

For more information on these, or any of Mosley antennas see your nearest authorized Mosley dealer, or write.

Dept. 150
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For further information, check number 5, on page 126

160 Meter Contest Results

8th Annual CQ Test Feels the Effect of the Sunspot Cycle Upsweep

BY CHARLES M. O'BRIEN,* W2EQS

So the sunspot cycle is reversing itself? Unfortunately for we Top Banders the answer is a most definite yes. There's nothing we can do about it, though. Reminds me of the old saying about the weather that goes: "The weather we have and the weather we got, we're going to have weather, whether or not".

Actually, during the 1966/67 season there were a number of excellent openings. But, in the over-all picture, there were less this season than last. From a personal point of view let me say that I had more QSOs to DX points on a lesser number of dates than I had the previous season on a greater number of dates.

Many of you have checked DHJ on 1831 kc as an indication as to how conditions to Europe would be. It was more difficult to determine this this season since DHJ previously ran 2 kw. They have cut their power back, now, to 200 watts. Did you know that? Then there have been times when DHJ was coming thru indicating the band was open, but no European hams were, apparently, on the band. Such a shame! It seems to be agreed that conditions during this 8th Contest were far from good but, at the same time, they weren't as bad as some would have us believe.

The weather, which can be so important a factor in a short Contest, was as varied as the winds. Saturday morning the boys on the west coast were having torrential rains; in the midwest, blizzards and tornadoes; rain, unseasonable temperatures and thunder storms on the east coast. Such QRN! But, conditions separate the men from the boys. Thankfully, as quick as the QRN came, it disappeared, and as a result, the west coast signals were beginning to build up to good strength commencing about 0600/0700Z here on the east coast. A few actually were S8 plus. There were hundreds of east coast/west coast QSOs from then until approximately 0900Z when one-way skip seemed to take over. The sixes and sevens continued to have great signals but working no one on the other side of the country. At 1000Z they suddenly fizzled out. Came back a bit later but very weak.

Sunday, conditions took an about face in certain respects. There the Europeans were, but not as strong or in total numbers as on other occasions. To show how odd the band was can be seen by the fact that your scribe didn't work a single European (ye gads!) but did get over to KH6IJ. How does one account for that? There was absolutely no QRN at all Sunday.

Toward the end of the Contest (1200Z)

* 48 Prospect Avenue, Westwood, N.J. 07675.

the 6s were building up to remarkable strengths again while in the early morning hours they were very weak. Next year we shall lengthen the duration of the Contest in order to give the west coast boys, the Pacific Area and Asia a better and longer chance. I'll say one thing, though. It sure is most difficult to please everyone but the gripes we received from certain areas and parts of the world seem to be well founded.

If only I were a fortune teller! Five minutes after the Contest had concluded didn't a WØ from North Dakota come on and worked a certain W6 who had needed that state. Asked the W6, "Where were you earlier?" "Didn't know a Contest was on. Couldn't sleep so came down to the rig," replied the WØ. So it goes. C'est la vie as our French brethren would say.

There was activity from 47 States. The only missing ones were Montana, Nebraska and Utah. Received a note from one of the boys out in Utah who planned on being active, but just the day before didn't he become a grandfather for the first time. So a hasty road trip was taken by him to see the new little one. He assures us he will be with us next year. In Canada there was no representation from New Brunswick, Prince Edward Island, Manitoba or Northwest Territories.

First log received was from VP7DX with whom I had the pleasure of QSOing on 160 just prior to my going to the Bahamas on a business trip. Had a wonderful evening together with Don and left contest logs.

So, conditions weren't as good as last year. Right? Well, it will be a pleasant surprise to most of you to realize that these were on: CO, DL, EI, G, GC, GD, GI, GM, GW, HB, HI, JA, KH6, KL7, KP4, OE, OH, OHØ, OK, PAØ, VE, VK, VP7, W, XE, ZB2, ZD8, ZL, 3A2, 9H1, 9L1, 9V1.

The greatest score ever racked up by anyone in the eight years of this Contest's existence goes to HI8XAL whom many Europeans worked. Note his score. On the other hand, in all fairness to everyone else, Fred is only a hop, skip and a jump from the United States and Canada and all these contacts were worth 10 points each to him.

Countries with us last year but not this were: HK, HP, KV4, LZ, 4U1, 6Y5 and 9M4. Countries with us this year but not last were: 3A2, 9H1, CO, 9V1, KP4, ZD8, and JA.

May we once again make this request?

WØVXO: Who of us hasn't heard Herb's thundering signal? And, in February of this year didn't he make a business trip/DXpedition to South America, Central America and many of the Caribbean islands giving many new Top Band countries. Herb heads up his own trio "The Herb Schoenbohm Trio" and just about "runs" radio station KQRS AM/FM in Minneapolis.

Please be sure to sign your call letters to your logs. Every year we run up against a few very neatly recorded logs, but no indication of the call. It takes a very time consuming process of checking before we are finally able to determine whose log it actually is.

An important point for the DX boys to note: A QSO to each separate State and Canadian Province gives you an extra multiplier plus the 10 points for such a contact. But, on top of this you cannot count the United States and Canada/Newfoundland as separate multipliers, too.

For all of you to make note of . . . this is a c.w.-to-c.w. Contest only. C.w.-to-phone QSOs are not permitted nor are any cross band contacts allowed. For the sake of awards, and in lieu of QSL, *CQ* will honor all listings within the logs received as sufficient proof of contact. And, we do not believe we are out of line in stating that ARRL will, likewise, agree on this point for any of their awards.

A most attractive certificate shall be sent the winners in each State, Province and DX country and, in cases where scores are close, a certificate shall be sent to second and third place contestants.

In ending, keep this in mind: Today is the tomorrow we worried about yesterday. Can any of you argue that one?

K1KSH: How many of you need introduction to Gary, K1KSH? He's an old timer on Top Band. Here he is at his set-up. Gary is Chief Engineer for broadcast radio station WADS in Connecticut.

Comments: 1st District

K1PBW: Antennas here consisted of two verticals 85′ and 95′ fed 90° out of phase to obtain a cardioid reversible pattern to the SW and the NE. Counterpoise ground system covered 120,000 sq. ft. [*Wow!*]. A 1,100′ Beverage antenna and a 610′ long wire were used for receiving. **K1KSH:** My 160 shack was set up in the transmitting building of WADS where I am Chief Engineer. A 270 foot antenna, almost vertical, was attached to the top of WADS's 280′ tower. This is one contest I simply make it a point not to miss. **W1WY:** My heart wasn't in this one. Got home 2 hours late—New Haven R.R. broke down. Then ran into TX trouble. By the time I got on fellows had 40 to 50 contacts jump on me. **W1AW:** Didn't get a chance to spend much time in the test but had a lot of fun. Chuck, W1WPR, was the op. **W1BB/1:** Had a wonderful time watching, listening, and piling in when I heard one I wanted. Lots of operating pleasure—especially af being off 160 for almost 4 months [*Stew and wife, Alice, took a cruise thru the Orient*]. See good to hear all the 160 activity especially aft scarcity of it in the Orient.

2d District

WA2KHL: Put up an 80′ vertical the night before the Contest by moonlight. On the locals it didn't seem to work too good but what a difference on the long stuff both receiving and transmitting. So, you win some and you lose some. Our nominations for best signals on the band go for W6YY and W6JTB. **W2HUG:** It was a FB Contest as usual, but didn't work anything new. How about sponsoring a 10 meter c.w. contest? [*How's about it, gang? Let me know if you'd like to have such a Contest which would be run along the same lines as this one on 160*]. **W2KHT:** Enjoyed participating again even tho the equipment and operator are both getting old. Might re-vitalize next year. **W2EQS:** How can one work Europe with ease week after week but when the Contest week-end arrives nary a one can be QSO'd? Yet, on the other hand, you work KH6IJ! How do you figure it out?

3d District

W3AZR/3: [*This was Ike operating portable in Delaware*]. Boy, we sure had a swell time . . . even tho condx were rotten. Many thanked us for their first Delaware QSO. The general appreciation of the guys on 160 made the trip worthwhile. We are going to do it again next year. **WA3DDW:** Really enjoyed Contest. First one for me since 1950 (KG4AD). Just finished home brew rig in time. Happy to meet many of the boys I haven't worked for years. [*Don is ex-KG4AD, NY4DD, W9ITC, WØITC, W4WMG, WA4KHO*]. **W3EIS:** The 1966 party had blizzard snow static. The 1967 one started with summer-like QRN which subsided later. But, condx were down from last year. Wasted lots of time on G, GW, DL, VE7. [*Many of you will remember Don as HC1DC and HC1AGI back in '62 and '63 giving many of us a new 160 country*].

4th District

WA4MTG: I did not know the Contest was on. Had only a couple of QSOs. [*This, boys, is the State of Alabama*]. **WA4PXP:** First time on for Contest. Just got on 160. Heard many Eu . . . G, DL, HB, OK, but no QSOs. Also heard ZD8J 559. **W4BGO:** Good Contest, but poor band condx. Heard nothing outside North America. **W4WHK:** Another good one—best USA [*and Florida*] activity ever with domestic signals very strong. DX was poor, tho. **K8HBR/4:** Very fine Contest as usual. Wished now I had improved my antenna. Ran 25 watts to a dipole. **WA4FJM:** Much fun as usual in spite of terrible line noise. Had the feeling the Western States on 2 mc gave up tuning the low end after the first evening due to lack of takers. How about an agreement that stations looking for 1.8/2.0 mc QSOs will give it a special try *on the hour?* Never did work my own State. [*What a shame, Jim, as W4PVT was in there giving out 76 QSOs*].

5th District

WA5EID: Louisiana. My first operation on 160 and I enjoyed it very much. Good condx and a large number of stations. Heard OI and ZD8 being called but nil here. Had a pole transformer denoised by Power & Light Co. just before Contest only to discover another intermittent source. **W5TTB:** [*Another one from Louisiana. So you think you're busy, eh? Get a load of this*]. I sure

K5MZU: Here's Les White, K5MZU, of that very rare State of Mississippi. Two years ago Les never "heard" of 160 until in QSO on 40 with 160 stalwart Dave, K5JVF, of Oklahoma. Good old Top Band is now his favorite.

enjoyed the Contest. Just wish I could have spent more time in it. Will be with you again next year. I've been kept so busy at the radio ship I haven't had time to do hardly anything. Just finished installing 41 new radios for the Water Dept. and now we have 51 new Police cars coming in for the installation of radios. Two of us maintain 263 two-way mobile units plus 4 different base stations.

6th District

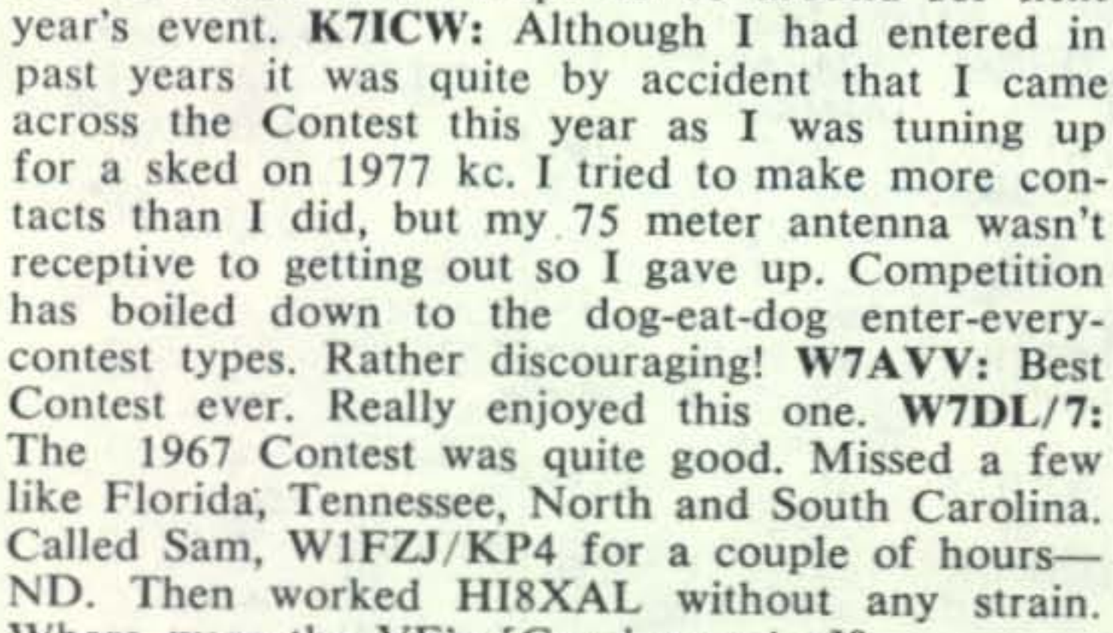
W6JTB: Regardless of sunspots, three new countries were worked. Condx were good but the lack of overall activity kept contact numbers low. Enjoyable Contest, as usual. **W6YY:** Always something wrong. Mort and I had to go to a wedding on Saturday night. We didn't hear ZD8J but understand he was hearing us fine. Mebbe next year! **W6RW:** Heard ZD8J but couldn't eke out a QSO. We object strongly to the times of the Contest this year. The earlier starting and ending times gave the east coast an even greater advantage over us. [*This is regrettable. We started the Contest earlier this year with the main thought in mind of helping the Europeans. Unless we hear from the boys we have no way of knowing if they do or don't have gripes. Next year changes will be made which, we hope, will satisfy all*]. **W6JEK:** Enjoyed it very much.

7th District

K7YFF: After finding out from W7DRA, who became my first entry, I spent several enjoyable hours providing Idaho contacts for the boys. Ordinarily I do not work contests, but enjoyed this one so much that I hope to be around for next year's event. **K7ICW:** Although I had entered in past years it was quite by accident that I came across the Contest this year as I was tuning up for a sked on 1977 kc. I tried to make more contacts than I did, but my 75 meter antenna wasn't receptive to getting out so I gave up. Competition has boiled down to the dog-eat-dog enter-every-contest types. Rather discouraging! **W7AVV:** Best Contest ever. Really enjoyed this one. **W7DL/7:** The 1967 Contest was quite good. Missed a few like Florida, Tennessee, North and South Carolina. Called Sam, W1FZJ/KP4 for a couple of hours—ND. Then worked HI8XAL without any strain. Where were the VE's [*Good question*]?

8th District

W8TJQ: Activity from the 7th district was much lower than last year. This is still one of the best tests there is and I would not miss it for the world. **WA8EMJ:** This was my 3d test and I sure do enjoy



WA5CXT: Another mighty close race for Texas honors. Wayne was just barely beaten out. This was Wayne's first entry in the 160 contest.

DL9KRA: One of the better signals out of Europe and a 1st class op. Here is Jan, DL9KRA. When not DXING on 160 he's flying for Lufthansa.

the event. Friday night came home from work to find my 65' top loaded vertical iced so thick that it was horizontal. By Saturday afternoon the sun had melted the ice enabling me to load normally again. **K8RRH:** More contacts, but smaller multiplier this year. Where were Alabama, Quebec, and others? **K8RYU:** This Contest has greatly encouraged 160 meter activity. Other similar projects are needed for less popular bands. Have been unable to make this test for the past 3 or 4 years because of college final exam schedules. Sure enjoyed this one, though. **W8LOF:** Using five 397' VEE's tied together.

9th District

W9YYG: Antennas consisted of a 71' base loaded vertical switchable to high or low segments and a 260' inverted Vee up 60' at center with open wire feed. Both were fed into a coax switch for fast changing from vertical to horizontal. **W9PNE:** Seems as though my time for hobbies is shorter each year. Don't understand it. Planned to operate a lot this winter, but. . . . 160 has been poor for DX this season. The little I've heard was way down in signal strength. Hope this sunspot cycle won't kill off our good old Top Band. **W9YB:** Our antenna was strung between the 100' high towers on the Purdue Electrical Engineering Building but an ice storm broke off the feed line the night before the Contest. A simple long wire had to serve as a substitute. Our operators were K9LZX who just got bitten by the 160 bug, K8DOU and WA9AMZ.

10th District

WØNFL: Enjoyed our land line QSO today very much. As you must have guessed, I work for the phone company. Really enjoyed the Contest again this year. The more I operate 160 the more fascinated I am with it. Have 49 States worked, 45 confirmed and 7 countries. **WØGDH:** This is only Contest I take part in any more. It's always an en-

Text continued on page 112. Scores are listed on the next page.

The first column indicates the number of contacts, second is the multiplier, third is the number of different countries worked and the last column is the final score.

Connecticut

K1PBW	174	43	8	18,748
K1KSH	180	42	4	15,792
W1WY	150	36	4	12,340
W1TX	105	34	6	9,588
W1AW	52	18	2	1,872

Maine

W1UOT	53	23	3	2,622

Massachusetts

W1BB/1	90	39	10	15,054
K1NWE	130	32	2	8,320
W1AQE	93	26	2	4,836
WA1FHU	66	24	3	3,360
W1PH	25	10	2	500
WA1CAG	1	1	1	2

New Hampshire

K1NBN	109	28	3	6,328

Rhode Island

K1ACC	54	17	2	1,836

Vermont

WITH	82	26	3	4,472

New Jersey

W2EQS	187	44	6	17,864
WA2KHL	160	39	5	13,416
W2IU	143	38	6	12,692
W2HUG	130	35	4	9,660
W2ADE	138	33	3	9,372
W2KHT	137	33	3	9,306
W2AQT	128	32	3	8,448
WB2OZW	126	29	3	7,308
W3MDE/2	106	32	4	7,296
W2DEN	53	19	2	2,014
W2MPP	30	13	1	780

New York

W2UWD	178	46	6	17,848
K2GNC	125	37	5	10,138
W2GP	74	21	2	3,108
W2GKZ	27	13	1	702

Delaware

W3AZR/3	140	33	4	9,768
WA3DDW	61	23	2	2,806

Maryland

W3EIS	211	47	7	21,714
W3MSR	135	35	2	9,450
W3JXS	104	29	2	6,032
W3EYF	64	30	4	4,330
K3EKO	52	27	7	3,888
W3MCG	31	14	2	868

Pennsylvania

W3VEQ	164	37	3	12,432
W3AJS	126	40	4	10,710
W3BUR	138	35	4	10,220
W3WGH	130	37	4	10,212
WA3BGN	118	31	3	7,564

Alabama

WA4MTG	2	2	1	4

Florida

WA4PXP	131	40	6	12,080
W4BGO	130	39	6	11,388
W4WHK	108	36	6	8,928
K8HBR/4	51	25	5	3,150

Georgia

W4YWX	124	41	4	10,824
K4UCQ/4	102	33	4	7,260

Kentucky

W4GSH	121	38	5	10,008

North Carolina

WA4FJM	133	34	3	9,316
W4PVT	76	27	3	4,266

South Carolina

WA4UPR	97	34	4	7,140

Tennessee

W4OQA	27	11	1	594
W4JGS	6	3	1	36

Virginia

W4BVV	218	48	9	23,616
W4KFC	100	32	3	6,656
WØVEH/4	81	28	3	4,760
W4ZM	68	22	3	3,168
WA4WCP	38	17	2	1,292

Arkansas

K5KDG	27	19	2	1,026
WA5KUD	15	11	1	330

Louisiana

WA5EID	66	29	3	4,060
W5TTB	42	17	3	1,564

Mississippi

K5MZU	110	34	3	7,752

New Mexico

W5SOT	53	28	4	3,360

Oklahoma

K5JVF	110	44	4	10,736

Texas

K5DMM/5	161	42	5	14,532
WA5CXT	144	44	4	13,376
W5FIX	85	39	5	7,566

California

W6JTB	133	44	8	14,872
W6YY	129	47	6	13,724
W6RW	100	38	6	8,816
W6JEK	61	34	5	4,964
W6BHZ	72	31	4	4,264
W6ITY/6	66	27	5	4,212
W6GWQ	51	23	3	2,530

Arizona

W7ENA	33	15	4	1,230

Idaho

K7YFF	23	15	2	690
K7MKW	21	12	1	504

Nevada

K7ICW	3	1	1	6

Oregon

W7AVV	71	33	5	5,478
K7MLO	46	21	2	1,932

Washington

W7DL/7	87	35	7	8,330
W7RGL	71	29	4	4,176
W7FIM	28	18	2	1,008
K7ZRG/7	16	10	2	320

Wyoming

W7HTL	28	12	3	768

Michigan

W8TJQ	207	52	8	24,024
WA8EMJ	149	33	3	11,016
W8IQS	102	29	2	5,916
K8BYI	100	28	3	5,824
WA8OLN	71	25	2	3,550

Ohio

K8RRH	259	53	8	29,998
W8QWI	142	37	2	10,508
W8MJG	131	34	2	8,908
K8RYU	122	34	4	8,840
W8LOF	62	32	4	4,608
K8IQQ	71	28	3	4,200
W8VDF/8	40	24	3	2,112

West Virginia

W8VVE/8	140	35	3	10,080
K8UZX	119	35	2	8,330
K8NNG/8	80	28	4	4,928
W8HZA	60	28	2	3,360

Illinois

W9YYG	200	48	5	20,352
W9PNE	71	31	4	5,146

Indiana

K9YWO	200	49	6	21,168
W9YB	124	38	3	9,728
K9MMH	115	35	2	8,050

Wisconsin

W9YT	175	45	4	16,830
WA9GAR/9	161	46	5	15,916

Colorado

WØEXS	44	23	3	2,208

Iowa

WØNFL	170	43	4	15,652
WØDRE	87	31	4	5,890

Kansas

WØGDH	191	49	5	19,894
WØPSF	136	44	4	12,496

Minnesota

WØVXO	219	50	8	24,700
WØRHI	97	39	3	7,878

Missouri

KØYGR	85	34	4	6,324
WØUXQ	81	33	2	5,346

North Dakota

WØSDN	111	40	4	9,520

South Dakota

WAØMWN	29	19	1	1,102

Newfoundland

VO1FB	45	18	8	4,644
3B1HN	9	9	3	189

Nova Scotia

VE1EK	42	14	2	1,176

Quebec

3C2UQ	10	5	2	100

Ontario

3C3BWY	146	35	3	10,500
3C3DU	103	32	3	6,848

Saskatchewan

VE5UJ	18	9	2	288

Alberta

VE6BA	1	1	1	2

British Columbia

VE7AKI	60	28	6	4,256

Aland Islands

OHØNI	24	5	5	575

Alaska

KL7FRY	9	5	4	285
KL7FSU	1	1	1	2

Australia

VK5KO	1	1	1	5

Austria

OE1KU	69	10	10	3,390
OE3AX	29	7	7	994

Bahamas

VP7DX	16	8	1	1,280

Cuba

CO2QR	1	1	1	10

Czechoslovakia

OK3KAS	153	16	16	9,200
OK1AHZ	136	17	16	8,483
OL4AFI	144	11	11	5,709
OL5ADK	114	12	12	4,788
OK2BOB	91	12	12	3,648
OK2KEY	104	10	10	3,460
OK1KOK	91	11	11	3,355
OL1AEM	92	9	9	2,727
OK1AOV	84	10	10	2,700
OK1KUA	93	9	9	2,673
OK2KGV	73	11	11	2,563
OK1AAU	80	9	9	2,466
OL6ACO	85	9	9	2,331
OK1TA	83	9	9	2,286
OL2AGC	91	7	7	2,177
OK1ZW	75	9	9	2,079
OK1KPU	95	10	10	2,040
OK1KPX	74	8	8	1,816
OK1AOR	72	8	8	1,752
OL1AGS	63	9	9	1,737
OK2QX	71	8	8	1,736
OK2BEC	69	9	9	1,728
OK1ALG	47	9	9	1,593
OL9AEZ	55	9	9	1,449
OL9ACZ	65	7	7	1,288
OK3BA	61	7	7	1,274
OK2HI	45	9	9	1,242
OK1AIA	50	8	8	1,208
OK2BLG	59	6	6	1,050
OK1ADM	14	10	10	740
OL5AFR	54	5	5	705
OK3CDN	52	5	5	685
OL1AFB	49	4	4	584
OK1NK	35	4	4	400
OK2BHT	39	4	4	372
OK1AEH	32	4	4	304
OK1ZD	24	3	3	169
OK3KRN	56	1	1	112
OK2BCI	7	4	4	92
OK3QF	16	2	2	88

Dominican Republic

HI8XAL	136	43	9	55,986

Eire

EI9J	71	15	12	5,775

England

G3KMI	210	17	14	12,478
G5RP	195	17	14	11,611
G6LD/A	199	16	15	10,912
G8NF	175	15	13	7,980
G3FVA/A	157	11	11	5,269
G2DC	115	12	12	5,208
G3JVJ	78	14	13	4,494
G3PVA	101	9	9	3,330
G3GHN	86	8	8	2,184
G3TIF	40	9	9	1,125

Finland

OH7NS	21	7	7	609
OH2BC	13	8	8	520

Germany

DL9KRA	229	21	17	24,696
DL5KS	60	8	8	2,328

Gibraltar

ZB2AM	9	6	6	300

Hawaii

KH6IJ	17	11	2	935

Isle of Jersey

GC3LFJ	1	1	1	5

Isle of Man

GD3HQR	4	4	4	68

Japan

JA3AA	14	5	4	280
KA9MF	9	4	4	152
JA3JM	7	3	3	75

Malta

9H1AE	2	1	1	10

Mexico

XE2OK	79	32	2	24,960

Netherlands

PAØGMU	92	11	11	5,027
PAØLOU	82	11	11	4,477

New Zealand

ZL1MQ	2	2	2	14

Scotland

GM3IGW/A	216	22	16	24,310
GM3KMR	132	11	11	6,710
GM3OXX	117	11	11	5,786

Singapore

9V1LP	7	6	5	252

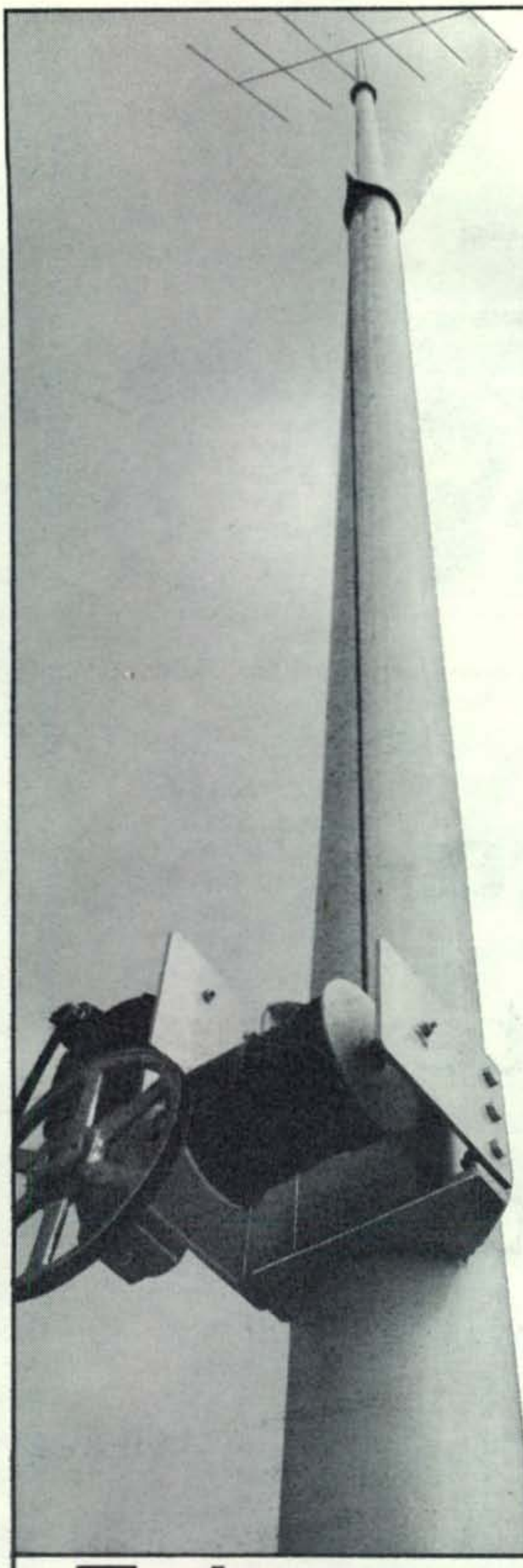
Switzerland

HB9TT	114	12	13	7,202
HB9YL	27	3	3	405
HB9UD	7	4	4	128

Wales

GW3CW	95	13	13	6,097

Check logs are gratefully acknowledged from: G3MWZ, OK1AHG, OK1AMS, OK1EV, OK1KHG, OL1AHU, OK2KVS, OK3CES, OK3CGZ, OK3CHZ, OK3HS, OK3KFV, OL6ACH.



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For further information, check number 4. on page 126

CQ Reviews:

The Omega-T Systems, Inc. Model TE7-01 Antenna Noise Bridge.

The Omega-T Systems Antenna Noise Bridge

BY WILFRED M. SCHERER,* W2AEF

QUITE some years ago the writer designed and described the Anteннascope,[1] a variable impedance bridge that allows you to look at an antenna for finding its resonant frequency and resistive impedance. Throughout the intervening years revised versions have been described [2] or have appeared commercially on the market under various names, other than the original, such as Antenna Bridge, R.F. Bridge, Z-Bridge, etc.

A new device, which is a radical departure from the others for the job at hand, has recently been introduced by Omega-T Systems, Inc. It is called the Antenna Noise Bridge (Model TE7-01), a title which somewhat belies its function, as it is actually a *Noise-Driven* Antenna Bridge.

The instrument is powered by a built-in noise source, instead of by an external variable-frequency r.f. signal. Another difference is the bridge configuration which is made up using a quadrafilar-wound toroid that provides two arms of the bridge. A variable resistor is used in the third arm to obtain a resistive balance against the unknown in the fourth arm. Correct balance is indicated by a noise-null detected with a radio receiver, instead of with a meter on the instrument. The bridge circuitry is shown at fig. 1.

The noise source is simply a diode noise generator followed by three transistors which function as a wide-band r.f. amplifier. The unit is actuated by a self-contained 9-volt

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* Technical Director, *CQ*.

[1] Scherer, W. M., "Building and Using the Antennascope," *CQ*, Sept. '50, page 13.

[2] Scherer, W. M., "Antennascope '54," *CQ*, June '54, page 23, and July '54, page 17. "Antennascope," *Radio Handbook*, published by Editors and Engineers.

battery. No accessory gear is required, except the receiver. Being self-contained and powered, the device can be conveniently used at any location, making it particularly suited for operation at mobile installations.

The impedance range of the Model TE7-01 is 0-100 ohms and the frequency range of operation is rated as "useful 1-150 mc, with reduced accuracy above 100 mc."

The bridge is built in a 2¼" × 3¼" × 3" (H.W.D.) gray-plastic case with a removable cover on the rear to provide access for installation of the battery. The variable-impedance control is on the front and is calibrated in 10-ohm steps from 0 to 100. Phono-type jacks are provided on the panel for connections to the receiver and the antenna under test. There also is a power ON-OFF slide switch.

Operation

Either one of the two following operating procedures may be used:

Where an antenna system is to be adjusted for a specific impedance and frequency, the receiver is set at the desired frequency and the Antenna Noise Bridge is set for the desired impedance. The necessary antenna adjustments are then made that result in a noise-null, as indicated by ear at the receiver output or by eye at the S-meter. An a.f. voltmeter also may be used at the receiver output.

Where it is desired to find the impedance and resonant frequency of an existing antenna system, both the receiver is tuned and the bridge-impedance control is varied to search for the frequency and impedance at which a noise-null is detected with the receiver.

Except in the case of mobile or similar close-at-hand installations, it most likely will be necessary to operate the bridge from a remote point where a receiver can be conveniently set up and monitored. In such situations the bridge should be connected to the antenna through a transmission line a multiple of an electrical half-wave in length. The correct related physical length for the line may be determined in the manner usually conducted with an r.f. bridge, as also can be done for quarter-wave lines.

When measurements or adjustments are being made with an antenna, it will be necessary to avoid on-the-air signals or picked-up noise background that could otherwise interfere with correct null indications.

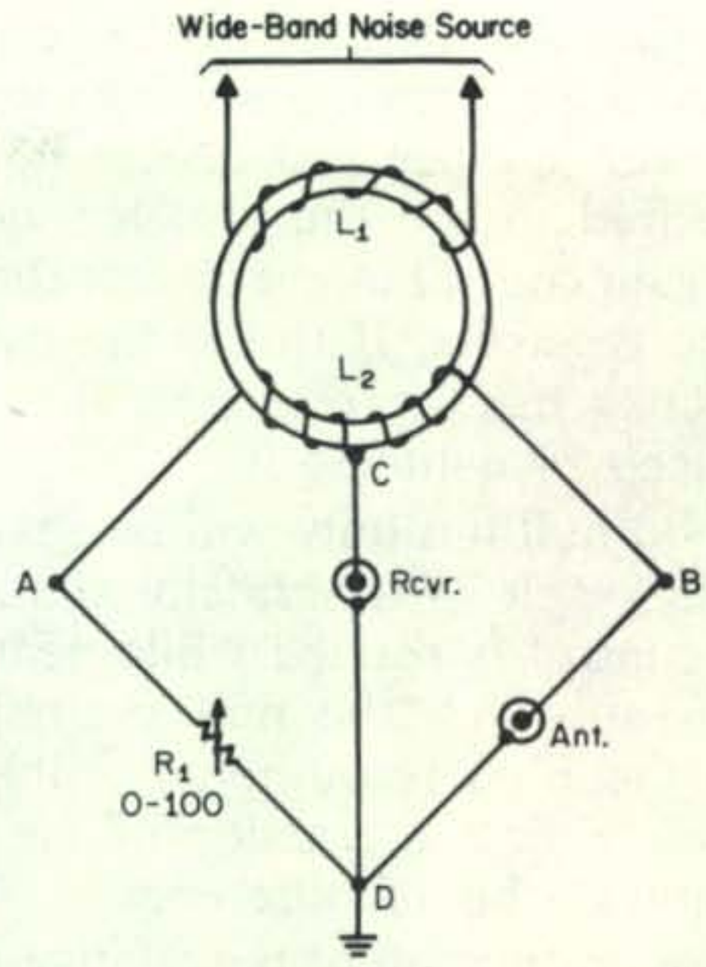


Fig. 1—Bridge Configuration for the TE7-01 Antenna Noise Bridge. L_2 is a bifilar winding on the toroid core. Each half of the winding comprises an arm of the bridge. R_3 in a third arm provides a resistive balance against the antenna in the fourth arm. The driving noise signal is applied to L_1 which is bifilarly interwound with L_2. The signal is essentially injected thereby at points *A* and *B*. Balance is detected by the receiver connected at the opposite junctures *C* and *D*.

Performance

The "nulls" [3] obtained with the Antenna Noise Bridge were found to be quite sharp and deep with resistive loads at the lower frequencies, but above 21 mc they tend to broaden out and not be as complete, as is also the case when the load is reactive.

It was revealed best to first determine how good a null should be expected at the frequency of concern. This may be done by substituting a ½ watt composition resistor, at the antenna jack on the bridge, of a value equivalent to the desired impedance. After setting the bridge for a maximum null, the receiver r.f. gain should be adjusted for a zero S-meter reading or for a minimum background noise (with the a.f. gain advanced) if an aural indication is to be used. This will provide a reference point for a proper null indication. Also, rotation of the bridge-impedance control to each side will indicate the degree of sharpness to be experienced.

[3] By definition a "null" is a void; however, in this application it is seldom so with a sensitive receiver. There usually is some noise from the bridge still present. Reference to good, best, complete, maximum, etc. nulls implies the relative "null" dip or degree of noise attenuation at the "null" point.

Reducing the r.f. gain of the receiver will minimize a.g.c. action and make null detection by ear sharper and easier; however, if it is desired to use the S-meter, decreasing the r.f. gain control might disable the S-meter on some receivers. If this is the case and if the receiver has a preselector, the gain may be reduced by detuning it.

A good null not only will be sharp, but it also will result in a scratchy sound as the bridge control is rotated while near the impedance at which the null occurs. This is due to the high resolution possible at this point where only a fraction of an ohm can make quite a bit of difference.

The determination of the relative degree of null may be difficult when observed by ear in cases where an antenna adjustment is made to improve a null at the moment when the adjustment must be made while the null cannot be simultaneously observed. In this situation, use of the S-meter or an a.f. output meter will furnish a visual indication for better relative references.

Finding the characteristics for an existing antenna might present problems with recognizing whether or not a null indicats a purely resistive or slightly reactive load, if a false null is indicated due to coupling from other elements, or even with locating a correct null that may be obscured by other signals when search is made with the receiver.

In addition, the reflected reactance at the bridge output with different impedance settings and loads may affect the tuning of the input stage of a receiver at various frequencies by a degree that alters relative noise levels and confuses null detection when you're searching the spectrum for the null or resonant frequency. It was found that much of this difficulty can be minimized by the insertion of a 3-6 db 50-ohm pad between the bridge and the receiver.

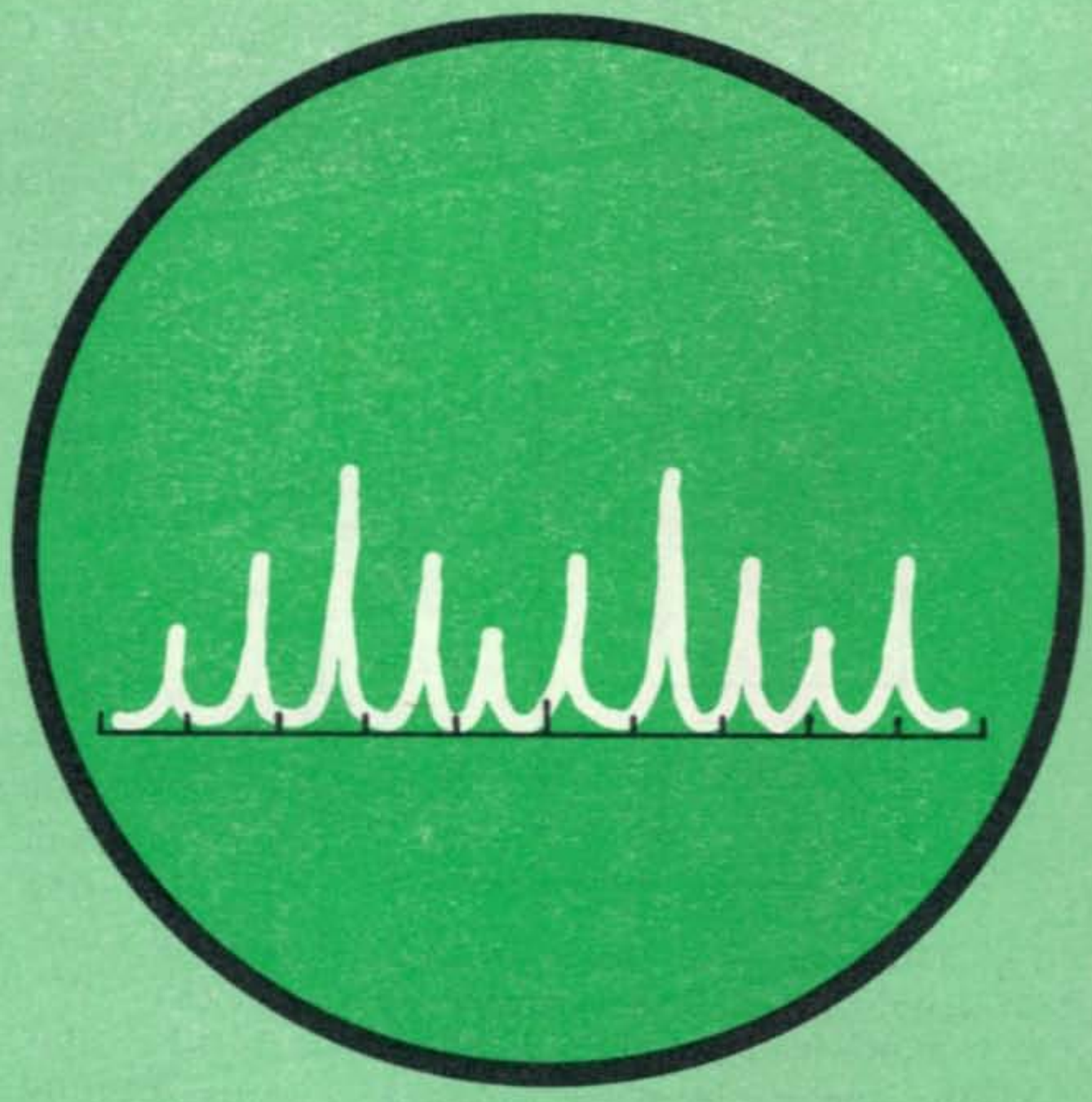
Usually the best and most convenient use for the Antenna Noise Bridge will be that of simply adjusting the antenna system for the best possible null at the desired frequency and impedance.

Other Uses

The Antenna Noise Bridge puts out several hundred microvolts of wideband noise which thus makes it a handy gadget for use as a signal source for aligning receivers, adjusting bandpass circuits, checking relative r.f. gain, etc. Since the noise is simultaneously produced over all the frequency spectrum, *both* a receiver and an r.f. signal generator need not be precisely tuned or readjusted together during the work, as would be the case if the latter were used for the signal source. Suitable lower noise levels may be obtained from the bridge, if needed, by the use of a step attenuator [4] installed between it and the receiver.

The Model TE7-01 Antenna Noise Bridge is priced at $24.95. It is a product of Omega-T Systems, Inc., 516 W. Belt Line Road, Richardson, Texas 75080.—*W2AEF*

[4] Scherer, W. M., "A Step Attenuator," *CQ*, Oct. '64, page 43.



A PANORAMIC ADAPTOR CONVERTER

SOLOMON KUPFERMAN,* W2GVT

The panoramic adaptor converter is used to change odd value intermediate frequency outputs to 455 kc, the input of the Heath Ham-Scan HO-13.

THIS transistorized converter permits flexible use of the Heath Ham-Scan HO-13 Panadaptor for any type of receiver. The need for altering the i.f. components for a change to another type of receiver is eliminated by simply inserting the appropriate frequency crystal into the converter.

The crystal frequency selected for the oscillator portion must be 455 kc plus or minus the i.f. frequency of the receiver. For example, the Hallicrafter SX-117 receiver i.f. is 1650 kc so a 2105 kc oscillator crystal was selected in order to operate the Ham-Scan whose input was wired for 455 kc.

Construction

The completed unit is mounted in a 4"×2¼"×2¼" Mini-box. The components are mounted on a 3⅜" by 1¾" Vector board, 6 holes per inch. The 455 kc i.f. transformer used is from a discarded transistor radio. Should the Ham-Scan be wired for a frequency other than 455 kc, a miniature i.f. transformer must be used whose frequency matches the Ham-Scan input. One end of the secondary, indicated by "N.C." on the schematic, may be left open. It was found that more gain could be obtained by leaving it ungrounded. This may not be true in all cases.

A Miller #4511 slug tuned coil is used to trap out any 2105 kc that may leak through from the oscillator to the pan-adaptor. A different inductance slug tuned coil may have to be used to trap the oscillator frequency for an oscillator out of the range of 2105 kc.

Jacks J_1 and J_2 are RCA phono types mounted on opposite ends of the Mini-box. The RG-59/U cable from the receiver may be as long as 4 feet. One cable is already attached to the Panadaptor.

The transistors used may be GE-9, RCA 2N384 or their equivalents and are selected for their low cost and efficient operation. The shields of Q_1 and Q_2 need not be grounded.

A nine-volt battery is mounted on top of the Mini-box in a battery holder. A Pee-Wee alligator clip and a short

* 157-28 18th Avenue, Whitestone, N.Y. 11357.

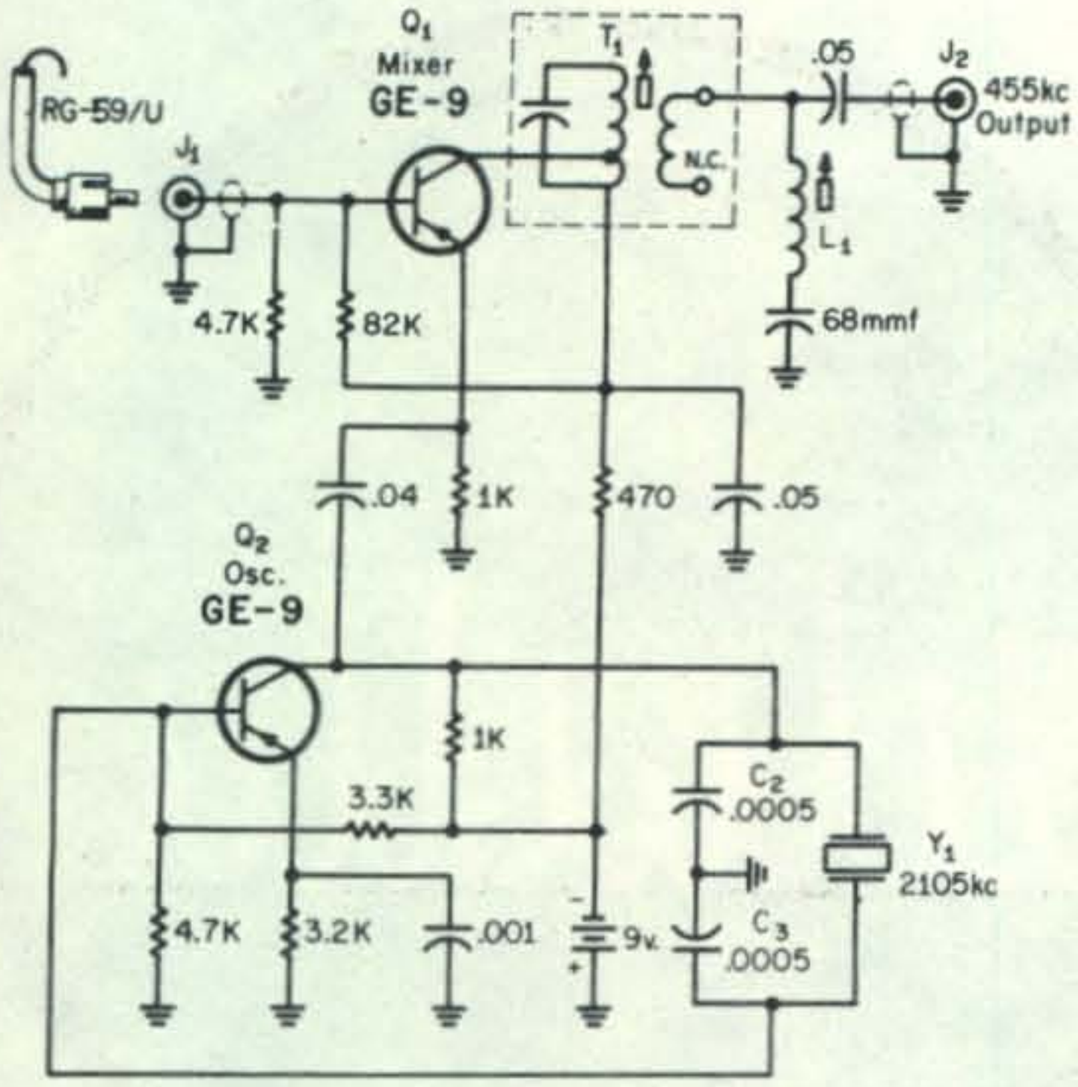


Fig. 1—Circuit of a converter used to shift the i.f. signal from a communications receiver to 455 kc to match the input of the Heath Ham-Scan HO-13. The input is a length of hook-up wire wrapped around the tube from which the signal is to be picked up. All capacitors are in mf except where noted and all resistors are ¼ or ½ watt. Transformer T_1 is a 455 kc i.f. scavenged from a transistor b.c. receiver. For a 1650 kc i.f. input, Y_1 is 2105 kc.

lead connected to ground is clipped on and off the positive pole of the battery. This assembly eliminates the need of a switch.

Wire the oscillator portion of the circuit and check for operation by placing a lead from the antenna connection of the receiver in close proximity to the oscillator. With the receiver tuned to the frequency of the oscillator, the S-meter should show a strong indication. Should the oscillator fail to work in spite of correct wiring, increase or decrease the values of C_2 and C_3.

Complete the assembly and wiring of the mixture portion of the converter and tie it to C_1 of the oscillator section. Make up the RG-59/U shielded cable with a loop of hook-up wire connected to the center conductor. *Do not ground* the shield at this end. Connect the input side of Mini-box to the RCA plug and ground the shield at this end. The hook-up-wire loop is placed around the first i.f. tube. Should this i.f. stage be tuneable, advance the loop to the tube of the next i.f. stage.

Operation

Tune the receiver to a strong signal. Be sure that the tuned pip seen on the Panadaptor can be moved along the reference line of the Panadaptor screen. A strong pip will appear in the center of the reference line that remains stationary regardless of any tuning of the receiver. This is the result of the adaptor oscillator signal. Tune this pip out with L_1, the slug tuned coil. Foreign and unwanted pips are the result of poor shielding of the cable and the unit. ■

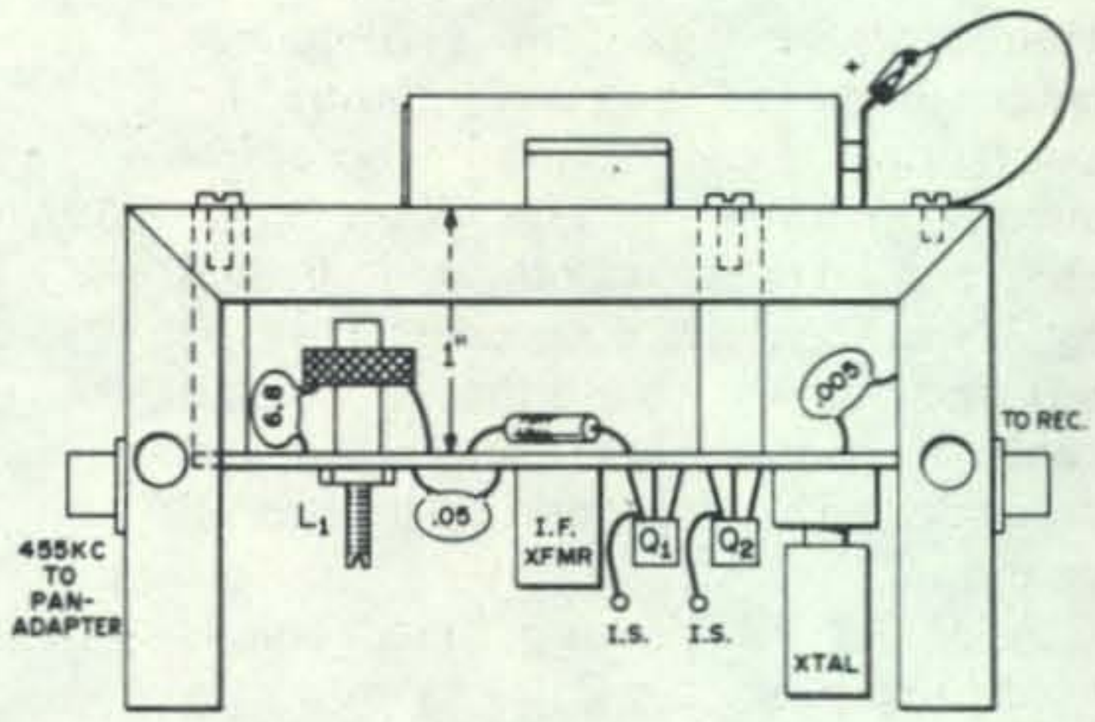


Fig. 2—Sketch showing the layout of the major components of the converter for the Ham-Scan panoramic adaptor.

A FERRET FOR HARMONICS

BY ROBERT N. TELLEFSEN,* WOKMF

This simple device can be of great help when debugging a rig that is generating TVI.

How often have you heard someone say, "Single-sideband rigs shouldn't generate harmonics." Well, it's true, such rigs shouldn't generate harmonics, but most of them do.

In most s.s.b. transmitters, the harmonic energy is fairly low and is not a problem. But for those of us in channel 2 fringe areas, *any* harmonic becomes a problem. Except for 15 meters, all the h.f. amateur bands multiply into channel 2 and are potential sources of TVI.

There are two ways to prevent harmonic radiation, assuming you are already using a low-pass filter in your transmitter feedline. One is to shield the rig thoroughly, and the other, more desirable means, is to eliminate the harmonic at its source.

Because of the low levels of most harmonics in stages other than the final, the usual detectors such as absorption wavemeters and grid-dip oscillators operated in the DIODE mode are just not sensitive enough. Also, they are usually too bulky to get down to individual components in a crowded transmitter.

Harmonic Detector

For ferreting out low-level harmonics, there is no better detector than your own TV set. Of course, it must have a good high-pass filter, such as the Drake TV-300-HP, installed to prevent fundamental overload.

Twenty years ago, Phil Rand, W1DBM, suggested using a length of 300 ohm twinlead as a probe. One end is connected to the TV set in parallel with the TV antenna, and a loop is made in the free end of the twinlead. This still works, but it is too sensitive. It picks up signal from all over and makes location of a specific "hot spot" difficult.

616 26th St. NW, Cedar Rapids, Iowa 52405.

Construction

A much more selective ferret can be made using a shielded 75 to 300 ohm TV balun transformer, a 75 ohm resistor, and ten to fifteen feet of RG-59 coax. The idea is to connect the 300 ohm output of the shielded TV balun to the TV set antenna terminals with fairly short leads, about six inches or so. The 72 ohm coax is then connected to the low impedance input of the balun, and the free end of the coax is terminated with the 75 ohm resistor, using very short leads. A ¼ watt resistor is fine, and is smaller and easier to manage than a ¼ watt resistor. The free end of the coax is insulated by wrapping with two or three layers of black plastic electrical tape.

If your balun is not shielded, it can be mounted in a 2¼" × 2¼" × 4" minibox. Grounding the balun shield to the TV chassis to prevent stray pickup doesn't seem necessary with rigs in the 100 watt output class, but it may be helpful when working at the kilowatt level.

[*continued on page 120*]

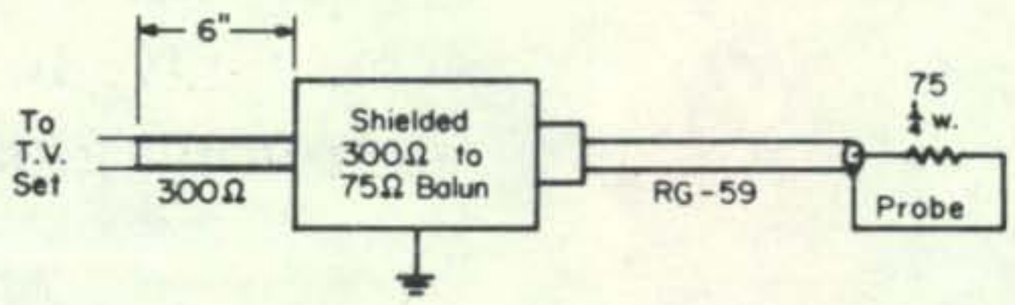


Fig. 1—A simple improved "ferret" for location of harmonics in a transmitter.

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voltmeter circuit loading

BY JOSEPH P. FINCUTTER,* K3STU

Part II

The second and final installment of this series explains the effects of the meter upon the circuit being measured. The use of voltage charts supplied by the manufacturer when troubleshooting is also covered.

FOR purposes of mental gymnastics and for a better understanding of meter loading let us do some calculations that will show just what happens when we place the test leads of a meter circuit across a resistor or two. We'll try to answer the question of "How much circuit change can be tolerated?" Again, let's limit our measurements to d.c. voltage and we'll use three different meters, any one of which might well be found in an amateur station. Most v.o.m.s used are depicted by fig. 2 (Part I). The value of R_{in} varies with the sensitivity of the basic meter movement and with the full scale voltage of each range. Equations (2) and (3) can be used to determine these values and Table II gives typical values for a 20,000 ohm/volt v.o.m. From Equations (2) and (3) it is easy to see that we could have three different meters with the same ranges, but with different sensitivities, and we would have different values of R_{in} for each range.

*5620 Alta Vista Road, Bethesda, Maryland 20034.

Meter Types

From ohm's Law, the voltage drop across each resistor in fig. 4 is 50 volts. Now let us consider (calculate) the voltage drop across either resistor when measured with three different meters, and on three different ranges on each instrument. We shall use:

a–a 1000 ohm/volt v.o.m.
b–a 20,000 ohm/volt v.o.m.
c–a v.t.v.m. with an 11 megohm input resistance.

and we shall use each meter on three separate ranges:

a–50 volts.
b–250 volts.
c–1000 volts.

Since both resistors are of the same value in fig. 4, we'll consider only R_1. Table III lists the results of calculations performed for each meter on each range and also lists the 'degree of uncertainty' of the measurement, based on a "$\pm 3\%$ *FS*" accuracy specification for each meter. NOTE: Equation (1) and the basic Ohm's Law equations for *E* and *I* are all that are required for the tabulations in Table III. For example: When the

meter leads are placed across the resistor, we want to know the "R_{equiv}" of R_1 and R_{in} in parallel. $R_{equiv} = \frac{R_1 \times R_{in}}{R_1 \times R_{in}}$.
Then we want to know I. So:

$$I = \frac{E}{R_2 + R_{equiv}}.$$

Then we want to know the voltage drop across R_{equiv} (what the meter should indicate). $E_{Requiv} = I \times R_{equiv}$, and so on for each range of each meter (substituting for R_{in} in each case).

Results

Study of the figures in Table III indicates that the 1000 ohm/volt meter *really* alters the circuit when the 50 volt range is used. Although the measured value approaches the calculated value on the two higher ranges, the degree of uncertainty (accuracy) of the measurement makes the value rather useless (bottom half of the scale). Further perusual of the values indicates that either the 20,000 ohm/volt v.o.m. or the v.t.v.m. gives us good accuracy on the 50 volt range, but the two higher ranges provide us with higher degrees of uncertainty because of the bottom half of the scale problem. For your own benefit you could change the values of R_1 and R_2 in fig. 4 to higher values of resistance and find that the 20,000 ohm/volt v.o.m. would soon become as useless as the 1000 ohm/volt v.o.m. and going still higher, the v.t.v.m. would also become useless because of the ratio of resistances. On the other hand however, lowering the values of R_1 and R_2 in fig. 4 would soon make all three meters equally usable, as long as you used a range where you could obtain a reading in the top 25% of the scale.

Calculating Parallel Resistance

Figure 5 is a graph developed for fast calculation of parallel resistance problems. It is based on Equation (1). The abscissa is the ratio of R_2/R_1 and the left hand ordinate is the equivalent resistance in terms of R_1 (a percentage of R_1). Study of the graph indicates that if $R_2/R_1 = 1$, then the equivalent resistance is 50% of R_1. As the ratio of R_2/R_1 becomes greater, the equivalent resistance is a greater percentage of R_1; and as this ratio becomes smaller, the equivalent resistance is a smaller percentage of R_1.

Although this graph is based on the ratio of two resistances in parallel, we could easily substitute the R_{in} of the meter being used for R_2, and the resistance, R, across which the measurement is being made for R_1 (such that the abscissa would represent the ratio of R_{in}/R and then the right-hand ordinate would indicate the percentage of change in resistance between the points where the test leads of the meter were connected. Therefore, when $R_{in}/R = 1$ there would be a 50% change in the value of resistance between the test points of the meter. As this ratio becomes larger, the percentage of change would become less and as the ratio becomes smaller, the percentage of change would become larger. However, it must again be pointed out that this percentage of change exists only between the points where the test leads of the meter are connected, and, therefore, does not indicate an overall circuit change. This is particularly true when the resistance across which a measurement is being made is in series with other resistances.

V.T.V.M Accuracy

Each circuit must be analyzed to determine the change resulting from connecting a meter into the circuit. Also, the old adage that a v.t.v.m. because of the high R_{in}, produces less "circuit change" (a more accurate reading) is not *always* true. For example, what happens when you measure voltages across high values of resistance, such as 5, 10 or 20 megohms? Substitute these values in Equation (1) or use the graph to determine the change.

Voltage Charts

Unfortunately we have fallen victim to a system in electronics which provides us with a "point-to-point" voltage chart (usually

Meter Scale	Calculated Value	Measured Values		
		1000 ohm/volt	20,000 ohm/volt	v.t.v.m.
50	50	25 (±1.5)	48 (±1.5)	50 (±1.5)
250	50	42 (±7.5)	49 (±7.5)	50 (±7.5)
1000	50	50 (±30)	50 (±30)	50 (±30)

Table III—Results of the calculated values of voltage across R_1 in fig. 4 and the actual measured values obtained with each type of meter.

from some terminal to ground) qualified by stipulations of the type of meter to be used and operating conditions of the equipment. I cannot deplore this system because it is practical and it provides us with a reference to determine faulty circuits. But sometimes in a mathematical analysis of the faulty circuit we come up with "answers" that do not follow the values listed in the chart because we fail to include the R_{in} of the meter being used. Many times, also, this leads us to question the reading obtained on a meter; then we switch scales and there is no correlation between readings (we think) and immediately chaos reigns supreme.

No, Ohm's Law has not been repealed! We are guilty of not using the law correctly. Many times I have seen a person who thought that he was in serious trouble with a measurement because his meter gave him an erroneous (?) answer, when in reality his meter was in good calibration and *he* was 'uncalibrated', or failed to use Ohm's Law, in its simplicity, to correct his thinking. Although it is a simple equation, we complicate it when we place a meter 'in' or 'on' a circuit. The law still holds; we just have a new circuit!

A.C. Readings

Earlier I limited the scope of this article to the alteration of a circuit caused by voltmeters and I further limited it to d.c. voltmeters. But, any piece of equipment used on a circuit *alters* the circuitry, and therefore the 'indication' of the test equipment must be evaluated in terms of the alteration. In a circuit involving a.c., the input impedance of the test equipment must be known. Therefore you must be knowledgeable about all the factors, such as resistance, capacitance, inductance, frequency, *etc.*, which limit the accuracy and proper indication of the test equipment.

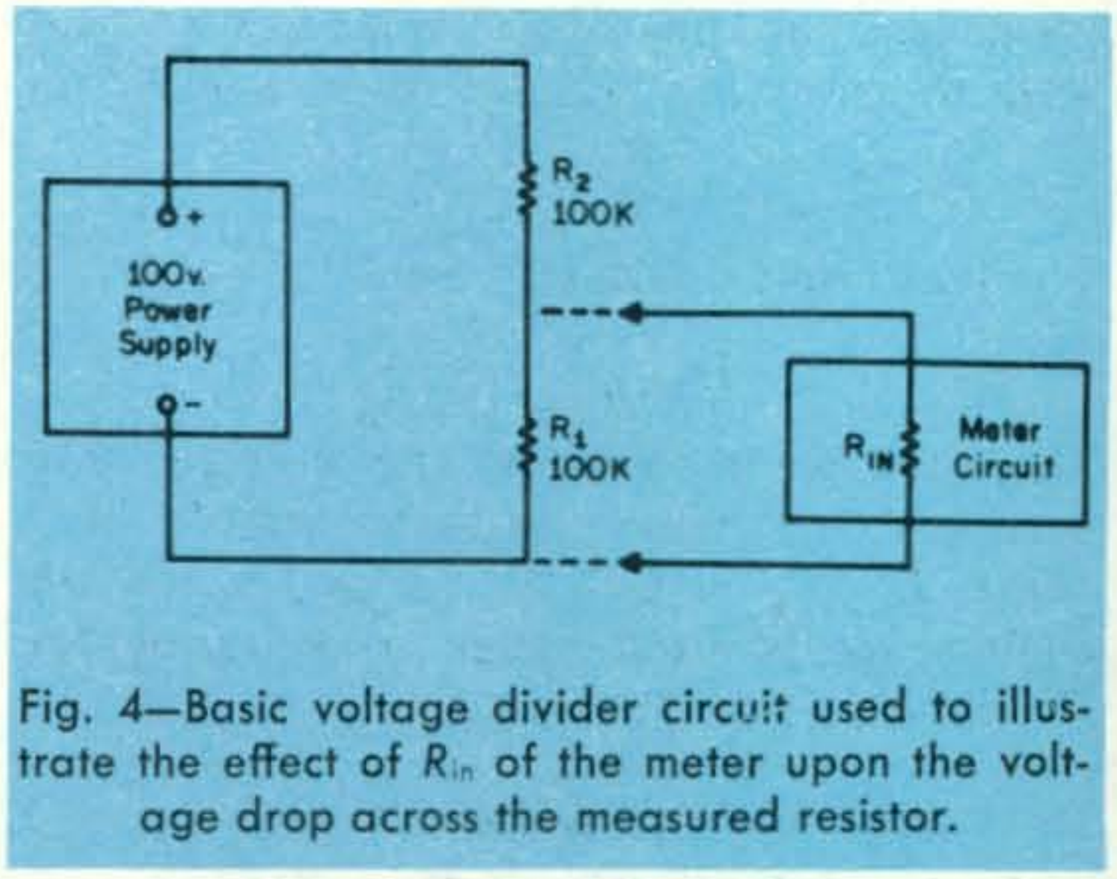

Fig. 4—Basic voltage divider circuit used to illustrate the effect of R_{in} of the meter upon the voltage drop across the measured resistor.

Accuracy and Precision

Now just a word or two about accuracy and precision as applied to measurements. These words are bandied about without any regard for their actual meaning. In fact these terms are used synonomously, to the point where neither express anything meaningful about the measurements being discussed. I have heard, and I'm sure you have too, statements like—"I have measured that voltage very precisely!"—"It's an accurate 100 volts!"—"I measured that voltage at exactly 100 volts because I have a very precise meter!"—*etc., ad infinitum*. What do these statements mean? It's really hard to say, but it does seem to me that in our modern times when so much of our everyday life depends upon measurements that we should have a better understanding of these terms, as well as the measurements we make.

If you search through various texts and reference books written by authors who have spent a lifetime in the field of measurements, you will find that *accuracy* is defined as an *"approach to a true value"* and *precision* is defined as *"repeatability."* Since accuracy is an approach to a true value, there must be some limitation, or degree of the approach,

[*Continued on page 116*]

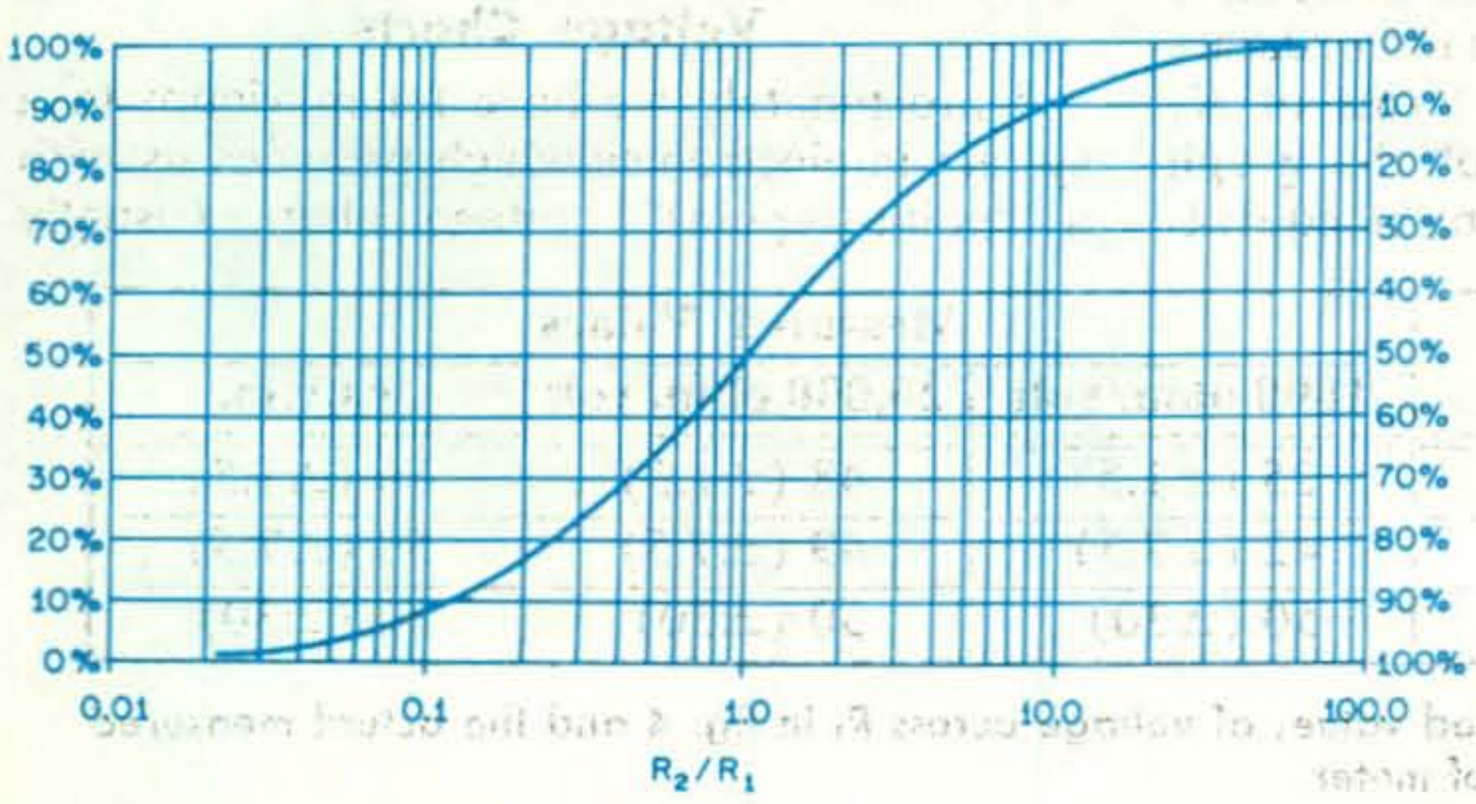

Fig. 5—The graph, at left, can be used for rapid calculation of parallel resistance problems as explained in the text.

COLLINS R388, R389, R390, R390A, R391

The best general purpose communications receivers available today! Product detector assemblies for each set are available at $155.00 extra.

Discriminating buyers have long sought a market place for the best communications receivers. Here in Harvard we have all models and makes and from every era to date. It is our conclusion that the Collins design series headlined above comes closest to satisfying the widest possible need. Teletype reception, VHF or satellite conversion reception, point to point work, or general surveillance can be better accomplished with Collins receivers. Even the most discerning of amateurs will recognize the superb electromechanical features of this series. For example:

The frequencies covered range from 15 kc to 1500 kc for the R389, to 500 kc to 32 megacycles for the R390A. Stability is excellent, such that a set may be pretuned while cold to any discrete frequency within its range; then when the set is turned on, be tuned exactly within plus or minus 300 cycles. Read out and linearity are unexcelled in any other set.

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The choice of AVC time values will satisfy SSB users, or even the broadcast shortwave listener. Both the BFO and main tuning oscillators are temperature compensated in ovens in all but the R388 set.

These are the best communications receivers available today and even Collins latest solid state receiver will do no more, except to reduce size and weight, as compared with the R388 and R389 and R390 series.

This company has prepared an interesting brochure on Collins equipment, including specifications, photographs, and technical information. We should be happy to forward a reproduction of this information to anyone requesting it. Remember that prices vary from $775.00 for a remanufactured R388, to $1985.00 for a remanufactured R391. Our prices are F.O.B. Harvard, Massachusetts, and include all necessary cordages and instruction manuals, and are provided in a wooden export type box at no extra charge. A product detector assembly, modeled after the new Collins 51S1, is available for inclusion on any of these sets, for $155.00 extra. Delivery is from stock on most models, with a maximum waiting period of about three weeks.

Grumbles

by Sam

WHILE there's nothing in the world quite as exciting as the first flush of fresh interest in something, there's also nothing quite like the prestige of the tried and true old-timer—someone with real experience, mellowed in traditions, a master of all of the kinks of his chosen field. So it is with ham radio, it's always an experience to listen to the fist of a real brass pounder; as you copy him you wonder if the hand that is pushing the dits and dahs through your phones once tuned a shipboard sparkgap rig, or maybe it rattled off some hasty orders during The Great War.

Sure puts us relative newcomers to shame sometimes. I remember once I was looking for a QSO with my high powered 3-speed chrome-plated "store boughten" rig with all of the modulation envelopes, peak envelopes, the pretty meters and lights and the relays that click. Who should I come up with but a fellow who was quite obviously from the old school; I was awe struck. He was still using a rig which he had built in 1937 and it sounded great. I was so put down by this fellow's obvious wealth of knowledge that I simply had nothing to say to him; like what could *I* say to him that he didn't already know?

It was then I decided that there was only one way to fully enjoy and savor this wonderful aspect of ham radio, it was to become an old-timer! I wasn't about to waste my time sitting around waiting to do it the hard way—by the time that happened I might have mellowed to the point where I might not even be able to feel the joy of popping all of the egos on the band. I would have to become an *instant old-timer*.

My first step was to acquire old copies of *QST* dating back to the days when it was really happening. With a pencil and a pad I jotted down some of the popular rigs of the day, the names and callsigns of some of the well known operators, and any other assorted trivia which I should know.

"Golly gee, Don Miller is on Finster Island with his S-Line."

"Must be almost like the thrill I got back in '27 when I worked XU6GRL running 5 watts portable from the back of a donkey. Doc wanted me to run a sked with him but I was already booked solid with skeds from AA5CN in Tangiers and ZA1B in Albania."

You can see the power I could wield.

Equipment was a problem. I actually tried to build a nifty 500 watt rig from the March '38 issue of *QST* but every time I tried to buy tubes I found that most parts shops thought that "RK-23" and "ZB-120" were CB callsigns. That failing, I bought a beautiful but ancient used Gross CB-200 transmitter (two RK-12's modulating TZ-40's in the final). Matched up with a Super Sky Rider receiver it made a handsome station.

This created the same old tube-availability problems, in addition to the fact that every time I tried to key the Gross it looked like electric chair time at the "big house." When you think about it though, there was really no point in torturing myself with such obsolete equipment when the guys who were hearing it were across the country.

Resurrecting my new kilowatt chrome plated special, I simply let people *think* that it was something that I had wired together on a breadboard back in 1937.

[*Continued on page 118*]

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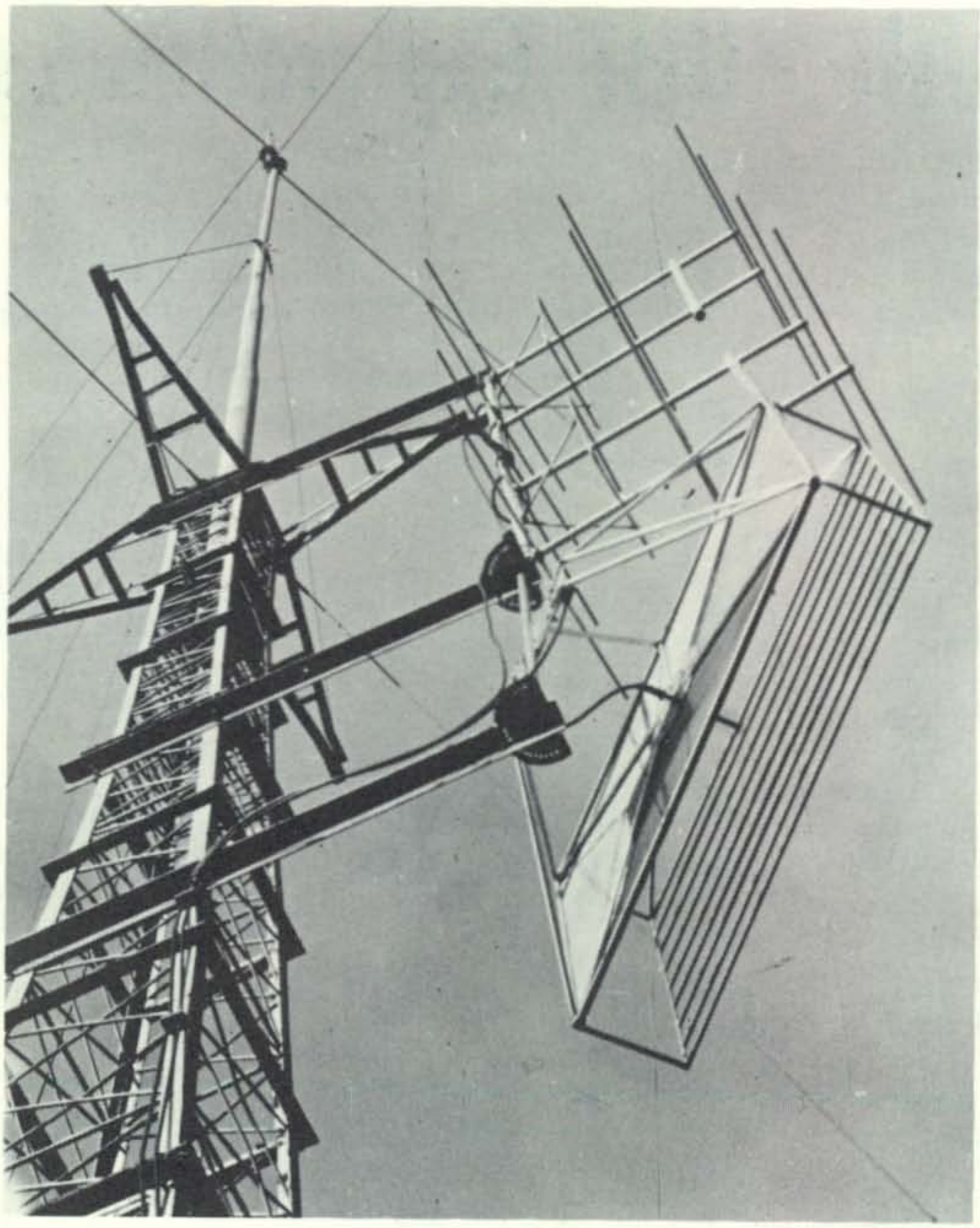
* c/c *CQ*, 14 Vanderventer Ave., Port Washington, L.I., N.Y., 11050.



View of the antennas and tower at the Steve Wright Memorial Beacon Station ZE1JZA located at a mountain top 50 miles from Salisbury, Rhodesia. Operation is in both the 144 and 432 mc bands as described in the text.

Installation of beacon transmitting station in Rhodesia, Africa.

VHF/UHF Exploration

BY PETER CAREY,* ZE5JJ

DURING the month of May, 1967, a dual band 100 watt input Beacon Transmitter operating in the 144 and 432 mc bands was commissioned at a site 50 miles north west of Salisbury on a mountain peak 5,609 feet above sea level, whose geographical co-ordinates are 17° .09′ South and 30° .42′ East. It is intended that this Beacon shall fulfill two important functions:

(a) Provide transmissions for a propagation survey to be carried out in Rhodesia and possibly the Republic of South Africa by recording signal levels on both frequencies, separately or simultaneously.

(b) Enable v.h.f./u.h.f. constructors to set up and adjust their equipments for optimum results.

Historical Background

The original concept of this Beacon was evolved by the Headquarters Council of the Radio Society of Rhodesia. It had been tabled that Peter Lowth ZE7JX (ex-VQ2PL —of 6 meter fame) had donated certain

* P.O. Box 377, Salisbury, Rhodesia.

VHF/UHF Exploration (Cont.)

funds to the setting up of a memorial to Steve Wright ZE1JZ of Bulawayo, who, until his passing several years ago was very active on the higher frequencies. It was decided that an appropriate memorial to this great amateur would be a Beacon radiating his own call-sign. Thanks are due to the licensing authorities for allowing this project to go ahead and in order to bring the call-sign in line with their requirements for Beacon stations, ZE1JZA became the allocated call-sign.

The construction of the transmitter and antenna has been the task of at least a dozen members of the Radio Society who have contributed much of their time and energies to making the project a success. Thanks are also due to many donors of component parts including Philips Rhodesia (Pvt) Ltd., and others who have seen fit to donate financial assistance without which the project could not have progressed.

Specifications

FREQUENCIES:	144.016 mc. 432.-048 mc.
MODULATION:	F.s.k. 600 c.p.s. on 144 mc 1800 c.p.s. on 432 mc.
POWER INPUT:	100 watts on both frequencies.
POWER OUTPUT:	70 watts on 144 mc. 55 watts on 432 mc.
MAINS POWER INPUT:	500 watts. 230 v 50 c.p.s.
WEIGHT:	Approx. 150 lbs.
CONSTRUCTION:	Steel Cabinet, Rack & Panel. Doors front and back.
COOLING:	By extractor fan and convection.
ANTENNAS:	(a) For 144 mc: Double Skeleton Slot. Gain 15 db above reference dipole, S.w.r. 1.1:1. 50 ohm input. (b) For 432 mc: Reflex - single unit. Gain 15 db above reference dipole. S.w.r. 1.05:1. 50 ohm input.

Circuit Description

A common exciter drives both finals to 100 watts input. The 144 mc final is driven directly from a 1 turn link on the exciter tank. In the case of the 432 mc final, exciter output at 144 mc is tripled before driving the final to 100 watts input.

Exciter

A 6BJ6 crystal oscillator (xtal frequency 9.001 mc) feeds a 12AU7 and 6360 set of multipliers to drive another 6360 to 10 watts output on 144 mc. The latter operates as a straight-through amplifier. Two separate one-turn links are provided for each of the two finals.

The crystal oscillator is frequency shift keyed initially by a mechanically driven code wheel which bears the call-sign ZE1JZA. The keying sequence comprises a carrier break of 18 seconds—an unmodulated carrier for 54 seconds, 5 call-signs every 18 seconds and an unmodulated carrier for 270 seconds. The entire sequence takes 432 seconds to complete.

The carrier break is inserted to enable recording stations to evaluate threshold noise levels every 7 minutes and 12 seconds throughout the 24 hours.

The 144 mc Final

The common exciter feeds directly via a 1 turn link to the push pull grids of a QQE06/40 (5894) in Class C running 100 watts input. R.f. output is obtained from an Eddystone Hairpin Push Pull Tank. R.f. output indication, plate, screen and grid current meters are provided for continuous monitoring. The output tube is protected by a combination of −75 volt grid bias and screen clamper tube (6V6G). In order to cut off screen voltage completely on silent periods, an 0A2 voltage regulator is inserted in series with the feed to the common screen grids.

432 mc Final and Tripler

The common exciter feeds directly via a 1-turn link to the push pull grids of a QQE06/40 tripler, which in turn drives the QQE06/40 final to 100 watts input. A special feature of the construction is the use of solid dielectric tuning on both tripler and final tanks. Tufnol is employed on the tripler hairpin tank which is inductively coupled

to the push-pull grids of the final Amplifier. Mycalex is used on the final tank which consists of a ½ wave stripline with dielectric tuning at its center. In order to preserve balance on both plates of the final QQE06/40, a specially designed balun pick up link transfers energy from the tank to the antenna. All critical parts of the tripler and final tank and grid circuits are silver plated and lacquered to preserve high *Q* and efficiency.

R.f. output indication is provided, likewise plate, screen and grid current meters for continuously monitoring of both tripler and final tubes.

For cooling a small fan blows air upwards past the plate seals of the final tube and a larger extractor fan sucks air up past the final and tripler as well as drawing cool air in from the back and sides of the steel cabinet through gauzed-in louvres. The two fans assist in keeping the entire electronics at a reasonable working temperature. Protection for the tripler tube is provided with −150 volts grid bias and a combination clamper tube (6V6GT) and a VR150 regulator to protect the final tube.

Power Supplies and Protection

Since most of the expensive parts of the power supplies were obtained very cheaply, no attempt was made to employ more modern silicon diode rectifiers. Instead a more conventional approach was followed by using 866A mercury vapor rectifiers which are known to give good performance particularly in areas subjected to lightning incidence. It was therefore considered that this type of rectifier was more likely to be less prone to lightning surge failures.

The high voltage is automatically controlled by a 90 second thermal delay circuit which also energizes the tripler 350 volt supply and both fan motors (110 v.).

Apart from the location of fuses at certain parts of the supplies, additional protection for the transmitter is provided (a) By installing a gas discharge tube across the 230 a.c. input. Should the potential across the 230 v. terminals exceed 600 v. the gas discharge tube will conduct heavily thereby blowing the 13 amp fuse on the mains side.

(b) Since the 600 v. hold-in relay is energized from the 75 v. regulated grid bias supply, failure of this bias supply will cut-off high voltage to the finals and tripler.

Since the bias rectifier is a solid state diode, an attempt has been made to provide surge protection for it by a combination of *R* and *C* in its input circuit.

Antennas

For 144 mc two 4 element skeleton slots are fed in phase and stacked one above the other approximately 1 wavelength apart. The array is mounted vertically on the side of a 65′ high lattice steel tower so that it can be turned through an arc of 200° and be locked at 7½° intervals throughout the arc. For 432 mc, a single section Reflex is mounted to give horizontal polarization. This may similarly be locked in any position throughout the 200° arc. The arc over which both antennas look runs approximately north through west to south on a mountain peak 5609 feet above sea level.

Overseas and Extra-Territorial Co-operation

According to presently accepted theory, it is unlikely that this Beacon will be heard overseas on 144 or 432 mc. However, with tropospheric bending and maybe freak or unusual conditions, contact may be established. Certainly this should be possible through a satellite repeater. Nevertheless it is to be hoped that anyone anywhere who positively identifies the call-sign ZE1JZA will report the matter immediately to the H. Q. Secretary, Radio Society of Rhodesia, P. O. Box 2377, Salisbury, Rhodesia for which a special acknowledgement will be sent.

It is hoped, also, that those listening stations able to record signal levels regularly within the borders of Rhodesia or the Republic of South Africa will send in reports on a monthly basis.

The success of the Propagation Survey is largely dependent on frequent and reliable reporting and all those who can do so are earnestly requested to give their fullest co-operation.

It is intended that this Beacon will radiate continuously for a period of 3 years or until such time that its usefulness is no longer desired or justified. ■

Turn immediately to page 122 for information about our subscribers' free classified ad section!

LA1ITU; From The Land Of

BY GEORGE JACOBS,* W3ASK

THE date: June 22, 1966; the place: Oslo, Norway, glowing in the sunshine of a balmy summer evening; the time: exactly 7 P.M.—and with a lusty CQ, LA1ITU is placed officially on the air, to mark another important event in the history of amateur radio.

LA1ITU was a special amateur radio station established jointly by the Norwegian Telecommunication Administration and the Norwegian Radio Relay League, to mark the XIth Plenary Assembly of the International Radio Consultative Committee (C.C.I.R.), which met in Oslo from June 22-July 22, 1966.

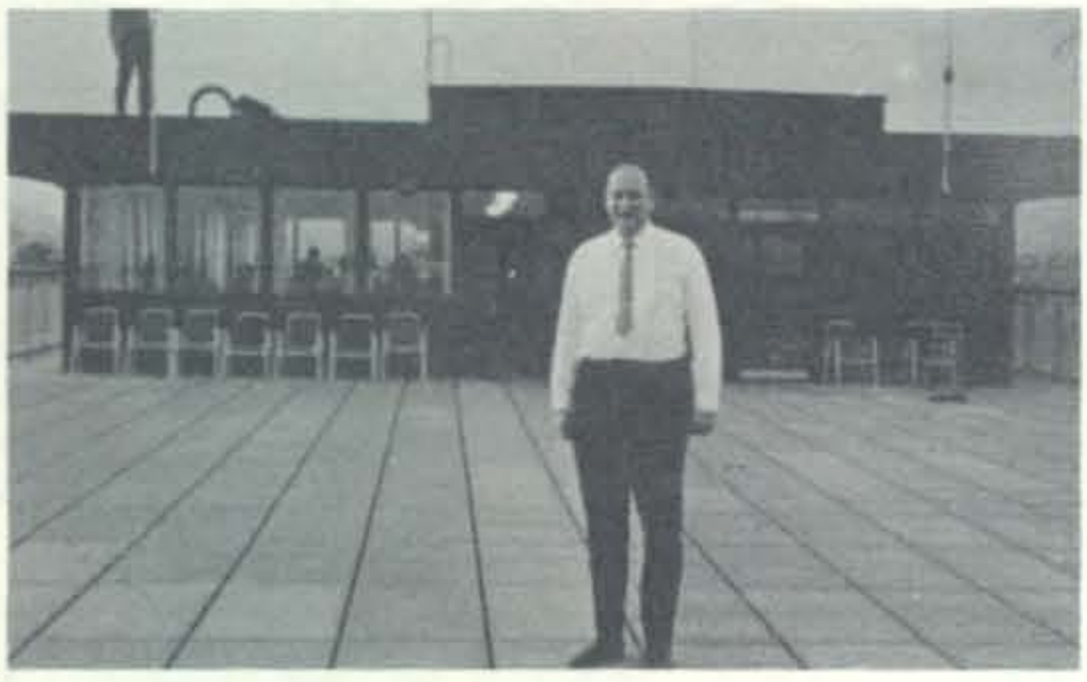
The C.C.I.R. is often referred to as the "technical arm" of the International Telecommunication Union, of which it is a part. It is responsible for studying, on an international cooperative basis, technical and operating questions and problems with the object of improving and facilitating international telecommunications. The main work of the C.C.I.R. is carried out in fourteen Study Groups, which together cover virtually the entire field of radio communication, including sound and television broadcasting, space communications, fixed service systems, radio relay systems, etc.

The C.C.I.R. maintains a small permanent staff in Geneva, and almost all of its work is carried out by experts made available on an ad hoc basis by member nations of the I.T.U., as well as by a large number of private communication organizations. Every three years a Plenary Assembly is held to review the work of the Study Groups, and to make recommendations to the I.T.U. where they are considered for international adoption.

The XIth Plenary Assembly of the C.C.I.R. was held in Oslo from June 22-July 22, 1966. Seventy-five national administrations were represented directly, and 22 others by proxy. Representatives were also present from several other international organizations and from nearly three-score private communication companies. In all, a total of nearly 750 telecommunication experts and officials attended the Conference in one capacity or another, to tackle the several hundred questions and study programs which were on the agenda.

It was the gathering of such an eminent assembly that prompted the Norwegian Radio Relay League to seek the permission of the Norwegian Telecommunication Administration for the establishment of a special amateur radio station to be made available for use by the delegates to the Conference. Previously similar stations had been made available to delegates of the IXth Plenary Assembly which was held in Los Angeles during 1959 (K6USA) and the

* 11307 Clara Street, Silver Spring, Md. 20902



The "shack" at LA1ITU: A penthouse atop Oslo's tallest building, the 17-story Telehus. Newly-built, the building is headquarters for the Norwegian Telecommunication Administration. That's W3ASK seen in front of the penthouse.

The Midnight Sun

Xth Plenary Assembly held in Geneva during 1963 (4U1ITU).

Under the very able leadership of Per Gunderson, LA5LG, the late President of the Norwegian Radio Relay League, the Telecommunication Administration agreed to the establishment of a special amateur radio station for the Conference. The Administration went much further—it made available a reasonable amount of funds for the purchase of amateur radio equipment, as well as providing a "shack" for the station. And what a "shack" it was! The Administration turned over to the League its penthouse laboratory atop the 17-story TELEHUS building located in St. Olavs Place. This newly-built headquarters building of the Norwegian Telecommunication Administration is the tallest in Oslo!

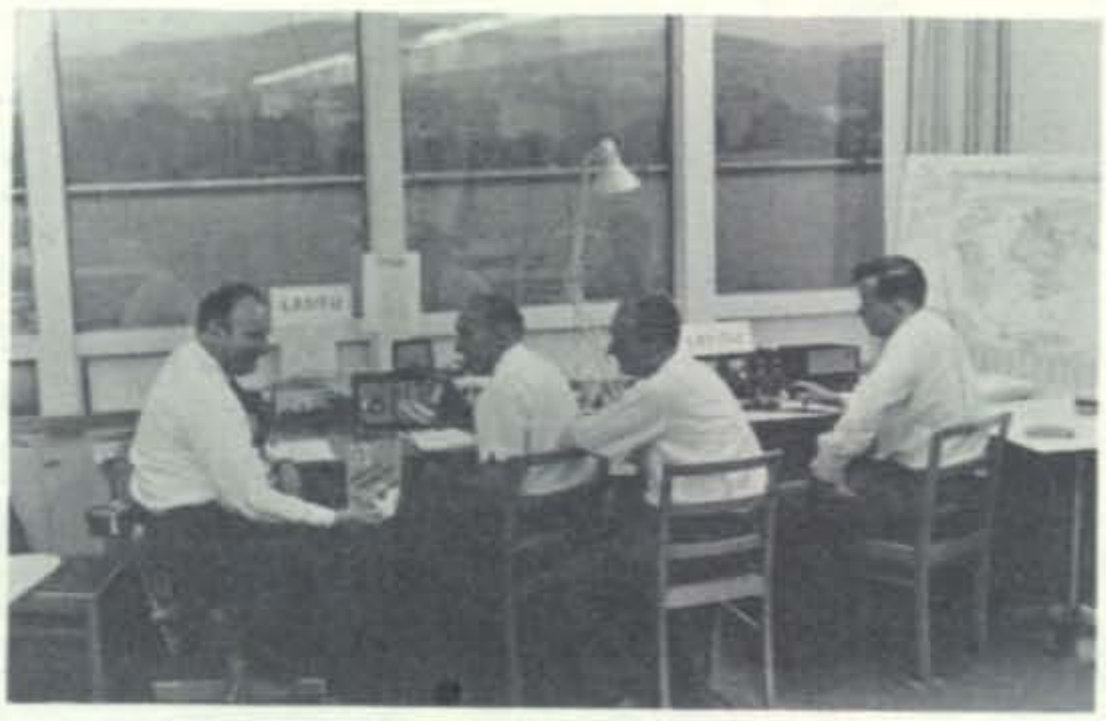
Working at fever pitch, members of the League, often assisted by their XYLs or YLs, installed the equipment provided by the Administration, as well as some additional equipment of their own. At least two radio amateurs among the C.C.I.R. delegates brought their own equipment as well, which was also installed in record time. By the evening of June 22, everything was in typical Norwegian "ship-shape", and ready to go on the air.

The station, when it began operations on June 22 before a large gathering of Norwegian radio amateurs, several radio amateurs from among the C.C.I.R. delegates, and a large number of guests and visitors, consisted of five h.f. transceivers operating in the 10-80 meter amateur bands on c.w., a.m. and s.s.b.; one amateur-built 2-meter station, some commercial receivers and also home-brew equipment of special interest. Antennas used ranged from a tri-bander beam, to several verticals and dipoles.

All participants to the XIth Plenary Assembly were officially welcome to visit and operate LA1ITU. A very large number of the delegates did visit the station to see amateur radio in operation. Among the C.C.I.R. delegates were at least three dozen licensed radio amateurs who operated the station as well. Playing hosts were the members of the Norwegian Amateur Radio League and their XYLs and YLs—and very charming and friendly hosts they were.

The station generally began operations at 7 P.M. daily, after the Conference had completed its sessions for the day. It often remained open well into the night. In late June, however, "night" in Oslo is pretty much "day", and those who operated the station were afforded a truly panoramic view of the midnight sun. From the glass enclosed penthouse of LA1ITU, the northern sun could be seen streaking across the horizon, dip out of view for an hour or so, then rise

[*Continued on page 78*]



Shown working the late 20 meter ssb openings to the States are, from left-to-right, W3ASK, K3BGX, DL1FZ and LA5KG. This picture was taken by the light of the midnight sun, seen through the window rising in the northern sky.

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HX-30 6m Xmtr 175
HA-20 6m Linear 75
HW-12 75m Xcvr 99
HW-22 40m Xcvr 89
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Mob. Xmtr (as-is) 15

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350 Xcvr (late) 29
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June 22, 1966—opening night at LA1ITU. Shown operating are W3ASK (left) and WA1EVH. Standing, from left-to-right, K2BZT, LA5 SE, LA9LE, WAØDE, LA4Y and LA8YB.
(Photo courtesy Aftenposten).

again in a symphony of color, just past midnight!

Radio amateurs throughout the world were given a verbal description of the beautiful midnight sunset-sunrise by the operators of LA1ITU.

But the midnight sun was not the only scenic view seen from this penthouse "shack". To the south, beyond the twin-red towers of Oslo's city hall, and the harbor, could be seen the beautiful and truly majestic Oslo fjord, whose sparkling blue waters were flecked with the colors of the rainbow from the sails of the countless number of small boats skimming along its surface. To the west could be seen the rising foothills, emerald green in June, which provide the citizens of Oslo and their visitors with a haven for camping, swimming and fishing during the summer months and skiing, skating and sledding during the winter months.

During the month that LA1ITU was in operation nearly 2000 contacts were made with approximately 85 countries, in all continents of the world. For the first time in the history of amateur radio in Norway, a station was permitted to handle third party traffic, and scores of messages were handled by LA1ITU for the C.C.I.R. delegates. In many cases, schedules were arranged between delegates and their families at home. Daily contacts were also arranged between LA1ITU and the headquarters station of the I.T.U. and the International Amateur Radio Club, 4U1ITU in Geneva. Each contact received a QSL card designed especially for the occasion of the C.C.I.R. Conference.

One sad note marked the otherwise almost festive atmosphere of the LA1ITU operation. During early July, the Conference was shocked to learn of the sudden death of Per Gunderson, LA5LG. Per, a pioneer radio amateur in Norway, and President of the Norwegian Radio Relay League at the time of his death, did more than anyone else to make LA1ITU a reality. The station, in fact, became a memorial to him both as a man and for the many contributions he had made in a lifetime devoted to the development of amateur radio in his beloved country.

In official recognition of the LA1ITU operation, A. Prose Walker, W3BMX/W4CXA, of the U. S. Delegation paid the following tribute to amateur radio at the final meeting of the Conference on July 22.

"I have asked for the floor at this time, Mr. President, to express the sentiments of the United States Delegation to you, personally, on a matter which has been most pleasantly received by our delegation, and I am sure, by many other delegations as well. The subject of my remarks is the authorization and establishment of Amateur Radio station (LA1ITU) during the period of this XIth Plenary Assembly of the C.C.I.R.

"If you will permit me, Sir, I would like to make some observations concerning Amateur Radio and its relation to the expanding period of technology throughout the world. I venture the opinion that a significant number of delegates here at this conference received their initial exposure in the field of electronics through the medium of Amateur Radio. Initially, Amateurs were influential in opening the possibilities for long distance communication via the high frequencies, after having pioneered in the area of the spectrum which administrations then found too valuable not to utilize for the benefit of all their people.

"All of us here know the history of the development of radio communications and the continued experimentation and development by Amateurs, which although mostly unheralded, has been of significant value. Countless advances in theory, techniques and equipment have been contributions of Amateurs or those who received their early stimulus and training in that medium. Today with the vastly more complex science of communications, we still find Amateurs keeping abreast of developments and maintaining the pace laid down by large national laboratories and developmental organizations in our respective countries. Even satellite communication does not daunt the Amateur, and in

the near future OSCAR IV will be in orbit enabling Amateurs throughout the world again to communicate on v.h.f. by means of an orbiting satellite. A chronicle of all these events and their significance would take entirely too much time.

"Allow me to say in a personal vein, that it has been most gratifying to meet face-to-face here in Norway and at this conference, fellow Amateurs with whom I have communicated over the past thirty years or more. I learned here that a member of the Delegation of Portugal was formerly CR5AR in Sao Thome Island, whose QSL card is in the files of my own station; that my good friend Mr. Ivanov of the Soviet Delegation was formerly EN9BU and that in many other delegations, active and former Amateurs are included amongst them. Through Amateur Radio at station LA1ITU, many delegates were able to communicate with their families at home, in an informal atmosphere, with gratifying results.

"There is, without question, a close correlation between the sponsorship and encouragement of Amateur Radio in countries of the world, and the technological advancement of those countries. If I might offer a suggestion to all countries represented here at this conference, it is that they encourage to the utmost the participation of their technically inclined students, in Amateur Radio. For I'm sure they would find a bright new zeal and thirst for learning in the communications field, by application of technical knowledge to equipment they build and operate themselves.

"Mr. President, Amateurs throughout the world will experience a thrill and pride, upon learning that the newly elected Director of the C.C.I.R., Mr. Herbstreit, also is an active Radio Amateur, WØIIN. I am equally certain that in the years to come he will continue his interest and activity, although he will be surrounded by all our problems and their most satisfactory solutions.

"Therefore, Mr. President, I tender you personally our thanks and gratitude for your wisdom and appreciation of Amateur Radio, in your approving the establishment of station LA1ITU. Nearly 2000 contacts have been made with approximately 85 countries, in all continents of the world. Our gratitude also is expressed to the Norwegian Radio Relay League, whose members have spared no effort to facilitate the success of the station in cooperation with your administration,

Adding some femininity to the station are (right) Peggy, LA3WG (XYL of LA4LE), and left, Miss Jane Anstey of the C.C.I.R. That's K3BGX busily engaged in conversation with Peggy.

and to make us all feel welcome here in your beautiful country. It was with sadness that we learned of the sudden death of the President of the Norwegian Radio Relay League, Mr. Per Gunderson, who was present in this hall at the opening ceremonies.

"Although I speak only on behalf of our delegation, I know that all delegations and Amateurs everywhere will join me in this salute to you, Sir, and in wishing you the best of life's pleasures and time to enjoy them all.

"I would appreciate having my remarks included in the minutes of this session of the Plenary Assembly."

LA1ITU was a complete success both from the viewpoint of the communication service it provided and as a "salesman" for amateur radio in general. In fact the LA1ITU operation has been given considerable credit for setting the groundwork which culminated earlier this year in the successful signing of a reciprocal licensing agreement between Norway and the USA.

No doubt each delegate to the XIth Plenary Assembly of the C.C.I.R. brought home with him fond memories of the warmth and friendliness of the Norwegian people, the charm of Oslo, the beauty of Norway, and of the glorious summer weather. Many a delegate also left Oslo very favorably impressed with amateur radio, as a result of the LA1ITU operation.

(*This article has been selected to appear in the 1967 annual publication of the International Amateur Radio Club, Geneva, Switzerland*).

TUNED CHOKE INPUT

BY FRED BROWN,* W6HPH

The Right Way To Make a Choke-Input Power Supply

THIS idea may be an old one but it does not seem to have been given the attention it deserves. Anyway I can claim no originality for it since it was described to me by Roy Brady, W6UXN.

Figure 1 shows a conventional choke-input filter circuit following a full-wave rectifier. It seems to be a neglected fact that a rather dramatic improvement in both regulation and ripple reduction can be achieved simply by shunting the choke with a small capacitor as shown. The capacitor should resonate with the no-load choke inductance to a frequency slightly higher than 120 cycles. The choke I used in the circuit required a value of C_s which resonated the choke to 145 cycles. The optimum value of shunt capacitor is best found experimentally by observing the ripple voltage on an oscilloscope. Lacking a scope, though, it is easy to measure the ripple output with an a.c. voltmeter (preferably a peak-reading type) connected across the load through a coupling capacitor. Capacitor C_s is then adjusted for minimum ripple with the power supply under full load.

Results

For the case of a capacitor-input filter circuit a reduction in ripple can also frequently be had by resonating the choke although there will be no corresponding improvement in regulation as with the choke-input circuit.

The curves of fig. 2 show the improvement in both regulation and ripple that occurred in the power supply circuit of fig. 1. This particular power supply is being used in a small v.h.f. exciter. It uses a power transformer removed from an old 5 tube bc set. Note in fig. 2 that for loads greater than 40 ma the output voltage is actually slightly raised by C_s, whereas for lesser loads the voltage is lowered. The slope of the curve at 40 ma (with C_s) corresponds to an output resistance of 800 ohms. This is mostly made up of the filter choke resistance (230 ohms) and the transformer resistance (450 ohms either side of center tap).

Silicon Diodes

Some experts claim that choke input is hard on silicon rectifiers because of switching transients. Others say just the opposite; capacitor input is bad because of the heavy charging current. Measuring the peak reverse voltage across the diodes in the circuit of fig. 1 I find it to be 1020 volts. With the choke shorted out (capacitor input) this voltage drops to 900 volts. From this we may conclude that choke input does raise the peak reverse voltage on the diodes, but only slightly. ■

* Pine Cove, Idyllwild, Calif.

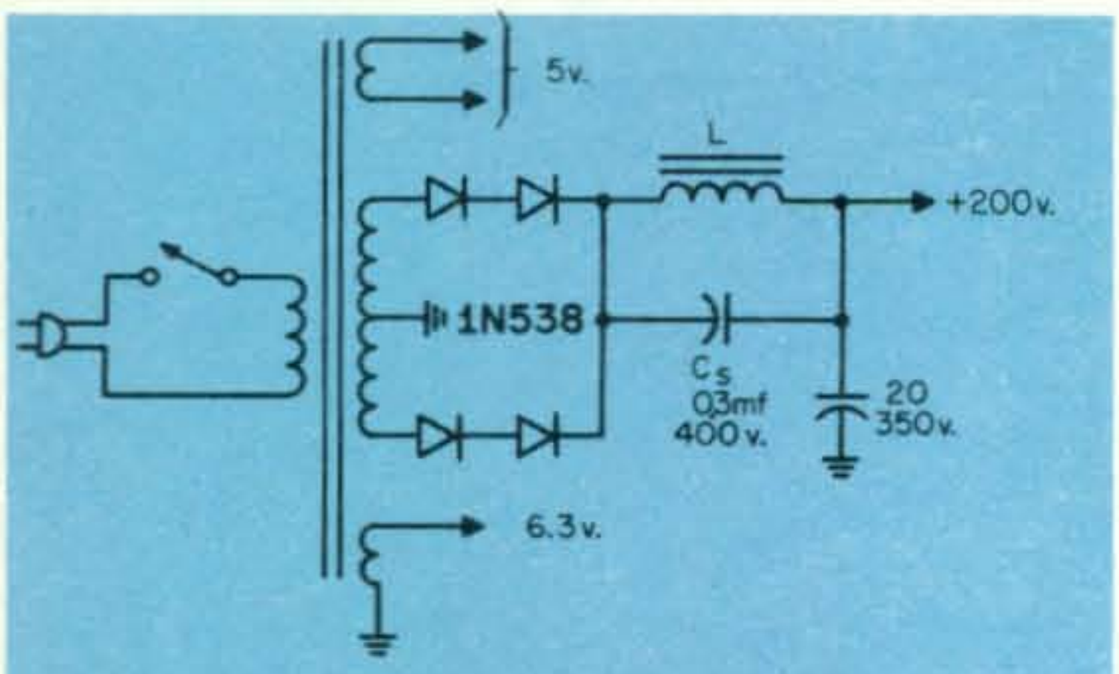


Fig. 1—Practical power supply using a small transformer from an old table model radio. The high voltage winding is 250 volts each side of center tap. The choke, *L*, has a no-d.c. inductance of 3.8 henrys. Shunt capacitor C_s improves regulation and filtering by resonating choke *L* to 145 c.p.s.

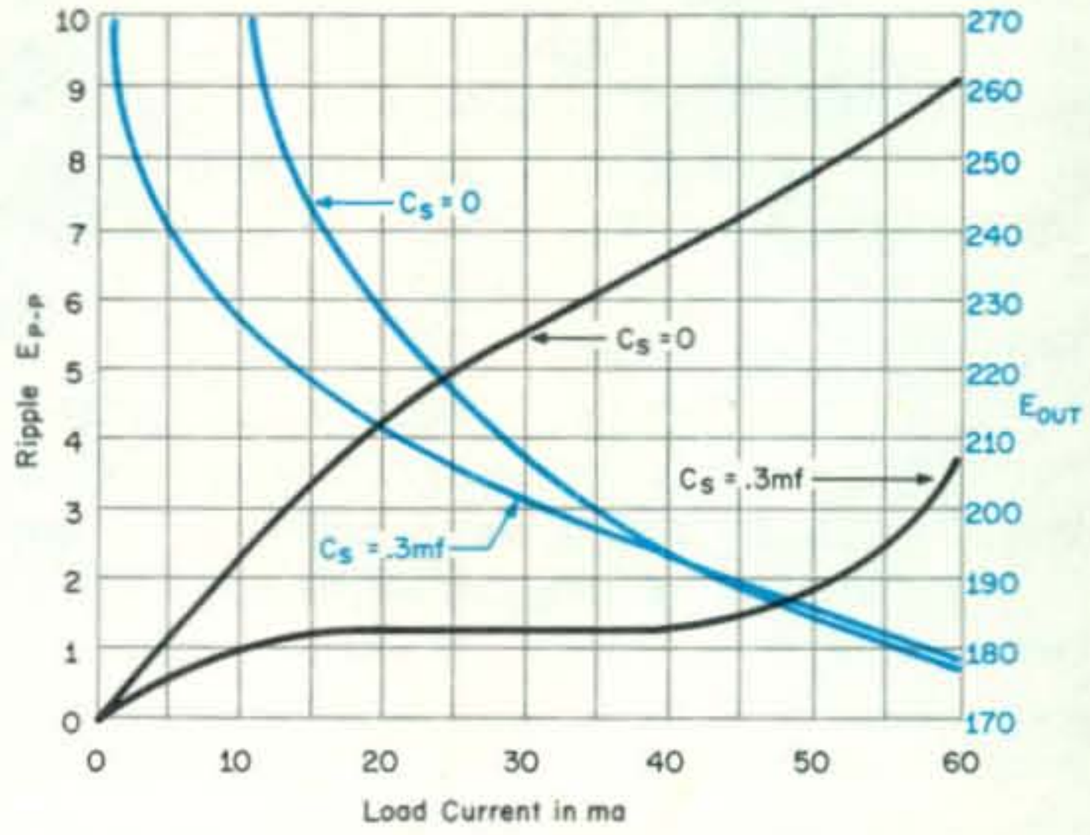
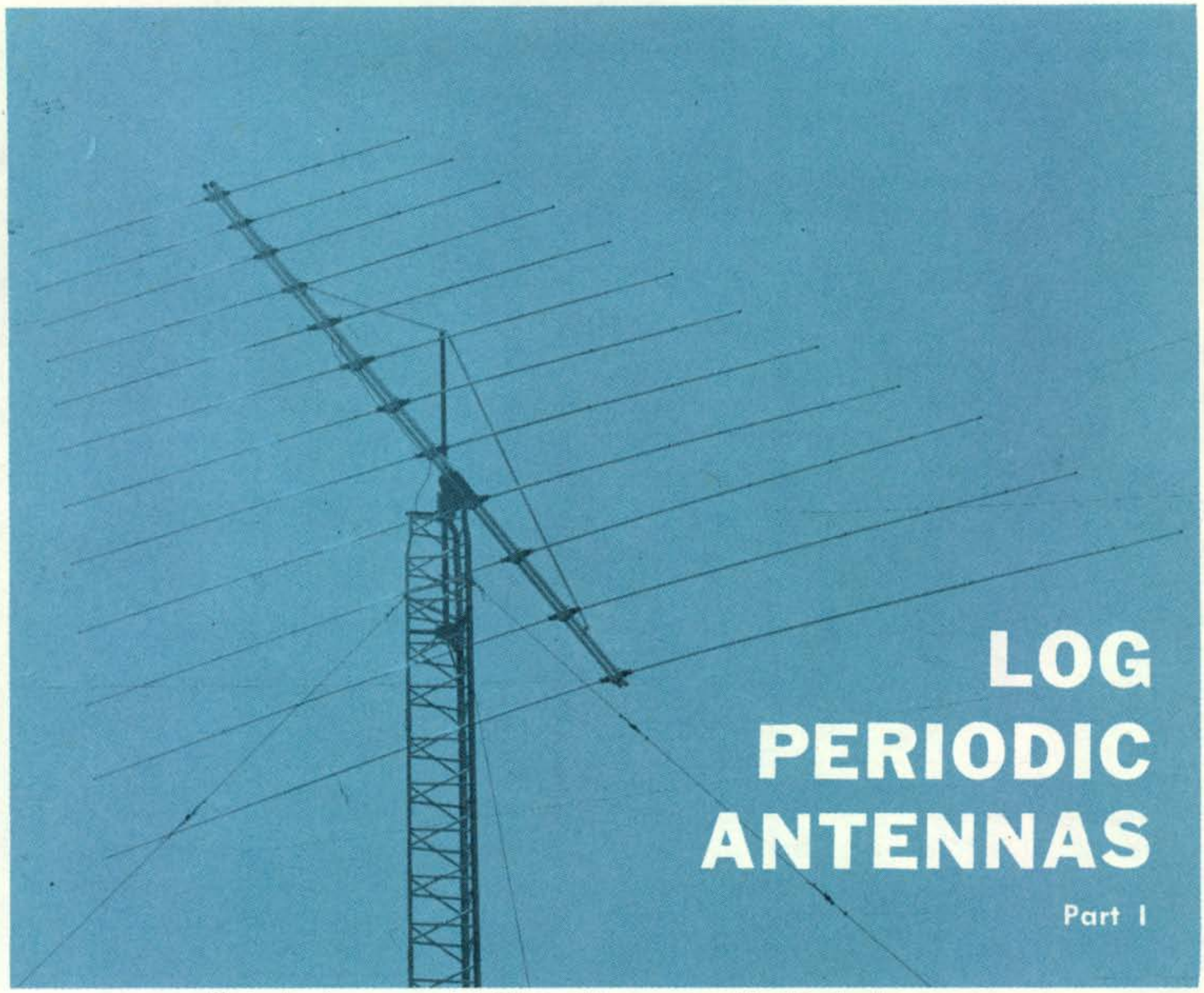


Fig. 2—(Black curves) Impovement in regulation resulting from C_s. (Color curves) Improvement in ripple reduction resulting from C_s.



LOG PERIODIC ANTENNAS

Part I

Photo 1—A commercial 13 to 30 mc rotatable LP dipole antenna.

BY AL BROGDON,* K3KMO

This is the first article of a two-part series on logarithmically periodical antennas. This first article covers the basic theory of operation of LP antennas, and describes some LP's which will be of interest to hams. The second article will consider the design parameters for LP dipole arrays, and will work through the design data for a typical LP dipole array.

UNTIL recently, a broadband antenna with reasonable gain and directional characteristics was not available. The problem centered around the fact that all antennas had their dimensions specified in terms of frequency—that is, they were frequency dependent. If an antenna were designed for one frequency, its performance would be best at this frequency, and would deteriorate as the operating frequency was moved to either side of the design frequency. If the antenna were designed for high gain and narrow beamwidth characteristics (as, for example, is the Yagi-Uda antenna), its bandwidth would be even more restricted. In such cases, it might even be impossible to build a practical antenna that would cover an entire amateur band without a serious degradation of performance at one or both ends of the band.

Then a group of scientists and engineers at the University of Illinois, led by R. L. Carrel, D. E. Isbell and V. H. Rumsey,

* RD 1, Box 390A, State College, Pa. 16801.

developed a family of antennas whose dimensions could be stated in terms of angles, and whose shapes repeated logarithmically. Such specifications resulted in true frequency-independent antennas—antennas that would perform equally well over a wide band of frequencies. It is quite common for such antennas to cover a 10:1 bandwidth (for example, 10 to 100 mc), and it is possible to cover even more.

An important characteristic of the log periodic antenna is that its performance is the same throughout its design range; there are no holes in its frequency response. Figure 1 shows the gain and v.s.w.r. of an experimental LP antenna designed for 1100 to 1800 mc. You can see that both parameters remain well within acceptable limits over the entire range.

The characteristics of the LP antenna make it an ideal antenna for the military and many commercial applications, where it is necessary to have continuous frequency coverage over a wide band. Amateurs, on the other hand, are allocated only a series of relatively narrow slots in the frequency spectrum. Therefore, in most cases, the amateur is better off with a series of single-band antennas, or some type of compromise antenna such as the "trap tri-bander" for multiband coverage.

In some cases, however, LP's can be put to good use by hams. An LP would enable a v.h.f. operator to cover an entire v.h.f. band, or two or more v.h.f. bands, with good performance. An LP could be designed to cover all bands from 20 meters to two meters. It would be big, but no bigger than some single band 20 meter beams. For the ham who has lots of time, patience and money, it would even be possible to have a rotary LP for 40 meters through six or two meters, or a family of fixed LP antennas to cover the 80 meter band on up.

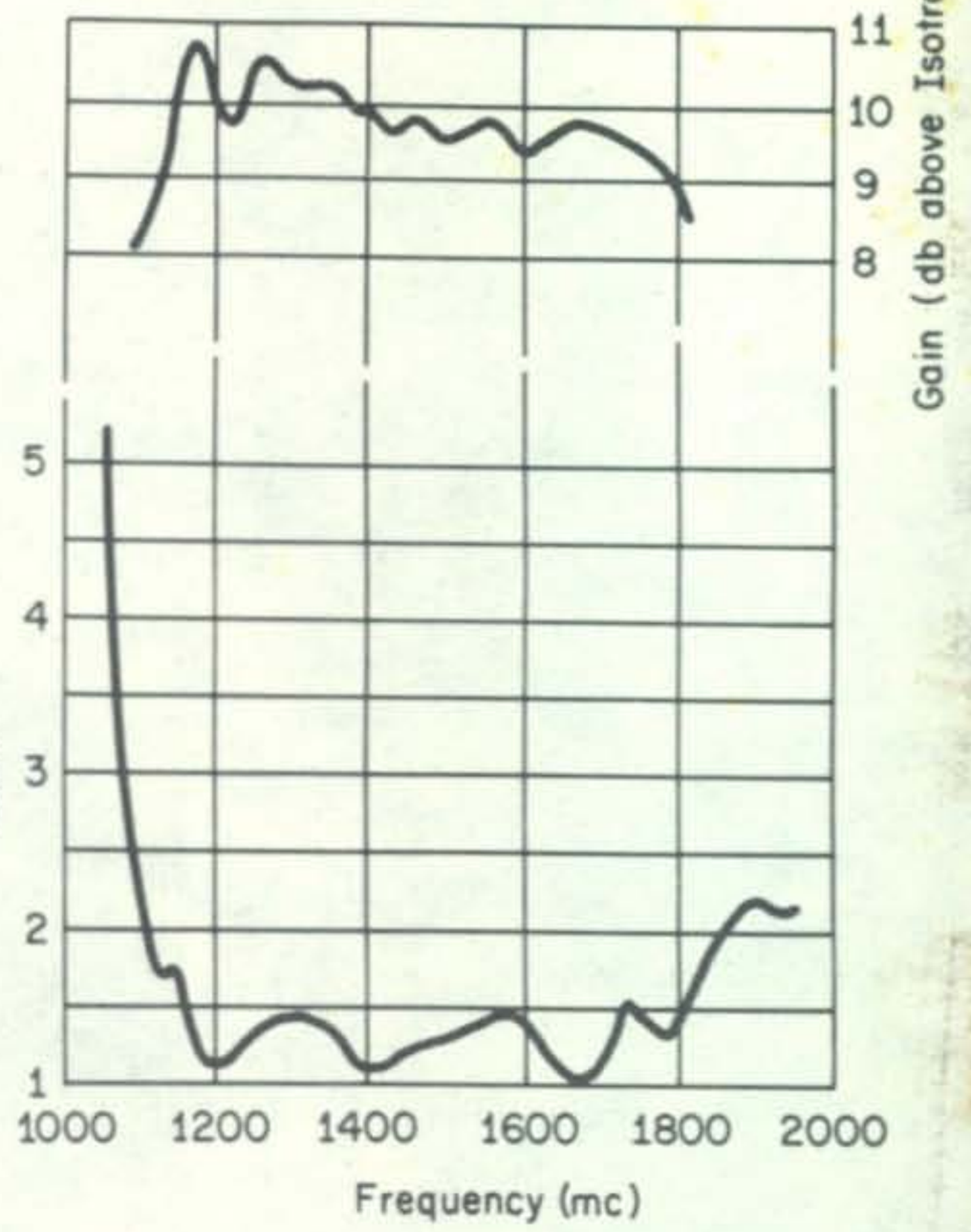


Fig. 1—Gain and v.s.w.r. of an 1100 to 1800 mc LP dipole antenna.

LP Structures

There are many types of LP structures, ranging from the familiar LP TV antennas to very weird shapes which are almost unrecognizable as antennas. The following discussion will deal with only one type of LP structure—the planar log periodic dipole array. As the name suggests, this array is made up of a number of dipoles, all lying in the same plane, whose length and spacing vary logarithmically. This type of LP is perhaps the easiest to understand and best for visualizing the principle of the LP antenna. Also, it is mechanically the simplest to construct as a ham project.

Figure 2 shows a sketch of an LP dipole antenna. The lengths of the dipoles and the spacings between them are logarithmically related. To visualize its operation, let us assume that the antenna is excited at a frequency near the center of its design range. The dipole nearest a half-wavelength will accept the most power; those on either side of this dipole will accept lesser amounts of power but will contribute to the over-all radiation. As the frequency is raised, the elements doing the work will be closer to the front of the antenna; as the frequency is lowered, the phase center of the array will move towards the rear. Note that the adjacent dipoles are transposed on the feedline to obtain the proper phase relationships. Also note that, except in the case of very large arrays, the two-wire feedline is constructed of tubing or channeling, and is clamped together with insulating spacers to serve as twin booms for the antenna.

No matter what other shape is used to develop a log periodic antenna, the same principle applies. In a properly-designed and constructed LP, the active region of the antenna passes smoothly from one element to the next, resulting in a nice flat frequency

response over the entire design band. Thus the LP will produce essentially the same gain and v.s.w.r. characteristics anywhere within the design frequency range.

Construction Types

Since we are considering log periodic dipole arrays, photos 1 through 4 will illustrate types of construction techniques which can be used with this basic design. Photo 1 is a commercial LP array manufactured by Hy-Gain. It is designed for the 13 to 30 mc range, with the longest dipole about 35 feet long, and the boom length also about 35 feet. Obviously, the size and weight of such an array are comparable with antennas considered common in ham radio today. It would be possible for the home constructor to build a similar antenna using good beam construction materials and techniques.

Photo 2 shows an antenna built by the author for military use in the 20 to 60 mc range. It was built as a field expedient until a permanent antenna could be procured, and was made from normal hardware store materials. Copper tubing was used for the booms and elements, with bakelite strips as insulating boom spacers. A wooden pole was used as a dielectric support mast, and an oak 2″ × 2″ was mounted to support the front end of the boom and the coax feedline. The antenna was constructed in true ham fashion, and, with the exception of being non-rotatable, would be well suited for ham use.

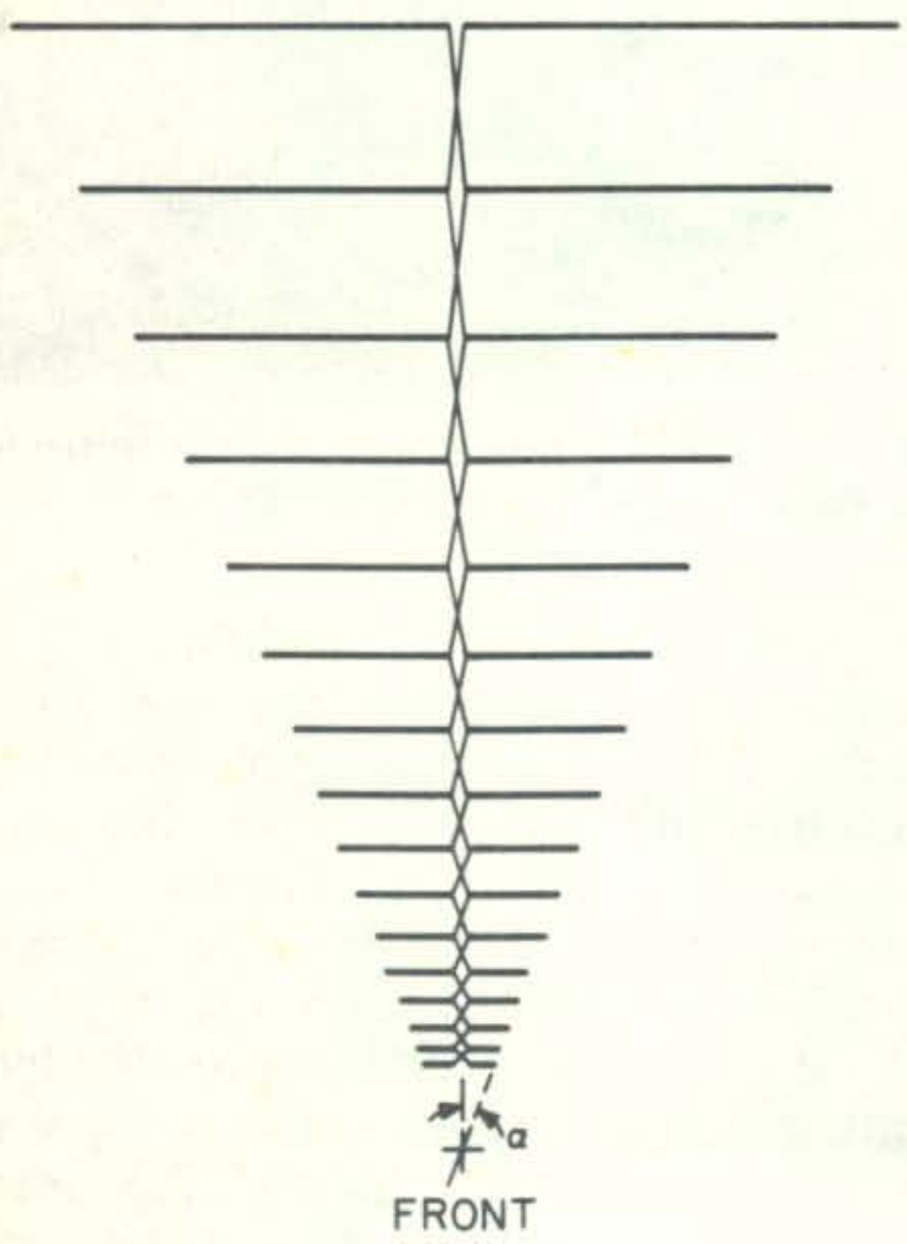
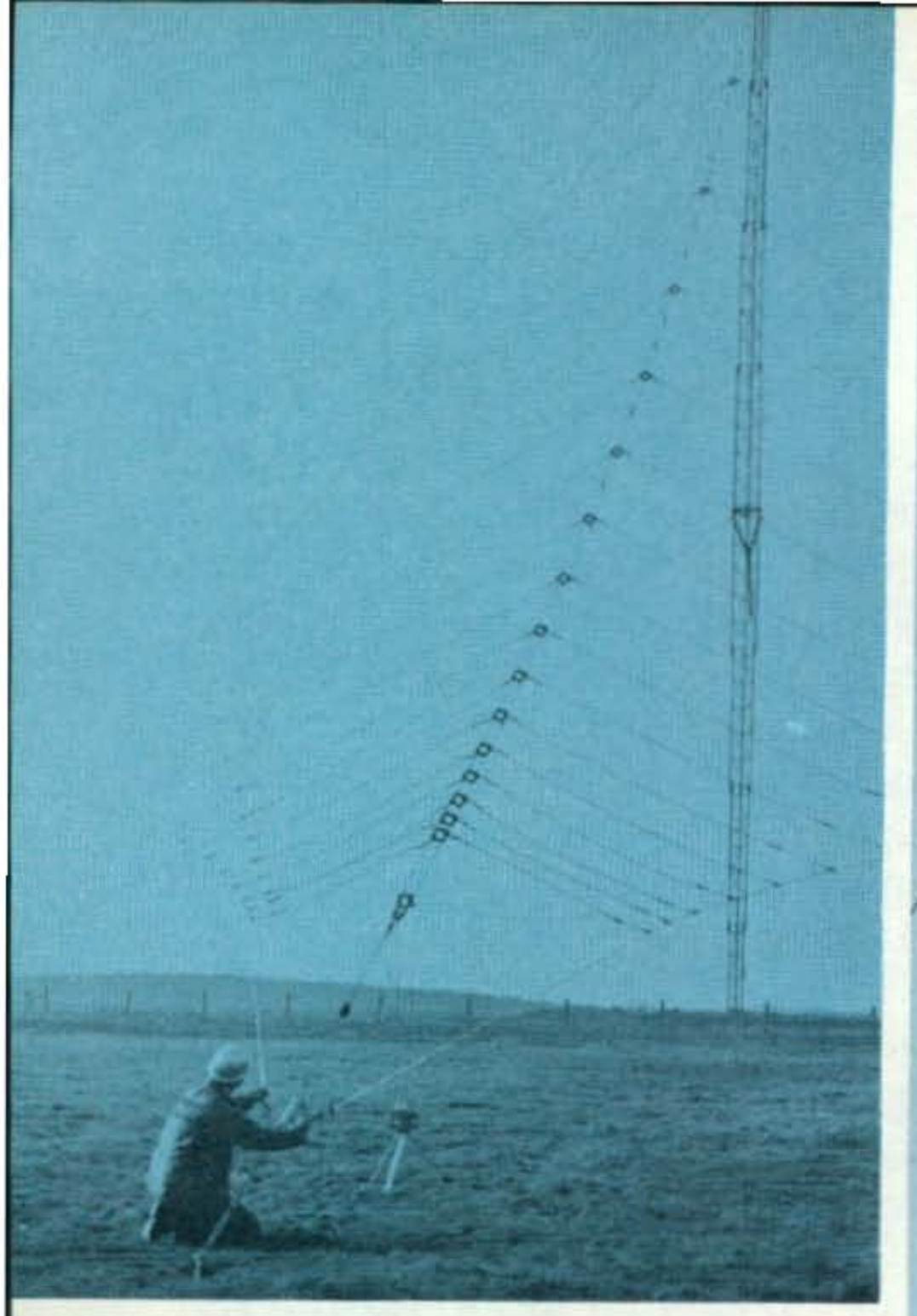


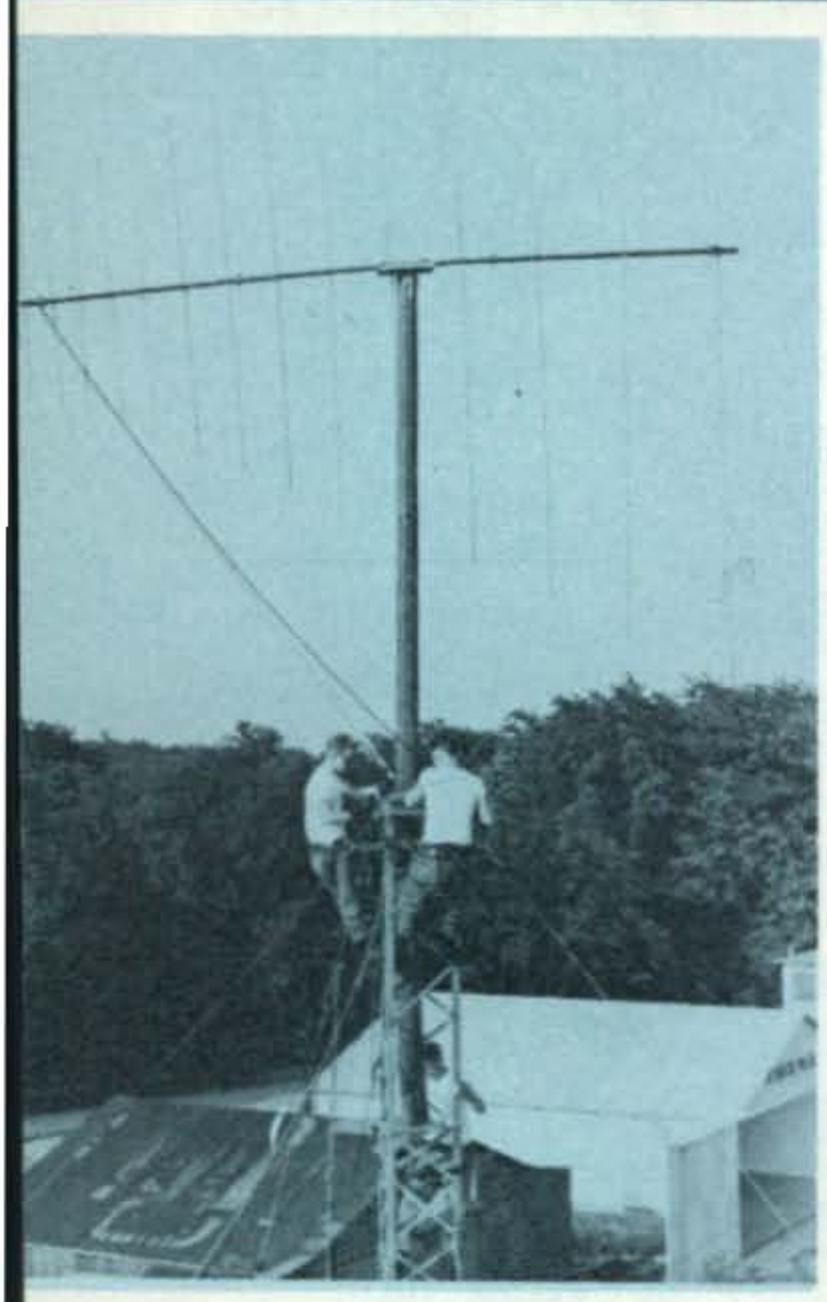
Fig. 2—Example of an LP dipole antenna design.

Photo 3 shows a Granger Associates transportable LP antenna for the 4 to 30 mc range. It is novel in that it directly compares with the familiar inverted vee dipole, with the ends of the elements closer to the ground than the centers. This LP uses a single tower for support. A cable reaching from the tower to a ground anchor near the man in the foreground supports the centers of the wire element dipoles. Cables from the front anchor to two side anchors support the ends of the dipoles. Although the antenna is in effect aimed down into the ground, its vertical take-off angle ranges between 32° and 50°. The most amazing thing about this particular antenna is its extreme portability. Unbiased tests have proven that the manufacturer's claimed erection time can be met and even surpassed. Starting with an open field and a five-man crew (with only a moderate amount of prior training), it takes one hour to set the required anchors, and another hour to erect the tower and antenna—two hours from packing cases to full operation! Wouldn't one of those be great for Field Day?

Photo 4 shows a vertically polarized Granger LP designed for the 3.5 to 32 mc range. A 100 foot tower at the rear and a 35 foot wooden pole at the front support a cable which holds up the top ends of the antenna elements. In this antenna, quarter-wave elements are fed against a ground screen in a manner similar to the usual ground-plane vertical antenna. Although the directivity of the array is obviously fixed in azimuth, the 3 db beamwidth of the antenna is 120°. Therefore, from the east coast of the US, one of these antennas could be used to cover Asia, Europe and most of Africa with a gain of 7 to 10 db (the maximum forward gain being 10 db). A ham with a good-sized field and a few dollars to spend could install a family of three of these mounted around a single tower for full 360° azimuthal coverage, 7-10 db gain, vertical polarization, and coverage of all h.f. ham bands. Now wouldn't that be great?

These examples will give you an idea of the applications of LP antennas to frequencies in and around the ham bands. In the h.f. range, one advantage of the LP antenna is its coverage of not only the ham bands, but the frequencies between the ham bands. The same antenna can be used with equal effectiveness for the amateur frequencies, MARS frequencies, SWL'ing on the inter-





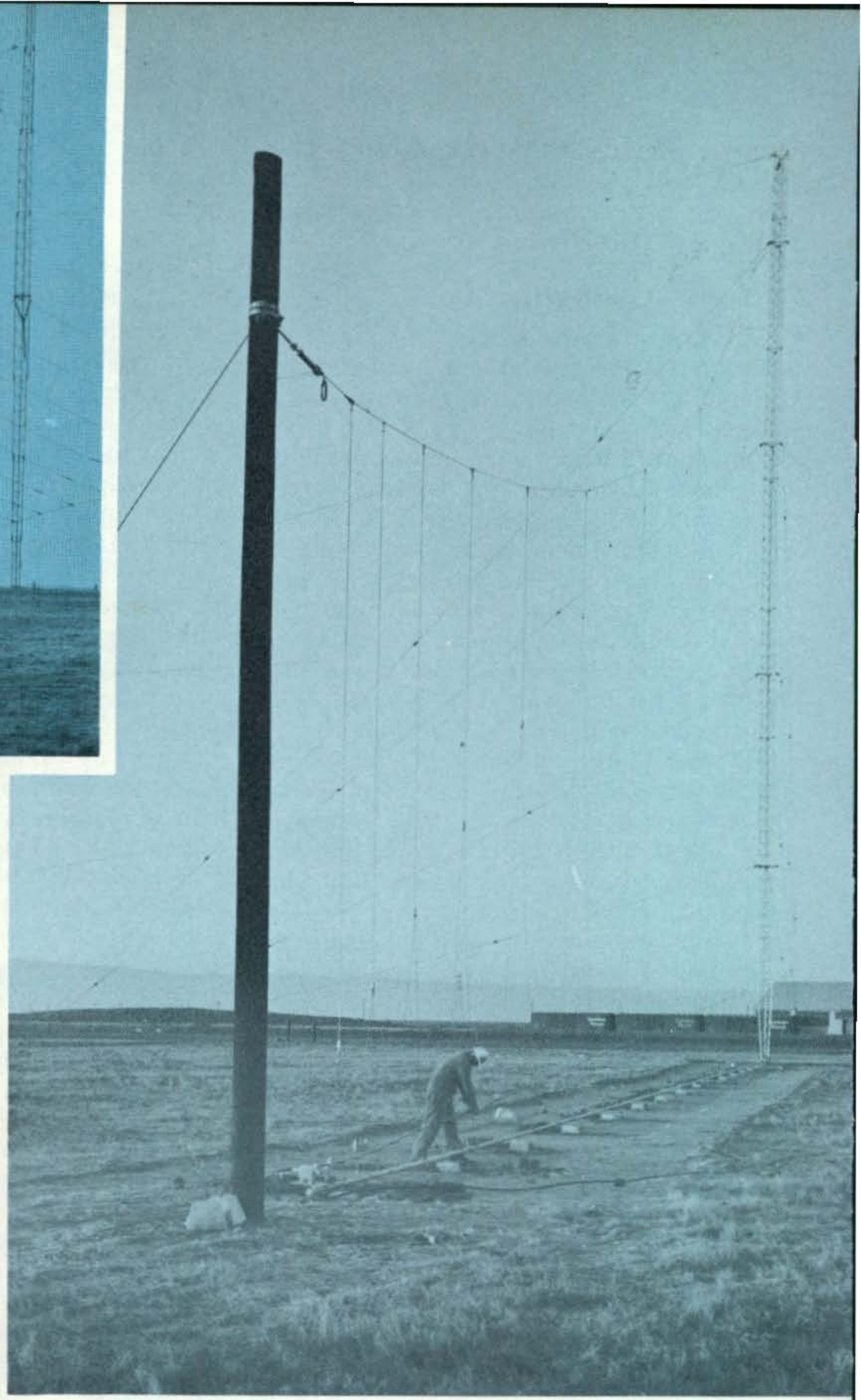


Photo 2 (bottom left)—A 20-60 mc LP dipole antenna, vertically polarized. Photo 3 (top left)—A Granger Transportable LP dipole for operation from 4 to 30 mc. Photo 4 (right)—A 3.5 to 32 mc vertical LP antenna.

national broadcast bands and other frequencies.

Design Variations

There are two interesting design variations which have appeared in recent years in LP dipole arrays. One is the use of inductive loading for the lower frequency dipoles to keep their length down to a more manageable size. The usual practice is to have no loading in the shorter elements, so their length increases logarithmically from one element to the next. Then past a certain length, each succeeding dipole remains the same physical length, with increasing amounts of inductive loading to resonate it at the correct frequency. The principle is the same as any inductively loaded antenna elements, with the loading coils normally located about halfway between the midpoint of the dipole and each end of the antenna. Such loaded dipole arrays may be reduced in size and weight as much as 40%, with

only a slight degradation in gain at the lower frequencies.

The other interesting gimmick which has appeared on LP dipole arrays for the TV bands is the use of swept-forward vee elements. Such antennas are designed so that their elements are used in 3/2 wavelength or 5/2 wavelength modes at the higher frequencies instead of the half wavelength mode of the normal LP dipole antenna. If you will recall the horizontal radiation pattern of a 3/2 wavelength dipole, the main lobe has split so that there is a null at right angles to the antenna with two major lobes at angles of 45° from the antenna. If the radiating element is bent into a vee shape, the split lobe (on one side of the element) is merged back into a single lobe, with slightly more gain than a halfwave element. Thus, an LP dipole array with elements operating in the longer wavelength modes can be designed to have a little greater gain than a straight dipole array.

However, there is one distinct disadvantage to this type of antenna. At the lower frequencies, the array may be operating in the one-half wavelength mode, and at the higher frequencies in the three-halves wavelength mode. At some frequencies in between these two modes, the elements will be approximately a full wavelength, and the antenna will not function properly. This means that the antenna will have continuous coverage of a "low" band and a "high" band of frequencies, with a big hole in the middle where the performance drops. With the TV antennas, this hole is conveniently placed in the frequency gap between channels 6 and 7, so the discontinuity does not affect any TV channel. In such applications, where a frequency discontinuity is not objectionable, the LPV antenna has some advantage over the usual LP dipole array.

Part II

The second article in this two-part series will present complete design information to enable you to design your own LP dipole arrays, together with some mechanical construction tips. This article will also work through the design data for a v.h.f. antenna which covers the v.h.f. TV band, the f.m. band, and several ham bands. A good all-purpose antenna—provided you don't want to watch TV and ham at the same time.

(To be continued)

DX

BY JOHN A. ATTAWAY,* K4IIF

The *CQ* DX Awards Committee is happy to announce the issuance of the following new WPX certificates:

S.S.B. WPX: HA5AM-261, CR4AJ-262, K4GXO-263, WA4PXP-264, CT1KT-265, OE7UD-266, W4FPW-267, PAØXPQ-268, VE6IN-269, PAØLOU-270, CX9CO-271, LA4DJ-272, K4IIF-273, YV3KV-274.

C.W. WPX: HK3AVK-754, SM7BHH-755, K7AGJ-756, W4ORT-757, WA2CFG-758, LA5QC-759, K4TUA-760, UA4LM-761, UA1UD-762, KR6ML-763, UA3KZO-764, W9ZTD-765, UB5QA-766, UP2CT-767, UA3DI-768, W8SH-769, WA2-LRK-770, DJ6EO-771.

WPX Fone: LU1DJU-138, W9ZTD-139, VE3BSJ-140.

WPX Mixed: WA4PXP-129, VE3UR-130, K4-ZCP-131, W4ZXI-132, W6OMR-133, W4HA-134, VE3AAZ-135.

Special Contest WPX S.S.B.: WA2SFP-1.

Attention Novices

In addition to the popular WPX Award, *CQ* is now offering the WPNX Award for Novices only. To earn this award you must work and confirm at least 100 prefixes. Examples of different prefixes are as follows: W5, K5, WA4, WN4, WB2, WV6, KP4, WP4, YV5, HK3, DL1, DJ3, G2, UA3, etc. Contacts for this award must be made after May 15, 1967. To receive an application blank send a self-addressed, stamped envelope to K4IIF, P.O. Box 205, Winter Haven, Fla. 33881.

Contest!—This Month

Don't forget the phone weekend of the *CQ* Worldwide DX Contest Oct. 21-22. This is a wonderful time for racking up prefixes and zones as well as having the best kind of fun ever invented by mortal man. This DX Editor will be on again from the Caribbean, because once you've operated from a DX location during a *CQ* contest its hard to stay home. *Specially endorsed WPX and WAZ certificates will be authorized for anyone qualifying for the award entirely by their contest operation.* For complete rules see Frank's Contest Column in the September issue.

De Extra

A lot of people don't like W9WNV. A lot of other people think he's the greatest thing that ever happened to DX. I'm not judge and I'm not jury and the full truth I don't know. However, one thing I do know, and *you* know it too. If we have any regard for this hobby of ours we *won't ever* let a situation like this develop again.

The Awards Program

WPX: Earlier columns have discussed some of the difficulties in the WPX program, chiefly the fact that many prefixes have been changed or deleted since WPX was first offered 10 years ago. To modernize every application in the files would require many more man hours of work than are currently available. As a stop-gap measure to facilitate the processing of a large backlog of endorsement aplications, the rules were modified to permit the scoring of every legitimate prefix worked whether all the prefixes are now in use or not. This policy placed the new applicant at a disadvantage as he cannot possibly build up as large a prefix score as the O.T. who has been in the game for many years. Consequently, a fresh start for WPX was considered. However, this was greeted by cries of alarm from many who felt that the rising postal rates would put too great a burden on all concerned, particularly QSL Managers.

* P.O. Box 205, Winter Haven, Fla. 33881.

Ed McVittie, VE40X, Manager of the VE4 QSL Bureau. Ed is also one of the leading QSL Managers and is *CQ's* QSL Manager of the Month for October.

As a consequence, a new plan has been devised. We will continue to accept all prefixes worked for initial applications and endorsements. This will be called the Gross Prefix Total. However, for the few highest scores at the top of the totem pole the obsolete prefixes will be deleted to give a Net Prefix Total. These top scores will be used to prepare a WPX Honor Roll. Both Gross and Net scores will be shown, but the member's position in the Honor Roll will be determined solely by his Net count. For example, W4OPM might have 801 prefixes confirmed of which 51 no longer count. If so, his Honor Roll score would be 750/801.

Remember gang, prefix chasing can be a lot of fun. More fun in many respects than country chasing because there are many more legitimate new prefixes than there are legitimate new countries.

WAZ: European applicants for the WAZ Award will be pleased to learn that Walter Geyrhalter, DL3RK, and G. Vollema, PAØLV, have permission to check QSL cards for WAZ. DL3RK will handle cards for DJ, DL, and DM amateurs, while PAØLV will be taking care of the Benelux countries and possibly Scandanavia. This is a new program designed specifically to eliminate the necessity of mailing valuable QSL cards across the ocean at great expense and with the risk of loss or damage in the mail. A WAZ application blank or list of the 40 stations in order of zone with the name, call, and QTH of the applicant *must* be enclosed with the cards. Eight IRCs and a self-addressed envelope for return of the cards should also be included. This is a step in the right direction, gang, so lets make it work.

Roger, MP4TBO, tuning the Drake 2B. Roger recently went back to G-land and can be reached at the address given in the "From the Bulletins" section of this column. (*Photo courtesy VE1ASJ*)

For those of you who have wondered at that fine signal from CR6EO here is Carlos operating his s.s.b. rig. His transmitter is a KW-Viceroy with 160 watts p.e.p. The receiver is homebrew with 13 tubes and double conversion. His antennas are a cubical quad for 10, 15, and 20, and a Vee on 40 and 80. He is active daily on 28 mc from 16-1700 *GMT*, 21 mc from 17-1900 *GMT*, and 14 mc from 2300-0200 *GMT*.

S.S.B. DX Awards: As most of you are aware, the S.S.B. DX Awards were introduced at a time when only a small percentage of amateurs were using s.s.b. The object was to promote the use of s.s.b., and the *CQ* S.S.B. DX Honor Roll was an important part of the effort. However, today it is no longer necessary to promote s.s.b. as its acceptance is widespread. Consequently, although we plan to continue offering certificates for working 100, 200, and 300 countries on two-way s.s.b., we no longer plan to maintain the S.S.B. DX Honor Roll. As mentioned above, a WPX Honor Roll is in process of formation and will be the *CQ* Honor Roll of the future.

New Prefixes in Finland

The following excerpt is from an interesting letter de John Velamo, OH2YV, Secretary of S.R.A.L., the Finnish Amateur Radio League:

"This year marks the 50th anniversary of the independent Republic of Finland. As part of the celebration Finnish *club stations* will have the right to use the prefix *OF* during the period Oct. 18-Dec. 6, the Independence Day of Finland. The 50 club stations will be very active during these 50 days, with OF activity beginning at 0000 local time Oct. 18 (2200 GMT Oct. 17th), and ending at 2400 hrs. local time on Dec. 6 (2200 GMT). Special QSL cards will be used to confirm the contacts. Note that both c.w. and phone periods of the *CQ* Worldwide DX Contest fall within this period."

160 Meter DX News, de W1BB

The lid is off in Brazil. Full privileges have been given the PY hams to use 1800-1850 kc day or night. Presumably the full power limit of 1 kw will be allowed. Listen for PY2PA, PY1NFC, and others.

Congratulations again to Earl, KL7FRY, for perseverance in 160 Meter tests this past summer. Earl scheduled W1BB, WØVXO, and others up through July 15.

A word of praise to the many DX stations who put out good signals on 160 using very QRP. Many G's make it across to VO1FB, W1BB, and others with only 10 watts. One chap in OK-land has QSOed G and PAØ with only 100 milliwatts, that's right, 0.1 watt. Who has the record for greatest miles per watt on 160? Write W1BB!

Six Meter DX?

Now that the Sunspots are back who's working DX on 50 mc? DX Editor, K4IIF, would like to receive some reports.

K6KA DXpedition Report

"We encountered many limitations on the round the world trip. W-pileups were scarce due to Sporadic-*E* layer conditions and no F2 layer hops at the times I was able to be on the air. Operations were generally confined to evening hours because of airplane and tour schedules. Some countries required a licensed ham to be at my elbow during all QSOs. Some of the stations visited had no crystals for the c.w. band and some had antenna limitations which restricted the bands we could use. Some had no key. Many had only transceivers. Often very few stations could be worked per hour on 14 mc s.s.b. so we reverted to c.w. whenever possible. We then had lots of USSR QRM until they were worked and out of the way. I did a lot of *CQ* WW SSB contest work in April from 9N1MM, but very few W,K's. I am handling the QSL cards for the following stations, *but only for the dates indicated:* 9M8RS—March 13; 9N1MM—April 7, 8; UI8KAA/K6KA—April 22; K6KA/YA—May 3; EP2GF/K6KA—May 5; 5X5AU/K6KA—May 20, 21, 22; SVØWS—June 3.

October's Outstanding QSL Manager

Ed McVittie, VE4OX, is a hard working QSL Manager. He complains about W/Ks who use U.S. stamps on their s.a.s.e.'s, and DX stations who think that being a QSL Manager is the equivalent of owning a gold mine. However, when the chips are down he gets the job done for some of the most active DX stations on the bands. Included among Ed's charges are 6O1AU, ZD5R, 9Q5HD, 9L1HX, VP2SJ, VP6KL, DU1MR, ZS9L, 9N1BG, and Smitty, ex-TU2AU, TU2AU/5U7, 5U7AU, and JY1AU.

Ed has been operating for 6 years, has made almost 10,000 QSOs, and is the proud holder of WAZ and WPX endorsed to 600 prefixes. He will be retiring this fall and hopes to be able to spend more time at ham radio and golf. He plans to put up an antenna for 10 and 15 meters, for the first time, to take a little of the load off 14 mc.

As if being an active QSL "Underwriter" were not enough, Ed also operates the ARRL VE4 QSL Bureau. He cautions that some DX stations only send logs every 3 months so he isn't always able to answer as quickly as he would like. However, he usually has the cards in the mail the day after the logs are in.

K2HLB—A Big Key is Silent

The DX World mourns the death of Dr. Harold Megibow, K2HLB. Dr. Megibow was a well known and highly respected DXer. His annual picnic was an outstanding event, and he was the donor of the trophy to the winners of the single operator, single band category of the *CQ* Worldwide DX Contests.

Oceania DX Contest

Remember the VK/ZL contest which occupies the 24 hours from 1000 GMT Oct. 7 to 1000 GMT Oct. 8 for phone, and 1000 GMT Oct. 14 to 1000 GMT Oct. 15 for c.w. This is a good time to look for needed prefixes in the Pacific area. For full details see Frank's Contest Column.

UPOL Prefix

Most WPX chasers are cognizant of the series of Russian polar expedition stations licensed as UPOL plus a number. The latest of these is UPOL-15. For WPX purposes, all of these stations will count as UPØ, just as RAEM is counted as RAØ.

The New Hebrides Prefix Situation

There has been considerable confusion among DXers with regard to the correct prefix for the New Hebrides Islands. Most of the island hams use YJ8 calls, but occasionally a YJ1 or FU8 is heard. The following letter from Bill Walker, YJ8BW, by way

of Gay, W4NJF, should cast a little light on the situation:

"The N.H. are governed jointly by Britain and France. Until about the end of World War II the French ran the radio system and consequently FU8 was the original prefix. Since the war the system has been run jointly by a staff representing both nationalities, and the radio call signs, both amateur and commercial, have been changed to the YJ series as YJ is the international prefix assigned to the islands. Consequently, all hams were issued YJ1 calls and FU8 was dropped completely. Later it was decided that *all* amateur calls should be YJ8, and every operator was so informed. However, many have been reluctant to cooperate. The FU8s did not want to part with the call which identified them as French, while many YJ1s thought that their call sounded better than YJ8. It is difficult and hardly worthwhile enforcing correct call signs in a scattered island group, but an official letter has been sent to ARRL, RSGB, and REF informing them that YJ8 is the correct callsign. It is then up to those societies to help clear up the mess by recognizing only YJ8 for awards."

New Officers on the West Coast

The best of luck to Jim Maxwell, W6CUF, and Ed Aleks, K6DXM, president and vice president, respectively, of the Northern California DX Club, and Gary Stilwell, W6NJU, president of the Southern California DX Club. The address of the Southern California club is 8114 Irondale Ave., Canoga Park, Calif. 91306. The Northern California club address is Box 608, Menlo Park, Calif. 94025.

The Northern California DXer is Not for Sale

Dave Palmer, W6PHF, editor of the Northern California *DXer* writes that *The DXer* is a club paper available only to members in good standing of the Northern California DX Club. The club has but two honorary members and associate members are not available. However, *The DXer* is exchanged with other clubs in return for their publications.

Here and There

de WA9HJM: The PX1NV operation in late August was by G3VNV, G3TOT, G3ULF, and G3VNH. WA9HJM is their stateside QSL manager.

de WA6HAI: The PX1, Andorra operation on Sept. 2-4 was conducted by Dave Llewellyn, DL5XE, and Jim Rayment, DL5XH. The QSL address is c/o S/Sgt. (YOFS) David T. Llewellyn, 22nd. Signal Regiment, BFPO 16, Germany.

de WA2EBS: I will shortly be operating maritime mobile between New York and Buenos Aires aboard the *S.S. Argentina*. The rig will be a Swan 350 to a 4-band vertical. QSOs will be in English, Spanish, and Italian, and will be confirmed by a very nice QSL card.

de T.A. Ferguson, ZK1AR: I ceased operations on April 19 after 6 years of ham activity from ZK1 land. Due to the turmoil logs were delayed. However, QSL Manager Vic, K4SHB, now has complete ZK1AR logs and all cards should go to him with SASE. When cards are available at my end all QSLs received direct will be answered. Those who specifically requested Cook Island stamps or who included sufficient IRCs will have their replies stamped with Cook Island stamps and these will be returned to the Cooks and placed in normal postal channels. This will involve a delay of an extra 2 months because of the infrequent shipping and airmail services. My 5W1 land operation should commence in November or December.

de UA1CK/JT1 via WA6AHF: About Oct. 1 I shall go back home to Leningrad where you can find me at Post Box N2, G.P.O. At the present time in JT land I'm using a 150 watts dc homemade transmitter, a 17 tube receiver, and a ground plane antenna. In a few days I will increase my power to 700 watts dc and hope it will give me better results. I shall QSL 100% to all stations worked.

de K6KA: All QSLs for my trip have been mailed where adequate postage was provided. I am still working on the others.

de K4YFQ: I am QSL Manager for Ron, W3DWG/VR6. He will be active from Pitcairn Island until around February, chiefly on 15 meters as he has a 21 mc beam. I will be happy to assist anyone needing Pitcairn before our sked at 2200 GMT on Sundays at 21350 kc.

de KH6GHZ/K6EWZ: My former calls are KL7DIR, TA3MP, W2JQU, and K4LWL. My present QTH is 1804 Holapa St., Honolulu, Hawaii. 96818.

de W4NJF: 7Q7LC has sent me logs for the

interval Jan. 21, 1967-June, 1967. I am now issuing QSLs for contacts made during this period.

de VS6FO: I will be leaving Hong Kong in September so this is my last VS6 report. The most active stations during the past year have been VS6AJ, the club station, VS6FS, VS5EK, VS6FZ (a newcomer exclusively on s.s.b.), VS6EN, VS6FO, and VS6FX (a newcomer mainly on c.w.). Other stations intermittently active include VS6CO (s.s.b.) and VS6DL (c.w.), both of which are recently reissued calls, and VS6AZ, VS6BE, VS6EQ, and VS6ER. An old timer just getting active again is VS6DJ. There is also VS6CJ who is very interested in 6 meter DX. A 10 watt limit on 160 meters discourages top band DX.

de KX6FJ/W1BRJ: I work for Sylvania Electric and am presently on Kwajalein Atoll in the Marshalls. There are about 25 active hams on Kwajalein with 10 or so having their own stations. Most fellows run full kilowatts on s.s.b. and operate chiefly between 1000 and 1300 GMT and 2300-0300 GMT. The island population is about 4000 and ham radio is the only way for the folks to talk home, so much effort is spent running phone patches.

de WØTUT/MM: The Research Vessel John E. Pillsbury of the Institute of Marine Science is beginning a new voyage to West Africa, Brazil, and the Caribbean. I will be aboard and should be on 15 and 20 meters c.w. and s.s.b. daily.

de K4IIF (DX Editor): Never give up on a QSL. An s.a.s.e. crusty with age turned up in the mailbox last week. It contained a card from the QSL Manager of a VP2 worked on March 9, 1961. Better 6½ years late than never.

de W1BB: On July 2 from 0355-0410 GMT. ZS6AM heard W1BB/1 5/9/9 and W1AW 5/6/9 on 160 meters using an AR-88 rcvr. Who said 160 was dead? In addition, on this same date WØVXO and W1BB were heard 4/4/9 by PY2PA, and W1BB, W2IU, and WØVXO were heard 5/8/9, 5/7/9, and 5/5/9, respectively, by G3UBW.

de K7GHZ: ZS9F is now on from Botswanna using 20 meter s.s.b. and c. w. only. I am his QSL Manager for all the world. He has an HW-32A which I loaned him. His name is Peter Ward and he is in the Peace Corps.

de CN8FV/W1NTH: Am busy on 15 and 20 looking for good DX, and getting very tired of some of the rude operators. Fortunately most of them are not in W,K land. See you in the pileups in the contest.

de W3GJY: To me WPX is much bigger than DXCC because a guy needs all the DXCC countries for prefixes besides a lot of other prefixes. Its much harder to attain a high standing in WPX than it is to work 300 countries for DXCC. I know because I have 313 DXCC countries confirmed and it wasn't too tough.

de K2CPR: My present WPX score is 731 worked and 658 confirmed. All operation was accomplished with a maximum of 150 watts and no beam. The antenna system is dipoles on 80 and 40 and a trapped ground plane on 20, 15, and 10. This is just to let prospective WPXers know that it *can be done* without all the "frills."

de I1WR: The International Institute of Communications of Genoa, Italy is sponsoring the 4th "Columbus Contest" to be held Oct. 7, 0000 GMT to Oct. 8, 2400 GMT. This will be a good time to listen for prefixes from the Italian Geographic group: I, IT, IS, 9A, M1, and HV. Activity will be on all bands 80-10.

de HL9KA: Am operating from Krangju, Korea with a Heath SB-100 to a triband quad (3 el. on 20, 4 el. on 15 and 10). QSL via W2CTN.

From The Bulletins

AP2, West Pakistan: AP2NMK, the Boy Scout station in Karachi, is still the only active station from East or West Pakistan. He can usually be heard around 1200 or 2200 GMT and favors 14195 kc. (*Tnx DX-NS*).

BV, Formosa: Tim, BV2A, continues active on 20 meters c.w. around 14030 kc. 1400-1700 GMT is his favorite time. Tim is ex-XU6A and C3YW. (*Tnx WGDXC*).

DX Poll: The latest returns from the Long Island DX Association poll, based on 1044 ballots, show that the following are the 20 most needed DX countries as of late July. Recent DXpeditions may have changed these standings, however. The relative vote count is shown to the right of the country name and indicates the rarity of the country. ZA-Albania is clearly the most needed country and prefix.

1. ZA, Albania—982
2. VU, Laccadive Islands—864
3. YI, Iraq—830
4. Narassa—830
5. VQ8, St. Brandon—777

6. HKØ, Malpelo—771
7. EAØ, Spanish Guinea—769
8. LH, Bouvet Island—761
9. FO8, Clipperton—760
10. EA9, Rio de Oro—751
11. VQ8, Rodriguez—749
12. VP8, South Sandwich—720
13. VR1, British Phoenix—720
14. 9K3, Kuwait—712
15. XU, Cambodia—706
16. AP, West Pakistan—701
17. AP, East Pakistan—685
18. AC3, Sikkim—678
19. 1G, Geyser Reef—678
20. 8Z4, Saudi Arabia—Iraq Neutral Zone —671

EA9, Rio de Oro: Justo, EA9EJ is frequently reported on 14125 kc, crystal controlled. (*Tnx WGDXC*).

FR7, Reunion Island: FR7ZN, a c.w. standby for many years, is now reported on s.s.b., 14210 kc at 1100 GMT. (*Tnx LIDXA*).

FY7, French Guiana: FY7YG is active on 20 meter s.s.b., 14202 at 2130 GMT. His QSL Manager is W2CTN so chances of confirming this rare country and prefix are excellent. (*Tnx LIDXA*).

JW3, Svalbard: JW3NI has been worked at 2330 GMT on 14060 kc. (*Tnx VERON*).

KH6, Kure Island: KH6EDY is reported active on 14215 kc s.s.b. at 1700 GMT. (*Tnx VERON*).

MP4: MP4TBO has returned to G-land. His new QTH is Moorfield, Hardstoft Rd., Pilsey, Chesterfield, Derbyshire. (*Tnx ONDXA*).

OHØ, Aland Island: The club station OHØAA is frequently active on the low end of 20 meter c.w. around 0400 GMT. (*Tnx LIDXA*).

TJ1, Cameroun—Herman, TJ1QQ, will be in this country for 3 years. He is frequently active on 14 mc at 0600 and 1900 GMT. (*Tnx NEDXA*).

VK4, Willis Island: VK4HG is scheduled to be operating from this rare one until December. Most operation will be on 14 mc s.s.b. (*Tnx LIDXA*).

VK8: This rare prefix is occasionally activated by VK8HA on the low end of 20 meter c.w. around 1500 GMT. (*Tnx LIDXA*).

VK9: Bob, W4CHA, ex-VK2BRH/9, hopes to return to the VK9 area in December and activate Nauru, Cocos-Keeling, and Christmas Island. (*Tnx DX-NS*).

VP2: St. Vincent: VP2SAB has been heard on 14205 kc at 2240 GMT. (*Tnx LIDXA*).

WAHN: Jim, W6CUF, suggests that some of the "islands" which are being proposed as new countries might be more appropriate for the WAHN list, *W*orked *A*ll *H*azards to *N*avigation. (*Tnx NCDXC*).

W9WNV: At deadline time Don and Bill, WA6SBO, are reported to be ready to commence operations from Rodriquez Island. As the ARRL DXCC Committee has disallowed Don's operations from Heard Island, Chagos, and St. Peter and Paul Rocks, his future impact on the DX world is uncertain. Frequencies for the DXpedition are c.w.: 3501, 7001, 14045, 21045, and 28045. S.s.b. frequencies are 3795, 7095, 14105, 21245, and 28605. Receiving frequencies will be announced over the air. All QSLs for future operations will go to the QTH of WA6SBO to be handled by Bill's wife, except that s.w.l. cards should go to VE3GCO.

XV5, Viet-Nam: At last report several ops had received FCC citations for working K8NHW/XV5. Unless you are *positive* that it is now OK to QSO this station, do not attempt to call him.

ZF1, Grand Cayman: ZF1GC is active around 0100 GMT on s.s.b. ZF1ES is a new station on the island. (*Tnx DX-MB*).

4X: Operation has been reported by Israeli amateurs using the prefix 4X6 in occupied Egyptian territory, 4X7 in occupied Syrian territory, and 4X8 in Jerusalem and occupied Jordanian territory. (*Tnx DX-NS*).

9V1, Singapore: 9V1MY, 9V1NY, 9V1MM, and 9V1MX have been reported on 21 mc s.s.b., and 9V1NV on 21 mc c.w. (*Tnx WGDXC*).

QSL Information

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FO8BW — Via W6JFM.
HL9KA — To W2CTN.
HR9EB — Eric S. Bryant, Utila Island, Honduras, Central America.
PJ3CC — For Aug. 9-17 QSOs only, to W3AYD, P.O. Box 73, Rockville, Md.
PX1NV — Via WA9HJM, 4820 Prospect Ave., Downers Grove, Ill. 60515.
TR8AH — To Box 3122, Libreville, Gabon Republic.
VK8AV — c/o K9JJR, 331 Annette Ct., Rhinelander, Wisconsin
VP6WR — Via W4OPM.
VP8JD — To CX2AM.
VS6FX — Via W2CTN.
VS9MB — To W2CTN.
YJ8BW — c/o W4NJF.
YV3KV — Via WA4AED.
ZS9F — To K7GHZ, 3213, -R- St., Vancouver, Wash. 98663.
4X4CW — WØDRT.
4W1L — HB9ABV.
5A1TV — W7WQR.
9L1TL — G3USF

73, John, K4IIF

SURPLUS sidelights

BY GORDON ELIOT WHITE *

THIS month I have another antenna "find" to describe, the AN/PRD-7-8, one of the same general family as the AS-989/ML surveillance antenna I described in the September, 1966 and December 1966 SURPLUS COLUMNS.

The PRD-7 (see fig. 1) is also a fibreglass-mast, lightweight, transportable unit designed to be handled easily and erected rapidly. It is easier to handle than the AS-989 because it is smaller, but lacks the extreme frequency coverage of the large log-periodic beam of the 989. It does have two advantages over the 989 however, with motor-driven azimuth and polarization controls.

The PRD-7 seems to me to be a perfect antenna for use in monitoring the satellite transmissions of interest to amateurs and s.w.ls, be they OSCAR, NIMBUS, TIROS, or whatever. With the motor-driven rotator it is relatively easy to track the rapidly moving satellites, and probably would be possible to build an automatic device based on receiver a.v.c. to follow the orbital path as long as the satellite was in range. The polarization drive would allow the antenna to be laid accurately on the elevation of the satellite, particularly on polar orbits, which are hard to follow manually.

While the AS-989 was a large log-periodic antenna on a portable but fixed mast, the PRD-7 is much smaller, and comes equipped with two antenna heads. The 989 covered 50-1,000 megacycles, while the PRD-7 covers 100-200 mc with a four-element beam and comes with a small log-periodic for the 200-1,000 mc portion of its coverage. The two heads are interchangeable with the exception of the polarization drive which is not contained in the log-periodic unit.

The weather satellites, in which much interest has been shown by amateurs, transmit now in the 136 mc band, not far from the midpoint of the beam portion of the PRD-7, making it an excellent antenna for that use. Gain of course is less than would be obtained from a precisely-cut Yagi, for example, but the drive system is probably worth more in signal strength over a complete satellite pass than a manually-operated Yagi or other relatively simple beam.

Unfortunately, I do not have the data on the PRD-7 that was available on the AS-989, but I would estimate that the Standing Wave Ratio was better than 2:1 over the bands covered, and that the unit could handle at least 500 watts of transmit power if properly matched to a transmitter. The termination at the base is type N coax, 50 ohms, and BNC at the end of the power/antenna cable supplied with the antenna, thus would probably provide a good match to a 50 ohm feed.

The PRD-7 system was part of a monitoring setup to listen to hostile communication and radar. It came with a control box that provided (fig. 2) polarization and azimuth switches, fuses, etc. and could contain a 24

[*Continued on page 97*]

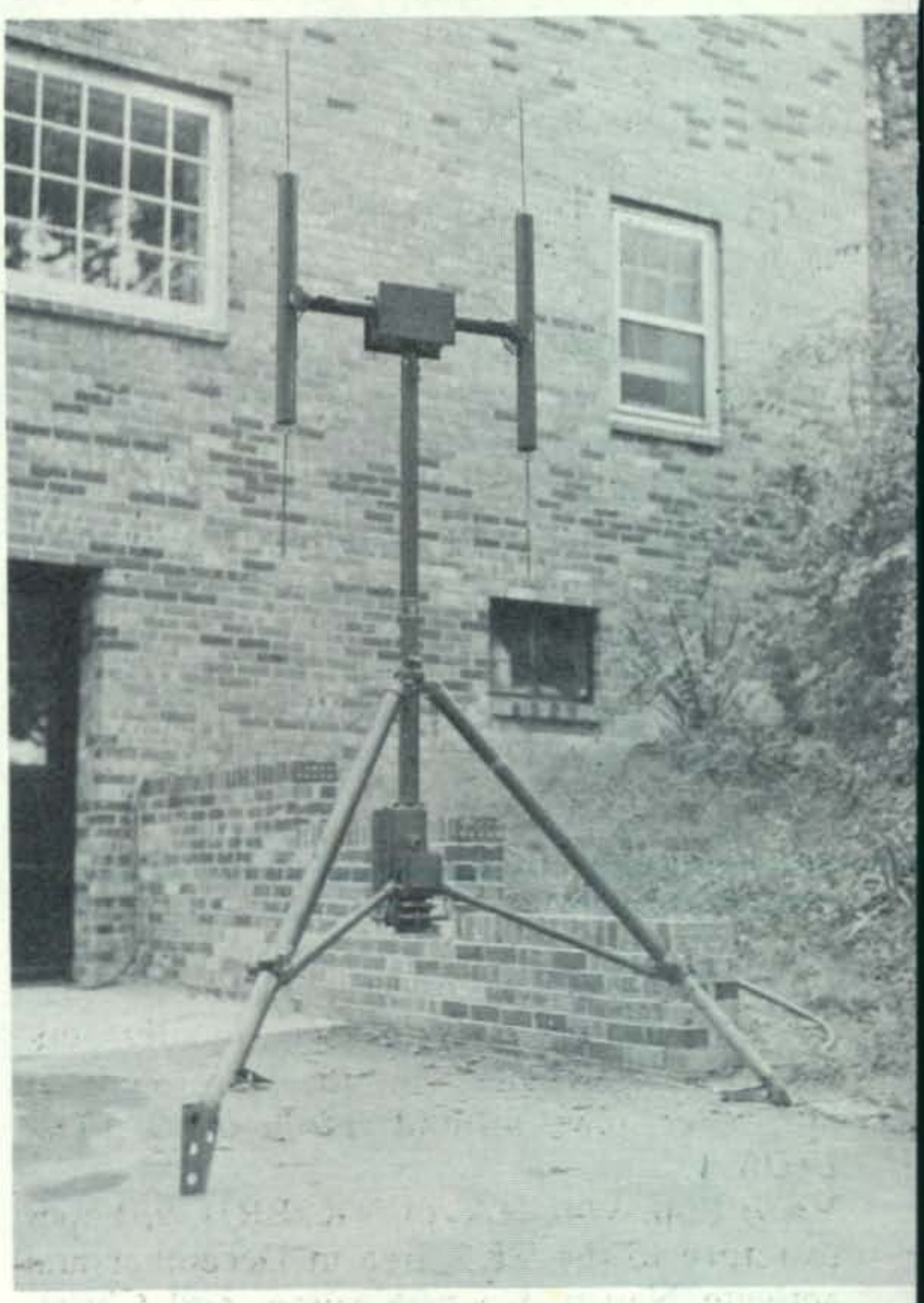

Fig. 1—AN/PRD-7 surveillance antenna, showing 4-element beam mounted on the mast. An additional section of mast is normally used, but was omitted for the photo above. The beam covers 100-200 mc.

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CL-298

For further information, check number 50, on page 126

Surplus [*from page 92*]
volt battery for local emergency drive, though power was commonly fed from an external source. Power drain is less than ½ amp at 24 volts. Also available was a scope presentation to show the alignment of the antenna. The scope attached to the control box and was connected to the antenna through the common power/RF cable.

A dog latch, painted red, holds the antenna in selected directions against wind or accidental rotation. Power should not be applied when the mast is locked.

The log-periodic is very lightweight, (fig. 3) and must be handled with some care. Likewise the beam is not particularly stout, and must be clear of branches before power is applied to either motor. The outer ends of the beam are aluminum tubing, attached through BNC plugs. It might be possible to improve gain at certain points in the band by adjustment of the element lengths, though I have not tried that approach as yet.

The AN/PRD-7 was made by American Electronic Laboratories Inc., Colmar, Pennsylvania, which may be able to supply more data on the unit, though as I write this I have not had a reply from the company. Anything that I do dig up I will run in a later column. Anyone who can supply specifications on the PRD-7 can gain the Surplus Editor's eternal gratitude by sending me a copy.

Fig. 2—Control box for AN/PRD-7 antenna. Unit requires 28 volts d.c. and connects through a multi-conductor cable to the antenna itself, providing fuses, switches, azimuth and polarity controls.

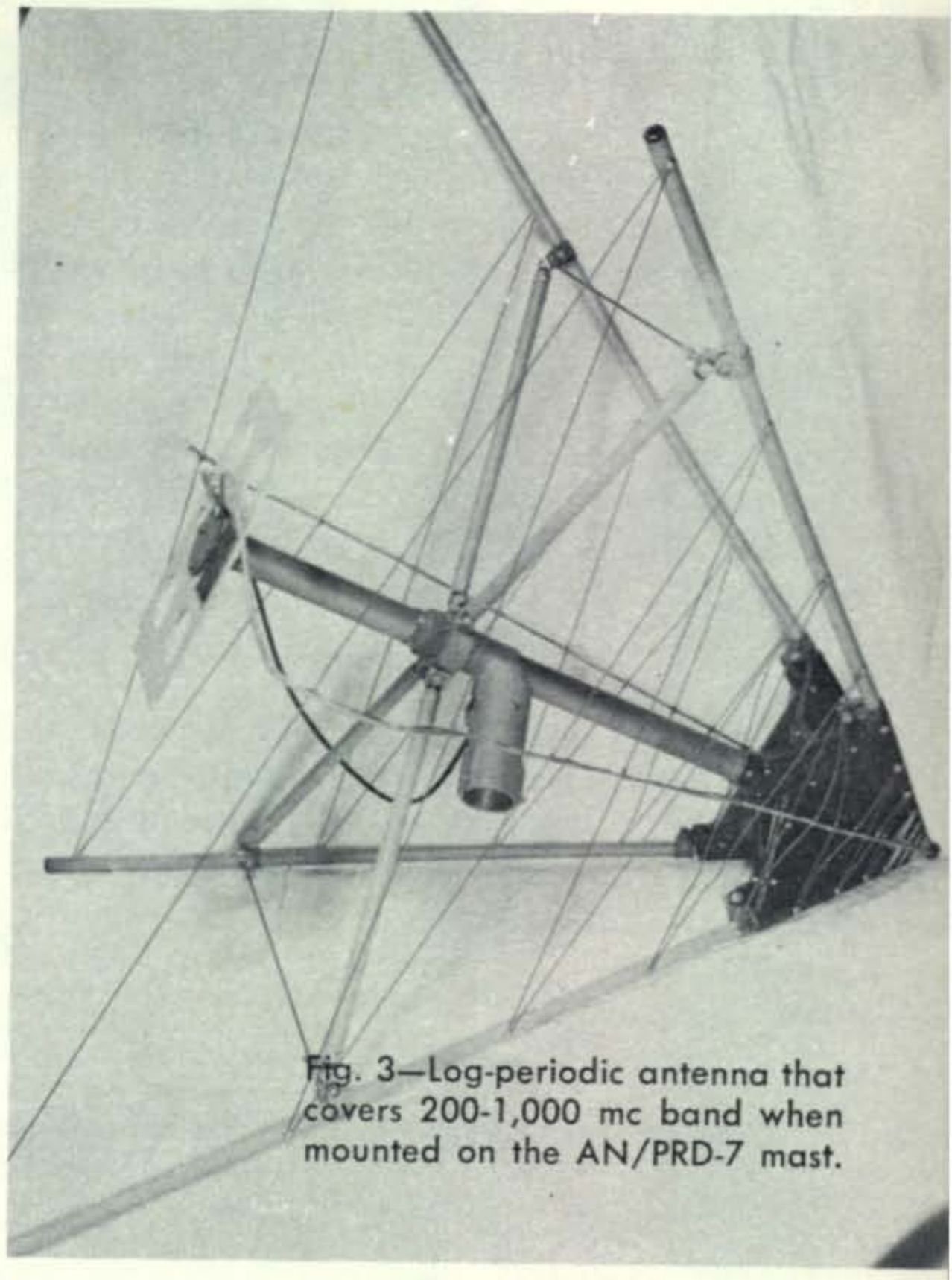


Fig. 3—Log-periodic antenna that covers 200-1,000 mc band when mounted on the AN/PRD-7 mast.

MBF Manual

Through the courtesy of a number of amateurs including two at Collins Radio, I obtained a copy of the MBF manual that I requested in a recent surplus column. R.O. Noyer, WØIKO of Collins offered it, and other helpful advice on Collins' equipment.

The MBF book, incidentally, is NavShips 900508 and its federal stock number is 0284-089-7000.

The MBF transceiver was a mid World War II design, built under Navy contract NXsr-80000, dated 21 October, 1944. (see fig. 4)

The MBF was clearly designed for shore station or shipboard (not aircraft) use. It weighs in at 55 pounds, and is designed for 115 volt, 60 cycle a.c. or d.c. power, unusual in military designs I have seen. Type designation of the set was COL-43065. Frequency coverage was 60-80 mc, with 3.5 watts rated rf output. Tuning, of course, was fixed, signal-channel, crystal-controlled. Modulation was a.m., of the high-level

Surplus [*from page 96*]

plate variety. The crystals used were in the 15-20 mc area, with four-times multiplication before the final rf amplifier.

Receiver sensitivity was not outstanding—five microvolts at 10 db signal to noise ratio. Selectivity was 80 kc wide at 6 db down. Receiver crystals were also multiplied four times, and the if was 5.3 mc. The receiver contained the usual military noise limiter and squelch circuits.

Stability of both transmitter and receiver is rated at .03 percent.

S.S. HOPE

Though this next is not strictly the province of the surplus department, I thought it would be useful to mention that Project Hope, the floating training hospital that has done so much good for underdeveloped nations, is heading for far-off Ceylon next year, and is in need of a power boost for its amateur station, HK1AFG. The S.S. HOPE has operated since its first voyage with Hallicrafters amateur equipment for contacts between the staff and Washington headquarters for both morale and administrative traffic. Hallicrafters does not make the kilowatt linear the HOPE operators feel they will need for reliable contact from Ceylon, and as this is written, no angel has offered them one.

HOPE is now at Cartagena, Colombia, on her sixth voyage to carry modern medical methods to doctors in countries where ignorance and poverty have held back the advance of such knowledge. Contrary to the common notion, HOPE is not just a hospital ship to help the sick, but is aimed at training local doctors to do a long-term medical job. Patients treated are selected for the value their treatment can offer in the medical training work.

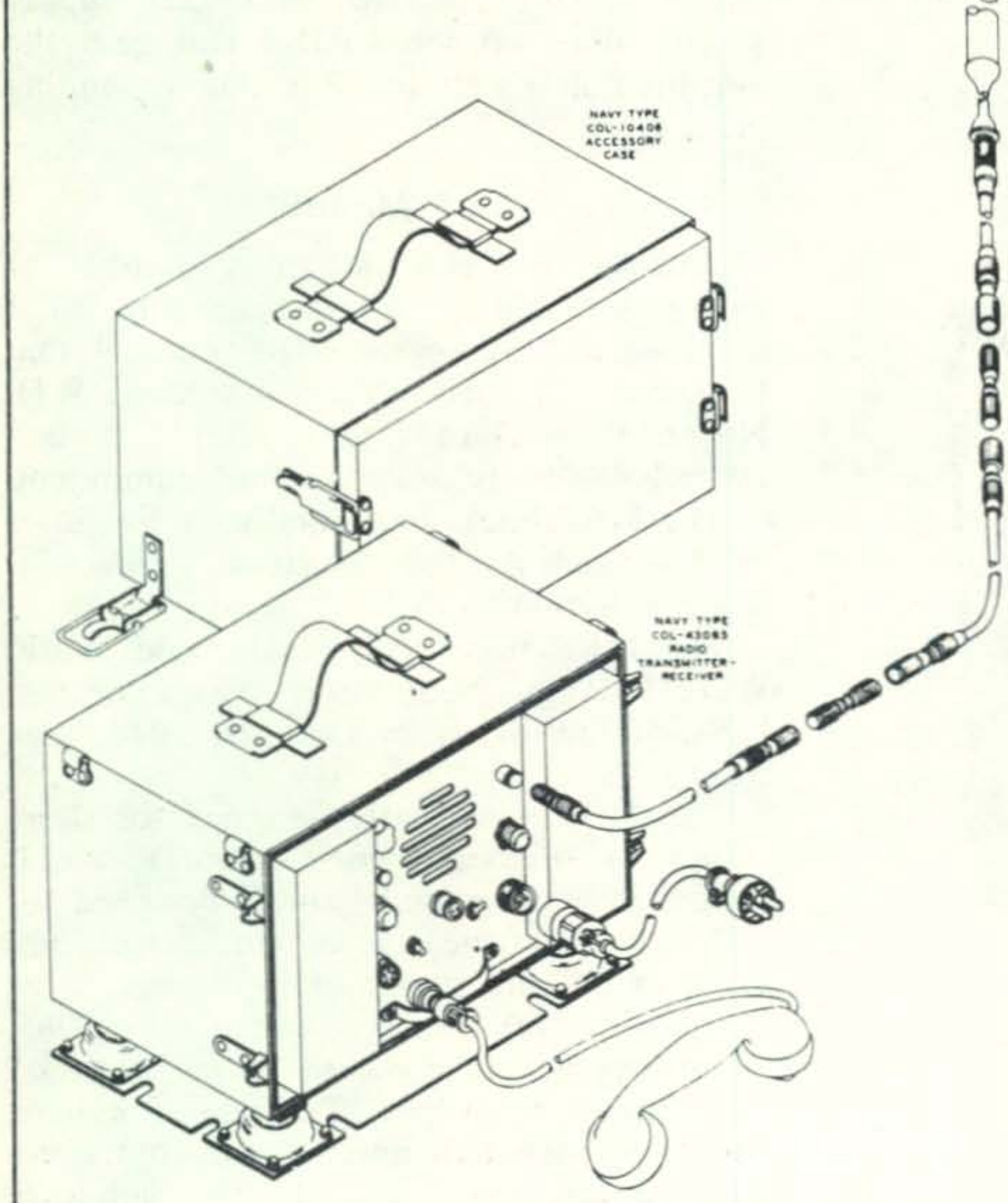
The present HOPE radio operator is Don MacLean, who operates as VE3BFA when he is at home in Ontario, Canada. Don may have to pass up the Ceylon trip, and his leaving would make an opening for an amateur who could serve aboard ship on that cruise, but right now those plans are still up in the air.

Equally important to the HOPE radio circuit is Virgil Bowers, WA2WUV, Massapequa, Long Island, who is the stateside terminal. Virgil, a retired manufacturer, puts in virtually 24-hour duty for HOPE, though most traffic is passed during the day he has to be on standby for emergencies from the ship.

I had a chance to talk to both Don and Virgil recently, as they put together a phone patch from Washington so that I could interview two Utah doctors on the HOPE for my newspaper, the *Desert News*. Both were very helpful, and the contact, on 15 meters, was solid despite fading conditions and a mid-day dip that Virgil told me was characteristic of their north-south circuit.

[*Continued on page 113*]

Fig. 4—Collins MBF tranceiver, a World War II design covering 60-80 mc.



NEW INSTRUMENT OR RECEIVER TRANSMITTER CABINET

Panel space 19" wide x 12½" high with a clear depth of 13". Outside depth is 14½". Partial rear panel. Painted black crackle.
Price: ..... **$3.95 each**

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All rated at 1.5 amps.

50-200 volts	6¢ each	20/$1.00
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600 plus	15¢ each	7/$1.00

RACK CABINET AND BLOWER

BRAND NEW 19" desk top rack cabinets that contain a NEW Rotron muffin fan with attached cord and plug for 115V 50-60cy, mounted on the rear door. There is also a top door, 2 drawer rails with ball bearing rollers (removable), 3 alignment tools and 2 Allen wrenches. Front panel space is 19" wide x 14" high with a 13½" clear behind panel depth. The outside measurements are 16" high x 21" wide x 15" deep. There are four rubber feet on the bottom, and the color is dark gray.
Price: ..... **$14.95 each**

DESK TOP RECEIVER OR TRANSMITTER CABINET

A modern design desk top cabinet with a top lid and rounded corners and painted a light gray. These cabinets are made of perforated steel on side and top for adequate ventilation. The panel space is 8¾" H x 18" W with 15" depth behind panel. Also, a bottom chassis cover is supplied. These units are BRAND NEW.
Price: ..... **$2.95 ea. or 2/$5.00**

NEW CRYSTALS

100 crystals in a case originally for type MAR equipment. These crystals cover the range of 4844.44 kHz to 7778.78 kHz. There are 16 units in the 40 meter amateur band, and an additional 7 units are usable in the 6 meter band. Also 17 are usable in the 10 meter band. Complete with case.
Price: ..... **$12.95 2 for $25.00**

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SEC: 12.8 V CT @ 20A.
The primary has 3 extra windings for buck or boost to enable you to adjust the secondary (12.8V) voltage.
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OR

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Mfg. by RCA BRAND NEW
Freq. range: 225-390 mMz.
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All this in original military boxes, receiver packed in aluminum waterproof case, manual included. Easily converted to 200 mHz ham band, or use as they are for UHF aircraft band. You get all that is required to operate except the 12 VDC source and the antenna.

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ARC-5 TRANSMITTER LIKE NEW 3-4 mHz

Complete with all tubes. One of the most versatile pieces of surplus equipment ever. Get yours now—not many of these left. Guaranteed excellent.
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Price: ..... **$1.00 ea.**
BNC Bulk heat mtg. "T" with TNC on each end of "T".
Price: ..... **$1.50 ea.**
BMC "T" connector similar to type UG-274/U
Price: ..... **75¢ ea.**
Cable—5" long with TNC right angle and TNC straight on ends.
Price: ..... **$1.00 ea.**

All prices are F.O.B. our Philadelphia warehouse. All merchandise described accurately to the best of our knowledge. Your purchase money refunded if not satisfied. Terms are CASH. Minimum order is $5.00

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For further information, check number 16, on page 126

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

October	7-9	Massachusetts QSO Party
October	7-8	WADM C.W. Contest
October	7-8	VK/ZL/Oceania Phone
October	14-15	VK/ZI/Oceania C.W.
October	14-15	R.S.G.B. 21/28 mc Phone
October	14-15	RTTY Sweepstakes
October	14-15	California QSO Party
October	18-19	YLRL Anniv. C.W. Party
October	**21-22**	**CQ WW DX Phone**
October	28-29	R.S.G.B. 7 mc Phone
October	28-30	Alabama QSO Party
November	1-2	YLRL Anniv. Phone Party
November	11-12	OK C.W. DX Contest
November	11-12	R.S.G.B. 7 mc C.W.
November	11-12	ARRL SS Phone
November	15	Trillium Memorial Week
November	18-19	ARRL SS C.W.
November	18-19	VU2/4S7 C.W. Contest
November	**25-26**	**CQ WW DX C.W.**
November	25-26	VU2/4S7 Phone Contest
December	9-10	9Q5 DX Contest

Massachusetts QSO Party

Starts: 2300 GMT Saturday, October 7
Ends: 0200 GMT Monday, October 9

The 3rd annual QSO party sponsored by the M.I.T. Radio Society was covered last month.

Mailing deadline is October 25th and logs go to: M.I.T. Radio Society, W1MX, Box 558, 3 Ames Street, Cambridge, Mass. 02139. Include a s.a.s.e. if results are desired.

VK/ZL/Oceania DX Contest

Phone: Oct. 7-8. **C.W.:** 14-15.
Starts: 1000 GMT Saturday. Ends: 1000 GMT Sunday in each instance.

Its the world working the VK/ZLs and other Oceania countries in this one. Complete rules in last month's CALENDAR.

This year logs go to: W.I.A., Federal Contest Committee, Box N1002, G.P.O., Perth, Western Australia, and must be received before January 20, 1968.

*14 Sherwood Road, Stamford, Conn. 06905.

YLRL Anniversary Party

C.W.: Oct. 18-19. **Phone:** Nov. 1-2.
Starts: 1700 GMT Wednesday. Ends: 2300 GMT Thursday in each instance.

See page 103 for details. Logs go to: Marte Wessel, KØEPE, P.O. Box 756, Liberal, Kansas 67901.

WADM C.W. Contest

Starts: 2000 GMT Saturday, October 7
Ends: 2000 GMT Sunday, October 8

The Radio Club of the German Democratic Republic organized this contest to promote activity for the WADM and RADM awards.

This is a c.w. contest only and all bands 3.5 thru 28 mc can be used. The same station may be worked once per band.

Classes: Single operator, multi-operator and s.w.1.

1967 CQ World Wide DX Contest

Phone

Starts: 0000 GMT Saturday, October 21
7:00 P.M. EST Friday, October 20
4:00 P.M. PST Friday, October 20
Ends: 2400 GMT Sunday, October 22
7:00 P.M. EST Sunday, October 22
4:00 P.M. PST Sunday, October 22

C.W.

Starts: 0000 GMT Saturday, November 25
7:00 P.M. EST Friday, November 24
4:00 P.M. PST Friday, November 24
Ends: 2400 GMT Sunday, November 26
7:00 P.M. EST Sunday, November 26
4:00 P.M. PST Sunday, November 26

Exchange: The usual six digit number, RST plus a QSO number starting with 001.

Points: Each completed DM contact counts 3 points. (s.w.1. get 1 point for each new DM call and contest number heard.)

Multiplier: A multiplier of 1 for each new DM district worked per band. (A district is identified *not* by the number in the call but by the last letter in the call, A thru O)

Final Score: Sum of QSO points from all bands multiplied by the sum of DM districts from all bands.

Awards: First place, a WADM contest flag (or plaquette) to the top scorer in each country. Second and third place awards will be made in countries with a large entry.

Applications for the WADM or RADM awards may be made from contacts in your contest log. (Plus QSL cards if they accompany your log.) Class IV and III require 4 IRCs, class II and I require 8 IRCs.

Mailing deadline is November 15th and logs go to: Radio Club of DDR, Contest Committee, P.O. Box 30, 1055 Berlin, German Dem. Rep.

R.S.G.B. 21/28 mc Phone

Starts: 0700 GMT Saturday, October 14
Ends: 1900 GMT Sunday, October 15

Its the world working the British Isles on 21 & 28 mc Phone in this one. This could prove to be a most interesting activity with the way these two bands have been improving.

Contacts may be made on a.m. or s.s.b. and the same station can be worked once on each band, but cross-band contacts not permitted. Multi-operator entries not accepted.

Exchange: The RS report followed by 3 figures starting with 001 for the first contact.

Scoring: Each completed QSO with a British Isles station counts 5 points. An additional bonus of 50 points is claimed for the first contact with each B.I. country/number prefix on each band, i.e. G2, GC3, GD4, GI5, GM6, GW8 and etc. (a max. of 36 on each band) There is no multiplier.

Awards: Certificates to the leading station in each country and each VE, VK, W/K, ZL and ZS call area.

There is also a s.w.1. section in the contest. Scoring is same as above except that the bonus point value is 20. Only British Isles stations are to be listed, as follows: Time GMT, call, number sent, call of station being worked, band and points.

A summary sheet with scoring and other information, a signed declaration and your name and address in BLOCK LETTERS is also requested.

Mailing deadline is October 30th and logs go to: R.S.G.B. Contests Committee, 28 Little Russell St., London W C 1, England.

RTTY Sweepstakes

Starts: 0200 GMT Saturday, October 14
Ends: 0200 GMT Monday, October 16

This is the 7th world wide RTTY DX contest, this year sponsored by the Canadian Amateur Radio Teletype Group, to commerate the Canadian Centennial Year.

Bands: All bands 3.5 thru 28 mc.

Exchange: Message number, signal report, GMT time, zone number and country.

Points: Two points for contacts with stations in one's own zone. Contacts with stations in other zones are score the points as listed in the exchange table. (Too large and complicated to be listed here. See Oct. '66 *QST*)

Additional contacts may be made with the same station on a different band. An additional 100 bonus points is given for each contact with the same station after the initial one.

Multiplier: Each country worked, including one's own is a multiplier of one. The same country may be claimed only once, regardless of the bands used.

Scoring: Total QSO points multiplied by the number of countries worked. (Use the ARRL country list. KL7, KH6 & VO are considered a separate multiplier.)

Awards: Centennial Medallions for the three top scores. Certificates for the top ten scores. The top Canadian station and the station having the most contacts with Canada will also receive a citation.

Logs must be received no later than November 25th. They go to: C.A.R.T. G.—3C3RTT, 85 Fifeshire Road, Willowdale, Ont. Canada.

California QSO Party

Starts: 2200 GMT Saturday, October 14
Ends: 2200 GMT Sunday, October 15

This is the 2nd annual party sponsored by the Claremont Ham Club of California.

The same station may be worked on each band and mode. Calif. stations can also work other in-state stations.

Exchange: QSO nr., RS/RST and QTH.

The Potomac Valley Radio Club always comes up with its share of awards in our World Wide DX Contest. Here is the quota for the 1966 Contest, presented at a recent dinner in Washington. L. to R.—W3MSR, W6HOH, W3MCG, K3EST, W3GRF (U.S.A. C.W. Champ award) W3ZKH, W3MSK (World High Club award) W4KFC, W4KXV (with W4BVV's Multi-Transmitter world high c.w. award) K3JZY and W3FYS.

County for California, state, province or country for others.

Scoring: All QSOs count 1 point. Calif. stations multiply total QSO points by total number of states, VE provinces and countries worked. All others will use Calif. counties for their multiplier. (max. of 58)

Frequencies: 1910, 3550, 3725, 3900, 7075, 7175, 7220, 14075, 14270, 21075, 21125, 21370, 28075, 28700.

Awards: A certificate to the top station in each state, VE province and country. The top 15 Calif. entries, 5 Novice and 2 Clubs are also in line for an award.

Mailing deadline is November 10th and logs go to: Claremont Ham Club, c/o Tom Frenaye, WB6KIL, 617 Purdue Drive, Claremont, Calif. 91711. Include a large s.a.s.e. if results are desired.

R.S.G.B. 7 mc DX

Phone: Oct. 28-29. **C.W.:** Nov. 11-12.
Starts: 1800 GMT Saturday. Ends: 1800 GMT Sunday in each instance.

This one is similar to the 21/28 mc phone contest held earlier in the month, except for the QSO point value. And of course operation is on 7 mc only, and again only single operator entries are permitted.

Exchange: The usual 5 and 6 figures, RS/RST plus a progressive 3 digit QSO number.

Scoring: Contacts with British Isles stations vary in point value according to the location of the DX station. If in Europe, 5 points. North America, 15 points. Africa, Asia and So. America, 25 points. Oceania, 50 points.

In addition, a bonus of 50 points may be claimed for the first contact with each B.I. country/numeral prefix. Same as 21/28 phone.

Awards: Certificates to the leading station in each overseas country and VE, VK, W/K, ZL & ZS call area. Providing there are 10 or more entries in any section.

Three is also a s.w.l. section in the contest. Scoring is similar to the transmitting section above, including the 50 bonus points.

A summary sheet and a signed declaration that all rules and regulations have been observed is a *must*.

Mailing deadline is November 27th. Logs go to: R.S.G.B. Contests Committee, 28 Little Russell St., London WC1, England.

Alabama QSO Party

Starts: 2000 GMT Saturday, October 28
Ends: 0200 GMT Monday, October 30

This is the second Alabama party sponsored by the Huntsville Amateur Radio Club.

Operate 24 out of the 30 hour period. The same station may be worked once per band, and phone and c.w. are the same contest. Operators are cautioned to listen carefully and avoid net frequencies.

Exchange: QSO nr., RS/RST and QTH. County for Alabama, ARRL section or country for others.

Scoring: Ala. stations, 1 point per QSO, including in state contacts. DX contacts also count only 1 point. A multiplier of one *only* per band can be claimed for all foreign stations worked. Final score, QSO points times ARRL sections and DX multiplier.

Out of state stations, 3 points per Ala. QSO multiplied by Ala. counties. (max. 67)

Frequencies: 3577, 3965, 7040, 7230, 14060, 14290, 21040, 21390, 28600, 50.550, 145.350, and novice frequencies.

Awards: Certificates to the top scorer in each ARRL section and foreign country. (min. of 100 points) Trophies to the "Top Banana" in Alabama and out of state station. Also 2nd, 3rd and 4th place certificates in Alabama.

Mailing deadline is December 4th. Logs go to: Huntsville A.R.C. c/o WA4RBH, 2103 Suzanna Terr. N.W., Huntsville, Ala. 35810. Include a s.a.s.e. if final results desired.

CQ WW DX Contest

Complete rules were in last month's CALENDAR with a brief run down in the August issue. Its the same old contest, on the same week-ends, with no changes in the rules.

Here again are a few reminders. A single operator can compete on all bands or a single band, but not on both. Multi-operator stations however are scored for all band operation only.

All scores will be published, but a minimum of 12 hours of operation for a single operator and 24 hours for multi-operators are required to be eligible for an award.

In the Multi-operator category, Single Transmitter stations are permitted only one signal on the air at the same time. Multi Transmitter operation permits all bands to be activated at the same time, but only one signal per band is permitted.

Check your country list, ARRL and WAE. There are a few countries in Europe that do not appear on the ARRL list. (See July CALENDAR for the latest WAE list)

You are expected to score your log as well as check for duplicate contacts and multipliers. Re-copied logs must be in their original form with duplicates crossed out and scoring corrections made.

Official log and summary sheets are available (s.a.s.e. to *CQ*) but you can make up your own. Keep 40 contacts to the page and enter the Zone and Country multiplier *only* the first time it is worked. The summary sheet is very important, follow the sample in last month's issue.

Be sure to check W3ASK's PROPAGATION Column, George's batting average has been pretty high.

Editor's Notes

The amateur fraternity was shocked by the sudden death of Dr. Harold Megibow, K2HLB in July. We at *CQ* are especially saddened, Doc was not only an avid DXer but also a competitive contest man. But most of all we always thought of him as our devoted friend.

This year *CQ* is donating the K2HLB Trophy IN MEMORY of Dr. Harold Megibow.

A recent letter from Charlie Weir, W3FYS of the W3MSK team and the PVRC gang, reported that he had successfully presented the K2GL Trophy to the OH2AM boys.

[*Continued on page 112*]

1967 YLRL Anniversary Party

Time: CW—Start—October 18, 1967, 1700 GMT
End—October 19, 1967, 2300 GMT
Phone—Start—November 1, 1967, 1700 GMT
End—November 2, 1967, 2300 GMT

Eligibility: All licensed women operators throughout the world are invited to participate. YLRL members only are eligible for the cup awards. Non-members will receive certificates. Only YLRL members are eligible for the Corcoran Award. Contacts with OMs will not count. Contacts on nets do not count.

Operation: All bands may be used. Cross-band operation is *not* permitted. Only one contact with each station will be counted in each contest.

Procedure: Call "CQ YL."

Exchange: Station worked, QSO number, RS or RST, ARRL Section or Country. Entries in log should show the time, band, date, transmitter and power.

Scoring: A. CW and Phone sections will be scored as separate contests. Submit separate logs for each contest.
B. All YLs located within an ARRL Section, score one (1) point for each QSO with another station located within an ARRL Section. Score two (2) points for each contact with a station not located within an ARRL Section. (i.e.:DX) Definition of DX-all stations not located within an ARRL Section. DX YLs shall score two (2) points for each contact with a station located in an ARRL Section. Score one (1) point for each contact with another DX station. (Note: Please know your ARRL section—section lists are available from vice president. Send S.A.S.E. to receive list.) Multiply number of contact points by total number of different ARRL Sections and/or Countries worked.
C. Contestants running 150 watts d.c. input at all times, may multiply the results of (B) by 1.25 (Low Power Multipier)
D. SSB contestants running 300 watts P.E.P. or less at all times may use the Low Power Multiplier (Results of B by 1.25)

Awards: Highest CW Score—Gold Cup (YLRL Member only). Highest Phone Score—Gold Cup (YLRL Member only). Highest CW and Highest Phone log from each district and Country will receive a certificate. Corcoran Award: Highest combined CW and Phone score. (YLRL member only).

DX Only: Highest combined CW and Phone score from North and Central America including the Greater and Lesser Antilles will receive an award from: Arlie Hager, W4HLF. Highest combined score from any other part of the world will also receive this award.

Logs: Copies of all logs must show claimed score, be signed by this operator and postmarked no later than *November 22, 1967* and received no later than December 6, 1967 or they will be disqualified. Mail copies of logs to: Marte Wessel-KØEPE, P.O. Box 756, Liberal, Kansas 67901.
Please read the rules carefully and note the postmark deadline!!
Do join in the fun of the YLAP! Even if you can only participate for a short time we want and need you to enter the contest! Help make this the largest YLAP ever! Meet new YLs—greet old friends. The frequencies 14.288 and 14.265 are popular with the YLs but do listen on ALL bands. See you on air and good luck to you.

Propagation

BY GEORGE JACOBS,* W3ASK

THE 1967 *CQ* World Wide DX Contest will be held on the following dates [1]:

PHONE SECTION: 0000 GMT October 21-2400 GMT October 22.

C.W. SECTION: 0000 GMT November 25-2400 GMT November 26.

Continuing the practice of the past sixteen years, this month's PROPAGATION column will be devoted to a special forecast for use during the 1967 contest periods. Last year's forecast was pretty much on the nose for both the phone and c.w. sections, bringing the score for the past sixteen years to "highly accurate forecasts" 24 times; "fairly accurate forecasts" 5 times, and missed the mark completely only 3 times.

Sunspot Cycle

The present sunspot cycle continues to rise and has now reached a level of moderately high intensity. The Swiss Federal Solar Observatory reports a monthly mean sunspot number of 88 for July, 1967. This results in a smoothed sunspot number of 73, centered on January, 1967. A smoothed sunspot number of 96 is forecast for October, and 98 for November, 1967. This is approximately the same level of solar activity that last occurred during the 1960 Contest. It is approximately 30 numbers higher than the level recorded during last year's contest.

General Forecast

Barring any sudden radio storms developing during the contest periods (check the "Last Minute Forecast" appearing at the beginning of this column), conditions during the 1967 contest are expected to be better than they were last year, and better than they have been for any contest period since 1959. The following is a band-by-band summary of general propagation conditions that are expected to occur during the 1967 contest.

10 Meters: Good-to-excellent openings are expected to almost every area of the world during the daylight and early evening hours. Openings to Europe and those in a generally easterly direction should peak an hour or two before noon, while those to South America and Africa are forecast

*11307 Clara Street, Silver Spring, Md., 20902.
[1] See page 98 of *CQ*, August, 1967 for contest rules and information.

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for October

Days	*Forecast Rating & Quality* (4)	(3)	(2)	(1)
Above Normal: **14, 18, 20, 22, 25, 27**	A	A-B	B-C	C
Normal: **1, 3, 7, 9, 12-13, 15-17, 19, 21, 23-24, 26, 28, 30**	A-B	B-C	C-D	D-E
Below Normal: **2, 4, 6, 8, 10-11, 29, 31**	C	C-D	D	E
Disturbed **5**	D	D-E	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 8 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 parentheses 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 higher 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 meanings: (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 with considerable fading and noise; E—poor opening, or none at all.

4—This month's Propagation Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 300 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 Eastern USA chart can be used in the 1, 2, 3, 4, 8 KP4, KG4, and KV4 amateur call areas; The Central USA Chart in the 5, 9 and Ø areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid through Nov. 30, 1967, and are prepared from basic propagation data published monthly by the Institute For Telecommunication Sciences And Aeronomy of the U.S. Dept. of Commerce, Boulder, Colorado.

to peak during the early afternoon hours. Optimum conditions to the Far East, Australasia, Southeast Asia, etc. are expected during the late afternoon and early evening hours. During most of the daylight hours it should be a toss-up between 10 and 15 meters for best DX band honors.

15 Meters: Excellent DX propagation conditions are predicted from shortly after sunrise through the early evening hours. Strong signal levels are forecast, and openings, are expected to take place to all areas of the world. During the late afternoon and early evening hours, 15 meters is likely to be the optimum band for DX propagation conditions.

20 Meters: Generally good DX openings are expected to one area of the world or another on this band almost around-the-clock. Optimum world-wide conditions should take place for a few hours after sunrise, and during the late afternoon and early evening hours. Excellent openings should also be possible during the late evening and early morning hours to southern and tropical areas.

40 Meters: The band should begin to open for DX during the late afternoon and early evening hours. Openings are expected to become more numerous during the hours of darkness, and the band is expected to remain open until shortly after sunrise. Fairly good DX openings to most areas of the world should be possible, with signals often exceptionally strong. During most of the hours of darkness it may be a toss-up between 40 and 20 meters for optimum DX propagation conditions.

80 Meters: Some fairly good openings are forecast to some areas of the world during the hours of darkness. Peak conditions should occur shortly before sunrise.

160 Meters: DX openings to some areas of the world may be possible during the hours of darkness and the sunrise period. Because of signal absorption and the low power levels used on this band, signals at best are expected to be weak and noisy.

For a more detailed circuit-by-circuit forecast refer to the special contest *DX Propagation Charts* appearing on the following pages. Instructions for the proper use of these Charts are given in the box following the "Last Minute Forecast" at the beginning of this column.

Contest Work Plans

The *DX Propagation Charts* on the following pages show the times that each amateur band from 10 through 160 meters are expected to open from the United States to all other areas of the world. The information contained in the Charts can be easily reorganized into operational work plans, or schedules, to serve as guides during the contest periods. Experience during previous contests has shown that such plans can be extremely useful in piling up a large number of contacts with a minimum of wasted time. The following plan is an example of what can be devised from the data appearing in the Charts. It shows, for each three-hour period throughout the day, the areas of the world for which 20 meter propagation conditions are expected to be optimum (a rating of 3 or higher in the *Charts*). An Eastern USA QTH has been chosen for this example, but similar plans can be devised for other QTHs and for other bands.

Sample 20 Meter Optimum Operating Schedule for Eastern USA

Time (EST)	*Areas To Which Opening Should Be Optimum*
00-03	Guam and Pacific Islands, Australia and New Zealand, South Americans.
03-06	Not much except some Australians and New Zealand. Good time to catch some sleep.
06-09	Most of Europe, Australia, New Zealand, Pacific Islands, Far East, Southeast Asia, most of South America.
09-12	Some Europeans, north and central South America.
12-15	Most of Europe, North Africa, Eastern Mediterranean, Middle East.
15-18	West and central Europe, Eastern Mediterranean, Middle East, most of Africa, most of South America.
18-21	Western Europe, Eastern Mediterranean, Middle East, most of Africa and South America.
21-00	Some Africans, Far East, Southeast Asia, Guam and Pacific Islands, Australia and New Zealand, all of South America, Antarctica.

The following is a typical *multi-band* operational work plan devised from the propagation charts. The plan, based on a Western USA QTH, shows the times and bands when propagation conditions are expected to be optimum to various areas of the world, for each three-hour period throughout the day.

Sample Multi-Band Work Plan for Western USA QTH

Time (PST)	*Areas To Which Band Expected To Be Open*
00-03	Far East, Asia, Pacific Islands, New Zealand, Australia, South America & Antarctica.
03-06	Far East, Asia, Pacific Islands, New Zealand, Australia, Northern and central South America.
06-09	Europe, Eastern Mediterranean, Middle East, Asia, Far East, Pacific Islands, New Zealand, Australia, most of South America.
09-12	Western Europe, Eastern Mediterranean, Middle East, most of Africa, S.E. Asia, Pacific Islands, New Zealand, Australia.
12-15	Some Europeans, most of Africa, Far East, Asia, Pacific Islands, New Zealand, Australia and most of South America.
15-18	Some Africans, Far East, Asia, Pacific Islands, New Zealand, Australia, and South America.
18-21	Far East, most of Asia, Pacific Islands, New Zealand, Australia, most of South America and Antarctica.
21-00	Pacific Islands, New Zealand, Australia, most of South America, Antarctica.

Radio Storms

The forecasts in this column are based on *normal* propagation conditions. If conditions should turn out to be above normal during the contest periods, DX openings on 10, 15 and 20 meters are likely to be somewhat better than shown in the forecasts. On the other hand, if radio storms should develop during the contest, with below normal or disturbed conditions, fewer openings will take place on these bands. During radio storms, conditions on 40, 80 and 160 meters generally also become erratic, and under certain conditions openings may be poorer than shown in the forecasts, while under other storm conditions they may actually improve.

If a radio storm should develop during the contest, circuits passing through or near the auroral zones will probably become weak, fade considerably, or may even black out entirely, depending on the severity of the storm. On the other hand, during certain types of storms, conditions on north-south paths may improve. During a radio storm, concentrate on working east-west openings during the daylight hours, and north-south openings during the evening and early morning hours. A "Last Minute Forecast" for the Phone section of the contest, made at press time (early September), appears at the beginning of this column. A similar forecast for the C.w. section will appear in next month's column.

Up-To-The-Minute Contest Forecasts

Check WWV for the latest information concerning actual propagation conditions *during the contest*. WWV broadcasts general propagation information on 2.5, 5, 10, 15, 20 and 25 mc twelve times every hour. The data is transmitted at 4½ minutes past the hour, and is repeated every five minutes thereafter. Given in slow Morse Code, the transmissions consist of the letters M, W, or U, followed by a number between 1 and 9. The letters designate propagation conditions *at the time* of broadcast, as follows:

N—Normal propagation conditions
U—Conditions unstable or erratic, signals subject to fading and noise
W—Radio storm in progress, conditions below normal or disturbed

The numbers designate propagation conditions forecast for the *following six-hour* period, as follows:

1. Useless
2. Very Poor
3. Poor
4. Poor-to-Fair
5. Fair
6. Fair-to-Good
7. Good
8. Very Good
9. Excellent

If, for example, propagation conditions are normal at the time of broadcast, but are expected to become poor during the next six hours, WWV would transmit N3 in Morse Code.

Up-to-the-minute propagation information can also be obtained by telephone from the Environmental Science Services Administration (ESSA) Radio Warning Centers at Fort Belvoir, Virginia (for the North Atlantic area), and Anchorage, Alaska (for the North Pacific area). The telephone numbers for this service at Fort Belvoir are Area Code 703-780-1444 or 780-1436, and at Anchorage the numbers are Area Code 907-753-2211 or 753-7210. Information on current radio propagation conditions can be obtained from Fort Belvoir 24 hours a day, and from Anchorage from between 0800 and 1700 Alaskan Standard Time.

Post Mortem

More radio amateur DX activity takes place in more parts of the world during the *CQ* World Wide DX Contest than probably during any other time. For this reason, the contest offers an excellent opportunity to check out the accuracy (or inaccuracy), of the *CQ* predictions. Reports received from previous contests have contributed considerably to improving these forecasts from year-to-year. Any comments or observations concerning this year's special contest propagation forecast would be appreciated. Comments may be sent directly to W3ASK, the Editor of this column.

C.w. Contest Forecast

The *Propagation Charts* appearing in this month's column are valid for *both* the phone and c.w. periods of the contest. *Be sure to retain the Charts for use during next month's c.w. period.* The *Charts* appearing in next month's column will contain Short-Skip forecasts for November and December, 1967. Short-Skip data for October appeared in last month's column.

Good luck in the Contest!

73, George,W3ASK

PLEASE USE YOUR ZIP CODE NUMBER ON ALL CORRESPONDENCE

OCTOBER & NOVEMBER, 1967

Time Zone: EST (24-Hour Time)

EASTERN USA To:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western & Central Europe & North Africa	07-08 (1) 08-09 (2) 09-13 (4) 13-14 (2) 14-16 (1)	06-07 (1) 07-08 (2) 08-09 (3) 09-13 (4) 13-15 (3) 15-16 (2) 16-18 (1)	04-06 (2) 06-08 (4) 08-09 (3) 09-12 (2) 12-13 (3) 13-16 (4) 16-20 (3) 20-01 (2) 01-04 (1)	16-17 (1) 17-18 (2) 18-20 (3) 20-01 (4) 01-02 (3) 02-03 (2) 03-04 (1) 19-21 (1)* 21-23 (2)* 23-01 (3)* 01-02 (2)* 02-03 (1)*
Northern Europe & European USSR	07-08 (1) 08-11 (2) 11-12 (1)	07-08 (1) 08-11 (3) 11-13 (2) 13-14 (1)	06-07 (2) 07-09 (3) 09-11 (2) 11-14 (3) 14-16 (2) 16-17 (1) 23-06 (1)	18-20 (1) 20-01 (2) 01-02 (1) 20-01 (1)*
Eastern Mediterranean & Middle East	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (2) 11-12 (1)	07-08 (1) 08-09 (2) 09-10 (3) 10-11 (4) 11-12 (3) 12-13 (2) 13-14 (1)	06-10 (1) 10-12 (2) 13-14 (3) 14-16 (4) 16-20 (3) 20-21 (2) 21-02 (1)	19-21 (1) 21-23 (2) 23-00 (1) 20-23 (1)*
West Africa	07-10 (1) 10-13 (2) 13-15 (4) 15-16 (3) 16-17 (1)	06-10 (1) 10-12 (2) 12-13 (3) 13-16 (4) 16-18 (3) 18-19 (2) 19-21 (1)	07-13 (1) 13-15 (2) 15-16 (3) 16-19 (4) 19-23 (3) 23-07 (2)	18-22 (1) 22-00 (2) 00-02 (3) 02-03 (2) 03-04 (1) 00-03 (1)*
East & Central Africa	07-11 (1) 11-13 (2) 13-15 (3) 15-16 (2) 16-17 (1)	06-12 (1) 12-14 (2) 14-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	06-14 (1) 14-16 (2) 16-17 (3) 17-19 (4) 19-23 (3) 23-06 (2)	21-23 (1) 23-01 (2) 01-02 (1) 23-01 (1)*
South Africa	07-09 (1) 09-11 (2) 11-12 (3) 12-15 (4) 15-16 (3) 16-17 (2) 17-18 (1)	06-10 (1) 10-12 (2) 12-14 (3) 14-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	07-14 (1) 14-16 (2) 16-19 (4) 19-20 (3) 20-22 (2) 22-03 (1)	18-19 (1) 19-22 (2) 22-23 (1) 19-21 (1)*
Central & South Asia	08-10 (1) 17-19 (1)	07-08 (1) 08-10 (2) 10-11 (1) 17-18 (1) 18-20 (2) 20-21 (1)	06-07 (1) 07-09 (2) 09-12 (1) 17-19 (1) 19-22 (2) 22-01 (1)	18-20 (1) 05-07 (1)
Southeast Asia	11-12 (1) 12-14 (2) 14-15 (1) 17-20 (1)	09-10 (1) 10-12 (2) 12-14 (1) 14-16 (2) 16-18 (1) 18-20 (2) 20-21 (1)	06-07 (1) 07-09 (2) 09-13 (1) 18-23 (1)	05-07 (1)
Far East	17-18 (1) 18-19 (2) 19-20 (1)	17-18 (1) 18-20 (3) 20-21 (2) 21-22 (1)	16-18 (1) 18-21 (2) 21-23 (3) 23-04 (2) 04-07 (1) 07-09 (2) 09-12 (1)	04-08 (1)
Guam & Pacific Islands	08-12 (1) 12-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	08-09 (1) 09-12 (2) 12-16 (1) 16-18 (2) 18-20 (4) 20-21 (3) 21-22 (2) 22-23 (1)	11-19 (1) 19-22 (2) 22-00 (4) 00-03 (3) 03-04 (2) 04-06 (1) 06-07 (2) 07-09 (4) 09-11 (2)	00-03 (1) 03-07 (3) 07-09 (1) 03-04 (1)* 04-06 (2)* 06-08 (1)*
Australia & New Zealand	10-13 (1) 13-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	07-09 (1) 09-12 (2) 12-16 (1) 16-18 (2) 18-21 (3) 21-23 (2) 23-00 (1)	07-09 (3) 09-11 (2) 11-20 (1) 20-22 (2) 22-00 (3) 00-02 (4) 02-04 (3) 04-07 (2)	02-04 (1) 04-07 (2) 07-08 (1) 04-05 (1)* 05-06 (2)*
Northern & Central South America	07-08 (1) 08-10 (3) 10-14 (2) 14-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-10 (4) 10-15 (3) 15-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	07-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-23 (4) 23-03 (3) 03-07 (2)	18-19 (1) 19-21 (2) 21-03 (3) 03-06 (1) 19-21 (1)* 21-03 (2)* 03-05 (1)*
Southern Brazil, Argentina, Chile & Uruguay	06-08 (1) 08-13 (2) 13-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1)	06-07 (1) 07-10 (2) 10-13 (1) 13-15 (2) 15-17 (3) 17-20 (4) 20-22 (3) 22-23 (2) 23-01 (1)	06-09 (2) 09-15 (1) 15-17 (2) 17-19 (3) 19-00 (4) 00-02 (3) 02-04 (2) 04-06 (1)	19-23 (1) 23-04 (2) 04-06 (1) 23-04 (1)*
McMurdo Sound, Antarctica	07-09 (1) 20-23 (1)	06-07 (1) 07-09 (2) 09-17 (1) 17-20 (2) 20 22 (3) 20-22 (3)	06-09 (2) 09-18 (1) 18-21 (2) 21-02 (3) 02-04 (2) 04-06 (1)	00-06 (1)

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

CENTRAL USA To:

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

* Predicted times of 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. In the 24-hour time system 01 through 12 are equivalent to 1 A.M. through 12 noon; 13 through 00 are equivalent to 1 P.M. through 12 midnight.

South-east Asia	09-10 (1) 10-13 (2) 13-16 (1) 16-18 (2) 18-20 (1)	08-09 (1) 09-14 (3) 14-16 (1) 16-18 (2) 18-21 (1)	06-07 (1) 07-09 (2) 09-14 (1) 18-19 (1) 19-21 (2) 21-22 (1)	04-07 (1)
Far East	15-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	08-10 (1) 15-16 (1) 16-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	06-07 (1) 07-10 (2) 10-12 (1) 16-19 (1) 19-22 (2) 22-01 (1)	03-09 (1) 02-04 (1)*
Guam, Pacific Islands & New Zealand	09-11 (1) 11-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	08-09 (1) 09-13 (2) 13-15 (1) 15-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	11-18 (1) 18-20 (2) 20-21 (3) 21-00 (4) 00-02 (3) 02-04 (2) 04-06 (1) 06-07 (2) 07-09 (4) 09-11 (2)	23-01 (1) 01-06 (3) 06-07 (2) 07-08 (1) 00-02 (1)* 02-06 (2)* 06-07 (1)*
Austra-lia	08-09 (1) 09-11 (2) 11-13 (1) 13-16 (2) 16-19 (3) 19-20 (2) 20-21 (1)	07-09 (1) 09-12 (2) 12-16 (1) 16-19 (2) 19-21 (3) 21-22 (2) 22-23 (1)	07-09 (3) 09-11 (2) 11-22 (1) 22-01 (2) 01-04 (3) 04-07 (2)	02-04 (1) 04-07 (2) 07-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
North-ern & Central South America	07-08 (1) 08-10 (3) 10-13 (2) 13-14 (3) 14-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	06-07 (1) 07-08 (2) 08-14 (3) 14-17 (4) 17-19 (3) 19-20 (2) 20-21 (1)	06-07 (2) 07-09 (3) 09-11 (2) 11-12 (1) 12-14 (2) 14-17 (3) 17-22 (4) 22-01 (3) 01-04 (2) 04-06 (1)	18-19 (1) 19-21 (2) 21-02 (3) 02-04 (1) 04-05 (2) 05-06 (1) 19-21 (1)* 21-02 (2)* 02-05 (1)*
South-ern Brazil, Argen-tina, Chile & Uru-guay	06-08 (1) 08-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-19 (2) 19-20 (1)	06-08 (1) 08-10 (2) 10-12 (1) 12-14 (2) 14-15 (3) 15-19 (4) 19-21 (3) 21-23 (2) 23-00 (1)	03-06 (1) 06-08 (2) 08-14 (1) 14-16 (2) 16-17 (3) 17-00 (4) 00-02 (3) 02-03 (2)	20-21 (1) 21-01 (2) 01-03 (1) 03-04 (2) 04-05 (1) 21-04 (1)*
Mc-Murdo Sound, Antarc-tica	07-08 (1) 08-09 (2) 09-10 (1) 19-20 (1) 20-21 (2) 21-22 (1)	06-07 (1) 07-10 (2) 10-16 (1) 16-20 (2) 20-22 (3) 22-23 (2) 23-01 (1)	06-08 (2) 08-11 (1) 16-18 (1) 18-20 (2) 20-02 (3) 02-04 (2) 04-06 (1)	23-06 (1)

Time Zone: PST (24-Hour Time)
WESTERN USA To:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
Western Europe & North Africa	07-08 (1) 08-10 (2) 10-11 (1)	06-07 (1) 07-09 (2) 09-11 (3) 11-12 (2) 12-13 (1)	05-06 (1) 06-08 (2) 08-10 (1) 10-12 (2) 12-14 (3) 14-16 (2) 16-20 (1) 00-02 (1)	18-00 (1) 19-23 (1)*
Central & North-ern Europe & Euro-pean USSR	07-09 (1)	06-07 (1) 07-09 (2) 09-11 (1)	06-07 (1) 07-09 (3) 09-10 (2) 10-14 (1) 14-19 (2) 19-23 (1) 23-02 (2) 02-04 (1)	21-00 (1)
Eastern Mediter-ranean & Middle East & East Africa	07-11 (1)	07-08 (1) 08-10 (2) 10-12 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-16 (2) 16-18 (1) 18-20 (2) 20-22 (1)	18-22 (1)
West & Central Africa	07-09 (1) 09-11 (2) 11-14 (3) 14-16 (2) 16-17 (1)	06-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-10 (1) 10-14 (2) 14-16 (3) 16-19 (4) 19-21 (3) 21-22 (2) 22-00 (1)	18-23 (1) 19-22 (1)*

South Africa	06-08 (1) 08-10 (2) 10-14 (3) 14-15 (2) 15-16 (1)	05-10 (1) 10-12 (2) 12-13 (3) 13-15 (4) 15-17 (3) 17-18 (2) 18-19 (1)	06-13 (1) 13-15 (2) 15-17 (3) 17-19 (4) 19-21 (3) 21-22 (2) 22-00 (1)	18-19 (1) 19-20 (2) 20-21 (1) 18-19 (1)*
Central & South Asia	17-18 (5) 18-19 (2) 19-20 (1) 06-09 (1)	16-17 (1) 17-19 (2) 19-21 (1) 06-09 (1)	06-07 (1) 07-09 (2) 09-11 (1) 16-18 (1) 18-20 (2) 20-22 (1)	07-09 (1) 17-19 (1)
South-east Asia	08-09 (1) 09-11 (2) 11-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-20 (1)	08-09 (1) 09-11 (3) 11-15 (2) 15-17 (3) 17-19 (2) 19-20 (3) 20-21 (2) 21-22 (1)	22-01 (1) 01-07 (2) 07-09 (3) 09-11 (2) 11-12 (1)	01-02 (1) 02-04 (2) 04-08 (1) 02-04 (1)*
Far East	13-14 (1) 14-15 (3) 15-17 (2) 17-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	08-13 (1) 13-17 (2) 17-18 (3) 18-19 (4) 19-20 (3) 20-21 (2) 21-22 (1)	06-07 (2) 07-10 (3) 10-13 (2) 13-17 (1) 17-19 (2) 19-21 (3) 21-22 (2) 22-06 (1)	23-01 (1) 01-03 (2) 03-08 (1) 01-03 (1)*
Guam, Pacific Islands & New Zealand	08-09 (1) 09-11 (3) 11-16 (2) 16-17 (3) 17-19 (4) 19-20 (2) 20-21 (1)	07-08 (1) 08-10 (3) 10-16 (2) 16-18 (3) 18-21 (4) 21-23 (2) 23-01 (1)	11-18 (1) 18-19 (2) 19-21 (3) 21-01 (4) 01-02 (3) 02-03 (2) 03-06 (1) 06-07 (2) 07-09 (3) 09-11 (2)	21-22 (1) 22-05 (3) 05-07 (2) 07-08 (1) 22-00 (1)* 00-05 (2)* 05-06 (1)*
Austra-lia	09-11 (1) 11-13 (2) 13-17 (3) 17-19 (4) 19-20 (2) 20-21 (1)	07-08 (1) 08-09 (2) 09-11 (3) 11-14 (2) 14-17 (1) 17-18 (2) 18-20 (3) 20-21 (2) 21-23 (1)	07-08 (2) 08-10 (3) 10-12 (2) 12-19 (1) 19-21 (2) 21-23 (3) 23-01 (4) 01-02 (3) 02-03 (2) 03-07 (1)	01-03 (1) 03-06 (3) 06-08 (1) 03-04 (1)* 04-06 (2)* 06-07 (1)*
North-ern & Central South America	06-07 (1) 07-09 (3) 09-12 (2) 12-14 (3) 14-16 (4) 16-18 (2) 18-19 (1)	05-06 (1) 06-11 (2) 11-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	05-08 (2) 08-13 (1) 13-15 (2) 15-17 (3) 17-21 (4) 21-00 (3) 00-02 (2) 02-05 (1)	18-19 (1) 19-01 (3) 01-03 (1) 03-04 (2) 04-05 (1) 19-22 (1)* 22-01 (2)* 01-04 (1)*
South-ern Brazil, Argen-tina, Chile & Uru-guay	06-07 (1) 07-11 (2) 11-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	06-12 (1) 12-14 (2) 14-15 (3) 15-18 (4) 18-19 (3) 19-20 (2) 20-22 (1)	06-14 (1) 14-16 (2) 16-18 (3) 18-21 (4) 21-00 (3) 00-06 (2)	20-22 (1) 22-00 (2) 00-02 (1) 22-02 (1)*
Mc-Murdo Sound, Antarc-tica	07-10 (1) 18-19 (1) 19-21 (2) 21-22 (1)	06-07 (1) 07-10 (2) 10-16 (1) 16-19 (2) 19-22 (3) 22-00 (2) 00-01 (1)	16-18 (1) 18-20 (2) 20-02 (3) 02-04 (2) 04-06 (1) 06-08 (2) 08-11 (1)	23-05 (1)

Good Luck In The Contest

THE dwards PROGRAM

FEATURING USA-CA

BY ED HOPPER,* W2GT

GOSH, it was fun, what? The County Hunters (CW) QSO Party on the last week-end in July. My only regrets are that my time was limited, I had no antennas for 7 mc or 3.5 mc, and I had but one QSO on 21 mc and none on 28 mc. I was able to find the keyer under a pile of papers/letters and I must admit that I got tangled with the papers, at times (at least, that is my story and I am sticking to it, Hi!). I am already hearing from our overseas friends who did not hear about it in time.

Statistics

When I receive USA-CA applications, I am usually questioned about the number of awards issued in certain areas, especially from non-W applicants. So while I have the space, I thought that the following data would be of interest.

To date, 630 USA-CA 500 awards have been issued; 117 of USA-CA 1000; 61 of USA-CA 1500; 35 of USA-CA 2000; 18 of USA-CA 2500; 10 of USA-CA 3000 and 3 ALL 3079 Counties.

Of the 630 USA-CA 500 awards, 49 went to K1/W1; 53 to K2/W2/WA2/WB2; 30 to K3/W3/WA3; 70 to K4/W4/WA4/WN4; 50 to K5/W5/WA5; 46 to K6/W6/WA6; 25 to K7/W7; 70 to K8/W8/WA8; 71 to K9/W9/WA9; 67 to KØ/WØ/WAØ; 88 to non-W; and 11 to s.w.l.s. Oh yes, God bless them, 36 went to YLs/XYLs.

Awards with unusual endorsements seem to be: Corwin, WAØLRQ, ALL 2 × SSB, ALL 75 M, ALL *1966*. Willie, W8GDQ for ALL 160 M. "JC", LU1DAB for ALL 28 mc A-3. Karl, SM7ID for ALL 21 mc. Charles, K8ZNI for ALL NOVICES. Two Novices earned awards, they were, Curtis, WN4EBE and William, WN4LSU. What seem to me (an ole 5 meter man) most difficult, even though 4 have been so endorsed —ALL 50 mc A-3, to Helen, W1HOY; Kirk, K1MRI; Harry, WA2SAZ; and Louis, K8IXU.

The 88 awards to non-Ws were issued to: 1—CO8; 1—CR6; 1—CR7; 1—CT1; 4—DL (not DL4/5); 1—F9; 1—FG7; 6—G; 1—GI; 1—GW; 5—HK; 1—HV; 2—I; 1—IT; 3—KH6; 1—KL7; 2—KP4; 2—KZ5; 4—LA; 1—LU; 3—OK; 1—OZ; 1—PAØ; 1—PJ3; 1—PZ; 3—SM; 2—SP; 2—TG9; 1—VE1; 1—VE2; 8—VE3; 4—VE6; 2—VE7; 4—VK3; 1—VK7; 1—VO1; 2—VP9; 3—XE; 1—YO; 2—YV5; 3—ZL1; and 1—ZL4. Check and perhaps you will find that you could be the first from your country, and remember none have gone to Asia. Also remember we can help the other fellow by sending our QSL card.

The "Story of the Month" is:

George M. Radion, UC2AR

George is 35 years old and has been on the air since 1957. His wife, Tanja, is also

Tanja, UC2AY and George, UC2AR.

* 103 Whittman St., Rochelle Park, N.J. 07662.

Hong Kong Firecracker Award

an amateur with the call UC2AY and they have a 12-year-old daughter, Eugenja and a 7-year-old son, Arthur.

Their transmitter uses 200 watts input and their double conversion commercial receiver uses 17 tubes and covers 1.5 to 25 mcs. Antennas include a ground-plane for 14 mc and a G5RV multiband dipole. George is a fine operator (I have not yet heard Tanja) and uses an EL bug, but no s.s.b.

Although UC2AR has had about 7500 QSOs with US amateurs he has received only about 3000 QSLs and so far has been able to identify QSLs from only 424 counties.

Other DX includes 262 different countries and 582 prefixes for WPX.

George is a professional engineer (mechanical, not electrical). If you take a good look at the size of his shoulders you will think that he should be a pro-football player, so if you owe him a QSL, I suggest you send it at once to Box 88, Moscow or I will forward it for you—but do it NOW.

Letters

Alan, ZL1AMQ, writes: "Many thanks to Mid, W7ZC for the POD 26. I work mostly c.w. and have worked over 300 counties but only 200 confirmed, so far.

"The County Hunter Nets interest me, but the hours for 7 and 3.5 operation are not good for us in the Pacific area and naturally 3.5 is very tough from here.

"14 mc is fine for us and I sure would like to see more efforts for a Net on 14060 or 14070."

John, W9OIJ/WB2LZF, telephoned and wrote; "Please tell the fellows that I will gladly send QSLs for my different W9OIJ/ portable operations if they write to me at my new address: John McColly, 12422 Boheme Drive, Houston, Texas 77024.

"I have intentions of operating from Kenedy county, Texas for one and perhaps both Sweepstakes weekends. I also have hopes of Loving County operations as it is very rare but I will keep you posted."

David, WA8EOH, said: "Enjoy your column and very pleased to see you in the QSO Party (CW)."

Walter, DL9PF, writes: "I am happy that I will get the chance to meet you next week and perhaps many of the fellows I work on the bands and the *CQ* staff.

"What is CQ CH ??? Some sort of County Hunters Contest? Heard fellows exchanging numbers, RST and county, but the whole thing sounded like a 'W-only' contest."

Awards

Connecticut Counties Award: This *new* WCONN award is sponsored by the Council of Connecticut Amateur Radio Clubs and supersedes the award formerly issued by the Willimantic Junior Chamber of Commerce. The Council of Conn. ARC is a young and fledgling outfit (2 years old) with 13 real active Connecticut clubs as members out of a possible 15 or 17 clubs in the state. Requirements: One contact with each of the eight (8) counties of Connecticut, except Connecticut stations are required to confirm two (2) contacts with each county. No limitations as to date, band or mode. Mobile

Werner Mohn, DL6VP, USA-CA-500-#629.

SMMRC Award

and portable contacts must show county and/or city on QSLs. GCR applications certified by two other amateurs will be accepted in lieu of cards. Award manager reserves the right to request QSL cards. Submit alphabetical list by county, showing station, band, mode and date. A donation of 50 cents must be included with application. DX stations (other than W/K) $.50 or 5 IRCs. Apply to Awards Manager, W. Stanley Lamb, W1WHQ, RFD 2, Ledyard, Connecticut 06339.

Flying Saucer Net Award: Sponsored by the Eastern Connecticut Amateur Radio Association of Danielson, Conn. Requirements are: Three (3) consecutive check-ins to the net from Conn., R.I. and Mass. area, and any three (3) check-ins from other locations. The Flying Saucer Net is operated Fridays at 0200 GMT to 0300 GMT on 28.625 mc. Net manager, Ed. Sochon, K1DNW. Apply with log information and $.50 to K1MUJ, Box 155, Danielson, Connecticut 06239.

Hong Kong Firecracker Award: Sponsored by The Hong Kong Amateur Radio Transmitting Society and available to licensed amateurs throughout the world. Claims may be made for c.w. only, c.w./phone or phone only, for contacts with VS6 stations made on or after 1 January 1964. Contacts may be made on any authorized amateur band or bands and contacts made during contests will also apply. Contacts are required to be made with *different* VS6 stations as follows: Zones 18, 19, 24, 25, 26, 27 and 28 need 8 contacts and all other Zones need 4 contacts. To support the application, QSL cards must be held for the contacts claimed but it is not necessary to send the cards. A log extract certified by a National Club or Society will suffice. Details required are: date, time, band, mode and signal reports both given and received. Minimum report accepted will be 3-3, or 338 for cw. Send application and 5 IRCs to the QSL Manager,


THE
COUNCIL OF CONNECTICUT
AMATEUR RADIO CLUBS
Connecticut Counties Award
TO

WCONN Award

Hong Kong Amateur Transmitting Society, P. O. Box 541, Hong Kong.

Honorary Houstonian Award: This certificate issued free of charge by the Bayou City VHF Club of Houston, Texas. Work ten (10) club members and send GCR list to Ben Harris, K5DRF, P.O. Box 295, Manvel, Texas 77578. For club membership list, send s.a.s.e. to Ben.

SMMRC Award: Sponsored by the Swedish Maritime Mobile Radio Club and issued for contacts with five (5) different members of SMMRC after January 1, 1965. Any band and any mode ok. Send the 5 QSLs you have received and 2 IRCs to SM6CKU/MM, Bengt-Arne Johansson, Gokgatan 8 A, Kina, Sweden.

Notes

Hope you all keep an eye on CONTEST CALENDAR by Frank Anzalone, W1WY, that is how I found out about the "County Hunters (CW) QSO Party."

I'm sorry, but K6CAA/KH6 did *not* make it to Kalawao county, Hawaii during the Hawaii QSO Party. I have not heard a word from him since he first got the idea back in April.

Although I mentioned in July *CQ* that Mike, K1DGQ had sent a POD 26 to


COMMEMORATING ORBITAL FLIGHT
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Flying Saucer Net
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MC.
CONN. AMATEUR RADIO ASSN.
DANIELSON
CONNECTICUT

Flying Saucer Net Award


The Membership of The
BAYOU CITY VHF RADIO NET
does herewith confer unto
The Title of
HONORARY HOUSTONIAN

Honorary Houstonian Award

GM3BCL, this was *not* correct and my letters to Mike, K1DGQ about it go unanswered.

Many of our overseas friends could make good use of a POD 26, so if you have one that you do not need, please let me know.

Sorry to report the loss of another friend, Dr. Harold Megibow, K2HLB, who died suddenly while on vacation in Las Vegas on 26 July.

Although I did take off for 2 weeks (vacation), every effort was made to keep up with the mail and issue of awards with a minimum of delay.

Keep well and let me know—How was your month? 73, Ed., W2GT.

Contest Calendar [*from page 103*]

Charlie recently returned from a trip to Scandinavian countries and a stop-over at Helsinki. The climax at a dinner for the occasion was a toast, in which the Trophy Cup was filled with cognac, and was emptied by W3FYS and the OH2AM crew. Watch it Charlie, those are pretty big Cups we are giving as Contest Trophies.

I had the pleasure of finally meeting DL9PF at the recent NJDXA annual picnic. Walter accepted the W4BVV Trophy and took it back home with him for presentation to DJ6QT.

Get those beams pruned up, it will not be long now. Good luck and 73 for now.

Frank, W1WY

The Top 3 scores in the New Hampshire (Dec. 1966) QSO Party were K8ANA, K1PRB and W8WVU. The N.H. winner was W1SWX.

In the Vermont QSO Party (Feb. 1967) The Trophy winner was K4BAI, with WA5QBO, W2ZV and W2LQP as runners up. The Vermont Trophy was won by W1AYK, with W1CBW, K1UZG and W1FRT trailing in that order.

Scratchi [*from page 11*]

QSO's. Say he sending see-w at 15 WPM, and xmitting for total of five minutes each QSO. Then say he having 50 QSO's. His part of xmissions taking 250 minutes (and feller he talking to also taking 250 minutes). That meening they on air for more than eight hours.

Now, if he had been able to talking at 5,000 words per second, he being able to having all 50 QSO's in one second. Not one minute, Hon. Ed., but one second.

At this rate amchoor could working WAC in one-tenth second—or WAZ in less than a second, give or take a millisecond or two. Wowiee! Maybe you could having special certificate for anybuddy working WAZ in less than one second!

Of coursely, Hon. Ed., you seeing problem. We having tecknology to sending and reseeving at reel high speed, but human being can't absorb 5,000 words per second and make any sense out of it. Even if words printed out on paper, it taking 5 minutes to reeding 5,000 words, even if whiz-bang reeder.

So, maybe some of your Hon. Reeders can coming up with way to using this idea.

Meanwhile I'm not letting QRM sityouayshun defeating good old Scratchi. No, indeedy not. From now on I taking weights off bug and I going to double my sending speed. So, listen carefully. That blur you heer may be me.

Respectively yours,
Hashafisti Scratchi

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160 Meter Results [*from page 55*]

joyable one. **WØPSF:**, Didn't get the normal sunrise signal strength from the East. Signals from the East much weaker this year. West signals much stronger and more plentiful. Got confused by that 3C (VE) call. Heard no real DX as last year even tho noise level lower. Be sure and sponsor another contest next year. This one was the talk of the band for months before. **WØVXO:** [*Look at Herb's score. And, how many of you were fortunate to work him on his business trip/DX-pedition in February to the following places: PY1NFC Brazil, OA4O Peru, VP2MK Montserrat, VP2KY Anguilla, FG7XL Guadeloupe, VP2AZ Antigua, and WØVXO/KV4*].

Canada

VO1FB: Condx were fair only with less frequent openings to Eu. But, again as in previous years, most of my score came from Eu contacts. Signal reports from the west were down. Was unable to operate during the whole contest period but, nevertheless, enjoyed the week-end and will certainly be in there next year! **3B1HN:** I entered the Contest by accident not knowing even what test was going on—but only to provide contacts for those wishing to get points. We find it discouraging here to be ignored by W/K stations who can get the same credit for working over the back fence as working us in Newfoundland. Nevertheless, see you in next year's test on 160. [*Hector—It's true that a fellow can work a station in his own town and get the same 2 points as he would if he worked you. But, what a rare multiplier you are. Newfoundland is in terrific demand. Be prepared for next year's event which, as usual, will be held over the last week-end of January. Put out a potent signal and just see the band go stark raving mad calling you*]. **3C3BWY:** Some stations were quite unable to understand or copy 3C3. I may have lost some con-

tacts over this. A WA9 called me a phoney but the thing that shook me was that some were unable to resolve the call. They copy c.w. by rote and not by brain! Enjoyed every bit of it. HI8XAL was a new 160 country for me.

DX DX DX DX DX DX DX DX

KL7FRY: Condx extremely poor to USA from this QTH during Contest. In fact, band seemed to go dead around New Year's. Condx in Oct., Nov. and Dec. 1966 were very good! QTH Shemya Island at end of Aleutians, 53 degrees North, 174 degrees East, in Eastern Hemisphere, ½ way between JA and KL7 mainland. **VK5KO:** Sent *CQ* WW Test each odd 5 minute period. QRN level high all evening. Heard a very weak sig several times on 1801.6 kc but couldn't identify it. At one time think a W8FPU gave me 229002 at 1303 GMT Jan. 28. Maybe I have dirt in transmitting relays. Worked only ZL1MQ. [*John, others did hear and call you including KL7FRY and 9V1LP, KA9MF. Better check that antenna and relays*]. **VP7DX:** Trouble getting out and not enough time to operate. Called you twice. [*This hurts. I needed Don but never heard him*]. **CO2QR:** Heard plenty but I simply couldn't get out. Something wrong either with the rig and/or antenna. **OK1AEH:** I am worked in Contest only part from vy QRL my family. I am very sorry! **HI8XAL:** Ran 250 watts into an inverted Vee 125' high. Good condx to Europe and W6/W7 on Saturday. **EI9J:** Condx between Eu stations were very good but during the times I was on condx to the States were very poor. Heard 9V1LP and called ZD8J for over an hour with no joy. We will have to hope for better condx next year but with increasing sunspot count chances are that we have had the best of it for some years. **G3KMI:** The set up here worked so well that it makes my home station look puny in comparison. The highlight of the Contest was working HI8XAL even though he took over an hour in coming back to us. Other stations heard but not worked were 9L1HX and ZD8J. **G6LD/A:** Condx very good generally—excellent signals from ZD8J but couldn't work him. Good opening to USA Sunday morning. Altogether, very enjoyable. Suggestion: period too long. Band went dead about 08 GMT Sunday. Guess everyone had had enough. Recommend that Contest should end at 08 GMT Sunday.

Surplus [*from page 98*]

HOPE has tried RTTY for some of the high-volume administrative traffic, and has a Model 28 ASR and a complete Hallicrafters station at the Washington headquarters, with an SX-115, an HT-32B and an HT-33B, but right now no one is available here to operate them. For a time, HOPE personnel ran the station, sans license, but they agreed to shut down after the Federal Communications Commission raised its eyebrows a bit. Mail service to Colombia is quite good, and has made the RTTY operation unnecessary, but HOPE headquarters feels it may become important for the 1968 Ceylon mission because of the slowness of

air mail across the Pacific.

Though Virgil handles almost all HOPE office traffic now, aside from the many personal messages transmitted through amateurs around the U.S. and Canada, he may be overloaded on the Ceylon circuit next year. HOPE has not yet decided what to do, but they may be looking for an amateur RTTY operator able to give them a hand in the Washington area. ■

Model Antennas [*from page 40*]

the entire radiation pattern. See fig. 3.

The response of the field-strength meter must be linear to obtain good gain comparisons. This can be checked by increasing the generator output a known amount with the meter a fixed distance from the radiating antenna. To reduce the effect of transmission line mismatch a 6 db pad can be used between the generator and transmission line or transmission line and antenna, the same as is done for receiver sensitivity measurements, if sufficient generator output is available.

Summary

In summary, one should not expect laboratory type results from using test antenna models. If one measures 10 db forward gain from a shortened dipole, as compared to a reference full-length dipole, something is wrong (with the test set-up, not antenna theory). However, even with the simplest test antenna set-up one can gain useful information about the probable performance of the real, full-size h.f. antenna. Certainly there is no more interesting way for the amateur fascinated by antenna experimentation, especially when bad weather rolls around, to explore ideas for new antenna configuration. ■

Increment Tuning [*from page 46*]

tinued to have after the increment tuning circuit was added. The c.w. keying is not affected either; it is perfectly clean with no blurps or chirps.

Adding It To Your Rig

Besides the extra transmit/receive relay contacts the only requirement for making the addition is a small amount of panel space, for the switch and pot. By using a lever type switch and a small pot, the behind-panel space requirements are kept small.

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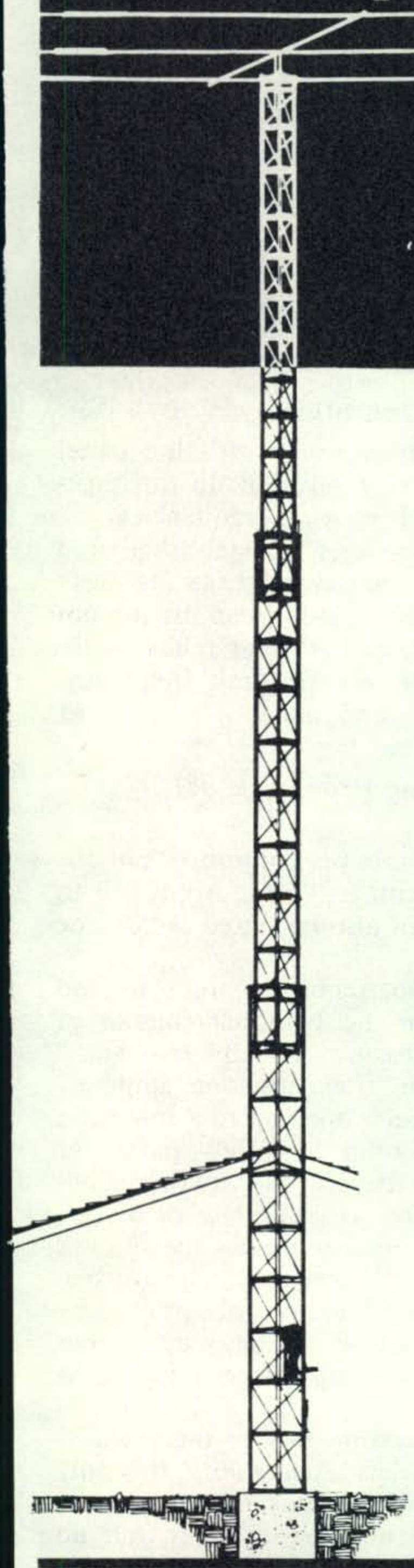

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For further information, check number 22, on page 126

There usually is no problem in finding a little extra room on the chassis for the few parts to be added. Critical layout is required only for the parts shown in the dotted box of the schematic. The leads of C_2 must be short, and it must connect directly and close to the grid terminal of the h.f. oscillator tube. Be sure to observe the proper polarity of the Varicap and connect its anode to ground. Remember, this diode is reverse biased. The rest of the circuit carries only d.c. and can be located anywhere there is space.

Operation

Operate your transceiver with the panel switch in the NORMAL position. In this position transmit and receive frequencies are the same. After contact is established and you are in perfect tune, switch to INCREMENT TUNE, and you will be able to adjust the pot to follow the drift of the other fellow without upsetting your own transmit frequency. It's terrific in a round table. ■

Voltmeter Loading [*from page 68*]

such as "within parts per million," "plus or minus some percentage," *etc.* "Approach to a true value" might also be stated as "degree of uncertainty."

It may be disheartening to some to find out that not even the National Bureau of Standards can measure "exactly one volt," "exactly one ohm," "exactly one ampere." But they can measure one volt to a few parts per million, one ohm to a few parts per million, *etc.* Not *exactly* one anything, but *one* to *some degree of accuracy* or *uncertainty!* So when someone makes the remark "exactly 100 volts" he is up the proverbial creek. This statement is not only limited by the semantics involved but also by proper application of the test equipment involved as explained earlier.

Where does *precision* fit into the picture? Since precision means repeatability, this only means that some parameter is measured at the same value a number of times, but no mention is made that the value is accurate to any degree. It just means that the test equipment indicated the same value each time it was connected to the parameter being measured.

In conclusion I would like to quote an instructor I had a number of years ago in a class on Measurement and Calibration Tech-

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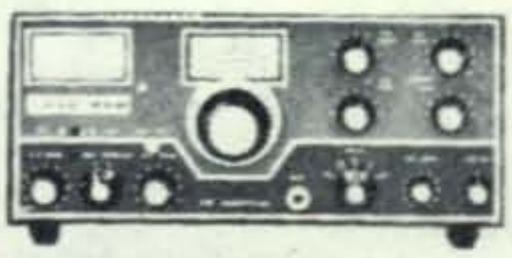

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niques and Methods, as follows: "Unless you can write an equation for the parameter you wish to measure, and, can define all the terms in the equation, and, can set up an analog computer (piece of test equipment) to solve the equation, *then,* the numbers read from a dial or a meter or the waveform viewed on an oscilloscope mean absolutely nothing." This may be utopian, but I guarantee that if you use this approach you will make better measurements and you will have more success and enjoyment from your work, or hobby, as it may apply. ■

Grumbles [*from page 70*]

"Quite a signal you're pumping through there sam, pinning the needle at 20 over on my Nuvistorized receiver. How's my signal? I just put up a new 14 element sky hook and it's really taking the full gallon from my Megacycle Maker Mark II."

"Lost part of your last transmission Fred, this little 1 tube inhaler just isn't what it used to be—guess the old 6F8 needs replacing. Did get your saying that I'm 20 over, FB since I thought that RK-47 was going when it started flashing blue last month. Besides that, the Zepp blew down again the other day. I really envy you fellows who don't have to keep tinkering with homebrew gear, I've been thinking about going that route myself one of these days but I just can't part with this thing."

I followed up such QSO's with a yellowing QSL card which identifies me as formerly holding a number of *very* exotic calls. One batch of cards had me ex-7XA, ex-NY2AC, and ex-ES9SAM. I varied the calls with each printing so as to include any calls of greater interest which caught my fancy.

You might have imagined that one problem which I didn't take into account. Yup, I worked a shaky-fisted Novice across town who invited himself over to see the shack and get a demonstration of genuine 1930's homebrew ham gear. Thank goodness he gave me a week's advance notice!

Back into view came the Gross and Super Sky Raider, under the desk went the push-button bone crusher special. A few days later I had bypassed all of the controls on the old sets and run them through to the stuff on the floor. The plan was that I would say that "Pop" had stepped out to the store for a minute and that I would, in his place, put the gear through its paces.

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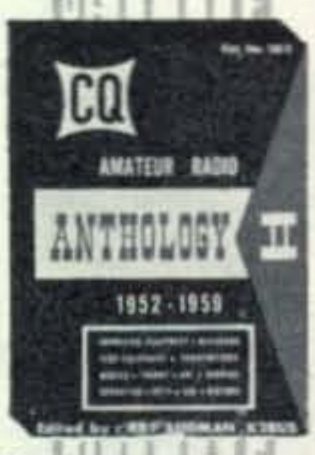

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My Novice visitor turned out to be silver haired, a veteran brass pounder from the days of coherers. He had dropped out of radio years before but was now getting started again.

A lump in my throat, I watched him tenderly tune across the band with the secretly souped-up Sky Rider. Two hours later he had unwound a score of tales about bird cage antennas, leyden jars, and rotary gaps.

"Pop" never returned from his trip to the store.

Harmonic Ferret [*from page 63*]

Application

In use, this ferret has almost no pickup until it is very close to the component or wire that is hot with harmonic energy. Then a definite interference pattern shows up on the TV set. You can be sure about the source of your harmonics because, using the end of the coax as a probe, you can literally touch the source and see its effect on your TV set. Once you have ferreted out the source of a harmonic, the hardest part of the job is done. Good hunting. ■

Low-Band Converter [*from page 19*]

mounted on the front 2⅜" × 2" face of the case. Interconnecting leads from the circuit board are connected to the switch and jacks before the unit is buttoned up. Drill and tap four #6-32 holes in the sides of the inside fitting cover for screws to hold the case.

Power for the converter is supplied by a 9 volt battery, and it should operate for a long time since the current drain is quite low. The battery is mounted on the board with a piece of #20 wire wrapped around it. Cover the battery with insulating tape to prevent shorts to the wiring on the circuit board.

General

Antenna requirements for the converter are minimal, but an outdoor antenna will improve reception. Use your 20 meter beam if you like; it gets some metal up in the air to pull in the broadcast stations. An HRO 60 receiver has been used here. The converter beats buying the BC band coils for the HRO. ■

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HR-10 RCVR. 3 months old and factory aligned. $60. Gus Lucas, 414 Durango St., El Paso, Tex. 79901.

SBE SB2-CW Codapter, CW Generator/Monitor, $25. Turner J254C PTT mike $7. Jack Mankus. 11431 Ortega Drive, St. Louis, Mo. 63138.

MULTI ELMAC AF-67, PMR-7 M-1070 Power Supply 6 VDC, 12VDC, 115VAC. Package only. $90. All Cables. Jack Mankus, 11431 Ortega Drive, St. Louis, Missouri 63138.

WANTED: RCA AR-88D with Manual. Must be clean and unmodified. Prefer late model with S meter. State full details and price first letter. F. Gilmore, KØJPJ, 560 S. Warren Ave., Springfield, Mo. 65806.

TEKTRONIX 511AD with manual, central electronics 200V, Model 26 with table. Want HC-10. Henry C. Garretson III, K2SSX, Box 175A, RD3, Troy, N.Y. 12180.

OLSON TRANSISTORIZED TV camera w/accessories, cost $370, $175; MM-2 $45; Meas. 59, $90. Spitz, W4API, Box 4095, Arlington, Va. 22204.

WANTED Lafayette HE-50 ten meter transceiver. G. A. Baldauf, W3JKH, 175 Wernersville Blvd., Wernersville, Pa. 19565.

MASTERS RESEARCH Report—Amateur Radio: Its effect on Society. $1. M. K. Gauthier, K6ICS, 10425 San Jose Ave., South Gate, Calif. 90280.

$1 brings construction data for the New & Unique Barb'wire Ant. an easy and low cost application to the Fat-dipole theory. C. L. Kerr, WA6CTKPO, Box 444, Montebello, Calif. 90640.

WANTED Gonset 2 Meter V.F.O. for Gonset II and electronic keyer. Best Price. Monroe Freedman W2ASI, 15 Kensington oval, Isle of Sans Souci, Davenport Neck, New Rochelle, N.Y. 10805.

FOR SALE: new prop pitch motor and 110 volt selsyns also surplus power transformer. Frank Kedl, W7CRP, 55 E. Eighth, Sheridan, Wyoming 82801.

SHACK CLEANUP Ultimatum by XYL "or else". Send for list of many years collection of bargain priced "Goodies" Etal, Hallicrafters S-85 $115. I. Megeff, W2DXK, 5015 Weeks La., Flushing, New York City, N.Y.

FOR SALE: Allied Police Band Radio KG-21 tunes 152-174 mcs/ $20. E. H. Marriner, W6BLZ, 528 Colima St., La Jolla, California 92037.

WANTED: Heath HØ10, HØ13, or SB-620, All letters answered. Tom Dornback, 19W167, 21st Place, Lombard, Ill. 60148.

FOR SALE: Heath Kit HG-10 VfO in good condition $27. You pay shipping cost. G. J. Cotellis, 1903 32nd St., W., Bradenton, Fla. 33505.

FOR SALE: Canadians; NCX3 with NCX-A & NCX-D Pwr Sup. also Motorola F.M. unit. Chapman, VE3TS, P.O. Box 662, Sarnia, Ontario.

HALLICRAFTERS SX-100 & Spkr. $170., Mint condition. Never used Johnson Matchbox $75. Speed Key $12. S. Goldblatt, WAØFQA, 175 So. Jersey St., Denver, Colorado 80222.

WANTED: DX-100-B or Ranger I xmitter. Will consider one requiring work. Stan, W8QKU, 2748 Meade, Detroit, Mich. 48212

FOR SALE: Heathkit Q Multiplier Model HD-11 exc cond, Pair BC-721A Walkie Talkies good cond, lacks batteries es tubes. Offers to WA9LHJ, Steven Kopstein Sr., RR 1-80X 117, Oxford, Wisc. 53952.

WANTED: Johnson 275 watt Matchbox, with manual, in fair or better condition. Steve Courts, WA8POS, RT. 2, Box 286, Milton, W. Va. 25541.

WANTED: Instruction manual for WWII oscilloscope TS-35/AP. Buy or Loan to make copy. Write AB Hallaway, WOHBT, 610 France Ave., So. Minneapolis, Minn. 55410.

MINT CONDX w/original box 80-10 SSB-CW-AM 130 W Sommerkamp FL-200B transmitter $275. R. O. Goodwin, W5OJX, RFD 2 Box 70, Carriere, Miss. 39426.

WANTED: Circa 1932 four letter portable QSL cards for historical collection. Also want old pre-1928 QSL cards. John Alley, W1DMD, 298 Taunton St., Lakeville, Mass.

FOR SALE: McCoy 32BI 22.00: HQ-129X $75: V7A VTVM $15: TRC-4B $9: 5894 $8. 4-65A $5: DB 23 $20: Super Six $25: John Turkal, K8EKG, 1020 4th St. SW., Massillion, Ohio 44646.

FULL GALLON Harts. H010 Scope, Jennings variable vacuum B&W 850 coil, 6C21 Tube. Swap for receiver. G. Lay. 109 N. 32 Ave., Yakima, Washington 98902.

4 NEW 4CX250B's with sockets and chimneys, 24 used but good 4CX250 B's with chimneys, no sockets, will consider anything in trade, even money for 1 or all. R. Grillo WBZMEX 1 Ardmore Pl. Utica, N.Y.

WANTED: Collins FL455 B Mech filters 800CY, others considered. GM5AFF Box 541 US Naveecgruact FPO N.Y. Ø9518.

WANTED: 2&6 meter SSB transceivers & supplies cash, or trade new Drake R4A R. Pankhurst 14005 Shaker Blvd., Cleveland Ohio 44120. WA4YOI.

FOR SALE. Sub prior Sale. Johnson 250-23 Matchbox FB cond $35. Dow-Key DK60-G2C Coaxial Relay like new $12. Both $4 F. Miller W5OYT 315 SE Wilshire Ave., Bartlesville, Oklahoma 74003.

TUBE TESTERS: type used in drug stores, perfect condition $12.50. Ted Banks, Wn9UNQ 1655 East 91st St., Chicago, Ill. 60617.

TOROIDS 44 or 88 mh, any 5/$2, 255A polar relay $2.30, 1 relay socket 70¢, all p.p. USA, EW Evans, K40EN, 220 Mimo Lane, Paducah, Ky. 42001.

SELL OR SWAP 4 Two Chul Lafayette intercoms xmtvia house elect wiring. "baby sitter" feature. $60 or good used tribander Jr. 3 El. Ant. or Quad. Wm R. Holly WA1HDP RFD 1 Box 1 Westbrook, Me. 04092.

MINT—Collins 75A-4 (#1487) with 3kc. filter, vernier knob and matching speaker. $425 firm. RG Dick WA1DPX, 6 Herbert Rd. Arlington, Mass.

WANTED: Bird Wattmeter or Similar unit in good condition Hi-Band F.M. 150/450 mc. Mobile/Base unit. Tech. Manual Bendix 1 P71C F.M. Transceiver. W. J. Davis K6KZT 4434 Jose Ave., Lakewood, Cal. 90713.

FOR SALE: Wheatstone oiled 15/32" perf. tape for Boehme Keying Head, any quantity. P. L. Lemon, W6DOU, 3154 Stony Pt. Rd. Santa Rosa, Ca. 95401.

SELL AS ONE Unit—Utica-650-6 Meters V.F.O. Sonar 150 w linear—$150. Takes all. A. Gargani, 101 W. 89th St., N.Y., N 10024.

WANTED: 500 cycle filter F455 FA-05 for 75S-3B. Sell Eico 7 Grid Dip Meter $20. K Grimm K5KBH, Box 8612 U.T. S Knoxville, Tenn. 37916.

FOR SALE: B & W FC 30 Filament Choke $15; Simpson Mo 479 FM-TV Signal/Sweep generator $85. R. P. Stein, 2 Carrizo, Dallas, Texas 75229.

TTY INFORMATION for the amateur interested in RTTY. emotte, P.O. Box 6047 Daytona Beach, Fla. 32019.

OR SALE: Linear systems LSA-3 Mobile Linear amplifier 500 atts, 80-40-20 meters w/power supply $150. Fob Arcadia, alif., 1775 Orange Wood Lane. Kirk.

ANTED: Antique radios of the early 1920's. Do not have to e in working condition. David McKenzie, 1200 W. Eudid, dianola, Iowa.

HUNDERBOLT, late model, mint condition, with power swamper. 295. Will deliver in Northern Calif. Don Woodruff, 15 Castlewood dr., San Rafael, Calif. 94901.

EASUREMENTS MEGACYCLE Meter $90, Trade Stereo 110 Watts r Ham Gear, Cleanout list Goodies for Stamp. Spitz, Box 4095, lington, Va. 22204.

OR SALE: Heathkit DX-60 transmitter $50. Collins SM-1 dymic mike. $20. I will pay shipping charges for each item. ob Kogen, 5701, N. Sheridan Rd., Chicago, Ill. 60626.

OR SALE: Textronix 512 scope new tubes may need calebrating d signal generator tektronix 105. Sold as a pair only. Offer er $300. Ranger 1 very used $75. Joe Beristle, 3728 Wilkie ay, Ft. Worth, Tex.

ADLY NEED Schematics for: receiver BC639A/R. 5032A 0-155MC. Also Harvey Wells TBS-50. Wilkinson, 9650 Timberne, Hesperia, Calif. 92345.

ANTED: Owners Manual for pyramid CRA-2 capacitor Analyzer. ll Buy, or pay for privilege of photocopying. Also need wer transformer for same. Jud Germon, 941 Clifton Rd., lanta, Ga. 30307.

R SALE: old QST, 33 copies Jan. 1928 thru Jan. 1934, 50¢ ch. Joe Horvath, 522 Third St., San Rafael, Cal. 94901.

R SALE: DX-100 SB-10 Vacuum tube keyer, relay switching. interconnection cables and manuals included. F.O.B. Southwelel, 200 S. 7th St., Dixon, Calif.

LLINS 30L-1 $350. SB-34 vox accessory $295. HO-13 panonic scope $49. Millen Transmatch 92200 $79. Autronic yer. $49. Autronic key. $13. BC-221 AC supply $45. Fry, 7 N. Leh St., Allentown, Pa. 18104.

R SALE. Large selection of Radio tubes, 1930 to 1941 Vinte. We may have the tubes you are looking for. Edwards, 09 W. 57th St., La Grange, Ill.

MACULATE & PERFECT 75A4-SN3358. 3.1 filter. $350 fob arleston, W. Va. 25304. Mel Swillinger.

R SALE: 75A3 with product detector $210. Heath HW29 with eamp mike 110 AC-12VDC, squald Ant. $55.

NT 75A4 & spkr $395. CW & SSB 75A4 fltr $35 ea. Husky kv pwr sply $50. 500 w AM mod, drvr, rack $30. Sprrex fones $15. Kuhl, 1149 Heatherstone, Sunnyvale, Cal. 94087.

R SALE: Boehme oiled tape 15/32" wide. P. L. Lemon, 3154 ny Point Road, Santa Rosa, Ca. 95401.

W UNPACKED HQ-170C $290. SB-33 DC Supply and mine 90. Excellent SB-400 $280. 6 Volt HP-13 mobile supply for kswagons $50. Stamp for list. Shank, 21 Terrace Lane, zabethtown, Pa. 17022.

19 Test Set for SCR-522, new, complete, case, manual. $25. nt DA-12 MS-44F for Bendix RTA-1 or ARC-9. Bauer, 119 N. chwood, Louisville, Ky.

ITAL COMPUTER KIT being developed for school or home . Low cost, delay-line memory, integrated logic, teletype . Contact D. W. Digby, 3134 Tallmadge Rd., Kent, Ohio 240.

-50DXMTR. 160 thru 2M $20. 120 FT-243 crystals w/chest 5-865oKC $12. PE-103 Dyn 600 VDC $2. Paragon Time tch 110VAC $5. QST's 1946-1958 25¢ ea. Wanted; Bird $43 ttimeter. W. J. Davis, 4434 Josie Ave., Lakewood, Cal. 90713.

L: Drake TR-3, RV-3 and AC power supply. Bernard Harris, Laurel St., Apt. 1, Culpeper, Virginia 22701.

GG Zeus-Intercepter-all bander-HX30 6 meter gonset. Linear Utica for sale. Make me a firm offer for all or part. arcik, 3422 Ashby Rd., Shaker Hts., Ohio 44120.

NTED: TM11-2222 for model 14TD 4CX300A w/socket & mney to go with the one I won at hamfeast. Philip D. enway, 234 Elden Dr., N.E. Atlanta, Ga.

FCC Decision [*from page 31*]

graded only by Commission personnel.

8. Section 97.33 is amended to read as follows:

S 97.33 Eligibility for re-examination.

An applicant who fails examination for an amateur operator license may not take another examination for the same or a higher class amateur operator license within 30 days, except that this limitation shall not apply to an examination for an Advanced or General Class license following an examination conducted by a volunteer examiner for a Novice, Technician, or Conditional Class license.

9. Section 97.51(a)(5) is amended to read as follows:

S 97.51 Assignment of call signs.

(a) * * *

(5) One unassigned two-letter call sign (a call sign having two letters following the numeral) may be assigned to a previous holder of a two-letter call sign the prefix of which consisted of not more than a single letter. Additionally, a two-letter call sign may be assigned to an Amateur Extra Class licensee who first held an amateur radio station license issued by the United States Government 25 years or more prior to the receipt date of an application for such assignment. Applicants for two-letter call signs are not permitted to select a specific assignment except in accordance with subparagraphs (1) and (2) of this paragraph.

* * * * *

10. Sections 97.59(a) and (b) are amended to read as follows:

S 97.59 License term.

(a) Amateur operator licenses are normally valid for a period of 5 years from the date of issuance of a new or renewed license, except the Novice Class which is normally valid for a period of 2 years from the date of issuance.

(b) The license for an amateur station is normally valid for a period of 5 years from the date of issuance of a new or renewed license except that an amateur station license issued to the holder of a Novice Class amateur operator license is normally valid for a period of 2 years from the date of issuance.

For further information, check number 27, on page 126

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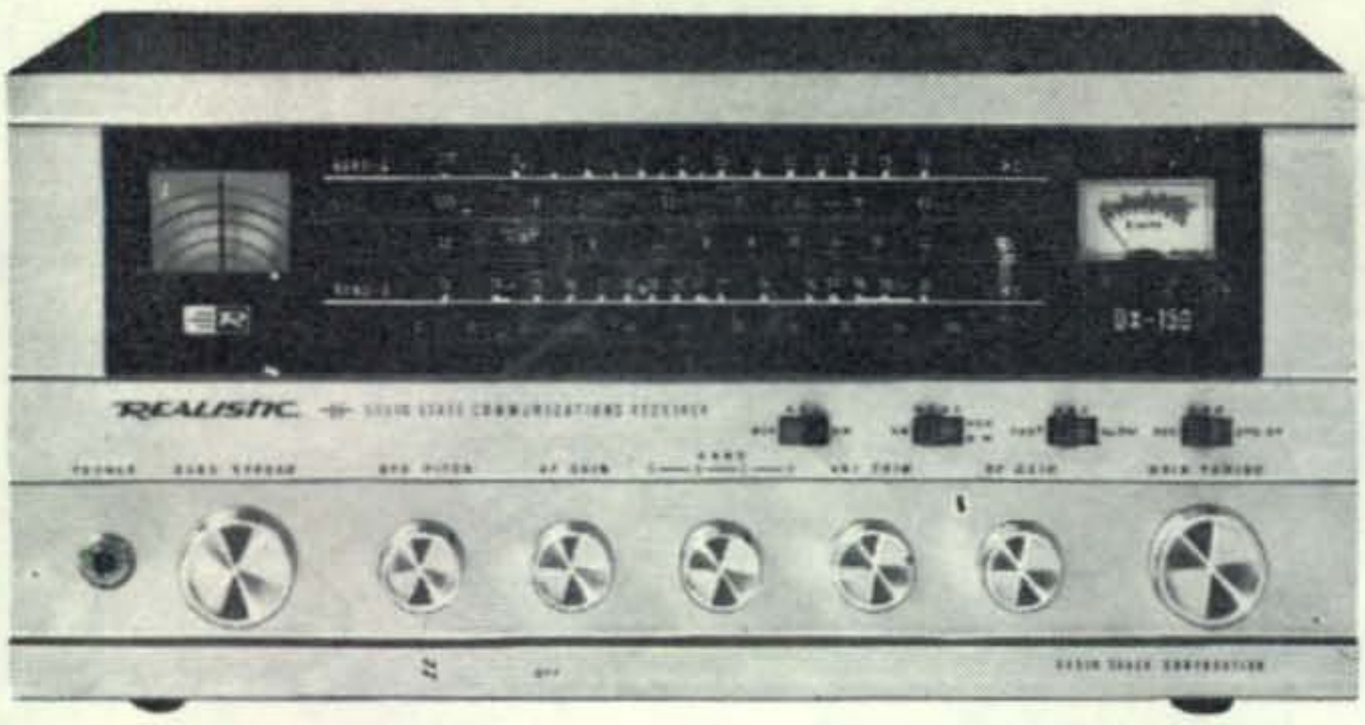

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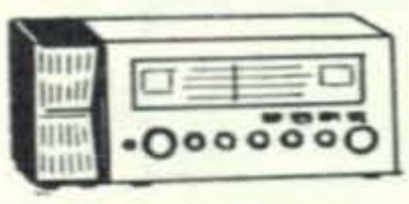

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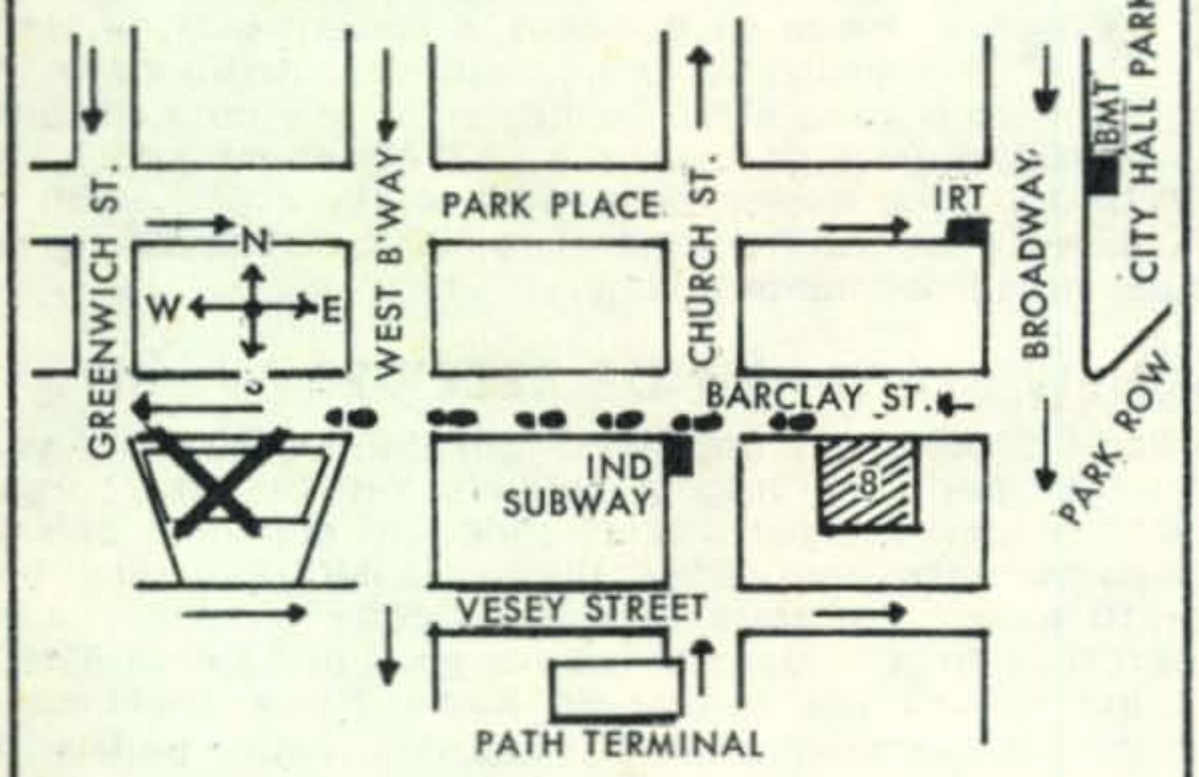

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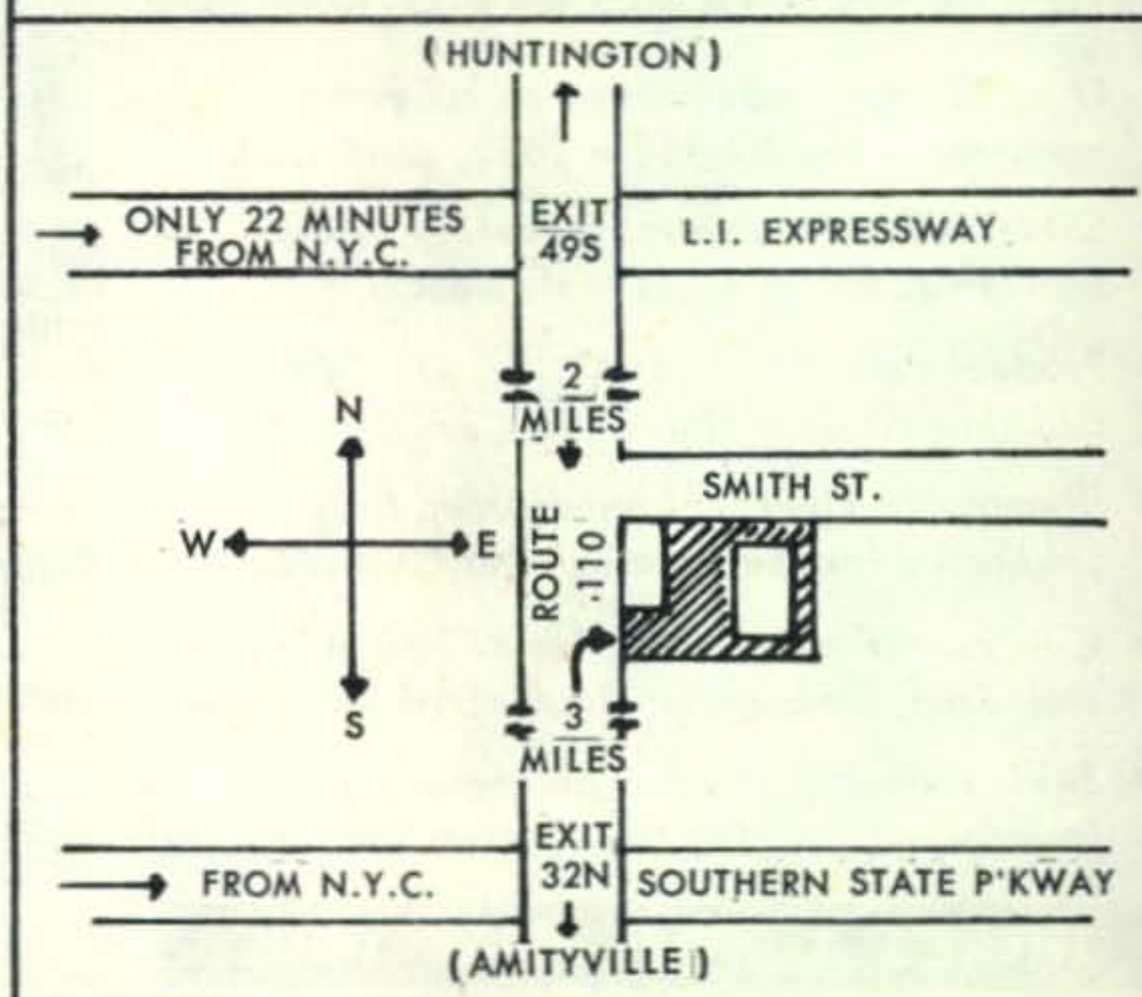

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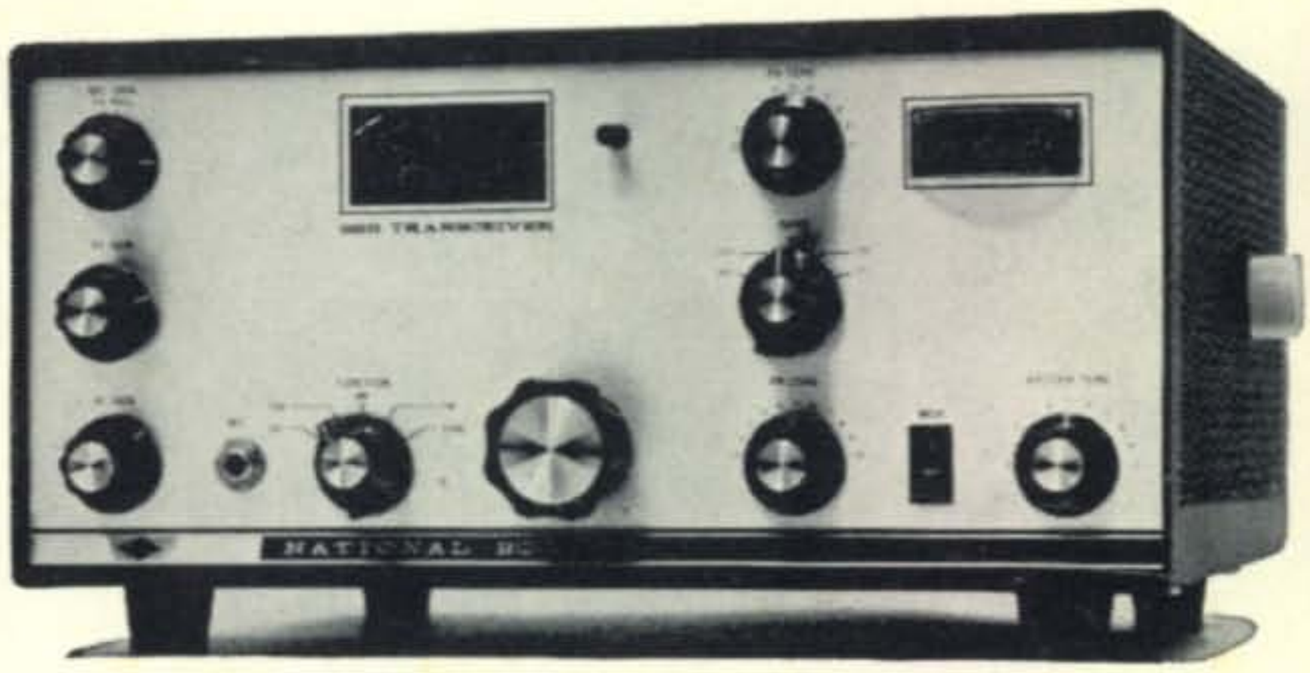

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National Radio Company

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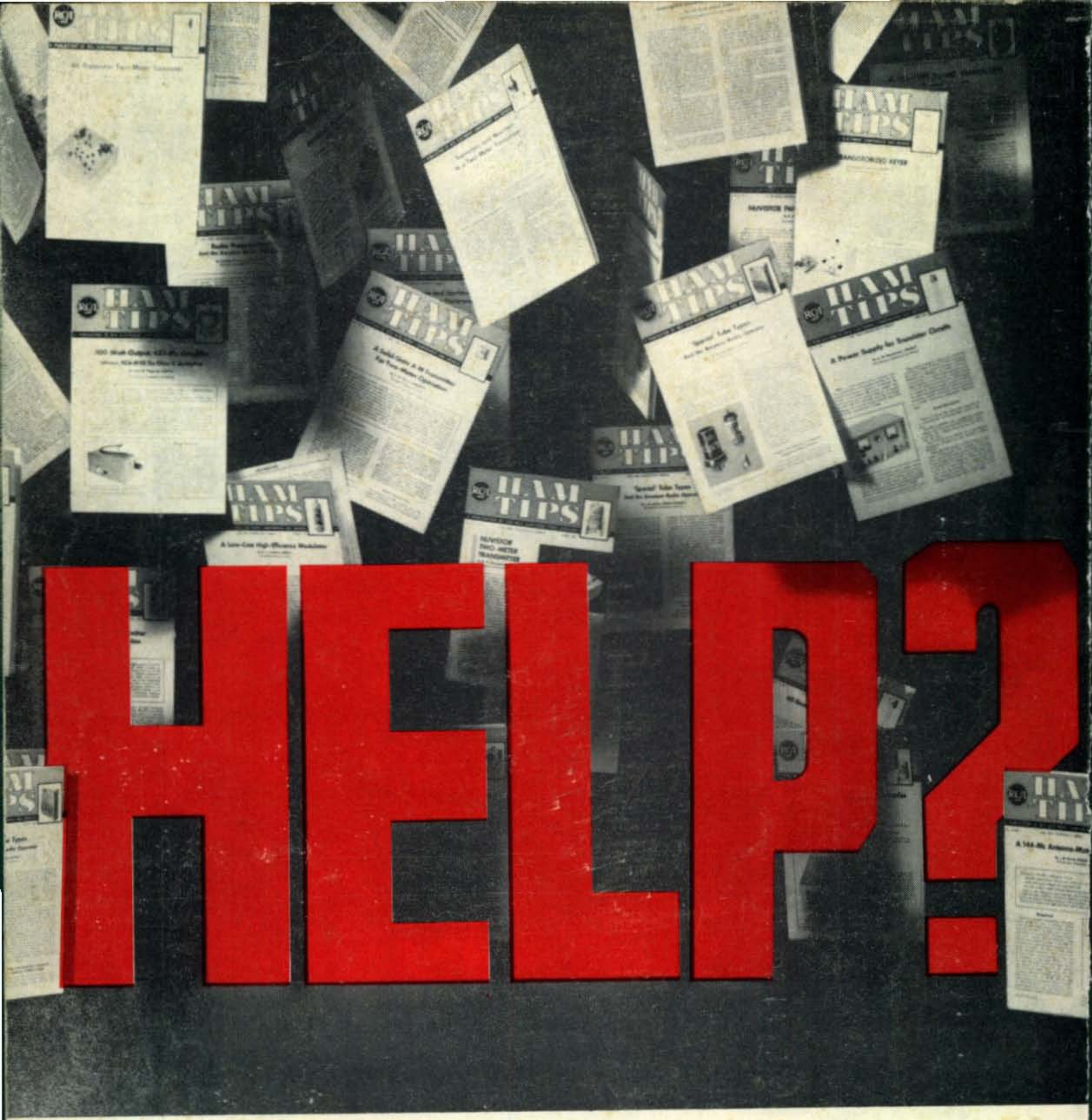

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