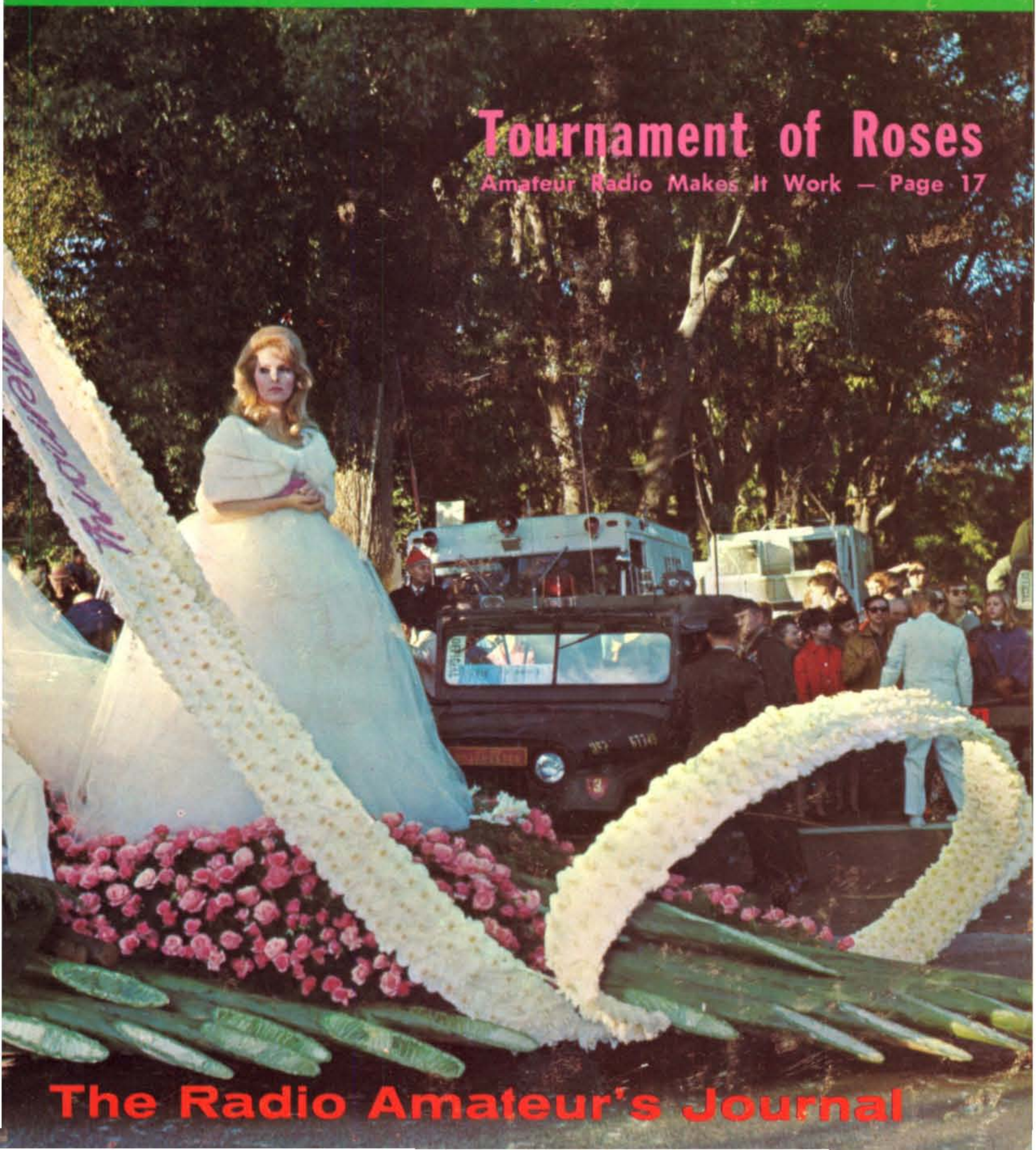
CQ

ICD

April 1969

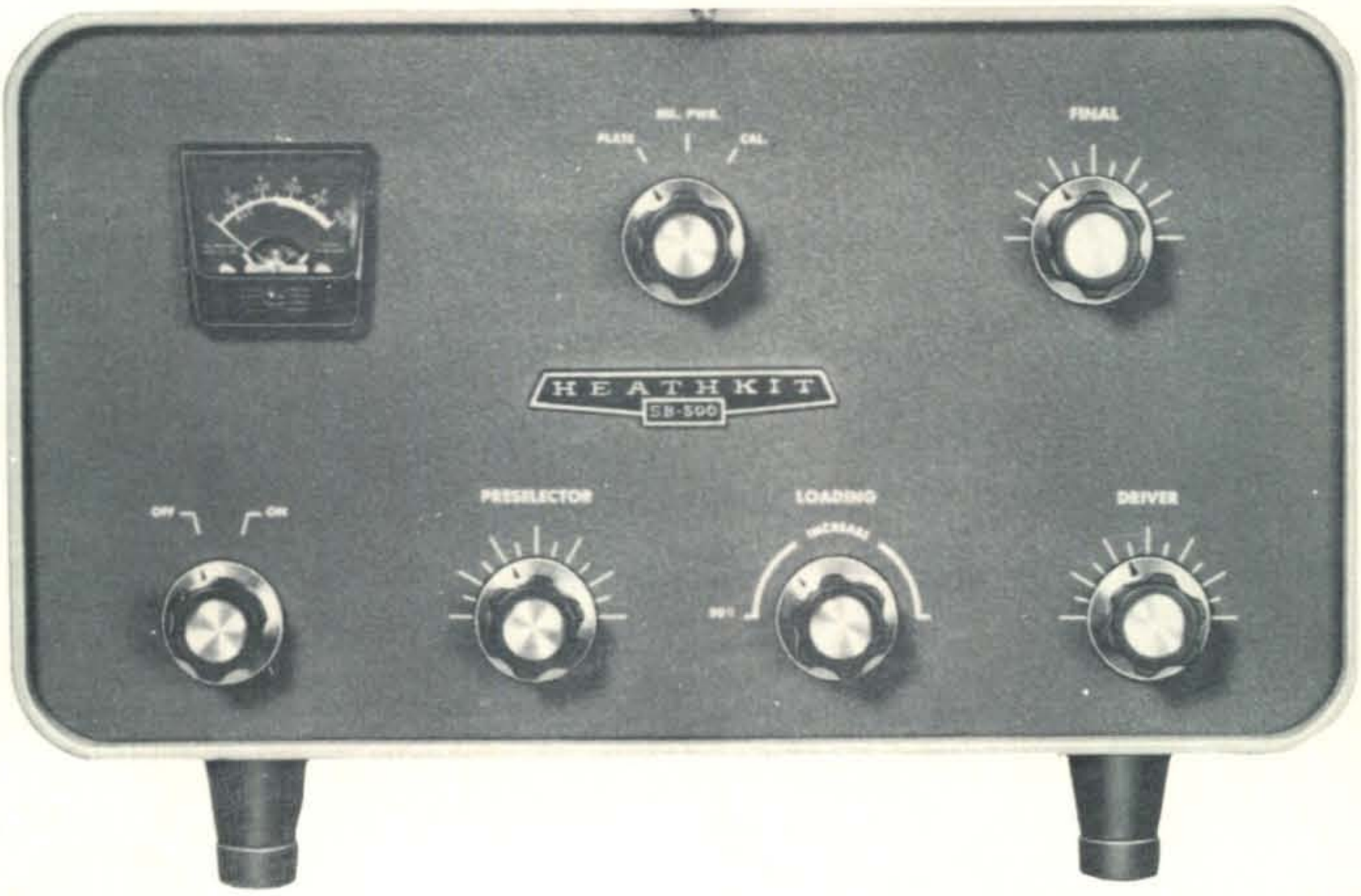
75¢

- How "ILS" Works
- An All-Solid-State IF Strip
- What FCC Says About FM Repeaters



The Radio Amateur's Journal

NEW Heathkit® SB-500 2-Meter Transverter



Put Your Heathkit® SB-Series Rig On "2" For Only $179.95*

• Provides complete 2-meter capability for SB-101, SB-110A, HW-100 and the SB-301/401 combination • USB, LSB & CW operation • 144 to 148 MHz coverage • 130 watts PEP input . . . 50 watts PEP output • Highly sensitive receiver • Fast, easy tuning • No cable switching • Handsome SB-Series styling

Now, in answer to many requests, Heath has a fast, low cost way to put you on two meters . . . without having to buy a whole new rig. If you own an SB-101, SB-110A, HW-100 or the SB-301/401 combo, you're almost there. Here are the details on how to get on "2" — the SB-500 way.

Here's How It Works. In the receive mode, the SB-500 takes an incoming 2-meter signal and heterodynes it to either 6 or 10 meters, where the low band gear handles it in the usual way. On transmit, a 28 or 50 MHz driver output is heterodyned to 2-meters, amplified and coupled to the output.

Here's What It Delivers. When used with any of the gear above, the SB-500 2-Meter Transverter gives you complete 2-meter SSB or CW transceive operation from 144 to 148 MHz. A pair of inexpensive 6146's in a push-pull AB1 circuit deliver a husky 50 watts output into a 50 ohm nonreactive load. Final plate voltages are derived from the driving unit, but all other operating voltages come from a built-in power supply — no extra supply to buy. Receiver sensitivity is 0.2 uV for a 10 dB S+N/N ratio . . . that means solid copy QSO's. A front panel on-off switch places the SB-500 into operation or allows the low band gear to operate straight through to an antenna or drive a linear . . . a combination of complete rear apron jacks and internal relay switching eliminates troublesome cable changing. Reliable relay-controlled T R switching too. Tuning is fast and easy, and a built-in meter monitors either final plate current or relative power. ALC voltage is supplied to the driver to aid in preventing over-driving and distorted signals. A built-in 1 MHz crystal calibrator is also included.

Solid, Stable Construction. The sensitive receiver and oscillator go together on well planned circuit boards. To insure stability and make adjustment more exact, the transmitter and power supply components are ruggedly chassis mounted. The SB-500 comes complete with all interconnecting cables too. Start enjoying the QRM-free world of 2-meters today . . . with the new Heathkit SB-500 . . . another hot one from the hams at Heath.

Kit SB-500, 19 lbs.....**$179.95***

SB-500 SPECIFICATIONS — RECEIVER: Sensitivity: 0.2 microvolt for 10 dB signal-plus-noise to noise ratio for SSB operation. **Spurious Response:** All are below 0.1 microvolt equivalent signal input, except at 145.310 MHz (50 MHz IF only). **Antenna Input Impedance:** 50 ohm unbalanced. **TRANSMITTER: DC Power Input:** 130 watts PEP. **Power Output:** 50 watts (50% duty cycle). **Output Impedance:** 50 ohm with less than 2:1 SWR. **GENERAL: Frequency Range:** Any 2 MHz segment between 144 & 148 MHz into 50 MHz or 28 MHz tuned IF. **Mode of Operation:** SSB or CW only. **Power Requirements:** (1) 120/240 VAC, 50/60 Hz at 82 watts (internal). (2) 700 to 800 VDC at 200 mA (from driving unit). **Fuse:** 3/4 ampere slow-blow for 120 VAC (formerly 3AG); 1/2 ampere slow-blow for 240 VAC. **Front Panel Controls:** Meter-calibrate switch, final tuning, off-on (function) switch, preselector, final loading, driver tuning. **Chassis Controls:** Relative power adjust & bias adjust. **Rear Apron Connectors:** RF output, ALC, linear relay, relay, drive, power plug, low f receiver, low f antenna, fuseholder. **Tube Complement:** 6CB6 transmitter mixer, 6CB6 crystal calibrator, 6DS4 receiver RF amplifier, 6DS4 receiver mixer, 12GN7 transmitter RF amplifier, (2) 6146 final amplifiers, (types 6146A or 6146B may be directly substituted), 7059 heterodyne oscillator-amplifier, 8156 RF driver, 0A2 voltage regulator. **Diode Complement:** 5 silicon diodes, 750 mA, 500 PIV; 3 in power supply, 2 in ALC. 1 Germanium diode, IN191: REL PWR. **Cabinet Dimensions:** 12 1/4" W x 6 5/8" H x 13" D. **Overall Dimensions:** 12 1/4" W x 7 15/16" H x 14" D including knobs and feet. **Net Weight:** 14 1/2 lbs.

*Mail order prices; F.O.B. factory.

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See page 110 for New Reader Service

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SWAN 508 FULL COVERAGE EXTERNAL VFO

The Model 508 Frequency Control Unit is designed for full coverage of 80, 40, 20, 15, and 10 meters. It provides for transmitting and receiving on separate frequencies, and plugs directly into the back of the 500C. A separate Dual-VFO adaptor is no longer required, since the relay control circuitry is built into the 508. A panel control permits selection of VFO's so that operation may be transceive mode with the 500C VFO, transceive with the 508 VFO, or transmit on the 500C and receive on the 508. The Model 508 features eight ranges of 500 kc each, with 5 kc calibration. It may also be used with the 350C transceiver.

$125

MARS OSCILLATOR

Ten crystal controlled channels with vernier frequency control. Plugs directly into Model 500C and may also be used with Model 350C and other Swan transceivers.

MODEL 510X (less crystals) . . $45

SWAN SPEAKS YOUR LANGUAGE

SWAN 500C FIVE BAND TRANSCEIVER

80 through 10 meters • 520 watts • Home station, mobile, portable operation • SSB-CW-AM.

The new model 500C is the latest evolutionary development of a basic well proven design philosophy. It offers greater power and additional features for even more operator enjoyment. Using a pair of the new heavy duty RCA 6LQ6 tetrodes, the final amplifier operates with increased efficiency and power output on all bands. PEP input rating of the 500C is conservatively 520 watts. Actually an average pair of 6LQ6's reach a peak input of over 570 watts before flattopping!

The 500C retains the same superior selectivity for which Swan transceivers are noted. The filter is made especially for us by C-F Networks, and with a shape factor of 1.7 and ultimate rejection of more than 100 db, it is the finest filter being offered in any transceiver today.

For the CW operator the 500C includes a built-in sidetone monitor, and by installing the Swan VOX Accessory (VX-2) you will have break in CW operation.

Voice quality, performance and reliability are in the Swan tradition of being second to none.

$520

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SWAN 117XC MATCHING AC POWER SUPP

Complete A.C. supply for 1
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with speaker, phone jack, a
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with plug for transceiver,
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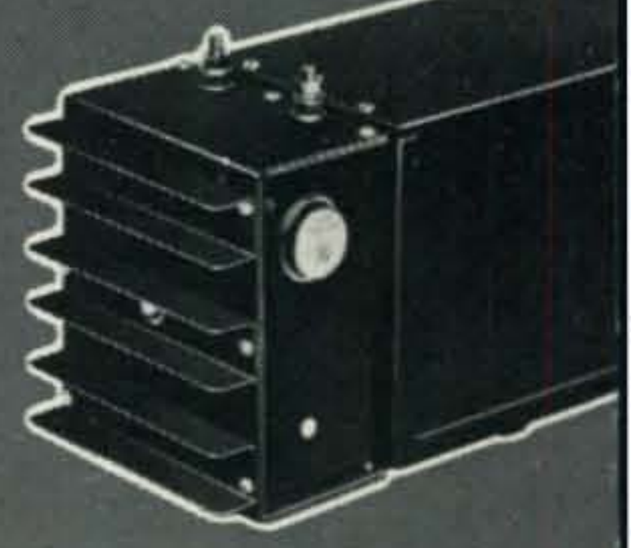

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Complete D.C. supply for
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also operate from 117 volt
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in 117 volt line cord. N
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Model FP-1 .....

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APRIL, 1969 VOL. 25, No. 4

CQ The Radio Amateur's Journal

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International Catalog

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INTERNATIONAL CATALOG

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See page 110 for New Reader Servi

ZERO BIAS

THE letter below, although taking a few abs at the admittedly "establishment" attiudes sometimes expressed in *CQ*, is such an utstanding defense of the youth of amateur adio that we feel completely justified in unning it in its entirety, without comment. Ve thank Mr. Jipping for saying eloquently hat we would have liked to say.

ditor, *CQ*:

It is most regretable that the amateur dio fraternity has within its ranks those ho hold the one-sided, obviously wrong ews of Paul Ninkin, W2WDH. Mr. Ninkin reading his newspaper too much and is ot personally taking a look at today's youth. disturbs me to read such obviously prediced remarks when those described reresent a very, very small percentage of toay's young people and particularly within given age group—the upper teen-ager or der.

When we speak of the young people as eing the new-life blood of amateur radio. hat do we mean? Certainly we do not mean he high school graduate... by then the oportunity to capture his interest has flown by. s a high school teacher, I have helped many igh school students to get their tickets, but hen they were freshman or sophomores. Now really, what do you mean in your Octber editorial when you suggest ways to ncourage the young newcomer? A freshman r sophomore in high school hardly has inerest in what you suggest and they don't eed or want the heroes. What they want is he what, how of amateur radio. They need elp learning, building, becoming more killed in code sending and receiving. They eed personal encouragement and experence even if that means sitting in an adult's hack listening to and even tuning the receiver.

When we talk about young people, let's e realistic when we say young people. They re the snippy kid next door who bugs me hen I'm working DX, or the kid down the lock who just happens to come around for chassis punch when I'm handling some mportant traffic like ARL-Twenty-one or ousin Alice's boy or girl who gets into my junk box and wants to borrow everything I have. It's also that bright seventh grader who happened to pick up a circuit for a ferriloopstick germanium diode receiver and wants to know why the thing works. It's also the freshman who needs a dual triode tube for a small preamp he can't get going. It's also the fatherless kid down the block who doesn't even know that ham radio exists and at the moment could care less but for whom amateur radio would be a God-sent blessing with you or me as a side benefit.

We have, as a group, become more and more irresponsible as our members grow and our technology becomes more sophisticated. With more commercial equipment reaching the store shelves we have divorced ourselves from helping the new convert. We feel we can't drill that hole or find the right coil for him (or so we think). Our publications (and *CQ* also unfortunately) have likewise become more sophisticated and left the newcomer far behind. I was very unhappy when you removed the Novice department. So were several of my students who are hams ...they now read another ham magazine. In your September, 1968 editorial you were also concerned for the growth of amateur radio and communicating the ideas of the fraternity and the technology to young people. TAKE A GOOD LOOK at that very issue and think of the intellectual and knowledge level of a sophomore or even a junior or senior in high school. About 70 pages of technical material, well over 20 pages of contest, DX or award material and maybe 3 or 4 pages that this group could get something out of. They still need that two-tube budget delight or low-keyed technical material that's designed to educate them not eliminate them. And don't forget there are hordes of old-timers who could use a simple article or two to teach them also! We're in communication, but communicate to a high school kid you DO NOT!

As you have so well put it, "One of the fundamental pleasures of hamming...is the local ham convention". But what have we done to make conventions pleasing for the young people. An ad in February *CQ*—1969 New England ARRL Convention May 24-25 —Saturday Dance and night club entertainment registration $10. Are we making conventions desireable to young people or are we here, too, as in our organization, forcing adult entertainment, adult reading, adult social requirements, adult service club atti-

[*Continued on page 107*]

ee page 110 for New Reader Service

OUR READERS SAY

The Operator's Viewpoint

Editor, *CQ:*

I rise in defense of the minority! I read with interest your ZERO BIAS in February *CQ*.

While I agree in general with what you say, I wish to point out that many of us (I for one) do not possess the technical know-how or ability to contribute to the advancement of the art of ham radio. Math is *not* one of my better subjects.

However, I have had a keen interest in amateur radio for years (since 1919) and I have been licensed since 1925 (as an amateur—second grade) now holding a General and studying for my Advanced ticket.

I try to contribute to the art by clean operating practices, helping other ops (especially Novices), buying up to date gear (retiring the model "T" as you call it) and reading *CQ*, *73*, *QST*, etc.

Ham radio is my chief hobby. I am 65 and about ready to retire from my job. I look forward to many pleasant hours and contacts on the bands; time I could not afford while raising the family.

I don't like the tags of "apathetic" and "lethargic." To each his own! We can't all be technicians, researchers and engineers. So we are content to enjoy the blessing of liberty as embodied in amateur radio.

I am thankful for the pioneers who made it possible for ops like myself to enjoy a wonderful hobby.

Paul V. Reuter, W9ROV
Robinson, Ill.

Editor, *CQ:*

Your ZERO BIAS in February *CQ* is stirring stuff. You are quite right, maybe most of us are being left behind in the electronics explosion. But please remember that for the majority of us, amateur radio is a hobby and a relaxation. While we should not slip in to limbo, we should not be expected to chase after the leaders in the science to qualify our existence. Radio should be a pastime, not an all-consuming obsession.

Laurie Margolis, G3UML
Essex, England

We Stand Corrected

Editor, *CQ:*

In your editorial in the February, '69 issue of *CQ* you stated:

"For instance, the field-effect transistor (FET) —the pride of the transistor world—as great an advance as it is in large-signal handling capability for transistor receivers, has still not been used in a single commercial design for the amateur."

I would like to point out that our two-meter FM ICE-1 transceiver utilizes an FET front end for the specific purposes you stated in your editorial.

J. George Loos, Jr., W5LFG
President, ICE, San Antonio, Tex.

One for the Builders

Editor, *CQ:*

I would like to reply to that letter on amateur construction by K1ZJH in your "Our Readers Say" section of the February issue of *CQ*.

I constructed the "Basic Teeter Totter" on page 27 and used figure 1 of the February 1969 issue together with and feeding the "Discone" antenna described on page 13 of the February issue of *S9* magazine issue and connected to the output of DX-100 I worked all continents on the 21 mc (15m.) amateur band in one evening on c.w. I have never had so much fun since I joined the amateur radio group and I want to thank you for these wonderful construction ideas for amateur radio operators.

Keep up the good work of helping the radio amateur.

Jack Neal Holt, WB4BUG
Jacksonville, Fla.

Philippine Operating

Editor, *CQ:*

In reference to the letter by K7MZC in the January issue of *CQ* on Philippine Operating. The story I get from a friend who is working in the Philippines on Civil Service is that the U.S. Government would not give the Philippines reciprocal licensing – so the Philippines would not license American Amateurs. He claimed to have done some extensive checking.

Perhaps someone can give us the straight dope on this.

Earl E. Stacy, W7JKG
Tacoma, Washington

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Versatility . . .
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near permeability tuned VFO with 1 kc dial divisions. and crystal frequencies pre-mixed for all-band sta- • **Covers ham bands** 80, 40, 20, 15 meters completely 28.5 to 29.0 Mc of 10 meters with crystals furnished **ny ten 500 kc ranges between 1.5 and 30 Mc** can be ered with accessory crystals for 160 meters, MARS, etc. 6.0 Mc not recommended) • **Four bandwidths of selec-**, 0.4 kc, 1.2 kc, 2.4 kc and 4.8 kc • **Passband tuning** s sideband selection, without retuning • **Noise blanker works on CW, SSB, and AM** is built-in • **Notch filter 25 Kc crystal calibrator** are built-in • **Product detector** SSB/CW, **diode detector** for AM • **Crystal Lattice Filter** s superior cross modulation and overload characteris- • **Solid State Permeability Tuned VFO** • 10 tubes, 10 sistors, 17 diodes and 2 integrated circuits • **AVC** for or high-speed break-in CW • **Excellent Overload and ss Modulation characteristics** • **Dimensions:** 5½"H, "W, 12¼"D. **Wt.:** 16 lbs.

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T-4XB TRANSMITTER

Use VFO of either R-4B or T-4XB for transceiving or separately.

• **Covers ham bands** 80, 40, 20, 15 meters completely and 28.5 to 29.0 Mc of 10 meters with crystals furnished; **MARS** and other frequencies with accessory crystals, except 2.3-3, 5-6, 10.5-12 Mc. • **Upper and Lower Sideband** on all frequencies • **Automatic Transmit Receive Switching on CW** (semi break-in) • **Controlled Carrier Modulation for AM** is completely compatible with SSB linear amplifiers • **VOX or PTT** on SSB and AM built-in • **Adjustable Pi-Network Output** • **Two 8-pole Crystal-Lattice Filters** for sideband selection, 2.4 kc bandwidth • **Transmitting AGC** prevents flat topping • **Shaped Grid Block Keying** with side tone output • **200 Watts PEP Input on SSB**—200 watts input CW • **Meter indicates plate current and relative output** • **Compact size; rugged construction** • **Solid State Permeability Tuned VFO** with 1 kc divisions • **Solid State HF Crystal Oscillator** • **11 Tubes, 3 Transistors and 12 diodes** • **Dimensions:** 5½"H, 10¾"W, 12¼"D. **Wt.:** 14 lbs.

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Triple Conversion • **Crystal-controlled First Converter** • **kc ranges** for 80, 40, 20, 15 and 10 Meters • **Also any kc range** between 3.0 mc and 30 mc by inserting an cessory Crystal • **Temperature-compensated VFO Tun-** • **Selectable Sidebands** without retuning • **Three ndwidths**—.4, 2.4, 4.8 kc at 6 db • **Solid-state** Audio, oduct and AM Detectors, AVC Amp and Xtal Osc • **AVC itch** (Fast, Slow and Off) • **SSB, AM and CW** with AVC d S-meter • **Works Break-in CW** with 2-NT Xmtr • **Tubes and Semi-Conductors** • **Dimensions:** 11 5/16"W x "H x 9 3/32"D. **Wt.:** 13½ lbs.

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cessories available: 100 kc Calibrator, Q Multiplier, tching Speaker, Noise Blanker, Crystals for other ges.

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Built-in essentials and accessories

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All prices are Amateur Net. Prices and specifications subject to change without notice.
Drake products are available at your distributor . . . for a free brochure on any unit, write Dept. 529

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See page 110 for New Reader Service

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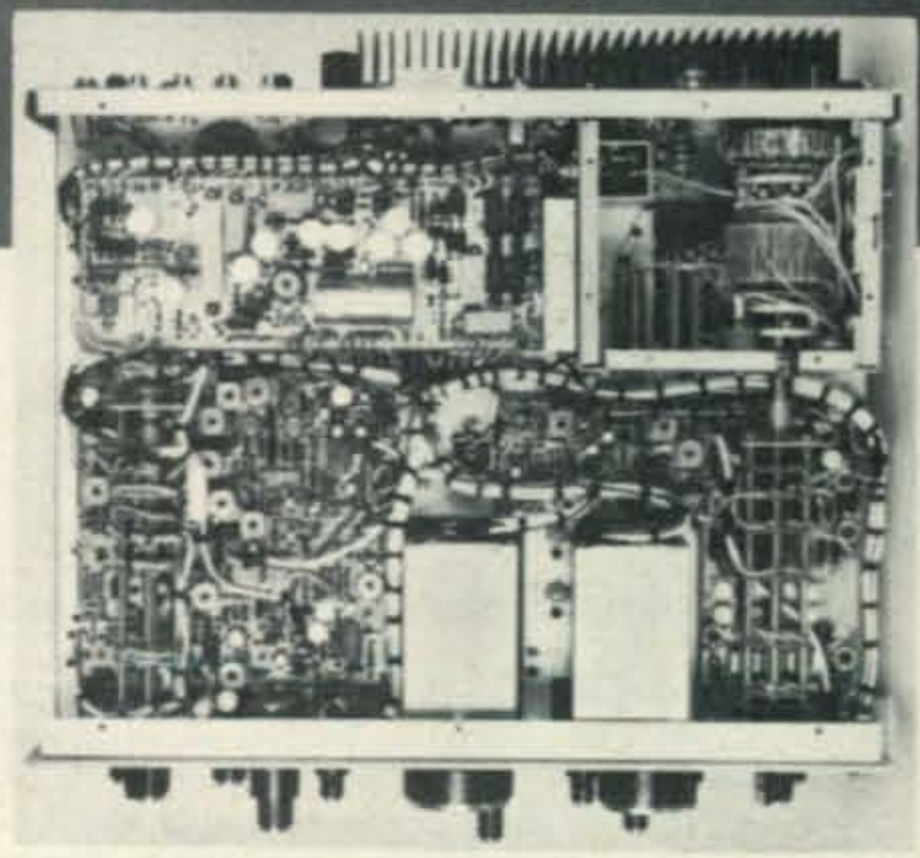

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- RUGGED CONDUCTION - COOLED P.A. for a cool 300-plus watts input even on CW and FSK
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Announcements

Chicago, Illinois

The Chicago Suburban Radio Association wi hold their annual banquet on Saturday, Apr 19th at the American Legion Hall, 1116-5t Ave., Maywood Ill. Contact WA9CCQ, 312 Clinton Ave., Berwyn, Ill. 60402 for information

Rockaway, N.Y.

The Rockaway Amateur Radio Club Sprin Auction will take place on Friday evening, Apr 25th at 8:00 P.M. at the American Irish Hal Beach Channel Drive at Beach 81st Stree Rockaway Beach, N.Y. Doors will open at 6:0 P.M. to accept items for sale. For information write to Rockaway Amateur Radio Club, c/ WB2DVK.

Sullivan, Illinois

The Moultrie Amateur Radio Klub (M.A.R.K will hold its annual Hamfest April 27th, 1969 a the American Legion Pavillion in Sullivan, Il There will be door prizes and the annual auction Everyone's invited to attend. The day's activite start at 7:00 A.M. and there will be refreshment available on the grounds. For further informa tion contact: Dan Poorman, 2813 Oak, Mattoon Ill. 61938.

Potosi Missouri

The Potosi Amateur Radio Klub (P.A.R.K would like to announce its formation as of Nov ember '68. At present the Club has eight mem bers, all of them working toward their Novic License except the President of the club who i working towards his General Class license. Sinc the club is school-sponsored they cannot affor to buy any equipment at this time and woul appreciate any unused or unwanted equipmen for a club station and will pay any shippin charges. Contact James A. Wooding, WNØVED 511 Raymond St., Potosi Mo. 63664.

Weekend of Armed Forces Day

On Sunday, May 18, WA9DZL, amateu radio station of the 128th Air Refueling Group Wisconsin Air National Guard, will help sup port local and nation wide Armed Forces Da activities by operating on 14.335 mc, ±5 kc WA9DZL will be on the air from 1515 GM through 2245 GMT. The 20 meter band wa selected for long range communications whic is in keeping with the unit's world wide mid ai refueling operations. Special QSL cards an accompanying letters will be mailed to all sta tions contacted. Short-wave listeners may als participate by mailing a letter or QSL card listin the station which was in contact with WA9DZL the approximate time, frequency and signal re ports. All cards and correspondance may b sent to WA9DZL, 128 Air Refueling Group Wisconsin Air National Guard, 1919 Eas Grange Avenue, Milwaukee, Wisc. 53207.

SCRATCHI

Feenix, Ariz

Deer Hon. Ed:

Taking your feet off your desk. sitting up strate, taking that one bux seegar out of your mouth, and paying atenshun. It are time Hon. Seek-You Magazine are getting up to date in this age of space and computers. Carefoo now, not tossing this letter in wastebasket—it may be worth several kilobux to you.

That's better. Let me hastening to assure you that Scratchi are not wanting to be reimbursed for this stewpendus idea I throwing your way. Not on your tinny-tipe. Of course if you wanting to see that I getting your Hon. Rag free for cupple yeers, I not objecting.

Now then. Your purpose in putting out Hon. Seek-You are to keeping reeders informed of various matters pertaining to amchoor radio. Right? Right! Natchyourally you also trying to make a few measly bux at same time.

How you going about this noble objective? First you sift thru all the artickles wha coming across your desk. Those that lookin good you skeduling for next issue. Howsum ever, from time poor author riting artickle sending it to you, you reeding it, you givin it to printer, and finely getting it printed cupple months are passing. Let's not forge that Hon. Uncle Sam also having to delive it, and that's taking another cupple weeks.

So, you getting this priceless, red-hot informayshun out to reeders sum eleventeen weeks after it's a gleem in author's mind. I that any way to run a magazine? Hah!

You gotta go modern—do it the NOW way Here's how. When you reeding stuff wha coming across desk, you dividing it into three piles. One for tossing away. File 13. Second is for handling and printing like you do now. Stuff in this pile are of general interest to amchoor, but not timely news stuff

See page 110 for New Reader Servic

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Third pile are important stuff. Dee predickshuns, latest FCC ackshuns, new red-hots theery, that kind of stuff. This m erial you quick-like inputting to Hon. Co puter.

Hon. Ed., I knowing you not having co puter now. Big deel!! So go buy one. O millyun bux down and a thousand bux day for rest of your life. Or, if you can't g ing first class, renting one. Don't botheri me with these detales.

Anyhow, after you got all this reel hones to-gracious news in computer, you fix slicky xmitter and reseever to input of co puter, so amchoors can get on air, talk computer, and getting latest news while still news.

Easiest way to talking to computer is wi teletipe machine, so you have to forming t Seek-You Radio Amchoor Teletipe Societ Everybody who joins knows the proper freal wency to call the computer on. He also ge ing chance to buy teletipe machine at cheep price.

Oh, eggscoosing me, Hon. Ed. I forgettin to tell you that. After you forming this grou of Seek-You R.A.T.S., I wanting to get the names for my mailing list. You see, I re sently investing in warehouse full of slitel used teletipe machines. They in reel goo shape, used mostly by little old ladies wh only knowing hunt and peck tiping system They be perfect R.A.T.S.

On acct. I got these machines for prac tickly nothing. I can making amchoors ree low price on them. By starting big direct male advertising campaign, I can sell then all like sixties. Everybuddy happy that way I getting money, amchoors getting teletip machines, and you getting R.A.T.S. in you computer.

Well, I know you are anxious to ruch rit out and making deel for a computer. Jus don't forget to putting my free ad about tele tipe machines in next issue.

Respectively yours,
Hashafisti Scratchi

Back Issues

Back issues of *CQ* are available from our Circulation Department. Issues in the current year sell for face value (.75) and all others in stock are one dollar each, postpaid. If the issue is no longer in stock, photo copies of specific articles are available at one dollar each. Preferably, the entire issue will be sent.

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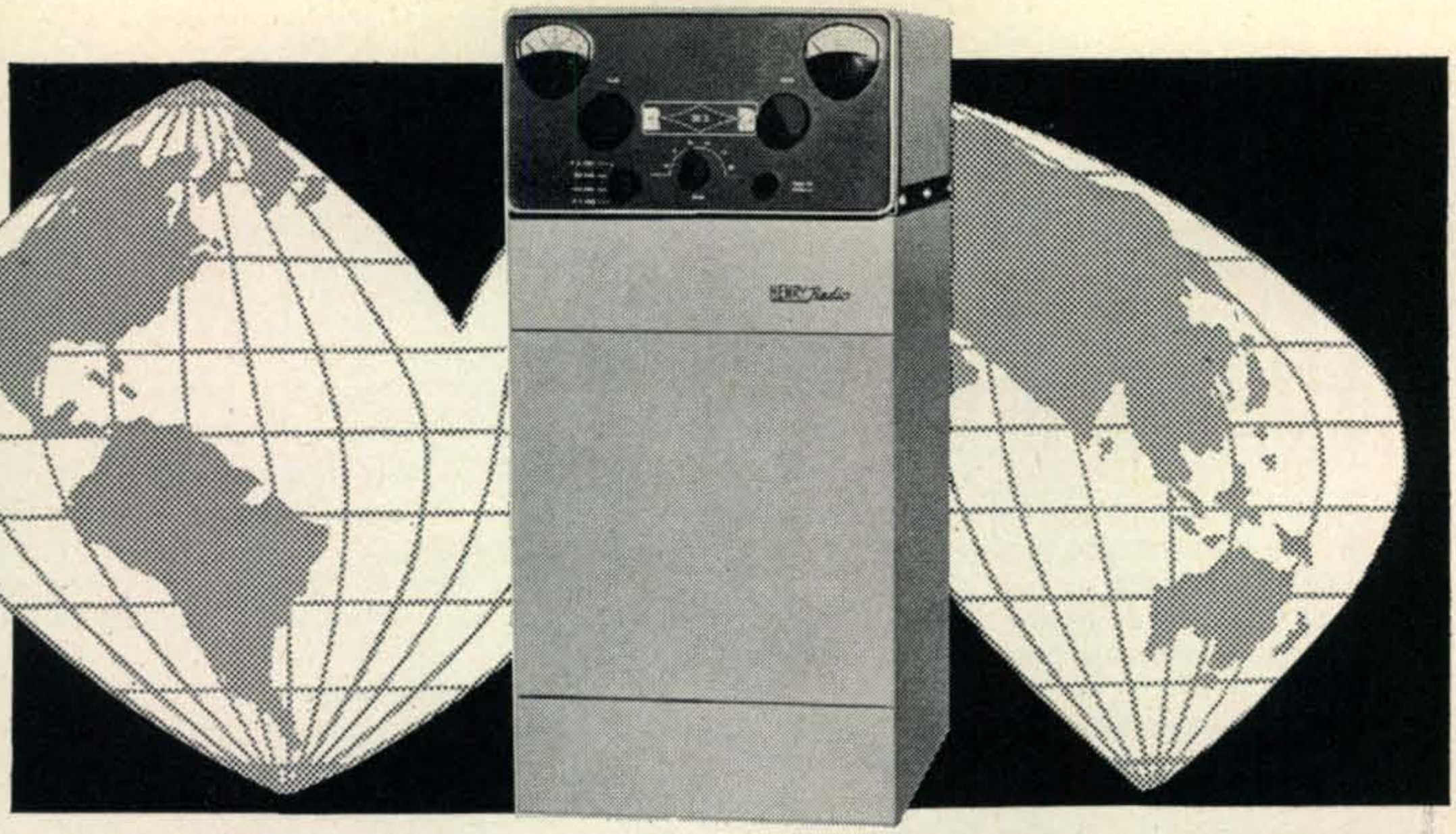

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HAM AND ROSES

AMATEUR RADIO AIDS THE ROSE PARADE

BY ROBERT F. ZEITER,* W6NAA

As you read this report, plans for the ext Rose Parade in Pasadena, California re in full swing. In fact they started the day fter the last parade, and continue thru the ear. The planning tempo gradually increases ntil it reaches a climax at the parade itself. On New Years Day, the efforts of 1400 olunteer and professional workers bear ruit. This year, the fruits of their labors vere observed by millions of people in North America, South America, Europe nd Hawaii. These 1400 people do not nclude the participants in the parade, nor he 1500 Law enforcement officers. Of hese 1400 people whose work ensures a mooth running operation, nearly one hunred are volunteer communications people.

The plans for the volunteer communiations circuits are introduced during the re-parade and parade operations in such omments by the operators as; "better not lo this next year", or, "by adding that epeater station, we would be able to cover hat float convoy better". Equipment changes re also suggested, and incorporating some f them would strain the talents of a Science iction movie set designer.

The count-down for the parade starts when the new Operations Committee Chairnan is handed his copy of the Rose parade Operations Manual, a four inch thick locument that truly does contain a countlown schedule of events. Such volunteer ommunications plans as 'how many', 'where', and 'what time' are included in the manual. Based on the last years parade, and the years before, changes are incorporated in the plans. About a month after the parade, critiques are

Marking the beginning of the 80th annual Rose Parade, the first flags appear in front of the Los Angeles County Disaster Communications Service Amateur Radio Teletype mobile message center parked at the intersection marking the starting line of the parade. The RTTY Van is owned by the Sheriff's Department and operated by volunteer members of the Disaster Communications Service at local disasters and public service events. Working with the D.C.S. members in this event were members of Pasadena Civil Defense Citizen Emergency Radio Service. *(Photo courtesy of W. Courtice.)*

*1637 Bender Ave., Glendora, California 91740.

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Mike Welch, at Craig and Colorado Blvd., provides communications from the parade route. Photograph was taken about midnight on New Year's Eve and shows the generator used to provide power for radio equipment and a portable TV to watch the parade.

held with representatives of the various organizations. Modifications are suggested and discussed by the operating personnel. These field suggestions are forwarded to the Tournament of Roses Association for their consideration. The officials of the association prepare their plans and by mid-summer each of the volunteer communications sites have been selected and instructions for each site prepared. Other activities, such as Law enforcement, have been notified of their locations.

Bill Skellenger, WB6BXJ, operates the RACES station located in Dow Radio on New Year's Eve.

The communications volunteers start to ge the word about mid-November. Phone call to key personnel of organizations like th Los Angeles County Disaster Communica tions Service under the direction of Sherif Peter J. Pitchess, and the Pasadena Civi Defense Communications under Mr. Hers chel Calvert, start the gathering of the clan The phone calls also bring such cheery re quests as, "we need the same set-up as las year, and just a few more for some othe places. Can you get them?".

Until the 1967 Rose Parade, voluntee communications had been adequately handle by Citizens Radio members of the Pasaden Civil Defense Communications organization During the last two years "skip" and jammin had become serious problems and the de cision was made to utilize facilities of th Los Angeles County Disaster Communica tions 2 meter RACES organization. Afte contacting Sheriff Pritchess's office, a 2 mete equipped Mobile RACES Van was mad available with its operators. This mobil station provided 2 meter links to the Pasa dena Police building and to the Los Angele County Sheriff's Dept. mobile Dispatch Sta tion servicing the Sheriff's units working th parade. This "Hot link" ensured emergenc communications to Law enforcement, Fire and Ambulance assistance throughout th formation and starting of the 1967 parade As a result of discussions by the RACES operators and Pasadena C.D. Communica tions Officers, the Rose Parade employed well meshed network of 2 meter RACES Stations and CB Stations. It stands as a excellent example of the ability of the tw services to work together for the commo good.

There are three phases to the voluntee communications plan for the nation's onl planned annual disaster held in Pasadena o New Years Eve and Day. The first phase i the assembling of the floats for the Ros Parade into their assigned starting spots at th west end of Pasadena. These floats, some o them, come from as far away as Burbank; 2 freeway miles to the Northwest. Another larg group come from the El Monte area, 10 mile away. The communications plan for thi phase was to employ CB Radio for communi cations within the individual float convoy which includes Police escort, towing vehicles service vehicles, and other sheparding units Communications from the convoy to th "Formation Area Headquarters" was to b

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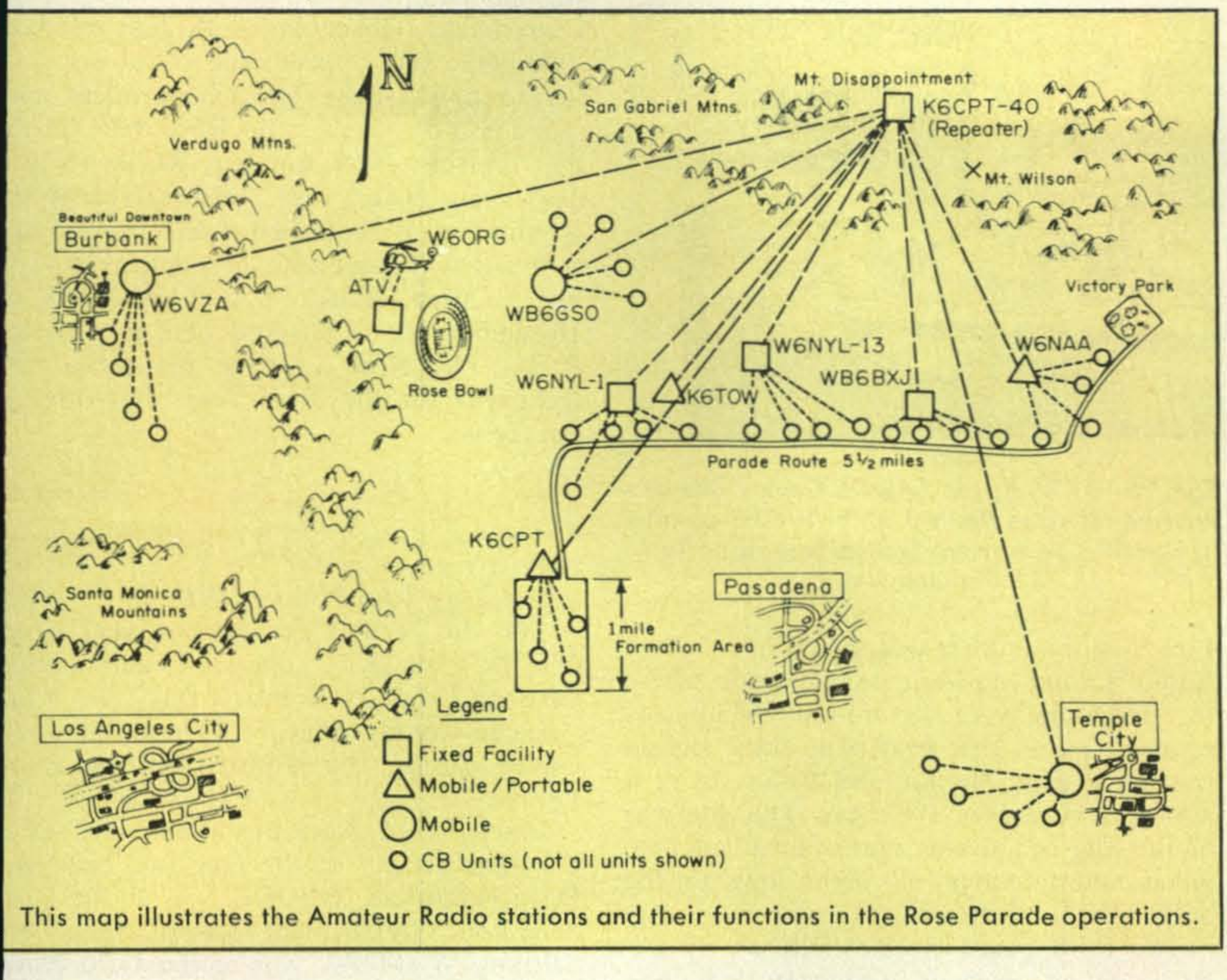

This map illustrates the Amateur Radio stations and their functions in the Rose Parade operations.

via a 2 meter RACES repeater station located north of Pasadena on a 5994 foot mountain overlooking the city. This repeater station, built by Deputy Frank Oakden, K6TOW, for the County RACES circuits, eliminated the communications shadow caused by the Verdugo Mountains between Pasadena and Burbank.

The third phase overlaps the first phase and continues beyond the end of the first phase. This portion of the volunteer communications plan deals with communications supporting Law enforcement, Fire, Ambulance, crowd control, and Parade communications from the starting line of the parade to its terminus in Victory Park, five and one half miles away in the East side of Pasadena. Communications starts about sundown when the first communications units move into their assigned stations along famed Colorado Boulevard. The communications plan here was to place 2 meter RACES Stations at intervals along the Boulevard, who would then function as relays for the many CB Stations spotted at the numerous points to alleviate the "skip" and jamming on the CB bands that was experienced in previous years. To further enhance the communications reliability, the 2 meter stations worked into the RACES repeater also. In 1968 each of these 2 meter stations were located in a different type of facility. One was in the kitchen of a

Duke Gjerset, Pasadena Civil Defense; and rear, Ed Cryer, WA6ADO, L. A. County RACES team up to operate K6CPT's RTTY Van built by Deputy Oakden, K6TOW.

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Sgt. Ward Cayot, Los Angeles County Sheriff's Reserve operates the two meter RACES position in Sheriff's Department Station Easy, a portable dispatch van.

Fire Station, another was set up in the Dow Radio store at Meridith and Colorado where the operators were tortured by being surrounded by all that gear. The third station was located at Mentor and Colorado in a housecar owned by W6NAA. This site was on the edge of a livelier part of town and provided entertainment all night long to the operators.

The third phase is essentially an all CB Radio activity since it is concentrated along the canyon edges that contain the Rose Bowl. Their mission is to assist in traffic control of vehicles carrying persons intending to watch the Rose Bowl Game. This phase is essentially a CB operation, but it does include Amateur Radio Television. In 1968 W6ORG

Vic Bell, WB6YOL, operates the RACES/CB facility in a Pasadena Fire Station during the night hours New Year's Eve. The portable TV enables him to watch the parade.

was mobile in a Los Angeles County Sheriff Department Helicopter with his Amateu Television Station providing visual informa tion to the Pasadena Police Department com mand post overlooking the Rose Bowl for th first time. In 1969 Amateur Radio TV wa used again in this very useful service to th community. It should be noted that the firs time a Rose Parade activity was televised wa by Amateur Radio Station W6XAO o December 30, 1938. And here is Amateu Radio TV, back again to pioneer a ne technique for the New Years festivities i Pasadena.

Amateur Television Coverage Addendur

The following information on the amateu radio TV coverage for The Rose Parade wa supplied by Tom Pollock, WB6ZYE.

For the second consecutive year, Tor O'Hara, W6ORG, operated aeronautica amateur TV on New Year's Day from a Lo Angeles County Sheriff's Department hel copter during the Tournament of Rose Parade.

Four ground intercept stations were set u this year instead of the one used last yea Dave Kauffman, W6QDP, was at the Pasa dena Police Department Headquarters; Gen Schraut, WA6KPB, was at the U.S. Nava Reserve Headquarters near the end of th parade route; Paul Stumbe, K6INQ, an Morris Turtletaub were stationed at a res dence overlooking all of the approaches t the Rose Bowl; Rudy Delgado, WA6EPX and Tom Pollock, WB6ZYE, were locate with the LA CO Sheriff's mobile commun cation station at the south enterance of th Rose Bowl.

Each station consisted of a two meter sta tion and television receiving equipment tune to 435 mc. Most of the equipment for mon toring television consisted of conventiona u.h.f. converters padded in a manner whic would lower the operating frequency to 43 mc. The camera operated into a five wa solid-state transmitter temporarily installe in the aircraft and operated from the 28 vo aircraft power source. Ground plane typ antennas were used on the aircraft and o the ground.

The purpose of this exercise was to fu ther develop the concept of using amateu television as a more sophisticated method c monitoring traffic under maximum load cor ditions. In the case of the Tournament c Roses Parade, one of the most difficult per

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s occurs between the time that the parade ishes about 1000 and the start of the Rose wl Game at 1300.

Janurary 1, 1969 was a beautiful summer- e day with the temperature in the 70's and s. The first flight with ATV was airborne out 0915 and the first pictures were re- ved about 0925. Good pictures were re- ved on the ground but the two meter nsmitter in the aircraft was not working. m. audio subcarrier came in fine as long as picture was being received. Communi- ions among the ground stations was good spite of the fact that all stations were not line of sight. After the helicopter landed d then took off on the second flight the o meter voice communications improved nsiderably but video reception deteriorated. ouble developed in the camera and in the nsmitter, probably as a result of the vi- ation of the chopper. No further pictures any quality were received that day.

In spite of the difficulties encountered this ercise was worthwhile in that it does show at Amateur TV can be used for providing blic Service in a new medium and that dio amateurs can set up functioning ground tions on a temporary basis with a min- um of practice.

Los Angeles County Sheriff's Department s purchased a portable camera and video corder for helicopter patrol work as a result the Southern California ATV Club demon- ation of the potential value of video verage.

Some of the ninety-eight volunteer communications personnel attending the briefing in Pasadena's Civil Defense Training Center.

participants on what they were letting themselves in for. The briefing informed us to expect not only our units talking to us, but also Detectives using walky-talkies. These Detectives will be investigating Juvenile problems, Narcotics, Vice, Pickpockets, and other illegal operators attracted by such large crowds. We are instructed on various aspects of communications involving many different disturbance situations.

The 1968 and 1969 Rose Parade volunteer communications activities are an outstanding example of planning and co-operation between all persons involved. The cooperative

Text Continued

At the first meeting held early in Dec- nber, Mr. Mal Rector, Pasadena Civil De- nse Radio officer, briefs representatives of e several organizations participating on the sic plans of the Rose Parade and Rose owl communications requirements. After e briefing, Fred Owens, WB6TVZ, Per- nnel Officer, starts his job of obtaining a list individual names and the equipment avail- le. Throughout December, Fred, and Frank gnorelli, WB6EML, Operations Officer, uffle names and equipment on their maps ntil they have their solutions. Then they epare assignment lists and maps for the al briefing.

At the final briefing held the last Monday December, Mr. Dave Orswell conducts an lightening discussion for the benefit of new

Patrolman Dave Orswell, Pasadena Police Department, emphasising a point during his briefing to Rose Parade participants at the Briefing prior to the parade.

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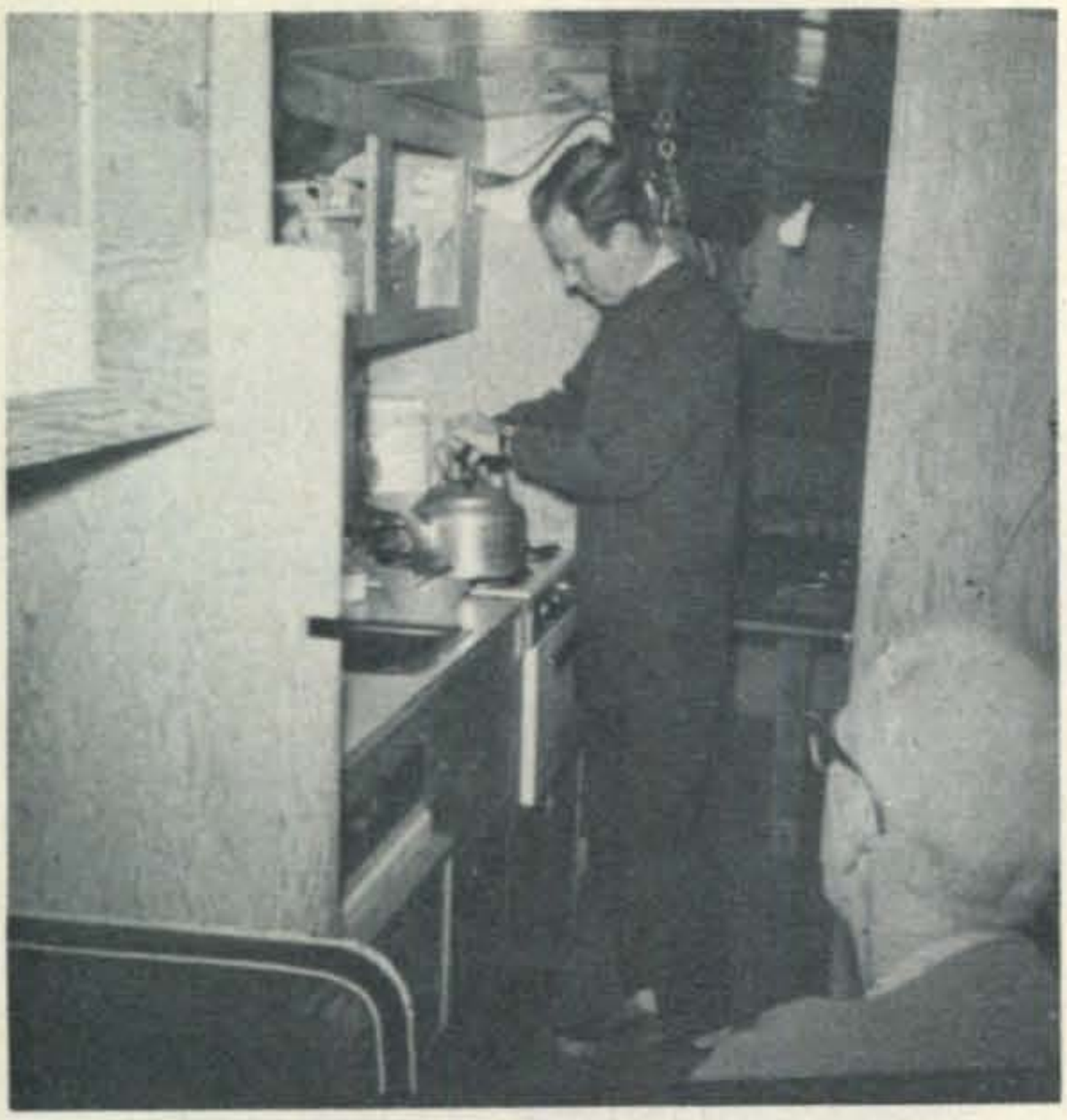

Rex McCray, WB6SGR, prepares a late supper with Bob Cole, K6OMU, supervising from the operating position in W6NAA/Mobile on New Year's Eve.

communications employed by the RACES and CB units were particularly effective in combatting the jamming problems. Jammers continue to be confounded by the ability of the CB Stations to complete their communications all night in spite of all their efforts. By dawn, all but the most determined jammers have slunk away with their tails between their legs, and the rest are then even less effective in disturbing communications. In the 1969 pre-parade activity, a variation was inserted in the jammers program. A CB Station installed in a Condor Motorhome across from Dow Radio was found to be jamming communications in that area when W6VZA embarked on a hidden transmitter hunt for an unmodulated signal causing interference to the system. After a quiet talk with W6VZA, who is a Los Angeles County Deputy and was in uniform, the father of the juvenile operator *agreed* to watch his station a little closer.

Adding spice to the operation was the appearance of then President-elect Nixon at the Bowl Game. His arrival was shortly before the Rose Parade was over. The normal communications had added the special instructions regarding the authentication of FBI and Secret Service agents and a request that stations be willing to stay on the air a little longer than usual in case of an emergency connected with the President-elect security measures.

Each year brings specialized problems the Pasadena Police that involves the volu teer communications people. This year t P.P.D. had a specialized problem with t hippie element in that they planned a psych delic rally near the parade route. Happily fizzeled out in the early evening hours, but did require additional volunteer communic tions personnel and equipment to cover th potential disturbance.

In most years the general run of commun cations involve the request for transportati of lawbreakers, small fires, recovered stol wallets and purses, lost children, lost paren and similar events. The 1969 parade co munications included communications dire to the starting line officials when the parade Grand Marshal's (Bob Hope) vehicle fail to complete the parade under its own pow It was pushed by several volunteers until t assistance of a tow truck was obtained. Nee less to say, the parade officials followed th portion of the parade progress with unusu interest.

Every year there are several life-and-dea type of communications handled by the v unteers. In the 1968 parade communicatio there were three heart attack calls involvi fatalities. In addition, there are an unusu amount of emotional people about th evening and early morning hours and t beat policemen keep in close touch wi their volunteer communications stations keep abreast with dangerous developmen

On the Amateur Radio frequencies, in 196 operators were members of two organizatio operating under RACES Rules. Operating f Pasadena Civil Defense Communications their Net Control Station, W6NYL was Fr Owen, WB6TVZ, and Frank Signore WB6EML, and at W6NYL-13 Vic Be WB6YOL, served for the entire 16 hou Operating for the Los Angeles County D aster Communications Service were t following: at K6CPT Mobile located at t starting line was Loman Zane, K6SE (Chf. Op.); Wm. Johnson, W6QAV; a Frank Rodriguez, WB6SQD. At Dow Rac operating the facility as K6CPT-BL 2 w Wm. Skellenger, WB6BXJ, who obtain relief from operators at K6CPT-33. Behi a Fire Station in Eastern Pasade was K6CPT-33 operated by Rex McCra WB6SGR; Bob Cole, K6OMU, and B Boulton, W6AAD. The Burbank float conv

[*Continued on page 100*]

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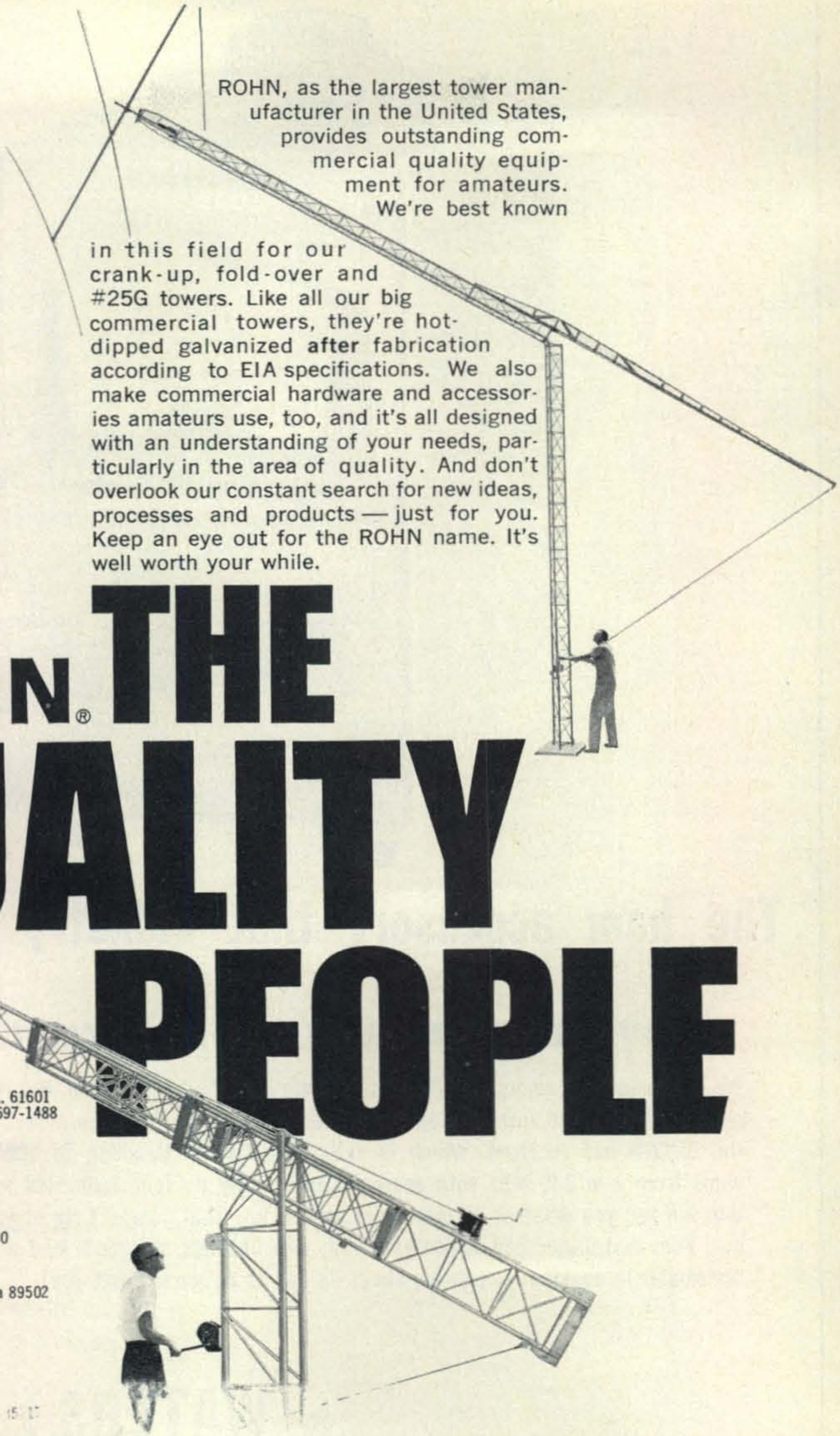

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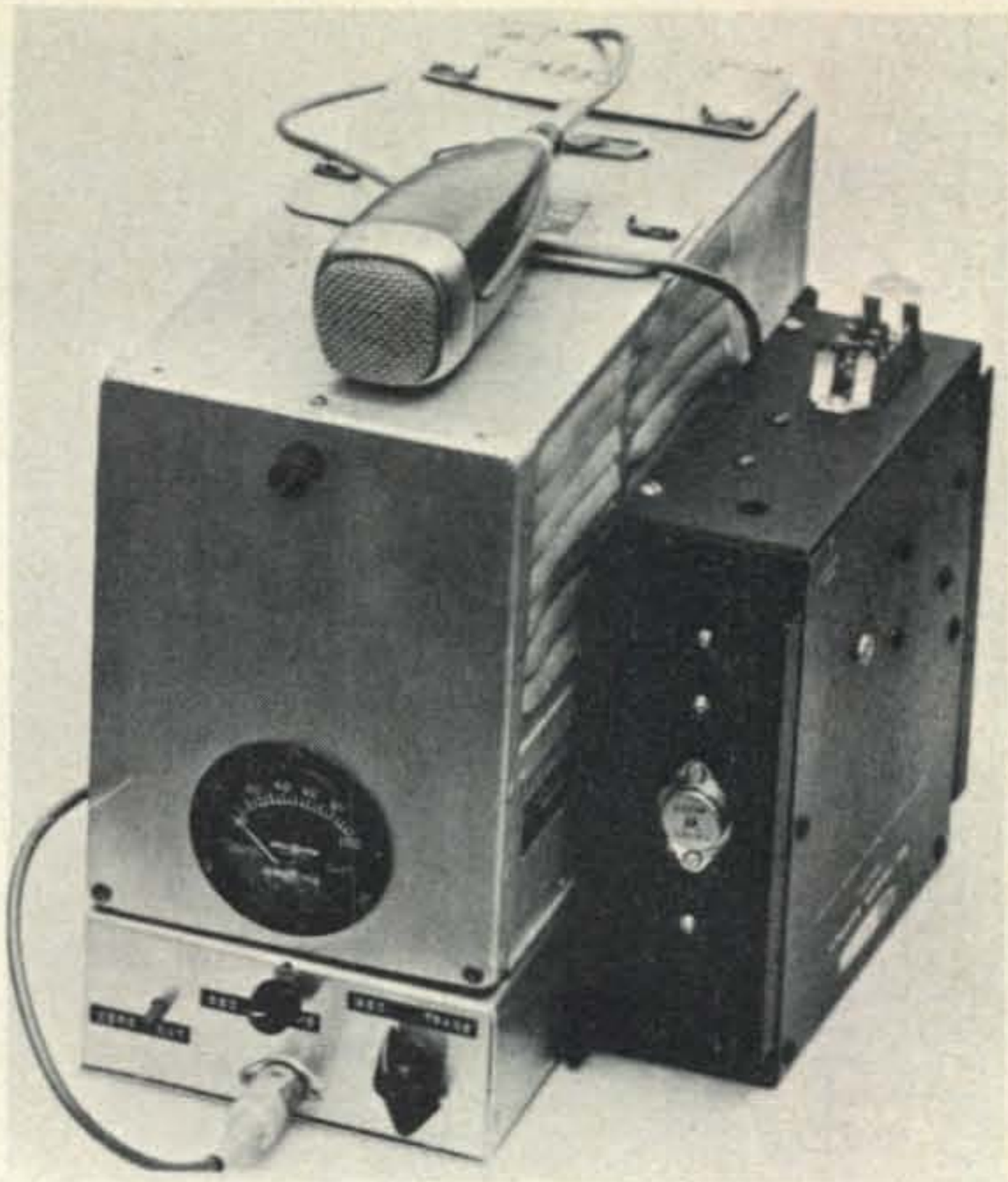
A Transistorized Transceiver I.F. Strip For Mobile S.S.B. Use



BY LARRY WALROD,* VE7BRK

TOWARDS the end of this article, we will suggest ways and means of turning this project into a complete mobile transceiver for 80 and 20 meters but our main concern for this time will be to describe in detail how any reader could construct an i.f. strip.

This i.f. strip consists of the carrier oscillator, balanced modulator, a.f. amp, i.f. amp crystal filter and a diode type product detector. All that is needed to provide complete transceiver operation is an input signal at the i.f. frequency for receiving and a mixer and power amplifier for transmission.

This unit is rugged enough to withstand any normal use and while reasonably simple to construct, it has the necessary sensitivity and selectivity to produce a piece of finished equipment which will show up well when compared with commercial gear.

Every effort was expended in the design of this unit to secure ease of construction as well as ease of repair service should this become necessary. The author has built a number of these units and found them satisfactory in actual field trials. Essentially, this design is a simplification and modernization of another unit presented earlier in *CQ*[1] but altered to serve for general amateur use instead of for use on a specific frequency such as our former unit was.

For increased reliability, we decided to use silicon transistors and in looking around for one which would serve acceptably in nearly all of our circuits, we came upon a Fairchild 2N3641 which worked out fine. Since we are operating it considerably below its maximum ratings, we anticipate that it will last indefinitely under these conditions.

We used a style of construction which allows the circuit board with all connecting switches and controls to be easily removed from the case. The case was built of such a size and shape so as to just fit under a surplus ARC-5 transmitter which we are using for our linear amplifier after suitable conversion.

Crystal Filter

Although the complete circuit diagram is shown in fig. 1, we will discuss the crystal filter first since that is the heart of the whole unit. Since the author's favorite spot in the 75 meter band is around 3800 kc and his preference in the 20 meter band is around 14300 kc, we got out a pencil and figured that a v.f.o. operating around 9050 plus or minus about 75 kc would heterodyne a 5250 signal just where we wanted it. We therefore selected

* Nasuli Malaybalay Bukidon, Philippines.

[1] Walrod, L., "A 40 Meter QRP SSB Transceiver," *CQ* August 1967, p. 12.

See page 110 for New Reader Service

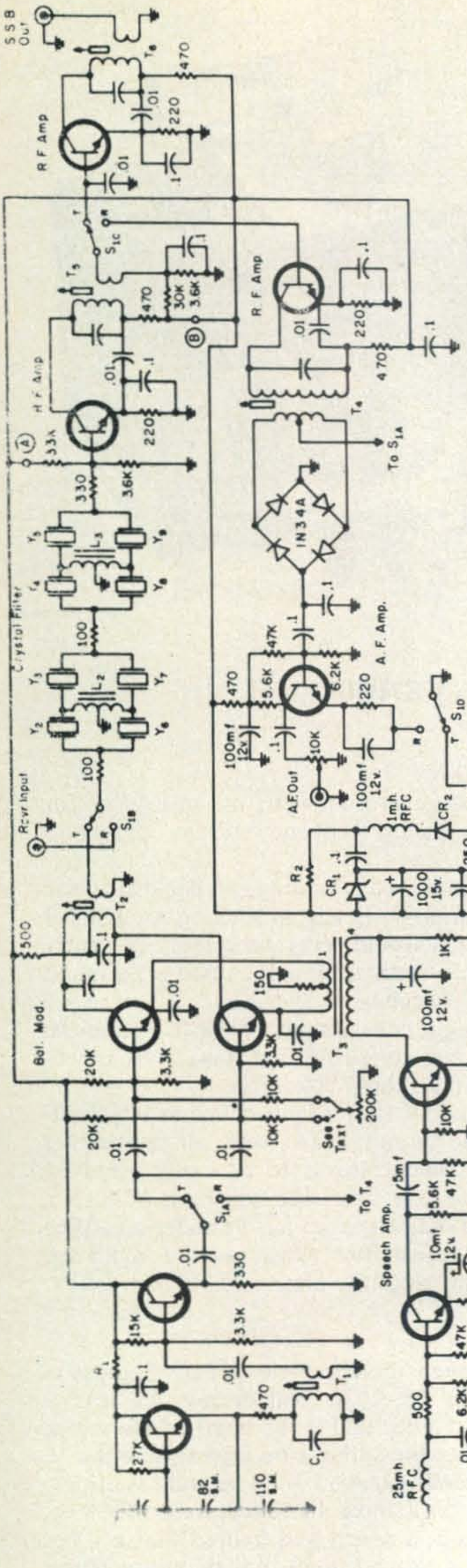


Fig. 1—Circuit of an s.s.b. transceiver exciter "i strip." Points *A* and *B* in the circuit are broken ar the resistor connected to the appropriately marke points in fig. 5 if a.v.c. action is desired. All resisto are ½ watt except where noted otherwise. A capacitors greater than one in value are in mm those less than one in value are in mf except whe noted. All transistors are Fairchild's 2N3641.

C_1—Approx. 300 mmf—value set to resonate T_1 carrier osc. freq. with slug set in middle of rang

CR_1—10 volt 1 watt zener diode.

CR_2—750 ma 600 p.i.v. silicon diode.

L_1—40 t #35 e. close spaced double layer ¼" dia 1¼" long on a ceramic slug tuned form.

L_2, L_3—approx. 40 bifilar turns (80 total) of #26 on a ⅜" x ⅛" torroidal ferrite form. The exa number of turns determined as described in th text.

R_1—Approx. 1500 ohms—adjusted for about 3 volts of r.f. at the input to the balanced mod lator.

R_2—75 ohms 1 w. adjusted for 5 to 6 ma throug CR_1.

T_1—9 t. pri., 2 t. sec., #40 e.

T_2—15 bifilar turns on pri., 10 turn sec., #40 e.

T_3—A.f. interstage trans. 4:1 c.t.

T_4—5 bifilar turns pri., 32 t. sec #40 e.

T_5, T_6—32 t. and 4 t. #40 e.

Y_1—5250 kc.

Y_2, Y_3, Y_4, Y_5—FT243, 5250 kc ± 25 cycles.

Y_6, Y_7, Y_8, Y_9—5251.5 kc ± 25 cycles.

Transformers T_1, T_2, T_4, T_5 and T_6 are wound on t

5250 kc as our approximate filter frequency This whole business might have been done th other way around with a 9050 filter and 525 v.f.o. except for the fact that we were attemp ing to produce a quality unit with the lea possible expense and found FT 243 surplu crystals available on 5250 but not on 9050.

We first tried a four crystal filter with fa results except for the reception of numerou out-of-bandpass signals in the receive mod This difficulty was caused by spurious cryst responses. To eliminate this tendency w simply added another four crystal section an found that random selection of crystals fo these units usually resulted in sufficient sta gering of the spurious responses so that the were not a problem in the completed filte

he completed filter can be built for about ven dollars and will have characteristics hich will pass fairly critical inspection. On-e-air tests have shown that both male and male voices are transmitted through this ter with sufficient degree of naturalness as make familiar voices easily recognizeable. We used slug tuned coil forms for the bi-ar coils in the first filters we made due to eir ease of winding and adjustment but we ere annoyed by the room they took up. pon switching to torroidal coils the size was uch more to our liking but found it took onsiderable time to adjust the number of rns on these torroids to get the results e wished to secure. We were able to over-ome both of these difficulties by first employ-g slug tuned coils in a temporary setup and djusting the slugs for suitable filter charac-eristics. The resonant frequency of the ad-sted coil was then checked with a signal enerator-v.t.v.m. combination and the tor-oidal coils were then easily wound to match ese characteristics. In winding these torroid-l coils in this manner, though, it is impor-ant to dress the leads from the coil in approxi-ately the same positions as they are expected be placed in the finished filter since lead ress around a torroidal core affects its res-nant frequency.

Filter Construction And Adjustment

Figures 2 and 3 show the type of construc-ion we used for the filter. A piece of ⅜" hick lucite was drilled to mount the eight rystals and the two torroidal cores. A strip f foam rubber was placed between the tor-oids and the crystals as shown on the closer f the two torroids in the picture. The lucite trip was drilled and routed as shown in the nverted view so that the shield tab shown rotruding from the center of the shield can ould be inserted right through the lucite. his was done for maximum shielding be-ween the input and output sections of the ilter.

Some arrangement must be employed to assess the characteristics of the filter during construction. Some easily controlled source of r.f. signal and some type of indicating de-vice will be needed. A spectrum analyzer and r.f. wobbulator (sweep generator) will give very satisfactory results but few will have this equipment available. The carrier oscillator described in this unit can be employed for the r.f. source provided that a crystal about 6 kc higher than the proposed carrier fre-

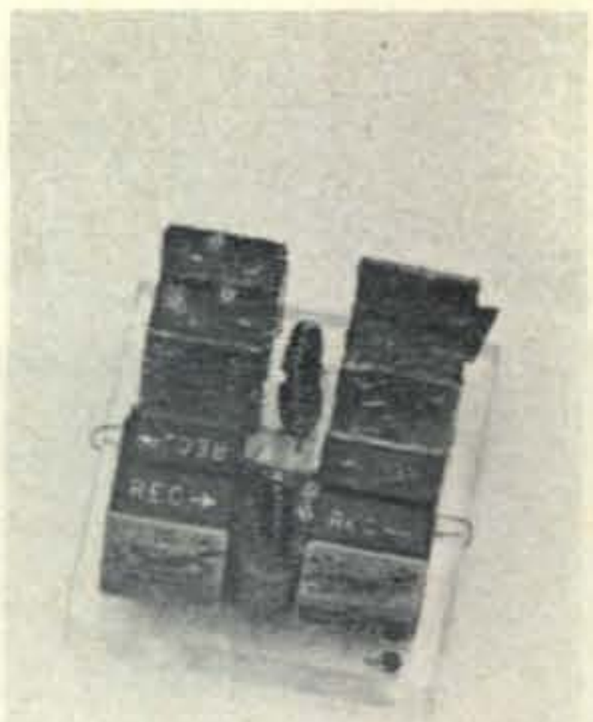


Fig. 2—Top view of the crystal filter and the torroid coils.

quency is inserted and the 20 mmf capacitor across the slug tuned coil in series with the crystal is replaced with a variable in series with a fixed capacitor. A fixed capacitor of about 50 mmf is wired in series with a vari-able of about 300 mmf as this arrangement gives some semblance of scale linearity which cannot be achieved with only a variable due to the fact that the scale of frequency divi-sions tend to bunch up on the high capacity end of the rotation. The capacitors must, of course, be mounted rigidly and some type of a vernier dial fixed to the variable shaft so that the combination can be calibrated as to frequency. When this deal is set up, the coil slug can be adjusted so that the variable ca-pacitor will be able to control the frequency of the oscillator over a range of about six kc, this being a little above and a little below the proposed bandpass of the completed filter.

Don't worry if the filter bandpass cannot be made flat along the top. The filter will sound pretty good on the air anyway. In fact if you produce a definite hump of 5 or 6 db higher than the rest around 1800 cycles from the carrier, the actual communicating ability of the combination will be better than if the filter bandpass were made perfectly flat. More important is the steepness of the skirts at the

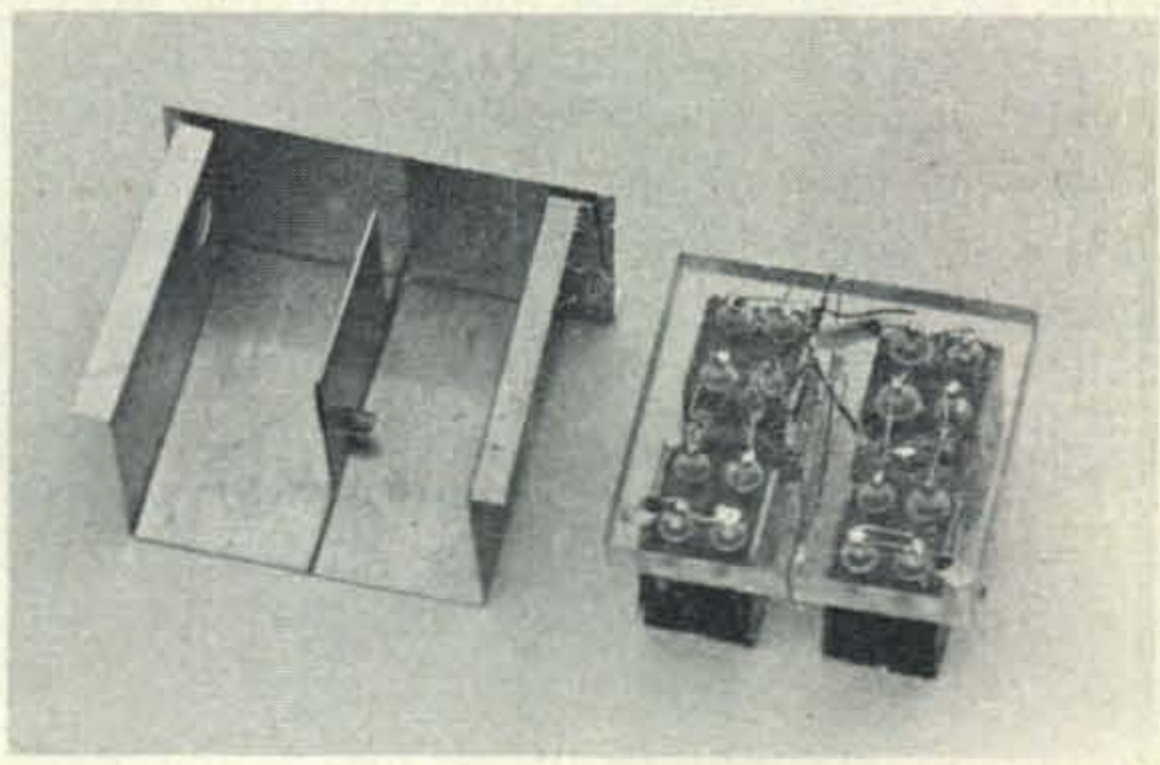


Fig. 3—Bottom view of the crystal filter and the shield.

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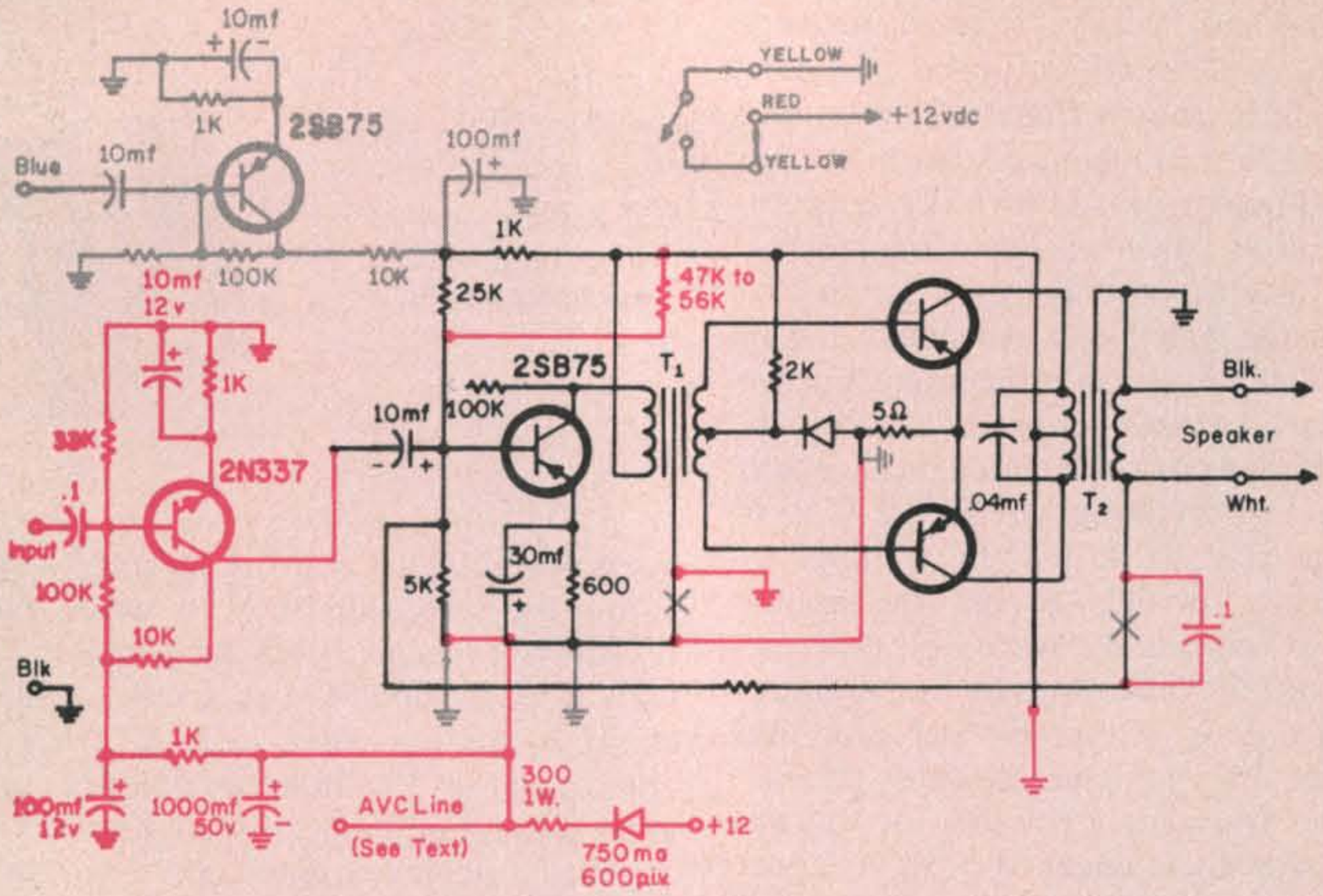

Fig. 4—Modifications made to a Lafayette 99-9038 audio amplifier to permit its use with a negative ground. Shaded areas are those removed and colored circuitry are additions.

edges of the bandpass. At the carrier frequency the filter attenuation should be 25 db or more and the maximum possible out-of-bandpass attenuation should be secured.

Crystal Frequencies

We have found it to be a good idea to get about a dozen crystals all on the same nominal frequency at the start of a project like this. Upon checking these carefully, it is usually possible to find four which are within a few cycles of each other and these are set aside for the low frequency elements. Four more are ground or etched until they are 1500 cycles higher in frequency plus or minus about 25 cycles. One of the remaining crystals can be used as the carrier oscillator—probably just as is—since inserting it into the carrier oscillator circuit and adjusting the v.x.o. coil will bring it down to the proposed carrier frequency.

Fine auto body emery paper called "wet and dry," mounted on a smooth surface, will do fine for grinding. A kilocycle can be removed from a crystal blank in a few seconds. If a constructor wished to try etching, he might want to remember that a concentrated solution of ammonium bifluoride will move the average FT 243 crystal blank 1500 cycles in about two minutes. Try one minute first. Two transistorized crystal oscillators and a calibrated audio oscillator can be used to compare and determine the beat note between two crystals in most any receiver that will tune around the frequency in question. It is not as necessary to establish the precise frequency of the crystals employed as it is to maintain the proper frequency difference between the upper and lower set.

By placing a 100 ohm resistor in series with the filter input, a 100 ohm resistor between the two filter sections and a 330 ohm between the filter output and the first i.f. amplifier we were able to secure fairly good output from the filter as well as maintain the filter characteristics. We have noticed some constructors recommend a 2K terminating resistor after a filter of this nature. We tried this but found it was not necessary due to the fact that the transistor base the filter feeds in conjunction with the base resistor and the 330 ohm series resistor worked out satisfactorily for this purpose.

Upper Or Lower S.B.

Choice of transmitting on upper or lower sideband on any specific frequency was not planned for in this design but this feature could be incorporated by adding a s.p.d.t. switch, an additional slug tuned v.x.o. coil and one more carrier crystal which would need to be something like 3 kc higher than the one

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we are proposing for this unit. Each crystal with its associated slug tuned coil would be n or out of the circuit according to the switch position. Some arrangement might also be considered for maintaining v.f.o. calibration n a completed transceiver as there would be about a 3 kc discrepancy of the carrier frequency between the upper and lower sideband positions.

Circuit Description

A brief general description of the circuitry might be in order here. The carrier oscillator, first r.f. amplifier and the crystal filter are switched from the transmit to receive mode n this unit. This was done to reduce the equipment to the least number of components necessary for operation. In the transmit mode, he carrier oscillator drives the bases of the wo balanced modulator transistors in parallel nd the audio is fed into the modulator emitters in push pull. After one of the sidebands is removed by the crystal filter, the ignal goes through two transistor r.f. amplifiers before leaving this section of the equipment. The second of these has an unusual eature in that its base is grounded through a .01 capacitor. One r.f. amplifier did not produce the output signal we wanted but two unning wide open had too much gain so we ttenuated the input signal to the second r.f. ome 60% with this 0.01 capacitor.

The transmitter audio system shows two tages of amplification but for the cheaper ow impedance dynamic microphones we are sing we have found it advisable to bypass he first stage. We left the two stages in the lesign in case we might sometime wish to use higher grade of microphone which would ikely have less output than the lower priced nits.

In the receive mode, the crystal filter is irst in the line-up followed by two stages of f. amplification, a product detector and one tage of audio amplification. Additional audio mplification is connected externally to this f. strip as described later.

Balanced Modulator

We have used a similar circuit before with .n.p. transistors resulting in reasonably good erformance. However, upon switching to he 2N3641 n.p.n.'s for this circuit we were ble to achieve much better results. We are ble to achieve approximately 40 db of carier balance with this arrangement and the alance is stable enough to employ a fixed balancing resistor once the correct size is ascertained. One end of a 10K resistor is connected to each base and the other end of each resistor is left floating in the initial wiring. By selecting the base bias resistors carefully so that they are within about 1% of each other you will find that the modulator is almost balanced when first fired up, even with random selection of the transistors.

The 200K balance potentiometer is connected successively to each of the 10K resistors and is adjusted for carrier balance and left on the 10K that gives the best results. The balance is so close that it usually requires a pot resistance close to the full 200K. The filter removes any carrier remaining so that in the final output, the carrier is down some 60 db from the p.e.p. level.

In constructing the balanced modulator we considered it best to select matched pairs of components wherever we could as in the case of the 0.01 capacitors in the base circuits and the emitter bypasses. Symmetrical layout was also employed as much as possible.

The aluminum case shown in the picture houses this i.f. strip only and another case of similar size and construction is used to contain our receiver front end and the v.f.o. as well as the mixers for converting our 5250 kc s.s.b. signal to the 20 and 75 meter bands. At some later date we plan to include this all in the same housing.

Audio Power Amplifier

We have considered it advisable to design all our equipment with negative ground due to the fact that this arrangement makes it compatible with a number of accessories which might be used. This decision got us into some extra work, however, when it came to selecting a receiver audio strip. We like the Lafayette 99B9038 1 watt audio strip at its $6.95 price and decided to alter it so it would be completely compatible with our system. We replaced the first audio driver with a n.p.n. and made other alterations as shown in fig. 4. We mounted our audio boards in the speaker cabinets. The cabinets must be metal, though and grounded to prevent any of our transmitted r.f. from being picked up and rectified which results in speaker "talk back."

While we use a 2N337 here for the first audio driver any n.p.n. would work provided it is supplied with the proper bias. One way to check the bias is to measure the voltage drop across the collector load resistor with a v.t.v.m. (an ordinary v.o.m. will not do

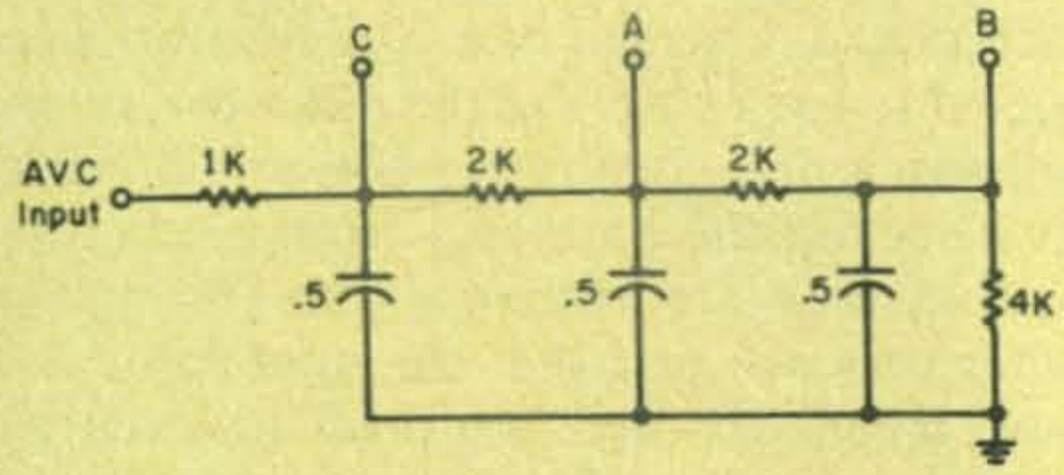

Fig. 5—A.v.c. r-c filter circuit. The input is picked up from the a.f. amplifier in fig. 4 and points A and B connect to the appropriate points in fig. 1 as described in the text. Point C above connects to the r.f. circuit of the receiver section.

here). If the drop is about 2 volts, the transistor is biased about right.

Some experts in transistor circuitry might notice that we use a number of 0.1 capacitors for coupling in our audio signal circuits where as the usual thing is an electrolytic of something like 5 mf capacity. For communications work, we have found the 0.1 mf adequate for a number of applications.

A.V.C.

While using our completed equipment, we found a tremendous variation in the level of the received signals we had to deal with as we were sometimes listening to a light plane flying right overhead and at other times to a weak signal from several hundred miles distance. Hooked up in the usual fashion we occasionally found our speaker almost blowing us out of the shack so we worked up the arrangement shown in fig. 5 where a two or three hundred ohm 1 watt resistor was placed in series with the 12 volt input line to the audio strip. This reduced the input voltage to about 9 volts. The bias on the driver transistors was adjusted for maximum sensitivity at this supply voltage. The input dropping resistor is followed by a 1000 mf capacitor which is there for the purpose of filtering out any power supply hum which might otherwise enter the audio strip when the transceiver is used in the transmit mode. This capacitor also stabilizes the input voltage over the audio envelope excursions from signals of reasonable strength. Strong local signals, however, force the Class B audio output stage to draw considerably more than normal current and this current is reflected in an additional drop across the input resistor. This results in a drastic reduction of the overall sensitivity of the audio channel and in effect acts as a sort of a.v.c. to control the output level of th speaker.

We used the system described above fo some time with a fair degree of satisfactio but subsequently attempted to improve th idea in an effort to prevent overloading ou i.f. stages on strong signals. The arrangemer in fig. 5 connected to the appropriate place in fig. 1 did the trick. By lifting our transisto bias resistors for the r.f. and i.f. stages when they attached to the positive supply at poin A and B fig. 1 and on the r.f. stage and con necting them to the a.v.c. line, fig. 5, w ended up with a workable arrangement. should be noticed here, though, that the bia resistors specified in fig. 1 are those that wer used without a.v.c. and the 33K at *A* wi have to be reduced about 25% and the 30 at *B* will need to be reduced about 50% t restore normal bias conditions to these stage with no signal input. The 1000 mf capacito at the audio strip input provides a usab attack and release time for this a.v.c. setup.

This a.v.c. system may be the simplest a rangement we have come across. It operate well enough for satisfactory communicatio

Notes

A few notes of interest might fit in we here. We do not recommend that all of th under-the-board wiring be done by the etch ing process unless considerable work in th line has been done. However the negative bu could be etched to advantage. We have n positive bus on our boards because we hav found it advantageous to make wire conne tions from each circuit to a central brass stri from which they can readily be unsolder at any time it might be necessary to check th operation of any particular circuit.

The choke and 0.01 filter in the mike inpu line are not on the circuit board but a mounted on the external chassis as close possible to the mike input plug.

We mentioned before in this article th we had placed an 0.01 capacitor from ba to ground in the output transistor (transm mode). The value of this capacitor can b varied with the purpose in mind of operatin the stage near maximum capacity whe speaking just normally into the microphon The transformer in this stage is inclined saturate with microphone inputs above no mal level. While this, at first, might be thoug of as detrimental it actually turns out to b

[*Continued on page 102*]

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INSTRUMENT LANDING SERVICE

BY KEN SCHOFIELD,* W1RIL

MANY of us have flown into airports in the States and have taxied by neatly painted orange and white checkered buildings with interesting antenna arrays mounted nearby. Of the number who have done this, it would be safe to assume that 90% had no inkling of what was in these buildings or what part the contents had to do with their safe arrival.

Enthused by the premise that amateur's should be well rounded individuals, and to enlighten those who believe these buildings to be overgrown checker boards, this article on an Instrument Landing System is presented.

The Instrument Landing System is commonly referred to in short form, as an ILS and is a result of development work conducted since 1928. Basically the ILS consists of four complete, separately located facilities, Localizer, Glide Slope, Middle Marker and Outer Marker, the combined use of which provides guidance to aircraft for landings during marginal weather conditions. Some systems have other facility components such as, Compass Locators at the Outer and Middle Markers, DME (Distance Measuring Equipment) co-located with the Glide Slope, so it would be inaccurate to say that all ILS's are the same. They do, however, produce the same basic product, electronic guidance for the landing of aircraft.

ILS Runway

Figure 1 shows a typical ILS runway, the location of the various facilities comprising the system, and a pictorial view of the radiated signals.

The Localizer facility is located at the fa end of the ILS runway. The radiation fron its antenna array gives horizontal guidance t aircraft on an ILS approach. The transmit ting equipment consists of a v.h.f. 200 wat transmitter in the 108-112 mc range, side band generator, 90/150 c.p.s. motor alter nator, modulator and driver, oscillator keye and a hybrid unit. The above equipment i usually provided in two complete sets to pro vide standby equipment in case of failure Other equipment at the Localizer are moni tors, which sample the critical parameters o the radiated signal, cause transfering o equipment when one set fails, or remove th signal from the air should any monitore parameter fail to meet established standards

Figure 2 represents a simple block dia gram of the Localizer equipment. The Local izer antenna array consists of 4 pairs o Alford loops, arranged as shown in fig. 2 The center, or carrier pair, is fed carrier plu equal 90/150 c.p.s. sidebands (a.m.), an radiate in an approximate circular pattern o uniform phase. The remaining antenna pair radiate 90/150 c.p.s. sideband energy an are connected out of phase to produce a nul along the Localizer course. The radiated energy from the sideband antennas has uni form phase on one side of the course line and uniform, but opposite phase on the othe side. The modulation recovered by an air craft receiver is the algebraic sum of the modulation components of the sideband an carrier signals. One hundred and fifty c.p.s will predominate to the right side of cente line, 90 c.p.s. to the left (facing the ap proach end of the runway), and along the center line, only carrier with equal 90/15

*21 Forestdale Road, Paxton, Mass. 01612.

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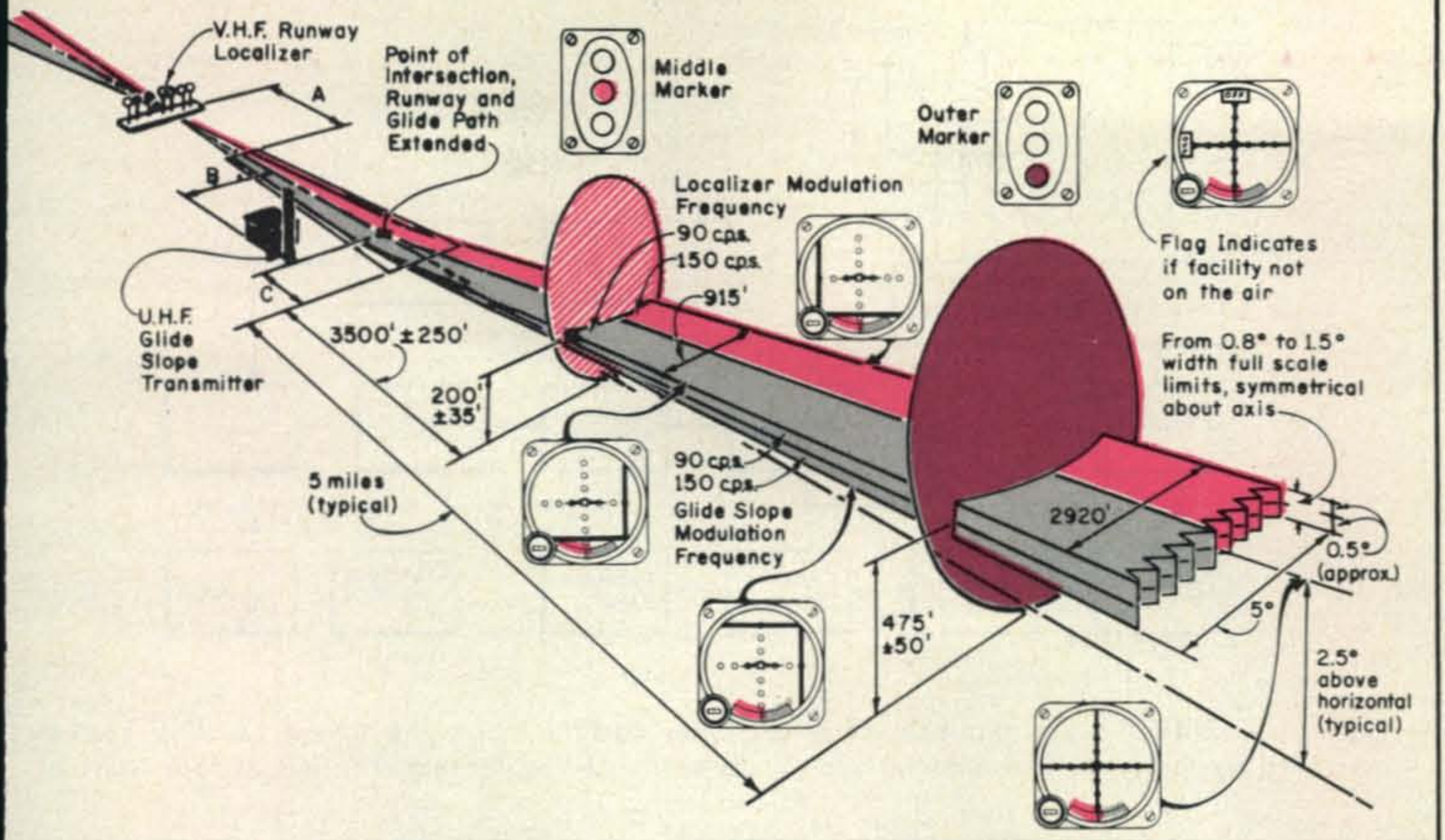

Fig. 1—Standard Characteristics and terminology of the Federal Aviation Administration for instrument landing systems (ILS). Distance *A* is typically 1000 feet with the transmitter building offset 300 feet from the runway center line. Distance *B* shows the u.h.f. glide slope transmitter 400 to 600 feet from the center line of the runway. Distance C shows the touchdown point at between 750 and 1250 feet from the beginning of the runway (about 15% of the runway length typically 7000 feet).

The Middle Marker has a 1300 cycle modulation keyed as alternate dots and dashes and is indicated by an amber light. The Outer Marker is modulated at 400 cycles keyed at two dashes a second and is indicated by a purple light. The Outer Marker is located 4 to 7 miles from the end of the runway where the glide slope intersects the procedure turn (minimum holding) altitude, ±50 feet vertically. Marker transmitters are about 2 watts at 75 mc. Compass locators in the 200 to 415 kc bands are installed at most Outer and Middle Markers. A 1020 cycle tone is keyed with the first two letters of the ILS identification on the outer locator and the last two letters on the middle locator. The distances marked by asterisks are suggested for clarity only and are not FAA standards.

p.s. will be received, which provides an on ourse indication. Modulation of the carrier y equal 90/150 c.p.s. frequency is approx- nately 20%. Voice modulation is available, eaking at 50%. Identification is accom- lished with 1020 c.p.s. at 5%.

Vertical Guidance

The vertical guidance portion of the ILS gnal is produced by the Glide Slope facility sually located off to the side of the instru- ent runway, 1000 or so feet from the ap- roach end. There are several types of Glide lopes; the one to be described here is the Null Reference type. The transmitters are .h.f., operating between 329-335 mc, with a ower output of approximately 9 watts. The Glide Slope transmitting equipment and monitors are in two sets much the same as the Localizer. Figure 3 is a simplified block diagram of a typical Null Reference Glide Slope facility.

The 90/150 c.p.s. modulation of the carrier is accomplished by means of a mechanical modulator, maintaining a specific audio phase relationship between the two modulating signals. Two signal outputs are provided, carrier plus sideband energy, (a.m.), fed to the carrier antenna, and sideband energy (no carrier) fed to the sideband antenna. The 90 c.p.s. sideband components on both signals are generated 180 degrees out of phase while the 150 c.p.s. components are generated in phase. The Glide Slope antenna system consists of two identical half wave dipoles mounted 1/4 wavelength in front of a screen reflector. The sideband antenna is so located

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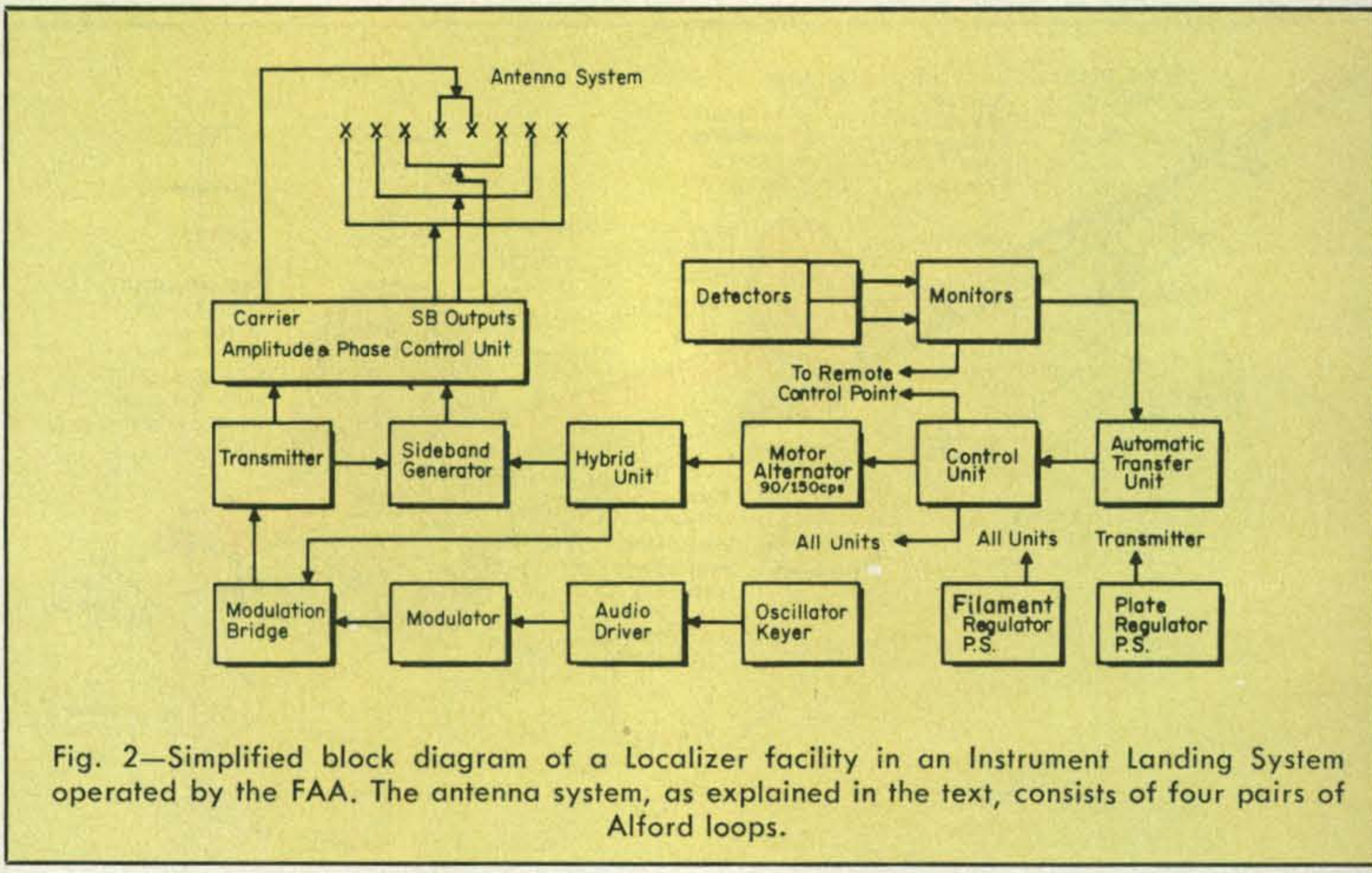

Fig. 2—Simplified block diagram of a Localizer facility in an Instrument Landing System operated by the FAA. The antenna system, as explained in the text, consists of four pairs of Alford loops.

in height above ground as to produce its first null (vertical radiation pattern) at the Glide Slope angle (2¼-3 degrees). The carrier antenna is located at 1/2 the height of the sideband antenna and produces in its first lobe a maximum amplitude (vertical radiation pattern), at the same Glide Slope angle. The aircraft receiver on the Glide Slope will receive only the signal radiated from the carrier antenna, and when above or below the Glide Slope will receive combined signals from the carrier and sideband antennas. When above the Glide Slope the 90 c.p.s. components of the signals add and the 150 c.p.s. subtract Below the Glide Slope the 150 c.p.s. components add and the 90 subtract. Figure shows a typical Glide Slope vertical radiation pattern illustrating the relative phase relationships between the carrier and sideband energy

Outer and Middle Markers

The Outer Marker is located about 4.5 miles from the approach end of the ILS runway while the Middle Marker is approximately 3500 feet. The Outer and Middle

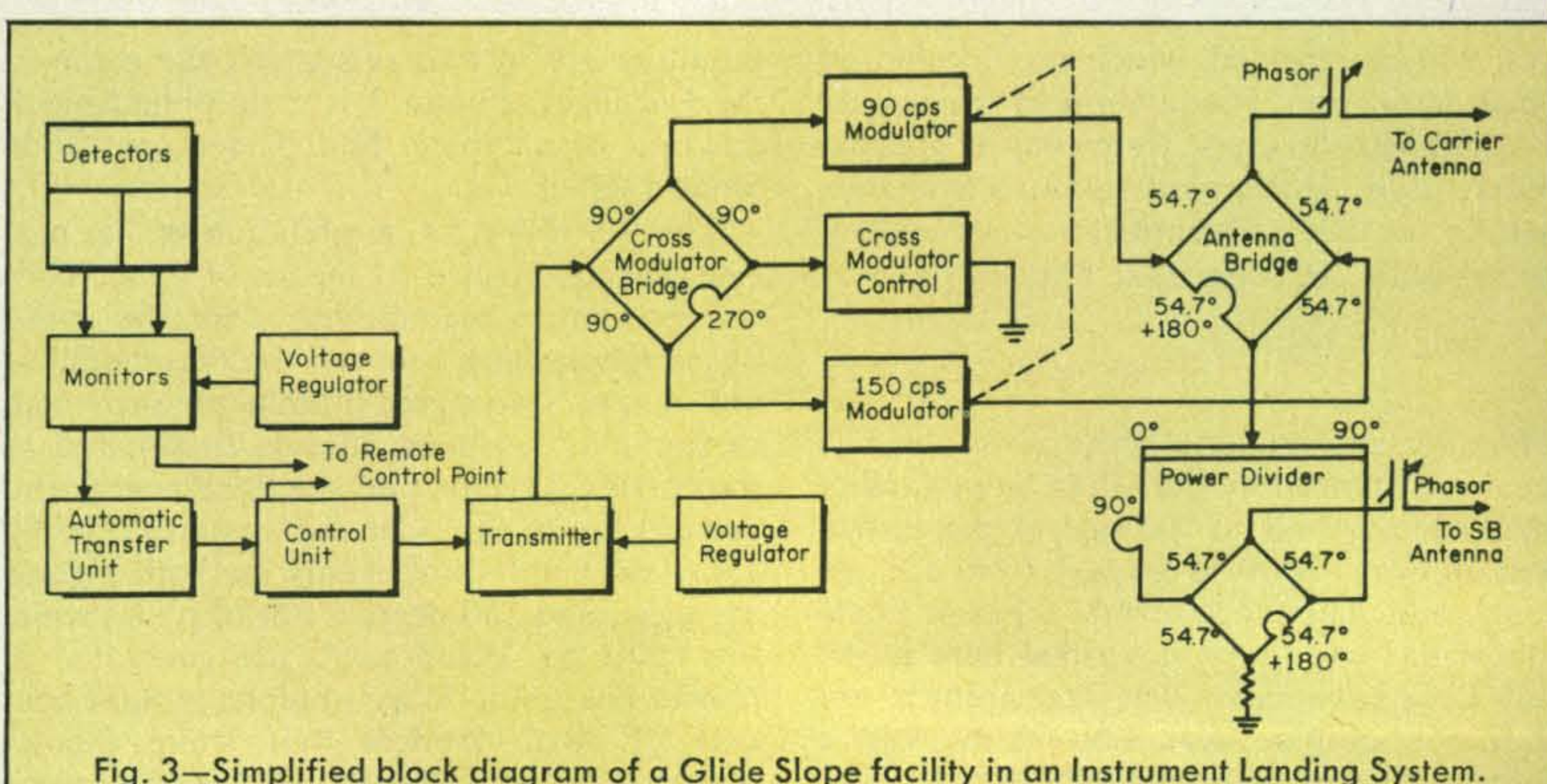

Fig. 3—Simplified block diagram of a Glide Slope facility in an Instrument Landing System.

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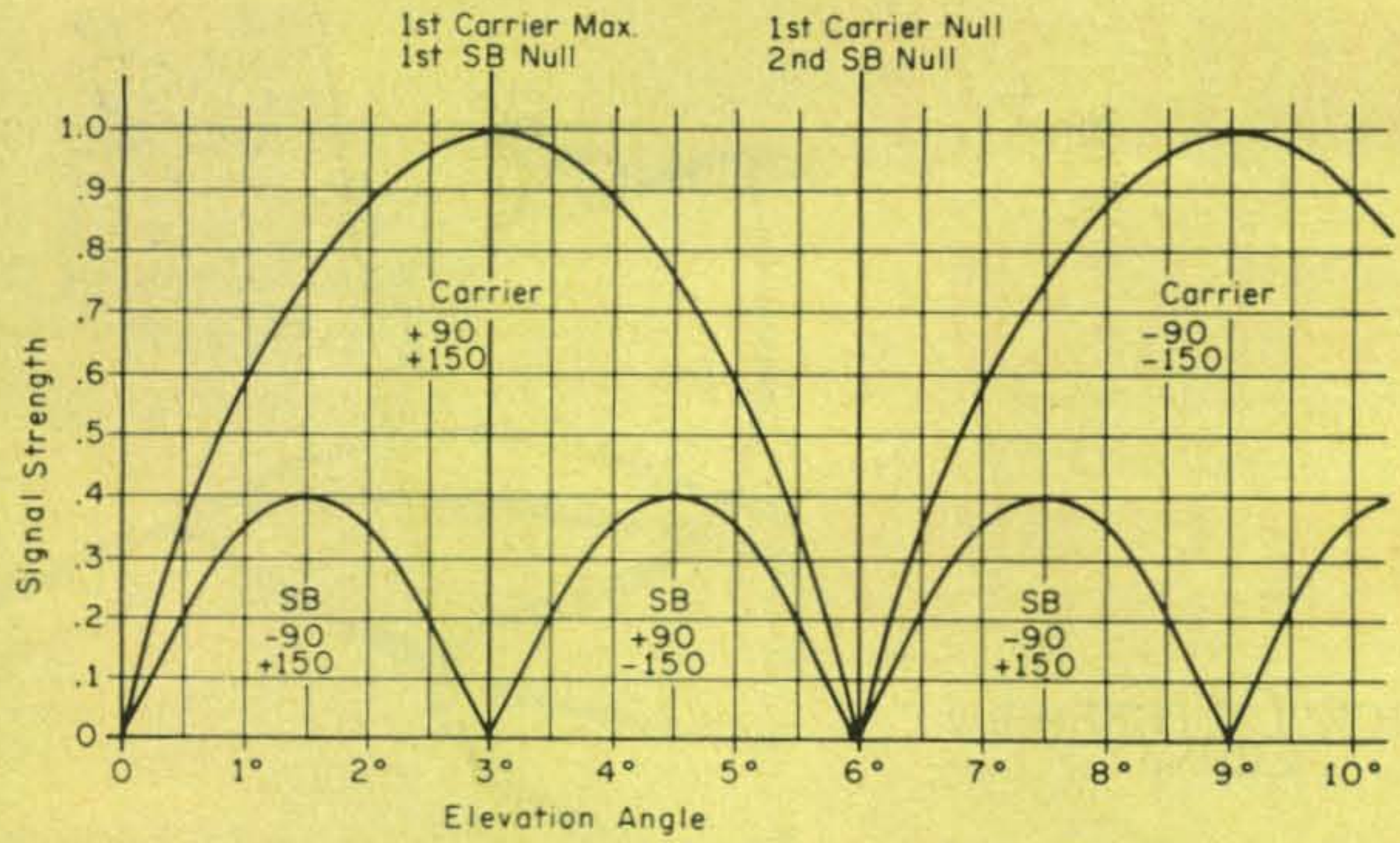

Fig. 4—Vertical radiation pattern of a Null Reference Glide Slope with a 3° angle, showing the relative phase of the modulation components.

arkers are electrically similar with the ception of modulation frequency and entification. Crystal controlled 75 mc trans- itters with an output of approximately 2 atts are utilized. Identification on the OM a 400 c.p.s. tone in continuous dashes and the MM it is a 1300 c.p.s. dot-dash tone. he Marker transmitting antenna consists a 2 element collinear 1/2 wave radiator d at the center and located 1/4 wavelength ove a counterpoise. Monitoring of both cilities is accomplished by detecting a por- on of the transmitted signal and feeding the sulting audio component, via control line, the control point. Both modulation and r.f. vel are monitored parameters.

Fail-Safe

The status of each facility of the ILS is onitored at the control point. Should an larm, transfer or shutdown occur on any of e facilities it is immediately indicated by ed lights and sounding buzzers. The moni- rs at the Localizer and Glide Slope are esigned to be fail-safe. When monitoring mits are exceeded, automatic transfer is itiated by the monitor and the standby quipment is placed into service. Should the onitor not "be happy"" with the signal para- eters being transmitted by the standby quipment the facility will be shut down. ll this can occur within a matter of seconds nd reflects the safety built into the system.

As a pilot proceeds inbound to the airport, he would intercept the Localizer on course signal approximately 10 to 15 miles from the runway, indicated by the centering of the left-right needle on the instrument panel of the aircraft. At this point in the approach, the aircraft would be at an altitude which would be below the Glide Slope on course signal and the up-down needle would be indicating a fly up condition. The centering of the updown needle would indicate to the pilot that he is on course on the Glide Slope. On passing over the Outer Marker an audio and visual signal is received in the aircraft. From the Outer Marker on, the pilot keeps the up-down, left-right needles centered to stay on course, vertically and horizontally and the aircraft would be lined up with the runway and descending at a rate determined by the Glide Slope angle. Over the Middle Marker an aural and visual signal is again received. At this point the pilot should have visual contact with the runway or approach light system.

The civil ILS facilities throughout the United States are maintained by the Federal Aviation Administration. The importance of safety in the operation of this equipment cannot be overemphasized It is built into the equipment and is a 24 hour a day, 365 day a year concern of the FAA personnel managing and maintaining it.

There are approximately 264 ILS systems installed in the United States. The next time you land, look around, chances are one will be there. You'll know where, and why. ■

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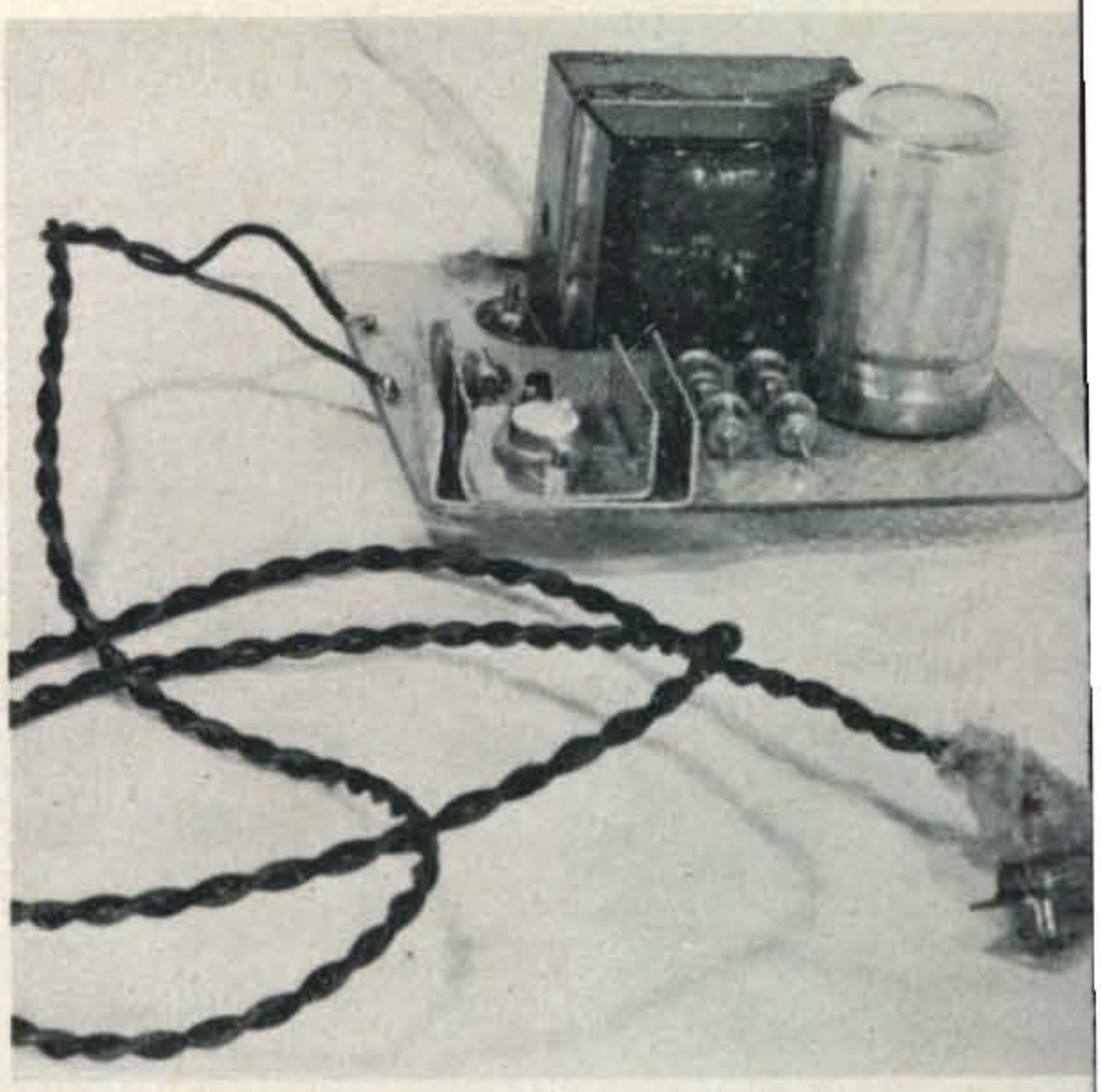
A SIMPLE 12V REGULATED POWER SUPPLY



BY RICK LITTLEFIELD,*
KIBQT

THIS power supply is intended for those of you who, like myself, build solid state transmitters and receivers for either home, mobile, or portable use. Although originally designed to operate a homebrew 7-watt six-meter transceiver, it also serves as a voltage source for bench projects in my apartment sized mini-lab. It provides 12 volts of clean, well regulated d.c. under continuous 600 ma service and will deliver up to 1 amp under intermittent cond.

The circuit begins with T_1, which can be any 12.6 volt filament transformer with a current rating of 2.5 amps or greater. Transformer T_1 feeds into the bridge rectifier configuration CR_1-CR_4. Filtering is accomplished for the most part by C_1, this case a 2700 mf 25-volt electrolytic.

The next step is the regulator circu Transistors Q_1 and Q_2 form a Darlingo pair controlled by a 13.5-volt zener diod The zener provides a reference voltage f Q_1, which in turn controls the series reg lating action of Q_2. Since the combin emitter to base voltage drop across Q_1 a Q_2 is equal to about 1.5 volts, a 13.5-v zener is necessary for a supply output 12 volts. Resistor R_1 sets the zener curre within the correct operating range, and eliminates any a.c that may appear acro the zener. Resistor R_2 serves as a bleed load for the supply output, and C_3 elimi ates the danger of high frequency oscill tion in the regulator. Fuse F_2 helps protect the circuit from overload.

Construction of this circuit is by n means critical, and it can be tailored to f your own particular needs. Mine has bee operating for months in breadboard forn However, I eventually plan to rebuild on an aluminum chassis. Also, it could b built into an existing piece of equipmer or designed into a new project. The or important consideration is that Q_2 be pr vided with a good heat sink. With a mic chassis mounting kit and a dab of silico grease, any aluminum chassis will serve a an adequate heat dissipator.

Again, this little circuit has produce excellent results for me. Its reliability an potentially compact dimensions are we worth considering if you wish to power fixed-mobile 12 volt piece of solid stat equipment.

*4 Main Street, Durham, New Hampshire 03824

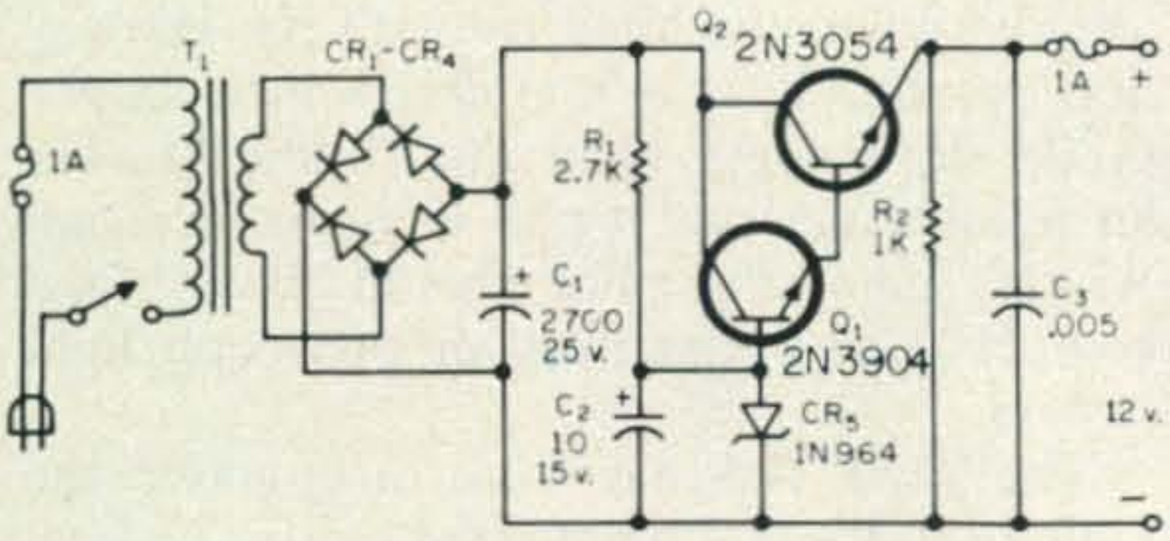


Fig. 1 - Circuit of a 12 volt regulated power supply for operating solid state equipment. Transistor Q_2 must have a heat sink, if only the metal chassis. All capacitors are in mf and both resistors are ½ watt.

CR_1, CR_2, CR_3, CR_4 - 1N4721 or 1N4719
CR_5 - 1N964 zener diode.
T_1 - 12.6 volts at 3 amps.

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POWER

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VERTICAL ANTENNAS

Part XI

BY CAPTAIN PAUL H. LEE,* W3JM

The effects of earth on the efficiency of radiation and the vertical patterns to be expected from a vertical antenna are often misunderstood or are not understood or are not understood at all. In this installment, the author discusses these effects in two phases. The first deals with the earth near the antenna and the need for a good ground system. The second is the effect of the earth in the reflection zone on the shape of the vertical pattern.

THESE articles have brought much mail, most of which has been from readers interested in using vertical antennas on 75 or 160 meters. The recent power increases authorized on 160 meters, plus the increased availability of s.s.b. equipment for that band, have just about doubled its "population" during the past six months. Because of space restrictions, most of the stations on that band are using verticals of one form or another. There has also been some mail from amateurs on 10, 15, 20 and 40 meters for DX contacts. One of these amateurs announced that he had made the discovery that the could tune and operate a half wave vertical without a ground system, driving it either by a parallel tuned tank or an "L" network whose lower end is grounded. He claimed that since a thermocouple ammeter in the ground lead showed no current, he cou dispense with the ground system and its losse He stated that although this series had so f covered the current fed antennas very we I should now "discover the new world of t half wave vertical with no ground system Actually, he was voicing a popular misco ception about ground systems and the ne for them. This moved me to write this pa of the series, to present a rather complicat subject in as clear and simple a fashion possible.

There are two areas of interest when o studies the effect of the earth on radiati from vertical antennas. One of these is t area immediately beneath and surroundi the antenna, and the losses which occ therein which make a ground system nece sary. The other area is that of the reflecti zone, or as it is called by those of us in t business, "the Fresnel Zone." I shall discu the close-in area and ground systems first.

*5209 Bangor Dr., Kensington, Maryland 20795.

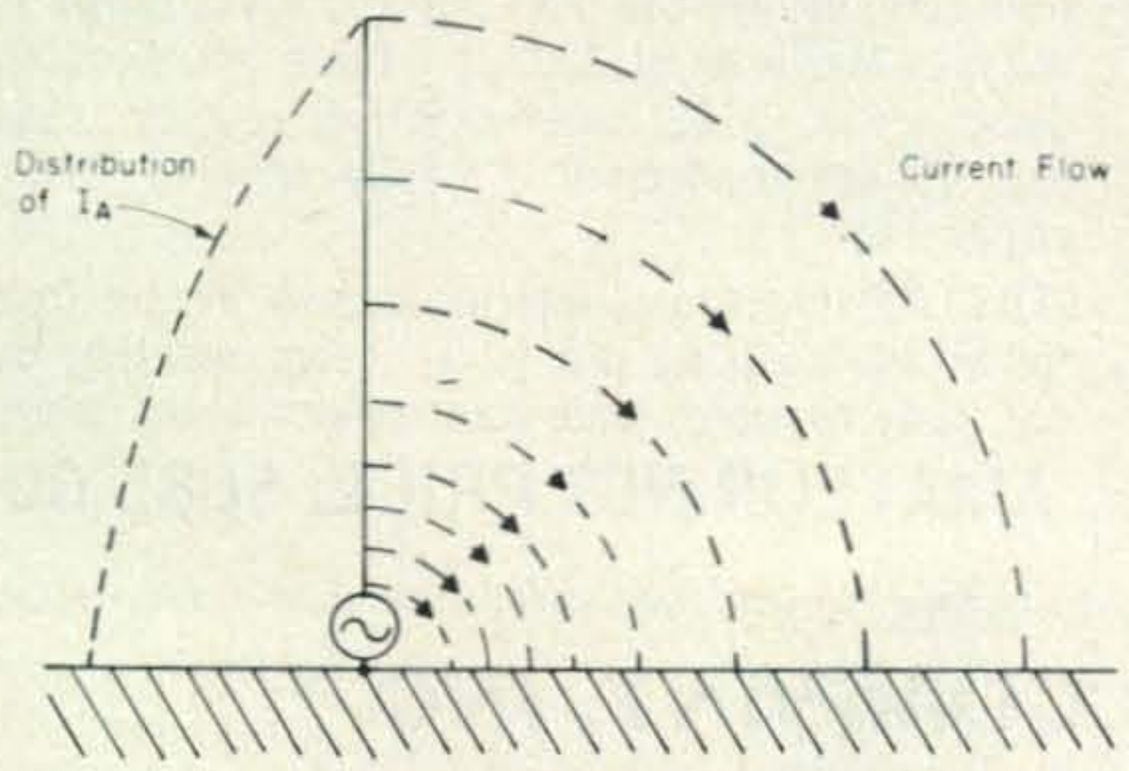

Fig. 99 — Current distribution along a quarter wave vertical and flow of r.f. currents into the ground.

Earth Conductivity

There have been many studies made a many papers written on the subject of ear currents and ground systems and their effe on antenna radiation efficiency. G.H. Brow whom we have met before in this series, pe formed an excellent analysis and confirmed by practical experiments.[79,80] R. C. Hil

[79]Brown, G. H., "The Phase and Magnitude Earth Currents Near Radio Transmitting A tennas", *Proc. of IRE*, Feb. 1935, p. 168.

[80]Brown, G. H. et al, "Ground Systems as Factor in Antenna Efficiency", *Proc. of IR* June 1937, p. 753.

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3HRH, a well known radio engineer in his wn country, wrote a very fine paper on the bject covered by this Part.[81] The matter is so covered quite thoroughly in technical ocuments of the International Radio Con-ltative Committee (C.C.I.R.) of the Inter-tional Telecommunications Union (I.T.U.), eneva, Switzerland.[82]

All materials are conductors of electricity. me are very much better than others, and me are very much poorer than others. The tter are sometimes called insulators. The rth is a conductor, and one may find fferent levels of ability to conduct for the rious geological types of earth surface. hen current flows in the earth's surface, the ell-known "skin effect" occurs.

Radio engineers who deal in h.f. and v.h.f. ork have to take this "skin effect" into nsideration in the design of conductors d inductors. Simply stated, the current tends concentrate near the conductor's surface, th the depth of penetration being less at gher frequencies. Usually, conductors are a homogeneous nature. However, the rth is not homogeneous, being made up of rious geological layers. It has been found, r example, that v.l.f. and e.l.f. waves pro-gate very well through certain types of ological formations, while they are rapidly tenuated by others. At frequencies of 2 mc more of the current will flow in the upper yer of soil of good conductivity, rather an through underleyins strata.

Depth of penetration is a function of the nductivity, and it is greater for poorer con-ctivities. The following table shows depth penetration.[82]

Hills, R. C. "The Ground Beneath Us", *RSGB lletin*, June 1966, p. 375.

Determination of the Electrical Characteris-s of the Surface of the Earth", Documents of IXth Plenary Assembly, Los Angeles, 1959, l. III—Reports, Report No. 139, p. 267.

Frequency (kc)	Depth (meters)		
	$\sigma = 5\times10^{-11}$ $\varepsilon = 81$	$\sigma = 1\times10^{-13}$ $\varepsilon = 10$	$\sigma = 1\times10^{-14}$ $\varepsilon = 5$
10	2	50	150
100	0.67	15	50
3000	0.20	5	17
10000		2	9

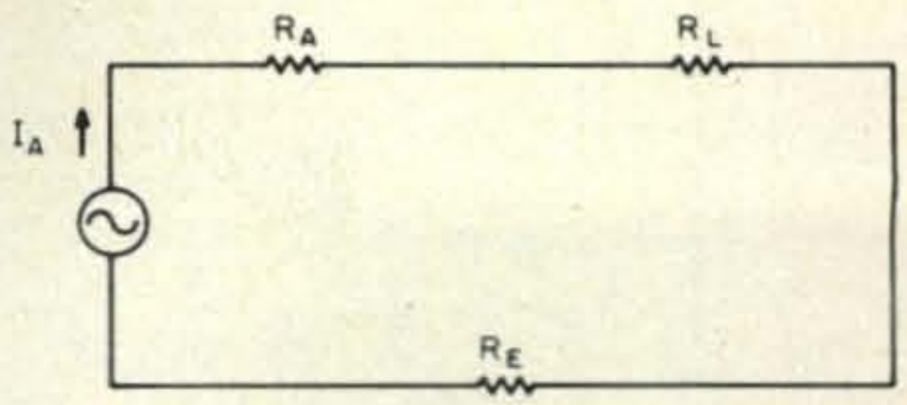


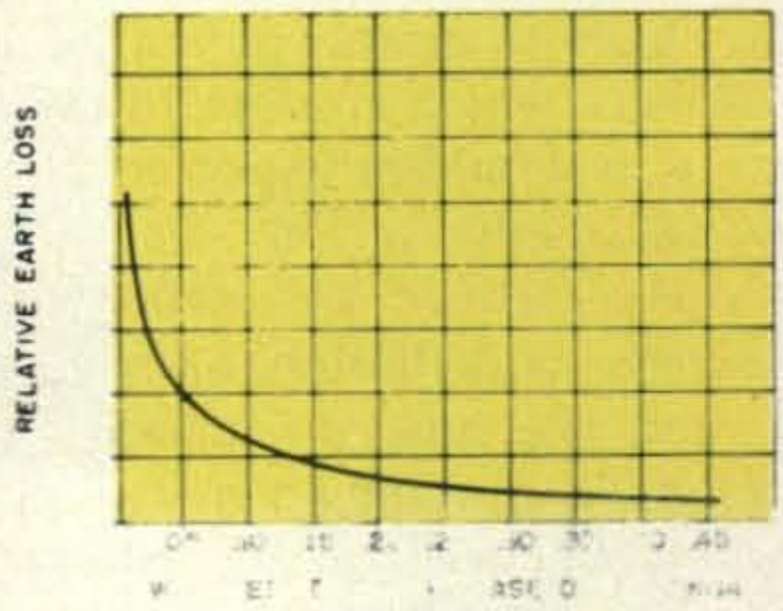
Fig. 100—Equivalent circuit of fig. 99. The radiation resistance is R_A, conductor losses R_L, and the effective ground resistance is R_E.

It may be seen that depth of penetration is also inversely dependent on frequency.

The permittivity[83] of the earth as a dielectric also has an effect. Below about 2 mc it is not important, but at the higher frequencies it becomes increasingly important in considering the earth's role as a reflector. Generally, higher permittivity is associated with higher conductivity, and therefor the effect of earth is usually spoken of as depending on its conductivity.

In the first area of interest, that near the vertical antenna, the earth acts as a return path for the flow of r.f. currents. Let us consider first the case of the quarter wave vertical antenna, current fed at its base. Figure 99 shows the current distribution along the antenna, and the flow of r.f. currents into the ground. The current in the antenna induces charges in the earth surrounding it, which give rise to the circulating current which flows back to the generator. This flow of current is at a depth of penetration which, as mentioned above, depends on frequency and on ground conductivity decreasing as both in-

[83]Permittivity it the property possessed by a material to permit an electric force field to be set up in it with greater or lesser effectiveness. If a material has a high permittivity an electric field will produce more effect in it than it would in a material of low permittivity.



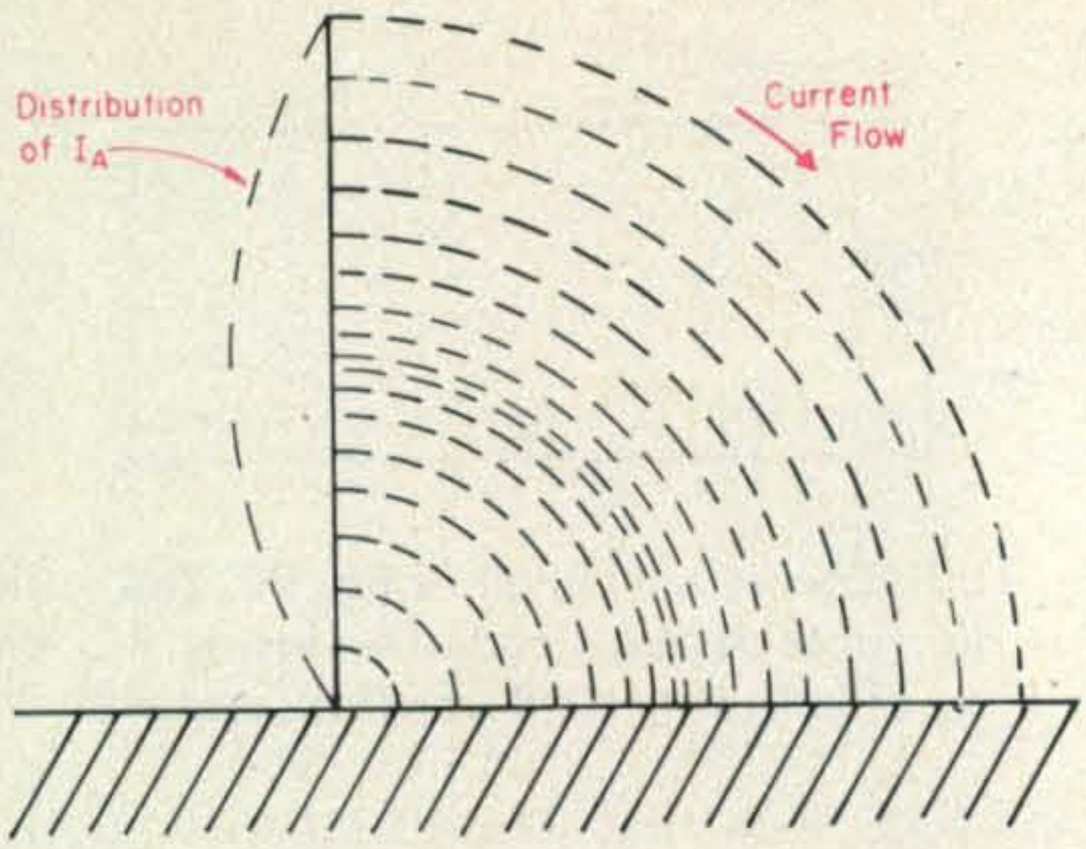


Fig. 102—Current distribution along a half wave vertical antenna and the flow of r.f. currents to ground of a halfwave antenna.

crease. The effect of this can be represented schematically by the series circuit of fig. 100, which shows r.f. power being dissipated in the several resistive elements of the circuit, which are the radiation resistance, R_A, the ohmic conductor losses, R_L, and the effective earth or ground resistance, R_E.

The standard practice is to make the radiation resistance as high as possible while making losses as low as possible, thus giving the highest efficiency. Ohmic losses can be kept low by proper design of inductances and use of low loss capacitors. Earth resistance, on the other hand, is something which is inherent to one's location, and unless one wishes to move the home and family to a new location, chosen on the basis of earth resistance, one has to live with it as it happens to be and make the best of it.

There is something one can do to make the best of it and that is to reduce the earth losses by the use of a ground system. Brown determined the distribution of earth currents and earth losses both analytically and experimentally.[80,81] The distribution around a quarter wave vertical antenna is shown in fig. 101. It may be seen that the current and the losses are highest in the region of greatest current density which is close to the base of the antenna, as would be expected.

Half Wave Antennas

The current distribution on a half wave antenna, and the flow of currents into the ground from it, are shown in fig. 102. The series circuit schematic of fig. 100 applies in this case also. Here again it is necessary to keep the earth losses and ohmic losses as low as possible. The distribution of earth currents and losses around a half wave vertical antenna whose base is close to earth is shown in fig. 103. Brown determined experimentally that the region of maximum current and lo occurs at a distance of about 0.35 wavelengt from the base of the antenna. There is ze loss at the base of the antenna itself, ina much as there is no base current because t antenna is fed at a current node. A therm couple ammeter in the ground lead at th point will read *zero*. However, don't be d ceived by this phenomenon, because a the mocouple ammeter in the antenna lead w also read zero.

Efficiency Versus Earth

Figure 104 shows the variations in a tenna radiation efficiency over earth, for se eral values of effective earth resistance ar various antenna heights (lengths of vertic radiator). It may be seen from this figure th with low effective earth resistance provide by a good ground system, the short vertic radiator (one eighth wave or so), can be qui efficient. It may also be seen that for a give effective earth resistance the efficiency d pends on the antenna's radiation resistanc which for a short antenna is less than that a tall antenna. There is not too much diffe ence between a half wave and a quart wave antenna provided that the effecti earth resistance is low. There is considerab difference between antennas of vario heights when effective earth resistance high. This set of curves very effectively sho that low effective earth resistance provide by a good ground system is an *absolu necessity* for vertical antennas of *any* heigh if good radiation efficiency is desired.

The correspondent's claim that one do not need a ground system under a half wa vertical radiator is true *only if he is conte to throw away from 40 to 80 per cent of h radiated power in the form of earth losse* He stated, "The ZL's *call me*, when I use n half wave vertical!" This is not surprising, view of the fact that the half wave's vertic pattern has a lower main lobe angle than quarter wave would have, and lower tha that of the usual horizontal Yagi array. Hov ever, he would hit the ZL's even harder if h would put in a ground system. Of course, th half wave vertical antenna is not depende on a ground plane, however lossy or efficien for the condition of *resonance*, since it *resonant in itself* because of its half wav length. However, *it is dependent on a groun*

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ne for its efficiency of radiation, as is any tical antenna. Actually, the 5/8 λ vertical etter than the half wave vertical from the ndpoints of low angle radiation and feed nt impedance.

The Ground Plane

How does the ground plane function? at should be its configuration? To answer se questions, one should look back at fig. and 102, which show the necessity for a urn path to the base of the antenna, and at 100, which shows the effective series cuit. Since the currents have to flow from points in the earth surface to a common ntral point (base of the antenna), it natuly follows that a *radial* configuration of nductors is required. Remembering what s previously said about the depth of penetion of earth currents being inversly protional to frequency, and recalling that ses in the earth increase with frequency, it lows that the radial wires should be buried se to the surface, for h.f. work. In case of awn or other sodded area, let them be just ow the level of the sod, at two or three hes depth. One of the half-round lawn ger blades, with a long handle, is ideal for king a slot in sod. By moving the handle erally as one steps on the blade, the slot may opened and the sod pushed aside for an h or so, and the wire dropped or pushed init with a narrow stick of wood. The wire ould be at least number 16 in size. Belden o. 8012, #16 tinned copper, in 1000 foot ls, makes excellent ground radial wire. This antity will make 25 radials of average gth of 40 feet.

How many radials are required? Reference ould be made to fig. 9 & 10 of Part I[84] to te the effect of varying the number and ngth of radials. Refering to fig. 104, a ound system of at least 120 radials a half ve long would be required to give an effece earth resistance of from 2 to 5 ohms. In e case of a short radiator, it is more impornt to have a large number close in, as own in fig. 105. If the configuration of e's property limits the length of radials in particular direction, a larger number of dials should be laid down where they have be short than where they can be nger, to improve the return path for the rth currents in the "short" sector, to keep

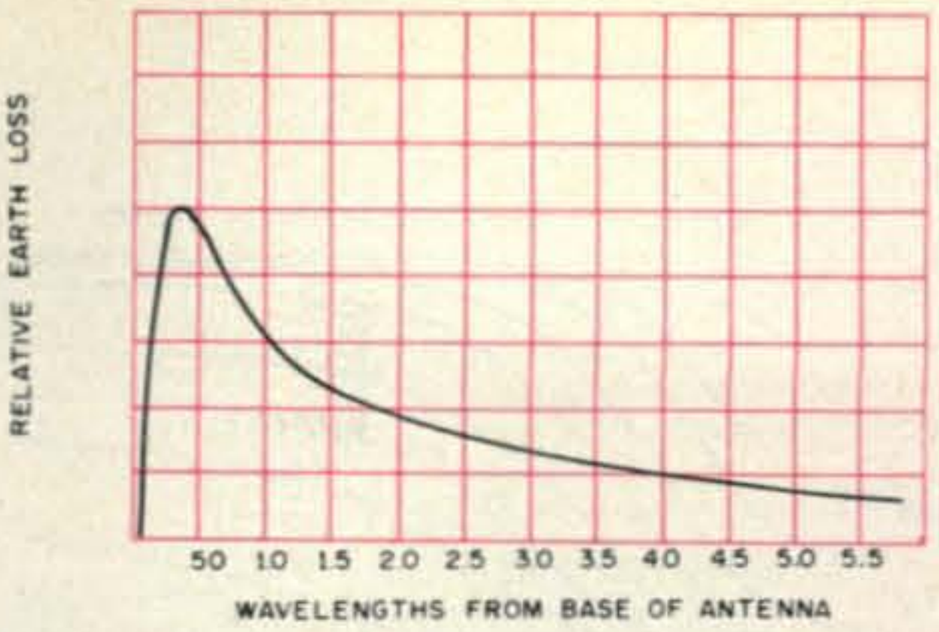

Fig. 103—Distribution of earth losses plotted against distance, in wavelengths, from the antenna base.

the losses down. In the case of the half wave radiator, however, there need be no larger number close-in, because the current density in that region is low. Instead, there should be a large number *as long as possible*, preferably a half wave long, for lowest losses and greatest efficiency, bearing in mind that the region of greatest current density occurs from about 0.35 wavelengths from the antenna on out to further distances.

Since not everyone has enough property for such long radials, it could actually turn out that a quarter wave antenna with a large number of short radials might be more efficient, although its angle of main lobe radiation would be higher. If one were fortunate enough to be located on a body of water, with its inherent high conductivity, one would indeed have a very fine site for an antenna of any height, with a low loss ground plane.

Fresnel Zone

The second area of earth influence is that of the reflection zone, or "Fresnel Zone." Here again the earth conductivity plays a part, although not such a great one as it does in the launching of the wave in the immediate area of the antenna. In practice, all antennas must be installed at some finite distance above ground, or with base on the ground. Therefor their vertical radiation patterns are always influenced by the earth, and never, never conform to the patterns for "free space" conditions. The signal radiated at any angle is the vector sum of the direct ray and the reflected ray. Consider fig. 106, wherein a dipole is located at a distance h above ground. For horizontal polarization:

$$E'_\theta = 2\,E_\theta \left(\sin \frac{2\pi\,h}{\lambda}\right) \sin\theta$$

where: $E\theta$ is the resultant field at a distant point,
$E\theta$ is the field at the same point, in free space,

Lee, P. H., "Vertical Antennas–Part I", *CQ*, ne 1968, p. 16.

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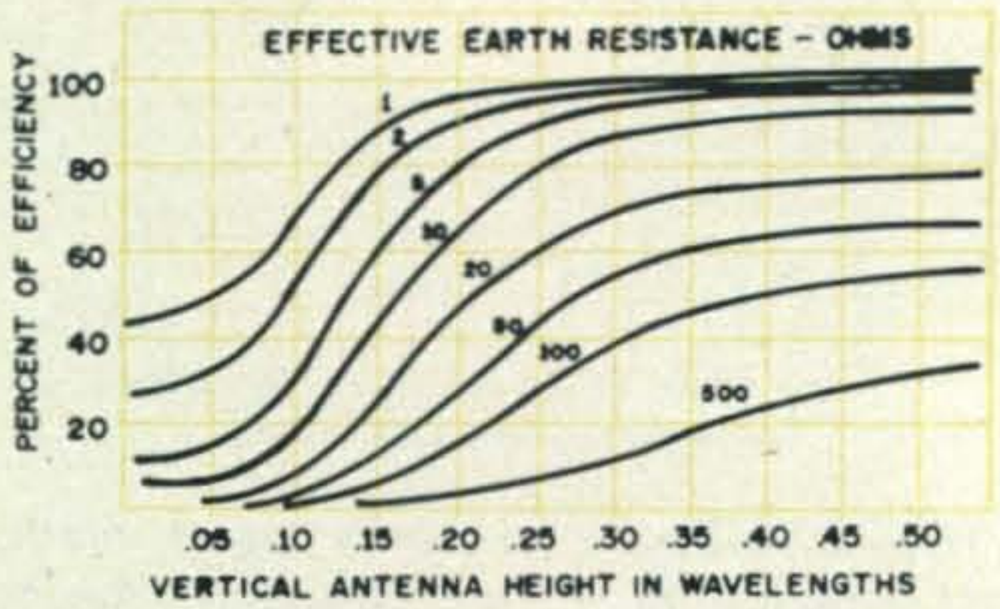

Fig. 104—Efficiency of radiation for antennas of different heights over various values of earth resistance.

θ is the angle of elevation of the point, and
h is the height of the center of the dipole above ground in wavelengths.

$$E'_\theta = 2\,E_\theta \left(\cos \frac{2\pi\,h}{\lambda}\right) \sin\theta$$

These two equations are of the same basic form, the difference between them being that in the case of horizontal polarization the wave is reflected with a phase shift of 180° at the reflection point, and with vertical polarization there is zero phase shift. *This is only with a perfectly conducting reflecting plane,* which is never the case in actual practice, although sea water approaches it.

In the "real life" case, with an imperfectly conducting earth, there is an effect called the "Brewster Effect," named after an English physicist, Sir David Brewster, who investigated certain optical properties of reflecting planes as related to polarization of incident light waves. Using non-polarized light, Brewster found that it was partially reflected and partially refracted at a plane surface, such as the surface between air and glass. (You snorkel fisherman may be aware of this effect as you look upward from below the surface of the water.) He discovered that there is a critical angle at which the reflecte wave is totally plane polarized. In the ca of radio waves and the earth's surface, it the horizontal component which is reflecte at the critical angle, and the vertical com ponent which is reflected or suppressed. S fig. 107. If the earth were a perfect diele tric, the critical angle would be 15° above t horizontal. However, it is not a perfe dielectric nor is it a perfect reflector, a energy will be lost at the reflection point in the earth. The ground reflection coefficie and the Brewster Angle will therefore va with ground conductivity.

Figure 108 shows the phase and amplitu of the ground reflection coefficient for varyi angles of incidence of a vertically polariz wave. The curves for higher frequencies m be taken to represent the trend for poor conductivity at the lower frequencies. Figu 109 shows the same thing for a horizontal polarized wave. The following relationsh applies:

$$Reflection\ Coefficient = \frac{Reflected\ Wave}{Incident\ Wave} \angle \underline{\phi^\circ}$$

What do these curves show us? We c easily see that there is a "suck-in" or atte uation of the low angle radiation from vertical antenna, plus a large phase shift the reflection point for very low angles incidence. On the other hand, with the h izontal antenna there is very low attenuati at the reflection point, but there is almo 180° phase shift at all angles of incidenc This tells us then that the horizontal antenn to have any good low angle radiation, mu be located at considerable height above t earth (at least a half wavelength and prefe ably higher) to equal the low angle perfo mance of the vertical. This fact, coupled wi mechanical and structural considerati plus those of available space, make the ve tical an ideal choice for the three low band 40, 75 and 160 meters. There is anoth benefit to be gained, also, and that is the fa that with a good ground plane and a quart wave antenna whose maximum current is the base of the antenna, the rays that accou for most of the radiation from the anten emanate from its lower portion of hi current and their reflection points will

hereby incurring less loss than if they were o fall at some distant points beyond the con- rol of the station owner. In fact, if one were o assume that the center of radiation of the uarter wave vertical is at a very small dis- ance above ground, for the sake of the form- las and curves above, the results would not e very far from reality as far as the vertical attern shape is concerned. There would be ome suck-in at low angles, which would epend to a great extent on the excellence of he ground plane itself. With a computer one an actually compute the vertical plane pat- erns from antennas of various heights, taking nto account the various ground conduct- vities which exist in different areas of the ountry.

This might all be summed up by saying hat *ground systems are very important*, and hat the conductivity of the earth itself is also vital factor in antenna efficiency. The fol- owing points should be observed, when in- talling a vertical radiator:

a. Install as many radials as possible, as ong as possible, in your ground system.

b. A short radiator can be quite efficient f ground radials are of sufficient number and ength to keep earth losses low.

c. If you use a halfwave or 5/8 wave adiator, use radials of at least one half wave ength, if possible, to keep earth losses low nd to enable you to realize the full benefit f the added height and its increased low ngle radiated field.[80,82,85]

d. Radials should be at least #16 copper ire, and should be brazed or soldered to a opper strap of 2" by 1/16" size around the ase of the antenna. If the antenna can be ocated on top of a sheet of copper or ex- anded copper screen, about two or three eet square, this is ideal as a tie point for the adials.

e. Soft or hard solder may be used. If it is sed, all soldered joints should be coated ith an asphalt paint or compound to pre- ent them from corroding when buried. Asphalt roofing cement or tile cement, when eated to make it more fluid, is ideal for this. A soldering torch should be used for solder- ng. Do not rely on the limited heat from a oldering iron. Brazing or silver solder is est.

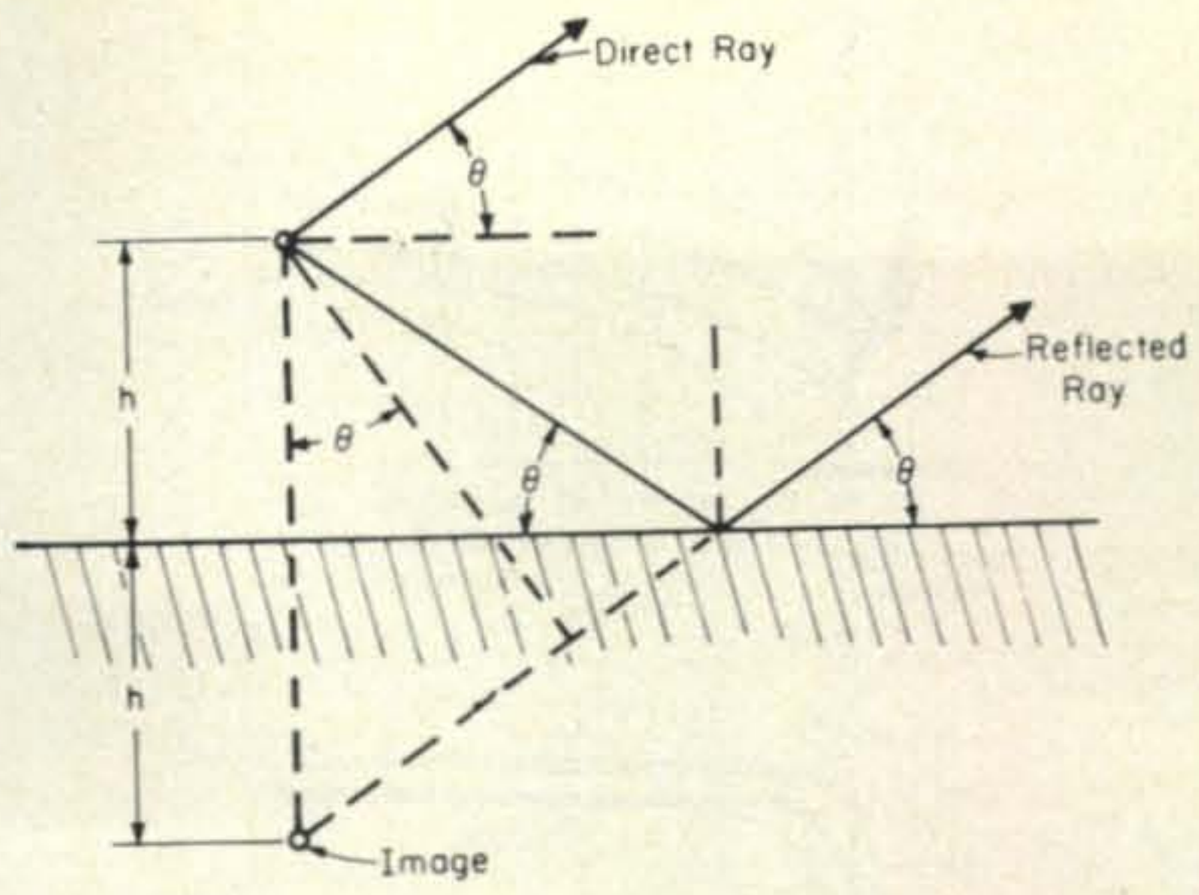

Fig. 106—Relationship between the direct and reflected wave from a dipole located a finite distance above ground.

f. Do not cross radials or tie their distant ends together. This avoids circulating currents which could cause loss.

g. If a Gamma Match type of feed is used with a grounded tower, the connection between tuning unit and tower should be heavy because it will have to carry considerable current if the feed point resistance is low.

h. Radials should be buried about 2 or 3 inches, just enough to get them under the sod for protection.

Summary

In closing, let me relate some personal experience. When I started operation at this location in 1959, I installed 8 radials of #9 aluminum wire, and several years later added 8 more. In the intervening years the aluminum has gradually corroded and been eaten away, and recently I was not sure how much

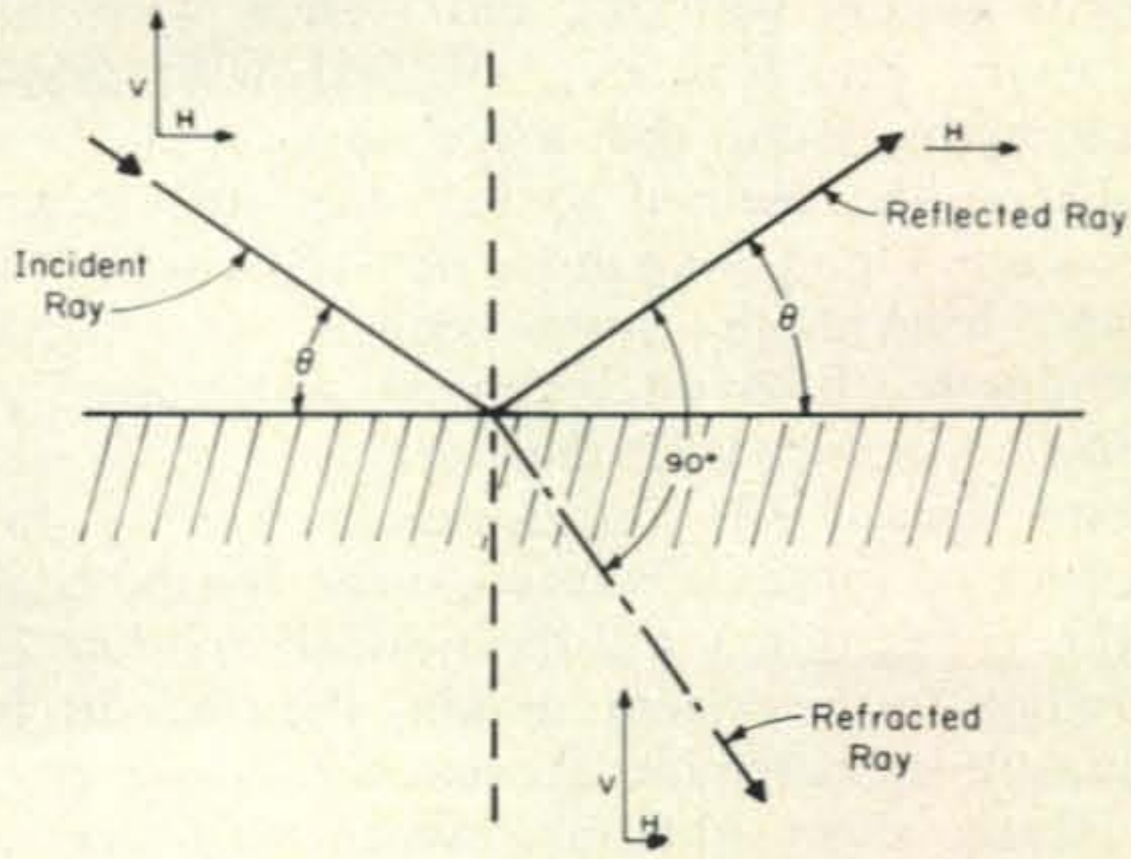

Fig. 107—Relationship between the reflected and refracted rays. The polarizations are shown for each ray.

[85]"HF Vertical Plane Patterns of Monopoles and Elevated Vertical Dipoles With and Without Extended Ground Systems", *Naval Electronics Laboratory Center Report* 1567, 25 June 1968.

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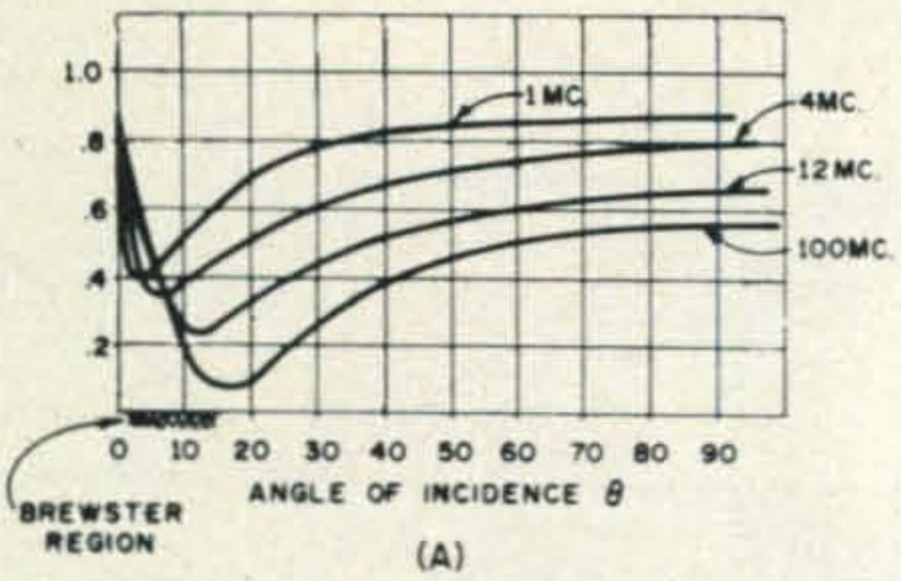
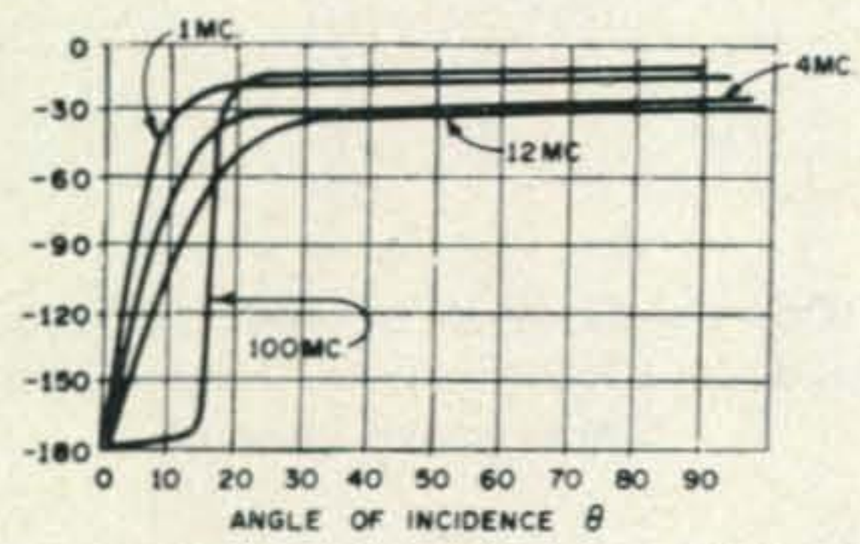


(A)



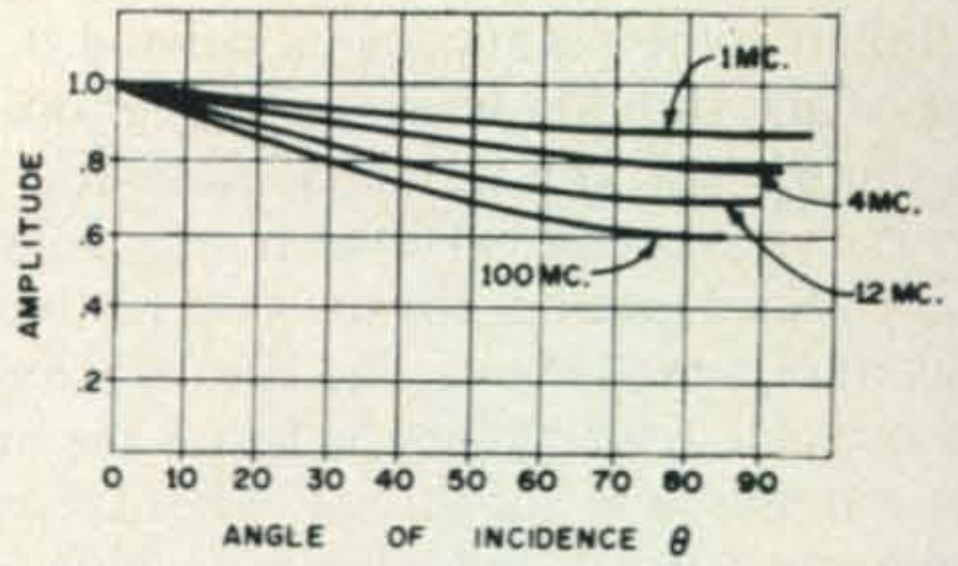
FOR GOOD EARTH, $\sigma = 12 \times 10^{-14}$ E.M.U. AND E=15

(B)

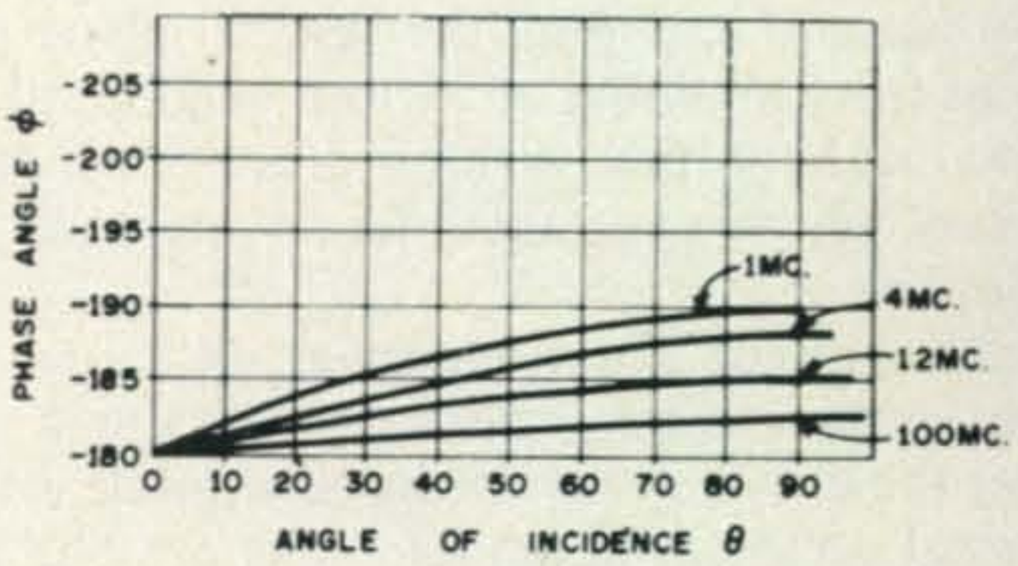
Fig. 108(A)—Amplitude of the ground reflection coefficient for various angles of incidence at different frequencies, (B) Phase angle for various angles of incidence at different frequencies. Both plots are for a vertically polarized wave. For good earth conductivity:

$$\sigma = 12 \times 10^{-14} \text{ e.m.u.}$$

and $\varepsilon = 15$.



(A)



(B)

Fig. 109(A)—Amplitude of the ground reflectio coefficient for various angles of incidence at dif ferent frequencies for horizontally polarize waves. (B) Phase angle for various angles o incidence at different frequencies for horizon tally polarized waves for good earth conductivity

ground system I actually had left. Not wishing to dig it up to find out, I bought 1000 feet of #16 copper and proceeded to install 50 new radials, of varying lengths from 35 to 80 feet, at intervals of about 7° around the Mark IV Antenna.[86] I had been working on 160 meters with the old system with fair results, but was not satisfied with signal strengths from the more distant stations. There had seemed to be some loss in the system. Upon tying in the new radials I noted an immediate improvement in signal strengths, both on receiving and transmitting, especially with the stations in more distant areas. The improvement was of the order of three or four S-points. By the time this is in print, I will have added another 24 radials to the system, making the total 50, to reduce the earth losses even further. An electrically short antenna, which this one is (about 0.16 wavelengths tall on 160 meters), can be quite efficient when earth losses ar kept low.

[86]Lee, P. H., "Mark IV DX Antenna", *CQ*, Feb. 1967, p. 60.

Correction

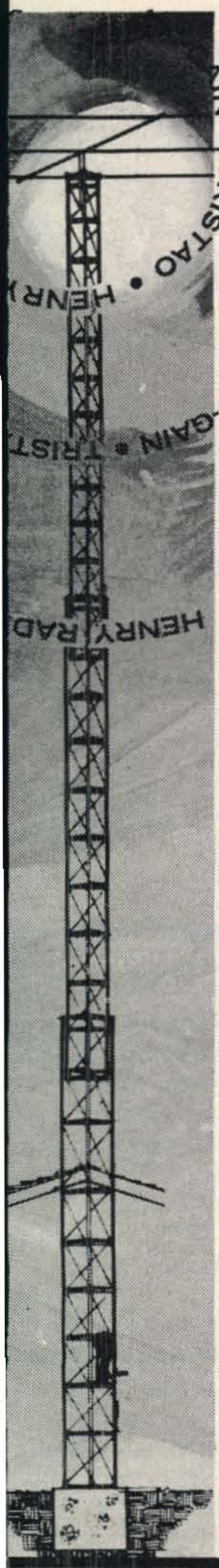
We regret an error in Part IV of this series in the September 1968 issue. In Figure 32 page 42, the designations of the two curve (resistance and reactance) were inadvertentl reversed. However, this does *not* make th numerical values for mutual impedance use in Parts VIII and IX incorrect. The value used in the examples were taken from cor rectly labelled original.

(To be continued)

ANNOUNCEMENT

Next month we conclude this twelve part series, "Vertical Antennas," by Captain Paul H. Lee. If you have missed any part of this series and wish to obtain earlier installments, write to: *CQ* Circulation Department, 14 Vanderventer Avenue, Port Washington, New York 11050. Issues published during 1968 are priced at $1.00 each and 75¢ for those published in 1969. These prices include postage.

See page 110 for New Reader Service



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Hy-Gain TH-3 Jr. antenna	**$325.00**
Hy-Gain TH-2 Mk 3 antenna	**$325.00**
Hy-Gain DB 10-15A antenna	**$325.00**
Hy-Gain 203BA antenna	**$330.00**
Hy-Gain TH-3 Mk 3 antenna	**$375.00**

A savings of approximately $70.00

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***Tristao CZ-454 New Concept 60 ft. crank-up tower w/mast**
CDR TR-44 rotator
100 ft. RG-58 A/U Coax
100 ft. Control cable

Complete with one of the following:

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Hy-Gain TH-2 Mk 3 antenna	**$480.00**
Hy-Gain DB 10-15A antenna	**$480.00**
Hy-Gain 203BA antenna	**$485.00**
Hy-Gain TH-3 Mk 3 antenna	**$520.00**

A savings of approximately $90.00

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***Tristao CZ-454 New Concept 60 ft. crank-up tower w/mast**
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AUTOMATIC REPEATER REQUIREMENTS

BY MARSHALL LINCOLN,* W7DQS

There is nothing to be found under "repeaters" in Part 97 of the FCC regulations but operation of a transmitter from a remote control point is covered in 97.41. Here are some answers to questions about repeater operation supplied by Ben F. Waple, FCC Secretary.

s our repeater station legal?"

It's a soul-searching question that comes up often these days at radio club meetings and v.h.f. bull sessions.

Conversion of commercial f.m. gear to amateur frequencies, mostly on 6 and 2 meters, is pretty common these days, and has brought with it the opportunity of borrowing another commercial communictaion trick, the automatic repeater station.

With f.m. hams usually on the same frequency (146.94 mc or 52.525 mc), and always crystal controlled, setting up a repeater that will serve all such hams in a given area is like shooting ducks in a barrel.

However, ham groups getting into repeater operations soon begin to wonder if this "technological breakthrough" hasn't outdistanced the FCC rule-making process.

Try to find "repeaters" in Part 97 and you'll draw a blank.

You will find, in 97.43, reference to operating a transmitter from a "remote-control point." Repeater enthusiasts generally use this section of the rules and cross their fingers hoping they are in the right when they put their repeater on the air.

To clear up some of the doubt and confusion, questions on this subject have been submitted to the FCC on behalf of *CQ* magazine, and are printed here, with the answe supplied by Ben F. Waple, FCC secretary.

If you have a repeater going, or want get one started, the information printed he should be invaluable.

Q. In the case of an "open access" repeat available to anyone transmitting on a giv amateur frequency, is it required that the be a specific licensed amateur operator mo toring all transmissions through the repea and having the capability of shutting do the repeater, or is the licensed amateur tra mitting on the repeater input frequency co sidered the controlling operator?

A. *A repeater station is subject to t requirements of Section 97.43 with respe to station location. If the repeater is remot controlled, the control point is a fixed loc tion specified on the station license, a Section 97.43 requires that a licensed ope tor be on duty at the control point at times when the repeater is in operation.*

Q. If a specific controling operator is quired for the repeater station itself, must be actually at the repeater site, or may exercise control over the repeater by mea of a radio or landline link from a remo location? (This situation might occur, f example, if a tall building or a mountain t is used for a repeater site, but this site is so distance from the home of the controlli operator.)

*Wickenburg, Arizona 85358

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A. *Remote control of the repeater is permissible if specifically authorized. Accordgly, the required operator may be at the thorized remote control point from which can exercise primary control of the transitter by means of a land wire circuit or a dio link operating on frequencies of 220 c or higher.*

Q. If remote control over the repeater is ceptable, may this be done by different erators at different times of the day?

A. *Different operators may exercise control ovided they are on duty at an authorized ntrol point.*

Q. If the controlling operator is not at the peater site, is it acceptable for him to onitor transmissions by the repeater transtter through a receiver tuned to the reater transmitter's frequency rather than by eans of a landline connection to the reater transmitter?

A. *Monitoring may be done by means of receiver at the remote control point.*

Q. If remote control over the repeater by radio link is acceptable, what frequencies y be used? How must this radio signal be ntified on the air and logged?

A. *Section 97.43(b)(6) specifies that frencies within the bands 220 mc or higher y be used for remote control purposes. ansmissions on the control frequency must mply with the identification requirements d logging requirements of Section 97.87 d 97.103 respectively.*

Q. Is it acceptable for control over the peater to be exercised by one or more operrs having the capability of transmitting an dio tone or other radio signal which will t down the repeater transmitter?

A. *Control may be authorized from more n one point, but if by radio, can be exered only on frequencies of 220 mc or her. Transmission of tones or other signals m a mobile unit, or any location other than authorized control point, is not a substitute the control requirements of Section 97.43, an operator at the control point who can ntrol the transmitters by a wire or radio cuit, the latter of which must operate on 0 mc or above.*

Q. May a "limited access" repeater be set in such a way that it will operate only en "keyed" on by a special signal, such an audio tone, transmitted on the repeater's ut frequency? (Such an arrangement might used by a small group of operators wishing keep control of the repeater for their own use only.)

A. *A "limited access" repeater may be set up in such a way that it will operate only when "keyed" by a special signal. However, this does not alter the control requirements of Section 97.43. (See answer to previous question.)*

Q. How must the repeater be identified on the air? Must the stations using it give the call sign of the repeater station when they give their own call signs for identification purposes? Or, is an automatic identifier, such as an automatically produced Morse code signal, acceptable?

A. *The repeater must be identified by its call sign transmitted by voice, or by telegraphy, either manually or automatically.*

Q. How must the repeater station operation be logged? Must a written log be kept, or is an automatic tape recorder linked to the repeater transmitter acceptable?

A. *The log requirements may be satisfied by maintaining a written log or using a recorder. The requirements of Section 97.103 must be met.*

Q. If an automatic tape recorder is acceptable, what is an acceptable method of entering time and date information on the tape?

A. *In the case of automatic tape recorder logging, any method which correlates the required time and date information with the transmissions is acceptable.*

Q. May a repeater license be obtained by a club, or must it be by an individual only? Must a repeater station maintained by an individual licensed amateur operator have a separate station license and call sign, or may it be operated under that operator's regular station license privileges?

A. *A "repeater" license may be obtained by a club as provided in Section 97.39. A repeater station operated by an individual licensee must have a separate station license and call if both the control location and the remote transmitter are different from the individual's other amateur station location.*

In addition to the above answers, Mr. Wample also made the following comment:

"It should be noted that the rules do not provide for the unattended operation of a repeater station. A properly licensed operator must be on duty at either an authorized control point or at the repeater transmitter. In addition, the operator must have facilities, either by wire line, or a radio link by which he can, in fact, control the operation of the

[*Continued on page 101*]

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BREADBOARD DUMMY LOAD

BY JIM ASHE

SOMETIMES the natural problems of bench testing transistor circuits at r.f. become complicated by the still less desirable problems that accompany haywired test gear. Many times it's hardly worth while making up specially built instruments, but most of their convenience can be realized with a happy-medium breadboard-like bit of wiring, quickly assembled. One generally useful piece of gear that can be put together in this way is the dummy load, useful for very many different applications from audio to v.h.f. Here is a simple dummy load arrangement, provided with a diode pump peak-reading rectifier, and conveniently arranged for use with a 50 microamp meter.

Construction

Circuits for use in the peace and quiet of a private lab don't have to be constructed to the same rugged standards as commercial or military gear. Why should you invest the extra effort? The only pieces of outside work required for this dummy load arrangement are a piece of 3/4 inch plywood and aluminum bracket about an inch high by tw inches long. The rest of it is several sm parts, not at all critical, available from su plus electronics gear or junk-box supply almost any private amateur lab. A few mi utes are sufficient for assembly and the fi ished circuit will last for years. And wi this open construction, if you burn up t load resistor the damage is instantly appare and can be repaired in minutes.

In building the dummy load, the circu was placed in one corner of the board so t rest of the area would be available for mour ing a general-purpose meter. See fig. 1. T meter box could be screwed down to t board, but it gets around the lab quite bu ily and so I let gravity and friction arran a sufficiently permanent location.

Assembly is simply a matter of fastenin one end of the coax to the board about tw inches from the bracket, which has a moun ing hole in its center for the BNC connect and another smaller hole nearby for t ground return lug, as in fig. 2. Some ta around the coax gives the clip a better gr

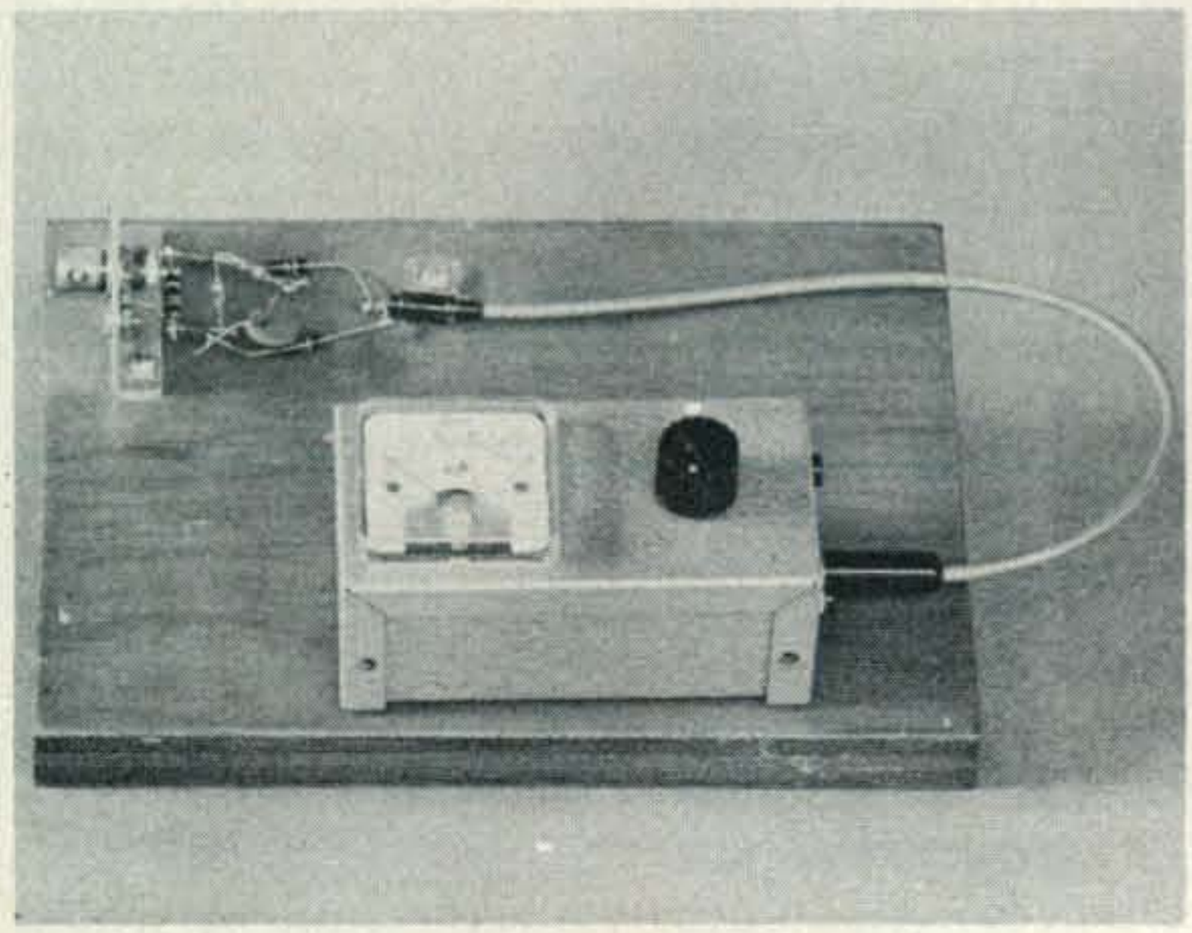

Fig. 1—Overall view of the dummy load, ready to use with a convenient general-purpose meter mounted on the same board.

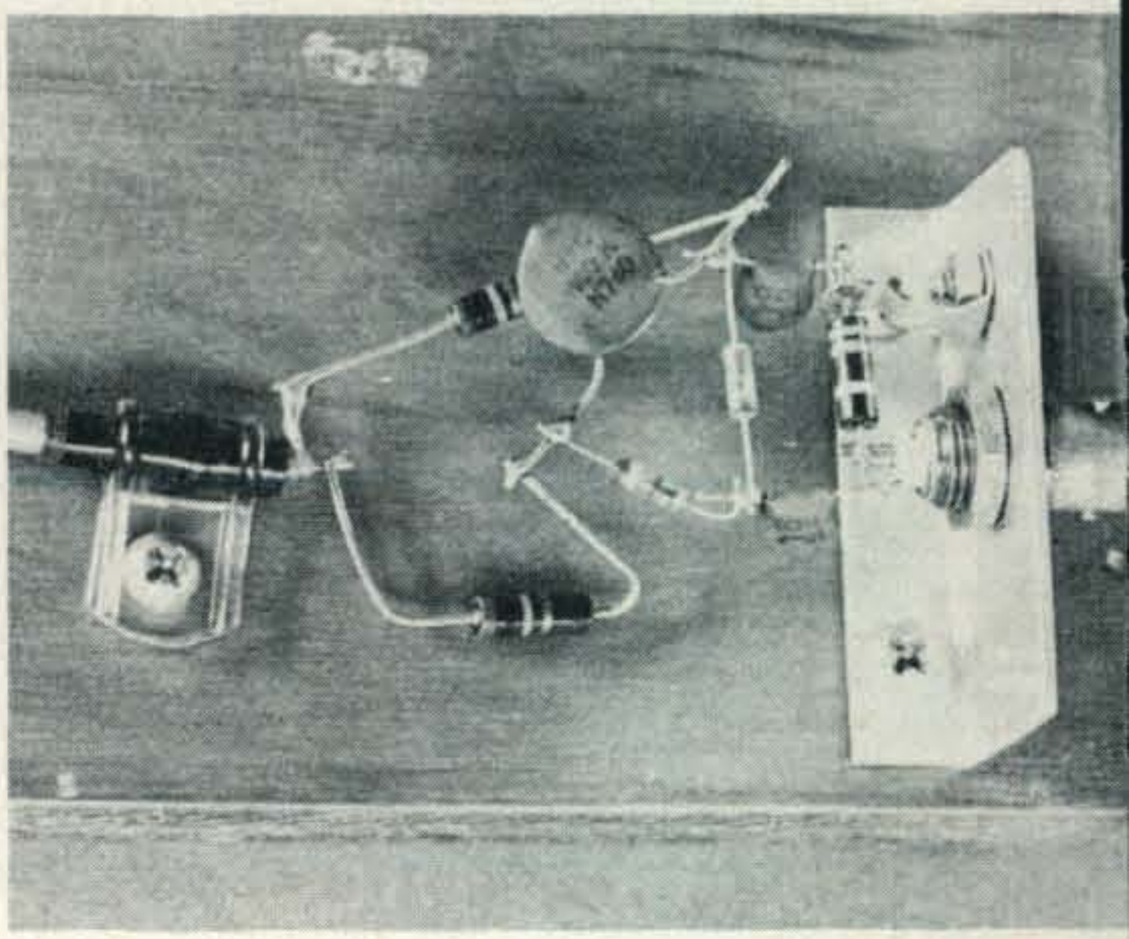

Fig. 2—Closeup of the simple dummy load a rangement. The short length of microphone cab is held in place by a transparent plastic clip.

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n the cable. The load resistor, R_1, goes from enter terminal to a ground lug; blocking apacitors C_1 and C_2 are soldered to the ends f R_1, and the rest of the circuit goes in the emaining space.

Operation

Here's how it works. Diodes CR_1 and CR_2 re arranged in the familiar diode pump ircuit, (half wave voltage doubles) which rovides a peak-to-peak reading of voltage cross dummy load resistor, R_1. At 68 ohms, $_1$ is not very different from the key values f 52 and 75 ohms commonly used in r.f. and .h.f. work as cable impedances.

The diode pump rectifier gives double the oltage reading we could obtain from a sinle diode circuit, improving the load's power ensitivity by a factor of four. An excellent ay to invest a few cents.

Capacitor C_3 bypasses r.f. remaining in he rectifier signal, and resistors R_2 and R_3 liminate coupling from the r.f. of the ciruit being tested to the test gear, other circuits n the bench, and to the general world. If ou are planning to use the dummy load ith a meter only, you can omit these resisors with a considerable gain in sensitivity. lternatively, a couple of clip leads can be laced across them when you need improved ensitivity and aren't concerned about the r.f.

Component values are not critical. You can arry this idea to audio by replacing the BNC onnector with a phone jack, R_1 with an 8 r 16 ohm resistor, C_1 and C_2 with one to ten nf capacitors, and C_3 with a ten to 100 mf apacitor.

Application

A 50 microamp meter indicating d.c. from his simple dummy-load circuit will turn out o be a surprisingly sensitive r.f. indicator. It nakes a reliable one too, because of the disinct advantages of having all joints soldered nd everything fixed in place. Saves a lot of rouble.

If the meter is not sensitive enough try a ow-range d.c. v.t.v.m. I have one that reads ne-tenth volt full-scale, and there are several it or finished meters on the market that ndicate 1 or 1.5 volts full scale. Heath's M-17 solid-state voltmeter is one of these.

The key application of a dummy-load levice in r.f. work is to estimate the relative mount of power an oscillator or multiplier tage can deliver, compared to some other djustment or circuit. If it delivers more ower it is working better, particularly if this

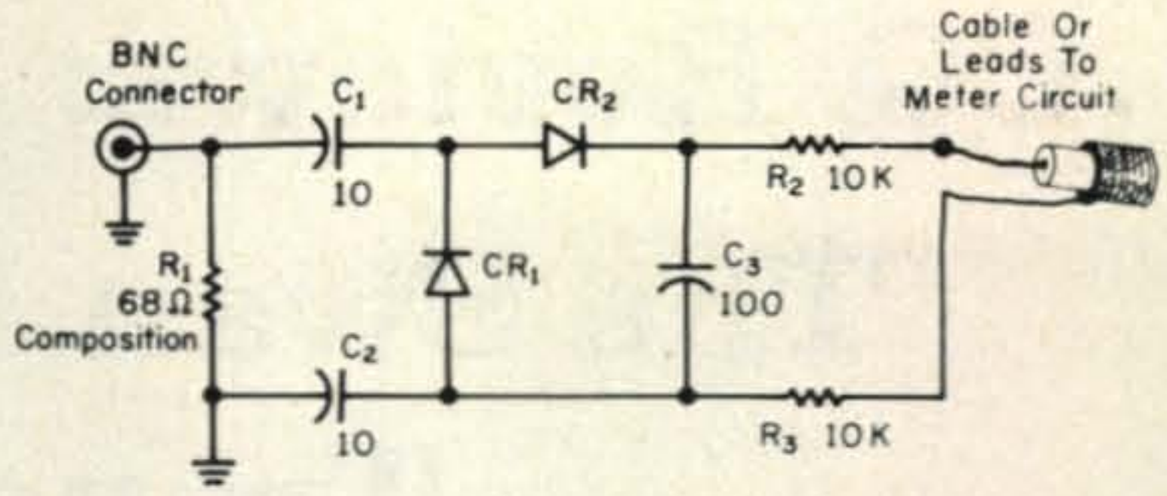

Fig. 3—Schematic of the dummy load. Capacitors C_1 and C_2 break any d.c. connection from r.f. circuit to indicating meter. The open space between resistor R_1 and the grounding surface could be reduced by better positioning, which would reduce inductive effects which reduce performance at high frequencies. The diodes are point contact germanium types or computer surplus units.

increase is achieved together with a reduction in collector current. It often is, but you have to be able to make both tests simultaneously, and to keep good records. It's sometimes quite surprising how much improvement you can achieve in a transistor r.f. stage.

If the r.f. isn't available through a terminal or connector, you can easily assemble a pickup link as shown in fig. 4. The capacitor isn't necessary for many applications or low frequencies,but it is good technique because it neutralizes the unavoidable inductance of the link.

To adjust the capacitor, connect the link and its cable to the dummy-load, and fix the link in place near a grid dip oscillator. Make fine adjustments in relative positioning until you see the g.d.o. indicate some power is being drawn from its coil, and then adjust the link capacitor to maximize the drain. This is indicated by lowest dip. Or you can tune the g.d.o. to find the dip frequency and change link diameter or series capicator to bring the dip frequency to the correct frequency. For details on link sizes and capacitor values, see the 1968 Radio Amateur's Handbook, pages 152 and 158. ■

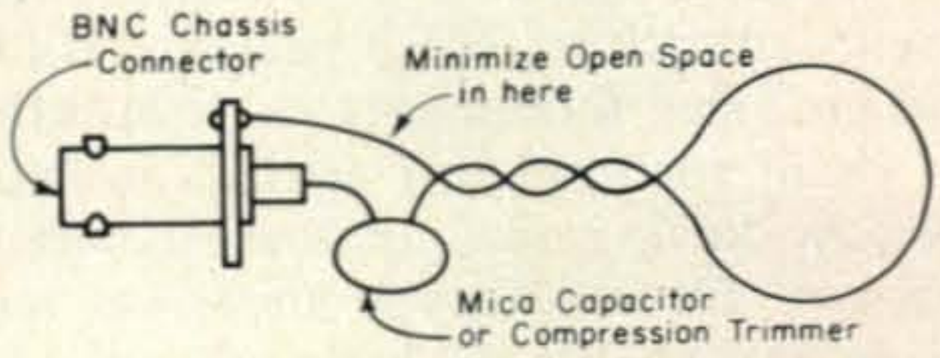

Fig. 4—Reactance-cancelled pickup link. It can be installed on a BNC connector, for a choice of operating frequencies. It can be tuned by adjusting the inductance, the capacitance, or both.

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CQ Reviews:

The Swan Model 500C Transceiver

BY WILFRED M. SCHERER,* W2AEF

THE Swan Model 500C Transceiver is an updated version of the Model 500 which is one of a series in the popular Swan line.

Since we have not previously reviewed the Model 500, we'll give a complete run-down on the 500C. The features common to both models are: full coverage on the 80-10 meter amateur bands; s.s.b. operation with essentially 1/2 kw p.e.p. input on either l.s.b. or u.s.b.; c.w. operation; compatible a.m. operation using a single sideband with 125 watts carrier-input power; wide-range adjustable Pi-network for matching loads of 15-500 ohms; p.t.t. operation or v.o.x. (with accessory unit); a.l.c.; two-speed v.f.o.-tuning drive; frequency calibration in 5 kc steps, except 20 kc ones on 28 mc band; dial-set for indexing calibration; built-in 100 kc crystal calibrator; provisions for split-frequency operation using external v.f.o. accessory. Power is obtained from an external source.

The basic differences found in the Model 500C over the provisions in the Model 500 are: use of 6LQ6 tubes in the p.a. instead of 6HF5's, providing 520 watts p.e.p. input rather than 480 watts; 15- and 20-meter band coverage changed to 21-21.45 and 14-14.45 in place of 21-21.5 and 13.85-14.35 mc; relative output-power meter readings provided in addition to signal-level and p.a. cathode-current indications; 6JH8 substituted for the 7360 balanced modulator; vacuum-tube carrier oscillator replaced with transistorized type; c.w. keying now possible through v.o.x. accessory for v.o.x.-type break-in, manual c.w. switching still available when the accessory not engaged; c.w. sidetone monitor; transmitter-frequency offset for c.w. operation; carrier-level control for c.w.; improv noise-limiter operation; nominal i.f. of 55 kc instead of 5173 kc.

*Technical Director, *CQ*

Technical Features

A block diagram for the 500C is shown fig. 1. Single conversion is used throughou This minimizes the possibility of many spu ious responses and lessens the chances non-linearity that might otherwise be intr duced by additional mixers.

The i.f. is nominally 5500 kc. The sid band filter used employs crystals for a 6 bandwidth of 2.7 kc. At 60 db down it 4.6 kc, resulting in a 1.7:1 shape factor. T bandwidth is 8.3 kc at 100 db down wi ultimate rejection outside this passband rat at greater than 100 db.

Since there is only one conversion, t frequency range of the v.f.o. is altered f the various bands as indicated at Table

Sidebands are changed by switching ca rier-oscillator crystals. A 5500 kc crystal employed for the "normal" sideband; that the one usually used on each amateur ban The "opposite" sideband carrier frequency 5503.3 kc.

The carrier frequency for the normal sid band permits passage of only the *upper* sid band through the sideband filter, but with t 80- and 40-meter bands the end result transmission of only the *lower* sideband, b cause the receiver i.f. is obtained by t v.f.o. frequency *minus* the signal frequenc rather than the *signal* frequency *minus* t v.f.o. frequency as is the case for the 20 15- and 10-meter bands.

On transmit, a similar inversion occu because on 80 and 40 meters the generat s.s.b. signal and the v.f.o. frequencies a

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The Swan Model 500C Transceiver shown with the Model 117XC A.C. Power Supply and Speaker Console.

ubtractively mixed; while on 20, 15 and 10 eters they are additively mixed as shown at able I.

Changing sidebands on any one amateur and also requires retuning the v.f.o. 3.3 kc. his is not an automatic shift, thus necessitat- g manual retuning; however, to facilitate ch operation, there are two fiducial hair- nes. They are identified by LSB and USB. ne indicates the frequency when the lower deband is engaged; the other similarly is sed for the upper sideband.

V.F.O.

The v.f.o. is a solid-state job with two ansistors. Q_1 functions as Colpitts oscilla- r in a common-base circuit with the various nges obtained by switching inductors and ssociated padders. Q_2 is an emitter follower at provides isolation between the oscillator nd the 6EW6 vacuum-tube amplifier for the f.o. signal, thus minimizing loading effects by the amplifier and thereby aiding in ensuring stability.

A negative operating potential of 10 volts is obtained for the v.f.o. setup from the transceiver bias supply and it is regulated by a Zenner diode, further contributing to stability particularly during line-voltage or power-supply variations.

The carrier oscillator, which is transistorized using a Pierce circuit, also is powered from the same regulated source.

C.W. and Tuneup

During tuneup a carrier is obtained by unbalancing the modulator which employs a beam-deflection type tube. One of the deflection plates is automatically grounded at this time.

For c.w., the carrier is obtained and its level is adjusted by varying the carrier-balance control as needed for the desired output.

Normally, the carrier crystal is 300 c.p.s.

Band (mc)	V.F.O. (mc)	Xmt-Mix	I.F. Sig. (mc)
3.5-4.0	9.00-9.50	Diff.	5.5
7.0-7.45	12.50-12.95	Diff.	5.5
14.0-14.45	8.50-8.95	Sum	5.5
21.0-21.45	15.50-15.95	Sum	5.5
28.0-29.7	22.50-24.20	Sum	5.5

able I—Band-to-band frequency setup used in the 500C. On receive, the difference mixture etween the input signal and the v.f.o. frequencies is used to produce the 5.5 mc i.f. On transmit, the utput signal is produced either by the difference or sum mixture of the v.f.o. frequency and the 5.5. mc s.s.b. generator signal as indicated at the Xmt-Mix column.

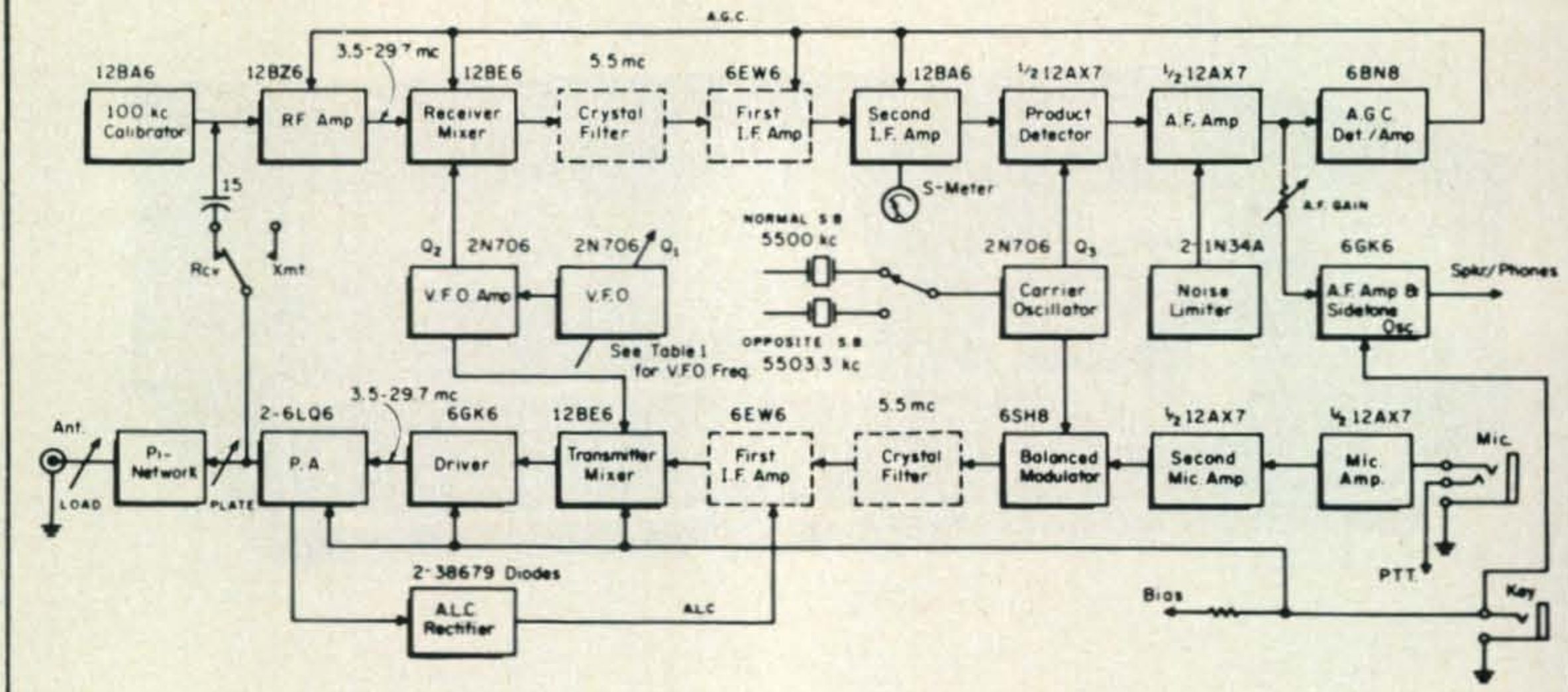

Fig. 1—Block diagram for the 500C. Salient technical details are given in the text. Circuit elements in dashed lines are common to both transmit and receive.

outside the passband of the sideband filter. For c.w. operation and tuneup, a "rubbering" padder is automatically switched in the crystal circuit of the carrier oscillator to shift the frequency of the 5500 kc crystal 800 c.p.s. higher, so that it falls well into the filter passband. This permits the carrier to pass unattenuated for full output.

It also provides an 800 c.p.s. frequency offset between receive and transmit as is desirable for c.w. work. Also at this time, the 2nd speech amplifier is disabled to prevent accidental modulation from the microphone.

Sidetone Monitor

Grid-block keying is used for c.w. along with a sidetone monitor that is a unique affair whereby the receiver a.f. output amplifier is automatically converted to a tone oscillator as shown at fig. 2.

A.G.C.

The a.g.c. is the audio-derived type with a slow release time provided by a suitable R/C combination in the a.g.c. line. The r.f. gain also may be manually controlled by a potentiometer that furnishes a fixed bias to the a.g.c. line for setting the overall gain as desired.

Noise Limiter

The noise limiter employs two back-to-back diodes shunted across the output of the 1st a.f. amplifier with circuitry similar to that often used for s.s.b. at an i.f. transformer. In the Model 500 the noise limiter is installed ahead of the a.f. amplifier, but in the 500C it *follows* the amplifier. This allows it to function at a higher signal level, thus making its performance more effective. The a.n.l. also prevents noise peaks from captivating the a.g.c. Its circuitry is shown at fig.3

R.F. Circuits

The same tuned-r.f. circuit for each band is used for both the receiver-mixer input and the transmitter-mixer output. This circuit is gang-tuned with a dual capacitor along with the transmitter-driver output and thus constitutes the *P.A. Grid Drive* control. It peaks up the circuits both on receive and transmit.

The receiver r.f.-stage input is tuned by the transmitter Pi-network to which it is coupled by a 15 mmf capacitor. On transmit this capacitor is disconnected by the changeover relay.

Transmitter

The Pi-network for the p.a. has two adjustable loading controls. One cuts in or out fixed capacitors for *course* loading, the other operates a varible capacitor for *fine* loading. As stated earlier, this allows proper matching to a wide range of loads. This feature, which is seldom found in tranceivers, enables operation under various antenna or transmission line conditions not otherwise possible without

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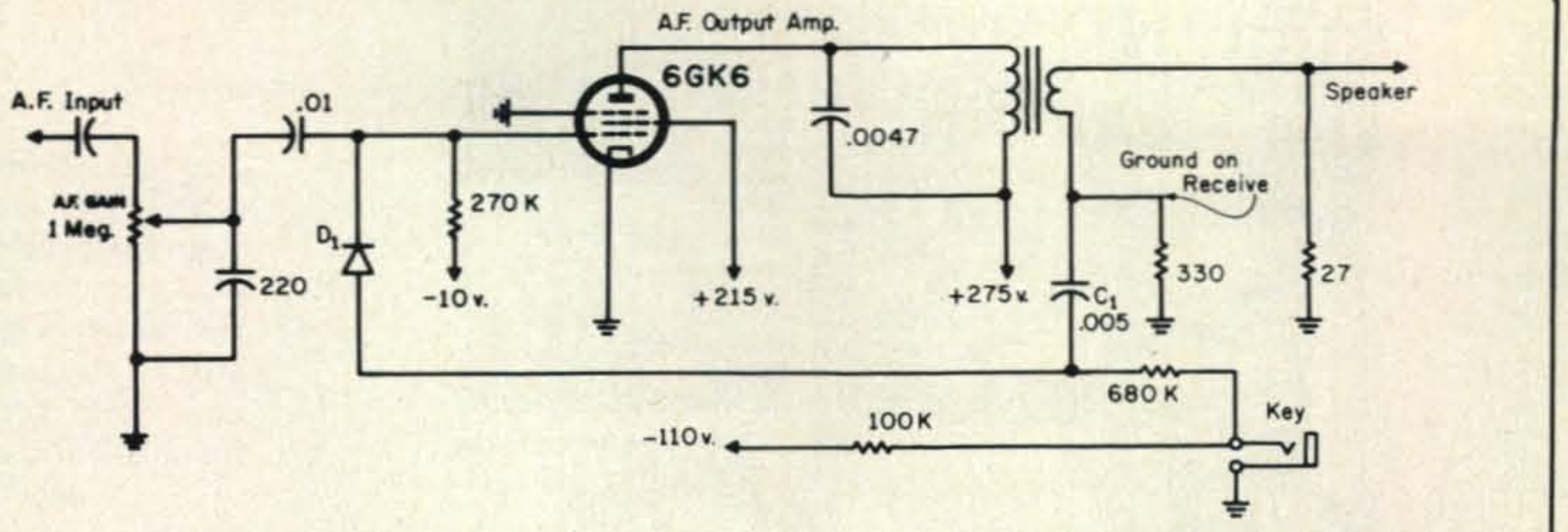

Fig. 2—Sidetone-oscillator setup used in the 500C. A feedback loop consisting of C_1 and D_1 is connected between the output and the input of the a.f.-output amplifier. The overall circuit constants are such that this causes the amplifier to oscillate and produce an audio tone of about 800 c.p.s. D_1 is a diode switch that disables the feedback loop on receive or activates it for tone with c.w. transmit.

the use of external coupling or matching devices.

Neutralization

Excellent overall stability is achieved by neutralization of both the driver and the p.a. using the capacitance-bridge method in each case. This is augmented in the p.a. with different value fixed capacitors for each band that are switched in or out of one branch of the circuit to counteract circuit strays through the band-switch wiring. Proper neutralization is thereby maintained on all bands with one setting of the customary varible neutralizing capacitor in the plate branch. In addition, on the 10-meter band, a separate variable capacitor is switched in to enable precise neutralization for this band where the circuit values usually become more critical.

A.L.C.

The a.l.c. is the conventional type using a solid-state voltage doubler to rectify the a.f. component that appears at the p.a. grid. when grid current tends to flow.

Meter

The S-meter operates from the a.g.c.-controlled 2nd i.f. On tuneup, it is automatically transferred to indicate relative power output. Included is a sensitivity control. On s.s.b. and c.w. transmit, the meter automatically indicates p.a. cathode current.

Tuning Dial

The drive for the v.f.o. has an inner knob that provides fast-speed tuning for quick excursions across the range with five turns required for such coverage. Slow-speed or vernier tuning with an outer knob covers 15-20 kc per revolution on all bands, except for 28 mc where it covers about 60 kc.

There are three scales on the dial: one for the 3.5 mc band, one for 7, 14 and 21 mc, and one for 28 mc. On all scales the incremental calibrations, as noted earlier, are spaced about 3/32" apart.

Indexing the dial calibrations against the fiducial hairline, referred to the calibrator marker signals, is done electronically by adjusting a small knob which slightly varies the v.f.o. frequency as needed. The l.s.b. and u.s.b. hairlines thus always remain centered at the dial window.

Equipment Connections

Transfer between transmit and receive is handled by two relays. Included on one is a

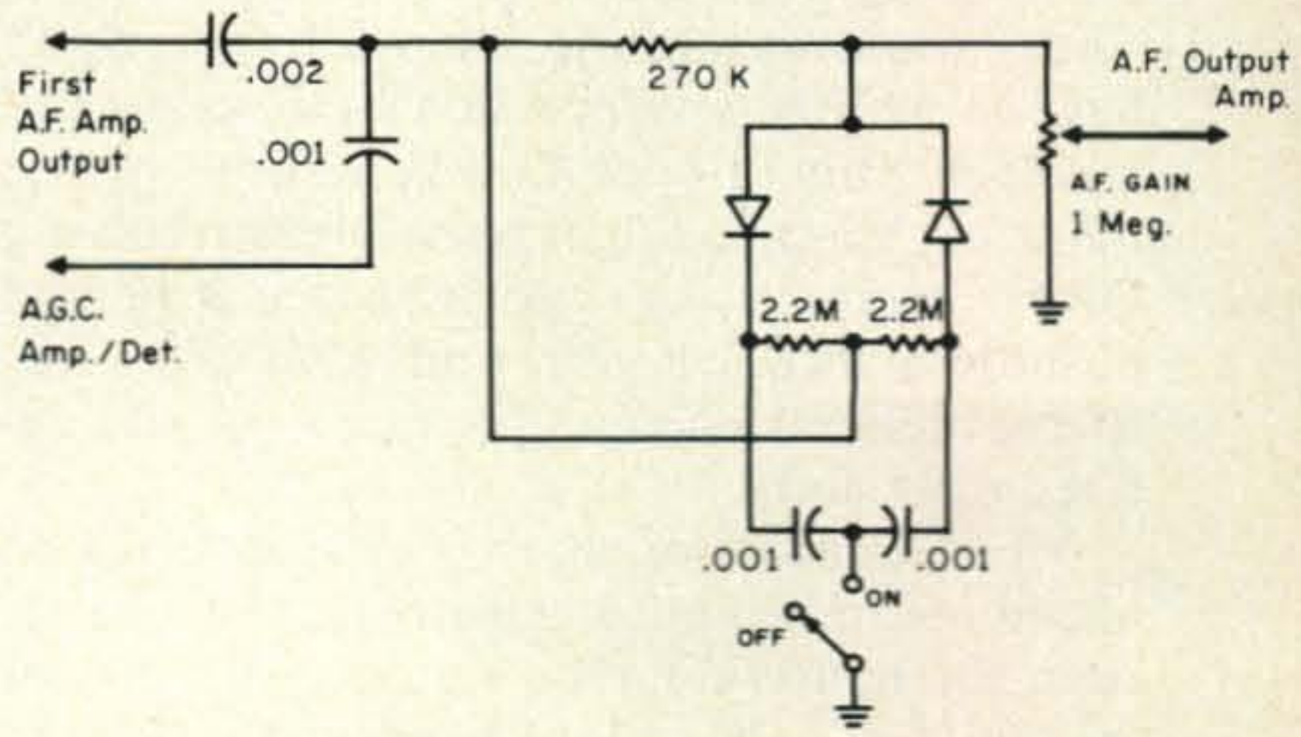

Fig. 3—Noise limiter circuit for the 500C.

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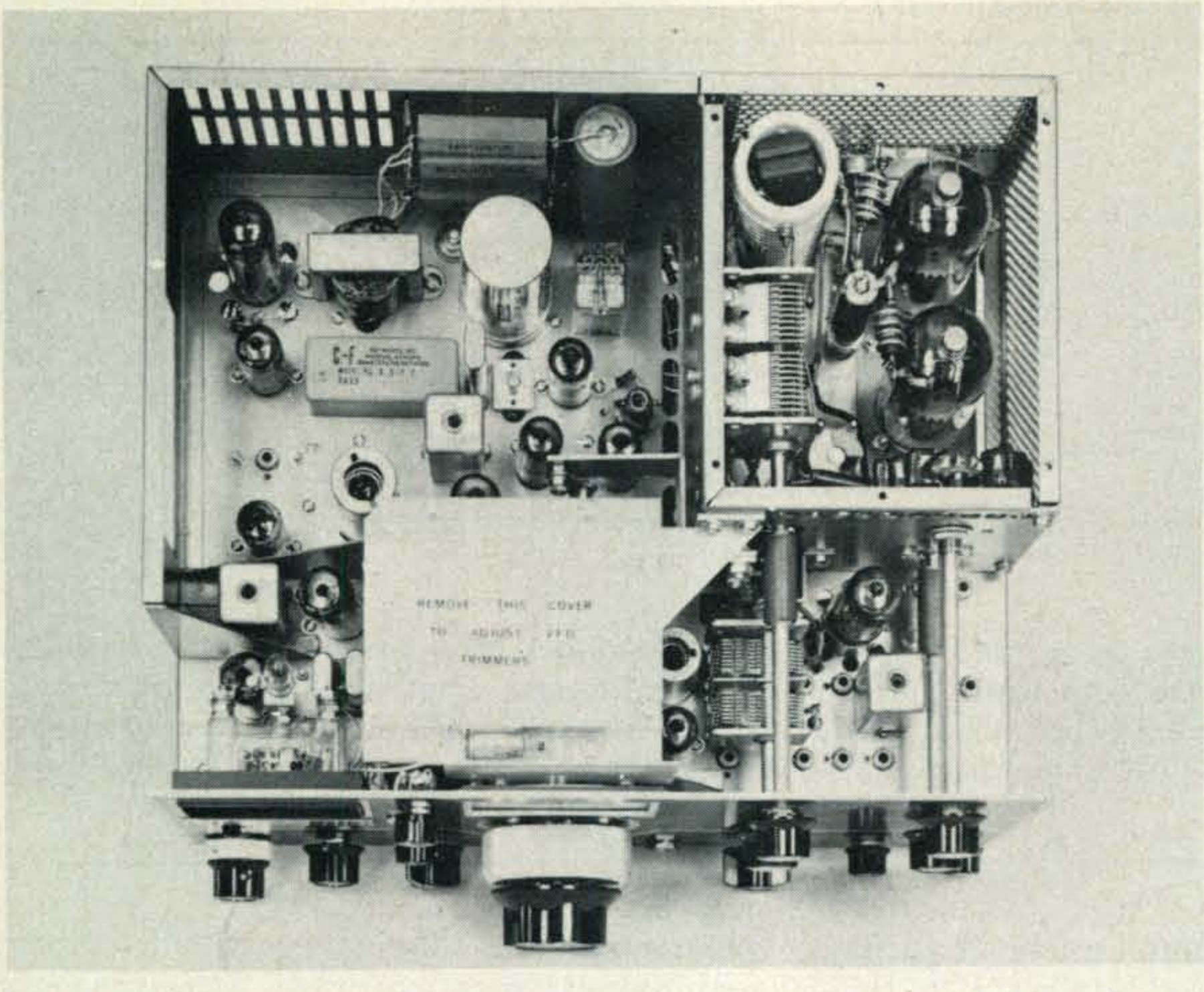

Top view of the Swa 500C. The cover ha been removed from th p.a. compartment o the upper right. Th job is ruggedly bui and well braced t resist twisting or warp ing.

set of s.p.d.t. contacts with terminals at the rear of the set for control of external gear. There also is a Jones 12-terminal power connector, an 8-pin octal socket for the v.o.x. accessory and a 9-pin octal-type socket for other accessories such as an external v.f.o. The c.w.-key jack also is on the rear. A 3-way mic jack is on the panel.

Operation and Performance

Operationally, one of the nice features that is characteristic of the Swan gear is the two-speed tuning drive for the v.f.o. Its performance is velvet smooth at either speed and it is conveniently manipulated by easy-to-grip knobs. No backlash was detected on the model made available to us.

Another convenient arrangement on the set is that the sideband-selector switch has one position marked *normal* for providing the sideband normally used on each band. Thus, when bands are changed, you don't have to manually switch sidebands as needed therefor. Should operation be desired on the other sideband, as might be helpful in dodging QRM, you flip the switch to the sideband position marked *opposite* and retune the v.f.o. to the fiducial hairline provided for the related sideband.

Measurements of receiver performance on all bands indicated a sensitivity 6 db better than the manufacturer's rating of 0.5 μv for 10 db S+N/N ratio. Unwanted-sideband suppression both on receive and transmit, rated at more than 50 db, was −42 db a 500 c.p.s. and −58 db at 1 kc, indicatin better-than-usual attenuation and very stee filter skirts.

Only two internal spurious responses wer found. These were out of the amateur band at 4001 and 7330 kc and were less than 0. μv. The i.f. signal rejected measured 44, 52 54, 66 and 60 db on the 3.5, 7, 14, 21 an 28 mc bands respectively. Image rejection fo the same respective bands was 85, 76, 72 80 and 74 db.

The a.g.c. characteristic was quite flat wit only a 3 db a.f. output change with 20 d r.f.-input signal changes of 1-10 μv. This i unusual in that with most receivers there i much less a.g.c. control in the low-micro-vol region. For a 60 db r.f. input change of 10 10,000 μv the a.f. output variation was 7 db

The a.g.c. release time was found to b good for eliminating pumping effects o strong signals, but the attack time appeared t be a bit on the slow side, inasmuch as i sounded hard with a tendency to slightly plop at the start of strong-signal transmissions.

The S-meter readings were quite generou ranging from 32 μv for an S-9 indication o 3.5 mc to 5-10 μv for S-9 on the other bands This also indicated a band-to-band gain var iation of 6 db, except for 3.5 mc where it i somewhat lower to a larger degree.

Insertion of the noise limiter slightly drop the a.f. level and the h.f. response, but it use was quite effective in providing goo

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gnal readability not otherwise possible der adverse noise conditions.

Frequency Stability

Since the v.f.o. operates on a different nge for each band, frequency-stability runs ere taken at the midpoint of *each* band and ere conducted separately the first thing on fferent days at the same morning-ambient 65° F.

Under these conditions, the drift during the st 30 minutes ranged from 100 to 500 .s., with a 100-150 c.p.s. drift the next 60 nutes and 50 c.p.s. or less per hour there- ter on all bands. This is exceptionally good pecially in view of the act that the v.f.o. nctions at comparatively high frequencies indicated at Table I.

Line-voltage variations of ±10% produced frequency shift of less than ±5 c.p.s. nging the transceiver cabinet created no verse effects on the frequency.

Transmitter

As usually is the case when TV sweep- pe tubes are used in a p.a., tuneup must be nducted carefully and quickly for reson- ce to avoid tube damage.

On transmit the *output* power under tune- or c.w. conditions was 275 watts on 3.5, and 14 mc; 250 watts on 21 mc and 225 atts on 28 mc. *Peak-output* power on all nds with voice modulation was 20% gher. With a two-tone test on s.s.b., the stortion products were equivalent to the ting of approximately 30 db down.

C.W.

We did not have the v.o.x. accessory, so nnot comment on its operation, partic- ary for c.w. break-in. Without it, transfer tween receive and transmit for c.w. must conducted by manually shifting the mode itch. P.t.t. operation is otherwise available r s.s.b. and a.m.

The c.w. keying was good and in spite of a irly steep wavefront on the make, no ad- rse clicks were evidenced with on-the-air eration. The break trails off gradually, so problems were expected here. A slight irp appeared during keying on the 28 mc nd. This was not experienced on the other nds.

The frequency offset on c.w. places the ansmitter frequency 800 c.p.s. *lower* than e receiver frequency on the 3.5 and 7 mc nds; while on 14, 21 and 28 mc it is 800 p.s. *higher* than the receiver frequency. This must be kept in mind when band-edge operation is conducted.

The sidetone monitor is set at a fixed level, but it may be altered by changing an internal resistor as prescribed in the manual.

On a.m., the carrier output power is about one-quarter that noted above for tuneup. A.m. transmissions are made using only one sideband. There is no envelope detector for receiving a.m., so such signals must be demodulated by zero-beating the carrier and listening to one of the a.m. sidebands.

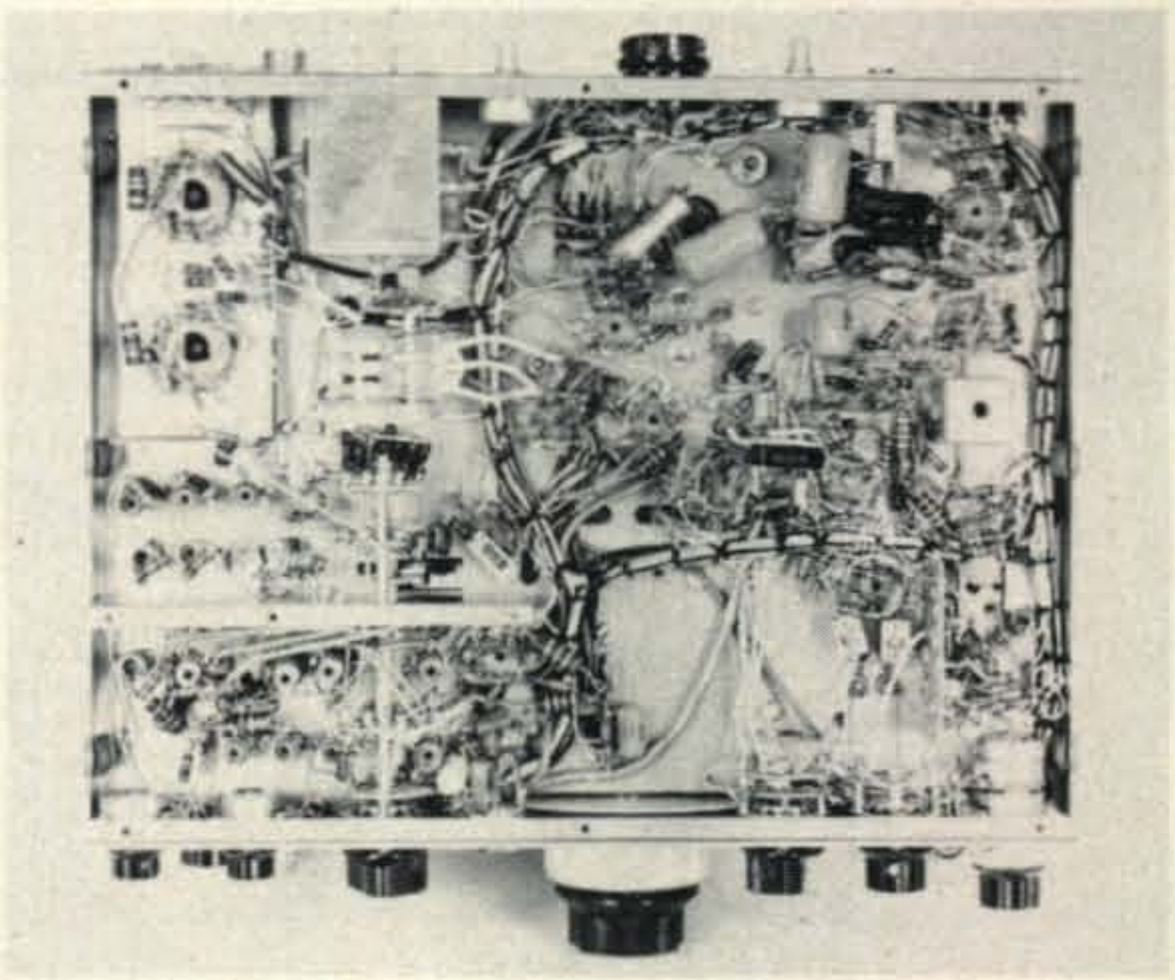
The size of the 500C is 5½" x 13" x 11" (H.W.D.) and it weighs 17¼ pounds.

Power requirements are: 800 v.d.c. at 550 ma peak; 275 v.d.c. at 150 ma; −110 v.d.c. at 100 ma; 12.6 v. a.c. or d.c. at 5 a.; 12 v.d.c. at 250 ma for relay.

These voltage may be had from a variety of Swan power supplies for operation from 117-230 v.a.c. or 12-13.5 v.d.c. There also is an external v.f.o. accessory, Model 410C, that may be used either for on-frequency transceive operation or for split-frequency work. Data on these units may be obtained by writing to the manufacturer.

The Swan 500C Transceiver is priced at $520. A matching 117 v.a.c. power-supply console with built-in loudspeaker is available at $105. These are products of Swan Electronics, Oceanside, California 92054.

—W2AEF



Bottom view of the Swan 500C. To minimize the possibility of TVI, the power-supply leads go through a copper box (left of upper center) where they are bypassed with feedthrough-type capacitors. The r.f. inductor cores for each band may be adjusted through access holes in the bottom cover where they are clearly identified.

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The Corkscrew

A New Type of Polarized Antenna

BY JOHN J. SCHULTZ - W2EEY/1

Combined vertically and horizontally polarized antennas are not new but th method described to achieve dual polarization is new. It is adapted from commercial broadcast antenna design and although it can be used on an band, it is particularly suitable for use on the v.h.f. bands and on the h.f DX bands.

DUAL polarization is of value in many circumstances since, due to reflections and other effects, a transmitted wave is rarely received with exactly the same polarization. For instance, a vertically polarized signal from the mobile unit can be received on a horizontally polarized fixed station antenna, although, theoretically, there should be no signal coupling between precisely polarized waves and antennas of the opposite polarization. Of course, there would be a considerable average increase in the signal level (20 db or more) between the mobile and fixed stations if both used antennas of the same polarization. Many v.h.f. mobile operators, of course, realize this and us horizontally polarized antennas of th "halo" type. Nonetheless, the signal di advantage due to antenna polarization sti exists if one desires to work a mobile un with a simple whip antenna or a portab unit.

*40 Rossie Street, Mystic, Connecticut 06355.

Dual Polarization

Almost exactly the same polarizatio problem was faced by f.m. broadcaste due to the increasing popularity of auto mobile f.m. receivers using simple whip an tennas, since their transmitting antenna were horizontally polarized. Many antenn designs were developed to allow broadcas

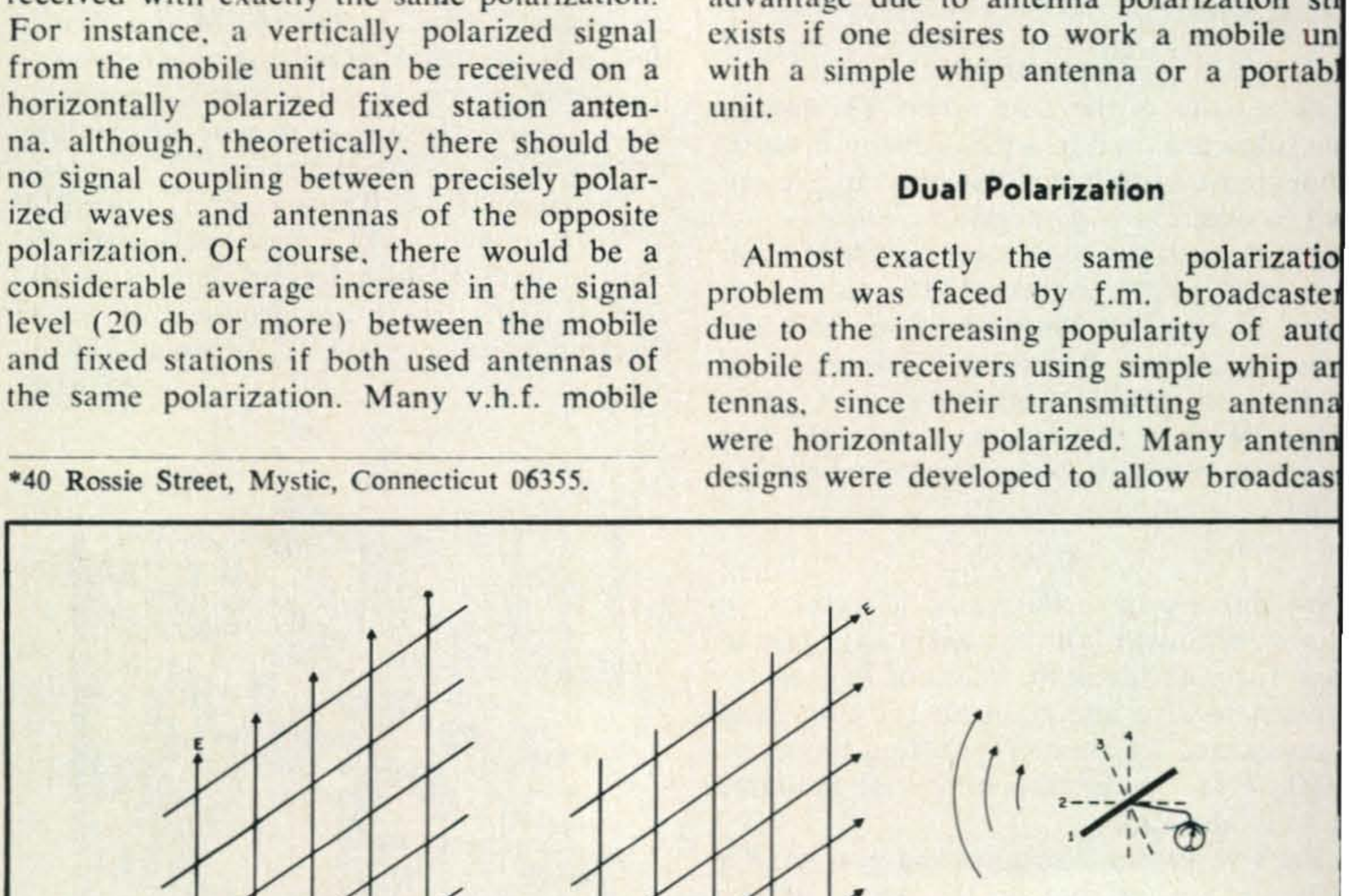

Fig. 1—Theoretically no coupling exists between vertically polarized wave and horizontally polarized electric dipole (A) while full coupling exists when polarizations are the same (B). Combination horizontally and vertically polarized, or circularly polarized wave, will couple to any dipole orientation (C) except, of course, end on.

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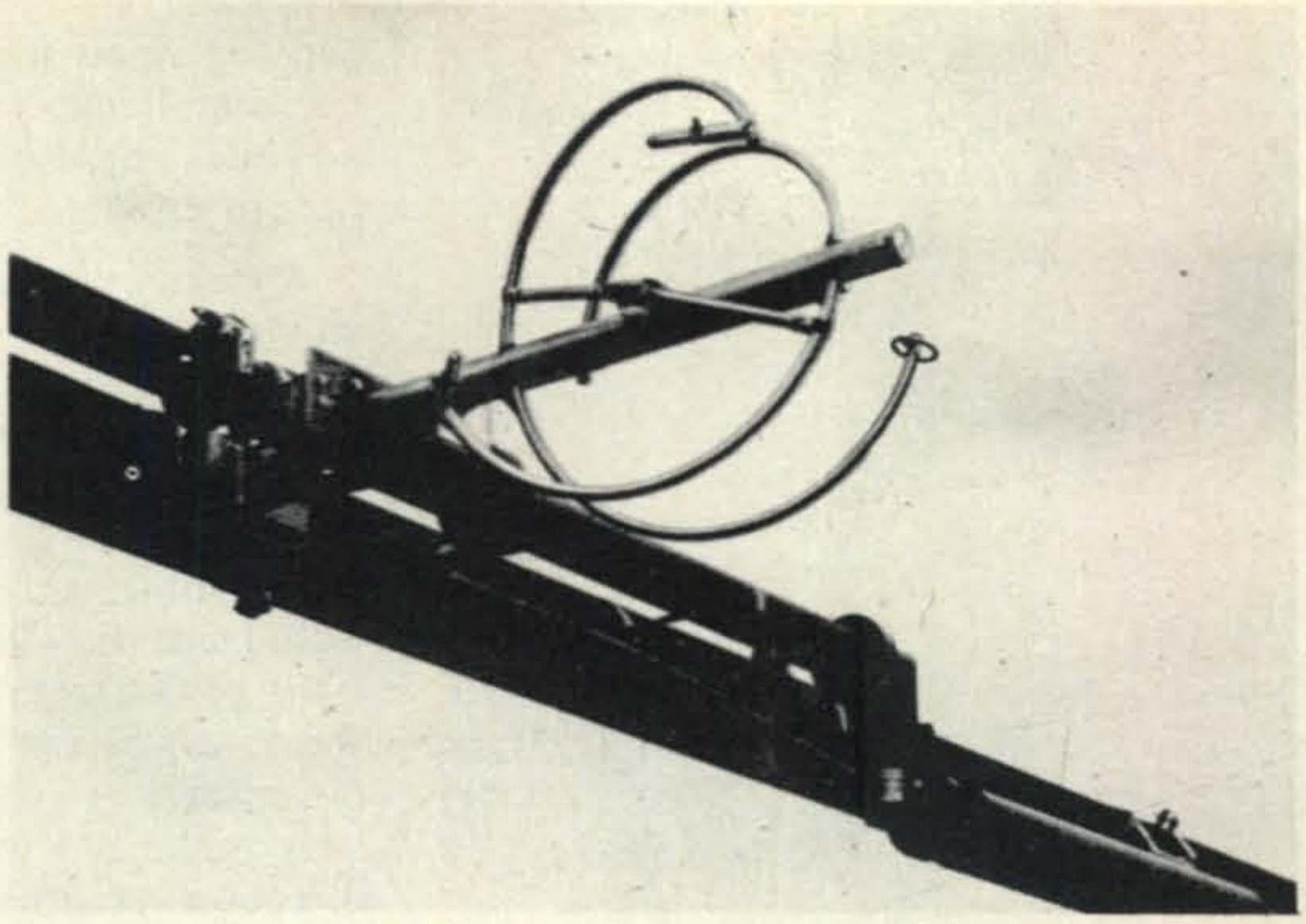

single section of RCA's
nmercial "BCF" antenna
f.m. stations which the
hor nicknamed a "cork-
ew" antenna. Note the
ta match arms to each
ix. The large center sup-
rt arm is the coaxial trans-
ssion line. Photo courtesy
of RCA.

g a signal with dual polarization. Com-
nations of conventional vertical and hori-
ntal antennas can be used, but the com-
ned feed systems and the total size is
ten a disadvantage. RCA, however, in
eir BCF type antenna developed a so-
lled circularly polarized design that is
th simple to feed, reasonably small and
echanically sturdy and simple. Fortunate-
the design is readily adapted to amateur
eds for either mobile or home station use.
radiates equal power level vertically and
rizontally polarized signals with a hori-
ntal plane omnidirectional pattern. Single
its can be used in a mobile installation
units may be stacked to provide gain, in
e vertical plane, for home station instal-
tions. The circular polarization means
at the receiving antenna (assuming the
rcularly polarized antenna is used for
ansmitting) can have *any* orientation, not
st vertical or horizontal, and still provide
e same received signal level.

The theory on which the antenna is
ased allows the construction of various
pes of circularly polarized antennas, not
st the dual-dipole form which RCA uses
and which we nick-named the "cork-
crew" antenna) which is described later.
When one looks at the latter antenna, it
ppears to be two "halo" antennas inter-
vined with their ends spread apart. Ac-
ually, although the physical form does re-
mble the "halo," the electrical operation
completely different. The electrical oper-
tion is described in some detail in the fol-
wing paragraphs and should be under-

stood, especially if one desires to experiment with other forms of the basic antenna. However, even if one does not care to worry about the theory of operation, the antenna can still be easily constructed and adjusted using the information presented later.

Theory of Operation

Most of us are used to the terms vertical and horizontal polarization, where polarization is defined as the orientation of the electric field of an electromagnetic wave, as shown in fig. 1. The simple flat vertical

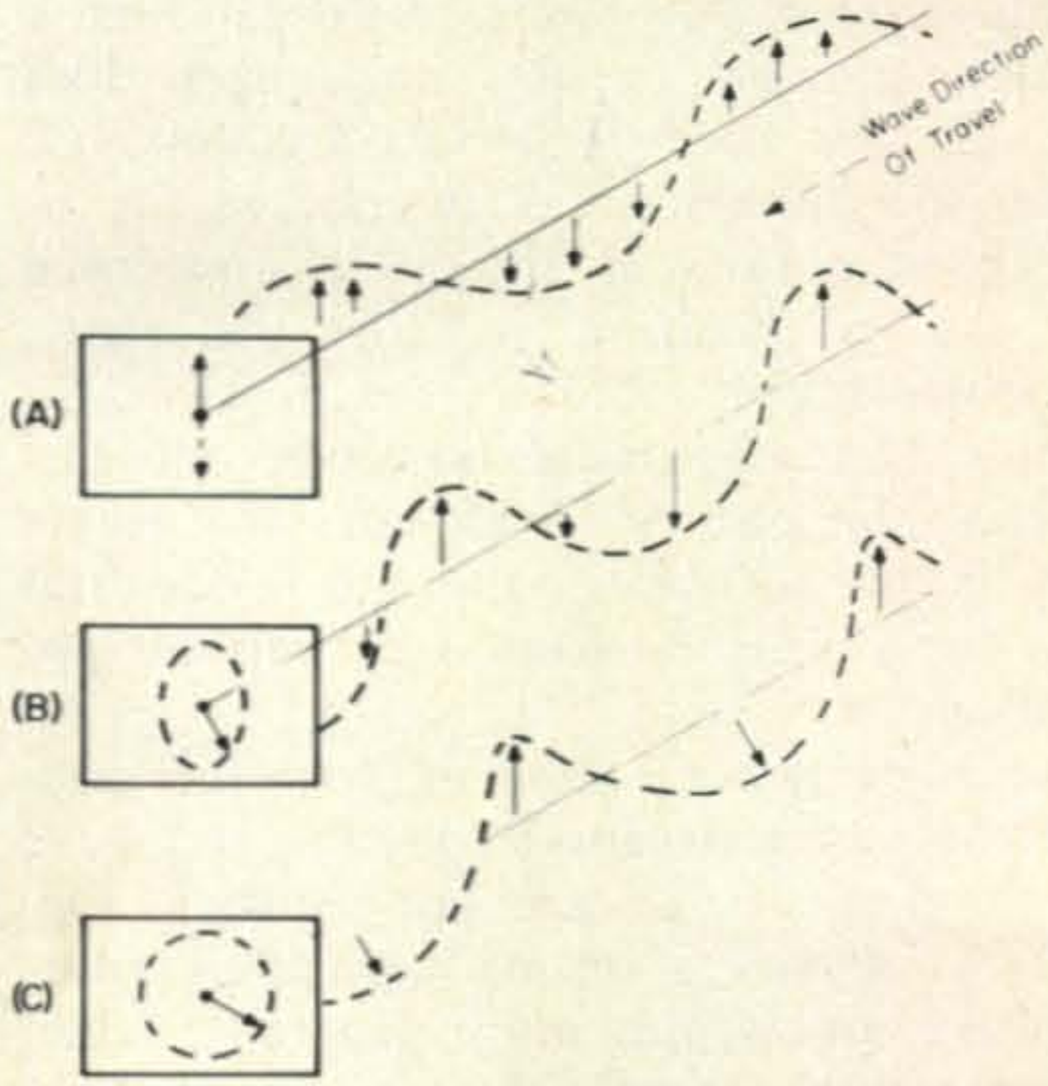

Fig. 2—Squares show how electric field would appear at an instant of time for linearly (A), elliptically (B) and circularly (C) polarized waves.

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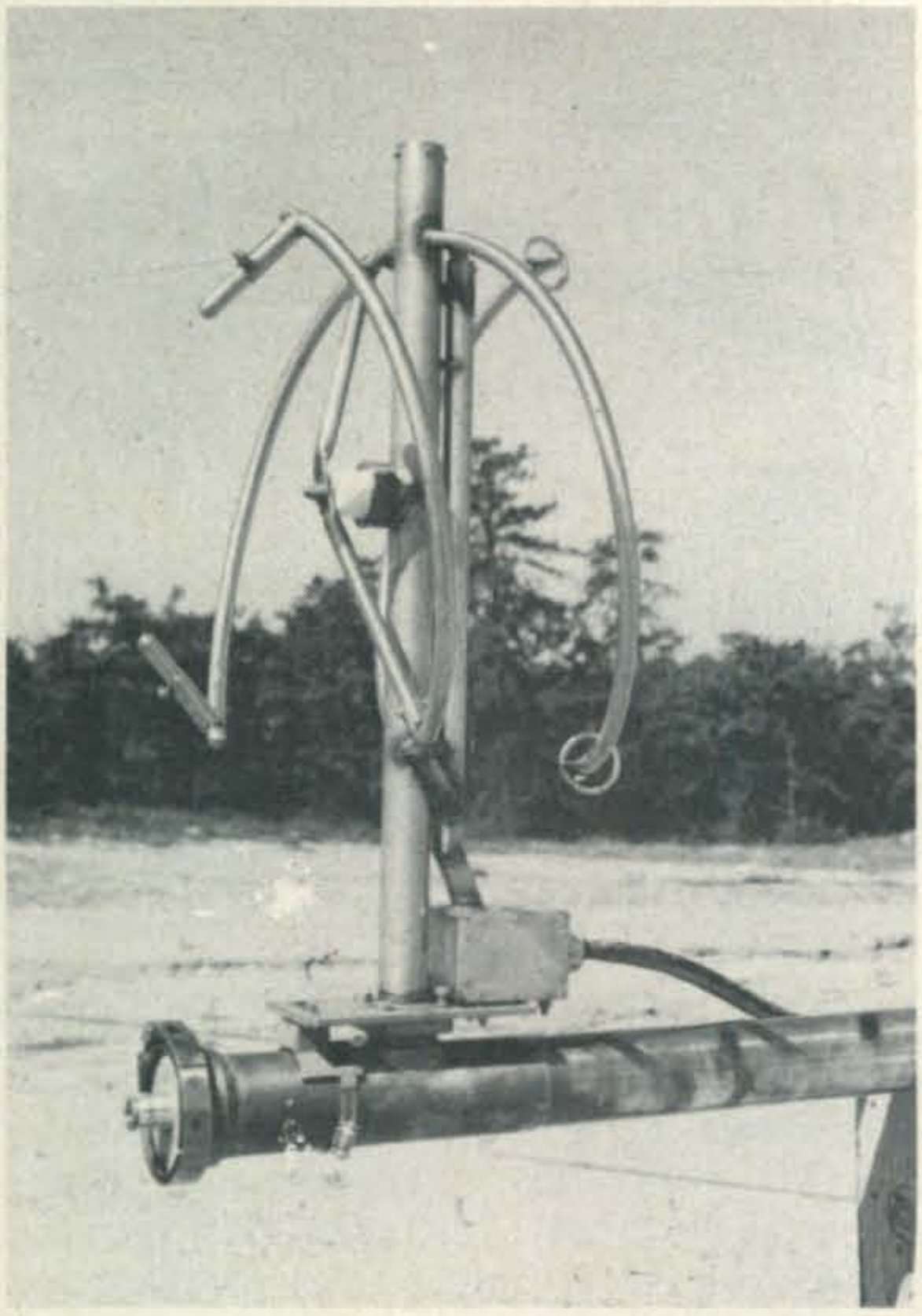

Another view of the construction of the BCF antenna. In this commercial version adjustable stubs are visible at the end of the dipole elements for fine tuning. Generally, for amateur use, such stubs are not necessary as the low antenna Q (about 13) permits easy broadband operation.

and horizontal line representation of a wave, which is often used, is somewhat deceiving in that one tends to forget that a constant reversal occurs, once each half cycle, of the electric field direction. Of course, this makes no difference as far as the representation in fig. 1 is concerned since the polarization remains the same, the arrows simply point in the opposite direction. More important, however, one forgets that the electric field can also rotate about its line of travel, although it does not do so for simple horizontal or vertical polarization.

The more general case of how the electric field can perform is shown in fig. 2 (the magnetic fields are not shown). Figure 2(A) shows a simple vertically polarized wave, or as it is more generally called whether purely vertically *or* horizontally polarized—*a linearly* polarized wave. Figures 2(B) and 2(C) show what happens when the electric field not only changes direction but rotates about its axis. Depending upon whether the excursion in th horizontal and vertical planes are unequa or equal, the polarization is said to be ellip tical or circular.

Although a dipole or other linear anten na would extract some power from an ellip tically polarized wave, the level would vary because of the non-uniform nature of th wave, with dipole orientation. The powe that a dipole of *any* orientation would ex tract from a circularly polarized wav would not vary (as long as the dipole is a right angles to the direction of travel of th wave) since the wave's power distributio is uniform. It should be noted that circu larly polarized waves do have a specifi direction of rotation. It is of no conse quence when a linear antenna (dipole whip, etc.) is being used but if two circu larly polarized antennas are used each mus produce and respond to the same directio of rotation.

Circularly polarized waves can be pro duced in a number of ways, including th combining of signals from separate verti cally and horizontally polarized antennas (dipoles mounted at right angles to each other). The separate antennas must be fed equal power and with a specific phase difference. A 90° phase difference will produce a circularly polarized wave. A 0° phase difference will produce a *linearly* polarized wave at an angle of 45°. Other phase differences will produce various forms of elliptically polarized waves. It should be noted that placing dipoles at right angles and directly connecting them together (no phase difference) does *not* produce an antenna that will most effectively respond to signals of random polarization. A phasing line between the dipoles of ¼ λ is required.

To avoid the need for a phasing line, another way to produce the 90° phase difference between antennas would be to feed the antennas in phase but physically separate the current elements in each antenna by 90° or ¼λ. This is the basic idea behind the RCA design, but they added a unique twist. As shown in fig. 3(A), the two current elements produce a circularly polarized wave. If each element is rotated in its plane, fig. 3(B), the resultant wave is still circularly polarized. If one adds another pair of current elements and places one each of the original elements at each end,

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g. 3(C), a circularly polarized signal in
l horizontal directions results and the an-
nna form becomes a single turn helix.

Certain dimensions must be observed for
e helix form to produce circular polari-
ation, however, as shown in fig. 3(D).

The foregoing discussion mentioned
current elements," all of which were in
hase and of constant amplitude. To trans-
te this requirement into a practical an-
nna form, one can use various forms of
poles. The simple single turn ½λ dipole
fig. 4(A), however, is *not* usable be-
use of its sinusoidal current distribution.
he simplest form of ½λ dipole that is
sable is the two turn antenna of fig. 4(B).
he total lineal length of the antenna is
λ, the diameter is .08λ and the spacing be-
veen turns (from the formula of fig. 3 (D)
only .03λ. Such an antenna *will* work,
ven though its diameter is only about 3'
)" and its height about 3' on 15 meters.
he *Q* of such an antenna will be rather
gh, however, and although acceptable on
e lower frequency bands would be too
strictive on the v.h.f. bands.

To produce an antenna form with great-
bandwidth[1] and achieve a constant cur-
nt condition around the elements, two
e-turn elements, each having a total lin-
l length of ½ λ was used, as shown in
g. 4(C). The spacing between the tips of
ch element is .13 λ. The current elements
t as though two separate one-turn ele-
ents were present in fig. 3(C) and the
al effect is an omnidirectional pattern
th circular polarization.

Construction and Adjustment

As might be apparent from the dimen-

mc within a 1.3:1 √ s.w.r. for the commercial f.m. band model.

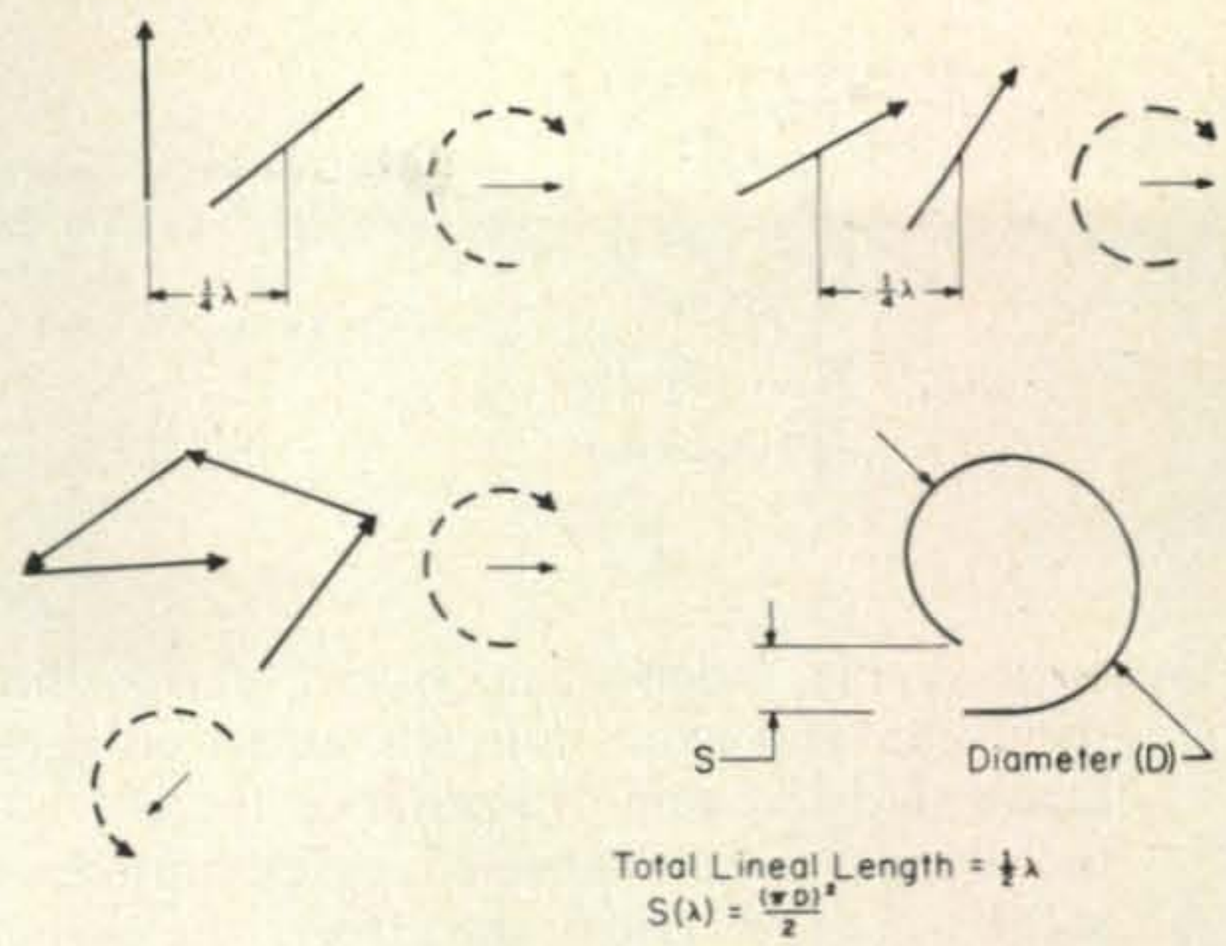

Fig. 3—Current elements fed in phase and spaced ¼ λ produce circular polarization (A) and (B). Adding additional current elements (C) produces omnidirectional circular polarization and gives helix form to antenna. Helix current element dimensions are shown at (D).

sions of fig. 4(C), the total space occupied by the antenna is little more than that required for a "halo" antenna of ½ λ construction and much less than that needed for a 3/2 λ "halo." What might not be immediately apparent is the ease with which the dipole elements can be mounted and fed from a transmission line. The general feed system can be seen in the photograph and is outlined in fig. 5. Basically, a Delta match is used to each dipole element with the two Delta arms simply paralleled where they are connected to the transmission line. The Delta arms are moved equally along each dipole element until a match to the transmission line is obtained. Since the impedance can be varied as desired using the Delta arms, a perfect match should be possible to any coaxial transmission line. For absolute balance, one could first match

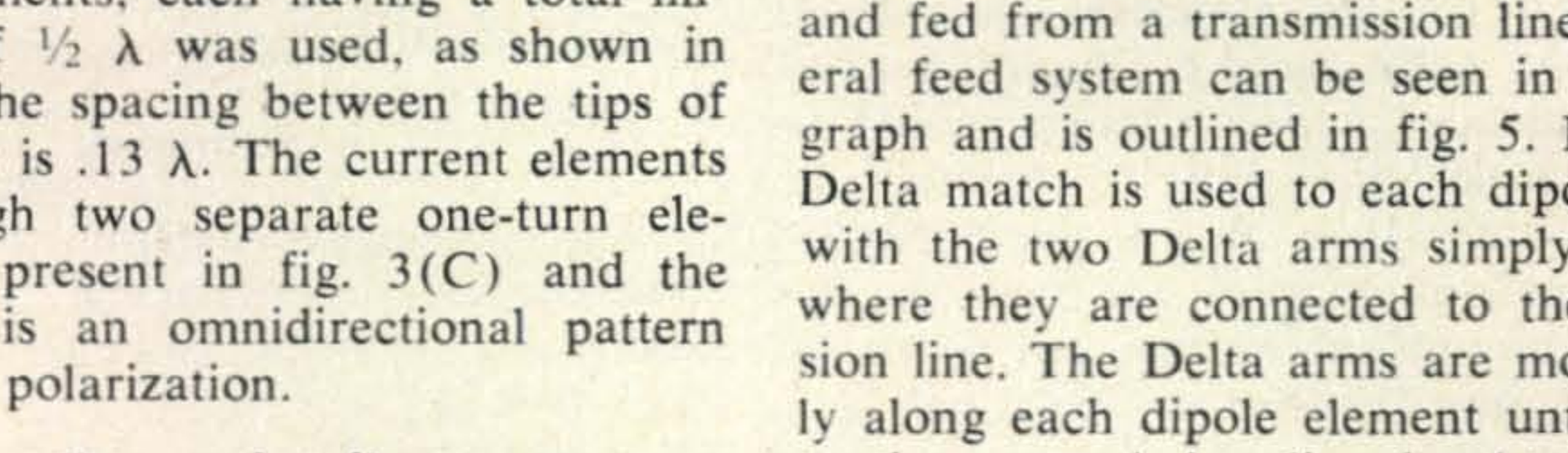

Fig. 4—For practical ½ λ helix (A) will not produce circular polarization because of its current distribution. A two-turn ½ λ helix (B) will work, although the dual-dipole helix (C) is preferred because of its better bandwidth.

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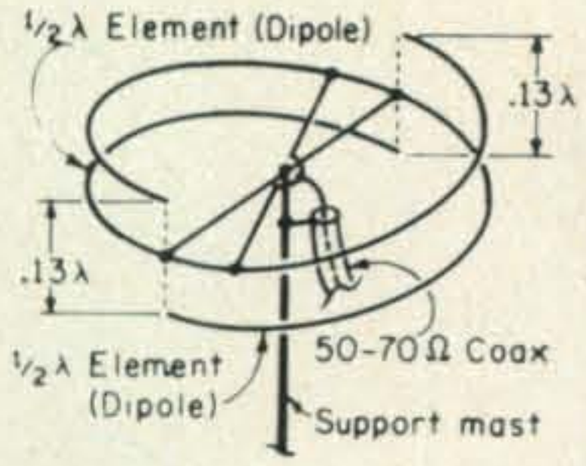

Fig. 5—Delta match and feed system for a single element "Corkscrew" antenna.

each dipole independently and check that the Delta arm excursions are equal on each dipole for the same impedance match, but the improvement obtained in performance will hardly ever justify the effort.

It should be mentioned that the Delta feed system using a single arm would, of course, also be applicable if one wanted to experiment with the two-turn antenna shown in fig. 4(B) on one of the lower frequency bands.

The physical construction of the antenna for use on the v.h.f. bands employs the same materials and techniques as that for normal "halo" antennas and so need not be mentioned in great detail here. Generally, 7/16" - 1/2" aluminum tubing is suitable and can be packed with sand and shaped to the proper diameter around some convenient form. On 2 meters, the end tips will not normally require support but on lower frequency bands provision should be made for a plexiglas spacer to maintain the proper spacing. It is also a good idea to have a small amount of the next smaller size of aluminum tubing that can be firmly press-fitted into the end of the dipole elements on hand in case the elements are cut slightly short and some extra length is required to resonate the elements.

Multiple Element Array

As is done with the broadcasting antenna, it is possible to "stack" a number of dual-dipole elements to achieve a power gain. The horizontal plane radiation pattern remains omnidirectional and circularly polarized, but the vertical plane radiation pattern is compressed towards lower radiation angles in order to achi gain. Elements are "stacked" by spac them 1 λ and feeding individual eleme in phase. Figure 6 shows the dimensi required for "stacking" of two elements 2 meters and the basic idea may be tended to "stacking" as many elements desired.

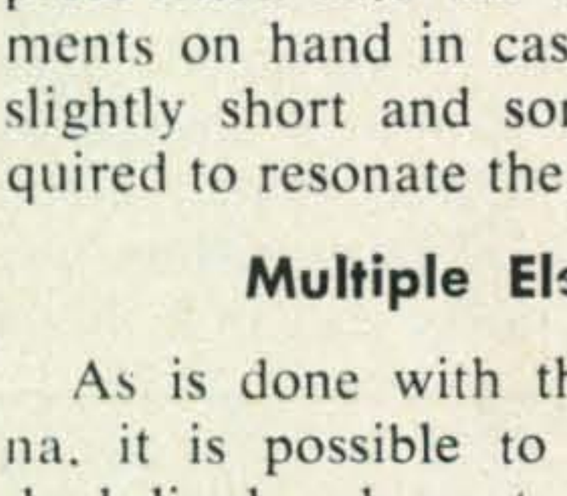

Fig. 6—Stacking dimensions for two "corkscrew" arrays on two meters. Similar arrangement of one wavelength spacing and in-phase feed may be followed on other bands.

A word should be mentioned about ga both as regards to single elements and "stacked" elements. At first, it may app as though one is getting "something nothing" since the corkscrew antenna perform as well as a separate vertical horizontal antenna simultaneously. Nat ally, this cannot be the case but the pr one does pay for the simultaneous horiz tal and vertical performance of the anter is very small indeed. Compared to a dip properly oriented for maximum perfor ance, the greatest loss of the corkscrew only ½ db, a figure hardly noticeable any practical situation and more of a t oretical significance than a practical o As elements are "stacked," the gain referenced to a dipole) does increase very roughly ½ db per added dual-dip element. Thus, a 4 element array has gain of about 2 db.

Summary

The corkscrew antenna design, as have decided to nickname it, is definit something new in antenna configurati Yet, it is *not* a theoretical concept, but that has already been *proven* in comm cial performance for f.m. transmitters.

The possibilities for the adoption of t type of antenna design, especially the tw turn ½λ model, to frequencies as low 14 mc open up a new range of designs reasonably compact DX antennas that not restricted by the polarization requi ments of present antenna designs. One c easily envision, for example, the repla ment of a conventional ground plane a tenna with its large radial system by a r atively inconspicuous "corkscrew" t would be only about ¼ the height of ground-plane antenna, require no radi and still be effective for both horizonta and vertically polarized signals! If De fed, the antenna also offers the advanta of a d.c. grounded system that should

(continued on page 90)

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D.O.S.E. AWARDED TO PROF. OSTERMOND-TOR (ex-YM4XR)

BY PROFESSOR EMIL HEISSELUFT*

ONE of the world's highest scientific honors, the Distinguished Order for Scientific Effort, has been awarded to Dr. Jerzy Ostermond-Tor, by the World Academy of Sciences. Dr. Tor, ex amateur radio YM4XR, is well known to readers of CQ for the many timely articles he has written during the past several years. CQ, at considerable expense, assigned Prof. Emil Heisseluft, a long-time friend and associate of Dr. Tor, to cover the award ceremony and review some of Dr. Tor's scientific contributions that have been beneficial to amateur radio. Dr. Heisseluft is himself a distinguished scientist, and a member of the famous Lauton Institute, located near Vienna, Austria. Here is Prof. Heisseluft's report received by cable from Greece at press time.

MUST confess, dear readers of *CQ*. that the o proudest moments of my life occurred ently. The first was the announcement t my closest friend and colleague, Dr. zy Ostermond-Tor, was to receeive the tinguished Order for Scientific Effort from World Academy of Sciences. What a nderful tribute to such a humble man who devoted so much of his life to science! The second moment of proudness came en I received a cable from New York re-esting that I cover the award ceremony *CQ* magazine, and to review those scien-c contributions of Prof. Tor's that have had gnificant influence on amateur radio.

D.O.S.E. Award

The Distinguished Order for Scientific ort, abbreviated as D.O.S.E., is one of the rld's oldest awards. History does not acc-tely record the first recipient, but there is ong evidence that it was first awarded to istotle by his teacher Plato, in ancient eece, more than 2300 years ago.

Many decades before the birth of Christ, D.O.S.E. award had already become a ular event in ancient Greece. At a tra-ional ceremony held on the small Ionian nd of Proto-Aprilia, the golden medal was arded to such great names in science as ppocrates, the father of modern medicine, Euclid, the father of modern geometry and Archimedes, who discovered specific gravity and the art of fluid mechanics.

As the Greek empire crumbled beneath the heels of the Roman legionaires, history lost track of the D.O.S.E. award. For 2000 years it remained a legend.

After a lapse of 20 centuries, and to commemorate the International Scientific Year, a modern version of the D.O.S.E. award was begun in 1968. Under the auspices of the World Academy of Sciences (WAS), the award is now given annually to leading scientists throughout the world, in recognition of outstanding contributions in a particular

The ancient Ionian temple in which D.O.S.E. awards have been given since the days of Plato and Aristotle. A 1968 D.O.S.E. was awarded to Dr. Jerzy Ostermond-Tor, ex-YM4XR, and a frequent contributor to CQ.

o *CQ*, 14 Vanderventer Ave., Port Washing-, N.Y. 11050.

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Dr. Tor graciously accepting his D.O.S.E. award. The event received worldwide television coverage by communication satellite.

scientific endeavor. No need to tell you, dear readers, that this is one of the most coveted awards in the scientific community. It is given only to the greatest of the great.

Throughout the world scientists held their breath in keen anticipation as the announcements of the first modern D.O.S.E. awards were made on December 31 of this past year. Among those few selected, I am proud to say the name.

JERSEY OSTEROND-TOR

with the following citation
"for his outstanding contributions to the furtherance of the science of telecommunications"

The D.O.S.E. Ceremony

The award itself is a heart-shaped medal about 4 inches at its widest and longest points. It is made of solid gold melted down from ancient Greek coins, and is believed to be an exact replica of the original D.O.S.E. first awarded to Aristotle. The medal is attached to a gold link chain so that it can be worn about the neck.

The World Academy of Sciences decided to present the awards in the same traditional ceremony, in the same temple, on the same island, and during the ides of March, exactly as was done in ancient Greece.

This was a terrible winter in Vienna, very cold, and I cannot remember so much snow. So I was glad to be heading for the warmer climate of the Ionian Sea. I left Vienna in a snow storm, and two hours later when I landed in Athens, it was warmer, but raining. As the Olympic Airways DC-6B from Athens banked to land on the small island of Proto-Aprillia, I could see beautiful white beach below me, glistening in a brilliant sunshin and forming a frame for the island against background of the deepest blue water I ha ever seen.

Directly below the low flying plane we green-spotted brown hills and the squa white rooftops of the small villages, u changed since the days of Aristotle. To t left, at the tip of the island, shining in the su I could see the white doric columns of t Parthenon of Proto-Aprillia, where the cer mony was to be held. What a beautiful setti for such a distinguished occasion!

The ceremony began precisely as the b in the old church struck the noon on the 15 of March, the ides of March of ancie Greece. Flute and lyre playing musician garbed in the multi-colored robes of ancie Greece, led the parade into the Parthenon cannot find the words to describe the beau of the Ionian maidens, the handsomeness the men, and the aura of this event, whi had turned the clock of time back 2000 yea

The Chairman of the WAS arose and intr duced each recipient amidst a fanfare of flut and lyres. As his name was called, Dr. T arose gracefully, and was immediately en braced by a dark-haired maiden in an ank length sea-green tunic, who insisted on e corting the Professor to the podium, whe the Chairman solemnly placed the golde D.O.S.E. around his neck. What a breat taking scene! I am not certain whether T bowed his head out of humbleness, or b cause it was being weighed down by t medal.

After the medals had been awarded, t ceremony continued for most of the da There was a wonderful feast, which w attended by many of the world's scienti leaders. I was rubbing elbows with a virtu Who's Who in Science.

To end the ceremonies, the recipients a cepted their awards publicly. Perhaps yo witnessed this, since it was televised an carried to Europe and the Western Hemi phere by communication satellite. In a ha full of distinguished guests and townspeopl each recipient thanked his peers. This is on of the few times that I have ever seen Pro Tor nervous. He stumbled as he came to th podium. (Perhaps this was intentional in hop that he would again be assisted by an Ionia beauty. Who knows? Tor can be awfully s at times!

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Now you might ask, what does this all have o do with amateur radio? True, the Professor vas an active radio amateur, but that was nany years ago, and he no longer holds a alid licence.

Well, I have worked very closely with Tor or the past thirty years, and I can tell you hat amateur radio is still the closest thing to is heart. Many of the scientific contribuions which earned him his D.O.S.E. were notivated by his desire to do something for mateur radio. In the following paragraphs will review briefly those of his activities hat have had significant influence on amateur adio.

Ionospheric Amplification

This is probably Prof. Tor's greatest claim o fame. He is generally given credit for discovering, as a radio amateur more than hirty years ago, a unique characteristic of he ionosphere which makes it possible to btain a greater amplification for very low ower signals, than for higher power.

Wartime difficulties made it impossible for he Professor to publish his Ionospheric Amplification paper until 1964. Since publication, however, it has been given much credit for he trend to low power now very much evident in the amateur bands. More radio amateurs are making more contacts with lower power than ever before as a result of Dr. Tor's experiments with Ionospheric Amplifiation.

DX Voice

In 1965, Tor was busily engaged in research of a very important nature and he asked me to prepare a technical paper on experiments that we had conducted together.

We both had noticed, over a long period of ime, that certain voices cut through the QRM nd QRN much better than others. Why?

After careful study, we found the trick to mproving voice intelligibility was to get as much power in the voice range between 1000 nd 3000 c.p.s. Of course, this can be done lectronically with filters, clippers and compressors, but these are costly devises. We, nstead, devised a series of voice exercises hat could produce a gain in intelligibility equivalent to 10 db, at no cost at all!

MEMTAC

MEMTAC, which stands for "modulation of the earth's magnetic field to affect communications", resulted from Tor's experiments with the earth's magnetic field as a long-distance carrier of modulation. He successfully developed a 50 watt magnetic amplifier to excite the earth's magnetic field. Once excited, Tor theorized, the lines of force would unlock stored energy in a chain reaction to propagate the modulation impressed by the amplifier over great distances.

As far as I know, Tor has discontinued his MEMTAC experiments, or he is working on them in the greatest of secrecy.

Mrs. Janeva Lixber, Dr. Tor's attractive assistant who helped uncover the SSS plot against amateur radio, proudly displays Dr. Tor's D.O.S.E. award. If you happen to notice the medal, its forged from ancient Greek coins.

S.S.S.

Dr. Tor's greatest contribution to amateur radio may not be one of his scientific discoveries at all, but his exposure of the S.S.S., or Special Subscriber Service.

S.S.S. was being developed secretly by an international telephone organization called ONIT, as a telephonic replacement for amateur radio. Quite by accident, Tor attended an ONIT conference and was shocked by what he discovered. The proposed new telephone service would consist of a small encoder attached to a regular telephone, enabling it to be used as an S.S.S. phone by merely flicking a switch. When in the S.S.S. position, the phone would be switched to a world-wide telephone master computer center. The com-

[*Continued on page 90*]

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DX

BY JOHN A. ATTAWAY,* K4IIF

GUS, HKØTU, Wallis Island, KH6GLU, VQ8CC—and it's just getting started. 1969 looks like one of the best DX years ever.

The controversy is all over and hopefully it won't happen again. If we can formulate a good, sane countries list acceptable to everyone, and stick to it, we can be sure it won't happen again. The road ahead looks good from this vantage point, HOW ABOUT YOU!

WAZ

It was a big month for WAZ, with 39 hard-working DXers being authorized to receive the world's toughest DX award during the period Jan. 1-31, 1969. This makes it the 3rd. highest month in the history of the award. Hat's off to the following winners:

WAZ S.S.B.: CE3ZN–635, W7PJL–636, SM6VR–637, OHØNI–638, W9WGQ–639, DL7BK–640, UA3HO–641, K6SVT–642, PY1WJ–643 and VK3VK–644.

WAZ C.W.–Phone: OE5CA–2567, W6-LVF–2568, SM7CXH–2569, SM7BBH-2570, SM7CFR–2571, LA9HC–2572, SM7ASA–2573, SM5CAK–2574, SM5BFJ-2575, K4GRD–2576, WA9NHQ–2577 K4CIA–2578, K4SWO–2579, W4JXM-2580, KØYIP–2581, W3HTO–2582, DL6IC–2583, W8UCI–2584, W8MSG–2585 UA9BZ–2586, DM2BYN–2587, DL8TG-2588, OK1AFN–2589, OK2PO–2590, G3BDS–2591, GC2FMV–2592 and HB9BN-2593.

WAZ Phone: CE3ZN–404 and CR7FM-405.

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

Walter Geyrhalter, DL3RK, in our book a real *Big* man in German DX Affairs. Walter had been editor of *DX-MB* for many years and is our CQ DX Committeeman in DL-land.

WPX

Business was good up Howard's way to with the following new WPX certificate an endorsement winners:

WPX S.S.B.: SM5EAC–387, G3BDS–388 FR7ZG–389, UAØNM–390, UA3FT–39 and UT5RO–392.

WPX C.W.:SM7DQC–907, W3CRE–90 OK1ARN–909, UAØLH–910, UA3HV 911, UB5KLD–912 and UB5LS–913.

WPX Mixed: SM5AD–188, SM5CAK 189, W4LRN, HB9RX–191 and I1BNU 192.

Continent Endorsements: *Europe:* OE KW, SM7TV, WA2FQG and W9HFB. *Africa:* SM7TV and WA2FQG. *Asia: SM* TV. *North America:* DL1QT.

Band Endorsements: *80 Meters:* OK2P SM5BGK and UA3FT. *40 Meters:* SM BGK. *20 Meters:* OE1KW, OK2DB, UA FT and WA2FQG. *15 Meters:* WA2FQ *10 Meters:* DL1QT.

Mode Endorsements: *S.S.B.:* W9DWQ 600, YV4UA–400, WA6AHF–350, UA FT–300, G3BDS–300 and FR7ZG–30 *C.W.:* UA3FT–500, SM5BGK–450, OK PO–450, OK1PT–400, W9HFB–350 a W2MBU–350.

Phone: W9WHM–850, PAØSNG–750 a YV4QG–450.

Mixed: W4LRN–850, W9DWQ–800, K CPR–750, G3DO–750, PAØSNG–70 WA2FQG–500 and SM5CAK–500.

S.S.B. DX Awards

There was a noticeable increase in terest in these awards from overseas, with of 14 new certificates authorized going DX-land. The winners were:

100 Countries: VK9WD–540, HP1JC–54 DJ3WW–542, SM7CSN–543, SM5EA 544, SM5AD–545, CO2FA–546, VP7N 547, DL8XA–548, PY1JZ–549 and JA KZQ–550.

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S.S.B. DX Honor Roll

V2TP	317	K6CYG	305	W2FXN	292	W6RKP	272
K3AHO	315	K6YRA	305	W9JT	292	G3NUG	270
VA2RAU	315	WA8AJI	304	K1IXG	288	G3WW	269
V9ILW	315	W6YMV	303	W2LV	286	K8ONV	269
I2HP	313	WØQVZ	303	K8RTW	286	MP4BBW	267
V3NKM	313	W2BXA	302	W6EUF	286	G2PL	265
VA21ZS	312	G3AWZ	301	W9EXY	284	G2BVN	264
L9OH	311	G6TA	301	F2MO	283	W2MJ	261
P4CL	310	W3DJZ	301	W3KT	281	DL3RK	259
3FKM	310	G3HDA	298	W1LLF	280	G3DO	259
V2RGV	309	XE1AE	298	W6UOU	280	PJ2AA	258
V4OPM	309	5Z4ERR	298	W4RLS	279	K1SHN	257
1AMU	308	K2DX	297	K4OEI	279	WA1EOQ	256
V8DE	308	W4QCW	297	DL1IN	276	SM6CAS	254
8KS	307	W4SSU	297	K4HYL	276	W6BAF	254
V5KUC	307	W8BT	297	W7DLR	276	K6CAZ	254
K6LGF	307	W4UF	297	PZ1AX	274	PAØSNG	252
V2ZX	305	W4PAA	294	K9EAB	273	VE6TP	251
V4NJF	305	W8EVZ	293	K9LUI	273	W1AOL	250

Claude Ronsiaux, F9MS, DX Editor for REF, the French national amateur radio society. Claude is also an oversea's member of the CQ DX committee and checks WAZ and S.S.B. DX QSL's for us in France.

00 Countries: SM6CAS–162 and W9JT–63.

00 Countries: W4NJF–40.

CQ DX Awards—Rules and Applications

A reprint of the rules, as well as application blanks, for all the CQ DX awards may be obtained by sending a self-addressed, stamped envelope (sase) to any of the award managers. These are K4IIF for WAZ, K4DSN for WPX and VPX, W8HBD for the S.S.B. DX Awards, and K4GRD for WPNX. All addresses are OK in a recent callbook.

Regular readers and subscribers will find rules for all the awards in the DX column of the Janurary, 1969 issue.

De Extra

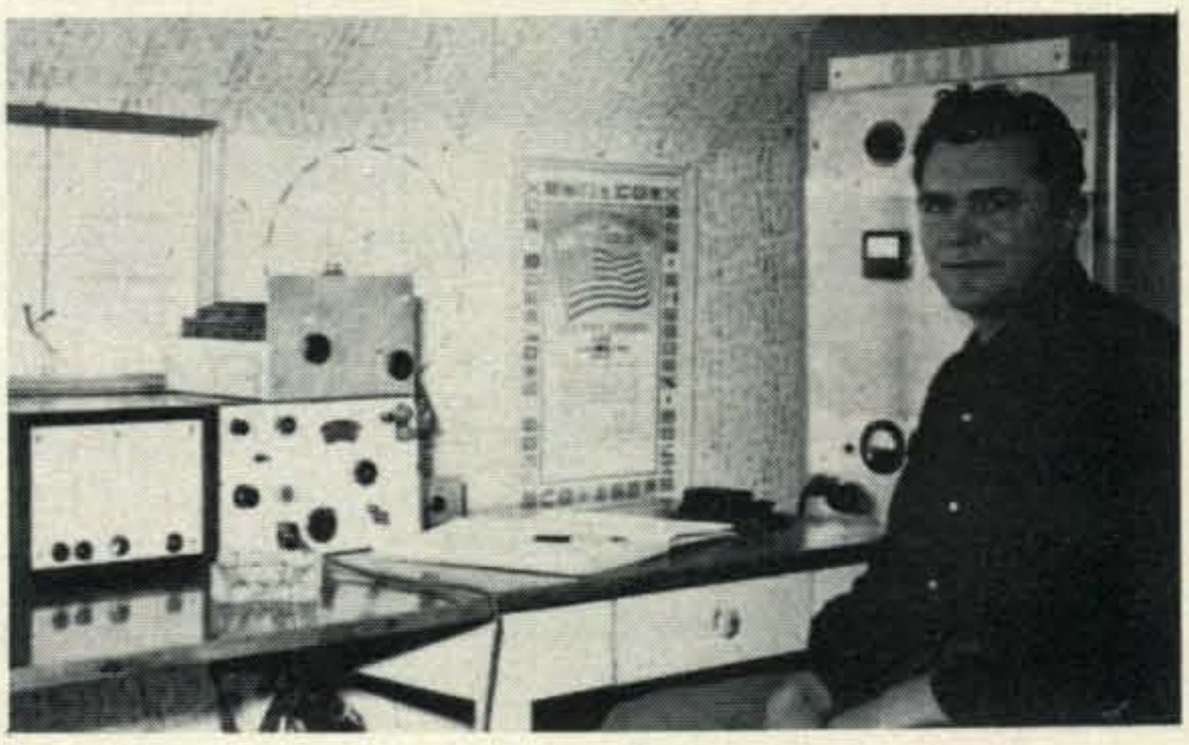
One thing which has absolutely amazed me since I became a regular contributing editor to *CQ* is widespread circulation of the magazine. Over the past 2 years I have received letters from subscribers in almost every real country in the world including such diverse ones as Russia and Lesotho. When you realize that you're that widely read it makes you take the job pretty seriously. Among those received recently is a letter from Leon, SP5AFL, giving his reaction to the CQ DX Advisory ballot which appeared in the November, 1968 issue. We are making it De Extra this month to give you and example of east European thinking on the country status question.

"Having just received my November copy of *CQ* with the DX Advisory ballot I decided to write a few comments. As a DXer and an author of a handbook with an awards section I am more than a little interested in it.

"Pt. 1–*Country should have a separate government administration*– Fully agree. It isn't down to earth to count as one country, two countries having different governments which love each other like cat and dog. This means that countries like DL & DM, North and South HL, or North and South 3W8 should be counted separately. West Berlin is difficult to put into a category since it is formally under the administration of 3 western powers but has the money of DL. It could be another country too.

"Pt. 2–*Islands as separate entities*–No comments. This seems logical.

"Pt. 3–*Separation by foreign land*–What is considered foreign land? If UP2 lay between UA2 and UA3 it could be considered that UA2 and UA3 were different countries, but UP2 isn't foreign territory. Also, how about ARRL's pseudocountries like GM, GW, and GD. Should they be different from G? I think not, because the only differences



Ruda Staigl, OK2QR, a top European DXer who recently qualified for the 650 sticker on his WPX certificate. Ruda is also interested in the USA-CA program and has 736 counties confirmed. He asks that everyone please print their county on their QSL card. In 12 years on the air Ruda has made over 23,000 QSO's using a 9 tube German army receiver and a homebrew transmitter with 200 watts input.

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This is Anna—she's one half of Poland's outstanding husband and wife DX team. Anna, SP6AZY, is giving some SSB experience to her young son, Paul. Behind the shutter is the other half of the duo, Andy, SP6AEG. (Photo via K4DSN)

in government is their county council or whatever it's called. This way *every* country could be divided into some smaller ones. Seventy-five miles doesn't mean much except to a W or an old type G man. Why not say 120 kilometers?

"Pt. 4– *Only count UN countries.* NO!!! Can you imagine the list without HB9 which isn't a UN member, or without DM or DL which aren't UN members??? What about the U republics? Only 2 of them are UN members?

"Pt. 5–*Must be a postoffice.* No comment. Only theoretically could there be an island with 10 permanent inhabitants and no postoffice.

"Pt. 6–*Certain minimum high water line.* Of course!!

"Pt. 7–*Don't count unclaimed islands or reefs.* Of course not!!"

There are some interesting views here. This isn't the first time someone has suggested separate status for the 2 Germany's, the 2 Korea's and the 2 Viet-nam's. However, it is the first time anyone has suggested to this column that West Berlin should have separate status. I'm sure that a Scot or a Welshman might have something to say on his interpretation of point 3.

See you next month.

W1WY—King of the Contest Makers

We've long considered Frank to be the world's top DX Contest organizer, and the following article reprinted from the Southern California DX Club Bulletin confirms this judgement:

"King of the Contests? by W6NJU: Upo reading the results of the 1968 ARRL Te and seeing where the contest is still th "King," I decided to make a comparison o the ARRL and *CQ* contests. Many Californ DXers have stated that they enjoy the *C* contest more than the ARRL because o better DX activity and single band entrie Keeping these comments in mind the follow ing analysis was made.

"Judging by number of entries and D participation the ARRL contest is no longe King. Below are comparisons of the 1967 *C* and ARRL tests:

	ARRL	*CQ*
Total Entries	2,225	2,911
Total DX Entries	710	1,896
DX Phone Entries	278	713
DX C.W. Entries	432	1,183

"Of the total ARRL entries, 32% wer from DX stations while 65% of the *CQ* con test entries were DX stations. The *CQ* te had 31% more entries and 156% more D participation in the Phone section and 174% more DX participation in the c.w. sectio Total DX participation in the *CQ* test wa 167% better than the ARRL test. The num ber of countries in the ARRL test was dow 16% from last year. The most noticabl continents of difference for DX participa tion are Asia, Europe, and South America DX entries in the *CQ* contest exceeded th ARRL by 223% in Asia, 202% in Europe and 138% in South America.

"It is obvious that something should b done to encourage more participation in th ARRL contest. Single band entries may help but possibly other measures could be taken I suggest that some changes be initiated im mediately. We've seen surveys on Field Day club score limits, and ARRL appointees Can't we run a survey among DX test en trants or even clubs showing an interest Approximately 514 entries are from U.S clubs and ideas could be obtained from these clubs."

New Netherlands Antilles Prefixes

A new system has been adopted by the government to designate and identify radio amateur stations on the different islands. It went into effect Jan. 1, 1969, and after that date the previous calls became illegal. This provides some juicy new ones for the WPX boys. The new set-up is as follows:
PJ2 – the island of Curacao in Zone 9

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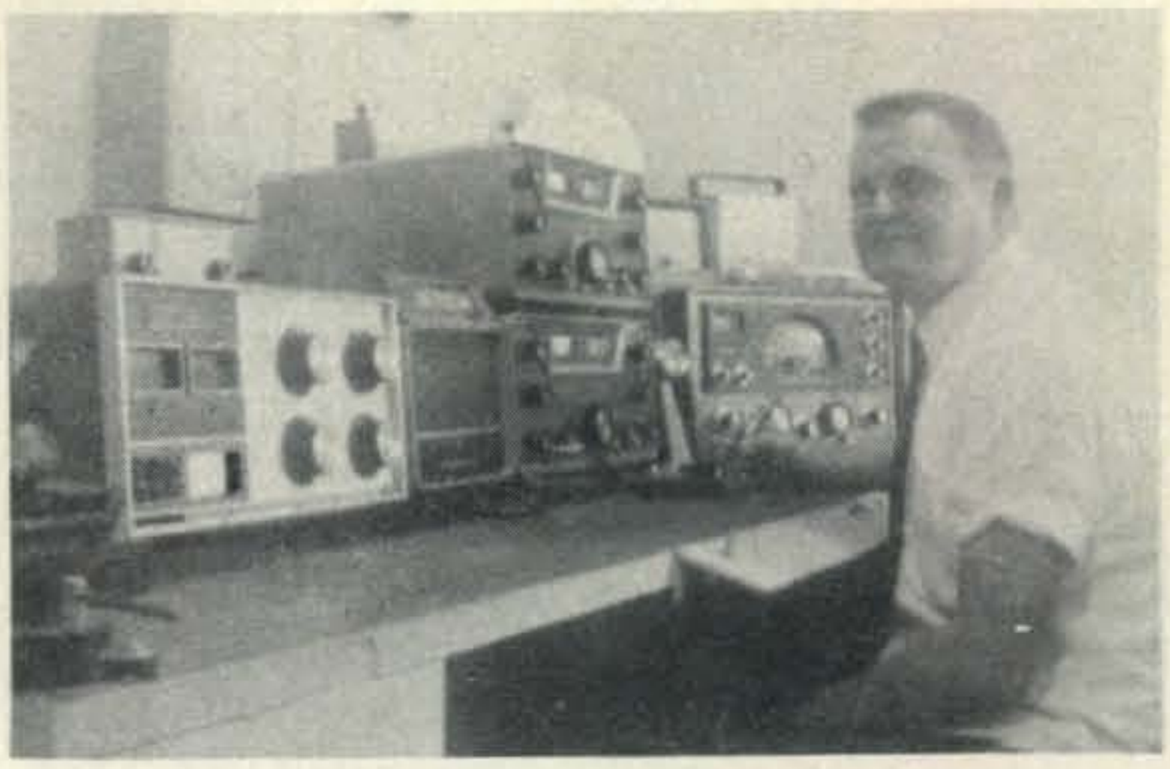
J3 – the island of Aruba in Zone 9
J4 – the island of Bonaire in Zone 9
J5 – the island of St. Eustatius in Zone 8
J6 – the island of Saba in Zone 8
J7 – the island of Sint Maarten in Zone 8
J8 – visitors in Netherlands Antilles Zone 8
J9 – visitors to Netherlands Antilles Zone 9
J1 & PJ∅ – for special calls only. Could be assigned to any island in either Zone.

his information was furnished by Jose M. ijntje, PJ7JC.



Joe Poston, K9GCE, one of the big guns of the Indianapolis DX Association. You've probably worked Joe from time to time in PJ5 and FS7 land.

160 Meter News de W1BB *et al*

The DX Window—The recent change in egulations which made the nice DX section etween 1825 & 1830 kc available to W/VE land ops has made a problem with appa-ntly no easy solution. As far as the east past is concerned the DX stations can oper-te in the clear space between 1850 and 1855 c. However, this is no good for the W8's, V9's, and W∅'s who hear much Loran QRM this band segment.

W1BB advises that we have no choice but "live with and work with" the QRM in the 825-1830 kc segment. Possibly we can lve this problem to the point where it is vable by tact, diplomacy, and understand-g. Discuss it with the boys who operate ere. Let them know that DX congregates ere and get them to listen for it and oper-te outside that section. Stew is willing to mpose a friendly letter which we could send stations heard there, explaining our prob-m to them and asking their help.

The point is that DXing time on 160 is nly a small portion of the available time, so aybe the boys won't mind at all QRXing nd maybe joining in the fun. Possibly this ection will gradually come to be known as e "DX Window" of 160 through which veryone can better enjoy top band. Any uggestions as to how best to accomplish this ill be greatly appreciated. Drop a line to tew Perry, W1BB.

Club News

Congratulations to Bob Norman, K4GRD, *Q* WPNX Award Manager, on his recent ppointment as new editor of the *Florida DX eport*, official organ of the Florida DX lub. A vote of thanks to Gene Sykes, W4-RB, for his many years of effective and aithful service. He leaves a big pair of shoes r Bob to fill.

The Southern California DX Club reports the following on it's rarest country list prepared from a poll of the membership:

1.) Albania–ZA
2.) Heard Island–VK∅
3.) Iraq–YI
4.) Malpelo Rock–HK∅
5.) Navassa–KC4
6.) Laccadive Islands–VU
7.) Rio de Oro–EA9
8.) Qatar–MP4Q
9.) Clipperton Island–FO8
10.) Bouvet Island–LH4

FEARL (Far East Auxilary Radio League) reports that its new officers are Capt. W.J.B. Ross, Jr.–KA2FL–President, and SFC R.W. Unger, K3FUR, Secretary. Appreciation is expressed to Don, KA2DO, and Leo, KA2-LS, outgoing President and Secretary, for the excellent job done during the past year.

The Canadian DX Club continues to add to its burgeoning membership and has definitely become a major force in amateur radio north of the border. New members since last month's column include VE1AUC, VE1AUI, VE1WX, VE2BOW, VE3ATF, VE3CYP, VO1QA, and VE3LJ.

From the Mailbag

de Kurt Meyers, W8IBX/2–"In view of the glaring inconsistencies in the ARRL Countries List, I wholeheartedly endorse your idea of an International Country Congress. However, you must take pains to see that a fair representation is present." *(We are presently investigating the possibility of working this out through IARU–DX Ed.)*

de Jose, PJ7JC: "I did admire your article in the December issue of *CQ* concerning a new approach to country status. I am in complete agreement that it is time for a

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An Olt Timer, WØGDH, John Dormois (Linotype business) of Kansas City, Kansas—proudly displays QSL cards for believed "FIRST EVER" 50 State "WAS" Award Certificate on 160 meters!

drastic change. I always felt that our Dutch islands in the Caribbean were never given the right recognition, although every bit of rock in God's ocean was given separate country status."

de Vic Olacke, VE3IG—"Please remind all that SASE or SAE plus IRC's to all QSL Managers are a must! Also remind W, K boys that USA postage is not valid in Canada. All VE QSL Managers have a lot of trouble with SASE's having U.S. stamps.

"CR5SP, CR6IV, and myself have a sked every Sunday at 2100 GMT. Anyone who needs a contact can drop me a line and I will set it up for him."

de Doc Pollard, WAØMOJ—"Thought you would like to know that my copy of your K4IIF/KV4 card was accepted for my DXCC certificate awarded 9/24/68."

de Ernie, VE1JO—"I would like to offer my services as QSL Manager for a DX station. Contact Ernest Guy, 133 McKenzie Ave., Oromoto, New Brunswick, Canada."

Here is a chap who has recently given many a happy DXer a new prefix and country, Fida, AP5HQ, who is very active on the c.w. bands with a 100 watt transmitter and an inverted Vee antenna.

de Ed, W2RAA—"On Jan. 21 I worked G3CFV on 160 meters between 2:20 and 2:50 A.M. EST. Signals were 5/8/9 both ways and his s.s.b. was also Q5. The antenna was a "double" Hula Hoop, only 3 ft. above the snow and 4 ft. above the ground, 80 ft. in diameter and made of #14 wire. I plan to substitute 6 in. aluminum flashing for the wire which should improve performance noticeably."

de Martin M. Goldberg, KØBUR – "I have worked over 260 countries with an HT-37 barefoot to qualify for my 2X S.S.B. WAZ. I believe this is one of the most difficult DX Certificates to obtain, and well worth the effort and satistfaction it has given me." *(Some DXers have reported working over 300 countries before making WAZ. It isn't easy, HI.—DX Ed.)*

de Charlie Carroll, WN3KKG/MM—"I operate a Heath HW-16 tranceiver aboard the *S.S. Australian Galaxy* in the Pacific. If any novices are interested in DXing they can find me on 21170, 21201, and 21213 around 2100-2200 GMT."

de Edward R. Dzeda, W8EM—"I am a subscriber to your fine magazine and think it is the *only* one which gives the complete DX picture, and DXing is all I have time for at present. I subscribe to all 3, but your articles beat the other 2 by a country mile."

Here and There

A2, Botswana—Jim, A2CAU, is active on 14 mc c.w. Skeds can be arranged through K4ADU.

AP5, East Pakistan—AP5CP reported on 14052 at 1254 GMT. QSL to Tiger Amateur Radio Club, Dacca Signals, Dacca 6, E. Pakistan.

AP5, West Pakistan—AP5HQ is frequently worked near 14203 kc between 1230 and 1300 GMT. He is also reported to have been heard on 14220 kc at 0300 GMT.

CR8, Timor—Three stations are currently active. They are CR8AG with 25 watts on a.m., CR8AH with a Swan 350 and 15 meter quad, and CR8AI on s.s.b. with a TH-3 beam. The latter is most active on saturdays between 21260 and 21300 kc.

DARC QSL Bureau—The new address for the DARC Bureau is P.O. Box 86 03 20, D 8 Munich 86, Germany.

DX1, Philippines—This is a new prefix for foreign operators in the Philippines. Na-

[*Continued on page 90*]

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Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

Mar. 29 - Apr. 13		IARC Propagation Phone
April	5-6	SP DX CW Contest
April	**12-13**	**CQ WW WPX SSB Contest**
April	19-20	Helvetia XXII Contest
April	26-27	PACC DX Contest
April	26-27	DARC WAE RTTY Contest
April	26-27	ONE LAND QSO Party
May	3-4	USSR DX Contest
May	3-4	OZ-CCA DX Contest
May	3-4	Nebraska QSO Party
May	3-4	Ohio QSO Party
May	10-12	Georgia QSO Party
May	17-18	Michigan QSO Party
May	24-25	YL International SSB
June	7-9	N.Y. State QSO Party
June	15-21	Mass. Amateur Radio Week
July	19-20	Columbia DX Contest
July	19-20	Minnesota QSO Party
October	4-5	VK/ZL/Oceania Phone
October	11-12	VK/ZL/Oceania C.W.
October	11-12	RSGB 28 MHz Phone Contest
October	18-19	Boy Scouts Jamboree
October	**25-26**	**CQ WW DX Phone Contest**
October	25-26	RSGB 7 MHz C.W. Contest
November	8-9	RSGB 7 MHz Phone Contest
November	8-9	ARRL SS Phone Contest
November	15-16	ARRL SS C.W. Contest
November	**29-30**	**CQ WW DX C.W. Contest**

IARC Propagation Contest

Phone: 0001 GMT Mar. 29 to 2400 Apr.13

The c.w. portion of the "contest with a purpose" was held last month. Complete rules in the February CALENDAR.

Mail your log before June 1st to: L.M. Rundlett, IARC Contest Committee, 2001 Eye Street, N.W. Washington, D.C. 20006

SP DX C.W. Contest

Starts: 1500 GMT Saturday, April 5
Ends: 2400 GMT Sunday, April 6

This is a c.w. only contest in which the world works the Polish stations.

Complete rundown of the rules in last month's CALENDAR.

Mailing deadline is May 1st and logs go to: PZK Contest Manager, P.O. Box 320, Warszawa 1, Poland (Indicate **SP DX** Contest)

Helvetia XXII Contest

Starts: 1500 GMT Saturday, April 19
Ends: 1700 GMT Sunday, April 20

This is your opportunity to work some of those rare Cantons needed for the attractive H22 certificate.

Check last month's CALENDAR for contest rules and list of Swiss Cantons.

Mail your log within 30 days to: Marius Roschy, HB9SR, USKA Traffic Mgr., Ch. des Granadiers 8, 1700 Fribourg, Switzerland.

Applications for the Helvetia XXII certificate however go to: Henri Bulliard, HB9RK, P. O. Box 384, 1701 Fribourg, Switzerland.

PACC DX Contest

Starts: 1200 GMT Saturday, April 26
Ends: 1800 GMT Sunday, April 27

Its the world working the Netherlands on all bands, 1.8 thru 28 mc. c.w. and phone are scored as separate contests with separate logs.

Exchange: The usual five and six figures, RS/RST plus a progressive QSO number starting with 001. PA/PE/PI stations will also include their province. (579001/GR)

The 11 provinces are: DR, FR, GD, GR, LB, NB, NH, OV, UT, ZH, ZL.

Scoring: Each QSO counts 3 points and the same station may be worked on each band for QSO and multiplier credit. The multiplier is the sum of provinces worked on each band, a possible 11 per band. Final score, total QSO points multiplied by the sum of provinces worked on all bands.

Awards: Certificates to the top scorers in each country and each call district in W/K, VE/VO, CE, PY, JA, VK, ZL, ZS.

*14 Sherwood Road, Stamford, Conn. 06905.

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Logs: Date/time in GMT, station serial number sent/received, multiplier column for each band, (fill only when it's a new multiplier) and QSO points.

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

Mailing deadline is June 15th to: P.v.d. Berg, PAØVB, VERON Contest Mgr., Keizerstraat 54, Gouda, Netherlands.

One Land QSO Party

Starts: 0000 GMT Saturday, April 26
Ends: 2400 GMT Sunday, April 27

The New England CHC Chapter 32 is the sponsor of this one.

Only 24 hours out of the 48 hour contest period may be used for credit. New England stations may work anyone, outside stations may work New England only. The same station may be worked on each band and mode, and more than once if it's from a different county. Only single operator stations are eligible for awards.

Exchange: QSO nr., RS/RST, county, state and operators name. Same for all stations.

Scoring: Domestic QSOs 1 point, DX 3 points and Novice 5 points.

NE stations—QSO points X (states + provinces) X (countries + continents).

Outside NE—QSO points X NE counties (max. of 67) X NE states. (max. of 6)

KH6 and KL7 count both as state and country.

Novice stations score separately, and s.w.l. get double point value if both sides of QSO are reported.

A minimum of 250 points must be obtained to qualify for an award.

Frequencies: c.w.—3575, 7080, 14075, 21090, 28090. s.s.b.—3990, 7290, 14340, 21440, 28690. Also all Novice bands.

Awards: Certificates to the 1st, 2nd and 3rd place winners in each state, province and country, and in each New England county. Certificates also go to Novices and s.w.l.'s.

There are 3 Trophies, one each to the highest scoring DX, U.S. and New England stations.

Logs go to: Thomas D. Walsh, K1VGM, 53 Neponset Road, Quincy, Mass. 02169 and postmarked before June 16th. Include a s.a.s.e. if a copy of results are desired.

WAE RTTY Contest

Starts: 0000 GMT Saturday, April 26
Ends: 2400 GMT Sunday, April 27

This is the first RTTY Contest organize by the DARC. Only 36 hours out of the 4 hour contest period are permitted for singl operator stations. The 12 hours of non opera tion may be taken in not more than 3 periods

All bands may be used, 3.5 thru 28 mc (It would be highly desireable of suggeste frequencies had been specified.) Both singl and multi-operator stations are permitted.

Exchange: QSO nr., RST and time in GMT

Points: Contacts within one's own con tinent count 1 point, outside one's continen 3 points. However non-European stations ge 5 points for each EU contact. The QTC fea ture is also used in this contest, each QT exchange is worth one point. (See July '6 CALENDAR for details and WAE country list QTC exchange is limited to 5 QSO's instea of 10.)

Multiplier: The multiplier is determine by the number of countries worked on eac band. The WAE and ARRL country lists ar the standards. In addition call areas in th following will also be used as multipliers: JA PY, VE/VO, VK, W/K, ZL, ZS, UA9,UAØ

Scoring: Final score, total QSO point plus QTC points multiplied by the sum tota countries from all bands.

Awards: Certificates to following: To Ten Single operators, European and non European; Top Five multi-operators, Euro pean and non-European; to the continenta leaders; and to the Top Three with mos QTC's sent.

Mailing deadline is June 10th and go to Uli Stolz, DJ9XB, In der Ostert 3, D-59 Plettenberg, West Germany.

USSR DX Contest

Starts: 2100 GMT Saturday, May 3
Ends: 2100 GMT Sunday, May 4

The Radio Sport Federation has not sen us an official announcement of this annua affair, but we feel reasonably certain that i will be held at the usual time. It's a worl wide type contest so don't concentrate or working USSR stations only.

Exchange: A six figure serial number, fo the USSR stations the RST plus the numbe of their oblast. Others will send the RST plus a progressive QSO number.

Scoring: QSO's between stations on the same continent count 1 point, and 3 points

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etween stations on different continents.
The final score is determined by the total SO points on each band multiplied by the fferent countries worked on that band.
The final all band score is the sum of the ores from each band. (Not like our WW ntest, you *add* the scores in the last column.)
Only 12 continuous hours out of the 24 our contest period may be used for scoring. he same country may be counted only once a multiplier, and contacts between stations the same city are not permitted.
Awards: 1st, 2nd and 3rd place awards ill be made to single and multi-operator aders in each country and also to contin-tal leaders.
S.w.l.s are invited to participate, they ore one point if the serial number of one ation is reported, 3 points if both of the change are reported.
Contest contacts can be credited for any the USSR awards: R-150-S, W-100-U, -100-0, R-15-R and R-6-K.
Mailing deadline is June 1st to: Central adio Club, P.O. Box 88, Moscow, USSR

Nebraska QSO Party

Starts: 1600 GMT Saturday May 3
Ends: 2200 GMT Sunday, May 4

This party is open to single operator sta-ns only. The same station may be worked each band and mode for QSO points.
Exchange: QSO nr., RS/RST and QTH. ounty for Nebr. and ARRL section for hers.
Points: One point per QSO for Nebr., 3 ints for others. (Nebr. stations may work her Nebr. stations for QSO points only)
Scoring: Nebr. stations, QSO points times multiplier of ARRL sections plus a max-um of 10 DX countries. Others, QSO ints times Nebr. counties worked. (max. 93)
Frequencies: 1815, 3600, 3982, 7100, 60, 14100, 14300, 21070, 28050, 28600.
Awards: Certificates to the top scorer in ch Nebra. county, ARRL section and untry.
Logs: Should show date/time in GMT, ex-ange sent and received, band, mode and ints. A summary sheet with the scoring and ur name and address in block letters is o requested.
Mail logs to: Lincoln Amateur Radio ub, Att: WAØKGD, 4921 Tipperary, ail, Lincoln, Nebraska 68512.

OZ-CCA DX C.W. Contest

Starts: 1200 GMT Saturday, May 3
Ends: 2400 GMT Sunday, May 4

This is the 18th running of this contest by the Radio Amateur Society of Denmark.
It's a world wide type contest, with operation on all bands 3.5 thru 28 mc. Both single and multi-operator stations are permitted.
Exchange: Six figures, RST plus a progressive QSO number starting with 001.
Scoring: Each completed QSO is worth 3 points, however contacts with OX, OY and OZ stations count double, or 6 points. Your multiplier is determined by the number of countries worked on each band. Call areas of the following W/K, VE/VO, PY, LU, VK and ZL will also be considered a multiplier. Final score, total QSO points times the sum of the multiplier from all bands.
Awards: Certificates to the highest scorer in each country and above call areas.
Include a summary sheet with your log and a signed declaration that all rules and regulations have been observed. Include an IRC for a list of the results.
Mailing deadline is June 15th and they go to: E.D.R. Contest Committee, P.O. Box 335, Aalborg, Denmark.

Ohio QSO Party

Two Periods
1900 GMT May 3 to 0300 GMT May 4
1500 GMT May 4 to 2300 GMT May 4

The same station can be worked on each band and mode for QSO points. Ohio may work in-state stations for credits.
Exchange: QSO nr., RS/RST and QTH; county for Ohio, ARRL section for others.
Points: One per QSO on 80 thru 10 meters, two if on 160 or above 50 mc.
Scoring: Total QSO points multiplied by the number of ARRL sections worked, including Ohio, for Ohio stations. QSO points multiplied by Ohio counties (max. of 88) for all others. DX stations may be worked for QSO points but have no multiplier value.
Portable stations changing counties may make repeat contacts and may be claimed both for QSO and multiplier credit. (There is a 1.5 multiplier for Ohio portables operating from some rare counties.)
Frequencies: 1805, 3575, 3875, 7075, 7275, 14075, 14275, 21075, 21375, 28075, 28575, 50.15 and 145.10. Ohio stations will

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Propagation

BY GEORGE JACOBS,* W3ASK

A seasonal decrease is expected in DX openings on 10 meters. On the average, considerably fewer openings will take place during April, compared to the winter months. Some excellent openings, however, are still forecast during the daylight hours to many areas of the world.

Fifteen meters is expected to be the optimum DX band during April from shortly after sunrise through the late afternoon and early evening hours. Exceptionally good openings are forecast to most areas of the world during this time period. On some circuits, primarily to southern and tropical areas, the band should also remain open well into the hours of darkness.

With an increasing number of daylight hours during April, 20 meters is expected to remain open to one area of the world or another, practically around-the-clock. Peak DX conditions are forecast for the sunrise period, and again during the late afternoon and early evening hours when excellent openings are expected to most areas of the world.

Good DX propagation conditions are predicted for the 40 meter band during the hours of darkness and the sunrise and sunset periods, with openings possible to many areas of the world. Some fairly good 80 meter DX openings should also be possible during the hours of darkness, and there is a chance for an occasional DX opening on 160 meters during this same time period.

Static levels are expected to increase considerably during April, especially on the 40, 80 and 160 meter bands.

DX propagation conditions for each of the amateur bands from 10 through 160 meters for the period April 15–June 15, 1969 appear in the *DX Charts* on the following pages. For predictions of short-skip openings, between distances of 50 and 2400 miles, refer to the *Short-Skip Charts*, which appeared i last month's column.

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for April 1, through May 15, 1969

	Forecast Rating & Quality			
Days	(4)	(3)	(2)	(1)
Above Normal: April 3, 9, 13, 18, 26, 30. May 3, 13.	A	A-B	B-C	C
Normal: April 1, 4-5, 10, 12, 14, 15-17, 19, 21-22, 24-25, 27-29. May 1-2, 4-6, 9, 11-12.	A-B	B-C	C-D	D-E
Below Normal: April 2, 6, 8, 11, 20, 23. May 7-8, 10, 14.	C	D	D	E
Disturbed: April 7; May 15.	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 parenthese 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 meaning: (A—excellent opening with strong, steady signals; B—good opening, moderately strong signals, little fading and noise; C—fair opening, signals fluctuating between moderately strong and weak; D—poor opening, signals generally weak and considerable fading and noise; E—poor opening, or none at all.

4—This month's DX Propogation Charts are based upon a transmitter power of 250 watts c.w.; 500 watts s.s.b., or 1000 watts d.s.b., into a dipole antenna a quarter-wave above ground on 160 and 80 meters, a half-wave above ground on 40 and 20 meters, and a wave-length above ground on 15 and 10 meters. For each 10 db gain 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 0 areas, and the Western USA Chart in the 6 and 7 areas. The Charts are valid from April 15, 1969, through June 15, 1969, 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.

Sunspot Cycle

The Swiss Federal Solar Observatory a Zurich reports a mean monthly sunspot num ber of 105 for Janurary, 1969. This result in a 12-month smoothed sunspot number o

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6 centered on July, 1968. A smoothed mber of 102 is forecast for April, 1969 as present cycle continues to decline slowly m maximum intensity.

V.h.f. Ionospheric Openings

A seasonal increase in sporadic-E pro- gation is expected to begin during April, d a number of short-skip openings between tances of approximately 750 and 1300 les should be possible on the 10 and 6 eter bands. During occasional periods of ense sporadic-E ionization, two hop open- gs up to distances of approximately 2500 les may be possible on 10 and 6 meters, th openings up to approximately 1300 les possible on 2 meters. While sporadic-E opagation may occur at any time of the y or night, there is a tendency for it to peak tween 8 A.M. and Noon and again between and 8 P.M., local standard time.

There is a good chance for some v.h.f. eteor scatter openings to occur between pril 20-22 when the *Lyrids* meteor shower is pected to take place. The shower should ak during the early evening hours of April when an average of 15 good-sized meteors r hour is expected to enter the Earth's mosphere.

April should be a fairly good month for ns-equatorial scatter propagation on 6 eters. TE openings are most likely to occur ring the early evening hours, on long rth-south paths for which the geomagnetic uator is approximately at the mid point.

V.h.f. auroral-type ionospheric openings e likely to occur during times when the nosphere is disturbed for h.f. signals. Days at are expected to be "disturbed" or "below rmal" are shown in the "Last Minute Fore- st" at the beginning of this column. These e the best days to check for auroral-type penings on the v.h.f. bands.

April 15-June 15, 1969

Time Zone: EST (24-Hour Time)

Eastern USA To:

	10 Meters	*15 Meters*	*20 Meters*	*40/80 Meters*
estern	11-17 (1)	07-08 (1)	08-12 (2)	18-20 (1)
Central		08-10 (2)	12-16 (3)	20-21 (2)
urope &		10-14 (3)	16-20 (4)	21-23 (3)
orth		14-16 (4)	20-22 (3)	23-01 (2)
frica		16-17 (3)	22-05 (2)	01-03 (1)
		18-20 (1)	05-08 (3)	20-22 (1)*
				22-23 (2)*
				23-00 (1)*

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

*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.

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Brazil, Argentina, Chile & Uruguay	09-11 (1) 11-14 (2) 14-16 (3) 16-18 (4) 18-19 (3) 19-20 (2) 20-21 (1)	06-07 (1) 07-10 (2) 10-14 (1) 14-15 (2) 15-16 (3) 16-19 (4) 19-22 (3) 22-23 (2) 23-01 (1)	15-16 (1) 16-17 (2) 17-18 (3) 18-00 (4) 00-02 (3) 02-04 (2) 04-05 (1) 05-07 (2) 07-09 (1)	20-21 (1) 21-03 (2) 03-06 (1) 23-04 (1)*
McMurdo Sound, Antarctica	16-18 (1)	14-17 (1) 17-20 (2) 20-21 (1)	16-18 (1) 18-20 (2) 20-02 (3) 02-07 (2) 17-08 (1)	19-00 (1) 00-04 (2) 04-05 (1)

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

Central USA To:

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

Time Zone: PST (24-Hour Time)

Western USA To

	Meters 10	*Meters 15*	*Meters 20*	*Meters 40/80*
Western Europe & North Africa	14-16 (1)	07-10 (1) 10-12 (2) 12-15 (3) 15-16 (2) 16-18 (1)	04-06 (1) 06-09 (2) 09-13 (1) 13-16 (2) 16-20 (3) 20-23 (2) 22-02 (1)	19-20 (1 20-22 (2 22-23 (1 20-22 (1
Central & Northern Europe & European USSR	*Nil*	08-09 (1) 09-12 (2) 12-16 (1) 21-23 (1)	00-06 (1) 06-08 (2) 08-12 (1) 12-16 (2) 16-20 (1) 20-00 (2)	19-22 (1
Eastern Mediter-ranean & Middle East	*Nil*	08-10 (1) 10-14 (2) 14-18 (1) 18-20 (2) 20-21 (1)	04-06 (1) 06-08 (2) 08-12 (1) 12-16 (2) 16-18 (1) 18-23 (2) 23-01 (1)	19-22 (1
West & Central Africa	12-14 (1) 14-16 (2) 16-17 (1)	07-10 (1) 10-12 (2) 12-14 (3) 14-16 (4) 16-17 (3) 17-18 (2) 18-19 (1)	10-14 (1) 14-17 (2) 17-18 (3) 18-20 (4) 20-22 (3) 22-23 (2) 23-00 (1)	20-00 (1)
East Africa	14-16 (1)	09-12 (1) 12-14 (2) 14-16 (3) 16-18 (2) 18-20 (1) 20-22 (2) 22-23 (1)	10-15 (1) 15-17 (2) 17-19 (3) 19-20 (2) 20-22 (1)	18-23 (1)

[*Continued on page 109*]

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THE awards PROGRAM

BY ED HOPPER,* W2GT

HE April, "Story of The Month" about
ane Harris, as written by Duane!

Duane H. Harris, K2PFC

"Checking back to my first log: Got a 310
e and put it in a Hartley circuit which I
ilt April 1928. Got a license 16th of June
t did not start operating then because I
d no "A" battery. On July 20th got the
eded battery and started to operate using
call NU8DYI.

Would you believe that USA-CA #ONE-A
s finally reached the 2950 county mark? If
u do not know who #ONE-A might be, it
K2PFC, Duane, in Stuben county, New
rk.

"After I received the number one certifi-
e, I started putting my time in chasing DX
d trying to complete WAZ because I fig-
ed it would be a long time before anyone
uld possibly get anywhere near that total
3079. WPX was also a prize worth work-
for, so I was looking for those prefixes
. By the grapevine I heard that the hunters
were building up toward the top very rapidly, so I began in earnest on 7 mc c.w. I got my total up to 1200 on c.w. and stalled right there. Friends in our local Radio Club who were not county hunters, said I was missing the boat by sticking to c.w. because s.s.b. on 7 mc was terrific and some could also be heard on 14 mc.

"I finally broke down and bought some s.s.b. gear and started listening (I was mike shy) around 14340. Later the county hunters started a net on 14336 and that is where I have been hanging out. I try to help out by taking net control once in a while and find most of the regulars cooperate in taking over also.

"I have had a ball going out mobile and giving out many counties. I have covered most of them in New York except down near New York City and Long Island. On our camping trips we always have a rig in the car and so far have put out 255 counties in many of the states across the country. Many of the hunters miss a lot of the good ones because we start out early in the morning and the net does not open until 1500 or 1800 GMT. We

03 Whittman St., Rochelle Park, N.J. 07662

The ham shack of K2PFC.

Duane, K2PFC, and the mobile.

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FLASH

THIRD USA-CA AWARD
TO AN ASIAN STATION
WENT TO JA2WB SHOHEI NUMOTO

SPECIAL USA-CA HONOR ROLL
Top Twenty-Five
County Hunters

K8IWI	3077	W5EHY	2975	WA4BMC	2688
K4VOF	3072	K2PFC	2950	K1WQU	2685
W2JWK	3067	WØKZZ	2935	VE3-9301	2683
K8KOM	3060	W9CMC	2932	W5PWG	2670
W9ICF	3058	W8DCD	2870	W8UPH	2655
W5SGJ	3020	W5OYG	2852	W5NXF	2550
K5SGK	3015	WØVFE	2800	K5BTM	2530
WAØEVO	3010	K3LXN	2760	K8YGU	2481
W7KOI	3008	K4ISE	2702	K8EUX	2405

travel early and set up camp shortly after noon and then see the sights all P.M.

"We have made special trips to Pennsylvania, West Virginia and all over New York State just for the county hunters. When we were down in W. Virginia we could not find a motel and it was much after dark, so we checked on frequency and one of the hunters got us on the right road where we could find something.

"Our next camping trip will be to North Carolina shores first week of May and then all over New England up to Maine in late June and most of July.

"On our trip west last summer we had 1264 mobile contacts and gave out last state county needed for several of the hunters. Our hope someday is to give out the very last one needed for someone to make 3079. On our trips we have been in all the states except Alaska and if we make that one, it will probably be by boat from the west coast.

"Started ham radio over 40 years ago and was very active from 1928-1936. In 1936 we started college and for four years we were rather busy, but so was Hitler, which cut down on DXing.

"I threw the towel in when the F.C.C. notified me that they were changing Western New York from W8 to W2 and that W2DYI was already issued. I did not renew when the licence expired and for a few years I w busy working and building a house a raising my family.

"For something to do back in 1955 I bu a small short wave receiver and when I hea that c.w. again, the bug bit me so I went up Buffalo and took the exam and got K2PF

"Getting back to the family we have th girls and two boys and all have moved out their own except one teenage boy who is high school. When this son finishes in couple of years, I expect to retire and XYL, Thelma, says we are going to do a of sight seeing to parts of the country found too hot before.

"To help support our amateur radio hob I teach school in a centralized district loca here, my XYL is an R.N. I teach high sch drafting and Jr. H.S. Industrial Arts. G other hobbies in order of preference a camping, traveling, hunting, fishing, sta collecting, gardening, rock hunting, astr omy and some others to keep us busy wh we retire.

"We love to meet ham friends (I say because the XYL, Thelma, is always w me), so attend many ham fests, etc.

"Last year Dave, W5PWG, came here visit our ham shack and we met Ben, W HDK, somewhere in Mississippi on our t south. We also stopped in to see WA5J and his XYL down in the state of Tex After we left Texas we went up to Colora and in the northern part of that state a hamburg stand, we met our good ra friend, Phil, WAØEVO.

"Some day we will announce a spec award for working K2PFC in all the count of New York State. In the meantime look us anytime usually 14336, but we work bands and modes."

All Oregon Certificates

Letters

Don, WA9PRE/2, writes: "Glad to Q you on the Independent County Hunter N (14336), thanks for fast QSL.

"Am QSL manager for 9J2XZ who is sta ing to hunt counties and working out som thing with ZL1KG who is already activ involved. Will be glad to help hunters in a way possible". Don McCarthy, WA9PRE exDL4LU, 5 Pennypacker Drive, Willi boro, N. J. 08046.

Clay, WA4RMX/DL5HH, writes: "Her my QSL for our QSO on the Independ County Hunter Net. I will be home again last of April and will be glad to work mo

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n all Southeast Alabama counties.
Tell all the gang on the Net hello for me.
heir cards will be out to them as soon as
come in". QSL to WA4RMX, P. O. Box
Daleville, Alabama 36322.

n, K6DLY/7, writes: "It was a pleasure
ontact you on the NET today. I enjoy
ding your column on the activities of the
r county hunters. I have over 1200 coun-
confirmed and will apply for the award
n I finish graduate school at the Univer-
of Utah this June. I only wish my time
e not so limited and I could make more
s through the Utah counties for the fel-
s. With luck, I should make at least one
bile trip through the state this spring. I
send a special QSL to anyone whom I
k in the last county they need in Utah; it
ery unique. Good Hunting". Thomas W.
dges, K6DLY/7, 362 Strong's Court,
Lake City, Utah 84102.

nold, WB4BZA, "Being a travaling sales-
n, I have certainly enjoyed my mobile unit
he car, it has been a great deal of com-
y. I must say however, that no group
been quite so cordial from the first
eak" as the County Hunters. I feel that I
ve made some new friends very quickly.
'It amazes me how you obtain such close
peration between the NCS and various
ay stations. Granted, it does sound like a
hive on occasion!
'From the mobilers viewpoint, though,
metimes we just can't wait at a county
e! Unfortunately, the vast majority of us
out there trying to get in a good days
rk and at the same time enjoy our hobby.
In general, your NCS do a splendid job
d the best cure in case of criticism is to
the critic to take NCS at some later date.
ter his turn, if he takes it at all, you won't
getting anything but praise from then on.
A few days ago I ordered county hunter
SL cards and also a couple of *USA-CA
cord Books*, so you can see the bug has
ten me!".

eve, GM5AHS/WA2DHF, writes: "Glad
QSO, here is my QSL from Kincardine
unty. Although my time is limited. I have
anaged about 475 counties in less than two
ars here. I love to collect QSLs and have
llected about 2250 so far for my 5000 sent
om here.
"I really enjoy your column and consider it
be 'state of the art' for us county hunters.
enjoy your shorts, and the new awards are

e page 110 for New Reader Service

Derby City Award.

cut out and pasted into my hunters book". Stephen Mendelsohn, 595-41-39, P. O. Box 574, NAVSECGRUACTY, FPO, New York 09518.

Awards

All Oregon Certificate: This Award is issued for working Floyd, K7WQJ in all 36 Oregon counties. When anyone has completed all the contacts, send list of the contacts to: Floyd A. Markham, K7WQJ, 4644 N. E. 38th Ave., Portland, Oregon 97211. Floyd is very active and if anyone is getting close to completing the 36, send list to Floyd and he will try to finish it for them. *(I have not been very active on the Net but I believe I have already worked Floyd in about 10 Oregon counties–Ed.).*

Derby City Award: The Kentuckiana Radio Club of Louisville, Kentucky will for the third year sponsor the Derby City Award. The rules are the same as last year, contact five (5) Louisville, Jefferson County, Kentucky amateurs. Time 0000Z (7:00 P.M. EST) 2 May 1969 to 2359Z (6:59 P.M. EST) 3 May 1969. Frequencies will be near (depending on QRM) 3960, 7050, 7260, 14050, 14345 and some activity on 15, 10 and 6 meters. The fee for the Award is 50¢, if an endorsement is desired by those who already have the award, the fee is 10¢, please indicate which is desired. A new custodian, so this year send log data and fee to: John R. De Graff, W4ISF, Custodian, Derby City Award, 8009 Poinsettia Drive, Louisville, Kentucky 40258.

Beaver Valley RC Certificate

AEL Achievement Certificate.

Blossomland Certificate: The Blossomland Amateur Radio Association of St. Joseph, Michigan announces the availability of a beautiful certificate to radio amateurs and s.w.l.s throughout the world. This certificate promotes the Southwest Michigan area in conjunction with the Spring Blossomtime Festival held each Spring with an attendance estimated at 300,000. The operating period for obtaining the certificate is from April 13, 1969 to April 19, 1969. Each certificate will be consecutively numbered. To obtain your award, Stateside stations must contact two club members, and DX stations one club member. Operating frequencies in all phone bands. Certificates will be issued by return mail upon receipt of QSO data, QSL and 10¢ to cover postage and mailing. Mail to Blossomland Amateur Radio Association P. O. Box 175, St. Joseph, Michigan.

Beaver Valley Radio Club Certificate: Beginning Janurary 1, 1969, for one full year, the Beaver Valley Amateur Radio Club (VE7) will award a certificate to any amateur in the world who achieves the following: VE7s must make two-way contact on any band and mode with TWO club members and any EIGHT VE7s. All others must make two-way contact on any band any mode with ONE club member and any NINE VE stations. Send a duplicate of your log entries and 25¢ or two IRCs to Beaver Valley Amateur Radio Club, Box 413, Fruitvale, British Columbia, Canada. Active club members are: VE7ADU, VE7ADW, VE7AKK, VE7BAD, VE7BDW, VE7BPN, VE7BWA, VE7BWB and VE7BWD. Remember this applies for the period of 1969 only.

AEL Achievement Certificate: The American Electronics Laboratories, Inc., Radio Club takes pleasure in offering an Achievement Certificate to anyone contacting five (5) members of its club. Only contacts after August 31, 1966 are acceptable for this award. Those qualified can apply for the Achievement Certificate by sending pertine log data of the five (5) contacts to: Awar Chairman, Mail Stop 1360, AEL Radio Clu P. O. Box 552, Lansdale, Pa. 19446. The is no charge for the award.

Notes

Our active County Hunter, W6DIX/7 H a new call, W7GKN, so if you desire to Q to him, Write K. D. Wilson, Box 89, Wa worth, Nevada 89442.

County Hunter QSLS: As the supply K9EAB is nearly gone, John, WA2AMM w be happy to supply such QSLs for $3.50 f 500 post paid to anyone east of the Miss sippi and due to high postal rates, $3.75 anyone west of the Mississippi. Write: Jo J. Brenner, WA2AMM, 162 Meisel Avent Springfield, N. J. 07081.

Speaking about QSLs, may I again remi all County Hunters that if they expect car from the mobile stations, be sure to send QSL (like those sold by K9EAB and WA AMM) all filled in and self addressed with stamp on it (or a self-addressed-stamp envelope). Thus the mobile operator c check the QSL against his log and sign it a drop in any mail box. Remember they wo hundreds of county hunters and just chec ing that many cards against their log is a h job! If you want a QSL, make it as easy possible for the fellow at the other end.

By the time this appears in print, it will longer be a secret, so I can now write abo it. In case you don't know, an avid Coun Hunter and Mobile Operator, Ben, K5DR has had a severe back injury, which requir major surgery. His spine had to be fuse which will necessitate his being in a com plete body cast for six months or more. Th his wage earning ability is about nil. Addi to this very dim picture for Ben and L K5LSI, is a monumental hospital bill. As County Hunter, you should be aware of t efforts Ben has put forth in our behalf, ye he has given unselfishly of his time for o benefit. Perhaps you would be happy to t to help him in his hour of need. Any amou you can spare will be greatly appreciated. A donations are to be sent to Roy, WA5OC They will be collected, and at such time the Fund is complete it will be presented Ben and Liz in person. THANKS.

I have been having a GREAT time on t Independent County Hunter Net—operati

[*Continued on page 100*]

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Q AND A

BY WILFRED M. SCHERER,* W2AEF

Weather and Press Transmissions for ode Practice and Propagation Checking

Since the advent of incentive licensing, any amateur operators are preparing to up-ade their license status, particularly for e Extra class license for which an examina-on requisite is the ability to receive and nd at a faster code speed.

This often necessitates a good deal of ractice before one becomes proficient and ay even be needed by the old timer who rough years of inactivity on c.w. must bone o on his code speed. Also there are many perators who may do pretty well at copying ode in their heads, but when it comes to riting the results down by longhand, as is quired during the code exam, the story is mewhat different.

One good and widely used source of code ractice is provided by transmissions for uch by the ARRL over W1AW and W6-PW. Nevertheless, from time to time we ave received requests for information re-ting to weather-broadcasts and press sche-ules of commercial or Naval stations.

These are an excellent source for code ractice under actual commercial operating onditions and using current subject matter. he press transmissions usually are made at 5-27 w.p.m. and the weather bulletin at 5-23 w.p.m.

We have therefore rounded up the sche-ules of a number of stations operating in he l.f. and h.f. commercial bands with the ope that this will aid our readers in finding elpful copying either for practice toward he 13 or the 25 w.p.m. FCC tests or just for he sheer fun of it.

Of course, the general-coverage type re-eiver must be available. This should pre-erably be one that is accurately calibrated, o that the signals may be easily located.

[*Continued on page 82*]

*Technical Director, *CQ*.

Press and Weather Broadcast schedules listed in the following order: Time in GMT, Type of Service (P—Press, W—Weather, N—Navigation Warnings), Frequency in kc.

KPH—RCA, Bolinas, Cal.		
0500, 1700	W	426, 2045, 4247, 6488, 8618, 12808.5
0818	P	4247, 6488, 8618, 12808.5
WAX—Tropical Radio Tel. Co., Ojus, Fla.		
0135	W, N	488, 6390, 8526, 13011
1335	W, N	488, 6390, 8526, 13011, 17199
WCC—RCA, Chatham, Mass.		
0050, 1250, 1650	W	147.5, 436, 2036, 4367, 6376
0300	P	147.5, 4367, 6376
WNU—Tropical Radio Tel. Co. Slidell, La.		
0000	P	6495, 12826.5, 17117.6 (Nov 1-May 31); 6495, 4310, 17117.6 (June 1-Oct. 31)
0430	W, N	478, 2048, 4310, 6495, 8570
1518	P	6495, 12826.5, 17117.6
1630	W, N	478. 2048, 6495, 8570, 12826.5, 17117.6, 22431
WSL—IT & T, Brentwood, L.I., N.Y.		
0300	P	4343. 6418, 8514, 12997
0500, 1100 1700, 2300	W	418, 4343, 6418, 8514, 12997
NPG—U.S. Navy, Mare, San Francisco, Cal.		
0400, 1100, 1600, 2300	W	114.95, 4010, 6428.5, 9277.5, 12966, 17288, 22635
NSS—U.S. Navy, Annapolis, Md. (Washington, D.C.)		
0000, 0600	W	88, 5870, 8090, 12135, 16180
1200, 1800	W	88, 5870, 8090, 12135, 16180 20225, 25590
NDT—U.S. Navy, Yokosuka, Japan		
0100, 0600, 1330, 1830	W	4366, 9095, 12090.5, 19068
NKA—U.S. Navy, Asmara, Eritrea, Ethiopia		
0230	W	3220, 4515, 9060, 12817.5, 22760
0700, 1300	W	9060, 12817.5, 17510, 22760
1930	W	3220, 4515, 9060, 12817.5, 17510, 22760
NST—U.S. Navy, Londonderry, N. Ireland		
0000, 0530, 1200, 1730	W	2589.5, 5052, 5167, 6487, 7535, 9318, 13110, 22919

A MUST FOR EVERY DXER

DX AWARDS LOG

This fabulous book sells for $3.95 anywhere in the U.S. and is available for immediate delivery from the CQ Technical Library. However, with any subscription to CQ you can obtain a copy of the *DX Awards Log* for just $1.50 (a $2.45 savings). To obtain your DX Log at the discount price it must accompany a subscription order to CQ, but that order can be for renewals or extensions as well as for new subscriptions.

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Special individual logs are set up und each award providing space for a comple record of contacts and confirmations i cluding log data required to be submitte with the award application.

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ADDRESS.....

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☐ I just want the DX Awards Log at $3.95
☐ New Subscription ☐ Renewal ☐ Extension

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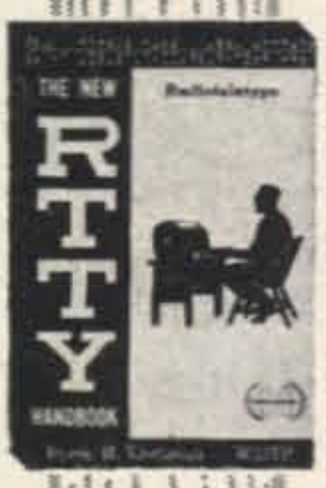

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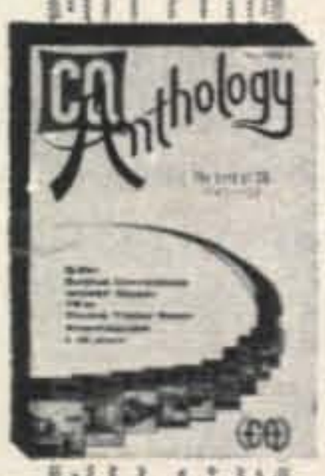

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Q & A [*from page 79*]

When an accurate calibration is not provided, a BC-221 frequency meter may be used to pinpoint the signal frequency or a search may be made near where the signal frequency is expected to be found on the receiver. The latter should be done prior to the scheduled broadcast when the stations are identifying themselves by a series of V's or QRA's followed by their call letters.

In the schedules which follow, weather bulletins from some of the commercial stations are transmitted on only *some* of their listed frequencies. This depends on the time of day and on the prevailing conditions.

The press schedules run between one and two hours, depending on the station. "Station Breaks" usually are made at 15-minute intervals, so the press transmissions are not necessarily over if you happen to tune in at one of these times. Some of the press data also includes stock-market reports, which gives you a good chance to bone up on numerals and punctuation.

Code speeds may be approximated by counting the number of characters (numerals and punctuation count two) sent in one minute and dividing this amount by five.

A more complete schedule of all the Naval stations may be obtained from your nearest U.S. Naval Oceanographic Office or from Department of Navy, U.S. Oceanographic Office Washington, D.C. 20390. Ask for "Broadcast Schedules of U.S. Naval and Coast Guard Stations for Mercast, Hydrographic Data, Weather Reports and Time Signals (for Atlantic and Pacific Stations)".

The listings include stations located in various parts of the world. Each station uses a wide range of different frequencies operated simultaneously, as indicated in the schedules. Signals therefrom thus can provide a good means for checking propagation conditions from the various areas from time to time.

More on Thrust Bearings

In the December Q & A Column a question involved the procurement of thrust bearings for beam-antenna installations. We have since received data on other sources as supplied by some of our readers, as follows:

From La Mar Ray, K9CUY, "Both W9-HLY and I have obtained the #B-143 ball thrust bearing from Vesto Company, Inc., 20th and Clay, North Kansas City, Mo. It is designed for use with rotating antenna systems and should withstand some of the largest antennas (but not the Big Bertha's –hi!) The bearing accepts a 2" O.D. mast."

From George Kerr, W8QNY, "A brand new thrust bearing may be obtained from Detroit Ball Bearing Company of Michigan, Jackson, Michigan. Other addresses may be found in purchasing agent's reference "Thomas Digest". The bearing I have is a nice #617 bearing which has a 1 3/16" hole in it to accomodate 1¼" masting. It cost me $1.53 plus tax."

From Barry Gross, "Alliance makes a bearing which should be suitable for Tri-banders. It can be purchased from Allied Radio, Lafayette Electronics or other suppliers which stock Alliance products. The cost is all of $2.91".

From John Hughlett, K7VPR, "An automotive clutch throw-out bearing makes a dandy. The one I used accepted a 1¼" galvanized-steel pipe. A pin through the pipe at the desired location for the bearing transmits the thrust to the bearing. This allows the mast to go on through any desired length into any sort of turning device. To make the bearing weather-tight, I soldered a tin can of the right size and depth concentrically to the mast, so that it fitted down over the thrust bearing with a little room to spare on the side.

Thanks fellows for your interest in helping others!

Pre-Amplifier with NCX-5

QUESTION: I'd like to build a wideband transistorized preamplifier for my NCX-5. Do you think it will improve the performance of the receiver?

ANSWER: We do not recommend the use of a preamp with any *high-quality* receiver, as in most cases it simply increases the gain without any significant improvement in signal-to-noise ratio.

On the other hand, if the preamp has sharply tuned input and output circuits, the front-end selectivity could be improved and thus provide better rejection of unwanted signals. Use of a wideband preamp, particularly a transistorized one, therefore would not be advantageous in this respect and besides, it could be inviting trouble with cross-modulation or other types of inteference. This also could be caused by a preamp that raises the gain high enough to drive a receiver into a non-linear region.

As for the NCX-5, it already embodies two

See page 110 for New Reader Service

.f. stages in the front-end. Furthermore, the ircuitry is such that installation of a separte preamp would be too involved. Our advice is to forget the whole idea.

Articles on Crystal Grinding

QUESTION: I find myself in need of information on crystal grinding or etching. Can ou refer me to any articles on the subject?

ANSWER: For information on processing rystals we refer you to the following articles:

"Quartz Crystal Finishing for Hams," *CQ*, uly 1945, p. 16.

"Changing Frequency of Plated Crystals," *CQ*, October 1947, p. 36.

"Grinding Crystals Simplified," *CQ*, January 1949, p. 37.

"How to Grind Crystals" (including etching), *CQ*, November 57, p. 74.

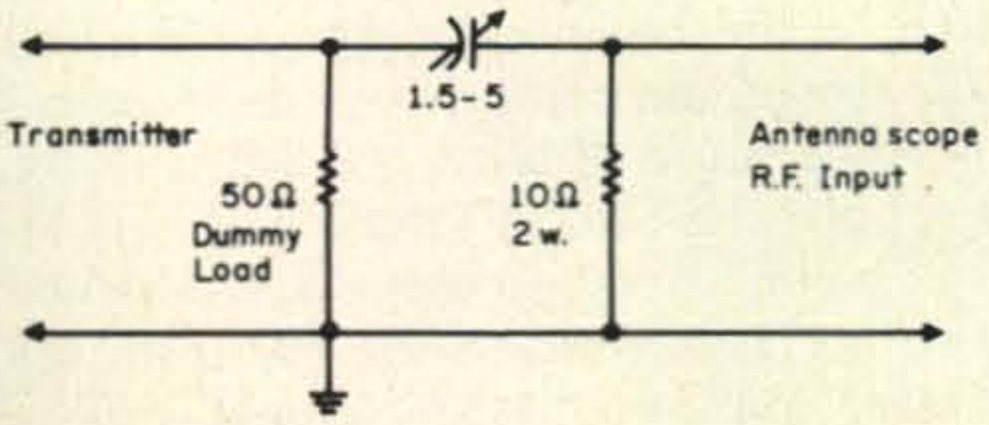
Xerox'ed copies of the above articles are vailable at $1.00 each from our Circulation Department. Back copies of these issues of he magazine are not available.

Signal Source for Antennascope

QUESTION: I have just built your Antennascope '54 which will not work. I do not have a rid-dip meter, so I'm using an r.f. signal enerator connected directly to the Antennascope. The instrument is wired correctly. What could be wrong? I'm interested in working at 145 mc.

ANSWER: For those who may not be familiar with the Antennascope, it is the original version of many of the varible r.f. impedance or -bridges currently in use.

It requires more driving power to operate these instruments than is available from he usual standard signal generator. At least ne-half watt, such as obtained from a acuum-tube type g.d.o., is needed for correct performance.



g. 1—Setup for obtaining low-level r.f. drive or operating Antennascope with r.f. sample taken from low-power transmitter output.

If a g.d.o. is not available, a sample of the low power from a transmitter may be used for the job instead. Very light coupling should be used to avoid overloading the Antennascope. A suggested setup in shown at fig. 1.

Central Electronics 100V-200V Data

Inquiries are received from time to time concerning alignment, service and replacement parts for the Central Electronics 100V and 200V s.s.b. transmitters. Though the courtesy of Russ Johnston, K3CVL/6, we understand that such assistance may be obtained from Roy Sherman, W9FHS, Zenith Corporation, 5801 West Dickens Ave. Chicago, Ill. 60639, Phone 312-745-5110 or 5103.

A Reminder

When submitting questions to the Q & A Column please limit queries to one subject matter. Also, include a self-addressed-stamped envelope. Thanks.

73, Bill, W2AEF

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VHF TODAY

BY ALLEN KATZ,* K2UYH

ONE of our favorite subjects of discussion is 432 mc antennas. There is certainly a wide divergence of opinion among amateurs as to what constitutes a good antenna for this band. Some people have had excellent results with yagis, while others have not.

It is generally excepted, that for the beginner, the colinear represents a better choice of antenna than the yagi. The reasoning behind this thought being that a colinear is a much less critical antenna than a yagi; and thus its choice greatly diminishes the chance of a serious error occuring during construction.

When it comes to big, high gain antennas, what unanimity there is disappears. The long yagi is supported because it offers fewer feedpoints for a given sized array. Others question the efficiency of long yagis and favor the colinear; while still others contend that a dish is best.[1]

*66 Skytop Road, Cedar Grove, N.J.

[1]A. Katz, VHF Today, *CQ*, page 50, May 1968.

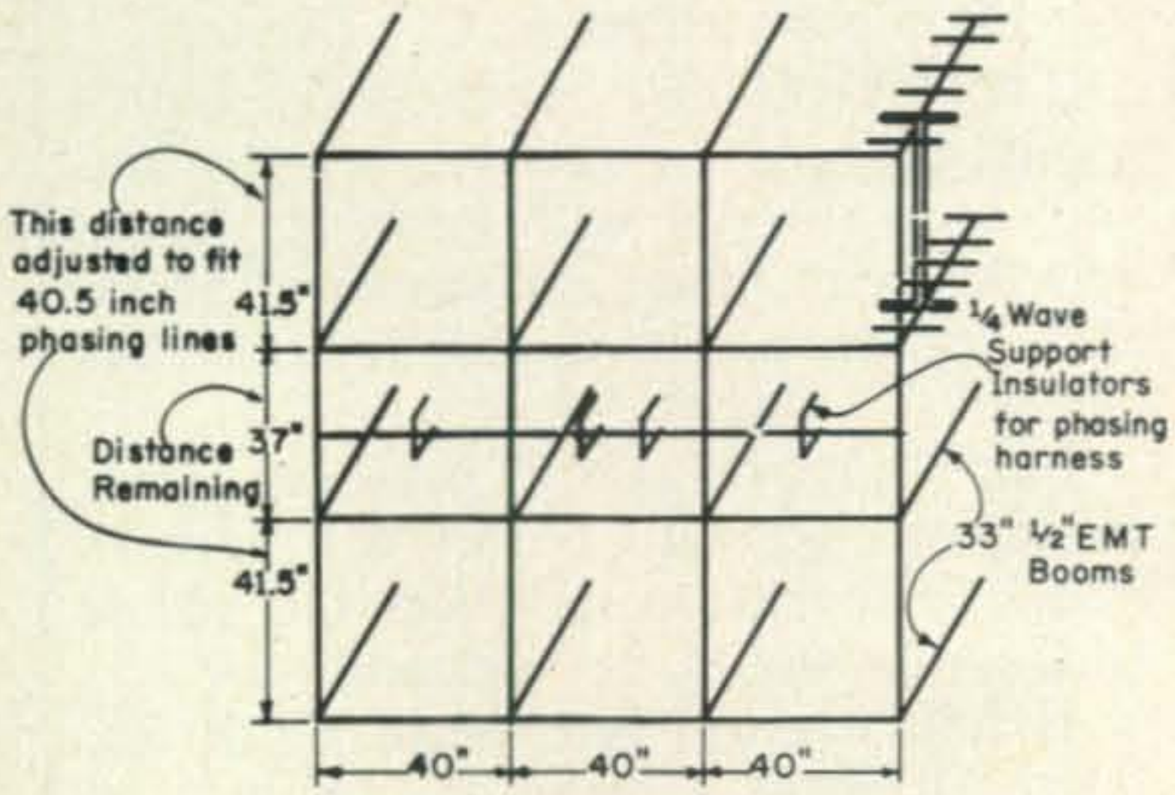

Fig. 1—Frame of K2CBA's 96 element array consisting of 9 10' pieces of 1/2" EMT conduit.

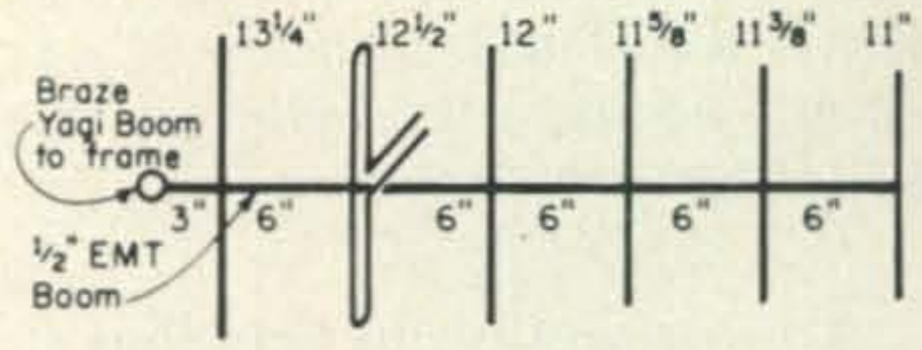

Fig. 2 — Dimension of individual "wide band" yagis.

An excellent compromise between the long yagi and big colinear points of view is an antenna design developed by Jud Snyder, K2CBA, after many less successful tries. This antenna design is presently in use at Jud's, W1OOP's, and my QTH, with very favorable results. Furthermore, the antenna has won every antenna contest it has been entered in by a wide margin.

The array consists of 16, "wide band" 6 element yagies (closed spaced elements of staggered length), phased with a simple and efficient stacking harness. It has a large effective area, 175 square feet when compared with its physical area of 100 square feet. This electric aperture would give a gain of 27 db (isotropic) assuming 100% efficiency. The actual gain has been measured to be between 22 and 25 db depending on the test sight. These results do not seem unreasonable since most antenna measurement conditions are unfavorable to big antennas and some loss must be expected considering the number of feedpoints and size of the phasing harness.

The array is constructed chiefly from electricians thinwall steel conduit called 1/2" EMT. This material is inexpensive (approximately 7¢ per foot). It is galvanized and can be welded or brazed to produce a relatively lightweight structure. The complete antenna weighs a little over 40 lbs. and is not difficult to handle.

The back frame is made of nine 10 ft. pieces of EMT brazed at the joints—see fig.1. The 16 booms for the yagies are brazed at these intersections, and the elements are brazed to the booms—see fig. 2. The folded dipole driven elements are made in pairs out of a single piece of wire, as shown in fig. 3. Thus, only one brazed joint is needed. There is not a nut or bolt in the whole antenna to loosen up. The elements are cut from #8 or #9 wire and should be cleaned with steel wool and lacquered after brazing. The whole antenna in fact may be painted to prevent weathering. Both #8 copperweld and #9

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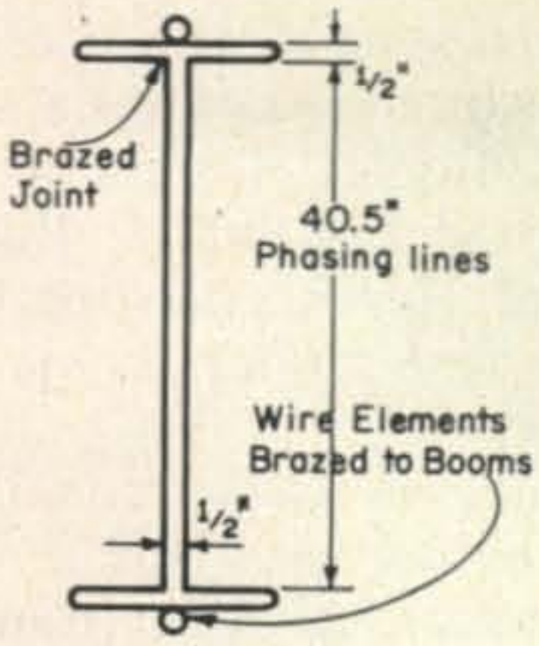


galvanized fence wire (zinc actually has a lower resistivity than brass) have been used by Jud for elements with good results.

The phasing harness is made from K-200 heavy duty twin lead of 200 ohm characteristic impedance—see fig. 4. Pairs of yagis are tied together with 3/4 wave matching transformers to provide a 200 ohm impedance at 8 feedpoints. These 8 feedpoints are tied together with the K-200 phasing harness. All of the phasing harness is "flat" (v.s.w.r.

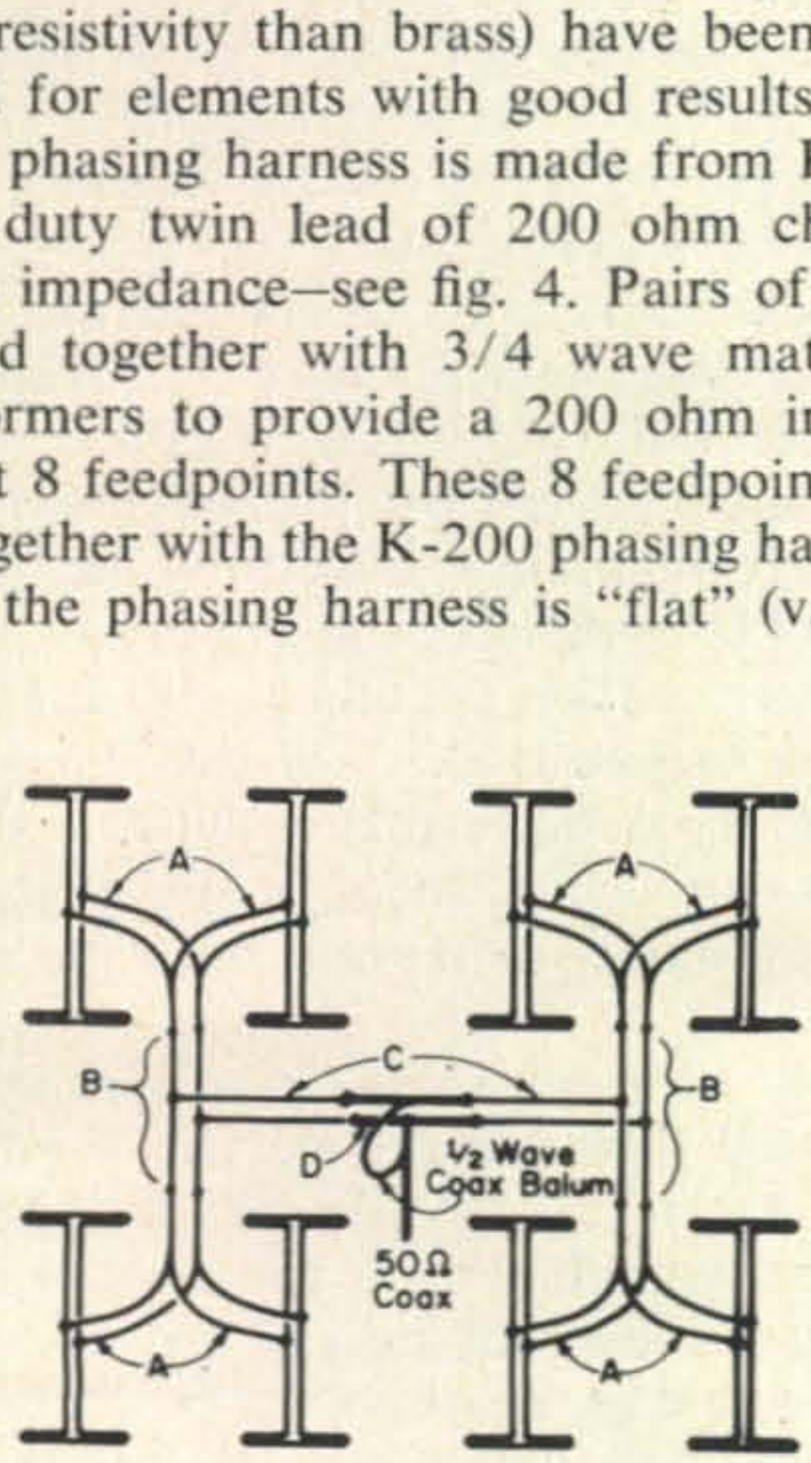


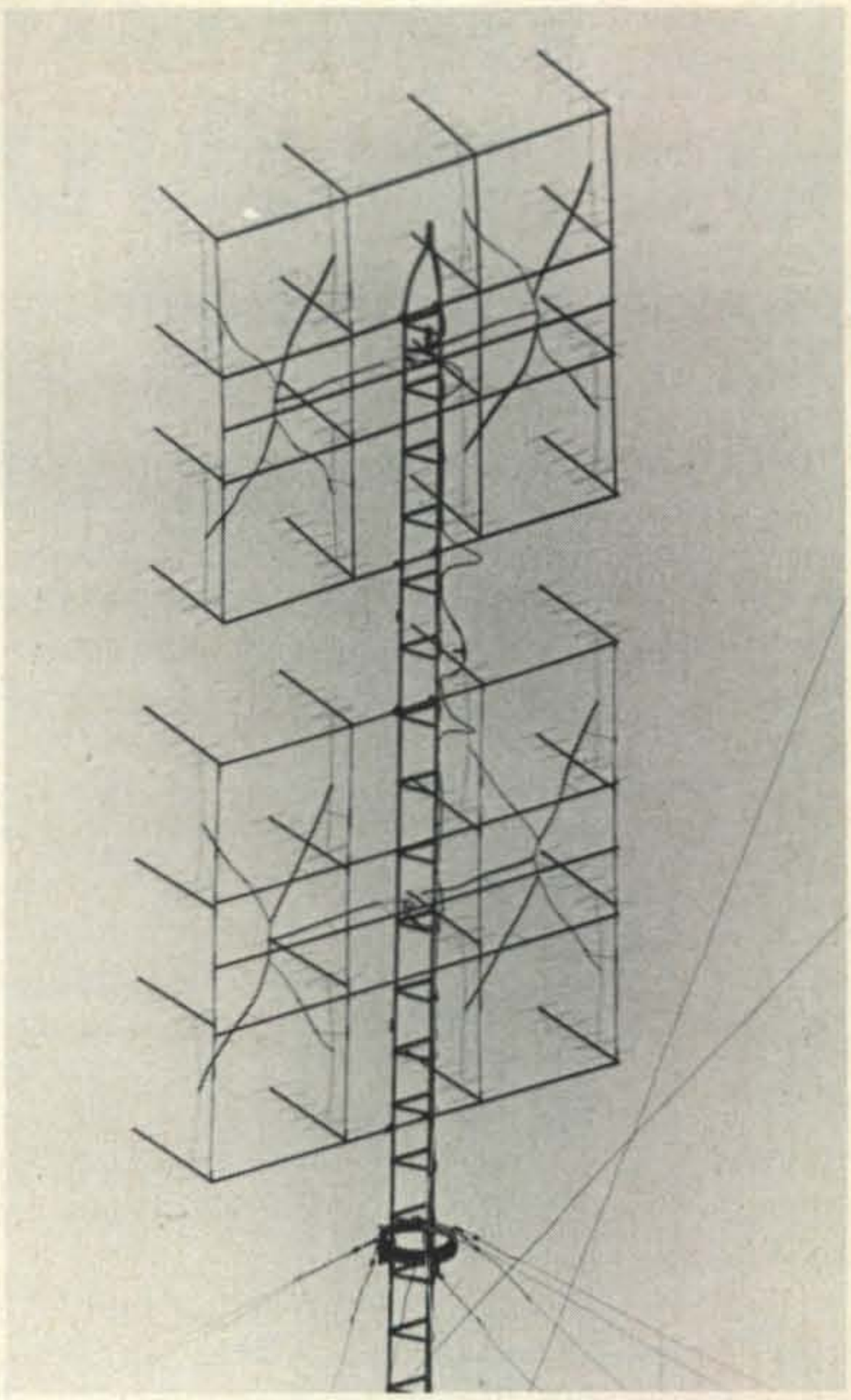
Fig. 4 — Details and dimensions of stacking harness.

Phasing lines "A": any convenient length of K-200 (approx. 40") as long as all lines are equal length (+ or —1/8").

Phasing lines "B": 13" of K-200 center taped (1/4 wave trans.).

Phasing lines "C": Any convenient equal lengths of K-200 (abt. 34").

Phasing line "D": 1/4 wave matching transformer made from 13" lengths of #8 or #9 wire center taped with spacing adjusted for best match (approx. 1/2" spacing).



Two of K2CBA's 96 element arrays phased together on an 80' rotating tower at his QTH.

approximately 1:1) except for the 6 quarter wave matching transformers. Where K-200 is unavailable, it should be possible to use transmitting type 300 ohm twin lead or fabricate your own 200 ohm transmission line for this purpose with little or no extra loss.[2] Quarter wave "insulators" made of wire are used in four places to support the phasing lines mechanically. These supports are "U" shaped and made from 13½" lengths of wire, 1/2" wide and with legs 6½" long.

In Jud's opinion this antenna represents the maximum in gain for the minimum in labor, expense, and wind resistance and we tend to agree!

73, Allen Katz—K2UYH

[2]A. Katz, VHF Today, *CQ*, page 96, July 1968.

PLEASE USE YOUR ZIP CODE NUMBER ON ALL CORRESPONDENCE

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SURPLUS sidelights

BY GORDON ELIOT WHITE*

AN item now showing up in surplus is the Western Union "Telfax" facsimile transceiver. There are several versions with minor variations, including sets used by RCA, ITT, etc., all bought from Western Union's Chattanooga, Tennessee, works about 15 years ago.

For the man who wants to get his feet wet in FAX, these ought to be just the ticket. They are small reasonably simple to wire back-to-back for landline use or over a v.h.f. audio frequency shift hookup. At present true carrier shift for fax is not sanctioned in the amateur bands by the Federal Communications Commission below 6 meters, though experimental permission to operate probably would be granted to a serious group of amateurs.

Figure 1 shows a typical Telfax unit, this one labeled "Desk-Fax." These are being advertised by Gateway Electronics[1] and others, for under $20.

The Telfax units measure 12" × 13" × 7"—a much more handy size for the operating desk than the military TXC-1, for example, which was forty inches long. The Telfax are used by Western Union customers who receive a lot of telegrams, but not enough to justify installing a teleprinter at six times th cost.

Many businesses with overseas operatio use them to receive cables and they are eve in use on Capitol Hill, particularly by men bers from distant states. Rep. Spark Ma sunaga, of Hawaii, has one in his office t give him fast service to his district, 5,00 miles away.

It should be understood that the Telfa units were *not* used for *direct* work ov long distances. A cable from Hawaii is r ceived here at the Western Union office v teleprinter, placed on a facsimile transmitte and sent to the receiver in Spark's office.

These units rely upon utility power lin phase stability for their synchronism, an thus eliminate the very expensive frequenc standards required for the military TXC-RD-92A, UXH-2, etc.

If that explanation is not clear, let me refe you to the description of fax transmissio I wrote with Bill Tyrell, W2YKG, in *CQ* i September, 1966. Briefly, however, it is im perative that the transmitting and receivin drums be synchronized within less than on part per million accuracy, else the receive picture will be skewed, or will show jitter, o worse. To achieve that stability with only radio connection requires sophisticated fr quency standards driving both the send an receive units.

For most fax work, a temperature-com pensated tuning fork, electrically driven, used, much like the standard in a good elec tric wristwatch. This is pretty expensive.

But if the receiving and transmitting end are hooked to the same a.c. power source, o to lines of a single power grid, kept in phas at all times, ordinary a.c. synchronous moto will give excellent synchronism.

The Telfax design is a little Rube Gold bergish, but they are quite re liable in commercial service and should give good amateu service. Five vacuum tube are used, plus a phototube, a light source, and various pilo lights. Relays and other majo

*5716 N. King's Highway, Alexandria, Virginia 22303.

[1]6150 Delmar Blvd., St. Louis, Mo. 63112.

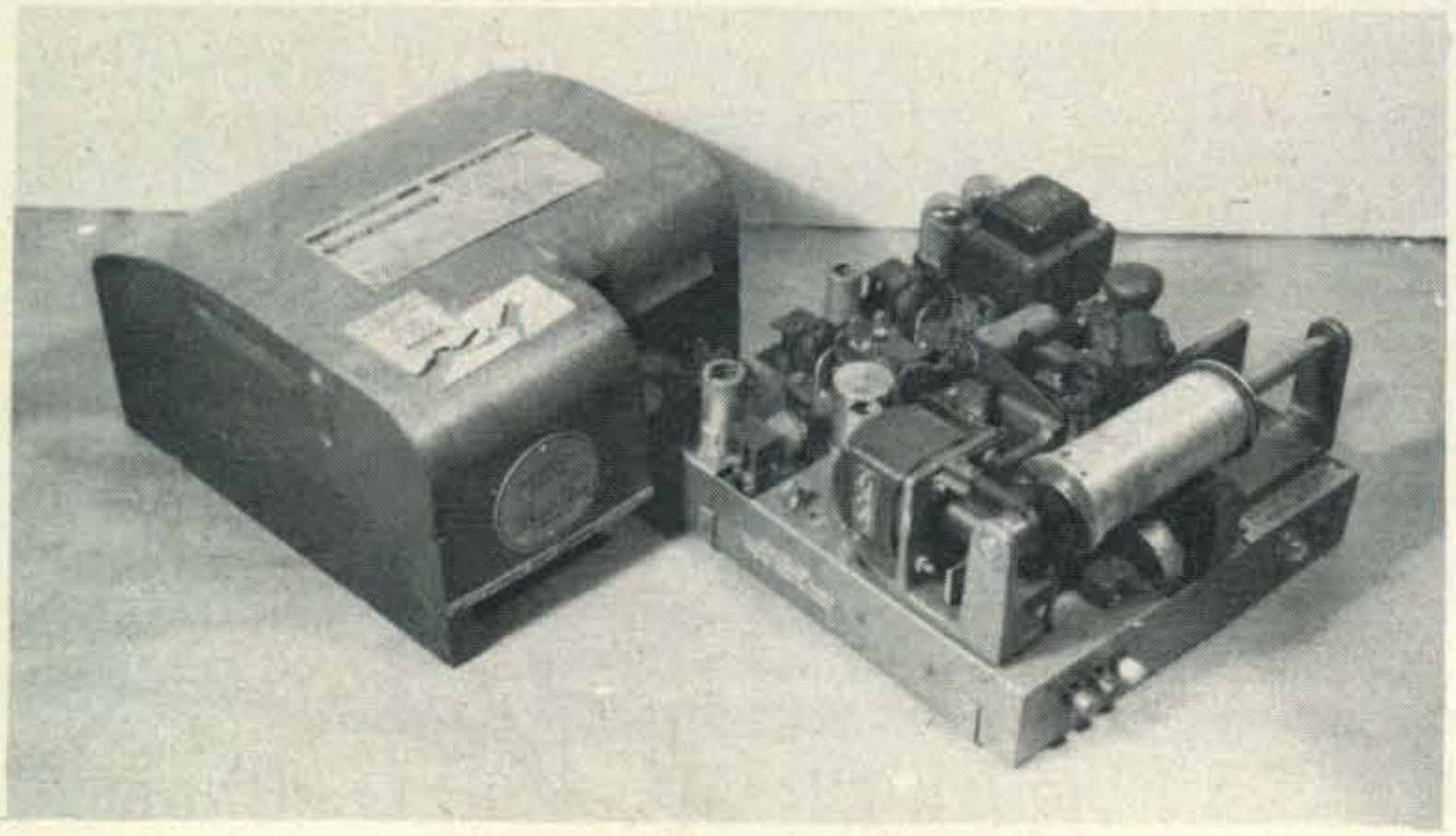

Fig. 1—Front view of the "Desk-Fax" unit.

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arts are identified by chassis markings.

The drum, designed to handle a 5" × 5" elegram blank, is turned at 180 r.p.m. by a 600 r.p.m. motor, appropriately geared lown 20:1. The sets of course require 117 olts a.c., and are interconnected by two line vires and a ground.

The type 6500 Telfax were designed to work only into a central office, and must be converted for back-to-back use. The type 6710 units, which look much the same as fig. , are designed for private-line interconnection. The differences include different wiring n the phase and start relays, and a different optical system. The 6500 sets, hooked together, give negative copy. In Western Union use, an inverter was part of the central office "concentrator," and without it a typed message comes out white-on-black at the receiving end.

Gateway Electronics has put together a rather complex conversion which will overcome the negative-sending problem for the 6500 units, too lengthy to print here. The description is available to anyone who buys one of the transceivers however.

To send a picture you wrap the copy on the drum, holding the paper with a garter-type spring. The drum is driven by a rack and pinion, and scanned by a stationary light source. Light is reflected through a lens upon a photocell which puts out a d.c. current, varied by the amount of light received, *i.e.* modulated by the images being scanned.

In the Telfax, a "chopper" disc, looking something like a deeply-toothed gear, is rotated in the path of the light so as to interrupt the image 2500 times per second, *i.e.* creating a 2500 c.p.s. alternating current at the photocell output, modulated in amplitude by the amount of reflected light falling on the cell. This signal is the a.m. audio output used to transmit the picture over wire lines.

In recording, the 2500 c.p.s. audio is amplified to a high level and applied to a stylus needle being "scanned" over the recording paper just the light was scanned over the original copy. "teledetos" type paper is used which blackens wherever sufficient current is passed through it, so a high-level signal from a white portion of the original becomes black in the recording unless inverted between machines.

The amplifiers in the units are capable of operating on a signal which does not lose

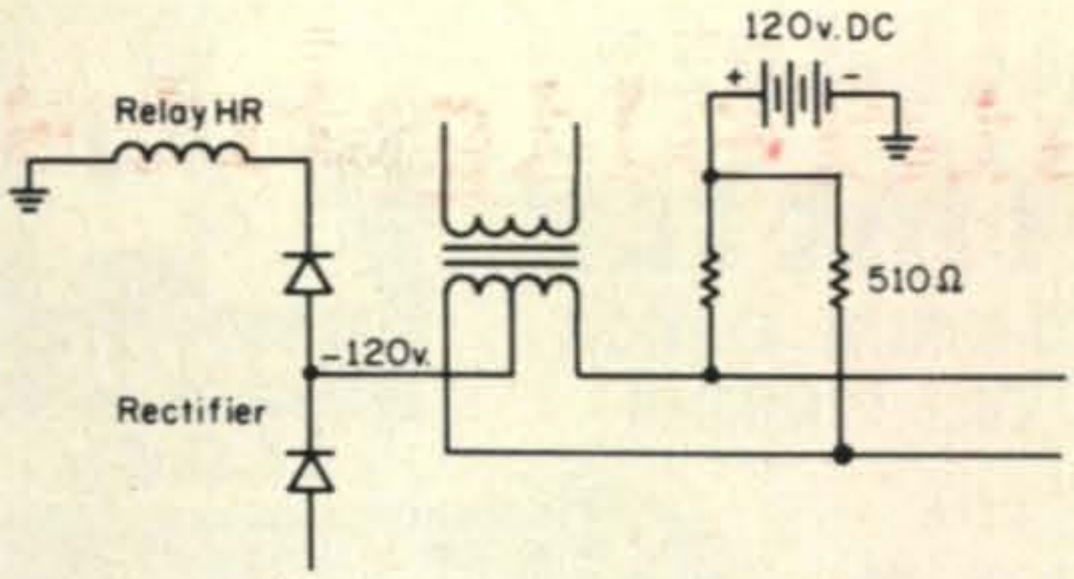

Fig.2—The original control circuit.

more than 25 db in transmission. Noise will cause "dirt" on the received image, but fax is inherently less susceptible to losses than, say, RTTY, where one bad character may throw the printer out of synch for several succeeding characters. There is far more redundancy, too in fax, where loss of half or more of the image can be tolerated where further reproduction (as in newspapers) is not required.

Control of the transceivers is accomplished by the central office concentrator by use of a superimposed d.c. telegraph circuit. It is this control function which must be provided in converting the Telfax units for amateur/experimenter use. The original control circuit is shown in fig. 2, which represents the standby condition. When ready to transmit, the central office would reverse the polarity of its battery, thus allowing feed motor relay HR to operate. That relay was blocked from operating in the standby condition by the polarity of the rectifier.

Drum motor power is controlled by the "outgoing" push-switch.

In recording, the central office removes the negative standby d.c. current, and applies positive current which activates a buzzer at the distant Telfax set. Pushing the "incoming" button applies a.c. power to the unit and starts the drum motor turning. When the receiving set's tubes are warmed up, a relay closes, completing the feed motor circuit, and allowing the phase contacts to momentarily interrupt the line circuit on each rotation. At the other end of the line, the transmitter recognizes the phase signal and starts to send.

Movement of the drum at the end of a recording trips switches which stop the recorder.

A red inking disc ON the Telfax is used only to show, on sending, that the machine *did phase* before the drum released, when unattended operation is desired.

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The 6500 set may be marked "Telfa chassis 6499A." In addition to the relativel heavy synchronous drum motor, there ar lighter motors to drive the drum advanc rack and to move the stylus into positio plus the chopper disc motor.

The first question which will come to mos readers' minds is "will it work with the satel lites to receive weather photos?" The quic answer is no, it won't. The satellites trans mit at a drum speed of 240 r.p.m., and t match that speed would require the cuttin of expensive new gears giving a 15:1 re duction ratio in place of the 20:1 gears i the set. It might be possible to use the sync signal of the satellite itself, properly counted down and then amplified, to obtain an 8 c.p.s. a.c. power source which would driv the drum at 240 r.p.m. with the original gears and this would be preferable, since the re corder would be locked to the transmittin unit, rather than dependent upon the ques tionable frequency correlation of the powe mains and the satellite.

The different aspect ratio of the satellit picture and the Telfax Drum would be o little inconvenience in most experimenta work, though it would tend to distort the re ceived copy slightly. The Telfax appears t operate on 72 lines per inch, from examina tion of the unit, though Western Union coul not furnish that data precisely. This coul be changed by alternating the drum advance

Others offering the Telfax are Fair Radio Lima, Ohio, and J. J. Glass Electronics, i Los Angeles.

Another source of RTTY items, includin toroids and gears, is W2DLT, 302 Passai Ave, Stirling, N. J.

I continue to receive more mail for man uals than on any other subject. Since I can not sell or loan instruction books to all wh write, I want to again list the people who se surplus handbooks.

Sam Consalvo, 4905 Roanne Dr., Oxo Hill, Md.—offers a list at 25¢, refundabl with first order.

Bill Slep, Box 78, Ellenton, Florida. N list; write him your needs.

Quaker Electronics, Box 215, Hunloc Creek, Pa. List is 25¢.

W2BVE, 327 Palmer Ave., Maywood, N.J

I have, right now, requests for data on th following surplus sets: RT-37/PPN-2 fo ON5FD, Box 72, Brussels 8, Belgium; RT 507/PRC-40 for K4ACP, 322 Royal Palm Blvd., Charleston, S.C.

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Ostermond-Tor [*from page 63*]

puter, on a purely chance basis, would co nect the S.S.S. phone to another S.S.S. pho anywhere in the world, ONIT planned establish this service for about $5 a mont No licence would be required to opera S.S.S., technical knowledge would not be prerequisite and there would be no need learn the Morse Code.

Tor spotted this as a plan that could spe the end of amateur radio as we know it toda and immediately set out to expose it, at co siderable personal risk to himself.

Well, dear readers, I believe you see no why amateur radio can be proud of profess Jerzy Ostermond-Tor.

Expressions of congratulations to Pro Tor can be sent to him c/o *CQ*.

PLEASE include your ★ ZIP code number on all correspondence ★

Corkscrew Antenna [*from page 60*]

free of such annoying effects as precipit tion static and provide inherent lightnin protection.

Naturally, the most uniform circular r diation pattern will be obtained if the a tenna is mounted on top of a tower, buil ing, etc. The antenna, however, has bee used commercially, mounted on the side antenna towers and still will perform ver well in this manner if the separation fro the tower is made as great as possible (a least ½ λ).

Special thanks are due Dr. M. Siukol ex OH2OA, of RCA for information pro vided about the design of this antenna.

DX [*from page 68*]

tionals will continue to use the DU prefix.

FO8, Clipperton – French licensing au thorities say that no licenses have been issued for any operation from this rare island.

GUS – Frequencies Gus will use on his DXpedition are as follows; for c.w.: 28025 kc, 21025 kc, 14025 kc, 7025 kc, 3525 kc, & 160 meter not yet known. For s.s.b.: 28495 kc, 21395 kc, 14195 kc, 7195 kc, 3795 kc, and 160 meter not yet known. He will tune up and down the dividing frequencies separating advanced/extra class from the generals. Oc-

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casionally he will QSY into the novice band. Low power stations are advised to stay near the edge of the pile-ups. QSL to W4ECI.

HKØ, San Andres—HKØBMO is active on 28600 kc from 1700-1900 GMT daily. Also on 14170 from 1100-1200 GMT and 0300-0430 GMT.

Indianapolis DX Hospitality Hour — This event will be Friday nite, May 23 from 9 till 1 in the Hunt Room patio and pool of the Stauffer's Inn in Indianapolis. Stu Meyer will be MC and Barry Goldwater the honor guest. This will be the kickoff of the all day Indianapolis Ham Convention of Saturday, May 24.

KC4, Navassa — K9GCE, W9ETO, and others are working on an operation for the CQ Worldwide WPX Contest April 12-13. If no go to Navassa they will be at PJ7, Sint Maarten. This will be an All Bands operation.

Silent Key—We regret to report the passing of noted DXer Dr. Kirkland A. Bush, KØGZN, on Oct. 16, 1968. He will be remembered by DXers for his PJ2SA and PJ-2BC operations.

VQ8, St. Brandon/Rodriques — Steve Gibbs, VQ8CC, and Gus, W4BPD plan to operate from these rare islands in mid-April, hopefully the weekend of the CQ Contest. Callsigns will be VQ8CCB for St. Brandon and VQ 8CCR for Rodrigues. QSL contacts with Steve to Box 14, Curepipe, Mauritius. Gus to W4ECI.

2B3DC—This station is said to be in Biafra, and has been heard in Europe on 21440 kc s.s.b. at 1600 GMT.

5W1, Western Samoa — The Western Samoa Amateur Radio Club reports the following members:

5W1AA—Ernest—c.w./a.m., but rarely on the air.
5W1AB—Percy—not on air at present.
5W1AC—Jim—not on air at present.
5W1AD—Don—20 meter s.s.b. with dipole only.
5W1AL—Ted—no rig yet.
5W1AR—Trevor—all bands, s.s.b. & c.w. daily 0500 GMT on.
5W1AS—Ron—all bands, s.s.b. only, daily 0500 GMT on.
5W1AU—Bernie—20 meter s.s.b. to dipole.
5W1AP—Club Station

The more active stations have QSL Managers as follows:
5W1AD—Via ZL1AAP
5W1AR—Via W4ZXI

See page 110 for New Reader Service

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See page 110 for New Reader Service

5W1AS—Via WB6KBK

We gratefully acknowledge the contributions of the following DX publications to this month's column: *DX-MB, DXer's Magazine, DX News-Sheet, DX-'press, FEARL News, Florida DX Report, Long Island DX Association Bulletin, Long Skip, Trieste DX Club News, and West Coast DX Bulletin.*

QSL Information

CR6LF—Via W3HNK
CR9AK—To W1CBH
CT3AS—c/o G2MI
EP2DK—Via W3HNK
ET3RB—To VE1ASJ
ET3USA—Via V.N. Olacke, 287 Kathleen Ave., Sarnia, Ontario, Canada
F9RY/FC—c/o W1PRI
FG7TI/FS7—Via VE3EUU
FO8AA—c/o K6KA for Feb. 21-26, 1969 QSO's
FY7YM—To VE1KG
GC5AET—c/o DJ1QP
HKØBMO—Via WA6AHF
HKØTU—To HK3RQ
JT1AG—Via UA1CK
JT1KAA—To UA1CK
KC4USM—c/o K1TWK
KS6CX—Via K4ADU
MP4BCU—To G3WET
OHØAM—c/o OH2AM
ON8CN—Via DJ2HO
OX5AY—To VE3DLC
SMØAAK/OH2—Via P.O. Box 12, S-161 26 Bromma 1, Sweden
TA1AC—c/o K7OSK
TA1MGP—Via W1UHY
TA3AR—To WA7GQA
TJ1AJ—c/o W4FRO
VK9KA—To K6KA for 1969 QSO's.
VKØJW—Via VK3UQ
VP2DAJ—To WB4EFE
VP2DAP—Via KV4AM
VP2DAQ—To K7TMK
VP2GBR—c/o WA5IEV
VP2KBC—Via W3YI
VP2KL—To VE3GCO
VP2MU—c/o VE2YU
VP7DX—Via W4FRO
VQ9DH—To WA6AHF
VR1P—c/o VE6AO
W8CNL/KL7—Raymond H. McClure, 120 Collier Ave., Battle Creek, Mich. 49017
WB6ZNM—Japanese QSO's are QSLed by JH1AJT
YO2AFB—Via WA2JHD
ZS2MI—c/o ZS2PX
ZS3BS—To WB2RLK
ZS3BP—c/o K4TRA
4S7PB—Via K6CAZ
4X4SO—To W4TKN
5U7AN—c/o W4WHF
5Z4KK—Via K1SLZ
6W8DG—To W2MES
6W8DY—c/o VE4SK
6Y5GG—Via VE4SU
7X3AA—To K8BYU
9E3USA—Via VE3IG, 287 Kathleen Ave., Sarnia, Ontario, Canada
9F3USA—To VE3IG
9J2BK—c/o-W2GHK
9Q5WS—Via W1BPM
9X5AA—To W1YRC
9Y4DS—NOT via K9KLR after Dec. 31, 1968

73, John K4IIF

Contest Calendar [*from page 71*]

generally operate phone on the even GMT hours and c.w. on the odd hours. And 160 at 0200 GMT on May 4th.

Awards: Certificates to the top scorers in each ARRL section and Ohio county. (min. of 10 contacts) Awards also to the three highest scorers in Ohio and out of state. Special awards to stations using 50.15 and

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145.10 exclusively.

Logs go to: Ohio QSO Party, Att: Robert Dixon, W8ERD, 311 E. Kelso Road, Columbus, Ohio 43202

Georgia QSO Party

Starts: 2100 GMT Saturday, May 10
Ends: 0300 GMT Monday, May 12

The eighth annual Georgia QSO Party is again sponsored by the Columbus A.R.C. The same station may be worked on each band and mode for QSO points.

Exchange: QSO nr., RS/RST and QTH. County for Georgia stations, State, province or country for all others. (Ga. to Ga. contacts permitted for QSO points)

Scoring: Each QSO counts 2 points, Georgia stations multiply total QSO points by number of states and VE provinces worked. (DX may be worked for QSO points only) Out of state stations will use Georgia counties for their multiplier. (Possible total of 159)

Frequencies: c.w.—1810, 3590, 7060, 14060, 21060, 28060. s.s.b.—3975, 7230, 14290, 21410, 28600. Novices—3725, 7175, 21110.

Awards: Certificates to the highest scoring station in each state, province, country and Georgia county. There are also plaques for the top Georgia station, the top out of state entry, the Georgia Club with the highest aggregate score, and the top Georgia portable within the state but operating outside his home county.

Make up your log in the usual sequence and include a summary sheeet and signed declaration.

Mailing deadline is June 4th to: Columbus A.R.C. Att: J.T. Laney, 3500 14th Ave., Columbus, Georgia 31904

YL Int. SSB'ers QSO Party

Starts: 0000 GMT Saturday, May 24
Ends: 2400 GMT Sunday, May 25

Rules for this one are quite long and a bit complicated. Some modifications have been made from last year's as they appeared in the May '68 CALENDAR. They will be given in details next month.

In the meantime it is highly recommended that you write Woody Bennett, WØGNX, 8939 E. 31st Street, Kansas City, Missouri 64129, and request a copy of the rules as well as application form and log summary sheet. This is important especially for the teaming of DX/WK teams. Include a s.a.s.e.

See page 110 for New Reader Service

to do the job you want done... use the

AFTERBURNER

10 THRU 6 METER

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150 WATTS

ONLY 3¾" x 7" x 8"

PRICE

BASE UNIT $97.97 MOBILE UNIT $119.95

This beautifully styled linear amplifier will compliment any communications station. Its clearly marked face is richly plated to accent the luxurious black case.

Comes in both base and mobile units. Case size for both is only 3¾" x 7" x 8".

New unique circuit design that uses new compactron tubes and provides high power multiplication with low distortion along with a minimum of channel bleeding, when properly tuned.

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R.F. DRIVE: Maximum requirement of 3½ watts to produce full output.

AUTOMATIC SWITCHING: Switches automatically with application of R.F.

CONTROLS: Loading and tuning controls, OFF-ON and standby switches, and output and power on indicating lights.

SIZE: 3¾" x 7" x 8".

OPERATING POWER: Base Model (No. 403)...115V AC. Mobile Model (No. 404)...12V DC.

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with your request.

CQ WW WPX SSB Contest

Starts: 0000 GMT Saturday, April 12
Ends: 2400 GMT Sunday, April 13

Not much object into going over any add tional details since we have covered this o thoroughly in the past two issues.

Remember, all scores will be published don't fail to send in your log.

The May 15th mailing deadline will extended for those in isolated areas. Logs to: CQ WPX SSB Contest, 14 Vandervent Ave., Port Washington, L.I. N.Y. 11050

Editor's Notes

You will note that the last week-end April and the first one in May are somewh overcrowded with contest activity. It wou seem that a little more planning should ha gone into the picking of these dates. Some these contests have been established on the week-ends for years and therefore cannot blamed. Others were advised of possible co flicts. Whatever the reason it makes for pretty confused couple of week-ends.

I try to keep informed with how the oth half lives by reading other publications a columns. Some prove informative, oth amusing. Take *QST* for February, page for instance. The inquiry, "What DX Conte You mean there is more than one? " Y Virginia, there is another DX contest. May George should also read other magazines. turn on his National SW3 the last week-e of October and November.

Also got a chuckle from the photo on p 81, which pictures the PJØMM gang on a D pedition. Didn't really expect Rod to m tion that those 6320 St. Maarten conta were made during the CQ Phone Con week-end.

Et tu, Brute?

Conditions for our 160 Contest back Janurary were rather horrible. Static le were reminiscent of the old days I spent "banana boats" in the Caribbean. Digg DX out of the racket was murder. The pansion of the band, as we feared, was conducive for DX operation. The 2000 end of the band where the west coast b hang out was cluttered up by the east middle west stations that are permitted operate up there. Must say however that m of the fellows were cooperative in keep "DX Alley" clear for DX stations. 73 now, Frank, W1WY.

See page 110 for New Reader Ser

NEW NEW

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hrough in VHF/UHF Amateur antennas! Cush Craft DX-Arrays combine the best colinear features into the World's most amateur communication antennas.

your interest may be, ragchewing, con- X or moonbounce, get in on the excite- VHF hamming today with DX-ARRAY!

ELEMENT ARRAYS 14.2 db GAIN

formance 20 element arrays featuring low radiation, optimum front lobe, broadband , direct 52 ohm feed, greater capture kability.

2 meter, 118" x 75" x 30"	$29.50
1 1/4 meter, 78" x 53" x 20"	22.50
3/4 meter, 42" x 29" x 11"	17.50

ELEMENT ARRAYS 17 db GAIN

element arrays combine two 20 element stacking frame, 1-1 balun, coax phasing hardware and instructions.

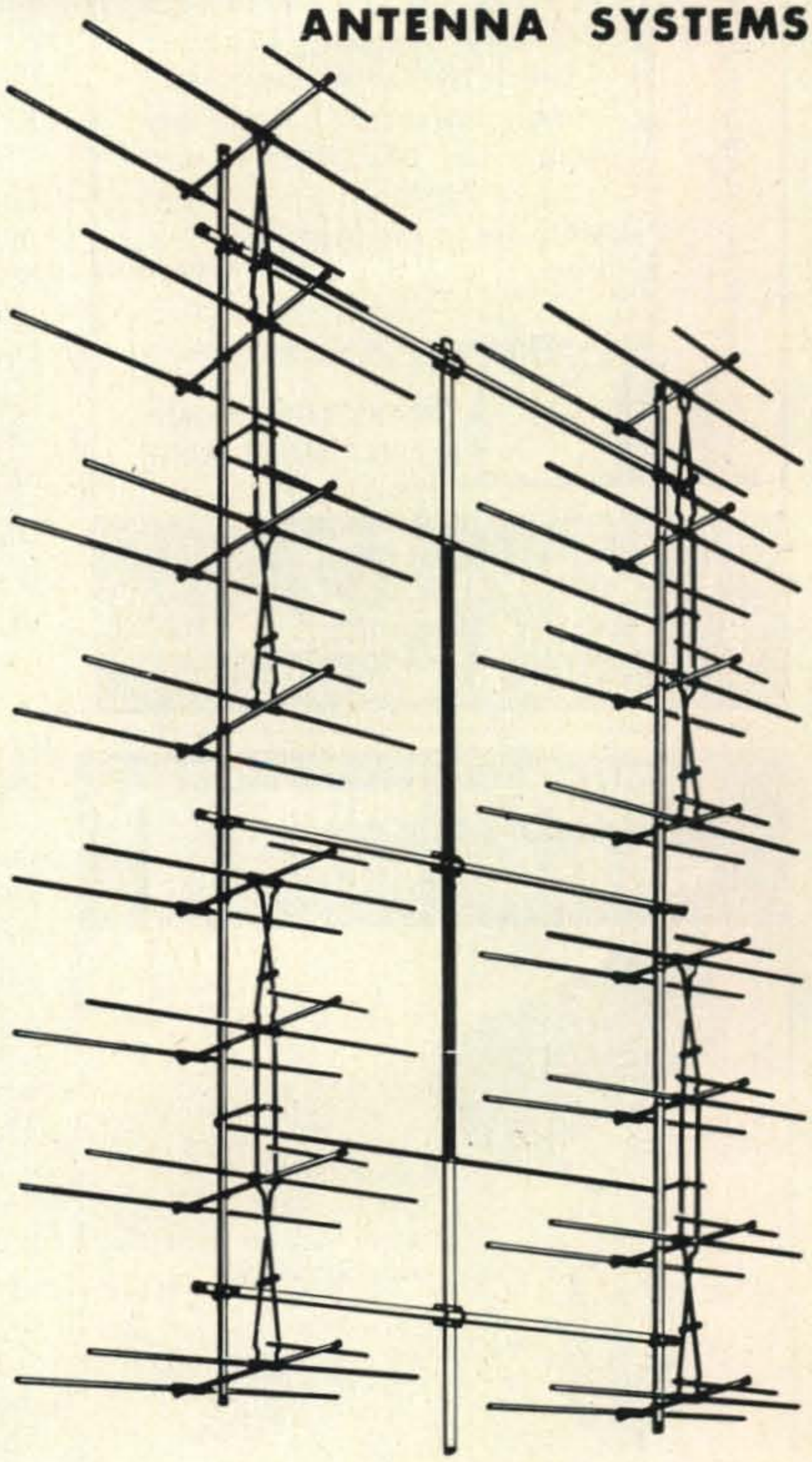
2 meter, 32 lbs.	$40.00*
1 1/4 meter, 22 lbs.	38.00*
3/4 meter, 12 lbs.	24.00*

ELEMENT ARRAYS 20 db GAIN

lement arrays combine four 20 element stacking frame, coax phasing lines, , all hardware and instructions.

2 meter, 64 lbs.	$80.00*
1 1/4 meter, 43 lbs.	67.00*
3/4 meter, 24 lbs.	49.00*

shown above are for stacking kits only t include antennas, i.e. price of 40 ele- heter = two DX-120 at $29.50 each plus 140 at $40.00 = $99.00



E BEST SIGNALS TODAY COME FROM DX-ARRAY

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97 Chambers St., N.Y., N.Y. 212 Digby 9 4411

• 525 Jericho Tpke., Mineola, N.Y. 516 Pioneer 2 2290

• 18 Isaac St., Norwalk, Conn. 203 838 4877

• 225 Rte 46, Totowa, N.J. 201 256 8555

Ham & Roses [*from page 22*]

was ably handled by Henry Richter, J K6VZA, assisted by Stan Fedora, WA6ID the Miller Brothers float convoy from Te ple City was Ed Cryer, WA6ADO; and Hershey, WB6GSO worked the Quonset H float detail. Located in the Sheriff's Depa ment mobile dispatch station called Stati Easy and operated as K6CPT-22 was Depu Frank Oakden, K6TOW; and Ward Cay K6CPT-31. The 1969 parade planners h their desperate moments when the Ho Kong Flu epidemic hit the Los Angeles ar The only Amateur Operator casualty w Dick Ambrosch, W6DSP, who had to c the day before the big event and withdr because of the flu. Your reporter, Bob Zeit W6NAA, was the Officer in charge of t County personnel and rode his bicycle fr the East side of Pasadena to the West si visiting operators and taking pictures, a to of seven miles.

USA-CA [*from page 78*]

from about 1600 GMT daily on 14336–j us, you will find many needed counties acti fixed and mobile.

A fine suggestion from Vic, that a set condensed USA-CA rules be printed on t paper so that County Hunters could eas (and at no extra postage) include a copy w their QSL to non-county hunters in the U and overseas. These are being printed a should be available when you read t Thanks Vic.

Since my participation on the Independ County Hunter Net (14336), much mail been received about the operation of the N Most of the mail is complimentary and so is critical of certain phases of it—I must ad nothing is perfect. Many have requested t I list at least some of the basic rules of operation (Guess they have not heard trying to be NCS–Hi!).

First, I would like to compliment and tha the many NCS (sometimes they are hard find) who have given so much of themsel (time and energy) and I am pleased at fine job they have been doing. I would l to list some of the faithful, but I am afr the list would be too long *and* I might for a worthy member—you know who you a so take the compliment to heart.

I would also like to compliment and tha the *many* mobiles for all their wonde help and efforts. I don't know how they d I have enough trouble in my own shack (w

See page 110 for New Reader Ser

distractions) keeping my log and records rect and up to date—and how the mobile rators can remember so *many* by name, is ond me.

'll try to list a few of the basic rules that all should try to follow. I realize we are teurs and not professionals (although ny sound like they have been at it for ny years).

Of course the basic idea is to permit biles and fixed stations to work as many ded counties in as short a time as possible please let NCS control things, wait your n, be brief and let NCSC answer the quer-. Try to zero with NCS (this is a problem all have whether fixed or mobile. I have a d rig but the shack is not temperature trolled and I seem to be in and out for rt periods of time and usually turn the off).

The priority for NCS is: Mobiles first and se on county lines have highest priority, n fixed stations.

Mobiles of course give other mobiles and first chance.

QRM is the biggest problem, so let us not to it by *all* trying to answer a querry, e that to NCS.

None of this is designed to lessen our enment in county hunting, exactly the opte is intended, so let me hear about your s and suggestions.

Again thanks for *all* the wonderful mail ecially to John, K8YGU for his great r). Thanks for all the fine QSOs and Ls. I am sure you all realize that *I* am not responsible for the delay in *CQ* and the USA-CA Record Books getting to you. Continue to write and let me know—How was your month?, 73, Ed., W2GT.

Repeater Requirements [*from page 47*]

repeater. The operator must also continually monitor all transmissions of the repeater station.

"Section 97.43(b)(6) sets forth the data which must be submitted along with an application for remote control by radio."

A recent letter from James E. Barr, chief of the FCC's safety and special radio services bureau, stated "The Buffalo Amateur Repeater Association and other groups have filed petitions proposing amendment of the Amateur Rules to specifically provide for repeater operation. These petitions are being considered at the present time and a Notice of Proposed Rule Making hopefully will be issued in the reasonably near future."

Mr. Barr also commented, regarding the ticklish problem of adequate control of a repeater station: "(repeaters) may be operated with the licensee present at the transmitter or at an authorized control point. If a remote control point is used it must be at a fixed location designated on the station license and on premises controlled by the licensee. In either case all transmissions must be monitored by the licensee and the operation of the station must be under his positive supervisory control, i.e. it must be possible for the licensee to overide the control exercised by another user of the station." ■

I.F. Strip [*continued from page 30*]

a usable and very simple transmitter a.l system. When this exciter is fired up with 2 tone audio generator and a scope to in cate the output waveform, a surprisingly go pattern appears on the scope even with co siderable audio overdrive. The sensitivity any subsequent amplifiers must be adjust so that the final is driven to full output at t same time this stage approaches its saturati point.

75 And 20

We promised to suggest ways and mea of getting this strip in and out of the 75 a 20 meter bands but first we would like suggest that our unit, as described, can used for single channel operation such as described in a former article in *CQ*.[1] Yes, can and is being used even with just the t receiver r.f. stages shown in some semi-co mercial applications over here. The ma point of interest here, though, is that reader might notice that we are using a s tem which might be described as "Front E Crystal Filters" since our antenna runs ri into the filter in this application. Our expe ence with these filters leads us to sugg that many ham operators would find ho constructed filters of 4 or 5 kc bandpass v useful in net operations. Even a half doz of these filters appropriately spaced alon 25 kc favorite segment in any ham ba would still come within the operating bud of many an amateur operator. They wo certainly help to cut out that high powe lad right around the corner. Even a poor ceiver could perform well with such an ad tion.

That's all we have to say today except t if you're looking for a 9 mc v.f.o. to hete dyne this system in and out of 20 and you couldn't do better than to refer W2YM's excellent article in December 1 *QST*.[2] If you're looking for a modern recei front end and mixer system you'll find it April 1967 *QST*.[3] The author is indebted Mr. Warner Peters for some of the pho graphic work in connection with this article

[2] Hanchett, G. D., "The FET As A Stable V. Element," *QST*, Dec. 1966, p.11.

[3] Daughters, Hayward, Alexander, "Solid-State ceiver Design With The MOS Transistor," *Q* April 1967, p. 11.

See page 110 for New Reader Serv

Ham Shop

Advertising Rates: Non-commercial ads 10¢ per word including abbreviations and addresses. Commercial and organization ads, 35¢ per word. **Minimum Charge $2.00.** No ad will be printed unless accompanied by full remittance. **Closing Date:** The 10th day in the second month preceding date of publication.

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AMATEUR RADIO CERTIFICATE: Display impressive 8½" x 11 personally endorsed certificate in your shack. Send $1.00 to Amateur Certificate, Box 224, Miami, (Kendall Br.), Fla. 33156.

WANTED—QST's—Last four issues needed to complete 1916—FEB, MAY, JUNE, JULY. Any reasonable price paid. K2EEK, CQ Magazaine, 14 Vanderventer Ave., Port Washington, L.I., New York 11050.

QSL's by RUTGERS VARI-TYPING SERVICE, Thomas St., Milford, N.J. 08848. Free samples.

NORTHERN California Hams: Best-deals—new and reconditioned equipment. Write or stop for free estimate. The Wireless Shop, 1305 Tennessee, Vallejo, Calif. 94590.

QSL's BROWNIE W3CJI-3111 Lehigh Allentown, Pa. 18103. Samples 10¢ with catalog 25¢.

DECADE COUNTER KITS—$13.95. Professional quality readout. Free information. Display Electronics, Box 1044, Littleton, Colo. 80120.

LINEAR BUILDERS: 100 MFD @ 3000 VDC condensors—$30 each. Basil J. Weaver, 1831-B Ave. M, Lubbock, Texas.

3 PLASTIC HOLDEPS will frame and protect 60 cards, $1.00 or 10 holders—$3. Prepaid and guaranteed. Patent 3309805. Tepabco, Box 198Q, Gallatin, Tennessee 37066.

RTTY GEAR for sale. List issued monthly. 88 or 44 Mhy toroids, uncased, five for $2.00 postpaid. Elliott Buchanan and Associates, Inc., 1067 Mandana Blvd., Oakland, Calif. 94610.

TEST EQUIPMENT WANTED: Any equipment made by Hewlett-Packard, Tektronix, General Radio, Stoddart, Measurements, Boonton. Also military types with URM-( ), USM-( ), TS-( ), SG-( ) and similar nomenclatures. Waveguide and coaxial components also needed. Please send accurate description of what you have to sell and its condition to Tucker Electronics Company, Box 7050, Garland, Texas 75040.

JOHNSON Viking II: Brochure, plus homebrew 1KW grounded grid 813's on previously Collins chassis Cabinet-power supply—new turner desk mike 254c ceramic. Special CW keys over 125 lbs. pickup nearby states, cheapest, $110.00. Cope 5011 F ST, Little Rock, Ark. 72205.

WANTED: 6 meter Quad in Kit. Manufactures name or builder of kits. John Korbelik, K70CG, 6540 North Black Canyon, Phoenix, Arizona. 85017.

TECHNICAL writers and editors wanted. Free-lance, part-time. Various electronics topics. Standard rates paid. Send resume. Electronic Publications Company, P.O. Box 504, New Hyde Park, N.Y. 11040.

WRL's used has trial-terms-guarantee! KWM1—$299.95; TR3—$399.95, SB34—$319.95; Galaxy V—$229.95; Galaxy 300—$139.95; HX20—$149.95; Invader 200—$269.95; T4X—$319.95; SX146—$189.95; HR20—$79.95; SB300—$229.95; Galaxy 2000* & PS linear—$329.95. Hundreds more—free "blue-book" list. WRL, Box 919, Council Bluffs, Iowa. 51501.

WANTED: Old battery receivers, books, and parts collection 1920's. Need not be working. State pr A. J. Brewer, 4917 Monte Vista Dr., Knoxville, Te 37914.

WANTED Rider's manuel Vol. 1 (unabridged); R.C "Service Data" (1938-42); Supreme Radio Diagra Vol. 2 (1939); buy, sell, swap old radio parts books; need Atwater Kent and R.C.A. Radiola Spea Housings and cabinets, parts, write. Wm. Huneyc Box 535, Norwood, N.C. 28128.

(2) Rolls Scotch 1" #489 computer magnetic t on metal reels @ $5. Hygain 12AVQ (10-15-20M) ve cal $12. Heathkit HO-10 Monitorscope $50. To C10WDG mobile 250 watt power supply. $50. F.C Richard M. Jacobs, 4941 Tracy, K.C.M.O. 64110.

DRAKE T4x, R4, MS4 Speaker, AC3 power supply. cables and manuals. $575.00 or best offer. Jos Koppi, 1026 No. State St., New Ulm, Minn. 5607

TWO Atwater Kent Circa 1920's. Model 20 and R.C.A. Speaker Model 100. Airline Head Set. $65 Donald Zehr, Rt. 4, Box 581, Roseburg, Ore. 9747

KWM-2 and Pm-2 power supply. Recent comp factory checkout. Like new condition. $695.00. Hingtgen, W0WIG, 272 Crandall Dr., N.E., Ce Rapids, Iowa. 52402.

TRANSMITTER GE Navy Model TAJ-19 500 w unused Spare parts, Diagrams, Specifications. RA Box 102, Hazlet, N.J. 07730.

SWAN 350 and 117XC power supply. Late model, new. $350.00 for both. J. A. Russell, 1170 Devonsh Muskegon, Michigan 49441.

RAGS (Radio Amateurs of Greater Syracuse) ann Hamfest on Saturday, March 29. 1969 at Song Mo tain. Lee Delasin, WA2DAD, P.O. Box 88, Liverp New York, 13088.

MW DXERS—Complete list 5000 US-Canadian stations including schedules, addresses, etc. $2 NRC, Box 99, Cambridge, Mass. 02138.

WANTED T—330 Magnetic Tape storage unit mad SCM. Jerome Gunderson, 13312 Inverness Rd., H kins, Minn. 55343.

AN/TRC-7B Manual Wanted TM-11-617 quote p and condition. E. M. Shank, W7DVR/7, 1937 Schuyler, Portland, Oregon. 97212.

FOR SALE: Galaxy V excellent $225.; 100 kc cry calibrator $10. cash. firm. M. C. Pogue, 45 Cavell W. Caldwell, N.J. 07006.

TEXT: For sale: HW-16. Excellent condition. $ K9ZNK David Blystone, 812 Niles Street, La P Indiana. 46350.

VARIACS, Powerstats, Power Transformers. Cho and other power supply components. Write needs. Dale R. Lee. W3JRM, 1228 Shelbourne Bethlehem, Pa. 18018.

FOR SALE: 2 ea. 4-125's—100th and 2 ea. 82 make an offer—all brand new unused. W3JGT Reynolds Ave., Carbondale, Pa. 18407.

65 Watt Novice Rig. $25. H. Smith, W8VVD, Box Birmingham, Mich. 48012.

TR108 with VFO $120. Homebrew 6 meter AM-CW watts, pick-up only. Siegel, 234 Lancaster Drive, Hiawatha, N.J. 07034.

WANTED: Several hams need manual for T62 R77 of ARC3 series. Will copy or else. Hear Lowry, K4VFA, 915 Madison Street, Manchester, T 37355.

WANTED VHF/UHF color slides of stations and an nas to be shown at the Pacific Convention in Sa mento 13/14/15 June. Send to: E. G. Taylor, W6D 4100 Worthington, N. Highlands, Ca. 95660.

WANTED To Buy National HRO-60 complete coils, must be in mint condition. Write Mel Mar 2242 Stevens Ave., Kalamazoo, Mich. 49001. Ph 616-342-8838.

FOR SALE—Geiger Counter—A-1 condition—m 107-B-$50.00. Plus shipping—cost $150. new—W3 —3811 Liberty Way, McKeesport, Pa. 15133.

GLASS house hams—Compiling a directory of h employed in the Glass Container Industry and A Fields. Send information to WB2AHF, 1197 Woodcrest Drive, Vineland, N.J. 08360.

FOR SALE: New Ameco converter on 39.46. Will c ate on 115 or 12 V. Complete with 110 power su Will ship PPD. $27.50, Fred Clinger, 640 Grove Galion, Ohio. 44833.

See page 110 for New Reader Ser

METER station, Heath tower—SX 28 with Ameco nverter, 7 El Beam with AR 22 rotor. $150 complete. ammerlund model 110 receiver. EICO 720 XMTR, atching spkr. Barker and Williamson, 75 Ohm low ass filter. B. Balter, 143 East 87 St., Bklyn, N.Y.— L 1-2870.

IDIANAPOLIS DX Association: Will provide a hos- tality suite for DX'ers on Fri-nite, May 23—Write Joe oston, 309 Benton Dr., Indianapolis, Ind. 46227.

IDIANAPOLIS Ham Convention (Sat.) May 24, (9 to at beautiful Lafayette Square Mall. Indoor manu- ctors Displays—for sale or auction. Free outdoor ea Market. 80+ Shops, Cinema, for XYL & Kios, side air-conditioned Mall. Airports & Interstate— /2 mile. Write Indianapolis Ham Association, 309 enton Drive, Indianapolis, Ind. 46227.

EW accuracy for your receiver; IC-3 Divider pro- uces 25KHz marks from your 100 KHz Calibrator. pecify 3-200 Volts DC. $7.25 postpaid. Paxitronix, ox 1038, Boulder, Colorado. 80302.

TTENTION 160 meter fans: Change any coax fed 5/80 meter inverted vee/dipole into an efficient 160 eter antenna. Adapts within seconds, right in the amshack. PL-259 and SO-239 connectors. Perfect for sidential areas. Top Band Systems' Model 86ADP 0 meter adaptor. $4.75 ppd. Martin Hartstein, 5349 obeyfield, Long Beach, Calif. 90815.

LEGG Apollo six linear amplifier for sale! Brand new. ubstantial discount, contact Jack Batts, Five Old avern Rd., Wayland, Mass. 01778. Phone 617-653- 91.

0th Grand Rapids Amateur Radio Assoc. (ARRL nctioned) State Convention, May 9-10, 1969. Write RARA, Box 1333, Grand Rapids, Michigan 49501 for kets and information.

HOSS TRADER ED MOORY" says if you don't buy ur ham gear from him, you might pay too much. hop around for your best price and then call the HOSS" before you buy!
ose Outs on new equipment: New Galaxy 5 Mk III, 95.00: Early Model Swan 500C, $395.00: New Swan 0C VFO and 22B VFO Adaptor, Reg. ($147.00) Cash ice $89.00: Hy-Gain TH6-DX Beam, $99.00:
ew Rohn 50 Ft. Heavy Duty Foldover Tower PRE- AID, $195.00: New Mosley TA-33 Beam and Demo am-M Rotor, $179.00:
SED EQUIPMENT: 75A-4, $349.00: HQ-170, $149.00: allicrafters SX-117, HT-44, and Supply, $425.00: R4, $409.00: T4-XB, $339.00: R4-B, $299.00:
am-M Rotor, $79.00.
d Moory Wholesale Radio Co." Box 506
hone (501) 946-2820 DeWitt, Arkansas 72042

ANTED: Collins 32S-3 and Henry 2K Linear, please ate price and condx. Tim Heflin, Duke University edical Center Amateur Radio Club, WB4BLK, P.O. ox 3005, Hospital-Durham, North Carolina. 27706, .: 919-684-4317.

ammarland H2-170. Factory noise blanker, 24 hour ock, speaker. All re-aligned, calibrated, excellent ndition. Will ship. W6NFW, P.O. Box 61, San Juan antista, Calif. 95045.

OVICE crystals airmailed: All frequencies .05%. 80 eter $1.75. 40, 15, and 2 meters $1.50 each. Airmail- g 10¢/crystal. Net crystals etc. Write for general equency bulletin. Crystals since 1933. C-W Crystals, ox 22-B, Marshfield, Missouri. 65706.

ELP FORMER DX BECOME W: Write your Senators d Representatives expressing support for K7UGA, n. Goldwater's bill: S. J. Res. 27.—Ex YO2BO.

OR SALE: Johnson 250—39 T-R switch. New, never een used—$25. plus shipping. Robert Kaefer, Box 24, owlesville, N.Y. 14037.

OON AND BOB" New Specials. TRIEX W-67 Free- anding Crankup, prepaid freight (REG. $851.50) 5.00; Galaxy GT-500, AC supply 465.00; Galaxy 530 625.50; Hammarlund HQ-215 475.00; TH6DXX EG. 165.95) 139.95; GE 811A 6.95; GE3B28 3.95; otorola HFP-170 2.5A, 1000V. 39¢; RG-22B for Poly- n Quad kit 15¢/Ft., new guaranteed surplus—1000 HZ HC6/U Crystal 3.95; Telex HMY-2000 Stetho- ope headset 3.95; Aerovox 250MFD/400V. 2.95. aranteed used special—Collins 75A-4 KWS-1 com- nation 1,000.00, no trade. Swan 260 Cygnet 359.00. e carry all major lines of used and new gear. ite for quote. We have export facilities. Collins arranty repair plus other maior lines. GECC finance. ices for Houston. Don K5AAD. Bob WA5UUK. Madi- n Electronics, 1508 McKinney, Houston, Texas. 002. (713) CA 4-2668.

WANTED: Collins S-line equip. — damaged or non-functional—with or without serial number. State problem, condition & price. G. Schads, 7015 N. 4th Pl., Phoenix, Az. 85020.

GOING MOBILE: Gonset commander, VFO, Super-6 conv., cables, etc., complete with instructions. $50.00 or best offer. W. Macomber, 46 Oakland St., Wilbraham, Mass. 01095.

LIKE: New 40MTR. mobile outfit. HW22A & Xtal Calib & Mike & Hustlerant—$150.00. Sell or trade "Joe", WA9TLO, 13 N. Grace St., North Aurora, Ill. 60542.

HAVE ANTIQUE? Supreme model 582 signal generator and frequency modulator S.N. 517A. Also, have 200 kc to 32. m.c. signal generator built for military. Either unit $16.00. Jim Beistle, 372B Wilkie Way, Fort Worth, Texas. 76133.

WANTED: Copy of "Radio Reminiscences: A Half Century" by Dr. Hoyt Taylor. M. Gauthier, 10425 San Jose Ave., South Gate, Calif. 90280.

FOR SALE: HW-32 Heath 20 meter xcvr. $70. Or trade for gen. coverage rcvr etc., Geo. Botsford, RR #1, Ainsworth, Neb. 69210.

SELL: Hallicrafters HA-6 6 meter transverter, AC power supply, waters VHF filter. Excellent condition. $125. L. Krenek, WA5KZE, 211 Hillwood Dr., Ark. 72116.

SELL: Q.S.T., C.Q. any amount; send requirements and offer. E. Guimares, WA1BFD, 17 West End Ave., Middleboro, Mass. 02346.

SELL: Ameco CN-50W, 7-11 IF, $35. ARC-5 3-6 mc w/ps $20.00. Old QST, CQ, 73, handbooks. Sase for list. WA3BGN, 6117 Smithfield St., Harrisburg, Pa. 17112.

COLLECTOR of antique radio tubes wants American, German, French, British tubes made prior to 1920. W9LGH, 610 Monroe Ave., River Forest, Ill. 60305.

COLLINS: 32S1 — $400., 51672 — $95., HW32 — $80., HP23—$45., SB610 scope $80., HO-13—$60., TH4ANT —$40.00, TH3JR—$30.00. Want 51S1—any condition. F. Baker, W8FLT, Box 546, McComb, Ohio 45858.

KWS-1: Recently overhauled by qual. Collins dealer. $615. Avail. mid March. Hold for 25% dwn. Bob, W0YVA/4. 4423 N. 17th St., Arl., Va. 703-524-2398 after 0100 GMT.

TRADE: Hallicrafter 100 Receiver other radio equipment for camera, equipment. M. Johnston, W4ALG, 2625 University Blvd., Tuscaloosa, Ala., 35401.

GONSET-4—2 meter in very good condition. $200.00. Companion VFO $60.00—Both $250.00. WA2OHN, 845 Cliffside Ave., N. Woodmere, N.Y. 11581.

DRAKE TR-3, excellent condition. Aero. Center Amateur Radio Club, 5824 N.W. 58th Street, Oklanoma City, Ok. 73122.

WANTED: Megger in good condition. Mech. or electronic type. State condition and price. J. Wong, W6ZSX, 820 Bedford Dr., Salinas, Calif. 93901.

FOR SALE: Mint NCL2000 $400. Perfect KWS-1 with all Collins modifications and new tubes $750. Can ship. WA8HNM, Lee Beyer, 10 W. 35th Holland, Mich. 49423.

FOR SALE: Decade Scaler plug in's good to 100 kc. Beckman. $8.00 unused. 6.5 KVA 120-240v 60 cps generator on trailer $350. Alum. inst. case, ants. etc., $275. R. M. Ellis, 1356 Elizabeth St., Las Vegas, Nevada. 89109.

SELL: 61 issues CQ 1948-1963, and 246 issues QST 1936-1963 for best offer plus shipping. Send sase for list. Henry Taylor, K7NHG, Star Route, Olga, Wash. 98279.

FOR SALE: Heath kit Apachie transmitter in excellent condition. $95.00. Leroy A. LaBardi, W9NWG, R R 4 Collinsville Road, Edwardville, Illinois. 62025.

BC 348 N recvr. clean. Sell $40. Pwr supply $12. Spkr. $8. N. Friz, Shelter Island, N.Y. 11965.

COLLINS 32S3, 75S3, P.S., Spkr. and mike. $995.00. Pat Lyons, Rt. 1, Box 105, Arvada, Colo. 80002.

FOR SALE: Vv fb ART 13 with brute pwr supply new 811s & 813-100.00 or best: T150 & R100A spkr, fb $100.00 firm, R. Huffman, WA3JRY, R D 1, Dillsburg, Pa. 17019.

TRADE my Apache & SB10 VY GD Condx for ur Ranger II Vy good condx. W9EOA. R. Martinmaki, Rte. 1. LaCrosse, Wis. 54601. Ph 608-784-1246.

FOR SALE: good cond. Knight T60 XMTR—741 E. 217 St., Bronx, N.Y. 10467.

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FOR SALE: 1.5—18Mhz Rcvrs BC 342 $75. BC 312 $50. Globe Chief Xmtr $25. S. N. Silbert, 2066 Creston Ave., Bronx, N.Y. 10453.

FOR SALE: Plans & specs 40 ft. crank up tower for under $40. Send $2. P. Schelter, 1007 Janiee Dr., Burkburnett, Tx. 76354.

SALE HQ145X w/spkr $200, HR10B w/cal unused $85, new 304TL $40., used 304TL $10, K4UWH, 106 W. Chestnut, Johnson City, Tenn. 37601.

FOR SALE: Collins 75-A1, with Crystal Calibrator mint condition, with manuals $130. C.O.D. Rafael Estevez, WA4ZZG. P.O. Box 2442, Hialeah, Fla. 33012.

BARGAINS: Pwr. XFMRS. 815V.-0-815V.-PRI-115V: $7.00; 660V.-0-660V.-PRI-115V: $6.50; PRI-110V.-SEC 360V-0-360V.-5V2A.-6.3V.4A: $5.00. E. Tischler, 58 Carey Ave., Wilkes Barre, Pa. 18702.

FOR SALE: Telrix 5el. triband beam model #TC-99D with balun. Excel. condition. $120.00 will bargain. WA2BPL, Elliot Levin, 415 Sheffield Road, Cherry Hill, N.J. 08034.

FOR SALE: Heath Tower, slight modification to transmitter section. $35.00. Bay area only. WA6PXG. 40 Laurel Ave., Millbrae, Calif. 94030.

FOR SALE: Harvey Wells T90/w/Man. & Hme. BRW. Pwr. Sply. $70. 2 M FM Gear Lcl Only. C. Van Buren, 3921 E. Fourth Plain, Vancouver, Wash. 695-6907.

WANTED hams to join NON SMOKERS UNITED. Object to eradicate smoke from public facilities. M. Hoshiko, WOCJW, 707 S. James, Carbondale, Ill. 62901.

SALE: Johnson Ranger II Transmitter-6-160M. Factory wired—$95. Geffner, 48 Park Ave., Merrick, N.Y. 11566.

TRADE for ham gear, complete Solid State Automatic Rhythm Section, cabinet, Pwr, 3 spkrs. W4AP1, 1420 S. Randolph, Arlington, Va. 22204.

TRADE: Dictaphone machine for general purpose oscilloscope. J. Rosenbaum, 25245 Roosevelt Rd., South Bend, Indiana 46614.

SELL: Henry 2-K2 Linear, Galaxy V Mark II, all accessories, ready to go. Five hours total time, guaranteed mint condition. Complete at $1050. F.O.B. W3NV, 8258 Brittany Place, Pittsburgh, Pa. 15237.

FOR SALE: SWAN-175 $110.00; Johnson 275W matchbox $35.00; BC457-80M. CW $14.00; will consider swap for general coverage receiver. Joe Turkal, K8EKG, 1020 4th St., S.W., Massillon, Ohio. 44646.

FOR SALE: Clegg 99er, $65., Knight V107, $20, Knight C577, $18. All in unused condition. David J. Reese, M.D., 747 Madison Ave., Charlottesville, Va., 22903.

FOR SALE: Cushcraft 6 element 6 meter beam, used very little, for local pickup only $15.00. M. Synder, K3YMN, 2185 Sampson St., Pittsburgh, Pa. 15235.

FRESNO HAMFEST, May 2-4, 1969, Tropicana Lodge. Prizes—Swan Linear and Tristao Tower. Write FARC, P.O. Box 783, Fresno, Calif. 93712.

FELLOW Galaxy Owners: Update your older galaxy to power level of MK3 and 550. Sase. K5TGJ 2817 Lakewood. Dr. Garland, Tex. 75040.

SELL Marion runing time meter $3. new; pipe taps 1/8 thru 1 inch set $5; Robert Ireland, Pleasant Valley, N.Y. 12569.

WANTED: 500 cps and 2.1 KC mechanical filters for 75A4. Also Jan/61 issue of 73. A. E. Johnson, K1IIK, 55 Pinnacle Rd., Newport, N.H. 03773.

FOR SALE OR TRADE: International Executive CB transceiver, excellent condition $90.00. Want good ham receiver such as NC-300, etc. Frank C. Dahm, 86 Garfield St., Natrona, Penna. 15065.

C.E. 10B, QT 1, VFO; $65. DX-40, VFO, $50.00. Gonset Super 6, $15. Ranger I, 6NZ; $150. 150 watt 6M. XMTR, $50. 160, 80, & 40M. ARC-5 XMTRS. $10. ea. Marty Feeney, K10YB, 38 Howard St., Portland,, Maine. 04101.

B&W 5100 and 51SB now operational. Chester Ludlam, 2309 Bullington, Wichita Falls, Tx. 76301.

WANTED: Johnson Invader, C. Keller, Butte Falls Star Route, Box 73, Eagle Point, Oregon. 97524.

WANTED: S meter for Collins 75S1 and control box for Ham M Rotator. State price. Myron E. Knowles, 9 Brown Street. N. Billerica. Mass. 01862.

FOR SALE: Entire Six Meter Rig, as a unit only. For information, contact Jim O'Sullivan, K2LAY, 30 Doubleday St., Binghamton, N.Y. 13901. 607-772-0574.

SELL: EICO 753 x-ceiver $75.00 K4CN, E. Hollis, F 24 Marlin Lane, Palmetto, Fla. 33561.

WANTED—Antique Radio Tubes made prior to 1 S. M. La Dage, 431 Oakland Ave., Maple Shade, 08052.

COLLEGE student must sell entire station. Swan TH3jr beam, Heath keyer, etc., Pls send for lis Freedland, WB60IB, 1115 Andrews Dr., Long Be Cal. 90807.

WANTED—"J" coil—50 KC to 100 KC for HRO-50. Cone, W9YLU, 6731 N. Hermitage, Chicago, Ill. 60

WANTED: Automatic CW keying equipment Mce Boheme, etc., L. C. Skipper, W6KP, 725 North 'O' Livermore, Cal. 94550.

WANTED: Will pay $1.00 apiece for old QST Binc Brother Gerald Malseed, Calvert Hall College, Tow Md. 21204.

WANT: BTL record back issues 1927-29, '37, '42, etc. to '51. Pay 50¢ for each issue needed. Also v Collins 75A4 Vernier Knob. W3AFM, 5800 Hillbu Chevy Chase, Md. 20015.

WANTED: For historical preservation, pre-1935 cards. Please state number of cards available price wanted. Alley, WIDMD, 298 Taunton St., L ville, Mass. 02346.

TRADE: Globe Scout Deluxe Xmitter, VFO HO-13 H Scan, 732 Modulater, etc., for stereo rece WA2RDO, 1992 Windsor St., Westbury, N.Y. 115

SELL: Knight audio compressor, C-577, like n $10.00; EIMAC 4-125A, never used, $5.00; plate tr former, 1000 V. with C.T., $5.00 B. Nastoff, 320 W 56th Place, Gary, Indiana. 46410.

NC-300—$120.00—Excellent condition; W0EUQ, 1 S. 17th St., Grand Forks, N.D. 58201.

NCX-5 with HB supply—$350. or trade for 3253, 3 or NCL-2000 WB4HMM, 5100 Hollyridge, Raleigh, 27609.

HAM transformers rewound. Jess Price, W4CLJ. Gunby Ave., Orlando, Florida 32801. Phone (3 425-7251.

FOR SALE: Eddystone slide rule dial #893, $16, 4-65 tube $5, Portable similar transmitter/rece see June 68 CQ p. 61—$30.—W6BLZ, 528 Colima La Jolla, Calif. 92037.

SALE: Brand new mobile Hi Band FM Receiver (1 Xtal-controlled, with built-in pwr supply, speaker, and squelch. Cost $150.00 sell for $35.00 or sw Sase please. J. Thomsen, W9YVP, 8280 S. Tennes Ave., Clarendon Hills, Illinois. 60514.

FOR SALE: Kw SSB station. HT-37, SX-111, War Will take CW rig in trade, R. Rockwell, 8672 Lin Blvd., Pittsburgh, Pa., 15237.

FOR SALE or TRADE: HR-10 Mint, HT-40 Works. ne work, Heath HAM-SCAN, Exc., EICO 722. Want: C presser, Monitor Scope. WA5PWX/5, P.O. Box Ruston, La. 71270.

TRADE PHOTO & Electronic musical equip. for H gear. Spitz, 1420 S. Randolph, Arlington, Va. 22

ANYONE interested in starting a Two Meter Side B Net for East Coast contact; William Ratliff, Jr., N 3rd St., New Freedom, Pa. 17349.

FOR SALE: Clegg, 99er, HW32 with H.B. P.S. Morkrid, 2089 Cypress Dr., El Centro, Calif. 9224

WANTED: 1961 Jan., Feb., Mar., and April QST's in shape. William P. Jacobs, WAEAGV, 5990 Glenw Ave., Boardman, Ohio 44572.

WANTED: Damaged or nonworking 75S-1 recei Condition not important. M. W. Ludkiewicz, 143 R mond Road, Ludlow, Mass. 01056.

SELL: 2 KW Heney 2K-2 with Galaxy V Mark 2 accessories. Mint condition, used 5 hrs. W3NV, 8 Brittany Place, Pittsburgh, Pa. 15237.

SELL: Deposited carbon film resistors 1/2 watt, 5 10 ohm through 1 meg. $1 for 8, postpaid. E. K Box 1966, Camden, N.J. 08101.

FOR SALE OR TRADE: QST complete 1934 thru 1 want receiver, 2M or 6M gear, or what? W. Sparf, Willowcrest, Villa Pk., Ill. 60181.

WANTED RME 4301 Sideband Selector, state co tion and price. Herbert M. Plummer, RT 234, Cath pin, Va. 22018.

FOR SALE: National NCX-5 Transceiver Mark Remote VFO, Speaker/Power Supply; Crystal C brator; good condition; best offer over $500. You postage. KX6FJ, Box 1554, APO San Francisco 965

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NTED—B & W Model 381 or 381B TR switch. ZZV, 2401 Penna. Ave., N.W., Roanoke, Va. 24017.

BE TESTER, mutual conductance, military I-177-B, -949 A/U adapter, manuals, new cond. $75. G. W. hie, P.O. Box 26, Salem, Virginia 24153.

Xistors—10 Heat Sinks—53 Diodes—24 Tant. Caps Xfmrs—1 Choke—4 Trimpots—3 Zeners—234 1% istors—$20 PPD. Details SASE—Ken Morey, 803 st 6th, Pittsburg, Kansas 66762.

gulated power supply, 250 to 300 VDC. Neg 110 s. 6.3 @ 10 Amps. New tubes included 5R4, 6080, 2, 6AFK & 6X4. Will ship in US $20.00 prepaid. HW, 226 Blake, Midwest City, Oklahoma. 73130.

R SALE SX-101 Mk2, $100. SB-10, $40. All in FB dition. Fred Atchley, 206 Rosemary Lane, College tion, Texas, 77840.

R SALE: Drake 2 B and 2BQ. Used very little. Best er over $150 takes it. Call after six 201-768-5299, write WB2GZL, 191 West St., Closter, New Jersey 24.

NTED—Scope, Tektronix 502—310 or similar—rable condition. G. Charlick, 163 Ledgewood circle. chester, N.Y. 14615.

NTED: Adaptor 3⅛" air dielectric line to type "N", AC current xformers, 15A to 5A at 60Hz (need); B. Weiterman, 4549 N. 38, Mil., Wis., 53209.

ICAGO AREA—FOR SALE—Clegg 22er, perfect, 5. Will ship FOB only on receipt of certified check. POU, 607 Pine St., Batavia, Ill. 60510.

UTHERN CALIFORNIA AREA: Collins 75A1—$150., lins exciter 310B—$80.00. Both with Handbooks d in excellent condition. Bud Veregge, 18111 Strat-d Circle, Villa Park, Calif. 92667.

METER LINEAR: 2KW PEP, 3-4CX250B's in Paral- $150.00 trade. John Richards, 3836 Isabella, cinnati, Ohio 45209.

R SALE: SX101 MK#1 with speaker, best offer. No p. Good condition. W2CG, Box 266, Wilson, N.Y. 72.

NTED: Motorola Sensicon G ot Uni-channel D eiver for lo-band. For sale or swap Collins mp-2 VM-2 power supply) $75. Schumacher, 12030 Wash-ton Bl., Los Angeles, Calif. 90066.

NTED: RTTY Model 14 TD, and Model 15 keyboard; o want all band 2kw linear amplifier. State price. WYH, 1507 A. Dodge City, Kansas 67801.

AKE 2C, 2CQ and 2NT brand new; must sell. Still warranty. $350. Kirt Fanning, 6021 Edgewood, grange, Ill. 60525.

TE Teleprinter $475, Monitorradio M-160 $75, Uni-t $85, Bolex P-4 Zoom 8 $85, Perera, 410 Riverside , N.Y.C. 10025.

NERAL Radio test equipment. Old, but still GR ality. Send Sase for list and prices. Carl Drumeller, JJ, 5824 N. W. 58th Street, Oklahoma City. Ok. 122.

EQUENCY Counter / Scaler, Beckman / Berkeley del 2025B and Beckman/Berkeley model 5916 Line digital Readout. Sase for spec. sheet. R. Spur-k. 7 Theriault Ave.. Salem, N.H. 03079.

STON VHF RTTY—activity—51.192 mhz—AFSK AM loriz Pdor. 30 Active Stations—Join the fun every e—more info sase—WAIDPX—Ray Dick, 6 Herbert ad. Arlington. Mass. 02174.

LE: Dumont-208 scope; $75 G.R. 566A Wavemeter; 5 Transpac TR-10A; $30, Electro-D-612; $30. Want: M-1. L. Kulhay, 19 Topstone Dr., Danbury, Conn. 310.

A4 — Mint condx — serial 4789 — Vernier Knob — 2 ors—Collins speaker $400. W2ASI, 15 Kensington al. New Rochelle, N.Y. 10805.

R SALE: Drake 2NT Transmitter with 3 crystals. 15. Marve Aden. WB9AAT, 1400 East Lyn Ct., Home-od. Illinois 60430.

NTED: Westinghouse Type FE service cable 474787 or connectors to make same. John Becker, 35 Birchwood, Wilmette. Ill. 60091.

DICO SSB-100 SSB/CW Exciter-Transmitter, $100. -110 Receiver, $90. Both in good condition. Will p. K5MDX Ham Sale, D. Thompson, 104 Dana Rd., tchez. Ms. 39120.

ATH General Coverage & Ham Band Receivers, dels GR-54 $60 and GR-64 $25. Or both for $80. k Stirratt, WN2HJM, 76 Woodridge Ave., Cheek-vaga, N.Y. 14225.

HEATH—Two'er (model HW-30) 2 meter transceiver $25. Hygain 2 Meter Halo Antenna (new) $5, Art Johnson, K2POA, 29 Boone St., Bethpage, N.Y. 11714. Phone 516-931-3374.

FOR SALE Collins 312B-4 Speaker Console. $120.00. D. Palmquist, P.O. Box 505, Barstow, Ca. 92311, WGHZZ.

FOR SALE: HR:20 $50; HX-20 $90. All cables and manuals. HP-23 in SB-600 cabinet $45 if purchased with another unit. Good condition. Shipped collect. John Scheurer, 6412 Myrtle Drive, Huntington Beach, Calif. 92647.

WANTED: 73 Magazines 1966: 1967: Jan., Feb.,, Mar., June, July, August 1968. Dave Cook K4RNA, 3917A Kings Bridge Road, Chattanooga, Tenn. 37416.

FOR SALE: Wheatstone oiled 15/32" perferator tape for Bohme Keying heads. P. Lemon, 3154 Stony Point Road, Santa Rosa, Calif. 95401.

SELL BC221AK W/PS $40.00 cash and carry. Vibroplex standard, like new, will ship for $18.00. Randall K6ARE, 1263 Lakehurst, Livermore, Calif. 94550.

FOR SALE: Precision—ES-500A, 5" scope $95.00; E200 sig gen, $50.00; EICO 360. $30.00; 950A, $25.00; all fob. R. Wendel WB2YYX, 160-20 Grand Central Pkwy., Jamaica, L.I., N.Y. 11432.

CANADIANS: Complete amateur equipment service by gov't licensed technician (and amateur). Bob Fransen, Box 197. Sherwood Park Alberta.

FOR SALE: EICO 723 60-w cw xmtr for 10, 15, 20, 40 and 80m. Handbook and 4 crystals. Ideal for novice. $30.00. R. H. Gauger, 20 Glen Lane, Glen Head, L.I., N.Y. 11545.

SELL variac V20amp 120 volt $25.: Vibroplex blue racer chrome bug $18.: Homebrew grid dipper $10.: Lists; SASE. W0KPZ, Box 1038, Boulder, Colo. 80302.

TRADE: (2) 2M8E1. Hygain beams, (1) new C116 colinear & MS.T12 rotator want. 220. 432 & 1296 converters & antennas. & low power plate moclulator 730 or equivalent. F. Harmon, P.O. Box 203, Owasso, Ok. 74055.

Zero Bias [*from page 5*]

tudes upon a teen-ager.

The young people of today are full of ideas, much better educated than we were, aware of today's problems and are generally a fine group. They are hard working and still have to scrimp for that extra something they want. The students I teach are a fine group of kids. Those who have been encouraged to join our group all had to work hard, save money for that 25 watter, then a 150 watter or worked up from a Space-Spanner to a better receiver like the SX-71. I don't know what they did with their silver spoon or whether they junked their private TV for parts. Here too Mr. Ninkin couldn't be more wrong.

It seems to me that nowhere can there be found a hobby that is more stimulating or challenging for our kids today. It can be an activity which is outdoor, indoor, intellectual, social, mechanical or as tough as you want it.

As individuals we must help not hinder, build up not knock down, love not hate, direct, not confuse our young people. Amateur radio provides that devise to do so. Hamming can be good for our kids and they will be good for hamming.

James H. Jipping, W9JAR
Lansing, Illinois

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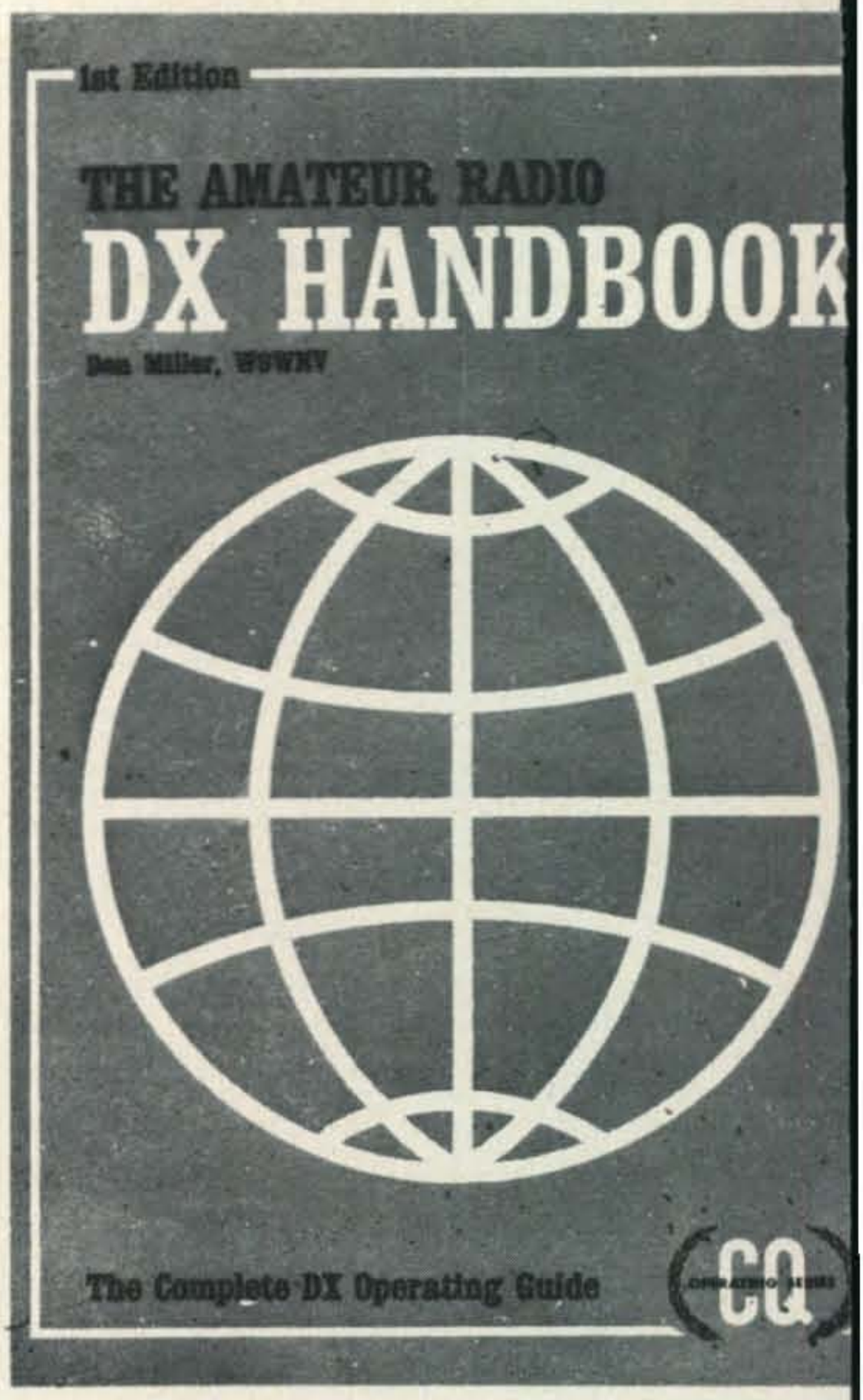
SPECIAL NOTICE

The Amateur Radio DX Handbook is off the presses and in the mail. CQ readers who ordered their copies direct from the publisher will have their copies as this issue of CQ is being prepared. Hundreds of local distributors and book stores will also have copies in stock.

This book is the absolute, most comprehensive sourcebook available on DX to the Radio Amateur. It contains every conceivable piece of information he'll need toward working better DX.

The chapter headings are listed below, although they don't come close to doing this fantastic volume the justice it deserves. You have to see a copy to appreciate just how valuable it is.

We anticipate that our first print run will be exhausted within the next month. To make sure you get your copy while they're still available, check your local distributor or order direct from the publisher. The price is $5.00 for 200 pages of priceless reading.



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Mobile DXing

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QSLing
The SWL DXer
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Great Circle Bearing Charts

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Advertiser's Index

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CW TRANSMITTERS

Or A Plea To Some Manufacturers To Put Heft Back Into Their Products

Many amateurs are finding out that their recently purchased sideband rigs fail to perform adequately on CW. Some, not liking to operate with less than the best, confine their time to SSB. Yet CW, as a mode of communication, is hard to beat — and truly can be a ham's "best friend." This impasse is logically a reflection of the fact that SSB is what modern rigs are designed to do best — CW is something of an after-thought.

Yet the requirements of each mode, while differing in degree, are not that far apart — if only present day manufacturers would enlarge the copper and steel content of their power supplies. In the typical sideband rig today the power transformer weighs between 8½ and 11 pounds. Nonetheless, it is expected to sustain up to 500 watts of PEP input or 400 watts of CW input. Is it any wonder, then, that your CW performance leaves something to be desired?

This same problem is even easier to see when it comes to RTTY operation with your sideband rig. You simply can't cope with teletype. Your rig will either get too hot, or you will have to operate with scarcely any input at all. Manufacturers of commercial gear were quick to recognize the advantage of low duty cycle power requirements of sideband. Marked reduction in cube, weight, and portability were extolled as virtues. Decent regulation and CW keying characteristics were not considered important.

The plain fact is that RTTY requires nearly 100% duty cycle, CW requires 45%, and SSB requires only about 12%. Albeit, we are not likely to repopularize AM on the HF bands, yet CW is here to stay, and efforts must be made to make AI more attractive.

My motivation for these words is two-fold. First, to cause some engineers in the throes of creating modern gear, to remember that you can't get "somathin from nothin." And, second, to suggest that one expedient answer is the tremendous amount of old traded-in gear that exists in dealers' stocks — gear that really works and is a pleasure to listen to and to operate. F'rinstance:

Collins 32V2	$175.00
Collins 32V3	$225.00
B & W 5100	$175.00
Johnson Valiant I	$150.00
Johnson Valiant II	$250.00
Ranger I	$125.00
Ranger II	$225.00
Eico 720	$ 55.00

Now, these sets are known to possess excellent reputations. You can pull out the modulators if you don't want to use 10 meter phone, and really start to enjoy CW. Naturally, the gear has been checked out and is guaranteed. Prices quoted are FOB Harvard, Massachusetts. Please allow 2 weeks delivery via well-packed Railway Express.

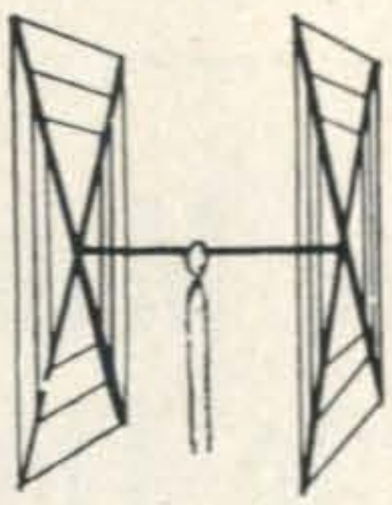
Wouldn't **you** rather use this gear on CW than listen to it on CB?

GOTHAM ANTENNAS ARE MUCH BETTER OF COURSE, YOU PAY MUCH LESS

*How did Gotham drastically cut antenna prices? Mass purchases, mass production, product specialization, and **16** years of antenna manufacturing experience. The result: The kind of antennas you want, at the right price!*

QUADS

Worked 42 countries in two weeks with my Gotham Quad and only 75 watts... W3 CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!



10/15/20 CUBICAL QUAD SPECIFICATIONS

Antenna Designation: 10/15/20 Quad
Number of Elements: Two. A full wavelength driven element and reflector for each band.
Freq. Covered: 14-14.4 Mc. 21-21.45 Mc. 28-29.7 Mc.
Shipping Weight: 28 lbs. Net Weight: 25 lbs.
Dimensions: About 16' square.
Power Rating: 5 KW.
Operation Mode: All
SWR: 1.05:1 at resonance
Gain: 8.1 db. over isotropic
F/B Ratio: A minimum of 17 db. F/B
Boom: 10' long x 1¼" O.D.; 18 gauge steel; double plated; gold color
Beam Mount: Square aluminum alloy plate incorporating four steel U-bolt assemblies. Will easily support 100 lbs. Universal polarization.

Radiating Elements: Steel wire, tempered and plated, .064" diameter.

X Frameworks: Each framework consists of two 12' sections of 1" OD aluminum 'hi-strength' (Revere) tubing, with telescoping ⅞" tubing and short section of dowel. Plated hose clamps tighten down on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings

Feedline (not furnished); 52 ohm coaxial cable

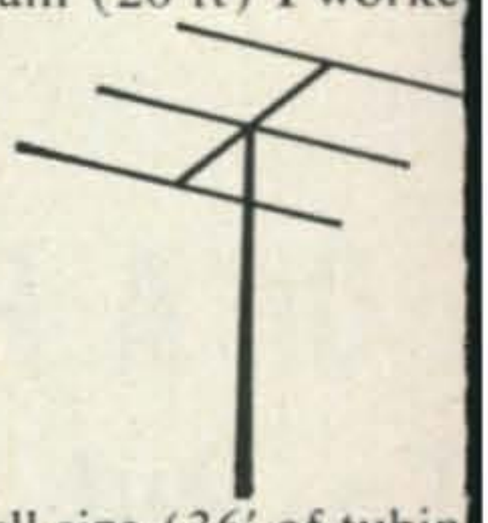
Now check these startling prices—note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$35.00
10-15 CUBICAL QUAD	30.00
15-20 CUBICAL QUAD	32.00
TWENTY METER CUBICAL QUAD	25.00
FIFTEEN METER CUBICAL QUAD	24.00
TEN METER CUBICAL QUAD	23.00

(all use single coax feedline)

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9ADQ, and 4U1ITU. THAT ANTENNA WORKS! WN4DYN Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history! Each beam is brand new; full size (36' of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞ and 1" alumnium alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.



2 EL 20	$19	4 EL 10	$18
3 EL 20	25	7 EL 10	32*
4 EL 20	32*	4 EL 6	18
2 EL 15	15	8 EL 6	28*
3 EL 15	19	12 EL 2	25*
4 EL 15	25*	*20' boom	
5 EL 15	28*		

ALL-BAND VERTICALS

"All band vertical!" asked one skeptic "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, W1WOZ, W2ODH, WA3DJT, WB2FCB, W2YHH, VE3FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, W8QJC, WA2LVE, YS1MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3KT, Moral: It's the antenna that counts!

FLASH! Switched to 15 c.w. and worked KZ5IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4AQL, SM5BGK, G2AOB, YV5CLK, OZ4H, and over a thousand other stations

V40 vertical for 40, 20, 15, 10, 6 meters	$14.95
V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters	$16.95
V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters	$18.95

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GOTHAM, 1805 Purdy, Dept. CQ, Miami Beach, Fla. 33139

See page 110 for New Reader Service

NOW—GALAXY PROUDLY UNVEILS

NEW Power!
NEW Features!
NEW Beauty!

THE EXCITING NEW

GT-550 TRANSCEIVER

5 BAND SSB
Mobile or Fixed Station

☆ AND A COMPLETE LINE OF HANDSOME
MATCHED ACCESSORIES!

The New Galaxy Wattmeter/Antenna Selector

The Powerful New Galaxy GT-550 TRANSCEIVER

The Beautiful, Matching Galaxy Speaker Console

"HOT," Husky, and Handsome!

You asked for it...now it's here! The new GALAXY GT-550 and a complete line of handsome matching accessories!

Your suggestions made it possible. We took your ideas—added some of our own and went to work. We built in new power, new conveniences—*such as a 25 kHz calibrator option, and no frequency jump when you switch sidebands.* Then we hired the best designers in the business to give GALAXY a distinctive "New Look"!

Our new GT-550 has all those great qualities of the famous Galaxy V's ...and then some! **It has new POWER...550 watts SSB,** making it the hottest transceiver made! **A new single scale VFO Dial** makes frequency interpolation child's play...the **new skirted knobs** make tuning and band-changing a split-second job...and, **that slick, king-sized finger-tip tuning knob** works like a dream! *Still the most compact—only 11¼ x 12⅜ x 6"!*

P.S. Sounds unbelievable but it's an even HOTTER receiver than our previous Galaxy V's!

Space prevents telling you all about the handsome, matched accessory line. Write for a free brochure that's loaded with exciting news!

GALAXY ELECTRONICS

"Pacesetter in Amateur/Commercial Equipment Design"

10 South 34th Street • Dept. **AA40** Council Bluffs, Iowa 51501

SOLID-STATE PROJECTS FOR THE SHACK

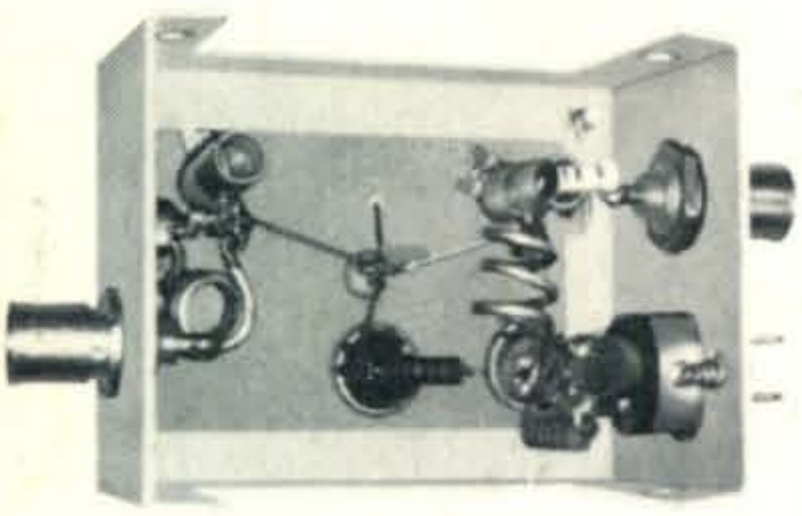
Here are two ideal VHF projects—pre-amps to "soup up" older receivers and help dig for the tough ones almost down to noise level. Both take advantage of the outstanding performance of RCA MOS/FET units—metal oxide semiconductor field effect transistors... high gain, low noise, improved sensitivity.

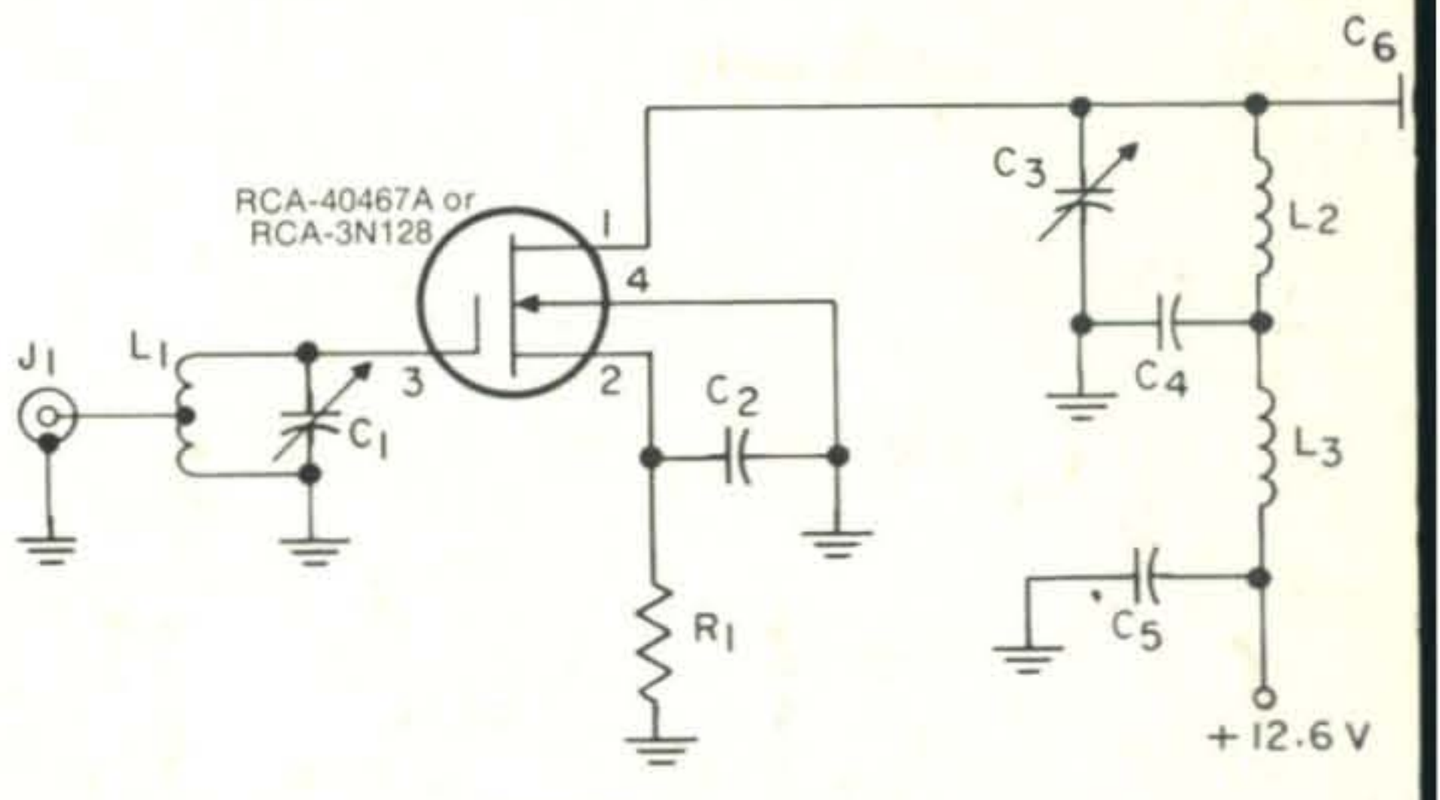
Full details are available in the November and December 1968 "Ham Tips". Write RCA Electronic Components, Commercial Engineering Section C15-SD Harrison, N. J. 07029 for copies.

All RCA devices listed are available from your RCA Industrial Solid-State Distributor.

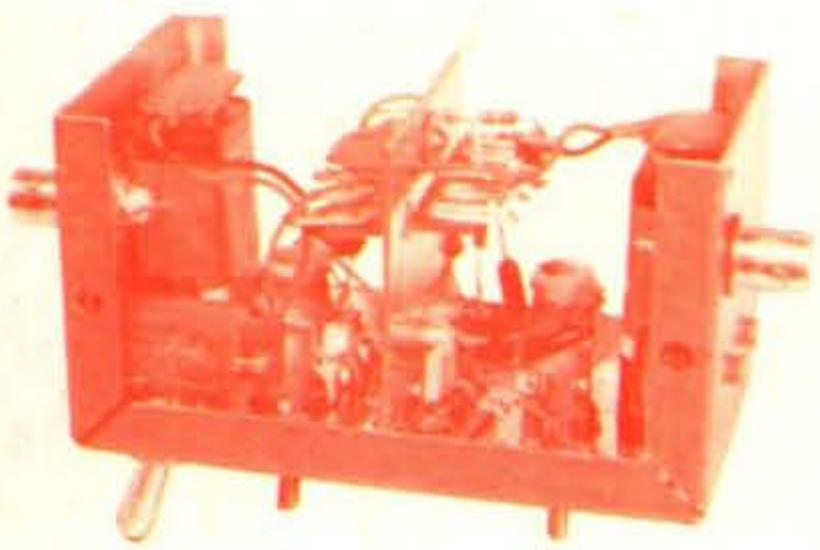
10 meter and 2 meter Pre-Amps

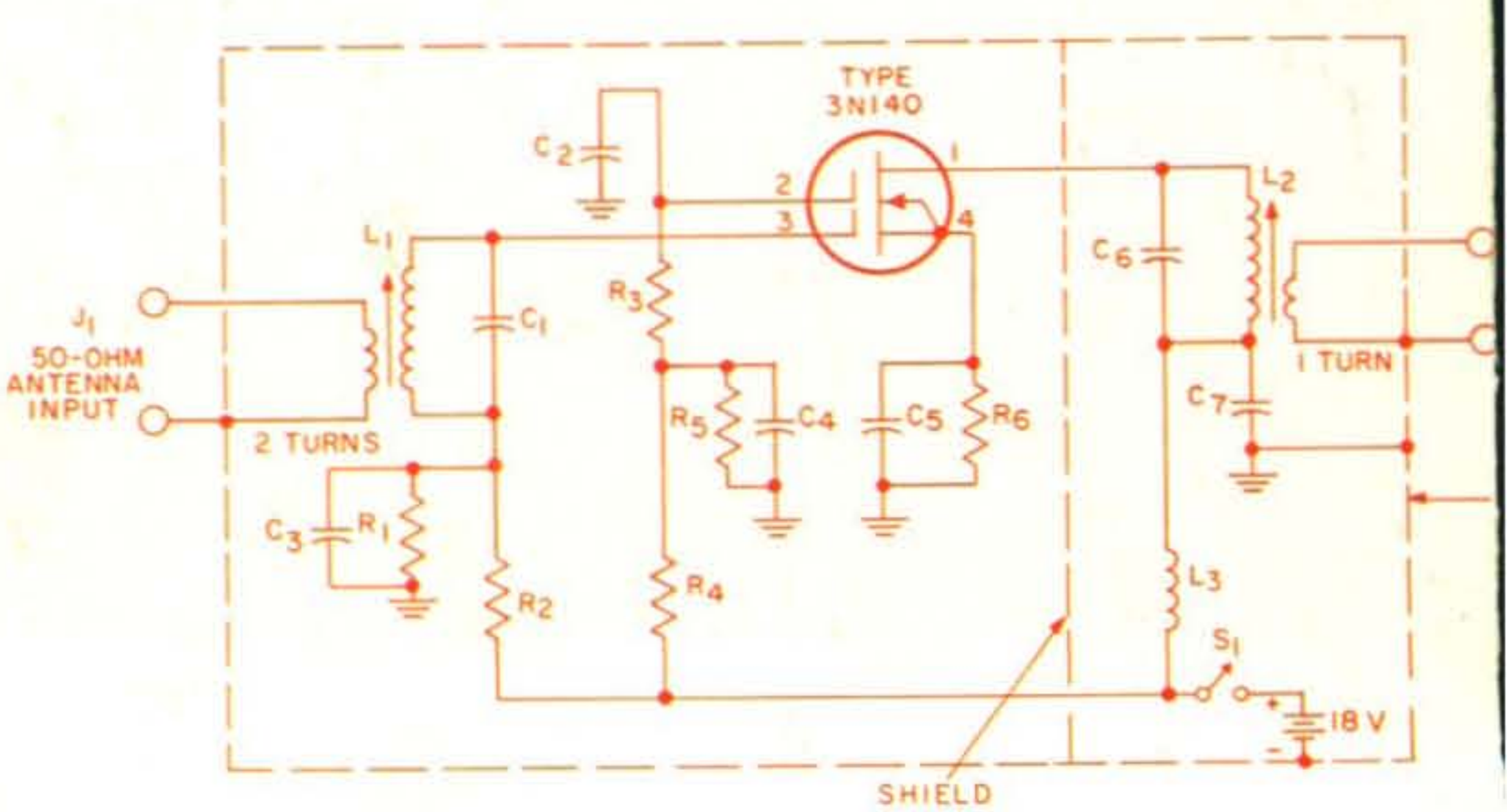
Single Gate MOS/FET 2M Pre-Amp





Dual-Gate MOS/FET 10M Pre-Amp





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