May 1966
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CQ

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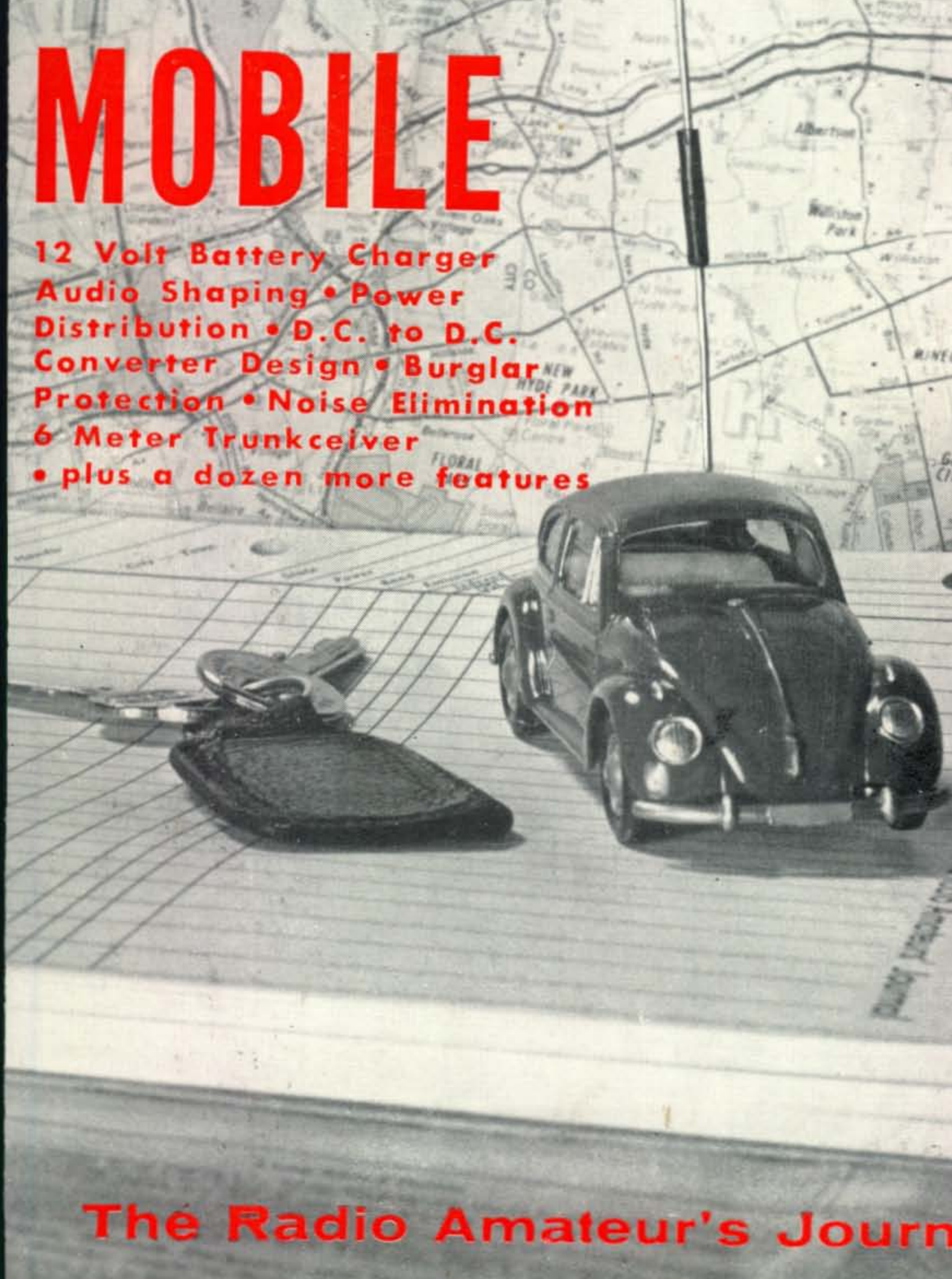
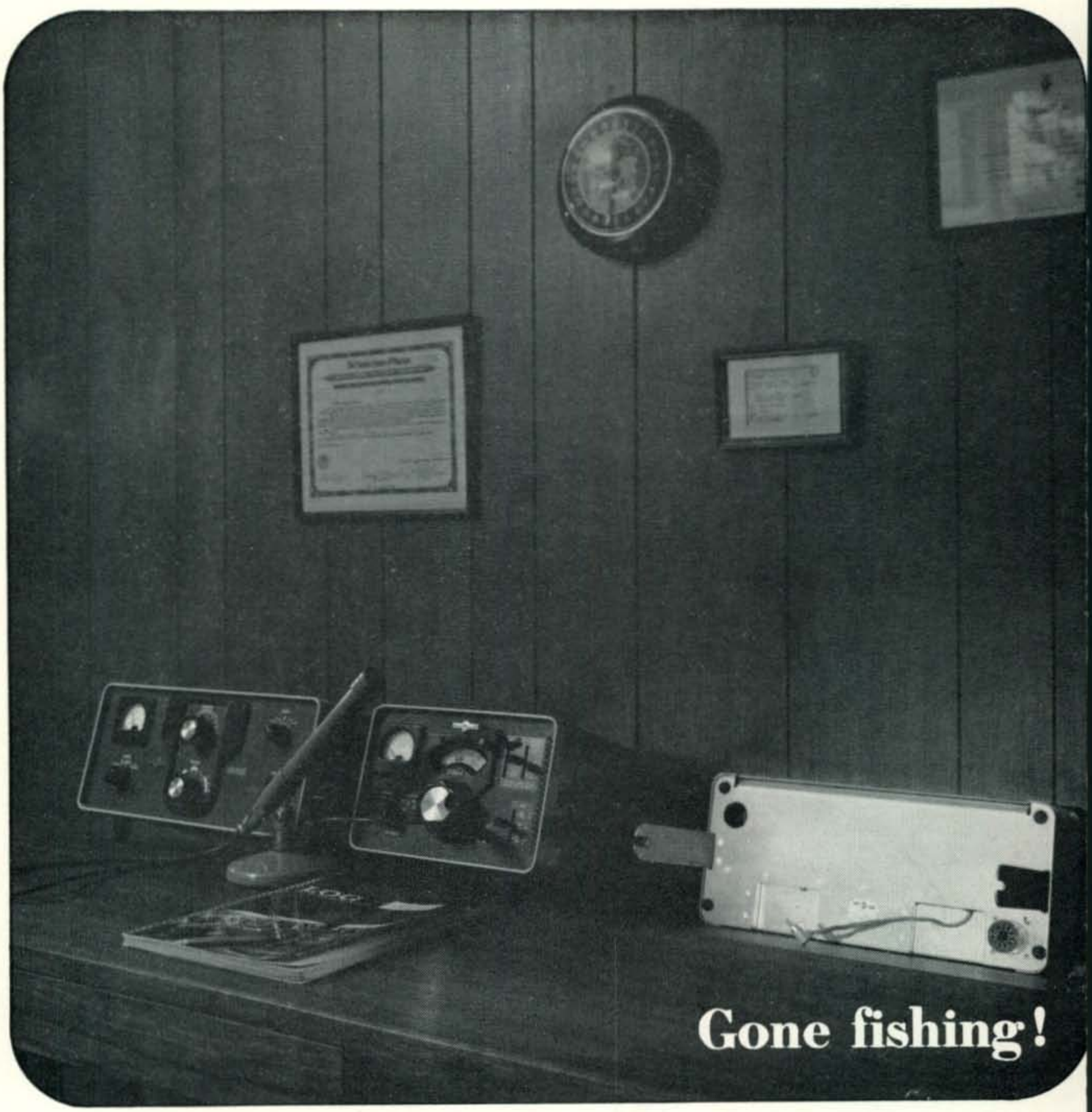
• plus a dozen more features



The Radio Amateur's Journal



A lot of ham operators just won't go anywhere without the KWM-2 transceiver. Why should they when it's so easy to take along? Just mount it in the car and you're ready to go with the same performance you get in the ham shack. Wherever you take it, the KWM-2 gives full coverage of the popular HF ham bands. Provides ample power on 80 through 10 meters with 175 watts PEP input on SSB, or 160 watts on CW. Before you go on vacation see your Collins Distributor and find out how easy it is to get a KWM-2 for your vacation trip. And, if you're going through Iowa this summer, stop during working hours in Cedar Rapids and visit the plant.

COLLINS

For further information check number 24 on page 110

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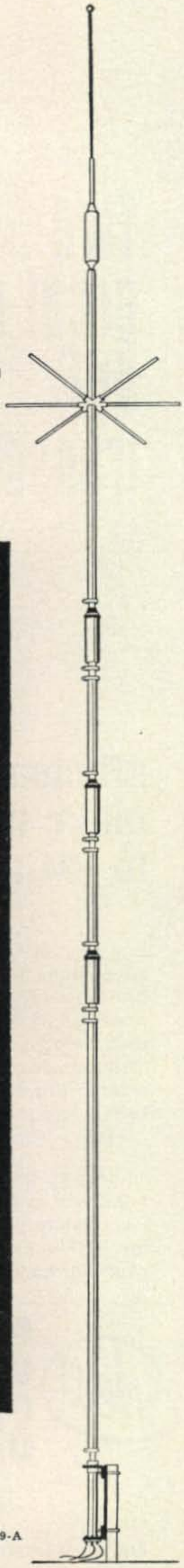
for the first time...

Hustler quality and reliability in a

FIXED STATION TRAP VERTICAL

4-BTV...*Only* $3295



Here's why the Hustler 4-BTV is the best trap vertical for the money.

- You'll get superb operation . . . 40 through 10 meters. (Also 75 meters with a Super Hustler RM-75-S on top.)
- 4-BTV performs as a true vertical . . . not as a bent dipole.
- Optimum-Q traps are individually and precisely tuned.
- 4-BTV handles full legal power on SSB.
- The lowest SWR (1.5 to 1 or better) and best bandwidths are possible with the 4-BTV . . . and it outperforms all other verticals.
- Vertical radiating sections between traps are tunable for peak performance.
- Sturdy heavy-walled aluminum construction with stainless steel clamps and cycolac base resists all weather.
- Guying is not needed . . . only the smallest space is required to install on the ground, roof top or chimney clamp.

BE A HUSTLER...USE A HUSTLER

See the new Hustler 4-BTV at your dealer today.

Ask about the complete Hustler line.

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For further information, check number 1, on page 110

HUSTLER®

for the first time...

Hustler quality and reliability in a

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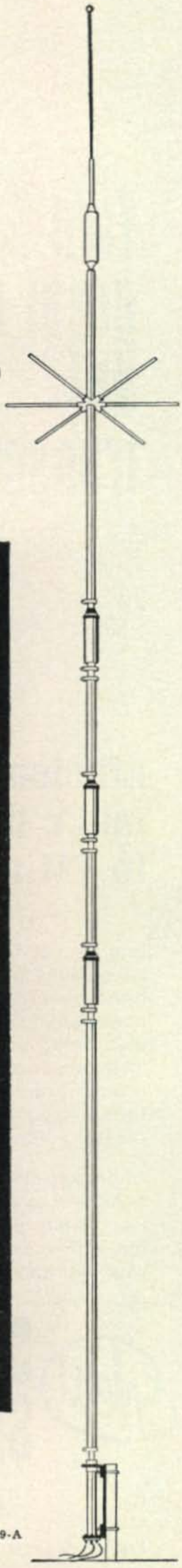
4-BTV... *Only* $3295



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Ask about the complete Hustler line.

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Two great new VHF transceivers

Efficient filters and selected injection frequencies make the new SR-46A and SR-42A virtually immune to FM and TV interference. Squelch, too!

Interference-free reception is only one of many advantages in the new SR-46. Complete six meter band coverage is another. Or full two meter coverage, if you prefer, in the companion SR-42 unit. Both give you double the usual bandspread, through use of dual tuning ranges. A neutralized nuvistor front end boosts sensitivity, and eleven tuned circuits increase selectivity while suppressing interference. Push to talk, of course.

Thorough field testing, before production, by hundreds of operators, assures you of years of trouble-free performance. It all adds up to your top VHF value. See the SR-46, or the SR-42, at your distributor today.

FEATURES

Frequency Coverage: 50 to 52 Mc and 52 to 54 Mc (144 to 146 Mc and 146 to 148 Mc in the SR-42). **Power Input:** 10-12 watts. **Power Supply:** 115 VAC and 12 VDC (vibrator and line cord optional extra). **Transmitter Crystals:** high frequency type; provision for four (one furnished), plus external VFO, switch-selected from front panel. **Tubes:** 10, plus zener diode oscillator control and four diodes (11 tubes, 2 zeners and four diodes in the SR-42). **"S" Meter** automatically switches to RFO. **Cabinet:** "snap-off" type for easy access. **Size:** 5½" high, 12⅛" wide, 8¼" deep. **Shipping Weight:** 17 lbs. **Amateur Net Price: $199.95**

New **SR-42A**
SR-46A

Nominations open for Amateur "Hall of Fame"! Amateur radio's first annual International "HALL OF FAME" awards will be made soon. Five hams to be honored for technical achievement, research, innovations, emergency service or international advancement. Help amateur radio by sending your nominations to: Dorothy Strauber, K2MGE, 12 Elm St., Lynbrook, N.Y. 11563, U.S.A.

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For further information, check number 2, on page 110

CQ

MAY 1966 VOL. 22, No. 5

The Radio Amateur's Journal

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Offices: 14 Vanderventer Avenue, Port Washington, L. I., N. Y. 11050. Telephone: 516 PO 7-9080.

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EIMAC

new power amplifier pentode provides excellent linearity

Now you can have reliable power in a new 1500 watt pentode. Eimac's 5CX1500A power amplifier tube is designed for use at the popular 1000-2000 watt peak envelope power range. And it's compact: height, 4⅞", diameter 3½". Physical configuration is similar to Eimac's well-known 4CX1000A tetrode. The tube carries control and screen grid dissipation ratings of 25 and 75 watts, respectively. The 5CX1500A is ideally suited for Class C operation. In linear service the tube can provide a two-tone signal with third-order products of −39 db at 1000 watts PEP or −35 db at 1700 watts PEP. Write Power Grid Product Manager for information or contact your local EIMAC distributor.

5CX1500A

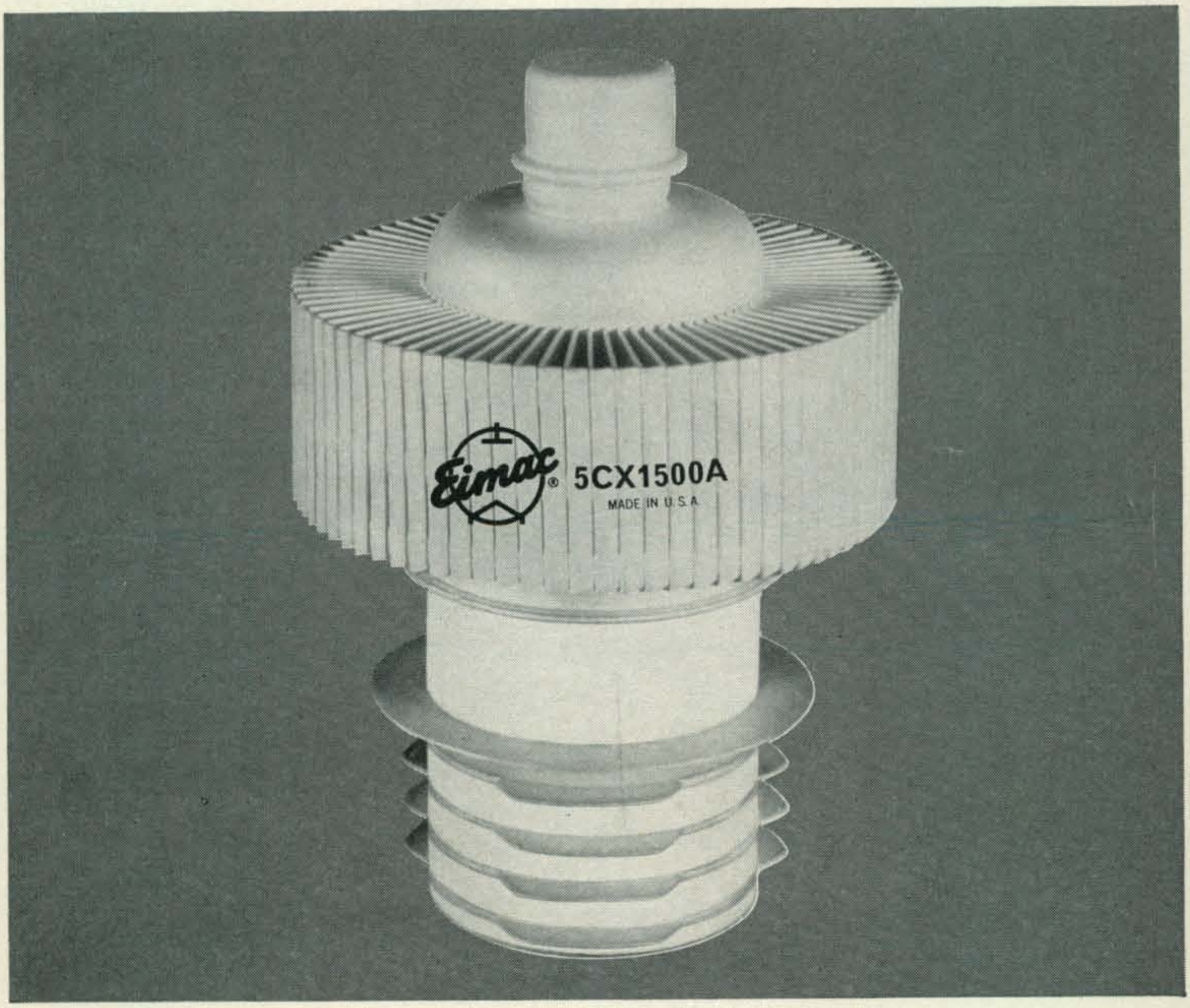
CLASS C MAXIMUM RATINGS

DC PLATE VOLTAGE	5000 V
DC PLATE CURRENT	1.0 Amp.
DC SCREEN VOLTAGE	750 V
PLATE DISSIPATION	1500 W
SCREEN DISSIPATION	75 W
GRID DISSIPATION	25 W
SUPPRESSOR DISSIPATION	25 W

TYPICAL CLASS AB_1 LINEAR AMPLIFIER MEASURED VALUES IN TWO TONE TEST

DC PLATE VOLTAGE	4000 V
DC PLATE CURRENT (No Signal)	250 mA
DC PLATE CURRENT (Two Tone)	485 mA
DC SCREEN VOLTAGE	500 V
PEAK ENVELOPE POWER OUT	1785 W
THIRD ORDER IM MAXIMUM	−35 db

EIMAC
Division of Varian
San Carlos, California 94070



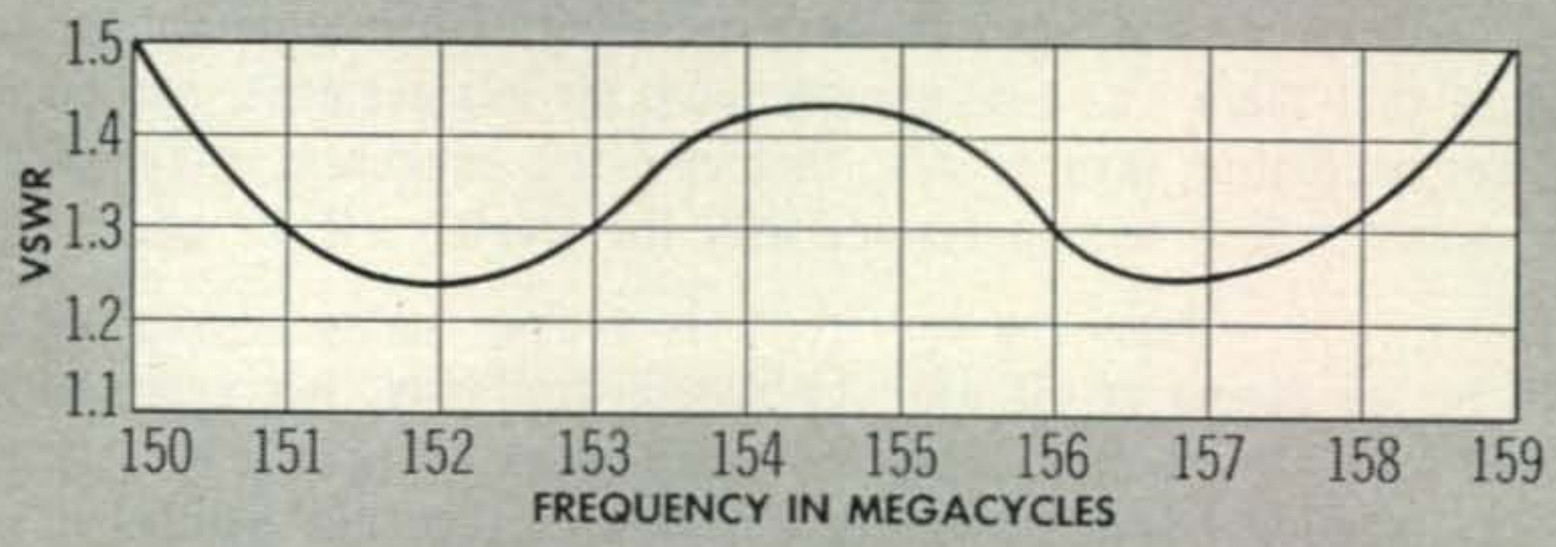
For further information, check number 4, on page 110

It's Here!

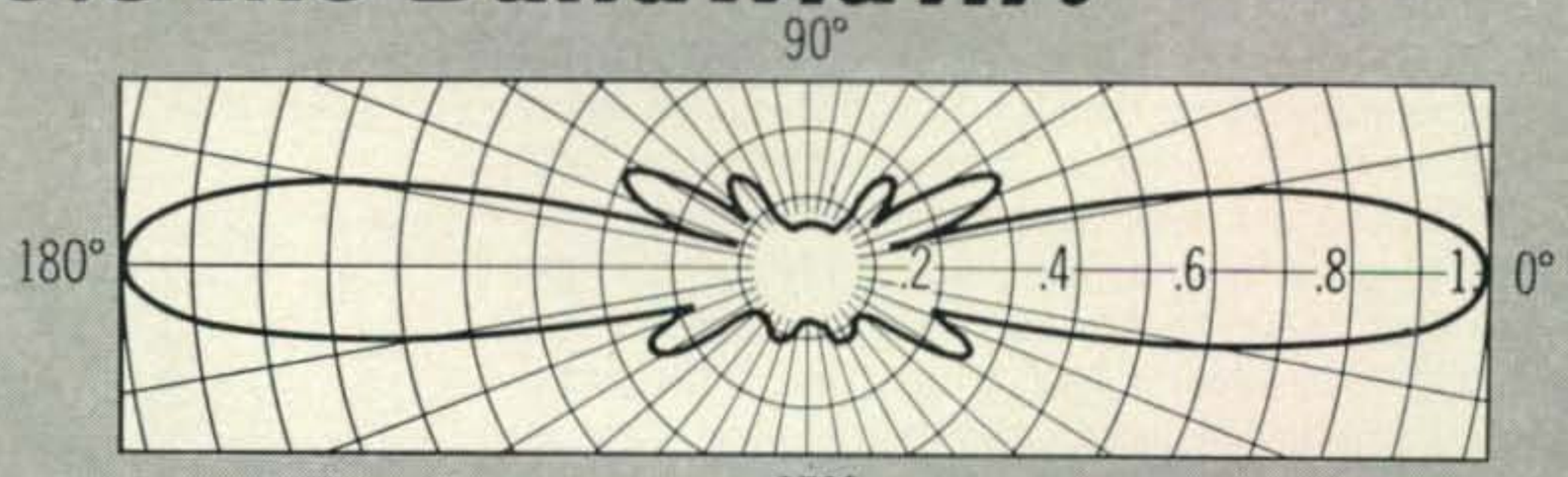
The New CPC BROADBAND...

SUPER STATIONMASTER®

Base Station Antenna



9.0 Mc Bandwidth!



This new CPC antenna has all the qualities of its predecessor, plus new features not now available in any antenna made for the land mobile services

—to GREATER efficiency!

—to HIGHER performance!

—SMOOTH OUT communication problems!

—to BETTER communication!

CAT. No. 220-509
SUPER STATIONMASTER

is a second generation antenna growing out of 30,000 STATIONMASTERS and ten years of experience with this type array.

Because of its exceptional bandwidth, the SUPER STATIONMASTER is produced in three ranges which cover the VHF band, 150 to 159 Mc, 157 to 166 Mc, 165 to 174 Mc.

A 10 db—10 Mc wide version, CAT. No. 455-509, is available to cover 450 to 470 Mc in two ranges.

Electrical Specifications

Nominal input impedance	50 ohms
VSWR	1.5:1
Bandwidth	9.0 MC
Maximum power input	500 Watts
Flexible terminal extension	18" of RG 8A/U
Terminations	Type UHF female and Type N male
Vertical beam width (½ power points)	18°
Lightning protection	Direct ground

Mechanical Specifications

Radiating elements	Copper
Element housing material	Fiberglass
Element housing length	20'
Support pipe	2¾" dia. 6061-T6 aluminum pipe
Rated wind velocity	100 MPH
Lateral thrust at rated wind	79 lbs.
Bending moment 1" below ground plane at rated wind	521 ft. lbs.
Weight	30 lbs.

Communication Products Company
DIVISION OF
PHELPS DODGE ELECTRONIC PRODUCTS
CORPORATION

MARLBORO, NEW JERSEY 07746—Telephone (Area Code 201) 462-1880
LOS ANGELES, CALIFORNIA 90065—Telephone: (Area Code 213) 245-1143

For further information, check number 5, on page 110

Take it from us...

and who the hell hasn't?

We began the manufacturing of ham gear not too many years ago on the simple premise that there was considerable room for improvement, particularly in the accessory field. It was our contention then as now, that up-dated equipment engineered right, built right and priced right would find a waiting market with the amateur. It did and it does!

From the very start we set our sights high, picking up where others had bogged down in the dogma of "it can't be done." Truthfully, improving on the products of some of the let-well-enough-alone makers was no considerable feat. They were sitting ducks for our kind of thinking. By ignoring trends and advanced theories they had continued year after year with the same antiquated items . . . never venturing, never daring, never doing.

Waters developed the Auto-Match mobile antenna because there was need for it. Need for an antenna that was structurally strong enough to withstand the rigors of mobile use. Need for an antenna electrically capable of pushing out a stronger signal. An antenna capable of handling the thousand watts PEP of the new mobile rigs being introduced. We had something too good to go uncopied for long. Within six months, manufacturers who hadn't incorporated a change in their antennas since initial introductions, latched on to Waters improvements, heralding their "innovations" to the high heavens and lauding long-dormant engineering skill.

The erstwhile leading co-axial switch maker had been turning out the same outmoded product since proverbial Hector was a very young pup. Originally improvised around a standard wafer selector switch (misalignment and all) it was never changed, never improved. Never, that is, until Waters engineered a totally new approach in co-axial switches. It took the old timer about four months to get into the me-too act with a completely new line based on you know what! Recently we announced "Protax", the only automatic grounding co-axial antenna switch. Right now we're alone in the field, but we won't be lonely for long. Want to bet?

We perfected a couple of nifty speech-processing devices at Waters — the Compreamp and Clipreamp. We're proud of the compact circuitry and theory because it took considerable doing. Apparently one of the better kit manufacturers went along with our good opinions. You can now buy his version of Clipreamp in kit form. And, we're nasty enough to add, at a higher price than for our assembled job.

Most good CW ops are familiar with our now-famous Codax Automatic Keyer and its rhythm-smooth action. It seems another kit maker is familiar with it too, and offers a reasonable facsimile of same in kit form. You might do better by knocking down a Codax and ordering duplicate parts but we must warn you, assembly and adjustment can be very tricky.

There's more — but you get the idea! Some bright guy once ventured the thought that imitation was the sincerest form of flattery. If so, we've been flattered to a fare-thee-well and getting the least bit fed up. You can even get odds in our Engineering Department whenever we introduce a new piece of gear as to how long it will take the Brand X, Y and Z boys to incorporate Waters advanced thinking into their own products.

It all adds up to a pretty logical conclusion. Waters pace-setting ham equipment is engineered for tomorrow . . . and you can own it today. Or you can wait until tomorrow and take it from the guy who is taking it from us today.

Bob Waters **W1PRI**

WATERS
MANUFACTURING INC.
WAYLAND, MASSACHUSETTS

WATERS QUALITY PRODUCTS ARE SOLD ONLY THROUGH WATERS QUALIFIED DISTRIBUTORS

For further information, check number 6, on page 110

Transistorized Goof

Dear Editor,

I recently received a piece of "fan mail" pointing out a discrepancy in the parts list for my article, "A Transistorized Modulator," (Feb. 1966). The five transistor amplifier board from Lafayette Electronics is a PK-544 as listed, but Olson Electronic's number for that amplifier is AM-260. I hope that this will clear up any difficulty any readers may have had in trying to get that amplifier board at Olson's.

Ray Turner, WB6FIK
15143 Nordhoff
Sepulveda, Calif. 91343

H.F. Broadcasting

Dear Sir:

Captain Paul H. Lee's (W3JHR) long and detailed defence of h.f. broadcasting is most interesting. But are there not several fallacies in the argument?

Firstly, he writes as though the amateurs had a monopoly of all the h.f. frequencies and were grudging giving space to h.f. broadcasting. In fact, from 1 to 27 mc the exclusive amateur bands represent in Europe only 900 kc; 1100 kc in U.S.A., (I believe).

The 80-meter band is not exclusively amateur. It is a shared band. 40-meters in Europe is only 100 kc wide—7.0 to 7.1 mc (I believe 300 kc in U.S.A.—7.0 to 7.3). 20-meters is 350 kc wide and 15-meters is 450 kc wide. Total 900 kc in Europe (1100 kc in U.S.A.). I have omitted the 10-meter band which is not normally open for sky wave propagation at present, and ground wave is fairly short range, about 20 to 30 miles. So we hardly monopolize the frequencies; 900 kc (1100 kc U.S.A.) in 26,000 kc!

Secondly, and far more important, Captain Lee argues that with fewer centers of population and a scattered population, h.f. broadcasting is necessary for many countries to reach their own population. But as every amateur knows on frequencies above, say, 10 or 12 mc the skip is normally fairly long and therefore, (except under Sporadic-E conditions or other unreliable phenomena) are quite unsuitable for distances under 1000 miles. It would seem, therefore, that on this basis only the 40-meter amateur band comes into question for broadcasting within most countries' own territory, and this has already been reduced to 100 kc in Europe. Does the world grudge the amateur service a paltry 100 kc (300 kc in U.S.A.) between 4 and 12 mc, *i.e.* 100 kc in 8,000 kc! Come, really Captain Lee.

As regards the 20- and 15-meter bands, the skip as we know is normally fairly long and the government broadcasting stations; interest in this range indicates a desire to transmit not so much to their *own* people as to the people of *other* countries. This, to anyone who listens to these broadcasts proves to be the case. A large number of these broadcasts are not even in the language of the country of the transmitter but are *aimed* at foreign countries.

Captain Lee refers to the competition between basic ideologies. Here is the purpose of their h.f. broadcasts.

◀ For further information, check number 8, on page 110

WELCOME ABOARD!

International's "FLYING SHOWROOM 66"

will visit your area soon.

Welcome aboard this fabulous electronic flying display.

During 1966, International's Martin 202 Flying Showroom will tour cities throughout the United States, bringing with it displays of International electronic equipment and products, plus a technical staff available for consultation. ■ A space age electronic show for Amateur Radio operators, radio experimenters, hobbyists, Citizens Radio dealers and users, commercial 2-way radio operators and manufacturers requiring special electronic products. ■ If you are a manufacturer, radio equipment dealer, Amateur or Citizens Radio Club, or other interested groups, we will attempt to schedule a specific time and date to visit your area. Watch for announcement or write International Crystal Manufacturing Co., Inc. for details.

Discuss your technical and engineering requirements with International's staff. See how International electronic products can work for you.

INTERNATIONAL

CRYSTAL MFG. CO., INC.
18 North Lee
Oklahoma City, Okla. 73102

For further information, check number 9, on page 110

They consist largely of political propaganda aimed by one country against the other. They are a weapon in the ideological war. To refer to them carrying the truth to their people is a euphemism. They would better be described as weapons of political propaganda used by nation against nation. Otherwise, owing to skip conditions, the broadcasting authorities would not be so interested in the h.f. frequencies.

A truly dispassionate consideration of these h.f. broadcasts must show that the prime object is to propagand to other people, not to give coverage in the broadcaster's own country.

Lastly, Captain Lee cites the Communication Act of 1934 which specifies the suspension of licenses for whose who "willfully or maliciously interfere with any radio communications," which is presumably based on International Agreements.

Has Captain Lee never heard the official jamming stations? Here, surely, is willful interference. (I admit when I hear a jammer in the amateur bands I am always interested to know what the jammer is jamming. I don't believe governments bother to jam amateur band, and this has confirmed my suspicions. I can, therefore, draw my own conclusions as to who pirated the exclusive amateur band first.)

Captain Lee wants to clean up the amateur operation. He apparently does not care about cleaning up the Professional operation with official broadcast stations illegally operating on the exclusive amateur bands, and I have logged harmonics and other spurious radiations of official broadcasting stations failing the amateur bands. These stations dispose over far greater resources of test equipment, etc. and are supposed to be operated by professional operators who are paid for this work. Surely they should set an example, and to quote Captain Lee, "present a proper image to the rest of the world" before the poor "amateur" using only his own meagre resources (not the taxpayers bottomless purse) is criticized for his misdemeanors.

Captain Lee seems to want action taken against the poor individual amateur who transgresses while powerful government jammers and the broadcaster illegally in the amateur bands who attracted the jammer are allowed to get way with it. One law for the rich and one for the poor.

I do not support Captain Lee's thesis.

E. M. Wagner, G3BID
5, Ferncroft Avenue
London, N.W.3
England

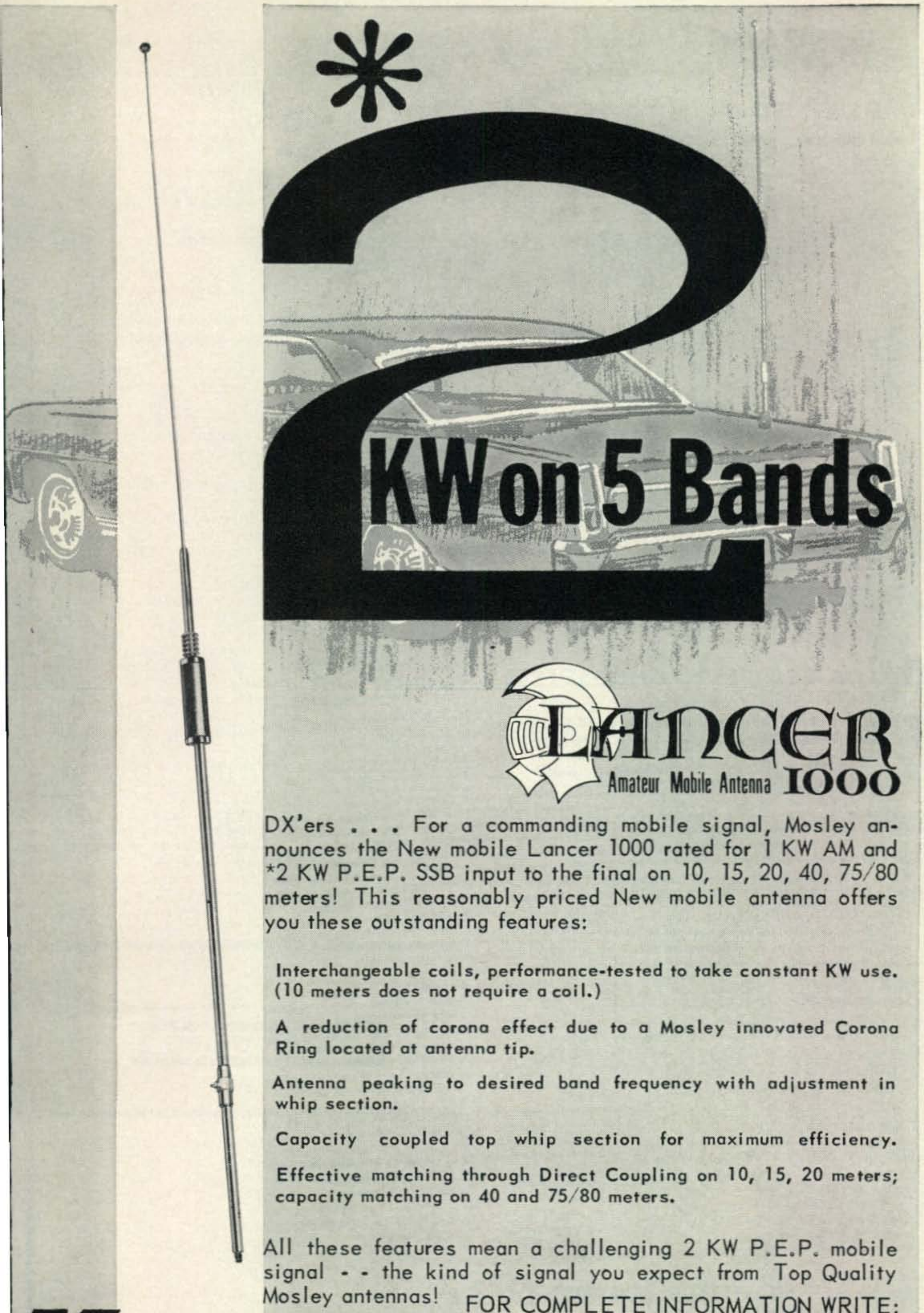
Dear Dick,

I read and then re-read Capt. Paul Lee's (W3JHR) letter on s.w. broadcasting in the March issue.

While I agree with the Captain's right to express his views, I certainly want to voice strong opposition of my own to some of the things he says or implies. Others will, no doubt, have some opinions of their own to add to mine.

In the ITU Conference at Atlantic City in 1947, and reaffirmed in several such conferences since that time, the world was divided into three major regions for the purpose of h.f. frequency allocations; Region 1, Europe & Africa; Region 2, North and South America; Region 3, the rest of the world. From the allocations made on the basis of these regional divisions, or rather from the apparent misuse of the avowed purpose of these allocations, stems most of the trouble and our apparent antipathy toward the s.w. broadcaster. As Captain Lee points out, the rest of the world is not as fortunate (?) as the U.S. in having near saturation coverage of m.f., v.h.f.-f.m. and TV, and therefore, s.w. broadcasting is a practical necessity for those parts of the world. The regional concept adopted by the ITU was, in part, an attempt to make more spectrum space available in those parts of the world, and a goodly portion was allotted to the s.w. broadcaster. On the surface, this seemed to be a logical approach. It is workable, however, only if all parties to the agreement make an honest effort to keep emissions peculiar to their region *confined to that region.*

If Radio Moscow, BBC or any other powerful source would beam their transmissions in the 7100-7300 kc band for example, on azimuths toward other parts of Region 1 or into Region 3, where that band is allocated to s.w. broadcasting, no one should object. But by the same token, I hold that they have an obligation to see to it that such broadcasts are not intentionally beamed into Region 2, where those frequencies are allocated to the amateur service.



DX'ers . . . For a commanding mobile signal, Mosley announces the New mobile Lancer 1000 rated for 1 KW AM and *2 KW P.E.P. SSB input to the final on 10, 15, 20, 40, 75/80 meters! This reasonably priced New mobile antenna offers you these outstanding features:

Interchangeable coils, performance-tested to take constant KW use. (10 meters does not require a coil.)

A reduction of corona effect due to a Mosley innovated Corona Ring located at antenna tip.

Antenna peaking to desired band frequency with adjustment in whip section.

Capacity coupled top whip section for maximum efficiency.

Effective matching through Direct Coupling on 10, 15, 20 meters; capacity matching on 40 and 75/80 meters.

All these features mean a challenging 2 KW P.E.P. mobile signal - - the kind of signal you expect from Top Quality Mosley antennas!

FOR COMPLETE INFORMATION WRITE:

Mosley Electronics, Inc.
4610 N LINDBERGH BLVD.,
BRIDGETON, MO. 63042 (#98)

For further information, check number 11, on page 110

(Does anyone doubt that they *are* intentionally beamed this way?).

In addition, even if we assume that their antenna arrays are capable of producing gains as high as 20 db, the power inputs must be well into the hundreds of kilowatts to lay down the field strengths those boys do in the U.S. (10 to 40 db over S9 consistently). As for U.S. amateurs taking delight, as the Captain seems to think they do, in trying to QRM these monsters: How far off base can you get?

J. Harvey Chase, WA4TPF/2
25 East 40th Street
Paterson, N.J. 07514

Overpopulation

Dear Editor,

Your report in the March, 1966 ZERO BIAS on the Reader Survey Questionnaire proved interesting if not encouraging. Especially pleasing is the reported interest in home building and perhaps a trend towards other aspects of traditional, genuine, amateur radio.

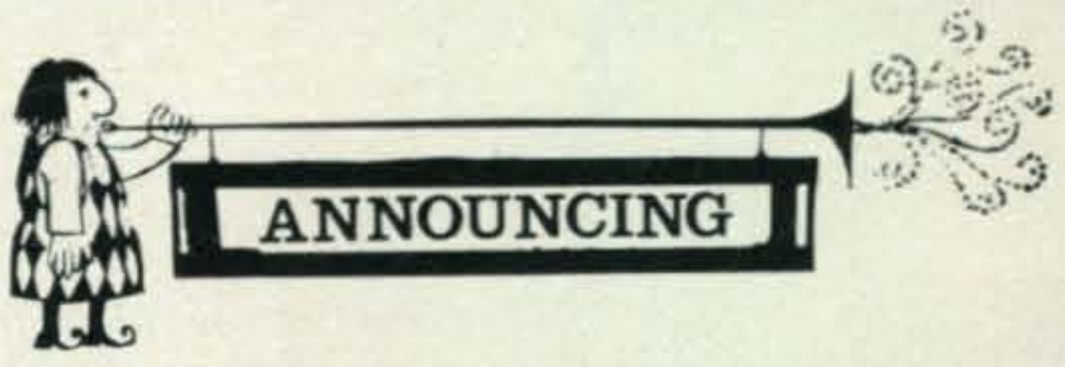
However, I question your alarm at the decrease in the number of newcomers to amateur radio. To me, considering the overpopulation of the amateur bands, already beyond the saturation point, this decline represents a healthy trend. With available new call signs as well as clear spots in our bands running at an all time low, why beg for the worsening of an already bad situation?

The practice of using propaganda and high pressure salesmanship techniques to bring in new recruits is one of the causes of the condition of the amateur bands today. We have far too many plug-in appliance operators, too many lids, and too much intentional QRM loose on the bands as it is. For heaven's sake, don't let's drive the remaining genuine amateurs off the band just to make room for more of the insincere operators.

It is the *quality*, not the *quantity* of amateur radio operators which needs to be raised. This was expressed by the League's incentive licensing proposal which was more or less supported by *CQ*. Now, I do not think that a single person who genuinely wishes to become a radio amateur should be prevented from doing so, but why drag along a bunch of reluctant beginners who have little, if any real interest in amateur radio other than as a mere passing fantasy.

One of the biggest moral and social issues before us today is overpopulation and birth control. Isn't it high time we realized that we face a similar problem on the amateur bands? Let us spend our time and money more wisely to up-grade the integrity of our hobby, while realizing that amateur radio possesses the inherent ability to attract newcomers of its own accord.

Donald Chester, K4KYV
RFD 1
Woodlawn, Tennessee



Correction

Several embarrassing errors crept into one of our April *CQ* articles, "The 80 and 40 Meter Transistor Special." In fig. 1 the "Transmit" side of switch S_{1B} is shown connected to the two bases of Q_3 and Q_4 whereas it should be connected to the two collectors instead. The r.f. choke at the input of L_1 should be 10 *micro*henries instead of 10 *milli*henries as shown. Collector current for the oscillator is 7.5 ma; for the buffer, 100 ma; and for the P.A., 800 ma, all with a 25 v. supply, on 80 meters.

Fresno, California

The Fresno Amateur Radio Club will present its 24th annual Hamfest on Saturday, May 14. For more details write to Dr. O. L. Orme, WB6ETQ, 1939 Fresno St., Fresno, Calif.

NOW! A 3-BAND SSB TRANSCEIVER KIT FOR 189.95

NEW EICO 753 SSB/AM/CW 3-BAND TRANSCEIVER

WITH SILICON SOLID STATE VFO

Build the finest of SSB/AM/CW 3-band transceivers with 200 watts of SSB punch and every wanted operating facility, plus the extra reliability and maintenance ease inherent in kit design. Assembly is made faster and easier by VFO and IF circuit boards, plus preassembled crystal lattice filter. Rigid construction, compact size, and superb styling make this rig equally suited for mobile and fixed station use. The new EICO 753 is at your dealer now, in kit form and factory-wired. Compare, and you will find that **only the 753 has all these important features:**

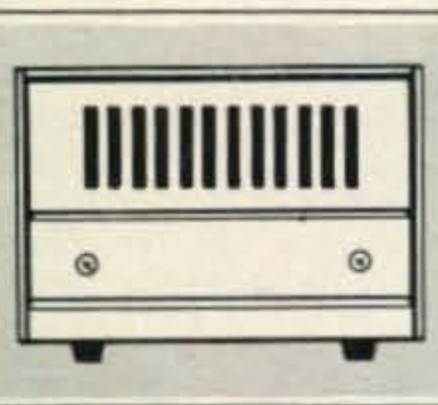
■ Full band coverage on 80, 40 and 20 meters. ■ Receiver offset tuning (up to ±10kc) without altering transmitter frequency. ■ SILICON SOLID-STATE VFO for drift-free and voltage stable operation in both fixed and mobile installations. ■ Built-in VOX. ■ Panel selected VOX, PTT & STANDBY. ■ High level dynamic ALC to prevent flat-topping or splatter and permit the use of a linear amplifier. ■ Automatic carrier level adjustment on CW and AM. ■ Dual ratio ball drive permits single knob 6:1 rapid tuning and 30:1 vernier bandspread (over 10 degrees of scale). ■ Position of hairline adjustable on panel. ■ Illuminated S-meter/PA Cathode Current Meter and tuning dial. ■ Fast attack, slow decay AGC. ■ Grid-block break-in CW keying. ■ Product detector for SSB and CW, triode detector for AM. ■ TR relay with auxiliary contacts for use with high power linear amplifier. ■ Includes mobile mounting bracket.

ADDITIONAL SPECIFICATIONS

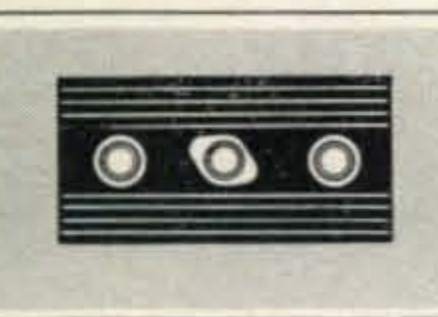
FREQUENCY COVERAGE: 3490-4010kc, 6990-7310kc, 13890-14410kc. SSB EMISSIONS: LSB 80 and 40 meters, USB 20 meters. RF POWER INPUT: 200 watts SSB PEP and CW, 100 watts AM. RF POWER OUTPUT: 120 watts SSB PEP and CW, 30 watts AM. OUTPUT PI NETWORK MATCHING RANGE: 40-80 ohms. SSB GENERATION: 5.2 Mc crystal lattice filter; bandwidth 2.7kc at 6db. STABILITY: 400 cps after warm-up. SUPPRESSION: Carrier-50db; unwanted sideband-40db. RECEIVER: Sensitivity 1uv for 10db S/N ratio: selectivity 2.7kc at 6db; audio output over 2 watts (3.2 ohms). PANEL CONTROLS & CONNECTORS: Tuning, Band Selector, AF Gain, RF Gain, MIC Gain with calibrator switch at extreme CCW rotation, Hairline Set (capped), Mode (SSB, AM, CW, Tune), Function (Off, Standby, PTT, VOX), Carrier Balance, Exciter Tune, PA Tune, PA Load, Receiver Offset Tune, MIC input, phone jack. REAR CONTROLS & CONNECTORS: VOX Threshold, VOX delay, VOX sensitivity, Anti-VOX sensitivity, PA Bias adjust, S-Meter zero adjust, power socket, external relay, antenna connector, key jack, accessory calibrator socket. METERING: PA cathode on transmit, S-Meter on receive. SIZE (HWD): 5 13/16" x 14 1/4" x 11 1/4". POWER REQUIREMENTS: 750 VDC at 300 ma, 250 VDC at 170 ma, -100 VDC at 5 ma, 12.6 VAC at 3.8 amps.

The Model 753 is an outstanding value factory-wired at $299.95.

Power Supplies Tailored for Optimum Performance of the 753.



Model 751 Solid State AC Supply/Speaker Console.
Matching table-top companion unit. Built-in PM speaker.
Kit $79.95 Wired $109.95



Model 752 Solid State Mobile Supply.
For use with 12 volt positive or negative ground systems. Fully protected against polarity reversal or overload.
Kit $79.95 Wired $109.95

EICO For FREE Catalog and 753 Spec. Sheet write to EICO Dept. CQ-5
131-01 39th Ave., Flushing, N. Y. 11352

For further information, check number 13. on page 110

13th Annual Michigan Week

An achievement Award signed by Gov. George Romney will be issued for working Michigan hams during May 15-21. Michigan hams must submit their QSL card with call letters and names and addresses of 15 or more contacts made with out of state or foreign hams. Out of state hams, must have at least 5 Mich. hams. Foreign hams (excluding Canadians) must have contact with at least 1 Mich. ham. All applications should be addressed to Gov. George Romney, Lansing, Mich.

Tulsa, Oklahoma

The Tulsa Council of Amateur Radio Clubs in conjunction with the International Petroleum Exposition has set up a station in the IPE building May 12-21, 1966. This station will accept and relay messages from anyone attending the exposition. The call will be W4OK and will be heard on the following frequencies: 3925, 7225, 14325, 21425, and 28625 mc—s.s.b. For c.w.: 3545, 7045, 14045 and 28045 mc.

Michigan County Expeditions

Expeditions by W8CXS, P. J. Kollar, 29317 Bonnie Dr., Warren, Mich.: May 14, Gogebic Co.; May 15, Keweenaw Co.; May 21, Antrim Co.; May 22, Grand Traverse Co.; and June 4, 5, Otsego Co. Hours: 1600-2100 GMT on 7030 kc and 2100-2230 GMT on 14075 kc. Eve. operations after 2300 GMT on 7030 kc. May 13-16 in Ontonagon, Houghton and Montcalm counties.

Belgium, Wisconsin

Ozaukee Radio Club will hold its 2nd Annual hamfest on May 14 at Belgium. Registration at 12 noon. Activities galore. Dinner at 7 P.M. Tickets $3.75 each, $4.50 at gate. Address: Box 13, Port Washington, Wis.

Memphis, Tennessee

The Mid-South VHF Amateur Radio Club is presenting a "Hamboree" for its members and hams of the area on May 29, 1966. It will be in Audubon Park. For more info contact L. LeJeune, Pres., 745 Leacrest, Memphis, Tenn. 38109.

Pittsburgh, Pennsylvania

Tri State Sideband dinner for the Pittsburgh area will be held May 7, Saturday, at Johnny Garneau's Smorgasbord, Monroeville, Penn. Activities begin at 7 P.M. Joseph Soroka, Jr., W3LGD, R.D. Box 1, Box 475, West Newton, Penn. 15089.

Rockaway Beach, New York

The Rockaway Amateur Radio Club Spring Auction will take place Friday eve., May 13, at 8 P.M. at the American Irish Hall on Beach Channel Dr. (at Beach 81 St.) in Rockaway. Doors open at 6 P.M. for items to sell. One dollar donation at door. For further info. contact RARC, P.O. Box 205, Rockaway Park, N.Y. 11694.

El Paso, Texas

The El Paso Amateur Radio Club will hold its 3rd Annual "Swap Fiesta" on May 14 and 15, 1966, at the Bassett Ctr. Hq at Remada Inn. Gus Browning, W4BPD, will be there with color slides of his last DXpedition.

Portland, Maine

The Portland Amateur Wireless Assn. will hold a hamfest Saturday, May 14, at the Holiday Inn. Tickets—$4.00. Further information may be obtained from M. J. Ferney, K1OYB, 38 Howard Street, Portland, Maine 04101.

Fargo, North Dakota

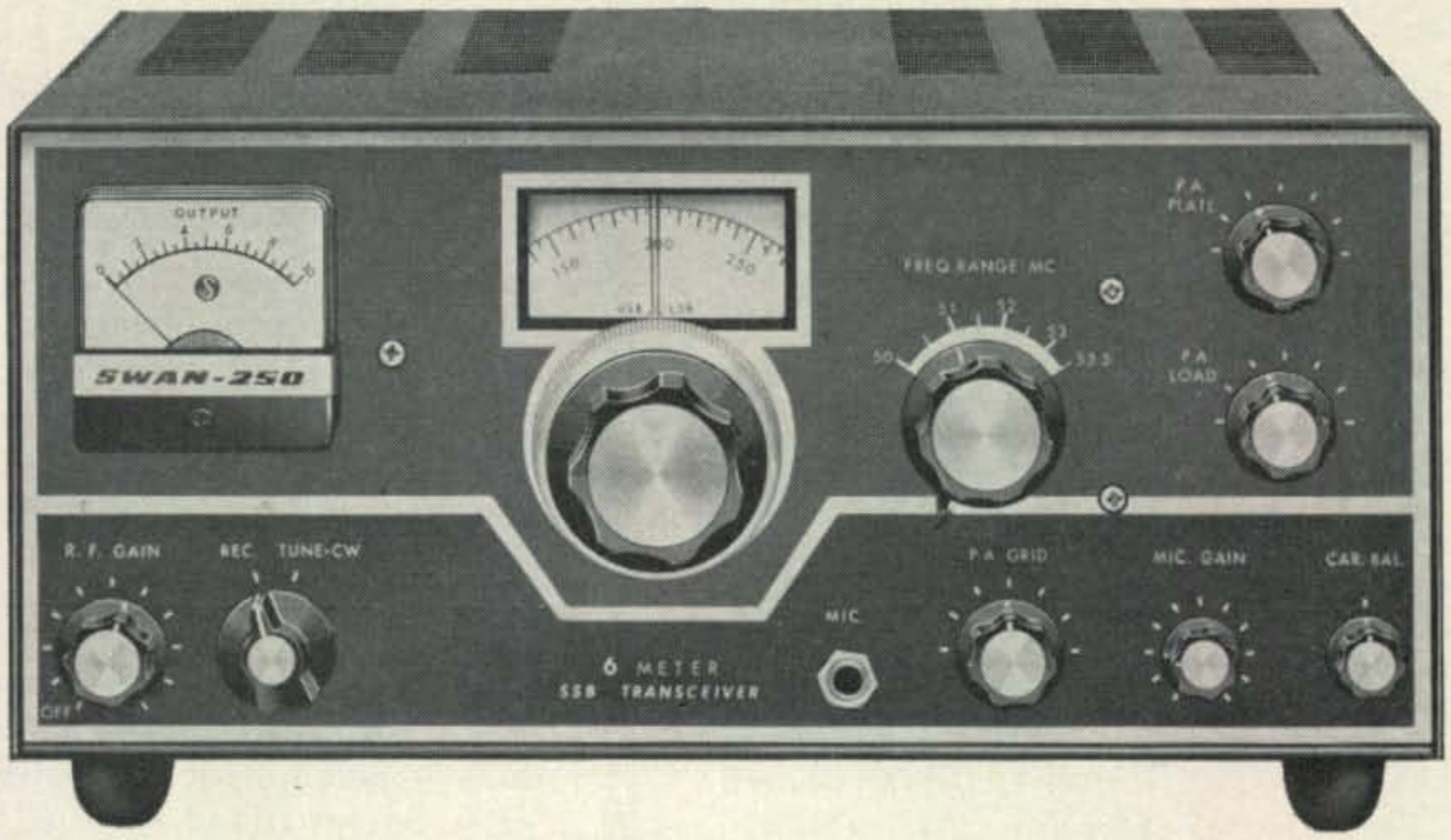
The North Dakota State Univ. Amateur Radio Soc. will sponsor its fifth annual Hamfest on the NDSU Campus in Fargo on May 8, 1966. Registration at 9 A.M. Plenty of activities. For more information contact Douglas Lochner, WAØNJY, Adv. Chrmn., N.D.S.U. Electrical Eng. Dept., Fargo, N. D.

Greenville, South Carolina

The Blue Ridge Radio Society is having its seventh annual Hamfest on Sunday, May 29 at the Greenville County Fairgrounds, Greenville, S.C. Full activities for area hams. Contact Bob King, WA4LVU, 101 Griffin Dr., Greenville, S.C. for details.

[*Continued on page 105*]

INTRODUCING THE



SWAN-250

6 METER SSB TRANSCEIVER

SPECIFICATIONS:

* 240 watts PEP input, 180 watts CW input, 75 watts AM input.
* Two 6146B tubes in Power Amplifier.
* Complete band coverage, 50-54 mc.
* Velvet smooth vernier tuning covers 500 kc, calibrated in 5 kc increments.
* Transmits and receives on Upper Sideband.
* 2.8 kc bandwidth with crystal filter at 10.7 mc.
* Single conversion design for minimum image and spurious.
* 40 db unwanted-sideband suppression, 50 db carrier suppression.
* Receiver noise figure better than 3 db. 6HA5 triode R. F. amp., 6HA5 triode mixer.
* Audio response essentially flat from 300 to 3100 cycles.
* Pi output coupling for matching wide range of load impedances.
* Meter indicates relative output for optimum tuning and loading.
* Provisions for adding 500 kc calibrator, or plug-in Vox unit.
* Dimensions: 5½ in. high, 13 in. wide, 11 in. deep. Weight: 17 lbs.
* **Price, amateur net:**
  Swan-250 .....$325

ACCESSORIES

117-XC matching AC supply with speaker as illustrated	$85
14-117, 12 vdc supply	120
500 kc crystal calib. kit	19.50
Plug-in VOX, model VX-1	35

SWAN SPEAKS YOUR LANGUAGE
NOW ON VHF TOO!

SWAN ELECTRONICS Oceanside, California

For further information, check number 15, on page 110

For further information, check number 16, on page 110

CLUB FORUM

AL SMITH,* WA2TAQ

In keeping with the mobile theme of this month's issue of *CQ* we might point out a couple of mobile activities that not only provide a program for the club members but a fine public service activity as well, not to mention the bonus of public relations to boot.

From *The RaRa Rag* publication of the Rochester (N. Y.) Amateur Radio Association. Public relations have received a decided boost in the Rochester area by activities spearheaded by Eddie Meath, and Eddie Dunn, WA2KMI, with the co-operation of members of the Rochester ARA, Squaw Island ARC, (Canandaigua, N. Y.) and members of Civil Defense.

This group participated in a "Penny-Thon," the proceeds of which are earmarked to buy toys for children in Hospitals in the Rochester area for 1966. Both Eddies took phone call pledges during a two hour program on radio station WHEC. The names and address of potential doners were transmitted from WHEC via an amateur radio teletype link to the Civilian Defense Control Center. At this point amateur radio stations dispatched mobile units operating on the six ten, and seventy five meter amateur bands to pick up the donations at the homes of the callers.

Many radio amateurs took part in this operation using some 40 mobile amateur radio units. Each mobile carried a co-pilot to act as logger, map reader and navagator. The mobiles covered a lot of ground, total mileage of the group was over 2000. The end result of all this fine public service activity was the collection of 66,300 pennies, a job well done.

From *The Communicator* publication of the Communications Club of New Rochelle (New York) we read of another public participation activity. In this fair city, radio amateurs supply mobile and portable communication for parades.

Why not give consideration as a club to offering your services to the old home town. In fact if you don't, some "other" service may beat you to the punch. If you have a club or Civil Defense vehicle available it would present a golden opportunity to show our friends and neighbors the constructive side of our avocation which is more often behind the scenes.

"Amateur Radio" walkie talkies could do a big job here, as a matter of fact a good club project could be to convert the inexpensive walkie talkies to ten meters.

*504 Beach 43rd St., Far Rockaway, N.Y. 11691.

SMALL PAIR BEATS A FULL HOUSE

One particular pair, **SB-34** sideband transceiver/exciter and **SB2-LA** gallon linear amplifier—are small enough to beat a full house. Or, for that matter, any no-room-for-passengers KW mobile installation.

Proof. Photograph shows **SB-34** and **SB2-LA** together as a complete 1KW, 4-band sideband station (including receiver of course) beating a full house handily. The two units placed end-to-end occupy less than 2 linear feet—just over 1 foot in depth, less than 6 inches high!

But SBE didn't set out to produce a miniature transceiver at the expense of undue component crowding—transistors and diodes aided by advanced bilateral circuits did it with room to spare.

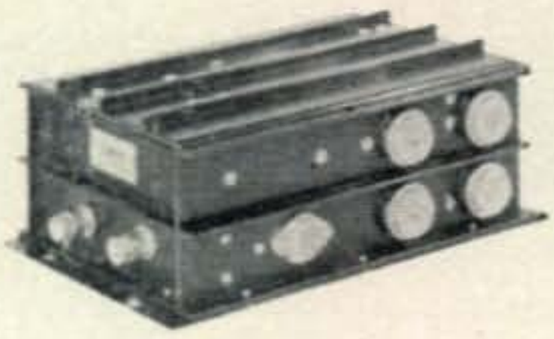
SB-34 specifically, is advanced equipment—predominantly solid-state—in pace with the trend toward elimination of all tubes in a host of electronic gear. The SB-34 SSB transceiver costs only 395.00 (**with** 12V DC and 117V AC built-in power supply) and uses 23 transistors, 18 diodes, a zener, a varactor—and only 3 tubes!

Highlights: **SB-34:** 4-bands: 3775-4025 kc, 7050-7300 kc, 14.1-14.35 mc, 21.2-21.45 mc. • 135W p.e.p. input (slightly lower on 15) • Built-in dual 117V AC/12V DC supply (negative ground) • Collins mechanical filter • Panel selectable USB-LSB • 11¼"W, 10"D, 5"H. Weight: 19 lbs.

SB2-LA: 80-40-20-15 meters • Input SSB: 1KW p.e.p. AM: 300W. CW-FM-FSK: 400W. • Built-in 117V AC power supply • 12"W, 12½"D, 5¾"H. Weight: 40 lbs.

MODEL SB3-DCP INVERTER

Heavy-duty transistorized inverter for mobile operation of SB2-LA linear amplifier at 1KW input. Input 12-15V DC, negative ground. Output @ 13.5V DC input, 150 volts AC peak square wave at 250 cycles. 6"W, 12"D, 3¾"H. Weight: 17 lbs.



Write for new brochure describing SBE line.

RAYTHEON COMPANY

213 East Grand Avenue, South San Francisco, California 94080

Export sales: Raytheon Company, International Sales & Services, Lexington 73, Mass, U.S.A.

For further information, check number 17, on page 110

Each communication point should have adequate signs designating its location as a link in the Parade Network. Of course we should also take advantage of the opportunity to include the clubs name on each sign displayed.

This month will see many parades throughout the nation almost every community has a Memorial Day Parade, let us in amateur radio show respect for those who have given their lives so that we may pursue freely our avocation.

We have many public service network activities in addition to those of regular traffic handling. One of the more prominent is the Eyebank Net, another is the Medical Net where stateside Doctors advise MDs in other countries of the latest techniques or medicines.

Yet another somewhat unusual activity is carried on by the "Country Cousins" a network operating in the Western States. This group undertakes mercy missions, that established charities and public service organizations are not equipped to handle.

One of the latest activities of the Country Cousins is to collect old eyeglasses. These are forwarded to an organization which distributes the glasses to Lepers in colonies throughout the world. Lenses are re-ground to suit the needs of the recipient. Even good frames as well as eye glass cases will help the cause.

A Country Cousin representing the Richland Washington area and one taking a very active part in this operation is Bob Lawrence, W7VFR. Bob has shipped off some 42 pounds of glasses, cases, etc., and expects to have even more sent off to a country cousin in Sacramento who in turn distributes them to the worthy organization.

The Club Forum has not been advised of any cut off date on this drive and we're sure that Bob and the cousins will be happy to receive even more glasses for the cause. If you have a few pair around why not wrap them well and ship them off to Bob Lawrence, 1030 Cedar, Richland Washington 99352.

The Club Forum is advised of the formation of a new Radio Council in the state of New Jersey. Its known as the "Central New Jersey Radio Council" and is composed of: The Woodbridge Radio Club, Shore Area Radio Club, South Ambpy Radio Club, and the Raritan Bay Radio Amateurs.

The group is looking forward to expanding their activities and want other clubs to join with them in their program to foster a better understanding between clubs through informal get-togethers and various activities of common interest.

Any Central New Jersey amateur radio clubs interested in CNJARC can contact the present Chairman of the Board of club representatives Richard Day, WA2JMV at 21 Pine Tree Dr., Parlin, New Jersey 08859.

By the way NOW is the time to start making plans for your summer activities. The well thought out and well planned events are always the best. 73, Al, WA2TAQ

The improved full coverage SIDEBAND TRANSCEIVER

DRAKE TR-4

All features of Drake TR-3
PLUS • • •

★ **Solid State VFO** with linear permeability tuning for maximum stability

★ **Automatic Transmit/Receive Switching on CW** (semi break-in)

★ **CW Sidetone Oscillator** built-in

★ **VOX or PTT on AM**

★ **Connections for External Receiver**

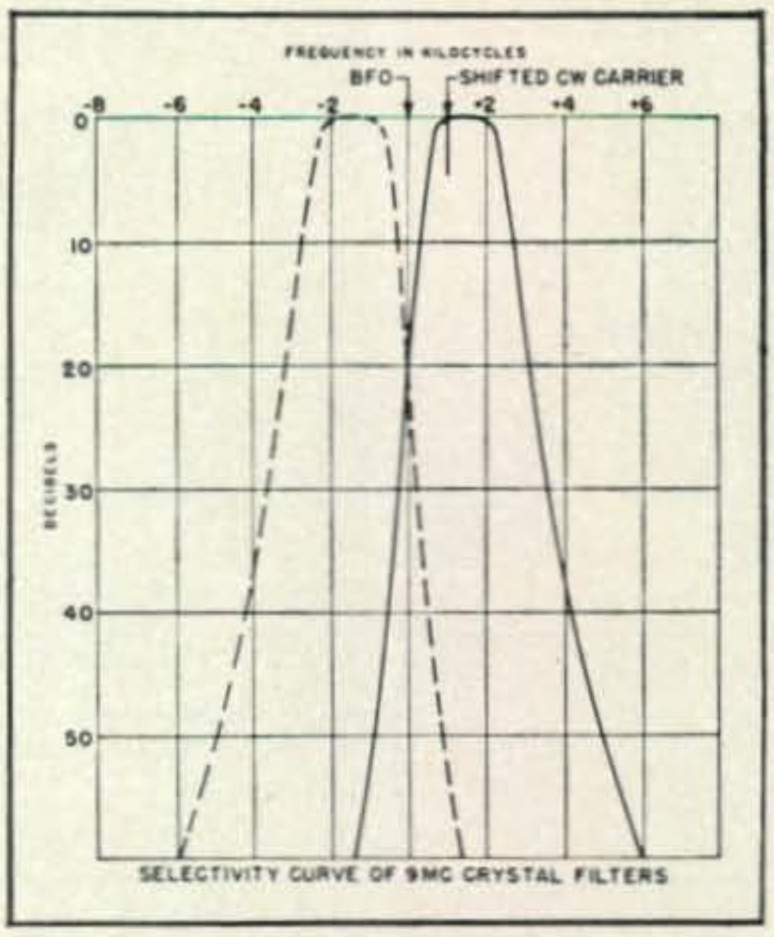
★ **Diode Detector on AM**

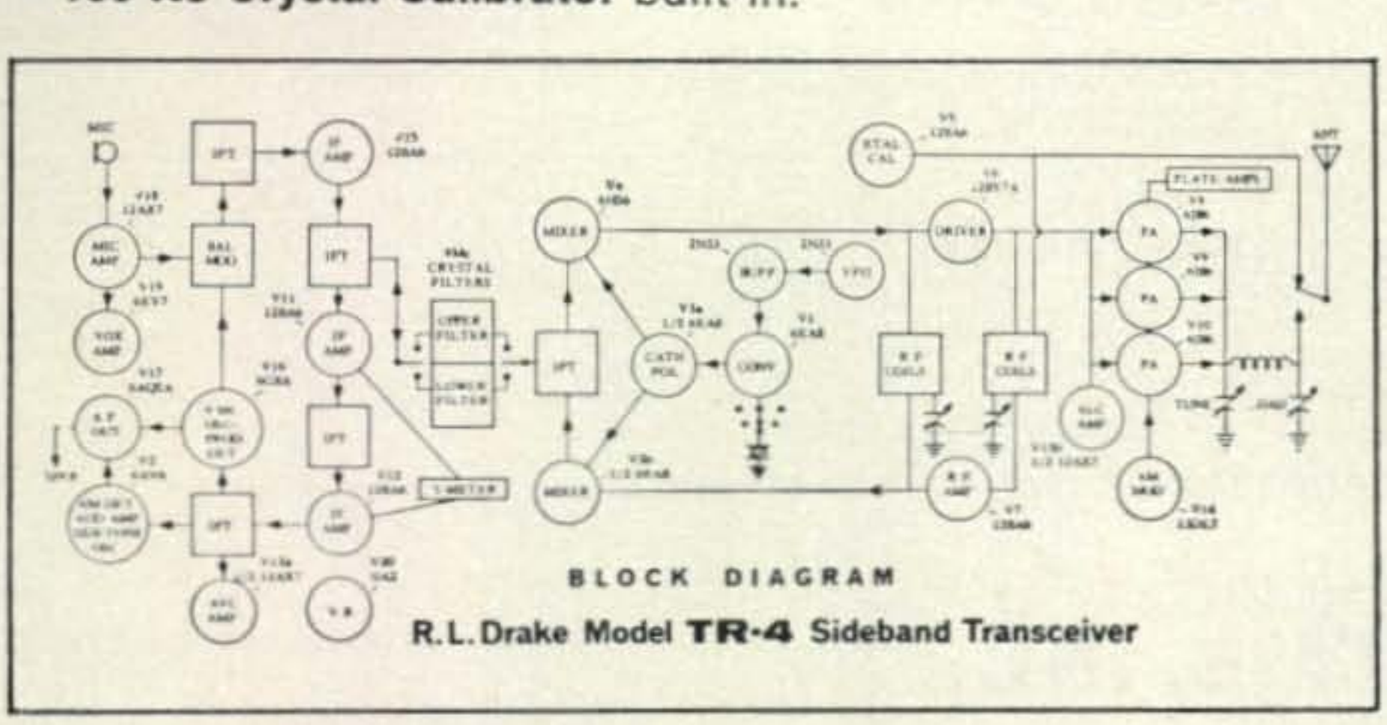
★ **Relative RF Output Indication**

$585.00 Amateur Net

Features of TR-4 and TR-3

- **Full Frequency Coverage** on all amateur bands 10 through 80 meters. No additional crystals required.
- **Upper and Lower Sideband** on all bands.
- **VOX or PTT** built-in.
- **Output Impedance Adjustable** with pi-network.
- **Separate Receiver S-Meter and Transmitter Plate Ammeter.**
- **300 Watts PEP input on SSB.**
- **Controlled-Carrier Screen Modulator** for AM built-in.
- **Shifted-Carrier CW** 260 watts input.
- **Two Special 9 Mc Crystal Filters** for sideband selection.
- **Separate RF and AF Gain Controls.**
- **1 Kc Dial Accuracy.**
- **100 Kc Crystal Calibrator** built-in.





BLOCK DIAGRAM

R.L. Drake Model **TR-4** Sideband Transceiver

ACCESSORIES
for either TR-4 or TR-3

REMOTE VFO
Model RV-3 . . . $79.95

MATCHING SPEAKER
Model MS-4 . . . $19.95

MOBILE MOUNTING KIT
Model MMK-3. . . $6.95

POWER SUPPLIES

AC Power Supply Model AC-3	$79.95
DC Power Supply Model DC-3	$129.95

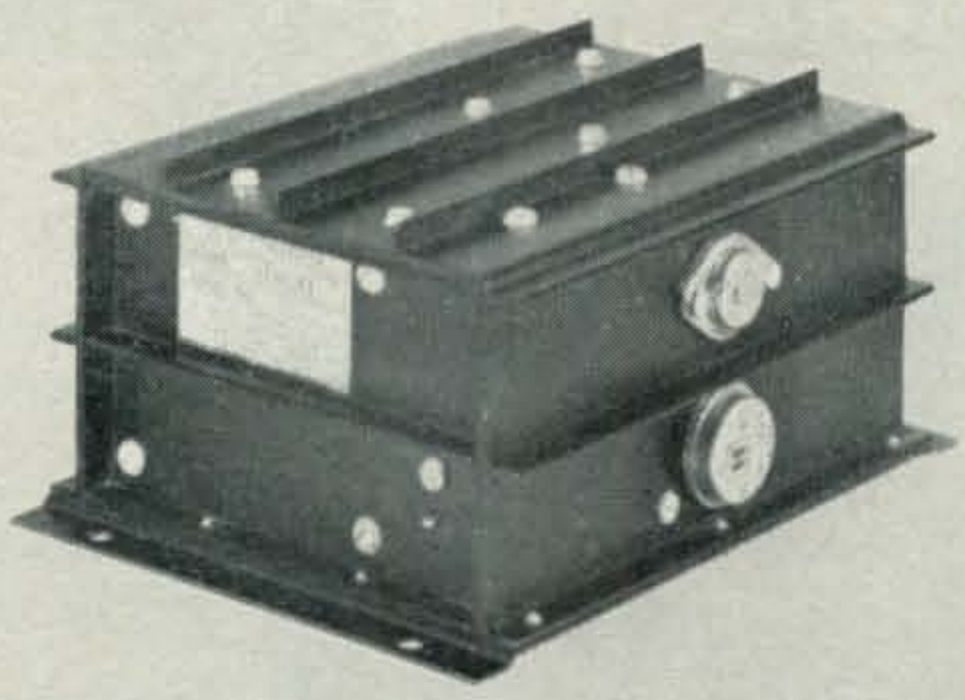
For more information, see your distributor or write:

R. L. DRAKE COMPANY MIAMISBURG, OHIO, 45342

For further information, check number 19, on page 110

Linear Systems

leading manufacturer of amateur mobile power supplies announces new price reductions on all *Century* models!



We are pleased to announce that high volume production of *Century* mobile power supplies at our new modern plant in Watsonville, California, enables us to offer these famous units at the lowest prices in history. Here is an opportunity to own a quality commercially-built mobile power supply at savings from $15.00 to over $25.00, depending upon the model. These new prices apply to all 12-volt *Century* models and are effective immediately.

ORDER NOW THROUGH YOUR DEALER!

MODEL	OUTPUTS	APPLICATION	OLD PRICE	NEW PRICE
350-12	800 Vdc 275/325 Vdc Adj. Bias 0 to −125 Vdc	Most 12-volt mobile transceivers	$114.50	**$ 99.50**
400-12	850/750/650 Vdc 250/285/325 Vdc Adj. Bias 0 to −125 Vdc	All 12-volt mobile transceivers	$145.00	**$124.50**
500-12	1150 Vdc 285/325 Vdc Adj. Bias 0 to −125 Vdc	For higher powered operation of many 12-volt mobile transceivers	$165.00	**$149.50**
1000-12	2200 Vdc 285/325 Vdc Adj. Bias 0 to −125 Vdc	Mobile 12-volt Linear Amplifier	$275.00	**$249.50**

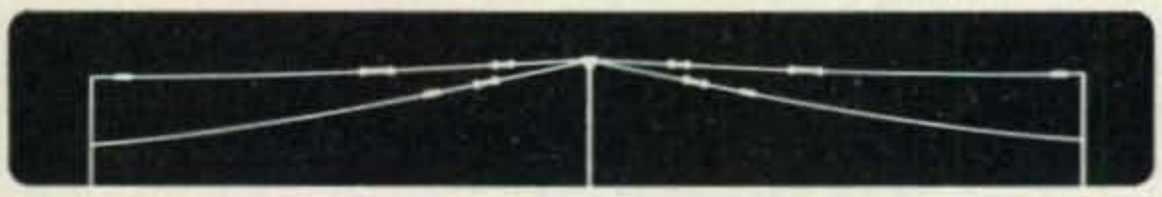
Input and output cables supplied with all units.

LINEAR SYSTEMS, INC.

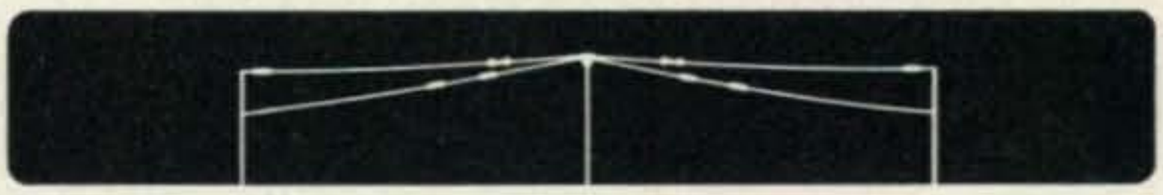
220 AIRPORT BLVD., WATSONVILLE, CALIFORNIA 95076

New Telephone: 722-4177 (Area Code 408)

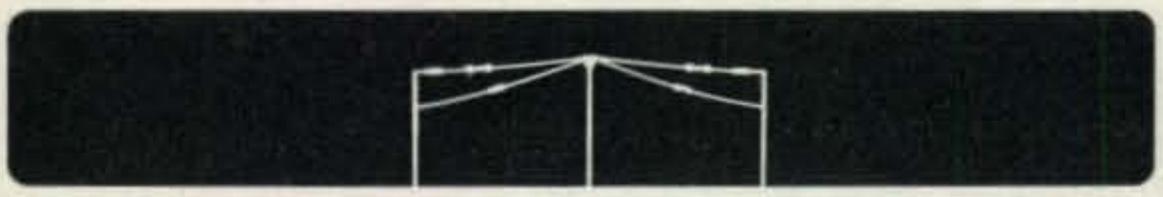
Let's face it. The key to maximum performance from any multi-band trap doublet is in the traps. Sure, it's significant that Hy-Gain multi-band doublets use single strand steel wire elements that defy corrosion...won't stretch...and will withstand hurricane-like winds. It's also important that Hy-Gain's multi-band doublets have rugged, weatherproof center and end insulators that will last a lifetime. But, performance-wise, the real key to the fact Hy-Gain multi-band doublets will take maximum legal power...will operate with SWR of less than 1.5:1 on all bands...and will deliver true 1/2 wavelength performance on each band, is in the superior design of Hy-Gain's "Hy-Q" traps and the fact there's a matched set of "Hy-Q" traps used for each band. "Hy-Q" traps are just what the name implies...they have large diameter coils that are exactingly wound and spaced to provide an exceptionally favorable L/C ratio for high Q performance. They employ air-dielectric design to eliminate any significant change in capacitor characteristics due to aging and extreme climatic conditions. But, most important of all, each matched set of "Hy-Q" traps is precision tuned to frequency to insure true 1/2 wavelength performance on each band. This means that with a Hy-Gain multi-band doublet there are no tolerance latitudes built in that will reduce the performance potential of the antenna...Hy-Gain multi-band doublets are built better to perform best. Five models to choose from plus a kit for building a 40 and 80 meter model.



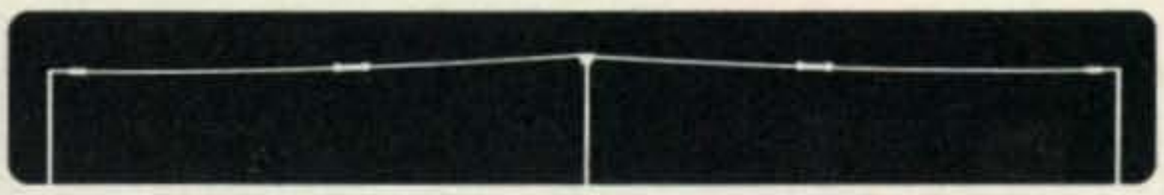
Model 5BDQ for 10 thru 80 meters.....$39.95 Net



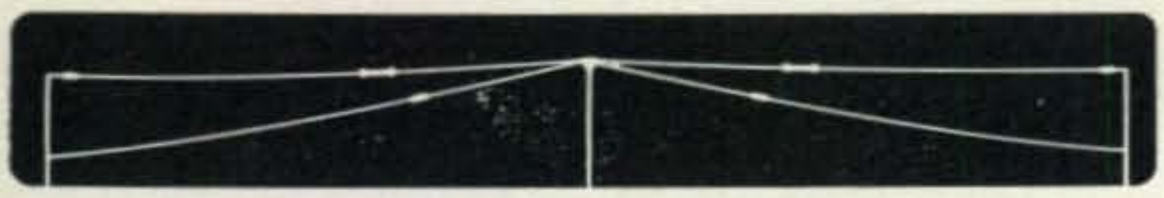
Model 4BDQ for 10 thru 40 meters.....$29.95 Net



Model 3BDQ for 10 thru 20 meters.....$19.95 Net



Model 2BDQ for 40 and 80 meters.....$23.50 Net



Model 248BDQ for 20, 40 and 80 meters...$26.50 Net

Model 2TDQ Matched Trap Kit for 40 & 80 meters .....$17.95 Net

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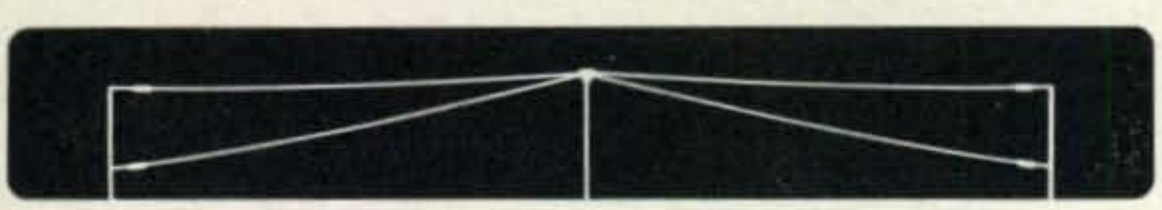
HY-GAIN'S TRAPLESS FAN DOUBLET for 15, 40 & 80 meters—Model 2BDP



Built to take maximum legal power, the Model 2BDP delivers outstanding performance on 15, 40 and 80 meters. Its superbly constructed center and end insulators with super-strength aluminum clad single strand wire elements insure years of lasting performance. Available at only **$19.95** Net.

FOR PERFORMANCE SAKE, BUY THE BEST...
BUY hy-gain MULTI-BAND DOUBLETS

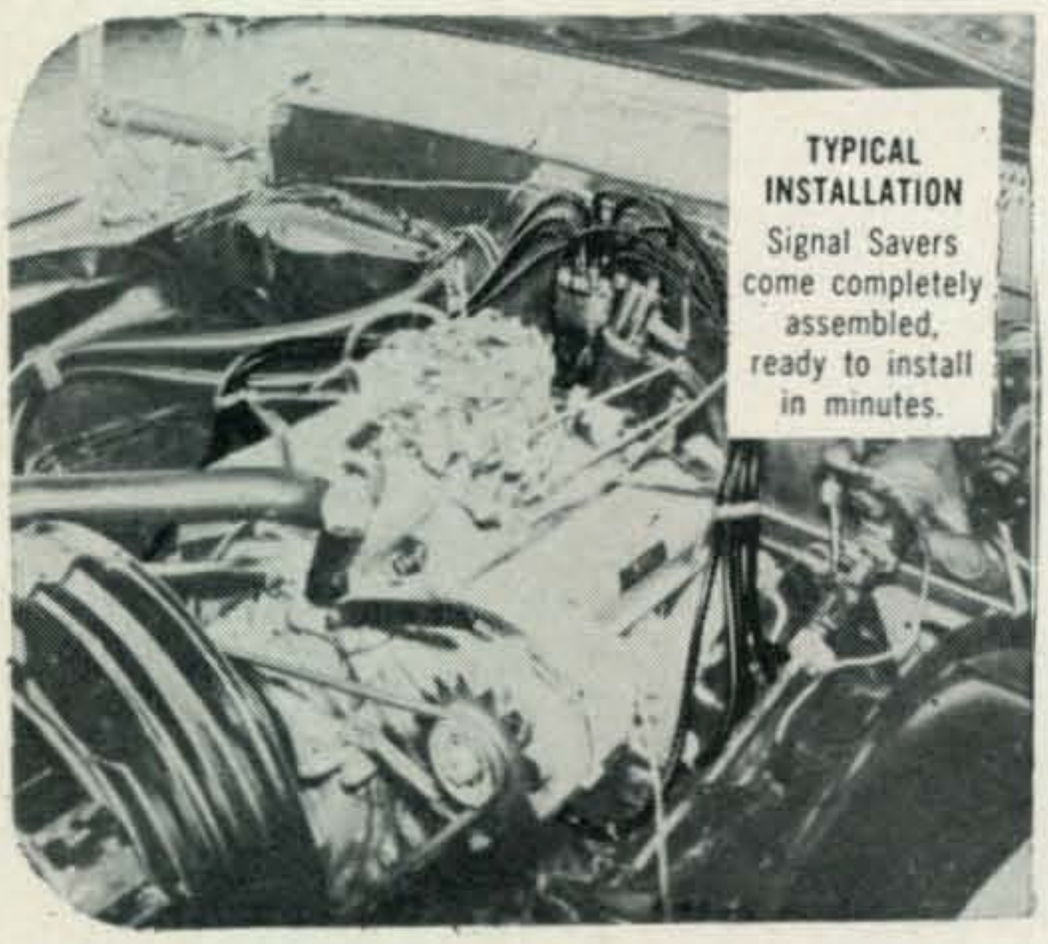
Available from your Hy-Gain distributor or write,

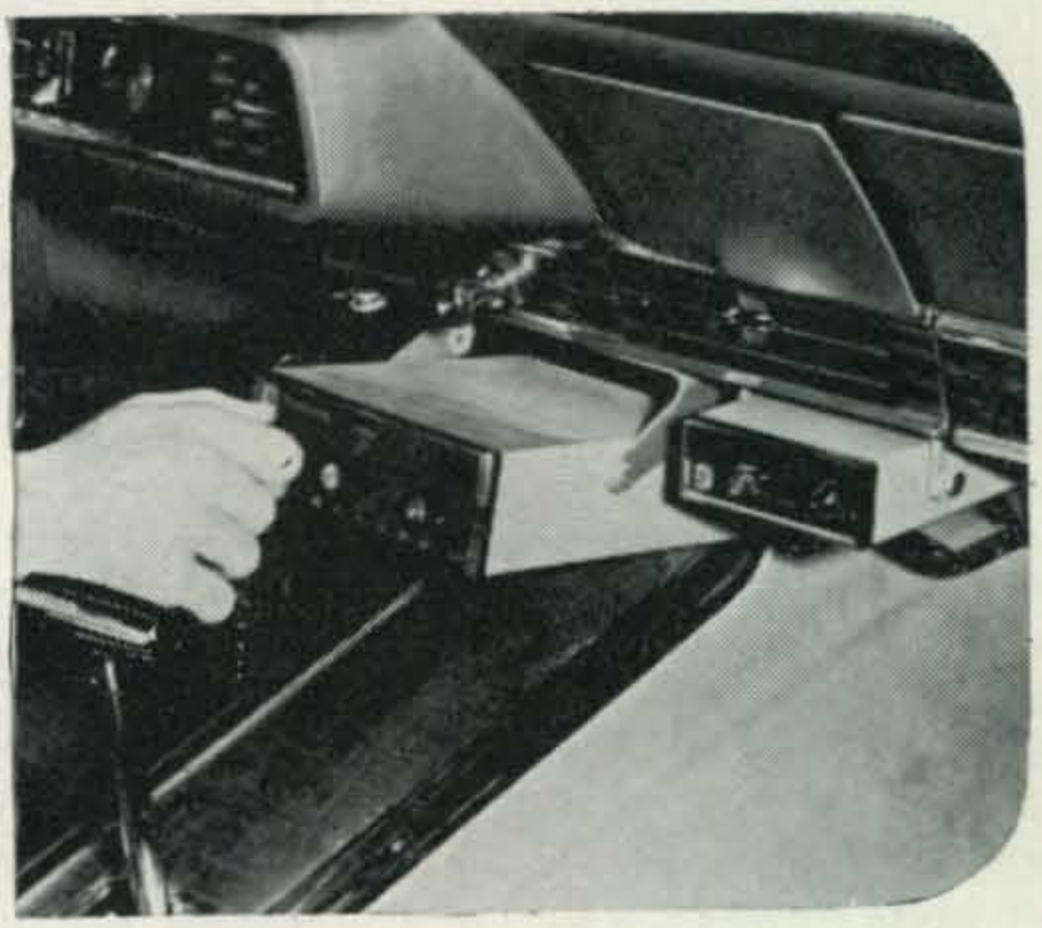
HY-GAIN ELECTRONICS CORPORATION 8429 N.E. Highway 6 - Lincoln, Nebraska 68501

For further information, check number 21, on page 110

ADD MILES TO RECEPTION
range of CB & FM receivers

by reducing ignition noise with HALLETT SIGNAL SAVERS*





HERE'S WHY SIGNAL SAVERS INCREASE RECEPTION RANGE

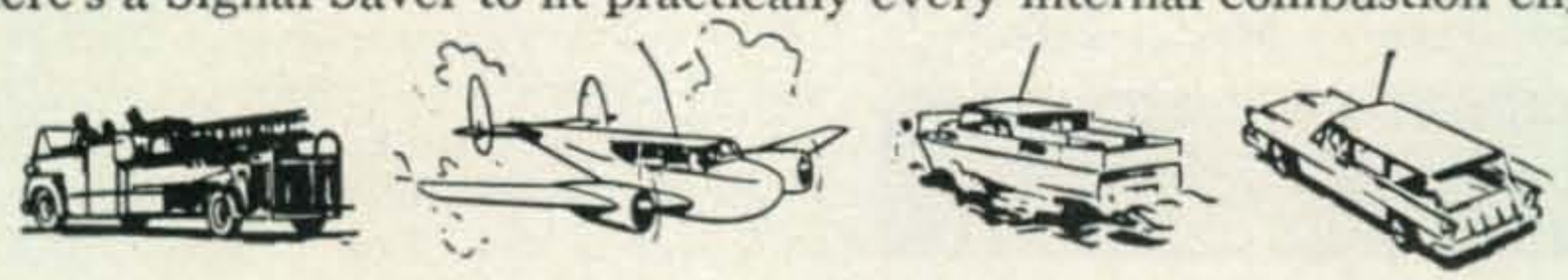
Your receiver has a given operating range, depending on the type, power and frequency of the base station equipment, your mobile equipment, and local conditions. However, all gasoline-spark type ignition engines create ignition noise that interferes with your reception. And as your vehicle moves further from your base station the signal becomes weaker, the ratio of ignition noise to signal strength increases, and eventually the noise interference overrides your signal. Thus, noise interference limits your communications range.

But by grounding noise interference so it doesn't "clobber" the incoming signal, you can extend your reception range. Even double it. That's how *Signal Saver* works. It places a noise blanketing shield around the sources of the noise — the distributor, coils, spark plugs and high tension leads. In short, *Signal Saver keeps the noise out, lets the message in.*

FREE

Write for helpful information on adding miles to mobile receiver reception. Includes prices and data on Hallett Ignition and Battery Charging Shielding Systems. Get full reception from your receiver by reducing ignition noise. Write today!

There's a Signal Saver to fit practically every internal combustion engine



*Signal Saver is a trademark of Hallett Manufacturing Company

HALLETT MANUFACTURING CO., Dept. Q-5
5910 Bowcroft St. • Los Angeles, Calif. 90016

For further information, check number 22, on page 110

5-Band High Power SSB Transceiver

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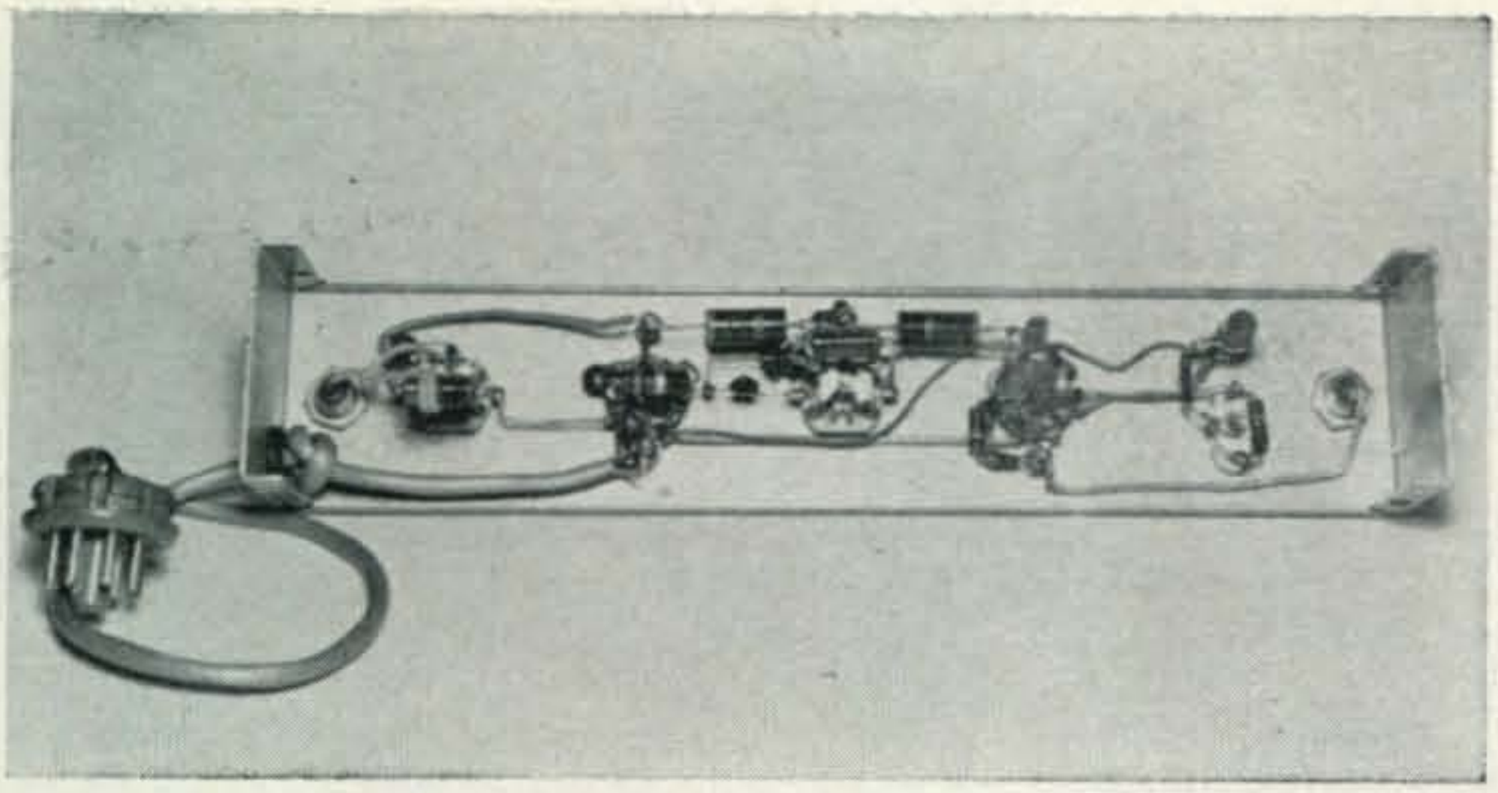


Interior view of the converter showing careful lcyout and neat wiring practice. Parasitic suppressor PC_1 was added after the photo was taken.

Six Metering The Central Electronics SSB Exciters

BY EVERETT G. TAYLOR,* W7BYF/K7YSE

It has been observed by the writer that since the advent of transceivers introduced by Collins, Drake, Swan and the like, the older Central Electronics exciter units such as the 10-A, 10-B and 20-A units popularized by Wes Schum, W9DYV, are in abundance on used equipment shelves of dealers throughout the country. There is no good reason why these excellent s.s.b. exciters cannot be used for 6 meters. The following discussion covers a transmitting converter to do just that, put them on 6. As most v.h.f. operators have an existing receiver which will receive s.s.b. and a converter, no attempt will be made to suggest the conversion of the C-E unit to a transceiver.

The only article that I have run across regarding the use of one of the C-E units (which were quite popular in the pioneering of amateur s.s.b. during the 1950's), for 6 meters was a very well written paper entitled "Single-Side-Band Ideas for the VHF Man"[1] that used plug-in coils tuned to 50 mc. These were used instead of the existing coils in the unit in conjunction with an oscillator with 41 mc output. About the only objection to the idea presented on the subject was the poor output with the 41 mc unit plugged in; this was the fault of the design of the C-E unit as it was not intended for use on bands above 28 mc. Another limitation with the 41 mc oscillator was the inability to QSY due to the use of crystals for frequency control.

Our idea on generating 50 mc s.s.b. output is to use the 10-B (or whatever unit you may have) as is without any changes other than an addition which will also aid in operation on the lower

*7338 E. Sheridan Street, Scottsdale, Arizona.

[1]Tilton, E., "Single-Side-Band Ideas for the VHF Man," *QST*, May 1957, p. 16.

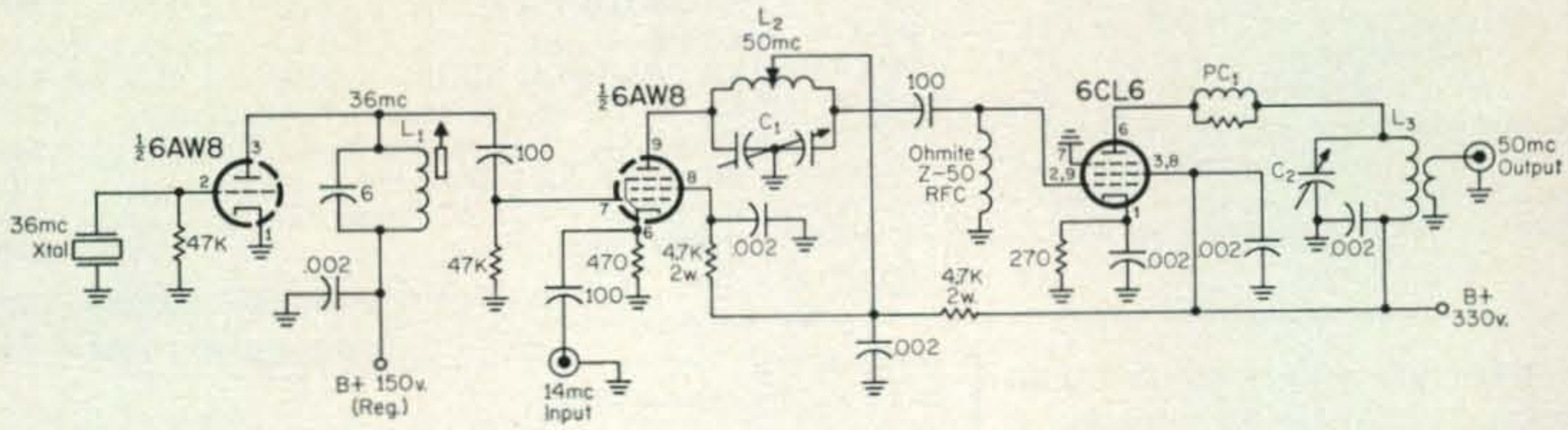
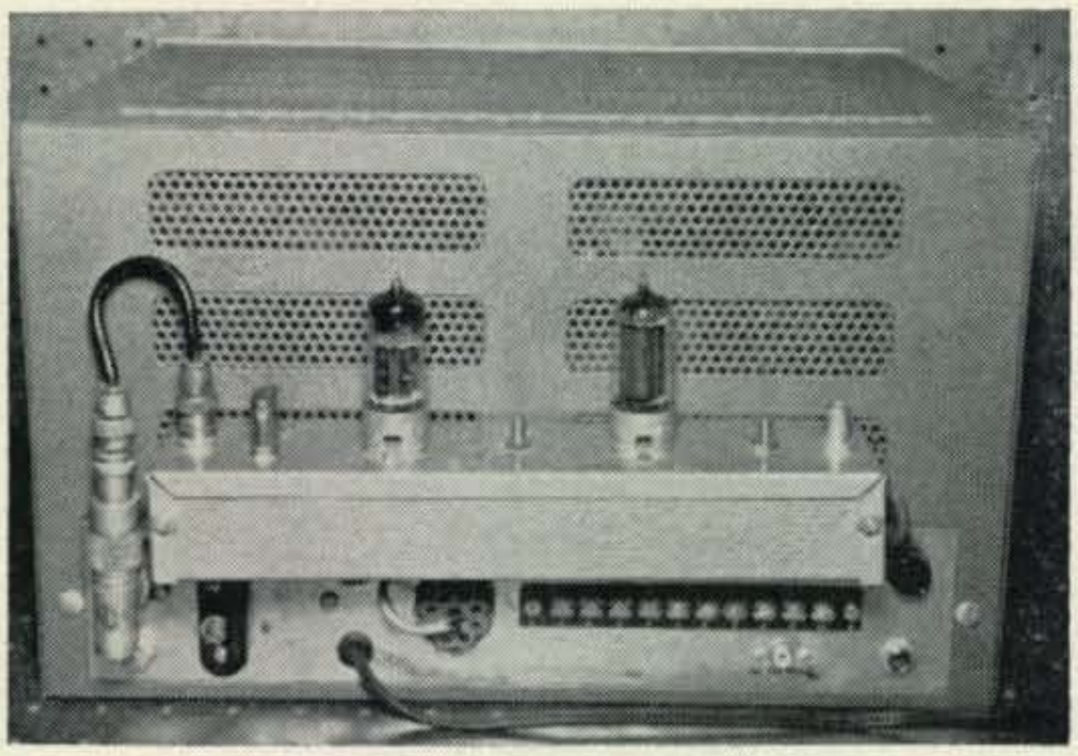


Fig. 1—Circuit of the converter used to put the 14 mc output of the Central Electronics 10-B on 6 meters.

C_1—10.8 to 2.7 mmf butterfly variable. Johnson 160-211 or equiv.
C_2—19.6 to 2.7 mmf variable. Johnson 160-110 or equiv.
L_1—18 t #26 e. wound on a ¼" slug tuned form.
L_2—24 t #26 e. c.t. wound on a 1 meg 1 watt Allen Bradley type resistor (¼" dia.).
L_3—12 t #26 e. wound on a 1 meg 1 watt Allen Bradley type resistor, (¼" dia.) with a 3 turn link of hookup wire on the cold end.
PC_1—6 t #18, diameter spaced, wound on a 100 ohm 1 watt Allen Bradley carbon type resistor (¼" dia.).



View of the transmitter converter mounted on the rear of the CE 10-B to enable operation on 6 meters. The output of the CE, on the left, feeds into the converter. The output of the converter is taken from the connector on the right. Inductor L_1 is hidden behind the crystal. The interstage butterfly tuning capacitor shaft is between the 6AW8 and the 6CL6. The output tuning capacitor C_2 is on the right. The power plug can be seen in the accessory socket.

frequencies at the same time.[2]

In order to obtain 50 mc output with a C-E unit it was decided to use the 14 mc coils that came with the unit in conjunction with a 36 mc signal source, the sum of which gives output in the 6 meter band. The oscillator for the 36 mc crystal is the triode section of a 6AW8 and uses a 36 mc overtone crystal. This, in conjunction with the 14 mc signal from the C-E, mixes in the pentode section of the 6AW8, being fed into the cathode of the mixer. This is shown in fig. 1.

The mixer, in turn, drives a 6CL6 as a linear which is about one of the easiest driven pentode tubes on the market. Bias for the 6CL6 is obtained from a 270 ohm cathode resistor. Due to the high G_m of the 6CL6 some self oscillation reared its ugly head. This was corrected by the insertion of the 100 ohm parasitic resistor and choke as shown in the circuit.

The 5 watts p.e.p. that is delivered by the 6CL6 is quite sufficient to drive just about any tetrode to the full input authorized by the FCC, considering normal circuit losses between the exciter and final tubes such as 4-400s or a 4CX1000.

If you are of mind to build a high powered linear for this unit it is recommended that you consult the Sideband Handbook[3] and the articles written by W6HLY regarding Class C Linears[4] which appeared in *CQ*. If you are only interested in finding out what 5 watts of s.s.b. will do *vs* what you are now using on a.m. let's get to work with the soldering gun and a few other tools.

Construction

The entire oscillator/mixer/amplifier was built on a 1½ × 2 × 10 inch aluminum minibox. The minibox is secured to the back of the C-E cabinet by slightly enlarging the holes that are normally used for the self-taping screws that are supplied with the minibox and inserting two lengths of 6-32 threaded rod stock through the holes in the back of the C-E cabinet, which are normal vent holes.

The usual practice of short leads should be kept in mind during the construction of this unit as in all equipment in the v.h.f. range. The photos just about tell the story as to parts layout.

Power

The power for the unit is obtained from the auxiliary power connection on the rear of the C-E unit.

The regulated 150 volts for the oscillator is obtained by adding a VR-150 which was mounted on the shield between the 6AG7 and the rest of the C-E exciter. The 330 volts from the C-E power supply is fed to the VR-150 thru a 6K, 20 watt wire wound resistor. All oscillators in the C-E are voltage regulated by the VR-150, in addition to the 36 mc. oscillator. This addition gives very excellent frequency stability on 6-meters.

Results

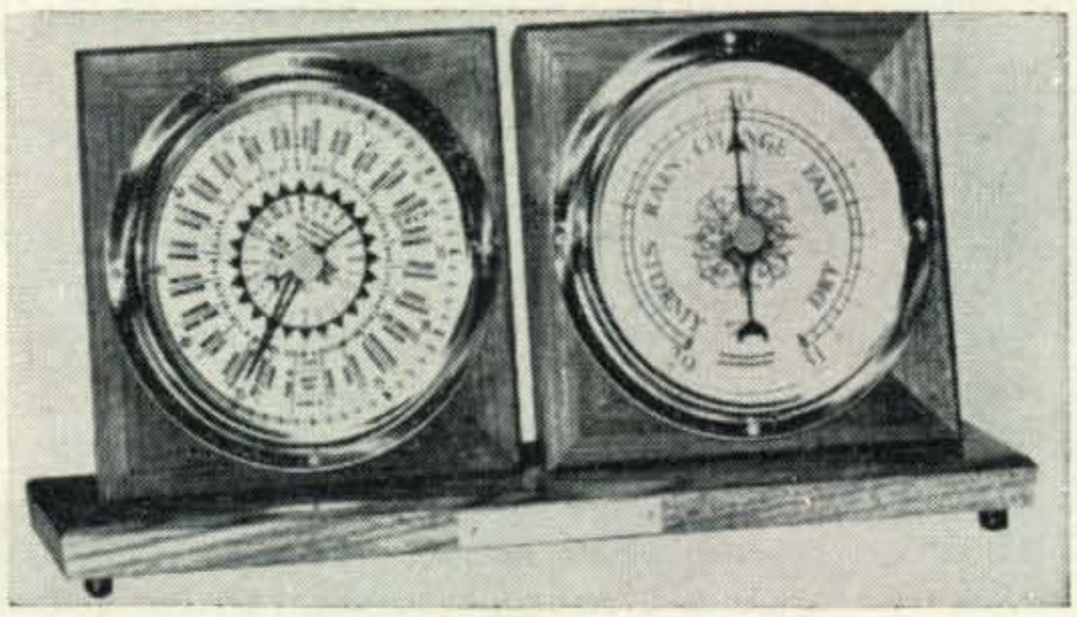
This low power s.s.b. transmitter should give upwards to 100 miles of range on groundwave under all conditions. K7DU in Tucson over 100 miles from here has been worked several times behind a 1000 foot mountain range. The first summer netted 22 states on "E" openings. ■

[2]Mitchel, E. J., "Improving The Speech Characteristics Of The 20A Exciter," *CQ*, April 1960, p. 49.
[3]Stoner, D., *The New Sideband Handbook*, Cowan Publishing Co.
[4]Mann, D., "The Class C Linear Amplifier," *CQ*, Part I, March, p. 32, Part II, April, p. 31, 1964.

New Amateur Product

Farmerie B-200 Clock

The Farmerie Corporation, 114 Spencer Lane, Glenshaw, Pa. has introduced the Farmerie World Time Zone Clock. The model shown (B-200), includes a barometer. The clock face is divided into the 24 time zones. It lists two principal cities in each, along with the international code symbol. When the clock is accurately set to a local time zone, the correct time is automatically shown in each of the other 23 zones. The clock has a battery powered, jeweled movement. The barometer portion of the unit is reported to give an accurate indication of weather conditions to a sea level range of 10,000 feet. The model B-200 sells for $98.50. For more information either write direct or circle 67 on page 110.



Using the V.O.M. and the V.T.V.M.

BY WILFRED M. SCHERER,* W2AEF

BASIC a.c. measurements made with the v.o.m. and v.t.v.m. were discussed last month. Other a.c. measurements may involve audio-frequency voltages which usually are made in connection with the frequency response of an amplifier, its gain input and output voltages or power levels.

Frequency-response readings are made by applying an a.f. signal of constant amplitude to the input of the amplifier at various frequencies and then measuring the output voltage for each frequency. A reference frequency of 400 or 1000 c.p.s. is generally used, with the output readings at other frequencies denoted at relative levels of plus or minus so many db from that of the reference. The db scales on the meter are used for this purpose.

To do this, apply the reference frequency from an a.f. oscillator to the amplifier and set the oscillator and amplifier levels for a meter reading at the 0 db calibration while the meter is connected to the amplifier output (a matching load also should be connected here).

Then without altering the level settings, proceed to check the output at other desired frequencies one at a time, recording the difference in the db readings from the initial zero reference in each case. The output from the oscillator should be held constant at all times and for best accuracy should be checked at each frequency. The oscillator voltage may be lower than the measuring capabilities of the voltmeter, but if you're using a modern oscillator, such as a Wein-Bridge type, its output will be relatively constant (within about 0.5 db) and measurement will not be needed.

Care must be taken to see that the amplifier is not overloaded, either by too much voltage from the oscillator that could overload an input stage preceding the amplifier gain control, or by setting the gain control high enough to cause overloading of stages that follow it. Overload is best visualized with an oscilloscope, but where this is not available, the best practice will be to use as little output from the a.f. oscillator as possible, consistent with obtaining normal amplifier-output voltages at nominal gain settings.

The operational continuity, gain or loss, and proper a.f. voltages on an audio amplifier may be checked by comparing the measured input and output voltages with one another. When a v.o.m. is used, its OUTPUT position should be employed on circuits that have a d.c. voltage at the same time. Also, when measurements are made on resistance-coupled amplifiers the ohms-per-volt rating of the v.o.m. must be considered to minimize the possibility of circuit loading as discussed earlier.

*Technical Director, *CQ*.

Power Measurements

Power cannot be directly measured with the instruments on hand, but if any two quantities—voltage, current, resistance—are known, the power can be calculated from $P = E^2R \div R$, $P = I^2 \times R$ or $P = E \times I$. Thus, referring to fig. 1, the power dissipated in the grid leak, R_1, is $P = 110$ v. $\times$ 110 v. $\div$ 22,000 ohms $= .55$ watts, $P = .005$ a. $\times .005$ a. $\times$ 22,000 ohms $= .55$ watts, or $P = .005$ a. $\times$ 110 v. $= .55$ watts. The power dissipated in R_2 and R_3 may be found likewise.[1]

The power drawn by the tube screen may be found by multiplying the screen voltage by the screen current ($P = E \times I$). Since the voltage drop across R_3 is 300 volts, the screen voltage is the supply potential, 500 v., minus 300 v. $=$ 200 volts. (Of course the screen voltage also may be found by direct measurement with a voltmeter connected between screen and ground.) The screen power therefore is $P = E \times I = 200$ v. $\times .01$ a. $= 2$ watts. The plate power similarly is 500 v. $\times .1$ a. $= 50$ watts.

Using Ohm's Law you can also find the value of R_1, R_2 or R_3 from the voltage and current, since $R = E \div I$. For instance: $R_1 = E_{grid} \div I_{grid} = 110$ v. $\div .005$ a. $= 22{,}000$ ohms.

A.F. Power Measurements

Power in a.c. circuits up through the audio frequency range also may be likewise determined

[1]This same diagram was discussed in last month's installment.

A pocket-size v.o.m. that has a 20,000 ohms/volt d.c. sensitivity, 5,000 ohms/volt a.c.

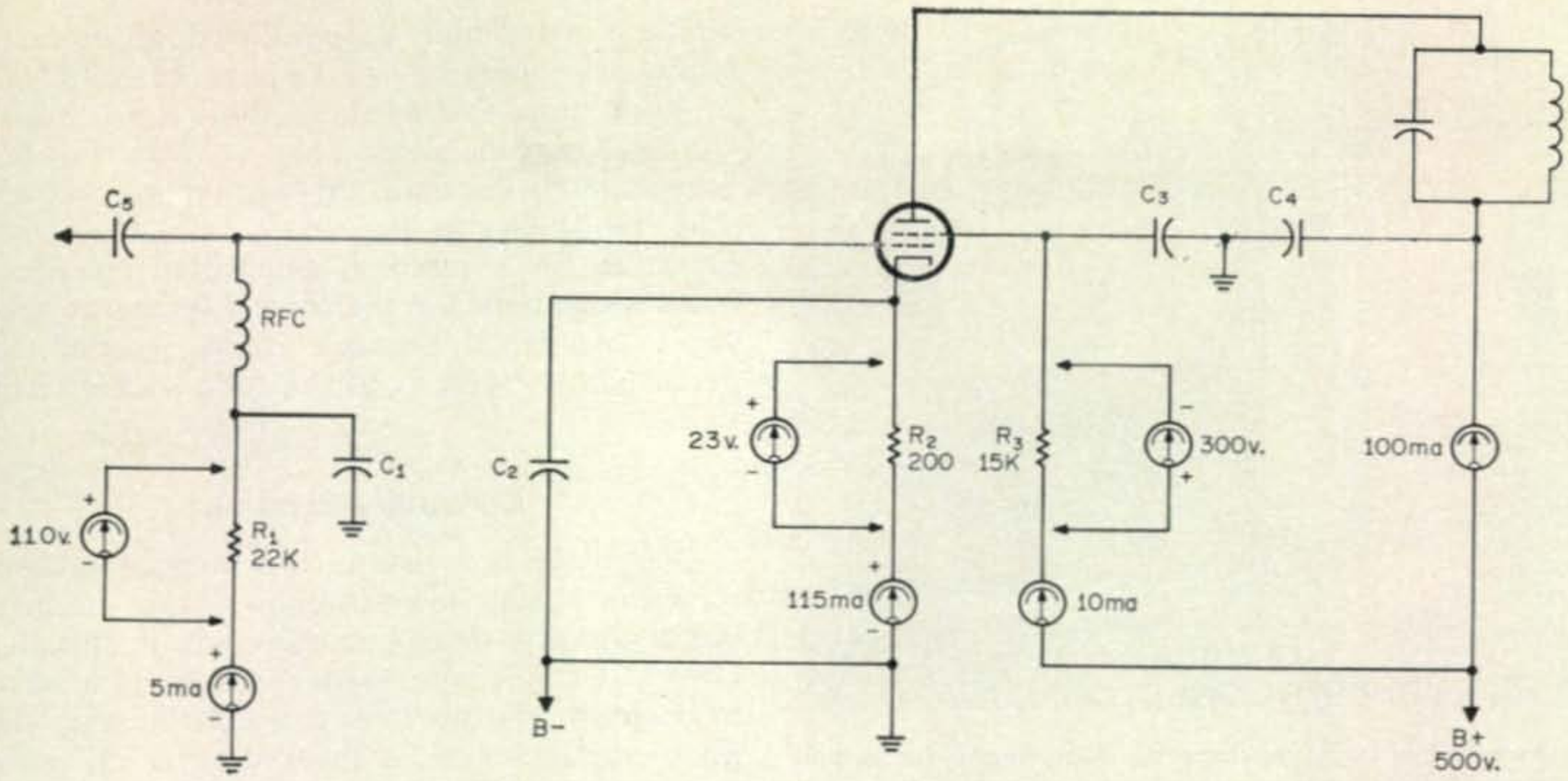
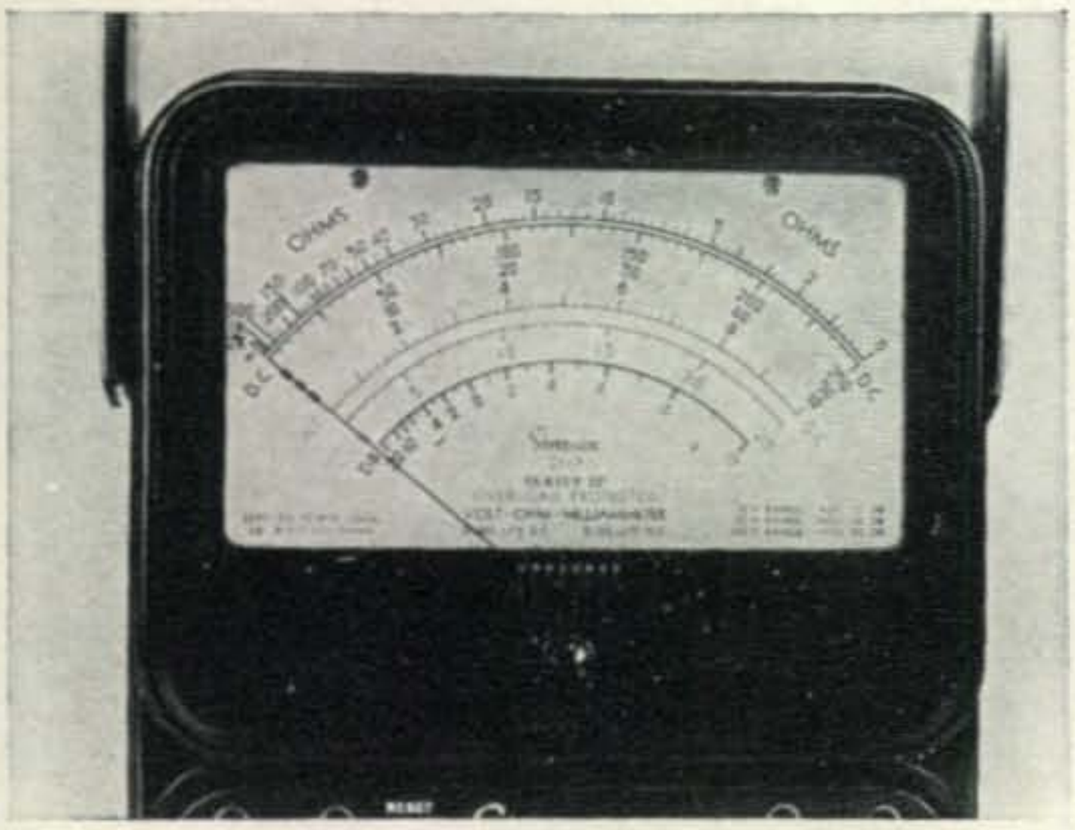


Fig. 1—Load power or power dissipated in a resistor may be determined from current drawn through a known resistance or from the voltage drop across the resistance. See text. This diagram was also shown in last months installment.

if the resistances, or loads, involved are non-inductive. For example: the power output from an a.f. amplifier may be found by measuring the a.f. voltage across a non-inductive resistor that is connected across the amplifier output (the resistor should match the amplifier output impedance and the loudspeaker, if any, should be disconnected). The power then is $P = E^2 \div R$.

A.f. power measurements also may be obtained directly from the db scales of the instrument. For absolute power, the readings must be made across an impedance at which the meter has been calibrated for a zero-db reference. The reference point usually is based on 1.73 v. across 500 ohms, equivalent to .006 watts or on .774 v. across 600 ohms for .001 watts.

When the lowest a.c. voltage range is used, the db value is directly indicated. With higher ranges a specific number of db must be added to the scale readings according to which range is used. The amount is given in the manufacturer's instructions, at the range-selector positions or are shown at one corner of the meter face.



A v.o.m. meter face with a db range (bottom scale). The number of db to be added for the different voltage ranges is indicated in the table at the lower right.

The following is an example of how the power is determined: Suppose a signal on a 600-ohm circuit indicates —2 db when the 0-15 v. range of the meter is engaged. If the instructions specify that 20 db is to be added to the reading with this range, the actual value then is the sum of +20 db —2 db, or 18 db. From a db/power chart[1] it will be found that an 18 db change from a zero reference is equivalent to a power ratio of 63. If the zero reference for the meter has been calibrated for 1 milliwatt at 600 ohms, the actual power level then is 63 × 1 mw, or 63 mw.

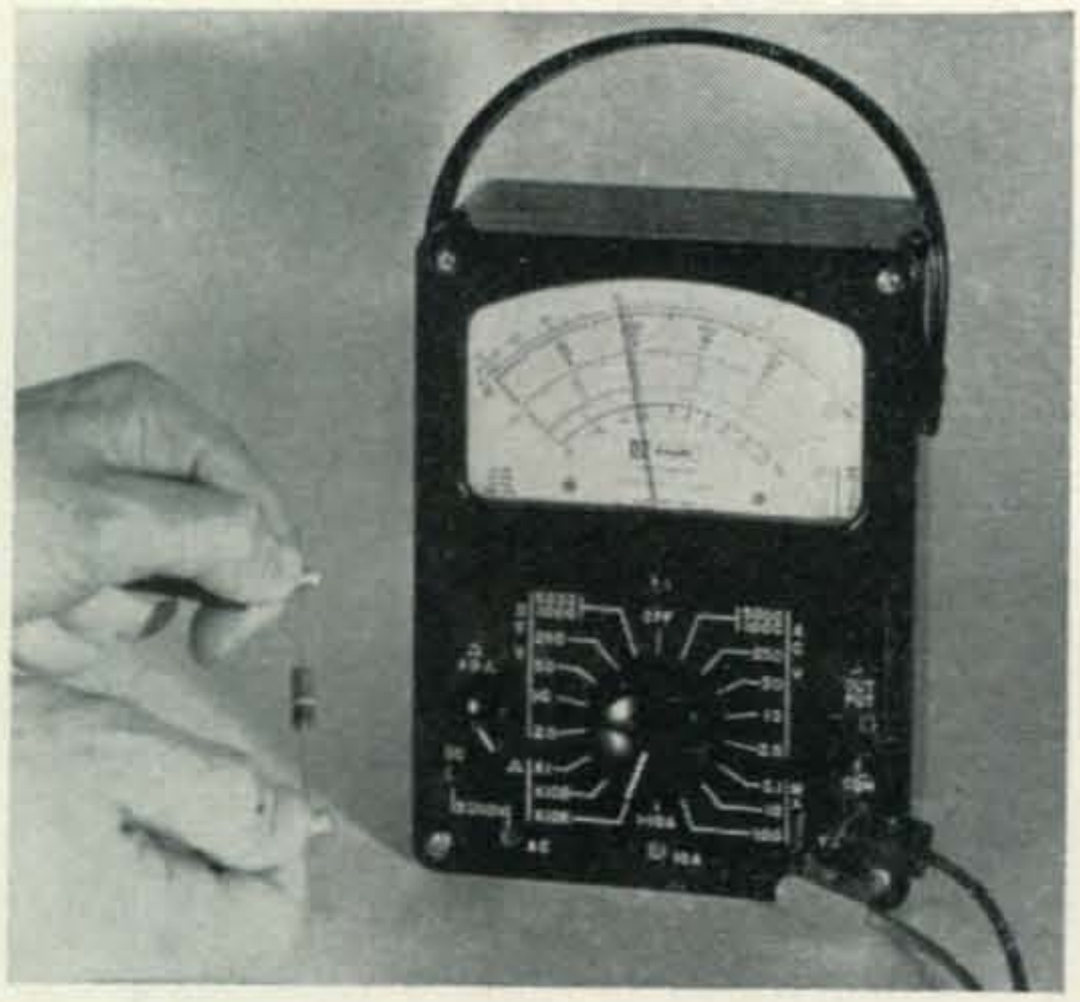
On the other hand, if a reference base has not been designated, the actual power may be determined by the voltage reading across the 600-ohm circuit. In this case the potential will be 6.15 v. which on the 0-15 v.a.c. range will line up with —2 db. The power then is $P = E^2 \div R = (6.15 \text{ v.})^2 \div 600 \text{ ohms} = .063 \text{ watts} = 63 \text{ mw}$. This confirms the value found using the db scale.

Relative power is often given in db when expressing the ratio between two powers, which are usually indicated P_1 and P_2. In this case $\text{db} = 10 \log (P_1 \div P_2)$. Relative voltage or current ratios are calculated similarly using $\text{db} = 20 \log (E_1 \div E_2)$ for voltage and $\text{db} = 20 \log (I_1 \div I_2)$ for current. Should your meter not have db scales, these formulas or a db conversion chart may be used instead. A few handy db relationships are shown in Table I.

Resistance Measurements

The first step to take for resistance measurements is to set the selector switch for the ex-

[1]Found in most handbooks.



The effect of body resistance through finger tips in contact with both ends of a 1-megohm resistor (or the test leads) during resistance measurement. An erroneous reading of 200,000 ohms is indicated on the × 10,000 ohm-range of a v.o.m.

pected range required and then set the OHMS-ADJUST control for a *zero* resistance reading while the test leads are shorted together if a v.o.m. is being used, or in the case of a v.t.v.m., for a *full-scale* reading while the test leads are open.

Make sure the contact ends of the test leads are clean and free from corrosion. This is especially important for very low resistance measurement and when the leads are shorted for zero-adjusting the lowest range, particularly with a v.o.m. Clip the leads tightly together rather than hold them in place by hand.

The measurement is then made by connecting a test lead to each terminal or lead of the resistor and noting the reading on the ohms scale. The actual value then is this reading *times* the multiplier indicated by the range selector. The accuracy for ohms generally is given as a percentage of the actual reading. In practice the best accuracy is usually obtained from a reading along the center portion of the scale. Therefore, use a range that best fits these requirements. Also, each time a range is changed, recheck the OHMS-ADJUST.

When a high value resistor (above a few thousand ohms) is checked while out of a circuit, avoid bodily contact with the ends of the test leads or the resistor, since body resistance in parallel with the resistor will produce an erroneously lower indication than the true value. Conversely, if a low value resistor (below about 100 ohms) is involved, exert firm pressure by hand at the points of contact to ensure a low-resistance connection.

In-Circuit Measurements

When resistors are to be checked while installed in equipment, first turn off all equipment power and discharge filter capacitors. As an extra precaution, pull out the power-line cord.

The resistor is then measured using the test leads as described above. In many cases an in-circuit resistor may be paralleled by other resistors or components, so the indicated value *may* be lower than that of the resistor itself. Such a situation may be determined be referring to a schematic diagram of the equipment, but this may not always be necessary, since the service literature for a piece of gear often includes a chart which indicates the correct resistance reading to be found between chassis ground and given points (such as at the tube socket terminals).

Continuity Readings

One of the most useful functions of an ohmmeter, in tracing down troubles, is that of checking continuity; that is, determining if an actual electrical connection exists between two points in a circuit. To do this, connect the test leads across the points to be checked, *after* the power has been removed from the circuit. Use the lowest-ohms range. If there is continuity between the selected points, the meter will read zero ohms, unless there is a resistor connected between the points, in which case the meter will indicate this resistance. If some resistance is indicated, even if an actual resistor is not involved, it may be due to a poor connection at one of the points in question and may be caused by a cold-soldered joint. Wiggling the connecting wire or the terminal will often show up this condition which can be cleared up by a little retouching with a soldering iron.

Continuity readings will also be helpful for tracing leads in a wiring harness, especially if the same color is used for more than one of the leads.

Continuity tests can be used to locate open transformer windings. Heater windings will indicate a low resistance, near zero; high-voltage windings will show resistance up to several hundred ohms, and a.f. transformer windings may run as high as several thousand ohms. Note that center-tapped or push-pull windings will have a lower resistance reading for the half nearest the core.

[*Continued on page 104*]

Table I—Common Db Relationships

Db	Power Ratio	Voltage or Current Ratio
+ 3	× 2	× 1.414
− 3	× ½	× 0.707
+ 6	× 4	× 2
− 6	× ¼	× ½
+10	× 10	× 3.14
−10	× 1/10	× 0.314
+20	×100	×10
−20	× $\frac{1}{100}$	× 1/10

The RPHTSSR

BY RAY W. SWINDERMAN,* KP4AMI

This article details the results of experiments performed by the writer in the years immediately following the end of World War II. These facts have been committed to paper belatedly at the urging of several friends to prevent this knowledge being lost to posterity forever.

At the end of World War II, the writer was stationed on a charming tropical island in the South Pacific which was then used as a Signal Corps supply depot. For strategic reasons it had been decided to keep this depot intact through the immediate post-war period. However, in accordance with the well known point system then in effect, service personnel were to be rotated off the island. At the final ceremonies, while autographing copies of my memoirs for the friendly natives, I mistakenly signed re-enlistment papers. When I awakened the next morning, I found myself assigned to a three year additional tour of duty as a one man custodial crew for the depot.

Time wore on and the ham bands again became filled with signals. I dusted off my ticket and set up a fairly complete ham shack using odds and ends available in the depot. Then followed bleak days, weeks, and months while I tried in vain to contact hams in the old home town. This period of complete frustration did nothing to satisfy that home-sick feeling. The few times I contacted a home town station, either the band would change or massive waves of QRM would roll over the elusive signal. No QSO. Something had to be done!

Long hours of creative thought developed a radically new approach. Up to this moment communication depended upon the transmitter getting a signal through the air to the receiver. This gateway sat there passively accepting, rejecting or heterodyning signals in accordance with the design of the unit and the skill of the operator. A means had to be found to get the receiver actively into the act. This means, as developed, was the Residual Persistence Home-Town Signal Seeking Receiver. The design and circuitry turned out to be amazingly simple after the basic concept had been established. For the present, it will suffice to say that a slight variation of the push pull principle used in the final stage of many transmitters inversely applied to the receiver detector stage did the trick with some minor modifications. Even before the first cold joint had been soldered, calculations indicated that the gain figure for the receiver was going to be astronomical. A native technician wore out three sets of beads on our abacus before deciding that the final answer was beyond the scope of his equipment.

Construction was completed quickly using available components and the unit shone forth in pristine glory on the workbench. To put it mildly, this innocent looking piece of gear was loaded with surprises. The RPHTSSR was carried out to the ham shack and quickly lashed into the circuit using the necessary cable, ropes and tiedowns. It looked different than any receiver I had ever seen. It was!

We fired up and the unit passed the smoke test without trouble. Now for the supreme test. A quick pass across the band showed that selectivity appeared to be average. Sensitivity was nothing sensational. The test up to this point was, to say the least, disappointing. Then up popped one of the hams from the old home town, W8ARV, calling CQ. We had lost two previous contacts with this station. History began to repeat itself as the signal started to fade. I reached over to the right side of the receiver, and threw the switch activating the additional gain circuitry. Wonder of wonders! ! The signal stopped fading and came in sharp and clear. The QRM disappeared and there was the home town station Q5 and 40 over 9 on the heavily damped S meter. This, with minimum setting on the additional gain control. On with the transmitter! Before I could give him a call he went back to another station. I courteously stood by, waiting for him to complete the QSO but he appeared to be having trouble establishing contact with the other station and eventually signed without getting a QSO started. (The reason for this became apparent later).

*Box 717 Guayama, Puerto Rico.

Lock-In

One call established contact and then began an arm-chair type QSO with the old home town. Through all this, the frequency remained clear—no other signals could be copied in the background. With the additional gain circuit switched out, I found there were many stations QRMing the frequency. It was impossible to copy W8ARV without using the additional gain switch.

So far, so good. Now came the truly amazing developments. After a two hour rag-chew W8ARV prepared to sign to keep a schedule 5 kc's lower in frequency. We signed him out, but did not shut down. Then, while we completed our notes at the operating position, the first demonstration of Residual Persistence was made. W8ARV's signal came back on the air. Apparently his v.f.o. was stuck. Muttered imprecations and grunts leaked out on the air through the still open mike. He was making no progress. I could feel his anger mounting. He decided to give up and shut down. More imprecations! The On Off and gain control on his transmitter was frozen also. Oho!! The pieces began to fall into place. I gave him a call and he explained the trouble in detail. I then asked him to try his controls while I listened. It took extreme finesse to carefully avoid any reference to the RPHTSSR. This time I stood by and cut off the additional gain control. Of course I lost him immediately but after several seconds I threw it on again and in came his signal. Sure 'nuff! His controls freed up with the switch off but froze again with the switch on. What a deal!! And all this with the additional gain control set at minimum.

The Accumulator

Then followed many interesting evenings with the RPHTSSR. The residual persistence and homing circuitry worked perfectly. We had many, many, excellent contacts with the old home town. One evening while working at the operating station, I noted that the loud speaker appeared to be leaning forward just a little bit on the shelf above the rig. I had been experimenting with advancing the additional gain control a little bit and it seemed to work very successfully. I reached up casually to push the loud speaker back into position and found to my amazement that there was some solid object apparently behind the speaker enclosure. This needed looking into—Holy smoke! It weighed a ton! A call for help and three of us wrestled it down to the workbench. What a mess! Miles of antenna wire—miscellaneous final amplifier tubes-tank coils and pi-net parts—both in front of and in the rear of the loud speaker cone. Great heavens! The additional power generated by advancing the gain control had actually torn bits and pieces off the antennas and out of the transmitters of the hams I had been working.

I cleaned the rats nest out of the speaker enclosure and replaced the speaker on the shelf. (*Mental note*—Just gotta be more careful with that additional gain control.) I resumed operations. After several successful contacts I became involved in a rag chew with a ham from the old home town and in the heat of interest I accidentally struck the gain control advancing it sharply. There was a shattering crash and bits and pieces of various electronic apparatus spurted through the grill in the front of the speaker enclosure and tumbled to the bench. There, I'd done it again! The cone of the speaker was absolutely ruined. Couldn't have holed it better with a twelve gauge shot gun.

Fail Safe

The next thing to do was figure some way out of this dilemma or at least work out some fail safe system that wouldn't require a new speaker cone every time we had an accident. Flash! Another idea struck! All I had to do was rig up an elastic cone and the days of shattering would be over. Pawing through the endless resources of the depot yielded a very thin elastic plastic membrane that appeared to have promise. Whipping up a speaker cone of this glop was no problem and with the new cone installed I was back on the air in jig time.

Super Selectivity

With the shattered cone worry out of my mind I relaxed at the operating station and even enjoyed a luxurious canister of malt liquor that had been prepared for the boys overseas.

Happily we tuned along—listening here and listening there and the elastic cone did not have to be called into service as an emergency measure because we kept the situation well under control. This was too easy! Quickly racking the possibilities through the old think-tank—I wondered if it would be possible to vary the elasticity of the cone in such a manner as to enhance the selectivity of the RPHTSSR even more. Back to the boards!

Thinking through the basic physical properties involved we quickly calculated that not only a variation in the magnetic field but also a variation in an audio field should cause nodes to be formed on the cone in such a manner as to increase or decrease its effective plasticity. This proved to be true and as soon as we had the necessary audio generating apparatus brewed up, we found that we could quite effectively superimpose certain characteristics upon the speaker cone which gave the exact desired results.

Back to the wars! Even better now. We found that we could actually differentiate between various signals coming from the old home town even though they were on the same frequency. Although certain stations were located only three or four houses apart it was quite possible for us to effectively separate these two equal strength signals with zero frequency difference. Mobiles were an even more fascinating story. But therein lies the end of our experiments with the RPHTSSR.

One day while operating our usual arm chair QSO, we heard a friend of ours on the band with

[*Continued on page 100*]

D.C. to D.C. REGULATED CONVERTERS

BY CANTRELL SMITH,* K4JQG

Part I

The design of d.c. to d.c. converters was covered by the author in a series of three articles published in 1963[1]. Now, in a two part article, the addition of a regulator circuit is described. The need for regulated power supplies is well known insofar as the load is concerned. This regulator circuit also maintains a constant frequency for the switching transistors. Part I discusses the design philosophy and the circuit operation while Part II covers the design procedure.

THREE of the most important reasons for regulating a power supply are the frequency stability, protection of the components, and consistent operation of the device to which power is being supplied. Regulation is becoming more and more important as we move rapidly into the high-power r.f. transistor era.

Frequency stability of oscillators has, of course, always been important, but, with today's well designed transmitters and receivers with highly selective tuned circuits, frequency stability is absolutely essential. It is difficult enough to compensate a tuned circuit for the effects of all other variables without having to worry about fluctuating supply voltages.

Protection of components from overvoltage is important both from the standpoint of economy and trouble-free operation. With a regulated supply one does not have to worry about using components with a voltage rating considerably higher than nominal operating voltage. High power r.f. transistors are particularly vulnerable to excessive voltage and over dissipation. A glance at a manufacturer's price list for these devices will immediately show why it is important to protect them.

Consistent operation means normal receiver performance and full r.f. power output of the transmitter over a reasonable range of input voltage change. In an automobile with a 12 volt electrical system the input voltage can vary from 11 to almost 17 volts. This can be disastrous, particularly in solid state receivers and transmitters, due to the detuning effect on tuned circuits as well as component failure and loss of power.

Regulators fall into two broad general categories—series and shunt. The series regulator consists of a controlled impedance in series with the load and the shunt type bypasses the load and

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[1]Smith, C., "Practical Design of a D.C. to D.C. Converter," *CQ*, Part I, May 1963, p. 29; Part II, June 1963, p. 28; Part III, July 1963, p. 22.

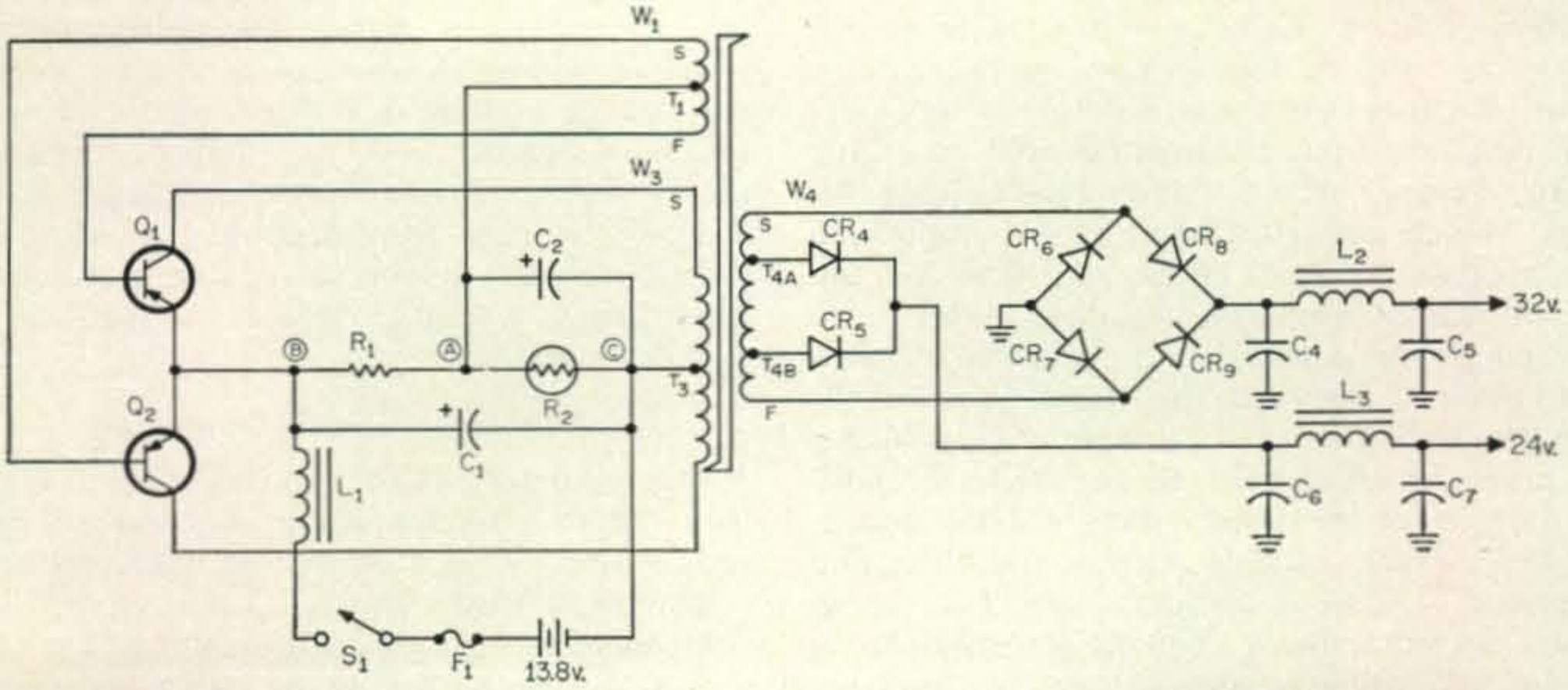

Fig. 1—Circuit of a d.c. to d.c. converter. The secondary circuit *(W4)* consists of a bridge and full wave rectifier.

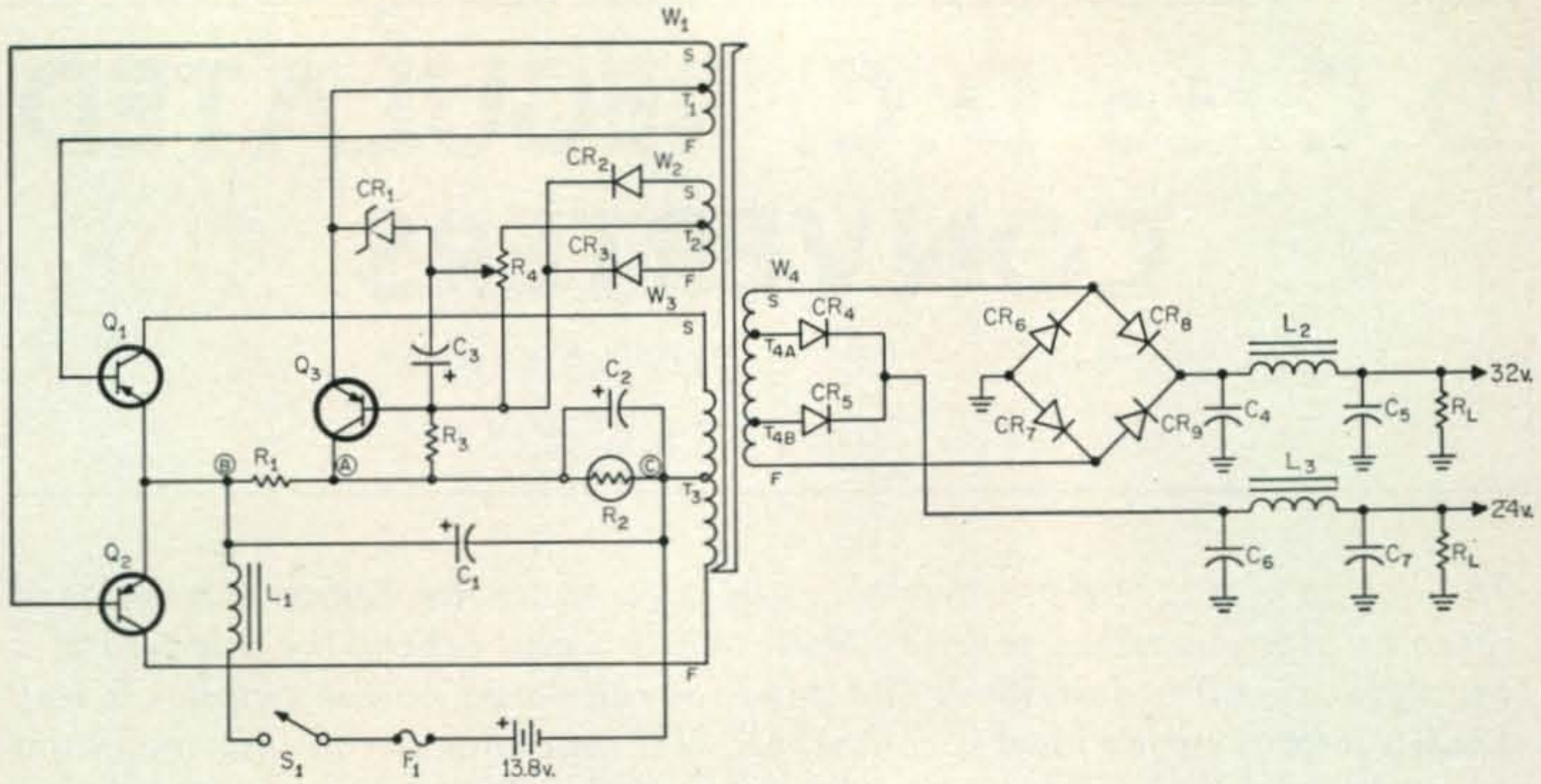

Fig. 2—Circuit of a d.c. to d.c. convert with a regulator circuit (Q_3) as part of the switching circuit. Insertion of the regulator in the primary controls both d.c. outputs.

draws extra current to hold the output voltage down. As a general rule, the series type is more efficient and is usually used to control high-current supplies.

The regulator described here is basically of the series type. The series elements in this case are the switching transistors. The circuit was developed to operate General Electric's solid state Porta-Mobil transceiver in an automobile. For the benefit of those not familiar with transistorized supplies I will first describe one complete cycle of the supply and then explain how the regulator works. Refer to fig. 1.

Circuit Operation

When S_1 is closed electrons will flow from the negative terminal of the battery to point C, through the voltage divider R_2 and R_1 to point B, and on to the positive terminal of the battery. This electron flow causes point A to be negative with respect to point B, the emitters of the transistors. You will note that for d.c. point A is connected to the bases of Q_1 and Q_2. Therefore, the bases will be negative with respect to the emitters. This is the proper bias to make the transistors conduct. Due to inherent characteristics of the transistors and differences in circuit constants, one of the transistors will start conducting before, or will conduct more than the other. Which one starts first is not important. Assume that Q_1 starts conducting first and follow the action through a complete cycle.

When Q_1 starts to conduct electrons will flow from point C through the upper half of the primary winding *W3* and throughout Q_1 collector to emitter circuit to point B, and on to the positive terminal of the battery. This will be a changing d.c. current, starting with a minimum and increasing to some maximum value. The changing d.c. current induces a voltage across the lower half of the primary and across the feedback winding *W1*. The induced voltage is of the proper polarity to increase conduction in Q_1 and prevent conduction in Q_2. In other words the base of Q_1 becomes more negative and the base of Q_2 swings positive with respect to the emitters. Transistor Q_1 continues to conduct with an increasing current until the core of the transformer saturates. At this point the flux ceases to change and the magnetic field starts to collapse. The collapsing magnetic field reverses the voltage polarities across all windings. This, of course, tends to stop conduction in Q_1 and start conduction in Q_2. The same series of events is now repeated in the Q_2 circuit and associated windings. The transistors will continue to switch back and forth as long as voltage is applied to the input terminals. The a.c. output of the secondary is essentially a square wave.

In the series of events described above each transistor should be in complete saturation (minimum voltage drop across it) during the time it is passing maximum current. For germanium transistors this minimum drop should be about 0.5 volts or less. If for any reason the base current to the transistors should decrease, the voltage drop across the collector-emitter junction would increase. This would decrease the voltage applied to the primary winding and of course cause a corresponding decrease in the voltages across all other windings. If such a change in base current could be controlled it would provide a means of regulating the supply. This is exactly what is done in the regulator circuit described here.

Regulator Circuit Operation

The regulator circuit is shown in fig. 2. The objective here is to change the base current in the proper relation to a change in input voltage or a change in load current. This response is accomplished by inserting a transistor in the center tap of the feedback winding (*W1*) and controlling it with the rectified voltage from an extra

winding (*W2*) on the transformer. Since all windings are on the same core, the voltage across this winding will tend to change in the same direction as the voltages across all other windings. If the input voltage is changed, the voltage across the primary winding (*W3*) will tend to change in the same direction and there will be a corresponding change in the voltages across all other windings.

If the load resistance R_L is increased the load current will decrease and the output voltage will tend to increase. The opposite is true for a decrease in R_L. These changes are due to the internal impedance of the supply and for practical purposes can be considered primarily as losses in the transformer and voltage drops across the switching transistors.

The control circuit is made up of Q_3, C_3, R_3, R_4, CR_1, CR_2, CR_3, and *W2*. Transistor Q_3 is controlled by the rectified output from the control winding (*W2*) and the zener diode CR_1. The ratio of winding *W2* to winding *W3* is adjusted to furnish just sufficient breakdown voltage for CR_1 at a minimum input voltage (11 volts) and the maximum desired load current. The bias on Q_3 will now be moving toward cutoff for all higher input voltages and all lower load currents. If the input voltage is increased the voltage across R_4 will tend to increase thereby increasing the current through CR_1 and driving Q_3 further into cutoff. This action causes the base current to Q_1 and Q_2 to decrease and the excess input voltage will be dropped across these transistors. The same action occurs if the output load current is decreased. Therefore, for an increase in input voltage or a decrease in output current the output voltage and input current will remain stable.

Advantages of This Circuit

There are several advantages of this type circuit over series regulators in the secondary. First of all, if series regulators were used in the secondary there would have to be one for each output of the supply. With this circuit multiple outputs can be regulated with the setting of only one control. This, of course, means fewer components, lower cost, and greater reliability.

Feedback control lends itself well to the control of power supplies with high voltage secondaries. The components in the control circuit need to withstand only the voltages present in the primary, feedback, and control circuits.

The over-all efficiency will be better than it would be with series regulators in the secondary. This is because the regulating is done before the losses in conversion and because one of the sources of conversion loss (the switching transistors) is used to do the regulating.

One disadvantage is that more heatsink than normal for the switching transistors is necessary. However, this is partially offset by the fact that regulator efficiency is better. If secondary regulators were used they would, of course, have to have heatsinks and the over-all heatsinking would have to be as great as, or greater than, that with feedback control.

Part II, to be presented in a later issue, will cover the design procedures for the regulated supply. [*to be continued*]

MOBILE SECURITY

BY AL SMITH,* WA2TAQ

How secure is your mobile gear? Could just anyone untwirl a couple of knobs, remove a few plugs and make off with your favorite transceiver? On the other hand, is it possible to put your mobile transmitter on the air by the mere turning of a switch? Remember, you are responsible for control of your station at home or mobile.

Have you ever considered the number of times your mobile gear is available to unauthorized persons? It happens every time your car is left unlocked or unattended, whenever you let someone use your car, when you leave it with a parking attendant, when you leave it at your gas station for repairs and even when leaving passengers alone, particularly children, you are leaving yourself wide open for trouble, unless you take measures that will in some way disable the transmitting portion of your rig. Now we have two security considerations, theft and unauthorized use.

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Theft

It would look a bit silly to tie your mobile rig with a stout chain and lock it to your steering column. Yet who knows? In some areas those measures may not prove safe enough.

A somewhat milder approach may be to install detachable bars that lock in place. Although this may appear good we must remember that there are a few locks that can't be opened.

This brings us to yet another security measure, that of some sort of an automobile alarm. An auto alarm is good for over-all protection. The easiest way for a thief to steal your gear is to take the car itself and remove the rig at his leisure.

Alarms

There is one gadget on the market that is easily installed. It works on a balance principal and is attached to the automobile horn. If someone enters your car it will set off the mechanism and sound your horn with a continuous series of

dots until reset. There is a disadvantage in using this system because the neighborhood clowns could set it off by leaning on a fender. This could be a little disturbing at three A.M.

A more sophisticated alarm could be installed so that a warning signal is heard when a door trunk or hood is opened. Almost every car on the market today has at least the front doors connected to a switch which turns on a light when the door is opened. The door switch usually grounds one leg of the light. Also, your horn button ring works on the same principle; it also grounds one side of the horn relay which activates the horn. By running a jumper wire from one of the door switch wires to the horn wire (before the relay) you have an alarm that will sound when the door is opened.

One slight drawback to this set up is that the horn will stop sounding when the door is closed again. We can circumvent this problem by installing a latching relay in the line that will keep the circuit closed even after the door is shut. One important consideration is to install a disabling switch that will shut the alarm off when you want to make normal use of the car.

For those cars without rear door switches you'll find they can be simply installed and you may even find a plate covering a ready-made hole for the switch. When the plate is removed you might even find a wire has been factory installed for this purpose.

Lines can be extended from this circuit to afford protection to your trunk and engine compartments. A door switch or other trip type device can be installed to sound the alarm if the trunk or hood is opened.

If the horn, as a warning system, is not desirable then a bell or siren can be substituted. In many areas the sound of a horn blowing may not be too unusual and will attract little attention. When a siren sounds its only natural to look to see where it eminates from.

Key Switch

People who have something they want protected do not advertise that the item is there for the taking. Anyone who installs a burglar alarm key switch in a prominent place is doing the same thing as posting a sign saying, "I have something valuable here." The professional thief has many tricks up his sleeve and he could no doubt disable the average car alarm in a matter of seconds. However if he does not suspect an alarm and trips it he will not be willing to wait around to disable it. A switch in an out of the way spot such as in the grille area, behind an ornament or under a fender would give even more security to your alarm set up.

Power Source

Most alarms in automobiles and trucks will operate from the vehicle battery. You can go a step further by using another battery located in the trunk. This will give you the advantage of not finding a dead battery if your alarm goes off and you can not get to your car right away. It will also keep the alarm working if the burglar disconnects the regular battery. You might set this battery up to accept a charge along with the regular car battery and use it for your rig as well.

As a final safeguard to the system a switch or trip device could be installed on the rig itself so that the alarm will sound if the rig is pulled off the mount.

Another easy way out is to mount the bulk of the gear in the trunk and use a small remote control unit under the dashboard such as the Swan 400 and the model 406 miniature remote v.f.o.

Insurance

The fine print of your insurance policy will no doubt state that your car must be locked in order for you to have coverage. Having an alarm will show your insurance company that you are acting in good faith and may make any settlement on a claim easier to come by. Incidentally you might check with your insurance agent (or read your policy if you can understand it) you may find that your Household Furniture or Homeowner's Liability policy may cover your amateur radio equipment not only in the home but possibly in the car and other locations.

Available Alarm Systems

In the course of seeking information on alarm systems for automobiles it was discovered that they are hard to come by and are usually wholesale only. Fortunately I came upon a complete automobile alarm kit consisting of a warning siren, 6 door switches, wire, brackets for hood and trunk switches and complete instructions. It also includes a key switch for disabling the system plus a decal indicating an alarm is installed. This unit carries a list price of $27.95 which sounds reasonable for the package.[1]

Illegal Transmissions

Having a microphone staring one in the face may prove too great a temptation for some people. The urge to call CQ DX could prove too great to overcome. This writer has had a personal experience with such a bootlegger using a mobile rig.

Just as we bugged the car we should also safeguard the rig to keep it off the air while out of our sight. An easy way is to pull a fuse. However fuses and holders are not uncommon and could be substituted.

A key switch would do the trick as would a toggle switch hidden somewhere. Most mobile power supplies have a negative line that runs to the on/off switch in the transmitter. This line activates a relay with heavy duty contacts which connects the 12 volt line to the power supply. If your key switch is put in this line it will make it impossible to put the rig on the air. If you wish you can connect this negative line to the alarm circuit. In fact, why not run a wire from the push to talk switch to the alarm system so that the siren (or horn) would sound when ever the mike switch is pushed? ■

[1]Made by On Guard, 512 W. 20 St., N.Y., N.Y. 10011. Sold by Lafayette, Allied and Arrow Electronics.

MOBILE ANTENNAS FOR PORTABLE USE

BY E. M. WAGNER,* G3BID

WHEN the mobile operator comes temporarily to rest in some portable or temporary location such as a hotel, motel, or a friend's house, he often likes to take the rig out of the car and operate.

He is then faced with the problem of an antenna. He can carry a trap dipole with him in the car, or possibly a long wire. If he uses the trap dipole he will need two supports, such as trees or masts in order to string his dipole. The long wire will probably only need one support, but he will need some sort of antenna matching unit as most mobile rigs will not operate happily into a long wire except for the band on which it offers a low impedance to the transmitter.

It seemed so tempting to take the mobile whip off the car and support it, somehow, outside the window. This was tried on a recent trip to Luxembourg and Austria. The outer conductor of the coax was grounded to a water pipe or radiator in the hotel bedroom with the hope of simulating the car. The results were frankly bad. We only worked a few locals and even these were at very poor signal strength compared with a long wire. No DX or even reasonably distant stations were worked.

Disappointing as these results were, they were not really surprising. The car is an integral part of the radiating system in a mobile installation. Some American mobile operators, I understand, carry a long length of coaxial cable and run this out from the motel bedroom to the car, using the mobile antenna still mounted on the car. While this may be an excellent system when operating from a motel with the car near at hand, it can be most inconvenient from a hotel bedroom several stories high at some distance from the car.

Mobile Antennas

There are at least two theories at present on the mode of operation of a mobile installation on the amateur bands. One theory sees the mobile whip operating as a ground plane, the car either providing the ground plane itself, or the capacity to real ground being adequate to provide the ground plane effect. The other theory sees the mobile whip and the car together operating as a dipole, and together resonating as a *half* wave length.

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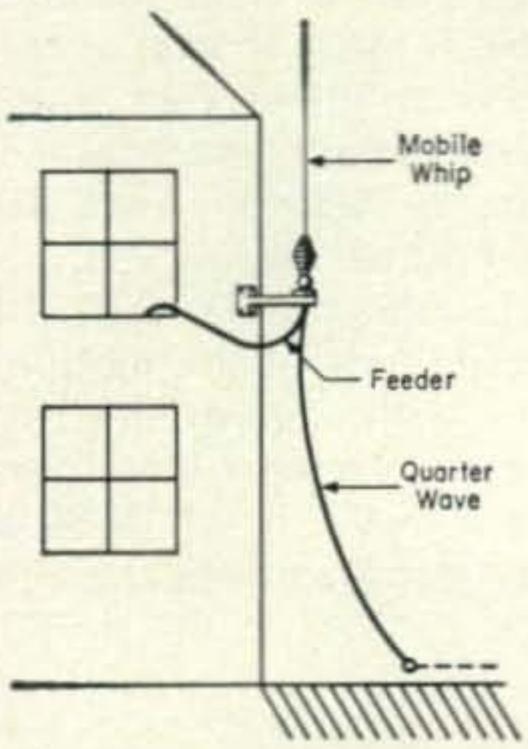


Fig. 1—Mobile whip used as a dipole for portable operations.

On 10 meters it is easy to envisage either effect. The car is quite large enough to provide a ground plane on 10 meters; equally, the car can be envisaged as providing the other quarter wave, so that the whole operates as a half wave length.

Similarly on 15-meters both solutions seem possible.

On 20-meters it is a little more difficult to envisage both theories, though the half wave theory is possible to explain in two ways.

1) That the whip is made essentially longer than a quarter wave to compensate for the absence of enough car to represent a quarter wave on 20 meters.

The electrical center need *not* necessarily be at the feed point. Erich Stöss, DL6UH, has done some experiments which would support the half wave theory and which seem to indicate that the feed point is not always the electrical center.

2) That owing to most cars containing large amounts of magnetic materials, the inductive effect of this makes it possible for a path of an electrical quarter wavelength to be found on the car even if this involves going round a few corners.

On 40, 80 and 160 meters both theories are more difficult to envisage. A car can hardly represent a quarter wave on 160 meters. Likewise the capacity to ground at these frequencies would have to be very large to support the ground plane theory, and with a car's ground clearance of, say, 5 inches from the surface of the ground, and probably many feet to *true* ground, it seems difficult to see that there is adequate capacity to real ground to support the ground plane theory.

Half Wave Operation

Turning these matters over in my mind and remembering the very poor results which we had obtained with the mobile whip working against a water pipe or radiator ground, I decided to try the *half wave* theory on 15 and 20 meters, by working the whip against a quarter wave of wire

hung downwards from the window, while the whip itself stuck upwards. (See fig. 1)

The nature of the building will obviously affect the results, and it is necessary to give details. The building is a brick built cottage with metal window frames, and the usual amount of water pipes, electrical wiring, *etc.*, but no rain gutters.

The mobile whip used initially was a Mark Mobile HW3 Tribander suspended about two or three feet out from the window on the first floor, with the base of the whip approximately at the level of the bottom of the window, and about 12 or 13 feet above ground. The whip was driven from a Drake TR3 in the first instance running about 300 watts p.e.p. input and the whip was fed with 52 ohm coaxial cable.

As 15 meters was open I decided to try this. Results were good and I worked W3ABI, K9PPX, W2DAG, K3ITE, K2PEJ, WA2TAQ, all Q5 and varying between S3 and S9, as well as W6CCP at 3/3.

At first the Drake was *not* grounded in any way. Then I grounded the chassis of the TR3 to the water pipe. At once there was a drop in signal strength. I then replaced the coaxial feed with a balun and 72 ohm twin line. The results were the same as when the transmitter was *not* grounded but now the transmitter could be grounded to the water pipe without any effect on the signal strength.

Two Band Operation

Then I changed to 20 meters, by disconnecting the quarter wave for 15 meters and connecting a quarter wave for 20-meters instead.[1] I worked VE2BCT 5/5 and various other stations.

I then remembered that I was using a Triband mobile whip for 10, 15 and 20-meters in which the coils for 10, 15 and 20 meters were in circuit all the time, I decided to connect the quarter waves for 15 meters and 20 meters simultaneously. This worked excellently and I had a two band arrangement. I did not bother about 10 meters at this stage as the band was not open.

The operation of the Mark Mobile HW3 Tribander may shed some light on the mode of operation of mobile installations. In the HW3 the three small helical loading coils, one for 10 meters, one for 15 meters, and one for 20 meters, are in circuit all the time. The r.f. energy automatically selects the particular coil which is resonant, ignoring the other two coils since they present the wrong impedance. May it not be true on the h.f. bands that in some direction across the car there is a path which is resonant at the frequency on which one is transmitting? The r.f. energy selects the resonant path. At a different frequency the r.f. may choose another path which is resonant at that new frequency. So that on 10, 15 and 20 meters some path in the car can always be found which is resonant at the frequency being used.

The car, therefore, represents an infinitely adjustable quarter wave, and the r.f. will automatically choose whichever path over the car body, chassis, engine, *etc.*, presents the perfect resonant length for the frequency in question. This would go far to explain the very satisfactory results obtained from mobile installations and the advantage of excellent bonding between all parts to ensure that whichever happens to be the ideal path for the r.f. to find its resonant length, is free from all avoidable resistance losses.

Next day I connected the mobile whip with its two quarter waves (one for 20 and one for 15 meters) to the normal home rig, a KW Viceroy, plus KW 500 Linear running about 500 p.e.p. input and worked a number of stations. (I usually reduced power to 400 p.e.p. to avoid possible damage to the whip.)

On the normal fixed station little difference could be found whether the whip was fed with coax or through the balun with 72 ohm twin feeder at first. This was probably due to a longer feeder being used.

It seems reasonable that if a short feeder is used as can often be done when using an antenna just outside the window, grounding the chassis will also ground the outer of the coax, and with a short feeder this will ground one side of the radiating system, thus reducing the efficiency of the radiating system. If the feeder is a quarter of a wavelength long, the grounding effect will be lost, but can recur again when the feeder is half a wavelength long.

Later I connected a Webster Bandspanner instead of the Mark Mobile HW3 and used only one quarter wavelength wire at a time. The tests were carried out mainly on 20 meters and no noticeable difference could be found with the Bandspanner compared to the HW3.

I then did a long test with K1AQI, using first the coax feed; next I grounded the outer braid of the coax, and signals were slightly weaker; then I changed to the 72 ohm twin feed with the balun, and signals were definitely better than with the coax, whether it was grounded or not.

I did notice that the s.w.r. was slightly better with 72 ohm twin and the balun. The s.w.r. was usually quite good—1: 1.2 to 1.5 with the 72 ohm and the balun. Not enough tests have yet been made with coax and twin feed to make any definite assertion on this point. I have had better reports on the coax on some occasions, and better reports on twin feed on others. The changeover can never be instantaneous and the normal QSB is likely to lead to varying results. Only after a larger number of tests could one come to a more definite conclusion. My own impression to date is that the twin lead with the balun is slightly better.

It is hoped that this will give some idea of the capabilities of the mobile whip outside the window with a quarter wave hanging down. While the experiments were carried out on 15 and 20 meters with the Mark Mobile HW3 and the Webster Bandspanner, there is no reason to believe that similar results would not be obtained with many other mobile antennas. ■

[1]The 20 meter quarter wave had to be pulled out a little to prevent it from touching the ground.

Silencing 3000 Pounds of Noise

BY TOM KNEITEL,* K2AES

A noise-grizzled veteran reminisces about some of the cheap-and-dirty tricks he has used to silence ignition noise. Diesel and gas-turbine drivers pass this by.

THE best way to silence a Jaguar is by bouncing a 30-30 off its cranium; that is if your name is Bwana. If you're a ham, you are possibly more familiar with the 4 *wheeled* version (as opposed to the 4-legged variety); and you'll have more luck with a few capacitors than with a rifle (it cracks the block, dents-in the carbs, makes a real mess).

As a matter of fact, I began my one man crusade against ignition noise back in the days when I had a Chevy. Through the years I have tried all manner of suggestions ranging from hanging asafetida bags on the radiator cap to chanting Druid incantations (don't laugh, that one seemed to reduce regulator noise to some extent). Through these trials I faithfully kept a detailed logbook of both the smashing successes and resounding failures. When I bought the Jag I gave the whole series of experiments one final run through, as the unmodified Jag engine generated noise decibels the likes of which I had not previously encountered. (The Jag is a 1958 3.4 with a 1962 3.8 XK-E engine, by the way.)

I am now happy to release the results of my efforts. Nothing revolutionary or previously untried, but a recap of some of the easier and less expensive noise crushing methods which seem to do the job.

Generator

Best way to confirm the fact that you have a noisy generator seems to be to turn on the rig and then to rev up the engine, switching off the engine suddenly. As soon as the engine is off, all of the QRM causing components in your car are eliminated with the exception of the generator (and regulator). The generator will continue to function for a few seconds after the ignition is cut, and give you a good receiver-full of generator whine. As an interesting sidelight, someone once asked if Italian cars have Chainti generator whine. I replied, "Whine not?"

My recipe for whiney generators is a 500 mf 12 volt electrolytic from the generator output ("A") terminal to ground (Fig. 1). Observe polarity.

An alternate method, usually somewhat more effective, is to make up a coil of 20 closewound turns of #12 enameled wire at a diameter of ¾". Attach this in series with the "A" generator terminal lead. A .01 mf capacitor is then hooked to the output side of this coil and grounded on the generator case Fig. 2.

At the point on the generator case where the capacitor is grounded, use steelwool to thoroughly clean off all paint and *yick* and make it a good connection.

Regulator

The regulator is next on the list. Before getting involved with connections to the thing, remove the cover and clean off any paint which insulates the cover from the frame. The mounting screws should also be checked to make sure that the regulator has a good ground connection on the firewall, if it hasn't, remove the unit and clean off any paint or grease which is there.

The lazy man's way of crushing regulator noise is by simply running a 10 ohm 1 watt resistor from the *field* terminal to ground. Sometimes this is all you have to do, but stubborn cases have responded to more drastic measures. (Fig. 3).

If the foregoing method proves a disappointment, dig up two .5 mf (Sprague 48P5 or equivalent) capacitors and install them at the "A" and "B" terminals. The metal capacitor case should be grounded on the firewall. Capacitor leads

* c/o Cowan Publishing Corp., 14 Vanderventer Ave., Port Washington, N.Y. 11050.

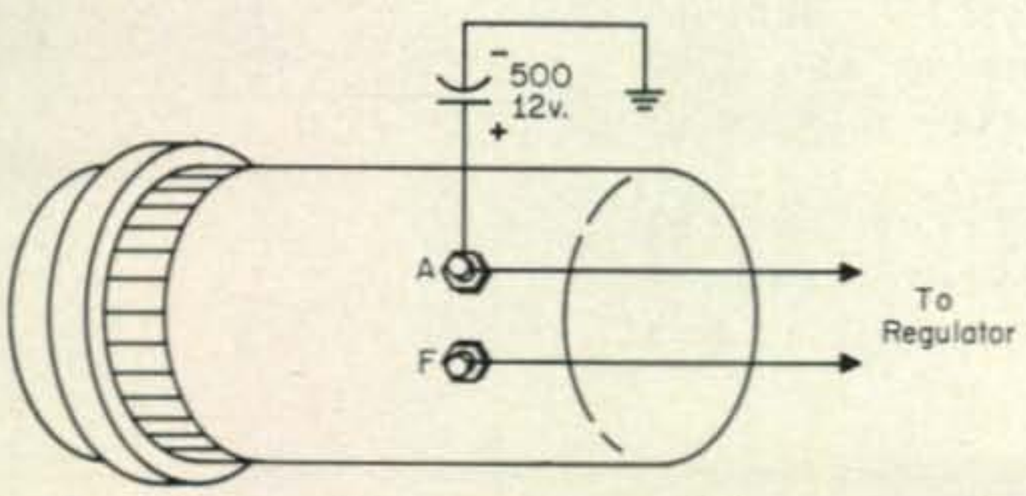


Fig. 1—A lazy man's generator cure. Observe capacitor polarity.

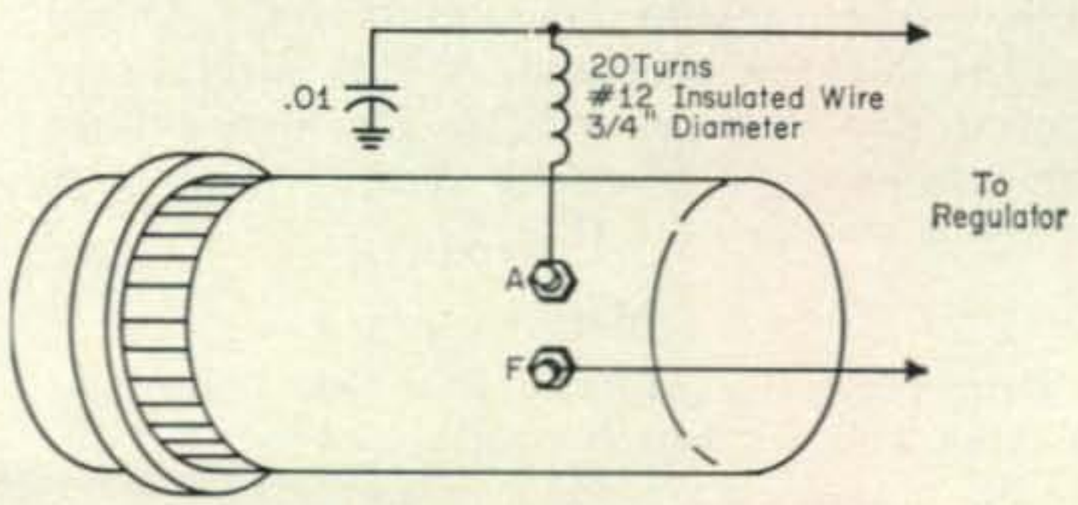


Fig. 2—A more effective generator suppression system.

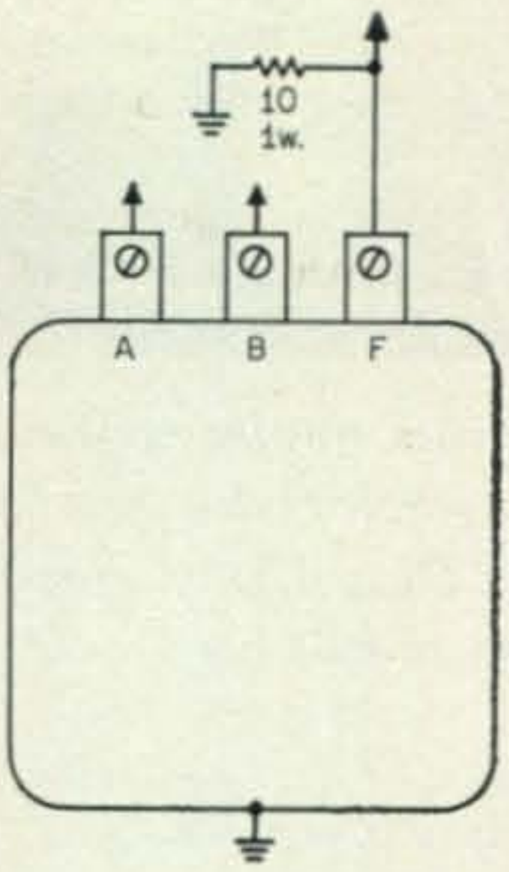


Fig. 3—The lazy man's regulator cure.

must be as short as possible.

As part of this procedure, connect a .002 mf capacitor in series with a 4 ohm resistor between the "F" terminal and ground, keeping all leads very short. This last trick (the R-C circuit on the "F" terminal) has been condemned in certain quarters as causing an early death for the regulator. I haven't found anything to back up this claim. If you find that the addition of the R-C circuit doesn't affect the noise, remove it and you'll have one less thing to worry about. This whole hookup is shown in Fig. 4.

As a final touch, you might wish to replace all cables between the generator, regulator, and battery with shielded stuff, grounding the shield wherever appropriate.

Plugs

So-called "resistor" plugs aren't new on the market, and a number of brands are available which are sold as such. My suggestion is to get a set of Auto-Lite or Champion Resistor plugs and pretend the others don't exist. Without going into other band names, some sold as "resistor plugs" did absolutely nothing, and I suspect that a few tried actually made *more* QRM than the non-resistor types I started out with.

Suggest that you have the resistor plugs checked, gapped, and cleaned every three months.

Also avoid those little clip-on spark plug resistors, I never had any luck with them, and they seem to cut into engine performance.

Distributor/Coil

The distributor should be checked to see if the capacitor across the breaker points has the proper capacitance, and the points are properly set. Every 30,000 miles the distributor cap and rotor should be replaced.

Replace the low voltage cable from the coil to the distributor with some RG-58 coax, grounding the shield at each end. A 10K carbon suppressor should be inserted in the *high* voltage cable running between the distributor's center terminal and the coil. (Fig. 5)

Meters

Panel meters cause more noise than you might imagine, and are usually overlooked by most operators on noise-suppression expeditions.

I have found that placing .01 disc ceramics between each meter terminal and ground does wonders. Keep the leads short, and solder the ground connection. Put one on the ignition switch too.

Accessories

Motors, such as heater and defroster, should be bypassed with .5 mf capacitors. Even the heat and oil sending units or the gasoline unit (mounted on the gasoline tank) can cause noise. Bypass the gasoline sending unit with a .5 mf capacitor by removing the inspection plate usually in the car's trunk compartment over the tank. If you have one of those Mercedes buggies using diesel fuel, don't write to ask for advice, I haven't the vaguest idea about your problem. Bypass heat and oil sending units with .5 capaci-

Cables

You might wish to replace the major cabling in your engine, especially if your car is more than 2 years old. This is especially true of the wiring harness between the distributor and plugs. You can make your own with 4K ohm-per-foot ignition cable, installing new terminals and making certain that they make good contact with the center conductor. In fact, solder these terminals on rather than crimp them because I have found that the crimp is a potential noise source.

Replacing the rig's power cable with RG-8 coax, right to the hot side of the battery, seems to reduce noise pickup in some cases. If you want to keep your existing power cable, try a Sprague 48P3 feed thru coaxial capacitor on the firewall and the hot battery lead from the rig connected through the capacitor to the battery terminal.

Bonding

There is always a good chance that body panels, fenders, air cleaner, mufflers, the engine hood, trunk lid, tail pipe, etc. are adding to the festival of QRM. Check this out by making up a portable bonding strap consisting of 12 inches of flat woven copper braid terminated at each end by a large battery clip. Attach one clip to the suspected metal object or panel and the other end to the frame, being certain that each of the clips gets a good bite in raw metal rather than into the rust, grit, undercoating which most of us seem to have readily available. If noise is reduced, replace the portable lashup with a permanent bond of the same braid; as short as possible, with sheet metal screws at each end.

Tires, wheel bearings and all kinds of other

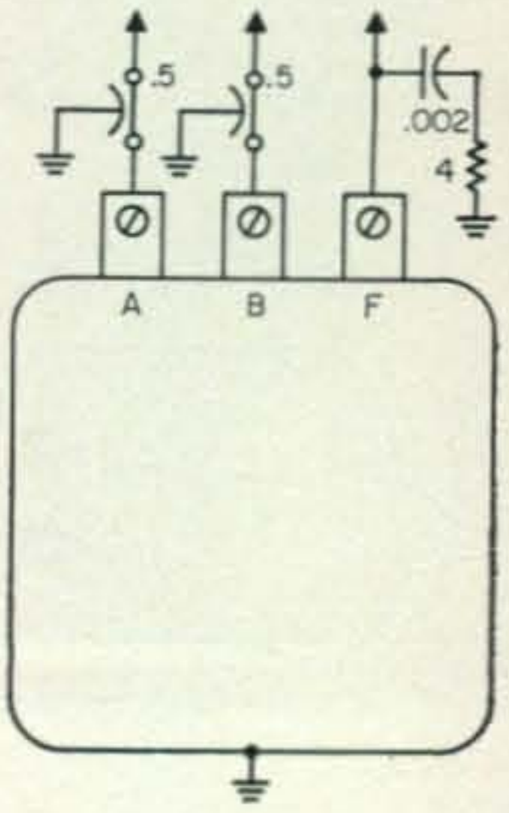


Fig. 4—The semi-ambitious man's regulator cure.

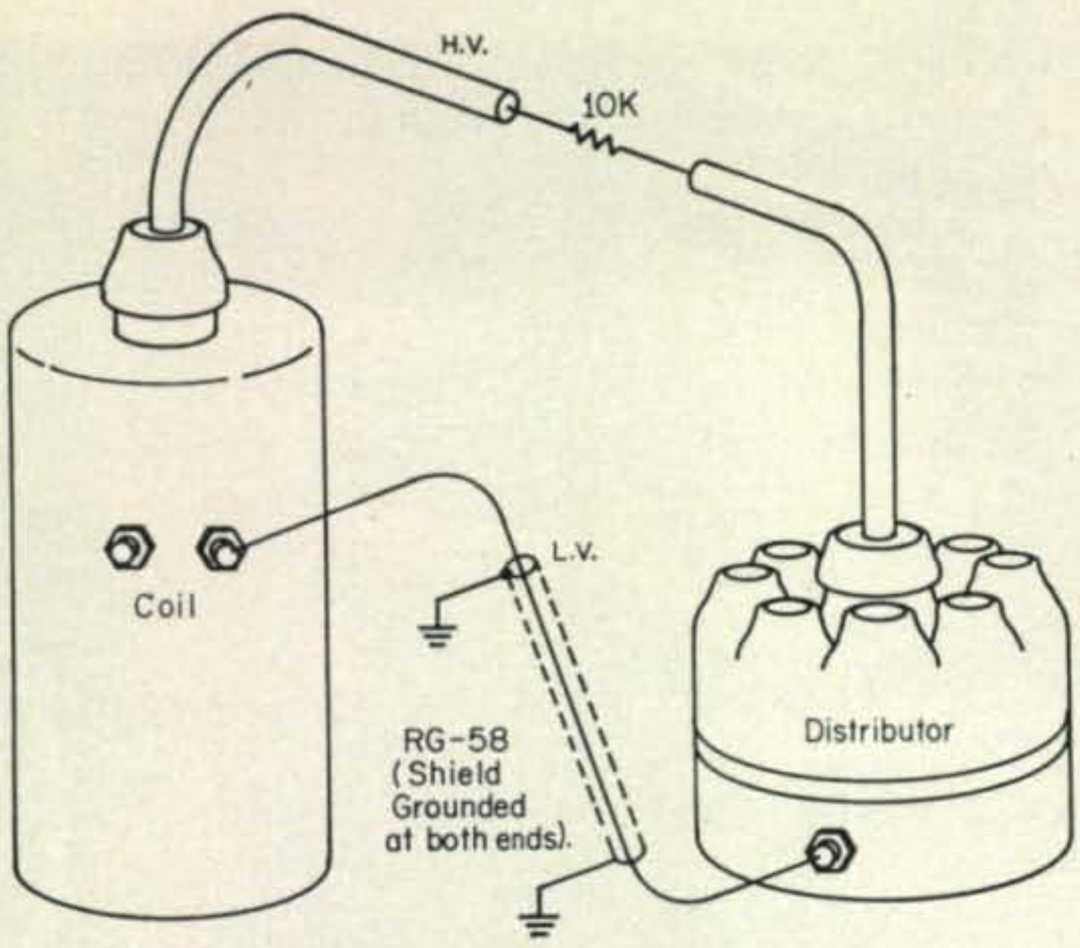


Fig. 5—Quieting the distributor and coil.

idiotic things also add to the noise and you will even find that grounding the brake shoes to the backup plates with bonding braid will help to quiet things. Put static collectors inside the front wheel grease retainer cups, and treat the tires with anti-static powder. Also add a bond from the end of the exhaust tail pipe to ground.

Alternator Systems

Some of the newer cars have alternator systems, and although I haven't been blessed with such a vehicle, I have had a sweaty hand in the silencing of several.

The problem seems to be of varying intensities in different vehicles, and some will let you off the hook easier than others.

As a start, place a Sprague 48P18 coaxial bypass capacitor at the alternator's output terminal, bonding the case to the frame rather than to the alternator case (which would be more convenient but not as effective).

Next, put an identical capacitor at the regulator in the lead from the alternator.

These two steps were sufficient to eliminate almost all of the alternator system noise in several vehicles, but others still required additional work.

The next step was to replace the lead from the alternator to the regulator with some #4 shielded cable, homebrewed by slipping ½-inch woven shield braid over regular #4 insulated wire. Bond the shielding to the capacitor cases at each end, and to the car frame a few places along the way.

Check the receiver. Still too noisy? Son of a gun!

Scrounging up a third bypass capacitor and some shielded cable, replace the lead from the regulator to the battery, placing the bypass right at the regulator, bonding it to the regulator cover and also to ground. A bond from the regulator cover to ground with 1" copper strap is usually a great help. You can also try, as a last resort, a 2" copper strap from the alternator case to the regulator case, to the firewall. Changing the control cable running from the regulator to the ignition switch also helped, use shielded wire here. (Fig. 6)

The v.h.f. bands require less work, but if you insist on trying to clean up the QRM on the lower frequencies you will probably run through all of the steps described.

Whether trying to work on either a generator or alternator system, stop the process after each step and check two things. First, does the car still function as a vehicle, will the engine start? Will it run for a few minutes without blowing the fuses? It does? Great! At least you haven't *added* to your hardship. Next, check the amount of noise reduction you have accomplished with the preceding step. We all have different tolerance levels and you may get only one or two steps into the cleaning up and find that the noise level is sufficiently reduced to scrap the rest of the project.

Of course, you still must have a receiver with a noise limiter capable of filtering out the noise generated by all the other cars operating near yours. If what you've got needs improving, a little t.n.s. noise squelch will do wonders. You can build one[1, 2], or buy one of the inexpensive wired ones sold under the Lafayette and Business Radio brands.

I have neglected to mention the possibility of your attempting any of this de-noising work by means of the commercially assembled "noise kits." Although costing somewhat more than the steps which I have described, they all seem to do a good job. They do not, however, permit you to end your investment halfway through the job if you have whittled away a sufficient amount of the noise to keep you happy.

That about sums up the noise silencing efforts on this end. You fellows with diesel cars are going to have to fend for yourselves, likewise anybody out there with a turbine job.

Turbine cars, I note in passing, have problems which *can* be cured. Batman seems to be pretty content with the job I did on the Batmobile. Went real easy, but *Holy Decibels,* that kid in the red vest is a CB'er! (*ughh*) Ever try to work with a boy wonder coaching on the sidelines? ■

[1]The TNS Twin Noise Squelcher, W2AEF, *CQ*, May '53, p. 29.
[2]More on the TNS, W2AEF, *CQ*, May '54, p. 48.

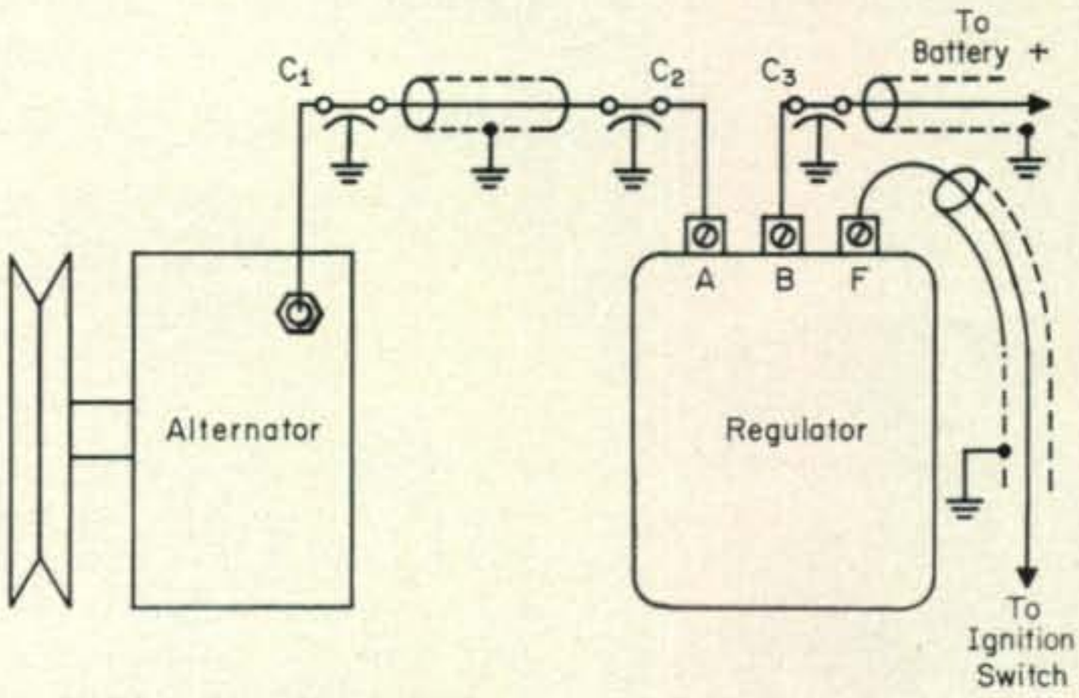
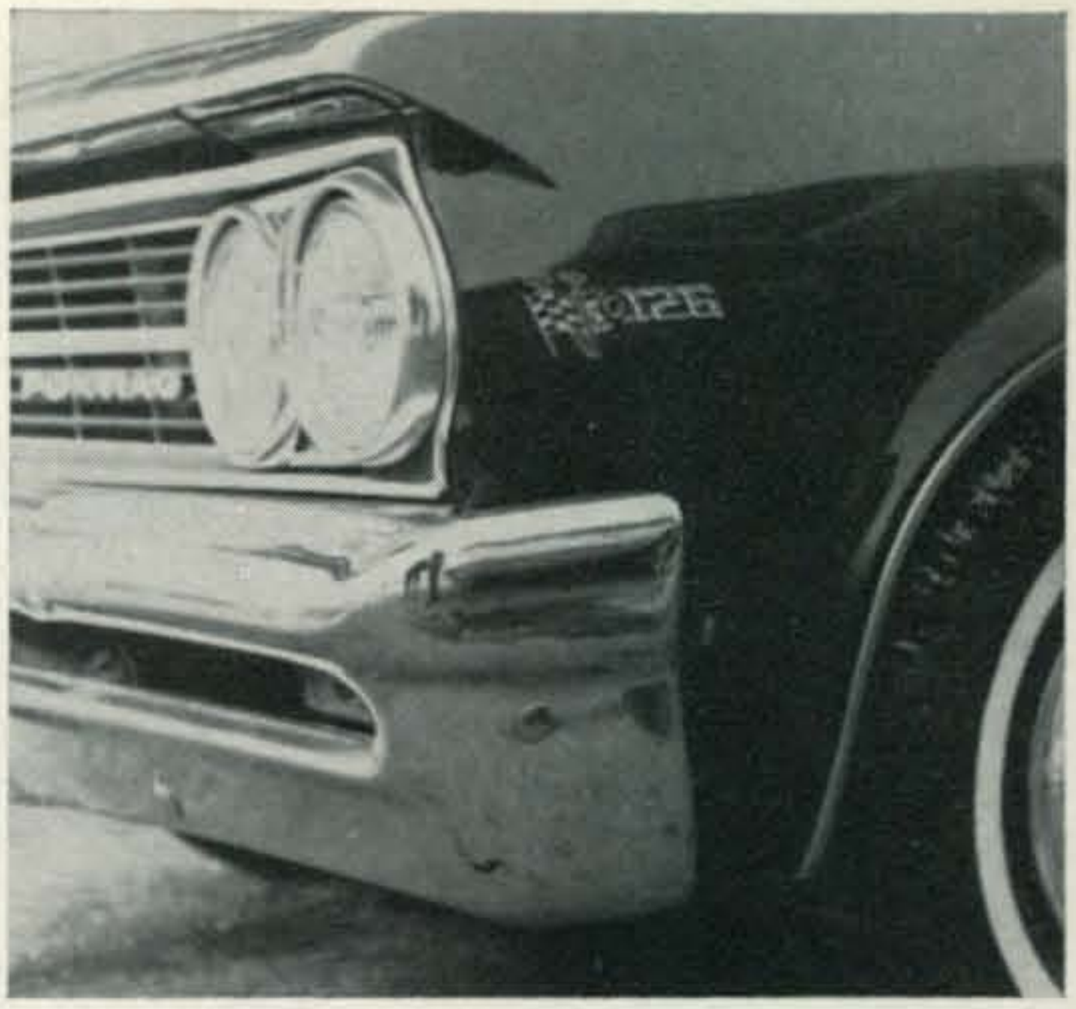


Fig. 6—A method of de-noising an alternator. $C_{1,2,3}$ are .5 mf coaxial capacitors. Banding straps described in the text are not shown. The cables shown are made by slipping ½" woven shield over #4 insulated wire.

"Help—Police! I've Been Robbed!"

BY STAN ROTHMAN,* WA2NRV



If you look close you will find the key lock for the alarm. No, that's not a James Bond device subtly hidden, that's the lock.

"HELP—Police! I've been robbed!" That was my cry only one month after buying a new car. Oh, the car was exactly where I had left it the night before, but now it was minus one completely modified transceiver and power supply, one converter, a full tool box and even a pair of gloves. After being told by the police that I could forget about finding the rig, and after listening to all the local ham comedians tell me how the anti-ham XYL had taken it out and thrown it in the Long Island Sound during the night, I decided it was about time to protect myself by putting some sort of burglar alarm system on the car.

The first type of alarm I investigated was a gravity system, a ball would hit a cylinder wall under the weight of someone entering the car as in fig. 1, therefore, setting off the alarm. The main drawback of this kind of a system is that it doesn't work if you are parked on a hill or have a flat tire.

The second system used a spark coil from a Model "A" Ford, with this alarm if you touch the car you complete the circuit, causing quite a shock. Most people only try this once. This system would not only be dangerous to my wife and me, but the car is parked in the apartment house parking lot and can be brushed against by children playing in the area as well as other tenants. I then decided against purchasing this type unit.

The third system only sounded the alarm while the door to the car was actually open, which makes it too easy to get into the car, close the door, therefore cutting off the alarm, rip out the rig, and get out and away from the car without making much noise at all.

The fourth type of alarm system was the one I wanted but proved too expensive to even mention.

This left me with only one alternative, which is to fall back on the ham tradition. This is, to start thinking and design my own system. This type of alarm system had to be:

1) Inexpensive
2) Loud
3) Easy to spot the car in the dark (by both sight and sound)
4) Trouble free

This alarm uses the car horns to scare the burglars off, and the interior lights to make the car easy to spot in the dark parking lot. In fig. 2 you will notice that I use two switches in parallel to activate the system. One is a toggle switch in a handy place enabling me to turn the alarm on and off when I am in a hurry or won't be away from the car for a long period of time. I used a

*247 North Regent St., Park Chester, N.Y.

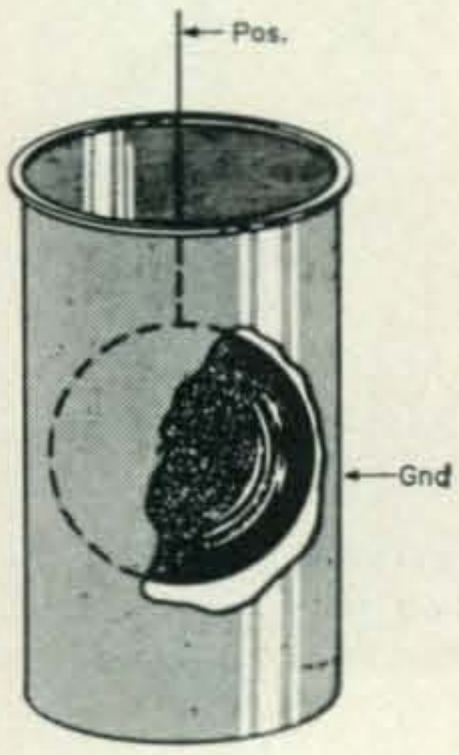


Fig. 1—A simple gravity system. Any movement on the car to disturb the balance of the ball results in contact with the cylinder thus setting off the alarm.

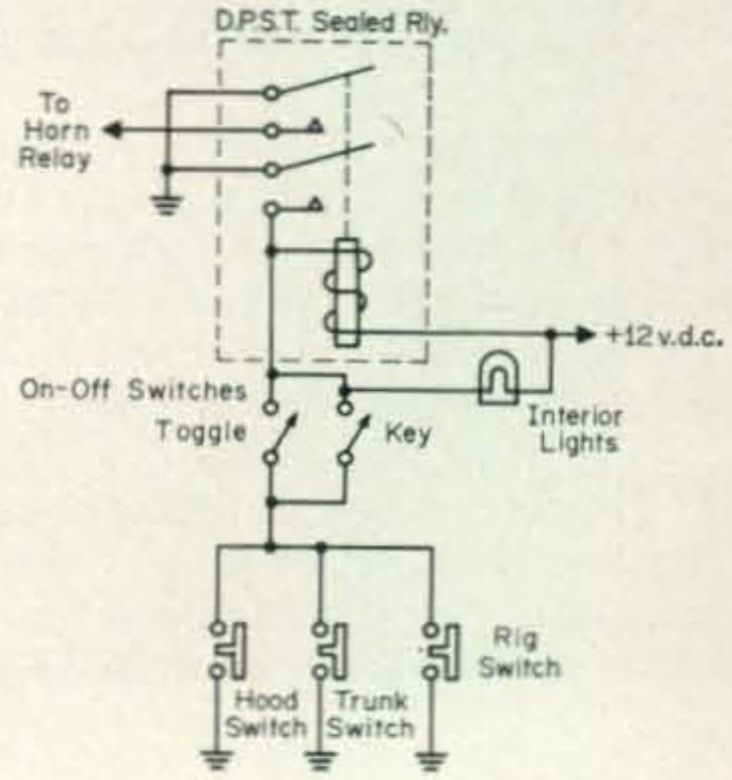
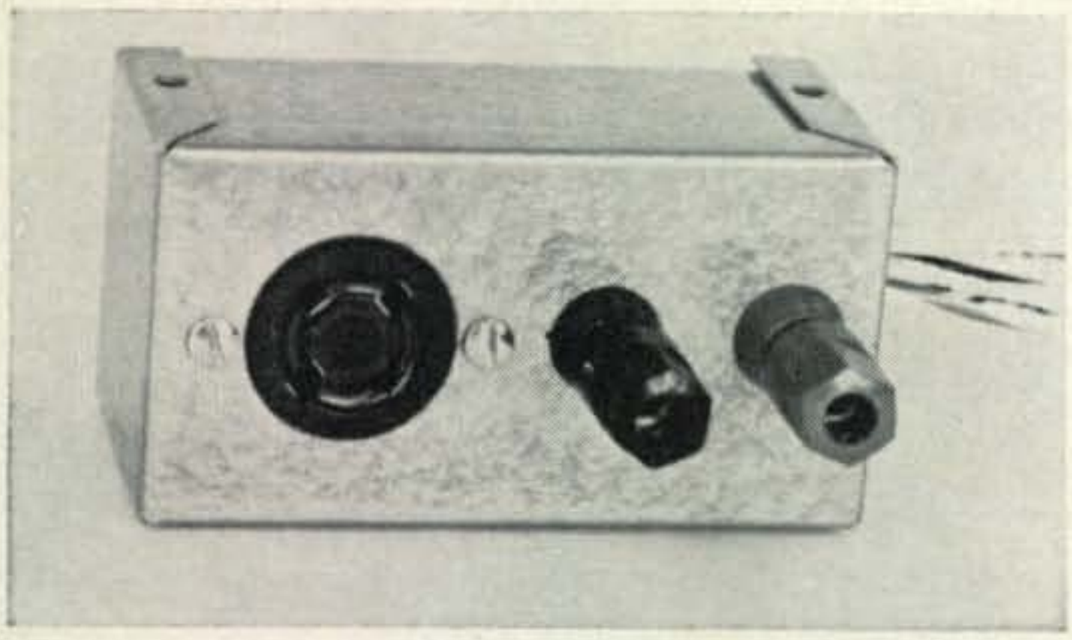


Fig. 2—Circuit of the author's alarm system. The parts are standard and available from any catalog house.

spot on the front bumper since this switch is easily accessible. The other is a key activated switch hidden in the body trim, which I use mostly at night. This is a safety measure. I used the existing door switches in conjunction with the alarm so the interior lights automatically go on if any switch closes the circuit. Here I found it easiest to tap on to the hot wire coming off the interior light itself. I also installed a switch under the hood and trunk at little extra cost. The relay itself should be placed in a position under the hood, close to the battery, horn relay, and on-off switches. I first used an open relay but dirt inactivated the circuit too often. After switching to a sealed relay no more problems were encountered. The relay is a d.p.s.t. unit with an octal base, making it easy to remove if necessary. An octal socket was mounted on an aluminum angle bracket and bolted to the wheel well, after it was wired. The parts are readily available from any local electronic, or auto supply house, and should cost a maximum of ten dollars for all new parts.

This system has been in the car over one year, and although it was only put to use once in the period, I feel it has already paid for itself. ■



The mobile 12-volt utility outlet.

Mobile 12-Volt Utility Outlet

BY WILFRED M. SCHERER,*
W2AEF

WHEN mobile gear is installed in a vehicle, the 6 or 12 v.d.c. power is usually obtained through connections made directly to the battery or through the cigar lighter on the dashboard. Direct battery connections are not always conveniently made, especially if operation is to be of a temporary nature or if the gear must be set up in a hurry.

Use of the cigar-lighter socket is convenient, but it requires a special plug, not always available. Besides this, the plug usually doesn't make a good low-resistance contact and when heavy current is drawn over periods of time, the contacts heat, and resistance increases with a resulting voltage drop. Excess heating also may burn up the contacts and even the plug itself. Another drawback is that the cigar lighter circuit is not fused, subjecting both the auto and the gear to possible damage.

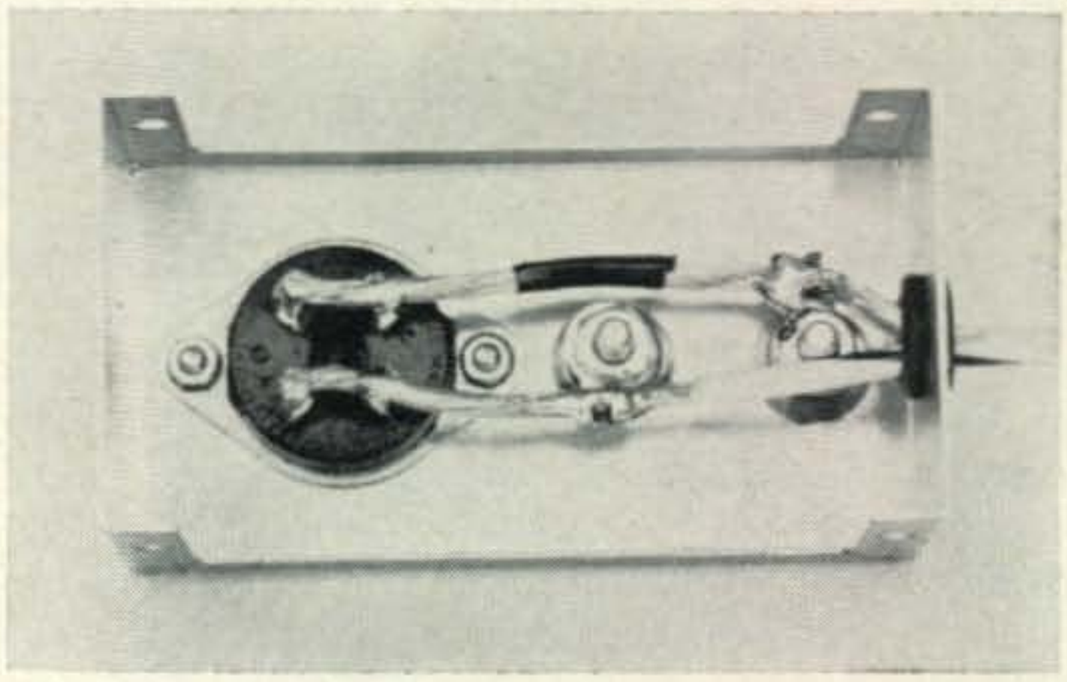
One way to avoid these difficulties is to install a 12-volt utility outlet under the dash or at some other convenient place in the front quarters of the car. The box should be equipped with a standard type receptacle of some sort and with suitable accessory terminals.

The model shown here is a 4" × 2⅛" × 1⅝" minibox equipped with a pair of Jumbo-size 5-way binding posts to which equipment, used on a temporary or test basis, may be connected directly by wire leads with stripped ends, or with spade lugs, etc. A black post is used for the negative terminal, a red one for the positive side.

A four-prong tube socket is also included to enable a mating cable plug to be used for quick installation and removal of gear that is habitually transferred between the car and other places.

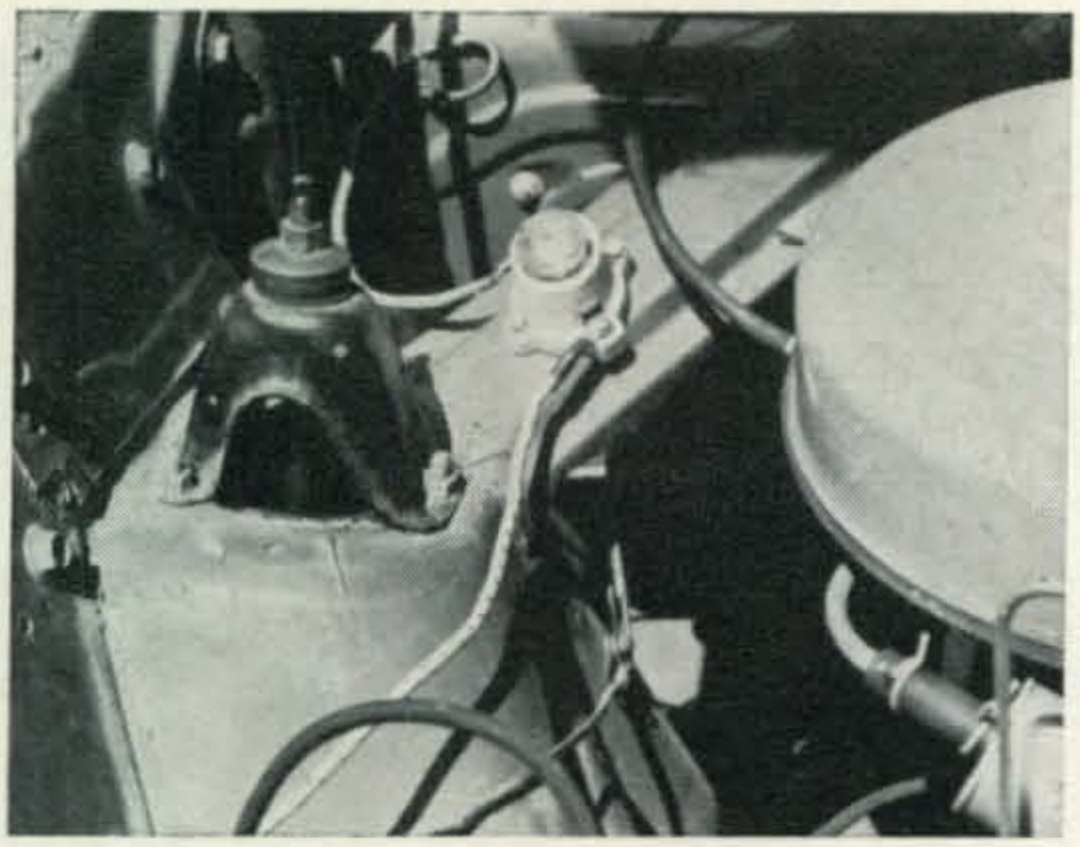
Two of the socket terminals are connected in parallel with each side of the battery-supply line to ensure a good low-resistance contact at all times. Other convenient receptacles and plugs may be used, but the main thing is to parallel as many terminals as possible to each side of the line. This is especially important if you use Jones-type plugs. Our experience with these is that the contact resistance often increases after use, so use of at least an 8-terminal plug and receptacle with 4 parallel-connected terminals to each side of the line is recommended. Octal-type units are not recommended because you'll be left in the lurch if the center key breaks off when you're manipulating the plug, as so often occurs when you're in a hurry.

The leads from the box to the battery should be at least #8 stranded wire (for resistance to



Interior view of the utility outlet box. One battery lead is connected to one of the binding posts and paralleled with two of the socket terminals. The other battery lead goes to the remaining post and socket terminals.

*Technical Director, *CQ*.



Porcelain socket with 120-volt screw type fuse shown mounted in motor compartment. The negative ground lead is connected to the firewall seen at the rear.

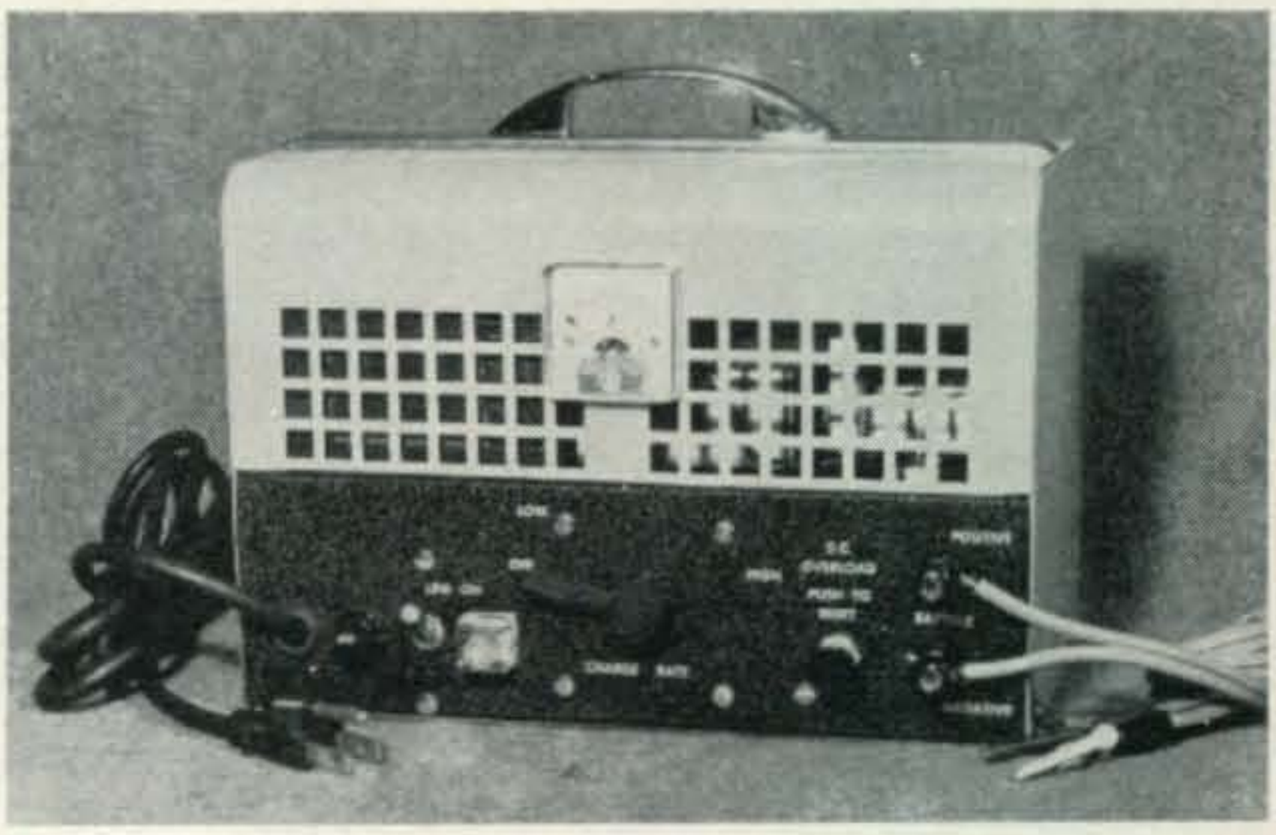
vibration). Connect the negative lead to a good ground (in a negative-ground system) either to the motor block or to the front side of the firewall. Be sure to clean the metal ground surface well and scrape off any paint. Solder a heavy spade lug to the end of the wire and secure it to the firewall with a husky self-tapping screw.

Mount a porcelain 12-volt lamp-bulb socket at a convenient spot in the motor compartment. Connect the positive leg of the utility box to one side of the socket, and the positive lead from the battery to the other side of the socket. The battery connection may be made on the battery-side of the starter relay. An ordinary 120-volt screw-type house fuse of suitable rating (10 a. usually will do) should be inserted in the socket.

This method of fusing has been used because replacement fuses are obtainable at many stores (important if you're caught on the road without a spare fuse) and because a good low-resistance contact can be maintained. Our experience with conventional electronic fuses and holders is that heating, corrosion and vibration during mobile service eventually produces high contact resistance, causing undesirable voltage drop. If you're wondering about whether or not the screw-type fuses will loosen with vibration, we've used this type for several years without experiencing such an occurrence. —*W2AEF*

A 12-Volt Battery Charger

BY GEORGE P. SCHLEICHER,* W9NLT



The stock cabinet and chassis are 10" wide and 5" deep. Height has been reduced to 6¾" as described in the text.

THE night is warm, the skip is in, and you're parked on a hill-top in the mobile, engine idling. Sure, you're putting quite a drain on the car's electrical system, but the battery's strong enough to get you started and home. You might not be so fortunate the next morning, though, and that almost-dead battery might create real problems that a good over-night battery charge would prevent. You say you don't have a charger? Funny you should bring that up—we just happen to have a neat little package that fills the bill.

The charger uses a re-wound oscilloscope transformer, silicon diodes, and a small cooling blower combined in a neat, self-contained cabinet. Output can be adjusted from 11.5 to 19.5 volts for use with either conventional 12 volt or industrial 18 volt batteries, but proper tap selection can produce 6 volt output for you VW and Porsche owners.

*1535 Dartmouth Lane, Deerfield, Illinois.

The Transformer

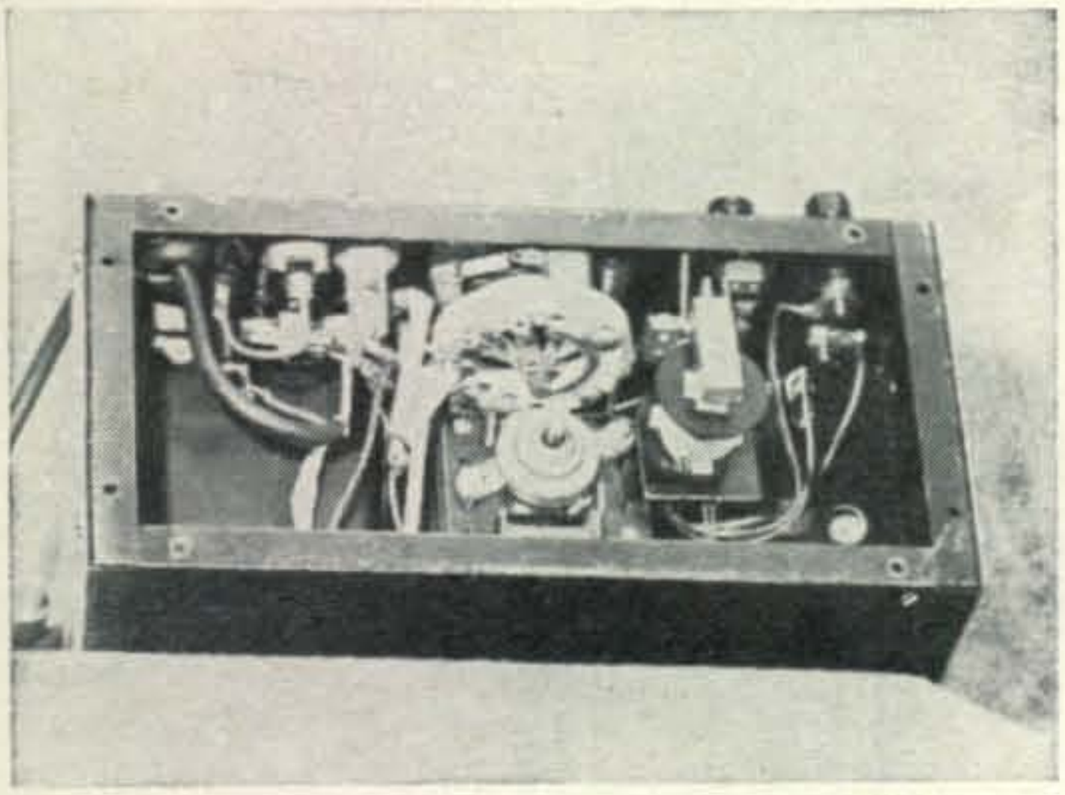
The transformer that I had was of shell-type construction. The laminations measured 3¾" by 4½" and were stacked 2½" high. The inner core measured 1½" by 2½"; cross sectional area was therefore 3¾ sq. in. A total winding length of 2¼" was available. A single turn loop of copper strip went around the whole core. This strip was removed intact and reused in the final assembly.

Dismantling the transformer carefully, I found that the 115-volt line winding was closest to the core; the electrostatic shield (a single layer wound with fine wire was next to it. Both were undamaged and were left undisturbed.

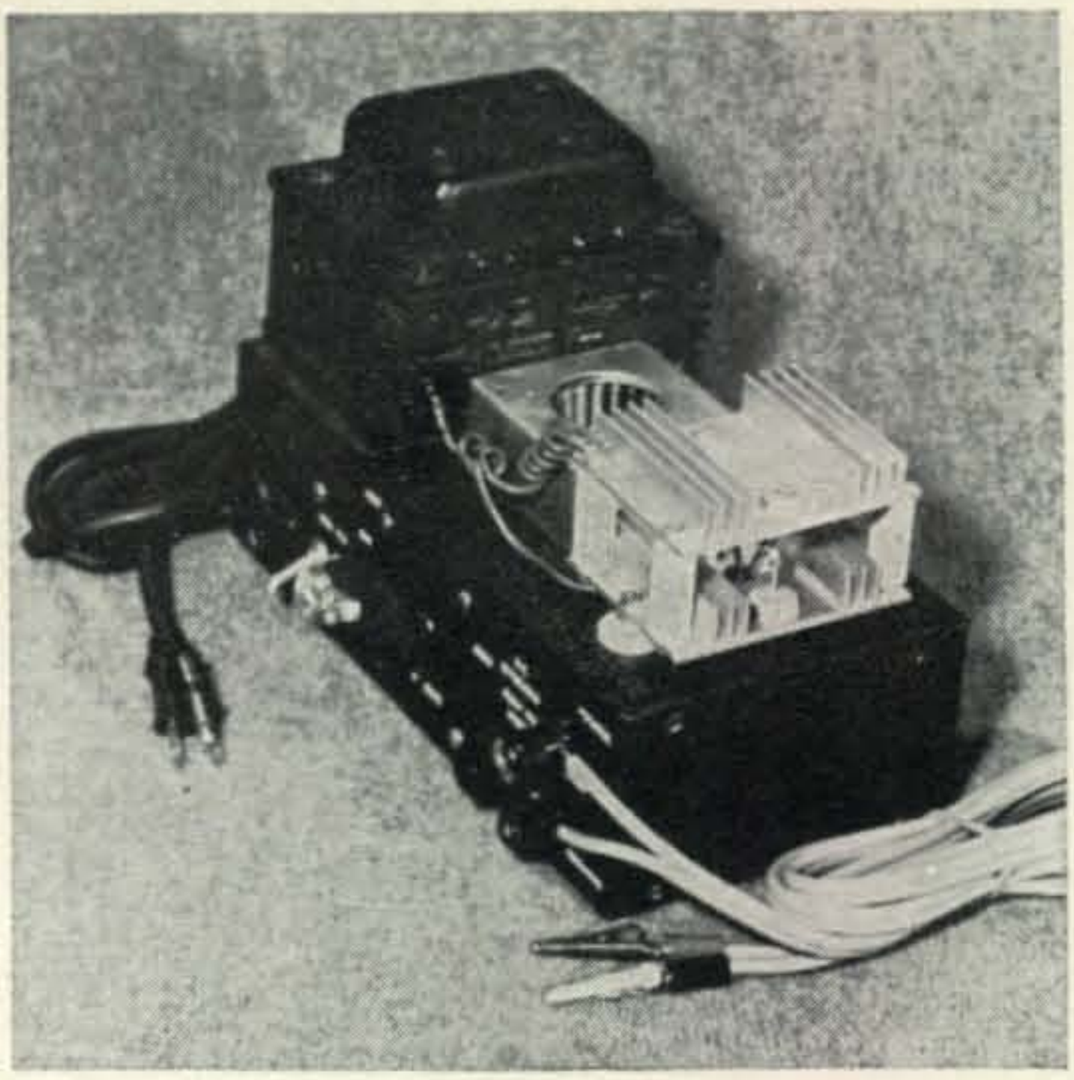
The number of turns for each filament windings was counted as the windings were removed. This information plus the data in the 'scope instruction manual revealed a basic relationship of two turns per volt in the transformer. It was designed to handle over 200 watts.

I decided that the transformer should be able to supply 10 amperes at about 13 volts, r.m.s. Several taps should be provided to control the charging rate. As only 2 turns would be required per r.m.s. volt, internal I^2R losses should be relatively small and so a current density of 1 ampere per 500 circular mills would be permissable in the secondary winding. (If more turns per volt had been required, the copper requirement would have been increased to 700 or 1000 circular per ampere.) For 10 amperes, 5000 circular mills would be needed. Two strands of 16 gauge enameled wire were chosen for the conductor. Four taps were provided at points 4 turns from the end of the winding and 4 turns apart. The entire winding consisted of 39 turns; output voltages of 11.5, 13.5, 15.5, 17.5 and 19.5 resulted. This range was selected to permit charging either 6 or 9 lead-acid cells at one time (13.2 to 19.8 volts). The narrower range provided by 1-volt steps from 11.5 to 15.5 volts would be adequate if only one 12-volt automotive battery was to be charged.

The tapped end of the secondary was wound first; this was done to permit adjustment of the over-all voltage by adding or removing turns on the outside layer of windings. Taps were made by soldering ¾" strips of thin copper to the winding. The strip was bent in a "U" around the conductor and the two were sweat-soldered together. The taps were located so that 2 came out of each end of the winding without over-lapping. The arrangement followed the original design of the transformer in that all leads came out of that side of the winding that ultimately would project through the chassis. The two layers of the secondary winding were separated from each other and from the static shield by double layers of plastic insulation salvaged when the transformer was dismantled. Thin varnished cambric was used to pad the tap strips where they crossed winding turns; each strip was insulated with 1" vinyl electrical tape. Transformer varnish was used generously on each winding layer. When the last layer had been wound and insulated the ends of the copper strips were soldered to heavy wires and formed to the outside of the winding assembly; the whole thing was then covered with



The underside of the chassis is dominated by the tap switch and the blower motor.



Twelve volt battery charger with cover removed. For ease of wiring, the bottom diodes are mounted in the inverted position.

a ⅓-lapped layer of vinyl tape. All of the winding and insulating was done while the windings were mounted on a crude coil winder made of ¾" wooden planking. After removal from the coil winder some additional taping was done to prevent the end windings from contacting the core laminations. The core laminations were reassembled in their original order.

The Rectifier

While half-wave rectification is suitable for battery charging, a full-wave rectifier was built because the charger would be used to maintain battery voltage while bench testing mobile gear. Four diodes of the type used in automotive alternators were chosen; they are capable of supplying 30 amperes at about 14 volts. I reasoned that 4 diodes of this type should handle 10 amperes with a safety factor of over 100%. Two diodes with positive case polarity and two diodes with negative case polarity were used. Aluminum radiators were used as heat sinks. Diodes should be pressed or driven in place in ½" holes in the heat sink; a tight fit is necessary for good electrical and heat conduction.

The two heat radiators are mechanically joined by 4 porcelain insulators. The lower radiator is mounted on ceramic bushings. The low-voltage a.c. and d.c. circuitry is completely isolated from the metal case.

The Blower

The blower is not absolutely essential to charger operation if the heat radiators are positioned for good air circulation, but it is very effective in keeping diode temperatures down. The motor was salvaged from a child's phonograph; its mount utilizes rubber grommets to reduce vibration and noise. A 2" diameter, ¾" high blower wheel is used as an impeller. An open end chassis base 2⅝" by 2¾" by 1" serves as a housing, and is fastened to the chassis with

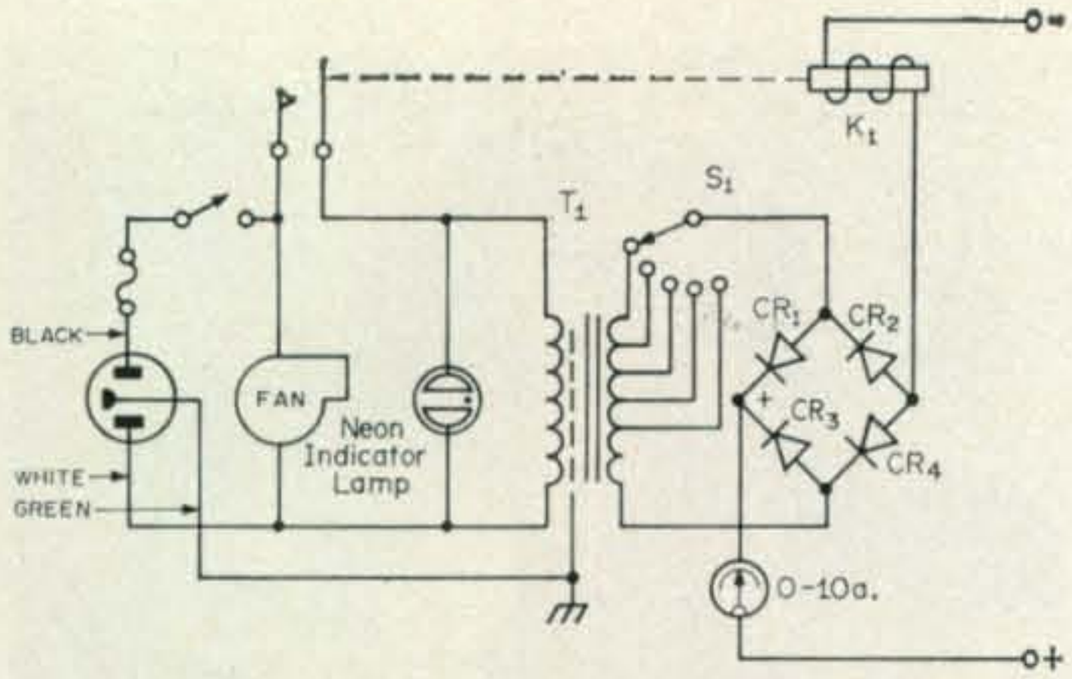


Fig.1—A simple, low-cost battery charger for 12 v. or industrial 18 volt batteries. The fuse is rated at 4 amperes.

CR_1, CR_3—International Rectifier JJ1020.
CR_2, CR_4—International Rectifier JJ1010.
K_1—Guardian manual reset overload relay. See text for modifications.
S_1—Single pole, 6-position heavy duty rotary switch. Scavenged from surplus BC-375 tuning unit.
T_1—Rewound oscilloscope power transformer. See text.

sheet metal screws. A 2" hole in the housing admits air to the blower wheel, while both ends of the housing are left open to direct air to the radiators and the transformer.

Overload Protection

Two protective devices are used in the charger. The first is a 4-ampere line fuse. The second is a manual-reset overload relay. The original relay coil was replaced with a double strand of #16 wire; 12 turns were required. The relay was adjusted to pull in at 12 amperes. This style relay should be adjusted only while in its final operating position.

Assembly

The minor components and assembly hardware are common. The heavy duty six position switch used in the secondary circuit, and the other ceramic parts were salvaged from a war-surplus BC-375 tuning unit.

The parts layout started with the transformer, tap switch and rectifier. The blower was an afterthought which accounts for the crowding in the center of the chassis. The front and rear panels of the perforated cover were shortened 2¼" to reduce the over-all cabinet height; the handle was relocated to the top.

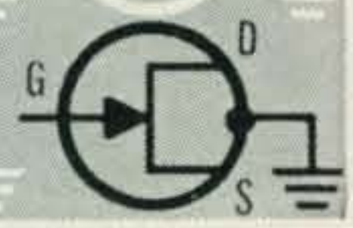
Operation

Charging current can flow from the charger to a battery even though the r.m.s. value of the transformer output is below the d.c. battery voltage. It is necessary only that the peaks of the a.c. ripple exceed the battery voltage by a small amount for current to begin to flow.

Losses in the internal circuit are greatest at high currents; charger efficiency is higher when supplying lower currents at higher voltage.

The power handling capability of the battery eliminator described here will be limited by the heating of the diodes and transformer. Temperature rise ratings of the diodes and insulation in the transformer should not be exceeded. If they are not known, a small thermometer of suitable range can be fastened to a heat radiator or the transformer with a wad of putty for testing. The load on the charger can then be increased slowly over a period of 2 or 3 hours while the temperature rise is being watched. A limit of 150° F. (65° C.) is usually quite safe. ■

An FET Preamp for 144 mc.



By ALLEN KATZ,* K2UYH

ALTHOUGH transistorized preamplifiers have been on the v.h.f. scene for several years, they have never really found acceptance on the 2 meter band. On the other hand transistors are in almost universal use on the 70 cm band. The reason for this neglect on the part of two meter operators is twofold. First of all there is the feeling that nothing can beat the performance of the vacuum tubes presently in use. And secondly there is the knowledge that transistors do tend to overload much more readily then tubes.

Possibly if more two meter operators were aware of the fantastically low noise levels transistors now produce on 432 mc, they might begin to question the perfection of their tube front ends. (It is now possible using the best in low noise v.h.f. transistors and common emitter circuits to obtain a noise figure on 432 better than that of a 416-B on 144 mc.[1]) But then again there is still the problem of overload and cross modulation. After all how many 70 cm stations have to put up with the equivalent of a fellow with a Gonset a few blocks away. It is this prob-

*48 Cumberland Ave., Verona, New Jersey, 07462.

[1]Brown *et al*, *"VHF COLUMN," CQ*, Nov. 1965, p. 82.

lem of overload which first brought the f.e.t. to our attention.

Field Effect Transistors

The f.e.t., a relatively old semiconductor device (first patented in 1935), has only recently become available to the amateur and the electronics industry in general.[2] Its operation, covered in several good articles, resembles more closely that of a pentode vacuum tube than any transistor.[3] It has a high input impedance as contrasted to the low input impedance of a regular transistor. It is this quality which explains the f.e.t.'s high resistance to overload and cross modulation, and our interest in the device for use as a two meter preamp.

There are two types of f.e.t.'s (N channel and P channel). The N channel biases identically with the triode vacuum tube (negative voltage on the gate, positive voltage on the drain). The gate, source, and drain are the names of the f.e.t. elements which correspond respectively to the grid, cathode and plate of a vacuum tube. As expected the P channel biases exactly opposite to the N channel type.

The noise figure of a good v.h.f. f.e.t. remains almost constant (approximately 1.5 db) as frequency is increased up to about 200 mc and then rises sharply.[4] Thus, though an f.e.t. at the present state of the art will not produce as good a noise figure as that of many transistors on 432 mc (about 4 db minimum), it should perform as well or better then the best transistor on 144 mc.

It is said that the proof of the pudding is in the eating . . . and there is no better proof then hearing with one front end that which you can not hear with another. When we constructed our first f.e.t. preamp we did not expect to hear anything outstanding. For how much better can one get then a good 416-B on two meters? Maybe one db. On this point we were greatly astounded. For after the initial tune up, we found that we could pull signals which were undetectable on the 416-B about half an "S" unit out the noise with the f.e.t. To say the least we were jubilant. Furthermore the f.e.t. performed as predicted and gave us no trouble with overloading.

Circuit

Figure 1 shows the schematic of a 144 mc preamp using an N channel (TI 2N3823) f.e.t. in a common source circuit. F.e.t.'s may also be used in common gate configurations (the f.e.t. equivalent of grounded grid), but common source appears to give a better noise figure.

The circuit is simple and the components inexpensive. Thirty five cent 1-10 mmf tubular plastic piston trimmers are used to tune the input and output circuits to resonance. The tap on

[2]Kolk, P., "The Insulated Gate F.E.T.," *Kmc Semiconductor Corp.*, Long Valley, N.J., Nov. 1964.
[3]Angelo, E., *Electronic Circuits*, Second Edition, 1964, McGraw Hill, p. 210-211.
[4]*Application Notes*, "V.H.F. Tuned Amplifiers Using The TI 2N3823 F.E.T.," Texas Instruments Inc., Dallas, Texas, Sept. 1965.

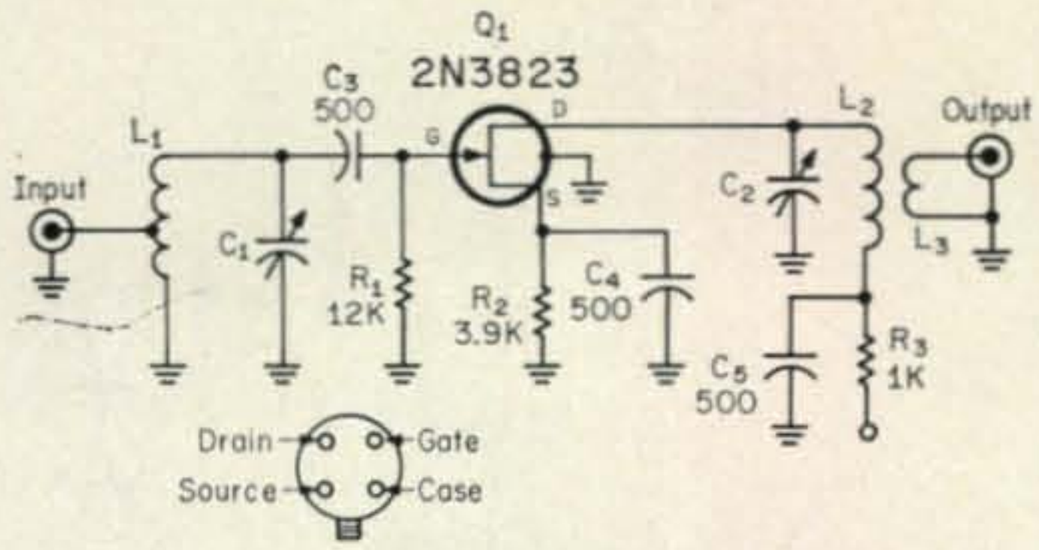


Fig. 1—Circuit diagram of the two meter f.e.t. preamp. All capacitors are in mmf and all resistors are ½ watts.

C_1—C2-1-10 mmf plastic piston trimmers.
C_4-C_5—500 mmf silver mica stand-off.
L_1—5t #16 tinned copper wire, ¼" diam., ¾" long, tapped 1½ t up from ground.
L_2—5t #16 tinned copper wire, ¼" diam., ¾" long.
L_3—2t #22 enameled copper wire, 5/16" diam.

the input coil should be adjusted for best noise figure, which according to theory is about ⅛ of the way up the coil from the ground end for a 50 ohm input. We found the optimum tap point to closer to ¼ of the way up. The output coupling loop is adjusted for maximum gain. Bias is provided by a 3.9K source resistor which should supply about–2.5 volts of gate bias for a 9 volt drain supply.

Construction

The amplifier was constructed on a 4" × 2½" piece of copper clad board. Ordinary copper or brass plates could be used as well; we just find printed circuit board a particularly easy material to work with. The photograph and fig. 3 show the layout. Care should be taken to make sure the input and output circuits are well shielded from each other. If this precaution is not followed a neutralization problem may develop. In the two f.e.t. preamps we have constructed thus far no such problem was encountered. However, should neutralization prove a problem, inductive neutralization, as used in vacuum tube circuits, may be used to cure it.

The amplifier described in this article is now in use a WA2FGK's QTH. Andy's operating results using the amplifier speak for themself.

One final note, remember that an f.e.t. pre-

[*Continued on page 104*]

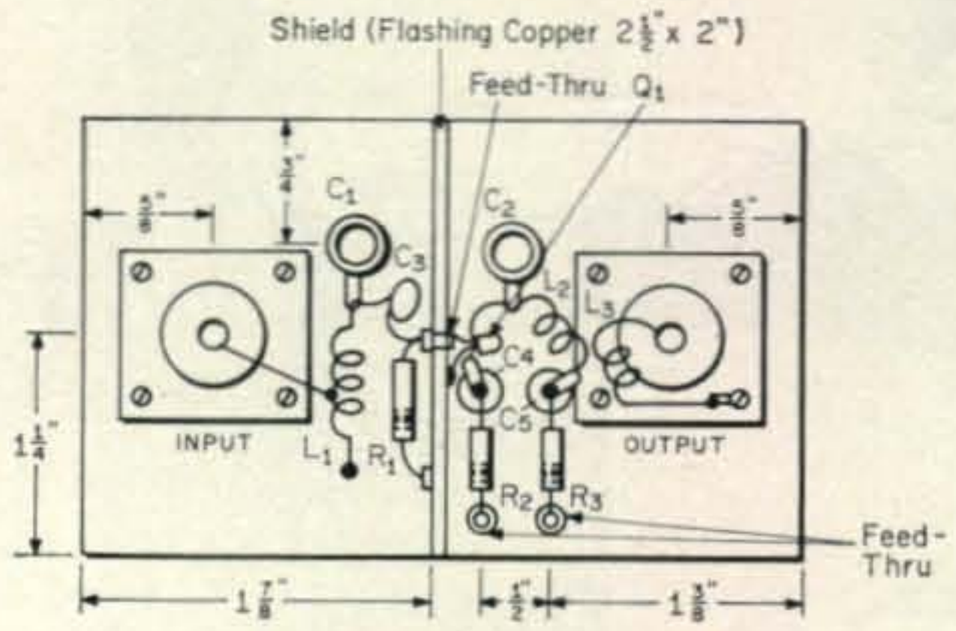
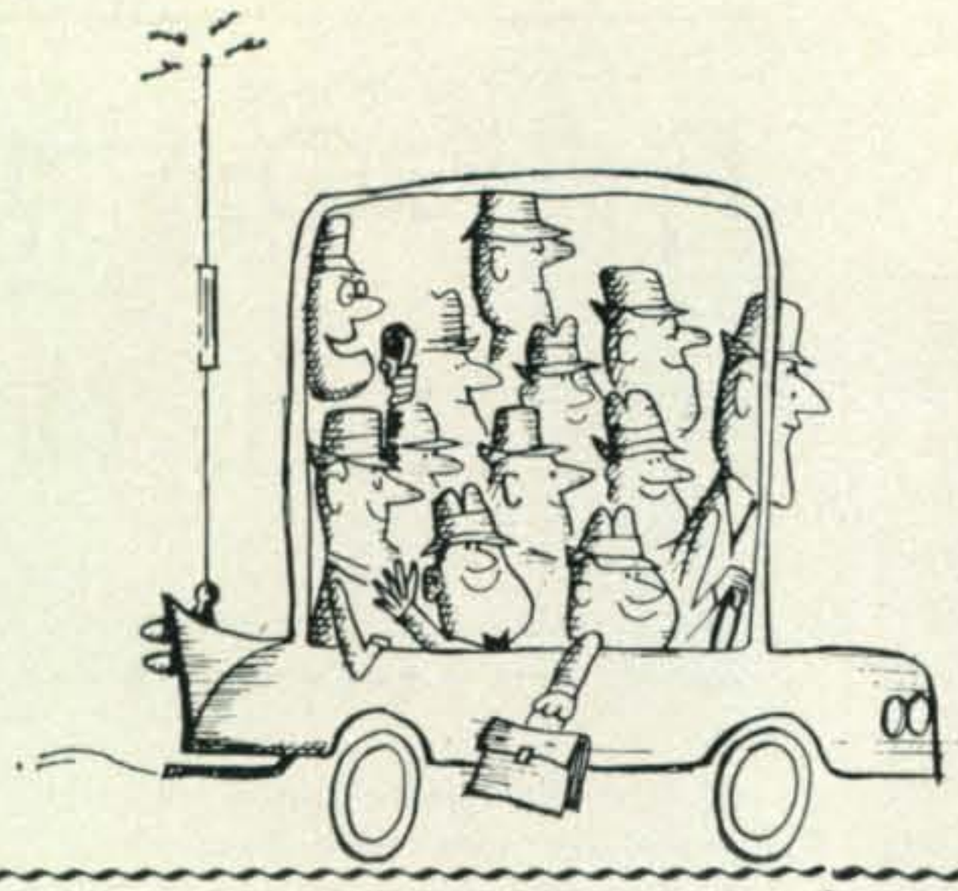


Fig. 2—Layout of the f.e.t. two meter preamp built on a 4" × 2½" copper clad board. The shield is a 2½ × 2" piece of flashing copper.



MOBILE FUN

"I don't care if division *doesn't* send QSL cards, Kolderup . . . GET ON THAT RADIO!"

"That's right Chief . . . it just looks like a routine accident . . . but it seems to go deeper than that!"

"Why couldn't you have said 'I do' like other grooms . . . instead of 'OK old man, fine business'?"

"I can't understand it . . . according to this we should be right on top of him now!"

Audio—The Weak Link In The Mobile Chain

or

How To Wiggle Your Listener's S-Meter

BY

CHARLES A. GUDER,* W1TFH

MOST Mobileers will spend countless hours eliminating noise, tuning antennas, and boosting their power, but will take to the road with a third hand carbon microphone (liberated from a phone booth), and none of the audio shaping he's come to accept in his home station. What a waste! The sole link between you and your mobile rig is the microphone and audio system, so to neglect this link is to weaken the entire mobile system.

How to strengthen the link? By careful and thoughtful use of what's already available. First let's explore the microphone itself.

There is a rather bewildering array of microphones available, ranging from the simple carbon that often finds itself removed from the telephone company's booth, to fancy, and very expensive, high fidelity mikes, ribbon or otherwise. Somewhere in between, and usually to the lower end of the price scale, there is a large number of microphones totally suitable for amateur use.

When we stop to think that a microphone is a transducer whose purpose is to translate sound energy into an electrical signal which can be amplified to modulate a transmitter, and that the legal purpose of the amateur service is communications, the choice of a microphone becomes much simpler. The continual comparisons of different microphones on the air shows that there is actually very little difference among the three types which seem to predominate in amateur service. These are, the crystal, dynamic, and ceramic. I don't think it strange at all that very adequate performance can be had from these types which fall close to the lower end of the price spectrum. The requirements, after all, are these: adequate output (5-30 mv average output seems to be normal for the types mentioned)—fairly smooth response over the audio range from about 300 to 3000 cycles, ruggedness, and reasonable price.

If we were to take these criteria one by one, we would find that the number given for output is adequate to give us full output from any commercial, or other well designed transmitter, so that the high output of a carbon mike is not necessary, and indeed, we should forego its poor quality and the need of a current source for it. Crystal microphones in general have a somewhat higher output than the figure mentioned above, can be inexpensive, but many show undesirable peaks of response in the audio range, are fragile, and worst of all, when we consider mobile service, are sensitive to heat and humidity. Leave one locked up in a closed car for a few hours during the summer and you'll see what I mean. The same thing can be said for the ceramic, as far as response goes, but they are not particularly fragile, nor will they turn into a puddle when left in a closed car in the summer, where temperatures can measure 150°F.

Dynamic microphones can be bought from a few dollars up to several hundred, and unless you are trying to broadcast the Philharmonic, the more expensive ones will not do anything for the ears at the other end of the amateur QSO. In general, dynamics have smooth response in the speech range. They can be fragile, and I can remember more than once spending hours with a jeweler's loupe trying to repair voice coil leads broken my dropping a dynamic—the wire must have been #46.

Cases for microphones range from plastic to die cast to stamped. High impact plastics are as rugged as any and weigh less—a consideration when hand held as they usually are in mobile use.

As far as directional response goes there are omni-directional mikes, bi-directional mikes, cardioids, and most important noise-cancelling types. These are so constructed that noise or sound from directions other than your mouth is highly attenuated. Exit wind noise problems and other noises, such as fighting kids, back-seat driving wives, etc.

Now that you've picked your microphone from the above combinations you've probably got something in the $10 to $20 range, noise cancelling, with a high-impact plastic case, and a ceramic element. At least that's what I've been using for the past few years, and it has served me well (despite occasional comments on audio quality from purists on the other end, but more on that later.)

Mobile operation, in general, gives you about a 10 to 20 db disadvantage over the fixed station for the same power level. At the lower end of our spectrum, say 75 meters, a good mobile antenna has about 5% efficiency compared to a ½ wave dipole. At six and two meters, the antenna is much more efficient, but the guy at the fixed

*RFD 2, Sudbury, Mass. 01776.

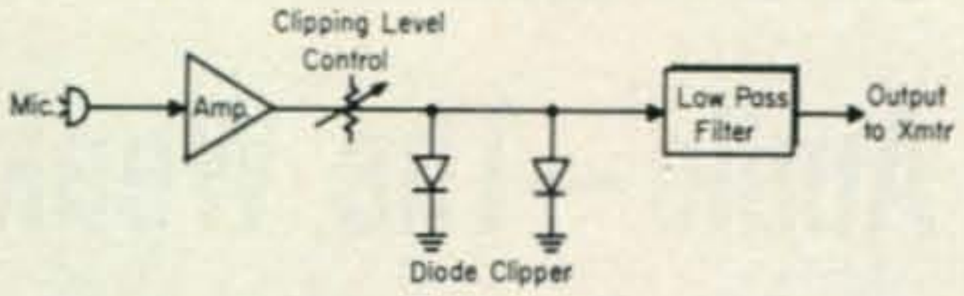


Fig. 1—Block diagram of a typical speech clipper/filter system.

station has a beam and in some cases at least, unless you want to use a ridiculous bird roost on the car (as most do) you also have to content yourself with a cross-polarization problem. The question is how do you gain back some of this disadvantage without running the legal limit in the car (done by some, but not easy or cheap).

Tailoring The Audio

There are relatively simple means available for gaining 5 to 6 db on the other guy's S-meter. As just about everybody knows by now, speech has a very high peak-to-average power ratio, somewhere around 14-15 db, with most energy being concentrated in the vowel sounds, and little in the consonants.

Needless to say, nature foils us as usual—since intelligibility suffers most when consonants are lost. If we operate on speech in a manner to try and equalize the levels, *i.e.*, bring the average level up by amplifying the weaker levels and holding the higher peaks down—we can increase the average power of a transmitter by 5 to 6 db.[1] This increase in level shows up in the S-meter reading of the station listening to you, and also increases your intelligibility. Effectively, you can be 5 to 6 db lower in signal strength at the receiver than another station and be copied as well.

There is more than one way of accomplishing the speech processing. One can use an audio compressor, which is a form of a.v.c. system operation at audio, rather complex, and not instantaneous in action. In other words, the compressor can not act to hold down a peak because it takes the compressor time to realize that a peak has occurred.

A.l.c. or automatic level control, is used by some for this purpose, but just listen sometime to the way most signals broaden and transmitter front end noise comes up when the gain is cranked up so that the a.l.c. meter wiggles. I don't recommend it.

[1]R. L. Craiglow, N. R. Getzin, and R. A. Swanson "Power Requirements for Speech Communication Systems", *IRE Transactions on Audio,* Nov.—Dec. 1961, pp. 186—190.

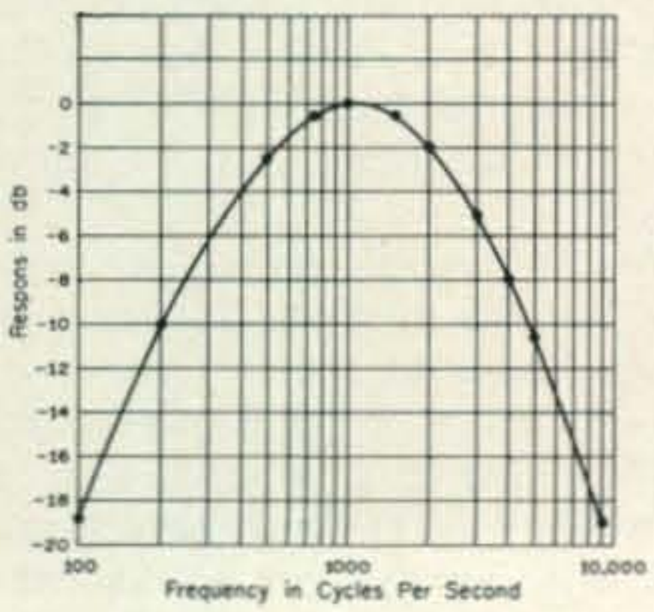


Fig. 2 — Measured overall frequency response of the Waters Clipreamp discussed in the text.

Clipping, a process whereby peaks above a certain level are sliced off, is a simple way of amplifying to a given level and never exceeding it. The process can be accomplished at audio, in the mike line, or at some point in the r.f. chain of the transmitter. The latter method is much more complex and expensive, requiring a filter with a bandpass equal to the audio bandpass desired (about 300-3000 cycles per second) at some intermediate frequency in the transmitter. Price a filter like the Collins Mechanical series, or the McCoy crystal filters at 9 mc and I think you'll agree (on expense at least). Therefore, the only system I will discuss is that which can be accomplished at audio, right in the mike line, and does not require surgery on the transmitter.

As an example, I will take the Waters Clipreamp™ (Model 372) because I am quite familiar with it. Figure 1 is a block diagram of the device.

Referring to fig. 1, audio from the microphone is amplified in two transistor stages, and at the same time the frequencies below 300 cycles per second are attenuated (little intelligible information is contained in these frequencies so there is no point in amplifying them.)

The amplified audio is fed to a pair of paralleled diodes which set the clipping level. No matter how large the signal presented to the diodes is, (above their conduction threshhold) they restrict the peak-to-peak excursion of the signal to the conduction threshold. The gain control sets the level to the diodes, thus setting the point on the audio waveform that clipping begins. The signal out of the diode pair is then filtered to restrict the high frequency response. If you whistle into the mike at 2 kc, the diodes will make harmonics of the 2 kc, which shouldn't go out over the air, so they are reduced in level with respect to the fundamental by the filtering.

Figure 2 is a response curve which shows the bandpass. The low frequency roll-off is obtained before amplification, and the high-frequency roll-off after clipping.

To illustrate the action of the Clipreamp take a look at fig. 3, which shows the input-output

[*Continued on page 102*]

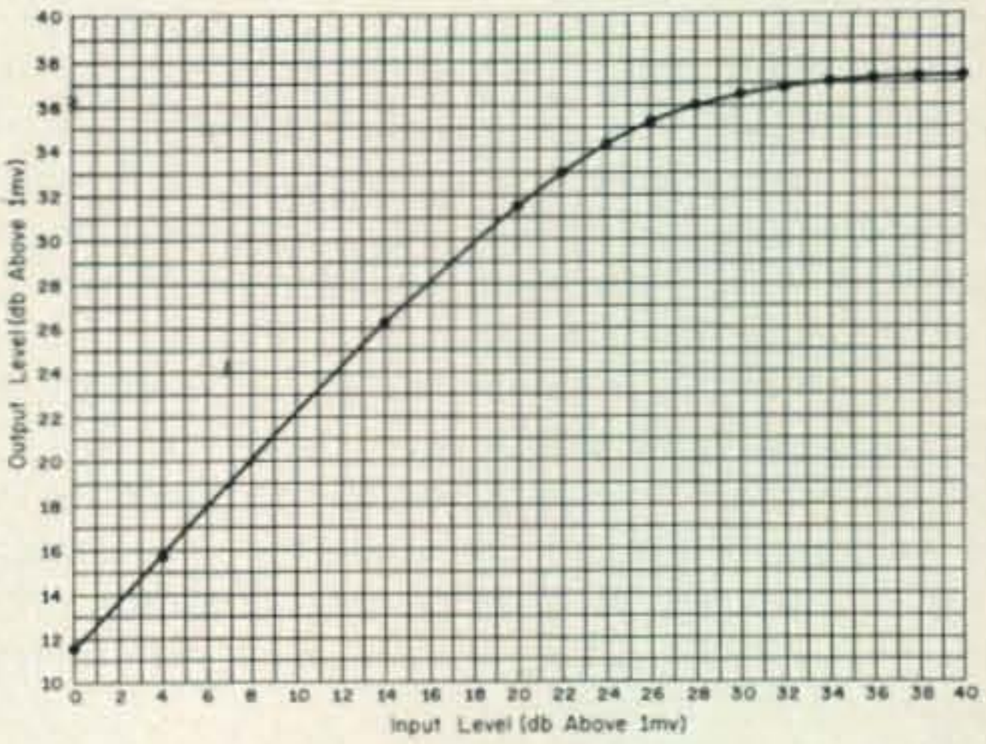


Fig. 3—Input—output characteristics of the Clipreamp showing the gain reduction with inputs exceeding 14 db. The gain reduction increases with increasing input, and gain becomes negative above 40 db input.

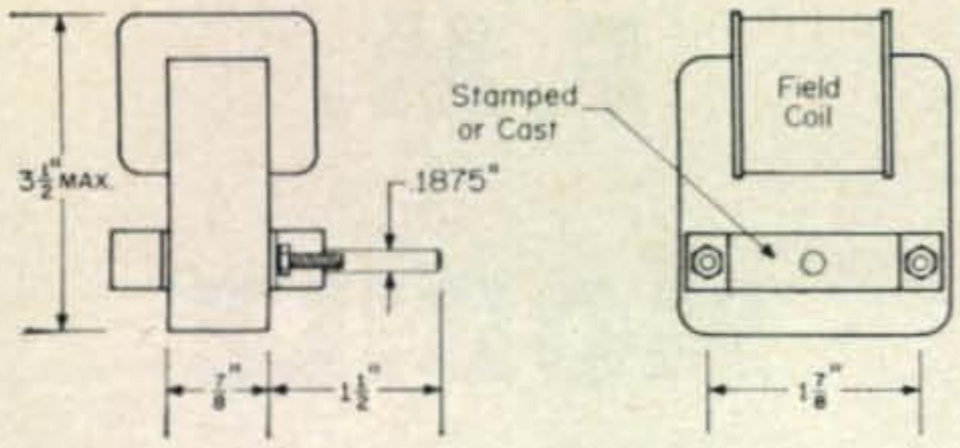


Fig. 1—Outline of the typical phonograph notor used for single players, rim drive type. They operate from 117 volts, 60 cycles and at full load dissipates 32 watts with a speed of 2900 r.p.m.

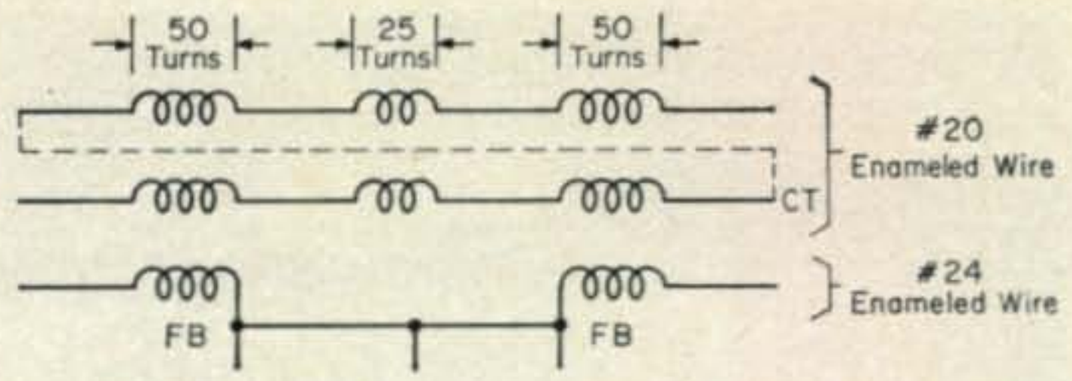


Fig. 2—Winding data for the new field coil. Start the winding with three wires, two #20 and one #24. Start with a trifilar winding for 50 turns. Bring out the #24 wire and continue the two #20 wires for 25 turns. Then start another #24 for 50 more turns with the two #20 wires. Bring out all three leads at the finish.

Brushless D.C. Fan Motor

BY WILLLIAM F. FRANKART,* WB6BLA

WANT to cool some mobile or other equipment that runs off of 12 v.d.c. and not have the problem of getting rid of d.c. motor brush noise The following article tells you how to do it and also how to have a small bias supply that will be on when the filament and blower comes on. This is useful, particularly if you want to build a high-power mobile amplifier.

First, obtain the common phonograph motor that is widely used as a cooling fan that operates from 117 volts 60 c.p.s., (fig. 1). Remove the field coil and rewind it as shown in fig. 2.

Now build a transistor switcher as shown in the schematic fig. 3. The transistors are a pair of RCA-Silicon n.p.n. type 40251 in a grounded emitter switching circuit. Enough energy is produced to run the fan motor and also a small bias supply by connecting a 117 v. 60 c.p.s. transformer primary across the ends of the collector winding. Remember, the primary of this transformer "sees" 24 volts and therefore the secondary will deliver about one-fourth the voltage it would on 117 v. 60 c.p.s. Therefore, pick the correct turns ratio. A typical transformer to produce bias voltage for a 4X150A used in linear service would be 117 volt primary with a 440 volt secondary.

If you are not inclined to do the work of rewinding the motor field coil, the fan motor can be obtained from Mamco in Racine, Wisconsin at a reasonable cost. Order Gonset Part No. 115-011. This arrangement will produce 10 c.f.m air flow through a back pressure of four-tenth inches of water—more than ample for the Eimac Air System Sockets, when using a squirrel cage assembly. It will cool any radiation type assembly when used with a four-inch fan blade. ■

*Chief Engineer, Gonset, Inc., 1515 So. Manchester Ave., Anaheim, California.

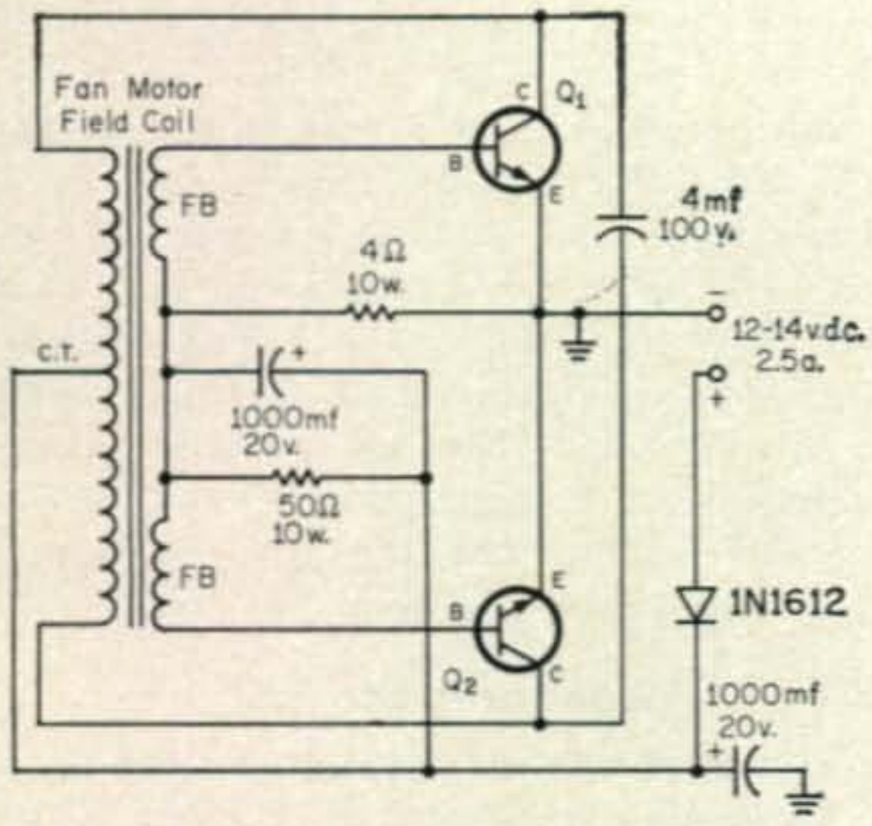


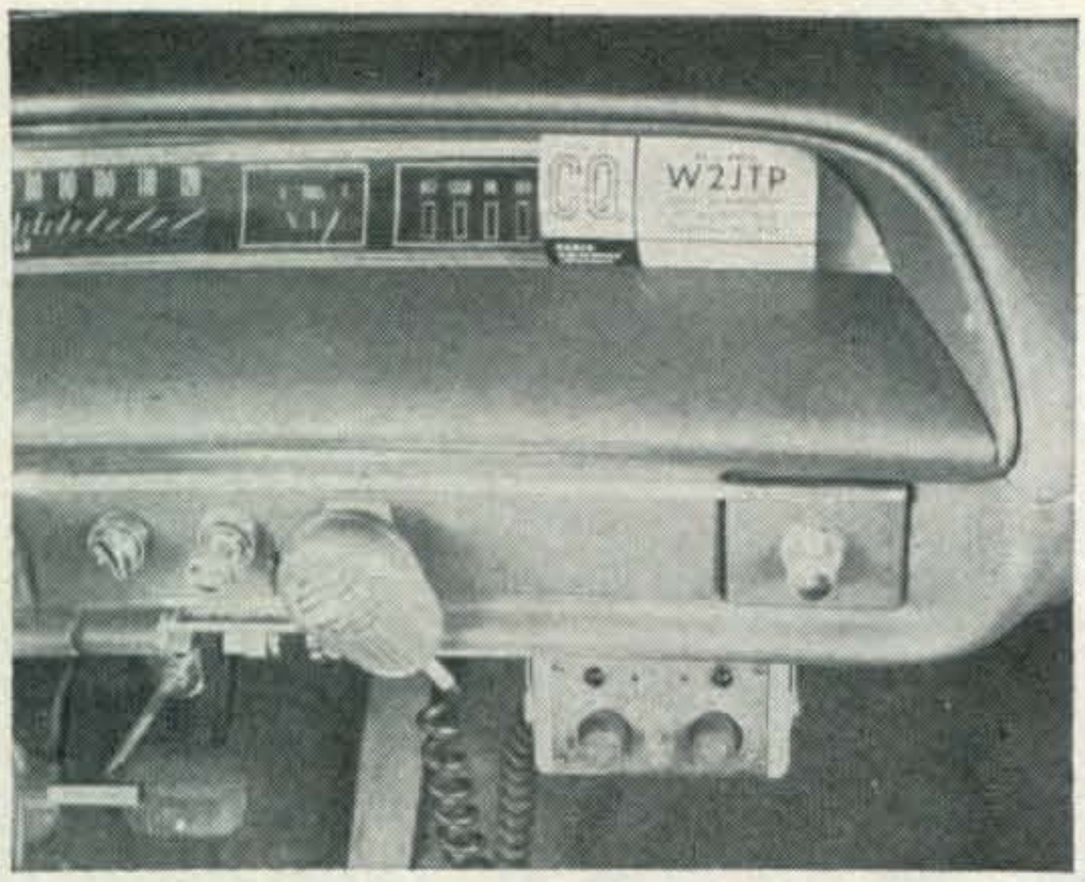
Fig. 3—Circuit of the d.c. to d.c. converter used to drive the fan motor. Transistors Q_1 and Q_2 core RCA type 40251. At 12.6 volts the frequency is 67-68 c.p.s. and at 14.8 volts 74-75 c.p.s.

New Amateur Product

Custom Devices

A new product is now available for the RTTY operator. Called the Identimer, the unit interrupts the signal every 9 minutes and 45 seconds for a period of 15 seconds during which the station call is automatically transmitted by m.c.w. in the a.f.s.k. mode or f.s.k. in the s.s.b. mode. During this period the *mark* tone remains on the air as not to lock up receiving printers. The Identimer sells for $54.95 wired and tested. For more information write to: Custom Devices, Inc., 439 South Canal St., South San Francisco, California, 94080, or circle 65 on page 110.

F.M. MOBILE TECHNIQUES



Control head installation for the Motorola-80D. The left knob is the squelch and the right is the on-off switch and volume control. The toggle switch in the center selects the channel.

BYRON H. KRETZMAN,* W2JTP

BACK in August of 1963 we wrote a short piece[1] about f.m. operation. This gave an inkling of what has been happening these past few years on our v.h.f. bands, namely the tremendous expansion of f.m. operation, an "un-ham-like" operation. Why? The biggest reason, we think, is the degeneration of our 'phone bands, in particular the h.f. bands but lately even creeping into the a.m. parts of our 6 and 2 meter bands. Now, don't poo-poo that statement. Ask any non-amateur friend what he thinks of the inane conversations that now take place on 75 and on 20 meters. And, ask any old-timer what he thinks of the blatant commercialism on s.s.b. transceivers in the ham magazines. "This is amateur radio?" *That's* what they all ask.

Many radio amateurs have answered the above question by going to f.m. on the v.h.f. bands, first on 2, then on 6, and then on 420 mc. Not separately, mind you, but all three together in *this* operation. On f.m. they find the *technical* interest that is supposed to be the backbone of amateur radio, as it was thirty years ago. Equipment is usually the commercial surplus two-way radio sets[2,3] formerly used in taxi cabs, police cars, *etc.* Most of these come with 6 volt d.c. power supplies, and they must be modified, either by building an a.c. power supply for home use or by building a 12 volt supply and rewiring the filament strings for 12 volts. Further modification is required to move them into the amateur bands. It's this conversion business which separates the men from the boys, the appliance operators from the *real* radio amateurs. Now, if you think f.m. is a very, very, small segment of "ham radio" you are only partly correct. It *is* small but it is steadily growing, growing to the point where it can no longer be ignored or swept under the real fine print of the activity reports in v.h.f. columns. (They tried to do that with RTTY, remember?)

Mobile operation is at its best when f.m. is used, and it *is* different. Compare an f.m. car installation with the usual "hammy" a.m. lash-up: For a.m. the receiver or converter is usually tunable, a distinct safety hazard; for f.m. an ordinary toggle switch permits instant switching, without looking, between two channels. For a.m. a big box with many controls takes up lots of room in the front seat; for f.m. the rig, well powered, is in the trunk with an unobstrusive control head under the dash. For a.m. the cumbersome halo antenna is an "attractive nuisance" while on f.m. the thin whip (for 2) is either difficult to see or (on 6) looks like a b.c. antenna.

Compare actual operation: On a.m. mobile contacts are usually on a hit-and-miss proposition with much useless calling and lost contacts (at turnpike speeds) because some rag-chewer has held it too long. On f.m. operation is very brisk, with rapid break-in via the hand-held push-to-talk microphone used; and there is no repetitious calling. And, it is a very nice feeling that there is *always* somebody listening on the channel. Let's emphasize that: It is common practice just to pick up the mike and call one of your friends, and have him come back within the minute. Also, we haven't said anything about the range of mobiles, but let us say it is more than excellent, and it is on a highly reliable day-after-day basis, *if* set up with the proper attention to antenna installation and feed line losses.

Standards for F.M.

Nearly all of the sets available were designed for ±15 kc deviation, and that is the way they are used by us. Most of the transmitters are rated as 30 watts *output*, some for 60. Receivers are exceptionally good. On 2 meters sensitivities are in the order of 0.6 to 0.8 microvolts for 20

*431 Woodbury Road, Huntington, N.Y. 11743.

[1]Kretzman, B. H., "A New VHF Operation: FM," *CQ*, August 1963, p. 74.
[2]Kretzman, B. H., "Putting the Motorola FMTRU-80D on 2 Meter F.M.," *CQ*, Part I, February 1966, p. 65; Part II, March 1966, p. 33.
[3]Kretzman, B. H., "A Test Set for F.M.," *CQ*, November 1963, p. 74.

db of quieting. And, because they are crystal controlled and have squelch circuits we can continuously monitor a channel without any annoying noise. Nobody uses a tunable receiver (or converter with an h.f. receiver) in this operation; there are no gooney boxes for f.m., and there are no v.f.o.'s to swish around.

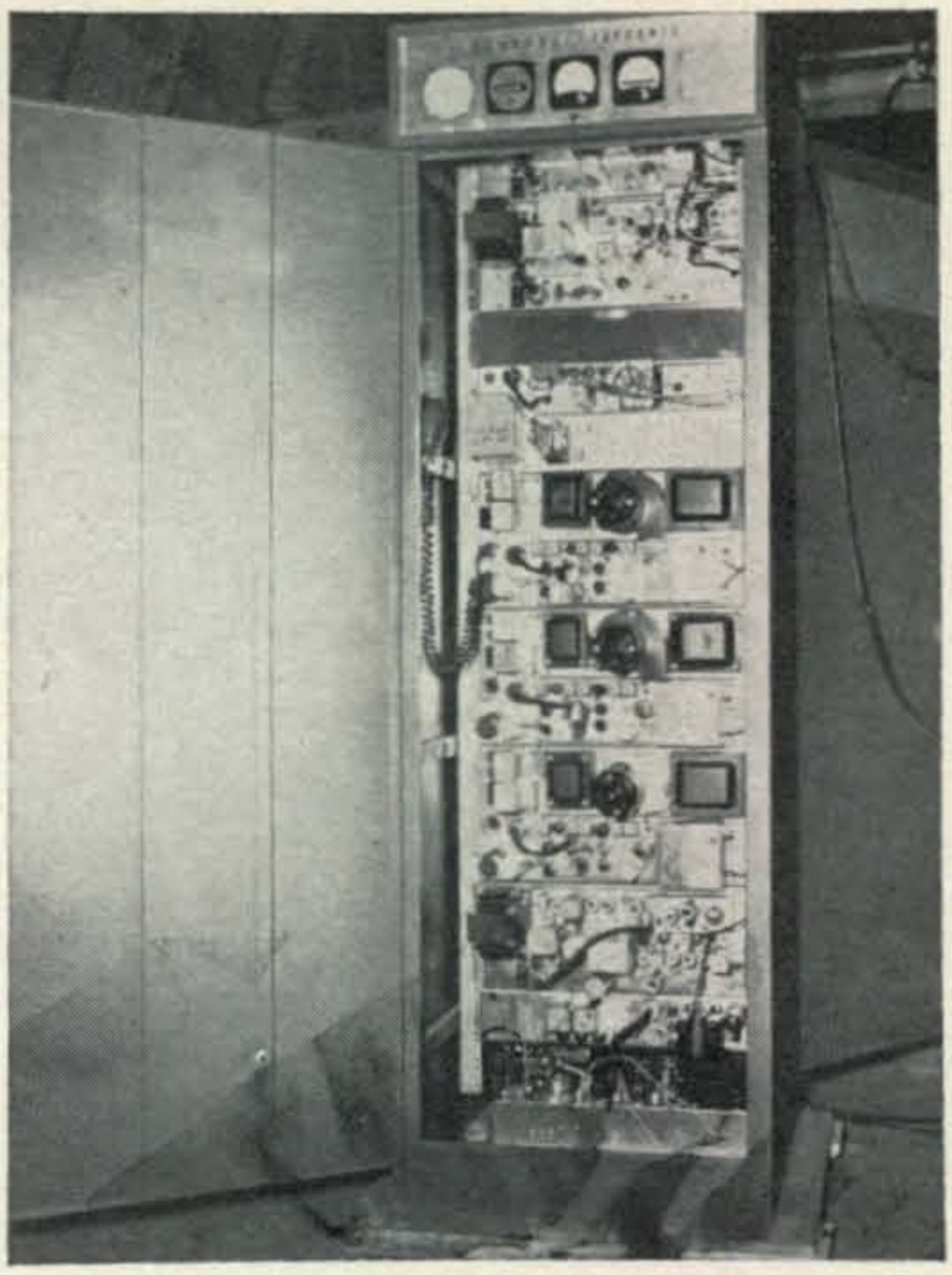
By general agreement, on a national basis (as we said, this is no longer a very small operation), channels have been set up with a 60 kc separation on 2 and 40 kc on 6, predominantly in the high ends of those bands. Certain channels have been selected as national calling (and operating, where activity is low) channels. These are 52.525 and 146.94 mc for 'phone F3), and 52.60 and 146.70 mc for a.f.s.k. (RTTY F2). Secondary channels are picked, on each local basis, close enough to the primary channels so that re-tuning is not necessary for either the transmitter or the receiver. Crystal oscillators, one for each channel, are merely switched by grounding the proper cathode. Transmitters are netted to well within 1-kc.

Antenna

Antenna polarization has been standardized as vertical, with the 5/8 wavelength groundplane[4] being the most popular. The object is to simplify mobile operation. Little objection is made to a 19" whip in the center of a car roof, and installation is greatly simplified because standard commercial two-way mobile antennas can be used. The 6 meter mobile is likewise simple. Ball-mount police-type ¼ wavelength "disguise" antennas are readily available and they look just like an a.m. broadcast antenna. Beams are seldom used in home stations unless a crowded area necessitates its use to null out undesired stations. The omni-directional gain antenna[5] is king in this operation as it is in the commercial and police two-way radio fields.

[4]Brier, H., "A 5/8 Wave Vertical for 2," *CQ*, February 1964, p. 45.
[5]Kretzman, B. H., "Five Half-Waves in Phase on 144 Mc," *CQ*, March 1964, p. 80.

Mobile installation in the rear luggage well of a Chevrolet 1965 station wagon. Shown is the Motorola-80D for 2 meters. On the left is the empty bottom half of another split case for a future 80D for 6 meters.



W4BLD in Waynesboro, Virginia, active repeater of Robert B. Kerby. 40 functions are performed over a 440 mc control link, permitting 4-frequency operation on 6 meters with 100 watts output and on 2 with 60 watts output. Fixed beam antennas are also switched as are the particular repeat functions. All equipment is GE, of the "Progress Line" type.

Operation

The objectives of f.m. operation, aside from the technical, are generally quite different from the ham v.h.f. activity as reported in v.h.f. columns. There is Civil Defense use of f.m., but more likely for point-to-point communication rather than for the mobile contacts so common on a.m. The major object, of course, is to serve as a vast intercom network on 146.94 and 52.525, but with this difference: there seldom is a "net control" station, and handling traffic on *these* channels is severely frowned upon. If traffic *is* to be handled, secondary channels are established especially for this purpose. (If this wasn't done, 146.94 and 52.525 would sound like 75-chaos and utter uselessness.)

Naturally there are groups, cliques if you like, on f.m. because this is a very personal type of communication—everybody knows everyone else. Invariably, particularly in large metropolitan areas, certain groups set up another channel for their own "private" use. DX associations do this so that hot DX info can be quickly passed around. As you can understand, they do not wish to advertise their operation, especially the frequency. RTTYers for the most part use 146.70 and 52.60 for a.f.s.k. so they take a real dim view of any general phone operation on those channels. As we said, f.m. is meant to be strictly a local operation so there is little attempt to work DX. Oh, once in a while, when 6 meters opens up and 52.525 gets boiling, the latent DX virus comes

out in a few, but it is discouraged by the purists.

Interestingly, operators on f.m. do *not* split into "technician" groups and "general class" groups. (It is the fellow's technical ability that is respected.) In fact there is little bearing on the class license held; that is until frequencies above 147 on 2 are being considered as another channel. So, as a result, most of the f.m. lies between 146 and 147 mc.

Procedures

Actual operating procedures on f.m. 'phone are very different from that used on 6 and 2 meter a.m., and are completely foreign to the ham used to 75 and 20. Long transmissions are one sure way to become unpopular. Ten *seconds* is long enough; shorter transmissions are preferred. Call signs are *not* given every time you turn it over to someone, either. As required by the FCC, call signs are given once at the beginning of a con tact, and only once every ten minutes during, and once at the end of the contact. Ten-signals, such as used by law enforcement agencies but with special modifications, are used in busy metropolitan areas to cut down on the transmission time.

10-1 You Are Unreadable. (Don't bother anymore—there's enough QRM on channel.)
10-2 Read You OK. (Never mind saying all those call letters.)
10-3 Message Received. (Roger; as used by FM'ers.)
10-4 Message Received. (Roger dodger; as used by CB'ers.)
10-5 Relay Message. (No third party traffic, unless about FM.)
10-6 Busy. (Don't call me; I'll call you.)
10-7 Shutting Down. (Pulling the big switch; no further transmission.)
10-8 In Service. (On the channel; would like to yak.)
10-9 Repeat. (Missed that; there was something funny on TV.)
10-10 Monitoring Channel. (Will answer if called.)
10-12 Visitors Present. (Be careful what you say!)
10-20 Location. (Where you are, now—if it's safe to tell!)
10-21 Telephone. (For traffic not for big-ears on the channel.)
10-30 Doesn't Conform To Rules. Careful, there is an OO listening!)
10-36 Confidential. (Not to be discussed on the channel.)
10-38 Group Meeting. (Not everybody, bonehead; just **our** group!)
10-41 Switch To Channel ..... (Too much flushing on .94!)
10-46 Telephone Number. (Given backwards to thwart the BCL.)
10-50 Auto Accident. (Listen carefully for traffic tie-up info.)
10-62 Teletype Traffic. (On 146.70 f.m., naturally.)
10-66 Cancel Arrangement. (Can't make it; 10-75, 10-95, etc.)
10-69 TVI. (Can make only real short transmission. Why tempt fate)
10-75 Family Problems. (The XYL is giving me the business.)
10-80 Net Meeting. (Everybody; even the Swans of Abbotsbury.)
10-93 Frequency Check. (How far off zero am I on **your** discriminator?)
10-95 Children Problems. (I'm baby-sitting tonight.)
10-99 CD Test. (Usually a.m. on **our** f.m. channels!)

Nobody, but nobody, calls *CQ*, not even on 146.94 or 52.525. And, one startling fact: you just don't come up on some group's private channel and start yakking with them, not without a special, personal and previously arranged, invitation. If you do you will either be ignored or will be politely (?) told that you are not welcome, even if you are a visitor from another area.

Repeaters

Repeater operation, like in commercial and police two-way radio practice, is the establishment of an unattended amateur f.m. station at a suitable high-elevation location such as on a mountain top or on a skyscraper in a city. Legally, this operation relies upon a broad interpretation of the FCC Rules (97.43) which permit remote control of an amateur station by radio providing that five specific conditions are met, the most significant being that the station be at all times under the positive control of a duly licensed operator at a control point who can, and must, immediately suspend radiation when there is a deviation from the Rules, like when some "comedian" feeds in music.

There are 6 meter to 2 meter repeaters, 2 to 6, 2 to 2, *etc*. Most of them are in-band repeaters, for example 146.34 to 146.94 as in the east. In the Chicago area there is one 146.82 to 146.64, and one 147.50 to 147.75. And in the west there are other combinations. Some even use 420 mc inputs. Legally, the Rules specify that the positive control mentioned above must be on frequencies 220 mc or above.

Many repeater systems are "private" systems, unopen to any amateur who puts a transmitter on the input frequency. These go to elaborate techniques to prevent retransmission by hams outside of their group.

References

Very few articles on f.m. equipment or operation have appeared in either *QST*, or *CQ*, until lately. Strangely, the ARRL had quite a promotion on f.m. going back in 1940. (Take a look under *FM* in the index in December 1940 *QST*.) *QST* did, however, have one good article in July 1960 entitled, "Two Meter F.M. for Noise Free Local Communication," by Jim Aagaard, K90JY. In those days, when diagrams and information on f.m. equipment was scarce, Jim and K9YHQ published their famous "blue" book *Wide-band FM for the Radio Amateur*. That book is out of print now, but Two-Way Radio Engineers, 1100 Tremont Street, Boston 20, Mass., has recently published the *FM Equipment Schematic Digest*, an excellent collection of Motorola circuits covering low band (6), high band (2), and 450 mc equipment. It sells for $3.95, postpaid. ■

Six Meter "Trunkceiver"

BY JERRY VOGT*, WA2GCF

The control unit is mounted in the ashtray compartment with the transceiver in the trunk. L. to r., meter light, on-off switch, S meter, L-pad, mic. connector.

Attention all non-smokers and potential converts. Here is an application for that useless ash tray (or potentially useless ash tray). The author built a 6 meter crystal controlled receiver and transmitter located in the trunk and placed the remote controls in a small chassis that fits in the ash tray space.

It seems, lately, that many folks are beginning to change their attitude on smoking, myself among them. What I am leading up to is, why not replace your automobile ashtray with a mobile transceiver?

Probably your first thought is that it wouldn't fit! You are partially correct. The *whole* transceiver wouldn't fit, but if you do my type of operating the important parts of the rig *would* fit into the ash tray. After pondering the subject for a few minutes, the idea developed into building a control center in a little chassis, the size of the ash tray, and building a rig which would mount in the trunk of the car. The rig would contain all the components which don't need continual attention during operation in mobile activities. The ash tray could be removed and saved to be put back in the car when traded in.

The type of mobile operation in which this was to be used did not demand having a tunable transmitter or receiver. The mobile frequency used in this area is 50.360 mc. Almost anyone could operate on this frequency to answer a CQ. Also, anyone in RACES or anyone operating in the local transmitter hunts normally operates strictly on this frequency. A crystal controlled receiver is used to avoid having to tune the receiver by remote control. However, if a tunable receiver is necessary, a Varicap could be used to vary the oscillator frequency in the converter section, and a well regulated voltage could be controlled by a dashboard pot.[1]

Only the necessary controls are mounted up front. This is the secret of the whole venture. Also to be considered in the design of such a system is the importance of keeping down the total number of conductors run between the dashboard and the trunk. To do this, we make as many of the controls as possible a function of grounding. In the case of the speaker audio, we use an L pad between the 4 ohm audio line and the speaker to save running two high impedance shielded conductors that would be needed for a conventional volume control circuit. An S-meter is a must and lighting it makes it useful at night. Rather than run an extra conductor for a lamp, 12 volts from the ignition switch is used to light the meter.

To avoid mass confusion in getting the whole radio functioning properly when done, I found that the best practice of all is to proceed one stage at a time, doing a little building and then a little testing and refining. This not only makes it easier to troubleshoot each stage but relieves the monotony involved in first doing a lot of building and then a hopeless (so it seems) troubleshooting job.

I don't really expect anyone to copy this piece of equipment part for part. The purpose of this article is the same as I use other construction articles for. The write-up is intended to serve as a source of ideas. These particular circuits may

*182 Belmont Road, Rochester, N.Y. 14612.

[1]Gellman, M., "A Unique 75 Meter S.S.B. Transceiver," *CQ*, July, 1964, p. 24.

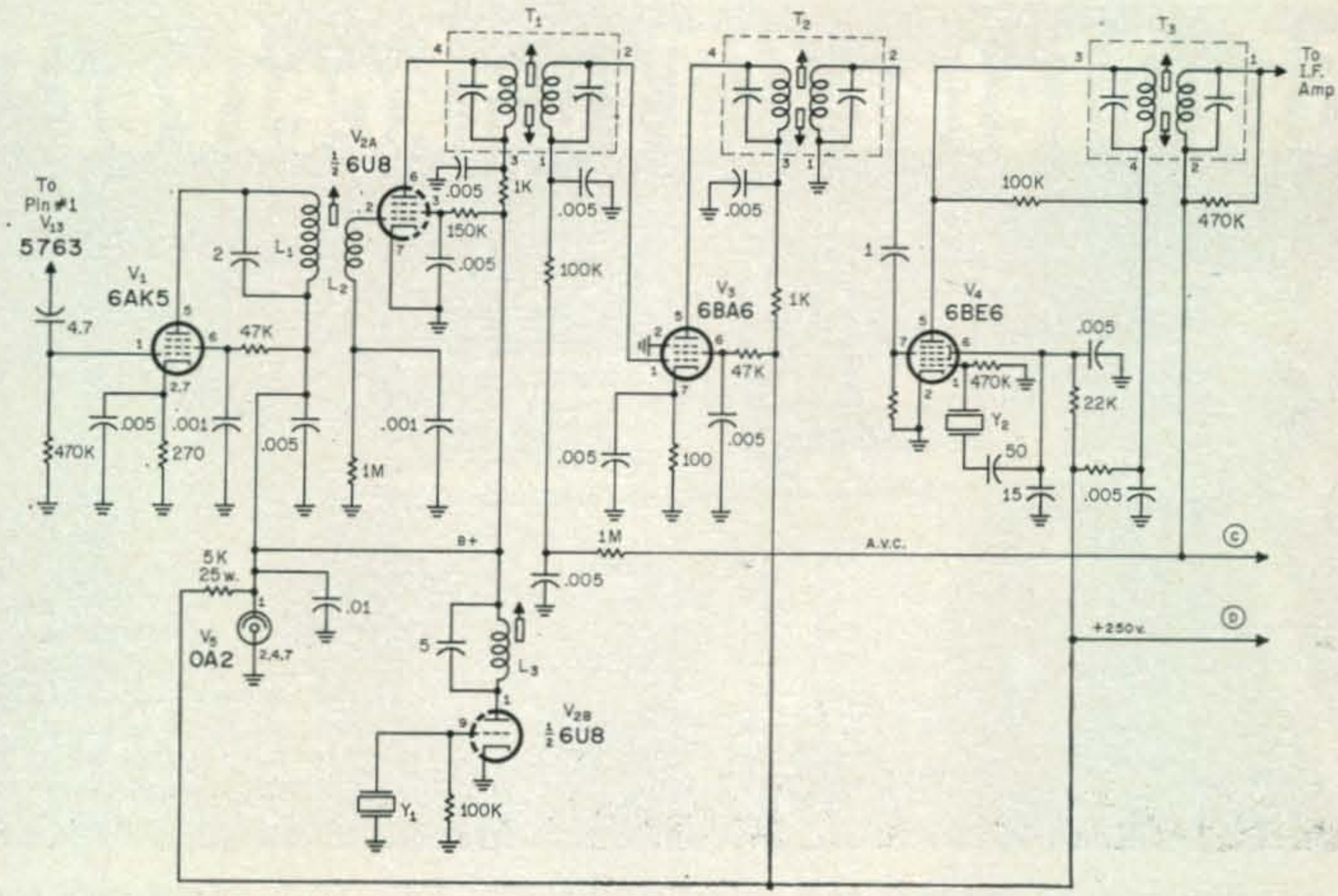


Fig. 1—Circuit of the converter section of the 50 mc mobile receiver designed for crystal controlled reception on 50.360 mc. All resistors are ½ watt unless otherwise noted, and all capacitors less than one in value are in mf and one or greater, in mmf.

L_1—14 t. #20e. close wound on ½" slug tuned forms. Cambion #3353 or equiv.
L_2—2 t. #20 hookup wire wound over cold end of L_1.
L_3—14 t. #20e. close wound on ½" slug tuned form, Cambion #3353 or equiv.
T_1, T_2—4.5 mc i.f. transformers Miller #6203 or equiv.
T_3—455 kc i.f. transformer, Miller #12C-2 or equiv.
Y_1—45.86 mc
Y_2—4.045 mc.

be of some value to copy directly since they worked well for me.

As far as most hams are concerned, the part of a transceiver which might cause the most problems is the receiver section. Receivers are not at all bad to construct yourself if you don't build and test more than a stage at a time. I started the project on the receiver section using a bench power supply until the whole rig was built and then finished off with the power supply. The transmitter was built next and then the control circuits were wired. Always build the audio stages or the detector in a receiver first and work toward the antenna. This is the easiest way to progress.

Receiver Front End

The v.h.f. converter and front end, shown in fig. 1, is simple and very stable. This circuitry was selected since it did not involve touchy neutralizing. Coils are slug-tuned and wound on ¼" paper forms and then coated with Q-Dope. This circuitry is very similar to the mobile converter in the ARRL Handbook. The crystal in this unit is soldered into the circuit; however, if you wished to QSY once in a while, you could use the plug-in type crystals. No retuning would be necessary with this circuit.

In order to avoid touchy input circuits, the tank for the transmitter is also used for the front end of the receiver. This also saves using an antenna change-over relay. The whole converter section of the receiver is voltage regulated for stability. I might add that no drift problems were encountered.

I.F. Stages

The i.f. stages, shown in fig. 1 and fig. 2, are all straight-forward. The last i.f. frequency of 455 kc was picked to give the approximate 20 kc bandwidth needed to hear stations transmitting slightly off the receiver frequency. Swamping resistors were placed across the i.f. transformers to help to widen the bandwidth. These resistors give us a side benefit in that they improve the stability of the i.f. stages.

An S-meter circuit was added to the last i.f. stage. This circuit is set for a 0-1 ma movement meter. However, changing the value of the 680 ohm resistor willallow using almost any meter in the circuit. This meter circuit is a good one if you prefer accurate readings. It works well at the low signal level area and tapers off at close range. This allows operation distant from a hidden transmitter up to a few feet from the transmitter.

The second mixer stage uses a 6BE6 which also acts as a crystal controlled oscillator. The crystal frequency is the difference between the 4.5 mc i.f. and the 455 kc i.f. The 4.5 mc i.f. is used partly because the transformers are available as TV replacement parts and partly because,

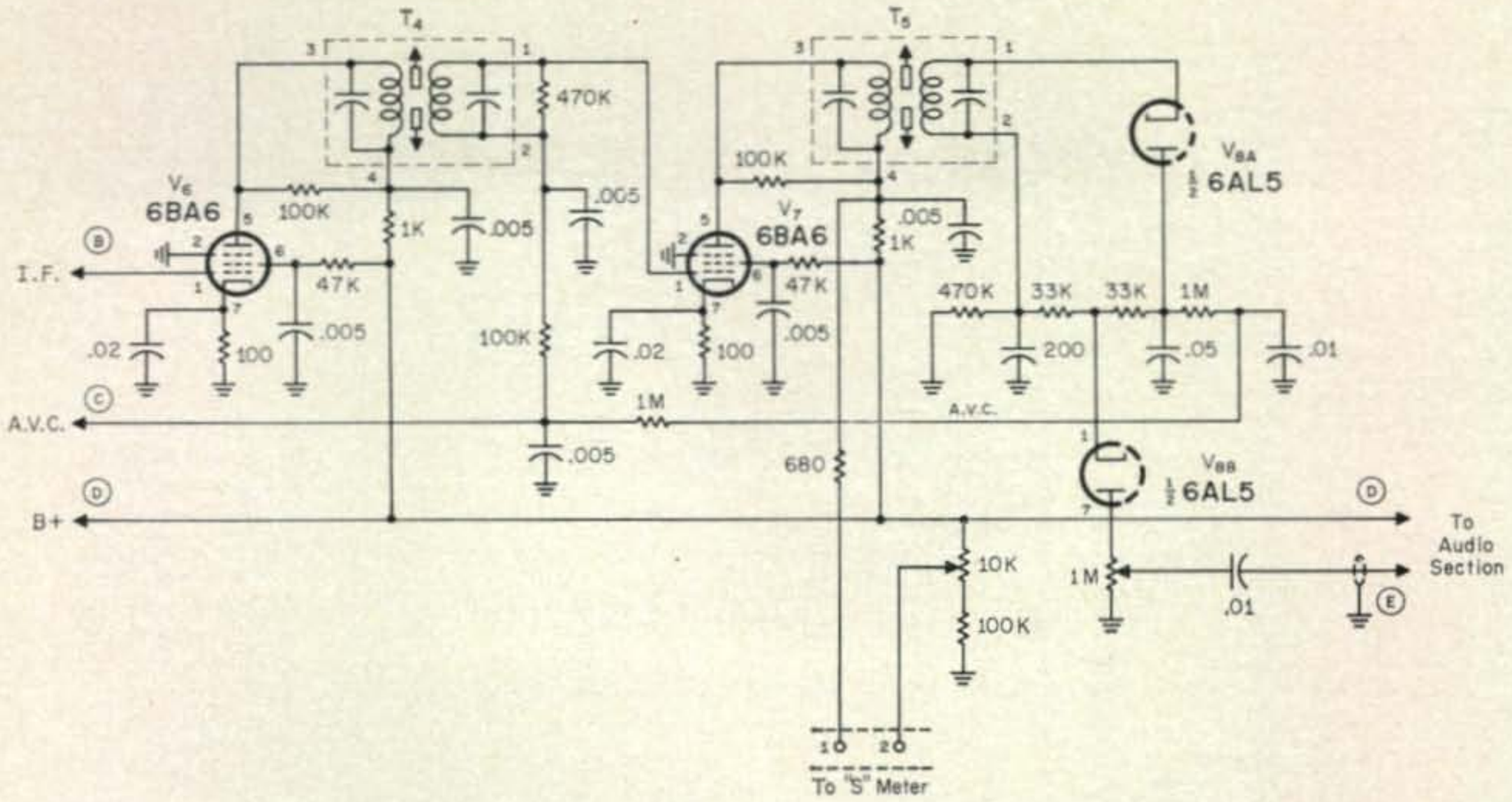


Fig. 2—Circuit of the low frequency i.f. amplifier, detector and noise limiter sections of the 50 mc mobile receiver. The two 455 kc i.f. transformers are Miller type #12C-1 or equivalent. The 10K S-METER ADJUST pot requires a linear taper and the 1 meg AUDIO GAIN control requires an audio taper.

as a general rule, the first i.f. frequency should be about 1/10th the operating frequency. This frequency will minimize any image problems.

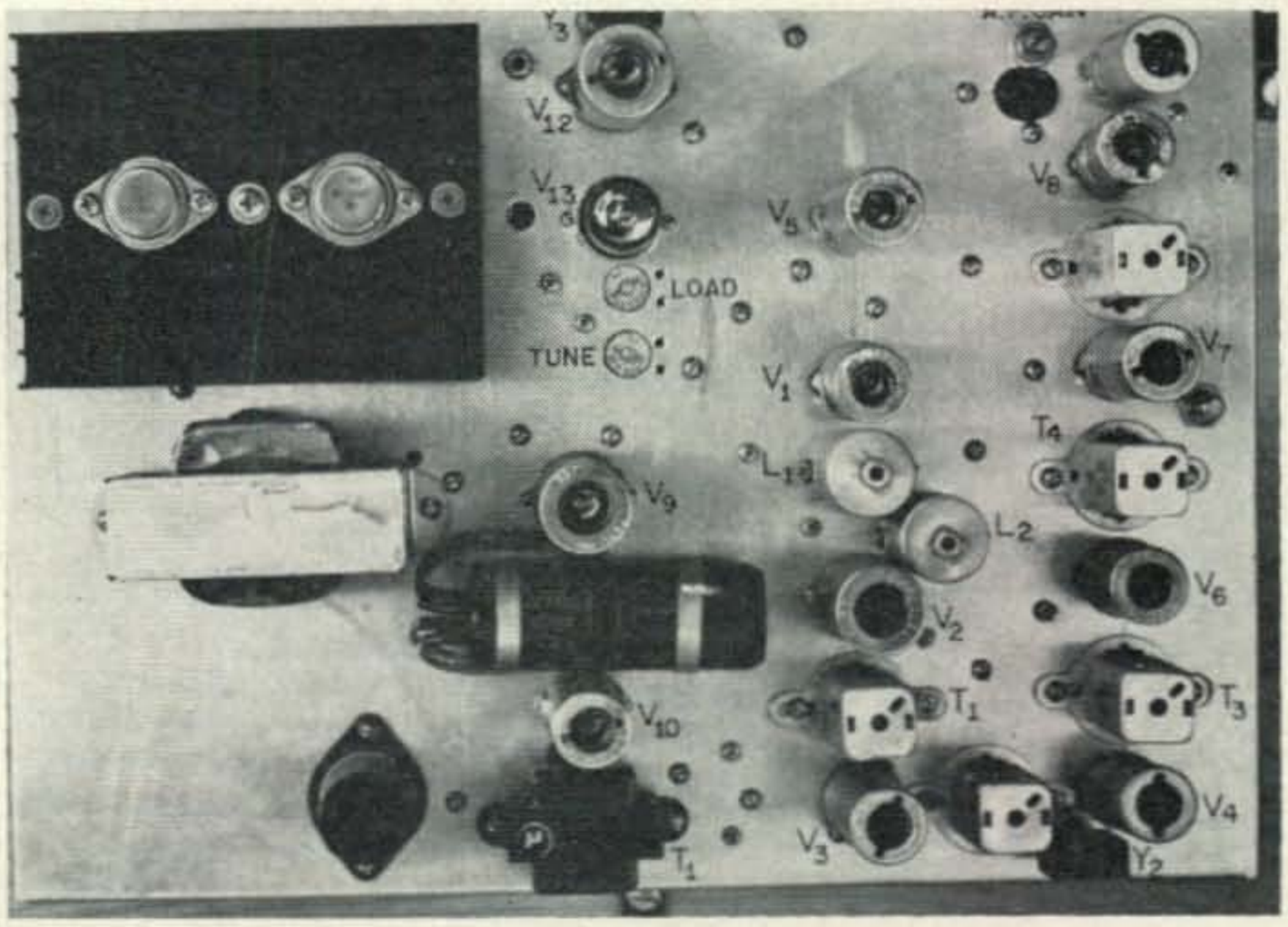
Detector and Noise Limiter

The detector and noise limiter, shown in fig. 2, is a new circuit developed by an engineer named Makino. It is easy to build, not very critical and works like a charm. Using this noise limiter, I hear ignition noise about once every few months and only when I am close to a car with a poor ignition system. Other times you can't tell you have any noise in the area. No spark plug suppressors are necessary in your own car. The limiter remains on all the time since it doesn't distort the normal audio. It merely eliminates all noise except in one case. Generator whine will not be eliminated by this circuit since it is not a random noise but more of an audio tone. A simple coax capacitor on the generator will eliminate this one noise leaving you with a quiet receiver.

The limiter is not really a limiter or a clipper. It acts as a series gate which opens during a noise pulse and closes at all other times. This is why it hardly distorts normal speech.

Audio Section and Control

The audio section, shown in fig. 3, consists of a 12AT7 microphone preamp-driver and a 6AQ5 output stage. The inputs are switched by the T-R relay. In receive mode, the audio output stage is a regular Class A amplifier. The output is fed to the dash board L-pad and then to the speaker in the car. The 6AQ5, when used in transmit mode, acts as a Class A amplifier also, but instead of using an expensive modulation transformer, an old filter choke is used in a basic Heising type of modulator. Using a carbon mike, which is also cheap, plenty of audio is available to modulate the final. The value of inductance for the choke is not critical and anything above 6 or 7 henries will work providing it can handle the small amount of current drawn



Top view of the 50 mc transmitter receiver as it is located in the trunk of the car. No data is given on the construction of the d.c. to d.c. converter as explained in the text.

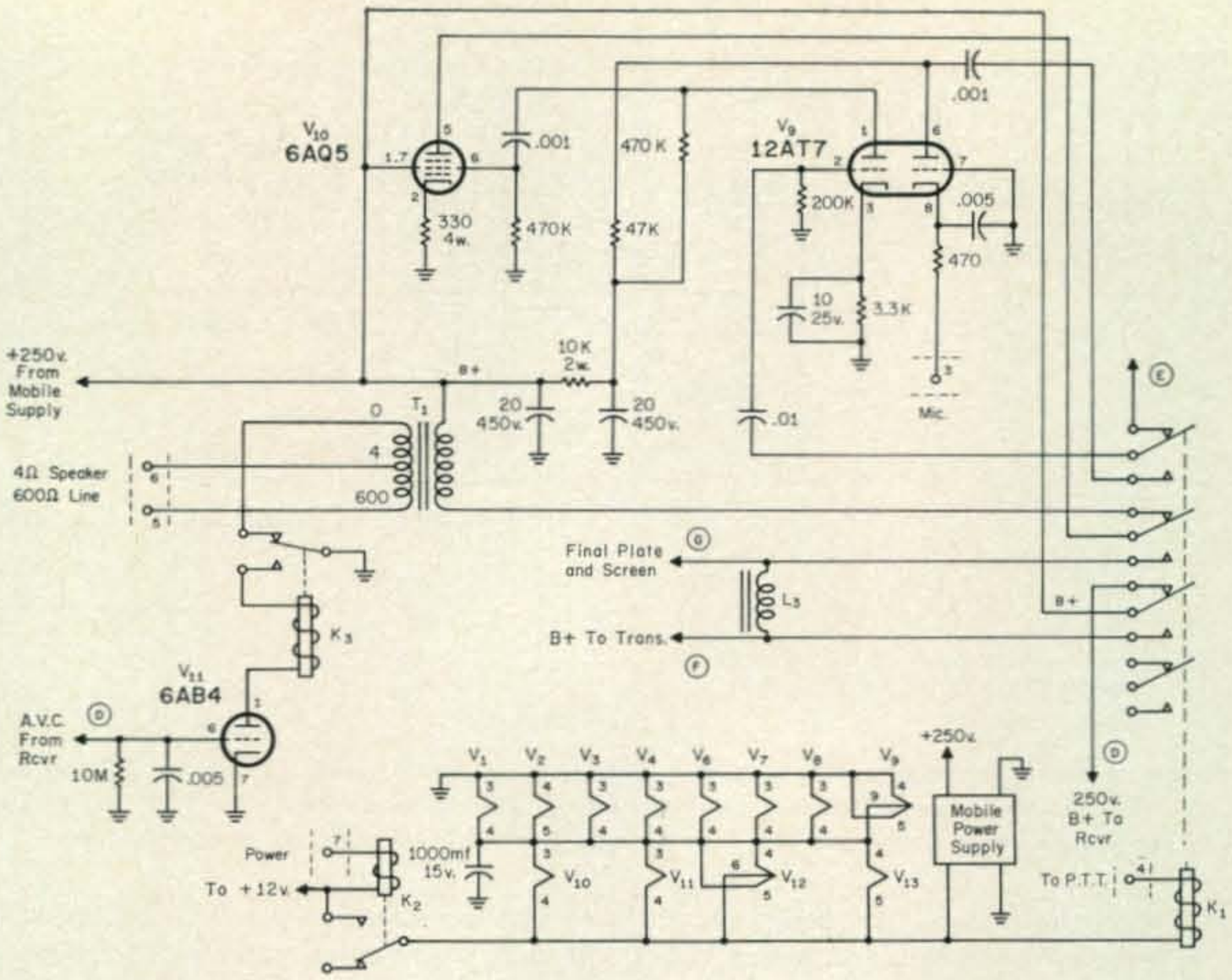


Fig. 3—Audio section of the 50 mc receiver doubles as modulator in transmit position. The filament and portions of the control circuit are also shown. All resistors are ½ watt unless otherwise noted. All capacitors are in mf. Relay K_1 is shown in the receive position

L_3—10.5 hy at 50 ma.
T_1—Output transformer 5K to 600 ohms and 4 ohms.
K_1—3 p.d.t. 12 v.d.c. relay.
K_2—S.p.d.t. (heavy duty contacts) 12 v.d.c. relay.

through it. You will notice that in order to use the 6AQ5 in both transmit and receive, it was necessary to switch the B plus as well as the plate circuit of the audio output stage.

The remote control panel circuit, shown in fig. 4, includes a microphone connector, an S-meter, the power switch, the L-pad for the receiver audio and a lamp to light the S-meter. The power switch which turns the power relay on also cuts in the audio from the L-pad to the car radio speaker so that the L-pad doesn't load down the car radio when the 6 meter rig is off.

You will notice that a special line connects the transmitter audio ground path directly to the transmitter. A great deal of research finally lead to running an extra wire for this to rid us of noise from the transistor power supply getting into the audio section. A word to the wise, *beware of the common ground*.[2] It can cause this type of problem.

Transmitter

The transmitter section consists of a 12BY7 oscillator-tripler and a 5763 double-final amplifier as shown in fig. 5. The circuitry for the transmitter section was carefully selected so that it could be tuned once with a field strength meter and then forgotten. The power input is low enough so that final is very stable. You needn't have any fears that it will run away from you if you don't keep it tuned to perfection. I picked a final circuit that doubled in order to get away from neutralizing. You sacrifice a small amount of efficiency for this feature but you don't need all that power anyway. The only three adjustments are very simple to tune. Using an output meter or field strength meter, simply peak all controls for maximum output. Receiver type Ceramicon trimmer capacitors were used suc-

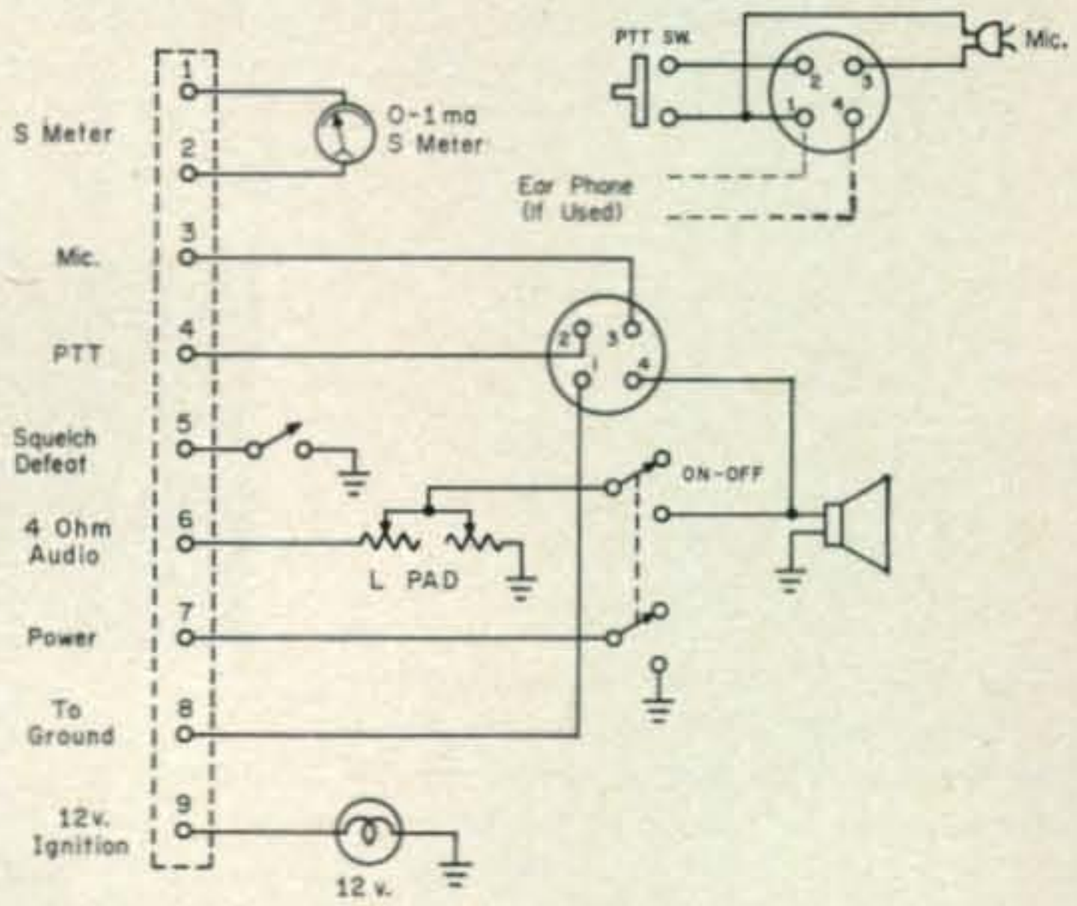


Fig. 4—Circuit of the control panel wiring for the 6 meter transmitter receiver. The compact unit is built into the ash tray compartment of the automobile. The squelch defeat switch was added after the photos were taken and, as shown, parallels the squench relay contacts in fig. 3.

[2]Brickey, R. "The Common Ground," *CQ*, March 1965, p. 49.

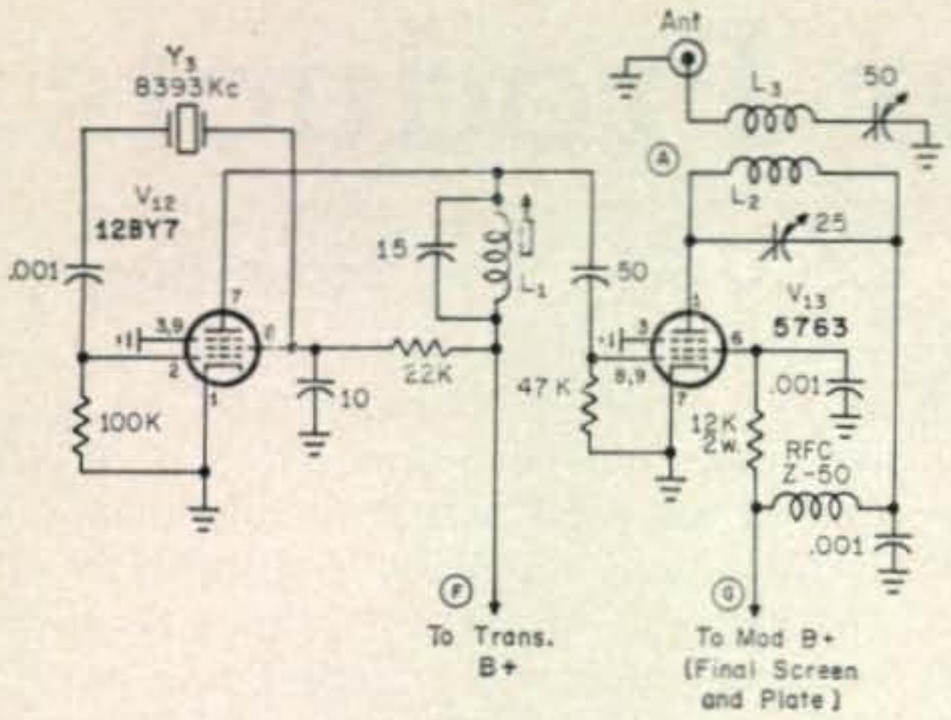


Fig. 5—Circuit of the 6 meter transmitter. An oscillator tripler brings the crystal frequency to 25.179 mc and doubling in the final brings it to 50.358 mc. All resistors are one half watt except as noted. All the 0.001 mf capacitors are disc ceramics. The two variables are receiver type Ceramicon trimmers and the remaining types are mica.

L_1—15 t. #20e. on ¼" tuned form. J.W. Miller #4500 form.
L_2—4 t. #24e. on ½" slug tuned form ½ long.
L_3—1 t. #24e. on cold end of L_2.
Both L_1 and L_2 have J. W. Miller #S-74 aluminum coil-shield cans.

cessfully for tuning the final tank circuit. This avoided the need for big, clumsy air variables. It saves a little money in the parts department too.

Power Supply

Getting at last to the power supply section, we can take care of the heater strings first by saying that they are connected in series-parallel so that 6 volt types of tubes can be used. This is the type we had in junk box. If you like you may buy some of the 12 volt equivalents.

The high voltage supply consists of a transistorized d.c. to d.c. inverter. The one I built used a prototype transformer that is not generally available so one of the many circuits around may be used.[3] Anywhere from 220 to 250 volts is required.

The 1000 mf capacitor is used to filter the noise from the filament line.

Construction Details

Construction is straightforward, with the entire rig built in rows. Shield strips are run between the rows of stages so that they don't couple to their neighbors. This method of arranging the components also makes a neat wiring job possible and all cables are laced for neatness. Color-coded wires were used for easy identification. These are easily gotten by obtaining multiconductor cables and slitting them apart to obtain individual conductors.

Adapter plates were used for the i.f. transformers so that no special holes were required. A terminal block was used for connections outside the rig, running to the front of the car. A plug could be used but the terminal strip is a iittle more versatile.

Alignment

Initial tune-up is accomplished on the bench. A signal generator is used to peak the i.f. stages and then a weak signal from an antenna is used to tune the converter section. The tuning should be accomplished stage at a time as your rig goes together so that a great confusion of alignment is avoided at the completion of the unit.

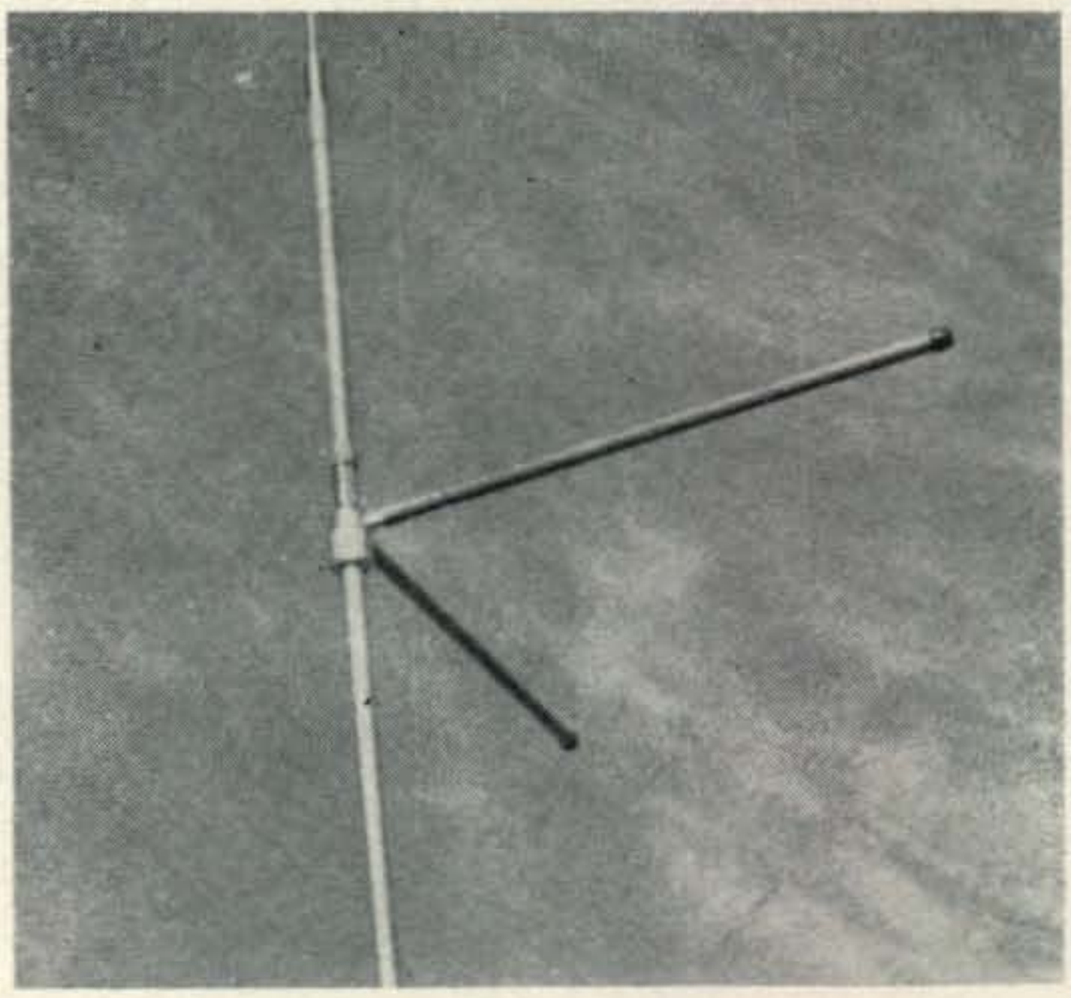
The transmitter is tuned using a field strength meter. Thus, no metering is incorporated in the rig itself.

[3]Gellman, M. "A Transistorized HV-LV Mobile Supply, *CQ*, Dec. 1964, p. 31.

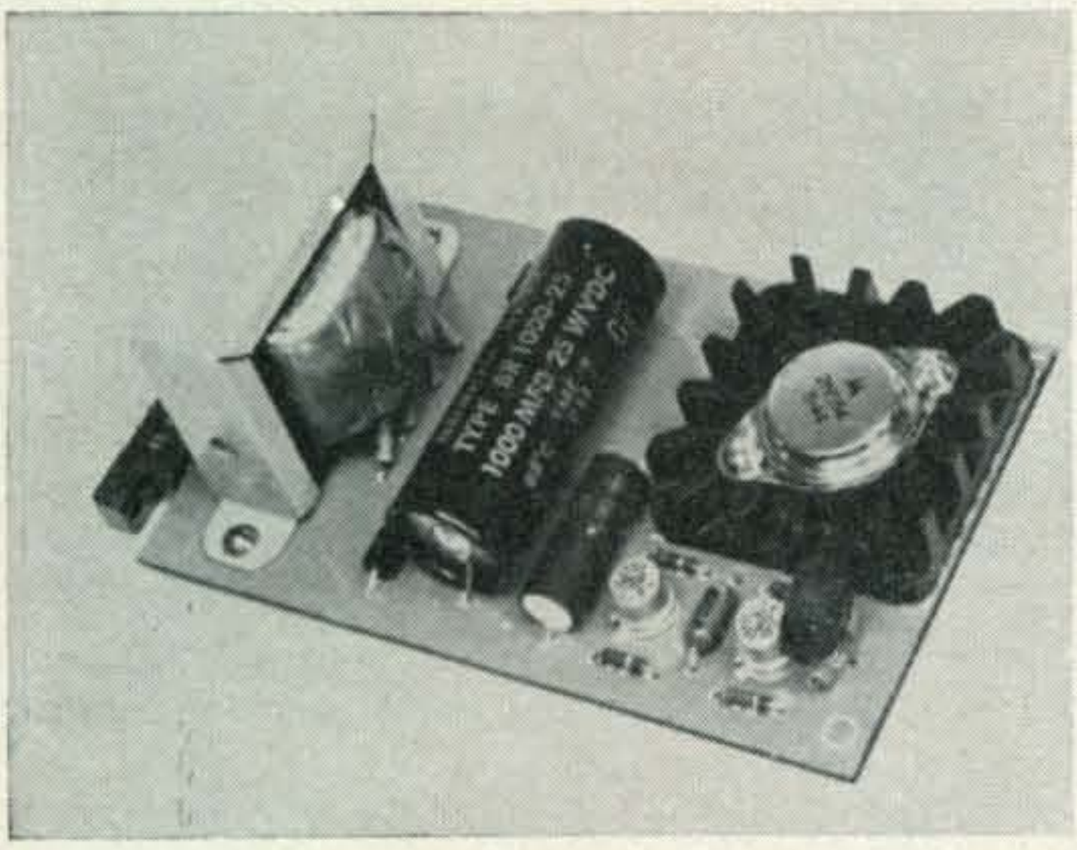
New Amateur Product

Mark Products

Mark Products Division of Dynascan Corp., 5439 West Fargo Avenue, Skokie, Illinois 60076, announces a new 40 Meter element for their HW-3 Tri-Band amateur mobile antenna. The new element, designated the HW-3/40, is a 1-foot long helical element topped by a very flexible 3-foot stainless steel whip. When mounted on the top of the HW-3, the HW-3/40 resonates the antenna on the 40 meter amateur band. Any two of the three remaining 10, 15, and 20 meter elements are then also installed on the HW-3, permitting instant choice (without mechanical or electrical antenna switching) of any three of the four amateur bands from 40 through 10 meters. The HW-3/40 sells for $7.95, while the HW-3 net price is $19.50. For further information, contact Joseph Schroeder, Sales Manager of Mark, or circle 72 on page 110.



New Amateur Products

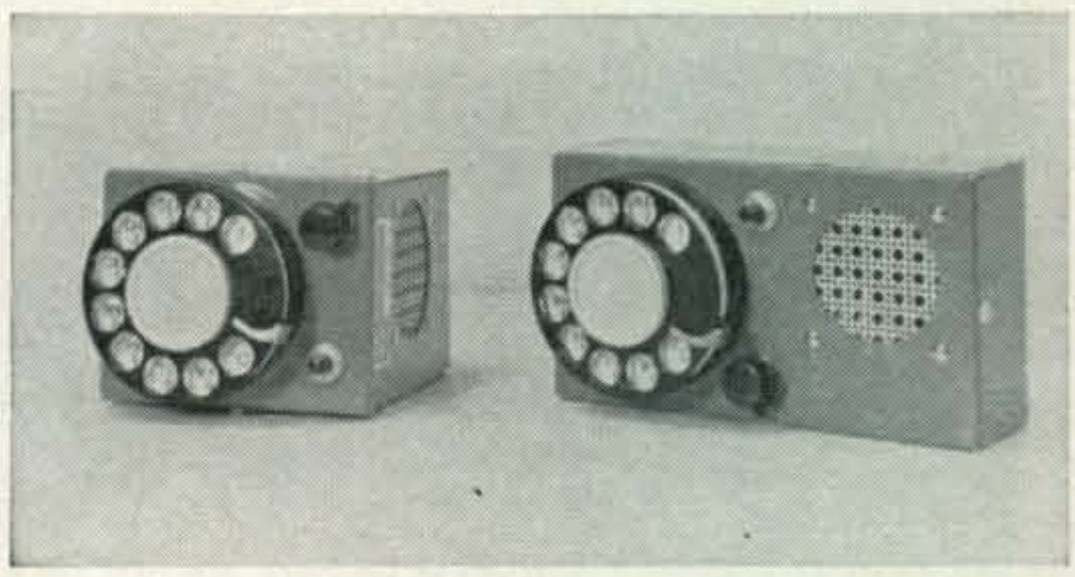


ESSCO Solid State Power Supply

A new solid state electronically regulated power supply employing three transistors and five diodes has been announced by ESSCO. The unit is designed to be operated from 110 v.a.c. The power supply is adjustable from 5 v.d.c. to 10 v.d.c. at 500 ma. From no load to full load the percentage of regulation does not exceed 3 percent, and the percentage of ripple at full load does not exceed .05 percent. The board is 3" × 5" and weighs less than thirteen ounces. It is available in kit form for $16.95 and fully wired at $26.95. For further information write to ESSCO, 324 Arch Street, Camden, New Jersey, 08102, or circle 68 on page 110.

Custom Devices Repeater Control

CUSTOM Devices has come up with a repeater control for the growing interest in repeater work. The use of a telephone dial which pulses a solid state osc. pwr.-amp. provides the proper tone at the correct dialing speed. The output of the speaker is adequate to allow speaker to microphone operation. The unit is available in three sizes for mounting choice. It sells for $22.50. For more details write to: Custom Devices, 439 South Canal Street, South San Francisco, California 94080, or circle 69 on page 110.



WINCO 4 Kw Generators

WINCHARGER Corporation announces their new WINCO 4BH-F series of generators. One of the major improvements is the Electronic Excitation, which means there is no commutator, d.c. brushes to wear out, and increased reliability. Other features include instant idling control, patented engine warm-up control, full power dual output generator and a power control for starting heavy motors. The generators are available with either Briggs and Startton or Wisconsin engines and various other options. Complete specifications and prices are available from Wincharger Corporation, East Seventh and Division, Sioux City, Iowa, 51102, or circle 70 on page 110.

EICO 715 Trans-Match

THE new EICO model 715 provides fast measurement of: standing wave ratio, r.f. power, modulation percentage, modulation distortion, and relative field strength. It is all solid state and self-powered and includes a 100 μa meter. The Trans-Match comes in kit form for $34.95 or wired and tested for $44.95. It is 4⅞" × 8⅛" × 3½", and weighs five pounds. For further details write to EICO, 131-01 39th Ave., Flushing, N.Y., 11352, or circle 71 on page 110.

The Heathkit SB-110. A slide-rule scale at the top of the dial escutcheon refers to the 50 kc points over a 500 kc range, while the circular scale is linearly calibrated in 1 kc steps. The fiducial hairline may be adjusted for calibrating purposes by means of the small knob on the upper right of the escutcheon.

CQ Reviews:

The Heathkit SB-110 6-Meter S.S.B. Transceiver

BY WILFRED M. SCHERER,* W2AEF

ONE of Heathkit's newer units in their popular "SB" series is the SB-110 transceiver which in one package, (less power supply), provides full coverage on the 6-meter band for fixed-station or mobile use on s.s.b., c.w. or a.m. (s.s.b. with carrier). You don't need any accessory trapping—translators, converters, linear amplifiers or what-have-you, usually used with present gear to get on 50 mc s.s.b.

Delivering 100 watts p.e.p. output with stable accurately calibrated v.f.o. frequency control over the entire 50-54 mc range, the SB-110 should set a new standard for this band. Let us take a look at some of its other features and specification that might put it in this category: Sideband generation and receiver selectivity obtained with a h.f. 2.1 kc crystal filter; Nuvistor front end with sensitivity of 0.1 μv for 10 db s./n. ratio; preselector tuning; a.g.c.; automatic receiver-frequency offset for c.w. operation; built-in crystal calibrator; v.f.o. stability 100 c.p.s. per hour; c.w. sidetone monitor; headphone level control; p.t.t. or built-in v.o.x.; v.o.x. type break-in for c.w. phone-patch input; upper or lower sideband operation; adjustable pi-output for 25-100 ohm loads; crystal-control operation for transceive or for transmitter only; panel meter calibrated in S-units or transmitter functions (plate, a.l.c. or relative power output); and an effective noise limiter, a feature missing on most s.s.b. transceivers. There are two power supplies available, one for 120 v. a.c. operation, the other for 12 v. d.c. mobile use.

Like most Heathkit products, the SB-110 comes in kit form, enabling you to have the fun and satisfaction of putting your own gear together at a substantial saving in cost over factory-wired equipment. Although the set appears to be quite complicated, it is not as difficult to build as one might expect. This was borne out by an experiment we tried; namely, turning the kit over to a novice to do the work. Happily this turned out to be a successful proposition from which a few good lessons were learned.

*Technical Director, *CQ*.

Receiver Section

A block diagram for the SB-110 is shown at fig. 1. Double conversion is used for the receiver with the first conversion of 8.4-8.9 mc obtained by heterodyning the input signals with a separate crystal (41.6-45.1 mc) for each 500 kc band segment. The second i.f. is at 3.395 mc, obtained by mixing the 1st i.f. signals with 5.0-5.5 mc signals from the v.f.o. Sideband selectivity is obtained with a 3.395 mc crystal filter and the signal is converted to audio by a product detector.

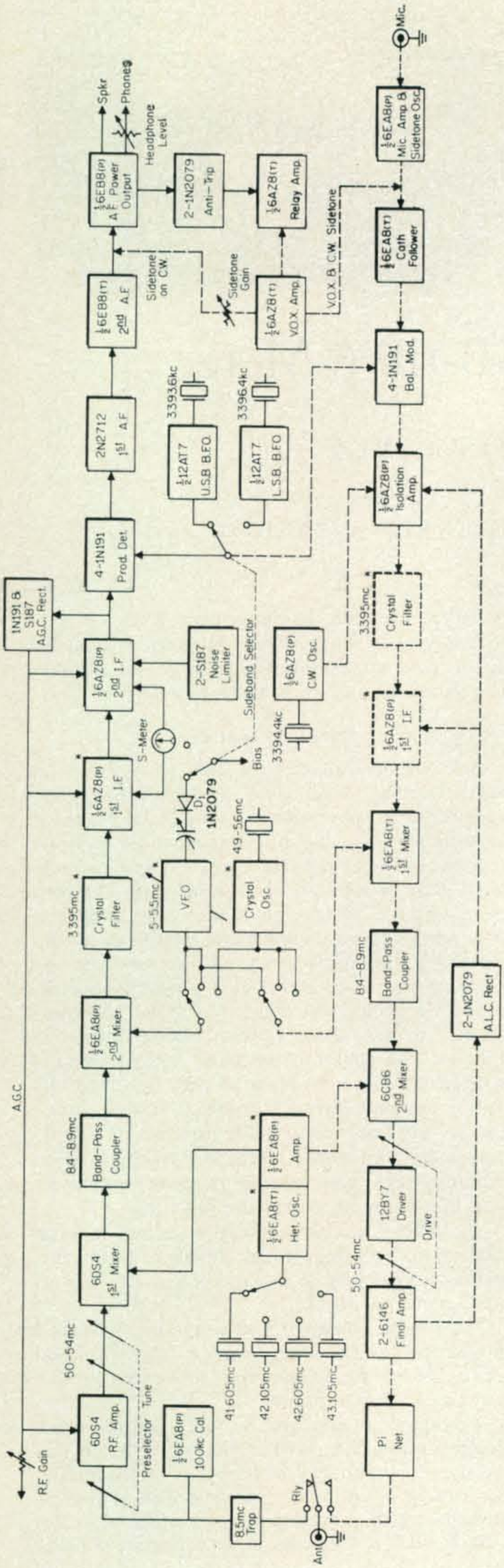
The r.f. stage is a neutralized 6DS4 Nuvistor, coupled to the mixer, another 6DS4, through a double-tuned narrow-bandpass circuit which, instead of being broadbanded with fix-tuned circuits, is resonated by a three-gang variable capacitor to provide "preselector tuning." This arrangement ensures better cross-modulation characteristics and maintains peak sensitivity with minimum noise over the full range.

The 8.4-8.9 mc bandpass coupler after the 1st mixer rejects all frequencies outside of this range, and an 8.5 mc trap in the antenna circuit rejects input signals at the i.f.

The product detector is a ring-type "balanced modulator" affair using four diodes, a method we've always found superior for exceptionally clean s.s.b. demodulation.

Sidebands are changed by switching the b.f.o. frequency to either skirt of the filter. When this is done, the frequency of the v.f.o. is automatically shifted to eliminate retuning. This is accomplished with the sideband selector which activates a diode switch that cuts in a capacitor, shifting the v.f.o. during l.s.b. operation.

For crystal-controlled net operation or work



on MARS frequencies the v.f.o. can be cut out with an OSCILLATOR-MODE switch, substituting a built-in crystal oscillator. Crystal-control is thus obtained on the same frequency for both receive and transmit. Another switch position provides crystal control for the transmitter only, with v.f.o. tuning retained for the receiver. An excellent feature is that the crystal oscillator has a trimmer to permit adjusting the crystal to exact frequency.

The set is supplied with four crystals for the heterodyne oscillator to cover 50-52 mc. For use at the top half of the band and for MARS work below 50 mc, additional heterodyning crystals are required.

The automatic noise limiter, one of the best for s.s.b., is an i.f. type utilizing a pair of silicon diodes in a full-wave circuit shunted across the last i.f. transmformer.[1] An on-off switch is included.

Besides the customary a.f. gain control, there is a separate screwdriver-adjust control to vary the high-impedance output level for comfortable headphone listening without changing the normal loudspeaker level.

Transmitter

The transmitter also employs double conversion, but in the reverse order from that of the receiver. The s.s.b. signal is generated through the crystal filter at 3.395 mc and then is mixed with the v.f.o. signals to produce an 8.4-8.9 mc signal which in turn is combined with the heterodyning signals of 41.6-45.1 mc for output in the 50-54 mc range.

A cathode follower after the speech amplifier matches this amplifier to the low impedance of the ring-type balanced modulator which uses four diodes. As in the receiver, an 8.4-8.9 mc band-pass coupler between the two mixers eliminates undesired responses.

The plates of the 2nd mixer and driver are gang tuned and the final has a Pi-network adjustable for 50-ohm output that allows matching to loads having up to a 2:1 s.w.r. The driver and final are each individually neutralized.

In the c.w. mode a phase-shift network is switched into the mike amplifier circuit, so that it now functions as a 1000 c.p.s. tone oscillator. Grid-block keying is used directly at the transmitter mixers and the v.o.x. amplifier. The tone then goes through the v.o.x. amplifier to actuate the v.o.x. relay just as the voice does for s.s.b. The a.f. tone from this amplifier also goes to the receiver a.f. output amplifier for sidetone monitoring using either the loudspeaker or headphones. A sidetone level control is provided too.

[1] "IFNL"—An S.S.B. I.F. Noise Limiter, *CQ*, June '60, p. 42.

Fig. 1—Block diagram for the SB-110. The receiver routing is shown with solid connections, the transmitter section is connected by dashed lines. Elements common to both transmitter and receiver are marked with an asterisk.

The c.w. carrier is obtained from a 3394.4 kc crystal oscillator and is injected at the isolation amplifier, the gain of which can be adjusted with a DRIVE-LEVEL control to produce the required power level for the final amplifier. The c.w. carrier frequency is 800 c.p.s. higher than when the receiver is used in the u.s.b. position. This provides "frequency offset," so that when the receiver is tuned for an 800 cycle beat note on a c.w. signal, the transmitter will automatically be zero beat with the signal for on-frequency operation.

Assembly

Except for the final amplifier and the v.f.o., all stages are built on five printed-circuit boards. This simplifies the work which is further made easier with a preassembled, factory-wired and aligned v.f.o. After the circuit boards have been assembled and installed along with other chassis components, the major part of the work consists of interconnecting the boards and panel controls. There are two preassembled color-coded harnesses provided for the job.

It took our neophyte 42 hours to put the SB-110 together. Several additional hours were required on our part to do some trouble shooting before the rig was aligned and working properly; all due to the fact that although the step-by-step instructions were clear and simple enough, our "eager beaver" was too hasty, admittingly neglecting to carefully read and correctly follow through with some of the steps. He also, no doubt, tired by doing the work in the evenings over stretches of 4-6 hours at a time.

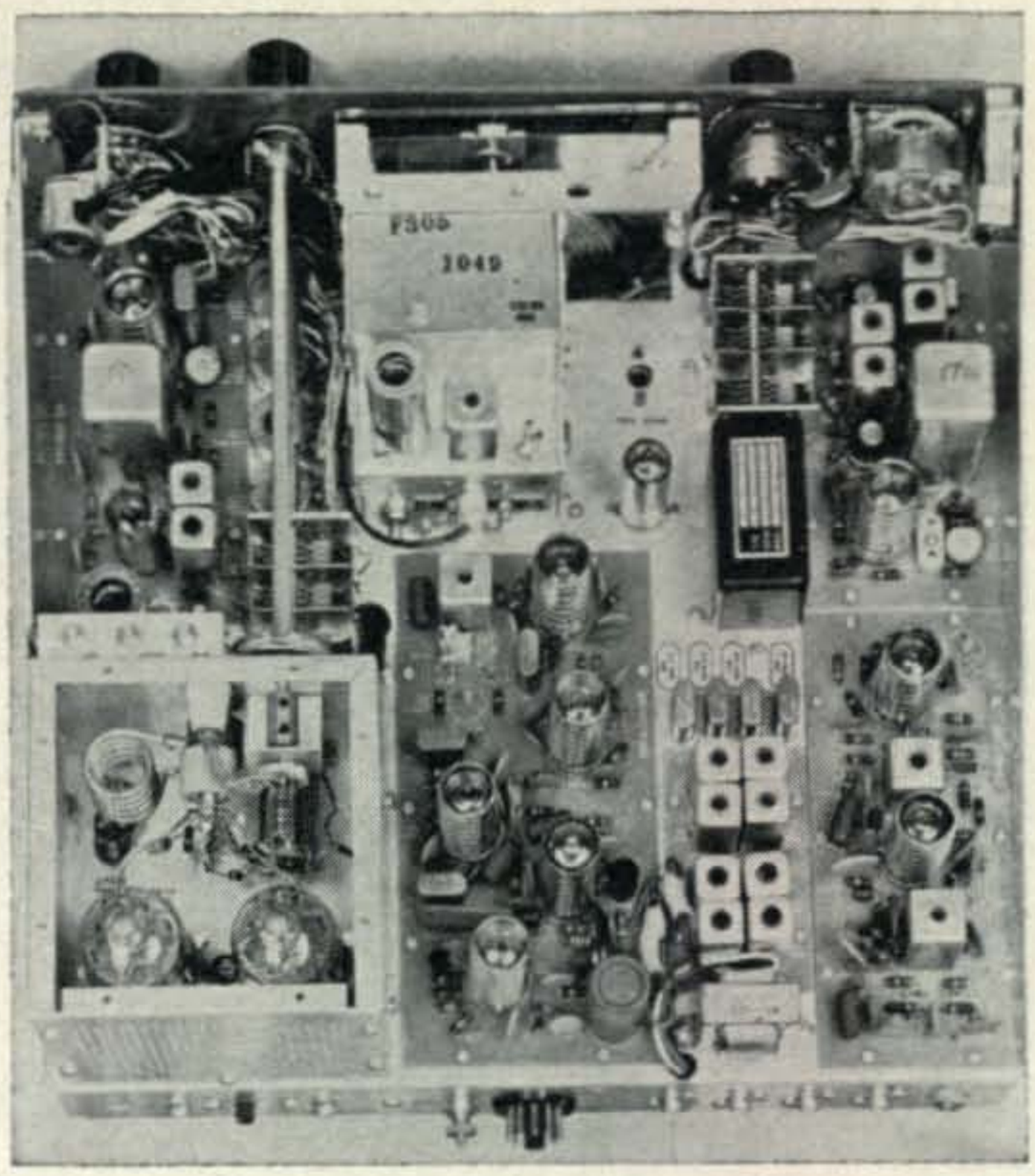
We therefore cannot emphasize too strongly the necessity for taking enough time to study each assembly step thoroughly and to "think it through" before proceeding. Also, do not work more than 1-2 hours at a clip, in order to minimize the chance of errors due to fatigue. Remember the old adage, "haste makes waste!" These suggestions apply to *any* kit work whether it be simple or complicated, and regardless of whether you're a newcomer or an old hand.

Performance

Let us now take a look at the results obtained with the finished product. The receiver sensitivity for the SB-110 was better than usually found with 6-meter gear, measuring within the rated 0.1 μv for 10 db s./n. and could be maintained over the whole band. Strong-signal handling capabilities also were excellent.

The following other measurements were up to specifications, except as noted: SELECTIVITY: 2.1 kc at 3 db, 5 kc at 60 db; UNWANTED-SIDEBAND SUPPRESSION: 55 db; IMAGE REJECTION: rated at 50 db, 48 db; I.F. SIGNAL REJECTION (8.5 mc): rated at 50 db, was 60 db; at 3.395 mc, 80 db (not rated); INTERNAL SPURIOUS RESPONSES: rated at 0.1 μv equivalent signal, except 0.3 μv at 51.250 mc—none was found in the 50-52 mc range except the specified one (crystals were not supplied for the upper half of the band).

We often marvel at the overall frequency sta-

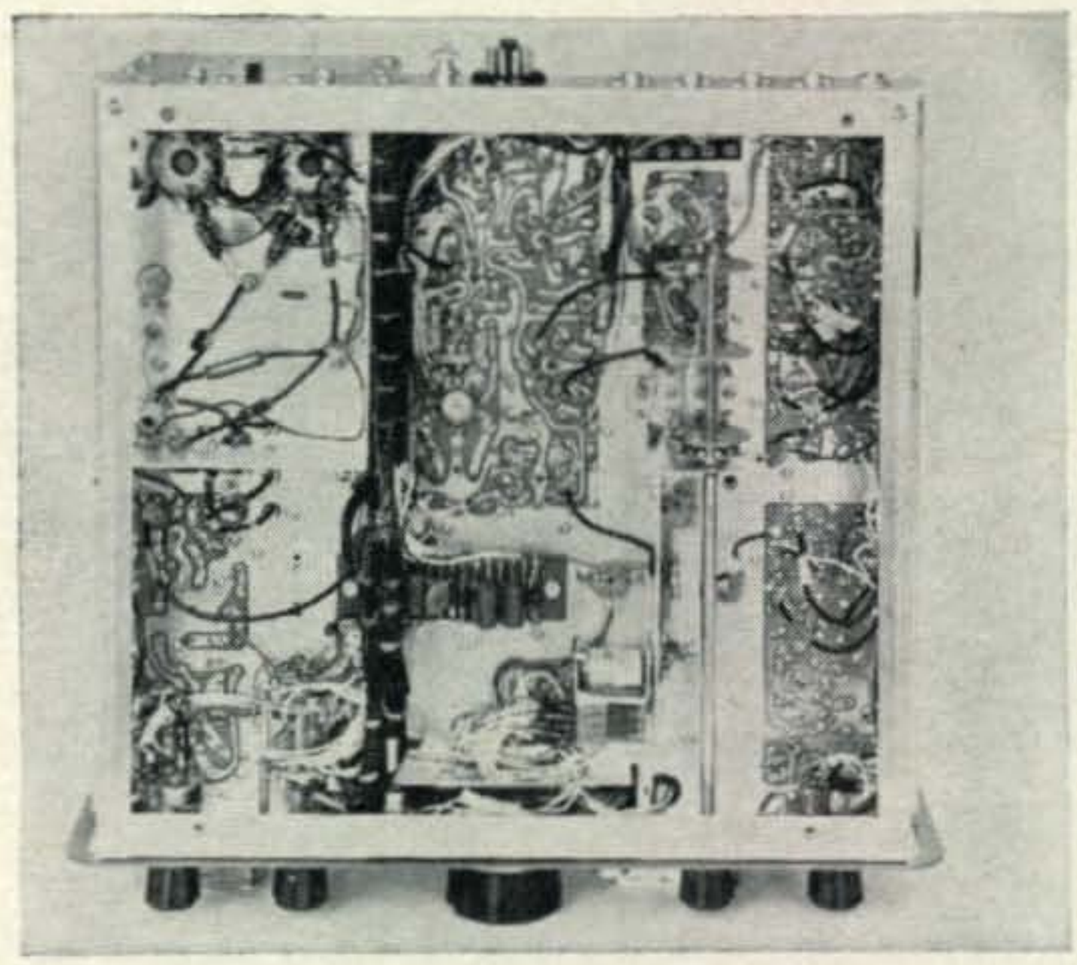


Top view of the SB-110. The v.f.o. is at the upper center. The final is shown "uncovered" at the lower left. The other stages are assembled on the various printed-circuit boards.

bility and calibration in the Heathkit SB-series of gear of which the SB-110 is typical. The stability, rated at less than 100 c.p.s. drift after 20-minutes warmup and less than 100 c.p.s. for $\pm 10\%$ supply-voltage variation, was 250 c.p.s. after 10 minutes warmup, 80 c.p.s. the next hour and 40 c.p.s. per hour or less thereafter. Line voltage variation of $\pm 10\%$ produced ± 70 c.p.s. change. In addition, mechanical stability as may be encountered in mobile service, was such that not a whimper of frequency twitter or microphonics was evident when the set was dropped an inch or so above the table.

The dial, (which has an adjustable hairline

[*Continued on page 100*]



Bottom view of the SB-110. Wiring for the grid side of the final is done in the partitioned section at the upper left. Most of the other wiring is made using two harnesses.

C. W. MONITOR WITH A "SWITCH"

BY JOHN J. SCHULTZ,* W2EEY

Another r.f. actuated, transistorized c.w. monitor but this time with a little "switch" in the literal as well as figurative sense.

C. w. monitors, like QSL designs, change constantly and no one will probably ever come up with the ideal answer. As with QSL designs, too much individual preference is involved. One fellow can be pleased with the sound of a plain buzzer and the other requires a tone with organ-type qualities. However, in recent years, one of the most popular types has become the r.f. actuated monitor built from scratch or made by modifying a commercial c.p.o.

Many schemes have been tried out for getting the r.f. into a d.c. form to power the monitors; an untuned rectifier circuit, pickup from the rectifier circuits of an s.w.r. bridge and tuned rectifier circuits. The former have the advantage of requiring no tuning when switching bands but the disadvantage of low voltage output unless the pickup antenna, especially with low power, is draped all over the shack. The tuned rectifier circuit has much higher output but requires accessibility and tuning. Both types have the disadvantage that the tone frequency and quality usually changes from band to band because the rectifying and filtering action is never quite the same.

While struggling to adapt a commercial c.p.o. as a monitor and encountering some of the above difficulties, I often thought why couldn't the c.p.o. sound, when used as a monitor, as good as when it was simply keyed as a c.p.o.? The answer was simply to use an additional transistor, r.f. actuated, as the key or switch across the c.p.o. terminals. The switching transistor would work as long as there was enough r.f. to actuate

*1829 Cornelia Street, Brooklyn, N.Y.C. 11227.

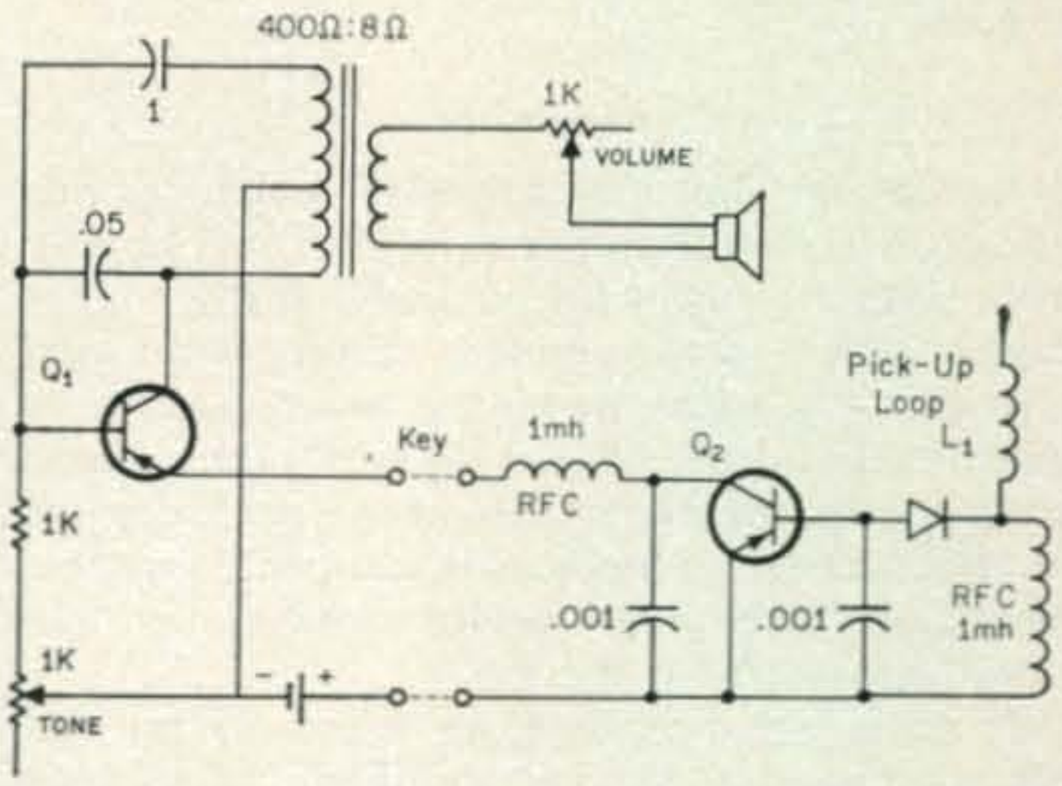


Fig. 1—Typical code practice oscillator circuit and an r.f. actuated transistorized switch.

it but isolate the monitor itself from the r.f. variations. The c.p.o. circuitry itself is unmodified and can be used at any time for its original purpose.

Figure 1 shows the switch as connected to a typical c.p.o. circuit. Transistor Q_1, and Q_2 can be any type of the 100 mw class. It is only necessary to watch that the diode, transistor and key terminal polarities are maintained as shown. No elaborate pick-up antenna is needed since only enough current is necessary to make Q_1 conduct while the monitor is still powered by its own battery. In my case, the pick-up coil L_1, consisted of a few turns of hook-up wire I placed around the *driver* stage tube in a 100 watt transmitter. No variation in tone quality is noted when changing bands and the keying is always clean, as though the key were connected directly across the c.p.o. terminals. ■

New Amateur Product

Ohmite Model C Rheostat

CONSIDERABLY smaller than most ½" watt composition potentiometers, the unenclosed Model C rheostat is rated at 7½ watts. It measures ½" in diameter and 15/32" in depth behind the panel. The Model C will be available in values from 10 to 5,000 ohms in both the standard and locking bushing types. For complete details, request Bulletin 203C from Ohmite Mfg. Co., 3670 Howard St., Skokie, Illinois, 60076, or circle 66 on page 110.

RTTY From A to Z

BY DURWARD J. TUCKER,* W5VU

PART XXII

Last month's installment covered keyboard distortion, servicing and the adjustment of some of the various keyboard parts. This installment covers the adjustment of additional parts of the keyboard and information and data on the typing unit.

THIS months installment continues with the adjustments of the various parts of the keyboard.

It will be noticed that, in most instances, the spacing of clearances and spring tensions allow for some leaway instead of exact values. Interpreting this in terms of usefulness, it simply means that as the values change with wear, the machine will continue to function (print) within limits. It means further that once the proper clearances and spring tensions are made, this chore will not have to be done for a long time to come under normal amateur RTTY service.

One must not overlook the fact that oiling, greasing and cleaning operations must be done periodically during this time. Failure to clean and lubricate a machine can hasten the day when the spacing of parts and adjustments of spring tensions must again be checked and corrected.

Clutch Teeth Spacing

The clearance between the clutch teeth should be between 0.005 and 0.0150 inches when the clutch is in its fully disengaged position. This position of the clutch is shown in fig. 130. If the clutch clearance is not within the above specified limits its position should be altered by adding or removing shims between the bracket and throw-out lever post as indicated in fig. 130.

It is desirable that the universal bar (fig. 130) have a small amount of end play but no more than 0.010 inches. The universal bar extension should be positioned approximately in the center of the space between the P and CAR RET key levers. The universal bar may be positioned to meet this requirement by loosening each pilot screw locknut and turning the pilot screws as required. This operation can best be visualized by referring back to fig. 113, a detailed view of the bottom of the keyboard, where the two pilot screws, #2, are shown. Be sure to retighten the two locknuts after this operation is performed.

The trip-off pawl should clear the sides of the stop-plate mounting screws, as well as the locking-lever bracket. This can be checked by depressing a key lever to operate the trip-off pawl.

The clearance between each of the key levers and the universal bar should be between 0.040 and 0.060 inches when the trip-off pawl is resting against the end of its stop plate. (See fig. 130.) This spacing may be changed by altering the position of the trip-off pawl stop plate. The stop plate has *slotted* mounting holes allowing for its movement. Its mounting screws should be retightened if it is found necessary to alter the position of stop plate.

*6906 Kingsbury Drive, Dallas 31, Texas.

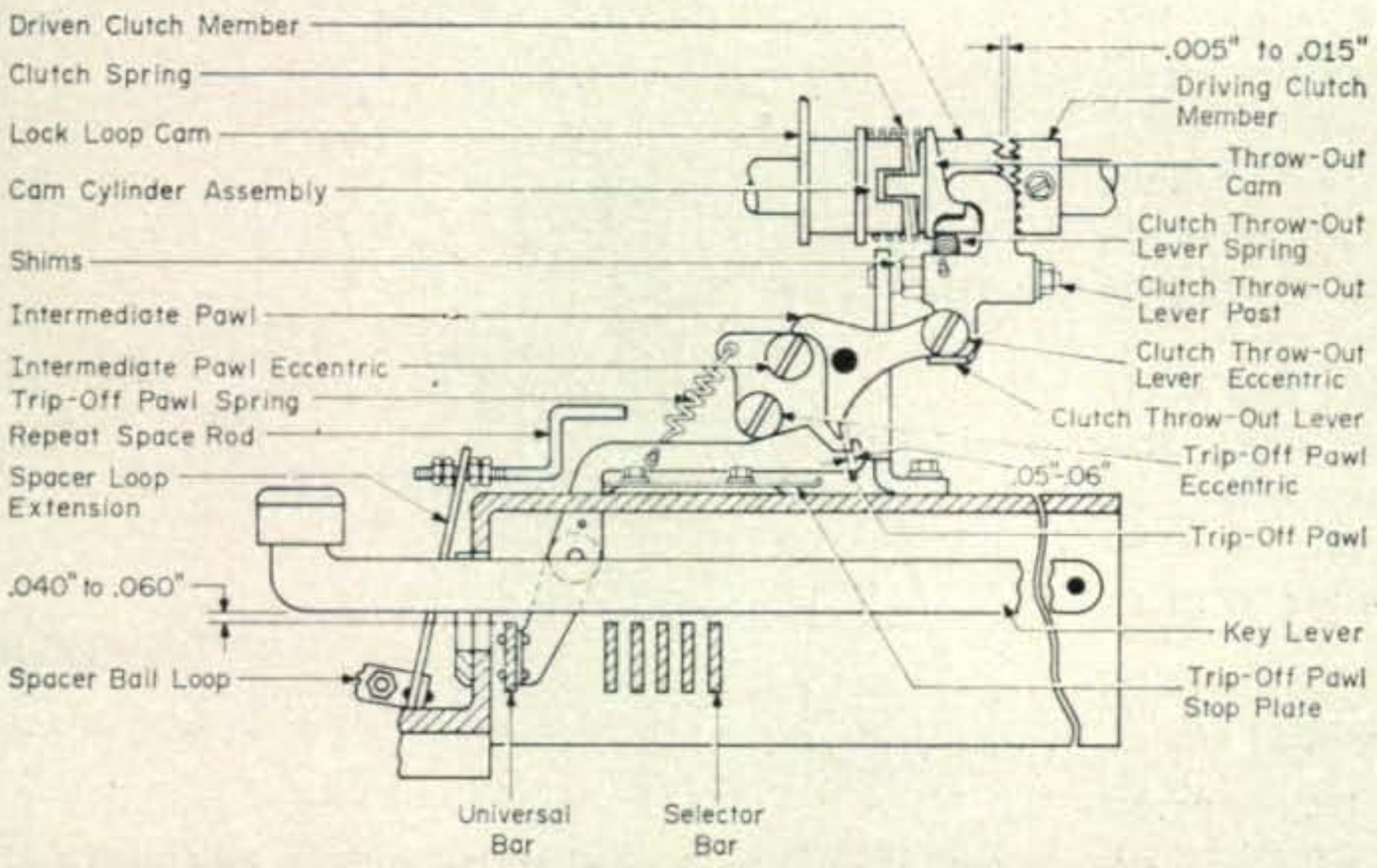


Fig. 130—Line drawing of a cross-section of a portion of the teletypewriter keyboard showing the clutch release mechanism and other parts associated with the transmitter. Various spacing adjustments are also shown.

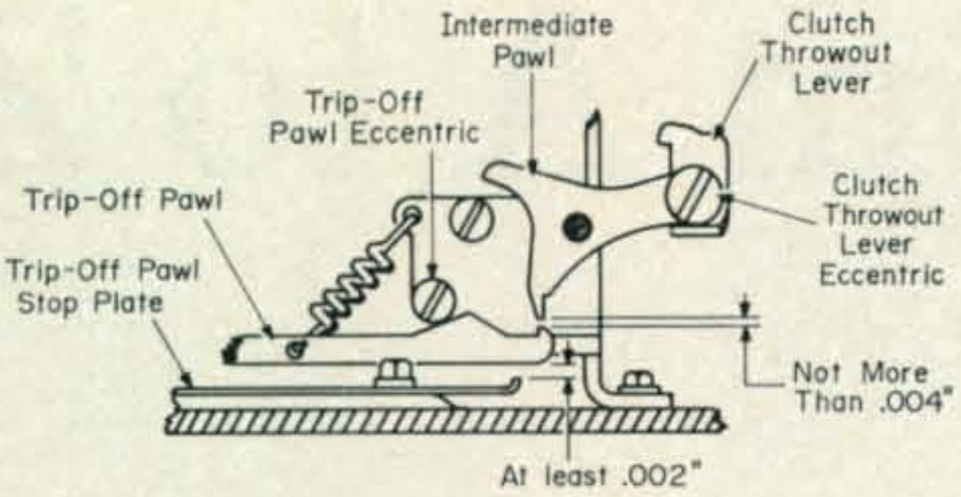


Fig. 131—Details of a keyboard trip-off pawl, intermediate pawl, various eccentric screws and associated parts.

Intermediate Pawl Eccentric

The clearance between ends of the trip-off pawl and the intermediate pawl should be between 0.050 and 0.060 inches, as shown in fig. 130, when the intermediate pawl rests against its eccentric and the trip-off pawl rests against the end of its stop plate. This clearance may be altered to fall within the required tolerance range by adjusting the *intermediate pawl eccentric*. This is done by first loosening the locknut and then turning the eccentric screw as required. The locknut should be retightened. Inspection of fig. 130 indicates that two positions of the eccentric screw satisfy the above spacing requirement. Choose the setting where the *high* part of the eccentric is towards the rear of the keyboard. (To the right in fig. 130.)

Clutch Throw-Out Lever Eccentric

The clutch throw-out lever eccentric should be positioned so that the intermediate pawl is held firmly between it and the intermediate-pawl eccentric when the clutch throw-out lever is resting on the *low* part of the clutch-driven member as illustrated in fig. 130. This eccentric screw is adjusted *after* its locknut has been loosened. This eccentric also has two positions that satisfy the above requirements. As in the other case, the position should be chosen where the *high* part of the eccentric is towards the rear of the keyboard.

Trip-Off Pawl Eccentric

Figure 131 shows a close-up view of the keyboard trip-off pawl, intermediate pawl, clutch throw-out lever, their associated eccentrics and other related parts. The clearance between the end of the trip-off pawl and the end of the intermediate pawl should be approximately 0.004 inches when the clutch throw-out lever is held against both the high part of its *cam* and its *eccentric*. This spacing can be altered by adjusting the trip-off pawl eccentric.

When the trip-off pawl is in its *operated position* the clearance between its lower edge and the formed-up end of the stop plate should be about 0.002 inches. This portion of the stop plate may be bent accordingly, in order to meet this spacing requirement.

Clutch Throw-Out Lever Spring

One end of the clutch throw-out lever spring is barely visible in the upper part of fig. 130. The rest of this spring is hidden from view behind the driven clutch member. Tension of this spring is measured under the following conditions: (1) Clutch teeth engaged (2) Clutch throw-out lever resting against the lower part of the clutch-driven member, (3) The intermediate pawl being held against its eccentric by the operator, (4) An 8-ounce scale hooked over the throw-out lever just above the spring hole and the operator pulling in line with the spring. The throw-out lever should start to move with a scale reading ranging from 1½ to 2½ ounces. The manufacturer recommends that the old spring be replaced with a new one if its tension fails to fall within the above range.

Trip-Off Pawl Spring

The "anchor end" of the trip-off pawl spring must be unhooked in order to measure its spring tension, as shown in fig. 132. An 8-ounce scale is hooked in the spring eye. In pulling on the spring its position should be kept as close to its anchor position as possible, as the tension measurement should be read when the spring is stretched to its normal position length. The tension under these circumstances should be between 3½ to 4½ ounces. The manufacturer recommends that a spring that does not fall within this range should be replaced.

Teletypewriter Units

It has been pointed out that the teletypewriter is made up of three major units. These three units are: (a) motor, (b) keyboard, and (c) typing unit. When the motor is turned on, power is available to both the keyboard and the typing unit transmitted through the main drive shaft and clutch for each respective unit. All of the units of the machine may or may not be in operation while sending whereas the keyboard is naturally not in use for receiving. It is possible to use only the motor and keyboard of the sending machine if the operator does not desire to make a copy of what he is sending. The various parts of the keyboard mechanism have just been covered. A word about the motor unit before we

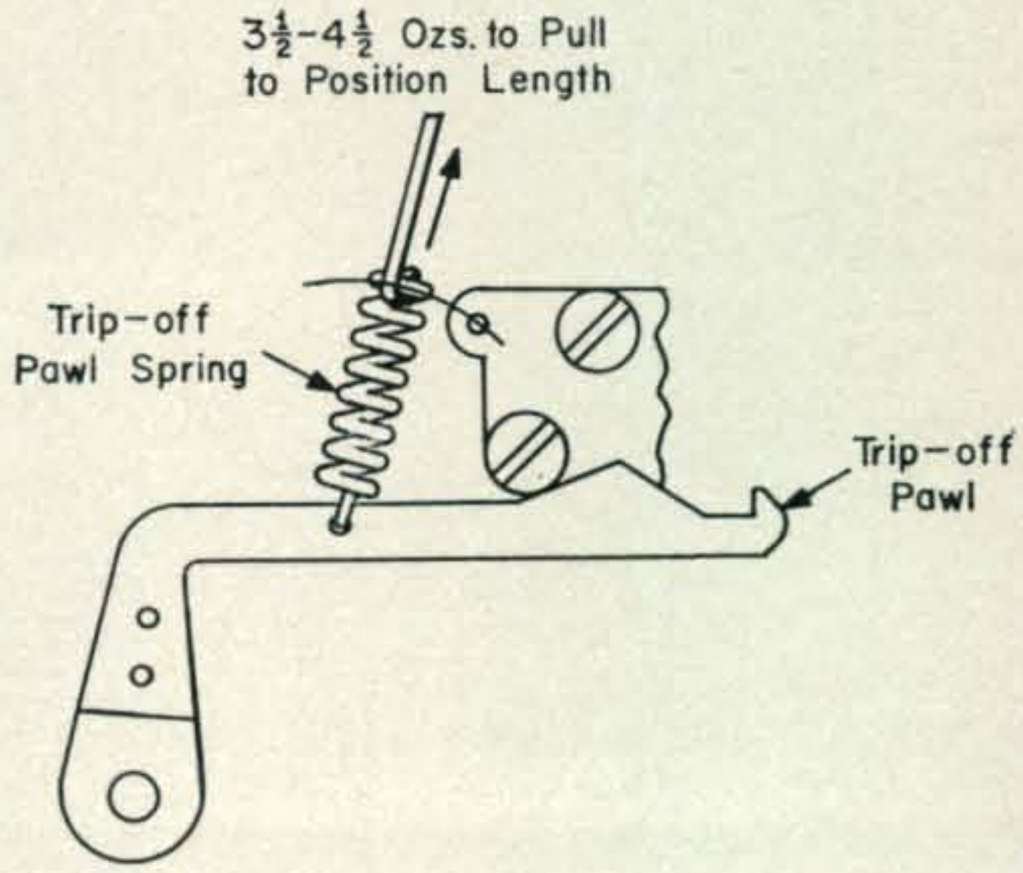


Fig. 132—Trip-off pawl spring tension measurement.

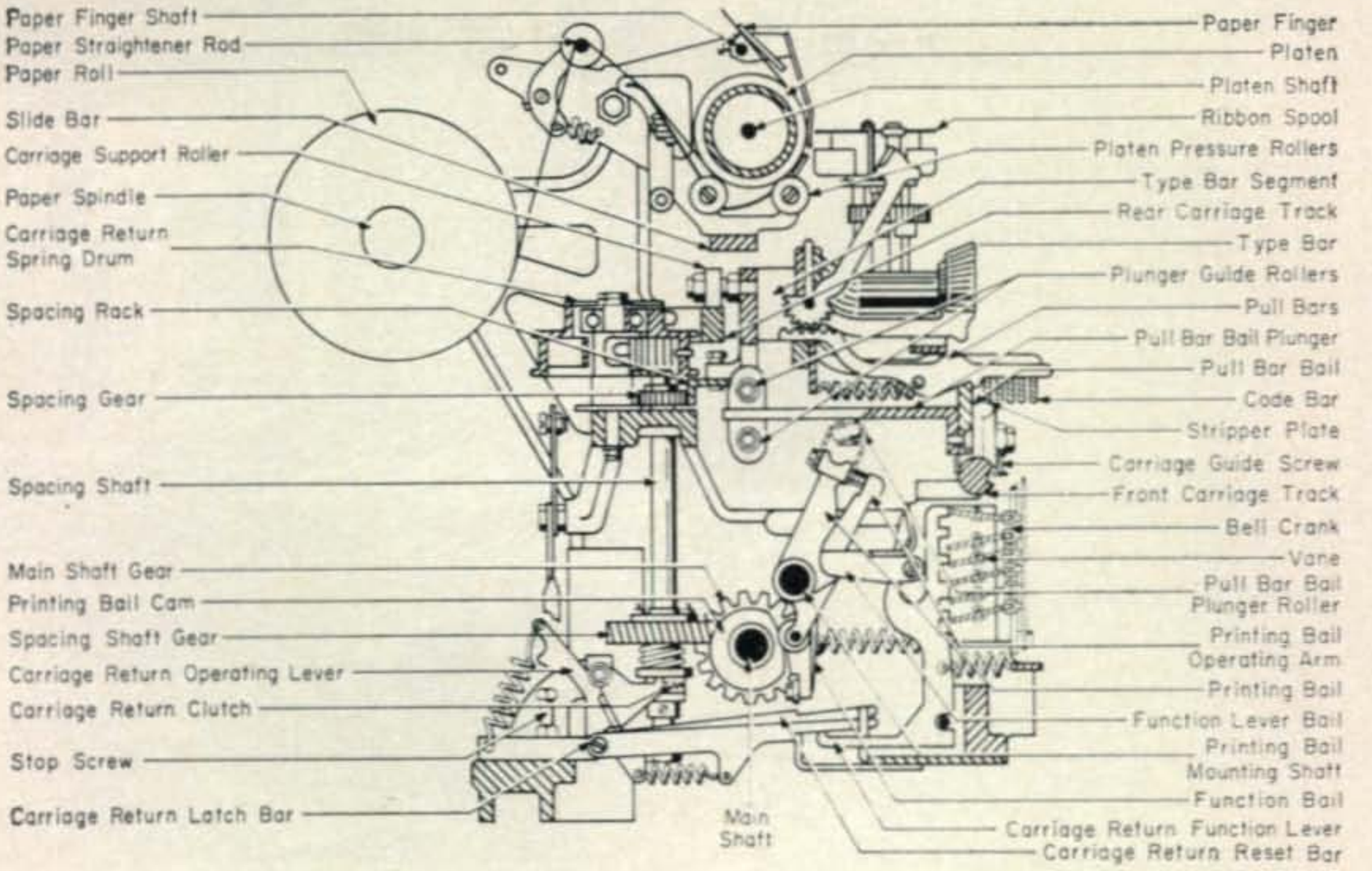


Fig. 133—End view of the typing unit showing the location and identity of many parts.

move on to the typing unit and its various mechanisms.

Teletype Motors

Perhaps the most important thing to remember about the motor that powers the teletype machine is that it must operate at a predetermined speed. In some of the older machines the motors were designed to operate from a power source that was either d.c. or a.c. This required the use of a governor to regulate the speed of the motor, which in turn, meant that the speed of the teletypewriter was regulated. It is required that all teletypewriter machines in a system operate at the same speed. This meant that some means of keeping the various machines operating in synchronization had to be used; otherwise, this too would be a source of printing errors. This led to the use of synchronous a.c. motors to drive teletype machines since such an electric motor operates at a speed determined by its construction and the frequency of the a.c. power line. Later Teletype Corporation machines are equipped with 110 v. 60 cycle a.c. synchronous electric motors. These are fractional horsepower motors (1/40 h.p. to 1/25 h.p. in many instances).

The teletypewriter keyboard was covered in considerable detail in previous sections. The reader should refer back to these sections for answers to any questions that may arise in regard to this unit. This brings us to the typing unit with its various functional mechanisms. This mechanism is far more complicated than the keyboard; That is the reason that the keyboard was covered first.

Typing Unit

The typing unit includes all of the mechanisms required to convert the code impulses into a typewritten page-form message, such as in the Teletype Model 15 and Model 19 and on tape in the instance of the Teletype Model 14 typing reperforator. All mechanically operated parts of the typing unit receive their driving power from the mainshaft assembly which is directly connected through the mainshaft gear to the pinion located on the end of the motor shaft. As long as the motor is running, power is immediately available through the various clutches, cams, and gears to move and rotate the various parts of the typing unit at the speed required to synchronize their action with the code impulses received by the selector magnet. The selector magnet through the associated selecting mechanism determines whether one of the type bars is to be thrown against the paten, causing a character or symbol to be printed or one of the functions listed below to be completed.

1—Platen line feeds.
2—Typing Carriage spaces.
3—Typing Carriage returns.
4—Platen shifts from letters to figures.
5—Platen unshifts from figures to letters.
6—Blank.
7—Signal bell operates.
8—Mechanical motor stop opens.

Figure 133, a detailed line-drawing of the end view of the typing unit, is included at this point as an excellent reference since it identifies so many of the parts. With a close inspection of this figure, one can note familiar names of parts and mechanisms already covered. At the same time one will discover other parts that have not yet come under discussion up to this point. These figures should give the uninitiated a wealth of information on all of the innards of the teletypewriter.

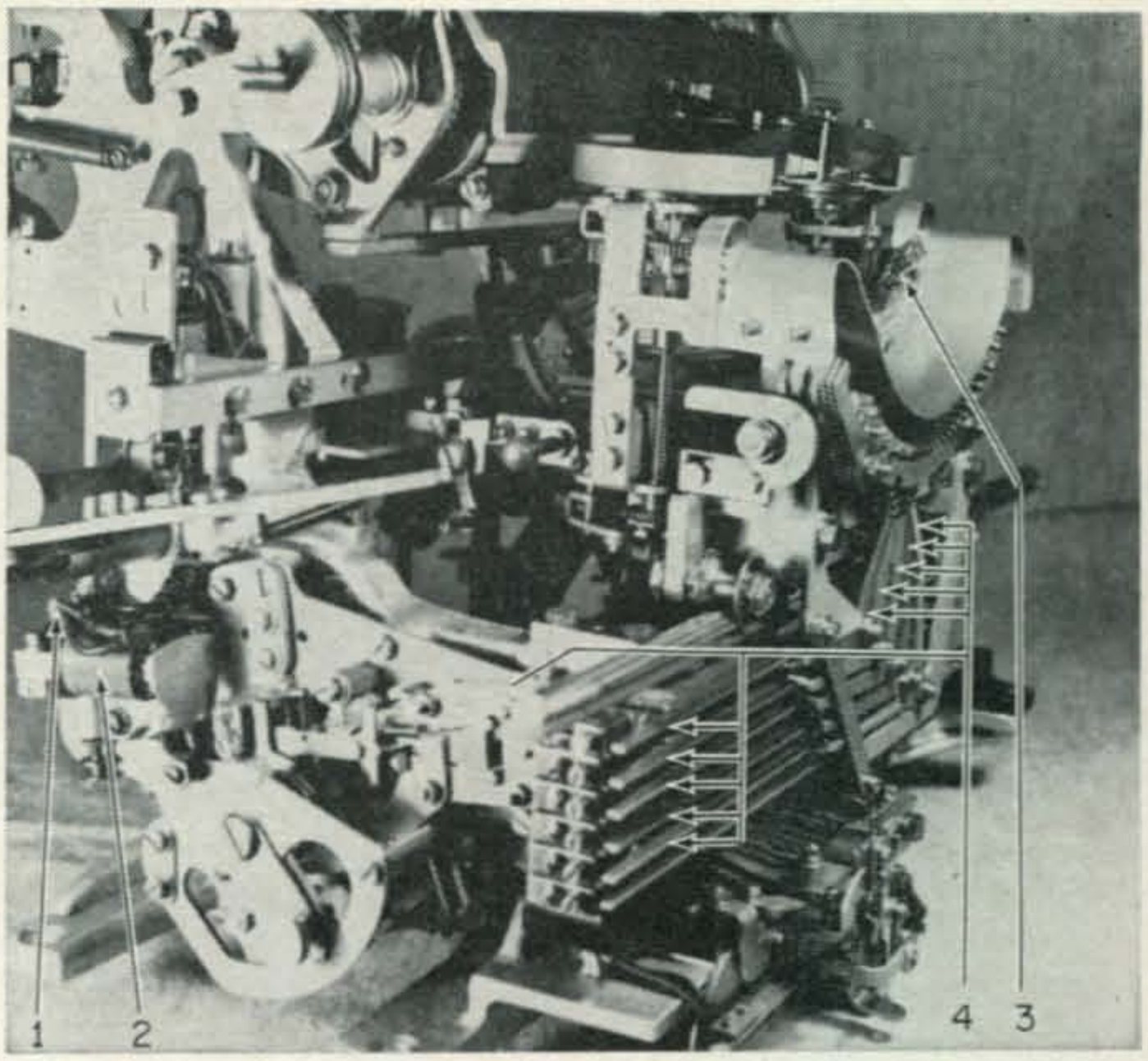


Fig. 134—Pictorial view of the typing unit with the receiving unit in the foreground showing its three principal functional sections.

1. Impulse input point.
2. Selector magnet.
3. Printing mechanism.
4. Selecting parts.

Receiving Mechanism

The receiving mechanism is shown in the forefront in fig. 134. It should be readily recognized that the *receiving mechanism,* as pictured in fig. 134 is a portion of the typing unit shown also in fig. 133 and various other figures throughout the text. The receiving mechanism consists of three basic units. These units are (a) Selector magnet (b) Selecting parts and (c) Printing mechanism as labeled in fig. 134. One should compare fig. 134 with fig. 133 and other figures showing details of the typing unit to see how the receiving mechanism and other parts of the typing unit function together.

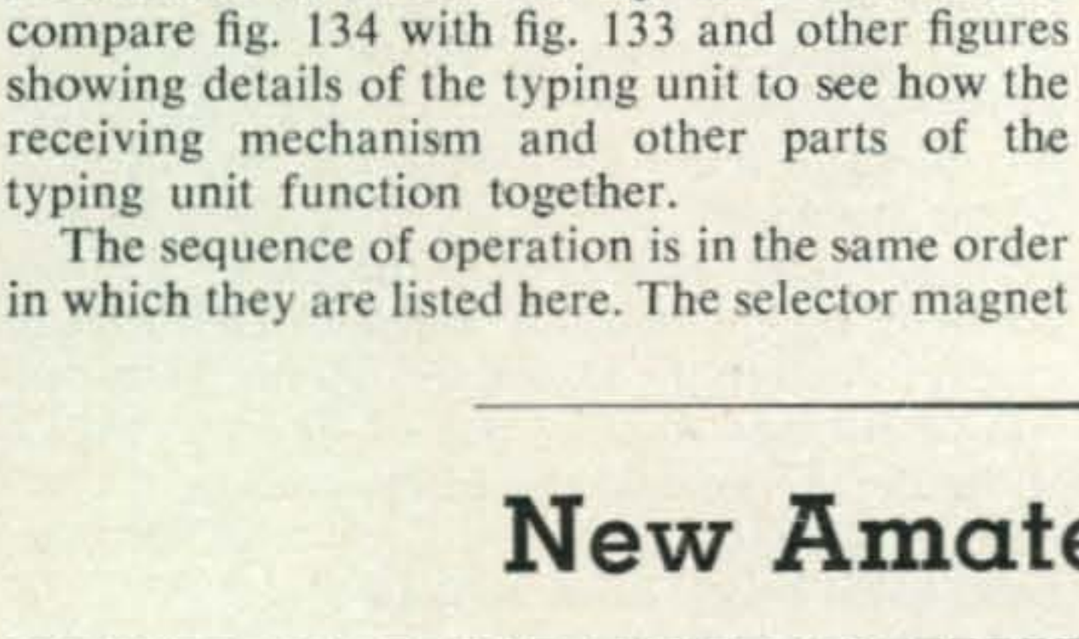
The sequence of operation is in the same order in which they are listed here. The selector magnet in the receiving mechanism is controlled by the code impulses received from a transmitting mechanism and translates them into related mechanical movements of certain parts. These are the parts labeled "selecting parts" in fig. 134. The selection of a particular combination of positions for these parts determines the *character to be printed* or the *function* (such as carriage return or line feed) to be completed by the typing unit of the teletypewriter.

Next Month

Next month we will cover the selector mechanism. The selector mechanism is, in a sense, the "other half" of the teletype machine.

[*To be continued*]

New Amateur Product



Hallicrafters SR-2000

MAXIMUM transmitter power has been compactly packaged in a new five band transceiver announced by the Hallicrafters Co. Transmitter power input is 2 k.w. p.e.p. on s.s.b. and 1 k.w. on c.w. The unit measures 7½" × 16½" × 15. The transmitter uses two 8122 tubes in the output and pi network tuning. Carrier and unwanted sideband suppression is rated at 50 db, and distortion products are 30 db. Sensitivity of the receiver is less than 1 microvolt for a 20 db signal-to-noise ratio. The SR-2000 uses 19 tubes, plus voltage regulator, 21 diodes, 1 varicap, and 1 zener. The unit includes receiver incremental control. Amateur net price of the SR-2000 is $995.00 less power supply. The matching a.c. supply (P-2000AC) sells for $395.00. For more information write to: The Hallicrafters Co., 5th and Kostner Avenues, Chicago, Illinois, 60624, or circle 73 on page 110.

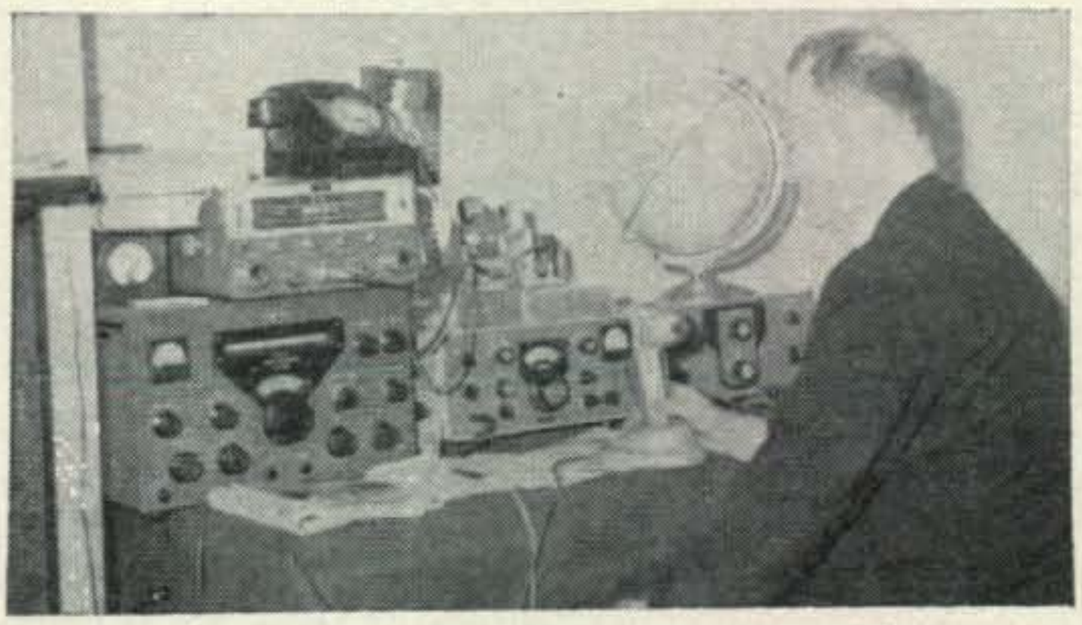
Glenn Crowe, VE3BSM, and George Webb (left and right) get filled in on laser beam communication from Bell Telephone lecturer Roy Smillie at a recent Rotarian meeting in Sault Ste. Marie Canada. Mr. Smillie told the group that the laser beam had the capacity of carrying 900 million messages at one time. It looks as though Glenn is getting some ideas.

Kelly J. Perkins, aviation electronics technician airman, checks his gear for another all night watch at the Point Mugu amateur radio station. From Dec. 24, 1965—Jan. 1, 1966 the MARS station there passed 800 separate Christmas messages between men in Vietnam and their loved ones here in the states. Point Mugu is the Navy Missile Center in California. (Official Navy photograph.)

PEOPLE AND PLACES

Dr. Manohar Balaji Sarwate of India, newly elected Secretary-General of the International Telecommunication Union, shown addressing the annual dinner of the International Amateur Radio Club of Geneva. To the left of Dr. Sarwate are Mrs. John Gayer, XYL of HB9AEQ; Bill Halligan, W9AC; and Dr. Miroslav Joachim, OK1WI, who is an I.T.U. official and president of the IARC. While not a radio amateur himself, Dr. Sarwate is reported to be very sympathetic to its cause. (Photo by HB9UD).

Shown in front of HB9AEQs new Mercedes 220 mobile station are (l. to r.): Ted Robinson, F8RU; Miss Vera Jackson of the I.T.U.; Igor Dolezel, OK1FY; and John Gayer, HB9AEQ. This picture was taken in front of the Geneva headquarters of the I.T.U., just as John was preparing to leave on a mobile expedition throughout Western Europe.



Rev. James A. Stone, EI4Q, shown operating his station at Blackrock, in County Dublin. Father James is among the most active radio amateurs in the Irish Republic.

Carl J. Ruh, W4TZT, former Kenton County Sheriff and Kentucky state senator has been hospitalized in the Good Samaritan Hospital, Cincinnati, Ohio since last June with a fractured hip. Known as "the ham from Good Sam," Carl with the aid of his doctor (WA8ONT) put a station on the air and maintains schedules with the International Handicap Net. Carl normally gets around on crutches due to a childhood bout with polio and now is confined to a wheelchair until mended.

DX

BY URB LE JEUNE,* W2DEC

Here and There

FW8 Wallis Island: FW8RC is reported as having been worked on 14123 kc s.s.b. and also on 14115. His name is Robert and he speaks only French. He has been on between 0700 and 0745 GMT. *(Tnx VERON and WGDXC).*

GR Rockall: Late word from John, G3NAC, to Dot, K2MGE, has his plans for this one still set for late May or early June. More info as received. *(Tnx LIDXA).*

HBØ Liechtenstein: Oscar, HBØAFM, plans a three-day stay from May 7th. *(Tnx LIDXA).*

KC6 Eastern Caroline Islands: The following stations are presently QRV: KC6BW, Hal, 14280 s.s.b. 0830 GMT; Fred, KC6FM, 14255, 14286 s.s.b. 0830 GMT.

KC6 Western Caroline Islands: Here are active: KC6BO, Harvey 14250 s.s.b. 0830 GMT; KC6CB, 14267 s.s.b. 0845 GMT. *(Tnx VERON for above KC6 items).*

KG6 Guam: For the next two years K6JIC will be the QSL manager for K6KII/KG6 on Guam Island. In addition to the Guam Island activity, Frank will also be the QSL manager for any of his DXpeditionary adventures. K6KII is Cliff G. Moore, USN, presently attached to the U. S. Naval Security Group on Guam. DXer and contest man for some ten years now, and presently 319/318 for DXCC. Cliff will be active 80 through 10, and is hoping for some 160 operation. The normal DX QSL procedure is desired, and that being date and time in GMT and s.a.s.e. or s.a.e. and IRCs for direct replies.

KG6I Bonim Island: KG6IG, John, 14245 at 0100 GMT. QSL to W3KTY. *(Tnx LIDXA).*

KS4 Swan Island: KH6BCB/KS4, Jim, on 14207 at 00 GMT and 14040 c.w. at 21-2200 GMT. QSL via Box 1148, Miami, Fla. 33148. Jim says that KS4CA is active on all bands and that his QSLs are handled by WA9OVE. *(Tnx LIDXA).*

ST2 Sudan: ST2BSS, ex-5N2JWC, is active on s.s.b. after several months QRX. He has special operating permit from the government on behalf of the Boy Scouts of Sudan. Operator Jim Collins says they are engaged in a drive to collect funds in order to send 8 Sudanese scouts to the BSA Jamboree in the States next year. So, any contribution or extra IRCs you may include with your QSL card will be of great help in this worthy cause. Jim also organized the Boy Scouts Jamboree in Nigeria last year. His address is c/o American Embassy, Khartoum, Rep. of Sudan, Africa. Mostly active on weekends after 1700 GMT, 14240 s.s.b. *(Tnx Puerto Rican DXer).*

TR8 Gabon Republic: Guy, TR8AG, active around 14060 c.w. He is a very slow operator and big pileups and fast calls apt to scare him off. He sends in French, so better keep at least the bare essentials for a c.w. QSO handy in that language, just in case. Also sporadically active on 14 mc s.s.b. is Max, TR8AD, but again he speaks only French. He is a fast direct-QSLer if IRCs included to Box 1025, Libreville, Rep. of Gabon, Africa. An added hint: Max is an avid stamp collector. *(Tnx Puerto Rican DXer).*

VK9 Papua: VK9CJ, Ced, active almost daily at 2200 GMT on 14162 listening on his own frequency for c.w. and 14205 for s.s.b. QSL via W2GQN for contacts after 1 Feb. 1966. *(Tnx LIDXA).*

VK9 Norfolk Island: VK9CB is reported active on 14105 s.s.b. working Europeans at 1230 GMT. *(Tnx VERON).*

VP8 South Georgia: At present there are only two stations. VP8HO who only recently returned there and has not been heard active as far as we know and VP8IE who has been worked on 14 mc a.m. in South Africa. *(Tnx VERON).*

XV5 Viet Nam: K1YPE/XV5 Bill may be found 14315 kc at 2330 GMT daily, but it is for schedules and may or may not accept other calls. He is now on with his 1 kw and beam. If sensible attempts are made before or after his skeds, it is possible to get a QSO. *(Tnx WGDXC).*

XW8 Laos: XW8AZ is looking for stateside contacts from 0000 GMT daily. 14114 kc is usually used while listening on 14210-220. *(Tnx LIDXA).*

ZD7 Saint Helena: George, ZD7IP, operates on 1822, 3501, 7006, and 7040 almost daily from about 0000 GMT. *(Tnx WGDXC).*

ZD9 Tristan Da Cunha & Gough Island: Alan, ZD9BE, first on a.m., 14161 at 1900 GMT then his c.w. on 14163 to W/K, s.s.b. 14250-255 at 2000 GMT saying QSL via ZS bureau. Harold, ZD8HL skeds Alan at 1900 GMT around 14170 and also ZD9BC at 1830 GMT on 15125 after which W/K's can try from 14202. **(Tnx LIDXA).**

ZF1 Grand Cayman: ZF1AA on 14207 at 2000 GMT. QSL via VE6TP. *(Tnx LIDXA).*

9H1 Malta: W4WZN/9H1 on 14245 kc s.s.b. from 1230 GMT saying QSL to Box 13, Chattanooga, Tenn. *(Tnx WGDXC).*

9K2 Kuwait: 9K2AN is active daily on 21075 starting at 1220 GMT. QSL Box 736, Kuwait. *(Tnx NEDXA).*

Radio Kiev: Serge, UB5UN, will be the narrator for a DX program on Radio Kiev, the broadcasts to be in English. It will be made on the last Thursday of each month at 0030-0100 GMT and 0430-0500 GMT on 7180, 7290, 7310, 7330 and 9659. *(Tnx NEDXA).*

DXpeditions

Harold R. Lund, ZD8HL writes via WGDXC that VP2ME, VP2MF, VP2MG during the January operation goes to DXPOTM, Stu, W2GHK,

*Box 35, Hazlet, New Jersey 07730.

The following certificates were issued between the period from February 6th, 1966 to and including March 5th, 1966:

CW-PHONE WAZ

2138	W8ILC	Ronald L. Moorefield
2139	OH2XA	Teppo Valanne
2140	F3BR	Henri Gadoin
2141	I1CSA	Antonio G. Costantino
2142	K9ECE	Don Wibel
2143	K1UDP	George St. Andre
2144	W1BPY	William H. Conant
2145	W4EEO	J. C. Taylor
2146	OK1IK	Vladimir Juranek
2147	YU1BCD	Radio Club "M. Pupin"
2148	K4WMB	Louis E. Smith

ALL-PHONE WAZ

331	K9ECE	Don Wibel
332	K1UDP	George St. Andre
333	K6CCY	T. H. Dutcher
334	W8PHZ	Ralph A. Dage

TWO-WAY SSB WAZ

377	K9ECE	Don Wibel
378	K1UDP	George St. Andre
379	W8PHZ	Ralph A. Dage
380	W4RLS	J. Foy Guin, Jr.
381	W6RCD	Win Goddard
382	K8VUR	Marion A. Miller
383	YO3ZA	Dan Antoni
384	W8KBT	T. Joe Shank, Jr.
385	W5PYH	James C. Brooks

CW WPX

707	DJ4QM	Willi Speckle
708	CT1LN	Paulo Vieira
709	LA9TG	Torvald Wistad
710	SP5ADZ	Zygmunt Jacyk
711	DJ5IO	Max Haas

PHONE WPX

127	KØUKN	Bill Dennis
28	I1YI	Piccini Cesare

SSB WPX

230	I1CSA	Antonio G. Costantino
231	ØUKN	Bill Dennis
232	G3RHM	George D. Clarkson

MIXED WPX

119	KØUKN	Bill Dennis
120	IT1AQ	Antonino Burgio

300 TWO-WAY SSB

13	W2VCZ	Robert Stankus
14	W4QCW	Bob Eshleman

100 TWO-WAY

481	K8BIT	C. R. Nelson

P. O. Box 7388, Newark, N. J. Harold also says he has transferred to ZS6 land. Operation from there is doubtful, but says maybe ZD5, ZS8, ZS9, CR7 and the like with tentative plans for FR7 islands as time permits with CR7GF and 6O1AU possibilities during March possibly including Aldabra, Juan de Nova and Glorioso.

Sir Gus, W4BPD/99 wishes to announce he will be available for speaking engagements and showing of slides made during his world travels. At present it is expected the months of May and June will be dedicated to this effort after which, it is likely another DXpedition will be made to new and rare DX spots. If you, or your club, whether it be DX club or regular Amateur Radio Clubs, or other groups interested will write him, Gus M. Browning, Rt. #1 Box 161A, Cordova, South Carolina, he will explain his itinerary and conditions to be met for appearance before your group.

Poll of Joint Meeting of N. and S. California DX clubs revealed most wanted to be PYØ-St. Paul, VQ8-Agalega, VKØ-Heard, VQ3-Rodriguez, FR7-Glorioso, VU-Laccadive, EA9-Rio, VQ9-Aldabra, KC4-Navassa, YI-Iraq, EAØ-Sp. Guinea, HKØ Malpelo, TA-Turkey, FR7-Tromelin, VS9K-Kamaran in the order named with 56 voters above 250 DXCC. DXpeditioners please note. . . . . .

QTHs and QSL Managers

CT2BO	via W6NJU
ET3AC	via K8UZA
FB8WW	s.s.b. only via K2MGE, all others via
FL8RA	5R8BC via W2LJX
ex-FO8BI	via F2HM
FW8RC	via FK8AU
HC8JG	via HC2GRC
HL9KF	via WØGLZ
IØFGM	via I1LCK
K6KII/KG6	via K6JIC
KC6FM	via W2CTN
KH6BCB/KC4	POB 1148, Miami, Fla.
KJ6DA	via WA6OET
KS4CA	via WA9OVE
LX2UW	via Box 7388, Newark, N. J.
OD5AX	via W2EUR
OX5AX	via W2EUR
PJ2MI	via VE3EUU
PJ5ME	via W1JYH
PZ1BW	via VE3EUU
SVØWF	Box 66, Rhodes
SVØWT	via K6YXR
TU2AN	W. Charles, 4th OTDM, Box 54, Port Buot, Cote d'Ivoire
TU2AP	via DJ1LP
VK9CJ	via W2GQN
VP2KY	via WØNGF
VP2VE	via W2MDQ
VP5AR	via WA8GUA
VP6BA	via W2CTN
VP8IU	via G3MBQ
VQ9HZ/A/D	via G8KS
VS6FF	via G3MZV
VS9KRV	via RSGB
ZD8J	via K4LJV
ZD8JPL	via W6HIT
ZF1BP	via VE3CJ
4M5A	via Box 7388, Newark, N. J.
5Z4DW	Jack Perrett, Box 834, Nakuku, Kenya
6O1GB	American Embassy, Magadiscio, Somali Rep.
7XØAP	Box 414, Alger Algeria
9K2AX	via G8AIU
9L1BC	via G5GH
9M6KS	via G3GPE
9Q5DP	via W2SNM
9Y4VU	via WA2CBB

BY THE WAY...

We offer a back issue or reprint service. If you are looking for a particular article or issue that we ran, let us know. Depending on what is available (either issue or reprint) we will send that at a cost of one dollar postpaid.

Propagation

BY GEORGE JACOBS,* W3ASK

As the sun rises higher in the northern skies, optimum frequencies for long-distance propagation are *lower* during most of the daylight hours, and somewhat *higher* during the late afternoon, early evening and nighttime hours, than during the winter months. Static levels also increase during the late spring, and signals are expected to be somewhat weaker on DX openings during the daylight hours.

During May, there is usually a considerable increase in sporadic-E ionization. This should result in frequent short-skip openings (up to distances of approximately 1400 miles, but sometimes considerably beyond this range), on most of the h.f. bands, and on 6 meters as well.

Except for occasional daytime openings to some southern or tropical areas, propagation conditions do not favor 10 meters for DX openings during May. Frequent short-skip openings, between distances of approximately 750 and 1400 miles, should be possible during the month.

Fairly good 15 meter openings are forecast to southern and tropical areas during the daylight hours. Numerous short-skip openings, between approximately 600 and 1400 miles are also predicted for May. DX conditions on this band are expected to peak during the late afternoon and early evening hours.

Twenty meters is expected to be the best band for DX propagation conditions during the month. Opening shortly after sunrise, good DX conditions should prevail to one area of the world or another, through the evening hours. The band is also expected to remain open to southern and tropical areas during the hours of darkness. During May, DX propagation conditions on 20 meters generally peak during the late afternoon and early evening hours. Numerous short-skip openings should be possible on this band, between distances of approximately 350 and 1300 miles, as a result of sporadic-E propagation. During most of the daylight and early evening hours, F-layer short-skip openings should also be possible between distances of about 750 and 2300 miles.

Fewer 40 meter DX openings are expected during May as a result of the higher static levels, and fewer hours of darkness. Fairly good openings to several areas of the world should still be possible, however, from shortly before sunset, through the hours of darkness, until shortly after sunrise. Good daytime short-skip openings are forecast for distances between approximately 150 and 750 miles, with nighttime openings extending up to and beyond 2300 miles.

DX propagation conditions on 80 meters are expected to continue to decline during the month, as static levels and solar absorption increase. DX openings are predicted, however, to some areas of the world during the hours of darkness. Regular short-skip openings between distances of about 50 and 250 miles are predicted for the daylight hours, with nighttime openings extending up to and beyond 2300 miles. On longer paths, noise levels may be high and signals weak.

Propagation conditions on 160 meters have

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

LAST MINUTE FORECAST

Day-to-Day Conditions and Quality for May

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

How To Use These Charts

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

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

2—Following each predicted time of band opening is a forecast rating which indicates the relative number of days the band is expected to open during each month of the forecast period. The higher the rating, the more frequent the opening, as follows: (4) band open more than 22 days each month; (3) between 14 and 22 days; (2) between 8 and 13 days; (1) less than 7 days.

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

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

4—This month's Propagation Charts are based upon a transmitter power of 75 watts c.w.; 150 watts s.s.b., or 300 watts d.s.b., into a dipole antenna one quarter-wave above ground on 160, 80 and 40 meters and a half-wave above ground on 20, 15 and 10 meters. For each 10 db increase above these reference levels, reception quality shown in the "Last Minute Forecast" will improve by one level; for each 10 db loss, reception will become poorer by one level.

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

6—These Propagation Charts are valid through June 30, 1966. These Charts 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.

passed their seasonal peak, and are expected to decline until the fall months. Short-skip openings beyond the groundwave range of approximately 50 miles are very unlikely during the daylight hours, due to intense solar absorption. As the sun sets, the skip on 160 meters should begin to increase, and during the hours of darkness regular short-skip openings up to approximately 1000 miles should be possible. Occasional openings up to 2300 miles, and to some DX areas of the world, may also be possible on some nights.

V.h.f. Ionospheric Openings

The *Aquarids,* a major meteor shower, is expected to take place during the first week of May. As a result of the ionization produced by millions of meteors entering the earth's atmosphere during this period, fairly frequent meteor-type ionospheric openings are expected on 10, 6 and 2 meters.

A considerable seasonal increase in sporadic-E ionization is expected during the month. This should result in some fairly good 6 meter short-skip openings between distances of approximately 1000 and 1400 miles. Openings of this type are most likely to occur between 9 a.m. and 1 p.m., and between 5 p.m. and 9 p.m. local standard time. Some 6 meter DX openings, by means of sporadic-E propagation, should be possible between the southern states in the USA and Central American and Caribbean countries. For a comprehensive review of 6 meter DX propagation see "50 Mc Propagation Effects—Summary Report On A Five-Year DX Study," by Morgan and Dorothy Monroe (K7ALE and K7ALF), which appeared in the November, 1964 issue of *CQ*.

While auroral activity is generally at a low level during May, some displays may occur during periods of below normal or disturbed ionospheric conditions. During such periods, openings are likely to occur on 6 and 2 meters for distances up to approximately 1200 miles, as a result of reflection or scatter from ionized patches produced by the auroral displays. Check the "Last Minute Forecast" at the beginning of this column for periods during May that are expected to be below normal or disturbed.

Sunspot Cycle

The Federal Solar Observatory at Zurich, Switzerland reports a monthly sunspot number of 24 for February, 1966. This results in a 12-month smoothed sunspot number of 16, centered on August, 1965. The new sunspot cycle continues to rise, but at a very slow pace. This month's propagation predictions are based upon a predicted smoothed sunspot number of 31, centered on May, 1966. 73, George, W3ASK

MAY—JUNE, 1966

Band Openings Given In Local Standard Time

AT PATH MID-POINT

(24-HOUR TIME SYSTEM)

Band (Meters)	*50-250 Miles*	*250-750 Miles*	*750-1300 Miles*	*1300-2300 Miles*
10	*Nil*	07-09 (0-1) 09-13 (0-2) 13-17 (0-1) 17-21 (0-2) 21-23 (0-1)	07-09 (1) 09-13 (3) 13-17 (1-2) 17-21 (2) 21-07 (1)	07-09 (1-0) 09-13 (3-0) 13-21 (2-0)
15	*Nil*	06-09 (0-2) 09-13 (0-3) 13-17 (0-2) 17-19 (0-3) 19-23 (0-2) 23-06 (0-1)	06-09 (2) 09-13 (3) 13-17 (2) 17-19 (3) 19-23 (2) 23-06 (1)	06-09 (2-0) 09-13 (3-0) 13-17 (2-0) 17-19 (3-1) 19-23 (2-0)
20	*Nil*	06-09 (0-2) 09-16 (0-4) 16-20 (0-3) 20-23 (0-2) 23-06 (0-1)	06-07 (2) 07-09 (3) 09-16 (4) 16-20 (3-4) 20-23 (2) 23-06 (1)	06-07 (2) 07-09 (3-2) 09-15 (4-3) 15-20 (4) 20-23 (2) 23-06 (1)
40	07-09 (0-2) 09-15 (1-4) 15-19 (2-4) 19-21 (1-2) 21-23 (0-1)	07-09 (2) 09-15 (4-2) 15-17 (4-3) 17-19 (4) 19-21 (2-4) 21-23 (1-3) 23-07 (0-2)	07-15 (2-1) 15-17 (3-1) 17-19 (4-2) 19-21 (4) 21-23 (3-4) 23-02 (2-4) 02-07 (2)	07-17 (1-0) 17-19 (2-1) 19-02 (4) 02-04 (2-3) 04-06 (2) 06-07 (2-1)
80	07-10 (4) 10-18 (4-3) 18-22 (4) 22-01 (3-4) 01-05 (2-3) 05-07 (3)	07-10 (4-1) 10-16 (3-0) 16-18 (3-1) 18-20 (4-2) 20-01 (4) 01-05 (3) 05-07 (3-2)	07-08 (1-0) 08-16 (0) 16-18 (1-0) 18-20 (2-1) 20-22 (4-3) 22-01 (4) 01-05 (3) 05-07 (2-1)	07-18 (0) 18-19 (1-0) 19-20 (1) 20-22 (3-2) 22-01 (4-3) 01-05 (3-2) 05-06 (1) 06-07 (1-0)
160	05-07 (4-1) 07-09 (3-0) 09-18 (2-0) 18-20 (3-1) 20-22 (4-2) 22-05 (4-3)	05-07 (1) 07-18 (0) 18-19 (1-0) 19-20 (1) 20-22 (2-1) 22-00 (3-2) 00-03 (3) 03-05 (3-2)	05-07 (1-0) 07-19 (0) 19-22 (1) 22-00 (2-1) 00-03 (3-2) 03-05 (2-1)	05-07 (0) 07-20 (0) 20-00 (1) 00-02 (2) 02-03 (2-1) 03-05 (1)

HAWAII

Openings Given in Hawaiian Standard Time†

To:	*10/15 Meters*	*20 Meters*	*40 Meters*	*80/160 Meters*
Eastern USA	15-17 (1)	01-05 (1) 05-07 (2) 07-14 (1) 14-16 (2) 16-18 (3) 18-19 (2) 19-21 (1)	18-20 (1) 20-23 (3) 23-02 (1)	20-21 (1) 21-23 (2) 23-01 (1) 21-23 (1)§
Central USA	09-16 (1) 16-18 (2) 18-20 (1)	03-05 (1) 05-08 (2) 08-14 (1) 14-17 (2) 17-19 (4) 19-20 (2) 20-22 (1)	19-20 (1) 20-21 (2) 21-01 (3) 01-02 (2)	20-21 (1) 21-00 (2) 00-02 (1) 22-00 (1)§
Western USA	13-18 (1)‡ 09-15 (1) 15-18 (2) 18-20 (1)	04-06 (1) 06-11 (2) 11-15 (3) 15-19 (4) 19-21 (2) 21-23 (1)	17-19 (1) 19-20 (2) 20-02 (4) 02-04 (3) 04-05 (2) 05-07 (1)	19-20 (1) 20-21 (2) 21-02 (3) 02-03 (2) 03-05 (1) 21-02 (1)§

ALASKA

*Openings Given In GMT**

To:	*15 Meters*	*20 Meters*	*40 Meters*	*80/160 Meters*
Eastern USA	*Nil*	22-01 (1) 01-03 (2) 03-05 (1)	*Nil*	*Nil*
Central USA	03-05 (1)	12-14 (1) 21-01 (1) 01-04 (2) 04-07 (1)	09-12 (1)	*Nil*
Western USA	04-06 (1)	15-17 (2) 17-01 (1) 01-03 (2) 03-06 (3) 06-07 (2) 07-15 (1)	10-14 (1)	*Nil*

†Hawaiian Standard Time is 5 hours *behind* EST; 4 hours *behind* CST; 3 hours *behind* MST; 2 hours *behind* PST and 10 hours *behind* GMT.

*To convert to local times in Alaska, GMT or Z Time is 8 hours *ahead* of PST; 9 hours *ahead* of Yukon Standard Time; 10 hours *ahead* of Alaskan Standard Time and 11 hours *ahead* of Bering Standard Time.

‡Indicated possible 10 meter openings.

§Indicates possible 160 meter openings.

Contest Calendar

BY FRANK ANZALONE,* W1WY

Calendar of Events

April	30 – May 1	Helvetia 22
April	30 – May 1	OZ CCA C.W.
May	**7**	**CQ Spring VHF**
May	7-8	USSR DX
May	14-16	Georgia QSQ Party
May	20-23	YL Int. SSB
May	21-22	Kansas QSO Party
May	22-23	Bermuda Contest
June	3-6	CHC/FHC/HTH Party
June	4-5	National Field Day
June	5-6	Bermuda Contest
June	11-13	New York QSO Party
June	25-26	ARRL Field Day
July	2-4	Venezuelan Contest

Helvetia 22

Starts: 1500 GMT Saturday, April 30
Ends: 1700 GMT Sunday, May 1

Complete details for this popular contest appeared in last month's CALENDAR.

Your logs go to: USKA Traffic Manager, HB9ZY, Meggen–LU, Switzerland.

OZ CCA C.W.

Starts: 1200 GMT Saturday, April 30
Ends: 2400 GMT Sunday, May 1

Rules for this one also appeared in last month's CALENDAR.

Logs go to: E.D.R. Contest Committee, P. O. Box 335, Aalborg, Denmark.

CQ Spring VHF

Starts: 9:00 A.M. Local Time May 7
Ends: 9:00 P.M. Local Time May 7

See Bob Brown's VHF Rules on page 36 of last month's issue for details on this one.

USSR DX

Starts: 2100 GMT Saturday, May 7
Ends: 2100 GMT Sunday, May 8

The Radio Sport Federation of the USSR is once again sponsoring its annual Radio Day contest with the motto, "Peace to the World."

This is a world wide contest so do not concentrate on working USSR stations only.

1. Contestants must indicate ONLY a 12 hour period of continuous operating time for scoring purposes. Of course you can operate the whole contest period but only 12 continuous of the 24 contest period can be used for scoring. It is requested that you submit a log for all your operating.

2. This is a c.w. contest only and you can use all bands, 3.5 thru 28 mc.

3. The exchange will be a six digit serial number. USSR stations will send the RST report plus the number of their oblast. Stations of other countries will use the conventional RST plus a progressive 3 figure contact number.

4. Each contact counts one point and you are permitted to work the same station on other bands for additional contact credit.

5. The R-150-S country list will be used to determine the country multiplier. (This is basically the same as the ARRL DXCC list with the addition of DM2 as a country.)

6. Contacts between stations in the same city are not allowed. (However I believe a station in the same country may be worked for multiplier credit.)

7. The final score is determined by the sum of QSO points on each band multiplied by the number of different countries worked on that band. The total all band score is determined by the sum of points composed on each band, (Not like in our WW contest, you add the scores in the last column.)

8. Awards will be made for all band operation only, and to the top stations, both single and multi-operator, in each country as follows:

1st Place–A 1st degree certificate and a memorial badge.

2nd & 3rd Place–A 2nd degree certificate and a memorial badge.

4th & 5th Place–A 3rd degree certificate and a memorial badge.

In addition, each operator of a multi-operator station will also receive a certificate and badge.

There will also be a special award for the overall highest scoring station, both single and multi-operator.

A minimum of 5 entries are required from each participating country for a station to be eligible for an award. However recognition will be given to stations in countries not meeting this requirement.

9. Contacts on contest logs can be credited for any of the USSR awards; R-150-S, W-100-U, R-100-0, R-15-R, R-10-R and R-6-K.

10. Use a separate sheet for each band and list your contacts as follows: Date/time in GMT, band, station worked, number sent and received, country multiplier, QSO points.

A summary sheet with your name and address in Block Letters, the scoring from each band, equipment description and etc. is also requested.

Your entry must be mailed no later than June 1st and they go to: The Central Radio Club of the USSR, P.O. Box 88, Moscow, U.S.S.R.

*14 Sherwood Road, Stamford, Conn. 06905.

Georgia QSO Party

Starts: 2300 GMT Saturday, May 14
Ends: 0500 GMT Monday, May 16

The fifth annual Georgia QSO Party is sponsored by the Columbus Amateur Radio Club.

There are no time or power restrictions and contacts can be made on c.w. and phone but only one contact per band is permitted with the same station. Crossband contacts are not allowed but c.w. to phone is OK.

Exchange: QSO number, RS/RST report and QTH; county for Georgia stations, state, province or country for others. (Ga. to Ga. contacts permitted for multiplier and QSO points.)

Scoring: Each completed contact counts 2 points. Georgia stations multiply their total QSO points by the number of different states and provinces worked. Out of state stations will use the number of Georgia counties worked for their multiplier. (A possible total of 159.)

Awards: Certificates to the highest scoring station in each state, province, country and Georgia county. Second and third place awards will be made in sections that warrant additional recognition. A plaque will be presented to the Georgia station submitting the highest s.s.b. score and the highest overall score. Plaques will also be awarded to the highest scoring out of state entry and to the Georgia club with the greatest aggregate score.

Frequencies: c.w.–1810, 3590, 7060, 14060, 21060, 28060. a.m.–3995, 7260, 14230, 21310, 28600. s.s.b.–3975, 7220, 14290, 21410, 28600. Novices–3735, 7175, 21110.

Your log should show in this order: Date/time in GMT, station worked, RS/RST sent and received, QSO number sent and received, county, state or province, band and mode.

Include a signed declaration that all contest rules and operating regulations have been observed and mail your entry no later than June 15th to: Columbus Amateur Radio Club, Att: John T. Laney III, K4BAI, 3500 14th Avenue, Columbus, Georgia, 31904.

Kansas QSO Party

Starts: 1800 GMT Saturday, May 21
Ends: 2400 GMT Sunday, May 22

The Jayhawk Amateur Radio Society of Kansas City invites all amateurs to participate in its QSO Party.

There is no time limit or power restrictions and the same station can be worked on each band and note.

Exchange: QSO number, RS/RST report and QTH; county for Kansas stations, ARRL section or country for others.

Scoring: Kansas stations, 1 point per contact, multiplied by number of ARRL sections worked. Out of state stations, 5 points for each Kansas contact, multiplied by number of Kansas counties worked. (A total of 105 possible.)

As a bonus, you may multiply your total score by 1.5 if you work WØLB the club station.

Awards: Certificates to the highest scoring station in each State, Canadian province and foreign country.

Frequencies: 5 kc above the National calling frequencies.

Mailing deadline for logs is June 18th and they go to: Jawhawk A.R.S., Att: Bob Summers, KØBXF, 3045 North 72nd, Bethel, Kansas 66009.

YL Int. SSB QSO Party

Starts: 2300 GMT Friday, May 20
Ends: 0600 GMT Monday, May 23

The YL International SSB'ers are again holding a QSO Party with many categories and a complicated scoring system. One of the features is the "team operation" category.

Rules in details are much to lengthy to be covered here but the following should be enough to get you started.

Don't let the title SSB confuse you, many members are also c.w. operators so activity will be found in both modes.

There are three categories and you can enter more than one if you wish.

1. DX/W-K Teams: These teams will consist of a DX station and a stateside station. Each will enter the single operator section. Scores will be combined for team score upon receipt of both logs.

2. YL/OM Teams: These teams will comprise of related pairs; husband/wife, father/daughter, mother/son, brother/sister. Operation must be from the same QTH and each will use their own call. Each partner scores separately, logs may also be submitted for single operator section.

3. Single Operator: This is the only category open to non-members. Of course members may enter this category too.

Exchange: QSO number, RS/RST, state or province, name, SSB number, (if member) and DX partners call. All times in GMT.

Scoring: For SSB'ers members: Contacts with members in own country 2 points, non-members 1 point. DX members 6 points, non-members 4 points.

For non-members: Contacts with SSB'er in own country 2 points, DX SSB'er 4 points, DX non-member 3 points. (non-member contacts in own country have no value.)

Multiplier: Is the sum of different prefixes, countries, states, VE provinces, continents and teams, where both members have been worked.

The same station may be worked on different bands and modes for additional QSO points.

Each station must show 6 hours of continuous rest in each 24 hours, and each log must have a minimum of 6 hours in each 24.

Awards are many and varied for the first 3 places in the many categories and sections.

Frequencies: s.s.b.: 3805, 7215, 14332, 21373, 28800. (DX–3773, 7090, 14132.) a.m.: 3825, 7250, 14240, 21340, 28800. (DX–3670, 7070) c.w.: 3565, 7020, 14080, 21080, 280, 80.

Stations wishing to enter the DX/W-K category should immediately contact WA6MWG via air mail or system control to advise him of your

partnership or to get a partner assignment.

Your contest logs must be postmarked within 30 days after the contest and go to: Pete Billon, WA6MWG, 4040 Via Opata, Palos Verdes Estates, Calif. 90274.

Bermuda Contest

Starts: 0001 GMT Sunday, May 22 & June 5
Ends: 0200 GMT Monday, May 23 & June 6

Once again the Radio Society of Bermuda is holding its annual contest open to all USA and Canadian amateurs. The "Top Banana" in the contest must go to Bermuda to pick up his award. The Society makes this possible by picking up the tab of your airline ticket and putting you up at the Belmont Golf & Country Club for a week. Now isn't that something.

1. Use all bands, 3.5 thru 28 mc.
2. Only single operator stations allowed.
3. Both c.w., phone and cross mode contacts are permitted, however only one contact can be made with the same station on any one band.
4. W/K and VE/VO stations will give a RS/RST report. VP9 stations a RS/RST report plus their Parish. (Abbreviations of Parishes: SAN, DEV, PEM, SOU, SMI, WAR, HAM, PAG, GEO.)
5. Each completed contact counts 3 points.
6. Your multiplier is derived by the number of Parishes worked on each band. (A possible total of 45.)
7. Final score, total QSO points multiplied by the total number of Parishes from each band.
8. There are no equipment, power or time limitations.
9. A certificate signed by His Excellency The Governor of Bermuda will be awarded to the highest scoring station in each call area of the USA and Canada. In case of a tie, the winner will be determined by the highest number of Parishes worked on 3.5 mc or each band.
10. Keep all times in GMT, carefully checking your log and computing your score. Print your name and address in BLOCK LETTERS and sign a declaration that rules and regulations have been observed.

All logs must be in the hands of the committee no later than July 15th and they go to: Radio Society of Bermuda, Att: Contest Committee, P.O. Box 275, Hamilton, Bermuda.

CHC/FHC/HTH

Starts: 2300 GMT Friday, June 3
Ends: 0600 GMT Monday, June 6

This one should generate a multitude of varied activities. What with the Certificate Hunters Club, the Flying Hams Clubs and Hunt the Hunters all going at it, it gets a bit involved.

Exchange: CHCers and FHCers; QSO number, RS/RST, name, CHC/FHC number, state and county. (DX stations; DOK, LAAN, Province and etc.) HTHers send same as above less the membership number.

Scoring: CHCers; CHC to CHC 1 point; CHC to HTH 2 points; YL and FHC contacts 3 points. HTHers; HTH to CHC 3 points; FHC contacts 4 points and YL CHCers 5 points. (HTH to HTH no value.) The same station can be worked on a different band and mode for contact point credit. (s.s.b. and a.m. different.)

S.w.l.s can also submit a log of stations heard in this activity for s.w.l. awards. They use same scoring system as the HTHers.

Multiplier: Add the number of different continents, countries, VE provinces and US states worked. Your own state/country can be claimed as a multiplier. KH and KL count both as a state and DX. Sum total of above is your multiplier.

Final score: Multiply your total QSO points by your multiplier.

Awards: 1st, 2nd and 3rd place certificates for the world, each continent, country, US state and VE province. Plus special Trophies for many different categories of CHC, HTH and s.w.l.

Frequencies: (Plus or minus 10 kc.) c.w.—3575, 7030, 14075, 21090, 28090. a.m.—3810, 7235, 14230, 21330, 28800. (DX 3675, 7075) s.s.b.–3990, 7210, 14340, 21440, 28690. (DX 3775, 7090) v.h.f. 50.3

A detailed and accurate log and summary sheet is requested. Inaccuracy in the scoring will be deemed sufficient cause for disqualification.

Besides contest awards your log can also be used for the many awards in the CHC program. Applications for these awards can be made with your contest entry. It is highly recommended however that you write K6BX (s.a.s.e.) for official forms so that you may get the most credits for your efforts.

Logs must be submitted no later than July 5th and they go to: Clif Evans, K6BX, Box 385, Bonita, Calif. 92002

New York State QSO Party

Starts: 1800 GMT Saturday, June 11
Ends: 0200 GMT Monday, June 13

Rules in next month's CALENDAR

Editor's Notes

If I had time and space I would dwell on the avoidable duplication of dates and the complicated rules of some of the activities. Since neither are available you will be spared any further harangue.

A Field Day for all school stations will take place the week-end of May 21/23rd. Rules and additional information can be obtained from Ken Johnson, W6VEB, Pasadena City College, 1570 Colorado Blvd., Pasadena, Calif. 91106

73 for now, Frank, W1WY

THE VHF COLUMN

BY BOB BROWN, K2ZSQ
AND ALLEN KATZ, K2UYH*

HERE it is May again, the birds singing, a warm breeze blowing, and tropo openings a'coming. May marks the start of the v.h.f. DX season in the minds of many amateurs. Too many if you ask us. It sure has been sad to listen to the near-deserted c.w. section of two meters these past months. But boy, what these fair weather v.h.f. men have missed!

There was WA6LET (SRIRC) moonbounce tests at the end of September in which Cliff, W2CCY, using four 8-foot yagis, and Jud, K2CBA, using a 10-foot square collinear, spanned the continent on 432 mc. Many other stations also made the earth-moon-earth circuit using larger antennas. In October K2MWA/2 (CARC) was on 432 mc with a 60-foot dish aimed at the moon for tests. During December and January the R.V.H.F.S. using the call K2UYH/2 was on 432 with another 60-foot dish for more moonbounce tests. And all these groups will be conducting still more tests in the future.

In the midst of all this moonbounce activity added to the usual v.h.f. frenzy, on December 21 Oscar IV was launched. Though Oscar did not go into the planned orbit, nor is it operating properly, contact is still possible through it. At present Oscar IV is not locking on f.s.k. signals, but it is still repeating bursts of information at random. (See W6YK's letter in last month's column for detailed operating practices). By the time you read this, another Oscar may have been launched—most likely a beacon.

During February, the moonbounce picture switched back to 144 mc with Ray, VK3ATN, trying to make a QSO with the U.S.A. Ray's antenna was a 350-foot per leg stacked rhombic with an estimated gain of 30 db! For the occasion the WA6LET group got back on the air with an 85-foot dish. Also participating in the tests were Bill, W6YK, and the R.V.H.F.S. using the call WA2FGK. The antenna at WA2FGK consisted of four 22-foot yagis fix-tilted at 15 degrees. This elevation conveniently corresponded with moon rise in Australia. W6YK was using four stacked "J" beams. Four nights of tests beginning February 28 produced tapes of WA6LET's signals by VK3ATN. The only signals heard by WA6LET were believed to be those of WA2FGK. WA2FGK heard nothing due to power line noise. The power company heard about this and now much of the problem has been eliminated. W6YK also heard nil. (Schedule information on further 144 mc moonbounce tests by WA6LET may be obtained from Bill, K6CLN). At present WA6LET is copying its own echo about 6 db above the noise and estimates that a two meter antenna linear polarization with 23 db gain is necessary for a contact. Ray, VK3ATN, will be on again every 28 days when the moon is in a favorable position. In the meantime he plans to stack another rhombic for an extra 3 db gain. Skeds can be made with Ray via 40 meter s.s.b. He hangs out about 7080 kc and puts a whopper of signal stateside since he uses the rhombic on this band also.

*c/o Allen Katz, K2UYH, 48 Cumberland Avenue, Verona, New Jersey, 07462.

Old Fashioned Propagation

Nature has not been unkind this winter either, as can be judged by a record-breaking two meter opening in November and a fine 432 opening in January. The November 16 opening is of particular interest since no one is quite sure by what means of propagation the signals travelled. The opening occurred during a meteor shower leading many operators to believe that the contacts were made via that path. But the signals were constantly readable and enhanced by occasional "pings." The middle of November is not the time of the year you would expect Sporadic *E* or tropo inversion to occur!

Back in April 1957's *QST*, the classic article on meteor scatter propagation by W4LTU was printed. Near the end of this article Walt de-

Outdoor moonbounce station, California style. In center is W6YK (see letter, April column); right with mike is K1LSY/6; at left, kneeling, WA6VTY. Antenna shown held by W6YK is a 32-element collinear extended made of aluminum clothesline for 432 mc. Gain measured at 18.5 db over tuned dipole.

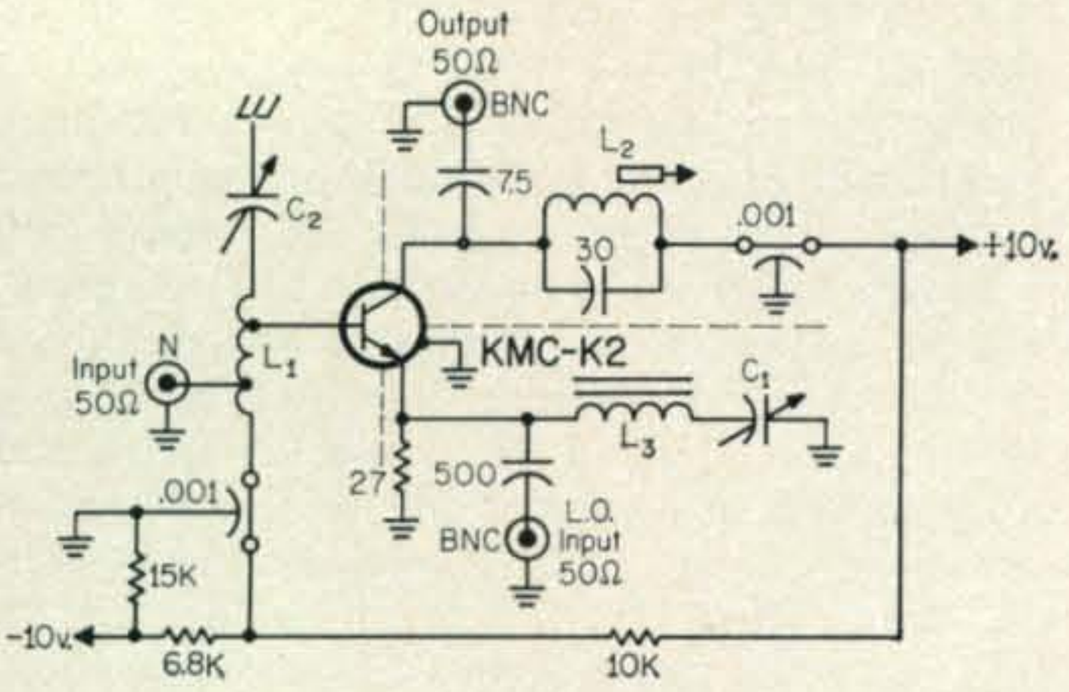


Fig. 1—WB2FSX's circuit of KMC Semiconductor's 1000 mc transistor r.f. amplifier. Transistor is a specially-selected KMC-K2 type. Shouldn't be difficult to put this one on 1296; spec's point out a noise figure of 4 db, gain of about 8 db. Note: All leads are ⅛" silver ribbon and minimum-length taps should be adjusted for minimum s.w.r.

C_1, C_2—Johanson 4700, .35-3.5 mmf, bottom ground flat.
C_3, C_4—100 mmf bare ceramic disc, connected with ⅛" silver ribbon.
C_5, C_6—1000 mmf mica buttons.
L_1, L_2—.125" × 1.125" brass rods mounted in ¾" × 1" cavity center between sides and ¼" from top.
L_1 (taps)—Input approximately ½" from bypass and base ¾".
L_2 (taps)—Collector 9/16" from bypass and output 7/16".

scribed experiencing a phenomena very similar to that which occurred on November 16. He believes that possibly a condition is reached when many meteors are entering the earth's atmosphere at the same time where the amount of ionization remains constantly at a level high enough to reflect signals on 144 mc.

V.h.f. amateurs have been traditionally interested in propagation and have justified their operation by doing propagational research. Yet when an unusual opening occurs hardly anyone says a word on the subject. The only thing anyone really seems to be interested in is the number of new states worked. If this is your attitude, you might as well operate on the low frequencies and chase DX. It's as much v.h.f. radio as what you're doing.

Possibly if more reports had been received about this (Nov. 16) opening, something new about v.h.f. propagation could have been learned. Reports of conditions on 6 meters certainly would have been useful. We do not have a staff of secretaries, nor do we have fancy forms, but we do have space to document your experience on the v.h.f. bands. Our policy has not been to print bits and pieces, but to print whole letters if necessary which can supply meanful information on v.h.f. and the state of the art. We do not care if letters are typed or handwritten. We do not care about spelling or form—that's our job as columnists. All we care about is content. This column is your sounding board. Use it!

U.H.F. Transistors

In the past half year or so there has literally been a revolution in v.h.f. transistor production. We first saw a hint of this break back in the November 1965 column with the circuit of a 432 mc, preamp having a noise figure of 2.8 db, designed by WA2FSQ. This preamp used relatively expensive transistors. Judging by the following letter from Vic, W3SDZ this situation has changed.

"I think the most interesting thing we have been doing is in the front-end of a TIX-MO5 mixer. Noise figures in the order of 2.9 db were produced with two stages of r-f. Now they have come up with a very simple but different circuit that produces a noise figure better than two db in front of a 5 db converter." What's different? "This is all done with 52 cent transistors!! In addition, the measurements are at this time deemed accurate. In other words these measurements were made taking into consideration all the problems that can arise when too low a NF is measured. I think this is a most important discovery for amateur radio, as it solves the 432 front-end problem within the budget of any worker. While a 2 db front-end can be improved upon to a small advantage on 432 mc, it is a most practical figure if the preamp is mounted at the antenna. It also means that a paramp can be built without a circulator, as a gain of 6 or 7 db would be enough to over-ride the transistor front-end noise. It further means that the paramp will be operating in a very wide-band mode that will be quite stable. We have been working and looking for something like this and I think it is here. I honestly think it is only a matter of time before all this will be possible on 1296."

That time might not be far off, for we also received information from Del, WB2FSX, of KMC Semiconductors (Parker Road, Long Valley, N.J.) of a 1000 mc transistor r.f. amplifier and mixer. Layout of the r.f. amplifier is shown in fig. 1. A schematic of the r.f. stage and mixer is shown in fig. 2. Del says the r.f. amplifier will produce a noise figure of 4 db and a gain of about 8 db. This is quite an improvement over any crystal mixer. The transistor employed is a specially-selected KMC-K2 type. Construction

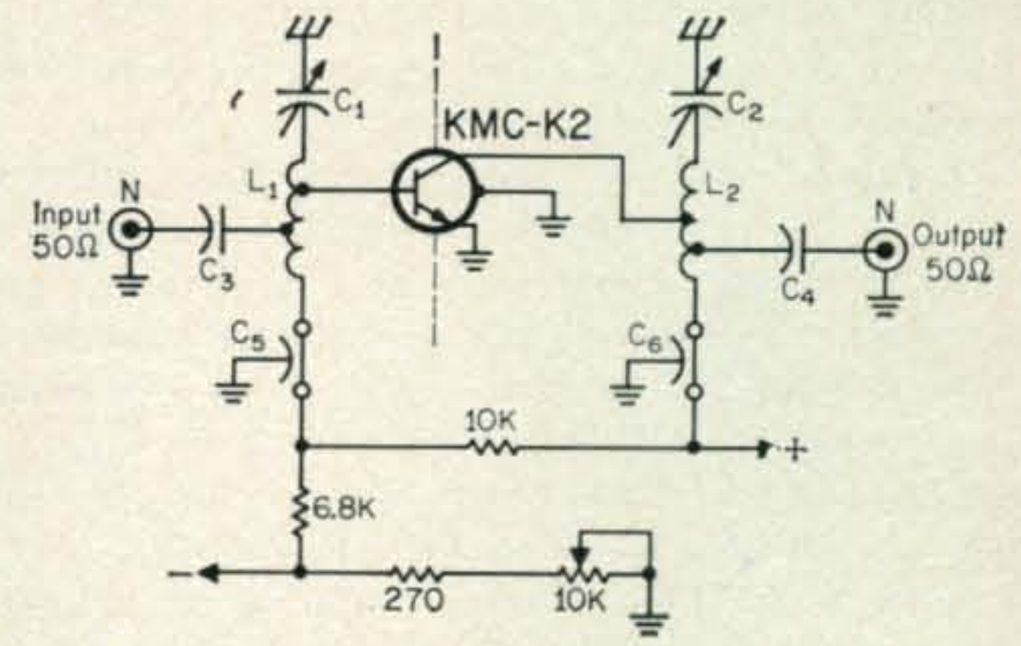


Fig. 2—KMC Semiconductor's 1000/60 mc r.f. stage and mixer (see text).

C_1—Avco 403.
C_2—Johanson 2901, 8-10 mmf.
C_5, C_6—.001 feedthru.
L_1—Same as 1000 mc r.f. stage.
L_2—10 t. #22 e. on 3.16" slug-tuned form.
L_3—7 t. #22 e. on ⅛" ferrite slug.

is certainly within the limitations of most amateurs and it should not be hard to move the circuit up to 1296 by cutting down on the dimensions. Del also mentioned that KMC will have a low-noise transistor preamp working on 2 kmc within a year!

From The Mailbag

Stanford, California: Bill Faulkerson, K6CLM, reports on the Australian trials.

"Here's a run-down of activities during the EME trials with Ray, VK3ATN. It was a rush affair here, as well as at the other stations involved, having about three days to prepare. A cross-polarized log periodic feed went into the Stanford Research Institute's 60-foot dish on Friday, Feb. 25th. (The dish is located at a Stanford University field site, just south of the University campus). On Saturday we had gathered most of the gear required and got the system working after a fashion. Except for the lack of a high-powered amplifier and a decent noise figure, we were ready to moonbounce. Since it was elected that we would use circular polarization, it was necessary to employ polarity sense switching in order to receive our own echos for a system check. On Sunday, after the contribution of an amplifier by Vic, WB6KAP, and a preamp by Chuck, WA6MGZ, we managed to receive our echos 3-6 db above the noise.

"System parameters were as follows: Antenna gain—26 db (not optimum because of feed type; polarization—left-or-right-hand circular; power —500 watts output; feedline loss—.8 db; noise figure—2.5-3 db; receiver bandwidth—100 c.p.s.; frequency—144.090 mc.

"Eme trials were made on February 27, 28, and March 4, 5. Other stations participating, to my knowledge, were VK3ATN, W6YK, and WA2FGK. Only one signal was heard here and

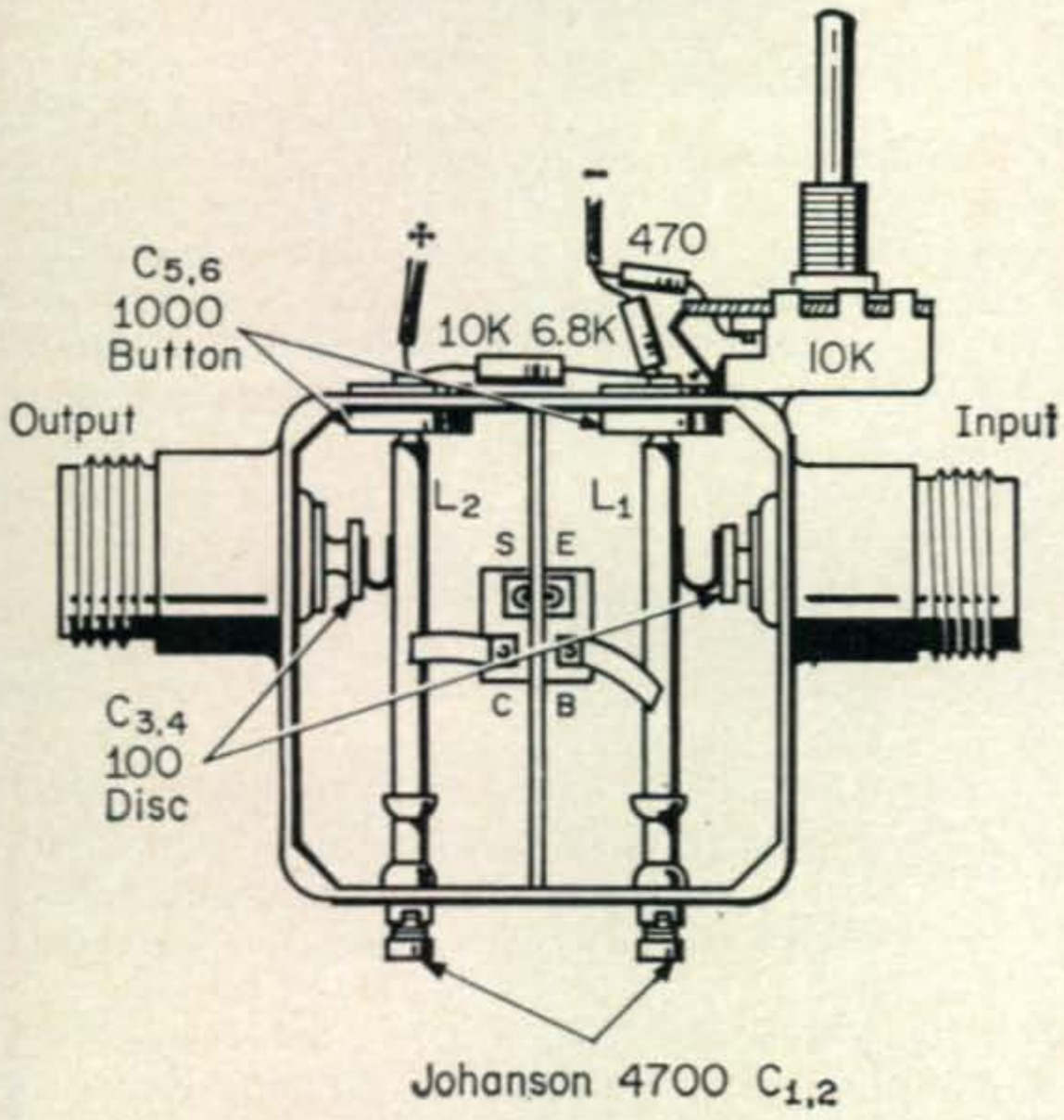
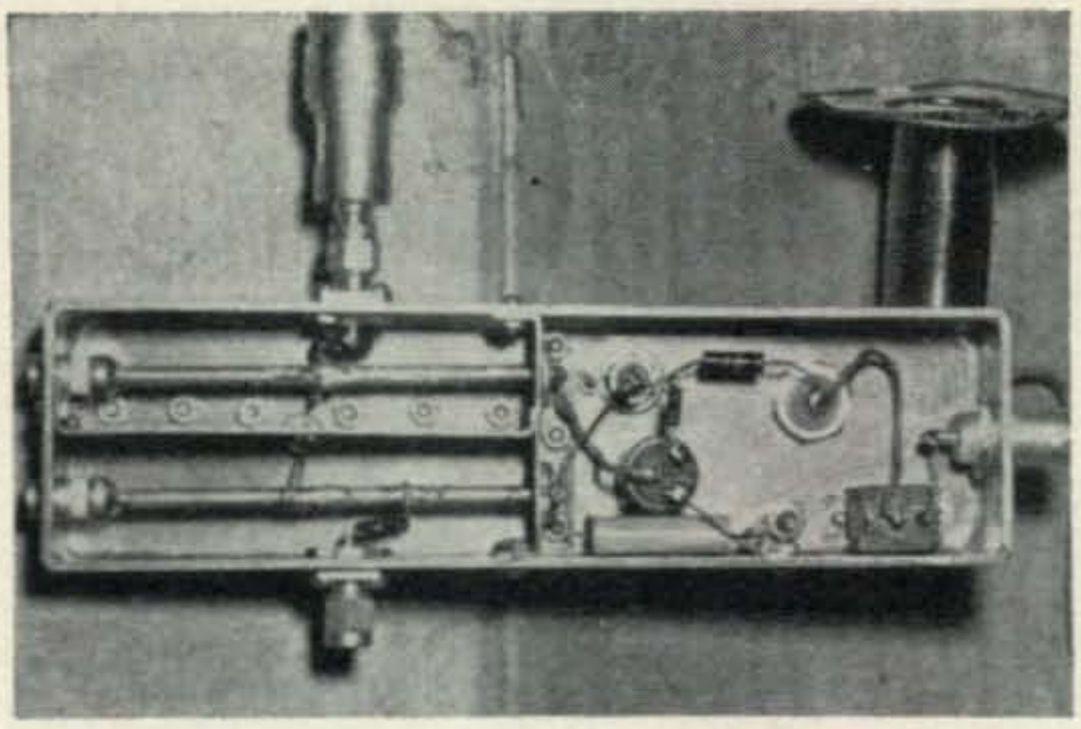


Fig. 3—Pictorial diagram showing cutaway view of 1 KMC r.f. stage (see fig. 1 for circuit). Connections must be as direct as possible, solder joints secure.



W3SDZ's single-stage 432 mc preamplifier that produces a 2.9 db noise figure in front of a 5 db converter. So what? The Texas Instruments TIX-MO5 transistor (see text) can be had for 52¢.

only a few later on 144.091 on Feb. 27. VK3ATN reported hearing signals during our transmit periods on Feb. 28 and March 5. No two-way contact was established.

"Participants at this end were: K6CLM, K6MYC, W6UES, W6ENE, K6TDR, and W6GXN.

"Here are a few facts about VK3ATN's installation in case you don't have them. Antennas are stacked, 50 wavelengths-per-leg rhombics. He has about 45 minutes per day, 4 days per month on the moon. Antenna azimuth heading is 60 degrees. Vertical take-off angle is 5 degrees. Transmitter power is 150 watts input.

"We hope to be in better shape for the next trial with Ray and yourself on about March 27."

San Antonio, Texas: George Munsch, W5VPQ, writes on v.h.f. f.m.

"The Texas VHF-FM Society recently held its second semi-annual meeting, and during the technical session, chose some standard operating frequencies for the state.

"On six meters, the suggested national frequency of 52.525 is in wide use, and 52.88 was chosen as the standard repeater input frequency. On two meters, 146.94 is the primary frequency, and the apparent national standard, 146.34 repeater input frequency, is confirmed for Texas.

"Choice of three-quarter frequencies generated a great deal of discussion, with 449.1 finally being chosen as the main frequency, and our choice as a proposed national frequency. For repeater operation the input chosen is 449.7 for use with 449.1. A secondary pair of frequencies was also chosen, 448.9 main channel and 449.5 repeater input.

"The society consists of seventy members, of whom thirty-five turned out for the one-day meeting. This indicates the high degree of interest in the organization across the state and cooperation between areas is extremely good."

Thirty

Lest you forget, there is still time to prepare for the fabulous *CQ* Spring Twelve-Hour V.H.F. Contest, slated for May 7. Full details appeared last month. See you in the contest!

73, Bob, K2ZSQ & Allen, K2UYH

HAM CLINIC

CHARLES J. SCHAUERS,* W6QLV

MANY radio amateurs have found —to their dismay—that equipment cooling involves more than just the simple mechanical installation of a cooling fan. If a fan is not installed properly it can vibrate critical frequency sensitive components thus causing an annoying fm'ing effect, or make a quiet receiver noisey. Without proper planning for good airflow (in and out), recirculated hot air can do more damage than good.

The Cooling Problem

Most ham equipment (other than high power final r.f. amplifiers) does not contain special cooling fans, but good ventilation is provided by using cabinets designed to permit the circulation of air from bottom to top and through the sides by means of well placed holes or louvres. Sometimes, however, a ham will discover that more ventilation is needed, either because he must frequently replace tubes and other heat producing components, or because he is operating in a location in which ambient temperatures are higher than normal.

Heating causes expansion of metal and glass and eventual melting. Some components such as tubes and electrolytic capacitors can literally explode when subjected to too much heat. We all know what happens when coils, capacitors and crystals which control frequency receive too much heat, there is frequency drifting. Too, receiver noise can be caused by an under-rated resistor in nearly any circuit of the set. This noise will generally be a distinctive frying type of noise and is, of course, caused by excessive heating.

Most manufacturers design their equipment to provide proper ventilation. Where they can, they provide for isolation of heat producing components so that these will not affect heat sensitive parts. But this design does little good if the ham places the set on the rear corner of a desk and the back and one side of the set are up against two walls!

A set (without a fan) must have *free* air around it. I suggest that increasing the air space *under* the set by mounting it on small wood blocks or plastic boxes will improve ventilation. Hot air flows *up*, cold air *down*.

Cooling was a problem with the old a.m. sets because of the long duty cycle, but with s.s.b. equipment cooling the final amplifier of a transmitter is not much of a problem for the amplifier has a much shorter duty cycle.

For proper cooling, the hot air must be displaced by cool air and in some sets this is a major problem because of the peculiar mechanical construction which prevents proper airflow. Hot air "pockets" around transformers and tubes can be created by special r.f. shielding. In some instances special air baffles must be installed to insure the even flow and proper amount of air.

Air like electricity will take the path of least resistance, so it is necessary before deciding on what cooling is necessary in any piece of ham equipment to make an "air flow analysis." This does not involve any major effort and can be done by the novice.

Air Flow Analysis

To begin your "analysis" first turn on your set and leave it on for a period of 24 hours under normal ventilating conditions. After 24 hours take four wooden blocks about 4" high and mount your set on these. Then with a smoke candle mounted under the center of the set, light it and observe (with the set cover on) where the greatest amount of smoke comes out the top and sides. Mark these spots with adhesive tape. Then do the same thing with the cover off and note how the smoke comes up through the bottom to the top. Look for air pockets. You will note that the smoke will take definite paths. It will not take you long to see "how" your set is ventilated. With your hand you can feel (outside the cabinet) where hot spots exist—these are the spots that need cooling. So then it will be necessary to decide where to mount a fan or make more ventilation holes. It's that simple. If you cannot obtain a smoke candle a cigar can be used but it will take a lot of steady puffing.

Choosing a Fan

Choosing a fan and properly locating it is a small problem but an important one. You can either utilize the fan to pull the air up from the bottom of the set or use it to blow air *into* the set. The mistake some hams make in mounting their fans is that they do not remember that advantage should be taken of the ventilation system already in existence. Merely installing a fan to blow on a tube or transformer is foolish. Why? Because in doing so the deflected hot air can be pushed onto a heat sensitive component or increase the bulb temperature of a nearby tube.

So before you choose a fan for the cooling job you must take into consideration *how* you want the cooling job done.

Remembering your air flow analysis, you may want to merely increase the airflow as it exists or you may wish to change it by using baffles or mounting the fan so that this can be accomplished.

Most ham sets do not have a lot of space for mounting a fan—especially in the most desirable location, so often, there must be a compromise. But one must be careful that the fan is not located so that it pulls the air via a short path thus

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

denying certain spots in the sets of needed air. This is obvious.

The exercise is to locate the fan where it will pull or push the *most* air where it is needed. Sometimes this is not easy. An airflow analysis will tell you if you have been right or wrong.

A fan should never be mounted where it pulls the hot air from a tube or transformer and exhausts it over other components. The fan should be mounted so that it will blow from the cool side of a set over hot spots and *out*. Or, it should pull the air across the set over the hot spots and *out*.

When top mounting the fan, it should be placed (if possible) over the spot determined in your airflow analysis to be the spot from which most of the air issues under *normal* ventilation conditions. If this is not possible, sometimes an aluminum baffle properly installed (by cut and try) will enable you to still install the fan in the maximum airflow spot.

At this juncture I would like to point out that most transceivers, receivers and small transmitters made for the ham require about 100 c.f.m. (cubic feet per minute) of air. This is based on averaging the size of the sets and considering the heat producing components.

One of the best fans that I could recommend is pictured on these pages. This is the *Skipper* (R) fan made by the *Rotron Mfg. Co.* of Woodstock, New York.

The Skipper is small, produces little noise, has a long life and is inexpensive. The Skipper produces no electrical noise and can be used in receivers. For full information on the fan write to the company at the address given above. Most reputable wholesalers stock the Rotron Skipper so it should not be difficult to find one.

The skipper fan by Rotron, which is ideal for cooling ham gear. No mounting screws are necessary. The proper diameter hole is cut in the cabinet or chassis and the fan simply fitted in.

Low Temperature Operation of Transistors

In the February 1966 column we mentioned the low temperature operation of transistors. My friend W6LSW of Camino, California writes and enlightens us further on the subject.

"In general, both PNP and NPN transistors were found to operate when subjected to temperatures as low as —300°F., excluding of course fast temperature changes which introduce expansion problems and can damage any type. However, the PNP transistors (germanium types) exhibited a loss of gain of 60 to 80%, while the NPN silicon types exhibited a loss of 90 to 95% of their gain (beta). It should be noted that the I_{co} also reduces tremendously as temperature is reduced. At —300°F leakage is not a factor. Pehaps it may be well to think of both PNP and NPN transistors as operating over a specific temperature range with that of the PNP germanium types operating with usable characteristics at the lower temperatures. Tests were not conducted at lower temperatures, but it is apparent that carrier mobilities are being hampered.

"For operations, say below zero+0° —50°F, either PNP or NPN types will probably be satisfactory, with very little loss of beta and a substantial loss of leakage effects. Of course, designs allowing internal heating of the transistors will bring the ambient characteristic back somewhat.

"Without getting into extensive details, the following statements can be made concerning other components. Silicon diodes exhibit a general drift of their entire characteristics to the right, with the forward and reverse characteristics possessing a lower dynamic resistance. The knee of the reverse characteristic becomes sharper. Note that this in general, covers the zener or avalanche diode. The temperature compensated types of recent construction operate very well. Power diodes, 10 amps, and higher will have self-heating to negate much of the low temperature drift. At temperatures below —100° to —150°F, the silicon unijunction transistor begins to be affected and its parameters will vary such that any use of it as a multivibrator must be investigated before use. The silicon controlled rectifiers will react as you might expect a two transistor equivalent circuit to from the above discussion.

"Electrolytic capacitors will gradually lose their effective capacity with lowering temperatures. Capacitors of the polystyrene, mylar and paper types of good construction operated well to the test temperatures.

"This data was taken from a test setup which allowed stabilization at a particular temperature. The results were then exhibited on a curve tracer and recorded on a Polaroid camera. The tests resulted in over 2000 pictures (of at least two tests) being gathered for analysis. While the project I was on was not intended to be basic research, it nevertheless presented an insight into information which was not available from the semiconductor manufacturers."

Thank you W6LSW for the interesting information gathered over a period of 3 years.

Questions

22'er Modification—"I have heard that there is some information out on modifying the 22'er for

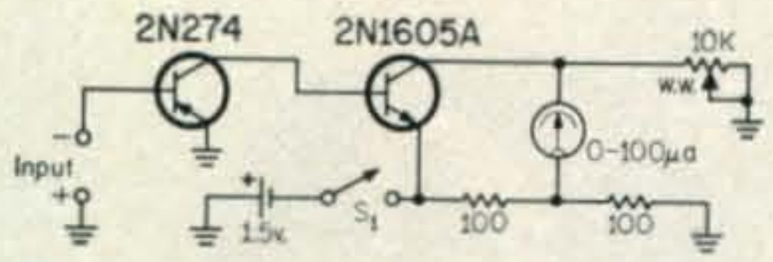


Fig. 1—A meter which will measure .5 μa full scale.

improved percentage of modulation. Can you help me on this one?"

Yes. Write to Squires-Sanders Inc. Martinsville Road, Liberty Corner, Millington, New Jersey 07946 and ask for their field change notice Series 1900 Number 7 dated Dec. 29, 1965. The change described in this bulletin results in virtually 100% modulation peaks by reducing the voltage on the 350 volt output to 300 volts ± 10 volts. If the notice is not available do this: remove R_{92}, 2K 10 watt resistor (located at the electrolytic can C_3) and replace with a 600 ohm 5 watt resistor. Then Change R_{81} (on the terminal strip between V_{13} and V_{14} from 470 ohms to 3.3 k ½ watt. Finally, remove R_{86}, a 27K ½ watt resistor and replace with a 39K ½ watt resistor (at pin 3 of V_{15}). Correct your parts list and schematic for these values. Thanks Squires-Sanders.

HT-44 and SX-117 Slave Operation – "Have there been any changes to the HT-44 circuitry to improve the performance when operated in transceive with the SX-117 receiver?"

Yes. Hallicrafters' Bulletin No. 1964-4 dated June 1, 1964 covers the changes. Write them. Thanks Hallicrafters.

Galaxy V Selectivity–"Any way to install a variable selectivity control on the Galaxy V? What do you suggest?"

If that Galaxy V is aligned properly you would seldom need a separate selectivity control because the receiver portion of that set is a very good one. However, the easiest control to install would be a "T" filter. See the May 1964 column page 69.

BC-669 Conversions–"In what issue of *CQ* did information appear on converting the BC-669 surplus set?"

See the July 1961 issue. Reprints from the editor of *CQ* for $1.00 (not me!).

KWM-2 On RTTY–"Where can I obtain information for using my KWM-2 on RTTY?"

You must not be a subscriber. See the April 1965 issue of *CQ*.

Modifying the R-390A/URR Receiver–"*CQ* ever publish information for modifying the R-390/URR receiver?"

Yes. See the January 1965 issue.

One Watt a.f. Amplifier–"I need a one watt a.f. amplifier that I can build for less than $10.00. What can you suggest.

Order one already built from Lafayette for $6.95. Ask for their No. 99R9038 one watt 4 transistor push-pull audio amplifier. You could not build one for less and have such a good unit.

Sensitive Microammeter–"I am experimenting with solar cells and I need a microammeter which will measure down to .5 microampere. Can you publish a circuit of a transistor booster or something that will enable me to measure this small current?"

Yes. See fig. 1. This circuit will give you exactly what you want. Use a mercury battery for long life and accuracy. Full scale deflection will be obtained with .5 μa input. By using different meters you can up the input current to the value desired, i.e., for 1 μa use a 200 μa meter etc.

NCX-3 Final Tube Replacements–"I have had to replace the final tubes in my NCX-3 about 4 times in as many months. Isn't this unusual? What should I check?"

First of all measure the bias to the final in accordance with the instructions in the manual. Next measure the final plate voltage. If these do not check out (or are way off) then review your method of tuning. Running the NCX-3 into a poorly matched antenna with its attendant high s.w.r. does not do the final tube much good. Check the drive to the final too. Over-driving the final tubes will make them unhealthy. Yes, your frequent tube replacement *is* unusual.

Linear Instability–"I have a well known brand of linear power amplifier and it operated fine up until about two months ago. Now the dern thing acts up. Here's what it does: after it has been on for a while the static final current gradually creeps up. When I excite the rig, I note that the meter wiggles more than it did before. I tried reducing the drive but this does not seem to help. On the air reports say I sometimes sound intermittent. What do I look for?"

First, if you had told me *what* final linear you have I could be of more help. Check your bias supply. Next check the final tubes for gas. I also suggest that you check neutralization, especially if you have replaced final tubes. Next, check your antenna connections and coaxial relay. If your final uses pentodes, then check the screen voltage and the regulators. Good luck. Readers please note: DO let me know *what* set you want troubleshooting information on–my files are full of instruction books and diagrams and they do little good unless I know *what* set is involved.

HX-50 Intermittent–"After operating on 40 meters with my HX-50 and I switch to 20 meters, I have to swing the bandchange switch through one complete revolution before I can settle down on 20. What's wrong?"

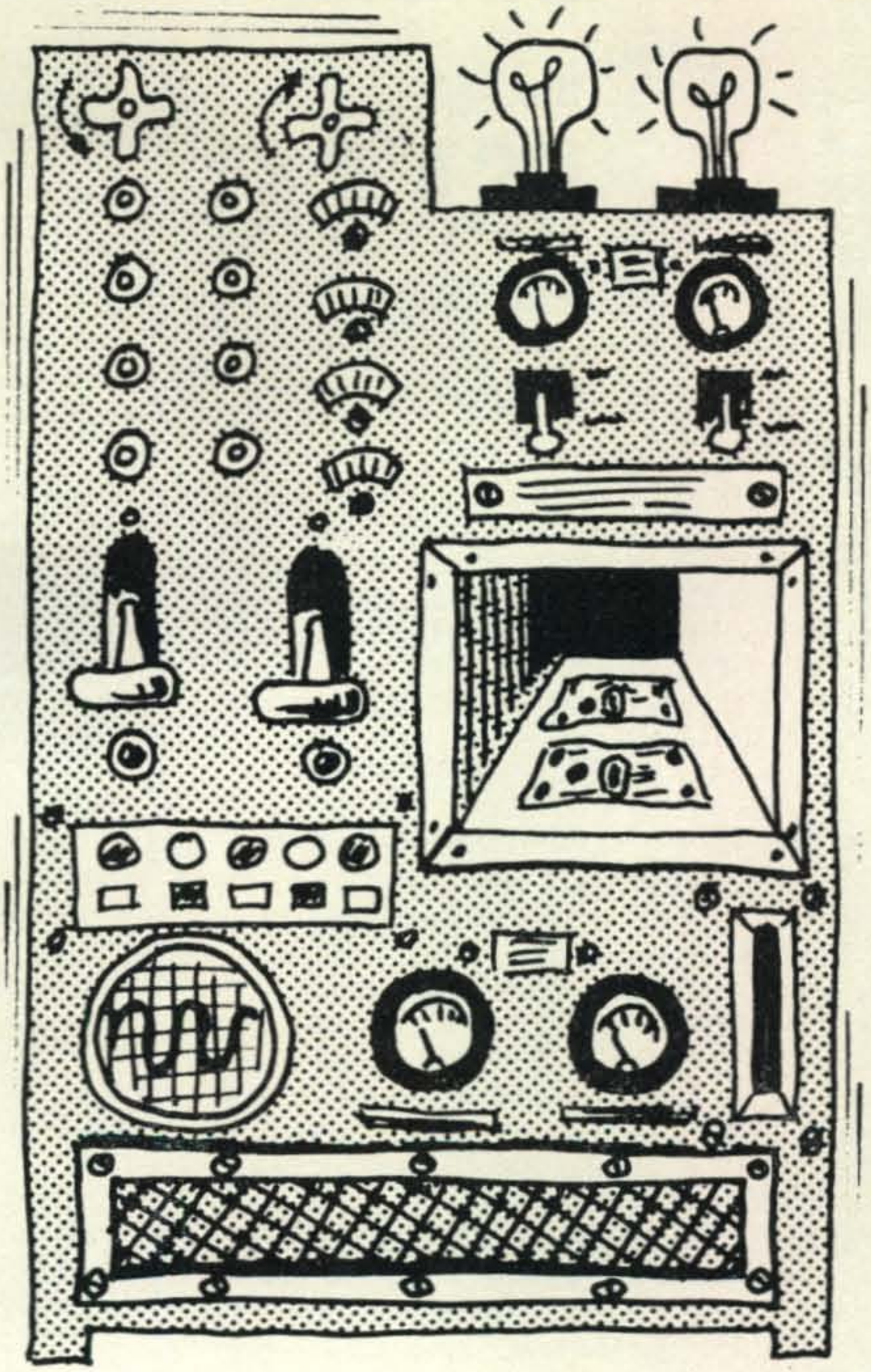
Dirty bandswitch contacts. Clean them with contact cleaner.

SB-33 or SB-34 on c.w.–"How can I modify my SBE-3 for c.w. operation?"

Adapters for this set for c.w. operation are available. However, it is a simple matter to put either the SB-33 or SB-34 on c.w. merely by feeding an a.f. oscillator into the mike jack. The oscillator can also feed a pair of phones for sidetone (monitoring). The output of the keyed oscillator should be a good clean sinewave and care should be taken that the set is not overdriven.

[*Continued on page 100*]

HOW TO MAKE MONEY!



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the USA-CA PROGRAM

BY ED HOPPER,* W2GT

THE story of The Award Hunters' Club International after this data on awards issued. A USA-CA-1500 mixed award went to Bob W1BHV/K1CXP and Nick, WA9AIB won a mixed USA-CA-1000 award. Mixed USA-CA-500 awards were earned by Arthur, K2BUS; Lou, W2LQP; Richard, K9VIE; John, KØIFL; Douglas, KØLGZ/WØJBK; and Benton, KØPCK. USA-CA-500 awards, endorsed All A-1 went to George, W40WE and Chas., W5AX.

The Award Hunters' Club International, Inc.

This first and original club in the world for award and certificate hunters, was founded in 1957 as The Award Hunters' Club. Address is: The Award Hunters' Club International, c/o Honorary Secretary, John Velamo, OH2YV, Isokaari 4-B-30, Helsinki 20, Finland. The Headquarters Club Station is OH2AH. There are continental sections as follows: Africa—P. R. Golledge, 9J2W, P. O. Box 1149, Kitwe, Zambia. Asia—Dady S. Major, VU2MD, Petit Mansion, 85 Sleater Road, Bombay 7, India. N. America—Dr. Howard A. Fine, K2TGH, Suite 1 B, 210-34 Grand Central Parkway, Queens Village, N. Y. 11427, U. S. A. Oceania—Alan Shawsmith, VK4SS, 35 Whynot St., West End, Brisbane, Queensland, Australia. S. America—Charles L. Hardy, LU1DJU, Rodriguez Pena 406, Banfield, F. C. Roca, Argentina. Requirements for membership are: One must be a duly licensed transmitting amateur, or a transmitting Club station. (S.w.l.s are no longer accepted). Applicant for the basic AHC membership must be a certificate holder of at least 25 different awards or certificates. A maximum of 15 awards may be listed from the applicant's own continent, and at least 4 continents must be represented. Certificates given for any contests do not count. Only awards available on a world-wide basis will count. For basic award, only ONE certificate of each award is accepted. (If applicant should list WAC-Phone, WAC-3.5, WAC-28 mc, they total ONE point only, for basic award). Club membership certificates do not count, nor do certificates having political background.

The applicant must have a QSL card of his/her own. An amateur who does not care to confirm QSOs is not suitable for AHC membership. Endorsement stickers to be attached to the membership certificates will be available for 50-100-150-200-250-300 awards.

How to apply for AHC membership: Send to your continental AHC Honorary Secretary an application list of your awards. The awards should be listed alphabetically by award abbreviations and give the following details: Award Abbreviation—full name of award—number of award or date of issuance—endorsement type (band or emission) if any.

Fees: The registration fee giving you a lifelong regular membership, is $1.00 US or 8 IRCs (or equal amount in any currency as agreed with the respective Honorary Sec. of your continental AHC in advance). In the *ACTIVE* membership, a different annual fee may be fixed by the respective continental Section according to the continental activity plans. The application for endorsement stickers should be accompanied by sufficient return postage and a self-addressed envelope would be appreciated. It is recommended that an IRC and self-addressed envelope be sent with all inquiries.

The AHC Honorary President is elected annually among members submitting the highest number of awards in accordance with AHC rules. AHC-International Honorary Presidents: 1964—DL9KP; 1965—DL1QT; 1966—EA4CR.

*103 Whittman St., Rochelle Park, N.J. 07662.

USA-CA HONOR ROLL

1500		500			
W1BHV/K1CXP	46	W40WE	549	W5AX	552
1000		K2BUS	550	W2LQP	553
WA9AIB	95	KØLGZ/WØJBK	551	KØIFL	554
				K9VIE	555
				KØPCK	556

SPECIAL USA-CA HONOR ROLL TOP TWENTY-FIVE COUNTY HUNTERS

K9EAB	3079	WØKZZ	2580
WØMCX	3079	WØVFE	2410
K8CIR	3064	W8UPH	2368
W91CF	3050	W9CMC	2368
K5SGJ	2960	WØGYM	2231
K5SGK	2960	K8VSL	2180
WØJWD	2950	W5NXF	2080
K4VOF	2944	WA5AEB	2062
WA9AJF	2900	W2JWK	2050
K8IWI	2780	K3LXN	2050
VE3-9301	2679	K9UTI	2000
K8KOM	2649	W5EHY	2000
WA8EZW	2000		

John, OH2YV, Sec. Award Hunters' Club Int.

Florida Cities Award

9M4LP Contest Award

J.A.R.S. 25th Anniversary Award

AHC-Bulletin: The Headquarters publishes a 16 sheet mimeographed "bulletin" monthly/bi-monthly, giving information on award rules. The subscription fee is $3.00 US or the equivalent per 12 issues. This "bulletin" available to non-members also—write OH2YV.

The AHC-International sponsors the "XL"-Club. This new top-operator club was introduced 1st of January 1966. The name of this fraternity has two meanings: The Latin figure XL stands for "forty" and the English pronunciation of XL is "excel" or "excellent."

The membership of this fraternity is based on long-term service and excellent achievements in the fields of Amateur Radio. The "XL" operators could claim to belong to the "High Society" of Amateur Radio. The requirements of this fraternity are intensive activity of many years on various amateur bands.

A minimum of forty (40) points is required for the membership. The points may be earned as follows: 1. Five (5) points for the first full 10 years the applicant has been duly licensed as transmitting amateur, PLUS three (3) points for each full 5 years thereafter. 2. Five (5) points for the FIRST 200 DXCC countries confirmed, PLUS three (3) points for each additional 50 countries confirmed. 3. Five (5) points for EACH 100 DXCC countries confirmed on EACH of the 28, 21 and 14MC amateur bands. 4. Three (3) points for each 50 DXCC countries confirmed on EACH of the 7 and 3.5 mc amateur bands. 5. Two (2) points for each 20 DXCC countries confirmed on EACH of 1.8 mc and v.h.f./u.h.f (V.h.f./u.h.f. considered as one band).

The country totals are calculated regardless of the mode of operation, so one country may be counted only once on each band. ARRL DXCC rules apply for counting the countries, however, official ARRL credit is not required. Count your points and if you can claim at least 40, send in your application. Give the following details: your call, your name and complete mailing address, plus (1) the date of your first transmitting license (in case there have been interruptions, give the details), (2) the DXCC score confirmed (OR credited by ARRL), (3) the number of confirmed countries separately on each band. Finally certify personally that the information in your application is true. No other certification is necessary; we trust the word of "XL" operators. If false information is given, it will spoil the Ham Spirit. Remember: HAM SPIRIT IS OUR GUIDING STAR. Enclose sufficient return postage (IRCs), there is no membership fee. Address the application to the Award Hunters' Club International, c/o John Velamo, OH2YV, Isokaari 4-B-30, Helsinki 20, Finland.

Arizona Calling

Your big opportunity to work rare Arizona Counties is coming. The following dates have been set up by the Arizona Amateur Radio Club, look for the club station W7IO from Santa Cruz County—14 May to 15 May; Greenlee County—11-12 June and Navajo County—13-14 August. Activity from these counties will be on sideband only, beginning at noon MST on Saturday and ending at noon MST on Sunday. Operation will be on approximately 14.275 mc from noon to 5 P.M. Saturday; 7.215 mc from 5 P.M. to 7 P.M. and 3.878 mc from 7 P.M. to 9 P.M. On Sunday on 3.878 mc from 7 A.M. to 8 A.M.; 7.215 mc from 8 A.M. to 10 A.M. and on 14.275 mc from 10 A.M. to noon. Frequencies are approximate and all times Mountain Standard Time. If you want a QSL, send s.a.s.e. to The Arizona Amateur Radio Club, P. O. Box 7543, Phoenix, Arizona 85011.

Charley, WØJWD; Leo, WA5AEB and Sherm, K9BLX on their return from that super county expedition mentioned in April CQ.

John, W4OHP who teamed with Sherm, K9BLX for that county expedition mentioned in April CQ.

WAGC (Georgia)

Award Hunter's Club Certificate

WKA General Certificate

Rare County DX-peditions

To help in the planning of future rare county DX-peditions/Caravans, send a list of your needed and rare counties on a regular size post card to Stuart Meyer, W2GHK, (already famous for the Hammarlund DX-pedition of the Month), P. O. Box 7388, Newark, N.J. 07107.

Letters

Garth, WAØGVJ, writes: "In December *CQ*, by error you had me listed as an active member of the Southwest Missouri ARC. As I am located in Lincoln, Nebraska, with no intentions of moving, please delete me from that list. But I am happy and willing to give out QSOs for Nebraska Centennial Certificates and Lancaster county. I am active most nights at 0100 GMT on 3525 kc and some mornings on the low end of 40."

Walt, WA2HGL, writes: "I recently became mobile and have been activating New Jersey counties as time permits. I can be found on any of the county and CHC nets, but mostly on 80. As weather improves my activity will increase and during my vacation in the last week of June I will cover some of the southern New Jersey counties and possibly some of Delaware and Pennsylvania. Keep up the good work in your column, it is the first thing I read when *CQ* arrives."

Bob, W1BHV/K1CXP, writes: "How about starting a promotion to get more States to sponsor QSO Parties—especially the Western States where the QSO Party is virtually unknown except for the stations working into the Eastern State Parties. Perhaps an item each month with information about sponsoring QSO Parties would stir up more interest. I operate in both Connecticut and New Hampshire Parties each year and have a ball. Keep up the FB work on USA-CA."

Sam, K6DQB, writes: "I've been meaning to write for some time concerning possible mobile operation later this year. If work and weather permit, I plan to operate from rare Alpin county (California) during the 1966 CHC QSO Party. Please pass word along that if K6DQB is heard operating K6DQB/6 during the party, it will be from Alpine. Otherwise, from the home QTH in not-so-rare Placer county. Operation will be c.w. on 15, 20 and 40 (maybe 80) as activity dictates."

Bob, K4GRD, writes: "Thanks to finally getting settled again, I am trying to get out all of my QSLs owed to those that I worked during past county expeditions. If there are any that have not received a QSL from me from past county expeditions, please re-submit a request with a s.a.s.e. The counties are Hamilton, Columbia, Gilchrist, Sumannee, Alachua, Dixie, and Lafayette in Florida; and Seminole, Colquitt and Lowndes in Georgia."

"I plan to be active in a number of hamless counties in the Florida and Georgia QSO Parties. If you hear K4GRD/M you might want to stick close by because I'm mobile in motion going through several counties, not just one. Please give me some business, fellows; and be sure to submit a log for the contests to the respective chairmen. CU then?". Current QTH: Bob Norman, K4GRD, P. O. Box 1266, Winter Haven, Florida 33880.

Awards

ET3USA Achievement Award: With rules and photo in April *CQ*, due to world conditions, has a new CUSTODIAN: Robert S. Wruble, W7TDK, 11900 S. W. Douglas St., Portland, Oregon 97225. Mail that has been sent to Al, K1QHP/1 will be forwarded to W7TDK, after some delay.

SPARC Certificate: issued by The St. Petersburg ARC, with rules and photo in January *CQ*, has a new CUSTODIAN: Naomi Spence, W4TDK, 940 Bay St., N.E., St. Petersburg, Florida 33701. May we wish the former custodian, Cathy, W4BAV, much happiness in her new venture.

Worked All Georgia Counters Award: WAGC awards are issued for post-war contacts with Georgia counties in four classes: Class IV—40 counties; Class III—80 counties; Class II—120 counties; Class I—159 (all) counties. Send QSLs and $1.00 or 10 IRCs to cover handling by certified mail to John T. Laney, III, K4BAI, 3500 14th Avenue, Columbus, Georgia 31904.

Zone 4 Award: Now sponsored by the O. B. P. #1 Radio Club of St. Louis (Club station WØWJ). Issued for working one station in each call district of Zone 4 on the WAZ list. Required call areas are VEs 3, 4, 5, 6, & W/K5, 9, Ø, 8 (Ohio *or* Michigan *only*), 4 Kentucky, Tennessee *or* Alabama *only*), and 7 (Wyoming *or* Montana *only* for a total of ten (10) cards required

[*Continued on page 98*]

Zone 4 Award

SPACE COMMUNICATIONS

BY GEORGE JACOBS,* W3ASK

NOT very much new to report about OSCAR-4 this month. While the amateur radio communication satellite continues to orbit the earth approximately every 574 minutes, its repeater is almost continuously blocked by the beacon transmitter, and no two-way contacts through the satellite have been reported since early January. Project OSCAR Headquarters points out that the repeater *isn't* completely inoperative, but clears for only a few seconds every minute. Two-way communication through the satellite is still possible, but requires a great deal of skill and patience. OSCAR Headquarters suggests the use of burst transmission techniques (pulses or high speed c.w.) as a means of getting through the repeater for the short time that it opens. The input passband to the repeater remains at 144.095-144.105 mc, centered on 144.1 mc. The repeater's output is between 431.933-431.943 mc, centered on 431.938 mc.

Some trouble has also developed with OSCAR 4's beacon transmitter on 431.928 mc. While reception of the beacon's signal continues to be reported from many areas of the world, it also is no longer operating continuously. The beacon is now operating in bursts, on for periods of 10 or 15 seconds, and then off for a few seconds, on again, and then off again, etc. OSCAR Headquarters feels that the burst operation of both the beacon transmitter and the repeater is being caused by failure of the electronic switching circuitry aboard the satellite, and not as a result of power of component failure.

OSCAR-4 is now reaching its point of apogee while deep in the southern hemisphere. This means that its present location is most favorable for reception in Australia, South America, Africa, Southeast Asia, India, etc. The satellite is expected to remain in orbit at least through July of this year.

Project OSCAR Headquarters continues to provide orbital data for OSCAR-4 through station W6EE. OSCAR bulletins are transmitted every Thursday on s.s.b. on 3935, 7235 and 14235 kc at 0400 GMT; on c.w. on 3507.5, 7015 and 14030 kc at 0415 GMT, and on RTTY on 3625, 7040 and 14090 kc at 0445 GMT. *Remember,* these times fall on Wednesday evening in the USA. OSCAR information is also carried nightly by W1AW on its regular bulletin schedule.

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

Weather Satellites

The United States implemented the world's first operational weather satellite system with the successful launch of the ESSA-1 satellite on February 3 and the ESSA-2 satellite on February 28, 1966. The ESSA, or *E*nvironmental *S*urvey *S*atellites, were developed from the highly successful TIROS experimental weather satellite series. Ten TIROS satellites were launched successfully between 1960 and 1965. ESSA-1 and ESSA-2, working together, form the world's first operational weather satellite system, and are providing forecasters with daily pictures of cloud cover over almost the entire earth.

ESSA-1 contains an advanced vidicon television camera system which scans the sky and, *upon command,* transmits live or stored cloud cover photographs to two specific ground stations at Fairbanks, Alaska and Wallops Island, Virginia. The pictures are transmitted with a power of two watts on 235.00 mc. Two 0.005 watt tracking beacons operate continuously on 136.23 and 136.92 mc.

ESSA-1 is orbiting the earth every 100.3 minutes, at an inclination of 97.9 degrees. The satellite's apogee height is 504 miles, and its perigee 424 miles. While the weather pictures being transmitted from ESSA-1 are intended only for two specific ground stations, reception of the 235.00 mc transmitter should be possible up to 2000 miles from Fairbanks and Wallops Island. As far as amateur space communication is concerned, ESSA-2 is the more interesting of the new weather satellites. Aboard the satellite are two television camera systems which automatically send cloud cover pictures back to earth to relatively simple receiving stations located throughout the world. Called the Automatic Picture Transmission system (APT), both cameras continually take pictures of cloud cover and immediately transmit them back to earth, using a *five watt* transmitter on 137.50 mc. A continuous beacon transmitter also operates on 136.77 mc, with a power of .25 watts.

Equipment capable of receiving the APT pictures can be set up anywhere in the world. At the present time, agencies of the United States government are operating approximately 50 such stations in various parts of the world, and foreign countries have about 30. In addition, several private groups in the United States and abroad are equipped to receive the satellite pictures. Equipment capable of receiving the APT pictures is relatively simple, and radio amateur interest in this area was discussed in the SPACE COMMUNICATIONS column appearing in the March issue of *CQ*. Shortly after ESSA-2 was launched, newspapers throughout the country carried stories describing equipment built by radio amateurs for receiving cloud coverage pictures from the satellite. (See fig. 1 for the location of many of the APT receiving stations).

ESSA-2 comes within 2000-mile picture-reception range of any station on two or three orbits a day. Two or three pictures, each covering four million square miles, can be received on each

of these orbits. Because the APT system does not store photographs after the transmission period, the ground stations receive only those "local" pictures transmitted while the satellite is within receiving range.

ESSA-2 is orbiting the earth every 113.5 minutes, at an inclination of 101 degrees. It is in a near circular orbit, with its point of apogee 848 miles high, and its point of perigee at 819 miles. In its near-polar, sun-synchronous orbit, the satellite's cameras view weather all over the sunlit portion of the world at least once every day, photographing a given area at the same local time each day.

The following are some of the technical characteristics of the ESSA-2 APT television camera system.

Camera lens effective field of view 89 degrees across flats.
2 mm resolution per TV line at picture center, not worse than 5 mm at 65 degrees zenith.
800 TV lines per picture.
Square picture 1700 mm on a side, 4 or 8 pictures per orbit.
352-second interval between pictures.
30% picture overlap along track.
Pictures from successive orbits contiguous at equator.
208 seconds per frame including start and phasing signals.
4 lines per second.
Video bandwidth: 1600 c.p.s.
Video a.m. subcarrier: 2400 c.p.s.
Transmission to ground in real time.
Transmitter: Frequency Modulated, 5 watts power output.
Carrier Frequency: 137.500 mc, plus or minus 0.005%.
Deviation: Plus or minus 10 kc max.
Transmission bandwidth: 30 kc.
Minimum spacecraft antenna gain: —4 db.

The APT photographs are proving to be a valuable new tool for weather forecasters in many lands, providing timely information on existing weather conditions over a large area around their stations. The information is now being used to improve local weather forecasts, to issue warnings of severe weather, and to select the safest routes for aircraft in flight and ships at sea.

ESSA-1 and ESSA-2, which make up the world's first operational weather satellite system, are financed by the Environmental Science Services Administration of the U.S. Dept. Of Commerce. The U.S. Weather Bureau is now a part of this Administration. The system is managed and operated by the Administration's National Environmental Satellite Center. ESSA-1 takes pictures of cloud cover over the entire world and stores them for readout by command at two specific stations located in Alaska and Virginia; ESSA-2 provides continuous pictures of cloud cover to dozens of local stations throughout the world. Between them, they provide both worldwide and local cloud cover pictures, thus tangibly demonstrating the benefits mankind can reap from the peaceful uses of satellites.

Although an operation weather satellite system is now a reality, the United States plans to launch another NIMBUS advanced experimental weather satellite in the very near future. This satellite will also contain an APT system, as

Location of many of the ground receiving stations equipped to receive the Automatic Picture Transmissions from the ESSA-2 operational weather satellite. Many radio amateurs plan to build equipment capable of receiving cloud-cover weather pictures from the satellite.

well as an infra-red camera system capable of taking cloud cover pictures in darkness. The APT system on NIMBUS will be identical to the one on ESSA-2, but will operate on 136.95 mc. A continuous beacon will operate on 136.5 mc, and infra-red picture information will be transmitted on 137.2 mc. NIMBUS will also contain a microwave transmitter for transmitting picture information on 1707.5 mc. The microwave and infra-red transmission will be controlled by command.

Dial-A-Satellite

The Smithsonian Astrophysical Observatory recently began a Dial-A-Satellite service in Boston, Mass. and Washington, D.C. In both cities, the Observatory provides an automatic phone-answering service, which offers, without charge (except for the phone call), a recorded report on the day's astronomical events, including the passage times of bright satellites.

In Boston, the Dial-A-Satellite number is Area Code 617, 491-1497, and in Washington it is Area Code 202, 737-8855. The recorded announcement includes an up-to-the-day total of man-made objects orbiting the earth, as well as other data concerning specific satellites and other astronomical events.

The Dial-A-Satellite data is prepared every weekday morning at the Smithsonian Astrophysical Laboratory in Cambridge, Mass. and placed on the Boston number about 9:30 A.M. The data is also teletyped to Washington, where it is recorded and placed on the Washington number at about mid-day.

The information on the Boston and Washington numbers are updated daily. Similar information, but updated weekly, can also be obtained from the Hayden Planetarium in New York City, by dialing Area Code 212, TR-3-0404.

The number of callers dialing the Boston and Washington Dial-A-Satellite numbers is increasing rapidly. Last fall, when the Comet Ikeya-Seki was visible, over 700 calls a day were received in Boston, and over 2000 in Washington.

73, George, W3ASK

NOVICE

WALTER G. BURDINE,* W8ZCV

I want to thank you for all of the comments on the column and its influence upon the trend of amateur radio as a hobby. I suppose that by reading the column from month to month you can tell that I am really sold on amateur radio as a hobby. I think it is the best hobby in the world, but I know that every one in the world can't be amateurs. We have a need for other hobbies to keep us occupied in our spare time. I believe that a good hobby, and its use, often relieves us of many of our anxieties that have developed in our times. It will give us something else to think about besides our troubles. Don't try to take up a hobby because someone tells you it is the best hobby in the world, look for a hobby that YOU like and think you will enjoy. Remember no one can make you enjoy a hobby, that is your department and only you can tell how much you will enjoy your chosen hobby.

Our better hobbies will center around about three things, you either collect items, build items or belong to groups of other peoples trying to better the world for others who live here. I really think amateur radio does all three of these and it has the added advantage of being used at all times during the day and night, through all kinds of weather and from almost any locale. The international goodwill generated by amateur radio operators can never be evaluated, even our rules are formulated by an international body. Our hobby is encouraged in almost every country in the world, our license is becoming a reciprocal article in many countries in the world and some day may be usable in all the countries. For your own good, get a hobby and enjoy it. It will make you a better citizen and a better person, more valuable to the world and your neighbor.

Almost all hobbies have publications devoted to them and these carry news and information on all the aspects of interest within that hobby. These publications keep you abreast of the latest in your chosen hobby. You can help by writing your new ideas either to the magazine, or to one of the contributing reporters and let them put the ideas into a column. Don't forget a column is made of many ideas so that there is something of interest to all. This column is written for the Novice and Technician and therefore it has to have many, many ideas ranging from c.w. to phone, television to facsimile, low frequency to s.h.f. It is natural that one person cannot become proficient in all phases of this intriguing hobby so, we must have your ideas to make it the most interesting collection of information that you can read. Let's make this a clearing house of information for our hobby. Your ideas will be welcomed and used if you take the time to outline them and send them to me, it is your column as well as mine.

*R.F.D. 3, Waynesville, Ohio 45068.

Frequency Multiplication

The upper limit of direct frequency control by crystal is about 75 to 100 megacycles. The use of low frequency crystals for control of frequency is common, going to higher frequencies requires the services of electronic frequency multiplication. Actually, frequency control above about 10 megacycles is by either mechanical of electronic multiplication. Overtone type crystals are mechanical mode oscillators. The frequency of oscillation of overtone type crystals is rarely the exact integral multiple of the crystal fundamental, but either above or below the fundamental frequency. Many of the low priced fundamental frequency type crystals can be made to oscillate on an overtone frequency by using the proper oscillator circuit configuration. When using this type of frequency control be sure to check your frequency if you operate close to the band edge. Frequency control of frequencies higher than those generated by the integral oscillator frequency is performed by electronic frequency multiplication.

The usual frequency doubler found in amateur and commercial transmitters employs a single tube operating in Class C (very high negative grid bias). Its grid circuit is tuned to the fundamental frequency produced by the previous stage, while its plate circuit is tuned to resonate at double this frequency, or its second harmonic. The plate circuit of the multiplier can be tuned to the second, third, fourth, or fifth harmonic of the grid circuit, this stage is also called a multiplier stage. When a stage is tuned to the second harmonic it is called a doubler stage. The use of a very high negative bias introduces intentional distortion of the radio wave, making it very rich

James "Jimmy" M. Inglis, WA1BOQ, Braintree, Massachusetts has worked 46 states and 33 countries with this DX corner. Jimmy needs Utah, Idaho, Alaska and Hawaii for all states. Can you help him?

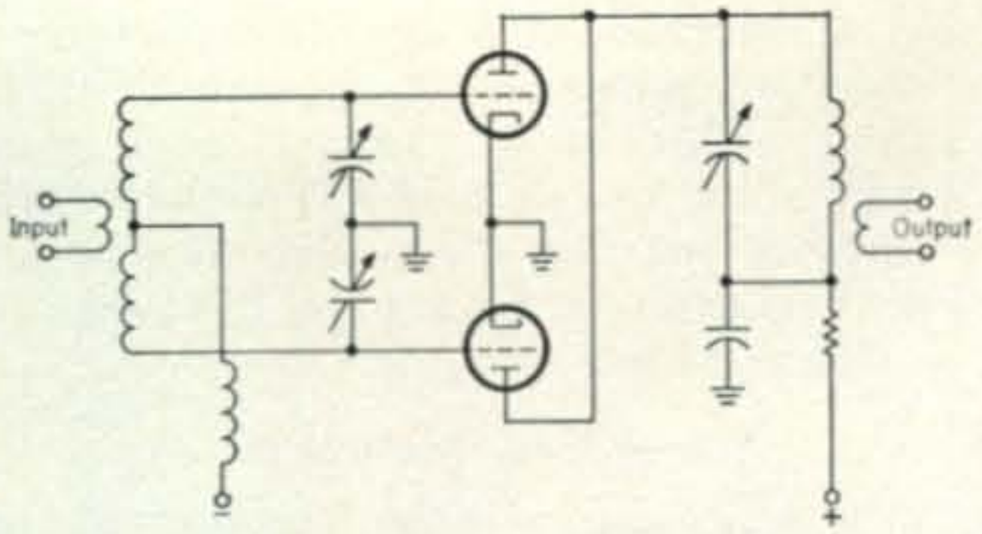


Fig. 1—A push-push doubler.

in harmonics. The plate of the frequency multiplier is tuned to the desired harmonic. This type of frequency multiplier is relatively inefficient. Some tricks of the trade can be selected to improve the efficiency of a doubler or multiplier stage. A couple of these trick circuits will be explained this month.

Push-Push Multiplication

The usual push-pull circuit cancels out the even harmonic distortion, if the tubes are matched. If the tubes are connected as shown in figure 1, the fundamental frequency and the ODD-harmonic distortion signals are cancelled out, but the EVEN-harmonic components are added. The grids of the two tubes are connected in push-pull and tuned to the fundamental frequency (the frequency of the plate circuit of the preceding stage); the plates are connected in a parallel configuration. This plate circuit is tuned to the second harmonic of the preceding stage, thus this circuit is called a push-push doubler. The efficiency of this multiplier approaches that of an amplifier. One tube of the dual triode type can be used to supply the low power requirements of frequency multiplier service in receiver circuits and low power stages of transmitter multiplier stages.

Operational theory can be explained simply. Assume that the input signal coupled to the grids is 8.00 mc; on each positive half-cycle, the grid of tube A is driven into conduction on each negative half-cycle, the same thing happens to tube B just as it does in a push-pull arrangement. But due to the parallel connection of the plates, the output tank circuit receives an excitation pulse of the same polarity each time either tube conducts. Hence, for the whole cycle of input there are two pulses of excitation fed to the output tank circuit. Since the latter is tuned to the harmonic frequency, its output will be double the input frequency by virtue of the paired-pulse excitation.

The push-push doubler circuit is unique because of its ability to operate almost as efficiently as a straight amplifier, because, unlike other frequency multipliers, it produces a pulse of plate current for each cycle of the output signal. It has the additional advantage of being operated as a straight amplifier simply by removing the filament voltage from one of the tube and tuning the plate circuit to the fundamental frequency. The grid-to-plate capacitance of the cold tube provides the necessary neutralization. Think of the possibility of using the popular 12AT7 tube to multiply your frequency and drive any of the popular pentode power amplifiers tube for a low-power transmitter. I doubt that this circuit is used as often as its merits demand. By using link-coupling between stages and proper shielding I think we could do away with our harmonic problems. That was just a side thought thrown in for your benefit, it could also cut down on many of our TVI complaints. HUHHHHHH.

Some other ideas that you might consider while planning that new rig is the employment of the new (to we amateurs) parametric varactor diodes. They have so many advantages that they will need more room than is available at this time. I would advise you to read every thing you can on these wonderful little units. They can triple frequencies into the u.h.f. frequency range with 60 to 70 percent efficiency. They need no high voltage components, can use small coils and need no operating power except the driving power supplied by your present rig. I hope that next month I can give you the results of my experiments with these marvelous little units. You won't believe it unless you do it. Here is the answer to many of our problems of getting on 432 mc and higher. We have very few tubes that will even give good efficiency at 220 mc. Again read all you can find on these little units.

Letters to the Editor

This letter was sent in late November so you can see that Frederick B. Kimble, WN3DWD, 1910 Blue Ridge Drive, Lancaster, Pennsylvania, 17603 is on the ball.

"Dear Walt: I want you to know that I enjoy your column very much and think you are doing a fine job helping us Novices. I have been licensed since June and have worked 31 states, Canada and Germany running a 50 watt Lysco transmitter, HQ-110 receiver and a Mosely V-4-6 vertical antenna. I am sorry that I do not have a picture of me at the controls. I hope to work you sometime. Keep up the good work. 73 for now."

Congratulations on the 31 states in the short time, Fred and lets have that picture, I'm sure the gang would like to see the fellow that can work 31 states in 4 months.

All I can say is that we old timers better get in there and start digging if these letters keep telling of the good operating practices of the new hams. Read on, buddy and see what I mean.

"Hi Walt: I have been reading your magazine for about two years and I thought it was about time for me to write. (*Thank you*) As you can see from the picture

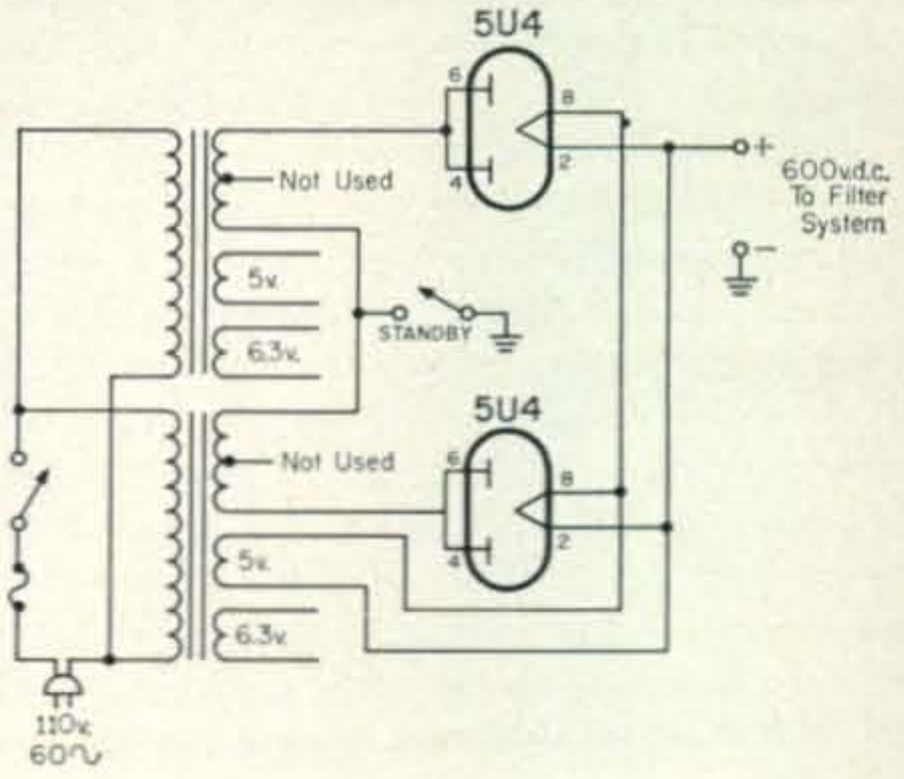


Fig. 2—A power supply constructed from juke box parts. See text for more details.

Radio runs in this family. George Tucker, 15, WN5NVI, Dallas, Texas has this DX corner. Dad, Durward W5VU, writes RTTY A-Z.

my station is pretty simple, but with this set-up I have worked 46 states and 33 countries with 19 confirmed.

"I put out about 50 watts, the receiver is a Heath GR-91. The little box on the transmitter is a screen modulator and the v.f.o. is a Health HG-10. I would like to contact Utah, Idaho, Alaska and Hawaii for my WAS.

"I think your column is real great. I may be a General but I am a real Novice at heart. Keep up the nice work and a lot more construction projects. Best wishes and 73. Jimmy."

This letter is from James M. Inglis, WA1BOQ, 24 Cotton Avenue, Braintree, Massachusetts.

I hope you will soon get those other four states Jimmy, and enough DX for DXCC. I need two cards for my DXCC. That will be a big thrill.

Some good ideas came through in an envelope postmarked Savannah, Georgia. This is a good idea to consider if you must start ham radio on a budget. The diagram of the power supply is shown in figure 2.

"Dear Walt: Sitting in a hotel reading your December column set me to thinking about my novice rig. The receiver was a BC-348 which I think is about the best receiver for the fellow with not much money to invest.

"I built several transmitters, mostly from juke box parts. There is a source of parts never mentioned in ham journals—your local juke box distribution. My friend contributed an obsolete Seeburg unit and I went on the air real quick as KN7UUB in 1962.

"A trick for the beginners—two identical transformers can be connected with the primaries wired in parallel and the secondaries connected in series for higher voltages, if the proper high voltage transformers are not available. My power supply used two 5U4s (I had em) connected as half-wave rectifiers to minimize voltage drop.

"I have included a rough sketch for you. I took the filament voltages from the other transformer to equalize the current load of the transmitter filaments. The filter capacitors were series connected 450 volt units, because they were available and the choke was a large unit from a TV set, the value of which I do not know. The plate meter was a 6-12 volt battery meter connected across a proper resistor.

"My final was parallel 6L6s which I ran to the full Novice gallon. The 6L6s are not rated this high but they will work OK at 600 volts if you DON'T hold the key down too long. I had plenty of them so I could experiment. My final tank coils were wound "cut and try" of #18 wire on the cardboard tube from a roll of toilet paper. Tank capacitors were from old ARC-5 units donated by W7DEM. By the way any Novices in or near Josephine County, Oregon who need parts should drop me a line, I've a batch of stuff there that I'll never use."

This fine letter from Bill Brown, WA8PKU, Richwood, Ohio. Whaddya mean, future W4???, Bill. Thanks, Bill, you see thats what I mean about the fund of good information that we have to help the beginner get going. Lets hear about it.

"Dear Walt: I enjoy the Novice write-up very much, I was wondering if any novices would like to go QRP. It makes good theory experience for the Novice and building it helped me quite a lot. My one tube QRP set has a 6AQ5 and the rest of the parts can be held in one hand. My first contact with it was on 80 meters with WN9PFY who is 425 miles away. RST was 569 for a complete QSO.

"How about printing a good QRP rig for some of the Novices, which I am sure some would take advantage of. The rig is very inexpensive and the 6AQ5 can be found in many auto sets and old radios.

"I have just finished working all states, winding up with Nevada, thanks to K7QWZ in Reno. I sure was glad to get all states while a novice. I had the pleasure of working W1AW.

"The rig here is an HT-40 into an inverted V antenna. The receiver is an SX-99. I passed my general test last week so I'll be WA5 MDN soon. 73, Walt es see you in *CQ*. Jim. WN5MDN, 1114 North Ash, Ponca City, Oklahoma."

Congratulations, Jim, on both the WAS and becoming General JIM. I know you are having fun. I hope to work you some time soon.

"Dear Mr. Burdine: Attached is a picture of my son, George Tucker, WN5NVI, who obtained his Novice license in September. He passed the test for his general during the Christmas school holidays and is waiting receipt of his license.

"You will note from the wall that he has been pretty active despite school work in Hillcrest High School, having 35 states confirmed on the 40 and 80 meter bands. You will note from the picture that he uses an HT-40 transmitter with a Johnson Matchbox and a rebuilt BC-348-R receiver with a Q-multiplier. Also on the table is a Health twoer.

"Incidentally, the wife says two hamshacks in the same house is just about the limit. Keep up the good work and best regards. 73. Durward. W5VU."

Help Wanted

Can you help the following amateur aspirants to get their problems solved? Needing help are John Benson, 4252 Queen Ave. North, Minneapolis, Minnesota. 55412.

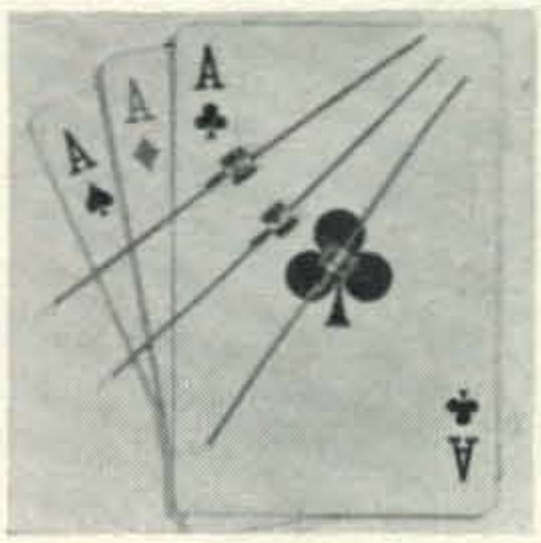
Jeffrey Markel, 14 Inwood Lane, Spring Valley, New York needs help with code and theory and if you have any old call book he would appreciate using it.

If you need help just drop a note to Walter G. Burdine, W8ZCV, R.F.D. #3, Waynesville, Ohio. Do not send it to New York, they are busy there and if they have to send it on to me in Ohio it take their valuable time.

73, Walt, W8ZCV

New Amateur Products

Sarkes Tarzian



SARKES Tarzian has announced a new smaller series of brimless rectifiers that will replace the Top Hat style. They are available in two types: the 40C (400 p.i.v. max, at 1.0 ampere) and the 60C (600 p.i.v. max, at 1.0 amp.). More information can be had by writing the Semiconductor division, Sarkes Tarzian Inc., 415 North College Ave., Bloomington, Indiana, or circle 74 on page 110.

General Electric

A 20 page catalog of compactrons is now available from G.E. It lists 97 types and their characteristics. Copies of the catalog (ETG-3983) can be had by writing General Electric Company, Schenectady, N.Y. 12305, or circle 75 on page 110.

RTTY

BYRON H. KRETZMAN,* W2JTP

SURPLUS, that is military surplus, has not been too plentyful for the amateur radioteletyper. Now, we are not talking about the machines themselves; plenty of the military version of the Model 15 Teletype machine, the TG-7B, have appeared, especially in MARS. Some receiving converters have appeared, like the AN/FGC-1, which has been described in detail in past RTTY Columns.

Nothing much has appeared, though, for transmitting f.s.k. Oh some a.f.s.k. units have shown up, like the AN/SGC-1 and the Northern Radio Type 152 equipment, but no v.f.o. sets or r.f. exciters; that is, except for the Oscillator-Exciter 0-5/FR made by the Press Wireless Manufacturing Company, no longer in business at this time. (Press Wireless, Inc., still in business, is an operating company. Transmitters and receivers were made by the manufacturing company for them and the military during World War II; the famous 40KW, 15KW, 2½KW PW-981A, and even the AN/FRR-3 diversity receivers to go with the AN/FGC-1.)

The O-5/FR

The O-5/FR Oscillator-Exciter, whose panel layout is shown in Fig. 1, is exactly that. High Power commercial transmitters, like those mentioned above, usually had crystal oscillators built in. To adapt these transmitters to send f.s.k. for single-channel radioteletype, it was unecessary to remove the crystal and feed right into the crystal socket r.f. from a separate exciter designed for f.s.k. operation. This is the purpose of the O-5/FR. It can operate from a standard neutral or polar telegraph loop via a self-contained 255A polar relay, or its shifter may be keyed directly by an external relay closing a circuit to the chassis for *space*. The entire frequency-determining section of the O-5/FR is enclosed in a shock-mounted temperature-controlled oven. The result is a frequency stability equal to or better than that of the crystal stage replaced.

Fig. 2 is the complete schematic diagram of the O-5/FR, a heterodyne exciter with an r.f. output from 2 to 6 mc. A crystal controlled h.f. oscillator, V_1, is mixed with a self-excited l.f. oscillator, V_4, in a balanced modulator or mixer stage, V_2 and V_3. It is the l.f. oscillator, operating around 200 kc, which is frequency-shifted by the reactance tube V_5. The crystal frequency is balanced out by the pot R_{33} and the mixer plate circuit L_2 and C_8 may be tuned to the crystal frequency plus 200 kc or minus 200 kc. A chart on the front panel helps the operator to tune the mixer to the correct upper SIDEBAND mixer product. The mixer output then is fed to the untuned grid circuit of the 807 amplifier V_7 which operates Class A to provide an r.f. output of about 2 watts.

A rugged, and heavy, power supply is part of the O-5/FR chassis. Separate primary windings and a switch on the chassis permit operation from either 110 or 220 volts a.c. Plate and filament switches on the front panel control the unit. The filaments should be left on continuously for long-term stability even though the oven heater, through its thermostat, is connected directly to the line input connector.

Although the O-5/FR is "crystal-controlled," the panel FREQUENCY control permits a variation of about plus and minus 1-kc at the output frequency of the exciter. To calculate the correct crystal frequency (where *mark* is the given net frequency), divide the given frequency by the multiplication factor in the associated transmitter and subtract 200 kc. For example, for operation on 7140 kc when the transmitter has one doubler stage: 7140 divided by 2 is 3570; then by subtracting 200, the crystal frequency is 3370 kc.

Tuning

Before setting up the 0.5/FR, give it an hour or so to warm up, with the oven door closed. The thermometer should read about 50 degrees Centigrade. Set the FREQUENCY control to mid-scale (50) and put the function switch (just below the pilot light) into the MARK position. The SHIFT control is out of the circuit in this posi-

*431 Woodbury Road, Huntington, N. Y. 11743.

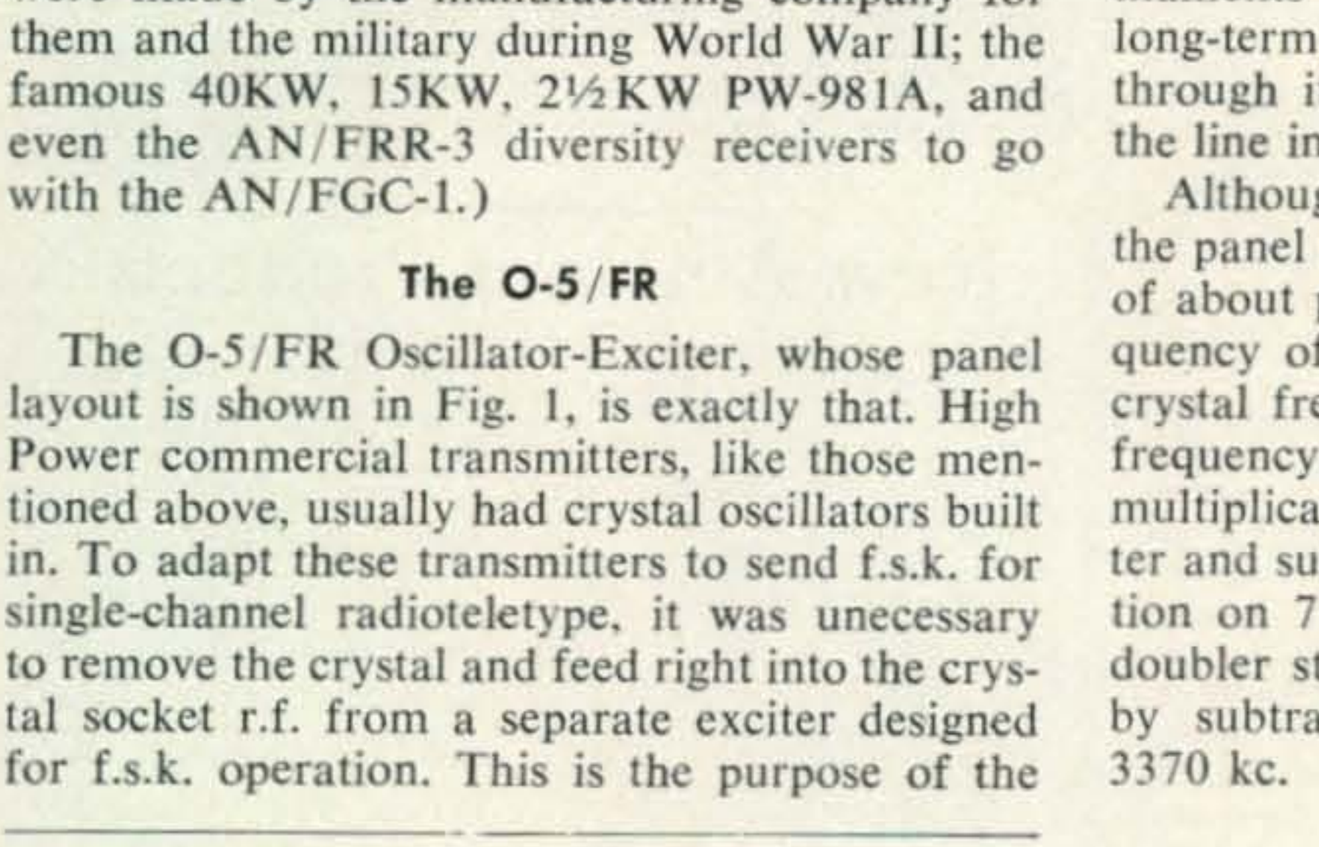


Fig. 1—Front Panel Layout of Oscillator-Exciter 0-5/FR

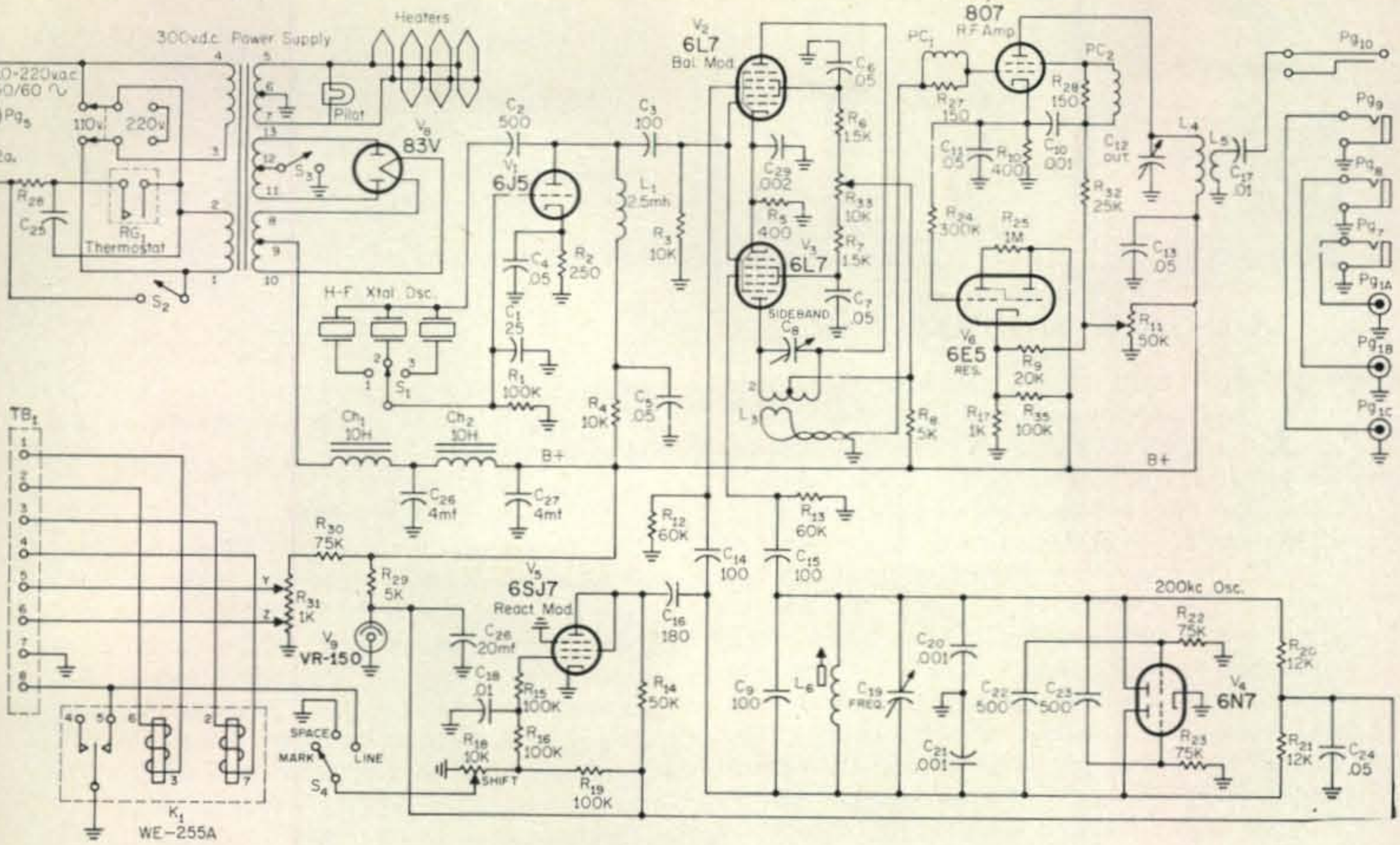


Fig. 2—Schematic Diagram of Oscillator-Exciter 0-5/FR

tion. Referring to the chart on the front panel, set the SIDEBAND and OUTPUT controls to the output frequency of the *exciter*. Turn on the PLATE switch and readjust the SIDEBAND and OUTPUT controls for exact resonance, as indicated by the tuning eye.

To check the frequency or the shift, listen on the output frequency of the transmitter, *not* the exciter. (The transmitter need not be on.) If the net *mark* frequency cannot be zero beat by a small adjustment of the FREQUENCY control, adjust either or both L_6 or C_{19} of the 200 kc oscillator. The adjustment range is about 20 kc at the output frequency of the exciter.

To check the shift, put the function switch on SPACE and adjust the SHIFT control to get the desired shift at the operating frequency. Your own TU with its tuning indicator should provide you this information when your receiver is tuned to the operating frequency. When satisfied that the shift is correct, switch to LINE. This connects the shift circuit to the 255A polar relay contacts. Like any polar relay, you can operate it from your neutral loop if you apply one-half the *mark* loop current to the bias winding. A resistor, R_{31}, with two slider contacts is connected to B + and both sliders are connected to the terminal strip provided. Fig. 3 shows the connections for the usual 60 ma neutral loop. The slider *Y* should be adjusted so that 30 ma of bias is provided, as indicated by the meter *M*.

The 0-5/FR can be frequency-shifted without using the internal polar relay by removing the relay and connecting to terminals 7 (ground) and 8. Be advised, however, that if you connect your machine keyboard directly to these terminals you will shift upside-down. In other words, closing the circuit between terminals 7 and 8 sends a *space* signal (lower frequency) rather than the proper *mark* (higher frequency).

The only modification for amateur RTTY operation, that we suggest is to switch on and off the crystal oscillator V_1 by bringing out of the oven separately the B + for that stage (it connects to R_4, which is 10K) so that this stage alone may be controlled by the station transmit/receive relay. It is also suggested that the PLATE switch, SW_3, be connected to also control the B + to V_1 so that the exciter can be turned on for spotting purposes. Of course the centertap (12) of the plate transformer should be then connected directly to ground.

73, Byron, W2JTP

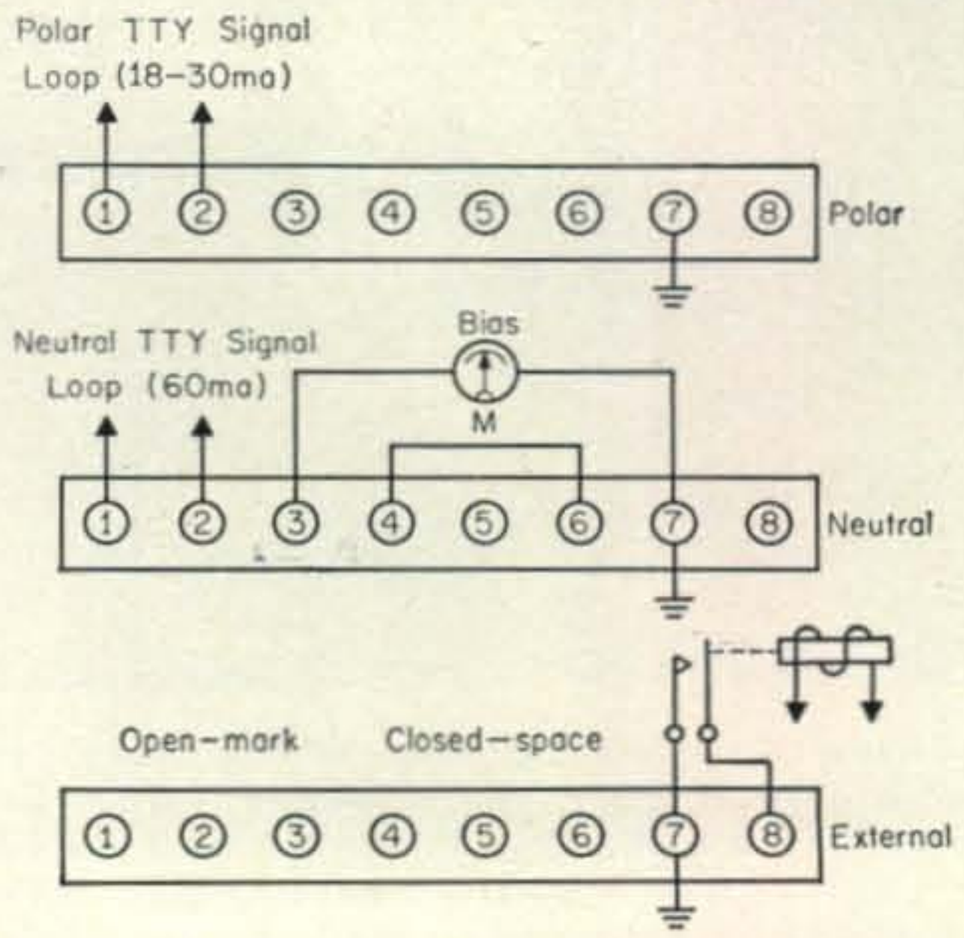


Fig. 3—Local Loop and Frequency-shift Connections

YL

LOUISA B. SANDO,* W5RZJ

A REAL ball! That is the way V. Mayree, K4ICA, founder and chairman of the Executive Council of the YL International SSB'ers, described the SSB'ers first convention. Chairman of the event was K4RHL, Ellie. Held Jan. 22-23 at Miami, Fla. in conjunction with Southeastern Div. ARRL Convention and Annual Tri-County "Hamboree," the SSB'ers drew some 100 members. They came from Ascension Is., Venezuela, Puerto Rico, Scotland, Hawaii, New Zealand, Canada, Caribbean area, and from coast to coast stateside. Though their special group was not large among the several thousand attending the overall conventions, V. Mayree adds, "I can truthfully say the SSB'ers booth was the most popular spot in the whole auditorium. People were fascinated with our perfectly gorgeous trophies; the certificates in color intrigued them, and our station, K41CA/P, was frantically making contacts with members everywhere. Members in far-away places who could not attend wanted us to know they were with us in spirit and hoped to attend next year. Telegrams arrived in dozens; flowers were wired to our booth; QTCs flooded in."

Sunday night, after the convention ended, V. Mayree and Dr. Tallman invited the SSB'ers to their home for a champagne party. Over 80 joined the fun and V. Mayree says "the old hacienda really jumped!" She concludes, "Wonderful memories will always remain of this SSB'ers first convention. Future ones may be more elegant, but this one will always be the best remembered!"

*4417 Eleventh St., N.W., Albuquerque, New Mexico 87107.

Sister Mary Cletus, WA9JIE, whom SSB'ers brought to Miami as guest of honor, and V. Mayree, K4ICA, pictured in the SSB'ers booth at the first YL International SSB'ers Convention. They are holding the enormous trophy which is presented to the world-wide winner in the SSB'ers Annual QSO Party.

Carolyn Hull, W2YCX, is an electronics engineer at Picatinny Arsenal, Dover, N. J.

YL Engineer

It is always a joy to learn of a YL who is actually working as an electronics engineer. One such YL is Carolyn Hull, W2YCX, who is employed at Picatinny Arsenal in Dover, N. J. as an electronics engineer designing special test equipment for the electronic parts of missiles. Carlie went to work at Picatinny within a month after graduating last year from Newark College of Engineering. She says there may be other YLs at Picatinny, but it's hard to tell with some 7000 employees.

In addition to her work, Carlie is teaching a code and theory class for would-be hams at Picatinny and they meet after work. Her class includes, among others, a sergeant and his teen-age son, a lieutenant who is also a chemical engineer, and a future YL. Carlie also sings alto in the chorus at Picatinny Arsenal.

There are no other hams in her family, so Carlie has her station to herself—32V1, S-76, a Windom and 3-element beam; she also has a 2-meter "Gooney Box" Gonset transceiver. W2YCX likes to experiment with test equipment and has an oscilloscope, a volt-ohm-milliammeter, vacuum-tube voltmeter, r.f. signal generator and an audio sine and square-wave generator, all of which she assembled herself from kits. She also has a homebuilt secondary frequency standard and a heterodyne frequency meter that she built as a senior project at school. Carlie is a member of the Morris Radio Club and enjoys their 10-meter net.

Other hobbies are shell collecting, reading, playing piano and accordion, nature study, collecting glass and china cats and other animals. She especially likes classical music and has a home-assembled hi-fi set. Favorite sports are swimming, ice skating and hiking.

Congrats, Carlie—YL Hamdon, especially, can well share pride in your accomplishments!

VE6ABP

As reported in April *CQ*, Margaret Tettelaar, VE3ABP, holds WPX on ssb, and WAZ on c.w.-phone, on phone only, and on 2-way ssb. Margaret received her first license in Nov. '59 (c.w. only), and later earned her ticket for phone. Her OM is VE6AAV, Karel, and their son also is interested in hamming. He is a graduate in

VE6ABP, Margaret, and VE6AAV, Karel, operating VE6GX, station of the recently formed EDmonton DX Club.

electrical engineering and an instructor in the RCAF. Margaret says her OM became interested in radio as a boy in Holland and always planned to get into the hobby. When he started on code practice, Margaret decided to study, too.

VE6ABP likes DX work best; also traffic and working the Novices on 15 meters. She also likes 10, but works 20 meters mostly. Other certificates include 100 SSB Countries, WAS, WAVE, Trans-Canada, St. Lawrence Seaways, WOC-30, Colonial America, Twin Cities, WAC, USA-CA 500 West Park Radiops of Cleveland (Novice), WACAN, RCC, Amateur Radio Society Certificate of Award A, B & C, CSA, YL Century Club, DX-YL, Borderline Friendship Award Cardinal Award, DXCC (mixed and phone) LARK (London, Ont.), and she has cards for a number of others.

Margaret and Karel are members of the Northern Alberta Radio Club, Amateur Radio League of Alberta, Int. SSB'ers, and the recently formed EDmonton DX club, for which VE6ABP is secretary and VE6AAV is treasurer/award custodian.

For other hobbies Margaret collects stamps, belongs to a curling club and an archaeological club, and also has studied prospecting. Her OM is QSL manager for the Prov. of Alberta. Their station consists of an HT-37 as an exciter to 4-811A's in homebrew linear, and the receiver is an SX-101A. They have a Telrex 20 M–326B, 65 feet up, and beams for 10 and 15.

15th Midwest YL Convention

W9LDK, Adeline, P/C of LARK, reminds us the time is drawing very close for the 15th Midwest YL Convention! The LARKs of Chicago, with convention chairman W9SJR, Bernice, at the helm, are planning many exciting activities from registration beginning at noon May 13 through brunch on May 15–all at the Flying Carpet Motor Inn near O'Hare Airport.

Highlights include *free* Welcome Supper on Fri. evening, followed by Bingo, Splash Party, Pajama Party and Kaffee Klatch. Saturday: Luncheon and prize drawing–at least one for each registered YL–and in the evening the banquet, with OMs welcome. Late morning brunch on Sunday. Between convention activities there are plenty of other things to do: play miniature golf, shuffleboard, swim, or shop in Old Orchard.

Send your reservations to Diane Price, K9TRP, 6123 N. Rockwell St., Chicago, Ill. 60645. After Apr. 1 registration is $2.50; luncheon $3.50 and banquet $6.50. Make motel reservations direct to Flying Carpet Motor Inn, 6465 N. Manheim Rd., Rosemont, Ill. 60018. Be sure to mention LARK as a complete wing is being set aside for conventioneers.

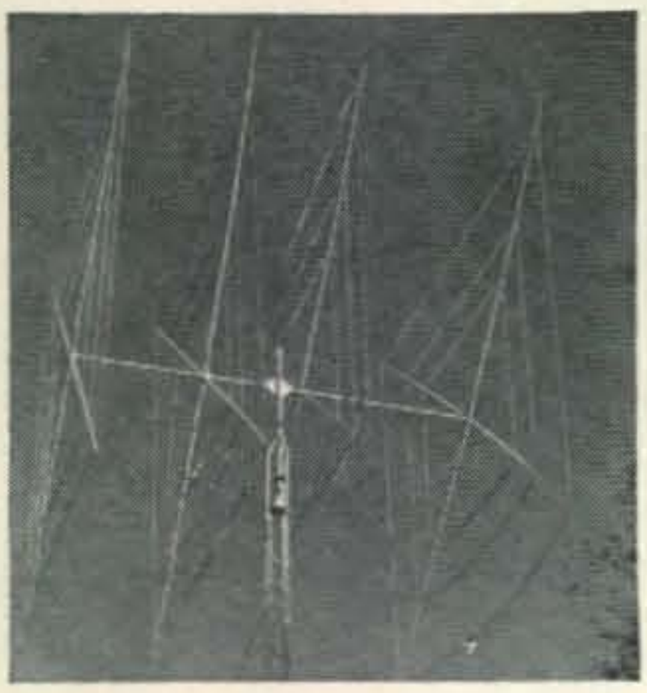
Buckeye Belles

Taking office in March for the Buckeye Belles: Pres., WA8GPO, Shirley; V.P., K8CEN, Louise; secy, WA8FSX, Ruth; treasurer, K8UKM, "Zip". This very active YL club is already working on "swaps" to take to the next YLRL Convention to be held in Denver in 1968.

33, Louisa, W5RZJ

WA6OET, Jessie, operating K4ICA/P during the first YL International SSB'ers Convention in Miami, Jan. 22-23, 1966.

New Amateur Product



Skylane Products

SKYLANE Products has introduced a new member to their line of Quads. The new quad is a four element array that boasts many advantages over the lesser element quads such as a greater gain, better F/B ratio and a much sharper horizontal field pattern. Input impedance is approximately the same as the three element quad, while the s.w.r. remains less than 2 to 1 at any place in any band for which the quad is designed, and approximately 1.1 at resonance.

Write for new catalog with complete information to Skylane Products, Dept. B, 406 Bon Air Drive, Temple Terrace, Florida, or circle 76 on page 110.

SURPLUS sidelights

BY GORDON ELIOT WHITE*

THE unit I want to discuss this month is an example of commercial, rather than defense surplus. The Collins 51M-2 receiver is rack-mounted v.h.f. equipment. It was widely used by the air lines, by ARINC, an aeronautical radio network, by the Federal Aviation Agency, and by charter air lines, and others, for air-to-ground communications in the 118-136 mc band.

The 51M-2 is now being replaced in aeronautical work, as channel separation has been narrowed, and they are appearing in surplus in reasonable quantities. There are not going to be a million around, but there will be several thousand in the surplus stores eventually. I have seen them three places during the last year, with prices that have come down to earth at last.

While the 51M-2 is designed for frequencies up to 136 megacycles, it should convert rather easily to the two-meter band. As it stands it is a very nice receiver for Civil Air Patrol work, or for anyone who wants to monitor an air traffic frequency. Additional crystals could be wired in with a switching arrangement to include more channels in a three or four megacycle segment of its band. Some have been converted to a 455 kc final i.f., for better selectivity.

The receiver mounts in a standard 19 inch rack, stands just under seven inches high, and twelve inches deep, weighing 25 pounds.

The crystal-controlled frequency stability is guaranteed better than .005% in the temperature range —30 to +50 degrees C.

Selectivity is better than one microvolt for a six db signal plus noise to noise ratio. This is a realistic figure. We checked one of these receivers last year at 119.1 mc and it was meeting the 1 microvolt test without even touching up the tuning!

Selectivity is 40 kc at 6 db down and 140 kc wide at 60 db.

Audio power is rated at 50 milliwatts for a one microvolt input with 30 percent modulation at 400 cycles. Maximum audio is one watt into a nominal 500 ohm load.

R.f. input should be 52 ohms, unbalanced. A u.h.f. type connector is provided for an RG-8/U coax antenna lead.

Automatic Volume Control is provided, as is a squelch, adjustable from a threshold of 1 to 200 microvolts.

Spurious response is rated at no worse than 90 db down in the 118-136 mc band, and no worse than 60 db at all other frequencies.

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

The 51M-2 is a 22-tube, double conversion superhet, operating on 117 volts, 60 cycle a.c. It uses a unique master-oscillator to eliminate images from unwanted crystal multiplier frequencies, in a drift-cancelling circuit. The accompanying block diagram shows the incoming r.f. amplified and passed to a mixer. Using for example an r.f. signal of 119.1 mc, the master oscillator would have to be 102.7 mc, giving a first i.f. of 16.4 mc.

A secondary output of the master oscillator is fed to an auxiliary mixer along with the output of the crystal multiplier circuit (122.3 mc) giving a resultant of 19.6 mc. This frequency is fed to the second r.f. mixer, leaving a final i.f. of 3.2 mc.

This seems a little complicated. I hope the diagram makes it clear. The advantages of all this are, first, that the crystal multiplier chain is isolated from the r.f. stages by two double-tuned stages at 19.6 mc, eliminating or vastly reducing birdies and images from leak-through of unwanted crystal multiples. Second, drift is cancelled by applying the master oscillator to two different mixers, in opposite sense, so that drift or general instability is of no effect on the i.f.

Incidentally, the chassis is stamped "6AQ6" by sockets for V_{108}, V_{111}, V_{112}, V_{115}, V_{117} and V_{118}. Collins recommends substituting 6AT6 tubes because of unsatisfactory results with the 6AQ6's.

For those who want to switch the alignment of the 51M-2, here is the necessary data:

$$\text{crystal frequency} = \frac{\text{r.f.} + 3.2\text{ mc}}{9}$$

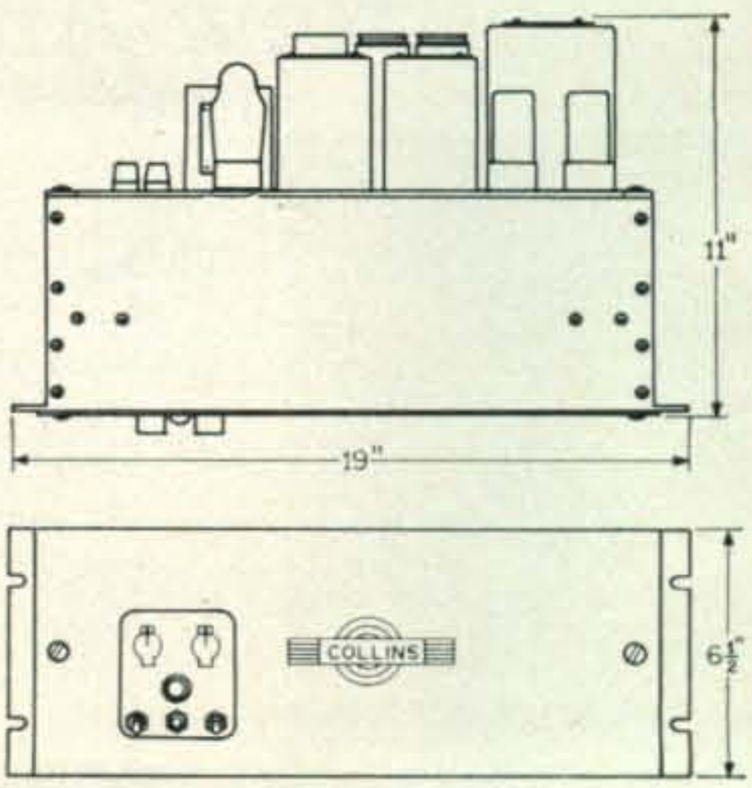
Master oscillator frequency = r.f. — 16.4 mc

In aligning the r.f. transformers (L_{101}, L_{102}, L_{103}) and the crystal multipler circuits (L_{106}, L_{107}) the brass slugs should be turned *in* to raise the frequency.

In the first crystal oscillator circuit an iron slug is used that must be turned *out* to raise the frequency.

The Master oscillator adjustment is L_{104}.

The 51M-2 is available from Ritco Electronics, Box 156, Annandale, Virginia. Ritco also has the manual for the set.



The 51M-2 receiver outline and mounting dimensions.

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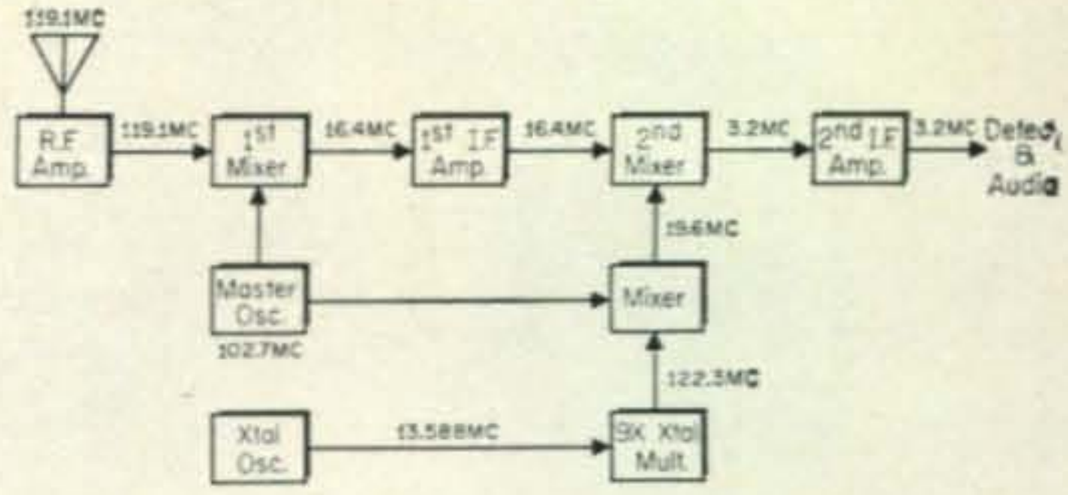

Block diagram of the Collins 51M-2 receiver.

AN/TRC-7

Another surplus item I want to mention is the AN/TRC-7 a little vhf set that might make a nice two meter portable rig.

This was an Air Force unit, for air-ground control. It is powered by batteries (BA-70) or by a hand generator (G-3/TRC-7) and draws 1.1 amps. It covers 100-156 mc, in 561 channels, of which two are pre-set at a time. Transmitter power is rated at ½ to 1½ watts.

The set alone is about the size of an AN/ARC-5 transmitter. The Tech manuals are TM-11-617 or TO-16-30TRC7-2.

More on Manuals

I have been battering at a good many doors here in Washington in an attempt to get the federal government to release technical manuals on surplus gear. So far I cannot report much progress. If you feel strongly about this problem, it might be worthwhile to write your Congressman and Senator and explain the problem to them. They could do something about it. It is simply a problem of getting the bureaucracy to move a little to help us with these non-classified books.

I can report that you can find some useful material listed in the monthly *Catalog of United States Government Publications.* These catalogs can be found in any major library of which there are more than 800 throughout the United States that are depositories for federal publications. Few people outside the library field realize this, but you can sometimes find technical manuals in these lists. Most common surplus equipment would be in the catalogs for the 1940-50 period. For example the book on the BC-312 was listed in 1942. At that time it could be bought for 25¢ from the Government Printing Office.

Of course the older books are out of print now, but the Photoduplication Office of the Library of Congress in Washington will sell either microfilm or full-size photocopies of listed books. You have to ask the Library for the price, which varies from book to book. Give them the full Catalog entry to be certain they copy the right manual for you.

The Air Force does sell technical orders and manuals. In addition to the Robins AFB address we listed in April, you can write to the Oklahoma Air Material Area, Code OCNSTT Tinker AFB, Oklahoma, for Air Force publications. The Army and Navy are still not at all helpful in this regard.

More on the AN/ARC-58

I have heard from a reader at Collins Radio in Cedar Rapids that there was an error in my AN/ARC-58 information (February 1966 *CQ*). The entire transmitter-receiver combination depends upon 400 cycle a.c. power as its main supply, not 28 volts d.c. as I claimed. The 28 volts d.c. is used for crystal ovens and some other circuits, but on transmit mode the AN/ARC-58 draws 2,000 watts of 400 cycle power.

The transmitter also requires an antenna with an s.w.r. of not worse than 1.3:1. This of course can be provided with proper loading coils, feed lines and antenna, but according to late information the set will not function properly with a bad antenna match.

In reference to the AN/ARR-2 article in the March issue, I mentioned the conversion published in the August, 1959 *CQ*. Let me add now that there was a second mention of this conversion in *CQ* for August 1960, containing improvements in the oscillator circuit which was wired in place of the fourth t.r.f. stage.

The test oscillator for the AN/ARR-1 set is very similar to the TS-24/ARR-2, except for the low-frequency detector channels, which were not in the ARR-1 set. I have heard from W8KTL that these are fine little oscillators, containing a gold-plated cavity with a silver-plated screw type tuning capacitor at one end. This is a very high-Q unit, tuning 140-280 mc in approximately ten turns. It is available for $4 from Engineering Associates, 434 Patterson Road, Dayton, 19, Ohio. E-A also has 955 tubes for the AN/ARR equipment at three for a dollar. ■

USA-CA [*from page 84*]

to be in your possession. Apply with a list of the cards which has been certified to be true by another amateur. Cost: 50¢ (3IRCs for DX only or 5 IRCs for air mail). Award can be indorsed *once* for single band and mode. Address application to Art Jablonsky, WØMCX, 1022 N. Rockhill Road, St. Louis, Missouri 63119.

Worked Kansas Awards: The Kansas Radio Club issues the following six awards for contacts with stations in the state of Kansas:

1. Worked Kansas CHF Award: (50 MC or higher)
   DX stations need 2 contacts, Kansas 20, other USA 6.
2. Worked Kansas YL Award:
   DX stations need 2 contacts, Kansas 10, other USA 7.
3. Worked Kansas Mobile Award:
   DX stations need 2 contacts, Kansas 15, other USA 7.
4. Worked Kansas Novice Award:
   DX stations need 2 contacts, Kansas 15, other USA 10. Kansas Novices need only 10.
5. Worked Kansas SSB Award:
   DX stations need 4 contacts, Kansas 20, other USA 10.
6. Worked Kansas General Award (Any mode):
   DX stations need 12 contacts, Kansas 30, other USA 30.

The beginning date for these awards is January 1, 1947. KH6 and KL7 shall be considered DX for these awards. Fee: 50¢ or 6 IRC per certificate. All certificates will be endorsed for "mode" or "band" at no extra cost. Send QSLs or list certified by a radio club officer or a radio amateur to Kansas Radio Club, 1629 Pleasantview, Wichita 3, Kansas, USA. These awards are issued to s.w.ls and same basic rules apply.

9M4LP Special Contest Award: These certificates are issued in appreciation for unusual help received in contests, to stations who have or have had contacts with VS1LP, 9M4LP or 9V1LP (new call) in a *single* major contest according to the following rules. Any of the options qualify for the certificate, but all contacts must be in the same contest (the two weekends of the ARRL phone or c.w. contests count as a single contest). More than one certificate can be earned by qualifying in more than one contest. Any of the following alternatives qualify: 1. 160 meters; 2. 80 and 40 meters; 3. 80 meters and two other bands; 4. 40, 20, 15 and 10 meters; 5. Any three bands, *provided* that at least one of the three contacts represent a multiplier not obtained from any other station during the contest. Apply to Robert M. Snyder, 9V1LP, Mount Elizabeth Flats, 53P Nutmeg Road, Singapore 9, Singapore.

Worked Florida Cities Award: Work any 10 of Florida's largest cities, which are: Miami, Jacksonville, Tampa, St. Petersburg, Orlando, Ft. Lauderdale, Hialeah, Miami Beach, Pensacola, West Palm Beach, Tallahassee, Lakeland, Hollywood, Coral Gables, Clearwater, Sarasota, Daytona Beach, Key West, Panama City and Gaines-

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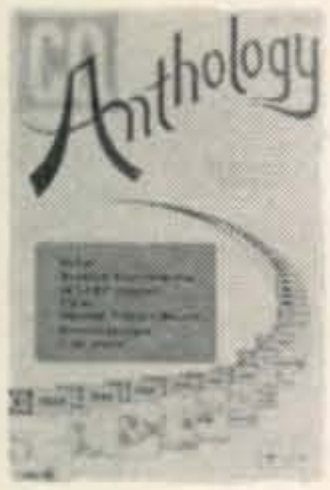

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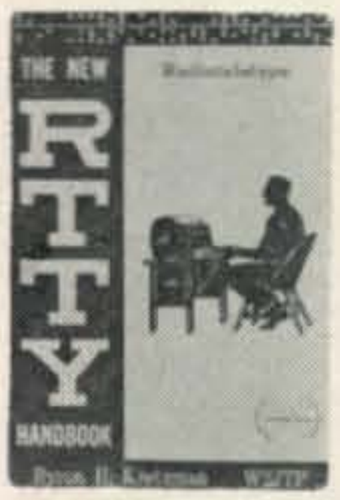

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Written by Don Stoner, W6TNS, who was almost one full year in the preparation of this terrific volume. This is **not a technical** book. It explains sideband, showing you how to get along with it . . . how to keep your rig working right . . . how to know when it isn't . . . and lots of how to build-it stuff gadgets, receiving adaptors, exciters, amplifiers.

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This is a book literally loaded with schematics for all the currently popular pieces of surplus gear. Most amateurs are well aware of the problems encountered in purchasing seemingly inexpensive surplus units, only to find that no schematic diagram is available. Trying to figure out the circuitry cold turkey can be many-times more difficult than the most involved puzzle, and purchasing a single instruction book can run as high as $3.50.

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J. A. R. S. Twenty-Fifth Anniversary Award: In conjunction with its 25th Anniversary celebrated during 1965, The Joliet Amateur Radio Society (W90FR), is issuing a ceritficate to anyone who worked W90FR during 1965. Anyone who worked *W90FR* during 1965, especially on Field Day or on one of our "on the air" sessions for the 25th Anniversary Station during September, October and November. We are very anxious to collect QSL cards, so please send your QSL and a s.a.s.e. for this award to, Joliet Amateur Radio Society, c/o Jim Rainford, WA9KPW, 813 Fisk Ave., Joliet, Illinois.

Sure glad that JA7CEK finally got his Marianas Amateur Radio Club Award. It seems that his first application was lost but it took about 7 months for the award to be issued from the application that MARC acknowledged receiving, and this after much pressure from several California stations.

An apology to W7DZB as by error his called was listed as W7JZB in the December full list of USA-CA Award holders.

Don't know who sent it but I enjoyed the card for my recent birthday which was addressed: To the "HAM" of Station H-O-P-P-E-R who sparks from 103 watts on Whitman St., Rochelle Park. Note on it read: Happy Sparking to a swell Ham & Cheese on Rye. From an Old Crystal Set. Also a drawing of a tower and crystal set on the card, and a photo of a dog with big ears, and my nickname used to be "big ears," not because I'm another Clark Gable, but I was pretty good at digging out the weak/rare signals. Or does the sender (?) think I'm a dog? Hi. . . . Anyway, Thanks. Hope you got some of those needed QSLs and counties, write and let me know, how was your month? 73, Ed., W2GT

Ham Clinic [*from page 80*]

Frequency Drift Measurement—"What do you suggest is the best way to measure frequency drift? I have a receiver that I would like to stabilize once and for all. Any hints?"

Try to borrow a frequency counter such as is made by Hewlett Packard. Be sure not to confine your drift measurements to one band or only one or two frequencies within a band—you'll find that the drift will vary according to frequency. If you can't locate a counter, then you will need a good stable heterodyne frequency meter. With both the receiver and meter warmed up good (48 hours or more), put the meter and set on the same frequency. Then let both alone for a couple of hours. Now come back and re-zero the meter to the receiver frequency. If your dial can be read closely, you plot the *difference* frequency on a chart. Do this for many frequencies. At the end, you'll have a good idea of the amount and duration of drift. The counter is easier though.

Thirty

Readers are requested to make their letters short and to the point. Always include two IRC's or 25¢ for airmail postage from our present overseas address, 4 Lutzelmatt St. Luzern, Switzerland. If you are in no hurry, then send your letters to me at *CQ*. We shall do the best we can to answer your questions; but please remember we cannot answer them all—for if we could we would not have to work for a living. Your kind letters and cards commenting on HAM CLINIC are always appreciated, believe me. To those of you who have asked many times if a HAM CLINIC Anthology is coming—the answer is *yes* . . . we hope you'll buy a copy.

73, Chuck, W6QLV

The RPHTSSR [*from page 30*]

a five watt transceiver, Jeep mobile, in the old home town. What a test! This would be the supreme effort. With the additional gain setting barely cracked he was extremely difficult copy on kilowatt alley. We called and listened without result. We called again and advanced the gain. No result. A third call and up went the additional gain control even more. Contact! ! Conditions were bad—he was fading. Up went the additional gain control even more. Just about Q5 copy now, maybe a little bit less. This had to be it. We cracked her wide open and just barely ducked aside in time to avoid a hurtling jeep that came screaming right through the loud speaker cone and into the room. Breathless and shaken we snapped off the switch and hastily penned a note to ourselves. THIS RIG MUST NOT BE OPERATED UNTIL THE I.P.S. IS INSTALLED.* ■

**Editor's note:* The Idiot Proof Switch was installed and man's progress out of the depths resumed. We are currently negotiating publishing rights for those other amazing developments.

Heathkit SB-110 [*from page 61*]

for calibrating), has 1 kc divisions spaced a little over ⅛" apart, permitting visual interpolation to about 200 c.p.s. The electrical accuracy obtained from the dial reading is rated at within 400 c.p.s. after calibration at the nearest 100 kc point. This averaged within 250 c.p.s. even with only one calibration indexing near the center of the v.f.o. range. One revolution of the tuning knob covers about 25 kc, making tuning easy. Dial backlash was well within the rated 50 c.p.s.

Transmitter Performance

With a power-line input of 120 v.a.c., the transmitter power output was 95 watts on c.w. (steady state—rated at 90 watts), 105 watts p.e.p. on s.s.b. and a.m., with a 52 watt carrier (ratings are 100 and 50 watts respectively). Sideband suppression was same as on receive, carrier suppression was at least 55 db down.

The SB-110 has been in regular use on the

For further information, check number 37, on page 110

air by one of our local 6-meter enthusiasts who is also a contest competitor. On-the-air reports indicate excellent s.s.b. quality, while the sensitivity, stability, calibration and the noise limiter are particularly superior features. V.o.x. operation was found to be good, except with the lower-level microphones where the v.o.x. gain was marginal. C.w. keying is every bit as good as that common on the lower-frequency bands as long as good line voltage regulation is available, otherwise a frequency "lilt" will be noted. The sidetone monitoring is a handy feature, although there is some tone leakage that appears as a low-level backwave.

Since there are no provisions for normal a.m. detection with the b.f.o. turned off, such signals have to be read by tuning the receiver to exact zero beat with the a.m. carrier. Although good demodulation can be obtained, occasional retuning may be required, should the a.m. signal drift or if one or more a.m. stations in a round-table QSO are not all on the exact same frequency.

The SB-110 measures 6⅝" × 14⅞" × 13⅜" (H. × W. × D.) and weighs 17 lbs. The kit is priced at $320.00. Operating voltages for the unit are obtained separately from either the HP-23 120 v.a.c. power supply for fixed-station use or from the HP-13 transistorized 12 v.d.c. unit for mobile service. The HP-23 measures 6¾" H. × 4¾" W. × 9" L., weighs 19 lbs. and it is priced at $39.95 (kit). The HP-13 measures 7¾" W. × 7 5/16" L. × 2⅜" D., weighs 7 lbs and is priced at $59.95 (kit). A separate loudspeaker also is required. The producer is The Heath Company, Benton Harbor, Mich. —*W2AEF*

Audio [*from page 48*]

characteristic. Note that if an input signal of 0 db (1 mv) is put into the device, there is an amplification of about 12 db. The same holds for all levels up to about 14 db (5 mv input), but above this level the gain starts to decrease. For instance with an input level of 28 db (25 mv) the amplification has dropped to 8 db. From this point on the amplification decreases–(finally becoming negative if we carry the curve farther to the right), so that the output level can never exceed about 70 mv, no matter how much is put into the input. You can see that the objective of amplifying low levels and holding down high levels mentioned earlier is achieved. We don't get something for nothing, however. Some distortion is introduced in the process. For instance, a voice component at 500 cycles, when clipped, produces harmonics at 1000 and 1500 cycles, which are still within the passband. This type of distortion is held to a minimum by the filtering in the output. When you're way down in the mud and trying to get a message across, the listener doesn't mind the distortion, and if at the other extreme, you have a good signal in his receiver, you don't need clipping, so the device should be turned off. You can't make a good circuit much better, but when the going is rough, a little audio shaping and the use of a noise-cancelling mike will make the difference between a QSO and none at all. ■

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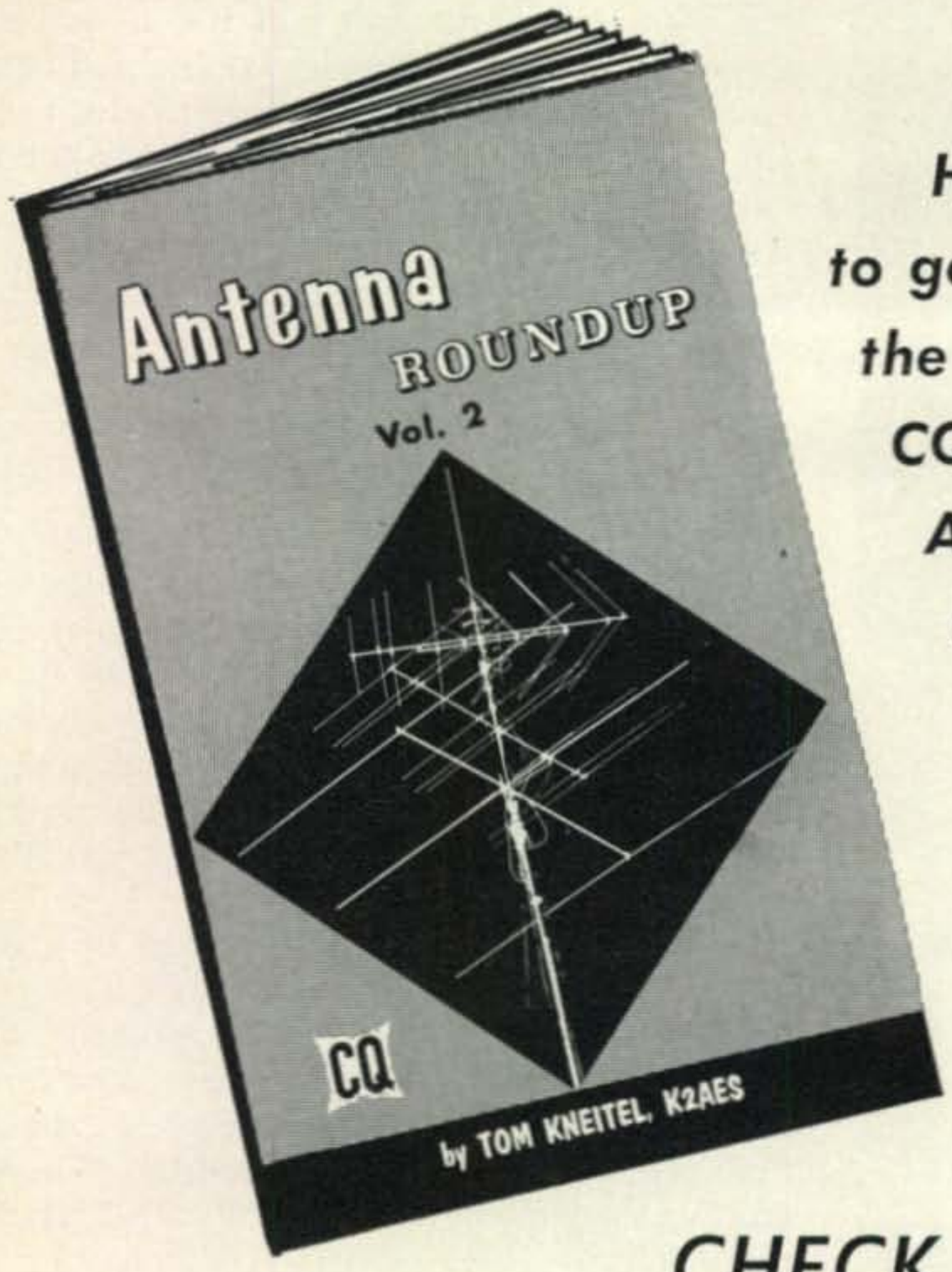

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FET Preamp [*from page 45*]

amp will add about 12 db of gain to your receiving system. Thus though the f.e.t. front end may not overload, this does not mean that your h.f. receiver's front end will not overload. To avoid this problem insert a variable pad between your converter and h.f. receiver.[5] Adjust the attenuation of the pad to a point where the noise output of the converter just rides over the noise level of your receiver. ■

[5]Glanzer, K., "T-Pads For R.F. Circuits," *CQ*, July, 1964, p. 31.

Test Equipment [*from page 28*]

Sometimes a continuity reading at the plate of r.f. amplifier tube may not indicate the source of trouble when there is intermittent or no r.f. output from the amplifier. This may be due to a poor r.f. contact in the tank circuit which will not show up under ordinary continuity checks. In a suspicious situation of this sort, tightening up or resoldering r.f. connections may clear up the trouble.

If a solid-state diode is involved in a circuit under test, two different resistance readings may be indicated, depending on the polarity of the meter leads which will introduce a low forward resistance or a high back resistance at the diode that can affect the overall reading. Where the reading is suspicious, reverse the test leads and recheck.

Testing Diodes

The ohmmeter function also may be used to check the forward and back resistance of most diodes. The forward resistance is indicated by a low-ohms reading (under a few hundred ohms), while the back resistance is indicated by a high-ohms reading (50,000 ohms or more). Diodes thus can be paired according to how closely their resistance tally with one another. A back resistance of less than 50,000 ohms is usually indicative of a poor diode, while a damaged diode may show an open or a short in both directions.

Do not use a v.t.v.m. for checking *germanium* diodes, (such as the 1N34), as the use of the low-ohms ranges may cause excessive current-flow through the diode and burn it out.

Testing Capacitors

Another useful application of the ohmmeter in service work is checking capacitors for shorts or leakage. First discharge the capacitor. Then, using the highest ohms range, check the resistance across the capacitor. A short will be indicated by a zero-ohms reading (on the lower ohms ranges), while "high leakage" will be indicated by an abnormally low resistance reading. (this may be compared with that of a unit known to be normal.)

Good paper capacitors will indicate a resistance above about 50 megohms per microfarad, mica units should read above 100 megohms. Good high-voltage electrolytics should

read about 500,000 ohms and low-voltage ones about 100,000 ohms.

When the test leads are first connected across a large paper or mica capacitor, the meter will momentarily kick toward zero ohms and then rest at the resistance reading of the capacitor. If the meter does not kick initially, chances are that the capacitor is open.

When testing an electrolytic unit, connect the positive lead of the ohmmeter to the positive end of the capacitor. Where the ohmmeter polarity is not known, connect the leads in a manner that indicates the highest resistance. When the leads are first connected, the resistance reading will be low and then it will gradually rise over a short period of time after which it will settle down to the correct value.

Storing the Instrument

When the meter is not in use, set its function and range selector to the highest voltage range. If it is left at a low range, for resistance or for current readings, the meter may be damaged if you forget to reset the range switch before making measurements. On the other hand, if you're transporting a v.o.m., setting it to the highest current range will provide damping across the meter movement that will minimize the possibility of damage due to excessive vibration. Some instruments have an OFF position which damps the meter with a short.

In the case of a v.t.v.m. do not leave the selector at a low-ohms position or unnecessary standby current drain will be made on the internal battery.

Conclusion

There are so many more applications for the v.o.m. and v.t.v.m., that to cover them all would require an entire book, but we have attempted in the past five months to cover as much commonly-needed material as possible. Further use will be made of these same instruments in later installments devoted to other pieces of test equipment such as the r.f. probe. Look for these new installments in the coming months.

Announcing [*from page 14*]

Mobile, Alabama

The Annual Hamfest sponsored by the Mobile Amateur Radio Club will be held on May 28 and 29 at Mobile, Ala. Prizes, entertainment, swap table, and fun for all. Write: Oliver Emery, W4VPW, P.O. Box 7232, Mobile, Ala.

Topeka, Kansas

The Kaw Valley Radio Club will hold its annual Hamarama at Garfield Park, Topeka, Kansas on Sunday, May 15. 9 to 5. Registration: $1.50. Free drinks, bring covered dish. For more information contact William R. Powell, KØYHI, 1654 Withdean Rd., Topeka, Kansas.

Rochester, New York

Saturday, May 14 is the date of the Western N.Y. Hamfest at Vince's 50 Acres, Rte. 15, 4 miles South of Thruway Exit 46. Continuous programming with outstanding speakers, State code Championships, noon luncheon and evening banquet. Registration $2.50, Banquet and reg. $5.25, $5.75 at door. For more details, write Rochester Amateur Radio Assoc., P.O. Box 1388, Rochester, N.Y. 14603.

Ham Shop

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SPRING AUCTION of the Rockaway Amateur Radio Club will be held Friday evening, May 13th, at 8:00 P.M., at the American Irish Hall, Beach Channel Drive (at Beach 81st St.), Rockaway Beach. Come to the best auction in the New York area. For detailed directions write to P. O. Box 205, Rockaway Park, N.Y. 11694.

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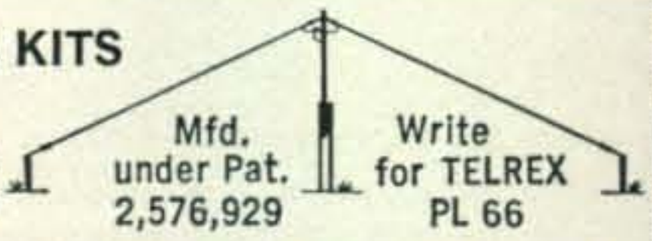

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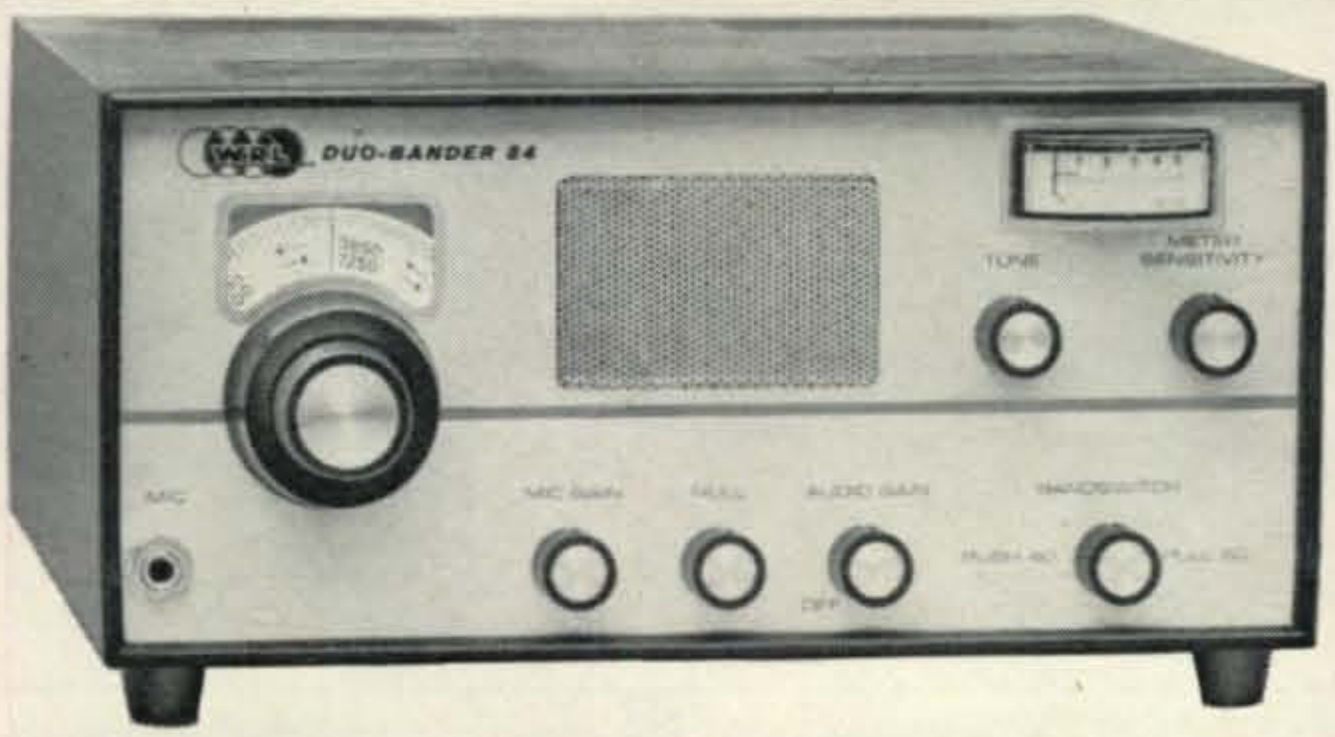

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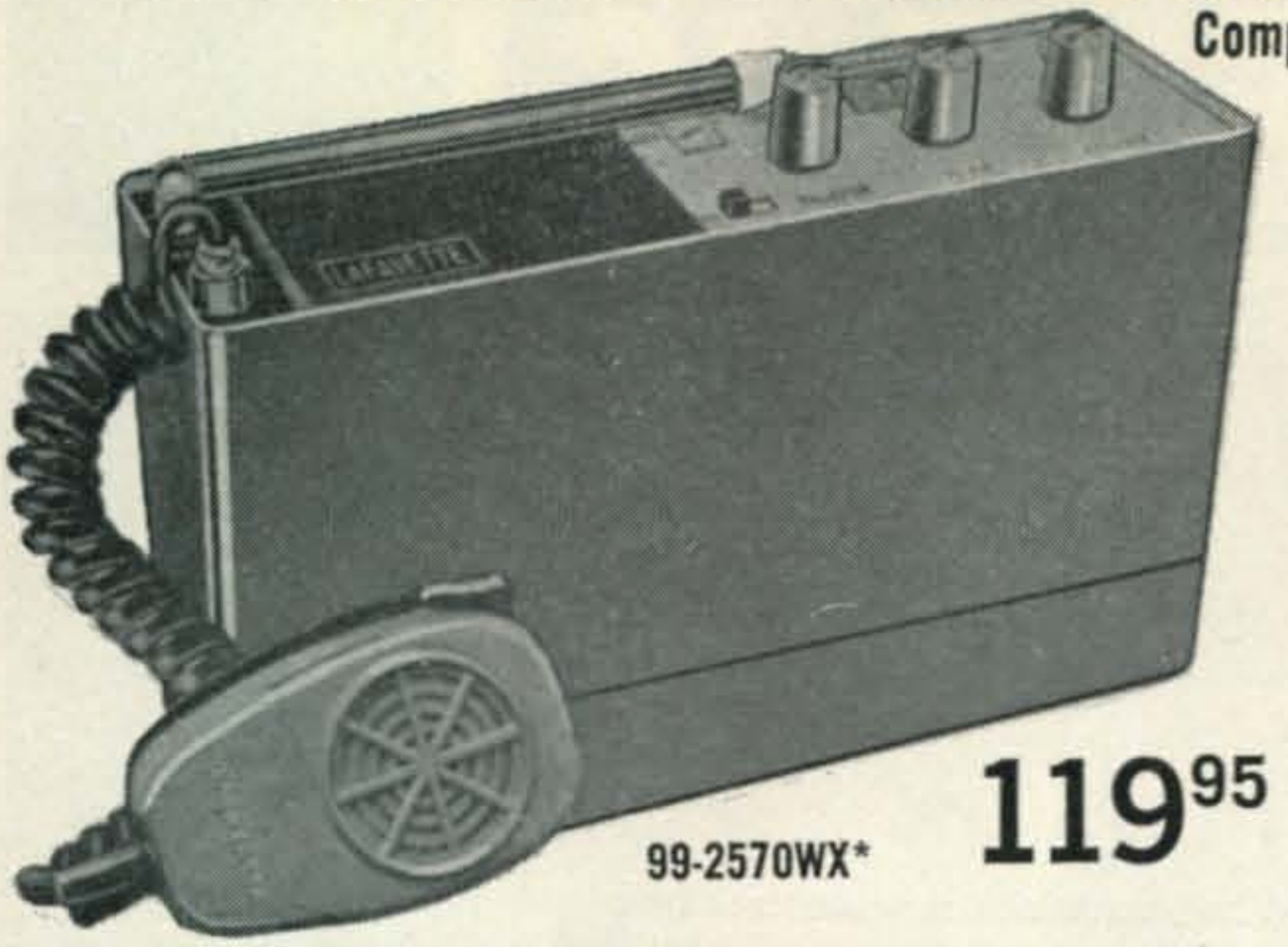

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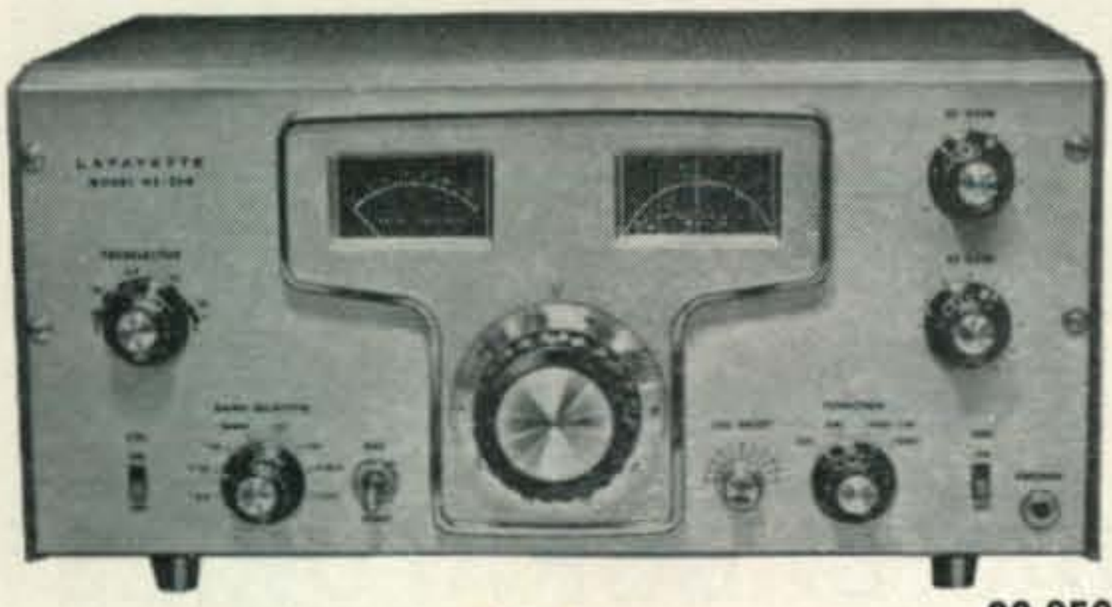

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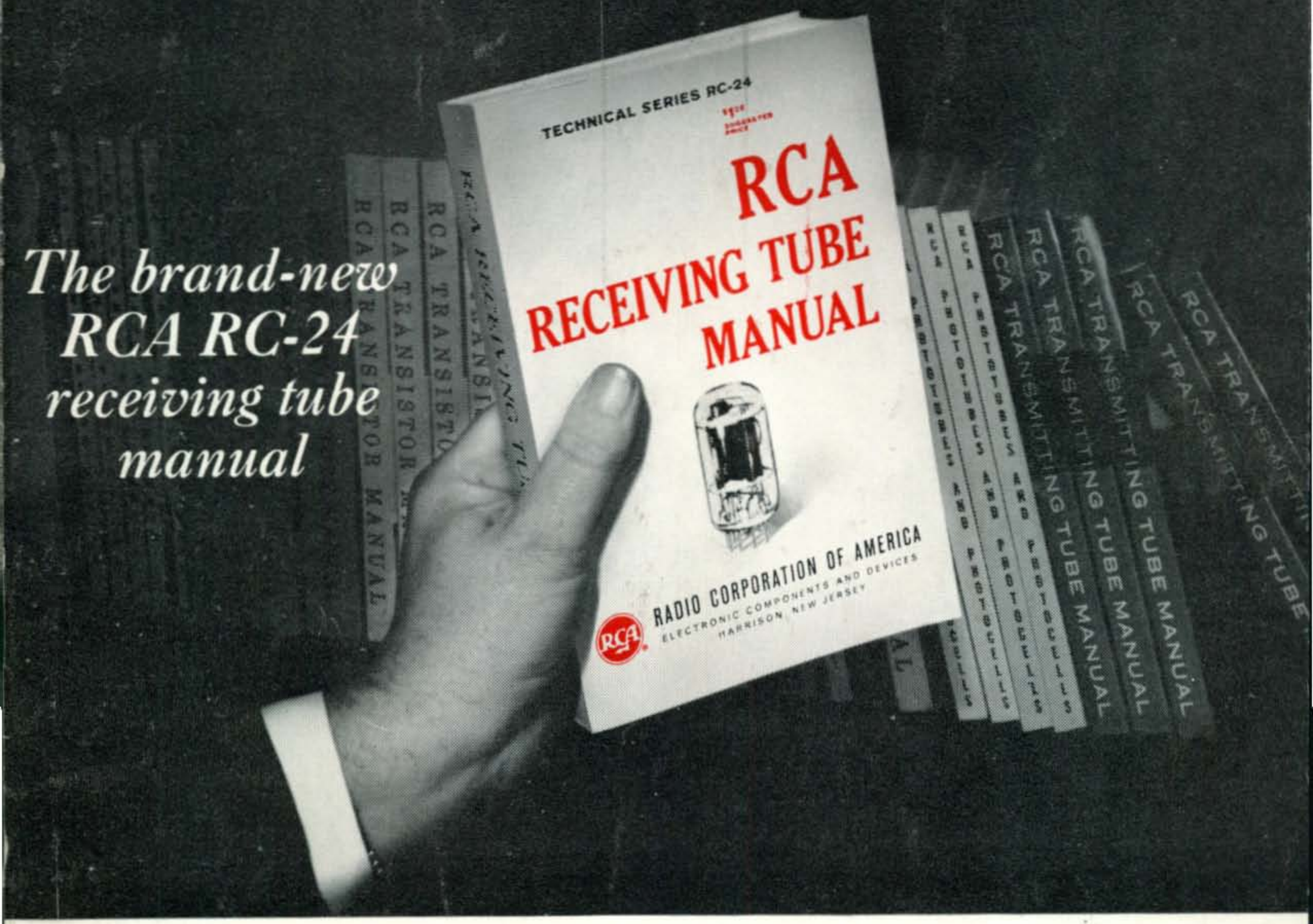

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