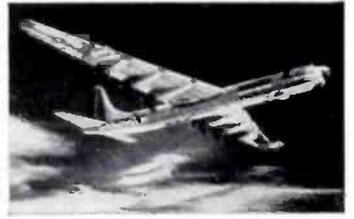
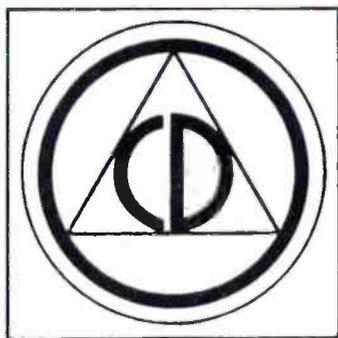
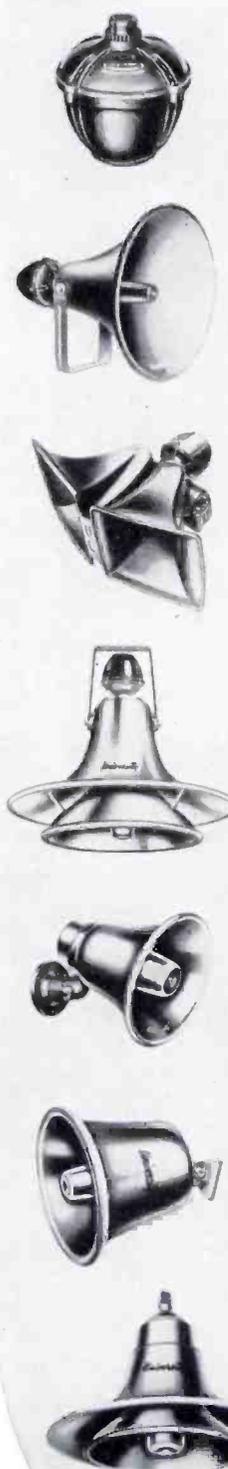


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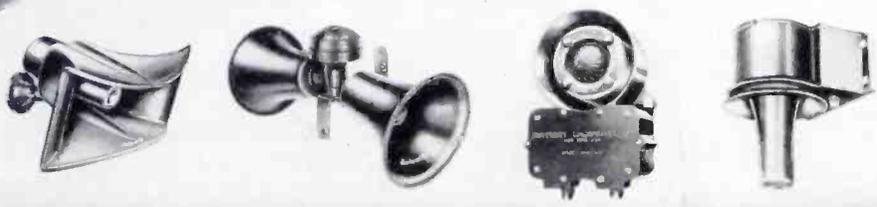
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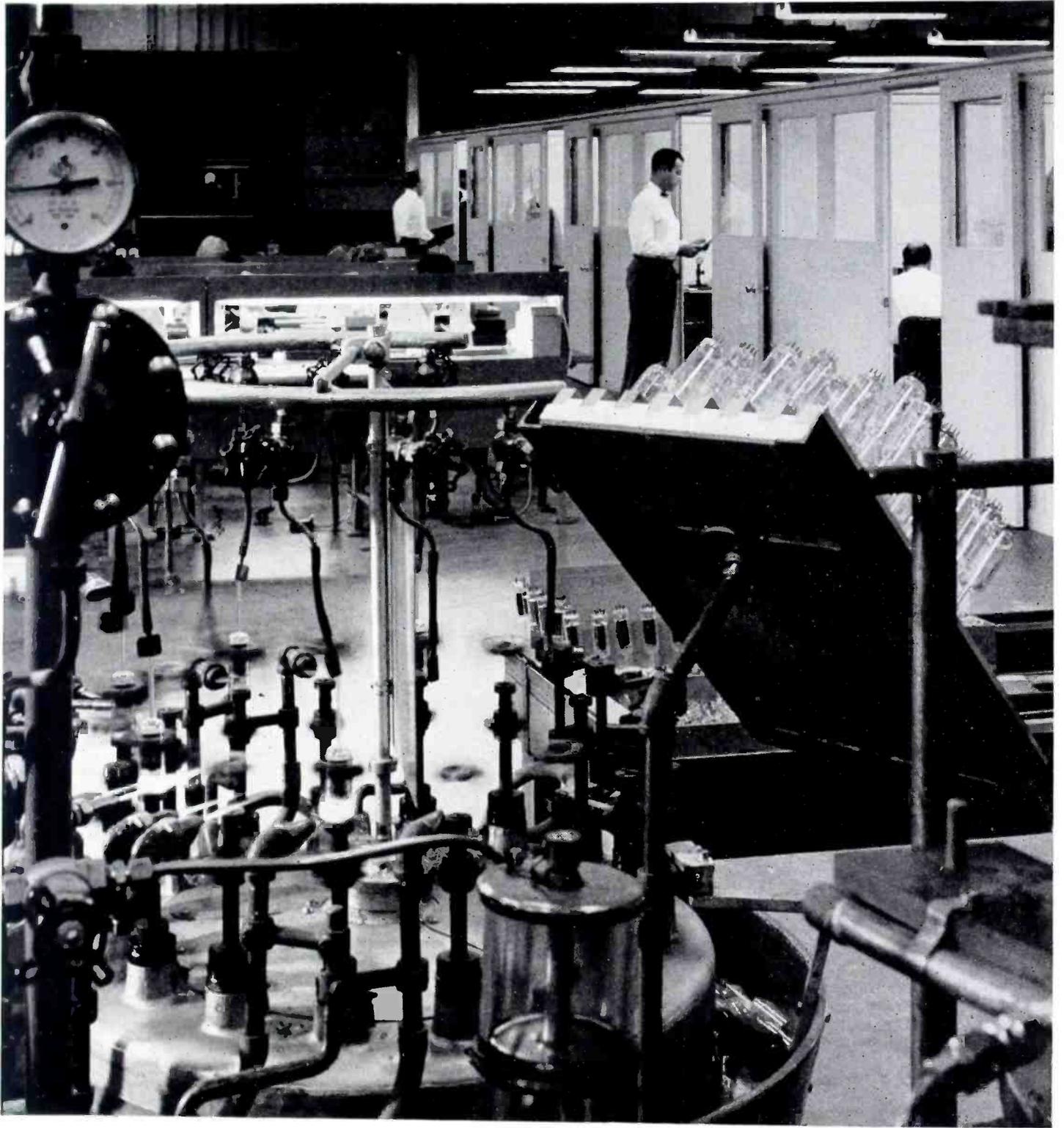
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# SERVICE

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE  
Including RADIO MERCHANDISING and TELEVISION MERCHANDISING  
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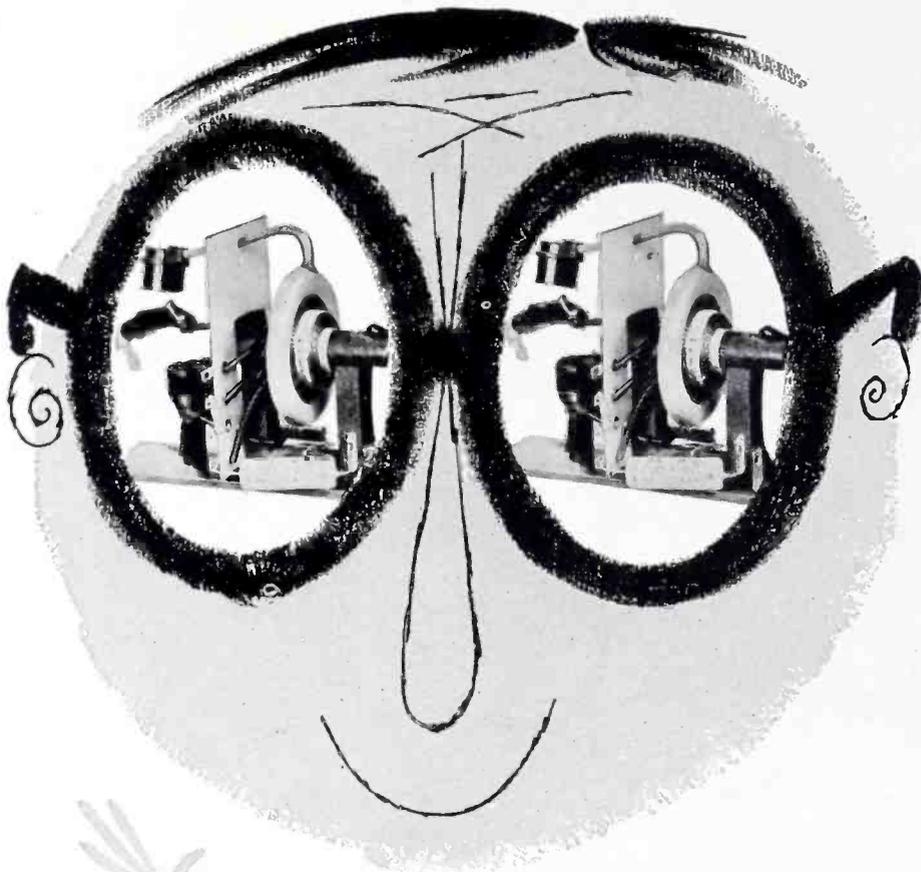
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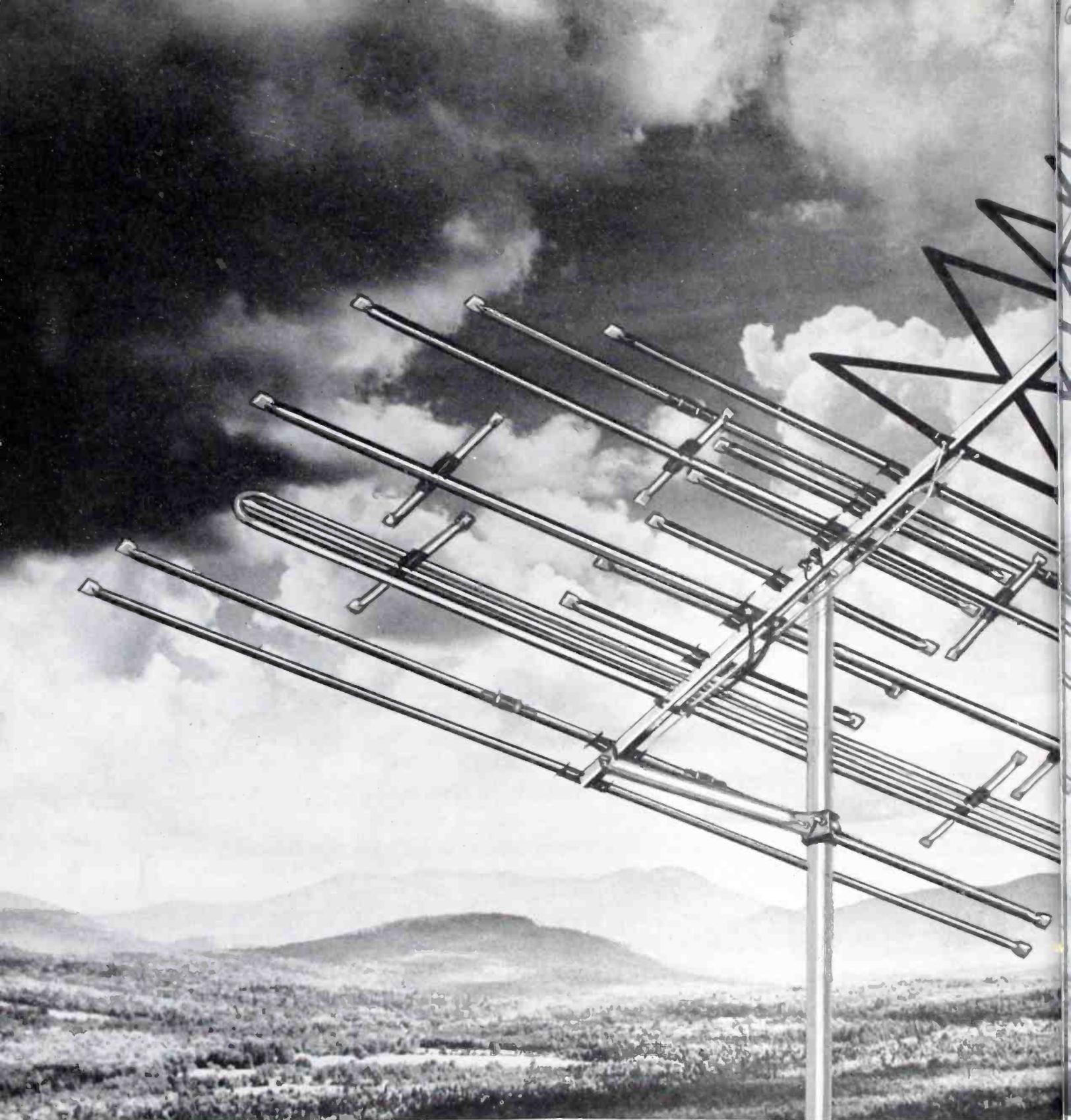
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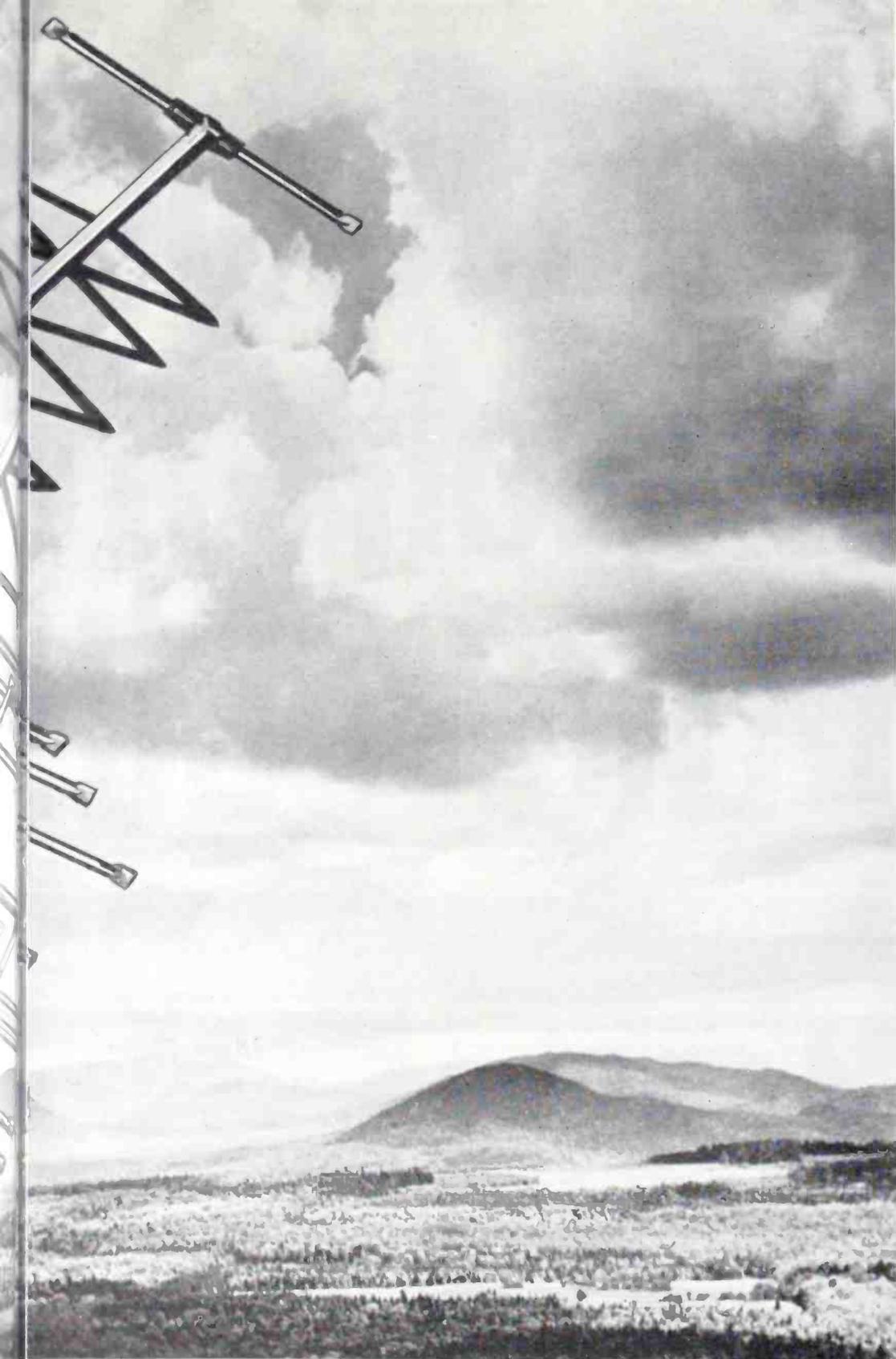


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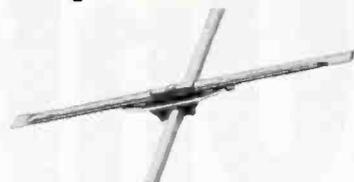
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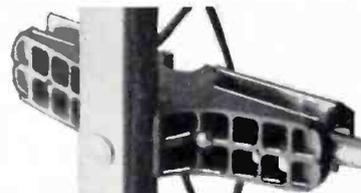
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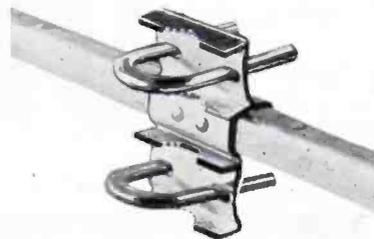
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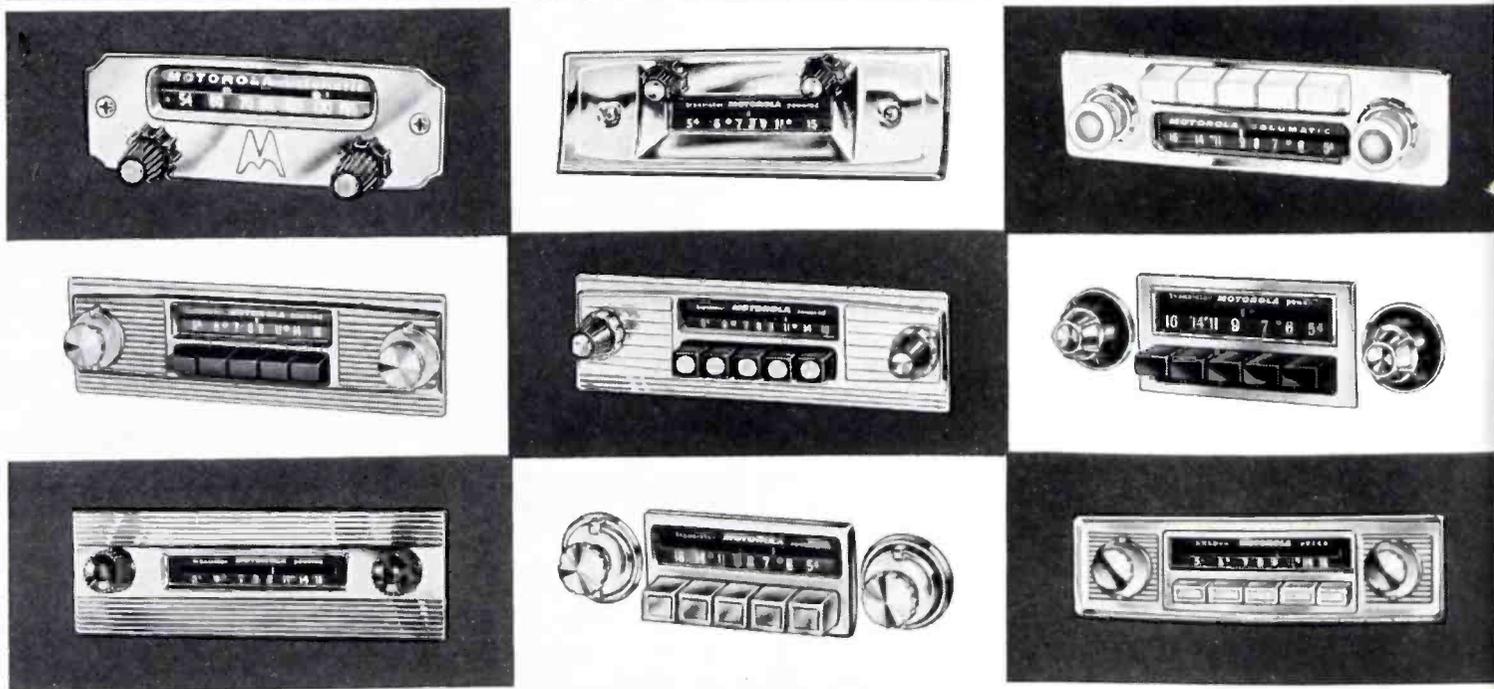
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*More to enjoy—More to sell*



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Here's the greatest flexibility ever built into a car radio line—and it makes Motorola installations faster and easier to handle than ever before.

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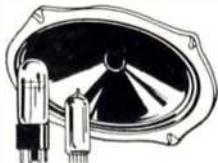
And that's not all! Right down the line Motorola car radios are built with famous Motorola quality you won't find in any other car radio. (Example: Motorola's trouble-free Golden Heart transistor-powered chassis.)

**Just think! You can make an extra profit on every car installation you sell by handling the Motorola line. Why not get all the facts? See your Motorola distributor right away.**

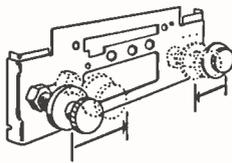
**These exclusive Motorola features give you more to sell!**



**Golden Heart That Never Wears Out** powers all Motorola transistor sets. One miracle transistor replaces 20 parts which cause more than 75% of set failure. Cuts battery drain 50%. Model GV700.



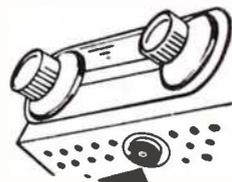
**New Push-Pull Audio Output Stage** amplifies signal and supplies more power to speaker with less distortion. Results in richer, clearer hi-fi like sound. Actually supplies twice as much power as single-end type.



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The lowest priced salesman a dealer ever had!  
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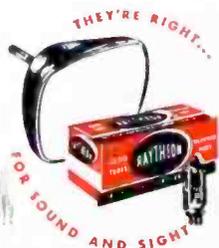
First of all, Raytheon has no factory TV-radio service organization that competes with you for profitable servicing business — you're not helping a "competitor" when you buy Raytheon Tubes.

Then, too, when you buy Raytheon TV and Radio Tubes you get the finest quality tubes money can buy — tubes designed for top performance in all makes and models of receivers. Raytheon does not manufacture sets and therefore must make tubes that will meet the rigid performance requirements of the many sets pro-

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# SERVICE

THE TECHNICAL JOURNAL OF THE TELEVISION-RADIO TRADE

## A Time For Specialization and Diversification

By this time it should be no secret to anyone that the boom we have been riding has passed its crest. Employment is down from last year, production is down, sales are down. Only prices remain at a record all-time high. Right now it is rather difficult to predict with any certainty the course our economy will take for the nation as a whole. However, it is possible to climb a short distance out on a limb and hazard a guess as to what may happen in the electronics servicing field.

Based on past experience, there is every reason to believe that the Service Man may regard the future with some optimism, even in the face of a continued business downturn. In the first place, the servicing business traditionally shows improvement when general production declines. To cite one example, the production of television sets dropped from 7.4-million sets in 1956 to 6.4-million sets in 1957. But during the same period, the amount spent for servicing and installing all types of electronic equipment rose from 2.3 billion to 2.7 billion dollars.

The reason why the electronic servicing industry runs counter to the prevailing economic trend is not hard to understand. With less money coming in, many people prefer to invest in keeping their present models operating rather than buy new equipment. Furthermore, with overtime bonuses a thing of the past, there is no extra cash to spend in night clubs and people are forced to seek more of their entertainment in front of their television or hi-fi sets. The alert and progressive Service Man should normally profit from this situation.

However, there is more to this picture. With less cash available, customers drive a harder bargain with the Service Man. Some prospective clients may even be driven to fix their own sets, even though most of them will butcher the job, and finally wind up calling in a TV repair man as a last resort. Regular Service Men may also find increased competition from newcomers in the field. All of these factors must be taken into con-

sideration in analyzing the economic situation facing the Service Man within the next few months.

In view of this unsettled future, what can the Service Man do to improve his position? The first and most obvious answer is to make himself as technically competent as possible so that he can service electronic equipment better and faster. To do this, he must keep up with the latest developments in the electronics field. The most practical way for him to accomplish this is to constantly read books and magazines such as SERVICE which provide useful and authoritative information on color TV, transistorized circuits and other important developments.

The next few months might also be a good time for the Service Man to think in terms of specialization, so that he can expand and broaden his field of operation. Without neglecting his regular trade, a worthwhile effort should be made to cultivate one or more electronic specialties. It could be high fidelity, which is more popular than ever right now and shows no signs of abating. Or it might be the auto radio field in which there is normally a spurt of activity at this time of the year. There is also the mobile radio field, which is becoming increasingly important and which can often be the source of profitable service contracts. Industrial electronics and service engineering are also fields which most Service Men are well equipped to handle and which can be built up by skillful merchandising and promotion.

To keep up with the demand for information in these specialized fields, SERVICE will continue to cover them regularly and in expanded form in its columns. This issue, for example, contains an article on the installation of a 60-watt hi-fi amplifier. The auto radio field is covered in two separate reports, one of them a roundup of the '58 models. There is also an interesting story on servicing airborne mobile communications equipment. These reports help to fulfill SERVICE's function of keeping its readers better informed so that they may face the future with greater confidence.

# 1958-Model 12-V Tube Transistor Output

## Analysis of Circuitry Employed and Repair Practices Required in the New

THE TREND IN AUTO radios for '58 continues in the direction of 12-v hybrid (tube-transistor) receivers with voltages supplied directly from the car battery. Output stages feature transistors in either single-ended or push-pull form. Also search tuning is becoming increasingly popular in new-car installations.

One typical auto receiver<sup>o</sup> which utilizes six 12-v miniatures, a transistorized push-pull output stage, and a search tuner is shown in Fig. 1. Five of the tubes serve as rf and if amplifiers, converter, and detector. The sixth, a 12AL8, is a trigger relay, which operates in conjunction with the search tuner.

The plates and screen grids of all tubes are fed from the positive A lead of the battery. In servicing hybrid receivers one must avoid probing with a screwdriver when checking for spark to ground. Because plate and

screen power is obtained directly from the storage battery, high currents can flow through a component that is accidentally shorted and cause permanent damage. The driver (12DL8) and push-pull transistor (2N176) stages are especially susceptible. If, while checking the unit with a probe, the transistor base electrode should be shorted to ground, bias would be removed from the base. This will allow excessive current to flow through the transistor and cause permanent damage to the transistor junctions.

A single-ended transistor output stage,<sup>†</sup> typical of many found in the '58 models, is shown in Fig. 2. In this model the audio signal from the driver (12K5) is applied across a transformer  $T_3$  to the transistor (2N176) which acts as a power amplifier. The necessary driving power for the transistor is obtained from the 12K5 which operates as a triode with an auxiliary grid next to the cathode. The driver transformer

matches the plate impedance of the 12K5 with the input impedance of the transistor.

Although the failure rate of a transistor is normally less than that of a standard receiving tube, a weak or distorted output may be caused by a damaged or defective transistor. The simplest and most effective way to check a suspected transistor is to replace it with one which is known to be in good condition.

When replacing a transistor in an auto radio, one should make sure that the transistor insulator is in place and the mounting screws are securely tightened. If the insulator is not in place, the transistor will be shorted to the chassis and the set will not operate. Mounting screws must be tightened to provide proper heat dissipation and prevent damage to the transistor.

The search tuning mechanism used

<sup>o</sup>Motorola, Mopar model 923.

<sup>†</sup>Motorola, model 8MX.

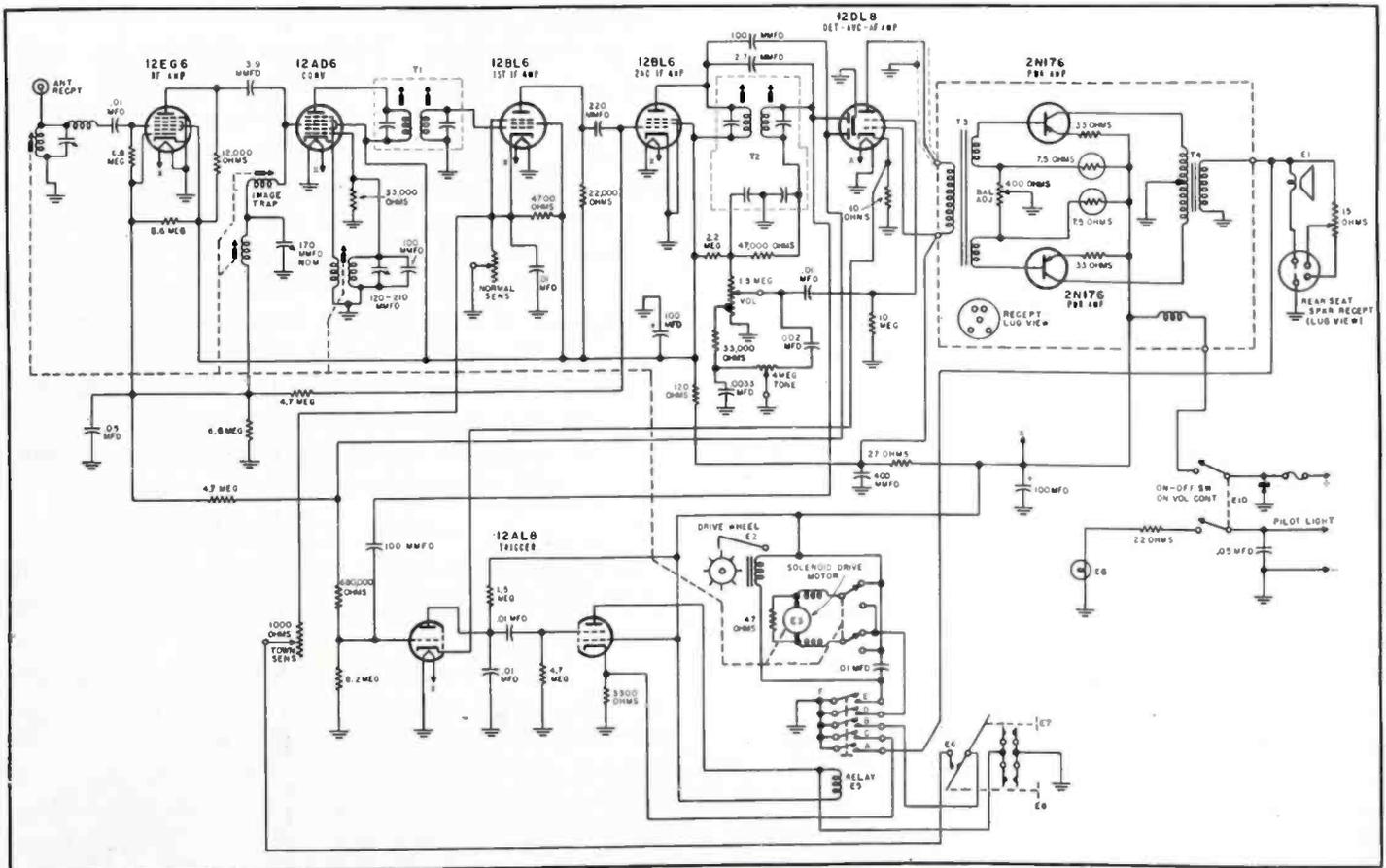


FIG. 1: COMPLETE CIRCUIT of Motorola Mopar model 923 which utilizes six 12-volt tubes and transistorized push-pull output.



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Smart... Attract Customers.*



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**E. DOOR, WINDOW DECAL.** Neat, attractive, new dry-apply type. 12" diameter.

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All your display needs are met by smart new G-E designs—from an eye-catching, easy-to-apply door or window decal, to metal and illuminated outdoor and indoor signs... plus colorful utility items like the electric clock and thermometer.

These brand-new signs and displays are waiting for you now at your General Electric tube distributor's. Ask him how to obtain them! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

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**GENERAL  ELECTRIC**

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**HANGING METAL SIGN.** For shop front or service entrance. Message both sides, plus your nameplate. Large—48" by 36"—easily seen. Hanging hardware is included; lights are available.



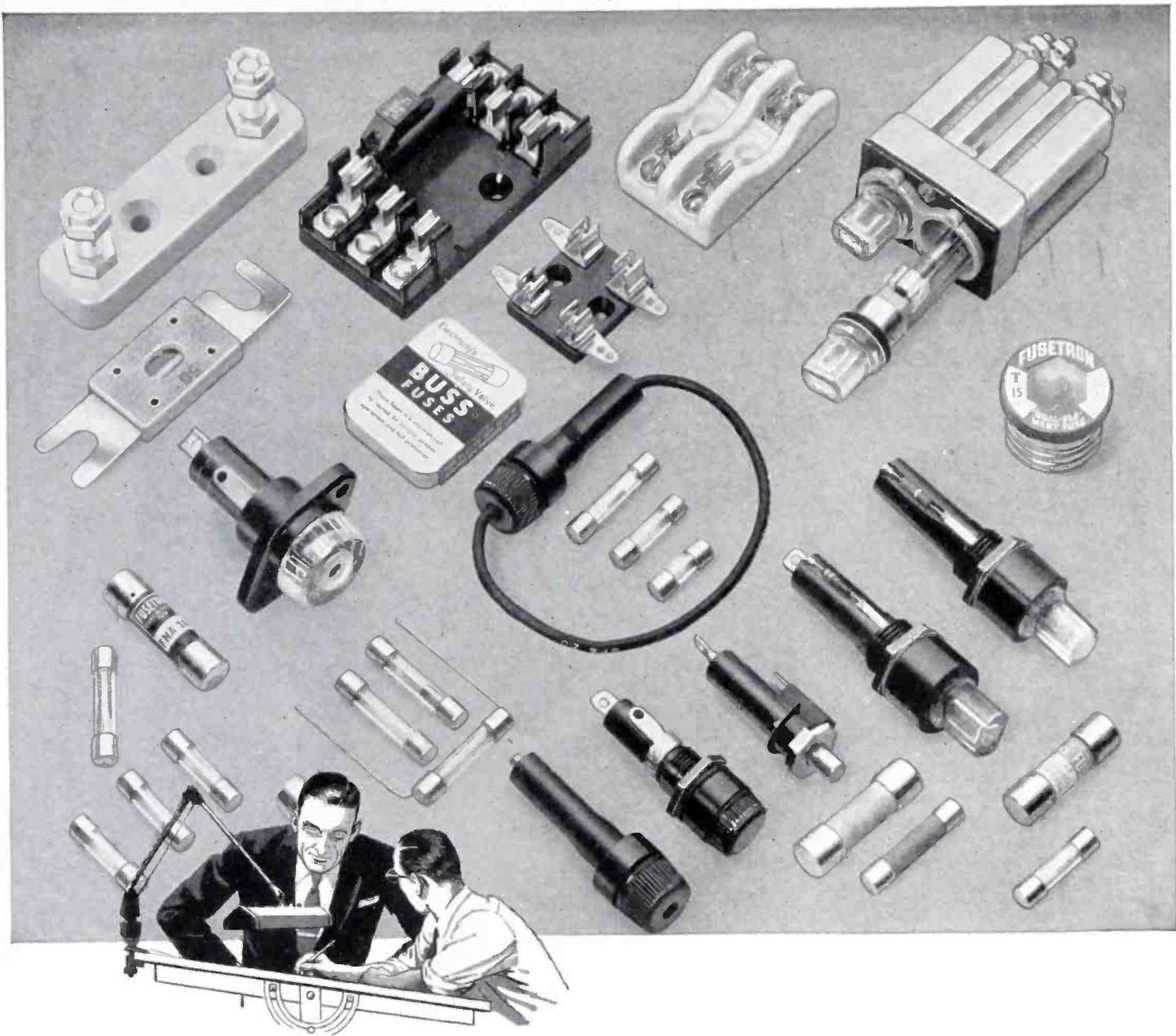
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***BUSS fuses are made to protect—not to blow, needlessly***

S-153



Makers of a complete line of fuses for home, farm, commercial, electronic, automotive and industrial use.

# THIS MONTH IN SERVICE

ELECTRONICS INDUSTRY CONTINUES GROWTH--The electronics industry continued to expand during 1957 to become the fifth largest manufacturing group in the United States, according to the Annual Fact Book for 1958 just released by the Electronic Industries Association. . . . Total value of consumer products, tubes, semiconductors, components, and other military and industrial electronic equipment reached \$7.5-billion. . . . Hi-fi component sales also continued to boom, approaching the \$200-million mark, the Institute of High Fidelity Manufacturers announced recently. . . . Of this total \$50-million were spent for speakers and enclosures, \$40-million for amplifiers and preamps, \$30-million for turntables and changers, and the balance for accessories and other equipment.

NATESA SALUTES RAYTHEON--The Raytheon Manufacturing Company's receiving tube and semiconductor operations received a Friends of Service Award from the National Alliance of Television and Electronic Servicemen's Associations at a luncheon in Boston on March 31. . . . An engraved plaque commemorating the award was presented for Raytheon's efforts in creating better customer relations for the nation's independent Service Men.

NEW ELECTRONIC TRAFFIC CONTROL SYSTEM--A new radio traffic control system which provides a flexible means of centrally controlling traffic lights electronically was announced this month by Motorola, Inc. . . . Utilizing radio transmission of signal tones, a city traffic department can alter the programming of its signal lights to meet rush-hour conditions, changing weather or other traffic problems.

SERVICING CONTINUES TO EXPAND--The combined total for servicing all radio and television equipment in this country including labor, tubes and parts reached \$2.5-billion in 1957, A. K. Mallard of the RCA Electron Tube Division noted in a recent speech before a group of service dealers in Montgomery, Ala. . . . Mr. Mallard further predicted that by 1975 the bill for electronic servicing would reach \$8-billion.

ELECTRONIC COMPONENTS CONFERENCE--Representatives of industry, government and military research organizations will take part in the Electronic Components Conference to be held in Los Angeles April 21-24. . . . Topics to be covered in the six sessions include transistors and solid state devices, component reliability evaluation and electron tubes and their application.

EIA SPRING INDUSTRY CONFERENCE--Senator Thomas H. Kuchel (R., Calif.) and Rep. George H. Mahon (D., Tex.) were among the many high-ranking government officials who addressed the spring conference of the Electronic Industries Association which was held in Washington March 19-21. . . . The association's guests were welcomed by Robert C. Sprague of Sprague Electric Co., a past president and acting chairman of the board of EIA.

COLOR TV SALES INCREASING--Nationwide sales of color television sets so far this year are running about 50% ahead of the same period a year ago, Martin F. Bennett, RCA Vice-President, Merchandising, revealed this month. Mr. Bennett told a luncheon meeting of the Indianapolis Advertising Club that the figures for January and February were especially significant because they came at a time when sales of most home appliances were declining.

HI-FI SHOWS GOING STRONG--Memphis will hold its first high-fidelity music show at the Peabody hotel on April 18-20. . . . Baltimore also held a successful show on March 28-30 at which about 100 hi-fi manufacturers exhibited their wares.

RADIO-TV OUTPUT DROPS--Factory production of radio and television receivers declined in January, the EIA reported. . . . TV production for the first month of this year totaled 434,000 compared with 573,000 in December and 450,000 produced in January of '57.

TRANSISTOR RADIO SALES INCREASING--Sales of transistor radios continue to increase and are up approximately 10% over last year. . . . In some cases, dealers report, transistor radios now account for 85% of all portables sold and up to 25% of the total radio volume.

CHICAGO PARTS SHOW--A gala 21st anniversary celebration will mark the coming of age of the Electronic Parts Distributors Show to be held at Chicago's Conrad Hilton Hotel May 19-21. . . . Name stars from TV and Hollywood will take part in the celebration. . . . SERVICE will be on hand too, in Suite 610, to welcome its many friends who will be in for the show.

# Airborne and Mobile Radio Servicing On The Pacific Coast

by HERMAN MILLER

San Jose Avionics Company

INDEPENDENT ELECTRONIC servicing firms can be found in some strange and interesting places; ours maintains headquarters at a commercial airport. We have a good reason for this. We service a wide area which includes a good part of Northern California and extends over into Oregon and Nevada. Only an airplane can enable us to reach these distant points quickly enough, and nothing can be more convenient for this purpose than an airport right in your own back yard.

From our shop at the San Jose Municipal Airport, we service anything that has wires and can be used on an airplane, car, truck or boat. However, we are primarily specialists in radio-communications equipment and navigation devices and have equipped ourselves so that we render service in the field. We are also setting up a maintenance depot so that we will be able to service mobile radio units on a wholesale basis within a three-county area.

Our business was started in March 1953. Today, our annual volume is over \$88,000, of which \$20,000 is derived from servicing; the balance is from the sale of parts and equipment. We now have a staff of four men, three



**BOTH AIRPLANES and automobiles are used by San Jose Avionics technicians to call on customers requiring servicing of mobile equipment.**

of whom are technicians. Kohachi Toyota heads the service department. One of our crew, Stephen Dodson, is a licensed pilot, as well as a very able Service Man. I, too, am a licensed pilot with over 17 years of experience in electronics, eight of these in engineering.

Because lives often depend upon the correct functioning of the units we install and service, we use the best test equipment available. Our equip-

ment includes four *rf* signal generators,<sup>1</sup> an *rf* wattmeter<sup>2</sup> for measuring transmitter output, and two frequency meters.<sup>3</sup> We also employ a tube tester<sup>4</sup> and have several measuring instruments including two *vtvm*'s,<sup>5</sup> a standard checker,<sup>6</sup> a 'scope, various audio oscillators, test power supplies and test harnesses for bench testing all popular types of aircraft and mobile two-way gear.

Our convenient location makes it possible to fly our crew out to any part of our vast territory at a few moments' notice. It also makes it possible to bring an airplane right into our backyard for more extended servicing and then fly it back to the owners.

<sup>1</sup>Hewlett-Packard 608D, Hickok 292X-AL, Aircraft Radio H14, Military standard TS/67C.

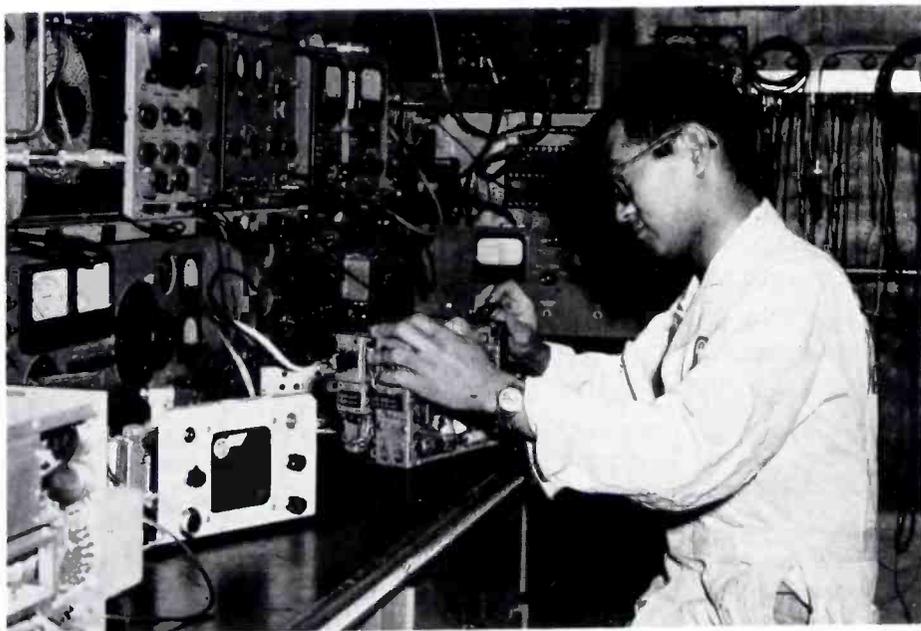
<sup>2</sup>Sierra 164 RF.

<sup>3</sup>Hewlett-Packard 524B electronic counter and Lampkin 105B.

<sup>4</sup>Hickok 535A.

<sup>5</sup>Hewlett-Packard 400D and 410B.

<sup>6</sup>ARC H-16.



**TECHNICIAN KOHACHI TOYOTA measures the frequency of a two-way unit transmitter with an electronic counter.**

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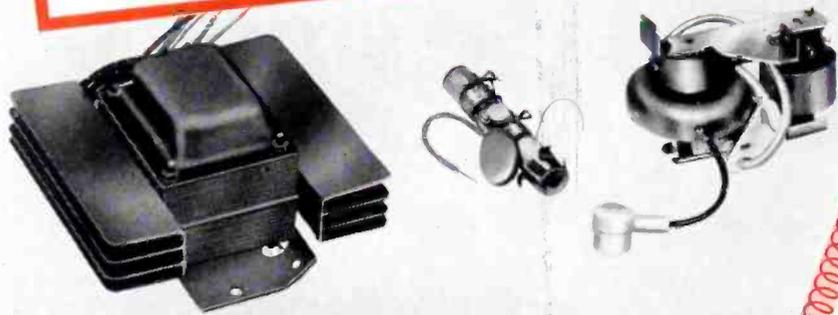
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# Packaged Hi-Fi P-W Board

## AM Radio-Phono With 3 Speakers

### and 4-Speed Changer

[See Front Cover]

by SOL LIBES

Technical Editor, Service Department  
TV-Radio Div., Westinghouse Electric Corp.

THE INCREASING INTEREST in *hi-fi* which has prompted engineering to concentrate on the audio sections of radio-phonos has resulted in the evolution of unique amplifying systems with many performance features.

An illustration of this advanced design appears on the cover and in Fig. 1, where we have a push-pull circuit with two 35C5 miniature pentodes in class A-B. The audio drive for the push-pull output is obtained from the first half of a 12AX7, with the second section functioning as a phase inverter. Cathode bias is fixed at .8 volt by a 470-6800-ohm divider network across 110 v B+. This approach has been found to provide maximum gain and minimum distortion without the need for a large bypass capacitor.

Signal for the phase inverter is obtained by dividing down the audio signal at the control grid of the top audio output amplifier across 470,000 and 22,000-ohm resistors to ground. The reduced audio signal developed across the 22,000-ohm resistor is used to control the phase inverter. The inverted signal at the plate of the phase inverter is then capacity coupled to the control grid of the bottom output power amplifier.

All of the resistors and capacitors in the coupling circuitry between the first audio amplifier-phase inverter and the push-pull audio output amplifier are contained in a single packaged-printed circuit.

The phase-inverter cathode requires no bypass capacitor since only a very small amount of gain is achieved. A .01-mfd capacitor, between the phono base and chassis ground serves to reduce any possible *ac* hum. This component provides a low *ac* impedance between the base and ground and yet has a sufficiently high impedance to isolate the base from the *ac* power line.

Two separate and independent bass

and treble tone controls are located in the input circuit to the first audio amplifier. No equalization network has been found necessary, because a cartridge with a flat frequency response is used. Maximum audio output power is rated at 6 watts; 3.5 watts for minimum distortion.

To provide ear-level sound three matched speakers have been located in an inclined baffle. These speakers include an 8-inch and two complementary 4-inch types.

The cabinet, constructed of  $\frac{3}{4}$ " wood has been designed as an acoustical cavity, as well as a housing for the tuner, amplifier and phono.

Terminal connections for the addition of an external speaker system are located at the rear of the cabinet. Two output speaker impedance taps are provided by the audio output transformer; a 12.8-ohm and a 6.4-ohm tap.

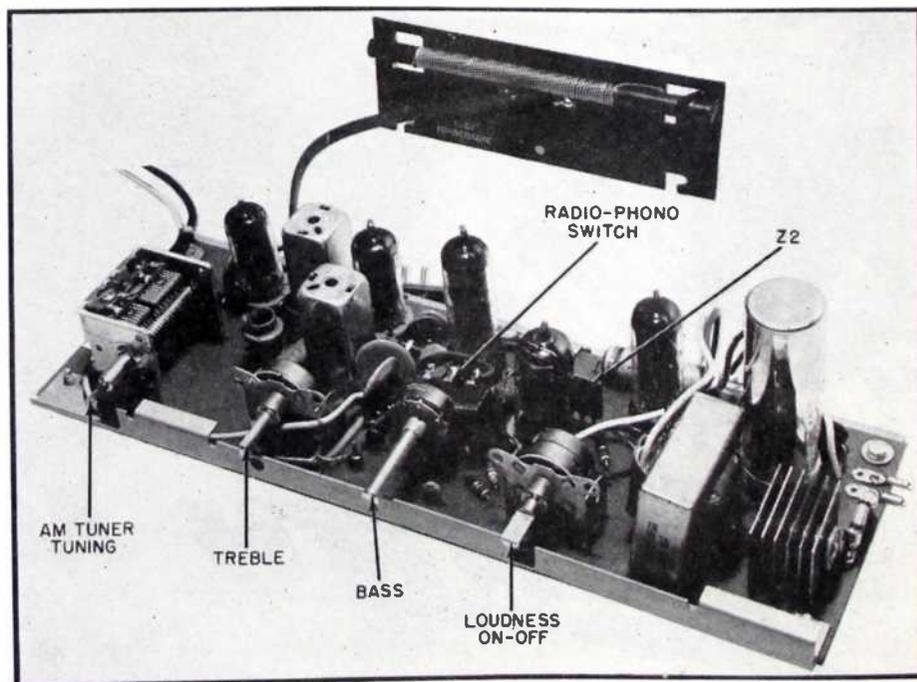
An AM tuner, using a ferrite-core antenna, is located on the same printed circuit chassis as the amplifier. A planetary drive tuning capacitor with

a turns ratio of approximately 4:1 is used. This type of drive provides vernier tuning for band-spread action and rejection of adjacent stations.

A pentagrid type converter has been included to provide an *if* of 455 kc. During phono operation screen voltage is removed from the converter tube to prevent AM signal interference. AVC control voltage is developed by a crystal diode detector to control the gain of the converter stage as well as the *if* amplifier.

*If* transformer coupling is used between the converter and *if* amplifier, and between the output of the *if* amplifier and crystal diode detector to insure better sensitivity and selectivity. The *if* amplifier stage is neutralized by .0033-mfd capacitor to provide stable stage gain independent of frequency and tube variations.

The 455-kc *if* signal is rectified by the crystal-diode detector and filtered by a resistor-capacitor network contained in the packaged printed circuit. A 470,000-ohm resistor serves as the audio load for the crystal diode



AF AMPLIFIER chassis used in Westinghouse radio-phonos which features use of a printed-circuit coupling unit between first *af*-phase inverter and push pull.

detector, while a .0047-mfd capacitor provides coupling.

The amplifier-tuner uses a single-series heater string. A transformerless-type power supply provides filtered *dc* voltages at 145, 134 and 110 v B+. A selenium rectifier is employed for conversion to the necessary *dc* supply voltages. Although only five tubes are used in the entire unit, two are dual purpose types; thus this complement plus the crystal diode and selenium rectifier provide the equivalent of nine tube functions.

The phono-radio switch is a slide type, ganged to the bass control. The bass control rotated to the left provides the radio position; when the control is rotated to the right, the phono position obtains. After the desired function has been selected, the bass control may be used to control the low-frequency response of the amplifier without interference with function selection. The on-off switch is ganged to the loudness control; the phono has its own on-off switch.

The phono<sup>o</sup> can be played at four different record speeds—78, 45, 33 $\frac{1}{2}$  and 16 $\frac{1}{2}$  rpm. The changer features a four-pole turntable motor which has been found to provide more constant speed and less vibration and rumble. A rubber mat turntable is used to provide better record support during playing.

The ceramic cartridge has dual sapphire styli.

Signal output has been found to be higher than that of magnetic cartridges (approximately .85 v at 1,000 cycles) thus making a preamplifier unnecessary. No equalization is required for the cartridge, since it is a constant amplitude device.

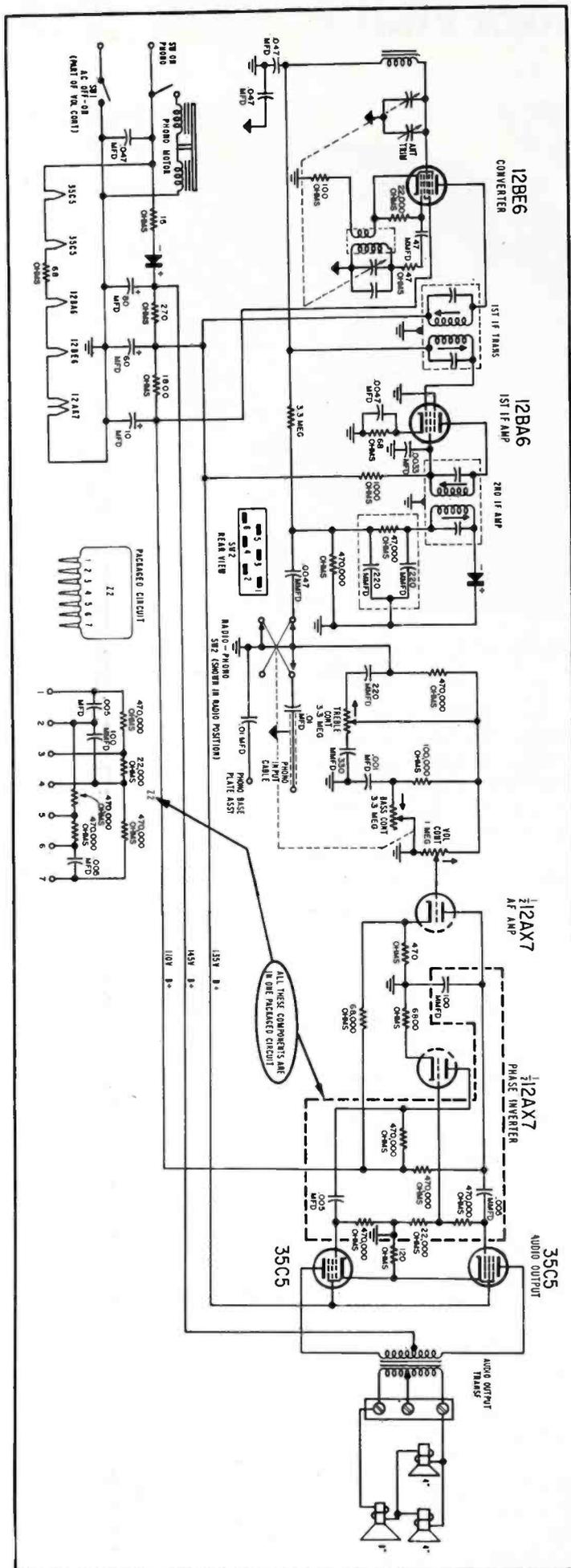
A terminal board at the rear of the cabinet provides for external speaker connection. One may use a remote speaker system;<sup>1</sup> the remote speaker system must have a voice coil impedance of not less than 6 ohms.

When connecting an external speaker system the internal speaker system lead should be moved from terminal 2 to 3. The remote speaker system should be connected in parallel with terminals 3 and 4 on the speaker terminal board. If the external speaker system is to have a loudness control, an *L* pad is necessary to maintain the impedance match as the level is varied. One must be sure that the external speaker system is in phase with the chassis' speaker system if both are to be within the same listening area.

<sup>o</sup>Collaro Conquest model.

<sup>1</sup>Such as Westinghouse HE 123, 124, 125.

FIG. 1: COMPLETE CIRCUIT of Westinghouse Granada AM radio-phono.



# Servicing Auto Radios In California



◀THE AUTHOR is shown getting at the radio in one of the small foreign cars serviced by his shop.

by AL POAGE

AUTO-RADIO SERVICING has always been a lucrative operation; today it offers more opportunities than ever, particularly if one is familiar with the basics of automobile service and is well grounded in electronics and in the use of tools.

In auto-radio repair, one not only requires a *com*, a set of spin wrenches and an assortment of screwdrivers, but an array of heavy tools which include pipe and crescent wrenches, circular saws, metal shears, mechanic's pliers and even a jig saw.

A knowledge of carpentry is very helpful when handling some auto radio installation and repair jobs; this means one will find a set of wood working tools very helpful.

My shop on Waverly Street (opposite our post office) in Palo Alto,<sup>1</sup> the home of Stanford University, is located just one block from the city's main artery.

When I entered the business six years ago, I had intended to concentrate on auto-radio servicing. However, I found myself doing some TV servicing, as well as radio and auto-radio work. It did not take me long to decide that I would like to specialize on auto radios.

My staff includes a full-time Service Man, my wife and myself. My

wife spends about one-third of her time in the office, taking care of the bookkeeping and filing, and the remainder of the day is spent in the shop repairing equipment. Since we bought the shop we have increased our business to six times our original annual gross revenue. This was accomplished in a variety of ways.

To begin with, auto radios appear to play a more active part in the lives of many in Palo Alto than TV. Radio stations in San Francisco, Oakland, San Jose and Palo Alto use directional arrays to beam their programs along the area's major traffic arteries where hundreds of thousands of cars pass every day. Most of these automobiles are radio-equipped and all of them need servicing.

When we started, I had contracts to do the warranty work for four Palo Alto garages. Today every garage in Palo Alto sends its warranty work to my shop, and many others in nearby Mountain View bring their work to me, too. In return for handling this warranty work, I suggested that these garages also send me all other types of radio work which come into their shops. The plan has worked out very well and today we service at least 15 sets a day from garages.

The man who repairs, services and installs auto radios must be prepared to get dirty—and by this I am not referring to a little grease on his hands.

The automobile radio Service Man must be prepared to live with pounds and pounds of grime, and stand on his head to remove or install a radio in dust-encrusted areas under the dashboard. He must be willing and able to design installations for unusual body types. He must be able to construct, design and install rear-seat speakers which will be attractive and functional when completed. What I am trying to stress is that the mere fact that one is an experienced Service Man is not enough to guarantee success in automobile radio servicing. There are many additional facets to consider.

For example, we install the radios in almost all of the many foreign cars sold in this area. With the exception of the Volkswagen, for which a standard American radio has been designed, the rest of these installations require custom handling. We have been able to standardize the equipment for the Hillman Minx, Sunbeam-Talbot, TR Triumph and several other smaller sports cars. But these are only a few of the foreign cars sold in this area and the others—about thirty of them—present such a variety of body types that standardization is almost impossible.

For the Triumph and similar small sports cars we have designed what we call the *tunnel mounting*. This houses the radio chassis in an expanded metal box which is cut to fit the drive-shaft tunnel. This fits a small radio conveniently in the only available space, with the speaker under the dash and the controls protruding from the box. The installation is cheap, efficient and easy to handle.

Other small cars, such as the Jaguar, Austin-Healey, Borg-Ward, Volvo, Goliath, British Fords, Fiat, Simca, Arnault-Bristol, Mercedes-Benz and other sold in this area, each presents a different problem which requires a custom installation.

I have discovered that it pays to use only the highest quality replacement parts. This is not extravagance, but a matter of economy. All my work is unconditionally guaranteed for 90 days. If a second-rate buffer should be installed, for example—at a savings of perhaps ten cents—it will surely burn out after a week or two and we'll have a callback on our

(Continued on page 28)

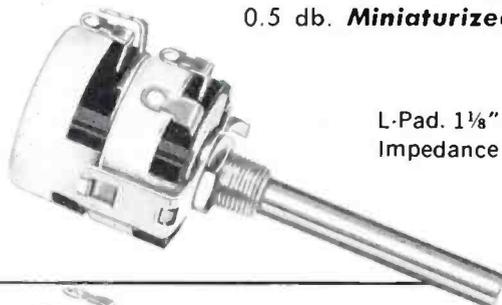
<sup>1</sup>Population—50,000.

SOUNDLY ENGINEERED BY

# CLAROSTAT

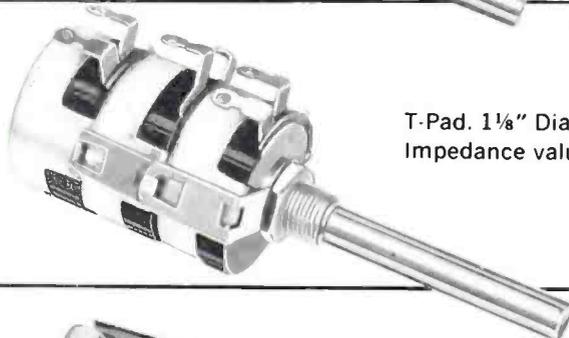
These new controls handle up to 4-watts audio and are small enough to fit standard electrical wall boxes. Ideal for remote control of speakers, in the home, office, stock-room, sound truck, or studio monitor speakers. All units have attenuation range of 0 to 30 db over 90% rotation and 60 db in remaining 10%. Insertion loss less than 0.5 db. **Miniaturized Sound System Controls.**

CIL43



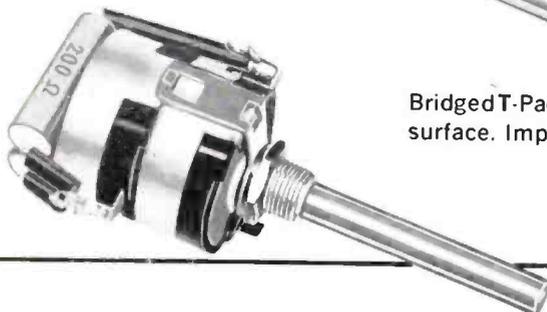
L-Pad. 1 1/8" Diameter. 1 1/2" depth from mounting surface  
Impedance values from 4 ohm to 500 ohm.

CIT43



T-Pad. 1 1/8" Diameter. 1 3/4" depth from mounting surface.  
Impedance values from 4 ohm to 500 ohm.

CIBT43



Bridged T-Pad. 1 1/8" Diameter. 1 1/2" depth from mounting surface.  
Impedance values from 4 ohm to 500 ohm.

Hardware Note: All shafts and bushings insulated from circuit elements. 3/32 x 3/8" long bushing. 1/4" dia. shaft, round, 1 1/2" long. Complete with bar knob and dial plates.



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# AUDIO INSTALLATION AND SERVICE

Phono • Tape • PA  
Cartridges • Needles • Amplifiers • Speakers

## 60-Watt Hi-Fi Power Amplifier

by RUDOLPH T. PLEMICH

WITH THE ADVENT of wide-range reproducing systems for not only the home, but commercial sound, there has been a concerted effort to develop amplifiers to fit such requirements.

As the result of this program, the amplifier circuit shown in Fig. 1, providing 60 watts output, has been evolved.<sup>1</sup> This amplifier which can be used with *pa* and industrial intercom systems, demonstrating of hi-fi equipment, and for hi-fi tuners, tape, and phono applications, features a seven-tube chassis with a low-noise level cascode input. Its output is fed into a phase-inverter driver. Common in industrial electronic circuits, this driver is often referred to as a *long-tailed pair*. This circuit is often used in welding equipment because of its precise signal timing requirements.

### Screen Series Regulator

To prevent hum from entering the circuits and causing distortion, even the modulation variety due to signal variation, an automatic screen series voltage regulator has been incorporated to feed all B+ points, except the plates of the push-pull tubes (EL34s) where it has not been found necessary. Thus, all regulated B+ points are constant with changing signal level. Supplying B+ for the 60-watt output are two 5U4GB's (the ruggedized version) in parallel.

The filaments are operated at *rf* ground potential and filtered through a 10-mfd capacitor at the center tap.

This avoids operating the regulator (6L6GB) beyond its cathode-to-heater voltage limit.

To obtain wide response the cascode output is direct-coupled into the long-tailed phase inverter driver, and a pair of .1-mfd capacitors are in the push-pull output.

The circuit provides a large amount of cathode degeneration feedback; due to the absence of capacitance in each of the stages, the rise time is very fast. This quick rise time is inherent in the use of an unbypassed

cascode-cathode resistor, and the fact that the cascode output is direct coupled.

One way of measuring stability or rather inability of the power amplifier to go into free running oscillation is to connect a square-wave generator, set at 1 kc, to the amplifier, so that the reading across a 16-ohm output is 1 to 3 volts with no load applied to the amplifier output. When the output is monitored with a 'scope, no ringing should obtain at any frequency out to 20,000 cps. No ringing should prevail when matched resistive loads of 4, 8, or 16-ohms or capacitance are added. When ringing occurs in hi-fi power amplifiers, poor performance results. Before investigating component troubles tubes should be checked. If components are suspect, the first parts to check are the coupling capacitors (.1-mfd) in the grids of the power output stages.

Besides the feedback loop, the amplifier has a cascode-output filter (10,000 ohms and 250 mmfd in series from the plate to ground) with a rather sharp cutoff beyond 50 kc. Additional attenuation of ringing is provided by a 100,000-ohm resistor in the grid (at pin 2) of the cascode input.

The bias applied to the push-pull output stages is well filtered by a 50-mfd, 22,000 and 10,000-ohm bias control. The output tubes (EL34s) must be selected so that their  $I_B$  matches accurately for *dc* balance, their total plate current is affected by the bias control.

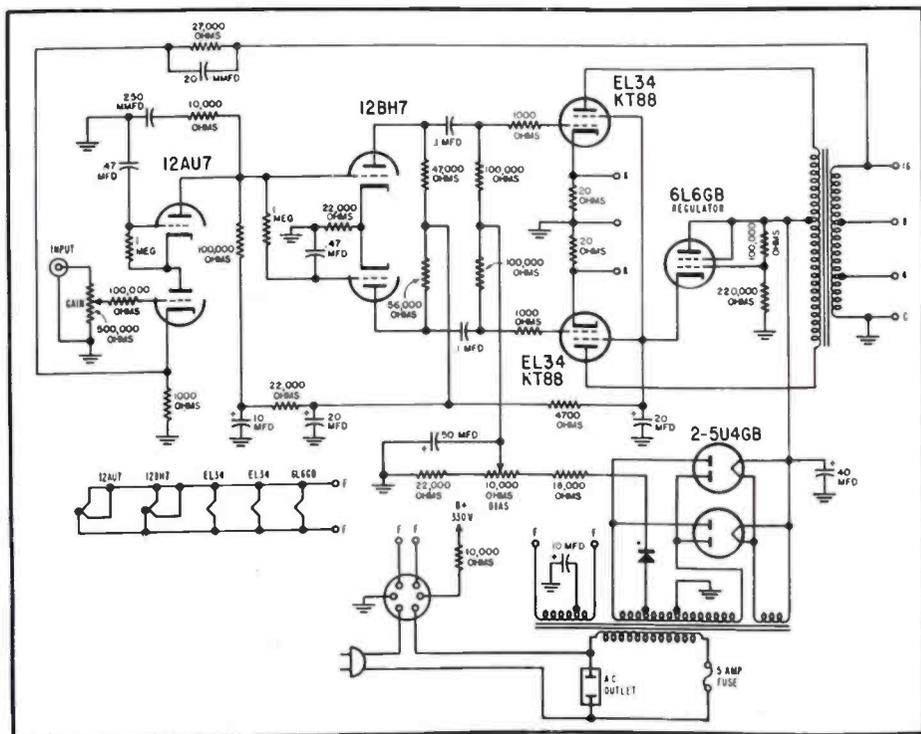


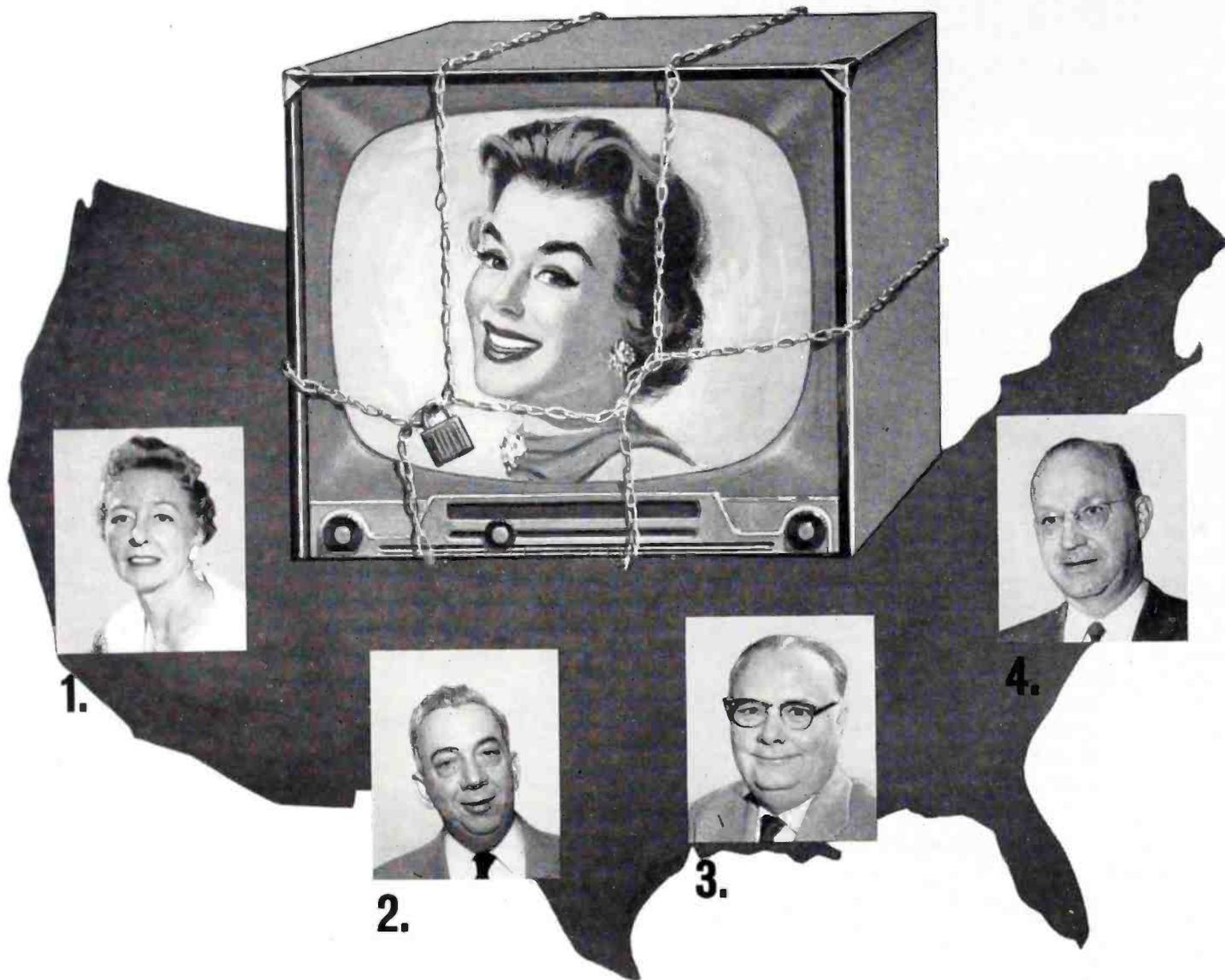
FIG. 1: CIRCUIT of Grommes 250-K 60-watt amplifier.

<sup>1</sup>Grommes 250K.

# ASK THOSE WHO "TORTURE TEST" WESTINGHOUSE RELIATRON® TUBES!

From coast-to-coast, TV tube distributors are putting Westinghouse RELIATRON Tubes through the most grueling "torture test" ever devised. Locked inside 87 standard make TV sets, these

tubes have racked up an amazing total of 425,000 hours' *continuous* operation—and are still going strong! Visual proof that when it comes to cutting call-backs... you can rely on RELIATRON Tubes.



**1.** Louise Miller of Miller's Radio & Television Supply, Oakland, Calif., says: "I padlocked Westinghouse RELIATRON Tubes inside a TV set 8,436 hours ago ... turned the set on ... and it's been running ever since! No wonder my Westinghouse Tube sales are booming!"

**2.** Bill Sutton of Sutton Radio-TV Company, Ft. Worth, Texas, says: "My 'Locked TV' has been operating steadily for 8,916 hours with RELIATRON Tubes! At this rate, my service dealers will certainly cut call-backs."

**3.** Charlie Goebel of Manhattan Radio Equipment Co., Kansas City, Missouri, says: "My 'Locked TV'

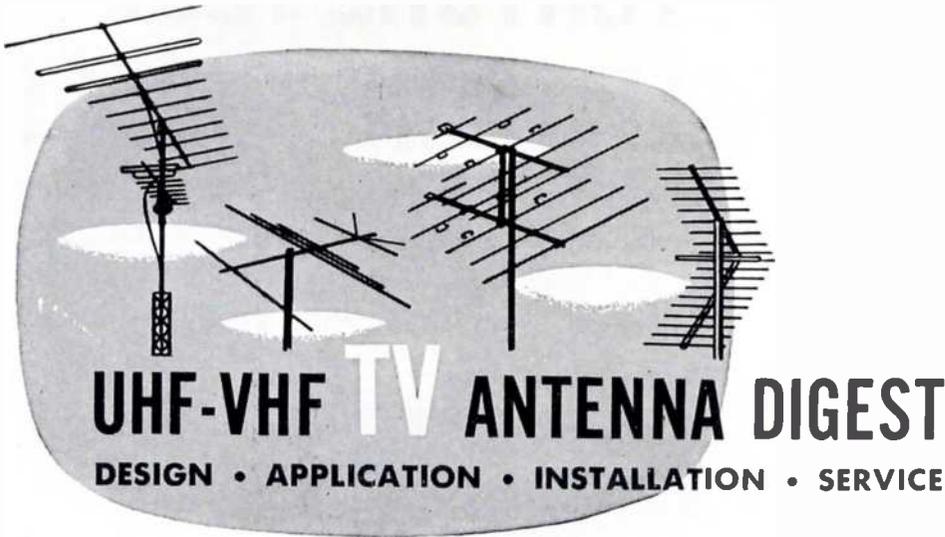
set has been turned on 9,936 hours without a single RELIATRON Tube failure! How's that for long tube life!"

**4.** I. Goldenberg, Sherwood Distributors Inc., Union, New Jersey, says: "8,649 hours have passed since I turned on my 'Locked TV' and it's still working fine. That's one reason why I've been selling more RELIATRON Tubes than ever before."

**YOU CAN BE SURE... IF IT'S**

## Westinghouse

Electronic Tube Division, Elmira, New York



by HAROLD HARRIS and PAUL MATTERN

Vice President Engineering  
Channel Master Corp.

Project Engineer  
Channel Master Corp.

As THE SIZE and number of *uhf* areas have diminished over the past several years, the amount of *uhf* antenna research has shrunk accordingly. This is illustrated dramatically by the fact that while *vhf* development has plunged ahead in spectacular fashion, no major *uhf* receiving antenna development has been made in more than four years.

This situation was to be expected. Throughout the country, only a limited number of electronics engineers are engaged in TV receiving antenna research. And the overwhelming preponderance of *vhf* set owners has made it almost mandatory for these engineers to concern themselves almost entirely with the solution of *vhf* problems. Furthermore, as a matter of simple economics, the size of a po-

tential market is what determines the size of the engineering investment a laboratory can afford to make.

However, with an estimated 8,500,000 families located within the range of *uhf* stations, the ultra-high phase of development cannot be ignored. Although the size of the *uhf* market is small in comparison to its *vhf* counterpart, satisfactory TV reception is just as important to those living in those areas; even more important since the boundaries of the fringe areas still remain relatively close to the transmitter. Furthermore, the recent introduction of translator stations has revitalized the role of *uhf* and placed a new value on the service it can render.

With these considerations in mind, our antenna development laboratory

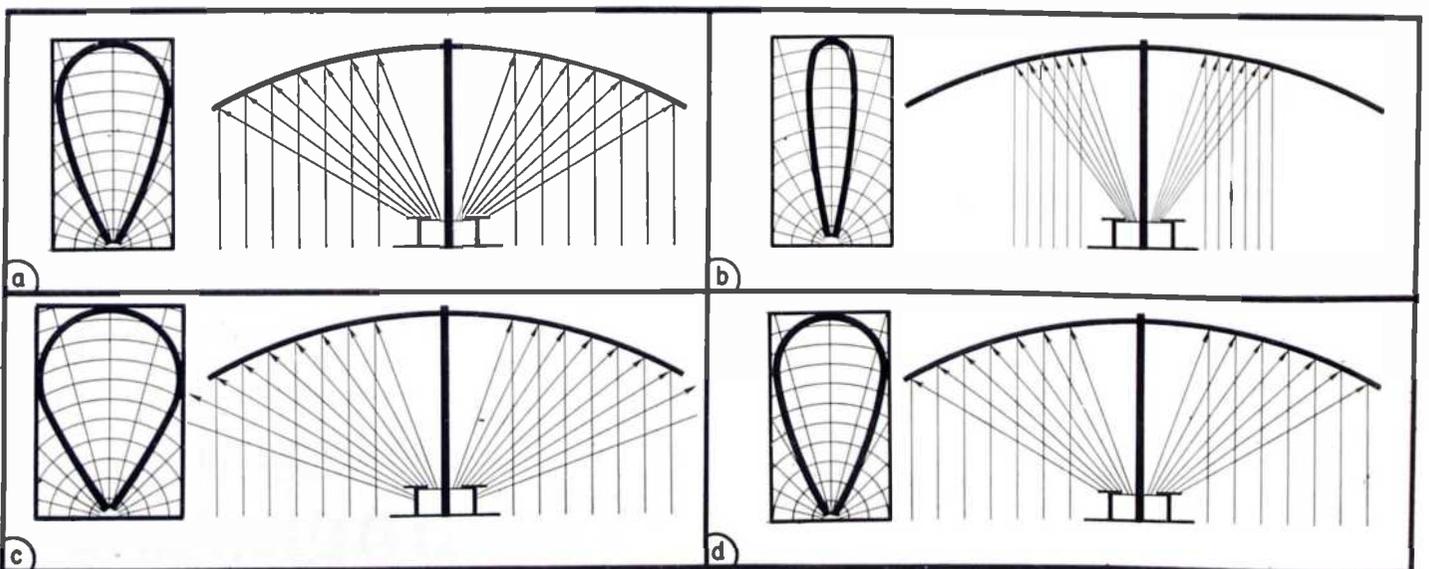
initiated a research project about one year ago to develop a *uhf* antenna. The project culminated in the evolution of a parabolic antenna.<sup>1</sup>

Electric engineers have known for many years that it is possible to build broad-band antennas with far superior performance than has heretofore been obtained. The outstanding example of such a design is the parabolic antenna. In widespread non-TV use for years, it has been used commercially for such long distance applications as radar, radio astronomy, forward scatter propagation, satellite and meteor tracking. The outstanding feature of the parabolic antenna is its large curved reflecting screen, a size factor which has been the major deterrent to the adoption of this type of antenna for TV reception. However, the fringe area's appetite for more db remains unsatisfied and accordingly it was decided to tackle the problem of adapting this high-gain antenna design for practical TV use.

The principle of the parabolic antenna revolves about the capture of signal by a large-diameter curved screen, and the reflection and concentration of this signal onto a focal area, or *feed system*. The screen is non-frequency sensitive and does not impose any inherent limitations on gain or bandwidth. The amount of gain is directly proportional to the area of the screen, because of the greater effective *capture* area and the higher concentration of signal reflected onto the dipoles. The screen may be vis-

(Continued on page 36)

<sup>1</sup>Para-Scope.



FIGS. 1a, b, c and d: Distribution of lower frequency uhf signals for a hypothetical parabolic antenna.

# Cut testing time in half— DOUBLE TUBE SALES



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Net, **\$169<sup>95</sup>**

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- Eliminates substitution testing
- Shows customer true condition and life expectancy of tubes
- Sells more tubes right on-the-spot
- Cuts servicing time, wins customer confidence
- Saves costly call-backs, brings more profit

One extra tube sale on each of 5 calls a day pays for the Dyna-Quik in a few weeks.

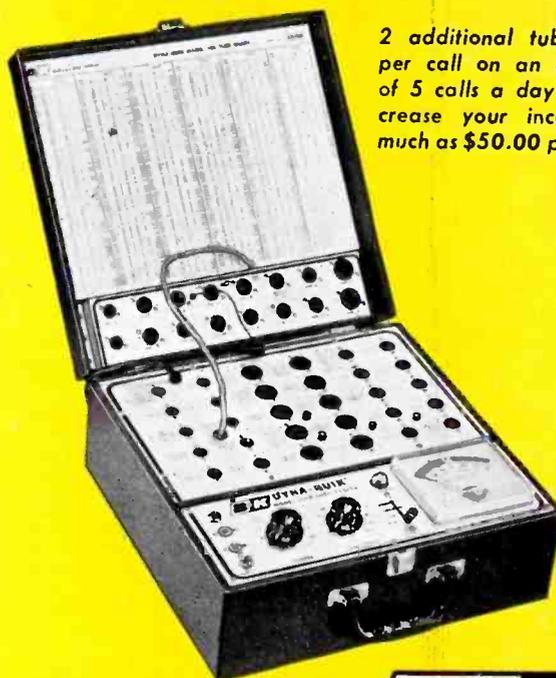
### **NEW MODEL 500B** *Money-Making Portable* **DYNAMIC MUTUAL CONDUCTANCE TUBE TESTER**

Thousands of the famous B&K Dyna-Quik are in profitable use today by service technicians everywhere. Servicemen say: "Best tube tester I've ever owned for speed and dependability." "Makes money. Really indispensable." "Have two...one for the shop and one for house calls."

Now, with more tube sockets, the new Model 500B makes it easy to test more tubes faster and make more money. Accurately quick-checks most of the TV and radio tubes usually encountered in everyday service work. Tests tubes for shorts, grid emission, gas content, and leakage. Measures true dynamic mutual conductance with laboratory accuracy in the home or shop. Makes complete tube test in seconds, tests average TV set in a few minutes. Quickly detects weak or inoperative tubes. Shows tube condition on "Good-Bad" scale and in micromhos. Life Test shows customer the tube life expectancy. Makes it easy to sell more tubes right-on-the-spot.

One switch tests everything. No multiple switching. No roll chart. Automatic line voltage compensation. 7-pin and 9-pin straighteners. New tube reference charts are made available by the factory at regular intervals.

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2 additional tube sales per call on an average of 5 calls a day can increase your income as much as \$50.00 per week

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**B&K MANUFACTURING CO.**

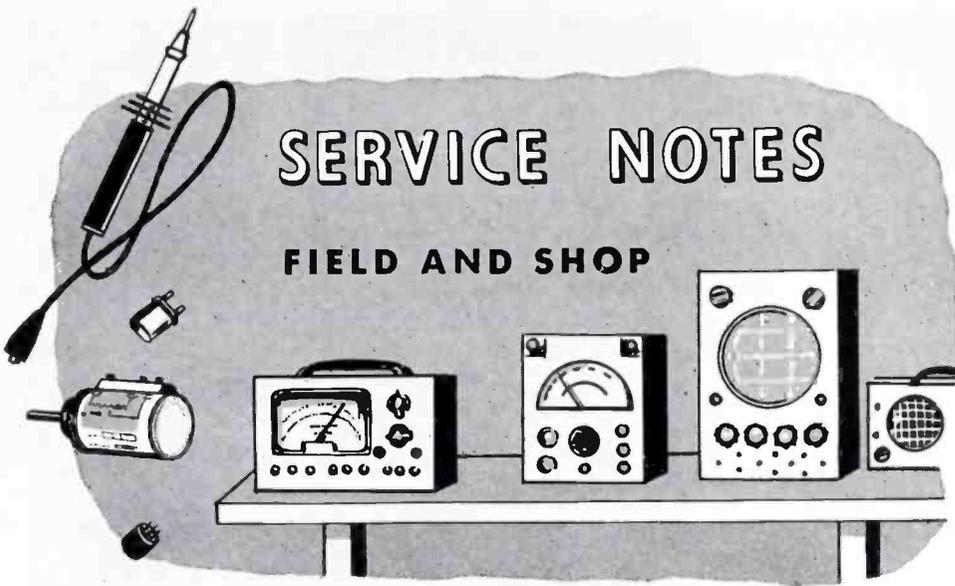
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# SERVICE NOTES

## FIELD AND SHOP



### Troubleshooting Short-Neck 90° Chassis

THE TREND to shallower TV chassis, which has resulted in the widespread use of 110° tubes, has also prompted the development of shortened 90° tubes<sup>1</sup> using straight guns and requiring no ion trap magnets.

Ion trap magnets have been found difficult to adjust in the field, and the cause of such troubles as low brightness and resolution.

In a recently developed series of chassis<sup>2</sup> featuring the use of this 90° tube, the straight gun, which permitted shortening the overall length of the picture tube by more than 2", has been found to deliver more than twice the beam current for the same modulating voltage used in standard 90° tube chassis.

The spacing from cathode to grid 1 in this new tube has been reduced from .0075" to .0045". Spacing from G<sub>1</sub> to G<sub>2</sub> has been reduced from .020" to .005". The tube operates with cathode feed only. The gun itself is 1½" shorter than the conventional 90° variety.

The FCC has placed great stress on the suppression of spurious radiation coming from TV sets which interfere with other sets. The new tube eliminates this spurious radiation by providing grounding of the outside shield of the tube. This is particularly important in this age of second sets which are prone to mutual interference.

#### Corrector Magnet Adjustment

Two corrector magnets are used in the Zenith Sunshine-tube chassis<sup>3</sup> to

obtain straight, sharply focused sweep lines across the face of the picture tube. The magnets are mounted on the deflection coil mounting brackets and can be moved in and out or up and down by bending the flexible arms which support them. Adjustment has been made at the factory and should not require readjustment unless accidentally bent out of position. If this occurs, the following adjustments should be made:

With the vertical and horizontal size controls, the size of the picture should be reduced to a point where

the four corners and sides of the picture are visible. (In some receivers it may not be possible to reduce the picture size sufficiently to see all the sides and in this case it may be necessary to shift the picture with the centering control to view one side at a time.)

The corrector magnet arms should be bent until the corners become right angles and the top of the raster is parallel with the bottom and the left side is parallel with the right side. After adjustment, the picture should be restored to normal size.

Misadjustment of the corrector magnets may cause pincushioning, barreling, keystoneing or poor linearity.

#### Bandswitch Tuner-Oscillator Adjustments

To adjust the receiver oscillator-adjustment screws in Zenith models,<sup>3</sup> the fine-tuning control should be set to a position where the index hole in the drive cam is directly over the channel 13 adjustment screw. Without further adjustment of the fine tuning control, one should insert an alignment tool into the tuner and adjust each operating channel to resonance starting with the highest channel and following each lower channel in sequence; be certain not to move the fine tuning shaft when switching channels. It will be noted that tuning to one side of resonance results in a faded, washed-

(Continued on page 43)

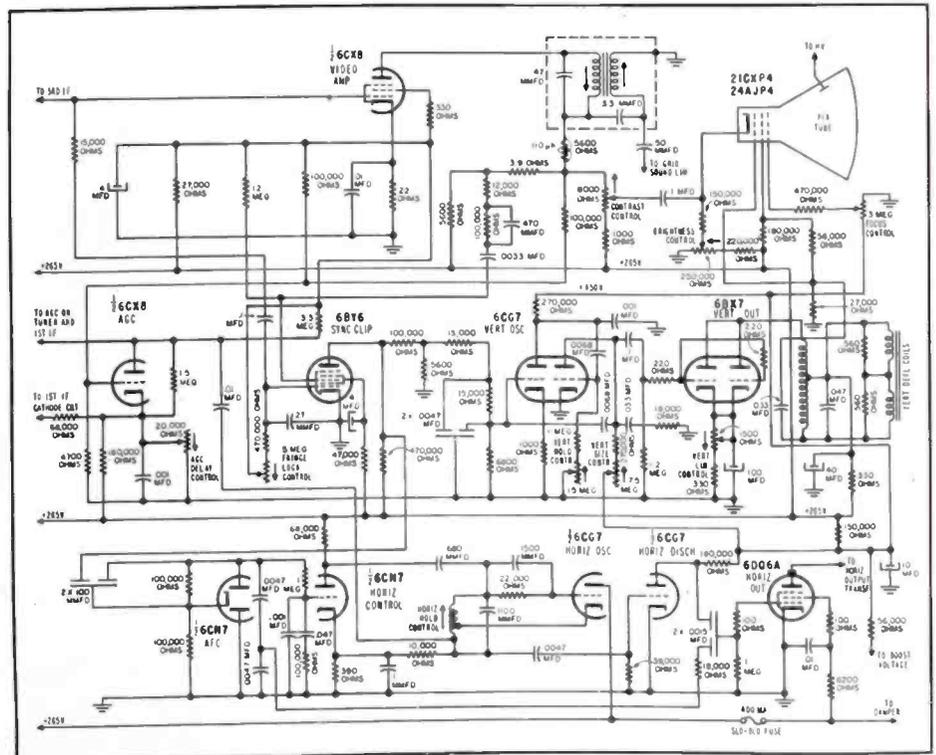


FIG. 1: SCHEMATIC of Zenith 19A20 chassis which uses a short-neck 90° picture tube.

<sup>1</sup>Rauland (Zenith) 21CXP4.

<sup>2</sup>Zenith Sunshine tube chassis.

<sup>3</sup>Zenith 19A20 chassis, which uses the 90° Sunshine tube.



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## ○ General Electric Service-Designed Tubes made even better... through "Snow White" cleanliness!

### SUPERIOR-QUALITY G-E SERVICE-DESIGNED TUBES INCLUDE:

1B3-GT	6AL5	6BK7-B	6BZ7	6SN7-GTB
1X2-A/B	6AV5-GA	6BQ6-GA/6CU6	6CB6/A	12SN7-GTA
5U4-GB	6AX4-GT	6BQ7-A	6CD6-GA	25BQ6-GA/25CU6
5Y3-GT	6BG6-GA	6BX7-GT	6J6	25CD6-GB

Lint-free Dacron and Nylon garments . . . filtered, conditioned air . . . floors cleaned many times a day . . . these and other steps toward "Snow White" cleanliness now make G-E Service-Designed Tubes still more dependable! Dust and lint—notorious for causing tube shorts—are banned in General Electric's immaculate receiving-tube factories.

General Electric Service-Designed Tubes increase your profit opportunity, build goodwill with customers. Performance is improved over prototypes; tube life is longer . . . yet Service-Designed Tubes cost the same as other receiving types. Phone your G-E Tube Distributor! *Distributor Sales, Electronic Components Division, General Electric Co., Owensboro, Ky.*

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ELMSFORD, NEW YORK

## Auto Radio Servicing

(Continued from page 20)

hands. To replace that defective part the profit on the first job is automatically lost. For one must, once again, remove the set from the car and then reinstall it—all time consuming and certainly not profitable.

We charge a flat \$3.50 for removal and reinstallation. In the light of present wage scales, this may have to be replaced with a flat book rate, based on the manufacturer's estimate of installation and removal time, in spite of the additional bookkeeping involved.

I am well satisfied with the auto-radio servicing business. Each year we have increased our gross and we have every prospect of continuing to do so. Most of this I attribute to the fact that we stand behind our guarantees, produce quality work, and are not afraid to get dirty in order to get the job done.

## 1958 Auto Radios

(Continued from page 11)

pressed, one should check for a defective search switch ( $E_7$  or  $E_8$ ), defective switch contacts or internal shorts in relay  $E_6$ , or a short in pin 6 of the 12AL8. If the tuner starts to sweep after the set warms up, the 12AL8 should be checked.

One must make sure that the drive motor is rewired properly after servicing the search tuner. If the motor is not properly rewired, it may be unable to reverse direction and cause the tuner to stick at one end of the dial.

Most '58 auto radios with search tuners and other new features come equipped with an external speaker. One-piece units with integrated speakers are usually the lower-priced models which employ mechanical tuning.

No special problems are involved in mounting the receiver and its external speaker to the dashboard of the standard American automobiles. Some receivers even provide a receptacle for connecting an additional rear-seat speaker. Installation in the small foreign cars, however, can be a tough job.\*

\*For a discussion of small-car installation see page 20 this issue.

# ROHN TOWERS

## cover 3 fields

*Bigger Profits for You!*

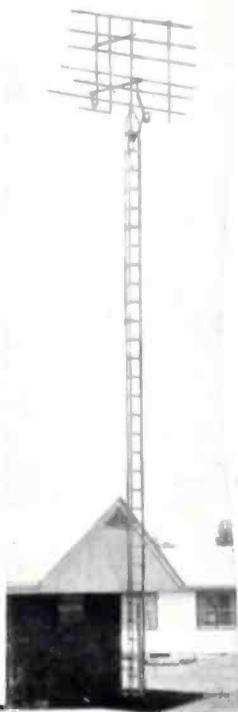


Rohn Manufacturing Company is the largest *exclusive* manufacturer of home television towers! Thousands of distributors, dealers and servicemen have handled, sold and installed Rohn Towers for years! They've proved to themselves that *there's more money in Rohn Towers and accessories than any other line!* Rohn Towers now *dominate the field* and profits for those handling this line are better than ever. Why? Because Rohn offers profits in all 3 major tower fields:

# 1

## HOME TV

By far the biggest usage of Rohn products has been and still is for home TV installations. In addition to finest of self-supporting towers, the Rohn line includes telescoping masts, tubing, roof towers and all other types of accessories for installations of all kinds. Wise dealers and servicemen rely *entirely* on the Rohn line for *all* installation requirements. This means **BIGGER PROFITS.**



# 2

## COMMUNICATIONS

Many distributors, dealers and servicemen are making **EXTRA PROFITS** by stocking or handling the heavier type Rohn Towers that are suitable for communications purposes. There is a demand in *every area* for radio communications towers, micro-wave towers, radio telephone towers and industrial towers. You can supply this need in your area. Special new literature is available for your use.



# 3

## AMATEUR USE

Another major field of usage for Rohn Towers is in the field of amateurs and experimenters. The especially designed "fold-over" tower is the *best in the field* for the amateur because it allows working on the antenna *on the ground*. Thousands of amateurs use Rohn Towers with a tremendous demand still to be sold. You can supply this demand in your area and capture **BIG PROFITS** for yourself.



Send the coupon or write or phone today for the field that you are neglecting or those that interest you the most. ▶

## ROHN Manufacturing Company

116 LIMESTONE, BELLEVUE  
PEORIA, ILLINOIS Phone 4-9156

## look at these ROHN exclusives

### ● HOT DIPPED GALVANIZED

The finest, most durable finish is available for ROHN Towers and accessories . . . all done entirely on the ROHN premises under careful ROHN supervision.

### ● UNEQUALLED DESIGN AND ENGINEERING

ROHN is the only design that has stood up over the years. ROHN has been first and foremost . . . and always the *leader* in new products to meet the changing demands.

### ● MASS PRODUCTION FOR LOW COSTS

ROHN was the first to utilize mass production techniques to build a superior tower at the most competitive prices. This means no sacrifice in quality yet far greater profits for you.

### ● UNIVERSAL CUSTOMER ACCEPTANCE

Thousands and thousands of installations prove the ROHN line first in customer satisfaction.

### ● PIONEER MANUFACTURERS

Pioneers in tower manufacturing—and today one of the world's largest manufacturers of this type equipment. The ROHN Company was built on satisfaction on the part of distributor, dealer and customer alike.

### ● COMPLETE LINE

Only ROHN offers a full line—*one* dependable one-stop source for all TV installation equipment. Save headaches, save shipping costs, save time . . . use ROHN unequalled service *exclusively*.

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116 Limestone, Bellevue

Peoria, Illinois

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## ASSOCIATION NEWS

### RTA, Pasadena, Calif.

RON KEALY has been elected president of RTA, Pasadena. Other officers include *Wayne Hartwell*, first vice president; *Ben Leff*, second vice president and CSEA delegate; *Don Page*, secretary; and *Tom Suechika*, treasurer.

• • •

### RTA, San Gabriel, Calif.

RTA, SAN GABRIEL, has chosen *George McCreary* as president; *Leonard Hoestetter*, vice president; *Dan Tomago*, secretary; *Phil Elfenbein*, treasurer; and *Jack Brown*, CSEA delegate.

• • •

### CSEA, California

FRED S. ABRAMS, JR., has been named chairman of the Board of Delegates of the California State Electronics Association.

• • •

### RTTG, Miami, Fla.

PARKER A. LATTA was elected president of the Radio Television Technicians' Guild at a recent meeting. *John J. Petruff* was named first vice president; *James J. Ross*, second vice president; *Samuel Kessler*, recording secretary; *Larry Lawrence*, corresponding secretary; and *Ed Stevens*, treasurer. Chosen as members of the board of directors were *Charley Minter*; *Dan Prowler*; *Roger Misleh*; *Jack Schinn* and *Stanley Seymour*. Carry over members of the board are *Jim White* and *Shan Desjardins*.

• • •

### TESA, Missouri

A RECENT MEETING of TESA featured a series of seminars on Service Business Operations, Transistor Operation and Service, and Servicing Instrument Research.

Plans were made for the NATESA Spring Convention in Columbia, Mo., on April 26 and 27. TESA Missouri will serve as host for the meeting. *Jack Mulford* heads up the program committee.

New officers of TESA are *Ed Engle*, president; *Dennison Houghton*, Northeastern vice president; *M. C. Crane*, Northwestern vice president; *W. A. Pryer*, Southwestern vice president; *E. Carroll*, Southeastern vice president; *Carrol King*, secretary; and *Carl Adcock*, treasurer. Elected members of the board of directors were *Robert Matteson*, *Howard J. Freiner*, *Wayne Lemons*, and *Arrent Patterson*.

• • •

### RTG, Long Island, N. Y.

AT A RECENT technical meeting of the Radio and Television Guild a group of speakers from JFD Electronics Corporation presented a program on selling up to a better antenna system, particularly for color installations. Participating in the program were *Marty Bettan*, JFD sales rep; *Herb Yassky*, sales manager; *Si Holzman*, chief engineer; and *Jim Sarayiotis*, advertising manager.

**SDA, Walnut Creek, Calif.**

A GROUP OF service dealers has set up a new association in Walnut Creek and named *Wesley Keys* as temporary chairman. He was instructed to appoint a committee to study bylaws of other associations and to employ an attorney to draw up corporation papers.

• • •

**AREA, New York City**

AT THE SECOND ANNUAL election of the Auto Radio Electronics Association, Inc. *Edward Eisen* was named president. Other new officers of the group are *Jerry Solow*, vice president; *Isidore Saltzman*, treasurer; and *Robert Silagi*, counsel and executive secretary. Members of the executive board are *Morris Zegareck*, *Dominick Monaco*, *Joseph Guarino* and *Julius Avruck*.

Silagi reported on progress made in '57 towards stabilizing prices on auto radio repair work and eliminating warranty abuses.

• • •

**TSADV, Philadelphia, Pa.**

AT A RECENT meeting the Northeast Television Service Dealers Association, the Philadelphia Radio Service Men's Association and the Television Service Dealers Association of Philadelphia voted to unite in a new organization, the Television Service Association of Delaware Valley.

Officers of the consolidated group are *Ray Cherrill*, president; *John McCloy*, vice president; *Harvey Morris*, secretary; *Louis J. Smith*, corresponding secretary; and *Jack Rubin*, treasurer. *Sam Brenner*, *Ray Fink*, *Al Haas*, *Charles Knoell* and *Ralph Newby* were elected to the board of directors.

---

**TEN YEARS AGO IN SERVICE**

JOHN BARSOPHY, corresponding secretary, reported that the Associated Radio Service Men of Central Pennsylvania were attending television classes conducted twice weekly by the Williamsport Technical Institute. To supplement this training a series of talks by engineering personnel of set manufacturers was inaugurated. First speaker in the series was *William D. Prusinowski* of Motorola. . . . The Akron, Ohio, Radio Technicians Association unanimously adopted the Code of Ethics presented at the earlier Philadelphia Town Meeting of Radio Service Men's Associations. The possibilities and limitations of television were discussed at a meeting featuring a talk by *Earl Whidden*, Westinghouse field representative. . . . The Lehigh Valley Radio Servicemen's Association held its 15th annual banquet in Phillipsburg, N. J. Arrangements for the affair were handled by *Hank Fillman*, *Phil Rothstein*, *Gordon Jacoby*, and *Stanley Eisenhard*. . . . The Radio Technicians Guild of Rochester, N. Y., has announced a monthly publication, the *Oscill-O-Gram*. Members of the group were attending five-hour monthly television classes conducted by *Al Saunders*. Additional discussions of the more difficult TV circuits were headed by *Carl Putnam* and *Harry Eskin* of the RTG educational staff. . . . A report on high-gain antennas for TV reception in fringe areas appeared in *SERVICE*. . . . *Sidney L. Chertok* was appointed sales promotion manager of Solar Manufacturing Corp and Solar Capacitor Sales Corp.

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CHOOSE  
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**LOW  
IN CALLBACKS**



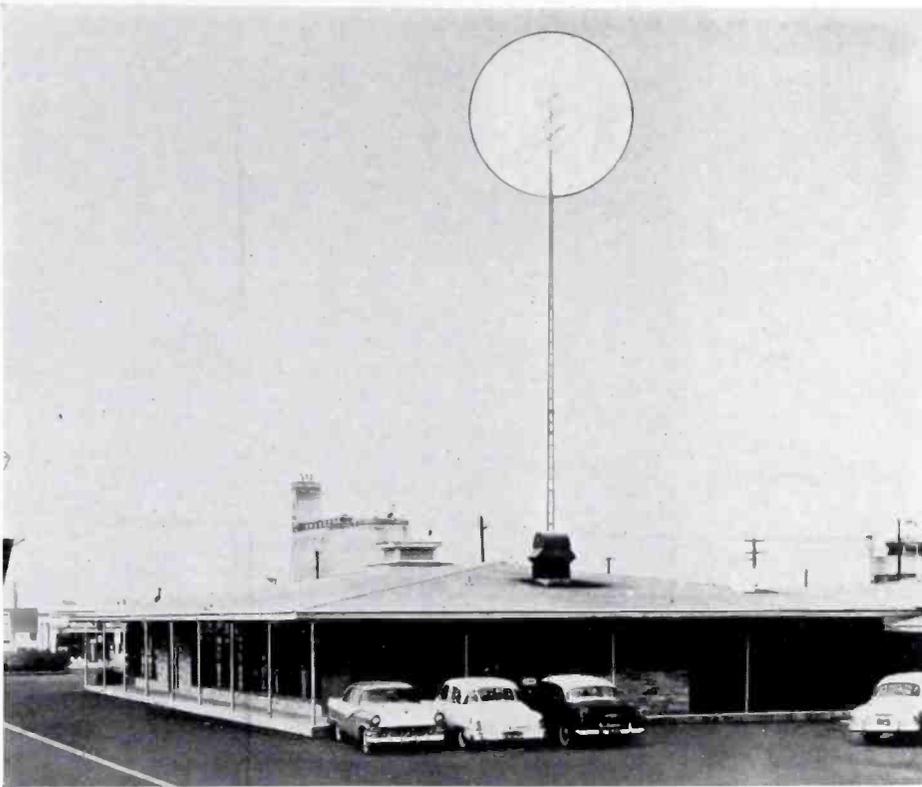
**TUNG-SOL®  
RECEIVING TUBES**

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NEWARK 4, NEW JERSEY

# Installing

## A Description

## High-Gain



**MASTER ANTENNA TV SYSTEM** installed at Holiday Inn Motel on Highway 51, Jackson, Mississippi.

by TOM SHEA

Sales Engineer, Blonder-Tongue Laboratories

MOST OWNERS AND MANAGERS realize that installing a master TV or central antenna system is far superior to providing individual antennas for each TV set. A maze of 20 or more antennas destroys the otherwise neat outward appearance of a motel. Such unsightliness can only be avoided by the installation of a master antenna to feed a TV distribution system. This results not only in improved external appearance but also provides better TV reception at lower cost.

There are today approximately 60,000 motels throughout the United States. Moreover, this total has been increasing by about 10% per year since the end of World War II. Because many of these motels are new and are anxious to provide conveniences like TV for their guests, they provide an excellent market for Service Men who are equipped to install master antennas. In many cases, too, the motel owner will permit whoever installs the master antenna to service all the sets in the motel on a contract basis, providing an additional income for the Service Man.

Improved appearance is not the

only benefit to be derived from using a master antenna. Other reasons cited by motel men in its favor are lower installation and maintenance costs over individual antennas, longer life, and less danger of damage to roof tops.

A typical master antenna system is described here. This system can be used, with only minor modifications, in over 90 percent of the motels now in existence.

### Head End

The head end of the system con-

sists of a broad-band antenna, an impedance matching transformer, a lead-in, an amplifier, and a line splitter. (See figure 1.)

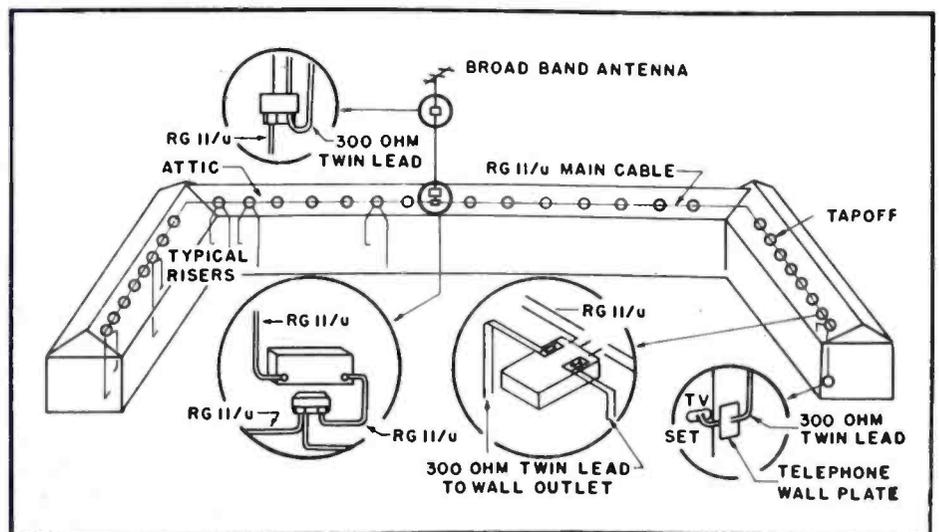
The antenna is a standard 300-ohm broadband VHF type suitable for the area. A 4-ft. length of 300-ohm twin lead interconnects the antenna with a mast-mounted, weatherproofed impedance matching transformer.<sup>1</sup> This is used to match the 300-ohm impedance of the antenna to the 75-ohm impedance of the RG 11/U coaxial cable down lead-in.

Coax cable (see Fig. 2) is recommended for use as the lead-in. This will reduce noise pickup where the signal is at its weakest strength and might cause degradation of the signal-to-noise ratio. A ratio of 10 to 1 is considered sufficient to insure acceptable snow-free reception.

The heart of the system is the amplifier. A typical amplifier<sup>2</sup> has a matched 75-ohm coaxial connector input and an output matched to operate with a 75-ohm impedance load. The

<sup>1</sup>Such as Blonder-Tongue type MB.

<sup>2</sup>Blonder-Tongue type MLA.



**FIG. 1: TYPICAL MASTER antenna system** suitable for installation in a motel.

# Master TV Antenna System In Motels

*of a System Utilizing Impedance-Matching Transformer and Amplifier Suitable for 90% of Existing Motels*

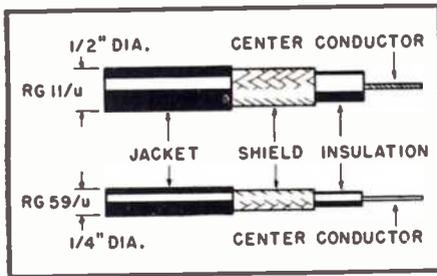


FIG. 2: COAX CABLE types used in antenna installation.

gain of this 7-tube cascode amplifier is 37 db, which represents a voltage gain of seventy times. The frequency response curve of the amplifier is within 1½ db, thus making it capable of passing quality color TV (see Fig. 3).

Incorporated in this amplifier, which has a maximum *rf* output of 1.25 volts per band, are two separate non-interacting circuits with controls for each. One is for the high band (channels 7 through 13); the other for the low band (channels 2 through 6).

The output of the amplifier is connected with a 2-ft. section of RG 59/U coaxial cable to a coaxial line splitter.<sup>3</sup> The line splitter should have a sufficient band width to pass both the low- and high-band VHF frequencies. Its purpose is to split the line into two outputs, providing cable runs in two directions. This type of line splitter results in a 3-db loss at each outlet with respect to the input signal strength. However, as opposed to a simple tee, it provides optimum impedance match and 14-db isolation between branch lines.

The amplifier and line splitter are mounted in the attic, and should be centrally located in the motel to maintain a balance between the losses

incurred in each branch line. The antenna and impedance matching transformer are mounted on the roof.

## Distribution

The distribution section of the system performs the function of distributing the now amplified signal to the individual antenna terminals of the television receivers in the motel. The distribution section is composed of two 300-ft. RG 11/U coaxial cables, 30 tapoffs, 900 ft. of 300-ohm twin lead, 2 line terminations, and 60 wall plates. As both branch lines are simi-

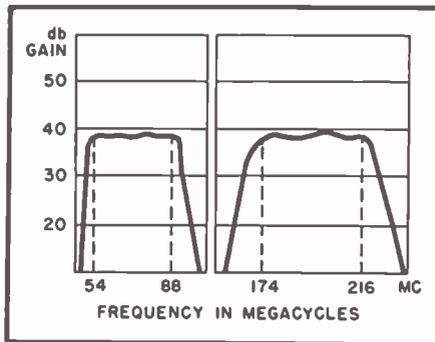


FIG. 3: FREQUENCY RESPONSE curve of 7-tube cascode amplifier.

lar in nature, the makeup of only one will be discussed here.

The branch line which originates from one output of the splitter is an RG 11/U coax cable. It runs horizontally through the center of the attic, interconnecting each of the 15 tapoffs. The purpose of the cable is to provide low loss transmission of the TV signal to each tapoff. Therefore, the low-loss RG 11/U cable is used, rather than the high-loss, RG 59/U cable (see Fig. 2). The last link in the system is the tapoff. This unit accepts a small portion of the signal for the TV set while allowing the major portion of the TV signal to continue down the line to the other tapoffs.

Two distinct types of losses result from the use of the tapoff. The *isolation loss* is the attenuation value of

the isolation between the main cable and the TV set outlet cable. The *insertion loss* is the attenuation of the signal incurred in the main cable run because of the insertion of the tapoff in the line.

A typical standard tapoff<sup>4</sup> has a 17-db isolation loss and ½-db insertion loss. This tapoff provides for two 300-ohm impedance outputs from the 15-ohm impedance coax line, which permits utilization of 300-ohm twin lead to connect the tapoff to the TV set antenna terminals. As two outlets are provided from each tapoff, the tapoff must be centrally located and mounted above the two wall outlet locations. This minimizes the length of 300-ohm cable that is run in the sidewall through a plastic telephone-type outlet plate to the TV antenna terminals. (See Fig. 4.)

The end of each branch line must be terminated with a 75-ohm ½-watt carbon resistor to properly match the line impedance. This resistor can be mounted at the last tapoff between the center conductor and ground in lieu of continuing the RG 11/U cable.

<sup>4</sup>Blonder-Tongue type TO 2-300.

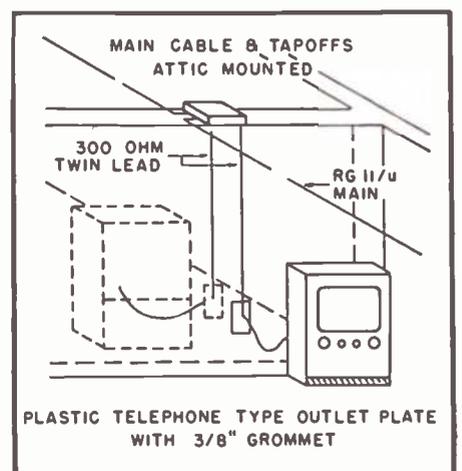
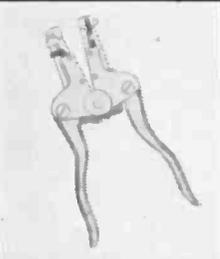


FIG. 4: CABLE RUN through outlet plate to TV antenna terminals.

<sup>3</sup>Such as the Blonder-Tongue MDC-2.

# GE Speedex Wire Strippers



## SPEEDEX STANDARD MODELS

Economy styles for most wire stripping requirements. Choice of 10 models to meet all wire sizes. Hardened steel cutting blades are interchangeable.

"733" Series Strippers

List \$6.60

## SPEEDEX AUTOMATIC MODELS

Fully automatic "delayed action return" models that prevent crushing of fine stranded wires. Interchangeable hardened steel blades. Choice of 12 models.

"766" Series Strippers

List \$8.25

## SPEEDEX STRIPPER KITS

Complete kits with stripper and 7 different size cutting blades. Strip all wire from #8 to #30.

Ask your G-C jobber.



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Division of Textron, Inc. Los Angeles—Rockford, Illinois

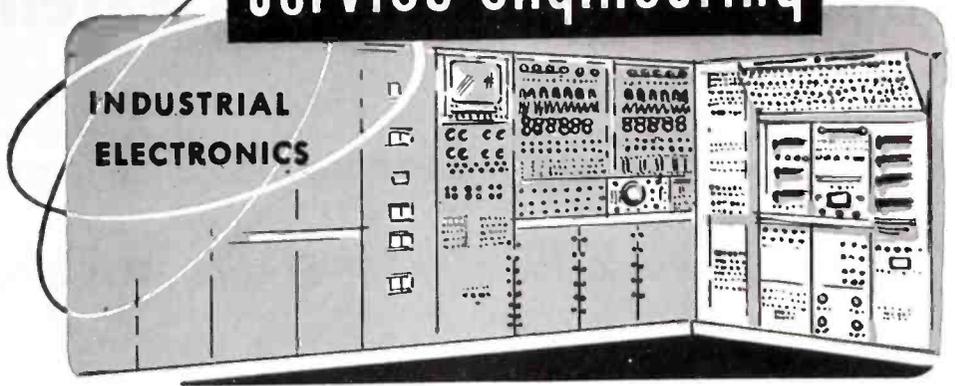
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"You're using my Jensen Needle again, I see."

# service engineering

## INDUSTRIAL ELECTRONICS



## An Analysis of Circuitry, Operation and Servicing of Magnetic Tape Dictating Machines

by HAROLD B. MCKAY and LEO G. SANDS

THE GENERAL OPERATING principles of magnetic tape dictating machines discussed in an earlier report,<sup>1</sup> are essentially the same as those of the home-type or professional tape recorders. However, there are some marked differences; one of these is the erasing procedure.

While many dictating machines make use of a high-frequency bias to erase recordings previously made on the magnetic tape, a number of them do not. This principle, which is almost universally used in general tape recording, automatically erases the old recording as the new one is being made. However, one dictating machine,<sup>2</sup> which uses a wide belt of magnetic material for the recording, may be erased by holding a magnetic erase bar against the belt while it travels through one excursion.

Thus a record once transcribed can be erased in a single turn of the machine, eliminating the possibility of unauthorized persons listening to it.

Among the earlier difficulties encountered when recording on wire was that wire was difficult to handle. It is often twisted and presented the magnetic field in a different direction in playback than it had in recording.

Handling problems were solved by the use of magazines, and the matter

of twist, within limits at least, was solved by recording longitudinally on the wire.

The use of flat metal tapes also presented mechanical difficulties in the earlier days of magnetic recording.

In the wide-belt model<sup>3</sup> two stages of amplification are used. This has been found to provide ample gain from microphone to the recording head which is biased by a 20-kc erase oscillator. Four stages of amplification are used in transcribing. A 6AK6 output drives the loudspeaker. The earphone is inserted into the circuit ahead of the power amplifier stage.

The recording-playback head has an impedance of 2000 ohms at 1000 cps and 26,000 to 34,000 ohms at 20 kc, the bias-erase frequency. The dc resistance is about 500 ohms. The recorded track is .014" wide; the gap between poles is .00025".

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Frequent flashing of the lamp is an indication of continuous overloading and distortion. Proper recording will cause occasional momentary flashes on voice peaks. Proper recording level can be maintained by adjusting the volume control to suit the speaker's voice.

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Because of the low-power requirements, this recorder is widely used in automobiles. A vibrator-type inverter is used to convert 6 or 12 volts

*dc* to 117 volts *ac*.

### Portable Machines

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(Continued on page 46)

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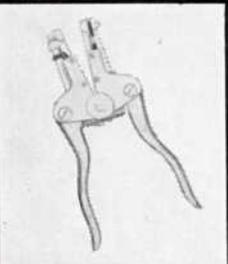
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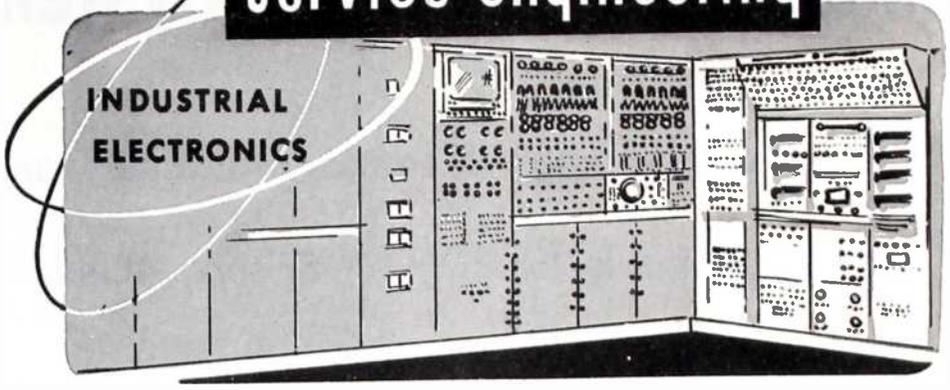
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## INDUSTRIAL ELECTRONICS



## An Analysis of Circuitry, Operation and Servicing of Magnetic Tape Dictating Machines

by HAROLD B. MCKAY and LEO G. SANDS

THE GENERAL OPERATING principles of magnetic tape dictating machines discussed in an earlier report,<sup>1</sup> are essentially the same as those of the home-type or professional tape recorders. However, there are some marked differences; one of these is the erasing procedure.

While many dictating machines make use of a high-frequency bias to erase recordings previously made on the magnetic tape, a number of them do not. This principle, which is almost universally used in general tape recording, automatically erases the old recording as the new one is being made. However, one dictating machine,<sup>2</sup> which uses a wide belt of magnetic material for the recording, may be erased by holding a magnetic erase bar against the belt while it travels through one excursion.

Thus a record once transcribed can be erased in a single turn of the machine, eliminating the possibility of unauthorized persons listening to it.

Among the earlier difficulties encountered when recording on wire was that wire was difficult to handle. It is often twisted and presented the magnetic field in a different direction in playback than it had in recording.

Handling problems were solved by the use of magazines, and the matter

of twist, within limits at least, was solved by recording longitudinally on the wire.

The use of flat metal tapes also presented mechanical difficulties in the earlier days of magnetic recording.

In the wide-belt model<sup>3</sup> two stages of amplification are used. This has been found to provide ample gain from microphone to the recording head which is biased by a 20-ke erase oscillator. Four stages of amplification are used in transcribing. A 6AK6 output drives the loudspeaker. The earphone is inserted into the circuit ahead of the power amplifier stage.

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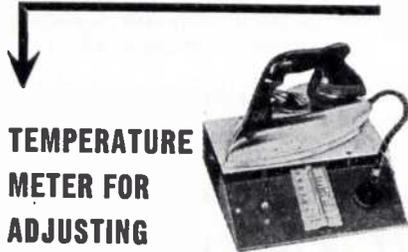
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## Parabolic Antenna Design

(Continued from page 24)

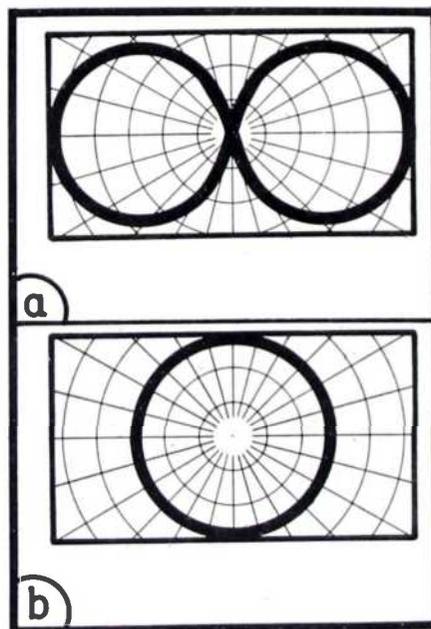
ualized as a solid optical mirror, carefully curved in accordance with a prescribed formula, picking up and reflecting signal in precisely the same manner as a mirror picks up and reflects light. Following this analogy, it can be seen that all the pickup is from one direction only, and there is absolutely no pickup from the rear.

Inasmuch as the parabolic screen presents no electrical difficulties, most of the engineering problems revolve about the feed system. As with all antennas, the two qualities sought in the *uhf* parabolic design were high gain and good directivity. Meeting these objectives meant solving two basic engineering problems.

The first involved the development of a feed system with a wide beam which would remain constant over the entire *uhf* range.

Beam width can be defined as the angle at which the response of the dipole falls 3 db (half power) from the peak. It is the natural tendency of antennas to have narrower beams as frequency increases. Normally, narrow beam width is a highly desirable characteristic. But in a parabolic antenna design, one faces a paradox; we want a *wide* beam in the feed system because the dipole should pick up signal reflected from the *entire surface of the screen*.

This will prompt many to say that a wide beam means low gain. This is so; however, in a parabolic antenna, it is the screen, *not the dipole*, which provides the gain. Since the screen picks up the signal, the dipole must be



FIGS. 2a and b: A horizontal polar pattern of a simple dipole is shown in a; in b we have a vertical polar pattern of a simple dipole.

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designed with as wide a beam width as necessary to pick up as much reflected signal as possible. The natural tendency of an antenna to have a narrower beam as frequency increases would prevent the dipole from picking up all the reflected signal. Only the signal reflected from the center of the screen would be picked up, while the signal reflected from the outside of the screen would be lost.

This can perhaps be visualized more readily by considering the antenna as a transmitting antenna. We are permitted to do this by the theory of reciprocity which states that the patterns of an antenna are identical regardless whether the antenna is used for receiving or transmitting. The distribution of signal for a hypothetical antenna on the lower frequencies, where the beam is wide enough to illuminate the entire surface of the screen is illustrated in Fig. 1a. Signal distribution of the same antenna on the *higher* frequencies where the dipole has asserted its natural tendency toward a narrower beam is shown in Fig. 1b. This action causes only part of the screen to be illuminated by signal. The outside surface of the screen is not being utilized.

This tendency must be overcome

by varying the design of the feed system. Fig 1c reveals what would happen if the dipole pattern were *over-corrected* and made too wide. It can be seen that some of the signal is bypassing the screen, and is not being utilized. The final pattern, after the design has been modified to achieve the desired result, without affecting the lower frequency pattern (Fig. 1a) is illustrated in Fig. 1d. With the beam width now held constant, the entire screen is *illuminated* over the full range of *uhf* frequencies.

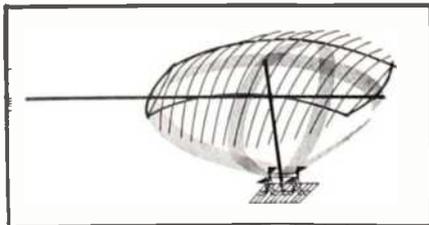
In the case of a receiving antenna, Fig. 1b means that the narrow angle of the antenna prevents signal pickup from the entire screen area, whereas Fig. 1c shows that all of the signal captured by the screen is reflected onto, and utilized by, the feed system.

The second problem concerned the technique that would be used to keep both the horizontal and vertical beams of the feed system the same width.

Although in everyday use Service Men are normally concerned only with the horizontal pattern of an antenna, they are nevertheless aware that the antenna also has a vertical pattern. The horizontal pattern of a simple dipole is a figure 8; Fig. 2a. Its vertical pattern is circular or omnidirectional; Fig. 2b. Because the feed system is receiving its signal from a round screen, its horizontal and vertical beam widths must be matched as closely as possible so that it will have equal sensitivity in virtually every forward direction, Fig. 3.

This was effectively accomplished in the new antenna by backing up the dipole with a small flat screen, which cut out the rear lobe. This was found to have only a slight effect on the forward lobe of the horizontal pattern. However, it changed completely the circular vertical pattern to a broad single lobe similar to the horizontal shape. Stacking the dipoles narrowed the vertical pattern further, and brought both the horizontal and vertical beams still closer together in width.

An interesting feature of the parabolic *uhf* antenna is the small screen



**FIG. 3: A DIAGRAMMATIC presentation showing the achieved result. Both vertical and horizontal beam widths have been matched so that the dipole can receive signals with equal efficiency from all points of the round screen.**

on the forward end. Actually, this screen is at the *rear* of the antenna's feed system, and its existence is vital to the performance of the antenna.

Accordingly, the screen performs a key function in keeping the beam width constant over the full frequency range. It eliminates signal pickup from the rear of the feed system (front of the antenna). Since only reflected signal is utilized, signal coming direct might arrive out of phase with the reflected signal. And by eliminating pickup from the rear of the feed system, the sensitivity of the

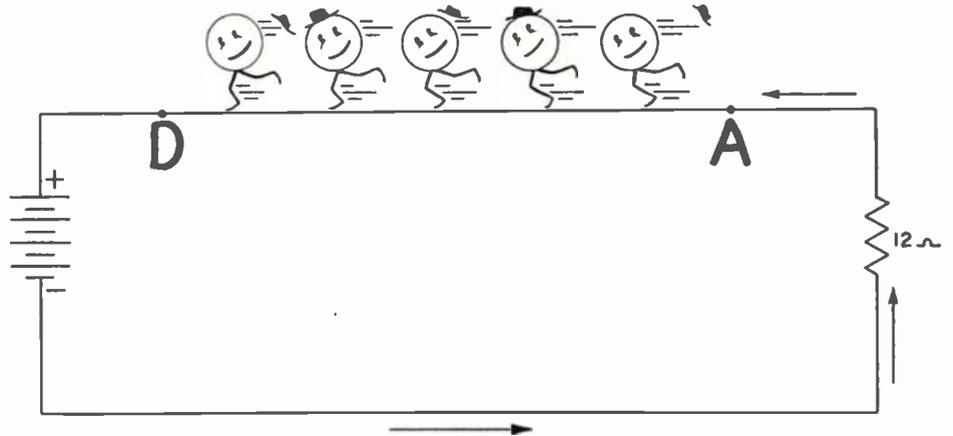
dipoles is increased.

The size of this screen posed a critical engineering problem. It had to be large enough to perform the foregoing functions efficiently, yet small enough to avoid blocking the aperture of the screen and creating a *blind spot*.

As stated earlier, the area of the parabolic screen determines the overall gain of the antenna. In designing this parabolic model, engineering adopted a 6 ft. diameter. The antenna has been found to have a gain of 14.5: 19.1.

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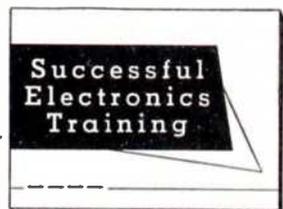
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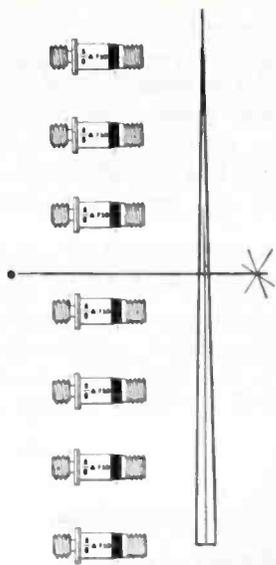
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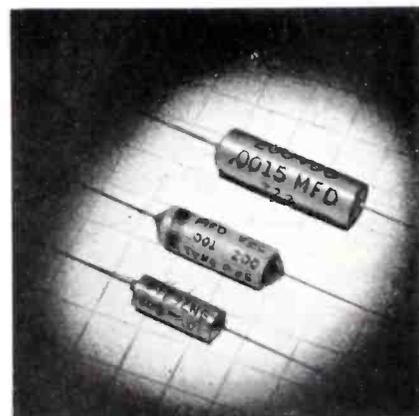
How small is *small* in capacitors? The question should be dated, for the answer is revised almost monthly.

Off to a good start as the economical filter capacitor, the electrolytic type lends itself to progressive shrinkage especially by way of etched foil and electrolyte advances. Every time we believe the limit has been reached, a new refinement sets brand new standards.

The familiar can type an inch or more in diameter, and several inches tall, has been making way for latest designs of a fraction of an inch in diameter and an inch or less tall. Yet for all that shrinkage the performance characteristics remain at a high level.

Typical are the diminutive electrolytics<sup>o</sup> designed for transistorized and miniaturized electronic circuitry where high capacitance at low voltage ratings is required. The construction here includes an insulating case that is plastic-lined and plastic end-sealed for maximum life. The etched-foil section features highest purity aluminum for foil and tabs, and chemically-pure separators, to achieve low power factor and low *dc* leakage. One type<sup>1</sup> has axial end pigtail leads, with positive polarity indicated on case and by red end-fill, while another<sup>2</sup> has terminal leads at one end only, with positive polarity indicated on case, for printed circuitry. Sizes range from  $\frac{1}{4}$ " to  $\frac{3}{8}$ " *d* by  $\frac{3}{8}$ " to 2" *l*. These capacitors are for low-voltage applications, in ratings of 3 to 50 *vdcw* and capacitance values of 1 to 500 mfd. Internal tab-to-lead connections are welded to provide positive operation at low voltages.

The metal-case feature is retained



**MINIATURIZED PAPER CAPACITORS:**  
Top—Metal-cased paper tubular with special oil impregnant. Center—Tiny paper tubular resin-impregnated. Bottom—Metallized-paper capacitor in metal can with glass end-sealing. Background of  $\frac{1}{4}$ " squares for size comparison.

# is Small in Capacitors?

Aerovox Corporation

even in some of the smallest electrolytics. In an earlier step in the shrinkage trend, capacitors<sup>3</sup> featured ratings from 3 to 150 vdcw and capacitance values of 25 to 250 mfd in metal-can containers of  $\frac{3}{8}$ " to  $\frac{1}{2}$ " d by 1" to 1 $\frac{1}{8}$ " l. A further shrinkage produced the types<sup>4</sup> in ratings of 3 to 25 vdcw and values of 1 to 100 mfd in a miniature hermetically-sealed aluminum can. Again, welded tab-to-lead connections were employed.

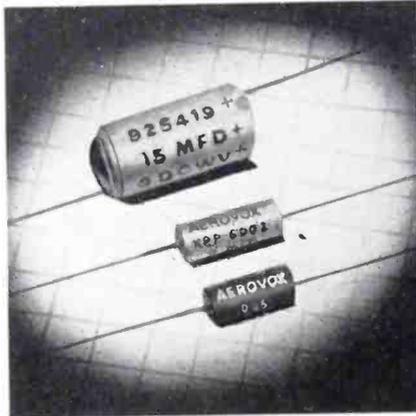
Turning from metal to ceramic casing, we have the type<sup>5</sup> designed specifically for use in ultra-compact assemblies where an insulated casing is desirable. Here again we are dealing with low-voltage applications; 3 to 50 vdcw and capacitance values of 1 to 500 mfd, in sizes of  $\frac{1}{8}$ " to  $\frac{3}{8}$ " d by  $\frac{3}{8}$ " to 2" l.

A departure from conventional electrolytic practice is provided by wire

tantalum capacitors.<sup>6</sup> Because of their small size and performance, they are ideally suited for the ultimate in miniaturized assemblies such as transistorized assemblies.

Typical sizes for the insulated style are .095" d and  $\frac{1}{8}$ " l for 4 v 2-mfd and

(Continued on page 42)



**MINIATURE ELECTROLYTICS:** Top — Typical miniaturized electrolytic. Center — Pee-wee in hermetically-sealed can. Bottom — Micro-miniature metallized-paper in thermo-plastic case. Background of  $\frac{1}{4}$ " squares for size comparison.

<sup>1</sup>Such as Aerovox types TNE<sup>1</sup> and TNED.<sup>2</sup>

<sup>3</sup>Aerovox Bantam SRE.

<sup>4</sup>Aerovox XXP. <sup>5</sup>Aerovox Pee-Wee PWE. <sup>6</sup>Such as Aerovox WT.

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## Capacitors . . .

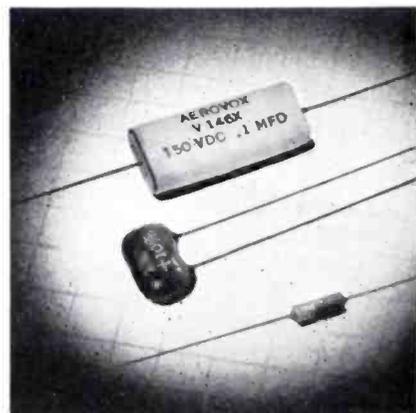
(Continued from page 39)

4 v 4-mfd units. These tantalum capacitors are lead mounted and available in polarized type only. Such a capacitor consists of a high-purity tantalum anode and a fine silver cathode with specially selected electrolyte and seal and spacer materials. The case and attached lead form the cathode terminal and are uninsulated. The anode tantalum wire extends through a bushing and is attached to a solderable lead with welded connection. A thermosetting resin embedment encases the welded joint for maximum protection. An insulating plastic sleeve slips over the case when desired.

Although the electrolytic capacitor is synonymous with compactness, there are applications where other dielectrics are required. Fortunately in the interests of further shrinkage new dielectrics are constantly being developed.

Thus the metallized-paper capacitor has come to play an important role in miniature assemblies, particularly for high-temperature conditions. To illustrate, there is the metallized-paper tubular hermetically sealed in a metal tube with glass end-seals soldered in the case for positive moisture exclusion. This type has been designed to meet critical operating temperatures and the need for increased reliability. Sizes range from .175" to 1"  $d$  by  $\frac{1}{2}$ " to 2 $\frac{1}{4}$ "  $l$ ; in voltage ratings of 200, 400 and 600, and capacitance values from .0005 to 2 mfd, standard. Case-grounded units are available with plastic insulating jacket.

The space-saving advantage of metallized paper is also available in wax-impregnated cardboard-sleeve units with metal end-caps,<sup>8</sup> and with end fills.<sup>9</sup> Both types are of extended-electrode construction for low-impedance requirements, in 200, 400 and



**ASSORTED MINIATURES: Top—Wrap and fill Mylar dielectric flattened tubular. Center—Plastic-coated dipped mica. Bottom—Tantalum wire capacitor.**

600 *vdcw* ratings, and .01 to 2 mfd. Measurements range from 3/16" to 23/32" *d* by 1/8" to 2 1/2" *l*.

Still further size reduction takes place in micro-minatures,<sup>10</sup> also featuring metallized-paper section and hyvol K impregnant, in a humidity-resistant molded thermo-plastic casing. Capacitance ranges are .004 to .04 mfd, and ratings of 200 to 600 *vdcw*; sizes from 3/16" to 1/4" *d* by 7/16" or 9/16" *l*.

#### The Latest In Paper Capacitors

Recent advances in paper dielectrics and impregnants are reflected not only in the smaller-sized paper capacitors presently available, but also in metallized-paper and film dielectric equivalents. The original paper tubulars become veritable giants alongside today's miniature and micro-miniature versions. *Wrap and fill* film type capacitors,<sup>11</sup> for instance, offer reduced size with excellent electrical characteristics. The case is rectangular—practically a flatted tubular—consisting of a synthetic film wrapped over the film dielectric section, and with ends sealed with plastic resin. High insulation resistance, high operating temperature, low power factor and substantial resistance to moisture are characteristics of this new type. Sizes range from 3/16" thick by 5/16" wide by 13/16" long, to 11/16" thick by 1 3/32" wide by 2 7/16" long. Capacitance values of .001 to 1 mfd, and ratings of 150, 400 and 600 *vdcw*.

Time-honored micas also have a bid in for size reduction, notably with the plastic-coated dipped types.<sup>12</sup> Radial leads, small size, high temperature operation, silver-mica construction plus a rugged dipped-plastic casing give the mica capacitor a brand new look. Available in values of 5 to 1200 mmfd and working voltage of 500. Sizes of 15/32" to 3/4" long by 5/16" or 15/32" wide by 7/32" maximum thickness.

Now available too is a ceramic capacitor<sup>13</sup>—a tubular unit with pigtail axial leads—whose sizes range from .090" maximum *d* to .310," x .320" to .750" maximum *l*; in voltage ratings of 100 *vdcw* (500 *vdct*) and 30 *vdcw*. Insulation resistance is greater than 10,000 megohms. Capacitance values are .001 to .1 mfd.

<sup>10</sup>Aerovox type P123ZC. <sup>11</sup>Aerovox P8ZZ. <sup>12</sup>Aerovox P9ZZN. <sup>13</sup>Aerovox P83Z.

<sup>10</sup>Aerovox V146X.

<sup>11</sup>Such as the Aerovox type ADM.

<sup>12</sup>Aerovox Cerafil.

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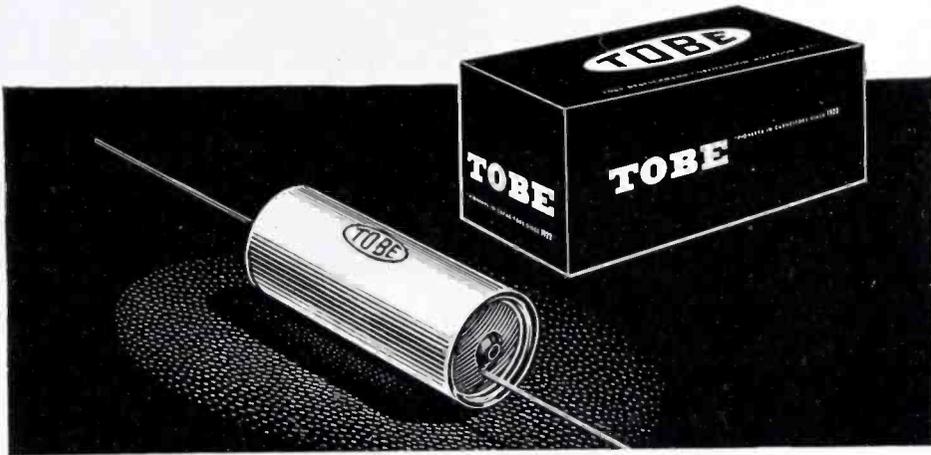
Next time an auto-radio vibrator replacement is called for, try Radiart. There's a complete line for all 6-volt and 12-volt applications. And no waiting for the type you want, because your local Radiart Distributor maintains a full stock for your convenience. Ask him for your free copy of the Radiart Vibrator Replacement Guide, or write to Dept. S-4, The Radiart Corporation, Indianapolis 5, Indiana.



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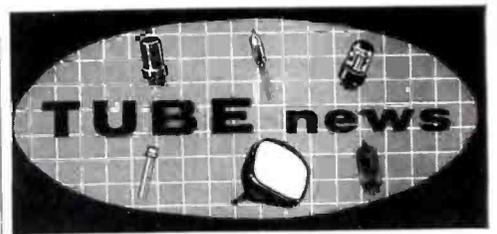
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I enclose a Tobe boxtop



### Replacement Tubes for B-W and Color-TV, Auto Radio and Hi-Fi Amplifiers

#### Miniature TV Triode-Pentodes

A 9-PIN triode-pentode miniature (6EB8) designed for b-w TV receivers has been announced by Sylvania. The tube features a high mu triode section which can be used as a voltage amplifier or sync separator, and a pentode section for video amplifier service.

The pentode section, is designed with a controlled low plate knee characteristic, a factor said to insure a maximum range of contrast from high whites to low blacks.

#### TV Replacements

FOUR TV TUBES have been added to the Raytheon replacement line; 6BN8, 6BW8, 6CY7 and 6DS5.

The 6BN8, a miniature heater-cathode type high-mu triode and double diode designed for color and b-w receivers, has a 600-ma heater for *series-string* sets.

The 6BW8, also a miniature heater-cathode type, features duplex-diode sharp-cutoff pentode construction, with the diode section serving as a horizontal phase detector and the pentode section used as a sound if amplifier, sound limiter, and automatic gain control keyer. This tube has a 450-ma heater rating for *series-string* receivers.

The 6CY7, a heater-cathode type double-triode of miniature construction has been designed for use as a combined vertical-deflection oscillator and amplifier. It is identical to the 8CY7, except that it has a 750-ma heater rating for *series-string* receivers.

The last tube, 6DS5, is a beam power miniature with a heater cathode, designed for use in the audio output stages of TV and radio receivers. It has an 800-ma heater rating.

*Twelve-Volt Miniatures*

TWO 12-V MINIATURES (12EC8 and 12EK6) for auto radios and FM chassis, have also been developed by Sylvania.

Type 12EC8, a combined medium-mu triode and sharp cutoff pentode, has been designed to serve as a mixer for FM hybrid communications receivers. It is said to afford good mixing action through the 100 mc and FM band, and because each section has its own cathode greater flexibility of circuit design is possible.

The 12EK6, a sharp cutoff pentode can be used for *rf* or *if* amplifier service in AM and FM hybrid auto receivers.

*AF High-Mu Twin Triodes*

A HIGH-MU TWIN TRIODE (7025) of the 9-pin miniature type, for use in high-fidelity audio amplifiers, has been introduced by RCA.

This tube was developed for critical audio designs where low noise and low hum are primary considerations.

**Service Notes**

*(Continued from page 26)*

out picture with the spacing between the wedge lines fogged and tuning in the opposite direction causes the spaces between the lines to clear up. However, going beyond this point causes the picture to take on a *wormy* appearance from sound getting into the picture. Correct adjustment is obtained by tuning to the *wormy* picture and then backing the control off slightly until the picture clears up.

*A G C Adjustment*

To adjust *agc* in Zenith TV sets the delay control should be turned slowly until a point is reached where the picture distorts and buzz is heard in the sound. The control should then be backed down from this position and set at a point comfortably below the level of intercarrier buzz, picture distortion and improper sync. This setting will correspond to approximately 3 v peak-to-peak output from the video detector.

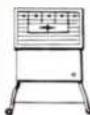
Misadjustment of the *agc* control can result in a washed-out or distorted picture, buzz in the sound or complete loss of picture and sound.

# WIN THIS FORD



## RANCH WAGON

*Or one of 49 other valuable prizes*



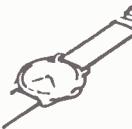
Here's all you do . . . In 25 words or less, tell us why you prefer TOBE SERVICE CAPACITORS.

Then, send your entry to us with the top from any TOBE capacitor carton, or the plastic box some TOBE capacitors are packed in.

That's all there is to it. Enter as many times as you wish, providing each entry is accompanied by a TOBE carton top or the plastic box. Use entry blank below. Additional entry blanks can be obtained from your TOBE DISTRIBUTOR.

Contest Closes May 30

Contest is open to all service-men over 21 years of age residing in the continental United States. Employees of the TOBE DEUTSCHMANN CORPORATION and their advertising agency are excluded. All entries become the property of TOBE DEUTSCHMANN CORPORATION. Decisions of the judges are final. In case of ties, duplicate prizes will be awarded. Contest closes May 30, 1958. Winners will be announced June 30th.



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*I enclose a Tobe boxtop*

## CATALOGS—BOOKS

CLAROSTAT MANUFACTURING Co., Inc., Dover, N. H., has issued catalog 58 listing replacement parts for radio, television and electronic servicing, as well as components for the industrial electronic field. Available from Clarostat distributors or direct. [SERVICE]

RAYTHEON MANUFACTURING Co., 55 Chapel St., Newton 58, Mass., has released a revised edition of its *Television Tube Characteristics* booklet with 14 pages of mechanical and electrical characteristics, as well as typical operating conditions for more than 300 picture tubes. Included are data on aluminized, black-and-white and color tubes. Face plate, deflection angle, bulb dimension and ion trap information are provided. Featured is a replacement guide with notes on necessary adjustments or changes required for interchangeability. Available from Raytheon distributors or direct. [SERVICE]

SARKES TARZIAN, INC., Rectifier Div., 415 N. College Ave., Bloomington, Ind., has issued catalog sheet 26 with complete specifications and ratings on K type axial-lead silicon rectifiers. [SERVICE]

B&K MANUFACTURING Co., 3726 N. Southport Ave., Chicago 13, Ill., has issued a 4-page illustrated bulletin, AP12, with information covering dynamic mutual conductance tube and transistor testers, a signal-injection TV analyst and a picture tube tester. [SERVICE]

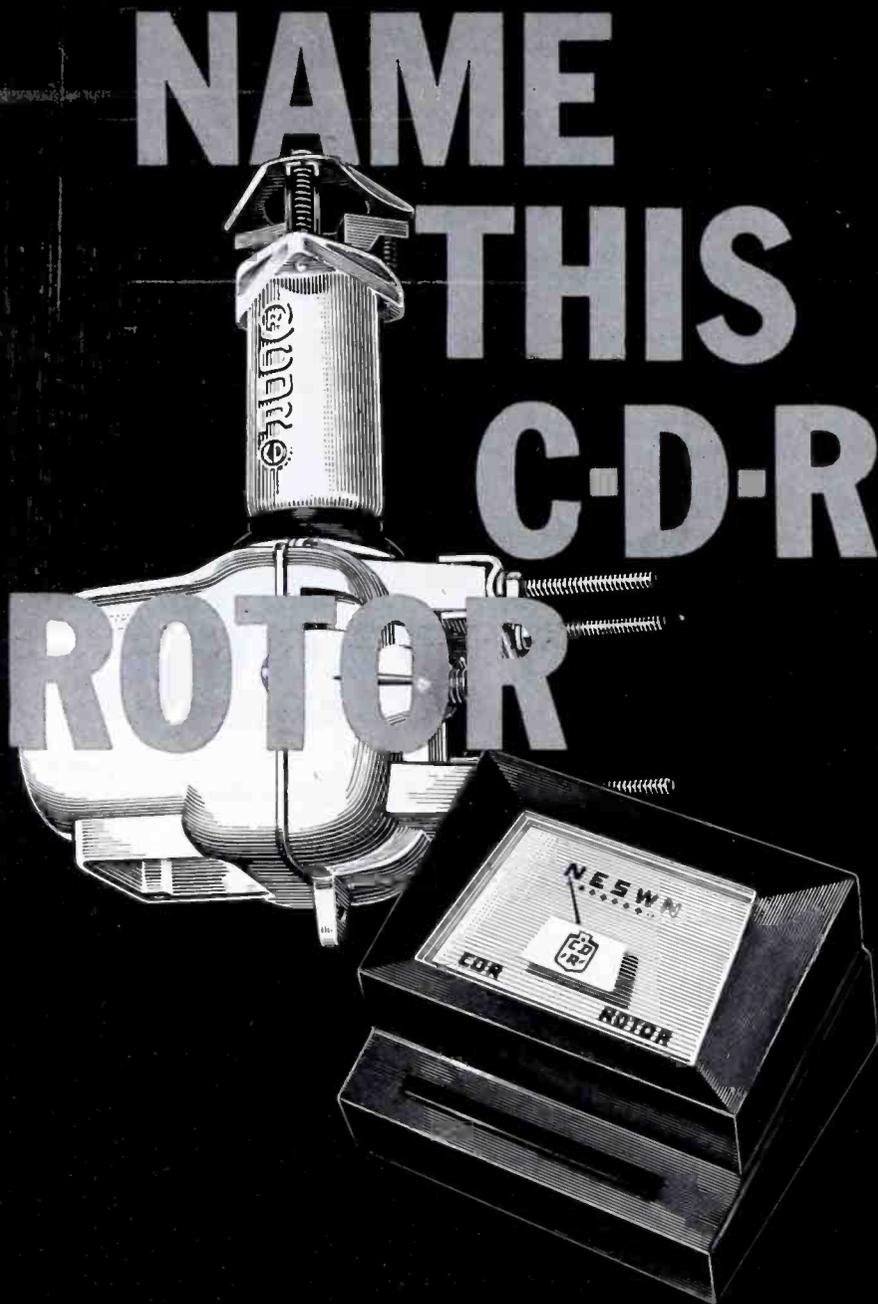
SPRAGUE PRODUCTS Co., 231 Marshall St., North Adams, Mass., has issued a bulletin, *The ABC's of Ceramic Capacitors*, covering all major ceramic types. Detailed descriptions, photos, charts and typical application data for each type are included. [SERVICE]

COYNE ELECTRICAL SCHOOL, Chicago, Ill., correct price of *Pin Point Record Changer Troubles in 5 Minutes* by P. Sheneman, reported in the March issue of SERVICE is \$3.95.

PYRAMID ELECTRIC Co., 1445 Hudson Blvd., North Bergen, N. J., has issued a 4-page engineering bulletin with data and characteristics on slug-type tantalum capacitors. [SERVICE]

ARROW FASTENER CO., INC., 1 Junius St., Brooklyn 12, N. Y., has released catalog 13 with illustrations and specifications covering desk, utility and plier-type, and precision-locked staplers; automatic staple guns and staples. [SERVICE]

AUDIO DEVICES, INC., Rectifier Div., 620 E. Dyer Rd., Santa Ana, Calif., has released a 64-page illustrated *Silicon Rectifier Handbook* with information on semiconductor concepts, manufacturing techniques, operational factors, engineering design, accessories, and engineering rectifier data. Priced at \$1. [SERVICE]



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# CDR Rotors

*Old Hands at Dependability*

## NEW PRODUCTS



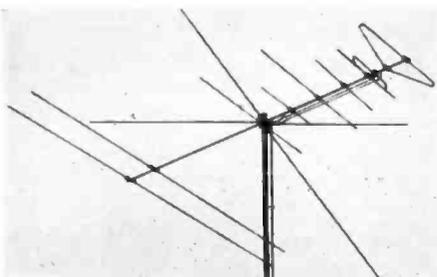
**RADIO-CONTROLLED** garage-door opener with electronic system said to prevent accidental operation or jamming by stray radio waves and eliminate need for FCC license. Push button on dashboard unlocks and opens garage door.—Genie; The Alliance Manufacturing Co., Inc., Alliance, O. [SERVICE]



**CERAMIC CARTRIDGE** with armature and part of needle guide encased in a fluid dampening compound which, it is said, is not affected by temperature or humidity. Hum from nearby magnetic fields is claimed to be eliminated.—Series 7; Sonotone Corp., Elmsford, N. Y. [SERVICE]

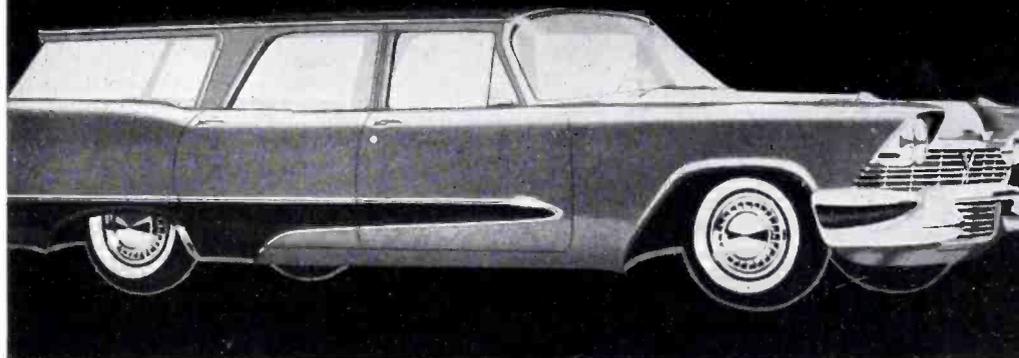


**MYLAR TUBULAR** capacitor kit containing an assortment of 80 PM type units in popular sizes, ratings and quantities for servicing requirements. Cornell-Dubilier Electric Corp., South Plainfield, N. J. [SERVICE]



**CONICAL-YAGI ANTENNA** featuring a wing director used in conjunction with a T-match dipole for increased gain and sensitivity. Available in single and two-bay models. (Winged 88; Trio Manufacturing Co., Griggsville, Ill.) [SERVICE]

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*this beautiful 1958 Plymouth Station Wagon*

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This contest is open to any person over 21 years of age, and residing in the continental U. S. Officers, employees and members of the sponsoring organization and advertising agency are not eligible. Contest is subject to Federal, State and local regulations.

No entries will be returned, and the decisions of the Judges will be final. Contest closes April 30, 1958.

CORNELL-DUBILIER ELECTRIC CORP. THE RADIART CORPORATION  
South Plainfield, New Jersey Indianapolis, Indiana



# CDR Rotors

*Old Hands at Dependability*



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could be readily farmed out to a local electronics service shop.

A review of the schematic shown in Fig. 1 reveals that there is nothing complex or mysterious about dictating machines. The electronic circuitry is simpler than a radio receiver and far less complex than a TV set.

Test equipment requirements are modest. A vacuum-tube voltmeter and perhaps a 'scope and an audio signal generator are all that are required. A flutter meter or a wow-and-flutter meter can come in handy for checking a tape transport or disk mechanism.

One company, for example, markets a prerecorded tape cartridge on which are recorded test tones at 400 and 3000 cps. With such a tape available, adjustment of recording heads can be made easily and far more precisely than when using guessing techniques.

## PERSONNEL

HELEN STANLAND QUAM, Quam Nichols Co., has been elected president of the Association of Electronic Parts and Equipment Manufacturers, Inc. . . . *Gail S. Carter*, Merit Coil and Transformer Corp., was named first vice president of the group and *Robert E. Svoboda*, Amphion Electronics Corp., second vice president.



Svoboda Quam Carter

AL TAGNON has been named field service manager of the appliance service division of Philco Corp., Philadelphia 34, Pa. . . . *Donald McKay* is product service manager of air conditioning and electric kitchens for the division.

ROBERT SNIDER has been named western regional manager of the jobber products division of Jerrold Electronics Corp., 12106 E. Firestone Blvd., Norwalk, Calif.

MILTON WISOFF has been appointed executive sales manager of Pyramid Instrument Corp., 630 Merrick Rd., Lynbrook, N. Y.

ANTHONY F. ANDERSON has joined the rectifier division of Sarkes Tarzian, Inc., 415 N. College Ave., Bloomington, Ind., as sales engineer.

LES A. THAYER and E. K. Butler were appointed general sales manager and manager of marketing services, respectively of Belden Manufacturing Co., H. W. Clough, Belden vice president, sales, announced.



Thayer Clough Butler

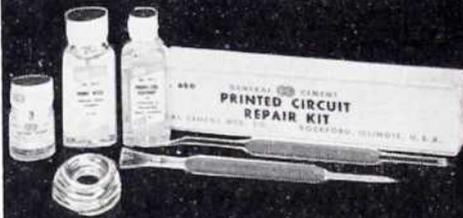
GEORGE SILBER, president of Rek-O-Kut Company, has been elected chairman of the board of directors of the Institute of High Fidelity Manufacturers, Inc.

SYDNEY O. JOHNSON has been promoted to manager of transistor advance and design engineering, semiconductor products department of General Electric Co. . . . *Martin E. Clark* has been named manager of transistor product engineering for the department.



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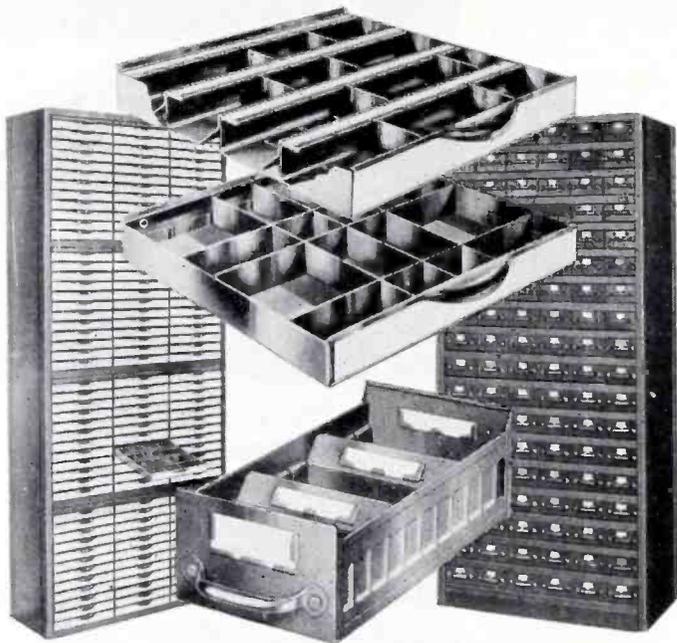
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**STATION WAGON & PANEL PICK-UP**  
appliance dolly



**YEATS Model No. 5**  
Aluminum alloy  
Height 47"  
Weight 32 lbs.

Only 47" tall, this new YEATS dolly is designed for TV and appliance men who make deliveries by station wagon or panel truck. No need to detach appliance for loading into the "wagon" or pick-up . . . the YEATS "Shorty" will slide into your vehicle with ease. Has aluminum alloy frame with padded felt front, quick fastening (30 second) strap ratchet, and endless, rubber belt step glide. New YEATS folding platform attachment, at left, saves back-breaking work handling TV chassis or table models. Call your YEATS dealer today!



Folding platform is 13 1/2" x 24 1/2" —attaches instantly. (Platform only) \$9.95.



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**"Everlast" COVERS & PADS**

YEATS semi-fitted covers are made of tough water repellant fabric with adjustable web straps and soft, scratchless white flannel liners. All shapes and sizes—Write.



TV Cover

**YEATS** appliance dolly

sales co.  
Milwaukee, Wis.

2109 N. 12th St.

## IRE Convention Highlights

A RECORD TOTAL of 54,500 engineers, technicians, Service Men and others interested in the state of the electronic arts attended this year's national convention and engineering show of the Institute of Radio Engineers which was held in New York from March 24 through 27. A number of new developments of interest to the servicing field were revealed for the first time at this gigantic trade show.

Probably the biggest story was the announcement of a new stereophonic phonograph record by Dr. Peter C. Goldmark of CBS Laboratories. Two signals from separate mike placements are cut on this record, one laterally as on standard LP's, the other vertically. The record may be played on any available stereophonic equipment and was described as compatible for use on standard monaural systems.

General Electric and Sylvania both unveiled glass-enclosed low power transistors. Transistors now are housed in metal cases, as were the first electronic tubes. Mass-production glass packaging will reduce their cost considerably. The models shown were prototypes only, though G-E expects to market one type later this year. The first glass transistors will probably be used in portable and car radios.

RCA exhibited a transistorized battery-operated television receiver and a miniature four-pound television camera, which were linked in a closed-circuit television system. The receiver circuitry contains 26 transistors and only one tube, a high-voltage rectifier, in addition to its 14-inch picture tube.

A new electronic dictionary which translates from Russian into English was described to the IRE delegates by George Shiner, a United States Air Force engineer. The brain of this system is a 10-inch glass disc on which 160,000 Russian words and their English equivalents are photographically coded. An electronic eye translates these marks into electronic signals which are then interpreted and translated by a computer.

Also described at the show was an electronic computer capable of reading ordinary typewritten addresses and sorting them by city and state. This device is unique in that it can read addresses prepared with virtually any standard typewriter or address imprinter.

SERVICE was represented at the show in its own booth as has been the case for the past ten years.



SERVICE BOOTH at the IRE show. From left to right, Solomon R. Kunis, Editor; David Pearsall, Associate Editor; Aaron Lafer, Advertising Manager; Lewis Winner, Vice-Chairman IRE Publicity Committee; and Nat Green, Circulation Field Representative.

# Tarzian...

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Low Priced... High Quality

**FERRULE-TYPE**  
Silicon Power Rectifiers



(ACTUAL SIZE)

● **M-500 - 1N1084**

Max. Peak Inv. Volts	400
Max. DC MA	100°C... 500
	150°C... 250
Max. RMS Volts	280
Max. RMS MA	100°C... 1250
	150°C... 625
Max. Rec. Peak MA	100°C... 5000
	150°C... 2500
Max. Surge Amperes	100°C... 30
	150°C... 15

● **40K - 1N1442**

Max. Peak Inv. Volts	400
Max. DC MA	55°C... 750
	100°C... 500
	150°C... 250
Max. RMS Volts	280
Max. RMS MA	55°C... 1875
	100°C... 1250
	150°C... 625
Max. Rec. Peak MA	55°C... 7500
	100°C... 5000
	150°C... 2500
Max. Surge Amperes	55°C... 30
	100°C... 30
	150°C... 15

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**LEAD-TYPE**  
Silicon Power Rectifiers



(ACTUAL SIZE)

As you prefer—we can supply you with either ferrule or lead mounting.  
Also available—voltage ratings of 100, 200 and 300 volts peak inverse on both types.

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DEPT. S-2

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A TV Picture Tube Warranty is only as good as the manufacturer who issues it...

You can rely on the

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The manufacturer's warranty is for your protection. An RCA 12-month warranty card is assurance that your replacement picture tube is a genuine RCA Silverama—and that the reputation and integrity of RCA stand behind it.

It's well worth while to insist on an RCA Silverama, the same advanced tube used in many of the new '58 TV sets. Often, it will even produce a picture more brilliant, sharper, clearer than your set gave when new! So, if your picture tube should need replacing, be sure you get what you pay for, the best picture tube made—RCA Silverama. After your service dealer installs it, ask him to complete your copy of the warranty card. One comes with every genuine RCA Silverama Picture Tube.

Super-Aluminized  Daylight Clear

## RCA Silverama

PICTURE TUBES

RCA Electron Tube Division, Harrison, N. J.

“Just as good”  
isn't good  
enough for  
your TV!



Let's face it! Nothing lasts forever. When you have to pay out good money for a replacement Picture Tube, you're entitled to the best that modern electronics can produce—that's an RCA SILVERAMA. It stands to reason that RCA, with its great laboratories, facilities, and “know-how”—produces the finest Picture Tubes money can buy. So, don't let “just as good” tempt you. Remember, RCA Silverama Picture Tubes cost no more than other brand-name aluminized tubes ... they are warranted for one full year, too.

Super-Aluminized  Daylight Clear

## RCA Silverama

PICTURE TUBES

RCA Electron Tube Division, Harrison, N. J.

...that makes it easy

for you to sell the #1  
picture tube... RCA Silverama

Messages like these appear regularly in TV Guide and other publications, telling millions of TV viewers (many of them your customers) the facts about their all-important picture tube.



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