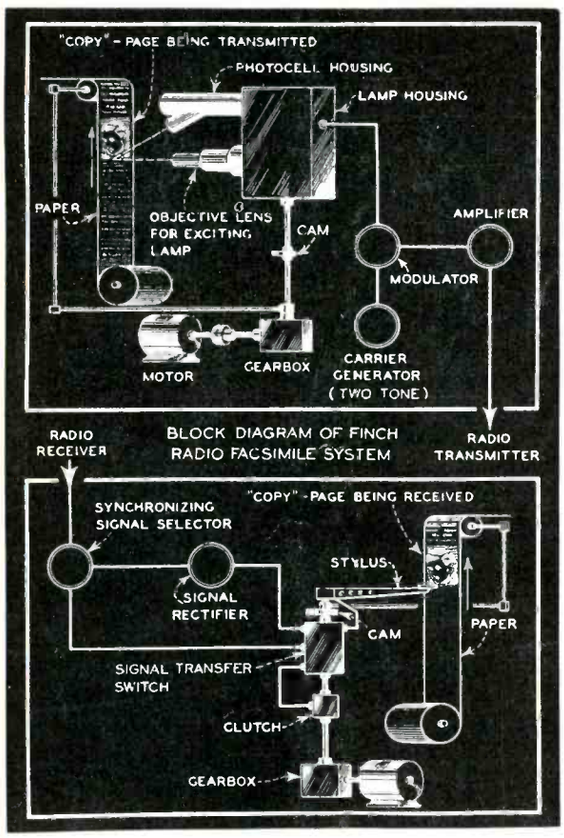
SERVICE

RADIO

A MONTHLY DIGEST OF AND ALLIED MAINTENANCE



FACSIMILE

(*See page 71*)

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FEBRUARY 1939

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Use YAXLEY REPLACEMENT VOLUME CONTROLS

Edited by
ROBERT G. HERZOG

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Contents

FEATURES

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Antenna

FREQUENCY MODULATION

MAJOR E. H. Armstrong, professor of electrical engineering at Columbia University, has announced that the first high-powered frequency-modulated station, W2XMN, at Alpine, N. J., will be put into operation this spring. The assigned frequency is 40 mc.

There are already two experimental stations broadcasting frequency modulated signals. One is at Albany, N. Y., and the other at Storrs, Conn. Six stations are in the process of construction—one by the Yankee Network near Worcester, Mass., will be the equal of W2XMN in power and performance.

General Electric will soon start production of frequency-modulated signal receivers. These will cost no more than ordinary receivers of similar quality. They will, however, be able to reproduce both the frequency-modulated and the present-day amplitude-modulated signals much the same as sets now receive both short and long-wave programs.

Major Armstrong has shown that whereas in an amplitude-modulated wave an interfering voltage which is one per cent of the carrier would spoil the program, an interfering voltage which is 50 per cent of the carrier will be negligible in his frequency modulated system. It appears that in the u-h-f band in which Major Armstrong proposes to use his system of modulation, ignition interference presents the only real problem.

While the full significance of frequency modulation cannot as yet be fully appreciated the new system seems to offer considerable possibilities. It involves an almost completely new technique and some of the present conceptions of modulation as well as customary axioms must be extended or discarded.

PORTABLE RECEIVERS

WHEN an owner's set needs repairs, he invites you into his home and lends a willing ear to your counsel. You don't have to go around "pushing doorbells" to gain admission. Once inside it is up to you to take the fullest advantage of the unique position which you enjoy. The new "pick-me-up" portable receivers, such as the one featured on the front cover of the January issue of SERVICE, offers you a special opportunity in this connection.

Every radio listener is a potential customer for one of these receivers. Take one along with you on the very next call. Show her how well it plays . . . how compact in appearance . . . how handy and light . . . how simple to operate . . . you'll be amazed how easy they are to sell.

TUBES

THERE has been, within the last few months, a veritable flood of new tube types. To help acquaint you with them we present, on pages 62, 64, 65, 66, etc., of this issue, a review of the single-ended, loktal, 1.4-volt and GT types.

Many of you may bemoan this seemingly endless procession of tubes but there is one fortunate circumstance in the situation which may have escaped notice. To quote from Mr. Teachman's article in a recent issue of SERVICE: "The complication of keeping an adequate stock of so many different types, plus the technical knowledge required to recommend the proper type, is driving most all of the big cut-price outlets out of the replacement tube business. No one is better suited to recommend and sell tubes than you are, and it should properly fall in your sphere to sell *all* replacement tubes. . . . The situation is changing rapidly and bids fair to dump the whole business in your lap. Obviously, every effort should be made to carry a complete and adequate stock of tubes for they represent the largest single item of sale and constitute more than half of all material sales."

FACSIMILE

FOR the last few months we have been predicting interest in radio facsimile recording. On page 71 of this issue we present a complete list of experimental broadcasting stations. Ten of these are already on the air with actual signals which can be received on practically every set now in use (provided it has at least three-watts output). These programs can be made useful through the attachment of a recording device which can be purchased for about $75.00 (list).

A typical recording device is discussed in this issue on page 74, and its connection to the receiver described. Similar units of other manufacturers will be shown in subsequent issues of SERVICE.

THE PERFECT REPLACEMENT TRANSFORMER!

Meissner DOUBLE-TUNED I.F. TRANSFORMERS

The ideal replacement transformer! Perfectly engineered! High in quality! Built to hold a plus or minus 5% *tolerance*—not 25%! Designed for the serviceman or experimenter who demands the utmost in I. F. transformer performance at low cost. Unusually high gain—extremely wide frequency range—and double-tuned with Meissner Low-Loss Ceramic Base Mica Di-electric trimmer guarantees you a superior, more efficient transformer which actually improves the receiver!

Eliminate Signal or Code Interference with MEISSNER WAVE TRAPS

For those of your customers who are annoyed at intermittent signal or code interference, MEISSNER offers Wave Traps to suit every purpose. They are connected to the aerial lead-in of the receiver, and are adjustable so that the interfering signal or signals may be "tuned out." Simple and easy to attach—Meissner Wave Traps are priced to make a handsome profit for you.

DeLuxe Dual Universal Wave Trap

A dual wave trap tuning two frequencies. Tunes 400-475 kc to eliminate code signals, etc., entering receiver at the intermediate frequency. Also tunes 550 to 1950 kc for interfering signals in the Broadcast and low-frequency Police bands. Constructed with Ferrocart (iron core) for greater efficiency. Retail List, **$2.65.**

NOTE: *Other Meissner Wave Traps available for eliminating interference on amateur bands or other wave bands.*

SEE YOUR PARTS JOBBER OR WRITE DEPT. S-2, MT. CARMEL, ILL.

Complete Receiver Kits
I. F. Transformers
Service Parts
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"A FAMOUS NAME FOR TWO DECADES"

The Utah Service-Pak consists of this cabinet plus a stock of 79 essential replacement parts.

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ASK YOUR JOBBER . . . IF HE CAN'T SUPPLY YOU WRITE US

EVERY active service man should have one of the new Utah Service-Paks—for building bigger profits and maintaining a normal stock of essential parts *economically.*

The new Service-Pak provides important economies—it saves time and space—it reduces costs—it safeguards parts—it permits a perpetual inventory to be kept easily.

Ask your jobber to show you the attractive kit—it is 17″ x 39″ x 10″. In one convenient, complete, easy-to-keep-up miniature stock room you can stock practically all your replacement parts essentials. The following high-grade Utah parts are included: 35 Assorted 10-Watt Vitreous Resistors, 6 Assorted 25-Watt Adjustable Vitreous Resistors, 16 Assorted Volume Controls, 6 Volume Control Switches, 3 Assorted Chokes, 5 Assorted Audio Transformers, 3 Assorted Universal Output Transformers, 4 Assorted Power Transformers, 1 5″ Electrodynamic Speaker. The Utah Service-Pak also accommodates condensers, vibrators, etc., to complete the stock of essential parts.

No service man should be without this kit of minimum stock essentials. The *Utah Service-Pak Is Priced So Low You Can't Afford to Be Without It.*

Tear this page out as a reminder to ask your jobber to show you the new Utah Service-Pak. If he doesn't have one, write us direct for complete information.

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SERVICE

A Monthly Digest of Radio and Allied Maintenance

FOR FEBRUARY, 1939

IT'S A SMALL WORLD

By JOHN F. RIDER

AS A general rule when we say that "It's a small world," we usually refer to the fact that we meet people where we least expect them, or to some other social situation. In this article, however, Mr. Rider considers the surprisingly small world which surrounds the Service Man, as far as his technical knowledge is concerned. By no means is it intended as an indictment, but rather as an analysis of a situation to show the vital need for expansion of knowledge.

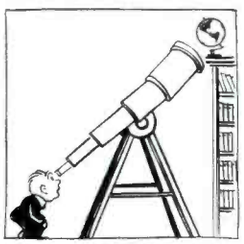
It is Mr. Rider's belief that such an analysis has been due for quite a long time. It is possible that some people will feel that he is elaborating unnecessarily and that some of the subjects here mentioned are superfluous. It is possible that after a comparison of the application of the subjects here named with those to be found in other maintenance fields, it might appear as if some of the suggestions are unwarranted, but we feel that past performance, while a valuable guide, is not necessarily unerringly accurate—that while it is quite normal to accord full recognition to past performance, it is nevertheless conceivable that new ideas may be injected into the life of the Service Man as an individual engaged in a certain form of enterprise.

IN MAKING these simple statements we recognize, without any intent to disparage, the educational background of the servicing industry in general. By this we mean that by and large the service personnel of the United States, to be specific, are not college or even high school graduates. Of course, there are some who have embraced such educational institutions, but if information gleaned during a number of investigations has any merit or value, then it is quite safe to say that the average Service Man has completed grammar school and about two years of high school. However, this does not limit the application of ideas—new ideas; neither does it prevent further study along any one or more lines of thought.

We make these statements as a preface to what will follow in answer to some people who may say that the ideas here presented are not capable of fulfillment because the average Service Man is not a college graduate.

Forget Past Performance

If we look back over the years since the inception of broadcasting and critically examine that which has transpired during the past six or eight years in the life of the service industry and note that

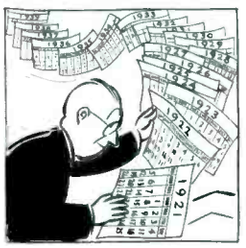


"The Service Man has erroneously considered his world too small."

which lies upon the doorstep, we find it extremely difficult to identify a parallel in any other maintenance field. In other words, we cannot think of a single field of endeavor which is as highly specialized as radio servicing, yet is as broad in its scope. Furthermore, we find it difficult to identify a field of activity in which the maintenance man is confronted with such rapid and complex developments as are to be found in the radio field.

In view of the fact that many of the finest radio engineers admit that radio development, although ostensibly upon a high level, is still in its infancy and we still know very little about its various branches and have very much to learn, there is still time for the industry to depart from tactics and habits of the past and make a new start—to approach upon a front which is more consistent with modern thought—to recognize the limitations and possibly the error of gauging activity by past performance.

In line with the suggestion that we forget past performance for the moment, it is also necessary to forget the fact that remuneration in the servicing field has been at a very low level. Maybe that can be attributed also to the fact that Service Men have been creatures of habit, like all other human beings, and have been very reluctant to try new tactics or new ideas. We shall, therefore, forget, or at least try to forget, that such a condition existed in the past, and



"If we look back over the years since the inception of broadcasting and critically examine that which has transpired . . ."

see where we arrive by the time this discourse is concluded.

Service Man—Salesman

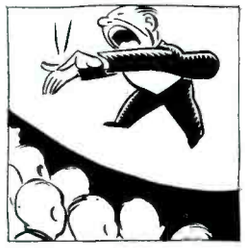
Let us consider first the business activities of the servicing industry. The Service Man is the individual to whom merchandise is sold and who is in turn expected to sell merchandise as well as his technical ability. For the present, we shall neglect that phase associated with the Service Man as a customer, but consider him as a salesman. He is that when he sells his technical knowledge to a customer and when he attempts to sell merchandise to his customer.

The fact that one of the paramount functions of a servicing organization is to sell, is never given any thought when an individual embarks upon the career of radio servicing. Maybe that is due to the fact that when servicing was first popularized, the sales angle was neglected. Maybe that is because the schools who first trained men for the servicing field neglected to place sufficient emphasis upon the sales angle. . . . Perhaps it is because the original articles which stimulated servicing activities back in 1922-1925 did not place any importance upon the fact that a Service Man must also be a salesman, because it was a seller's market.

Years passed but things did not change. There were a few feeble efforts

made to convince the personnel in the service field that they were ideally located, maybe not so suited—but ideally located to sell. These efforts went by the board, until the majority of Service Men considered themselves solely technical men and as a matter of fact considered any association with the commercial, an actual affront to the dignity of their activity.

The Service Man has erroneously placed himself in too small a world. He has surrounded himself with tech-



"Organizations can well devote some of the service meeting discussions to methods of selling. . . ."

nical considerations, which in themselves were too narrow and small, as we shall discuss; and which blinded him against seeing the true light of things. Radio periodicals contributed to this condition by not printing enough commercial material—by not educating along selling lines as well as technical lines. We too were guilty of the same thing years ago and we can understand the reasons for the non-publication or limited publication of sales articles. The Service Men did not want them—they craved technical data. That was the answer of the publishers and it was correct—but it must be changed.

More than likely it is true that salesmen are born and not made, but it is also true that when men who have had no sales training of any kind get into a business where sales ability is essential, that guidance along such lines must come from some place. Service circulation of radio periodicals comes from the independent Service Man and the employed Service Man. Both men must sell, the independent man his services and perhaps equipment, and the employed man, whatever his concern has for sale. It is a commonplace condition to find employed Service Men receiving commissions on sales to supplement their income. Sales material of interest to the Service Man, therefore, deserves space in every radio periodical.

Advertising

If you investigate the operations of maintenance organizations or for that matter of all organizations who have something for sale, you will find that much money is spent in establishing selling tactics—in training men in sales psychology. Such tactics can very well be taught in periodicals to fulfill the needs of the servicing industry. Observation of both independent and employed Service Men during their efforts to sell shows an absence of such a vital thing as the opening approach, the value of negative or affirmative response to situations, and a myriad of other items.

The organizations responsible for service meetings and who are trying to aid the servicing industry can well devote some of the service meeting discussions to methods of selling, to all of the problems associated with selling, which includes advertising. There is one item which has suffered a great deal. At one time some of the manufacturers, who cater to the servicing industry, prepared various types of direct mail literature which was sold to the servicing industry. That type of activity has just about ceased and can well be renewed.

There are various places where service organizations offer their wares, that is, in the form of advertisements. It would not be amiss if magazine articles appearing in radio periodicals and intended for Service Man consumption would embrace the field of advertising.

It is, of course, far-fetched to imagine service station operators devoting time to the study of selling and advertising, particularly direct mail selling. As things stand they do not have the time

"There are Service Men who are earning their keep by being doorbell-pushers . . ."

or the finances, but it is anything but a wild dream to visualize written material covering such subjects as regular items in radio periodicals.

We have seen such material and we make this statement for the benefit of the editors who have included such data in their magazines, but we do not think that sufficient importance or pressure has been placed upon the subject. Our reason for making this statement is that granting a capable individual who does the service work, a service organization possessed of proper selling ability, can always secure the required amount of technical help, but the finest technical man without sales ability is going to find it virtually impossible to make a living. Therefore, selling in its various branches is extremely important. The present servicing world is too small. It must be expanded.

The Service Man must of necessity recognize his present limitations, and he must make up his mind to a change. For one he must become sales-conscious. He must broaden his horizon.

There are Service Men with shops of their own who are earning their keep by being door-bell-pushers. . . . There are plenty of other fields of activity in which the salesmen sell in a similar way, that is, they push door-bells. It might be well for those who prepare material for Service Man consumption, editorially or orally, to investigate those fields and ascertain the manner in which the problems associated with such methods of contact are solved. There must be certain methods of approach which are superior to others, once the door has been opened. These should be established and made known.

A great deal of sales material of various kinds is published for consumption by the set dealer and set jobber and, for that matter, by the various sales organizations in other fields. Why should the service field be neglected?

Advertising, like other forms of selling, can be of various orders—good, bad or excellent in direct mail, telephone book or newspaper form. True that the individual service organization does not spend much money in connection with such activity, but only because the basic revenue is low. Increase the revenue and the amount spent for advertising is increased, but no matter what the money spent, it can be spent to best advantage.

Business Side

Associated with the selling angle is the business side of servicing. The last year or two has seen more than the usual activity in this connection, but it is not sufficient. That, too, must be broadened. It started with the means of establishing service charges and continues along the same vein. Without any attempt to make the service station operation fully cognizant of capital, assets, liabilities, etc . . . it is still necessary to convey information to the servicing industry concerning its financial capabilities in terms of the individual establishments.

More than one man who was making satisfactory progress attempted some

"These questions are asked by receiver owners — customers —not engineers."

program of activity, maybe in the public address field, which was beyond his financial status to handle. Working with the servicing industry, the financial condition of the average service establishment is not a mystery so that it is possible to present facts for absorption

by the servicing industry on a basis consistent with the amount of money available to work with. More than one parts jobber knows of service shops among his clientele which were virtually ruined by biting off more than they were able to chew. They choked upon what was thought to be a choice morsel.

Technical Angle

Let us now consider the technical angle and look in upon the narrow world we live in. By and large the majority of material which has appeared in the service press has been devoted to practical radio and in connection with receivers. The suggestion is not being made that a Service Man should become an engineer, although just what will be the exact requirements for successful television and radio facsimile servicing is still an unknown quantity. But what is being suggested is that the Service Man broaden his knowledge of radio along lines somewhat different from what has been presented heretofore.

Much has been said about the fact that service capabilities were not on a par with receiver development. Also that it was necessary for the Service Man to secure a more thorough grounding in radio. However, as a general rule these comments were associated with radio receivers only. Maybe that was wrong. It seems that way because that idea has very definitely narrowed the world in which the service industry operates. It has made the Service Man think too much in terms of receivers. It has stifled any growth of the power of interpretation. It has made too many Service Men feel that all they were concerned with were receivers, that all else was secondary.

There seems to be justification for the belief that such an attitude maintained years ago has contributed greatly to the technical limitations now experienced. In this connection it might be possible to place more blame upon the doorstep of the Service Men than upon those people who serve the servicing industry as magazine publishers or as

"Service Men who are asked questions concerning their own test units find great difficulty answering these questions."

manufacturers. Many of the editors are guided by letters from readers but not enough readers have taken interest in the full breadth of their much needed knowledge and communicated these needs to the publishers.

There has been too much demand for practical data and too little for that information which would be of general and basic utility. The phenomenon of transmission, and the relation between the antenna and the signal has been neglected on the grounds that the antenna was the least important portion of the receiver installation. Yes, we know that every so often an article would appear in which the antenna would be discussed, but we venture to say that less than 0.1 percent of all of the technical text which has appeared in magazines during the past ten years was devoted to that subject.

Today, with the advent of television, ultra-high-frequency transmission phenomenon and antennae loom very important.

Strange though it may seem after years of activity, many Service Men do not comprehend the functions occurring in the various parts of a transmitter and find it difficult to answer questions relative to the operation of a transmitter—a broadcast transmitter. These questions are asked by receiver owners — customers — not engineers. More than one Service Man has failed to explain in a logical manner just why WOR with its present directional antenna is not received as well in different

"If every man who reads these lines will take pen and paper and list all the subjects associated with normal broadcasting . . . etc., he will have a surprisingly large list."

parts of Pennsylvania as with the original antenna.

Field strength of transmitters and microvolt sensitivity of receivers, percentage modulation of transmitters and even test equipment have been items to which very little thought has been given, but will require more and more attention as the months roll by. All because so very much attention was placed upon receivers and because the attention of the Service Men was focused upon a very small world, the receiver. Whatever technical information has been given was interpreted in terms of the receiver.

Test Equipment

Take as a case in point, the actual test equipment which men have used in connection with receiver servicing. Take the oscillator as one item, a very popular piece of equipment, used on practically every service job. It would be a safe gamble, judging by what has been observed in the field, to state that most Service Men who use the equipment are not fully conversant with oscillator circuits—with what type of circuit is used in service test oscillators and what makes these units work—with the significance of 30, 40, or 50 percent modulation. Some men, but not the majority, understand the relation between the r-f carrier and the a-f voltage at various carrier frequencies in such units. This because reference to oscillators has usually been associated with the simplest manner in which an oscillator is used for testing purposes and perhaps a simple explanation of the

"Schools likewise must recognize this condition and there is no doubt of the fact that school attendance will increase." . . .

heterodyne oscillator in the radio receiver.

Now that some attention is being focused upon sensitivity testing of receivers and reference to signal input at the antenna and audio output at the speaker for a certain value of percentage modulation, recognition of what is meant is very meagre. The operation of test equipment, like receivers, has been within a very small world—the mechanical operation of a test unit, without regard to fostering comprehension of what is going on in the unit and what is being done when the unit is applied.

Proof of this fact is that Service Men who are asked questions concerning their own test units find great difficulty answering these questions. As a result of continually living in a very narrow world, service procedure and general operation has been brought to a step-by-step level with minimum application of individual initiative and ingenuity. This can be attributed in a large measure to the fact that the presentation of test equipment to its users has been along the lines of what it will do in the simplest words without any description of what is in the device and how the device functions.

A similar situation exists in tube checkers. Today the tubes are checked according to the "Good," "Bad" or "Replace" indication. This is quite in order, but what is deplorable is that the Service Man who is using the device is not familiar with what he is testing, or how and why the indication is attained. Some may say that such a situation is the desired one, in that it may be easier to sell test equipment if the simplicity of operation is stressed, That is correct, but when carried out over a period of

(*Continued on page* 86)

TUBES

By D. BEE

THE never-ending ingenuity of tube engineers has resulted, once again, in a veritable deluge of new types. Of these, for the Service Man, the principal interest will be in the *single-ended,* the *loktal,* the 1.4 *volt,* and the GT types.

SINGLE-ENDED

Despite the many advantages inherent in complete sub-chassis wiring, in order to reduce circuit instability due to grid-plate capacitance, it has, in the past, been necessary to bring the control grid lead out at the top of the glass envelope. A new constructional design, however (see Fig. 1) enables the grid lead to be brought out at the base of the tube. This new design not only results in a grid-plate capacitance which is as low as the corresponding top-capped type, but also materially reduces the input and output capacitance, and increases the transconductance.

As seen in Fig. 1, a conical stem shield is embedded in the glass seal and is connected to the metal shell lead of the tube. This shields the leads passing through the glass seal from each other and thereby lowers interlead capacitance.

A cylindrical base shield is inserted inside the bakelite locating plug of the otherwise standard octal base, and connected to the metal shell of the tube. This shields the pins of the tube from each other and reduces interpin capacitance.

This shielding is most effective when the grid and plate pins are opposite each other, as in the 6SQ7, or almost opposite each other, as in the 6SJ7 and 6SK7.

Eleven single-ended metal tubes have been released, namely, a 6SA7, 6SC7, 6SJ7, 6SK7, 6SQ7 and their 12-volt counterparts, and a 6SF5. Single-ended tubes are characterized by the letter S following the first numeral, with the exception of the 6S7G, which is a glass, octal based, top-capped tube.

6SA7

Type 6SA7 is a new, single-ended, metal, pentagrid converter designed to perform simultaneously the functions of a mixer tube and of an oscillator tube in superheterodyne circuits, especially those of the all-wave type. The oscillator section is designed to operate in a Hartley circuit with the cathode connected to a tap on the oscillator coil, The tube may also be used as a separately excited mixer.

Utilizing a special structure, the 6SA7 has excellent oscillator frequency stability. The magnitude of the input capacitance of the oscillator grid is not appreciably affected by signal-grid bias; changes in cathode current and in oscillator transconductance with avc voltage are small.

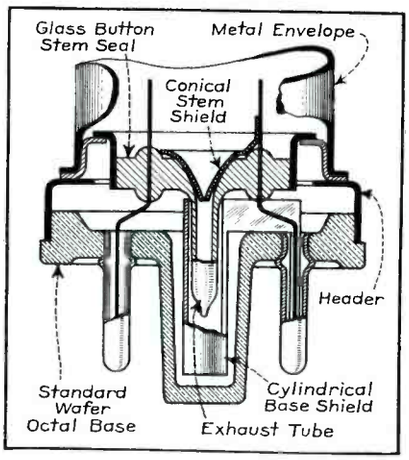
Tentative Ratings

Heater voltage	6.3 v
Heater current	0.3 amp

Operating Characteristics

Self-Excitation		
Plate voltage	100	250 v
Grids 2 & 4 voltage	100	100 v
Grid 3 (control grid) voltage	0	0 v
Shell & grid 5 voltage	0	0 v
Grid 1 resistor	20,000	20,000 ohms
Plate resistance (approx.)	0.5	0.8 meg
Conv. transconductance	425	450 μmhos
Conv. transconductance at —35	5	5 μmhos
Plate current	3.2	3.4 ma
Grids 2 & 4 current	8	8 ma
Grid 1 current	0.5	0.5 ma
Separate Excitation[1]		
Plate voltage	100	250 v
Grid 3 (control grid)	—2	—2 v

The transconductance between grid 1 and grids 2 and 4 tied to plate (not oscillating) is approximately 4500 μmhos when grids 1, 3, 5 and the shell are at



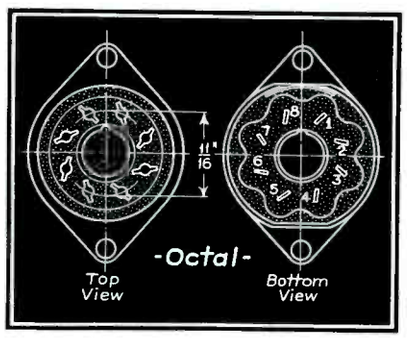
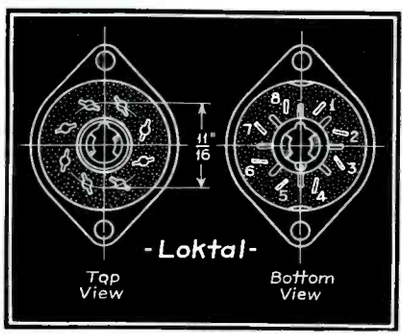
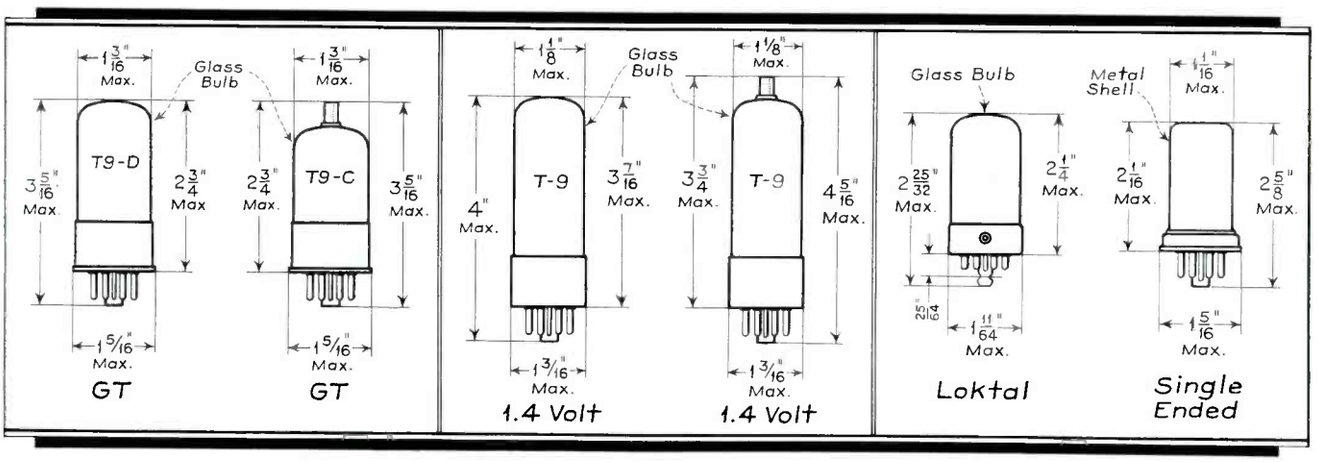
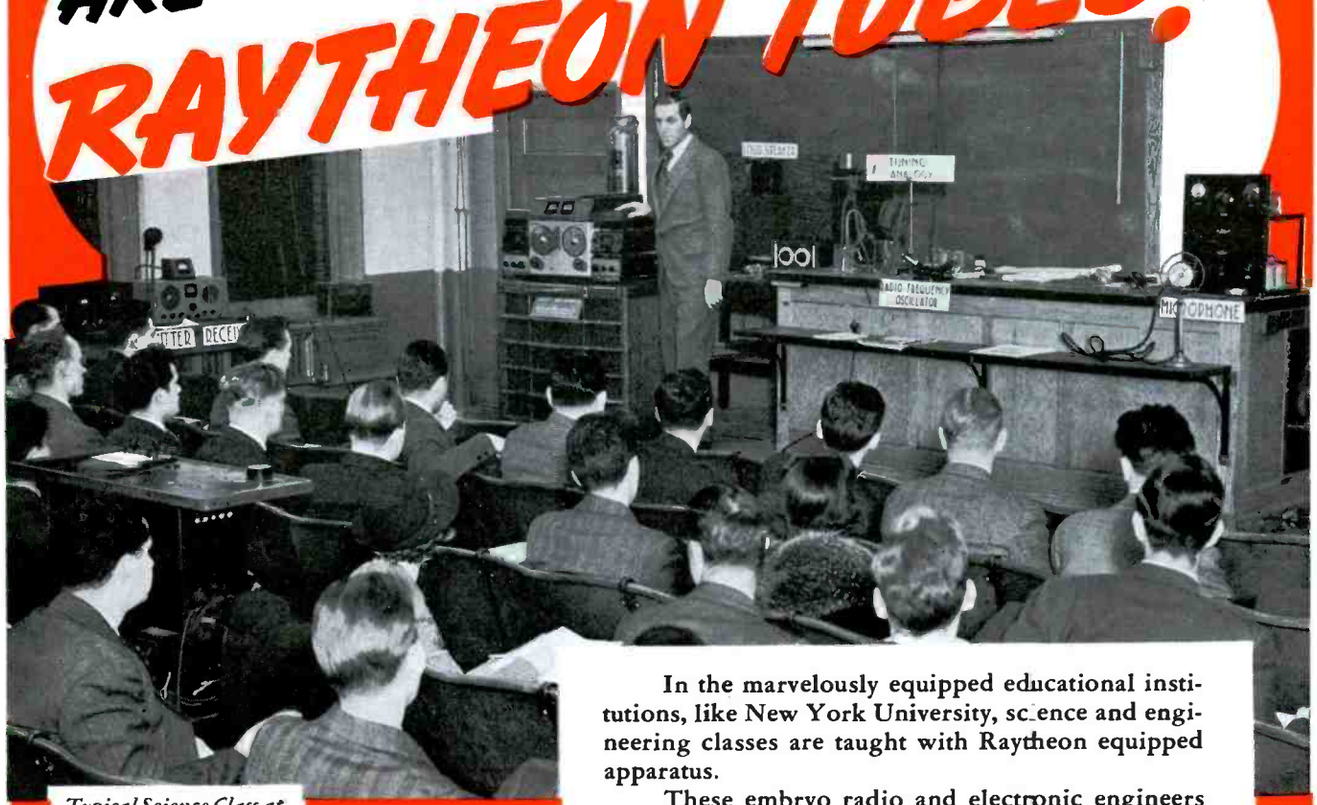


Fig. 1. The new constructional design of the tube base (above) allows the grid lead to be brought out at the base of the tube. The resulting single-ended metal tube employs the familiar octal socket shown to the left. Loktal tubes are also single-ended but are all glass and use the socket shown to the right. The bulb shapes and dimensions are shown below.





Radio Engineers of the Future ARE TAUGHT WITH RAYTHEON TUBES!



Typical Science Class at New York University attending lecture with demonstrations on Raytheon equipped receivers.

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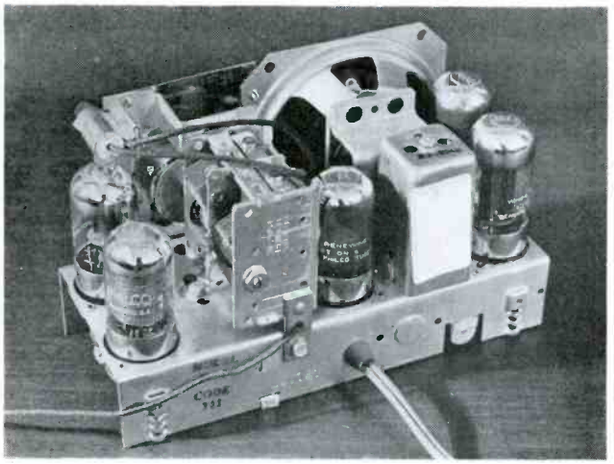


Loktal tubes enable this midget receiver to eliminate high-heat dissipating line-cord or ballast resistors and make it eligible for Underwriters' Laboratory approval.

Photo courtesy Philco Radio & Television Corp.

0 volts and grids 2, 4 and the plate are at 100 volts.

Direct Interelectrode Capacitances

Grid 3 to all other electrodes (r-f input)°	9.5 μμf
Plate to all other electrodes (mixer output)°	12 μμf
Grid 1 to all other electrodes°	7 μμf
Grid 3 to plate°	0.13 max. μμf
Grid 1 to grid 3°	0.15 max. μμf
Grid 1 to plate°	0.06 max. μμf
Grid 1 to all other electrodes except cathode	4.4 μμf
Grid 1 to cathode	2.6 μμf
Cathode to all other electrodes except grid 1	5 μμf

Basing

Pin	Connection	Pin	Connection
1	Shell & grid 5	5	Grid 1
2	Heater	6	Cathode
3	Plate	7	Heater
4	Grids 2 & 4	8	Grid 3

°With shell connected to cathode.

[1]Characteristics not listed under separate excitation are the same as those for self excitation. Characteristics values are approximate only and are shown for a Hartley circuit with a feedback of approximately 2 volts peak in the cathode circuit.

6SC7

The 6SC7 is a new, single-ended, metal, twin triode amplifier intended primarily for phase-inverter service. Each triode unit is designed with a high mu-factor to give high gain.

Tentative Ratings

Heater voltage	6.3 v
Heater current	0.3 amp
Base	Octal
Bulb	MT8G-1

Operating Characteristics

Plate voltage	250 max. v	
Grid voltage	—2 v	
Amplification factor	70	
Plate resistance (approx.)	53,000 ohms	
Transconductance (")	1,325 μmhos	
Plate current	2 ma	
Typical operation as phase inverter:		
Plate—voltage supply[1]	90	300 v
Plate load (R_l)	250,000	250,000 ohms
Grid resistor (R_g) for following stage	0.5	0.5 meg
Cathode resistor (R_c)**	3,750	1,675 ohms
Blocking condenser	0.006	0.006 μf
Voltage output[2]	9	55 peak v
Voltage gain[3]	30	42

Basing

Pin	Connection	Pin	Connection
1	Shell	5	Plate (triode 1)
2	Plate (triode 2)	6	Cathode
3	Grid (triode 2)	7	Heater
4	Grid (triode 1)	8	Heater

[1]Voltage at plate equals plate supply voltage minus voltage drop in R_l and R_c. For other supply voltages differing by as much as 50% from those listed, the values of resistors, condensers, and gain are approximately correct. The value of output voltage, however, for any of these other supply voltages equals the listed voltage output multiplied by the new plate-supply voltage divided by the plate-supply voltage corresponding to the listed voltage output.

[2]Voltage across R_g at grid-current point.

[3]Voltage gain at 5 volts (rms) output.

**The value of R_c is specified on the basis that both units are operating simultaneously at the same values of plate load and plate voltage. For phase-inverter service, the cathode resistor should not be by-passed by a condenser. Omission of the condenser in this service assists in balancing the output voltages.

The small size and low heater current drain of the GT series make them particularly suited for a-c, d-c receivers.

Illustration courtesy Arcturus Radio Tube Co.

6SF5

The 6SF5 is a high-mu triode type amplifier tube featuring *single-ended* construction. The electrical characteristics of the 6SF5 are similar to those of the type 6F5.

Ratings

Same as for 6SC7.

Operating Characteristics Class A

Plate voltage	250 v
Grid Bias	—2 v
Amplification factor	100
Plate resistance	66,000 ohms
Transconductance	1,500 μmhos
Plate current	0.9 ma

Direct Interelectrode Capacitances*

G to P (grid to plate)	2.6 μμf
G to K (grid to cathode)	4.2 μμf
P to K (plate to cathode)	3.8 μμf

Basing

Pin	Connection	Pin	Connection
1	Shield	5	Plate
2	Cathode	6	No connection
3	Control grid	7	Heater
4	No connection	8	Heater

*With shell connected to cathode.

6SJ7

The 6SJ7 is a pentode type amplier tube featuring *single-ended* construction.

Ratings

Same as for 6SC7.

Operating Characteristics Class A

Plate voltage	100	250 v
Screen voltage	100	100 v
Grid bias	—3	—3 v
Suppressor—Connected to cathode at socket		
Amplification factor (approx.)	1,100	2,500
Plate resistance (app.)	0.7	1.5 meg
Transconductance	1,575	1,650 μmhos
Plate current	2.9	3.0 ma
Screen current	0.9	0.8 ma

Direct Interelectrode Capacitances*

G_1 to P (grid to plate)	0.005 max. μμf
G_1 to all other electrodes except P (input electr.)	6.0 μμf
P to all other electrodes except G_1 (output electr.)	7.0 μμf

Basing

Pin	Connection	Pin	Connection
1	Shield	5	Cathode
2	Heater	6	Grid 2
3	Grid 3	7	Heater
4	Grid 1	8	Plate

*With shell connected to cathode.

6SK7

The 6SK7 is a pentode type amplifier tube featuring *single-ended* construction.

Ratings

Same as for 6SC7.

Operating Characteristics Class A

Plate voltage	100	250 v
Screen voltage	100	100 v
Grid bias	—3 min.	—3 min.
Suppressor—Connected to cathode at socket		
Amplification factor (approx.)	475	1,600
Plate resistance (app.)	0.25	0.8 meg
Transconductance	1,900	2,000 μmhos
Plate current	8.9	9.2 ma
Screen current	2.6	2.4 ma
Grid bias	....	—35 v
(For transconductance = 10 μmhos)		

Direct Interelectrode Capacitances*

G_1 to P (grid to plate)	0.005 max. μμf
G_1 to all other electrodes except P (input electr.)	6.0 μμf
P to all other electrodes except G_1 (output electr.)	7.0 μμf

Basing same as 6SJ7.

6SQ7

The 6SQ7 is a duo-diode high-mu triode type amplifier tube featuring *single-ended* construction. The electrical characteristics of the 6SQ7 are similar to those of the type 75.

Ratings

Same as for 6SC7.

Operating Characteristics Class A

Plate voltage	250 v
Grid bias	—2 v
Amplification factor	100
Plate resistance	91,000 ohms
Transconductance	1,100 μmhos
Plate current	0.8 ma

Direct Interelectrode Capacitances*

G to P (Grid to Plate)	1.8 μμf
G to K (Grid to Cathode)	4.2 μμf
P to K (Plate to Cathode)	3.4 μμf

Basing

Pin	Connection	Pin	Connection
1	Shield	5	Diode 1
2	Grid (triode)	6	Plate (triode)
3	Cathode	7	Heater
4	Diode 2	8	Heater

*With shell connected to cathode.

12SA7

Type 12SA7 is a single-ended pentagrid converter.

Tentative Ratings

Heater voltage	12.6 v
Heater current	0.15 amp

Except for the heater, this tube is practically identical to the 6SA7.

12SC7

Type 12SC7 is a single-ended twin triode amplifier.

Tentative Ratings

Heater voltage	12.6 v
Heater current	0.15 amp

Except for the heater, this tube is practically identical to the 6SC7.

12SJ7

Type 12SJ7 is a single ended triple-grid detector amplifier.

Tentative Ratings

Heater voltage	12.6 v
Heater current	0.15 amp

Except for the heater, this tube is practically identical to the 6SJ7.

12SK7

Type 12SK7 is a single-ended triple-grid super-control amplifier.

Tentative Ratings

Heater voltage	12.6 v
Heater current	0.15 amp

Except for the heater, this tube is practically identical to the 6SK7.

12SQ7

Type 12SQ7 is a single-ended duplex-diode high-mu triode.

Tentative Ratings

Heater voltage	12.6 v
Heater current	0.15 amp

Except for the heater, this tube is practically identical to the 6SQ7.

LOKTALS

Loktal tubes are single-ended, glass tubes which are as small as the corresponding metal tubes. All loktal tubes are 1 3/16 inch in diameter and they are all less than 3 inches in height.

Unlike customary tubes, the loktal tube does away with the usual tube base. The prongs of the loktal tube are sealed into the glass base plate on which the tube mount is assembled. A metal guide ring fits over the lower part of the tube. The base has a key somewhat similar to that used on the octal tube. The loktal key, however, is made of metal and has an indentation around the lower part which locks into a snap ring in the socket thereby locking the tube into its socket.

Despite the fact that loktal tubes have eight prongs, their special construction necessitates the use of a new type of socket. Present standardized practice makes pins No. 1 and No. 8 heater connections, while pin No. 7 is the cathode.

Since loktal tubes are single-ended there is no top grid cap, thereby enabling short grid leads to be made, and also the attainment of complete subchassis wiring. The metal guide key assists in lowering the capacitance existing among the base pins.

In the past, compact radio receivers, such as a-c, d-c sets, were not approved by fire underwriting companies. This was partly due to the excessive internal heating of the set caused by vacuum tubes, and partly due to the heating of the power socket resistance cord. The greatly reduced heater current of the loktal series results in a material reduction of heat produced by the tubes. The line dropping resistor may be incorporated within the set itself, thus doing away with the resistance in the power cord. Properly designed sets using loktal tubes will pass Underwriter Laboratory requirements.

The special loktal type base and socket enable these tubes to be inserted or removed without the necessity of taking the chassis out of the cabinet.

7A6

Type 7A6 is a duo diode having characteristics somewhat similar to the type 6H6G.

Tentative Ratings

Heater voltage (nominal)	7.0 v
Heater current (nominal)	0.160 amp
Base	Loktal
Bulb	T-9

Operating Characteristics

Heater voltage	6.3 v
Max. a-c voltage per plate (rms)	150 v
Max. d-c output	10 ma
Volt drop at 10 ma	8 v

Basing

Pin	Connection	Pin	Connection
1	Heater	5	Shield
2	Cathode No. 1	6	Plate No. 2
3	Plate No. 1	7	Cathode No. 2
4	No connection	8	Heater

7A7

Type 7A7 is a single ended r-f pentode with characteristics somewhat similar to the type 6K7G.

Tentative Ratings

Heater voltage (nominal)	7.0 v
Heater current (nominal)	0.32 amp
Base	Loktal
Bulb	T-9

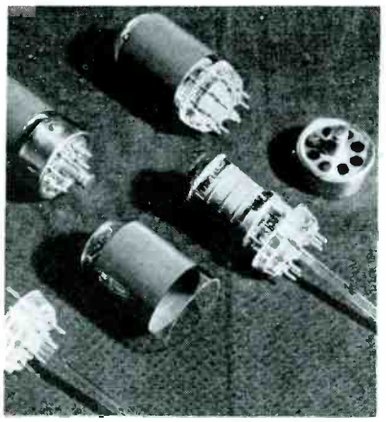


Photo courtesy Hygrade-Sylvania

The prongs of the loktal tube are sealed into the glass base plate on which the tube mount is assembled.

Operating Characteristics

Heater voltage	6.3 v
Plate voltage	250 v
Screen voltage	100 v
Grid voltage	—3 v
Suppressor	Connected to cathode at socket
Plate current	8.6 ma
Screen current	2.0 ma
Plate resistance	0.8 meg
Amplification factor	1,600
Transconductance at —3.0	2,000 μmhos
Transconductance at —35.0	10 μmhos

Basing

Pin	Connection	Pin	Connection
1	Heater	5	Shield
2	Plate	6	Control grid
3	Screen grid	7	Cathode
4	Suppressor	8	Heater

7A8

Type 7A8 is a single ended frequency converter tube with characteristics somewhat similar to type 6A8G.

Tentative Ratings

Same as for 7A6.

Operating Characteristics

Heater voltage	6.3 v
Plate voltage	250 v
Control grid voltage	—3.0 v
Screen voltage	100 v
Anode grid voltage (through 20,000 ohms)	250 v
Oscillator grid resistor	50,000 ohms
Plate current	3.0 ma
Screen current	2.8 ma
Oscillator plate current	4.5 ma
Oscillator grid current	0.4 ma
Self-bias resistor	300 ohms
Plate resistance	0.7 meg

The filament of the new 1.4-volt tubes is designed to function satisfactorily when connected directly across a 1.5 - volt dry cell without the intervention of a voltage dropping resistor.

Conv. Cond. at —3.0	600 μmhos
Conv. cond. at —30.0	2 μmhos

Basing

Pin	Connection	Pin	Connection
1	Heater	5	Screen grid
2	Plate	6	Signal grid
3	Anode grid	7	Cathode
4	Oscillator grid	8	Heater

7B7

Type 7B7 is a single ended r-f pentode with characteristics somewhat similar to the type 6S7G.

Tentative Ratings

Same as for 7A6.

Operating Characteristics

Heater voltage	6.3 v
Plate voltage	250 v
Screen voltage	100 v
Grid voltage	—3 v
Suppressor	Connected to cathode at socket
Plate current	8.5 ma
Screen current	2.0 ma
Plate resistance	0.7 meg
Amplification factor	1,200
Transconductance at —3.0	1,700 μmhos
Tranconductance at —40.0	10 μmhos

Basing same as 7A7.

7C6

Type 7C6 is a single-ended duo-diode high-mu triode with characteristics somewhat similar to Type 75. Fixed bias is not recommended for the triode section. A high value of grid resistor should be employed and a plate load resistor (for 250 v supply) of approx. 0.25 meg. Pins 4 and 7 are internally connected together.

Tentative Ratings

Same as for 7A6.

Operating Characteristics

Heater voltage	6.3 v
Plate voltage	250 v
Grid voltage	—.1 v
Plate current	1.3 ma
Plate resistance	0.1 meg
Amplification factor	100
Transconductance	1,000 μmhos

Basing

Pin	Connection	Pin	Connection
1	Heater	5	Diode plate
2	Plate	6	Diode plate
3	Grid	7	Shield & cathode
4	Shield & Cathode	8	Heater

7Y4

Type 7Y4 is a full-wave cathode type high-vacuum rectifier with characteristics somewhat similar to type 84.

Tentative Ratings

Heater voltage (nominal)	7.0 v
Heater current (nominal)	0.53 amp
Base	Loktal
Bulb	T-9

Operating Characteristics

Heater voltage	6.3 v
Full Wave	
Max. a-c voltage per plate (rms)	350 v
Max. d-c output	60 ma
Max. peak inverse voltage	1,000 v
Max. peak plate current	250 ma
Volt drop at 60 ma	19 v
Max. voltage heater-cathode	450 v
Half Wave	
Max. a-c plate voltage	350 v
Max. d-c output	75 ma
Max. peak inverse voltage	1,000 v

Basing

Pin	Connection	Pin	Connection
1	Heater	5	No connection
2	No connection	6	Plate
3	Plate	7	Cathode
4	No connection	8	Heater

35A5

Type 35A5 is a power output pentode somewhat similar in characteristics to the 25L6G and is designed primarily for use as an output tube in a-c, d-c sets.

Tentative Ratings

Heater voltage (nominal)	35.0 v
Heater current (nominal)	0.160 amp
Base	Loktal
Bulb	T-9

Operating Characteristics

Heater voltage	32.0 v
Plate voltage	110 v
Screen voltage	110 v
Grid voltage	—7.5 v
Plate current	35 ma
Screen current	2.8 ma
Plate resistance	25,000 ohms
Transconductance	5,500 μmhos
Signal input	5.3 v (rms)
Load resistance	2,500 ohms
Power output	1.4 watts
Total harmonics	10 %

Basing

Pin	Connection	Pin	Connection
1	Heater	5	No connection
2	Plate	6	Control grid
3	Screen grid	7	Cathode and deflectors
4	No connection	8	Heater

35Z3

Type 35Z3 is a half-wave high-vacuum type rectifier designed primarily for use in a-c, d-c sets where the 35A5 is used as the output tube.

Tentative Ratings

Same as for 35A5.

Operating Characteristics

Heater voltage	32.0 v
Max. a-c plate voltage (rms)	250 v
Max. d-c output	100 ma
Max. peak inverse voltage	700 v
Max. peak plate current	400 ma
Max. voltage heater-cathode	300 v
Volt drop at 200 ma	22 v

Basing

Pin	Connection	Pin	Connection
1	Heater	5	No connection
2	Plate	6	No connection
3	No connection	7	Cathode
4	No connection	8	Heater

1.4-VOLT TYPES

The new 1.4-volt glass tubes are intended for use with a single 1.5-volt dry cell battery and a 90-volt B battery, thus making them particularly suitable for use in portable receivers or in rural districts where electricity is not available.

The filament of these tubes is designed to function satisfactorily when connected directly across a 1.5-volt dry cell without the intervention of a voltage dropping resistor.

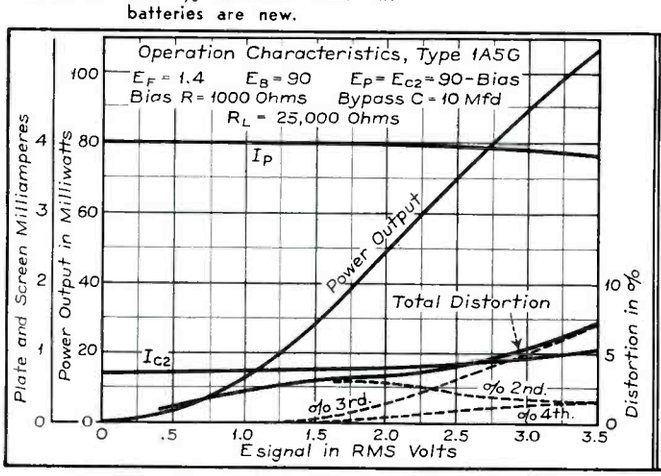
Unlike most tubes, the 1.4-volt types must be operated only in a vertical position.

It is recommended that self-bias operation be employed so that the grid bias will be automatically compensated as the B battery voltage decreases during battery life.

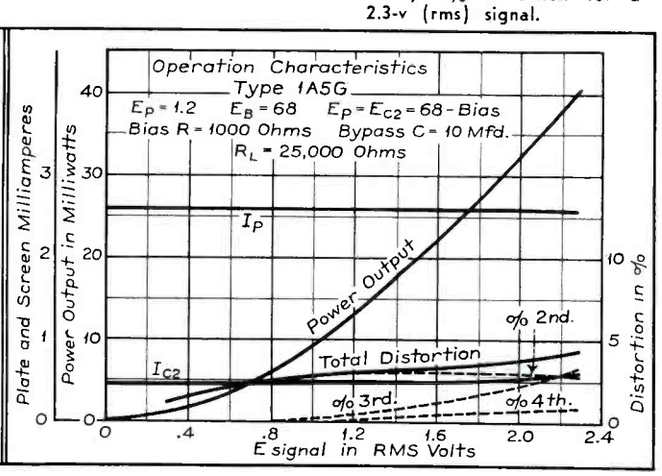
In Fig. 2 there is shown the normal characteristics of the 1A5G when operated from new batteries, namely, a 1.4-volt filament supply and a 90-volt plate supply. The end of the useful life of a 1.5-volt dry cell is reached when, under load, its voltage is 1.2 volts. Similarly, the approximate end of usefulness of a 90-volt B battery is reached when its voltage becomes 68 volts. The curves in Fig. 3 show the characteristics of a 1A5G when operated under these conditions.

(*Continued on page 82*)

Fig. 2. With 2.3-v (rms) on the grid, the 1A5G will deliver approximately 60 milliwatts with 4% distortion when the batteries are new.



Fgi. 3. When the batteries have reached the end of their useful life, the 1A5G will still deliver approximately 40 milliwatts with only 4% distortion for a 2.3-v (rms) signal.



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- 10 Microamperes to 10 Amperes. 7 ranges of 0/500 microamperes/2.5/10/50/250 milliamperes/1/10 amperes D.C.
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- 7 individual working voltages of 450, 300, 250, 200, 100, 50 and 25 volts.
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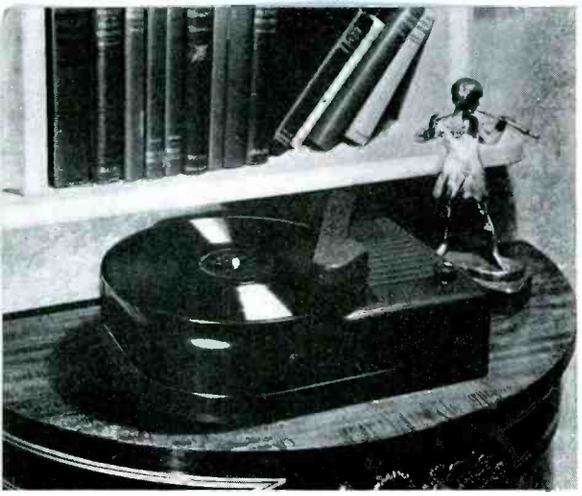


Fig. 3. RCA.

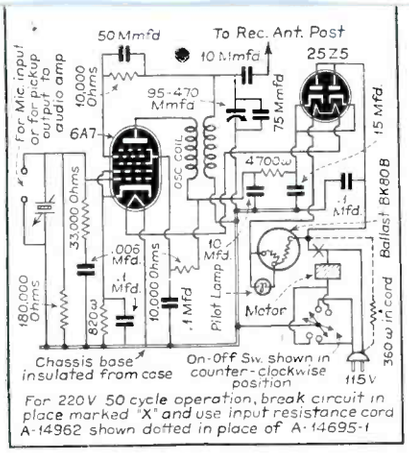
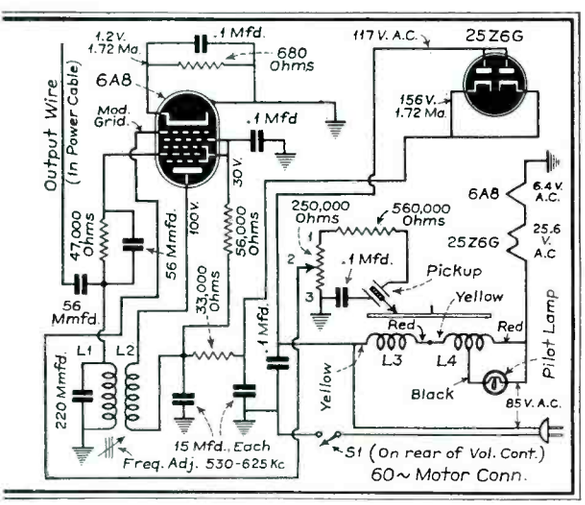


Fig. 6. Sparton.



WIRELESS

By RAY D.

SINCE wireless record players were first announced last June, much interest has been evidenced in these units . . . so much so, in fact, that they are now being produced by approximately ten manufacturers. In addition, several new record players are in the design stage and will probably be placed on the market at an early date.

The popularity of these units are undoubtedly due to a number of factors. In the first place, the mystery feature, i.e., the fact that they play through the radio without direct connection, is intriguing. In addition, the record player may be placed at any convenient location, the location being limited only by the distance from the receiver and the convenience of an a-c outlet. Further, these wireless players are relatively inexpensive and simple to operate. When properly designed they are capable of good quality.

Shortly after the introduction of the wireless record player, the Federal Communications Commission were asked to make a ruling as to its legitimacy. This was done because these units are actually nothing more than a low-power transmitter which might be considered as capable of producing interference in the broadcast band if not limited in power. The resulting FCC ruling stated that "if the control device is to be operated from the conventional house lighting circuit or makes use of this circuit as a radio-frequency link between the transmitting device and the receiver, it should be so constructed that no matter what type of house lighting circuit it is associated with, the radiation at the distance

$$\frac{157{,}999}{f\,(kc)}\ \text{ft.}\left(\frac{\lambda}{2\pi}\right)$$

shall not exceed 15 microvolts . . . "

*Editor, COMMUNICATIONS magazine.

Fig. 7. Sonora.

Fig. 4. Philco.

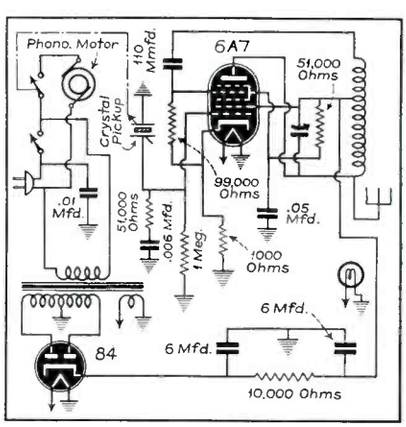
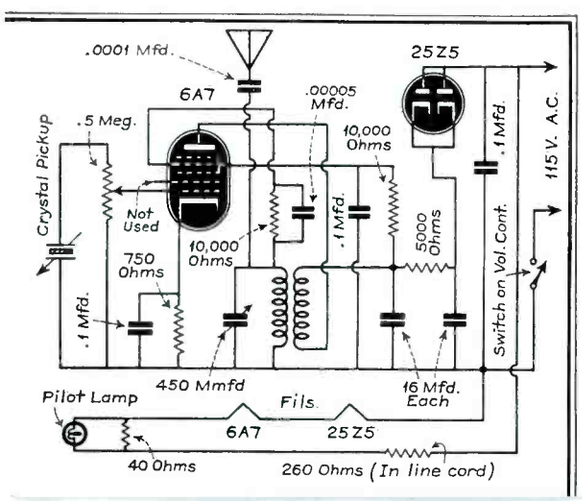
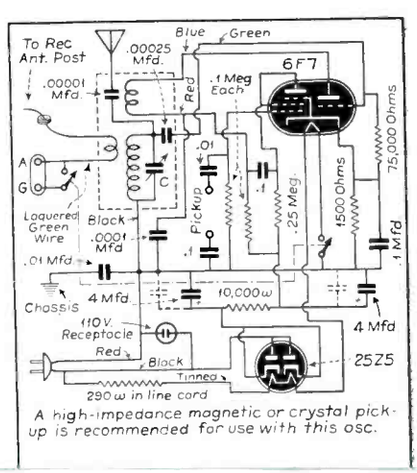


Fig. 5. Meissner.





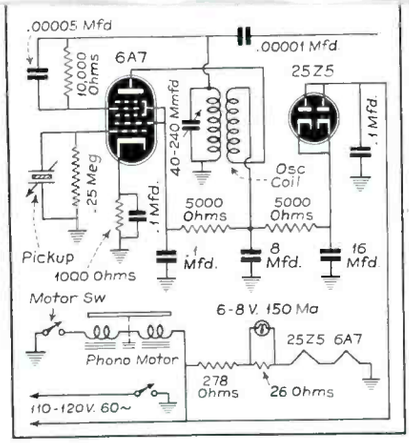


Fig. 1. Wilcox-Gray.

Fig. 8. Admiral.

RECORD PLAYERS

RETTENMEYER*

In simpler words the field strength at a distance in ft., obtained by dividing the wavelength (on which the player operates) by 6.28 (approximately) should be no greater than 15 microvolts per meter.

The principle of operation of these units is quite simple. As pointed out previously, these record players are nothing more than a low-power broadcast transmitter. Referring to the typical circuit, such as Fig. 1, it will be seen that the unit contains two tubes, one operating as an oscillator-modulator and the other as a rectifier. The oscillator-modulator, generally a 6A7, is modulated with audio by means of the crystal pickup and the phonograph record being played. The oscillator is tunable over a small range in the broadcast band. The tuning being accomplished by means of a trimmer.

Microphone connections are provided in some of the units as an additional feature. Crystal pickups are used in all cases. The turntable speed is, of course, 78 rpm and all units are designed to use either 10 or 12 inch records. In most cases self-starting induction motors are used to drive the turntable, although in one instance a manual-starting synchronous motor is employed. As a result, operation is from a 110-volt, 60-cycle power supply. Detailed information as to trade names, prices, tubes used, turntables, pickups, etc., is given in the chart which accompanies this article.

Various record players and their circuit diagrams are shown in Figs. 1 through 11.

In referring to the schematic drawings a number of rather unusual circuits will be noticed. One unit, for example, uses a 12A7 tube as a combined rectifier

(*Continued on page* 80)

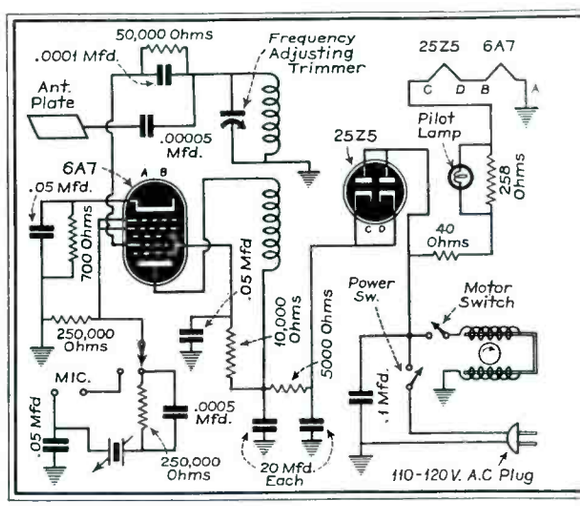


Fig. 2. G.E.

Fig. 4. Philco.

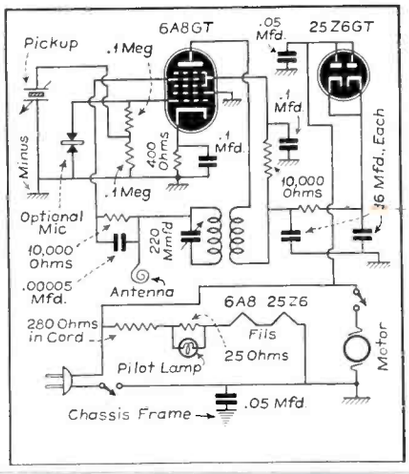
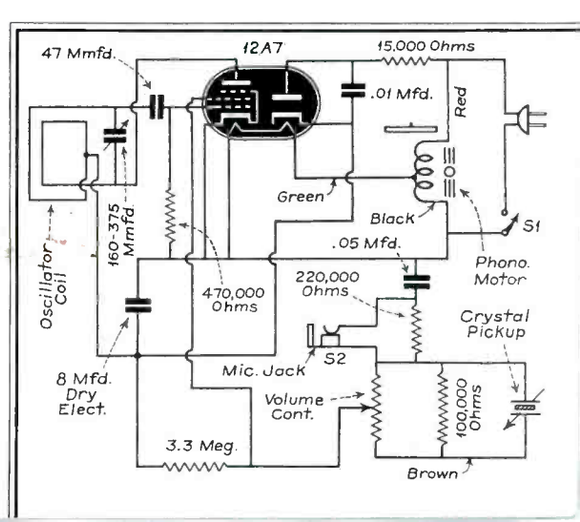


Fig. 9. Espey.



FACSIMILE

(See Front Cover)

By FRED C. EHLERT*

Newspapers at home by radio is now possible through facsimile equipment.

IN SPITE of the rapid development and use of everyday wire and radio facsimile service, many are unaware of its greater capabilities as a mass communications medium in the broadcasting field. This is largely because of the fact that facsimile transmissions have almost been entirely employed to handle press photos for subsequent newspaper reproduction and in the average layman's mind this is the limitation of the method. Many also confuse television with facsimile and ask why television ultimately will not perform the same duty.

Briefly, facsimile involves the conversion of illustrations or other copy, such as printed matter, photographs, line drawings, sketches, etc., into an electrical signal which can be sent over radio or telephone circuits. At the receiver, the signal is automatically converted back into its visible form appearing as a recorded replica of the original copy. The received copy is permanent and like a printed page can be handled, observed or read whenever desired.

Television involves the conversion of visible aspects of subjects into electrical signals which can be sent to distant points. However, the speed of this conversion is such that ordinary telephone circuits or conventional sound-broadcasting equipment cannot handle the signal.

In addition, there is as much difference in the technique of the two communications mediums as there is between the making of a newspaper and a motion picture. For primarily, where facsimile is concerned only with the transmission and subsequent recording of copies of still subjects such as pictures and printed pages, television deals with moving objects or persons. The image on the screen of a cathode-ray tube receiver has the basic qualities of a motion picture. The image moves, it is transitional, and when the show is over, the screen is black. Since nothing has been recorded, the images will not be seen unless someone watches the screen when they are to be received.

Facsimile and television thus perform widely different functions. Each will fit into the communications picture as separate services, having fundamental distinctions as widely divergent as those of the public press and the motion picture.

The facsimile transmitter now employed by the broadcasters in their experimental service employs a scanning machine in which copy to be sent over the air is inserted in what is termed the "copy head." (See Front Cover.) This holds and advances the copy in front of the "scanning" head, consisting of a small electric bulb, lens system and photocell. Light from the bulb is focused, as a small spot, on the surface of the paper carrying the copy and the reflected light is picked up by the light-sensitive photocell. The scanning head is moved from side to side by an electric motor so that the spot of light traces a series of parallel paths across the copy which is moved upwards through a distance equal to the diameter of the light spot at the end of each scanning stroke. In this manner, the entire surface of the paper is scanned, line by line, the black, half-tone and white areas reflecting to the photocell varying amounts of light ranging from minimum to maximum. These variations in reflected light effect a change in the amount of electric cur-

A PRIVATE newspaper with any spot in the house as the press room, the world's best editors and reporters as a staff and the radio as copy boy—this an actual accomplishment . . . is available today to anyone in the United States possessing an ordinary radio receiving set. No thundering press while the newspaper is printed, but instead, equipment contained in a small attractive cabinet, silently will print the latest edition while you sleep, completing it in time for reading at breakfast.

The name of this new service is facsimile, first cousin of television since it shares with it some of the same basic principles.

Unlike its more glamorous and well publicized relation, facsimile steps into broadcasting from other communication fields in which it already has proved its capabilities in a quiet but exceedingly effective manner. For facsimile, as most Service Men know, has been in daily commercial use for several years in speeding newsphotos back and forth across the country via the telephone circuits and across the Atlantic by short waves.

Ten experimental facsimile broadcasters are now on the air with actual programs; two will soon begin field tests and others are awaiting delivery of equipment.

*Finch Telecommunications Labs., Inc.

EXPERIMENTAL FACSIMILE BROADCASTERS

CALL LETTERS	LOCATION	FREQUENCY	OWNER	POWER (WATTS)
WLW	Cincinnati, Ohio	700 Kc.	Crosley Radio Corp.	50,000
WOR	Newark, N.J.	710 Kc.	Bamberger Broadcasting Co.	50,000
WGN	Chicago, Ill.	700 Kc.	WGN, Inc.	50,000
WHO	Des Moines, Iowa	1000 Kc.	Central Broadcasting Co.	50,000
WSM	Nashville, Tenn.	650 Kc.	National Life & Insurance Co.	50,000
KSTP	St. Paul, Minn.	1460 Kc.	National Battery B'casting Co.	25,000
WWJ	Detroit, Mich.	920 Kc.	Detroit News	5000
WSAI	Cincinnati, Ohio	1330 Kc.	Crosley Radio Corp.	5000
WCLE	Cleveland, Ohio	610 Kc.	Cleveland Plaindealer	500
WHK	Cleveland, Ohio	1390 Kc.	Cleveland Plaindealer	2500
WGH	Newport News, Va.	1310 Kc.	Hampton Roads B'casting Co.	250
*W8XAN	Jackson, Mich.	–	Sparks - Withington Co.	–
**W2XBF	New York City	–	W.G.H. Finch	1000
W2XUP	New York City	25.7 Mc.	Bamberger Broadcasting Co.	100

* Facsimile license just granted by FCC.
** Transmitter is the first of the duplex type employing both amplitude and frequency modulation. Both voice and facsimile programs will be transmitted simultaneously on the ultra high frequencies.

rent flowing through the photocell which in turn controls the loudness of a high-pitched whistle-like tone. The tone called the "facsimile carrier" with its characteristic rising and falling sounds is then applied to ordinary broadcast amplifiers. These deliver it to the radio transmitter in the same manner in which broadcast signals are handled. Any conventional receiver tuned to the frequency of the transmitter will then pick up the signals.

However, in order for the listener to utilize these signals he must have a recording machine to convert them back into their visible equivalents on paper.

The recording machine (see Front Cover) in many ways is similar to the scanning instrument. What is termed the "copy head" holds the *dry* processed paper which is fed as a continuous strip two newspaper columns wide from a roll carried in the lower part of the machine. A recording stylus is then moved, by a small electric motor, from side to side across the surface of the paper, forming marks on the paper corresponding in position and quality to the elements of the copy at the transmitter. When the incoming signal is loudest the line traced is darkest, when it is weakest no trace is formed. At the end of each of these recording strokes the paper is moved up by an amount equal to that of the width of each line element. By means of extremely short low-tone signal impulses sent out by the transmitter just before the start of each recording stroke and by the use of a small motor turning over at a predetermined speed the recording stylus moves across the paper in step with the scanning head of the transmitter, recording copy in its proper position. In this manner the recorded copy is built up line by line to appear as a duplicate of the original. One hundred lines will build an inch of type, or at the operating speed of the present machine a two column newspaper at the rate of 5 feet per hour. Increasing use of the machine will lead to requisite refinements.

The actual home recording machine comes as a complete unit in a small cabinet approximately a foot square. It may be connected without auxiliary amplifying equipment to the output circuit of any broadcast receiver having a power rating of 3 watts or more. A switch in the voice-coil circuit can be employed to cut the speaker off during the recording of facsimile broadcasts. The broadcasting station from which facsimile signals are sent is tuned in with a receiver as would be the case if regular sound programs were to be received. The facsimile recorder is switched on and the volume control of the receiver is turned to the point where copy has the desired contrast. The actual recording operation is wholly automatic and requires no attention. The simple statement that recording is automatic may seem relatively unimportant to the average reader, but it is largely the solution of the automatic recording problem that has made it possible to open the home facsimile field. Until the development of an automatic machine and inexpensive *dry* recording paper of wide latitude the adaptation of facsimile recording methods to home service seemed rather remote. The home facsimile machine operates without attention throughout facsimile broadcasting periods. It holds a roll of dry recording paper which is automatically fed as long as facsimile signals are received.

An obvious question at this point might be "When will facsimile broadcasts occur and what stations will handle them?"

During the period when only experimental licenses are available and probably thereafter broadcasts will take place in the early morning hours between 1 a.m. and 6 a.m. when sound broadcasting facilities are idle. The high-frequency stations will broadcast facsimile programs during the daylight hours as well. There are some 15 major broadcasting stations already on the air with facsimile programs together with other high-frequency stations for daylight facsimile programs.

FINCH RB FACSIMILE RECORDER

THE Finch RB home facsimile recorder is built as a complete, self-contained facsimile recording instrument which may be connected without auxiliary amplifying equipment to the final power stage of any modern broadcasting receiver having an output power rating of 3 watts or more. The recorder embraces two units, both included in the same cabinet. These are designated as the signal rectifier and the recording machine.

Installation Procedure

The recorder may be connected to the plate of the output power tube through the use of a suitable plate connection wafer, as shown in Fig. 1. If two or more tubes are used in push-pull combination in the power stage, connect to whichever one is in the most convenient location. A 0.25-mfd paper coupling condenser with a rating from 400 to 600 volts should be used as indicated. The interconnecting wire may be a twisted pair or a low-capacity shielded cable. The shield (or second wire if a twisted pair is used) should be connected to the ground binding post or other grounded part of the receiver chassis. The single-pole double-throw toggle switch shown in the circuit (Fig. 1) is for the purpose of disconnecting the recorder from the receiver when the former is not in use. This switch may be mounted on a small bracket or panel fastened to the rear of the receiver chassis.

Connect the recorder end of the plate coupling wire to the screw lug 4 in Fig. 2, located nearest the motor on the three-lug terminal strip at the right side of the rectifier chassis marked 1. The shield or ground wire should be connected to screw lug 2 located farthest from the motor on the terminal strip,

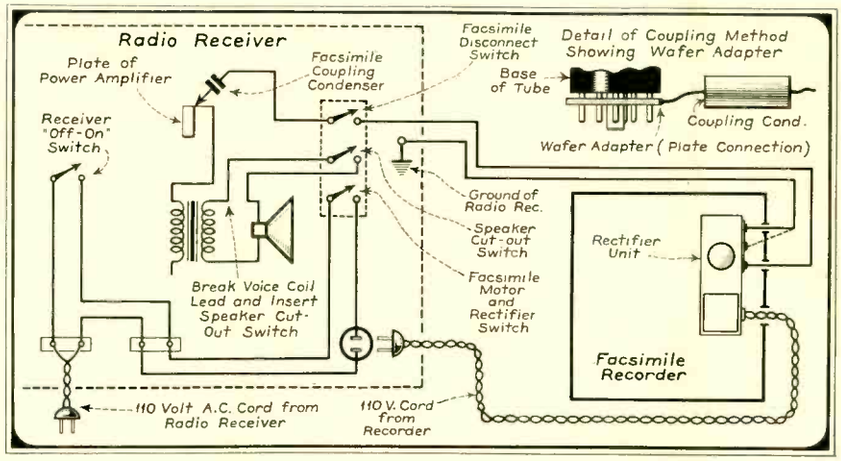


Fig. 1. A facsimile recorder may be connected to the average radio receiver by means of a simple plate connection wafer.

if the receiver employs a power tube of the high resistance type such as the 6F6, 6L6 or 42. This will connect the entire primary winding into the plate coupling circuit. If the power tube in the receiver is of the low plate resistance type such as the 45, it may be necessary to connect the ground wire to middle lug 3 on the terminal strip. Tests for determining which connection to use are described below.

In order to effect silent operation of the radio receiver when it is used for facsimile recording, a speaker cut-out switch should be connected in series with the voice coil, as indicated in Fig. 1. For convenience this switch should be mounted alongside the recorder cut-off switch.

A 6A6 tube should be inserted in the socket on rear of the rectifier unit. Connections for use of a time switch are shown in Fig. 4. The switch is shown in Fig. 5. Mounting and connecting instructions for the time switch are given below.

A half-inch felt pad approximately 12⅝ by 14 inches should be placed under the recording machine. The pad should be centered properly so that the cover of the machine rests on the felt. Leads from the recorder may be brought out through the opening cut in the right side of the cabinet. The cabinet should be adjusted over the machine so that noise is a minimum.

When the recorder is turned on the rectifier tube will operate and the motor run quietly.

Reloading Paper

Load paper in machine as follows: Remove cover. Insert roller 16 (see Fig. 2) in center of paper roll, holding it so that leading edge of paper (cut in shape of flap of envelope) will extend toward rear of machine from the *bottom* of the roll. Insert roll at rear of machine under recording back-plate 14, and mount on notches provided for roller as shown in Fig. 2. Thread paper leader under the guide bar and rollers at the lower part of the copy head just above the base of the machine. Turn stylus holder 7 out of the way by turning it on its pivot at right angles

The facsimile recorder consists largely of mechanical devices for moving the stylus across the paper.

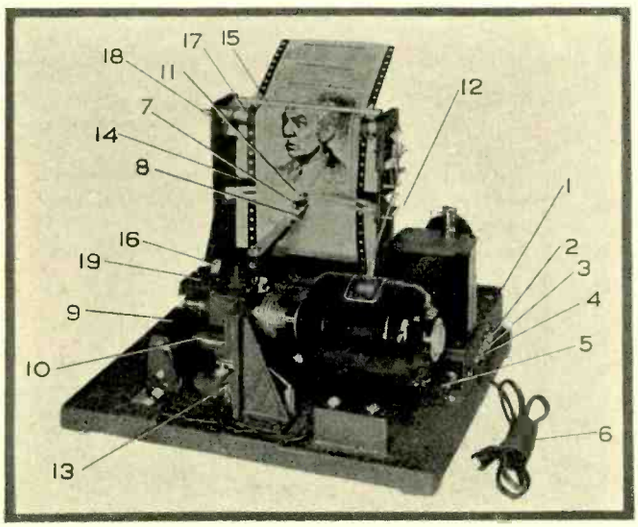
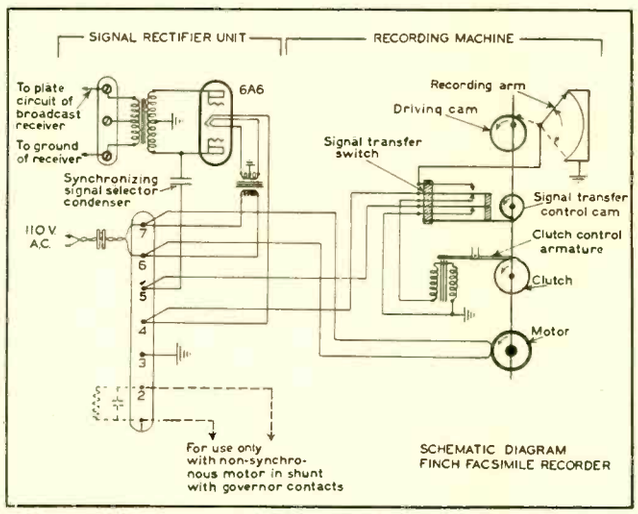


Fig. 2. When the recorder is turned on, the rectifier tube will operate and the motor run quietly.



to the recording arm. Open copy gate 11 by moving lever 12 towards rear of machine until latch holds it in open position. Thread paper leader straight upwards from guide bar through copy gate. Raise the pressure roller bar 15 on top of feed sprocket at the top releasing the gate latch, then straighten paper so that it extends straight upwards from guide bar to sprocket, 17. Sprocket holes should fit over sprocket teeth properly. Turn stylus holder back into position on recording arm so that stylus rests on paper.

Check on operation of the recording mechanism by moving the armature at the end of clutch control lever 10 towards the electro-magnet's pole pieces. The recording arm should operate, moving the stylus from side to side through the recording arc extending between equally spaced margins at the coated edges of the paper. The stylus should remain in contact with paper at all times during the movement of the recording arm.

Time Switch

Mount the switch in upright level position on inside wall of radio cabinet. There are four holes in back of case for this purpose. Care should be taken not to bend or otherwise damage the case in mounting. Make connections as shown in Fig. 4.

It is important that the clock be started by turning the red gear to the left. Set clock by turning red disc in back of dial to the right until time indicator points to correct time of day. Do not attempt to turn dial. The pointer indicates time and should point down. The pointer is stationary and the dial turns.

There are 12 taper pins provided with the switch. After setting the clock, place a pin in hole in dial at the indicated time you wish the radio receiver and recorder to be turned on, then for each hour of operation, place pins in holes at one hour intervals. For example, if operation of the recorder is desired from 1 a.m. to 3 a.m., and again from 5 a.m. to 6 a.m., place a pin in each hole marked 1 a.m., 2 a.m., and 5 a.m. The receiver and recorder will then go on at 1 a.m. and turn off at 3 a.m.; go on again at 5 a.m. and turn off at 6 am. In other words, one pin for each hour of light.

See that wires inside case do not interfere with movement of mercury tube. The tube is shellaced in clip. If loosened by accident it must be properly adjusted by moving endways in clip until mercury makes all contacts properly.

During daylight and evening hours when the time switch is not in use, it it taken out of the circuit by throwing

the shunting switch to the on position. Application of power to the receiver is then controlled in normal manner with the regular off-on switch.

TEST PROCEDURE

Turn on receiver and facsimile recorder. Motor and rectifier tube should operate. Turn tone control of radio receiver to off or treble position.

Tune in any local broadcasting station transmitting a musical program. The incoming signals should start the recorder. Take the speaker out of the circuit with speaker cut-out switch. Turn up the volume control of the receiver until marking on the paper is heavy black when signals are of maximum level. If paper marks readily with some reserve remaining on the volume control adjustment satisfactory facsimile recording should result during facsimile broadcast periods.

Set volume control at minimum signal position. Then turn recording stylus holder 7, see Fig. 2, at right angles to recording arm so no current will flow

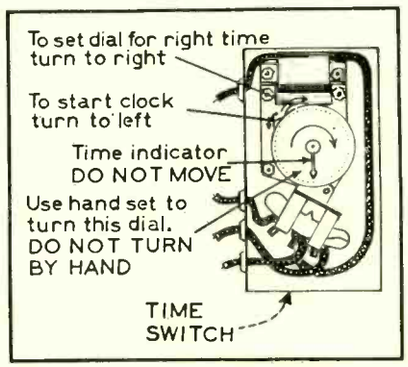


Fig. 5. There are twelve tapered pins provided with the time clock. Each pin is used in the proper hole to give one hour of light.

to paper. Disconnect antenna leads of receiver so broadcast signals will not interfere with further tests. Bring speaker back into circuit.

Use any standard signal generator having 400-cycle modulating tone as local test signal source. Set generator to approximate frequency of facsimile broadcasting station and tune for maximum undistorted signal. At this point take the speaker out of the circuit.

Measure the voltage between stylus lead and ground with a high resistance 0-600 d-c voltmeter. This may readily be done by connecting voltmeter to the second lug from the left on switch 13 and any unpainted metallic part of the recorder. As the recording arm moves from left to right, the voltmeter should read at least 200 volts. If the voltage is substantially lower than this, as may be the case with radio receivers having low plate resistance output tubes such as the 45, it will be necessary to change the connections on the three-lug terminal strip mounted on the right side

WHEN YOU CHANGE YOUR ADDRESS

Be sure to notify the Subscription Department of SERVICE at 19 E. Forty-seventh St., New York City, giving the old as well as the new address, and do this at least four weeks in advance. The Post Office Department does not forward magazines unless you pay additional postage, and we cannot duplicate copies mailed to the old address. We ask your cooperation.

of rectifier unit 1. To make this change, take the ground wire from lug 2 located farthest from motor and connect it to middle lug 3. This will bring half the primary winding of the coupling transformer into the circuit instead of the entire winding, and accordingly the step-up ratio of the transformer will be increased. Again check on the voltage between stylus and ground.

Insert a small paper wedge or piece of cardboard between the pole pieces of the electromagnet and the armature at the end of clutch control lever 10. This will keep the recording arm in place in the left-hand starting position. In this position the signal transfer contacts of switch 13 are connected so that the rectified signal voltage is applied to the windings of electromagnet 10. Also, in this position of the recording arm, the signal selecting condenser 5 at the motor end of the rectifier chassis is connected across half of the secondary windings of the coupling transformer to by-pass to ground wave energy having frequencies higher than 1000 cycles. In this manner discrimination is made between the 500-cycle synchronizing pulse and the 2000 cycle facsimile marking signal. Measure the voltage across the electromagnet windings by connecting the voltmeter between ground and the third lug from the left on switch 13. The 400-cycle tone from the signal generator should give a rectified voltage of 50 or more across the electromagnet when the receiver is adjusted to give maximum undistorted signal. When the volume control of the receiver is turned down to give proper marking voltage (about 200 volts between ground and recording stylus) the voltage across the electromagnet windings should be 40 or more. *If stylus or marking voltage is too high when the receiver is*

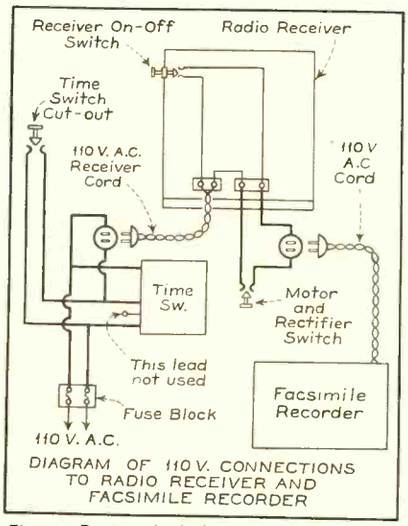


DIAGRAM OF 110 V. CONNECTIONS TO RADIO RECEIVER AND FACSIMILE RECORDER

Fig. 4. During daylight and evening hours the time switch can be taken out of the circuit by operating the shunting switch to the on position. Application of power to the receiver is then controlled in normal manner with the regular off-on switch.

adjusted to give synchronizing voltage of 40 *or* 50 *volts across the windings of the electromagnets connect a* 5000 *to* 10,000 *ohm resistor* (1 *watt, non-inductive*) *in series in the vertical portion of the wire leading from the extreme left lug on switch* 13 *to the stylus.* The resistor should have a value high enough to reduce the stylus voltage to give moderately black marking when the voltage across the electromagnets is approximately 45 or 50. If the synchronizing voltage is less than 40 it will be necessary to replace condenser 5 with another of lower capacity. Since the condenser mounting lugs are easily accessible this may readily be done. A 0.05-mfd condenser (paper dielectric) having rating of 400 volts will ordinarily give satisfactory results in lieu of the standard condenser of 0.1-mfd capacity. This change in condenser usually is necessary only when the receiver's power stage employs tubes of the low plate resistance type which require the use of half the primary winding of the coupling transformer in order to increase stylus voltage for marking.

Turn down volume control of receiver. Move stylus holder back into normal operating position parallel with the recording arm. Check on stylus contact with surface of recording paper. The tip of the stylus should make positive, but not too heavy, contact with the surface of the paper, and the stylus shank should move freely back and forth in the bushings at the ends of the stylus holder.

Remove wedge between armature and pole pieces. Increase setting of volume control until the sustained 400-cycle test signal actuates the clutch control and the recording arm moves from side to side across the paper. If circuits are working properly an unbroken black line should be traced across the paper during the entire recording stroke from left to right and during a small part of the return stroke. Turn down the volume control to the point where light marking is formed. Let recorder run for fifteen or twenty minutes without adjusting controls of receiver. If level change is noticed test tubes and other parts of receiver, such as volume control to determine cause of signal variation. The recording latitude of the electrosensitive coating of the paper is such that moderate signal level changes will not seriously affect quality of copy. If the automatic volume control circuit of the receiver is operating properly, there should be no difficulty in maintaining a substantially uniform recording level at points within the primary service area of the facsimile broadcasting station.

Check on operation of the paper feed sprocket and associated driving system. The ratchet wheel should turn one tooth during each return stroke of the recording arm. Be sure that ratchet and pawl move freely and do not stick at any point.

Check on operation of signal transfer and signal selector control arms of switch 13. Making and breaking of contacts by contact springs should be positive. Clean contact points, arms and the switch control cam with cloth moistened with Carbona or similar cleaning fluid. Remove any oil accumulation on the external surfaces of the clutch discs or vertical discs shafts.

Check on operation of time clock.

Inspect gear box for proper lubrication. To do this, remove the screws on the cover of the gear box and pull cover upwards. Grease level should come to within ¼ inch of top of box. Use only lightest grease if box needs filling.

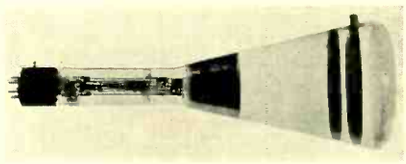
In the educational field RCA Institutes has developed the necessary laboratory equipment to provide the student body with facilities for the study of television and facsimile. Illustrative of this equipment, the test bench shown contains the necessary meters, attenuation box, oscilloscope, calibration dials, power supplies, repair tools and parts for complete testing and repairs. J. H. Whitteker, chief instructor of RCAI, has directed the school faculty in the development of this test equipment.

Photo courtesy Radio Corp. of America

CATHODE-RAY INTENSIFIER

PRIMARILY for larger and brighter television images at given cost, but likewise of importance in other applications, the DuMont cathode-ray intensifier element has been announced by the Allen B. DuMont Laboratories.

The intensifier electrode takes the form of one or two metallic deposit rings near the screen end of the cathode-ray tube, and serves to accelerate the electrons *after* deflection. So equipped, it is said, a tube has increased brilliance without corresponding loss in



DuMont C-R tube with intensifier.

deflection sensitivity. Heretofore, attempts at increasing deflection sensitivity while operating at given anode voltage, have been along lines of increasing deflection plate size and decreasing the space between.

The DuMont 54-9-T five-inch tube is provided with the intensifier feature, as well as several refinements in its gun structure to obtain better focus and modulating characteristics. In operation, the electron gun is operated at the same potentials and in the same manner as other DuMont tubes of corresponding screen diameter. The intensifier electrode may be connected to the final anode and the tube operated in the conventional manner. If, however, an additional voltage equal approximately to the accelerating electrode potential be applied between intensifier and second anode, the effect of the former is to brighten the pattern equivalent to doubling the accelerating voltage, yet not causing so great sensitivity decrease as might normally result. In terms of screen pattern size, this means that, instead of a 50% reduction which doubled accelerating voltage would normally produce, the voltage with use of accelerating element reduces pattern size by only 18 percent. Thus the design of deflection amplifiers is simplified.

The positive potential required between second anode and intensifier electrode may be taken from existing cathode-ray tube power supply by addition of a single half-wave rectifier operating from the same transformer winding and connected in reverse polarity. Filter requirements may be satisfied by the use of a small filter condenser and a high resistance bleeder (approximately 10 megohms) because of the low current to this electrode.

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RCA Radio Tubes

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A SERVICE OF THE RADIO CORPORATION OF AMERICA

Knight.

WIRELESS RECORD PLAYERS

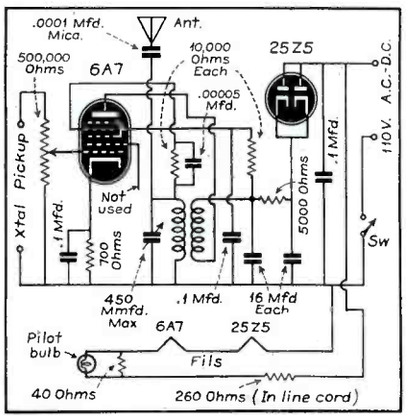
(*Continued from page 69*)

and oscillator. (See Fig. 2.) Another unique feature of this same unit is the method of obtaining heater voltage. Instead of employing the more conventional method of obtaining heater voltage from the supply line through a ballast resistor, it is tapped off the motor winding. In this connection, it is interesting to note that another unit employs a similar method for obtaining voltage for its pilot lamp (Fig. 3).

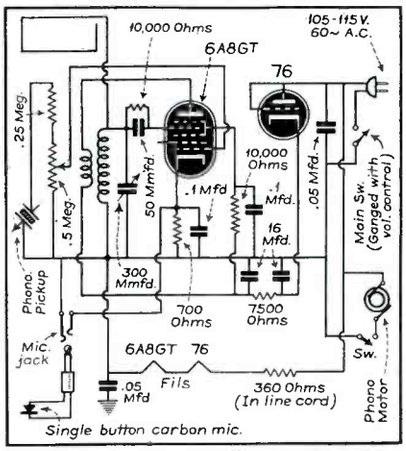
In Fig. 4 is shown a unique method for automatically starting and stopping the turntable by means of the tone arm. When the pickup is placed on the record, it automatically closes the motor switch and starts the turntable. Similaly, when the tone arm is removed from the record, the motor switch is automatically opened.

Also of interest is the phonograph oscillator shown in Fig. 5. This type of unit is designed for operation through a direct connection to the receiver antenna circuit and will not ordinarily supply sufficient radiated signal to provide satisfactory wireless operation, even if the coil shield is removed. There is no reason, however, why the same components and exactly the same circuit would not provide wireless operation if a simple addition were made.

A radiator connected to the oscillator coil (indicated as an antenna in the circuit of Fig. 5) will provide satisfactory results, especially if this radiator is included in the power line cord.



Knight.



Lafayette.

Lafayette.

Four to six feet of wire should provide ample radiation. Some difficulty may be experienced from broadcast interference with the signals from the record player. In general the wireless units use a radiation frequency which is more free from such interference.

In setting up a wireless record player, the general procedure is as follows:

The radio receiver should be turned on and tuned to a *quiet* spot in frequency range covered by the oscillator. The oscillator should then be tuned to the frequency of the receiver. Adjust the volume controls on the receiver and record player to the proper levels. In very noisy locations, it may be necessary to wrap several turns of the oscillator antenna around the antenna lead-in to the receiver. In receivers having push-button tuning, one of the buttons may be set up for the oscillator frequency.

In conclusion, the writer wishes to express his appreciation to Robert G. Herzog, Editor of SERVICE for his help in securing much of the data contained in this article, and to the various manufacturers, for their cooperation in supplying the information on which this article is based.

The wireless record players now offered vary in price from $14.95 to $29.95. Chart compiled from data supplied by the manufacturers.

Manufacturer	Trade Name	Model No	Frequency Range	Pilot Light	Tubes: Osc.-Mod.	Tubes: Rect	Voltage	Cycles	Motor Type	Turntable: Speed	Turntable: Dia.	Turntable: Record	Pickup: Type	Pickup: Impedance at 1000 ~	Pickup: Voltage at 1000 ~ 250,000 Load	Micro-phone Conn	Controls: OFF ON	Controls: Vol	Dimensions: High	Dimensions: Wide	Dimensions: Deep	Weight Lbs.	Price
Allied Radio Corp	Knight	–	–	Yes	6A7	25Z5	110	60	–	78	–	10" or 12"	Crystal	–	–	No	Combined		–	–	–	–	14.95
Continental Radio & Television Corp.	Admiral	AW-11	540Kc	Yes	6A7	25Z5	110-120	"	–	"	–	"	"	–	–	Yes	Yes	No	6½"	13"	13"	16	24.95
Espey Mfg. Co., Inc	Espey	922	1475-1750 Kc	No 47	6A8GT	25Z6GT	110-125	"	Self-Start Induction	"	9"	"	"	100,000	1½	Yes	"	"	6"	14"	14"	10	"
General Electric Co	G.E	GM-11	1400-1600 Kc	No	12A7		"	"	"	"	10"	"	"	80,000	1½	Yes	Combined		8"	15⅛"	13¼"	10	29.95
Philco Radio & Television Corp.	Philco	RP-1	1450-1750 Kc	Yes	6A7	84	"	"	"	"	8"	"	"	150,000	*3-4	No	Yes	No	3½"	10⅛"	10⅛"	7½	19.95
RCA Mfg Co., Inc.	RCA	VA-20	530-625 Kc	No.47	6A8	25Z6G	"	"	Manual Start Synch.	"	7"	"	"	100,000	1½	No	Combined		5"	12½"	8¼"	7¼	17.95
Sonora Electric Phono. Co	Sonora	PBW	–	Yes	6A7	25Z5	"	"	Self-Start Induction	"	–	"	"	–	–	–	"		7¼"	13⅛"	10⅜"	–	–
Sparks-Withington Co	Sparton	219P 219PB	1200-1700 Kc	No.44	6A7	25Z5	"	"	"	"	–	"	"	–	–	Yes	Yes	No	–	–	–	–	24.95 29.95
Wholesale Radio Service Co.	Lafayette	K21965	540 Kc	NO	6A8GT	76	"	"	"	"	8"	"	"	150,000	*3-4	Yes	Combined		6½"	13"	10¾"	13	29.50
Wilcox-Gay Corp.	Wilcox-Gay	8K2	540-750 Kc	Yes	6A7	25Z5	"	"	"	"	–	"	"		–	No	Yes	No	–	–	–	–	–

* Infinite impedance load

For The Serviceman who wants to be "Ready"

JOHN F. RIDER, Publisher, 404 Fourth Ave., NEW YORK CITY

TUBES

(*Continued from page 66*)

1A5G

Type 1A5G is a pentode type power amplifier tube designed for service in the output stage.

Ratings

Filament voltage	1.4 v
Filament current	0.05 amp
Base	Octal
Bulb	T-9

Operating Characteristics Class A

Plate voltage	90 v
Screen voltage	90 v
Grid bias	—4.5 v
Transconductance	850 μmhos
Plate current	4.0 ma
Screen current	0.8 ma
Plate resistance	300,000 ohms
Amplification factor	255
Load resistance	25,000 ohms
Total harmonics	7 %

Basing

Pin	Connection	Pin	Connection
1	No connection	5	Grid
2	Filament	6	No connection
3	Plate	7	Filament
4	Screen	8	No connection

1A7G

Type 1A7G is a pentagrid converter designed for service as a combined mixer and oscillator.

Ratings

Same as for 1A5G.

Operating Characteristics

Plate voltage	90 v
Screen (grids 3 & 5) voltage	45 v[1]
Anode grid (2) voltage	90 v
Control grid (4) bias	0 v[2]
Oscillator grid (1) resistor	200,000 ohms
Plate resistance	0.6 meg.
Conv. transconductance	250 μmhos
Plate current	0.55 ma
Screen current	0.60 ma
Anode grid current	1.2 ma
Oscillator grid current	35 μm
Total cathode current	2.4 ma
Conv. transconductance at —2.0	50 μmhos
Conv. transconductance at —3.0	5 μmhos

Direct Interelectrode Capacitances

G_4 to P (grid to plate)	0.40[3] μμf
G_4 to G_2 (grid to osc. anode grid)	0.25[3] μμf
G_4 to G_1 (grid to osc. grid)	0.12[3] μμf
G_1 to G_2 (osc. grid to plate)	1.5[3] μμf
G_4 to all other electrodes (r-f input electrode)	7.5 μμf
G_2 to all other electrodes except G_1 (osc. output electrode)	4.0 μμf
G_1 to all other electrodes except G_2 (osc. input electrode)	3.2 μμf
Plate to all other electrodes (mixer ouput electrode)	10.0 μμf

Basing

Pin	Connection	Pin	Connection
1	No connection	5	Grid 1
2	Filament	6	Grid 2
3	Plate	7	Filament
4	Grids 3 and 5	8	No connection

Top cap. Control grid (4)

[1]Obtained preferably by using 70,000 ohms in series with plate supply.
[2]Return to negative filament (pin 7).
[3]Measured with close fitting shield.

1C5G

Type 1C5G is a pentode power amplifier tube designed for operation in the output stage.

Ratings

Filament voltage	1.4 v
Filament current	0.1 amp
Base	Octal
Bulb	T-9

Operating Characteristics Class A

Plate voltage	83	90 v
Screen voltage	83	90 v
Grid bias	—7	—9 v
Amplification factor	165	180
Plate resistance	0.110	0.115 meg
Transconductance	1500	1550 μmhos
Plate current	7	6 ma
Screen current	1.6	1.4 ma
Load resistance	9000	8000 ohms
Total harmonic distortion	10	10 %
Power output	200	240 mw

Basing same as 1A5G.

1H5G

Type 1H5G is a diode-triode amplifier designed for service as a combined diode detector and amplifier in receivers operating from a low voltage battery filament supply. The diode is located at the negative end of the filament and is independent of the triode unit except for the common filament.

Ratings

Same as for 1A5G.

Operating Characteristics Class A

Plate voltage	90 v
Grid bias	0 v[1]
Plate resistance	0.24 meg
Amplification factor	65
Transconductance	275 μmhos
Plate current	0.15 ma

Direct Interelectrode Capacitances

G to P (grid to plate)	1.1 μμf
G to F (input electrode)	0.35 μμf
P to F (output electrode)	4.0 μμf[2]

Basing

Pin	Connection	Pin	Connection
1	No connection	5	Diode plate
2	Filament	6	No connection
3	Triode plate	7	Filament
4	No connection	8	No connection

Top cap. Control grid.

[1]Return to negative filament (pin 7).
[2]Diode plate connected to pin 7.

1N5G

Type 1N5G is a pentode type amplifier tube designed for service as a high frequency amplifier.

Ratings

Same as for 1A5G.

Operating Characteristics Class A

Plate voltage	90 v
Screen voltage	90 v
Control grid bias	0 v[1]
Plate resistance	1.5 meg
Amplification factor	1160
Transconductance	750 μmhos
Plate current	1.2 ma
Screen current	0.3 ma
Transconductance at —3.2 v	50 μmhos
Transconductance at —4.0 v	5 μmhos

Direct Interelectrode Capacitances

G1 to P (grid to plate)	0.007 max. μμf[2]
G1 to F1, G2 & G3 (input electrode)	2.2 μμf
P to F, G2 & G3 (output electrode)	9.0 μμf

Basing

Pin	Connection	Pin	Connection
1	No connection	5	No connection
2	Filament	6	No connection
3	Plate	7	Filament
4	Screen	8	No connection

Top cap. Control grid.

[1]Return to negative filament (pin 7).
[2]Measured with close fitting shield.

THE GT MIDGETS

In addition to the 6.3-volt GT tubes and their corresponding 25-volt rectifier, several 12.5-volt tubes and a corresponding 35-volt rectifier and beam-power output tube are now available.

All of the GT series are particularly designed for series heater operation in a-c, d-c receivers. The 12.5 and 35-volt GT tubes appear to be especially suited for this purpose, for since they require a heater current of only 0.15 ampere, a low power resistance may be connected in series with the heaters, thereby eliminating the necessity for plug-in or line cord resistors.

6A8GT

Type 6A8GT is a pentagrid converter designed for service as a combined oscillator and mixer.

Ratings

Heater voltage	6.3 v
Heater current	0.3 amp
Base	Octal
Bulb	T-9

Operating Characteristics

Plate voltage	100	250 v
Screen voltage	50	100 v
Anode grid voltage	100	[1]
Control grid bias	—1.5	—3 v
Osc. grid resistor	50,000	50,000 ohms
Plate current	1.1	3.5 ma
Screen current	1.3	2.7 ma
Anode grid current	2.0	4.0 ma
Osc. grid current	0.25	0.4 ma
Plate resistance	0.6	0.3 meg
Conv. conductance	360	550 μmhos
Control grid voltage for conv. conductance of 2 μmhos	—20	—45 v

Basing

Pin	Connection	Pin	Connection
1	No connection	5	Oscillator grid
2	Heater	6	Anode grid
3	Plate	7	Heater
4	Screen grid	8	Cathode

Top cap. Control Grid

[1]Obtained from plate supply through a 20,000-ohm resistor.

6J7GT

Type 6J7GT is a triple grid general purpose detector amplifier.

Ratings

Same as for 6A8GT.

Operating Characteristics

Class A Amplifier

Plate voltage	100	250 v
Screen voltage	100	100-125 v
Control grid voltage	—3	—3
Suppressor	Connected to cathode at socket	
Plate current	2.0	2.0-3.7 ma
Screen current	0.5	0.5-1.0 ma
Plate resistance (approx.)	1.0	1.5-1.7 meg
Transconductance	1185	1125-1510 μmhos
Amplification factor	1185	1850-2500
Control grid voltage for cathode current cut-off	—7	—7- —9 v

Biased Detector

Screen voltage	16	100 v
Plate resistor	1	0.5 meg
Cathode resistor	30,000	10,000 ohms

Basing

Pin	Connection	Pin	Connection
1	No connection	5	Suppressor
2	Heater	6	No connection
3	Plate	7	Heater
4	Screen grid	8	Cathode

Top cap. Control grid.

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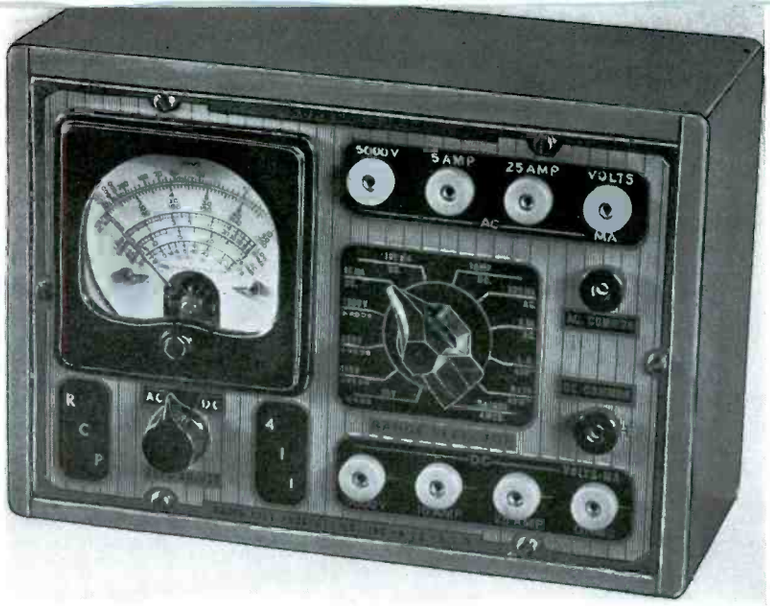
MODEL 411



The test instrument field has seen many revolutionary developments. Advertisers have claimed time and again that their particular instrument was the finest "money's worth" ever offered to servicemen. But never in the annals of the industry has an instrument been designed that gave the serviceman "so much" for "so little." The "greatest money's worth" doesn't do real justice to the new RCP Model 411 Supertester. The only way that we could prove our claim to you — that no other unit or the market offers as much for only $16.25 — is to have you try it. So we say to you—check the features of this job—then call on your local jobber and have him show you Model 411. You will be quick to agree that the outstanding "buy" of the year is the Model 411.

Particularly ideal for the Serviceman—contains the equivalent of 33 individual instruments in one compact case. Just the job for television. Measurements of 5,000 volts, 4 microamps, etc., make the Model 411 just the meter for television work.

Best all around tester for the Ham—low and very high AC and DC voltage, resistance and current ranges is just what the amateur wants. And at a price tailored to the average pocketbook.

Unequalled for the Electrician and Engineer—makes possible maximum number of useful measurements for motors, plants, labs, substation, electric light circuit work, etc.

Before you buy your next test instrument be sure to consider the new RCP Model 411 Supertester. It speeds up service work—combines all important meters for accurate quick analysis in one small case, broadens your scope for more profitable business.

Some of the unusual features of this instrument are:

- 5 stage, high AC-DC voltage range to 5,000 volts.
- High voltage not applied to selector switch nor to general test circuits. New design all bakelite body jacks are used.
- 3 stage, high AC-DC current range to 25 amps.
- 3-inch square meter with movement of 200 microamperes or 5,000 ohms per volt.
- DC Volts 0/10/100/250/1000/5000.
- DC Amps 0/1/10/25.
- DC Milliamps 0/10/100.
- DC Microamps 0-200.
- Center of scale, on low ohmmeter range, only 5 ohms with each of first ten divisions measuring 0.1 ohm.
- 3 stage easy reading, high ohmmeter range up to 4,000,000 ohms.
- AC Volts 0/10/100/250/1000/5000.
- AC Amps 0/2.5/5/25.
- AC Milliamps 0/500.
- db meter from —10 to +69 in 5 stages.
- Output meter same as AC volts.

Natural finish wood case 7⅞ inches x 5½ inches x 3½ inches. Weight 2 lbs. 3 oz. Model 411 complete **$16.25 net.**

Model 411B same as Model 411 with additional provision for testing ballast tubes with octal bases—net **$17.95.**

Model 411P same as 411 except in portable hinged cover case—net **$19.45.**

CONFIDENTIAL!

It seems RCP engineers have been working overtime. Laboratory 'info' says that the new Model 504 analyst will be ready March 1st. The Analyst is an improved unique push button circuit selector—making possible greater speed, safety and flexibility for analyzing symptoms at socket terminals in radio sets and P.A. installations.

Some of the exclusive features of the Analyst are as follows:

(1) Two or more buttons can be pushed at the same time without danger of "shorting." This protection is exclusive with the RCP Analyst.

(2) Any button can be left locked in depressed position—not necessary to keep it down manually as in other testers.

(3) Eliminates necessity for "release" button.

(4) Speeds up service work because:—
- Prods to tester do not have to be changed.
- No necessity for turning through various intermediary position as in rotary selector switches.
- Eliminates necessity for additional "meter read" and "reverse" buttons required on other instruments.

(5) Permits both current and voltage measurements in the same circuit at the same time.

(6) Meter polarity reversed by simply changing polarity of circuit buttons pressed for voltage measurements.

(7) First plug in analyzer unit available with six sockets including loctal built into panel.

(8) 10 wire analyzer cable including spare lead for future requirements.

(9) Complete with latest design toggle latch plug and 7 adapters. Terminal numbers clearly etched at each socket and push button.

Be sure to ask your jobber about the Model 504. No shop is complete without it—and at $13.75 no shop can afford to be without it. Model 504C in 3-inch deep case— $14.95.

SIGNAL GENERATOR

Now at NEW Reduced Prices

Direct reading, full vision AC all wave signal generator, 400 cycle sine wave modulation. Provides for unmodulated and externally modulated signal. Coil, attenuator and R.F. circuits individually triply shielded. Continuously variable from 25 kc. to 90 mc.

Lowest Priced High Quality Signal Generator Available.

MODEL 701 - - - Formerly **$29.95** - - - **NOW $25.95**

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DEPENDABLE TUBE TESTER

Model 307 tube tester is far ahead of more expensive testers in performance. Every type of tube is properly tested including the latest LOCKTALS—SINGLE ENDS—OZ4-BH, etc. Tests made under RMA specified voltages and loads. Hot interelement short and leakage tests between ALL INDIVIDUAL ELEMENTS. Tests all ballast tubes, pilot lights, etc.

307C (counter type) **$16.95**

307P (portable type) **$18.95**

For complete information on these and other RCP instruments, send for Complete Catalog.

RADIO CITY Products Co. INC

88 PARK PLACE NEW YORK CITY

6K7GT

Type 6K7GT is a triple grid variable-mu amplifier.

Ratings

Same as for 6A8GT.

Operating Characteristics

Plate voltage	100	250 v
Screen voltage	90	100-125 v
Control grid voltage	—3	—3 v
Suppressor grid	Connected to cathode at socket	
Plate current	5.4	7.0-10.5 ma
Screen current	1.3	1.7- 2.6 ma
Plate resistance (Approx.)	0.32	0.8-0.6 meg
Transconductance	1275	1450-1650 μmhos
Amplification factor (approx.)	400	1160-990
Control grid voltage for conv. conductance of 2 μmhos	—38.5	—42.5 - —52.5 v

Basing same as 6J7GT.

6Q7GT

Type 6Q7GT combines two diodes and a high-mu triode in a single bulb, with a common cathode. It is designed for service as a diode detector, avc rectifier and an impedance or resistance coupled amplifier. The tube may be used in a zero cathode resistor circuit where the high grid resistor is sole bias source.

Ratings

Same as for 6A8GT.

Operating Characteristics

Class A Amplifier

Plate voltage	100	250 v
Grid voltage	—1.5	—3 v
Plate current	0.35	1.1 ma
Plate resistance	87,500	58,000 ohms
Transconductance	800	1,200 μmhos
Amplification factor	70	70

Zero-Bias Amplifier

Plate load resistor	0.25 meg
Grid circuit resistor	6.0 meg
Grid coupling condenser	0.01 mfd

Resistance Coupled Amplifier

Plate load resistance	0.1-0.5	0.1-0.5 meg
Cathode resistor	4000-10,000	2,000-5000 ohms
Voltage gain	30-32	38-42

Basing

Pin	Connection	Pin	Connection
1	No connection	5	Diode plate 1
2	Heater	6	No connection
3	Plate	7	Heater
4	Diode plate 2	8	Cathode

Top cap. Control grid.

12A8GT

Type 12A8GT is a pentagrid converter designed for service in a-c, d-c receivers.

Ratings

Heater voltage	12.5 v
Heater current	0.15 amp
Base	Octal
Bulb	T-9

Operating Characteristics

Plate voltage	100	250	v
Screen voltage	50	100	v
Anode grid voltage	100	250*	v
Control grid voltage	—1.5	—3	v
Plate current	1.2	3.3	ma
Screen current (grid 3 and 5)	1.5	3.2	ma
Anode grid current (grid 2)	1.6	4.0	ma
Osc. grid current (grid 1)	0.25	0.50	ma
Plate resistance	0.60	0.36	meg
Osc. grid resistor	50,000	50,000	ohms
Conv. conductance	350	500	μhmos
Control grid voltage for Sc = 2 μmhos	—20	—45	v

Direct Interelectrode Capacitances

°Grid 4 to plate	0.20 μμf
°Grid 4 to Grid 2	0.19 μμf
°Grid 4 to Grid 1	0.13 μμf
Grid 1 to Grid 2	1.0 μμf
Grid 4 to all other electrodes	7.5 μμf
Grid 2 to all other electrodes	5.0 μμf
Plate to all other electrodes	7.5 μμf
Grid 1 to all other electrodes	6.2 μμf

Basing same as 6A8GT.

*Through 20,000-ohm dropping resistor.
°With close fitting shield.

12F5GT

Type 12F5GT is a high-mu triode designed for service in a-c, d-c receivers.

Ratings

Same as for 12A8GT.

Operating Characteristics

Plate voltage	100	250 v
Control grid voltage	0	—2 v
Plate current	1.8	0.9 ma
Plate resistance	50,000	66,000 ohms
Transconductance	1,520	1,500 μmhos
Amplification factor	80	100

Direct Interelectrode Capacitances

Grid to plate	2.4 μμf
Input	1.0 μμf
Output	3.4 μμf

Basing

Pin	Connection	Pin	Connection
1	No connection	5	No connection
2	Heater	6	No connection
3	No connection	7	Heater
4	Plate	8	Cathode

12J7GT

Type 12J7GT is a pentode detector amplifier designed for service in a-c, d-c receivers.

Ratings

Heater voltage	12.5 v
Heater current	0.15 amp

Except for the heater, this tube is practically identical to the 6J7GT.

12K7GT

Type 12K7GT is a remote cut-off pentode designed for service in a-c, d-c receivers.

Ratings

Heater voltage	12.5 v
Heater current	0.15 amp

Except for the heater, this tube is practically identical to the 6K7GT.

12Q7GT

Type 12Q7GT is a duplex diode high-mu triode designed for service in a-c, d-c receivers.

Ratings

Heater voltage	12.5 v
Heater current	0.15 amp

Except for the heater, this tube is practically identical to the 6Q7GT.

25L6GT

Type 25L6GT has high power sensitivity and high-power output with low-supply voltages and is designed for service in the output stage of a-c, d-c receivers.

Ratings

Heater voltage	25.0 v
Heater current	0.3 amp
Base	Octal
Bulb	T-9

Operating Characteristics

Class A Amplifier

Plate voltage	110	110 v
Screen voltage	110	110 v
Grid voltage	—7.5	—7.5
Peak a-f signal	7.5	7.5 v
Grid circuit resistance (Max.)		
Self-bias	0.5	0.5 meg
Fixed-bias	0.1	0.1 meg
Amplification factor (approx.)	82	82
Transconductance	8,200	8,200 μmhos
O signal plate ma	49	49 ma
Max. signal plate ma	54	50 ma
O signal screen ma	4	4 ma
Max. signal screen ma	9	11 ma
Load resistance	1,500	2,000 ohms
Distortion		
Total harmonic	11	10 %
Second harmonic	10	3.5 %
Third harmonic	4	8.5 %
Power output	2.1	2.2 watts

Heater voltage should not be allowed to rise more than 10% above rated with fluctuations in line supply voltage.

25Z6GT

Type 25Z6GT is designed primarily for service as a power rectifier in a-c, d-c receivers. Two separate rectifier units allow use of the tube as a voltage doubler, full wave rectifier or half wave rectifier. For half-wave operation the two units may be operated separately or in parallel to reduce tube drop.

Ratings

Same as 25L6GT.

Operating Characteristics

Half-Wave Rectifier

A-C voltage per plate (rms)	125	250 v[1]
Peak plate current per plate	500	500 ma[1]
D-C output per plate (Max.)	85	85 ma[1]

Voltage Doubler

A-C voltage per plate (rms)	125 v.
Peak plate current per plate	500 ma
D-C output (Max.)	100 ma
Average tube drop at 170 ma	22 v

Basing

Pin	Connection	Pin	Connection
1	No connection	5	Plate 1
2	Heater	6	No connection
3	Plate 2	7	Heater
4	Cathode 2	8	Cathode 1

[1]An a-c input voltage greater than 125 volts requires the use of a series resistor or resistors. A 100-ohm resistor in each plate lead or a 100-ohm resistor common to both plates (giving somewhat poorer regulation) may be used.

35L6GT

Type 35L6GT is a beam-power amplifier tube.

Ratings

Heater voltage	35.0 v
Heater current	0.15 amp
Base	Octal
Bulb	T-9

Operating Characteristics

Plate voltage	110 v
Screen voltage	110 v
Control grid voltage	—7.5 v
Plate current (zero signal)	40 ma
Plate current (max. signal)	41 ma
Screen current (zero signal)	3 ma
Screen current (max. signal)	7 ma
Transconductance	5,800 μmhos
Amplification factor	80
Signal voltage (peak)	7.5 v
Load resistance	2,500 ohms
Power output	1.5 watts
Total harmonic distortion	6.5 %

Basing

Pin	Connection	Pin	Connection
1	No connection	5	Grid
2	Heater	6	No connection
3	Plate	7	Heater
4	Screen	8	Cathode and deflectors

35Z4GT

Type 35Z4GT is a half-wave high-vacuum rectifier.

Ratings

Same as for 35L6GT.

Operating Characteristics

A-C plate voltage[1] (rms)	125 v
A-C plate voltage[2] (rms)	250 v
Peak plate current (max.)	600 ma
D-C output (max.)	100 ma
Voltage drop at 200 ma d-c	15 v

Basing

Pin	Connection	Pin	Connection
1	No connection	5	Plate
2	Heater	6	No connection
3	No connection	7	Heater
4	No connection	8	Cathode

[1]Without series resistor.
[2]With 100-ohm series resistor.

The writer wishes to express his appreciation to the various tube manufacturers for their cooperation in supplying the information upon which this article is based.

LOKTAL ADAPTERS

FIVE adapters are required for testing all loktal tubes released up to the present writing. This set of adapters

will make all standard tests in any tube tester wired for octal tubes.

Use No. 22 bare tinned wire. Cut into 3-in lengths. Solder one end of each length to each of the loktal socket contacts. String 1-in of thin walled spaghetti tubing over each lead. Run leads down through proper prongs of base (see accompanying table). Pull on wire protruding through prongs while the socket is pushed into place. Insert the side set screws. Clip off the excess wire at the bottom of the prongs and solder neatly.

To facilitate wiring the socket contacts shown in the accompanying illustration have numbers molded into the bakelite. The base numbers indicated in the table, looking down into the base from the top, are numbered counter clockwise. No. 1 is directly to the left of the raised bakelite dot.

OCTAL	LOKTALS					
	BLACK 5&L	GREEN L	GRAY 1&L	BLUE L	YELLOW L	RED 1&L
1	1	1	1	1	1	2
2	2	2	3	2	2	3
3	3	5	2	5	3	4
4	4	6	6	4	6	5
5	NC	NC	NC	3	NC	6
6	8	8	8	8	8	7
7	7	NC	7	7	7	8
8	6	3	NC	6	NC	NC
GRID STUD	"L" is Loktal Center Contact			"NC" is no connection		

Adapters should be coded by using colored socket tops.

Because loktal tubes in some instances have higher emission than their octal counterparts, it is necessary to test several loktal tubes to determine the correct position for the plate load control. This control is usually a variable resistor connected across the plate meter in the tube tester circuit.

**The 1231 has unusually high emission, the plate load control should therefore be lowered before the test is made.

***Adjust the filament voltage for proper test. Twenty-five or thirty volts will test this tube perfectly. The 35Z3

SOCKET TOP	LOKTALS	TEST AS FOR-
BLUE	7A8 & 7B8	6D8G
YELLOW	35A5	25L6G
GREEN	7C6 7B6	6T7 7C6
GRAY	7A6 * 7Y4	6H6 6X5
BLACK	** 1231 7A7 - 7B7 - 7B5 *** 35Z3	6K7 6K7 6X5

is a half-wave rectifier and the 6X5, a full-wave type; only one plate test will show emission. *Amphenol*

IT'S A SMALL WORLD

(*Continued from page* 61)

years it tends to stifle knowledge rather than augment the servicing capabilities of the individual.

Because of the limited knowledge concerning the internal functioning of test equipment, the majority of Service Men are not able to derive the maximum utility from their equipment. We hope that what is said here is not taken as criticism of the test equipment. It is not intended as such. What is being criticized is the fact that for some reason or other the basic information which would enable the equipment owners to comprehend his equipment properly has not generally been forthcoming, and descriptions concerning the equipment usually placed much more stress upon "how" rather than "why." The "how" of any subject has much less breadth and depth than the "why."

Modus Operandi

It may be very difficult for many of the readers of this page to believe us when we say that in many places not more than 50 percent of the Service Men asked could differentiate between power input and power output of a radio receiver. This does not reflect upon the educational institutions—it reflects more upon what perhaps can be described as the "modus operandi" of the radio servicing industry over a period of fifteen years. In other words, it indicates a definite desire to stay in a certain circuit, to reject outside influences, outside suggestions—to be content with the knowledge at hand without any attempt to broaden this knowledge.

Perhaps a more definite sign of this condition is that so few men express any desire for theoretical articles in magazines. They are content with what they know and feel that they can "get along." This ability "to get by" over a period of years has painted a false picture; it has created a false illusion of the breadth of the radio servicing world; it is not as narrow as many believe it to be and modern developments are going to force the issue very rapidly.

Too Narrow

The erroneous idea that all there is to servicing is to find the trouble has been created and maintained. Such is not the case. Not only is it necessary to be able to service the receiver—but it is necessary for the Service Man to know what is in the receiver and how the components function.

Take a case in point. The oscillator in a receiver performs a certain role. During the process of servicing, all that is considered is the function of servicing, all that is considered is the function of this oscillation in connection with frequency conversion. Seldom, if ever, is any thought given to the manner in which the circuit works—to the function of the various components—to the similarity between this oscillator as an entity and other oscillating systems. Generally speaking, the two considerations embraced in service operations are: (1) Does the circuit oscillate? and (2) At what frequency?

Beyond these two most popular considerations, very little thought is accorded the relation between this portion of the receiver and the mixer. Examine service literature and you will find very little if any reference to the effect of excessive oscillator output voltage upon the operation of the converter or mixer tube, the effect of insufficient oscillator output voltage upon the same tube, etc. Maybe this is because the majority of service troubles isolated in the oscillator tube are of the first two named types, but it is not sufficient to rest upon the laurels of being able to identify those conditions. Given either of the second two named, and the likelihood of discovering the defect in a profitable amount of servicing time is very, very remote—only because the area in which the Service Man focuses his attention is too narrow.

Another Case

Take another case in point, that of the average r-f, or i-f transformer. The usual thoughts associated with such transformers during the process of servicing are "opens" and "shorts." Why? Because these are the commonplace complaints and it is felt that beyond this it is not necessary to go. When a condition develops or, as a result of a change in servicing procedure, it becomes necessary to understand a few additional facts concerning such transformers and their effect upon the signal in the system with respect to the tubes associated with them, mystery prevails. Once more you will note the absence in service literature of information which will explain the relation between such transformers and the tubes with which they work. You will note the absence of data relative to where the gain in an r-f stage is obtained—whether it is achieved in the transformer—in the tube or as a combination of both and the difference between, say, an antenna transformer and an interstage transformer, etc.

We can go on enumerating in this fashion until we fill this entire magazine, but that is unnecessary. Sufficient has been said to substantiate what will follow. We feel confident that if every man who reads these lines will take pen and paper and list all of the subjects associated with normal broadcasting, including the transmitter and the receiver and the process of servicing (with which he comes in daily contact and about which he knows that he comprehends little) he will have a surprisingly large list. And we are not concerned with the engineering phases either! He will have a list which will prove to him that his past servicing world has been very small.

If we were to list all of the new subjects which will become of moment with the advent of television and radio facsimile, the list would increase still further. Such items as light, optics, lenses, photoelectric cells, polarization of light and electric waves, square-wave amplifiers, square-wave generators and many more—now foreign, will be commonplace.

Solution

"What is the solution?" you ask. It is the broadening of a viewpoint in every branch of the servicing industry and by this we mean the Service Man himself has to realize that his operating sphere has enlarged. There has been an attempt to segregate Service Men according to classification. Years ago, any Service Man who would attempt to consider some of the items listed in the preceding paragraph would feel that he had stepped out of the radio receiver servicing field and now was in the field of electronics. Television comes forth, and that which was electronics once more is receiver servicing, except that Mr. Service Man must know infinitely more than before. He is back in the receiver servicing field, except that it has become much more complex.

Schools likewise must recognize this condition and there is no doubt of the fact that school attendance will increase, but so will the period of time that a student must go to school in order to absorb that which represents the present level of radio education to fit a man for radio servicing. Television and radio facsimile are now part and parcel of normal radio transmission and reception. Schools must broaden the viewpoint of the student, and in this respect they are in the most advantageous position—be the student a beginner or advanced.

Radio periodicals, too, must change. They must enlarge the world the Service Man lives in. It has been kept too narrow for too long a time. There must be more of that material which constitutes all of service activity—theory, practice, salesmanship, administration. The broadest viewpoint possible.

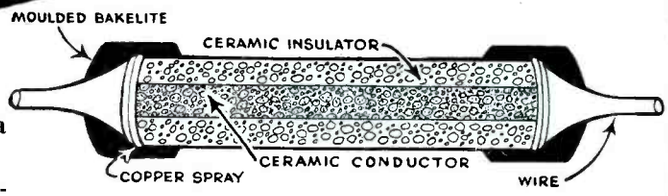
All the forces must combine to make this little world very much larger.

OLD Man Centralab took his baptism in a furnace at 2500 F.

He laughs at such temperatures as 200 degrees . . . the sort of heat he has to take sometimes when he is parked near a ballast resistor or a transformer in a radio receiver.

Even where chassis temperatures ARE elevated the Centralab resistor, with its complete ceramic construction baked at 2500 degrees, laughs at a mere 200 degrees. Where ordinary fixed resistors break down under temperatures of 200 or even less. Centralab is positively unaffected.

Join the thousands of Centralab addicts . . . specify Centralab for original equipment or replacements.



Baptized in fire at 2500 degrees . . . hard as stone. Center ceramic core, and ceramic jacket fired together to form a single shock-proof unit. Pure copper covers resistor end for wire lead contact.

Centralab: Division of Globe Union, Inc.
MILWAUKEE, WIS.

Centralab
FIXED RESISTORS

Associations

RADIO SERVICEMEN OF AMERICA

FORT WAYNE, Ind., and St. Joseph Mo.,. have joined RSA within the month. Officers of Ft. Wayne chapter are: Henry A. Schryver, pres.; E. Moennig, sec. and treas. St. Joseph is under direction of Cleo Blodgett, pres.; E. R. Sullwold, sec. and Russell Goerhe, treas.

The basis for a chapter in Toledo, O., was laid at a meeting of some 200 Service Men on Jan. 13 at Warren Radio Co.

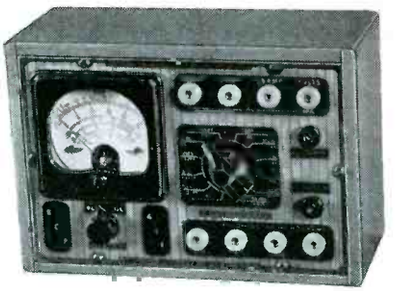
Service Men of Pekin, Ill., are taking the necessary steps to form a chapter in that city and official affiliation may be expected soon.

With several days still remaining, 12 chapters have already scored 100% in the inter-chapter renewal dues contest, and will each be awarded a copy of Rider's Volume IX as a prize.

Houston, Texas, was the first with dues in full for all members. Their check arrived shortly after the announcement of the contest. Alton, Ill.; Binghamton, N. Y.; Danville, Ill.; Duluth, Minn.; Freeport, Ill.; Holyoke, Mass.; Jamestown, N. Y.; Nashville, Tenn.; Oklahoma City, Okla.; Peoria, Ill.; and Steubenville, O. reached 100% as the month advanced.

RADIO CITY SUPERTESTER

Radio City Products have announced their Model 411 Supertester. The Supertester is an a-c and d-c volt-ohm milliammeter with a sensitivity of 5000-ohms-per-

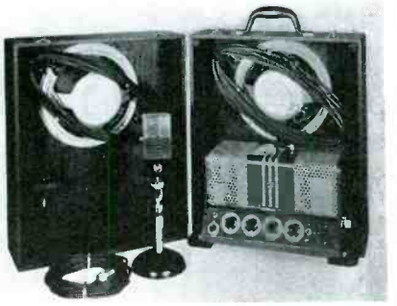


volt. The voltmeter ranges extend to 5000 and the ohmmeter to 4 meg. A decibel scale is also provided.

For additional details write *Radio City Products Co., Inc.,* 88 Park Pl., New York City.—SERVICE.

RCA SOUND SYSTEM

A low-cost portable sound system, Model PG112B, including 2 speakers, a velocity mike and a 12-watt amplifier in one carrying case, has been announced by W.



L. Rothenberger, manager of RCA's Commercial Sound Section.

Additional information can be obtained directly from *RCA Mfg. Co., Inc.,* Camden, N. J.—SERVICE.

THORDARSON AMPLIFIER

The Thordarson 8-watt, 4-tube beam power amplifier, Model T-20WO8, features individual mixing of mike or pickup. Six

watts are provided for field excitation.

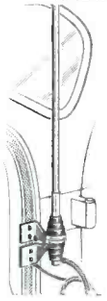
Additional information may be obtained from *Thordarson Electric Mfg. Co.*, 500 W. Huron St., Chicago.—SERVICE.

SIMPSON HAMMETER

Simpson Electric Co. have introduced a pocket-size a-c, d-c volt-ohm-milliammeter. The instrument has voltage ranges up to 3000.

Additional information may be obtained from *Simpson Electric Co.*, 5218 W. Kinzie St., Chicago.—SERVICE.

RADIART COWL ANTENNA



The Radiart CB1 telescopic cowl antenna has its mounting bracket designed to fit under the hood. The antenna is made of Admiralty metal chrome plated.

Bulletin No. 639 contains complete information on the 1939 Radiart auto aerials. It can be obtained directly from *Radiart Corp.*, Shaw Ave., Cleveland, O.—SERVICE.

CONSOLIDATED COILS

Consolidated Wire announce a line of air-core and iron-core coils for various purposes. These coils are made uniform by checking and prealigning on special test equipment built to duplicate actual operating conditions, it is said.

Additional information may be obtained from *Consolidated Wire & Associated Corps.*, 518 S. Peoria St., Chicago.—SERVICE.

UTAH SERVICE PAK

After an investigation of current servicing practices Utah Radio Products Co. have developed a service pak which in-

cludes an assortment of 79 basic replacement parts believed essential to the operation of a normal service shop.

Additional information may be obtained from *Utah Radio Products Corp.*, 850 Orleans St., Chicago.—SERVICE.

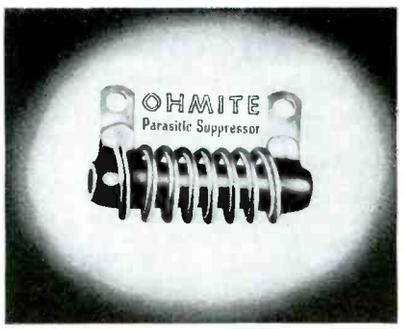
PUSH-BUTTON TUNER

By means of a two-deck arrangement, both oscillator and antenna condensers of the CX-52 push-button tuner recently announced by Sprague, are adjusted with a single screw. The two-deck strips may be used in conjunction with permeability coil tuned or trimmer tuned oscillator circuits for three-circuit receivers.

Literature on this unit may be secured by writing to the *Sprague Specialties Co.*, North Adams, Mass.—SERVICE.

OHMITE PARASITIC SUPPRESSOR

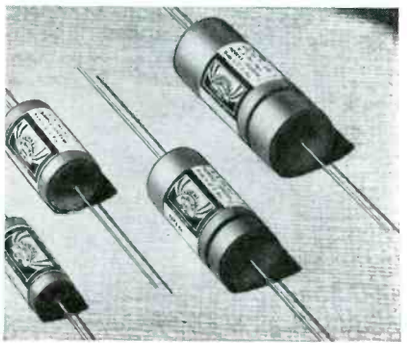
The Ohmite type P300 parasitic sup-



pressor is a non-inductive vitreous enamel resistor combined with a choke into one integral unit. For full details, write to *Ohmite Mfg. Co.*, 4835 Flournoy St., Chicago.—SERVICE.

PAPER TUBULAR CAPACITORS

The research laboratories of the Cornell-Dubilier Electric Corp. announce a new paper tubular capacitor. This unit is impregnated in Dykanol "D," the impregnant used in C-D high voltage transmitting capacitors. This new method of



manufacture has made possible the production of tubulars with an internal series resistance of over 5,000 megohms per microfarad, it is said. Approximately fifty capacities are available in 400, 600, 1,000 and 1,600 voltage ratings.

Catalog No. 165A, describing these units, free on request at the main office of the *Cornell-Dubilier Electric Corp.*, South Plainfield, N. J.—SERVICE.

ICA AUTO ANTENNA

Insuline have announced their latest type universal bracket cowl auto aerial. The new aerial is made of Admiralty brass tube, triple chromium plated and stainless steel rod. No holes are required in the car to install the antenna.

An 8-page illustrated catalog may be obtained from *Insuline Corp. of America*, 25 Park Pl., New York City.—SERVICE.

3000 VOLTS A.C. and D.C. *Available in the*

New "PRECISION" *Automatic*

PUSH-BUTTON A.C.-D.C. MULTI-RANGE TESTER

ACTUAL SIZE

29 RANGES
Including a 3000 Volt
A.C.-D.C. RANGE

SERIES 870

PRECISION engineers once again bring you an advanced and highly practical improvement in test equipment. The new Series 870 offers a novel and simplified method of complete push-button circuit and range selection, making available ALL A.C. and D.C. MEASUREMENTS, except the 3000 volt A.C.-D.C. range, from ONLY TWO polarized tip jacks.

FEATURES

- ★ **29 RANGES . . . COMPACT**
- ★ **D.C. VOLTAGE RANGES** at 1000 ohms per volt: 0 to 6/30/300/600/1200 and 3000 v.
- ★ **A.C. VOLTAGE RANGES** at 500 ohms per volt: 0-12/60/600/1200 and 3000 volts.
- ★ **D.C. CURRENT RANGES:** 0-1.2/12/120/600/1200 milliamperes.
- ★ **RESISTANCE RANGES:** 0-5000 ohms (20 ohms at center of scale) 0-500,000 ohms (powered by self contained battery) 0-5 megohms (powered by external battery).
- ★ **DECIBEL RANGES:** —10 to +64 DB. ODB (—10 to +16 DB) +14 DB (+4 to +30 DB) +34 DB (+24 to +50 DB) +40 DB (+30 to +56 DB) +48 DB (+38 to +64 DB).
- ★ **OUTPUT METER INDICATIONS** on Five A.C. voltage ranges: 0 to 12/60/600/1200 and 3000 v. A.C.
- ★ **D.C. CURRENT MEASUREMENTS** OF LEAKAGE IN ELECTROLYTIC CONDENSERS.
- ★ **QUALITATIVE PAPER CONDENSER TESTS.**
- ★ **LARGE SIZE 3 INCH D'ARSONVAL TYPE METER.**
- ★ **WIRE WOUND SHUNTS 1% ACCURACY.**
- ★ **MATCHED METALLIZED MULTIPLIERS 1% ACCURACY.**

Net Price, complete with 3 v. battery **$16.95**

SIMPLE TO OPERATE

1-CIRCUIT SELECTION

Depress the button to automatically select the TYPE of measurement you desire.

2-RANGE SELECTION

Depress the button clearly identified with the desired range.

3- TESTING

All tests are obtained at only two tip jacks (except 3000 volts A.C. and D.C.). The center knob between the jacks is rotated only for zero adjustment when ohmmeter scales are employed.

SEE this new Series 870 as well as any of the other 12 popular PRECISION models on display at all the leading radio parts jobbers, or write direct for latest "spec" sheets.

EXPORT DIVISION - 458 BROADWAY - NEW YORK, N. Y. U. S. A. - CABLE ADDRESS: MORHANEX

PRECISION APPARATUS CO.

821 EAST NEW YORK AVENUE — BROOKLYN, NEW YORK

UTC EXPANDS

The United Transformer Corp. have expanded their facilities and moved to a new and larger plant. The main offices, engineering division and manufacturing are now at 150 Varick St., New York.—SERVICE.

PRECISION SERVICE

Free service to owners of Precision series 500, 500A, 510, 600, 700, 800, 815 or 900; supplementary tube charts; test data and additional information on how to test loktal, single-ended and other new tubes may be obtained from Precision Apparatus Co., 821 E. New York Ave., Brooklyn, N. Y. When writing for this literature be sure to mention model and serial number of the instrument.—SERVICE.

Paul Ellison (Sylvania), P. R. Dawson (Tung-Sol), Chas. Caine (Cornell-Dubilier), and Mac Silver (Guthmann) watch dutifully and patiently for their numbers to come up at the Annual Drawing for Space at the Parts Trade Show. More than a third of the seventy-six companies participating in the drawing were represented at the meeting held at the Stevens Hotel, January 25th.

ELECTRO PRODUCTS BULLETIN

Electro Products Laboratories, 549 W. Randolph St., Chicago, Ill., have issued a catalog sheet, No. 1138, dealing with their 2 and 6-volt battery eliminators. To secure a copy of this bulletin, write to the above organization.—SERVICE.

UNIVERSAL MICROPHONE BULLETIN

Universal Microphone Co., Ltd., Inglewood, Calif., have issued a 1939 edition of its "Treatise on Practical Wax Recording," by E. K. Barnes. The new edition contains the identical illustrations and text of the earlier printing but it is printed in smaller type and in handy pocket size with the price reduced to 25c.—SERVICE.

TRIPLETT CONTEST WINNERS

Herbert L. Holmes, first prize winner in the Triplett Service Puzzler contest, is associated with Holmes Brothers, Marshfield, Mo. Mr. Holmes received his choice of $250 worth of Triplett test equipment.

Other prize winners were: Floyd A. Martin, Columbus, Ohio; Claude Lydick, Kansas City, Mo.; Don M. Wherry, Jefferson, Iowa; Reynolds Schwemberger, Toledo, Ohio; John Edmondson, Franklin, Ind.

Joseph Kaufman, National Radio Institute, Washington, D. C., was in charge of adjudicating the many entries.—SERVICE.

ACA CATALOG

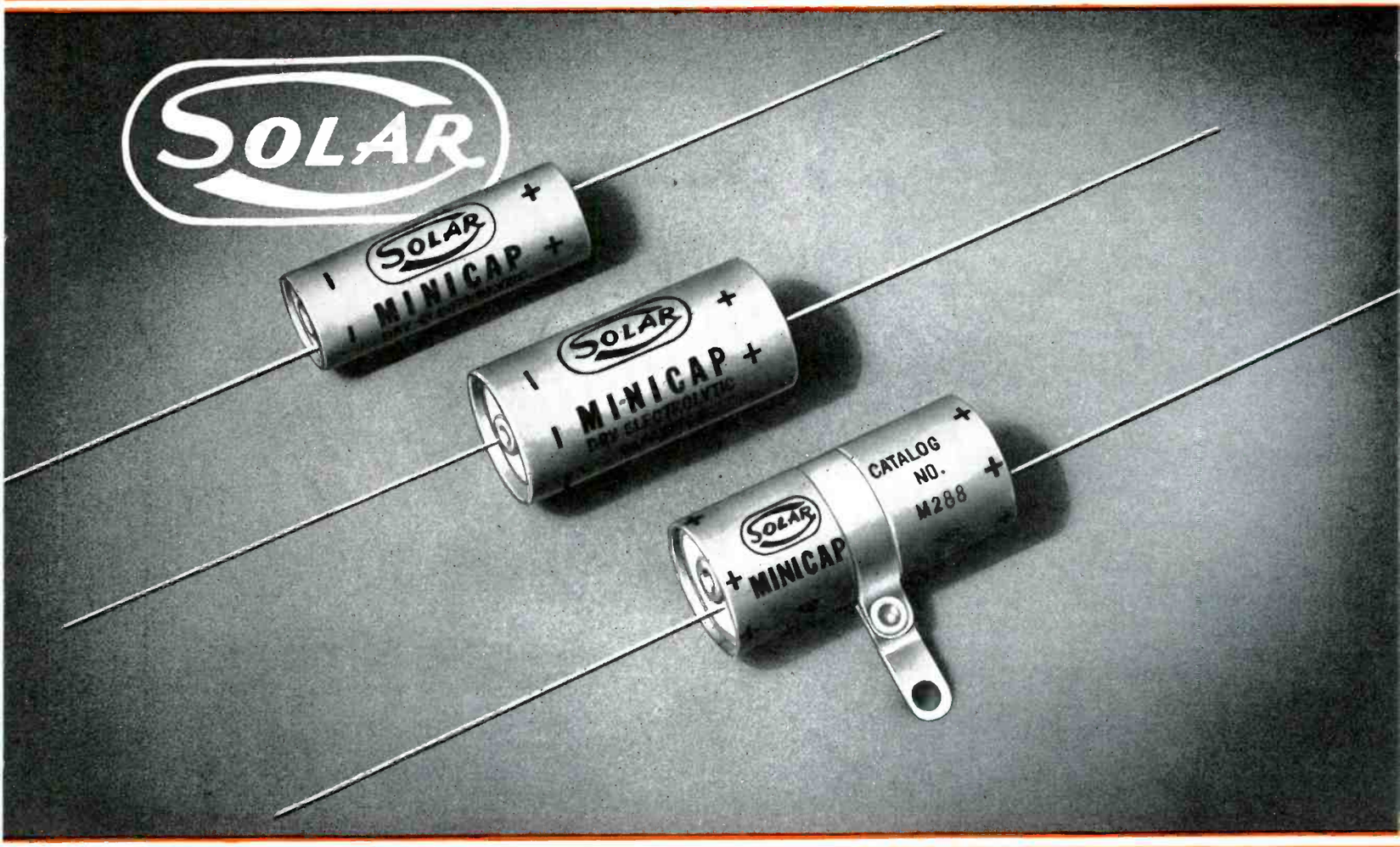
Amplifier Co. of America, 17 W. 20 St., New York City, have issued their catalog which illustrates and describes 14 amplifiers, equalizers, audio band-pass filters, microphones, etc. Copies may be obtained directly from ACA.—SERVICE.

Advertising Index

latest development

in

DRY ELECTROLYTIC CAPACITORS



- HIGHLY STABLE
- SEALED IN METAL
- REMARKABLY SMALL
- WILL FIT ANYWHERE
- IDEAL FOR REPLACEMENT

more FOR YOUR MONEY

Ask for Catalog 9-S

SOLAR MFG. CORP., 599-601 BROADWAY, NEW YORK, N. Y.

FLASH ...You can test New "Loktal" Type Tubes with RCA TUBE TESTER!

ONLY $37.95 NET

Stock No. 156-A. Also available for Portable use as Stock No. 156...$39.95

If you now own an RCA Tube Tester you can test "Loktal" types—here's how!

Because RCA is aware of the fact that many present owners of the RCA Tube Tester will want to test the new "Loktal" type tubes, an adaptor (illustrated) has been built for use with the Tube Tester. Stock No. 9858 Adaptor $1.00 list—will make your present RCA Tube Tester just as capable of testing these new tubes as the instruments now being built at the factory.

The RCA Tube Tester tests all standard receiving tubes including the "Single-ended" and "Loktal" types!

Everyone agrees that the RCA No. 156 Tube Tester is one of the best buys on the market—an instrument combining truly outstanding features with amazingly low cost.

Now this universal acclaim will be even further emphasized! For all RCA Tube Testers shipped from Camden from now on will be equipped to test the new "Loktal" type tubes as well as other types! Just one more important reason why you'll buy wisely when you buy an RCA Tube Tester!

Over 225 million RCA radio tubes have been purchased by radio users . . . in tubes, as in parts and test equipment, it pays to go RCA ALL THE WAY.

Listen to the Magic Key every Sunday, 2 to 3 P. M., E.S.T., on the NBC Blue Network.

Only the RCA Tube Tester offers all these fine features!

1 Tests new 1½ volt battery tubes.

2 Tests every standard type of receiving tube including "Loktal" base and all ballast tubes. Also tests cathode ray tubes for shorts and emission. All tests made according to RMA standards.

3 Tests four prong and octal base ballast tubes for noisy welds and opens.

4 Tests Magic Eye tubes for brilliance and opening and closing of eye.

5 Tests voltage drop on all types of Gas Tubes, such as OA4-G, OZ4-G, 874 and others.

6 Easily operated. All operating instructions and settings shown on simplified roller chart

7 One Finger Operation. Buttons released or retained automatically as required for testing.

8 Shows line voltage up to instant of actual test. Not necessary to set line voltage before inserting tube in socket.

RCA *Test Equipment*

RCA MANUFACTURING CO., INC., CAMDEN, NEW JERSEY
A SERVICE OF THE RADIO CORPORATION OF AMERICA