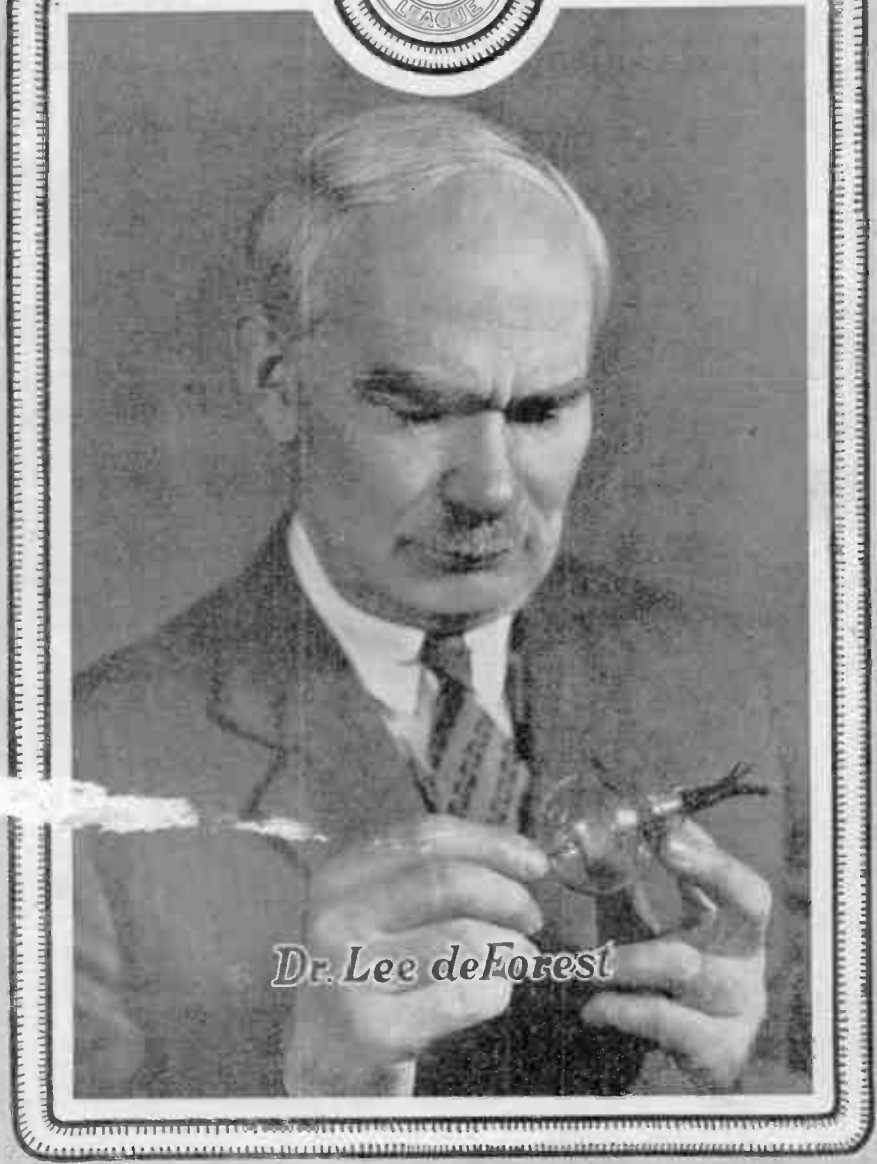
DIAGNOTRICIAN

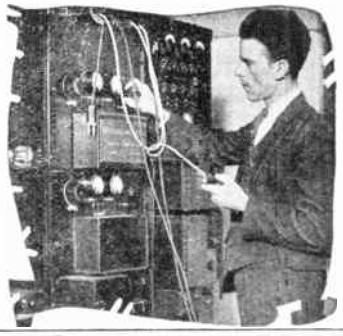
The Radio Service Man's Monthly



Dr. Lee deForest

Yearly $1.50 **Price 20¢**

I Will Train You at Home to Fill a Big-Pay Radio Job



If you are earning a penny less than $50 a week, send for my book of information on the opportunities in Radio. It's FREE. Clip the coupon NOW. A flood of gold is pouring into Radio creating hundreds of big pay jobs. Why go along at $25, $30 or $15 a week when the good jobs in Radio pay $50, $75 and up to $250 a week? "Rich Rewards in Radio" gives full information on these big jobs and explains how you can quickly learn Radio through my easy, practical home-study training.

Salaries of $50 to $250 a Week Not Unusual

The amazing growth of Radio has astounded the world. In a few short years three hundred thousand jobs have been created. And the biggest growth is still to come. That's why salaries of $50 to $250 a week are not unusual. Radio simply hasn't got nearly the number of thoroughly trained men it needs.

You Can Learn Quickly and Easily in Spare Time

Hundreds of N. R. I. trained men are today making big money — holding down big jobs—in the Radio field. You, too, should get into Radio. You can stay home, hold your job, and learn in your spare time. Lack of high school education or Radio experience are no drawbacks.

Many Earn $15, $20, $30, Weekly On the Side While Learning

I teach you to begin making money shortly after you enroll. My new practical method makes this possible. I give you SIX BIG OUTFITS of Radio parts and teach you to build practically every type of receiving set known. M. E. Sullivan, 412 73rd St., Brooklyn, N. Y. writes: "I made $720 while studying." G. W. Page, 1807 21st Ave., S., Nashville, Tenn.: "I picked up $935 in my spare time while studying."

Your Money Back If Not Satisfied

My course fits you for all lines—manufacturing, selling, servicing sets, in business for yourself, operating on board ship or in a broadcasting station—and many others. I back up my training with a signed agreement to refund every penny of your money if, after completion, you are not satisfied with the lessons and instructions I give you.

ACT NOW — 64-Page Book is FREE

Send for this big book of Radio information. It has put hundreds of fellows on the road to bigger pay and success. Get it. See what Radio offers you, and how my Employment Department helps you get into Radio after you graduate. Clip or tear out the coupon and mail it RIGHT NOW.

J. E. Smith, President,
Dept. 9WA8

National Radio Institute
Washington, D. C.

Here's the PROOF

$375 One Month in Spare Time

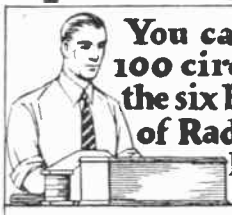
"Recently I made $375 in one month in my spare time installing, servicing, selling, Radio Sets."

Earle Cummings, 18 Webster St., Haverhill, Mass.

$450 a Month

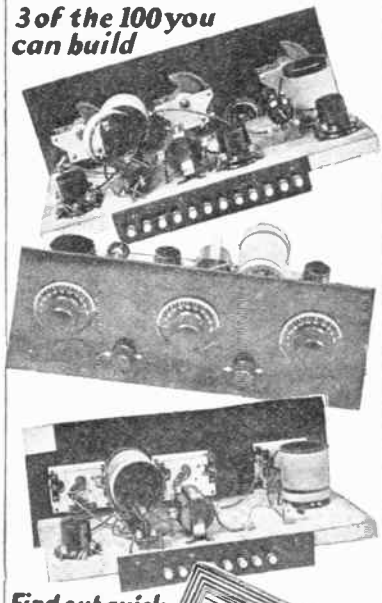
"I work in what I believe to be the largest and best-equipped Radio shop in the Southwest and also operate KGFI. I am averaging $450 a month."

Frank M. Jones, 922 Guadalupe St., San Angelo, Tex.



You can build 100 circuits with the six big outfits of Radio parts I give you

3 of the 100 you can build



Find out quick about this practical way to big pay

Mail This FREE COUPON Today

J. E. SMITH, President,
Dept. 9WA8, National Radio Institute,
Washington, D. C.

Dear Mr. Smith: Send me your Free book "Rich Rewards in Radio," giving information on the big-money opportunities in Radio and your practical method of teaching with six Radio Outfits. I understand this places me under no obligation.

Name ..... Age .....

Address .....

City ..... State .....

Employment Service to all Graduates

Originators of Radio Home Study Training

DIAGNOTRICIAN
THE RADIO SERVICE MONTHLY
Official Publication
SUPREME SERVICE LEAGUE, Greenwood, Mississippi
SPENCER PEIRCE, Editor
Vol. 1, No. 4
NOVEMBER, 1929

Confidence and the Service Man

By LEE DeFOREST, Ph.D.
Chief Consulting Engineer
DeForest Radio Company

Dr. DeForest's greatest gift to radio was a satisfactory detector for radio telegraphy, which made possible first long distance telephoning over wires, and then the even more astonishing feats of radio telephony. Recently his efforts have been devoted to developing Phonofilm, a "talking-movie" system in which the DeForest "audion" finds another unique opening for its services.

THERE is, to my mind, no other individual in the radio industry so heavily vested with confidence as the radio service man. He is looked upon by the general public as the one man who can come into the home and repair the ailing radio set, thus avoiding the trouble, worry, time and expense of returning it to the distant factory. In this respect the service man has the same responsibility as the doctor who must choose between exerting his time and skill to facilitate the recovery of the patient in the home, or of "passing the buck" by having the patient removed to the hospital with, of course, the attendant increase in expense.

The radio service man is equally relied upon by the set and accessory manufacturer to uphold the good name of his product. It is taken for granted that the service man will do all in his power to service the set in the home, and not advise its return to the factory upon the slightest provocation. Continual returns soon breed mistrust, so that the radio service man actually has it in his power to make or break the reputation of a particular product in his locality.

And so it is presumed that the radio service man operates in good faith and is thoroughly acquainted with the technical requirements of his job. Radio servicing has vastly improved in this respect during the past few years. Not so long ago, the unscrupulous service men were capitalizing the ignorance of the average radio set owner, even to the extent of diagnosing a loose connection or a faulty jack as "three bad tubes," "one burned out transformer," "two dead B-batteries," and so on, selling the unfortunate victim the necessary replacements and removing the excellent apparatus so maligned. Fortunately, however, this type of service man has disappeared, but his memory lingers on. The service man of today sometimes faces the additional burden of proving his own integrity of purpose and rewinning the confidence of the victim of yesterday's service methods.

It must be admitted that the average service man of today is rapidly gaining the complete confidence of the radio public, and is achieving a real position in his community. I attribute the change of opinion to two factors: first, the fact that he is generally a well-trained man and knows his work thoroughly; and secondly, that he is now adequately provided with the legitimate tools of his trade. The service man no longer must rely on makeshift hit-or-miss methods of deduction. He does not tinker, experiment or pose foolish questions. Rather, he is provided with test apparatus that helps him locate trouble in a minimum of time and with a minimum of effort. His positive, reassuring and rapid diagnosis marks a new day in servicing.

The genuine radio service man actually inspires confidence in the set owner, and the far-reaching effects of this confidence are felt in every branch of the industry. The service man has become, in large measure, a good will emissary and a salesman. While selling is by no means his primary function, he nevertheless exerts a strong influence in the selling field. The well equipped service man generally carries a complete line of vacuum tubes and other accessories and replacements. These are, necessarily, of the best type, since his very job depends upon accessories and replacements that can be positively relied upon. From constant association and experience, the service man develops certain preferences, and when he makes or advises replacements or repairs, he does so with tried and true merchandise which he himself is thoroughly sold on. And so the public comes to be sold on given products through the indirect selling efforts of the service man. Indeed, the service man has been the greatest factor in encouraging the industry to make good products.

Servicing today has attained its majority. It is no longer a matter of tinkering, experimenting and hobby. It is a full-fledged profession. The handy man has long since been replaced by a trained service man who knows the technicalities of radio in general, and the lines of radio sets which he services, in particular. The service man seeks the testing equipment and tools

(Continued on Page 12)

Planning Efficient Servicing

Wherein the Writer Undertakes to Point Out Well Known Items of Interest That Are Too Often Overlooked.

By LINDLEY BURKIT

The Service Department, being one of the sources of revenue for the radio dealer or the direct source for many who are actively engaged in only the servicing work, must be built upon a strictly sound business basis.

The location of the service station should be planned and a careful analysis of all things pertaining to the business must be worked out in selecting the proper location. Briefly, a few of the important factors to consider are:

1. Accessibility. If it is one of the departments of an established business, it should be easily accessible to the rest of the building. If it is a separate business, then it should be accessible to the street, making it as easy as possible for your customers to contact directly with you. The American public is too busy a people to climb three flights of stairs and go to the back room of some building to see you.
2. The layout of your shop should be planned to give you a maximum amount of work with the minimum effort, enabling you to do your work efficiently and quickly. A neat arrangement should be maintained, your shelves, tables, benches and cabinets should be laid out so as to allow you access to your testing equipment at all times. Care should be taken to keep your shop tidy and sightly, thereby making a favorable impression on the customer when he comes in to see you. Although these things may at first seem unimportant to you, they make lasting impressions on your customer, and he makes his own deductions as to the kind of work you do by the appearance of your work shop. Your place of business must be well lighted, for it is impossible to do a good job without plenty of light. Even at best some of your delicate jobs are hard to see and it is very tedious work even when light conditions are the best.
3. Your service equipment should next be taken into consideration. The day of untrained screw driver and plier radio "mechanic" is over. The highly trained, technical radio repair man gets the job provided he has up-to-the-minute equipment in his shop, and service equipment that he can take to the customer's home and diagnose every ill on any set—and then tell the customer what the trouble is, what caused it, and then remedy it.

Man power comes under the heading of equipment, for no service shop is ever going to make money without adequate man power of the right kind. Probably more importance should be placed on getting the right kind of help than on your equipment.

First of all, your organization, whether large or small, must have some snap and pride—men who know their job and men who love the game. The pace is too fast for those who falter—only those who are on their toes and can deliver service with a snap will make the grade. Quick service and a sunny smile go farther than a lot of talk.

When you are on a job whether in your shop or in a home, go about your work as the trained man of another profession would. That's what you are, a professional radio man. Be courteous. Answer all questions in a way that that are easily understood. It is well to get as much information as possible from your customer about his radio before starting to work on it.

One service man I knew made a call on a set owner, walked smilingly in and asked, "What seems to be the trouble?" Was that the proper introductory statement to make? It may at first thought sound logical but on second thought, it is all wrong, for the answer is seldom informative.

Very seldom does the set owner know what is wrong or why it is wrong—but there are several things he does know, and you should get this information before you start to locate the trouble:

How long has set been in use?
How long has set been "dead"?
Or, how long has this particular trouble been in it?
What has he done to remedy it?
How old are tubes?
Has set been moved or jarred?
Is aerial in good condition?
Are ground connections O K?

Get owner to tell all he can about the set and in all probability he can give you a clue as to the trouble. Remember that a rapid diagnosis and analysis is profitable to every one concerned. Rapid repair means profit to the service man because he spends a minimum amount of time on each job. The service man sells time and knowledge—nothing else.

By having the best testing equipment available you can quickly diagnose the trouble and by using analysis charts check instrument with the owner looking on, presuming we are still in his home, and when you have finished you leave him a copy of your analysis, it being a record for his information as well as yours.

In all probability you have "sold" the owner on your ability, your equipment and your service establishment as a whole and he will gladly pay you the required fee and you leave him, a booster for you.

A record should be kept on all jobs done, this information taken from the job ticket or analysis card and a follow-up at regular intervals made to ascertain whether or not he is receiving the proper service from his particular make of set. Don't be partial to any set if you are doing general service work, for regardless of the receiver he has, he is entitled to good reception from the set and it is your job to see that he gets service.

Again let me state that you must be about "three jumps ahead of the hounds" to get the business. Send out reminders, short letters, questionnaires, use display material, advertise your Good Service and follow it up with exactly that kind of service and yours will be a busy organization.

Applying Ohms Law to "B" Power Dividing Resistances

By J. A. DOWIE,
Chief Instructor, National Radio Institute
Washington, D. C.

The relation between volts (pressure potential or electromotive force) amperes (current) and ohms (resistance) from which any one of the values may be found when the other two are known, is called Ohms Law. The rules based on this law are very useful in Radio, therefore it is advisable for students to become familiar with their application to practical problems.

Fortunately, Ohms Law is very simple, and a common school arithmetic (ordinarily multiplication and division) is sufficient to work out problems which may arise under it. It may be stated forward or backward; and in its three formulas, will give the rules: (1) for determining the voltage "applied to" or "across" or "dropped in" a circuit when both the flow of current and the resistance in the circuit are known; (2) for determining the flow of current when both the voltage and the resistance are known, and (3) for determining the resistance when both the voltage and the current flow are known.

The voltage or potential, as it is sometimes called, existing in an electrical circuit is equal to the product of the current passing through the circuit by the resistance in the circuit. As the potential or pressure is expressed in "volts," the current in "amperes" and the resistance in "ohms," we may say that the voltage equals the product of the amperes multiplied by the ohms. This is written as our first formula.

$$E = I \times R \qquad (1)$$

E in electrical engineering signifies voltage (electromotive force); I represents current (intensity), and R represents resistance.

The above formula (1) is useful when we wish to know the voltage and know the current and the resistance in the circuit. We may turn this formula backward in two ways. To determine the current when the applied voltage and the resistance are known, we use it in this form—

$$\text{Current} = \frac{\text{voltage}}{\text{resistance}} \quad \text{or}$$

$$\text{Amperes} = \frac{\text{volts}}{\text{ohms}}$$

Here is the second Ohms Law formula:

$$I = \frac{E}{R} \qquad (2)$$

Or, supposing that we know both the voltage and the amperage, we can determine the resistance by dividing current into voltage:

$$\text{Ohms} = \frac{\text{volts}}{\text{amperes}}$$

This is the third formula:

$$R = \frac{E}{I} \qquad (3)$$

In designing a voltage dividing resistor for any power unit, it is first necessary to know the exact voltages and the amount of current which will be required by a receiving set which is to be operated from the power unit. This is absolutely necessary; as any change in current will produce a different voltage drop, with the result that the tubes of the receiver will not be operated at their rated voltages.

The data supplied by the manufacturer indicates the plate current required by the various tubes of the set.

Figuring the Resistances

We are now in a position, after studying the previous paragraphs, to determine the current and voltage demand on the B power unit. Let us consider a 6-tube receiver using three 226 radio frequency tubes, a 227 detector tube, a 226 audio frequency tube, and a 171 power tube.

TABLE I

Type Tube	Plate Volts	Grid Volts	Plate Current m. a.
Power tube 171	180	—40	20
A. F. tube 226	90	—6	2.6
Detector tube 227	45	grid leak	2.5
3 R. F. tubes 226	90	—6	9.3
		(Total)	34.4 milliamperes

Thus a total of 34.4 milliamperes must be delivered by the power supply for the plate circuits of the tubes.

In calculating the values of resistances necessary for a B power unit, it is only necessary to keep clearly in mind just how the direct currents are to be distributed. Consider the voltages and currents as outlined in Table I. Let us picture where these currents are going. Figure 1 pictures the distribution of currents from the B power unit to the set. At the 180-volt terminal point on the voltage divider, we are going to draw off 20 m.a. for the plate of the 171 power tube. Also, at the 90-volt terminal, we shall take off enough current for the plates of the R.F. and A.F. tubes.

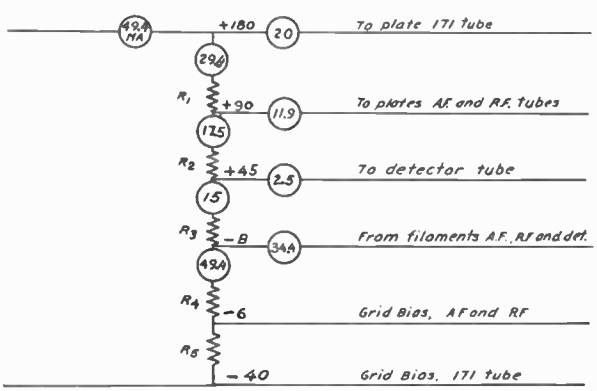


Fig. 1—Plate Voltage and Grid Bias Resistors connected across power output unit.

(Continued on Page 16)

Co-operative Advertising

Teamwork Brings Results

The efforts of a single small advertiser does not avail much in the ad-filled columns of a metropolitan newspaper. Space and display count heavily in securing the readers' attention and interest. You, too, read the full page display ads while hurriedly passing up the pages filled with a conglomeration of small ads —too many for any single one to stand out,—to challenge your attention, to create interest.

Every ad you put out is a horse — hired to pull a load for you. A score of horses pulling in opposite directions get nowhere; but a score of horses teamed together and pulling with a united concerted effort will show a tremendous pulling power—and results.

Radio dealers who are banded together by a common interest—such as the sale of one brand of radio receiving sets—pool their advertising efforts and through co-operative advertising secure prominent display space at a very moderate cost to all participating in the advertising. Thus through combining their efforts and pulling together as a team, results are secured which could not be approached by individual effort.

Members of the SUPREME SERVICE LEAGUE are banded together in a common cause—that of giving the highest possible grade of service ot radio set owners. Advertising of SUPREME LEAGUE SERVICE by two of these individual members in a community is but a drop in the bucket and too often causes but a mere ripple on the surface of reader interest—simply because the individual advertisers can not afford the expense of space of sufficient size to make a splash that will cause WAVES of interest to dash in every direction.

Many members of the SUPREME SERVICE LEAGUE allow the shining light of their ability to remain hidden in the bushel of obscurity—because of a dependency on word-of-mouth advertising to spread their story.

CO-OPERATIVE ADVERTISING is the most effective and cheapest means of telling the story of SUPREME LEAGUE SERVICE—YOUR SERVICE—to your community. Co-operative advertising of the SUPREME SERVICE LEAGUE will soon be inaugurated in several centers. Carefully and attractively designed copy has been forwarded to the leading newspapers of these centers, together with the names of members of the SUPREME SERVICE LEAGUE located within the trade area of the publication. Thus will be ushered in a new era in radio servicing—removing the bushel of obscurity and revealing to the radio owning public the outstanding quality of SUPREME LEAGUE SERVICE and the unusual ability of the SUPREME SERVICE LEAGUE member.

The advertising used is designed to create prestige for the SUPREME SERVICE LEAGUE member in his community. The advertising is one full page in size and the center of the ad is devoted entirely to SUPREME LEAGUE SERVICE and the efficiency of this service. It tells of the fitness — the rating — and the ability of every member; his equipment—the fact that every and any servicing operation can be handled in the home—that guess-work or needless expense, delay or inconvenience can be eliminated. In short, it explains "WHY" the SUPREME SERVICE LEAGUE member is the master-craftsman of the radio servicing industry . . . the public is informed of the distinguishing marks of the SUPREME SERVICE LEAGUE member, by the Decalcomania, Membership Card and the Lapel Button which guarantees that they actually represent SUPREME LEAGUE SERVICE. The tie-in advertising of each individual member identifies his service as SUPREME LEAGUE SERVICE and creates unquestionable prestige in his community.

It is planned to immediately extend this advertising to other centers, to your own section; to reach those hundreds who are seeking such outstanding radio service in your own community—your logical customers. Mediums are being selected and advertising is being prepared to fit the special needs of your particular locality. Soon your own newspaper will advise you that there is available to you the benefit of such co-operative advertising.

Join with the other members of your community in building up prestige for the service which you render. Signify your willingness to participate in co-operative advertising in your section by filling in the blank form shown below. Specify the name of the best advertising medium among your local newspapers and thus help us to line up our co-operative campaign so as to bring the greatest results for the smallest expenditure. Send the coupon at once and also give us your views regarding this all-important feature of acquainting the set-owners of your community with the outstanding service which you can render to them as a member of the SUPREME SERVICE LEAGUE.

SUPREME SERVICE LEAGUE, Date.....
GREENWOOD, MISS.

I (or we) favor Co-operative Advertising of the SUPREME SERVICE LEAGUE. I (or we) will participate in such advertising if used in our community.

Signed.....

Address.....

Newspaper preferred:

.....

The SUPREME SERVICE LEAGUE

The SUPREME Service League is dedicated to the development of greater proficiency in radio service and to the task of acquainting the public with the more efficient and dependable service rendered by its members.

The League Seeks to Accomplish a Two-Fold Purpose

First: To equip its members ith the mechanical means and echnical knowledge necessary to nsure the maximum efficiency and lepe.adability in radio service.

Second: To familiarize the radio public with the superiority of SUPREME League Service through the means of intelligent, truthful advertising, thereby cintributing materially to the continuous and substantial growth of its members. There are no fees or assessments to be paid in order to enjoy the privileges and advantages of membership.

Means of Accomplishment

The primary requisite to efficient radio service is the possession of the most thorough and complete mechanical equipment available. That SUPREME Instruments answer this need is unquestioned. The SUPREME Radio Diagnometer is the greatest forward stride since the inception of radio. This remarkable instrument enables the service man to easily, quickly, and accurately diagnose ALL radio ills.

This one instrument in compact, convenient, portable form provides those vital tests, analyses, and diagnoses which were formerly restricted to the tedious process of expensively equipped radio engineering laboratories. The possession of a SUPREME Diagnometer places its owner in position to render a vastly better service than can his competitor of like ability and technical knowledge.

Membership in the SUPREME Service League is restricted to owners of SUPREME Instruments. All owners in good standing may become members.

Free Membership to SUPREME Owners

All owners of SUPREME Instruments are entitled to a year's FREE membership in the SUPREME Service League. However, no one is enrolled in the League who does not make application and pledge himself to conform to the high standard of service required by the League.

All applicants must pass such examination as will establish their fitness to render SUPREME Service. Instructions and advice will be given those who may not at first be able to pass this examination, so that by close study and application they may, within a reasonably short time, meet the standards demanded.

Benefits of Membership

An attractive lapel button and engraved membership card are issued to all members. These marks of identification command respect for the ability of SUPREME League members wherever they may go to give radio service.

A liberal quantity of advertising folders for public distribution is furnished each member free of charge. These folders link the SUPREME League member with the SUPREME League national advertising.

An attractive decalcomania window sign which illustrates the SUPREME League Emblem in three rich colors is furnished each of the members, enabling them to cash in shop or store as a reliable source of radio service.

Well designed cuts, or electrotypes, are available, at cost, to all members, enabling them to cash in on the business producing benefits of the League.

A year's free subscription to "**DIAGNOTRICIAN**" is given to all new members. This publication contains technical articles written by outstanding authorities in the radio field.

National Advertising of SUPREME Service League.

Each month in the national radio publications there appear attractive advertisements of the SUPREME Service League. This national advertising directs the radic public to "look for the SUPREME Service League emblem as a guarantee of efficient and dependable radio service."

Co-operation Between Membership Vital.

The purpose, ideals, and objectives of the League are admirable, and are of the greatest benefit to each individual member. Success depends upon the co-operation of the membership. Individually, the most efficient of us can accomplish only a limited success—but collectively, all reap abundant reward.

Every member should make judicious and vigorous use of the advertising material placed at his disposal. He should take full advantage of the national prestige of the League and link his business with the national advertising for the League. It is but natural that an increase in his profits or earnings will result.

How to Join the League.

Write to the Secretary of the SUPREME Service League for card of application today. It's the first and best step you can take for making your service work a source of satisfaction and profit.

Secretary,

SUPREME SERVICE LEAGUE,

Greenwood, Mississippi.

Technical Salesmanship

By FLOYD FAUSETT

Good salesmanship consists mainly of rendering a distinct service to a customer in helping the customer choose an article of maximum value to the customer for the investment of funds involved. It is obvious that the salesman, in order to render such service to a customer, must have a more specialized knowledge than that of the customer of the utility of the commodities which the salesman hopes to induce his customers to select.

The success of every industry is dependent upon its sales outlet. Every phase of development, manufacturing and distribution must be co-ordinated with sales probabilities.

It is the purpose of this discussion to emphasize the part radio technicians can play in retail radio selling directly and indirectly through co-operation with radio salesmen. Many of us have seen promising salesmen join radio merchandising organizations and put forth faithful efforts towards demonstrations and sales, but without the degree of success we feel they should accomplish. Many of us have seen antagonism develop between salesmen and service men where the salesmen were inclined to blame the service men for sales losses on demonstrations. And sometimes service men are negligent and partly responsible for lost sales. Instead of such situations it is highly essential that there be close co-operation between sales and service efforts, and it is often the duty of radio men to help the salesmen by teaching them the technical and service advantages of the radios they have to offer their customers. The importance of this co-operation may be emphasized for the benefit of service men who will imagine themselves in the salesman's position, comparatively ignorant of the various differences between the many radios on the market. The service man knows how to compare different radios for sensitivity, selectivity, power and fidelity of tone, but few salesmen know even these fundamentals of radio performance. The service man knows which side of the tuning range is the more sensitive or selective, and generally which of two radios offers more uniform sensitivity over the whole tuning range and what one of any two standard radios affords more uniform audibility response over the musical range. These are important elements to be considered by a customer in comparing radios. The customer must rely upon the radio salesman for assistance in discovering the points of superiority of the salesman's radio, and the salesmen often must learn these from the service man who nurses various and sundry radios in his shop experience or learns their various peculiarities through his studies of the laboratory comparisons made by technical publications.

Competition in the engineering, manufacturing, and merchandising of radios is becoming more keen, and it is highly probable that there will be comparatively little difference in the performance of the various radios manufactured in the future. Sales will then be won by the salesmen who excel in their ability to point out the various features of this radio. In other words, a customer may compare two or more radios of equal efficiency in performance, but he will naturally be more favorably impressed with the radio which is best demonstrated by a salesman who inspires the greater confidence in his customer by showing his greater familiarity with the features of his radio. The salesman must still obtain his knowledge from the service man.

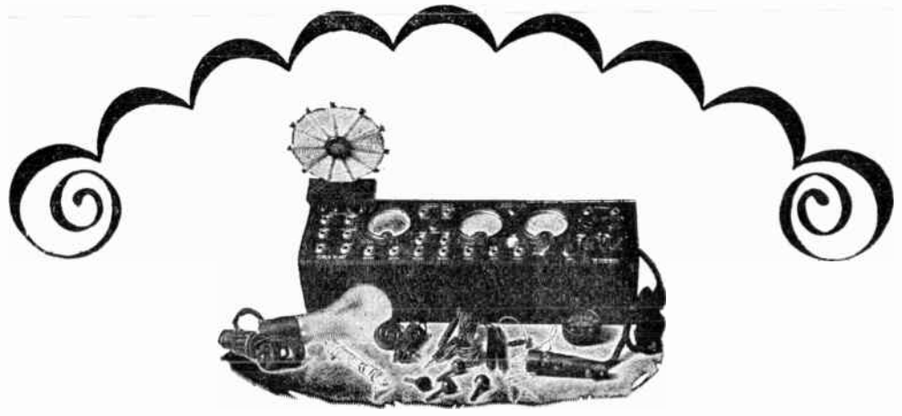
As radios become more alike in performance, radiomen must further assist salesmen by endeavoring to excel in the service offered with the radios sold. A dealer of reliability and financial standing equal to that of a competitive dealer selling a radio of equal reliability, can outsell the competitive dealer only by selling better radio service along with his radios. Highly efficient professional radiomen are highly essential in radio-merchandising organizations aspiring to lead in the competitive radio markets of the future.

Some men make much out of little—others make little out of much. Members of the SUPREME SERVICE LEAGUE are men who have invested in training and equipment—who know their game thoroughly. Make the most of your ability—tell the world, if possible, but above all tell your own community—use your decalcomania — your membership card — your lapel button—and your other helps. Make the most of your membership.

Write for the advertising folder of the SUPREME SERVICE LEAGUE — showing electros and prepared ads available to all members.

. . And two yards to go!!! . .

It's having the punch to make that gain that counts in Football!!!



It's being able to make that extra test that counts in Radio Servicing!!!

Put added PUNCH into your servicing by using a SUPREME Diagnometer

The only complete portable radio testing laboratory

There is no servicing problem that the **SUPREME DIAGNOMETER** will not solve easily and quickly. No more returns to factory or distributor for adjustment or repair. All service can be given, right in the customer's home, so quickly that the cost of servicing is negligible compared with antiquated methods. The work is done by scientific analysis, insuring the perfect results that create enthusiastic customer satisfaction and good-will.

Most good distributors carry the **SUPREME DIAGNOMETER** in stock. If yours cannot supply you, **SEND ORDER DIRECT** on form to right.

SUPREME
Radio Diagnometer

Makes every test on any Radio Set—

No other radio testing device can anywhere near approach the range, completeness and flexibility of the **SUPREME DIAGNOMETER.** Make any test you like. Send for ours, which is confidently called "A Test that Challenges Attention." Some of the outstanding features of the **SUPREME** are:

All tubes tested under actual operating conditions.
Screen grid socket analysis without oscillation.
750 Volt 4 scale A. C. and D. C. Meters, 3 scale milliameter.
Self-contained power plant.
Modulated radiator for testing, synchronizing. neutralizing.
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Tests both plates '80 type rectifiers.
All continuity tests without batteries.
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Handy carrying case providing compartments and space for all tools and spare tubes.
750/150/16/4 A. C. Meter.
750/250/100/10 D. C. Meter.
2/12 Ampere-125-25 Milliameter.
Thermo couple meter for measuring output of a set.
Measures resistances.
Measures capacity of condenser 5 to 9 M. F. D.
Makes all analysis readings.

and a request for complete specifications will reveal numerous other superiorities.

Supreme Instruments Corp.
346 Supreme Bldg.
Greenwood, Miss.

Please ship SUPREME DIAGNOMETER Model 400-B on basis checked below.

☐ Net cash $139.50.

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Please give three or more bank or trade references and names of distributors from whom most purchases are made.

Supreme Service League

TO RADIO OWNERS: Look for this emblem in your radio shop, on the lapel button or card of your service man. It is your guarantee of dependable radio service.

The Diagnometer's Completeness, Range and Flexibility will Prove Astounding

Making Strong Grids For Well-Behaved Tubes

If the filament or heater represents the heart, and the plate current represents the blood circulation, certainly the grid represents the mind or controlling member of the usual vacuum tube. It is essential, therefore, that the grid should be correctly proportioned and positioned if it is to control tube action in the intended manner.

The usual vacuum tube grids are made by notching the parallel support wires and then winding the grid wire proper so that each turn is held in the corresponding nicks. While this method serves well enough for the larger grids, it is somewhat cumbersome for the finer grids employed in the A.C. and D.C. screen-grid tubes. The closer spacing of turns proves troublesome, and there is always danger of having the wire squirm or work loose in the nicks.

The engineering staff of the DeForest Radio Company, under the direction of Lee DeForest, long ago worked out the spot-welded grid, in which each turn is spot-welded to the support wires, forming a welded or solid grid structure. The spot welding, as demonstrated at the Radio Show, is accomplished in an ingenious grid-winding machine which not only spot-welds each turn but automatically spaces the turns and even spaces between successive grids, dropping complete grids into a tray for immediate use, as contrasted with the usual method of continuous winding in which girl operators must unwind part of the grid turns and trim the wire to form a finished grid. The wire employed is the expensive molybdenum or "molly," so that the saving effected in the DeForest grid winding machine is appreciable when dealing with tens of thousands of grids per day, quite aside from precisely uniform grids.

Screen-Grid Efficiency Depends on Mutual Conductance

The predonderance of screen-grid radio sets in evidence at the New York Radio Show has given rise to considerable speculation as to the efficiency of this new idea in broadcast reception particularly since many set manufacturers are still presenting the usual three-element tube circuits as alternative offerings. Commenting on this point, Allen B. DuMont, Chief Engineer of the DeForest Radio Company, points out that the output of a screen-grid circuit is directly proportional to the mutual conductance of the screen-grid tubes employed, provided other characteristics are as they should be.

"Last year's sets," states Mr. DuMont, "employing the three-element tubes, had an overall gain of somewhere between one-fourth and one-half million. This season's sets, utilizing screen-grid tubes, have an overall gain of somewhere between one and three fourths and two and one-half millions, so far as the radio set designers are concerned. However, the deciding factor in the efficiency of present-day screen-grid sets is the mutual conductance of the screen-grid tubes themselves. Unfortunately, the matter of mutual conductance is not receiving as much attention as it deserves, with the result that some screen-grid tubes when placed in screen-grid sets fail to develop the expected gain or sensitivity. In fact, the results have been so disappointing in some instances that there has been little improvement over the three-element tube sets utilizing satisfactory tubes.

"Properly designed and employing screen-grid tubes with a satisfactory mutual conductance, the usual screen-grid circuit should have a gain of 25 to 50. The three-element tube circuit should have a gain of 5 to 10. It is just a question of tubes and circuits."

Confidence and the Service Man

(Continued from Page 3)

and supplies which will help him do his work well, quickly and inexpensively. Most important of all, the service man constantly seeks to add to his store of knowledge, for he must keep abreast of every radio development. After all, he is, collectively, the shock troops of the radio industry, out in the front-line trenches, where a real job must be done, alone, unaided, and without alibi.

To my mind it is particularly significant that the very organization which has done so much to place proper testing apparatus in the hands of a competent service man, should now complete its work by placing the mental equipment as well in the hands of this same man. I commend the publisher of the "Diagnotrician"—The Radio Service Man's Monthly—which is destined to weld all service men into a compact guild of well-informed craftsmen. I pledge my knowledge of radio to the Editor of this publication, to be drawn upon as he may desire.

FATHER OF RADIO SPENDS MUCH TIME AT RADIO SHOW

A rather tall, medium build, white-haired man, supremely interested in every detail of every exhibit, may have been noticed about the Radio Show held in New York City more for his persistent visits than for his manner of speech. The man is none other than Dr. Lee DeForest, the inventor of the present-day vacuum tube upon which the entire radio structure now rests, as well as the original broadcaster, who has won the proud title of "Father of Radio." Jostled this way and that by the swirling crowds, few visitors have realized that here is the man who has made the radio show possible; for without his contributions to the art, there would be no radio broadcasting and popularized radio.

"I have thoroughly enjoyed this radio show," states Dr. DeForest. "In variety, ingenuity, quality of offerings and many indications of enormous and ingenious production as reflected in the low selling prices, I believe the radio industry has made tremendous strides during the past twelve months. Also have I been greatly impressed by the keen interest displayed by the radio public in every little detail of refinement and improvement, which fact, to my mind, means that the industry has little to worry about in the matter of market saturation. Just as automobile owners are contented with a reasonable rate of obsolescence in supporting the vast research and engineering laboratories, so the radio owners are indicating their willingness to encourage research and engineering by exchanging their radio sets for new sets in a reasonable period of time."

Vacuum Tube History a Feature of Radio Show

An outline of the history of the vacuum tube is told in a series of models and documents, comprising one of the outstanding features of the Sixth Annual Radio World's Fair held in New York City.

Beginning with the gas flame detector, employed by Lee DeForest in 1903, the history of radio exhibit covers in turn the first rectifier tube with filament and a pool of mercury, the first control electrode vacuum tube with control member in the form of a band on the outside of the glass bulb, and then the vacuum tube with control member inside the glass bulb, in the form of a second plate placed closer to the filament than the actual "plate." The accompanying patent application of Dr. Lee DeForest, covering that tube, shows the use of a grid bias voltage even at that early date—1907. Then comes the most important invention in the entire history of the radio development —the first audion, in the form of a glass bulb with filament, zigzag wire electrode or grid, and plate. A subsequent model presents the first commercial audion of 1907, followed by an improved type used commercially from 1909 until 1917. This last audion is quite similar in general design to present-day tubes, with grid and plate placed on both sides of the filament so as to obtain better characteristics. It was this type of audion that Dr. DeForest employed in his first cascade amplifier which he demonstrated to the Bell Telephone System engineers in October, 1912. This was also the first tube to contain a vacuum approximating that used in present-day vacuum tubes, and was successfully employed in the first oscillating tube circuits. There are two more exhibits, one showing the type of audion having all leads brought through one press as employed commercially from 1917 until 1927, and lastly the present-day screen-grid audion.

Service Men Attain Professional Rank

Due to special testing equipment quite as well as through training, the radio service man has attained the dignity of a professional worker, according to J. E. Smith, President of the National Radio Institute.

Recently, special testing equipment has been developed whereby the service man can make every conceivable test out in the field, and locate any source of trouble in a radio set. This kind of service is essential to the prosperity of the radio industry which now operates on the principle of mass production, volume sales and satisfied public.

SERVICE INFORMATION EXCHANGE

WE PROFIT BY HELPING EACH OTHER

QUESTIONS AND ANSWERS

Q. Is it possible to make a three dial tuned radio frequency set adaptable to short wave reception in the same receiver?

A. It is possible but not to be recommended. A short wave set is a job all by itself. To incorporate its structural demands with those of a tuned radio frequency set is to court disaster.

* * * *

Q. In what manner can screen grid amplification be added to a neutrodyne to obtain greater selectivity, sensitivity and volume?

A. This cannot be done if the set is of the single control type. If of the older, multi-controlled type, the first stage of radio frequency may be rewired to include a screen grid tube, but the "improvement" would be questionable. The reason for this is, that the neutrodyne is a "balanced" circuit and any change in one part of the circuit affects the remainder of the circuit. If screen grid tubes are wired in to replace the regular tubes, the neutralizing capicators are not needed and the set is no longer a neutrodyne; and in addition the set in tuning would be several times as broad as before.

As inductances and capacities must be exactly matched for single dial operation, it is impossible to use the same equipment and obtain matched tuning; for the screen grid tube has different internal capacity values from those of "regular" tubes; and its grid and plate circuit inductance requirements are different.

* * * *

Q. While recently repairing a radio set, I found a fixed resistor connected across the secondary of one of the radio-frequency transformers. What was the purpose of the resistor?

A. This resistor was used as one of the several optional means of controlling circuit oscillation. This is a very effective method and does not possess as many disadvantages as some other systems. It cannot be called purely a "losser" method; for it does not cause a reduction of the signals in the same proportion as the parasitic circuit oscillation is reduced.

Many service men apply this oscillation control means to balky receivers, as it is very convenient; not necessitating the breaking of any leads.

* * * *

Mr. Irvin F. Maurer, 625 Baker Street, Minersville, Pa., desires a discussion in this publication of prices for calls, analytical work and repair work by the Supreme League members and users of the SUPREME DIAGNOMTER. We will be pleased to hear from any members regarding the matter and will publish suggestions and examples that might prove beneficial to other members of the League.

Let Supreme League Engineers help you with your problems. Daily, they are assisting many "Diagnotrician" subscribers with their knotty problems and they invite your questions. The outstanding ones will be printed on this page so others may also derive the benefit. : : : :

THREE USEFUL TESTS

Fort Ethan Allen Vt.
Sept. 18, 1929.

Mr. Vivion A. Johnson, Chief Engineer,
Supreme Instruments Corp.,
Greenwood, Miss.

My Dear Mr. Johnson:

I am deeply indebted to you and very grateful for your letter of September 13, which informed me of the connection for measuring low resistance with the thermo-couple meter of the SUPREME DIAGNOMETER 400-B. I wonder if your organization appreciates the value of this test as an advertising inducement. Future advertising should not fail to include some of the uses for this test, the three most important of which are, in my opinion, as follows:

1—Test for Shorted variables w/o disconnecting R. F. Coil.
2—Test for rosin joints or corroded connections.
3—Test for locating resistive center of center tapped filament resistances in A.C. sets.

Also comparative test for determining value of any resistance of 25 ohms or less.

I have just finished making a resistance graph. The methods I use and the resulting graph may be of interest to you. The meter readings noted are of the 250 volt scale, which I have assumed to be from 0 to 250 mils when using the thermo-couple input to the D.C. V.M. I plotted the resistance as ordinates and the meter scale divisions as abscissas beginning with zero in the lower left hand corner in each case. The 30 ohm rheostat was left open and the A.C. line voltage was reduced to 90 volts by means of the series resistor in the lamp cord which I have previously described to you. On my instrument, this gives a deflection of 200 mils when the test clips are shorted, leaving a safe margin for voltage surges in the A.C. line various fixed resistances of from 6 to 26 ohms, in series and parallel combinations were used as standard. Some of the principle points on the curve are as follows:

0. ohms — 200 mils.	8. ohms — 50 mils.
1. ohms — 175 mils.	10. ohms — 40 mils.
2. ohms — 145 mils.	12.5 ohms — 30 mils.
4. ohms — 95 mils.	20. ohms — 17 mils.
6. ohms — 65 mils.	25. ohms — 10 mils.

Thanking you again for your kindness, I am,

Yours sincerely,

MORTIMER K. BARBER.

THE SUPREME *Service League*

OFFERS YOU A COMPLETE COURSE IN "SELLING RADIO"

Just the thing for the Service Man, Salesman, Dealer, Jobber and Technician

EVERYBODY wants to make more money selling and servicing radio sets. A hundred and one facts must be taken into consideration if you wish to become a successful radio merchant or salesman. The service man's ambition is to be a salesman—eventually the boss of a business of his own. Now you can learn the innermost secrets of SELLING RADIO. The national trade magazine, "RADIO," is publishing a complete course of instruction in SELLING RADIO. It starts in their December issue. The Supreme Service League will accept subscriptions to "RADIO" from readers of the "DIAGNOTRICIAN" at the **special 50% discount rate of $2.00 per year.** With your subscription to "RADIO" the publishers give you a FREE subscription for one year to their monthly loose leaf price and data sheet service and a loose leaf binder for holding these sheets. **This service, alone, is worth many times the subscription price.**

THE COURSE IN "SELLING RADIO"

IS A COMPLETE AND PRACTICAL EXPOSITION of successful methods for selling radio sets. It starts in the December issue of "RADIO." No salesman should miss it. Mr. Parker, the author of this practical series of articles, has sold radio for years and has taught hundreds of others how to sell it. He has been manager of a prominent Radio Trade Association, sales manager for the Magnavox Company, in charge of sales promotion for the Leo J. Meyberg Company, and now gives the results of this experience, as well as several years as an electrical salesman, in the form of a complete series of articles to be published in "RADIO" during the next year.

You can learn all these things and all of the other fine points of selling radio at retail by reading this monthly series of articles by Heckert L. Parker, Merchandising Editor of "RADIO."

Jobbers and Dealers are Urged to Order this Service for all Salesmen, Service Men and Others in Their Organization.

Your Salesmen Will Sell More Merchandise for You If They Follow the Monthly Instructions in "SELLING RADIO." Order the Course for All of Your Men. It Costs but $2.00 per Subscriber.

50% Discount
IF YOU ACT IMMEDIATELY!

THE PRICE for this entire service for one full year is only $2.00, if your order reaches us at once. Soon, this price will be increased to $4.00. You save exactly 50% by subscribing now. The only reason for selling this entire service for $2.00 is to enable the publishers of "RADIO" to greatly increase their net paid-in-advance subscription list.

Dealers . . . Jobbers! Here is the Solution to Your Xmas Problem

SOMEBODY in your employ—a salesman, repairman or service-man, will welcome this subscription to "RADIO" as the ideal Christmas Gift. Why not send subscriptions to "RADIO" to all people in your organization? "RADIO" will help ALL of them make more money for themselves—and for you. Five subscriptions for five people cost but $10.00. There's a tip for you! The publishers will send a Christmas card to those for whom you subscribe, telling them that the magazine is being sent to them for one year with your compliments.

HOW TO ORDER

Send us $2.00, and the coupon at the right. We will then forward your order to the publishers of "RADIO." This $2.00 is payment IN FULL for a one-year subscription to "RADIO," a one-year subscription to their monthly loose leaf price and data sheet service, of which 16 sheets are sent to you each month, ... also a loose leaf binder for holding these sheets. Your subscription will start with the December issue of "RADIO," the first issue to carry the articles on "SELLING RADIO."

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The **Supreme Service League** guarantees to send your order to the publishers immediately upon its receipt and assures you that there are no further payments of any kind to be made. We will refund your money without question if you are not entirely convinced that this is the most liberal offer ever made by any radio magazine publisher.

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Greenwood, Mississippi.

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STATE.....

Note: Why not ask your dealer or jobber friends to subscribe? Send their subscriptions along with your subscription, writing their names and addresses in the lower margin of this page.

Applying Ohms Law to "B" Power Dividing Resistances

(Continued from Page 5)

Current coming from the power unit has two well-defined paths to follow. Twenty milliamperes will be delivered to the plate of the power tube, to be returned to —B; the rest of the current will flow through R1. At the 90-volt section, the plate current of the A.F. and R.F. tubes will be drawn. A total of 11.9 m.a., to be returned to —B; the rest of the current will flow through R2. At the 45-volt terminal, 2.5 m. a. will go to the detector tube and the rest will flow through R3.

In addition to the current required by the receiver some current greater than 34.4 m.a. must flow into the output resistor, since there must be some surplus current left to flow through R3 to establish a voltage across it. Taking a value of 15 m.a. to flow through R3, will give a value of resistance for that section, which will not be too large and will be suitable for the circuit design.

We have established the amount of current to be drawn from the filter circuit which will be 34.4 m.a. for the set and 15 m.a. for the resistor, giving a total of 49.4 m.a.

Now that we have studied the distribution of current in a power unit, the voltages obtained are determined by the familiar Ohms Law, $E = I \times R$, where E is expressed as a function of the current, and the resistance. This gives us an accurate and working formula for calculating the resistance, R, required for the power unit design. E is in volts, I is in amperes, and R is in ohms. A milliampere is one thousandth of an ampere, or expressed in figures, is equal to .001 ampere. Thus, for the values of voltages and currents outlined above, the following resistance values are calculated:

TABLE II

Resistor	Voltage across R	Current through R m. a.	R (Ohms)
R1	90	29.4	3,061
R2	45	17.5	2,571
R3	45	15	3,000
R4	6	49.4	122
R5	34	49.4	690

The resistors R4 and R5 are for obtaining the "C" biasing voltages and the current passing through each of these resistors is equal to the total current delivered by the power unit, or 49.4 milliamperes, as no "C" current is drawn by the tubes. The easiest way of determining the resistance in the above table when we are dealing with milliamperes is to multiply the volts by 1000 and divide by the milliamperes. For example, 90 multiplied by 1000 is equal to 90,000; 90,000 divided by 29.4 is equal to 3,061.

In actual practice, it usually will be found impossible to buy resistors having the exact resistance values required. However, the resistance of each unit need not be exact and the standard resistors having the nearest value may be substituted.

SUPREME SERVICE LEAGUE Folders are available to members and are supplied at cost —75c per hundred. In lots of 1000 your name and address will be imprinted without additional charge.

ZENITH

Models 52, 53, 54, 532 and 542 Zenith

The 50 series circuit incorporates three stages of audio frequency amplification. The first stage is resistance coupled, the second, push-pull using two 227 tubes and the third, also push-pull using two 245 tubes. Only two push-pull transformers are shown in the diagram, the third being in the speaker. The plate circuit from the output or third transformer is completed through the cable provided with the 5-prong plug.

The grid bias for all tubes excepting the UX 245 or C 345 tubes is obtained by the usual voltage drop through resistances connected between cathode and ground. Twelve condensers are connected across the resistors.

Instead of the usual grid leak and condenser in the detector grid circuit, the linear detection method is used. This consists of a 50,000 ohm resistance paralleled with a .2 condenser between detector cathode and ground. This method allows a greater amount of volume input to the detector tube without blocking or distorting.

The values and markings of the resistances used in the 50 series are as follows:

Parts Number	Resistance	Marking
63-108	50,00 Ohms	Green
63-109	100,000 Ohms	Red
63-110	400 Ohms	Yellow
63-111	2,000 Ohms	Black
63-112	4,000 Ohms	Blue
63-113	250,000 Ohms	White

The voltage divider (63-105) is of 6,000 ohms resistance tapped at 850 ohms from one end and 2800 ohms at the other, leaving 2350 ohms at the center section. The center tapped resistor (63-114) is 10 ohms.

The Mershon filter condenser is used.

If, during the operation of the set, a frying sound emanates from the condenser, the cause is high line voltage and the fuse should be placed in the 120 volt position. A line resistance should be used to reduce the A.C. supply if the fuse is already in the 120 volt position.

Make sure that tubes test all right. Efficient tubes are very essential. It must be borne in mind that when one or more of the RF tubes are bad, the receiver will have considerable lack of sensitivity, selectivity and tone quality. It stands to reason that when a distorted signal is conveyed to the detector tube, that tube cannot undo what has been passed by the RF amplifiers; neither can the AF tubes overcome any deficiency originating in tubes before them. Therefore, **make certain all tubes are good quality.** If a hum is present, change tubes in the detector socket.

If when the volume control is advanced, maximum volume is reached at a point before the volume control is turned completely to the right and after passing that point volume gradually decreases, this is an indicator that a poor tube is being used in either the RF or detector sockets.

It will be noted from the circuit diagram that the screen grid voltage for the detector tube is obtained from the same source as that for the RF tubes. However, the readings at the socket would indicate that the detector screen grid voltage is somewhat lower than the RF screen grid voltage. Due to the nature of the test, this condition is natural.

Rebalancing of Set.

The service man will find that it is not necessary to remove the chassis from the cabinet to make this adjustment.

Set may be balanced by modulated oscillator. Tune in a signal at a low wave-length position on dial. Without further tuning, adjust balancing nuts for peak (starting with one at left). It may be necessary to rebalance a set so that it is off scale five meters each way from the wave-length of a station, in order to bring the set to the best operating point. The difference in the dial reading may afterwards be corrected by adjusting the dial strip.

Adjusting Dial Strip.

The Dial Strip is held in place by the knurled dial segment, which in turn is secured at each end to the drum with two flat head machine screws. There are also three small screws running through the dial strip into the dial segment on the inside of the drum.

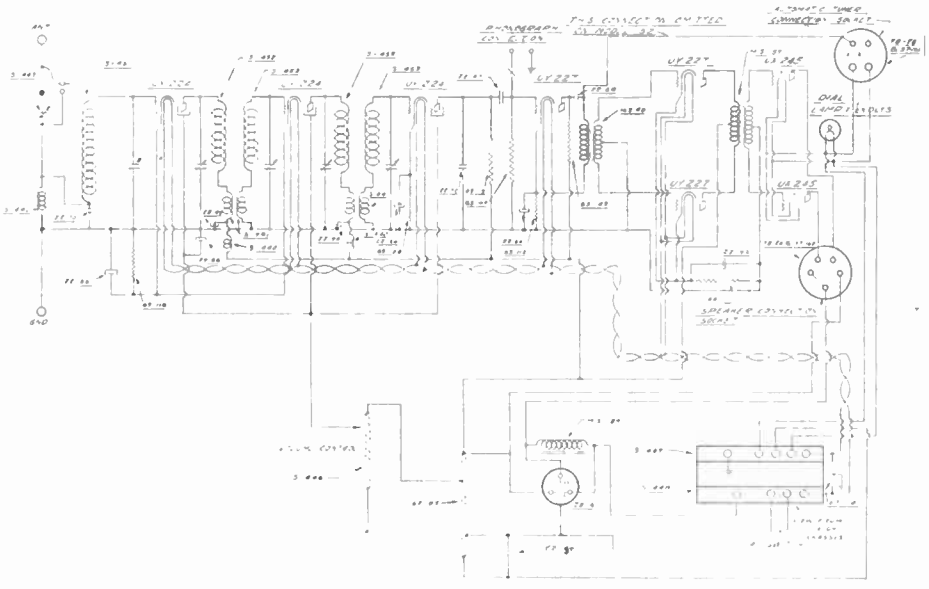
The five screws (two large and three small) should be loosened just enough to allow the dial strip to be slipped around the drum under the dial segment. After the dial strip is adjusted to the proper position the screws should be tightened.

Average Analytical Voltages

Socket No.	Tube Type	Location	Filament Volts	Plate Volts	Grid Volts	Cathode Volts	Screen Grid Volts
1	Y 24	1 RF	2.3	173	2	2	54
2	Y 24	2 RF	2.3	173	2	2	54
3	Y 24	DET	2.3	85	4	5	36
4	Y 27	1 AF	2.3	55	1.5	4	....
5	Y 27	2 AF	2.3	155	13	13.5	....
6	Y 27	2 AF	2.3	155	13	13.5	....
7	X 45	3 AF	2.1	250	50	.....	....
8	X 45	3 AF	2.1	250	50	.....	....

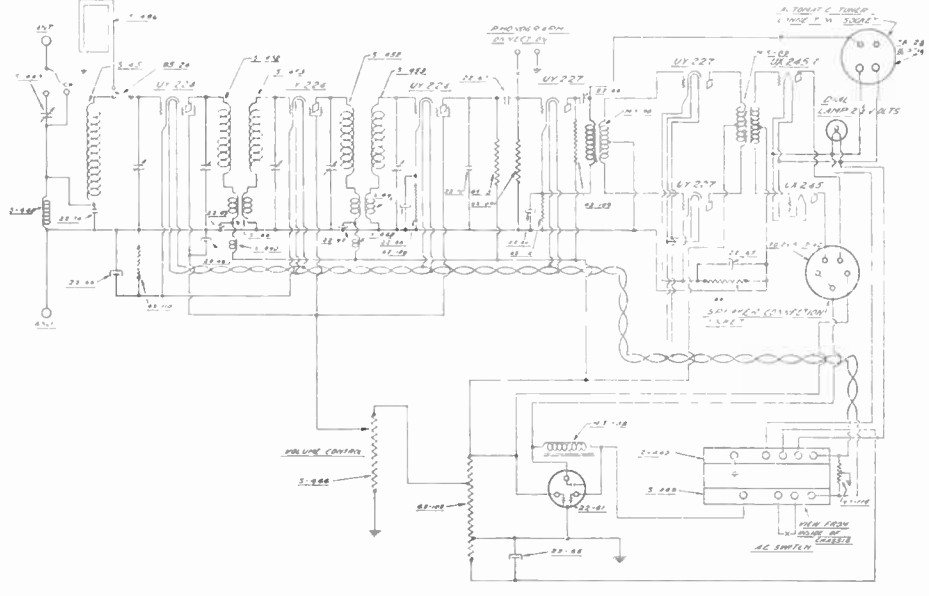
SUPPLEMENT SHEETS
FOR THE
SUPREME RADIO MANUAL

Four Supplements to the Supreme Radio Manual will be issued each month. Complete Manual is available to SUPREME SERVICE LEAGUE members.



72 SUPREME RADIO DATA

ZENITH MODEL 52-53



70 SUPREME RADIO DATA

ZENITH MODEL 54

FACTS AND FANCIES

Mrs. Smith: "So you have two radio sets at your house?"

Mrs. Jones: "Yes, the one my husband repairs himself and the one we get the music on."

* * * *

Rachael: "How do you make Abie take his hand hand off your knee?"

Mollie: "That's easy. I just ask him to explain something."

* * * *

"How's your ear running?"

"Not so good; can't get her throttled down."

"How's your wife?"

"She's the same, thank you."

* * * *

Mary: "I had a date with a boy friend last night, at home, and he only stayed an hour."

Mabel: "Gosh, bet that was a night wasted away."

Mary: "Don't be foolish. He isn't an efficiency expert for nothing!"

* * * *

He: "See that man over there? He's a bombastic ass, a vacuous nonentity, a conceited humbug, a parasite, and an encumbrance to the earth."

She: "Would you mind writing that down? You see, he's my husband and I would like to use it on him some time."

* * * *

"Oh, George, do you realize it's been almost a year since our honeymoon, and that glorious day we spent on the sands? I wonder how we will spend this one?"

"On the rocks."

* * * *

Mary had a little lamb,
It's fleece was white and how!
It followed her where'er she went,
So it's a black sheep now!

* * * *

Our advertising manager says the mosquito does a humming business because it's not satisfied with one insertion.

* * * *

Little Percy: "Our garage man has a fine radio set, mamma."

Unsuspecting Mamma: "What makes you think that, dear?"

Little Percy: "Why, I heard him say he would get hell when he went home tonight."

* * * *

Twists to twists,
And twirls to twirls,
Gimme heavy dates
With light headed girls.

There must be something in this heredity theory, remarks a friend of ours. Else why does my six-months' old baby try to get his toes in his mouth if it isn't because of his dad's constant struggle to make both ends meet?

* * * *

Office Boy: "I tell ye the editor ain't in. I've just looked."

"That's too bad. I wanted to pay him some money I owe him."

"Wait a second. I'll look again."—Life.

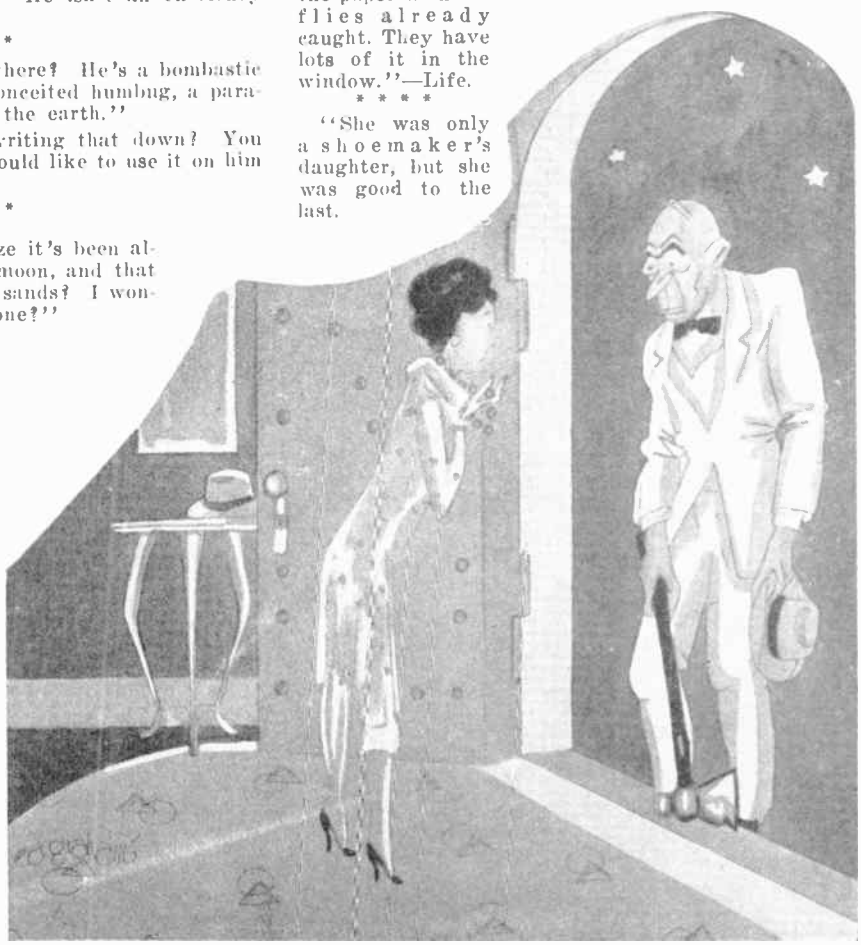
* * * *

Little June's father had just returned from the store and was opening up some sheets of sticky fly paper and placing it about the room. June watched a minute and then burst out with:

"Oh, papa, down at the corner grocery you can get the paper with the flies already caught. They have lots of it in the window."—Life.

* * * *

"She was only a shoemaker's daughter, but she was good to the last.



NEIGHBOR: "I've come to fix the radio!" —*Life.*

The Radio Service Man's Monthly

DIAGNOTRICIAN

NOVEMBER, 1929 --- 50,000 COPIES

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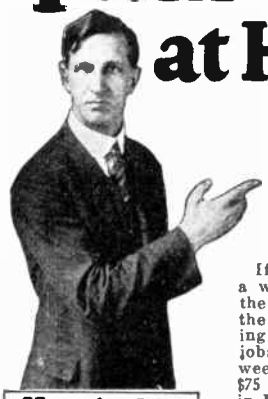
I Will Train You at Home to Fill a Big-Pay Radio Job



If you are earning a penny less than $50 a week, send for my book of information on the opportunities in Radio. It's FREE. Clip the coupon NOW. A flood of gold is pouring into Radio creating hundreds of big pay jobs. Why go along at $25, $30 or $45 a week when the good jobs in Radio pay $50, $75 and up to $250 a week? "Rich Rewards in Radio" gives full information on these big jobs and explains how you can quickly learn Radio through my easy, practical home-study training.

Salaries of $50 to $250 a Week Not Unusual

The amazing growth of Radio has astounded the world. In a few short years three hundred thousand jobs have been created. And the biggest growth is still to come. That's why salaries of $50 to $250 a week are not unusual. Radio simply hasn't got nearly the number of thoroughly trained men it needs.

You Can Learn Quickly and Easily in Spare Time

Hundreds of N. R. I. trained men are today making big money — holding down big jobs—in the Radio field. You, too, should get into Radio. You can stay home, hold your job, and learn in your spare time. Lack of high school education or Radio experience are no drawbacks.

Many Earn $15, $20, $30, Weekly On the Side While Learning

I teach you to begin making money shortly after you enroll. My new practical method makes this possible. I give you SIX BIG OUTFITS of Radio parts and teach you to build practically every type of receiving set known. M. E. Sullivan, 412 73rd St., Brooklyn, N. Y. writes: "I made $720 while studying." G. W. Page, 1807 21st Ave., S., Nashville, Tenn.: "I picked up $935 in my spare time while studying."

Your Money Back If Not Satisfied

My course fits you for all lines—manufacturing, selling, servicing sets, in business for yourself, operating on board ship or in a broadcasting station—and many others. I back up my training with a signed agreement to refund every penny of your money if, after completion, you are not satisfied with the lessons and instructions I give you.

ACT NOW — 64-Page Book is FREE

Send for this big book of Radio information. It has put hundreds of fellows on the road to bigger pay and success. Get it. See what Radio offers you, and how my Employment Department helps you get into Radio after you graduate. Clip or tear out the coupon and mail it RIGHT NOW.

J. E. Smith, President,
Dept. 9VA8

National Radio Institute
Washington, D. C.

Here's the PROOF

$375 One Month in Spare Time

"Recently I made $375 in one month in my spare time installing, servicing, selling, Radio Sets."

Earle Cummings, 18 Webster St., Haverhill, Mass.

$450 a Month

"I work in what I believe to be the largest and best-equipped Radio shop in the Southwest and also operate KGFI. I am averaging $450 a month."

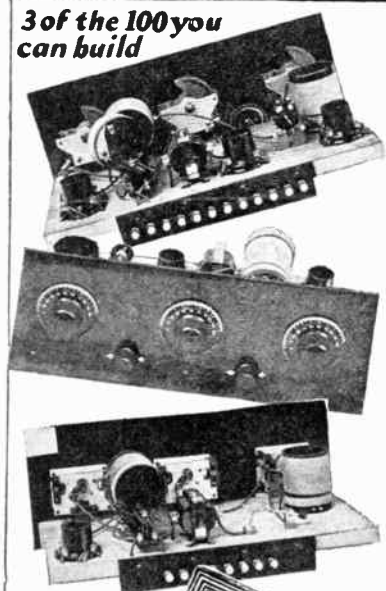
Frank M. Jones, 922 Guadalupe St., San Angelo, Tex.

Employment Service to all Graduates

Originators of Radio Home Study Training

You can build 100 circuits with the six big outfits of Radio parts I give you

3 of the 100 you can build



Find out quick about this practical way to big pay

Mail This FREE COUPON Today

J. E. SMITH, President,
Dept. 9VA8, National Radio Institute,
Washington, D. C.

Dear Mr. Smith: Send me your Free book "Rich Rewards in Radio," giving information on the big-money opportunities in Radio and your practical method of teaching with six Radio Outfits. I understand this places me under no obligation.

Name .....Age.....

Address .....

City .....State.....

DIAGNOTRICIAN
THE RADIO SERVICE MONTHLY
Official Publication
SUPREME SERVICE LEAGUE, Greenwood, Mississippi
SPENCER PEIRCE, Editor
Vol. 1, No. 2 AUGUST, 1929

MAJOR HERBERT H. FROST

Facts of Interest About This Outstanding Figure of the Radio Industry

THE story of the rise of Major Herbert H. Frost to the vice-presidency of Kolster Radio Corporation, an organization representing two of the oldest radio firms in the country and rapidly increasing in prominence through Kolster Radio products and affiliations with Columbia Phonograph Company and Postal Telegraph, is a tale of remarkable progress made by a young lad who left a small Alabama town in 1914 to seek his fortune, and arrived in Chicago with $2 and a telescope suitcase filled with home-made clothing.

His rise in so short a time from the obscurity of a poor unknown stranger looking for a job to the vice-presidency of a $10,000,000 corporation, in charge of marketing its products over the entire world, is a romance of business marked by a series of frequent upward steps. He took advantage of every opportunity that came his way. Now he is one of the most popular and influential leaders in the radio world.

Herbert Frost was born on a Dakota ranch. He began his travels early. When he was only three weeks old his family moved to Nashville, Tenn., to make their home. There he attended the public schools. His family later moved to Huntsville, Ala., and he took up the study of electrical engineering at Butler Institute.

It was in 1914 that he began his business career by leaving the Alabama home and striking out to Chicago. His first job was with the Illinois Public Service Co. A year later he became electrical buyer for Sears, Roebuck & Co. In 1916 he saw army service on the Mexican border as a cavalry officer. When war was declared in 1917, he immediately joined the Signal Corps. His ability was recognized and he was made a Captain, assigned to radio research work in France. He was especially charged with testing and analyzing radio equipment captured from the German army. He prepared a "Manual for Radio Companies of the Signal Corps" which became recognized as standard army practice.

At the close of the war he was awarded a Majority in the reserve corps. He is now vice-president of the American Signal Corps Association and an active member of the U. S. Cavalry Association.

Soon after his return to civilian life, he organized the firm of Herbert H. Frost, Inc., for the manufacture of wireless apparatus, and he was one of the few exhibitors in the first wireless exhibit in Chicago, held at the Broadway Armory in the fall of 1921.

With a few other Chicago manufacturers he organized the Radio Manufacturers Association in 1922, and was made its first president. The aim of the group was to "promote the best interests of the radio trade and listening public by the enforcement of higher standards in radio manufacture, the elimination of unfair and dishonest merchandising practices, and the establishment and maintenance of fair price levels." Those were Major Frost's ideals and he has been fighting for them ever since. Today the R. M. A. is a real power in the industry, and Major Frost has just ended another year as its president.

When in 1925 Congress threatened to tax radio apparatus, Major Frost took a leading part in the opposition, leading the protests of the R. M. A. and of thousands of radio fans. The protests won. It showed for the first time what power in public opinion was held by the broadcast listeners when united.

The city of Chicago called upon Major Frost to represent it as a member of Hoover's Radio Conference at Washington and as a member of the Mayor's Radio Committee in Chicago in 1924 and 1925, where he helped bring about radio reforms. When the Dill and White bills clashed in Congress in trying to solve the tangle of federal control over broadcasting, Major Frost as a representative of the R. M. A. was influential in bringing about a compromise which was favorably reported by the congressional committee.

At the First Radio World's Fair, in New York in 1924, he was awarded a trophy for the year's greatest development in loudspeaker construction. He had produced a horn with a diecast aluminum throat and a molded bakelite bell, the first time that bakelite had been used in loudspeaker construction.

As the next step into greater prominence, he accepted the eastern sales management of E. T. Cunningham, Inc., makers of radio tubes. The company soon expanded and he was offered the position of general sales manager with offices in New York. That was in 1926, and the young radio engineering student who had wandered into Chicago 12 years before, unknown, with $2 and home-made clothes, was called upon to say farewell to four hundred members of the radio industry at a banquet in his honor, sponsored by nineteen national and state radio associations and attended by some of the most widely known men in the country. He was presented with a loving cup by the radio industry in recognition of his valuable work, and with a sabre by the officers of the U. S. Signal Corps Reserve. Major Frost was leaving Chicago as a nationally recognized leader in the radio field.

After a successful year selling Cunningham tubes,

(Continued on Page 12)

The SUPREME SERVICE LEAGUE

The SUPREME Service League is dedicated to the development of greater proficiency in radio service and to the task of acquainting the public with the more efficient and dependable service rendered by its members.

The League Seeks to Accomplish a Two-Fold Purpose

First: To equip its members with the mechanical means and technical knowledge necessary to insure the maximum efficiency and dependability in radio service.

Second: To familiarize the radio public with the superiority of SUPREME League Service through the means of intelligent, truthful advertising, thereby cintributing materially to the continuous and substantial growth of its members. There are no fees or assessments to be paid in order to enjoy the privileges and advantages of membership.

Means of Accomplishment

The primary requisite to efficient radio service is the possession of the most thorough and complete mechanical equipment available. That SUPREME Instruments answer this need is unquestioned. The SUPREME Radio Diagnometer is the greatest forward stride since the inception of radio. This remarkable instrument enables the service man to easily, quickly, and accurately diagnose ALL radio ills.

This one instrument in compact, convenient, portable form provides those vital tests, analyses, and diagnoses which were formerly restricted to the tedious process of expensively equipped radio engineering laboratories. The possession of a SUPREME Diagnometer places its owner in position to render a vastly better service than can his competitor of like ability and technical knowledge.

Membership in the SUPREME Service League is restricted to owners of SUPREME Instruments. All owners in good standing may become members.

Free Membership to SUPREME Owners

All owners of SUPREME Instruments are entitled to a year's FREE membership in the SUPREME Service League. However, no one is enrolled in the League who does not make application and pledge himself to conform to the high standard of service required by the League.

All applicants must pass such examination as will establish their fitness to render SUPREME Service. Instructions and advice will be given those who may not at first be able to pass this examination, so that by close study and application they may, within a reasonably short time, meet the standards demanded.

Benefits of Membership

An attractive lapel button and engraved membership card are issued to all members. These marks of identification command respect for the ability of SUPREME League members wherever they may go to give radio service.

A liberal quantity of advertising folders for public distribution is furnished each member free of charge. These folders link the SUPREME League member with the SUPREME League national advertising.

An attractive decalcomania window sign which illustrates the SUPREME League Emblem in three rich colors is furnished each of the members, enabling them to cash in shop or store as a reliable source of radio service.

Well designed cuts, or electrotypes, are available, at cost, to all members, enabling them to cash in on the business producing benefits of the League.

A year's free subscription to "**DIAGNOTRICIAN**" is given to all new members. This publication contains technical articles written by outstanding authorities in the radio field.

National Advertising of SUPREME Service League.

Each month in the national radio publications there appear attractive advertisements of the SUPREME Service League. This national advertising directs the radio public to "look for the SUPREME Service League emblem as a guarantee of efficient and dependable radio service."

Co-operation Between Membership Vital.

The purpose, ideals, and objectives of the League are admirable, and are of the greatest benefit to each individual member. Success depends upon the co-operation of the membership. Individually, the most efficient of us can accomplish only a limited success—but collectively, all reap abundant reward.

Every member should make judicious and vigorous use of the advertising material placed at his disposal. He should take full advantage of the national prestige of the League and link his business with the national advertising for the League. It is but natural that an increase in his profits or earnings will result.

How to Join the League.

Write to the Secretary of the SUPREME Service League for card of application today. It's the first and best step you can take for making your service work a source of satisfaction and profit.

Secretary,

SUPREME SERVICE LEAGUE,

Greenwood, Mississippi.

Relation of Service to Sales

By B. F. DULWEBER
President
SUPREME INSTRUMENTS CORP.

It is presumed that the readers of this article will be restricted to those interested in radio and regardless of what our position in the industry may be, manufacturer, distributor, dealer or service man, there is an inseparable and mutuality of interest that can best be promoted by earnest co-operative effort.

In the last analysis, our individual opportunities in the radio industry are controlled by one factor—the extent to which we can interest the public in the purchase of radio receiving sets. If we can create such public interest as will make possible a 50% or 100% increase in set distribution, the individual opportunities of each one of us are proportionately enhanced; so it behooves us to give serious consideration to the problem of creating such additional public interest. It is true that the distribution of receiving sets has shown substantial yearly gains, but we must not allow ourselves to be deluded into the belief that like results will be achieved in the future without some new effort on our part, or solely through the employment of high pressure salesmanship. The tremendous growth in business in recent years may be attributed to the unique appeal of radio; its newness and novelty, combined with effective advertising and superior merchandising methods. If it were to depend solely on this appeal in the future, we would find it increasingly difficult from year to year to maintain the ratio of increase of the past and it is probable that before we realized it, the much-dreaded saturation point would be upon us.

The answer, therefore, to the problem "How to maintain and increase public interest in radio," is to provide such service as will insure the continuous satisfactory operation of receiving sets in use. This means that servicing must be so simplified that any competent service man can make any repair, adjustment or replacement in the set owner's home so easily and quickly that the charge made will be purely nominal and still return a good percentage of profit to the service department. This can be accomplished through the employment of competent men; not the cheapest men but the best men; through the purchase of the most efficient and complete testing equipment available and through the application of the same character of management to the service department that is extended to the merchandising effort.

The problem before us, therefore, is "How to maintain and increase public interest?" The same attractive advertising and display and efficient merchandising efforts must, of course, be continued with even greater vigor than in the past, but these necessary efforts must be supplemented by a greater interest in the individual set owner after the sale has been consummated. The permanent success of the radio industry does not depend so much upon attractive advertising, display and salesmanship (though these things are very necessary) as upon the degree of satisfaction obtained by the individual set owner from his purchase. If every receiving set now in use were kept in continuous efficient operation, all danger of a saturation point would be removed and the greatly increased productive capacity in receiving sets need cause no alarm, for an enthusiastic demand would be found awaiting this increased production.

An efficiently operating receiving set provides the owner with more pleasure and with a greater return for the expenditure made than any article that has ever been offered the public. After short acquaintance, a radio becomes absolutely necessary to the average set owner. It is so important a thing in his life that he becomes impatient with and will not tolerate interruptions to the effective operation of his set or lack of efficiency in operation. He expects, and rightly so, the continuous efficient operation of his receiving set and the interest of the entire industry can be best promoted by supplying such results.

It is gratifying indeed, to note the awakening of the industry as a whole, to its greater duty to the radio public. The manufacturer is naturally most keenly alive to the need of providing the individual owner with the maximum results from his radio. Practically all of the larger manufacturers are now laying particular stress on service, are urging their distributors and dealers to improve their service and at considerable expense are employing service engineers to personally contact their distributors and dealers for the purpose of developing more efficient servicevicing on their sets in order that the public may receive better results from their radio purchases. Most of the larger, better class distributors have had a similar awakening and many of the more successful dealers are keenly alive to the situation, but too many of the latter class still give too little consideration to the purchaser after the sale has been consummated and fail to provide such service as will keep the set in satisfactory operation. This is most unfortunate indeed, as it is through the dealer that the entire industry must make its contact with the public.

The employment of the best service man that can be found, the purchase of the most complete servicing and testing apparatus that can be procured and the application of the same business management to the service department that is given to the sale of receiving sets is the best and most profitable move that any dealer can make. Such a step not only insures the individual success of such dealer but contributes substantially to the constructive development of the entire radio industry.

There is still too much "passing the buck" in the radio business. Upon the slightest provocation the dealer who is not prepared to render efficient service will remove a set from a customer's home and return it to his distributor for adjustment and repair and the latter in many cases will return it to the factory. The dealer who by such procedure feels that he is being relieved of some of his obligations and is profiting thereby, is deluding himself. The cost of such handling of the transaction is needlessly high and this cost must come out of the industry and in the long run it is borne pretty equally by the manufacturer, distributor and dealer. If such cost is charged to the dealer and the latter does not make a similar charge to his customer, the excessive cost of such servicing naturally comes out of the dealer. If on the other hand, the dealer assesses this charge against his customer, the charge must be such that a state of dissatisfaction is

(Continued on Page 12)

Special Subscription Offer

TO RADIO SERVICE MEN AND DEALERS

Every subscriber to "Diagnotrician" will be furnished with a copy of the Service Manual and will have access to the advisory services of the Supreme Service League's Technical Organization.

Thus,—for the small subscription fee of $1.00 per year which is the special figure which we are offering for a limited time only, you will receive:

DIAGNOTRICIAN—a magazine devoted entirely to the Radio Service man—containing technical data invaluable to your work—articles on current developments and new methods of testing by recognized authorities—as well as helpful hints for service rules.

THE SUPREME SERVICE MANUAL—a most complete Radio Service handbook containing test data of every possible character—providing a ready reference of constant value to you. Prepared in loose leaf form. Compiled by experts and kept up to date at all times by means of loose leaf inserts ———giving you the benefits of new developments in radio and keeping your Service Department abreast of the times.

TECHNICAL ADVISORY SERVICE—giving you the privilege of discussing and exchanging ideas and securing solution of unusual service problems through the Technical organization of the Supreme Service League.

Just tear off the Subscription Coupon below and mail to the Supreme Service League, Greenwood, Miss., at once.

SUPREME SERVICE LEAGUE,
Greenwood, Miss.

Gentlemen:

Please enter my subscription for a period of one year, for the "DIAGNOTRICIAN"—the Radio Service Man's Monthly.

It is understood that the SPECIAL INTRODUCTORY OFFER of $1.00 per year will entitle me, (or us) to a copy of the SUPREME SERVICE MANUAL and to the advisory services of the technical organization of the Supreme Service League.

Name.....

Address.....

City.....State.....

A Test that Challenges Your Attention

Proven Superiority--

The SUPREME DIAGNOMETER, the result of several years' intensive engineering effort, has come to be recognized as the outstanding, in fact, the only complete portable radio testing outfit ever produced. Its performance is as distinctive as the name . . . . not merely a "set tester" but a carefully designed practical apparatus for instantly and correctly diagnosing every radio ill.

Its sweeping success is without parallel. In the brief space of eighteen months this remarkable instrument has been sold in very substantial quantities in every state in the Union, in every province of Canada; in Mexico, Cuba, Panama, Brazil, Spain, Italy, Australia, Hawaii Islands, Czechslovakia and China. Wherever radio service penetrates, the superiority of the SUPREME DIAGNOMETER is recognized. Radio technicians and engineers are unanimous in declaring the DIAGNOMETER to be the most complete portable testing instrument ever designed.

The more you know about radio, the more you will appreciate the SUPREME DIAGNOMETER.

The chart at the right shows a comparison of the SUPREME DIAGNOMETER with the three leading set testers and with a test board selling for more than double the price.

THE STORY AT A GLANCE

Tests, Functions and Facilities	Set Tester "A"	Set Tester "B"	Supreme Diag-nometer	Set Tester "C"	Test Board
D. C. Filament Voltage Reading		x	x	x	x
A. C. Filament Voltage Reading		x	x	x	x
Plate Voltage Reading	x	x	x	x	x
Plate Current Reading	x	x	x	x	x
Simultaneous Plate Current and Voltage readings	x		x	x	x
Grid Voltage Reading	x	x	x	x	x
Cathode Bias Reading	x	x	x	x	x
Screen Grid Voltage	x	x	x	x	x
Control Grid Voltage	x	x	x	x	x
Analysis Without Use of Adapter	x	x	x	x	x
Line Voltage Reading	x	x	x	x	x
Locate Unbalanced Secondaries	x		x		
Reads both positive or negative Cathode Biasing	x	x	x		
Oscillation Test of Tubes			x		
A. C. Line Tube Testing			x		
Bias Emission Tube Tester			x		
Tests 15 Volt Filament Tubes Independent of Radio			x		
Tests Screen Grid Tubes Independent of Radio			x		
Tests Overhead Filament Type Tubes Independent of Radio			x		
Tests Both Plates '80 Type Tubes			x		
Rejuvenates Thoriated Filament Tubes out of Set			x		
Without Removing from Set			x		
D. C. Continuity Tester Without Batteries			x		
Furnishes Modulated Signal for Testing			x		
Synchronizing—By Thermal-Meter Method			x		
By A. C. Meter Method			x		
By Audible Method			x		
Neutralizing Signals Provided			x		
Thermo—Couple Meter			x		
Tests Gain of Audio Amplifiers			x		
Measures Up To 250 Mils. A. C. Current			x		
External Use of Meters	x	x	x	x	x
Of 750 D. C. Meter	x		x		x
Of 750 A. C. Meter	x		x		x
Of 2.5 Amps. Milliameter			x		
Measures Capacity of Condensers .01 to 9. Mfd.	x		x		x
Tests Charger Output by Meter			x		
Bridges Open Audio Stages for Tests			x		
Positive Milliameter Protection for tube testing			x		
500,000 Ohm variable resistor for testing			x		
30 Ohm Rheostat for Testing			x		
Self Contained Power Plant for all required tests			x		
Percentage of EFFICIENCY	40%	29%	100%	29%	36%

Tube Testing Plus--

The only dependable tests on all tubes, including screen grid. Tests each plate separately of '80 type rectifiers. *An exclusive feature and of prime importance.*

The only commercial means of testing tubes under actual working conditions, *revealing all tube deficiencies,* many of which cannot be determined by any other service instrument or tube checkers.

Don't rely upon partial or misleading tests. *Stop guessing.* Use the SUPREME DIAGNOMETER and *KNOW* to an absolute certainty the condition of all tubes. *Saves time and money.*

Screen Grid Analysis, Etc.

Accurate screen grid analysis *without producing oscillations in the set.*

Synchronizing by thermo-couple meter or A.C. meter. Easy and accurate. Same method almost universally employed in factory practice. Neutralizing. External connections to all apparatus. All continuity tests without the use of batteries. *It's completeness, range and flexibility will prove astounding.*

INSTRUMENT AND CASE COMPLETE COMPARTMENTS FOR ALL TOOLS AND EXTRA TUBES

A Complete Portable Laboratory

There is no servicing problem that the SUPREME DIAGNOMETER will not solve easily and quickly. No more returns to factory or distributor for adjustment or repair. All service can be performed, right in the customer's home, so quickly that the cost of servicing is negligible compared with antiquated methods. The work is done by scientific analysis, insuring the perfect results that create enthusiastic customer satisfaction and good-will.

Imitation--

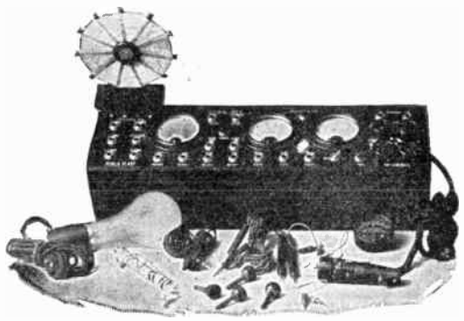
Attracted by the achievement of the SUPREME DIAGNOMETERS, others have attempted to copy certain of its features and have used SUPREME advertising phrases word for word. Do not be mislead by these attempts at imitation. Study the chart to the left; then make your own comparisons—your intelligence will lead you to the right conclusion.

COMPACT, STURDY CARRYING CASE

PRESENT PRODUCTION permits immediate deliveries, but the momentum of sales is such that buyers are cautioned to place their orders **NOW.**

RESERVATIONS WILL BE MADE against all orders placed for future delivery on specified dates.

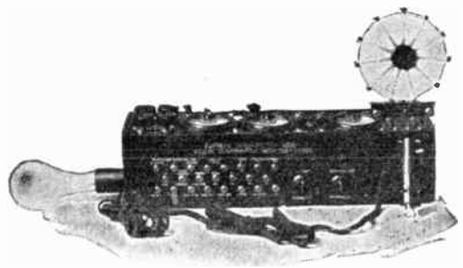
MAKE USE OF THIS PLAN TO AVOID DISAPPOINTMENTS



INSTRUMENT TRAY REMOVED FROM CASE—SHOWING ALL ACCESSORIES

There is no other commercial testing equipment that even remotely approaches the **SUPREME DIAGNOMETER** in efficiency —

It is the only equipment you can afford to buy



REAR VIEW INSTRUMENT TRAY SHOWING PIN JACKS AFFORDING EXTERNAL ACCESS TO ALL APPARATUS

Date.....

SUPREME INSTRUMENTS CORP.,
325 Supreme Building,
Greenwood, Miss.

Kindly send us more complete information on the Supreme Radio Diagnometer and the Supreme Service League.

Signed.....

Firm Name.....

Address.....

City..... State.....

Name of your distributor.....

8-1-29

SCREEN GRID RADIOS

By FLOYD FAUSETT,
Service Engineer, Supreme Instruments Corp.

THE development to a utilizable degree of perfection of the new four-electrode D. C. and five-electrode A.C. screen grid tubes by Messrs. A. W. Hull and N. H. Williams, of the General Electric Research Laboratories, has opened up a new realm of possibilities in radio receiver design of such importance that it is acclaimed one of the major scientific contributions to the radio industry. This tube, by reason of its design and resultant inherent characteristics when used in properly designed circuits, accomplishes more in the field of radio frequency amplifier circuit stabilization than had previously been accomplished by the most efficient circuitual balancing methods made possible through the invaluable contributions of Hazeltine, Rice, Roberts, and others to the art of radio frequency amplifier design around three-electrode tubes.

By reason of the established merits of the A.C. radio, the 5-element A.C. Screen tube bids fair to become the general purpose radio receiver tube of the future. In its design, it incorporates features similar to those of the D.C. screen tube and of the A.C. detector tube, its control grid construction being similar to that of the D.C. screen grid tube, while its other elements resemble those of the A.C. detector tube. It is equipped with the Y-type 5-prong base and with a cylindrical contact at the top of the tube to which the control grid, which is negatively biased and which corresponds to the grid of the 3-electrode tubes, is attached. The screen grid, which carries a positive potential, is connected to the grid terminal of the tube base. The action of the screen grid tube is similar to that of 3-electrode tubes, except as modified by the screen grid. The most accurate and careful mechanical construction of the electrodes assembled within the small space afforded by the tube is necessary in order to efficiently attain the remarkable performance of this tube.

The outstanding feature of the tube is, of course, the action of the "screen-grid," which is maintained at a positive potential of a value about 1/4 to 1/3 of that of the plate potential, interposed between the control grid and the plate, and capacitatively coupled to the ground potential of the radio, resulting in a practical elimination of control grid-plate capacity, which greatly increases the capacity reactance of the tube to alternating current "feed back" so that radio-frequency amplification at frequencies as high as 100,000 kilocycles is possible with the screen grid tube. With three-electrode tubes, balancing to prevent "feed back" is necessary above about 700 kilocycles, and stabilization above 3000 kilocycles is very difficult.

So long as the plate potential is maintained at a value three or four times that of the screen grid, the plate current is practically independent of plate voltage variations. This feature is very advantageous with new methods of plate supply from devices of comparatively high internal resistance. It will be recalled that in calculating the amplification factor of a tube it is necessary to divide the number of volts change of plate potential required to produce a certain increase in plate current by the number of volts change on the grid necessary to produce the same increase of plate current. Since the plate current of the screen grid tube is so nearly independent of plate voltage changes, it follows that this calculation for the screen grid tube involves an equation in which the numerator is much larger than that encountered in other tubes, indicating the very high amplification constant of this tube.

When amplifying signals through successive radio-frequency stages an increase of voltage from stage to stage is desired. The absence of appreciable control grid-plate capacity affords a maximum capacitive reactance to the passage of radio-frequency current. The effective plate resistance of the screen grid tube is so extremely high that the amount of voltage amplification obtainable depends upon the amount of effective external plate resistance obtainable multiplied by the mutual conductance of the tube. Since the mutual conductance has a constant value for any particular grid voltage, the voltage amplification of the screen grid tube is proportional to the effective value of the external plate resistance.

While the screen grid tube is also adaptable for use as a "space charge" audio amplifier, it appears likely that it will be most used as a radio-frequency amplifier in many of the radios announced for the 1929-1930 season. Some manufacturers are announcing models utilizing screen grid tubes along with models not designed for screen grid tubes. The efficient performance of screen grid tube radios will depend upon the degree of sound engineering back of the product. Some of the manufacturers of screen grid radios may not attempt an application of the fine engineering principles necessary for a realization of the full potentialities of screen grid tube performance, so that the public may expect to see some "screen-gridless" radios out-performing some loudly-heralded screen grid radios.

Efficient shielding is very essential for screen grid circuits to prevent stray couplings and excessive eddy current losses occasioned by improper shielding. The impendance value of screen grid circuits must be carefully calculated to obtain maximum "gain per stage." The relation between sensitivity and selectivity is a factor requiring new considerations in screen grid radios. Heretofore it has been the custom to rate the sensitivity of the average radio by the number of radio-frequency stages, and to rate the selectivity by the number of tuned stages. When utilizing screen grid radio-frequency amplification, sensitivity will be greatly enhanced, but the effective selectivity will be relatively reduced, especially when fewer tuned stages are used, so that some means must be used for gaining selectivity along with sensitivity. This may call for larger coils, and better parts in the mechanical make-up of the radio-frequency chassis. The problem of selectivity improvement may induce such an application of engineering talent as will eventually develop a new type of radio with only one tuned stage, thereby eliminating the service problem of tuning condenser synchronizing along with the problem of neutralizing which promises to pass into radio history with the universal approval of the screen grid radio.

SHORT WAVES

By GARLAND ARCHER

Although a great deal of progress is being made, and it will not be long now before most stations will have their short-wave transmitters, short-wave technique is still in its infancy, and it will be sometime yet before broadcast stations will abandon entirely their present wavelengths and go down into the short-wave bands.

One of the most amazing things about the radio art is the astonishing speed of its growth. It was only a few years ago that the crystal was in the majority; then the one tube single circuit regenerative receiver. Several years ago even a broad tuning receiver found ready sale. Today, unless it tunes sharp, has sensitivity and selectivity, no one will buy it. But still, there is another factor which must be taken into consideration in this day of modern radio reception; that is DX, or what is more commonly known as distant reception. The discovery of the short waves affords a means for this new thrill of being able to receive music and speeches from every continent.

The short waves which are now being used for broadcasting are nothing new to the amateurs, for they have been conversing below the 200 meter band for the past ten or fifteen years, but for broadcasting it opens an entirely new field. The lower wave lengths have already been divided into forty or more channels to be used for four or five kinds of service. Among these, the amateurs were given well-deserved recognition for their pioneer work in this field. They were assigned three channels, a 300 k. c. band between 42.8 and 41 meters; a 400 k. c. channel between 21.4 and 20.8 meters; and those wavelengths below 13.1 meters. They share with other services the bands from 175 to 150 meters. Five short-wave channels are reserved for fixed or mobile stations.

The majority of the stations that are on the short-waves are operating two transmitters which are connected together, and what goes out over the long-wave band, goes out over the lower wave band as well.

In order to receive the short-wave broadcast, it is necessary to have a set entirely different from the one ordinarily used, and if you are unable to build one, as most short-waves fans do, there are now on the market so-called converters. These make it possible to listen to short-wave broadcast from all over the world on a regular broadcast receiver, although they are not as satisfactory as the separate sets built for this purpose. Of course, the tuning and adjustment of a short-wave receiver is entirely different from the ordinary receiver, and if you are not careful in making adjustments you will pass up many stations that you would get if just a little care and patience were exercised. One of the disadvantages of short-wave transmission is the so-called skip spots; these are more noticeable if you are within a hundred or two hundred miles of the short-wave station. One of the peculiar characteristics of short-wave reception is that reception improves with distance from short-wave transmitting stations.

Those new to radio seem unable to understand just why it is necessary to have short-wave broadcasts. A 500-watt broadcast transmitter cannot be heard consistently over a distance of more than 400 to 500 miles, while with the same power in a short-wave transmitter distance means little, and one is able to hear the foreign stations as clearly as the local ones on the longer wave lengths.

A striking illustration of the fact that those who take advantage of the airplane's speed in travel also use the DIAGNOMETER'S speed in locating radio troubles. "Bub" Pepper of Greenwood, Miss., long a member of the Supreme Service League, is here pictured with his "Command-aire."

—o—

I like business because it demands faith. Faith in human nature, faith in one's self, faith in one's customers, faith in one's employees.

I like business because it rewards deeds and not words.

I like business because it undertakes to please, not to reform.

I like business because each day is a fresh adventure.—Anonymous.

The Vacuum Tube as a Voltmeter

By J. A. DOWIE, Member I. R. E.
Chief Instructor, National Radio Institute, Washington, D. C.

The utilization of a vacuum tube as an instrument suitable for the measurement of voltages is a puzzling action to the average Radiotrician. As a matter of fact, the mere mention of a vacuum tube as a voltmeter brings forth a vision of highly technical equipment and operation.

The vacuum tube when used as a voltmeter is nothing more than a calibrated detector tube. The electrical characteristics of a vacuum tube are such that the application of a voltage to the grid of the tube causes a certain change in the normal plate current of that tube. The basis of action of the tube as a voltmeter is the calibration of the effect of a voltage applied to the grid upon the plate current; in other words, the change in the plate current is calibrated for certain values of applied grid voltage.

J. A. Dowie

When a vacuum tube is used as an amplifier, it is essential that the plate current fluctuations be symmetrical with the wave shape of the alternating voltage applied to the grid of the tube. But, under such conditions, a meter indicating D. C. plate current would not show either an increase or a decrease in plate current when the signal is applied to the grid circuit as the increase is equal to the decrease and the final result is zero fluctuation.

When the vacuum tube is used as a voltmeter, however, its electrical constants are so adjusted that the fluctuations of plate current are symmetrically unequal. As a matter of fact, an adjustment is made so that the negative half of the alternating cycle applied to the grid circuit does not display any effect whatever upon the plate current, but the positive half of the alternating cycle displays a marked effect by causing an appreciable increase in plate current.

This state is obtained by applying a negative voltage on the grid of the tube. The value of grid negative voltage is governed by the plate voltage, but it is usually of sufficient value to reduce the normal plate current of the tube to a very small value.

The diagram shown in Figure 1 gives one form of vacuum tube voltmeter circuit, together with a circuit to illustrate its application to measurement of the A. C. grid potential and the A. C. component of current in a plate circuit of a vacuum tube.

The calibration of such a vacuum tube voltmeter is very simple.

To calibrate M, short circuit terminals P and P1, and adjust R so that from 200 to 3000 ohms are in the circuit. Use such a value of C bias that M will give zero deflection for this condition. Remove short circuit from P and P1 and apply successive known input voltage at ordinary frequency. Calibrate M directly in terms of input voltage.

With M. calibrated, connect P and P1 to A and A1 terminals, without changing R. If there is a bias on the grid of the vacuum tube under test, readjust C for zero deflection of M, when there is no input voltage at A and A1 terminals. When an input voltage is then applied at A and A1 terminals, it will be indicated by M.

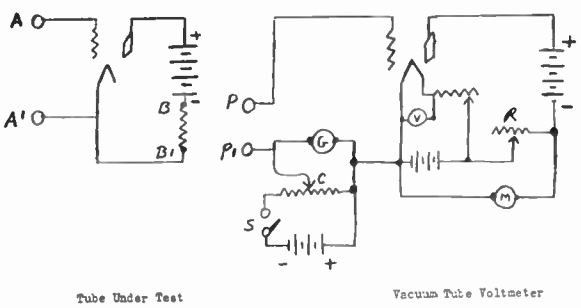


Figure 1

A,A1-Input to grid
B,B1-Non-inductive resistor.
P,P1-Terminals for voltage measurement.
V-Filament voltmeter
G-Grid bias voltmeter.
R-Rheostat of 3000 ohms
M - Western Electric Model 322, sensitivity 50 microamperes or Model 440 Galvanometer, to be calibrated by user directly in input voltage.
S - Switch, kept open when not in use.

To measure the A. C. component in the plate circuit, transfer the terminals P and P1 of the vacuum tube voltmeter to terminals B and B1, where B and B1 is a non-inductive resistor of known resistance. With no input voltage at A and A1 terminals, re-adjust C bias until M reads zero. The A.C. component

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Relation of Service to Sales

(Continued from Page 5)

created that is detrimental not only to the dealer involved, but to the entire industry. Probably the most harmful result of such procedure is the effect that it has on the individual set owner, who is perhaps without the use of a radio in the interim during which his set is being repaired, and who naturally becomes weaned away and loses his enthusiasm for radio. If the dealer loans him a set while his is being repaired, that is a further expense that must be borne by someone. The average set owner knows practically nothing about radio and when the receiving set is removed from his home and taken either to the dealer's shop or shipped to the distributor or factory, he naturally gains the impression that a radio is an extremely intricate, delicate piece of mechanism, easy to get out of order and that when it is out of order, its repair is such a difficult problem that it must be shipped off at great distances in order that the repair or adjustment may be properly made. The effect of such impression is most harmful, and while this effect is most directly felt by the dealer involved, cumulatively it has a tremendous harmful influence on radio distribution as a whole.

Many dealers complain that the public is unwilling to pay an adequate price for radio servicing, and that as a result the service department is conducted at such a loss that it is necessary to curtail the expenditures in that department to the absolute minimum. If the truth were known such dealers are "Putting the cart before the horse" in that they have failed in the beginning to employ competent men, to properly equip their service department or give it the benefit of proper management, with the result that they are incapable of rendering efficient service and that such service as they do give is entirely too high at any price. The public does not object to paying fair compensation in exchange for real value, but it does rightfully object to paying something for nothing. If the dealer will employ competent men and properly equip himself, his customers' sets can be kept operating at maximum efficiency, at a small percentage of the cost of performing wholly inadequate service under his plan of mistaken economy. A charge can be made for such proper service that will yield a good profit and what is of greater importance, the customer is kept satisfied.

Many dealers refuse to render service on any sets except those they sell. This very forcibly illustrates their erroneous mental attitude towards servicing. Instead of constituting a constructive aid to their merchandising business, they regard it as a necessary evil, as something to be dealt out very sparingly. This is a confession of the inadequacy of their repair departments. It is an indication that their repair departments are not functioning efficiently, that they have not been properly equipped and manned and that the same managerial attention has not been given to them that has been extended other departments of their business. Such dealers should either completely abandon their repair departments or bring them up to such a state of efficiency as will make them a real asset to their business.

The opportunity to service radios, regardless of by whom they may have been sold, is one that will be eagerly embraced by every wide-awake dealer who has a really capable service department. Such dealer knows that when he services a radio and revives its maximum operating efficiency the confidence of the owner is gained to such an extent that he has a very decided advantage not only in the future sales of such owner, but in sales to his friends and neighbors. The set owner naturally has a kindly feeling and a deep respect for the service man who comes into his home and so easily, quickly, and at a nominal cost, restores the operating efficiency of his receiving set. He comes to regard such a man as an authority on radio and naturally is greatly influenced by his opinion, all of which can be turned into good account for the dealer through the proper co-operation between the service and sales departments. Naturally, if the character of the service the dealer renders is not of such type as will insure the satisfactory operation of the set or that will necessitate repeated call-backs or excessive charges, the results will be detrimental rather than helpful, but if the dealer is prepared to render truly efficient service (which can always be done at much lower cost than the other kind) a splendid opportunity is open to him for increasing the sale of his receiving sets through the extension of such efficient service to all who demand it, which service in itself can be made to pay a good profit.

Major Herbert H. Frost

(Continued from Page 3)

his ability was further recognized, and he was offered the vice-presidency of Kolster Radio. He has entire supervision of the merchandising division.

Hobbies? Yes, he has them. One is a collection of vacuum tubes dating back to the two-element Fleming valve and including the developments of every nation up to the present time. Another collection is of military weapons, beginning with the 15th century. Among his favorite sports are hunting and fishing in different parts of the country, and especially stalking big game. A mountain lion hunt in southern Arizona is one of his favorite vacation trips.

Major Frost has a home in Rye, N. Y., where he is a member of the Kenilworth Riding Club. He is also a member of the Lake Shore Athletic Club of Chicago, the Sons of the American Revolution, the U. S. Cavalry Association and the American Signal Corps Association. He is one of the most active members of the Radio Manufacturers Association and an associate member of the Institute of Electrical Engineers. He has been chairman of the Speakers' Committee of the Radio Industries Banquet for four years, and he has been in charge of the national Radio Trade Show held in Chicago early each summer. It is difficult to find a busier man in radio than Herbert H. Frost.

The Vacuum Tube as a Voltmeter

(Continued from Page 11)

will then be balanced out and if an input voltage is applied at terminals A and A1, M will give the A. C. voltage drop across B and B1 terminals. Knowing the resistance across B and B1 terminals, the A. C. component of the plate current is given directly by $I = \frac{E}{R}$

It can be seen from the foregoing that by placing the same input on two amplifiers under test and then connecting the vacuum tube voltmeter across the output of each, the readings may be obtained. Obviously, the amplifier will produce the greatest deflection which has the greatest amplification.

No doubt, after six months in the Arctic, the Byrd Polar Expedition will be willing to call it a day.

* * * *

Not so many of us ever expected Elinor Glyn and Calvin Coolidge to be headliners for the same magazine.—Indianapolis News.

SUPREME RADIO MANUAL

SUPPLEMENT SHEETS FOR THE

TEAR OUT AND INSERT IN YOUR MANUAL

See over

VICTOR R-32 AND RE-45 MICRO SYNCHRONOUS RADIOS

By Courtesy of Radio-Victor Corporation of America.

The Victor-Micro-Synchronous Radio is a power operated radio frequency receiver of the antenna type, employing an antenna coupling stage and four stages of tuned and neutralized radio frequency amplification, a detector, a first stage audio, and a power stage of push-pull amplification.

A high degree of sensitivity is made possible by means of a mechanical system of micrometer adjustments on the tuning condensers, permitting precision automatic alignment of the tuned radio frequency stages throughout the entire tuning range at all times. Each set of condensers is thus properly aligned at the factory and locked into position. A new method of stabilizing the radio-frequency circuit permits a high degree of selectivity without causing any decrease in sensitivity.

The instrument comprises three standard units as follows: (1) Radio, in which are contained the R. F. stages and the detector; (2) Power Amplifier, containing the first audio, the power stage of push pull amplification, and the rectifier; and (3) Electro Dynamic Reproducer. The units are so designed that all parts are readily accessible for servicing.

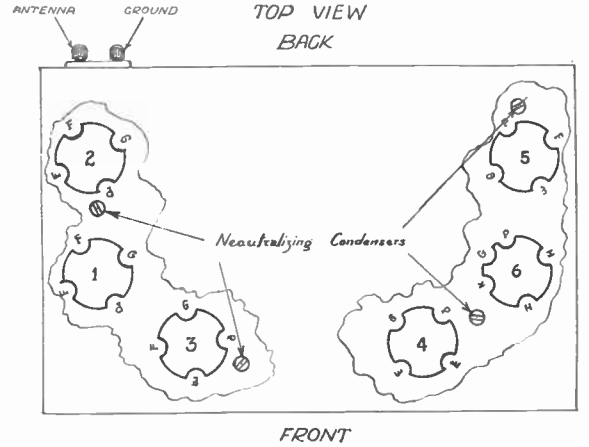


Fig. 1. Top view of Radio, showing layout of tubes and neutralizing adjusting screws.

The Victor Radio is designed for operation on 105 to 120 volts, 50 to 60 cycles, alternating current. Special equipment is available for operation on 105 to 120 volts, 25 to 40 cycles.

AVERAGE ANALYTICAL VOLTAGES

(110 volts A. C. Power Supply)

Socket No.	Tube Type	Location	Filament	Plate	Grid	Cathode
1	X-26	1 RF	1.40	105	9	
2	X-26	2 RF	1.40	105	9	
3	X-26	3 RF	1.40	105	9	
4	X-26	4 RF	1.45	105	9	
5	X-26	5 RF	1.50	105	9	
6	Y-27	Det.	2.10	40	0	0
7	X-26	1A	1.40	100	6	
8	X-45	2A	2.20	230	40	
9	X-45	2A	2.20	230	40	
10	X-80	Rect.	4.60			

For best average sensitivity and selectivity the antenna employed should be as high as practicable and from 50 to 75 feet long including the lead-in and ground wires.

WESTON METER SERVICE OUTSIDE OF UNITED STATES

By T. S. CAUTHORNE, *Assistant Foreign Sales Manager, Weston Electrical Instrument Corp.*

The users of Weston meters whose establishments are outside of the United States of America will find the following lists of institutions abroad of value in the event repair or replacement facilities should be desired.

1. Sales and Engineering Representatives Outside the United States Maintaining Their Own Repair Institutions:

   Northern Electric Co., Ltd.,
   121 Shearer Street,
   Montreal, Que., Canada.

   Powerlite Devices, Ltd.,
   171 John Street,
   Toronto, Ont., Canada.

   Weston Electrical Instrument Co., Ltd.,
   15 Great Saffron Hill,
   London, E. C. I, England.

   Dipl. Ing. D. Bercovitz & Sohn,
   Belzigerstr. 61,
   Berlin, Schoneberg, Germany.

   Anciens Establissements V. Duquesne & Cie.,
   13 Rue Liedts,
   Brussels, Belgium.

   Material Electrique de Controle et Industriel,
   2, Faubourg Poissonniere,
   Paris, France.

   Ing. S. Belotti & Co.,
   Corso Roma 76-78,
   Milano, 114, Italy.

   Mitsubishi Shoji Kaisha, Ltd.,
   Marunouchi,
   Tokyo, Japan.

2. Sales and Engineering Representatives Having Direct Contact with Local Repair Laboratories:

   Maskin-Aktieselskapet Zeta,
   Stortingsgaten 8,
   Oslo, Norway.

   Aktiebolaget Zander & Ingestrom,
   Fredsgatan 4,
   Stockholm, Sweden.

   Mr. A. F. Hulsewe,
   Keizersgracht 188,
   Amsterdam, Holland.

   Bartle & Co., Ltd.,
   Loveday House, Loveday St.,
   Johannesburg, So. Africa.

SUPPLEMENT SHEETS
FOR THE
SUPREME RADIO MANUAL

Four Supplements to the Supreme Radio Manual will be issued each month. Complete Manual is available to SUPREME SERVICE LEAGUE members.

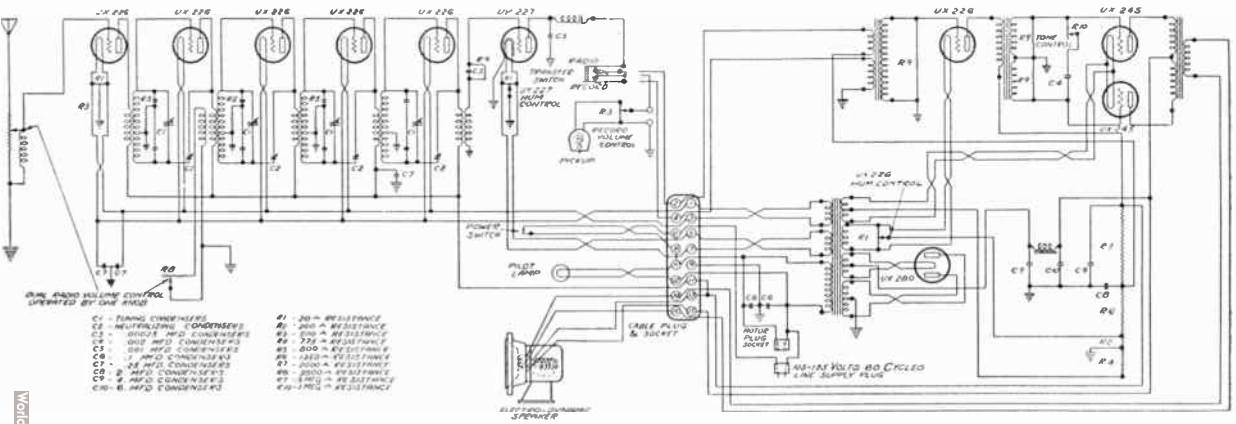


Fig. 2. Schematic Wiring Diagram V ictor Radio, Models R-32 and RE-45.

M. Barros & Co.,
Rua S. Jose N. 70,
Caixa Postal No. 89,
Rio de Janeiro, Brazil.

Cia Standard Electric Argentina,
Paseo Colon 185,
Buenos Aires, Argentina.

Warburton, Franki, Ltd.,
307-315 Kent St.,
Sydney, N. S. W., Australia.

Warburton, Franki (Melb.) Ltd.,
380-382 Bourke Street,
Melbourne, Australia.

M. S. Vernal & Co.,
5, Council House St.,
Calcutta, India.

China Electric Co.,
Kincheng Bank Bldg.,
22 Kiangse Rd.,
Shanghai, China.

Mr. Oskar Orgel,
Ungargasse 15,
Vienna 111, Austria.

Mr. Otto Ahrens,
Ryesgade 3,
Copenhagen, Denmark.

Mr. Rudolf Guth,
Zlatnicka 6,
Prag 11, Czecho-Slovakia.

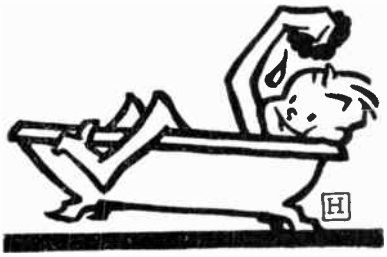
Mr. Carl Engel,
Vorosmarty-utica 16,
Budapest VII, Hungary.

"Noris,"
Gunduliceva 26,
Zagreb, Jugo-Slavia.

Elektroprodukt,
Nowy Swiat 5,
Warsaw, Poland.

"Noris,"
Str. Tudor Vladimirescu 6,
Cluj, Roumania.

FACTS AND FANCIES



"Go," said the landlady, "and never darken my bath-tub again."

* * * *

FULL INFORMATION

Business Man, dictating to new stenographer, was in doubt as to the use of certain phrase.

Harry: "Do you 'retire' a loan?"

Stenog: "No, I sleep with mamma."

* * * *

COMPREHENSIBLE

He (in motor car): "The lever here controls the brake. It is put on very quickly in an emergency."

She: "I see, something like a kimona."

* * * *

NO PARTIALITY

"I'm bothered fierce with rats," said Mrs. Casey, owner of the boarding house, as she talked over the back fence.

"Did yez buy any of thim rat biscuits for them?" suggested Mrs. Kelly.

"Now, Mrs. Kelly, what kind av a house do you think I'm runnin'? Sure, if the beasts can't eat what the rest of us do, they kin go hungry."

* * * *

"The jig is up," said the doctor—as the patient with St. Vitus dance died.

* * * *

Mother: "Remember, dear, curiosity killed the cat."

Son: "How, mother?"
—Goblin.

* * * *

A Scotchman always buys a wrist watch so he will never have to take anything out of his pockets.

* * * *

"Just one more glass, boys, and we'll all go home," said the dish-washer as he laid down the soap.

"Have you heard the Sextet from Lucia?" inquired the music lover.

"I don't listen to those kind of stories," answered the beautiful but dumb companion.

* * * *

The sweet young thing turned to a polite young man who was showing her through the factory and said, "What is that big thing over there?"

"That is a locomotive boiler."

"Why do they boil the locomotives,"

"To make the locomotives tender."

And the polite young man continued to look straight ahead.

* * * *

The farm hand took his girl out for a buggy ride. Nine miles out in the country the horse dropped dead. Louise said she knew she'd drop dead, too; it was a terrible predicament.

"Suppose I give you a nice, sweet kiss. That will put lots of life in you."

"Are you sure that a kiss will put lots of life in me?"

"Positive, darling."

"Then suppose you kiss the horse."

* * * *

It is true that the meek will inherit the earth—after the strong and enterprising have all passed away.

* * * *

Customer: "I want to buy a plow."

Clerk: "I'm sorry, sir, but we don't carry plows."

Customer: "This is a hell of a drug store "

* * * *

"I'll remember de place, 'cause it was here, I passed de statue of de horse."

Drunk: "Shay, who's following me?"

Ditto: "N'body. Thatsh your shadow."

Drunk: "Well, what do they want?"

* * * *

"Crack, crack, crack"" spoke young Dick's rifle; and mamma, papa, and grandma bit the carpet.

* * * *

"Waiter, about half an hour ago I ordered a drink. Now, did you bring it, did I drink it, or didn't I order it?"—Voo-Doo.

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DIAGNOTRICIAN

The Radio Service Man's Monthly

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