The Most Complete Set Tester Ever Built!

Pattern 444 Set Analyzer, complete with all accessories, Jewell Data Service and data pad.
List Price $112.00 Servicemen's Price $84.00

The Jewell Pattern 444 Set Analyzer tests every circuit in any set, including those using variable mu, and output and radio frequency pentode tubes.

An improved switching system for selecting circuit tests separates all A.C. and D.C. tests. This speeds testing and greatly reduces the possibility of securing incorrect readings.

In addition to all the voltage and current measuring ranges being available at time saving pin jack terminals, a triple range output meter circuit and a triple range ohmmeter are provided for use in set servicing. A.C. current ranges up to 8 amperes are provided for servicing other household appliances such as vacuum cleaners, oil burners, and electric refrigerators.

Every possible feature has been incorporated that will reduce wear and make the instrument more sturdy. The elimination of binding posts which loosen and break, non-shatterable glass scale covers, and a test plug and cable that are separable from the analyzer by a multi-plug at the instrument panel are typical examples.

The Jewell Analyzer Data Service is more complete than ever this season, and adds greatly to the value of this instrument.

A Portable Oscillator That's Reliable!

Pattern 560 Test Oscillator, complete with two '230 tubes, batteries, and portable triple-range output meter.

List Price $102.00
Servicemen's Price $76.50

Pattern 560 Test Oscillator without output meter.

List Price $82.00
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Pattern 559 Output Meter only.

List Price $15.00
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Radio frequency circuits, whether in a tuned-radio-frequency or super-heterodyne receiver, must be accurately adjusted to obtain the greatest sensitivity and selectivity.

The Jewell Pattern 560 Test Oscillator and 559 Output Meter are designed and built to meet the needs of the radio servicemen. The simplicity of operation, hair line accuracy, and assured reliability are unequalled features of this portable test oscillator.

The Jewell Pattern 560 Portable Test Oscillator covers the complete broadcast band from 550 to 1500 K.C., and the complete intermediate frequency band from 125 to 185 K.C. The Jewell Test Oscillator is adequate for testing and adjusting every super-het receiver built today and provides for future design in that it covers the band from 125 to 185 K.C.

Write for a bulletin describing the complete Jewell Radio Service Instrument Line. You can pay for them from your extra profits.

Jewell Electrical Instrument Co., 1642-V Walnut St., Chicago

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Sparton—Sparks Withington Co.
Splitdorf—Edison, Thomas A., Inc.
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Sterling—Sterling Mfg. Co.
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Replacement By-Pass and Filter Blocks For All Receivers

Unequalled Hi-Speed Shipment of Standard Condenser Units

Potter Condenser service provides immediate shipment of condenser units for standard sets.

Use the Potter Wall Chart of Replacement Condensers when you need by-pass or filter condensers. Just look up the make and model, and order by number the unit you want.

Replace defective units with Potter Condensers, made to the set manufacturer's specifications. There's more profit and you can depend on the quality.

Special Units Duplicated 48 Hours After Receipt of Order

Any condenser unit can be duplicated in less than 48 hours. Send the old block in and get back from Potter an exact duplicate. Our container plant makes special cases for any job.

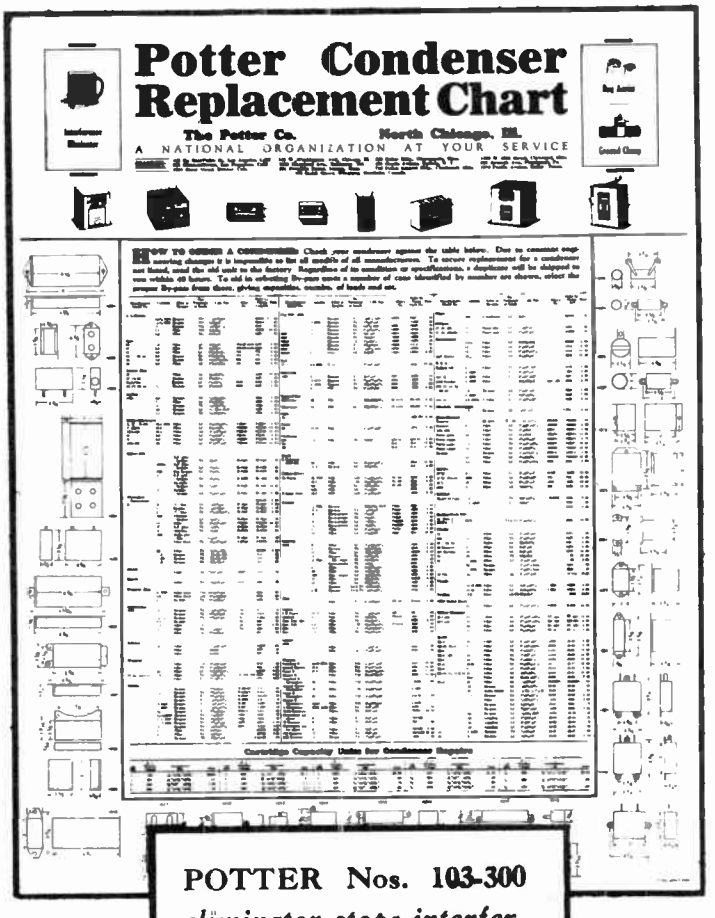
If it's a condenser you need, Potter has it or will make it to your exact specifications on short notice.

Order from your jobber, any Potter sales office, or from the factory in North Chicago, Ill.

Send For This Free Chart

Potter Rug Aerial

The convenient and sensitive aerial for all sets. Makes the outside antenna unnecessary. No installation; just connect to receiver.



Cartridge Units **No. 1 Wax**

Potter cartridge condenser units and No. 1 wax should be carried by every serviceman. Invaluable for quick repairs.

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A National Organization

POTTER Nos. 103-300 *eliminator stops interference from entering set through the power supply.*

At Your Service

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Announcement!

OFFICIAL RADIO SERVICE MEN'S ASSOCIATION

EVER since the appearance of the commercial radio broadcast receiver as a household necessity, the Radio Service Man has been an essential factor in the radio trade; and, as the complexity of electrical and mechanical design in receivers increases, an ever-higher standard of qualifications in the Service Man becomes necessary.

The necessity, also, of a strong association of the technically-qualified radio Service Men of the country is forcing itself upon all who are familiar with radio trade problems; and their repeated urgings that such an association must be formed has led us to undertake the work of its organization.

This is the fundamental purpose of the OFFICIAL RADIO SERVICE MEN'S ASSOCIATION, which is not a money-making institution or organized for private profit; to unite, as a group with strong common interests, all well-qualified Radio Service Men; to make it readily possible for them to obtain the technical information required by them in keeping up with the demands of their profession; and, above all, to give them a recognized standing in that profession, and acknowledged as such by radio manufacturers, distributors and dealers.

To give Service Men such a standing, it is obviously necessary that they must prove themselves entitled to it; any Service Man who can pass the examination necessary to demonstrate his qualifications will be elected as a member and a card will be issued to him under the seal of this Association, which will attest his ability and prove his identity.

The terms of the examination have been drawn up in co-operation with a group of the best-known radio manufacturers, as well as the foremost radio educational institutions.

The following firms are co-operating with us:

GRIGSBY-GRUNOW CO (Majestic), CHICAGO
STROMBERG-CARLSON TELEPHONE MFG. CO., ROCHESTER, N. Y.
CROSLEY RADIO CORP., CINCINNATI, OHIO
COLIN B. KENNEDY CORP., SOUTH BEND, IND.

The schools who have consented to act as an examination board are:

International Correspondence Schools, Scranton, Penna.; Mr. D. E. Carpenter, Dean.

RCA Institutes, Inc., New York, N. Y.; Mr. R. L. Duncan, President.

East Bay Radio Institute, Oakland, Calif.: Mr. T. T. Tonnehilt, Director.

Radio Training Association of America, Chicago, Ill.; Mr. A. G. Mohaupt, President.

School of Engineering of Milwaukee, Milwaukee, Wisc.; Mr. W. Werwath, President.

Rider-Goll Radio School, New York, N. Y.; Mr. John F. Rider, Director.

Radio College of Canada, Toronto, Canada; Mr. J. C. Wilson, President.

Radio Division, Coyne Electrical School, Chicago, Ill.; Mr. H. C. Lewis, President

We shall not attempt to grade the members into different classes. A candidate will be adjudged as either passing or not passing. If the school examining the papers passes the prospective member as satisfactory, we shall issue to him an identification card with his photograph.

If the candidate does not pass this examination the first time, he may apply for another examination three or six months later.

There is absolutely no cost attached to any service rendered by the Association to its members, no dues, no contributions.

If you wish to become a member, just fill out the coupon below and mail it to us. We will send you all the papers necessary to become a member.

O. R. S. M. A.,
c/o RADIO CRAFT,
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I wish to become a member of your Association. Please mail me the examination papers and application blanks.

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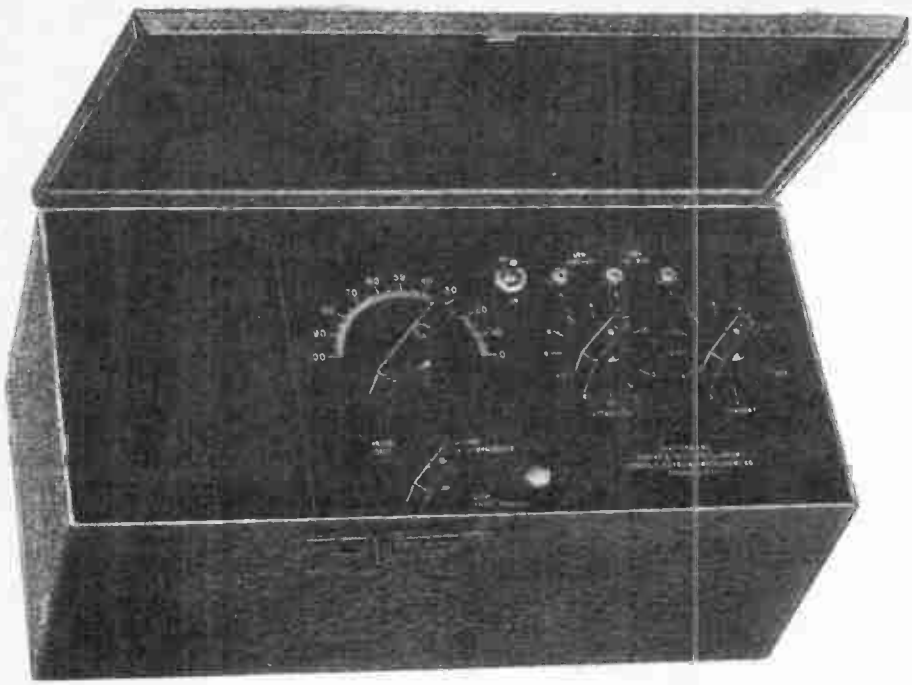
A new Jewell Test Oscillator



—with every necessary test feature

—plus Jewell quality construction and dependable operation

—at an astonishing low price

The Jewell Professional Service Combination

Here is combined in a single unit all the testing equipment the radio serviceman needs for quickly and accurately performing every service task.

The Jewell Pattern 531 Professional Service Combination includes a Jewell Pattern 444 Set Analyzer, a special model of the oscillator described to the right, and a power unit that supplies all necessary power for testing tubes in the analyzer. No separate output meter is needed as receiver output measuring ranges are available in the set analyzer.

Write for complete details.

In the Pattern 563 Test Oscillator, Jewell has again set new standards in value.

Now no serviceman need go without an adequate oscillator or be handicapped by an inaccurate or undependable instrument.

This remarkable instrument combines every oscillator feature necessary for servicing modern radio receivers, and Jewell dependability of operation.

Features of the Pattern 563

Output frequency continuously variable from 550 to 1,500 K. C. in the broadcast.

Two intermediate bands, 125 to 185 K. C. and 175 to 450 K. C., allow servicing of all modern supers.

Metal carrying case and panel form effective shield.

Operates from batteries carried within shielded case.

Single control adjusts output frequency.

Three-position switch allows instant change to any of the three frequency bands.

Calibration curves and operating instructions carried in cover.

Trimmer adjustment permits spotting any much used intermediate frequency at a convenient point on the dial.

Space provided in case for carrying Jewell Pattern 559 Output Meter, which may be purchased separately.

Completely equipped with shielded output lead, calibration curves, instruction chart, one '30 type tube, and all necessary batteries.

Handsomely finished metal carrying case protects the instrument from damage and provides an effective shield for the oscillator.

Write for prices and complete description.

31 YEARS MAKING GOOD INSTRUMENTS

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Please send me literature describing the new Jewell instruments, Patterns 563 and 531.

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In order that there will not be any conflict between the 1931 Manual and the 1932 edition of the Manual, we have combined Supplements five and six of the 1931 Manual and have issued them both together under one index. These Supplements you are receiving here with complete your subscription and wind up all the material you will receive for the 1931 edition.

We now urge you, if you have not already done so to place your order immediately for the 1932 Manual, which together with all Supplements for one year will cost you only $5.00.

None of the material contained in the 1931 edition and the Supplements will be repeated in the new Manual. Therefore, to have a complete directory of the wiring diagrams of all commercial receivers, you need both books. As an inducement to the purchaser of our 1931 Manual, we will allow you to place your order at the pre-publication price of $4.00 (instead of $5.00) although this offer has already been withdrawn.

We thank you for your past patronage and if you have not already done so, we hope you will send us your order by return mail.

Sincerely yours,

GERNSBACK PUBLICATIONS, INC.

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Majestic—Grigsby Grunow Co.
Marti—Marti Radio Corp.
Master—Master Radio Mfg. Co., Ltd.
McMillan—McMillan Radio Co.
Melo Head—Robertson Davis Co.
Melorad Cathedral—Federated Purchasers.
Minera—Minerva Radio Co.
National—National Co., Inc.
National—National Transformer Mfg. Co.
Navigator—A. C. Dayton Co.
Orpheus—Roth-Downs Mfg. Co.
Ozarka—Ozarka, Inc.
Patterson—Patterson Radio Corp.
Peerless—United Reproducers Corp.
(Now Gray Electric Co.)
Pfansteihl—Pfansteihl Products Co.
Philco—Philadelphia Storage Battery Co.
Pierce Airo—Pierce Airo, Inc.
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Pioneer—Pioneer Radio Corp.
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Radiette—Keller Fuller Mfg. Co., Ltd.
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Republic—Republic Radio Co.
RPL—Radio Products Laboratory
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Scott—Scott Transformer Co.
Sentinel—United Air Cleaner Co.
Seven-Seas—Levitz, Inc., C. R.
Silver—Silver Marshall, Inc.
Silvertone—Sears, Roebuck & Co.
Simplex—Simplex Radio Co.
Sonora—Sonora Phonograph Co., Inc.
Sparton—Sparks Withington Co.
Splitdorf—Edison, Thomas A., Inc.
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Steinite—Steinite Radio Co.
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Sewart Warner—Stewart Warner Corp.
Story & Clark—Story & Clark Radio Corp.
Stromberg-Carlson — Stromberg-Carlson Tele. Mfg. Co.
Telmaco—Telephone Maintenance Co.
Temple—Temple Corp.
Tom Thumb—Automatic Radio & Mfg. Co.
Transitone—Automobile Radio Corp.
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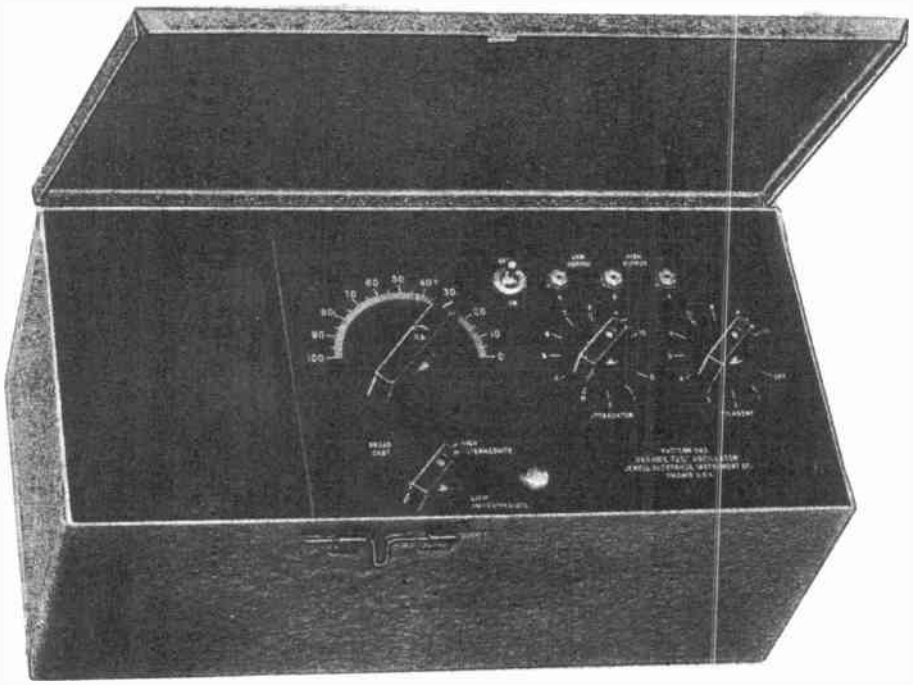
Willard—Willard Storage Battery Co.
Work-Rite—Work-Rite Radio Corp.
Wurlitzer—(See All American Mohawk Corp.)
Zenith—Zenith Radio Corp.

A new Jewell Test Oscillator



—with every necessary test feature

—plus Jewell quality construction and dependable operation

—at an astonishing low price

The Jewell Professional Service Combination

Here is combined in a single unit all the testing equipment the radio serviceman needs for quickly and accurately performing every service task.

The Jewell Pattern 531 Professional Service Combination includes a Jewell Pattern 444 Set Analyzer, a special model of the oscillator described to the right, and a power unit that supplies all necessary power for testing tubes in the analyzer. No separate output meter is needed as receiver output measuring ranges are available in the set analyzer.

Write for complete details.

In the Pattern 563 Test Oscillator, Jewell has again set new standards in value.

Now no serviceman need go without an adequate oscillator or be handicapped by an inaccurate or undependable instrument.

This remarkable instrument combines every oscillator feature necessary for servicing modern radio receivers, and Jewell dependability of operation.

Features of the Pattern 563

Output frequency continuously variable from 550 to 1,500 K. C. in the broadcast.

Two intermediate bands. 125 to 185 K. C. and 175 to 450 K. C., allow servicing of all modern supers.

Metal carrying case and panel form effective shield.

Operates from batteries carried within shielded case.

Single control adjusts output frequency.

Three-position switch allows instant change to any of the three frequency bands.

Calibration curves and operating instructions carried in cover.

Trimmer adjustment permits spotting any much used intermediate frequency at a convenient point on the dial.

Space provided in case for carrying Jewell Pattern 559 Output Meter, which may be purchased separately.

Completely equipped with shielded output lead, calibration curves, instruction chart. one '30 type tube, and all necessary batteries.

Handsomely finished metal carrying case protects the instrument from damage and provides an effective shield for the oscillator.

Write for prices and complete description.

31 YEARS MAKING GOOD INSTRUMENTS

JEWELL

Jewell Electrical Instrument Company,
1642-V Walnut Street, Chicago, Ill.

Please send me literature describing the new Jewell instruments, Patterns 563 and 531.

Name .....

Address .....

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

INDEX TO COMMERCIAL WIRING DIAGRAMS

WITH the issuance of each set of supplements, a completely revised and up-to-date index is furnished. To use this first remove all of the pages from the cover; throw away the old index pages and replace them with the new ones; and then insert the supplement pages in their numerical and alphabetical order. Then replace the cover and the book is complete.

Often, the trade name of a set is known by the user of this book but the name of the manufacturer not known.

In searching for diagrams, if the particular diagram you desire cannot be found, be sure to look through the Miscellaneous section at the end of this index. If it is not listed there look through the Trade Name Index; this gives the name of the manufacturer for each trade name. Since all diagrams are listed in the index in alphabetical order in accordance with the manufacturers' names, it is absolutely necessary to know the name of the manufacturer before a particular diagram can be found.

In the supplements are included diagrams for which we have received requests. Wherever the diagrams that have been requested are not included in one set of supplements, they will appear in the first set published after we receive them. Many diagrams of obsolete sets are difficult to obtain, but we are using every possible effort to procure them.

We wish to express our thanks to the many subscribers who have taken such extreme interest in the MANUAL, and especially to those who have voluntarily submitted diagrams for publication in the supplements.—THE PUBLISHERS.

In order that there will not be any conflict between the 1931 Manual and the 1932 edition of the Manual, we have combined Supplements five and six of the 1931 Manual and have issued them both together under one index. These Supplements you are receiving here with complete your subscription and wind up all the material you will receive for the 1931 edition.

We now urge you, if you have not already done so to place your order immediately for the 1932 Manual, which together with all Supplements for one year will cost you only $5.00.

None of the material contained in the 1931 edition and the Supplements will be repeated in the new Manual. Therefore, to have a complete directory of the wiring diagrams of all commercial receivers, you need both books. As an inducement to the purchaser of our 1931 Manual, we will allow you to place your order at the pre-publication price of $4.00 (instead of $5.00) although this offer has already been withdrawn.

We thank you for your past patronage and if you have not already done so, we hope you will send us your order by return mail.

Sincerely yours,

GERNSBACK PUBLICATIONS, INC.

T

U

W

Z

Trade Name Index

Aero—Chas. Hoodwin Co.
Acme—Acme Electric Co.
Airline—Montgomery, Ward & Co.
Amertran—American Transformer Co.
Amrad—Amrad Corp.
Apex—United States Radio & Television Co.
Arcadia—Wells Gardner Co.
Argus—Argus Radio Corp.
Atchison—Atchison Radio Mfg. Co.
Atwater Kent—Atwater Kent Mfg. Co.
Audiola—Audiola Radio Co.
Aztec—Stein, Fred W.
Baldwin—Nathaniel Baldwin Co.
Balkite—National Transformer Mfg. Co.
(Balkite Sales Division)
Bosch—American Bosch Magneto Corp.
Brandes—Kolster Radio Corp.
Bremer Tully—Bremer Tully Mfg. Co.
(Now Brunswick Radio Co.)
Browning Drake—Browning Drake Corp.
Brunswick—Brunswick Balke Collender Co.
(Brunswick Radio Co.)
Buckingham—Buckingham Radio Co.
Bush & Lane—Bush & Lane Piano Co.
Capehart Orchestrope—Capehart Corp.
Webster Elec. Co.
Cardinal—Long Radio Co.
Cardon-Sparks—Cardon-Sparks Phonocraft Corp.
Carteret—Carteret Radio Lab.
Clarion—Transformer Corp. of America
Cleartone—Cleartone Radio Corp.
Div. of Cincinnati Time Recorder
Colonial—Colonial Radio Corp.
Columbia—Columbia Phonograph Co.
(Columbia Radio Co.)
Counterphase—Bremer Tully Mfg. Co.
Courier—United Reproducers Corp.
(Now Gray Electric Co.)
Crosley—Crosley Radio Co.
Daven—Daven Radio Co.
Day Fan—General Motors Radio Corp
DeForest—DeForest Radio Co.
Delco—Delco Radio Corp.
Earl—Freed Radio Corp.
Edison—Edison, Thomas, A., Inc.
Electrad—Electrad, Inc.
Emerson—Emerson Radio & Phonograph Corp.
Erla—Electrical Research Laboratories
Eveready—National Carbon Co.
Fada—Andrea, F. A. D., Inc.
Federal—Federal Radio Corp.
Fin-All—Find-All Radio Co.
Freed Eisemann—Freed Radio Co.
Freshman—Freed Radio Co.
Garod—Garod Radio Co.
General Motors—General Motors Radio Corp.
Gilbert—Gilbert, R. W.
Gilfillan—Gilfillan Bros., Inc.
Graybar—Graybar Electric Co.
Grebe—Grebe Radio Co., A. H.
Gulbransen—Gulbransen Co.
Hammarlund—Hammarlund Mfg. Co.
HFL—High Frequency Laboratories
Howard—Howard Radio Co.
Hyatt—Hyatt Electrical Corp.
H-Y—Hatry and Young, Inc.
ICA—Insuline Corp. of America.
Jackson Bell—Jackson Research Lab.
Jesse French—Jesse French & Sons Piano Co.
Kellogg—Kellogg Swbd. & Supply Co.
Kemper—Kemper Radio Corp., Ltd.
Kennedy—Kennedy Corp., Colin B.
King—King Mfg. Corp.
Knight—Wextark Radio Stores, Inc.
Kolster—Kolster Radio Corp.
Kylectron—United Reproducers Corp.
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Leutz—Leutz, Inc., C. R.
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INTRODUCTION

THIS book has been compiled in an attempt to give the radio Service Man as complete and concise a compendium of practical data and instruction concerning radio installation, maintenance and repair as could be selected from the hosts of material already written on the subject. It is evident that a book of this type, to be entirely complete, would cover virtually all phases of radio and include complete diagrams and specifications of every radio set that has ever been built -- an enormous undertaking which would give the book a stupendous size. While such a volume would be of value for reference, it would be too clumsy to be handled by the busy radio Service Man who wants practical information, suggestions, and data in few words at his finger tips, with diagrams and specifications of the more popular types of sets in active service that daily require his attention. Therefore, only the salient features of radio servicing are given, and information on the servicing of battery sets, which are daily becoming obsolete, is covered more in general than in detail. In all instances where possible, specifications are given in connection with the diagrams, which were obtained through the kind assistance of the various manufacturers. More up-to-date information on later sets can be supplied from time to time as the material becomes available, for which purpose the loose-leaf form of this book has been adopted. In connection with RADIO-CRAFT Magazine (which supplies the latest important news on the subject in proper page size to fit in this book) the book can be kept alive and up-to-date and be of inestimable value to the active Service Man.

No attempt is made to delve into the theory of radio, since this is not within the scope of a book of this type. There are many technical books covering the theory and practice of radio, from which the would-be Service Man can get a good elementary grounding on the subject. Therefore, it is here assumed that the reader has an adequate technical knowledge of the subject, although technicalities are avoided as much as possible and simple language is used throughout, covering mainly the practical rather than the theoretical aspect of the subject. For, after all, the Service Man is practical. He must go out in the field, diagnose the troubles in radio sets from the symptoms, and in a few minutes' time correct the defects. A man of theoretical knowledge only is at sea when up against a set, apparently in perfect order, but which does not work; and all his theory is of no avail without some background of practice. All the books in the world cannot give as much knowledge in this line of work as can be obtained by installing, servicing, and repairing a hundred sets of different types. Highly-trained engineers have been known to labor for hours on a set that would not work, only to find out later that the antenna was disconnected; a condition which would be instantly noticed by a less-technical but practically-trained Service Man. He who can give the quickest and best service will have the greatest number of satisfied customers and will build up the greatest reputation and monetary income. He who bluffs his way through and makes only temporary repairs in hopes of obtaining future work on the same sets, will soon find that his best customers have left him. A thorough knowledge of the work, backed by a few months' practice, together with a data book of this type containing information one cannot reliably carry in his head, should be the foundation of a successful servicing business, provided it is conducted in an honest manner. We hope that the readers will find this book as valuable as we are trying to make it.

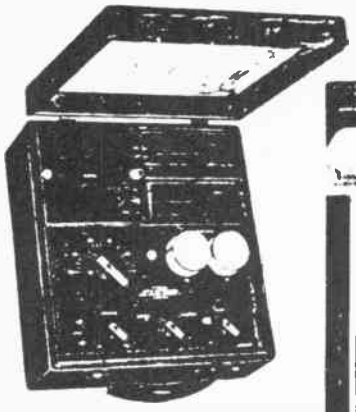
Aside from his theoretical and practical knowledge of radio, the Service Man, like a practicing doctor, should be somewhat of a psychologist. Not that his psychology will have any effect upon the subject on which he is working, as in the case of the doctor, but he will come in contact with all kinds of people, the vast army of radio set owners, some of whom will look upon him with suspicion and presume that they are being swindled, no matter how fairly he treats them. He will be called upon to explain in detail everything connected with the work, and must not only repair the set, but give the highly-

Now! A Complete Line of Service Equipment

Radio Service Oscillator

Radio frequency circuits, whether in a tuned radio frequency or super-heterodyne receiver, must be accurately adjusted to obtain the greatest sensitivity and selectivity. To make these adjustments accurately and quickly, a test oscillator of special design is required. No makeshift, cheaply built oscillator can be used for checking modern high gain receivers.

The Jewell Pattern 560 Portable Test Oscillator is designed and built to meet the needs of radio servicemen. Simplicity of operation, hair-line accuracy, and assured reliability are the cardinal features of this portable test oscillator. Each feature has been achieved by incorporating constructional details which have proved absolutely necessary.

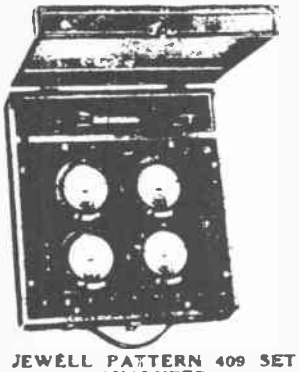


Pattern 560 Test Oscillator complete with tubes, batteries and output meter
List Price $97.00
Net Price 72.75

Pattern 560 Test Oscillator without output meter
List Price $82.00
Net Price 61.50

Pattern 559 Output Meter only.
List Price $15.00
Net Price 11.25

JEWELL PATTERN 199 SET ANALYZER



JEWELL PATTERN 409 SET ANALYZER

PEATURES OF THE JEWELL RADIO SERVICE OSCILLATOR

Self-Contained Batteries
Leak-Proof Interlock Shielding
Broadcast and Intermediate Bands
New '30 Type Tubes
Output Meter
Easy to Operate

JEWELL SET ANALYZERS

Unequalled for ease of operation and completeness of the tests that may be made. Dependable operation is assured by sturdy construction. Pattern 199 compact light weight and low priced. Pattern 409, the speediest set analyzer ever built, simultaneous readings of plate, filament, and grid voltages and plate currer. All Jewell analyzers are backed by the comprehensive Jewell Test Data Service.

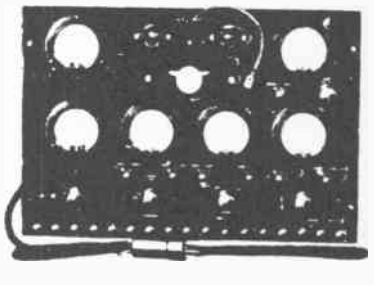
JEWELL TUBE CHECKERS

Pattern 210, portable, A C operated, no calculating for dynamic tube condition. Pattern 209, counter type, low price, compact, easy to operate. A single button gives desired reading.

JEWELL TEST PANELS

Complete repair shop equipment. Speed every service job. Pattern 578, simultaneous reading of plate, grid and filament voltages, and plate current. Direct readings of resistance and capacity. Pattern 579, seven meter, test panel with remote control box. The finest and most complete test panel ever built. Greatly increases the capacity of any service department.

JEWELL PATTERN 209 TUBE CHECKER



JEWELL PATTERN 578 TEST PANEL

BUY SERVICE EQUIPMENT ON THE JEWELL TIME PAYMENT PLAN

Jewell radio service equipment pays for itself when purchased under the Jewell Time Payment Plan. More accurate work, greater number of jobs per day and the increased prestige of a radio organization when Jewell equipped, results in real dollars of profit. The serviceman who is looking for a future in radio will be quick to take advantage of this liberal plan.

JEWELL ELECTRICAL INSTRUMENT CO.

1642-V Walnut Street, Chicago, Ill.

31 YEARS MAKING GOOD INSTRUMENTS

JEWELL

TRADE NAME INDEX

Acme - Acme Electric Co.
Airline—Montgomery, Ward & Co.
Amertran—American Transformer Co.
Amrad—Amrad Corp.
Apex—United States Radio & Television Co.
Arcadia—Wells Gardner Co.
Argus—Argus Radio Corp.
Atchison—Atchison Radio Mfg. Co.
Atwater Kent—Atwater Kent Mfg. Co.
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(Balkite Sales Division)
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Brandes—Kolster Radio Corp.
Bremer Tully—Bremer Tully Mfg. Co.
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Browning Drake—Browning Drake Corp.
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Freed Eisemann—Freed Radio Co.
Freshman—Freed Radio Co.
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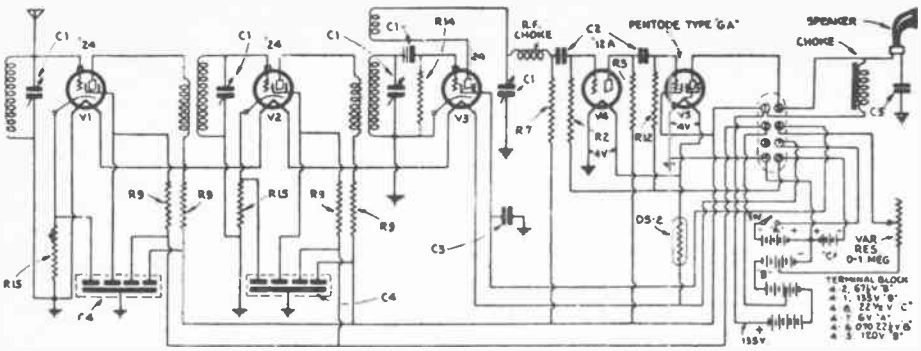
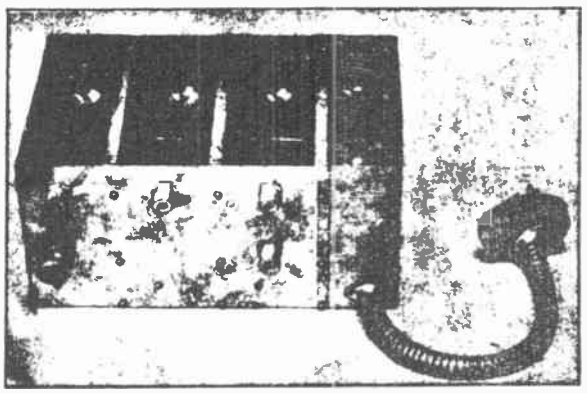
Westinghouse—Westinghouse Elec. & Mfg. Co.
Willard—Willard Storage Battery Co.
Work-Rite—Work-Rite Radio Corp.
Wurlitzer—(See All American Mohawk Corp.)
Zenith—Zenith Radio Corp.

A "POLICE" SHORT-WAVE SET FOR AUTOMOTIVE USE



Above the schematic circuit of the Delco "Police" short-wave receiver, showing battery and speaker connections. It will be observed that a screen-grid tube is used as a regenerative detector; the variable condensers shown here are set with a screwdriver and locked (their shafts are seen protruding through the chassis in the view at the left). R2, 1 meg.; R3, 250,000 ohms; R7, 500,000; R9, 10,000; R12, 2 meg.; R14, 5 meg.; R15, 400 ohms.



The circuit, which is shown herewith, incorporates three '24 screen-grid tubes, which are connected in series to the car's storage battery; a first audio stage, with a '12A tube, resistance-coupled between detector and a pentode; and the latter, which serves as the output stage. This tube, which follows the description given in May RADIO-CRAFT (page 578) is here first used for the first time in a commercial receiver in America. With a filament voltage of 5, and consumption of ¼-ampere current, it has an amplification factor of 70, and a rating of 500 milliwatts undistorted output, on 135-volt plate supply. It is a product of the Arcturus Radio Tube Co.

The *minimum* operating conditions, which permit a considerable reduction of battery voltages, are given as follows (a special analyzer being used):

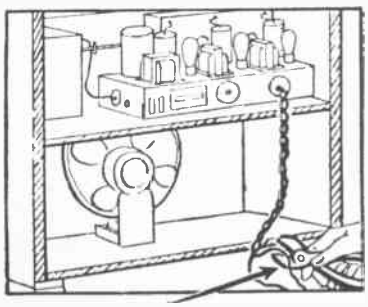
	F	P	CG	SG	PC	GT
1 R.F.	2.0	100	1.1	55	2.0	2.8
2 R.F.	1.9	100	1.1	53	2.0	2.7
Det.	1.9	18	0.0	22.5	0.23	0.24
1 A.F.	4.0	80	0.1	....	0.13	0.5
2 A.F.	4.0	135	9.0	135	7.5	6.0

(F, filament voltage; P, plate voltage; CG, control-grid voltage; SG, screen-grid voltage; PC, normal plate current in analyzer; GT, grid test reading.)

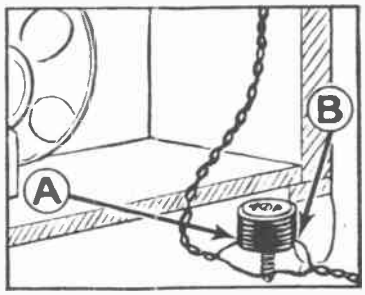
LINE VOLTAGE CONTROLS

The Service Man will encounter a wide variety of line-voltages in different localities -- ranging anywhere between 105 and 130 volts. Under such conditions it is logical to expect erratic operation of the various sets. To avoid such troubles various forms of line-voltage regulators have been produced. An automatic voltage regulator requires a certain amount of current for its operation, and for this reason many sets are designed to operate on a lower than line-voltage. The difference between this voltage and the line voltage is used up by the regulator. Directions for installing the AMPERITE line-voltage regulator are given below. To make the installation, first disconnect the set power cord from the house lighting line outlet. If the set chassis is provided with a voltage control switch or variable voltage fuse, place on the "low" voltage position. When installed the voltage supplied to the set will remain practically constant and reliable operation is assured.

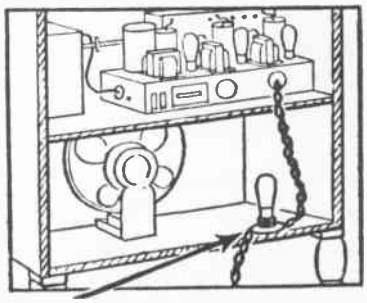
Method of Installing AMPERITE Line Voltage Control



To install the new AMPERITE line voltage control cut one lead of the power supply line or cable at any place between the set and the house socket plug.



Connect these two cut ends to the terminals of an AMPERITE socket as shown by lines "A & B" or to any standard UX tube socket. If a tube socket is used, make connections to either two opposite terminals.



Mount the socket at any convenient place inside the cabinet. Insert the proper AMPERITE Line Voltage Control tube and the receiver is ready for operation.

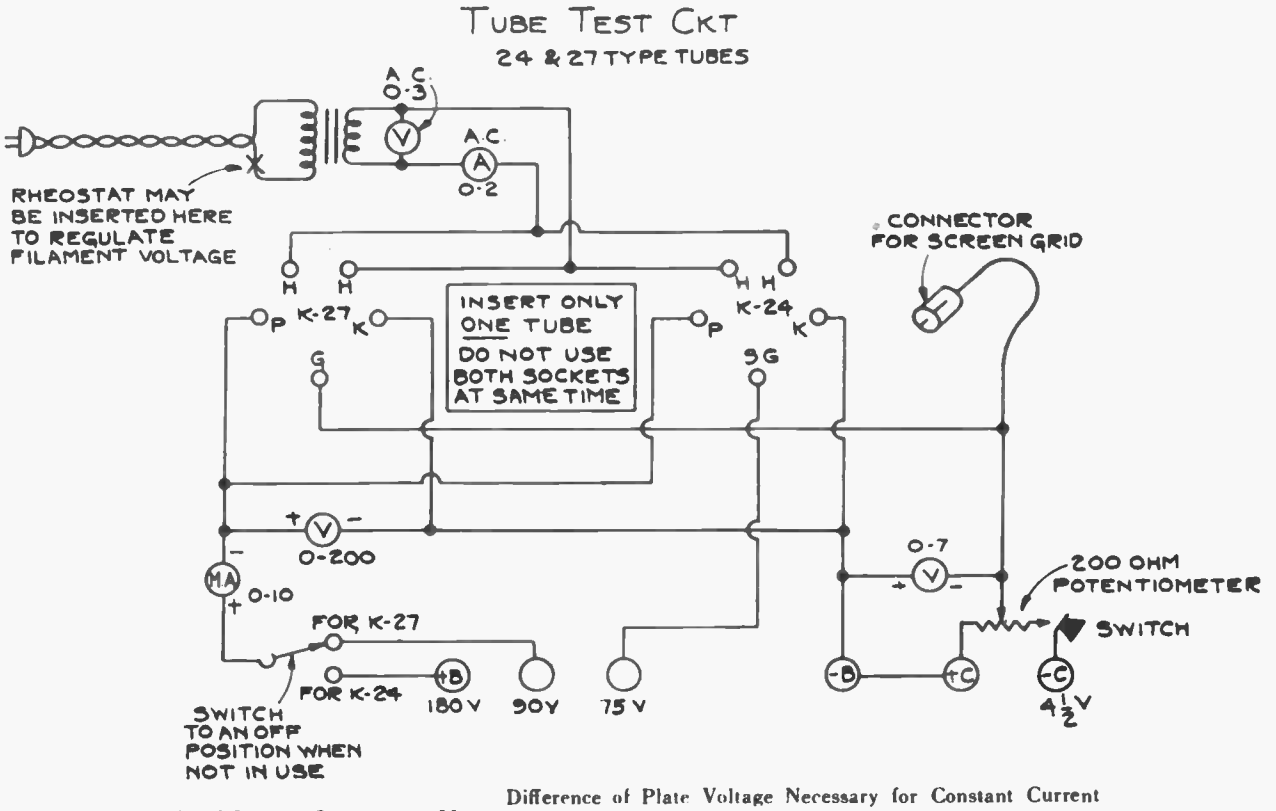
TUBE TESTING CIRCUIT

(Courtesy Kellogg Swd. & Supply Co.)

For the convenience of the service man who has no elaborate tube tester, a circuit is furnished on this page using equipment which every service man should have. A tester of this type will facilitate tube tests and may often save time in correcting trouble caused by defective or worn out tubes.

With this equipment resistors and capacitors may be tested. Resistances may be calculated from the Ohms Law formula $I = \frac{E}{R}$ or $E = IR$ or $R = \frac{E}{I}$ wherein I = current in amperes, E = voltage, R = resistance in ohms.

All measurements of D.C. voltages as indicated on charts, are to be made with a high resistance meter, 800 to 1000 ohms per volt. Lower resistance meters will not indicate as accurately and allowance should be made for slightly lower readings than specified in the tables.



$$\text{Amplification Constant or Mu} = \frac{\text{Difference of Plate Voltage Necessary for Constant Current}}{\text{Difference of Grid Voltage}}$$

$$\text{Plate Impedance or Rp} = \frac{\text{Difference of Plate Voltage}}{\text{Difference of Plate Current}}$$

$$\text{Mutual Conductance or Gm} = \frac{\text{Difference of Plate Current}}{\text{Difference of Grid Voltage}}$$

K-27 TUBES

Gm { With 4½ Volts on Grid and 90 Volts on Plate Note Plate Current
{ With 0 Volts on Grid and 90 Volts on Plate Note Plate Current

Rp { With 4½ Volts on Grid and 90 Volts on Plate—Note Plate Current
{ With 4½ Volts on Grid and 75 Volts on Plate—Note Plate Current

Mu With 4½ Volts on Grid and 90 Volts on Plate—Note Plate Current—Change Grid to 3 Volts—Change Plate Voltage until Plate Current Is Same as Noted Above—Note Plate Voltage

K-24 TUBES

Gm { With 1½ Volts on Grid—75 Volts on Screen Grid and 180 Volts on Plate—Note Plate Current
{ With 0 Volts on Grid—75 Volts on Screen Grid and 180 Volts on Plate—Note Plate Current

Rp { With 1½ Volts on Grid—75 Volts on Screen Grid and 180 Volts on Plate—Note Plate Current
{ With 1½ Volts on Grid—75 Volts on Screen Grid and 150 Volts on Plate—Note Plate Current

CHARACTERISTICS OF KELLOGG A.C. TUBES

	Fil. A.C. Volts	Fil. A.C. Amp.	Grid Volts	Plate Volts	Plate Current	Gm	Rp	Mu
K-24	2.5	1¾	1½	180	2. M.A.	800 to 1600	400,000 W to 1½ Meg.	75 Volts on Screen Grid
K-27	2.5	1¾	4½	90		800 to 1200		8 to 10

AIRLINE "8"—MODEL A.E.-11

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2.25	100	6.0			6.0	3.5	7.5
'27	2 R.F.	2.25	100	6.0			6.0	...	....
'27	3 R.F.	2.25	100	6.0			6.0	...	....
'27	Det.	2.25	45					2.4	4.3
'27	1 A.F.	2.3	95	5.2			5.2	3.0	4.3
'31A	2 A.F.	4.7	170	43				15	18.5
'31A	P.P.	4.7	170	43				-	....
'80	Rect.	4.8	...	-			...	37.5 per anode	

LV—115 — No Voltage Adj. — Vol. Con. Max.

AIRLINE "9"—MODEL A.E.-10

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R.F.	1.35	116	8.5				4.7	8.7
'26	2 R.F.	1.35	116	8.5					
'26	3 R.F.	1.35	116	8.5					
'26	4 R.F.	1.35	116	8.5					
'24	Det.	2.2	80	1.5	15				
'26	1 A.F.	1.4	110	1.0				4.0	5.0
'45	2 A.F.	2.2	232	42				27	32
'45	P.P.	2.2	242	42					
'80	Rect.	4.6	...	-				42 per anode	

LV—115 — No Voltage Adj. — Vol. Con. not Critical

AMRAD—MODEL 81

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.3	180	1.5	75	...	+2	3.4	4.7
'24	2 R.F.	2.3	180	1.5	75	...	+2	3.4	4.7
'24	3 R.F.	2.3	180	1.5	75	...	+2	3.4	4.7
'27	Det.	2.3	30					1.4	1.4
'27	1 A.F.	2.3	165	10			+2	5.5	6.8
'45	2 A.F.	2.3	225	40				30	37
'45	P.P.	2.3	225	40				30	37
'80	Rect.	4.7	...	...	...	...	...	54 Per Anode	

LV—118 — 1VS—120 — Vol. Con. Max.

NOTE—Cathode Volts variable according to setting of Hum Control

APEX 47 & 47A

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.36	173	2.7	86	0.8	2.7	3.0	4.1
'24	2 R.F.	2.31	173	2.7	86	0.2	2.7	3.0	4.1
'27	Det.	2.28	38	0.0			0.0	2.8	3.0
'27	1 A.F.	2.28	100	6.1			6.1	3.2	3.8
'45	2 A.F.	2.29	169	38.0				11.3	13.8
'45	P.P.	2.29	169	38.0				11.3	13.8
'80	Rect.	4.61					...	34.5 per anode	

LV—115 — Vol. Con. Max.

APEX 48 & 48A

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.4	181	3.4	90	0.2	3.4	4.0	5.4
'24	2 R.F.	2.4	181	3.4	90	0.2	3.4	4.0	5.4
'24	3 R.F.	2.4	181	3.4	90	0.2	3.4	4.0	5.3
'27	Det.	2.3	75	9.0			9.0	0.2	0.6
'27	1 A.F.	2.4	105	6.0			6.0	4.3	5.9
'45	2 A.F.	2.4	187	41.0				12.0	15.0
'45	P.P.	2.4	187	41.0	...	...		12.0	15.0
'80	Rect.	5.0	...	...	...	...	...	38.0 per anode	

LV—115. — Vol. Con. Max.

ARCO—MODEL A

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2.45	146	9.4			29	6.6	11
'27	2 R.F.	2.45	146	9.4			29	6.6	11
'27	3 R.F.	2.45	146	9.4			29	6.6	11
'27	Det.	2.45	55	2			40	3.2	4
'27	1 A.F.	2.5	140	9			29	5	6.2
'45	2 A.F.	2.5	215	38				45	50
'45	P.P.	2.5	215	38				45	50
'80	Rect.	5.5	...	...				55	

LV—114 — Volume Control Max.

ATWATER KENT—MODEL 55

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.25	155	3.6	84		+3.8	1.8	4.6
'24	2 R.F.	2.25	155	3.5	80		+3.8	3.1	4.5
'27	Det.	2.25	83				+1.2	4	7
'27	1 A.F.	2.25	64	1.0	1		+3	3.5	3.5
'45	2 A.F.	2.35	223	42.5	...	...	...	28	30
'45	P.P.	2.35	223	42.5	...	...	...	28	30
'80	Rect.	4.5	...	...	...	...	...	37	

LV—114 — Vol. Con. Max.

ATWATER KENT—MODEL 60

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.4	170	8	130	.7	+8	2.2	8.5
'24	2 R.F.	2.4	175	4	130	.8	+4	2.5	7.5
'24	3 R.F.	2.35	175	4	130	.8	+4	2.5	7.5
'27	Det.	2.35	105	12	.....		+12	...	...
'27	1 A.F.	2.35	75	2	.....		2	3.5	4.5
'45	2 A.F.	2.35	250	48	.....	...	...	25	37
'45	P.P.	2.35	250	48	.....	...	...	25	37
'80	Rect.	4.9	.....	.....	.....	.....	.....	45	....

LV—120. — Vol. Con. Max.

ATWATER KENT—MODEL 56

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.1	165	5.2	110	6	+6	2.6	5.4
'24	2 R.F.	2.1	175	2.5	80	3	+3	2.8	5.0
'24	3 R.F.	2.2	165	2.5	74	8	+3	3.6	5.4
'27	Det.	2.2	225	23.0	...	...	+23	.6	.7
'27	1 A.F.	2.2	165	5.0	...	...	+12	5.8	6.5
'50	2 A.F.	7.0	440	78.0*	...	...	...	35	40
'50	P.P.	7.0	440	78.0*	...	...	...	35	40
'81	Rect.	7.1	...	...	...	...	...	58	....
'81	Rect.	7.1	.....	.....	.....	.....	.....	58	....

LV—118. — Vol. Con. Max.

* Resistors in series with grid

ATWATER KENT—MODEL 70

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.4	170	8	130	.7	+8	2.2	8.5
'24	2 R.F.	2.4	175	4	130	8	+4	2.5	7.5
'24	3 R.F.	2.4	175	4	130	8	+4	2.5	7.5
'27	Det.	2.4	105	12			+12	...	...
'27	1 A.F.	2.4	75	2			+2	3.5	4.5
'45	2 A.F.	2.4	250	48				3.5	37
'45	P.P.	2.4	250	48				2.5	37
'80	Rect.	4.9						4.5 per anode	

LV—120 — Vol. Con. Max.

BOSCH—MODEL 48

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.4	175	2.5	70	.5	3	3.0	6.0
'24	2 R.F.	2.4	175	2.5	70	.5	3	3.0	6.0
'24	3 R.F.	2.4	175	2.5	70	.5	3	3.0	6.0
'27	Det.	2.4	280	27				2.0	
'45	1 A.F.	2.4	250	45				30	50
'45	P.P.	2.4	250	45				30	50
80	Rect.	4.8						55	

LV—115 — 1VS—115

BOSCH—MODEL 49

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.3	170	2.4	68	.5	+3	2.8	6.0
'24	2 R.F.	2.3	170	2.4	68	6	+3	2.7	5.8
'24	3 R.F.	2.3	170	2.4	68	6	+3	2.8	5.4
'27	Det.	2.2	285	26				2.1	2.2
'45	1 A.F.	2.3	245	43				30	42
'45	P.P.	2.3	245	43				30	42
'80	Rect.	...	...	...				...	

LV—120 — LVS—115 — Vol. Con. Max.

BOSCH 54 (DIRECT CURRENT)

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.5	100	Var.	25	.5		1.0	2.0
'24	2 R.F.	2.5	100	1.0	25	4		1.0	2.0
'24	3 R.F.	2.5	100	1.0	25	4		1.1	2.0
'27	Det.	2.5	100	1.0				1.5	2.5
'27	1 A.F.	2.5	95	4.0				3.5	5.0
'71A	2 A.F.	5.0	110	22.5				12.0	24.0
'71A	P.P.	5.0	110	22.5				12.0	24.0

LV—110 DC — Vol. Con. Max.

BOSCH MOTOR CAR RADIO

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	6	180	3.5	90	7		2.0	5.0
'24	2 R.F.	6	180	3.5	90	7		2.0	5.0
'24	3 R.F.	6	180	3.5	90	7		2.0	5.0
'24	Det.	6	50	1.0	1.0	1			
'12	A.F.	1.8	165	10.5				6.5	9.0

Vol. Con. Max.

BRANDES—MODEL B-16

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2	80	2	...	....	+2	2.5	4
'27	2 R.F.	2	82	2	...	....	+2	2.5	3.5
'27	3 R.F.	2	83	2	...	....	+2	1.7	2
'27	Det.	2	34	...	...	....	....	.8	1
'27	1 A.F.	2	80	2	...	....	+2	1.8	2.5
'45	2 A.F.	2.35	185	33	...	....	....	20	22.5
'45	P.P.	2.35	185	33	...	....	....	20	22.5
'80	Rect.	4.7	.....	.....	.....	.....	.....	48	.....
								48	....

LV—115. — Vol. Con. Max.

BREMER TULLY—MODEL 81

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2.4	160	12.5			12.5	3.7	7.5
'27	2 R.F.	2.4	162	12.5			12.5	3.5	7.2
'27	3 R.F.	2.4	162	13			13	3.8	7.2
'27	Det.	2.4	45					3.8	4
'27	1 A.F.	2.5	157	7			12	6.7	8.5
'45	2 A.F.	2.5	245	20				42	50
'45	P.P.	2.5	245	20				42	50
'80	Rect.	5						35	

LV—112 — Vol. Con. Max.

NOTE—Test across speaker terminals gives actual bias, approx 50 volts

BRUNSWICK—MODEL S-14

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.6	145	7	55	.65	+2	1.5	3.5
'24	2 R.F.	2.6	140	7	55	1.2	+2	1.5	3.5
'24	3 R.F.	2.6	135	7	55	4.5	+2	1.5	3
'27	Det.	2.65	80	2	38	.05	+2	0	.75
'27	1 A.F.	2.7	125	8			8	4	5
'45	2 A.F.	2.5	240					33	38
'45	P.P.	2.5	240					28	32
'80	Rect.	5						40	per anode

LV—120 — Vol. Con. Max.

BRUNSWICK—MODEL 31 COMB.

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2.4	160	13			+13	3.5	6.6
'27	2 R.F.	2.4	160	14			+13	3.5	6.6
'27	3 R.F.	2.4	160	15			+14	3.5	6.7
'27	Det.	2.4	45	...			....	3.2	3.3
'27	1 A.F.	2.5	150	8		...	+12	3.4	4.2
'45	2 A.F.	2.3	250	25*		....	....	31	35
'45	P.P.	2.3	250	25*		....	....	31	35
'80	Rect.	5					....	42	....
105	Ballast	-							

LV—120 — Vol. Con. Max.

* Resistor in series with grid.

BUCKINGHAM—MODEL 80

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R.F.	1.25	145	8				6.6	11
'26	2 R.F.	1.25	135	8				6.6	11
'26	3 R.F.	1.25	135	8				6.6	11
'27	Det.	2.25	46					2.6	3.3
'26	1 A.F.	1.25	125	7.5				5	8.5
'71A	P.P.	4.9	205	42				18.2	22.5
'80	Rect.	5						38	

LV—115 — Vol. Con. Max.

COLIN B. KENNEDY—MODEL 10

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2.1	118	7		.....	7	4.9	9
'27	2 R.F.	2.1	118	7		.....	7	4.9	9
'27	3 R.F.	2.1	118	7		...	7	4.9	9
'27	Det.	2.1	37			...	....	2.8	3.2
'27	1 A.F.	2.1	113	6.2		.....	...	4.9	6.5
'45	2 A.F.	2.2	210	37		...	...	28	32.5
'45	P.P.	2.2	210	37		...	...	28	32.5
80	Rect.	4.6						55	32

LV—115 — Vol. Con. Max.

COLONIAL—MODEL 28 AC

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R.F.	1.5	105	—3				7.5	
'26	2 R.F.	1.5	105	—3				7.5	
'99	Det.	3.3	30-50	+ 6				1.5	
26	1 A.F.	1.5	90	—6				3.8	
71A	2 A.F.	5.	165	37				17	
B.H.	Rect.							32	

COLONIAL—MODEL 28 DC

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'01A	1 R.F.	5	100	1.5				5-7	
'01A	2 R.F.	5	100	1.5				5-7	
'01A	Det.	5	60	3.0				.25	
'01A	1 A.F.	5	90	3.0				1.5-2.5	
'71A	2 A.F.	5	95	15				10	

LV—115 D.C.

COLONIAL—MODEL 31 AC

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R.F.	1.35	95	4.5				6	
'26	2 R.F.	1.35	95	4.5				6	
'27	Det.	2.15	80					2	
'27	1 A.F.	2.15	80	4.5				3	
'71A	2 A.F.	4.5	160	38				15	
71A	P.P.	4.5	160	38				15	
'80	Rect.	4.5						42	per anode

COLONIAL—MODEL 31 DC

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R.F.	1.4	90	2				2	
'26	2 R.F.	1.4	75	2				5	
'26	3 R.F.	1.4	75	2				5	
'26	Det.	1.3	40	2				1	
'26	1 A.F.	1.3	70	1.5				2.5	
'71A	2 A.F.	4.4	75	12				10	
'71A	P.P.	4.4	75	12				10	

COLONIAL—MODEL 32 AC

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.2	155	*	56	.5	+10	2.5	3.5
'24	2 R.F.	2.2	155	1.2	56	5	+10	2.5	3.0
'24	3 R.F.	2.2	160	1.1	52	4	+10	2.5	3.0
'24	Det.	2.2	88	*	9	.05	+4		.5
'27	1 A.F.	2.2	68				+5	2.5	3
'45	2 A.F.	2.3	230	26				25	27
45	P.P.	2.3	230	36				25	27
'80	Rect.							R53	
								L53	

LV—117. Vol Con. Max.

* No reading due to a resistor in series with the grid

CROSLEY—MODEL 33-S

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.5	160	1.6	62	0.5	+2.0	2.4	3.1
'24	2 R.F.	2.5	160	1.6	62	0.5	+2.0	2.4	3.1
'27	Det.	2.5	110	17.0			+14.0	0.2	0.4
'27	1 A.F.	2.5	105	8.0*			+11.0	3.5	4.8
'45	2 A.F.	2.5	240	45.0				33.0	37.0
'45	P.P.	2.5	240	45.0				33.0	37.0
'80	Rect.	5.0						55.0	per anode

LV—119 Vol Con Max

* First A.F. resistance coupled

CROSLEY—MODELS 40-S, 41-S, 42-S, 82-S

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.1	145	2.3	68	.3	+2.5	2.0	4.0
'24	2 R.F.	2.1	140	2.3	68	.3	+2.5	2.0	4.0
'24	3 R.F.	2.1	140	2.3	68	.3	+2.5	1.8	4.0
'27	Det.	2.2	90	11.0			+11.0	.2	.3
'27	1 A.F.	2.1	145	4.0			+11.0	3.6	4.5
'45	2 A.F.	2.2	240	40				28	33
'45	P.P.	2.2	240	40				28	33
'80	Rect.	4.5						55	

LV—117 Vol Con Max

CROSLEY—MODEL 705

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.2	195	2.8	90	0.8	+4	0.8	1.2
'24	2 R.F.	2.2	195	2.8	92	0.9	+4	0.8	1.3
'22	Det.	2.3	155	23.0			+23	0.0	0.1
'71	1 A.F.	5.0	180	40.0				19.0	22.0
71	P.P.	5.0	180	40.0				19.0	22.0
'80	Rect.	5.0						33.0	per anode

LV—119 Vol Con Max

CROSLEY SHOWBOX 706

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R.F.	1.5	160	10				6.5	10.0
'26	2 R.F.	1.5	160	10				6.5	10.0
'26	3 R.F.	1.5	160	10				6.5	10.0
'27	Det.	2.2	55	0			0	2.5	2.5
'26	1 A.F.	1.5	160	9				4.5	5.5
71	2 A.F.	5.0	185	35				20.0	24.0
71	P.P.	5.0	185	39				18.0	22.0
80	Rect.	5.0						38.0	per anode

LV—119 Vol Con Max

DAY FAN—PECK & HILL 5090

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R.F.	1.4	108	5				5.0	11
'26	2 R.F.	1.4	108	5				5.0	11
'26	3 R.F.	1.4	108	5				5.0	11
'26	4 R.P.	1.4	108	5				5.0	11
'27	Det.	2.05	20				44	7	
'26	1 A.F.	1.35	98	5.5				3.2	6.5
'71A	2 A.F.	4.8	165	29				16	19.5
'71A	P.P.	4.8	165	29				16	19.5
'80	Rect.	4.2						40	per anode

LV—110 LVS—115 Vol Con Max

DAY FAN—66-68- 69-77 MODEL—PECK & HILL 5096

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R.P.	1.3	150	9				4.5	8
'26	2 R.P.	1.3	150	9				4.5	8
'26	3 R.P.	1.3	150	9				4.5	8
'26	4 R.P.	1.3	150	9				4.5	8
'27	Det.	2.2	30				—9	1.7	
'26	1 A.F.	1.3	130	5				4.5	7.5
'45	2 A.P.	2.25	235	*7				27.5	32.0
'45	P.P.	2.25	235	*7				27.5	32.0
'80	Rect.	4.5						40	per anode

LV—110 LVS—None Vol Con. Max

* Resistor in series with grid on '45 tubes

EDISON LIGHT-O-MATIC MODELS R-4, R-5 AND C-4

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.P.	2.4	114	6			+6	5.6	8.2
'27	2 R.F.	2.4	114	6			+6	5.6	10.0
'27	3 R.F.	2.4	114	6			+6	6.2	10.5
'27	Det.	2.15	28					2.0	
'27	1 A.P.	2.4	112	6.5			+7	3.7	5.0
45	2 A.F.	2.35	250	46				27.5	32.0
45	P.P.	2.35	250	46				27.5	32.0
'80	Rect.	4.9						50	
								50	

LV—105 LVS—105 Vol Con Max

ERLA MODELS 30, 31, 32, AR-3 CABLE AND SKY ROVER—MODEL 224

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.25	170	1.75	85	2	2	3.0	4.4
'24	2 R.F.	2.25	170	1.75	85	2	2	3.0	4.5
'24	3 R.F.	2.25	170	1.75	85	2	2	3.0	4.5
'27	Det.	2.25	90	12.0			+12	0.5	0.5
'27	1 A.F.	2.25	105	7.0			+5.5	5.0	6.5
'45	2 A.F.	2.4	250	2[illegible]				30.0	35.0
'45	P.P.	2.4	250	22.5				30.0	35.0
'80	Rect.	4.8						37.0	per anode

LV—110 LVS—95 115 Vol Con Max

EVER READY SERIES 30

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.P.	2.4	110	7			+7	5	10
'27	2 R.F.	2.4	110	7			+7	5	10
'27	3 R.F.	2.4	110	7			+7	5	10
'27	Det.	2.4	45					4	4.1
'27	1 A.F.	2.4	105	6			+6	3.5	5
71	2 A.F.	5.2	172	40				19	22.5
71	P.P.	5.2	172	40				20	22.5
80	Rect.	5.0						45	per anode

LV—117 LVS—115

EVER READY SERIES 40—MODEL 42-43-44

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.P.	2.18	95	6			+6	3.2	8.1
'27	2 R.P.	2.18	94	6			+6	3.2	8
'27	3 R.P.	2.15	92	6			+6	3.2	8
'27	Det.	2.15	40					2.8	3.0
'27	1 A.F.	2.15	89	5.5			+5.5	3.7	5
45	2 A.F.	2.35	245	49				32	35
45	P.P.	2.35	245	49				32	35
'80	Rect.	4.9						90	per anode

LV—117 LVS—115

EVER READY SERIES 50—MODEL 52-53-54

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.1	145	2.8	60	.4	+1	1	1.6
'24	2 R.F.	2.1	144	2.6	60	.4	+1	1	1.5
'24	3 R.F.	2.1	144	2.6	60	.4	+1	1	1.5
'27	Det.	2.1	70	5	....	....	+5	.5	.7
'27	Rec. tap.	2.1	130	*1	....	....	+11	3.8	4.9
'45	2 A.F.	2.15	205	40	....	....	....	22	26
'45	P.P.	2.15	205	40	....	....	....	22	26
'80	Rect.	4.4	....	....	....	....	....	45	per anode

LV—109 LVS—105

* Resistance Coupling.

Resistance in series with grid

FADA—MODEL 15-M

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.2	112	9	40	4	—27	2	.5
'27	2 R.F.	2.1	110	4.0			—25	1.1	2.0
'27	3 R.F.	2.2	110	4.0			—24	1.1	2.0
'27	Det.	2.2	75			—		4	.5
'27	1 A.F.	2.1	95	5.0			—24	6	1.0
45	2 A.F.	2.1	150	25.0				20.0	25.0
45	P.P.	2.1	150	25.0				20.0	25.0
'80	Rect.	4.6						32.0	

LV—117 LVS—High Vol Con Max

FADA 25 (7 MA CHASSIS)

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.2	160	1.7	55	4	+2	0.5	0.7
'27	2 R.F.	2.2	140	5.0			+15	1.4	2.1
'27	3 R.F.	2.2	135	5.0			+16	1.1	2.0
'27	Det.	2.3	50	1.0				0.7	0.8
'27	1 A.F.	2.2	135	8.0			+9	1.4	1.8
45	2 A.F.	2.5	215	40.0				25.0	30.0
45	P.P.	2.5	215	40.0				25.0	30.0
'80	Rect.	4.8						37.0	per anode

LV—117 LVS—Hi Vol Con Max

FADA—MODEL 35 OR 35Z

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.1	161	1.7	79	5	—46	3	4.6
'24	2 R.F.	2.1	160	1.7	78	5	—45	1.9	3
'27	Det.	2.1	75	9.0			+ 9	1	1.0
'27	1 A.F.	2.1	145	6.5			—36	4.0	9.5
45	2 A.F.	2.1	210	41				24.5	30
45	P.P.	2.1	210	41				25.0	32
81	Rect.	7						75	

LV—116 High Tap Vol Con Max

FADA 40

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.1	162	3.3	65	0.3	—45	1.8	2.0
'24	2 R.F.	2.1	170	3.3	70	0.3	—45	2.0	2.4
'24	3 R.F.	2.1	165	5.0	97	0.4	—40	2.0	2.4
'27	Det.	2.2	75	12.0			+12	0.5	0.5
'27	1 A.F.	2.1	160	20*			—36	3.5	4.5
45	P.P.	2.2	225	46.0				25.0	27.0
45	P.P.	2.2	225	46.0				27.0	29.0
'80	Rect.	4.8	....					67.0	per anode

LV—110 LVS—High Vol. Con. Max

First A.F. resistance coupled

FADA—MODELS 41, 42, 44, 46 and 47. (KA CHASSIS)

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
24	1 R F	2.2	140	2	80	8		2.5	4.8
24	2 R F	2.2	140	2	80	8		2.5	4.8
24	3 R F	2.2	140	2	80	8		2.6	4.6
27	Det	2.2	24				+2	.4	.5
27	1 A F	2.2	130	*5				4.6	7.7
45	{2 A F}	2.2	225	42				30	35
45	{P P }	2.2	225	42				30	35
80	Rect	4.5						40 per anode	
27	Vol Con	2.2	0	2.5			−1.0		

LV—115 Vol Con Max

Resistance in grid circuit

FADA—MODELS 75-77

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
24	1 R F	2.2	160	1.4	25	1.2	+1.5	6	1.5
24	2 R F.	2.2	160	1.4	25	.1	+1.5	.4	1.0
24	3 R F	2.2	160	1.4	25	1	+1.5	.4	1.1
27	Det	2.2	50	8.0	....	....	+8.0	.1	1.1
27	1 A F	2.2	145	8.0	....	....	+11	3.6	4.5
10	{2 A F}	6.6	400	29.0	....	....	....	24.8	28
10	{P P }	6.6	400	29.0	....	....	....	24.8	28
81	Rect	6.7	....	....	....	....	....	63	....

LV—117 LVS—High. Vol. Con. Max

FREED—MODEL 55 EARL—MODEL 22

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
26	1 R F	1.4	90	1.5	....	....	....	4.2	6.1
26	2 R F	1.4	82	3.5	....	....	....	4.2	8.7
26	3 R F	1.4	92	3.5	....	....	....	4.2	8.7
27	Det	.9	18	....	....	....	....	1.3	2.5
27	1 A F	1.9	78	4.8	....	....	+4.8	3.8	4.0
71	{2 A F}	4.8	130	27.0	....	....	....	13.8	18.0
71	{P P }	4.8	130	27.0	....	....	....	13.8	18.0
80	Rect	4.5	....	....	....	....	....	32.5	....

LV—115 Vol Con Max

FREED—MODEL 78-79 DC EARL—MODEL 31-32 DC

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
01A	1 R F	1.6	75	1.5				4.2	7.9
01A	2 R F	1.4	70	1.3				4.9	7.2
02A	3 R F	1.05	70					3.7	7.0
01A	Det	1.6	29	5.0				1.0	1.0
01A	1 A F	1.45	78	1.0				1.0	3.3
71A	{2 A F}	4.5	78	13.0				6.0	13.0
71A	{P P }	4.5	75	12.0				2.5	6.0
71A	{2 A F}	4.6	85	13.0				10.5	15.6
71A	{P P }	4.5	80	12.0				4.2	8.0

LV—105—DC

FREED—MODEL 78-79 EARL—MODEL 31-32

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R F.	2.35	89	5.8			+5.8	3.5	7.2
'27	2 R F	2.35	84	5.0			+5	3.2	7.0
'27	3 R F	2.35	94	5.0			+5	3.2	7.0
'27	Det	2.28	22					1.0	1.2
'27	1 A F.	2.28	85	5.5			+5.5	3.5	4.8
'45	{2 A F}	2.3	190	35.0				25.0	28.0
45	{P P }	2.3	190	35.0				25.0	28.0
80	Rect.	4.7						34.0	

LV—114 0. High Tap Vol Con Max

FREED—MODEL 95 EARL—MODEL 41

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R F	2.25	80	5.0			+5.0	3.5	7.5
'27	2 R I	2.25	80	5.0			+5.0	3.5	7.5
'27	3 R I	2.25	80	5.0			+5.0	3.5	7.5
'27	4 R I	2.25	80	5.0			+5.0	3.5	7.5
'27	Det	2.25	20					1.0	1.0
'27	1 A F	2.28	75	5.0			+5.0	2.7	4.0
'45	{2 A F}	2.3	195	17.0				26.0	32.0
'45	{P P }	2.3	195	7.0				26.0	32.0
'80	Rect	4.7						35.0	

LV—113 High Tap Vol Con Max

GENERAL ELECTRIC—MODEL H-31

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
24	R I	2.2	240	3.5	80	5	34	3.2	
27	Osc	2.5	60				22	6.5	
24	1 Det	2.2	100	9.5	95	5	25	0.25	
24	1 I F	2.2	240	2.2	78		34	4.0	
24	2 I I	2.2	240	4.2	78		31.5	1.6	
27	2 Det	2.2	212	22			12	0.25	
45	{A F}	2.2	200	*19				25	
45	{P P }	2.2	200	*19				25	

Vol Con Max

*Resistance in Grid Circuit

GENERAL MOTORS RADIO CORP. MODEL "A"

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2.2	140	3.0	64	0.3	+3	2.0	4.0
'24	2 R F	2.2	140	3.0	64	0.3	+3	2.0	4.0
'24	3 R F	2.2	140	3.0	64	0.3	+3	2.0	4.0
'27	Det	2.2	100	15.0	....	....	+15	0.2	0.5
27	1 A F	2.2	145	2.0	....	....	+8	4.0	6.0
45	{2 A F}	2.3	235	20.0*				30.0	35.0
45	{P P }	2.3	235	20.0*				30.0	35.0
80	Rect	4.5	....	....	....	....	....	55.0 per anode	

LV—118 LVS—120 Vol. Con. Max.

* Resistance in grid circuit.

GRAYBAR—MODEL 311

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
26	1 R F	1.4	125	8				5.5	14
'26	2 R F	1.45	126	8.5				5	15
'26	3 R F	1.45	126	8.5				5	15
'27	Det	2.1	26					1.5	1.5
'26	1 A F	1.4	121	8				4.5	11.5
'71A	2 A I	4.7	135	29				17.5	22
'80	Rect	4.7	....	....					

LV—117 Vol Con Max

GRAYBAR—MODEL 500

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2.15	155	1.2	40	2	+1	1	2
'24	2 R F	2.15	155	1.2	40	1	+1	1	2
'24	Det	2.15	155	4.5	59	4	+8	.5	2.5
'45	A P.	2.25	220	5*				30	32
'80	Rect	4.6						{28 / 28}	

LV—114 High Tap Vol Con Max

*NOTE—This is not the true bias voltage, but the reading obtained at the socket due to series resistance

GREBE SUPER SYNCHROPHASE SK4

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R P	2.4	155	2	38	5		2.8	3.2
'24	2 R P	2.4	150	2	38	5		2.8	3.0
'24	3 R P	2.4	150	2	38	5		2.8	3.5
'27	Det	2.4	180					.5	1.4
'45	{1 A F}	2.4	225	*				37	42
45	{P P }	2.4	225	*				37	42
'80	Rect	4.9						50 per anode	

LV—116

* No bias reading at socket due to resistance in series with grid. Bias can be read with voltmeter lead connected between filament and chassis

GULBRANSEN MODEL C

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R F.	1.3	115	8				3.5	7.0
'26	2 R F.	1.3	120	8				4.0	8.0
'26	3 R F.	1.4	125	8				4.5	8.5
'26	4 R F	1.25	125	8				4.5	8.5
'24	Det	2.2	85		17.5			0.2	0.5
'26	1 A F	1.4	80	8				2.5	3.5
45	{2 A F}	2.25	220	40				30.0	34.0
45	{P P }	2.25	220	40				30.0	34.0
'80	Rect	4.5						40.0 per anode	

LV—114 Vol Con Max

KELLOGG—MODEL 523

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2.5	160	4	43	5	+3	1.5	3.0
'24	2 R F	2.5	150	3	43	5	+3	1.4	3.0
'24	3 R I	2.5	150	3	43	5	+2	1.5	3.0
'27	Det	2.5	135	13.0			+13	1.2	1.4
27	1 A I	2.5	135	8.0			+8	4.4	5.7
45	{A F}	2.5	230	45				33	38
45	{P P }	2.5	230	45				33	38
'80	Rect	4.8						53	

LV—118 Vol Con Max

KELLOGG—MODEL S 524, 525

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F.	2.4	155	2	47	.7	+2	1.6	3.5
'24	2 R F	2.4	155	2	47	.7	+2	1.6	3.5
'24	3 R F	2.4	155	2	45	6	+2	1.6	3.2
'27	Det	2.4	180	17.0	....	....	+17	1.6	2.0
'27	1 A F	2.4	175	11.0	....	....	+11	5.7	7.0
50	{2 A F}	7.5	450	94.0	....	....	....	24	27
50	{P P }	7.5	450	94.0	....	....	....	24	27
'81	Rect	7.4	....	....	....	....	....	65	....
'81	Rect	7.4	....	....	....	....	....	65	....

LV—118 Vol. Con. Max.

KELLOGG—MODELS 528 (25 CYCLES)

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2.4	155	2	47	.7	+2	1.6	3.5
'24	2 R F	2.4	155	2	47	.7	+2	1.6	3.5
'24	3 R F	2.4	155	2	45	6	+2	1.6	3.2
'27	Det	2.4	180	17.0	....	....	+17	1.6	2.0
'27	1 A F	2.4	175	11.0	....	....	+11	5.7	7.0
50	{2 A F}	7.5	450	94.0	....	....	....	24.0	27.0
50	{P P }	7.5	450	94.0	....	....	....	24.0	27.0
'81	Rect	7.4	....	....	....	....	....	65	....
'81	Rect	7.4	....	....	....	....	....	65	....

LV—118 Vol Con Max

KENNEDY—MODEL 20

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2.5	170	3	60	2	3	8	1.5
'24	2 R F	2.5	170	3	60	4	3	1.4	1.5
'24	3 R F	2.5	170	3	60	5	3	2.2	2.5
'27	Det	2.5	80	10			10	1.0	1.1
'27	1 A F	2.5	145	10			10	7.2	10
45	{2 A F}	2.5	240	45				34	38
45	{P P }	2.5	240	45				34	38
'80	Rect	4.8						54 per anode	

LV—115

KOLSTER—MODELS K-20, K-22

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R F.	1.4	90	6				4.3	6.1
'26	2 R F.	1.4	88	6				4.2	5.8
'26	3 R F	1.4	90	6				4.4	6.0
'27	Det	2.1	45				−9	1.2	1.8
'26	1 A F	1.3	90	5.8				4.1	6.2
'71	2 A F	4.8	185	43				18.3	22.8
'80	Rect	4.9						42 per anode	

LV—117. LVS—120 Vol. Con Max

KOLSTER—MODELS K-21 and K-23

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R F	1.4	90	2.5				4.2	6.1
'26	2 R F	1.4	90	2.6				4.1	6.2
'26	3 R I	1.5	90	2.6				4.3	6.1
'26	4 R I	1.4	90	2.5				4.2	6.1
'27	Det	2.1	35				−6	1.0	1.2
26	1 A F	1.4	95	2.5				4.5	6.0
71	2 A I	4.8	185	45				21	26
'80	Rect	4.8						48 per anode	

LV—117 LVS—120 Vol Con Max

KOLSTER—MODEL K-43

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2.2	108	1.7	42	.3	+2	.7	2
'24	2 R F	2.2	118	1.7	42	.3	+2	.7	2
'24	3 R F	2.2	120	1.7	42	.3	+2	.7	2
'27	Det	2.2	35					1.5	....
27	1 A F	2.2	108	3	....	....	+8	2.5	3.5
45	{2 A F}	2.25	188	33	....	....	....	17	20
45	{P P }	2.25	188	33	....	....	....	17	20
'80	Rect	4.7	....	....	....	....	....	{48 / 48}	....

LV—115 Vol. Con. Max

KOLSTER—MODEL K-44

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2.2	138	1.5	48	.2	+2	1.5	2.5
'24	2 R F	2.2	138	1.5	48	.2	+2	1.5	2.5
'24	3 K F.	2.2	135	1.5	48	.2	+2	1.5	2.5
'27	Det	2.2	125	11	....	....	+11	.5	3
'27	1 A F	2.35	120	3	....	....	+9.5	3.5	4.5
45	{2 A F}	2.49	260	47	....	....	....	30	35
45	{P P }	2.49	260	47	....	....	....	30	35
'81	Rect.	7.2	....	....	....	....	....	{70 / 70}	....

LV—115 LVS—110-120 Vol. Con. Max.

KOLSTER—MODEL 45

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	1.9	110	1.1	35	.3	+1.0	.8	1.6
'24	2 R.F.	2.0	110	1.1	36	.4	+1.0	6	1.3
'24	3 R.F.	2.1	112	1.1	36	2	+1.0	.6	1.2
'27	Det.	2.1	100	9.0	.	.	+9.0	8	2.9
'27	1 A.F.	2.2	100	2.5	.	.	+7.5	2 6	3.5
'27	{2 A.F.	2.2	100	7.5	...		+8.0	2.5	4.4
'27	{P.P.	2.2	100	7.5	...		+8.0	2.5	4.4
'50	{3 A.F.	7 1	375	64.0	...	.	....	56.0	62.0
'50	{P P	7 1	375	64.0	...	.	....	56.0	62.0
'81	Rect.	7.0	.	...	...	...	...	85.0	....
81	Rect.	7 0	...	...	...	....		85 0	..

LAUTER A—DAY FAN 5096

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R I	1 3	150	9				4 5	8
'26	2 R F	1.3	150	9				4 5	8
'26	3 R I	1 3	150	9				4 5	8
'26	4 R F	1.3	150	9	...			4.5	8
'27	Det	2 2	30	.			—9	1.7	1 7
26	1 A.F	1 3	130	9	...	...		4.5	7.5
45	{2 A.F.	2.2	235	7*	....	...		27.5	32.0
45	{P.P.	2.2	235	7*	....	...		27 5	32.0
80	Rect	4 5	..	..	...			40	per anode

LV—115 Vol. Con. Max

Resistor in series with grid

LYRIC—D-11, D-19, D-29, D-39, D-69

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2 6	110	1.4	64	.8	{1 2	2 5	3 5
24	2 R F	2 2	110	1 4	64	8	{1 2	2 5	3 5
24	Det	2 2	90	2	8	1	{2 0	0 1	0 3
27	1 A F	2 5	95	*1			1 6 0	3 0	5 6
45	{2 A F	2 2	220	40				25	30
45	{P P	2 2	2**	30				25	30
80	Rect	4 5						40	per anode

LV—116 LVS—110 Vol. Con. Max

Resistance in Grid Circuit

LYRIC—MODEL 90

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
27	1 R F	2 5	100	7			7	4 0	7 5
27	2 R F	2 5	100	7			7	4	7 5
27	3 R F	2 5	100	6			6	4 .	8
27	4 R F	2 5	100	6			6	4 5	8
27	Det	2 5	95					1 5	1 7
27	1 A F	2 5	100	6			6	3 6	6 4
27	{P P	2 5	100	6			6	3 6	6 4
45	{2 A F	2 4	225	44				30	35
45	{P P	2 4	225	44				30 .	35
80	Rect	4 5						42 5	

LV—114 Vol. Con. Max

LYRIC, MODEL 94, 96, 175

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.4	150	4.0	92	0.6	4.5	3	6.0
'24	2 R F	2.4	150	4.0	92	0.6	5.0	3	6.0
'24	3 R.F.	2.4	150	4.0	92	0 6	4.5	3	6 0
'27	Det.	2.4	95	7.0	.	.	7.0	.7	1.0
'27	1 A F.	2.4	135	2 0	.	.	10.0	4.4	5.5
'45	{2 A.P.	2 4	240	50.0	..			22.5	27.0
'45	{P P	2.4	240	50.0				22 5	27.0
'80	Rect.	4 7	...					38	2per anode

LV—115. LVS—95-115. Vol. Con. Max

MAJESTIC—MODEL 90-91-92

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2.3	150	14	....	....	19	3.4	6
'27	2 R.F.	2.3	150	13	....	....	17	3.5	6
'27	3 R.F.	2.3	150	13	....	....	18	3.6	6
'27	4 R.F.	2.3	158	12	....	....	12	6.6	8
'27	Det.	2.3	290	29	....	....	28	.8	1
'45	{1 A.F.	2.4	285	50	....	....	....	35	40
'45	{P.P.	2.4	285	50	....	....	....	35	40
'80	Rect.	4 8	..	..	....	....	..	60	....

LV—114. Vol. Con. Max.

NOTE—Volume control controls bias on first three R.F. tubes

MAJESTIC 90A

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R F	2 3	137	7 5	.	.	7 5	5.3	9 2
'27	2 R F	2 3	137	7 5	.	.	7 5	5.7	9 7
'27	3 R F	2 3	135	7 5	.	.	7 5	6 4	10 3
27	4 R F	2 3	135	9 0	.	.	9 0	5 0	6 4
'27	Det	2 3	280	31.0	.	.	31 0	0 7	0.85
'45	{1 A F	2 4	255	48 0	.	.	.	33	37.0
'45	{P P	2 4	255	48 0	.	.	.	34	36 0
'80	Rect	5 0	.	.	.	.	.	63	per anode

LV—116 Vol Con Max—dial 550 KC.

MAJESTIC 90B

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2 3	13*	7.5	.	.	7 5	5.3	9 0
'27	2 R.F.	2 3	135	7.5	.	....	7.5	5.8	9.8
'27	3 R.F.	2 3	136	7 5	.	....	7.5	6 5	10.5
'27	4 R.F.	2 3	134	8 7	.	.	8 7	5.0	6 5
'27	Det.	2 3	240	28 0	.	.	28 0	1 0	1.2
'45	{1 A.F.	2 3	260	48 5	.	.	.	33 0	37 5
'45	{P P	2 3	260	48 5	.	.	.	28 0	31 5
80	Rect	4 8	.	.	.	.	.	63 0	per anod.

LV—118 LVS—115. Vol Con Max.—dial 550 KC

MAJESTIC 93

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R F	2 3	145	10	.	. .	+10	3 5	5.9
'27	2 R F	2 3	145	10	.	.	+10	4 0	7.5
'27	3 R F	2 3	145	10	.	.	+10	3 5	7.5
'27	Det	2 3	240	24	.	..	+23	0 7	0 9
'27	1 A F	2 4	145	9	.	..	+9	5 0	6 5
'45	{2 A F	2 4	260	48	.	.	.	32 0	37.0
45	{P P	2 4	260	48	.	.	.	32 0	37 0
'80	Rect	5 0	.	.	.	.	.	61 0	per anode

LV—118 Vol Con Max

MAJESTIC—MODEL 180

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
27	1 R F	2 25	143	8 5	.	.	+1	5 5	16 5
'27	2 R F	2 2	143	8 5	.	.	+1	5	16
'27	3 R F	2 2	143	8 5	.	.	+1	4	15 5
'27	Det	2 2	38	.	.	.	. 8	3 3	3
'27	1 A F	2 2	135	* 5	.	.	.	4 5	10 5
'80	{2 A F	7 3	355	64	.	.	.	49	60
'80	{P P	7 3	3**	64	.	.	.	49	60
81	Rect	7 3	.	.	.	.	.	80	
81	Rect	7 3	.	.	.	.	.	80	

LV—117 Vol Con Max

MAJESTIC MODEL 90, 91, 92 and 181 comb.

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R F.	2.2	130	7.5	....	....	+7.5	5.0	8.7
'27	2 R.F.	2.2	130	7.5	....	....	+7.5	6.0	10.3
'27	3 R.F.	2.2	130	7.5	....	....	+7.5	5.4	9.5
'27	4 R.F.	2.2	130	8.2	....	....	+8.2	4.6	6.0
'27	Det.	2.3	280	26.0	....	....	+26.0	1.0	1.2
'45	{1 A.F.	2 37	250	47 0	....	....	....	30.0	34.0
'45	{P P	2 37	250	47.0	....	....	....	32.5	36.0
'80	Rect	4 8	..	.	....		..	63	per anode

LV—116 Vol Con Max

Equalizer resistor at 550 KC approx. 600 ohms.

NORDEN HAUCK ADMIRALTY SUPER—10-30-AC

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 Det	2 2	125	0 15	55	0 3	0	1 0	1.6
'24	1 I F	2 2	125	0 15	55	0.3	0	1 0	1 6
'27	Osc	2 2	55	11 00	..		11.5	3 0	4 1
'24	2 I F	2 2	125	0 15	55	0 3	0	1.0	1 6
'24	3 I F	2 2	125	0 15	55	0.3	0	1 0	1 6
'24	4 I F	2 2	125	0 15	55	0 3	0	1 0	1.6
'24	2 Det	2 2	130	1 40	85	0 2	1 0	1 0	1 7
'27	1 A F	2 2	35	7 50			1 5	2 0	3 0
'50	{2 A F	7 2	425	76 00				55 0	59.5
'50	{P P	7 2	425	76 00				55 0	59 5
'81	Rect	7 2						62 0	
'81	Rect	7 2						62 0	

LV—115 Vol Con Max.

OZARKA 91 AC

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2 1	165	-9 5	{+44	5	2	2	2 75
'24	2 R F	2 1	165	9 5	{+44	5	2	2	2.75
'24	3 R F	2 1	165	9 5	{+44	.5	2	2	2.75
24	Det	2 1	42	—4 6	{24 5	07	8	1	2
'27	1 A.F.	2 1	143	—1			10	4.5	10
'45	{2 A.F.	2 2*	243	—46 5				32	80
'45	{P.P	2 2	240	—46				32	80
'80	Rect.	4 8	..	..				42	per anode

LV—113 Vol. Con Max

PEERLESS COURIER WITH KYLECTRON

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.5	190	2.2	88	.6	+2	3 5	5.4
'24	2 R.F.	2.5	190	2.2	90	.6	+2	3.5	5.5
'24	3 R.F.	2.5	185	2.2	90	1.1	+2	5.0	8.5
'27	Det.	2.5	55	7.5	90	....	+8	.1	.2
'27	1 A.F.	2.6	85	2	...	....	+5	4.5	5.6
'45	{2 A.F.	2.6	280	33*	.	.	.	25	30
'45	{P.P.	2 6	280	33*	.	.	.	25	30
'80	Rect	5 0	.	.	.	.	.	50	per anode
'99	Spkr Exciter	3.3	Revered 38						

LV—120 LVS—Low. Vol. Con Max

NOTE—Voltage across speaker—340 V. (D C).

* Resistor in series with grid

PHILCO 20, 20A

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
24	1 R F	2 2	225	2 8	82		10	3 0	
24	2 R F	2 2	130	2 8	82		10	3 0	
24	Det	2 2	30	1	2		8	0	
27	1 A F	2 3	115				7	3 0	
71A	{2 A F	4 8	190	43				18 0	
71A	{P P	4 8	190	43				18 0	
80	Rect	4 8						36	per anode

LV—115 Vol Con Max

PHILCO 30

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'32	1 R.F.	2	150	.	60	....	....	1.5	..
'32	2 R.F.	2	150	.	58	...	...	1.5	..
'32	3 R F	2	150		58			1.5	..
'10	Det								
	Rect	2							
'10	Det								
	Amp.	2	15	..	.	....	....	...	.
30	1 A.F	2	90	*	.	.	.	2	..
'31	{2 A.F.	2	150	24	.	...	...	8	..
'31	{P.P.	2	150	24	.			8	

*Volume control off 4 volts

Volume control on less than 1 volt

PHILCO 40, 41

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F.	2.1	100	0.4	75	.4	....	2.7	3.4
'24	2 R.F.	2.1	100	0.4	75	.4	...	2.7	3.3
'24	Det.	2 1	45	1.8	15	0	...	....	....
'27	1 A.F.	2 4	87	0.2	....	....	....	2.7	3.3
'71A	{2 A.F.	5	85	13	..	....	....	15	19
'71A	{P.P.	5	85	13	....	....	....	15	19

LV—115. Vol Con Max.

PHILCO—MODEL 65

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2 1	120	1.4	54	. .	1 4	1.6	2.5
'24	2 R F	2 1	120	1.4	54	..	1 4	2.0	2.8
'27	Det	2 1	215	24	...	.	+24	1.3	1.5
'45	{1 A F	2 2	215	37				30	34
'45	{P P	2 2	215	37			..	30	34
'80	Rect	4 4						47	

LV—115 Vol Con Max

PHILCO 76

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2.3	145	3.0	90	0.4	13	3.5	4.2
'24	2 R F	2.3	145	3.0	90	0.4	13	3.5	4.2
'24	Det	2 3	36	1.4	30	0 0	12	0.0	0.2
'27	1 A.F.	2 3	140	1 0	.	...	10	3.0	4.0
'45	{2 A F	2.3	230	46.0	.	....	....	30.0	33.5
'45	{P P	2 3	230	46 0	.	....	....	30.0	33.5
'80	Rect	4 5	.	.	.	...	...	50.0	per anode *

LV—115 Vol. Con. Max.

PHILCO 77, 77A

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.3	145	3	..	..	13	3 5	.
'24	2 R.F.	2 3	145	3	90		13	3.5	.
'24	Det.	2 3	36	1 4	30	.	12	..	.
'27	1 A F	2 3	140	1	..	.	10	3.0	...
'45	{2 A.F.	2 2	230	46	....			30	....
'45	{P P	2 2	230	46	..		.	30	....
'60	Rect	4 5	. . .	..	...	...	....	90	per plate

LV—115 Vol Con. Max

Courtesy Weston Electrical Inst. Corp.

PHILCO—MODEL 87

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R.F.	1.3	78	5.5	....	....	....	3.4	6.9
'26	2 R.F.	1.3	78	5.5				3.4	6.9
'26	3 R.F.	1.3	78	5.5				3.4	6.9
'27	Det	[illegible]	25						
'26	A.F.	1.3	[illegible]	4.5				3.2	6.3
'45	2 A.F.	2.25	205	35.5				25	30
'45	P.P.	2.25	205	35.5				25	30
'80	Rect.	4.4						45	

LV—115 Vol. Con. Max

PHILCO 95

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.15	155	0.0	95	0.8	5.3	4.0	5.1
'24	2 R.F.	2.15	155	0.0	95	0.8	5.3	4.0	5.1
'24	3 R.F.	2.15	155	0.0	95	0.8	5.3	4.0	5.1
'27	Det.	2.15	0	0.5	—	—	0.7	0.0	0.0
'27	Det Amp.	2.15	27	0.5	....	....	5.5	0.0	0.1
'27	1 A.F.	2.15	85	0.2	....	....	5.5	2.5	3.1
'45	2 A.F.	2.2	250	41.0	....	....	....	28.0	30.0
'45	P.P.	2.2	250	41.0	....	....	....	28.0	30.0
'80	Rect.	4.5	....	....	....	....	....	43.0 per anode	

LV—115. Vol. Con. Max.

PHILCO 96, 296, 96A, 296A

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.15	155	0	95	.8	5.3	4	5.6
'24	2 R.F.	2.15	155	0	95	.8	5.3	4	5.7
'24	3 R.F.	2.15	155	0	95	.8	5.3	4	5.6
'27	Det.	2.15	0	.5	....	....	.7	0	0
'27	Det Amp.	2.15	27	.5	....	....	5.5	0	0
'27	1 A.F.	2.15	85	2.0†	....	....	5.5	2.5	4.0
'45	2 A.F.	2.2	250	41	....	....	....	28	33
'45	P.P.	2.2	250	41	....	....	....	28	33
'80	Rect.	4.5	....	....	....	....	....	43 per anode	

LV—115. Vol. Con. Max.

†Volume control off.

RADIOLA—MODEL 33

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'26	1 R.F.	1.4	127	8				5.5	14
'26	2 R.F.	1.45	126	8.5				5	15
'26	3 R.F.	1.45	126	8.5				5	15
'27	Det	2.1	26					1.5	1.5
'26	1 A.F.	1.4	121	8				4.5	11.5
'71-A	A.F.	4.7	135	29				17.5	22
'80	Rect	4.7						20	

LV—117 Vol. Con. Max

RADIOLA—MODEL 44

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.4	162	1.4	38		+1.5	1	1.75
'24	2 R.F.	2.3	155	1.3	39		+1.5	1.1	2
'24	Det	2.2	150	4.5	55		+6	2	2.2
'45	A.F.	2.4	215	6				29	32
'80	Rect	4.8						30	

LV—117 Vol. Con. Max

RADIOLA—MODEL 44 WITH INCREASED SCREEN BIAS VOLTAGE

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.15	155	1.2	40	.2	+1	1	2
'24	2 R.F.	2.15	155	1.2	40	.1	+1	1	2
'24	Det.	2.15	155	4.5	59	.4	+8	.5	2.5
'45	A.F.	2.25	220	5*	—	—	—	30	32
'80	Rect.	4.6	....	....	—	—	—	28 / 28	—

LV—114 High Tap Vol. Con. Max

*NOTE—This is not the true bias voltage, but the reading obtained at the socket due to series resistance.

RADIOLA—MODEL 46

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	[illegible]	160	1.4	37		+1.5	1	1.75
'24	2 R.F.	2.2	150	1.3	39		+1.5	1.1	2
'24	Det	2.2	150	4.6	56		+6.2	.2	2.2
'45	A.F.	2.4	217	6				27	30
'80	Rect	4.7						47.5	

LV—117 Vol. Con. Max

RADIOLA—MODEL 46 WITH INCREASED SCREEN BIAS VOLTAGE

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.1	145	1.6	54	.2	+2	1.5	2.5
'24	2 R.F.	2.1	145	1.6	54	.4	+2	1.6	2.8
'24	Det.	2.1	90	3	[illegible]	[illegible]	+4	.4	1.6
'45	A.F.	2.1	190	*8	....	....		25	27.5
'80	Rect.	4.2	....	....	....	....	....	40	....

LV—109 Vol. Con. Max

*Resistor in series with grid.

RADIOLA—MODEL 64

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	Coupler	2.4	124	2.5			—15	3.8	11.8
'27	R.F.	2.35	124	2.5		....	—15	3.8	7.2
'27	1 Det	2.4	75	9			+15	.2	2.2
'27	Osc.	2.4	140	7.5			—17	6.2	11
'27	1 I.F.	2.4	140	7.5			—17	6.2	7
'27	2 I.F.	2.4	70				—15	8.2	7.2
'27	2 Det	2.4	170	24			—14	....	9
'27	Vol Con	2.5	70	2					.8
'50	A.F.	7	356	65				53	65
'81	Rect	7.1						60	
'81	Rect	7.1						60	

LV—117 LVS—120 Vol. Con. Max

No Station tuned in

RADIOLA—MODEL 66

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	R.F.	2.3	70	1.5	....		—21	4	8.5
'27	Det.	2.3	65	—7	....		14	.4	2.5
'27	1 I.F.	2.3	70	3	....		—21	3.8	7.2
'27	2 I.F.	2.3	70	—3	....		—21	4	8
'27	Osc.	2.3	61	....	....			6	11
'27	2 Det.	2.25	210	27	....		—15	1	2
'45	A.F.	2.3	200	12*	....	....	....	27	30
'80	Rect.	4.6	....	....	....	....	....	50 / 50	

LV—114. High Tap. Vol. Con. Max.

*NOTE—This is not the true bias voltage, but the reading obtained at the socket due to series resistance.

R. C. A.—MODELS 47, 67

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2.4	125	3			—15	4.3	9.4
'27	1 Det	2.3	70	8	....		—14	6	3.1
'27	1 I.F.	2.4	135	6			—16	6.0	6.8
'27	2 I.F.	2.4	140	8		....	—17	6.0	6.8
'27	Osc.	2.3	68				—13	6.4	7.0
'27	2 Det	2.3	230	27	....		—14	.1	8
'27	Vol Cont.	2.3	65	2					
'50	A.F.	7.0	420	76				55	58
'81	Rect	7.0	....					63	
'81	Rect	7.0	....					63	

LV—116. Vol. Con. Max

R. C. A.—VICTOR THEREMIN

Tube Position	Type Tube	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.
1	'27	1.95	60.	11.5			0	7.1
2	'24	1.95	135.	11.5	10.2	0.1	0	0
3	'27	1.95	60	11.0			0	5.5
4*	'27	1.95	2 to 40	0			0	0 to 3.5
5*	'20	0	10 to 64	0				0.5 to 1.1
6*	'71-A	4.6	95.	30 to 31				12 to 17
7*	'71-A	4.6	140 to 145	25 to 30				26 to 30
Rect*	'80	4.6	....					26 to 31 per anode

* The range of variation of the readings taken on Radiotrons Nos. 4, 5, 6 and 7 is caused by a change in the resonance point of the volume control loop circuit. Any object (such as the measuring instrument cable, body of the operator, etc.) coming in proximity to this circuit will give the variations noted above.

LV—120 LVS—120.

SILVER 30 (Serial number above 12907)

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.2	142	1.0	60	0.6	1.0	2.6	3.2
'24	2 R.F.	2.2	140	1.4	58	0.6	1.4	2.3	3.1
'24	3 R.F.	2.2	140	1.2	58	0.6	1.2	3.2	4.2
'24	Det	2.2	55	5.4	40	0.1	10.0	0.2	0.4
'27	1 A.F.	2.3	176	0.0	....	....	12.0	6.5	8.6
'45	2 A.F.	2.3	205	40.0	....			28.0	32.0
'45	P.P.	2.3	205	40.0	....		....	28.0	32.0
'80	Rect.	4.3	....				....	41.0 per anode	

LV—114 Vol. Con. Max.

SILVER 43

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.4	152	1.5	64	0.8	1.7	4.5	5.5
'24	2 R.F.	2.4	145	2.0	64	0.8	2.0	3.6	5.1
'24	3 R.F.	2.4	148	2.0	64	0.7	2.0	3.3	5.0
'24	Det.	2.5	68	6.0	72	0.2	5.0	0.1	0.3
'27	1 A.F.	2.5	184	1.0			13.0	7.0	9.3
'45	2 A.F.	2.4	223	44.0				28.0	33.0
'45	P.P.	2.4	223	44.0				28.0	33.0
'80	Rect	4.4					....	43.0 per anode	

LV—117 Vol. Con. Max

SILVER—60, 95

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.3	140	1.2	60	.6	+2	2.5	3.5
'24	2 R.F.	2.3	135	1.2	60	.6	+2	2.4	3.4
'24	3 R.F.	2.3	135	1.2	60	.6	+2	2.5	3.4
'24	Det	2.3	60	3.8	40	.0	+6	0.1	0.2
'27	1 A.F.	2.3	180	1*			+11	5.6	7.0
'45	2 A.F.	2.3	210	40.0				29.0	33.0
'45	P.P.	2.3	210	40.0				29.0	33.0
'80	Rect	4.8						38.0 per anode	

LV—117 Vol. Con. Max

*Res. in grid.

SILVER 63

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.4	170	1.0	71	0.9	1.0	2.8	4.1
'24	2 R.F.	2.4	161	2.0	71	0.8	1.7	3.1	4.0
'24	3 R.F.	2.5	164	2.0	70	0.7	2.0	3.0	3.8
'24	Det.	2.5	76	7.0	69	0.2	7.0	0.1	0.5
'27	1 A.F.	2.4	196	1.0			14.0	7.8	9.2
'45	2 A.F.	2.5	225	44.0				30.0	33.0
'45	P.P.	2.4	225	44.0				30.0	33.0
'80	Rect.	4.5						42.0 per anode	

LV—117 Vol. Con. Max

SILVER MARSHALL—MODEL 30

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.25	142	—1	+60		+1	2.6	3.5
'24	2 R.F.	2.25	140	—1.4	+58		+1	2.3	3.3
'24	3 R.F.	2.25	140	—1.2	+58		+1.2	3.2	4.2
'24	Det.	2.25	55	—5.4	+30		+10	.2	.5
'27	1 A.F.	2.3	176				+12	6.5	8.7
'45	2 A.F.	2.3	205	—40				28	37
'45	P.P.	2.3	205	—40				28	37
'80	Rect	4.7							40

LV—114 Vol. Con. Max

NOTE.—These are lowest allowable values.

SILVERTONE MODEL 51—58 comb.

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2.0	110	9	....	....	+9	2.6	4.0
'26	2 R.F.	1.5	110	8	....	....	....	4.4	8.0
'26	3 R.F.	1.5	110	8	....	....	....	5.0	8.7
'27	Det.	2.0	45	....	....	....	0	3.0	3.1
'26	1 A.F.	1.5	110	7	....	....	....	5.0	7.8
'71A	2 A.F.	4.5	175	38	....	....	....	15.0	17.0
'71A	P.P.	4.5	175	38	....	....	....	15.0	17.0
'80	Rect.	4.5	....	....	....	....	....	35.0 per anode	

LV—118. Vol. Con. Max.

SILVERTONE 53—54—60

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2	105	7	....	....	+7	3.5	6.5
'27	2 R.F.	2	105	7	....	....	+7	3.5	6.6
'27	3 R.F.	2	105	7	....	....	+7	3.6	6.4
'27	4 R.F.	2	105	7		....	+7	3.0	6.0
'27	Det.	2	40	0		....	0	2.0	2.1
'27	1 A.F.	2	100	6		....	+6	3.0	4.5
'45	2 A.F.	2.1	180	30	....	....	....	22.0	25.0
'45	P.P.	2.1	180	30		....	....	22.0	25.0
'80	Rect	4.5	....					42.0 per anode	

LV—118 Vol. Con. Max

SILVERTONE 56

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	Det.	2.1	65	6.0	....	....	+6	0.5	1.0
'24	1 R.F.	2.1	150	2.6	70	.4	+3	1.0	1.5
'24	2 R.F.	2.1	150	2.6	70	.7	+3	1.0	1.5
'27	1 A.F.	2.1	135	9.0	....	....	+9	5.0	7.5
'45	2 A.F.	2.1	190	35.0	....	....	....	25.0	29.0
'45	P.P.	2.1	190	35.0		....		25.0	29.0
'80	Rect	4.5	....	....	....	....	....	37.0	

LV—118 Vol. Con. Max.

SLAGLE "STAR RAIDER"—MODEL 20—25—30—R. P. 40

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
484	1 R F	2 85	110	5	..	..	5	5	9.4
484	2 R F.	2 85	126	5	..	..	5	5 4	10.3
484	3 R F.	2 85	112	5	..	..	5	5	9.6
484	4 R F	2 85	126	5 5	..	..	5 5	4 9	6 8
484	5 R F	2 85	117	5 5	..	..	5 8	4 0	8 4
484	6 R F	2.85	120	5 5	..	..	5.5	4 1	6
484	Det	2.85	250	20	....	....	20	1 5	1 7
250 or 585	1 A F / P P.	7.2	360	66	....	....	....	38	45
		7 2	360	66	..	..	.	38	45
2-'81	Rect	7 2	..	..	..	..	..	55	..
4-'81	Rect	7 2	..	..	..	..	..	57	..

LVS—115. Vol. Con Max.

SPARTON—MODEL 110

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA
484	1 R.F.	2.6	145	4.5	....	....	+4.5	4	8
484	2 R.F.	2.6	150	4.5	....	....	+4.5	4.6	9
484	3 R.F.	2.6	145	4.5	....	....	+4.5	4	8
484	4 R.F.	2 6	148	4.5	....	....	+4.5	3.5	7
484	5 R.F	2.6	140	4.5	....	.	+4.5	4	8
484	Det	2.6	125	10	....	.	+10	.5	.7
2226	1 A.F.	1.25	20	.	..	....	..	8.5	11.5
2585	2 A.F	7.2	415	..	....	....	....	60	72
2281	Rect	7 2	....	..	....	.	..	80	..

LV—110 Vol Con. Max

SPARTON—MODEL 301

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
484	1 R.F	2 75	130	4	..	..	+4	3 5	6
484	2 R.F	2.75	130	4	..	..	+4	4	7.5
484	3 R.F.	2.75	128	4	..	..	+4	3 5	6
484	4 R.F.	2 75	130	4	....	....	+4	4.5	8
484	5 R F	2.75	125	4	..	..	+4	4	7.5
484	Det.	2.75	100	20	.	..	+20	.1	1.5
585	1 A.F.	7 0	380	..	..	..	..	40	45
585	P.P	7.0	380	..	..	..	..	40	45
281	Rect.	7.0	....	....	..	....	..	72.5	..
281	Rect.	7.0	..	..	..	..	.	72.5	

LV—117 Vol. Con. Max

SPARTON—MODEL 930

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
C-48	1 R.F.	2.8	100	3.5	..	....	+3.5	5	8.5
C-48	2 R.F.	2 8	115	3.5	....	....	+3.5	8.7	13.7
C-48	3 R.F.	2 8	115	3.5	....	....	+3.5	3.2	6.5
C-48	4 R F	2 8	113	3.5	....	....	+3.5	6.7	14.3
C-48	5 R F	2 8	115	3.5	....	....	+3.5	5 8	9.2
C-48	Det.	2.85	160	16	....	....	+16	1 2	3
182-P-80	A.F.	4.6	180	36	....	....	....	14	37
182-P-80	P.P	4 6	180	36	....	....	....	14	37
'80	Rect	4.6	....	....	....	..	....	39	

LV—114. LVS—110-120. Vol. Con. Max.

SPARTON—MODEL 931

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
484	1 R F.	2 6	155	5	....	....	+5	8.5	15.5
484	2 R F.	2.6	155	5	..	....	+5	8.5	15.5
484	3 R.F.	2.6	155	5	..	....	+5	7	12
484	4 R.F.	2.6	155	5	..	....	+5	10	18.5
484	5 R F.	2 6	150	5	.	....	+5	7.5	14
484	Det.	2.6	150	11	..	....	+11	.2	.5
182	1 A.F.	4 5	255	..	..	....	..	25	27.5
182	P.P.	4 5	255	.	..	....	....	25	27.5
280	Rect.	4.8	. . .		.		. . .	47	..

LV—117. Vol. Con. Max.

P. A. STARK PIANO CO.

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F.	2 05	164	....	60	....	1.3	2.4	3.6
'27	2 R F.	2.05	150	12.5	....	....	12.5	6.5	9.0
'27	3 R.F.	2.05	150	12.5	....	....	12.5	6.5	9.0
'27	Det.	2.05	53	....	....	..	....	6.8	7.0
'27	1 A.F.	2.05	144	12.3	....	....	12.3	5.7	7.8
'27	P.P.	2.05	144	12.3	....	....	12.3	5.7	7.8
'45	2 A F	2.3	245	40.0	....	....	....	27.5	32
'45	P.P.	2.3	245	40.0	..	....	....	27.5	32
'80	Rect.	4.4	.. ..	..	..	..	....	54	per anode

LV—110. Vol Con Max.

Dial Set at 535 K C

STEINITE—MODELS 70-80

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.4	226	.75	100	.4	+3.0	2.5	5.5
'24	2 R.F	2.4	210	3.1	98	.5	+3.1	3.4	6.0
'24	3 R.F.	2.4	205	3.9	98	.65	+4.5	3.0	6.3
'27	Det.	2.4	235	24.0	....	....	+44.0	1.3	1.6
'45	1 A F	2.5	230	45.0	....	....	....	32.5	37.0
'45	P P.	2.5	230	45.0	....	....	....	32.5	37.0
'80	Rect.	4.8	.....	....	....	....	....	42.0	per anode

LV—120. LVS—High. Vol. Con. Max.

STEWART WARNER—MODEL 900

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R F	2.2	145	10		..	+10	3.7	6 7
'27	2 R F	2 3	147	10		..	+10	4 7	8.0
'27	3 R F	2 2	147	10		..	+10	3 9	7 1
'27	Det.	2 2	30	..	.			1 8	2.0
'27	1 A F	2 2	140	8	.	.	1 8	4 5	5 7
'45	2 A.F	2 2	235	44				27.5	30.0
'45	P.P	2 2	235	44		..		32	35 0
80	Rect	4 6	.					47:5	

LV—109 Vol Con Max

STEWART-WARNER—MODEL 950 (60 CY.)

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.2	172	—1.6	72	.7	+1.5	2.5	4.0
'24	2 R F	2 2	170	—1.6	72	1.2	+1.5	4.25	5.7
'24	3 R F	2 15	170	—1 3	71	.6	+1.5	3.0	4.0
'27	Det	2.15	157	—13 0	..	..	+16	0 6	0.7
'27	1 A F.	2.2	170	—1.5	..	....	+11	4.7	5.7
'45	2 A F	2	233	—40 0	..	..	..	26.0	29.0
'45	P P	2	235	—40 0	..	..	..	27.0	30.0
'80	Rect.	4.6	..		....	....	..	52.5	per anode

LV—107. Vol. Con Max.

STEWART WARNER SERIES 950

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.3	166	1.5	78	0.8	—1.3	3.9	7.2
'24	2 R.F.	2.3	168	2.0	75	0.8	—2.0	5.9	9.6
'24	3 R F.	2.3	167	2.0	75	0.8	—2.0	6.2	9.8
'27	Det.	2.3	180	18.5	....	..	—20.0	0.6	0 6
'27	1 A.F.	2.3	182	2.5	....	....	—13.5	5.8	6.8
'45	2 A.F	2.3	260	46.0	....	....	....	24.0	28.0
'45	P P.	2.3	260	46.0	..	.	..	27 0	31 0
'80	Rect	4.6	.....	....	....	..	..	.	.

LV—115 Vol. Con. Max.

STROMBERG CARLSON—MODEL 638-A

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2 1	90	4		..	+4	2 5	3
'27	2 R F	2 1	90	4		..	+4	2.8	4.3
'27	3 R F	2 1	90	4		..	+5	3.5	5.4
'27	Det.	2	35	..				2	1 5
'27	1 A F	2	80	4	..		+4	3.5	4.5
'71A	2 A F.	4.4	155	30	.	.	..	22	40
'71A	P.P.	4.4	155	30	..	..	..	22	40
'80	Rect.	4 4	...	...	..	..	..	37	

LV—117 LVS—HI Vol Con. Max.

STROMBERG-CARLSON—MODEL 641 & 642

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.25	125	2.5	54	.1	+2.5	75	2.2
'24	2 R.F.	2.25	125	2.8	54	.1	+2.5	1	3
'24	3 R.F.	2.25	130	2	58	.4	+1	2	3
'27	Det.	2.2	230	—2*	....	....	+27	1.8	2
'45	A.F.	2.2	230	40	....	....	....	32.5	32
'80	Rect.	4.4	.....	....	....	....	....	{27 / 27	.... / ....

LV—115. High Tap Vol. Con. Max.

*NOTE—This is not the true bias voltage, but the reading obtained at the socket due to series resistance.

STROMBERG-CARLSON 652

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F	2.2	130	2.4	57	0.2	+3	0.7	2.0
'24	2 R F	2.2	130	2.4	57	0.2	+3	0.6	2.0
'24	3 R.F.	2.2	135	2.3	60	0.2	+3	0.6	1.8
'27	Det.	2 3	250	9.0*	....	....	+25	1.6	1.8
'45	A.F.	2.3	240	41.0	..	..	....	32.0	35.0
'80	Rect	4.4	.. ..	..	....	.	..	45.0	per anode

LV—118. LVS—High. Vol. Con. Max.

* Resistor in grid circuit

STROMBERG CARLSON—MODEL 846

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.4	150	.2	58	.8	+3	2.4	3.6
'24	2 R.F.	2.4	150	.3	58	.8	+3	2.5	3.7
'24	3 R.F.	2.4	155	.7	60	.6	+3	1.7	4.0
'27	Det.	2.1	220	22	....	....	+22	.1	.2
'27	1 A.F.	2.1	110	6	..	....	+7	4.4	6.3
'27	Vol. Contr.	2.5	25	2	....	....	—50	..	....
'45	2 A.F.	2.5	270	50	....	..	....	35	40
'45	P.P	2.5	270	50	....	....	....	35	40
'80	Rect. Fil	5.0	.....	....	....	....	....	50	....
'80	Rect. Sglr.	5.0	.....	....	....	....	....	17	....

LV—120. LVS—High. Vol. Con. Max.

TEMPLE—MODEL 860, 880, 890

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'27	1 R.F.	2.05	100	5	.	.	+5	3.8	5.5
'27	2 R.F	2.05	100	5	.	.	+5	4	6
'27	3 R.F.	2.05	100	5	....	.	+5	4.2	6
'27	4 R.F.	2.05	100	5			+5	4	5.7
'27	Det.	2.05	35	..	..	..	.	2.4	2.5
'27	1 A.F.	2 1	115	7	....	.	+7	4.2	5.7
'45	2 A.F.	2.4	190	38	....		..	27.5	30
'45	P.P.	2.4	190	38	....		..	27.5	30
'80	Rect.	4.8	.....	....	....	..	..	40	.

LV—109 Vol. Con. Max.

VICTOR—MODEL R. E.-45, R-32

Type Tube	Position of Tube	"A" Volts	"B" Volts	"C" Volts	Normal MA.	Grid Test	Screen Grid	Cathode Volts
'26	1 R.F.	1.3	105	9	3.9	7.3	..	....
'26	2 R.F.	1.3	105	9	3.9	7.3	....	....
'26	3 R.F.	1.3	105	9	3.9	7.3	....	....
'26	4 R.F.	1.3	105	9	3.9	7.3	....	..
'26	5 R.F.	1.3	105	9	3.9	7.3	....	..
'27	Det.	2.1	40	....	3	3.4	....	....
'26	1 A.F.	1.3	100	6	4.5	7.4	....	....
'45	2 A.F.	2.1	230	40	37	41	....	....
'45	P.P.							
80	Rect.	4.4	.....	....	57	....	....	....

LV—110. Volume Control Max.

ZENITH—MODEL 41

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R F.	1.95	200	2	98	...	+2	3	4
'27	2 R.F	2	95	4.5	....	....	+4.5	4	7.1
'27	3 R.F.	2	95	4.5	....	....	+4.5	4	7.1
'27	Det.	1.95	38	.	..	..	..	2.1	2.3
'27	1 A.F.	2	89	4 5	.	.	4 5	3	4.3
'71A	2 A.F.	4 2	145	29	..	..	..	14.5	15.5
'80	Rect.	4.1	.. ..	..	..	..	..	7.8	....

LV—110 Vol. Con Max

ZENITH—MODEL 42

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	1.90	214	3	94	....	+2.2	3.4	5.7
'27	2 R F	1 90	80	4	.	....	+4	3.5	6.5
'27	3 R.F.	1.90	85	4		..	+4	3.5	6.5
'27	Det.	1 90	35	.	.	.	....	2.2	2.7
'27	1 A.F.	1.90	78	4	.	....	+4	2.5	3.8
'10	2 A.F.	6.5	420	31	.	..	....	20	22 5
'81	Rect	6 9			..	....	....	31	
'81					..	..	....		

LV—115 Vol Con Max

ZENITH—MODEL 52-53-54-55

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2 3	173	1	54	.3	2	2	3.9
'24	2 R.F.	2.3	173	2	54	.3	2	2.2	3.9
'24	Det.	2.3	85	4	36	....	5	....	.5
'27	1 A.F.	2.3	55	1.5	....	....	4	1.2	1.5
'27	2 A.F.	2.3	153	13	....	....	13.5	3.4	5
'27	P.P.	2.3	153	13	....	....	13.5	3.4	5
'45	3 A.F.	2.1	250	49	..	....	....	23	27.5
'4*	P.P.	2.1	250	49	....	....	....	23	27.5

LV—116. LVS—120. Vol. Con. Max.

ZENITH 71, 72, 73, 77—60 CYCLES 712, 722, 732, 772—25 CYCLES

Type Tube	Tube Position	"A" Vts.	"B" Vts.	"C" Vts.	Screen Vts.	Screen Current	Cath. Vts.	Nor'l MA.	Grid Test MA.
'24	1 R.F.	2.5	175	2	55	....	2	2.0	3.1
'24	2 R.F.	2.5	175	3	55	....	2	2.0	3 1
'24	Det.	2.5	85	4	*	....	2.5	0.2	4
'27	1 A.F.	2.5	60	2	....	....	5	1.5	3 4
'27	2 A.F.	2.5	150	12	....	....	13	3.5	5.2
'27	P.P.	2.5	150	12	....	....	13	3.5	5.2
'45	3 A.F.	2.4	250	52	....	....	....	40.0	44
'45	P.P.	2.4	250	52	....	....	....	40.0	44

LV—120. LVS—120. Vol. Con. Max.

Actual voltage same as on R.F. plates, but cannot be measured unless Electrostatic voltmeter is used.

AMPERITE LINE VOLTAGE CONTROLS FOR STANDARD RECEIVERS

SET	USE AMPERITE
ACME	
Models—	Amperite
77	8-A-5
88	9-A-5
AC-7	6-A-5
AMRAD	
Models—	Amperite
84B; 84C; 84D	9-A-5
81	10-A-5
70	8-A-5
APEX	
Models—	Amperite
10; 11; R-1; R-2	8-A-5
115; 140; 240	8-A-5
28; 31; 37	8-A-5
46; 47; 48; 49	8-A-5
ATWATER-KENT	
Models—	Amperite
70; 74; 75; 76	9-A-5
55; 1055	7-A-5
60; 1060	8-A-5
46; 53	6-A-5
56; 57; 40; 37	5-A-5
AUDIOLA	
Models—	Amperite
60; 70; 80	9-A-5
733C; 8430	9-A-5
829; 929	8-A-5
BALDWIN	
Models—	Amperite
50; 70	5-A-5
80	6-A-5
BALKEIT	
Models—	Amperite
C	9-A-5
F	8-A-5
BALKITE	
Models—	Amperite
S. G. &	12-A-5
A-3; A-7	7-A-5
B-7; B-9	12-A-5
BOSCH	
Models—	Amperite
58-A; 58-B	9-A-5
60-D; 60-E; 62-C	10-A-5
48 Series; all models	9-A-5
49	9-A-5
38 Series	5-A-5
29 Series	6-A-5
28 Series	4-A-5
66; 96; 116	5-A-5
136; 146	5-A-5
126; 166; 176; 107	5-A-5
BREMER TULLY	
Models—	Amperite
S-81; S-82	9-20*
81; 82	9-A-5
8-20; 8-21	9-A-5
6-40; 6-41; 7-70; 7-71	5-A-5
BR. — DRAKE	
Models—	Amperite
60 Series	8-A-5
70; 70-R; 71; 71-R	9-A-5
53; 54; 56; 57	11-A-5
34; 36; 46	8-A-5
BRUNSWICK	
Models—	Amperite
15; 22; 42	7-A-5
S-14; S-21; S-31	9-20*
14; 21; 31	9-20*
BUCKINGHAM	
Models—	Amperite
1; 2; 3; 4; 80	8-A-5
80-SG	10-A-5
BUSH & LANE	
Models—	Amperite
55; 75; New	9-10*
20; 21; 30; 32; 34	8-A-5
40; 50; 60; 70; 90	8-A-5
9-K; 10-K; 11-K	8-A-5
12-K; 172	8-A-5
CLARION	
Models—	Amperite
AC-51; AC-53; AC-55	10-10*
CLEARTONE	
Models—	Amperite
112 All Models	8-A-5
COLONIAL	
Models—	Amperite
31-AC; 32-AC	8-A-5
33-AC; 34-AC	8-A-5
COLUMBIA	
Models—	Amperite
SG-8; 940	8-A-5
C-1; C-3	5-A-5
C-2; C-4	10-A-5
C-20; C-21	11-A-5
COURIER	
Models—	Amperite
65; 65-1; 65-2; 65-3	7-A-5
CROSLEY	
Models—	Amperite
53; 54	6-A-5
77	10-A-5
84	11-A-5
70-S	5-A-5
30-S; 31-S; 32-S; 34-S	9-A-5
30; 31; 32; 40; 41	5-A-5
40-S; 41-S; 42-S; 82-S	9-A-5
41-A; 42; 82	7-A-5
609; 610; 704	5-A-5
706; 708	5-A-5
804	6-A-5
DAYFAN	
Models—	Amperite
90; 91; 93; 94	9-A-5
66; 68; 69; 72	6-A-5
80; 81; 82; 83	6-A-5
25; 26; 27; 28	6-A-5
43; 48; 54; 56	6-A-5
EARL	
Models—	Amperite
21; 22	5-A-5
31-S; 32-S; 33-S	10-A-5
31; 34	6-A-5
32; 41	10-A-5
EDISON	
Models—	Amperite
R-6; R-7	13-A-5
R-1; R-2	10-A-5
R-4; R-5	9-A-5
EMERSON	
Models—	Amperite
E-3; F-3; G-3	7-A-5
ERLA	
Models—	Amperite
34; 36; 38; 37	9-A-5
30; 31; 32	9-A-5
S-52 R	9-A-5
S-61 R	10-A-5
71; 72; 73	8-A-5
EVEREADY	
Models—	Amperite
52; 53; 54	8-A-5
42; 43; 44	8-A-5
31; 32; 33; 34	7-A-5
FADA	
Models—	Amperite
40; 41; 42	9-A-5
44; 46	9-A-5
20; 20-Z	7-A-5
75; 77	10-A-5
25; 25-Z	9-A-5
16; 17; 32	6-A-5
10; 11; 31	5-A-5
71; 72; 50-E-420	11-A-5
70-E-420	11-A-5
50-E-180; 70-E-180	10-A-5
FALCK	
Models—	Amperite
23; 26; 27	6-A-5
FEDERAL	
Models—	Amperite
Type "M"	8-A-5
Type "K"	5-A-5
Type "L"	8-A-5
FREED-EISEMAN	
Models—	Amperite
NR-55; NR-56	5-A-5
NR-78-AC	6-A-5
NR-79-AC	8-A-5
NR-85; NR-85	9-A-5
NR-80; NR-80W	5-A-5
FRENCH, JESSE	
Models—	Amperite
All Models	9-A-5
FRESHMAN	
Models—	Amperite
N-14; N-17; N-12	9-A-5
G-2; G-3; G-4; G-5	6-A-5
G-6; 3-Q; 3-QD	6-A-5
"K"; "M"; M-11	6-A-5
Q-16; QD-16	6-A-5
GENERAL ELEC.	
Models—	Amperite
31; 51	9-V-10 or 8-A-5
Combination	9-V-10 or 8-A-5
7 Tube T.R.F.	
GEN. MOTORS	
Models—	Amperite
120; 130; 140	10-A-5
150; 160	10-A-5
GILBERT	
Models—	Amperite
69	6-A-5
GILFILLAN	
Models—	Amperite
105; 106	7-A-5
100; 101; 102; 103	9-A-5
33; 44; 66; 77	9-A-5
GRAYBAR	
Models—	Amperite
700; 770	9-V-10 or 8-A-5
900	9-V-10 or 8-A-5
330; 340	9-A-5
500; 550; 520-L	5-A-5
GREBE	
Models—	Amperite
160; 18950; 225; 265	9-A-5
285	9-A-5
21950-A; 270-A	10-20*
270-C	10-20*
285-A; 450-A	10-20*
6; 7	5-A-5
GULBRANSEN	
Models—	Amperite
291; 292; 200; 9950	7-A-5
290; 295; 296; 297	7-A-5
161	8-A-5
HAMM.-ROBERTS	
Models—	Amperite
Hi Q-31	10-10*
Hi Q-30	11-20*
Hi Q-29	6-A-5
H F L	
Models—	Amperite
Mastertone	14-20*
Isatone	8-A-5
HOWARD	
Models—	Amperite
Nutro-Models	8-A-5
S. G. A.-Models	8-A-5
KELLOG	
Models—	Amperite
523; 526; 533; 534	10-A-5
524; 527	8-A-5 (use 2)
514; 516; 517; 518	5-A-5
515; 519; 520; 521	5-A-5
510; 511; 512	5-A-5
KEMPER	
Models—	Amperite
S. G. 7; S. G. 71	6-A-5
KENNEDY	
Models—	Amperite
426; 526; 626	9-10*
726; 826	9-10*
632; 1030	9-10*
210; 310; 220; 320	9-A-5
60; 70; 80	7-A-5
KING	
Models—	Amperite
100; 101; 109	5-A-5
218 Chassis	8-A-5
Royal; Monarch	7-A-5
H. K.; J. K.	6-A-5
KNIGHT	
Models—	Amperite
8 Tube Sc. Grid	8-A-5
9 Tube Sc. Grid	9-A-5
6-7	5-A-5
8-9 all Models	7-A-5
KOLSTER	
Models—	Amperite
K-43; K-23	9-A-5
K-20; K-21; K-22	6-A-5
K-25	6-A-5
K-24	10-A-5
6-K; 6-J; 6-R	7-A-5
6-H; K-44	13-A-5
KYLECTRON	
Models—	Amperite
K-71; K-72	11-20*
LAFAYETTE	
Models—	Amperite
Duo-Symphonic	8-A-5
Pre-Selector	7-A-5
Challenger	7-A-5
LEUTZ, C. R.	
Models—	Amperite
Seven Seas	10-A-5 (use 2)
Silver Ghost	11-A-5 (use 2)
LINCOLN	
Models—	Amperite
De Luxe 10-all Models	9-A-5
LYRIC	
Models—	Amperite
D-11; D-19; D-29; D-39	8-A-5
H-19; H-29; H-89	9-A-5
93; 95	10-A-5
60; 61; 62; 65; 66	6-A-5
80; 83; 84; 85	7-A-5
86; 88	7-A-5
MAJESTIC	
Models—	Amperite
130; 131; 132	11-A-5
91; 92; 93	7-A-5 (use 2)
90	12-A-5
71; 72	12-A-5
MASTER	
Models—	Amperite
70; 50; Console	7-A-5
Mc MILLAN	
Models—	Amperite
995-S; 969-S; 959-S	9-A-5
959; 965; 975; 999	8-A-5
925; 935; 937	8-A-5
8; 8-Y; 185; 186	7-A-5
MIDWEST RADIO	
Models—	Amperite
A; B; H; J;	8-A-5
K; L; M; AC-9	8-A-5
MINUET	
Models—	Amperite
30; 31; 32 33; 34	8-A-5
35; 38	8-A-5
NATIONAL TRAN.	
Models—	Amperite
Air Knight; Admiral	10-20*
Asonian; Crown;	10-20*
Electra	10-20
La Paer; Melotrope	10-20*
National; Windsor	10-20*
NAVIGATOR	
Models—	Amperite
AC-98; AC-9960	8-A-5
AC-9970	8-A-5
AC-9980; AC-9990	8-A-5
AC-99100	8-A-5
AC-66	7-A-5
50; 60	6-A-5
NORDEN-HAUCK	
Models—	Amperite
Short Wave DX-5	7-A-5
Admiralty	11-20 (use 2)
ORPHEUS	
Models—	Amperite
82	9-A-5
52; 62	8-A-5
PATTERSON	
Models—	Amperite
6-59; 6-69	7-A-5
7-69; 7-79	8-A-5
PEERLESS	
Models—	Amperite
23; 25	11-20*
21; 22; 24	11-20*
PHILCO	
Models—	Amperite
77; 77-A; 296	8-A-5
76; 65; 87	8-A-5
92; 95; 96	8-A-5
62; 82; 83; 86	7-A-5
511; 512; 513; 514	5-A-5
515	5-A-5
521; 522; 523; 524	5-A-5
525; 531; 551; 561	5-A-5
PIERCE-AIRO	
Models—	Amperite
S.G.-724; AC-725	8-A-5
524	5-A-5
RADIETTE	
Models—	Amperite
F	6-A-5
PIONEER	
Models—	Amperite
All Models	11-20*
RADIOLA	
Models—	Amperite
80; 82	9-V-10 or 8-A-5
86	9-V-10 or 8-A-5
42; 46 A.C.	8-A-5
60; 62; 66	8-A-5
RANGER	
Models—	Amperite
44; 45; 48	8-A-5
REPUBLIC	
Models—	Amperite
31; 1 P. C.	5-A-5
SARGENT	
Models—	Amperite
7-10	10-A-5
SCOTT	
Models—	Amperite
AC-10 All Models	12-20*
SENTINEL	
Models—	Amperite
11; 12; 15; 18	10-10*
104 Chassis	10-10*
444; 445; 555	8-A-5
666; 8; 9	9-A-5
666-C	10-A-5
SILVER-MARSH.	
Models—	Amperite
Type 34 Chassis	7-A-5
Type 35 Chassis	8-A-5
60-B; 75-B; B-Highboy	10-25*
60; 75; 95	10-25*
30; 30-B	10-25*
722; 735	7-A-5
SIMPLEX	
Models—	Amperite
All Models except H	8-A-5
H	6-A-5
SONORA	
Models—	Amperite
A-31; A-33; A-35	10-A-5
A-30; A-32; A-36	12-A-5
A-40	12-A-5
SPARTON	
Models—	Amperite
589; 600; 610; 620	11-A-5
591; 593; 930; 931	10-A-5
740; 750	8-A-5 (use 2)
109; 301	9-A-5 (use 2)
110; 114	10-A-5 (use 2)
SPLITDORF	
Models—	Amperite
Warwick; Avon	8-A-5
Lorenzo ;Winthrop	8-A-5
Salem; Como; Devon	9-A-5
STAR-RAIDER	
Models—	Amperite
R-20; R-30	18-10 (use 2)*
RP-40	18-10 (use 2)*
Tuner	6H-20*
STEINITE	
Models—	Amperite
80; 95; 70; 105; 100	7-A-5
45; 40; 60	10-A-5
50; 102	8-A-5 (use 2)
261; 262; 263	6-A-5
264; 265; 266	6-A-5
STERLING	
Models—	Amperite
A-260; A-360; B-260	9-A-5
C; E	7-A-5
F	5-A-5
STEWART WARN.	
Models—	Amperite
Series 100	10-A-5
Series 950	10-A-5
900; 901; 902; 903	12-A-5
911; 912; 913	12-A-5
951; 952; 953	12-A-5
801-B; 802-B; 811-B	5-A-5
812-B	5-A-5
STORY & CLARK	
Models—	Amperite
36; 43; 50; 51	10-A-5
STROMBERG CA.	
Models—	Amperite
10; 11; 10-A; 11-A	10-A-5
12; 14; 846	12-A-5
641; 652	6-A-5
642; 654	8-A-5
TEMPLE	
Models—	Amperite
8-60; 8-80; 8-90	8-A-5
8-61; 8-81; 8-91	8-A-5
6-60	9-A-5
TYRMAN	
Models—	Amperite
80	10-A-5
72-AC	9-A-5
VICTOR	
Models—	Amperite
R-35; R-39	9-V-10 or 8-A-5
RE-57	9-V-10 or 8-A-5
R-32; R-52	10-V-10 or 9-A-5
RE-45	10-V-10 or 9-A-5
RE-75; RE-154	10-A-5
RE-156	10-A-5
WESTINGHOUSE	
Models—	Amperite
WR-5	9-V-10 or 8-A-5
WR-6; WR-7	9-V-10 or 8-A-5
WR-4	
WORK-RITE	
Models—	Amperite
33; 35; 37; 39; 40	6-A-5
18; 28; 38; 58	5-A-5
ZENITH	
Models—	Amperite
70 Series	10-A-5
60; 61; 62; 64; 67	12-A-5
602; 612; 622	12-A-5
642; 672	12-A-5
34-P; 342-P	10-A-5
35-P; 352-P	10-A-5
35-PX; 352-PX	11-A-5
35-APX; 352-APX	11-A-5
35; 35-A; 352	7-A-5
352-A; 33-X	7-A-5
52; 53; 54; 57; 522	10-A-5
14; 33; 342; 362	7-A-5

Note: Models indicated by * mark following the Amperite do not require the mounting socket. Their chassis provide a socket for Amperite.

RADIO SERVICE OSCILLATOR No. H23618

(Courtesy Canadian Westinghouse)

ELECTRICAL CONSTRUCTION.

The filament heating transformer used is a standard push-pull output choke coil with two additional windings wound on top of the standard coil to secure 1.8 volts, .06 amperes, for the filament of the oscillator radiotron, and 3.2 volts, .06 amperes to light the filaments of the two rectifier radiotrons which are connected in series for convenience. The details of the filament heating transformer are as follows:

The primary consists of 8000 turns of No. 40 enamelled copper wire. The 3.2 volt secondary consists of 335 turns of No. 29 enamelled copper wire. The 1.8 volt secondary consists of 180 turns of No. 29 enamelled copper wire. Standard silicon steel audio transformer punchings are used to give a core area of about 2/10th of 1 square inch cross section.

The radiotrons used are all of the UX-230 type. This tube is used on account of its extreme ruggedness, its low filament consumption and its ability to operate on widely varying voltages. The radiotron UX-230 in the oscillator circuit used will operate with a filament voltage anywhere from 1.5 to 2.2A and still give satisfactory service and life. One radiotron is used as an oscillator, the other two are used as rectifiers by connecting the grid and plate of each tube together.

The value of the condenser C1, when the oscillator is going to be used most of the time on 60 cycle, is .1 MFD. When the oscillator is going to be used mostly on 25 cycle it is marked 25 cycle and the value of the .2 MFD is used for the condenser C1. The value of the condenser C1 is not critical as either the 25 cycle oscillator or the 60 cycle oscillator may be used on either 25 or 60 cycle supply line, the only difference being that the percentage modulation will change if the oscillator is used on the different frequencies.

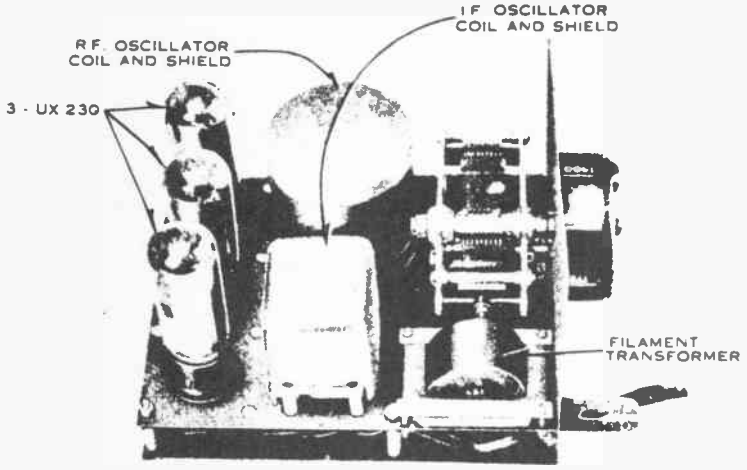


Fig. 4. Interior View.

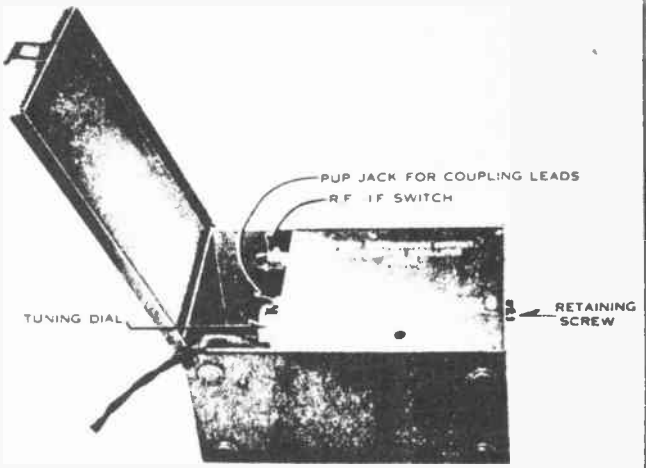


Fig. 5. Oscillator Ready For Use.

Referring to the circuit diagram, Fig. 3 of the oscillator S No. H-23618 it will be seen that two oscillating circuits may be used by throwing a 3 pole double throw switch from one side to the other. With the switch thrown to one side, the intermediate frequency oscillator coil is connected to the condensers C2 and C3, in series to form an oscillating circuit. With the switch thrown in the opposite position a radio frequency oscillator coil is connected to the condenser C2, also an auxiliary contact on the switch short circuits the condenser C3 so that the condenser C2 only, tunes the RF-oscillator coil.

It will be noted that the condenser C2 which is a .00035 MFD condenser has neither the rotor nor the stator grounded as this is not desirable in this type of circuit. The condenser is therefore mounted with insulating washers and a bakelite shaft is used to minimize hand capacity effect. On the RF side the frequency range is from 550 kilocycles to 1400 kilocycles. Calibration points are marked approximately at 1400 and 550 kilocycles. On the IF side the range is approximately from 150 to 200 kilocycles, calibration points at 180 kilocycles and 175 kilocycles.

The RF oscillator coil consists of 87½ turns of .0089 enamelled copper wire wound with a centre tap on a micarta tube 1 3/16" long and 1½ inches outside diameter. The pick-up winding is a coil about 1" diameter consisting of 275 turns .005 insulated wire. This complete RF coil is mounted in a copper shield.

The IF oscillator coil consists of a standard intermediate frequency transformer as used on Model No. 110 set except that only one of the adjustable condensers is used, the primary tuning condenser is removed and the primary winding is used as the pick-up winding. This is mounted in a standard metal container in the usual way.

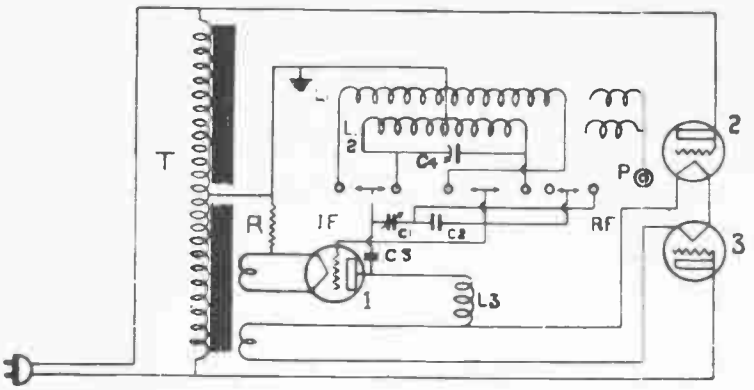


Fig. 3. Schematic Circuit Diagram R.S. Oscillator H23618

Key To Circuit Diagram

R Grid Bias Resistor 3,000 ohms.
L1 I.F. Oscillator Coil and Pick-up Winding.
L2 R.F. Oscillator Coil and Pick-up Winding.
L3 R.F. Choke Coil.
C1 Tuning Condenser .00035 MFD
C2 I.F. Series Condenser 100 MMF
C3 Filter Condenser (25 cycle .2 Mfd) (60 cycle .1 Mfd).
C4 I.F. Calibrating Condenser.
P Pup Jack for coupling leads.
I.F.-R.F. 3 pole double throw switch.
T Filament transformer (approx. .5 Watt).
Radiotron No. 1—Oscillator UX-230.
Radiotron No. 3 and No. 2—Rectifiers UX-230.

MECHANICAL CONSTRUCTION

Figure No. 4 shows the general mechanical details of the oscillator. All of the parts are assembled on a sheet metal frame with all wiring and small parts on the upper side of this frame. This frame is secured to a metal panel. This complete assembly is supported in the metal container by two pivot screws and one retaining screw. To remove the assembly in order to replace a radiotron, it is merely necessary to unscrew the retaining screw shown in Figure No. 5, lift up on the thumb nut on top of the panel just above the retaining screw and the whole assembly will pivot from the rear around the two pivot screws and when in an upright position the assembly may be removed entirely from the metal container.

ADDITIONAL EQUIPMENT REQUIRED:

For performing the various adjustments described hereafter, the following additional pieces of equipment will be required.

(a) **Dummy Antenna.** The purpose of the dummy antenna is to simulate the electrical characteristics of the average broadcast receiver antenna. That is, the dummy antenna should possess inductance, capacity and resistance, the same as an ordinary antenna but should have no pickup ability. By means of this dummy antenna the desired signal from the local oscillator may be fed into the radio receiver and extraneous signals from local broadcasting stations or electrical interference eliminated during the period of the test. The electrical characteristics of such a dummy antenna should be 25 microhenries inductance, 25 ohms resistance and 200 micro-microfarads capacity.

A simple dummy antenna of convenient design is illustrated in Figure No. 6. The dummy antenna shown is wound with resistance wire on a micarta tube, the winding serving both as a resistance and an inductance. If resistance wire is not available to wind the coil, it may be wound with the same size copper wire and a resistor added in series. This resistor should be non-inductive, and may be mounted inside the micarta tube. One-half of a standard 60 ohm filament centre tapped resistor is quite satisfactory.

(b) **Coupling Lead.** When it is desired to feed a signal of varying strength from the oscillator into the radio set, a coupling lead should be used. This coupling lead should consist of approximately 4 ft. of flexible insulated wire with a phone tip on one end and a blind coil of three or four turns on the other end. This blind coil should be formed by making a loop of three or four turns of the same insulated wire, leaving the actual end of the wire unconnected. This loop should be about 2½" in diameter and should be held in shape by means of tape or string and covered with shellac.

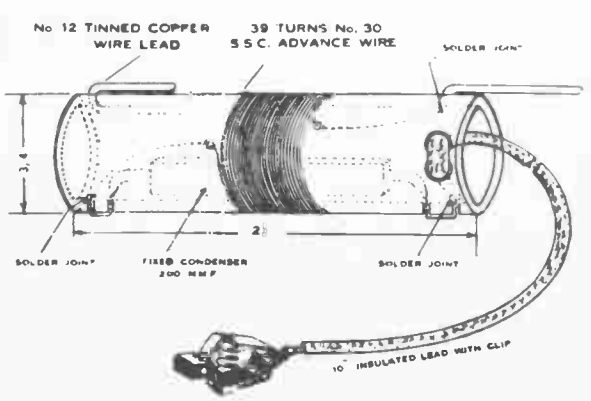


Fig. 6. Dummy Antenna.

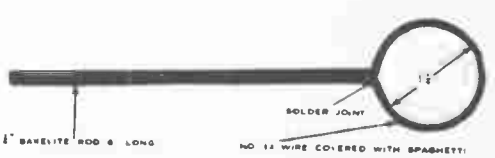


Fig. 7. Balancing Ring.

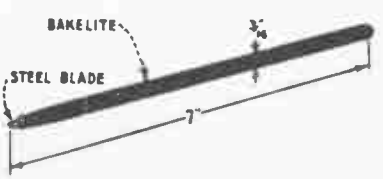


Fig. 8. Dimensions of Non-metallic Screw Driver.

(c) **Clip Lead.** When it is desired to feed a very strong signal from the oscillator into some portion of the radio set under test a clip lead should be used. This lead consists of approximately thirty inches of flexible insulated wire, having a phone tip on one end and a Pee-Wee clip on the other.

(d) **Neutralizing Screw Driver.** Except where the screws of the adjustable trimming, neutralizing, compensating condensers, etc., are at ground potential, (these screws are at ground potential when they make a metallic contact to the metal frame of the radio set), a special neutralizing screw driver is required. On most Westinghouse sets standard slot-headed screws are used in the adjustable condensers. The screw driver illustrated in Figure No. 8 is therefore the type that is required. In a few Westinghouse sets a special hexagon head unslotted screw is used in the adjustable condensers. In this case a special bakelite or fibre hexagon socket wrench should be used.

(e) **Output Meters.** Any of the standard forms of output meters may be used with radio service oscillator S No. H-23618. It is more convenient however as a rule for the service man to use the ordinary A.C. voltmeter that is included in most set testers. In receiving sets using dynamic speakers having output transformers with a step down ratio of approximately 20 to 1, the 4 volt scale of the meter in common use serves excellently as an output meter when connected across the terminals of the loud speaker cone coil. The lead from the cone coil terminals to the cone coil may be left connected or disconnected, as desired. In other radio sets not having step down transformers of ratio approximately 20 to 1, the ten or fifteen volt scale of the A.C. voltmeter in common use may be used. In this case the connection should be made across the loud speaker input terminals or across the primary of the output transformer of the radio set under test and a very weak signal used.

(f) **Balancing Ring.** In lining up the gang condensers of most radio frequency sets, it is useful to have a balancing ring of the type illustrated in Figure No. 7. The purpose of the balancing ring is as follows:

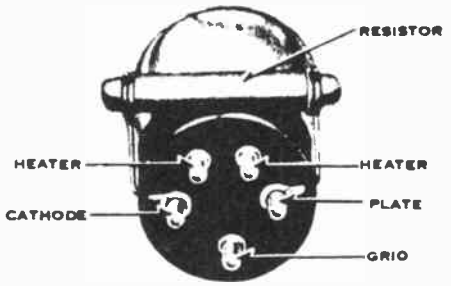


Fig. 9. Dummy Automatic Volume Control Radiotron.

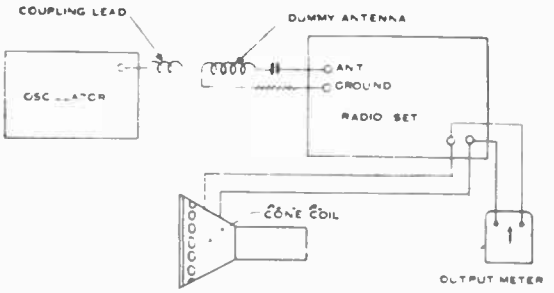


Fig. 10. Hook-up of Oscillator, Radio Set, Dummy Set, Dummy Antenna and Output Meter.

If the balancing ring is placed so that the ring is around one of the radio frequency coils, or the ring is flat against the end of the coil, it will act as a short circuited turn and decrease the inductance of the coil. By using the ring in this way, as described further on, a check may be made to see whether one of the gang condenser sections needs to be decreased in capacity.

(g) **Dummy Radiotron.** For neutralizing purposes a dummy radiotron will be required. This consists of a standard radiotron of the type normally used in the radio set being neutralized, but having one filament or heater prong cut off. A burnt-out or shorted radiotron should not be used for this purpose.

(h) **Dummy Automatic Volume Control Radiotron.** In radio sets similar to the Westinghouse Model No. 110 having an automatic volume control radiotron which is coupled to the power detector radiotron through a coupling condenser, difficulty is sometimes experienced in securing a sufficiently weak signal for balancing purposes. In most sets when the signal used for test purposes is so great that the output meter goes off scale it is merely necessary to decrease the sensitivity of the receiver by turning back the volume control. The best way of course to reduce the signal to a convenient value is to move the test oscillator and coupling lead farther away from the dummy antenna, but sometimes with a sensitive receiver, this method does not decrease the signal strength sufficiently.

In sets having an automatic volume control it is not satisfactory to reduce the sensitivity of receiver during adjustment by turning back the volume control as then the automatic volume control radiotron tends to keep the output of the radio receiver constant in spite of the various adjustments that are being made.

To reduce the sensitivity of a receiver having an automatic volume control radiotron without throwing any of the tuned circuits out of resonance, a dummy automatic volume control radiotron may be used.

PHONO-RADIO INSTALLATION

When phonograph equipment is to be placed in a phono-radio console, the installation should be of a permanent nature. For this purpose, the circuit shown in Fig. 1 is recommended as the best possible method of permanently connecting phonograph equipment to our chassis.

The circuit consists of a pickup connected in the grid circuit of the first audio tube through a transformer. The transformer is necessary so that sufficient volume may be obtained on phonograph reproduction. Two single pole single throw toggle switches are connected together so that they form a single pole double throw switch, and are used to change from phonograph reproduction to radio reception. A special adapter is used to connect the equipment in the grid circuit of the first audio tube.

If the pickup used has a self-contained volume control, no other control is necessary. If the pickup used has no control, it will be necessary to use a separate variable resistor as a volume control.

The volume control system shown in Fig. 1 is recommended. For a medium impedance pickup (see below) the resistor may have a value of 25,000 to 35,000 ohms. This resistor should be of the potentiometer type, and is connected as shown in the diagram so that the resistance across the pickup will remain constant and the characteristics of the pickup will not be changed as the volume is varied.

Phonograph pickups may be either of the low, medium or high impedance type. Both the low and medium impedance types may be used with a coupling transformer, as shown in Fig. 1, but the high impedance type is usually directly connected to the grid of the amplifier.

A medium impedance pickup will have an impedance of approximately 2,000 ohms at 400 cycles. A low impedance pickup will have an impedance of approximately 200 ohms at 400 cycles, and a high impedance pickup will have an impedance of 5,000 ohms or higher at the same frequency. We recommend the use of a medium impedance pickup.

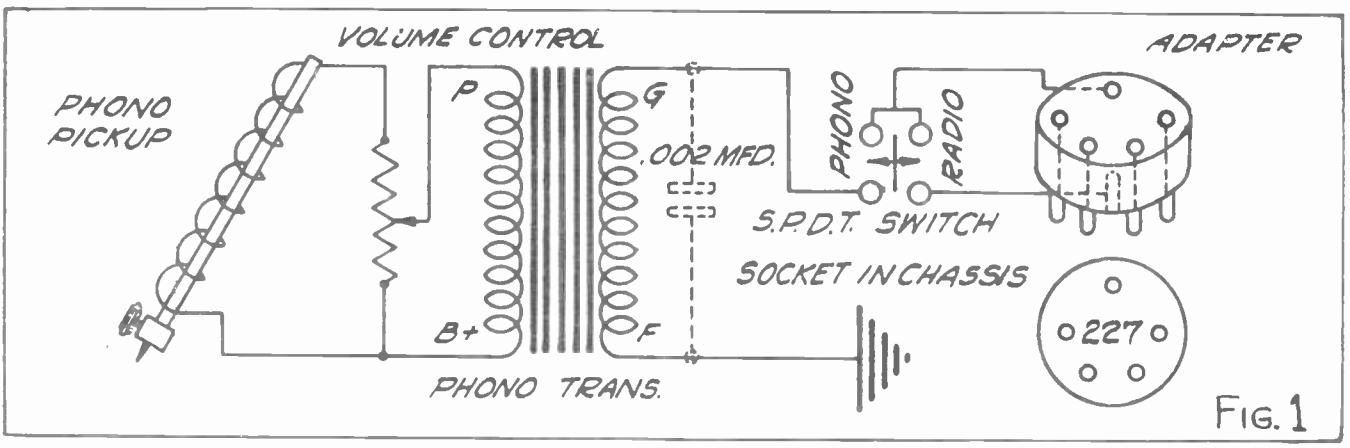


FIG. 1

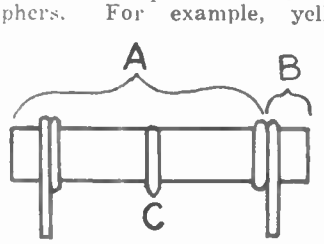
For use with any low or medium impedance pickup, a 4 to 1 ratio transformer will prove satisfactory. The pickup is connected to the primary of this transformer, and the secondary is connected to the grid circuit of the 1st audio tube. The impedance of the primary of the transformer should be at least 4 times the impedance of the pickup at 400 cycles. The .002 mfd. condenser, shown connected across the secondary of the transformer, may be used to permanently lower the pitch of the reproduction.

The adapter shown in Fig. 1 is of the "split-grid" type. This type of adapter is necessary because of the shunting action of the grid to ground resistor on the first audio tube. The adapter removes this resistor from the circuit, and allows ample volume to be obtained on phonograph reproduction.

The R.M.A COLOR CODE

"A"—Base color.
"B"—(1) end color.
"C"—Band color or dot.
In this system,
"A" represents the first numeral of the resistance value;
"B" represents the second numeral; and
"C" represents the number of ciphers after the second numeral.
The colors are numbered as follows:
1—brown
2—red
3—pink or orange
4—yellow
5—green
6—blue
7—violet
8—gray
9—white
0—black

The numbers in front of the colors in this table also represent the number of ciphers. For example, yellow equals No. 4 in "A," No. 4 in "B," and 0000 in "C." A resistor entirely of yellow would therefore have a value of 440,000 ohms.



To illustrate further, suppose a certain resistor has a base color "A" of violet; an end color "B" of orange; and a band color or dot "C" of red. From the tables we find that its resistance would be:
"A" = Violet = 7
"B" = Orange = 3
"C" = Red = 00, giving a value of 7,300 ohms.
If the band or dot color C were black, it would have a resistance of 73 ohms.

Fada Resistances

All fixed resistances used in Fada sets are identified by color.

Our Part No.	Resistance Ohms ± 10%	Identification	Diameter in Inches
1408-Ms	2-Megs	Red	1/4"
2-1299-Ms	250	Light Brown	1/4"
2-1300-Ms	750	Green	3/8"
2-1207-Ms	2000	Black	1/4"
1265-Ms	3000	White	1/4"
2-1308-Ms	5000	Orange	1/4"
1341-Ms	20,000	Green	1/4"
1417-Ms	50,000	Blue	1/4"
2-1315-Ms	70,000	Violet	1/4"
1375-Ms	125,000	Gray	1/4"
1311-Ms	250,000	Yellow	1/4"
1394-Ms	500,000	Brown	1/4"
1467-Ms	2000	None	3/8"
2-1330-Ms	3000	White	3/8"
2-1334-Ms	1200	Dark Green	1/4"
2-1344-Ms	1000	Green with yellow end	3/8"
2-1345-Ms	2500	Red with yellow end	3/8"
2-1346-Ms	125	Gray with yellow end	1/4"
2-1347-Ms	10,000	Blue with yellow end	1/4"
2-1358-Ms	500	Brown with blue end	1/4"
2-1364-Ms	7500	Yellow with blue end.	1/4"

Wire wound resistances used in Fada receivers are identified by spots of color in accordance with the listing below.

Our Part No.	Resistance in Ohms	Identification
1458-Ms	75	Red & White
1414-Ms	250	Yellow & White
1459-Ms	500	Blue & Green
1460-Ms	600	Red & Blue
1461-Ms	750	Red & Green
1328 Ms	1,000	Yellow
2-1219-Ms	1,200	Green & Yellow
1415-Ms	2,000	Green & White
2-1218-Ms	2,500	Blue & White
1416-Ms	3,000	White & White
1462-Ms	6,000	Red & Yellow
1463-Ms	10,000	Blue & Yellow
2-1249-Ms	65	Red
2-1250-Ms	65 Tap at 40	Blue
2-1251-Ms	10	Yellow
2-1311-Ms	20	White
2-1312-Ms	200 taps at 10 & 160	Green
2-1379-Ms	1500	Red & Red
2-1390-Ms	5000	Blue & Blue

Fada Condensers

These condensers are all labeled with our part number, capacity and voltage.

Our Part No.	Capacity	Operating D. C. Voltage	Type
1238-Ms	1.0 Mfd.	200-V	I
1239-Ms	2.0 "	200-V	I
1240-Ms	1.0 "	400-V	I
1241-Ms	0.5 "	200-V	I
1242-Ms	0.5 "	200-V	I
1418-Ms	.25 - .25	200 & 400-V	II
1419-Ms	.5 Mfd.	400-V	I
1490-Ms	.15 "	400-V	I
1225-Ms	.25 "	400-V	I
2-1307-Ms	.07 "	400-V	I
2-1340-Ms	.25 "	200-V	I
2-1341-Ms	.25/.25	400 - 400	III
2-1353-Ms	..25 - .25	200 - 200	II
2-1360-Ms	.25/25	200 - 200	III

On the above, type I has two lugs. Type II has three leads and a red lead connects to a 400 volt section, a brown lead to a 200 volt section and the black lead is common.

Type III condensers have four leads. A red lead connects to 400 volt sections and a brown lead to 200 volt sections. Thus a 400-400 condenser has two red leads and two black leads a 200-200 condenser has two brown leads and two ack leads. The black leads are not common in type III.

WATTAGE OF RADIO RECEIVERS

The wattage of a radio receiver is the amount of electric energy it consumes. In a direct-current "electric" receiver, it is equal to the total current in amperes multiplied by the pressure in volts. In a battery receiver, it is equal to the sum of the wattages used from the various batteries, each one delivering a wattage equal to its current in amperes multiplied by the pressure in volts.

In alternating-current receivers, the wattage may be calculated in the same manner, there being a slight difference on account of the *power factor*. However, the wattage of a receiver may be computed once the number and types of tubes are known.

The first thing to determine is the wattage consumed by the various tube filaments. In a single tube, the wattage equals the voltage multiplied by the current (neglecting "power factor," which is not of sufficient importance in dealing with low-power apparatus). For example, the wattage of a type 171A tube filament is equal to 5 (volts) times 0.25 (ampere), or 1.25 watts. Making similar calculations for all the tubes (most likely to be used), we have the following table:

Type of Tube	*Filament Watts*
224	4.375
226	1.575
227	4.375
112A	1.25
171A	1.25
210	9.375
245	3.75
250	9.375

To find the total watts used by the tube filaments in the set, add up the watts used by each filament. Thus, if the set has three 226's, one 227, and one 245, the total wattage will be:

3 times 1.575 or 4.725
plus 4.735
plus 3.75

total: 12.85 watts

This gives a total of 12.85 watts for the filaments. To determine the remaining power used by the set, simply add the wattage consumed by the rectifier (both plate or plates and filament); for the rectifier supplies all the plate current for the set, as well as that lost in the voltage divider, voltage regulator, etc. The following table gives the rectifier ratings:

Tube	*Filament and Plate watts (maximum rating)*
280	50
281	65

Knowing these figures, if the set above described used a type 280 rectifier, the total wattage used by the entire set would be the filament wattage (14.21) plus the rectifier wattage (50) or:

12.85
50.00

62.85 watts

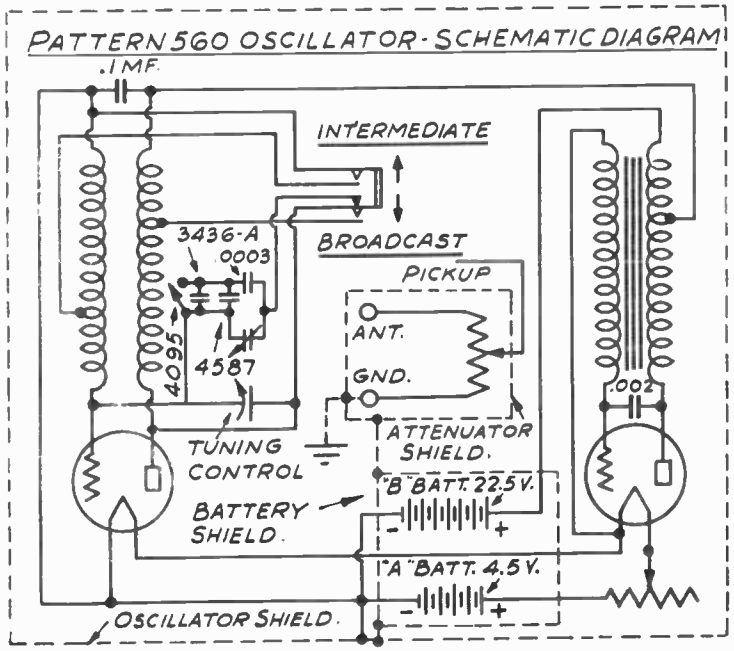
This is the maximum rating. The receiver would probably consume about 60 watts.

Condenser Data

The following Color Code will be used to determine the capacity of the small fixed condensers used in all models of Philco Receivers.

PART NO.	CAPACITY MF.	COLOR
3082	.00025	Yellow
3774	.00005	White
3910	.0005	Green
4059	.002	Light Blue
4519	.00011	Blue and Golden Yellow
4520	.0007	White and Golden Yellow
4587*	.00005	Light Blue and White
5120	.00041	Yellow and Orange

*Note: Part No. 4587 is held to closer tolerance limits than Part No. 3774. Do not substitute either of these Condensers. Use the part listed in the Service Manual.



CIRCUIT DESIGNED FOR EITHER 175 OR 260 K. C PHILCO.

PHILCO

Resistor Data

Starting with the Model 46 and continuing in all future models, standard R. M. A. colors are being used to indicate the value of the various resistors in Philco Receivers. The code is as follows:

0 — Black
1 — Brown
2 — Red
3 — Orange
4 — Yellow
5 — Green
6 — Blue
7 — Violet
8 — Gray
9 — White

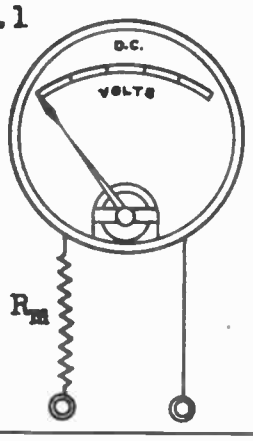
The body color represents the first digit in the resistance. The tip color represents the second digit. The dot color represents the number of zeros after the second digit: If the dot color is not present consider it to have the same color as the body. For instance, Resistor No. 3524 in the table below has a brown body—this means that the first digit is one, it has a black tip meaning that the second digit is zero, it has an orange dot meaning that there are three ciphers after the second digit or a resistance value of 10,000 Ohms.

Philco Resistors are made in two sizes—one to carry .5 watt and a larger resistor to carry 1 watt. Below is a table giving the part number and color code used in present Philco Resistors.

PART NO.	POWER (Watts)	RESISTANCE (Ohms)	— COLOR —		
			BODY	TIP	DOT
3524	1	10,000	Brown	Black	Orange
3525	1	32,000	Orange	Red	Orange
3526	1	5,000	Green	Black	Red
3542	1	70,000	Violet	Black	Orange
3655	1.6	1,000	Brown	Black	Red
3656	1	25,000	Red	Green	Orange
3766	1	13,000	Brown	Orange	Orange
3767	1	99,000	White	White	Orange
3768	1	240,000	Red	Yellow	Yellow
3769	1	490,000	Yellow	White	Yellow
4237	1	51,000	Green	Brown	Orange
4409	.5	1,000,000	Brown	Black	Green
4410	.5	240,000	Red	Yellow	Yellow
4411	.5	99,000	White	White	Orange
4412	.5	10,000	Brown	Black	Orange
4414	1	1,000,000	Brown	Black	Green
4515	1	2,000	Red	Black	Red
4516	.5	25,000	Red	Green	Orange
4517	.5	490,000	Yellow	White	Yellow
4518	.5	51,000	Green	Brown	Orange
4590	1	1,000	Brown	Black	Red
5023	1	190,000	Brown	White	Yellow

INTERNATIONAL RESISTANCE COMPANY

Fig.1

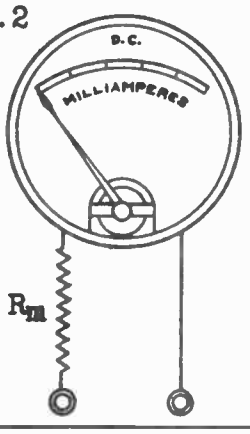


TO MAKE a D.C. VOLTMETER a MULTI-RANGE VOLTMETER.

R_v = resistance of voltmeter in ohms, or, if ohms per volt is given, then
R_v = ohms per volt x maximum reading, in volts.
V_1 = original maximum reading, in volts.
V_2 = desired new maximum reading, in volts.
$\frac{V_2}{V_1} = N$ = multiplying factor.
R_m = resistance of multiplier needed, in ohms.

Then $R_m = (N-1) \times R_v$

Fig.2



TO MAKE a D.C. MILLIAMETER a D.C. VOLTMETER.

I = original maximum reading, in milliamperes.
V = desired maximum reading, in volts.
R_m = resistance of multiplier required, in ohms.

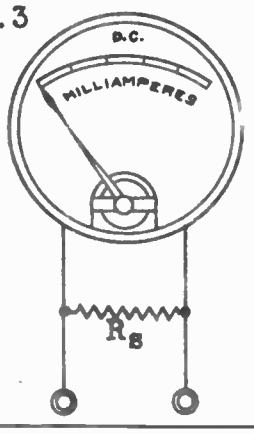
Then $R_m = \frac{1{,}000 \times V}{I}$

TO FIND THE SHUNT REQUIRED TO MAKE ANY D.C. MILLIAMETER A HIGHER RANGE MILLIAMETER.

R_m = resistance of meter, in ohms.
I_m = original maximum reading, in milliamperes.
I = desired new maximum reading, in milliamperes.
$\frac{I}{I_m} = N$ = multiplying factor.
R_s = resistance of shunt required, in ohms.

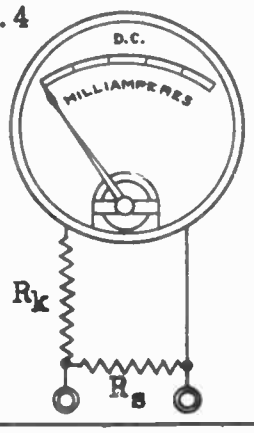
Then $R_s = \frac{R_m}{N-1}$

Fig.3



If the meter resistance is not accurately known, greater accuracy in scale conversion may be had by the use of two Precision Wire Wound Resistors, as shown in Fig. 4.

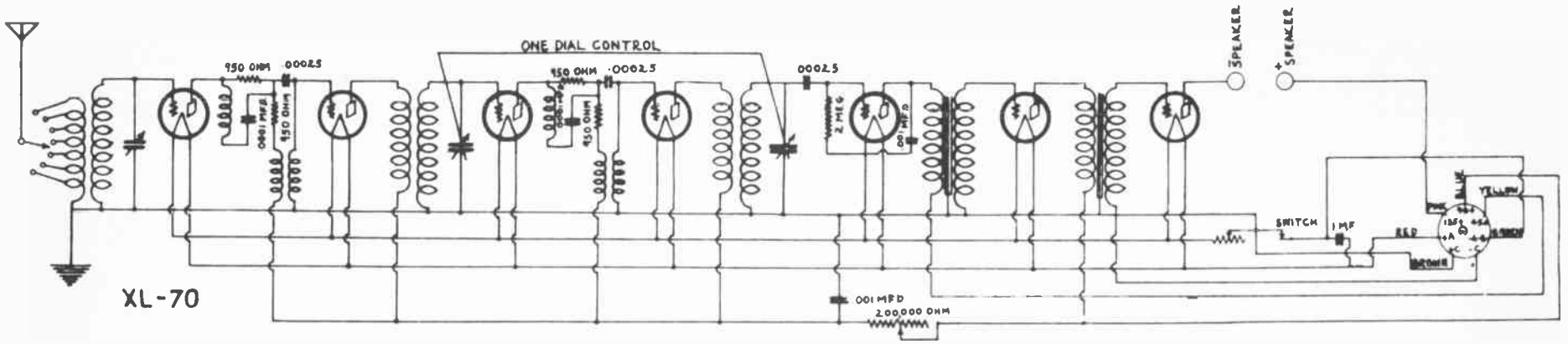
Fig.4

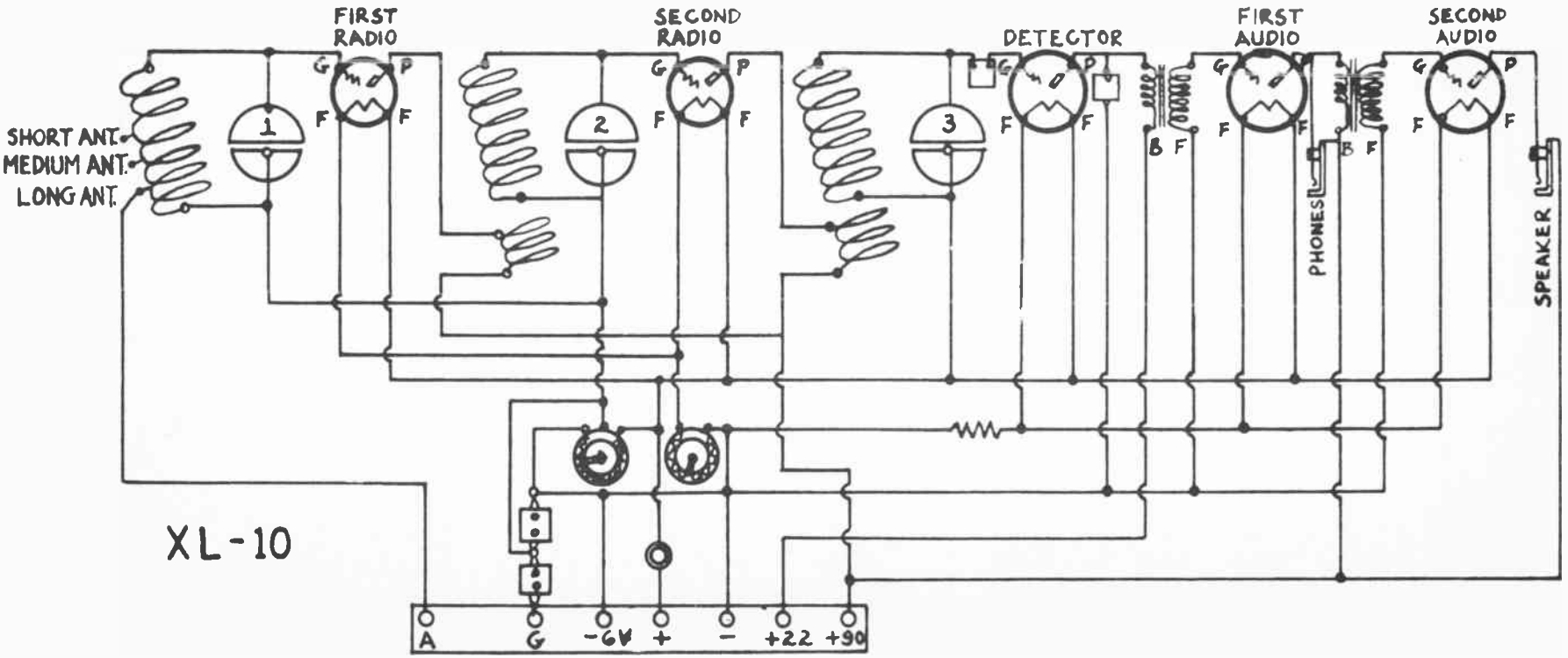


R_m = approximate meter resistance, as from manufacturer's catalog.
R_k = a resistor, equal, in ohms, to 9 times R_m.

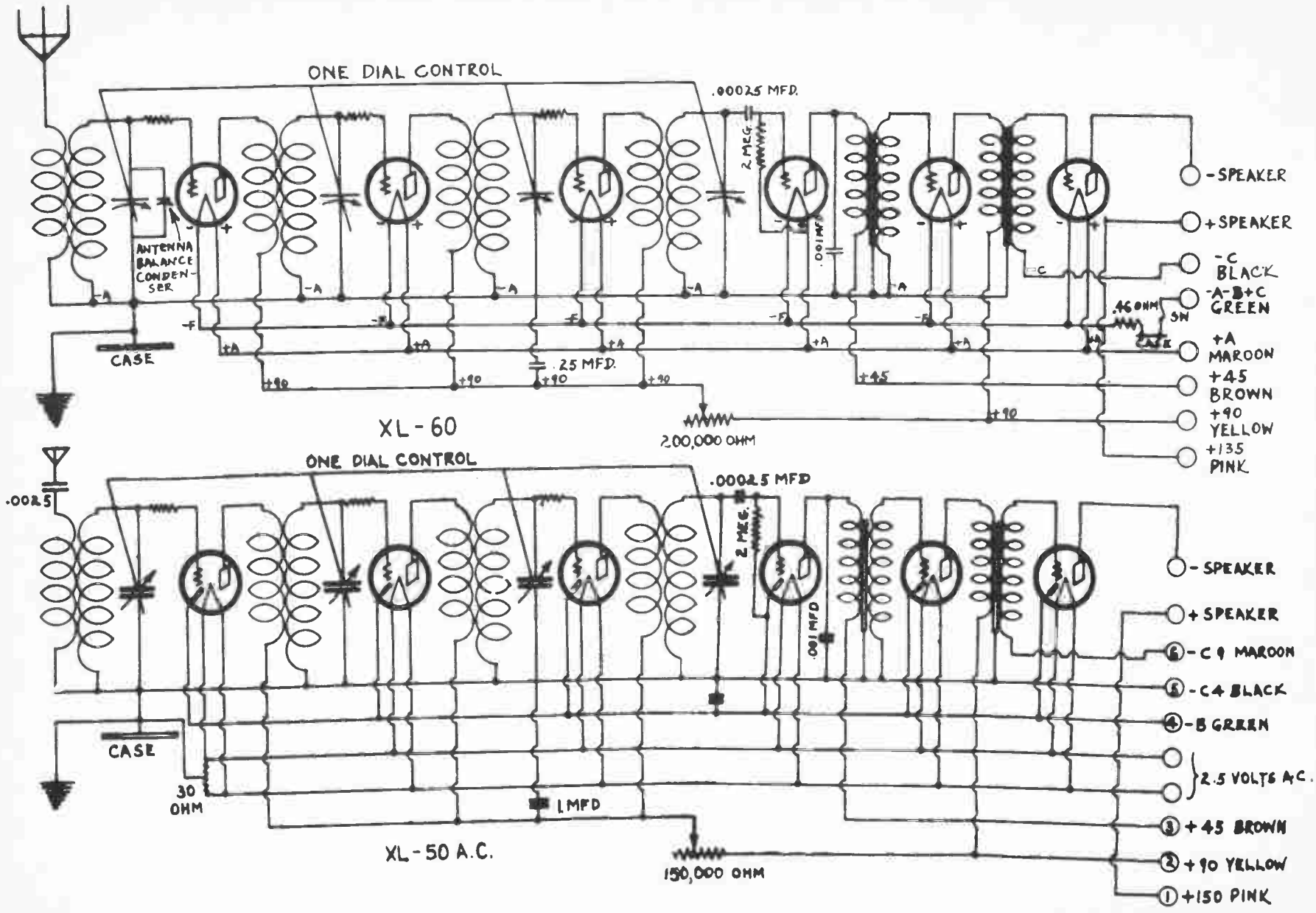
Then $R_s = \frac{R_k + R_m}{N-1} = \frac{10\ R_m}{N-1}$

Note: For intermittent use, it is recommended that the load on any Precision Wire Wound Resistor should not exceed 2 watts.





A. C. DAYTON CO.



A.C. DAYTON CO.

Radio Service Data Sheet

ALL AMERICAN-MOHAWK "MODEL D" LYRIC RECEIVERS

This radio set, manufactured by All-American Mohawk Corp., North Tonawanda, N. Y., is made into a number of different cabinet jobs.

Following are the values of the units in the assembly. Resistors: R1, 10,000 ohms; R2, 7,500 ohms; R3, 200 ohms; R4, R5, 30,000 ohms; R6, 300,000 ohms; R7, 70,000 ohms; R8, 1.0 megohm; R9, 900 ohms; R10, 300 ohms; R11, 1,000 ohms; R12, 2,000 ohms; R13, 2,000 ohms. The ganged tuning condensers are of .00034-mf. capacity; the others measure: C1, C2, 35 mmf.; C3, C4, .05-mf.; C5, C14, 0.5-mf.; C6, .00025 mf.; C7, .0001-mf.; C8, .02-mf.; C10, C11, 1.0 mf., C13, 1.5 mf.; C12, .073-mf. and C9, 0.5-mf.

The following figures are given as the average D.C. potentials for the tubes in this set when measured, on a high-resistance meter, with the leads on chassis and tube prong. The volume control R1-R2 must be on full-volume position; and the line potential should not exceed 115 volts.

Cathode voltages; V1, V2, 1.6; V3, 5.0; V4, 10.0: plate voltages; V1, V2, 140; V3, 50; V4, 130; V5, V6, 300; screen-grid voltages; V1, V2; 90; V3, 35; control-grid voltages; V5, V6, 50. Filament voltages are: V1, V2, V3, V4, V5, V6, 2.45.

The color code of the resistors in this set is given: R8, black with red end; R6, orange with green end; R7, orange; R4, R5, white; R3, red with black ends.

In this receiver a 24-henry choke coil is used as Ch. 1; it is tuned by C12. In the 25-cycle set, the inductance has a value of 50 henries, and the tuning condenser C12 required (to form a 120-cycle rejector) has a value of 0.2-mf. This circuit arrangement for reducing hum to a minimum should be carefully noted.

The color code for the by-pass condenser block is as follows: 0.05-mf., red leads; 0.5 mf., blue lead. The filter condensers, contained in their metal cases, have a black lead, indicating ground; green lead, 1.0 mf.; soldering lug next to green lead, .073 mf.; lug next to red lead, 1.0 mf.; red lead, 1.5 mf.

The tone control switch Sw.1 is located at the rear of the chassis, next to the antenna and ground binding posts.

The tandem volume control R1, R2, is of the tapered-resistance type, with a hop-off resistance value of 0.15-ohm; and replacements should be of the same design. This low resistance value is necessary to obtain complete control of the volume of the receiver.

The cable tension spring on the tuning control's fabric cable should be stretched to an overall length of 1⅝ in., or more. Should this length be less, it may be corrected by shortening the cable. This is most conveniently done by unhooking the spring, tying a knot in the cable, and then again connecting the spring.

Tip jacks J1 are for a phonograph pick-up, which must be connected manually by removing the jumper and inserting the tips. The volume control is turned off.

The R.F. transformers are of special design, and each has a two-section primary. One section is resonated by means of a condenser (C1 or C2) to a wavelength above the broadcast band; the other is effective at the shorter wavelengths. When the shorter wave stations are being tuned in, condensers C1 and C2 act as by-passes; at the longer wavelength both coil sections are effective. The purpose of this "staggered" design is to obtain more even amplification throughout the tuning band.

The screen-grid detector V3 is wired for plate-rectification, and is resistance-capacity-coupled to the first stage of A.F.

Connected to the reproducer is a 4-conductor cable terminating in a plug which is to be inserted in a socket (on the chassis) marked "speaker;" it is A in the diagram. The two primary plate leads from T2 are brown and yellow, the two speaker field leads are red and white; the red one being connected also to the center tap of T2.

Power transformer PT has a 5-volt winding S2, two 2½-volt windings S3, S4, and the usual high-voltage secondary S1.

Filter tuning condenser C12 is within the filter condenser can.

As a matter of record it may be of interest, to some of our readers, to list the equipment suggested by the makers as necessary for outside service, namely; a high resistance voltmeter reading 0-50-250; a battery and high-resistance meter for continuity testing; a kit of radio service tools; a set of tested tubes for purposes of comparison or replacement with those in the receiver. Where shop service is necessary the following items are recommended: an audio-modulated oscillator for balancing; an output meter (thermo-galvanometer, preferably. The design and use of such units has been given in past issues of RADIO-CRAFT); and a tested dynamic reproducer for this model chassis.

In this receiver model, the procedure in balancing is as follows: connect the output test meter in series with voice coil of reproducer, tune set to approximately 1,500 kc. and tune oscillator to set; of course, placing oscillator sufficiently near set to be heard.

To protect output meter against burn-out, shunt it with a 6-ohm rheostat, which will serve also to control the deflection. Also, during the first part of balancing the set this resistor may be set to short the meter, and the tests conducted by ear. Greater precision is obtained later by cutting in about one-half the resistance of this shunt.

Now, adjust the trimmers for maximum deflection of the meter, starting from the antenna circuit.

Further balancing should take place at about 1,100, 750, and 570 kc. However, the adjustment is to be made by bending the slotted sections of the rotor plate, slightly, instead of adjusting the trimmer condensers. (For this adjustment a fiber strip will be handy.) To do a real job, the set should be checked again at 1500 kc.

Slightly distorted reception and reduced volume may be due to an open in one-half the secondary of T2; which is conveniently checked by removing one tube and noting reception. It is pointed out that a quick and convenient test of the entire audio system and power supply may be made by checking the performance of a phonograph pick-up connected to tip-jacks J1.

Abnormal hum usually can be traced to troubles which have been described in past issues of RADIO-CRAFT; but, for the sake of completeness these possible causes are given here: filament or heater wires grounded to chassis; socket prongs grounded to chassis by solder; defective by-pass or filter condensers; grounded biasing resistors; unbalanced or defective type '45 tube; defective '80, perhaps with only one plate functioning; open C12; reversed field coil leads; defective detector tube. In the latter instance, a convenient check is to interchange the detector and one of the R.F. tubes. If this clears the trouble, it is not necessarily an indication that the tube need be replaced by a new one, if it functions satisfactorily in the R.F. position.

When checking the receiver for antenna or light-line interference pickup, do not forget, after removing the aerial lead, to short the antenna and ground leads; as the pick-up from the binding posts only may be considerable in some localities.

The recommended antenna length for this set is 85 feet, including lead-in.

If it becomes necessary to replace resistors R1, R2, or condensers C1, C2, C7, or C12, exceptional care should be taken to obtain the correct types and values in the replacement units. In particular, condenser C12 must be exactly right to resonate the circuit Ch1-C12 at the second harmonic (120 cycles) ripple of the 60-cycle A.C. line-frequency.

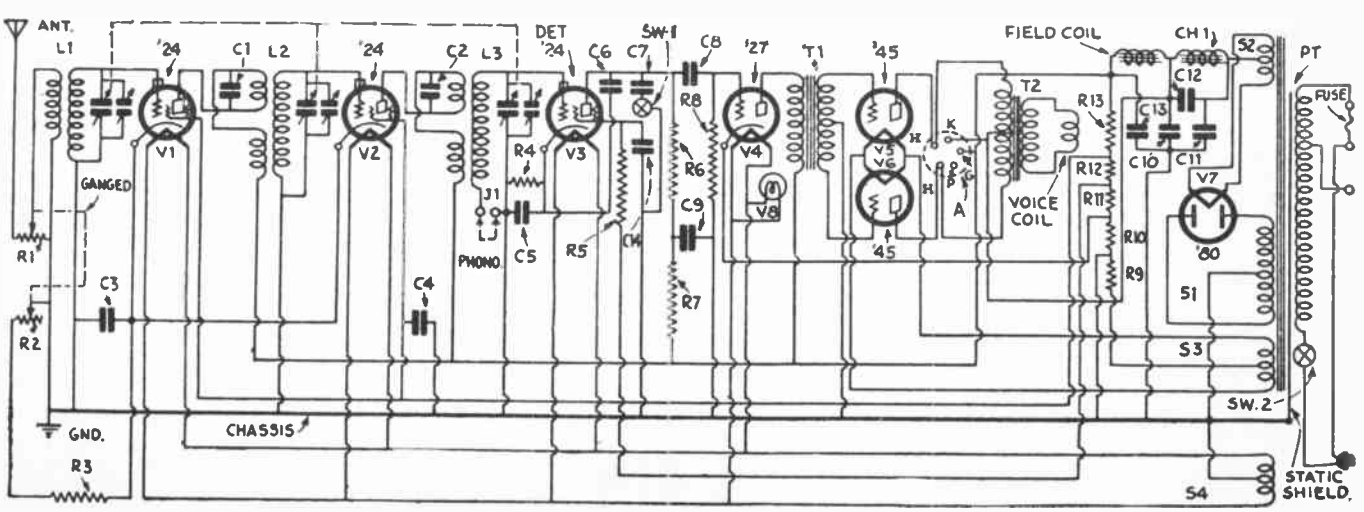
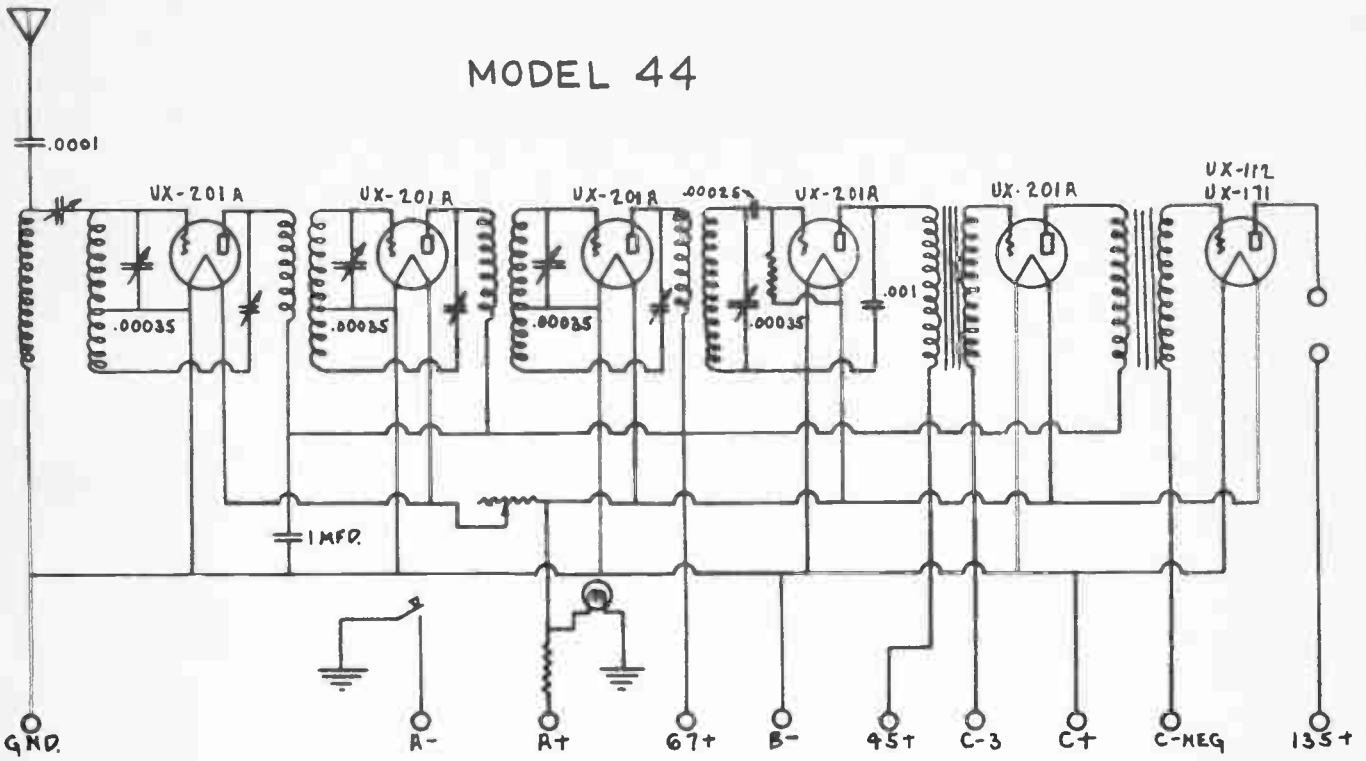


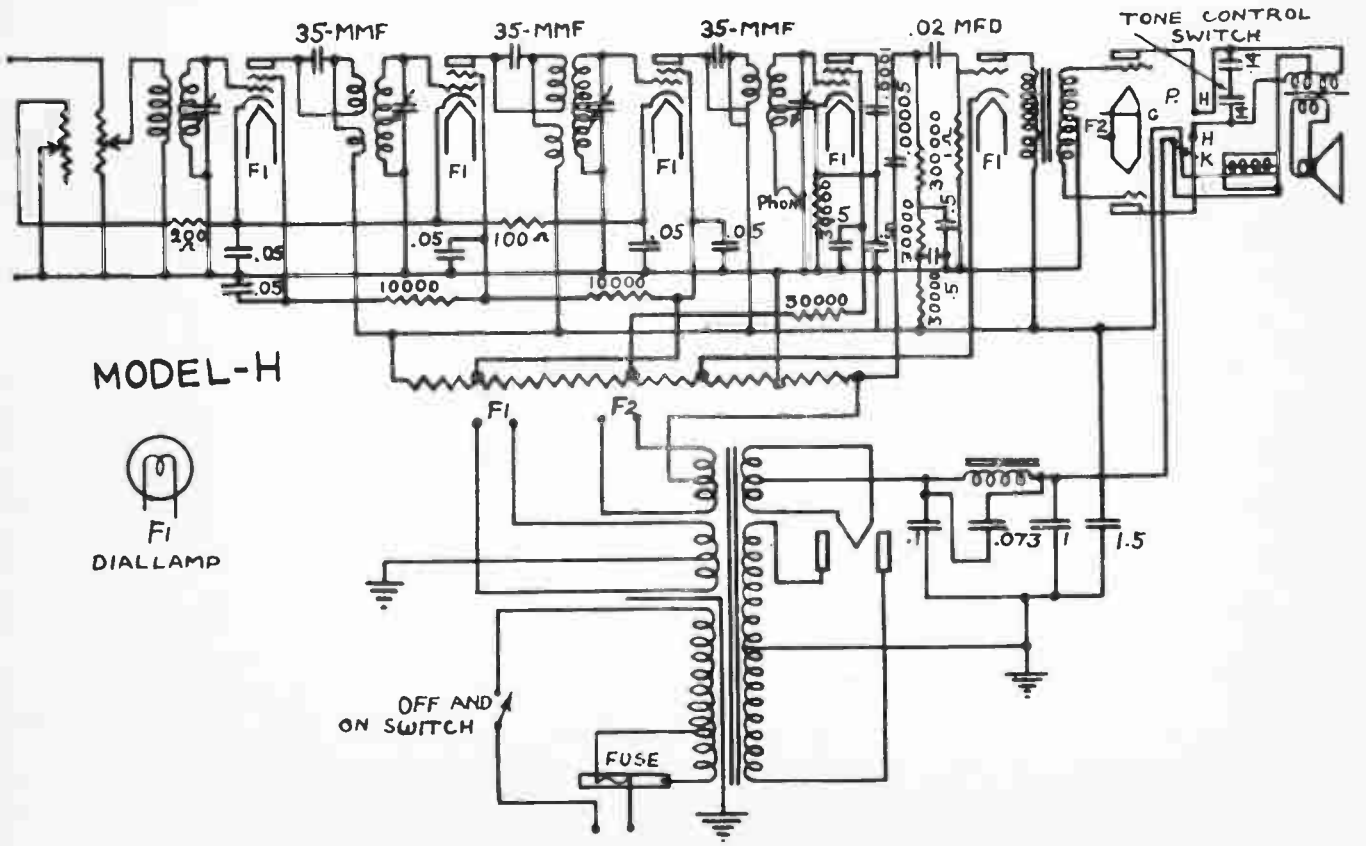
Diagram of connections of the All American-Mohawk "Model D" Lyric screen-grid receiver; a jumper closes the circuit at J1 when a phonograph pick-up is not in use. Tone control is obtained with switch SW.1.

ALL AMERICAN MOHAWK CORP.

MODEL 44



MODEL-H



AMERICAN BOSCH MAGNETO CORP.

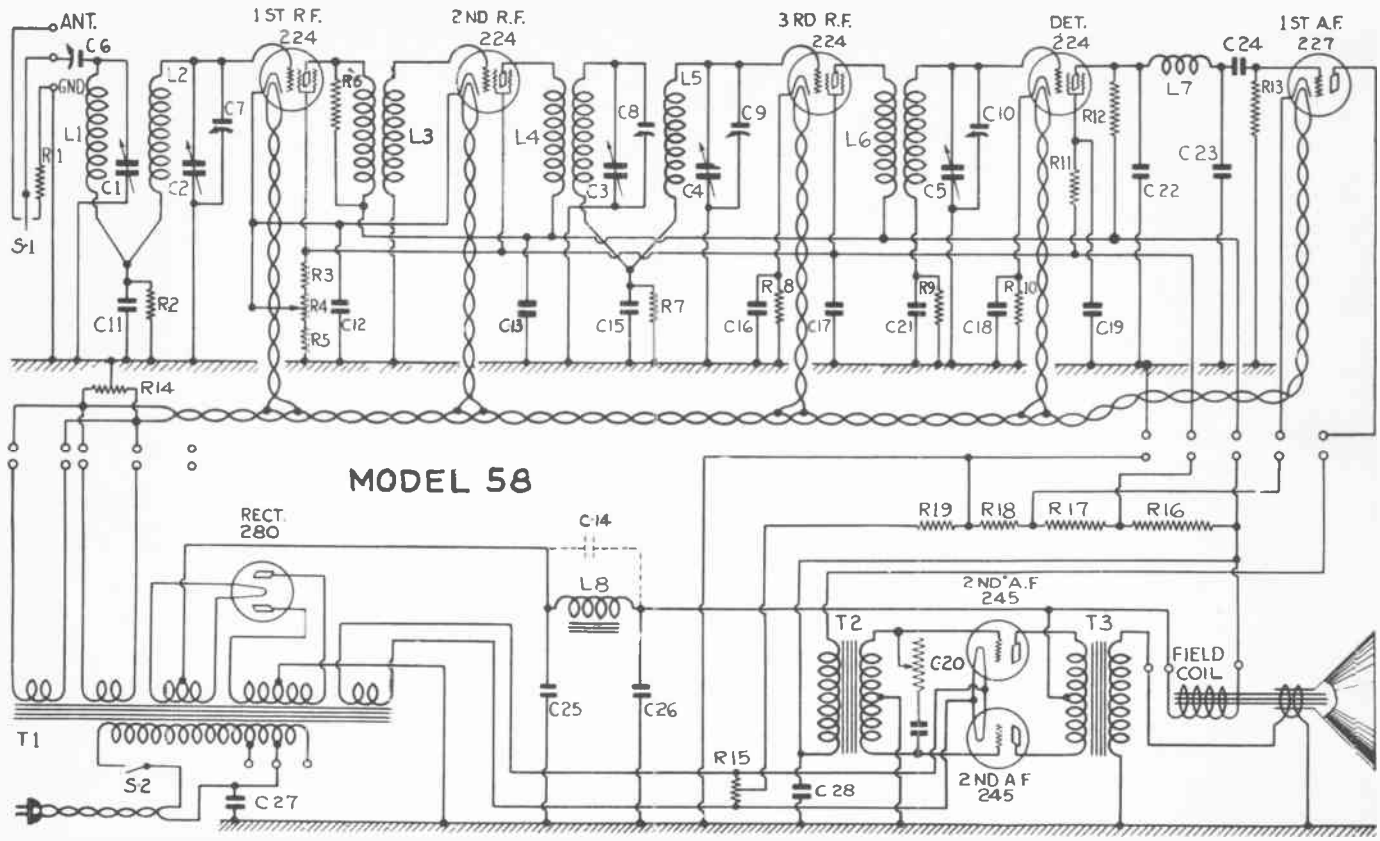


Figure 3—Schematic Diagram of Model 58 Receiver.

Model 58 Receiver

L1—1st RF Coil
L2—1st RF Coil
L3—2nd RF Coil (untuned)
L4—3rd RF Coil
L5—3rd RF Coil
L6—Detector Coil
L7—Detector Plate Choke
L8—Filter Choke

T1—Main Power Transformer
T2—Audio Input Transformer
T3—Audio Output Transformer

C1—1st RF Tuning Condenser
C2—1st RF Tuning Condenser
C3—3rd RF Tuning Condenser
C4—3rd RF Tuning Condenser
C5—Detector Tuning Condenser
C6—Antenna Trimming Condenser
C7—1st RF Alignment Condenser
C8—3rd RF Alignment Condenser
C9—3rd RF Alignment Condenser
C10—Detector Alignment Condenser
C11—1st RF Coupling Condenser .04 mfd
C12—Cathode By-pass Condenser .5 mfd.
C13—Plate By-pass Condenser .5 mfd.
C14—Filter Condenser .2 mfd (25 cycle only)
C15—3rd RF Coupling Condenser .04 mfd.
C16—Cathode By-pass Condenser .5 mfd.
C17—Screen By-pass Condenser .5 mfd.
C18—Detector Cathode By-pass Condenser 1 mfd.
C19—Detector Screen By-pass Condenser .5 mfd.
C20—Tone Control Condenser .006 mfd.
C21—Detector Condenser .04 mfd.
C22—Detector Plate By-pass Condenser .0001 mfd.
C23—Detector Plate By-pass Condenser .0001 mfd.
C24—Audio Coupling Condenser .006 mfd.
C25—Power Pack Filter Condenser 2 mfd.
C26—Power Pack Filter Condenser 2 mfd.
C27—Buffer Condenser 1 mfd.
C28—Audio By-pass Condenser 4 mfd

R1—Antenna Resistor 500 ohms
R2—De-coupling Resistor 1,000 ohms
R3—Screen Resistor 20,000 ohms
R4—Volume Control 3,000 ohms
R5—Screen Resistor 250 ohms
R6—Untuned Transformer Resistor .1 megohm
R7—3rd RF de-coupling Resistor 1,000 ohms
R8—3rd RF Cathode Resistor 1,000 ohms
R9—Detector Grid Resistor 1,000 ohms
R10—Detector Cathode Resistor 50,000 ohms
R11—Detector Screen Resistor 1 megohm
R12—Detector Plate Resistor .25 megohm
R13—1st Audio Grid Resistor 2 megohms
R14—Center Tap Resistor (chassis)
R15—Center Tap Resistor (power pack)
R16—Screen Supply Resistor 2,050 ohms
R17—Audio Cathode Resistor 1,950 ohms
R18—Divider Resistor 180 ohms
R19—Audio Bias Resistor 950 ohms
R20—Tone Control .5 megohm

Model 60 Receiver

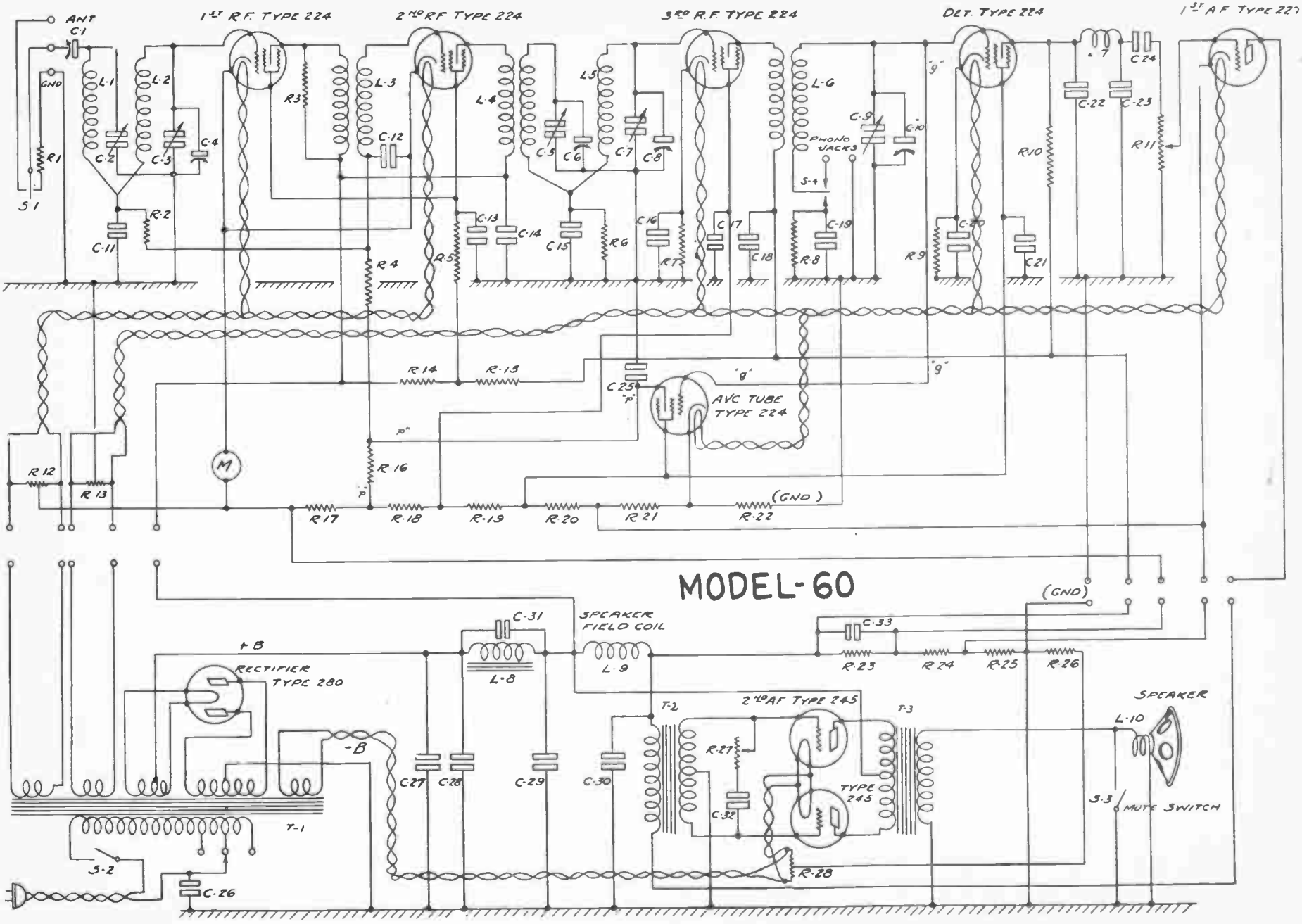
L1—1st RF Coil
L2—1st RF Coil
L3—2nd RF Coil (untuned)
L4—3rd RF Coil
L5—3rd RF Coil
L6—Detector Coil
L7—Detector Plate Choke
L8—Power Pack Filter Choke
L9—Speaker Field Coil
L10—Speaker Voice Coil

T1—Main Power Transformer
T2—Audio Input Transformer
T3—Audio Output Transformer

C1—Antenna Trimmer Condenser
C2—1st RF Tuning Condenser
C3—1st RF Tuning Condenser
C4—1st RF Alignment Condenser
C5—3rd RF Tuning Condenser
C6—3rd RF Alignment Condenser
C7—3rd RF Tuning Condenser
C8—3rd RF Alignment Condenser
C9—Detector Tuning Condenser
C10—Detector Alignment Condenser
C11—1st RF Coupling Condenser .04 mfd.
C12—2nd RF Grid Return Condenser .5 mfd.
C13—1st and 2nd RF Screen Condenser .25 mfd.
C14—1st and 2nd RF Plate Condenser .25 mfd.
C15—3rd RF Coupling Condenser .04 mfd.
C16—3rd RF Cathode Condenser .5 mfd.
C17—3rd RF Screen Condenser .5 mfd.
C18—3rd RF Plate Condenser .5 mfd.
C19—Detector Grid Return Condenser .04 mfd
C20—Detector Cathode Condenser 1. mfd.
C21—Detector Screen Condenser .5 mfd.
C22—Detector Plate By-pass Condenser .0001 mfd.
C23—Detector Plate By-pass Condenser .0001 mfd.
C24—Audio Coupling Condenser .006 mfd.
C25—AVC Plate By-pass Condenser .006 mfd
C26—Buffer Condenser .1 mfd
C27—Power Pack Filter Condenser 2. mfd
C28—Power Pack Filter Condenser 2. mfd
C29—Power Pack Filter Condenser 4. mfd.
C30—Power Pack Filter Condenser 2 mfd.
C31—Filter Choke Tuning Condenser .075 mfd
C32—Tone Control Condenser .006 mfd
C33—By-pass Condenser 2 mfd

R1—Antenna Resistance 500 ohms
R2—1st RF de-coupling Resistor 1000 ohms
R3—Untuned Coil Resistor 50,000 ohms
R4—1st and 2nd RF Grid Resistor .5 meg.
R5—1st and 2nd RF Screen Resistor 20,000 ohms
R6—3rd RF de-coupling Resistor 1,000 ohms
R7—3rd RF Bias Resistor 1,000 ohms
R8—Detector Grid Resistor 1,000 ohms
R9—Detector Bias Resistor 50,000 ohms
R10—Detector Plate Resistor 5 meg.
R11—Volume Control .5 meg.
R12—1st and 2nd RF Center Tap Resistor
R13—Center Tap Resistor
R14—1st and 2nd RF Screen Resistor 20,000 ohms
R15—Resistor 10,000 ohms
R16—AVC Resistor .5 megohms
R17—Resistor 900 ohms
R18—3rd RF Screen Resistor 5,000 ohms
R19—AVC and Detector Screen Resistor 25,000 ohms
R20—Resistor 5,000 ohms
R21—1st AF Bias Resistor 2,000 ohms
R22—AVC Bias Resistor 2,000 ohms
R23—Voltage Divider Resistor 1,300 ohms
R24—Voltage Divider Resistor 2,380 ohms
R25—Voltage Divider Resistor 160 ohms
R26—2nd Audio Bias Resistor 950 ohms
R27—Tone Selector Resistor .5 megohm
R28—2nd Audio Center Tap Resistor

AMERICAN BOSCH MAGNETO CORP.



Note: Values of parts are given on page 90A

Radio Service Data Sheet

BOSCH MODEL 60 VOLUME-CONTROL RECEIVER

This receiver, the "Model 60" chassis with automatic volume control, is manufactured by the American Bosch Magneto Corp., Springfield, Mass.; the following parts valnes are used:

Condensers C1, C2, C3, C4, C5 are the usual tuning capacities; C6, an antenna trimmer; C7, C11, C14, .04-mf.; C8, C10, .25-mf.; C9, C12, C13, C17, 0.5-mf.; C15, C20, C26, .006-mf.; C16, 1.0 mf.; C18, C19 .0001-mf.; C21, C22, C27, 2 mf.; C23, C24, 4 mf.; C25, 0.75-mf. (exact).

Resistors R1, 500 ohms; R2, R4 R6, R8, R9, 1,000 ohms; R3, R11, R12, R13, R26, ½-meg.; R5, 20,000 ohms; R7, 10,000 ohms; R10, R28, 50,000 ohms; R16, 900 ohms; R17, R19, 5,000 ohms; R18, 25,000 ohms; R20, R21, 2,000 ohms; R22, 1,300 ohms; R23, 2,380 ohms; R24, 160 ohms; R25, 950 ohms.

The "Model 60" and the "Model 58" are very similar in general arrangement. The "60," however, is equipped with automatic volume control, a "mute" switch, and a larger reproducer. On the side of the cabinet is the tone control. In addition to the tubes required for the "58," the "60" requires a type '24 tube for the volume control, V8. An automatic "radio-phono." switch is operated by simply turning the tuning dial to zero. The "Model 61" corresponds to the "60," but is designed for use on 25-cycle, 100 to 130 volt A.C. supply. The chassis is the same, and the power pack differs only in the power transformer and filter condensers. Letters D and E refer only to the style of cabinet.

Lack of sensitivity may be due to incorrect connection of the three leads to the "local-distance" switch. It may be advisable, in some localities, to operate the set without a ground connection. Check the alignment of the tuning condensers.

Poor tone quality may be due to a defective '45 (which is ionized). Check also the remaining tubes in the receiver. If the plate currents of the type '45 tubes differ more than 5 ma., the output transformer will be overloaded and some distortion will result.

Operating voltages for this receiver follow: Filament potentials; V1, V2, V6, V7, 2.4 volts; V3, V4, V5, V8, 2.3 volts; V9, 5.0 volts. Plate potentials; V1, 170 volts; V2, 180 volts; V3, 185 volts; V4, 60 volts; V5, 150 volts; V6, V7, 250 volts; V8, 30 volts. Screen-grid potentials; V1, 70 volts; V2, 80 volts; V3, 85 volts; V4, 10 volts; V8, 20 volts. Control-grid potentials; V1, V2, 2.0 volts; V3, 1.5 volts; V4, 1.0 volt; V5, 0.1-volt; V6, V7, 50 volts; V8, 0.2-volt. Plate currents; V1, V2, 3 ma.; V3, 2 ma.; V4, 0.1-ma.; V5, 6 ma.; V6, V7, 30 ma.; V8, 0.2-ma.

The condenser drive-belt consists of a heavy stranded phosphor-bronze cable having a small loop at each end. Correct tension is maintained by means of a spring. After replacing the belt it is necessary to reset the dial; to do which, loosen the small gear on the knob shaft. Turn the shaft to the left as far as it will go. Set the dial against the stop at "100" position, and re-tighten the small gear. The procedure in replacing the belt is as follows: turn the condensers to the position of minimum capacity. Place the loop at one end of the drive-cable over the pin at the top right hand side of the large drive drum. Lead the belt along the groove and downward to the small grooved drum. Turn the condenser gear to the "100" position (condenser fully engaged). Start the belt at the center groove of the small drum and wind on 6½ turns in a clockwise direction (to the right), toward the front of the receiver. Bring the belt up and over the idler pulley. Follow down the groove of the large drum and hook the loop over the drum's tension spring. The spring can most easily be pulled into the correct position by looping a length of wire or strong cord around the spring hook.

The field coil of the dynamic reproducer has a resistance of 2,000 ohms; and the voice coil, one of 10 ohms. A copper shield ring over the core prevents feed back between voice and field coils and the "B" supply. The only adjustment consists in centering the moving coil in the air gap. Do this as follows: loosen the holding screw. Insert in the air gap, around the moving coil, four gauges made of paper strips 0.01-in. thick. The strips should be about 6 in. long and 3/16-in. wide. Retighten the screw and remove the gauges. The connections to the reproducer are made at the terminal strip located under the name plate. The red and brown leads run to the voice coil; and the black lead to a terminal.

On the "Model 60" is a meter M which may be used in aligning the tuned stages. The meter will swing to the right as alignment is reached.

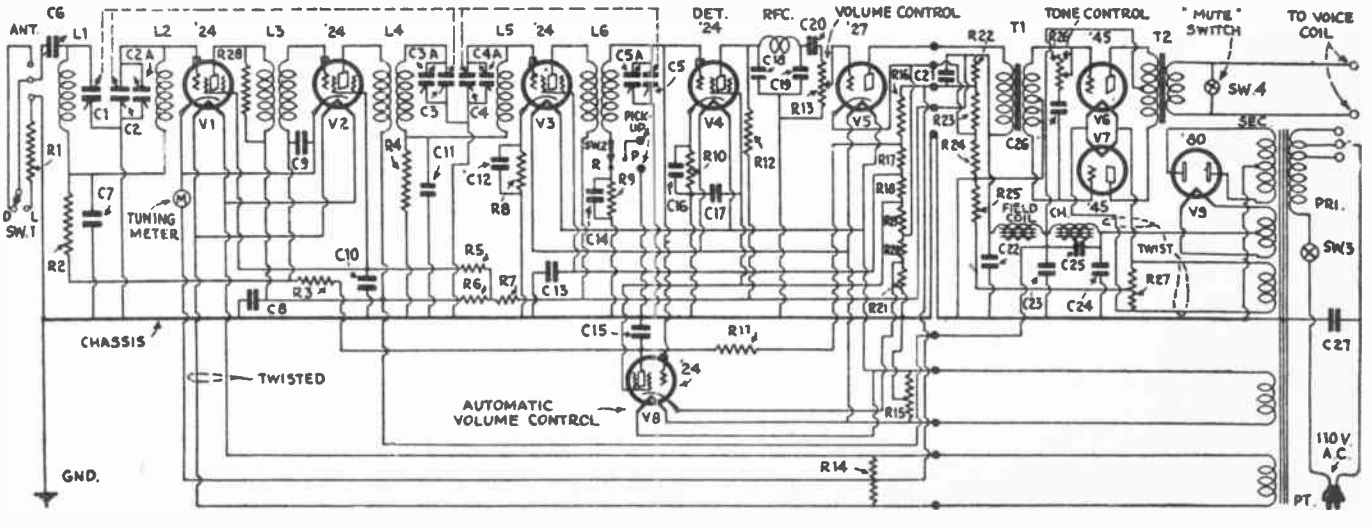
A grounding spring on one of the tuning condensers, in the third R.F. stage, grounds this condenser in the "phono" position, or dial zero setting, and in this position prevents circuit oscillation.

The operation of the automatic volume control circuit is as follows: When the signal being received increases in volume (as in tuning in a more powerful station) it results in a higher signal voltage on the detector tube. This higher voltage is applied to the grid of the automatic volume-control tube, by direct connection through one lead. A higher voltage on the grid of the automatic volume-control tube results in the tube drawing greater plate current through R3, which controls the grid bias on the first and second R.F. tubes. The increased plate current through R3 causes a greater increase in the voltage drop across this resistor. This change increases grid bias on the first and second R.F. tubes and thereby cuts down the signal. The tuning meter M is in the plate circuit of these two tubes; it also indicates, therefore, the action of the automatic volume control, swinging further to the right(low plate current) as the signal level rises on a powerful station. It will be noted that the filament, cathode, and grid circuits on the first two R.F. stages are separate from those of the rest of the receiver, and are at approximately the same voltage (above ground) as the plate of the automatic volume control tube.

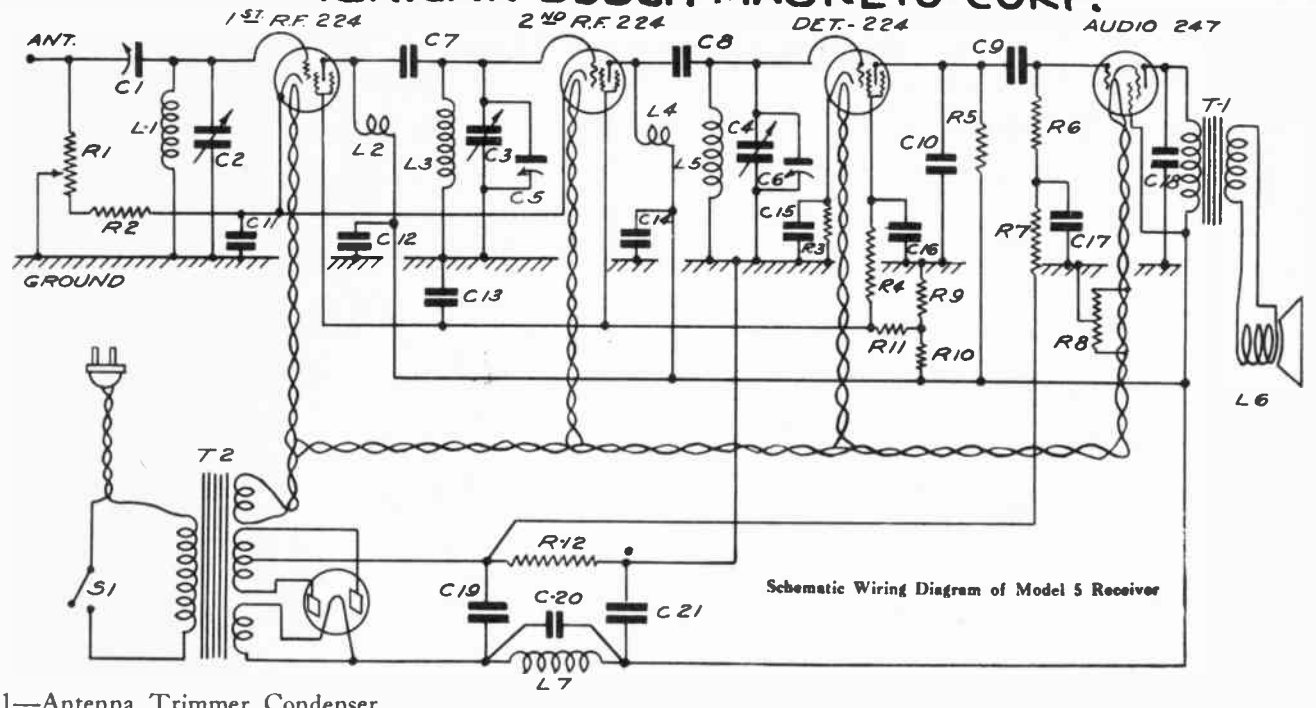
It is necessary, for the proper functioning of the receiver, that there shall be no points in the coils or wiring where leakage to ground may occur. It is also important, for proper operation, that the automatic volume-control tube should have proper characteristics. Such a tube can easily be selected as follows: have all the tubes in place except the automatic volume control, and switch the receiver "on"; hut do not tune in a station. If the tubes are all operative, the meter needle will swing to the left from 3½ to 5 divisions. Insert the automatic volume-control tube, V8, and note the action of the needle. *The automatic volume-control tube tested is suitable if the needle remains in the same position.*

The various resistors in the receiver have the following color code: 250 ohms, white; 500 ohms, yellow; 900 ohms, black-brown; 1,000 ohms, white-red; 2,000 ohms, brown-yellow; 5,000 ohms, black-yellow; 10,000 ohms, blue-yellow; 20,000 ohms, green-yellow; 25,000 ohms, blue; 50,000 ohms, green-white; 0.1-meg., blue-white; 0.25-meg., brown; 1.0 megohm, black; 2 megohms, black-white.

R.F. transformer L3 is untuned, and signal amplification through this stage increases in the low-frequency region (100 on the dial). The antenna input system is so designed that one setting of the antenna trimmer condenser C6 will maintain the antenna in tune over the entire broadcast band. This condenser is provided with a small adjusting knob, and need be set only when it is installed or when subsequent changes are made in the aerial. It is recommended that this condenser be adjusted in the following manner: tune in a semi-distant station which comes in at some point between 40 and 60 on the dial. Reduce the volume until the station can barely be heard; then turn the adjustment knob until it is at the point of loudest reception.



AMERICAN BOSCH MAGNETO CORP.



Schematic Wiring Diagram of Model 5 Receiver

C 1—Antenna Trimmer Condenser
C 2—Tuning Condenser
C 3—Tuning Condenser
C 4—Tuning Condenser
C 5—Alignment Condenser
C 6—Alignment Condenser
C 7—Coupling Capacity
C 8—Coupling Capacity
C 9—Audio Coupling Condenser .006
C 10—Det. plate By-pass .0001 mfd.
C 11—RF Cathode By-pass .05 mfd.
C 12—RF Plate By-pass .05 mfd.
C 13—RF Screen By-pass .25 mfd.
C 14—RF Plate By-pass .05 mfd.
C 15—Det. Cathode By-pass 1.00 mfd.
C 16—Det. Screen By-pass .25 mfd.
C 17—Audio Grid By-pass .01 mfd.
C 18—Audio Plate By-pass .01 mfd.
C 19—Filter Condenser 4. mfd.
C 20—Field Condenser .08 mfd.
C 21—Filter Condenser 4. mfd.

S 1—Switch

R 1—Volume Control 10,000 ohms
R 2—RF Cathode Resistor 300 ohms
R 3—Det. Cathode Resistor 50,000 ohms
R 4—Det. Screen Resistor 2 megohms
R 5—Det. Plate Resistor 1 megohm
R 6—Audio Grid Resistor ½ megohm
R 7—Audio Grid Resistor 100,000 ohms
R 8—Mid Tap Resistor
R 9—Divider Resistor 50,000 ohms
R 10—Screen Resistor 50,000 ohms
R 11—Screen Resistor 10,000 ohms
R 12—Audio Bias Resistor 400 ohms

L 1—Antenna Coil
L 2—Primary } of RF Coil
L 3—Secondary }
L 4—Primary } of RF Coil
L 5—Secondary }
L 6—Speaker Moving Coil
L 7—Speaker Field Coil

T 1—Audio Output Transformer
T 2—Power Transformer

SOCKET VOLTAGES

Stage	Tube	Fil.	Plate	Screen	Cathode	Grid	Plate MA
1st RF	224	2.3	250	90	2.5	2.5	4.5
2nd RF	224	2.3	250	90	2.5	2.5	4.5
Det.	224	2.3	*150	*20	3.0	1.5	.5
Audio	247	2.3	250	250	.....	*16	32
Rect.	280	4.8	Plate current of each plate—20				

The readings were made with the volume control in the full "on" position.

*These voltages are the correct values. The average test kit will give much lower readings, (as low as 1/10 of these values) due to the low resistance of the meters compared to the high resistance included in the detector plate and screen circuits and the audio grid circuit.

When the volume control is reduced the

RF plate voltage remains constant
RF screen voltage increases
RF cathode voltage increases
RF grid voltage increases

BOSCH MODELS 60 AND 61 (Automatic Volume Control)

The Bosch Model 60 receiver incorporates an automatic volume-control tube, V8; a "mute switch" Sw4 (which should be closed, during the operation of tuning, to short the voice coil of the dynamic reproducer; thus eliminating the sounds incidental to tuning in programs, the automatic volume control's panel-meter being the resonance indicator) and connections for a phonograph pickup. The pickup circuit is controlled by an automatic switch, SW2, which, in the tuning dial's "O" position is designed to replace a 1,000-ohm resistor and its bypass condenser by a pick-up of approximately 1,000 ohms. At the same time, a ground spring makes contact with condenser C4; shorting it out of circuit and eliminating the need to detune the R.F. portion of the receiver.

The components of the "Model 60" receiver have the following constants: Condensers C1, C2, C3, C4 and C5 are tuning units, shunted by aligning condensers C2A, C3A, C4A and C5A in the positions indicated in the schematic circuit; C6, antenna trimmer; C7, band-selector coupling condenser; C8, C10, 0.25-mf.; C9, C12, C13, C17, C28, 0.5-mf.; C11, C14, .04-mf.; C15, C20, C26, .006-mf.; C16, 1 mf.; C18, C19, .0001-mf.; C21, C22, 2 mf.; C23, C24 (each two 2-mf. sections in shunt), 4 mf.; C25, .075-mf.; C27, 0.1-mf.

Resistor R1, 500 ohms; R2, R4, R8, R9, 1,000 ohms; R3, R11, R12, R13 (volume control), R26 (tone control), 0.5-meg.; R5, R6, 20,000 ohms; R7, 10,000 ohms; R10, R28, 50,000 ohms; R14, R15, R27, center-tapped resistors; R16, 900 ohms; R17, R19, 5,000 ohms; R18, 25,000 ohms; R20, R21, 2,000 ohms; R22, 1,300 ohms; R23, 2,380 ohms; R24, 160 ohms; R25, 950 ohms.

The resistor color code used in this receiver is as follows: 250 ohms, white; 500, yellow; 900, black-brown; 1,000, white-red; 2,000, brown-yellow; 5,000, black-yellow; 10,000, blue-yellow; 20,000, green-yellow; 25,000, blue; 50,000, green-white; 0.1-meg., blue-white; 0.25-meg., brown; 0.5-meg., gray; 1 meg., black; 2 megs., black-white.

Average operating voltages for the "60" are as follows. Filament potentials: V1, V2, V6, V7, 2.4 volts; V3, V4, V5, V8, 2.3 volts; V9, 5 volts. Plate potentials: V1, 170 volts; V2, 180 volts; V3, 185 volts; V4, 60 volts*; V5, 150 volts; V6, V7, 250 volts; V8, 30 volts*. Plate currents: V1, V2, 3 ma.; V3, 2 ma.; V4, 0.1-ma.*; V5, 6 ma.; V6, V7, 30 ma.; V8, 0.2-ma.*. Screen-grid potentials: V1, 70 volts; V2, 80 volts; V3, 85 volts; V4, 10 volts*; V8, 20 volts*. Control-grid potentials: V1, V3, 3 volts; V3, 1.5 volts; V4, 1. volt*; V5, 0.1-volt*; V6, V7, 50 volts; V8, 0.2-volt*.

These readings are made with the volume control full on. These figures followed by asterisks are measured through resistors of high value and, therefore, the reading will vary with the particular type of testing instrument used.

The trimmer condensers are located on the condenser gang. The antenna coupling condenser C1A is adjusted from the side of the chassis, when the set is installed, in the following manner: tune in a somewhat weak station at some point between 40 and 60 on the dial; reduce the volume until the station can be barely be heard; and then turn the adjustment knob of C1A until the signal is received with maximum volume.

The trimmer condensers may be adjusted for maximum motion (to the right) of the tuning meter M.

The automatic volume control circuit functions in the following manner. When the signal being received increases in volume (as when tuning in) a signal of increased strength is applied to the detector tube V4; and thus to the control-grid of screen-grid automatic volume control tube V8. This increase in the control-grid potential of V8 results in increased plate current, which must pass through resistor R11. The voltage drop across this resistor, which also is in the cathode circuit of the R.F. amplifier tubes V1 and V2, therefore increases; and this increased bias is effective on the control-grid of V1, and V2, causing a reduction in volume. This increase or decrease in cathode current is indicated on the meter M in the portion of the cathode circuit common to V1 and V2. (Motion to the right indicates a reduction in current; since the meter is wired to work "backward" to standard test meters).

Note that the filament, cathode, and control- and screen-grid potentials of V1 and V2 are at approximately the same potential above ground as the plate of V8. Therefore, particular attention should be given to the possibility of a short or leakage to ground through any portion of the wiring or the associated apparatus.

A suitable tube to use as V8 may be selected in the following manner; Note the meter indication with the set turned on, but detuned, and tube V8 out of the socket. The reading should be between 3½ and 5 divisions. Now insert V8; the needle should then remain stationary if the tube is suitable.

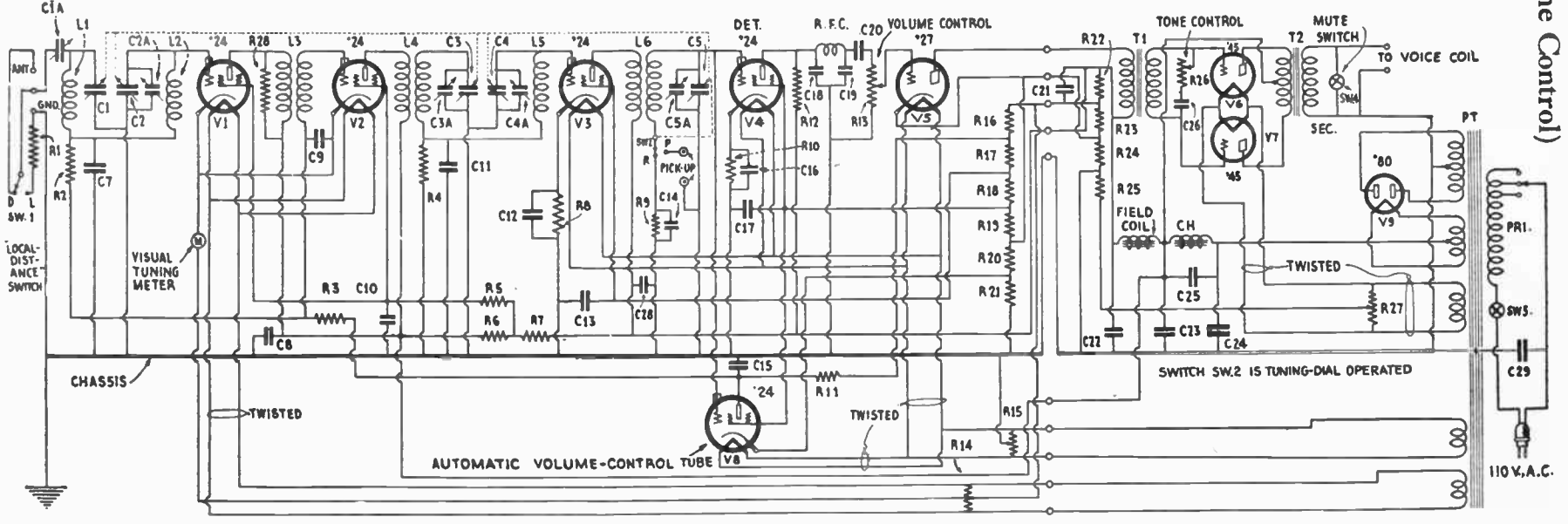
The phosphor-bronze drive-cable may be replaced in the following manner: turn the tuning condenser gang to the zero position (plates fully open), and place one of the cable loops over the pin at the top right-hand side of the large drive drum. Lead the cable along the groove and down to the small grooved drum, and turn the condenser gang to the "100" position. Next, start the cable at the center groove of the small drum and wind on 6½ turns in a clockwise direction (to the right); winding toward the front of the receiver, bringing the belt up and over the idler pulley. Follow down the groove of the large drum and hook the second loop over the drum tension spring; which is conveniently pulled into position by catching a wire or cord in the hook of the spring. The final operation is to reset the dial; by loosening the small gear on the knob shaft; turning the shaft to the left as far as it will go; setting the dial against the stop at the "100" position; and re-tightening the small gear.

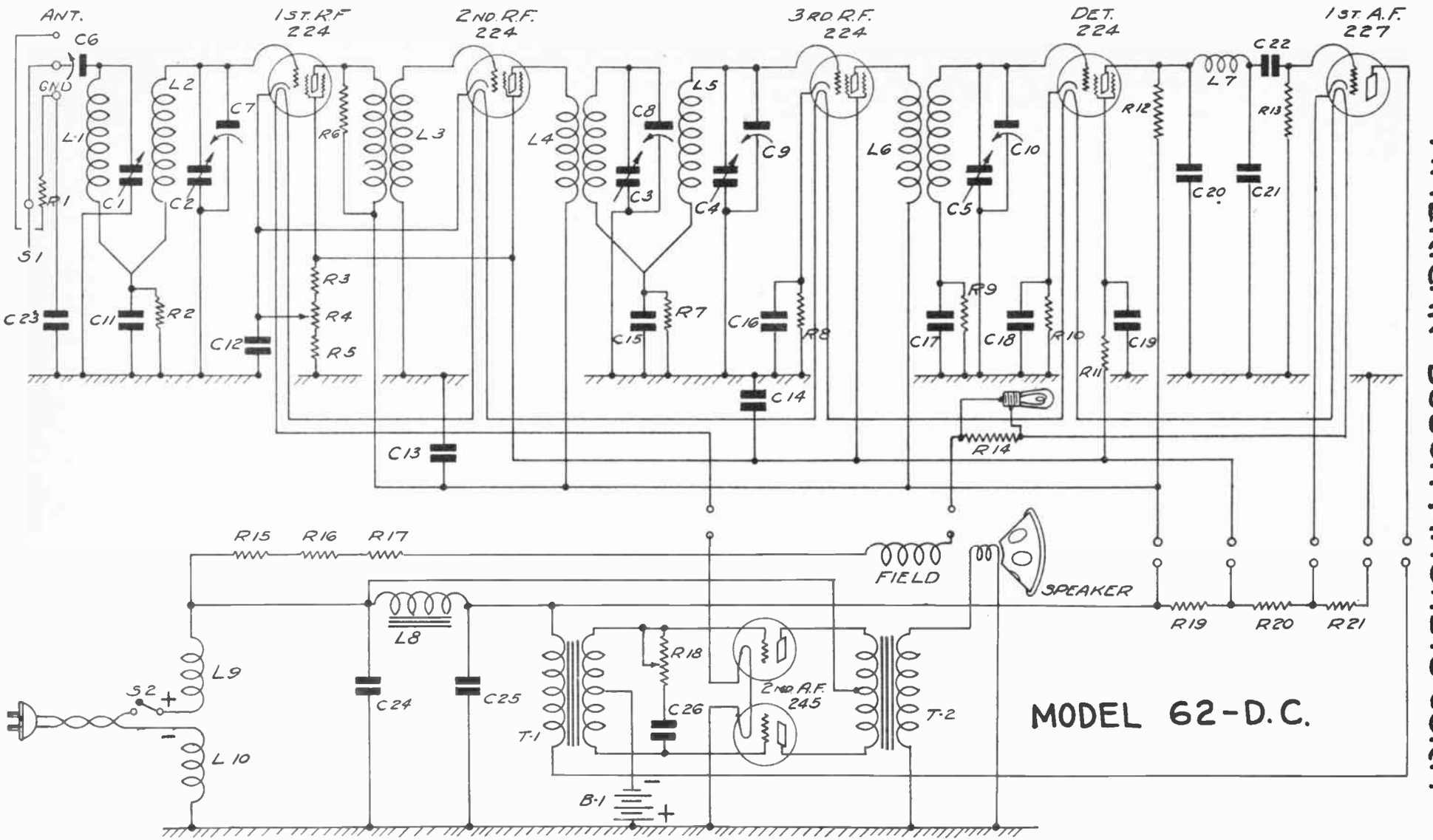
Two cables, terminating in plugs, connect the receiver's chassis to the power pack and power audio chassis. It is important to plug the left cable connection into the left receptacle, and the right-hand connection into the right-hand receptacle; so that the two cables do not cross.

The dynamic reproduced in the "Model 60" receiver is provided with a copper shield, between its core and the field coil, which prevents hum induction between this coil and the voice coil. The field coil has a resistance of 2,000 ohms; and the voice coil of 10 ohms, approximately. Four strips of .01-in. paper may be used as gap gauges. The brown and red leads connect to the terminals marked "field coil"; and the black lead to the terminal marked "V."

The "Model 61" receiver has a chassis designed for 25-cycle operation; the only difference being in the power transformer and the increased filter capacity.

A letter following the numerals indicates the cabinet style.





~ SEE PAGE 90H FOR VALUES OF PARTS ~

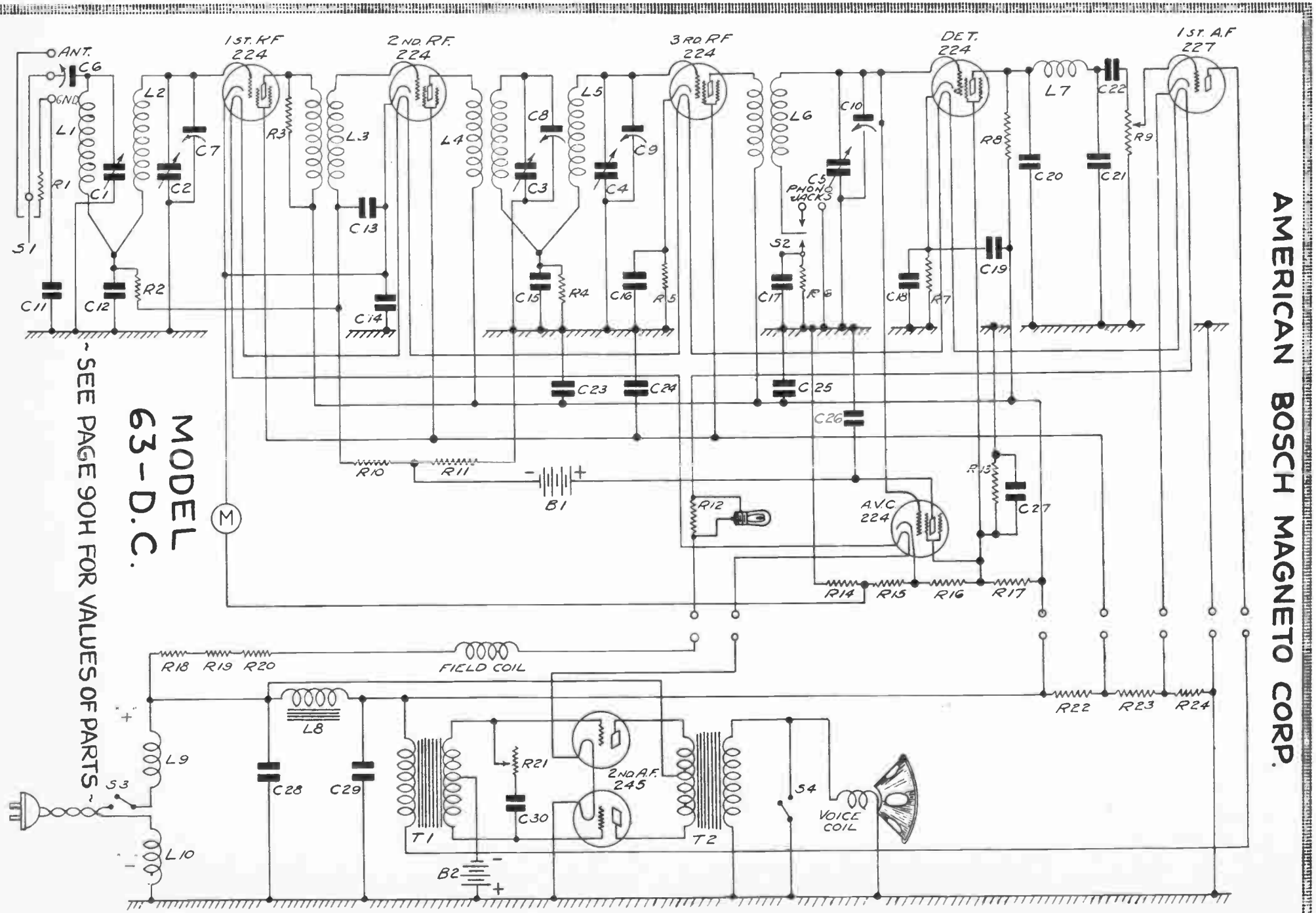


Fig. 2—Schematic Diagram of Model 63 Receivers

NOMENCLATURE
Model 62 Receiver

R 1—Antenna Resistor 500 ohms
R 2—De-coupling Resistor 1,000 ohms
R 3—Resistor 20,000 ohms
R 4—Volume Control 3,000 ohms
R 5—Resistor 150 ohms
R 6—Untuned Transformer Resistor .1 meg.
R 7—De-coupling Resistor 1,000 ohms
R 8—3rd RF Cathode Resistor 600 ohms
R 9—Resistor 1,000 ohms
R10—Detector Cathode Resistor 50,000 ohms
R11—Detector Screen Resistor 1 meg.
R12—Detector Plate Resistor .5 meg.
R13—1st Audio Grid Resistor 2 meg.
R14—Filament Resistor 1.8 ohms
R15—Filament Resistor 18 ohms
R16—Filament Resistor 18 ohms
R17—Filament Resistor 18 ohms
R18—Tone Selector Resistor .5 meg.
R19—Voltage Divider Resistor 1,400 ohms
R20—Voltage Divider Resistor 2,600 ohms
R21—Voltage Divider Resistor 250 ohms

C 1—1st RF Tuning Condenser
C 2—1st RF Tuning Condenser
C 3—3rd RF Tuning Condenser
C 4—3rd RF Tuning Condenser
C 5—Detector Tuning Condenser
C 6—Antenna Trimming Condenser
C 7—1st RF Alignment Condenser
C 8—3rd RF Alignment Condenser
C 9—3rd RF Alignment Condenser
C10—Detector Alignment Condenser
C11—1st RF Coupling Condenser .04 mfd.
C12—Cathode By-pass Condenser .5 mfd.
C13—Plate By-pass Condenser .5 mfd.
C14—Screen By-Pass Condenser .5 mfd.
C15—3rd RF Coupling Condenser .04 mfd.
C16—3rd RF Cathode Condenser .5 mfd.
C17—Detector Condenser .04 mfd.
C18—Detector Cathode Condenser 1. mfd.
C19—Detector Screen Condenser .5 mfd.
C20—Detector Plate By-pass Condenser .0001 mfd.
C21—Detector Plate By-pass Condenser .0001 mfd.
C22—Audio Coupling Condenser .006 mfd.
C23—Ground Condenser .006 mfd.
C24—Filter Condenser 4 mfd.
C25—Filter Condenser 4 mfd.
C26—Tone Selector Condenser .006 mfd.

S 1—Local-Long Distance Switch
S 2—Off and On Switch

B 1—"C" Battery—22½ volts

T 1—Audio Input Transformer
T 2—Audio Output Transformer

L 1—1st RF Coil
L 2—1st RF Coil
L 3—Untuned Transformer
L 4—3rd RF Coil
L 5—3rd RF Coil
L 6—Detector Coil
L 7—Detector Plate Choke
L 8—Filter Choke
L 9—Filter Choke
L10—Filter Choke

NOMENCLATURE
Model 63 Receiver

R 1—Antenna Resistor 500 ohms
R 2—De-coupling Resistor 1,000 ohms
R 3—Untuned Transformer Resistor 50,000 ohms
R 4—De-coupling Resistor 1,000 ohms
R 5—3rd RF Cathode Resistor 600 ohms
R 6—Detector Resistor 1,000 ohms
R 7—Detector Cathode Resistor 50,000 ohms
R 8—Detector Plate Resistor .5 meg.
R 9—Volume Control .5 meg.
R10—1st and 2nd RF Bias Resistor 1 meg.
R11—Bias Control Resistor 1 meg.
R12—Filament Resistor 1.8 ohms
R13—AVC Screen Resistor 20,000 ohms
R14—Voltage Divider Resistor 150 ohms
R15—Voltage Divider Resistor 900 ohms
R16—Voltage Divider Resistor 5,000 ohms
R17—Voltage Divider Resistor 20,000 ohms
R18—Filament Resistor 18 ohms
R19—Filament Resistor 18 ohms
R20—Filament Resistor 18 ohms
R21—Tone Control Resistor .5 meg.
R22—Voltage Divider Resistor 1,400 ohms
R23—Voltage Divider Resistor 2,600 ohms
R24—Voltage Divider Resistor 250 ohms

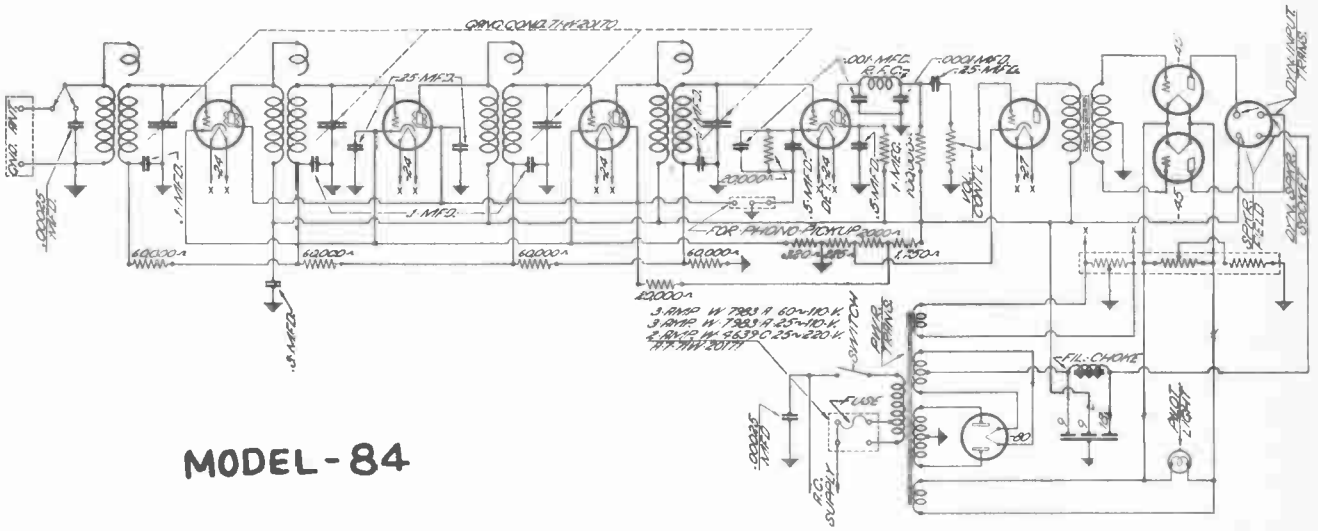
C 1—1st RF Tuning Condenser
C 2—1st RF Tuning Condenser
C 3—3rd RF Tuning Condenser
C 4—3rd RF Tuning Condenser
C 5—Detector Tuning Condenser
C 6—Antenna Trimmer Condenser
C 7—1st RF Alignment Condenser
C 8—3rd RF Alignment Condenser
C 9—3rd RF Alignment Condenser
C10—Detector Alignment Condenser
C11—Ground Series Condenser .0001 mfd.
C12—1st RF Coupling Condenser .04 mfd.
C13—2nd RF Condenser .5 mfd.
C14—Cathode By-pass Condenser .5 mfd.
C15—3rd RF Coupling Condenser .04 mfd.
C16—3rd RF Cathode Condenser .5 mfd.
C17—Detector Condenser .04 mfd.
C18—Detector Cathode Condenser 1 mfd.
C19—Detector Plate Condenser 1 mfd.
C20—Detector Plate Condenser .0001 mfd.
C21—Detector Plate Condenser .0001 mfd.
C22—Audio Coupling Condenser .006 mfd.
C23—Plate By Pass Condenser .25 mfd.
C24—Screen By Pass Condenser .25 mfd.
C25—Plate By Pass Condenser .5 mfd.
C26—AVC Plate By Pass Condenser .006 mfd.
C27—AVC Screen Condenser .5 mfd.
C28—Filter Condenser 4 mfd.
C29—Filter Condenser 4 mfd.
C30—Tone Control Condenser .006 mfd.

T 1—Input Transformer
T 2—Output Transformer

B 1—AVC Plate Battery 22½ volts
B 2—2nd Audio "C" Battery 22½ volts

S 1—Local Distance Switch
S 2—Phono Switch
S 3—Main Switch
S 4—Mute Switch

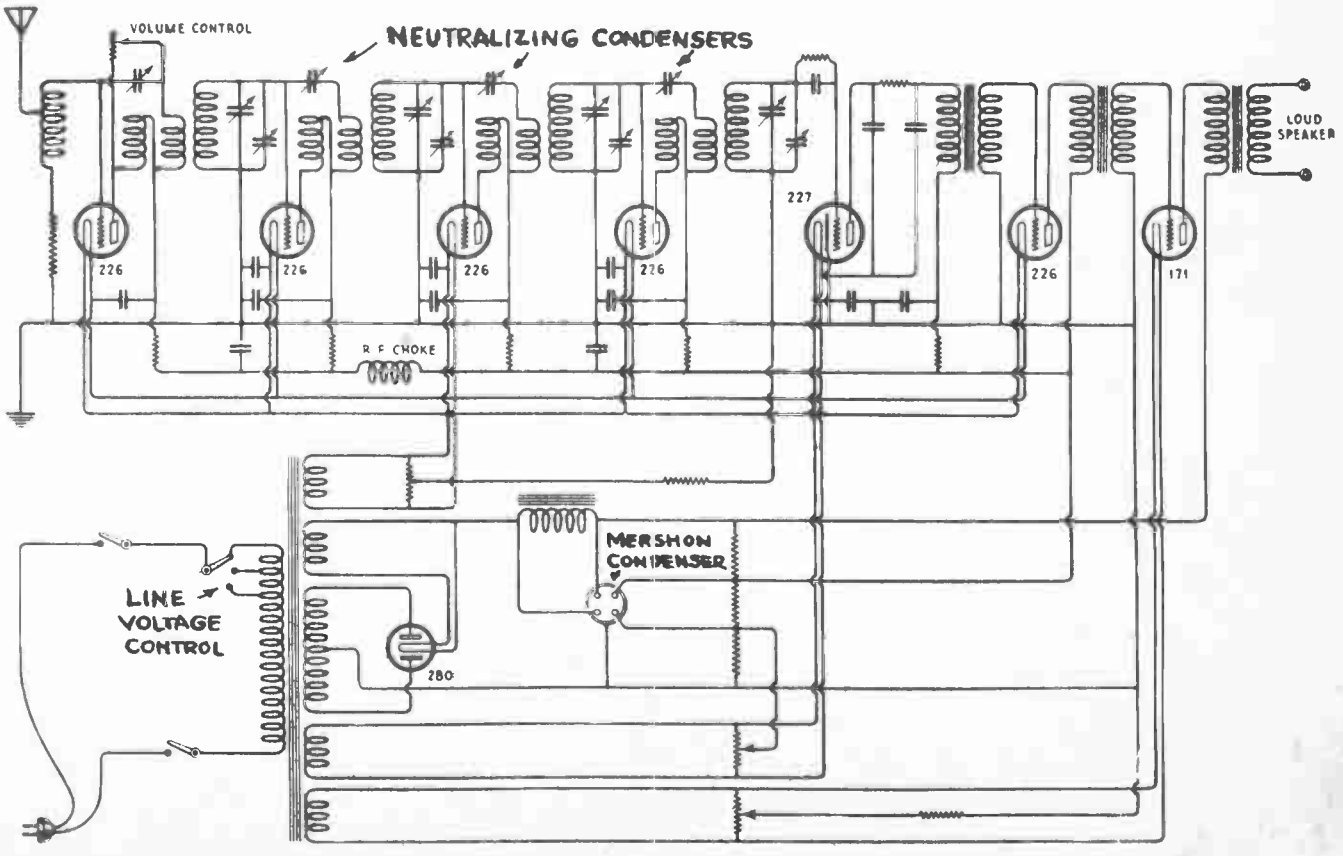
AMRAD CORPORATION



MODEL-84

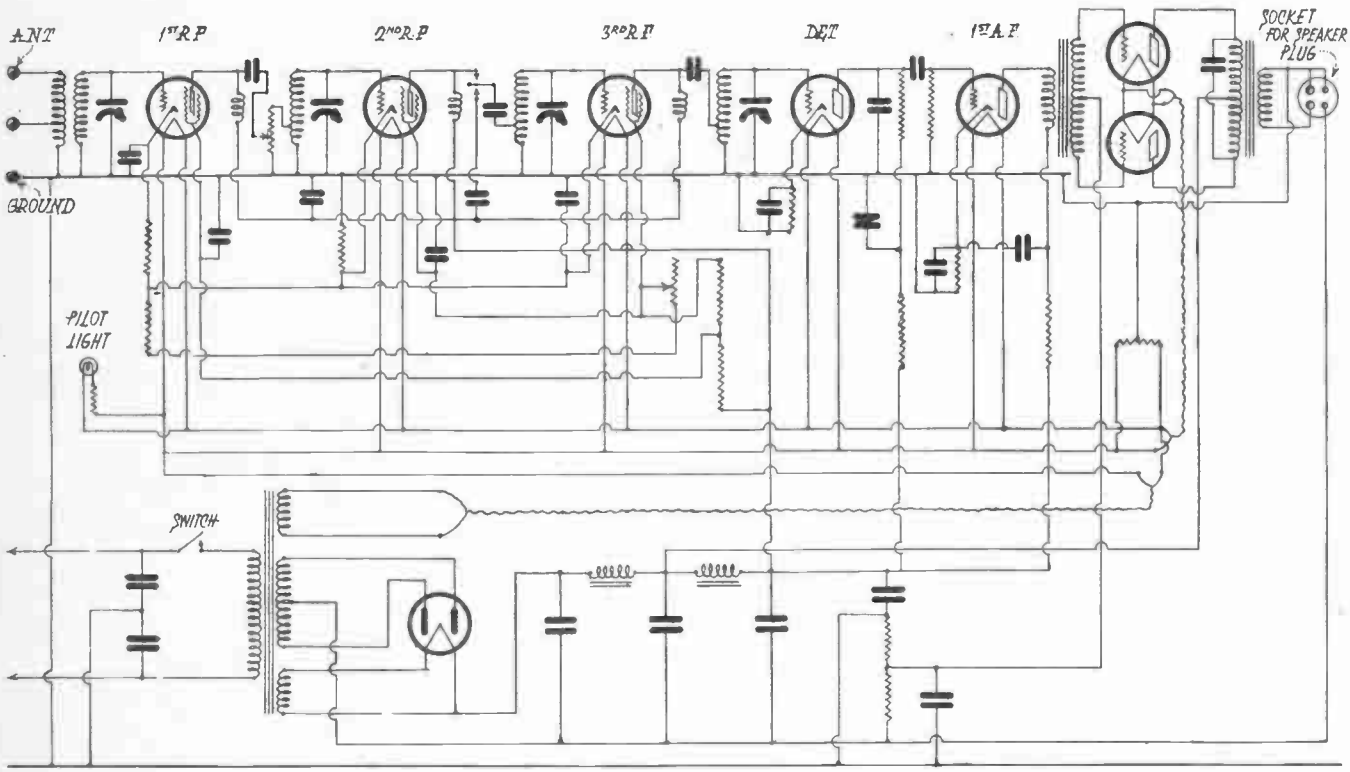
Tube Operating Voltages

Tube	Position	A	B	C	Screen
'24	1st r.f.	2.3	170	2.5	60
'24	2nd r.f.	2.3	170	2.5	60
'24	3rd r.f.	2.3	170	2.5	60
'24	detector	2.3	95	4.0	35
'27	1st a.f.	2.3	130	8.0	
'45	2nd a.f.	2.3	220	40	
'45	2nd a.f.	2.3	220	40	
'80	rectifier	4.6	250	--	



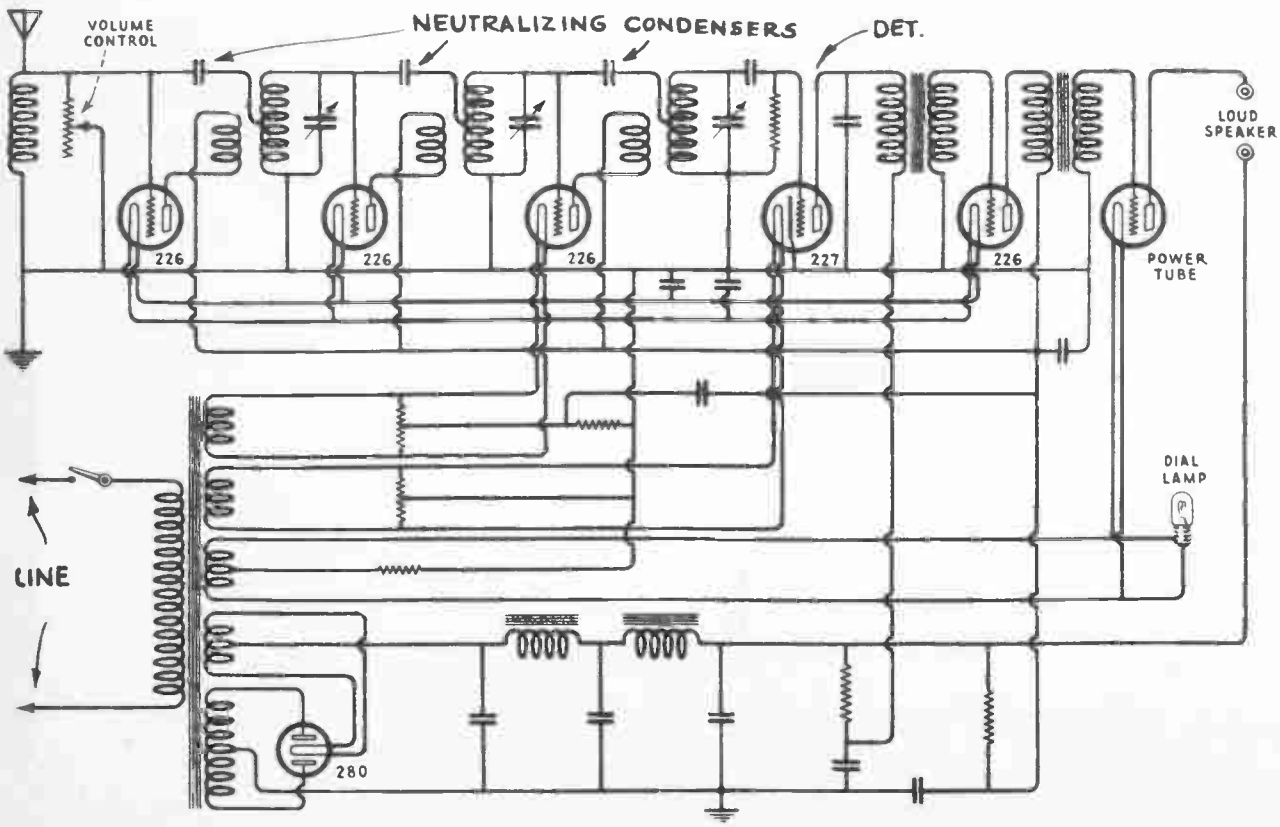
ATWATER KENT MFG. CO.

MODEL 60

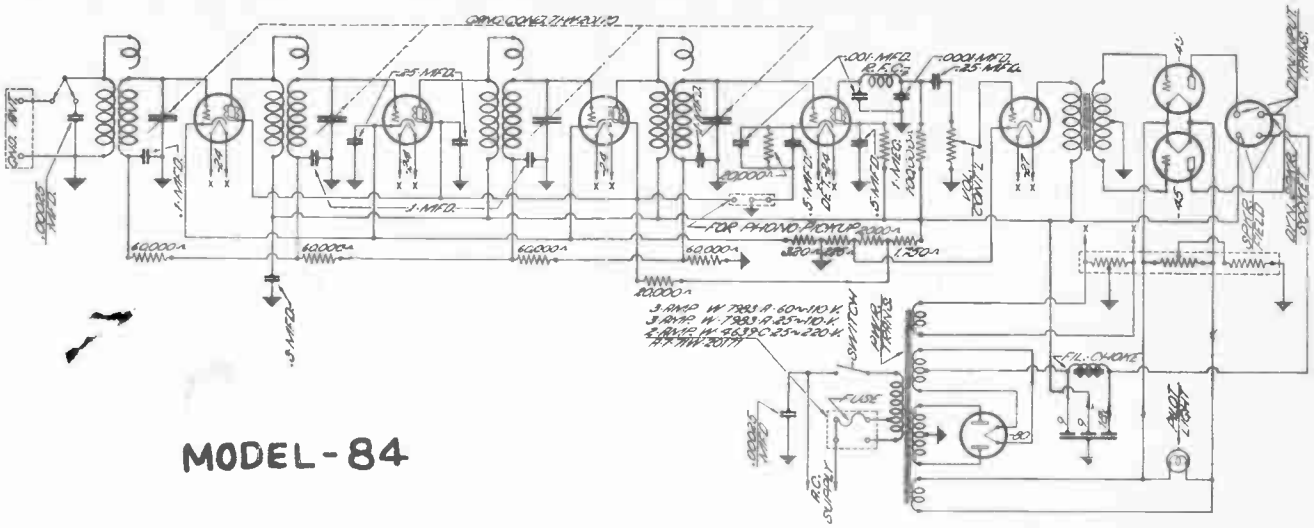


U.S. RADIO & TELEVISION CORP.

APEX MODEL 36



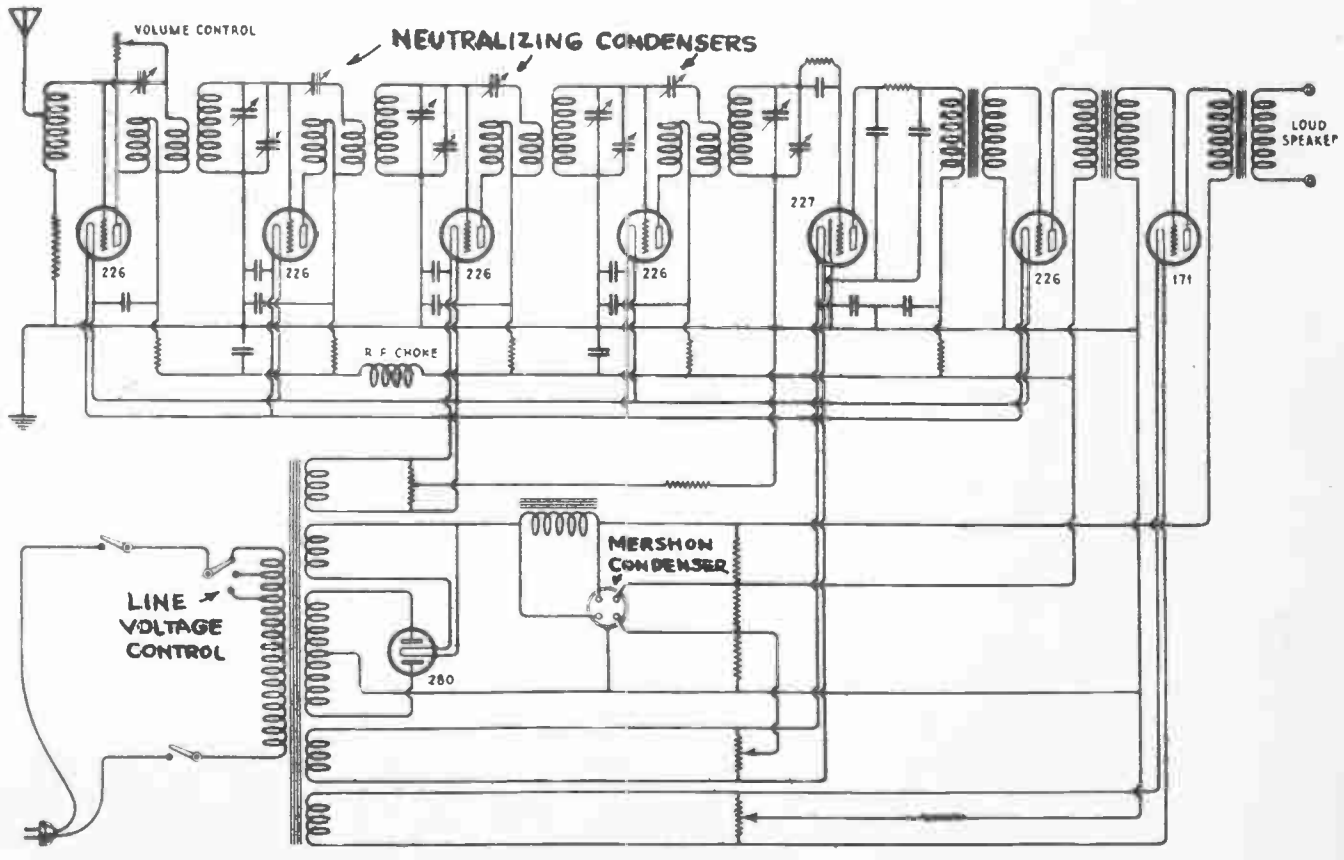
AMRAD CORPORATION



MODEL-84

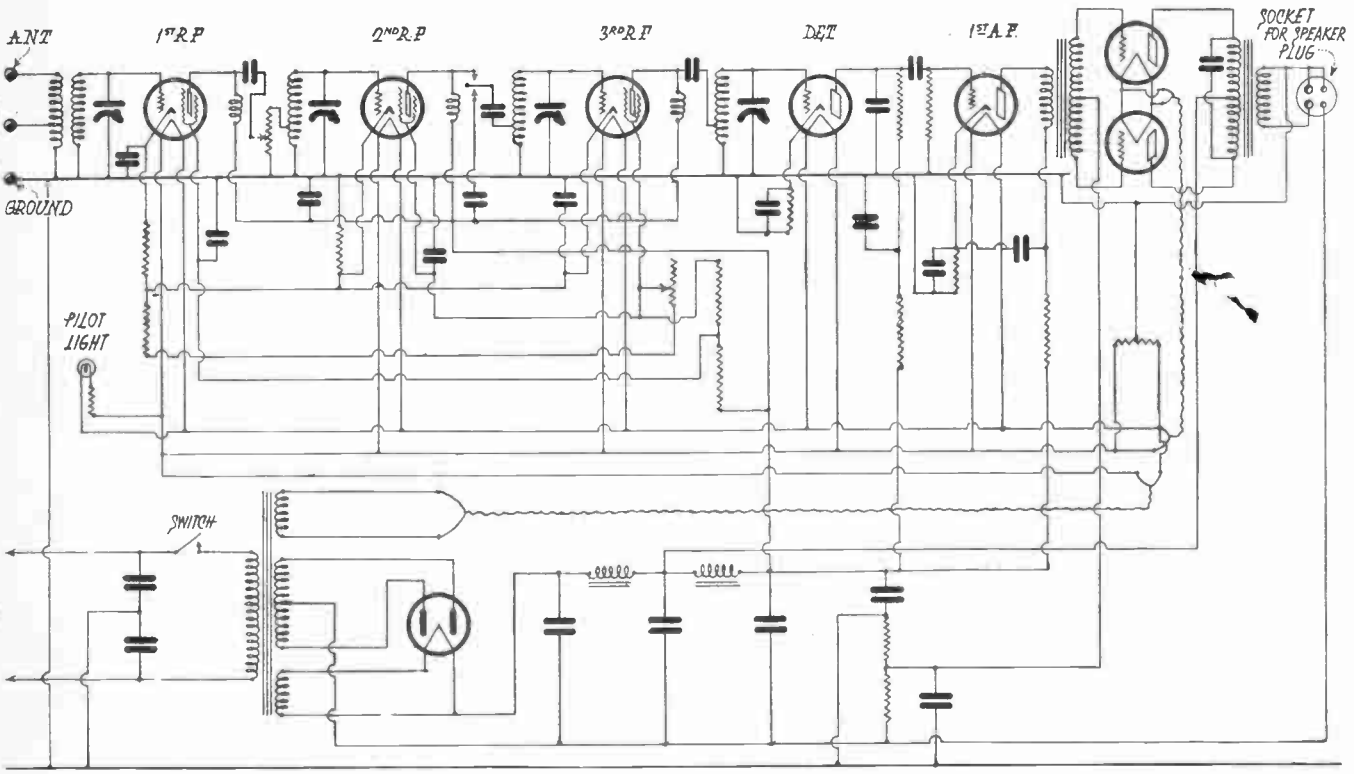
Tube Operating Voltages

Tube	Position	A	B	C	Screen
'24	1st r.f.	2.3	170	2.5	60
'24	2nd r.f.	2.3	170	2.5	60
'24	3rd r.f.	2.3	170	2.5	60
'24	detector	2.3	95	4.0	35
'27	1st a.f.	2.3	130	8.0	
'45	2nd a.f.	2.3	220	40	
'45	2nd a.f.	2.3	220	40	
'80	rectifier	4.6	250	--	



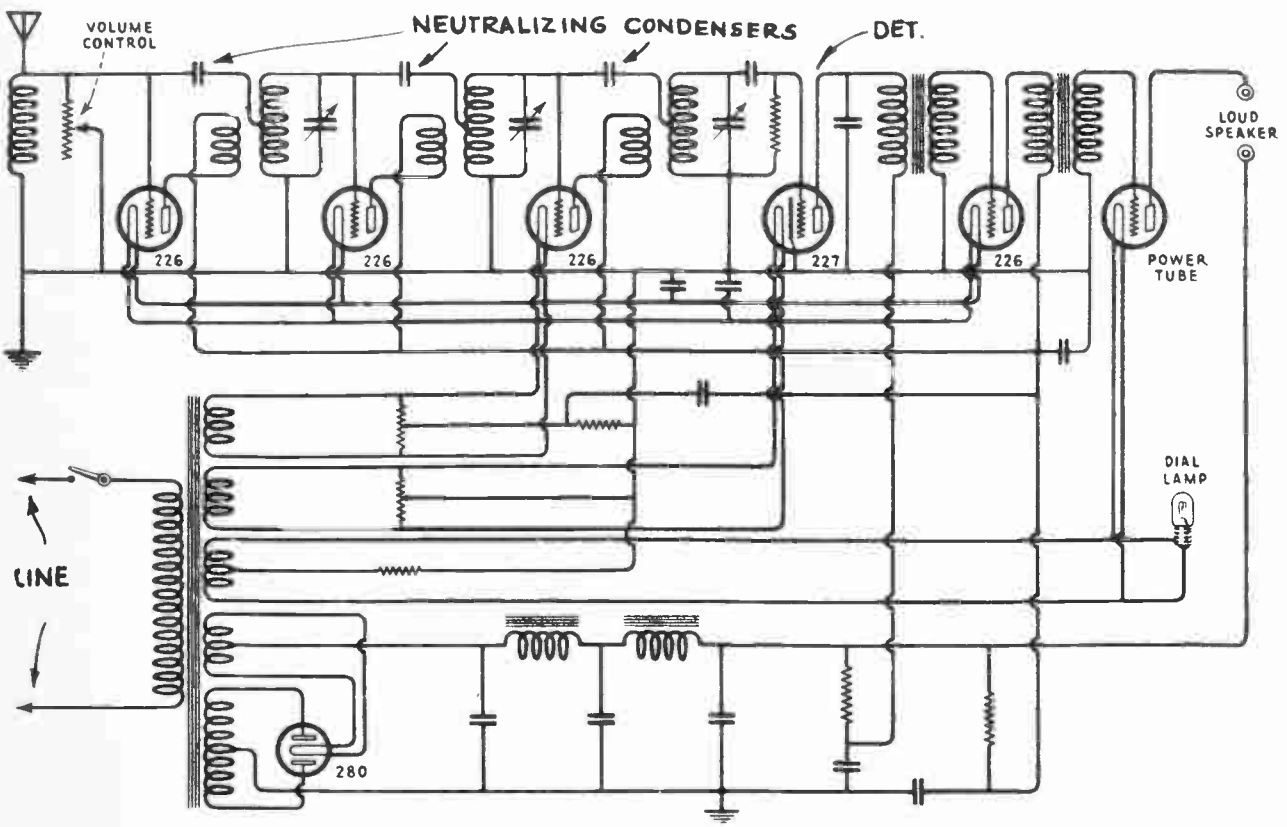
ATWATER KENT MFG. CO.

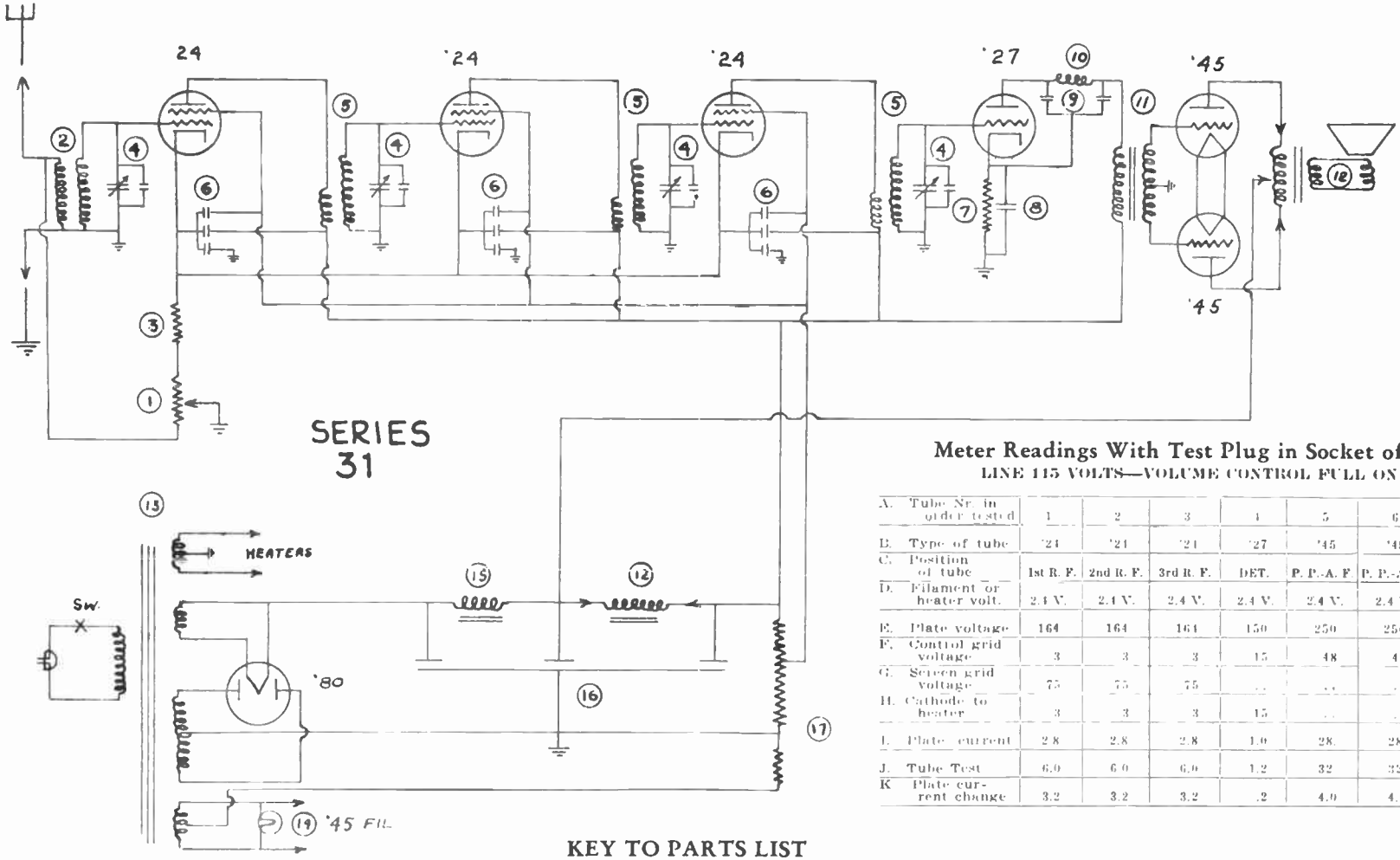
MODEL 60



U.S. RADIO & TELEVISION CORP.

APEX MODEL 36





Meter Readings With Test Plug in Socket of Set

LINE 115 VOLTS—VOLUME CONTROL FULL ON

A. Tube Nr. in order tested	1	2	3	4	5	6	7
B. Type of tube	'24	'24	'24	'27	'45	'45	'80
C. Position of tube	1st R. F.	2nd R. F.	3rd R. F.	DET.	P. P.-A. F.	P. P.-A. F.	RECT.
D. Filament or heater volt.	2.4 V.	2.4 V.	2.4 V.	2.4 V.	2.4 V.	2.4 V.	4.9 V.
E. Plate voltage	164	164	164	150	250	250	276
F. Control grid voltage	3	3	3	15	48	48	..
G. Screen grid voltage	75	75	75	..	..	..	..
H. Cathode to heater	3	3	3	15	..	..	..
I. Plate current	2.8	2.8	2.8	1.0	28.	28.	58.
J. Tube Test	6.0	6.0	6.0	1.2	32	32.	..
K Plate current change	3.2	3.2	3.2	.2	4.0	4.0	..

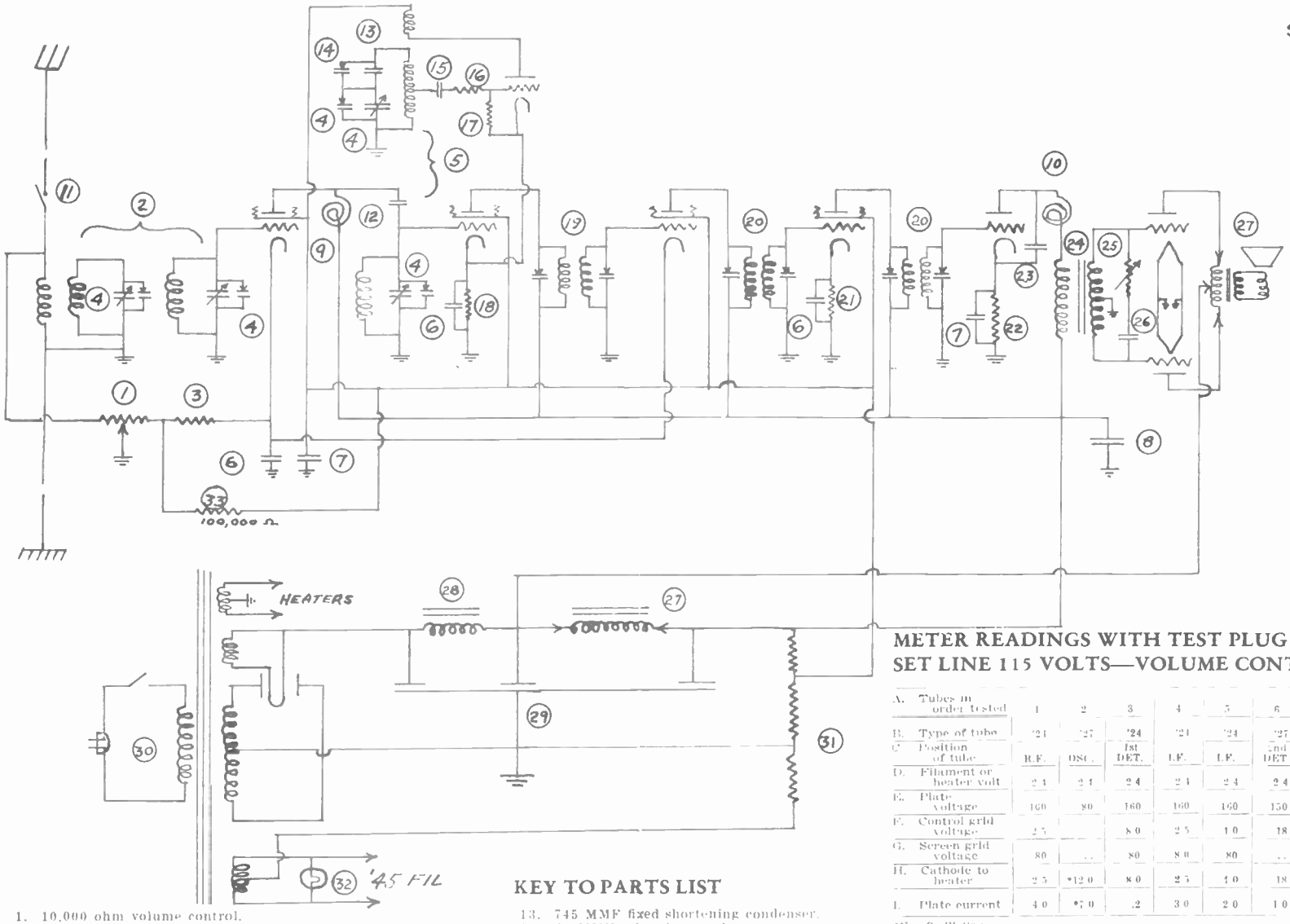
KEY TO PARTS LIST

1. 10,000 ohm volume control.
2. Antenna input RF transformer.
3. 300 ohm RF C bias resistor.
4. 4 gang variable condenser, 370 mmf, with trimmer.
5. Intermediate stage radio frequency transformer
6. 3-.1 RF by-pass condenser block.
7. 15,000 ohm detector bias resistor.
8. .5 mfd detector by-pass condenser.
9. 2-.001 detector plate by-pass condensers.
10. Detector plate RF choke.
11. Push-pull input audio transformer.
12. Dynamic speaker assembly with plug and 4 conductor cable; 2500 ohm field; voice transformer in speaker chassis.
13. 100 watt power transformer.
14. 2.5 volt pilot light.
15. 150 ohm, 3 henry filter choke.
16. 3-8.0 mfd filter condenser.
17. Voltage divider resistor 2300-2100-850 ohm.

Note: Models incorporating "Tone Control" have a third knob in center below escutcheon plate, which rotates a one megohm variable resistor (part No. 18), in a series with a .001 mfd condenser (part No. 19) connected grid to grid in the push-pull stage.

AUDIOLA RADIO CO.

SUPERHETERODYNE
RECEIVER
AUDIOLA RADIO
CHICAGO
DWG # 92430



METER READINGS WITH TEST PLUG IN SOCKET OF SET LINE 115 VOLTS—VOLUME CONTROL FULL ON

A. Tubes in order tested	1	2	3	4	5	6	7	8	9
B. Type of tube	'24	'27	'24	'24	'24	'27	'45	'45	'80
C. Position of tube	R.F.	OSC.	1st DET.	I.F.	I.F.	2nd DET	P.P A.F.	P.P A.F.	RECT.
D. Filament or heater volt	2.1	2.1	2.1	2.1	2.1	2.1	2.25	2.25	4.7
E. Plate voltage	160	80	160	160	160	150	245	245	260
F. Control grid voltage	2.5		8.0	2.5	1.0	18	48	48	..
G. Screen grid voltage	80	..	80	8.0	80	..	..	..	..
H. Cathode to heater	2.5	*12.0	8.0	2.5	1.0	18	..	..	..
I. Plate current	4.0	*7.0	.2	3.0	2.0	1.0	28	28	58

*Non-Oscillating.

KEY TO PARTS LIST

1. 10,000 ohm volume control.
2. Antenna—Pre-selector inductance assembly.
3. 250 ohm R. F.—1st I. F. C Bias resistor
4. 4 gang variable condenser, 330 mmf., with trimmers.
5. Detector—oscillator inductance assembly
6. .1 mfd. 150 volt by-pass condenser.
7. .5 mfd. 150 volt by-pass condenser.
8. .5 mfd. 250 volt Plate Supply by-pass condens
9. R. F. choke coil.
10. Detector choke coil.
11. Local-distance switch.
12. 5 M.M.F. R.F. Coupling condenser.
13. 745 MMF fixed shortening condenser.
14. 60 MMF trimming condenser.
15. 745 MMF grid condenser.
16. 6000 ohm resistor.
17. 40,000 ohm grid leak.
18. 2000 ohm detector-oscillator bias resistor
19. First I. F. transformer.
20. 2nd and 3rd I. F. transformer.
21. 2000 ohm bias resistor.
22. 15,000 ohm bias resistor.
23. .002 by-pass condenser.
24. Push-pull input transformer.
25. 1 Megohm tone control.
26. .004 MFD condenser.
27. 2500 ohm dynamic field and speaker assembly with input transformer.
28. 150 ohm, 3 Henry choke.
29. Triple 8 mfd. Mershon Condenser.
30. Power Transformer.
31. Voltage divider resistor. 2450—3150—850 ohms.
32. 2.5 volt dial light bulb.
33. 100,000 ohm resistor.

BALKITE PRODUCTS COMPANY

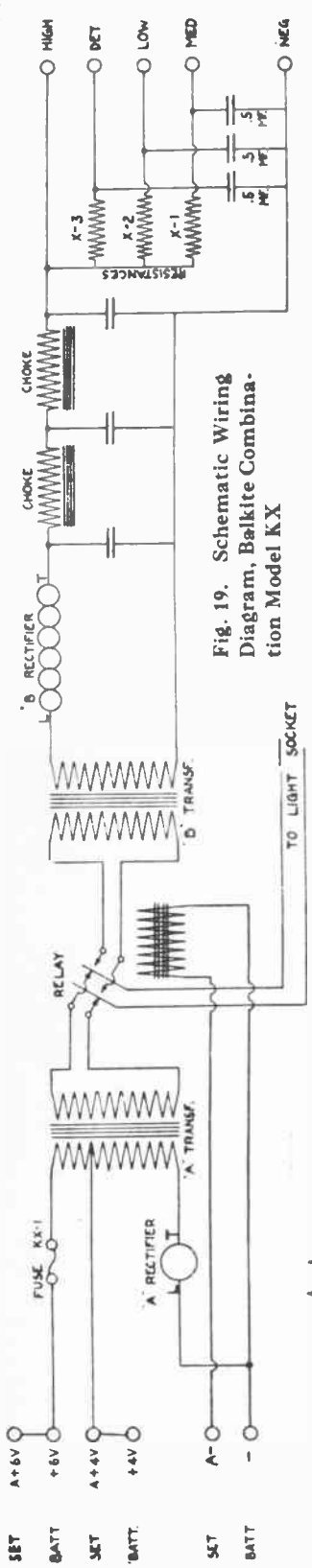
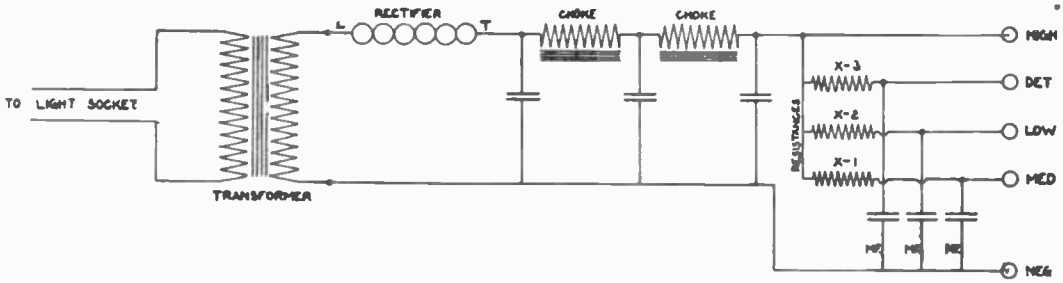
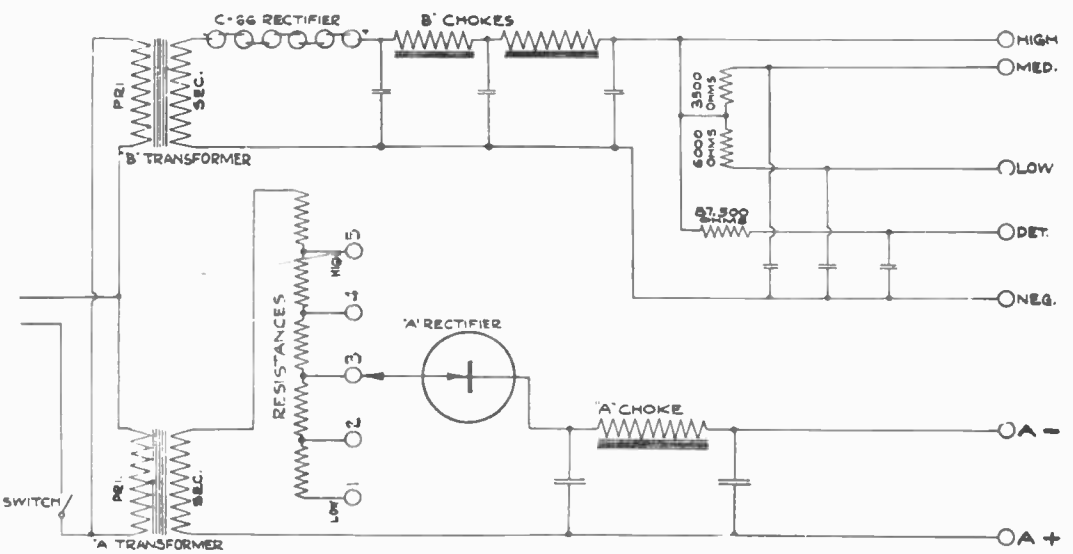


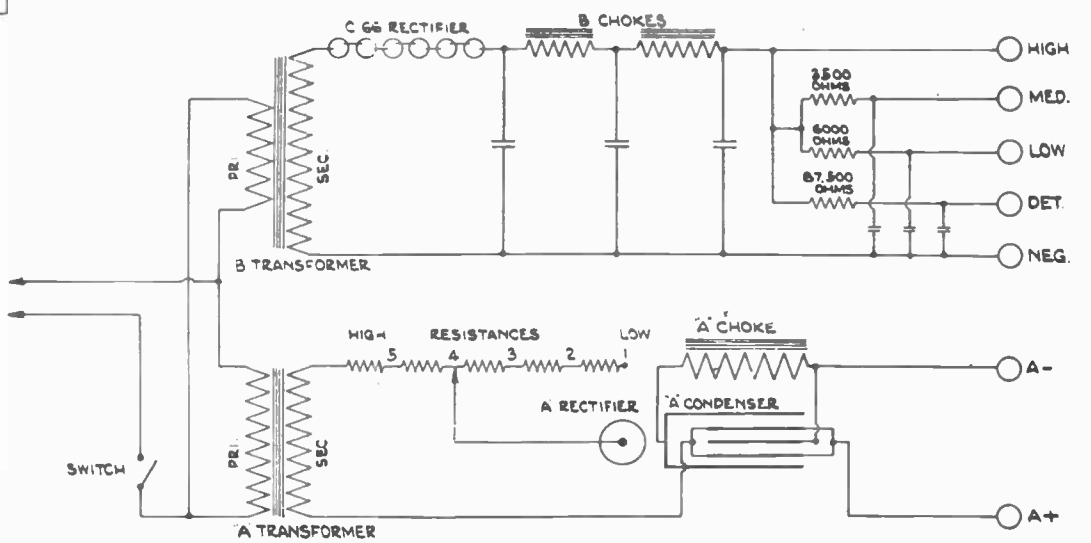
Fig. 19. Schematic Wiring Diagram, Balkite Combination Model KX



Balkite BX



Balkite AB 6-135, Form A

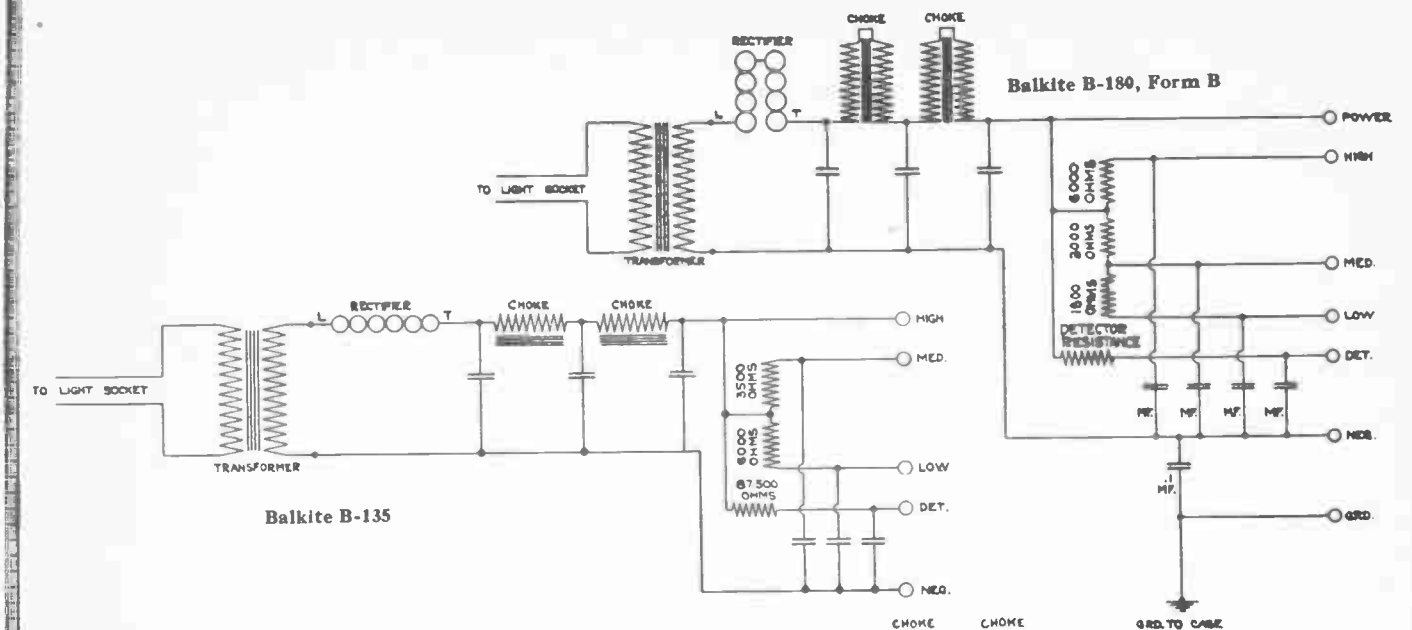


Balkite AB 6-135, Form B

Balkite Electrolyte

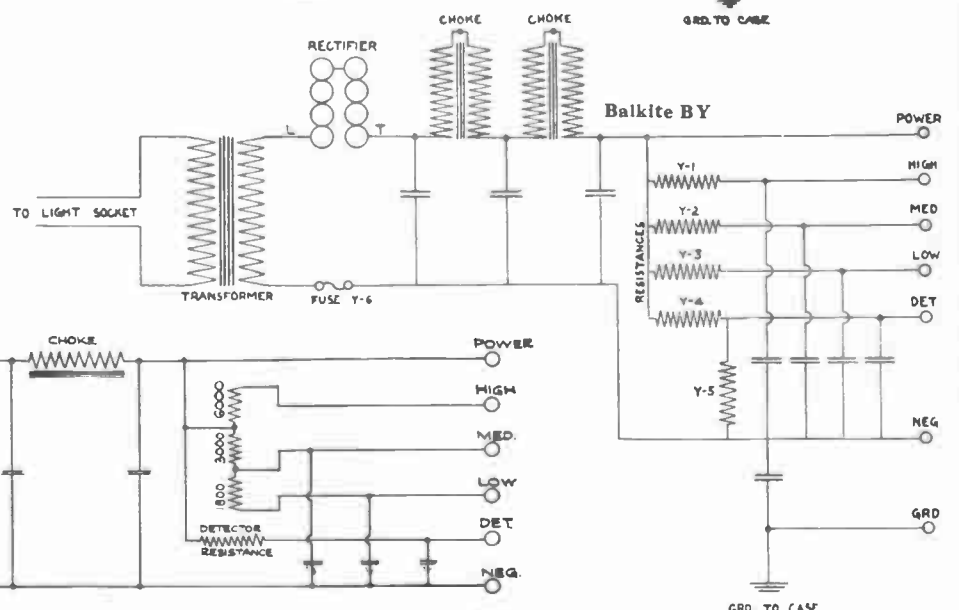
The electrolyte used in the various Balkite Radio Power Units differs considerably Electrolyte for chargers should not be used in B current supplies and under no circumstances should Balkite A refill be used in any other Balkite unit or should Balkite electrolyte be used in the Balkite A as in either case destruction to the unit would result.

BALKITE PRODUCTS COMPANY.

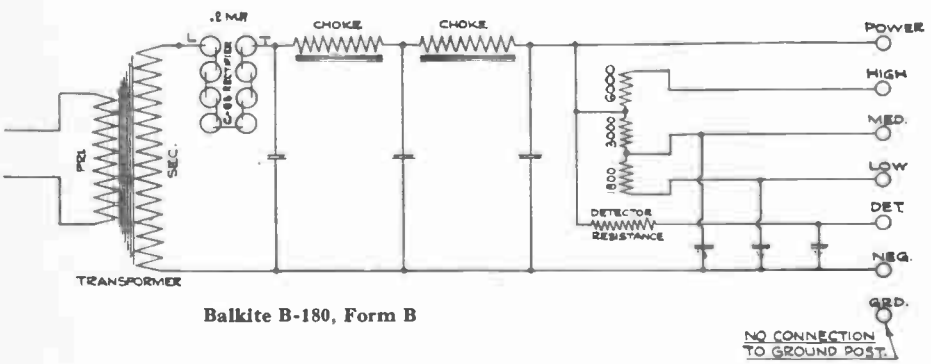


Balkite B-180, Form B

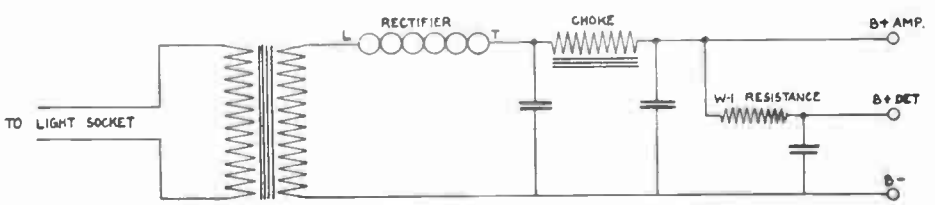
Balkite B-135



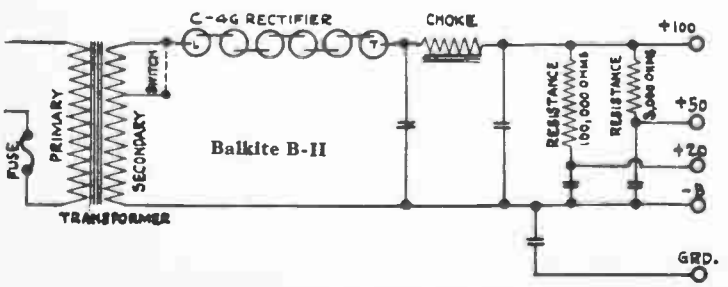
Balkite BY



Balkite B-180, Form B



Balkite BW or Balkite B, Model D



Balkite B-II

BROWNING DRAKE CORP.

CONSTANTS FOR MODEL 69

1. - 400 ohms 1 watt
2. - 600 ohms 1 watt
3. - 50,000 ohms 1 watt
4. - 3000 ohms 1 watt
5. - .5 megohms 1/3 watt
6. - 1 megohm 1/3 watt
7. - 45,000 ohms 2 watt
8. - 20,000 ohms 3 watt
9. - .25 megohms 1/3 watt
10. - 60,000 ohms 2 watt
11. - 90 ohms wire wound
12. - .25 megohms 1/3 watt
13. - .25 megohms 1/3 watt
14. - 2 megohms 1/3 watt
15. - 2000 ohms wire wound
16. - 2000 ohms wire wound
17. - .25 megohms 1/3 watt
18. - .25 megohms 1/3 watt
19. - 30 ohms C.T. wire wound
20. - Vol. Cont. Pot. 10,000 ohms
21. - .1 megohms 1/3 watt

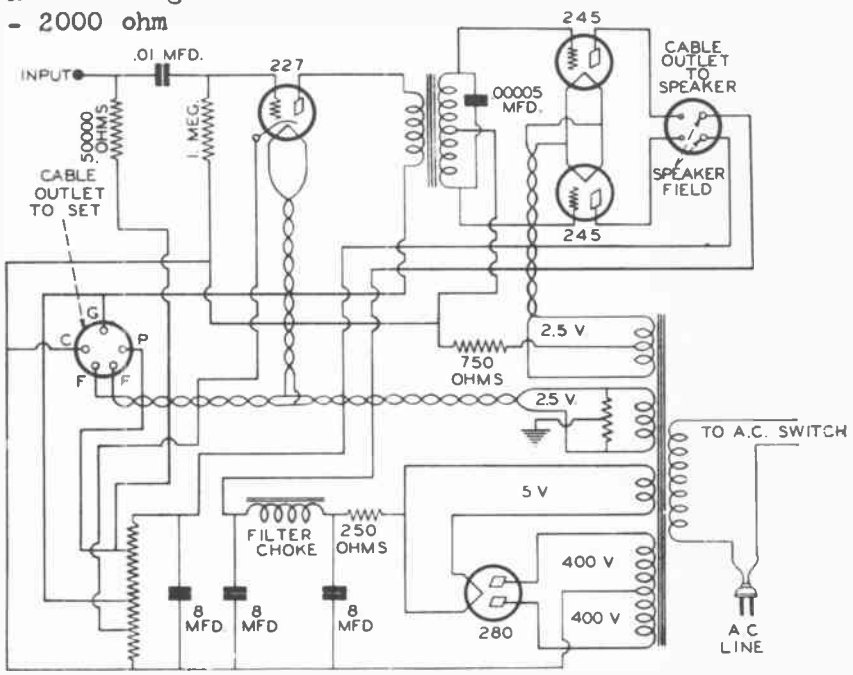
CONDENSERS

101.1 - .5 MF 200 volt
101.2 - .5 MF 300 volt
102.1 - .5 MF 200 volt
102.2 - .5 MF 300 volt
103 - .1 MF Midget
104.1 - .2 MF 200 volt
104.2 - .2 MF 300 volt
104.3 - .2 MF 200 volt
104.4 - .2 MF 200 volt
104.5 - .2 MF 300 volt
104.6 - .5 MF 200 volt
105 - .01 MF Midget
106 - .00025 MF Midget
107 - .00025 MF Midget
108 - 8 MF Electrolytic
109 - 8 MF Electrolytic
110 - .01 MF Midget

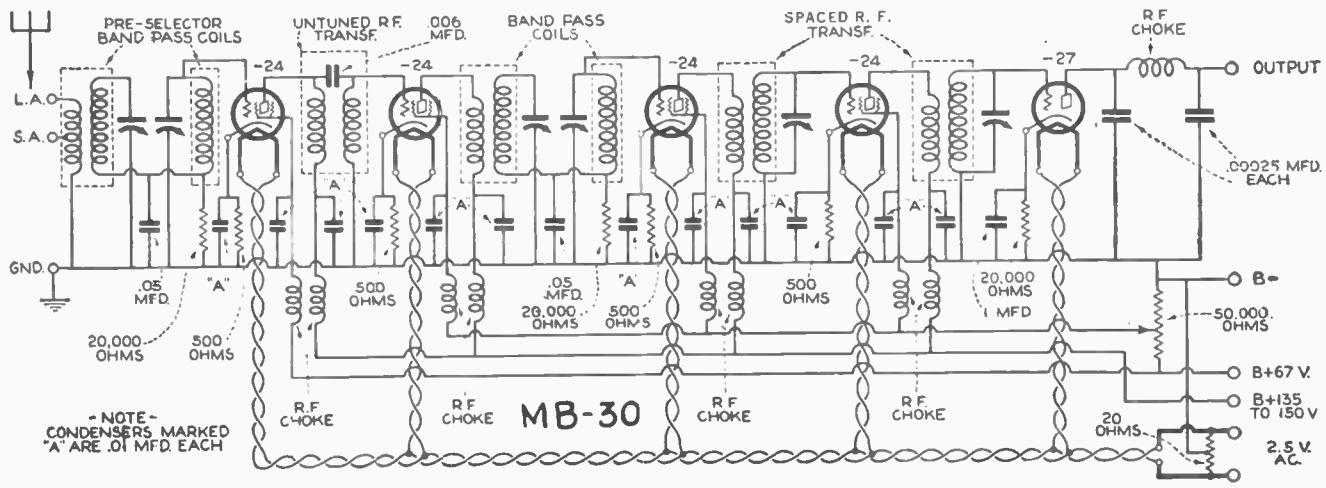
CONSTANTS FOR MODELS 70 & 71

R1 R2 R3 R14 R13 - .25 meg.
R4 R5 R6 - 10,000 ohm
R7 R8 R9 - 20,000 ohm
R10 R29 - 1 meg.
R11 R18 R19 - 40,000 ohms
R12 - .1 meg.
R16 - 40,000 ohm
R17 - 90,000 ohm
R20 - 200,000 ohm
R21 - 300 ohm
R22 - 45 ohm
R23 - 20 ohm
R24 - .5 meg.
R25 - .15 meg.
R26 - 20 ohm
R27 - 10,000 ohm
R28 - 20,000 ohm
R30 R32 - 2 meg.
R31 - 2000 ohm

C1.1 C2.1 C3.1 C1.2 C2.2
C3.2 - .1 MF 200 volt
C1.3 C2.3 C3.3 - .1MF 300 V
C4.1 C4.2 - .1 MF 200 V.
C4.3 - .25 MF 300 V.
C5.1 C5.2 - 1 MF 200 V.
C6 C7 C13 - .00025 MF
C8 - .01 MF
C10.1 - .25 MF 200 V.
C10.2 - .5 MF 300 V.
C10.3 - .1 MF 300 V.
C10.4 - .2 MF 200 V.
C10.5 - 2 MF 200 V.
C14 - .00025 MF

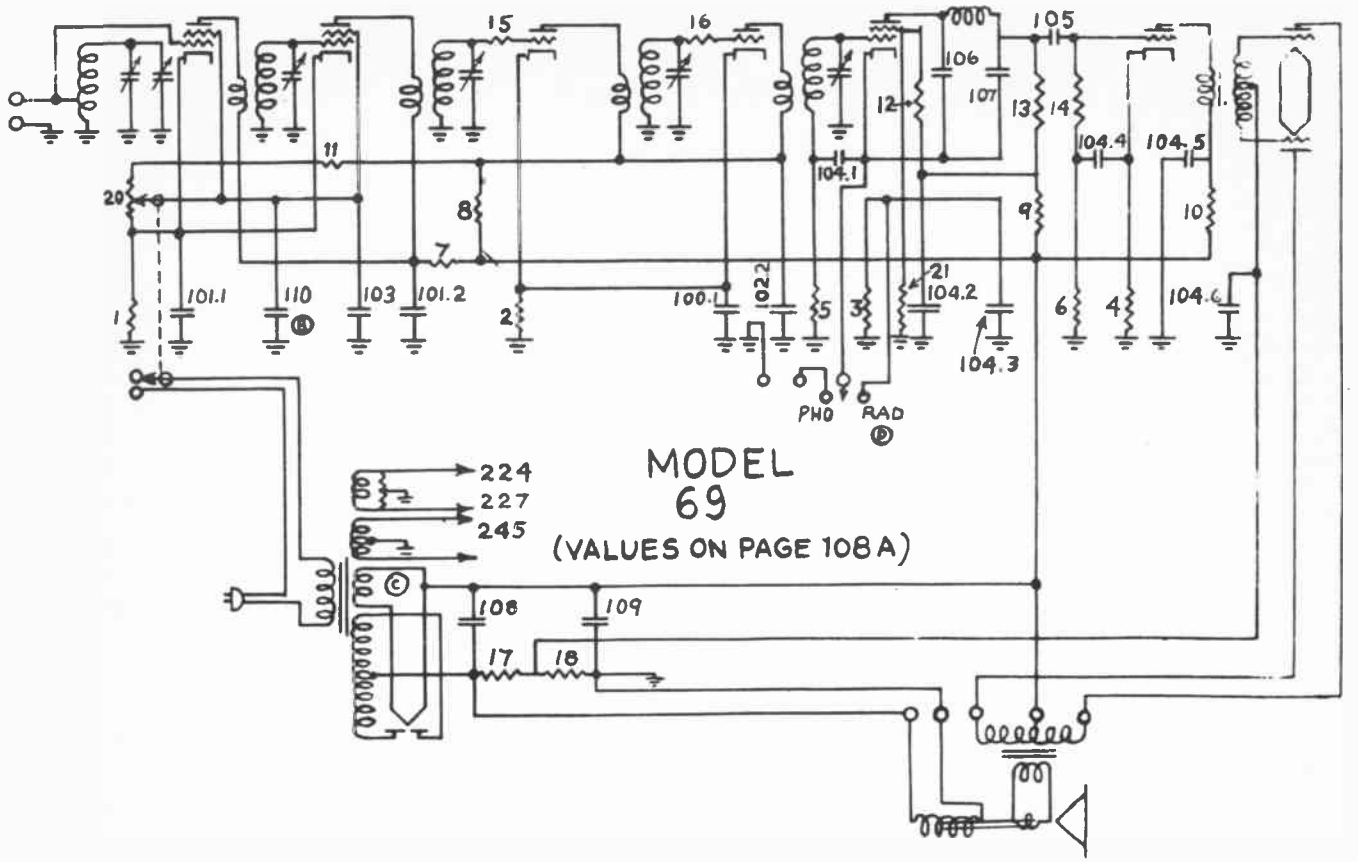


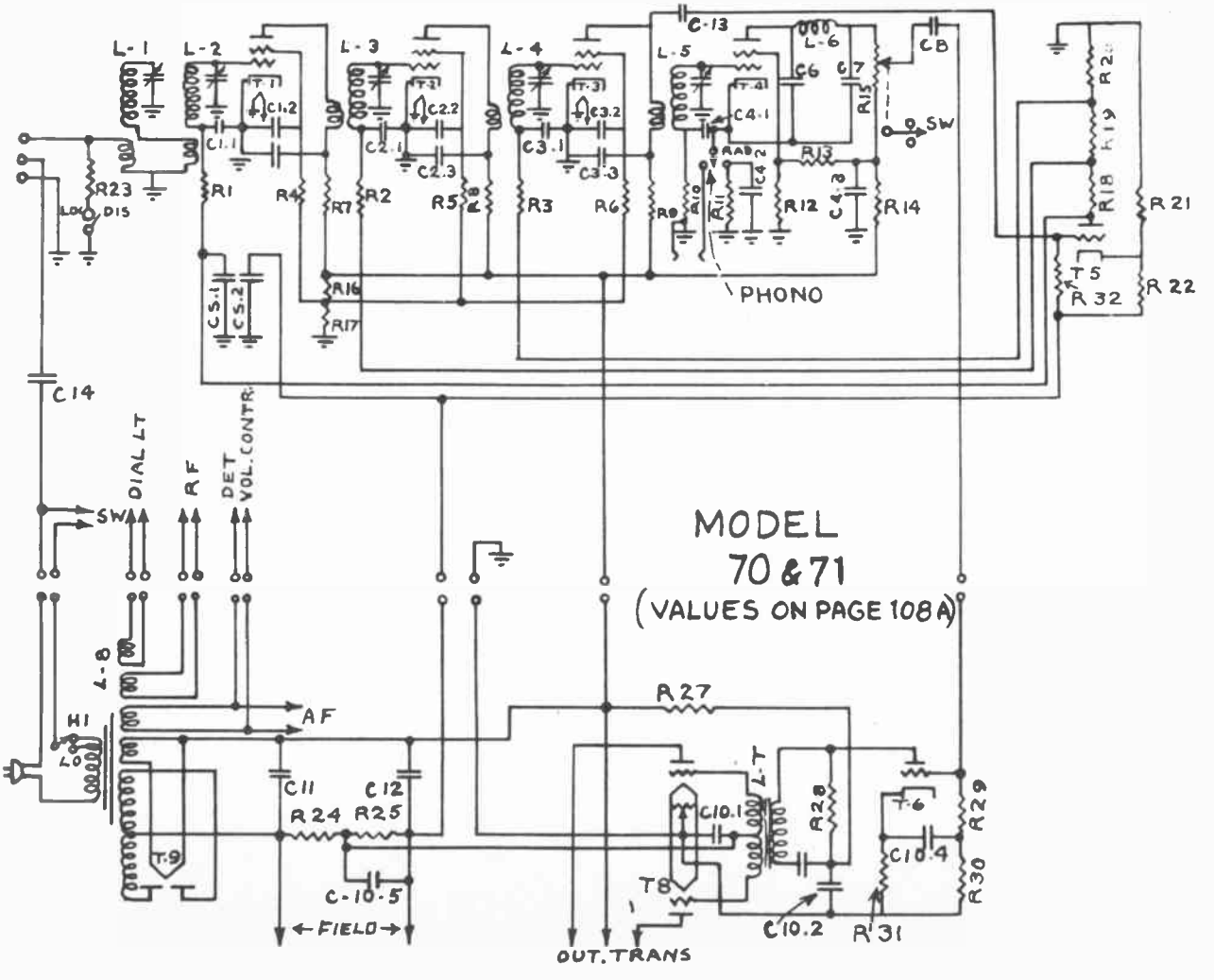
Circuit diagram of the type VSA Speaker-Amplifier for use with the MB30 tuner.



The complete circuit of the five-tube tuner. Note the band pass or "Vreeland" circuit as used in the antenna tuning system. Note also that the second s.g. tube works into an untuned coupling stage for leveling out the overall r.f. gain of the tuner

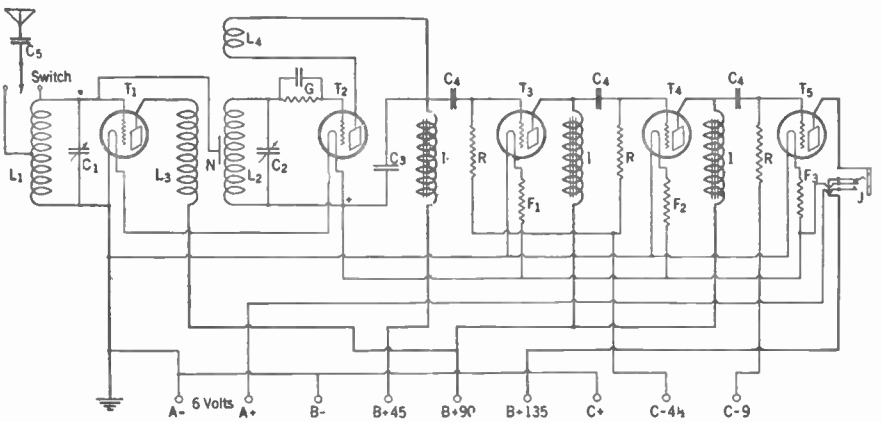
BROWNING DRAKE CORP.





BROWNING-DRAKE CORP.

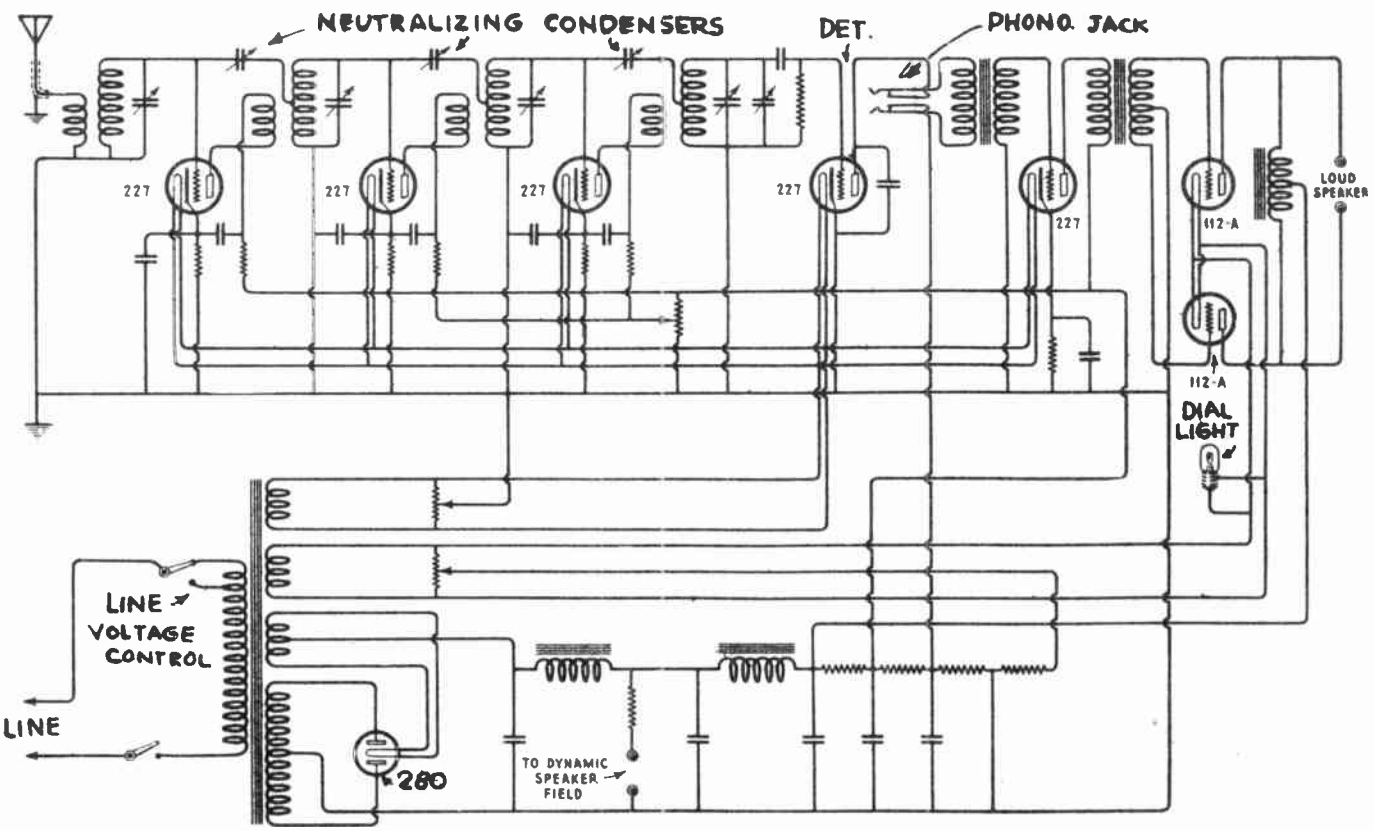
FOUR-TUBE BATTERY OPERATED.



C_1—.0005-mfd. variable condenser.
C_2—.00025-mfd. variable condenser.
C_3—.00025-mfd. fixed condenser.
C_4—.0.1-to 1.0-mfd. fixed condenser.
C_5—.0001-mfd. fixed condenser.
L_1—46 turns No. 20 d.s.c. wire on a form 3 inches in diameter, with a center tap.
L_2—75 turns No. 20 d.s.c. wire on a 3-inch form.
L_3—24 turns No. 28 d.c.c. wire wound in a groove and placed under the filament end of the secondary
L_4—20 turns No. 28 d.c.c. wire wound on a 2½-inch form to fit in grid end of secondary (L_2).
I —100-henry choke coils.
R —1-megohm grid leaks
N—Neutralizing condenser, consisting of a small brass disc about an inch in diameter, mounted so as to make its position, in relation to L_2, variable.
F_1, F_2, F_3,—Fixed filament control resistances to match the type of tubes employed.
J —Single-circuit filament control jack.
G —.00025-mfd. grid condenser and leak (6-megohm).
T_1, T_2,—Two UV-199 tubes.
T_3, T_4,—Two UV-201-A or High-mu tubes. If the latter are used, F_1 and F_2 may be omitted.
T_5,—Semi power tube.

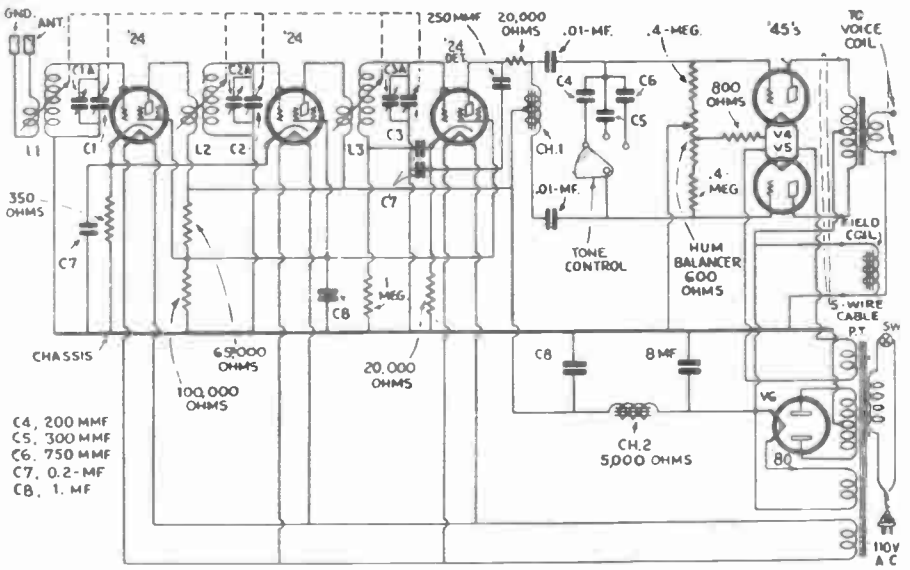
FANSTEEL PRODUCTS CO.

BALKITE MODEL-A.



COLONIAL RADIO CORP.

MODEL 36



Note the manner in which push-pull operation is obtained from the screen-grid detector output; through the use of a center-tapped A.F. choke coil. The primary coils of the R.F. transformers turn with the motion of the main tuning dial; while auxiliary adjustment of this coupling is used to obtain volume control. The kilocycle setting of the dial should correspond to the station frequency when the last cipher of the latter is omitted.

A hum-control resistor is situated at the left of the light-line. The tone control is the extreme left knob on the front of the panel.

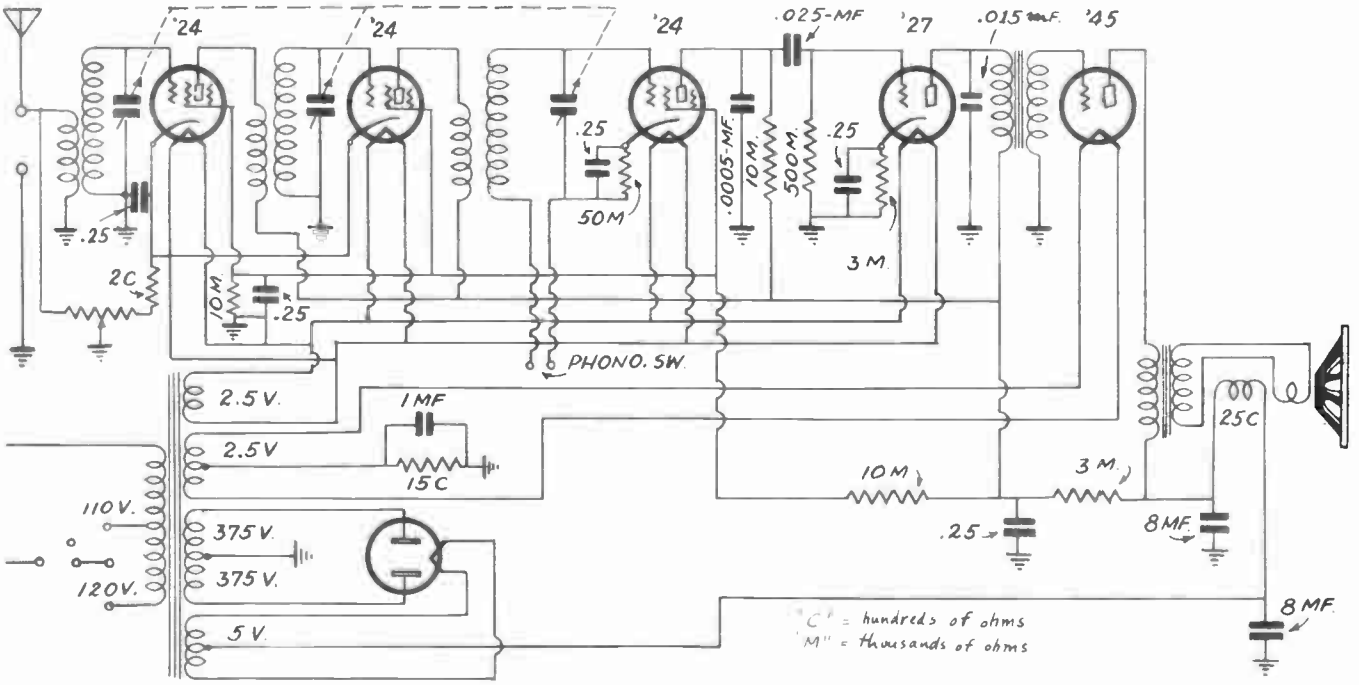
The following data are offered to Service Men by the manufacturers, for use when it becomes necessary to replace either the tuning condensers or the R.F. transformers:

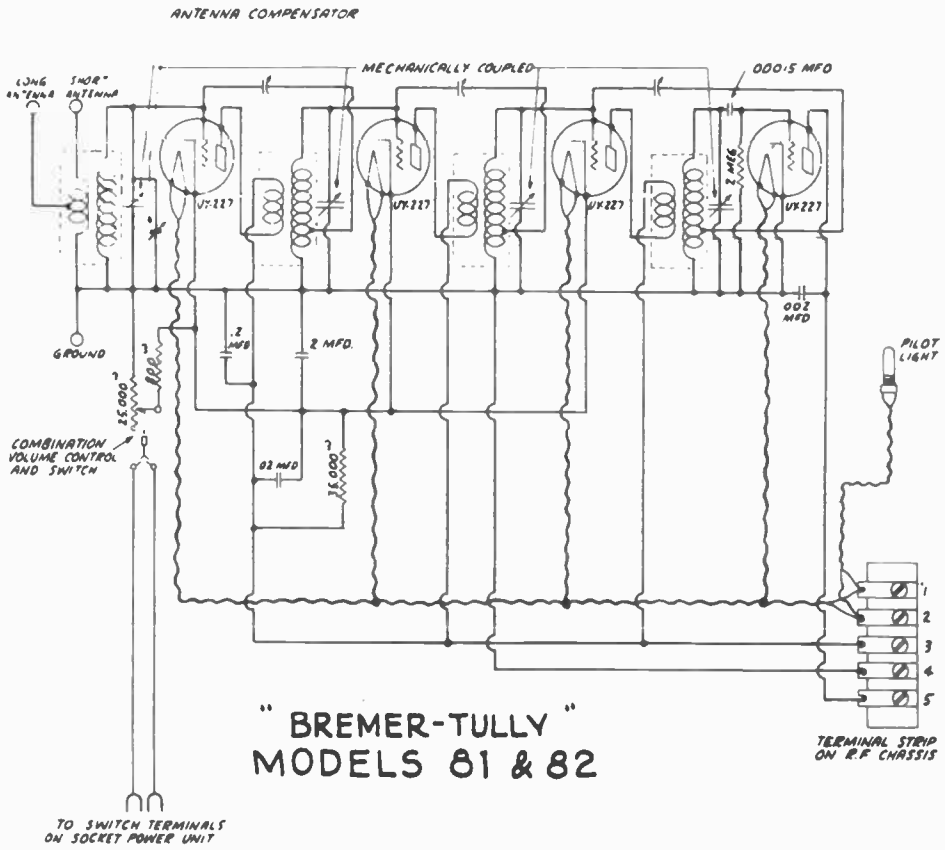
The station selector dial should be set to the frequency of some strong local station, above 1,000 kc. and preferably between 1,200 and 1,400 kc.; and the volume control then reduced until the signal is barely audible. The compensating condensers should be adjusted (preferably by means of the three screws reached through the three holes in the top of the tuning condenser's cover) until the signal is at a maximum. Care must be taken not to adjust the compensating condensers too tight; or the receiver will not tune to 1,500 kc. Service Men are cautioned against changing the settings of these condensers unless the tuning units have been replaced.

Of course, it is well to reduce the volume control's setting each time the signal is brought up with the compensating condenser; since any change in volume is more easily detected at a low signal level.

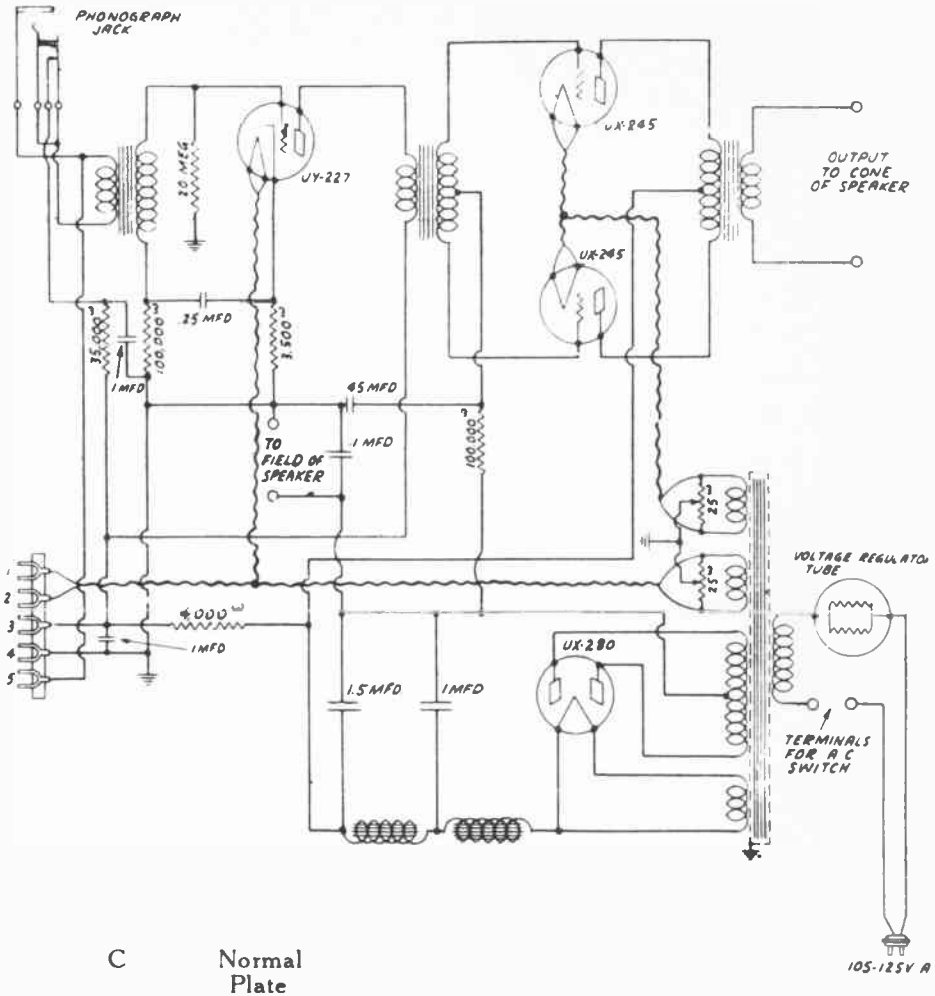
LONG RADIO CO.

"CARDINAL" MODEL 70.





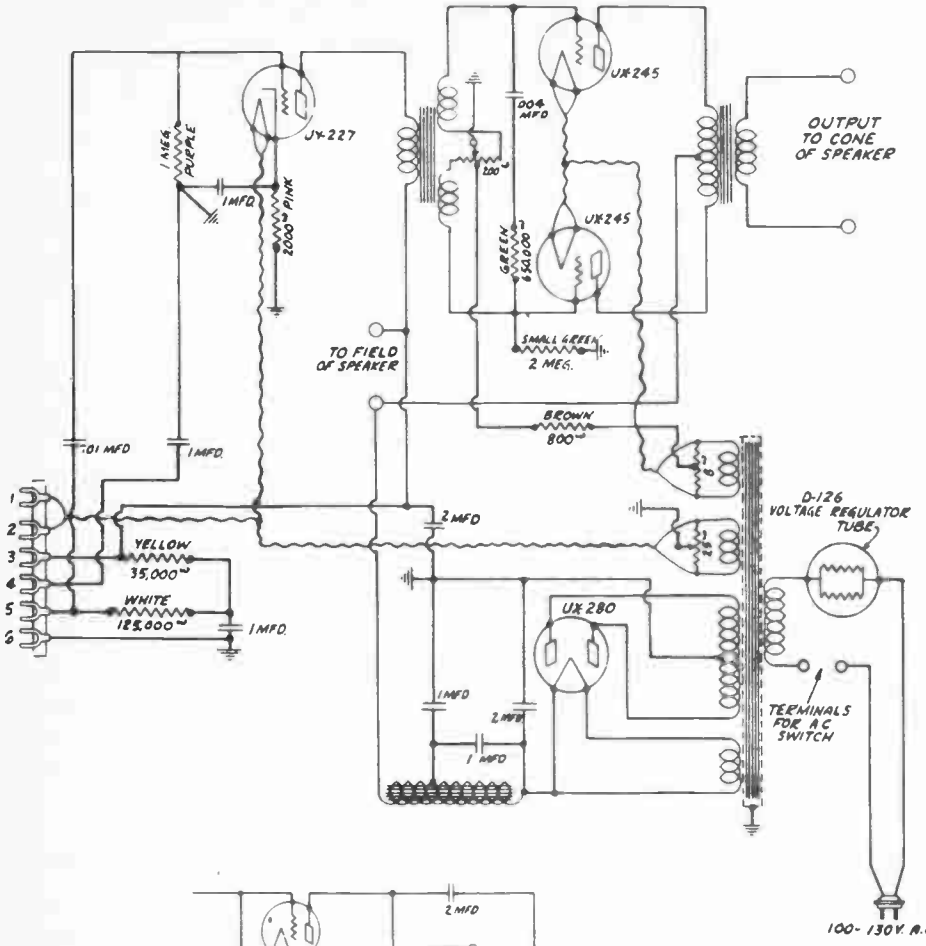
"BREMER-TULLY"
MODELS 81 & 82



BRUNSWICK RADIO CORP.

Tube No. in Order	Type of Tube	Position of Tube 1st R. F., Det., Etc.	A Volts	B Volts	C Volts	Normal Plate M. A.
1	227	1st R. F.	2.5	150	12	5.5
2	227	2nd R. F.	2.5	150	12	5.5
3	227	3rd R. F.	2.5	150	12	5.5
4	227	Detector	2.5	45	0	3.4
5	227	1st Audio	2.5	145	9	3.6
6	245	1st P-P	2.4	240	27	30
7	245	2nd P-P	2.4	240	27	30
8	280	Rectifier	5			
9	D98	Ballast				

BRUNSWICK RADIO CORP.



BT S81-S82-25~
BRUNSWICK S14-S21

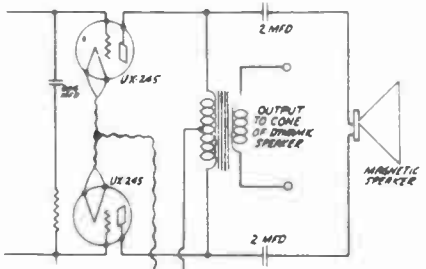
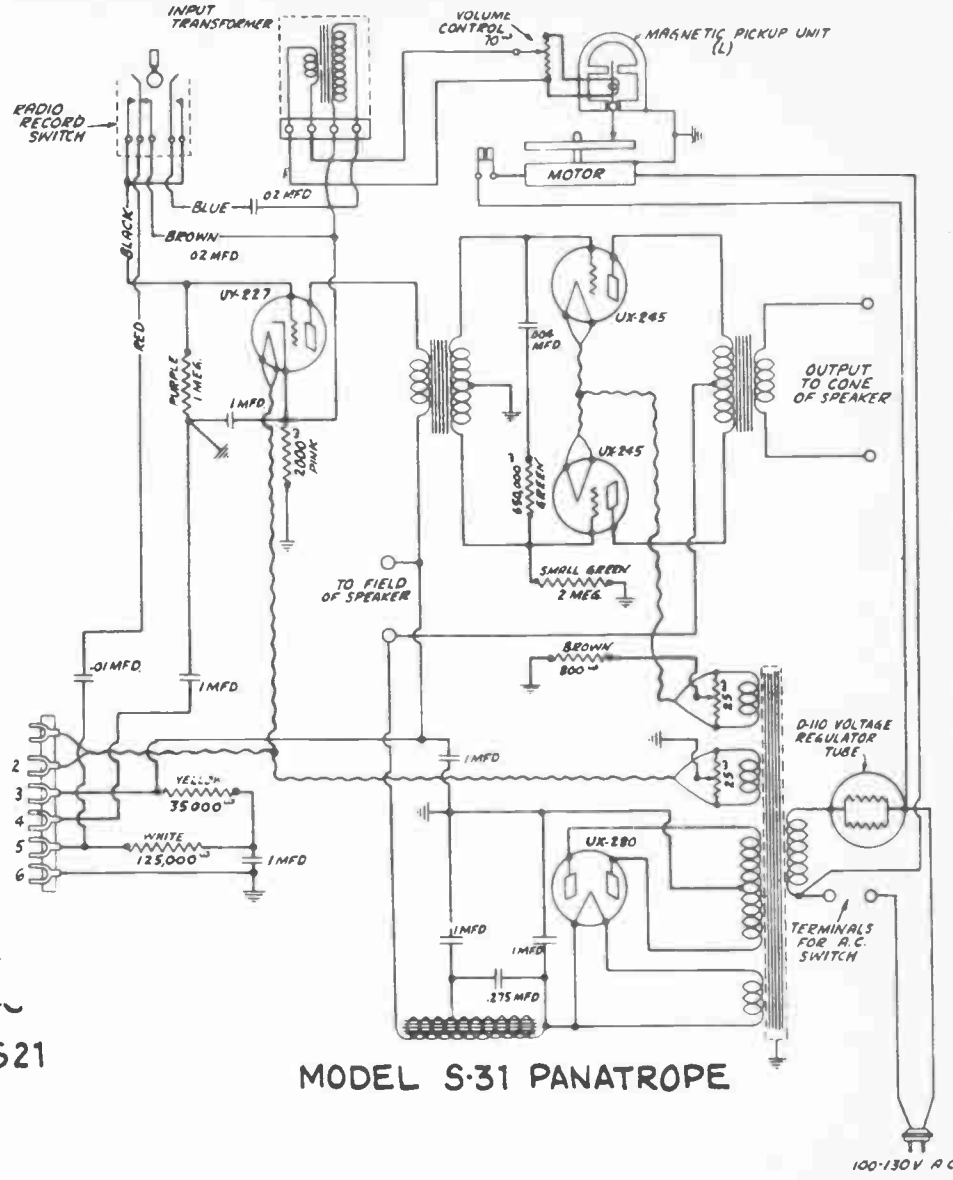
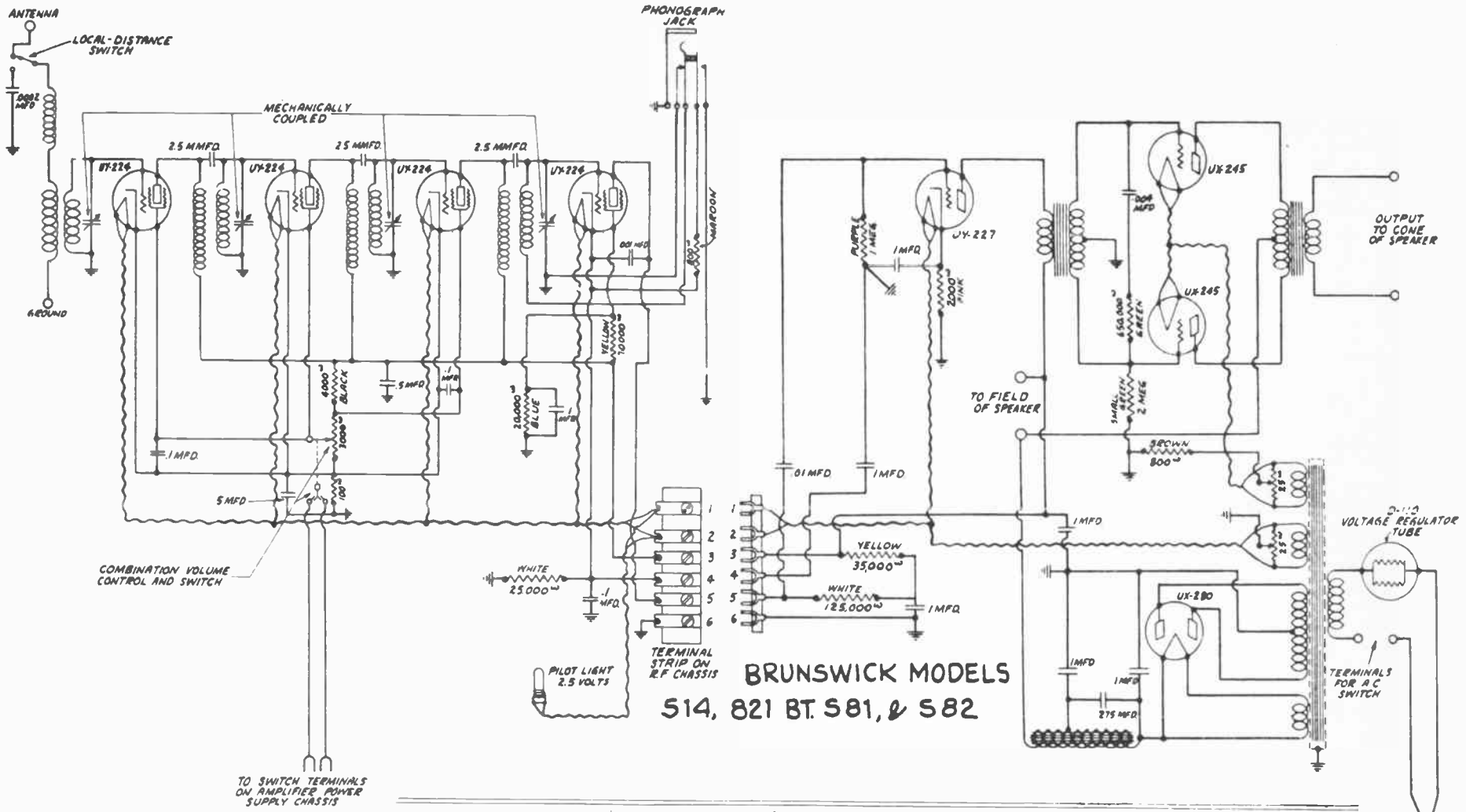


FIGURE-5
METHOD OF CONNECTING MAGNETIC SPEAKERS



MODEL S-31 PANATROPE



BRUNSWICK RADIO CORP.

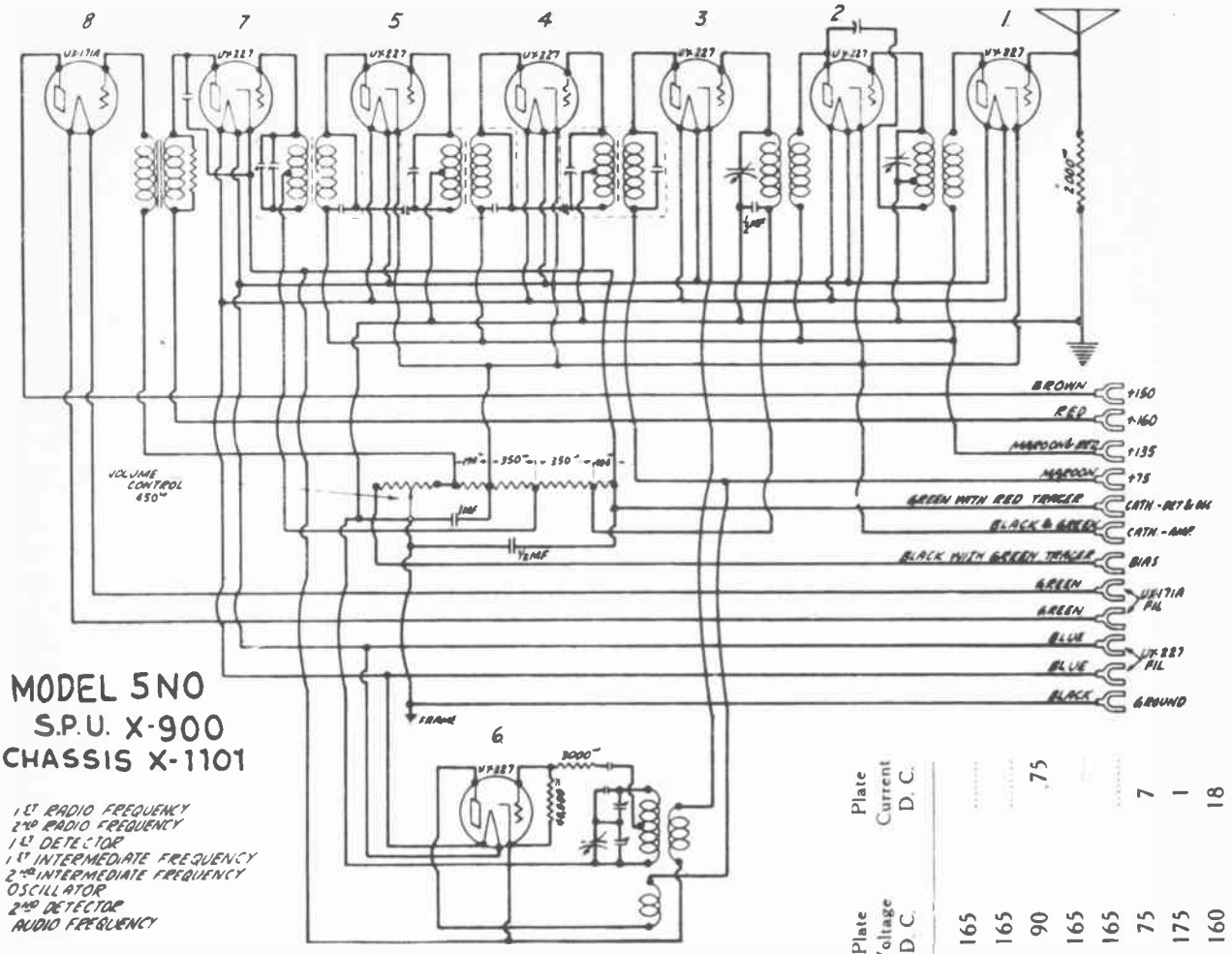
BRUNSWICK MODELS 514, 821 BT. S81, & S82

VOLTAGE AT SOCKETS
(Volume control at maximum.)

*Readings may vary considerably depending on resistance of voltimeter used.

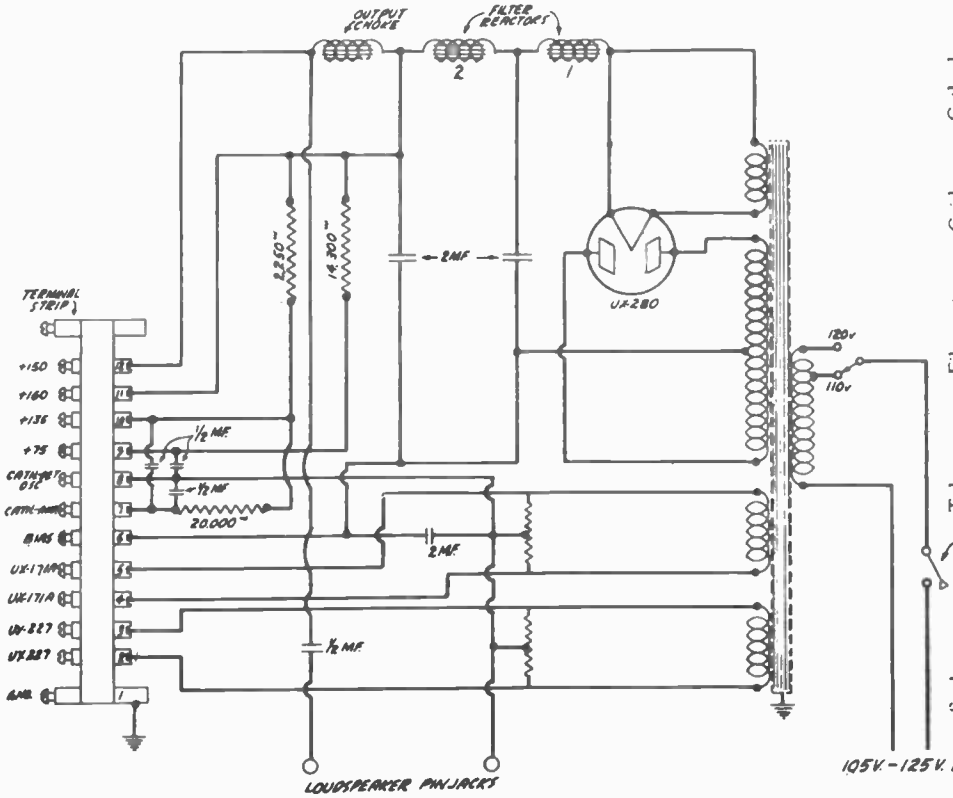
Position of Tube	Heater to Cathode Volts	Control Grid to Cathode Volts	Screen-Grid to Cathode Volts	Plate to Cathode Volts	Plate Current Milamps	Filament or Heater Volts
1st, 2nd, 3rd R. F.	—2.5	—2.5	60	135	1.7	2.5
Detector	*—5	*— 5	*13	*84	.2	2.5
1st A. F.	—8	*— .27		130	4.5	2.5
Power Stage		—45		215	28	2.5
Rectifier					45 per Plate	5

BRUNSWICK RADIO CORP.



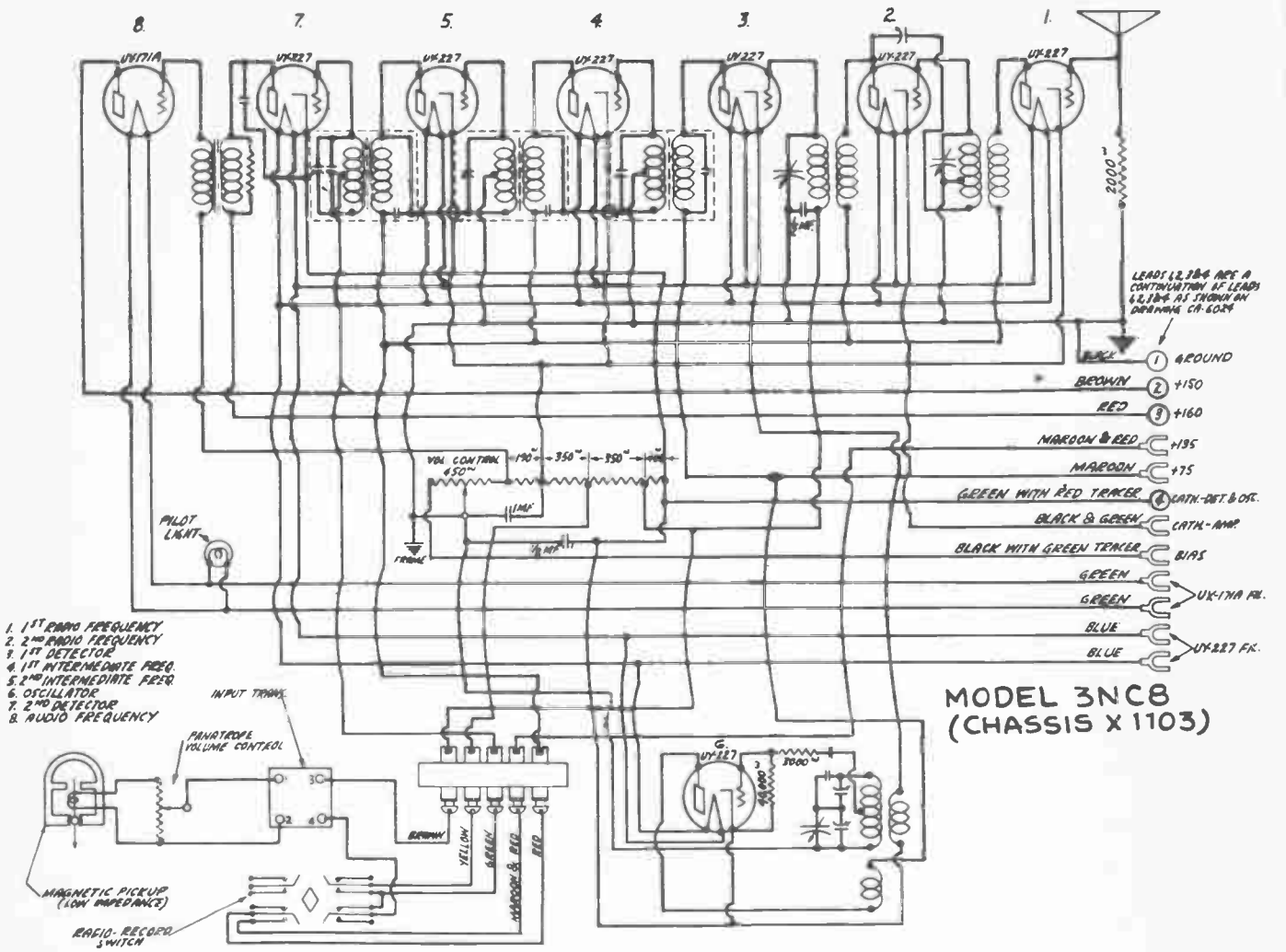
MODEL 5NO
S.P.U. X-900
CHASSIS X-1101

1 1ST RADIO FREQUENCY
2 2ND RADIO FREQUENCY
3 1ST DETECTOR
4 1ST INTERMEDIATE FREQUENCY
5 2ND INTERMEDIATE FREQUENCY
6 OSCILLATOR
7 2ND DETECTOR
8 AUDIO FREQUENCY



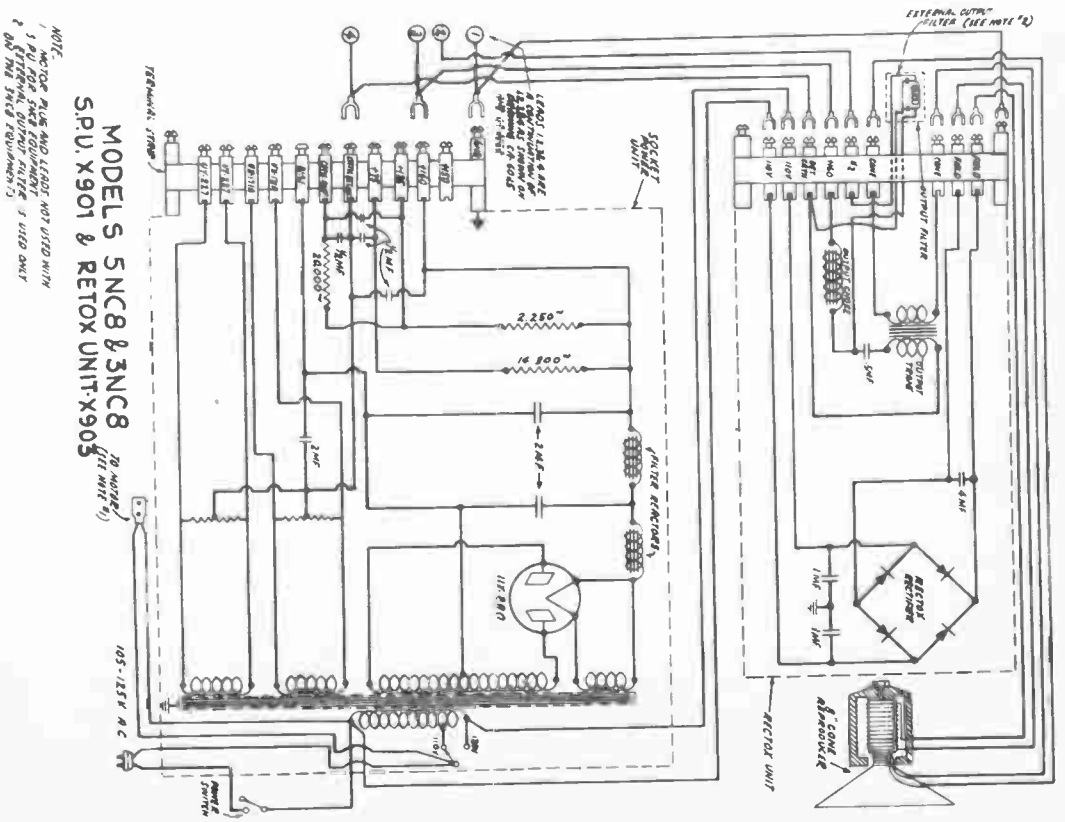
Socket Purpose	Tube Type	Filament Voltage A.C.	Grid Voltage D.C.	Cathode Voltage D.C.	Plate Voltage D.C.	Plate Current D.C.
1st R. F.	UY-227	2.25	30	30	165	.....
2nd R. F.	UY-227	2.25	30	30	165	.....
1st Det.	UY-227	2.25	11	...	90	.75
1st I. F.	UY-227	2.25	30	30	165	.....
2nd I. F.	UY-227	2.25	30	30	165	.....
Oscillator	UY-227	2.25	....	....	75	7
2nd Det.	UY-227	2.25	20	....	175	1
Audio	UX-171-A	5.	37	....	160	18

BRUNSWICK RADIO CORP.

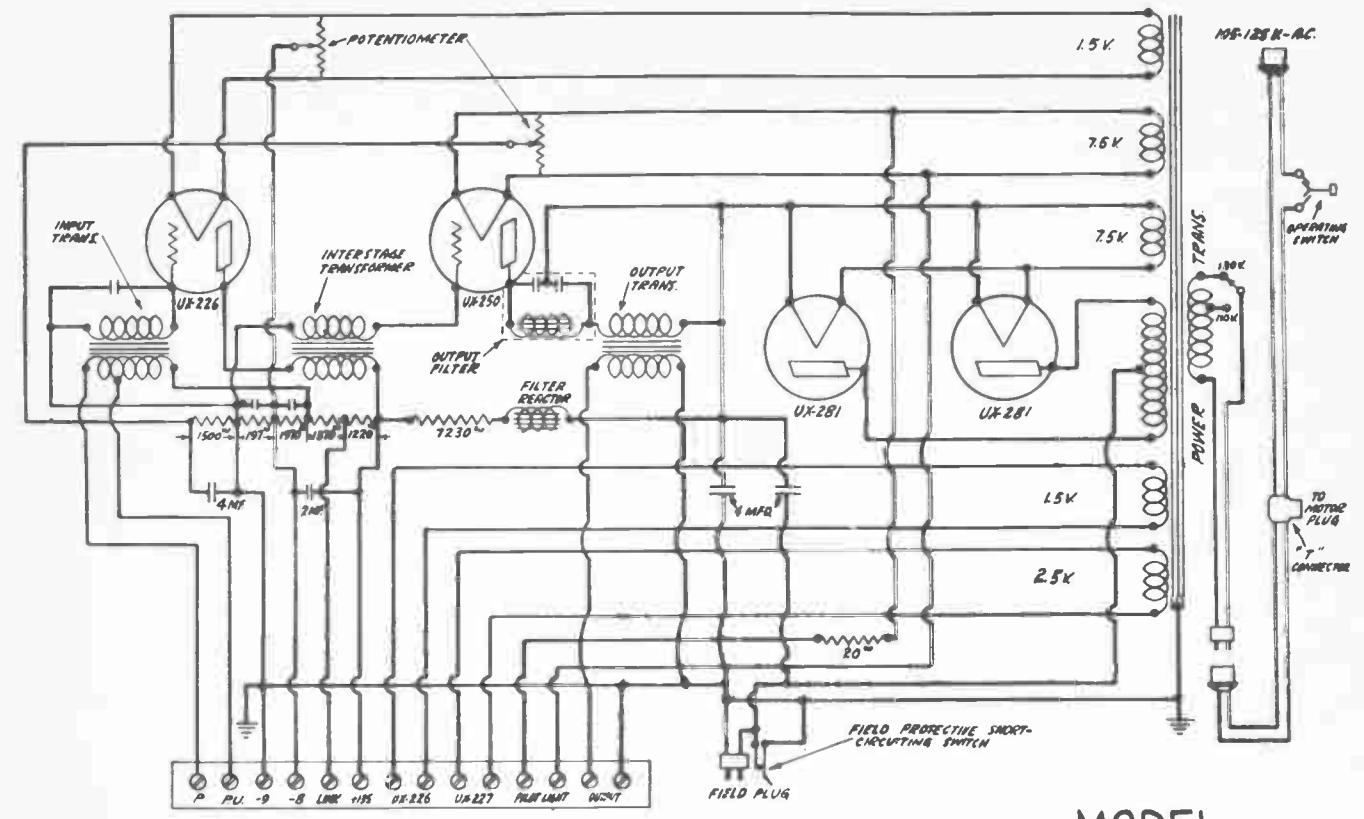


MODEL 3NC8 (CHASSIS X 1103)

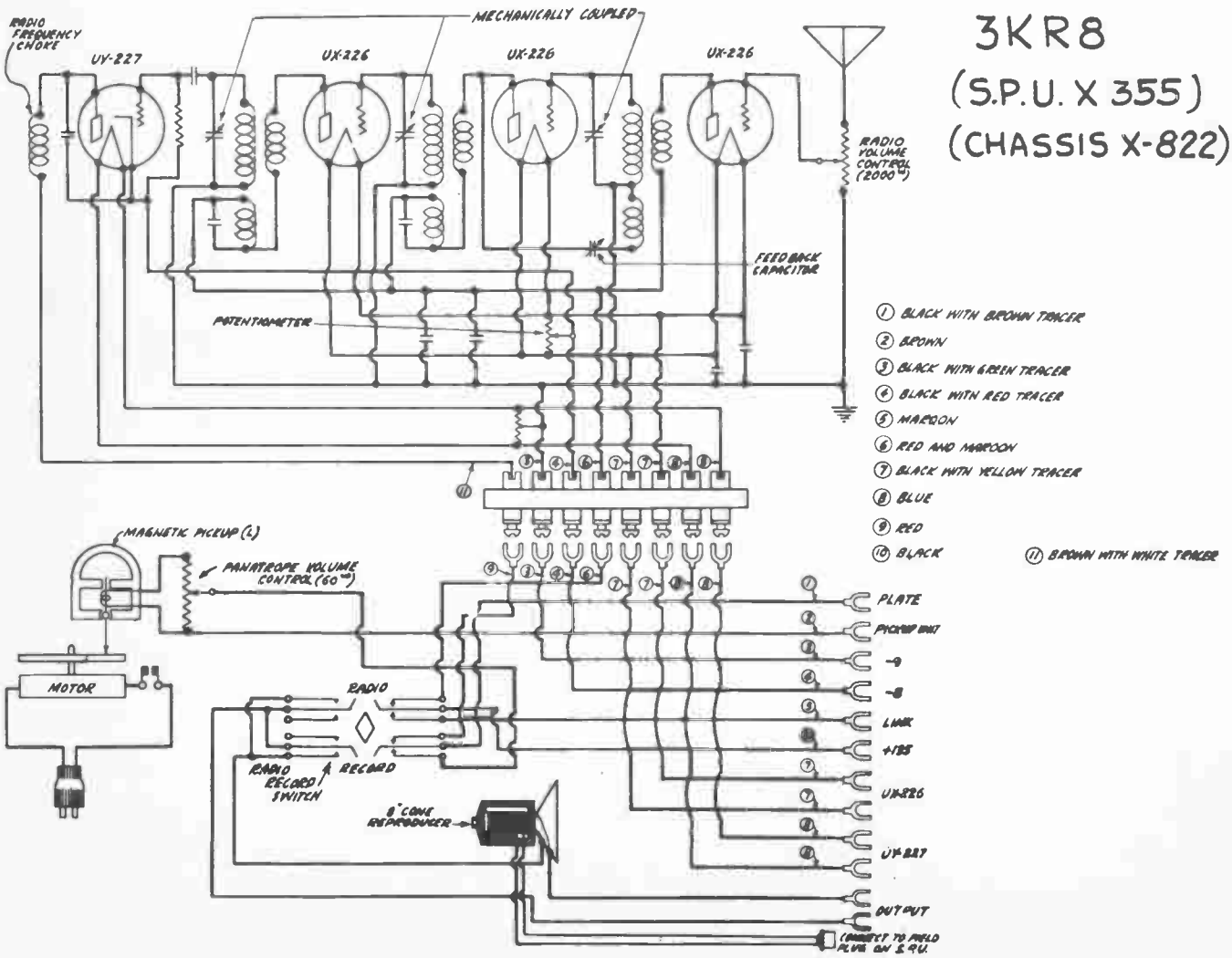
MODELS 5NC8 & 3NC8 S.P.U. X901 & RETOX UNIT X903



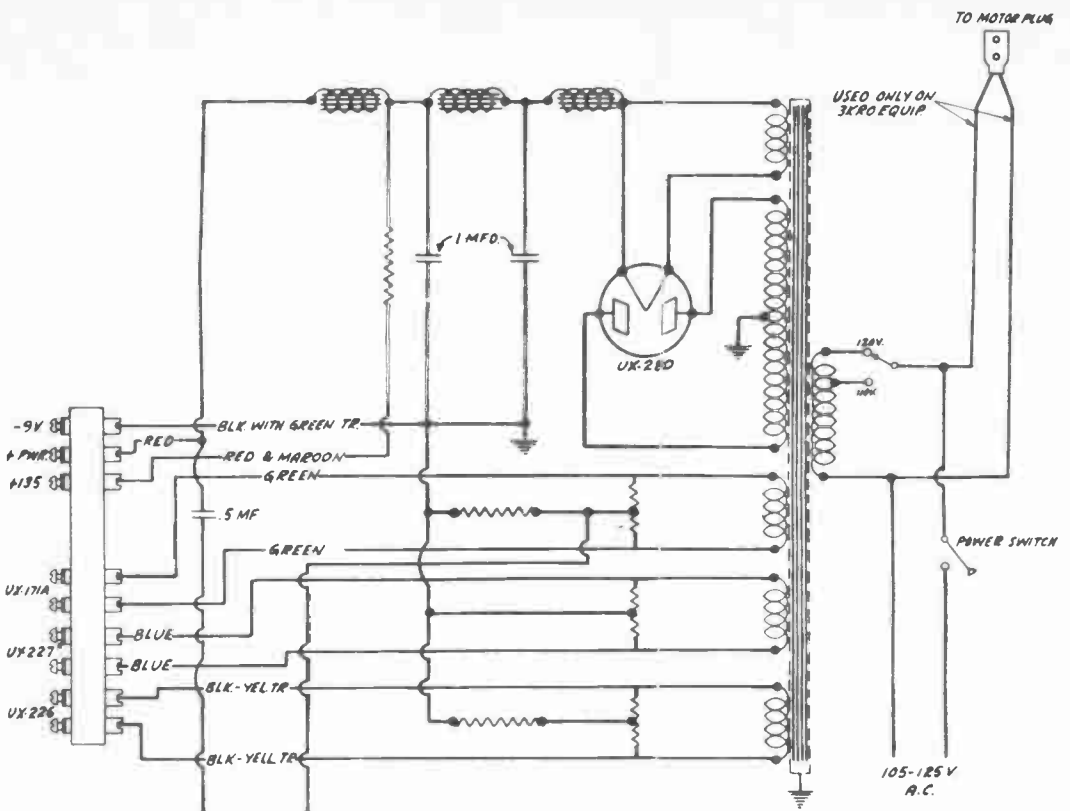
BRUNSWICK RADIO CORP.



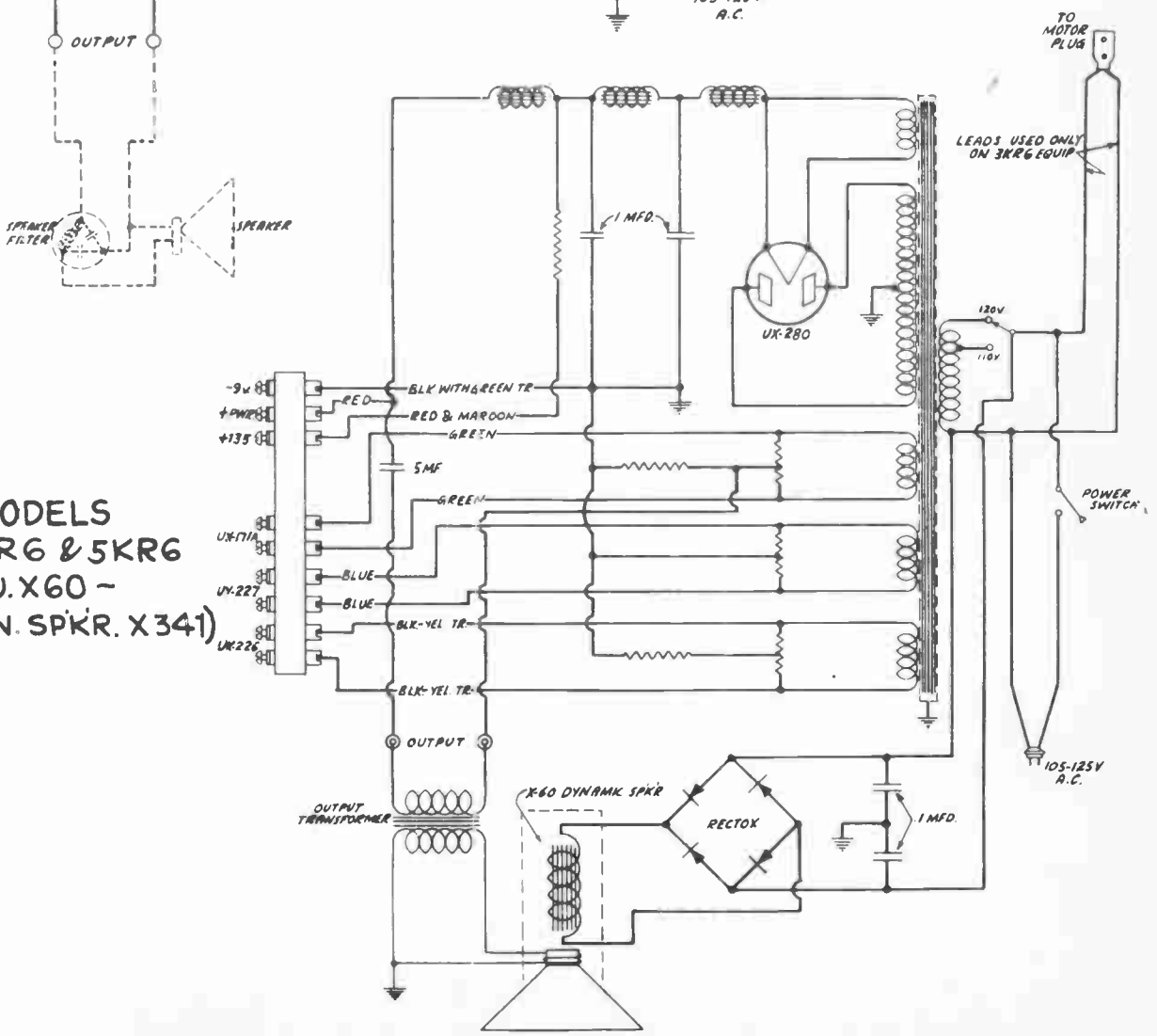
MODEL 3KR8 (S.P.U. X 355) (CHASSIS X-822)



BRUNSWICK RADIO CORP.

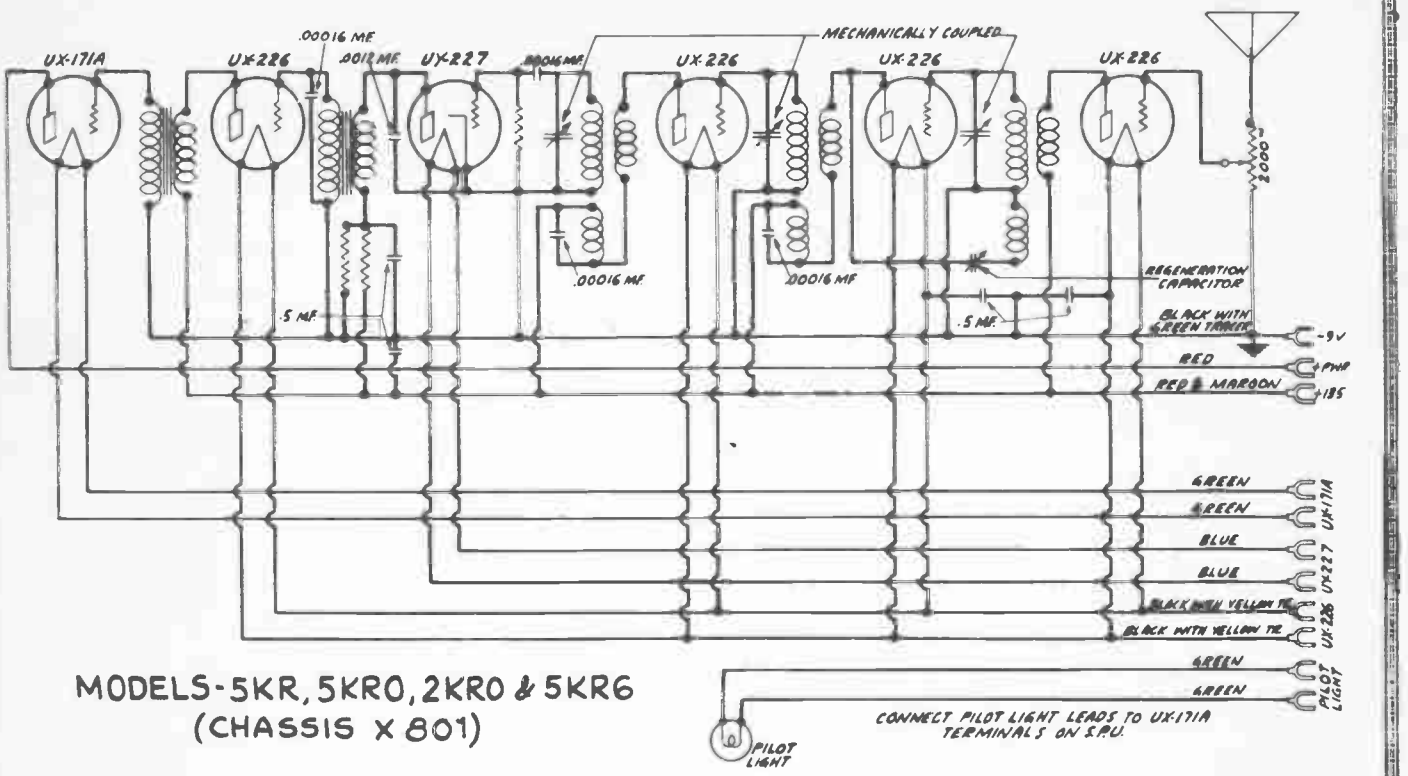


MODELS
5KR, 5KRO,
2KRO & 3KRO.
(S.P.U. X-341)

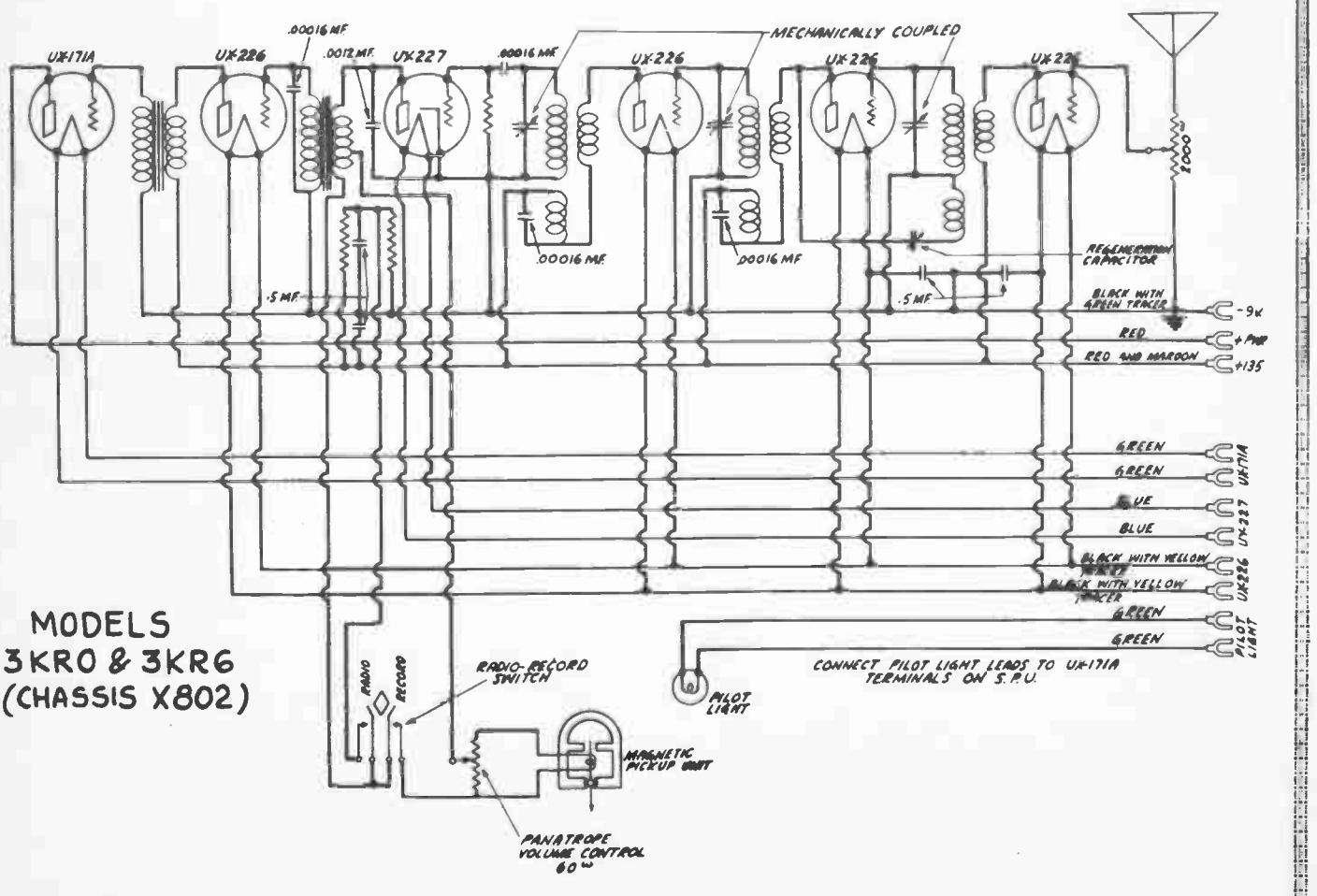


MODELS
3KR6 & 5KR6
(S.P.U. X60 –
DYN. SP'KR. X341)

BRUNSWICK RADIO CORP.

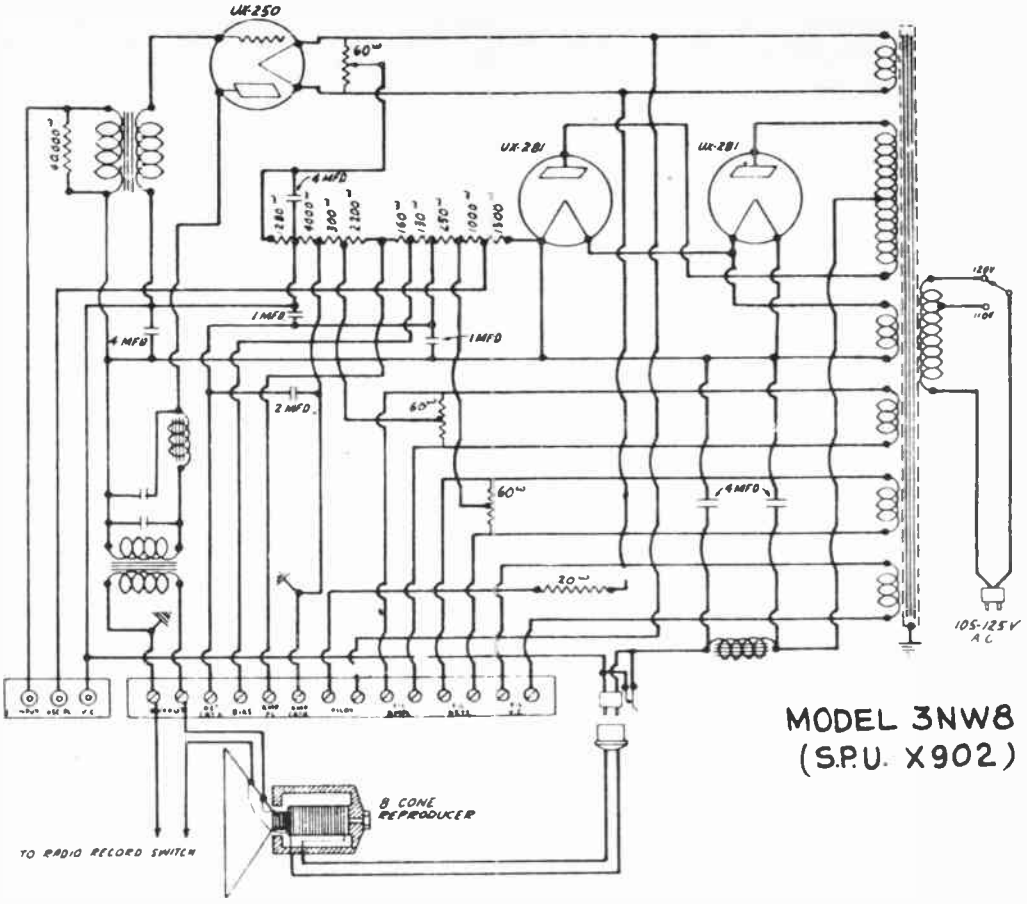


MODELS-5KR, 5KR0, 2KR0 & 5KR6
(CHASSIS X 801)

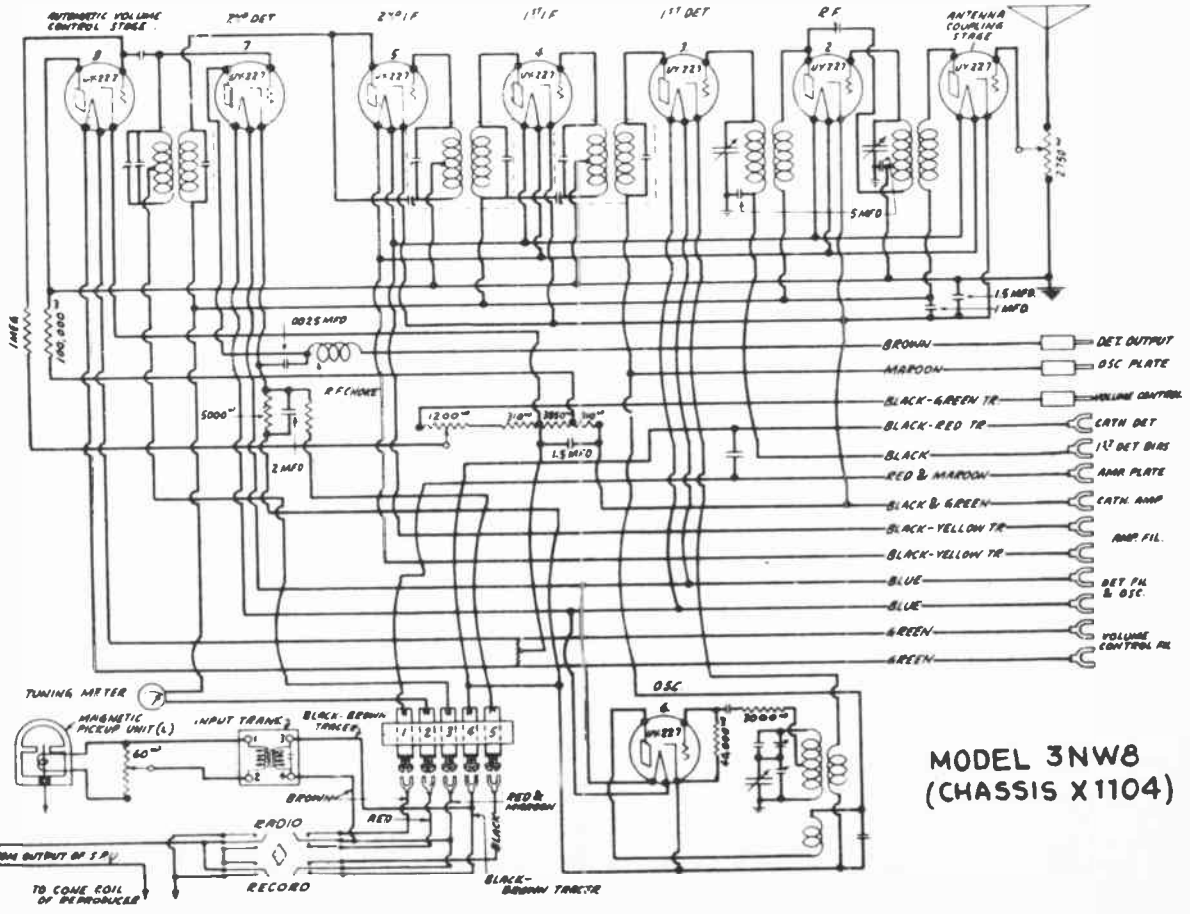


MODELS
3KR0 & 3KR6
(CHASSIS X802)

BRUNSWICK RADIO CORP.

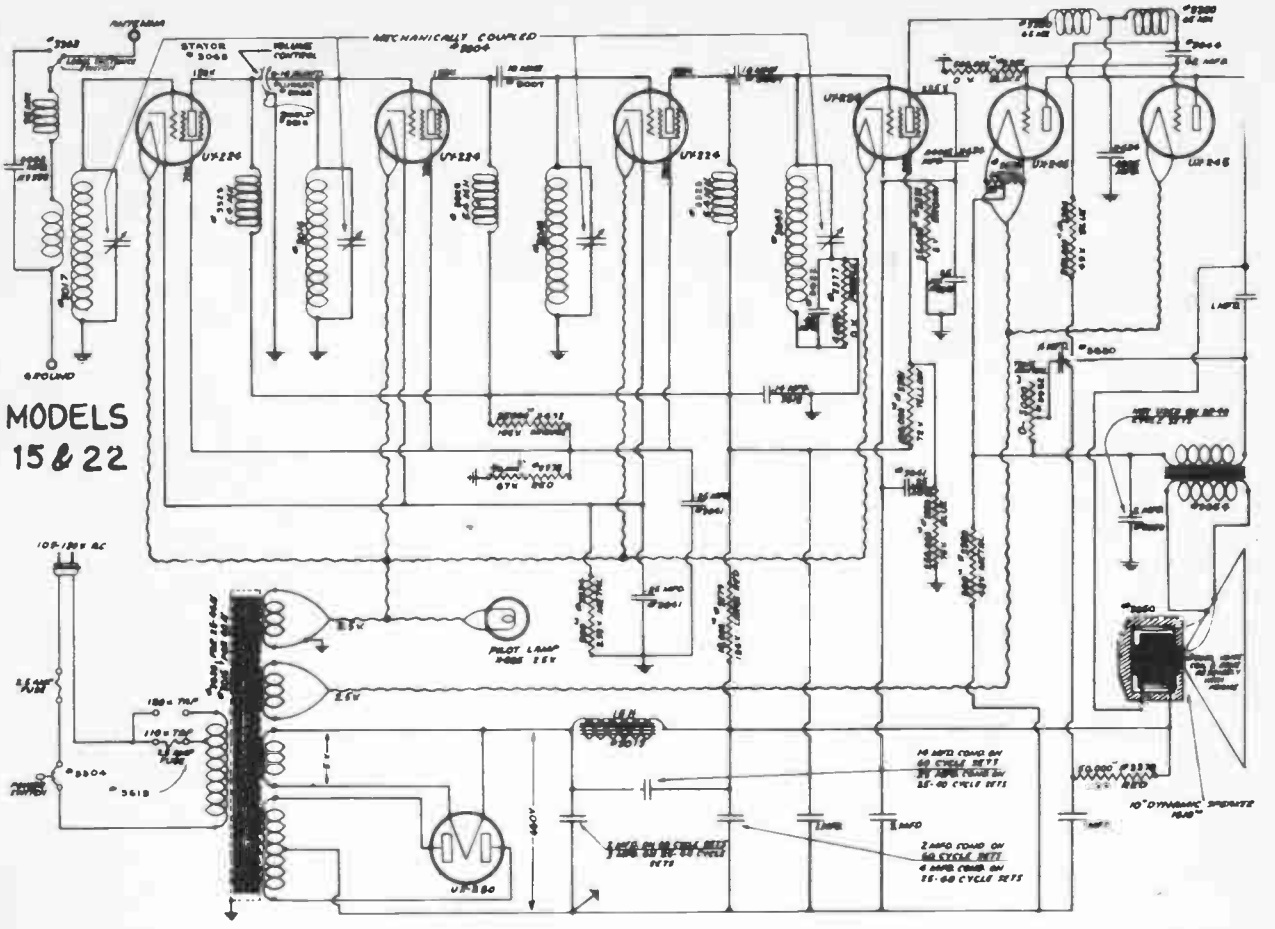


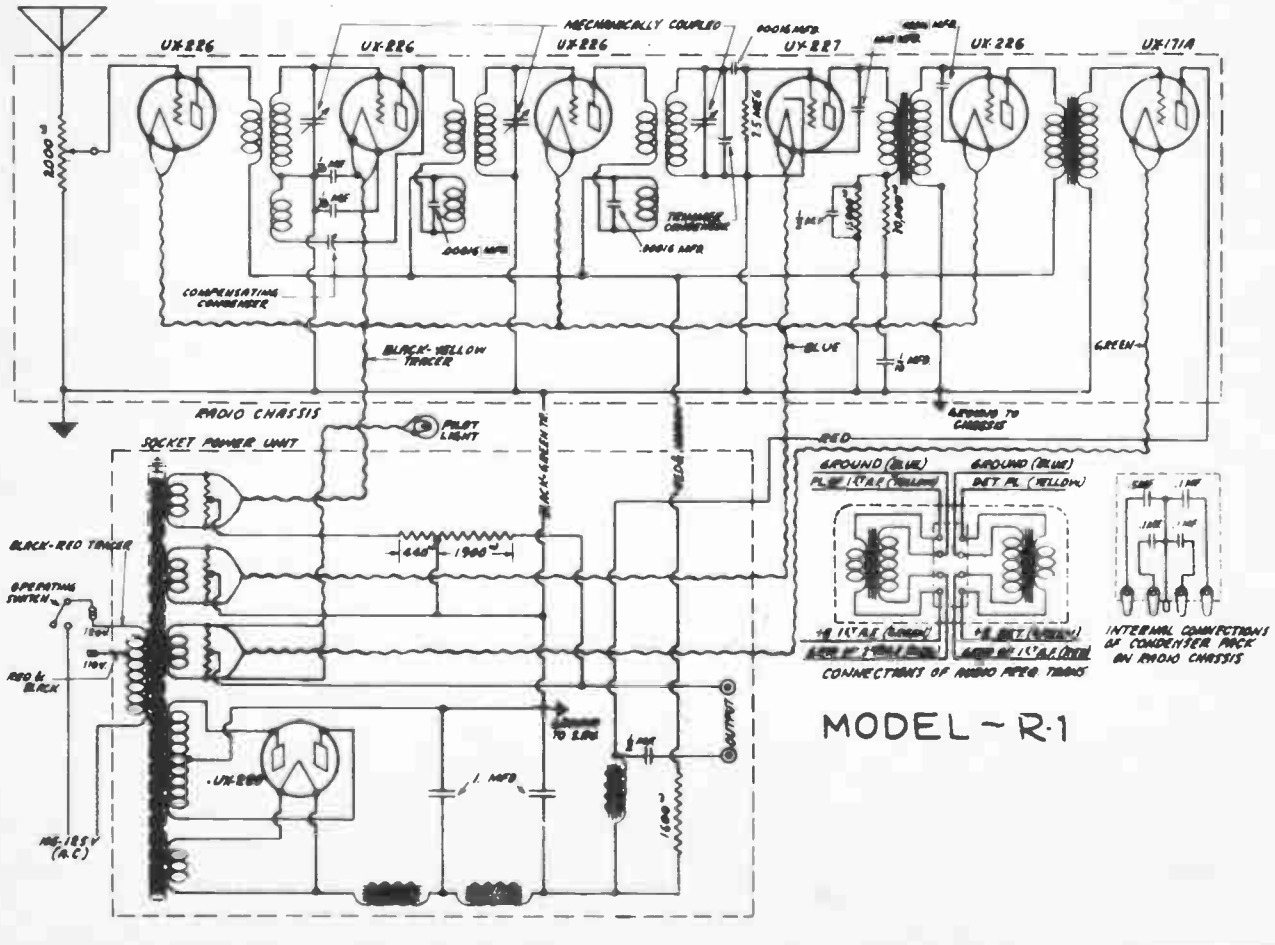
MODEL 3NW8
(S.P.U. X902)



MODEL 3NW8
(CHASSIS X1104)

BRUNSWICK RADIO CORP.





Radio Service Data Sheet

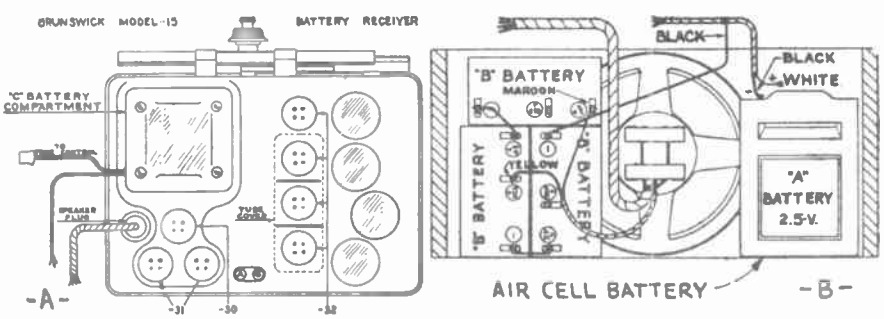
BRUNSWICK MODEL B-15 "UNI-SELECTOR" RECEIVER

This screen-grid receiver, a product of the Brunswick Radio Corp., New York City, incorporates four of the 2-volt type-'32 screen-grid tubes (three R.F. stages and a screen-grid detector, to obtain high amplification); a type '30 A.F. amplifier; and two type '31 power tubes in push-pull. The completed receiver is designed to operate three "B" batteries, a "C" battery, and 2-volt "A" battery, particularly the Eveready type A-600 "Air-Cell."

The values of the various construction units are itemized in the following list:

Resistor R1, 750,000 ohms; R2, 250,000 ohms; R3, 500,000 ohms; R4 (tone-control variable resistor), 0-50,000 ohms; R5, 2 megs.; R6, filament current limiting resistor, 0-6-ohm.

The condensers in the "B-15" have the following designations and respective capacities: C, 10 mmf.; C1, tuning condensers, C2, C3, C4, .000425-mf.; C5 (volume control) variable dual condenser, 10 mmf.; C6, C7, 10 mmf.; C8, .0002-mf.; C9 ("A +" by-pass to chassis) C10 and C12 ¼-mf.; C11, 0.14-mf.; C13, .0002-mf.; C14, .02-mf.; C15, .03-mf.; C16 and C17, 1 mf. The A.F. transformer T has a ratio of 2:1.



At left, top view of the Brunswick "Model B-15," designed to work with 2-volt tubes, an "inductor dynamic" reproducer, and an air-cell "A" battery; the last unit, approximately the size of a storage battery, will be noted in the sketch at the right.

In connection with the voltage readings obtained, during analysis at the tube sockets, it must be remembered that, because of the large resistances in the plate and screen-grid circuits of the detector tube, V4, the reading on most set analyzers will be in the neighborhood of 5 volts; whereas, the values indicated, in the list below, are the effective operating potentials.

The potential applied to each tube filament is the same—2 volts. The plate potentials applied to these tubes have various values, depending upon the tube's position in the circuit, as follows: V1, V2, V3, V6, V7, 135 volts; V4, 67.5 volts (note comment above); V5, 67.5 volts. Control-grid potentials: V1, V2, V3, V4, V5, 3 volts; V6, V7, 22.5 volts. Screen-grid potentials, V1, V2, V3, V4, 69 volts. The plate-current readings are as follows: V1, V2, V3, 1.1 ma.; V4, 0.03-ma.; V5, 2.4 ma.; V6, V7, 6.2 ma.

From consideration of these figures it will be noted that the total plate current consumption is only slightly over 18 ma.

The color code of the resistors used in the "B-15" is as follows: R1, purple; R2, blue; R3, black; R5, green.

The reproducer is special; this "inductor dynamic" unit reproduces low notes with more efficiency than the ordinary magnetic reproducers, while it does not require the field-current supply used by the regular dynamic reproducers.

The moving voice-coils of the inductor dynamic reproducer, like the coils in an ordinary magnetic reproducer, are of the high-impedance type.

The small tone-control knob is located directly below the "Uni-Selector" control, which is, really, a combination of two knobs; one of these governs the tuning condensers; the others is a multiple control. Pushed in, it operates switch Sw1 for "local" station reception; pushed out, for distant reception. When turned to the extreme left, switch Sw2 is placed in its "off" position; turning it to the right puts it "on," and continuing to turn this knob to the right increases the volume.

The arrangement of the tubes in their sockets, and the location of the "C" battery, are shown in the detail sketch. It will be noted that the "A" battery's terminal reading is 2.5 volts; in the set this is reduced to the required 2 volts by the drop through resistor R6.

The accessories are specially recommended for use in the Model B-15. The color code for the battery leads is as follows: "A—," "B—" and "C +" black; "A +," white; "B + 67½," yellow; "B + 135," maroon; "C — 3" (and chassis), brown; "C — 22½," yellow.

There are a few precautions to be observed when checking this receiver; probably the most important is not to use any method of testing which will put a short circuit across the tube filaments, or the "A" supply.

The reason for this is, that if the current output of the air-cell "A" battery exceeds the value of 0.75-amp., the carbon electrodes of the battery will become filled with the electrolyte in the cells, and cannot again be made to function. Service Men accustomed to shorting the "A" circuit (as when a storage battery is used for the "A" supply) cannot use the same test procedure in connection with the air-cell battery without permanently damaging the latter.

Another point to be observed is that this characteristic of the air-cell requires that no more tubes than are shown here be employed in the circuit; consequently, a pilot light must not be placed in the set as an additional convenience, since these lamps usually consume at least ¼-amp.

At the present moment, there is no convenient way of determining the life remaining in an air-cell battery; except by making a rough estimation on the basis of its normal life. This will be about 1,000 operating hours, when operating a receiver of the type exemplified in the Brunswick "Model B-15," for three hours per day. A voltmeter of the low-resistance type will draw too much current, and will endanger the air-cell battery. Also, it probably will lack the accuracy required to determine the output voltage of the battery at a particular point on its discharge curve; although, with a high-resistance voltmeter, a certain approximation of the "life-expectation" of the air-cell may be obtained in this manner.

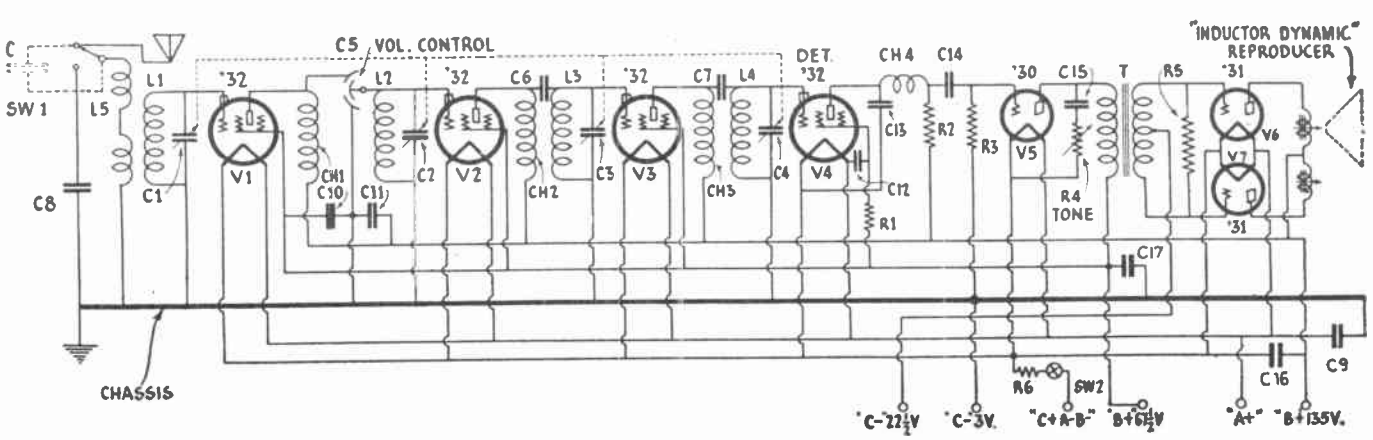
It is a common practice among service men, in an effort to speed the testing of receivers, to successively tap the tubes in a receiver. In the "B-15" this is inadvisable, because the danger of shorting the elements of a tube, and thus destroying the air-cell "A" battery through the added current drain.

About six quarts of water will be required to fill the air-cell battery. It is not necessary to use distilled water; ordinary drinking water being satisfactory.

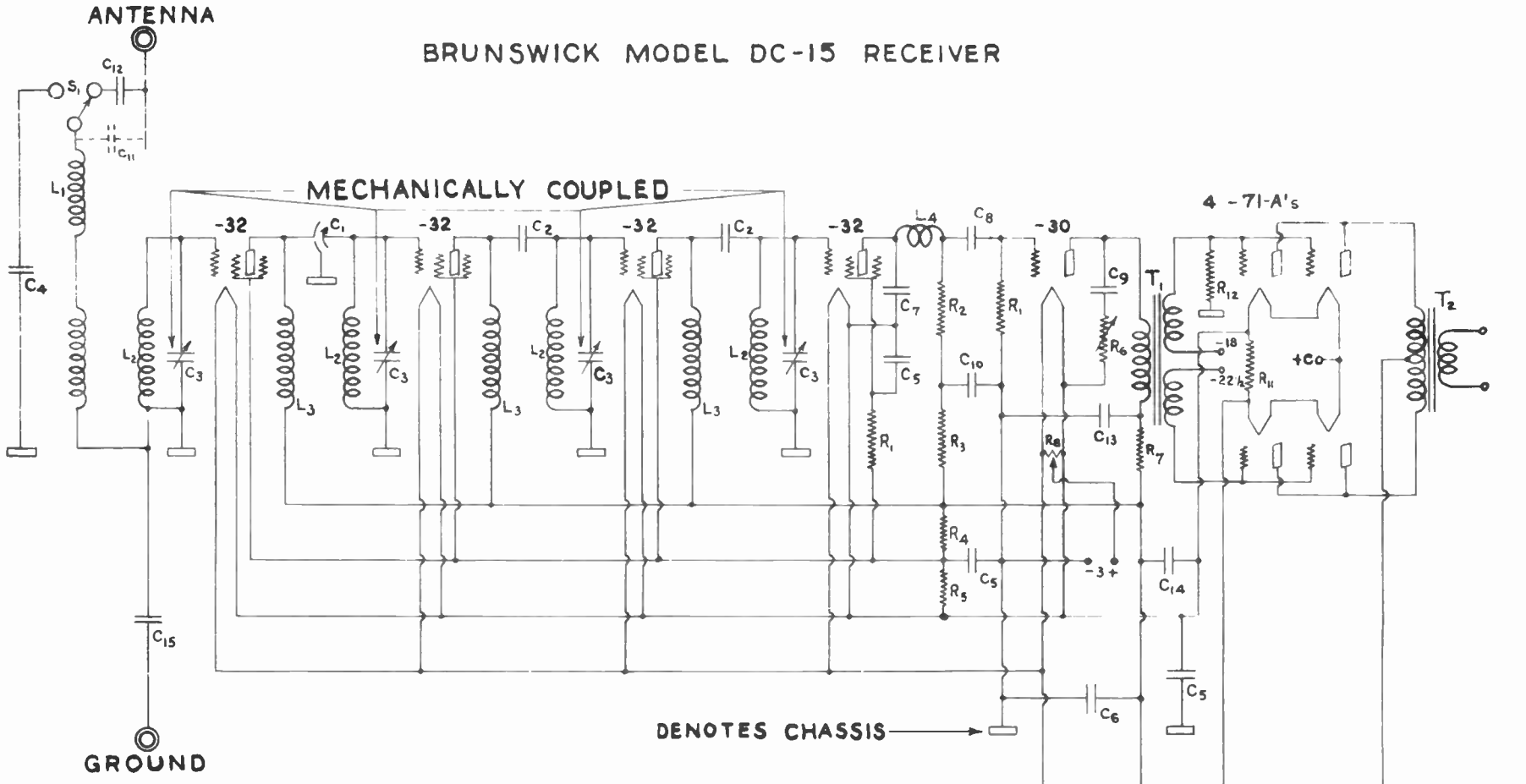
This current-supply unit is of the "primary" type; that is, it generates its own current. Consequently, it cannot be charged like a storage or "secondary" battery. Also, unlike other primary batteries having a liquid electrolyte, this is not designed to permit replenishing the elements or the solution after the useful life of the battery has ended.

Care should be taken to use only the correct tubes in this set, as any change probably would cause an overload of the "A" supply. For this reason only tested tubes of rated characteristics should be used

Unlike the average modern radio set, this receiver was designed for the use of a long outdoor aerial, up to a hundred feet, well elevated; though its location, and distance from the nearest broadcast station, must be controlling. It is intended for a distance-getter, having a rated sensitivity of 5 microvolts per meter, on the standard antenna.



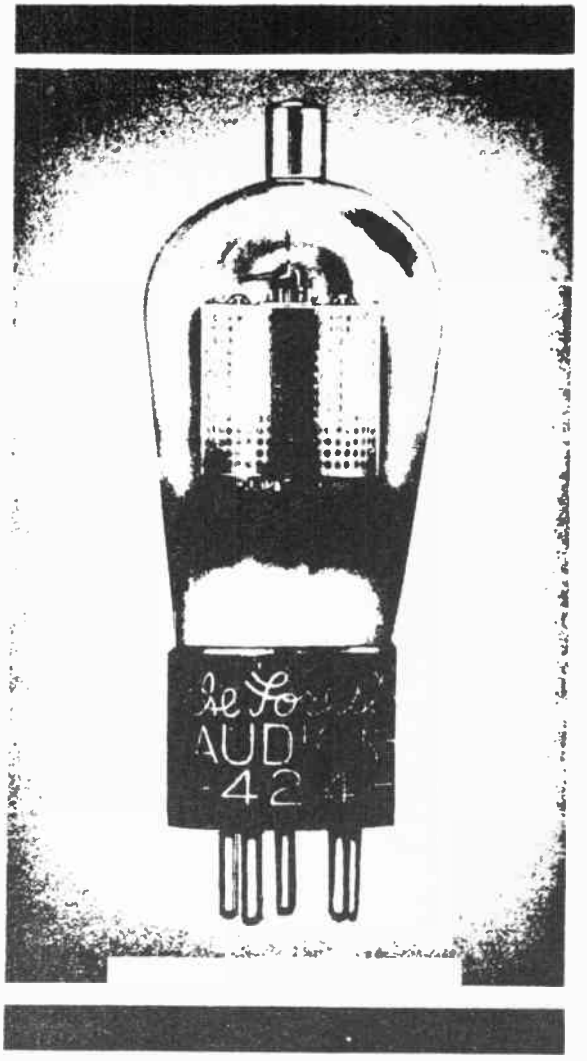
BRUNSWICK MODEL DC-15 RECEIVER



L_1 1.0 m.h.	C_7 200 $\mu\mu f$.	R_4 15,000 (YELLOW)	
L_2 205 μh.	C_8 0.02 μf.	R_5 30,000 (ORANGE)	
L_3 5.2 m.h.	C_9 0.03 μf.	R_6 0-50,000	
L_4 65 m.h.	C_{10} 2.0 μf.	R_7 15,000 (YELLOW)	
L_5 D.C. Res. 60$^{\omega}$ ± 5%	C_{11} 10 $\mu\mu f$.	R_8 18.0 ohms	
L_6 12-15 hy.	C_{12} 0.02 μf.	R_9 150 ohms ± 10%	
C_1 0-10 $\mu\mu f$.	C_{13} 1.0 μf.	R_{10} 15.0 " ~ R_{11} - 90 ohms.	
C_2 10 $\mu\mu f$.	C_{14} 1.0 μf.	R_{12} 2 megohms (GREEN)	
C_3 425 $\mu\mu f$. Max.	C_{15} 0.14 μf.	S_1 H.&H. 3 Point Switch	
C_4 200 $\mu\mu f$.	R_1 500,000 (BLACK)	S_2 H.&H. 2 Point Switch	
C_5 0.25 μf.	R_2 250,000 (BLUE)	T_1 2:1 P.P. Transformer	
C_6 0.14 μf.	R_3 50,000 (RED)	T_2 60:1 Output "	

BRUNSWICK RADIO CORP.

Why not service those radio sets with fresh tubes?



IMPROVEMENTS are constantly being made in radio tubes as well as in radio sets. For the past twenty-five years, the DeForest organization has led and continues to lead in radio tube research and engineering development. What is more, those improvements and refinements are translated into everyday terms — into tubes available to you without delay. And that's what counts from the servicing and merchandising standpoint.

Operating on a controlled production schedule rigidly geared to actual demand, the DeForest organization offers you *fresh* tubes — tubes produced a month or two ago, and not tubes piled up in big inventories and consequently without the latest improvements and refinements.

If you would know the latest technique in radio tubes and what it means in radio set operation, insist on *fresh* DeForest Audions. And for your guidance —

Here's how you can identify fresh, up-to-date tubes:

Improved Tone Quality resulting from greater rigidity and therefore minimum microphonic effects, together with suppression of distortion arising from undesirable regeneration.

Quiet Background brought about by DeForest research into causes of hum and crackle, resulting in one-fiftieth the noise level heretofore considered standard, together with lower gas content made possible by unique DeForest exhaust units now in use.

Positive Characteristics because of the doubling of the diameter of some support wires and better bracing and spacing, together with tightened electrical characteristic tolerances.

Longer Service Life brought about by important improvements in filaments, cathode insulators and emitters, insuring a full thousand hours of peak efficiency.

Greater Volume through the increase of the mutual conductance in power tubes, yet maintaining full interchangeability with usual tubes of lower output.

Quick Heating averaging about 10 seconds for the 427 and the 424 types, due to patented DeForest notched cathode insulator, without sacrificing life, reliability or quiet operation.

Higher R.F. Amplification due to the latest DeForest 424 H.G. (High-Gain) Audion, or 60 instead of usual 30 per stage, ideal for midget sets. Also, more uniform grid-plate capacity permits of maximum stability or minimum regeneration for highest gain without distortion.

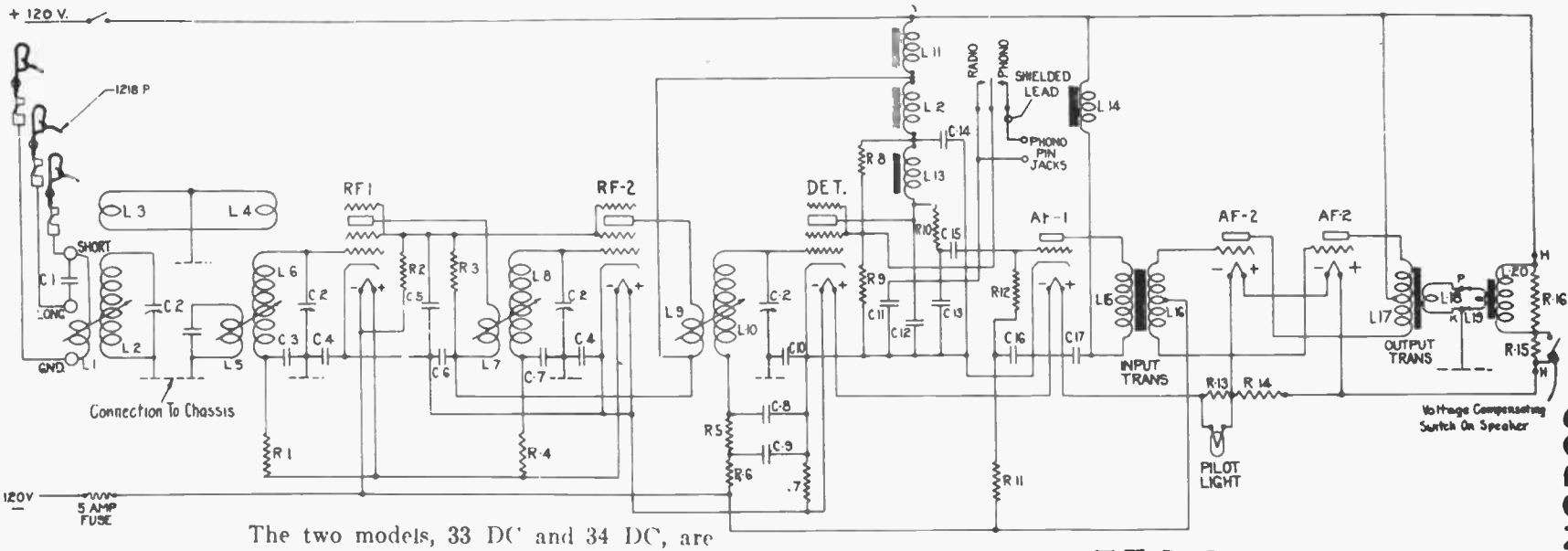
And after all, fellows, there's no substitute for 25 years' experience!

DE FOREST RADIO COMPANY :: PASSAIC, N. J.

de Forest (AUDIONS) RADIO TUBES

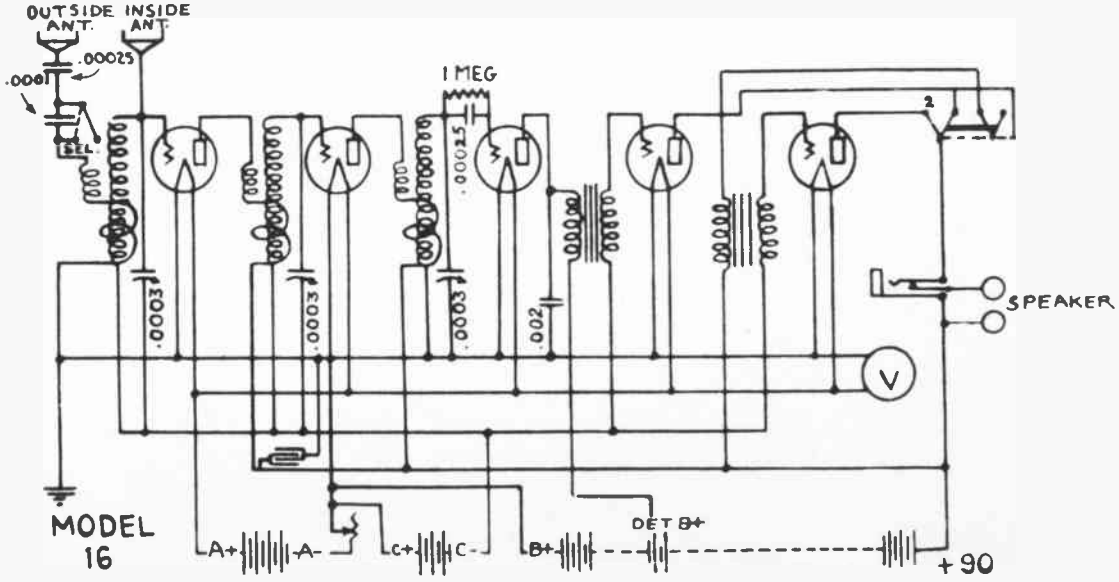
	ohms
R 1	200,000
R 2	50,000
R 3	10,000
R 4	200,000
R 5	200,000
R 6	200,000
R 7	75
R 8	200,000
R 9	200,000
R 10	50,000
R 11	200,000
R 12	400,000
R 13	1.83
R 14	17.56
R 15	5.86
R 16	61.5
R 15	5.86
R 16	69.

C 1	.00025 mfd
C 2	.0003
C 3	.2
C 4	.2
C 5	1.
C 6	1.
C 7	.2
C 8	.2
C 9	.2
C 10	.2
C 11	1.
C 12	.0001
C 13	.0001
C 14	1.
C 15	.02
C 16	.1
C 17	1.

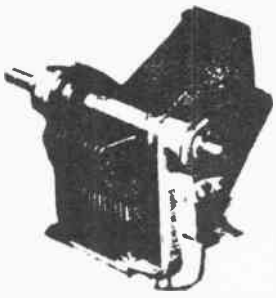
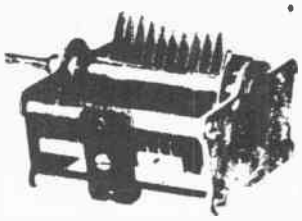


MODEL 33 D.C.

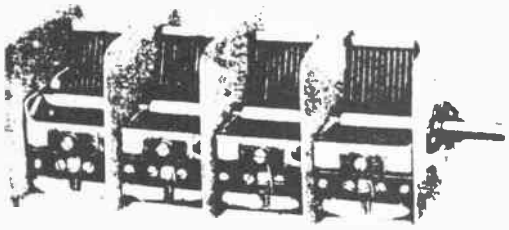
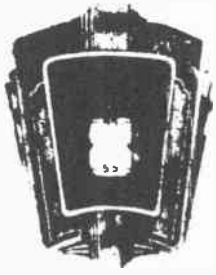
The two models, 33 DC and 34 DC, are identical electrically except that Model 34 has a more sensitive loudspeaker, capable of finer reproduction.

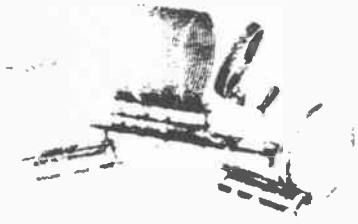


COLONIAL RADIO CORP.



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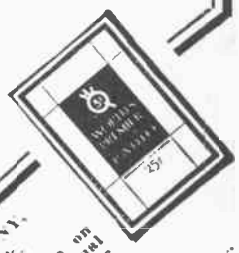

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Radio Service Data Sheet

COLUMBIA SCREEN-GRID 8 RECEIVER

This is a standard radio receiver merchandised under a number of individual trade marks. For instance, Wextark Radio Stores, Inc., of Chicago, distribute this chassis; and so does Allied Radio Corporation, Chicago,. Its manufacturers are the Columbia Radio Corp., Chicago, Ill.

The constants are as follows: capacities C4, C5, C6 are blocking condensers with celluloid washers, .025-in. thick, separating each pair of plates; C7, C14, C19, 0.1-mf.; C8, 0.88-mf.; C9, C10, 0.2-mf.; C11, 1.0-mf.; C12, C13, .001-mf.; C15, 0.5-mf.; C16, 1.8-mf.; C17, C18, 2.3-mf.

Volume control resistor R1 may be either a Yaxley 6,000-ohm or a Centralab 30,000-ohm potentiometer; R2, 110 ohms; R3, R4, R12, 10,000 ohms each; R5, R8, 100,000 ohms; R6, R7, 65,000 ohms; R9, 1,000 ohms; R10, 30,000 ohms; R11, 7,500 ohms; R13, R14, 30 ohms.

R.F. chokes Ch1 Ch2, and Ch3 consist of 635 turns each of No. 38 S.S.C. wire; Ch4, 400 turns of No. 38 silk enamel covered wire. Ch5 (located on top of the chassis adjacent to the power pack) has a resistance of 1250 ohms; Ch6 (contained within the power pack), 400 ohms; Ch7, the dynamic reproducer's field winding, 1,000 ohms.

The resistor strip-assembly, underneath the chassis, includes the following resistor units, parallel to each other in this order, starting from the end nearest to the strip on which are mounted the R.F. coupling impedances and capacities: R5, R9, R8, R4, R10, R7, R6, R11, R12. Resistor R3 is connected at the side of the resistor strip, one lug being soldered to R9 and the other to R4. Resistor R2 is mounted at about the center of the strip carrying the R.F. coupling impedances and capacities. Resistors R13 and R14 are located at the power pack.

Between the tuning drum and the power transformer is located a condenser bank, which comprises the following capacities: C11, brown-white leads, 300-volt rating; C15, slate, and green-white, 200 v.; C16, red, 300 v.; C17, green, and green-white, 600 v.; C18, red, and green-white, 600 v. The '80 tube fits in the corner, behind the power transformer; the other tubes range along the back of the chassis in numerical order.

It will be observed that the metal brackets (shown dotted in the schematic circuit) supporting the R.F. chokes Ch1, Ch2 and Ch3, are connected to the catbodes of the screen-grid tubes; approximately three thousand receivers were manufactured with these brackets connected to low-potential end of the tuned secondary inductances; while seventeen thousand more were made with these supports grounded to the chassis. The final circuit, shown in this Data Sheet, was responsible for greatly improved stabilization of the R.F. circuits, at the upper end of the tuning dial.

If oscillation exists, only between 95 and 100 on the tuning scale, changing the R.F. chokes above mentioned for units having 650 or 675 turns will probably eliminate this tendency, which may exist in a few instances. The reason for this circuit oscillation is that th. chokes are designed to resonate at a wavelength just above the upper end of the broadcast band; this results in obtaining more even amplification throughout the tuning band.

Circuit oscillation, between 70 and 100, may be caused by an open *or short* in C8.

The makers of this receiver, in their manual, stress the point that the Service Man should determine whether the radio receiver has a good ground connection and a set of good tubes, before looking further for faults in operation.

Circuit oscillation or strong regeneration may, in some cases, be traced to lack of the shield which is furnished as a cover for the bottom of the chassis.

Power detection is used in this receiver: Note that the detector is resistance-capacity coupled to the first stage of A.F. amplification.

Hum will result if one of the '45's loses emission, thus disturbing the balance in the push-pull circuit. This same defect will probably cause circuit oscillation in the R.F. stages, due to the rise in voltages when the load of one of the power tubes is lessened.

Where high signal gain is obtained in the R.F. amplifier, it is in most cases necessary to have two volume controls; one to vary the amount of signal input to the first tube, and another to vary the amount of amplification obtainable through the R.F. amplifier. Here these functions are combined in R1 by employing the circuit shown and the values given above.

Coupling condensers C4, C5, C6, are made in a novel manner. Exact spacing between the two plates is obtained by using a celluloid washer having a thickness of .025-in. Capacity adjustment is obtained, not by varying a screw, but by changing the spacing washer of each condenser; and tightening the holding screw to the fixed point that is necessary to hold the plates tightly in position. The selectivity of this receiver may be increased, at the expense of selectivity, in special installations by substituting, for the .025-in. washer furnished in the chassis, celluloid spacers having a thickness of .020- or 0.030 in. It is important to remember that any increase or decrease in the capacity of these condensers does not unbalance the tuning circuits, so long as the increase or decrease in the amount of capacity is alike in all stages.

A defect in the "radio-phono." switching system such as the switch's failing to connect C10 or to open the pick-up circuit, may cause a loud hum.

Following is a table of average operating voltages for this receiver, taken at a line potential of 115 volts, with the volume control set at maximum, and the power transformer's primary tap switch set at the position shown in solid lines in the schematic circuit:

	Tube Out		*Tube in Tester*				*Ma.*	*Ma.*
Tube	*"A"*	*"B"*	*"A"*	*"B"*	*"C"*	*K*	*Normal*	*Grid Test*
V1	2.45	180	2.40	174	— 1.5	1.5	4.5	6.7
V2	2.45	180	2.40	174	— 1.5	1.5	4.5	6.7
V3	2.45	180	2.40	174	— 1.5	1.5	4.5	6.7
V4	2.45	106	2.40	106	—14.5	14.5	0.2	....
V5	2.45	162	2.40	68	— 3.0	3.0	3.2	3.8
V6	2.35	230	2.20	212	—38.0	....	20.	23.
V7	2.35	230	2.20	212	—38.0	....	....	....

The screen-grids should carry 80 volts positive potential.

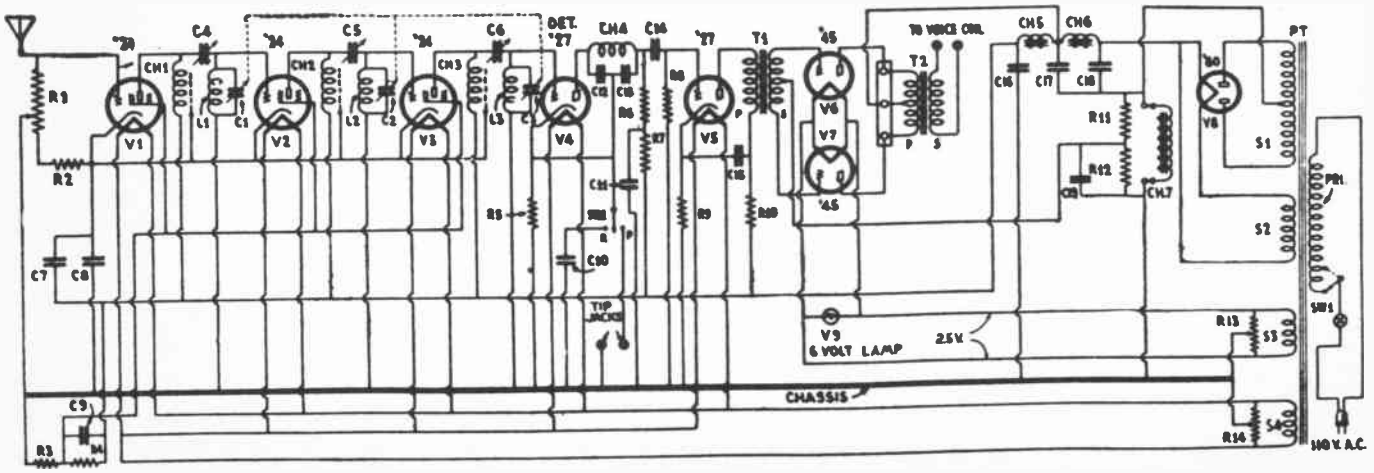
Condensers C7 and C9 are contained in one case. The identifying colors are: C7 lead, red; C7-C9 common lead, four cabled red leads; C9, blue.

Condensers C10 and C19 are contained in one case. The identifving colors are: C10 lead, green; C10-C19 common lead grounded; C19, slate.

The color code for the detector tone filter condensers and coupling condenser, contained in one case, are: C12, green; C12-C13 common lead, yellow; C13-C14 common lead, red; C14, brown.

To prevent circuit oscillation, the tube shields must be fastened securely.

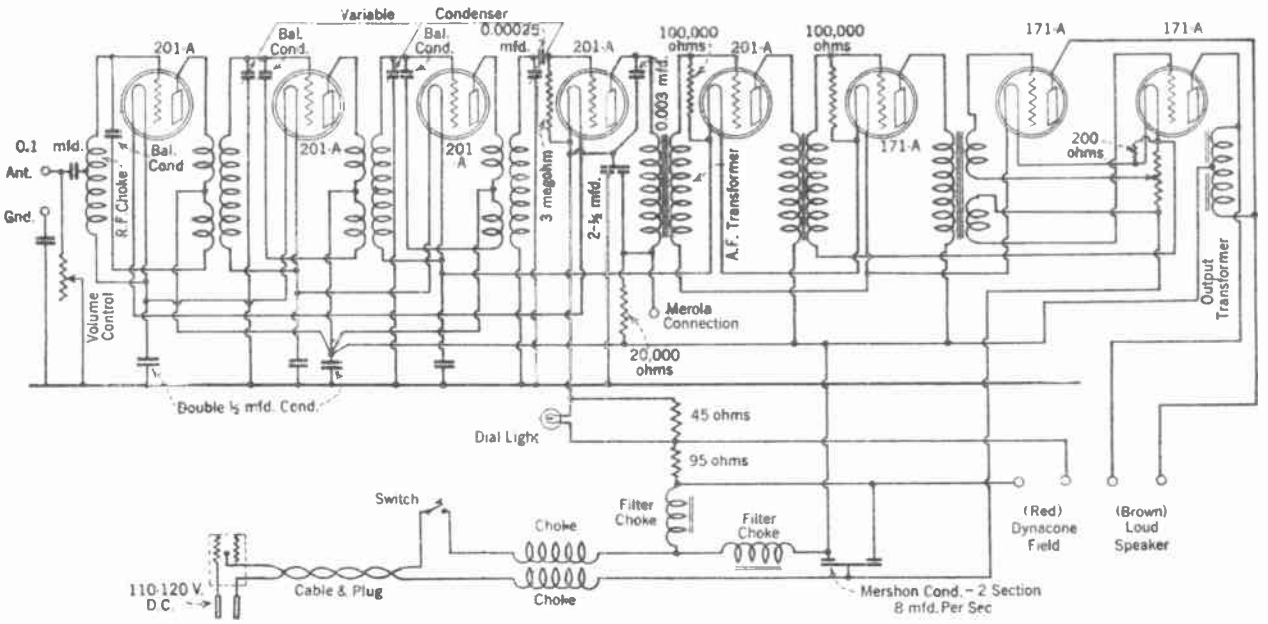
A defective rubber grommet on the pilot-light assembly will short one side of the '45 filament winding and cause R13 to burn out; resulting in hum, no signal, or a burnt-out or shorted power pack.



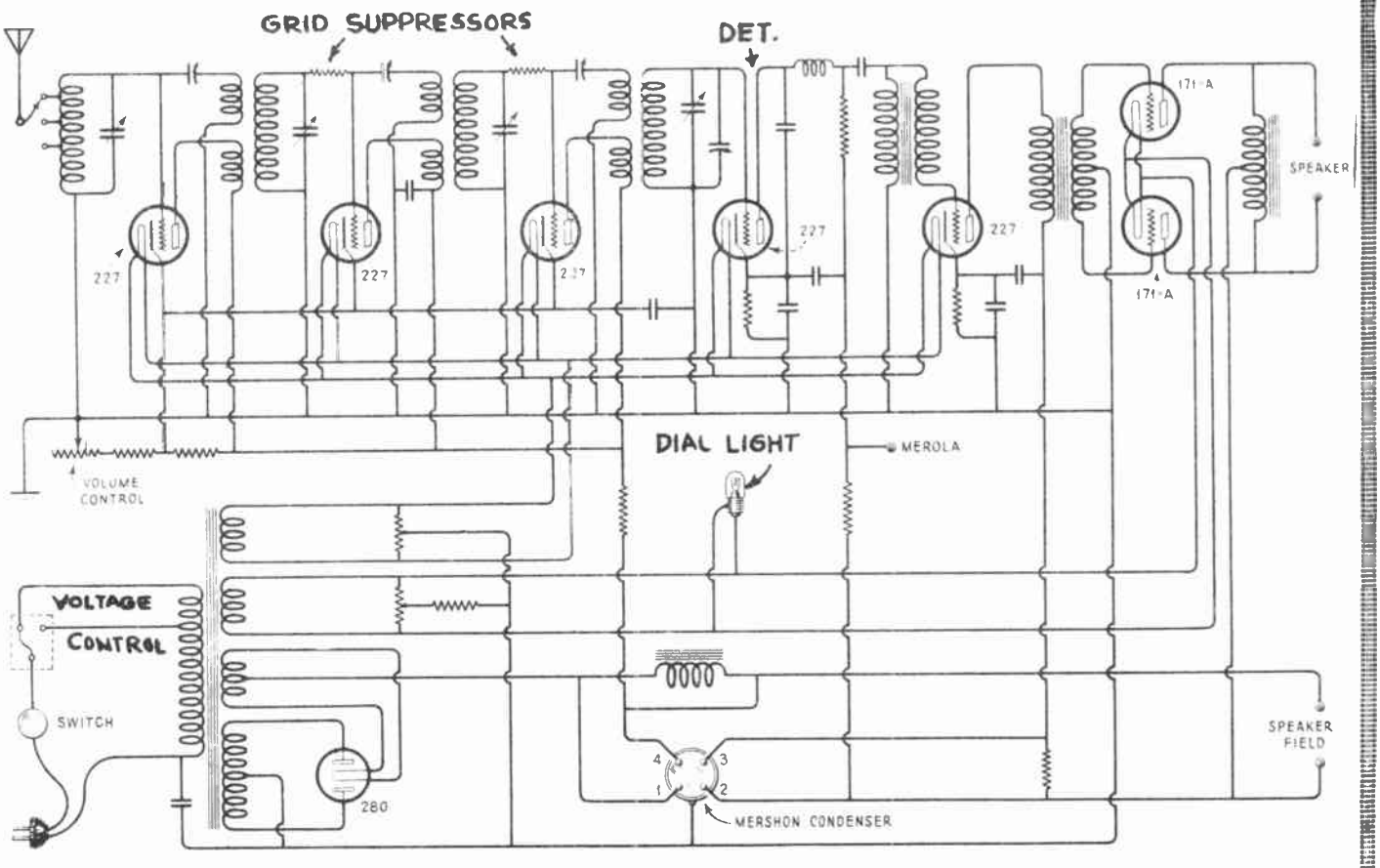
This seven-tube modern receiver is manufactured for distribution by retailers, jobbers and mail order houses under their private brands. Observe the metal brackets indicated by dotted lines alongside Ch 1, Ch 2 and Ch 3; the connections of these vary in different receivers, as explained in the text.

CROSLEY RADIO CORP.

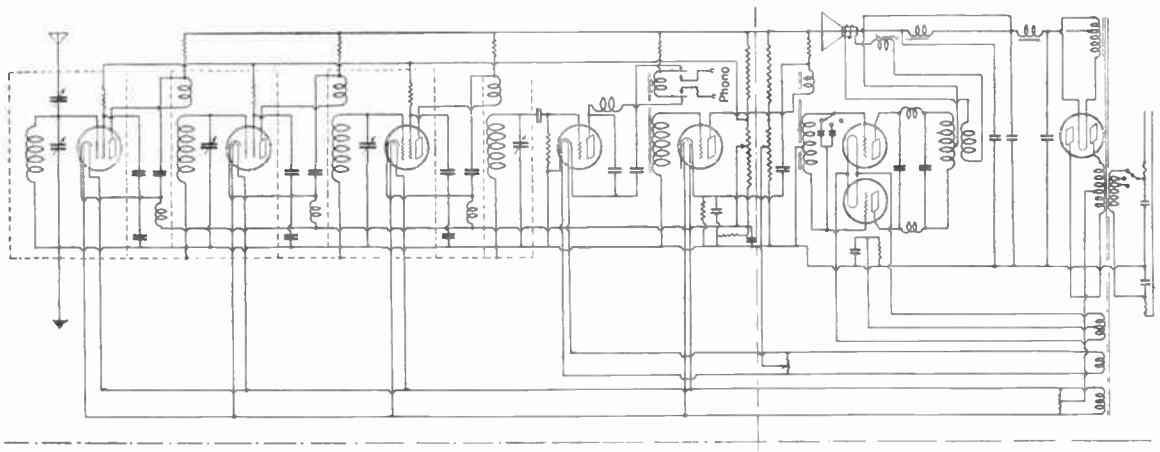
MODEL 705



MODEL 804



FEDERAL RADIO CORP.

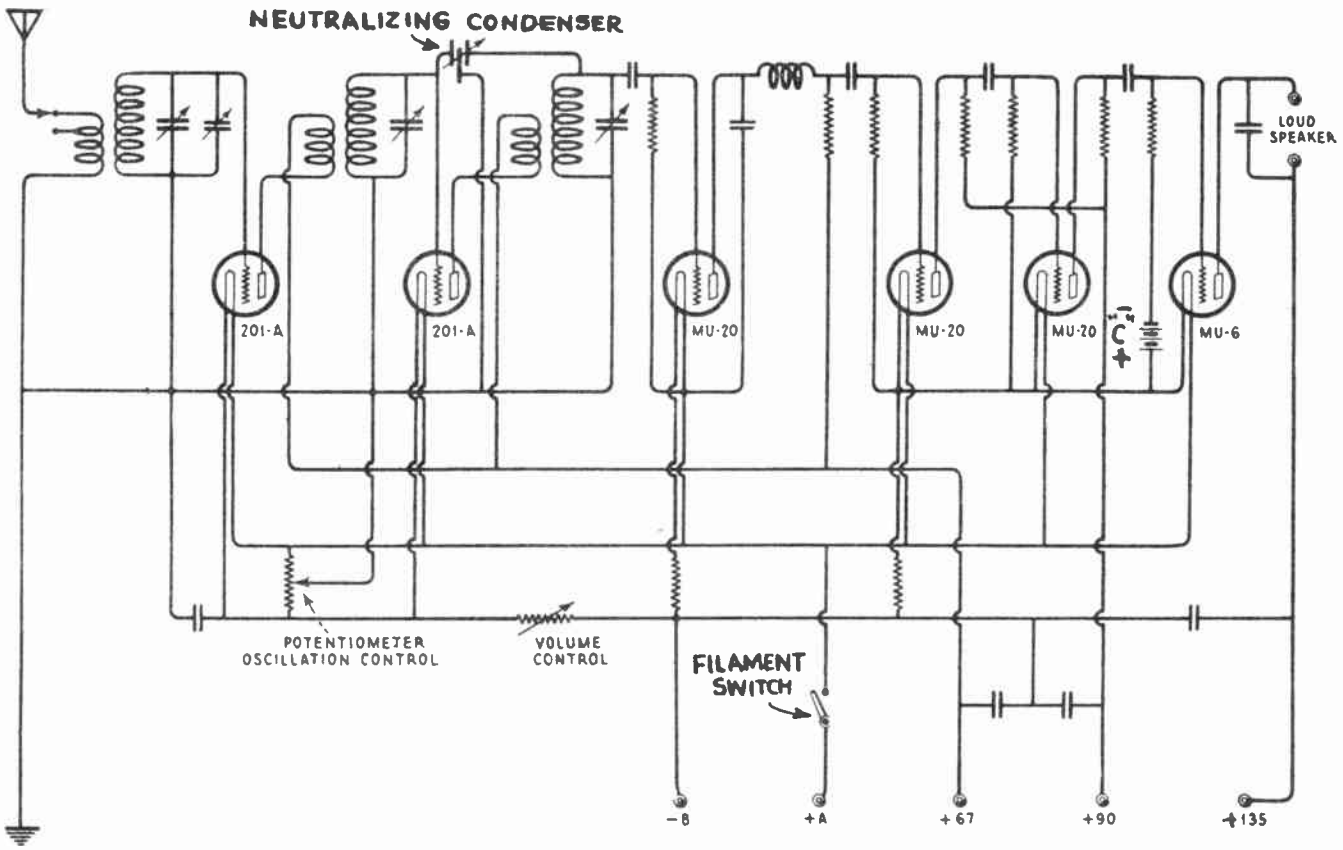


MODEL L

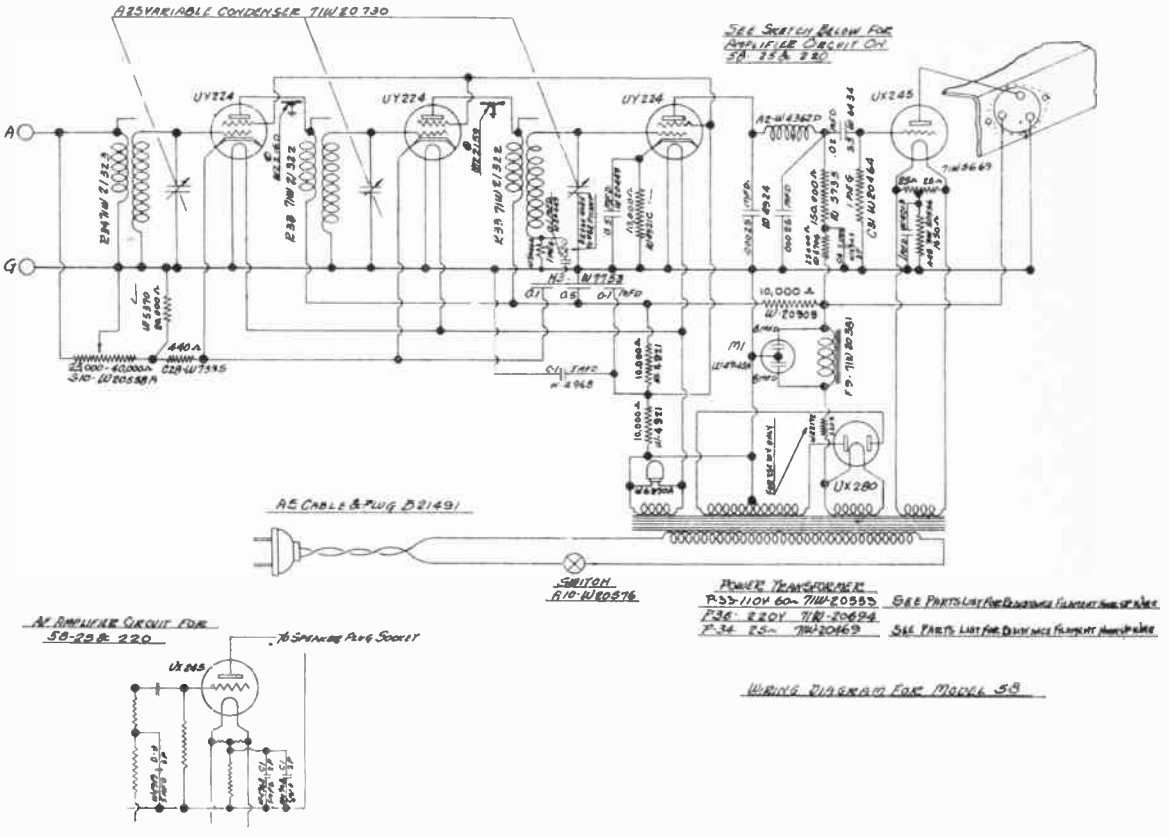
The timber control is an essential part of the receiver. It contains three positions, each having been given a name to indicate the type of reproduction it provides. These three names are utilized in connection with organs to indicate which stop is heing used. The first position on the timber control is known as the "Clarion" stop which, as its name implies, gives very brilliant reproduction. It is especially useful in rooms that are acoustically rather "dead." If the set is to be used in more normal surroundings, the "Mezzo" stop should be employed. With this stop some brilliancy is sacrificed to secure somewhat better balance. This is the most useful of the Stops and Model L receivers when shipped have the control set on the Mezzo stop. The third position is known as the "Bourdon" stop. With this stop considerable emphasis is given to the extremely low tones.

DAVEN RADIO CO.

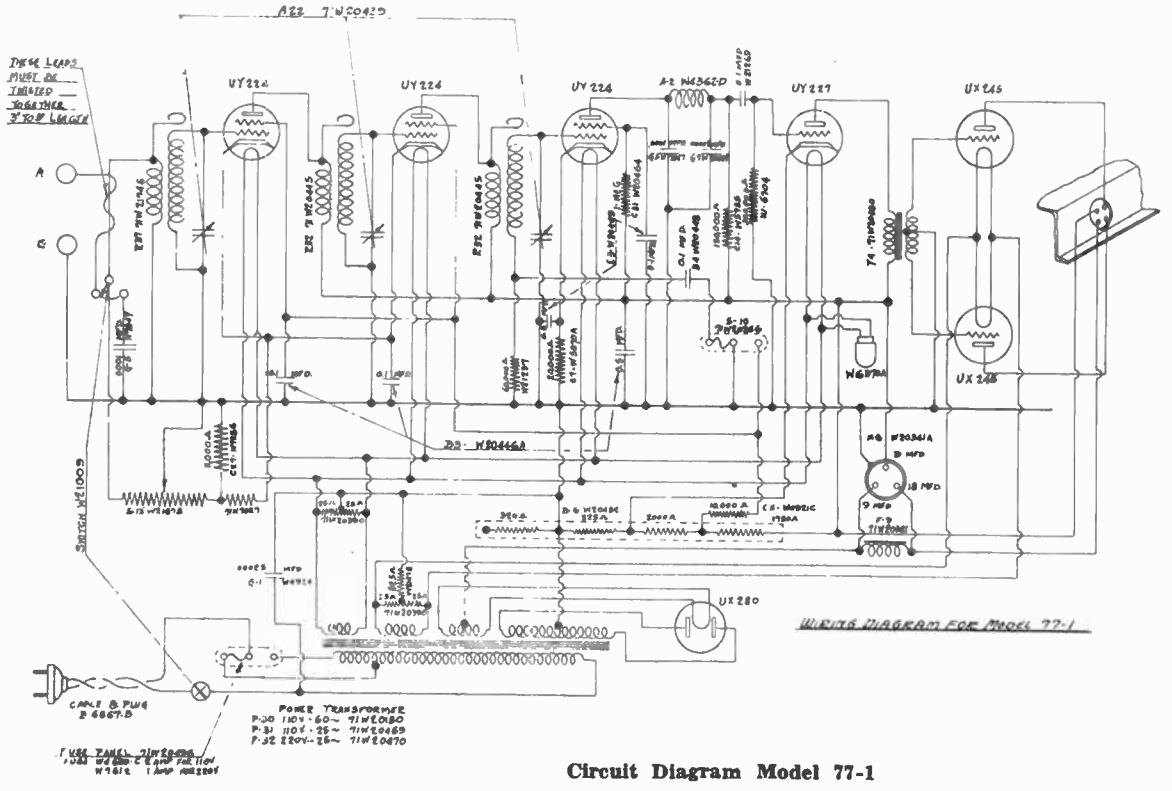
"BASS NOTE" CIRCUIT.



CROSLEY RADIO CORP.

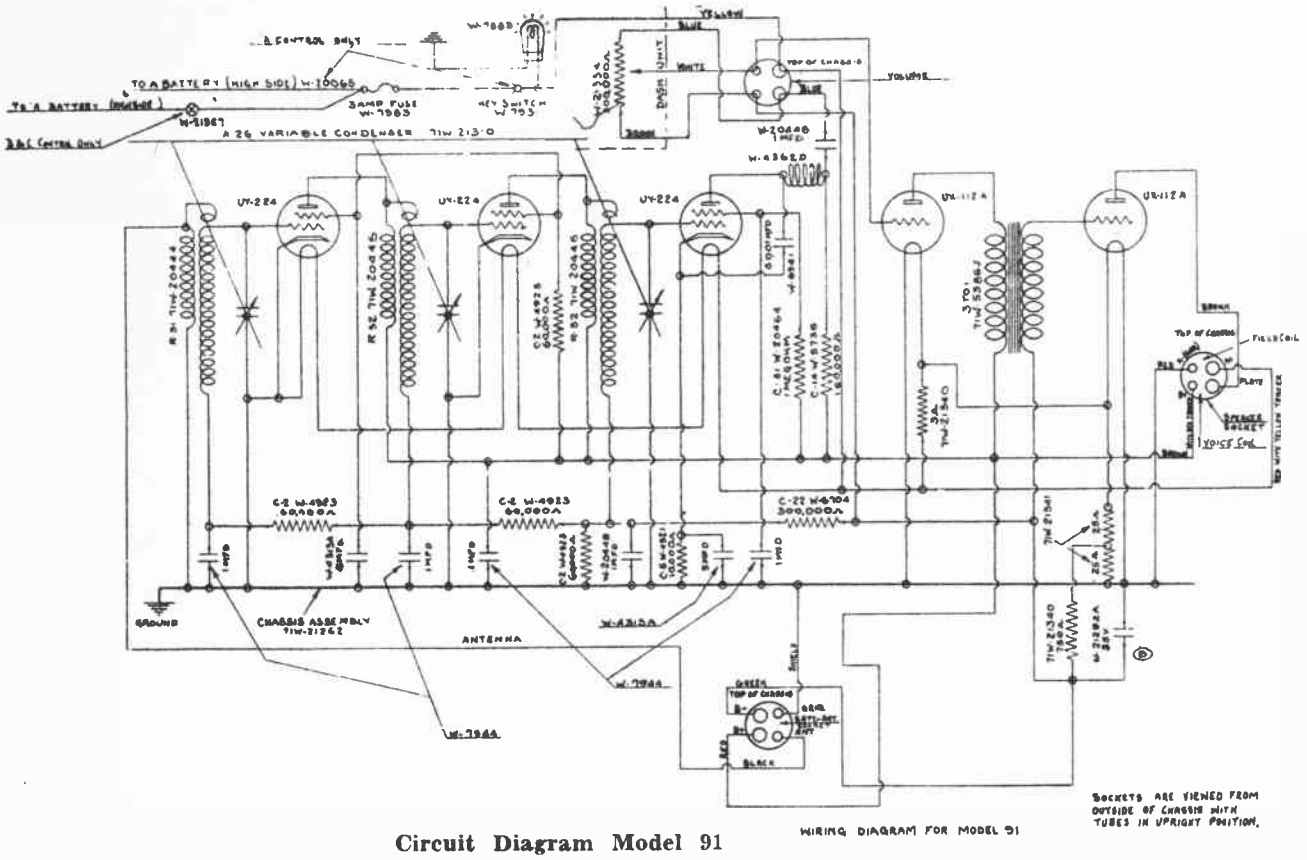


Circuit Diagram Model 58



Circuit Diagram Model 77-1

CROSLEY RADIO CORP.



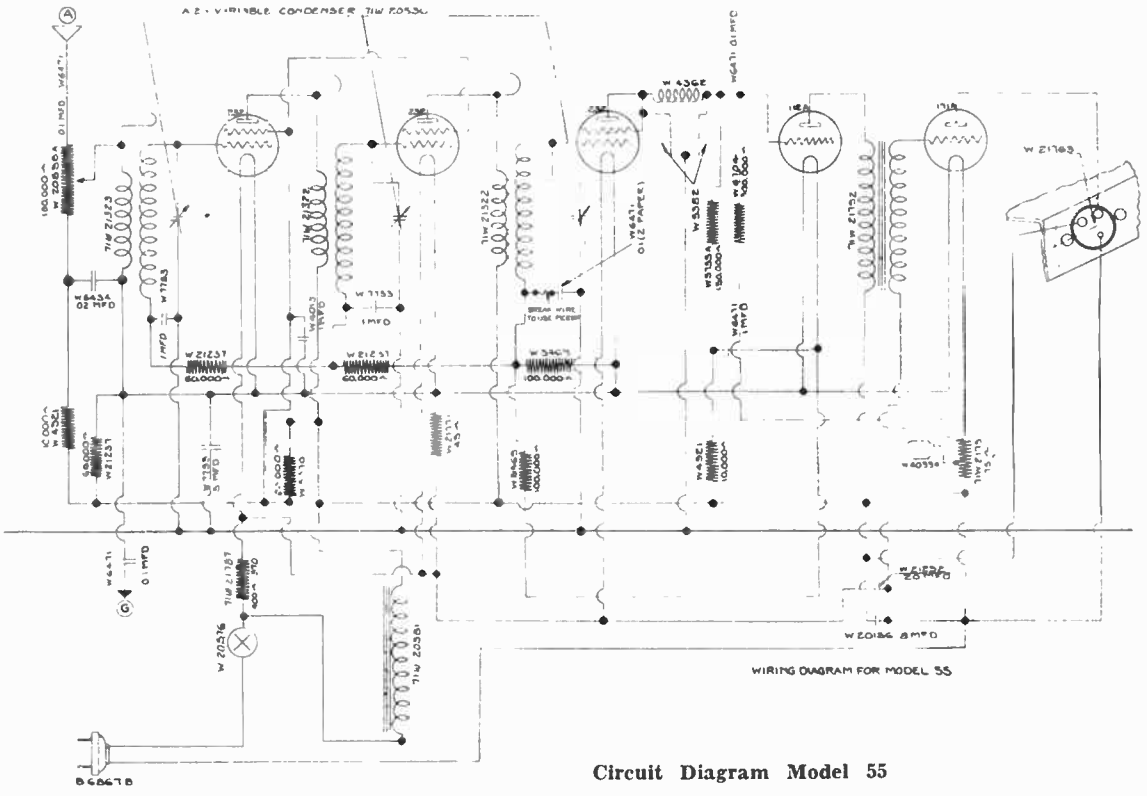
Circuit Diagram Model 91

Continuity Tests

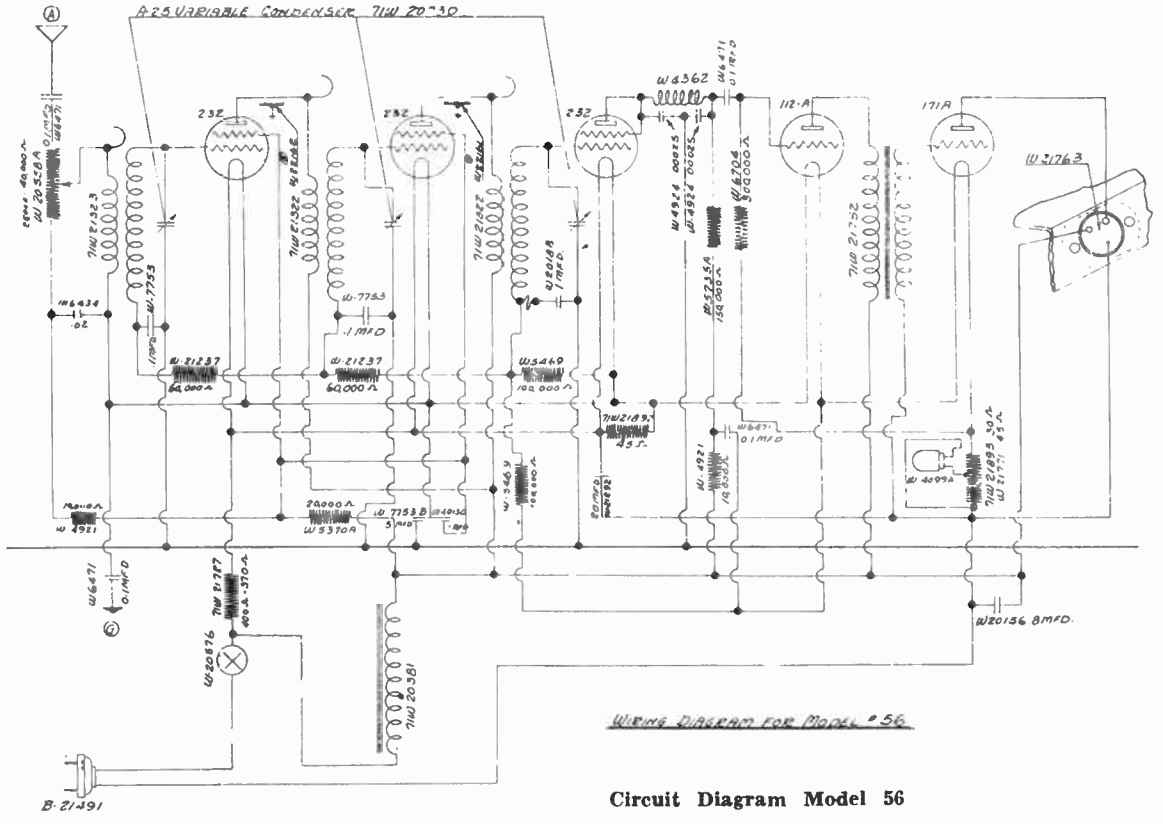
NOTE—In order to make the test procedure as simple as possible, certain tests are omitted which are taken care of by the voltage limits in the accompanying table.

Circuit	Remarks	Correct Test	Incorrect Test
Using 50 Volt D. C. Voltmeter in Series With 45 Volt "B" Battery, or Other Standard Circuit Tester.			
Antenna to Ground (Chassis)		Practically Full Scale (about 45 volts)	Open antenna transformer primary or faulty connections
Emitters to Chassis R. F. Stages		Practically Full Scale	Faulty connection or open circuit
Emitter to Chassis, Detector Stage		Part Scale	Faulty connection or open resistor shorted Conderser.
Operating Grids R. F. and Detector Stages to Chassis		Part Scale	No reading indicates open resistor or faulty connections. Full scale indicates short.
Operating Grids A. F. Stages to B—.	Volume Control connected but turned all the way off.	Part Scale	No reading indicates open resistor or faulty connections. Full scale indicates short.
Screen Grids R. F. and Detector Stages to B+.		Part Scale	No reading indicates open resistor or faulty connections. Full scale indicates short.
Plates R. F. and A. F. Stages to B+.	Speaker connected	Practically Full Scale	Faulty connections or open transformer primary or speaker armature
Plate Detector Stage to B+.		Part Scale	No reading indicates open choke, open resistor, or faulty connections. Full scale indicates short.

CROSLEY RADIO CORP.

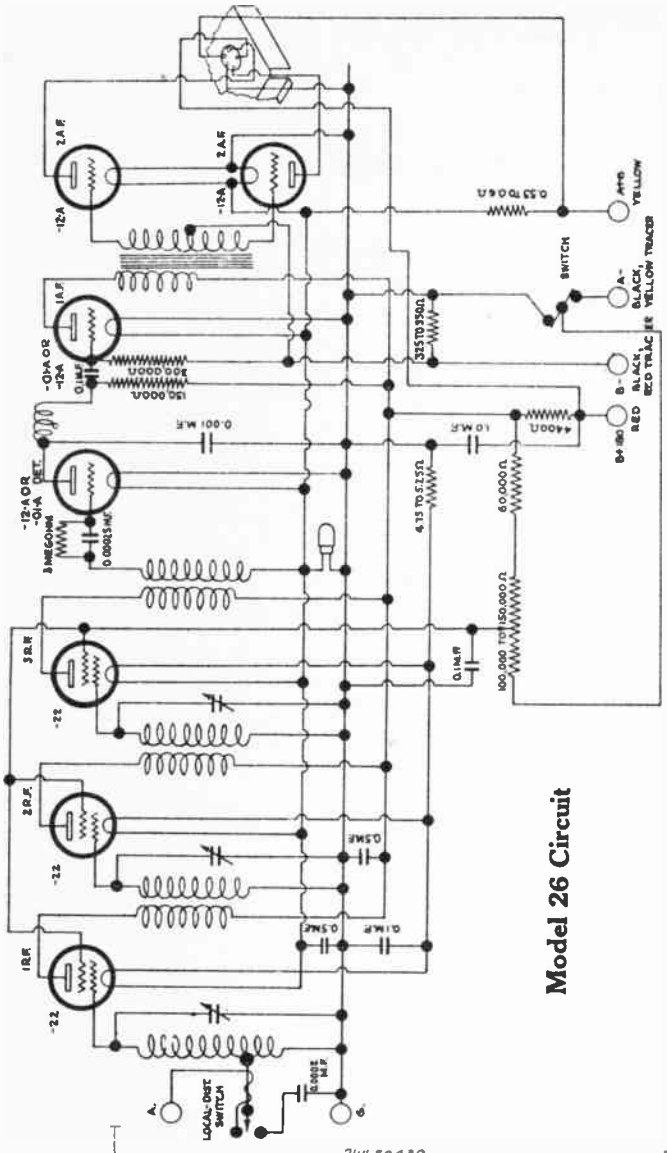


Circuit Diagram Model 55

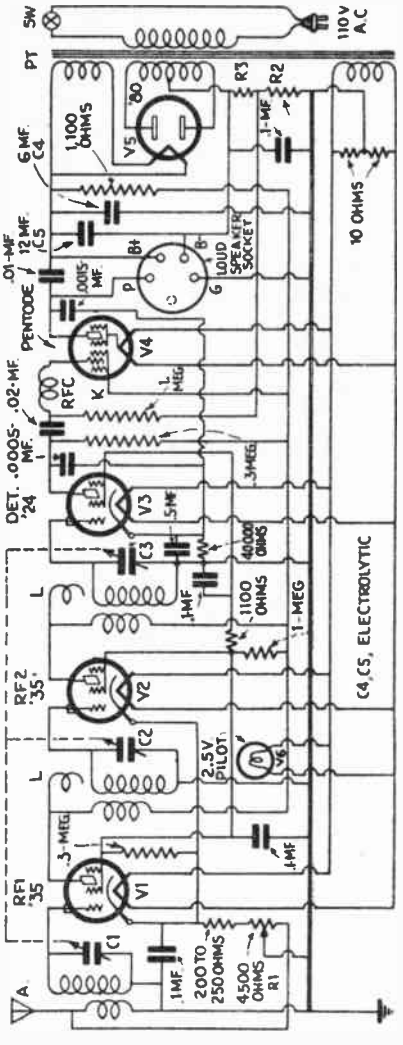


Circuit Diagram Model 56

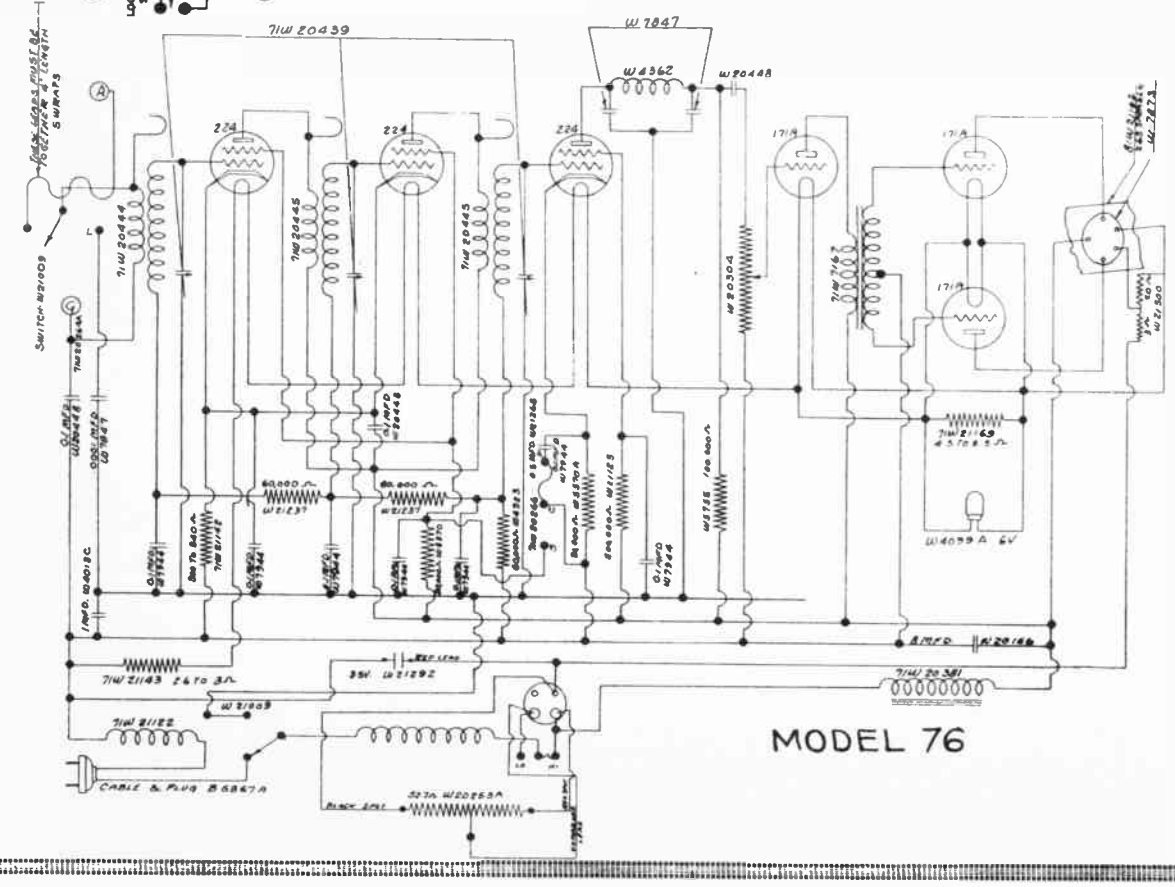
CROSLEY RADIO CORP.



Model 26 Circuit



Schematic circuit of the Crosley "Model 59." The field coil is between "G" and "B—;" the pentode's biasing resistor R2 is 300,000 ohms, R3 one megohm.



MODEL 76

Radio Service Data Sheet

CROSLEY MODEL 120 SENIOR SUPERHETERODYNE (PLIODYNATRON) CHASSIS

"Super-Sondo," "Super-Rondeau," and "Super-Administrator" Receivers

In the diagram below is shown the foundation chassis incorporated in a number of superheterodyne receivers manufactured by the Crosley Radio Corp., Cincinnati, Ohio. Standard consoles are the models Super-Administrator and Super-Rondeau; while the Super-Sondo console is a radio and phonograph combination. Available constants for the components will be the first consideration.

Condensers C6, C13, C14, 0.5-mf.; C7, C8, C9, C10, 0.1-mf.; C11, .001-mf.; C12, C15, .02-mf.; C16, C20, C21 (optional), .00025-mf.; C17, C19 (electrolytic), 9 mf.; C18 (electrolytic), 18 mf.; C3B, .001-mf. (fixed); C3C, 50 to 300 mmf. (variable).

Resistor R1 (volume-control potentiometer, ganged to power switch Sw), 10,000 ohms; R2, R4 (flexible), 375 ohms; R3 (flexible), 165 ohms; R5 (red, black, orange dot), 20,000 ohms; R6, 6,500 ohms; R7 (tone-control potentiometer), R8, 1750 ohms; R9, 2,000 ohms; R10, 545 ohms; R11, R13, 10 ohms (each half); R12, 850 ohms.

Normal operating readings (as measured with speaker connected, volume control on full, and line potential of 117 volts with fuse in "high" position; or 107 volts with fuse in "low" position), are as follows:

Plate potentials, V1, V4, 160 volts; V2, 155 volts; V3, 20 volts; V5, 145 volts; V6, V7, 260 volts; V8 (each plate), 275 volts. Filament potentials, V1, V2, V3, V4, V5, V9, 2.5 volts; V6, V7, 2.4 volts; V8, 4.9 volts. Screen-grid potentials, V1, V2, V3, V4, 90 volts. Control-grid potentials, V1, V4, 3 volts; V2, 7 volts; V3, 1.0 volts; V5, 15 volts; V6, V7, 54 volts.

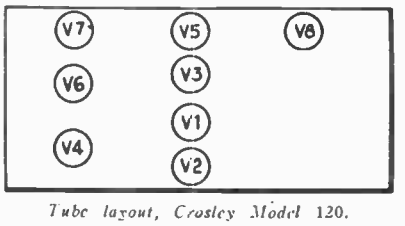
A long antenna on this receiver is a detriment to good reception.

Phonograph pick up connections P, C, S, will be noted in the grid-return circuit of the second detector, V5. The pick-up must be connected to the detector circuit through an audio coupling transformer, and a volume control must be provided; since the volume control on the receiver operates in the R.F. portion of the circuit. Phonograph motorboards are supplied with Crosley phonograph combinations. It is merely necessary to connect the marked leads from the pick-up switch to the terminals P, C and S on the chassis, and to break the wire between terminals P and C. If the pick-up is later disconnected, a wire must be connected between terminals P and C for radio reception.

The "fixed tune" I.F. stages (including variable condensers C4A-C4C, and C5A-C5B) are tuned to the intermediate frequency of 175 kc. Since care is taken at the factory to properly align these circuits, no attempt should be made by the experienced Service Man to re-align them, unless tests indicate positively that they are in need of readjustment. In that case, the following procedure will apply:

Remove oscillator tube V3 from the chassis, and remove the clip wire from the control-grid of I.F. amplifier tube V4. Connect the output leads of an *accurate* 175-kc. oscillator to the control-grid of V4 and the chassis. Adjust the two screws (C5A-C5B) on either side of the rear I.F. coil L5 (between the socket of V4 and the power tubes), until the test-oscillator signal gives the largest reading on an output meter connected to the audio output circuit of the receiver.

Next, replace tube V3, connecting screen-grid clip to the top of the tube. Remove the first detector tube V2, and connect the oscillator output from the control-grid of V2 to the chassis; then adjust the two screws C4A-C4C on either side of the front I.F. coil, L4, for maximum output meter reading. Slight readjustment of the screws beside the rear coil may improve the output somewhat.



Tube layout, Crosley Model 120.

Oscillator V3 is a screen-grid tube connected as an oscillator of the dynatron type (more correctly, a "pliodynatron"; the generic term applied by Dr. Hull to a 4-element or screen-grid oscillator as differentiated from the dynatron" or 3-element oscillator). Its plate potential is lower (20 volts) than its screen-grid; which is at a positive potential of 90 volts. It may be necessary to try two or three tubes in this position to obtain a satisfactory one.

The volume-control resistor R1 performs the dual functions of increasing the control-grid bias of amplifiers V1 and V4, and grounding the antenna—that is, when reducing volume—and vice versa. The tone-control circuit is ingenious and should be carefully noted as to electrical values and arrangement.

If, when receiving some signals, the volume control is turned up so far that the first detector is overloaded, a whistling note will be heard. This is a perfectly normal characteristic of superheterodynes, and does not mean that anything is wrong with the receiver: when the volume is adjusted for normal reception, the whistle does not occur.

If it becomes necessary to re-align the main tuning-condenser gang, the procedure is as follows: leave the shield cover in place, and tune in a station or modulated-oscillator signal near 1,400 kc. Turn the volume control on fully. If all signals within the required range are too loud, connect a fixed condenser C21 to the posts marked "A" and "G," and loosely couple the antenna to the leads of the local-distance switch.

If, when the receiver is carefully turned to the middle of the band, the dial reading does not correspond to the frequency of the signal, but is not more than two channels off, set the dial at the correct frequency, and adjust the trimming condenser C3A (the control farthest toward the rear of the chassis) until the signal is loudest. Check the tuning by readjusting the station selector. It may be impossible to regulate the oscillator trimming condenser C3A so that the oscillator condenser is properly aligned with the *exact* dial setting; in which case align the trimming condenser with a dial setting as close to the actual frequency as practicable.

After aligning the oscillator circuit by adjustment of C3A, adjust the trimmers C1A and C2A for greatest volume. This completes the adjustments for best reception at the *low* wavelengths. Now proceed as described below, for test and possible re-adjustment at *high* wavelengths.

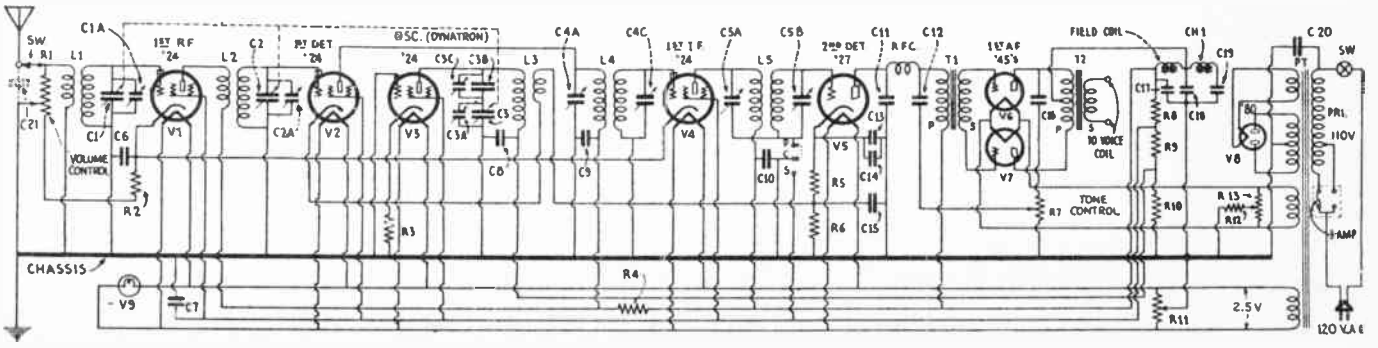
Tune to a signal near 600 kc. If the dial setting, when carefully adjusted, is not more than a single channel (10 kc.) away from the actual frequency of the signal, it is possible to align the low-frequency tracking. DO NOT MAKE THIS ADJUSTMENT UNLESS ABSOLUTELY NECESSARY.

For this purpose, a bakelite screwdriver will be required. The low-frequency adjustment (condenser C3C) is at the rear of the chassis, behind the shield, and is sealed at the factory. It is necessary to break this seal before the screwdriver can be inserted and turned. Turn the tuning control until the actual frequency of the signal is indicated by the dial reading, and adjust for best volume. If it is not possible to align the condenser with the dial set at the exact signal frequency, set the dial as close as practicable to the exact frequency.

If signals are not heard after trying a new tube, the circuits may be checked as follows: remove the top of the condenser shield and, having removed the antenna, touch it to C2A. Tune to a strong signal; if not received, the oscillator may not be functioning, or remainder of set requires checking. Touch antenna to C1A; if signal is not increased, check the circuits of V1. Of course, lack of signal only at the antenna post indicates a defect in the antenna circuit. In lieu of a powerful broadcast station, an A.F.-modulated R.F. oscillator, operating in the broadcast range, may be used.

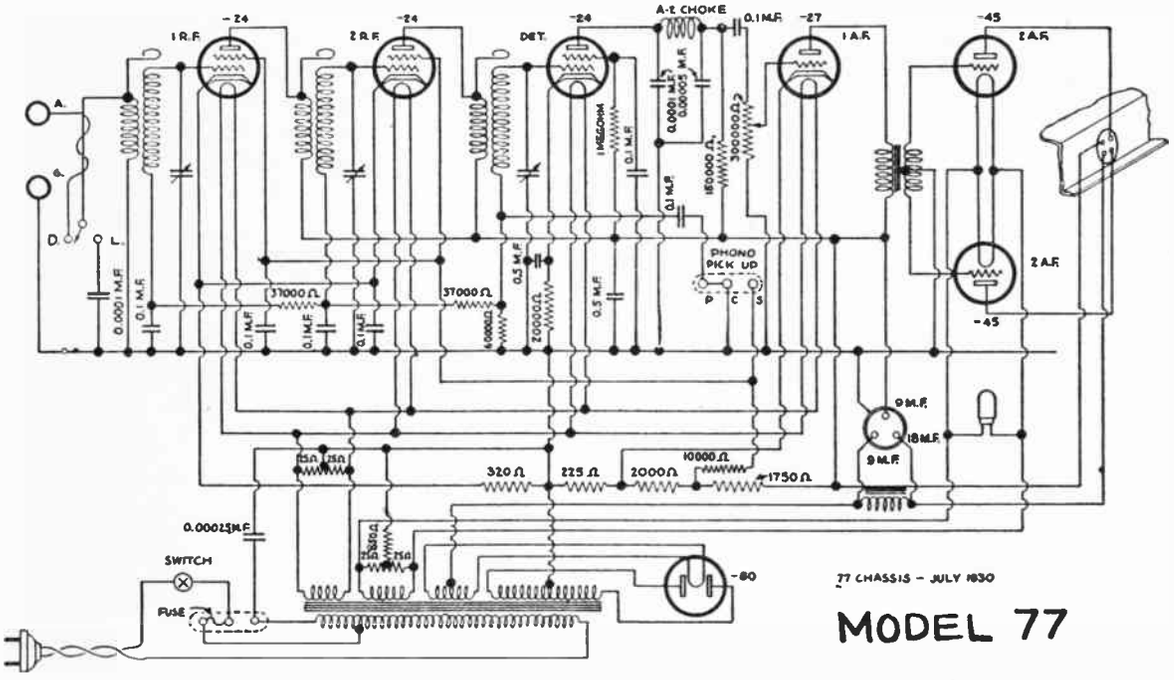
Switch Sw1 is the "local-distance" adjustment. The manufacturers refer to the tone control as the "static and tone control."

The Model 120 receiver may be considered non-radiating; since V3 and its circuits are shielded, and preceded by circuits sharply tuned off the oscillator frequency.



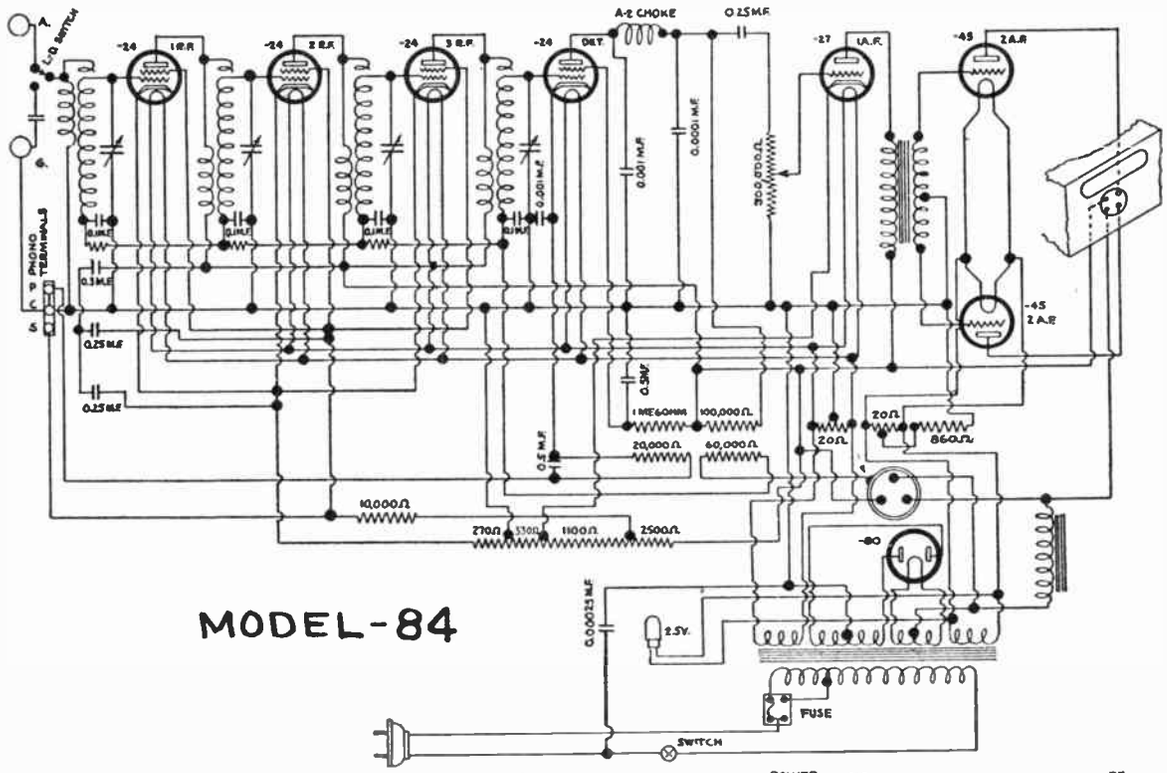
Schematic circuit of the Crosley Model 120 series "Senior Superheterodyne" (Pliodynatron) chassis.

CROSLEY RADIO CORP.



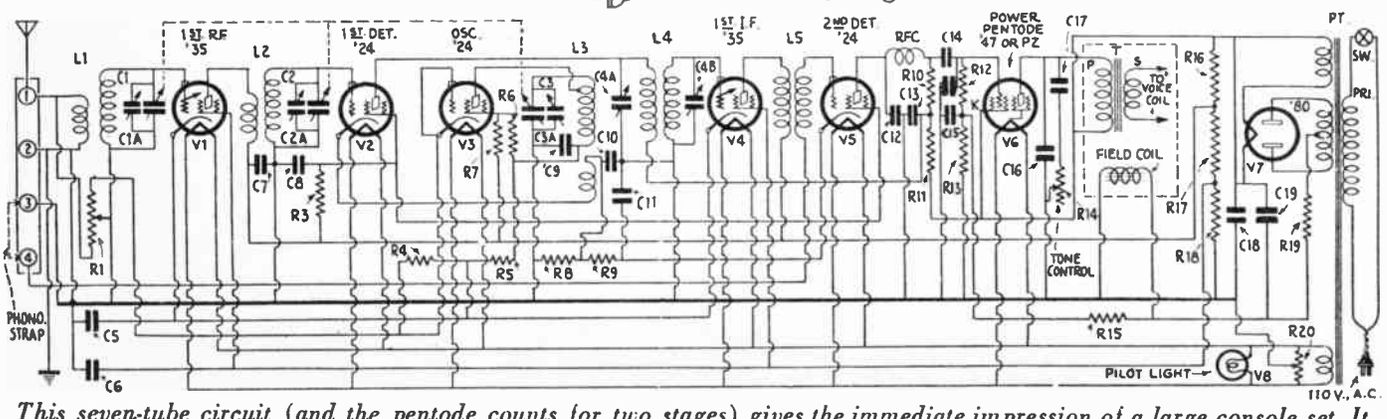
77 CHASSIS – JULY 1930

MODEL 77

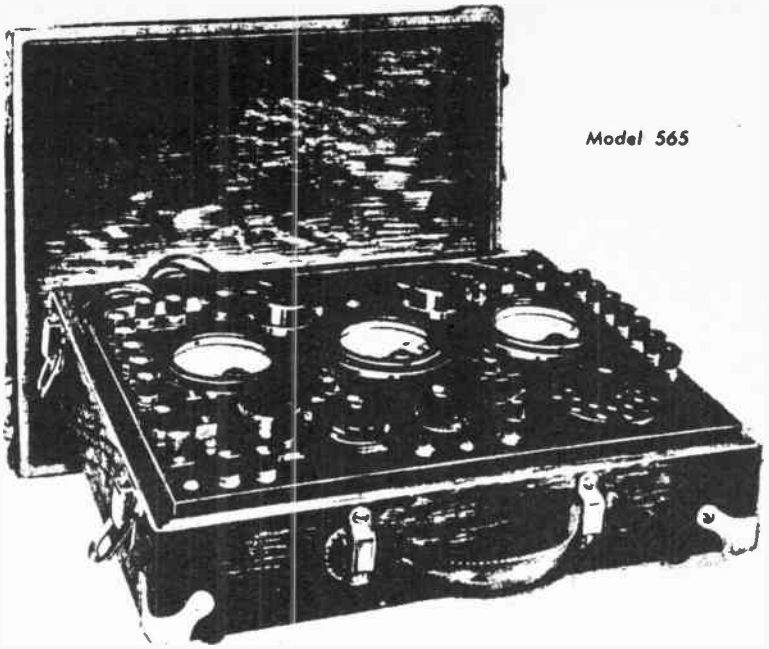


MODEL-84

SUPER BUDDY BOY



This seven-tube circuit (and the pentode counts for two stages) gives the immediate impression of a large console set. It incorporates the latest tubes—variable-mu amplifiers, and a pentode output giving a margin of volume on all signals



Model 565

Model 564

Model 566

ELECTRICAL MEASURING INSTRUMENTS FOR EVERY RADIO USE

WESTON is the instrument headquarters of the entire electrical world. Since 1888 Weston has set the standards of quality, dependability, and accuracy in electrical measuring instruments. Today, the wide scope of Weston instruments includes test sets for radio servicing, meters for radio transmitting panels, and instruments for radio laboratories, and manufacturing plants.

Illustrated above are three of Weston's recent contributions to better radio servicing. They are outstanding in design, speed of operation and reliability.

Whatever your instrument requirements may be, Weston can serve you.

MODEL 564—VOLT OHMMETER for voltage and resistance measurements and continuity tests. The compact construction, low cost and simplicity of operation make this small instrument suitable for shop and factory tests, radio laboratory use, and as accessory equipment for home, automobile and airplane radio servicing. Four voltage ranges 600/300/30/3 volts and two resistance ranges 0-100,000 and 0-10,000 ohms.

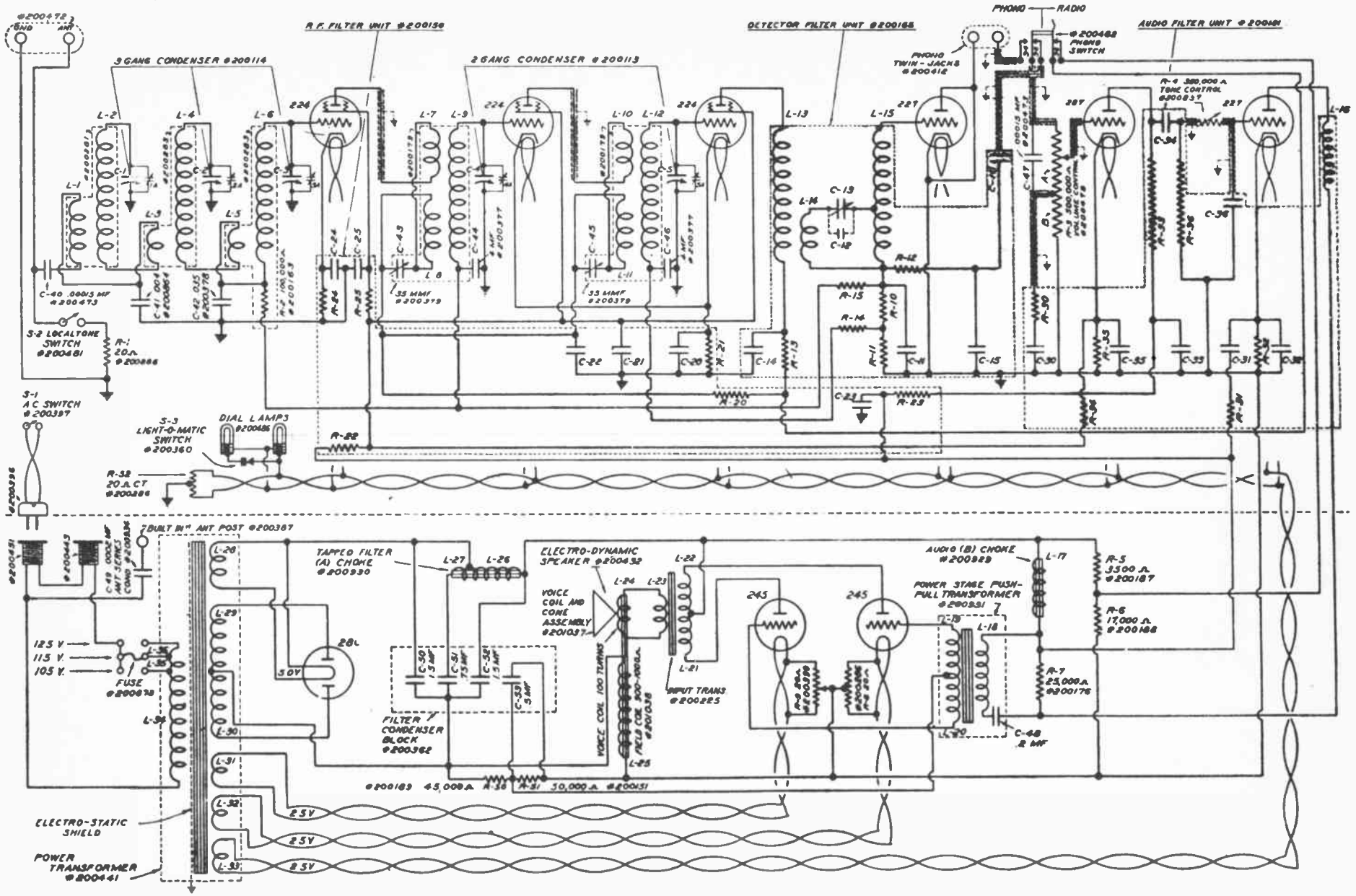
MODEL 565—THE COMPLETE RADIO SERVICE TEST SET with an Oscillator and Tube Checker, Practically a portable radio testing laboratory. Checks all types A. C., D. C., Pentode and Rectifier tubes and all types A. C. and D. C. Sets.

MODEL 566 — RADIO SERVICE TEST SET. For radio dealers and service men who desire a lower priced but less complete test set than Model 565. Checks tubes under same conditions as exists when in their sockets. Checks all type A.C., D.C. tubes and all makes of Radio Receivers.

WESTON

ELECTRICAL INSTRUMENT CORP.

578 Frelinghuysen Avenue • • • • Newark, N. J.



MODELS R-6 & R-7

THOMAS A. EDISON INC.

MOELS R6 AND R7

BOTTOM VIEW OF RECEIVER UNIT SHOWING FILTER UNIT TERMINALS AND RESISTORS

R-10 AUTOMATIC VOLUME CONTROL VOLTAGE DIVIDER
R-11 " " " " "
R-12 DETECTOR OUTPUT FILTER RESISTOR
R-13 3RD R.F. PLATE ISOLATING "
R-14 " " GRID " "
R-15 1ST + 2ND R.F. GRID " "

R-20 1ST + 2ND R.F. PLATE ISOLATING RESISTOR
R-21 2ND + 3RD " BIAS "
R-22 HIGH POTENTIAL END S. G. VOLTAGE DIVIDER
R-23 1ST A.F. PLATE ISOLATING RESISTOR
R-24 1ST R.F. BIAS "
R-25 1ST SCREEN GRID ISOLATING "

R-30 TONE BALANCE RESISTOR
R-31 HUM BUCK "
R-32 2ND A.F. BIAS "
R-33 PLATE COUPLING "
R-34 LOW POTERTIAL END S.G VOLTAGE DIVIDER
R-35 1ST A.F. BIAS RESISTOR
R-36 GRID LEAK

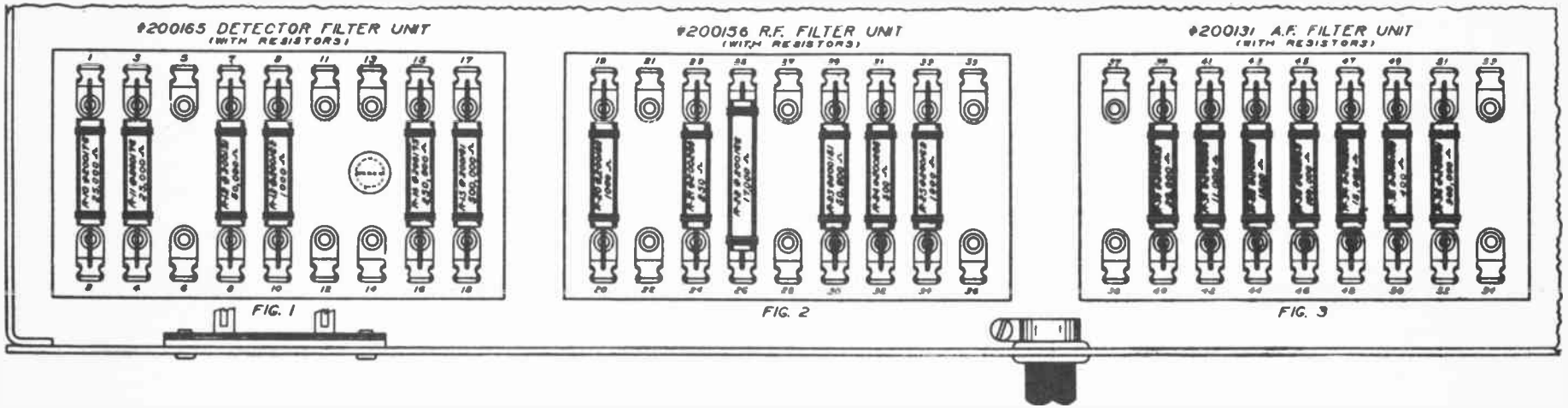


FIG. 1 FIG. 2 FIG. 3

SCHEMATIC DIAGRAM FOR FILTER UNITS (RESISTORS NOT SHOWN)

#201046 DETECTOR FILTER UNIT

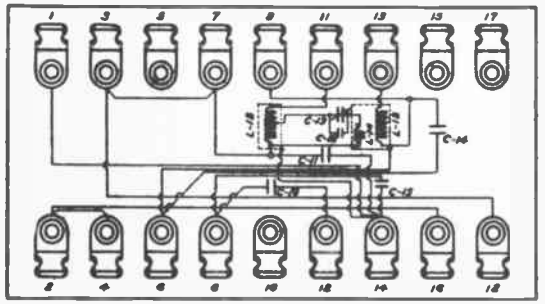


FIG. 1-A

C-10	0.25 MF	#900130	DETECTOR COUPLING	CONDENSER
C-11	.0001 "	#200468	AUTO. V.C. RES. BY-PASS	"
C-12	40 MMF	#201000	FIXED COUPLING	"
C-13	60 MMF	#200373	ADJUSTABLE "	"
C-14	.05 MF	#900200	3RD R.F. PLATE BY-PASS	"
C-15	.0006 "	#900168	DETECTOR OUTPUT FILTER	"
L-15		#900170	AUTO TRANSFORMER	
L-13 + L-14		#900172	COUPLING "	

#201045 R.F. FILTER UNIT

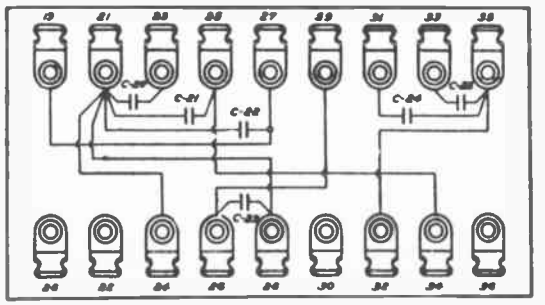


FIG. 2-A

C-20	0.5 MF	2ND + 3RD R.F. BIAS	BY-PASS	CONDENSER
C-21	1.0 "	" " SCREEN GRID	"	"
C-22	.05 "	1ST + 2ND R.F. PLATE	"	"
C-23	1.0 "	2ND A.F. PLATE	"	"
C-24	0.5 "	1ST R.F. BIAS	"	"
C-25	0.1 "	" SCREEN GRID	"	"

#201044 A.F. FILTER UNIT

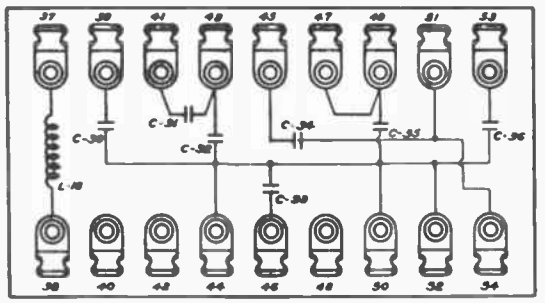
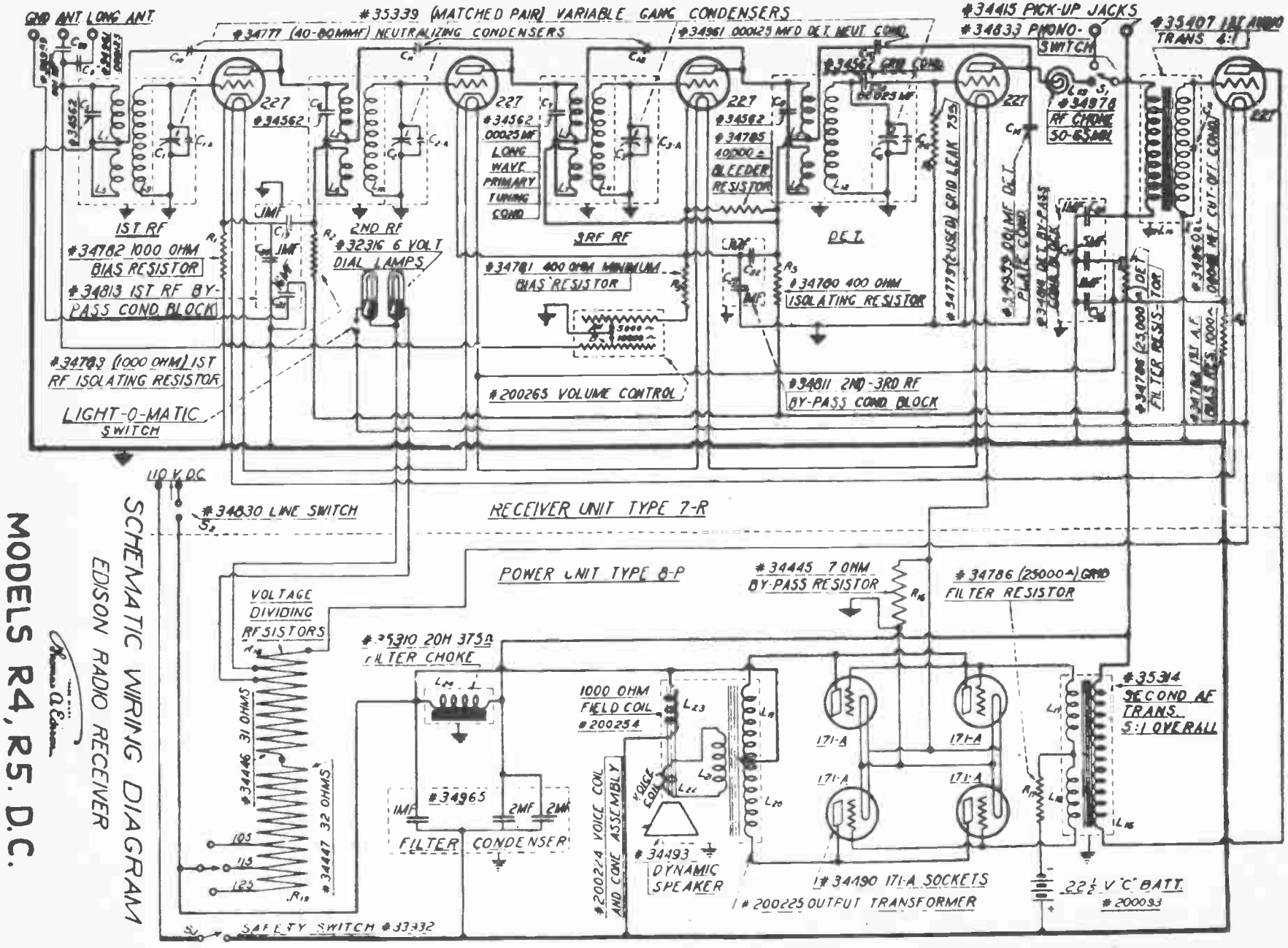


FIG. 3-A

C-30	0.25 MF	TONE BALANCE CONDENSER #1	
C-31	0.5 "	HUM BUCK "	
C-32	1.0 "	2ND A.F. BIAS BY-PASS	CONDENSER
C-33	1.0 "	1ST " PLATE "	"
C-34	0.25 "	" " PLATE COUPLING	"
C-35	1.0 "	" " BIAS BY-PASS	"
C-36	.0005 "	TONE CONTROL	"
L-16		#900167 R.F. CHOKE	

THOMAS A. EDISON, INC.

THOMAS A. EDISON, INC.



SCHEMATIC WIRING DIAGRAM

EDISON RADIO RECEIVER

MODELS R4, R5. D.C.

Radio Service Data Sheet

ERLA MODEL 224 A.C. SCREEN-GRID RECEIVER

This receiver is manufactured by Electrical Research Laboratories, Inc., Chicago, Ill. The following values are used in this circuit:

Condensers C1, C2, C3, C4 are the tuning capacities; C5, C15, 0.5-mf.; C6, C7, C8, C12, C13, 0.25-mf.; C9, C10, .001-mf.; C11, C19, 1. mf.; C14, 0.1-mf.; C16, C17, 2 mf.; C18, 3 mf.

Resistors R1, R6, R7, 70,000 ohms; R2, 5,600 ohms; R3, R12, 6,000 ohms, R4, 80 ohms; R5, R8, 100,000 ohms; R9, 1,000 ohms; R10, R11, 10,000 ohms; R13, R14, 20 ohms.

Average current readings for this set are as follows: filament potentials; V1, V2, V3, V4, V5, 2.4 volts; V6, V7, 2.5 volts; V8, 5 volts. Plate potentials; V1, V2, V3, 175 volts; V4, 70 volts; V5, 95 volts; V6, V7, 245 volts; V8, 350 volts. Screen-grid potentials; V1, V2, V3, 80 volts. Ground-to-cathode; V1, V2, V3, 1.5 to 2 volts; V4, 6 to 7.5 volts; V5, 4.5 volts. Grid-to-filament, V6, V7, 50 volts.

This chassis is well shielded and normally does not oscillate. However, if a tube shield is left off, or if the aerial lead is allowed to dangle in around the tubes or control-grid leads, oscillation may occur. If the bottom shield of the chassis is removed, oscillation is generally encountered. It is likewise important that the ground and the aerial leads be connected as oscillation may occur if these are left unconnected. It is also important that all the shielding, particularly on the gang condenser be in place and fastened securely. Changing the screen-grid tubes around may correct oscillation or tendency to motorboat.

Considerable heat and loud humming of the transformer should be investigated for short circuits across one of the windings of the transformer. A piece of wire or solder may have become loose, or the insulation of one of the leads may have been cut through, and short-circuited one or more of the transformer's windings. In any of these cases, if the transformer has not been allowed to remain in this short-circuited condition too long, correction of the short or separation of the shorted leads and the insertion of new leads will correct this and, usually, the transformer will again operate satisfactorily.

If the switch leads of the "high-low" voltage switch become shorted, considerable heating and danger to the power transformer will result. If one of the plates of the '80 should become quite red and its filament bright, whereas the other filament and plate are comparatively cool, the trouble is due to improper connection of the high-voltage winding to the plates of the '80 tube. Voltage tests will generally show a considerably higher reading on one plate than on the other. This is due to the connection of the tap on this winding to one plate, instead of the tap's being connected to its proper circuit connection. Filter chokes of this power-supply unit generally will give very little trouble; however, if either should be shorted, a considerable increase of hum, as well as abnormally high plate voltages, will result. An open circuit of either choke coil will result in absence of voltage across this coil, as well as the circuits to which it supplies. The filter condenser used in the power supply is considerably oversize, and there should be very few cases of breakdown of these units. Excessive hum may be due to an open resistor, which will require replacement.

The volume control-and-switch combination is a particularly rugged unit; the resistor being rated considerably above its operating value. The possible troubles from this unit are an open circuit, due to cutting of the resistor wire, or improper operation of the phono-radio switch. The cutting may be caused by hitting with a sharp tool or the like. Care should be exercised in working on this unit, in order not to injure the resistor element. If this resistor is open at one end, there will be no control of volume on weak or strong signals. This, of course, should not be confused with the somewhat abrupt variation of control when attempting to control strong local volume in the "distance" switch position. If this resistor is open at the other end, there will be no signals received, since no voltage is then impressed on the screens of the screen-grid tubes. A check for either of these conditions may be made by connecting a voltmeter from the screen to the cathode; and varying the volume control should show variation of the screen-grid voltage.

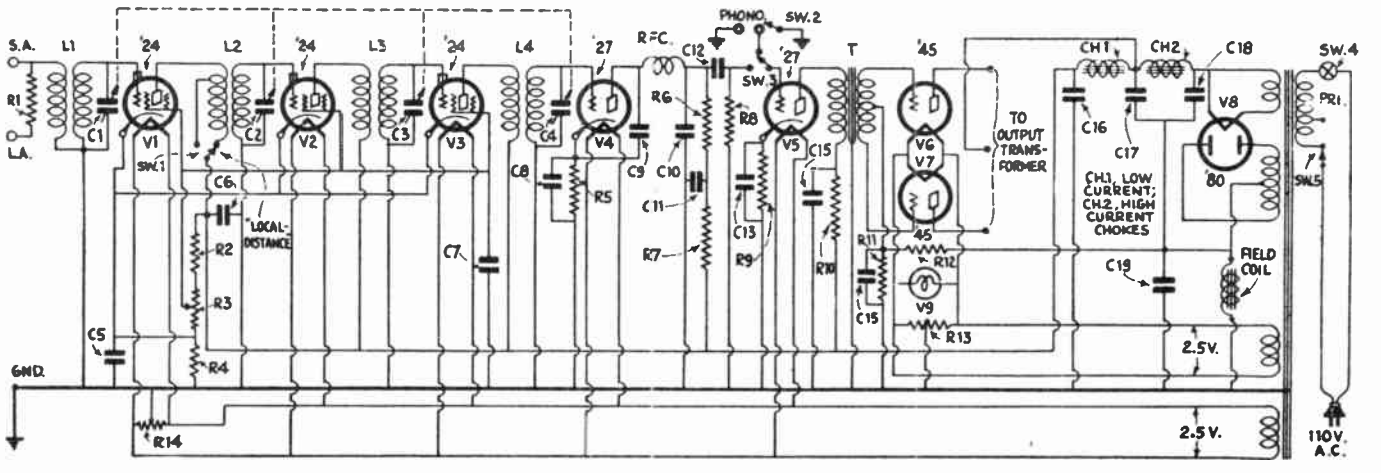
If the single-pole switch, governed by the shaft of this control does not operate, when the control is turned toward the extreme left in the "off radio and on phono" position, no phonograph operation will be had. An examination of this switch will generally reveal either condition, and the method of its correction by re-adjustment. A little roughness in the volume control will be overcome by applying a touch of light oil with the finger tips across the resistor element. It should be noted that the shaft and body of this control must be insulated from the chassis frame.

Distorted signals may be due to poor '27's or '45's, but there are a number of other possible causes of this trouble. Low "B" voltages resulting from a defective '80 will, of course, cause distortion. If the distortion is due to rattles in the speaker, this may be defined by substituting another speaker. Generally a speaker which rattles will have its moving coil rubbing on the center pole-piece. This can generally be felt, by slightly pressing the diaphragm in and out, and noting whether any rubbing exists. Another cause of distortion, which is generally very bad, is caused by either reversed connections in the speaker transformer or by an open or shorted connection at this point. Open grid-biasing resistors, or shorted bias condensers in the first audio or push-pull stage will result in distortion and increase in the hum level. An open field connection will also result in distortion and weak signals. Voltage readings across the field connections will be abnormal and, also, no magnetic pull will be felt on touching an iron or steel tool to the center pole-piece. An open winding on one side of the push-pull transformer will also result in some distortion, principally on strong signals; this latter condition will bring about some increase in the hum level.

The field coil of the reproducer in this receiver has a resistance of 1,000 ohms and is designed to carry 100 milliamperes.

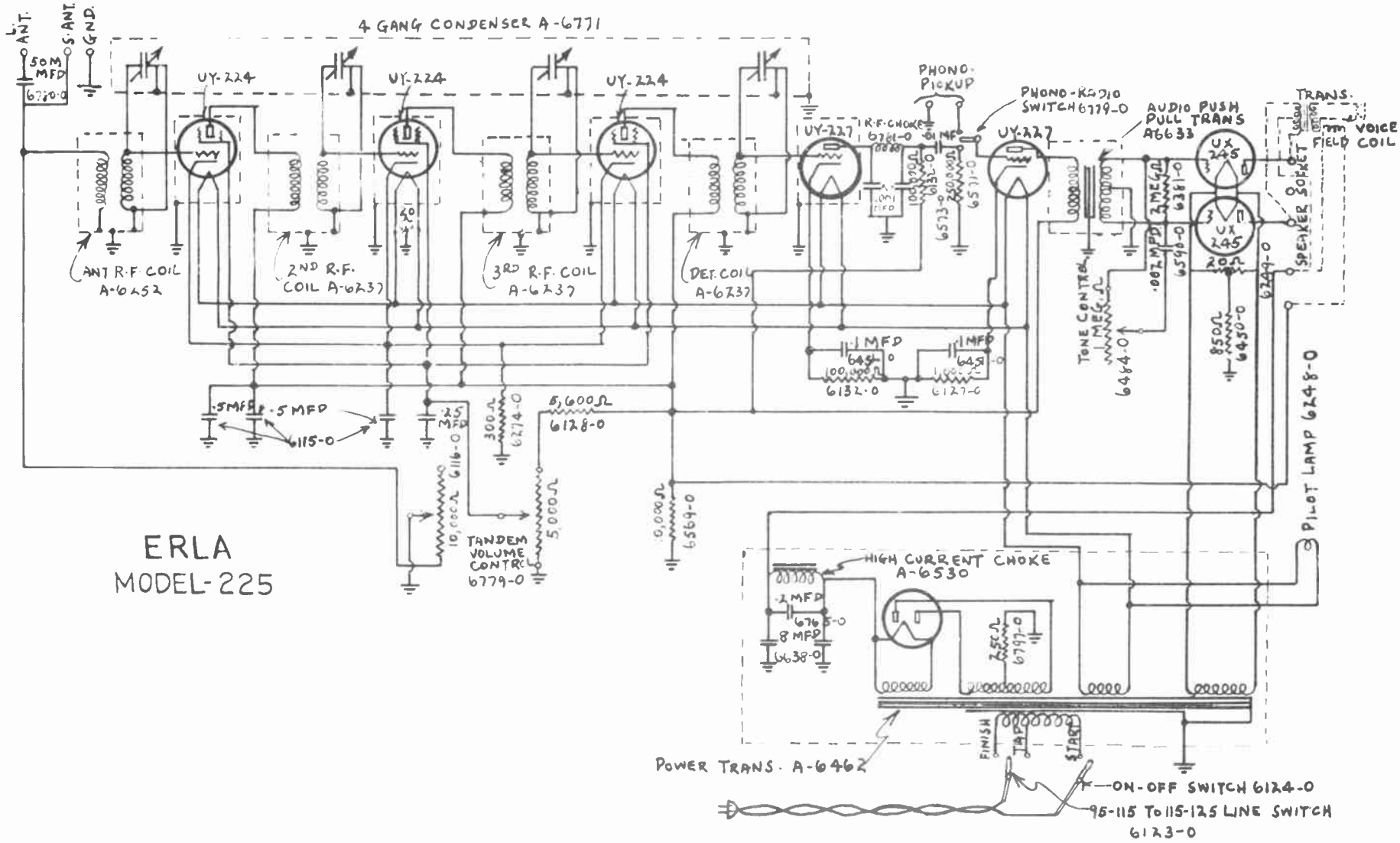
Mounted on top of the condenser shield is the pilot lamp and receptacle. On looking at the front side of the condenser shield, the four aligning condenser adjusting nuts will be seen; these serve to align the tuned stages, and seldom require readjustment. To make adjustments in the alignment of the tuning condenser, the receiver must first be removed from the cabinet and connected up on a bench with antenna and ground as for receiving. By looking to the left of the tuning dial, four holes will be seen along the shield can of the tuning condensers. Through three holes can be seen four hexagonal nuts, which are to be adjusted for aligning the tuning condenser. Any wrench which will fit these nuts whether insulated or not may be used. Proceed as follows, to align the circuits: Tune in an oscillator signal between 220 and 240 meters; use an indicating meter. Set the "local-distance" switch on the "distance" position. Turn down the volume control until station can just be heard. With the No. 4 Spintite wrench turn the adjusting nut (nearest the tuning dial) first to the right and then to the left. If this section of the tuning condenser is properly aligned, the signal will get weaker whichever way the nut is turned; however, adjust for strongest signal. Follow this procedure with the remaining circuits.

It is important that the proper polarity in connecting the pick-up leads to the chassis be observed. One jack is marked "R," meaning red or grid side of cord; and the other is marked "B," for the ground side of cord. Connection to the incorrect terminals may result in hum, or lack of phonograph volume.



Schematic circuit of the Earl "Model 224 A.C." screen-grid receiver. Note that the field coil of the reproducer is in series with the "B—" lead of the power pack; and the phonograph pick-up connects to the input of the first audio tube, V5. A novel "local-distance" switch, Sw1, is part of the design.

ELECTRICAL RESEARCH LABORATORIES



ERLA
MODEL-225

NOTE: - Dotted lines denote shielding. All numbers shown relative to parts are our part numbers. Numbers shown with prefix "A" are complete assemblies.

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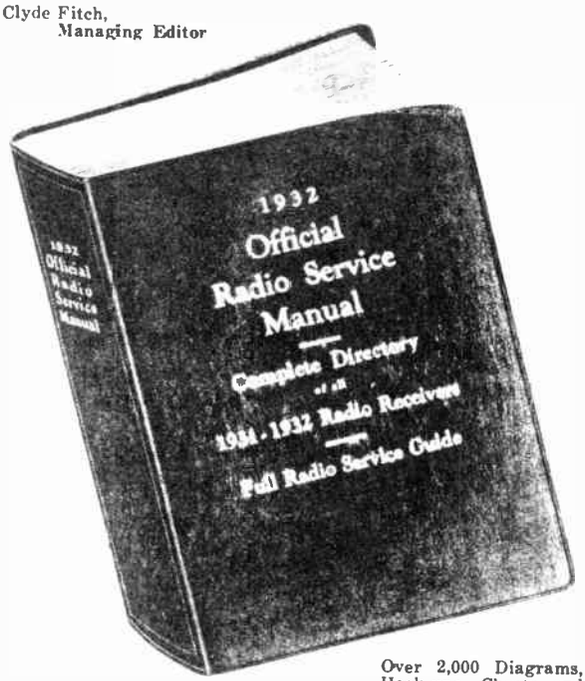

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A step-by-step analysis of a typical radio receiver, which has all the features and all possible combinations of modern radio practice; all this has been included in a single design for the instruction of the service technician. This chapter contains a great many pages, fully illustrated by many diagrams to make every point plain. It is the most valuable contribution to the radio service field that has been made, and nothing like it has ever appeared in print.

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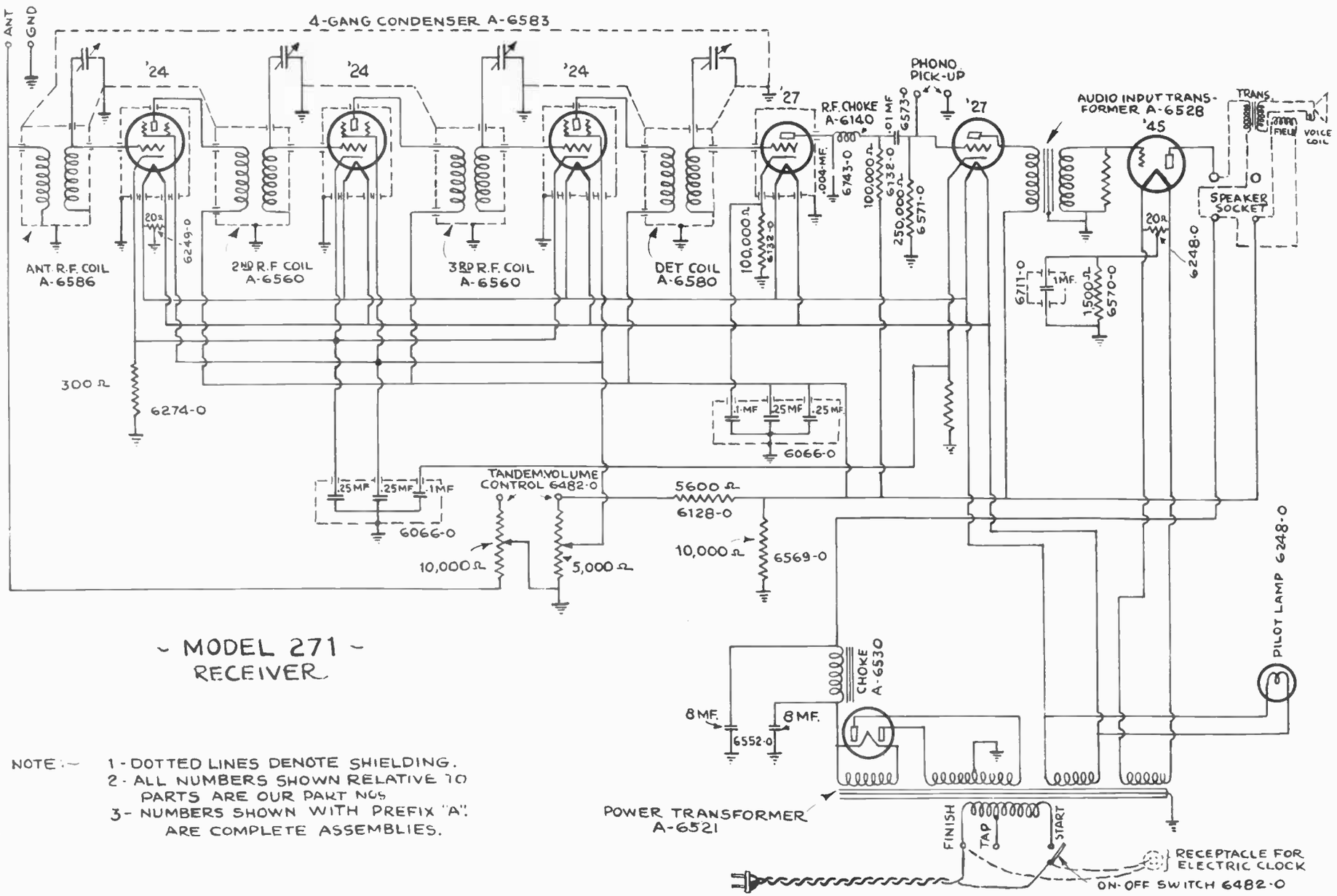

ELECTRICAL RESEARCH LABORATORIES

~ MODEL 271 ~ RECEIVER

NOTE:— 1 - DOTTED LINES DENOTE SHIELDING.
2 - ALL NUMBERS SHOWN RELATIVE TO PARTS ARE OUR PART NOS
3 - NUMBERS SHOWN WITH PREFIX "A" ARE COMPLETE ASSEMBLIES.

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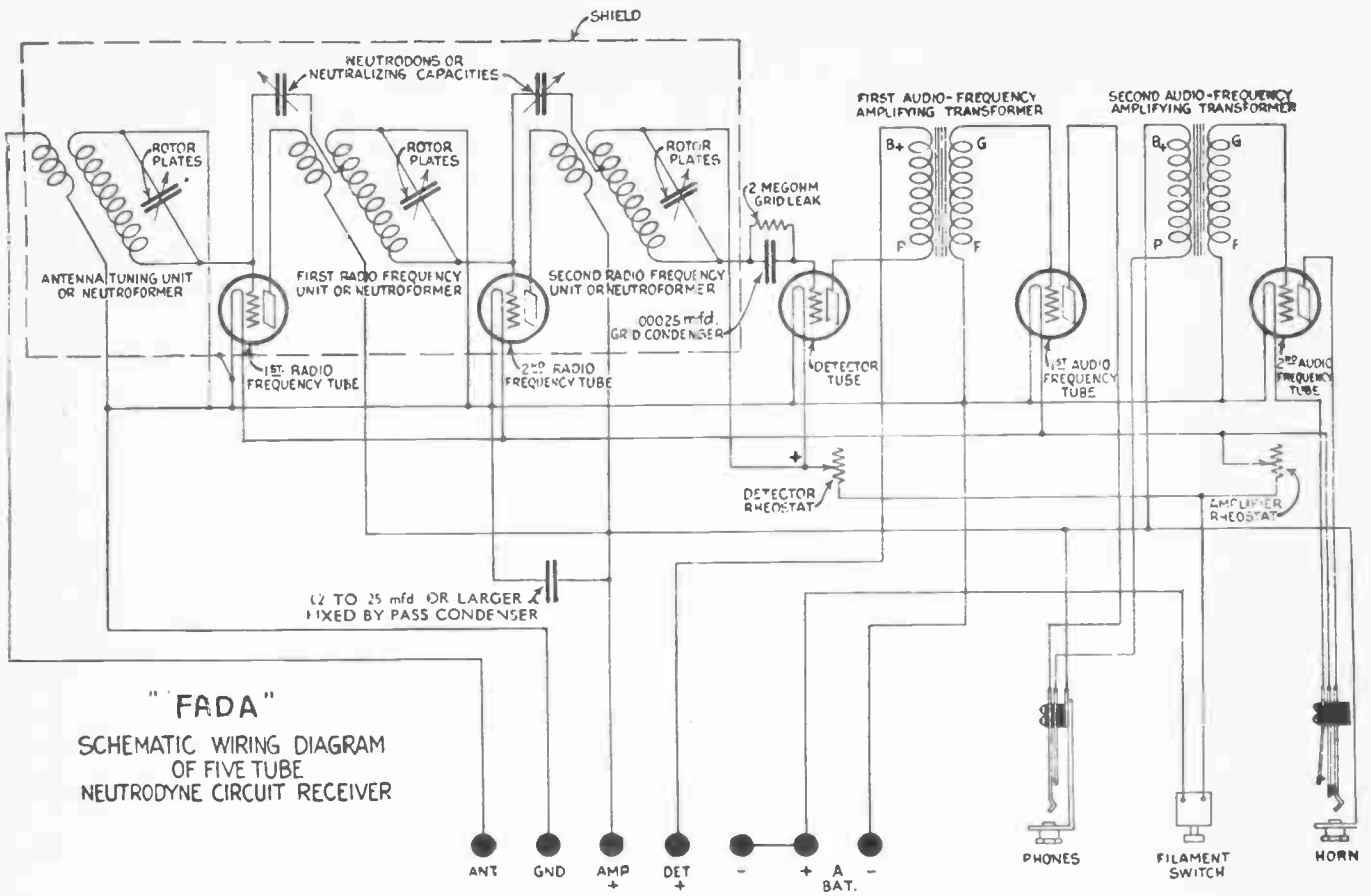
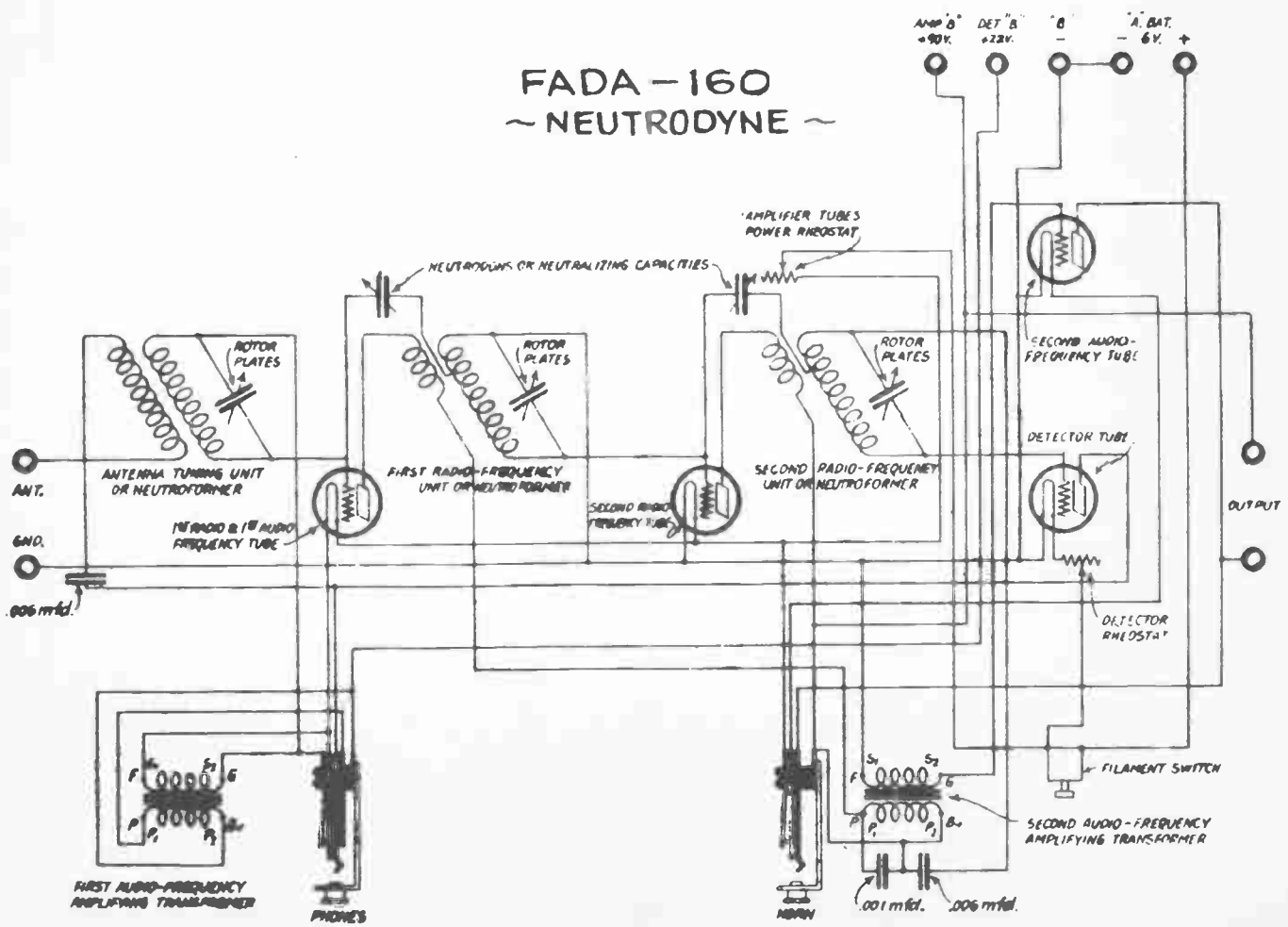


"FADA"
SCHEMATIC WIRING DIAGRAM
OF FIVE TUBE
NEUTRODYNE CIRCUIT RECEIVER

FADA-160
~NEUTRODYNE~



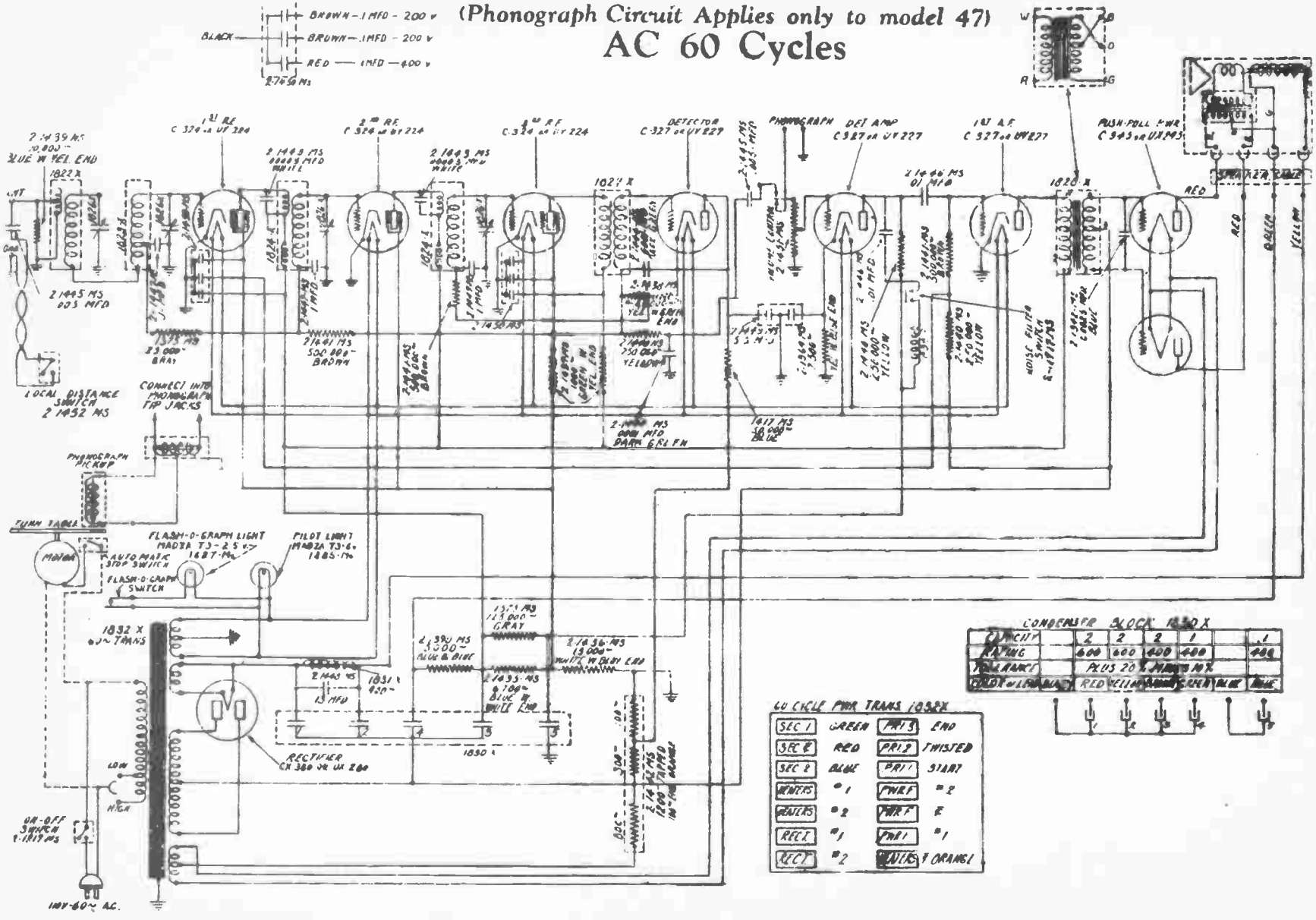
This circuit makes use of a two element detector working out of an untuned coupling transformer in the third screen grid amplifier stage.

KA-60 CHASSIS

Fada Models 42-44-46-41-47

(Phonograph Circuit Applies only to model 47)

AC 60 Cycles



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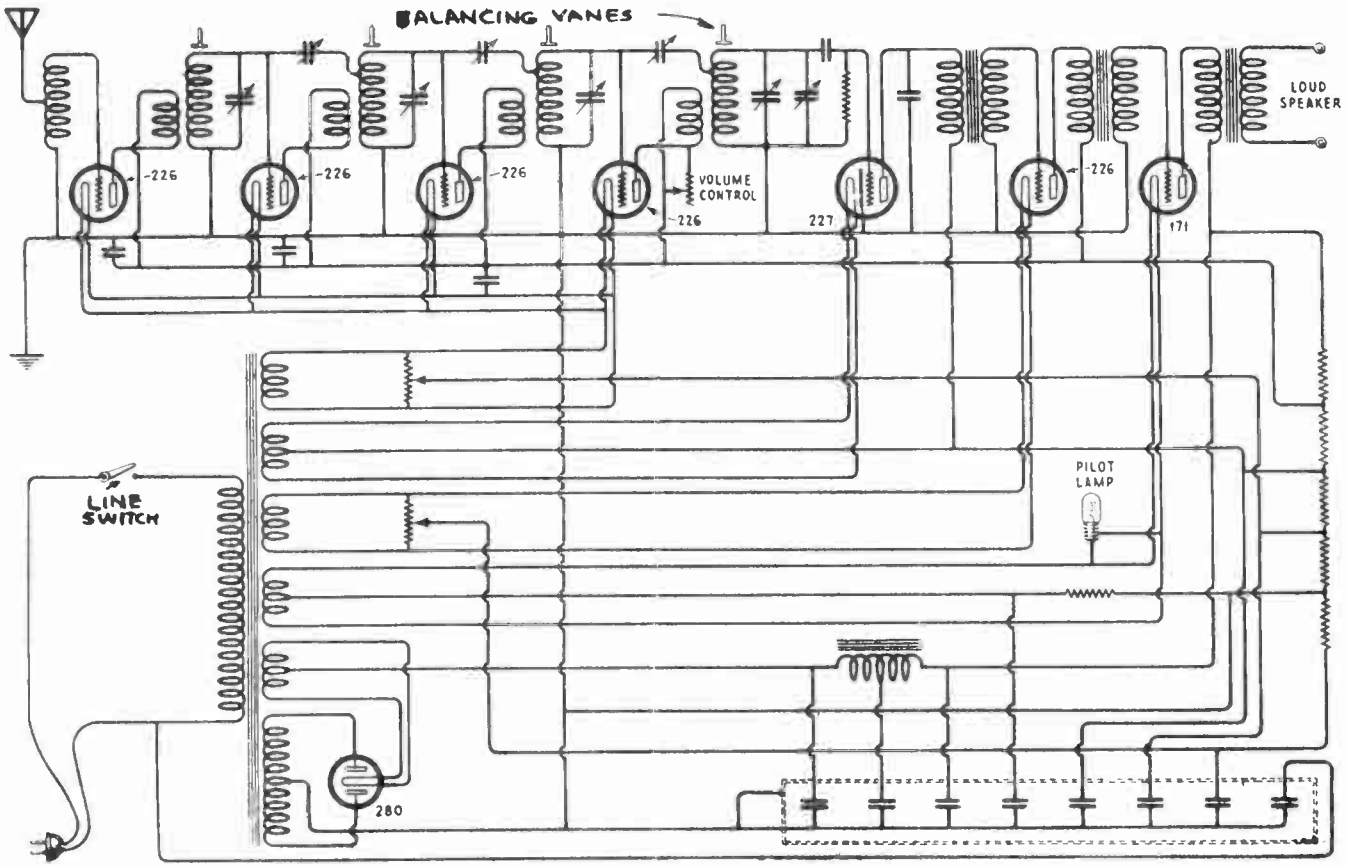
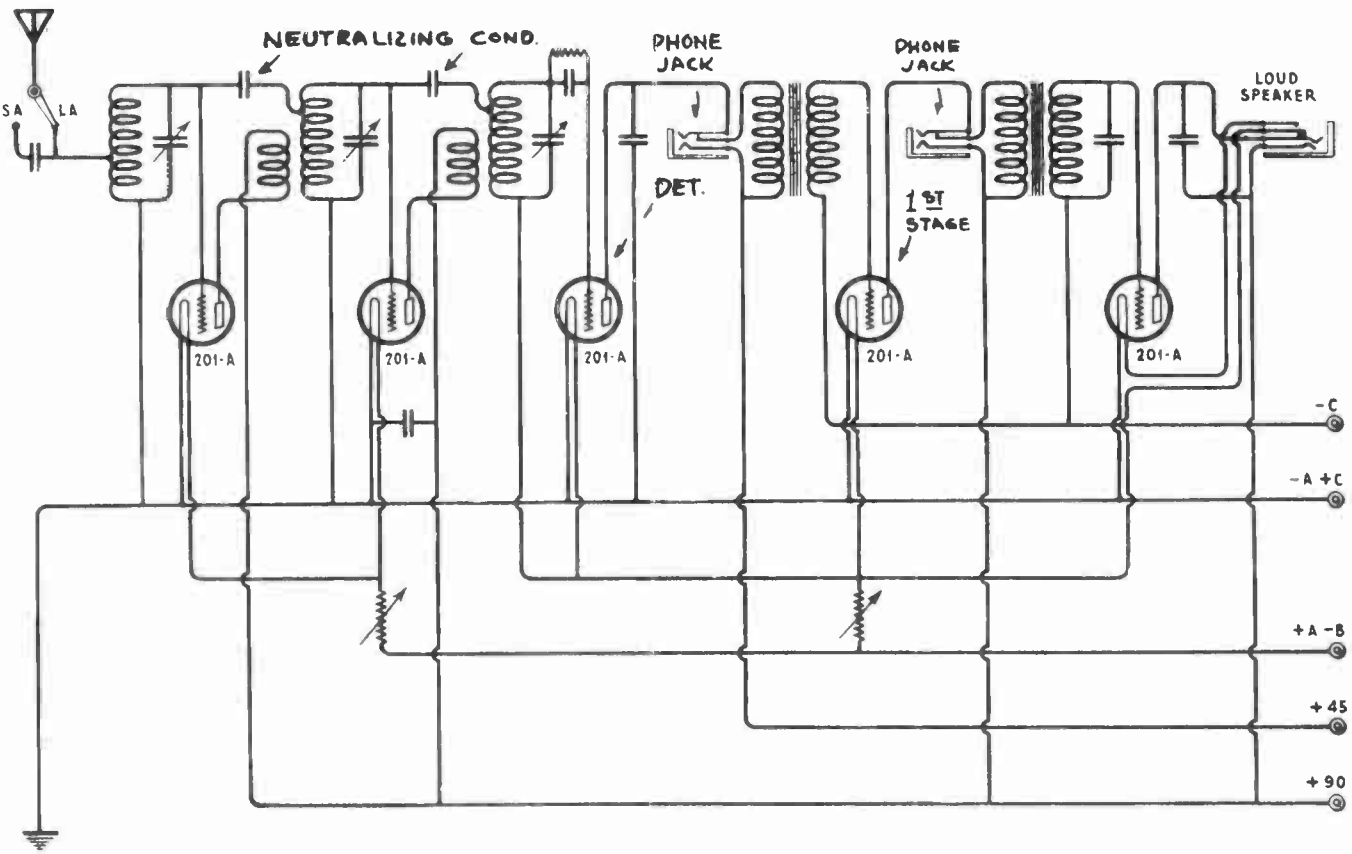


MODEL NR-5



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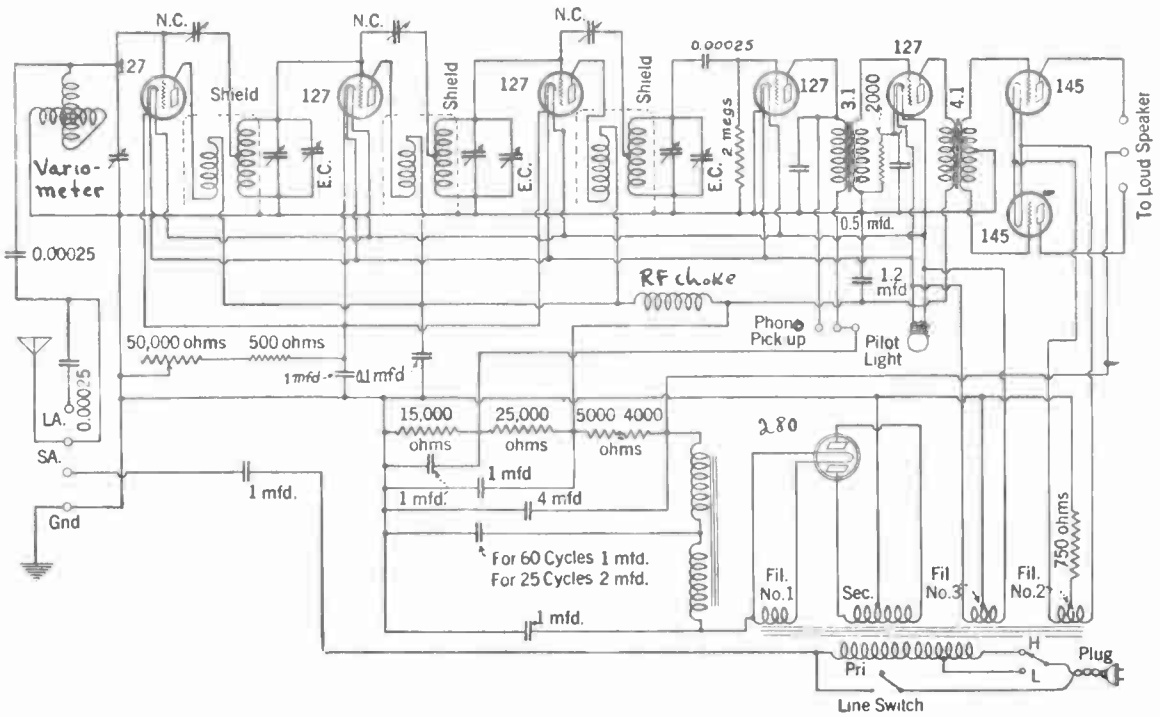
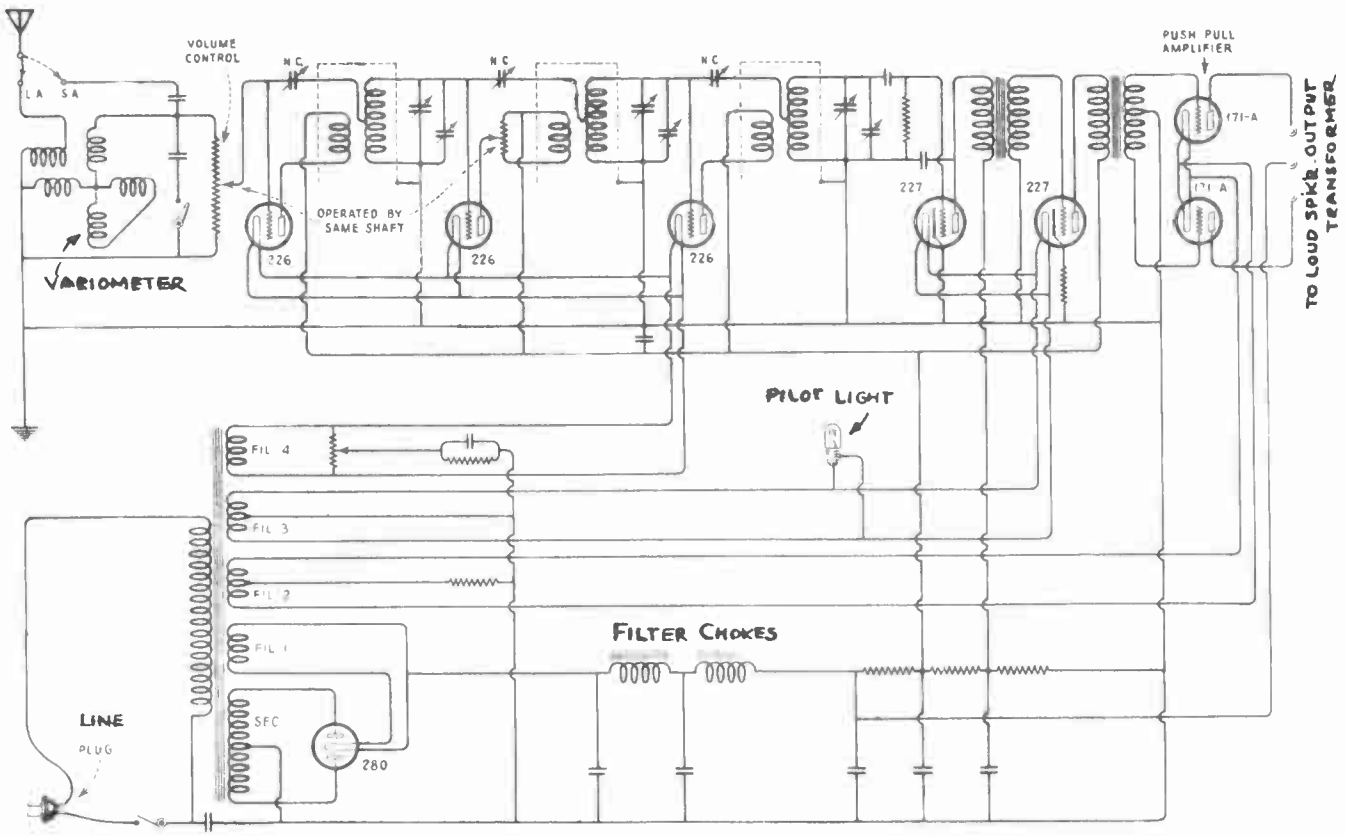
MODEL NR-78 A.C.



MODEL NR-55 A.C.



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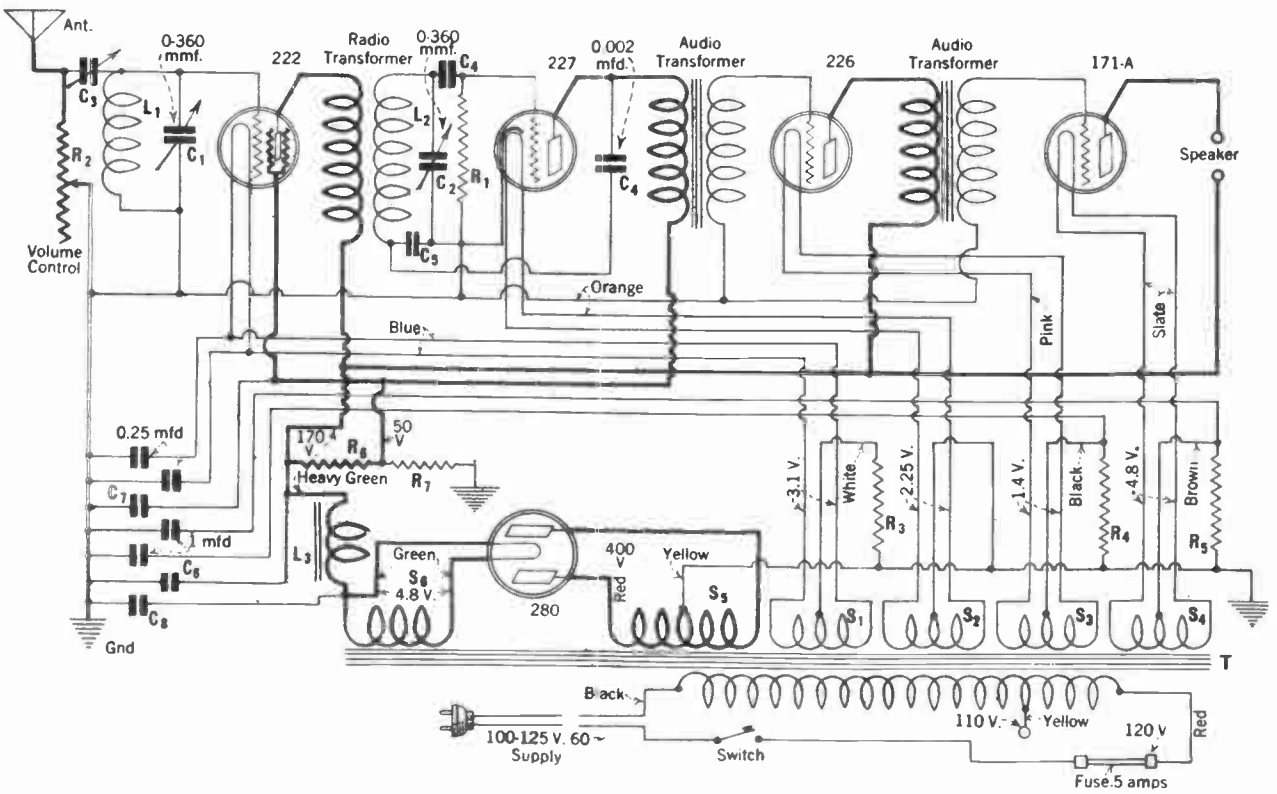
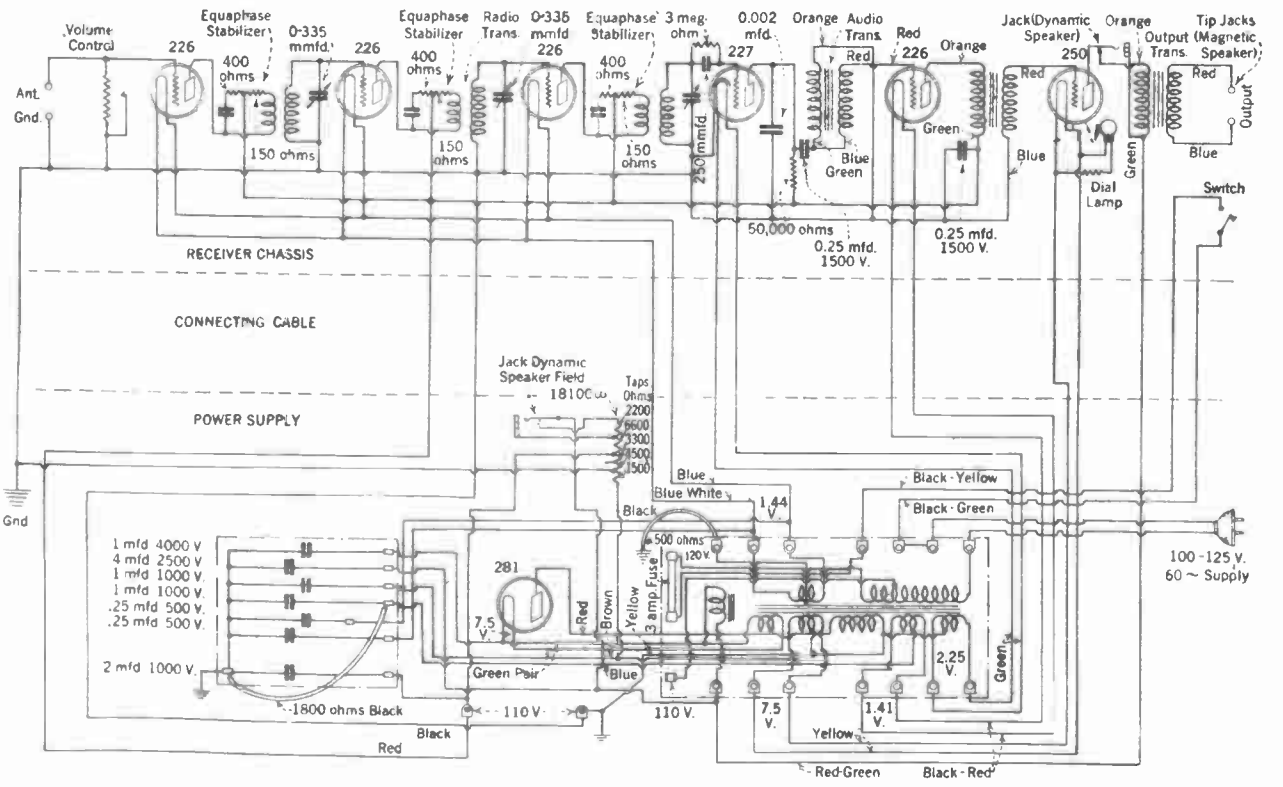
MODEL "Q"



MODEL 2N-12



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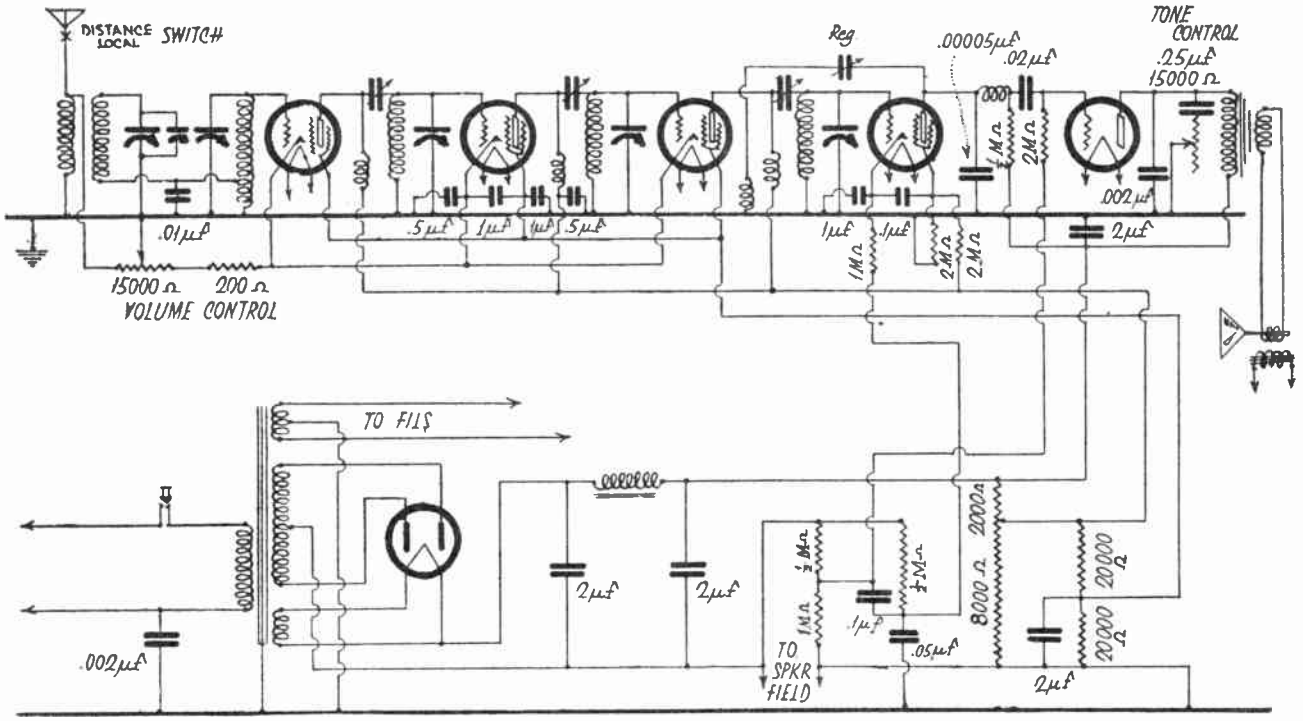
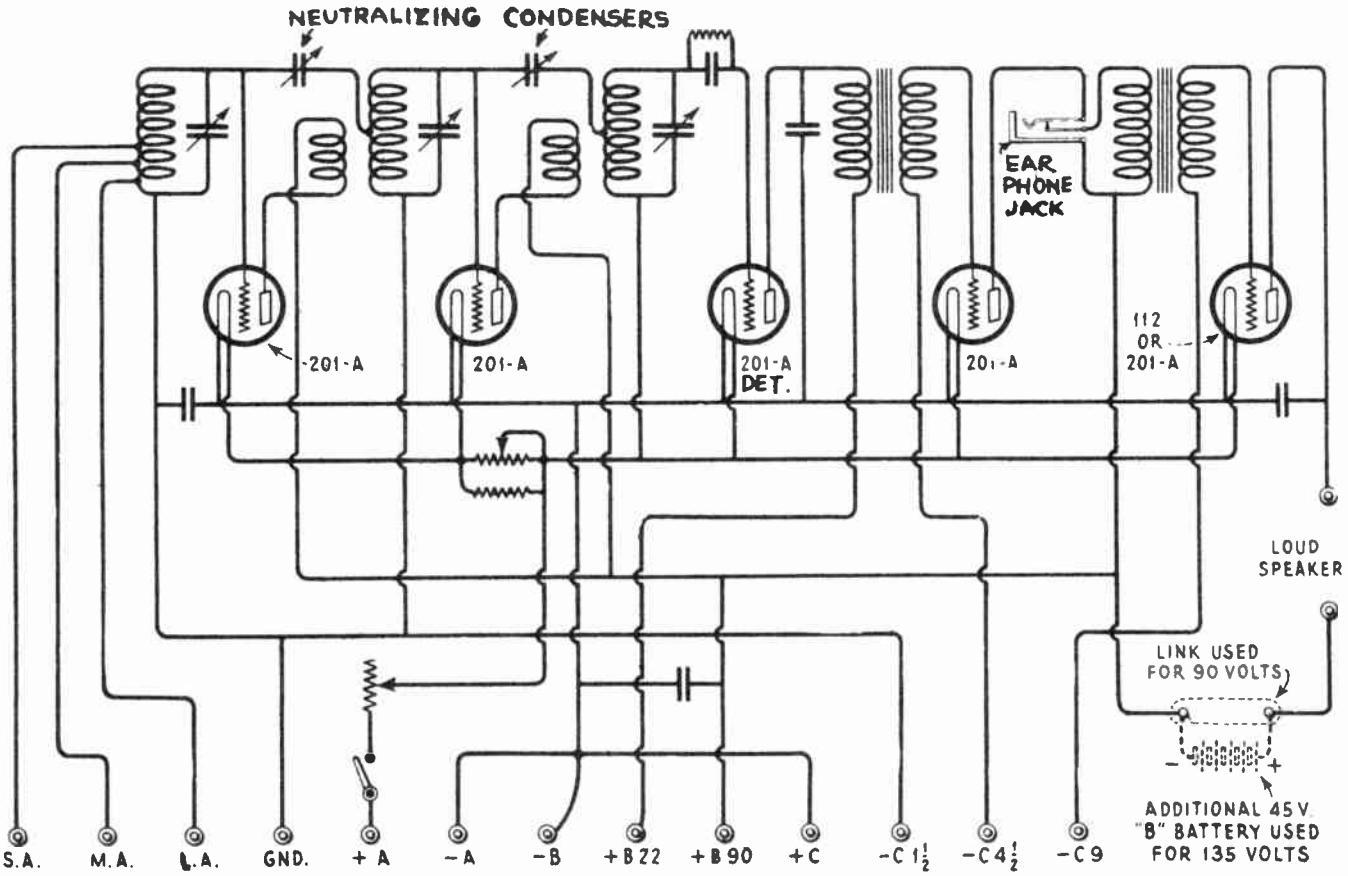


MODELS 105 AND 106



GILFILLAN GN6

Radio Service Data Sheet

GREBE SUPER-SYNCHROPHASE A.C. RECEIVER MODEL SK-4

This A.C. screen-grid receiver, a product of A. H. Grebe and Co., Richmond Hill, N. Y., incorporates a band-selector input to the first R.F.; the resistor bypass-condenser type of filter in control-grid, screen-grid and plate leads; a power detector; push-pull '45's; and an auto-transformer (Phono. T., in the diagram, with common tap C, low-impedance pickup tap L, and high-impedance pickup tap H) for phonograph pickup connection.

It is important that the correct line ballast be used at R21, in accordance with the following line-voltage ranges and ballast model numbers: 95-110 V., No. 6310; 105-125 V., No. 6412; 115-138 V., No. 6420; 213-252 V., No. 5932 (used in special 230-volt, 60-cycle sets); 107-129 V., No. 2404 (in 25-cycle sets.)

To remove chassis: Take off the knobs of the volume control R13 and local-distance switch SW1; remove the five screws holding the panel escutcheon; loosen lock-nut holding SW3 to escutcheon, and then remove knurled ring on front of this plate; loosen hook-bolts holding R.F. chassis to console; disconnect cable at terminal plate, and lift out chassis.

Following are the constants of the units comprising this set: R1, R2, R6, R8, R10, 20,000 ohms; R3, R7, R11, 1,000 ohms; R4, R14, 7 ohms; R5, 152 ohms; R9, R22, ¼-meg.; R12, 1/10-meg.; R13, 2,800 ohms; R15, 677 ohms; R16, 2,200 ohms; R17, 62 ohms; R18, 7,000 ohms; R19, 10,000 ohms; R20, 1,500 ohms; dynamic reproducer field coil, 650 ohms.

The condensers in this receiver have the following capacities: C1, C2, C3, C4, C5, C7, 350 mmf.; C6, C11, C12, C13, C14, C15, C16, C17, C18, C19, C25, 0.1-mf.; C8, C9, C10, 7 mmf.; C20, .002-mf., C21, 1.0 mf., C22, 1.5 mf.; C23, 1.5 mf., C24, 2 mf.

Coupling coil L6 has 6 turns of bare No. 26 wire wound on a tube about 1⅛ in. in diameter, the turns being spaced about ⅛-in.

Hum is occasionally traced to reversed field coil connections to the reproducer. Other sources of audio distortion are included in this listing: loose fiber wedges between the transformer windings and core; power transformer cover not tight; tube shields loose; loose chassis hooks or bolts; console doors not fitting well; poor contact at caps of control-grids; defective cone paper.

Circuit oscillation may be a matter of tubes. Then again, the ground may not be sufficiently good; or even an accumulation of dirt under the contact brakes on the condenser rotor shaft may cause circuit oscillation (usually between 550 and 700 kc.). Merely clean the contact surfaces—do not use oil.

Compensating condensers of about 30 mmf. capacity shunt each of the tuning condensers although they are not shown in the diagram. The leads from these units to the coils must be correctly placed with regard to the chassis and each other, in order to prevent circuit oscillation.

Circuit oscillation not remedied by any of these corrective measures may respond to adjustment of the three adjustable "gain screws" protruding through the base of the R.F. chassis; these screws control C8, C9 and C10. This adjustment will not be necessary except in rare instances. At the factory the correct setting is obtained by turning down the screws tightly and then backing them all out, ¾-turn each. If this position does not stop oscillation, the screws may be turned out an additional 1/16 or ⅛ of a turn. (More than ⅛-turn will change the resonance of the tuned circuits and necessitate re-calibration of the kilocycle scale. The over-all sensitivity of the receiver is also reduced by turning out the gain screws—which are most effective for correcting circuit oscillation in the frequency range from 1200 to 1500 kc.)

Checking the alignment of the gang condenser is accomplished by watching for maximum reading on an 0-5 or 0-10 ma. milliammeter (or, an 0-15, or less, voltmeter connected as a milliammeter) in the plate circuit of detector V4, when an audio-modulated R.F. oscillator calibrated at 1400, 800, and 550 kc. (used in this order) is the circuit driver. The circuits of L1, L2, L3, L4, may be checked by inserting a small shorted coil (on the end of an insulating bar) into these inductances; correct adjustment being shown by a reduced reading on milliammeter (increased reading denotes circuit out of resonance; and reducing the inductance of the coil, through use of the shorted ring, has brought the circuit into resonance with the oscillator). Since L5 is covered by a shield can, which, if removed, would throw the circuit out of balance the shorted-coil test cannot be applied here; hence it is necessary to use the equivalent plan of carefully bending outward, slightly, the end plate of condenser C5, and noting the meter reading (which should remain fixed or decrease).

This procedure completes the check on the high-frequency side of resonance; now we will check the low side. Using an insulated rod, gently press inward the end plates of C1, C2, C3, C4 and C5. This increase of capacity should result in the meter's indicating no change, or else a little reduction in the scale reading; an increase indicates lack of resonance on the low side of the oscillator frequency. The antenna condenser C7, is not in a sharp-tuning circuit and will not require balancing; incidentally, this condenser, mounted on the extreme right of the condenser gang, is insulated from the remaining condensers.

Before correcting an off-resonance condition, make sure that the three "gain" control studs are set as previously mentioned; then, if necessary, adjust (at 1400 kc. only) the aligning condensers on the rear of the gang-condenser frame in this order: C1, C2, C3, C4, C5.

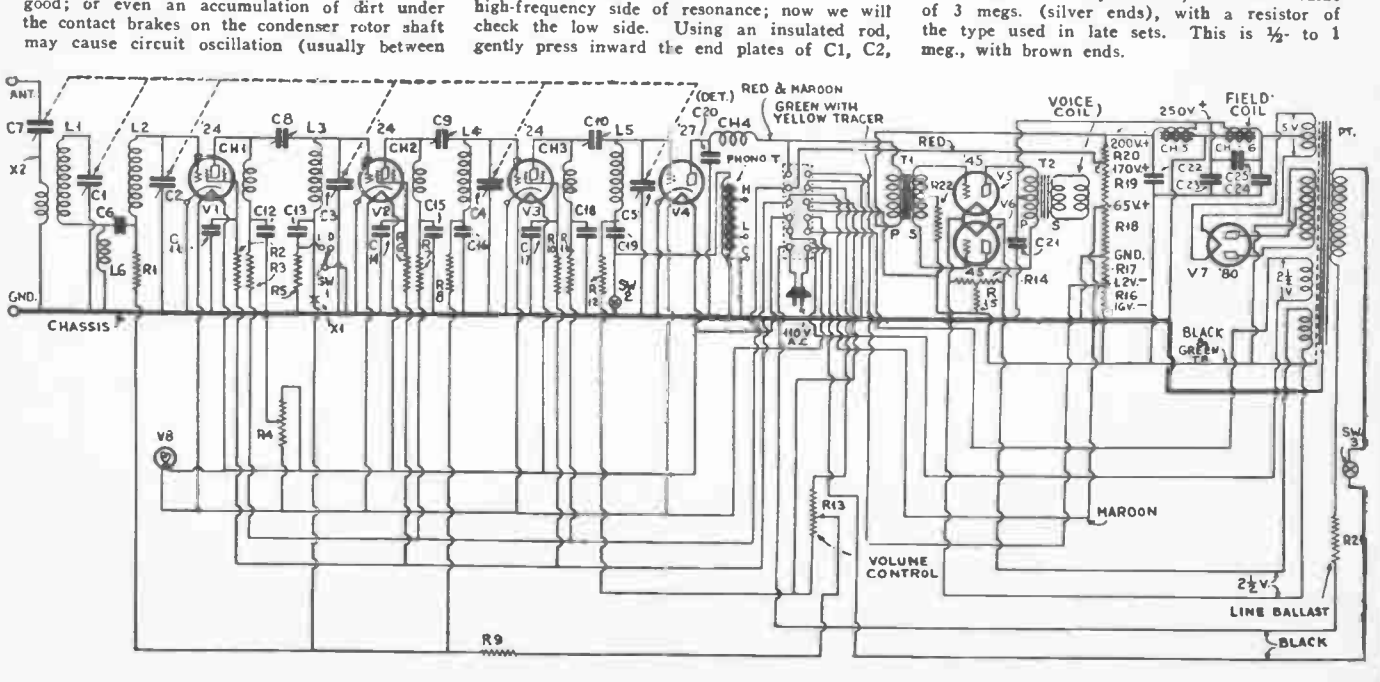
If an alignment test at 800 kc. indicates the necessity for aligning one or more of the circuits, this may be done by *carefully* bending the rotor end plate at the point where it meshes with the stator, (the aligning condensers being used only at 1400 kc.). Repeat this cycle of operations at 550 kc.

Modulation hum in earlier sets (a strong 60- or 120-cycle hum heard only when set is tuned to one of several local, powerful stations) may be corrected by inserting a ¼-meg. resistor in the lead to the arm of the volume control, and shorting the control-grid filter resistor of V2. As this change has been made in later production of the Super-Synchrophase, the circuit shown below incorporates these modifications; R9 is the ¼-meg. resistor, and X1 denotes the former position of the filter resistor.

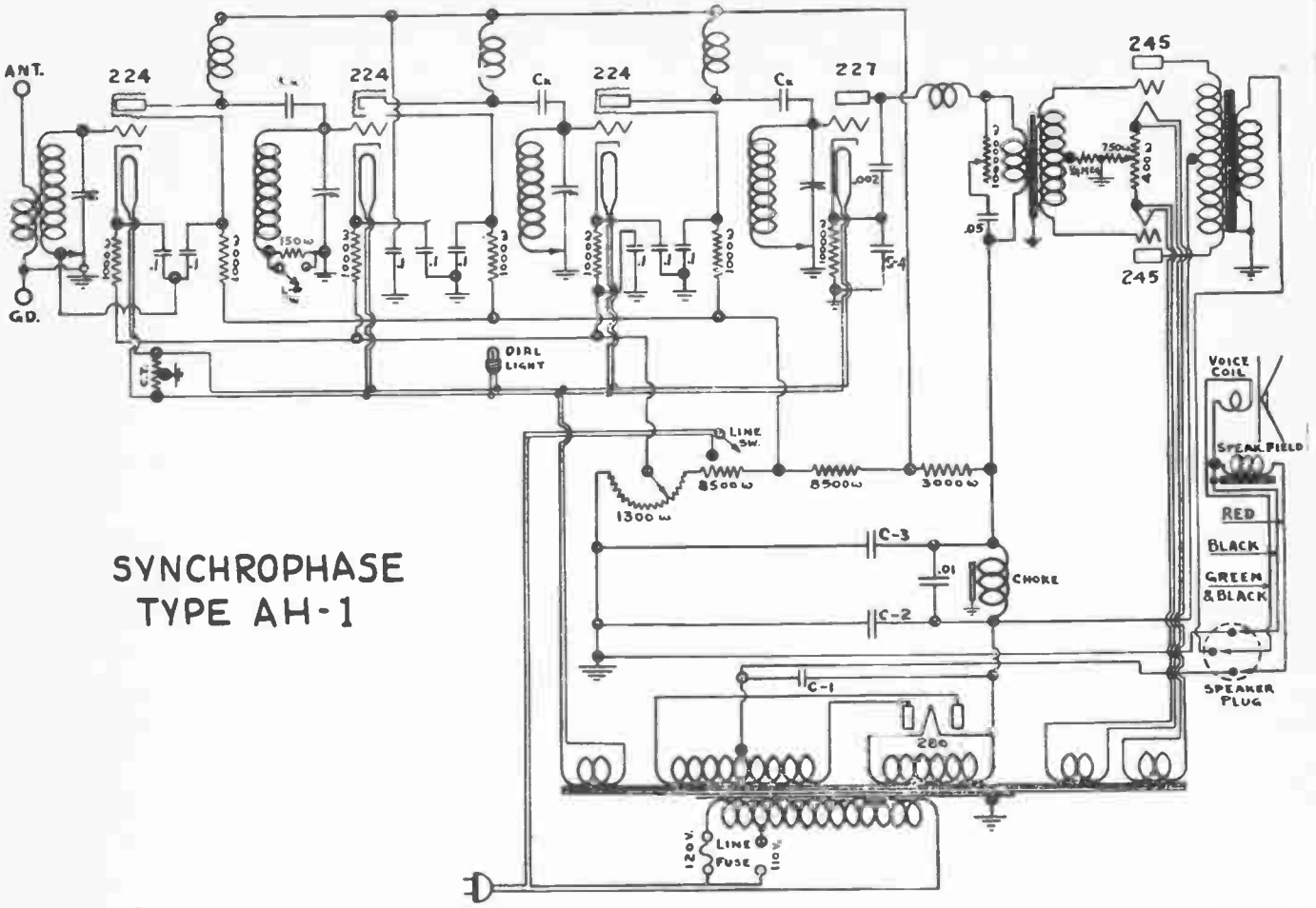
If strong local stations which are separated 30 kc. interfere with each other, the trouble is probably due to pickup via the light lines.

Weak signal, or no signal, may be due to the screen-grid tubes; and it may be handy for the Service Man to know that a convenient test may be applied. The screen-grid caps are removed and the control-grid is touched with a moistened finger; when a hum will result if the tube is good.

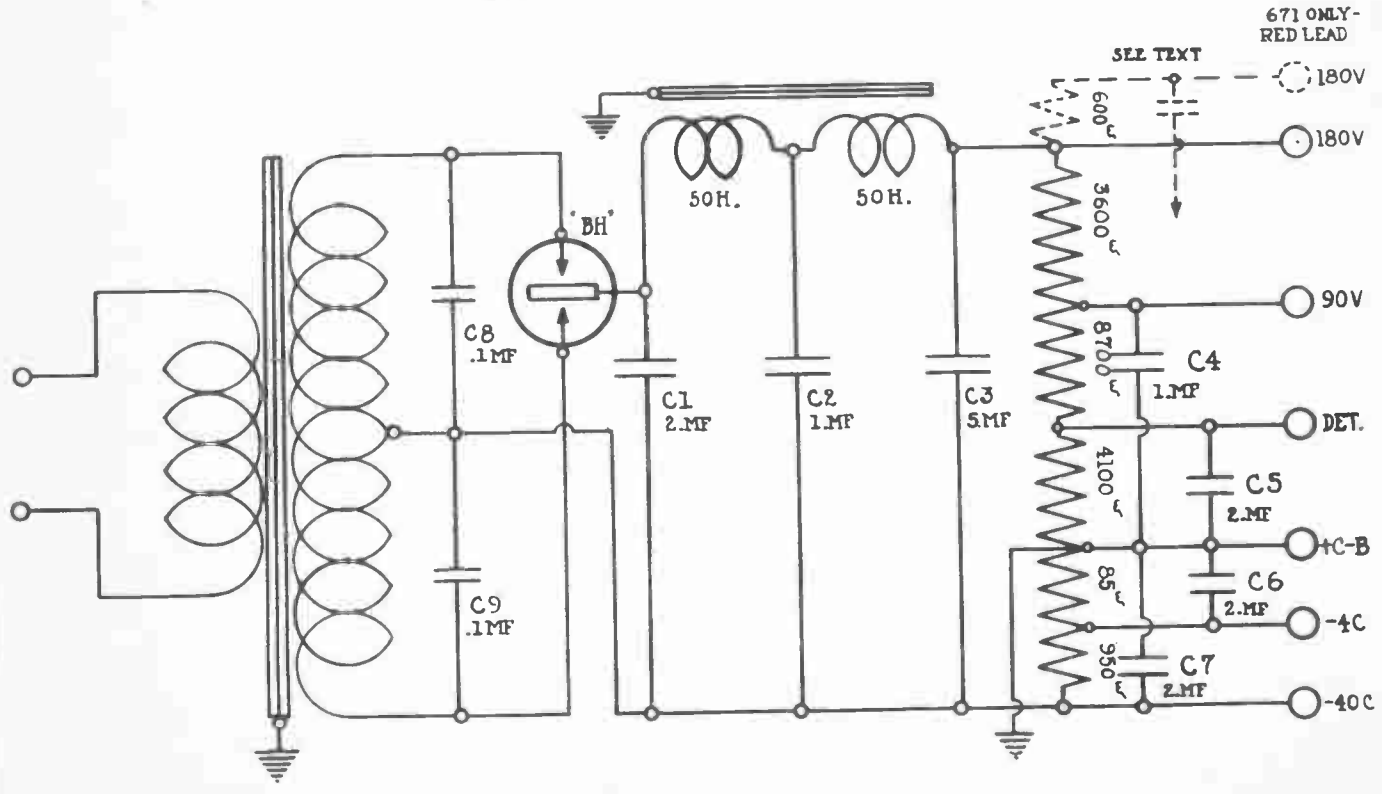
Fading and intermittent reception may be due to defective tubes, grid-to-cathode leakage, or intermittent grounds inside bypass or filter condensers. In the second instance, the fault will not develop until the tubes have been heated for some time; advancing the volume control then brings the signal back, but it fades again. The remedy is to replace R12, if it has a value of 3 megs. (silver ends), with a resistor of the type used in late sets. This is ½- to 1 meg., with brown ends.



A. H. GREBE & CO.



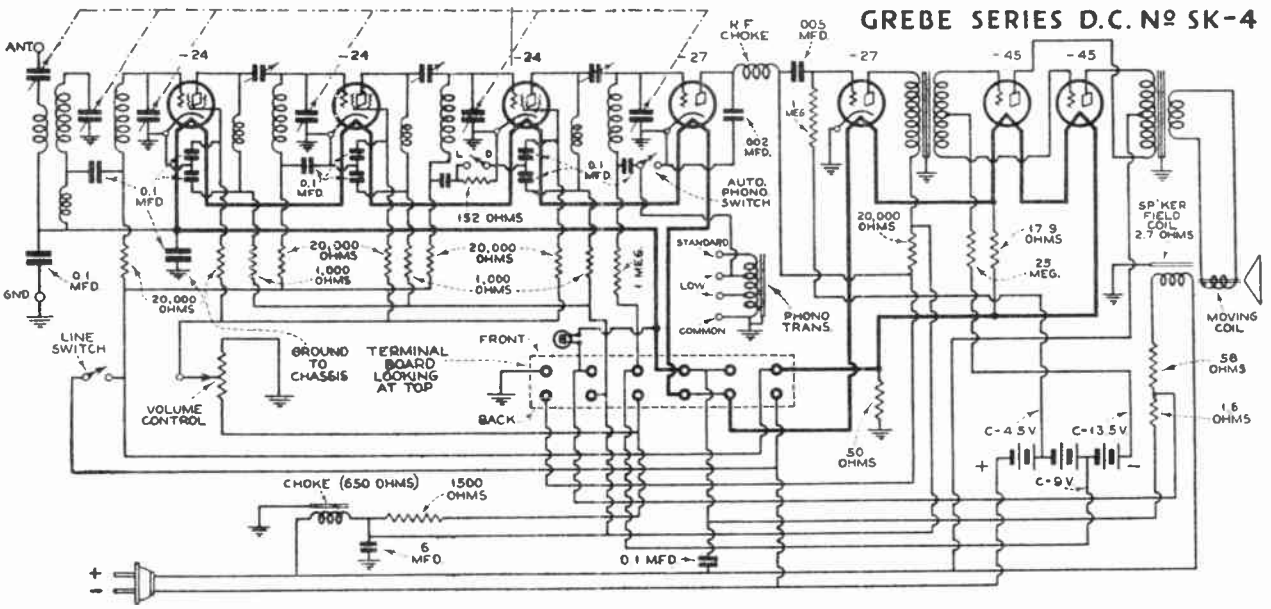
SYNCHROPHASE TYPE AH-1



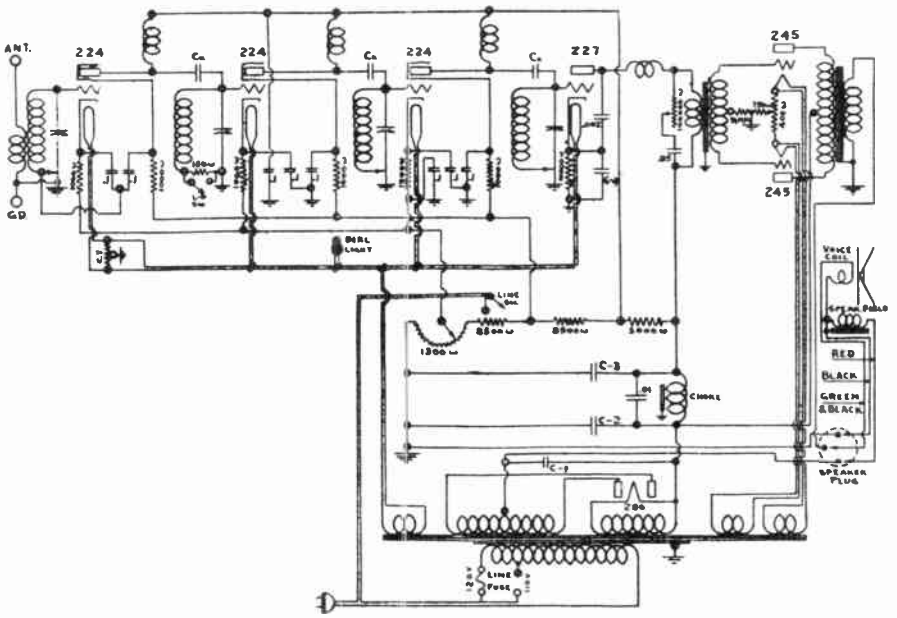
B & C SOCKET POWER
TYPE 671-B

A.H. GREBE & CO.

GREBE SERIES D.C. Nº SK-4



MODEL AH-1



Line Voltage 115—Volume Control Full On

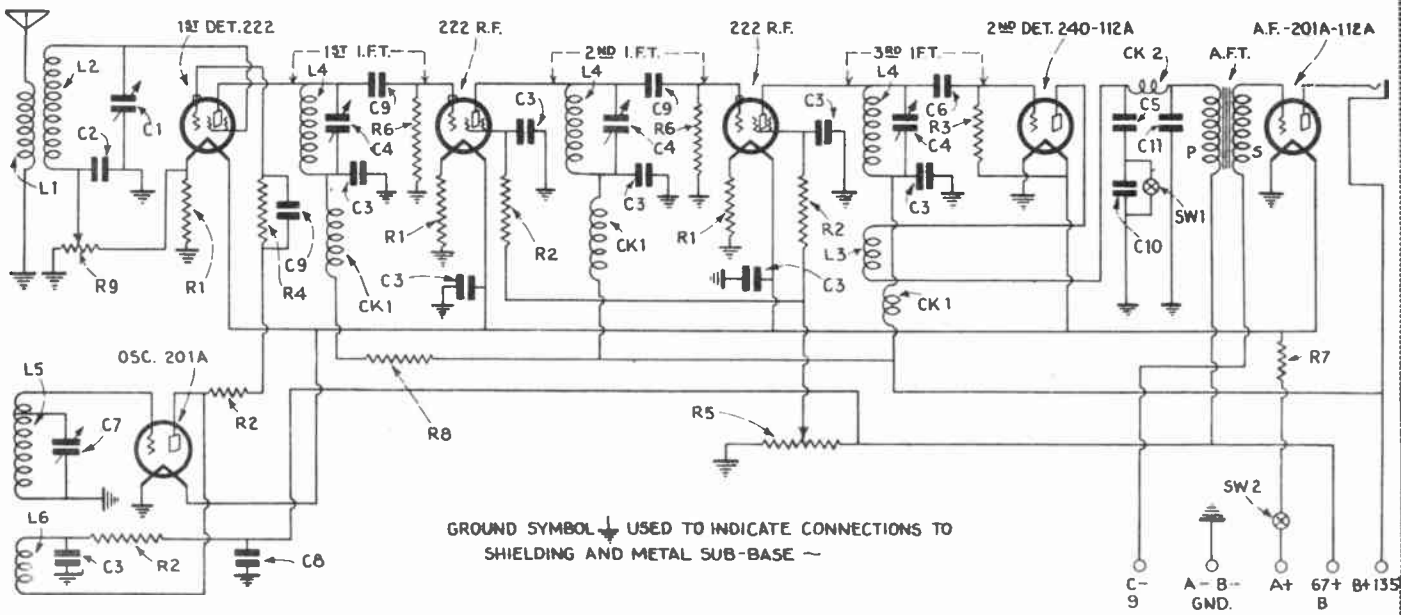
TUBE NO. IN ORDER TESTED	TYPE OF TUBE	POSITION OF TUBE IN SET	METER READINGS WITH JEWELL TEST PLUG IN SOCKET OF SET — OPERATING VOLTAGES: FILAMENT OR HEATER	PLATE OR ANODE	CONTROL GRID — SPACE	NORMAL GRID — SCREEN	CATHODE TO HEATER	MILLIAMPERES: SCREEN GD. L.H. '90 PLATE	PLATE R.H. '90 PLATE	TUBE TEST	PLATE CURRENT CHANGE
1	224	1 R.F.	2.4	160	2.5	80	-	-	2.5		
2	224	2 R.F.	2.4	160	2.5	80	-	-	2.5		
3	224	3 R.F.	2.4	160	2.5	80	-	-	2.5		
4	227	Det.	2.4	200	-	80	-	-	2.0		
5	245	PP-AF	2.4	250	-	14	-	-	50		
6	245	PP-AF	2.4	250	-	14	-	-	50		
7	280	Rect.	4.8	-	-	-	-	50	50		
8											
9											
10											

Volume Control Minimum

TUBE NO IN ORDER TESTED	TYPE OF TUBE	POSITION OF TUBE IN SET	METER READINGS WITH JEWELL TEST PLUG IN SOCKET OF SET — OPERATING VOLTAGES: FILAMENT OR HEATER	PLATE OR ANODE	CONTROL GRID — SPACE	NORMAL GRID — SCREEN	CATHODE TO HEATER	MILLIAMPERES: SCREEN GD. L.H. '90 PLATE	PLATE R.H. '90 PLATE	TUBE TEST	PLATE CURRENT CHANGE
1	224	1 R.F.	2.4	190	15	90	-	-	2.5		
2	224	2 R.F.	2.4	190	15	90	-	-	2.5		
3	224	3 R.F.	2.4	190	15	90	-	-	2.5		
4	227	Det.	2.4	225	-	21	-	-	2.0		
5	245	PP-AF	2.4	250	-	14	-	-	50		
6	245	PP-AF	2.4	250	-	14	-	-	50		
7	280	Rect.	4.8	-	-	-	-	50	50		
8											
9											
10											

HATRY AND YOUNG, INC.

"H-Y" SHORT-WAVE 6



List of Constants

L1—Detector coil primary or antenna winding;

L2—Detector coil grid winding;

L3—Second-detector tickler. 8 turns of No. 30 D.S.C. on top of L4 at "B+" end;

L4—I.F.T. winding, 140 turns No. 30 D.S.C. on 1-inch (outside diameter) tubing. Three required;

L5—Oscillator-coil grid winding;

L6—Oscillator coil plate winding;

CK1—R.F. chokes, Hammarlund shielded type. In manufactured I.F. transformers for the "HY-7," CK1, L4 (and L3 in one), and C3 are within the shielding can along with C9 or C6. Thus live circuits are fully shielded;

CK2—Hammarlund shielded R.F. choke. One or three required;

A.F.T.—National A-100 audio transformer.

C1—50-mmf. Hammarlund or Pilot midget condenser for first-detector tuning; two required;

C2—.01-mf. Sangamo fixed condenser, by-pass for R9;

C3—0.25 mf. Sprague midget fixed condenser, six required;

C4—100-mmf. mica variable condensers (Hammarlund "EC80" equalizers), three required;

C5—.001-mf. Sangamo fixed condenser, two required if second detector is '40. (C5 becomes .0002-mf. if second detector is '12A);

C6—200-mmf. Sangamo fixed condenser. Grid condenser for detector;

C7—Same as C1, but tuning condenser for oscillator;

C8—1-mf. Tobe fixed condenser;

C9—500 mmf. Sangamo fixed condenser, three required unless second detector is '12A (see C10);

C10—500-mmf. for '40 second detector, or 200-mmf. for '12A;

C11—.001 mf. Sangamo fixed condenser;

R1—15-ohm Yaxley filament resistor, three required;

R2—2000- or 3000-ohm Electrad flexible resistors. Used for R.F. choking or filtering effect, 4 required; if substituted in place of CK1s in home-made job, 7 would be required;

R3—Second-detector grid-leak, Electrad metallic type. 7 megs. for the '12A as second detector, or 4 megs. for the '40;

R4—100,000-ohm Electrad metallic fixed resistor, leak type. Reduces D.C. voltage placed on space-charge grid;

R5—50,000- or 100,000-ohm Electrad "Royalty" variable resistor, potentiometer type for volume control;

R6—2-megohm Electrad metallic leak, two required;

R7—Resistance to set filament voltage on tubes. Yaxley 4L or any 2-ohm rheostat or resistor adjustable to approximately 0.9 ohm;

R8—10,000-ohm Electrad

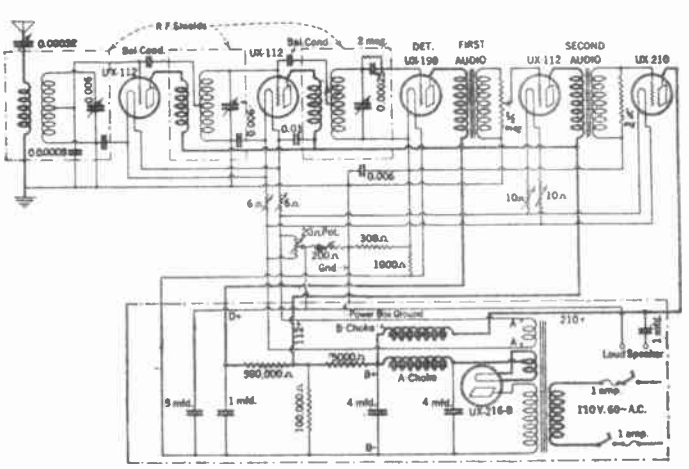
R9—50,000-ohm Electrad

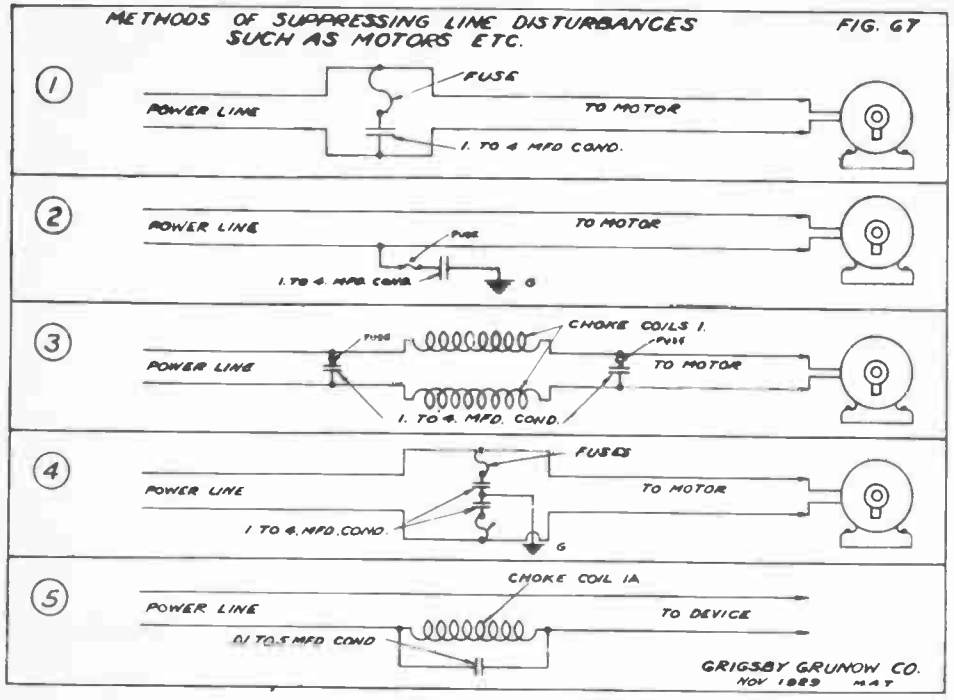
SW1—Battery switch,

SW2—Same as SW1

GAROD RADIO CO.

MODEL EA





Methods of Suppressing Line Disturbances Such as Motors, Etc.

This illustration shows you various methods of eliminating disturbances caused by motors, generators, and other electrical devices.

FIGURE No. 1 Shows power line connected to the motor. Across this 110 volt A C line we place a 1. to 4. MFD condenser. In series with this condenser, a fuse of about 3 amperes must be used.

FIGURE No. 2 Shows you how a 1. to 4. MFD condenser is connected to one lead of the line and grounded.

FIGURE No. 3 Shows the application of two 1. to 4. MFD condensers across the line and also the application of one choke coil in each line. Choke coils used in this installation are made by winding approximately 560 turns of No. 18 B & S gauge double cotton covered or enamel wire on to the fibre, bakelite, or treated wooden spool having a core diameter of ⅜" and outside diameter of 1½" and winding space of two inches wide. This type choke is for a load of 5 amperes or less.

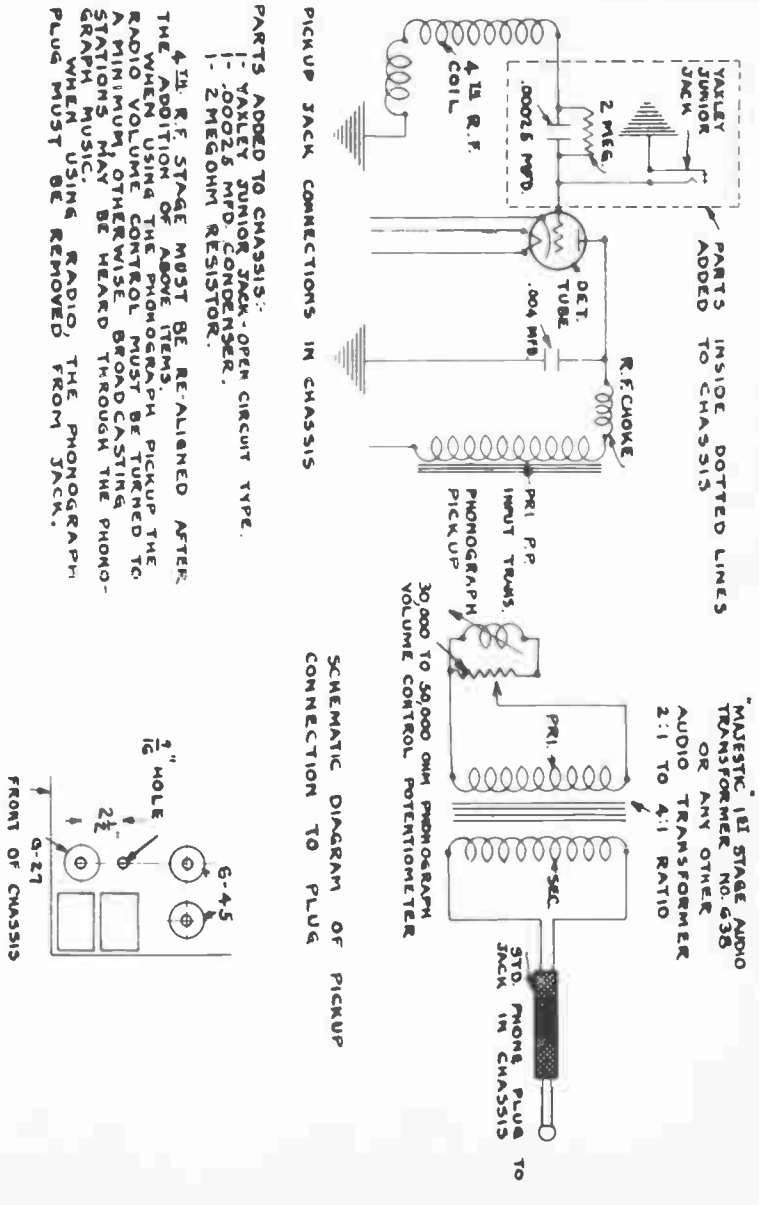
FIGURE No. 4 Shows method of connecting two 1. to 4. MFD condensers in series across the A C line. In series with these condensers you will note a fuse of 3 amperes, the connection between the two condensers should be grounded.

FIGURE No. 5 Shows method of connecting a choke coil and condenser in parallel, in one side of the line. The condenser in this case should be .1 to .5 MFD capacity. Choke coil is to be used made by winding 150 turns of No. 18 DCC magnet wire on a fibre or bakelite tube 3" in diameter and approximately 3" long. Only one layer of wire is wound on it.

The arrangement shown in Figure No. 5 can be used for eliminating the line disturbances of various electrical devices. This method has been found advisable where it has not been possible to clear interference in any other way. The idea is to tune the interference to a frequency which does not fall within the receiving band.

GRIGSBY-GRUNOW CO.

METHOD OF ADDING PHONOGRAPH JACK TO MODEL 90 CHASSIS



PARTS ADDED TO CHASSIS:
1- YAXLEY JUNIOR JACK-OPEN CIRCUIT TYPE.
1- .00025 MFD. CONDENSER.
1- 2 MEGOHM RESISTOR.

4TH. R.F. STAGE MUST BE RE-ALIGNED AFTER ADDITION OF ABOVE ITEMS.

WHEN USING THE PHONOGRAPH PICKUP THE RADIO VOLUME CONTROL MUST BE TURNED TO A MINIMUM, OTHERWISE BROADCASTING STATIONS MAY BE HEARD THROUGH THE PHONOGRAPH MUSIC.

WHEN USING RADIO, THE PHONOGRAPH PLUG MUST BE REMOVED FROM JACK.

PICKUP JACK CONNECTIONS IN CHASSIS

SCHEMATIC DIAGRAM OF PICKUP CONNECTION TO PLUG

Radio Service Data Sheet

MAJESTIC "MODELS 50," "51" AND "52" SUPERHETERODYNE RECEIVER

The "Model 50" chassis is used in the "Model 52" Majestic superheterodyne; removing the legs from the small cabinet, thus making a radio set of the mantel type, results in the "Model 51" receiver. This circuit is one of the latest developments of the Grigsby-Grunow Company, Chicago, Ill.

Referring to the diagram, the following parts values will apply: (C1, C2, C3, ganged variable condensers); (C5, C6, C8, C9, C10, C11, C12, C13, are built into the receiver assembly as circuit-aligning units); C4, C7, C17, C18, .001-mf.; C14, C15, C21, C22, C23, C28, 0.15-mf.; C16, C19, C24, 1.0 mf.; C20, .04-mf.; C25, 3 mf., C26, 2 mf.; C27, .09-mf.

The resistors have the following ohmic values: R1, 10,000; R2, 100,000; R3, 12,500; R4, 500; R5, 35,000; R6, 25,000; R7, 800; R8, 60; R9, 2,680; R10, 4,170; R11, 4,030; R12, 645; R13, 116.

Filter choke Ch1 has a resistance of 330 ohms; the field coil is filter choke Ch2, 1,000 ohms. A 3.2-volt pilot light is used at V9. The volume control is a double unit; the ganged resistors R1, R12.

Lack of plate voltage on the second detector may be reported in some instances; probably due to an open resistor (R6).

Condenser C8 is the antenna compensator.

Operating current values are as follows: Filament potentials, V1, V2, V3, V4, V5, V6, V7, 2.35 volts; V8, 4.8 volts. Plate potentials, V1, V2, 180 volts; V3, 256 volts; V4, 225 volts; V5, 90 volts; V6, V7, 250 volts; V8, 358 volts. Plate currents, V1, V5, 3 ma.; V2, 0.8-ma.; V3, 4 ma.; V4, 0.5-ma.; V6, V7, 25 ma.; V8, 40 ma. Control-grid potentials, V1, V3, 3 volts; V2, 8 volts; V4, 20 volts; V6, V7, 37.5 volts (on analyzer, the grids may read about 1.75 volts; to get true reading, measure from filaments to ground). Screen-grid potentials, V1, V2, V3, 90 volts. (Cathode potentials, same as control-grids.)

Following are the correct (manufacturer's) code numbers for the Majestic tubes recommended for the receiver: V1, V2, V3, "G-24;" V4, "G-27;" V6, V7, "G-45;" V8, "G-80." V5 is a "427" de Forest tube.

Where the line potential exceeds 118 volts, it will be necessary to use a line-voltage regulator; there is available a special unit which is recommended in such instances. It is designed with three outlets marked "110," "120," and "130" volts, rating the corresponding inputs.

It is extremely important that an accurately-calibrated oscillator be used to supply the 175-kc. frequency required for aligning the receiver; and that the procedure be followed accurately.

To align the intermediate-frequency oscillator, connect the output of the I.F. oscillator to the grid of first detector V2. Tune the oscillator to a frequency of 175 kc., and align the plate circuit of V2, the grid and plate circuits of V3, and the grid circuit of V4 for maximum deflection of a milliammeter or thermogalvanometer connected (in place of the dynamic reproducer's voice-coil) across the output secondary terminals of the output transformer T2. This alignment should be done with great caution, inasmuch as it materially affects the entire selectivity of the receiver.

If the I.F. circuits are so far out of alignment that no signal can be heard, it may be necessary to put the oscillator output (which should be adjustable) on the grid of V3 and roughly align the second half of the I.F. stage, first; then proceed with the remainder of the steps indicated above. The four aligning condensers are located on the rear of the chassis about midway down the right-hand side; from left to right (facing the receiver from the rear) their order is: C10, C11, C12, C13.

The procedure to follow in aligning the R.F. circuits is given below. The locations of the small circuit-aligning condensers are as follows: C5 (aligning condenser balancing the minimum capacity of the oscillator tuning condenser C3 to the minimum capacities of the band-selector tuning condensers C1, C2-C9), is accessible from the bottom side of the chassis, and is located next to the end of the gang condenser on which the cable drive is mounted; C6 ("tracking" condenser, shaping the tuning graph of the oscillator to accurately match that of the hand-selector), is accessible from the rear side of the chassis through a hole in the R.F. base assembly, and just to the right of the power transformer; C8, the first antenna alignment condenser, is accessible from the back of the chassis, just slightly upward and to the right of the antenna and ground binding posts; C9, the second antenna or band-selector alignment condenser, is accessible from the bottom of the chassis and is located through the center hole of the chassis base.

Tune in a station at approximately 1,280 kc. and align the oscillator and antenna or band-selector condensers C5, C8, C9. Next, tune in a 600-kc. signal and adjust the tracking condenser C6, while slightly rocking the tuning condenser knob from side to side, until maximum signal strength is obtained, (as indicated on the output meter). The third step is to set the main tuning dial to exactly 1,500 kc. and tune in, by means of the oscillator aligning condenser C5, a 1,500-kc. signal. It now will be necessary to readjust condensers C8 and C9. At this point, the dial reading should be checked by tuning in a broadcast station with a known frequency higher than 1,000 kc.; and then the dial strip is to be slipped to the correct setting with respect to the index of the dial escutcheon. As a final check, test the receiver for sensitivity and selectivity; and, if necessary, repeat the operation until satisfactory results are obtained.

Note that in some cases maximum output may appear to fall at either the maximum or the minimum capacity setting of the oscillator tracking condenser C6. A simple check to determine whether this is actually the maximum output is as follows: after obtaining the best setting of C6, try a slight readjustment of C9. If this readjustment results in nothing more than slight improvement, the adjustment of C6 is satisfactory.

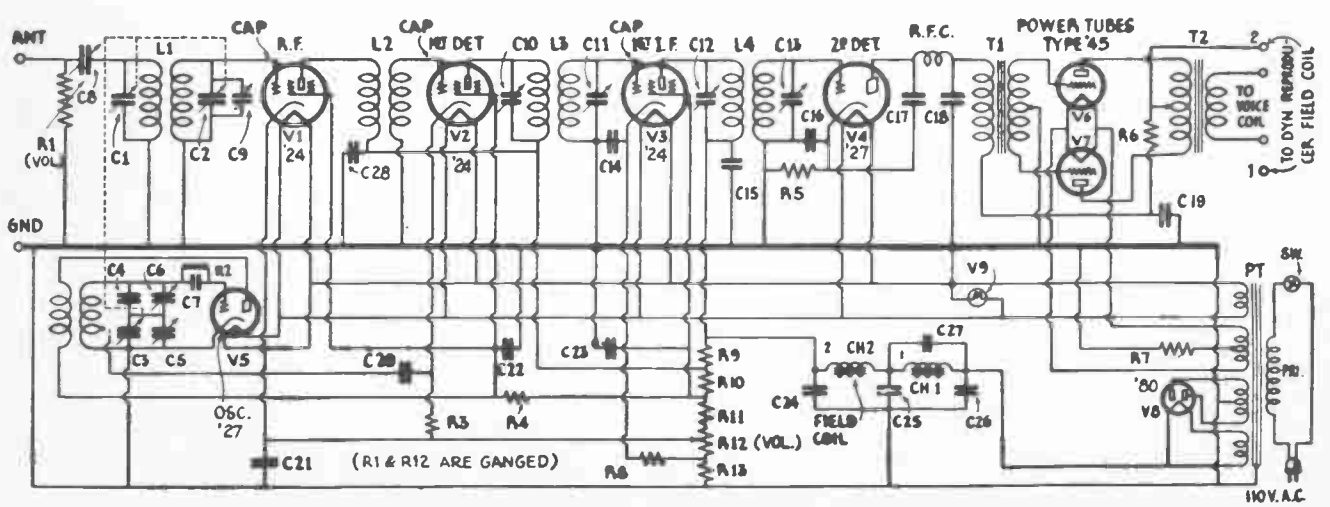
Resistor R6 is located at the right of the connecting terminals, inside the can above the power transformer; it is below and between the sockets of the power tubes.

Resistor R1 varies the signal input to the R.F. amplifier tube V1. The other half of the volume control (R12) controls the biasing voltage on the R.F. amplifier V1 and the first detector, V2.

Condenser C8 is adjustable through a hole in the rear of the chassis. When the installation of the receiver is complete, a station between 1,000 and 1,400 kc. should be tuned in, and the volume control adjusted to low volume. Then adjust C8 until maximum volume is obtained. Further adjustment of this condenser will not be necessary unless the length or position of the antenna is changed.

The manufacturers advise that *under no conditions* should an attempt be made to use a ground connection on the antenna binding post.

A tuned filter choke-and-condenser system (Ch1, C27) is used to reduce the hum level to a minimum. For this reason, a replacement condenser of exactly the right capacity must be used, if it becomes necessary to change condenser C27; otherwise, the absorption circuit (Ch1, C27) will not resonate at the correct frequency.



The Majestic "Model 50" chassis is the most compact of the A.C.-operated superheterodynes yet produced, being adaptable to even a midget cabinet. It has a single stage (screen-grid) of intermediate-frequency amplification, working at 175 kc. The tuning is single-dial; the R.F. stage's tuning condenser being ganged with that of the oscillator.

Radio Service Data Sheet

HOWARD "MODEL SG-A" SCREEN-GRID RECEIVER

This radio set is a product of Howard Radio Co., South Haven, Mich. A novelty in its design is the type of the tuning scale, which is a white strip, graduated in kilocycles, arranged to slide from side to side.

Following are the parts values used in this receiver: Tuning condensers C, .00036-mf.; C1, 0.25-mf.; C2, C3, C5, 0.9-mf. (in individual shield cans); C4, 0.5-mf.; C6, C7, .001-mf.; C8, C9, C10, each 8 mf. (Mershon electrolytic triple unit).

Volume in this receiver is controlled by the tandem unit R1-R2. The resistance of R1 is 20,000 ohms; R2, of the "tapered" type, has a resistance of 10,000 ohms maximum (two thirds turned, about 2,500 ohms; and one third reading, about 10 to 25 ohms); R3, 300 ohms; R4, R6, 10 ohms; R5, 15,000 ohms; R7, 900 ohms; R8, 1,600 ohms; R9, 2,300 ohms. The reproducer's field coil has a resistance of 2,400 ohms; and Ch. 2 is a 200-ohm unit rated at 20 henries.

The primary of L1 has a resistance of 9.5 ohms; while the primaries of L2, L3, L4 have a considerably higher resistance—245 ohms. The resistance of the primary of the input transformer T1 is 1,200 ohms; of the secondary, total, 10,000 ohms. The primary of T2 has a resistance of 400 ohms.

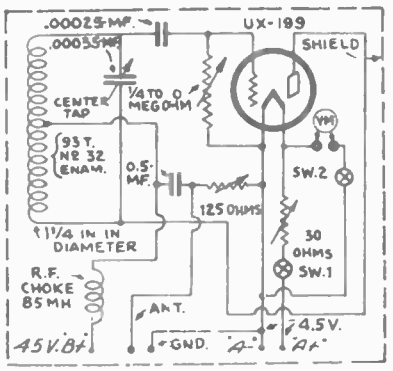
Operating current supply values for this set follow (tube out of socket): Filament potentials, V1, V2, V3, 2.45 volts; V4, 2.47 volts; V5, V6, 2.33 volts; V7, 5.60 volts. Plate potentials, V1, V2, V3, 171 volts, V4, 167 volts; V5, V6, 272 volts.

With the tube under test placed in a standard analyzer the following readings may be obtained: Filament voltages, V1, V2, V3, 2.3 volts; V4, 2.35 volts; V5, V6, 2.18 volts; V7, 4.56 volts. Plate potentials, V1, V2, V3, 164 volts; V4, 152 volts; V5, V6, 254 volts. Grid bias potentials, V1, V2, V3, 2.88 volts; V4, 1.47 volts; V5, V6, 48 volts. Cathode potentials, V1, V2, V3, 3.12 volts; V4, 12.4 volts. Normal plate current readings, V1, V2, V3, 3.6 milliamperes; V4, 1.1 ma.; V5, V6, 26 ma.; V7, 60 ma. Screen-grid potentials, V1, V2, V3, 68 volts.

These values were obtained with a line potential of 110 volts, and the power transformer PT set on 110-volt tap, volume control full on and tuning control turned to lowest frequency.

If a bridge is available for measuring the mutual conductance of the tubes to be used in the set, note that a value of 1050 mmhos. is average. 750 mmhos. is low, and tubes reading higher than 1300 mmhos. probably will cause circuit oscillation. Screen-grid tubes having a plate current ranging between 2.5 and 3.1 ma. usually are good ones for this receiver; those reading higher may cause circuit oscillation, and those reading lower may result in poor volume.

In instances where the set has been allowed to stand idle for some time, it may be found that there is a very noticeable hum in the reproduction; this is an indication that the electrolytic condensers are in need of re forming. This is simply done by leaving the set turned on for about fifteen minutes, with all tubes except rectifier V7 removed from their sockets. (This puts about 400 volts across the filter electrolytic condensers.) However the correct forming time will depend upon the length of time the set has been idle; merely repeat performance until correct operation is obtained. The reason the set may act in this way, when first turned on, lies in the fact that the leakage current through the electrolytic condensers has increased appreciably, thus lowering the voltage on the tubes. Checking the voltages is a convenient way of finding out when the condensers again are fully formed. This forming operation will not be necessary if the set is in operation at least one hour each day.



In this modulated R.F. oscillator, the variable grid leak controls the audio note. Voltmeter VM may connect externally for initial settings, the tip jacks being insulated from the shield. The number of coil turns will vary with the tuning capacity employed; the oscillator may be calibrated against broadcast stations, if desired. The amount of testing signal coupled into the set under inspection is determined by the 125-ohm variable resistor.

Each make of radio set has its own particular design, which responds best to certain types of service procedure; and therefore the method of re-ganging the condensers in this receiver (called by the manufacturer "re-gauming the set") will be described.

In no case, when re-gaining the set, should the compensator condensers be adjusted with the set cover removed. Before attempting to improve the gain of the receiver, it is necessary to see that, when the tuning dial is swung as far as possible to the right, all the condensers are entirely meshed; otherwise, the condensers will not track over the entire tuning range. Should this procedure indicate that one or more of the condensers is not entirely meshed, adjustment of this condenser may be made by rotating it; and for this operation, set screws holding the condenser to the drive pulley are provided.

If it is necessary to adjust the trimmers to an extreme setting for maximum reading on a meter (connected across the voice coil at M), re-adjust them to a more central position and move the serrated plates on the condenser rotors until meter M shows maximum deflection.

An oscillator of somewhat unusual circuit design is recommended as particularly convenient for re-gaining this set; its circuit connections are reproduced here. To complete the connections for the use of this test unit, connect an A.C. voltmeter, with a scale of 0-3, across the leads of the voice coil of the dynamic reproducer.

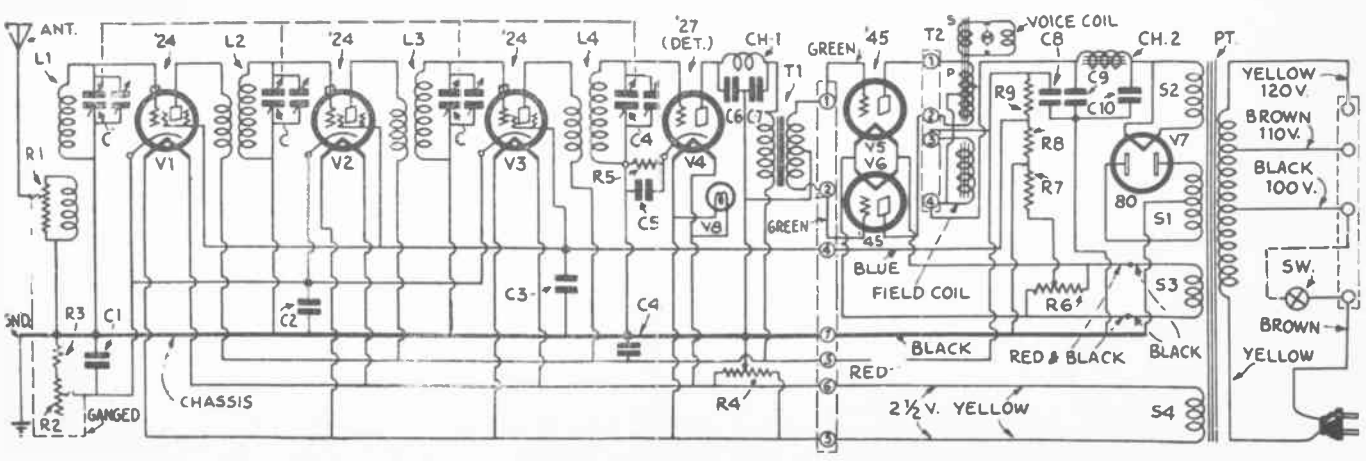
Next, with a "twisted pair," connect the "Ant." and "Gnd." of the set to the posts provided on the *shielded* R.F. service oscillator, adjust the oscillator for a frequency of 1400 kc., and adjust the 30-ohm filament rheostat until the voltmeter VM reads 3 volts. Then, adjust the 125-ohm rheostat (which may be a 125-ohm potentiometer connected as a rheostat) until the A.C. meter M indicates 1.0 volt.

Now, insert a screwdriver in the hole provided in the chassis cover and adjust the compensator on the variable condenser tuning the input circuit of V1, until maximum deflection of the A.C. voltmeter is obtained. Then follow to the next stage, adjusting the rheostat for a 1-volt deflection. Duplicate these operations at 950 and 550 kc.

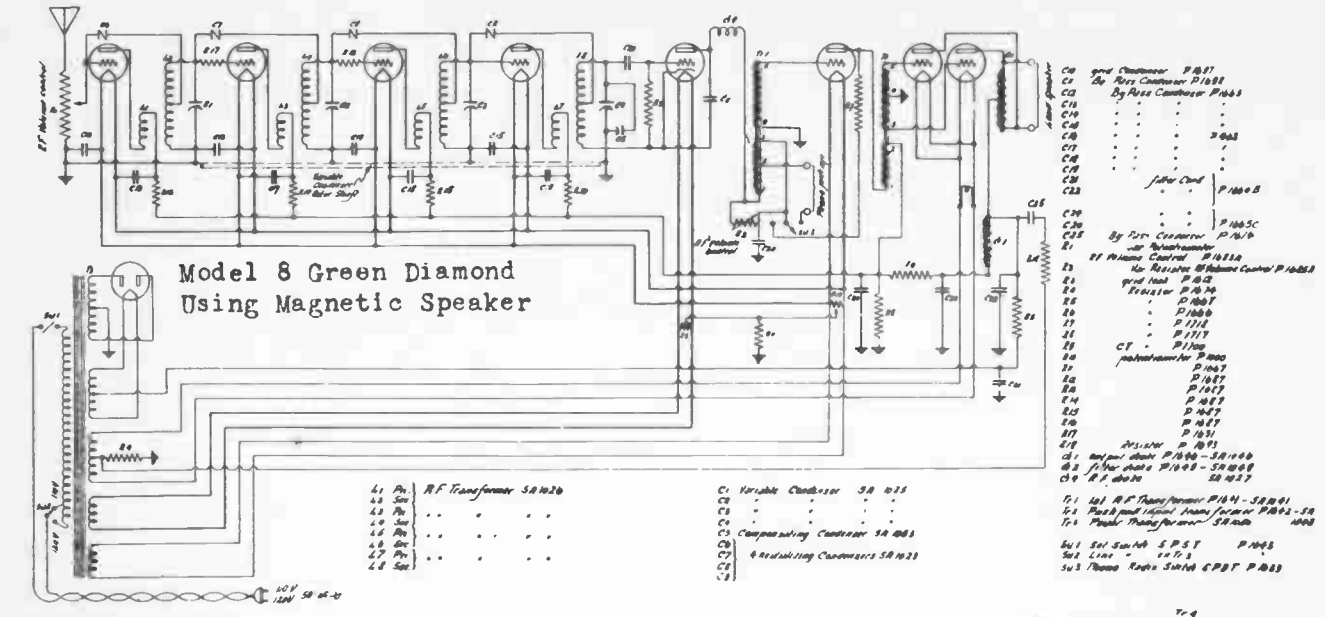
The Service Man is cautioned to check carefully the line connections to this receiver, if it has become necessary to remove these leads, and to make sure that the connections are in accord with the diagram of the receiver. Otherwise, either a short may result and cause a fuse to blow, or a portion of the primary winding of PT may be burned out.

For proper ventilation (and therefore longer life of the screen-grid tubes) the set cabinet should be placed at least three inches from the room wall.

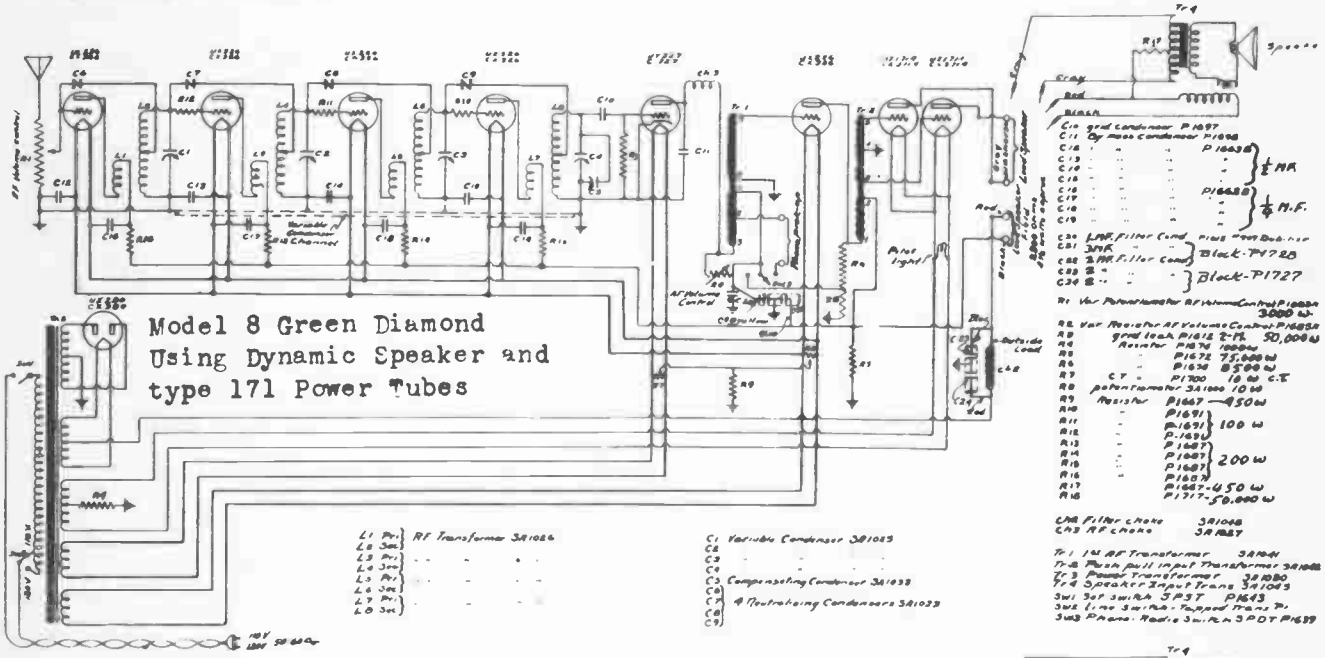
To check the line terminal plug connections for best operation, follow this procedure: tune in a distant station, reduce the volume, and then very quickly reverse the position of the line plug in the wall plate (before the tubes' heater elements have a chance to cool). Increased signal strength often will be noted in one position of the line plug.



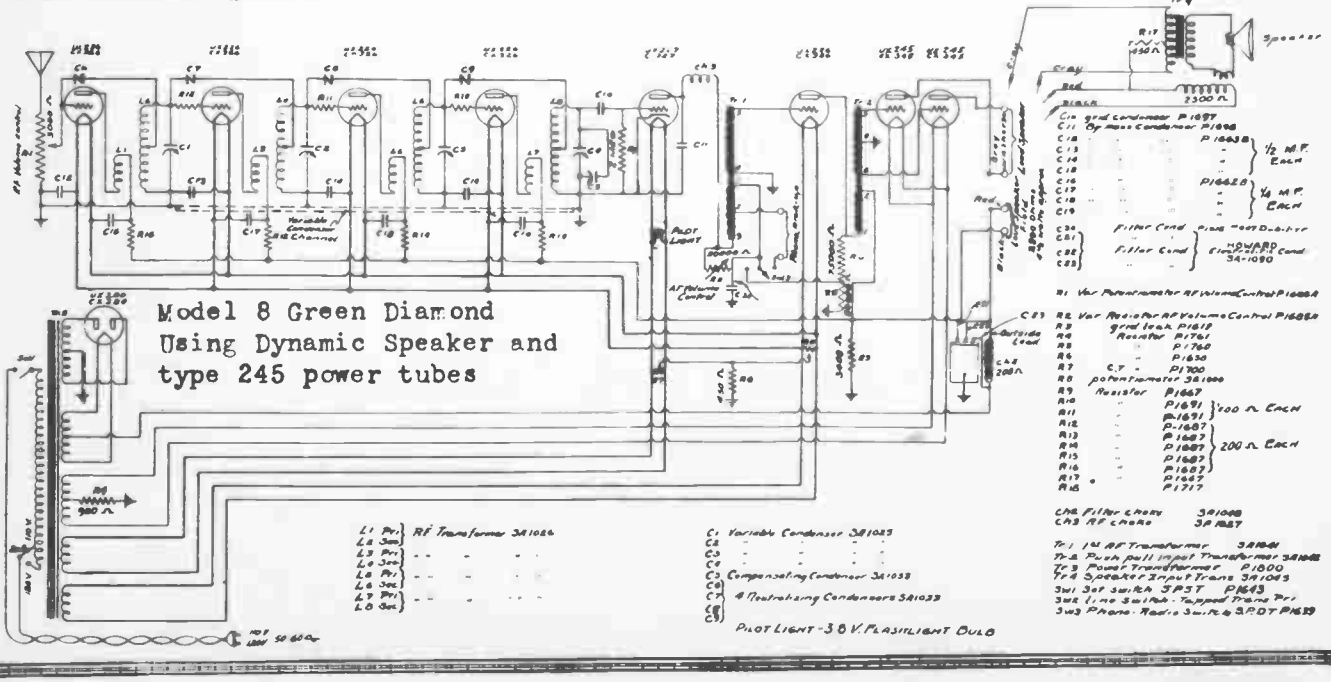
HOWARD RADIO CO.



Model 8 Green Diamond
Using Magnetic Speaker

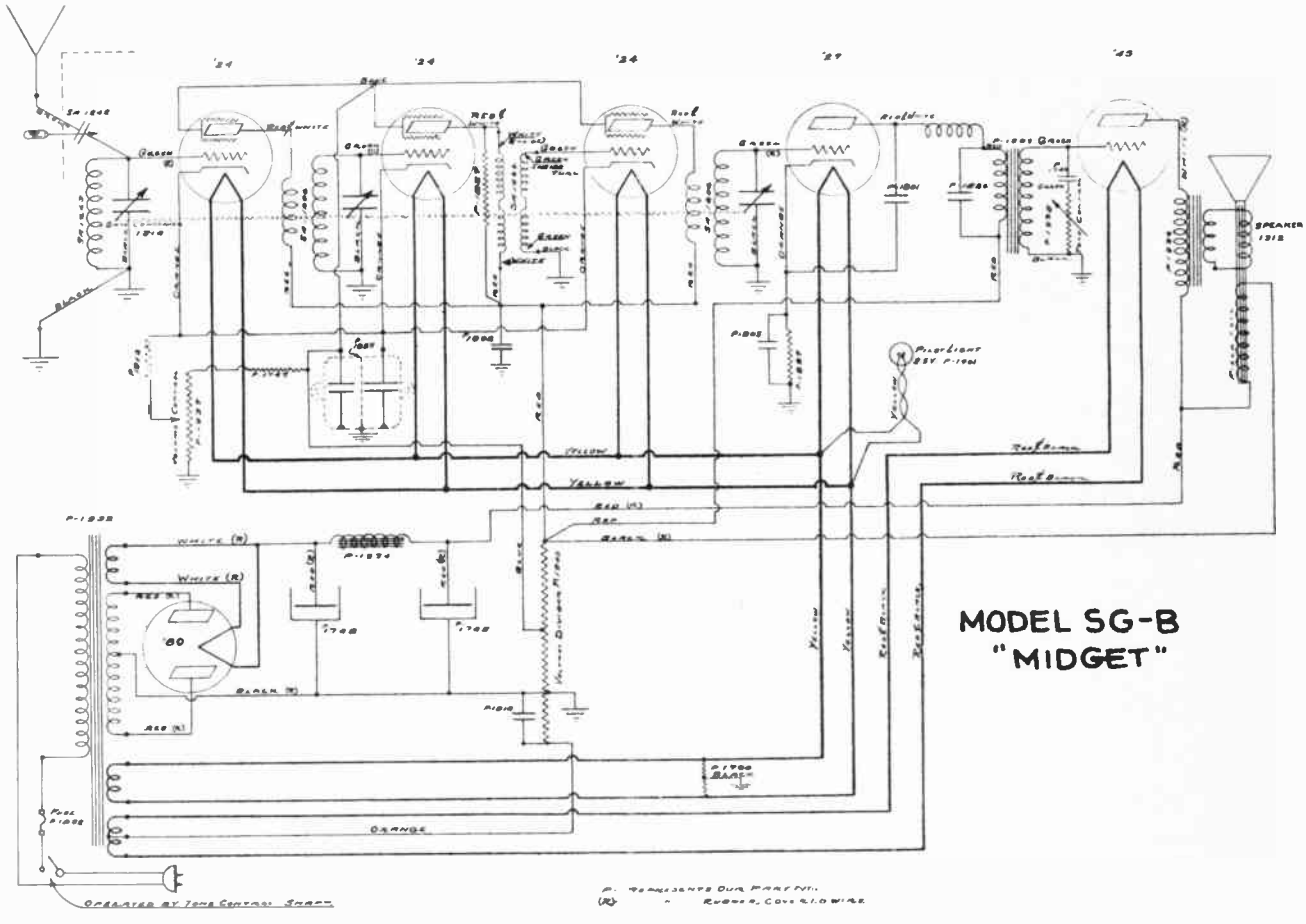


Model 8 Green Diamond
Using Dynamic Speaker and
type 171 Power Tubes



Model 8 Green Diamond
Using Dynamic Speaker and
type 245 power tubes

HOWARD RADIO CO.



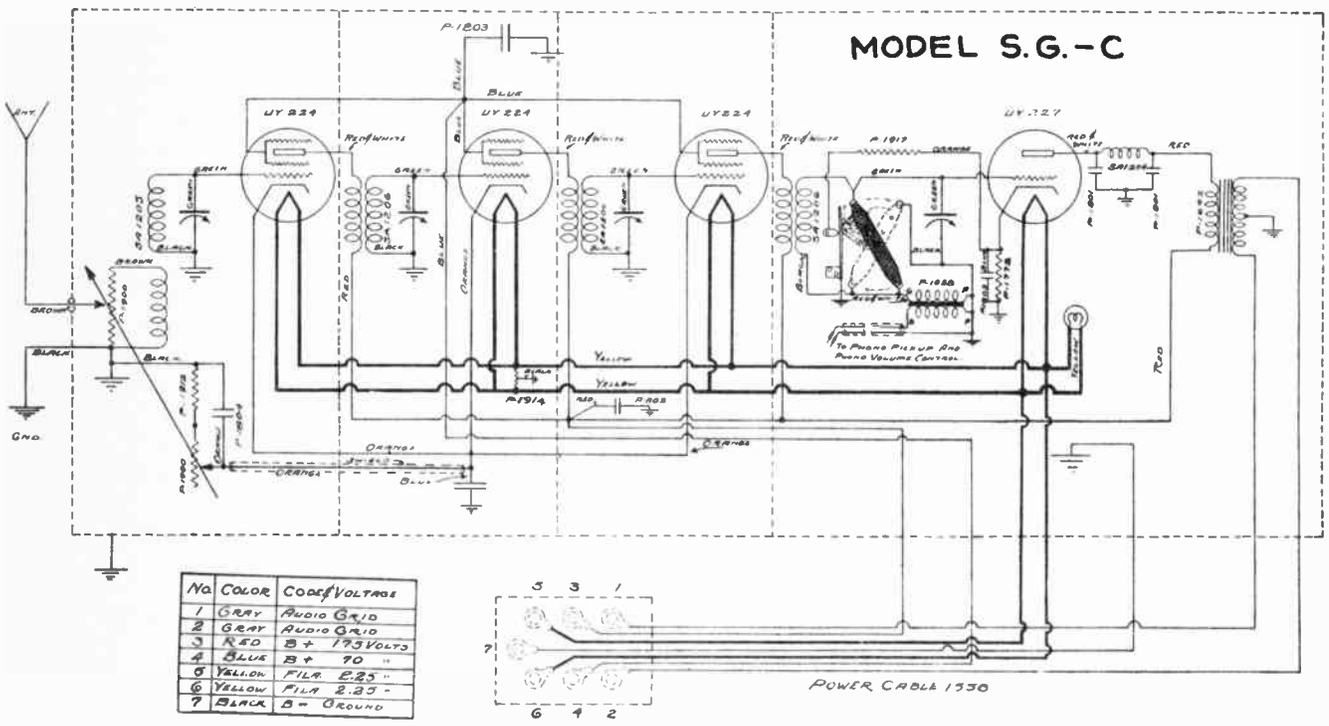
LIST OF PARTS

Part Numbers	Description	Remarks
1310	Gang tuning condenser	
1827	Resistor	(Used only on sets numbering 150,000 to 151,000)
1801	Condenser	.001 mfd. (fixed)
1826	Condenser	.005 mfd. (fixed)
1744	Condenser	.004 mfd. (fixed)
1802	Condenser	.5 mfd. (fixed)
1803	Condenser	1.0 mfd. (fixed)
1912	Resistor	300 Ohm, ½ Watt
1937	Potentiometer	10,000 Ohm, (tapered)
1747	Resistor	50,000 Ohm, ½ Watt
1827	Resistor	30,000 Ohm, ½ Watt
1938	Variable Resistor	2.5 megohms (tapered)
1935	Audio Transformer	Ratio 3:1
1825	Condenser	¼ mfd. and ½ mfd.
1832	Fuse	2 amp.
1932	Power Transformer	
1748	Electrolytic-condenser	8 mfd. ea. unit
1934	Choke	10 henry
1940	Resistor	Voltage divider 7400 ohms.
1812	Condenser	½ mfd. (fixed)
1700	Resistor (Center tap)	10 ohms.
1312	Speaker	2400 ohm. Field
1936	Output Transformer	

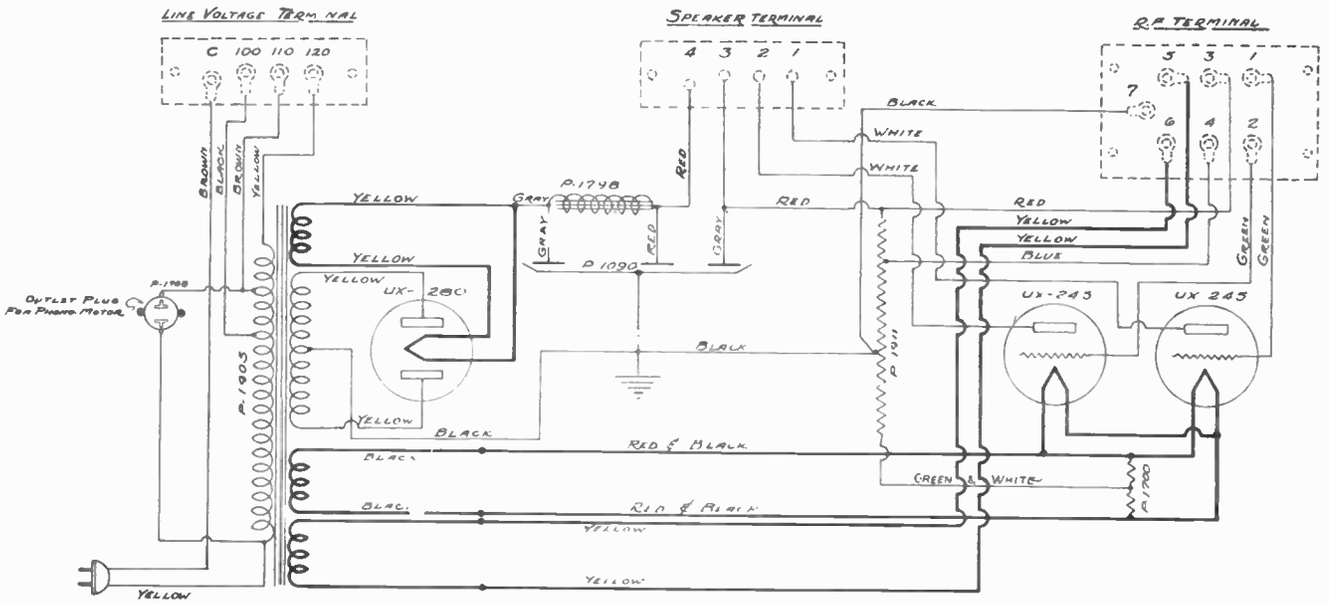
Sub-Assembly Numbers	Description
1242	Antenna compensating, cond.
1243	Antenna coil
1206	Radio frequency transformers
1244	Broad band transformer
1245	Radio frequency choke coil

HOWARD RADIO CO.

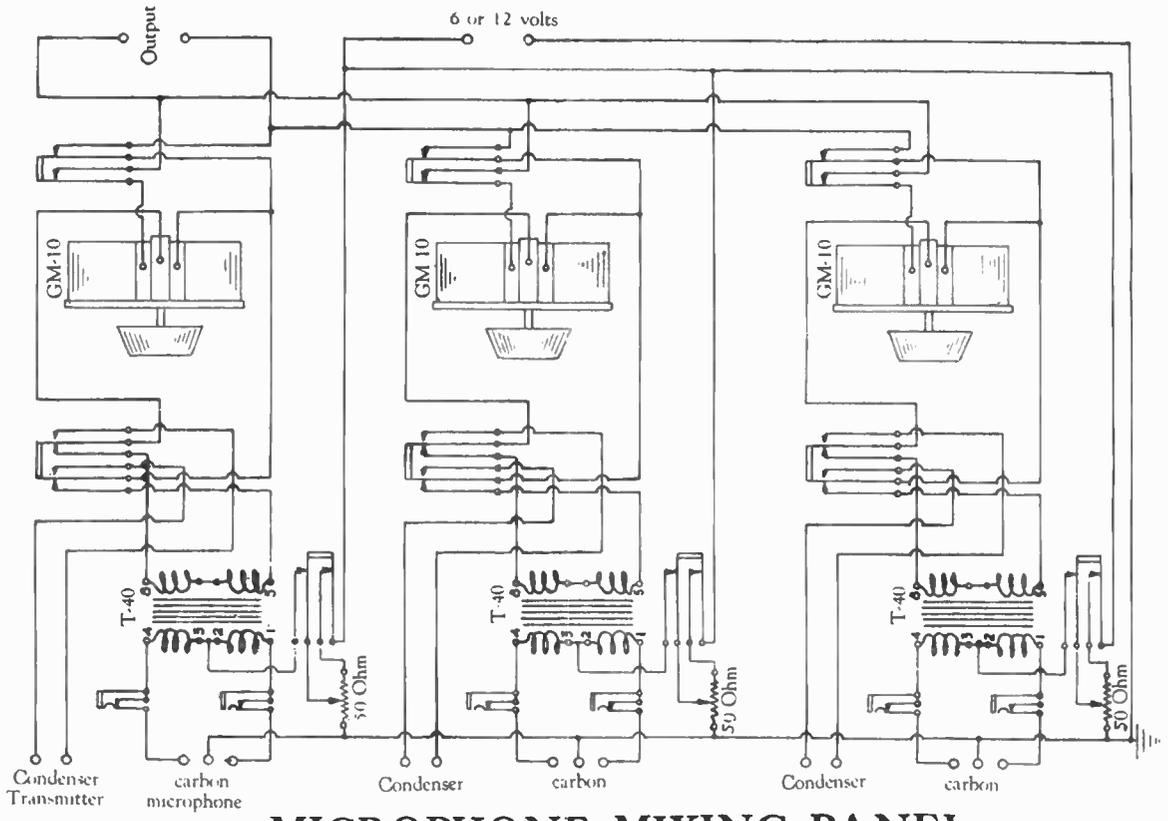
MODEL S.G.-C



No.	Color	Code of Voltage
1	Gray	Audio Grid
2	Gray	Audio Grid
3	Red	B+ 175 Volts
4	Blue	B+ 90 "
5	Yellow	Fila. 2.25 "
6	Yellow	Fila. 2.25 "
7	Black	B- Ground

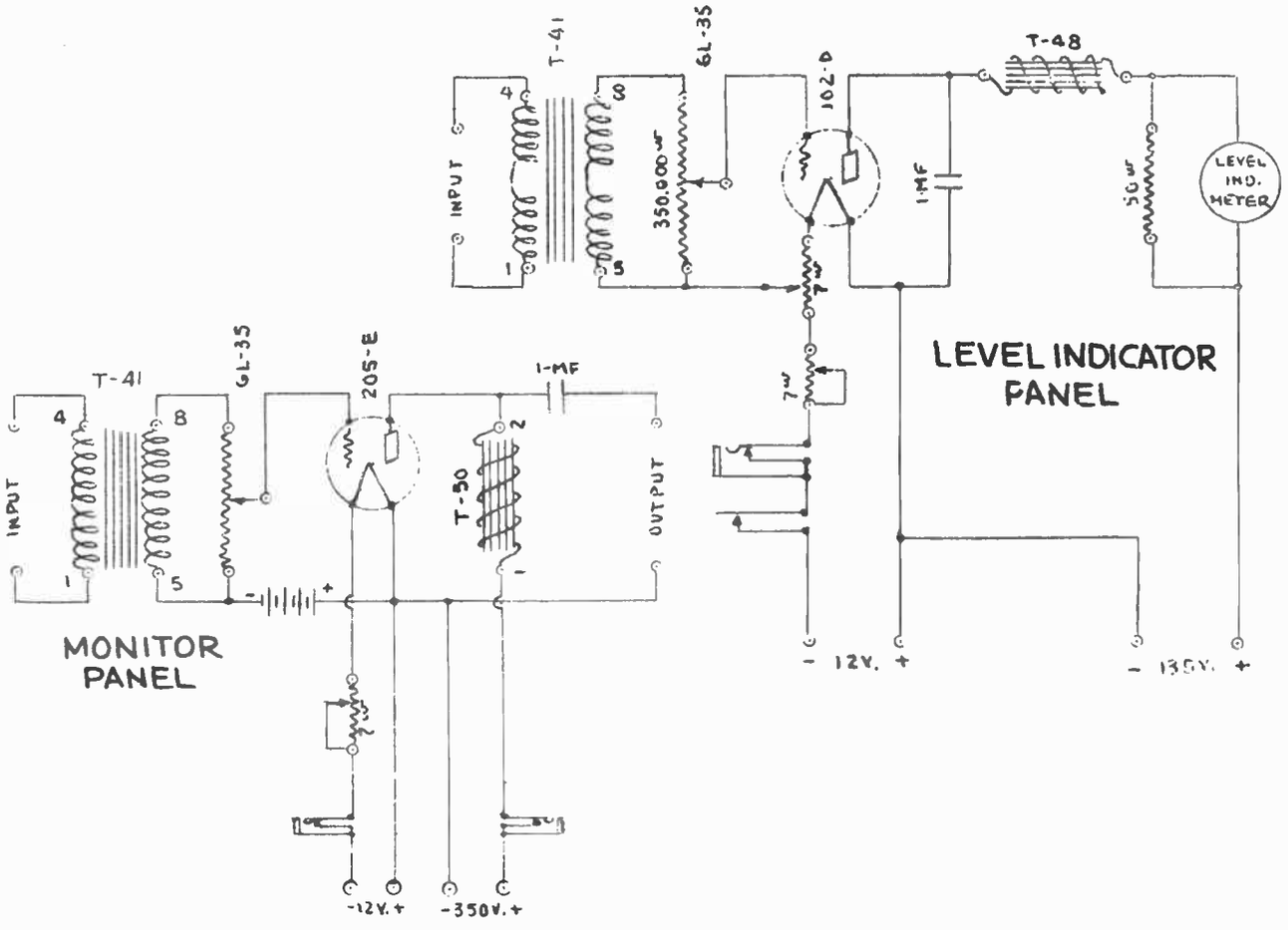


JENKINS AND ADAIR, INC.

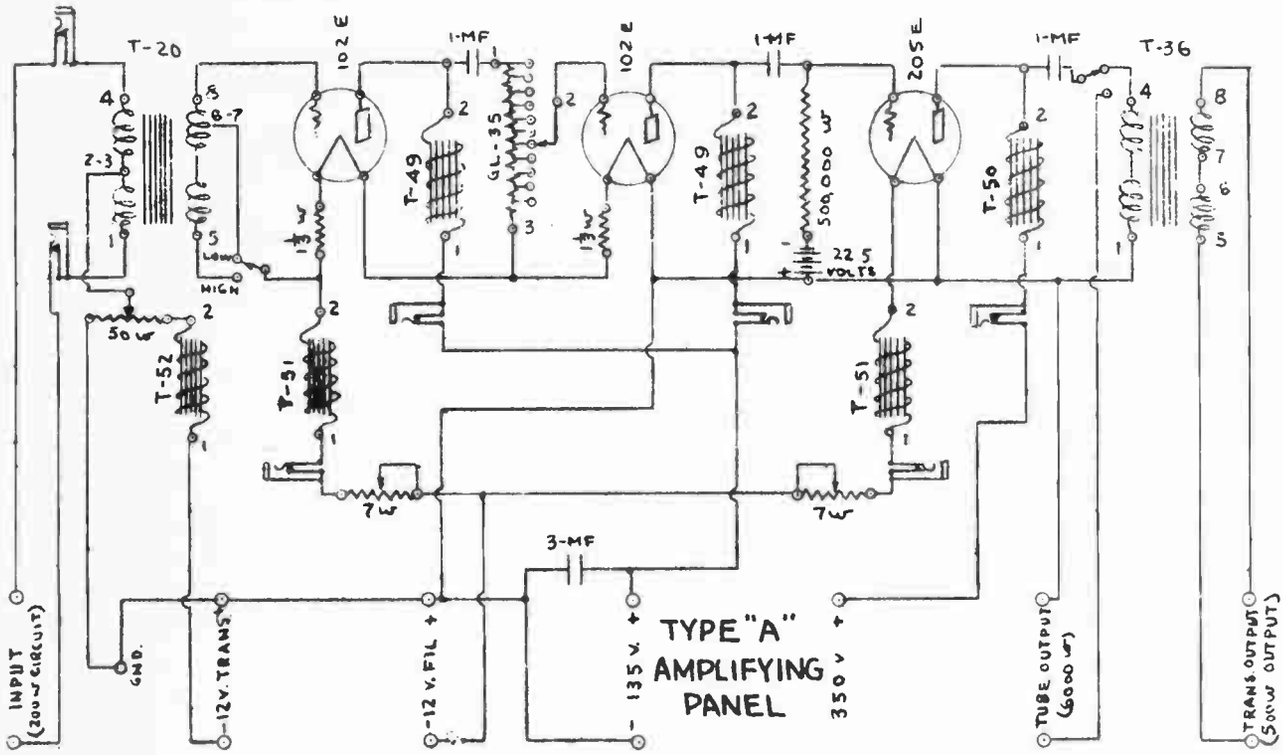


MICROPHONE MIXING PANEL

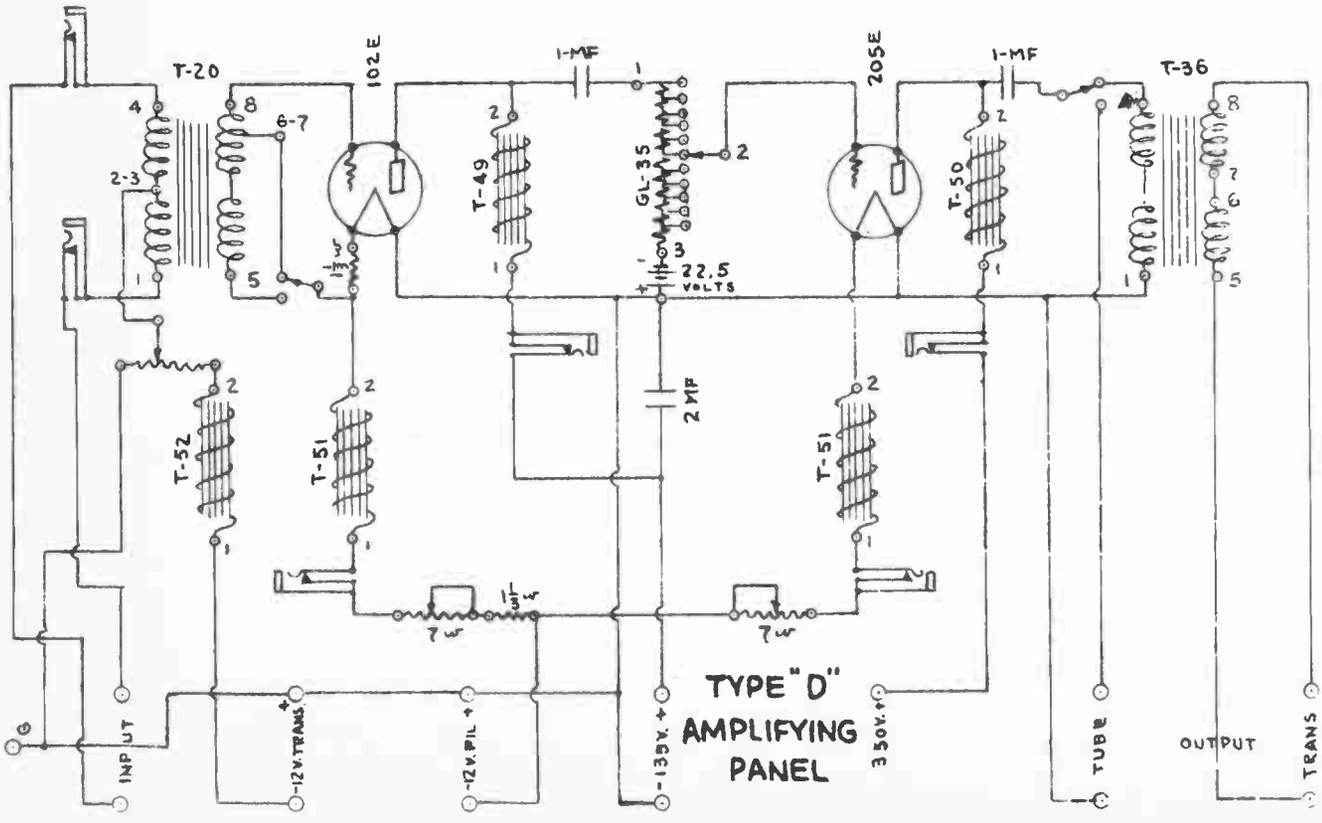
TYPE 3-B



JENKINS AND ADAIR, INC.



TYPE "A" AMPLIFYING PANEL



TYPE "D" AMPLIFYING PANEL

GULBRANSEN COMPANY

CARBON RESISTORS

CODE—Fig. 1	STOCK NO.	RESISTANCE	COLOR*
R2	90953	350 ohms	Orange-green-brown
R3	90954	250,000 ohms	Red-green-yellow
R4	90910	½ to ¾ megohm	Pink
R6	90932	70,000 ohms	White
R7	90931	8,660 ohms	Black and red
R8	90905	15,000 ohms	Brown-green-orange
R9	90958	1,800 ohms	Brown-gray-red
R10	90959	20,000 ohms	Red-black-orange
R11	90934	4,000 ohms	Yellow-black-red
R12	90932	70,000 ohms	White
R14	90959	20,000 ohms	Red-black-orange
R15	90937	12,300 ohms	Brown-red-orange

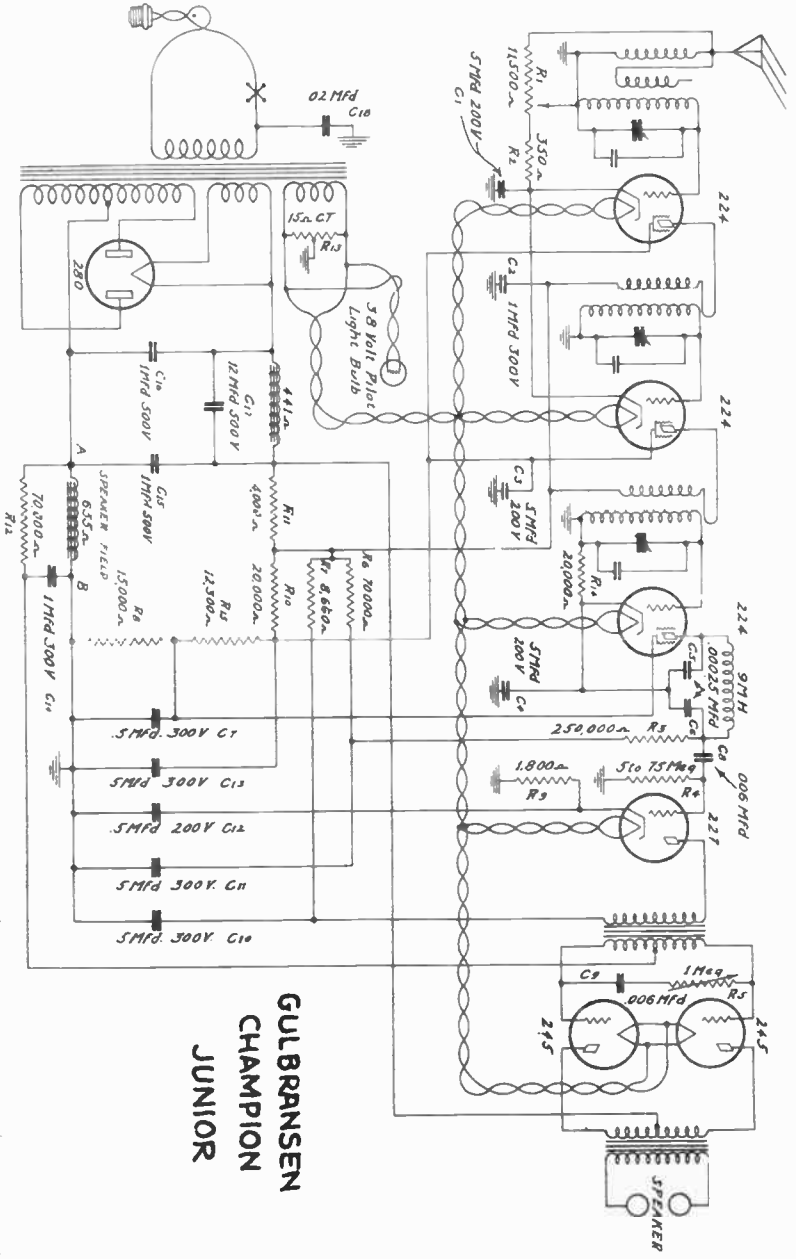
**Where three colors are given, the first color indicates the color of the body of the resistor, the second color indicates the end color, and the third color indicates the color of the dot placed in the middle of the resistor.*

VOLTAGE CHARACTERISTICS

ALL D.C. VOLTAGES TAKEN WITH A 1,000 OHM PER VOLT VOLTMETER
CHECK YOUR LINE VOLTAGE BEFORE TAKING READINGS
VOLUME CONTROL FULL ON

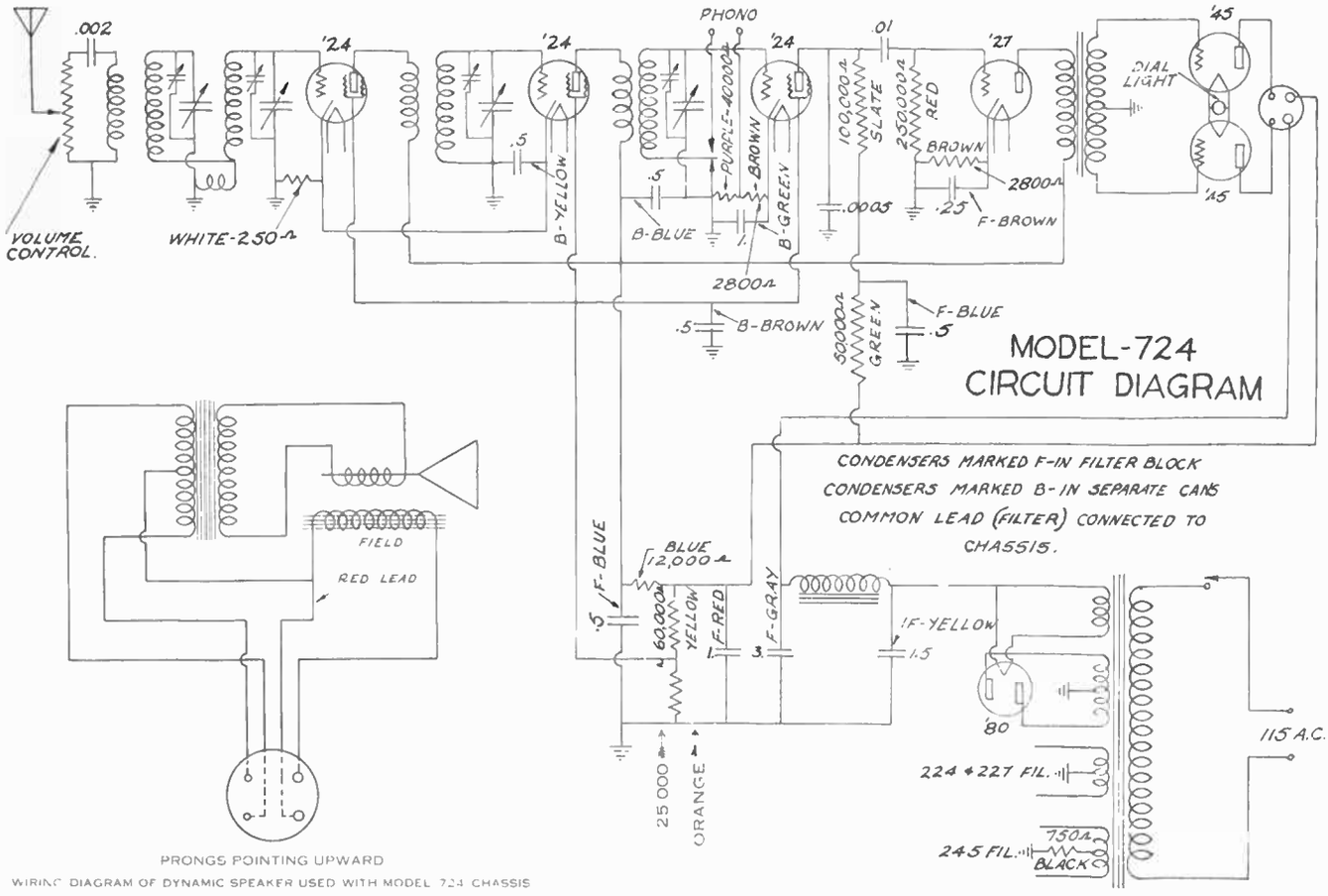
TUBE CIRCUIT UNDER TEST		LINE VOLTAGE				
		90 V.	100 V.	110 V.	120 V.	130 V.
224 R. F.	Fil.	1.75	1.95	2.17	2.3	2.57
	Plate	130	150	169	183	193
	Screen	68	78	86	94	100
	Cathode*	2.0	2.43	2.83	3.2	3.6
224 Detector	Fil.	1.77	1.97	2.19	2.33	2.6
	Plate	35	40.8	45.5	50.5	55
	Screen	37.5	43	48	52	56.8
	Cathode*	2.55	3.1	3.65	4.2	4.8
227 1st A. F.	Fil.	1.79	1.99	2.22	2.34	2.62
	Plate	95	108	118	122	138
	Cathode	5.7	6.7	7.5	8.4	9.3
245 2nd A. F.	Fil.	1.8	2.0	2.23	2.35	2.62
	Plate	180	210	233	255	280
	Grid	—35	—42.3	—49	—55	—62
280 Rect.	Fil.	3.66	4.1	4.55	4.8	5.35
	Plate Current	54 ma	64 ma	73 ma	82 ma	90 ma

**Control grid voltages on the 224 tubes are measured from cathode to ground.*

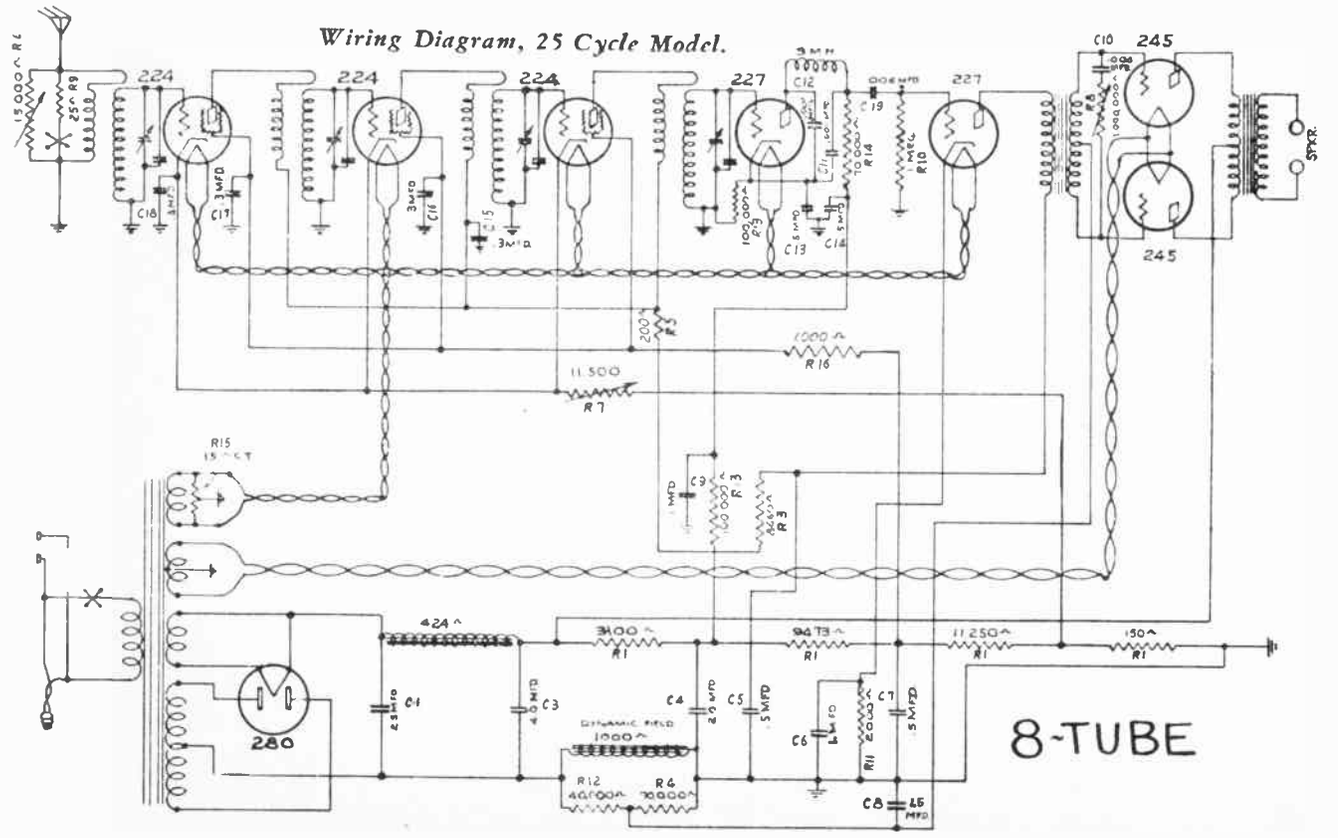


GULBRANSEN CHAMPION JUNIOR

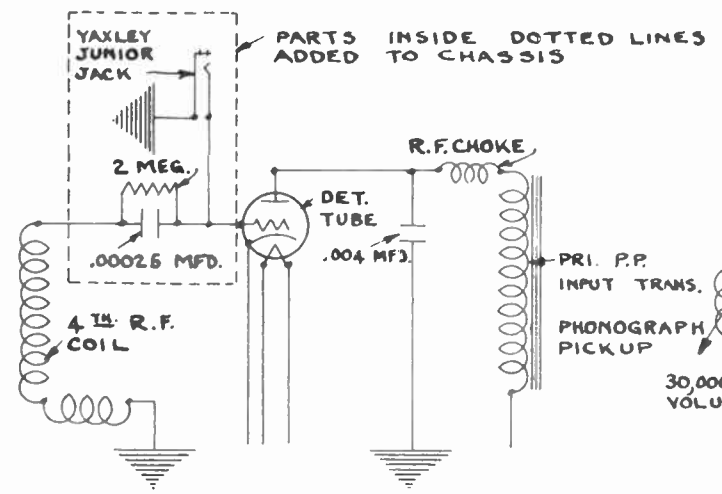
GULBRANSEN COMPANY



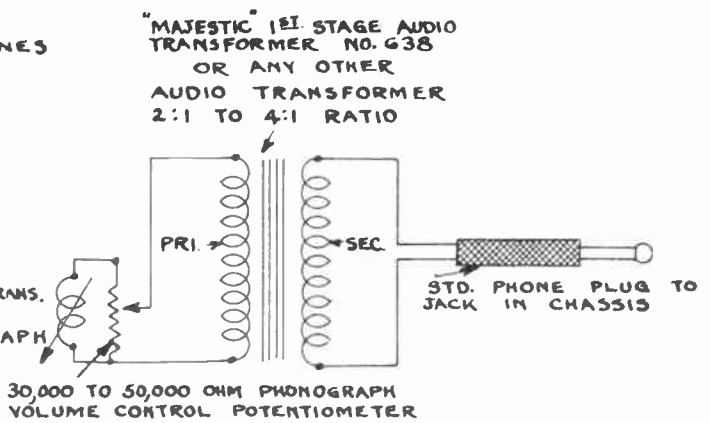
WIRING DIAGRAM OF DYNAMIC SPEAKER USED WITH MODEL 724 CHASSIS



GRIGSBY-GRUNOW CO.(MAJESTIC)
MODEL 90



PICKUP JACK CONNECTIONS IN CHASSIS



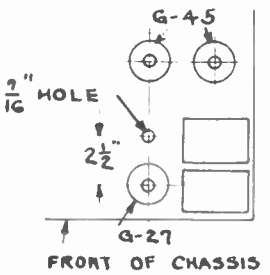
SCHEMATIC DIAGRAM OF PICKUP CONNECTION TO PLUG

PARTS ADDED TO CHASSIS:-
1- YAXLEY JUNIOR JACK - OPEN CIRCUIT TYPE.
1- .00025 MFD. CONDENSER.
1- 2 MEGOHM RESISTOR.

4TH R.F. STAGE MUST BE RE-ALIGNED AFTER THE ADDITION OF ABOVE ITEMS.

WHEN USING THE PHONOGRAPH PICKUP THE RADIO VOLUME CONTROL MUST BE TURNED TO A MINIMUM, OTHERWISE BROADCASTING STATIONS MAY BE HEARD THROUGH THE PHONOGRAPH MUSIC.

WHEN USING RADIO, THE PHONOGRAPH PLUG MUST BE REMOVED FROM JACK.



Method of Adding Phonograph Jack to Model 90

Table of Voltages

The voltage readings given below were taken with the receiver tuned to 550 kilocycles, and the volume control set at maximum. When taking comparative readings on Majestic Model 90 receivers, be certain that receiver is tuned to 550 kilocycles and volume control is set at maximum.

Model 90 Receiver

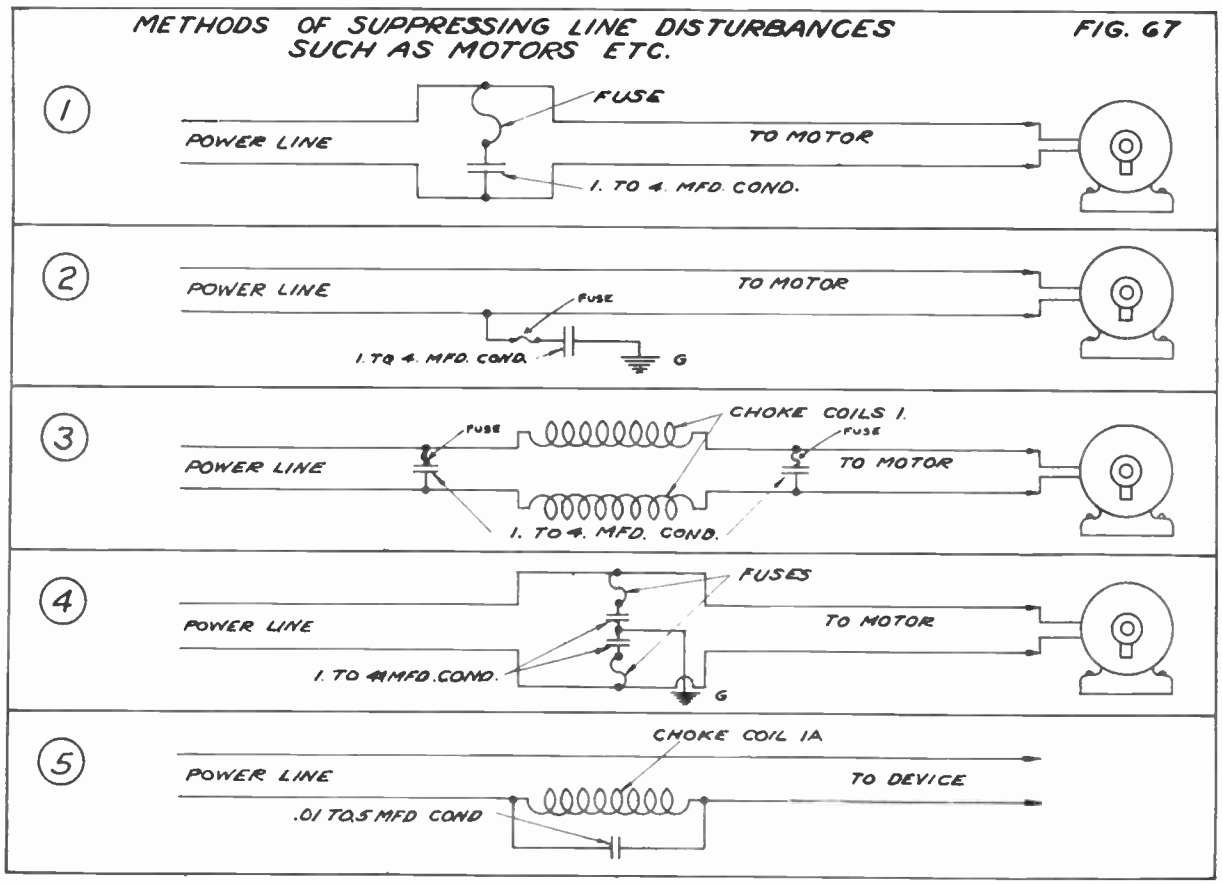
Type of Tube	Position	A Volts	B Volts	C Volts	Cathode Volts	Normal Plate M. A.
G-27	1st R. F.	2.35	130	8	8	5.5
G-27	2nd R. F.	2.35	130	8	8	5.5
G-27	3rd R. F.	2.35	130	8	8	5.5
G-27	4th R. F.	2.35	130	9	9	5.0
G-27	Detector	2.35	270	30	30	1
G-45	Power	2.45	250	50	.....	32
G-45	Power	2.45	250	50	.....	32

Line Voltage 115 A. C.

Variations in voltage readings will occur, due to different line voltage, tubes, etc. The accuracy of the meters used affects, to a great degree, the readings obtained. When using other than accurate meters, a variation of from 5 to 10% from the above readings may be noted.

INTERFERENCE SUPPRESSION.

(SUGGESTED BY GRIGSBY GRUNOW CO.)



Methods of Suppressing Line Disturbances Such as Motors, Etc.

This illustration shows you various methods of eliminating disturbances caused by motors, generators, and other electrical devices.

FIGURE No. 1 Shows power line connected to the motor. Across this 110 volt A C line we place a 1. to 4. MFD condenser. In series with this condenser, a fuse of about 3 amperes must be used.

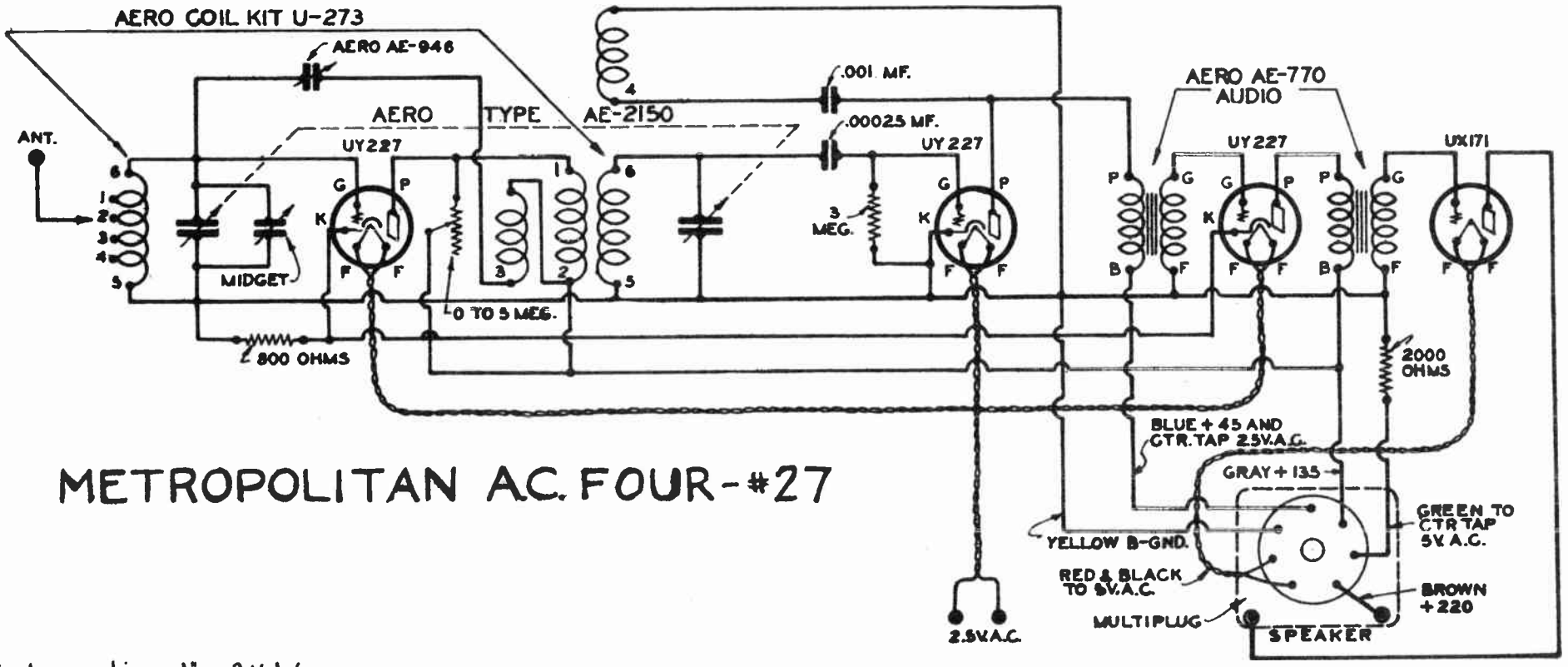
FIGURE No. 2 Shows you how a 1. to 4. MFD condenser is connected to one lead of the line and grounded.

FIGURE No. 3 Shows the application of two 1. to 4. MFD condensers across the line and also the application of one choke coil in each line. Choke coils used in this installation are made by winding approximately 560 turns of No. 18 B & S gauge double cotton covered or enamel wire on to the fibre, bakelite, or treated wooden spool having a core diameter of ⅜" and outside diameter of 1½" and winding space of two inches wide. This type choke is for a load of 5 amperes or less.

FIGURE No. 4 Shows method of connecting two 1. to 4. MFD condensers in series across the A C line. In series with these condensers you will note a fuse of 3 amperes, the connection between the two condensers should be grounded.

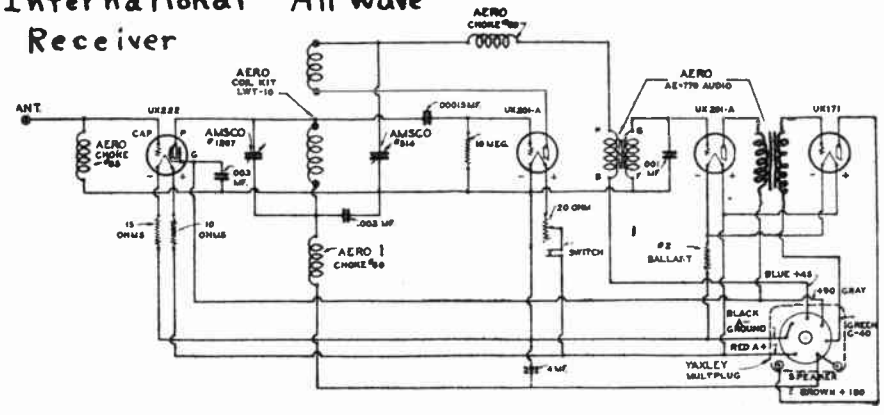
FIGURE No. 5 Shows method of connecting a choke coil and condenser in parallel, in one side of the line. The condenser in this case should be .1 to .5 MFD capacity. Choke coil is to be used made by winding 150 turns of No. 18 DCC magnet wire on a fibre or bakelite tube 3" in diameter and approximately 3" long. Only one layer of wire is wound on it.

The arrangement shown in Figure No. 5 can be used for eliminating the line disturbances of various electrical devices. This method has been found advisable where it has not been possible to clear interference in any other way. The idea is to tune the interference to a frequency which does not fall within the receiving band.



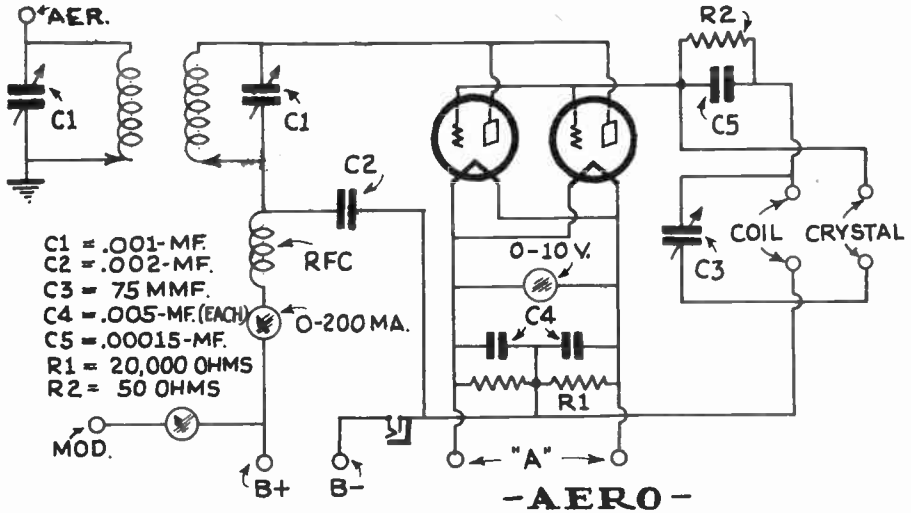
METROPOLITAN A.C. FOUR - #27

"International" All-Wave Receiver



LIST OF PARTS

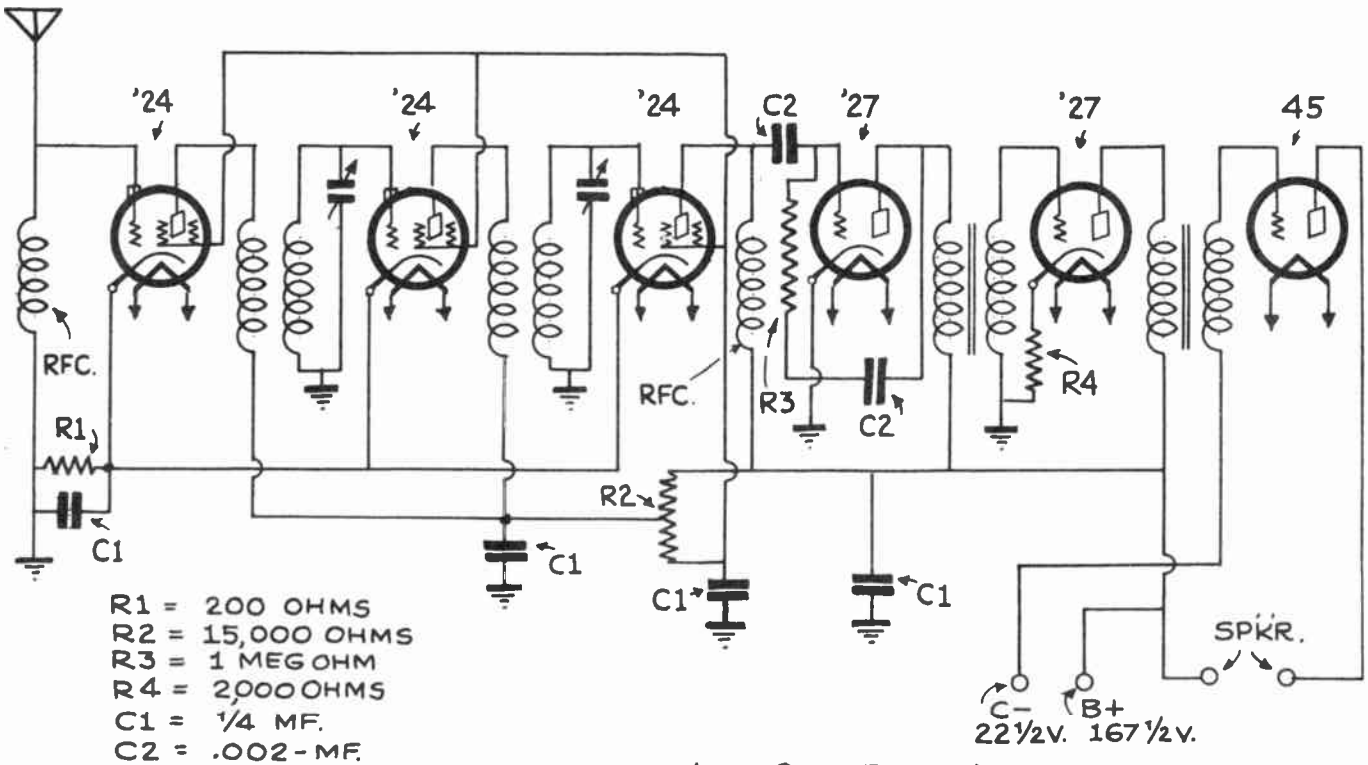
1—Aero Base Unit No. 8. 1—Aero Coil Kit LWT -10. 2—Aero C-60 R. F. Chokes. 1—Aero C-65 R. F. Choke. 2—Aero AE-770 Audio Frequency Transformers. 1—Aero Special Amsco Condenser. .00014. 1—Amsco S. L. T. .00025 Condenser. 1—Aerovox Mica Condenser .00015. 1—Aerovox Mica Condenser .001. 2—Aerovox Mica Condenser .003. 1— No. 520 Yaxley Rheostat, 20 Ohm. 1— No. 500 Yaxley Rheostat Switch. 1— No. 669 Yaxley Cable Connector. 1—10 Ohm Yaxley Resistance. 1—15 Ohm Yaxley Resistance. 1—Daven No. 2 Ballast without mounting. 1—Type E. National Dial. 1—Carter Shield Grid Connector No. 342. 1—Eby Binding Post. 1—Bradley 10 Megohm Grid Leak.



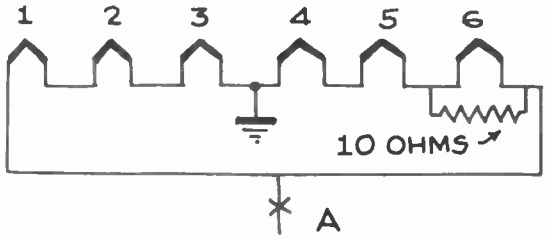
-AERO-
15-30 WATT TRANSMITTER

CHAS. HOODWIN (AERO)

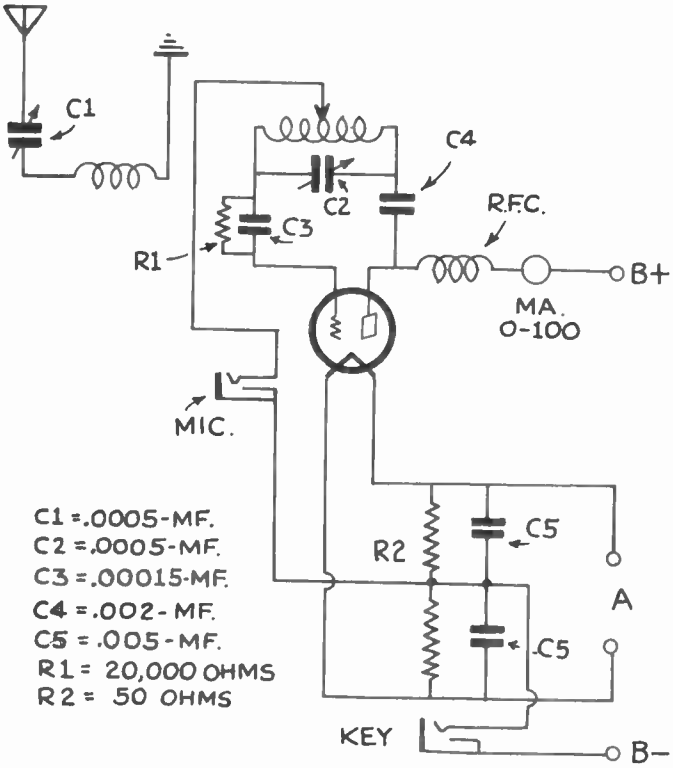
CHAS. HOODWIN (AERO)



R1 = 200 OHMS
R2 = 15,000 OHMS
R3 = 1 MEG OHM
R4 = 2,000 OHMS
C1 = ¼ MF.
C2 = .002-MF.
RFC. = 85 MH.

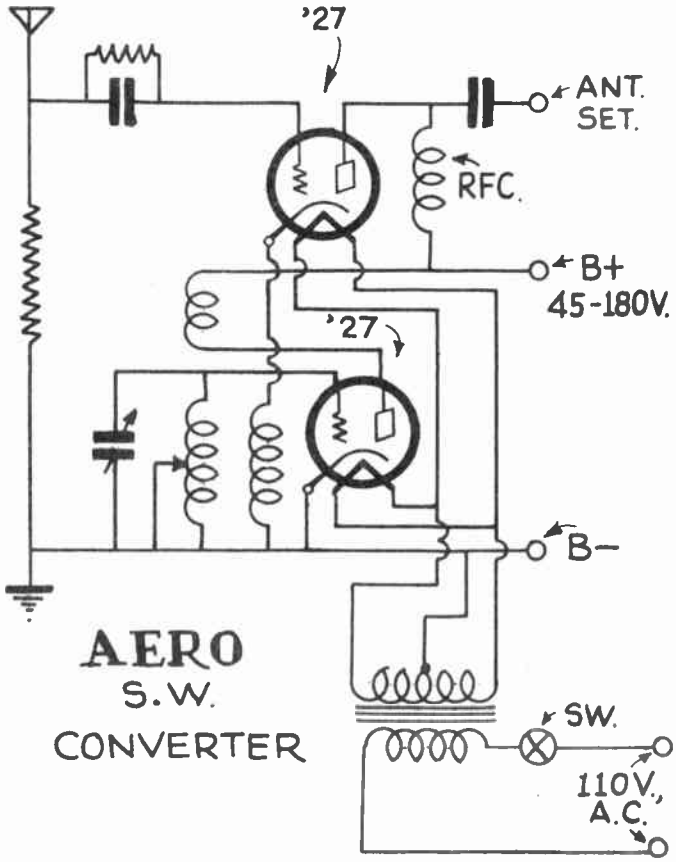


1929 - 1930
HOODWIN AERO
AUTO RADIO



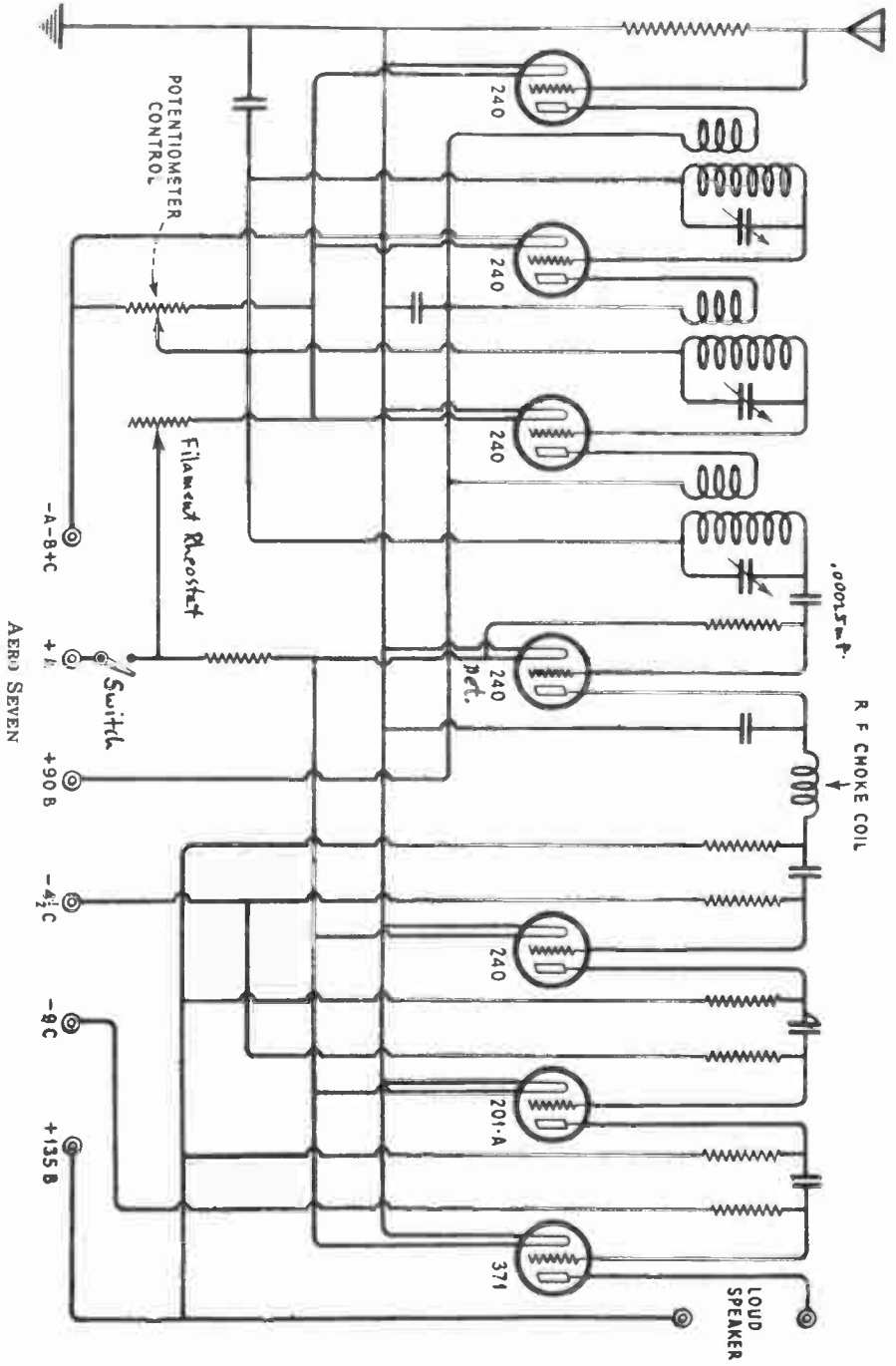
C1 = .0005-MF.
C2 = .0005-MF.
C3 = .00015-MF.
C4 = .002-MF.
C5 = .005-MF.
R1 = 20,000 OHMS
R2 = 50 OHMS

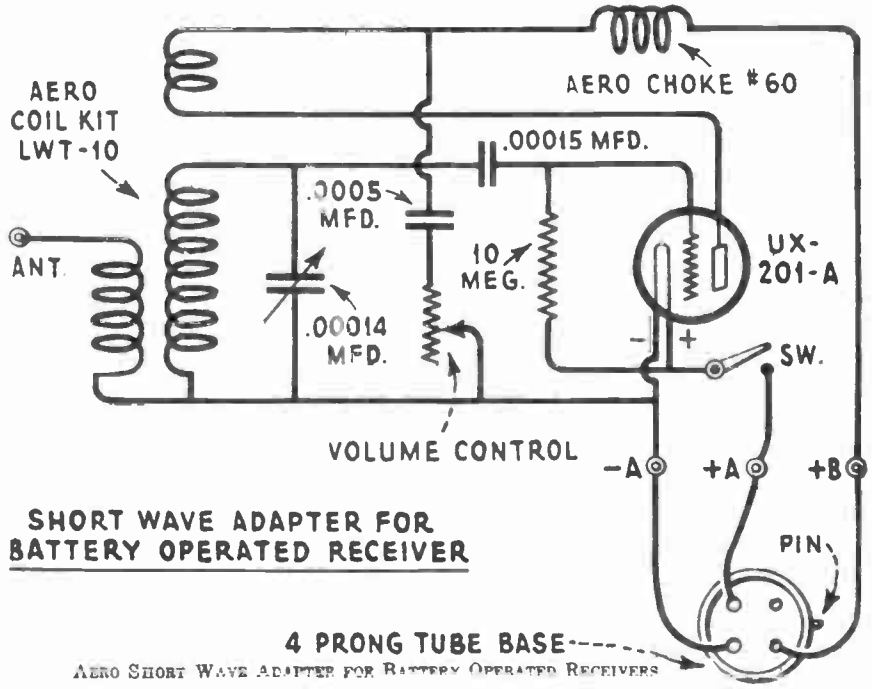
AERO Lo-POWER
TRANSMITTER
1931



AERO
S.W.
CONVERTER

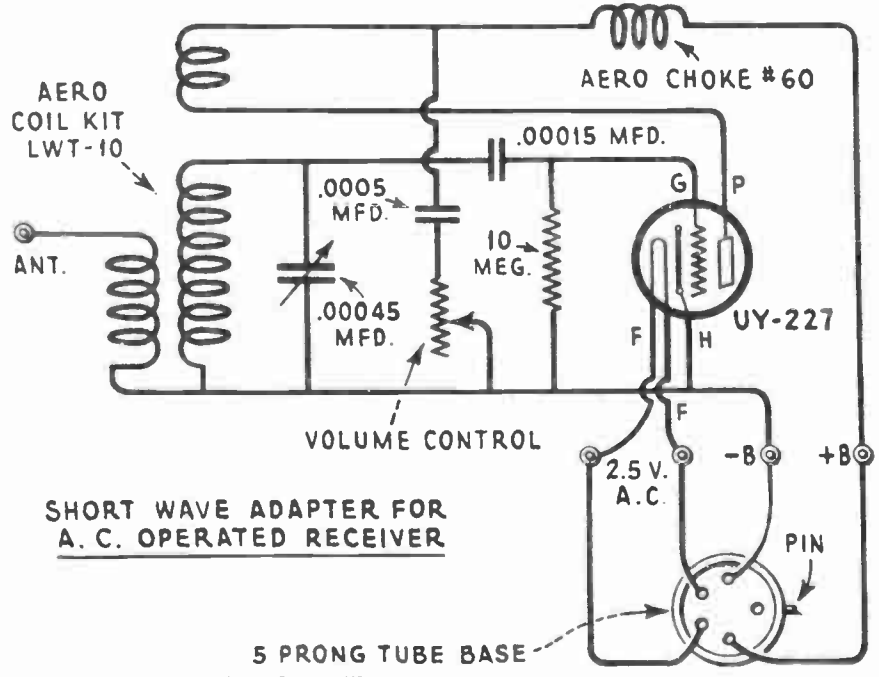
CHARLES HOODWIN CO. (AERO)





SHORT WAVE ADAPTER FOR BATTERY OPERATED RECEIVER

AERO SHORT WAVE ADAPTER FOR BATTERY OPERATED RECEIVERS

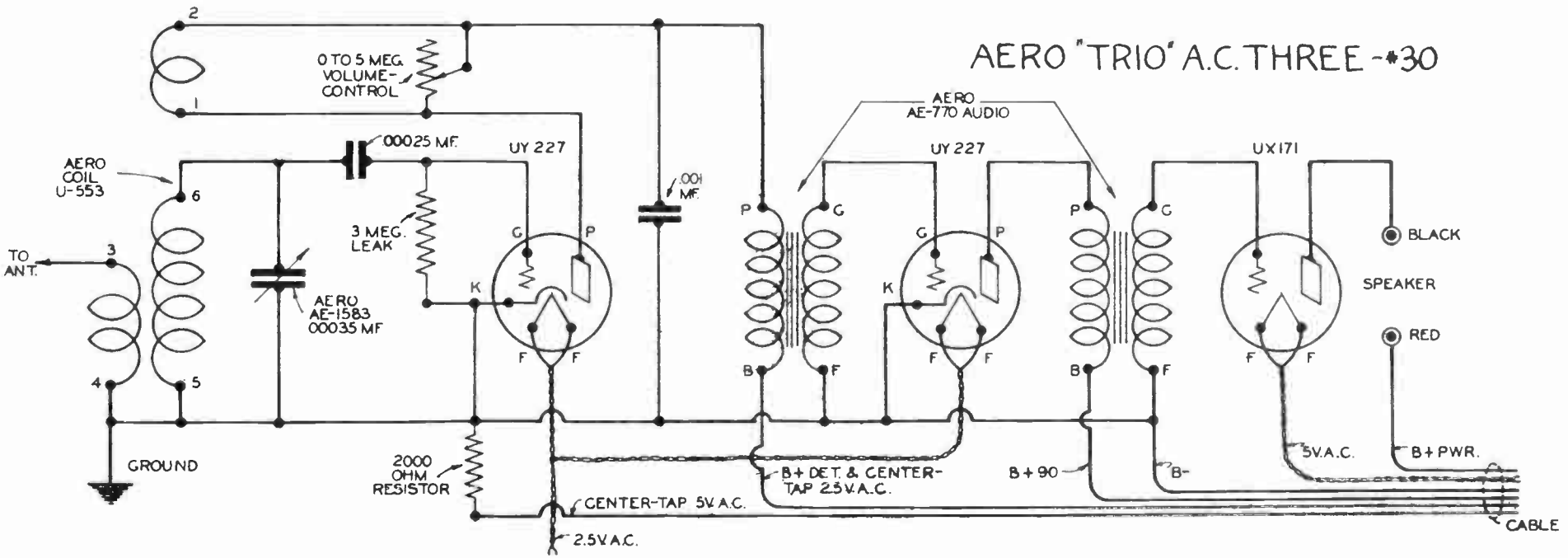


SHORT WAVE ADAPTER FOR A. C. OPERATED RECEIVER

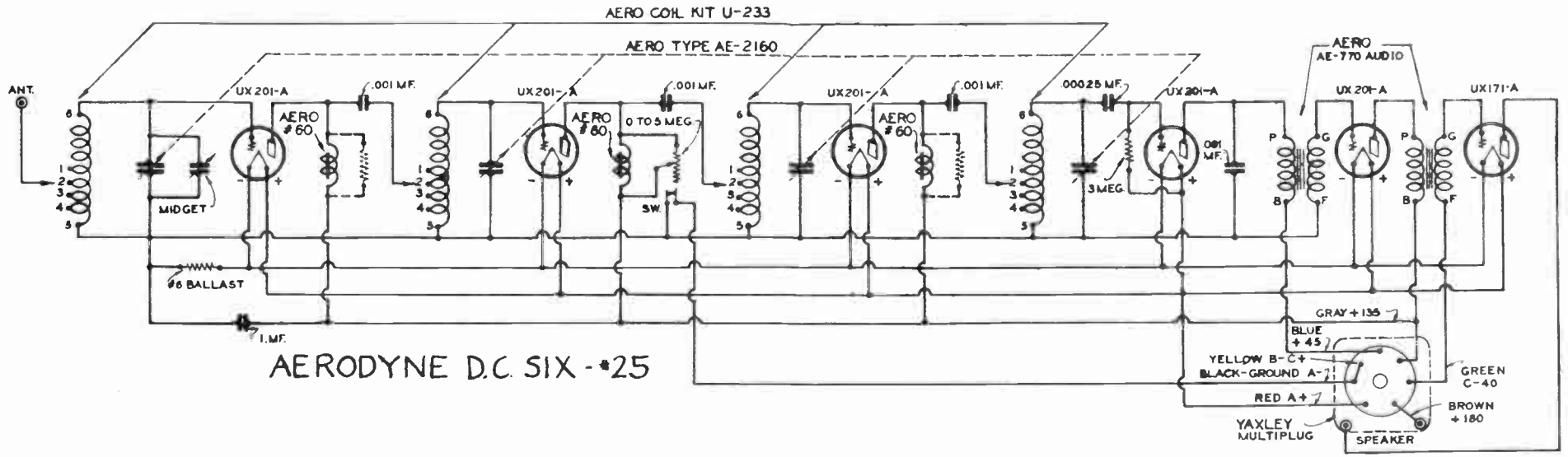
AERO SHORT WAVE ADAPTER FOR A.C. RECEIVERS

CHARLES HOODWIN CO. (AERO)

AERO "TRIO" A.C. THREE - #30

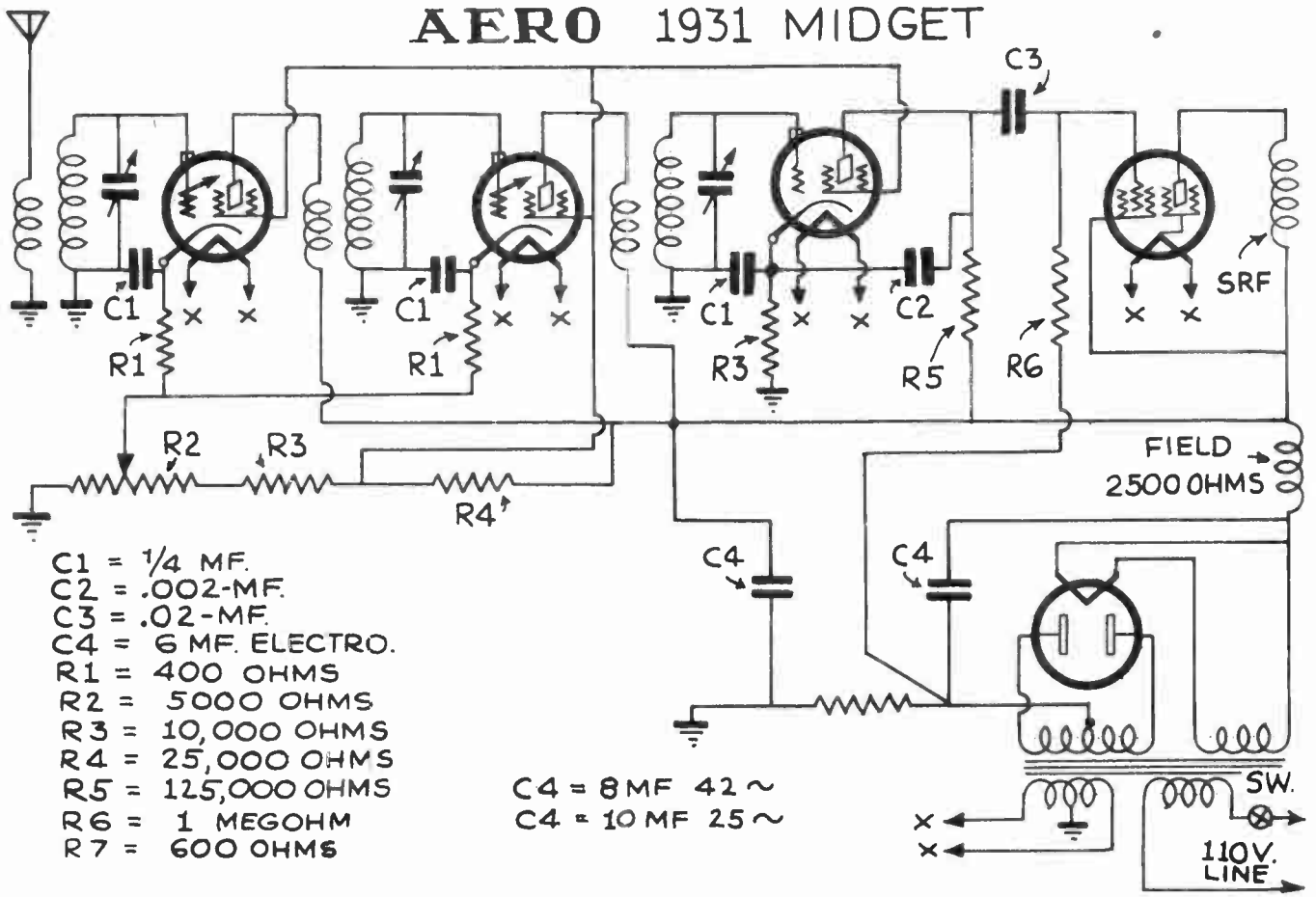


AERODYNE D.C. SIX - #25



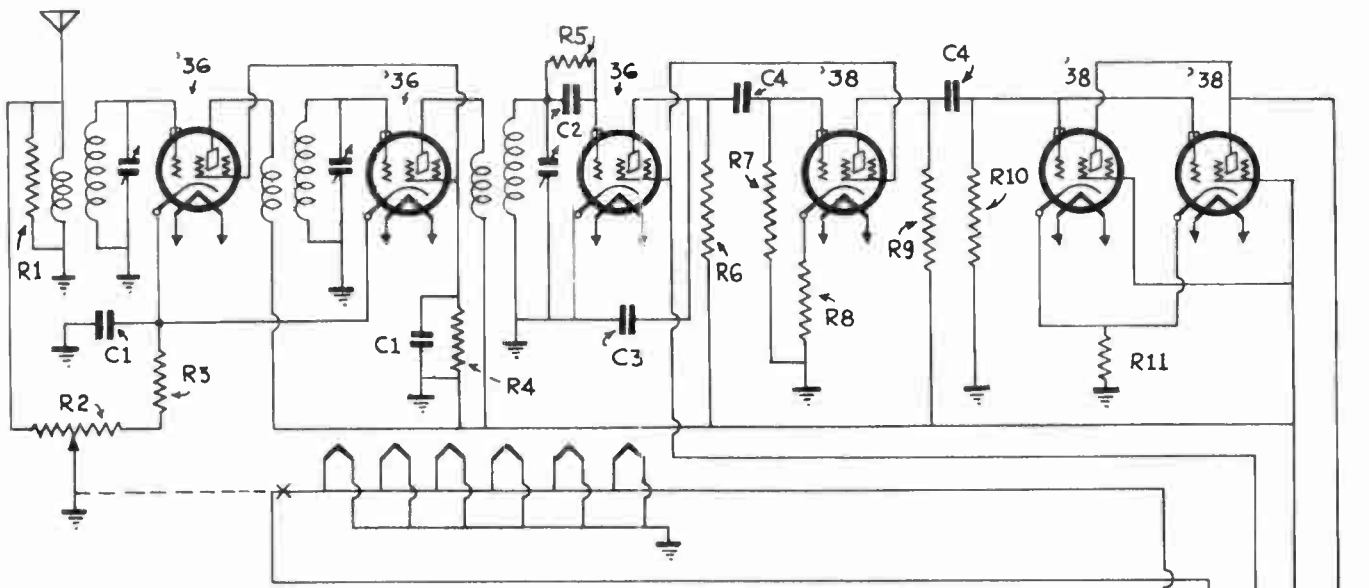
CHAS. HOODWIN CO. (AERO)

AERO 1931 MIDGET



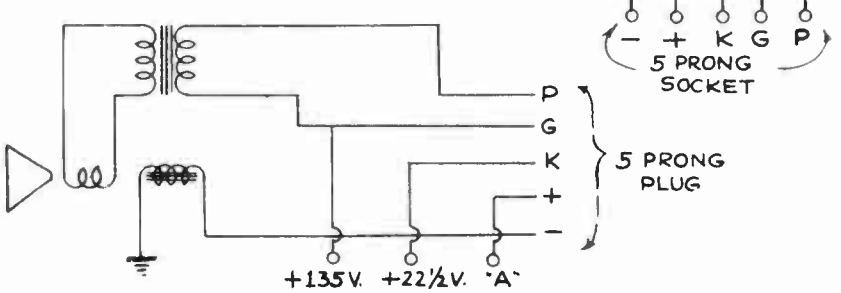
C1 = 1/4 MF.
C2 = .002-MF.
C3 = .02-MF.
C4 = 6 MF. ELECTRO.
R1 = 400 OHMS
R2 = 5000 OHMS
R3 = 10,000 OHMS
R4 = 25,000 OHMS
R5 = 125,000 OHMS
R6 = 1 MEGOHM
R7 = 600 OHMS

C4 = 8 MF 42 ~
C4 = 10 MF 25 ~



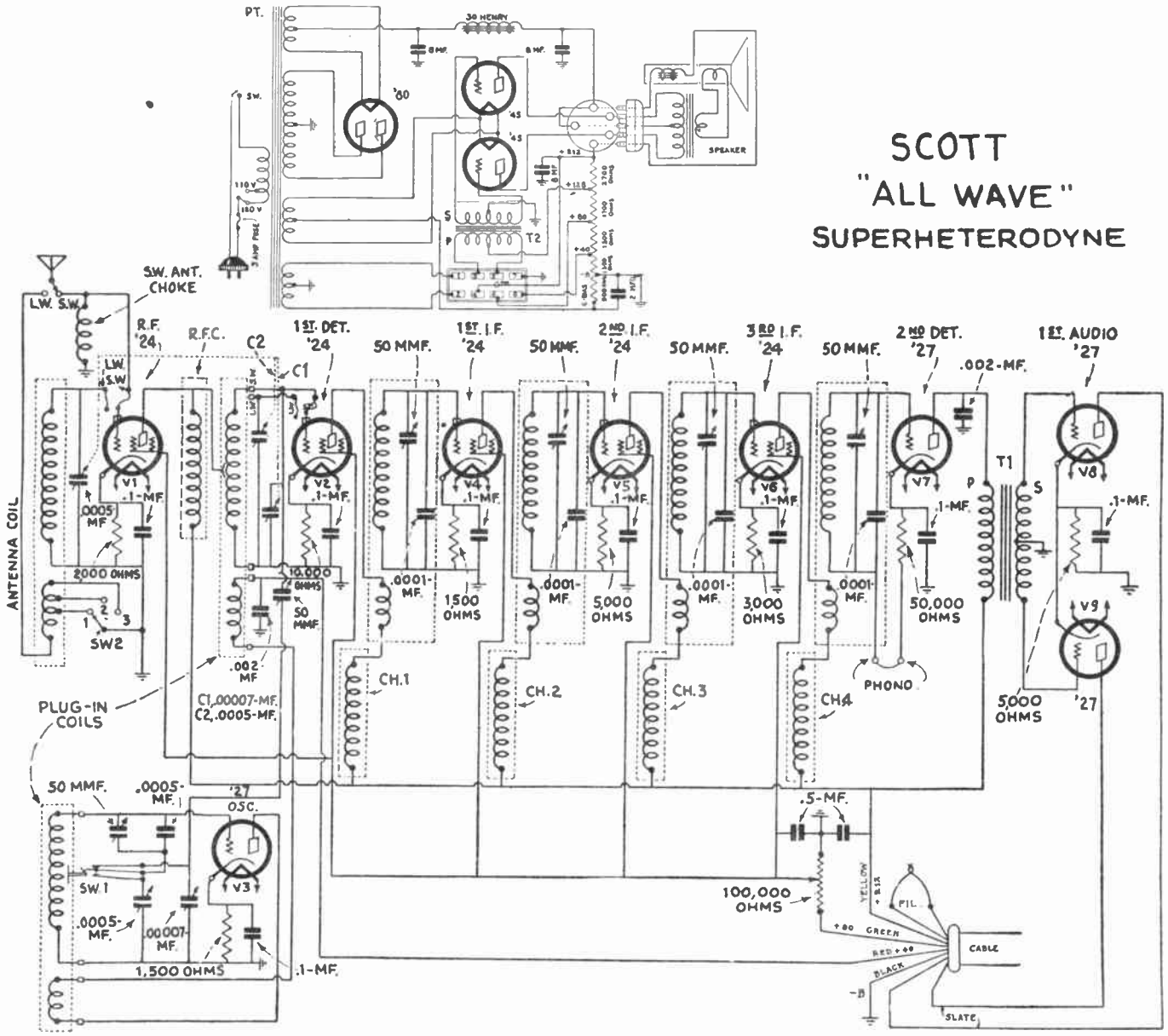
R1 = 10,000 OHMS
R2 = 30,000 OHMS
R3 = 200 OHMS
R4 = 25,000 OHMS
R5 = 1. MEGOHM
R6 = 1/4 MEGOHM
R7 = 1. MEGOHM
R8 = 2000 OHMS
R9 = 1/4 MEGOHM
R10 = 1. MEGOHM
R11 = 1000 OHMS

C1 = 1/4 MF
C2 = .00025-MF.
C3 = .002-MF.
C4 = .02-MF.
C5 = .02-MF.



AERO
1931 AUTO RADIO

SCOTT "ALL WAVE" SUPERHETERODYNE



Schematic circuit of the receiver chassis of the Scott "All-Wave" superheterodyne. The long-wave antenna post is at the rear of the chassis; and the short-wave post on the shield over the tuning gang. The output feeds a push-pull '45 pack (Fig. 2); a push-pull '50 unit is also obtainable.

ATWATER-KENT MFG. CO

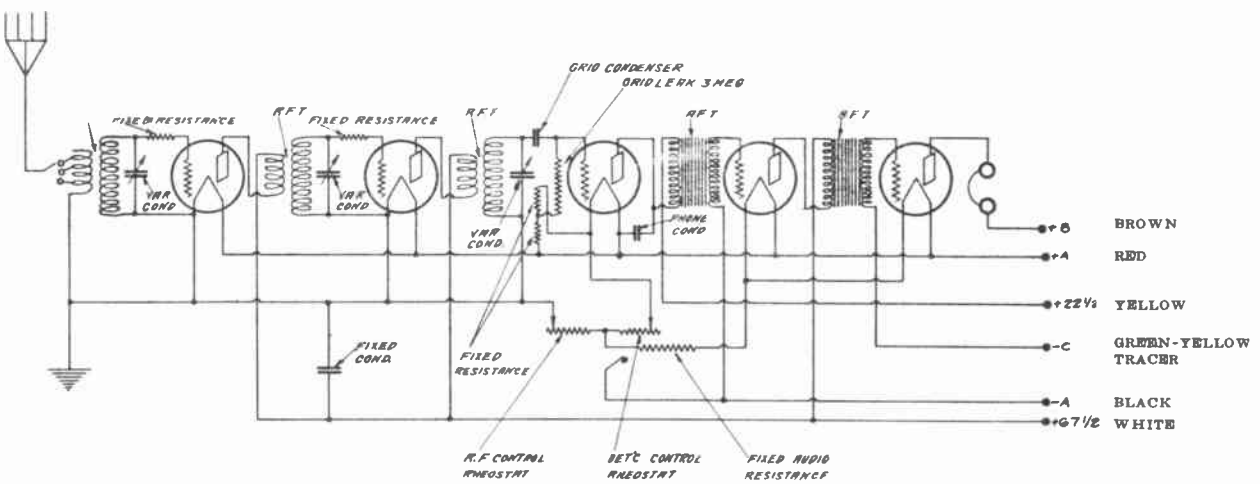
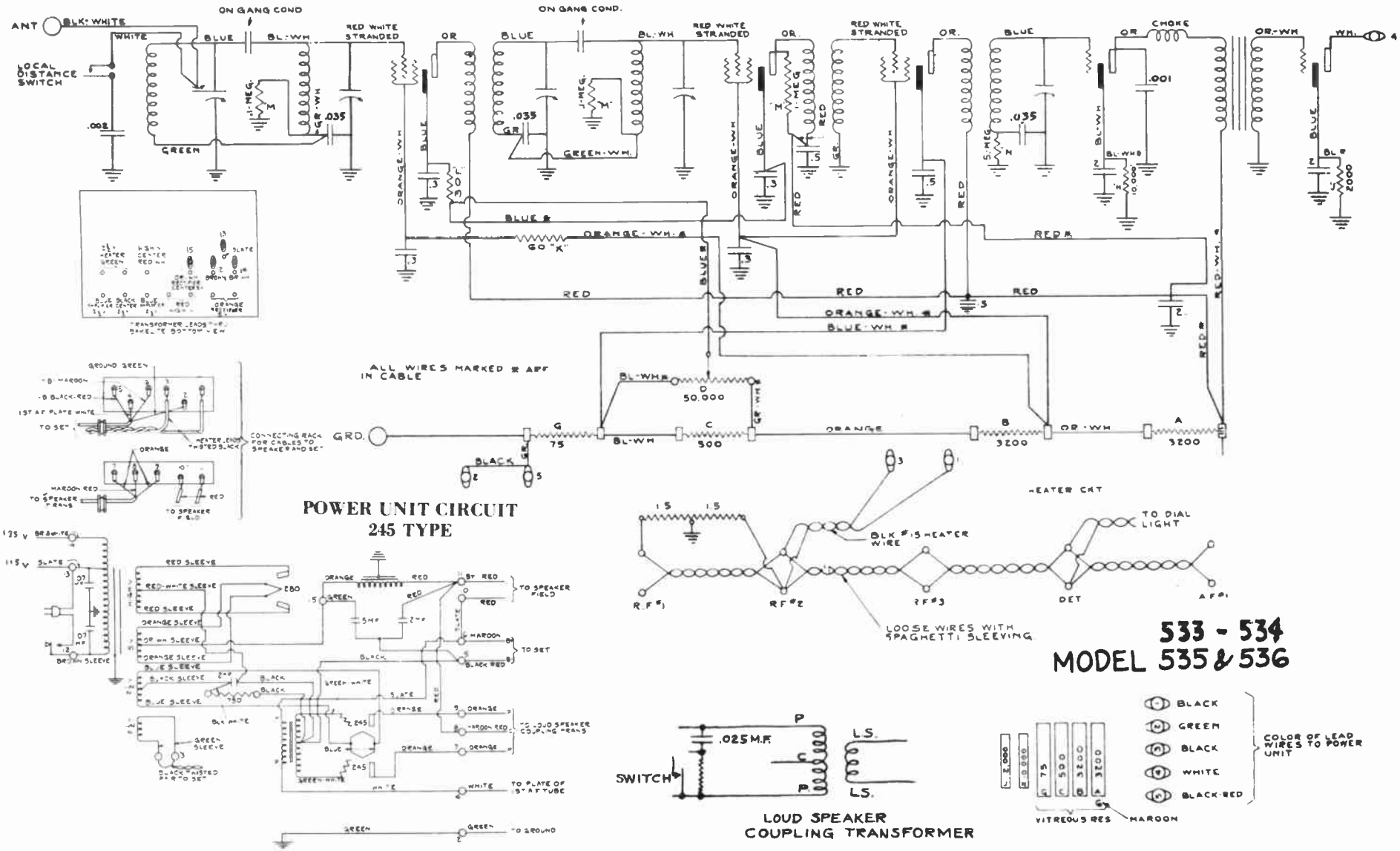


DIAGRAM OF MODEL 20 COMPACT NO. 7960.

KELLOGG SW'BD. & SUPPLY CO.



Radio Service Data Sheet

SILVERTONE "F," "FF," "G," "H" AND "J"

The Silvertone, it will be remembered, is the trade name of a line of radio receivers sold by Sears, Roebuck & Co., Chicago, Ill. The "Model FF" and "J" are two of the older sets dating back to 1926, which were manufactured for this company by King Mfg. Co., Buffalo, N. Y.

These two complete diagrams, shown below, have been selected as representative of the circuits followed in the following models: "F," "FF," "G," "H," "J." A few words will serve to distinguish them:

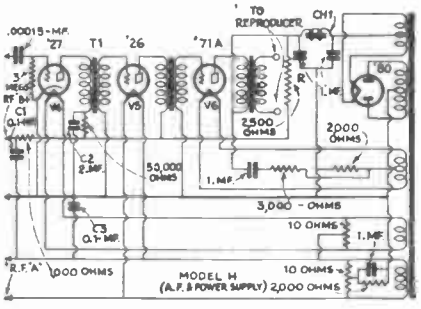
The "Model F" Silvertone radio set is a 5-tube receiver using four '01A's and a power tube which is either a '12A or a '71A. It is a battery set of the neutrodyne type, with single control. The grid condenser has a value of .00015-mf.; and the grid leak of 3 megs. The detector plate by-pass capacity is .006-mf. The detector grid leak does not shunt the grid condenser, but returns directly to the positive side of the detector filament; and between this point and the "A" supply lead is a 2-ohm resistor. This detector filament lead and the positive filament leads of the two audio tubes connect to a 1-ohm resistor; which is also wired to the "A+" post, as well as a 10-ohm rheostat to complete the positive "A" circuit of the two R.F. tubes. This rheostat is the volume control. The off on switch is in the "A—" lead, which is grounded. The R.F. tube circuits are designed to operate at 90 volts on the plate. The first and the second audio stages have independent "B" and "C" supply leads. The reproducer connects directly in the plate circuit of the last tube.

When this standard 5-tube neutrodyne battery set is made all-electric, it becomes the "Model FF" shown below. The color code of the battery cable is as follows: Yellow, "A+"; blue, "90 V.+; maroon, "45 V.+"; blue-red, "B+1st A.F."; black-green, "C—1st A.F."; black-yellow, "A—"; brown-green, "C—power"; black-red, "B—"; green, "C+"; red, "B+power."

Consulting the diagram of the "Model FF," the resistor values are as follows: R1, 10,000 ohms; R2, 3 megs. (red), R3, 2,500 ohms (large, black); R4, 1,000 ohms (brown); R5, 50,000 ohms (gray); R6, 3,000 ohms (green); R7, 2,000 ohms (small, black); R8, 300 ohms, wire-wound; R9, R10, 20 ohms, each.

The capacity values are as follows: C1, C2, C3, tuning condensers; C4, C5, neutralizing condensers; C6, 0.1-mf.; C7, .00015-mf.; C8, .006-mf.; C9, C10, C11, C12, C13, C14, 1-mf., each.

Turning now to the "Model G," we find that it is substantially the same as the Model F; except that there has been added a stage



of R.F. amplification, making six tubes in all. Other details are as follows.

There is in the antenna circuit a fixed .001-mf. condenser; one side of this is connected to the chassis; the other to a binding post, to which the ground may be connected, to reduce noise or increase selectivity. Across the filament leads of the first R.F. tube is shunted a fixed 0.1-mf condenser; another of the same rating being similarly connected in the filament circuit of the third R.F. tube. Three neutralizing condensers are incorporated in the design. The grid condenser is a .00015-mf. unit; and the 3-megohm grid leak connects to the positive side of the tube filament. The two A.F. tube filament positive leads are connected together and return to the "A+" connection through a 1-ohm resistor; the detector's positive filament lead returning, through a 2-ohm resistor, to the juncture of the tube filaments and the 1-ohm resistor. The "A+" of the three R.F. tubes returns to the battery through a 5-ohm rheostat. All the "A—" leads connect together and are grounded. In series with the plate supply lead to the three R.F. tubes is a 1,000-ohm resistor; by-passed to ground through a 1-mf. fixed condenser. The cable color code for the "Model G" Silvertone is the same as in the "Model F" battery set.

Two all-electric versions of the basic 6-tube circuit used in the "Model G" receiver are the Models H and J; the latter having a push-pull output.

The slightly more complicated circuit of the "Model J" Silvertone is shown in full. Condensers C1, C2, C3, C4 (which are to be balanced at 720 and 1400 kc.) are the regular tuning capacities; C5, C6 and C7 are used to neutralize the R.F. circuits. C8 may be used for obtaining added selectivity; its capacity is .0001-mf.. C9, C10, C11 are 0.1-mf.; C12, .00015-mf.; C13, C14, C18, 3mf.; C15, C16, 1 mf.; C17, 2 mf.; C19, .006-mf.

The resistors in the "Model J" radio set have the following values: R1, 10,000-ohm potentiometer; R2, 3 meg.; R3, 1,000 ohms; R4, R10, 20 ohms; R5, 50,000 ohms (gray); R6, 2,500 ohms (black); R7, 10,000 ohms (blue); R8, 1,000 ohms, (brown); R9, 3,000 ohms (green); R11, 300 ohms.

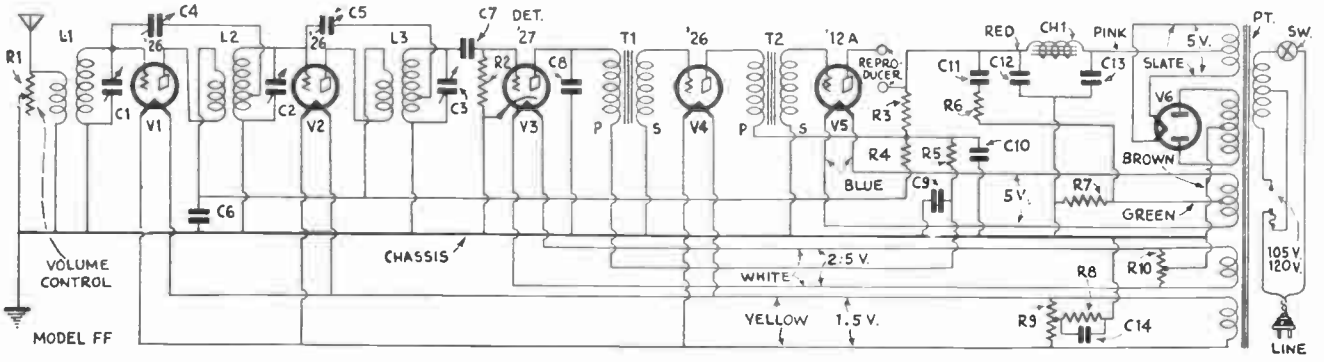
Following are the approximate operating voltages of the A.C. Silvertone models: Filament potentials; R.F. amplifier stages, 1.4 volts; detector, 2.4 volts; first A.F., 1.4 volts; power tube, 5 volts. Plate potentials; R.F. amplifier, 140 volts; detector, 35 volts; first A.F., 140 volts; power tube, 180 volts. Grid potentials; R.F. amplifier, 9 volts; detector, zero; first A.F., 9 volts; power tube, 35 volts.

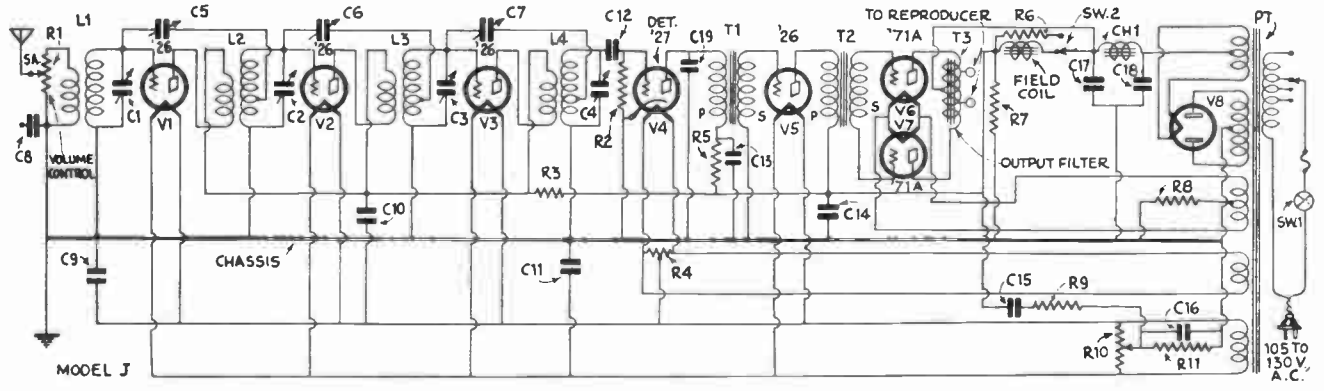
Loss of volume or noisy operation in any of these models may be due to a faulty volume-control resistor.

A toggle switch (Sw.2) connects a 2,500-ohm resistor R6 into circuit when the field coil of a dynamic reproducer is not utilized as the second filter choke.

The power transformers for the "Models H" and "J" receivers are not interchangeable.

Thanks are extended to Mr. R. Hartwell Allen for the use of references in the preparation of this Data Sheet.





KENNEDY "MODEL 826B" COMBINATION RECEIVER

Radio Service Data Sheet

With the "Model 826B" broadcast receiver, the Colin B. Kennedy Co., South Bend, Ind., pioneers the field of mass-produced "combination-wave" radio receivers. The long-wave chassis, covering the regular broadcast band (and a bit more), tunes from about 195 to 550 meters, and is "Model 26;" the short-wave chassis, "Model 34," tunes over three wave-length bands of 15-25, 25-50 and 50-100 meters, each band being switch-selected. The two chasses, in a "Model 826" cabinet, comprise the Kennedy "Model 826B" receiver; the latest diagram of connections appears below. The receiver has a tone-control (R8-C17).

The parts used in the short-wave chassis are distinguished by the letter S in the following lists.

Condenser C1S, .00016-mf.; C2S, midget condenser of small capacity (built-in); C3S, C5S, C6S, C11S, C13S, C14S, ¼-mf.; C4S, C8S, .0001-mf.; C7S, 2 mf.; C9S, .0005-mf.; C10S, .06-mf.; C12S, .002-mf.

Resistor R1S, 2₀ megs.; R2S, ½-meg.; R3S, 500 ohms; R4S, 1,500 ohms; R5S R12S, 25,000 ohms; R6S, R7S, R8S, R10S R11S, 50,000 ohms; R9S, 10,000 ohms. The color code of these resistors is as follows Yellow, 50,000 ohms; red, 1,500 ohms; red (large) 2 megs.; grey, 25,000 ohms; brown, 500,000 ohms; black (flexible, covered resistor) 500 ohms. The volume and regeneration control is potentiometer R9S. Unit RFC 1S is a wire-wound resistor of 1,000 ohms acting as an R.F. choke. Component LS is an R.F. choke consisting of 50 turns of No. 30 enamelled wire, spaced .005-in., on a spool 0.5-in. in diameter. R.F. chokes RFC 2S, RFC3S, and RFC 4S are of the standard 1,000-turn type. A.F. choke AFCS is an audio transformer with primary and secondary in series (aiding).

The "Model 26" chassis is composed of the following units: Condensers C1, C2 C3, C4 are the tuning condensers (ganged); C5, C6, C7, C8, C9, C10, C11, C12, C13, 0.25-mf.; C14, 1.0-mf.; C15, C16, .0005-mf. C17, .04-mf.; C18, C19, C20, 8-mf. (electrolytic); C21, .06-mf.; C22, .0001-mf.

The resistors have the following values R1, R7, 10,000 ohms; R2, R8, R12, 50,000 ohms; R3, 25,000 ohms; R4, R11, 5,000 ohms; R5, R6, 3,000 ohms; R9, 750 ohms R10, 20 ohms (center-tapped); R13, 0.5-meg.; R14, 1,500 ohms. Color code (biasing resistors): green. 3,000 ohms; blue, 5,000 ohms; grey, 10,000 ohms; yellow, 50,000 ohms; brown, 0.5-meg.; red, 1,500 ohms.

The tubes in chasses 26 and 34 test as follows (line potential, 120V.): Filamen potentials, V1S, V2S, V3S, V1, V2, V3 V4, V5, 2.3 volts; V6, V7, 2.3 volts; V8 4.8 volts. Plate potentials; V1S, V1, V2, V3, 160 volts; V2S, 140 volts; V3S, 55 volts; V4, 125 volts; V5, 155 volts; V6, V7, 230 volts. Control-grid bias, V1S, 1.1 volts; V3S, 5 volts; V1, V2, V3, 3.5 volts; V4, 10 volts, V5, 9 volts; V6, V7, 45 volts. Screen-grid potentials; V1S, 70 volts; V2S, (volume control at maximum) 30 volts; V3S, 160 volts; V1, V2, V3, 85 volts. Detector V2S is of the grid-leak and-condenser type; tube V4 is a power detector. Screen-grid tube V3S is connected as an oscillator of the "dynatron" type, (requiring no grid circuit inductance), working at the fixed frequency of approximately 1550 kc. (about 196 meters).

Switches Sw1 and Sw2 (for change-over between long and short-wave units) are ganged. The power pack and long-wave chasses are connected by a 5-wire cable terminating in plugs; to this cable is connected a 4-wire cable for the short-wave chassis.

The cable color codes are as follows: 5-wire cable; 1, large black; 2, large white; 3, red; 4, black; 5, yellow. In the 4-wire cable, on the contrary, they are: 1, black; 2, white; 3, small black; 4, red.

Facing the unit, the shielded coil at the left, toward the rear, is the 50-100 meter coil; shielded coil at right front corner 25-50 meters; unshielded coil in center of base, 15-25 meters.

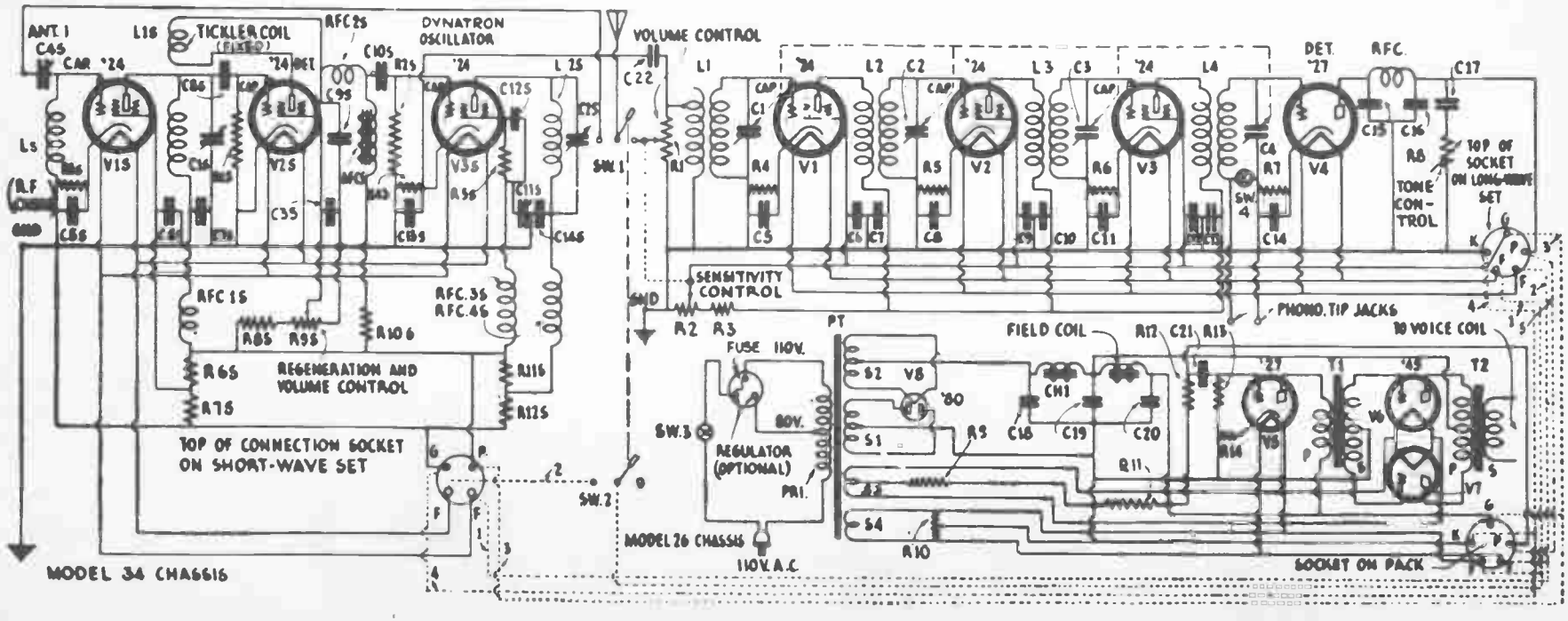
The midget condenser C2S tunes the oscillator in the neighborhood of 1500 kc., and compensates for variation in internal tub capacities.

The following modifications for increasing the sensitivity of the "Model 826B" receiver are recommended only to the experienced Service Man, and are to be applied with care: Change C13S to .04-mf., and shunt the old 0.25-mf. unit across C14S. Replace C22 by a .002-mf. unit. The shielding of the oscillator output wire must be grounded to the chassis. A good ground connection must be used for the combination set. Tube variations will be more evident in a set of this nature and, for best results, it is advisable to try several of each type;

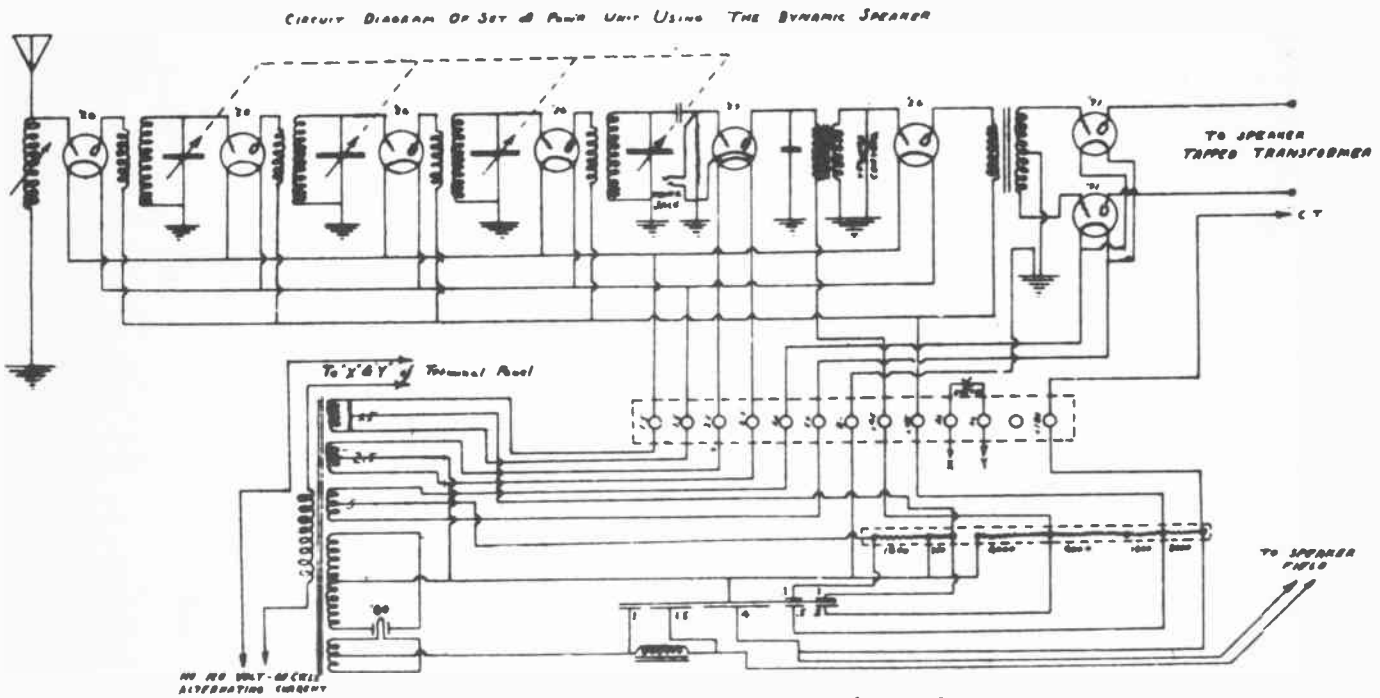
All shielding must be fastened tightly The shielded coil at the rear center of the base is L2S; midget condenser C2S is on its shield top.

Referring now to the "Model 26" chassis, the dynamic reproducer field coil has a resistance of 2250 ohms. Note that all wiring must remain in the original positions. Phonograph pick-up switch Sw4 is part of R1-R2. Abnormal hum with chassis inverted is natural, and due to the disturbance of the electrolytic condensers; otherwise, exceptional hum (in normal position) often may be corrected by interchanging the connections of the electrolytic condenser sections.

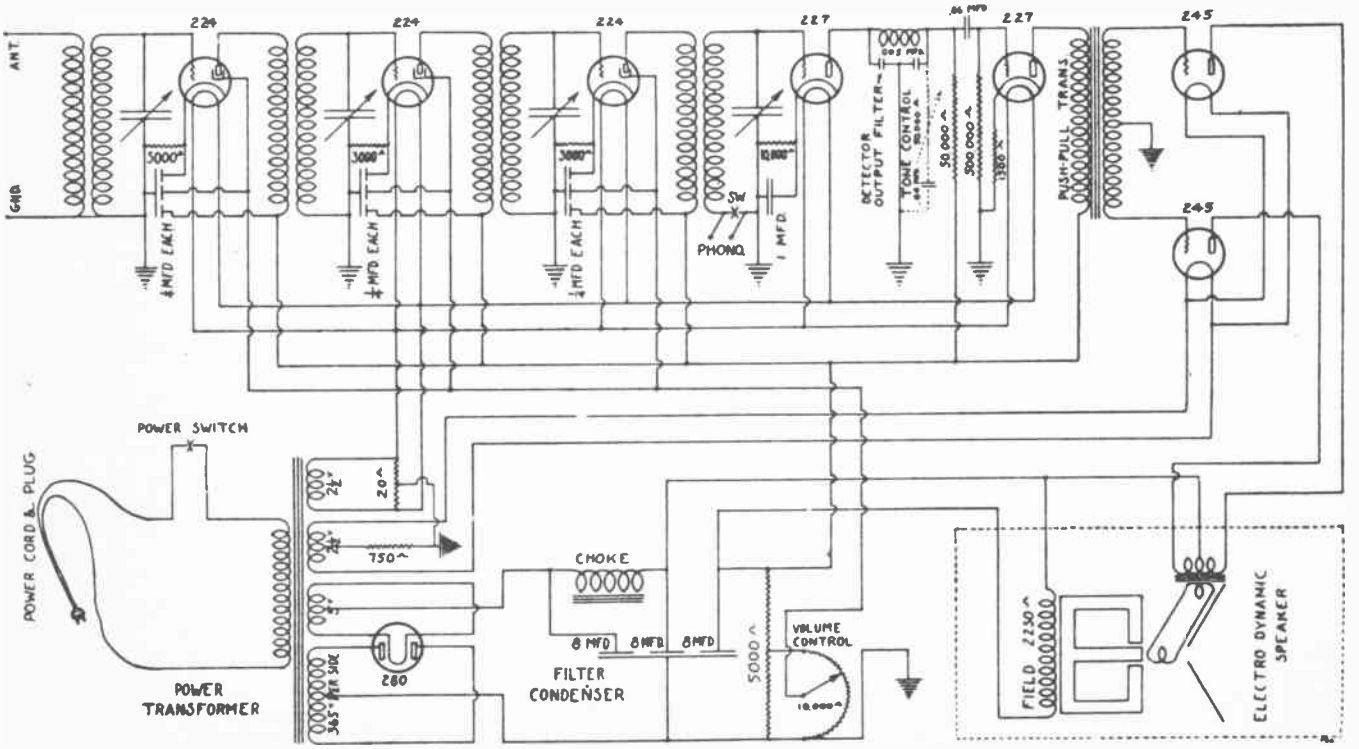
Test for circuit oscillation only with chassis right-side up and with base-plate screwed on. If one R.F. coil becomes defective, change the set of four (otherwise, volume and selectivity may not be satisfactory). The line fuse is in a plug which is to be removed if the regulator tube is used. Excessive circuit oscillation may be to open or high-resistance R3 (graphite).



COLIN B. KENNEDY CORP.



KENNEDY ROYAL-80



MODEL 30 AND 32

Radio Service Data Sheet

KOLSTER K20, K22, K25, K27 AND K37 SIX-TUBE RECEIVERS

Before proceeding with a detailed description of these Kolster receivers, of which the "K20" is the most popular representative, we will point out the major differences that differentiate the several models broadly referred to as the "six-tube" sets. The "K20" model is a table-type radio receiver incorporating the four-tube chassis and the two-tube audio amplifier, which is combined with the 60 cycle power-supply unit shown in the schematic circuit; the "K25" has the same general design for operation on 25 cycles. The "K22" is a console arrangement of the tuner chassis and power pack used in the K20; while the "K27" is a console adaptation of the 25-cycle equipment. Another model of the Kolster line was designed for use as a portable demonstrator; this number, the K37, employs the circuit of the K20.

The service department of the Kolster Radio Corp. points out that the use of a lamp for testing continuity in the Kolster sets will probably cause the grid resistors R1, R2 or R3 to burn out; a high-resistance meter and low voltage should be used, instead.

The unit at the left end of the panel, constituting the "sensitivity" control, comprises a tap-switch controlling the inductance value in the antenna coil that is being used; and also tunes the combined variometer and variocoupler L1.

It is pointed out that the low-frequency response characteristic of the A.F. transformers used in these sets is particularly good and this should be considered when there is a complain of exceptional hum; for the least bit of disturbance of the circuits may develop an A.C. hum that would not be evident in many other makes.

Volume control is centered in R5.

Following are the values of the parts used in all the models mentioned above: Resistors R1, R2, R3, 1700 ohms; R4, 2 or 5 megs.; R5, 25,000 ohms; R6, R7, 6 ohms. These values are found in the vitreous voltage-divider: R8, 840 ohms; R9, 60 ohms; R10, 220 ohms; R11, 3,000 ohms; R12, 3,000 ohms.

Condensers C5, C6, C7 are 45-mmf. capacity; C8 is .00025-mf.; C9, .002-mf.; C10, C11, 0.6-mf.; C12, 1.0-mf., 400 V.; C13, 2 mf., 160 V.; C14, 2 mf., 400 V.; C15, 2 mf., 400 V.; C16, 1.0 mf., 400 V. The condenser bank in the power pack contains units that may be identified by the following color code for the leads: C12, blue, and yellow; C13, black, and green; C14, gray, and brown; C15, red, and brown; C16, orange, and black with white tracer. The values given are for 60-cycle operation; for 25-cycle operation the following changes are to be noted: condenser C16 has a capacity of 4 mf., and returns to the tap between R8 and R9, instead of the tap between R9 and R10 (chassis ground).

Choke Ch1 has a resistance of 3,000 ohms; Ch2, 1,300 ohms; Ch3, 800 ohms.

Jack J is the provision for phonograph pick-up connection.

Pilot light V8 is of the 2.5-volt type and operates at 2.2 volts.

Hum control resistor R6 is located at the top right front corner of the tuner chassis; while hum control R7 is placed at the rear.

The tube sockets mounted along the back of the receiver chassis, are in numerical order; with V1 at the left and V4 at the right, behind the grid leak.

Following are the average normal voltages at the terminals on the connection panel: 1-2 (R.F. filament) 1.5 V., A.C.; 3-6 (heater bias) —3 V., D.C.; 3-5 (detector plate) +45 V., D.C.; 3-7 (grid bias) —6V., D.C.; 4-7 (R.F. plate) +90 V., D.C.; 8-9 (detector heater) 2.2 V., A.C. The power-transformer output is 300 volts A.C. on each side of the center tap.

Accidental grounds of instruments to chassis may be due to defective fiber washers.

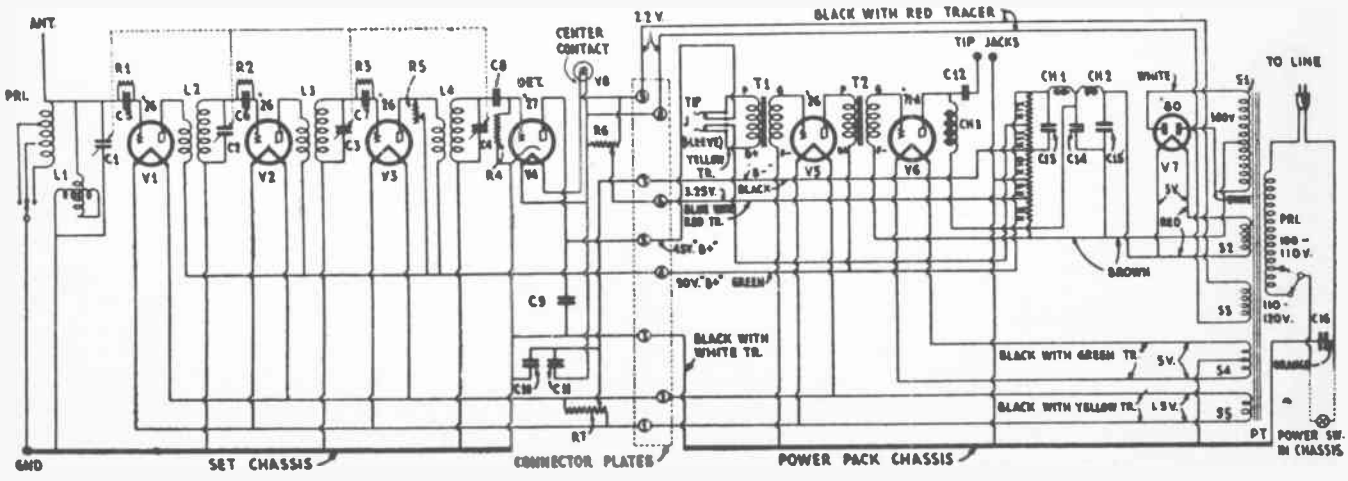
Circuit oscillation may occur in any receiver; the possible sources of the trouble will vary with the individual design of each receiver. In the case of Kolster sets incorporating the circuit shown, this fault may usually be localized to one of the following causes: poor tubes; shorted R1, R2 or R3; excessive voltage at tap 4 on the connector plate; C10 or C11 open or shorted, antenna too long; poor ground conditions; reversed primary winding of the special R.F. transformer combination L1; shorted C5, C6, C7, C8 or C9; or open C9.

Microphonic howl will yield to service attention directed with regard for the same factors as mentioned above in connection with circuit oscillation. Substitution of a 5-meg. resistor, for the more usual value of 2 megs. in the grid leak R4, is sometimes a successful curative measure. Additional palliatives may be necessary; such as changing the positions of the exposed corner plates of C5, C6 and C7, and noting the result upon retuning; or bending the bus-bar leads to the circuit balancing condenser at the right of the variable condenser gang (and therefore on the side toward the connector plate—as we call the power pack-chassis connection posts) so that it is further removed from the shield of this 4-gang component. (This variable condenser, in shunt with C4, is not shown in the schematic circuit.) Increasing the value of R1, R2 and R3, up to 2,100 ohms each, also may reduce the sensitivity to a satisfactory value. If the resistors in the grid leads of V1, V2 and V3 are uniformly changed in value the balance in these circuits will not be disturbed. Another resort may be to remove entirely one of the grid condensers, preferably C6, (leaving the shunting resistor in circuit). A thorough inspection should be made for looseness in the cabinet, and to determine whether the chassis is properly mounted so that it floats on the rubber cushions.

To remove this chassis, first take out the power pack; then unscrew the cap screws in the bottom of the set. Next, remove the three knobs on the control shafts (the antenna switch lever is to be removed by unscrewing a screw and lock-nut; there is also an escutcheon nut to be removed from the control switch, and another nut which fastens the volume-control shaft to the panel).

To replace a drive cord there will be needed a pair of long-nose pliers, a screw-driver, and a No. 7 Spintite wrench. The replacement cord should measure 13 inches, from knot to knot, after being thoroughly stretched. Now, turn chassis upside down and put both ends of cord through the opening in the chassis, so that the cord will loop around the main drive pulley. Next, turn the chassis to obverse side and rotate the tuning drum; so that, holding the drum tightly, one end of the cord can be threaded over the rear idler pulley, underneath the drum, and the cord brought up until the knot can be placed in the socket (at about 12 on the dial). The other end is to be looped over the other idler pulley and under the dial drum to the front of the set; it may then be grasped with the pliers, and the knot caught into the slot in the tension spring provided.

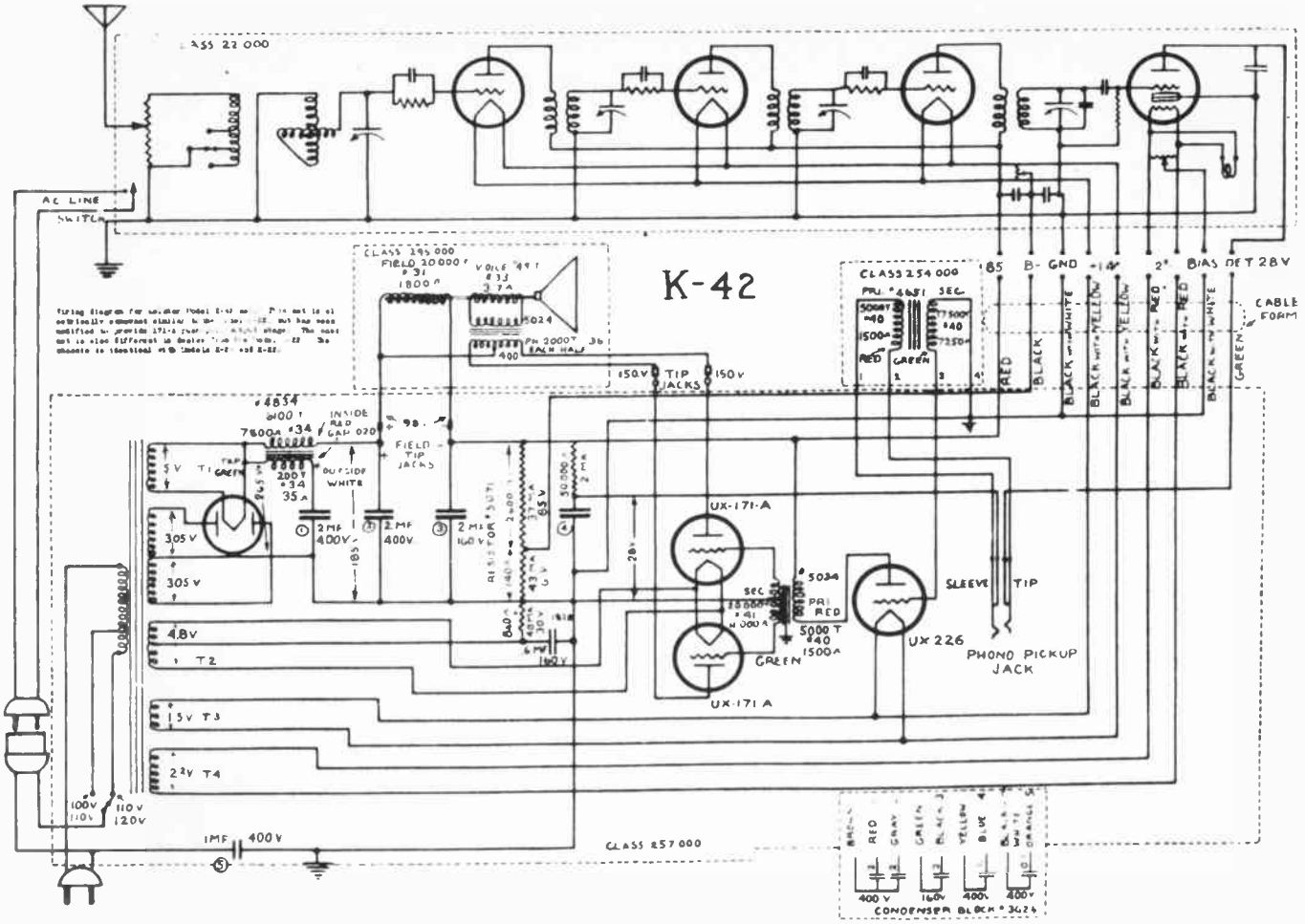
The line-current consumption of these models is 50 watts; and the following resistance values may be used for resistors in series with the line where it is deemed necessary to reduce the line voltage (the first figure is the potential of the line above the desired 110 volts, and the second is the value of the series limiting resistor): 112.7 V., 7.0 ohms; 114.0 V., 10 ohms; 115.1 V., 2.5 ohms; 116.1 V., 15 ohms; 119.0 V., 22 ohms; 122.7 V., 31 ohms; 128.7 V., 45 ohms; 136 V., 62 ohms.



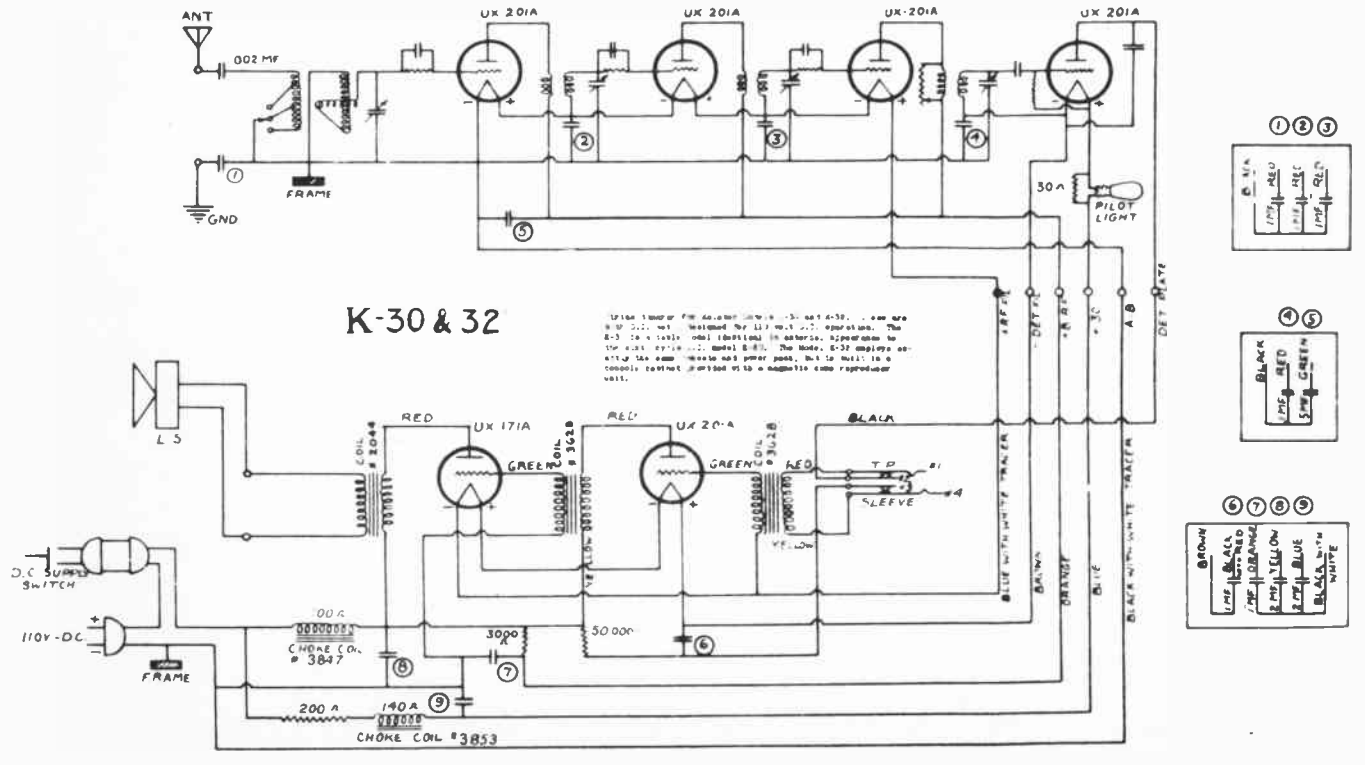
Above, the circuit used in the group of Kolster models listed at the top of the page. The details and connections of the R.F. chassis (left) and the audio amplifier and power pack (right) are those of the 60-cycle models.

KOLSTER RADIO CORP.

K-42

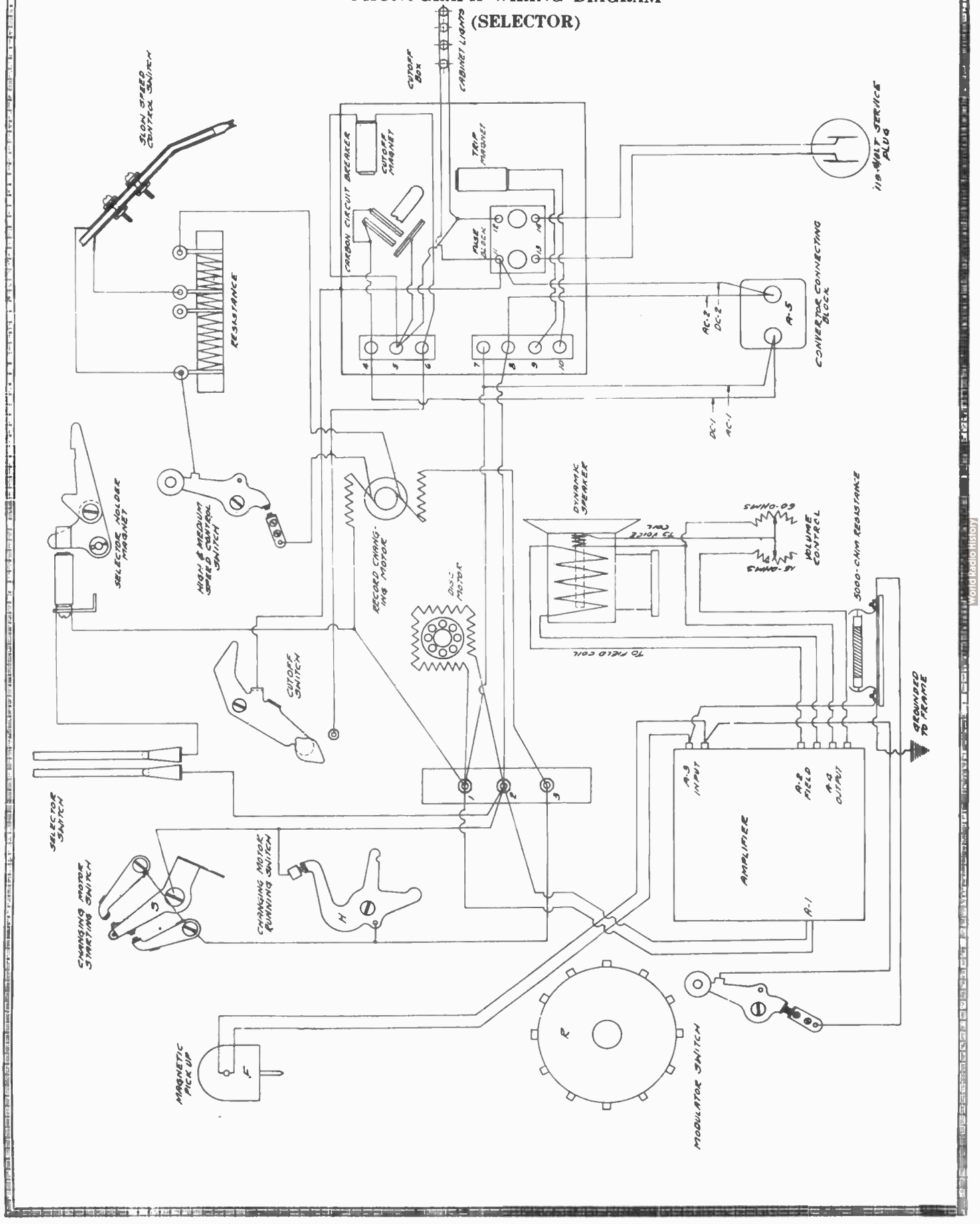


K-30 & 32

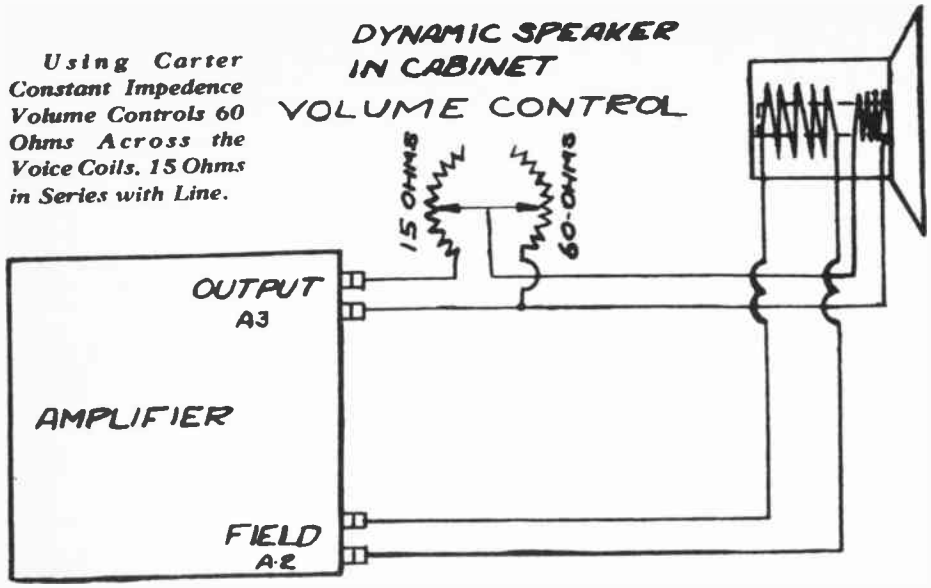


MILLS NOVELTY CO.

PHONOGRAPH WIRING DIAGRAM
(SELECTOR)

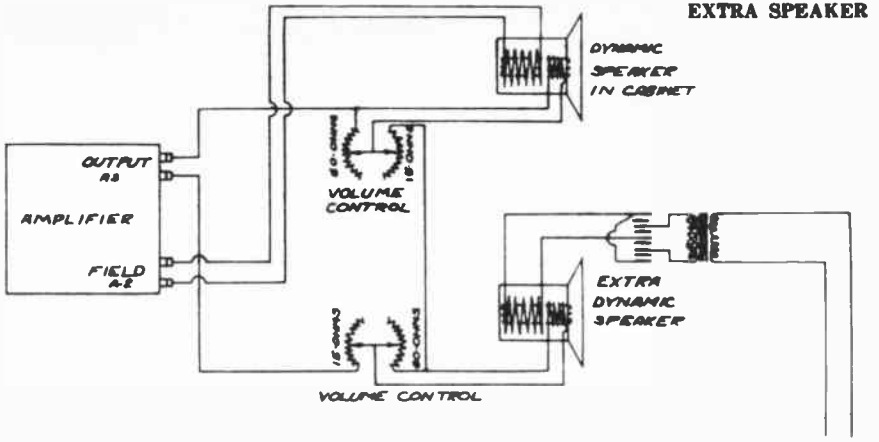


Using Carter Constant Impedence Volume Controls 60 Ohms Across the Voice Coils. 15 Ohms in Series with Line.



PHONOGRAPH SPEAKER WIRING DIAGRAM WITH EXTRA SPEAKER

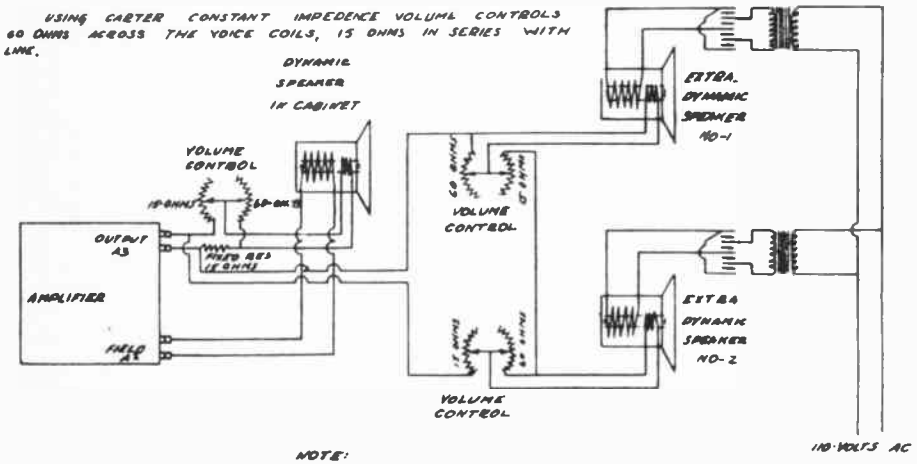
USING CARTER CONSTANT IMPEDENCE VOLUME CONTROLS 60 OHMS ACROSS THE VOICE COIL & 15 OHMS IN SERIES WITH LINE



NOTE
EXTRA SPEAKERS FOR MILLS PHONOGRAPH ARE A SPECIAL TYPE AND MAY BE PURCHASED AT MILLS NOVELTY COMPANY

PHONOGRAPH SPEAKER WIRING DIAGRAM WITH TWO EXTRA SPEAKERS

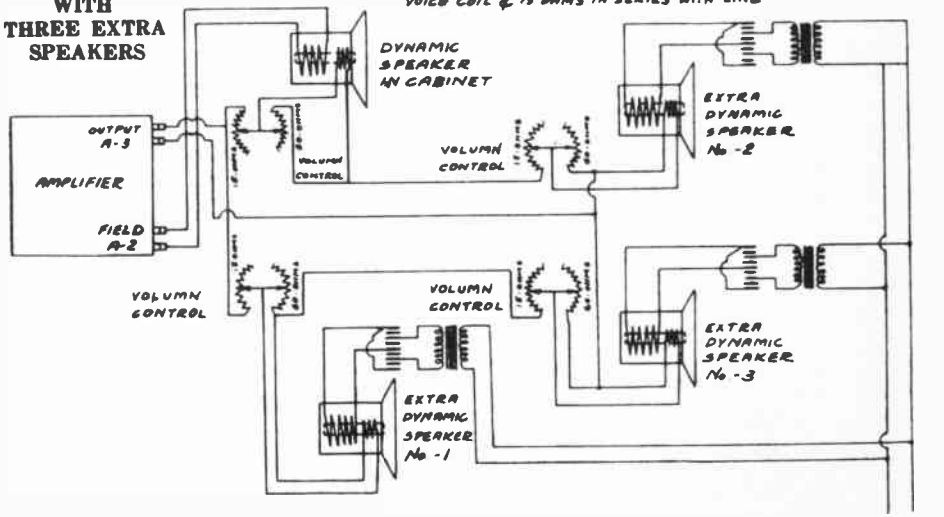
USING CARTER CONSTANT IMPEDENCE VOLUME CONTROLS 60 OHMS ACROSS THE VOICE COILS, 15 OHMS IN SERIES WITH LINE.



NOTE:
EXTRA SPEAKERS FOR MILLS PHONOGRAPHS ARE A SPECIAL TYPE AND MAY BE PURCHASED AT MILLS NOVELTY COMPANY

PHONOGRAPH SPEAKER WIRING DIAGRAM WITH THREE EXTRA SPEAKERS

USING CARTER CONSTANT IMPEDENCE VOLUMN CONTROLS - 60 OHMS ACROSS THE VOICE COIL & 15 OHMS IN SERIES WITH LINE

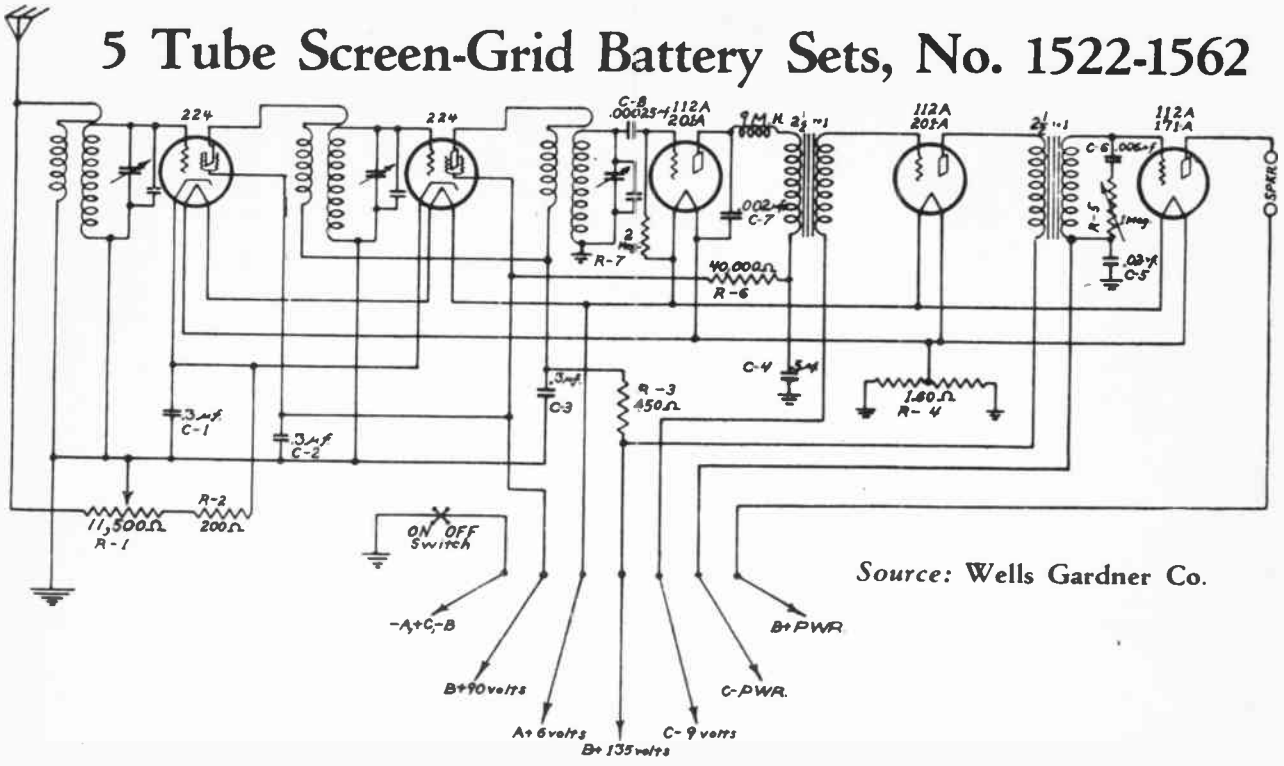


NOTE:-
EXTRA SPEAKERS FOR MILLS PHONOGRAPHS ARE A SPECIAL TYPE AND MAY BE PURCHASED AT THE MILLS NOVELTY COMPANY

MILLS NOVELTY CO.

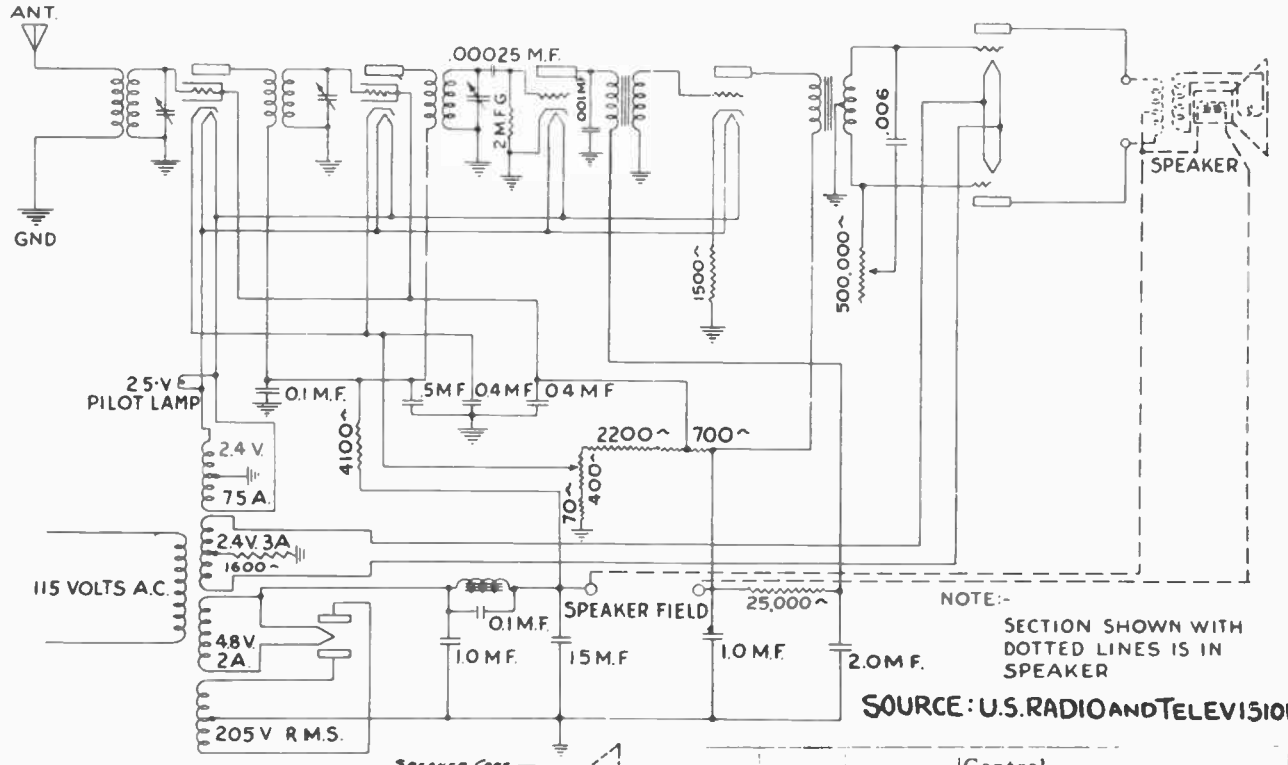
MONTGOMERY WARD & CO.

5 Tube Screen-Grid Battery Sets, No. 1522-1562

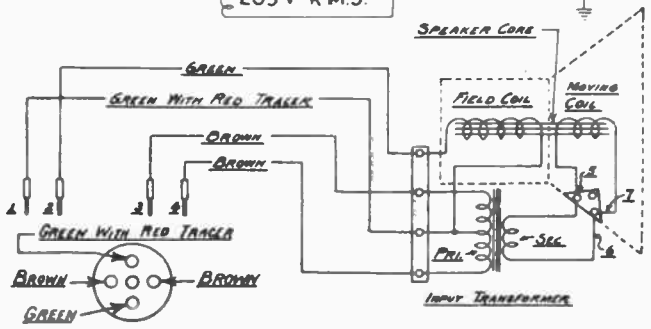


Source: Wells Gardner Co.

Seven Tube A. C. Screen Grid Receiver, Nos. 2822, 2827, 2895, 2897



SOURCE: U.S. RADIO AND TELEVISION CORP.



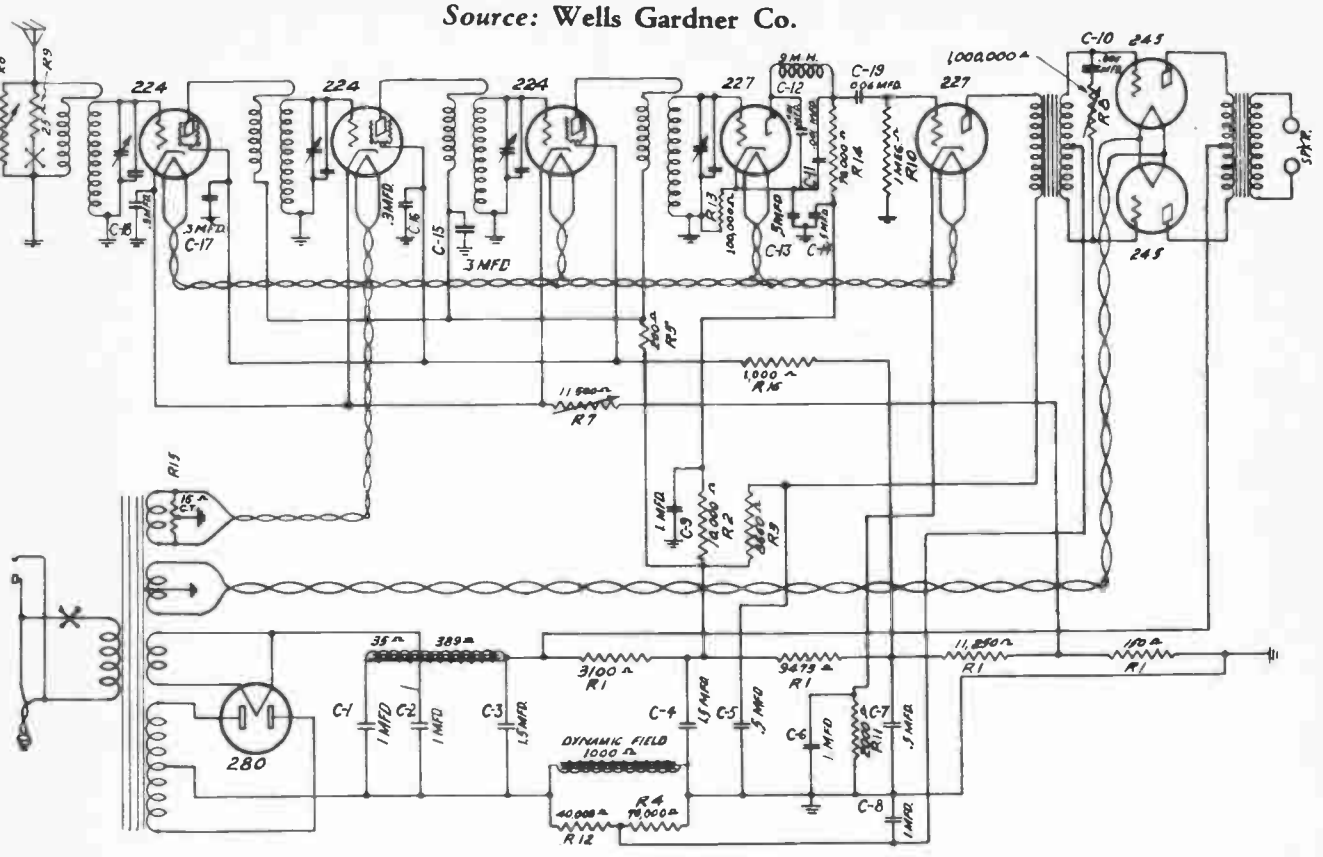
Type of Tube	Position of Tube	"A" Volts	"B" Volts	Control Grid "C" Volts	Screen Volts	Screen Current	Cathode Volts	Plate MA
224	1	2.36	173	2.72	86	.87	2.72	3.0
224	2	2.31	173	2.72	86	.21	2.72	3.0
227	3	2.28	38	0			0	2.8
227	4	2.28	100	6.1			6.1	3.25
245	5	2.29	169	38				11.3
245	6	2.29	169	38				11.3
280	7	4.61						34.5 Per Plate

Volume Control at Maximum

MONTGOMERY WARD & CO.

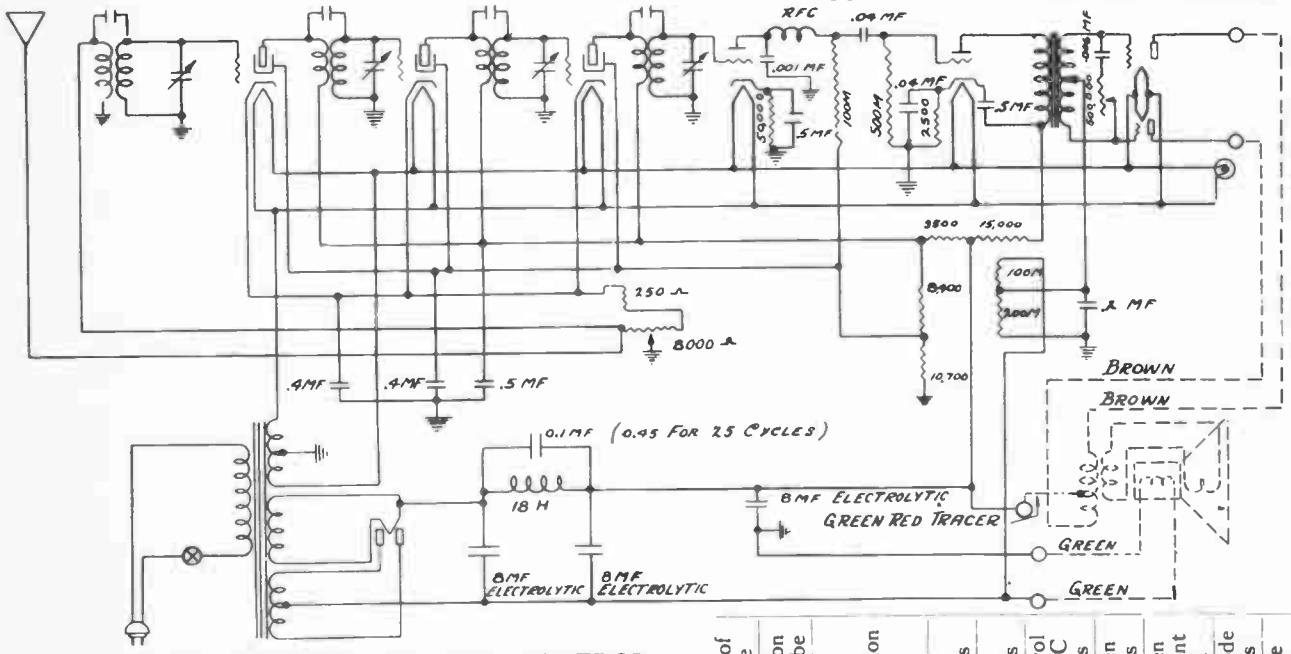
Eight Tube A. C. Screen Grid Receiver, Nos. 2955 and 2957

Source: Wells Gardner Co.



Eight Tube A. C. Screen Grid Receiver, Nos. 3035, 3037, 3065 and 3067

Source: U. S. Radio and Television Corp.



VOLTAGES AT SOCKETS—VOLUME CONTROL AT MAXIMUM—LINE VOLTAGE, 115 PLUG IN SOCKET OF RECEIVER—TUBE IN TEST SET

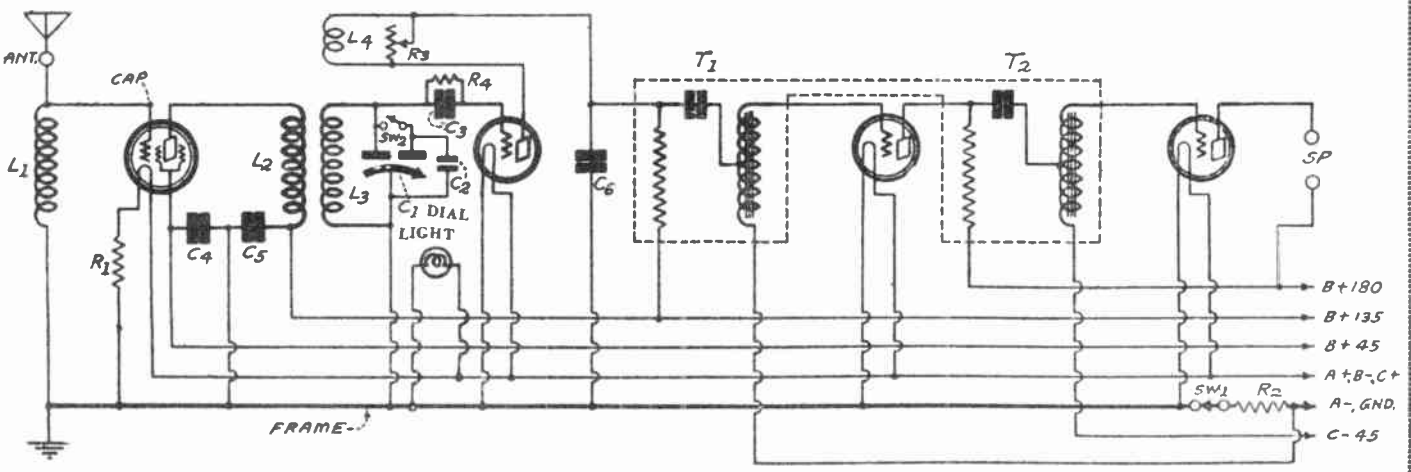
Type of Tube	Position of Tube	Function	A Volts	B Volts	Control Grid C Volts	Screen Volts	Screen Current MA	Cathode Volts	Plate MA	Grid Test MA
224	1	1st Radio	2.25	178	3.0	86	.45	3.0	3.4	5.8
224	2	2nd Radio	2.25	178	3.0	86	.45	3.0	3.4	5.8
224	3	3rd Radio	2.25	178	3.0	86	.45	3.0	3.4	5.8
227	4	Detector	2.25	60	9			9	.25	.3
227	5	1st Audio	2.25	160	12			12	4.5	5.5
245	6	2nd Audio	2.35	246	40				25	30
245	7	2nd Audio	2.35	246	40				25	30
280	8	Rectifier	4.9						Per plate	37

25 Cycle Chassis No. 3067 and 3037

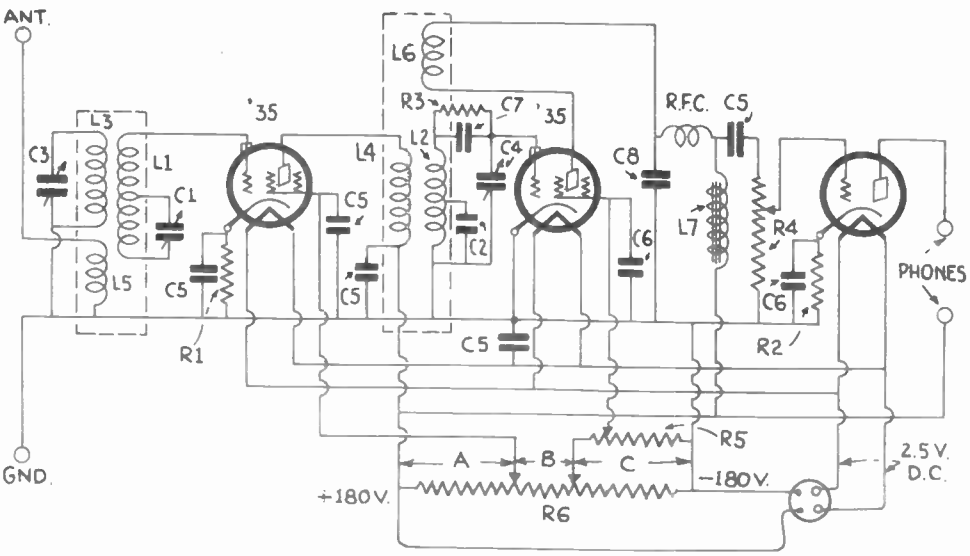
This chassis is the same as the 60 cycle with the exception of the power transformer and the filter choke condenser. A 0.45 M.F. condenser is connected across the choke in the 25 cycle chassis, instead of the 0.1 M.F. condenser as in the 60 cycle chassis.

NATIONAL CO., INC.

NATIONAL SW-4

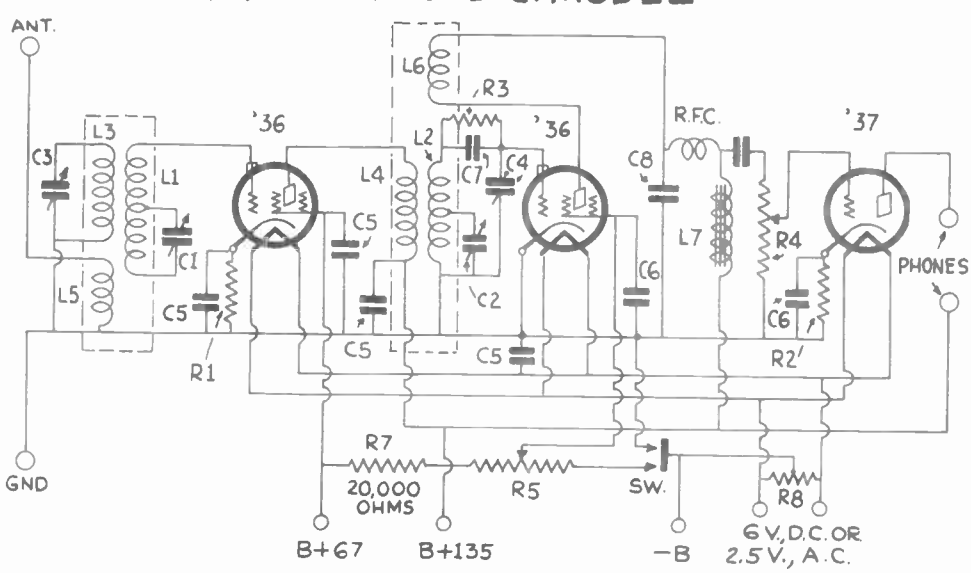


NATIONAL SW-3 A.C. MODEL



L1, L2, L3, L4, and L5 — r.f. transformers.
L6 — 750-henry plate coupling resistor. A good audio transformer with primary and secondary connected in series might be used.
C1 and C7 — 90-mfd. ganged tuning condensers with insulating shaft coupling.
C2 — Midget type trimmer condenser.
C7 — Ganged detector transformer trimmer condenser (incorporated in coil form), Hammarlund No. 15.
C — .01-mfd. non-inductive mica fixed condensers.
C4 — 5-mfd. non-inductive paper fixed condensers.
C8 — 100-mfd. mica grid condenser, small type. Incorporated in detector r.f. transformer.
C5 — 25-mfd. mica by-pass condenser.
R1 — 600-ohm cathode resistor, 2-watt type.
R2 — 2000-ohm cathode resistor, 2-watt type.
R3 — 5-megohm grid leak, one in each detector transformer.
R4 — 500,000-ohm calibrated tapered type potentiometer. See text.
R5 — 50,000-ohm regeneration control potentiometer.
R6 — Bleeder divider, total resistance 12,000 ohms divided as follows: A, 9000 ohms; B, 2000 ohms; C, 1100 ohms.

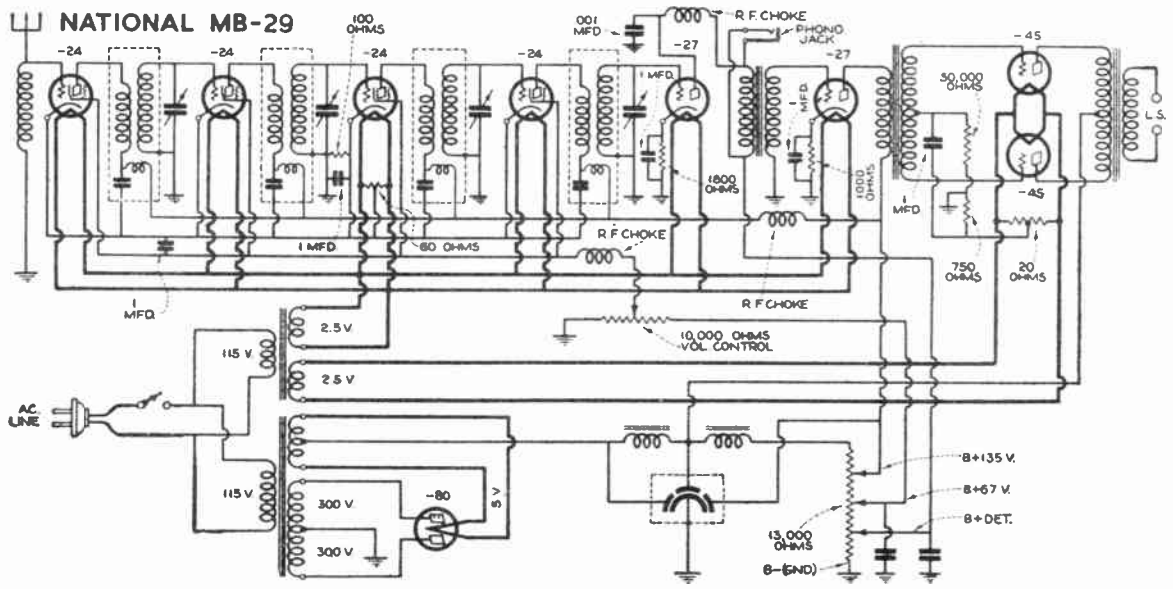
NATIONAL SW-3 A.C.-D.C. MODEL

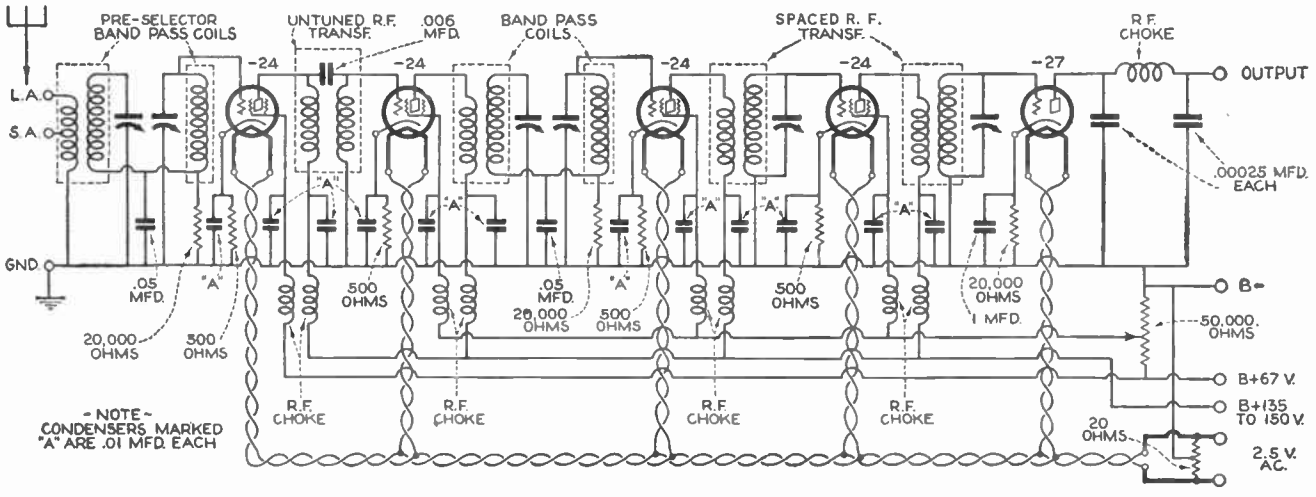


R — 30,000-ohm 2-watt type resistor.
R1 — 50- or 100-ohm filament center-tap resistor, necessary only with a.c. filament supply.
SW — Regeneration control and cathode circuit switch.

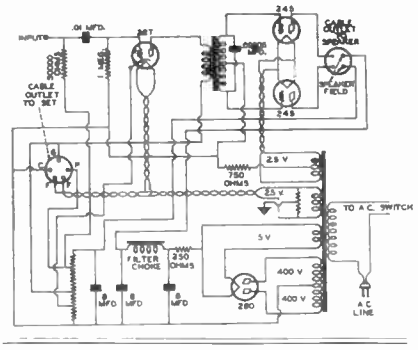
NATIONAL CO., INC.

NATIONAL MB-29





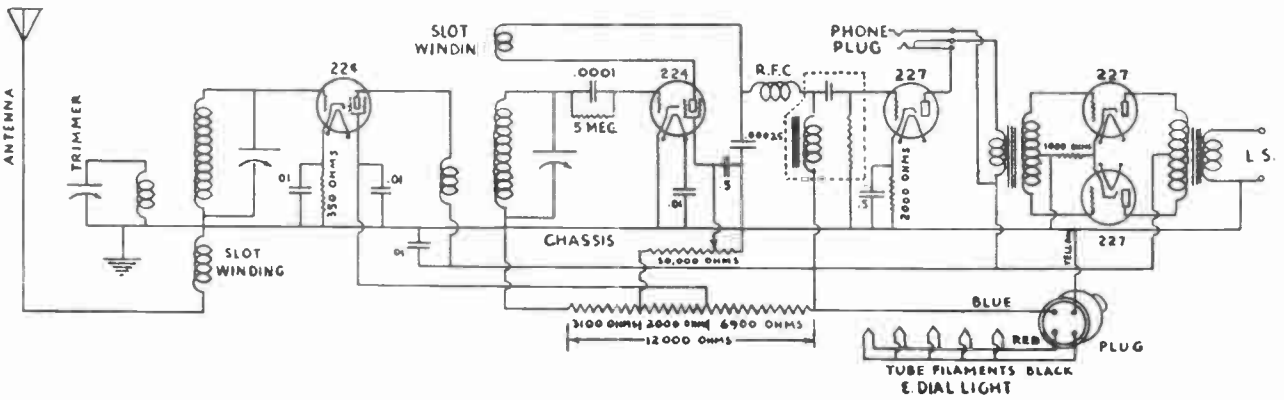
NATIONAL MB-30



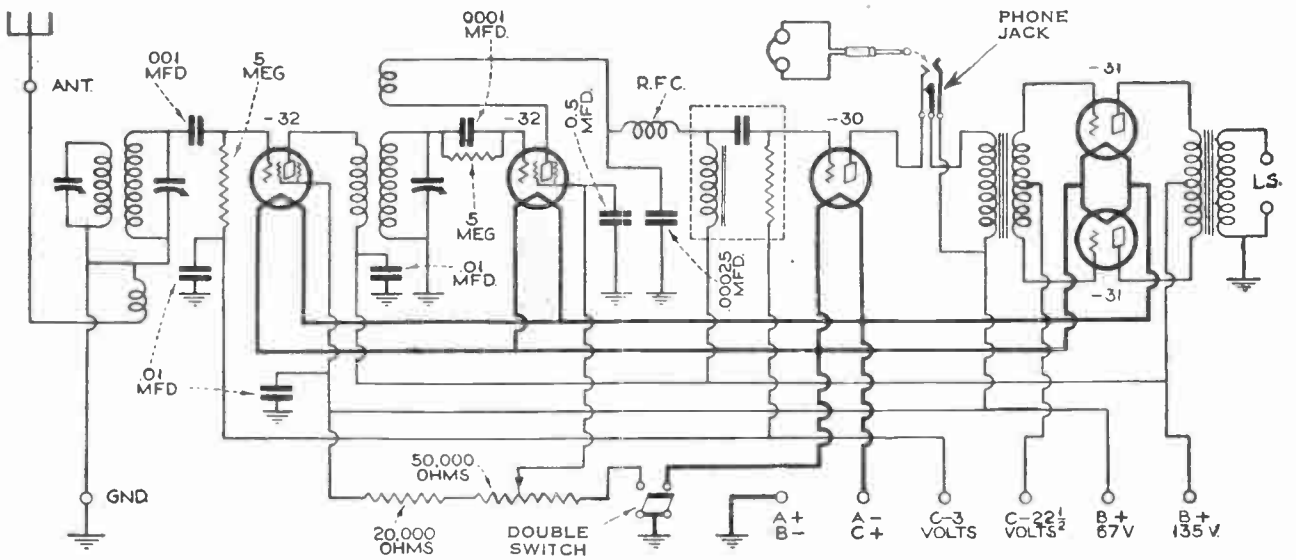
Circuit diagram of the type VSA Speaker-Amplifier for use with the MB30 tuner.

NATIONAL CO., INC.

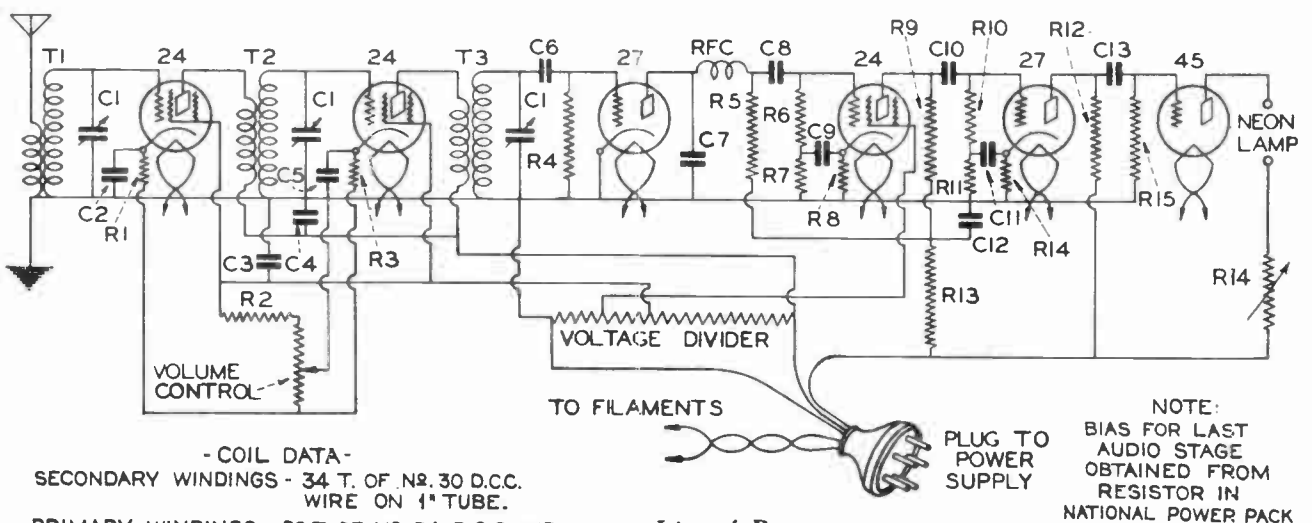
NATIONAL SW-5 — A.C. MODEL



NATIONAL SW-5 — BATTERY MODEL



SPECIAL TELEVISION RECEIVER



NOTE: BIAS FOR LAST AUDIO STAGE OBTAINED FROM RESISTOR IN NATIONAL POWER PACK

- COIL DATA -

SECONDARY WINDINGS - 34 T. OF No. 30 D.C.C. WIRE ON 1" TUBE.

PRIMARY WINDINGS - 20 T. OF No. 34 D.S.C. WIRE.

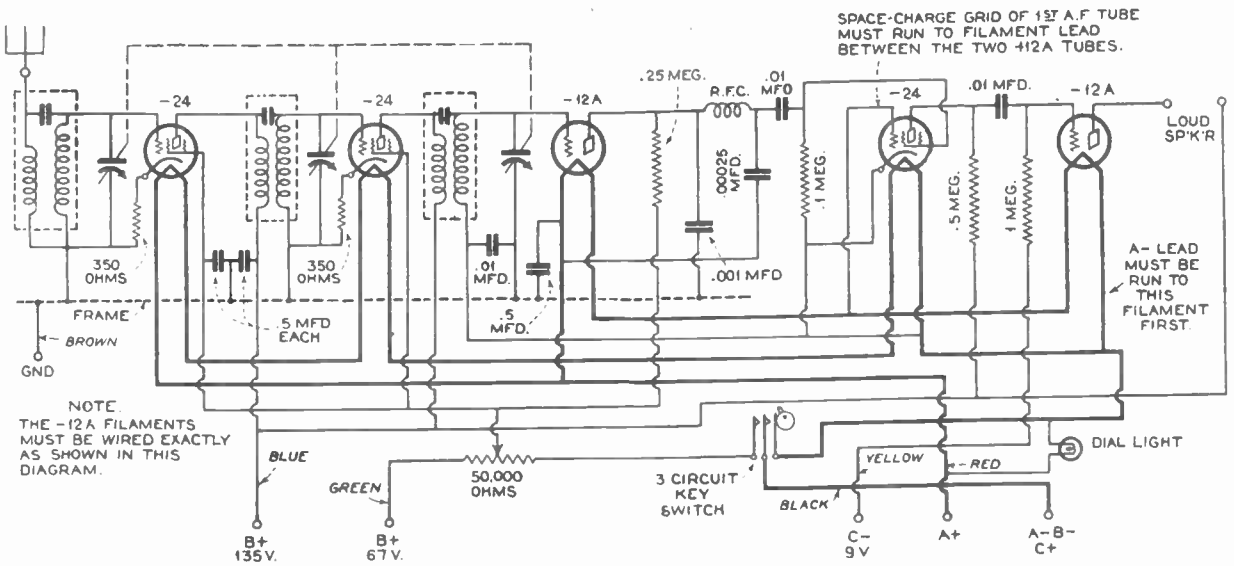
Metal chassis containing 6 sockets, binding posts and necessary mounting brackets; National type E Velvet Vernier Dial; National-Scovil 3 gong Variable Condenser (C1); National shielded R.F. transformers, set of 3 (T1 T2 T3) for television range; Lynch Fixed Resistors; 350 ohms 2 watt R1, 3, 8; 2,000 ohms 2 watts R14; 50,000 ohms 2 watt R11, 7, 13, 5, 9, 12; 5 megohms

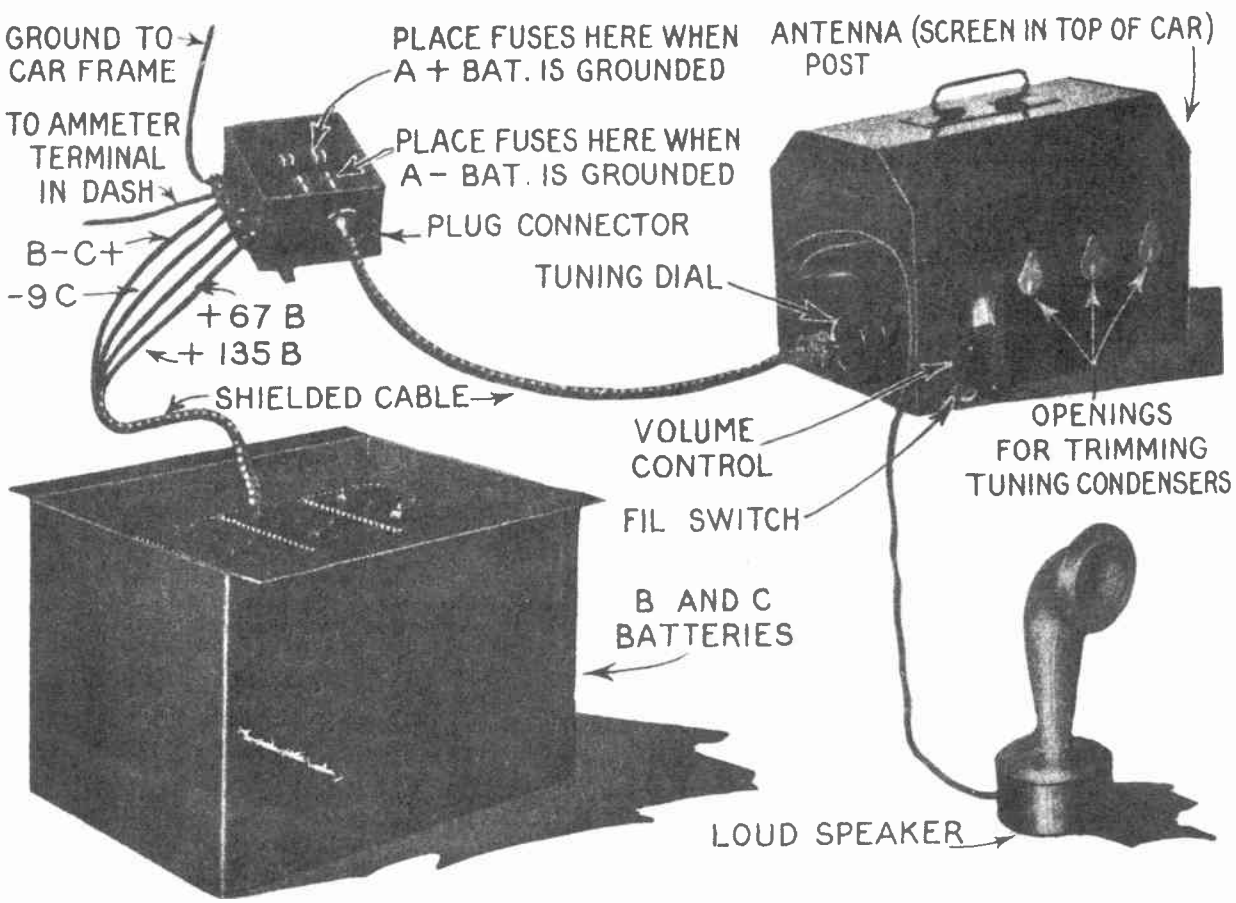
List of Parts

1 watt R4; ¼ megohm 1 watt R6, 10, 15; .5 mfd.—C2, 5, 9, 11, 12; .01 mica—C8, 10, 13; .0002 mica—C6, 7; Aerovox Fixed Condensers; Variable Resistors—R2—50,000 ohms, R14—10,000 ohms (wire); National Voltage Divider; National R.F. Choke; Cable, plug, grid grips, wire, etc.; National Power Pack.

NATIONAL CO., INC.

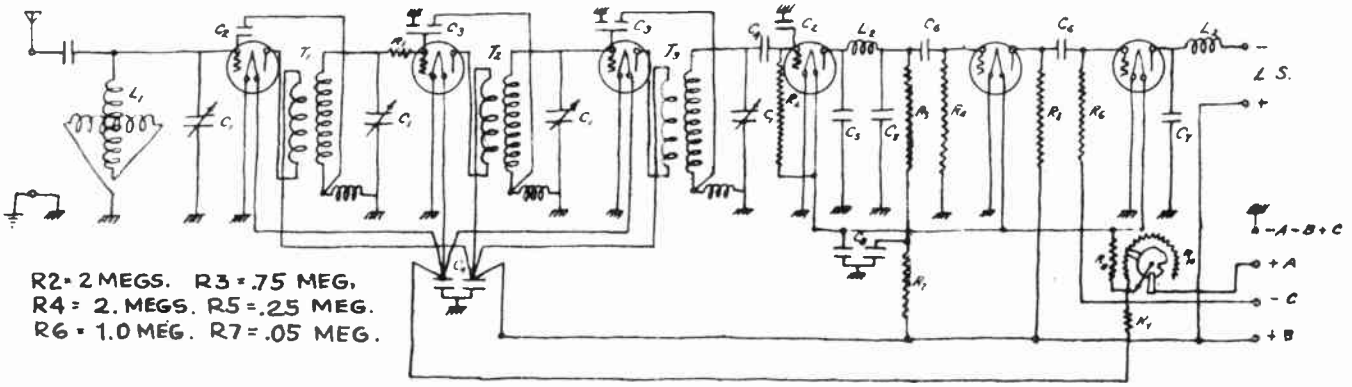
NATIONAL AUTOMOBILE RECEIVER





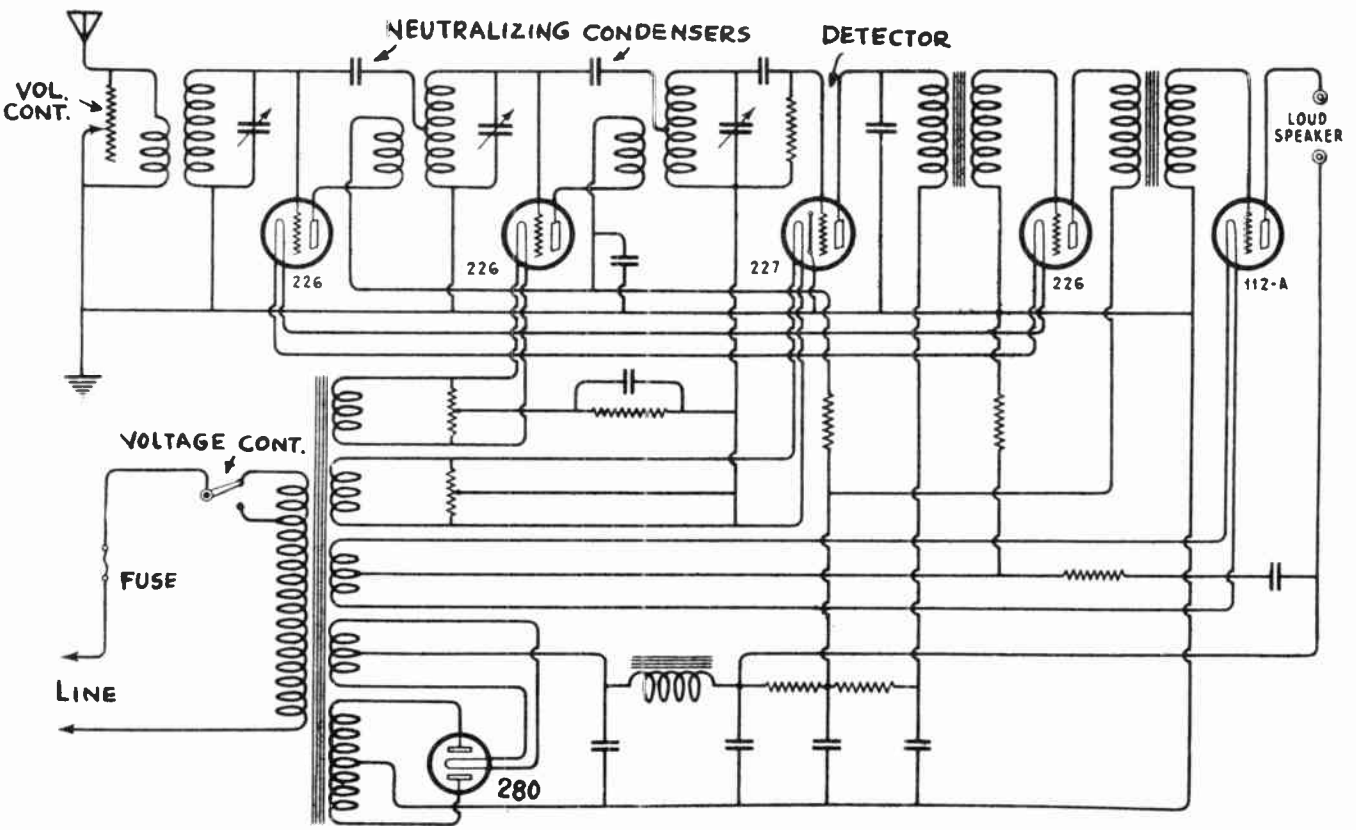
NATIONAL CARBON CO.

EVEREADY MODELS 20-21



R2 = 2 MEGS. R3 = .75 MEG.
R4 = 2. MEGS. R5 = .25 MEG.
R6 = 1.0 MEG. R7 = .05 MEG.

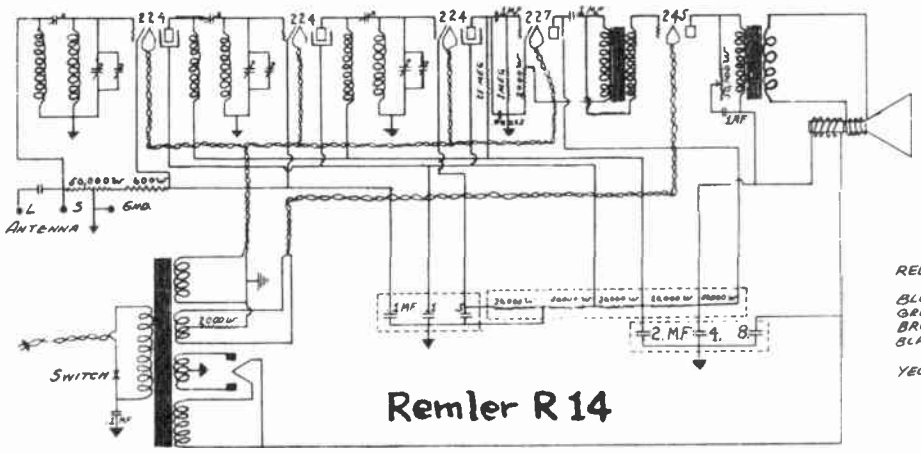
KING MFG. CORP.



KING—MODEL FF

GRAY & DANIELSON MFG. CO.

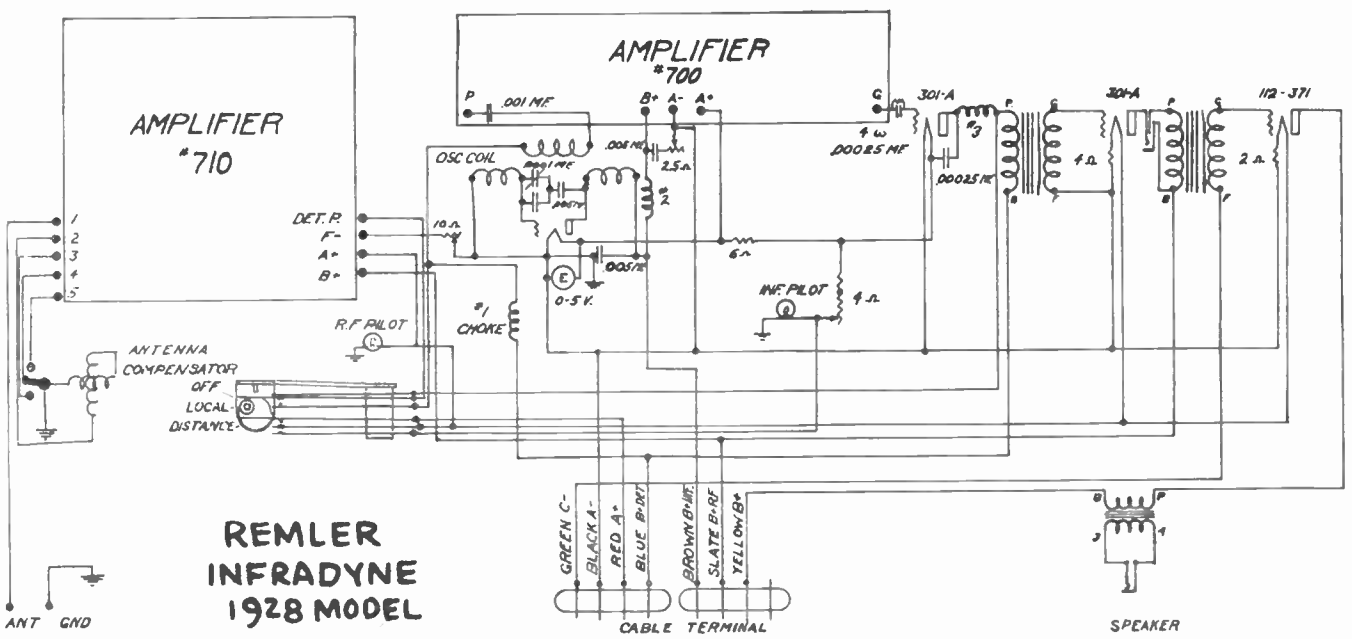
"REMLER" SETS



REMLER R-14

- WIRE COLOR CODE -

RED - FILAMENT RECTIFIER - KATHODE A.F. - PLATE R.F. - PLATE POWER TUBE - SPEAKER FIELD.
BLUE - FILAMENT POWER TUBE - PLATE DETECTOR + B.R.F.
GREEN - KATHODE DETECTOR - GRID POWER TUBE
BROWN - FILAMENT R.F. TUBES AND DETECTOR
BLACK - FILAMENT 1ST A.F. TUBE - DETECTOR KATHODE - SPEAKER VOICE COIL.
YELLOW - SHIELD GRID - PLATE 1ST A.F. - PLATE RECTIFIER



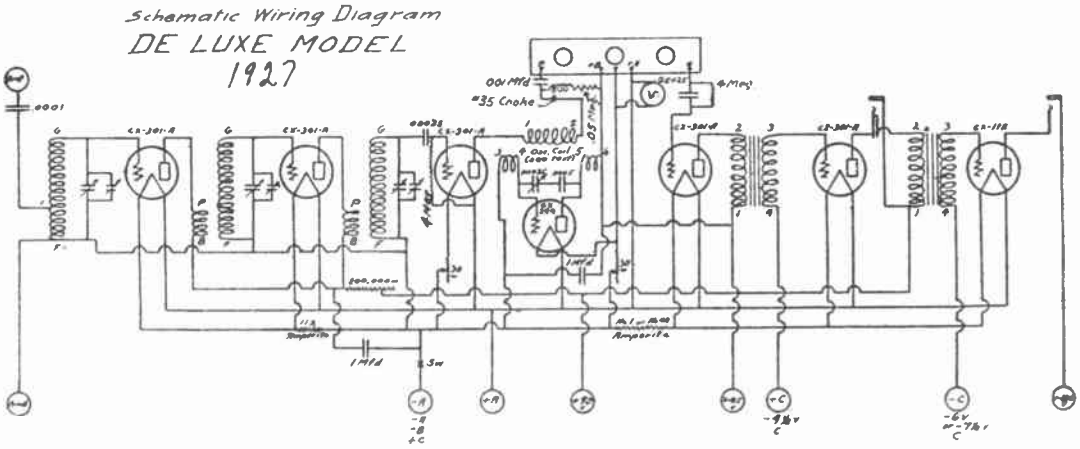
REMLER
INFRADYNE
1928 MODEL

SARGENT-RAYMENT INFRADYNE

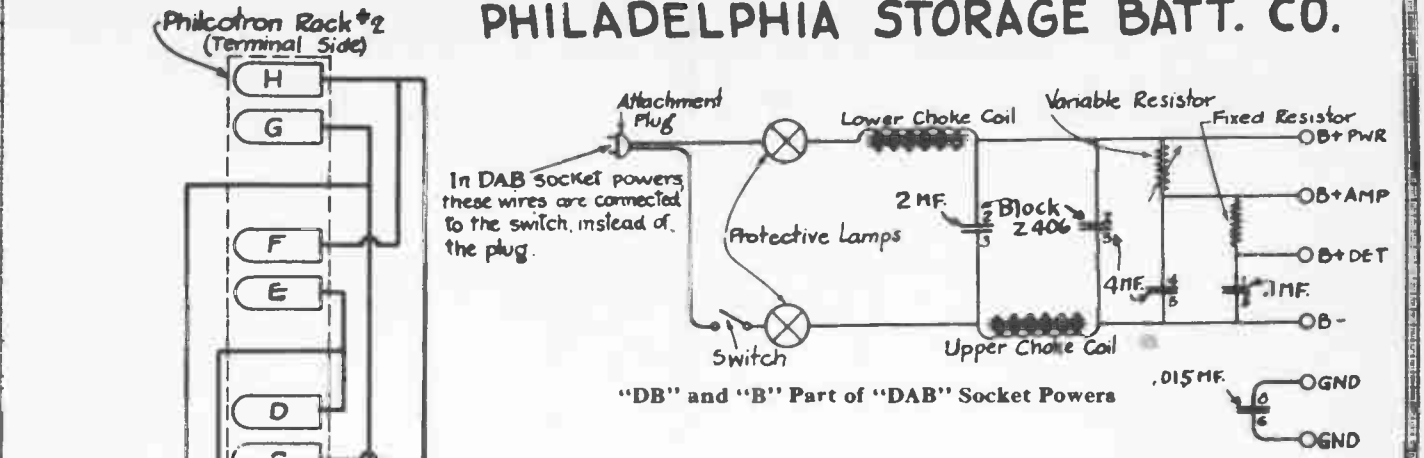
Schematic Wiring Diagram

DE LUXE MODEL

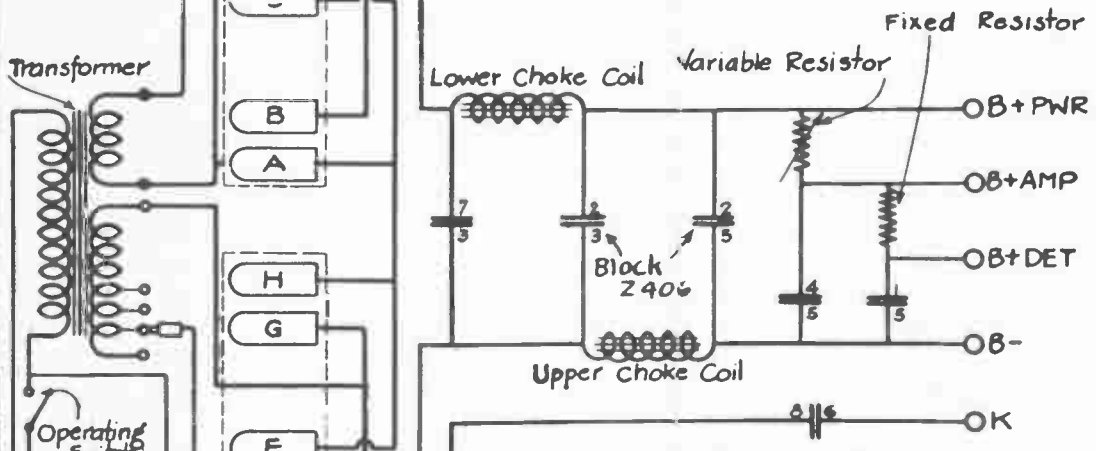
1927



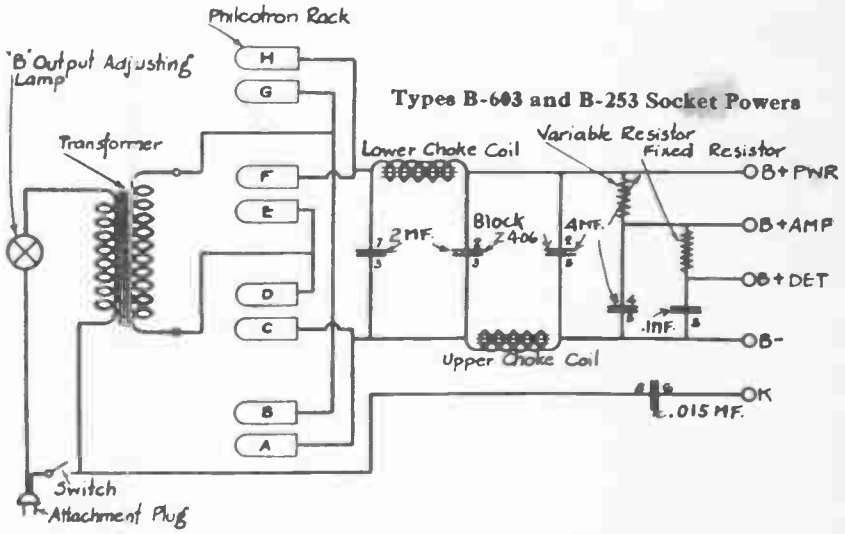
PHILADELPHIA STORAGE BATT. CO.



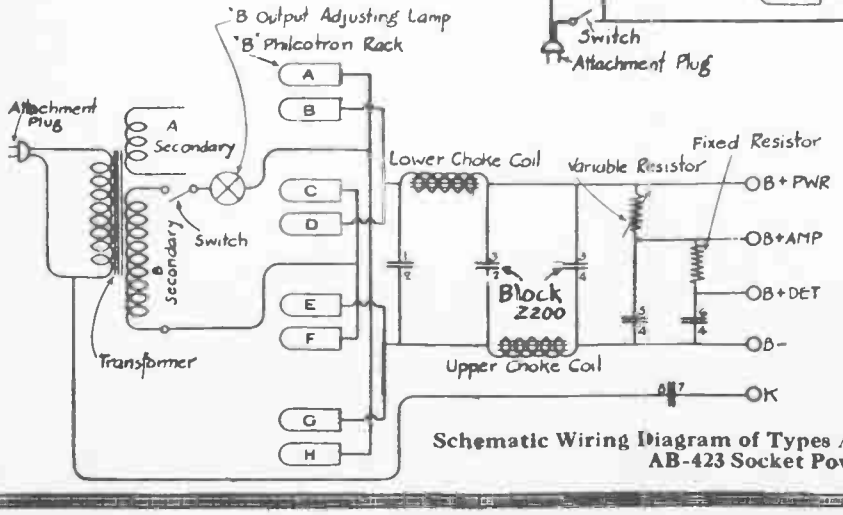
"DB" and "B" Part of "DAB" Socket Powers



Schematic Wiring Diagram of 180-Volt "B" and "B" Part of 180-Volt "AB" Socket Powers



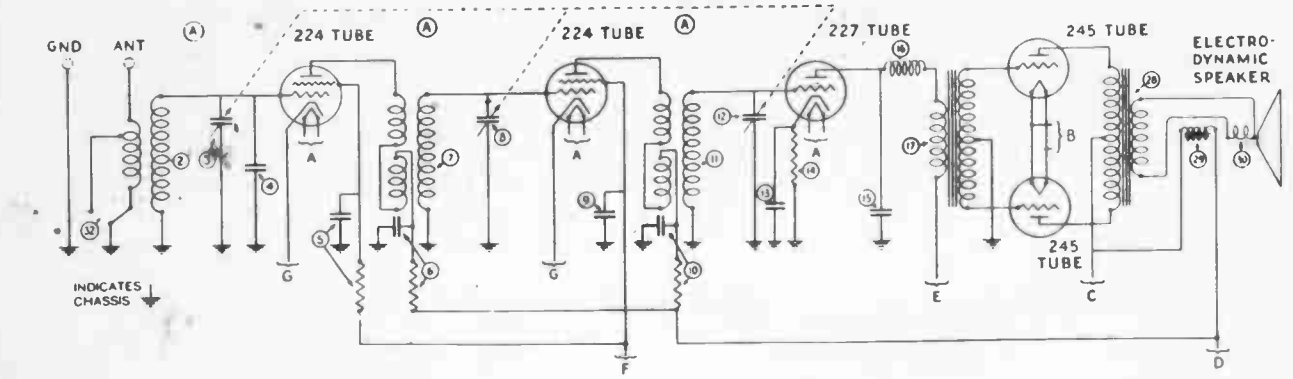
Types B-603 and B-253 Socket Powers

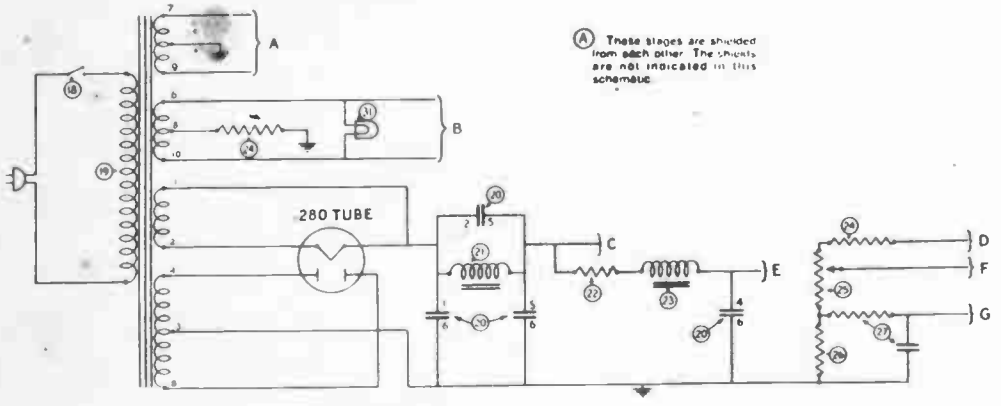


Schematic Wiring Diagram of Types AB-663, AB-623, AB-463, AB-423 Socket Powers

PHILADELPHIA STORAGE BATT., CO.

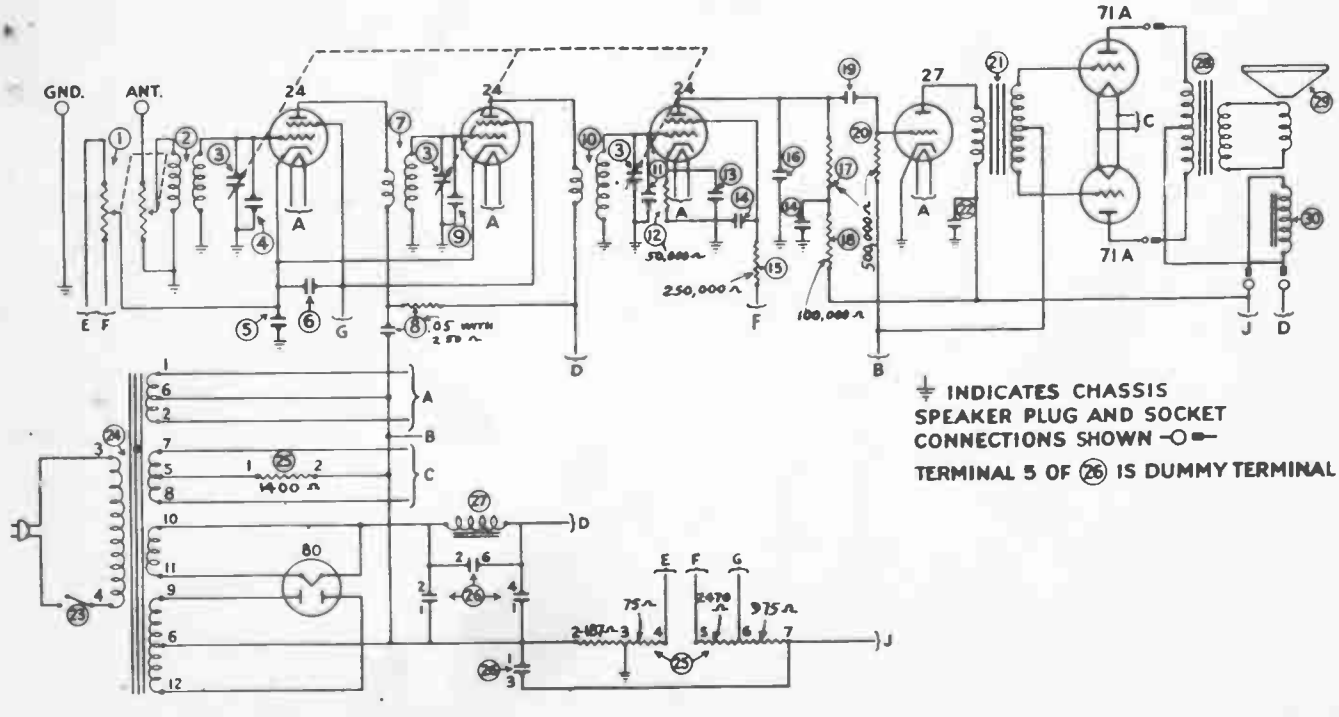
Philco Model 65





Ⓐ These stages are shielded from each other. The shields are not indicated in this schematic.

Models 20 and 20-A



⏚ INDICATES CHASSIS
SPEAKER PLUG AND SOCKET CONNECTIONS SHOWN -O-
TERMINAL 5 OF (26) IS DUMMY TERMINAL

Radio Service Data Sheet

PHILCO "SCREEN-GRID PLUS" RECEIVERS MODELS 92, 95, 95E, 96, 96A, 96E, 296, 296A, 296E.

Perhaps the best known type of radio receiver made by the Philadelphia Storage Battery Company, Philadelphia, Pa., is found in the line of "Screen-Grid Plus" chasses. The circuits used in the various models differ as follows: "Model 92" is a 25-cycle model; the "Model 95," the standard 60-cycle, 110-volt chassis, which is illustrated below; the "95E" is a 210-270-volt model, of the "95"; "Model 96" adds a tone control; the "96 A" is designed for 25-cycle operation; "96 E" is the "96" for 210-270-volt line supply. "Model 296" is the "96" in combination with a phonograph; "296A," the same for 25-cycle supply; and "296E" is equipped to use a 2 0-270- volt power supply.

Automatic volume control and the "Multiplex" linear power detector V4, which has two element or "diode" connection of the type '27 tube giving exceptionally fine audio quality characterize these "Screen-Grid Plus" Philco models.

Since the "95" is the foundation circuit, and is illustrated in the figure, data directly applicable to it will be first considered.

The parts indicated in the diagram have the following values: Condensers C are the aligning condensers; C1, C2, C3, C4, the tuning capacities; C5, C6, C7, C8, C9, C10, C11, C17, C22, C29, 0.15-mf.; C12, .0005 mf.; C13, C19, 0.5-mf.; C14, C18, .05-mf.; C15, C20, C27, 1.0-mf.; C16, C28, .0025-mf.; C21, .01-mf. (each); C23, 0.25-mf.; C24, C26, .2 mf.; C 25, 0.15-mf.

The resistors measure as follows: R1, 5,000 ohms; R2, 20 ohms; R3, R16, R18, 70,000 ohms; R4, R5, R7, R12, 250 ohms; R6, R11, R13, R14, ½-meg.; R8, R19, 13,000 ohms; R9, R10, R21, 1/10-meg.; R15, R25, ¼-meg.; R17, 25,000 ohms; R20, 8,300 ohms; R22, R23, 70 ohms each side; R24, 800 ohms. Choke Ch measures 200 ohms.

Early models of the "95" did not have resistors R7 and R12; these units having been added shortly after production started. Their inclusion in the circuit prevents oscillation when using the "Loc." terminal.

Following are the readings indicated for the average set analyzer: filament potentials; V1, V2, V3, V4, V5, V6, 2.15 volts; V7, V8, 2.2 volts; V9, 4.5 volts. Plate potentials; V1, V2, V3, 155 volts; V4, zero; V5, 27 volts; V6, 85 volts; V7, V8, 250 volts. Control-grid potentials, V1, V2, V3, zero; V4, V5, 0.5-volt; V6; 0.2-volt to 2.0 volts; V7, V8, 41 volts. Screen-Grid potentials, V1, V2, V3, 95 volts. Cathode potentials, V1, V2, V3, 5.3 volts; V4, 0.7-volt; V5, V6, 5.5 volts. Plate current, V1, V2, V3, 4 ma.; V4, V5, zero; V6, 2.5 ma.; V7, V8, 28 ma.; V9, 43 ma. per plate. The current drain of the screen-grids of V1, V2, V3, is 0.8-ma.

The color code, or other identification, of the resistors is as follows: R1, golden yellow; R2, flat wire-wound; R3, R16, R18, jade green; R4, combined with C7; R5, combined with C8; R6, R11, R13, battleship gray; R7, combined with C11; R8, R19 Pelgian blue; R9, R10, R21, silver gray; R15, R25, white; R17, auto buff; R20, wire-wound tube, 6 in. long; R22, R23, flat wire-wound, center-tapped; R24, wire-wound tube, 2 in. long.

The power transformer's connections may be determined by referring to the diagram; observe the lugs of this unit with the chassis inverted and the power transformer at the right. Counting from left to right, the top two are, 1, 2; second row, 3, 4, 5, 6; third row, 7, 8, 9, 10. Two leads are primary connections; instead in the "96," two lugs at the left of 1 and 2 are provided.

In the 25-cycle models, condensers C24 and C26 rate 3 mf.; and condenser C25, 0.3-mf.

In the Models "96" and "296," resistor R2 and switch Sw. 1 are not used; see the smaller diagram (detail A) at the lower left. Also, the dynamic reproducer plugs into the circuit at X1, X2, X3, X4. The tone control C21-Sw4 is found in the "96" and "296." Condensers C23 are not used in the "Model 96"; but they are retained in the "296." Condenser C22 is not found in the "96" and "296" chasses.

In these last, the pilot light V10 may be replaced without removing the chassis from the cabinet; merely remove the screw fastening the lamp bracket to the condenser housing, and bring the bracket out over the condenser.

When taking voltage readings, keep the R.F. shields on; and tune to eliminate circuit oscillation. The two condensers C23 are provided to reduce the tendency toward circuit oscillation.

In the diagram, the standard pick-up connection is shown, using a high-impedance pick-up. In a few early models of the "296" there will be found a low-impedance pick-up and a special matching transformer; the latter is part "No. 4145." The lubricant of its turntable motor's worm-gear is clear petroleum jelly; and of the motor, a few drops of clear, thin oil.

The "Screen-Grid Plus" receivers are to be aligned at some frequency between 1200 and 1400 kilocycles; first adjusting the aligning condenser of C4. If it is desired to use the meter method of aligning, a convenient manner of making the test is to connect the negative side of a 250 volt (1000-ohms-per-volt) meter to the chassis; and its positive side, by means of an adapter plug, to the cathode of V3. Align for maximum deflection.

In detail B (lower left) is shown the arrangement of the condensers in the filter block "No. 3754"; at C, the tube layout.

Reception may be improved if the position of the line plug is reversed; this change will be particularly noticeable when the receiver is being operated with the connection "LOC" (to which may be attached any short wire, or a lead to metallic wall lathing). Do not operate the receiver without a good ground connection.

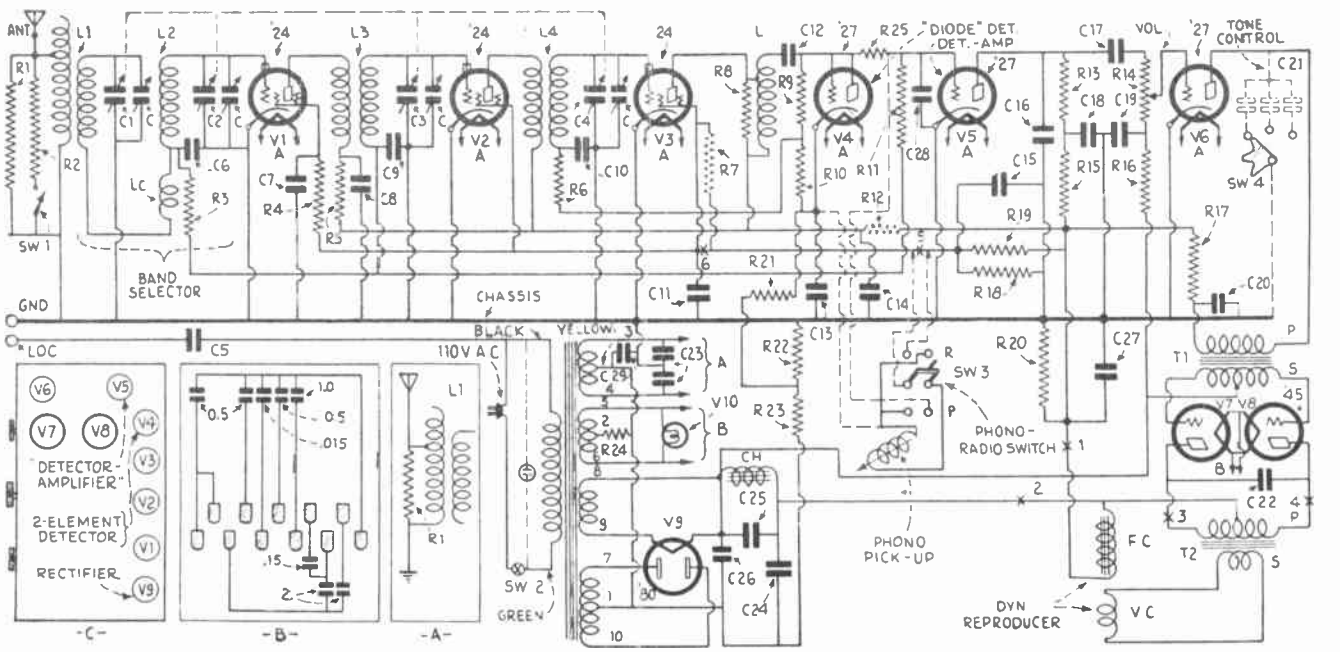
The light line connection for the turntable motor and its switch is in shunt with the primary of the power transformer; and is shown dotted.

In some receivers of the "296" model, the motor's speed control will be found below the motor-board; it is to be reached from the back by a screw-driver.

"Fuzzy," distorted, or noisy reproduction in this model may be due to the motor-board's holding screws being too tight to permit the motor to "float" in the gum-rubber washers provided. Lack of lubrication may cause the same effect.

Chemically-pure vaseline may be used to eliminate noise due to the contact arm's rubbing on the wire of the volume control, R14.

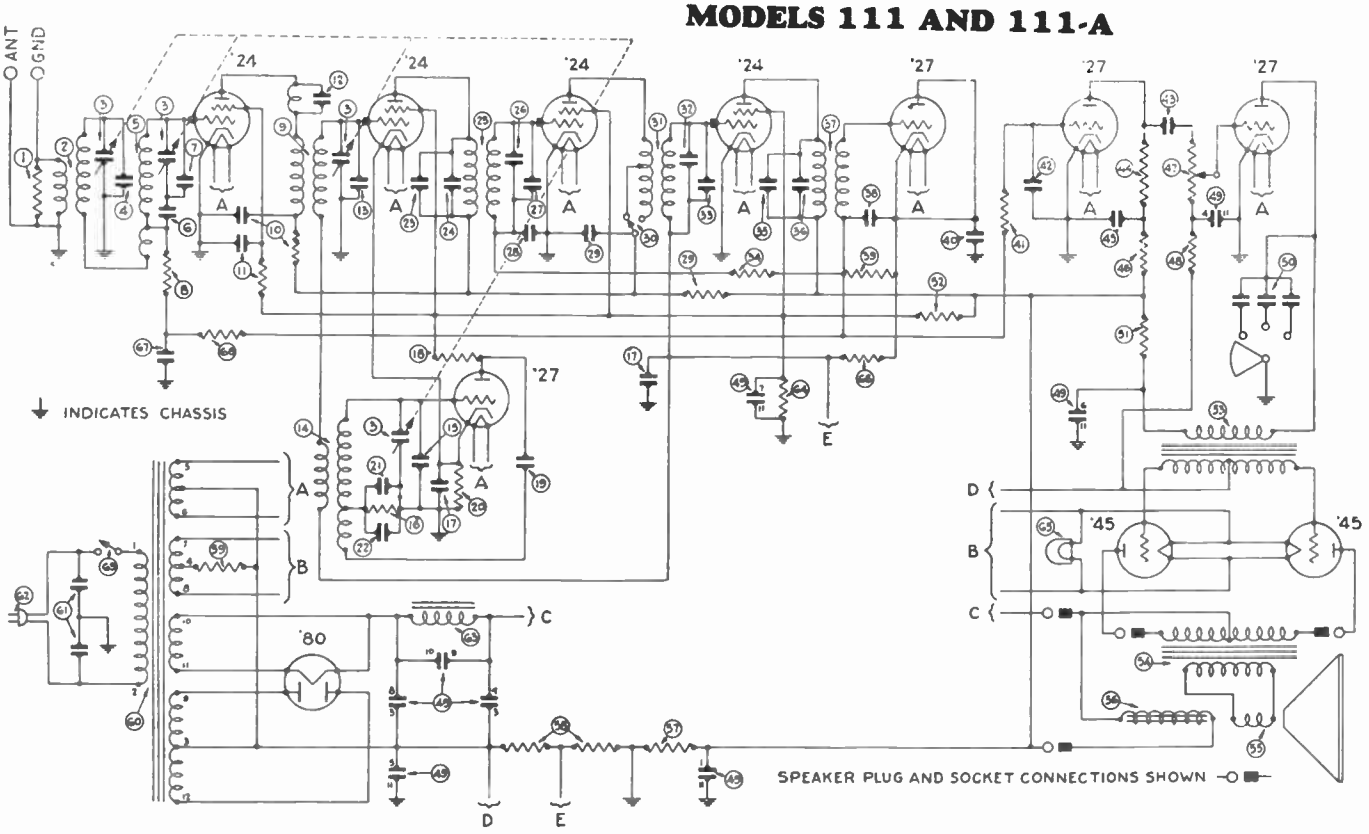
In locations where it is impossible to get a low resistance ground connection, it is advisable to detune slightly the first aligning condenser shunted across C1; about one-eighth of a turn is usually sufficient. This will reduce the tendency toward circuit oscillation.



Schematic circuit of the Philco "Model 95" receiver, including the variations which distinguish several other models of the "Screen-Grid Plus" series. At the lower left, additional details of the sets are: A, the input connections of the "96" and the "296"; B, terminal connections of filter condenser block "No. 3754"; C, tube layout. Since V4 does not amplify, it is supplemented by V5.

PHILADELPHIA STORAGE BATT., CO.

MODELS 111 AND 111-A



NOTE: The connection shown between Condenser No. ⑦ and Condenser No. ⑧ should also be connected to ground.

Model 111 Receivers are for operation on 100-130 volt, 50-60 cycle AC lines
Model 111-A Receivers are for operation on 100-130 volt, 25-60 cycle AC lines

Table 1—Tube Socket Readings Taken with AC Set Tester AC Line—115 volts

Tube		Filament Volts	Plate Volts	Screen Grid Volts*	Control Grid Volts	Cathode Volts	Plate Milli-Amperes	Screen-Grid Milli-Amperes ‡
Type	Circuit							
24	1st R. F.	2.1	190	60	.2	5	1.7	1.75
27	Osc.	2.1	45	..	.7	7	1.6	....
24	1st Det.	2.1	180	62	4.6	8	.5†	.15
24	1st I. F.	2.1	185	65	....	5	1.5	1.7
24	2nd I. F.	2.1	190	82	2.2	5	3	1.85
27	Det. Rect.	2.2	....	..	.4	.5	.....	....
27	Det. Amp.	2.2	35	..	.4	5	.20‡	....
27	1st A. F.	2.1	95	..	1.2	5	4.	....
45	2nd A. F.	2.2	255	..	50	...	32.5	....
45	2nd A. F.	2.2	255	..	50	...	32.5	....
80	Rect.	4.9	...	..	....	...	50/Plate	....

*Read with C 100 Scale.
†Read with 20 Mil. Scale.
‡Read with 2 Mil. Scale.

Note—Volume Control Off; Station Selector turned to Low Frequency End; Range Switch set in "Normal" Position.

Table 2—Power Transformer Voltages

Terminals	A.C. Volts	
1—2		Primary
3		Center Tap 80 Tube
4		Center Tap 45 Tubes
5—6	2.67	Heaters for 24 and 27 Tubes
7—8	2.68	Filaments for 45 Tubes
9—12	750	Plates 80 Tube
10—11	5.0	Filament 80 Tube
Rubber Covered Lead		Center Tap for 24 and 27 Tubes

PHILADELPHIA STORAGE BATT., CO.

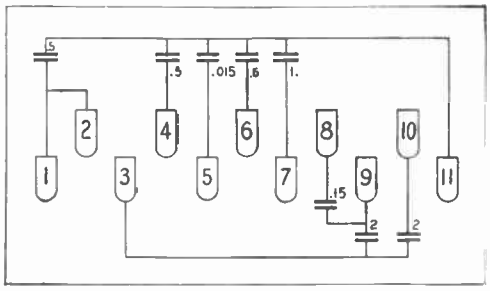
Table 3—Condenser Data
(Other Than Filter Condenser)

No. on Figs. 3 and 4	Capacity
6	.05
10 11	.05 and 250 Ohm Resistor
17	.25 (two sections)
19 23 27 33 38	.00011
21	.0007
28	.05
29	.05 and 250 Ohm Resistor
35	.00005
40	.5
42	.00025
43	.015
45	.05
61	.015 (two sections)
67	.05

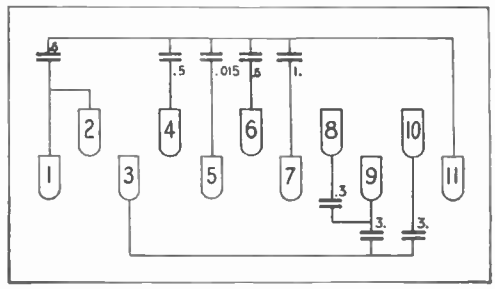
Table 4—Resistor Data

No. on Figs. 3 and 4	Resistance	Color
1	10,000	Black
8 39 41 66 86	100,000	Silver Gray—Yellow Tip
16	50,000	Orange
18	13,000	Belgium Blue
20	1,000	Brown Body—Black Tip—Red Dot
24	500,000	Battleship Gray
44	500,000	Battleship Gray
46	250,000	White
48 — 64	70,000	Jade Green
51 — 52	25,000	Auto Brown—Yellow Tip
57	10,000	Long Tubular
58	70	Flat Wire Wound (two sections)
59	800	Short Tubular

Model 111 Condenser Block Part No. 3754

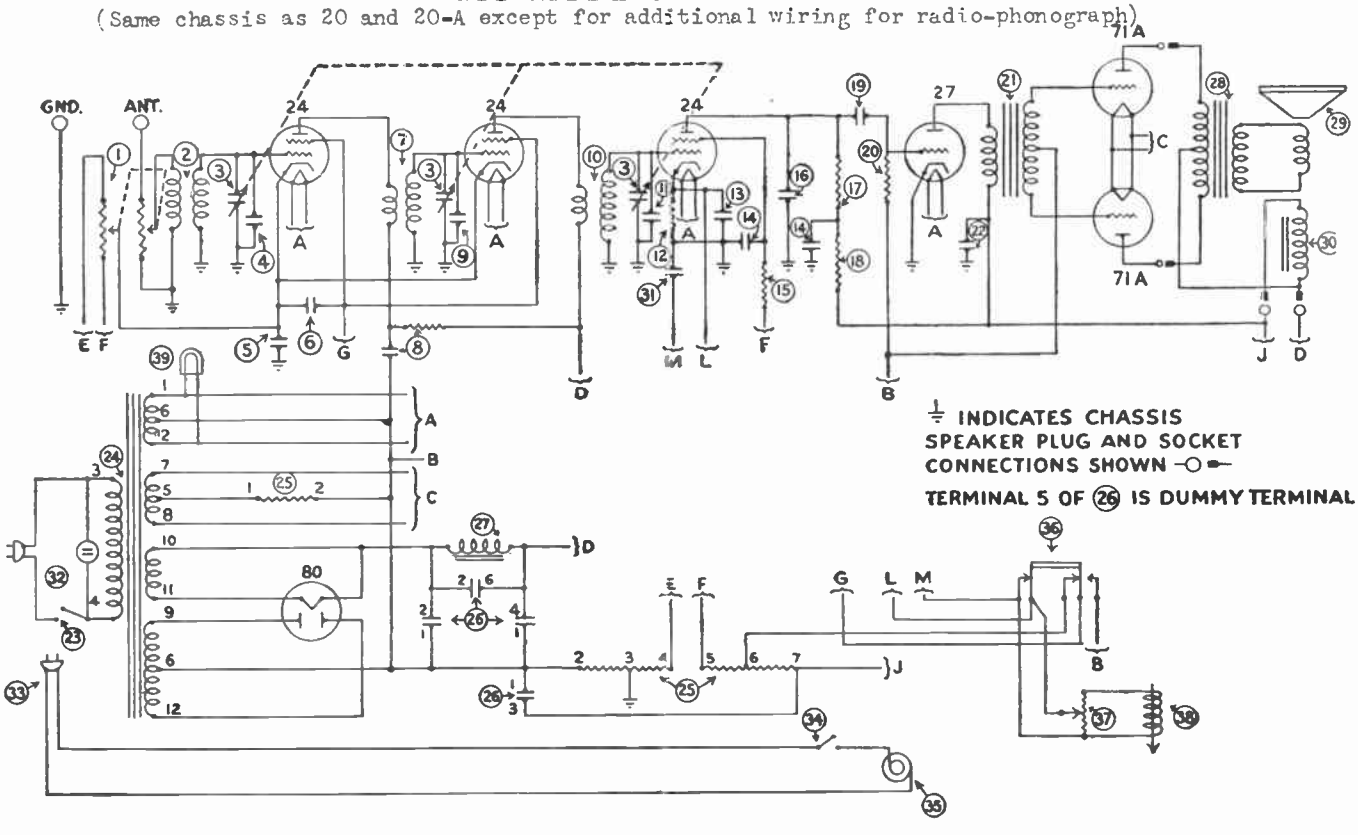


Model 111-A Condenser Block Part No. 3755



PHILCO MODELS 220 AND 220-A

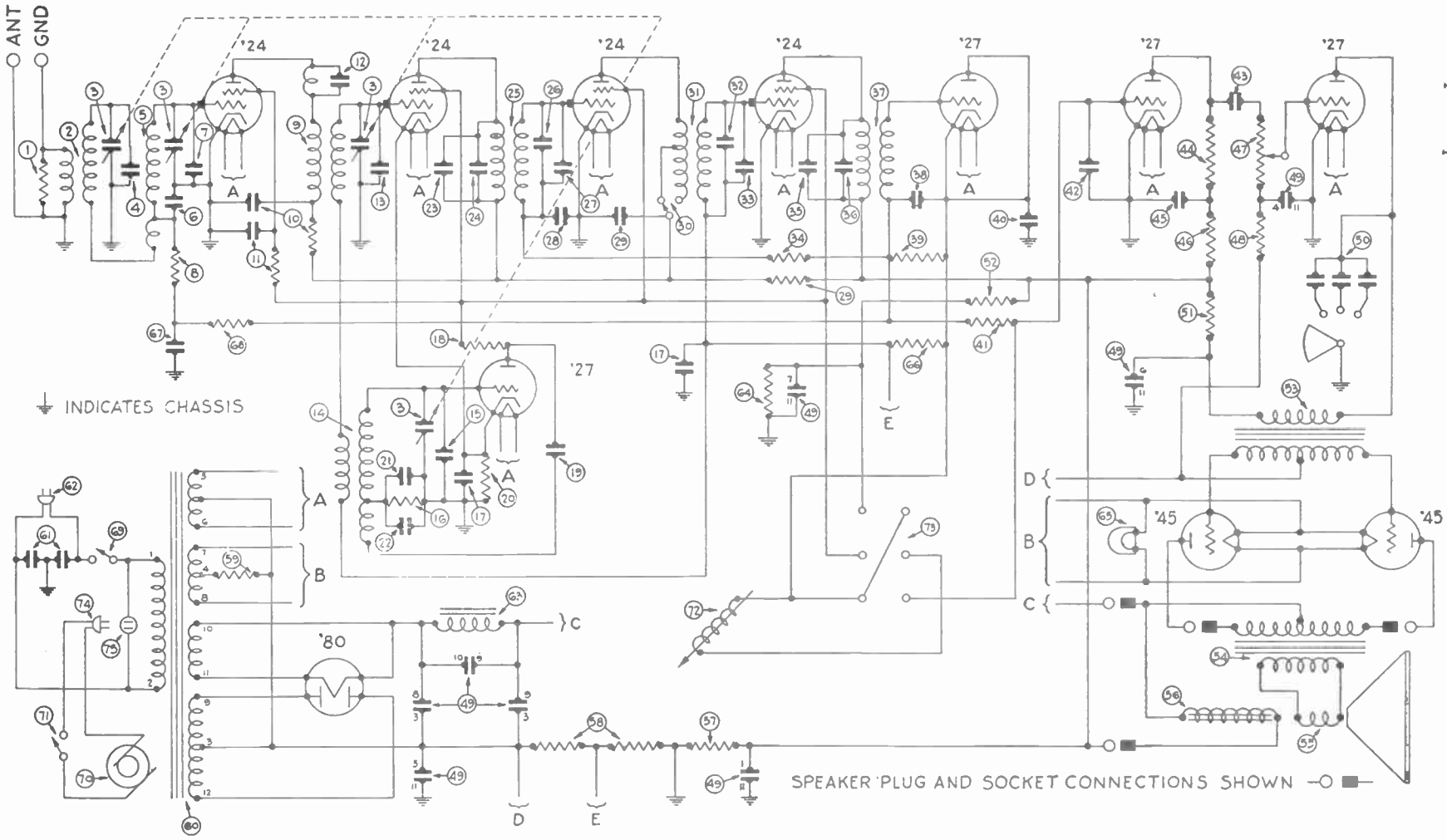
(Same chassis as 20 and 20-A except for additional wiring for radio-phonograph)



DIFFERENT CIRCUIT ARRANGEMENT FOR MODEL 220-A

Model 220-A for use on 25-60 cycle lines is wired differently than the Model 220. The plate supply lead for the two 24 R. F. Tubes is taken from the low side of the Speaker field Coil. The lead "D" to the 24 tubes should be changed to "J" for the Model 220-A only. This will change the plate voltage from 250 volts to 115-125 volts. The plate current readings will also be lower than those given in the table.

MODEL 211 AND 211-A RADIO-PHONOGRAPH



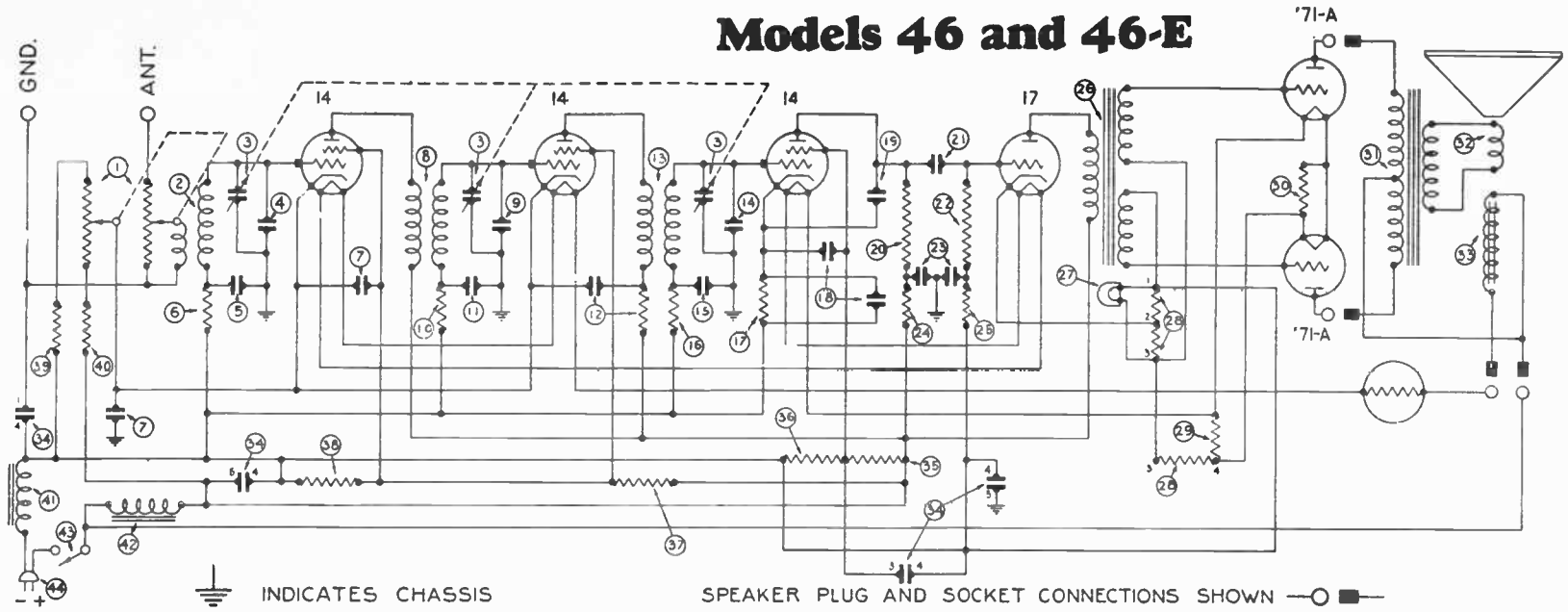
NOTE:—Starting January 15th, the connection from the pick-up to the Detector Rectifier Cathode is changed so as to reach the connection between the volume control No. 47 and resistor No. 48. This change has been made by removing the green wire in the radio-phono switch cable from resistor No. 66, and lengthening it to reach the connection indicated at the volume control.

PHILADELPHIA STORAGE BATT, CO.

MODEL 211 IS FOR USE ON 50-60 CYCLE 100-130 VOLT AC LINES
MODEL 211-A IS FOR USE ON 25-40 CYCLE 100-130 VOLT AC LINES

The chasses of the 211 and 211-A are the same as the chasses of the lll and lll-A except for the additional wiring of the radio-phono switch and pickup.

Models 46 and 46-E



Model 46 Receivers are for Operation on 105-125 volt, DC Lines.
Model 46-E Receivers are for Operation on 210-240 volt, DC Lines.

WARNING—This Receiver is for use on DC current only. The type 2 ballast tube is to be used on 105 to 125 Volts DC and the type 3 ballast tube is to be used on 210 to 240 Volts DC. The type 14 and 17 tubes are designed especially for this Receiver, using a 14 volt filament. No other tubes are to be used in this Receiver.

Table 1—Tube Socket Readings Taken with Set Tester, DC Line, 115 Volts

Tube		Filament Voltage	Plate Voltage	Grid Voltage	Screen Grid Voltage	Cathode Voltage (Measured with Prod)	Plate Milliamperes
Type	Circuit						
14	1st R. F.	13.5	100	1.5	60	2.5	2
14	2nd R. F.	13.5	100	1.5	60	2.5	2
14	Detector	13.5	30	1.0	25	2.5	.1
17	1st Audio	13.5	100	.25	..	4.5	5
71-A	2d Audio	4.5	90	15.5	..	...	11.5
71-A	Push-Pull	4.5	90	15.5	..	...	11.5
2	Ballast	8	...	.....	..	...	....
3	Ballast	128	...	.....	..	...	....

All readings taken with antenna disconnected and ground on. Volume Control on full.

The majority of set testers are not equipped to measure a DC filament voltage as high as 14 volts. In this case the volt meter binding post prods will have to be used. This method will also have to be used in checking cathode voltages across resistances No. 17—No. 39 and No. 28 and No. 29.

The field coil of the Speaker used with this Receiver is of low resistance. It is not the same as the field coil used with the AC Electric Receiver. If, by mistake, a speaker from an AC Electric Receiver is plugged into the DC Receiver no damage will result.

Table 2—Condenser Data
(Other than Filter Condenser)

No. on Figs. 2 and 3	Capacity MFD
(10)	.0005
(21)	.01
(5)—(11)—(16)	.05
(12)	.05 and 250-ohm resistor
(7)	.25
(18)—(23)	.25 (two sections)

Part No.—4860

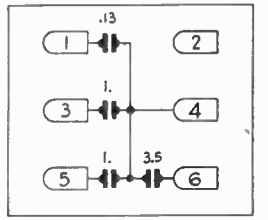


Fig. 1

Table No. 3—Resistor Data

No. on Figs. 2 and 3	Terminal	Resistance	Color
	(2—3)	10	
(28)	(1—2)	14	Tubular
	(3—4)	29	
(29)		200	Tubular
(30)		210	Flat Wire Wound
(39)		250	Flat Wire Wound
(14)		5,000	Yellow
(37)—(40)		13,000	Belgium Blue
(6)—(10)—(17)—(36)		33,000	Belgium Blue—Yellow Tip
(38)—(26)		70,000	Jade Green
(24)		100,000	Silver Gray—Yellow Tip
(25)		250,000	White
(28)—(22)		500,000	Battle Gray

Radio Service Data Sheet

PHILCO "MODELS 111" AND "111A" SUPERHETERODYNE RECEIVERS

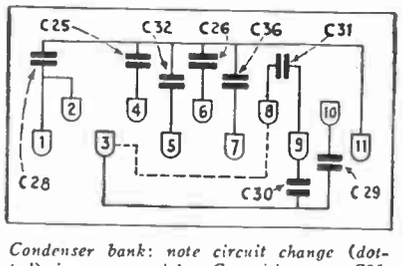
The fundamental circuit of the above listed Philco receivers, manufactured by the Philadelphia Storage Battery Co., Philadelphia, Pa., is the subject of this Data Sheet; with particular reference to the Model 111 set.

Available constants are listed, as follows:

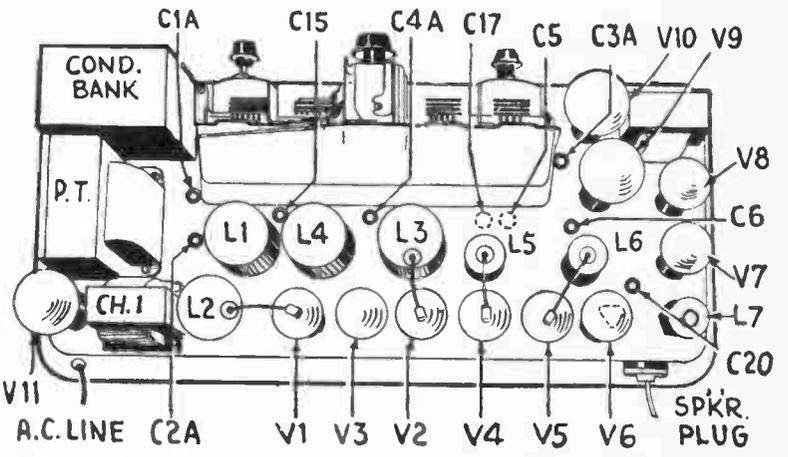
Condensers: C1, C2, C3, C4, tuning gang; and their H.F. trimmers, C1A, C2A, C3A, C4A. C5, C6, C17, C20 are I.F. trimmers; C6A, C7, C17A, C35, .00011-mf.; C8, C9, C10 (with resistor), C11 (with resistor), C18, C19, (and resistor), C23, .05-mf.; C13 and C16 (double unit), 0.25-mf.; C14, .0007-mf.; C15, L.F. trimmer; C12, L.F. resonator; C20A, .00005-mf.; C21, 0.5-mf.; C22, .00025-mf.; C24, .015-mf.; C25, C26, C28, C29, C30, C31, C32, C36 (in filter-condenser bank; see illustration of condenser connections); C27, tone control condenser bank; C33 and C34 (double unit), .015-mf.

Resistors: R1 (black), 10,000 ohms; R2, R3, R12, R13, R23 (silver gray, yellow tip), 100,000 ohms; R4, R5, R10 (with condensers), 250 ohms; R6 (orange), 50,000 ohms; R7 (brown body, black tip, red dot), 1,000 ohms; R8 (belgian blue), 13,000 ohms; R9, R14 (battleship gray), 500,000 ohms; R11, R18 (auto brown, yellow tip), 25,000 ohms; R15 (white), 250,000 ohms; R16, volume control; R17, R24 (jade green), 70,000 ohms; R19 (long tubular), 10,000 ohms; R20, R21 (one unit, flat, wirewound, center-tapped), 35 ohms (each half); R22 (short, tubular), 800 ohms.

The operating voltages for the "Model 111" are as follows: Filament potentials: V1, V2, V3, V4, V5, V8, 2.1 volts; V6, V7, V9, V10, 2.2 volts; V11, 4.9 volts. Plate potentials: V1, V5, 190 volts; V2, 180 volts; V3, 45 volts; V4, 185 volts; V7, 35 volts; V8, 95 volts; V9, V10, 255 volts. Screen-grid potentials: V1, 60 volts; V2, 62 volts; V4, 65 volts; V5, 82 volts. Control-grid potentials: V1, 0.2-volt; V2, 4.6 volts; V3, 0.7-volt; V5, 2.2 volts; V6, V7, 0.4-volt; V8, 1.2 volts; V9, V10, 50 volts. Plate currents: V1, 1.7 ma.; V2, 0.5-ma. (as read on 20-ma. scale); V3, 1.6 ma.; V4, 1.5 ma.; V5, 3 ma.; V7, 0.2-ma. (as read on 2 ma. scale); V8, 4 ma.; V9, V10, 32.5 ma.; V11, 50 ma. per plate. Screen-grid current (as read on 2-ma. scale): V1, 1.75 ma.; V2, 0.15-ma.; V4, 1.7 ma.; V5, 1.85 ma.

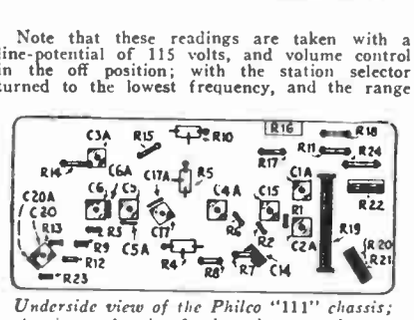


Condenser bank: note circuit change (dotted) in some models. Capacities are: C25, C26, C28, 0.5-mf.; C29, C30, 2 mf.; C31, 0.15-mf.; C32, .015-mf.; C36, 1 mf.; in 25-cycle model, C31, 0.3-mf; C29, C30, 3 mf.



Arrangements of parts on the top of the chassis of the Philco "111" Superheterodynes. Two trimmer condensers (C5, C17) seldom requiring attention are adjusted from the underside of the chassis. These two condensers connect, respectively, to the input and output windings of the first I.F. transformer, L5; and, in conjunction with this transformer, form a particularly selective input circuit for the first I.F. tube, V4. The oscillator adjustments are distinguished as "high-frequency" (C4A) and "low-frequency" (C15).

Note that these readings are taken with a line-potential of 115 volts, and volume control in the off position; with the station selector turned to the lowest frequency, and the range



Underside view of the Philco "111" chassis; showing only the fixed resistors and condensers, and the trimming condensers; their locations in the chassis may be fixed in relation to the long black resistor, R19.

switch SW 1 in the diagram set at "normal." Putting this switch in the "maximum" position increases greatly the sensitivity of the Philco "111" receiver. Positions "normal" and "maximum" are indicated in the diagram respectively as 1 and 2. Check the setting of this switch; since its incorrect use will result in the complaint of distorted reproduction and erratic operation, due to the overloading effect of powerful locals with the switch set at "maximum."

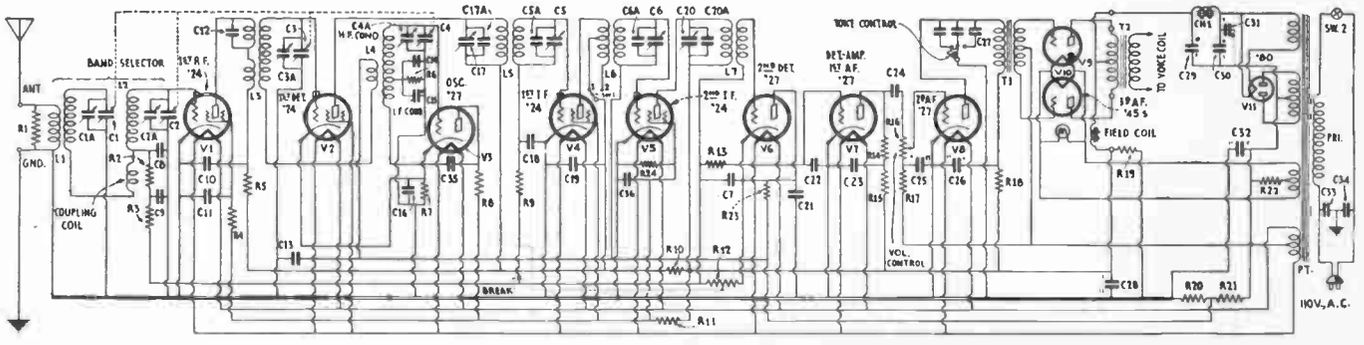
The factory makes the following observation concerning adjustment of the nine compensating or trimmer condensers: "These receivers are accurately adjusted at the factory prior to their shipment. Under no circumstances are the adjusting condensers to be changed in the field. This alignment requires special oscillator equipment, which all Philco distributors have. If for any reason the receiver needs adjustment, it must be returned to the distributor's service department."

"Model 111A" is a 25-cycle design, and its parts values vary slightly from the above. "Model 211" is a phonograph combination; while "211A" is its 25-cycle designation.

It will be noted, from the top-view illustration of the chassis, that two of the trimmer capacities are adjusted from the under side. Their locations, and the positions of all the resistors, are shown in the under view.

As indicated by dotted lines, those models dated later than March 15, 1931, are wired to place a higher bias on the first I.F. amplifier, V4. This connection is made by swinging the resistor R9 from the chassis to a center-tap which is obtained by changing R12 from a single 100,000-ohm unit to two 50,000-ohm units, and connecting them in series.

The intermediate frequency used in these models is 175 kilocycles. All final adjustments are to be made with switch Sw. 1 in its "normal" position, No. 1. A fiber wrench is required for adjusting the I.F. trimmers. The high-frequency circuits are to be adjusted at 1400 kc. The single "low-frequency" condenser C15 is to be adjusted at 600 kc. After adjusting the R.F. and I.F. stages, tune the receiver to the eighth harmonic of the I.F. circuits; the dial reading should then be 140. At this time, make any adjustment of the high-frequency condenser C4A which may be necessary.



Schematic circuit of the Philco "Model 111" Receiver. Tone control is obtained by shunting one to three fixed condensers across the output of the second A.F. tube, V8. Note that the center-tap of the high-voltage secondary does not connect directly to the chassis, but returns through two resistors, R20 and R21. The plate of V6 connects directly to the cathode.

Models 112 and 112-A Receivers

Model 112 Receivers are for operation on 100-130 volt, 50-60 cycle AC lines
Model 112-A Receivers are for operation on 100-130 volt, 25-60 cycle AC lines

Table 1—Tube Socket Readings Taken with AC Set Tester AC Line—115 volts

Tube		Filament Volts	Plate Volts	Screen Grid Volts*	Control Grid Volts	Cathode Volts	Plate Milli-Amperes	Screen-Grid Milli-Amperes ‡
Type	Circuit							
24	1st R. F.	2.1	190	60	.2	5	1.7	1.75
27	Osc.	2.1	45	..	.7	7	1.6	....
24	1st Det.	2.1	180	62	4.6	8	.5†	.15
24	1st I. F.	2.1	185	65	....	5	1.5	1.7
24	2nd I. F.	2.1	190	92	2.2	5	3	1.85
27	Det. Rect.	2.2	....	..	.4	.5	.....	....
27	Det. Amp.	2.2	35	..	.4	5	.20‡	....
27	1st A. F.	2.1	95	..	1.2	5	4.	....
45	2nd A. F.	2.2	255	..	50	...	32.5	....
45	2nd A. F.	2.2	255	..	50	...	32.5	....
80	Rect.	4.9	...	..	....	...	50/Plate	....

*Read with C 100 Scale.
†Read with 20 Mil. Scale.
‡Read with 2 Mil. Scale.

Note—Volume Control Off; Station Selector turned to Low Frequency End; Range Switch set in "Normal" Position.

Table 2—Power Transformer Voltages

Terminals	A.C. Volts	
1—2		Primary
3		Center Tap 80 Tube
4		Center Tap 45 Tubes
5—6	2.67	Heaters for 24 and 27 Tubes
7—8	2.68	Filaments for 45 Tubes
9—12	750.	Plates 80 Tube
10—11	5.0	Filament 80 Tube
Rubber Covered Lead		Center Tap for 24 and 27 Tubes

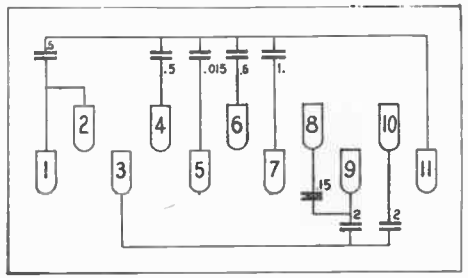
Table 3—Condenser Data
(Other Than Filter Condenser)

No. on Figs.	CAPACITY	COLOR
6	.05	Bakelite Container
10 11	.05 and 250 Ohm Resistor	Bakelite Container
17	.25 (two sections)	Metal Container
19 23 27 33 36	.00011	Blue, Golden Yellow
21	.0007	White, Golden Yellow
28	.05	Bakelite Container
30	.05 and 250 Ohm Resistor	Bakelite Container
38	.00005	Light Blue, White
40	.5	Metal Container
42	.00025	Yellow
43	.015	Bakelite Container
45	.05	Bakelite Container
61	.015 (two sections)	Bakelite Container
67	.05	Bakelite Container

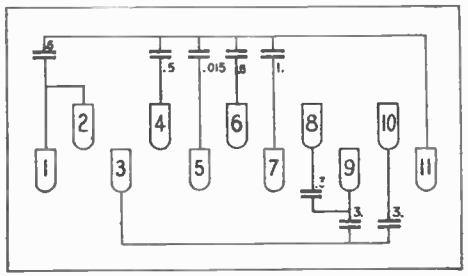
Table 4—Resistor Data

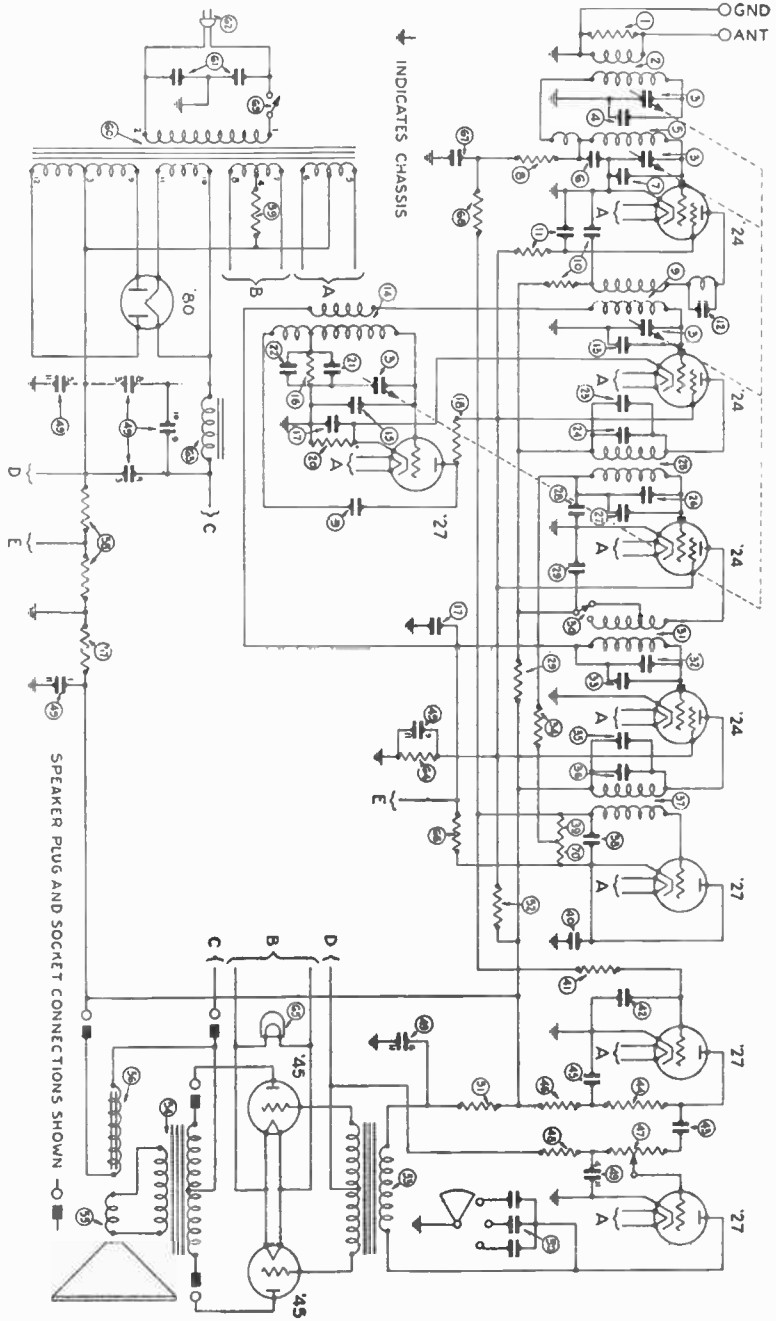
No. on Figs.	Power (Watts)	Resistance	COLOR Body	Tip	Dot
30	1.	1,000	Brown	—Black	—Red
1	.5	10,000	Brown	—Black	—Orange
18	1.	13,000	Brown	—Orange	—Orange
31 32	1.	25,000	Red	—Green	—Orange
16 26 70	.5	50,000	Green	—Brown	—Orange
48 64	1.	70,000	Violet	—Black	—Orange
8 41 66 68	.5	100,000	White	—White	—White
46	1.	250,000	Red	—Yellow	—Yellow
34	.5	500,000	Yellow	—White	—Yellow
44	1.	500,000	Yellow	—White	—Yellow
58		70	Flat Wire Wound (two sections)		
59		800	Short Tubular		
67		10,000	Long Tubular		

Model 112 Condenser Block Part No. 3754



Model 112-A Condenser Block Part No. 3755



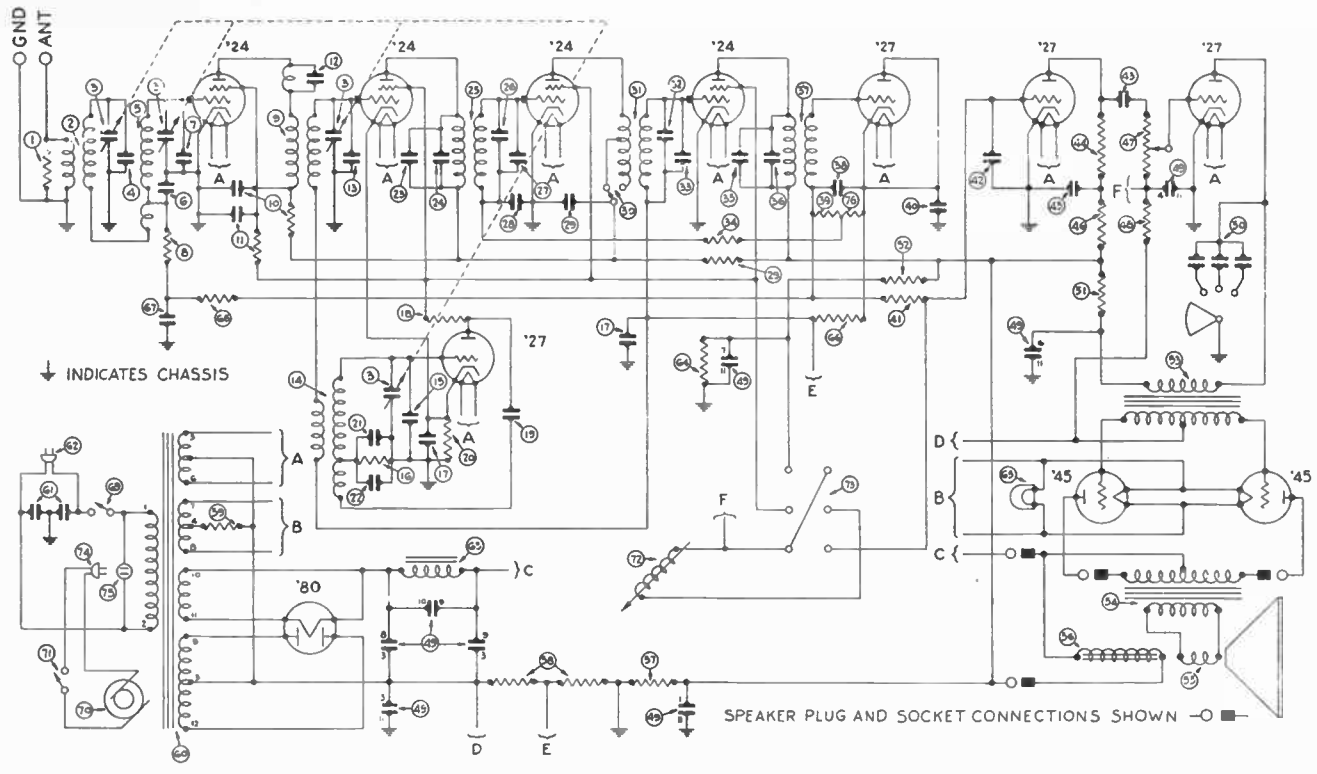


PHILADELPHIA STORAGE BATT. CO.

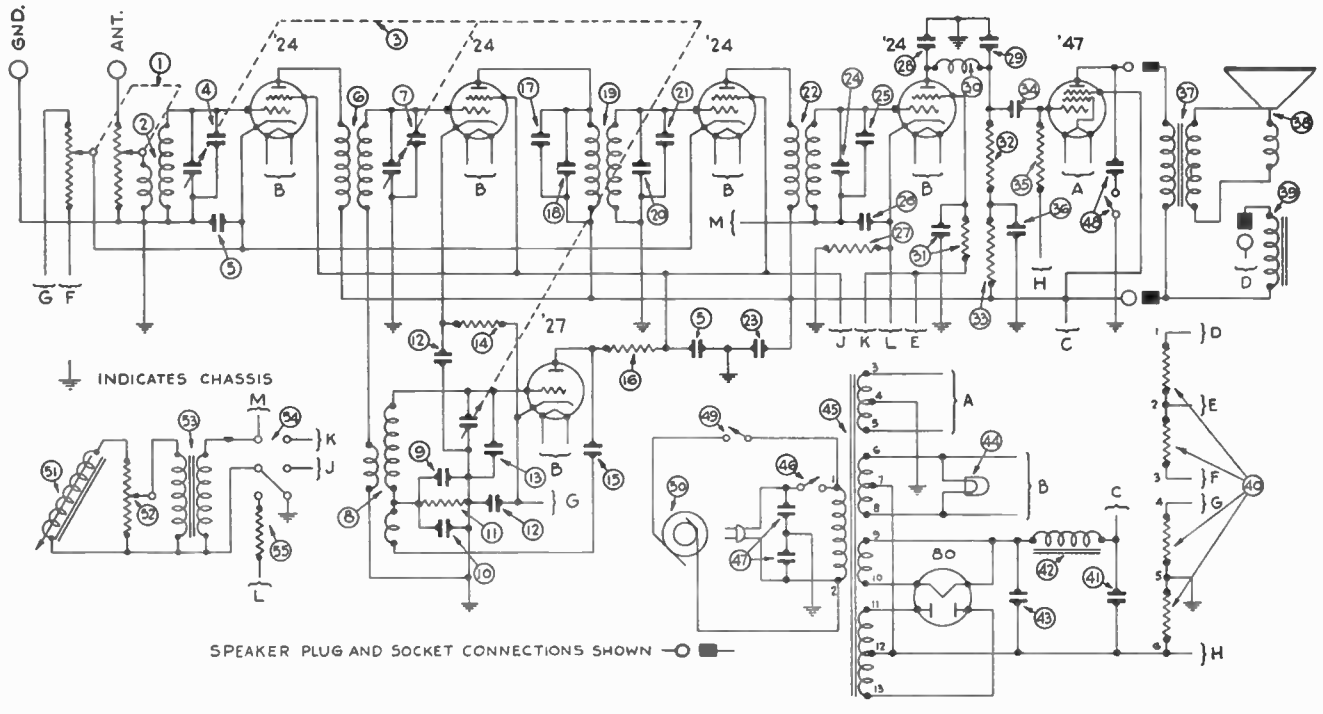
MODELS 112 AND 112-A

PHILADELPHIA STORAGE BATT. CO.

MODEL 212 AND 212-A RADIO-PHONOGRAPH



MODELS 270 AND 270-A



Models 70 and 70-A Receivers

Model 70 Receivers are for operation on 100-130 volt, 50-60 cycle AC lines
Model 70A Receivers are for operation on 100-130 volt, 25-60 cycle AC lines

Table 1—Tube Socket Readings Taken with AC Set Tester AC Line—115 volts

Tube		Filament Volts	Plate Volts	Screen Grid Volts	Control Grid Volts	Cathode Volts	Plate Milli-amperes
Type	Circuit						
24	1st R. F.	2.25	250	85	3.	19.5	3.
24	1st Det.	2.25	250	87	5.5	21.5	.5
27	Osc.	2.25	85	. .	2.	19.5	2.5
24	1st I. F.	2.25	250	87	3.	19.5	3.
24	2nd Det.	2.25	105	75	6.	22.	.1
47	Audio	2.25	245	255	1.	. .	. .
80	Rectifier	4.7	. .				40 plate

Note—Volume Control Off; Station Selector turned to Low Frequency End.

Table 2—Power Transformer Voltages

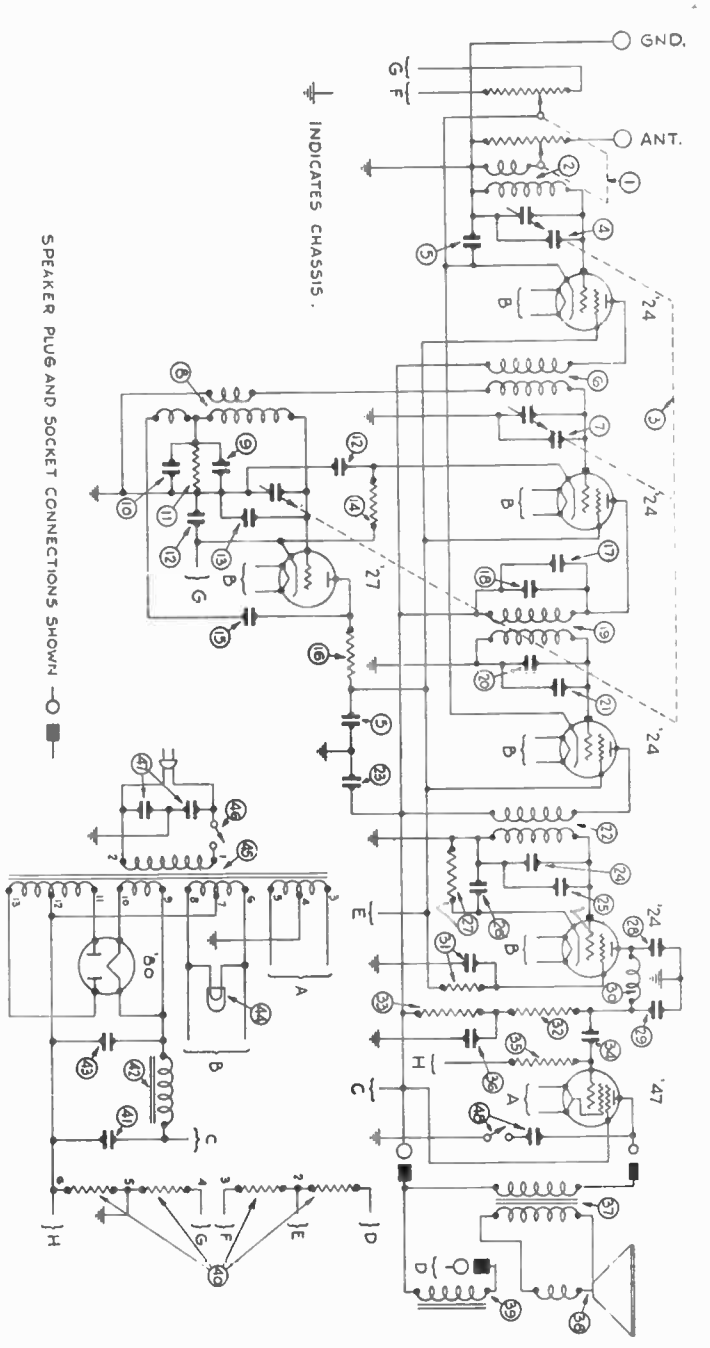
Terminals	A.C. Volts		
1–2	105 to 125	Primary	Black (Small Gauge)
3–5	2.5	Filament of 47	Dark Green
6–8	2.5	Filament of 24	Black (Heavy Gauge)
9–10	5.	Filament of 80	Light Blue
11–13	700.	Plates of 80	Yellow
4	. . . . .	Center Tap of 3–5	Black, Green Tracer
7		Center Tap of 6–8	Black, Yellow Tracer
12	. . . . .	Center Tap of 11–13	Yellow, Green Tracer

Table 3—Condenser Data

No. on Figs. 3 and 4	Capacity MFD	Color
(8)	.09	
(9)	.00041	Yellow Orange
(12)	.09	
(18) (17) (21)	.00011	Blue, Golden Yellow
(22)	.05	
(24)	.00005	Light Blue, White
(26)	.5	
(28)	.0005	Green
(29)	.00025	Yellow
(31)	.09 and 250 Ohm Resistor	
(34)	.01	
(36)	.25	
(41)	(25 to 40 cycles) 6.	
(41)	(50 to 60 cycles) 10.	
(43)	6.	

Table 4—Resistor Data

No. on Figs. 3 and 4	Resistance	Terminal	Color Body	Color Tip	Color Dot
(11) (27)	50,000	. . .	Green	Brown	Orange
(14)	5,000	. . .	Green	Black	Red
(16)	13,000	. . .	Brown	Orange	Orange
(32) (35)	250,000	. . .	Red	Yellow	Yellow
(33)	100,000	. . .	White	White	Orange
	1,060	1–2			
	2,300	2–3			
(40)	70	4–5	Long Tubular		
	180	5–6			



Models 90 and 90-A Receivers

Model 90 Receivers are for Operation on 105-125 volt, 50-60 cycle AC Lines.
Model 90-A Receivers are for Operation on 105-125 volt, 25-60 cycle AC Lines.

Table 1—Tube Socket Readings Taken with AC Set Tester, AC Line, 115 Volts

Tube		Filament Voltage	Plate Voltage	Grid Voltage	Screen Grid Voltage	Cathode Voltage	Plate Milliamperes
Type	Circuit						
24	1st R. F.	2.1	250	3.3	83	15	3
27	Osc.	2.1	60	1	...	15	2
24	1st Det.	2.1	250	5.5	23	15	.5
24	1st I. F.	2.1	250	3.8	80	15	4.5
24	2nd Det.	2.1	48	3.7	42	15	3
27	1st Audio	2.1	140	.25	...	10	....
45	Audio	2.2	243	46	...	...	30
45	Audio	2.2	243	46	...	...	30
80	Rect.	4.5	...	...	...	...	...

All readings taken with antenna disconnected and ground on. Volume Control on full.

Table 2—Power Transformer Voltages

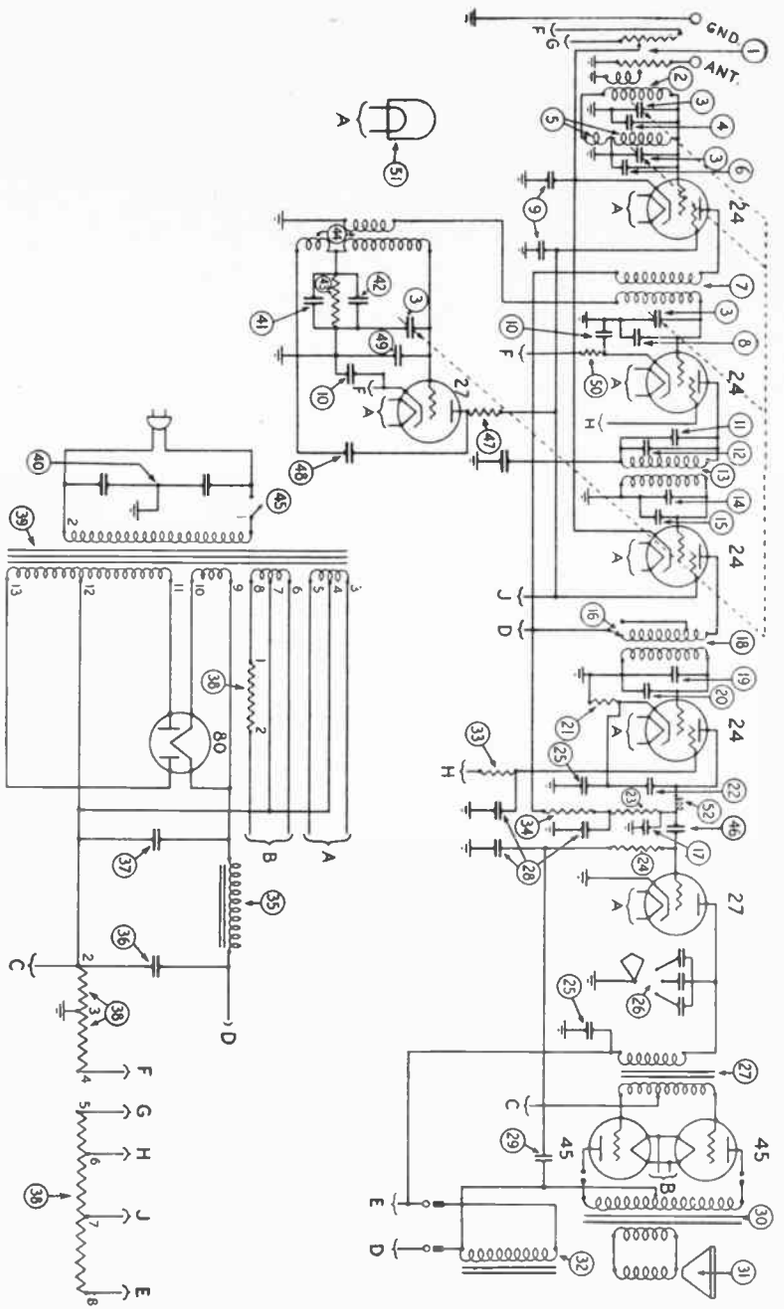
Terminals	A.C. Volts		Color
1—2	105 to 125	Primary	Black (Small Gauge)
3—5	2.5	Heaters of 24 and 27 Tubes	Black (Heavy Gauge)
4	2.5	Center Tap of 3—5	Black with Yellow
6—8	2.5	Filament of 45 Tubes	Dark Green
7	2.5	Center Tap of 6—8	Black with Green
9—10	5.0	Filament of 80 Tube	Light Blue
11—13	650.	Plates of 80 Tube	Yellow
12	...	Center Tap of 11—13	Yellow with Green

Table 3—Resistor Data

No. on Fig.	Terminal	Power (Watts)	Resistance	Color Body—Tip—Dot
	1—2	...	800	
	2—3	...	263	
	3—4	...	75	
(26)	5—6	...	370	(Long Tubular)
	6—7	...	1,800	
	7—8	...	1,430	
(47)	....	1.	13,000	Brown—Orange—Orange
(21)	....	.5	50,000	Green—Brown—Orange
(48)	....	1.	50,000	Green—Brown—Orange
(33)	....	1.	250,000	Red—Yellow—Yellow
(24) (32)	....	.5	250,000	Red—Yellow—Yellow
(34)	....	.5	1,000,000	Brown—Black—Green

Table 4—Condenser Data

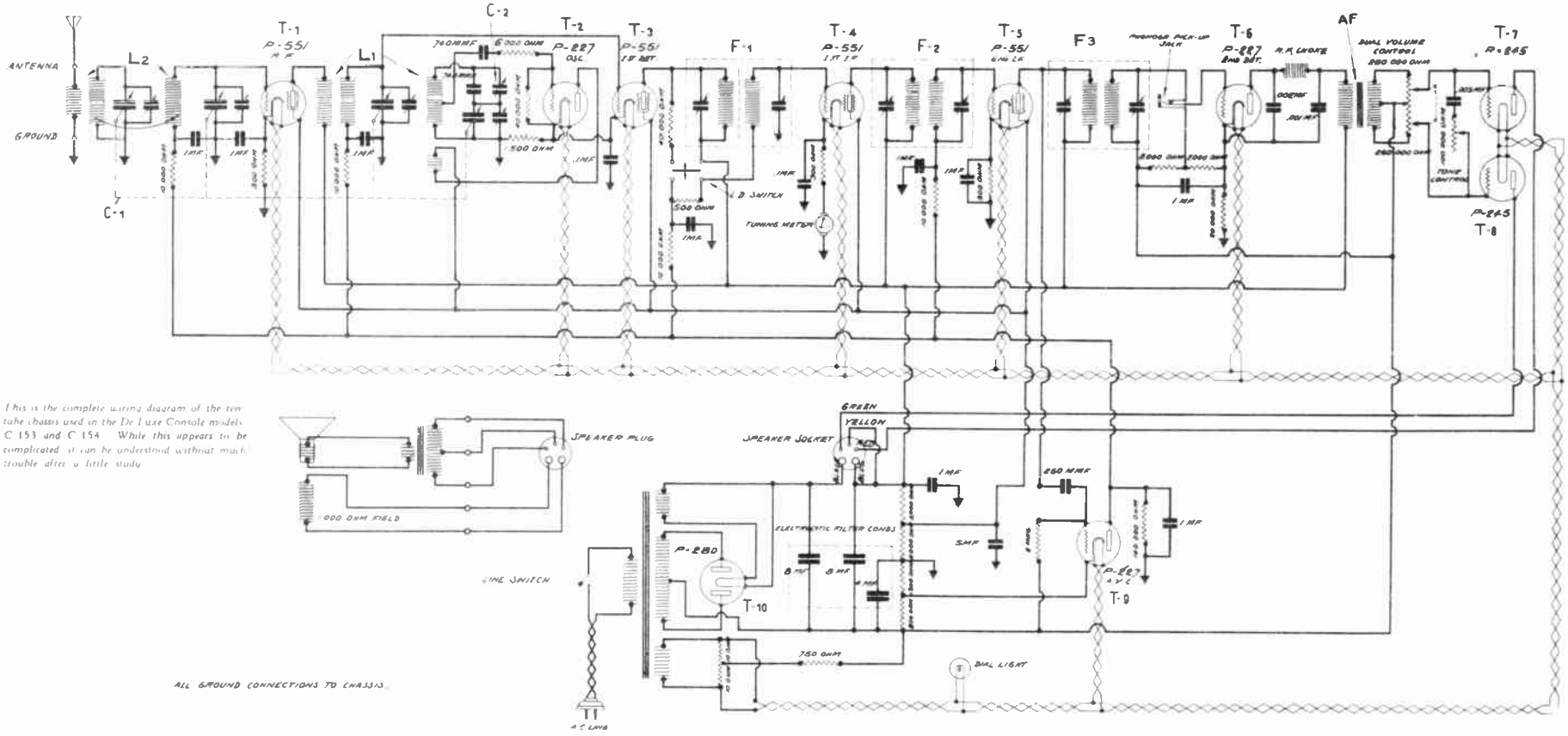
No. on Figs.	Capacity	Color
(9) (10) (13) (15) (16) (20) (49) (17) (22) (35)	.09 Double	Black Bakelite Container
	.09 Double	Black Bakelite Container
	.00011	Blue, Golden Yellow
	.000035	Yellow and Green
	.5	Metal Container
(26)	.25 Double (Black wires to Ground) .5 (White wire to Ground)	Metal Container
(25) (28) (37) (42) (25 to 40 cycles)	.05	Black Bakelite Container
	6.	Electrolytic Type
	10.	Electrolytic Type
(40)	.015 Double	Black Bakelite Container
(41)	.0007	White, Golden Yellow
(8)	.001	Green and White



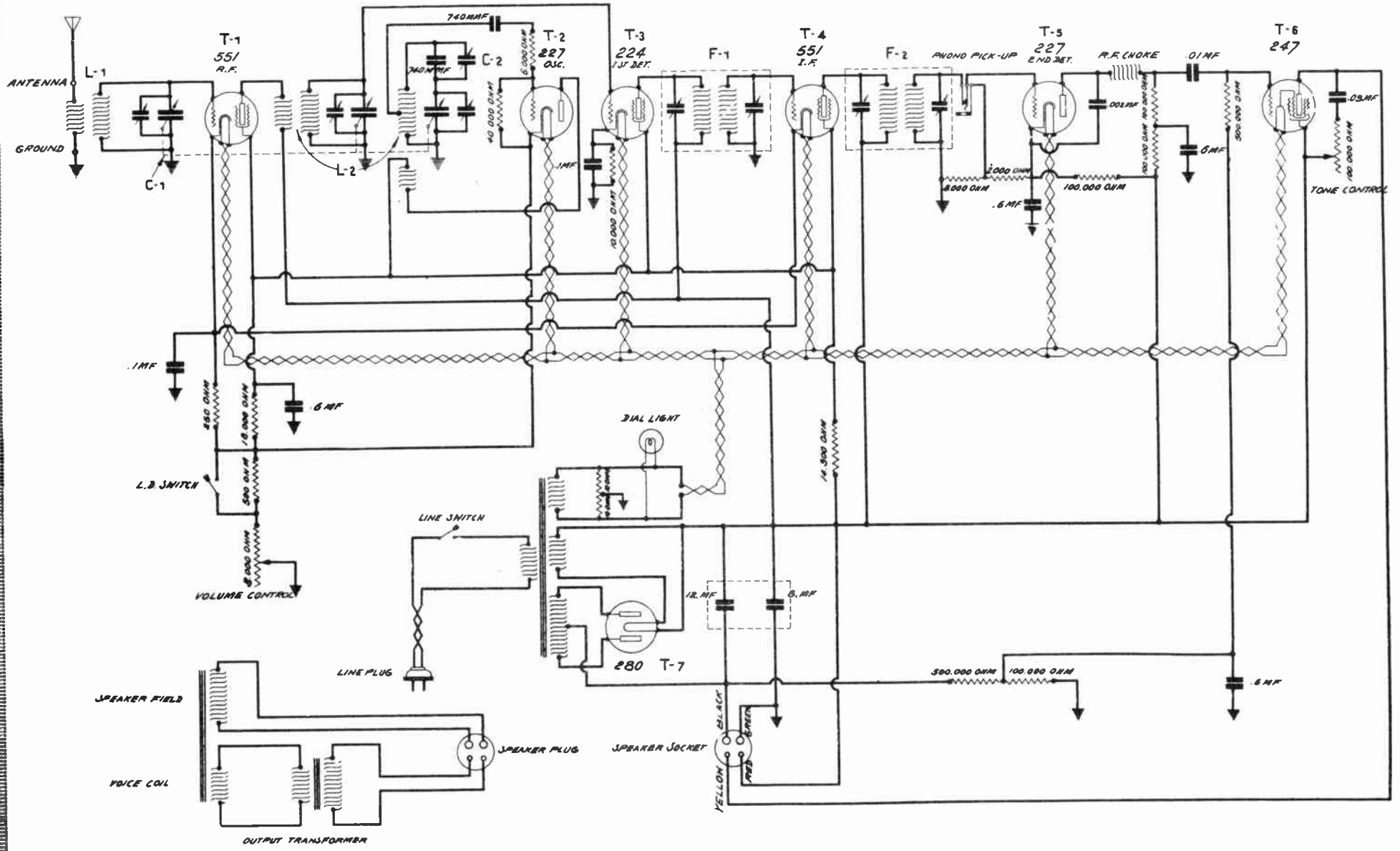
PHILADELPHIA STORAGE BATT. CO.

Models 90 and 90-A

PILOT RADIO & TUBE CORP.



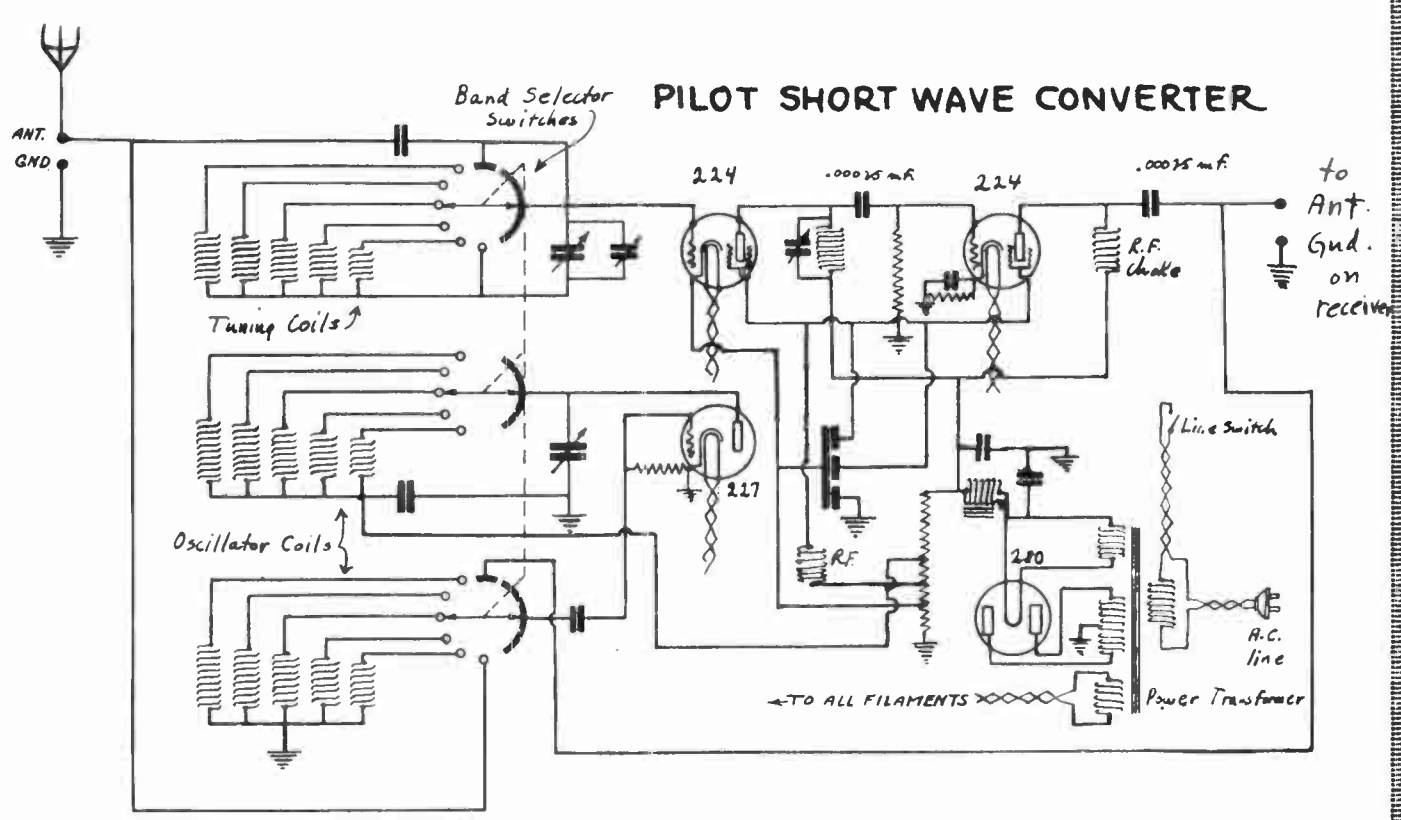
This is the complete wiring diagram of the ten tube chassis used in the De Luxe Console models C 153 and C 154. While this appears to be complicated it can be understood without much trouble after a little study.

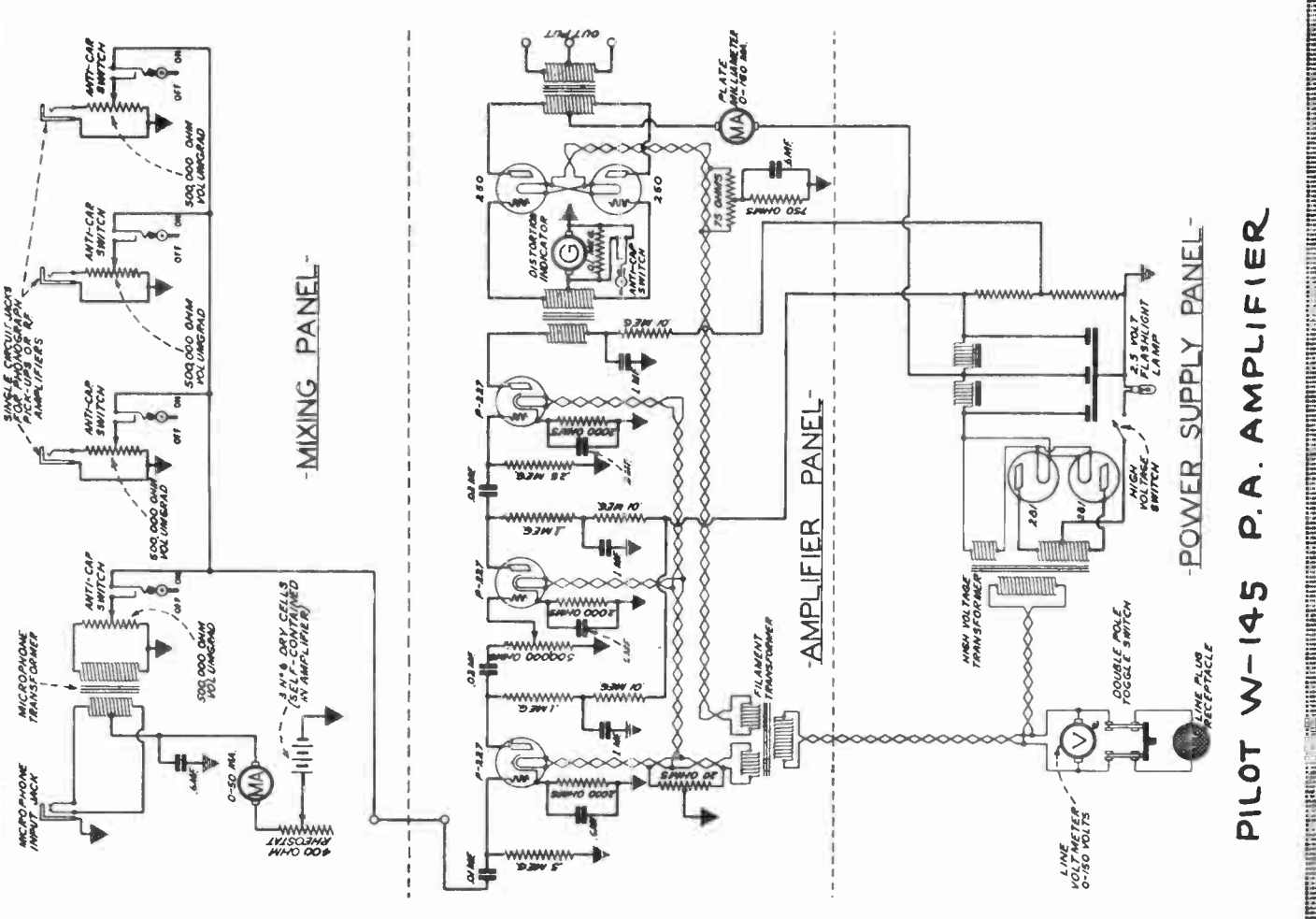


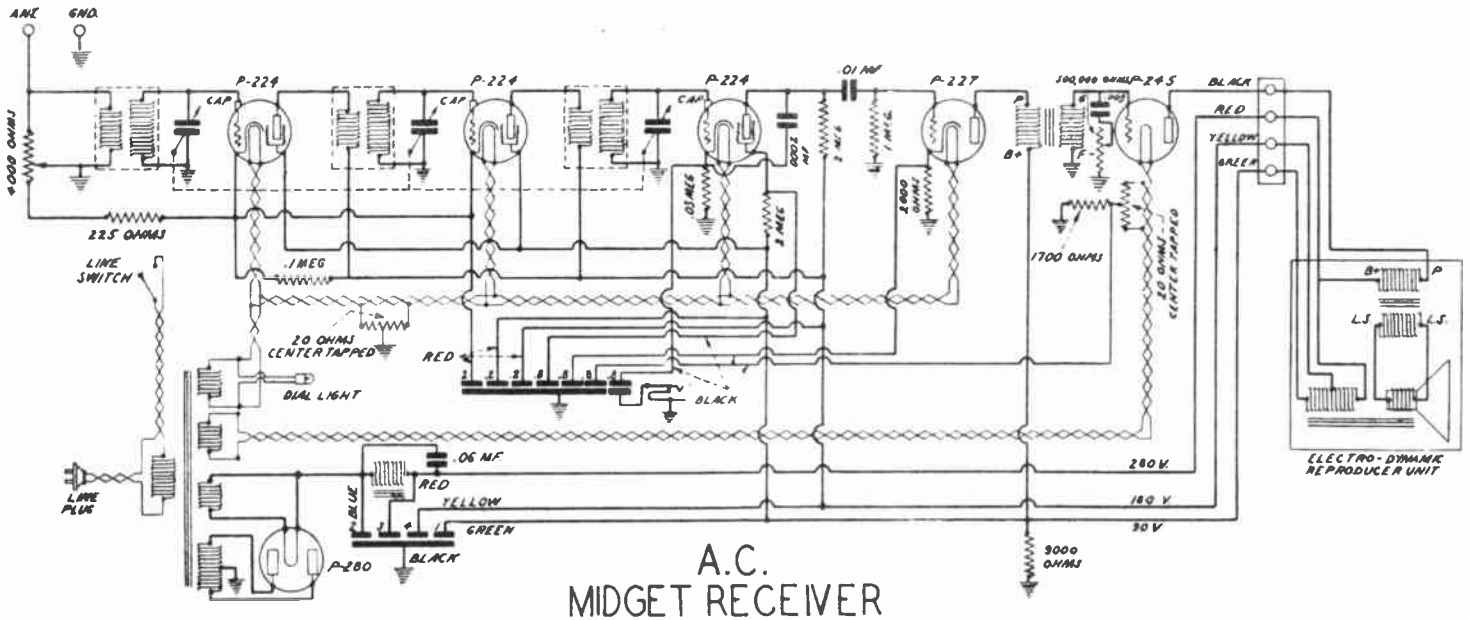
PILOT RADIO & TUBE CORP.

Pilot Super-Heterodynes Models S-148, S 164.
Also C-151, C1-62

PILOT RADIO & TUBE CORP.



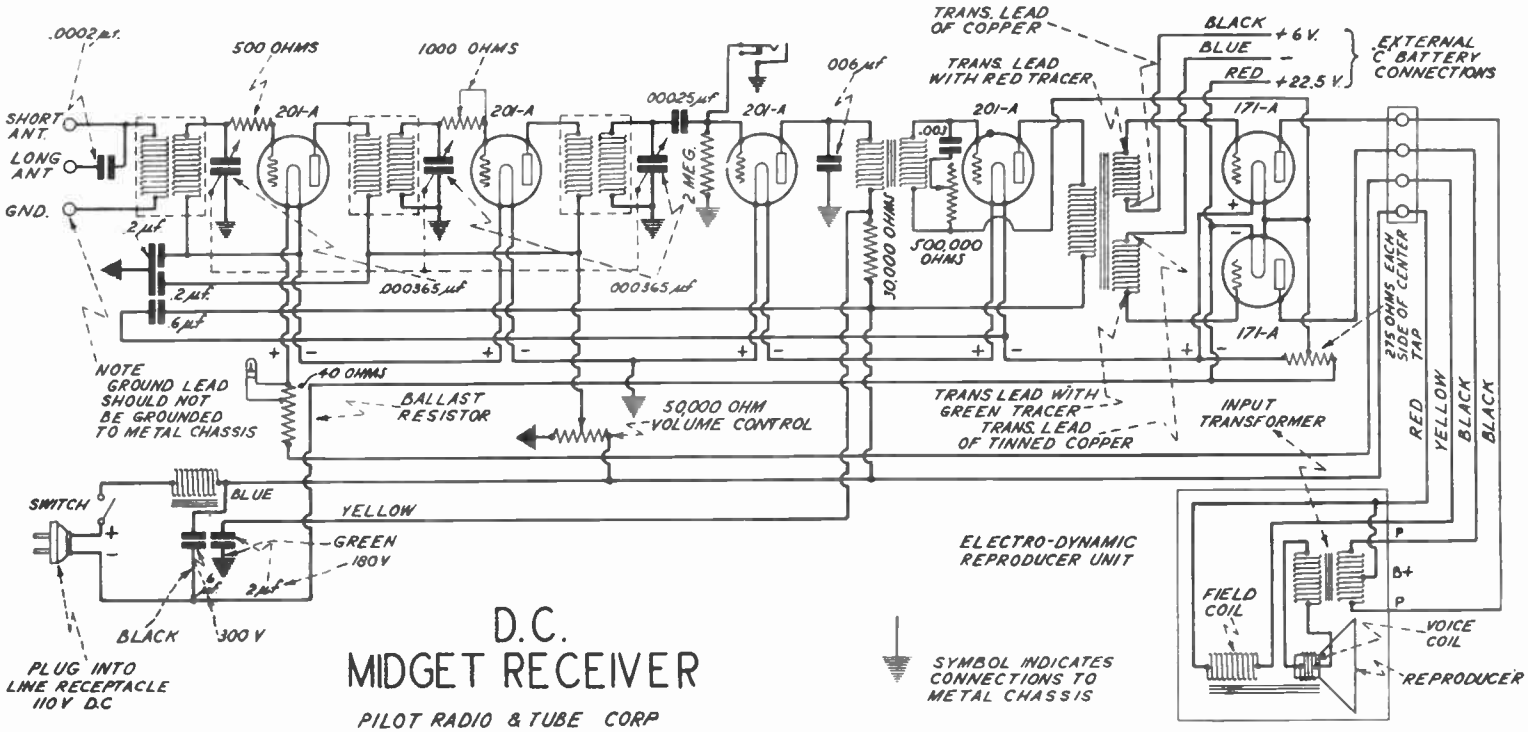




A.C.
MIDGET RECEIVER

Pilot Midget

Models S-155, C-157.
Also S-155A, S-155B,
S-155F, C-157A, C-157B,
C-157F



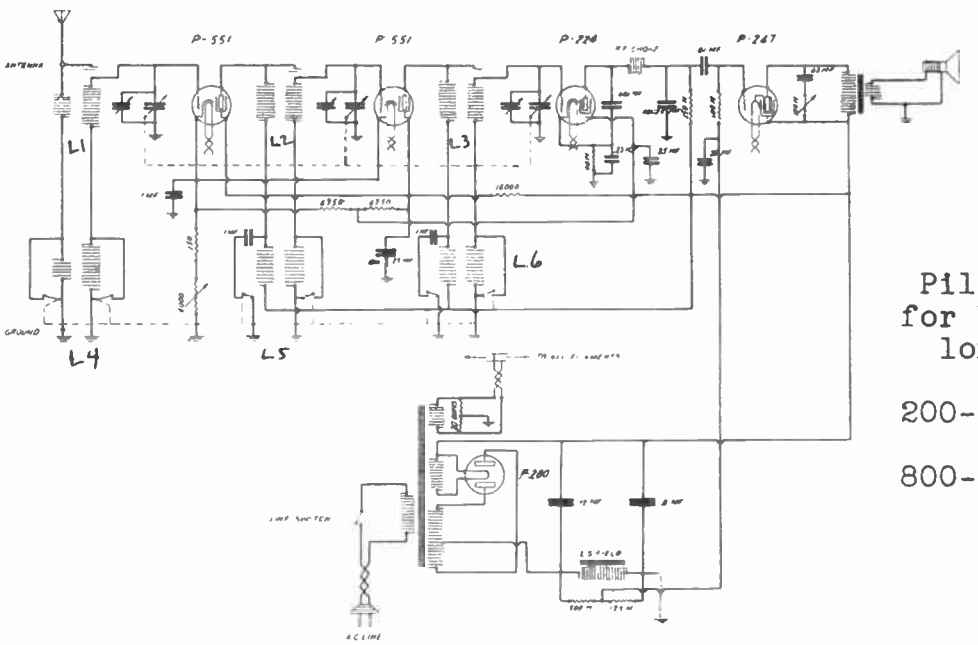
D.C.
MIDGET RECEIVER

PILOT RADIO & TUBE CORP

Pilot DC Midget

Models S-156, C-158

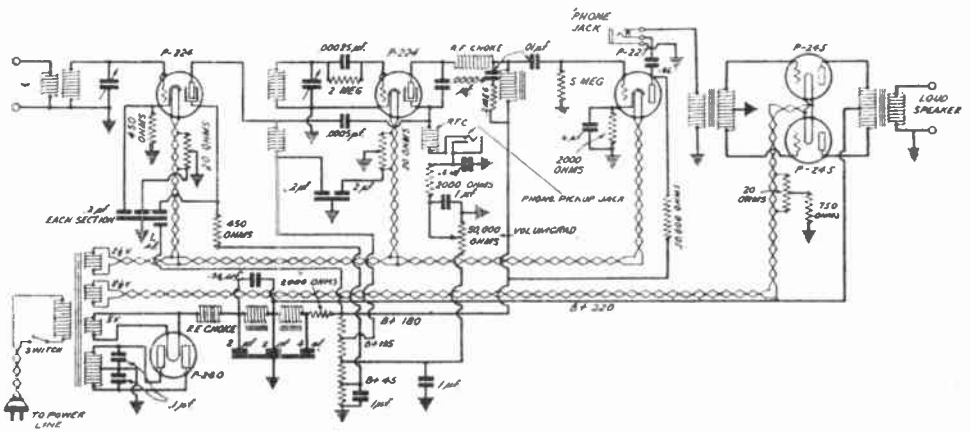
PILOT RADIO & TUBE CORP.



Pilot TRF Midget
for broadcast and long
long waves

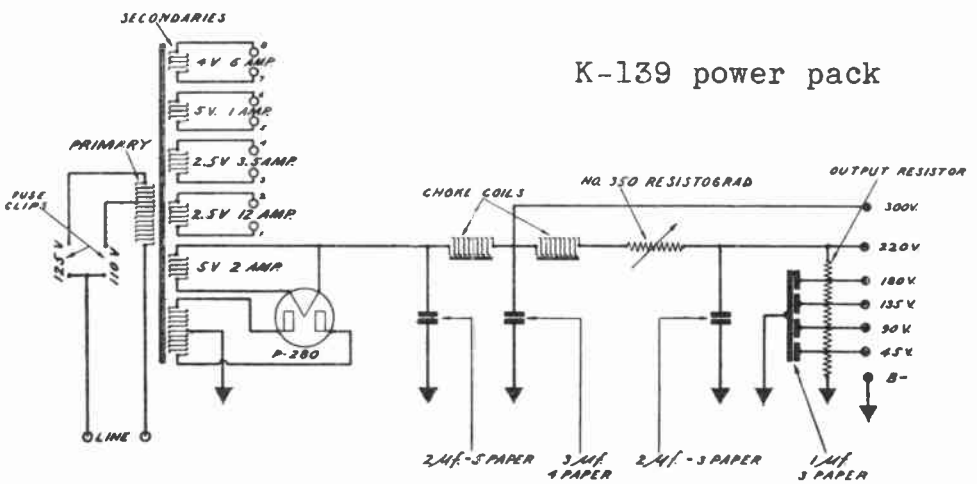
200-550 meters
and
800-2000 meters.

Pilot Universal
S-141

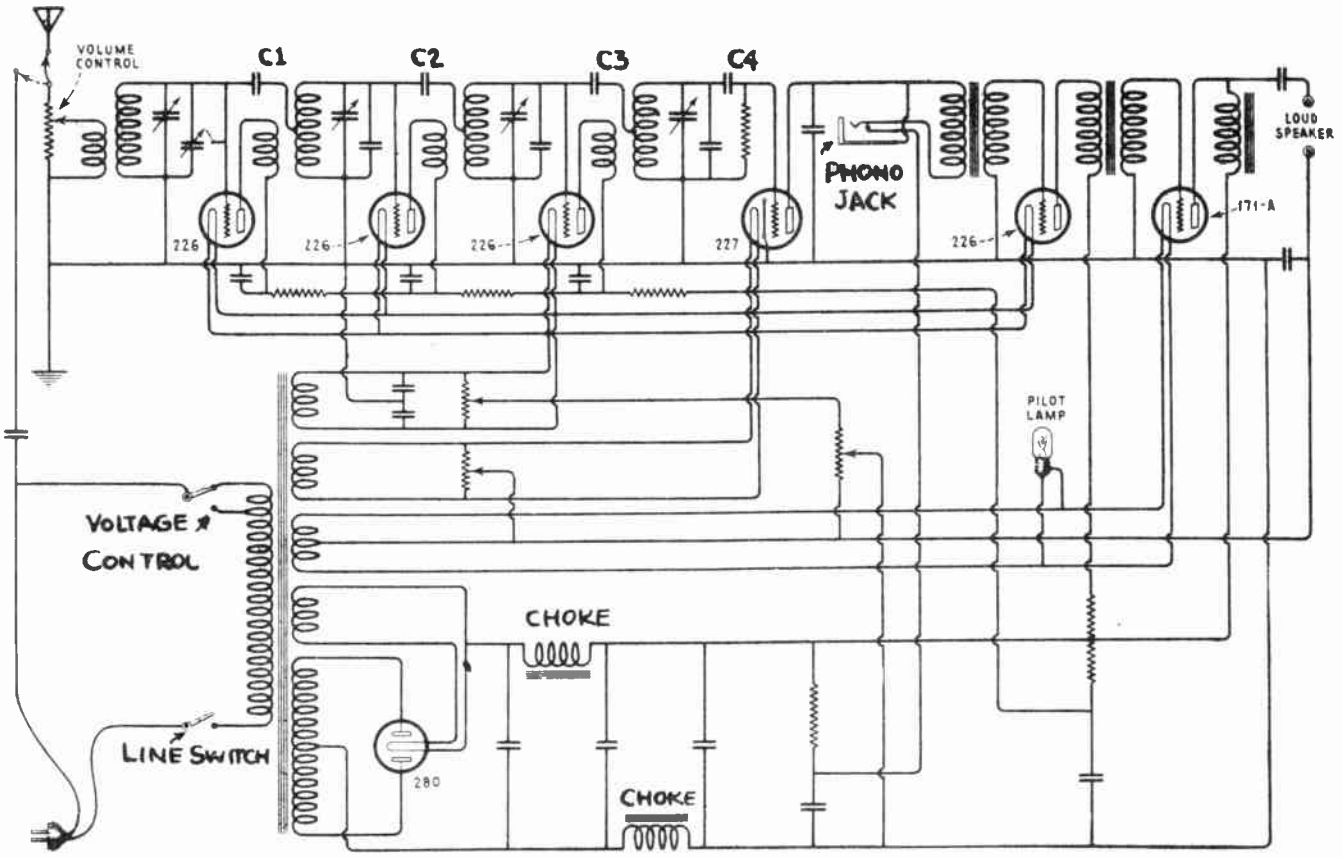


This schematic diagram of the Universal is a functional hook-up, and does not show the actual connections to the cam switches.

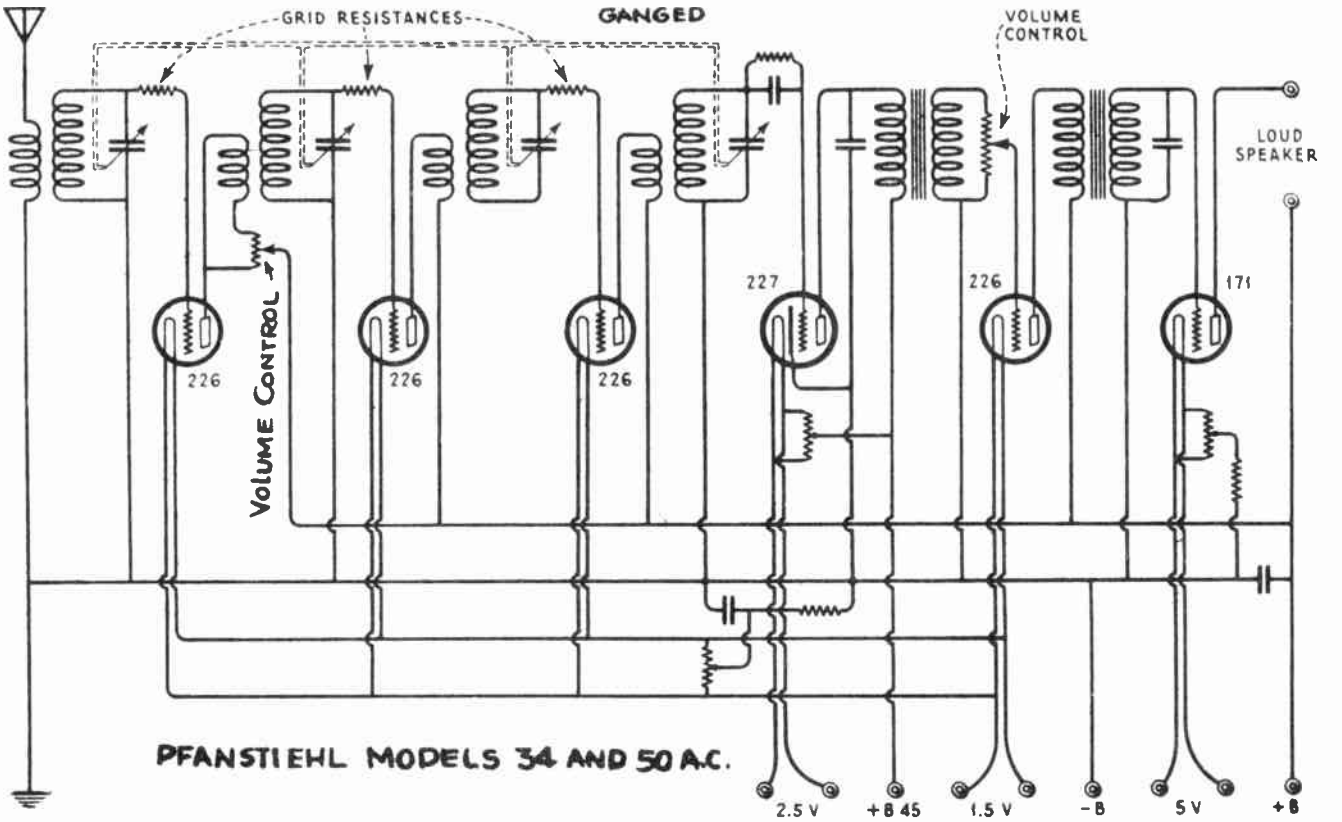
K-139 power pack



PHILADELPHIA STORAGE BATT. CO.



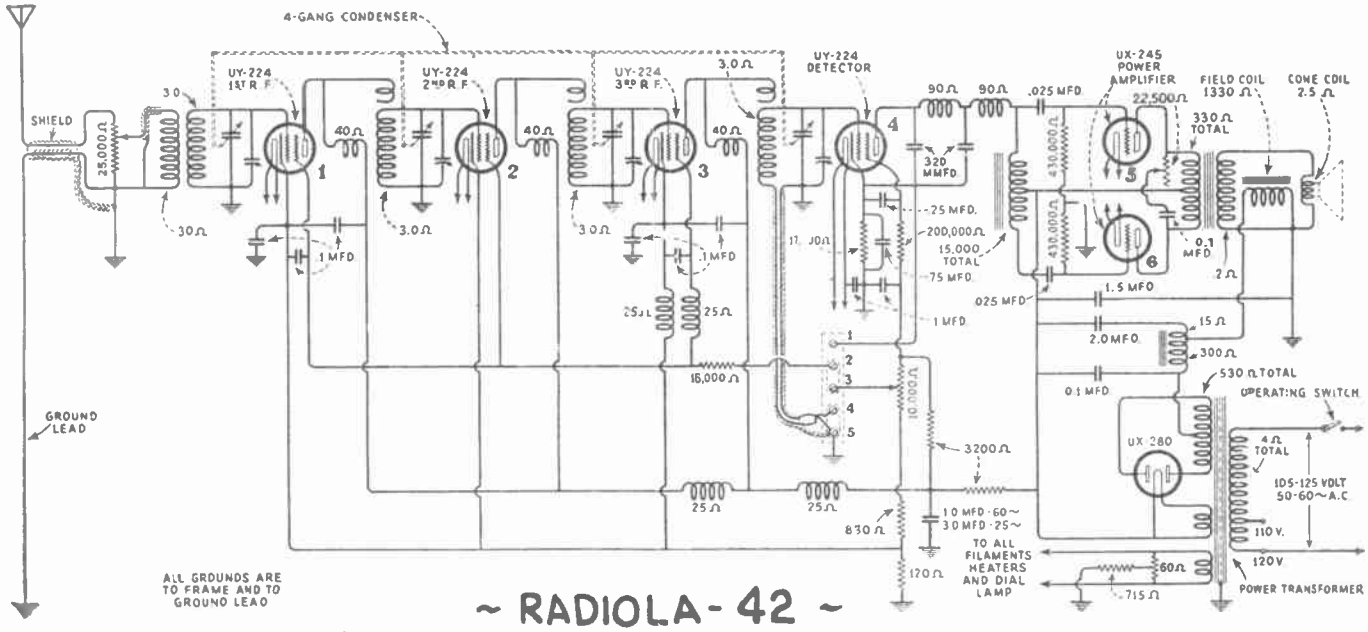
PFANSTIEHL PRODUCTS CO.



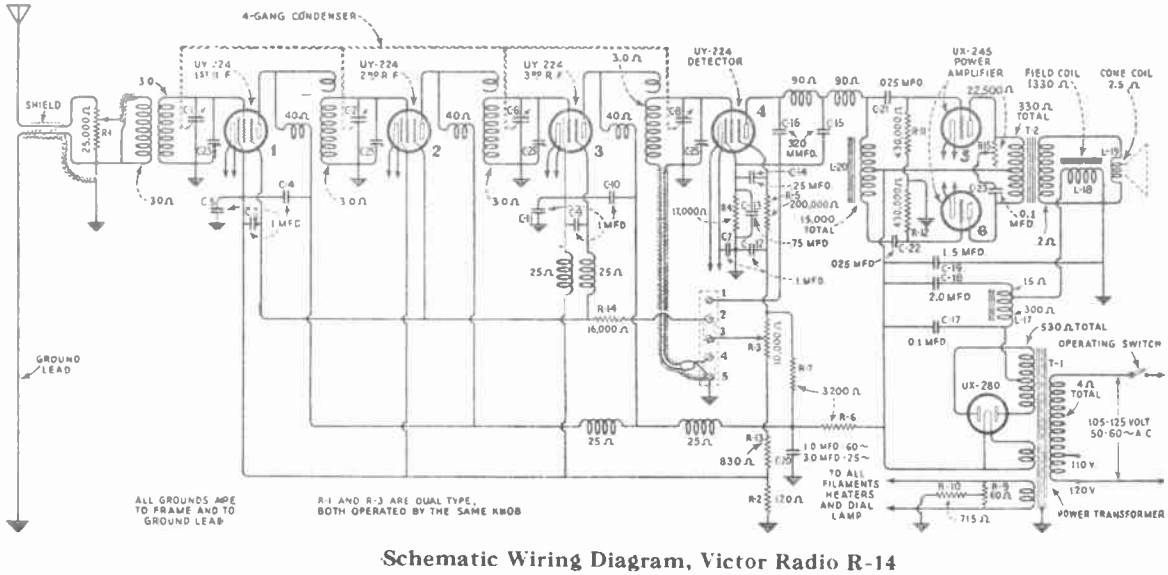
R.C.A. VICTOR CO.

RCA Radiola 42 is a four circuit, tuned radio frequency radio receiver utilizing the chassis and reproducer unit of Radiola 48 together with a tone control. The tone control is mounted on the side directly under the operating switch.

All the information contained in the Radiola 48 Service Notes will therefore apply to the Radiola 42. The wiring diagram is shown in Figures 1 and 2 and the schematic diagram in Figure 3.



It will be noted that a new volume control is used. The antenna section of this unit has a value of 25,000 ohms instead of 50,000 ohms as used in the Radiola 48. This volume control is also being used as a replacement in Radiola 48. The screen grid voltage section has a value of 10,000 ohms and the 12,000 ohm shunt resistor is not used. The 0.005 mfd. condenser across the plates of Radiotrons UX-245 has been omitted due to the connection of the tone control in the same position. When making replacements of the condenser and reactor unit it will be necessary to clip the two leads that are connected to the .005 mfd. condenser close to the container. The reason for this is that the replacement unit supplied is suitable for either the Radiola 42 or 48.



Schematic Wiring Diagram, Victor Radio R-14

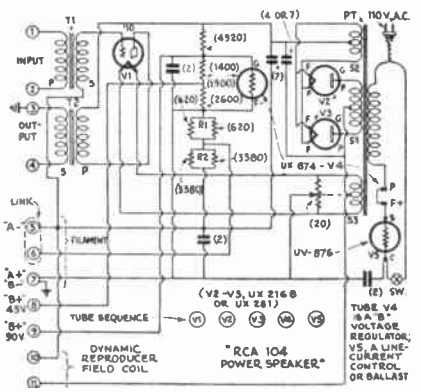
Radio Service Data Sheet

RADIOLA "28" SUPER AND "104" POWER SPEAKER

Condenser C1, in the principal diagram below, is the loop-tuning condenser, in the input circuit to the first R.F. tube (V1); this may be balanced by an experienced Service Man, in accordance with standard practice for superheterodyne circuits, to match the constants of the loop antenna, by the compensating condenser C4 (at the left of the loop socket, looking from the front). Condenser C2 tunes the input to the first detector, V2 (the numerical sequence of the tubes, when plugged into the catacomb sockets, is: V2, V4, V1, V5, V3, V6, V7, V8, as indicated by the numbers immediately beneath these in the diagram, which correspond to the numerals stamped in the bakelite top plate.) Condensers C1 and C2 are ganged, and are under the control of the left tuning drum; condenser C3, tuning the circuit of oscillator V3, is adjustable by means of the right drum. The first R.F. stage is neutralized by means of condenser C5 and the center-tapped loop; this condenser is mounted on the bakelite strip carrying the main terminal lugs. The primary of the first I.F. transformer is tuned to the intermediate frequency (40 kc.) by means of condenser C6; this I.F. circuit is neutralized by condenser C7 (inaccessible). The dotted rectangle denotes the shield can of the catacomb; everything inside this line, except the filament connectors, is under seal (to break which cancels all factory repair obligations). The remaining condensers inside the catacomb are also inaccessible; so is the grid leak, R3.

Low volume, howling, noisy or intermittent operation may be due to defective tubes. Noisy or intermittent operation may also be due to a loose screw holding the filament connection busbar (underneath the "whiskers" or catacomb leads). Noisy or poor operation may be due to a defective phosphor-bronze spring on the loop or in the loop receptacle; or a break in one of the flexible leads. Short "C" battery life may be due to a defective tube (grounded grid); or a loop spring grounding to the frame.

Lack of signals may be due to an open safety resistor (Lamp V9). For test, its three leads may be bonded together; or an auto lamp substituted (first making sure that the 2-mf. condensers, C12, C15, are not shorted). If condenser C12 or C15 is open, circuit oscillation and low volume may result. Noisy or intermittent operation may be due to one of the variable condensers' pigtails being open or grounding against the frame. The loop *must* be centered in the receptacle to take a vertical position. Interchanging tubes (except the power tube) may greatly improve operation. The



metal markers may cut through the insulation of the wires and short to other parts of the circuit.

Noisy operation—particularly during adjustment of either rheostat; and more especially when energized by the "Model 104" power speaker—may be due to imperfect contacts.

To insure satisfactory operation of the "28," by keeping the filament potential below 3 volts, a "pin-jack" voltmeter should be permanently plugged into the tip-jacks provided for this purpose. To improve the pick-up in shielded localities, an outdoor antenna may be inductively coupled to the receiver by placing one or two turns of the lead-in quite near the loop, L. Since the magnetic reproducer connects directly into the plate circuit, it must be correctly poled.

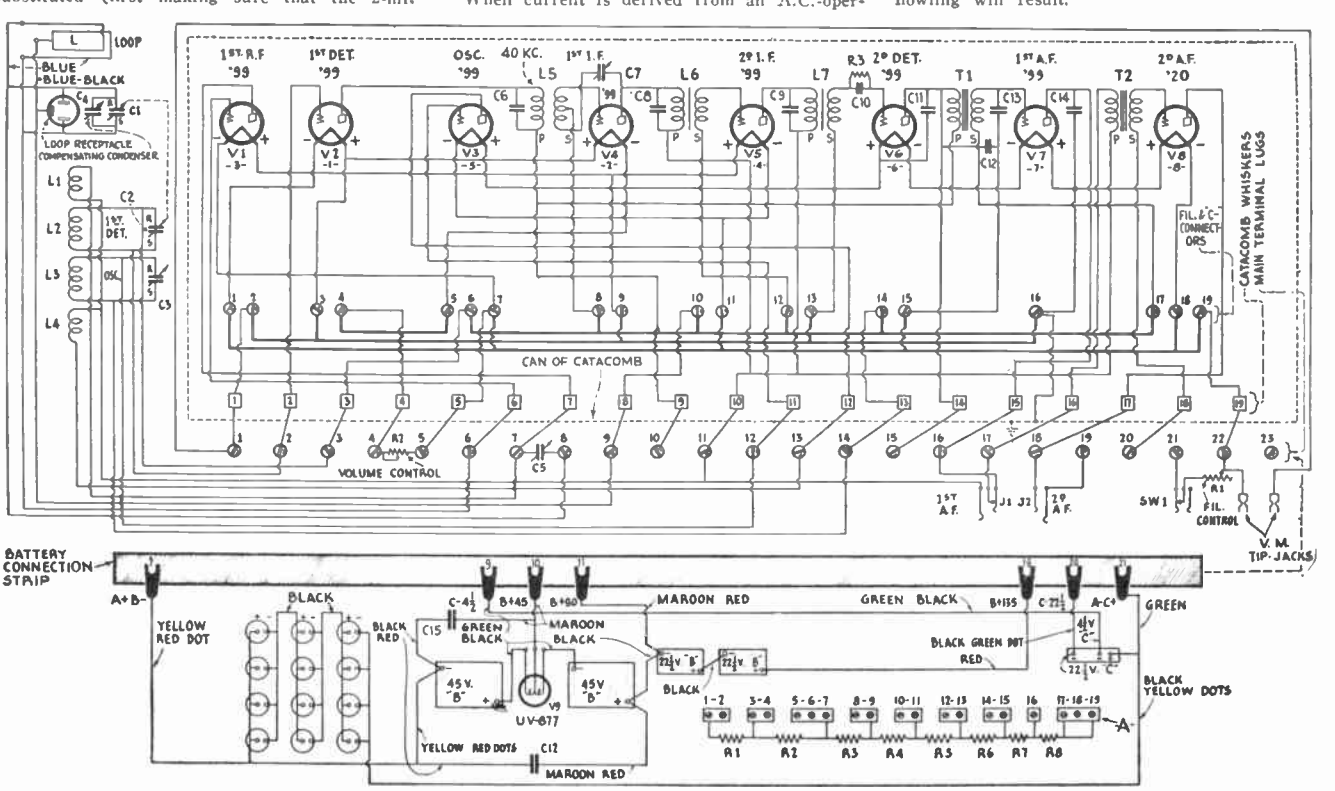
When current is derived from an A.C.-operated power unit, such as the "104" speaker, the filament-connector busbar underneath the catacomb whiskers (heavy lines in the diagram) must be replaced by a resistance strip (A in the diagram). The low-resistance rheostat R2 is then replaced with a resistance cartridge of 350 to 375 ohms, each section of strip A having the following resistance respectively: R1, 190 ohms; R2, 390 ohms; R3, 163 ohms; R4, 155 ohms; R5, 130 ohms; R6, 120 ohms; R7, 115 ohms; R8, 50 ohms. When R2 has a value of 250 ohms (as in the "Radiola 32"), the connecting strip A will have these values: R1, 271 ohms; R2, open; R3, 236½ ohms; R4, 197 ohms; R5, 183½ ohms; R6, 154½ ohms; R7, 145½ ohms; R8, 50 ohms.

When the "28" is A.C. operated, the low resistance cartridge of the filament-control rheostat R1 is replaced with a cartridge having a resistance of 185 ohms.

THE "104" POWER SPEAKER

Before connecting the "104" to the "28," the strap marked "link" must be removed. Replacement resistance and capacity values shown in the diagram of the "104" are the figures in parentheses. In some models, the secondary S3 may be center-tapped, the potentiometer not being used. Resistor R1 may be a single unit of 310 ohms; and R2, another of 1690 ohms. In normal operation, tube V4 will glow pink or violet; and V5 will be dark but hot. Keep the ventilating stack over this tube.

After connecting the "104" to the "28," the two filament leads should be shunted by a fixed capacity of 20-mf. or more (such as an electrolytic unit.) The "A" potential will be about 32 volts; and the battery-type filament voltmeter is no longer required. All voltage terminals should be by-passed by 2-mf. fixed condensers. A 30- to 50-henry choke, connected across main terminal lugs 10 and 195, may be necessary to stop "fluttering"; although changing the '99's usually is sufficient. When the "104" is used, tube V8, in the '20, is not needed; and the "Battery Switch" jack must be shorted—off-on control being obtained through a conveniently placed light-line snap switch. If the power speaker is too close to the "28," howling will result.



Radio Service Data Sheet

RADIOLA-VICTOR R 80—WESTINGHOUSE WR5—GRAYBAR 700—GENERAL ELECTRIC H-31

In the diagram is shown what might be termed the "foundation chassis" of a number of superheterodyne receivers of different trade names and external designs. This is the fundamental circuit plan recently released to all the Radiola-Victor licensees.

To the experienced Service Man it will be evident that extreme care must be taken in servicing these receivers, in order to maintain perfect circuit balance.

The figures in parentheses represent the resistance of each element of the circuit. The capacity values are as follows: C1, C2, C3, C4, 18 to 330 mmf.; C5, C6, C7, C8, C9, C10, 120 to 220 mmf.; C11, 745 mmf.; C12, 4.5 mmf.; C13, C15, C16, C19, 0.1-mf.; C14, 0.5-mf.; C17, 1.0 mf.; C18, .0024-mf.; C20, C21, 3 mf.; C22, 2 mf.; C23, .05-mf.; C24, 3 mf. (for 25 cycles only); C, 745-mmf.

Normal operating readings with volume control R2 at maximum and local-distant switch at "distant," are as follows:

Plate voltages, V1, V4, V5, 240; V2, 70; V3, 235; V6, 210; V7, V8, 200. Plate currents; V1, 4 ma.; V2, 6 ma.; V3, 0.25-ma.; V4, 5.5 ma.; V5, 2 ma.; V6, 0.5-ma.; V7, V8, 30 ma. Control-grid voltages; V1, V4, 2.2; V3, 8; V5, 5; V6, 23; V7, V8, 20. Screen-grid voltages; V1, 90; V3, 80; V4, V5, 85; Filament voltage (between 2 and 3 on the terminal strip), 2.5. Power-pack output voltage (between 4 and 5 on the strip), 250.

The antenna coupler L1 has a high-inductance primary coupled to the first of two tuned coils in slight inductive relation, thus forming a highly-selective link circuit preceding a stage of signal-frequency amplification, V1. The R.F. choke Ch1 in the plate circuit of the latter has a high inductance.

The color code for the main cable is: 1, red with yellow tracer; 2 and 3, brown; 4, yellow; 5, red.

By using the principle of the auto-transformer in the design of filter choke Ch3, a voltage 180 degrees out of phase with the ripple voltage is caused to cancel the latter; the field coil of the dynamic reproducer completes the filtering job (the current through this coil is 85 milliamperes and the drop across it is 110 volts).

Compensation for line voltage is obtained by changing the position of the fuse, which is of 5-amp. rating. A blown fuse may be due to a short in a pack condenser, the rectifier V9, the filament leads, or in the pilot-light socket.

Jerky action of the station selector may be corrected by adjustment of the condenser-drive cable spring or by placing a few drops of oil on the condenser bearing.

Remember that when this set is located close to a powerful station, better volume control may be obtained by removing R3.

Should a noisy volume control fail to respond to treatment with a pipe cleaner and cigarette-lighter fluid, it will probably be necessary to change the control.

Acoustic howl may be due to defective rubber cushions, wood shipping blocks not being removed, microphonic tube, or chassis not swinging freely in the rubber cushions.

Low volume may be caused by defective tubes, poor antenna system, or condensers out of balance (in either R.F., oscillator, or I.F. circuits), defective A.F.T's., shorted field coil (check current through coil), or opens, shorts or grounds in set or pack chasses.

This chassis is practically humless. Excessive hum, however, may be due to these defects: poor '80, open or shorted Ch3, defective condensers, shorted or open resistors.

Distorted reproduction not traceable to reproducer may be due to one of the following conditions: defective tubes, circuit oscillation (resulting in whistle on stations, where the whistle is not due to the heterodyne of two stations), defective A.F.T's., faulty alignment of tuned circuits, tuning slightly off the correct tuning point, strong local station, open or shorted condensers or resistors.

Audio howl often may be traced to defective tubes (particularly V6, V7, V8), open condensers, or circuit oscillation at R.F. causing heterodyne with station carrier.

Circuit oscillation and misalignment of the tuned circuits are probably the two foremost troublesome factors in this receiver. The former is fairly easy to locate and remedy by ordinary service procedure; the latter should not be attempted by anyone not experienced in superheterodyne repair, or anyone who has not made a careful and thorough study of the method of balancing the several circuits.

Circuit oscillation when localized will probably prove to be due to shielding not making proper contact, control-grid leads out of position or not making good contact, open by-pass condensers, defective screen-grid tubes, or separate grounding lead from by-pass condenser case not connected.

In addition to the five circuit-balancing condensers in shunt with the four tuning condensers and the fixed condenser C, there are five adjustable sectors on each of the four tuning condensers. These are adjusted by studs; as they were balanced carefully at the factory it is not likely that it will be necessary to touch them.

However, it may be noted that these sectors are adjusted for five positions of the test oscillator: 1120 kc., 840 kc., 700 kc., 600 kc., and 550 kc. (with the condenser so meshed that the slot of the sector under adjustment, and the next highest capacity, are level with the edge of the stator plate.)

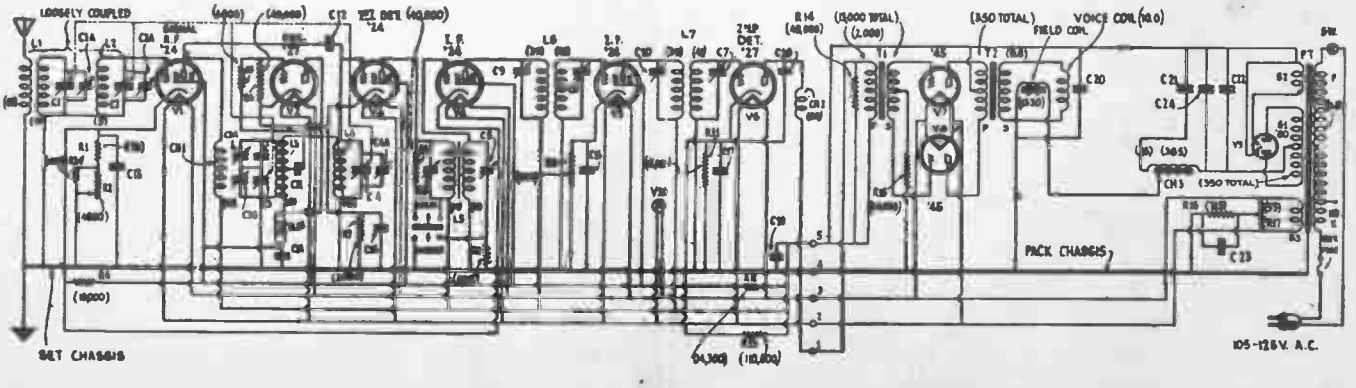
For this adjustment, there will be required a socket wrench, an audio modulated oscillator, and a 0-2-scale milliammeter connected in the plate circuit of the detector. (This connection may be obtained through an adapter that breaks the plate circuit, or by unsoldering the wire that is connected to the plate socket-contact and connecting the meter to this lead and the socket contact.) Then, remove the oscillator tube and connect a 20,000-ohm resistor from the socket plate connection of V2 to its cathode. These connections are to be made with the receiver out of the cabinet and a ground connected to the set.

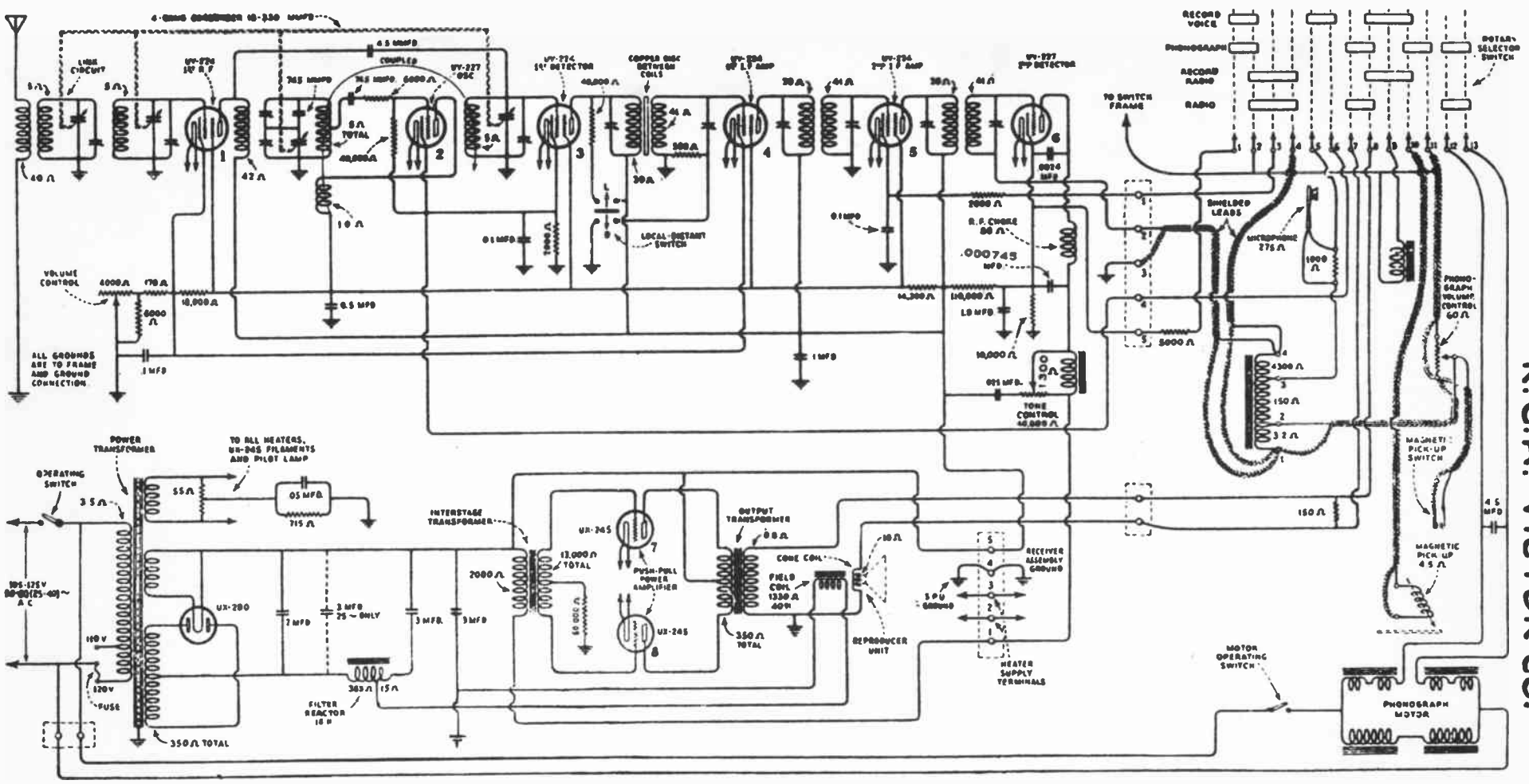
This is a sketchy outline of the procedure (seldom necessary) in lining up the gang condenser; but to do this work correctly involves considerably more detail data than this space permits. Hence, these adjusting studs should not be touched until the complete service data is available; as it is necessary after this adjustment to check over the I.F. condensers, and the scale and oscillator readings.

A modulated oscillator is required adjustable to exactly 600 kc. and to 1400 kc. for balancing the R.F. circuits. A suitable indicating device is a 0-5-scale milliammeter connected in the plate circuit of V6. Set the local-distant switch on "distant" and adjust the 600-kc. oscillator trimming condenser on the chassis, (between the second and third variable condensers), about three quarters of the way in. Now, set the oscillator in operation at exactly 1400 kc., turn the selector knob until the scale reads 1400 kc.; and adjust oscillator, first detector, R.F., and link-circuit trimming condensers, in the order given, for maximum output. Then, with the oscillator readjusted to 600 kc., adjust the 600 kc. trimming condenser while rocking the gang condenser back and forth. (The dial scale should now read 600 kc.) Readjust oscillator to 1400 kc. and set the selector scale at exactly 1400 kc.; then adjust the four trimming condensers, in the order C3, C4, C2 and C1, for maximum meter indication. Place the oscillator again in operation at 600 kc., tune in the signal, and the scale at maximum meter deflection should indicate 600 kc. Otherwise, repeat the former operations.

The I.F. transformers peak at 175 kc. and are so designed as to require a test oscillator variable from 171 kc. to 179 kc., for aligning them.

Making sure that there is a good ground connection, put the set in normal operation, place volume control at minimum, and remove V2. Connect a meter in the output circuit of set and connect the coupling lead of the oscillator to the control grid of V5 (oscillator set for 175 kc.). Adjust C7 and then C10 so that there is no appreciable drop in the meter reading between 172.5 and 177.5 kc., and an equal drop at 171 and 179 kc. After adjusting the tuning of L7, repeat the operation for L6, putting the test oscillator output lead on the control-grid connection of V4. Finally, shift the oscillator lead to the control-grid of V3 and balance the circuits of L5 (which will tune very sharply).





RCA RADIOLA 86 - WESTINGHOUSE WR7 - GRAYBAR 900 - GENERAL ELECTRIC H-71

This instrument is a combination radio receiver similar to Radiola 82, an electric phonograph employing an improved type of magnetic pick-up and tone arm and a home recording mechanism by which either a radio program or sound production in the home may be recorded on the Victor home recording record blanks. This set incorporates the tone control of the Radiola 82 and when the rotary switch is in the "radio" position, it is electrically the same as the Radiola 82.

SCHEMATIC AUDIO CIRCUIT DIAGRAMS

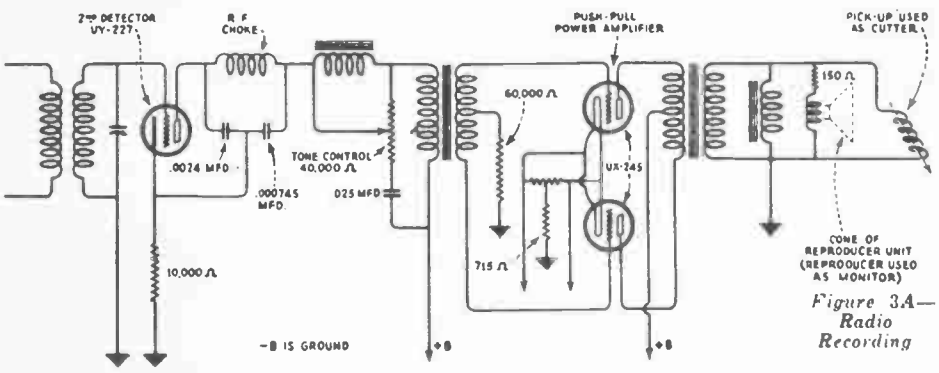


Figure 3A— Radio Recording

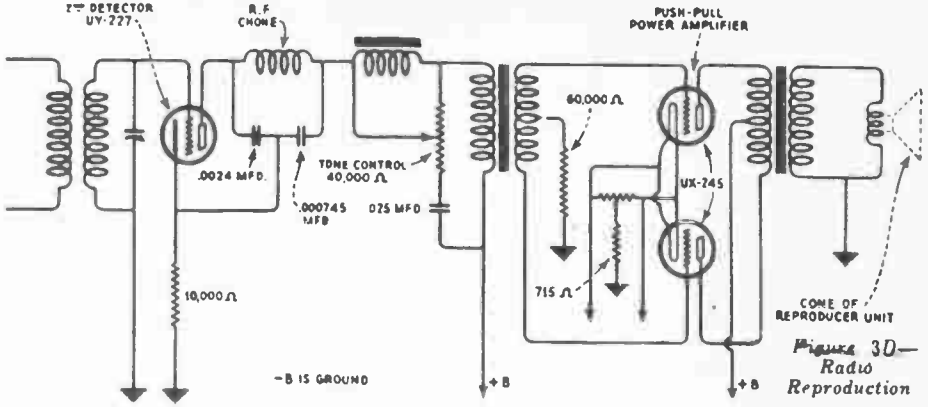


Figure 3D— Radio Reproduction

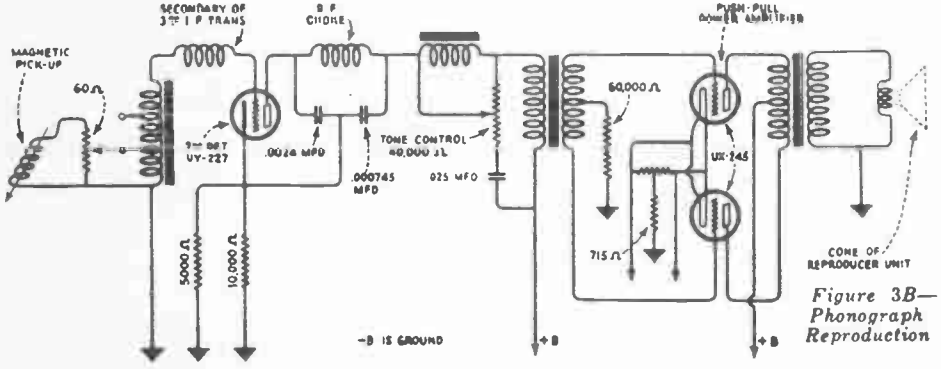


Figure 3B— Phonograph Reproduction

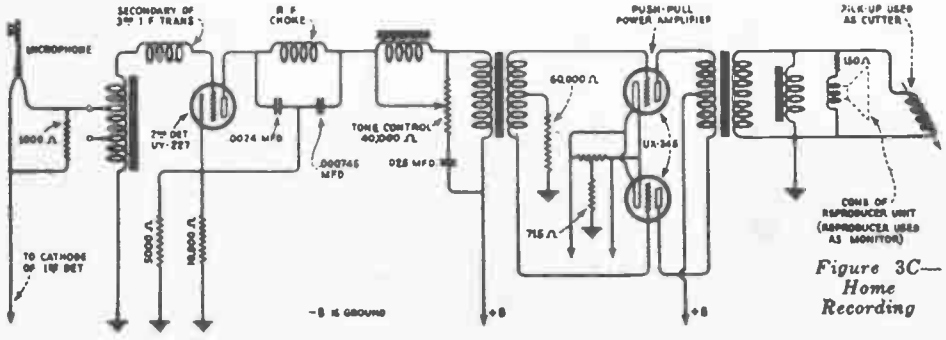
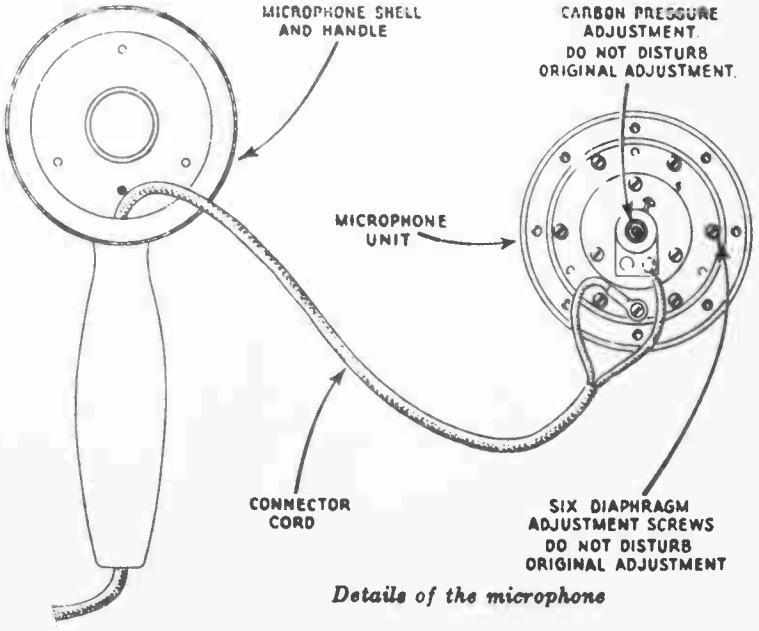


Figure 3C— Home Recording

RCA RADIOLA 86 - WESTINGHOUSE WR7
GRAYBAR 900 - GENERAL ELECTRIC H-71

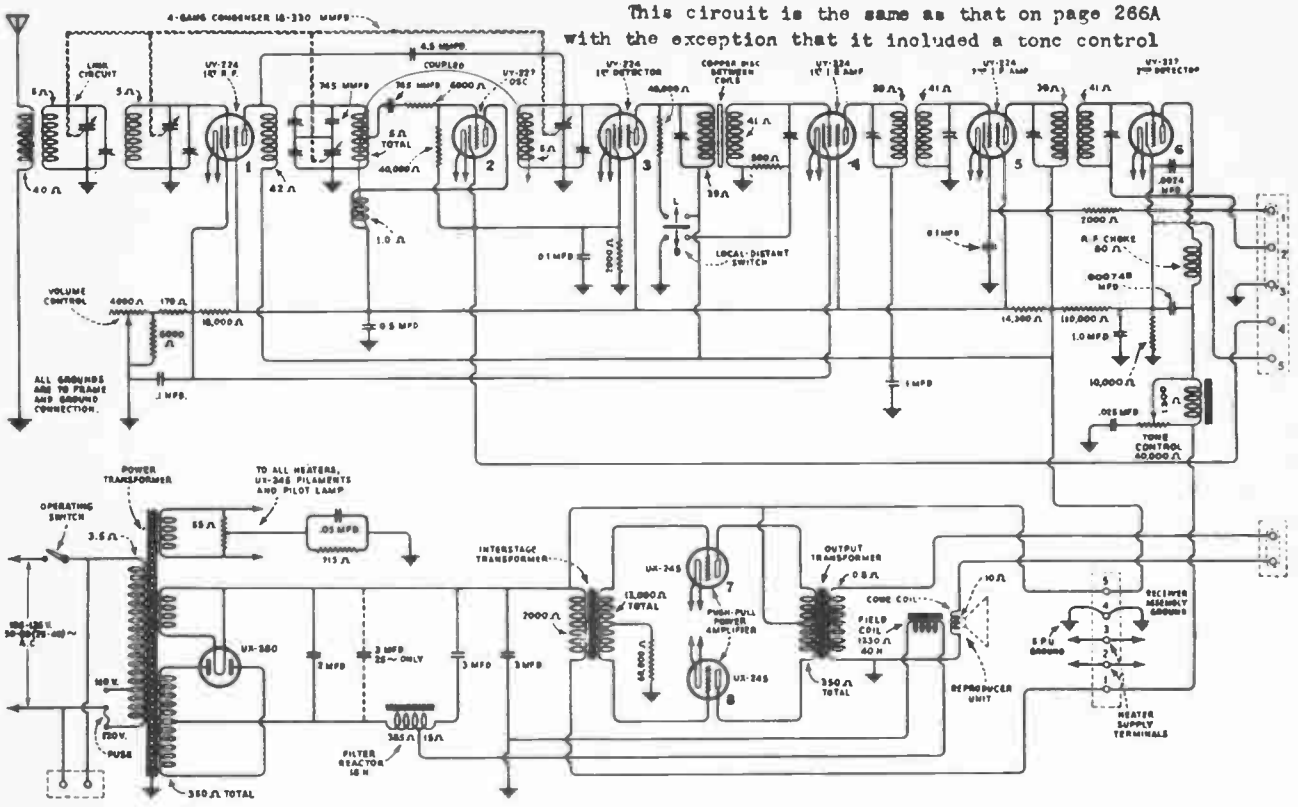


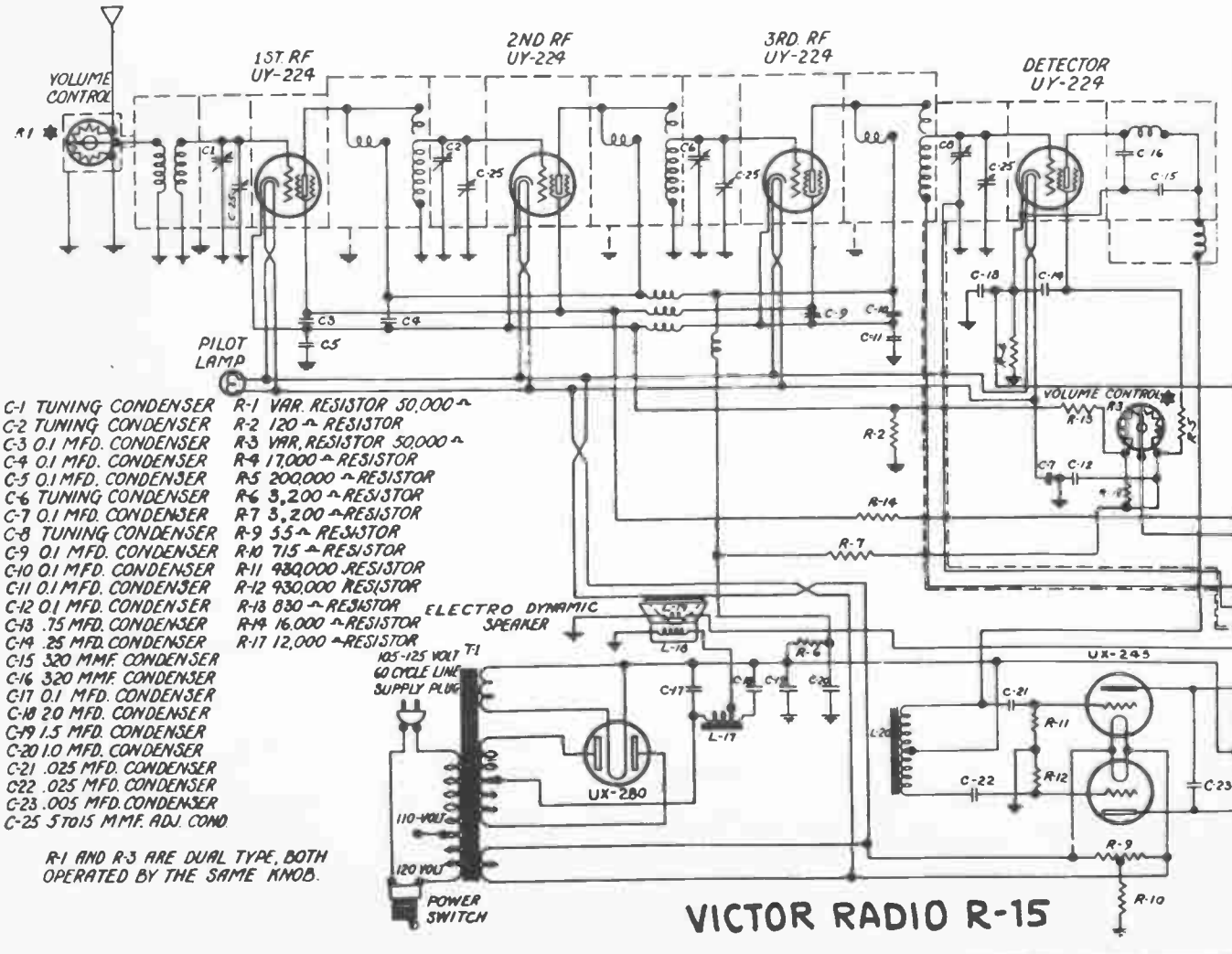
Details of the microphone

R.C.A.-VICTOR CO.

RCA 82 - WESTINGHOUSE WR6 - GRAYBAR 770 - GENERAL ELECTRIC H-61

This circuit is the same as that on page 266A with the exception that it included a tone control





C-1 TUNING CONDENSER
C-2 TUNING CONDENSER
C-3 0.1 MFD. CONDENSER
C-4 0.1 MFD. CONDENSER
C-5 0.1 MFD. CONDENSER
C-6 TUNING CONDENSER
C-7 0.1 MFD. CONDENSER
C-8 TUNING CONDENSER
C-9 0.1 MFD. CONDENSER
C-10 0.1 MFD. CONDENSER
C-11 0.1 MFD. CONDENSER
C-12 0.1 MFD. CONDENSER
C-13 .75 MFD. CONDENSER
C-14 .25 MFD. CONDENSER
C-15 320 MMF. CONDENSER
C-16 320 MMF. CONDENSER
C-17 0.1 MFD. CONDENSER
C-18 2.0 MFD. CONDENSER
C-19 1.5 MFD. CONDENSER
C-20 1.0 MFD. CONDENSER
C-21 .025 MFD. CONDENSER
C-22 .025 MFD. CONDENSER
C-23 .005 MFD. CONDENSER
C-25 5 TO 15 MMF. ADJ. COND.

R-1 VAR. RESISTOR 50,000 Ω
R-2 120 Ω RESISTOR
R-3 VAR. RESISTOR 50,000 Ω
R-4 17,000 Ω RESISTOR
R-5 200,000 Ω RESISTOR
R-6 3,200 Ω RESISTOR
R-7 3,200 Ω RESISTOR
R-9 35 Ω RESISTOR
R-10 715 Ω RESISTOR
R-11 930,000 RESISTOR
R-12 930,000 RESISTOR
R-13 830 Ω RESISTOR
R-14 16,000 Ω RESISTOR
R-17 12,000 Ω RESISTOR

R-1 AND R-3 ARE DUAL TYPE, BOTH OPERATED BY THE SAME KNOB.

VICTOR RADIO R-15

VICTOR "MICRO-SYNCHRONOUS" RADIO, MODELS "R-35," "R-39," "RE-57"

Radio Service Data Sheet

These T.R.F. receivers are manufactured by the Victor Division of RCA Victor Co., Inc., Camden, N. J. The schematic circuit shows the multiple-contact switch designed for changing the connections to "radio," "phonograph," "home-recording," or "radio-recording." The parts used in this Victor chassis are itemized below:

Condensers C2, C4, C12, each 5 mmf. (each capacity is formed by a single turn of wire); C5, C6, C7, C9, C13, C14, C15, 0.1-mf.; C10, 10 mmf.; C17, 0.25-mf.; C18, 0.75-mf.; C20, C21, 50 mmf.; C22, 100 mmf.; C24, 0.01-mf.; C25, C29, 1.0 mf.; C26, C27, C28, C30, C34, 2 mf.; C31, 0.2-mf.; C32, .0012-mf.; C33, 4.5 mf.

The resistors in these models have the following values: R1, 50,000 ohms; R2, 130 ohms; R3, 1,000 ohms; R4, 2 megohms; R5, 1.5 megohms; R6, 28,000 ohms; R7, 1.0 megohm, R8, R9, 0.5-megohm, R10, 2,800 ohms; R11, R15, 55 ohms; R12, R13, 8,000 ohms; R14, 70,000 ohms; R16, 730 ohms; R17, 9000 ohms; R18, 60 ohms; R20, 250 ohms; R21, 140 ohms. The two volume-control resistors R1 and R3 are operated by the same knob.

The hand microphone connects to the pin-jacks J. Unit L20 is the record microphone input transformer.

The portion enclosed by the dotted line DL is used only on the combination models. The links are to be closed, on radio models.

The strips in the enclosure DL, marked R, RR, PG, and RV are used to segregate the little rectangles which denote the contacts on the transfer switch. The four positions of these rectangles, and the wires they then connect, are thus clearly indicated.

Following are the voltage readings at the tube sockets of the receiver. Filament potentials: V1, V2, V3, V5, 2.1 volts; V4, 2.0; V6, V7, 2.25; V8, 4.9. Plate potentials: V1, V2, V3, 173 volts; V4, 50; V5, 67; V6, V7, 222. Plate currents: V1, V2, V3, 3.1 ma.; V4, 0.3; V5, 1.5; V8, each plate, 40 ma. Grid potentials: V1, V2, V3, 3.1 volts; V4, 1.5; V5, 0.2; V6, V7, 37. Screen-grid potentials: V1, V2, V3, 89 volts; V4, 3.4.

The power consumption of the "Models R-35" and "R-39" is 120 watts; the "RE-57," 170 watts for the combination.

Microphonic howl in a set of these types may be due to the reproducer's being not properly insulated, from the cabinet front; adjust the felt. In home-recording, an open in R20 or R21 may cause a howl.

A good ground connection is essential, and must be used at all times.

If the line voltage is high, a "Type 9-V-10" Amperite may be used to limit the line supply.

Oscillation may be due to an ungrounded, or poorly-grounded chassis; or to shielding for condensers, coils, or tubes, being out of place; too much exposure of the green lead between control grid of a '24 and the coil (the unshielded portion of this wire should be as short as possible). An open circuit in any of the 0.1-mf. by-pass condensers, or poor grounding of one of these condensers (due to loose contact at the rivets), may cause this trouble. Faulty grounding of the shielding of a lead in the radio amplifier may cause the same effect.

Following is the color code of the main cable: 1, 2, light brown, 3, yellow (in most cases); 4, yellow-red tracer, in one cable, and red-yellow tracer, in the other; 5, green-red; 6, blue; 7, red; 8, green-red.

(Note: when replacing a coil, or tube-shield caps, always be sure that the slots are aligned with the green wire before the cap is forced into position. To avoid damage to the wire or coil, never turn the cap after it is once in place.)

Failure of the home-recording section of the receiver may be due to the following causes: poor contacts in microphone pin jack terminals; a loose or broken wire or connection; an open or a short in the microphone; a short in either of the resistors R20, R21, on reactor unit; a shorted or open record-microphone input transformer on motor board; faulty contact in control switch; an open coil L22, reactor unit; a weak magnet in the electric pick-up.

Faulty record reproduction with noticeable blasting, particularly on bass notes, may be caused by worn records or needles, or by improper centering of the pick-up armature. If such a condition is traced to the pick-up, center the armature in the following manner: remove pick-up from the pick-up arm, and remove the cover. (Note: It is highly important that the magnet be in contact with the pole pieces, or with a small iron or steel "keeper," at all times. Even a momentary break in the magnetic path of the pick-up magnet will produce a noticeable loss of magnetism, which is reflected in decreased efficiency of the pick-up, particularly in home recording.) Place a steel keeper, 1⅛ x ½ x ⅛-in. across the two ends of the magnet, and carefully slide the magnet from the pole pieces onto the keeper. Next, slide the magnet back onto the underside of the pole pieces. Then, loosen both round-head screws in the armature adjusting plate.

Insert a pick-up gauge between the armature and the pole pieces, and retighten the round-head screws in the adjusting plate. After properly centering the armature, replace all parts of the pick-up assembly.

In some models C33 has a capacity of 5.8 mf.; it is not in circuit for electric phonograph or radio reproduction, but serves to increase the power of the motor, during home-recording with either microphone or radio, to avoid increase of speed on playback. It is out of circuit for radio reproduction, to prevent the motor running at high speed and becoming excessively hot as it might if left running after moving the change-over switch from "recording" to "radio."

Following are the oscillator frequencies at which the variable condensers are to be aligned: 550, 710, 1000, 1300, 1500 kc.

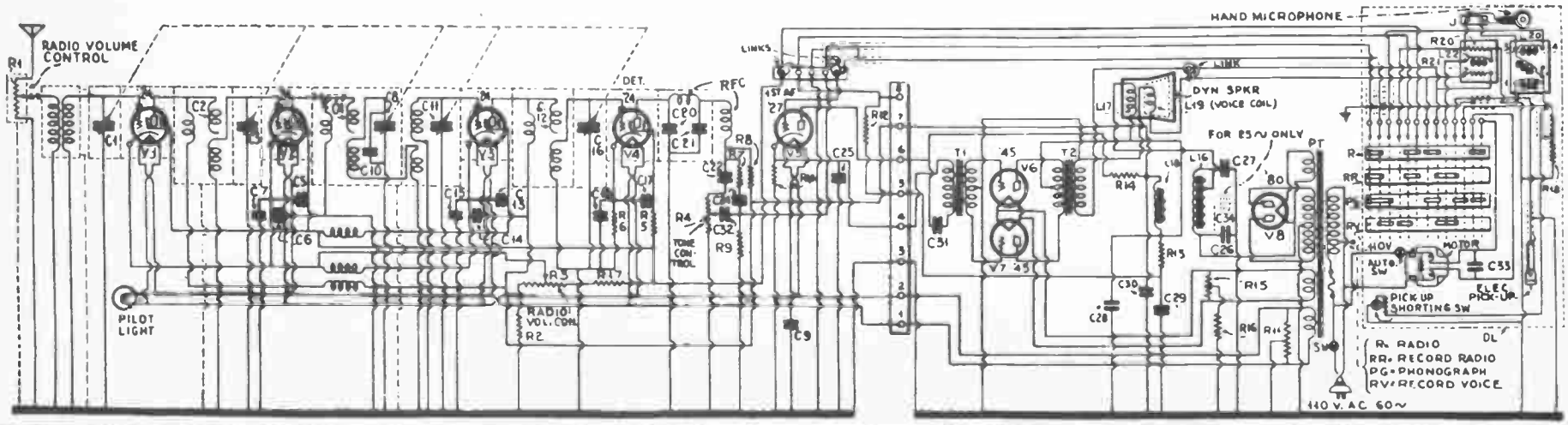
If it becomes necessary to re-center the cone of the dynamic reproducer, a strong 60-cycle hum may be obtained by removing one of the R.F. tubes and running a lead from its cathode to one of the filament terminals of a screen-grid tube's socket.

Should the tuning lever fail to operate freely, or should the vernier roller fail to track when turned, adjust the tension of the lever on its track, by means of the adjusting nut; which will be found on the lever midway between the cam wheel and the dial. A small amount of grease should be placed on both the top and the bottom of the roller track, to assure free movement of the lever.

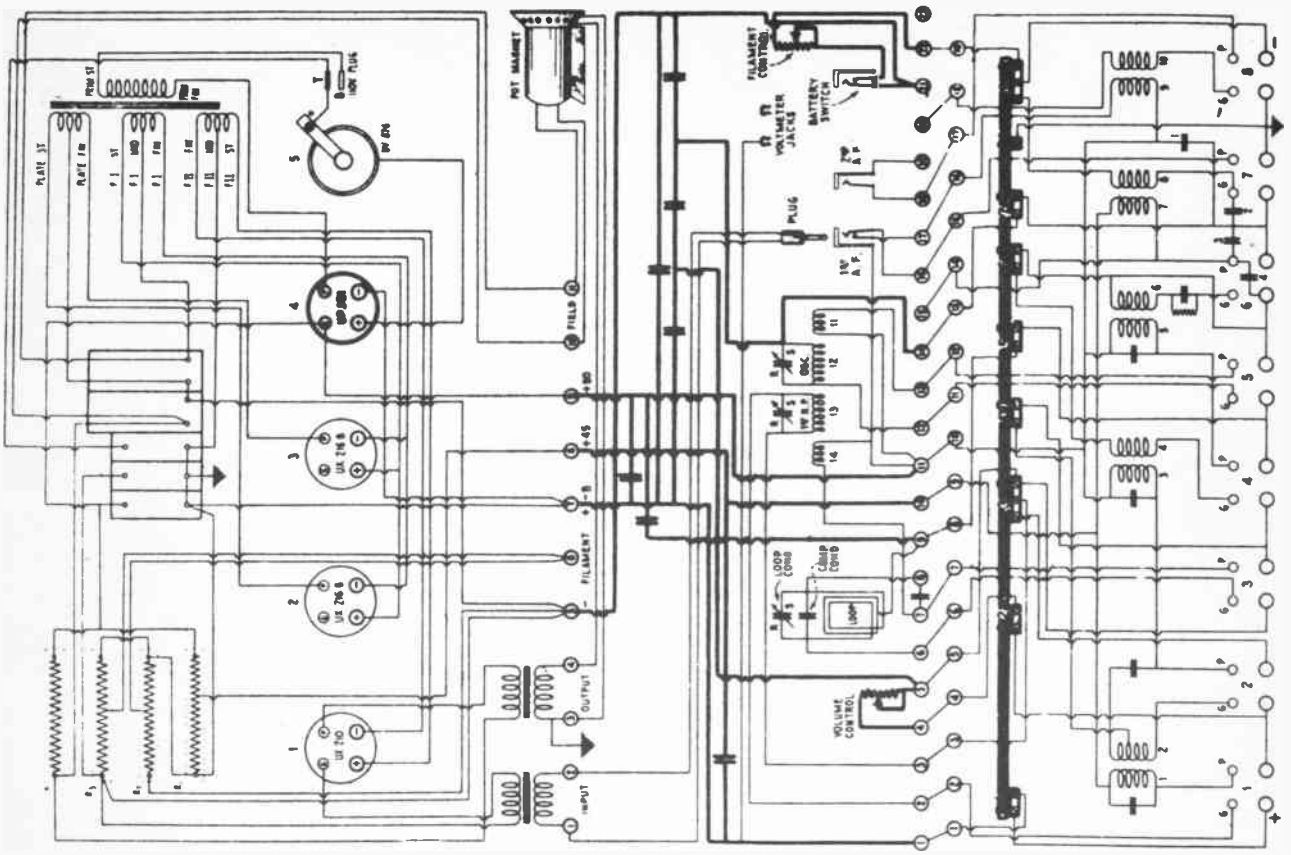
When replacing or repairing the selector scale, slide the scale to right and left until the indicator is in line with the frequency marking which is correct for a station then being received. Check this at several different points on the scale. If the pilot lamp is mounted off center, the dial readings at certain sections of the scale will be incorrect. Check the location of lamp, which should be exactly in the rear of the center of the dial; while the hair-line station indicator should be vertical at the center and at the extreme ends of the dial.

The tone control is effective on both radio and record reproduction.

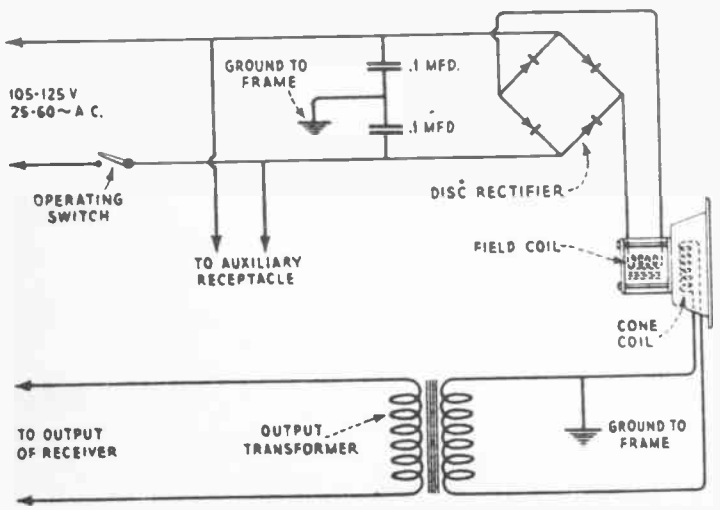
To prevent a twisting action the length of the pick-up during recording, the head is splayed. This weight on the sides serves by its inertia to maintain a "level keel."



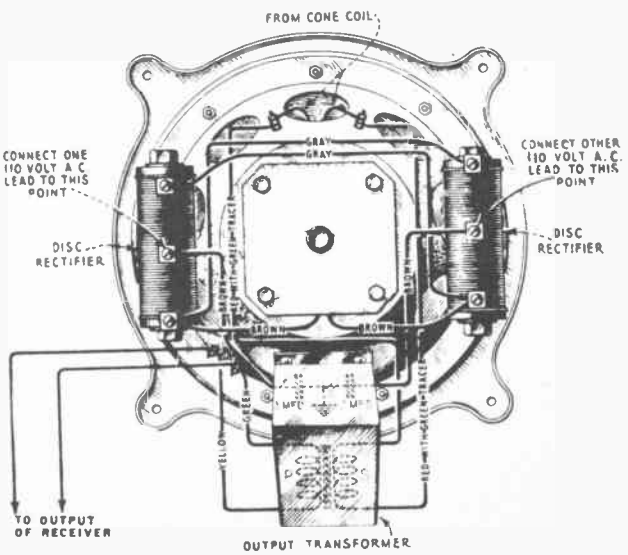
R.C.A. VICTOR CO.



RADIOLA 28 A.C.



Schematic wiring diagram of Loudspeaker 106



Wiring diagram of reproducer unit

RCA LOUDSPEAKER 106

Radio Service Data Sheet

RCA-VICTOR RADIOLA "SUPERETTE" MODEL R7 SUPERHETERODYNE

Graybar No. 8 Midget; Westinghouse No. WR-10 Columnette; and General Electric Models G. E. Jr. No. S-22, G. E. Jr., with clock, No. S-22X, and G. E. Jr. Console No. S-42.

The circuit of this receiver is of particular interest, as being the first of the mantel radio sets brought out by these companies. It is seen, by reference to the diagram below, that this superheterodyne uses a limited number of tubes, in the following manner: One stage of signal-frequency R.F., V1, using the new type '35 variable-mu tube; a type '27 as oscillator, V2; a '24 screen-grid first-detector V3; a type '35 variable-mu first stage of I.F. amplification, V4; a type '27 power second detector, V5; push-pull '45's, V6, V7, in the power A.F. circuit; and the usual '80 rectifier V8.

The resistance values of the choke coils and transformers in this model chassis are shown in parentheses in the diagram (Fig. 1); other constants are given below:

Tuning condensers C1, C2, C3, 18 to 325 mmf.; trimmer condensers C1A, C2A, C3A, 4 to 50 mmf.; oscillator padding condenser C4, 745 mmf.; padding trimmer C5, 15 to 75 mmf.; C6, 745 mmf.; C7, C14, C19, C21, 0.5-mf.; C8, 1 mf.; C9, 0.1-mf.; C10, C13, 10 to 70 mmf.; C11, C12, 20 to 220 mmf.; C15, .05-mf.; C16, C17, .0024-mf.; C18, 4 mf. (electrolytic); C20, 10 mf. (electrolytic).

Volume-control resistor R1, 3,800 ohms; R2, 150 ohms; R3, 14,300 ohms; R4, 8,000 ohms; R5, 6,000 ohms; R6, 10,000 ohms; R7, 1 meg.; R8, 30,000 ohms; R9, tone control, 0.5-meg.; R10, R11, 0.1-meg.; R12, 40,000 ohms.

Operating voltages in this chassis are as follows (volume control at minimum): All filament potentials except V8: 2.4 volts. Cathode potentials: V1, V2, V4, 40 volts; V3, 8 volts; V5, 25 volts. Control grid potentials: V1, V4, 40 volts; V2, 0 volts; V3, 7 volts; V5, 5 volts; V6, V7, 30 volts (note that the readings of V5, V6, V7 are taken through units of high resistance, and therefore are not the effective values). Screen-grid potentials: V1, V4, 55 volts; V2, 90 volts. Plate potentials: V1, V4, 200 volts; V2, 50 volts; V3, 240 volts: V5, 220 volts; V5, 220 volts; V6, V7, 245 volts. Plate currents: V1, V4, 0 ma.; V2, 4 ma.; V3, V5, 0.5-ma.; V6, V7, 30 ma. Screen-grid currents: V1, V4, 0 ma.; V3, 0.25 ma.

With the volume control in *maximum* position: Cathode potentials: V1, V4, 3.5 volts; V2, 2.5 volts; V5, 25 volts. Control-grid potentials: V1, V4, 3.5 volts; V2, 0 volts; V3, V5, 5 volts; V6, V7, 30 volts (indicated). Screen-grid potentials; V1, V3, V4, 70 volts. Plate potentials; V1, V4, 240 volts; V2, 65 volts; V3, 235 volts; V5, 220 volts; V6, V7, 245 volts. Plate currents: V1, V4, 5 ma.; V2, 5.5 ma. V3, V5, 0.5-ma. Screen-grid currents: V1, V4, 0.7-ma.; V3, 0.25-ma. (these last values may be higher or lower, depending upon the age of the tube).

The field coil is electrically center-tapped to obtain one-half the 100-volt drop across it as "C" bias for the power tubes. Note the following points of interest in the design of this chassis:

Phonograph operation is obtained by removing the strap (shown dotted) from lugs 1 and 2, and placing it across lugs 3 and 4; and connecting in a phonograph pickup at the terminals provided. The power transformer has a static shield," shown dotted. Volume is controlled by simultaneously varying the cathode biases of the two variable-mu tubes (which are used to prevent cross-modulation) and the '27 oscillator. The high-inductance primary of L1 prevents antenna variations from affecting the secondary tuning.

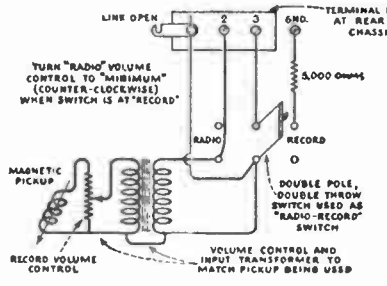


Fig. 3

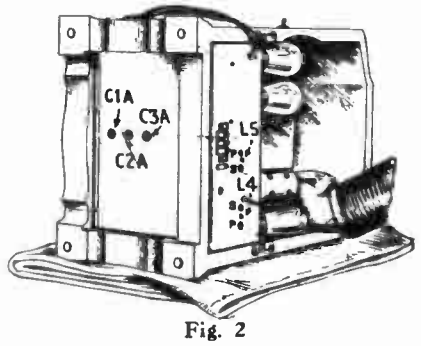


Fig. 2

Locations of the trimming capacities; C5 (underneath the dynamic reproducer) is being adjusted by the operator.

Observe that the I F. transformers L4, L5, are reversed in their connection to the tubes; the high-resistance winding being the plate inductance in one instance, and the grid coil in the other. The I.F. transformers are not flat-topped, but are "peak-tuned" to the intermediate frequency of 175 kc. High selectivity is obtained by tuning both windings. The tone control serves partially to compensate for the lack of a large baffle; for, in the extreme bass response position, the condenser and A.F. transformer primary resonate at a very low frequency. Note that this is an efficient method of obtaining low-note response by resonance, and not by merely bypassing the high frequencies. In the former case low notes are actually amplified; in the latter, they are evident merely because the volume of the high notes has been reduced below the normal volume of the low notes.

The oscillator's output is inductively transferred to the remainder of the circuit by coupling between L2 and L3. The detector's grid-circuit filter, comprising R7 and C15, serves to reduce the hum level.

Since the electrolytic filter condensers are not efficient at radio frequencies, two paper-dielectric fixed condensers of 0.5-mf. capacity each, C19, C21, are included in the filter circuit as R.F. by-passes.

The electrolytic condensers may be tested by noting their leakage current; which at 400 volts D.C. should be 2.4 ma. for the 10-mf. unit and 1 ma. for the 4-mf. unit. The current through the reproducer field coil is 80 ma.

Three strips of "visiting card" bristol board may be dropped through the slits in the dynamic reproducer spider, to center the cone.

The positions of the condenser adjustments are shown in Fig. 2; connections which may be followed for phonograph operation are shown in Fig. 3.

The rubber friction-roller on the drum dial is provided with a means of adjustment, if the continued operation wears down the roller.

If it becomes necessary to open the case of the tone-control unit, to make repairs, a pin or sharp instrument is to be pushed into the small hole on the side of the case. This pushes down a spring, releasing the cover.

Acoustic howl may be due to hardening of the rubber chassis supports; replace these. Also, check the position of the chassis; if it does not swing freely, but touches the cabinet, a microphonic action may be produced.

Oscillation in the R.F. or I.F. circuits may be due to poor shielding contacts, open by-pass condensers, or an ungrounded light line. In the latter instance, try connecting the ground to both the chassis and the ground lead.

The R.F. circuits are adjusted first at 600 kc. and then at 1400 kc. A suitable output meter to indicate resonance may be a "current-squared" thermo-galvanometer, connected to the secondary of T2 instead of the voice coil of the reproducer; a low-range A.C. voltmeter may be connected across the voice coil; or an 0-5-scale milliammeter may be connected in series with the plate supply to the second detector.

The I.F. stages may be resonated by tuning to the output of an external oscillator connected to the control-grid cap of V3, with oscillator tube V2 removed and the chassis grounded; adjusting for maximum meter deflection.

It is best to align the I.F., R.F., and oscillator in this order; because of the interlocking of the controls.

The 3-gang condenser unit includes split end plates which are to be bent for stage alignment, only if tests indicate that this procedure is necessary.

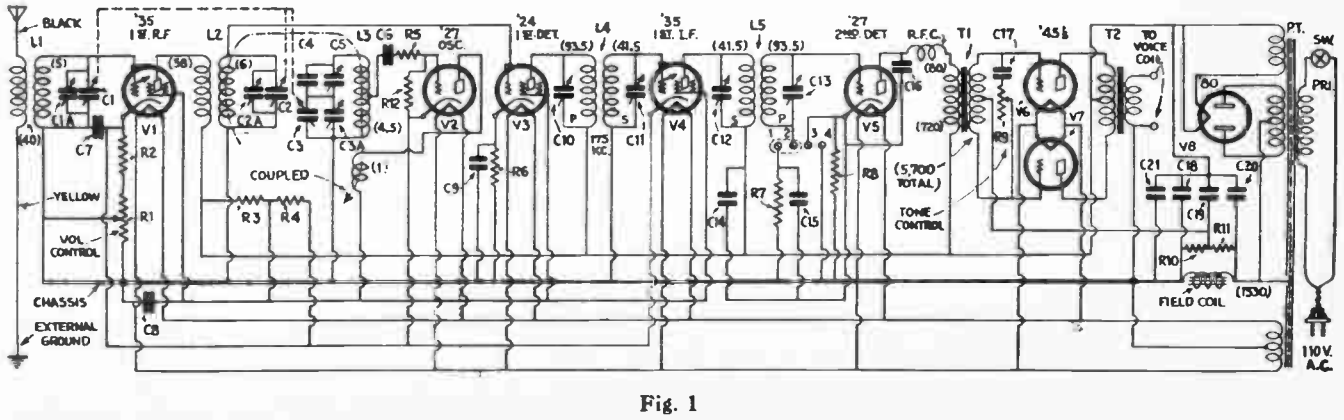


Fig. 1

Radio Service Data Sheet

WESTINGHOUSE "COLUMNAIRE" MODELS WR-8 AND WR-8-R (REMOTE CONTROL)

Also WR-5 (RCA Victor 80, G.E. H-31, Graybar 700); WR-6 (RCA Vic. 82, G.E. H-51, Graybar 770); WR-7 (RCA Vic. 86, G.E. H-71, Graybar 900); WR-6-R, and WR-7-R remote-control models

The fundamental circuit of these receivers is the WR-5 receiver chassis and power pack shown in Data Sheet No. 29. The model WR-6 is a highboy; its circuit is the same as used in the WR-5, except as modified for tone control. The Model WR-7 is similar to the Model WR-6, except as modified for an electric phonograph. Models WR-6-R and WR-7-R are the same as the respective WR-6 and WR-7 chasses, except as modified for remote control. The Model WR-8 uses the same chassis and power pack as the Model WR-6, only an electric clock and the cabinet distinguishing it as the "Columnaire;" the remote-control model being coded as the Model WR-8-R.

The resistance of each individual unit appears in Data Sheet No. 29. The values of only the resistors, capacities, and chokes follow:

Resistors R1, 4,000 ohms (potentiometer); R2, 170 ohms; R3, R6, 6,000 ohms; R4, 18,000 ohms; R5, R10, 2,000 ohms; R7, R8, 40,000 ohms; R9, 500 ohms; R11, 14,300 ohms; R12, 10,000 ohms; R13, 110,000 ohms; R14, 60,000 ohms, R15, 715 ohms; R16, 55 ohms.

Condensers C1, C2, C3, C4, 18 to 330 mmf.; C5, C7, C24, 0.1-mf.; C6, 0.5-mf.; C8, 4.5 mmf.; C9, C18, 745 mmf.; C10, C11, C12, C13, C14, C15 120 to 220 mmf.; C16, C23, 1.0 mf.; C17, .0024-mf.; C19, C21, 3 mf.; C20, 2 mf.; C22, .05-mf.

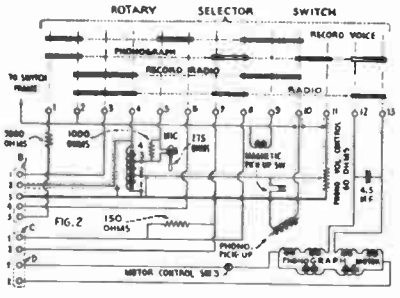
The tone-control units have the following values: C, .025-mf.; R, 40,000 ohms (potentiometer); Ch, 2 henries.

The phonograph attachment is shown in Fig. 2. The remote-control attachment is shown in Fig. 3. Variations in Fig. 1 are dotted.

The normal operating voltages of all these receivers, with volume control R1 at mavimum and switch Sw1 at "distant," are given below:

Plate voltages, V1, V4, V5, 240; V2, 70; V3, 235; V6, 210; V7, V8, 200. Plate currents; V1, 4 ma.; V2, 6 ma.; V3, 0.25-ma.; V4, 5.5 ma.; V5, 2 ma.; V6, 0.5-ma.; V7, V8, 30 ma. Control-grid voltages; V1, V4, 2.2; V3, 8; V5, 5; V6, 23; V7, V8, 20. Screen-grid voltages; V1, 90; V3, 80; V4, V5, 85; Filament voltage (between 2 and 3 on the terminal strip A), 2.5. Power-pack output voltage (between 4 and 5 on the same strip), 250.

The color code of the push-pull A.F. transformer is as follows: T1 input, red and yellow; red with yellow tracer. Output, yellow (center-tap); and green. Transformer T2 input, red (center-tap); and blue; output, black. Power transformer PT, primary, black-with-red-tracer; black-and-red (110 volts); black (120 volts). Secondary, 2.5 volts, brown; 5 volts, black-with-green tracer; high voltage, yellow-with-red-tracer (center-tap), and black-with-blue-tracer.



The combination model (the Model WR-7) has substantially the same receiver and power pack chassis as the Model WR-6, except as modified for the special rotary switch which makes the necessary circuit changes for the following operations: personal home recordings; radio home recordings; radio reception; phonograph operation; (see Fig. 2.). See page 521, March, 1931 issue of RADIO-CRAFT for details of phonograph automatic switch. The turntable's speed is 78 r.p.m. In normal operation the motor develops considerable heat.

In the microphone-coupling auto-transformer (Fig. 2) read 3.2 ohms from 1 to 2; 2 to 3, 150 ohms; 3 to 4, 4,300 ohms.

In the remote-control receivers Models WR-6-R and WR-7-R, the control motor is part of the receiver chassis. Operation of the tone control or local-distant switch must be done at the receiver; but tuning and volume control may be effected at a distance of not more than 75 feet. The details of this external equipment are shown in Fig. 3. The 60-ohm resistors reduce the potential to 23 volts for station selection, and 18 volts for volume control, (special); the end thrust of the motor at the different speeds causing the proper gears to engage. The tapped phase-changing impedance and capacity change the phase-angle of the applied current, so that operation of the motor in either direction is obtained. The "on-off" operation of the set is relay-controlled; a series of drums and contactors start the motor in the right direction for station selection. In normal operation the pilot light dims, until a station has been tuned in (when the volume control is to be operated to suit). If trouble develops in the drum assembly, the entire unit must be replaced.

The "Columnaire" Model WR-8 is, except for the cabinet, the same as the Model WR-6; while the Model WR-8-R receiver chassis and power pack are almost identical with the Model WR-6-R. Leads for the synchronous electric clock are shown and, (in dots) the leads for the remote control attachment. The primary of T3 connects to the 110 V. line; the secondary output is 23 V.

Do not use the manual station selector with the chassis removed from the cabinet, unless the chassis is in a vertical position; otherwise, damage will result. Push either the "+" or the "—" button; the armature should *not* rise and engage the station-selector gear. Now push a station-selector button; if the armature does *not* rise and engage the station-selector gear, increase the tension of the spring. Next, increase the spring's tension until the armature just rises when a volume-control button is pressed; then decrease the tension until the armature just fails to rise when one of these buttons is pressed.

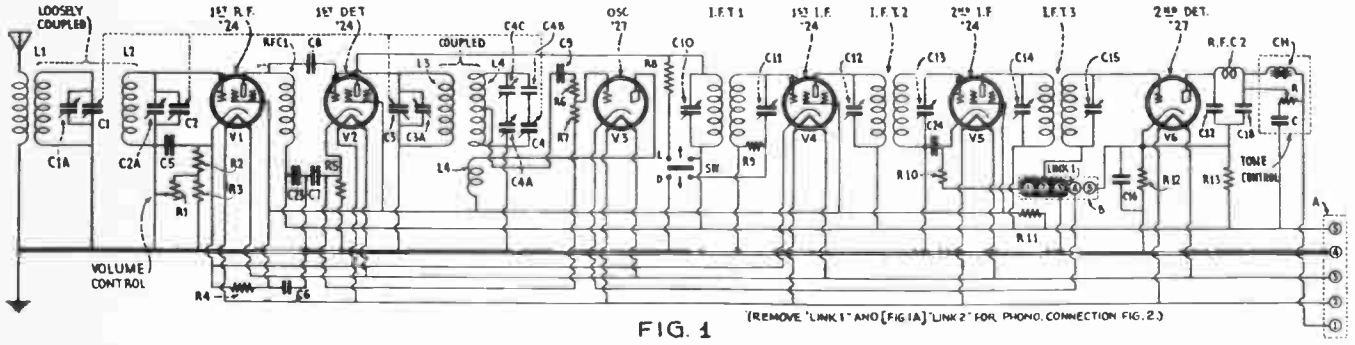
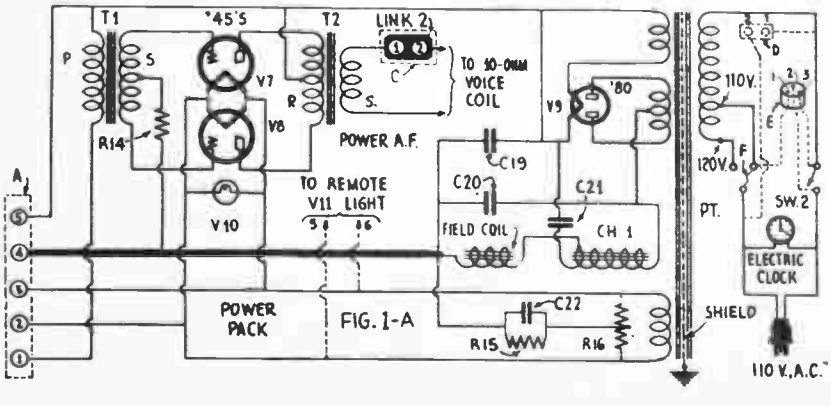
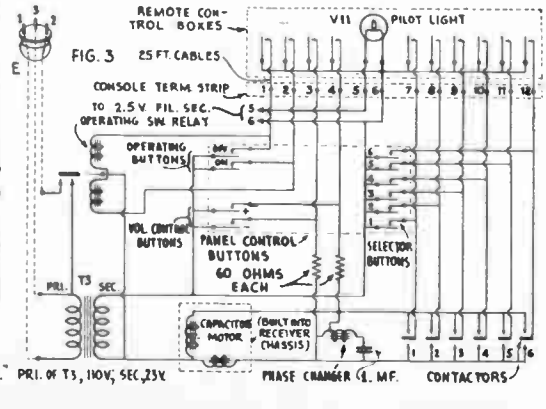


FIG. 1

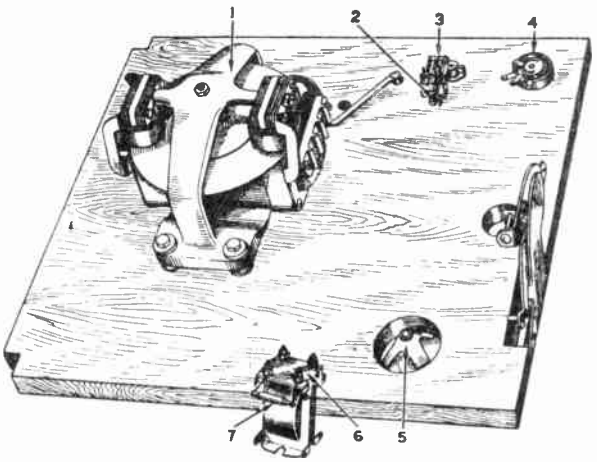




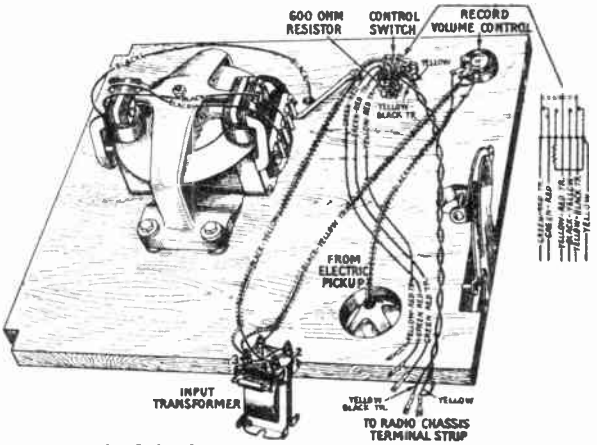
R.C.A. VICTOR CO.

Model RE-17

The Victor Radio with Electrola RE-17 is a combination of the four-circuit radio equipment in the R-15 with the Electrola equipment, less home recording, of the RE-57. A transfer switch controls the change-over from radio to record operation. When the switch is in the "Electrola" position, the power detector becomes a first stage audio amplifier, transformer coupled, by a change in the grid bias of this tube when a 600-ohm resistor is connected into the grid bias circuit. The screen grid voltage supply to the R.F. tubes is opened to prevent the possibility of obtaining both radio and record reproduction simultaneously.



Under Side of Motor Board Showing Parts



Under Side of Motor Board Showing Wiring Between Parts

No.	Name of Parts	Stock No.
1.	Motor (60 Cycles)	A-9054
	Motor (25 Cycles)	A-9053
	Motor Capacitor (25 Cycles)	A-241
	Motor Resistor (25 Cycles)	A-359
2.	600 Ohm Resistor (Green, White, Green)	A-358
3.	Radio-Record Control Switch (Complete less knob)	A-425
4.	Electrola Volume Control (Complete less knob)	A-336
5.	Electric Pickup Arm and Base	A-1454
6.	Input Transformer	A-24
7.	Input Transformer Capacitor)	A-257

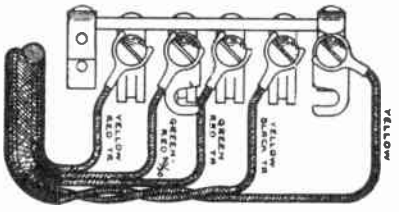
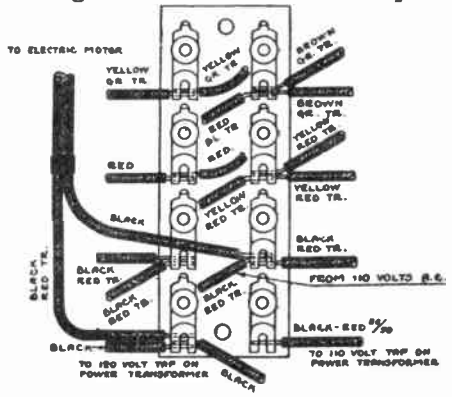


Fig. 3—Electrola Terminal Strip



Radio Chassis Terminal Board, showing Additional Connections for Motor

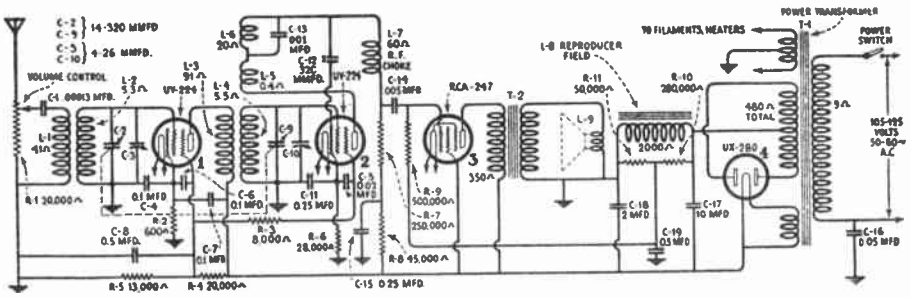
Voltmeter Continuity Test of Electrola Parts

Using 10 volt scale of Weston 547 Test Box and 4½ volt "C" battery.

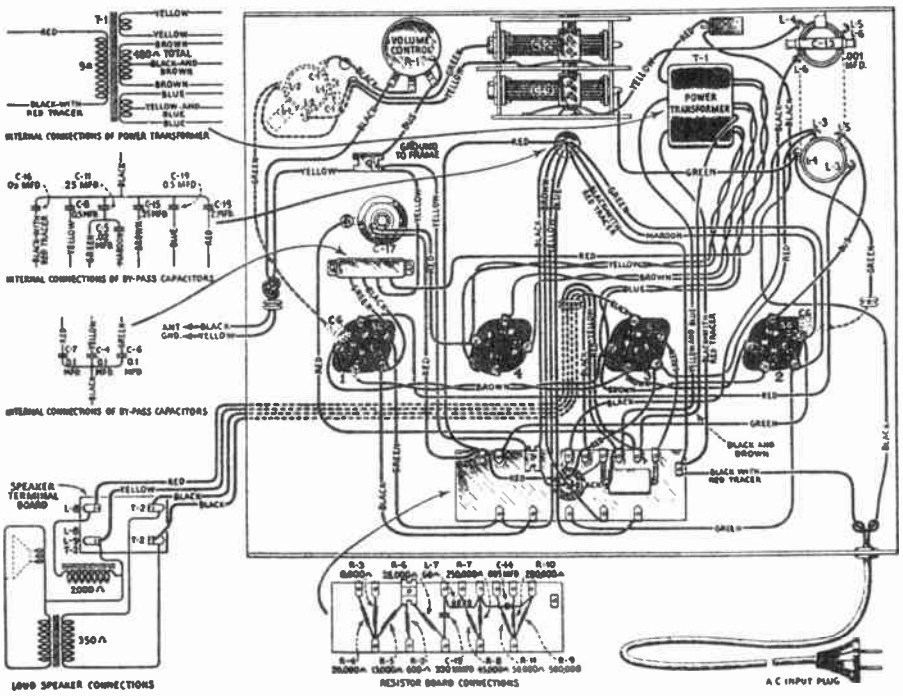
TEST	TERMINALS	APPROX. VOLTAGE (10 Volt Scale)
Electric Pickup	On P. U. Connector Block	9.0 Volts
Record Volume Control	Two End Terminals	8.6 Volts
Input Transformer	1 and 2 3 and 4	9.0 Volts 7.2 Volts

R.C.A. VICTOR CO.

MODEL R-5



Schematic Circuit Diagram of Model R-5



SOCKET VOLTAGE READINGS

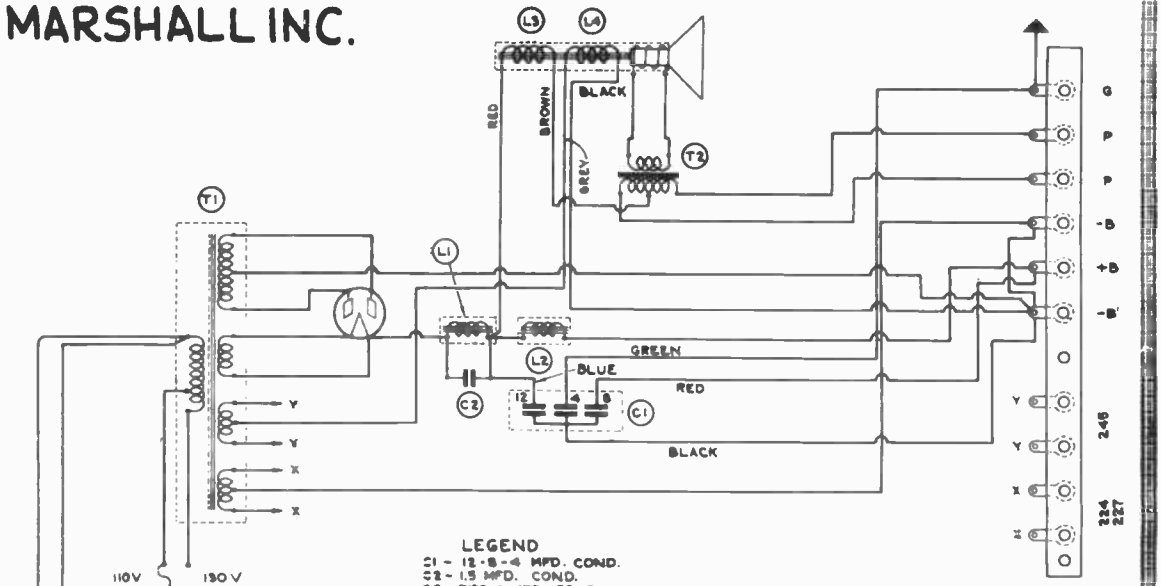
110-VOLT LINE

These are readings obtained with the usual Set Analyzers and are not true readings of the voltages at which the Radiotrons operate.

Radiotron No.	Heater to Cathode Volts	Cathode or Filament to Control Grid Volts	Cathode or Filament to Screen Grid Volts	Cathode or Filament to Plate Volts	Plate Current M. A.	Heater Volts
1	3.0	3.0	85	225	4.0	2.2
2	7.0	7.0	65	100	0.25	2.2
3	——	2.0	225	215	30.0	2.2

SILVER MARSHALL INC.

33-A POWER SUPPLY 25 ~



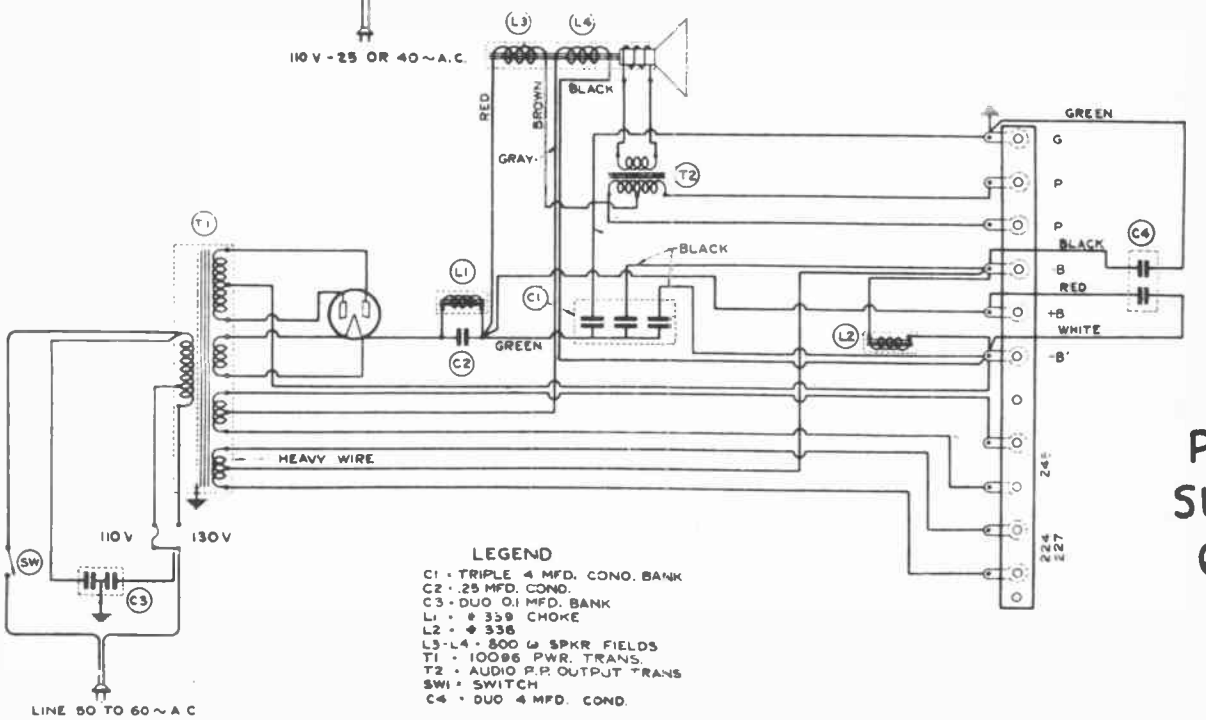
LEGEND
C1 - 12-8-4 MFD. COND.
C2 - 1.5 MFD. COND.
C3 - DUO .1 MFD. COND.

L1-#339 CHOKE
L2-#338 "
L3-L4 - 800 Ω SPEAKER FIELDS

T1 - #10088 POWER TRANS.
T2 - #271 P.P. OUTPUT TRANS.

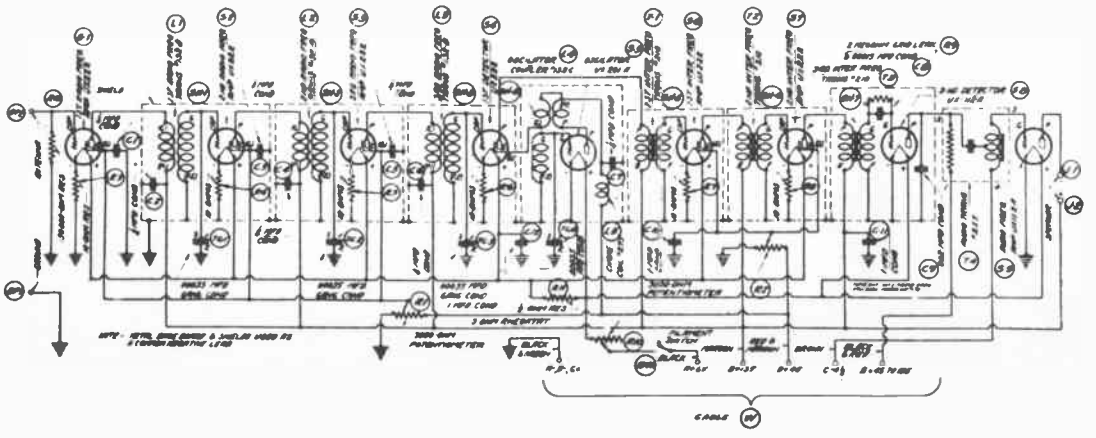
SW - SWITCH

33-A POWER SUPPLY 60 ~



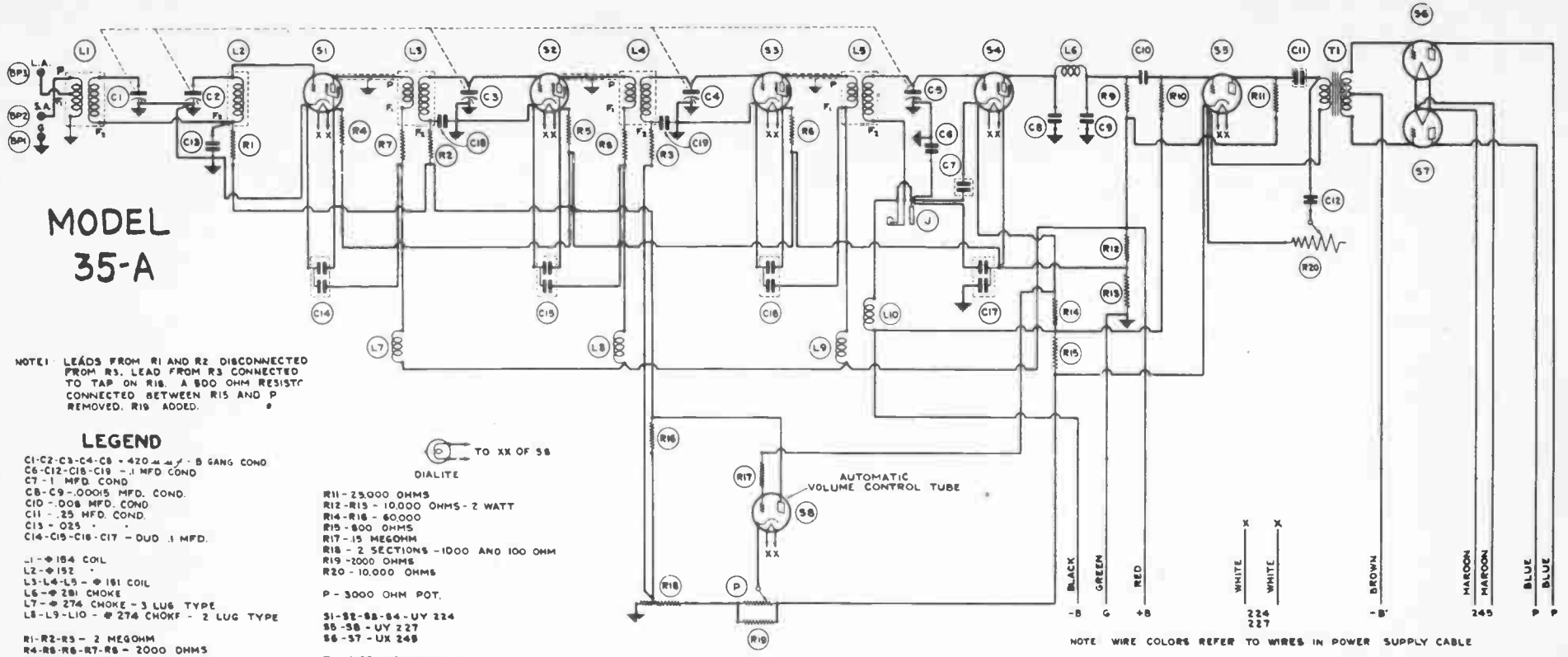
LEGEND
C1 - TRIPLE 4 MFD. COND. BANK
C2 - .25 MFD. COND.
C3 - DUO 0.1 MFD. BANK
L1 - # 339 CHOKE
L2 - # 338
L3-L4 - 800 Ω SPKR FIELDS
T1 - 10086 PWR. TRANS.
T2 - AUDIO P.P. OUTPUT TRANS
SW1 - SWITCH
C4 - DUO 4 MFD. COND.

1929 - 9-TUBE S-G. SUPER.



SILVER MARSHALL INC.

MODEL 35-A



NOTE: LEADS FROM R1 AND R2 DISCONNECTED FROM R3. LEAD FROM R3 CONNECTED TO TAP ON R18. A 500 OHM RESISTOR CONNECTED BETWEEN R15 AND P REMOVED. R19 ADDED.

LEGEND

C1-C2-C3-C4-C5 - 420 $\mu\mu f$ - 5 GANG COND.
C6-C12-C18-C19 - .1 MFD COND
C7 - 1 MFD. COND
C8-C9 - .00015 MFD. COND.
C10 - .006 MFD. COND.
C11 - .25 MFD. COND.
C13 - .025 " "
C14-C15-C16-C17 - DUO .1 MFD.

L1 - Φ 184 COIL
L2 - Φ 152 "
L3-L4-L5 - Φ 181 COIL
L6 - Φ 281 CHOKE
L7 - Φ 274 CHOKE - 3 LUG TYPE
L8-L9-L10 - Φ 274 CHOKE - 2 LUG TYPE

R1-R2-R3 - 2 MEGOHM
R4-R5-R6-R7-R8 - 2000 OHMS
R9-R10 - .3 MEGOHM

DIALITE

R11 - 25,000 OHMS
R12-R13 - 10,000 OHMS - 2 WATT
R14-R16 - 60,000
R15 - 800 OHMS
R17 - .15 MEGOHM
R18 - 2 SECTIONS - 1000 AND 100 OHM
R19 - 2000 OHMS
R20 - 10,000 OHMS

P - 3000 OHM POT.

S1-S2-S3-S4 - UY 224
S5-S6 - UY 227
S6-S7 - UX 245

T - Φ 270 TRANSFORMER

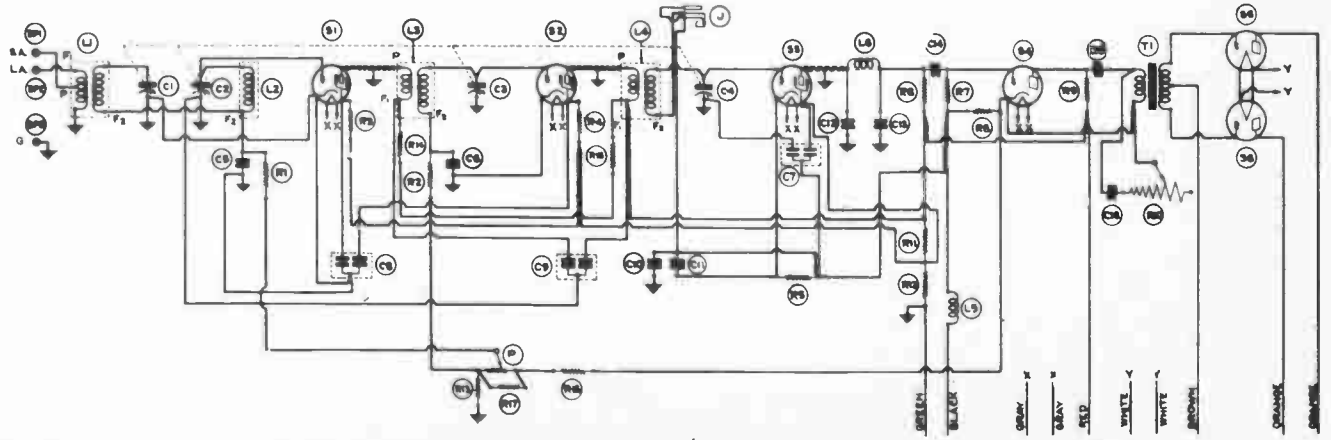
TO XX OF S6

AUTOMATIC VOLUME CONTROL TUBE

BLACK -B
GREEN G
RED +B
WHITE X 224
WHITE X 227
BROWN -B'
MAROON 245
MAROON
BLUE P
BLUE P

NOTE WIRE COLORS REFER TO WIRES IN POWER SUPPLY CABLE

MODEL 34-A



LEGEND

L1 - Φ 184 COIL
L2 - Φ 187 "
L3-L4 - Φ 195 COIL
L5 - Φ 274 CHOKE L6 - Φ 281 CHOKE
C1-C2-C3-C4 - 405 $\mu\mu f$ MAX (NOMINAL)
C5-C6 - .025 μf COND.
C10 - C14 - 0.1 μf COND.
C11 - 1.0 μf COND.
C7-C8 - C9 - DUO 0.1 μf BANKS
C12-C13 - 150 $\mu\mu f$ COND.
C15 - 25 μf COND C14 - .006
R5-R1-R2 - 60,000 Ω
R3-R4 - 2000 Ω
R9 - 25,000 Ω
R6 - 500,000 Ω
R7 - 500,000 Ω
R8 - 400 Ω
R10 - 10,000 Ω
R11-R12 - 10,000 Ω
R13 - 100 Ω
R16-R14-R15 - 2000 Ω
T1 - Φ 270 AUDIO TRANS.
J PHONO. JACK
BP1-BP2-BP3 - BINDING POSTS
S1-S2-S3 - 224
S4 - 227
S5-S6 - 245
P - 1000 Ω R17 - 2600 OHMS

TO XX OF S3

NOTE WIRE COLORS REFER TO WIRES IN POWER SUPPLY CABLE.

SILVER-MARSHALL SUPERHETERODYNE, WITH "MODEL 36A" CHASSIS AND "32A" POWER PACK

This late model superheterodyne, a product of Silver-Marshall, Inc., Chicago, Ill., operates on an intermediate frequency of 175 kc. The single stage of signal-frequency amplification is preceded by a band-selector. The power consumption is only 100 watts, and it is so sensitive that an antenna longer than 25 feet will seldom be required.

The load for the power pack is the receiver chassis; and the pack must never be operated without the receiver chassis being attached. This is important.

Following is a list of replacement-part values: Condensers C1, C2, C3, C4, 407 mmf.; C5, 750 mmf.; C6, 250 to 600 mmf.; C7, C8, C9, triple 0.1-mf. bank (C7, C8, 200 volts rating; C9, 300 volts); C10, C14, C16, C20, 0.25-mf.; C11, C17, C21, 0.1-mf.; C12, C15, C18, 1.0 mf., C13, .001 mf., C19, 4 mf. electrolytic condenser bank.

Resistors R1, R5, 25,000 ohms; R2, 500 ohms; R3, 750 ohms; R4, 2,000 ohms; R6, 300,000 ohms; R7, 400 ohms; R8-R9, 100 to 1000 ohms on one strip, wire wound; R10, 375 ohms; Rv, 3,000 ohms; R11, 3500 ohms, R12, 4,000 ohms; R13, R15, 10,000 ohms, R14, 20,000 ohms. Resistors R2, R3, R7, and R10 are wire-wound. Note that resistors R12 and R13 are of 2-watt rating; while R11 is rated at 3 watts.

The inductances in this receiver have the following catalog designations. L1, L2, "No. 161" coil; L3, "No. 160" coil; L4, L5, "No. 162" coil; L6, L11, "No. 281" choke; L7, L8, L9, "No. 163" oscillator coil; L10, "No. 339" choke. The speaker field SF has a resistance of 800 ohms per section. The transformers are listed as follows: T1, "No. 272"; T2, "No. 271A" or special; PT, "No. 346"; IT1, "No. 212"; IT2, IT3, "No. 213."

Average tube-supply values for this receiver are as follows. Filament potentials: V1, V2 V3, V4, V5, V6, 2.27 volts; V7, V8, 2.4. Screen-grid potentials: V2, 85 volts; V3, 80; V4, V5, 110; V6, 162. Grid potentials; V7, 22.5 volts (depending upon meter); V8, 42.5. Cathode potentials: V1, V3, 37.5 volts; V2, V6, 7; V4, 42.5; V5, 45.0. Plate potentials: V1, 82 volts; V2, 162; V3, 76 (depending upon meter); V4, V5, 160; V6, 245; V7, V8, 255. Plate currents: V1, 11 ma.; V2, V4, V5, V6, 4; V3, 3.

One 800-ohm section of the field coil supplies "C" bias for the power tube. Switch Sw2, the "local-distance" control unit, controls both selectivity and amplification at the same time. One power tube is impedance-coupled, and the other transformer-coupled, to the detector tube. The undistorted power ouput of this cumbination is rated at 4 watts.

It may be found desirable to arrange a line filter, consisting of two 1-mf. condensers in series; the center tap being grounded, and the two ends being connected across the light line, at the receiver. In some localities, it may be necessary to use a shielded lead-in, the antenna length being increased to compensate for the by pass effect of the shield.

When placing the tubes in the sockets, note that the little metal disc should be placed on top of the '24 tube shield located third from the left, with the grid wire passing through the slot.

Perhaps the most important comment, in connection with this receiver, is the suggestion that extreme care and attention be given to the selection of tubes of satisfactory characteristics for the different positions in the set.

The first detector (V3) may be selected by tuning in a weak station, and tapping the tube in the second-detector (V6) socket; least noise being the desired quality. When a non-microphonic tube is located, it is to be taken out of socket V6 and put in socket V3. The tube for regular use as V6 may be selected by turning the volume control for medium volume (on a local station) and selecting the tube which gives best tone quality.

A noisy volume control may often be repaired by simply turning the control knob rapidly to remove oxidization.

If an exceptional hum develops, check for defective power or rectifier tubes. The power tubes, and each plate of the rectifier tube, should read within 5% of each other. Also, hum may be due to the pilot light V10 becoming grounded.

Granting that good tubes have been selected, a microphonic howl may be due to non-removal of shipping blocks, or to the receiver chassis not being entirely supported by the rubber cushions.

Many radio service stations have a workbench with a metal top. The manufacturers of this set point out that it should be aligned only on a table with a wooden top.

If the set lacks sensitivity and selectivity, even though all tubes check perfect, it is probable that the circuits should be aligned. Start with the I.F. circuit, then check up the R.F. and oscillator circuits.

The I.F. transformer trimmers are accessible through the tops of their shield cans, adjustment for 175 kc frequency being made with an *insulated* screwdriver.

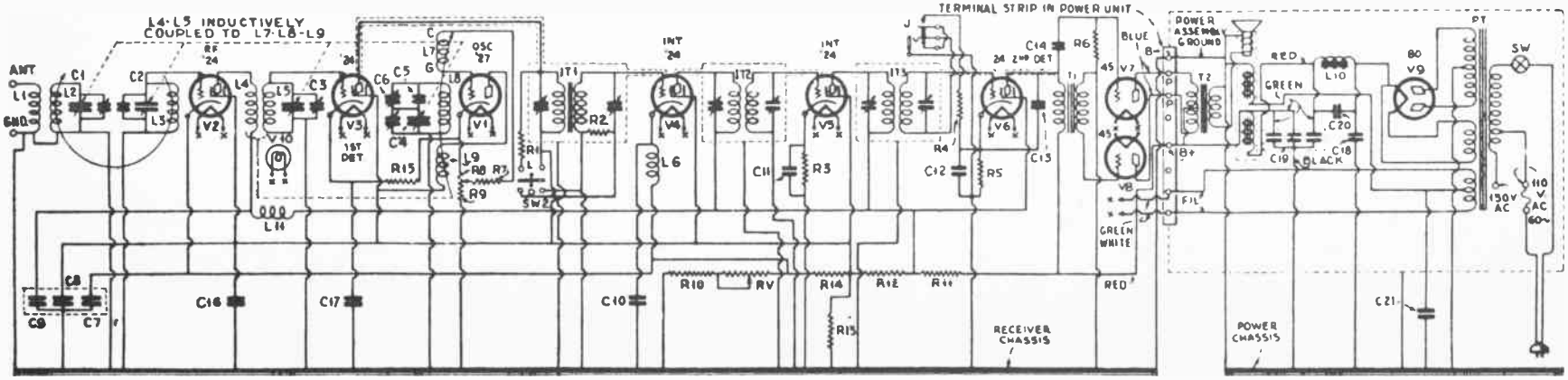
Before proceeding with this alignment process, it will be necessary to provide a temporary pointer, on the dial scale, against which alignment may be made (the chassis being out of its cabinet). Arrange the pointer so that (with the setscrew stop on the drive shaft released and the variable condenser against its own stop in the minimum position) the temporary pointer will line up exactly with the line marked "stop" on the dial. The dial should then be rotated until the 1400-kc. marking is directly opposite the temporary dial pointer. Both of these operations must be performed accurately.

The R.F. circuits are to be balanced at 1400 kc. and the oscillator at 600 kc. To balance the oscillator, it is necessary to locate accurately the point at which 600 kc. is passed by the R.F. amplifier.

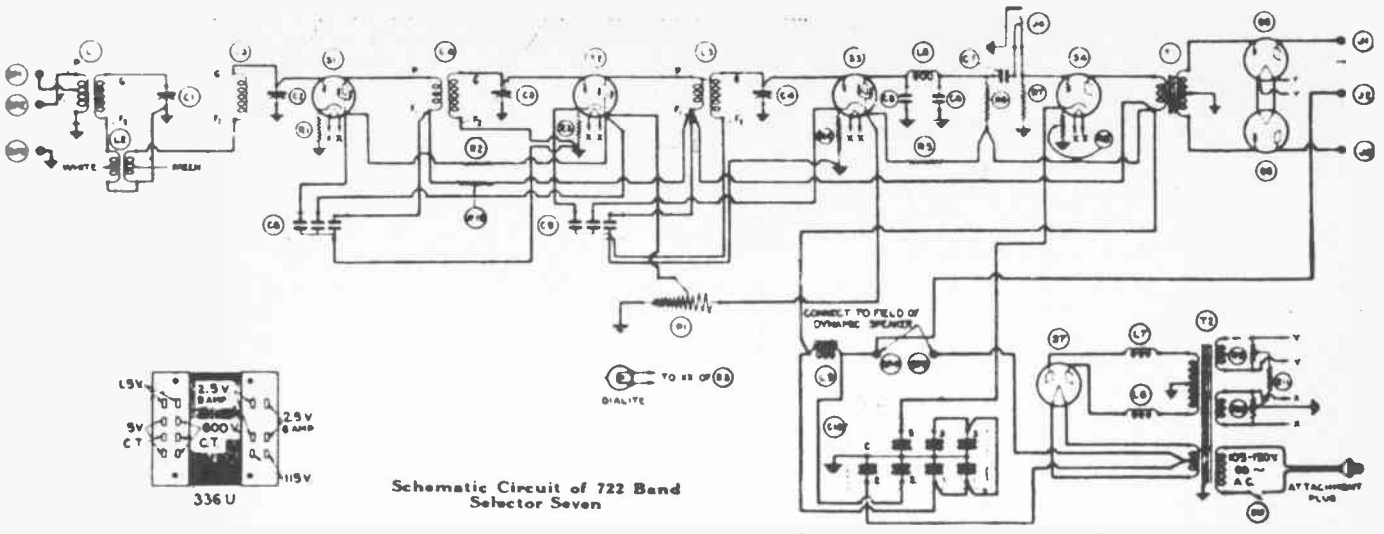
To do this, the wire connecting C6 (on the centrally located micarta strip) to C4, is disconnected from C4. The free end of this wire now should be connected to a separate 350- or 500-mmf. condenser, the other side being grounded to the chassis. The test oscillator should now be re-adjusted to 600 kc., and the receiver dial turned to that reading as well. The external condenser, which has been added to the oscillator, is now rotated until the signal is heard; and the input to the receiver from the oscillator is adjusted to give a convenient value on the output meter connected to the output of the receiver. The dial of the receiver should now be rotated, turning the gang condenser, until the reading in the output meter is a maximum. From this point on, both the setting of the receiver dial and the adjustment of the *four* trimming condensers on the gang condenser should remain undisturbed.

The external condenser should now be removed, and the wire between the oscillator section of the gang condenser and the second oscillator trimmer should be replaced and soldered. Now, with a bakelite screwdriver, adjust this oscillator low frequency trimmer, by means of the adjusting screw in the back of the micarta mounting strip, until the output meter reads maximum. This completes the alignment procedure on the receiver. If, after the chassis is replaced in the cabinet, the dial does not read exactly true, it may be shifted slightly on the shaft.

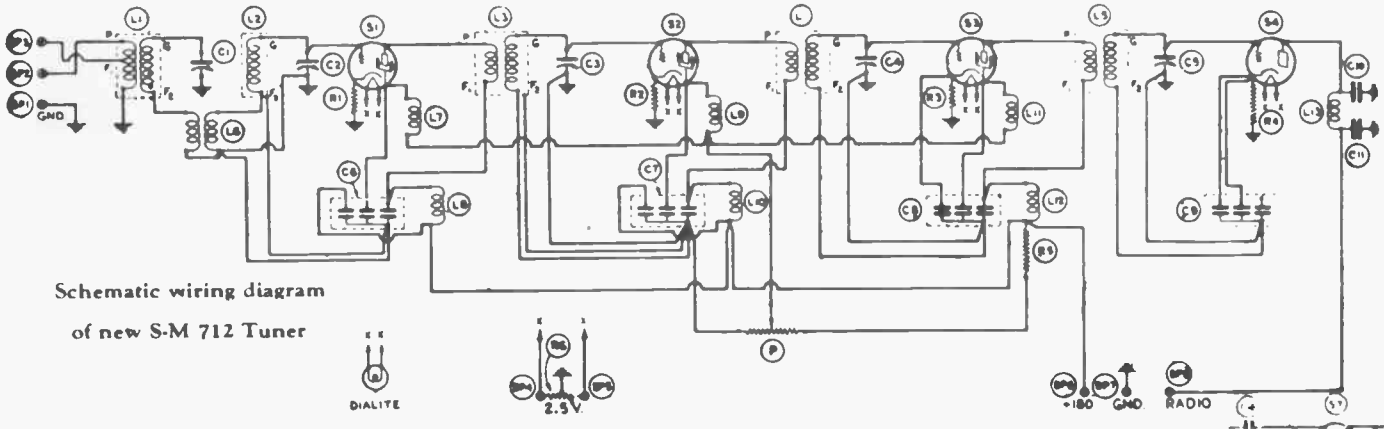
A new cord may be installed on the drum dial without removing the dial from the set; a 21½-in. length of "SM 3913" Heavy Dial Cord is required. If the drum dial turns stiffly, the gang condenser bearing may be too tight.



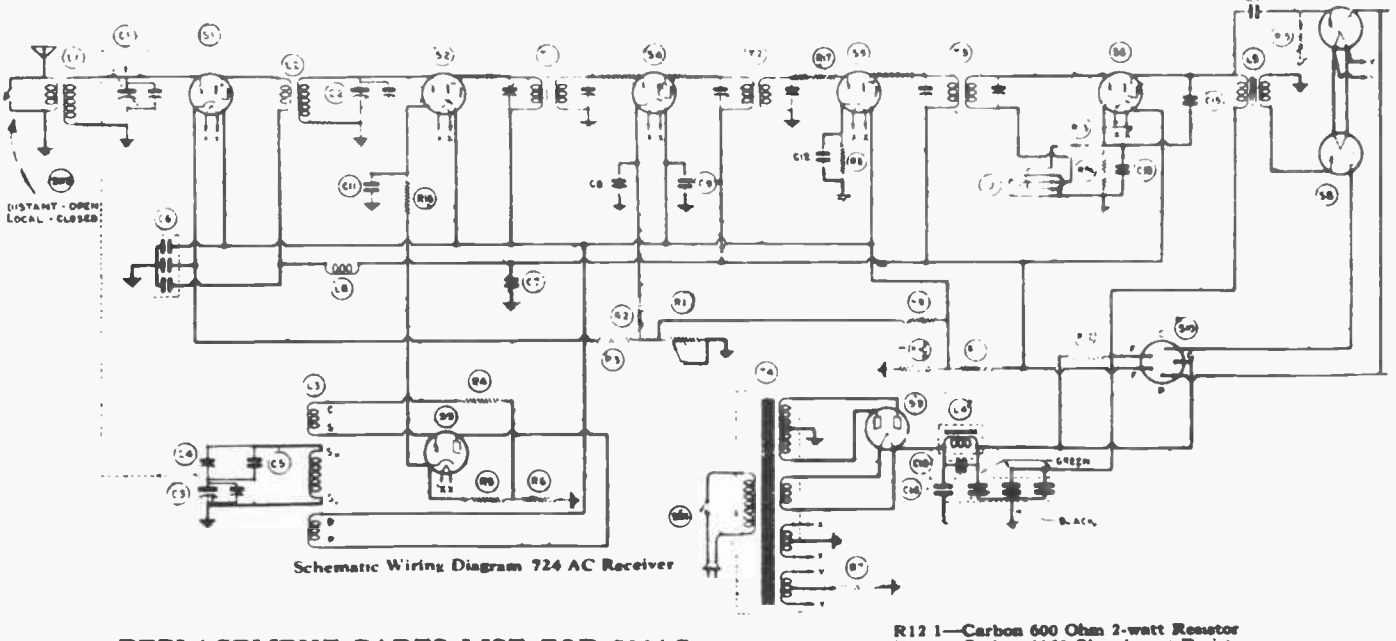
SILVER MARSHALL, INC.



Schematic Circuit of 722 Band Selector Seven



Schematic wiring diagram of new S-M 712 Tuner



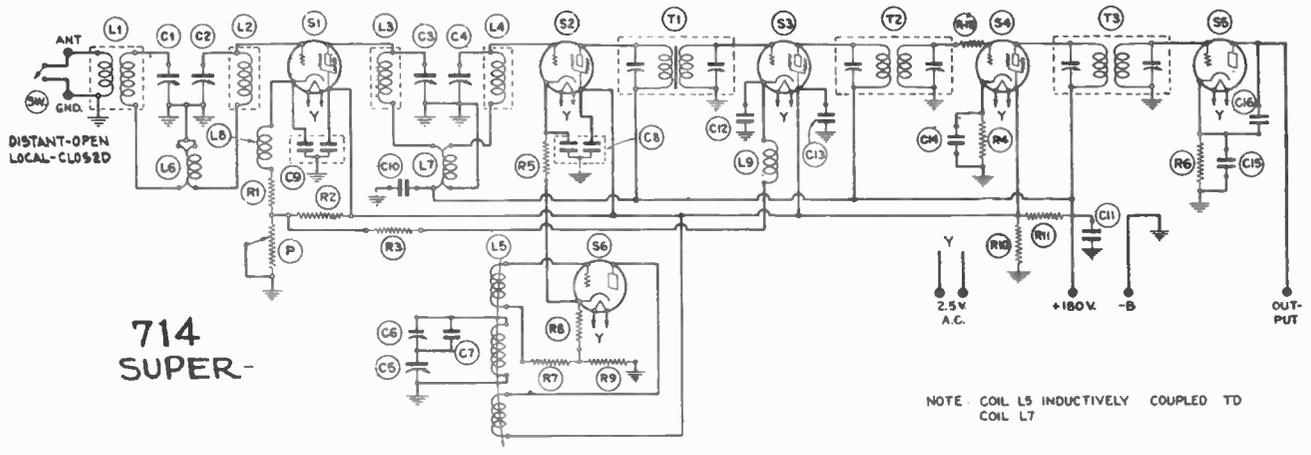
Schematic Wiring Diagram 724 AC Receiver

REPLACEMENT PARTS LIST FOR 724AC

C7, C8, C9, C10, C16 5—Polymet .25 Cond. Cased
C13 1—Potter 1 mfd. Cond
C6 1—Potter 30B Triple .1 mfd. Cond.
C14 1—Elkton #7044 (or Potter #6258B) Condenser bank (4-4 mfd.
1—S-M 6371 Oscillator-Detector Coil Assembly (Includes) L2 1—162 r.f. Coil
L3 1—163 Osc. Coil
R3, R4 2—Carter RU400 ohm Res.
R2 1—Yaxley 1000 ohm Res.
1—Bakelite strip
Hardware
C1, C2, C3 1—S-M 6369 Condenser & Dial Assembly (SM325 & SM811)
C4, C5 1—S-M 6362 Oscillator Trimmer Assembly

R12 1—Carbon 600 Ohm 2-watt Resistor
R11 1—Carbon 2360 Ohm 4-watt Resistor
R10 1—Carbon 3750 Ohm 3-watt Resistor
R7 1—Carbon 900 Ohm 3-watt Resistor
R17 1—Carbon 150,000 Ohm Grid Supressor Resistor
R14 1—Durham 25,000 Ohm 1-watt Resistor
R9 1—Durham 20,000 Ohm 1-watt Resistor
R13 1—Durham 2,000 ohm 1-watt Resistor
R15 1—Durham 300,000 ohm 1-watt Resistor
R16 1—Durham 10,000 Ohm 1-watt Resistor
R18 1—Durham 3500 ohms 2-watt Resistor
R8 1—Yaxley 1000 Ohm Resistor
R1 1—Yaxley 3000 Ohm Variable Resistor with Milled Shaft
R5, R6 1—Yaxley 1100 Ohm Tapped Resistor
J 1—Yaxley #704A 5-prong Jack
SW1 1—H & H #5174 Rotary Switch with Milled Shaft
SW2 1—H & H #5192 On-Off Toggle Switch Long Shank
C15 1—Polymet .001 Fixed Condenser
C11, C12 2—Sprague .1 mfd. Condenser

SILVER-MARSHALL INC.

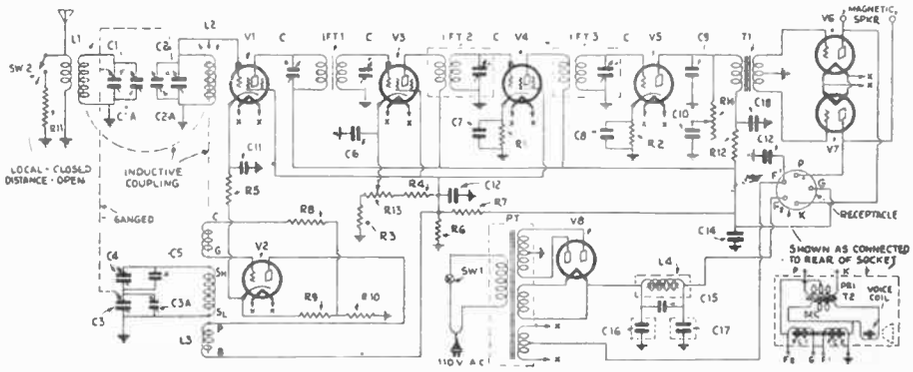


714 PARTS LIST FOR REPLACEMENT

1--S-M 714 Chassis assembly.....		$43.45
(Includes) 1--Chassis complete with shields @ 10.50		
T1	1--212-41 Transformer @ 5.50	
T2	1--213-42 Transformer @ 5.50	
T3	1--213-43 Transformer @ 5.50	
C8, C9	2--Potter dual .1 mfd. cond. @ $1.10 ea.	
C12, C13	2--Polymet .25 mfd. cond. @ $1.00 ea.	
C11	1--Potter .1 mfd. cond. @ 1.25	
S1, S2, S3, S4	4--CR 224 Sockets @ .50 ea.	
S5, S6	2--CR 227 Sockets @ .50 ea.	
L1	1--SM 167 antenna coil @ 2.00	
L2, L3, L4	3--SM 166 r.f. Coils @ 2.00 ea.	
C1, C2, C3, C4, C5,	1--SM 6384 Condenser and Dial Assembly.....	19.00
(Includes SM 316 condenser and SM811 dial)		
C6, C7	1--S-M 6350 Oscillator Trimmer Assembly.....	3.50
R1, R3	1--S-M 6408 Volume Control Resistor Assembly for 714 (1--RU400, 1--1000 ohm).....	1.25
L5	1--S-M 163 Oscillator Coil...	1.75
L8, L9	2--S-M 281U Choke Coils @ .75	1.50
	3--S-M 637 Tube Shields @ .40	1.20
	1--S-M 814 Escutcheon.....	.50
	1--S-M 819 Knob.....	.30
	2--S-M 820 knobs @ .30.....	.60
	1--S-M 818 Hookup Wire.....	.50
L6, L7	2--S-M 30X Couplers @ .60	1.20
R8, R9	1--Yaxley 1100 ohm. Resistor Tapped at 100 ohms.....	.65
R4	1--Yaxley 1000 ohm Resistor..	.50
P	1--Yaxley 3000 ohm Variable Resistor.....	1.50
R2	1--Durham 20,000 ohm 1-watt Resistor.....	.75
R5	1--Durham 10,000 ohm 1-watt Resistor.....	.75
R6	1--Durham 60,000 ohm 1-watt Resistor.....	.75
R12	1--Durham 300,000 ohm 1-watt Resistor.....	.50
R10	1--Carbon 3750 ohm 3-watt Resistor.....	.75
R11	1--Carbon 2360 ohm 5-watt Resistor.....	1.10
C10, C14	2--Sprague .1 mfd. Condensers @ .90.....	1.80
C16	1--Polymet .002 Fixed Condenser.....	.75
C15	1--Potter .1 mfd. Condenser..	1.25
R7	1--Carter RU 400 ohm Resistor	.20
	1-- H & H 5174 On-Off Switch.	.85
SW	1--H & H 5192 On-Off Toggle Switch, Long Shank.....	1.00
	7--Binding Posts @ .15.....	1.05
	1--Set of Hardware.....	1.20

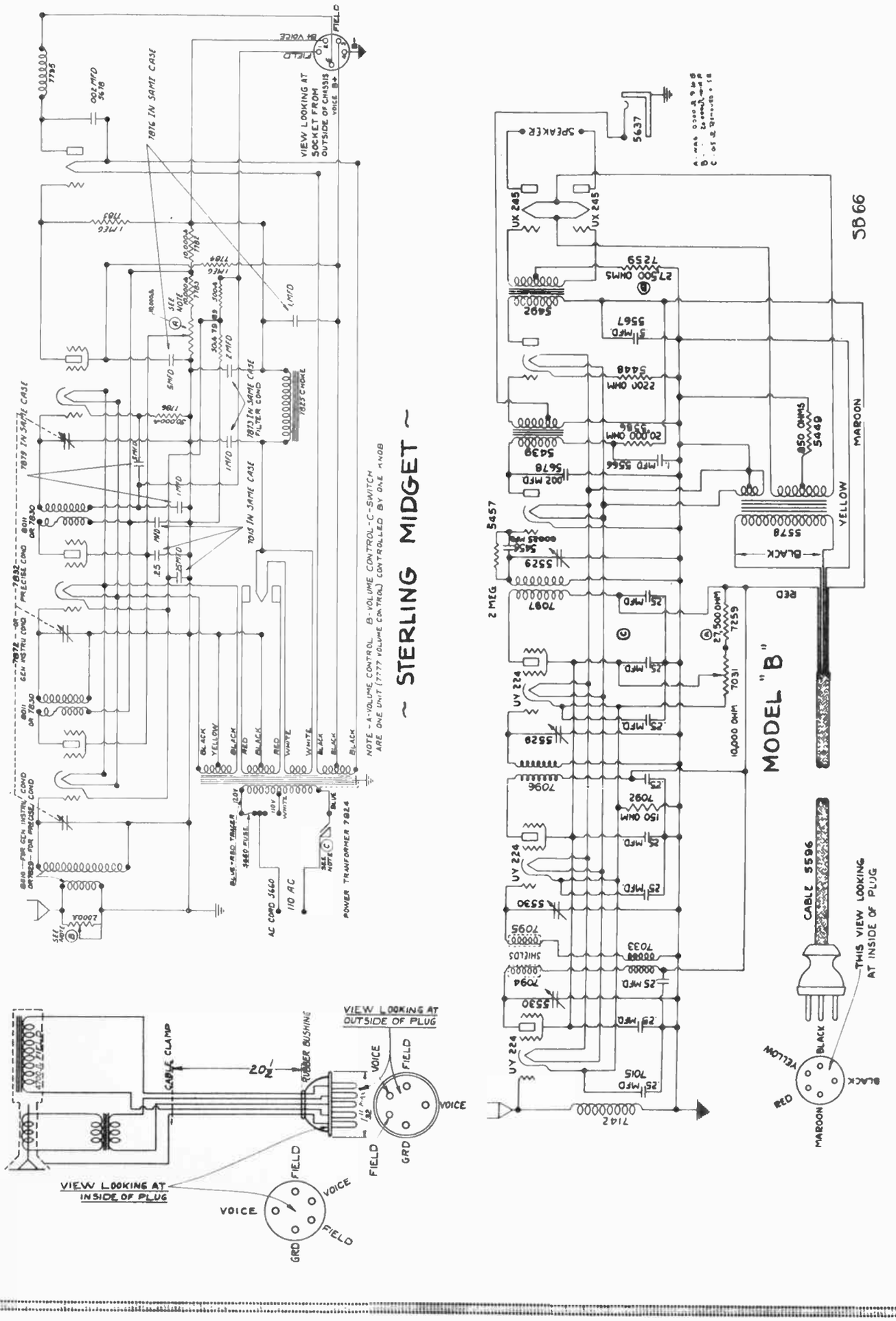
HARDWARE

10--3898 L60 Lugs
36--5701 #6 Shakeproof Washers
29--4113 6/32 x ¼ Hex Nuts
41--4980 6/32 x ½ RH CP MS
2--5697 #4 Shakeproof Washers
2--4110 2/56 Hex Nuts
2--4976 2/56 x ⅜ RH OX MS
1--3034 714-304 Coil Mtg. Bracket
7--Feet #14 Yellow Wire
1--5716 ¼" Hex Brass Stud
3--5713 ¼" Fibre Washers
2--4994 6/32" x 1⅞" RH CP MS
2--4989 6/32" x 1" RH CP MS
5--5705 Ext. BP Washers
5--5706 Plain BP Washers
2--5031 6/32" x 1⅛" RH CP MS
2--5049 11/16" x ¼" Spacer

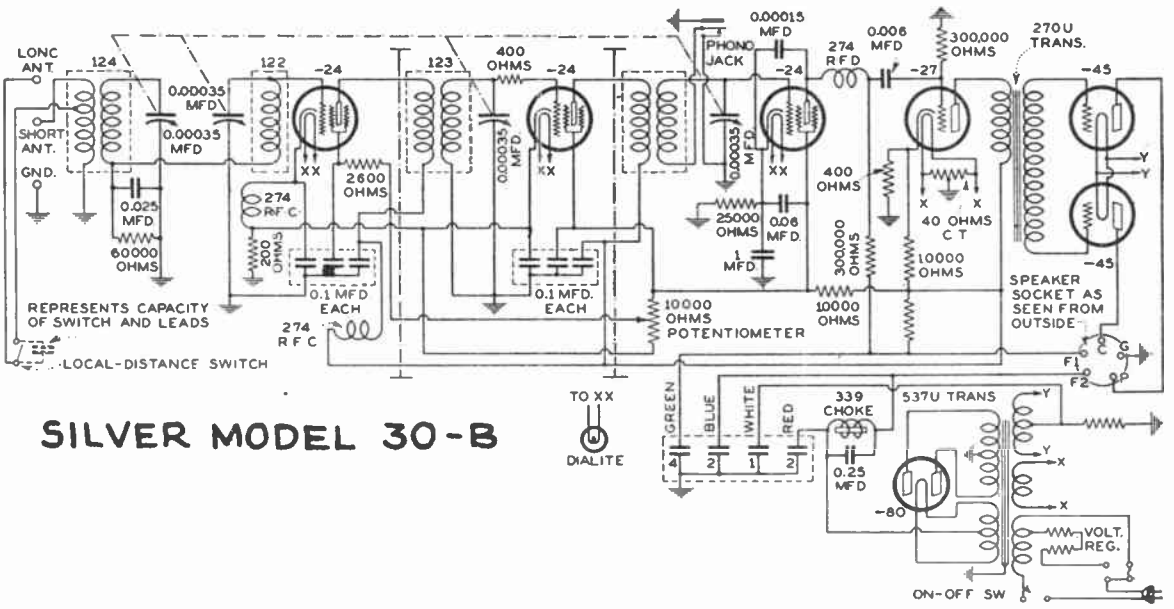


The new "37, 38 and 39" Silver-Marshall super circuit, for midget chasses. Resistances (ohms): R1, 750; R3, 200; R5, R6, R7, 10,000; R8, 400; R9, R11, 100; R10, 1,000; R12, 4,000; R13, 10,000; R14, 500,000. Capacities (mmf.): C1, C2, C3, 425 max.; C4, 250-600; C5, 750: (mf.) C6, C7, C11, C13, 0.1; C8, C12, C14, 1.0; C9; .001; C10, C15, 0.25; C16, C17, 8 (electrolytic). R2 and R4 are 25,000-ohm resistors of one-watt rating.

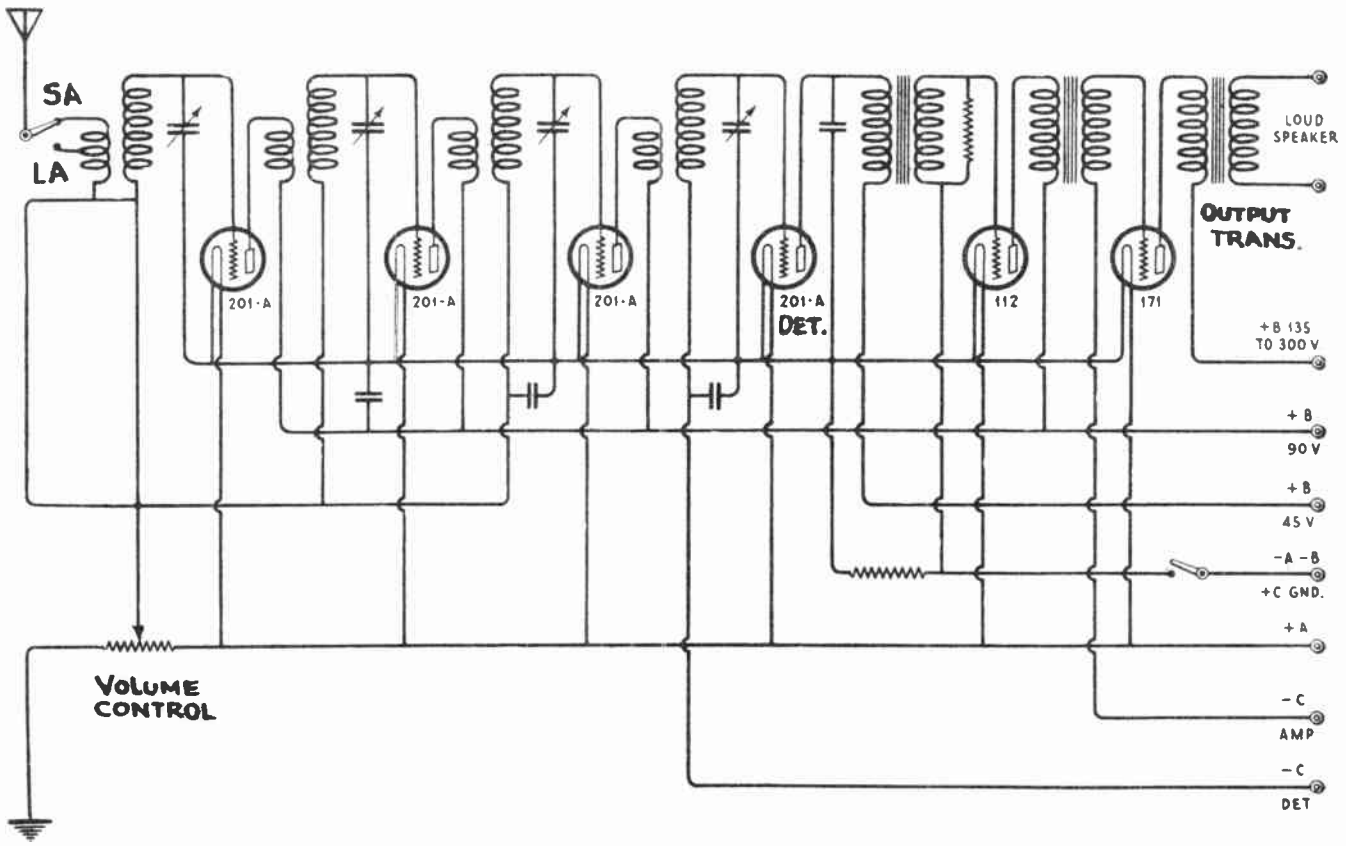
STERLING MFG. CO.



SILVER-MARSHALL, INC.



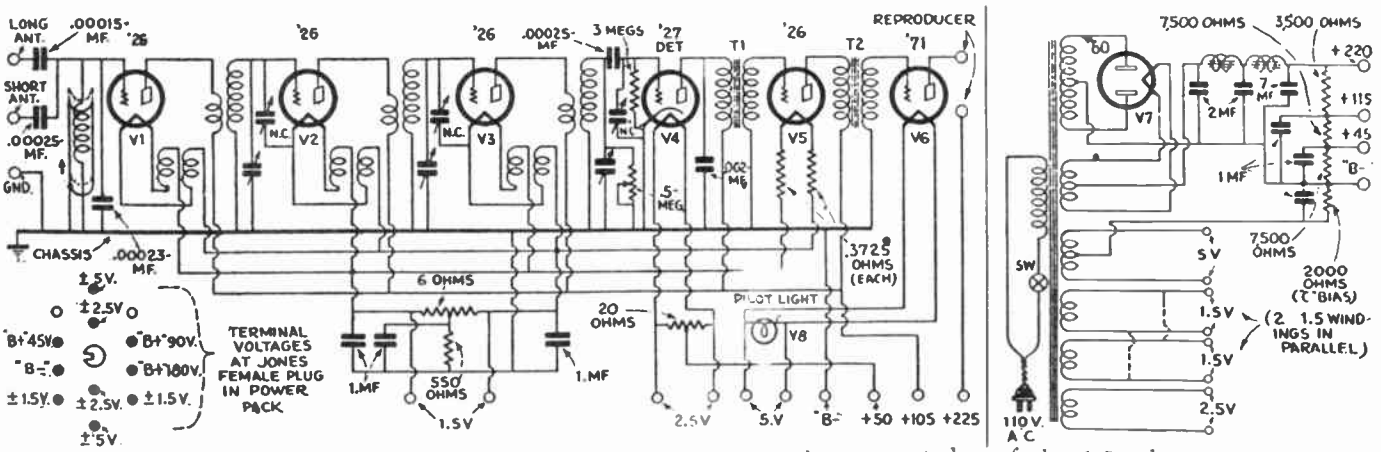
SILVER MODEL 30-B



SILVER MODEL 630

SONORA PHONOGRAPH CO., INC.

SONORA MODEL E-A.C.



The circuit of the Sonora Model E-AC is the conventional one used in conversion jobs on 1927 circuits; a neutralizing circuit of tfhe modified Rice type is used.

The neutralizing condensers are mounted on their respective R.F. sockets, while a detector alignment condenser is found on the first A.F. tube socket.

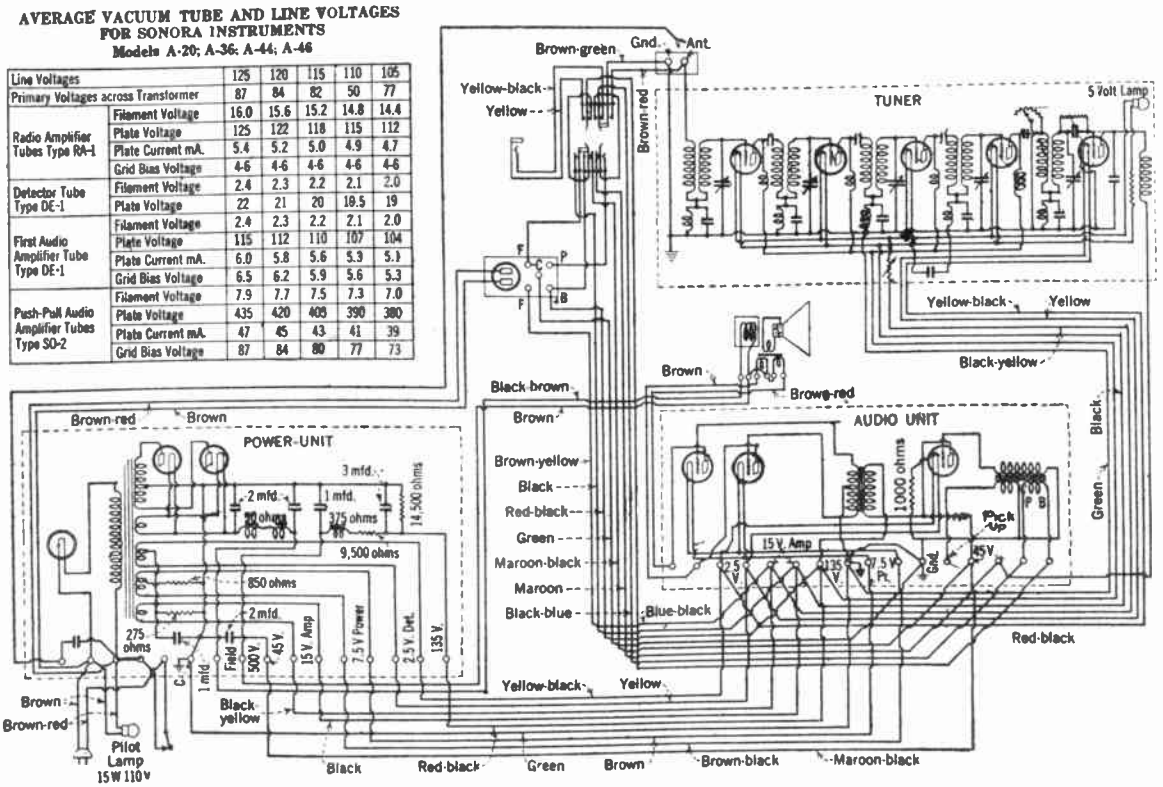
A trombone-shaped copper shield slides over the antenna coil, which is a 160-turn unit, shunted by a .00023-mf. condenser. It is essential that perfect 1-mf. condensers be used in the connection to each leg of the 1.5-volt filament. Note that the pilot light must be insulated from the chassis.

The power for this receiver is obtained from a special pack, either Majestic or Acme, shown at the right. A Jones 13-wire plug-in cable connects the two units. Because of the resistance of the neutralizing windings in the R.F. filament leads the pack is made to provide a 2.4-volt potential at its terminals; this voltage is lowered to 1.5 at the R.F. tube socket by the drop across these windings. Nichrome-wire leads take care of this drop in the '26-type A.F. stage.

MODEL - A - 36

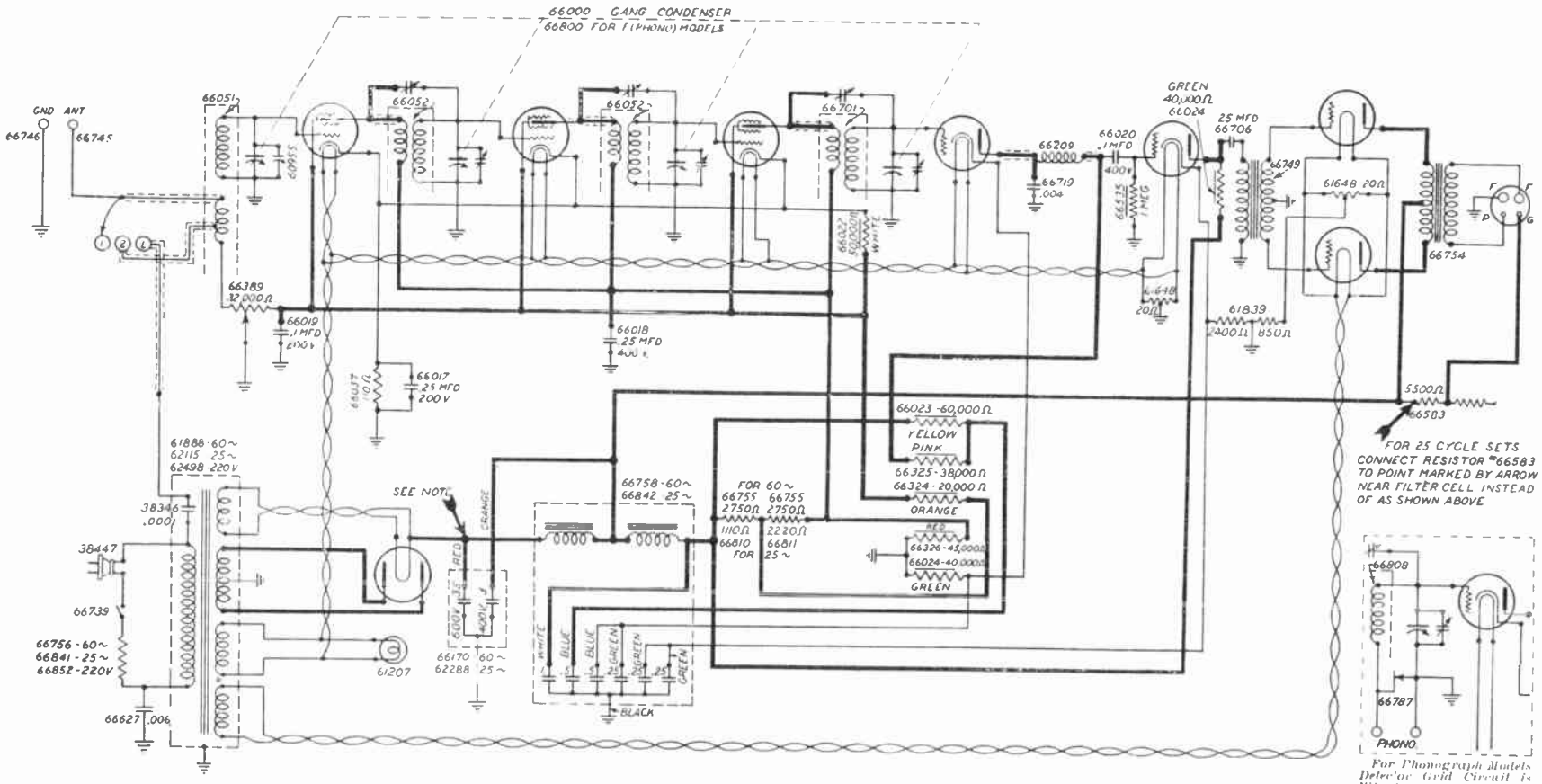
AVERAGE VACUUM TUBE AND LINE VOLTAGES FOR SONORA INSTRUMENTS
Models A-20; A-36; A-44; A-46

Line Voltages		125	120	115	110	105
Primary Voltages across Transformer		87	84	82	50	77
Radio Amplifier Tubes Type RA-1	Filament Voltage	16.0	15.6	15.2	14.8	14.4
	Plate Voltage	125	122	118	115	112
	Plate Current mA.	5.4	5.2	5.0	4.9	4.7
	Grid Bias Voltage	4-6	4-6	4-6	4-6	4-6
Detector Tube Type DE-1	Filament Voltage	2.4	2.3	2.2	2.1	2.0
	Plate Voltage	22	21	20	19.5	19
First Audio Amplifier Tube Type DE-1	Filament Voltage	2.4	2.3	2.2	2.1	2.0
	Plate Voltage	115	112	110	107	104
	Plate Current mA.	6.0	5.8	5.6	5.3	5.1
	Grid Bias Voltage	6.5	6.2	5.9	5.6	5.3
Push-Pull Audio Amplifier Tubes Type SO-2	Filament Voltage	7.9	7.7	7.5	7.3	7.0
	Plate Voltage	435	420	405	390	380
	Plate Current mA.	47	45	43	41	39
	Grid Bias Voltage	87	84	80	77	73



STEWART-WARNER CORP.

Models R-100A, AF, B, BF, E, and EF



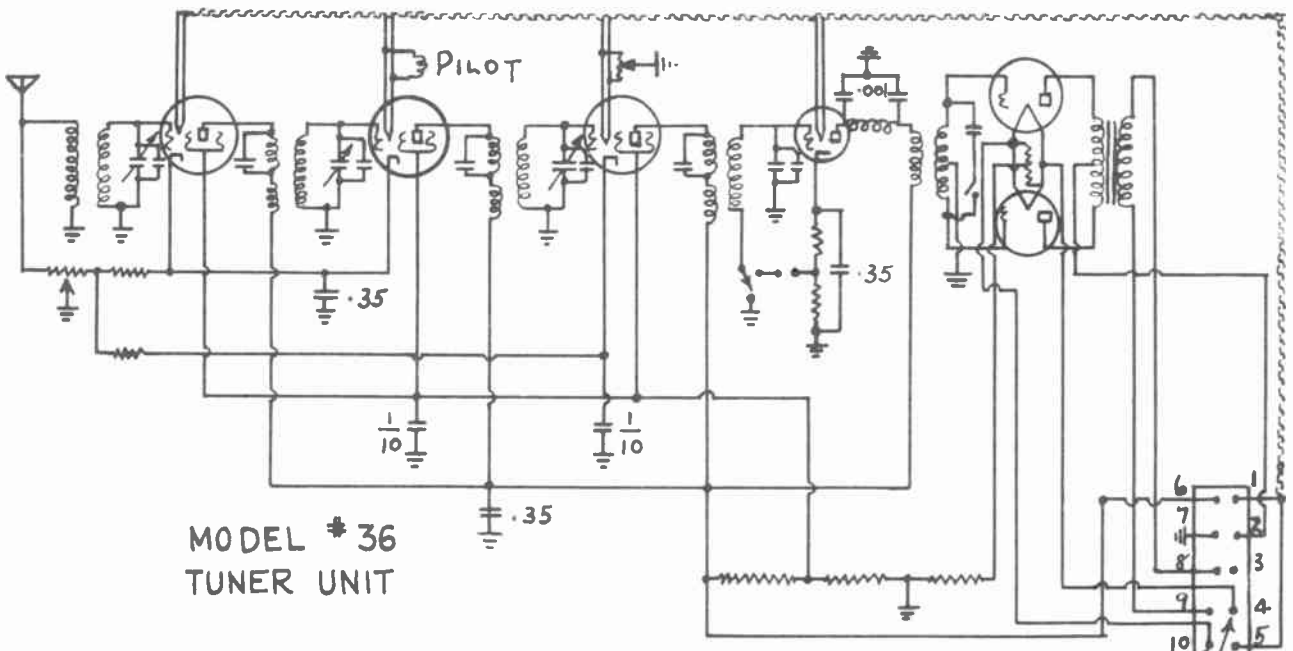
For Phonograph Models Detector Grid Circuit Is Wired as above. Note different Part Number for Radio Frequency Transformer.

AVERAGE VOLTAGE READINGS FOR MODEL R-100A

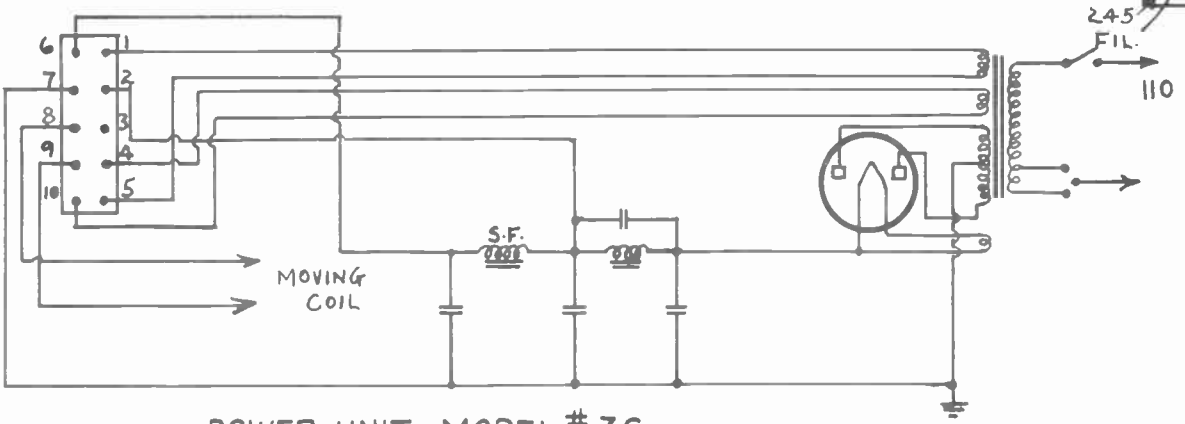
Line Voltage 115 **Volume Control Full On**

Position of Tube in Set	Type of Tube	Filament Voltage	Effective Plate Voltage (Plate to Cathode)	Plate to Ground	Screen-Grid Voltage	Bias Voltage
1 R. F.	'24	2.16	160	165	79	1.7
2 R. F.	'24	2.18	160	165	79	1.7
3 R. F.	'24	2.2	160	165	79	1.7
Det.	'27	2.18	175	170		23
1 A. F.	'27	2.18	125	130		9
2 A. F.	'45	2.25	250	300		50
2 A. F.	'45	2.25	250	300		50
Rectifier	'80	4.7				

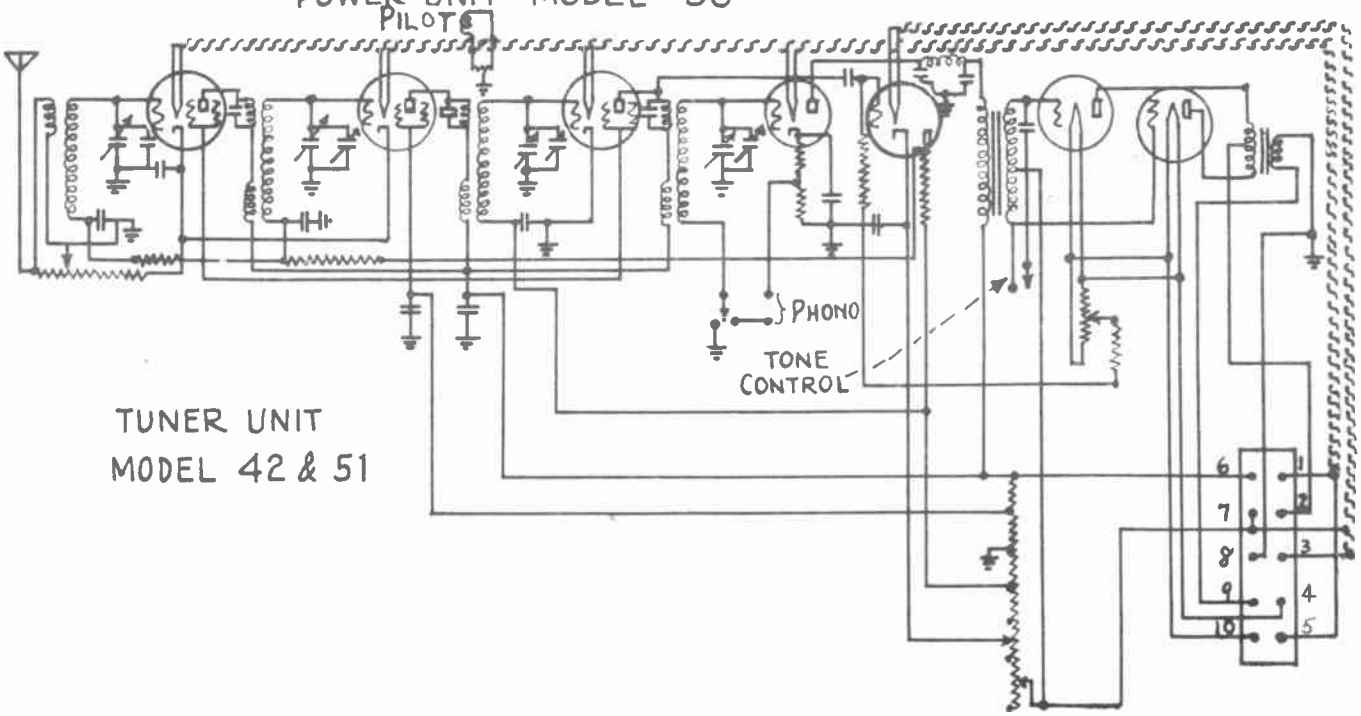
STORY AND CLARK RADIO CORP.



MODEL # 36
TUNER UNIT

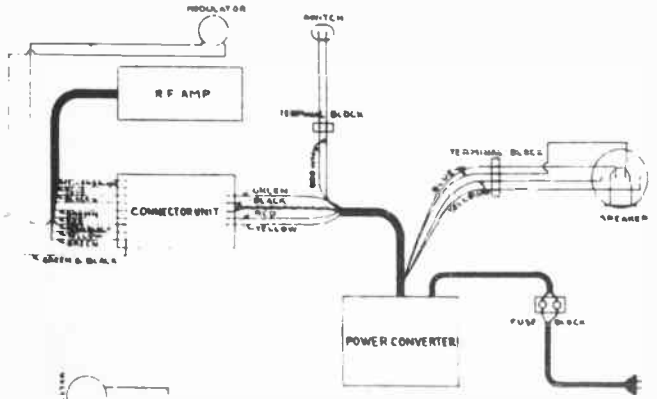


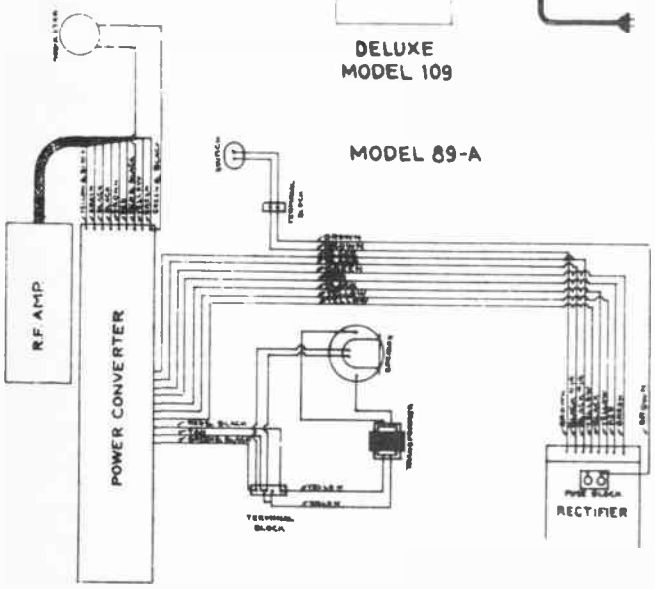
POWER UNIT MODEL # 36

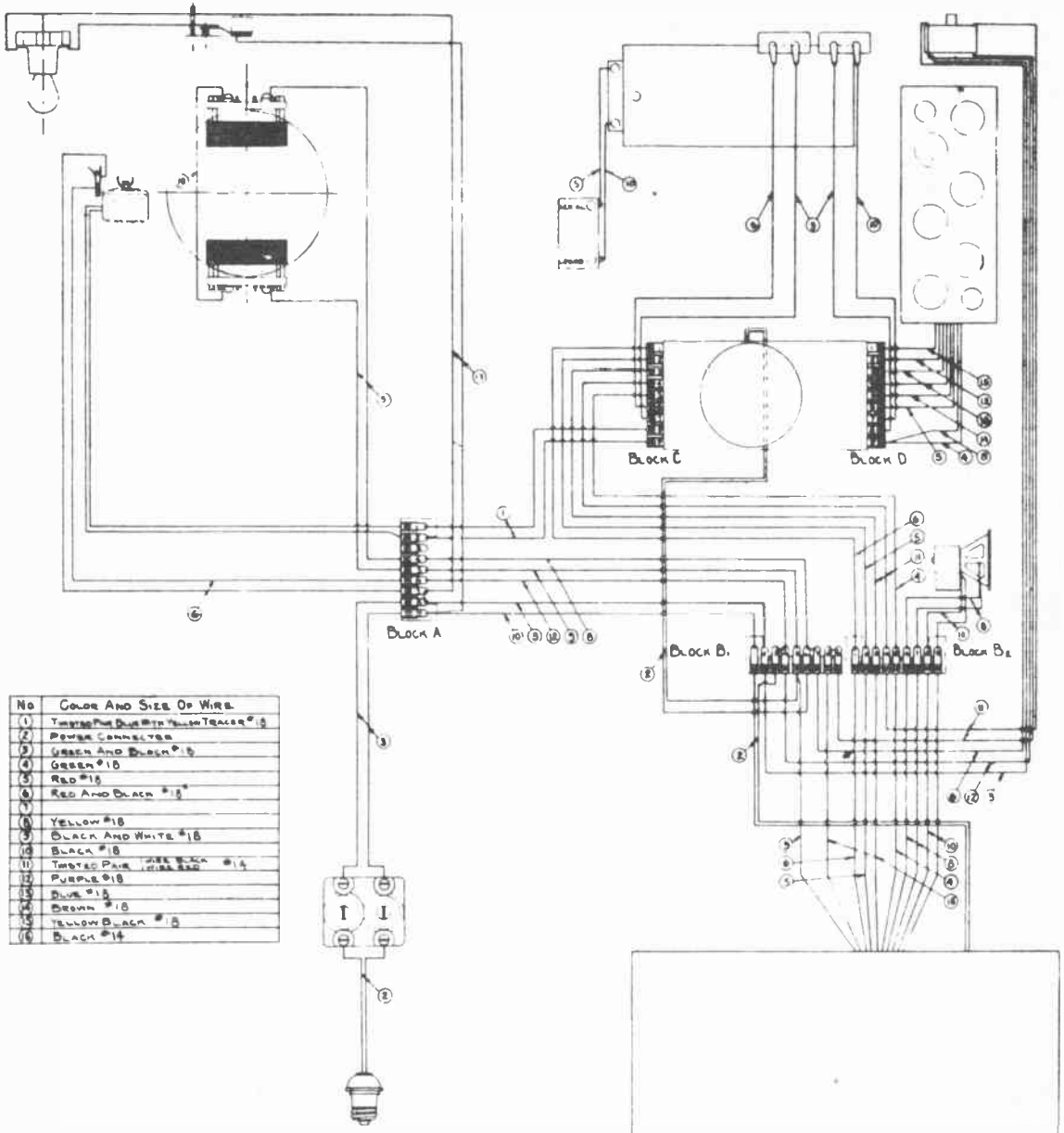


TUNER UNIT
MODEL 42 & 51

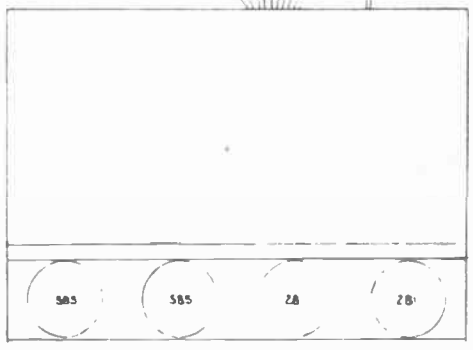
SPARKS-WITHINGTON CO.







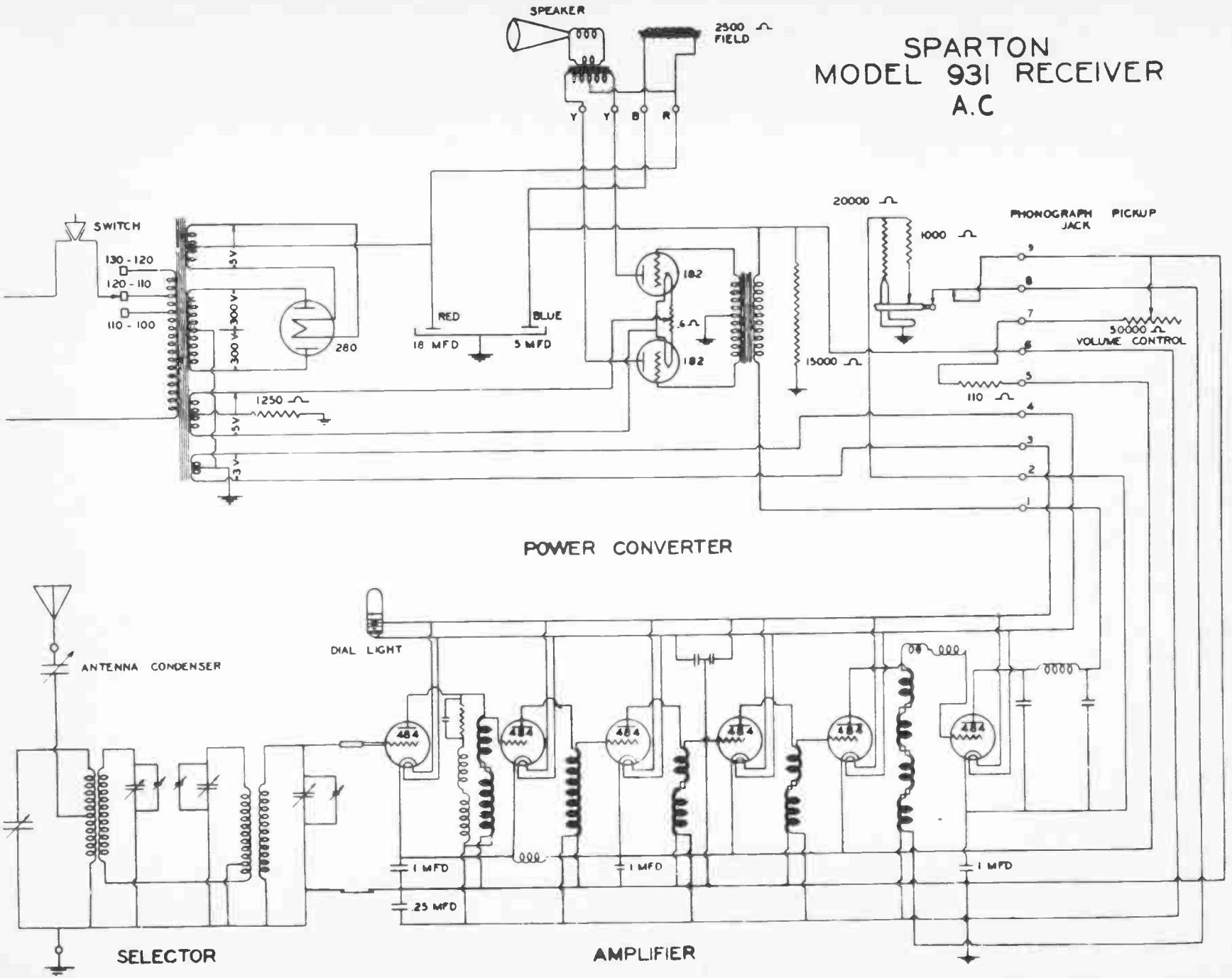
No	Color And Size Of Wire
1	Twisted Pair Blue With Yellow Tracer #18
2	Power Connector
3	Green And Black #18
4	Green #18
5	Red #18
6	Red And Black #18
7	
8	Yellow #18
9	Black And White #18
10	Black #18
11	Twisted Pair #14
12	Purple #18
13	Blue #18
14	Brown #18
15	Yellow Black #18
16	Black #14



WIRING DIAGRAM - SPARKS ENSEMBLE

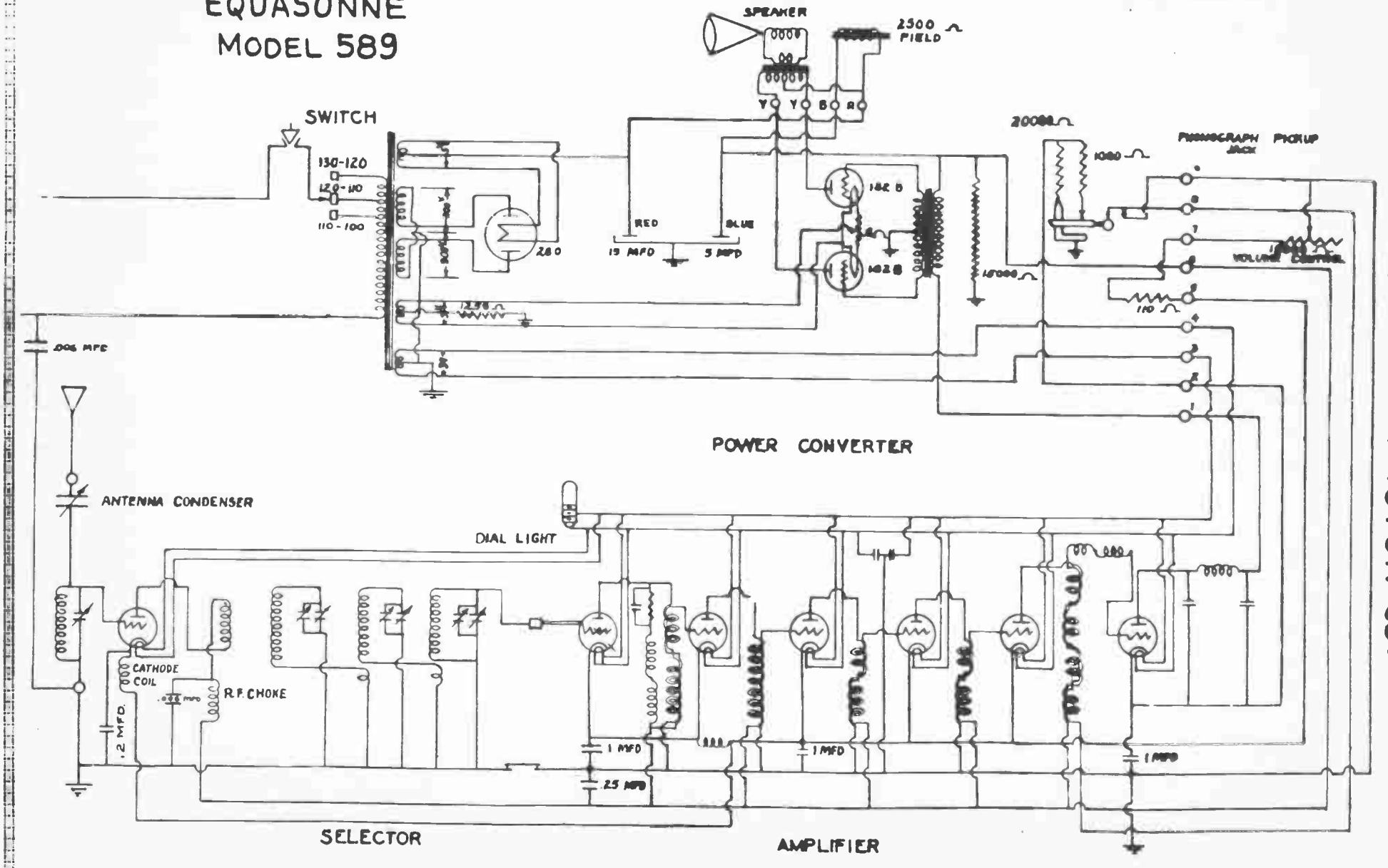
THE PHONOCRAFT CORPORATION

SPARTON MODEL 931 RECEIVER A.C



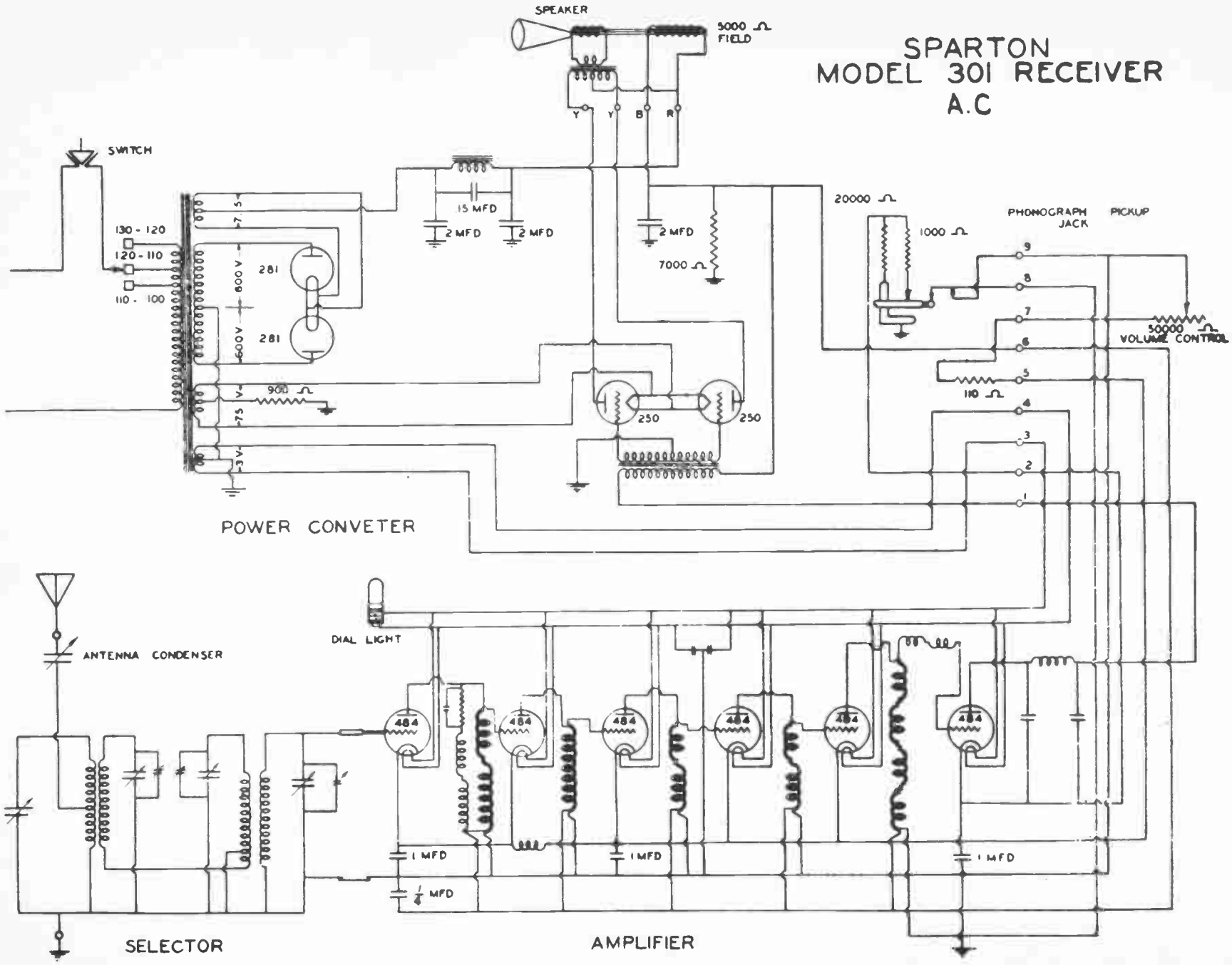
SPARKS-WITHINGTON CO.

EQUASONNE MODEL 589



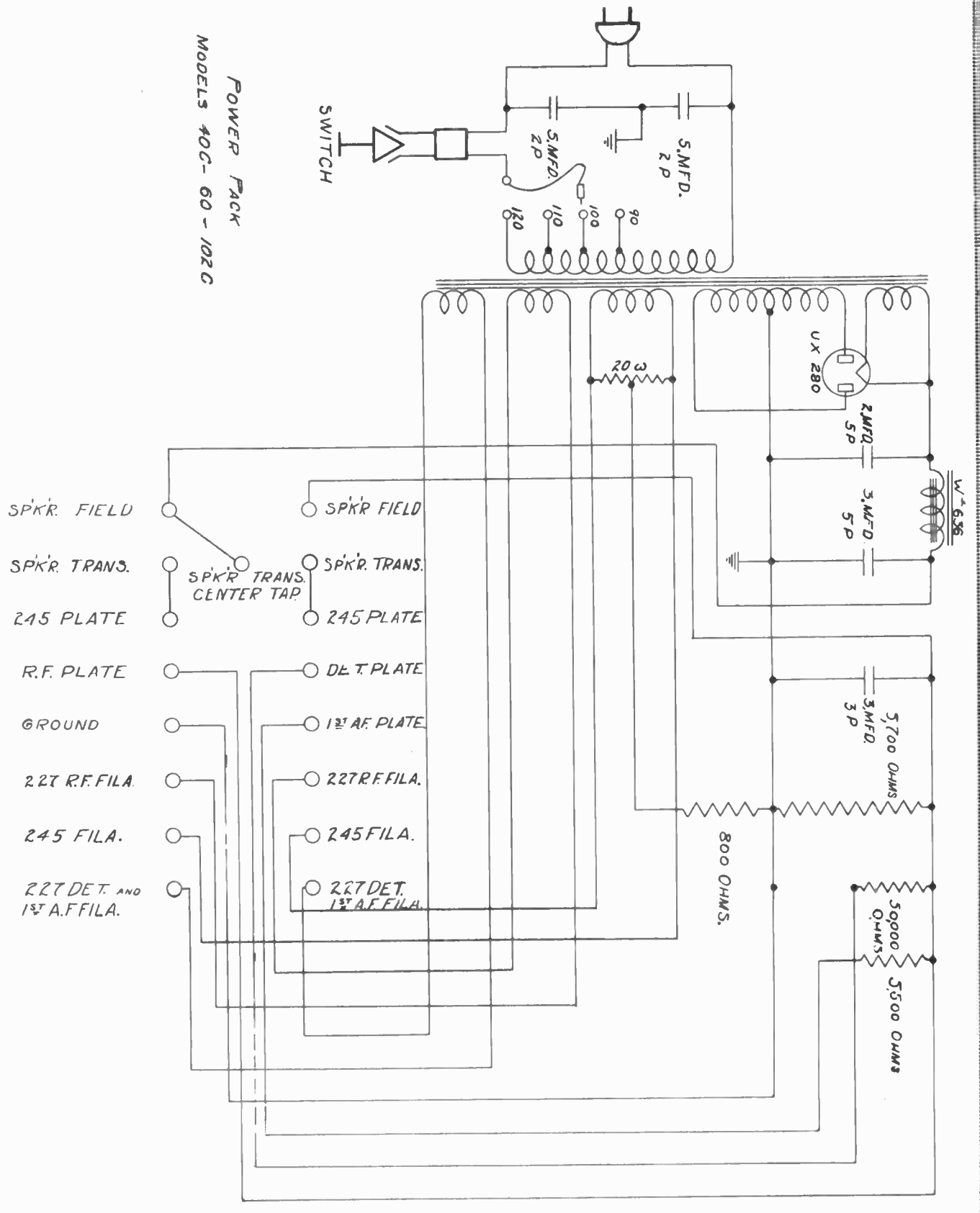
SPARKS-WITHINGTON CO.

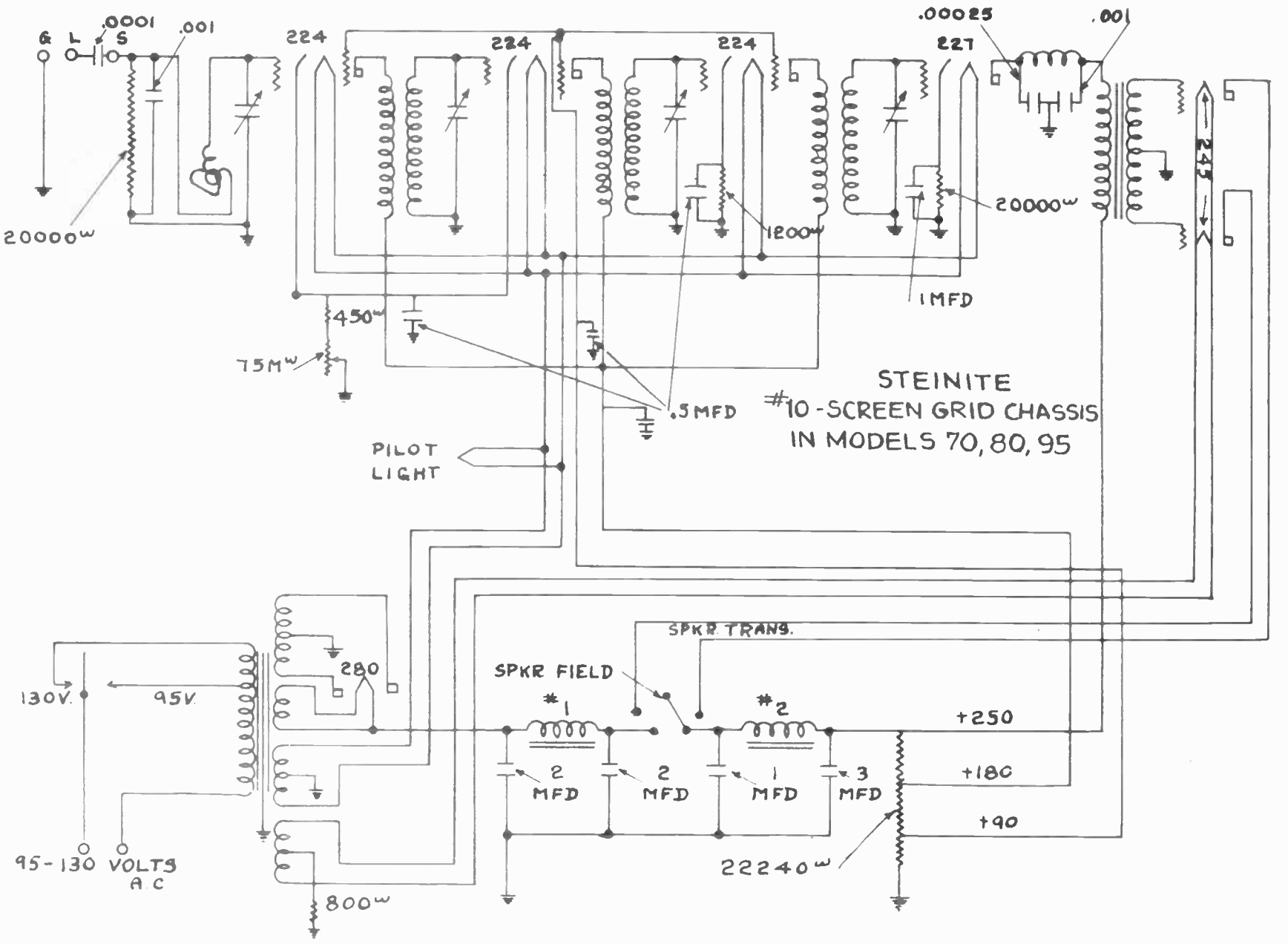
SPARTON MODEL 301 RECEIVER A.C



SPARKS-WITHINGTON CO.

STEINITE RADIO CO.





STEINITE RADIO CO.

STROMBERG-CARLSON MFG. CO.

Schematic Circuit of Multiple Record Phonograph.

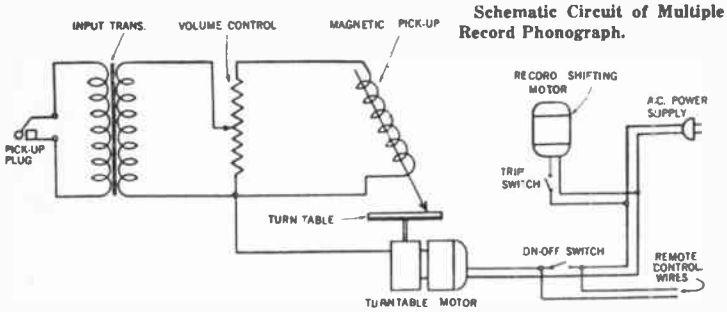
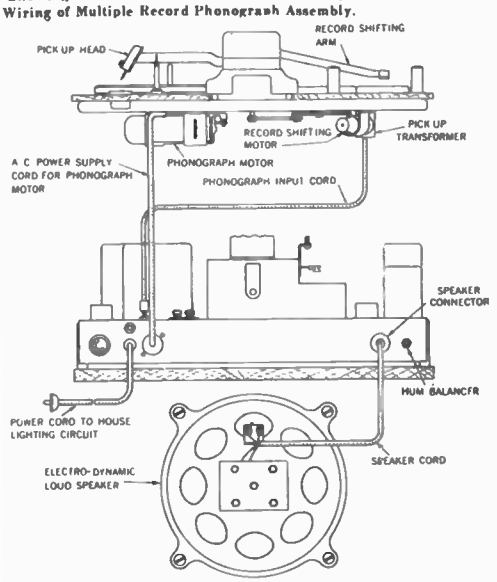
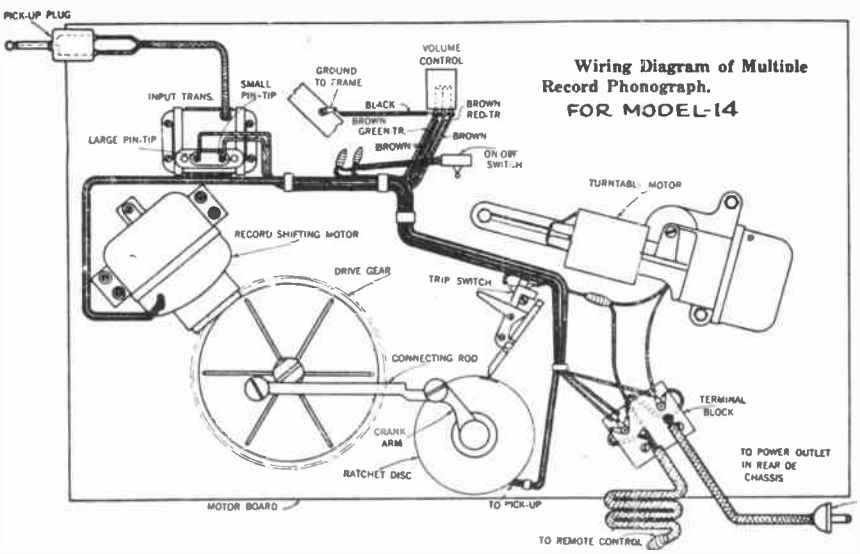
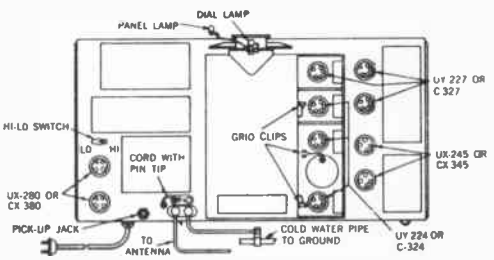


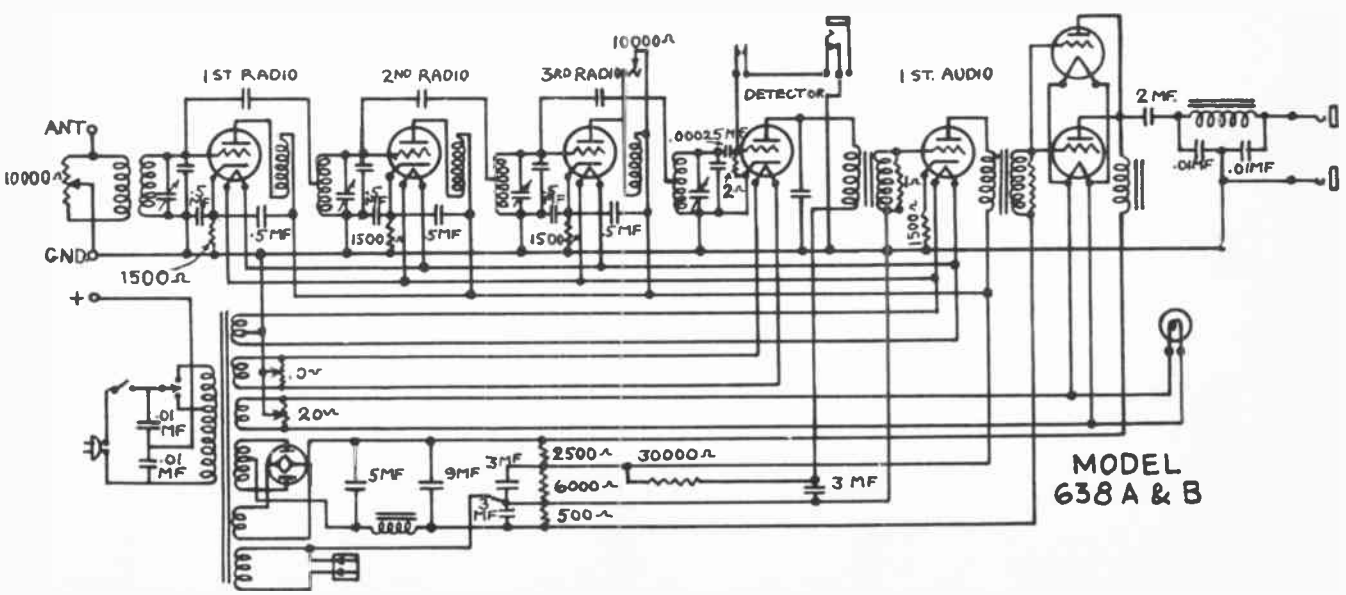
Diagram Showing Location of Tube Sockets and Proper Connections of Wiring of Multiple Record Phonograph Assembly.



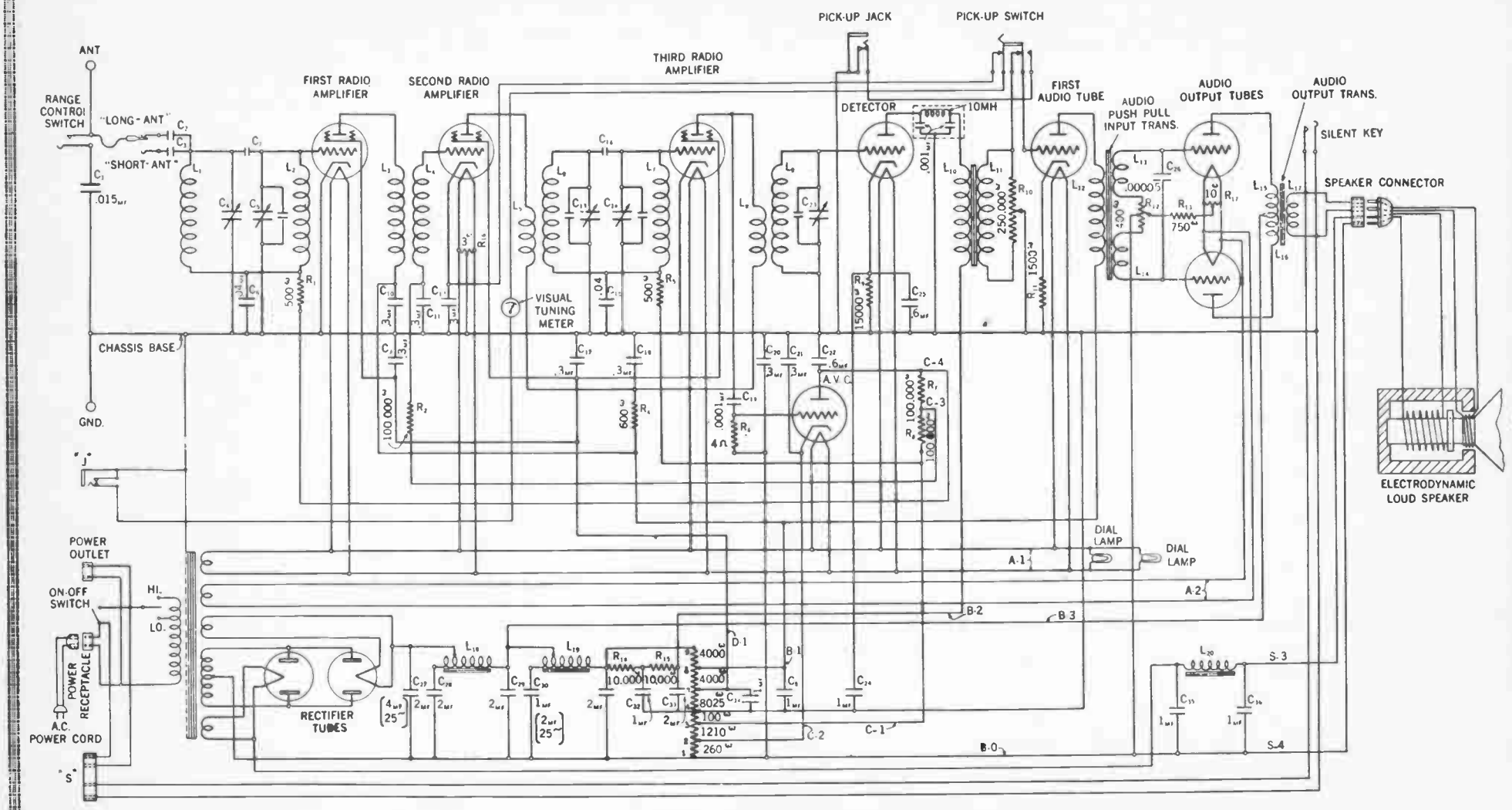
Wiring Diagram of Multiple Record Phonograph. FOR MODEL-14

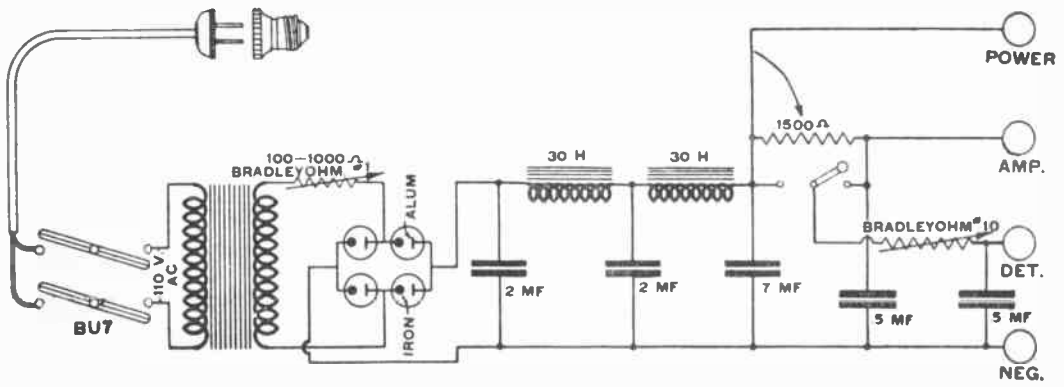




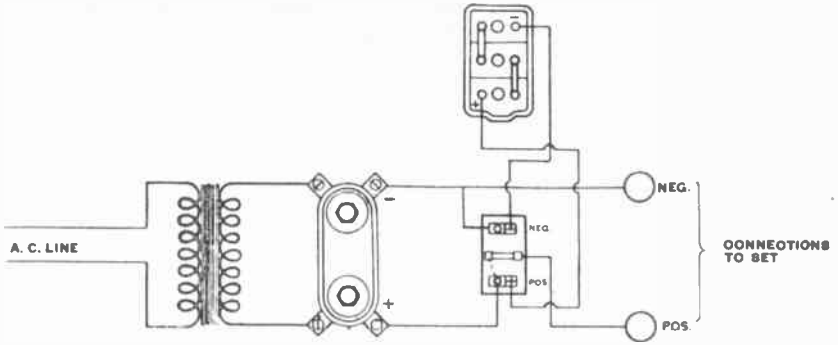


Nos. 12 and 14 Receivers

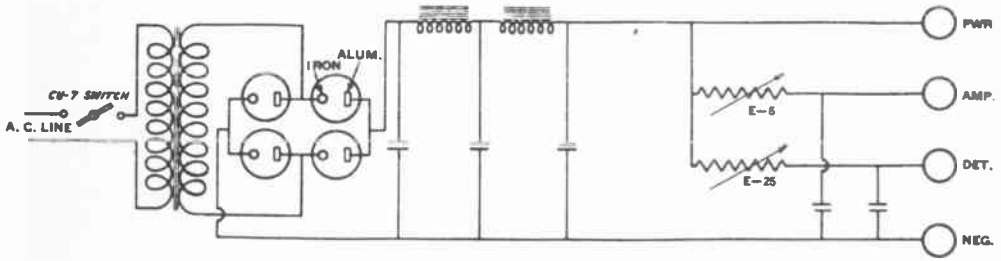




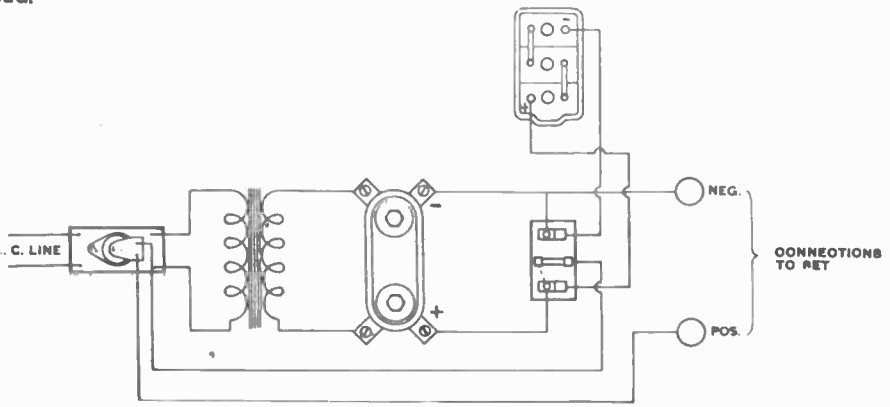
Standard "B" Power Unit, Part No. 3095, 50-60 Cycle



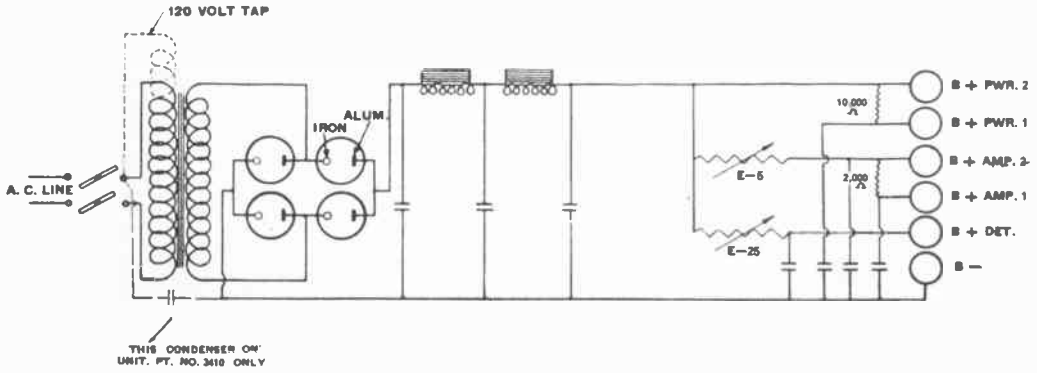
Standard "A" Power Unit, Part No. 3280, 6 Volt, 50-60 Cycle (Without Relay)



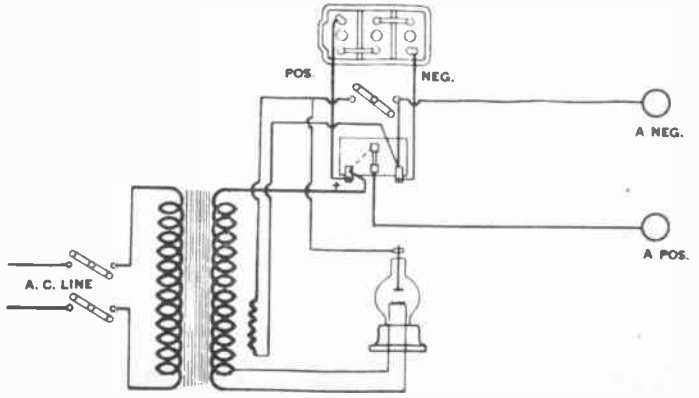
Standard "B" Power Unit, Part No. 4095, 50-60 Cycle



Standard "A" Power Unit, Part No. 3262, 6 Volt, 50-60 Cycle (with Relay)

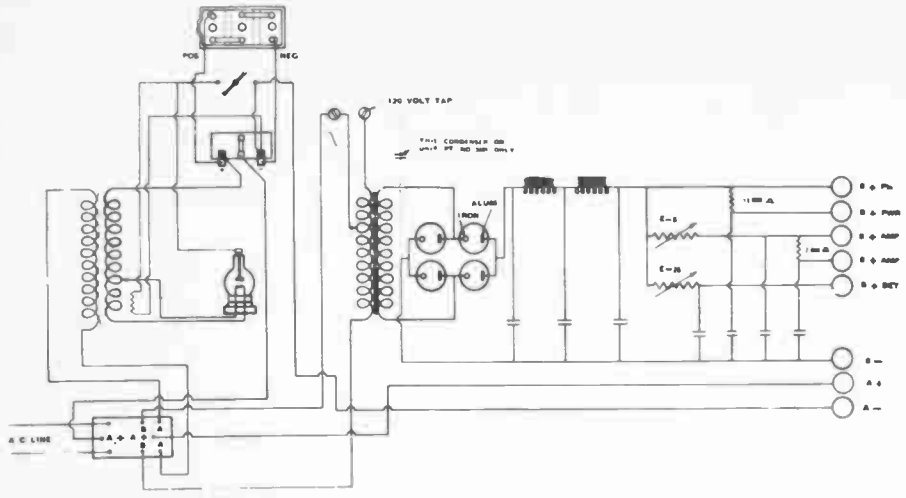


Super "B" Power Units, Part Nos. 3310 and 4310, 25-40 and 50-60 Cycle

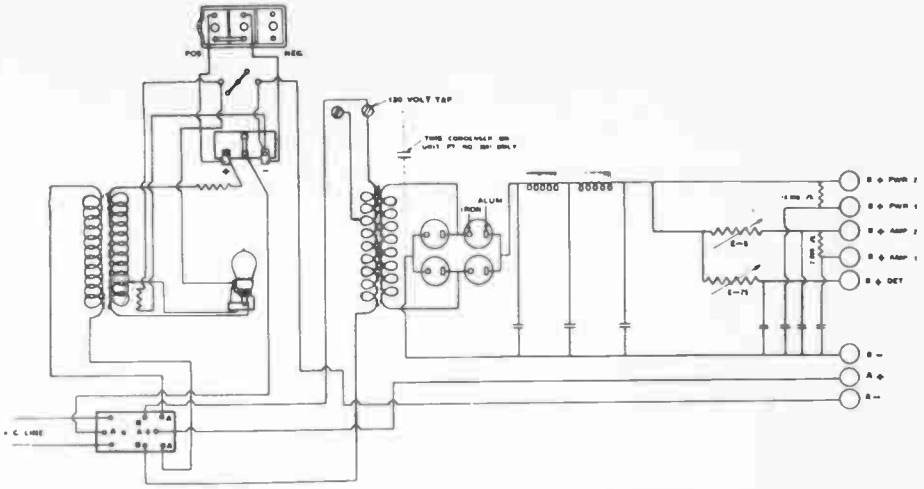


Super "A" Power Units, Part Nos. 3290 and 3390, 4 and 6 Volt, 50-60 Cycle

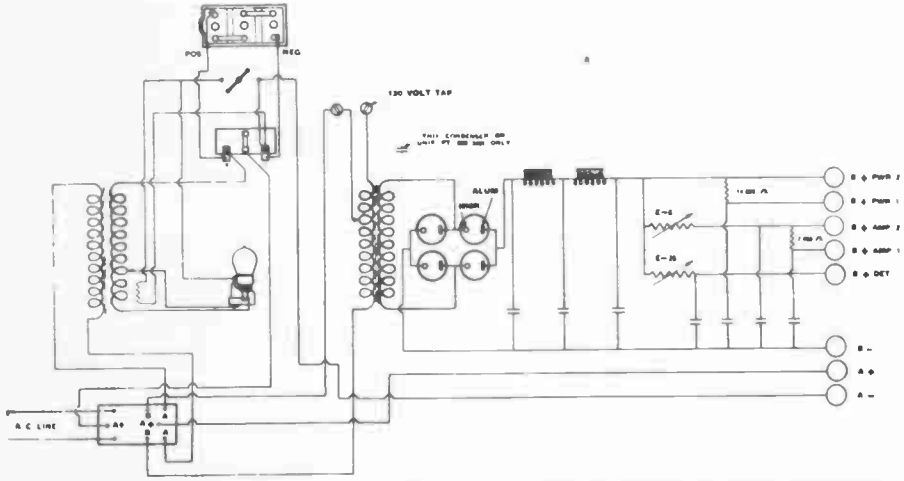
Super "A"—4 volt is schematically the same as the Super "A"—6 volt, except for increased resistance in the charge circuit and a battery using 2 cells instead of 4 cells.



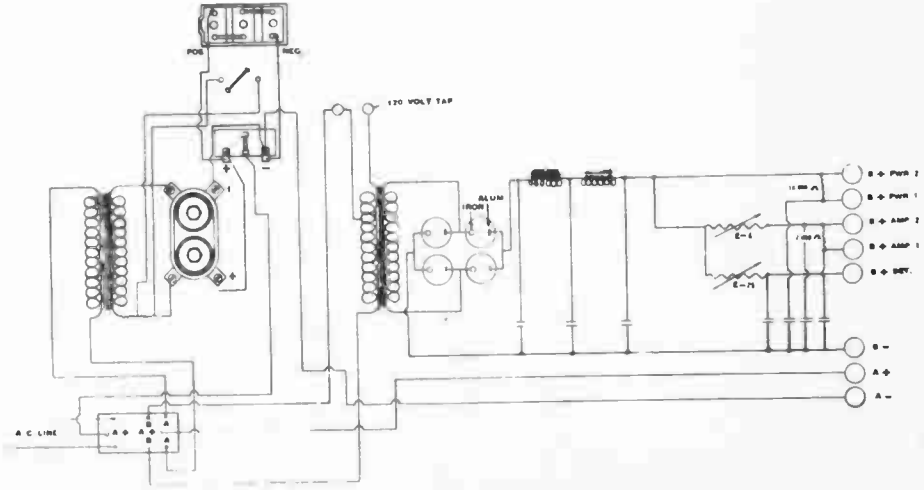
Combination "A-B" Power Unit, Part No. 3301 (Westinghouse Charger), 6 Volt, 50-60 Cycle



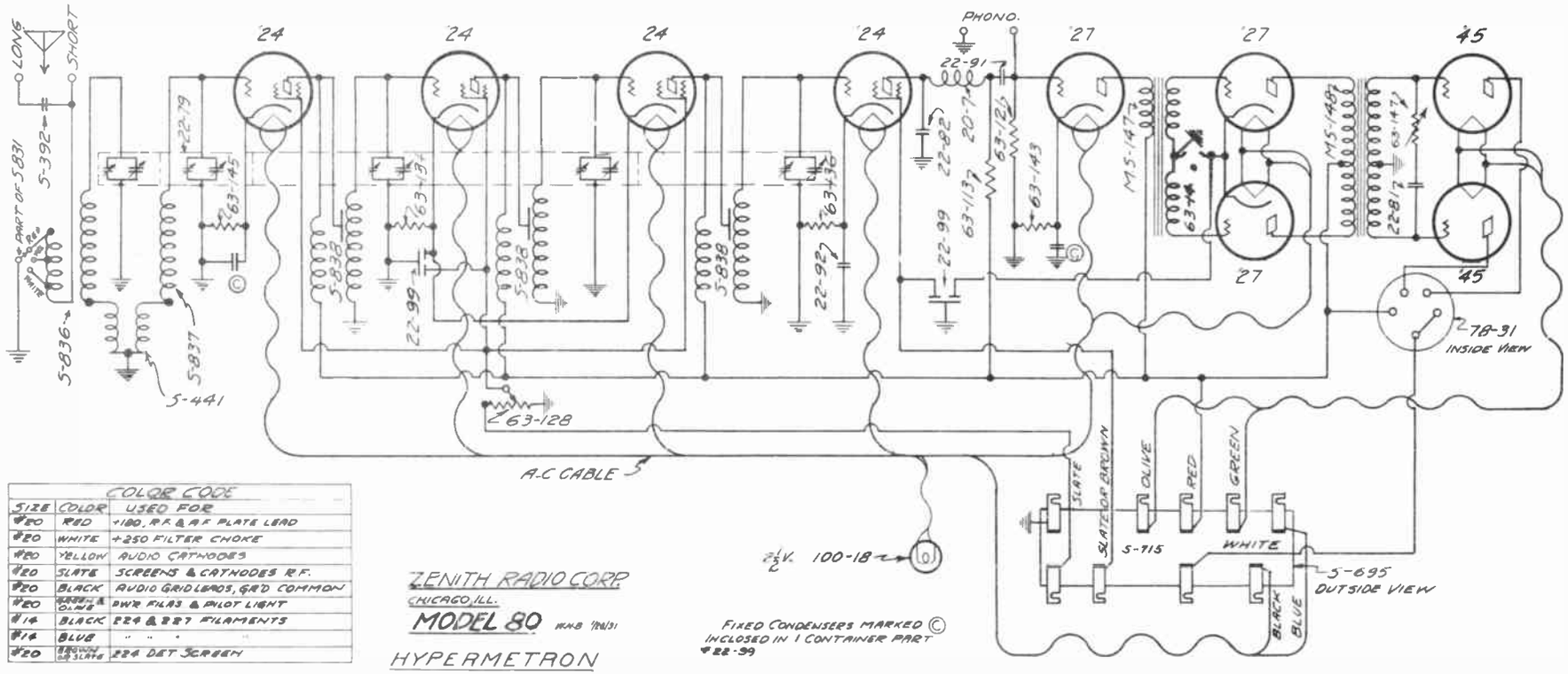
Combination "A-B" Power Unit, Part No. 6301, 4 Volt, 50-60 Cycle



Combination "A-B" Power Unit, Part No. 3301 (General Electric Charger), 6 Volt, 50-60 Cycle



Combination "A-B" Power Unit, Part No. 4301, 6 Volt, 25-40 Cycle



COLOR CODE		
SIZE	COLOR	USED FOR
#20	RED	+180, R.F. & A.F. PLATE LEAD
#20	WHITE	+250 FILTER CHOKE
#20	YELLOW	AUDIO CATHODES
#20	SLATE	SCREENS & CATHODES R.F.
#20	BLACK	AUDIO GRID LEADS, G&D COMMON
#20	GREEN & OLIVE	DWR FILAS & PILOT LIGHT
#14	BLACK	224 & 227 FILAMENTS
#14	BLUE	" " "
#20	BROWN OR SLATE	224 DET SCREEN

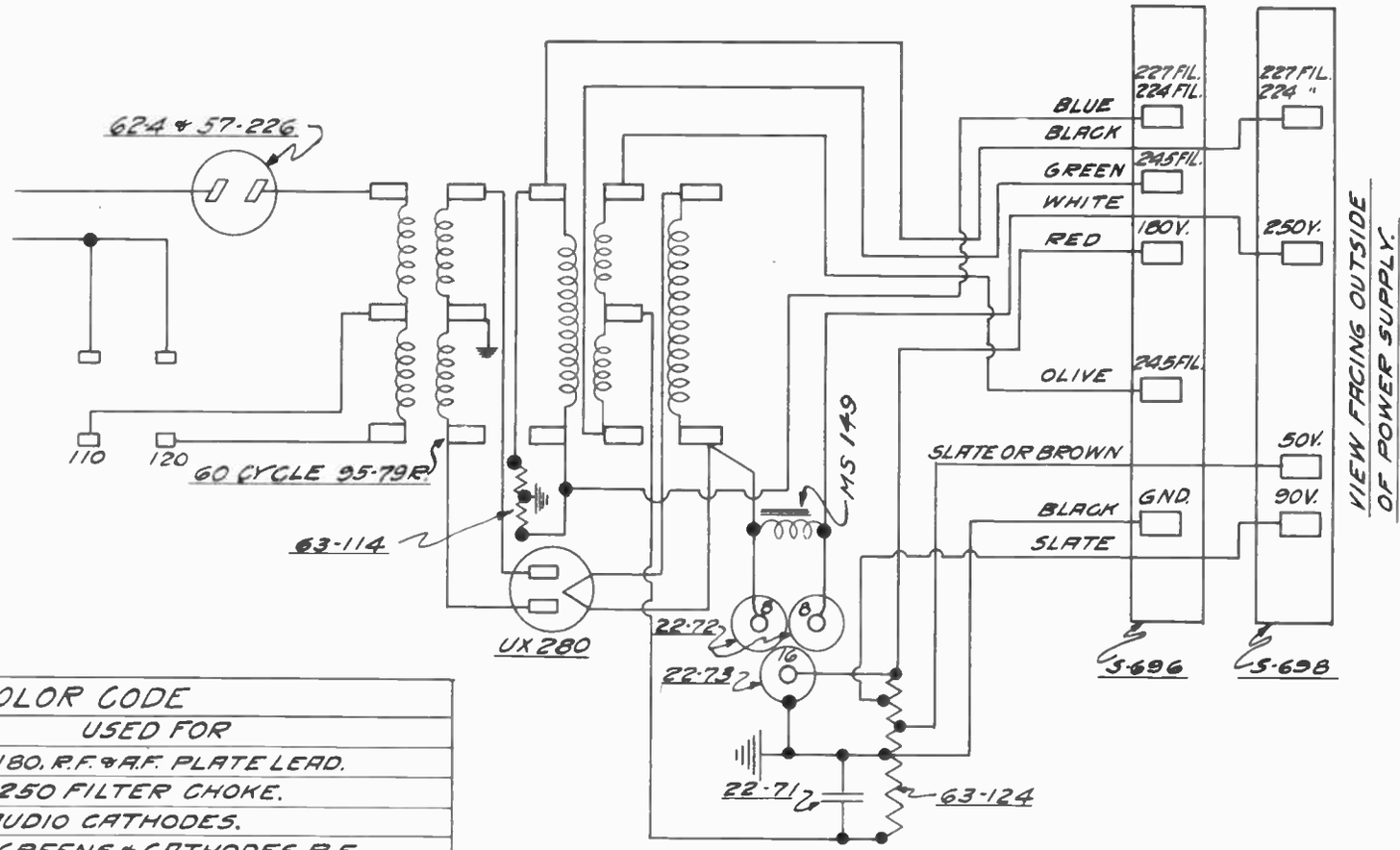
Fixed Condensers

22-81	Single .01 mf	Condenser.....(Tone Control Cond.).
22-82	Single .001 "	" .....(Detector Plate).....
22-91	Single .03 "	" .....(Audio Coupling).....
22-92	Single .5 "	" .....(Det. Cathode Bypass)
22-99	Dual .1 "	" .....(2nd RF & Det.Bypass)
S-392	Antenna Series Condenser	

Resistors

63-113	250M Ohm	Resistor.....(Red,Green End,Yellow Dot)...
63-121	100M "	" .....(Pink).....
63-131	400 "	" .....(Yellow,Black End, Brown Dot)
63-136	50M "	" .....(Green, Black End, Orange Dot)
63-143	4M "	" .....(Yellow, Black End, Red Dot)
63-145	800 "	" .....(Gray, Black End, Brown Dot)
63-146	2000 "	" .....(Red, Black End, Red Dot)

ZENITH RADIO CORP.

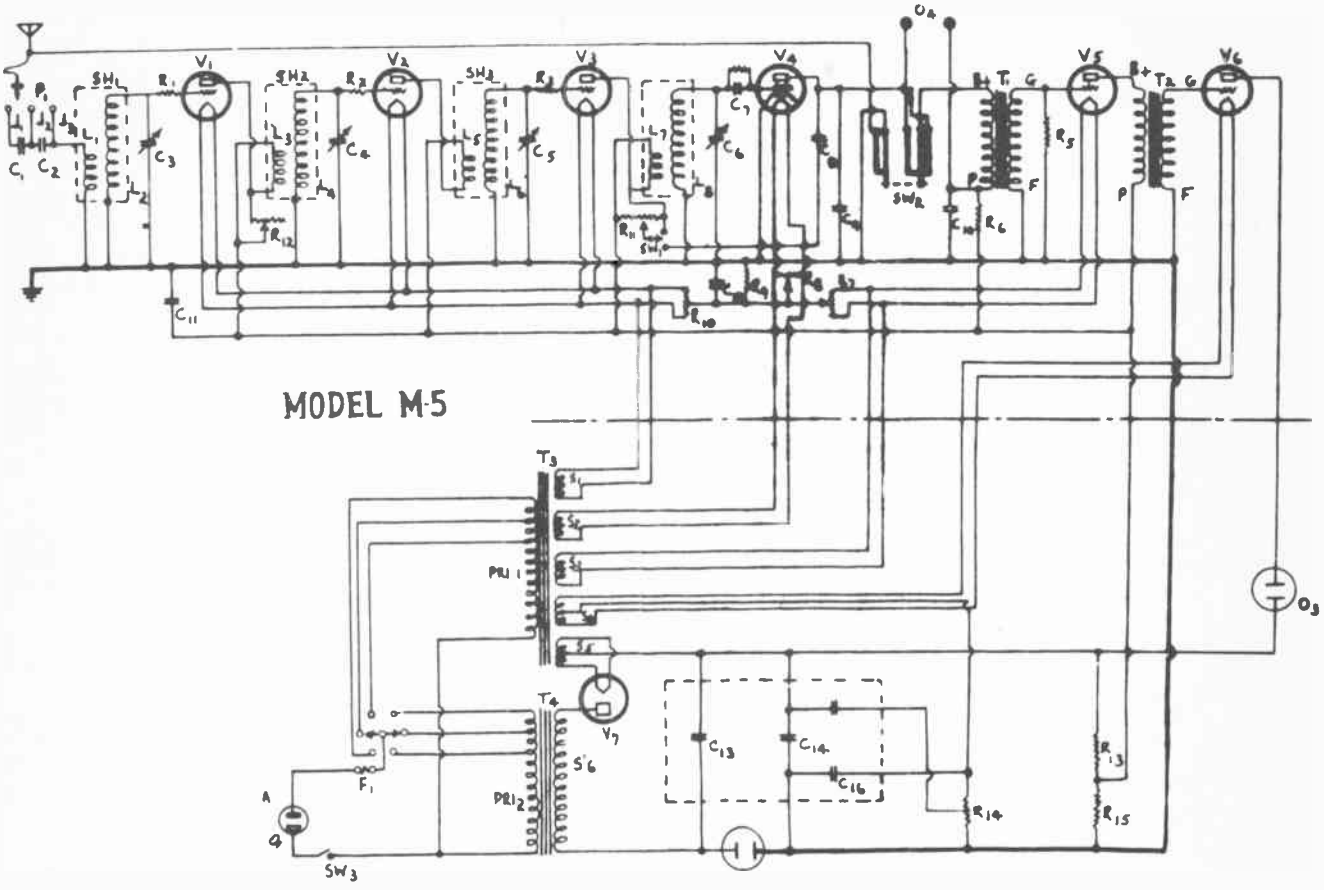


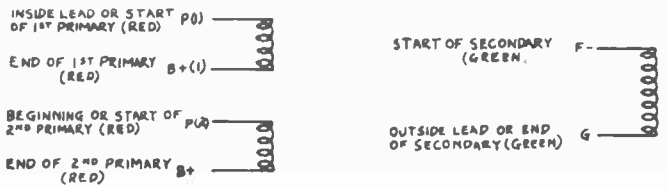
COLOR CODE		
SIZE	COLOR	USED FOR
#20	RED	+180. R.F. & A.F. PLATE LEAD.
#20	WHITE	+250 FILTER CHOKE.
#20	YELLOW	AUDIO CATHODES.
#20	SLATE	SCREENS & CATHODES R.F.
#20	BLACK	AUDIO GRID LEADS, GR'D COMMON.
#20	GREEN & OLIVE	POWER FILA'S. & PILOT LIGHT.
#14	BLACK	224 & 227 FILAMENTS.
#14	BLUE	" " "
#20	BROWN OR SLATE	224 DET. SCREEN.

ZENITH RADIO CORP.
CHICAGO, ILL.
MODEL 80

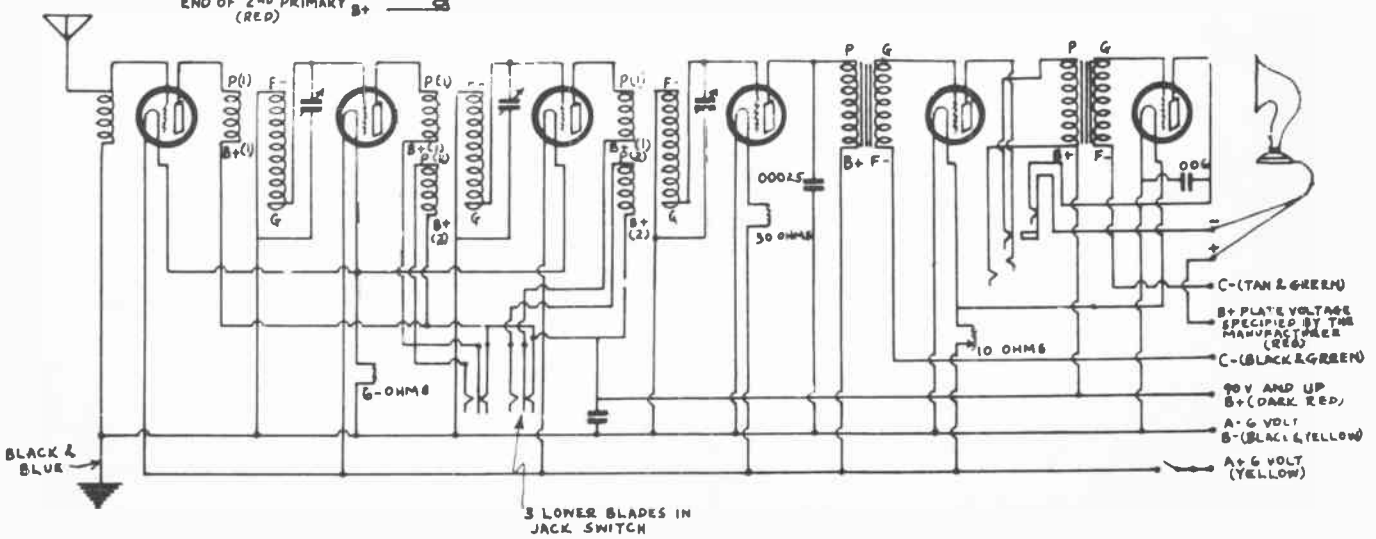
22-71	1. mf	Condenser.....(Power Bias)..
22-72	8. " "	.....(Electrolytic)
22-73	16. " "	.....(Electrolytic)
Note: 16 mf Condenser can be identified by Blue marking		
63-114	10 Ohm	Center Tap Resistor.....
63-124	10,450 "	Voltage Divider.....
57-226		Bias Plate.....
57-242		Bias Socket & Guide Plate.....
78-32		Four Prong Socket for Rectifier.....
95-79		Power Transformer.....(60 Cycle)
95-93		Power Transformer.....(25 Cycle)
136-2		2 Amp Fuse.....
S-696		Terminal Strip Assem.....(Five)
S-698		Terminal Strip Assem.....(Four)
S-700		Fuse Receptacle & A.C. Outlet Plate
MS-149		Power Choke

SPLITDORF ELECTRIC MFG. CO.

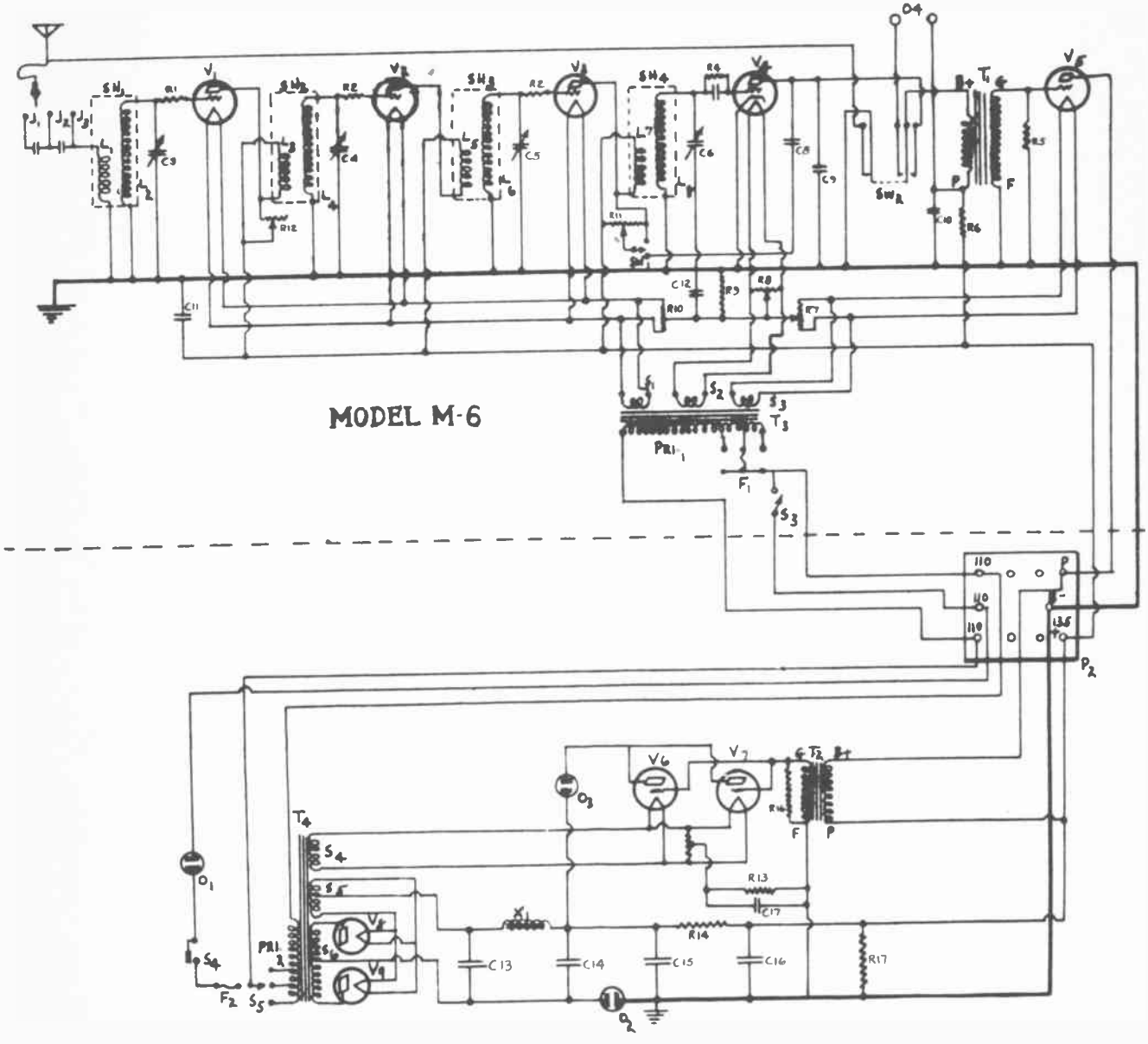


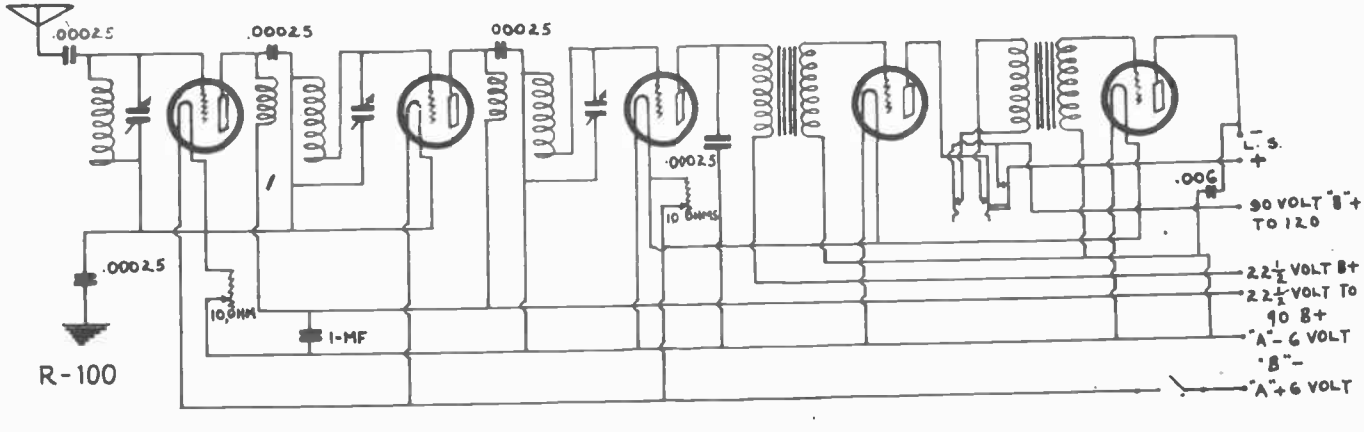


R-V-695



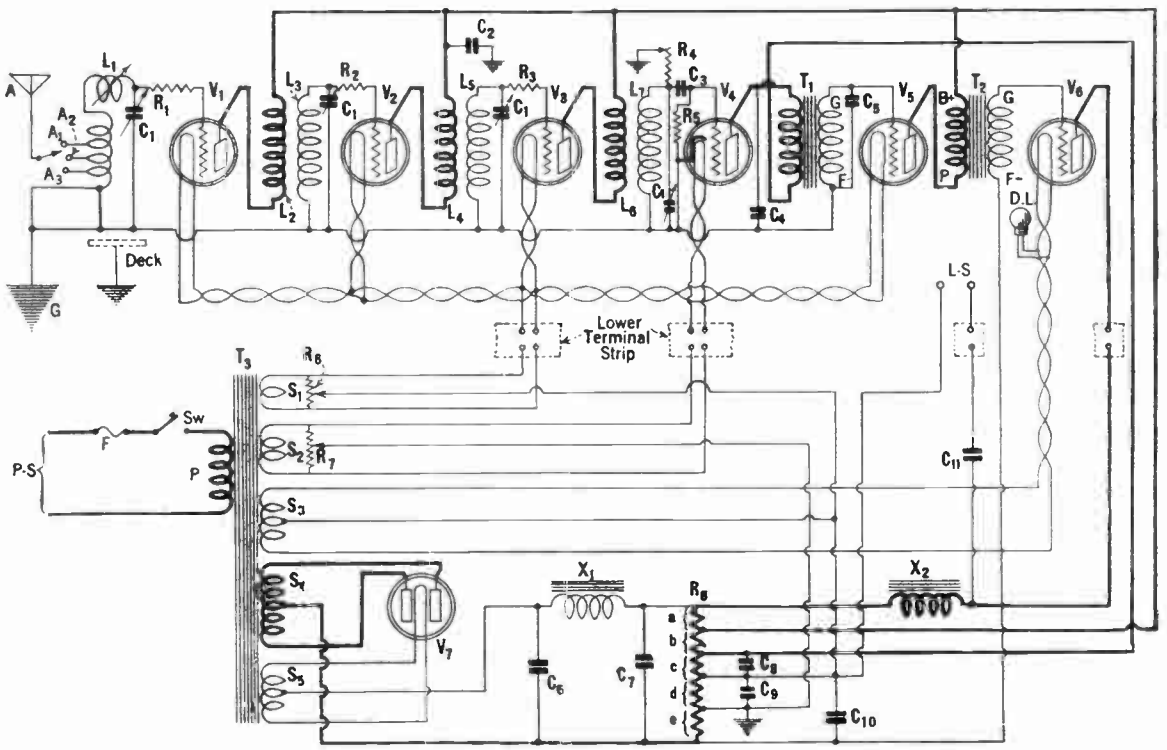
SPLITDORF ELECTRIC MFG. CO.





SPLITDORF ELECTRIC MFG. CO.

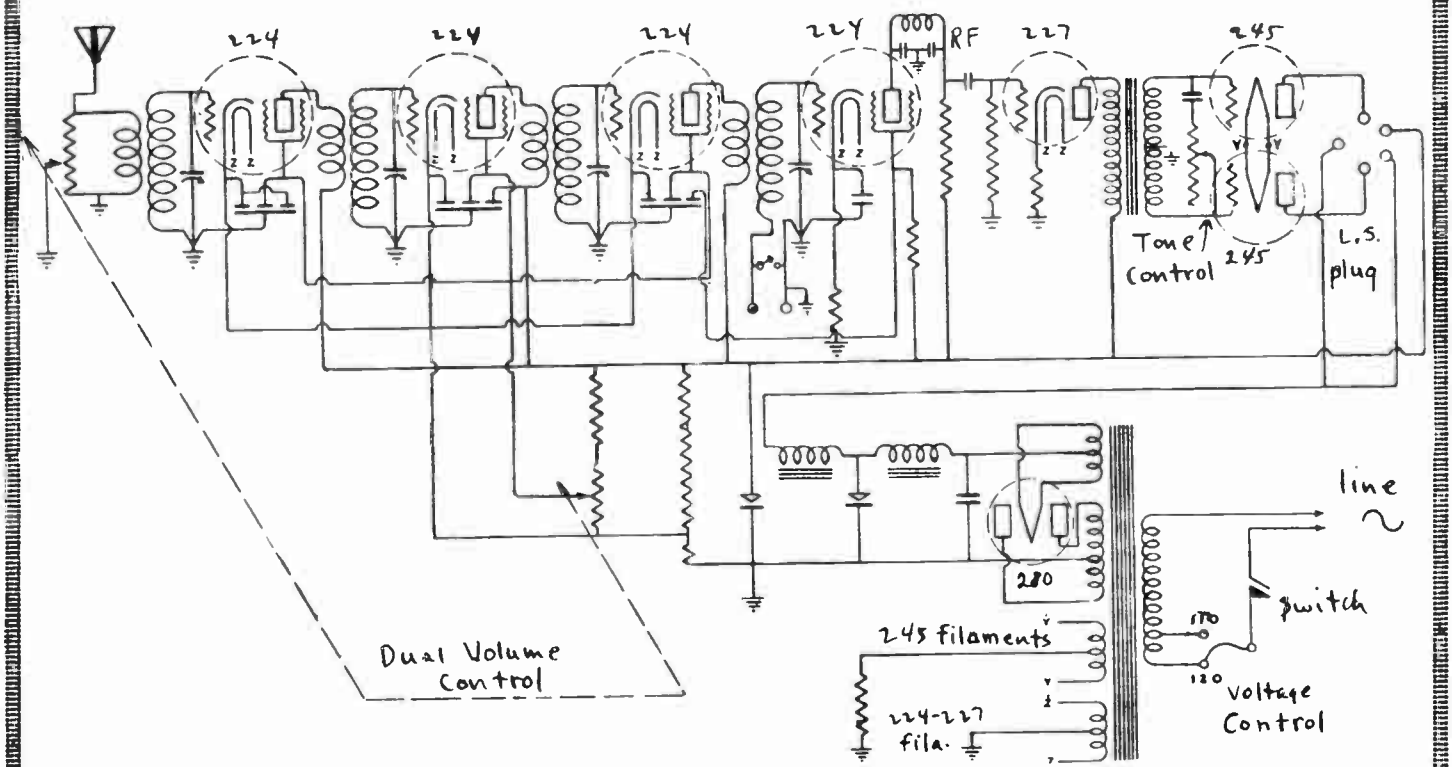
"INHERENTLY ELECTRIC" MODEL

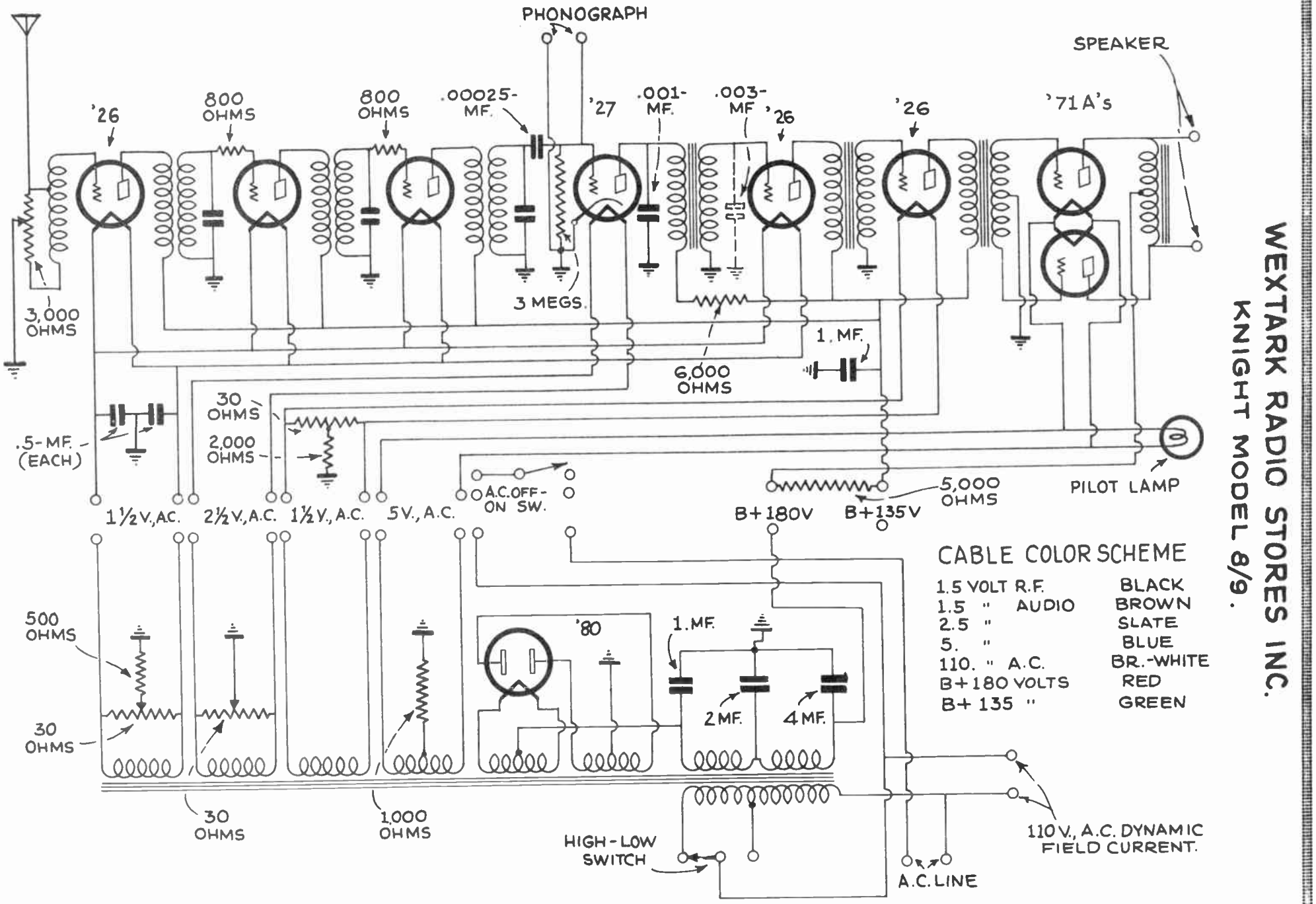


C1—Four-gang variable, .00035 mf. per section.
R1, R2, R3—600-ohm grid resistors.
C3, R5— .00025 mf. and 2 megohms.
C2—0.5 mf.
C8, C10—1.0 mf.
C9—2.0 mf.
R8—13,200 ohms.
C6—4.0 mf.
C7—6.0 mf.
C4— .0001 mf.
C5— .00025 mf.
C11—1.0 mf.
R4—500,000 ohms.
T3—Power transformer.
R6, R7—30 ohms.

UNITED AIR CLEANER CO.

MODEL 50





WEXTARK RADIO STORES INC.

KNIGHT MODEL 8/9.

CABLE COLOR SCHEME

1.5 VOLT R.F.	BLACK
1.5 " AUDIO	BROWN
2.5 "	SLATE
5. "	BLUE
110. " A.C.	BR.-WHITE
B+180 VOLTS	RED
B+135 "	GREEN

Radio Service Data Sheet

CLARION "SERIES 90" SUPERHETERODYNES
(MODELS AC-90, AC-91, AC-91A, 25-90, AND 25-91)

The latest Clarion receiver, manufactured by the Transformer Corp. of America, Chicago, Ill., incorporates the newest advances in set design. Among the features with which the Service Man must familiarize himself are the following: a superheterodyne circuit with variable-mu tubes; a screen-grid first detector; a power screen-grid second detector; a pentode power stage; together with tone control, tuned hum filter, and automatic volume control; as the circuit illustrates.

Models "AC-90" and "AC-91" operate on 110 volts 60 cycles; and the "25-90" and "25-91," on 25 cycles. Model "90" is mantel-type; Model "91," a console, and Model "91-A," a phonograph combination.

The volume control, in its extreme left position, operates a phonograph switch, in the Model "90A" receiver; the phonograph pick-up circuit being shown dotted in the diagram; and the switch at X. The pick-up impedance should be between 2000 and 5000 ohms; and the volume controlled at the unit.

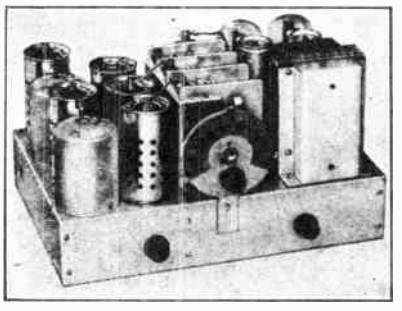
All available constants are as follows: condensers C1, C2, C3, tuning units; C1A, C2A, C3A, shunt trimmers; C5, C21, .0008-mf.; C6, C7, C8, C9, I.F. circuit trimmers; C10, C15, C16, C18, C20, C22, C23, .05-mf.; C11, 0.25-mf.; C12, 1.0-mf.; C14, C24, C27, C28, 0.1-mf.; C17, .00005-mf.; C19, 0.35-mf.; C25, C26, 8 mf. (electrolytic).

Resistors R1, R3, R6, 1,000 ohms; R2, 230 ohms; R4, 2,000 ohms; R5, R9, 100,000 ohms; R7, 40,000 ohms; R8, ½-meg.; R10, 1.0-meg.; R11, 12,000 ohms; R12, 3,800 ohms; R13, 4,300 ohms; R14, 1,800 ohms; R15, 1,300 ohms; R16, 435 ohms; R17, 400 ohms; R18, 65,000 ohms; R19, 20,000 ohms; R20, 210 ohms.

Operating voltages (with volume control in position "full" and line potential 115 volts) are as follows: Filaments V1, V2, V3, V4, V5, V6, V7, 2.2 volts; V8, 4.6 volts. Plate potentials, V1, 160 volts; V2, 168 volts, V3, 125 volts; V4, 163 volts; V5, 178 volts; V6, 25 volts; V7, 260 volts; V8, 350 volts. Control-grid potentials, V1, 0.9-volt; V2, 7.6 volts; V3, none; V4, 0.6-volt; V5, 6.8 volts; V6, 4.6 volts; V7, 16.5 volts. Cathode potentials, V1, V4, 2 volts; V2, 4.9 volts; V3, none; V5, 9 volts; V6, 4.5 volts. Plate currents (normal), V1, 2.8 ma.; V2, V4, 2. ma.; V3, 9.5 ma.; V5, 0.25-ma.; V6, none; V7, 36 ma.; V8, 72 ma. Screen-grid potentials, V1, V2, V4, 77 volts; V5, 90 volts; V6, 40 volts; V7, 260 volts.

Removal of the tube shields will cause circuit instability. Use of the variable-mu tube eliminates the hissing sound usually associated with high-gain superheterodynes. The manufacturer's (T.C.A.) code for the tubes is as follows: V1, V2, V4, CL-51; V3, CL-27; V5, V6, CL-24; V7, CL-PZ or CL-47; V8, CL-80.

The above readings on the pentode were taken



Chassis of Series "90" Clarion: compare this illustration with the coded layout at the lower right.

in the following manner: the plate potential is read between plate and filament prongs, on the 250-volt scale. The control-grid is checked between the black common lead (on the reproducer's voice coil) and ground. The space-charge-grid is tested between this prong and filament. Connections to the UY base of the 'PZ resemble those of a '27—except that the cathode prong becomes the space-charge-grid lead. An adapter which exposes these five connections will be of assistance to Service Men not yet provided with modern analyzers designed to test pentodes.

Lack of sensitivity may be due to an open circuit, a high resistance, or a short circuit; seldom to trimmers out of adjustment. Exceptional care is taken to align these circuits accurately; after which they will retain their adjustment in nearly all instances.

Poor selectivity is seldom due to mis-alignment of the tuned circuits; but, more often, to a high-resistance joint in an R.F. circuit. An ohmic test may not indicate the faulty connection; but the application of a soldering iron to suspected joints may clear the trouble.

To align the I.F. circuits, (if the procedure is imperative), use a bakelite screwdriver to adjust C6, C7, C8, C9 for maximum output meter reading; with a 175-kc. (exact) oscillator output wired to the cap of V2, all tubes in their respective sockets; and all cap leads connected.

The R.F. circuits are to be aligned at 1400 kc. and 600 kc.

The oscillator low-frequency "padding" trimmer C4 is next adjusted, with the R.F. oscillator (connected to the antenna and ground posts) operating at exactly 600 kc.; at the same time, the receiver's dial is to be swung back and forth over the 600-kc. setting—adjusting for maximum output. Repeat the operation at 1400 kc.; except that C3 (the high-frequency tuning condenser) remains fixed, only C3A being adjusted, if necessary. Check also C1A and C2A.

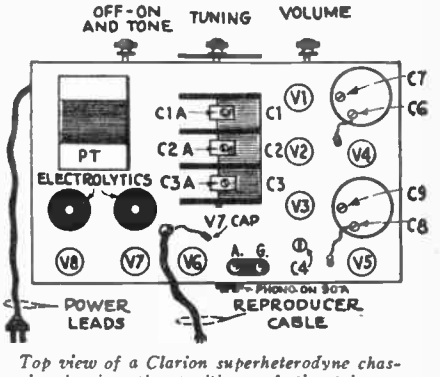
High-percentage modulation at the transmitter will result in increased signal strength at the receiver, as compared to other stations for which the automatic volume control has been adjusted.

Poor tone quality may be due to off-resonance tuning by the listener. Check by using a short-wire antenna, with volume control full on; the automatic volume control circuit will then cease to level the signal strength, and a tuning peak can be obtained. A poor '24 second-detector may mar the tonal reproduction; check also V6. A "fluttering" signal may be due to a poor ground.

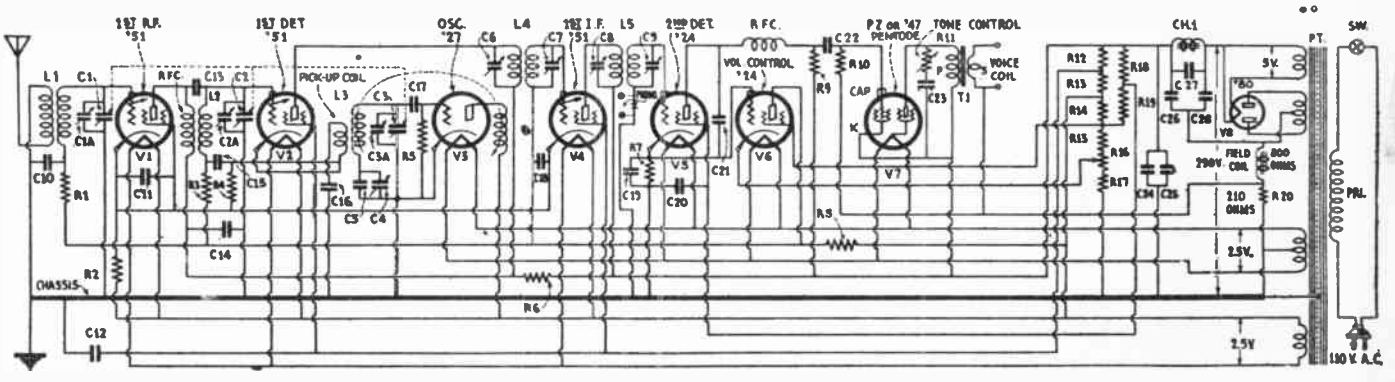
A 100-watt lamp should light brilliantly when connected between ground and one side of the light-line. A dim light indicates a poor ground connection; and no light, an ungrounded light-line. If the power company corrects the latter condition, hum, fluttering, circuit oscillation, and back-ground noise may be eliminated.

Although the intermediate frequency of 175 kc. has been selected by most manufacturers as the most satisfactory it is to be noted that a weak fourth harmonic, 700 kc., may heterodyne a broadcast station carrier and cause a whistle. Another cause of circuit oscillation is high line voltage; look also for open by-pass condensers.

Note that one side of the filament secondary which supplies V1, V2 and V4 connects also to other parts of the circuit, including the cathodes of V1 and V4, and the plate of the oscillator V3; and that, with respect to ground, this lead has a positive voltage of 95.

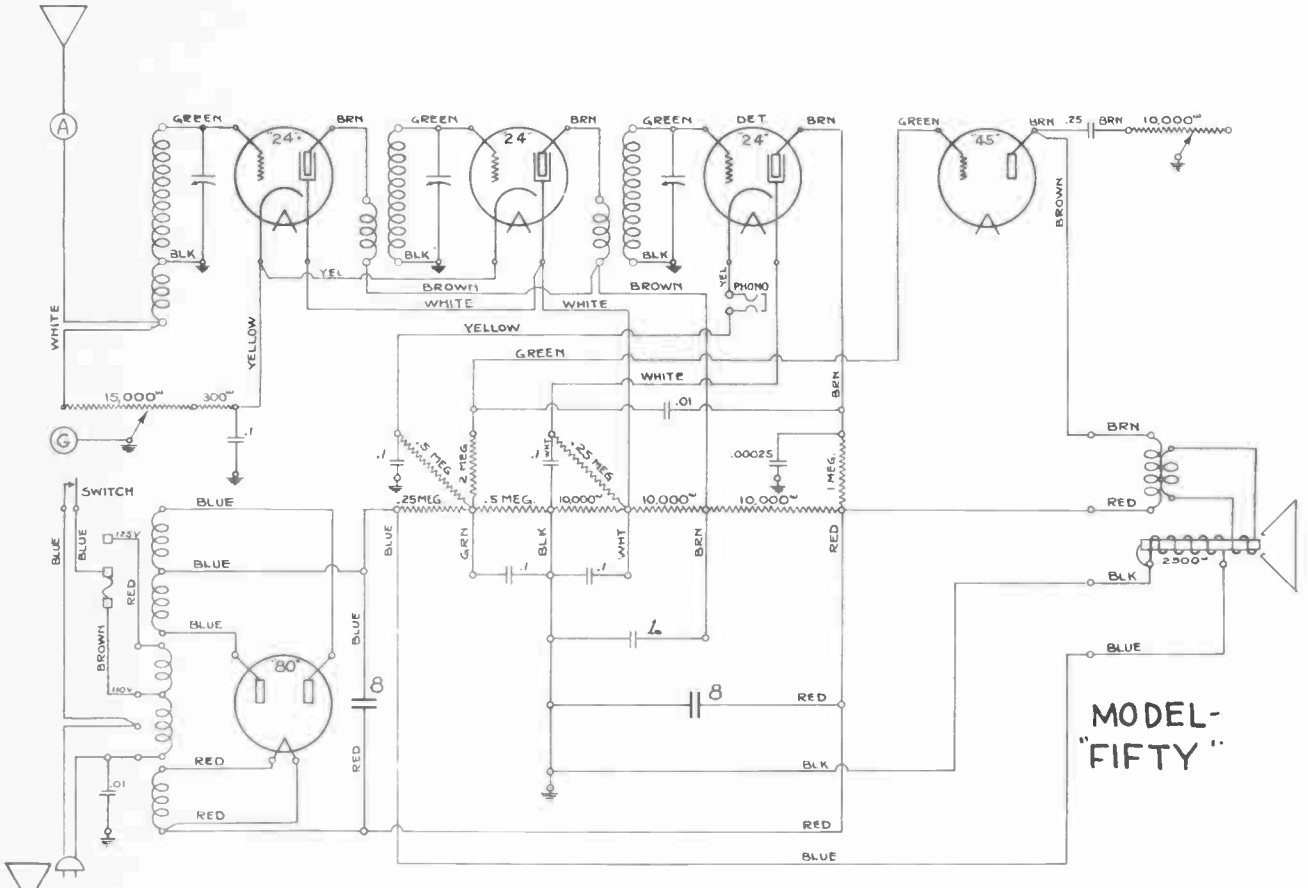


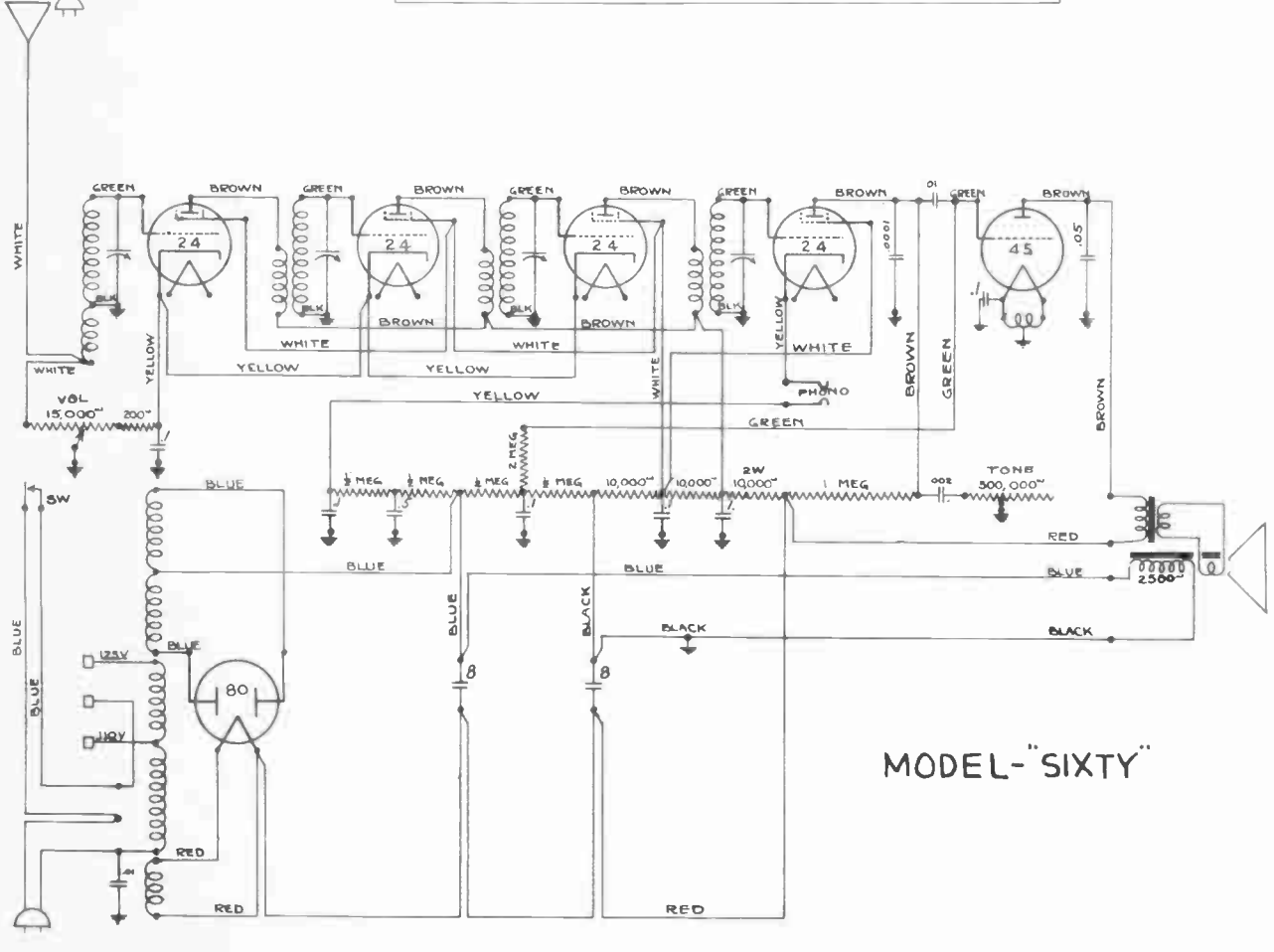
Top view of a Clarion superheterodyne chassis showing the positions of the trimmer condensers. The phonograph connection appears only on the "Model 90-A" chassis.



Schematic circuit of the highly-developed midget and console Clarion "Series 90" superheterodyne receivers; these utilize both variable-mu and pentode tubes, with automatic volume control. (Note: in the manufacturer's "breakdown analysis" illustration of this receiver, condensers C24 and C25 return to the juncture of R10 and R20, instead of to the chassis.)

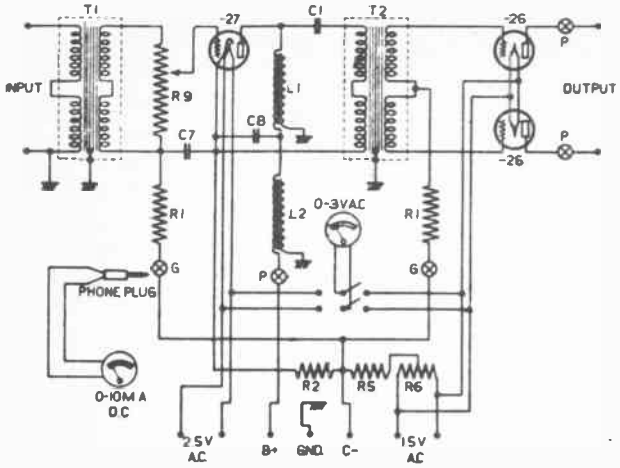
KELLER FULLER MFG. CO. LTD.



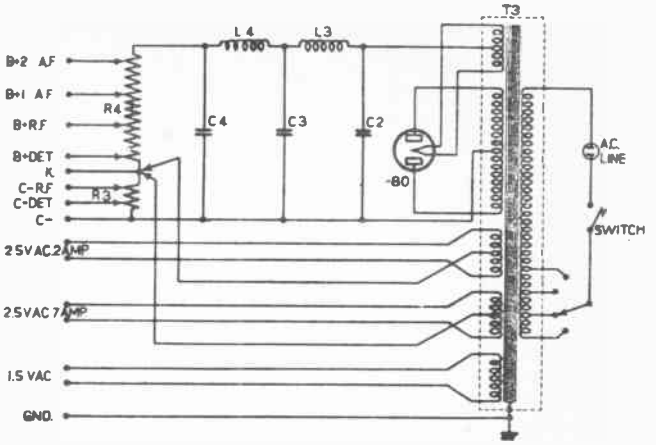


AMERICAN TRANSFORMER CO.

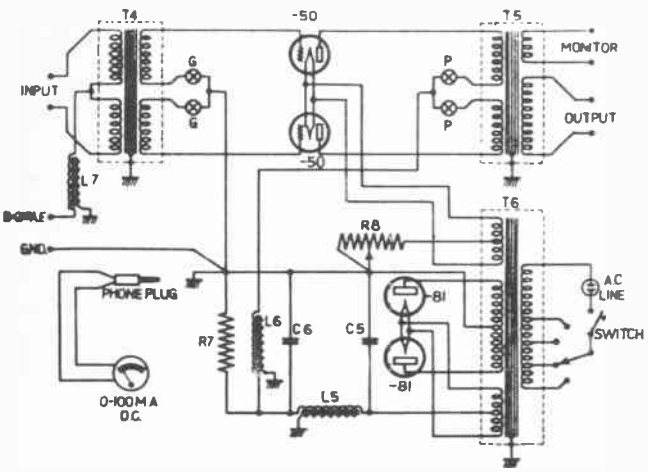
CONCERT-HALL AMPLIFIER—TYPE 25A



Panel A—Two-stage input audio-frequency amplifier. First stage: one 227-type tube. Second stage: two 226-type tubes.



Panel P—Power-supply unit. Provides all d.c. plate voltages and a.c. filament currents required for operation of panel A, also for radio tuner if equipped with 2½-volt a.c. tubes. Type 280 rectifier tube used.



Panel PA—Power output stage. This unit includes input and output transformers and a self-contained power supply for two 250-type tubes which are connected in push-pull. Two 281-type tubes are used as rectifiers.

The standard Type 25A amplifier comprises three panel sections, employs three stages of power audio-frequency amplification, and may be operated directly from the standard 115-volt, 60-cycle power line. The first stage uses a single 227-type tube, the second stage employs two 226-type tubes in a push-pull circuit, and in the output stage two 250-type tubes are connected in push-pull. The undistorted output of the last stage is 12.6 watts, and, in cases where greater power is required, twice this value may be obtained by connecting two output panels in parallel.

Two power-supply circuits are utilized to provide plate and filament voltages for the various tubes of the amplifier; the output stage is equipped with an individual power circuit and the first two stages are supplied with power from another power panel, which also furnishes plate current for the radio tuner and filament current for 2.5-volt, heater-type tubes.

APPROVED AMERTRAN AUDIO CIRCUITS

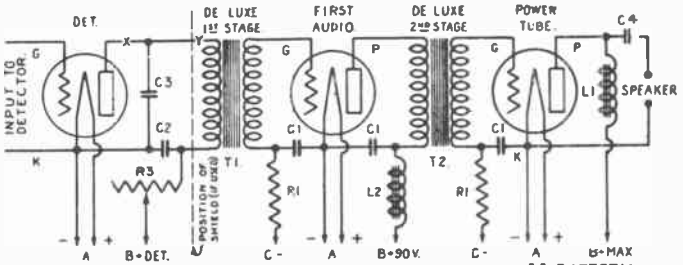


FIG. 7 STANDARD AUDIO CIRCUIT OPERATED WITH "A" BATTERY.

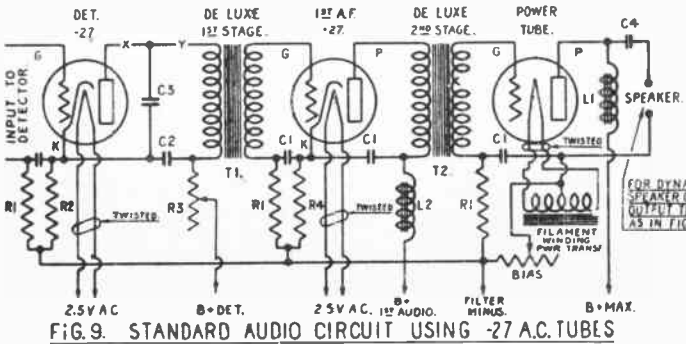


FIG. 9. STANDARD AUDIO CIRCUIT USING -27 A.C. TUBES FOR DETECTOR AND 1ST AUDIO, BOTH SELF BIASED.

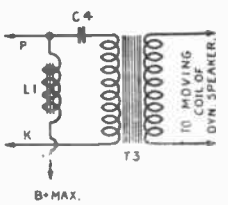


FIG. 8. SAME AS FIG. 7 EXCEPT OUTPUT ARRANGED FOR DYNAMIC SPEAKER.

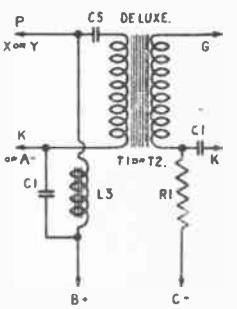


FIG. 10. PARALLEL FEED ANY AUDIO STAGE.

C1—Non-inductive by-pass condenser, 2-mfd.
C2—Non-inductive by-pass condenser, 1- or 2-mfd.
C3—Non-inductive by-pass condenser, 0.0005- to 0.001-mfd.
C4—Non-inductive (high-voltage) condenser, 4-mfd.
C5—Non-inductive by-pass condenser, 0.25-mfd.
K—Cathode or —A.
L1—AmerChoke (output), type 101.
L2—AmerChoke, type 3482.
L3—AmerChoke, type 3482 or 988
R1—50,000-ohm resistor. Filmenco, or Ward Leonard
R2—10,000- to 15,000-ohm adjustable potentiometer for biasing detector.
R3—100,000-ohm variable resistor for detector plate control.
R4—1800- to 2000-ohm wire-wound resistor for biasing.
Bias—Wire-wound resistor for power tube bias (Res. ohms = —C volts ÷ plate current amps.
T1—AmerTran audio transformer, First Stage De Luxe or type AF-8.
T2—AmerTran audio transformer, Second Stage De Luxe or type AF-8.
T3—10- to 15-ohm AmerTran output transformer, type 115.
X—Location of tickler, if regenerative.
Y—Location of r.f. choke coil, if used.

AMERICAN TRANSFORMER CO.

PLATE SUPPLY TRANSFORMER CONNECTIONS

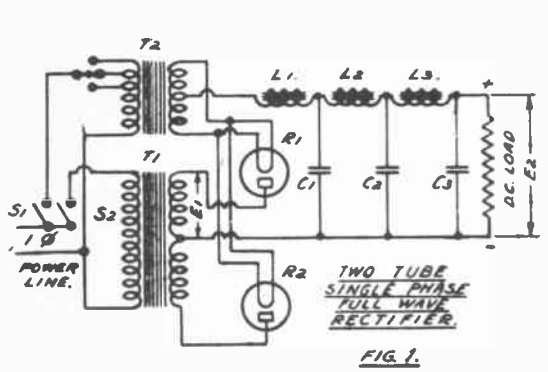


FIG. 1.

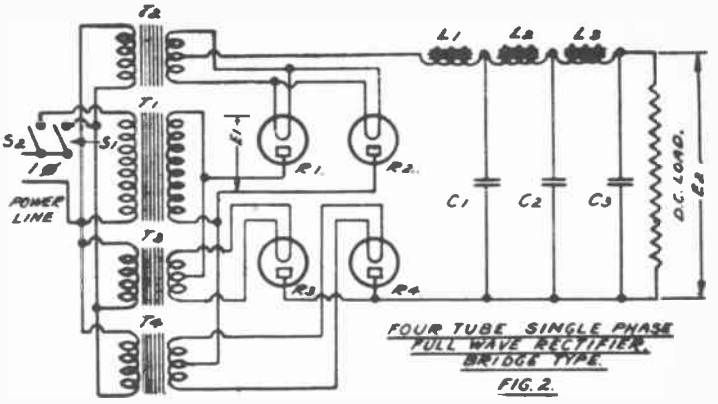


FIG. 2.

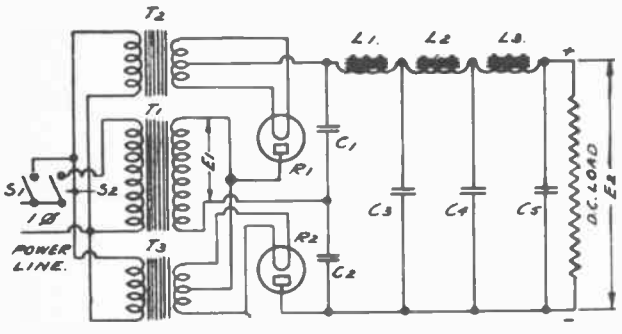


FIG 3.

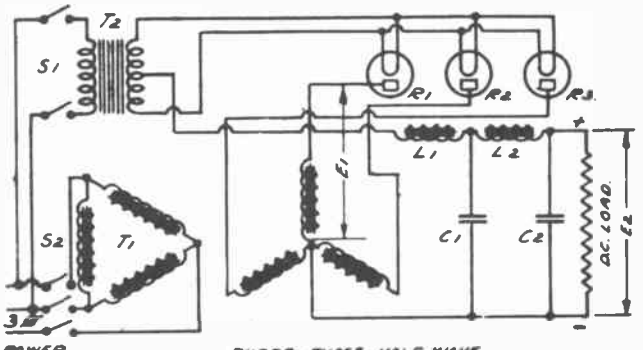


FIG. 4.

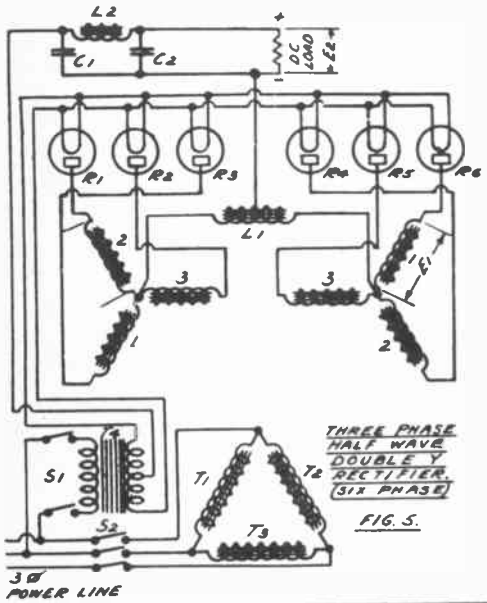


FIG. 5.

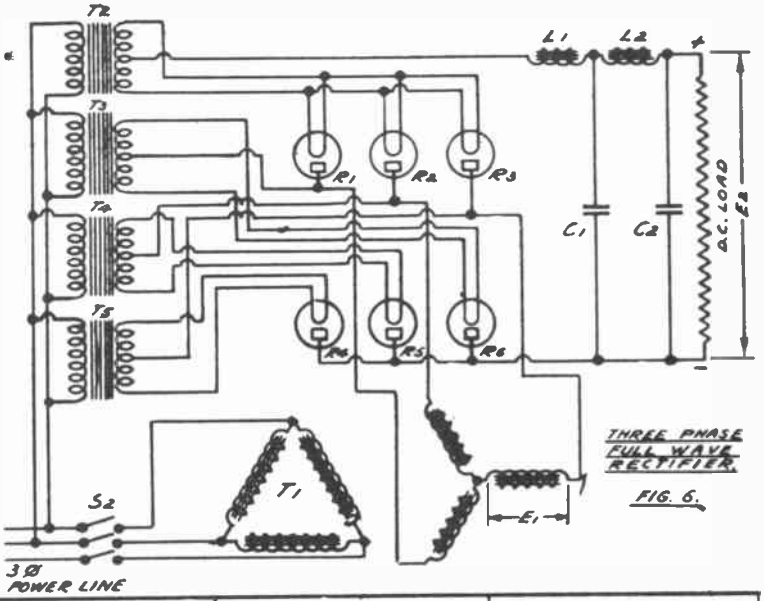


FIG. 6.

CIRCUIT	NO. TUBES.	MAX. INPUT VOLTS E1 R.M.S.	D.C. OUTPUT VOLTS E2 LESS DROP IN FILTER.	MAX. D.C. OUTPUT CURRENT.
FIG. 1	2	35.3 % M.P.I.V.	45 % E1	66⅔ % M.P.P.C.
IF L1 IS OMITTED			113 % E1	27.5 % M.P.P.C. OF 1 TUBE.
FIG. 2	4	70 % M.P.I.V.		66⅔ % M.P.P.C.
IF L1 IS OMITTED			113 % E1	27.5 % M.P.P.C. OF 1 TUBE.
FIG. 3.	2	114 % M.P.I.V.	170 % E1 *)	33⅓ % M.P.P.C.
FIG. 4	3	41 % M.P.I.V.	117 % E1	84 % M.P.P.C.
FIG. 5.	6	41 % M.P.I.V.	117 % E1	200 % M.P.P.C.
FIG. 6	6	41 % M.P.I.V.	234 % E1	100 % M.P.P.C.

*) DEPENDS ALSO ON SIZE OF C1 & C2

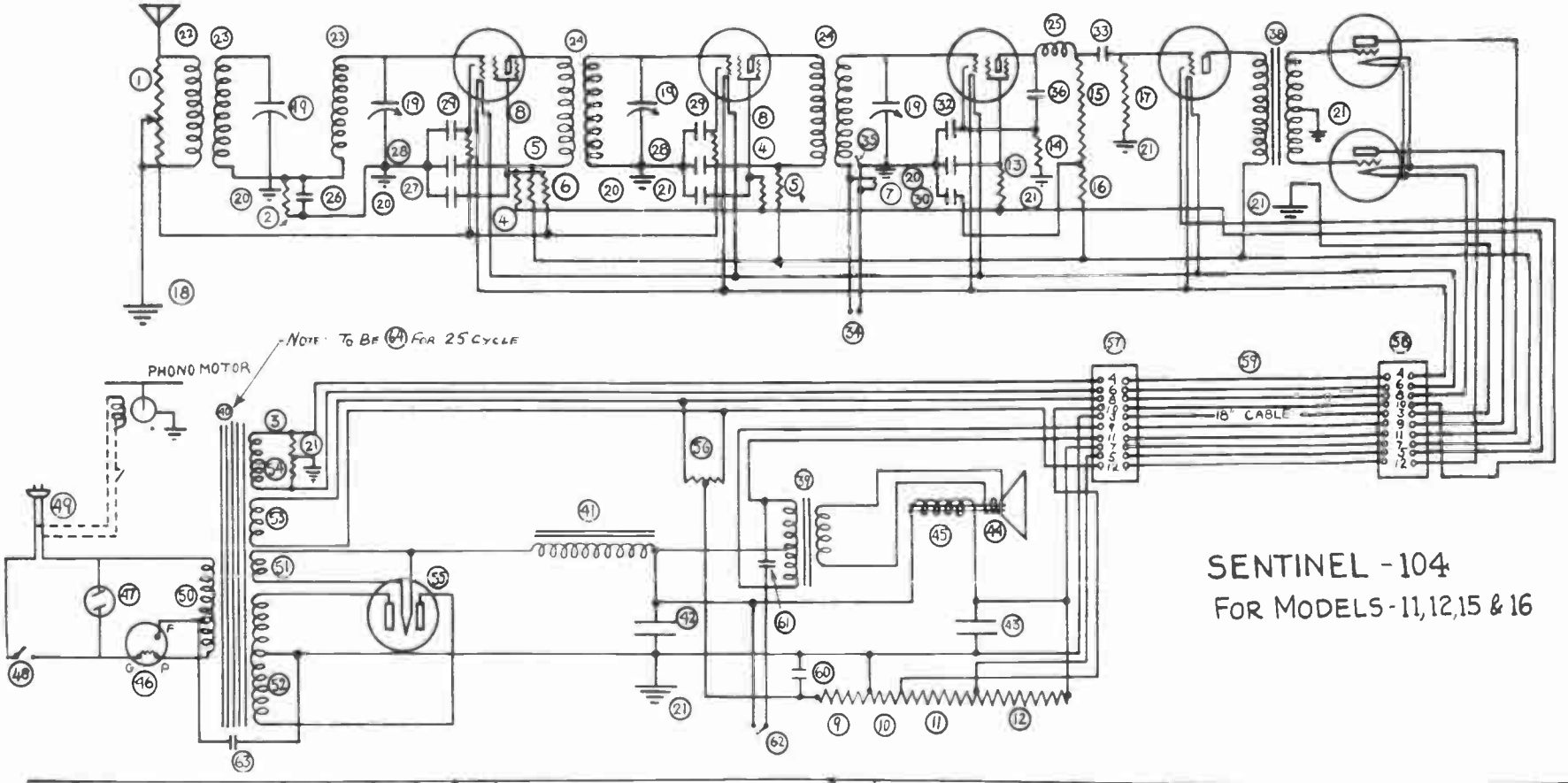
FOR 3-PHASE OPERATION ONLY.

M.P.I.V. - IS MAXIMUM PEAK INVERSE VOLTAGE RATING OF RECTIFIER TUBE.
M.P.P.C. - IS MAXIMUM PEAK PLATE CURRENT RATING OF RECTIFIER TUBE.

MUST BE USED WITH T TYPE FILTERS WHOSE PARTS CAN HAVE SMALLER VALUES THAN THOSE OF FILTERS FOR 1 PHASE.
INTERPHASE REACTOR ACTS AS FIRST CHOKE.
TRANSFORMERS CAN BE EITHER THREE-PHASE WITH DELTA PRIMARIES & STAR SECONDARY OR PREFERABLY THREE SINGLE PHASE TRANSFORMERS WITH DELTA PRIMARIES & STAR SECONDARIES.
SWITCH S1 SHOULD BE CLOSED FIRST. S2 CLOSED 40 SECONDS AFTER S1.

A. T. Co. Drawing C-12985

UNITED AIR CLEANER CO.



SENTINEL - 104
FOR MODELS - 11, 12, 15 & 16

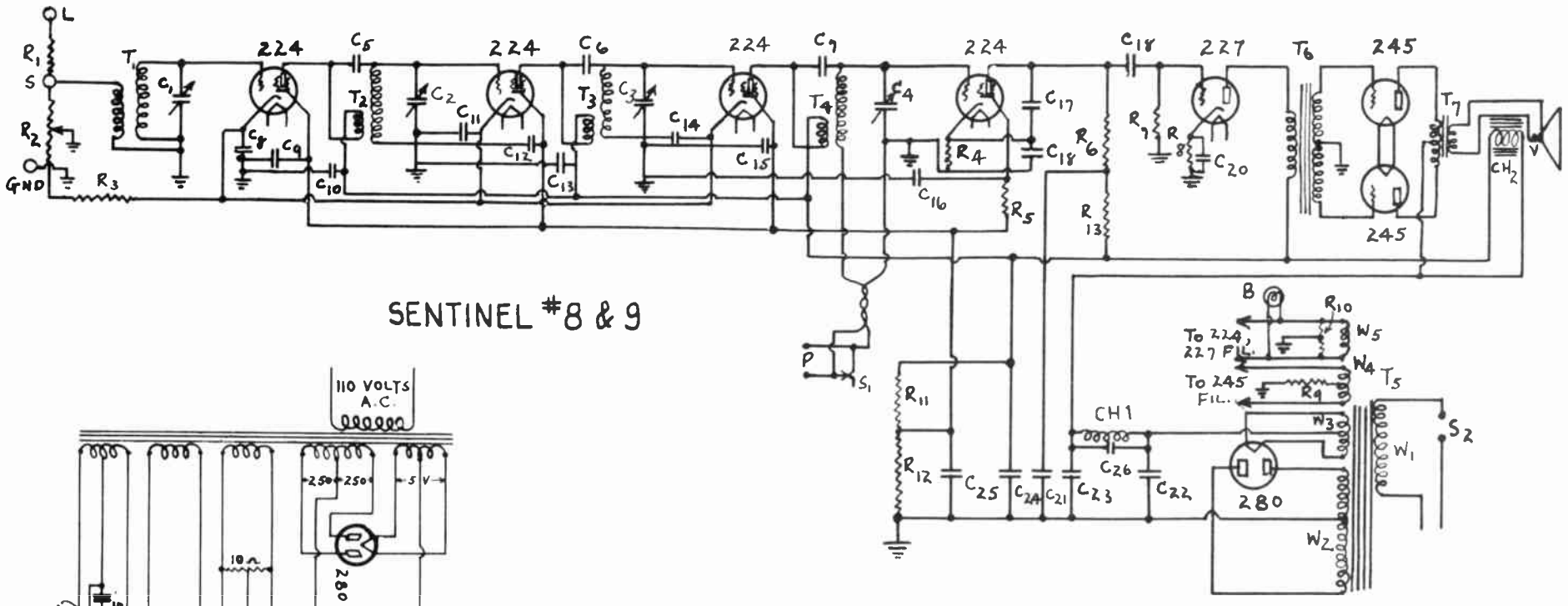
Nº	DESCRIPTION	R	I	E	W
1	VOLUME CONTROL	1.0M	8 MAX	∝	0-.001
2	COUPLING RESISTOR	760	0	0	0
3	CENTER TAP RESISTOR	20	125	25	315
4	SCREEN FILTER RESIS	750	1	75	.0009
5	PLATE FILTER RESIS	750	4	3	012
6	BIAS RESISTOR	100M	1	93	09
7	PICKUP LOAD RESIS	2500	0	0	0
8	CATHODE BIAS RESIS	750	4	3	012
9	245 BIAS RESISTANCE	775	62	50	3.1
10	AUDIO BIAS RESIS	295	44	12.5	.55
11	SCREEN RESISTANCE	1850	46	80.5	3.6
12	FIELD LOAD RESIS.	2100	46	93	43
13	SCREEN BLEEDER RESI	1.5MM	.055	110	.006
14	DETECTOR BIAS RESIS	5M	.38	1.9	.0007
15	PLATE LOAD RESIS.	300M	32	96.	03
16	DETECTOR FILTER RESIS	50M	32	16	005
17	GRID RESISTANCE	1MM	0	0	0

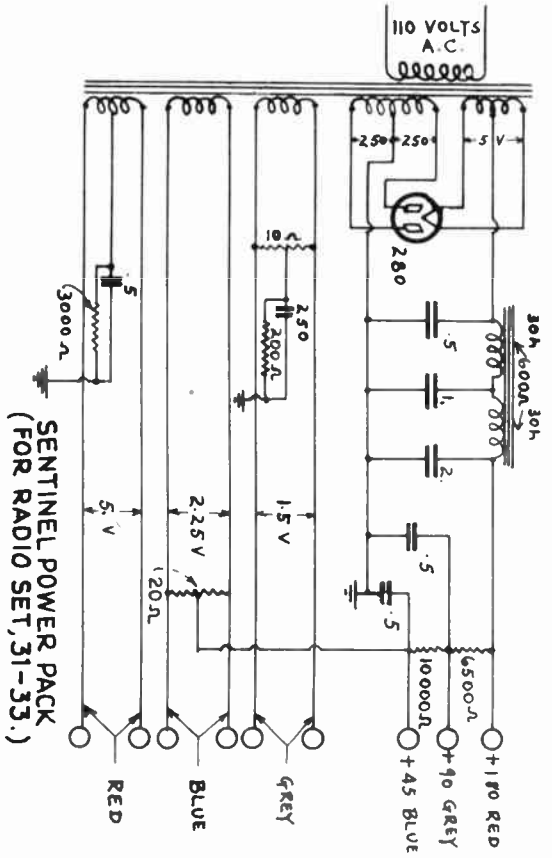
Nº	DESCRIPTION
18	SET EXTERNAL GROUND
20	ROTOR BRUSH GROUND
21	CHASSIS GROUND
19	TUNING CONDENSER
22	PRIMARY COIL 690 mhs K=122
23	BAND PASS INDUCTANCES
24	R.F. TRANSFORMERS
25	R.F. CHOKE 8 mh.
26	COUPLING CONDENSER .025 mfd.
27	SCREEN FILTER CONDENSER 1 mfd.
28	PLATE FILTER COND. 1 mfd. 300 V.
29	CATHODE BYPASS COND 1 mfd - 20 V.
30	DETECTOR FILTER COND 5 mfd - 300 V.
31	SCREEN FILTER COND. 25 mfd 20 V.
32	CATHODE BY PASS 1 mfd - 20 V.
33	COUPLING COND .005 mfd Mica
34	PICKUP JACK

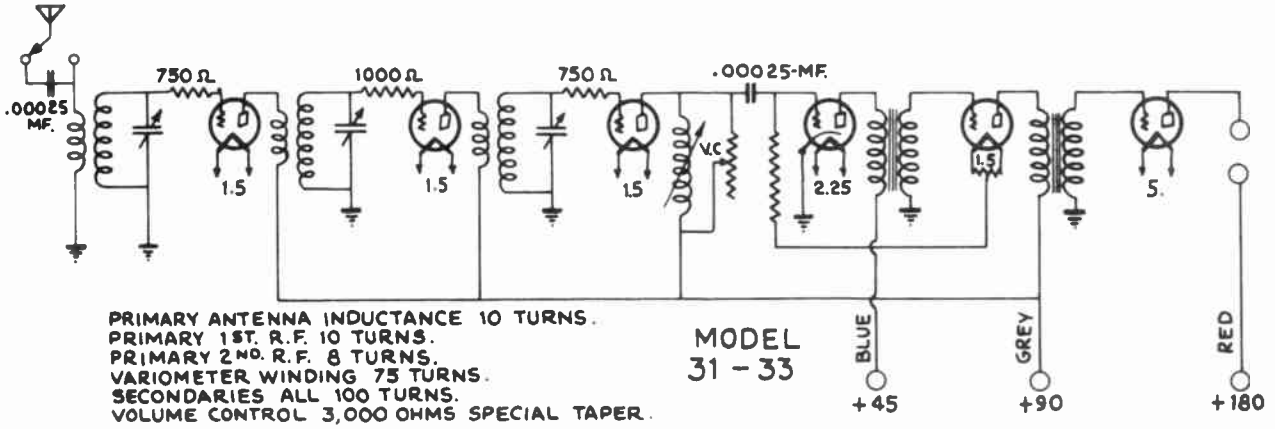
Nº	DESCRIPTION
35	PHONOGRAPH SWITCH
36	DETECTOR R.F. BY PASS .0001 mf. mica
37	245 BIAS BY PASS COND. 025 mf 900 V
38	INPUT PUSH-PULL TRANS. THORD. #218-B
39	OUTPUT PUSH-PULL TRANS THORD 0382-A
40	POWER TRANSFORMER Y-4218-D
41	POWER CHOKE THORD. 3696 200Ω
42	15 MFD. MERSHON COND. 300 V.
43	5 MFD MERSHON COND 300 V.
44	VOICE COIL
45	FIELD 2000Ω ± 5%
46	BALLAST LAMP SOCKET
47	PHONO-MOTOR OUTLET
48	LINE SWITCH
49	PLUG AND 8' CORD BELDEN
50	POWER PRIMARY 82 amp @ 115 V.
51	280 FIL 2 Amp 5 V

Nº	DESCRIPTION
52	HIGH VOLTAGE WINDING
53	245 FILAMENT WINDING
54	224 FILAMENT WINDING
55	RECTIFIER TUBE TYPE 280
56	CENTER TAP 245 FILAMENT
57	JONES PLUG and RECEPTACLE
58	CABLE TERMINAL STRIP
59	18½ CABLE 10 CONDUCTOR
60	.025 PAPER CONDENSER 300 V
61	.1 MFD PAPER CONDENSER 10000 V
62	TONE CONTROL SWITCH
63	.005 BY PASS COND
64	POWER TRANS 4296-A FOR 25 CYCLE

UNITED AIR CLEANER CO.

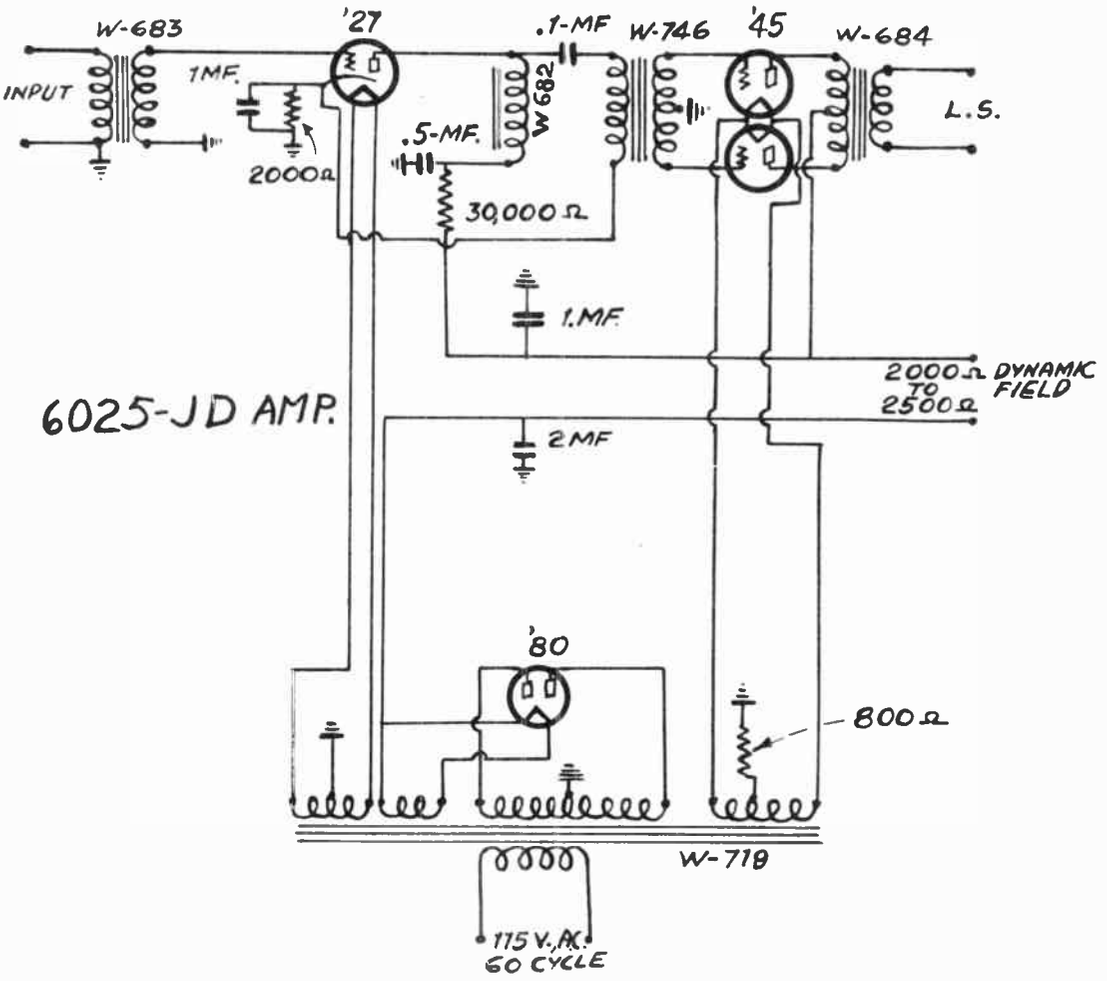


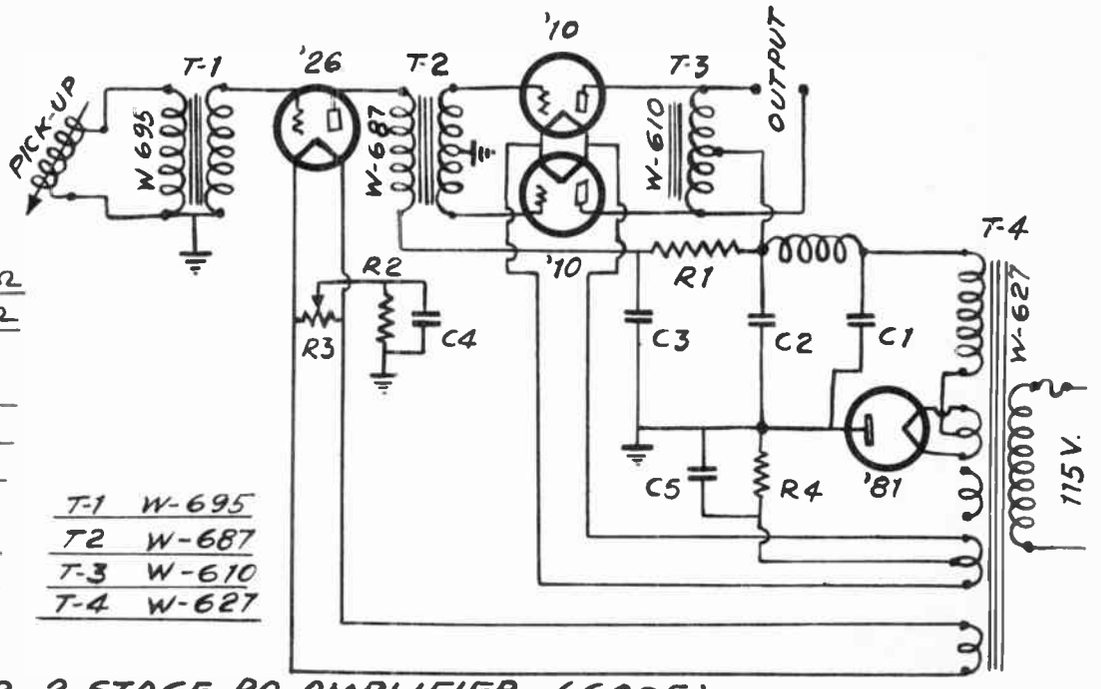




PRIMARY ANTENNA INDUCTANCE 10 TURNS.
PRIMARY 1ST. R.F. 10 TURNS.
PRIMARY 2ND. R.F. 8 TURNS.
VARIOMETER WINDING 75 TURNS.
SECONDARIES ALL 100 TURNS.
VOLUME CONTROL 3,000 OHMS SPECIAL TAPER.

WEBSTER ELECTRIC CO.



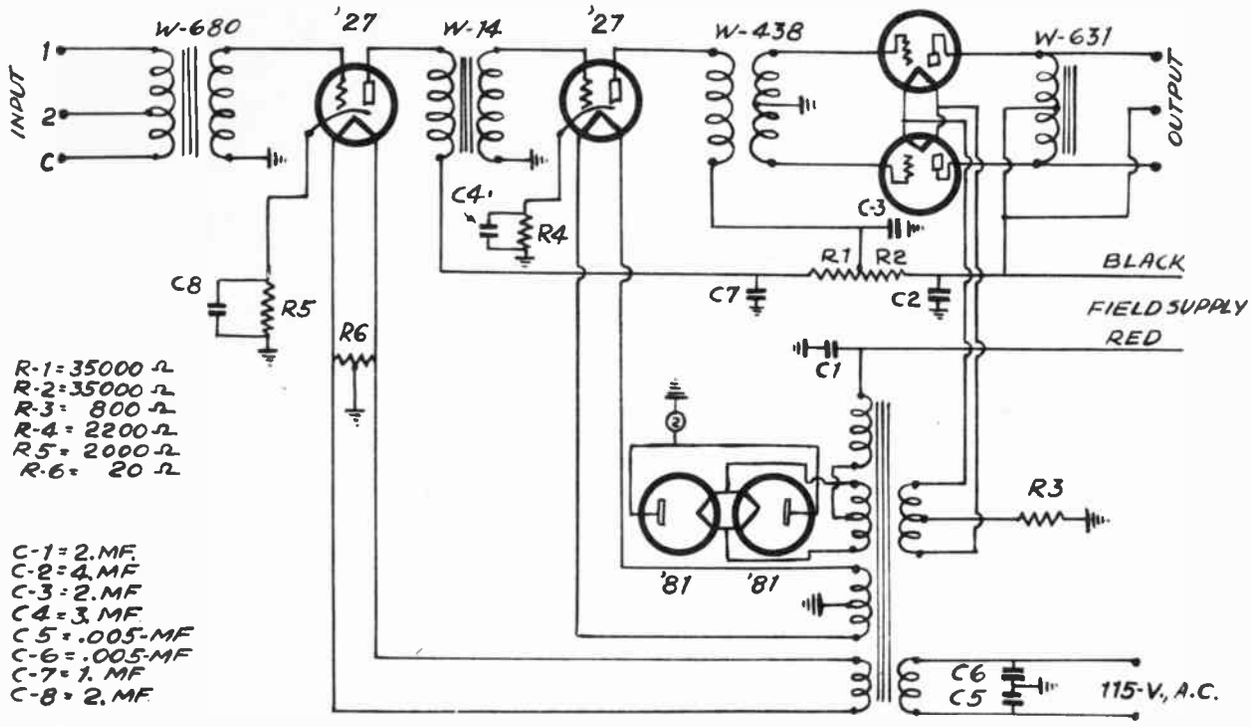


R-1	85000 Ω
R-2	5200 Ω
R-3	10 Ω
R-4	800 Ω
C-1	2. MF.
C-2	4. MF.
C-3	2. MF.
C-4	3. MF.
C-5	1. MF.

T-1	W-695
T-2	W-687
T-3	W-610
T-4	W-627

WEBSTER 2 STAGE P.O AMPLIFIER (6005)

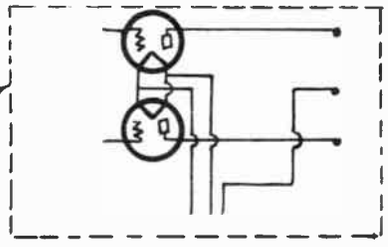
WEBSTER ELECTRIC CO.



R-1 = 35000 Ω
R-2 = 35000 Ω
R-3 = 800 Ω
R-4 = 2200 Ω
R-5 = 2000 Ω
R-6 = 20 Ω

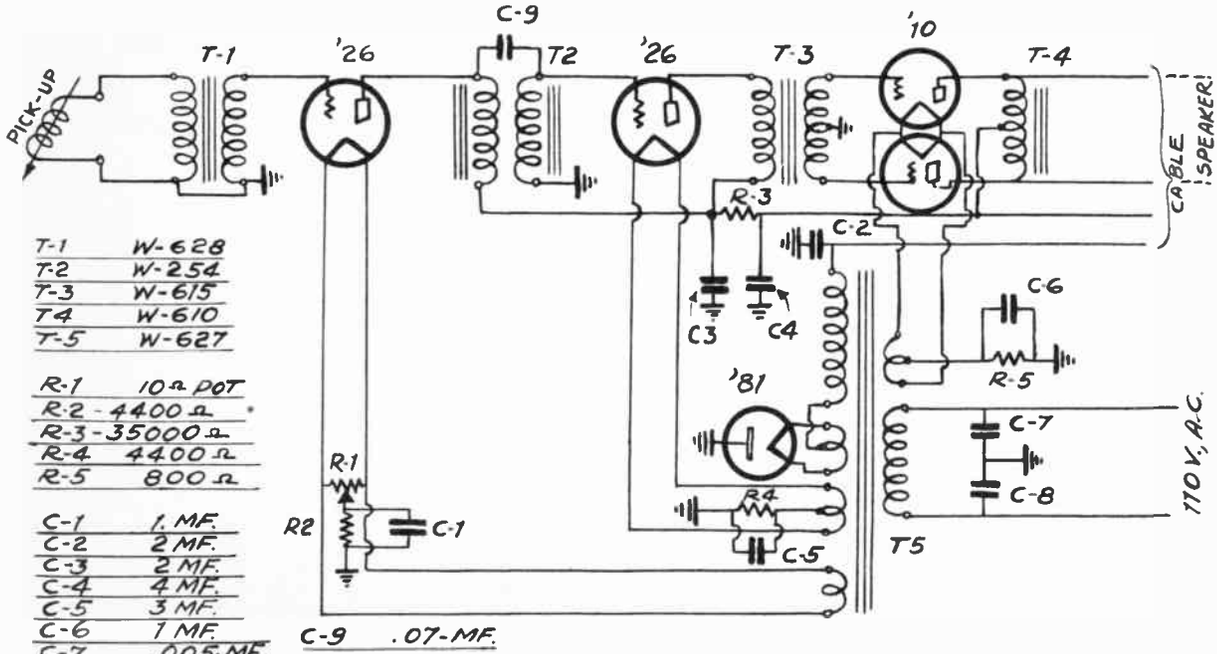
C-1 = 2. MF.
C-2 = 4. MF
C-3 = 2. MF
C-4 = 3. MF
C-5 = .005-MF
C-6 = .005-MF
C-7 = 1. MF
C-8 = 2. MF

L = 3-CP 12-16 VOLT S.C. BULB



DETAIL OF OUTPUT FOR JB&JD MODELS. OUTPUT IMPEDENCE OMITTED (W-631)

6030-JE & B-37-50 AMP.



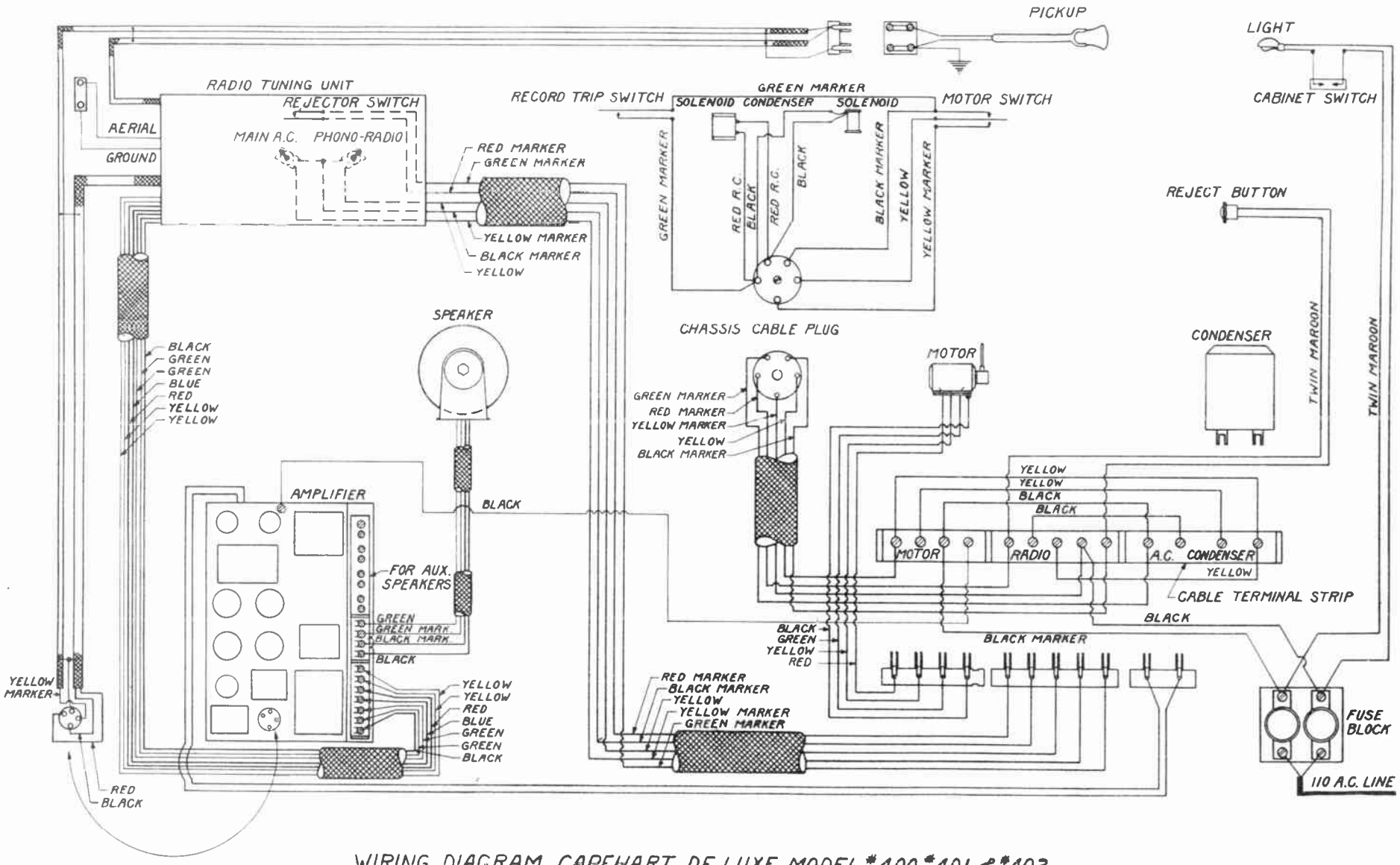
T-1	W-628
T-2	W-254
T-3	W-615
T-4	W-610
T-5	W-627

R-1	10 Ω POT
R-2	4400 Ω
R-3	35000 Ω
R-4	4400 Ω
R-5	800 Ω

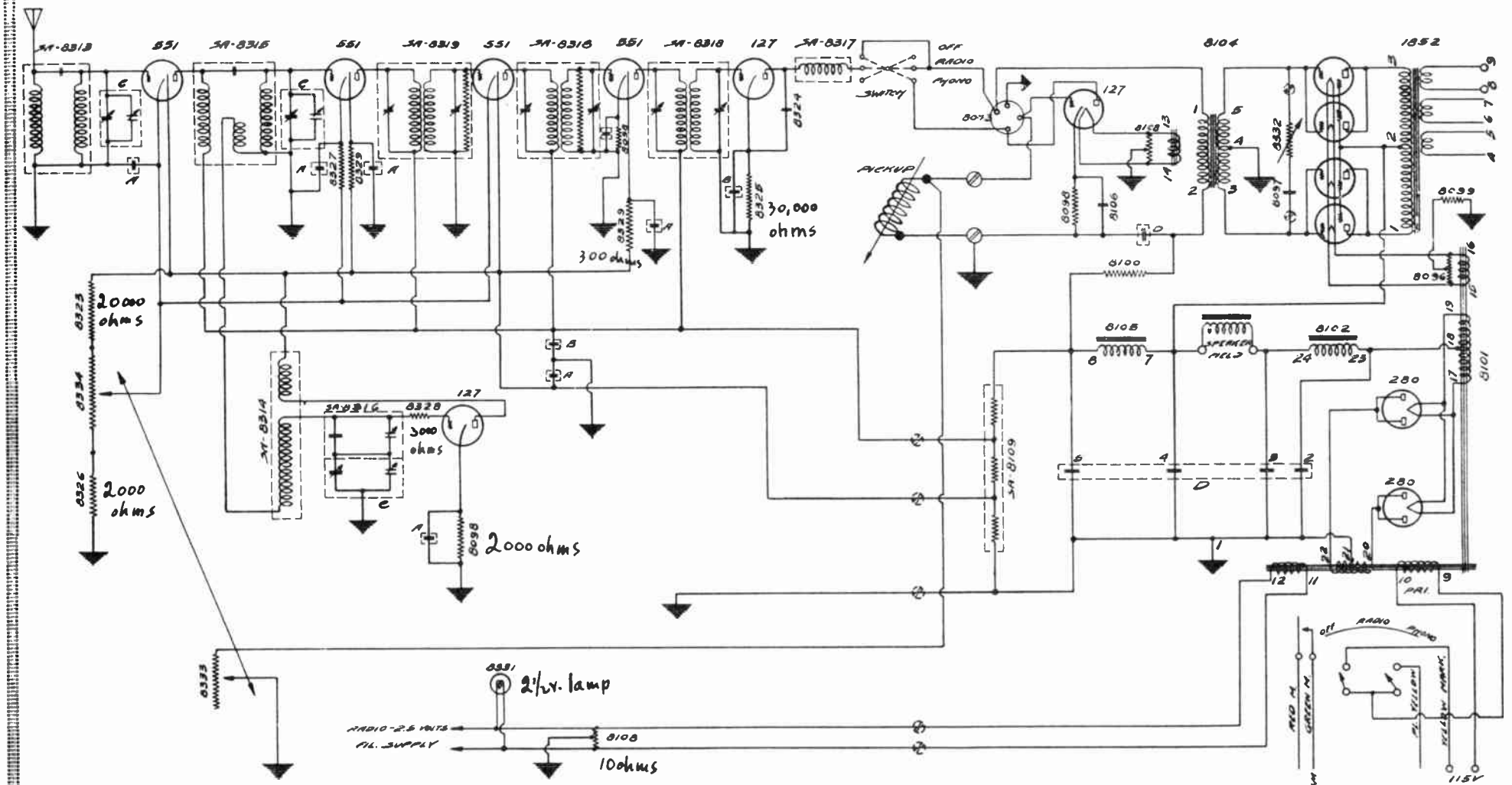
C-1	1. MF.
C-2	2 MF.
C-3	2 MF.
C-4	4 MF.
C-5	3 MF.
C-6	1 MF.
C-7	.005-MF.
C-8	.005-MF.

C-9 .07-MF.

WEBSTER 3 STAGE P.O. AMPLIFIER (6009)



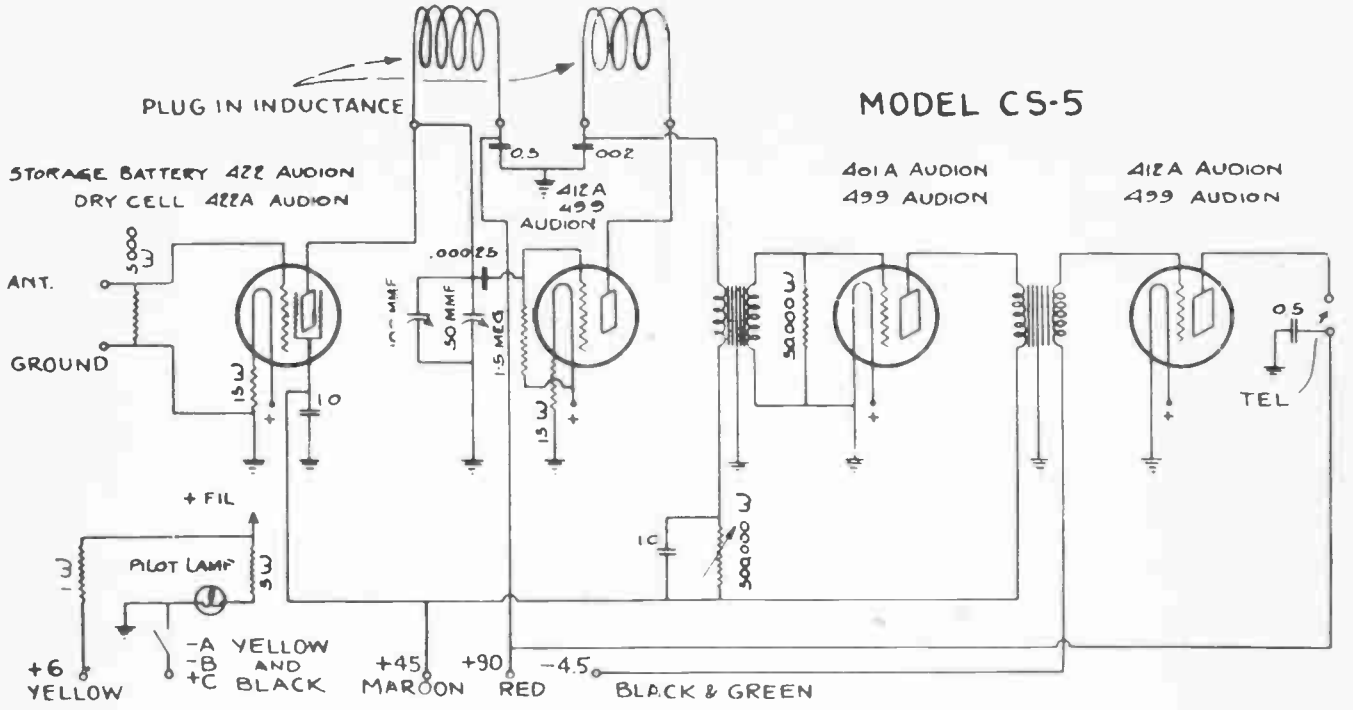
WIRING DIAGRAM CAPEHART DE LUXE MODEL *400-*401 & *402



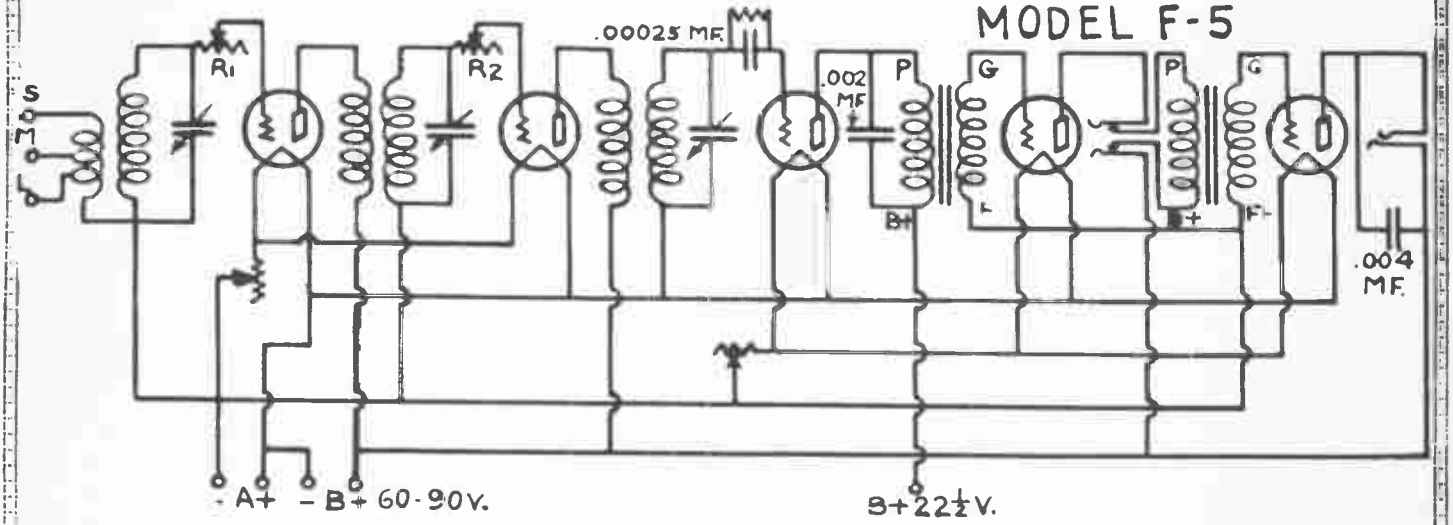
SCHEMATIC - CAPEHART TUNER & AMPLIFIER #400 - #401 - #402

DE FOREST RADIO CO.

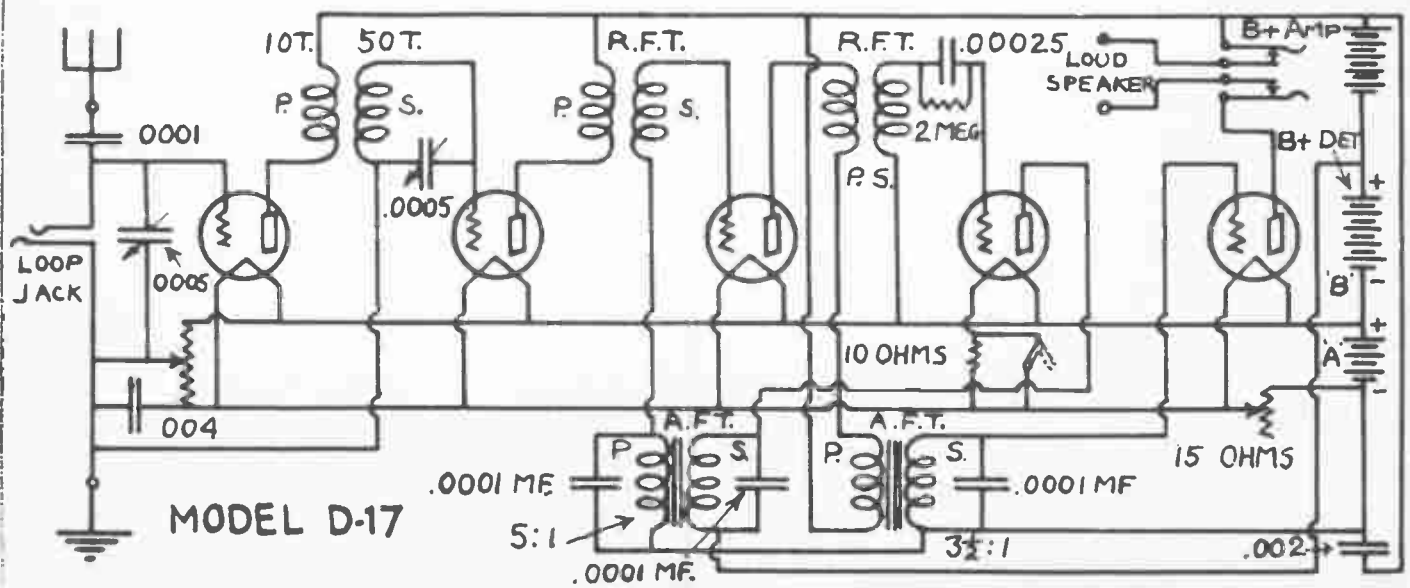
MODEL CS-5



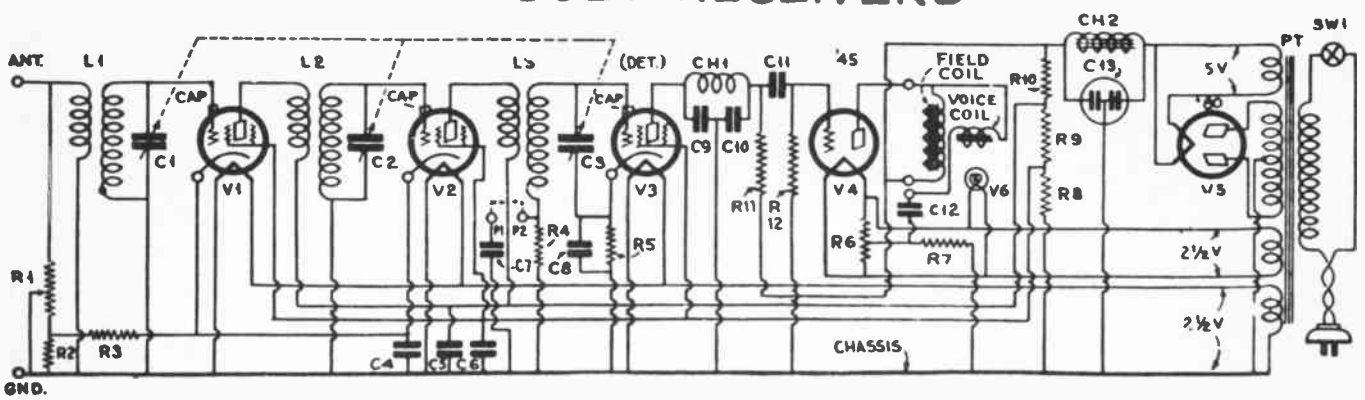
MODEL F-5



MODEL D-17



MIDGET RECEIVERS



Circuit of the Crosley "Model 54—New Buddy." (The pilot lamp shown is used in the similar circuit of the "Model 53.")

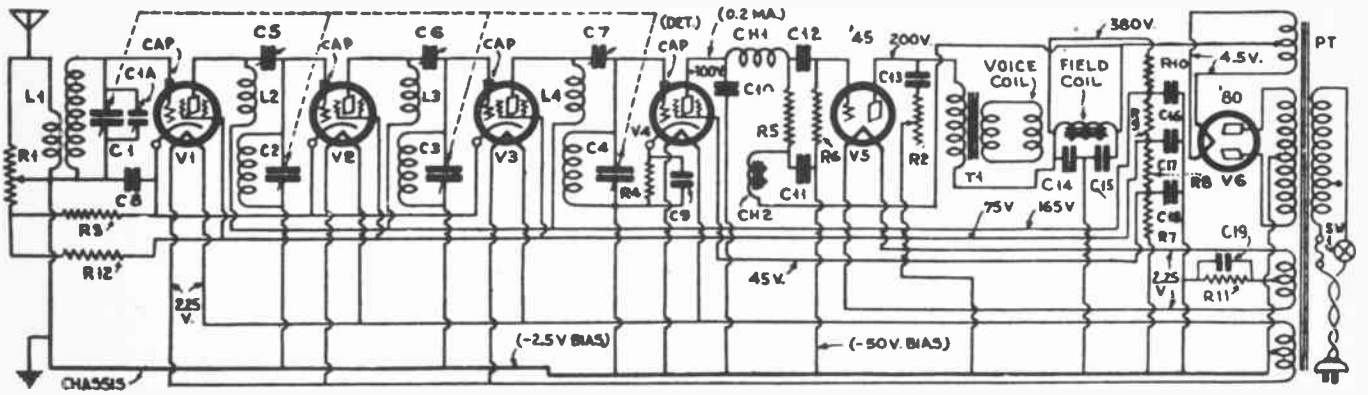
In the Crosley 54 ("New Buddy") a conventional circuit is used, with provision for a phonograph pickup (P1, P2) Resistor R1 is the volume control, and the reproducer (though in the diagram it seems like a dynamic) is a special magnetic unit, with an electromagnetic field replacing the more usual permanent magnets. (This circuit is the diagram of the latest "New Buddy" and hence it varies a little from previous releases dated July, 1930.)

As a matter of reference, the following values are given for the components:

Type '24 tubes are used at V1, V2, V3, and a type '45 tube for the power amplifier V4; V5 is an '80. Resistor R1 is a 25,000-ohm potentiometer; R2, 20,000 ohms; R3, 440 ohms; R4, 1 megohm; R5, 10,000 ohms; R6, 25 ohms on each side of the center tap; R7, 1650 ohms; R8, R9, R10, 10,000 ohms; R11, 150,000 ohms; R12, 1 megohm.

The condenser capacities are as follows: C4, C6, C7, C11, 0.1-mf., C5, C8, C12, 0.5-mf.; C9, C10, .00025-mf., C13, a "twin-8" electrolytic condenser.

(The pilot light, V6, is not used in the "Model 54" set.) The R.F. choke Ch1 and the condensers C9, C10, form a carefully-designed R.F. filter system. The receiver is illustrated at the upper right on page 274.

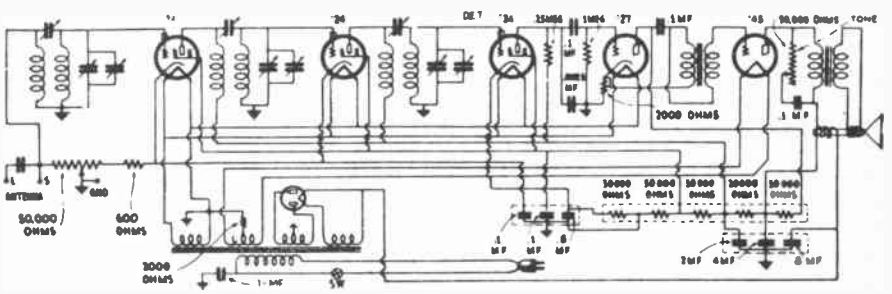


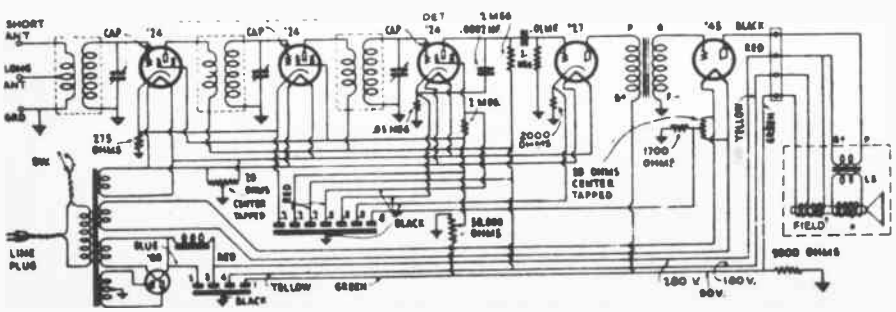
The schematic circuit of the Jackson-Bell "Model 62" The large filter capacities are provided by dry electrolytic condensers.

Following are the values used in this set: Volume-control resistor R1, 3,000 ohms; R2, 10,000 ohms; R3, 250 ohms; R4, 30,000 ohms; R5, 0.5-megohms; R6, 2 megohms; R7, R8, R9, 10,000 ohms; R10, 5,000 ohms; R11, 2,200 ohms: R12, 30,000 ohms.

Condensers C5, C6, C7, 7 mmf.: C8, C16, C17, C18, 0.1-mf.; C9, C19, 1.0 mf.; C10, .00025-mf.; C11, 8 mf.; C12, .02-mf.; C13, .25-mf.; C14, 2 mf.: C15, 4 mf.

Remler Division,
Gray & Danielson Mfg. Co.
CAMEO MODEL 14

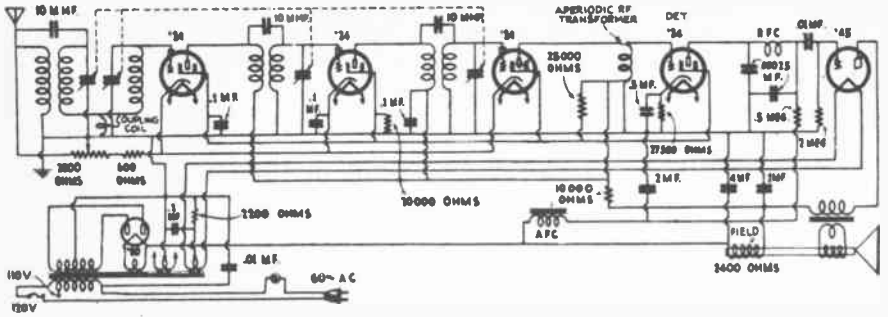




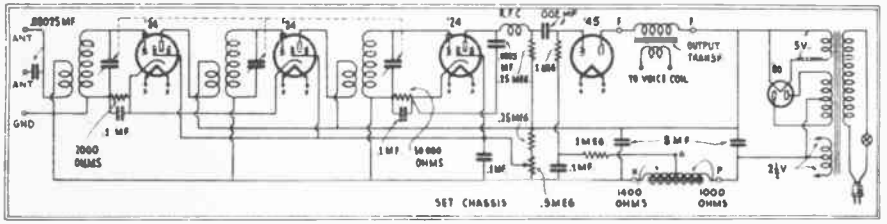
Pilot Radio & Tube Corp.

"PILOT MIDGET"

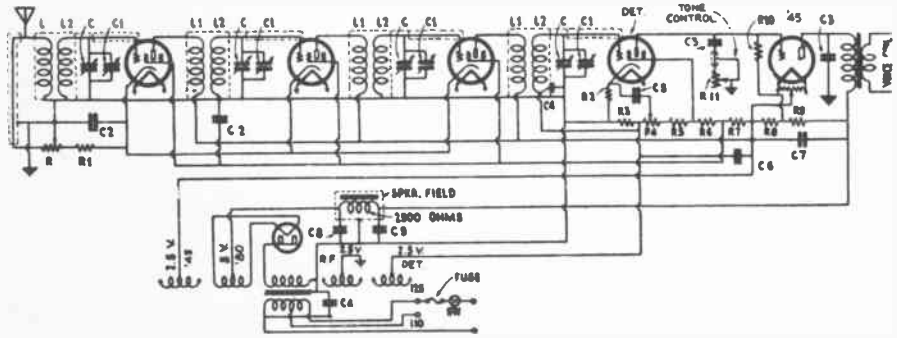
Keller-Fuller Mfg. Co. Ltd.
RADIETTE MODEL 14F



Federated Purchaser
MELORAD "CATHEDRAL TONE"



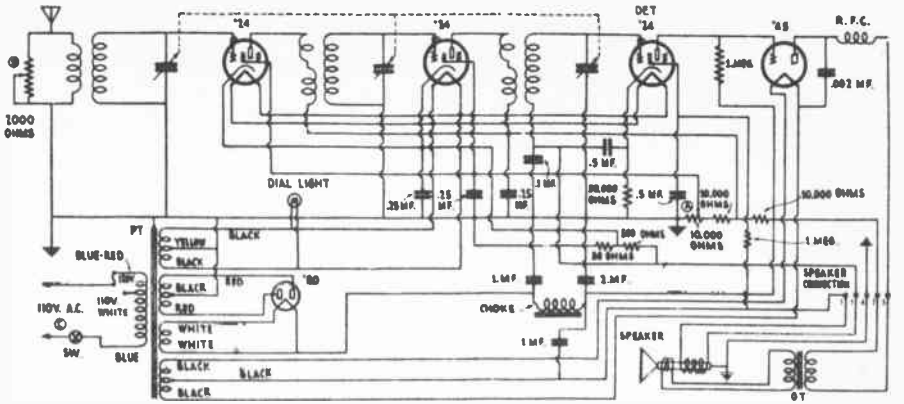
Master Radio Mfg. Co. Ltd.
MASTER MODEL 424



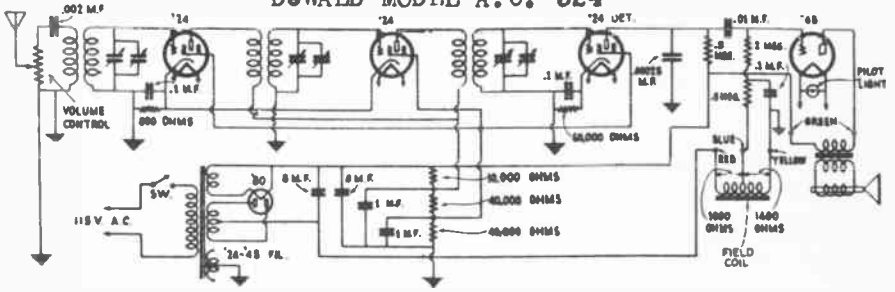
The technical details are as follows: R (volume control), 6,050 ohms; R1, 500; R2, R8, 50,000; R3, 425; R4 (hum control) 200; R5, 1584; R6, 1,800; R7, 2515; R9, 100,000; R10, R11, 500,000 (tone selector). The voltage divider comprises R3, R5, R6, R7.

The condensers have the following values: C, 350 mmf.; (C1, trimmer condenser); C2, C4, 0.1-mf.; C3, .002-mf.; C5, 0.5-mf.; C6, C7, 1.0 mf. (600 V.); C8, C9, 2 mf. (1,000 V.); Condensers C4, C5, C6, C7, C8, C9 are in filter bank. In some cases it is necessary to use .004-mf. for C3, to overcome feedback from the R.F. stages.

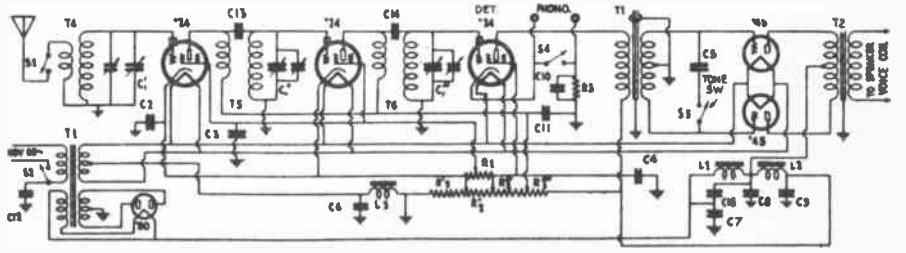
Jesse French & Sons Piano Co.
JUNIOR MODEL "G"



Pierce-Airo, Inc.
DeWALD MODEL A.C. 524



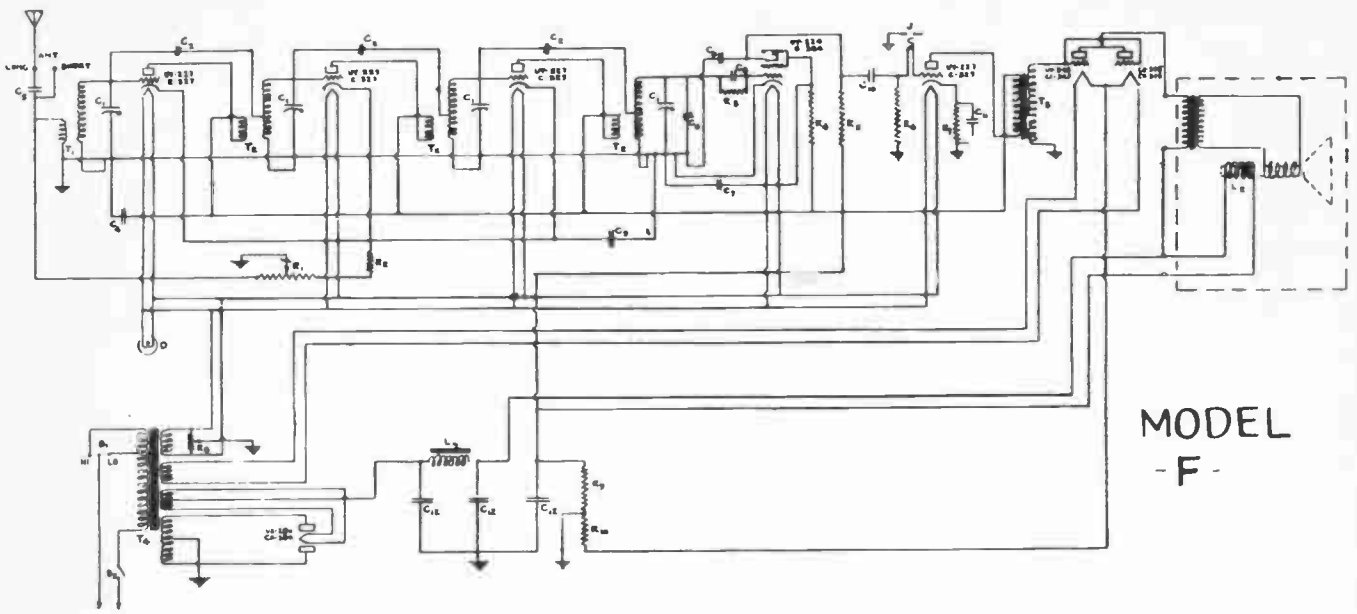
Transformer Corp. of America
CLARION JR. MODEL 60



Following are the values of the components: tuning condensers C1, 420 mmf.; C2, C12, 0.1-mf.; C3, C15, 0.24-mf.; C4, C9, 0.5-mf.; C5 (tone control), .0005-mf.; C6, C10, 1.0 mf.; C7, C9, 1.5 mf.; C11, 0.4-mf.; C13, C14, 12 mmf.

The resistors have the following values: R1 (volume control), 25,000 ohms; R2-1, 167; R2-2, 13,400; R2-3, 8,200; R2-4, 4,600; R3, 40,000.

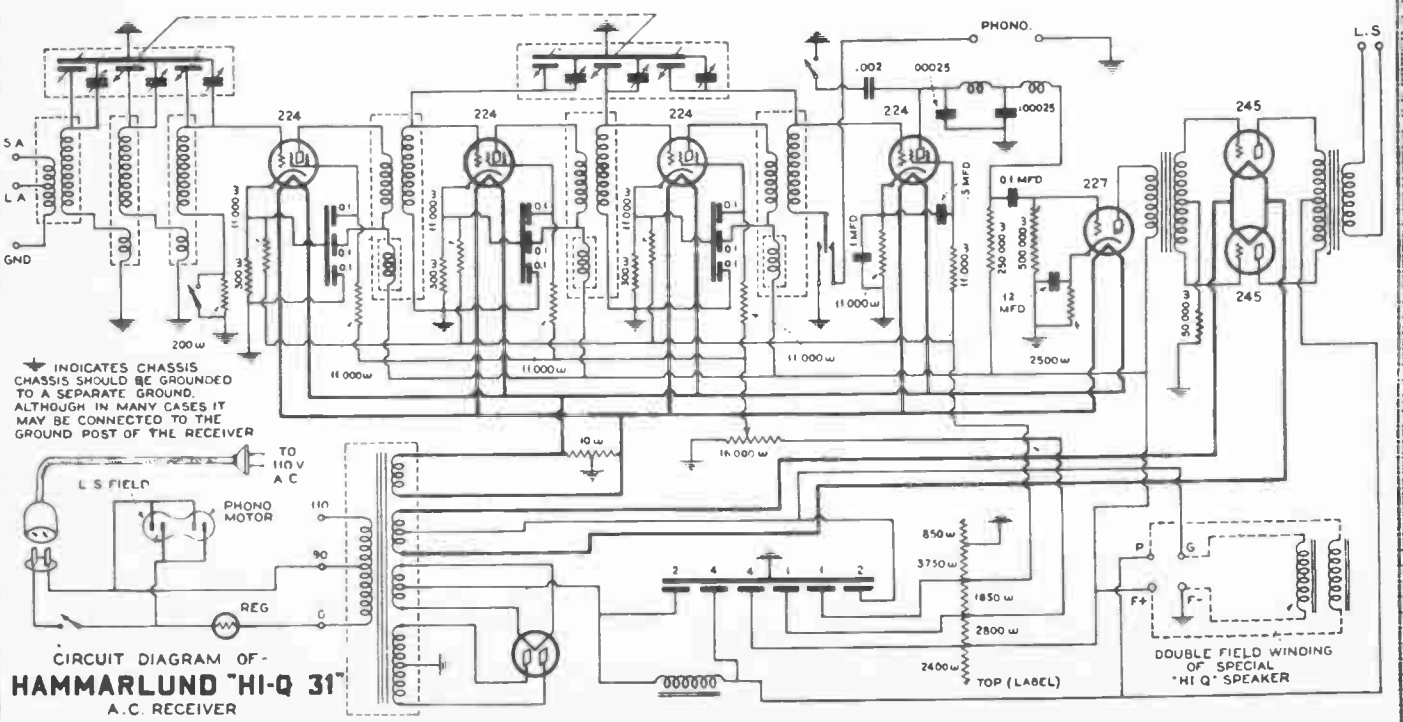
EMERSON RADIO & PHONOGRAPH CORP.



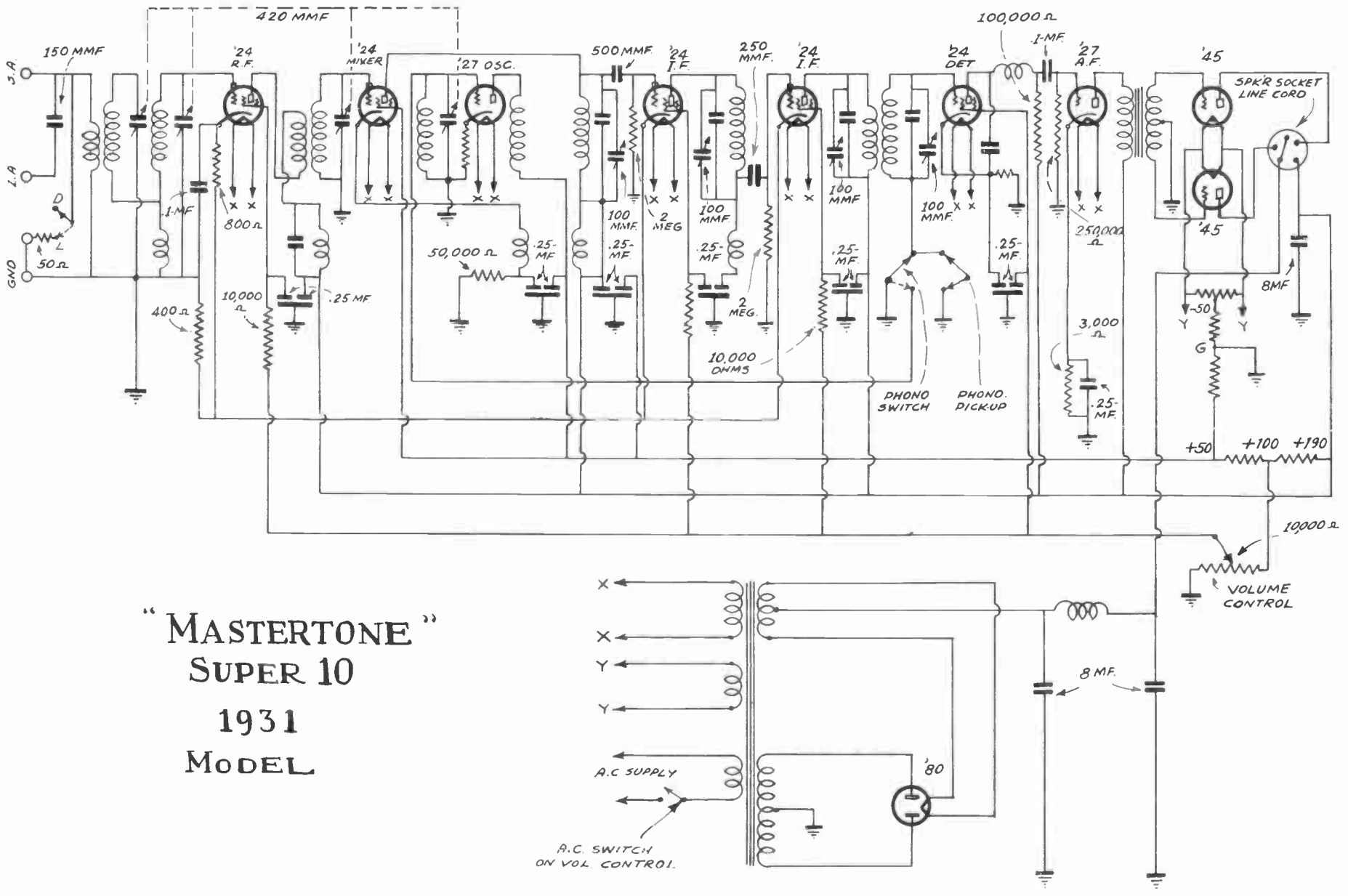
MODEL
-F-

C_1 Tuning Condenser.
C_2 Neutralizing Condenser.
C_3 R.F. Grid Bias Condenser .25 MF.
C_4 R.F. Plate By-Pass Condenser .25 MF.
C_5 Antenna Condenser .00025 MF.
C_6 Det. Padding Condenser.
C_7 Det. Screen Grid Bias Condenser .25 MF.
C_8 Det. Control Grid Condenser .0001 MF.
C_9 Det. Plate Condenser .0005 MF.
C_{10} 1st Audio Coupling Condenser 0.1 MF.
C_{11} 1st Audio Grid Condenser 0.5 MF.
C_{12} Filter Condensers 8.0 MF Each.
L_1 Filter Choke.
L_2 Speaker Field 2500 Ohms.
J Phonograph Jack.
D Dial Lamp.
R_1 Volume Control 15,000 Ohms.
R_2 R.F. Grid Bias Resistance 620 Ohms.
R_3 Det. Control Grid Resistance .5 Megohm.
R_4 Det. Screen Grid Resistance .5 Megohm.
R_5 1st Audio Coupling Resistance .1 Megohm.
R_6 1st Audio Grid Resistance .5 Megohm.
R_7 1st Audio Grid Bias Resistance 1750 Ohms.
R_8 Hum Control 20 Ohms.
R_9 Loss Current Resistance 4500 Ohms.
R_{10} 245 Grid Bias Resistance 650 Ohms.
T_1 Antenna Transformer.
T_2 R.F. Inter stage Transformer.
T_3 Input Audio Transformer.
T_4 Power Transformer.
B_1 Hi-Lo S.P.D.T. Toggle Switch.
B_2 S.P.S.T. Toggle Switch.

HAMMARLUND MFG. CO.

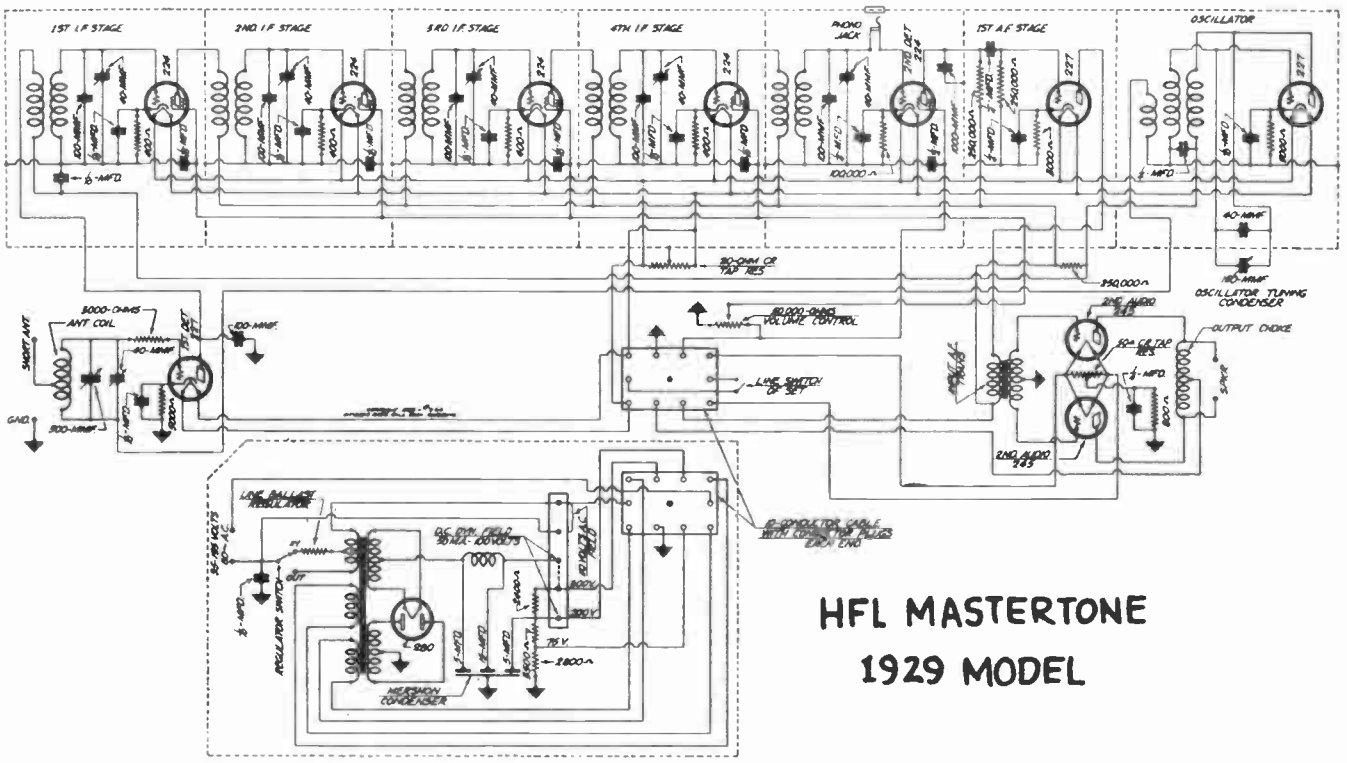


CIRCUIT DIAGRAM OF-
HAMMARLUND "HI-Q 31"
A.C. RECEIVER

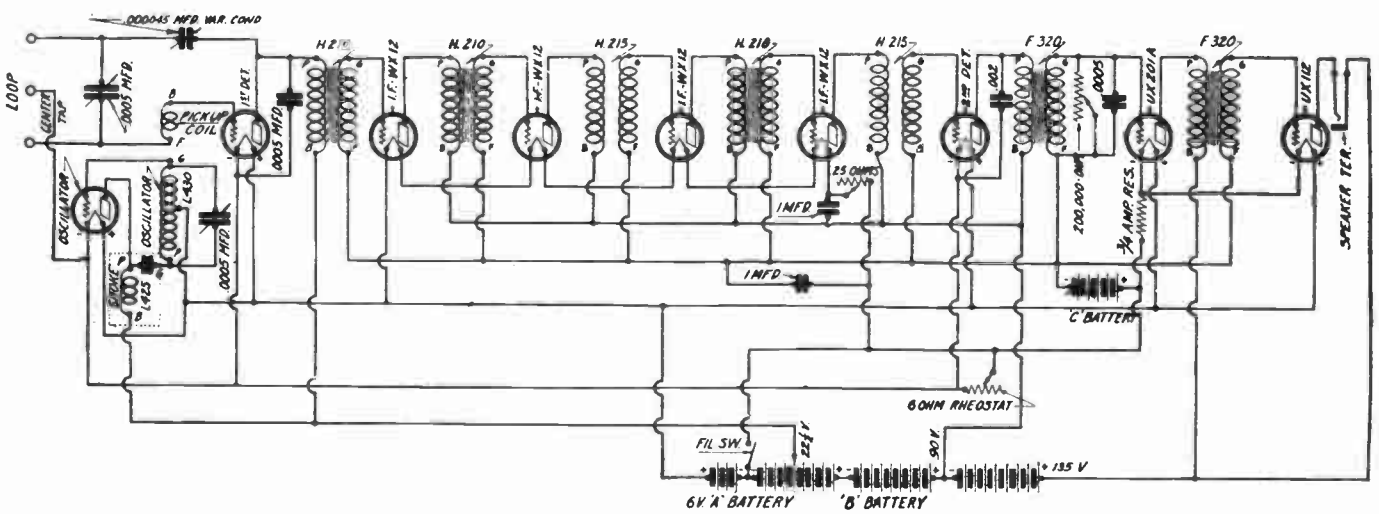


"MASTERTONE"
SUPER 10
1931
MODEL

HIGH FREQUENCY LABORATORIES

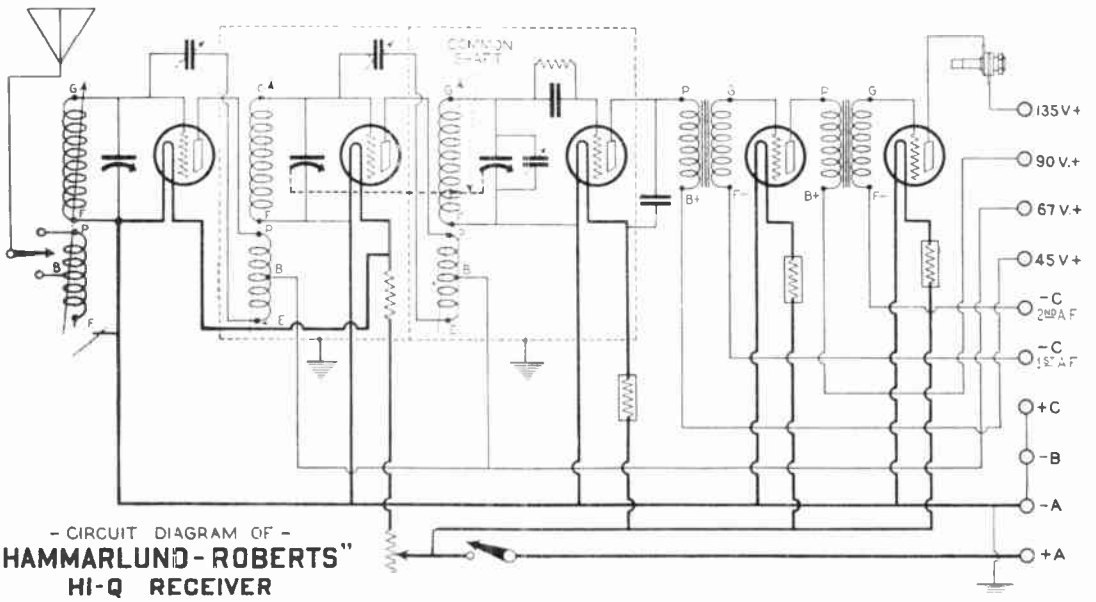


HFL MASTERTONE
1929 MODEL

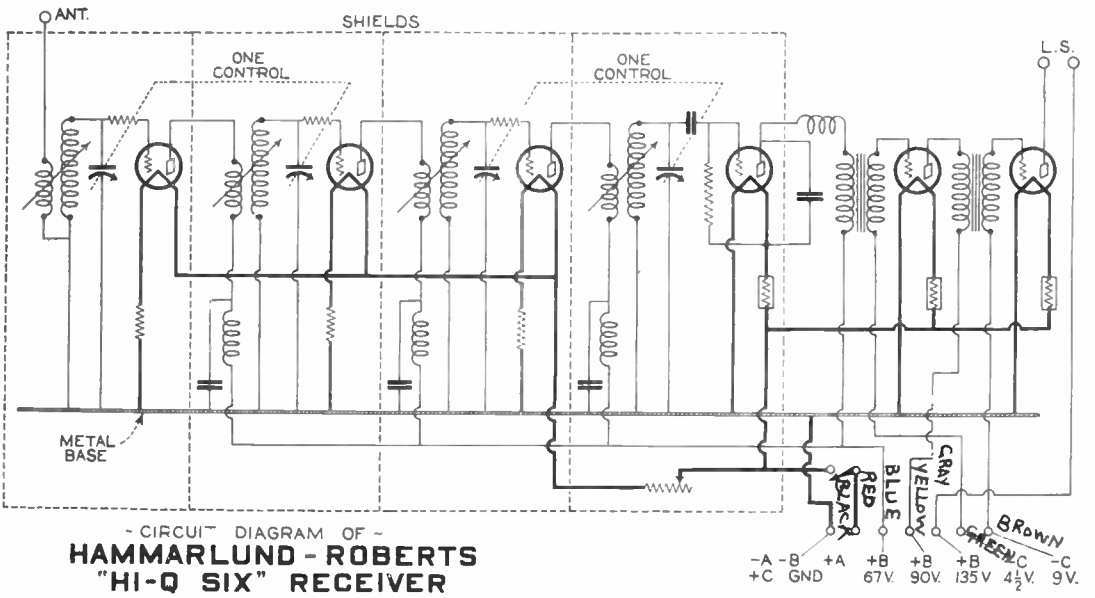


Nine-in-Line Superheterodyne circuit. A common "C" battery of 4.5 to 6 volts is used for all grid returns. It will be noted that this "C" battery will provide the necessary bias also for the second detector tube, so that rectification will be accomplished on the negative side of the static characteristic curve of this tube.

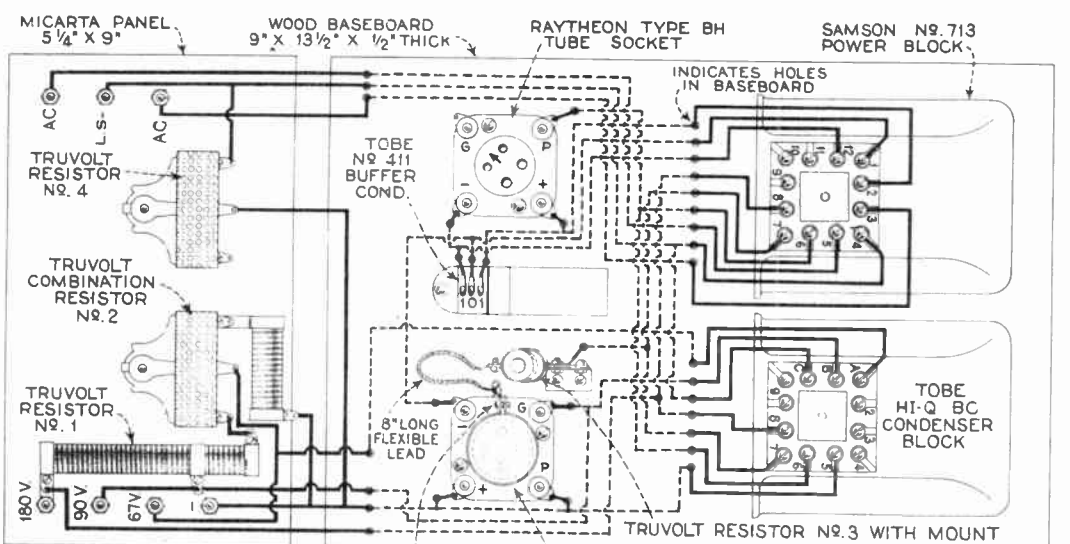
HAMMARLUND MFG. CO.



- CIRCUIT DIAGRAM OF -
"HAMMARLUND-ROBERTS"
HI-Q RECEIVER



- CIRCUIT DIAGRAM OF -
HAMMARLUND-ROBERTS
"HI-Q SIX" RECEIVER



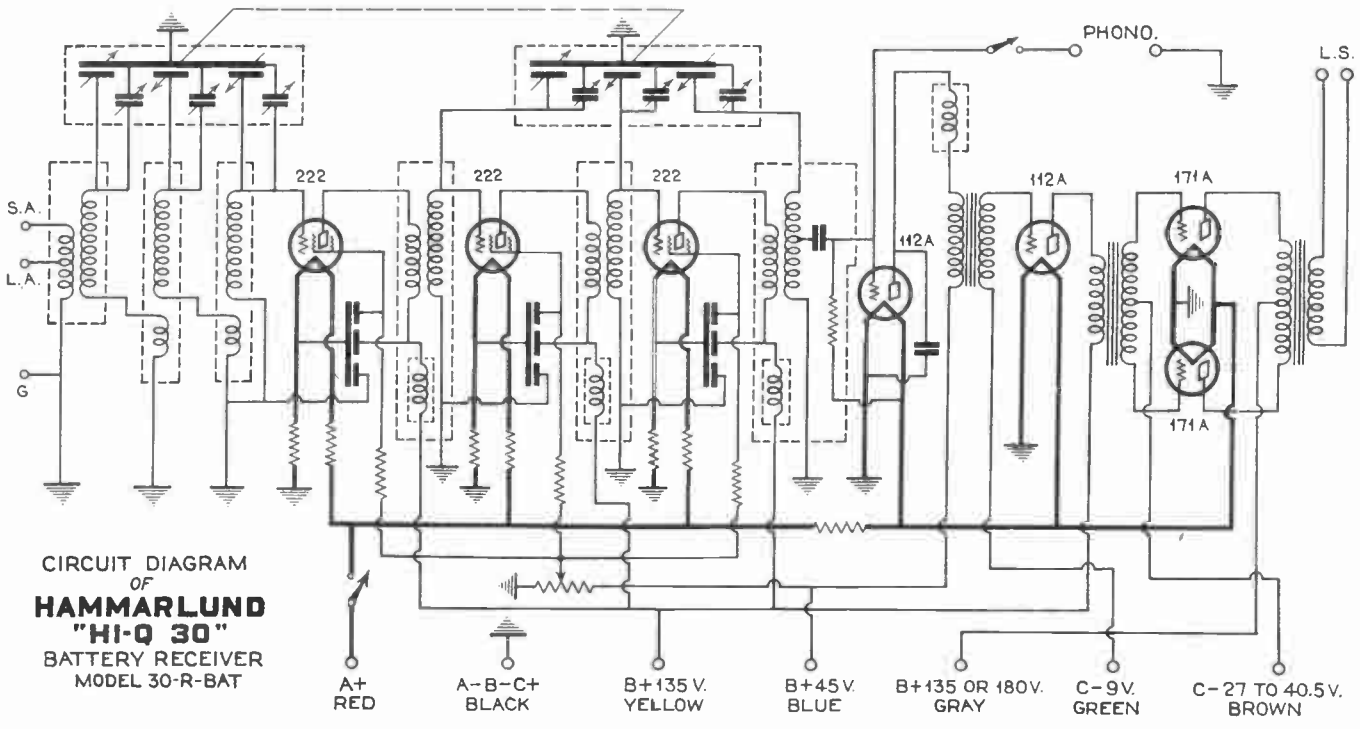
WIRING DIAGRAM OF -
HAMMARLUND ROBERTS "HI-Q SIX" POWER SUPPLY
- FOR USE WITH 171 POWER TUBE -

FAHNESTOCK TYPE R CONNECTING CLAMP

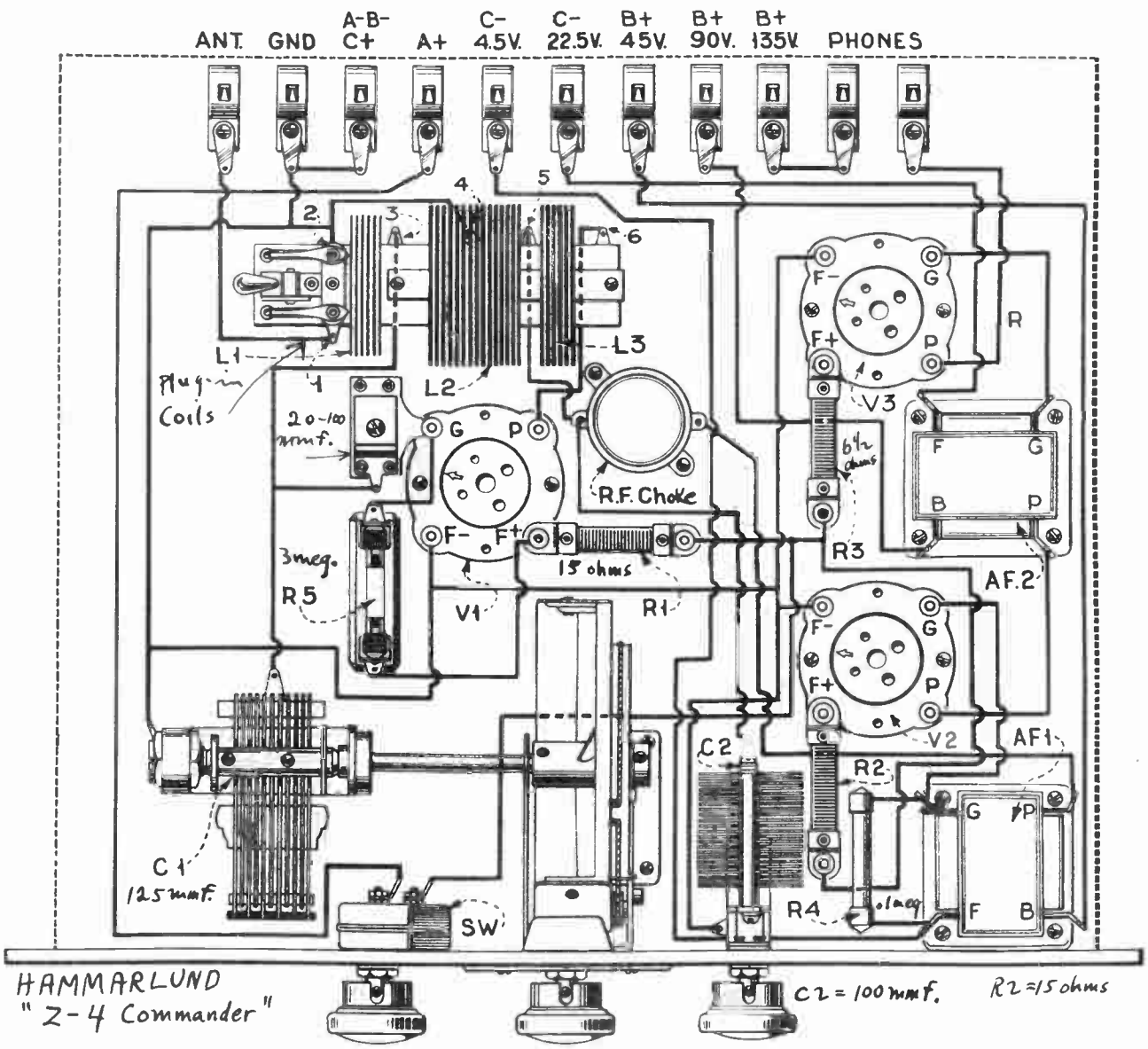
RAYTHEON TYPE R REGULATOR TUBE SOCKET

HEAVY BLACK LINES INDICATE CONNECTIONS TO BE MADE ABOVE BASEBOARD. DOTTED LINES SHOW CONNECTIONS TO BE MADE UNDER BASEBOARD

HAMMARLUND MFG. CO.



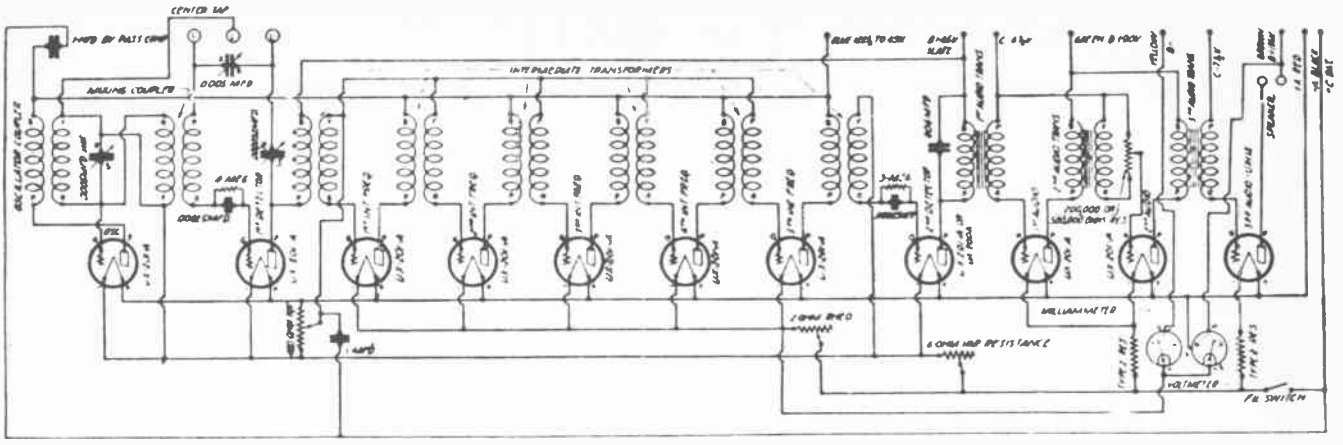
CIRCUIT DIAGRAM
OF
HAMMARLUND
"HI-Q 30"
BATTERY RECEIVER
MODEL 30-R-BAT



HAMMARLUND
"2-4 Commander"

C2 = 100 mmf. R2 = 15 ohms

ROBERTSON-DAVIS CO.

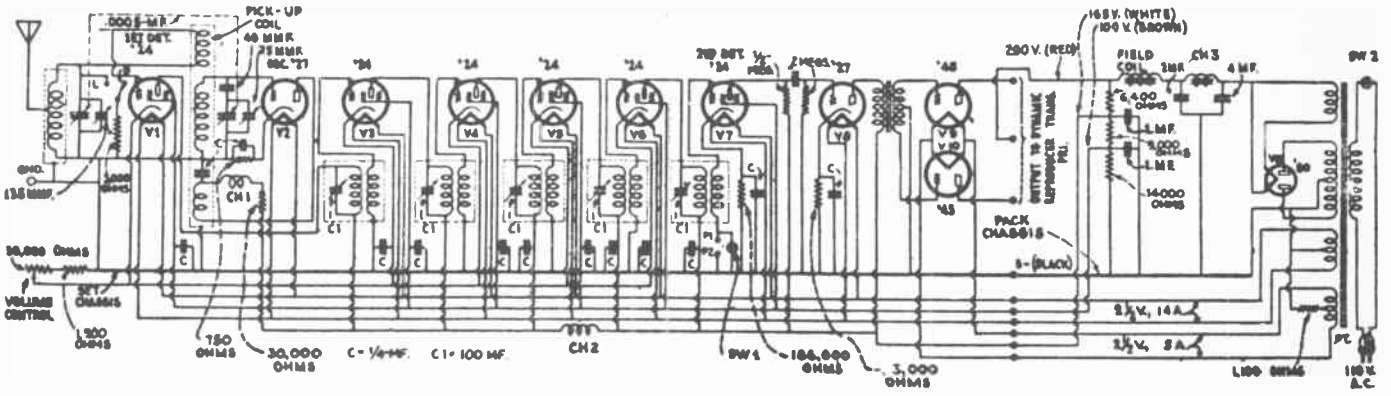


MELO-HEALD 11-TUBE SUPER-HETERODYNE

LIST OF PARTS

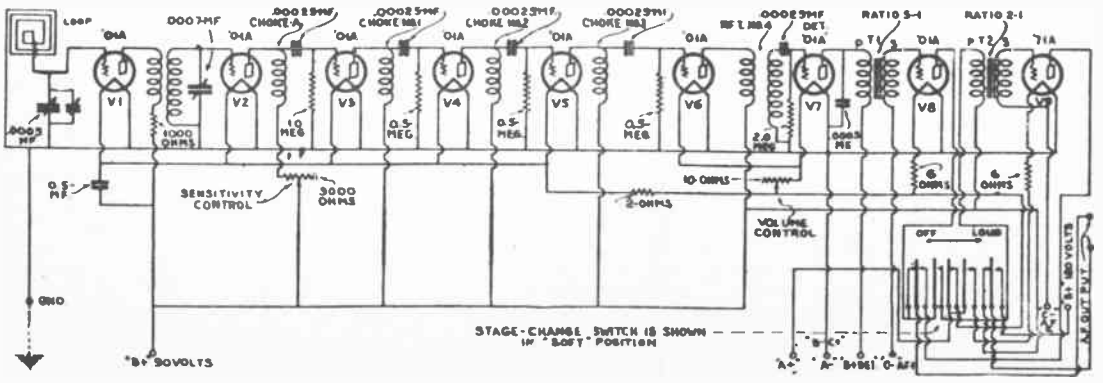
1—160 Oscillating Robertson-Davis Certified Melocoupler.
1—129 Mixing Robertson-Davis Certified Melocoupler.
6—135 Long Wave Robertson-Davis Certified Melocouplers.
3—Multistage Robertson-Davis Certified Meloformers.
11—Na-Ald UX Cushion Sockets.
2—Dubilier 601G .00025 MF Condensers.
1—Dubilier 601 .006 MF Condenser.
2—Dubilier 907 1 MF Condensers.
1—Dubilier 3 Meg. Grid Leak.
1—Dubilier 4 Meg. Grid Leak.
6—Eby Binding Posts.
1—Yaxley 400 Ohm Potentiometer.
1—Yaxley No. 10 Filament Switch.
1—Yaxley 2-Ohm Rheostat.
1—Yaxley 6-Ohm Fixed Variable Resistance.
1—Yaxley 060 Cable Connector.
2—Hammarlund .0005 MF Midline Variable Condensers.
1—Hammarlund .000032 MF MC9 Midget Condenser.
1—Jewell 135 0-100 Milliameter.
1—Jewell 135B Double Scale Voltmeter.
2—Elkay Type 2 Equalizers.
1—Frost No. 882 200,000 Ohm Variable Resistance.
10—UX 201A Radiotrons.
1—UX 112 or UX 171 Radiotron.
1—Lignole 7x28 Drilled and Engraved Panel.
1—10x27-Inch Baseboard.
3—Formica Terminal Strips.
2—Kurz-Kasch No. 592 Walnut Dials.
50—Feet Belden No. 12 Wire.
100—Kellogg Soldering Lugs.
1—Package Kester Solder.

LINCOLN RADIO CORP.



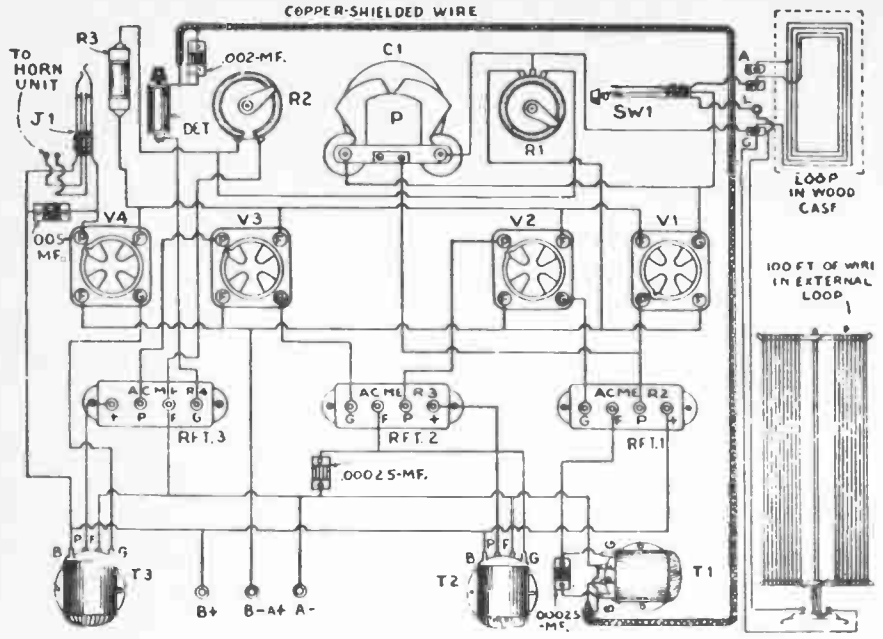
The heart of every superheterodyne is its intermediate amplifier. The "Model 31" has four screen-grid I.F. stages, with plate windings tuned by the 100-mmf. midget condensers C1. The bypass condensers C are 0.25 mf. P1-P2 are phonograph pickup jacks; and L-D the "local-distance" switch.

PRIESS RADIO CO.



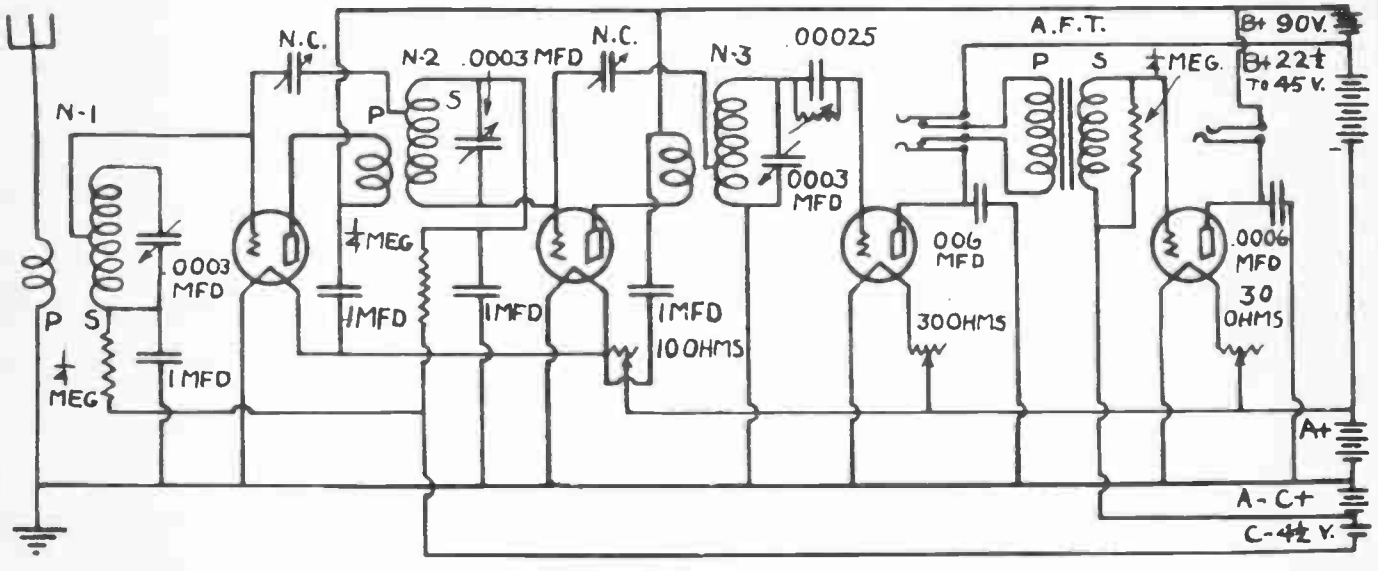
The circuit at the left is that of the Priess "Nine-in-Line," one of the most powerful and efficient receivers of its day. This is the "Model R"; the "Model C" added another tuning circuit, to increase selectivity in congested district. Many inquiries for this circuit have been received; but it has only now become available. In some receivers, slightly different connections to the audio-stage switch will be found.

TELEPHONE MAINTENANCE CO.

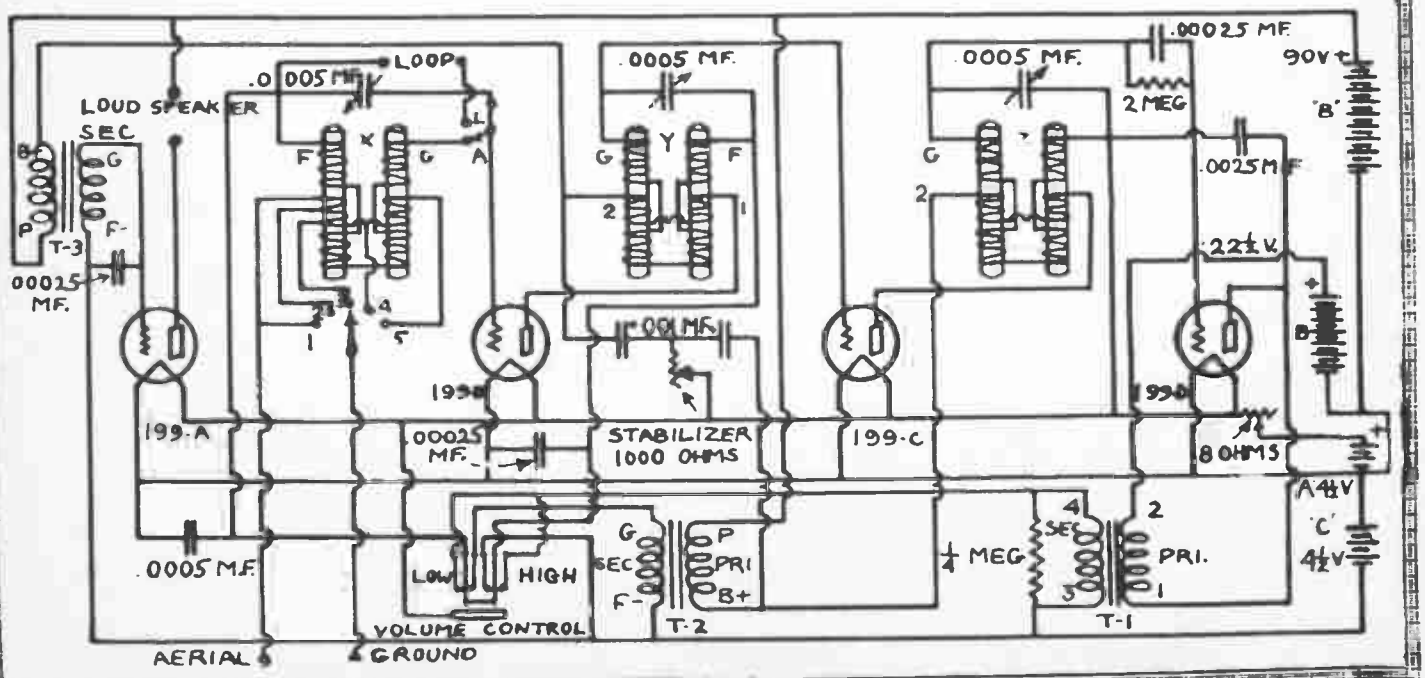


The "Telmaco P-1" portable receiver, with optional loop and aerial and ground connections. The set, with its reflex circuit, gives three R.F. and three A.F. stages with four V'99 tubes. The battery consumption is very slight.

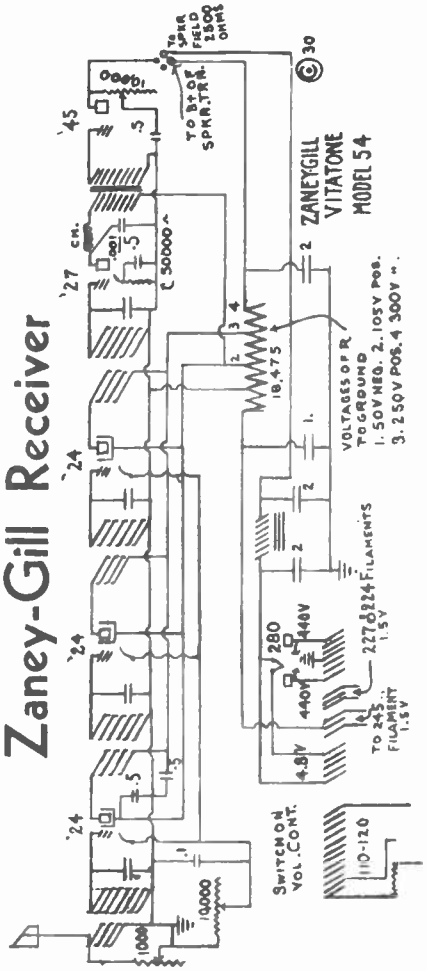
- GAROD - NEUTRODYNE

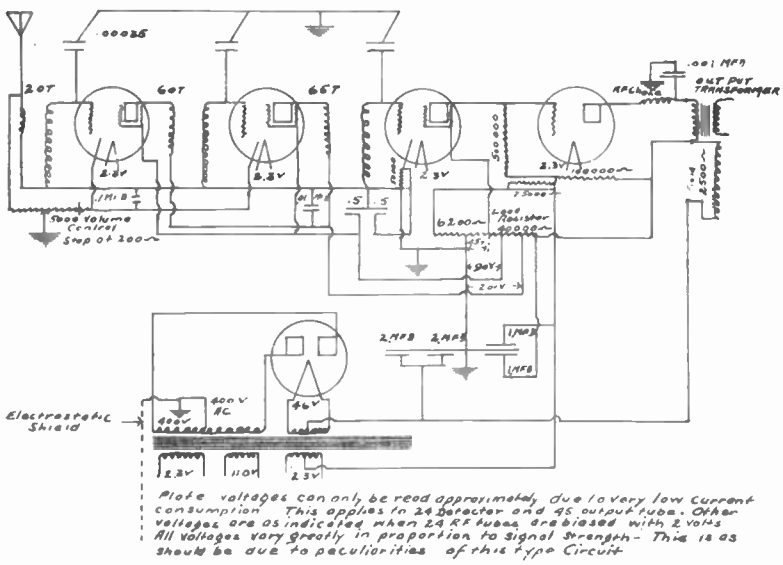


GRIMES 4-DL INVERSE DUPLEX

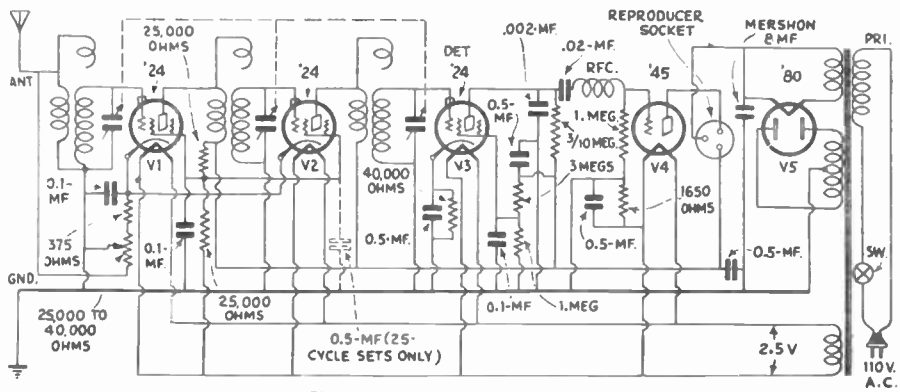


Zaney-Gill Receiver

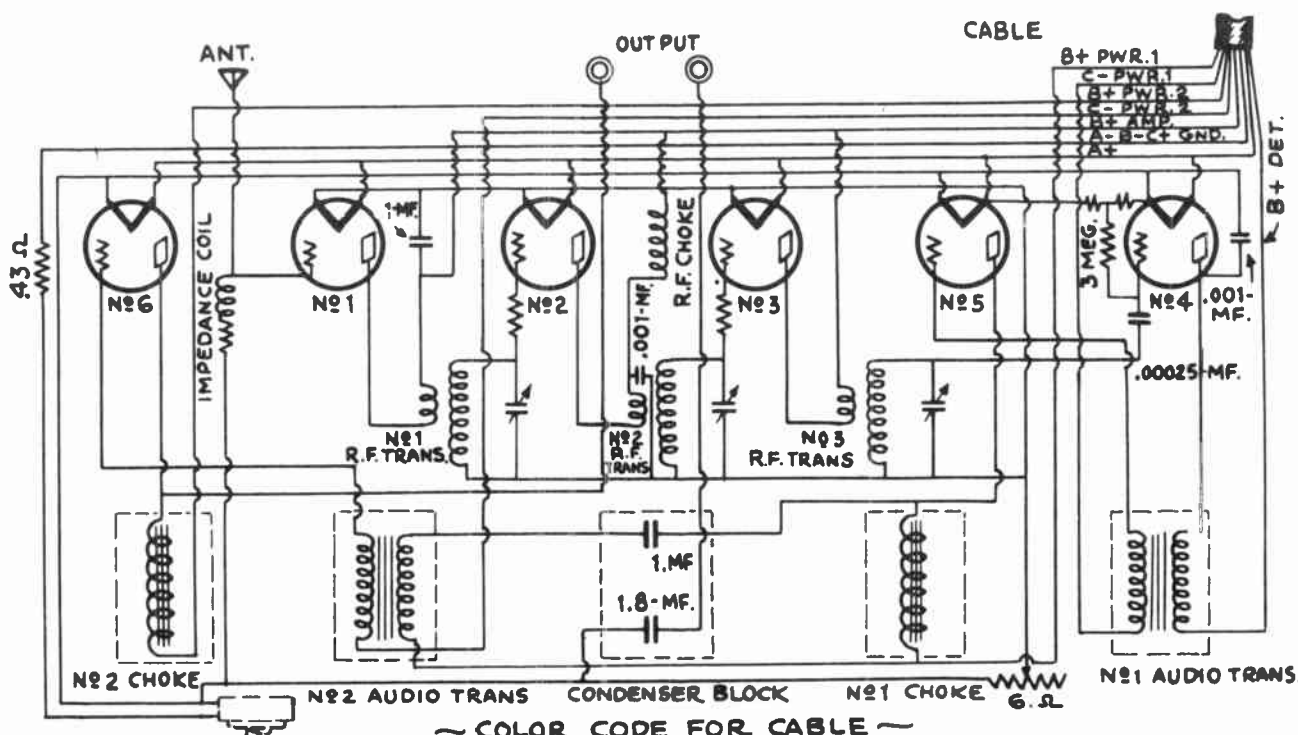




This is the circuit used for the famous Mission Bell chassis which has been used in some of the best known midget sets. It was used exclusively in the Royale until recently, and is still being offered by many distributors under different "brand" names.



Circuit of the Crosley "Model 48" or "Wiait"



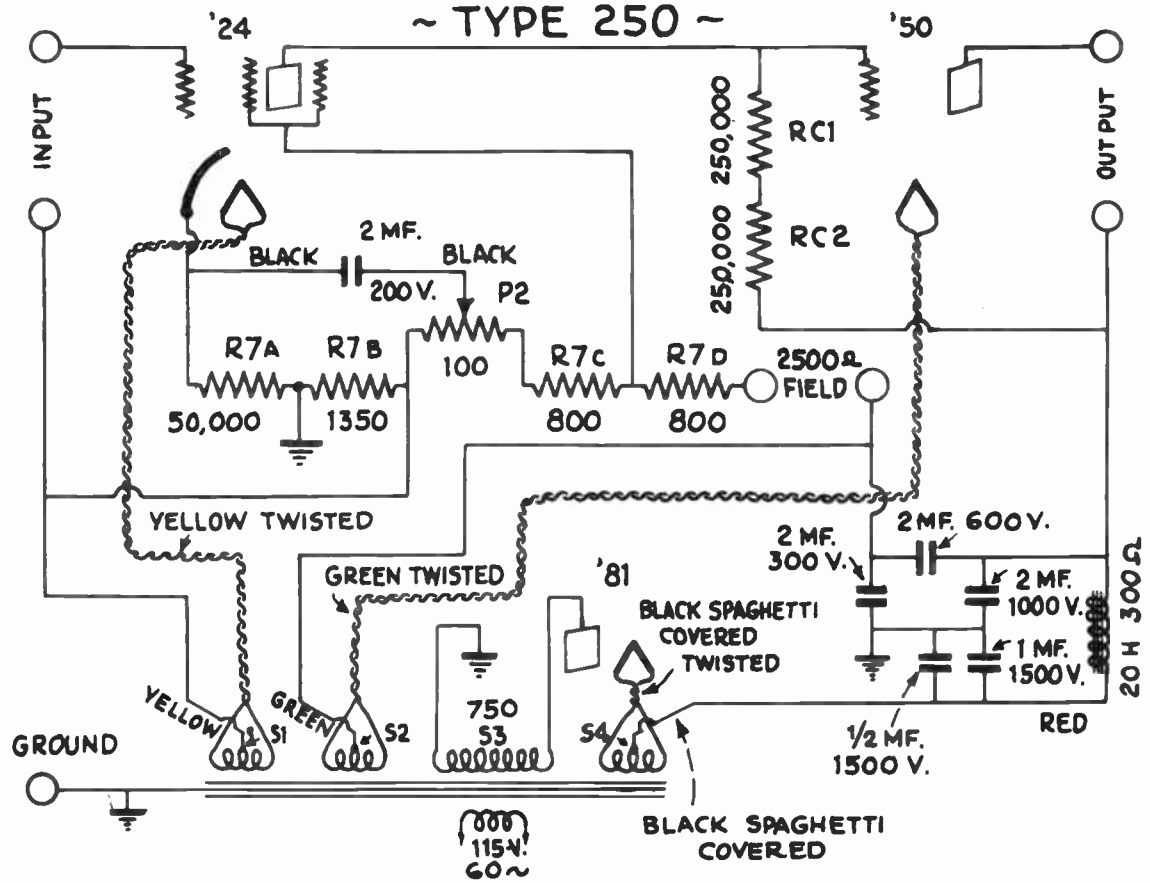
"DAY-FAN" MODEL-5055

~ COLOR CODE FOR CABLE ~

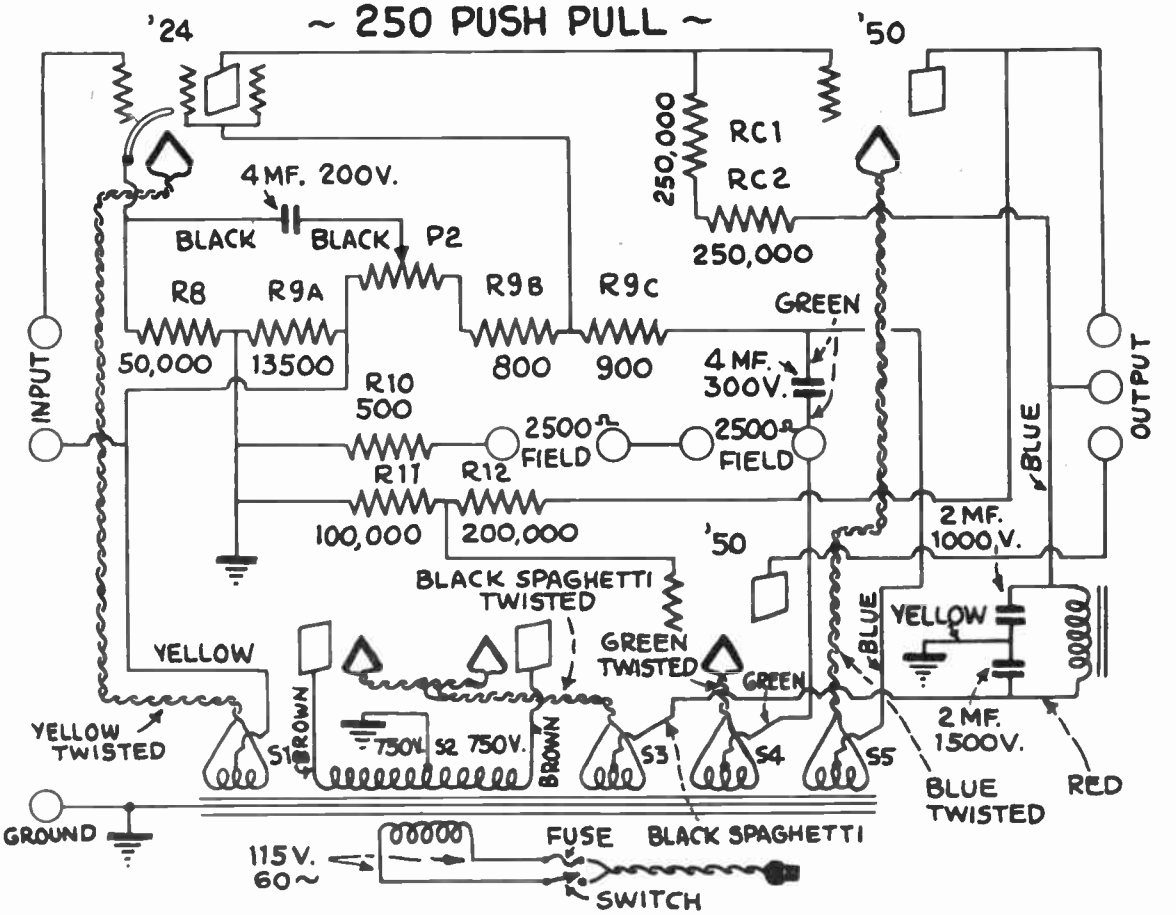
RED = B+ PWR. 2 ; RED & WHITE = B+ PWR.1; MAROON & RED = B+ AMP.; MAROON = B+ DET.; GREEN WITH RED & YELLOW TRACER = A-B-C+ GND. YELLOW = A+; BLACK WITH GREEN TRACER = C- PWR.1; BLACK WITH WHITE TRACER = C- PWR. 2

ELECTRAD-LOFTIN-WHITE

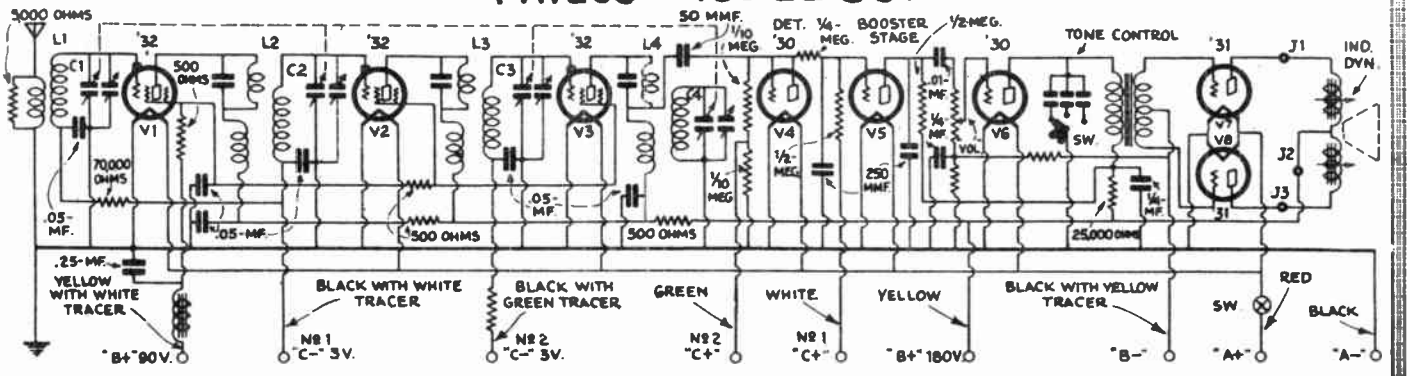
~ TYPE 250 ~



~ 250 PUSH PULL ~

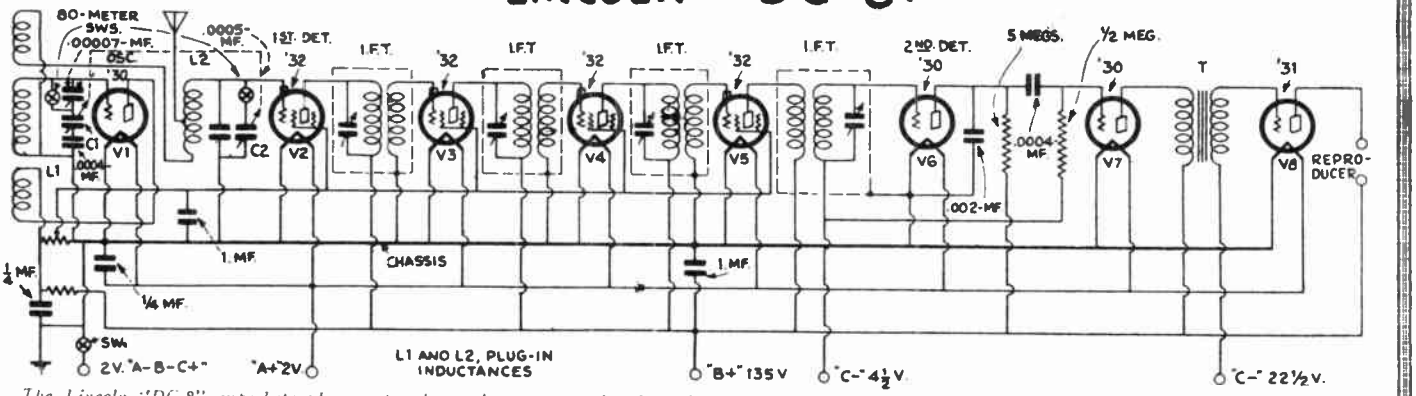


PHILCO "MODEL 30."



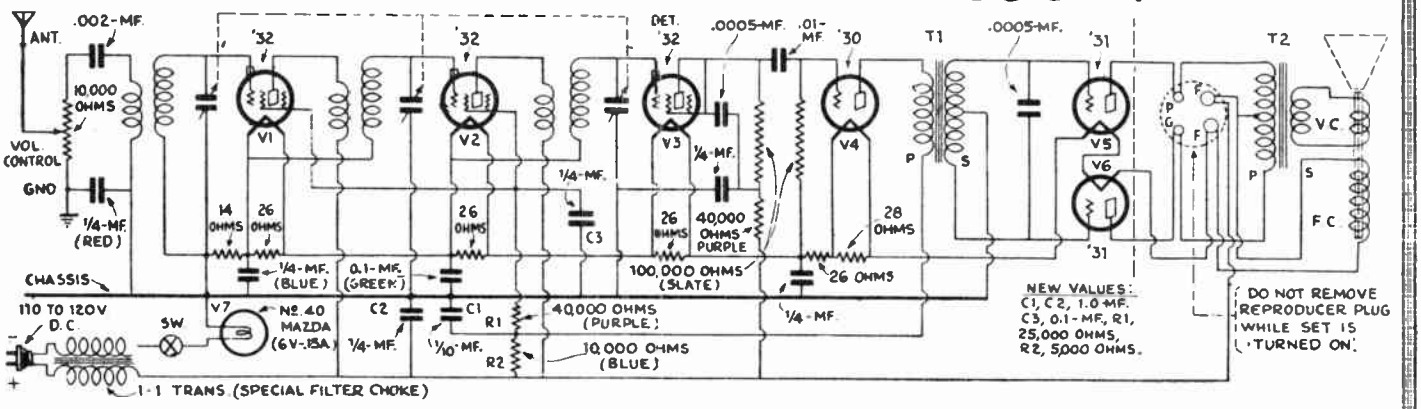
The circuit of the Philco "Model 30" receiver, which is designed for operation from a two-volt source. It incorporates automatic volume control and tone control; and operates an inductor dynamic which requires no field current

LINCOLN "DC-8."



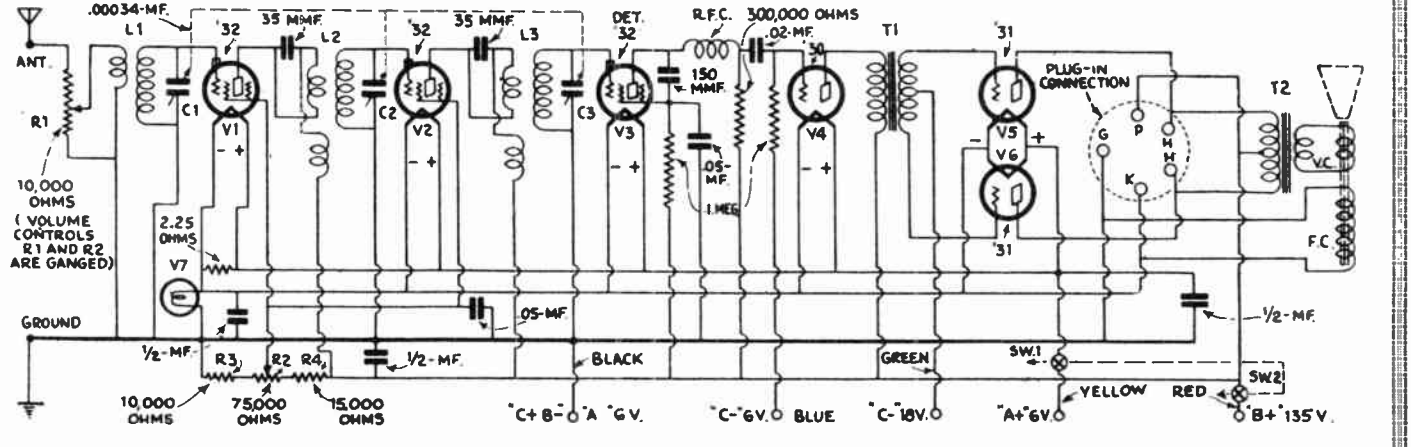
The Lincoln "DC-8" superheterodyne not only works on two volts, but gives a choice of two wavebands, which may be extended by the use of plug-in coils. This specially powerful set may be operated from an air-cell battery; or a storage battery may be used. The filament-voltage control is external to the circuit shown

PIERCE-AIRO "DEWALD MODEL DC 632."



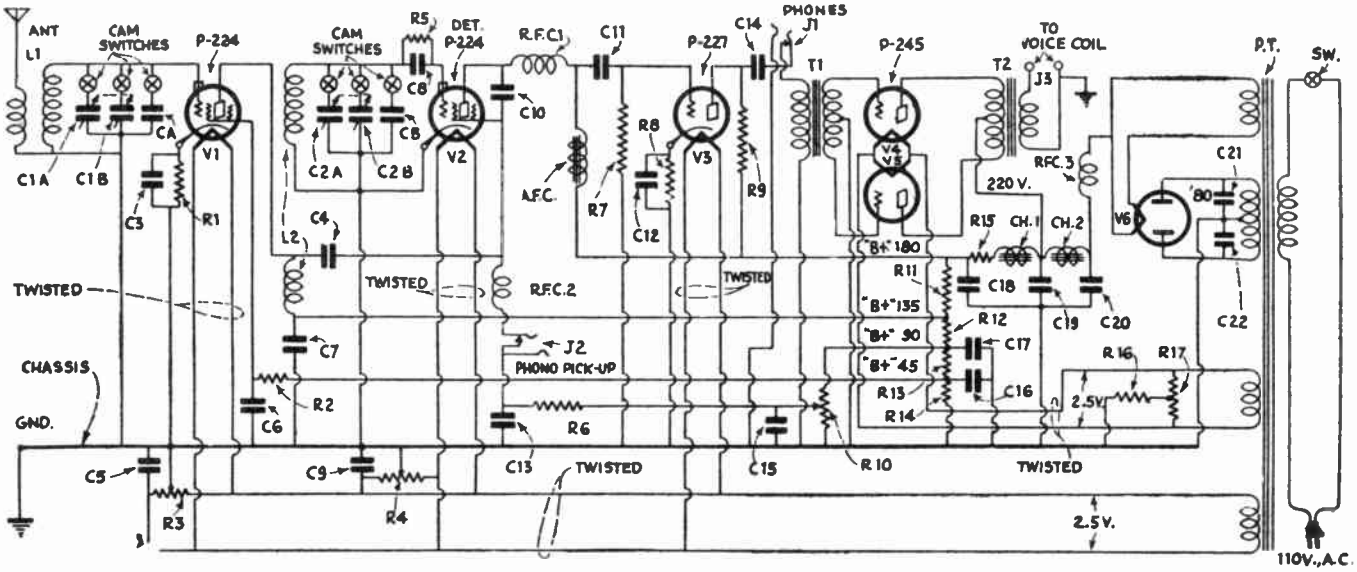
The schematic circuit of the Pierce-Airo "DeWald Model DC 632" midget illustrated above. It is designed for 110 volt D.C. operation but may be connected to a 220-volt line through a series resistor the Mazda lamp ballasts the circuit. Note the dynamic's field coil is in series with the filaments.

"MODEL B-94" LYRIC.

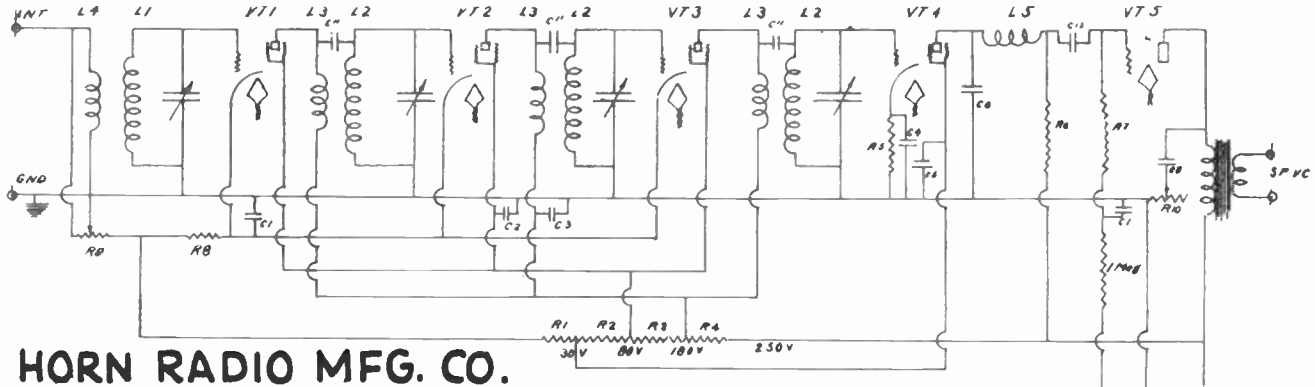


The schematic circuit of the All-American Mohawk "Model B-94" Lyric.

PILOT "UNIVERSAL SUPER-WASP."

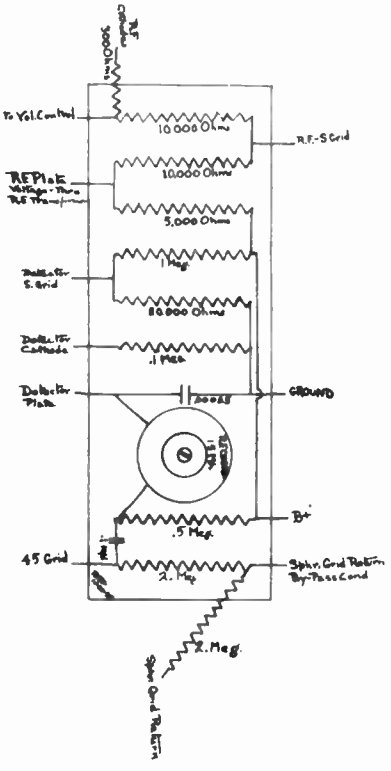


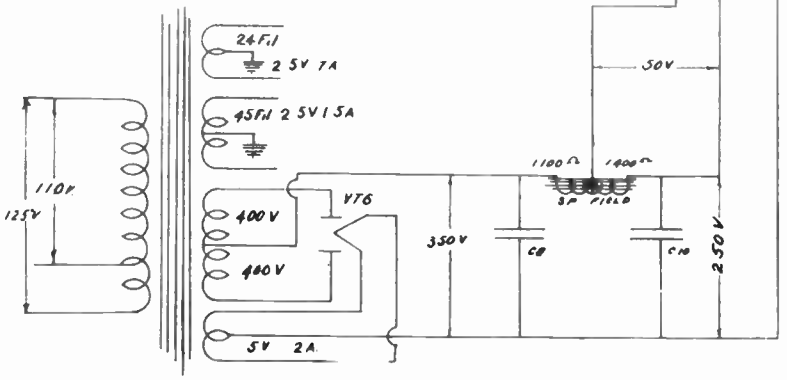
The circuit of the "Universal Super-Wasp," somewhat simplified by the representation of the four sets of R.F. transformers as one. The capacities CA and CB are fixed .0004-mf. condensers used only to tune the highest waveband, above 470 meters. Note the unusual regeneration method.

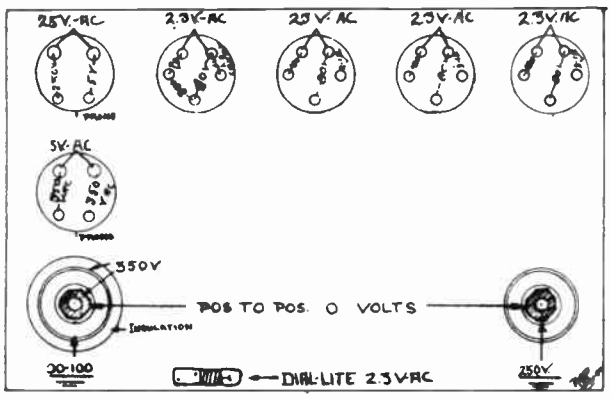


HORN RADIO MFG. CO.

MODEL No. 15 -- Four Screen Grid Receiver



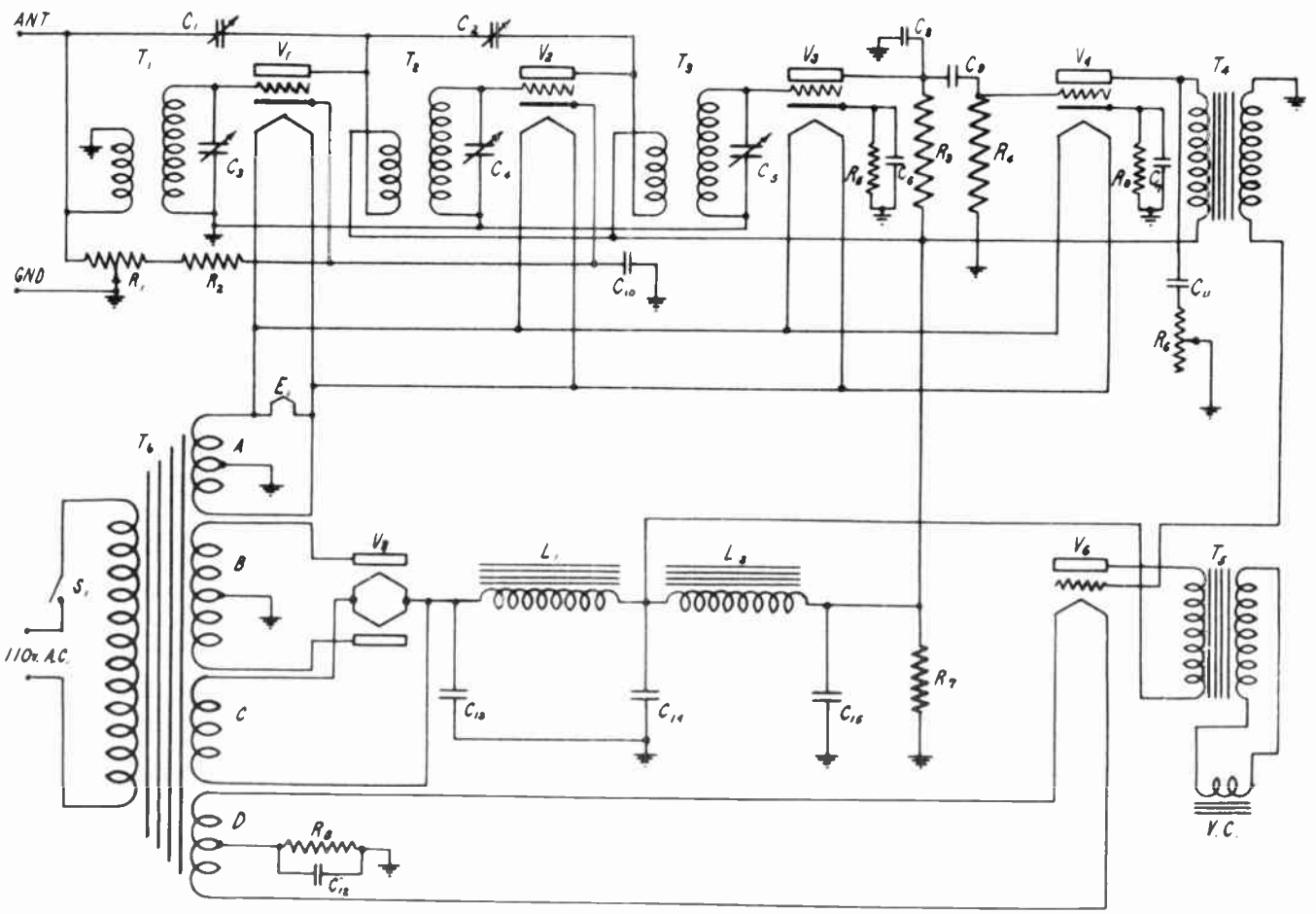




ALL VOLTAGES ARE DIRECT CURRENT - UNLESS MARKED OTHERWISE

NATIONAL TRANSFORMER CO.

MIDGET SIX

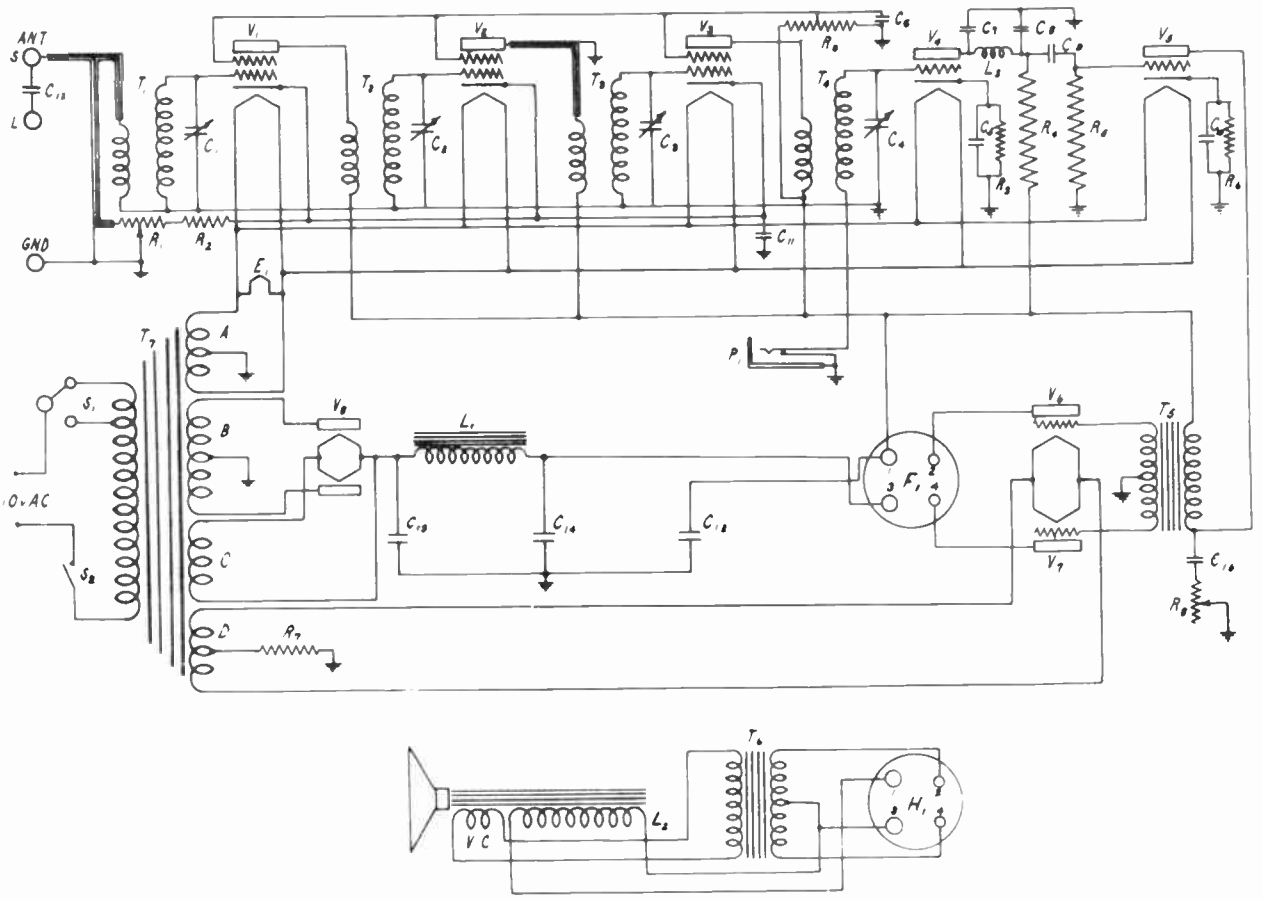


MIDGET SIX
LIST OF PARTS.

A	Fil.- 2.5 Volts - 227		
B	High Voltage		
C	Fil. 5.0 Volts - 280		
D	Fil. 2.5 " - 245		
El	Dial Light 2.5 Volts		
C1	Neutralizing Cond.		
C2	" "		
C3	1st R.F. Cond. Var.	.00035	M.F.
C4	2nd " " " "	"	" "
C5	3rd " " " "	"	" "
C6	Det. Bypass Cond.	0.25	" "
C7	1 A.F. " "	0.25	" "
C8	Det. Plate Bypass Cond.	0.001	" "
C9	R.F. Coupling Cond.	0.1	" "
C10	R.F. Bypass Cond.	0.25	" "
C11	Tone Var. Cond.	0.1	" "
C12	245 Bypass Cond.	0.25	" "
C13	Filter Cond.	8.0	" "
C14	" "	"	" "
C15	" "	0.25	" "
R1	Volume Control	15,000	Ohms
R2	R.F. Bias Res.	625	"
R3	Det. Plate Res.	100,000	OHMS
R4	1 A.F. Grid Res.	500,000	"
R5	Det. Bias Res.	25,000	"
R6	Tone Control	7,500	"
R7	Bleeder Res.	5,150	"
R8	245.Bias Res.	1,500	"
R9	1 A.F. Bias Res.	1,750	"
V1	1 R.F. Tube	227	
V2	2 R.F. "	"	
V3	Det. "	"	
V4	1 A.F. "	"	
V5	Rec. "	280	
V6	2 A.F. "	245	
T1	Ant. Trans.		
T2	1 R.F. "		
T3	2 R.F. "		
T4	2 A.F. "		
T5	Output "	(On Speaker)	
T6	Power Tran.		
S.	Switch on Volume Control		
VC	Speaker Voice Coil		
L1	Choke Coil		
L2	Speaker Field		

NATIONAL TRNSFORMER CO.

SCREEN GRID EIGHT

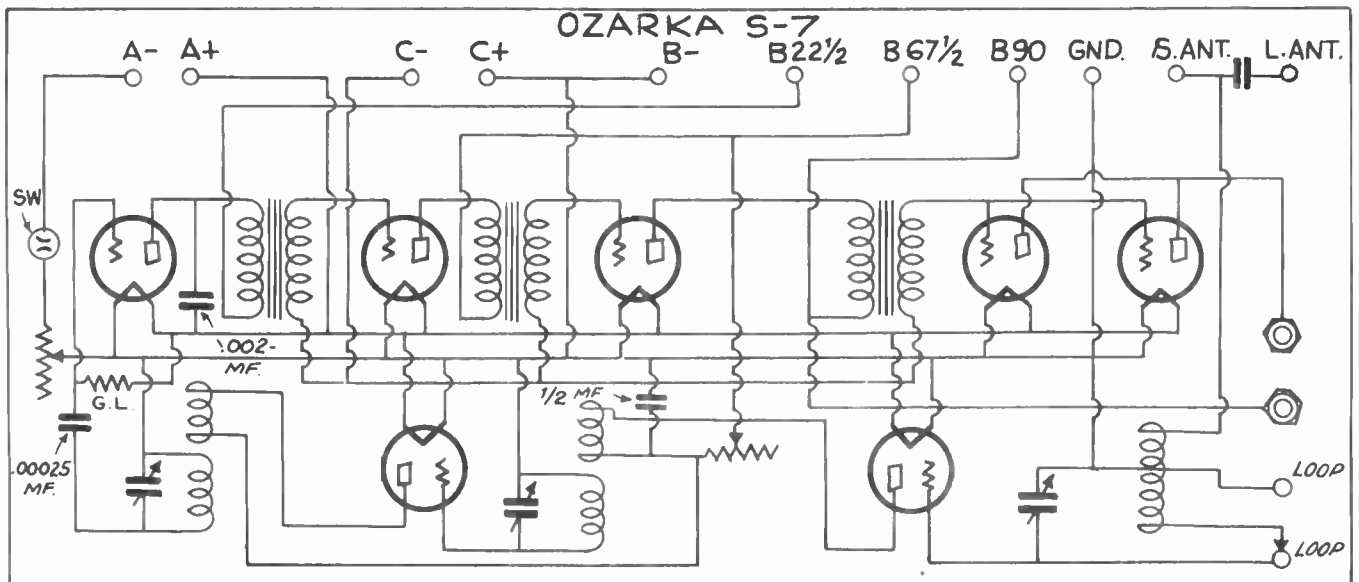


SCREEN GRID EIGHT
LIST OF PARTS

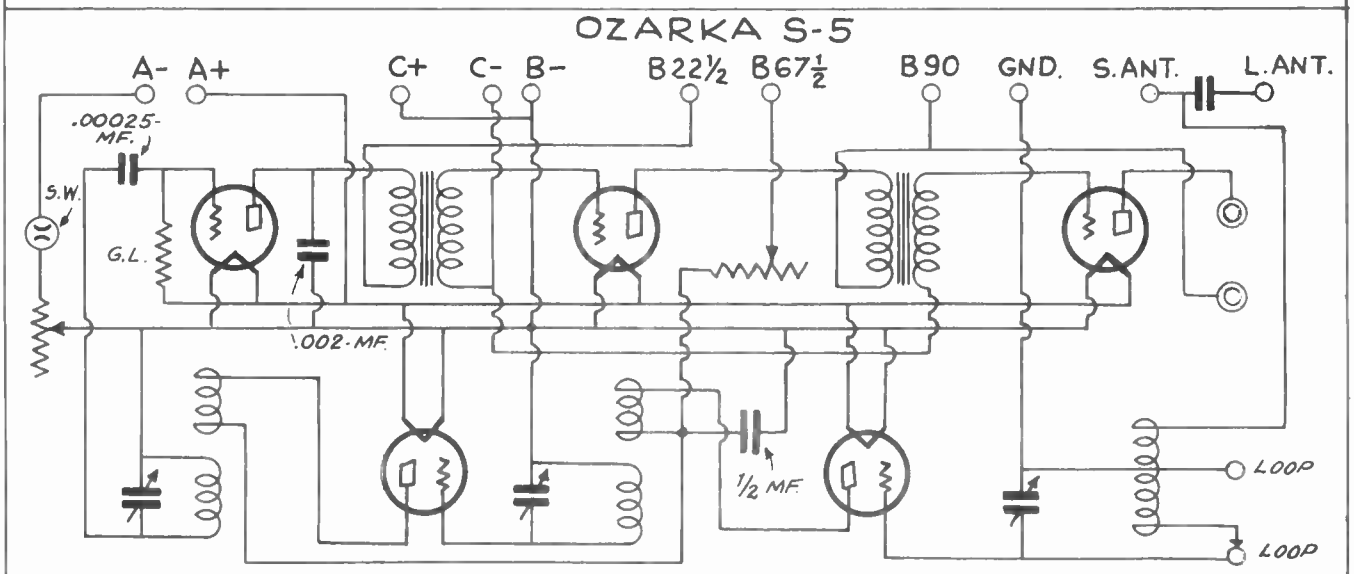
A	Fil. 2.5 Volts - 227	
B	High Voltage	
C	Fil. 5.0 Volts - 280	
D	Fil. 2.5 " - 245 Push Pull	
El	Dial Light 2.5 Volts	
Fl	Speaker Socket (Front View)	
Hl	Speaker Plug	
C1	1st R.F. Cond. Var.	.00035 M.F.
C2	2nd R.F. " "	" " "
C3	3rd " " " "	" " "
C4	4th " " " "	" " "
C5	Det. Bypass Cond.	.25
C6	Screen Grid Bypass	.25
C7	Det. Plate Bypass	.001 M.F.
C8	" " "	" "
C9	1 A.F. Coupling Cond.	.25 " "
C10	1 A.F. Bypass Cond.	.25 " "
C11	R.F. Bypass Cond.	.25 " "
C12	Ant. Cond.	.00025 " "
C13	Filter Cond.	8.0 " "
C14	" "	" " "
C15	" "	" " "
C16	Tone Var. Cond.	0.1 " "
R1	Volume Control	15000 Ohms
R2	R.F. Bias Res.	150 "
R3	Det. Bias Res.	75000 "
R4	Det. Plate Res.	200000 "
R5	1 A.F. Grid Res.	100000 "
R6	1 A.F. Bias Res.	4000 "
R7	245 Bias Res.	900 "
R8	Tone Control	7500 Ohms
R9	Bleeder Res.	8500 "
V1	1 R.F. Tube - 224	
V2	2 R.F. " "	
V3	3 R.F. " "	
V4	Det. " 227	
V5	1 A.F. " "	
V6	Push Pull Tube 245	
V7	" " " "	
V8	Rec. Tube - 280	
T1	Ant. Trans.	
T2	1 R.F. "	
T3	2 R.F. "	
T4	3 R.F. "	
T5	2 A.F. " (Input Push Pull)	
T6	2 A.F. " (Output Push Pull on Speaker)	
T7	Power "	
L1	Choke Coil	
L2	Speaker Field	
S1	Hi - Lo Switch	
S2	Switch on Volume Control	
VC	Speaker Voice Coil	
P1	Phonograph Jack	

OZARKA, INC.

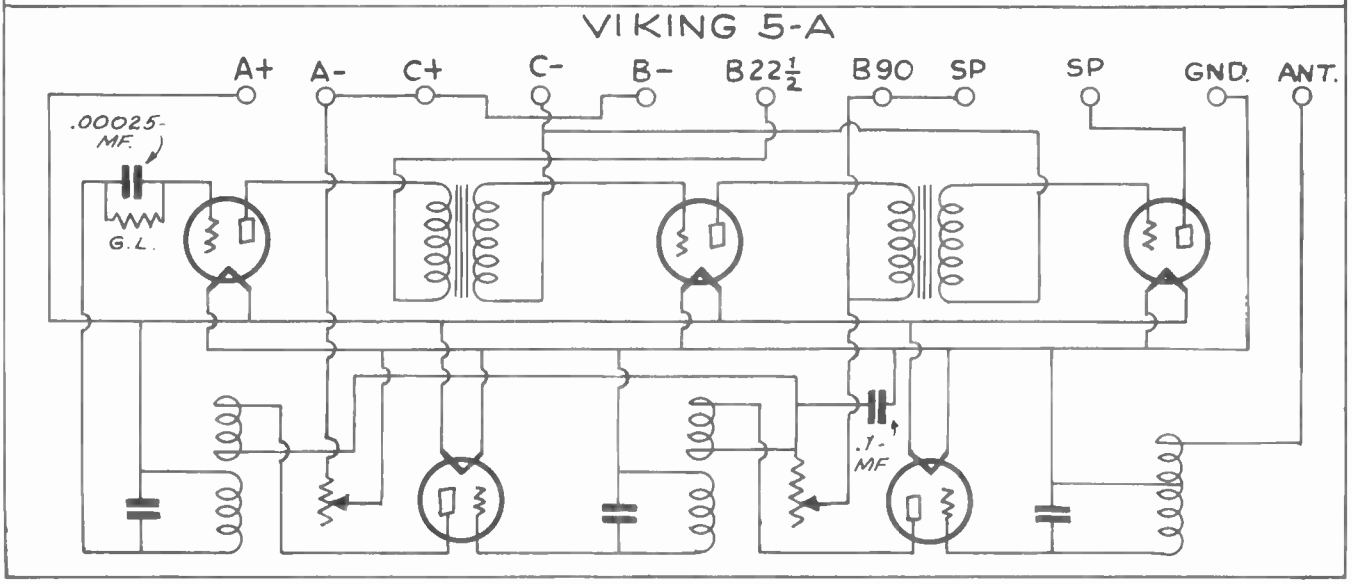
OZARKA S-7



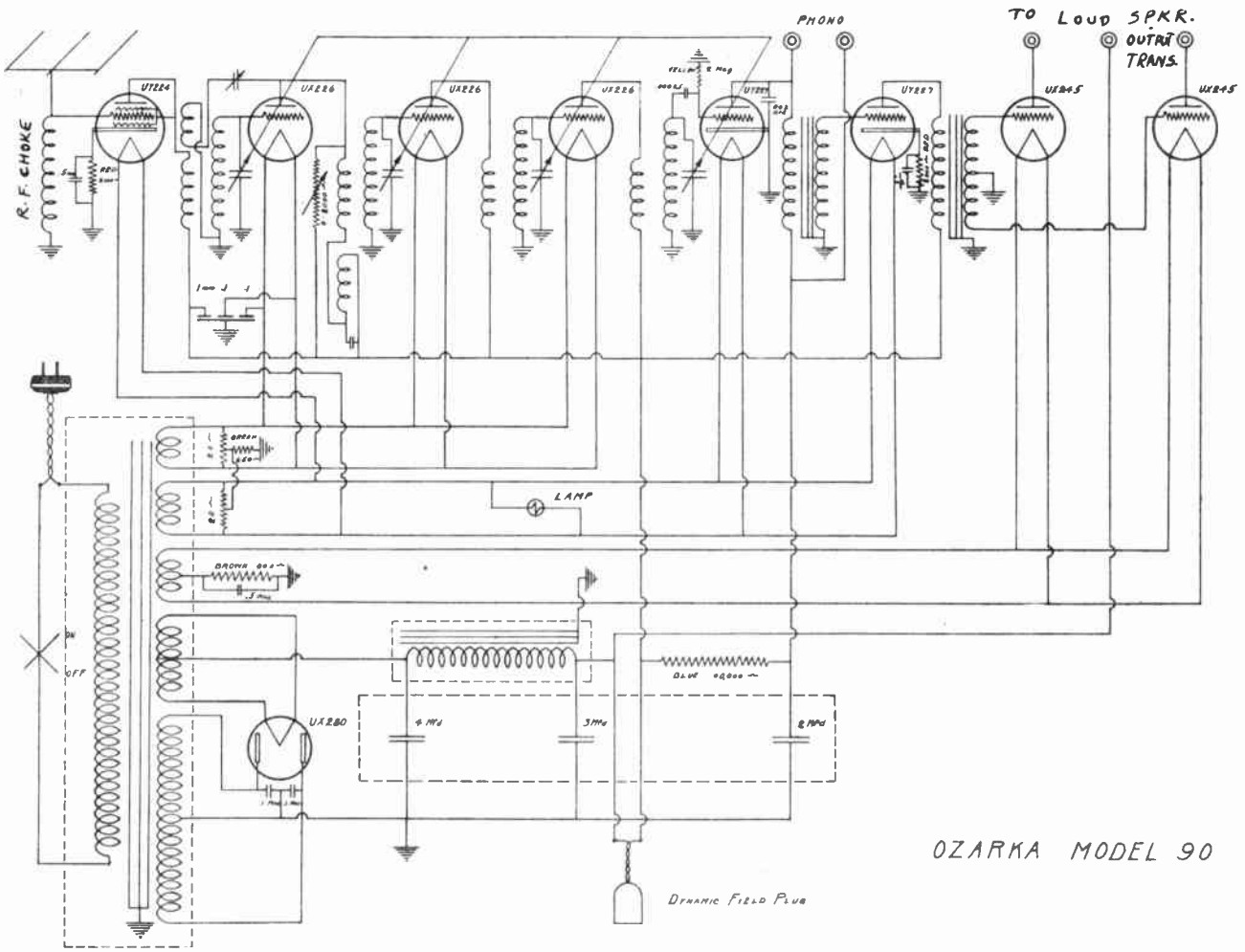
OZARKA S-5



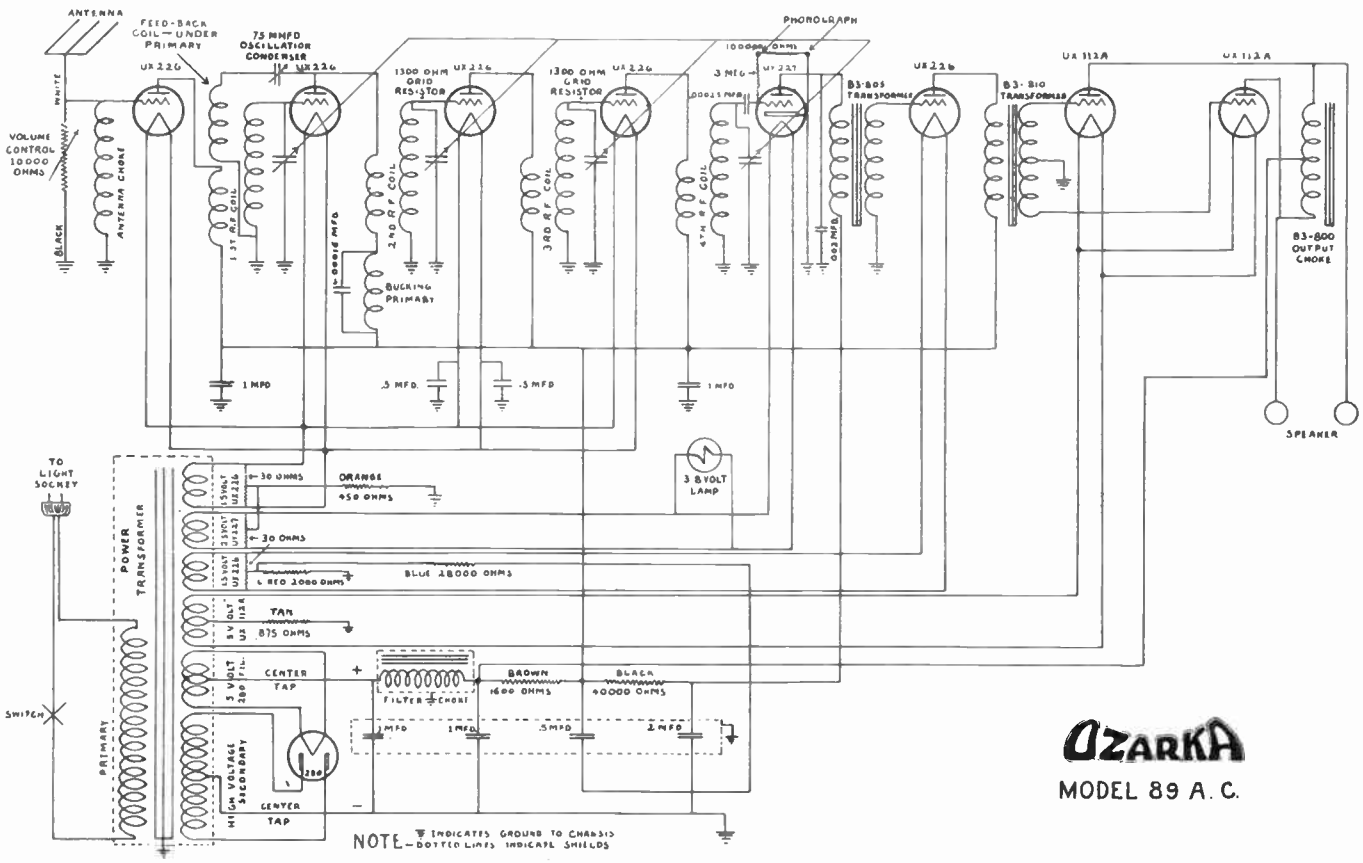
VIKING 5-A



OZARKA, INC.



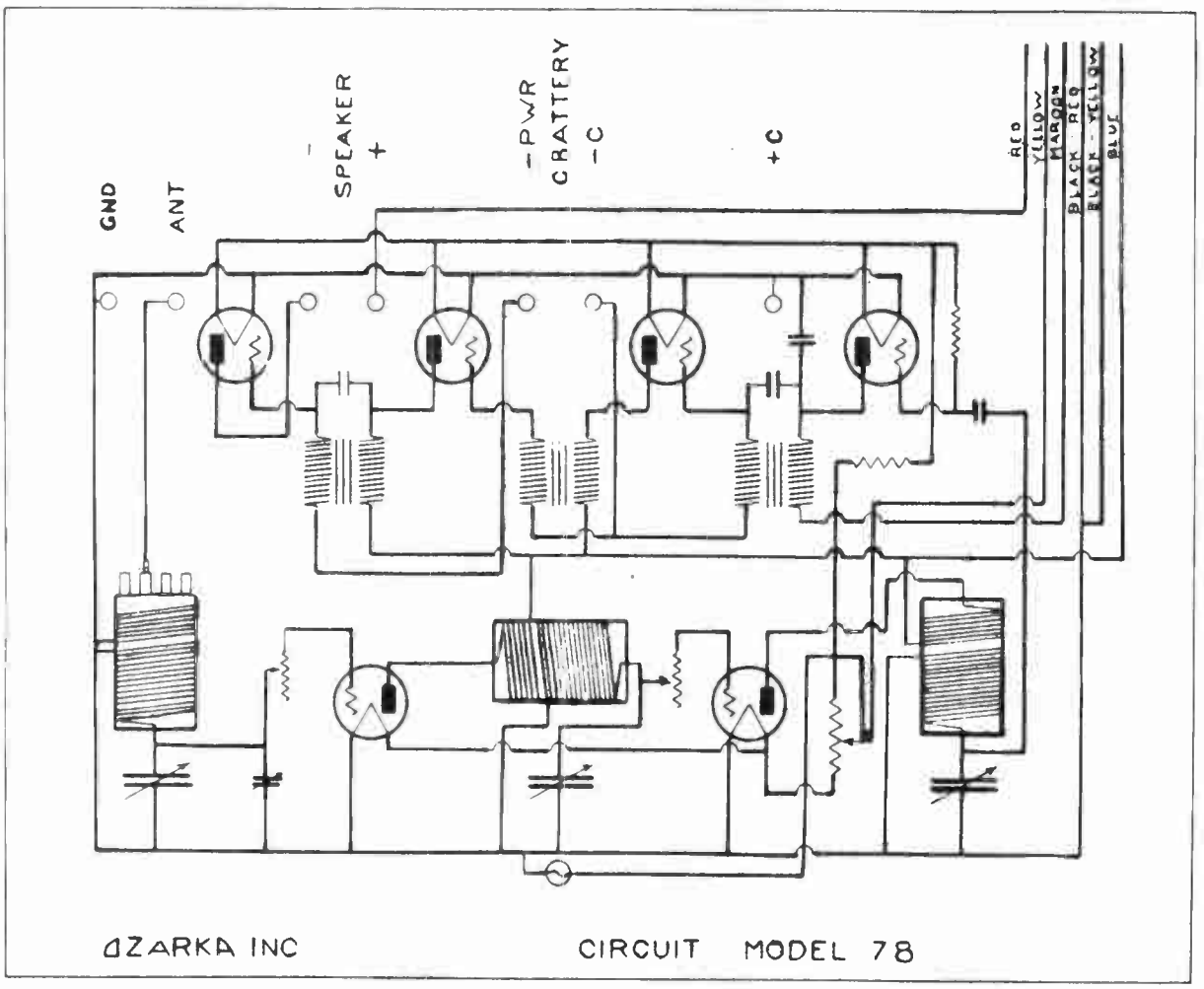
OZARKA MODEL 90

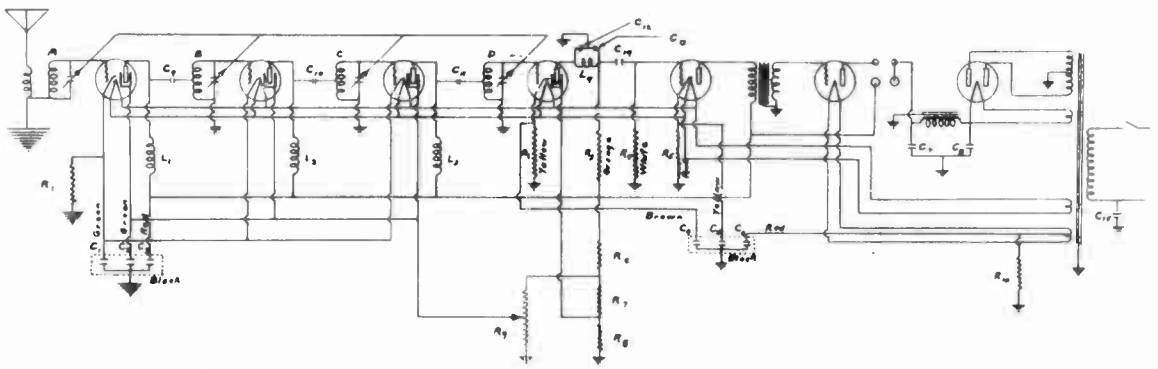


OZARKA

MODEL 89 A. C.

OZARKA, INC.



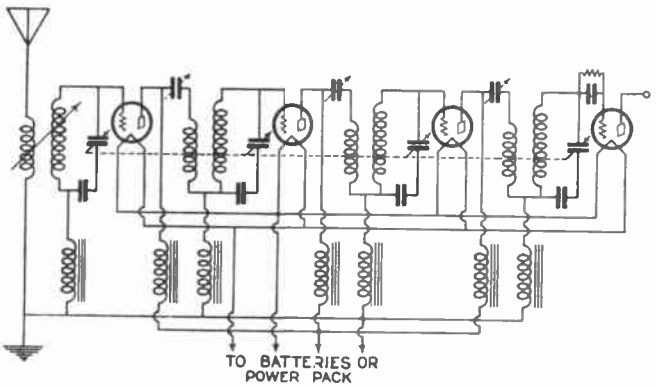


C1- 25
C2- 25 } RF Osc Trim
C3- 10
C4- 25
C5- .1 } AF Osc Trim
C6- .5
C7- 8.0
C8- 8.0
C9- .0001
C10- .0001
C11- .0001
C12- .001
C13- .001
C14- .005
C15- .005

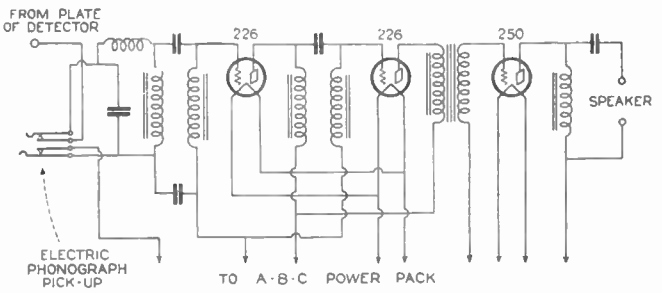
R1- 225 ~
R2- 90,000 ~
R3- 350,000 ~
R4- 1 Meg ~
R5- 2000 ~
R6- 5000 ~
R7- 5000 ~
R8- 5000 ~
R9- 10,000 ~
R10- 1600 ~

THE VIKING
MODEL 92-AC

RADIO PRODUCTS LABORATORY

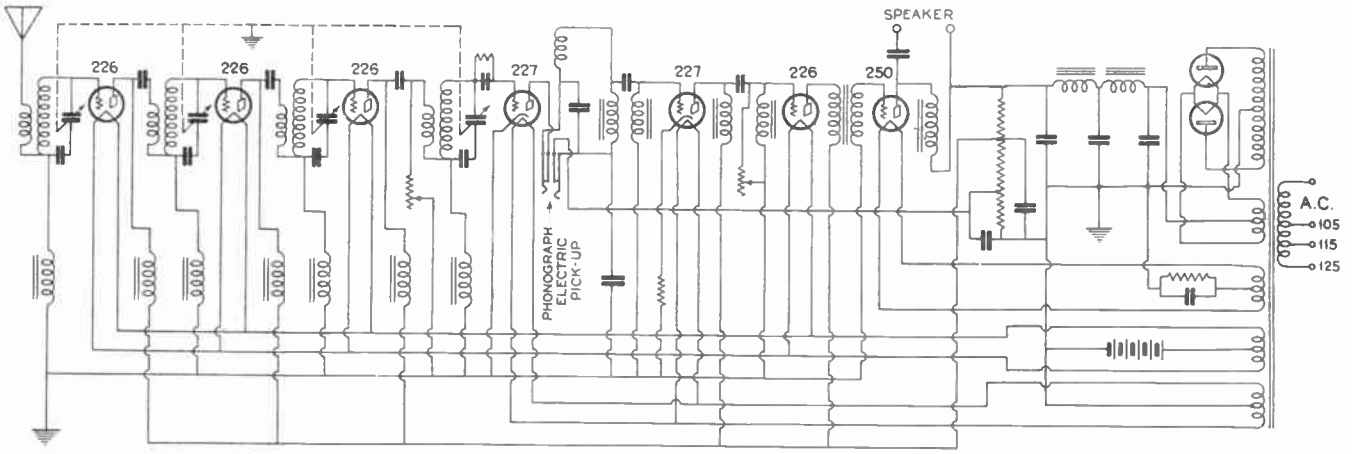


"LOFTIN-WHITE TUNER"

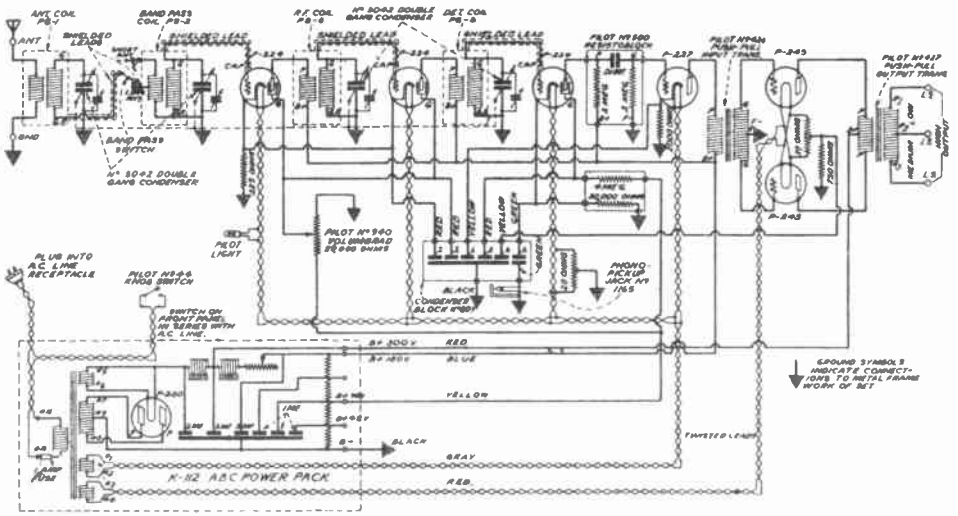


"AUDIO AMPLIFIER"

COMPLETE SET



PILOT RADIO & TUBE CORP.



PRE-SELECTOR

HOW TO OBTAIN CORRECT FILAMENT VOLTAGE

The purpose of the special eight-point switch is to enable one to obtain the proper "A" voltage for any receiving set up to eight tubes. When the arrow on the switch knob points to A, the lowest available voltage is obtained; when the knob points to H, maximum output results. For best performance, a reliable voltmeter should be connected across the "A" terminals of your receiver. The switch knob should then be rotated until the voltmeter reads 6 with all tube filaments lit. A 6-volt supply is correct for all sets using 201-A, 112, 112-A, 171 and 171-A type tubes. Once the voltage adjustment has been made, no further voltmeter readings are necessary, nor is any other attention required by the Knapp "A" Power Unit.

For small sets, such as those using three or four tubes, it may be necessary to install a 6 or a 10 ohm rheostat in the "A" minus lead wire, so as to reduce the output voltage to 6. Under no circumstances should the tubes be operated above the rated voltage specified by their manufacturers.

IN CASE HUM IS EXPERIENCED

The Knapp "A" Power Unit is designed to operate without the slightest trace of hum. Some sets and circuits are super-sensitive and critical, and in case any hum is experienced, one of the following suggestions will undoubtedly eliminate the trouble:

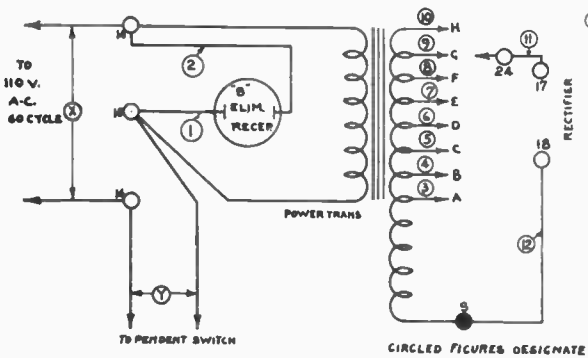
1st. Hum may be caused by the AC line supply. Pull out the AC plug, turn it 180 degrees and put it back.

2nd. Ground the negative "A" lead through a condenser of .1 mfd. or higher.

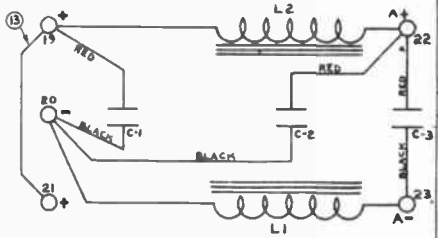
3rd. Place a .1 mfd. (or higher) by-pass condenser between the grounded side of the AC input and the negative side of the DC output.

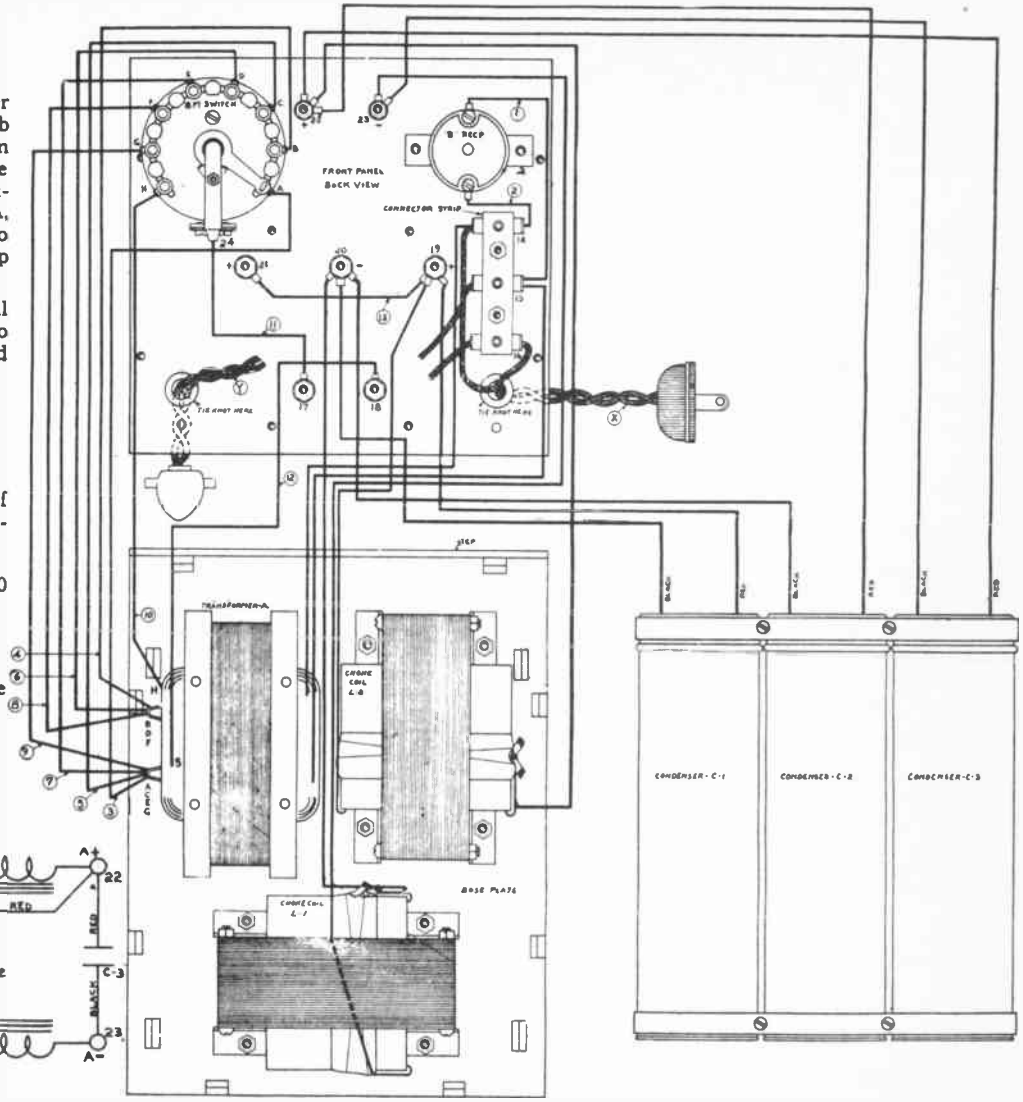
4th. Move "A" Power away from super-sensitive set.

5th. Investigate the "B" eliminator, as defective "B" eliminators often cause hum.



Schematic Wiring Diagram of Knapp "A" Power Unit

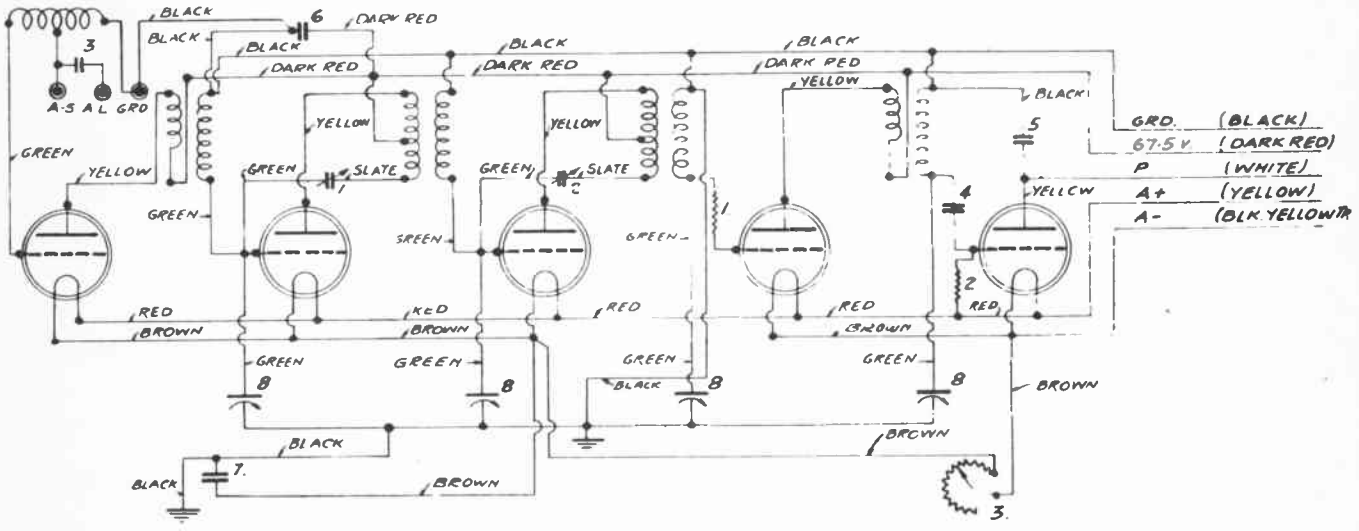




Picture Wiring Diagram of Knapp "A" Power Unit, showing rear of Panel and Transformer and Chokes mounted on Base Plate

KNAPP "A" POWER UNIT.

CANADIAN MARCONI CO.



TYPE XIV D.C.

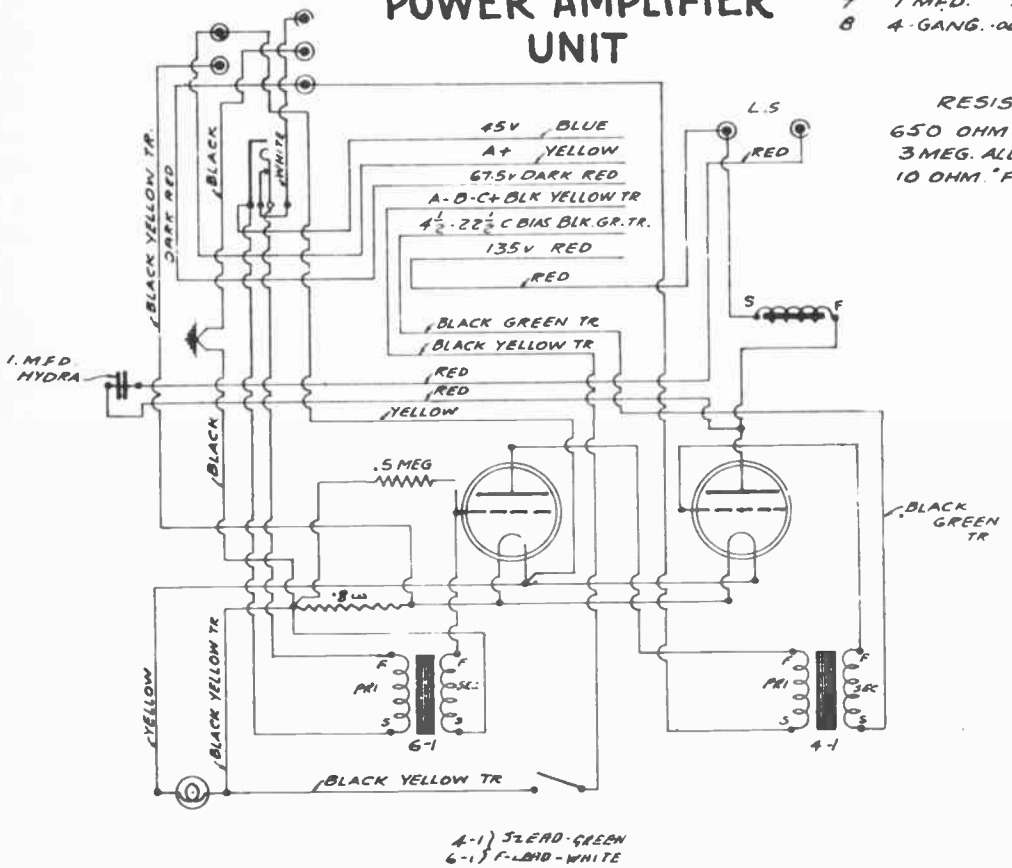
CONDENSERS

1	NEUT CONDENSER	1
2	NEUT. CONDENSER	2
3	.001 M.F.D. AEROVOX.	3
4	.00025 "AEROVOX"	4
5	.002 "AEROVOX"	5
6	1 M.F.D. "HYDRA"	6
7	1 M.F.D. "HYDRA"	7
8	4 GANG .00035 "TALLMAN"	8

RESISTANCES

650 OHM "ELECTRAD
3 MEG. ALLEN BRAD. GRIDLEAK
10 OHM "FROST." RHEOSTAT

POWER AMPLIFIER UNIT



4-1) 3 LEAD-GREEN
6-1) F-LEAD-WHITE

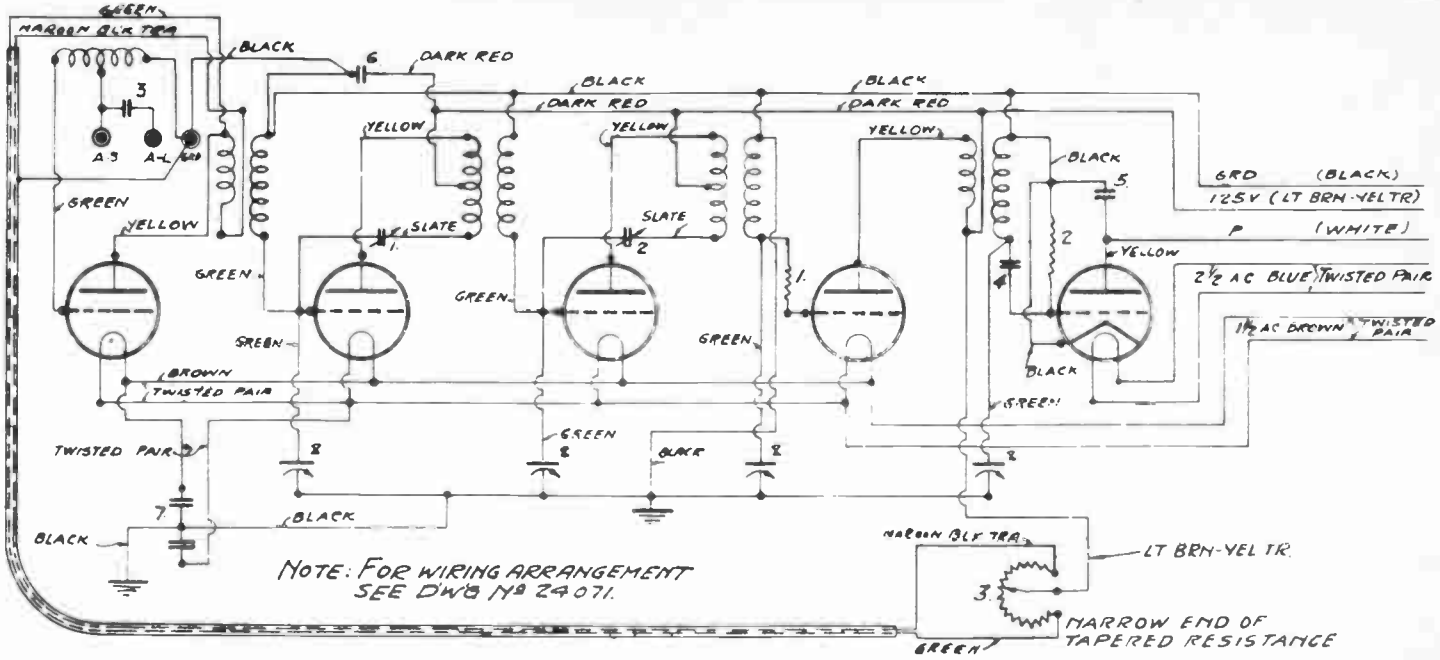
CONDENSERS

1	NEUT. CONDENSER
2	NEUT. CONDENSER
3	·001 M.F.D AEROVOX
4	·00025 MFD AEROVOX
5	·002 MFD. AEROVOX
6	1 MFD HYDRA
7	2 × ½ MFD HYDRA
8	4-GANG. ·0003S TALLMAN

RESISTANCES.

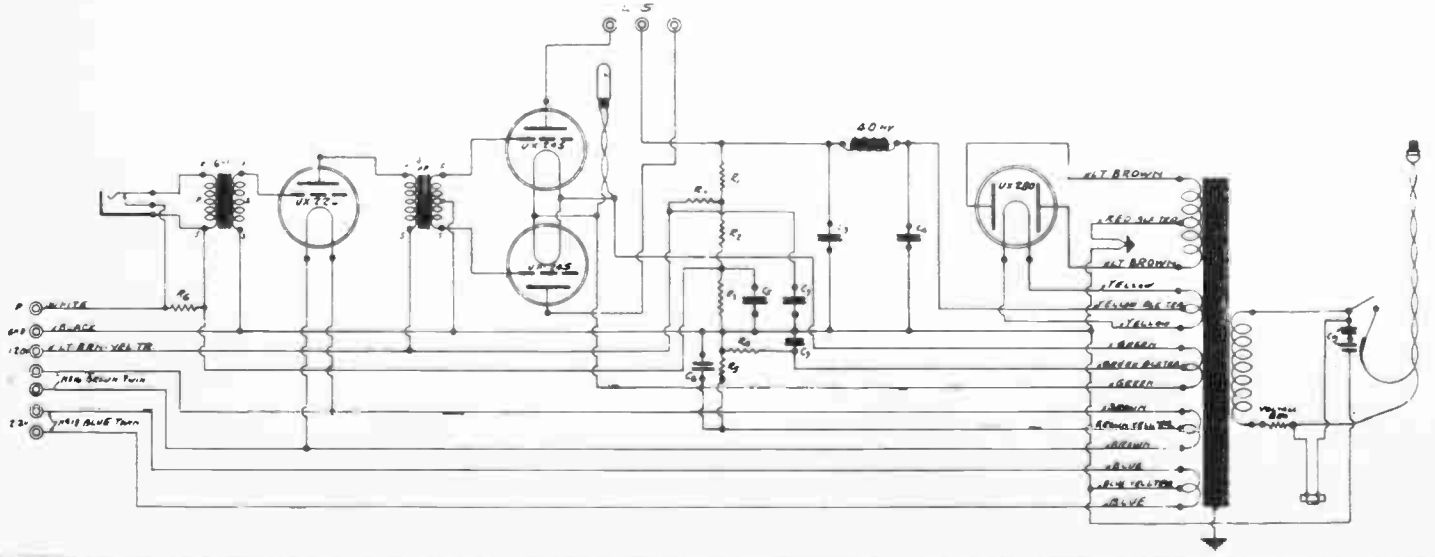
900 OHM ELECTRAD
3 MEG. ALLEN. BRD GRID LEAK.
1000 OHM. CARTER POTENT.R.

TUNER UNIT TYPES XV, XVI, XVII, XVIII A.C.



NOTE: FOR WIRING ARRANGEMENT SEE D'W'G Nº 24071.

POWER UNIT TYPE XVI



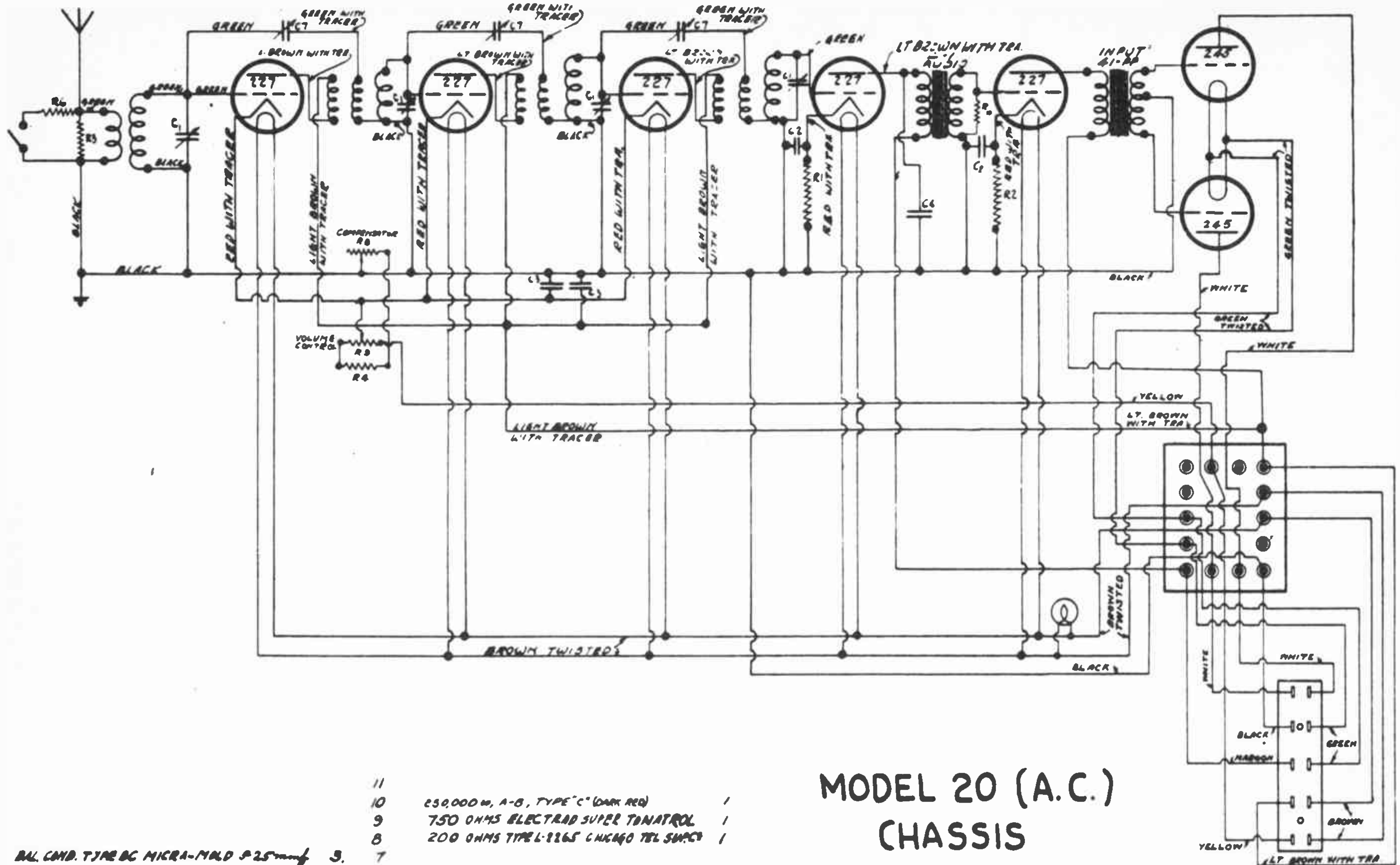
Nº	RESISTORS
8	
7	800 OHMS ELECTRAD
6	8000 OHMS GRIDLEAK ALLEN BRADLEY
5	350 OHMS
4	640 OHMS
3	9000 OHMS
2	10600 OHMS
1	3275 OHMS

(5, 4, 3, 2, 1: POTENTIAL DIVIDER ALLEN BRADLEY)

Nº	CONDENSERS
10	
9	2 × .1 MFD HYDRA
8	
7	1 MFD
6	1 MFD
5	2 MFD
4	8 MFD
3	2 MFD
2	2 MFD

(5, 4, 3: 1½ MFD CONDENSER BLOCK "HYDRA")

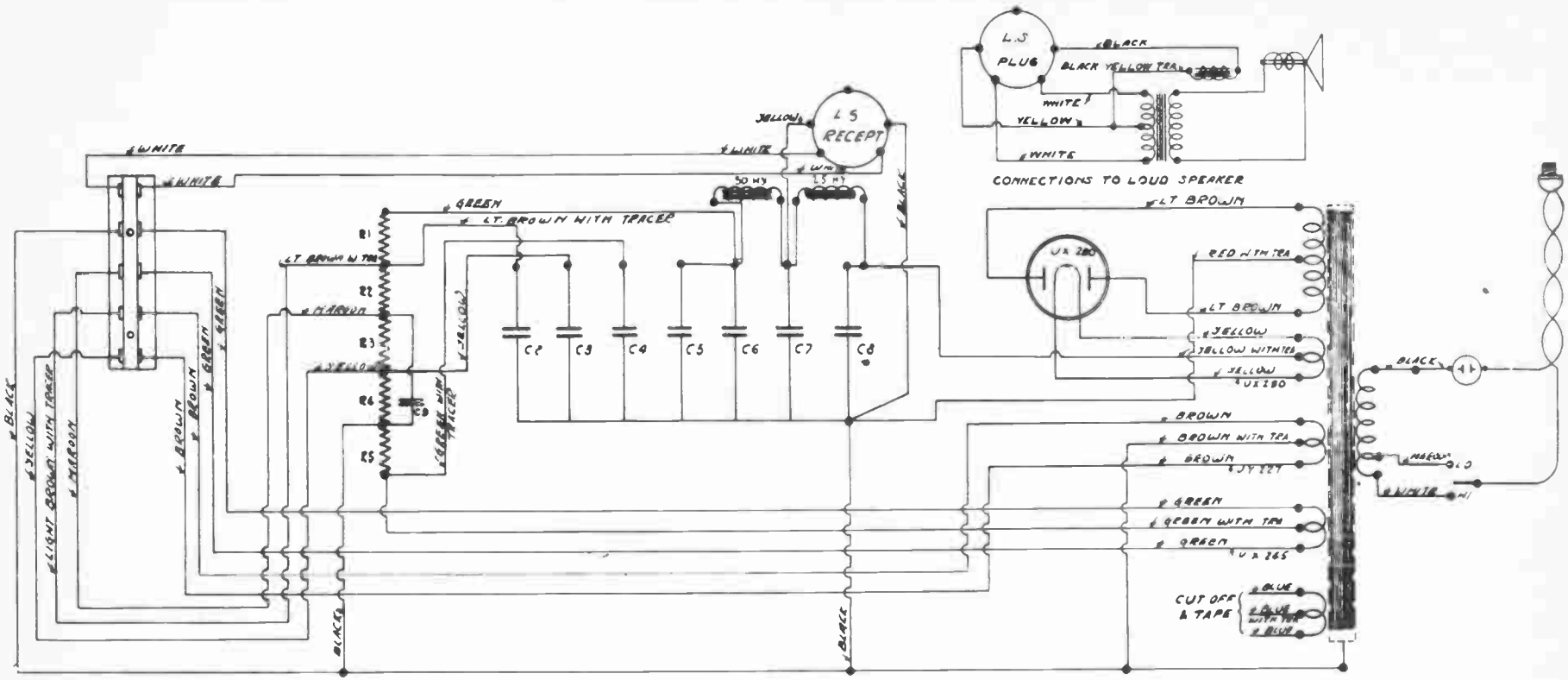
CANADIAN MARCONI CO.



MODEL 20 (A.C.) CHASSIS

	CONDENSERS	REQ.
11		
10		
9		
8		
7	BAL. COND. TYPE BC MICRA-MOLD ≠25 mmf	3.
6		
5		
4	.002 MFD. AEROVOL	1
3	1 MFD "HYDRA"	2
2	5 MFD "HYDRA"	2
1	360 mmf 4 GANG SCOVILL	1

	RESISTANCES	REQ.
11		
10	250,000 ω, A-B, TYPE "C" (DARK RED)	1
9	750 OHMS ELECTRAD SUPER TONATROL	1
8	200 OHMS TYPE L-2265 CHICAGO TEL SUPPLY	1
7		
6	15 OHMS No. 35 ADVANCE WIRE	1
5		
4	120 OHMS 4 WATT TYPE No. 26575	1
3	10000 OHMS 3/4 WATT "B" TYPE "BLACK"	1
2	1500 OHMS 75 WATT "B" TYPE ORANGE	1
1	15000 OHMS .4 WATT "B" TYPE YELLOW	1



NOTE 1 FOR WIRING ARRANGEMENT SEE DWG No. 26743

NOTE 2 DIAGRAM SHOWS 10 POINT RECEPTACLE AND L.S RECEPTACLE AS SEEN WHEN LOOKING UNDER POWER UNIT

MODEL 20 (A.C.) POWER UNIT

CONDENSERS

11	
10	
9	1 MFD. "HYDRA"
8	6 MFD.
7	3 MFD
6	2 MFD.
5	2 MFD.
4	1 MFD.
3	1 MFD.
2	1 MFD.
1	

8, 7, 6, 5, 4, 3, 2 → 16 MFD "HYDRA"

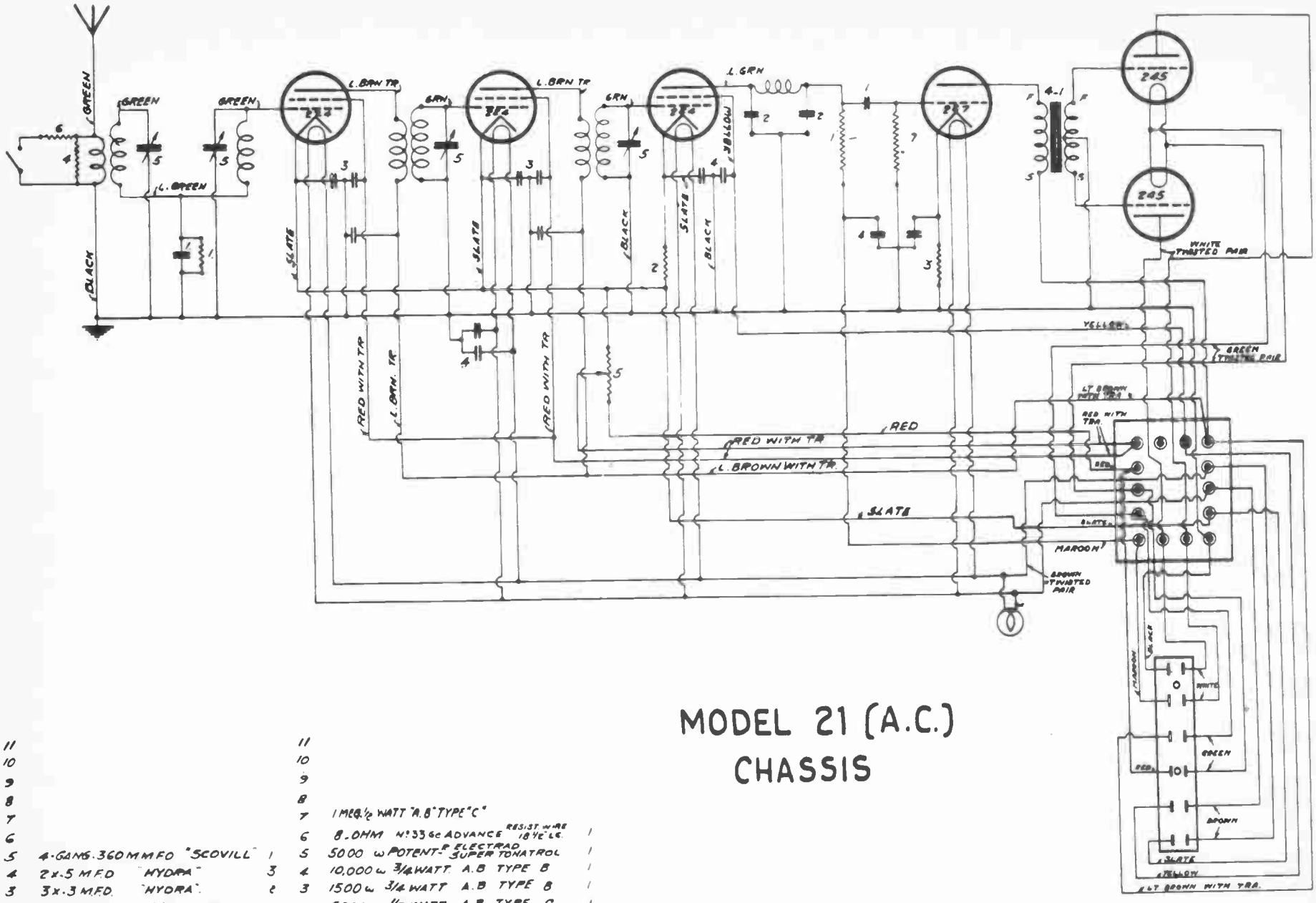
RESISTANCES

11	
10	
9	
8	
7	
6	
5	760 OHMS
4	25000 OHMS
3	1100 OHMS
2	3375 OHMS
1	3750 OHMS

5, 4, 3, 2, 1 → VOLTAGE DIVIDER

CANADIAN MARCONI CO.

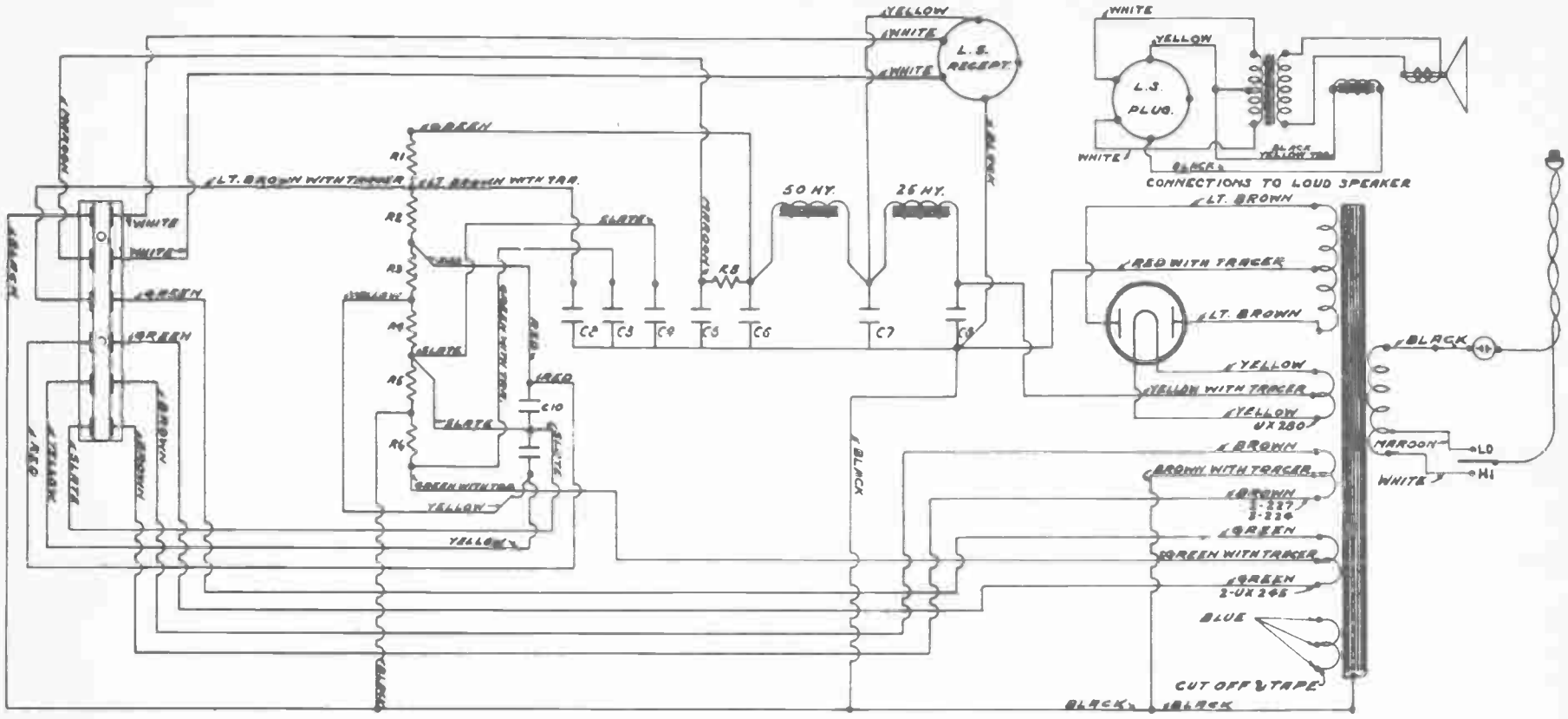
CANADIAN MARCONI CO



MODEL 21 (A.C.) CHASSIS

	CONDENSERS	QTY.
11		
10		
9		
8		
7		
6		
5	4-GANG .360 MMFD "SCOVILL"	1
4	2x.5 M.F.D "HYDRA"	3
3	3x.3 M.F.D. "HYDRA"	2
2	.00025 M.F.D. "AEROVOX"	2
1	.02 M.F.D. "AEROVOX"	1

	RESISTORS	QTY.
11		
10		
9		
8		
7	1 MEG. ½ WATT "A.B" TYPE "C"	
6	8 OHM No 33 gc ADVANCE RESIST. WIRE 18" LG.	1
5	5000 ω POTENT- ELECTRAD SUPER TONATROL	1
4	10,000 ω ¾ WATT A.B TYPE B	1
3	1500 ω ¾ WATT A.B TYPE B	1
2	5000 ω ½ WATT A.B. TYPE C	1
1	.25 MEG 1 WATT A.B. TYPE B	1



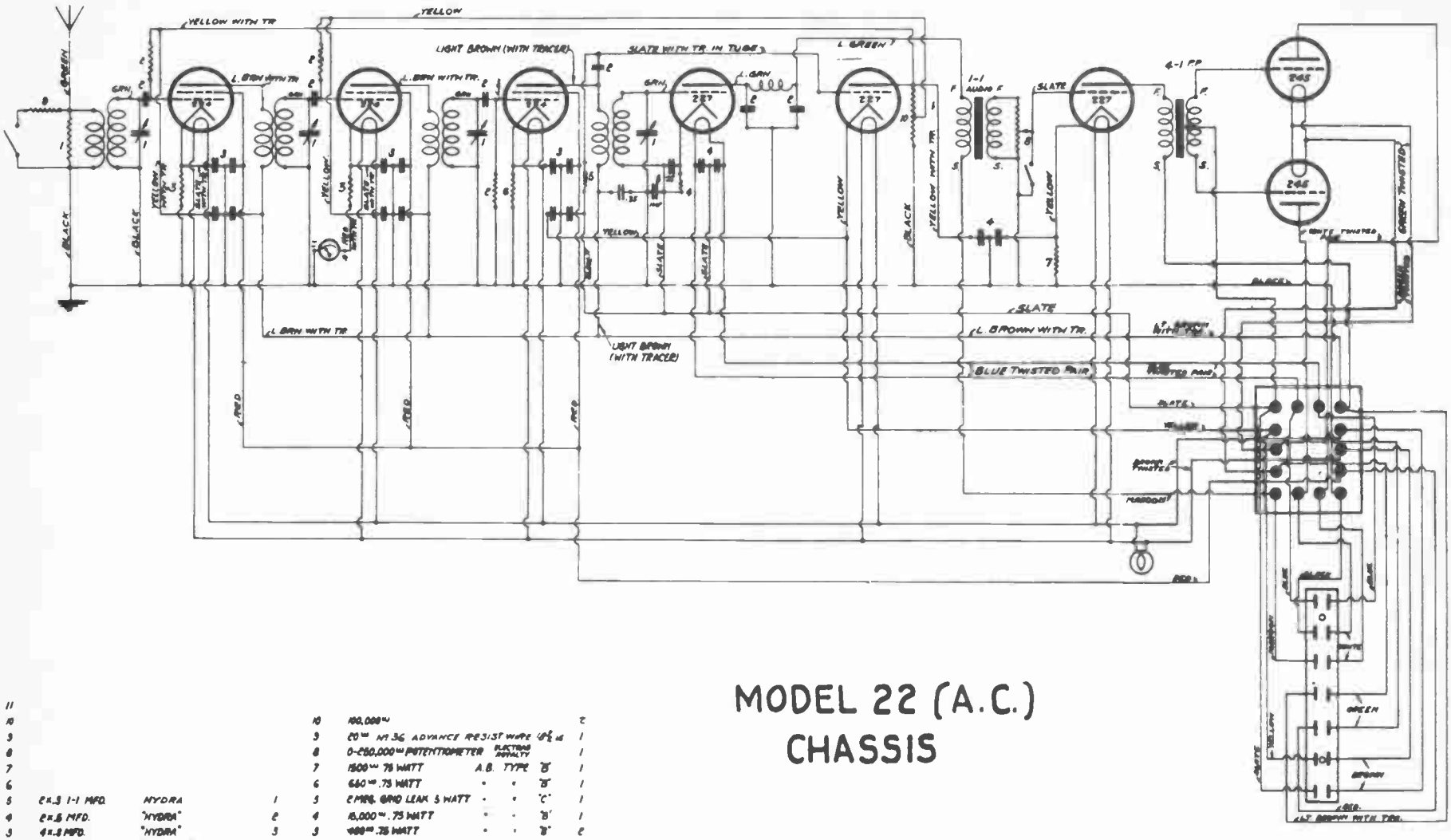
NOTE - FOR WIRING ARRANGEMENT SEE Dwg. 26742
DIAGRAM SHOWS 12 POINT RECEPTACLE & L.S. RECEPTACLE
AS SEEN WHEN LOOKING UNDER POWER UNIT

	CONDENSERS		RESISTANCES	
11		11		
10	2-1.5 MFD. "HYDRA"	10		
9		9		
8	4 MFD.	8	10,000 OHMS RESISTOR, 75 WATT, A.B., TYPE B	
7	3 MFD.	7		
6	2 MFD.	6	760 OHMS	
5	2 MFD. — 16 MFD "HYDRA"	5	60 OHMS	
4	.1 MFD.	4	25,000 OHMS	VOLTAGE DIVIDER
3	1 MFD.	3	25,000 OHMS	
2	1 MFD.	2	41,00 OHMS	
1		1	2650 OHMS	

MODEL 21 (A.C.)
POWER UNIT

CANADIAN MARCONI CO.

CANADIAN MARCONI CO.



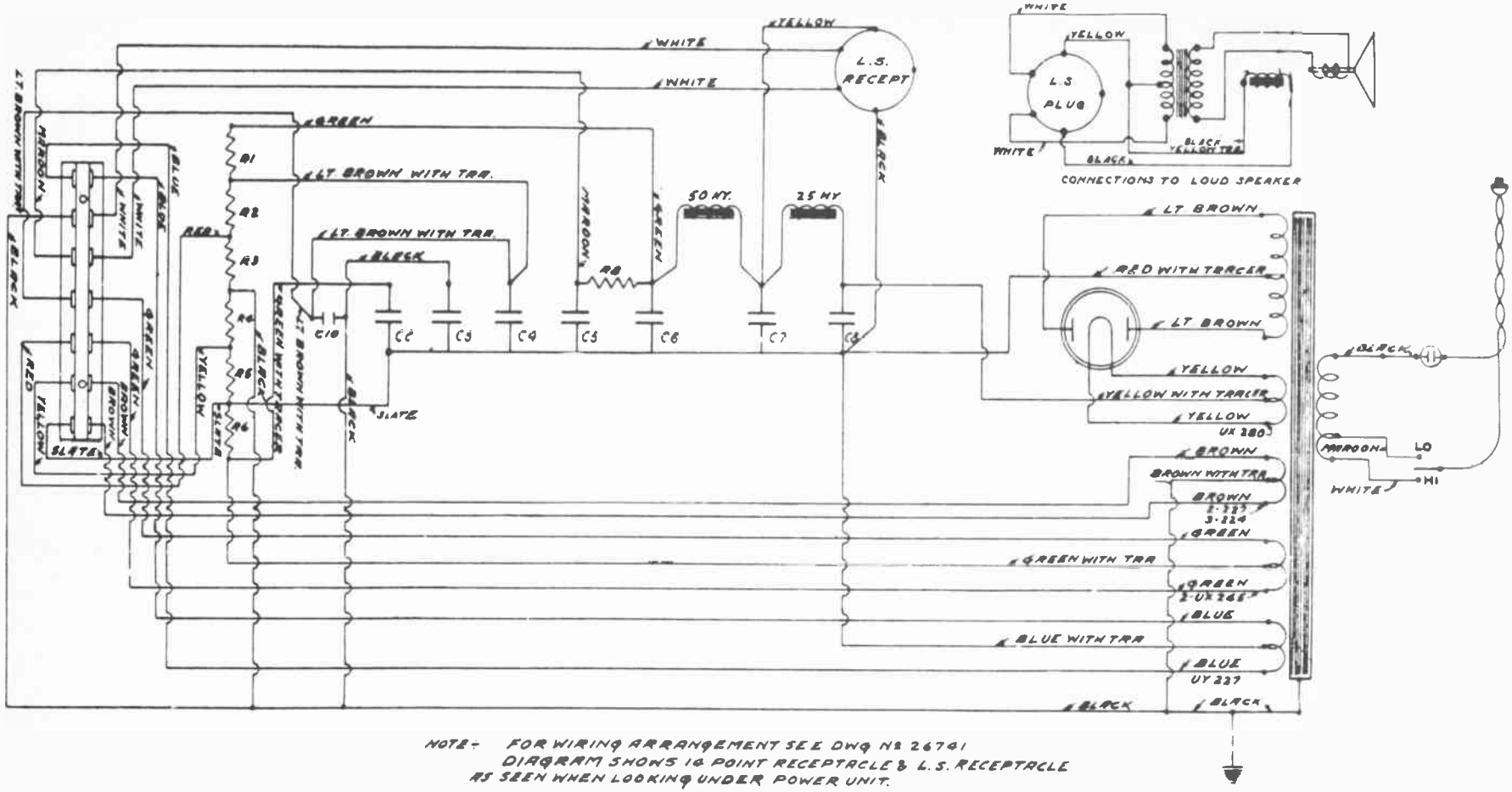
MODEL 22 (A.C.) CHASSIS

CONDENSERS

11				
10				
9				
8				
7				
6				
5	2 m.f. 1-1 MFD.	HYDRA	1	5
4	2 m.f. MFD.	"HYDRA"	2	4
3	4 m.f. MFD.	"HYDRA"	3	3
2	.0005 MFD.	"AEROVOX"	6	2
1	888M.MFD. 4 GANG	"SCOVILL"	1	1

RESISTORS

10	100,000 ohms					2
9	20 ohms NI 36 ADVANCE RESIST WIRE					1
8	0-250,000 ohms POTENTIOMETER			ELECTRAD ANALOTY		1
7	1500 ohms 75 WATT	A.B.	TYPE		"B"	1
6	660 ohms .75 WATT	"	"		"B"	1
5	2 MEG. GRID LEAK .5 WATT	"	"		"C"	1
4	15,000 ohms .75 WATT	"	"		"B"	1
3	400 ohms .75 WATT	"	"		"B"	2
2	5 MEG. GRID LEAK .5 WATT	"	"		"C"	3
1	10,000 ohms 75 WATT	"	"		"B"	1

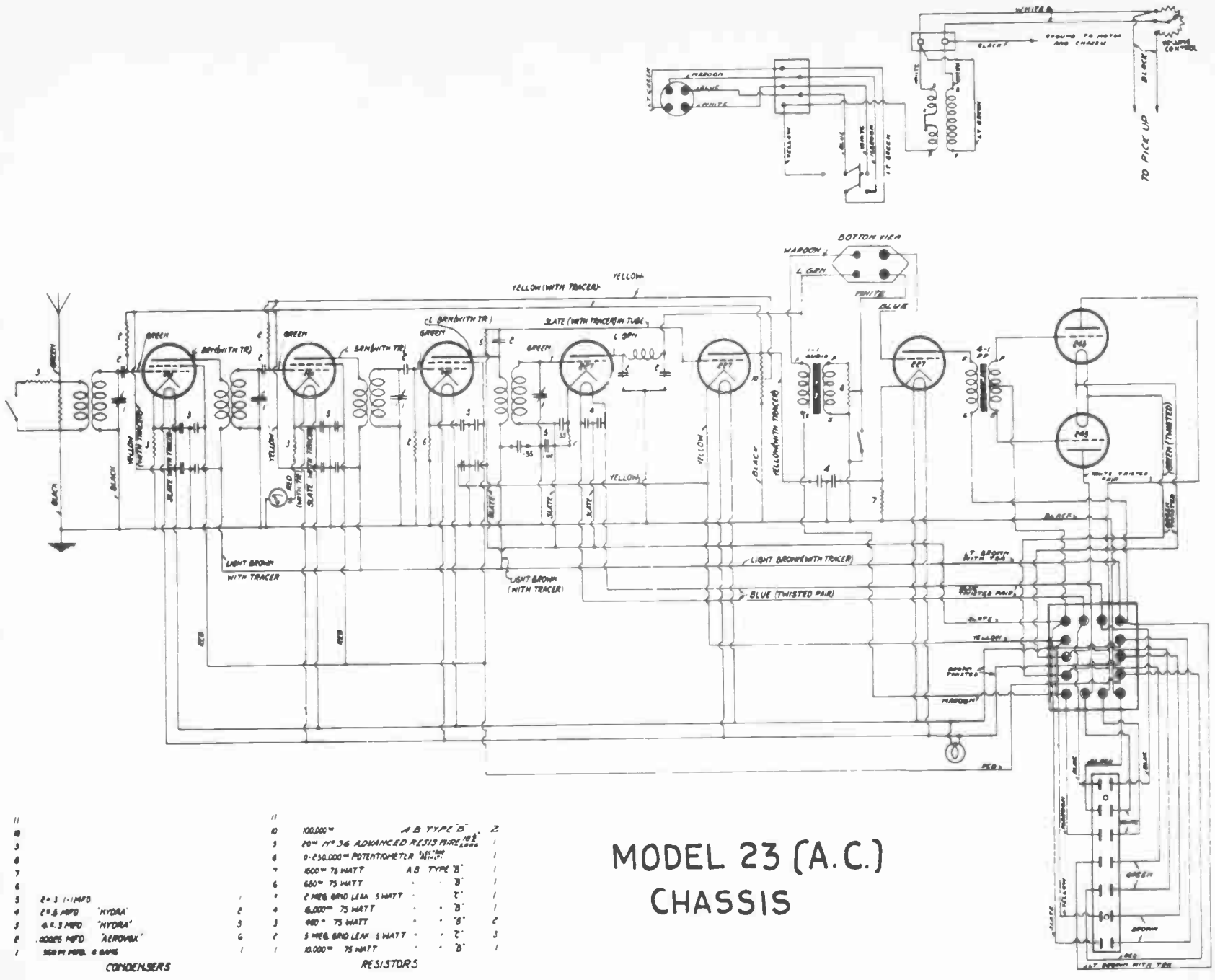


NOTE- FOR WIRING ARRANGEMENT SEE DWG Nº 26741
DIAGRAM SHOWS 16 POINT RECEPTACLE & L.S. RECEPTACLE
AS SEEN WHEN LOOKING UNDER POWER UNIT.

	CONDENSERS		RESISTANCES	
11		11		
10	1 MFD. "HYDRA"	10		
9		9		
8	6 MFD.	8	10,000 OHMS RESISTOR .75 WATT AB TYPE B.	
7	3 MFD.	7		
6	2 MFD.	6	760 OHMS	
5	2 MFD. 16 MFD. "HYDRA"	5	285 OHMS	
4	1 MFD.	4	1425 OHMS	VOLTAGE DIVIDER
3	1 MFD.	3	3500 OHMS	
2	1 MFD.	2	4550 OHMS	
1		1	1150 OHMS	

MODEL 22 (A.C.)
POWER UNIT

CANADIAN MARCONI CO.



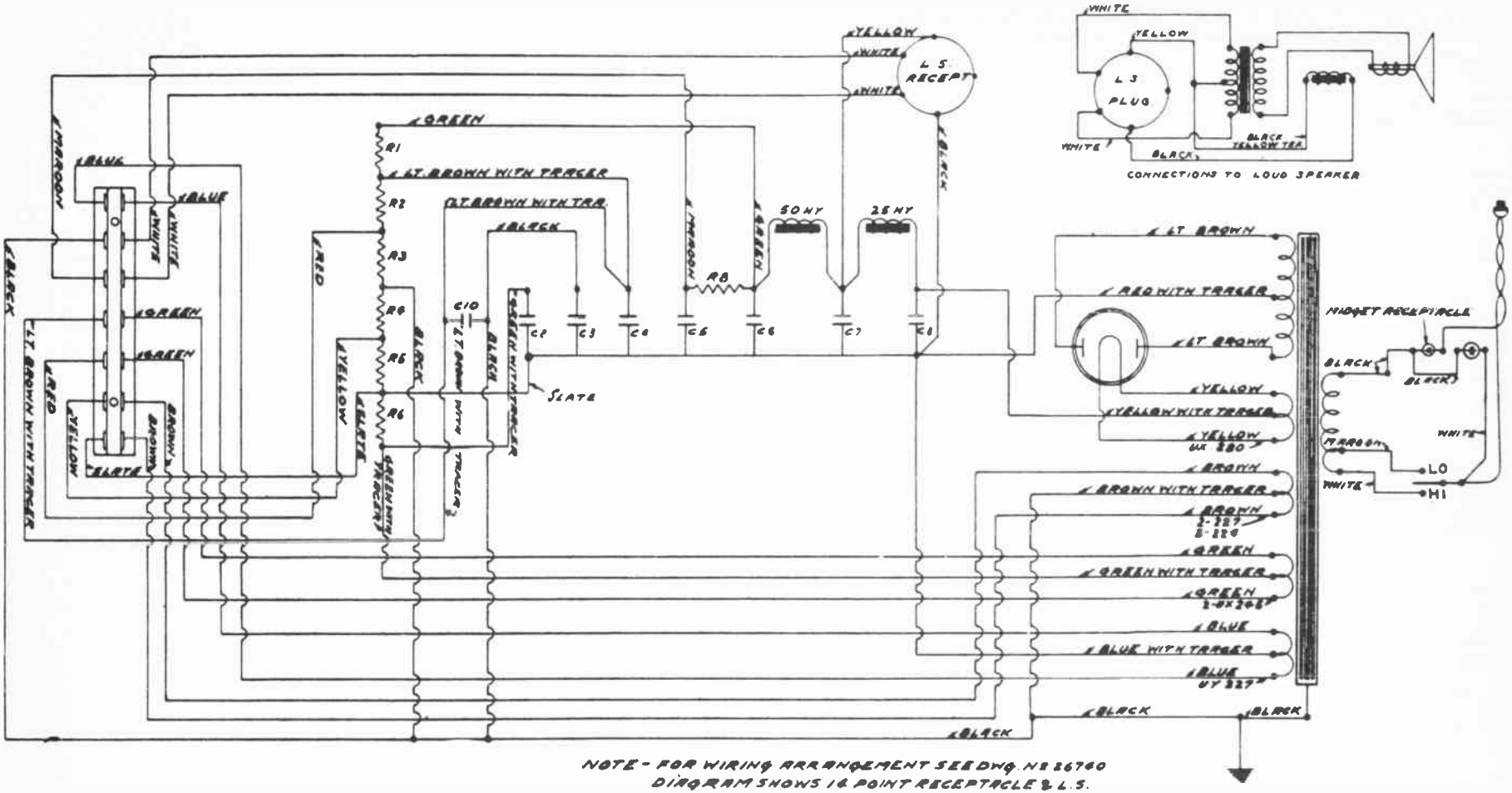
MODEL 23 (A.C.) CHASSIS

11				11			
10				10	100,000 ohms	A.B. TYPE "B"	2
9				9	50 ohms #36 ADVANCED RESIS WIRE 10%		1
8				8	0-250,000 ohms POTENTIOMETER (VOLUME CONTROL)		1
7				7	1500 ohms 7½ WATT	A.B. TYPE "B"	1
6				6	650 ohms 75 WATT	" " "B"	1
5	2 + 1 + 1 MFD			5	2 MEG. GRID LEAK 5 WATT	" " "C"	1
4	2 + 2 MFD "HYDRA"		2	4	15,000 ohms 75 WATT	" " "B"	1
3	1 + 1 + 1 MFD "HYDRA"		3	3	980 ohms 75 WATT	" " "B"	2
2	.0005 MFD "AEROVAR"		6	2	5 MEG. GRID LEAK 5 WATT	" " "C"	3
1	350 M.M. FREQ. 4 GANG		1	1	10,000 ohms 75 WATT	" " "B"	1

CONDENSERS

RESISTORS

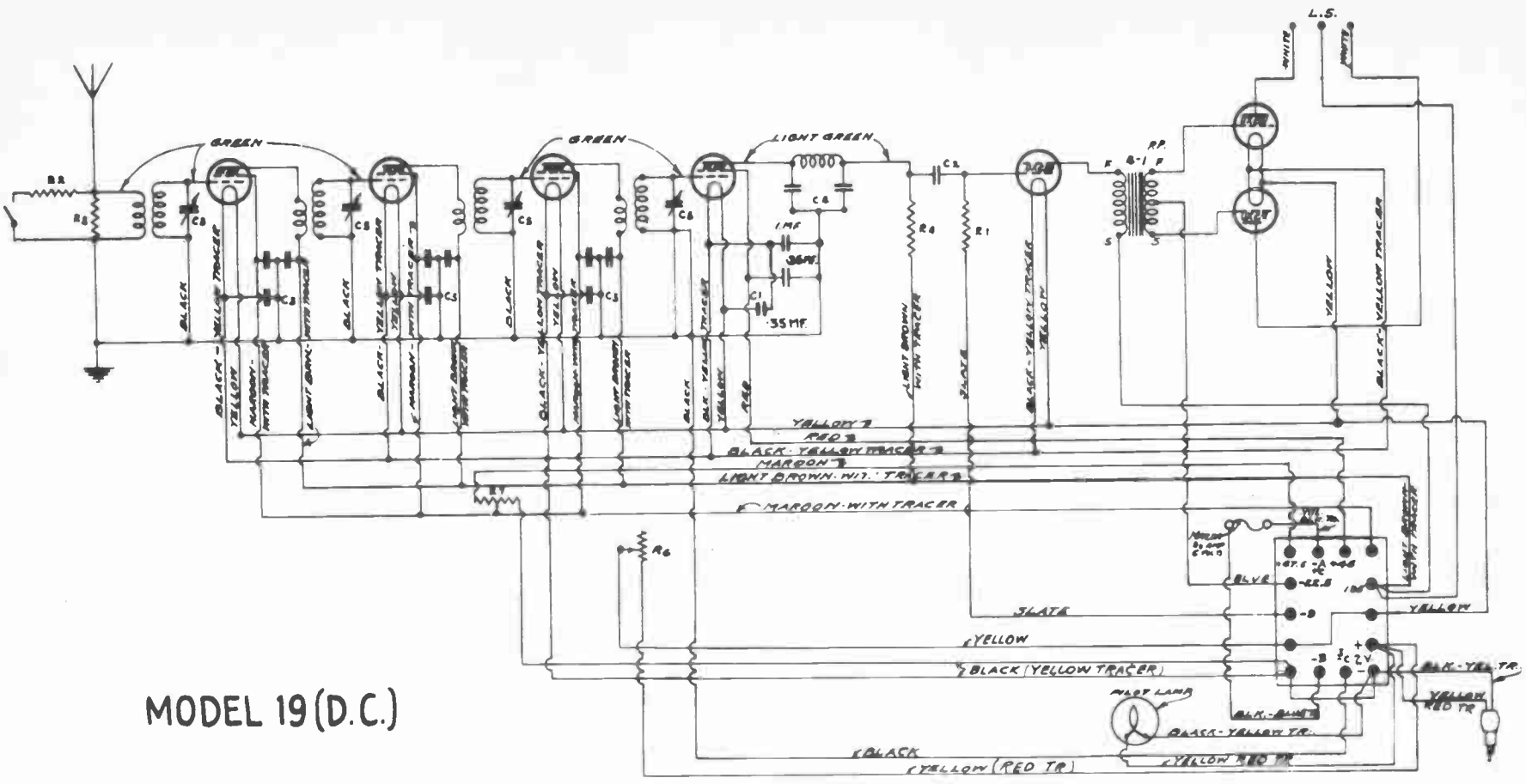
CANADIAN MARCONI CO.



NOTE - FOR WIRING ARRANGEMENT SEE DWG. NO 26760
DIAGRAM SHOWS 16 POINT RECEPTACLE & L.S.
RECEPTACLE AS SEEN WHEN LOOKING UNDER POWER UNIT

	CONDENSERS			RESISTANCES	
11			11		
10	1 MFD. "HYDRA"		10		
9			9		
8	6 MFD		8	10,000 OHMS RESISTOR. 75 WATT R.B. TYPE	
7	3 MFD.		7		
6	2 MFD.		6	760 OHMS	
5	2 MFD.	16 MFD. "HYDRA"	5	286 OHMS	
4	1 MFD.		4	1026 OHMS	VOLTAGE DIVIDER
3	1 MFD.		3	3500 OHMS	
2	1 MFD.		2	4560 OHMS	
1			1	1150 OHMS	

MODEL 23 (A.C.)
POWER UNIT

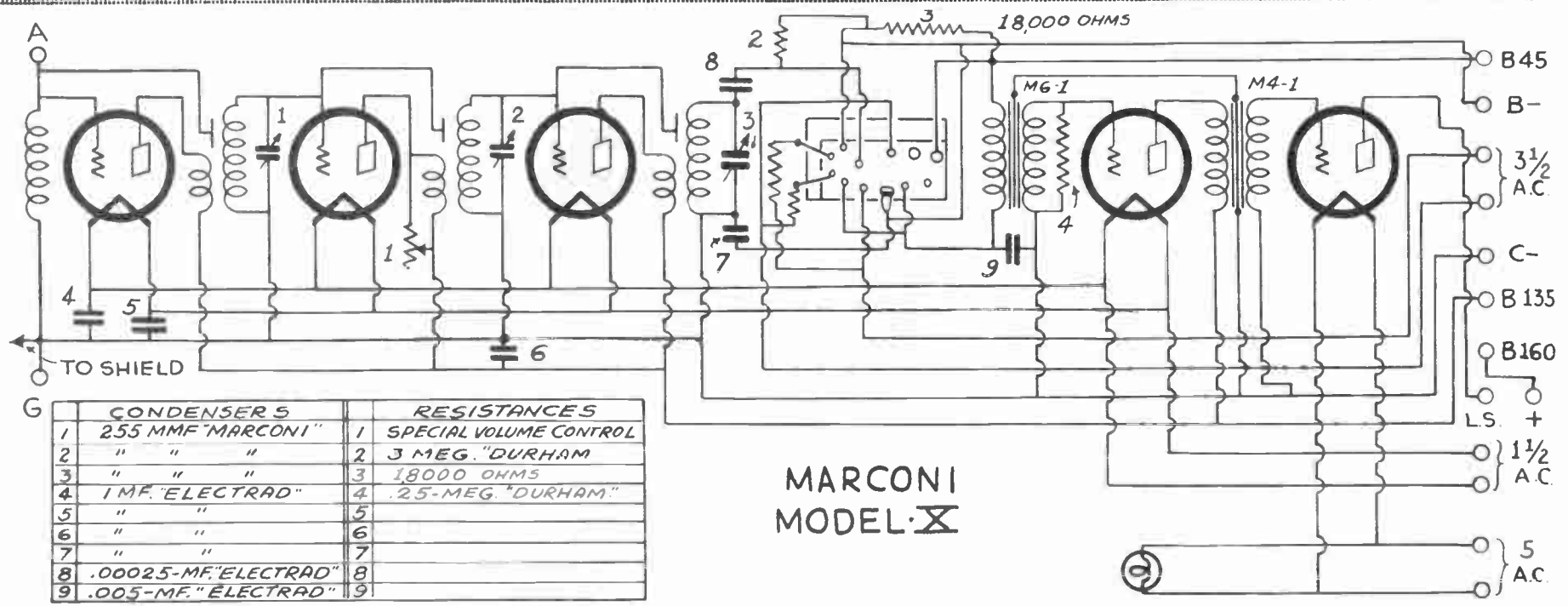


MODEL 19 (D.C.)

CANADIAN MARCONI CO.

7			7	30,000ᵐ POTENTIOMETER ELECTRAD SUPERTONATROL		1
6			6	2ᵐ RHEOSTAT FROST		1
5	360 M MFD 4 GANG CONDENSER SCOVILL	1	5			
4	.00025 CONDENSER AEROVOX	2	4	100.000ᵐ RESISTOR ⅓ WATT A-B TYPE B		1
3	3x.3 MFD "HYDRA"	3	3	10,000ᵐ RESISTOR A-B TYPE B		1
2	.02 MFD "AEROVOX"	1	2	5ᵐ RESISTOR. N°30 Ge. ADVANCE RESIST. WIRE 20½ LG		1
1	.35MF.-1MF. SPECIAL. HYDRA	1	1	2 MEG. ½ WATT RESISTOR A-B TYPE C		1
CONDENSERS			RESISTORS			

CANADIAN MARCONI CO, LTD.

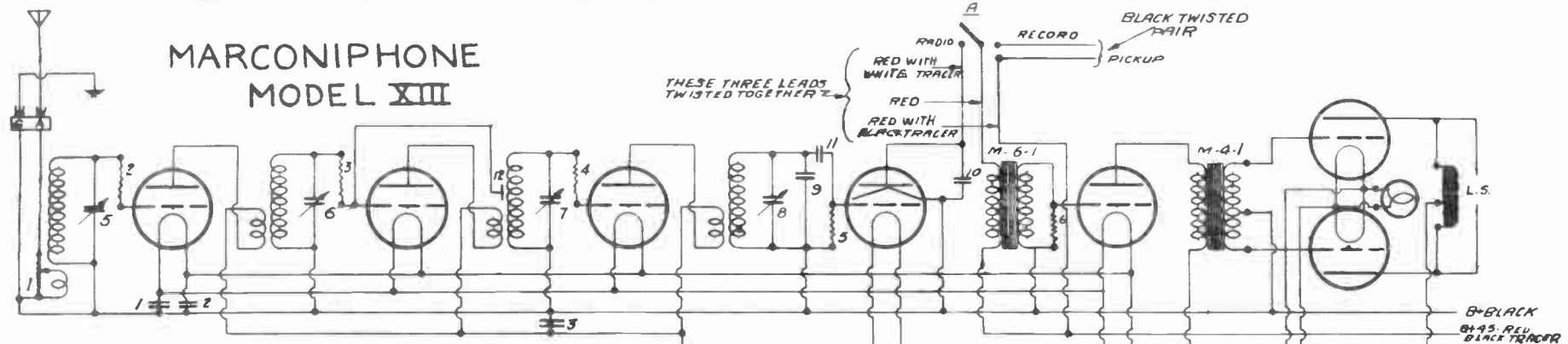


G

	CONDENSERS		RESISTANCES
1	255 MMF "MARCONI"	1	SPECIAL VOLUME CONTROL
2	" " "	2	3 MEG. "DURHAM
3	" " "	3	18000 OHMS
4	1 MF. "ELECTRAD"	4	.25-MEG. "DURHAM"
5	" "	5	
6	" "	6	
7	" "	7	
8	.00025-MF. "ELECTRAD"	8	
9	.005-MF. "ELECTRAD"	9	

MARCONI MODEL X

MARCONIPHONE MODEL XIII

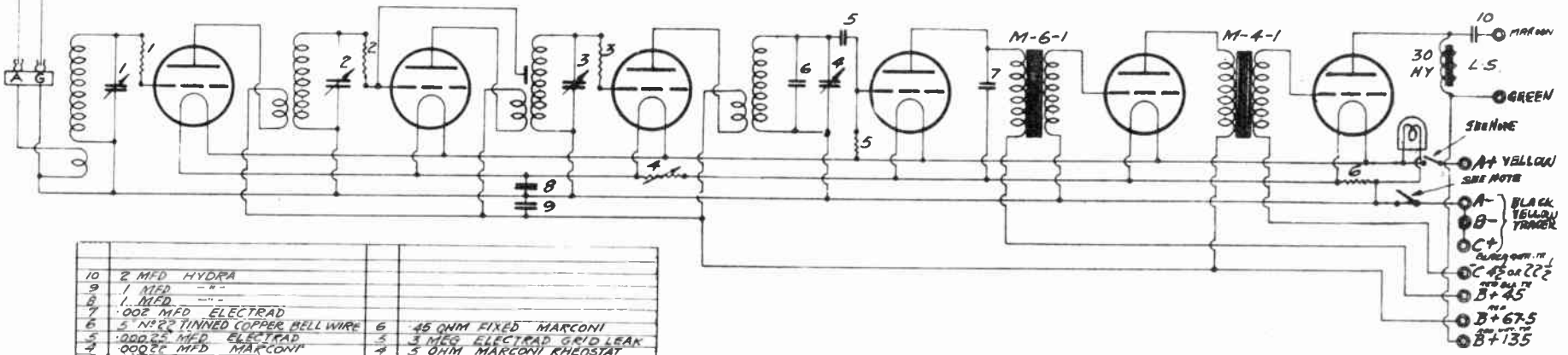


	CONDENSERS
12	BALANCE CONDENSER
11	.0005 ELECTRAD
10	.002 "
9	5' Nº22 TINNED COPPER BELL WIRE
8	.0002 MARCONI
7	" "
6	" "
5	" "
4	
3	1 MFD HYDRA
2	" "
1	" "

A	M & H SPOT SWITCH * E1172
6	0.5 MEG ELECTRAD GRID LEAK
5	3 MEG ELECTRAD GRID LEAK
4	1000 OHM FIXED MARCONI
3	" " " "
2	" " " "
1	2000 OHM MARCONI POTENTIOMETER
	RESISTANCES

NOTE - WIRE SIZES & COLOR REFER TO POWER UNIT CABLES ONLY

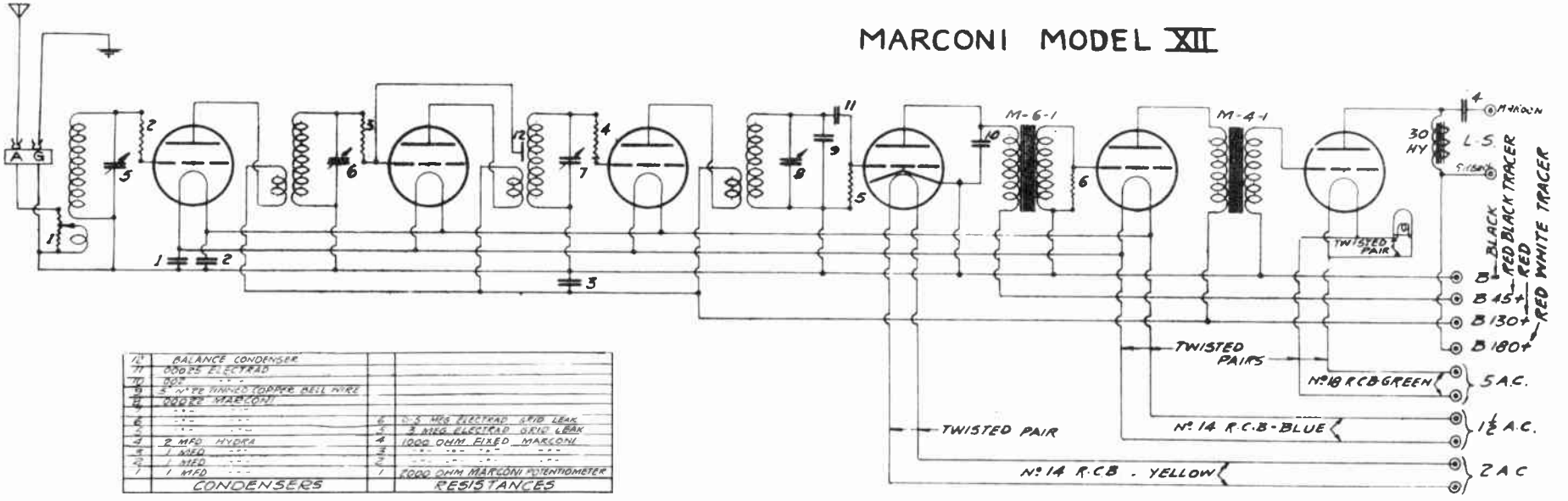
MARCONI MODEL XI



10	2 MFD HYDRA	6	45 OHM FIXED MARCONI
9	1 MFD "	5	3 MEG ELECTRAD GRID LEAK
8	1 MFD "	4	5 OHM MARCONI RHEOSTAT
7	.002 MFD ELECTRAD	3	675 OHM FIXED MARCONI
6	5 N°22 TINNED COPPER BELL WIRE	2	" " " "
5	.00025 MFD ELECTRAD	1	" " " "
4	.0002 MFD MARCONI		
3	" " " "		
2	" " " "		
1	" " " "		
	CONDENSERS		RESISTANCES

NOTE
FILAMENT SWITCH IN + LEAD FOR CONSOLE MODEL
do do IN - do TABLE do

MARCONI MODEL XII



12	BALANCE CONDENSER		
11	.00025 ELECTRAD		
10	.002 " "		
9	5 N°22 TINNED COPPER BELL WIRE		
8	.0002 MARCONI		
7	" " " "		
6	" " " "	6	5 MEG ELECTRAD GRID LEAK
5	" " " "	5	3 MEG ELECTRAD GRID LEAK
4	2 MFD HYDRA	4	1000 OHM FIXED MARCONI
3	1 MFD "	3	" " " "
2	1 MFD "	2	" " " "
1	1 MFD "	1	2000 OHM MARCONI POTENTIOMETER
	CONDENSERS		RESISTANCES

NOTE: WIRE SIZES & COLOR REFER TO POWER UNIT CABLES ONLY

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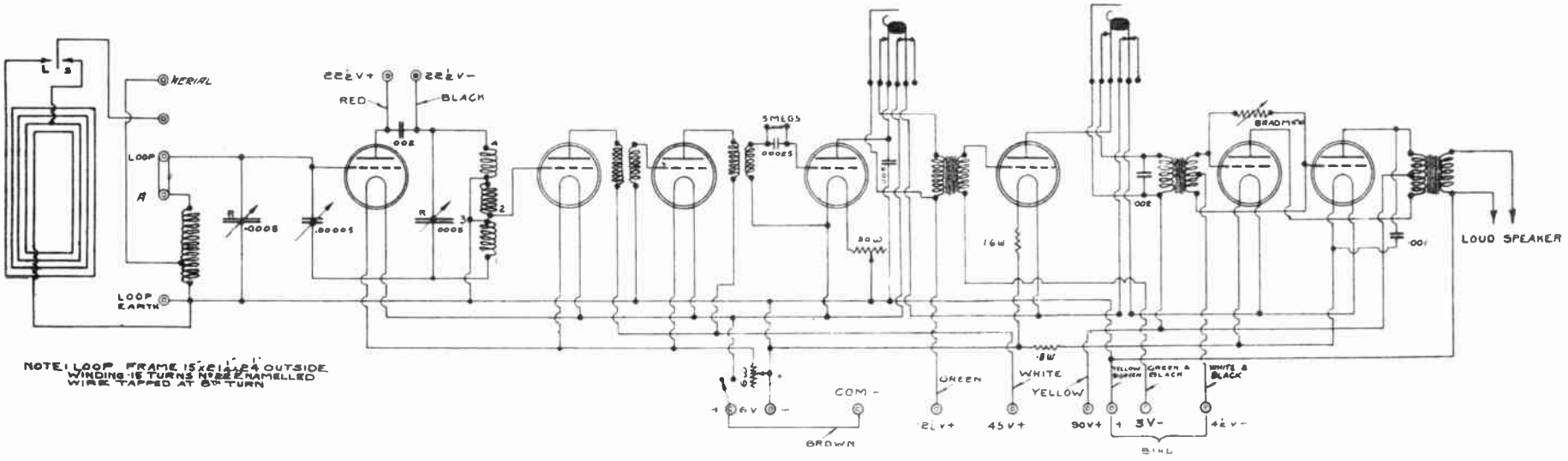
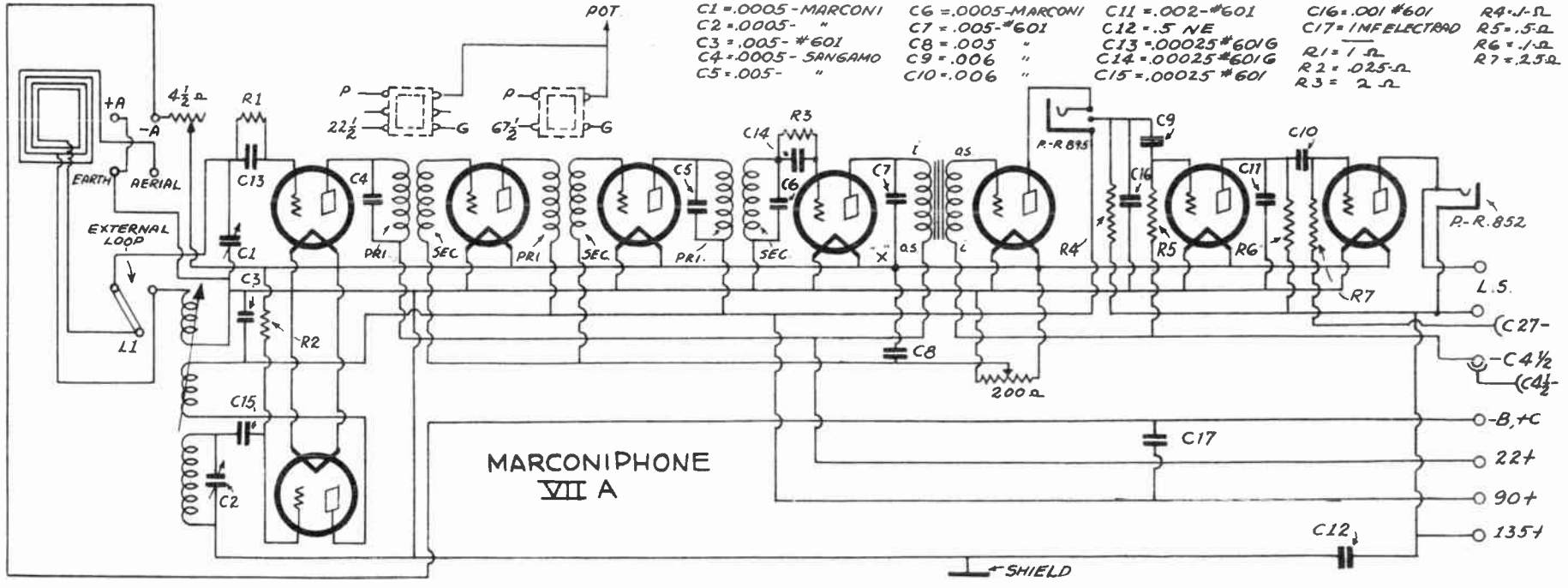


MARCONIPHONE V

C1 = .0005 - MARCONI
C2 = .0005 - "
C3 = .005 - #601
C4 = .0005 - SANGAMO
C5 = .005 - "
C6 = .0005 - MARCONI
C7 = .005 - #601
C8 = .005 "
C9 = .006 "
C10 = .006 "
C11 = .002 - #601
C12 = .5 NE
C13 = .00025 #601G
C14 = .00025 #601G
C15 = .00025 #601
C16 = .001 #601
C17 = 1MF ELECTRAD
R1 = 1 Ω
R2 = .025 Ω
R3 = 2 Ω
R4 = .1 Ω
R5 = .5 Ω
R6 = .1 Ω
R7 = .25 Ω



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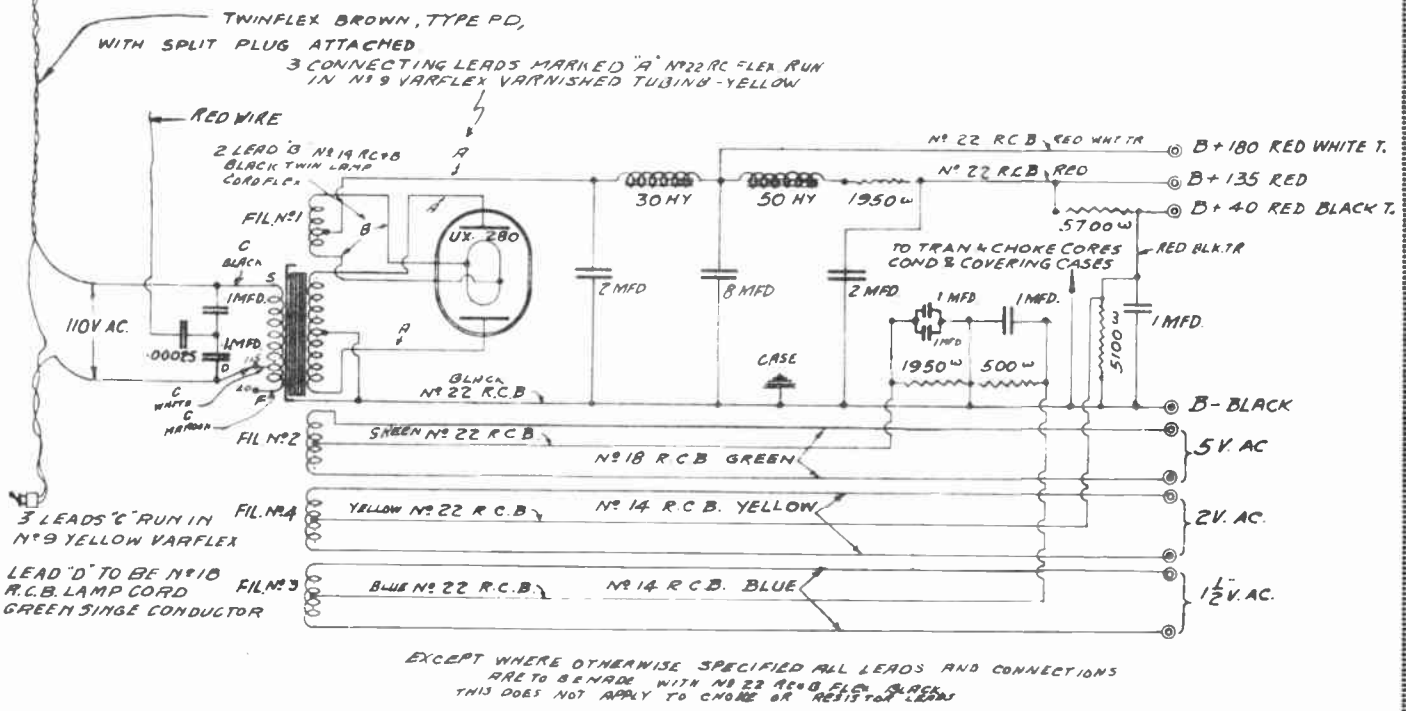
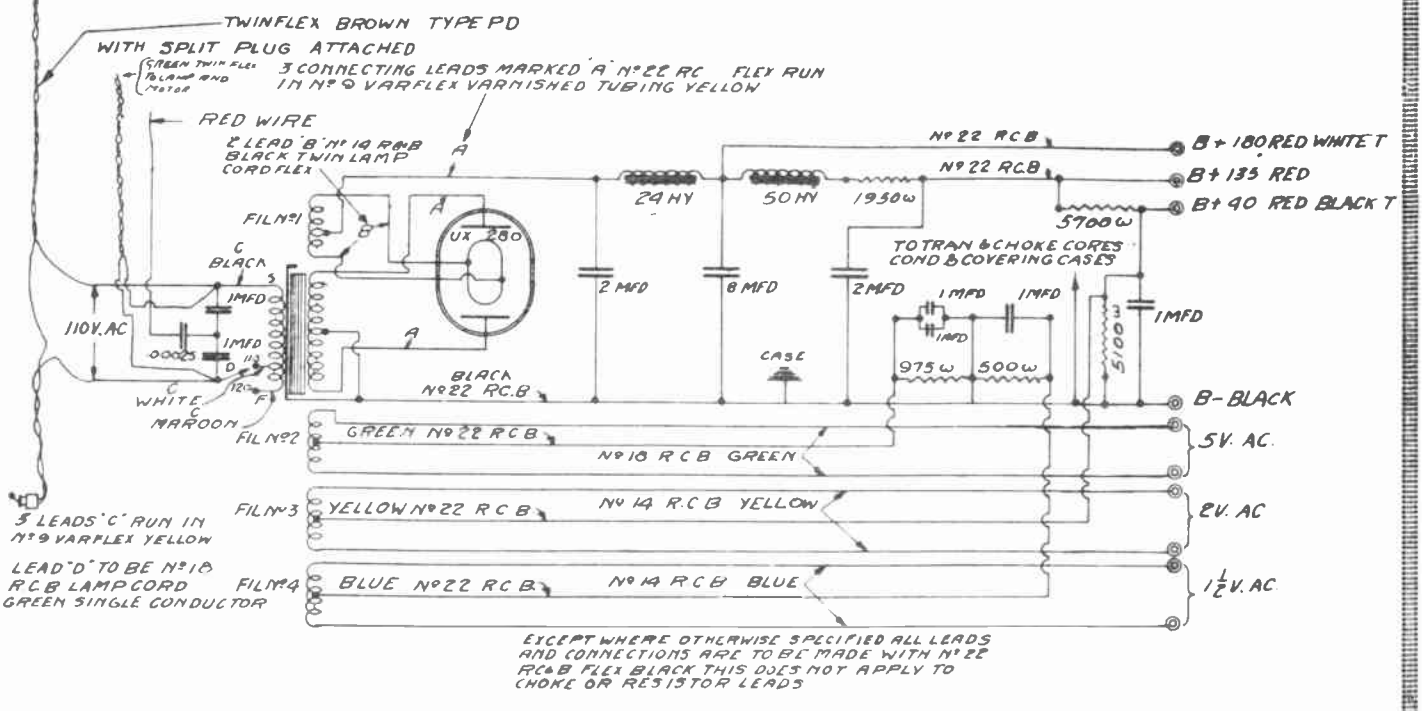
MARCONI MODEL XII POWER UNIT



EXCEPT WHERE OTHERWISE SPECIFIED ALL LEADS AND CONNECTIONS ARE TO BE MADE WITH Nº 22 RC&B FLEX BLACK THIS DOES NOT APPLY TO CHOKE OR RESISTOR LEADS

MARCONI MODEL XIII POWER UNIT



EXCEPT WHERE OTHERWISE SPECIFIED ALL LEADS AND CONNECTIONS ARE TO BE MADE WITH Nº 22 RC&B FLEX BLACK THIS DOES NOT APPLY TO CHOKE OR RESISTOR LEADS

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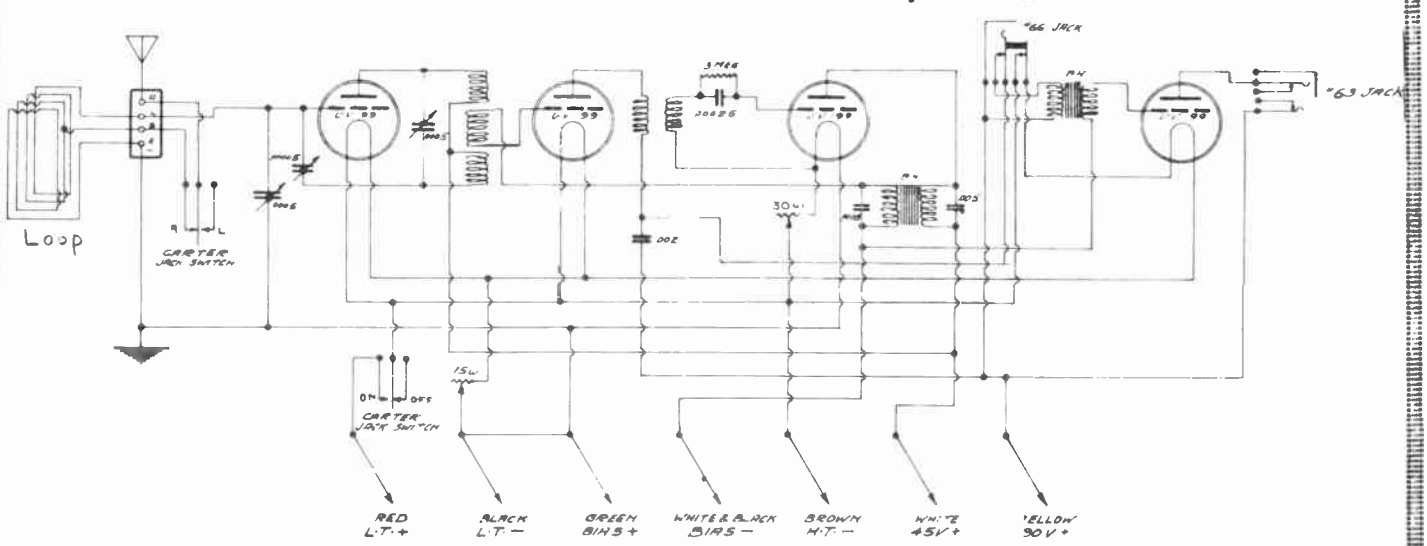
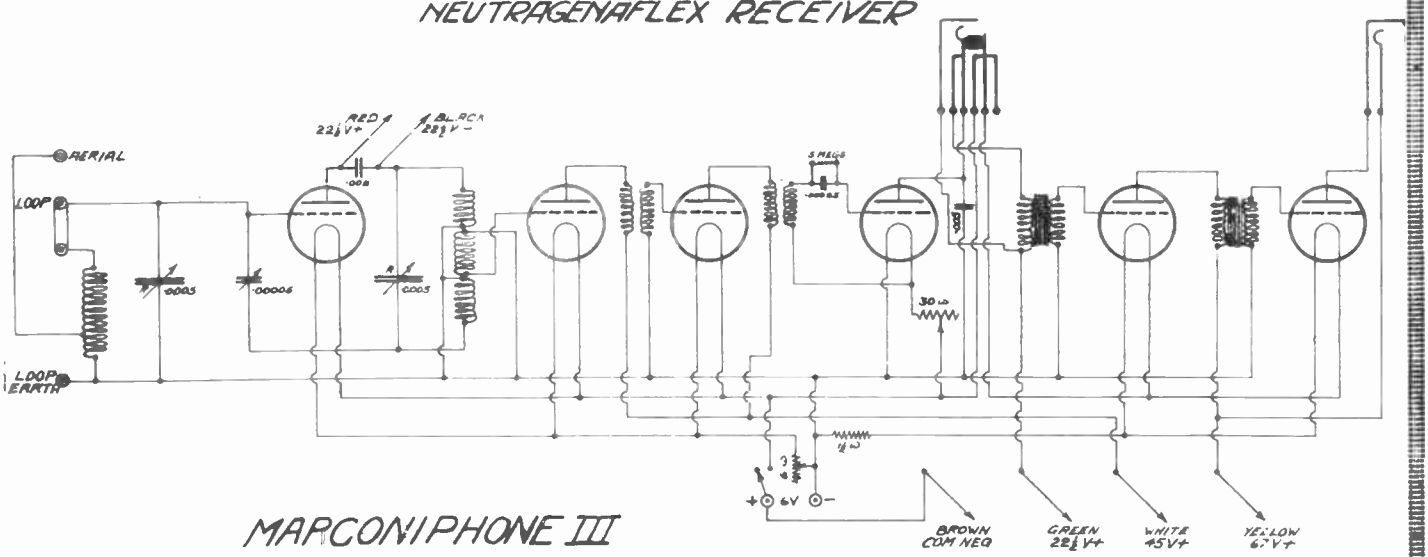


MODEL IV

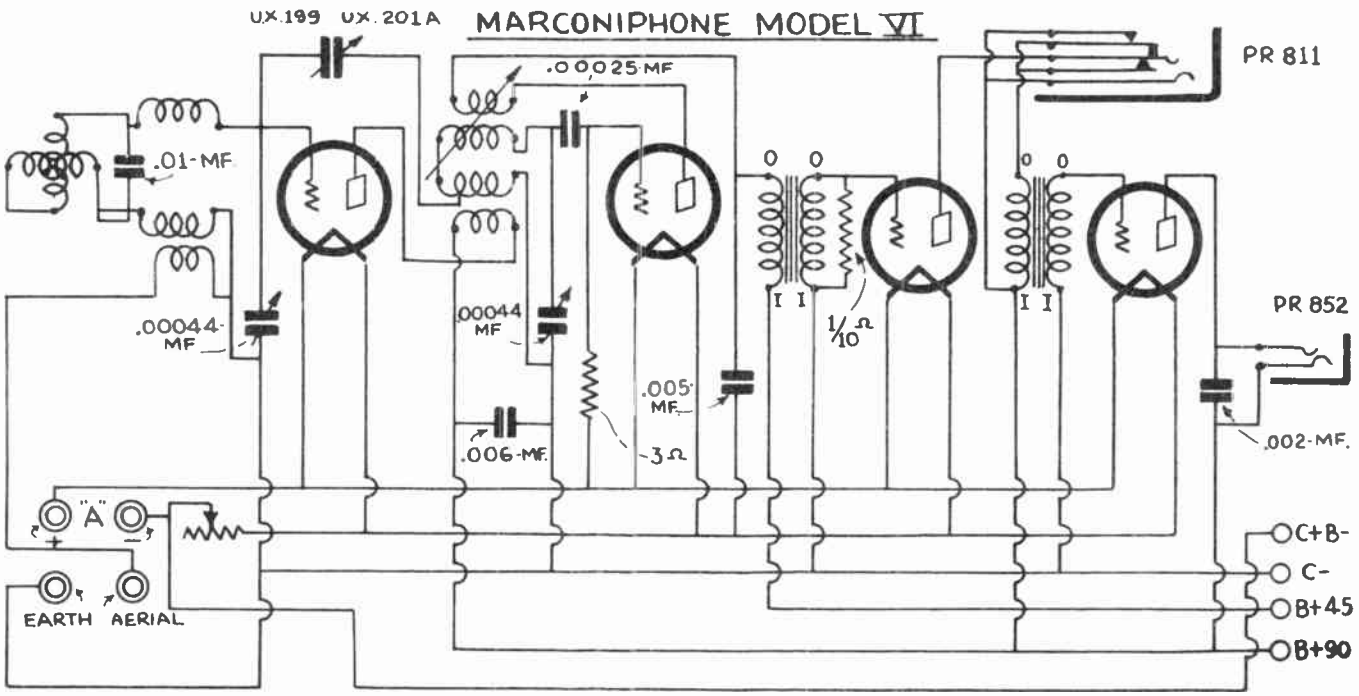
NEUTRAGENAFLEX RECEIVER



MARCONIPHONE III

UX.199 UX.201A

MARCONIPHONE MODEL VI



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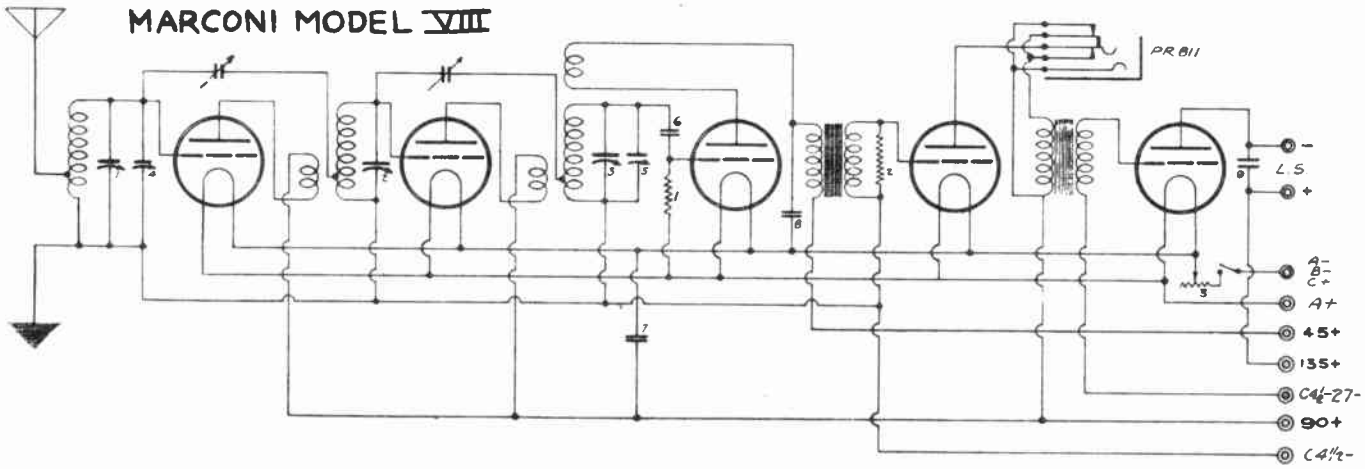
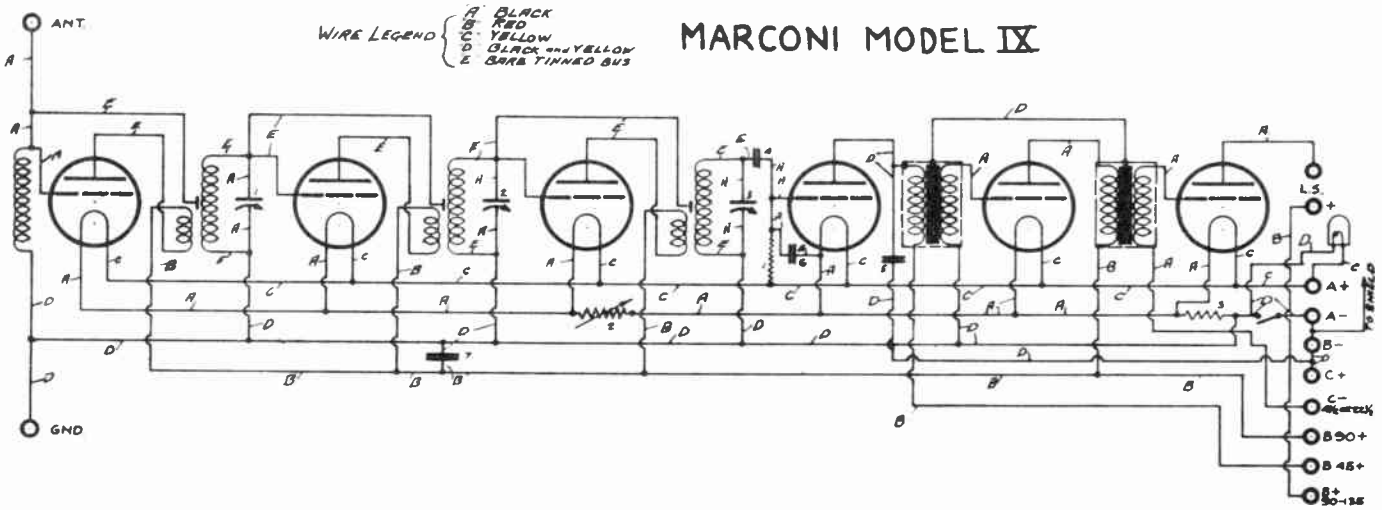
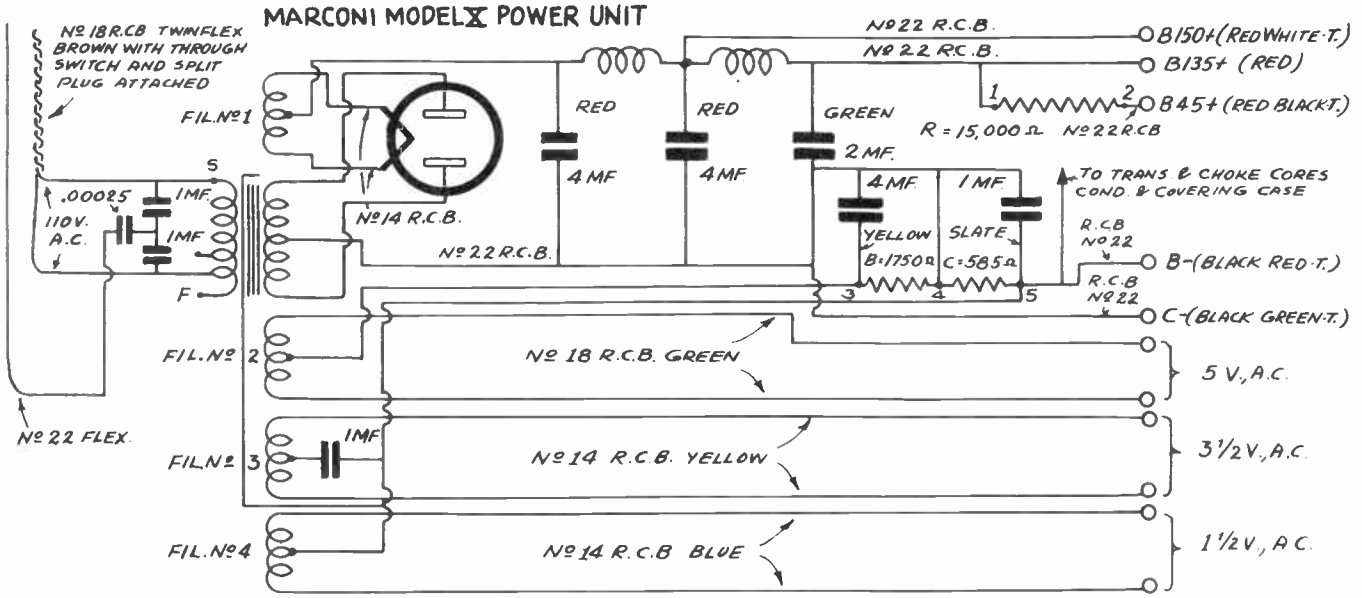
MARCONI MODEL VIII



MARCONI MODEL IX



MARCONI MODEL X POWER UNIT



	CONDENSERS		RESISTANCES
1	440 MMF MARCONI	1	3 MEG 'DURHAM'
2	220 MMF "	2	5 MEG "
3	220 MMF "	3	20 OHMS 'MARCONI'
4	30 MMF "	4	
5	30 MMF "	5	MODEL VIII
6	.00025 MFD 'SPLITDORF'		
7	.1 MFD " "		
8	.005 MFD 'SPLITDORF'		
9	.002 MFD "		
10			

	CONDENSERS		RESISTANCES
1	255 MMF 'MARCONI'	1	3 MEG 'DURHAM'
2	" " "	2	5 OHMS 'MARCONI'
3	" "	3	.45 " " "
4	.0025 MFD 'ELECTRAD'	4	
5	.005 " " "	5	
6	COMPENSATING 'MARCONI'		MODEL IX
7	1 MFD 'TOBE'		
8			
9			

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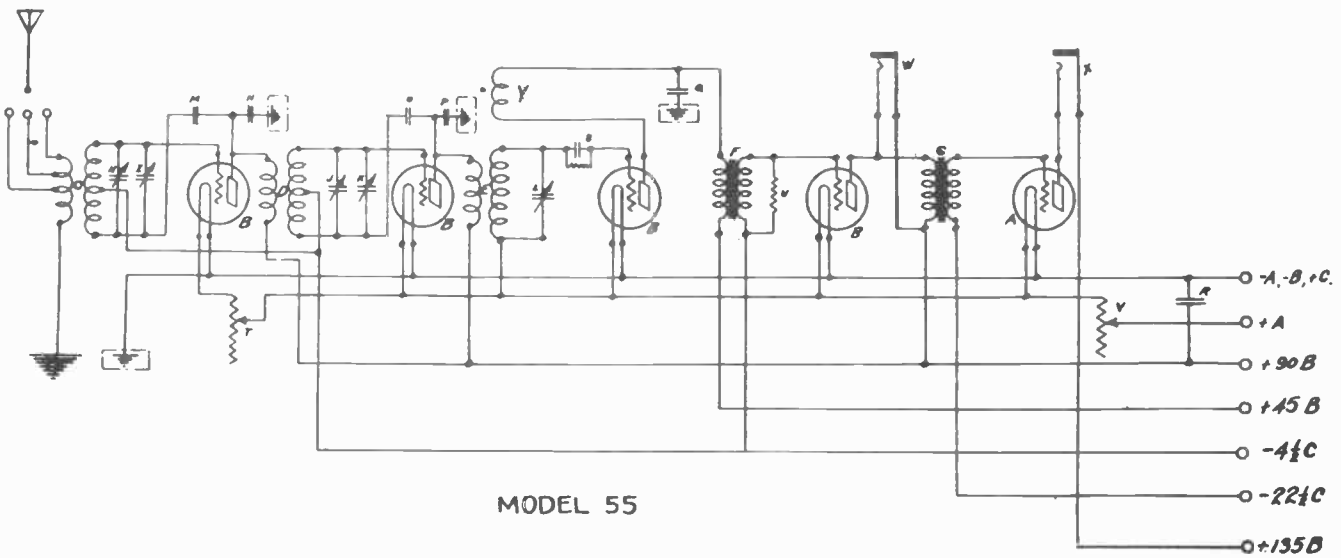

MODEL 55

PARTS

A Radiotrons UX120.
B Radiotrons UX199.
C Antenna Coil Assembly.
D First Stage R.F. Transformer Assembly.
E Second Stage R.F. Transformer Assembly.
F First Stage Audio Transformer.
G Second Stage Audio Transformer.
H J and L Gang Condensers.
I First Stage Vernier Condenser.
K Second Stage Vernier Condenser.
M First R.F. Stage Neutralizing Condenser.
N First R.F. Stage Compensating Condenser.
O Second R.F. Stage Neutralizing Condenser.
P Second R.F. Stage Compensating Condenser.
Q Phone Condenser.
R By Pass Condenser.
S Grid Leak and Condenser.
T Volume Control.
U Audio Resistor.
V Battery Setting Control.
W Phone Jack.
X Loud Speaker Jack.
Y Tickler Coil.

−A−B+C Green, Yellow and Red.
+A Yellow.
+90B Maroon and Red.
+45B (or +22½B) Maroon.
−4½C Black and Green Bands.
−22½C Black with Green Tracer.
+135B Red.

WIRING DIAGRAMS OF W55A, W57, W60, W58

Wiring Diagrams of W55A and W60 are similar to that of W55 with necessary modifications for use with UX201A and UX201B Radiotrons respectively.

Wiring Diagram of W57 is similar to that of W55 with necessary modifications for use with 201A or 201B tubes, for use of a fixed tickler coil controlled by a shunt resistance and with phone and loud speaker jacks omitted.

Wiring Diagram of W58 Chassis is similar to W55 diagram with necessary modifications for use with A.C. Radiotrons.

Wiring Diagram of W58 Power Unit is identical with that of Socket Power Unit No. 18 as used with Westinghouse Six Tube Batteryless Sets.

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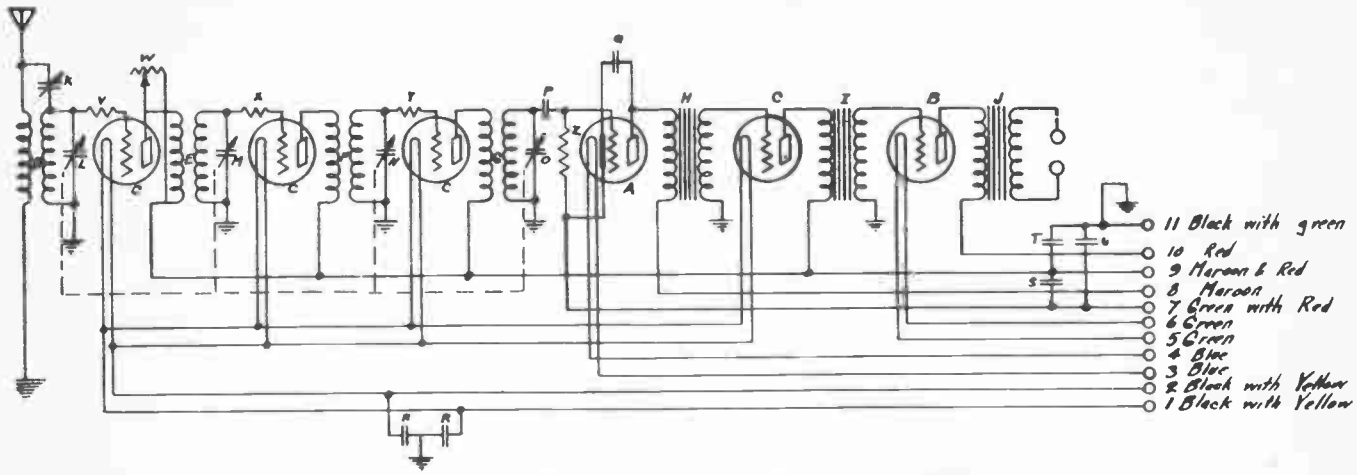
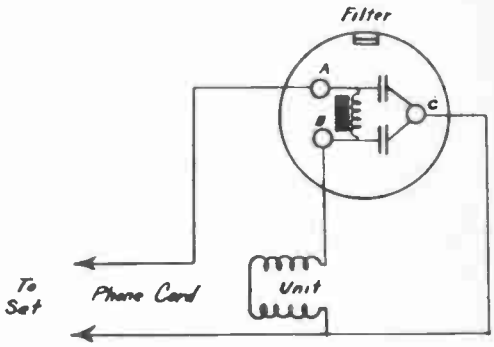
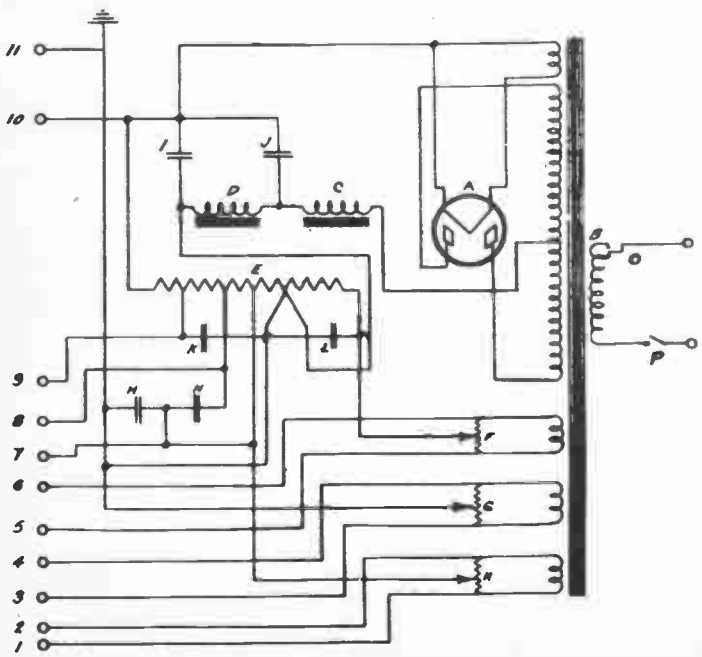


WESTINGHOUSE SIX TUBE A. C. CHASSIS 1928 MODEL AND 200B LOUDSPEAKER

PARTS

A—Radiotron UY227.
B—Radiotron UX171A
C—Radiotron UX226.
D—Antenna Coil Assembly.
E, F, and G—First, Second and Third R.F. Transformer Assembly.
H and I— Audio Transformer Assembly.
J—Output Transformer.
K—Selectivity Control.
L, M, N, and O—Four Gang Condenser.
P—Grid Condenser.
Q—Phone Condenser.
R—By Pass Condenser (tapped).
S and T—By Pass Condenser (tapped).
U—By Pass Condenser.
V—First R.F. Stage Grid Resistor.
W—Volume Control.
X—Second R.F. Stage Grid Resistor.
Y—Third R.F. Stage Grid Resistor.
Z—Grid Leak.





SOCKET POWER UNIT No. 18 WIRING DIAGRAM

PARTS

A—Rectron UX280.
B—Line Transformer.
C and D—Filter Choke Assembly.
E—Voltage Dividing Resistor.
F—Potentiometer.
G—Potentiometer.
H—Potentiometer.
I, J, K, L, M, and N—Filter Condenser Assembly.
O—Line Voltage Compensating Switch.
P—Line Switch.

TERMINALS

1 and 2	—Black and Yellow	1.5 Volts A.C.
3 and 4	—Blue.	2.5 Volts A.C.
5 and 6	—Green.	5.0 Volts A.C.
7	—Green and Red.	—B
8	—Maroon	+45 Volts Detector.
9	—Maroon and Red	+135 Volt Amplifier.
10	—Red.	+B Power Amplifier.
11	—Black and Green	- 9C and Ground.

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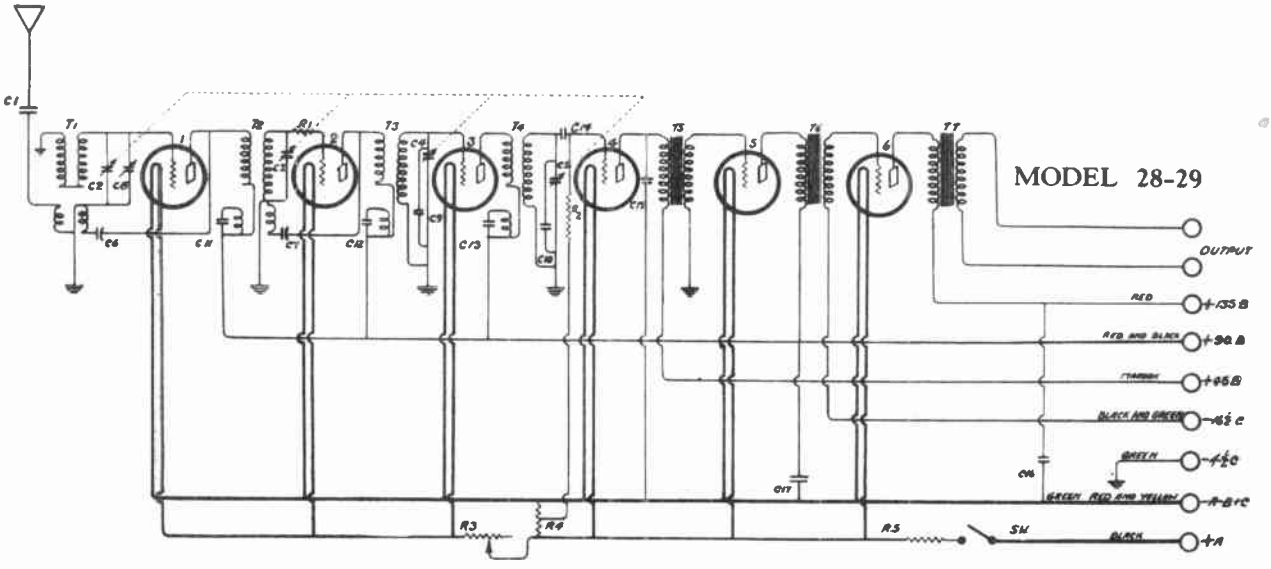
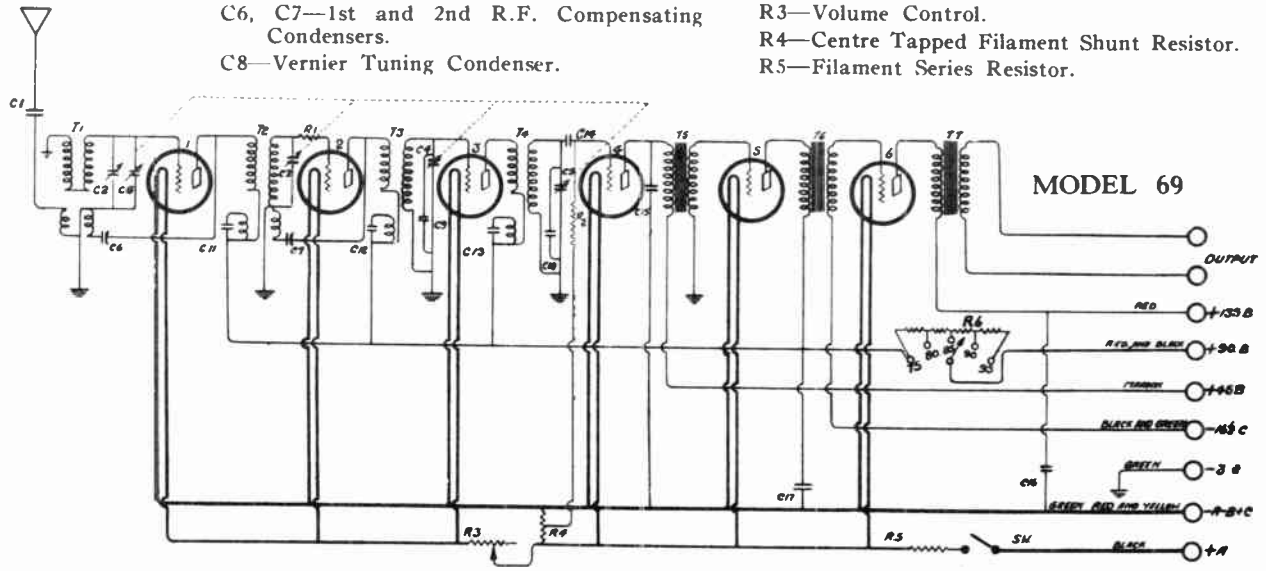


S.W.—Operating Switch.
T1—Antenna R.F. Transformer.
T2—1st R.F. Stage Transformer.
T3—2nd R.F. Stage Transformer.
T4—3rd R.F. Stage Transformer.
T5—1st Audio Transformer.
T6—2nd Audio Transformer.
T7—Output Transformer.
C1—Antenna Series Condenser (Marked III; m.m.f.).
C2, C3, C4, and C5—Four Gang Condenser.
C6, C7—1st and 2nd R.F. Compensating Condensers.
C8—Vernier Tuning Condenser.
C9, C10—Gang Condenser Trimming Capacities.
C11—Fixed Condenser (Marked III; 160m.m.f.
C12—Fixed Condenser (Marked IIII; 320 m.m.f.).
C13—Fixed Condenser (Marked IIIII; 880 m.m.f.).
C14—Grid Condenser (Marked III; 160m.m.f.).
C15—Phone Condenser (Marked IIIIII; 1200 m.m.f.).
C16, C17—By-Pass Condensers (.5 m.f.d.).
R1—Grid Resistor (800 ohms.).
R2—Grid Leak (Red.; 4 meg.).
R3—Volume Control.
R4—Centre Tapped Filament Shunt Resistor.
R5—Filament Series Resistor.



S.W —Operating Switch.
T1—Antenna R.F. Transformer.
T2—1st R.F. Stage Transformer.
T3—2nd R.F. Stage Transformer.
T4—3rd R.F. Stage Transformer.
T5—1st Audio Transformer.
T6—2nd Audio Transformer.
T7—Output Transformer.
C1—Antenna Series Condenser (Marked III; 160 m.m.f.).
C2, C3, C4 and C5—Four Gang Condenser.
C6, C7—1st and 2nd R.F. Compensating Condensers.
C8—Vernier Tuning Condenser.
C9, C19—Gang Condenser Trimming Capacities.
C11—Fixed Condenser (Marked III; 160m.m.f.
C12—Fixed Condenser (Marked IIII; 320 m.m.f.).
C13—Fixed Condenser (Marked IIIII; 480 m.m.f.).
C14—Grid Condenser (Marked III; 160m.m.f.)
C15—Phone Condenser (Marked IIIIII; 1200 m.m.f.).
C16, C17—By-Pass Condensers (.5 m.f.d.).
R1—Grid Resistor (800 ohms.).
R2—Grid Leak (Red.; 4 meg.).
R3—Volume Control.
R4—Centre Tapped Filament Shunt Resistor.
R5—Filament Series Resistor.
R6—Battery Voltage Compensating Resistor.

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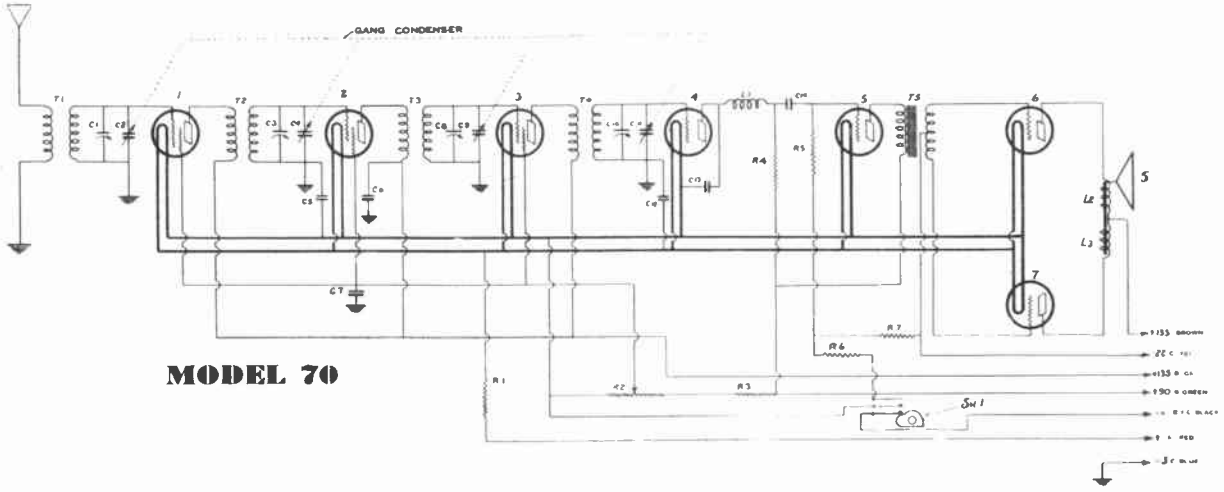

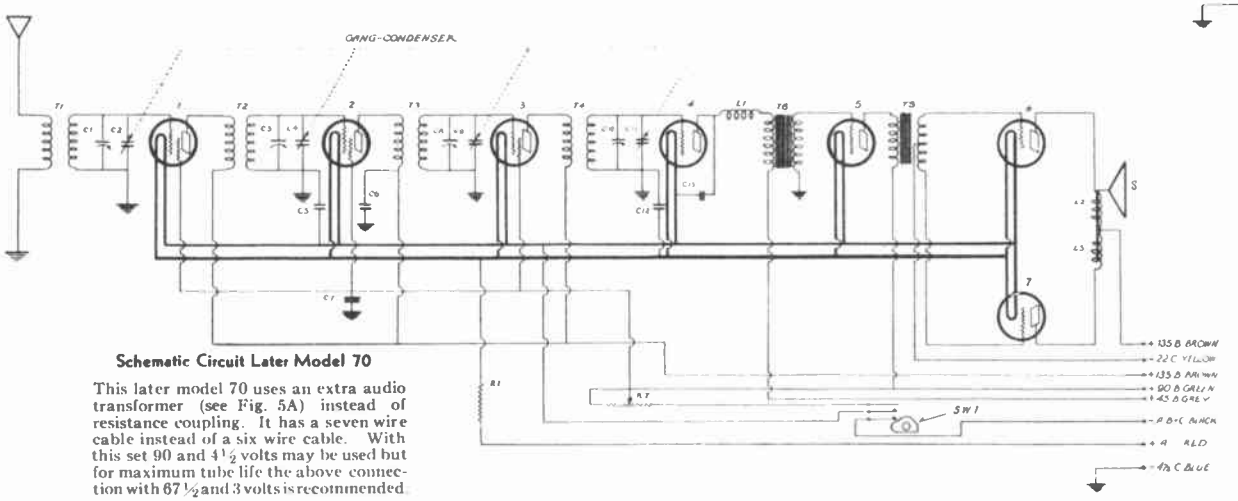

Schematic Circuit Later Model 70

This later model 70 uses an extra audio transformer (see Fig. 5A) instead of resistance coupling. It has a seven wire cable instead of a six wire cable. With this set 90 and 4½ volts may be used but for maximum tube life the above connection with 67½ and 3 volts is recommended.

RESISTORS, COLOUR AND VALUE (OHMS)

R1 Filament Series Resistor—Wire Wound—.56
R2 Volume Control—500,000.
R3 Screen Grid Series Resistor—50,000 Green.
R4 Audio Coupling Resistor—2 Meg. Yellow.
R5 Audio Grid Leak—2 Meg. Yellow.
R6 "C" Voltage Divider Resistor—500,000 Blue.
R7 "C" Voltage Divider Resistor—2 Meg. Yellow.

TRANSFORMERS

T1 Antenna R.F. Transformer.
T2 1st Stage R.F. Transformer.
T3 2nd Stage R.F. Transformer.
T4 Detector R.F. Transformer.
T5 Input Transformer.
T6 Audio Transformer.

REACTOR COILS

L1 R.F. Choke—(40 ohms.)
L2 & L3 Louspeaker Coils—(425 ohms each).

CONDENSER

C1 1st Gang Condenser Trimmer.
C2 1st Gang Condenser Section.
C3 2nd Gang Condenser Trimmer.
C4 2nd Gang Condenser Section.
C5 R.F. By-pass .5MFD. (Type 1268).
C6 R.F. By-pass .5MFD. (Type 1268)
C7 R.F. By-pass .5MFD. (Type 1268)
C8 3rd Gang Condenser Trimmer.
C9 3rd Gang Condenser Section.
C10 4th Gang Condenser Trimmer.
C11 4th Gang Condenser Section.
C12 R.F. By-pass Condenser .5MFD. (Type 1268)
C13 R.F. By-pass Condenser .0005.
C14 Audio Coupling Condenser .01 MFD.

The following voltages are correct for 90 volts on the green cable lead and 4½ on the blue lead.

Socket No.	Filament Volts	Filament to Control Grid Volts	Filament to Screen Grid Volts		Filament to Plate Volts	Plate Current Milliamps.	
1. Ant. Stage	2.1	4.5	60*	0	145	1	0
2. 2nd R. F.	2.1	4.5	60*	0	145	1	0
3. 3rd R. F.	2.1	4.5	60*	0	145	1	0
4. Det.	2.1	4.5			10*	0	0
5. 1st Audio	2.1	0*			90	3	3
6. Push Pull	2.1	22			145	7.4	7.4
7. Push Pull	2.1	22			145	7.4	7.4
Socket Reading Later Model 70 (See Note under Figure 6A)							
1. Ant. Stage	2.1	4.5	90	0	145	1	0
2. 2nd R. F.	2.1	4.5	90	0	145	1	0
3. 3rd R. F.	2.1	4.5	90	0	145	1	0
4. Det.	2.1	4.5			46	0.6	0.6
5. 1st Audio	2.1	2.8*			96	1.8	1.8
6. Push Pull	2.1	22			145	7.4	7.4
7. Push Pull	2.1	22			145	7.4	7.4

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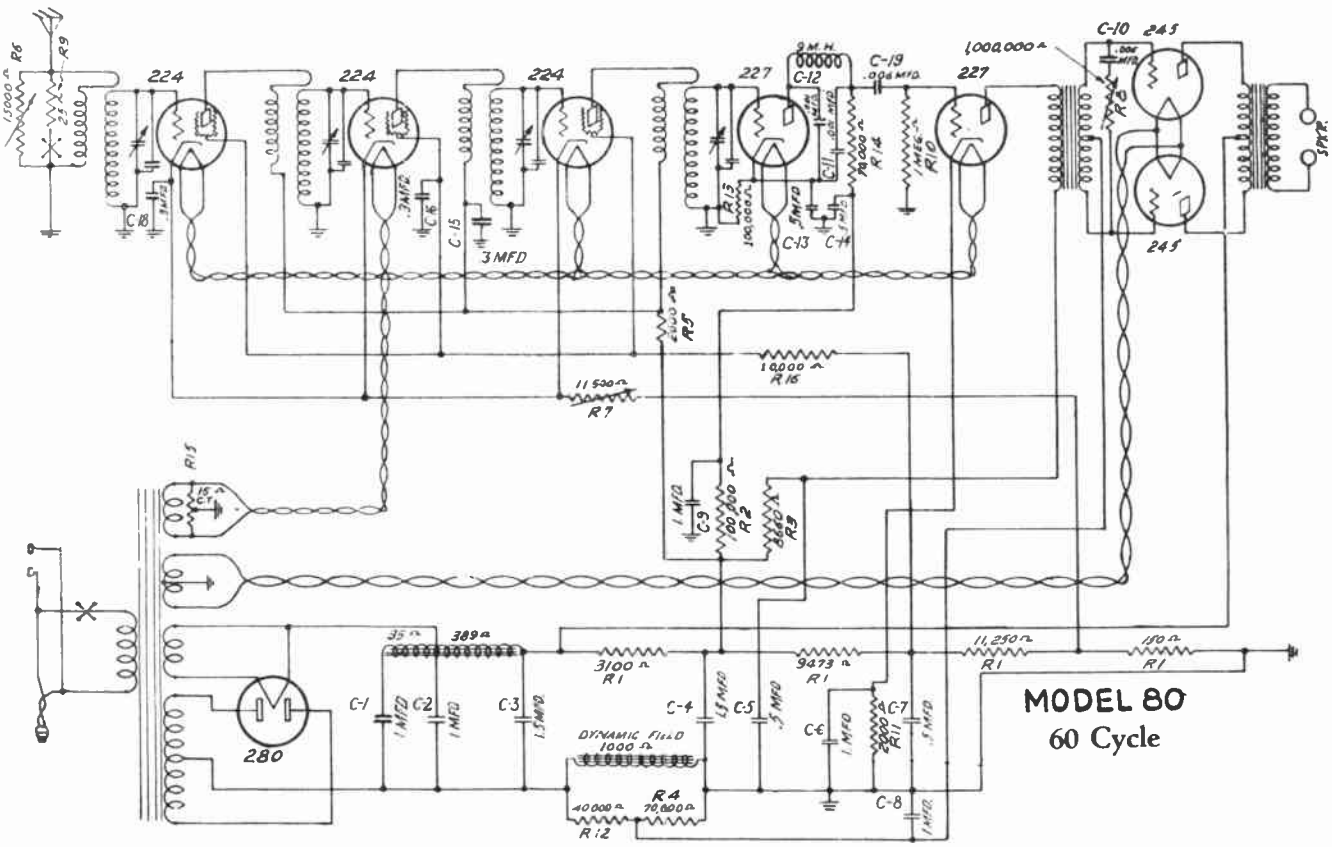
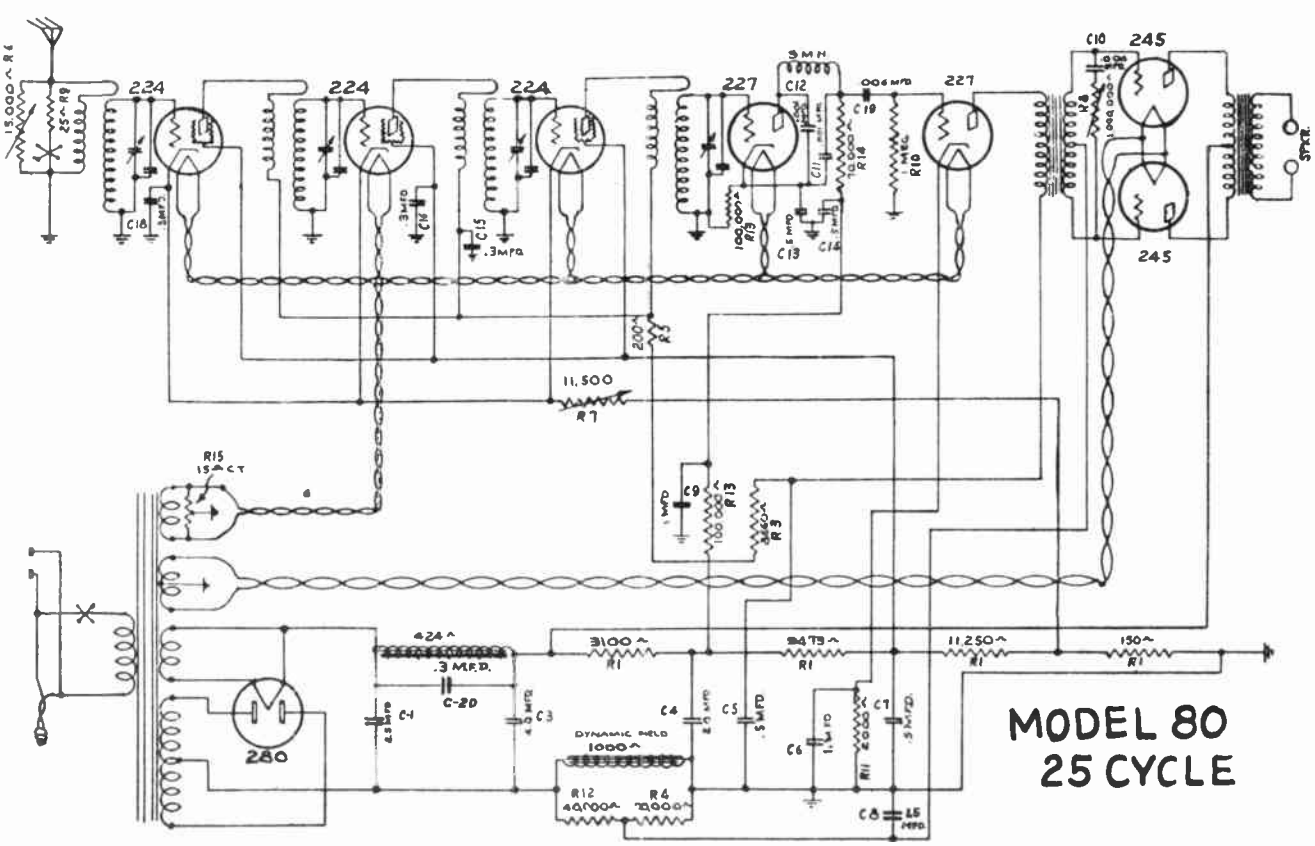


Note: The 25 ohm resistor R9 and local distance switch are not used in the present Model 80 Receiver.



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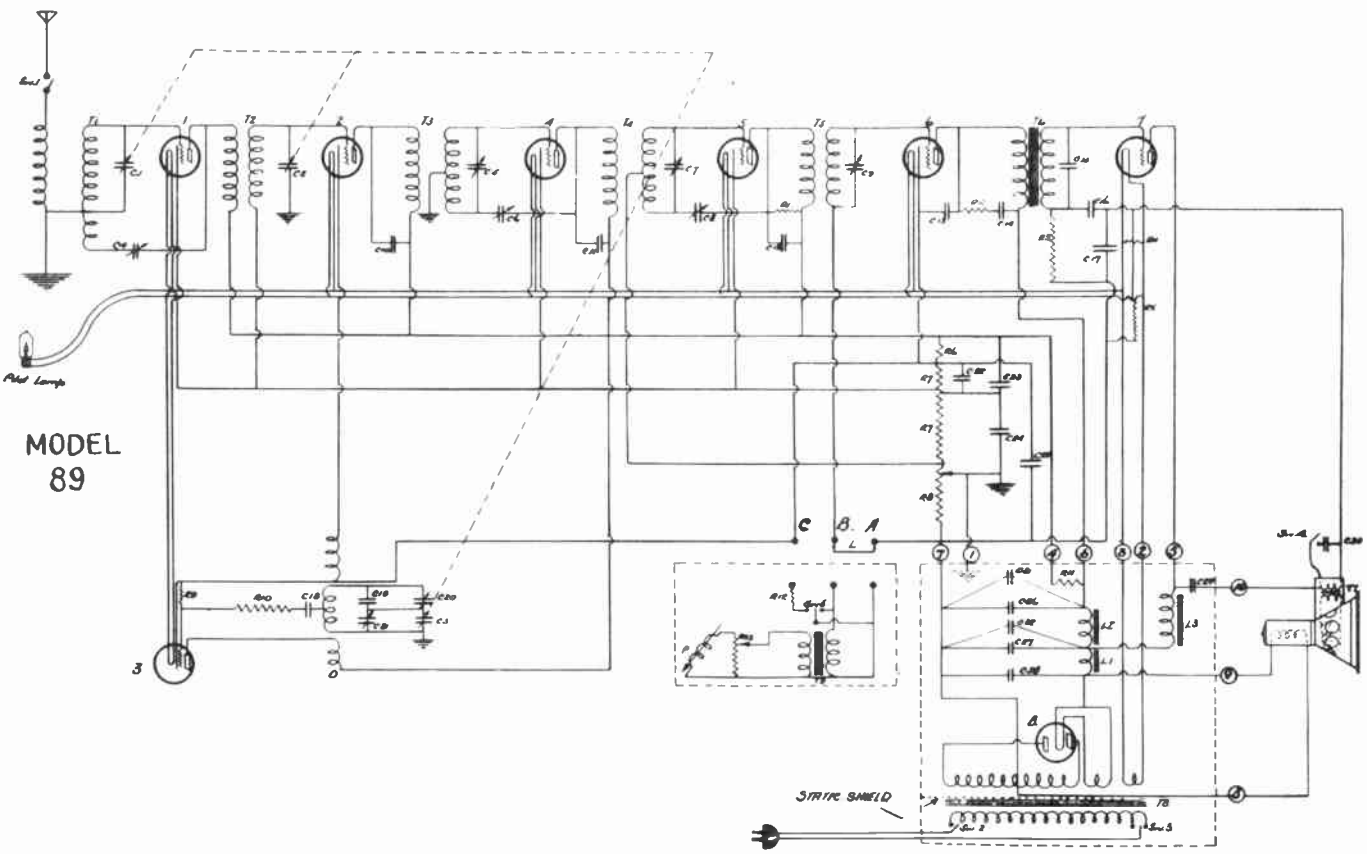

MODEL 89—"KEY" TO SCHEMATIC WIRING DIAGRAM

S.W. 1—Local-Distant Switch
S.W. 2—Line Switch
S.W. 3—110-120 Volt Switch
S.W. 4—Tone Control Switch
S.W. 5—Phonograph Switch (if pick-up is used)
T1—Antenna R.F. Transformer
T2—First Stage R.F. Transformer
T3—First Inter. Freq. Transformer (assembled with C.10, C. 5 and C. 6
T4—Second Inter. Freq. Transformer (assembled with C. 11, C. 7 and C. 8
T5—Third Inter. Freq. Transformer (assembled with R. 1, C. 12 and C. 9)
T6—Audio Freq. Transformer (assembled with C. 14, C. 16, C. 17, C. 22, C. 23, C. 24 and C. 25)
T7—Output Transformer
T8—Line Transformer
T9—Input Transformer (for Phono. Pick-up if used)
O—Oscillator Coil Assembly (assembled with C. 18)
P—Phonograph Pick-up (if used)
L—Short Circuiting Link on Chassis Terminal Board. (This link to be removed if Phono. Pick-up is used)
R1—Oscillation Suppressing Resistor (7000 ohm. Red and Yellow; was Brown and Yellow)
R2—Audio Resistor (40,000 ohm. Black with Black dot)
R3—Power Stage Grid Resistor, (¼ Meg. Brown)
R4—Filament Centre Tapped Resistor (60 ohm. wire-wound)
R5—Grid Bias Resistor, (1460 ohm. Blue with Red tip or 1500 ohm. Blue)
R6—Voltage Divider Resistance (Carbon 5000 ohm. Blue with Yellow Tip)
R7—Voltage Divider Resistance (wire-wound, tapped) (375 and 90 ohms.)
R8—Volume Control 650 ohms. (approx.)
R9—Oscillator Grid Leak, (Black with Black dot, 40,000 ohms.)
R10—Oscillator Grid Resistor (3,000 ohm. Green with Blue tip; was Green)
R11—Voltage Divider Resistor (Vitrohm 4800 ohms.)
R12—Phono. Pick-up Bias Resistor (if used, 2000 ohms.)
R13—Phono. Pick-up Volume Control (if used)
C1, C2, C3—Three Gang Condenser
C4—R. F. Compensating Condenser
C5, C7, C9—Inter. Freq. Tuning Adjustable Condenser
C6, C8—Inter. Freq. Compensating Condensers.
C10, C11, C12—Inter. Freq. Primary Tuning Condensers (fixed 800 m.m.f.)
C13—Phono. Condenser, (2400 m.m.f.)
C14—Audio Condenser (.05 mfd. assembled with T. 6)
C15—Audio Condenser (160 m.m.f.)
C16—Audio By-Pass Condenser (.5 mfd. assembled with T. 6)
C17—Audio By-Pass Condenser (.05 mfd. assembled with T. 6)
C18—Oscillator Grid Condenser (720 m.m.f.)
C19—Fixed Oscillator Trimming Condenser (720 m.m.f.)
C20, C21—Oscillator Trimming Condensers (Series and Shunt)
C22—By-Pass Condenser (.5 mfd. assembled with T. 6)
C23—By-Pass Condenser (.5 mfd. assembled with T. 6)
C24—By-Pass Condenser (.5 mfd. assembled with T. 6)
C25—By-Pass Condenser (.5 mfd. assembled with T. 6)
C26—Filter Condenser (1 m.f.d.) } Filter Condenser assembly
C27—Filter Condenser (2 m.f.d.) }
C28—Filter Condenser (2 m.f.d.) }
C29—Output Filter Condenser (.5 m.f.d. assembled with C. 26, C. 27, C. 28)
C30—Tone Control Condenser (.05 m.f.d.)
C31—Filter Condenser (External 2 m.f.d.)
C32—Filter Condenser (External two 2 m.f.d. condensers in parallel)
L1, L2—Filter Choke Coils (assembled together)
L3—Output Filter Choke (assembled with C26, C27, C28)

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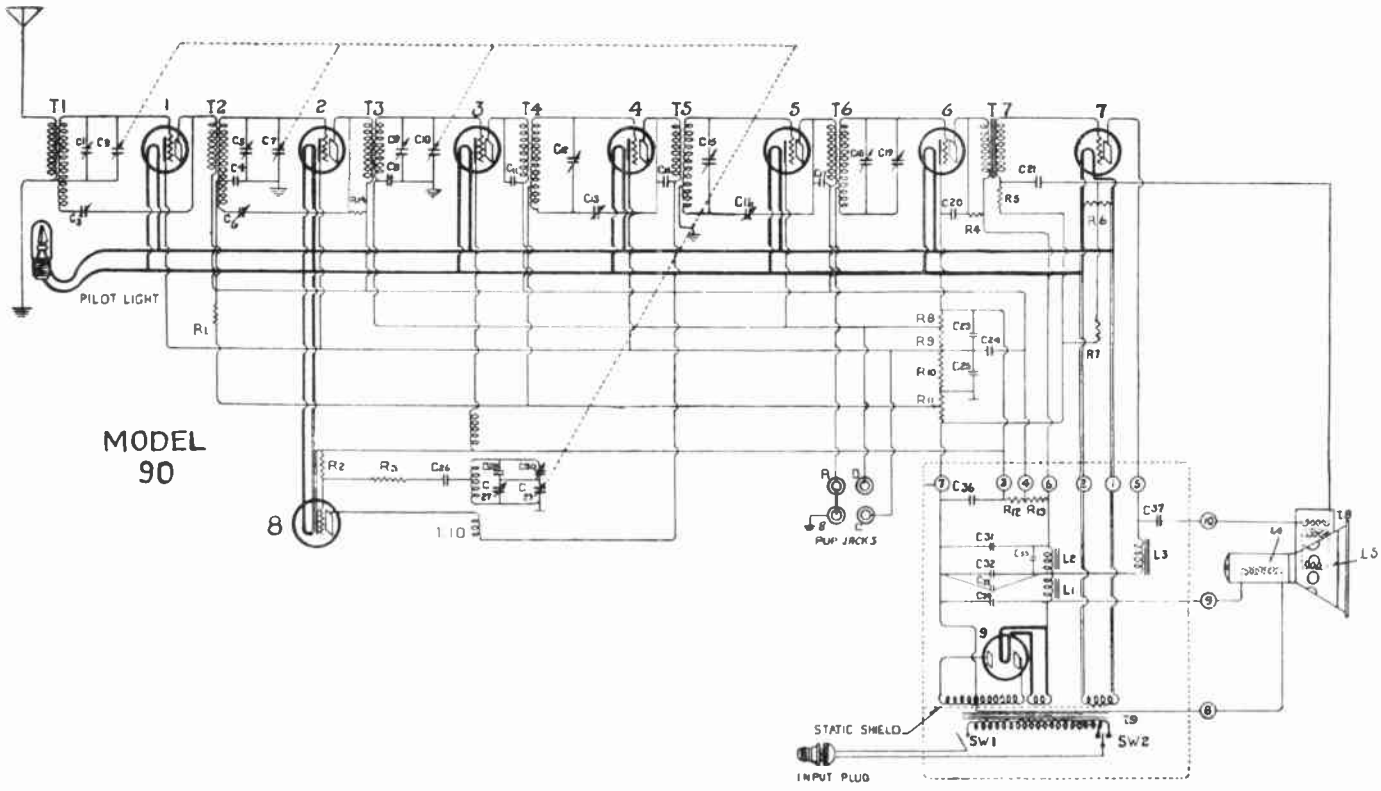

MODEL 90—KEY TO CIRCUIT DIAGRAM

RESISTORS, COLOUR AND VALUE (OHMS)

R1. Suppressor—Green with Blue—3,000.
R2. Oscillator Grid Leak—Black—40,000.
R3. Oscillator Grid Suppressor—Green with Blue—3,000.
R4. Audio Resistor—Black—40,000.
R5. Power Stage Grid Resistor—Brown—250,000
R6. Filament Centre-tapped Resistor—Wire-wound—60.
R7. Grid Bias Resistor—Blue or Blue with Red—1,500.
R8. Voltage Divider 425.
R9. Resistors wire- 875.
R10. wound. 130.
R11. Volume Control—500.
R12. Voltage Divider Resistor—Red and Yellow—7,000.
R13. Voltage Divider Resistor—Vitrohm—4,800.
R14. Stabilizer—Black with Grey—8,570.

CONDENSERS

C1. 1st Gang Condenser Trimmer.
C2. 1st Gang Condenser Section.
C3. 1st R.F. Compensator.
C4. R.F. By-pass—1 MFD. WG-44.
C5. 2nd Gang Condenser Trimmer.
C6. 2nd R.F. Compensator.
C7. 2nd Gang Condenser Section.
C8. R.F. By-pass—.1 MFD. WG-44.
C9. 3rd Gang Condenser Trimmer.
C10. 3rd Gang Condenser Section.
C11. I.F. Primary Condenser—800 MMF.
C12. I.F. Tuning Condenser.
C13. I.F. Neutralizing Condenser.
C14. I.F. Primary Condenser—800 MMF.
C15. I.F. Tuning Condenser.
C16. I.F. Neutralizing Condenser.
C17. I.F. Primary Condenser—800 MMF.
C18. & C19. I.F. Tuning Condensers.
C20. I.F. By-pass Condenser—2,500 MMF.
C21. Audio By-pass .5 MFD.
C23. Condensers in .5 MFD.
C24. Container WG-41 .5 MFD.
C25. .5 MFD.
C26. Oscillator Grid Condenser—720 MMF.
C27. Oscillator Shunt Trimming Condenser.
C28. Oscillator Fixed Series Trimming Condenser—720 MMF.
C29. 4th Gang Condenser Section.
C30. Oscillator Series Trimming Condenser.
C31. Filter 1 MFD.
C32. Condenser 2 MFD.
C33. Assembly S No. 652360 2 MFD.
C34. External Filter Condenser—2 MFD. WG-23.
C35. Tuned Filter Condenser—.4 MFD.
C36. Voltage Divider By-pass—.5 MFD. Assembled
C37. Output Filter Condenser—.5 MFD. with C31&c

TRANSFORMERS

T1. Antenna R.F. Transformer.
T2. 1st Stage R.F. Transformer.
T3. 2nd Stage R.F. Transformer.
T4. 1st I.F. Transformer.
T5. 2nd I.F. Transformer.
T6. 3rd I.F. Transformer.
T7. Audio Transformer.
T8. Output Transformer.
T9. Line Transformer.
T10. Oscillator Coil Assembly.

REACTOR COILS

L1. Filter Reactor—25 henries, 330 ohms.
L2. Filter Reactor—35 henries, 800 ohms.
L3. Output Choke—15 henries, 500 ohms.
L4. Reproducer Field Coil—7,000 ohms.
L5. Reproducer Cone Coil—10 ohms.

MISCELLANEOUS

SW1. Line Switch.
SW2. 110/120 Volt Switch.

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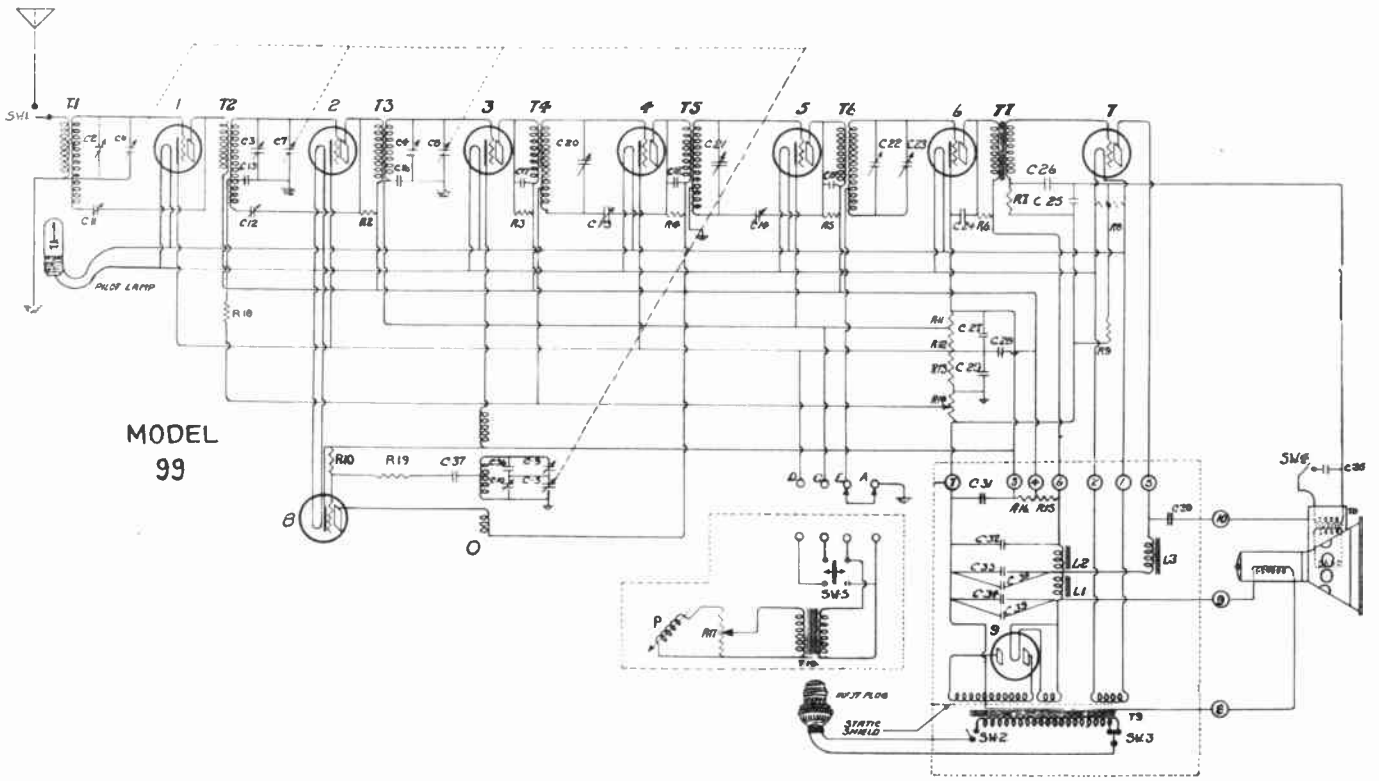

KEY TO MODEL "99" WIRING DIAGRAM

SW. 1—Distant-Local Switch
SW. 2—Line Switch
SW. 3—110-120 Volt Switch
SW. 4—Tone Control Switch
SW. 5—Phonograph Pick-up Switch (if used)
C2, C3, C4 and C5—Four Gang Condenser
C6, C7 and C8—Radio Frequency Trimming Condensers (assembled with C1, C2, C3, and C4)
C9—Oscillator Series Trimming Condenser
C10—Oscillator Shunt Trimming Condenser (assembled with C1, C2, C3, and C4)
C11, C12 } Radio Frequency Compensating Condensers
C13, C14 } Inter. Frequency Compensating Condensers Assembled with T4 and T5
C15 Radio Frequency By-pass Condensers (.1 mfd.)
C16 (Marked WG 44)
C17, C18, C19—Inter. Frequency Primary Tuning Condensers, (800 m.m.f. fixed—assembled with T4, T5, and T6)
C20, C21, C22, C23 } Inter Frequency Secondary Tuning Condensers (assembled with T4, T5, and T6)
C24—Phone Condenser (2500 m.m.f.)
C25—Audio Frequency By-pass Condenser (.1 m.f.d)
C26—Audio Frequency By-pass Condenser (.5 m.f.d.)
C27—Voltage Divider By-pass Condenser (.5 m.f.d.)
C28—Voltage Divider By-pass Condenser (.5 m.f.d.)
C29—Voltage Divider By-pass Condenser (.5 m.f.d.)
} By-pass Condenser Assembly W.G. 41 or W.G. 53
C30—Audio Frequency By-pass Condenser (.5 m.f.d.)
C31—Voltage Divider By-pass Condenser (.5 m.f.d.) (C30 and C31 assembled with C32, C33, and C34)
C32—1 m.f.d.
C33—2 m.f.d. } Filter Condenser Assembly S No. 652360
C34—2 m.f.d.
C35—Tone Control Condenser (.05 m.f.d.)
C36—Fixed Oscillator Trimming Condenser (720 m.m.f.)
C37—Oscillator Grid Condenser (720 m.m.f.)
C38—External Filter Condenser (two of 2 m.f.d. WG. 23)
C39—External Filter Condenser (two of 1 m.f.d 579651)
O—Oscillator Coil Assembly
P—Phonograph Pick-up (optional)
T1—Antenna R.F. Coil Assembly
T2—First Stage R.F. Coil Assembly
T3—Second Stage R.F. Coil Assembly
T4—First Intermediate Freq. Transformer
T5—Second Intermediate Freq. Transformer
T6—Third Intermediate Freq. Transformer
T7—Audio Transformer
T8—Output Transformer
T9—Line Transformer
T10—Phono. Pick-up Input Transformer
R2 } R.F. Oscillation Suppressor Resistor (Black and Grey 8750 ohms.; was Red and Yellow)
R3, R4, and R5—(Assembled with T4, T5, and T6, 40000 ohms. Black with Black dot) (omitted on later production).
R6—Audio Resistor (40000 ohms. Black with Black dot)
R7—Power Stage Grid Resistor (¼ Meg. Brown)
R8—Filament Centre-tapped Resistor (60 ohm. wire-wound)
R9—Grid Bias Resistor, (1500 ohm. Blue or 1460 ohm. Blue with Red End)
R10—Oscillator Grid Leak, (40000 ohm. Black with Black dot)
R11—425 Ohms. }
R12—875 Ohms. } Voltage Divider Resistor (wire-wound)
R13—130 Ohms. }
R14—Volume Control 500 ohms
R15—Voltage Divider Resistor (4800 ohm. Vitrohm)
R16—Voltage Divider Resistor (7000 ohms. Red and Yellow; was Brown and Yellow)
R17—Phono. Pick-up Volume Control (if used)
R18—R.F. Grid Resistor (3,000 ohm Green with Blue Tip; was Green).
R19—Oscillator Grid Resistor (3,000 ohm Green with Blue Tip; was Green).
L—Link (to be removed if Phono. Pick-up is used)
L1, L2 } Filter Reactor Coil Assembly
L3—Output Filter Choke Coil, (assembled with C32, C33, and C34.)

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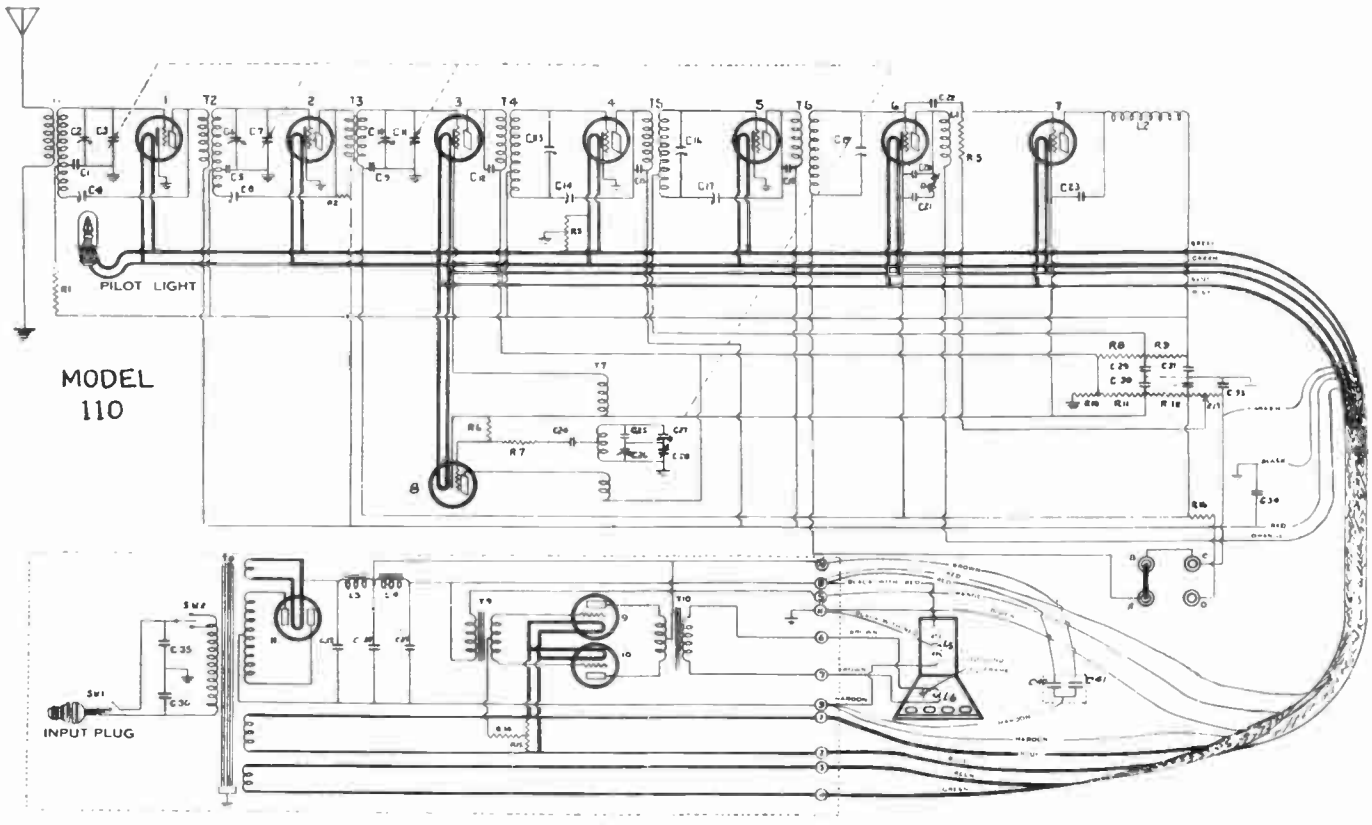

MODEL 110—KEY TO CIRCUIT DIAGRAM

RESISTORS, COLOUR AND VALUE (OHMS)

R1. Suppressor—Blue with Maroon—7,700.
R2. Stabilizer—Black with Grey—8,570.
R3. Filament Center-tapped Resistor Wire-wound—60.
R4. Variable Tone Control—0-50,000.
R5. Automatic Volume Control Grid Leak—Green with Grey 2,000,000.
R6. Oscillator Grid Leak—Black—40,000.
R7. Oscillator Grid Suppressor—Green and Blue—3,000.
R8. & R9. Automatic Bias Resistors—Red—100,000.
R10. Voltage Divider Resistors—mounted together. Wire-wound—485.
R11 Maroon with Green—8,000.
R12. Wire-wound—395.
R13. Volume Control—1,600.
R14. Grid Bias Resistor—Yellow with Black—740.
R15. Filament Centre-tapped Resistor—Wire-wound—60.
R16. Extra Bias Resistor—Blue with Maroon—7,700.

CONDENSERS

C1. R.F. By-pass—.1 MFD. WG-44.
C2. 1st Gang Condenser Trimmer.
C3. 1st Gang Condenser Section
C4. 1st R.F. Compensator.
C5. R.F. By-pass—.1 MFD. WG-44.
C6. 2nd Gang Condenser Trimmer.
C7. 2nd Gang Condenser Section.
C8. 2nd R.F. Compensator.
C9. R.F. By-pass—.1 MFD. WG-44.
C10. 3rd Gang Condenser Trimmer
C11. 3rd Gang Condenser Section.
C12. I.F. Primary Condenser—800 MMF.
C13. I.F. Tuning Condenser.
C14. I.F. Neutralizing Condenser.
C15. I.F. Primary Condenser.
C16. I.F. Tuning Condenser.
C17. I.F. Neutralizing Condenser.
C18. I.F. Primary Condenser—800 MMF
C19. I.F. Tuning Condenser.
C20. I.F. By-pass Condenser—2,500 MMF.
C21. Tone Control .05 MFD. WG-106.
C22. Coupling Condenser 800 MMF.
C23. I.F. By-pass Condenser 2,500 MMF.
C24. Oscillator Grid Condenser 720 MMF.
C25. Oscillator Fixed Trimming Condenser 800 MMF
C26. 4th Gang Condenser Trimmer.
C27. Oscillator Series Trimming Condenser
C28. 4th Gang Condenser Section.

C29. By-pass Condensers Assembled in two Containers Marked WG-41 .5 MFD.
C30. .5 MFD
C31. 1.0 MFD.
C32. .5 MFD.
C33. 1.0 MFD.
C34. .5 MFD.

C35. Line Filter Condenser—Centre Tapped.
C36. 1 MFD. each half. S No. 700759

C37. Filter Condensers Assembled with T10 2 MFD.
C38. 4 MFD.
C39. 4 MFD.

C40. External Filter Condensers 4 MFD.(2 of S No.552844)
C41. 2 MFD.(2 of S No.579651)

TRANSFORMERS

T1. Antenna R.F. Transformer.
T2. 1st Stage R.F. Transformer.
T3. 2nd Stage R.F. Transformer.
T4. 1st I.F. Transformer.
T5. 2nd I.F. Transformer.
T6. 3rd I.F. Transformer.
T7. Oscillator Coil.
T8. Line Transformer.
T9. Input Transformer.
T10. Output Transformer.

REACTOR COILS

L1. I.F. Choke Coil (large)—85 ohms.
L2. I.F. Choke Coil (small)—35 ohms.
L3. Filter Reactor—10 henries, 300 ohms.
L4. Filter Reactor—10 henries, 300 ohms.
L5. Reproducer Field Coil—3,250 ohms. each side of tap.
L6. Reproducer Moving Coil—10 ohms.

MISCELLANEOUS

SW1. Operating Switch.
SW2. 110-120 Volt Switch.

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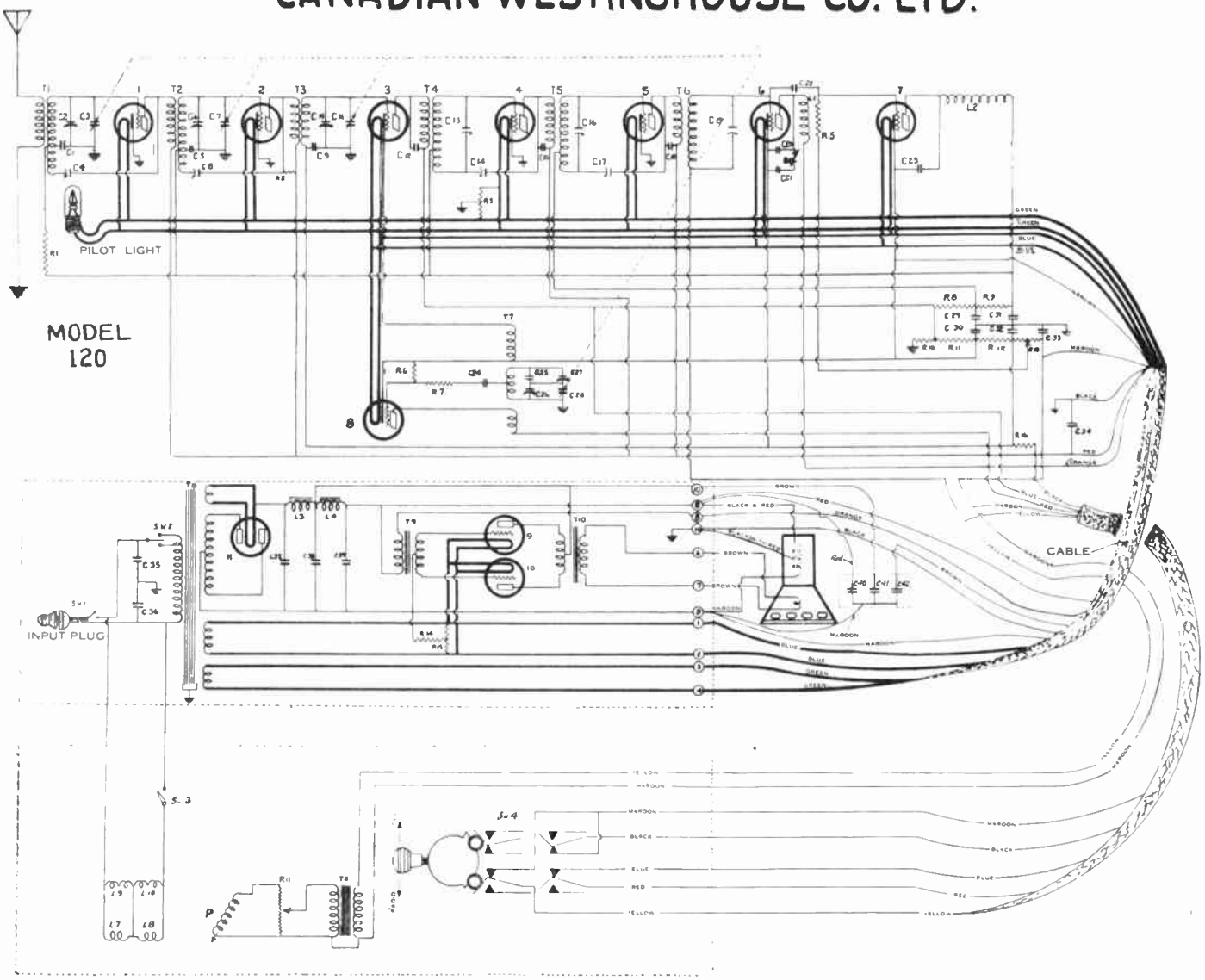

MODEL 120---KEY TO CIRCUIT DIAGRAM

RESISTORS, COLOUR AND VALUE (OHMS)

R1. Suppressor—Blue with Maroon—7,700.
R2. Stabilizer—Black with Grey—8,570.
R3. Filament Center-tapped Resistor Wire-wound—60.
R4. Variable Tone Control—0-50,000.
R5. Automatic Volume Control Grid Leak—Green with Grey 2,000,000.
R6. Oscillator Grid Leak—Black—40,000.
R7. Oscillator Grid Suppressor—Green and Blue—3,000.
R8. & R9. Automatic Bias Resistors—Red—100,000.
R10. Voltage Divider Wire-wound—485.
R11. Resistors—mounted Maroon with Green—8,000
R12. together. Wire-wound—395.
R13. Volume Control—1,600.
R14. Grid Bias Resistor—Yellow with Black—740.
R15. Filament Centre-tapped Resistor—Wire-wound—60.
R19. Extra Bias Resistor—Blue with Maroon—7,700.
R17. Record Volume Control—0-60.

CONDENSERS

C1. R.F. By-Pass—.1 MFD. WG-44.
C2. 1st Gang Condenser Trimmer.
C3. 1st Gang Condenser Section.
C4. 1st R.F. Compensator.
C5. R.F. By-pass—.1 MFD. WG-44.
C6. 2nd Gang Condenser Trimmer.
C7. 2nd Gang Condenser Section.
C8. 2nd R.F. Compensator.
C9. R.F. By-pass. .1 MFD. WG-44.
C10. 3rd Gang Condenser Trimmer.
C11. 3rd Gang Condenser Section.
C12. I.F. Primary Condenser—800 MMF.
C13. I.F. Tuning Condenser.
C14. I.F. Neutralizing Condenser.
C15. I.F. Primary Condenser.
C16. I.F. Tuning Condenser.
C17. I.F. Neutralizing Condenser.
C18. I.F. Primary Condenser—800 MMF.
C19. I.F. Tuning Condenser.
C20. I.F. By-pass Condenser—2,500 MMF.
C21. Tone Control .05 MFD. WG-106.
C22. Coupling Condenser 800 MMF.
C23. I.F. By-pass Condenser 2,500 MMF.
C24. Oscillator Grid Condenser 720 MMF.
C25. Oscillator Fixed Trimming Condenser 800 MMF.
C26. 4th Gang Condenser Trimmer.
C27. Oscillator Series Trimming Condenser.
C28. 4th Gang Condenser Section.
C29. .5 MFD.
C30. By-pass .5 MFD.
C31. Condensers 1.0 MFD.
C32. Assembled in .5 MFD.
C33. two Containers 1.0 MFD.
C34. Marked WG-41 .5 MFD.
C35. Line Filter Condenser—Centre Tapped.
C36. .1 MFD. each half. S. No. 7007.59.
C37 Filter 2 MFD.
C38. Condensers 4 MFD.
C39. Assembled with T10 4 MFD.
C40. External Filter 4 MFD. (2 of S No 552844)
C41. 1 MFD. (S No. 579651).
C42. Condensers 1 MFD. (S No 579651).

TRANSFORMERS

T1. Antenna R.F. Transformer.
T2. 1st Stage R.F. Transformer.
T3. 2nd Stage R.F. Transformer.
T4. 1st I.F. Transformer.
T5. 2nd I.F. Transformer.
T6. 3rd I.F. Transformer.
T7. Oscillator Coil.
T8. Line Transformer.
T9. Input Transformer.
T10. Output Transformer.
T11. Phonograph Input Transformer.

REACTOR COILS

L1. I.F. Choke Coil (large)—85 ohms.
L2. I.F. Choke Coil (small)—35 ohms.
L3. Filter Reactor—10 henries, 300 ohms.
L4. Filter Reactor—10 henries, 300 ohms.
L5. Reproducer Field Coil—3,250 ohms. each side of tap.
L6. Reproducer Moving Coil—10 ohms.
L7. & L8. Motor Series Coils.
L9. & L10. Motor Shunt Coils.

MISCELLANEOUS

SW1. Operating Switch.
SW2. 110-120 Volt Switch.
SW3. Motor Switch.
SW4. Radio-Record Switch.
P. Phonograph Pick-up.

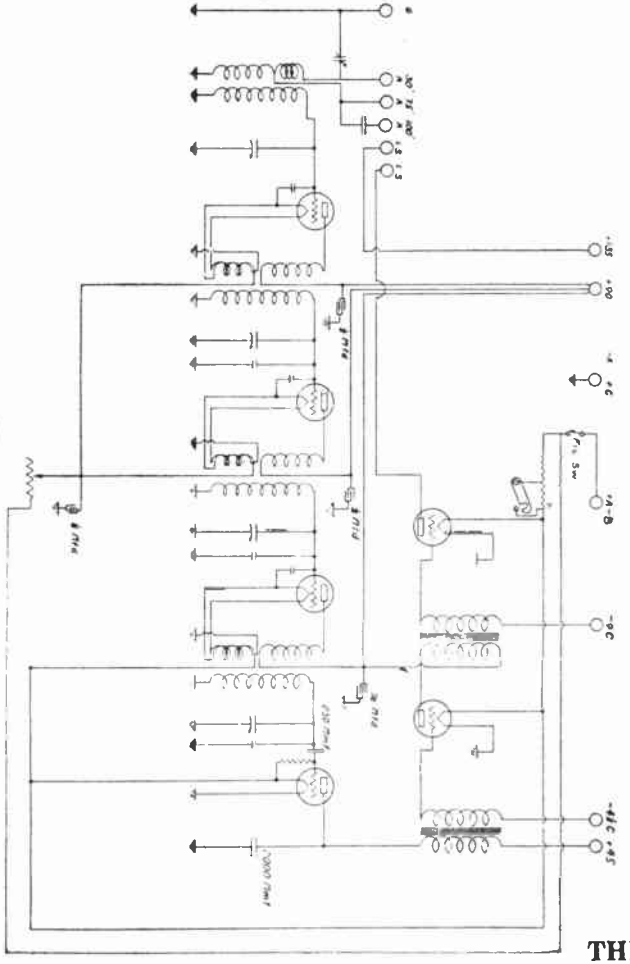

Figure 10

THE C6 COMPACT AND CONSOLE—1926-27

Figure 10 shows the circuit diagram of the C6 Compact and Console. The chasses in both of the above models are identical with the exception of the cable, which is longer in the Compact model than in the Console. The "ground" symbols indicate that the circuit is grounded to the chassis at those points.

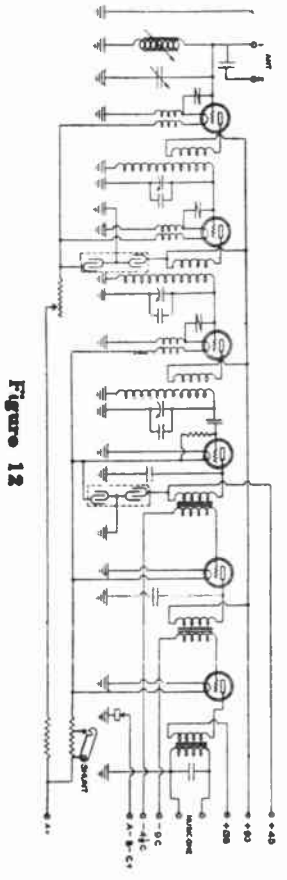

Figure 12

THE CONWAY AND HASTINGS (1927-28)

The circuit diagram of the Conway and Hastings Models is illustrated at Figure 11. The chasses of both models are identical with the exception of the cable, which is longer on the Conway than on the Hastings.

THE WARWICK AND WINDSOR (1927-28)

Figure 12 shows the circuit diagram of the Warwick and Windsor Models. The chasses in both models are identical with the exception of the battery cable, which is longer on the Warwick than on the Windsor. The "ground" symbols indicate that the circuit is grounded to the chassis at these points.

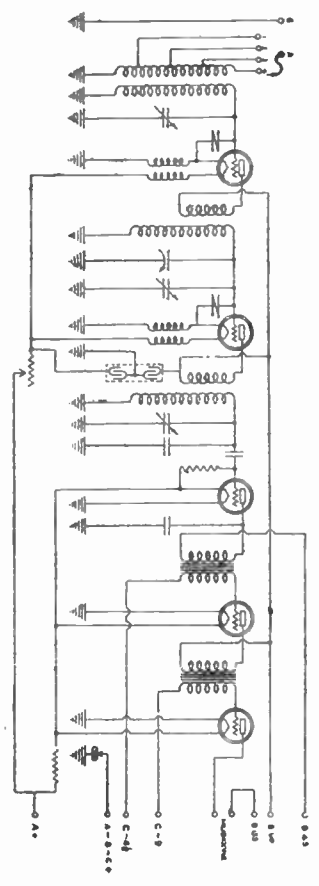

Figure 11

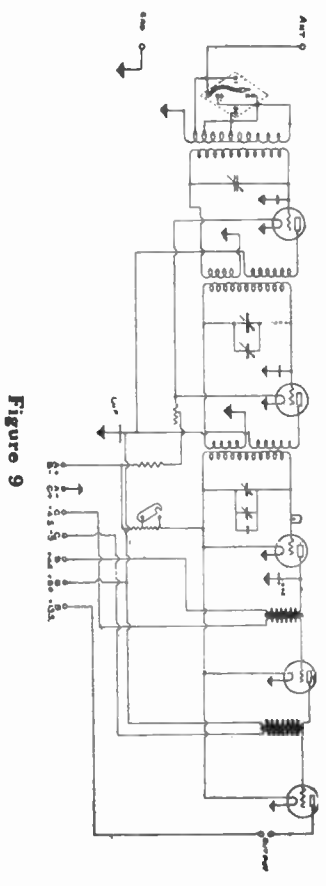

Figure 9

THE DC5 COMPACT AND CONSOLE (1926-27)

Figure 9 shows the circuit diagram of the DC5 Compact and Console. The chasses in both of the above models are identical with the exception of the cable which is longer in the compact model. The "ground" symbols indicate that the circuit is grounded to the chassis at those points.

While the diagram shows the order of the tubes in their natural progressive sequence for the purpose of simplicity, their actual order in the chassis, counting from left to right, is as follows:—1st R.F. Amplifier, 2nd Audio Amplifier, 2nd R.F. Amplifier, 1st Audio Amplifier and Detector.

DE FOREST CROSLEY LTD.

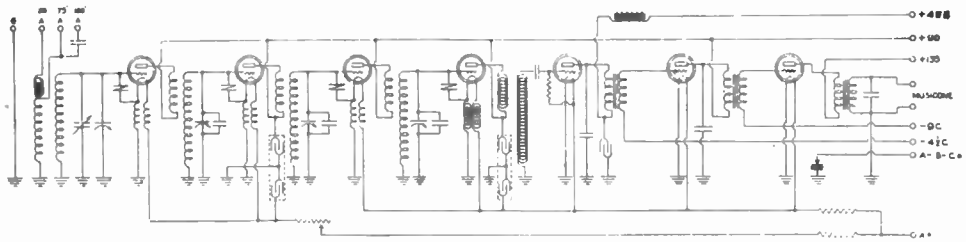

Figure 13

THE BALMORAL AND BERWICK (1927-28) Battery Operated

Figure 13 shows the circuit diagram of the Balmoral and Berwick. The chasses of both Models are identical with the exception of the cable which is longer in the Balmoral than in the Berwick. The "ground" symbols indicate that the circuit is grounded to the chassis at these points.

THE BANDBOX JUNIOR (1928)

Figure 14 is the schematic circuit diagram of the Bandbox Junior, which is made in two models, namely, for use with WX 199 Radiotrons and for use with UX 201B Radiotrons. The WX 199 Model has a finer wound volume control rheostat than the UX 201B type. The R.F. coils are also different. The Bandbox

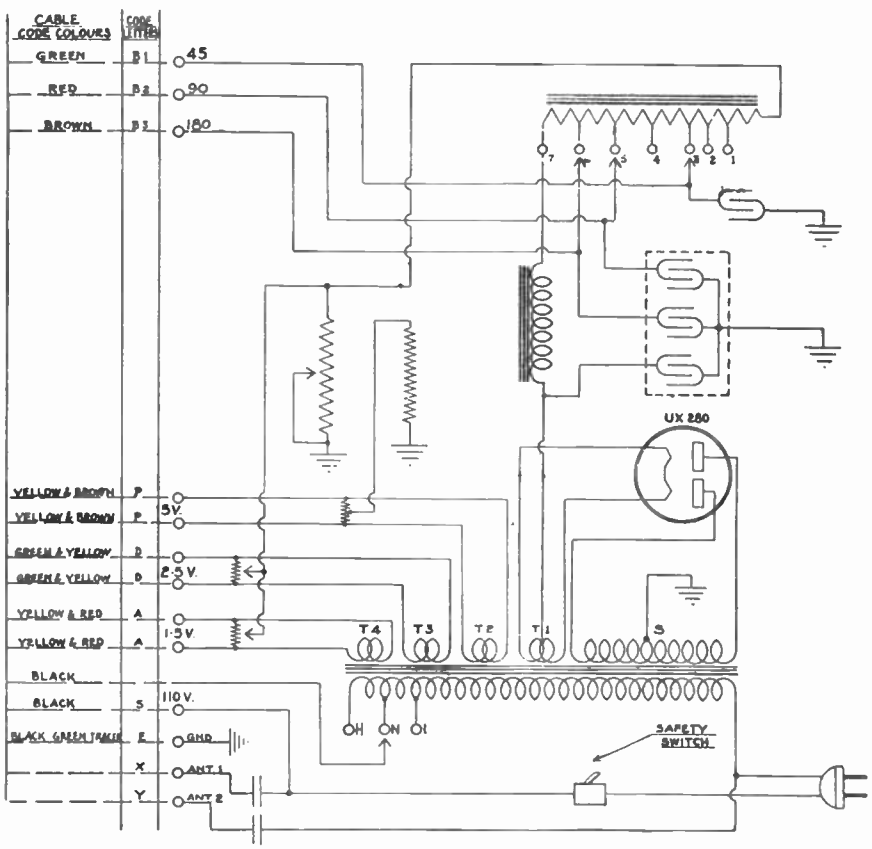

Figure 17
Schematic diagram of the A.B.C. Power Unit Circuit.

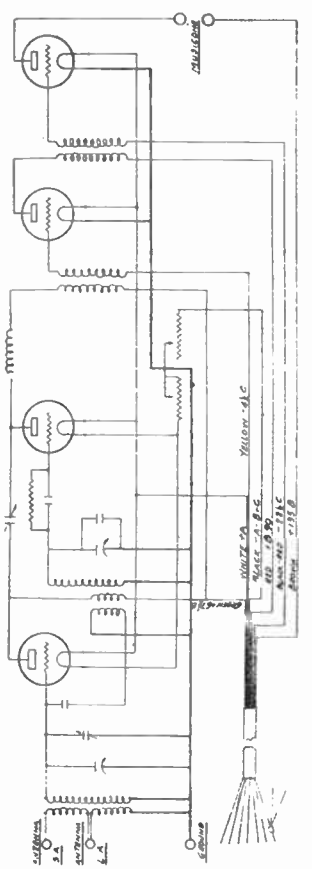

Figure 14

THE DE FOREST CROSLEY POWER UNIT FOR ELECTRIC HASTINGS, BERWICK AND FIRST SERIES SYMPHONY MODEL (1927-28)

Figure 17 illustrates the circuit of the Power Unit used in the above electric models. The transformer is shown at the bottom with its separate windings for the filaments of the UX 226, UY 227, UX 171A, and UX 280 Radiotrons respectively. The Mershon condenser is illustrated at the left upper centre, while choke coils are indicated at the centre and top. The 2 M.F. fixed condenser connected between the green lead and the chassis is illustrated just above the Mershon condenser. The variable resistance shown at the left centre is the rheostat indicated as "E" in Figure 17. The winding to the right of the rheostat is the UX 171 bias resistor wound on a flat bakelite form. The potentiometers placed at the lower right of the power unit are shown at the left, connected across the filament windings of the UX 226 and UY 227.

The mid top resistor connected across the UX 171A filament terminals is the narrow fine winding on the bakelite strip and the ground symbols represent connections to the chassis.

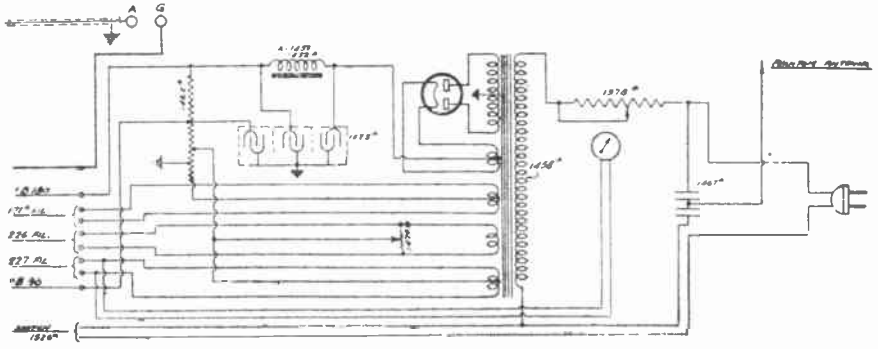

Figure 18
Schematic diagram of the Etude and Symphony Power Unit.

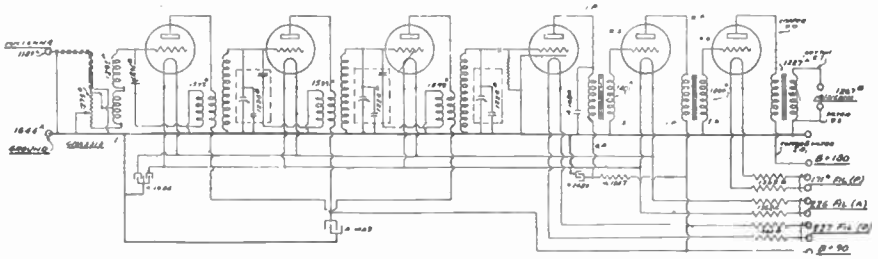

Figure 21
Circuit diagram of the First Series Symphony Chassis.

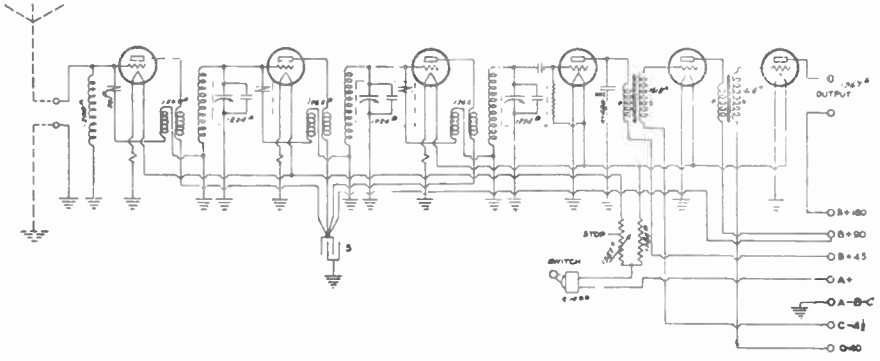

Figure 15

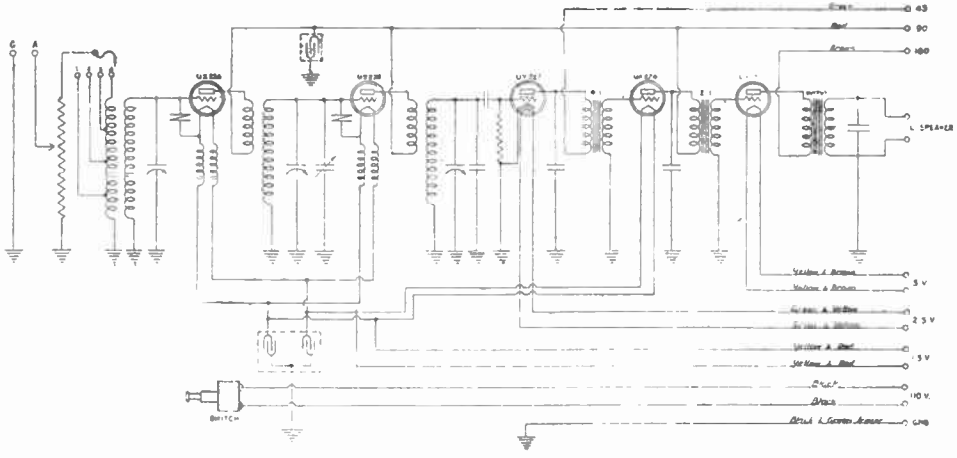

Figure 19
Schematic diagram of the Electric Hastings Chassis Circuit.

THE BARCAROLLE AND MINUET (Battery Type—1928-9)

Figure 15 is the circuit diagram of the above Receivers. The ground symbols indicate connections to the chassis at these points.

While the diagram shows the order of the tubes to be in their natural progressive sequence for the purpose of simplicity, their actual order in the chassis is as follows:—

Row parallel to rear edge—From left to right, 1st R.F. amplifier, 2nd R.F. amplifier, 3rd R.F. amplifier, Detector.

Remaining two Tubes—Front tube, 2nd A. F. amplifier, middle tube, 1st A.F. amplifier. The points between which series tests may be made are obvious but one or two examples are illustrated below.

THE ELECTRIC HASTINGS CHASSIS (1927-28)

Figure 19 is the circuit diagram of the Electric Hastings chassis. While the position of the tubes are shown in their natural progressive order of sequence for the purpose of simplicity, their actual order in the chassis is as follows, counting from the left to right:—1st R.F. Amplifier, 2nd A.F. Amplifier, 1st A.F. Amplifier, 2nd R.F. Amplifier and Detector.

THE SYMPHONY CHASSIS (First Series—Power Unit Separate) (1928-29)

Figure 21 is the circuit diagram of the Symphony Model, first series. The heavy horizontal line near the centre represents the steel chassis. It will be noticed that several connections are made to it.

THE DE FOREST CROSLEY POWER UNIT FOR ETUDE AND SECOND SYMPHONY SERIES (1928-29)

Figure 18 illustrates the circuit diagram of the power unit of the Etude and Symphony Models. The "ground" symbols indicate connections to the chassis. The Mershon Condenser is shown at the upper left while the tapped resistor mounted vertically in the power unit is placed to the left of the Mershon. The transformer is located near the centre of the drawing. It will be noticed that the filament windings for each type of tube are placed to the left of the primary.

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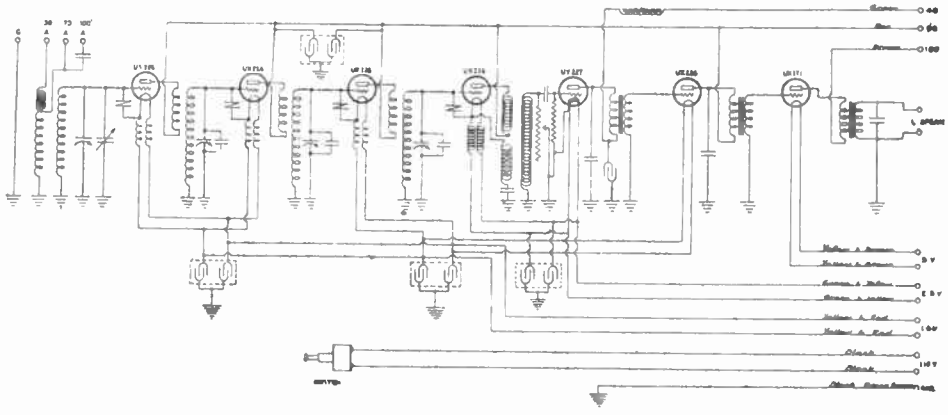


Figure 20
Schematic diagram of the Electric Berwick Chassis Circuit.

THE NOCTURNE (AC. 1928)

Figure 23 shows the circuit of the Nocturne chassis and power unit. The chassis occupies the left portion, while the power unit is shown at the right. The chassis is placed on the upper shelf and the power unit is located on the bottom shelf.

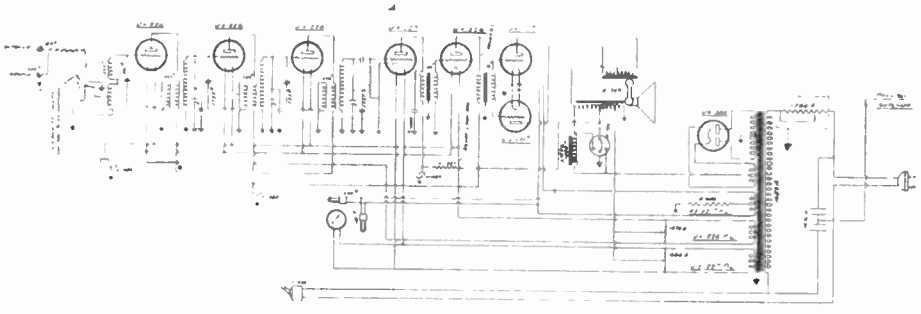


Figure 23
Schematic diagram of the Nocturne Circuit.

THE SYMPHONY (Second Series) AND THE ETUDE (AC. 1928)

Figure 22 is the circuit diagram of the second series Symphony and Etude chasses. The heavy horizontal line near the centre represents the steel chassis. It will be noticed that several connections are made to it.

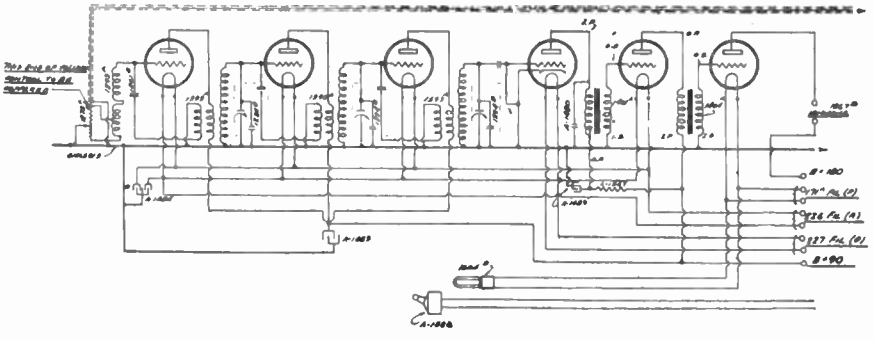


Figure 22
Circuit diagram of the Second Series Symphony.

THE CONCERTO, SONATA AND OPERA MODELS (1928-29)

Figure 24 is the circuit diagram of the chassis contained in the above models. It will be noted that the R.F. coils are slightly different from other types as the balance winding is a portion of the secondary winding.

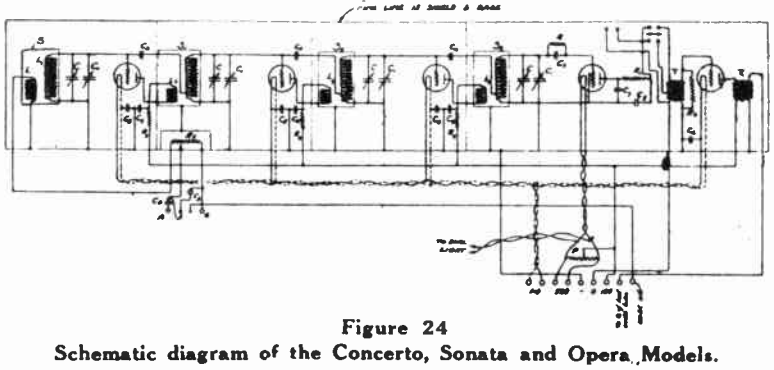


Figure 24
Schematic diagram of the Concerto, Sonata and Opera Models.

Figure 25 represents the circuit of the power unit used in the above models. The power transformer, with its several windings, is shown at the right, the Mershon Condenser is located near the centre and the adjacent rectifier tubes are the UX 281 Radiotrons. The UX 250 power amplifier is indicated near the left.

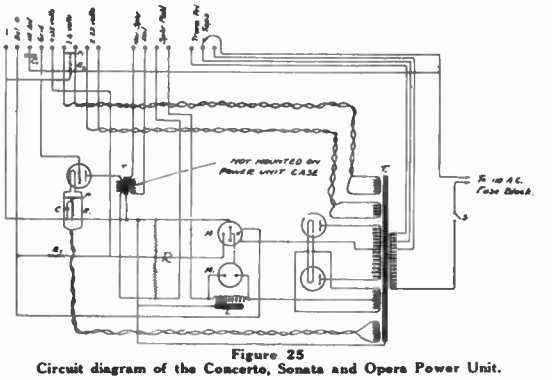
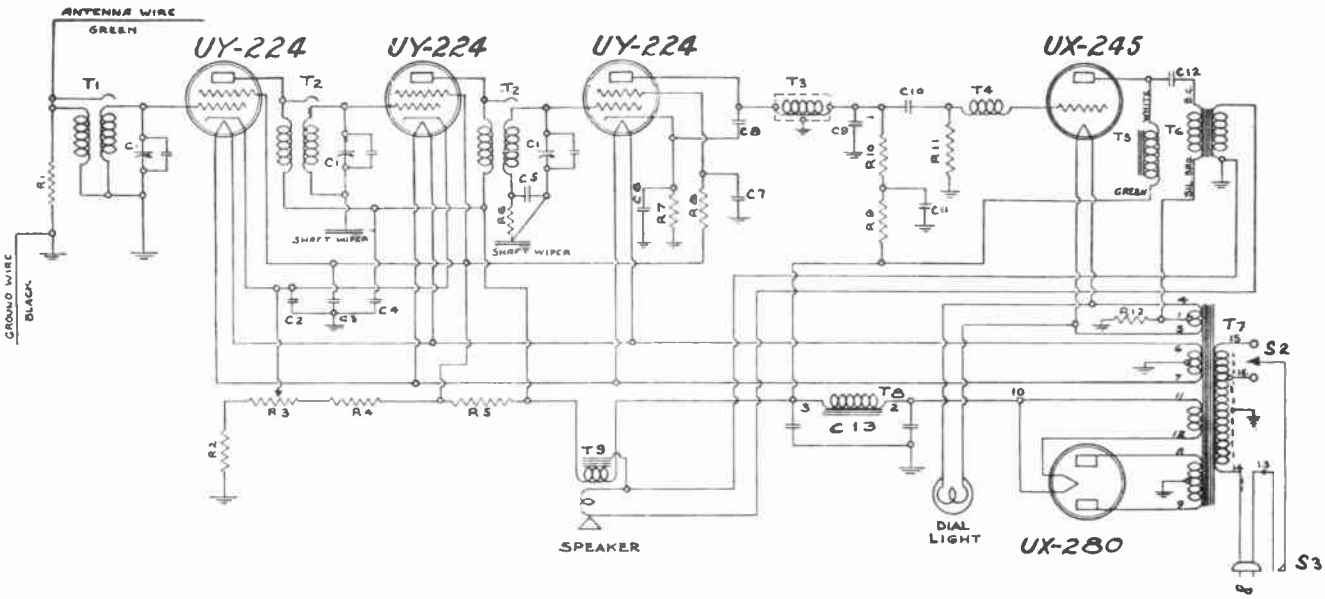


Figure 25
Circuit diagram of the Concerto, Sonata and Opera Power Unit.

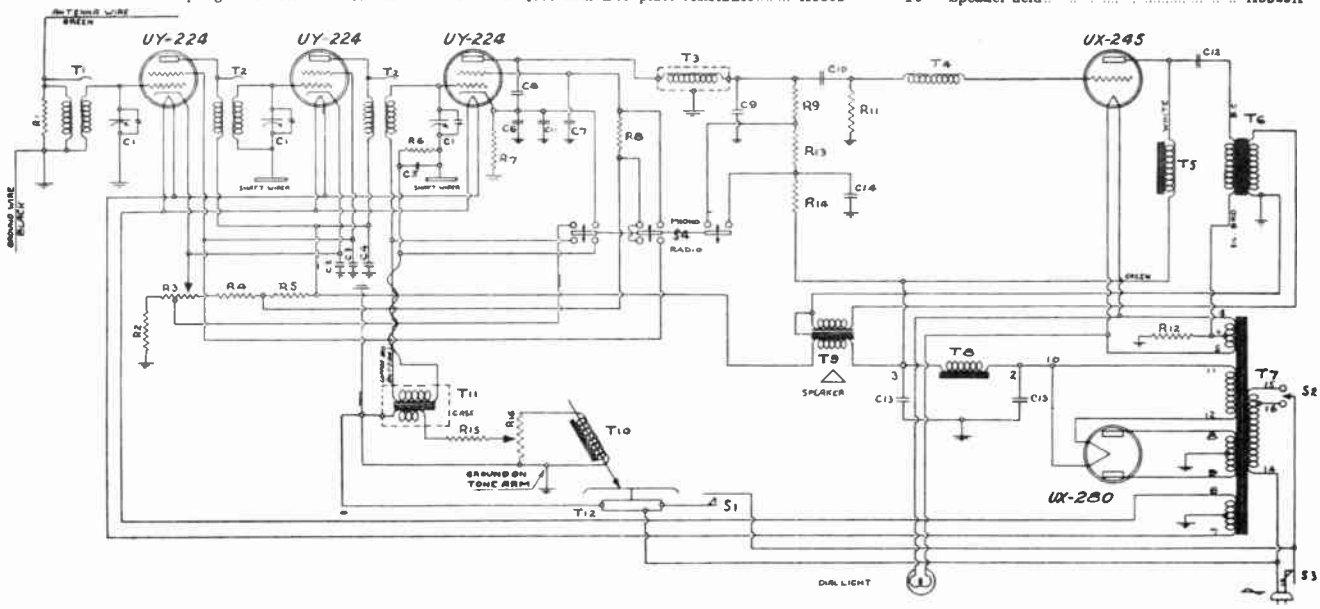
DE FOREST CROSLEY LTD.



TYPES 400-420 CHASSIS

("Brock" and "Rideau" Models)

Symbol	Description	Part No.
C1	Tuning condenser gang	A3394A
C2	.25 Mfd. cathode R.F. by-pass condenser	A3819
C3	.25 Mfd. screen R.F. by-pass condenser	
C4	.30 Mfd. plate R.F. by-pass condenser	
C5	.10 Mfd. Det. automatic bias by-pass condenser	A3820
C6	1.0 Mfd. R.F. cathode by-pass condenser	
C7	.10 Mfd. R.F. screen by-pass condenser	
C8	.0001 Mfd. R.F. plate by-pass condenser	A3815
C9	.0001 Mfd. R.F. plate by-pass condenser	A3861
C10	.02 Mfd. A.F. coupling condenser	A3821
C11	.10 Mfd hum filter condenser	A3820
C12	1.0 Mfd. output coupling condenser	
C13	8 Mfd. Mershon power filter condenser	A3845
R1	5,500 ohm antenna resistance	A3791
R2	75 ohm UY 224 bias resistance	A3792
R3	300 ohm vol. control (bias) resistance	S3773
R4	2,500 ohm voltage divider resistance	A3794
R5	3,050 ohm voltage divider resistance	
R6	550,000 ohm Det. automatic bias resistance	A3796
R7	24,000 ohm cathode bias resistance	A3797
R8	250,000 ohm screen voltage reducing resistance	A3798
R9	100,000 ohm hum filter resistance	A3799
R10	300,000 ohm Det plate resistance	A3802
R11	900,000 ohm A.F. grid leak resistance	A3800
R12	1,650 ohm UX 245 bias resistance	A3801
S2	"Hi-lo" switch (voltage control)	C3393B
S3	"On-off" switch (power control)	S3774
T1	Antenna coupling transformer	A3826A
T2	R.F. Interstage transformers	A3909A
T3	R.F. choke	A3840A
T4	R.F. choke	A3841A
T5	A.F. output choke	A3779
T6	A.F. output transformer	A3780
T7	Power transformer	A3781
T8	Power filter choke	A1692
T9	Speaker field	A3529A



TYPE 410 CHASSIS

("Elgin" Model)

Symbol	Description	Part No
C1	Tuning condenser gang	A3394A
C2	.25 Mfd. cathode R.F. by-pass condenser	A3819
C3	.25 Mfd. screen R.F. by-pass condenser	
C4	.30 Mfd. plate R.F. by-pass condenser	
C5	.10 Mfd. Det. automatic bias by-pass condenser	A3820
C6	1.0 Mfd. R.F. cathode by-pass condenser	
C7	.10 Mfd. R.F. screen by-pass condenser	
C8	.0001 Mfd. R.F. plate by-pass condenser	A3815
C9	.0001 Mfd. R.F. plate by-pass condenser	A3861
C10	.02 Mfd. A.F. coupling condenser	A3821
C11	.10 Mfd. R.F. cathode by-pass condenser	A3820
C12	1.0 Mfd. output coupling condenser	
C13	(2) 8 Mfd. Mershon power filter condenser	A3845
C14	.5 Mfd. hum filter condenser	A2263
R1	5,500 ohm antenna resistance	A3791
R2	75 ohm UY 224 bias resistance	A3792
R3	300 ohm vol. control resistance	A4047
R4	2,500 ohm voltage divider resistance	A3794
R5	3,050 ohm voltage divider resistance	
R6	550,000 ohm Det. automatic bias resistance	A3796
R7	24,000 ohm cathode bias resistance	A3797
R8	250,000 ohm screen voltage reducing resistance	A3798
R9	90,000 ohm Det. plate resistance	A4048
R11	900,000 ohm A.F. grid leak resistance	A3800
R12	1,650 ohm UX 245 bias resistance	A3801
R13	280,000 ohm Det. plate resistance	A4050
R14	20,000 ohm hum filter resistance	A4049
R15	51 ohm phono. vol. limit resistance	A3686
R16	60 ohm phono. vol. control resistance	A3687
S1	Motor "on-off" switch	A4076
S2	"Hi-lo" switch (voltage control)	C3393B
S3	"On-off" switch (power control)	S3774
S4	"Radio-record" switch (3 gang)	A4051
T1	Antenna coupling transformer	A3826A
T2	R.F. Interstage transformers	A3909A
T3	R.F. choke	A3840A
T4	R.F. choke	A3841A
T5	A.F. output choke	A3779
T6	A.F. output transformer	A3780
T7	Power transformer	A3781
T8	Power filter choke	A1692
T9	Speaker field	A3529A
T10	Pickup (record)	D2283B
T11	Pickup transformer	A4055A
T12	Motor (25 cycle)	A3698
T12	Motor (60 cycle)	A3699

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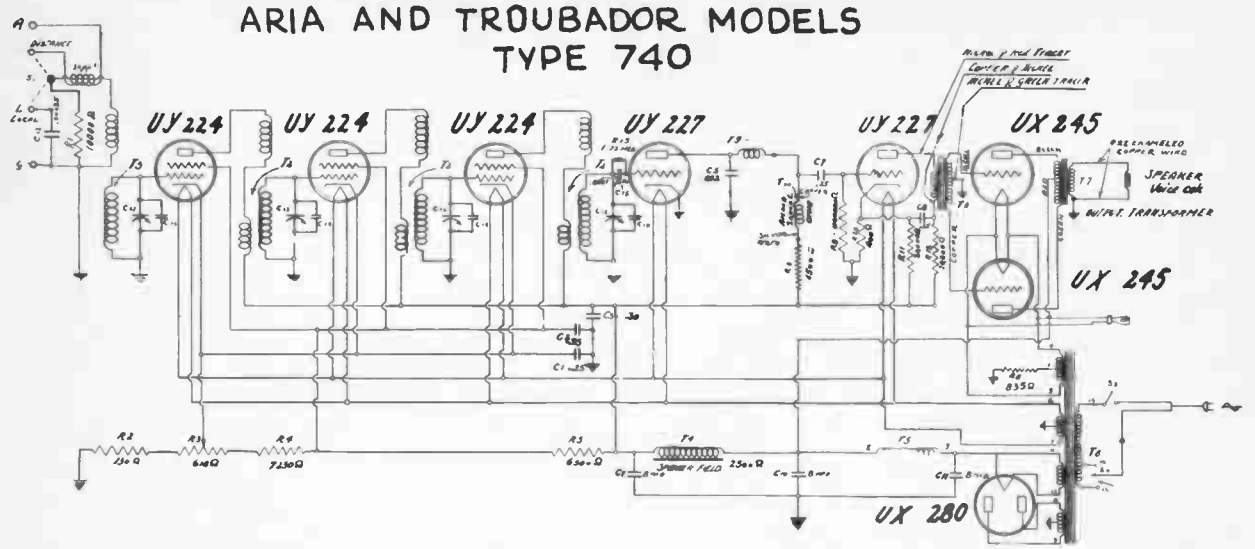
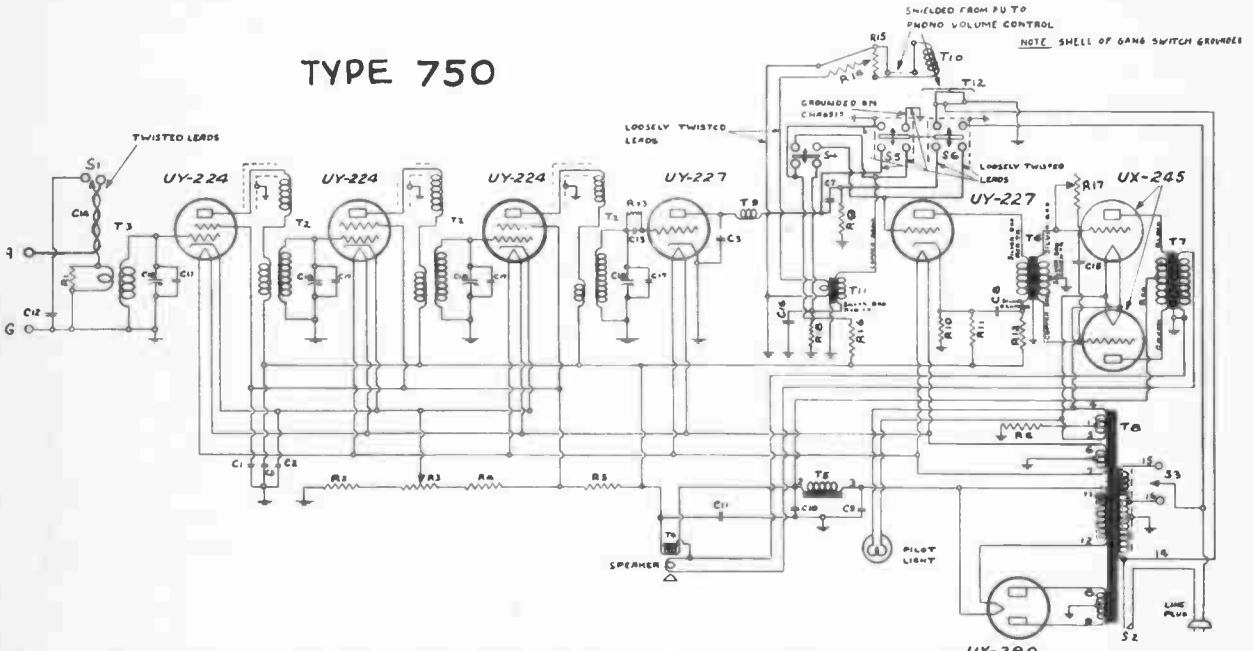
ARIA AND TROUBADOR MODELS
TYPE 740



Symbol	Description	Part No.
C1	.25 Mfd. by-pass condenser }	
C2	.25 Mfd. by-pass condenser } Block	A3565
C3	.30 Mfd. by-pass condenser }	
C5	.002 Mfd. by-pass condenser	B3676
C7	.25 Mfd. by-pass condenser } Block	A3564
C8	.25 Mfd. by-pass condenser }	
C9	8 Mfd. filter condenser }	
C10	8 Mfd. filter condenser } Mershon	A1456
C11	8 Mfd. filter condenser }	
C12	.00025 Mfd. by-pass condenser	A1496
C13	Gang condenser }	
C14	Aligning condenser }	B3530B
C15	.0001 Mfd. grid condenser	A3669
R1	10,000 ohm Attenuator resistance	A3595
R2	130 ohm Bleeder resistance	A3589
R3	615 ohm vol. control (Potentio) resistance	A3602
R4	7,330 ohm voltage divider	A3596
R5	6,500 ohm voltage divider resistance	A3594
R6	835 ohm 245 bias resistance	A3572
R8	4,500 ohm Detector plate resistance	A3670
R9	1 megohm grid leak resistance	A3597
R10	400 ohm 227 bias resistance	A3590
R11	20,000 ohm 227 bias bleeder resistance	A3671
R12	20,000 ohm 1st audio filter resistance	A3598
R13	1.25 megohm grid leak resistance	B3668
S1	Local-distance (range control) switch	A3581
S2	Hi-lo (volt. control) switch	A3393B
S3	On-off switch	A2647
T2	Radio frequency transformers	3578A
T3	Antenna transformers	A3575A
T4	Speaker field coil	A3496
T5	Filter choke	D3567B
T6	Push-pull audio transformer }	F3544B
T7	Output audio transformer }	
T8	Power transformer	D3567B
T9	Radio frequency choke	B3677A
T10	Audio frequency choke	B3673B

TYPE 750



Symbol	Description	Part No.
C1	.25 Mfd. by-pass condenser }	
C2	.25 Mfd. by-pass condenser } Block	A3565
C3	.30 Mfd. by-pass condenser }	
C5	.002 Mfd. by-pass condenser	B3676
C7	.25 Mfd. by-pass condenser } Block (also	
C8	.25 Mfd. by-pass condenser } C16)	A3564
C9	8 Mfd. filter condenser }	
C10	8 Mfd. filter condenser } Mershon	A1456
C11	8 Mfd. filter condenser }	
C12	.00025 Mfd. by-pass condenser	A1496
C13	.0001 Mfd. grid condenser	A3669
C14	.00003 Mfd. antenna condenser (Twisted wire)	A3723
C15	.002 Mfd. by-pass condenser (Tone control)	B3676
C16	.5 Mfd. by-pass condenser	A3564
C17	Aligning condenser }	
C18	Gang condenser }	B3530B
R1	10,000 ohm Attenuator resistance	A3595
R2	130 ohm Bleeder resistance	A3589
R3	615 ohm voltage control resistance (Potentio)	A3782
R4	7230 ohm voltage divider resistance	A3596
R5	6,500 ohm voltage divider resistance	A3594
R6	835 ohm 245 bias resistance	A3572
R9	1 megohm grid leak resistance	A3597
R10	400 ohm 227 bias resistance	A3590
R11	20,000 ohm 227 bias bleeder resistance	A3671
R12	20,000 ohm 1st audio filter resistance	A3598
R13	1.25 megohm grid leak resistance	A3703
R14	31 ohm limiting resistance	A3686
R15	60 ohm phono volume control resistance (Potentio)	A3687
R16	10,000 ohm det. plate resistance	A3948
R17	1 megohm tone control resistance (Potentio)	A3777
R18	200,000 ohm loading resistance	A3947
S1	Local-distance (range control) switch	A3581
S2	On-off switch	A2647
S3	Hi-lo (volt. control) switch	A3393B
S4	Radio-record (on volume control) switch	A3782
S5	Radio-record } Gang switch	A3945
S6	Radio-record }	
T2	Radio frequency transformers	3578A
T3	Antenna switch	A3575A
T4	Speaker field (Pot) coil	A3496
T5	Filter choke	D3567B
T6	Push-pull audio transformer }	F3544B
T7	Output audio transformer }	
T8	Power transformer	D3567B
T9	Radio frequency choke	B3677A
T10	Phono pickup	A2283
T11	Phono pickup transformer	B3684
T12	Phono motor 25 cycle	A3698
	Phono motor 60 cycle	A3699

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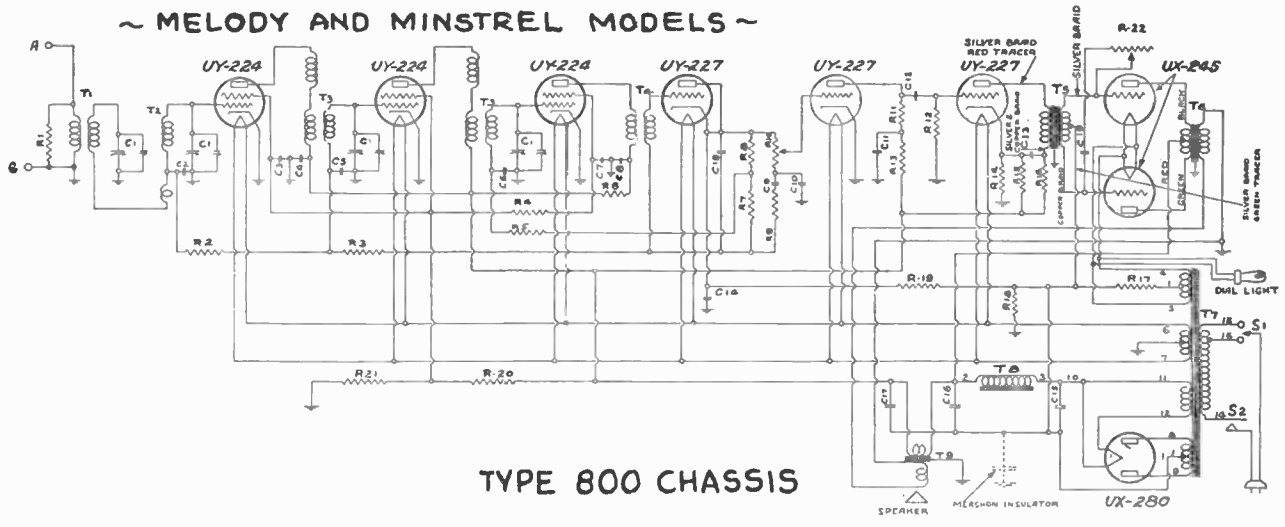
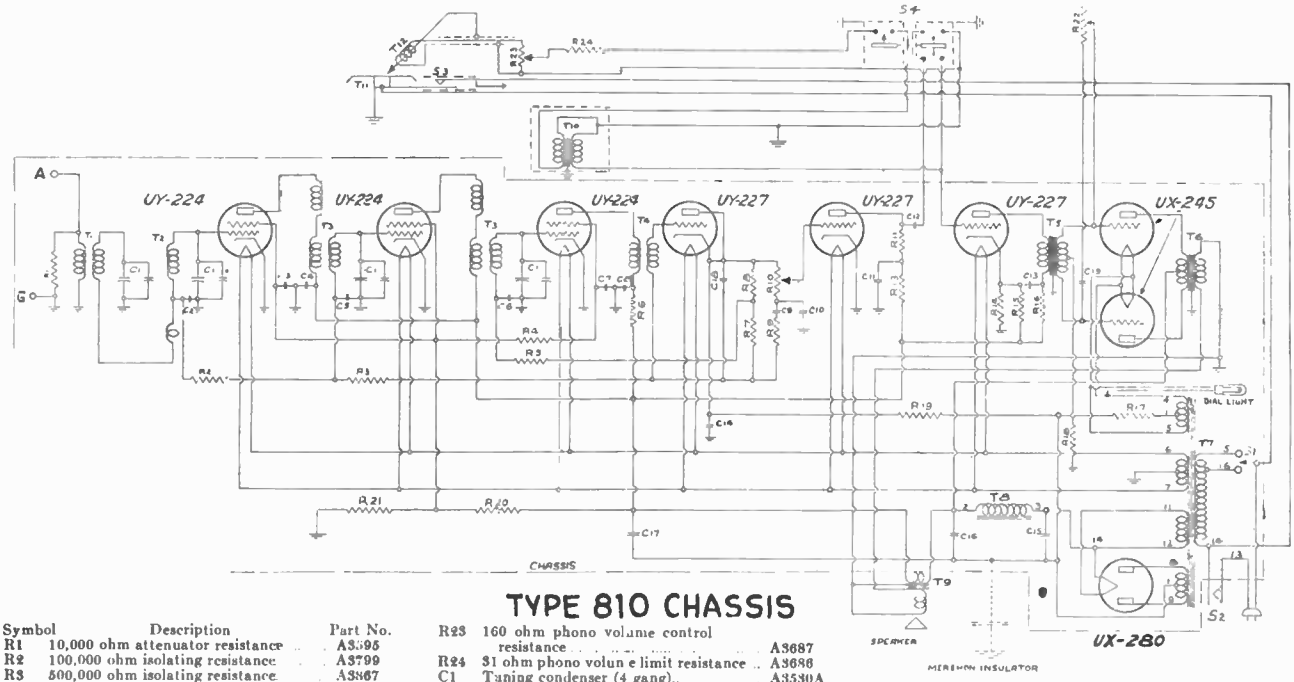
~ MELODY AND MINSTREL MODELS ~



TYPE 800 CHASSIS

Symbol	Description	Part No.
R1	10,000 ohm attenuator resistance	A3595
R2	100,000 ohm isolating resistance	A3799
R3	500,000 ohm isolating resistance	A3867
R4	1,000 ohm isolating resistance	A3869
R5	500,000 ohm isolating resistance	A3867
R6	1,000 ohm isolating resistance	A3869
R7	25,000 ohm voltage dividing resistance	A3600
R8	25,000 ohm voltage dividing resistance	A3600
R9	250,000 ohm plate resistance	A3798
R10	1,000,000 ohm level control resistance	C3904
R11	250,000 ohm plate resistance	A3798
R12	500,000 ohm grid leak resistance	A3867
R13	100,000 ohm isolating resistance	A3799
R14	400 ohm bias resistance	A3590
R15	20,000 ohm A.F. bias bleeder resistance	A3671
R16	18,000 ohm isolating resistance	A3598
R17	835 ohm UX 245 bias resistance	A3868
R18	67 ohm R.F. bias (constant) resistance	
R19	250,000 ohm isolating resistance	A3907
R20	4,700 ohm voltage divider resistance	A3865
R21	5,600 ohm bleeder resistance	A3866
R22	1,000,000 ohm tone control resistance	C3922
C1	Tuning condenser (4 gang)	A3530A
C2	.05 Mfd. by-pass condenser	B3873
C3	.1 Mfd.	B3872
C4	.1 Mfd.	R.F. by-pass condenser
C5	.05 Mfd. by-pass condenser	B3873
C6	.05 Mfd. by-pass condenser	B3873
C7	.1 Mfd.	B3874
C8	.1 Mfd.	R.F. by-pass condenser
C9	.005 Mfd grid condenser	B3891
C10	.0001 Mfd. R.F. by-pass condenser	B3861
C11	.1 Mfd. by-pass condenser	B3871
C12	.1 Mfd. grid condenser	B3875
C13	.25 Mfd. by-pass condenser	B3871
C14	1.0 Mfd. R.F. by-pass condenser	
C15	9 Mfd.	
C16	18 Mfd.	Mershon filter condenser A3932
C17	9 Mfd.	
C18	.00025 Mfd. R.F. by-pass condenser	B1496
C19	.002 Mfd. tone control condenser	B3676
S1	Voltage control switch	A3393A
S2	"On-off" power switch	A2647
T1	R. F. Antenna transformer	
T2	R. F. pre-selection transformer	3886A
T3	R. F. inter-stage transformer	
T4	R. F. fixed-tune transformer	A3889A
T5	A. F. intermediate transformer	A3903A
T6	A. F. output transformer	
T7	Power transformer	A3884A
T8	Filter choke	
T9	Speaker (field)	A3913A



TYPE 810 CHASSIS

Symbol	Description	Part No.
R1	10,000 ohm attenuator resistance	A3595
R2	100,000 ohm isolating resistance	A3799
R3	500,000 ohm isolating resistance	A3867
R4	1,000 ohm isolating resistance	A3869
R5	500,000 ohm isolating resistance	A3867
R6	1,000 ohm isolating resistance	A3869
R7	25,000 ohm voltage dividing resistance	A3600
R8	25,000 ohm voltage dividing resistance	A3600
R9	250,000 ohm plate resistance	A3798
R10	1,000,000 ohm level control resistance	C3904
R11	250,000 ohm plate resistance	A3798
R13	100,000 ohm isolating resistance	A3799
R14	400 ohm bias resistance	A3590
R15	20,000 ohm A.F. bias bleeder resistance	A3671
R16	18,000 ohm isolating resistance	A3598
R17	835 ohm UX 245 bias resistance	A3868
R18	67 ohm R.F. bias (constant) resistance	
R19	250,000 ohm isolating resistance	A3907
R20	4,700 ohm voltage divider resistance	A3865
R21	5,600 ohm bleeder resistance	A3866
R22	1,000,000 ohm tone control resistance	A4034A
R23	160 ohm phono volume control resistance	A3687
R24	31 ohm phono volume limit resistance	A3686
C1	Tuning condenser (4 gang)	A3530A
C2	.05 Mfd. by-pass condenser	B3873
C3	.1 Mfd.	B3872
C4	.1 Mfd.	R.F. by-pass condenser
C5	.05 Mfd. by-pass condenser	B3873
C6	.05 Mfd. by-pass condenser	B3873
C7	.1 Mfd.	B3874
C8	.1 Mfd.	R.F. by-pass condenser
C9	.005 Mfd. grid condenser	B3891
C10	.0001 Mfd R.F. by-pass condenser	B3861
C11	.1 Mfd. by-pass condenser	B3871
C12	.1 Mfd. grid condenser	B3875
C13	.25 Mfd. by-pass condenser	B3871
C14	1.0 Mfd. R.F. by-pass condenser	
C15	9 Mfd.	
C16	18 Mfd.	Mershon filter condenser A3932
C17	9 Mfd.	
C18	.00025 Mfd. R.F. by-pass condenser	B1496
C19	.002 Mfd. tone control condenser	B3676
S1	Voltage control switch	A3393A
S2	"On-off" power switch	A2647
S3	Automatic stop switch	A3812
S4	"Radio-record" change-over switch	A3955
T1	R. F. Antenna transformer	
T2	R. F. pre-selection transformer	3886A
T3	R. F. inter-stage transformer	
T4	R. F. fixed-tune transformer	A3889A
T5	A. F. intermediate transformer	A3903A
T6	A. F. output transformer	
T7	Power transformer	A3884A
T8	Filter choke	
T9	Speaker (field)	A3913A
T10	Pickup transformer	A3684
T11	Motor (25 cycle)	A3810
	Motor (60 cycle)	A3811
T12	Pickup	A3697A

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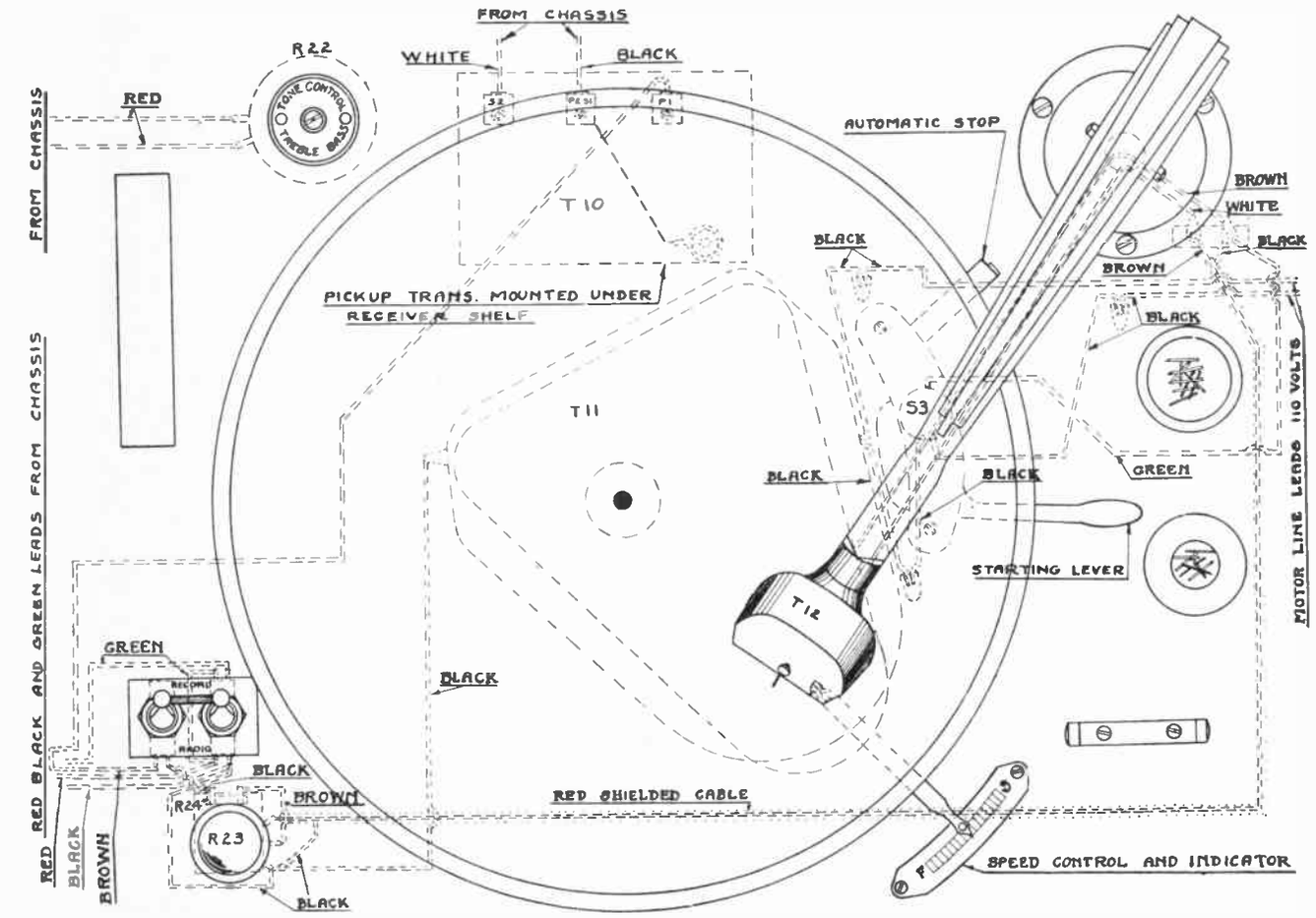
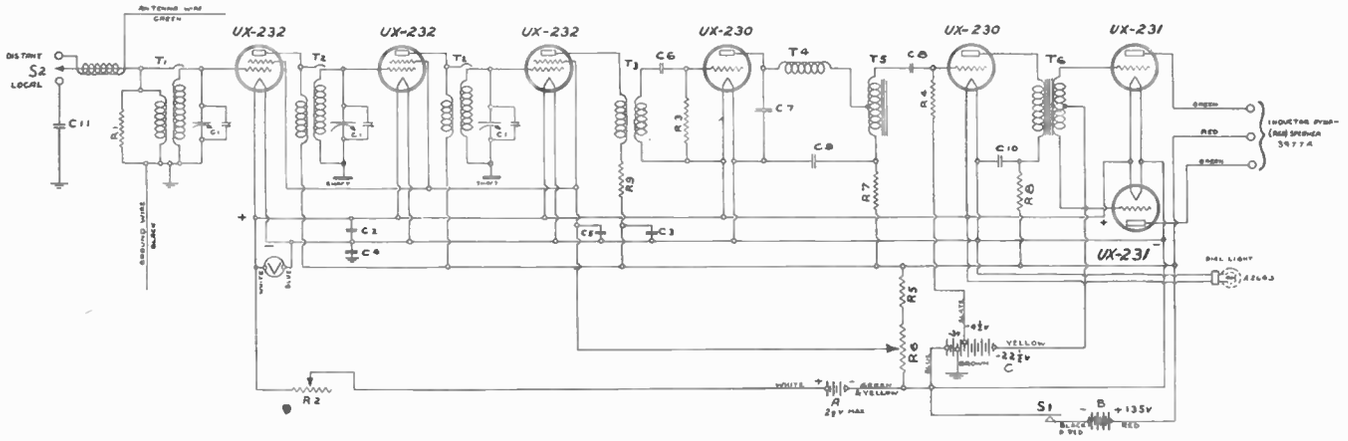


TYPE 810 CHASSIS

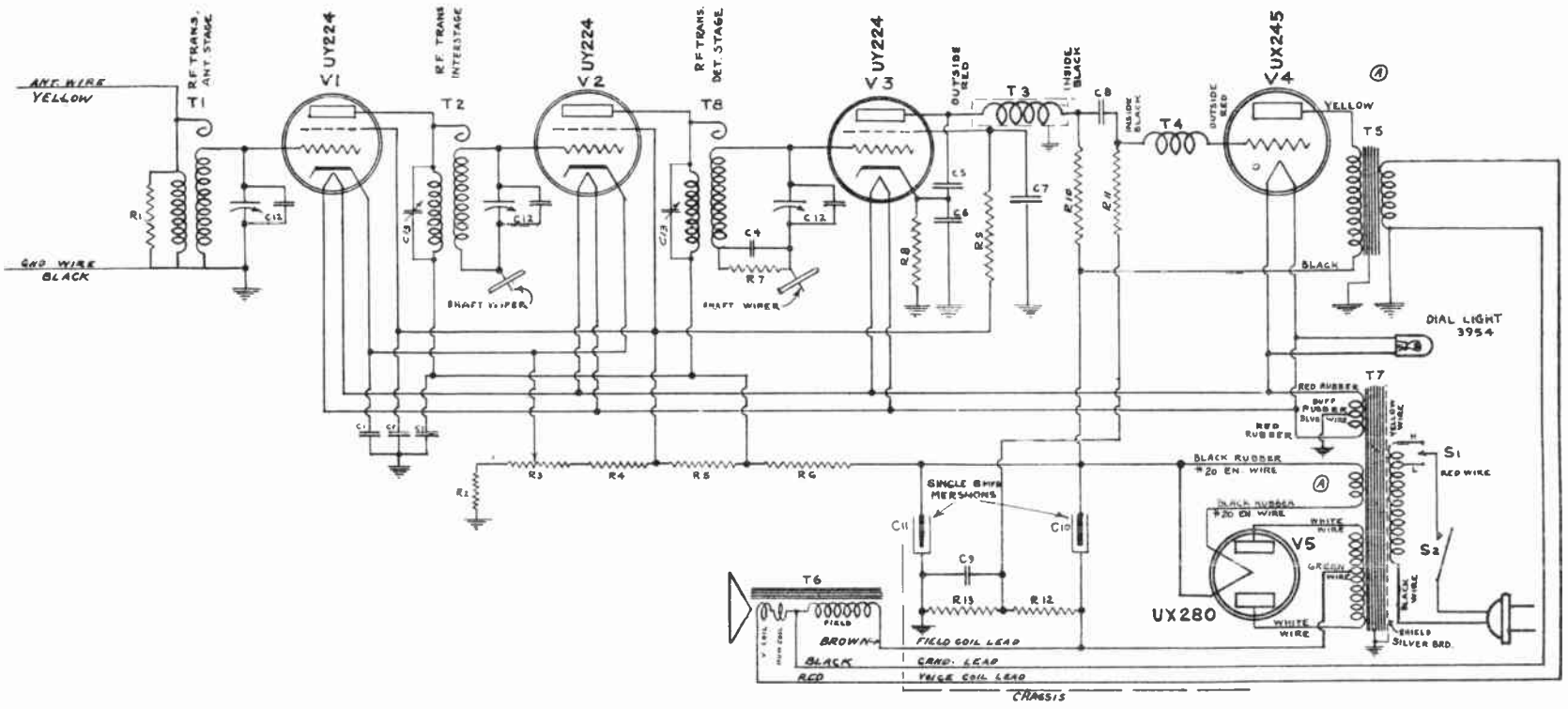
Motor Board Wiring



TYPE 700 CHASSIS

("Serenata" Model)

Symbol	Description	Part No.
C1	Tuning condenser (3 gang)	A3394B
C2	.5 Mfd. filament by-pass condenser	A3972
C3	.5 Mfd. plate by-pass condenser	
C4	.5 Mfd. filament by-pass condenser	
C5	.5 Mfd. screen by-pass condenser	
C6	.00025 Mfd. grid condenser	A3993
C7	.00025 Mfd. plate by-pass condenser	A3993
C8	.002 Mfd. grid condenser	A3992
C9	.25 Mfd. plate by-pass condenser	A3973
C10	.25 Mfd. plate by-pass condenser	
C11	.00025 Mfd. antenna by-pass condenser	A1496
R1	5,500 ohm Antenna resistance	A3791
R2	2 ohm filament resistance	A3978
R3	3 megohm grid leak resistance	A3987
R4	900,000 ohm grid leak resistance	A3800
R5	25,000 ohm bleeder resistance	A3990
R6	35,000 ohm volume control resistance	A3994
R7	45,000 ohm voltage divider resistance	A3988
R8	20,000 ohm voltage divider resistance	A3989
R9	5,500 ohm isolating resistance	A3927
S1	B supply "on-off" switch	A3978
S2	"Local-Distance" switch	B3581
T1	Antenna transformer	A4090A
T2	R. F. Interstage transformers	A4089A
T3	R. F. Untuned transformer	A3889A
T4	Radio frequency choke	A3841A
T5	Audio frequency transformer	A2095
T6	Audio frequency transformer	A2096
V	Filament Voltmeter	A3979



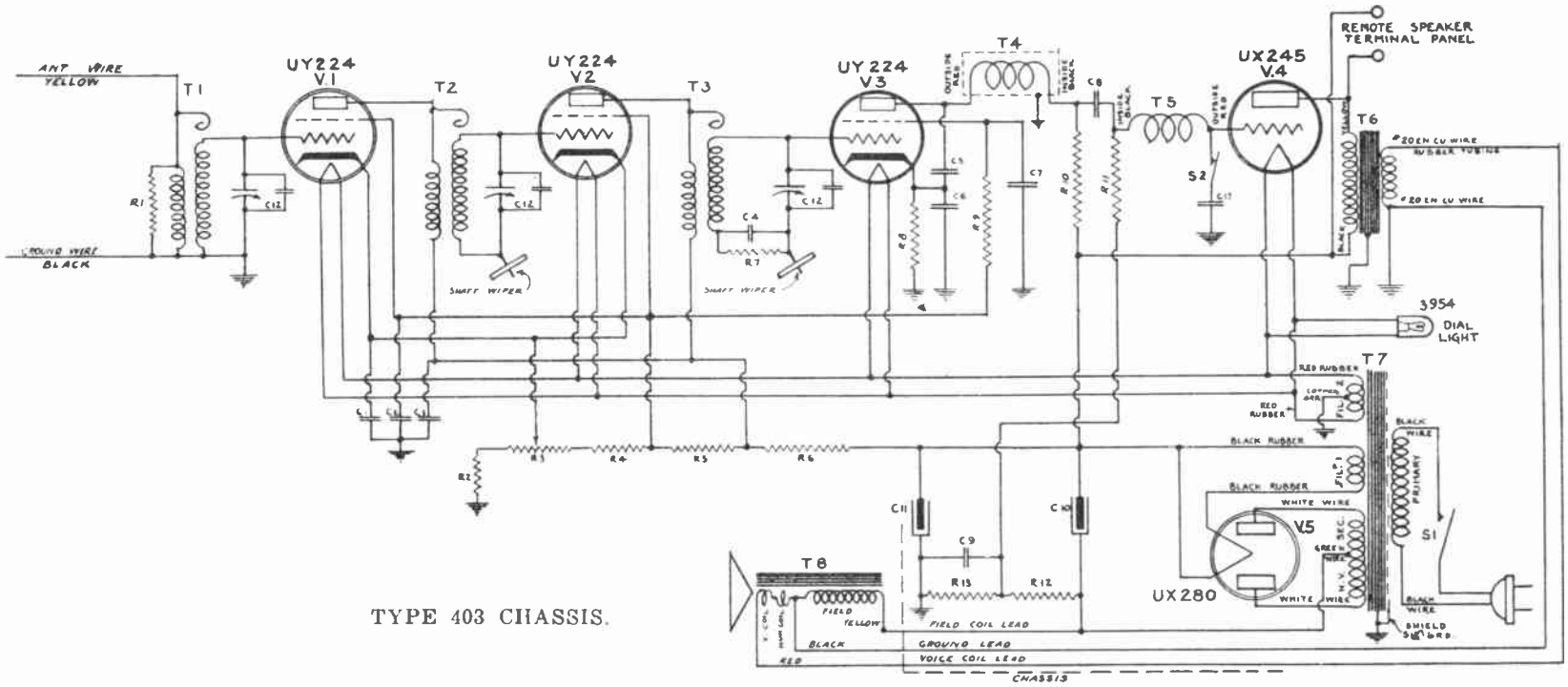
TYPE 402 CHASSIS
CIRCUIT DIAGRAM
("Drake" and "Nelson" Models)

Symbol	Description	Part No.
C1	.25 Mfd. cathod R.F. by-pass condenser	A4231
C2	.1 Mfd. screen R.F. by-pass condenser.	B4230
C3	.1 Mfd. plate R.F. by-pass condenser.	
C4	.018 Mfd. Det. auto-bias by-pass condenser	C4229
C5	.0001 Mfd. Det. plate by-pass condenser	A3815
C6	1 Mfd. Det. cathode bias by-pass condenser	C4229
C7	.1 Mfd. Det. screen by-pass condenser	B4230
C8	.02 Mfd. A. F. coupling condenser	A4220
C9	.05 Mfd. output bias by-pass condenser	(See note
C10	8 Mfd. Mershon filter condenser	A4173
C11	8 Mfd. Mershon filter condenser	A4173
C12	3 gang tuning condenser	A4207A
C13	R.F. resonating condenser	A4314

R1	5,500 ohm antenna resistance	B3791
R2	120 ohm R.F. bias resistance	A4205
R3	615 ohm (vol. cont.) bias resistance	A4242
R4	5,000 ohm voltage divider resistance.	
R5	5,140 ohm voltage divider resistance.	A4205
R6	3,080 ohm voltage divider resistance.	
R7	550,000 ohm Det. auto-bias resistance.	A3796
R8	35,000 ohm Det. cathode bias resistance	A4226
R9	250,000 ohm screen voltage drop resistance	A4225
R10	400,000 ohm Det. plate resistance	A4224
R11	900,000 ohm A. F. grid leak resistance.	A3800
R12	800,000 ohm resistance	A4223
R13	1,000,000 ohm	A4222

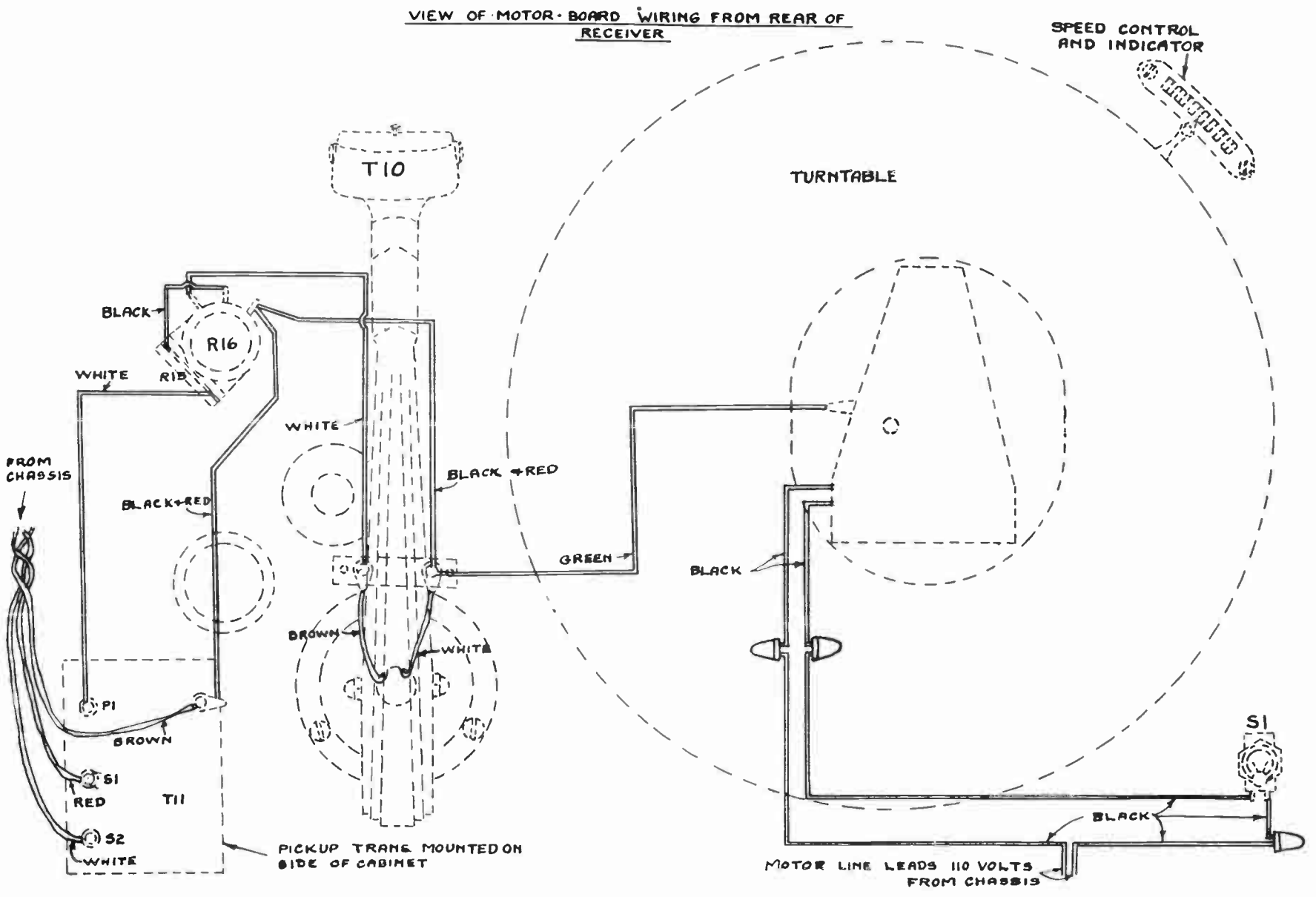
T1	Antenna coupling transformer	4297A
T2	R. F. interstage transformer	4298A
T3	Detector R. F. choke	A4293A
T4	Output R. F. choke	A4296A
T5	A. F. output transformer	A4245A
T6	Speaker field (used as filter choke)	4261
T7	Power transformer	A4243A
T8	R. F. interstage transformer	4311A
S1	Hi-lo switch	A4219A
S2	On-off switch	A4242

NOTE:—First releases use two capacities of .1 Mfd. in series, parts B4230 and A4458. Later releases use only .05 section of block B4230.

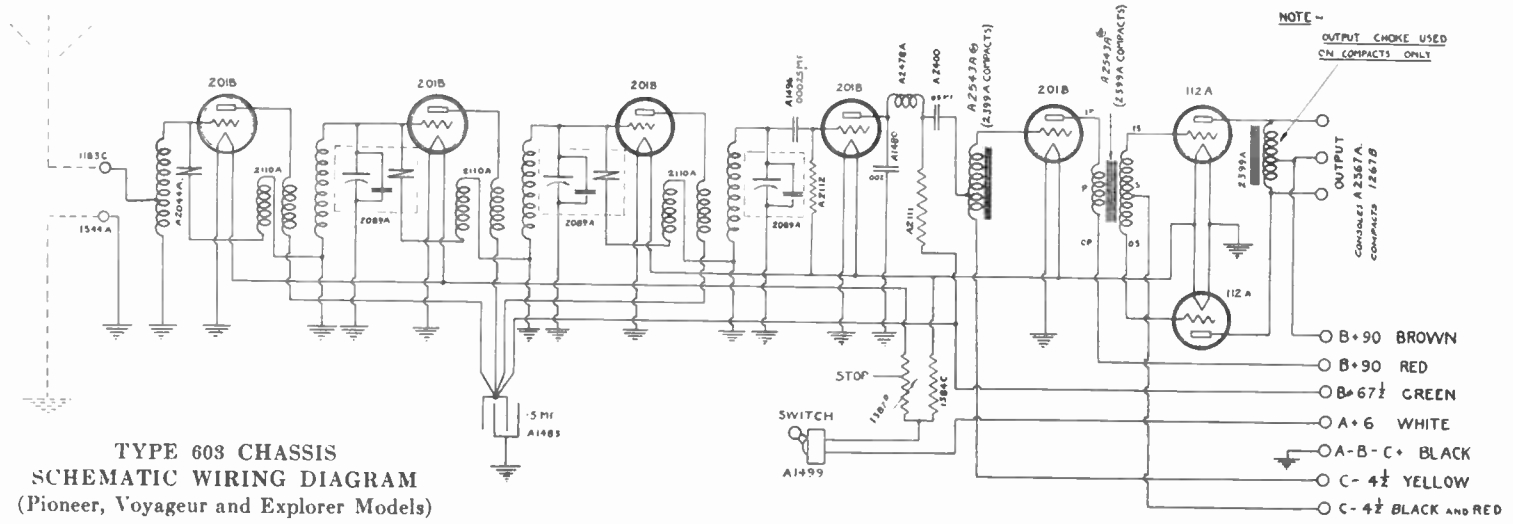


TYPE 403 CHASSIS.

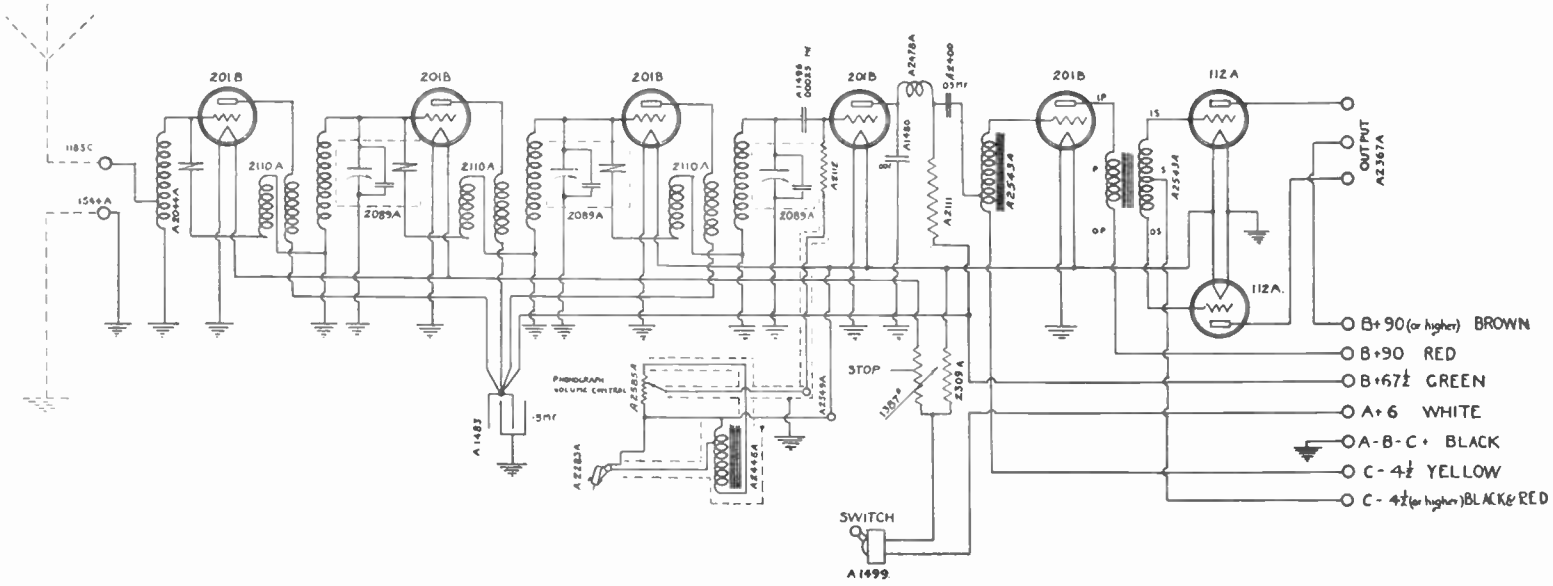
Symbol	DESCRIPTION	Part No.
C1	R. F. cathode by-pass condenser, .25 Mfd.	4772
C2	R. F. screen by-pass condenser, .1 Mfd.	4810(B)
C3	R. F. plate by-pass condenser, .1 Mfd.	4810(B)
C4	Det. grid by-pass condenser, .018 Mfd.	4229(C)
C5	Det. plate by-pass condenser, .0001 Mfd.	3815
C6	Det. cathode by-pass condenser, 1.0 Mfd.	4229(C)
C7	Det. screen by-pass condenser, .1 Mfd.	4810(B)
C8	A. F. coupling by-pass condenser, .02 Mfd.	4220
C9	245 bleeder by-pass condenser, .03 Mfd.	4810(B)
C10	Filter condenser, (electrolytic) 8 Mfd.	4560
C11	Filter condenser, (electrolytic) 8 Mfd.	4560
C12	R. F. tuning condenser (3 gang)	4728
C13	Tone control condenser, .001 Mfd.	3588
R1	Ant. resistance, 5,500 Ohms	3791
R2	R. F. minimum bias resistor, 120 Ohms	4205(A)
R3	Volume control resistor, 615 Ohms	4534
R4	Voltage reducing resistor, 5,000 Ohms	4205(A)
R5	Voltage reducing resistor, 5,140 Ohms	4205(A)
R6	Voltage reducing resistor, 3,080 Ohms	4205(A)
R7	Det. automatic bias resistor, 550,000 Ohms	3796
R8	Det. cathode bias resistor, 35,000 Ohms	4226
R9	Det. screen filter resistor, 250,000 Ohms	4225
R10	Det. plate resistor, 400,000 Ohms	4224
R11	245 grid leak resistor, 900,000 Ohms	3800
R12	245 grid bias resistor, 800,000 Ohms	4223
R13	245 grid bias bleeder resistor, 1,000,000 Ohms	4681
S1	"On-off" power switch	4534(D)
S2	Tone control switch	4784
T1	R. F. transformer, antenna stage	4729
T2	R. F. transformer, second stage	4730
T3	R. F. transformer, detector stage	4731
T4	R. F. choke, detector stage	4293
T5	R. F. choke, output stage	4296
T6	A. F. output transformer	4715
T7	Power transformer	4725
T8	Speaker (Type D6)	4580
(A)	Part of candohm resistor strip	4205
(B)	Part of block condenser	4810
(C)	Part of block condenser	4229
(D)	Part of volume control assembly	4534



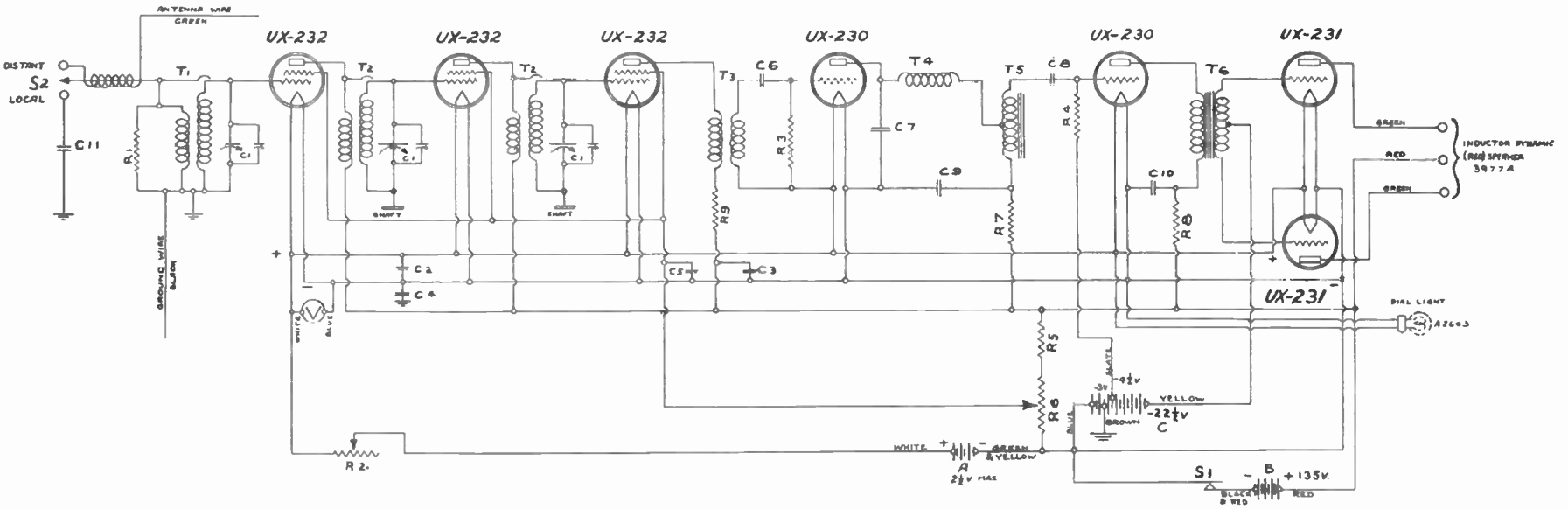
PICTURE DIAGRAM—TYPE 410 CHASSIS
("Elgin" Model—Motor Board Wiring)



TYPE 603 CHASSIS
SCHEMATIC WIRING DIAGRAM
(Pioneer, Voyageur and Explorer Models)

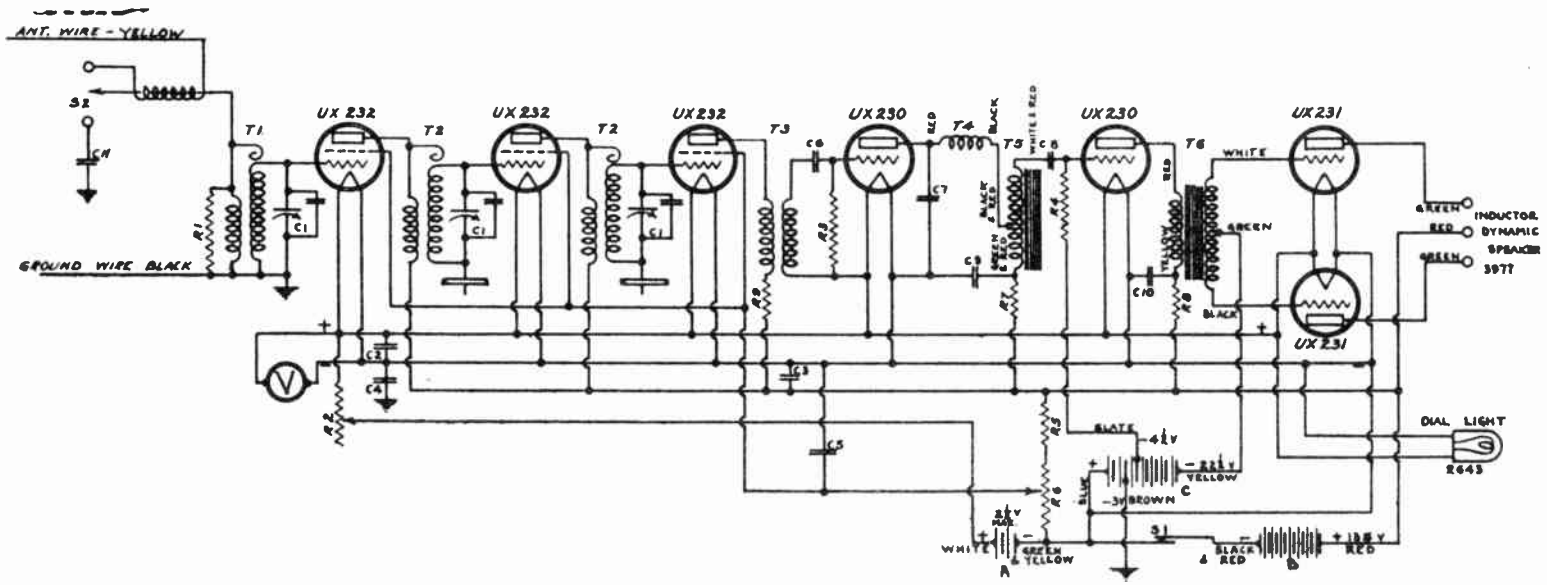


TYPE 605 CHASSIS
SCHEMATIC WIRING DIAGRAM
(Adventurer Model)



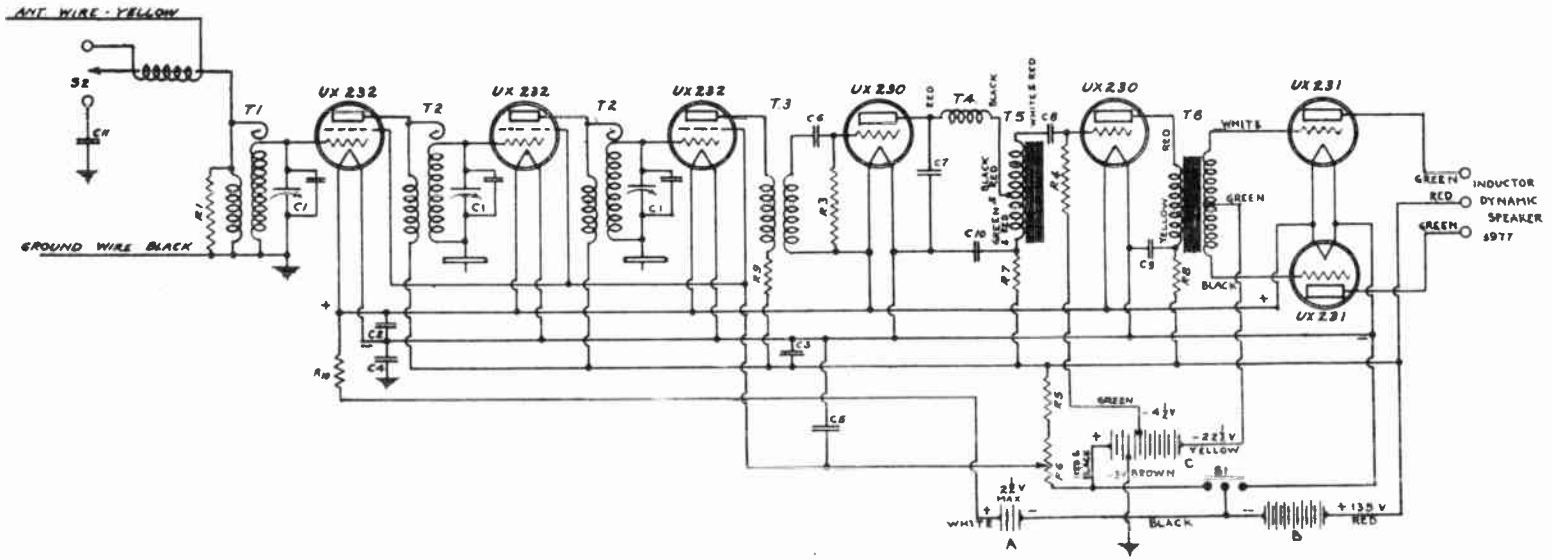
CIRCUIT DIAGRAM—TYPE 700 CHASSIS
("Serenata" Model)

Symbol	Description	Part No.
C1	Tuning condenser (3 gang)	A3394B
C2	.5 Mfd. filament by-pass condenser	A3972
C3	.5 Mfd. plate by-pass condenser	
C4	.5 Mfd. filament by-pass condenser	
C5	.5 Mfd. screen by-pass condenser	
C6	.00025 Mfd. grid condenser	A3993
C7	.00025 Mfd. plate by-pass condenser	A3993
C8	.002 Mfd. grid condenser	A3992
C9	.25 Mfd. plate by-pass condenser	A3973
C10	.25 Mfd. plate by-pass condenser	
C11	.00025 Mfd. antenna by-pass condenser	A1496
R1	5,500 ohm Antenna resistance	A3791
R2	2 ohm filament resistance	A3978
R3	3 megohm grid leak resistance	A3987
R4	900,000 ohm grid leak resistance	A3800
R5	25,000 ohm bleeder resistance	A3990
R6	35,000 ohm volume control resistance	A3994
R7	45,000 ohm voltage divider resistance	A3988
R8	20,000 ohm voltage divider resistance	A3989
R9	5,500 ohm isolating resistance	A3927
S1	B supply "on-off" switch	A3978
S2	"Local-Distance" switch	B3581
T1	Antenna transformer	A4090A
T2	R. F. Interstage transformers	A4089A
T3	R. F. Untuned transformer	A3889A
T4	Radio frequency choke	A3841A
T5	Audio frequency transformer	A2095
T6	Audio frequency transformer	A2096
V	Filament Voltmeter	A3979



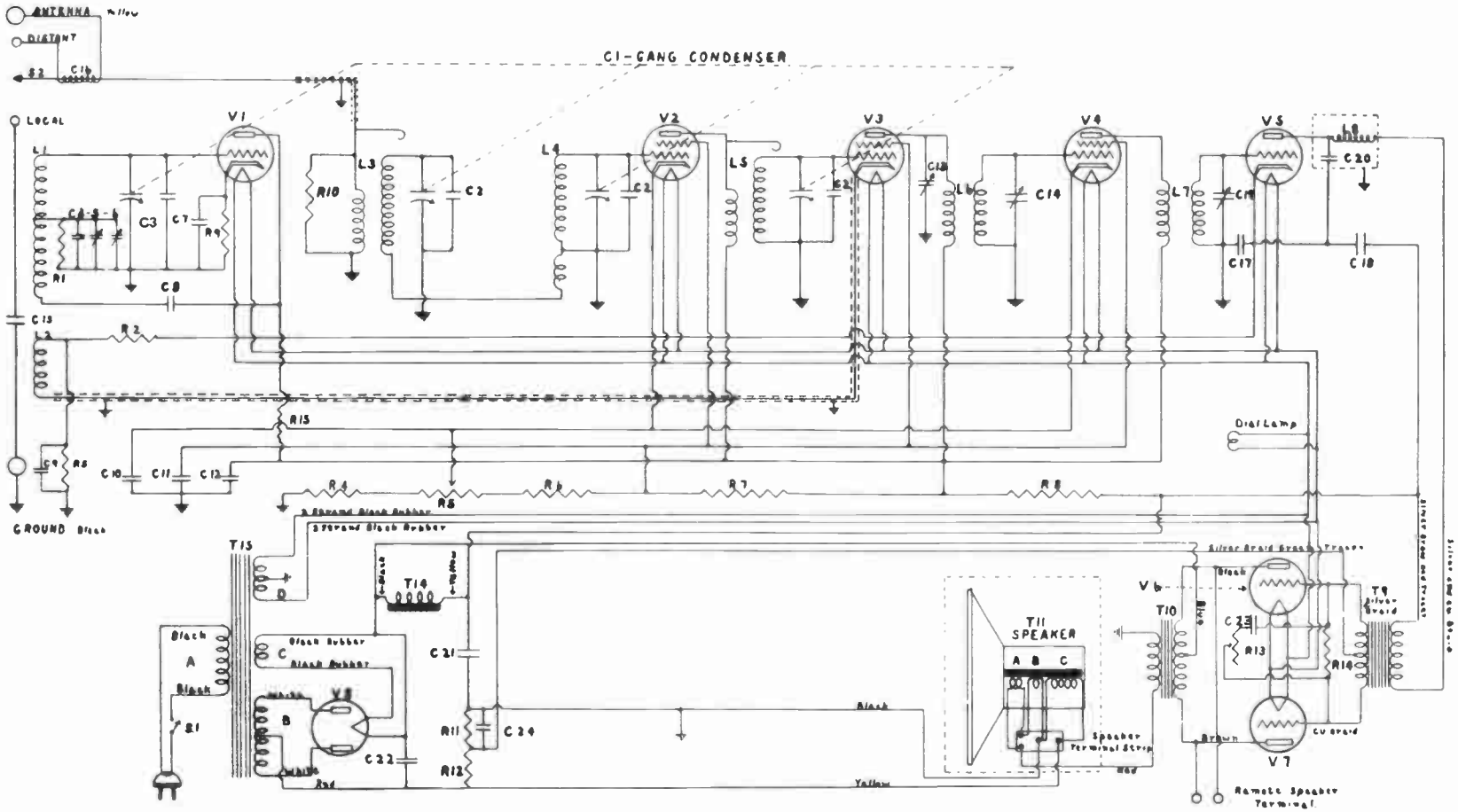
TYPE 701 CHASSIS—CIRCUIT DIAGRAM

Symbol	DESCRIPTION	Part No.
C1	Tuning Condenser (3 gang).....	4811
C2	Filament by-pass condenser, .5 Mfd.	4803
C3	R. F. Plate by-pass condenser, .5 Mfd.	4803
C4	Filament by-pass condenser, .5 Mfd.	4803
C5	R. F. Screen by-pass condenser, .5 Mfd.	4803
C6	Det. Grid condenser, .00025 Mfd.	3993
C7	Det. Plate by-pass condenser, .00025 Mfd.	3993
C8	A. F. coupling condenser, .002 Mfd.	3992
C9	A. F. filter condenser, .25 Mfd.	4804
C10	A. F. filter condenser, .25 Mfd.	4804
C11	Antenna condenser, .00025 Mfd.	1496
R1	Antenna resistance, 5500 Ohms	3791
R2	Voltage control resistance, 2 Ohms	3978
R3	Det. grid leak resistance, 3,-000,000 Ohms	3987
R4	A. F. grid leak resistance, 900,000 Ohms	3800
R5	Bleeder resistance, 25,000 Ohms	3990
R6	Volume control resistance, 35,-000 Ohms	3994
R7	Voltage divider resistance, 45,-000 Ohms	3988
R8	Voltage divider resistance, 22,-000 Ohms	3989
R9	R. F. isolating resistance, 6,100 Ohms	4827
S1	On-off switch (part of R2).....	3978
S2	Local-distance switch	3581
T1	Antenna coupling transformer..	4815
T2	R. F. interstage transformer....	4816
T3	R. F. untuned transformer.....	3889
T4	Detector R. F. choke	4826
T5	A. F. (1st stage) transformer	4860
T6	A. F. (input) transformer	4860



TYPE 702 CHASSIS—CIRCUIT DIAGRAM

Symbol	DESCRIPTION	Part No.
C1	Tuning condenser (3 gang).....	4811
C2	Filament by-pass condenser, .5 Mfd.	4803
C3	R. F. plate by-pass condenser, .5 Mfd.	4803
C4	Filament by-pass condenser, .5 Mfd.	4803
C5	R. F. screen by-pass condenser, .5 Mfd.	4803
C6	Det. grid condenser, .00025 Mfd.	3993
C7	Det. plate by-pass condenser, .00025 Mfd.	3993
C8	A. F. coupling condenser, .002 Mfd.	3992
C9	A. F. filter condenser, .25 Mfd...	4804
C10	A. F. filter condenser, .25 Mfd.	4804
C11	Antenna condenser, .00025 Mfd.	1496
R1	Antenna resistance, 5,500 Ohms	3791
R3	Det. grid leak resistance, 3,-000,000 Ohms	3987
R4	A. F. grid leak resistance, 900,-000 Ohms	3800
R5	Bleeder resistance, 25,000 Ohms	3990
R6	Volume control resistance, 35,-000 Ohms	3994
R7	Voltage divider resistance, 45,-000 Ohms	3988
R8	Voltage divider resistance, 22,-000 Ohms	3989
R9	R. F. isolating resistance, 6,100 Ohms	4827
R10	Fixed filament resistance, .6 Ohms	5243
S1	On-off switch	4986
S2	Local-distance switch	3581
T1	Antenna coupling transformer..	4815
T2	R. F. interstage transformer....	4816
T3	R. F. untuned transformer.....	3889
T4	Detector R. F. choke	4826
T5	A. F. (1st stage) transformer	4860
T6	A. F. (input) transformer.....	4860

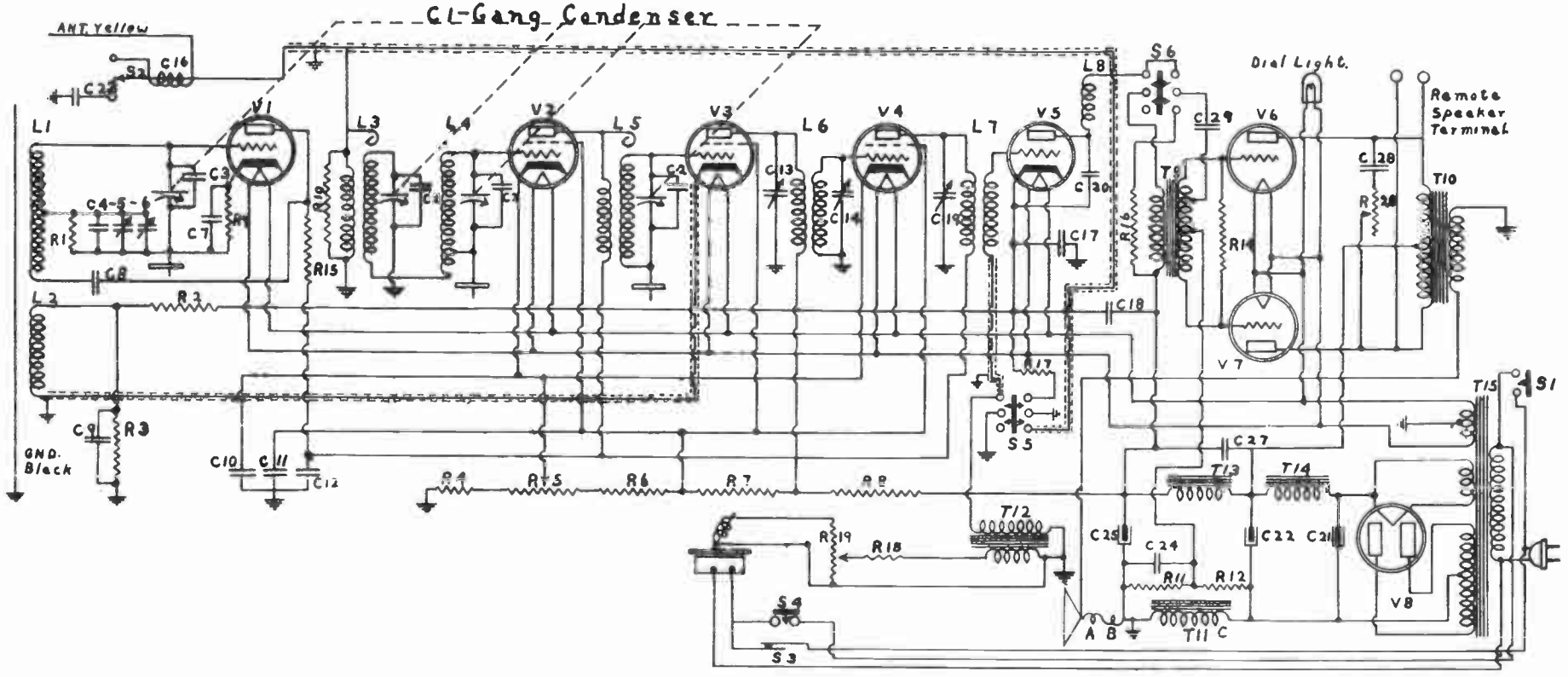


Circuit Diagram—Type 705 Chassis

Symbol	DESCRIPTION	Part No.
C. 1	Gang Condenser, 4 unit	4558
C. 2	R.F. Aligning Condensers	
C. 3	Osc. Aligning Condenser	
C. 4	Osc. Padding Condenser .0005 mfd.	4554
C. 5	Osc. Aligning Condenser	4673
C. 6	Osc. Aligning Condenser 380 mmfd.	
C. 7	Osc. Cathode Bypass Condenser .05 mfd.	4513
C. 8	Osc. Plate Coupling Condenser .0001 mfd.	3815
C. 9	Det. Cathode Bypass Condenser .05 mfd.	4679
C.10	R.F. & I.F. Cathode Bypass Condenser .25 mfd.	4550 (A)
C.11	R.F. & I.F. Screen Bypass Condenser .3 mfd.	4802
C.12	Osc. R. F. & I.F. Plate Bypass Condenser .3 mfd.	4550 (A)
C.13	I.F. Aligning Condenser	(B)
C.14	I.F. Aligning Condenser	(B)
C.15	Antenna Bypass Condenser .00025 mfd.	1496
C.16	Antenna Series Condenser 30 mmfd.	(C)
C.17	Det. Cathode Bypass Condenser 1 mfd.	4487
C.18	A.F. Filter Condenser .12 mfd.	4553
C.19	I.F. Aligning Condenser	(B)
C.20	Det. Plate R.F. Bypass Condenser .002 mfd.	4548
C.21	Power Filter (Mershon) Condenser 8 mfd.	4560
C.22	Power Filter (Mershon) Condenser 8 mfd.	4560

Symbol	DESCRIPTION	Part No.
C.23	A.F. Tone Control Condenser .001 mfd.	4514
C.24	245 Bias Bypass Condenser .5 mfd.	4801
(A)	Two sections in one unit (B) Part of Assemblies L6 and 7 (C) Twisted leads of S2	
R. 1	Osc. Voltage Equalizing Resistance 25000 ohms	4591
R. 2	Mixer, Det. Bias Resistance 30,000 ohms	4608
R. 3	Mixer, Det. Bias Resistance 6600 ohms	4545
R. 4	R.F. Minimum Bias Resistance 140 ohms	4861 (E)
R. 5	R.F. Variable Bias (Vol. Cont.) Resistance 725 ohms	4891
R. 6	Voltage Dividing Resistance 6225 ohms	4676
R. 7	Voltage Dividing Resistance 6400 ohms	4622
R. 8	Voltage Dividing Resistance 2200 ohms	4622
R. 9	Osc. Bias (Cathode) Resistance 5000 ohms	4546
R.10	Antenna Resistance 7000 ohms	4378
R.11	245 Bias Resistance 1000000 ohms	4681
R.12	245 Bias Resistance 400,000 ohms	4680
R.13	A.F. Tone Control Resistance 6 megohms	4611
R.14	A.F. Shunt Resistance 3.5 megohms	4892
R.15	Osc. Plate Resistance 30000 ohms	4631
(E)	In two sections in first releases	

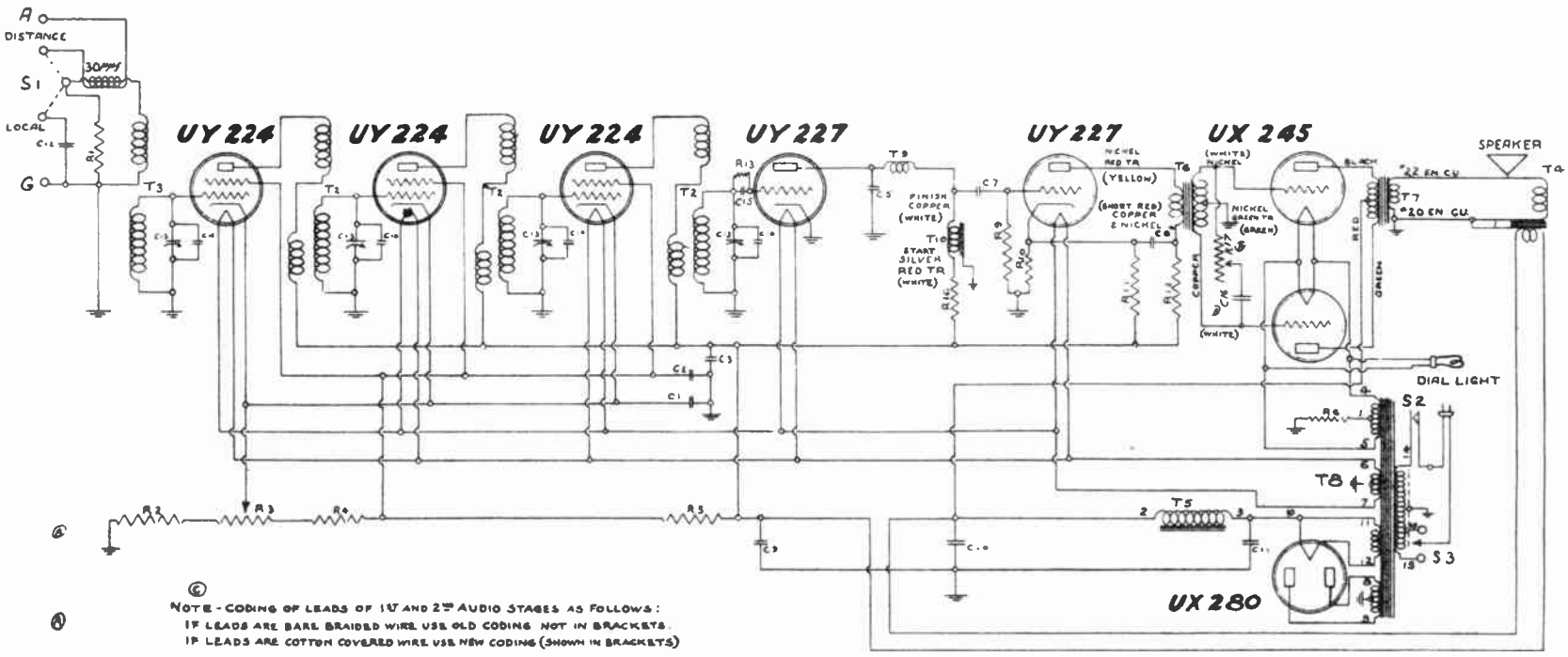
Symbol	DESCRIPTION	Part No.
L. 1	Oscillator Tuning Coil	4597
L. 2	Oscillator Coupling Coil	
L. 3	R.F. Transformer (pre-selection)	4683
L. 4	R.F. Transformer (R.F. stage)	4595
L. 5	R.F. Transformer (Mixer stage)	4684
L. 6	I.F. Transformer (I.F. stage)	4662
L. 7	I.F. Transformer (Det. stage)	4669
L. 8	R.F. Choke	(D)
(D)	Part of L7	
T. 9	Push-pull, Input Transformer	4592
T.10	Push-pull, Output Transformer	
T.11-A	Speaker, voice coil	4625
T.11-B	Speaker, hum coil	
T.11-C	Speaker, field coil	
T.14	Power Filter Choke	4593
T.15-A	Power Transformer, primary winding	4544
T.15-B	Power Transformer, H.V. secondary wind.	
T.15-C	Power Transformer, 280 Fil. secondary winding	
T.15-D	Power Transformer, 227, 224, 245 Fil. winding	
S. 1	"On-off" Switch	(G)
S. 2	"Loc-Dist." Switch	3581
(G)	Part of Vol. Control R5	



TYPE 707 CHASSIS—CIRCUIT DIAGRAM

NOTE—Unless shown below parts and symbols are the same as for Type 705 Chassis.

C17	Audio Cathode By-pass Condenser 1 Mfd.	4973A
C18	Audio Blocking Condenser .12 Mfd.	4973A
C25	Power Filter (Mershon) 8 Mfd.	4560
C27	Audio By-pass Condenser .5 Mfd.	4959
C28	Tone Control Condenser .12 Mfd.	4973A
C29	Audio Coupling Condenser .1 Mfd.	4973A
R5	Radio Vol. Control and Phono-Radio Switch, 725 ohms	4971
R16	Phono Coupling Resistor, 26,000 ohms	4974
R17	Cathode Bias Resistor, 2,000 ohms	4957
R18	Phono Volume Control Fixed Resistor, 31 ohms	3686
R19	Phono Volume Control, 80 ohms	4985
R20	Tone Control Rheostat, 45,000 ohms	4975
S3	Automatic Switch on Record Changer	.....
S4	"On-off" Motor Switch	5018
S5	Phono-Radio Switch	(F)
S6	Phono-Radio Gang Switch on Motor Board	4986
T12	Phono Pickup Transformer	4894
T13-14	Filter Choke Assembly	4965A
(F)	Part of Volume Control Assembly R5.	

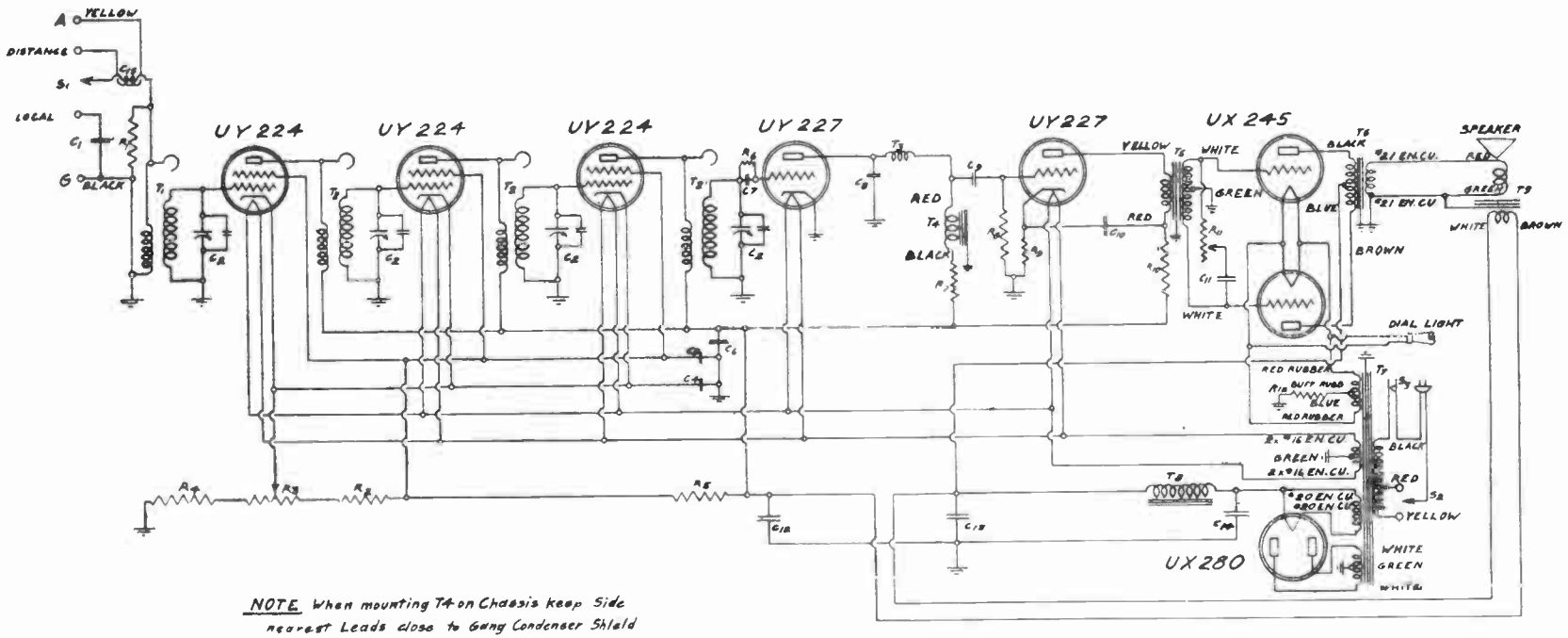


TYPE 740-B CHASSIS
CIRCUIT DIAGRAM

Symbol	Description	Part No.
C1	.25 Mfd. by-pass condenser	Block A3565
C2	.25 Mfd. by-pass condenser	
C3	.30 Mfd. by-pass condenser	
C5	.002 Mfd. by-pass condenser	B3676
C7	.25 Mfd. by-pass condenser	Block A4019
C8	.25 Mfd. by-pass condenser	
C9	8 Mfd. filter condenser	Mershon A1456
C10	8 Mfd. filter condenser	
C11	8 Mfd. filter condenser	
C12	.00025 Mfd. by-pass condenser	A1496
C13	Gang condenser	B3530B
C14	Aligning condenser	
C15	.0001 Mfd. grid condenser	A3669
C16	.002 Mfd. tone control condenser	A3676

R1	10,000 ohm antenna resistance	A3595
R2	130 ohm Bleeder resistance	A3589
R3	615 ohm vol. control (Potentio) resistance	A3602
R4	7,230 ohm voltage divider	A3596
R5	6,500 ohm voltage divider resistance	A3594
R6	835 ohm, 245 bias resistance	A3572
R9	1 megohm grid leak resistance	A3597
R10	400 ohm 227 bias resistance	A3590
R11	20,000 ohm 227 bias bleeder resistance	A3671
R12	20,000 ohm 1st audio filter resistance	A3598
R13	1.25 megohm grid leak resistance	A3703
R16	4,500 ohm Detector plate resistance (was R8)	A3670
R17	1 megohm tone control resistance	A4024

S1	Local-distance (range control) switch	A3581
S2	On-off switch	A2647
S3	Hi-lo (volt. control) switch	A3393B
T2	Radio frequency transformer	3578A
T3	Antenna transformer	A3575A
T4	Speaker field coil	A3496
T5	Filter choke	D3567B
T6	Push-pull audio transformer	F3544B
T7	Output audio transformer	
T8	Power transformer	D3567B
T9	Radio frequency choke	B3677A
T10	Audio frequency choke	B3684



CIRCUIT DIAGRAM TYPE 741 CHASSIS

(Note:—Coding of primary of T5 should be reversed—Red to plate and yellow to plate supply)

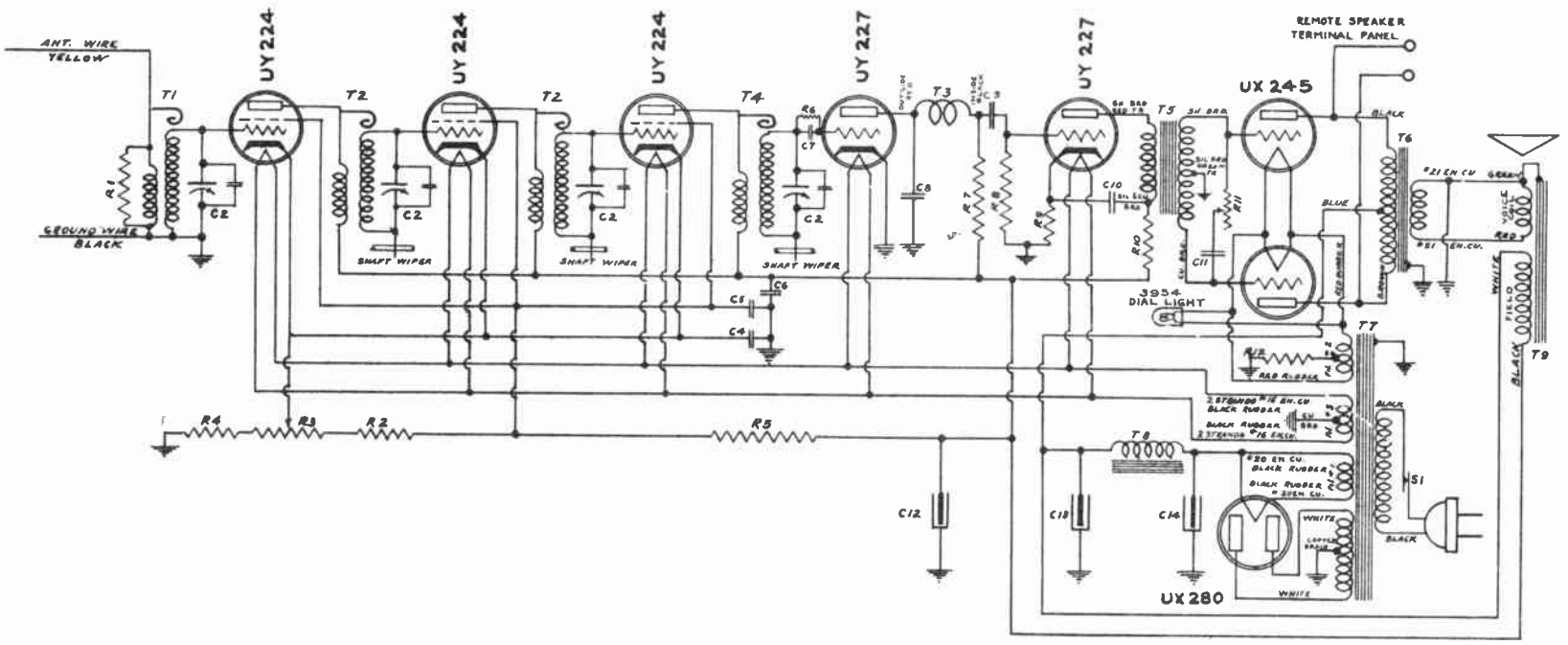
Symbol	Description	Part No.
R1	7,000 ohm antenna resistance	A4378
R2	4,725 ohm voltage divider resistance	*
R3	415 ohm volume control resistance	A4372
R4	98 ohm minimum R.F. bias resistance	*
R5	4,200 ohm voltage divider resistance	*
R6	1,250,000 ohm. Det. grid leak res.	B3703
R7	4,500 ohm Det. voltage reducing resistance	*
R8	500,000 ohm Audio Grid leak resistance	A4379
R9	1,250 ohm A.F. bias resistance	A4353
R10	18,000 ohm A.F. filter resistance	B3598
R11	1,500,000 ohm tone control resistance	A4382
R12	835 ohm Output bias resistance	A3572
*	Tapped sections of the same unit	A4352

Symbol	Description	Part No.
C1	.00025 mfd. antenna condenser	B3993
C2	4 gang tuning condenser	A4389
C4	.25 mfd. cathode bias bypass condenser	A4339
C5	.25 mfd. R.F. screen bypass condenser	A4339
C6	.25 mfd. R.F. plate bypass condenser	A4339
C7	.0001 mfd. Det. grid condenser	A3669
C8	.002 Mfd. Det. plate bypass cond's'r	B3676
C9	.1 mfd. Audio coupling condenser	A4483
C10	1 mfd. Audio filter condenser	B4340
C11	.002 mfd. tone control condenser	B3992
C12	8 mfd. power filter condenser	A1456
C13	8 mfd. power filter condenser	A1456
C14	8 mfd. power filter condenser	A1456
C15	30 mmfd. antenna condenser	A4376**

**Twisted leads between S1 and Chassis

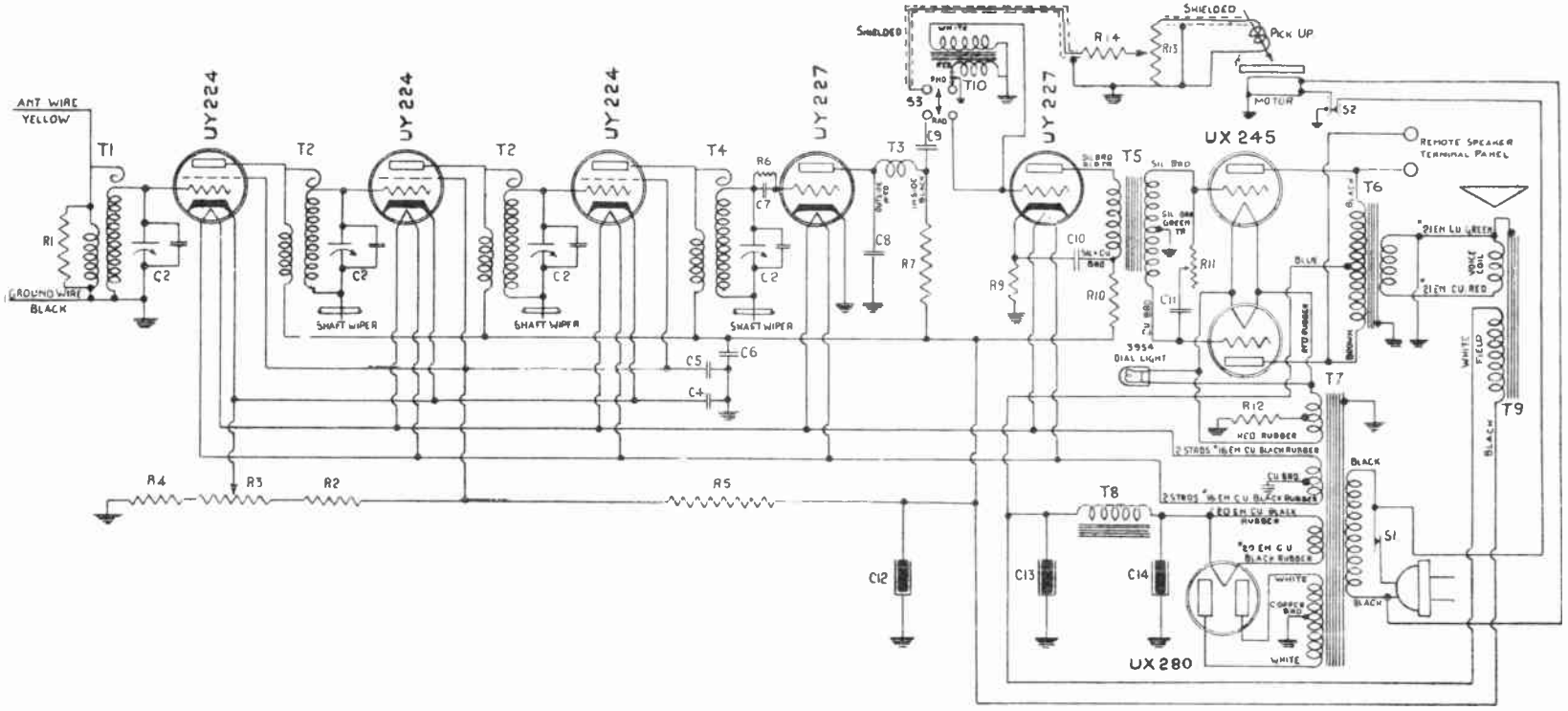
Symbol	Description	Part No.
T1	Antenna R.F. transformer	A4310
T2	Interstage R.F. transformers	A4317
T2(1)	Detector R.F. transformer	A4426
T3	Detector R.F. plate choke	A4293
T4	A.F. choke	B4401
T5	Pushpull input transformer	B4398
T6	Pushpull output transformer	B4398
T7	Power transformer	A4407
T8	Power filter choke	A4404
T9	D3 dynamic speaker	D3529
S1	Local—distance switch	B3581
S2	Hi-lo switch	A3393
S3	On—off switch	A4372***

***A part of volume control resistance.



TYPE 742 CHASSIS—CIRCUIT DIAGRAM

Symbol	DESCRIPTION	Part No.
C2	R. F. tuning condenser (4 gang)	4882
C4	R. F. cathode by-pass condenser, .25 Mfd.	4851(A)
C5	R. F. screen by-pass condenser, .1 Mfd.	4851(A)
C6	R. F. plate by-pass condenser, .1 Mfd.	4851(A)
C7	Det. grid by-pass condenser, .0001 Mfd.	3669
C8	Det. plate by-pass condenser, .002 Mfd.	3676
C9	A. F. coupling condenser, .1 Mfd.	4866(A)
C10	A. F. filter condenser, .4 Mfd.	4866(A)
C11	Tone control condenser, .002 Mfd.	3992
C12	Filter condenser (electrolytic), 8 Mfd.	4560
C13	Filter condenser (electrolytic), 8 Mfd.	4560
C14	Filter condenser (electrolytic), 8 Mfd.	4560
R1	Antenna resistance, 7,000 Ohms	4378
R2	Voltage reducing resistor, 4,640 Ohms	4864(B)
R3	Volume control resistor, 500 Ohms	4865
R4	R. F. minimum bias resistor, 98 Ohms	4864(B)
R5	Voltage reducing resistor, 4,200 Ohms	4864(B)
R6	Det. grid leak resistor, 1,250,000 Ohms	3703
R7	Det. plate resistor, 20,000 Ohms	4854
R8	A. F. grid leak resistor, 500,000 Ohms	4379
R9	A. F. cathode bias resistor, 1,250 Ohms	4353
R10	A. F. filter resistor, 18,000 Ohms	3598
R11	Tone control resistor, 1,500,000 Ohms	4887
R12	245 bias resistor, 835 Ohms	3572
S1	"On-off" power switch	4865(C)
T1	R. F. transformer, antenna stage	4884
T2	R. F. transformer, 2nd and 3rd stage	4885
T3	Det. R.F. plate choke	4293
T4	R. F. transformer, detector stage	4883
T5	A. F. input transformer	4871(D)
T6	A. F. output transformer	4871(D)
T7	Power transformer	4870
T8	Power filter choke	4874
T9	Speaker (Type D)	4889
(A)	Part of block condenser	4851
(B)	Part of candohm resistor	4864
(C)	Part of volume control assembly	4865
(D)	Part of audio block assembly	4871



TYPE 743 CHASSIS—CIRCUIT DIAGRAM

Symbol	DESCRIPTION	Part No.
C2	R. F. tuning condenser (4 gang)	4882
C4	R. F. cathode by-pass condenser, .25 Mfd.	4851(A)
C5	R. F. screen by-pass condenser, .1 Mfd.	4851(A)
C6	R. F. plate by-pass condenser, .1 Mfd.	4851(A)
C7	Det. grid condenser, .0001 Mfd.	3669
C8	Det. plate by-pass condenser, .002 Mfd.	3676
*C9	A. F. coupling condenser, .1 Mfd.	4863(A)
*C10	A. F. filter by-pass, .4 Mfd.	4863(A)
C11	Tone control condenser, .002 Mfd.	3992
C12	Filter condenser (electrolytic), 8 Mfd.	4560
C13	Filter condenser (electrolytic), 8 Mfd.	4560
C14	Filter condenser (electrolytic), 8 Mfd.	4560
R1	Antenna resistance, 7,000 Ohms	4378
R2	Voltage reducing resistor, 4,640 Ohms	4864(B)
*R3	Volume control resistance, 500 Ohms	4862
R4	R. F. Minimum bias resistance, 98 Ohms	4864(B)
R5	Voltage reducing resistance, 4,200 Ohms	4864(B)
R6	Det. grid leak resistance, 1,-250,000 Ohms	3703
R7	Det. plate resistance, 20,000 Ohms	4854
R8	A. F. grid leak resistance, 500,000 Ohms	4379
R9	A. F. cathode bias resistance, 1,250 Ohms	4353
R10	A. F. filter resistance, 18,000 Ohms	3598
R11	Tone control resistance, 1,-500,000 Ohms	4887
R12	245 bias resistance, 835 Ohms	3572
*R13	Record volume control resistance, 80 Ohms	4985
*R14	Record volume limit resistance, 31 Ohms	3686
*S1	"On-off" power switch	2647
*S2	Motor auto-stop switch	3812
*S3	"Radio-record" switch	4862(C)
T1	R. F. transformer, antenna stage	4884
T2	R. F. transformer, 2nd and 3rd stage	4885
T4	R. F. transformer, detector stage	4883
T5	A. F. input transformer	4871(D)
T6	A. F. output transformer	4871(D)
T7	Power transformer	4870
T8	Power filter choke	4874
T9	Speaker (Type D)	4889
*T10	Pick-up transformer	4894
	*Motor, 25 cycle, 120 volt	3698
	*Motor, 60 cycle, 120 volt	3699
	*Pick-up	2283
(A)	Part of block condenser	4863
(B)	Part of candohm resistor	4864
(C)	Part of volume control assembly	4862
(D)	Part of audio block assembly	4871

* Parts marked by asterisk are in addition to or slightly different from assemblies used in the type 742 chassis.

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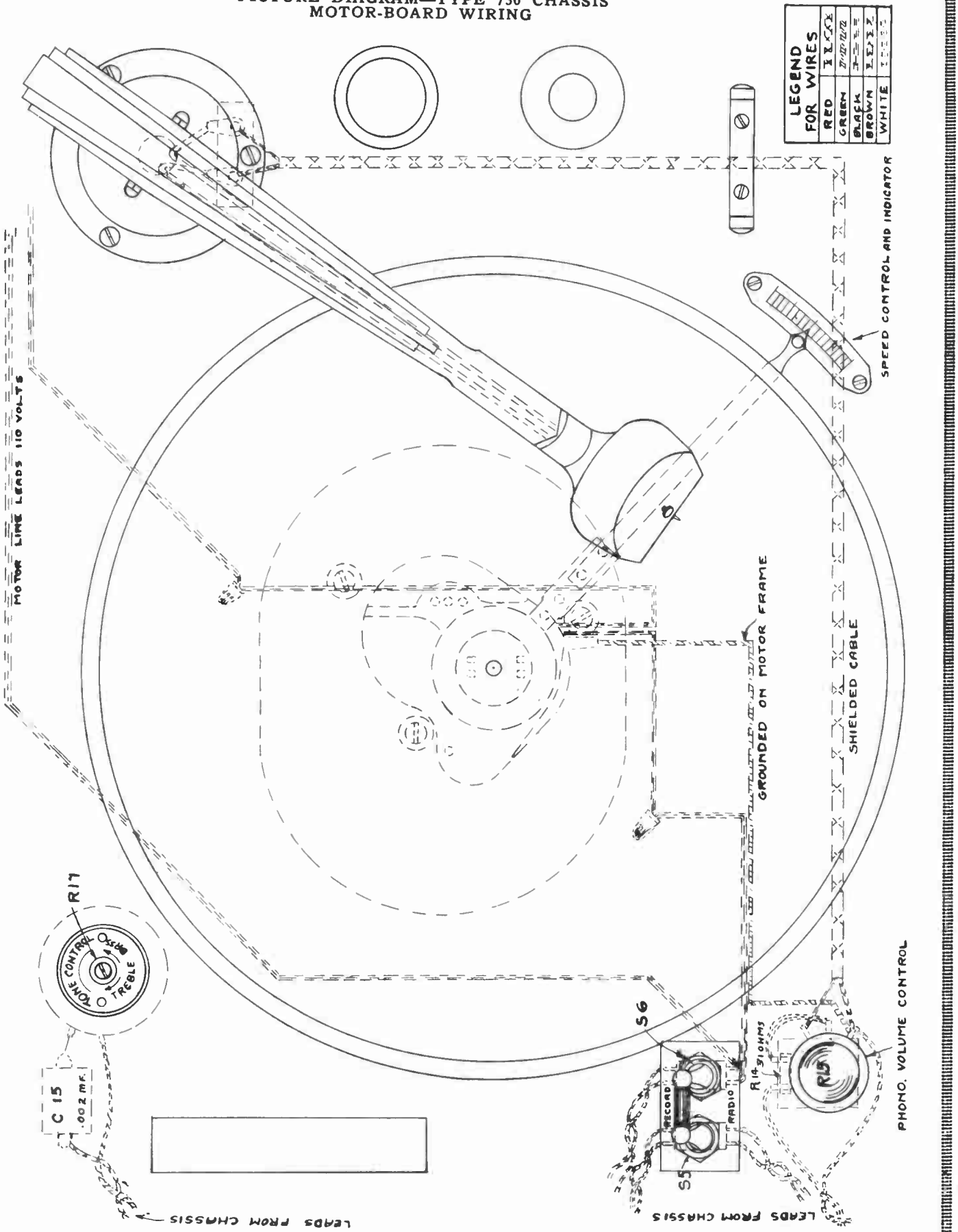
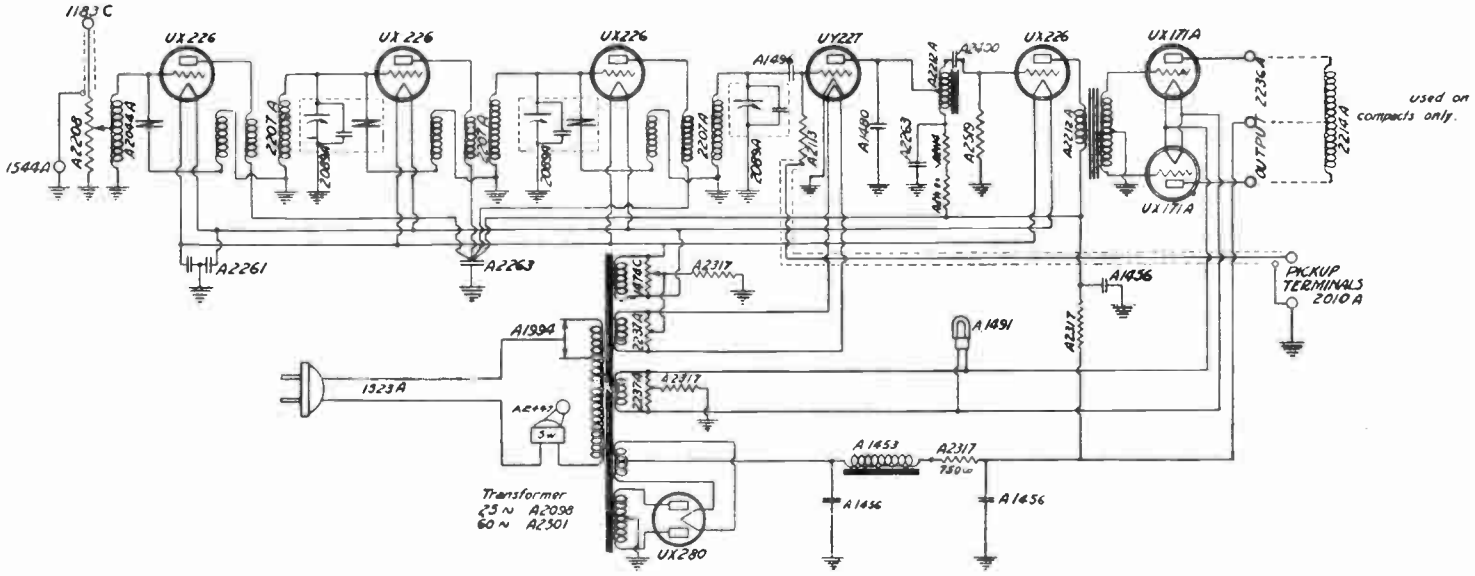
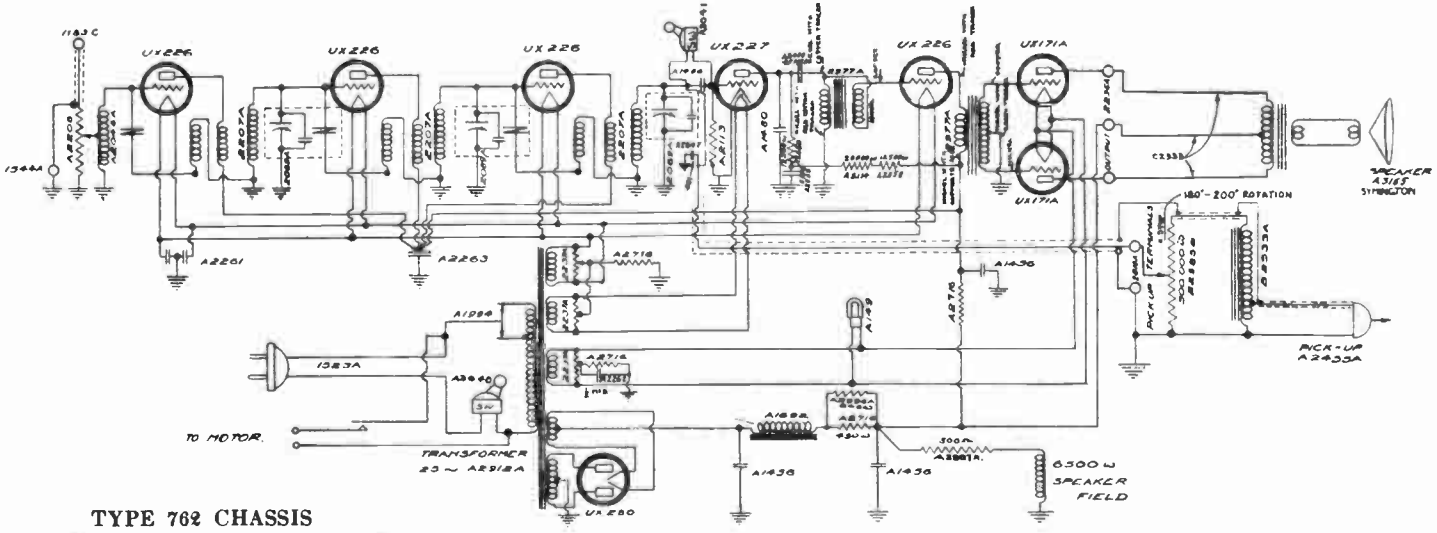
PICTURE DIAGRAM—TYPE 750 CHASSIS MOTOR-BOARD WIRING

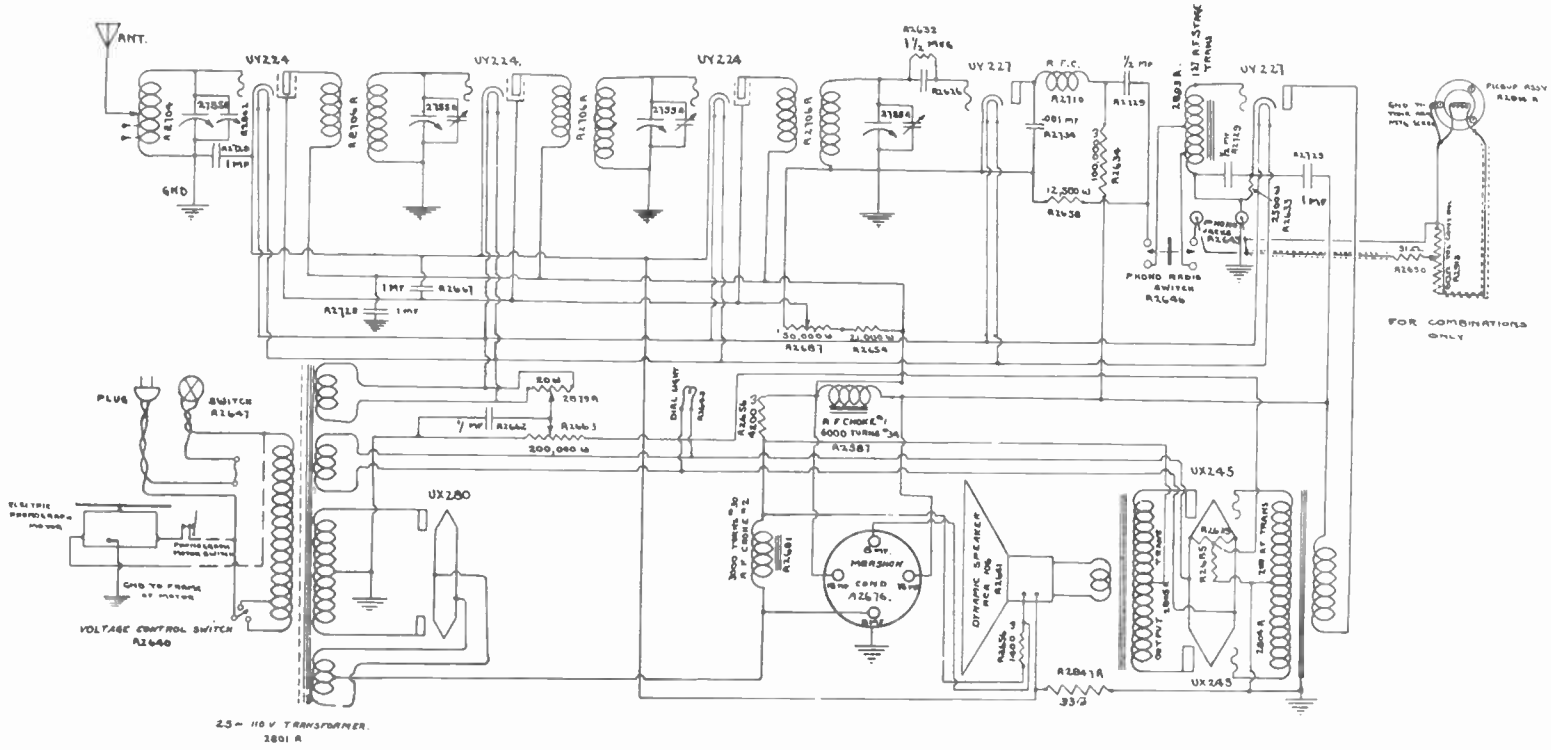




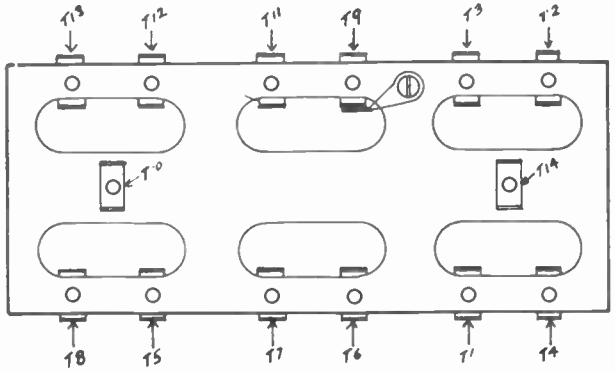
TYPE 762 CHASSIS
SCHEMATIC WIRING DIAGRAM
Dauntless, Invader A and B, and Renown Models)



TYPE 762 CHASSIS
SCHEMATIC WIRING DIAGRAM
(Conqueror Model)



TYPE 766 CHASSIS
SCHEMATIC WIRING DIAGRAM
(Renown B, Tudor, Royal York, Norman, Norman B, Stuart and Lancaster Models)



POWER TRANSFORMER
Showing Connections.

Power Transformer Connections

T 1—To Line Cord.

T 2—To Hi-lo Switch.

T 3—To Hi-lo Switch.

T 4, T 5—To UY 224 and UY 227 Filaments.

T 6, T 7—To UX 245 Filaments.

T 8—To Plate of UX 280.

T 9—Center Tap of High Voltage Secondary grounded.

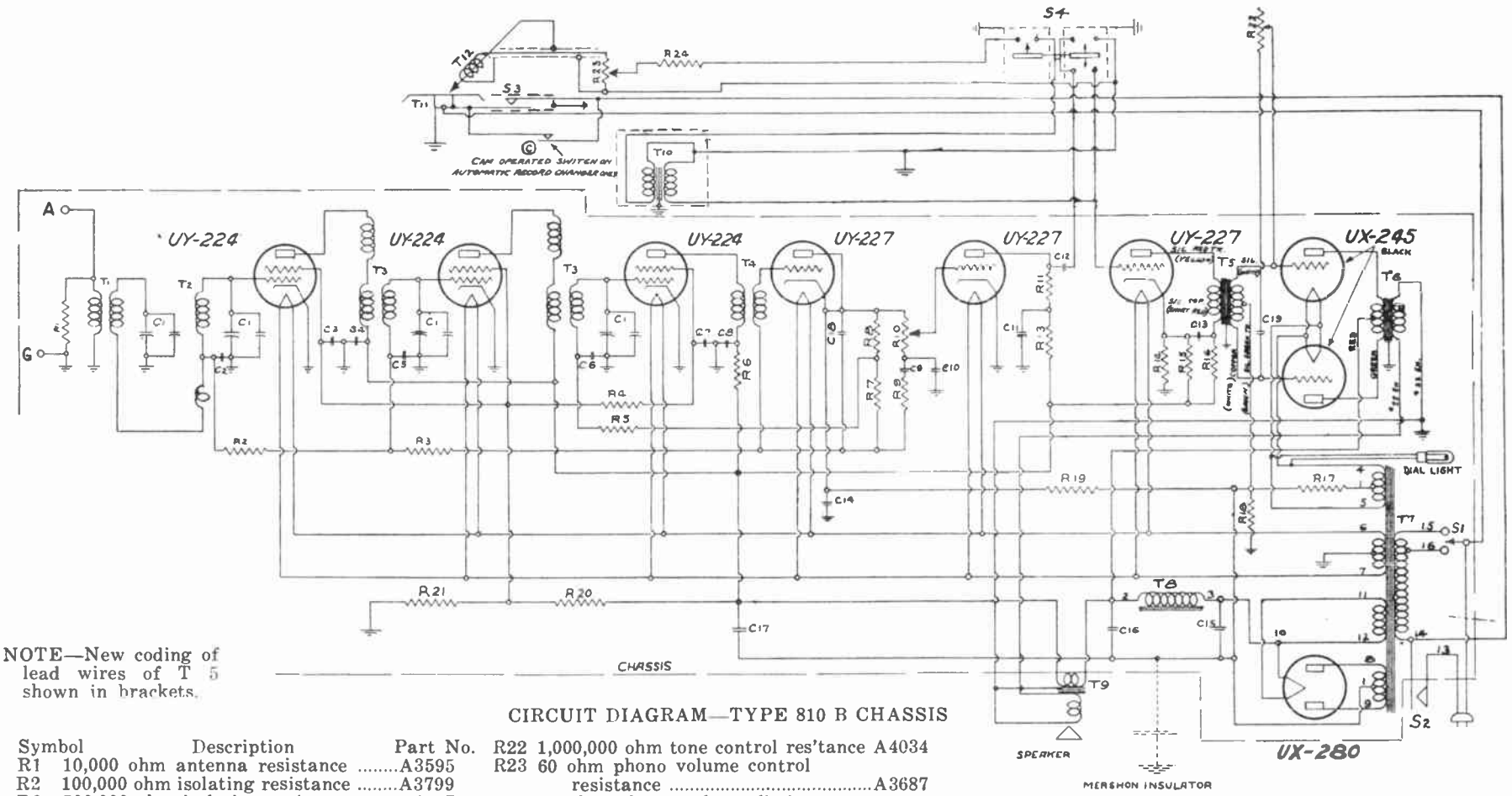
T 10—To Plate of UX 280.

T 11—To Filament of UX 280.

T 12—Center Tap UX 280 Filament (Pos. B supply).

T 13—To Filament of UX 280.

T 14—Dummy Connection for Line Cord and Hi-lo Switch.



CIRCUIT DIAGRAM—TYPE 810 B CHASSIS

NOTE—New coding of lead wires of T 5 shown in brackets.

Symbol	Description	Part No.
R1	10,000 ohm antenna resistance	A3595
R2	100,000 ohm isolating resistance	A3799
R3	500,000 ohm isolating resistance	A3867
R4	1,000 ohm isolating resistance	A3869
R5	500,000 ohm isolating resistance	A3867
R6	1,000 ohm isolating resistance	A3869
R7	25,000 ohm voltage div'g resistance	A3600
R8	25,000 ohm voltage div'g resistance	A3600
R9	250,000 ohm plate resistance	A3798
R10	1,000,000 ohm level control res'ance	C3904
R11	250,000 ohm plate resistance	A3798
R13	100,000 ohm isolating resistance	A3799
R14	400 ohm bias resistance	A3590
R15	20,000 ohm A.F.bias bleeder resistance	A3671
R16	18,000 ohm isolating resistance	A3598
R17	835 ohm UX 245 bias resistance	A3868
R18	67 ohm R.F. bias (constant) resistance	A3868
R19	250,000 ohm isolating resistance	A3907
R20	4,700 ohm voltage divider resistance	A3865
R21	5,600 ohm bleeder resistance	A3866
R22	1,000,000 ohm tone control res'tance	A4034
R23	60 ohm phono volume control resistance	A3687
R24	31 ohm phono volume limit resistance	A3686
C1	Tuning condenser (4 gang)	A3530 A
C2	.05 Mfd. by-pass condenser	B3873
C3	.1 Mfd.	B3872
C4	.1 Mfd.	(R.F. by-pass condenser)
C5	.5 Mfd. by-pass condenser	B3873
C6	.05 Mfd. by-pass condenser	B3873
C7	.1 Mfd.	B3874
C8	.1 Mfd.	(R.F. by-pass condenser)
C9	.005 Mfd. grid condenser	B3891
C10	.0001 Mfd. R.F. by-pass condenser	B3861
C11	.1 Mfd. by-pass condenser	B3871
C12	.1 Mfd. grid condenser	B3875
C13	.25 Mfd. by-pass condenser	B3871
C14	1.0 Mfd. R.F. by-pass condenser	(B3871)
C15	9 Mfd.	
C16	18 Mfd.	Mershon filter condenser A3932
C17	9 Mfd.	
C18	.00025 Mfd. R.F. by-pass condenser	B1496
C19	.002 Mfd. tone control condenser	B3676
S1	"Hi-lo" switch	A3393A
S2	"On-off" power switch	A2647
S3	Automatic stop switch	A3812
S4	"Radio-record" change-over switch	A3955 and A3949
T1	R. F. Antenna transformer	
T2	R. F. pre-selection transformer	3886A
T3	R. F. inter-stage transformer	
T4	R. F. fixed-tune transformer	A3889A
T5	A. F. intermediate transformer	A3903A
T6	A. F. output transformer	
T7	Power transformer	A3884A
78	Filter choke	
T9	Speaker (field)	A3913A
T10	Pickup transformer	A3684
T11	Motor 25 cycle	A3810
	Motor 60 cycle	A3811
T12	Pickup	A4500

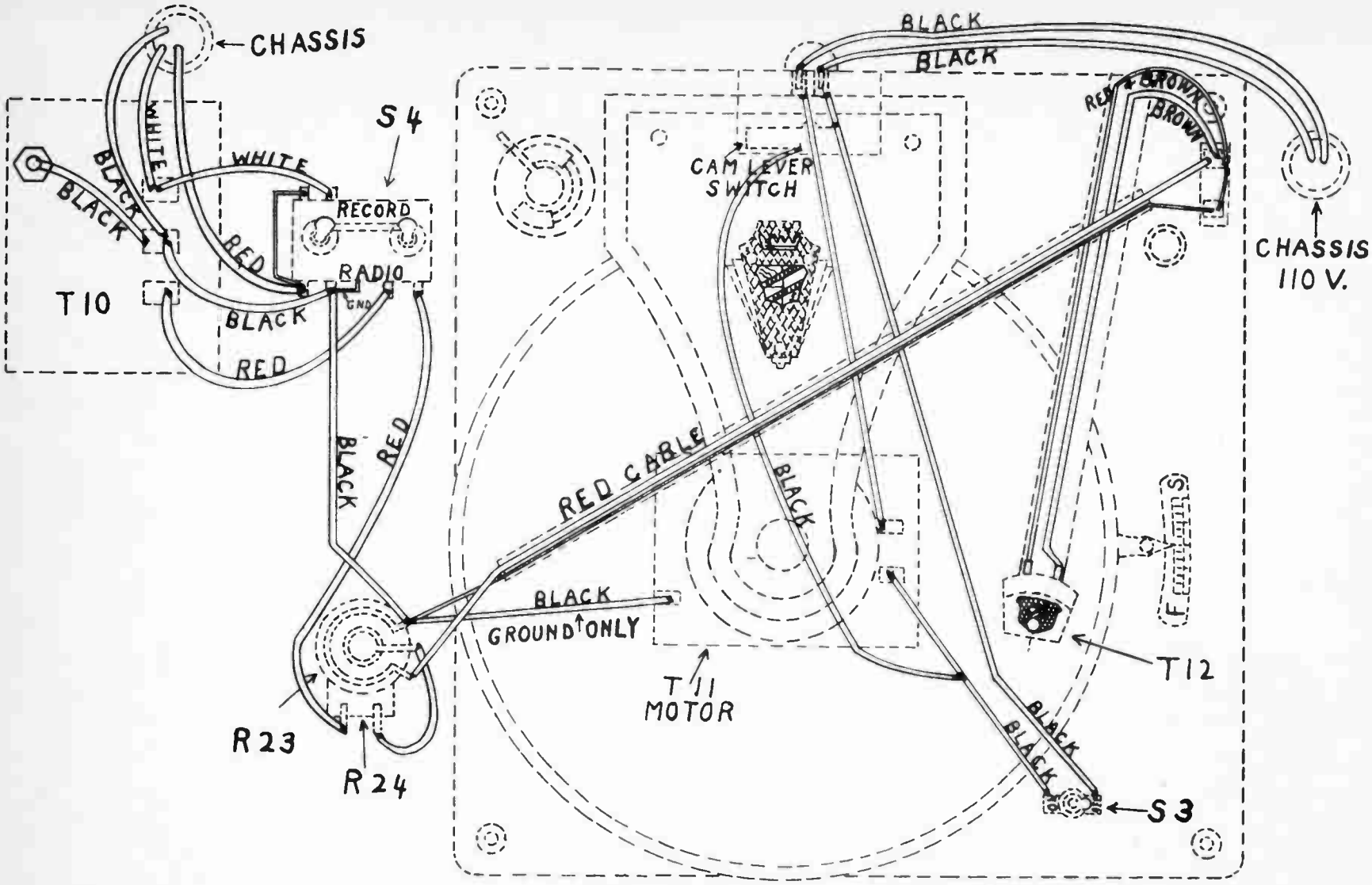


ILLUSTRATION 6
MOTOR BOARD WIRING "MARLBOROUGH" MODEL
(Type 810 B Chassis)