# SERVICE DATA

on the

## Types 400-410 and 420 Chassis

of the

## *"BROCK" "ELGIN" "RIDEAU" Models*

and

## Type 700 Chassis
## *"SERENATA" Model*

*Copyright 1930*

*Service Department*

# DE FOREST CROSLEY LIMITED

Toronto - - Canada

*November, 1930*

*Distribution* :—One copy, free of charge, to each authorized De Forest Crosley dealer. Additional copies, 50 cents each.

# FOREWORD

Radio is not different from any other industry in that it is dependent on certain factors to influence future sales.

Quality, appearance and cost are some of these factors, but the one to remain uppermost and longest in the owner's mind is "Service."

As paralleling the automobile industry, radio service must put forward its best effort in ensuring the owner of complete satisfaction.

All radio equipment requires service from time to time and the visits made to customers' homes are valuable to you not only in maintaining satisfied owners but also in the building up of a closer contact which will bring both new and repeat business to you.

Pave the way for increased future sales, now, by building up the goodwill of your past contacts through "Service."

ROBERT M. FOSTER,
*Manager, Service Department,*
DE FOREST CROSLEY LIMITED

**Toronto, Ont.,**
**November, 1930**

# INDEX


| | Page |
|---|---|
| Foreword | 2 |
| **DATA ON THE TYPES 400, 410 AND 420 CHASSIS :** | |
| Chassis, Illustration 1 | 4 |
| Introduction | 5 |
| Antenna Input | 5 |
| R. F. Amplification | 5 |
| Detection | 5 |
| Output Circuit | 5 |
| Volume Control | 5 |
| Power Supply and Filtering | 5 |
| Chassis, Illustration 2 | 6 |
| Voltage Control | 7 |
| Speaker | 7 |
| Radiotron Sequence | 7 |
| Phono Equipment | 7 |
| Transformer Connections | 7 |
| Removing Chassis | 7-9 |
| Chassis, (400, 420) Picture Diagram, Illustration 3 | 8 |
| Removing Assemblies | 9 |
| Circuit Diagram (400, 420) Illustration 4 | 10 |
| Voltage and Current Readings | 11 |
| Chassis, (410) Picture Diagram, Illustration 5 | 12 |
| Trouble Chart | 13-15 |
| Circuit Diagram (410), Illustration 6 | 14 |
| Continuity Tests | 15-17 |
| Phonograph Wiring (410) Illustration 7 | 16 |
| **DATA ON THE TYPE 700 CHASSIS :** | |
| Chassis, Illustration | 18 |
| Introduction | 19 |
| Antenna Input | 19 |
| R. F. Amplification | 19 |
| Detection | 19 |
| A. F. Amplification | 19 |
| Output Amplification | 19 |
| Volume Control | 19 |
| Voltage Control | 19 |
| Chassis, Illustration 9 | 20 |
| Power Supply | 21 |
| Battery Connections | 21 |
| Speaker | 21 |
| Radiotron Sequence | 21 |
| Dial Light | 21 |
| A. F. Transformer Connections | 21 |
| Removing Chassis | 21 |
| Removing Assemblies | 21 |
| Chassis, Picture Diagram, Illustration 10 | 22 |
| Voltage and Current Readings | 23 |
| Circuit Diagram, Illustration 11 | 24 |
| Trouble Chart | 25 |
| Continuity Tests | 26 |
| Parts List, (400, 410, 420 and 700) | 27-28 |

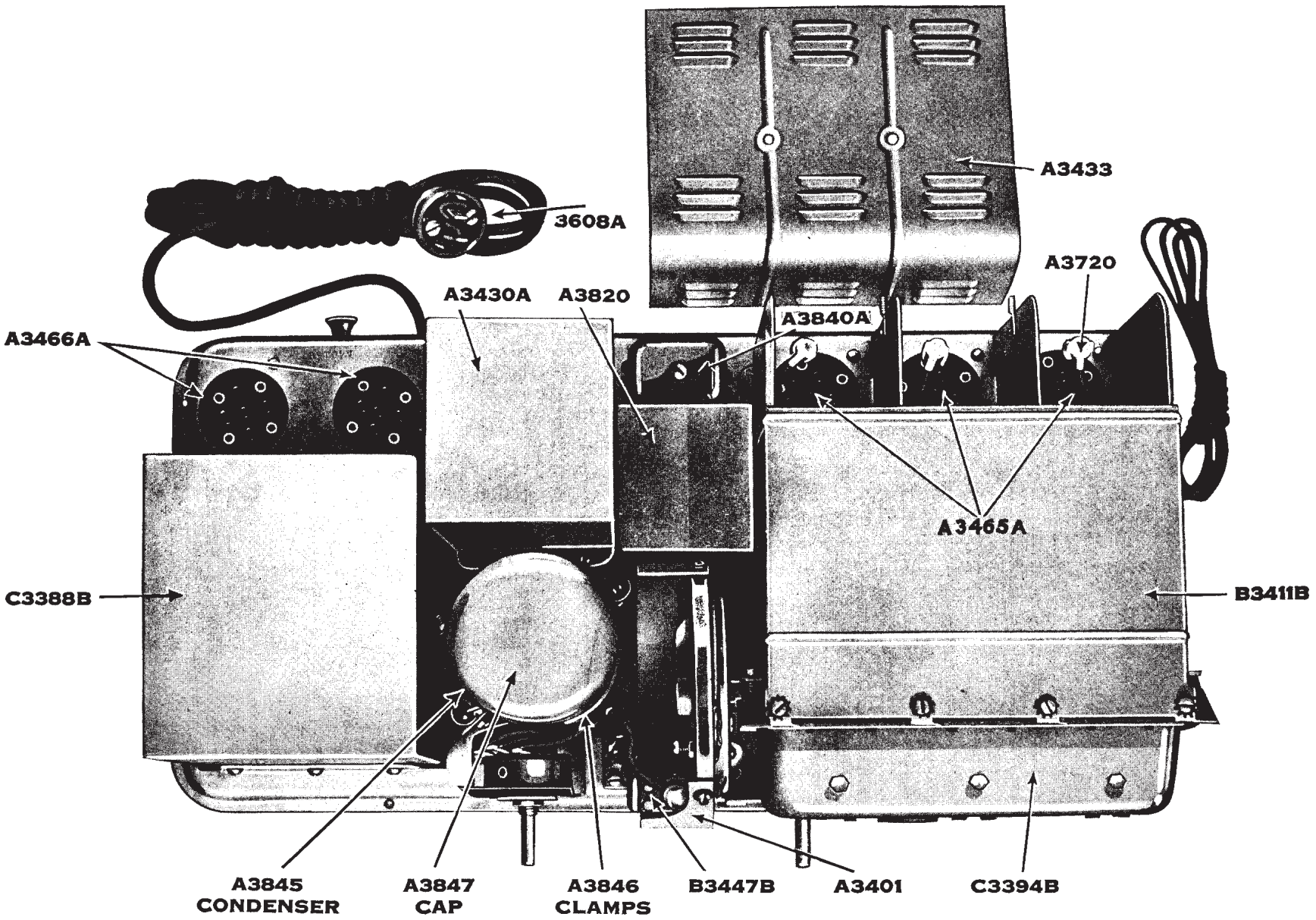



ILLUSTRATION 1.
TOP VIEW—TYPES 400-420 CHASSIS
(Showing Part Numbers)

# DATA ON THE TYPES 400-410 AND 420 CHASSIS

*INTRODUCTION*

The "Brock" (400) "Elgin" (410) and "Rideau" (420) models operate a chassis which is essentially the same in so far as circuit arrangement is concerned, with slight physical modifications to fit cabinet style.

In the "Elgin" model (410 chassis) certain switching arrangements are necessary because of the electric phonograph. The switches are discussed in later paragraphs.

When describing units of the chassis or certain circuit arrangements, it is to be considered that the details given apply to all the above chassis irrespective of type. Exceptions are clearly defined in the description. Reference to the various illustrations will show the locations of parts referred to by symbols.

*ANTENNA INPUT*

Flexible lead wires are provided for attaching the receiver to the antenna and ground rather than the terminal arrangement common to previous models. The black wire terminates inside the chassis at a grounded lug. The green wire (antenna) is connected to the terminal lug of the primary of T1, the first R.F. transformer. Across this primary winding is connected the resistance R1 which tends to flatten out the characteristic of this coil so that there is practically an even transfer of energy from antenna to the grid of the First R.F. tube irrespective of frequency. This resistance also compensates to some degree for large variations in antenna dimension. (See also Page 5, Service Data 740 chassis.)

*RADIO FREQUENCY AMPLIFICATION*

Two UY 224 tubes are used as R.F. amplifiers in a tuned circuit. Coupling between stages is through the use of R.F. transformers indicated by the symbols T1 and 2. The grid circuit of each stage is tuned by a section of the gang condenser C1. Plate, screen and cathode are bypassed through the condensers C4, 3 and 2 respectively. Necessary bias for the control grid is obtained across the resistors R2 and 3. R4 and 5 are voltage divider resistances.

The average minimum sensitivity and selectivity figures are given in the following table. (Frequency in parenthesis).

| | 500 metres (600) | 300 metres (1000) | 214 metres (1400) |
|---|---|---|---|
| Sensitivity (in m/v)..... | 65 | 45 | 35 |
| Selectivity (at 100x) .... | 45 | 47 | 75 |
| (Aligned at 1400 kc.) | | | |

When re-alignment is necessary the adjusting screws will be found along the top frame of the gang condenser, and if a short aligning tool is available the operation may be carried out without removing the chassis from the cabinet. Considered from the back of the chassis, the aligning screws are in this order:—left, 1st R.F.; centre, 2nd R.F.; right, Det.

If through trouble it is necessary to replace an R.F. transformer, (T1 or 2) a complete set of three matched units should be installed for best results.

*DETECTION*

A UY 224 screen grid tube is used as detector and the control grid is biased by the voltage drop across the resistor R7.

Additional automatic bias is obtained from the resistor R6. This comes into action under the condition of increased volume, when the grid of the detector tends to draw current. This additional bias prevents early overloading and consequent distortion.

(*In the type 410 chassis this detector tube is used as an audio amplifier during phonograph operation. The secondary of the pickup coupling transformer T11 is cut in and out of the grid circuit through the action of the gang switch S4.*)

The plate circuit of the detector contains the R.F. by-pass condensers C8, 9 and the R.F. choke T3. A voltage drop resistor R8 is introduced in the feed to the screen of the detector tube and is separately by-passed by C7. (*This resistor, R8, is shorted out by the gang switch S4, during phonograph operation.*)

R10 is the detector plate resistance. A hum filter made up of the resistor R9 and condenser C11 is also introduced in the detector plate circuit. (*The type 410 chassis differs slightly in the make-up of the plate resistor.* [See illustration 6.] *R9 and 13 are the plate resistances. R14 and C14 comprise the hum filter. During phonograph operation the switch S4 shorts out the resistance R13.*)

*OUTPUT CIRCUIT*

A single UX 245 radiotron is used as output amplifier. The input circuit of this tube consists of the coupling condenser C10, the grid leak resistance R11 and the R.F. choke T4. Bias is obtained across the resistor R12. The plate voltage is fed to the tube through the plate choke T5. C12 is the output coupling condenser which allows transfer of audio frequency output to the primary of the speaker coupling transformer T6.

*VOLUME CONTROL*

The potentiometer resistance R3 controls the volume level by varying the bias applied to the control grids of the R.F. tubes.

*POWER SUPPLY AND FILTERING*

The power transformer T7 and the power filter choke T8 are assembled in a single unit. This method of assembly reduces considerably the amount of wiring necessary in assembling the

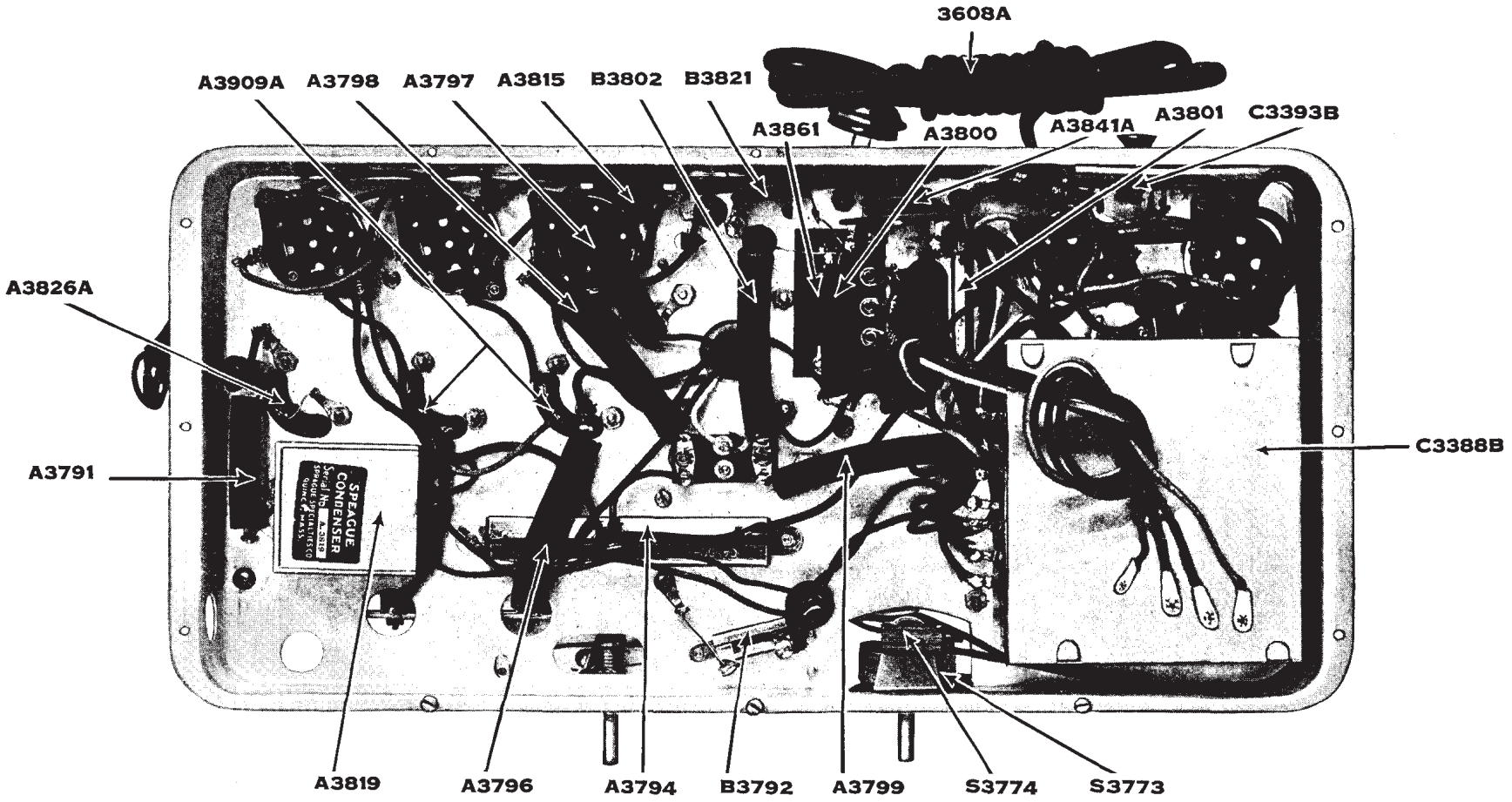



ILLUSTRATION 2.
BOTTOM VIEW—TYPES 400-420 CHASSIS
(Shield removed—Showing Part Numbers)

power supply circuits. Leads from the power transformer windings are brought out through an insulating panel to numbered terminals. (See illustration 3.)

A "brute force" type of power filter is used comprising the filter choke T8, the Mershon condenser C13 and the field winding of the speaker T9.

### *VOLTAGE CONTROL*

The voltage control switch is of the plug and jack type, located on the back of the chassis. It provides compensation for line voltage variation between the limits of 105 and 120 volts. All receivers are shipped from the factory with the plug in the "high" (H) position. Servicemen should ensure that the plug is not moved to the "low" (L) position, except in localities wherein the voltage is known to remain consistently below 110 volts. The voltage control switch is indicated by the symbol S2.

### *SPEAKER (D-3 Dynamic)*

This unit is similar to that used with the types 740 and 750 chassis. (See pages 7 and 19, Service Data on types 740 and 750 chassis.)

### *RADIOTRON SEQUENCE*

The position and function of each of the tubes used in the 400, 410 and 420 chassis is shown below.

| UY 224 | UY 224 | UY 224 | UX 245 | UX 280 |
|---|---|---|---|---|
| 1st R.F. Amplifier | 2nd R.F. Amplifier | Detector | Output Amplifier | Rectifier |

(Back of Chassis)

### *PHONOGRAPH EQUIPMENT (410 chassis)*

Certain equipment is required in the "Elgin" model for the reproduction of records. The change from "radio" to "record" operation is arranged through the gang switch S4. The switch S1 controls the operation of the motor T12 which drives the turntable. A "Green Flyer" motor is used. Service details will be found on Page 21 of the Service Data covering the type 750 chassis.

The electric pickup is similar to that used in the "Troubador" and "Minstrel" models. It is indicated by the symbol T10 in illustration 6. (For details of adjustment see page 19, Service Data on type 750 chassis.) A potentiometer, R16, is connected across the pickup windings and serves to control the volume of record reproduction. R15 is a limiting resistance, controlling maximum volume. T11 is the pickup coupling transformer.

### *TRANSFORMER CONNECTIONS*

Reference to illustrations 3, 4, and 7 will show color code and markings of the various transformer assemblies. For direct reference the following list of color codes is supplied.

*Power Transformer and Filter Choke (T7 and 8)*

| Terminal No. | Color of Connecting Lead | Connects to |
|---|---|---|
| (1) | Black— | Ungrounded end of R12. |
| (2) | Black— | To Mershon terminal C13. |
| | White— | To speaker field T9 and resistance R9 (R14 in 410). |
| (3) | Black— | To Mershon terminal (C13). |
| (4) | Green— | To UX 245 filament and dial light. |
| (5) | Green— | To UX 245 filament and dial light. |
| (6) | Green— | To UY 224 heaters. |
| (7) | Green— | To UY 224 heaters |
| (8) | Rubber covered— | To UX 280 plate. |
| (9) | Rubber covered— | To UX 280 plate. |
| (10) | Rubber covered— | To UX 280 filament. |
| (11) | Rubber covered— | To UX 280 filament with lead 10. |
| (12) | Rubber covered— | To UX 280 filament. |
| (13) | Black— | To switch S3 and power cord. |
| (14) | Black— | To switch S3. |
| (15) | Rubber covered— | To "H" terminal of S2. |
| (16) | Rubber covered— | To "L" terminal of S2. |

Centre contact of S2 terminates one lead of power cord.

*Output Choke and Coupling Transformer (T5 and 6)*
*Color Code*

Copper braid, white cotton wrapper—to plate UX 245 socket.
Copper braid, green cotton wrapper—to terminal No. 2 power transformer (T7-8).
Copper braid—to terminal assembly and yellow wire of C12.
Silver braid—to ungrounded lug of R12.
Solid copper, enamelled—to terminal assembly and red speaker lead.
Solid copper, enamelled—to grounded lug of R12 and green speaker lead.

### *REMOVING CHASSIS FROM CABINETS*

The following schedules cover the step by step operations necessary to remove chassis from cabinets.

*Types 400 and 420 Chassis*

(1) Back out set screws in control knobs and remove.
(2) Disconnect speaker lead wires.
(3) Slacken off and remove the six machine screws which hold the chassis in place. These screws are accessible from the underside of the chassis mounting strips.
(4) Lift chassis slightly and slide out of back of cabinet.

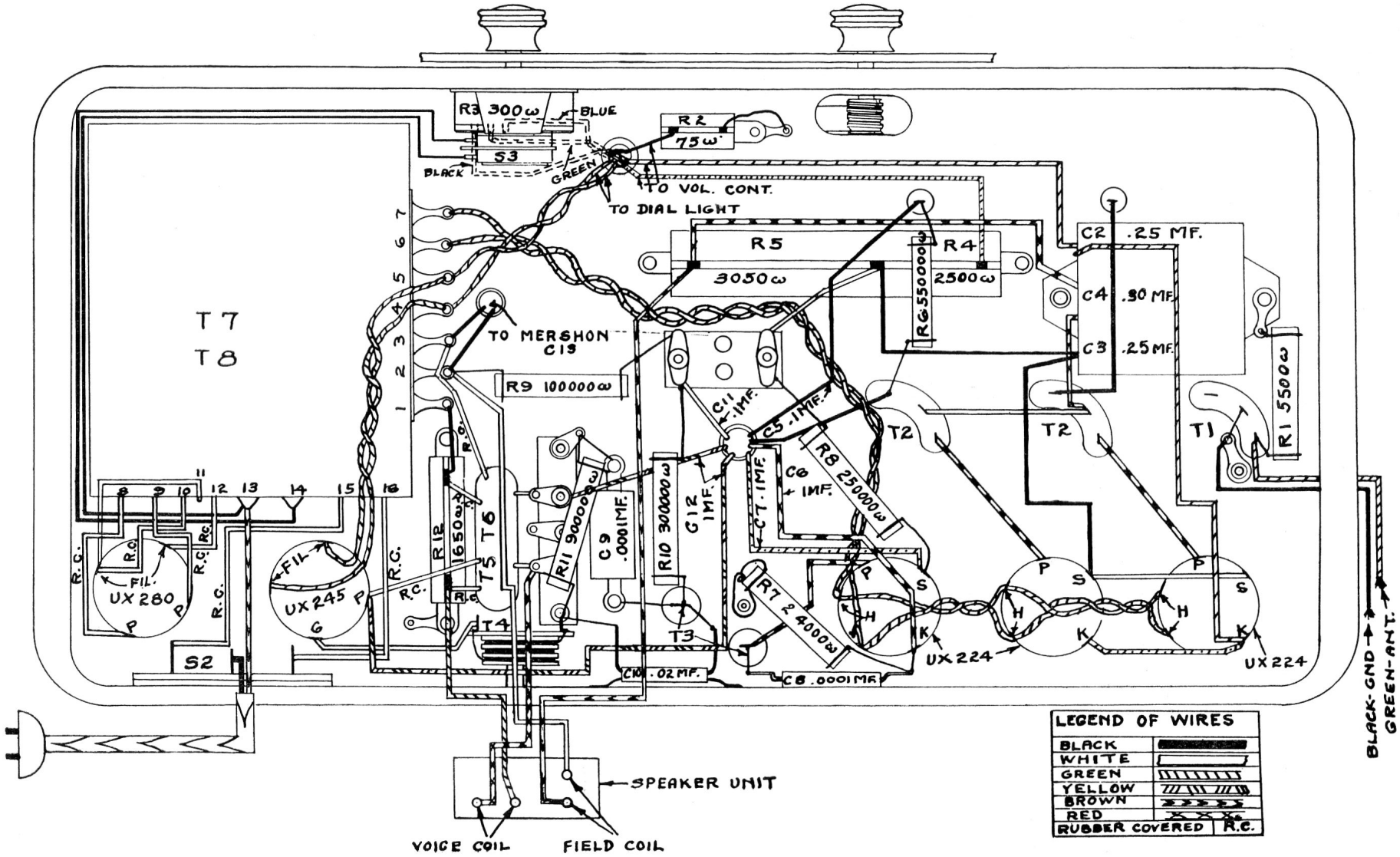



ILLUSTRATION 3.
PICTURE DIAGRAM—TYPES 400-420 CHASSIS
("Brock" and "Rideau" models)

*Type 410 Chassis*

(1) Back out set screws in control knobs and remove.
(2) Disconnect speaker lead wires.
(3) Disconnect motor lead wires at connectors. Remove wood clamps.
(4) Remove three wood screws holding pick-up transformer (T11) to cabinet. Disconnect brown, red and white leads from chassis at transformer terminals.
(5) Remove the six machine screws which hold chassis in place.
(6) Lift chassis slightly and slide out of back cabinet opening.

*Dynamic Speaker (D-3)*

(1) Disconnect chassis lead wires to speaker.
(2) Back out and remove the six large wood screws holding speaker to baffle board.

*Phonograph Motor (410)*

(1) Disconnect motor lead wires at connectors.
(2) Unsolder ground wire (white lead) at lug on motor frame.
(3) Remove cap nut from centre of turntable.
(4) Lift turntable from motor shaft.
(5) Remove four machine screws and nuts from outer edge of motor frame. The motor may then be lifted from motor board through phonograph compartment.

(Details of motor adjustments will be found on page 21 of Service Data on the type 750 chassis).

*Phonograph Pickup (410)*

The pickup head is held in position by a small set screw, visible on the underside of the tone arm. To remove the pickup, slacken the set screw slightly and pull pickup head straight out from arm. (For pickup adjustment see page 19 Service Data on the type 750 chassis.)

*REMOVING ASSEMBLIES*

Detailed instructions covering removal of the various assemblies need not be given. An examination of the method of mounting a unit will determine the most convenient way of dismounting.

Points which should be kept in mind by servicemen are as follows:—

(a) Never cut lead wires when dismounting assemblies. Always unsolder at nearest junction point.
(b) Before removing any part or assembly, always note the position and color code of lead wires.
(c) Always test out replacement parts before installation. This will save time. (*See also page 10 Service Data on Type 740 chassis.*)

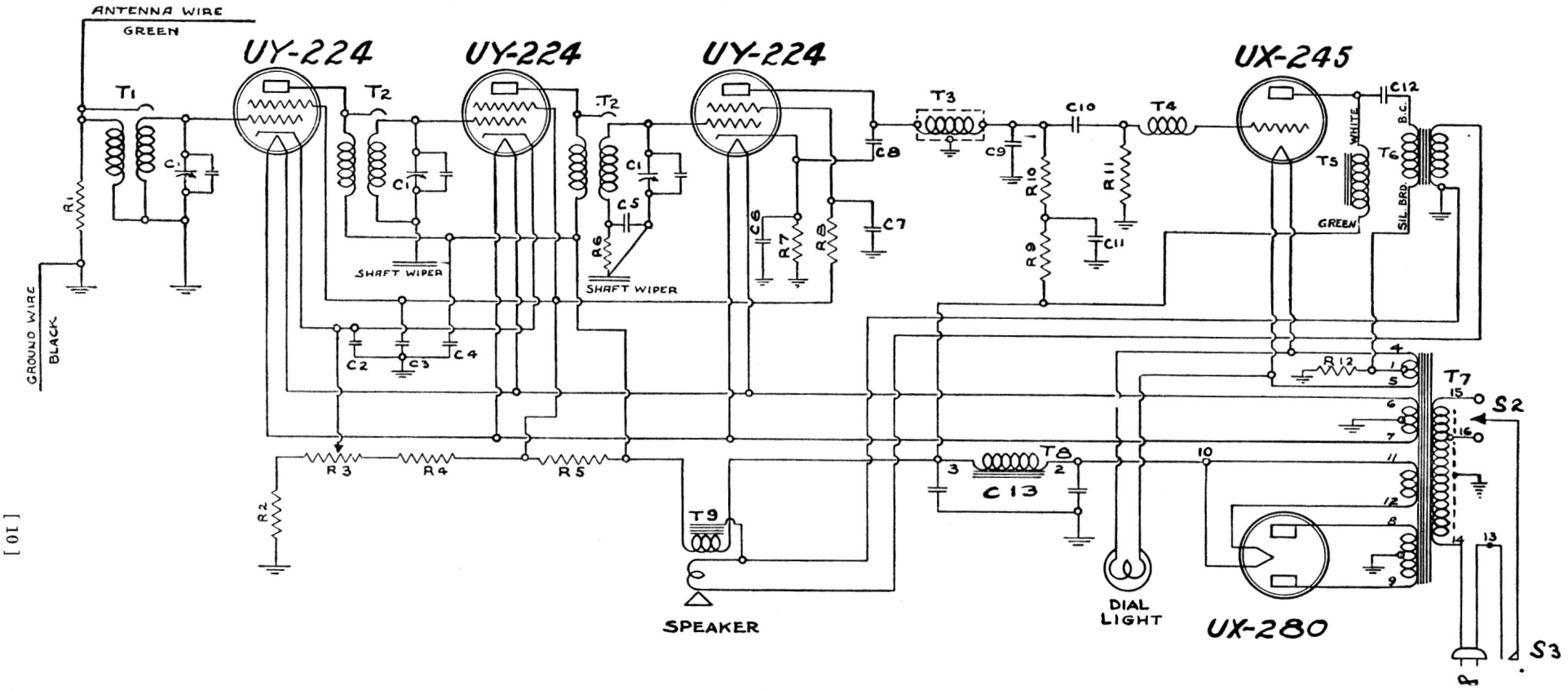



ILLUSTRATION 4.
CIRCUIT DIAGRAM—TYPES 400-420 CHASSIS
("Brock" and "Rideau" Models)

| 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 |

# Average Voltage and Current Readings

## (400-410 AND 420 CHASSIS)

Readings taken at 120 volts line with "hi-lo" switch in high position. Figures given are for reference only. Variations in the tubes will be reflected in slight differences in the values shown. *The volume control should be set at maximum.*

*UY 224 R. F. AMPLIFIERS*

| | | |
|---|---|---|
| Heater volts | (Ef) | (a) 2.3 A. C. |
| Plate volts | (Ep) | (a) 196 |
| Plate current | (Ip) | (a) *2-4 M. A. |
| Screen volts | (Esg) | (a) 90 |
| Screen current | (Isg) | (a) Not more than 1/3 plate current |
| Control grid volts | (Ecg) | (a) *3.1 |

*UY 224 DETECTOR*

| | | |
|---|---|---|
| Heater volts | (Ef) | (a) 2.3 A. C. |
| Plate volts | (Ep) | (a) 100 |
| Plate current | (Ip) | (a) .15—.5 |
| Screen volts | (Esg) | (a) 20 |
| Screen current | (Isg) | Not more than 1/3 plate current |
| Control grid volts | (Ecg) | (d) 6 |

*UX 245 OUTPUT AMPLIFIER*

| | | |
|---|---|---|
| Filament volts | (Ef) | (a) 2.25 A. C. |
| Plate volts | (Ep) | (a) 250 |
| Plate current | (Ip) | (a) 25-45 M. A. |
| Grid volts | (Eg) | (a) 50 |

*UX 280 RECTIFIER*

| | | |
|---|---|---|
| Filament volts | (Ef) | (a) 4.7 A. C. |
| Plate volts | (Ep) | (e) 325 A. C. |
| Plate current | (Ip) | (a) (f) 32-37 M. A. |

*LINE DRAW (at 120 volts)*

| | |
|---|---|
| 25 cycle Power transformer (all tubes in position) | *79 watts |
| 60 cycle Power transformer (all tubes in position) | *71 watts |
| 25 cycle Phono motor (no load on turntable) | 32 watts |
| 60 cycle Phono motor (no load on turntable) | 23 watts |

*IMPORTANT*

Because of the high values of certain of the resistors used in the circuits it is necessary that in one or two cases readings be taken by other methods than plugging the analyzer into the socket. All measurements must be made with the tube in position and a high resistance voltmeter (1,000 ohms per volt) is essential for reading plate, screen and control grid voltages.

The following schedule covers the method by which a given reading should be obtained.

(a) Read with tube in analyzer and analyzer adapter in chassis socket.
(d) Read between cathode of tube and chassis.
(e) Read between each plate of UX 280 and chassis.
(f) Each plate of UX 280.
(*) Varies according to position of volume control.

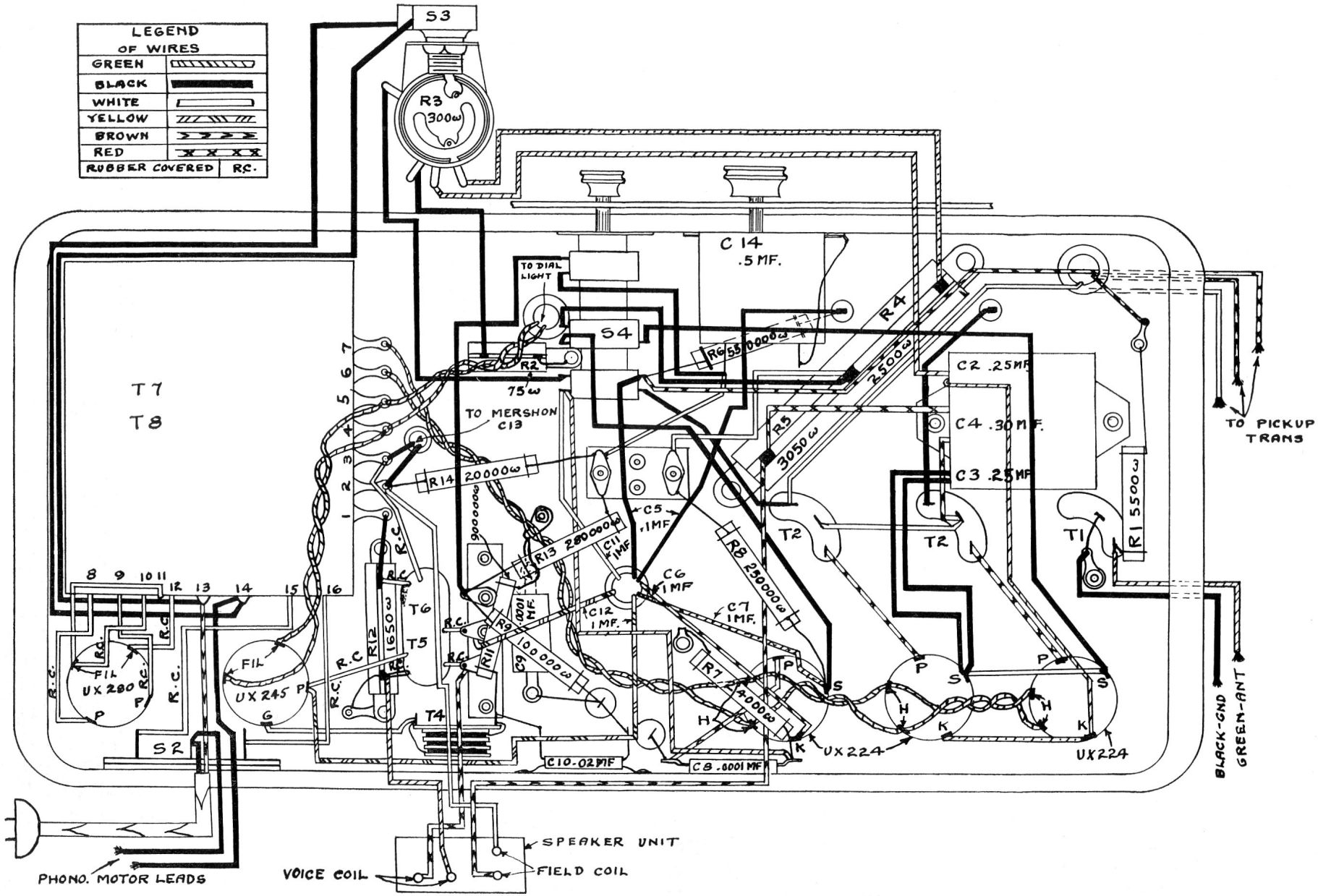
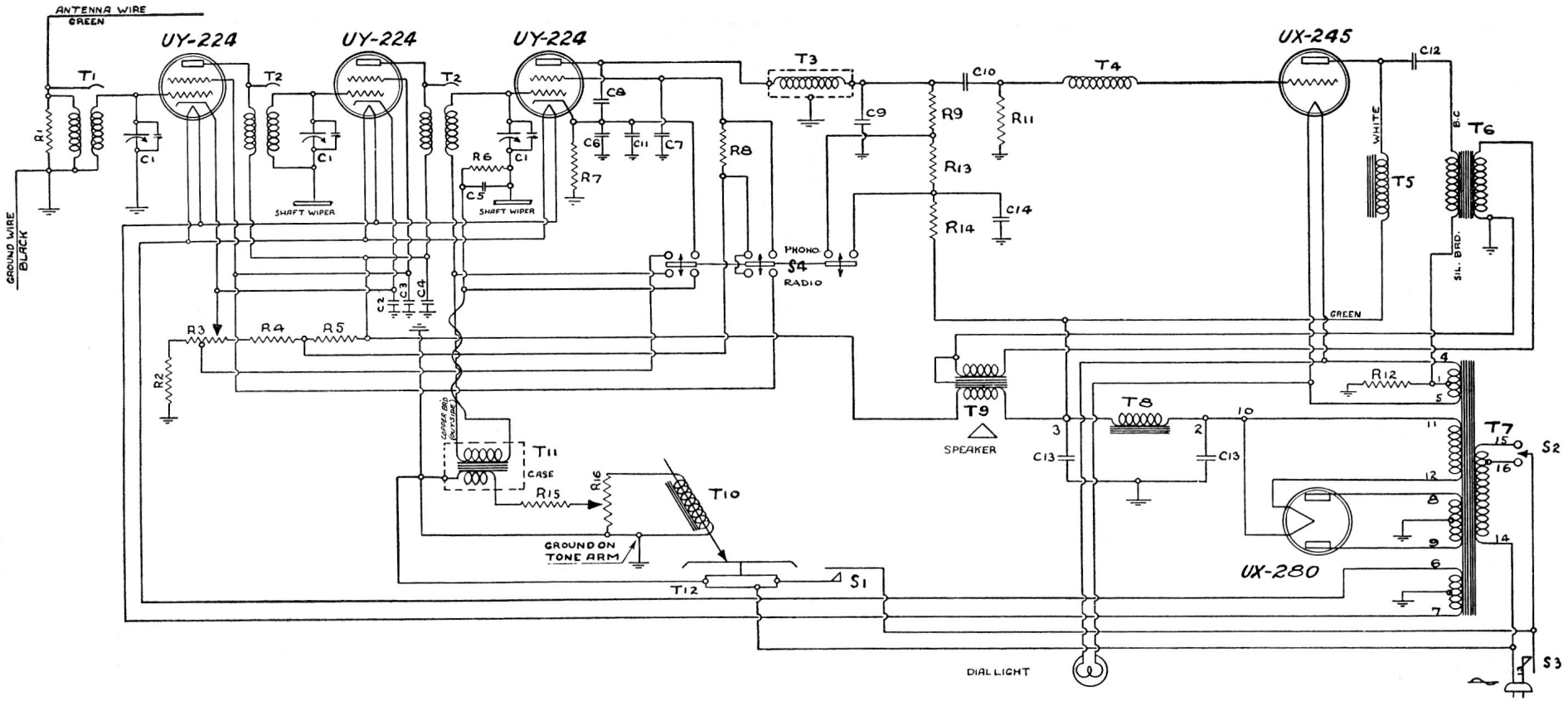



ILLUSTRATION 5.
PICTURE DIAGRAM—TYPE 410 CHASSIS
("Elgin" model)

# TROUBLE CHART TYPES 400-410 AND 420 CHASSIS

| FAULT | PROBABLE CAUSE | HOW TO CHECK FAULT |
|---|---|---|
| Dead (Inoperative) | Voice coil of speaker (T9) or secondary of output transformer (T6) open or shorted. | Check voltages with analyzer. If found correct but no click in speaker when power tube removed will indicate short in either of these circuits. (NOTE:—the voice coil is grounded one side.) |
| | Open or grounded B supply. | Check voltages with analyzer. Series test will indicate open or ground in B supply. If speaker is okay, absence of click when 245 tube is pulled out will indicate lack of B supply on that tube. In this particular case, note that the 245 plate is fed through a separate choke T5, the output transformer T6 being coupled through a one Mfd. condenser C12. A short in this condenser will cause a short in the B supply. |
| | Defective 280 tube. | Test tube for operation. |
| | Grounded grid 245 tube. | Series test for ground (T4). |
| | Grounded grid R.F. tubes. | Examine brackets mounted on the R.F. coils to which grid clips are attached. A visual check will indicate if these are grounding on shields. Check gang condenser C1 for shorted plates. The detector grid circuit is grounded through a 500,000 ohm resistor by-passed with 1/10 Mfd. condenser. (R6 and C5). |
| | Open circuit power transformer T7 primary. | Series test from line plug to include switches S2 and 3. |
| | Filaments do not light. | Continuity test filament circuit including secondary windings of T7. |
| | Antenna circuit grounded. | Check antenna for ground. Give connections to T1 visual inspection to ensure that antenna lug is not grounding on chassis. |
| Weak | Open primary of T1. | Series test. (The primary is shunted by a 5,500 ohm resistor R1.) |
| | Open coupling condenser C10. | Check condenser C10 or replace. |
| | Open R.F. choke in grid circuit of 245 tube (T4). | Series test. Voltmeter test will also show no indication of bias on 245 grid. |
| | Shorted coupling condenser C10. | Check 245 plate current. If the coupling condenser is shorted plate current will read high owing to detector plate voltage being impressed upon grid of 245 in opposition of normal bias. |
| Weak, low and high frequencies. | Gang condenser C1 out of alignment. | Check gang for alignment and realign each stage if necessary. |
| Detector dead. | Open R.F. choke T3.<br>Shorted C7, 8 or 9. | Tested for plate voltage that stage.<br>Very low voltage indicates shorted condensers. No voltage indicates open choke T3. |
| R.F. dead. | Open primary windings T2. | Test with analyzer for plate voltage. |
| | Shorted by-pass condensers C3 and 4. | Absence of plate or screen voltage both stages indicates both condensers shorted. |
| Oscillates. | Open circuit by-pass condensers C2, 3 or 4 or poor contact between fingers and rotor shaft of C1. Tube shield not in place. Poor ground connection. | Test by-pass condensers. Increase tension of contact fingers. Install tube shield. Try additional ground. |
| Distorts. | Defective bias resistances R7 and 12. | Measure value of resistors or replace. |
| Excessive hum. | Defective Mershon condenser C13. | Replace condenser. |
| | Open circuit .1 Mfd. condenser C11. | Try separate by-pass condenser. |
| | Defective filter choke T8. | Short terminals No. 2 and 3 of power transformer. If hum does not increase replace choke-transformer assembly. |
| Excessive plate current UX 245. | Ground on UX 245 filament winding of T7. | Examine leads to dial light for possible grounds and also terminals of power transformer and R12. If ground not visible disconnect leads to UX 245 filament and test for ground to chassis. Terminals 4 and 5. (Also disconnect R12) |




## ILLUSTRATION 6.
## CIRCUIT DIAGRAM—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 | A3819 |
| C4 | .30 Mfd. plate R.F. by-pass condenser | A3819 |
| C5 | .10 Mfd. Det. automatic bias by-pass condenser | A3820 |
| C6 | 1.0 Mfd. R.F. cathode by-pass condenser | A3820 |
| C7 | .10 Mfd. R.F. screen by-pass condenser | A3820 |
| 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 | A3820 |
| 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 | A3794 |
| 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 | 31 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 |

# TROUBLE CHART TYPES 400-410 AND 420 CHASSIS—(Continued)

| FAULT | PROBABLE CAUSE | HOW TO CHECK FAULT |
|---|---|---|
| Excessive drain on UX 280. | Shorted by-pass condensers C3, 4, 7, 8, 9, 11 and 12. Ground on T3, 5, 8 and 9. | Test for shorts. Test for grounds. |
| Excessive primary drain T7. | Shorted windings. | May be in either primary or secondary windings. High primary drain when operated without load indicates shorted primary or high voltage secondary. |
| | Shorted UX 280. | Replace. |
| | Shorted filament windings T7. | Check all filament voltages with analyzer. Low voltage indication of shorted winding. |

# CIRCUIT CONTINUITY TESTS ON 400-410 AND 420 CHASSIS

| TEST BETWEEN | PART TESTED | NORMAL READING | INCORRECT READING WOULD INDICATE |
|---|---|---|---|
| Antenna (Green) and Ground (Black) lead wires | R1 and primary of T1 | Full scale | No reading, open primary T1 and R1. Half scale open primary T1. |
| Control grid clips of 1st and 2nd R.F. tubes and chassis | Secondaries of T1 and 2 | Full scale | No reading, open secondary windings T1 and 2. |
| Control grid clip of Detector and chassis | Secondary of T2, C5 and R6. | Very slight indication | No reading, open secondary T2 or open R6. Half to full scale, shorted C5 or low resistance R6. |
| Screen contact of 1st and 2nd R.F. sockets and chassis. (Remove brown speaker lead). | C3, R2, 3 and 4. | 2/3 scale | Full scale indicates shorted C3 or grounded R3, 4 or 5. Slightly higher than normal, shorted C4. Very low reading, open R2, 3 or 4. |
| Screen contact of Detector socket and chassis (Brown speaker lead removed) | R2, 3, 4 and 8 (Also C3, 4 and R5 as above). | Very slight indication | Full scale, shorted C7. No reading, open R2, 3, 4 or 7. |
| Plate contacts of 1st and 2nd R.F. sockets. | Primaries of T2. | Full scale. | No reading, open primaries. |
| Plate contacts of 1st and 2nd R.F. sockets and ground. (Brown speaker lead removed). | Primaries of T2 and C4. (Also R2, 3, 4 and 5). | 1/2 scale | No reading, open primaries T2 or open R2, 3, 4 or 5. Full scale, shorted C4. |
| Cathode contacts of 1st and 2nd R.F. sockets and ground (Brown speaker lead removed) | C2, R2 and 3 | Varies from slightly under full scale to full scale as volume control (R3) is increased from min. to max. | No reading, open R2 or 3. (If no change as R3 is varied, probably shorted C2 or grounded R3). |
| Cathode contact of Detector socket and chassis. | C6 and R7. | 1/4 scale | No reading, open R7. Full scale, shorted C6. |
| Plate contact of Detector socket and chassis | C8, 9 and T3 | Very slight indication only | Full scale, shorted C8, 9 or grounded T3. |
| Plate contact of Detector and grid contact of Output (UX 245) socket | T3, C10 and T4 | Very slight kick only | Full scale indicates shorted C10. No reading open, T3 or 4. |
| Plate contact of Output (UX 245) socket and white speaker lead (Disconnect T5 white lead) | T5 | Nearly full scale | No reading, open T5. |
| Field coil of speaker (Brown and white leads) | T9 | 2/3 scale | No reading, open T9. |

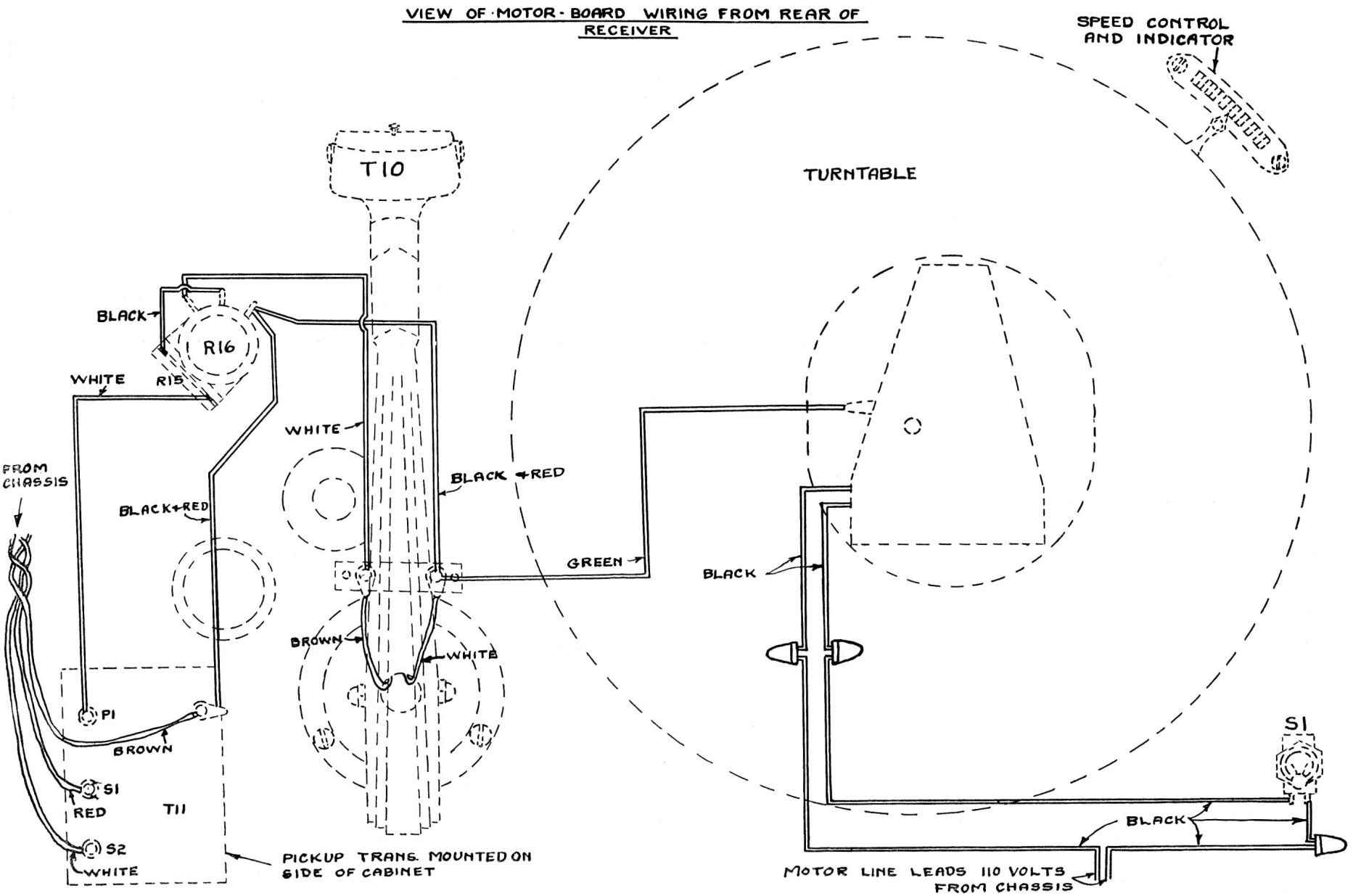



ILLUSTRATION 7.
PICTURE DIAGRAM—TYPE 410 CHASSIS
("Elgin" Model—Motor Board Wiring)

# CIRCUIT CONTINUITY TESTS ON 400-410 AND 420 CHASSIS—(Continued)

| TEST BETWEEN | PART TESTED | NORMAL READING | INCORRECT READING WOULD INDICATE |
|---|---|---|---|
| Plate contact of Output (UX 245) socket and either filament contact (Disconnect white speaker lead) | Primary of T6 and C12 | 1/3 scale slowly reducing to zero | 2/3 scale, shorted C12. No reading, open primary T6 or open R12 (NOTE:—if meter fails to return to zero, reverse test prods. If on reversing prods meter does not drop back, indicates leaky C13. |
| Red and green speaker leads (Disconnect from speaker) | Secondary of T6. Also C13 | Full scale | No reading, open secondary of T6. |
| Voice coil terminals of speaker (Disconnect red and brown leads) | Voice coil | Full scale | No reading, open voice coil. |
| Heater contacts UY 224 sockets and chassis | Heater winding (T7) and wiring | Full scale | No reading, open circuit wiring on winding of T7. |
| Filament contacts UX 245 socket and ground | R12, UX 245 filament winding and wiring | Slightly over 2/3 scale | No reading, open circuit R12 or filament winding or wiring. Full scale, shorted R12, ground on filament or dial light circuits. |
| Right hand filament contact of UX 280 socket and white speaker lead | UX 280 filament winding, wiring and T8 | Nearly full scale | No reading indicates open filament winding, wiring or choke T8. |
| Either filament contact of UX 280 socket and chassis | T8 and C13 | 1/2 scale dropping to zero | If meter does not drop back reverse test prods. Continued reading following reversal indicates shorted Mershon C13. (Reading of meter increased slightly if test prod polarity is reversed). |
| Each plate contact UX 280 socket and chassis | High voltage secondary of T7 | Slightly under full scale | No reading, open secondary section. Lower than normal reading indicates shorted turns in that section of H.V. secondary. |
| Plate contacts of UX 280 socket | High voltage secondary T7 | Slightly lower than above | No reading, open secondary. Lower than normal reading, shorted turns in H.V. Secondary. (Power transformer [T7] will heat badly under this condition). |
| Contacts of line plug ("on-off" switch in "on" position) | S2, 3, primary of T7 | Full scale | No reading, open primary of T7 or switches S2, 3 not making contact. (Make this test with S2 in both "high" and "low" positions). |
| Line plug contacts and chassis | Primary of T7, S2, 3 and wiring | Nil | Any reading under this test indicates ground on primary circuit of T7 including switches S2 and 3. |

Certain modifications in the Detector circuit arrangement of the "Elgin" model, type 410 chassis. (See illustration 6), are incorporated to provide the necessary coupling for the electric pickup. The following continuity tests apply to the type 410 chassis only and supplement those given in preceding pages.

| TEST BETWEEN | PART TESTED | NORMAL READING | INCORRECT READING WOULD INDICATE |
|---|---|---|---|
| Contacts of line plug (On-off switch in "on" position, plug removed from hi-lo switch and motor switch in "on" position.) | S1 and T12 | Full scale | No reading indicates open field windings T12. |
| Contacts of pickup head (Remove from tone arm.) | T10 | Full scale | No reading, open winding T10. |
| Contacts of pickup head and casing (Head removed) | T10 | Nil | A reading indicates ground between windings and case. |
| Contacts of tone arm (Remove pickup head) | R15, 16 and T11 primary | Practically full scale. Slight variation as Vol. Control (R16) is rotated | No reading, open R15, 16 or primary of T11. |

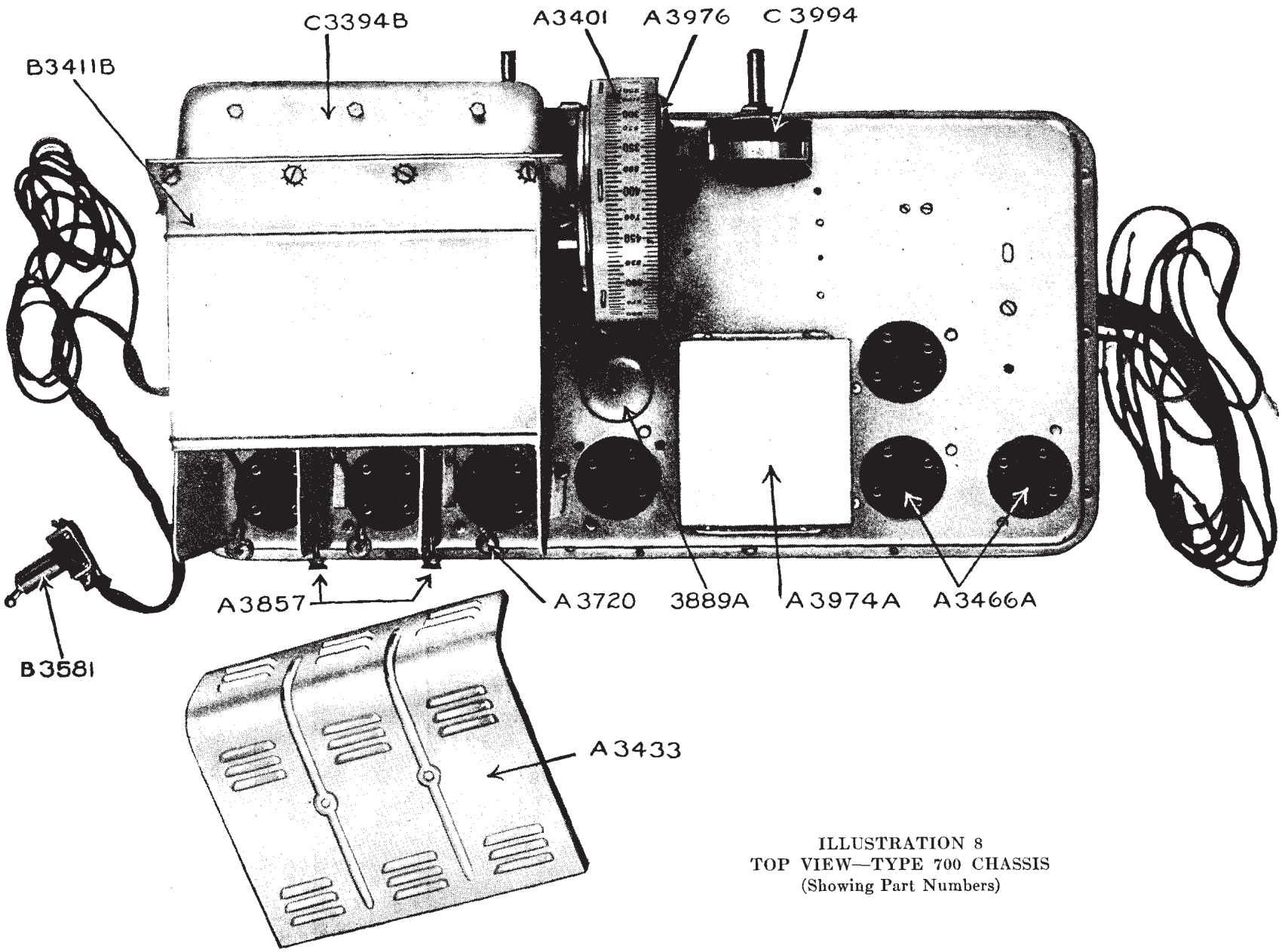



ILLUSTRATION 8
TOP VIEW—TYPE 700 CHASSIS
(Showing Part Numbers)

# DATA ON THE TYPE 700 CHASSIS

*INTRODUCTION*

The type 700 chassis incorporated in the "Serenata" model is a seven tube battery operated unit designed for use with the two volt low filament current radiotrons. Three of the type 232 screen grid tubes are used as R. F. amplifiers. The chassis is identical in physical dimension to the types 400–410 and 420. A description of the circuit is given in the following paragraphs.

*ANTENNA INPUT*

The antenna and ground connections to the chassis are made through colored flexible lead wires, green for antenna and black for ground.

Because of the extreme sensitivity of the type 700 chassis a range control or local distance switch is provided and is very satisfactory in reducing overloading in the radio frequency stages when the receiver is to be operated in the vicinity of local or high-power broadcasting stations. Reference to Illustration 11 will show details of the antenna input arrangement. The switch S2 is the range control. When thrown to the "distance" position the antenna circuit consists of the primary of the R. F. transformer T1 which is paralleled by the resistor R1. (See also Page 5 Service Data 740 chassis). With the switch in the "local" position the antenna is removed from direct contact with the primary of T1 and coupling is obtained through the capacity offered by the twisted lead wires which are attached to S2. The by-pass condenser C11 is also cut into circuit in the "local" position and serves to by-pass some of the incoming signal energy.

*RADIO FREQUENCY AMPLIFICATION*

Three type 232 radiotrons are used as radio frequency amplifiers. Coupling between stages is obtained through radio frequency transformers indicated by the symbols T1 and 2. The secondary of each transformer is tuned by a section of the gang condenser C1. Coupling between the third R. F. tube and the detector is through the untuned transformer T3. The R. F. transformers (excepting T3) are similar to those used in the types 400, 410 and 420 chassis. A by-pass condenser C2 is placed across the filament supply. In addition to this the control grid bias for the R. F. tubes is by-passed by the condenser C4. (This is an R. F. by-pass). Screen and plate supplies are by-passed by the condensers C5 and 3 respectively. R9 is a voltage reducing resistance in the plate circuit of the third R. F. tube.

Alignment of the tuning condenser (C1) is provided for and the method of adjustment is similar to that covering the 400 chassis. (See page 5).

The minimum sensitivity and selectivity figures of the average chassis are given in the following table. (Frequency in parenthesis).

| | 500 metres (600) | 300 metres (1000) | 214 metres (1400) |
|---|---|---|---|
| Sensitivity (in M/V) | 25 | 20 | 15 |
| Selectivity (at 100X) (Aligned at 1400 kc.) | 45 | 55 | 80 |

*DETECTION*

The familiar "grid leak condenser" circuit arrangement is used for detection. Input to the type 230 tube operated as detector embraces the secondary of the untuned transformer T3, the grid condenser C6 and the grid leak resistance R3. The output circuit of the detector includes the R. F. by-pass condenser C7, the R. F. choke R4 and the lower section of T5. Voltage supplied to the plate of the detector tube is dropped to the correct value through the resistance R7 and this supply is by-passed by the condenser C9.

*AUDIO FREQUENCY AMPLIFICATION*

A single type 230 is used between the detector and output tubes as an audio amplifier. The input circuit of this stage consists of the choke T5, the grid condenser C8 and the grid leak resistance R4. Grid bias from the "C" battery is applied through this resistance. Output from this stage is coupled to the push-pull amplifiers through the primary of the audio frequency transformer T6. R8 is a voltage reducing resistance, by-passed by the condenser C10.

*OUTPUT AMPLIFICATION*

Two type 231 radiotrons are used as output amplifiers. These tubes are operated in a "push-pull" stage the input end of which is the secondary of T6. Bias is supplied to the grids through the centre-tap of the transformer winding.

*VOLUME CONTROL*

A variable resistance is used as volume control. This is indicated by the symbol R6 and varies the voltage applied to the screens of the 232 tubes (R. F. amplifiers). R6 together with R5 comcomprises a bleeder circuit in the "B" (plate) supply. When the voltage control (R2) is turned to the "off" position the switch S1 opens this bleeder circuit.

*VOLTAGE CONTROL*

Because of wide variations in the voltages delivered by the batteries used as filament supply, a voltage control is required to allow operation of the filaments at the correct temperature. The rheostat R2 is used as a voltage control and also serves as an "on-off" switch. The voltmeter V is connected in parallel with the tube filaments and in conjunction with R2 allows a definite setting of filament voltage to be obtained.

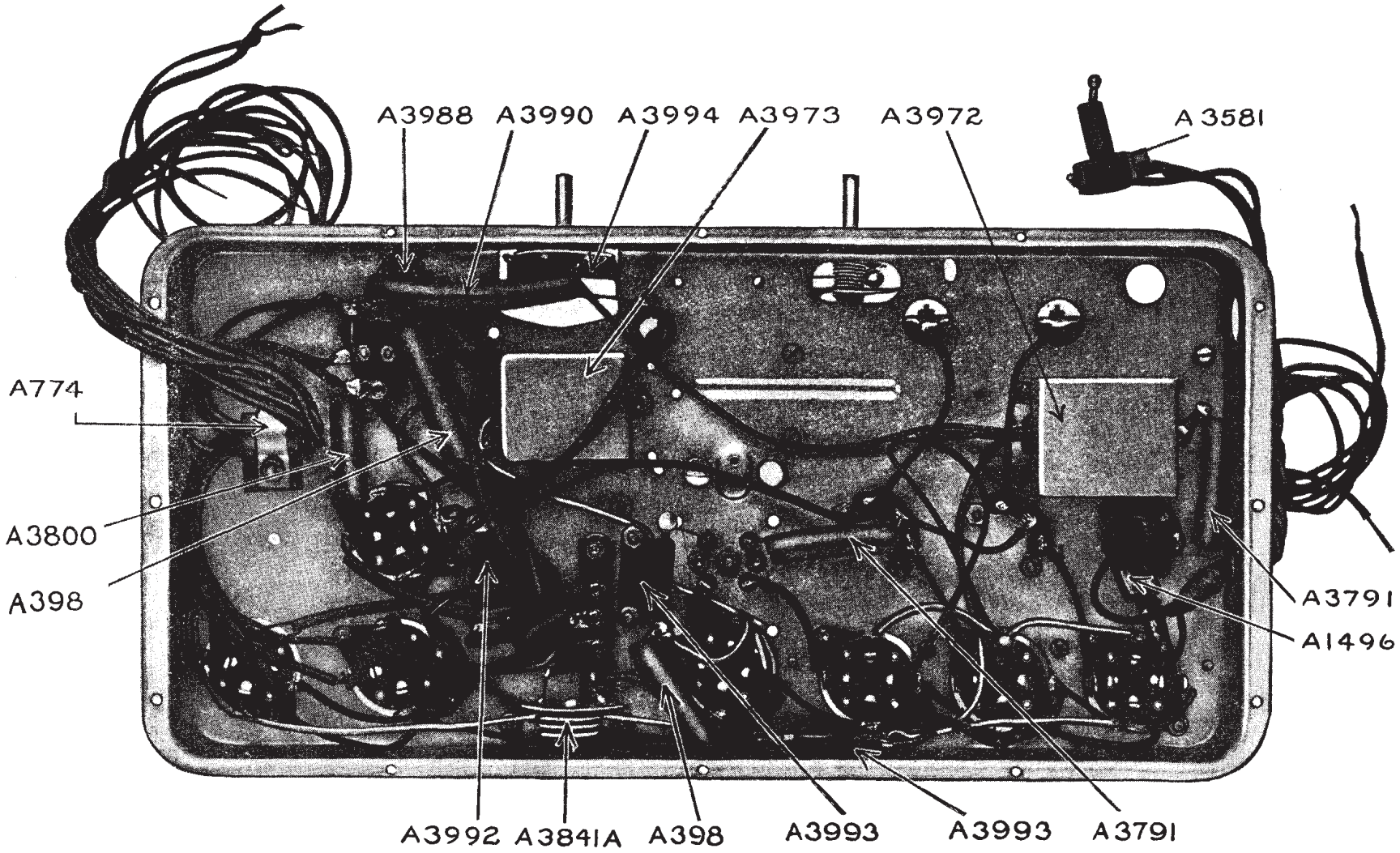



ILLUSTRATION 9
BOTTOM VIEW—TYPE 700 CHASSIS
(Shield removed—Showing Part Numbers)

## *POWER SUPPLY*

Power to operate this chassis is obtained from the A, B and C batteries.

Ample resistance is available in the voltage control rheostat to allow filament operation from various types of A batteries such as a two volt storage unit, a group of number six dry cells or one of the new air cell units. Full instructions covering the proper method of connecting the various batteries will be found in the instruction booklet supplied with each instrument.

The large "heavy duty" type of B battery should always be used as it is more economical.

Battery manufacturers have introduced this year a 22½ volt C battery fitted with a three volt tap in addition to taps at 4½, 6 volts, etc. This type of C battery should be used whenever available. If unobtainable a separate 4½ volt C battery must be used to supply the 3 volt bias. When using this last mentioned arrangement, the positive terminal of the 4½ volt unit should be connected to the blue wire and the brown lead (-3 volt) to the 3 volt tap.

## *BATTERY CONNECTIONS*

The color code of battery lead wires follows:—

| | | |
|---|---|---|
| White | — | +A (2 volts) |
| Green and Yellow | — | −A (2 volts) |
| Black and Red (or plain Black) | — | −B |
| Red | — | +B (135 volts) |
| Blue | — | +C |
| Brown | — | −C (3 volts) |
| Slate | — | −C (4½ volts) |
| Yellow | — | −C (22½ volts) |
| Green | — | Antenna |
| Black | — | Ground |

## *SPEAKER (Inductor Dynamic)*

An inductor type of speaker is used in connection with the type 700 chassis. It is illustrated on Page 38 of the 1929 Service Manual. The two green wires from the chassis connect to the two outside lugs on the speaker terminal strip. The red lead from chassis runs to the centre lug.

## *RADIOTRON SEQUENCE*

The position and function of each radiotron is given herewith. Perspective is from above looking down.

| 232 | 232 | 232 | 230 | 230 | 231 | 231 |
|---|---|---|---|---|---|---|
| | | | | 1st A. F. Amplifier | | |
| 1st R. F. Amplifier | 2nd R.F. Amplifier | 3rd R.F. Amplifier | Detector | | Output Amplifier | Output Amplifier |

(Back of Chassis)

## *DIAL LIGHT*

The use of a dial light is not recommended where economical operation is desired. A dial light increases the drain on the A (filament) battery nearly 100 per cent.

*Servicemen are especially warned against the installation of a dial light, when the "Serenata" (type 700 chassis) is to be operated with the Eveready type A600 air cell. The maximum safe drain on this battery is .60 ampere. Increasing the drain over this figure will seriously curtail the life of the battery.*

## *AUDIO TRANSFORMER ASSEMBLY*

The various lead wires of the audio transformer (T5-6) are color coded to assist in identifying the various windings when it becomes necessary to change a unit. Push rubber sleeving back slightly to observe code.

| | *Color Code of Lead* | *Connects to* |
|---|---|---|
| T5 | Copper braid | Terminal of C8 (.002 Mfd) |
| T5 | Silver braid with black cotton cover | Terminal lug of R. F. choke T4. |
| T5 | Copper braid with green cotton cover | Terminal of C9 (.25 Mfd.) and R7 (45,000 ohm). |
| T6 | Silver braid | Plate terminal of 1st A. F. socket. |
| T6 | Silver braid with red cotton cover | Terminal of C10 (.25 Mfd) and R8 (20,000 ohm). |
| T6 | Copper braid with black cotton cover | Grid terminal of one output (231) socket. |
| T6 | Copper braid | Grid terminal of one output (231) socket. |
| T6 | Copper braid with green cotton cover | Lug on small insulating strip and yellow (-22½ volt C) lead. |

## *REMOVING CHASSIS FROM CABINET*

This operation is not difficult and the following remarks will suggest the most satisfactory method.

(1) Disconnect all battery leads and remove tubes.
(2) Disconnect speaker lead wires by unsoldering.
(3) Back out set screws in control knob and remove.
(4) Remove ring nut holding range control switch in place.
(5) Remove voltage control knob and nut clamping rheostat to cabinet.
(6) Back out and remove the six machine screws holding chassis in place. (Accessible from speaker compartment.)
(7) Lift chassis slightly and slide out of cabinet.

*When replacing chassis always ensure that rubber pads are placed in position between chassis and shelf.*

## *REMOVING ASSEMBLIES*

The most satisfactory method of removing an assembly can be determined by examining the type of mounting used. Assemblies that are rivetted to the chassis may be dismounted by cutting out rivet burrs with a small machine drill. Replacement assemblies may be held in position with either drive screws or small nuts and bolts.

Never cut lead wires, always unsolder at nearest joint. Always test out replacement parts before installation. Make a note of the position of lead wires and color coding (if any) when disconnecting an assembly.

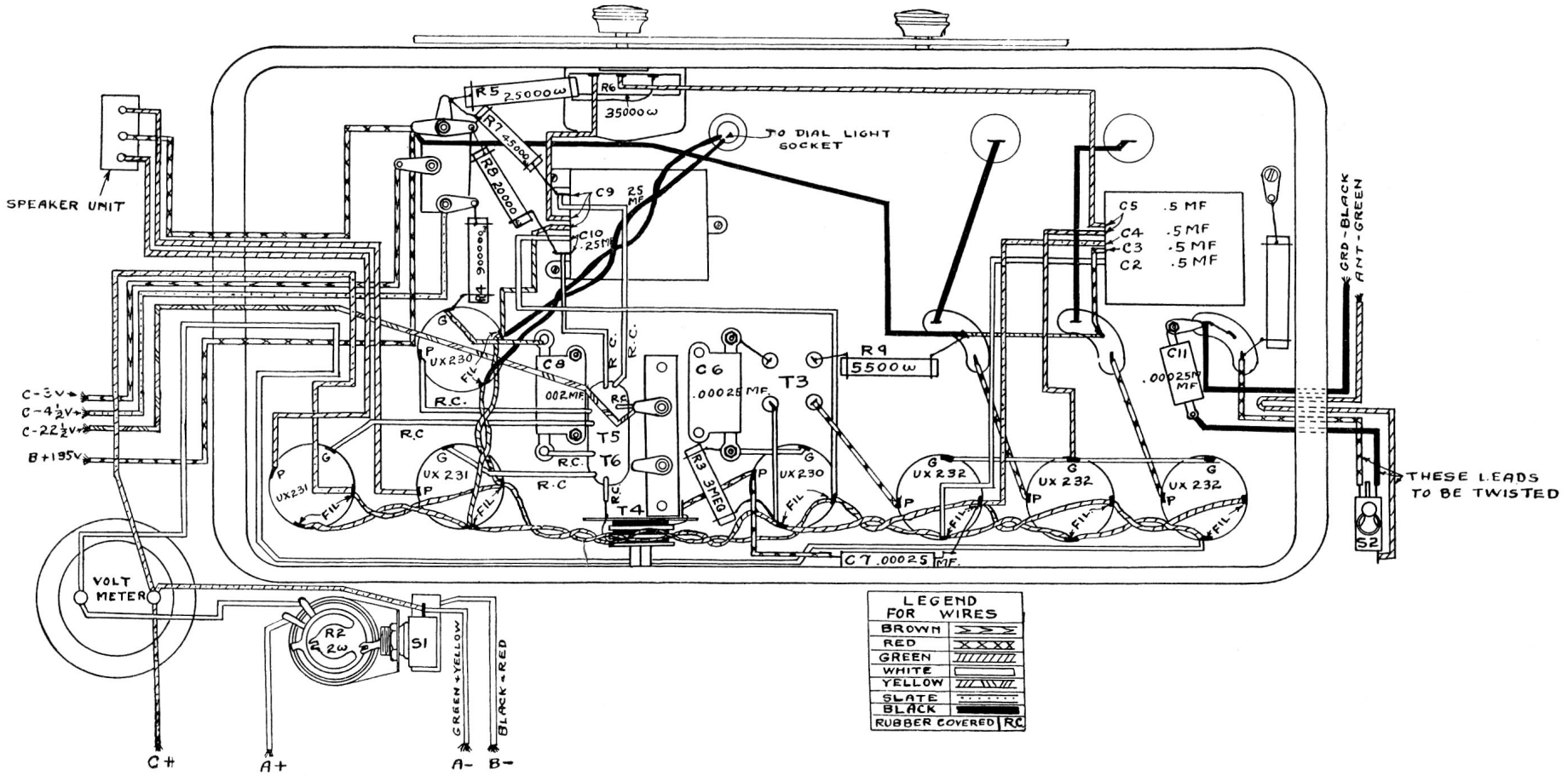



ILLUSTRATION 10
PICTURE DIAGRAM—TYPE 700 CHASSIS
("Serenata" Model)

# Average Voltage and Current Readings

## (TYPE 700 CHASSIS)

Figures given are for reference only. Variations in the tubes will be reflected in slight differences in the values shown. The volume control should be set at maximum.

*UX 232 R. F. AMPLIFIERS* (*1st and 2nd stages*)

| | | |
|---|---|---|
| Filament volts | (Ef) | (a) 1.9 |
| Filament current | (If) | .06 |
| Plate volts | (Ep) | (a) 135 |
| Plate current | (Ip) | (a) 1.5 M.A. |
| Screen volts | (Esg) | (a) 61 |
| Screen current | (Isg) | (a) Not more than 1/3 plate current |
| Control grid volts | (Ecg) | (a) 3 |

*UX 232 R. F. AMPLIFIER* (*3rd stage*)

| | | |
|---|---|---|
| Filament volts | (Ef) | (a) 1.9 |
| Filament current | (If) | .06 |
| Plate volts | (Ep) | (a) 125 |
| Plate current | (Ip) | (a) 1.4 M.A. |
| Screen volts | (Esg) | (a) 61 |
| Screen current | (Isg) | (a) Not more than 1/3 plate current |
| Control grid volts | (Ecg) | (a) 3 |

*UX 230 DETECTOR*

| | | |
|---|---|---|
| Filament volts | (Ef) | (a) 1.9 |
| Filament current | (If) | .06 |
| Plate volts | (Ep) | (a) 40 |
| Plate current | (Ip) | (a) .5 |
| Grid volts | (Eg) | 0 |

*UX 230 A. F. AMPLIFIER*

| | | |
|---|---|---|
| Filament volts | (Ef) | (a) 1.9 |
| Filament current | (If) | .06 |
| Plate volts | (Ep) | (a) 91 |
| Plate current | (Ip) | (a) 2 |
| Grid volts | (Eg) | (z) 4.5 |

*UX 231 OUTPUT AMPLIFIERS*

| | | |
|---|---|---|
| Filament volts | (Ef) | (a) 1.9 |
| Filament current | (If) | (a) .15 |
| Plate volts | (Ep) | (a) 129 |
| Plate current | (Ip) | (a) 7 |
| Grid volts | (Eg) | (a) 22½ |

*BATTERY DRAIN*

| | |
|---|---|
| Filament "A" circuit (includes meter; less dial light) | (x) .60 amp. at 1.9 volts |
| Filament "A" circuit (includes meter and dial light) | (x) 1.10 amps at 1.9 volts. |
| Plate "B" circuit (volume control "full-on") | (w) 26-28.5 M. A. |

*IMPORTANT*

All measurements must be made with the tube in position and a high resistance voltmeter (1,000 ohms per volt) is essential for reading plate, screen and control grid voltages.

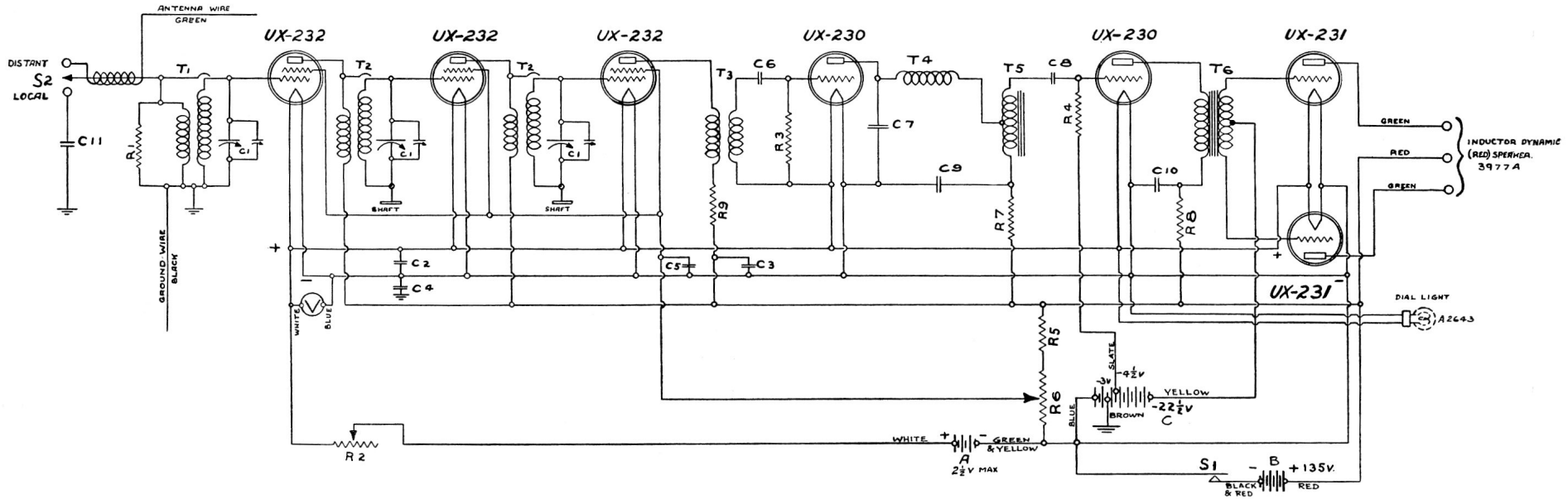
The following schedule covers the method by which a given reading should be obtained.

(a) Read with tube in analyzer and analyzer adapter in chassis socket.

(w) 0-50 D.C. Milliammeter in series with negative (−) "B" battery lead (Black and Red).

(x) Read with 0-2 ammeter (D. C.) in series with positive (+) "A" battery lead (White).

(z) Measure between "Blue" and "Slate" battery leads. Indication only when obtained by method (a).




## ILLUSTRATION 11
## 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 | A3972 |
| C4 | .5 Mfd. filament by-pass condenser | A3972 |
| C5 | .5 Mfd. screen by-pass condenser | A3972 |
| 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 | A3973 |
| 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 |

# TROUBLE CHART TYPE 700 CHASSIS

| FAULT | PROBABLE CAUSE | HOW TO CHECK FAULT |
|---|---|---|
| Dead (Inoperative) | Open or shorted voice coils in speaker | Check plate voltage on output tubes. If normal pull out one of the output tubes. If no click in speaker, indicates shorted voice coil. No plate voltage on output tube indicates open voice coil winding. |
| | Open, shorted or grounded plate supply | Check all plate voltages throughout chassis. If any stage shows no plate volts probability open coil, resistance or wiring in that circuit. Continuity test for open. Shorts in plate supply due to defective by-pass condensers (C2, 3, 4, 5, 7, 9, and 10) will be reflected in excessive "B" battery drain. Measure total "B" current and continuity test. Grounds in plate circuits will also be reflected in high "B" drain. |
| | Shorted primary T1 (Grounded antenna circuit.) | Continuity test primary of T1 and examine for visible grounds. Examine antenna. |
| | No filaments | If voltage indicator reads normally continuity test filament circuits for loose or open connections.<br>If voltage indicator does not give reading, continuity test voltage control R2. |
| | No "B" voltage any stage | Continuity test switch S1. |
| Weak | Gang condenser out of alignment (C1)<br>Low emission tubes or low batteries<br>Lug on primary of T1 not grounded<br>Open secondaries T1, 2, 3 and 4<br>Leaky by-pass condensers, C3, 4 and 5<br>Open grid condensers or grid leaks | Check alignment of each stage.<br>Check all tubes and batteries.<br>Examine lug connections.<br>Continuity test.<br>Check by-pass condensers.<br>Replace condensers C6 or 8. Check resistors R3 and 4. (See also "distortion" and "fading"). |
| | One half voice coil of speaker open circuit | Continuity test speaker windings. (See also "dead".) |
| | Grid section of T5 open circuit<br>Open secondary of T6<br>Reversed polarity "A" or "C" batteries | Continuity test between R7 and C8.<br>Continuity test.<br>If "A" connections reversed voltage indicator (v) will read reverse. Reversed polarity in case of "C" battery will show up as severe distortion and excessive "B" drain. |
| Fading | Loose terminal connections, T1, 2, 3 and 4 | Give all lugs visual inspection and continuity test coils. Resolder all connections. |
| | Open grid leak resistances R3 or 4 | Check resistors. |
| Distortion | Improper voltages from "B" or "C" batteries. Defective tubes. Defective speaker. | Check all battery voltages. Test tubes. Replace speaker. |
| | Resistors R3 and 4 too high value | Replace. |
| Audio howl | Feed back in audio circuit<br>Rundown "B" or "C" batteries | Reverse connections to primary of T6.<br>Check batteries under load for voltage. |
| Microphonic | Microphonic tubes | Install tube shield on UX 230 in detector stage. Interchange tubes in R. F. stages. Interchange detector and 1st audio tubes. |
| Excessive "A" battery drain | Shorted by-pass condenser C2, defective voltage indicator V or short in dial light circuit | Continuity test C2, remove voltmeter V from circuit and check dial light circuit. |
| Excessive "B" battery drain | Shorted by-pass condensers C3, 5, 7, 9 and 10 or grounds in plate or screen circuits | Continuity test condensers for shorts. Check primaries of T2, 3, 4, 5 and 6 for grounds. |
| Short in "C" battery circuit | By-pass condenser C4 shorted | Continuity test. |
| Uncontrollable oscillation | Poor ground connection. Tube shield not in place. Leaky by-pass condensers C2, 3, 4 and 5. Fingers on rotor shaft of C1 not making contact | Install proper ground. Install tube shield. Check condensers. Adjust spring fingers for maximum pressure and clean shaft at point of contact. |

# CIRCUIT CONTINUITY TESTS ON TYPE 700 CHASSIS

| TEST BETWEEN | PART(S) TESTED | NORMAL READING | INCORRECT READING WOULD INDICATE |
|---|---|---|---|
| Antenna connection (green lead) and chassis (S2 in "distance" position.) | S2, R1 and primary of T1 | Full Scale | Lower reading indicates open primary T1. No reading open T1 and R1 or defective S2. |
| Antenna connection (green lead) and chassis (S2 in "local" position.) | C11 | Nil | Shorted condenser C11. |
| Control grid clip of UX 232's and chassis. | Secondaries T1 and 2 | Full scale | No reading; open secondary stage under test. |
| Between plate contacts of UX 232's and 135 volt (red) battery lead. | Primaries T2 and 3 also R9 | Full scale. 1st and 2nd R. F. stages. Half scale 3rd R.F. | No reading any stage open primaries T2 and 3, (3rd R. F. stage probability open R9.) |
| Plate contacts UX 232 sockets and chassis | C3 and primaries T2 and T3 | Initial kick only then nil | Full reading shorted C3 or grounded primary, T2 or 3. |
| Screen contacts UX 232 sockets and 135 volt (red) battery lead. (Volume control R6 at minimum) | R5 and R6 | Approx. 1/10 scale | No reading, open R5 or R6. Open in associate wiring. |
| Grid to filament contact of detector socket | C6, R3 secondary T3 | Very slight indication | Higher reading indicates shorted C6 or low resistance R3. |
| Plate contact detector socket and 135 volt (red) battery lead. | R7, T5 and T4 | Approx. 1/10 scale | No reading, open R7, T5 or T4, 1/5 scale shorted C7. |
| Plate and filament contacts detector socket | C7 and C9 | Slight indication | Full scale shorted C7 ¾ scale shorted C9. |
| Grid contact 1st audio socket and 4½ volt (slate) battery lead | R4 | Indication only | No reading, open resistor R4. Higher reading, short on resistor or low value. |
| 135 (red) and 2 (yellow-green) volt battery leads | R5, R6 | 1/10 scale | No reading, open in R5 or 6. Higher reading low resistance R5 or 6. |
| Plate contact of detector and grid contact of 1st audio socket | C8 | Nil | Reading indicates shorted or leaky C8. |
| Plate contact 1st audio socket and 135 volt (red) battery lead | R8 and primary T6 | 1/5 scale | No reading, open R8 or T6 primary ¼ scale reading, shorted T6 primary |
| Plate and filament contact 1st audio socket | C10 | Nil | ¾ scale, shorted C10 |
| Grid contacts of output sockets and 22½ volt (yellow) battery lead | Secondary of T6 | ½ scale | No reading, open secondary section of T6. |
| Plate contacts of output sockets and 135 volt (red) battery lead | Speaker windings | Full scale | No reading, open speaker voice coil. |
| Between "A" battery leads (Disconnect voltage indicator V) | C2 | Initial kick only then nil | Full or nearly full, shorted or leaky C2. |
| Between green and yellow "A" battery lead and chassis | C4 | Initial kick only then nil | Full or nearly full, shorted or leaky C4. |

# PARTS LIST

## BROCK AND RIDEAU MODELS TYPES 400 AND 420 CHASSIS

| Part No. | Description | List Price |
|---|---|---|
| B3447B | Bracket, dial light | $ .50 |
| A3954 | Bulb, T3-3 volt | .20 |
| A3847 | Cap, Mershon | .20 |
| A3820 | Condenser Block, 3-.1 Mfd. and 2-1.0 Mfd., (C5, 6 and 7) | 3.60 |
| A3815 | Condenser, .0001 Micamold, (C8) | .50 |
| A3845 | Condenser, 2-8 Mfd. Mershon (C13) | 5.95 |
| 3608A | Cord, attachment | 1.50 |
| A3840A | Choke, R. F. (T3) | 1.75 |
| A3841A | Choke, R. F. (T4) | 1.50 |
| A3846 | Clamps, Mershon | .10 |
| A3720 | Clips, grid | .05 |
| A3819 | Condenser Block, 2-.25 Mfd. and 1-.3 Mfd., (C2, 3 and 4) | 2.00 |
| C3394B | Condenser, Gang, (C1) | 16.00 |
| A3861 | Condenser, .0001 Mfd. Micamold, (C9) | .60 |
| B3821 | Condenser, .02 Mfd., (C10) | 1.00 |
| A3857 | Nuts, knurled | .01 |
| S3773 | Potentiometer, volume control, (R3) | 2.00 |
| A3800 | Resistor, 900,000 ohm Carbon (black and white) (R11) | .90 |
| A3796 | Resistor, 550,000 ohm Carbon (black and red) (R6) | .90 |
| B3802 | Resistor, 300,000 ohm Carbon (black and yellow) (R10) | .90 |
| A3798 | Resistor, 250,000 ohm Carbon (black and green) (R8) | .90 |
| A3799 | Resistor, 100,000 ohm Carbon (black and brown) (R9) | .90 |
| A3797 | Resistor, 24,000 ohm Carbon (black and blue) (R7) | .90 |
| A3791 | Resistor, 5,500 ohm Carbon (black and orange) (R1) | .90 |
| B3792 | Resistor, 75 ohm Candohm, (R2) | .20 |
| A3794 | Resistor, 2,500 and 3,050 ohms Candohm (R4 and 5) | 1.10 |
| A3801 | Resistor, 1,650 ohm Candohm (R12) | .80 |
| A3401 | Scale, dial | .60 |
| A3439 | Shield, chassis bottom | 1.00 |
| S3774 | Switch, on-off, (S3) | 1.30 |
| C3393B | Switch, Hi-lo, (S2) | .60 |
| C3388B | Transformer, power and filter choke, (T7 and 8) | 25.00 |
| A3430A | Transformer, double audio (T5 and 6) | 12.00 |
| A3909A | Transformer, detector and interstage, R. F. (T2) | 3.00 |
| A3826A | Transformer, antenna R. F., (T1) | 3.50 |
| B3424 | Shield, R. F. transformer | 1.00 |
| B3411B | Shield, gang condenser | .75 |
| A3433 | Shield, R. F. tube | .60 |
| A3466A | Sockets, UX | .35 |
| A3465A | Sockets, UY | .50 |

## SPEAKER, D-3 DYNAMIC

(See parts list, Page 22, Service Data on type 740 chassis)

## BROCK MODEL CABINET FITTINGS

| Part No. | Description | List Price |
|---|---|---|
| B3859 | Blocks, chassis mounting | $ .10 |
| A3736 | Cabinet | On application |
| A3860 | Case, Packing | net 1.50 |
| A3443A | Chassis | 85.00 |
| R210 | Chassis bolts | .05 |
| S4279 | Grill, fret only | 1.50 |
| S4280 | Grill cloth | .50 |
| | Instruction booklet | net .15 |
| A3610 | Knobs, tuning | .25 |
| S4281 | Leg, front | 2.50 |
| S4282 | Leg, rear | 1.75 |
| A3858 | Plate, escutcheon | 1.00 |
| A1376 | Screws, Escutcheon plate | .01 |
| D3529H | Speaker, D-3 Dynamic | 25.00 |
| S4284 | Stretcher, leg side | 1.50 |
| S4283 | Tops | 4.00 |

## RIDEAU MODEL CABINET FITTINGS

| Part No. | Description | List Price |
|---|---|---|
| R219 | Bolts, chassis mtg | $ .05 |
| B4150 | Cabinet, less hardware | On application |
| A4154 | Case, packing | net 1.00 |
| 4147A | Chassis | 85.00 |
| A3858 | Escutcheon plate | 1.00 |
| S4433 | Grill, fret only | 1.50 |
| S4434 | Grill, cloth | .50 |
| | Instruction book | net .15 |
| A3610 | Knobs, tuning | .25 |
| A1376 | Screws, escutcheon plate | .01 |
| D3529H | Speaker, D-3 Dynamic | 25.00 |

## ELGIN MODEL TYPE 410 CHASSIS

(Unless listed below parts same as for type 400 chassis)

| Part No. | Description | List Price |
|---|---|---|
| A2263 | Condenser, ½ Mfd. (C14) | $ 1.75 |
| A4047 | Potentiometer, Vol. control (R3) | 2.25 |
| A4048 | Resistors, 90,000 (black and purple) (R9) | .90 |
| A4049 | Resistors, 20,000 (black, brown and red) (R14) | .90 |
| A4050 | Resistors, 280,000 (black, brown and white) (R13) | .90 |
| A4051 | Switch, phono radio (S4) | 4.50 |

## ELGIN MODEL CABINET FITTINGS

| Part No. | Description | List Price |
|---|---|---|
| A2903 | Album, Record | $ 3.00 |
| 3639E | Arm, pickup | 4.25 |
| B4025 | Cabinet, less hardware | On application |
| A4030 | Case, Packing | net 1.75 |
| A4046 | Chassis | 90.00 |
| A2853 | Cover, needle cup | .07 |
| A2860 | Cup, needle | .14 |
| S4436 | Grill, cloth | .50 |
| S4435 | Grill, fret only | 1.75 |
| S4441 | Hinge, top | .25 |
| | Instruction book | net .25 |
| A3610 | Knobs | .25 |
| A4052 | Knob, gang switch | .20 |
| S4437 | Knob, Door pull | .25 |
| S4438 | Leg front | 3.00 |
| S4439 | Leg, rear | 3.00 |
| A3698 | Motor, Green Flyer, 25 cycle (T12) | 25.00 |
| A3699 | Motor, Green Flyer, 60 cycle (T12) | 23.00 |
| D2283 | Pickup Head (T10) | 10.00 |
| A3858 | Plate Escutcheon | 1.00 |
| A1376 | Plate Escutcheon screws | .05 |
| A3687 | Potentiometer, phono vol. control (R16) | 1.25 |
| A3686 | Resistor, 31 ohm Candohm, (R15) | .50 |
| A3730 | Rest, pickup | .25 |
| S4442 | Rest, top | 1.00 |
| D3529H | Speaker, D-3 Dynamic | 25.00 |
| A3695 | Stroboscope, 25 cycle | .20 |
| A3696 | Stroboscope, 60 cycle | .20 |
| A4076 | Switch, motor, (S1) | 1.50 |
| S4440 | Top | 6.00 |
| A4055A | Transformer, pickup, (T11) | 8.00 |
| A3709 | Turntable | 3.00 |

## GREEN FLYER MOTOR

(See page 23, Service Data, 740 chassis)

## SERENATA MODEL TYPE 700 CHASSIS

| Part No. | Description | List Price |
|---|---|---|
| A3976 | Bracket, dial light | $ .50 |
| A2643 | Bulb, T3-2.5 volt | .20 |
| A774 | Clamps, cable | .07 |
| A3720 | Clips, grid | .05 |
| A3841A | Choke, R. F. (T4) | 1.50 |
| C3394B | Condenser, Gang (C1) | 16.00 |
| A3972 | Condenser Block, 4-.5 Mfd., (C2-C3-C4-C5) | 2.75 |

# PARTS LIST—(Continued)

SERENATA MODEL TYPE 700 CHASSIS—*continued*

| Parts No. | Description | List Price |
|---|---|---|
| A3973 | Condenser Block, 2-.25 Mfd., (C9-C10) | $1.75 |
| A3992 | Condenser Block, .002 Mfd., Micamold (C8) | .90 |
| A3993 | Condenser Block, .00025 Mfd., Micamold (C6-C7) | .50 |
| A1496 | Condenser Block, .00025 Mfd., Micamold (C11) | .50 |
| A3857 | Nuts, knurled | .01 |
| C3994 | Potentiometer, 35,000 ohm Vol. control (R6) | 3.00 |
| A3791 | Resistor, 5,500 ohm Carbon (black and orange) (R1) | .90 |
| A3987 | Resistor, 3 Megohm Carbon (white and blue) (R3) | .90 |
| A3800 | Resistor, 900,000 ohms Carbon (black and white) (R4) | .90 |
| A3990 | Resistor, 25,000 ohms Carbon (white and yellow) (R5) | .90 |
| A3988 | Resistor, 45,000 ohms Carbon (white and brown) (R7) | .90 |
| A3989 | Resistor, 20,000 ohms Carbon (white and green) (R8) | .90 |
| A3791 | Resistor, 5,500 ohms Carbon (black and orange) (R9) | .90 |
| A3401 | Scale, dial | .60 |
| A3433 | Shield, R. F. tube | .60 |
| B3424 | Shield, R. F. Transformer | 1.00 |
| B3411B | Shield, Condenser gang | .75 |
| A4166 | Shield, Antimicrophonic tube | .20 |
| A3466A | Socket, UX fixed | .35 |
| A3581 | Switch, local-distance (S2) | 1.50 |
| A3974A | Transformer, double audio, (T5-6) | 12.00 |
| A3909A | Transformer, interstage R. F. (T2) | 3.00 |
| A3826A | Transformer, antenna tuning R. F. (T1) | 3.50 |
| A3889A | Transformer, untuned stage R. F. (T3) | 2.50 |

## SPEAKER INDUCTOR DYNAMIC

(See parts list, page 46, Service Manual, 1929)

## SERENATA MODEL CABINET FITTINGS

| Part No. | Description | List Price |
|---|---|---|
| A3962 | Cabinet, less hardware | On application |
| A3963 | Case, packing | net $ 1.75 |
| 3970A | Chassis | 70.00 |
| S4285 | Grill, fret only | 1.50 |
| S4286 | Grill, cloth | .50 |
| | Instruction book | net .25 |
| A3610 | Knobs, tuning | .25 |
| S4287 | Legs, front | 2.00 |
| S4288 | Legs, rear | 1.50 |
| A3979 | Meter, filament control | 5.00 |
| A3975 | Pads, chassis mtg. | each .05 |
| A3858 | Plate, escutcheon | 1.00 |
| A3580 | Plate, local-distance | .10 |
| A3978 | Rheostat, filament control (Switch attached) (R2 and S1) | 3.00 |
| R219 | Screws, chassis mtg. | .05 |
| A1376 | Screws, escutcheon plate | .01 |
| 3977A | Speaker, Inductor dynamic | 25.00 |
| S4290 | Stretchers, side | 1.50 |
| S4291 | Stretchers, centre | 3.00 |
| S4289 | Top | 4.50 |

(All prices are list, excepting wherein otherwise stated, and are subject to change without notice. Delivery on all items, F.O.B. Toronto or Divisional Offices. Transportation extra.)