Radiola

SERVICE INSTRUCTIONS

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Service an Aid to Sales

Service goes hand in hand in sales. The well-informed Radiola dealer renders service at the time of sale in affording information as to proper installation and upkeep. Subsequent service and repair may be required by reason of wear and tear and mishandling.

Obviously this service can best be rendered at point of contact, and therefore dealers who are properly equipped with a knowledge of the design and operation of Radiolas occupy a favourable position to render efficient service.

To assist in promoting this phase of the dealer's business, the A.W.A. Service Section has prepared this booklet containing information which has been compiled from experience with Radiola Dealers' Service problems. It is hoped that these notes, which will be added to from time to time as further data is collected, will prove a practical help in servicing Radiolas.

To simplify reference, the notes have been divided into ten sections, as follows:—

General Information

METHODICAL FAULT LOCATION ESSENTIAL.

From a very careful survey it has been found that a very large percentage of faults reported on first installations are due to either the accessories used or to mistakes in installation. There is no doubt that a great deal of unnecessary work will be eliminated when servicing if the investigation is carried out in the following order:—

1. Test the accessory equipment.
2. Make the preliminary voltage tests on the Radiola chassis before removing from the cabinet.
3. Remove the chassis from the cabinet for further systematic fault location.

In servicing A.C. operated Radiolas, the important thing to remember is that the A.C. Radiola is essentially the same as its predecessor, the battery operated set, with one major exception—that is, the valves. Therefore when you are called upon to service an electrically operated Radiola, do not begin by tearing it apart, but carry out the fault location in the above sequence by making a start with the equipment used with the set, next carry out preliminary voltage tests with the set in the cabinet, and last of all remove the Chassis and Power Unit from the cabinet.

EQUIPMENT DATA

VALVES.

Valves are inherently fragile and should be handled with care. Sometimes due to rough usage the internal elements become short circuited, and in such a state are liable to cause serious trouble, even to the extent of causing permanent injury to the Radiola.

It is often found that valve prongs become dirty, causing bad contact in the socket. The prongs should be cleaned with a piece of sand-paper. Also it is sometimes found that excessive solder is left on the ends of the valve prongs. This should be cleaned off with a knife or a file.

In inserting valves in the Radiola, care should be taken that a valve of low filament voltage is not inserted in the socket of a valve of higher filament voltage. This is more likely to happen in the case of the A.C. Radiola. For instance, if a UX245 valve (filament voltage 2.5 volts) be inserted in a UX171A valve socket (filament voltage 5 volts) it is obvious that the UX245 valve will be burnt out.

If there is the least suspicion that valves are faulty, they should be tested in a reliable valve tester. If it is impossible to have them thoroughly tested with the proper equipment, the valves should be tested out for performance in a Radiola which is known to be working satisfactorily.

BATTERIES.

The "A" battery should be kept well charged. The battery solution should never be allowed to fall below the top of the plates. Only distilled water should be used to replenish the solution. After charging, carefully wipe any traces of solution from off the battery container, and keep the terminals and connecting strip free from corrosion.

The specific gravity of the electrolyte should be checked carefully with a hydrometer, and unless otherwise specified by the manufacturers, the specific gravity at full charge should be 1250 to 1275.

The terminal voltage test on an "A" battery is not a reliable indication of the state of the battery unless it is taken when the full valve filament load is being taken from the battery, and after at least 30 minutes run at that load.

Exhausted "B" batteries may be the cause of distortion, noisy operation, or uncontrollable oscillation. "B" batteries should be tested with a high resistance D.C. voltmeter, preferably when supplying the full plate current to the Radiola, i.e., when operating a Radiola which is known to be working satisfactorily. Forty-five volt "B" batteries should be replaced when their voltage drops to thirty-five or forty volts.

"C" batteries may also cause distortion, noisy operation or uncontrollable oscillation. The voltage should be tested with a high resistance D.C. voltmeter, and a battery whose voltage is not equal to the rated value should be looked upon with suspicion.

PRELIMINARY VOLTAGE TESTS.

Voltage tests should be made after the equipment is tested and before the chassis is removed from the cabinet. Tests should be made across the valve contacts with all the valves inserted, and the Radiola switched on for operation, but with the selector dial turned to 560 on the scale, and the volume control set at maximum.

As the valve contacts in 1930 Radiolas are totally covered by the chassis it is necessary to use a test adaptor with which to carry out the voltage tests.

A type of adaptor which gives satisfactory results is made from a base that has been removed from an old valve, and a commercial valve socket.

Solder leads in the pins of the valve base and connect them to the corresponding terminals on the valve socket, so that the adaptor may be inserted in the receiver and the valve in the adaptor. With this arrangement the Radiola should function normally, except in the case of screened grid valves when the receiver may oscillate on stations at full volume. However, this trouble should not be experienced if care is taken to see that the selector is turned to the end of the scale (560 metres).

Using the adaptors described above the voltages on all the valves may be measured conveniently. If necessary one adaptor may be used in rotation for all valves having the same type of valve base.

With electrically operated receivers care should be taken to see that the valves have been allowed to reach their working temperature before making measurements.

Plate and grid bias voltages in the case of both A.C. and D.C. receivers should be measured with a high resistance voltmeter, i.e., a meter having a resistance of at least 600 ohms per volt. Filament voltages for the D.C. Radiola should be measured with a D.C. low reading voltmeter and the filament voltages for the A.C. Radiola on a low voltage A.C. meter.

The values given under the preliminary voltage test for each Model Radiola must be considered as an average value and a reading approximating that shown should be taken as an indication that the Radiola is working satisfactorily. The reason for this—especially in the case of the electrically operated Radiolas—is that meters having different resistances throw a different load on the circuit being tested and accordingly give different readings. Also in the case of the A.C. set, any variation in the line voltage will make an appreciable difference to these readings and cause them to vary considerably from the values given. It is advisable when making voltage tests on an A.C. Radiola to also measure the line voltage with a reliable A.C. voltmeter.

CONTINUITY TESTS.

In the continuity tests for each type of Radiola, is given a testing schedule which is reasonably complete and which should cover the general faults met in servicing that particular Radiola. However, agents will place themselves in a better position to service Radiolas if, instead of looking upon this as a complete schedule, they consider it rather as a guide to the method. If a study of the testing schedule is made in conjunction with the circuit diagram, the reason for each continuity test will be understood, and further subsidiary continuity tests will be able to be originated, which will be very helpful in localising faults.

Continuity tests should be made with an A.W.A. Radio Service Tester or with a low reading D.C. voltmeter in series with a 4.5 volt dry cell. See Fig. 1.

Fig. 1

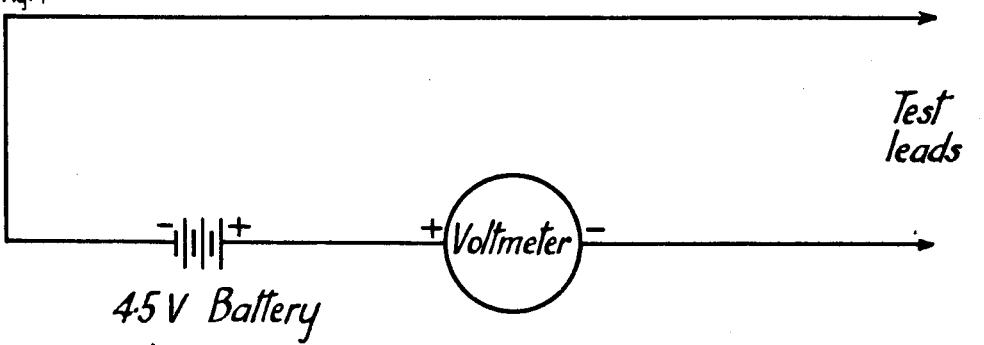

Fig. 1—Continuity Tester.

Remember, when making continuity tests, a deflection on the meter denotes a closed circuit, and no deflection denotes an open circuit. Circuits whose resistances are high will not give deflections as great as those having low resistances. For instance, the deflection obtained across the secondary of an audio transformer will be less than the deflection obtained across the primary. Further, the deflection obtained across the primary of an audio frequency transformer will be less than the deflection obtained across the primary of a radio frequency transformer.

MODULATED OSCILLATOR.

A suitable modulated oscillator for "lining up" gang condensers is shown together with the receiver and valve voltmeter, in Fig. 2. The oscillator will cover the wave-range of approximately 200 to 560 metres. The grid condenser and leak modulate the output, the note being dependent on the value of the grid leak. In addition to the use of "lining up" condensers, the oscillator will be found useful for general testing of Radiolas.

VALVE VOLTMETER.

The valve voltmeter referred to in a later section, can be made up according to the circuit shown in Fig. 2.

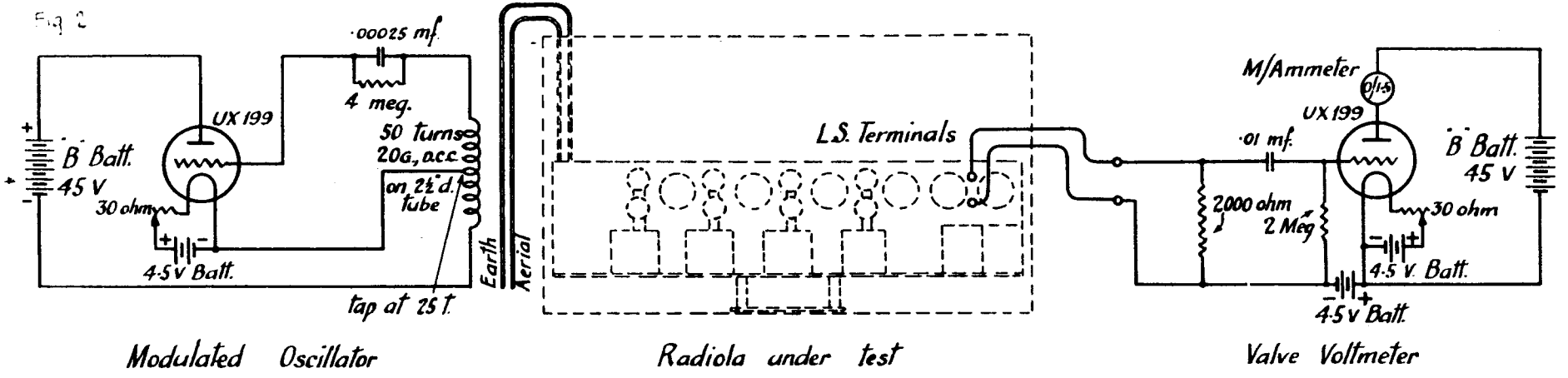

Fig. 2—Modulated Oscillator and Valve Voltmeter.

MISCELLANEOUS DATA COMMON TO ALL RADIOLAS

The Radiolas of the Fisk series are all of similar design. The valve sockets and chassis ends are all riveted firmly to the main pressed steel chassis.

An individual by-pass condenser unit for each radio-frequency stage is mounted under the chassis. The A.W.A. logarithmic variable condensers and driving mechanism are mounted on a removable steel panel. The radio frequency transformers are mounted on brackets on the top of the chassis, and are covered with shields held in position by screws from under the chassis.

The A.W.A. "Ideal" audio transformers and "Pick-up loud speaker" bracket are mounted on the chassis with screws.

The battery or power unit connecting cable terminates under the chassis and is held firmly with a cable clamp.

CHASSIS INSPECTION.

When inspecting the chassis, take particular care not to disarrange the wiring. Each wire—especially those in the radio frequency circuits—has a definite relation to other wires, and if this arrangement is altered to any extent it is quite possible that uncontrollable oscillation will be the result when operating the Radiola.

UNCONTROLLABLE OSCILLATION.

Sometimes a Radiola may oscillate when the volume control is at the maximum volume position. Turning the volume control in an anti-clockwise direction will very often eliminate the oscillation, and give quite satisfactory volume. If this does not control the oscillation, try changing the detector valve, and as a further remedy in the case of an electrically operated Radiola, check the line voltage to see that the valves are not receiving excessive filament voltage.

FAULTY VOLUME CONTROL.

A loose volume control contact may cause noisy or intermittent operation and should be remedied. If the contact arm is loose, the remedy is to bend it slightly, so that it makes firm contact against the resistance strip. To do this remove the two screws holding the volume control to the cabinet and unsolder the leads. Take the contact arm off, bend it slightly and replace. With the Remote volume control of the Radiola Ninety and Duoforte Ninety, it is necessary to remove the back cover only to get at the contact arm. In the case of the Remote volume control the cable may become open circuited and cause the Radiola to become "dead"; temporary repairs can be effected with any three wire connection until a standard braided cable or a complete new control is procured.

BEARINGS BINDING IN VARIABLE CONDENSERS, SELECTOR DRIVES AND VOLUME CONTROL.

By certain improvements in condenser mountings, driving bands and selector drive, the possibility of trouble from these parts has been greatly reduced. Should the movement be stiff or noisy lubricate with a good grade of oil. Take particular care that the oil does not run down on the selector drive friction wheel, for if this should happen it will probably lead to slipping.

FAULTY BYPASS CONDENSER.

The indication of a fault in these small condensers (.001, .0004 and .0002 m.f.d.) located in the audio frequency amplifier is an intermittent crackling in the loud speaker reproduction. Any suspicious condenser should have one end disconnected from the circuit and a test made across the condenser with a pair of phones in series with a 90 volt battery. If a sizzling or crackling is heard in the phones the condenser should be replaced.

Note: These bypass condensers should not be confused with the bypass condenser units used in the radio frequency amplifier.

LINING UP GANG CONDENSERS.

The gang condensers are adjusted to line up correctly before leaving the factory and should not be interfered with unless it is certain that the condensers have been shifted from their original position. To carry out "lining up" accurately it is necessary to have a modulated oscillator (similar to the type incorporated in the A.W.A. Radio Service Tester) and a valve voltmeter to measure the output.

Particulars of the modulated oscillator and valve voltmeter are given in previous sub-sections.

To "line up" the condensers proceed as follows:—

1. Remove the Radiola from the cabinet as described in a later sub-section. See that the moving plates are central with respect to the fixed plates. If any condenser has been damaged or is badly out of setting, it should be removed from the condenser panel by unsoldering the wires connected to it, and removing the three screws holding it to the front panel. The condenser can then be adjusted by eye and replaced.
2. Connect up the Radiola for normal operation and couple the oscillator to it by placing the oscillator near the earth lead of the instrument.
3. An improvised pointer such as a piece of wire under a screw head should

be used over the top of the dial. Turn the selector to read 560 on the dial. Loosen the binding screws in the driving drums and set all the condensers to the "all in" position and tighten the binding screws.

4. Turn the selector to read 200 and adjust the oscillator to give a note in the loud speaker.
5. Replace the loud speaker by a valve voltmeter and adjust the coupling between the oscillator and Radiola until a suitable deflection is obtained on the milliammeter.
6. Adjust the trimmer condensers by turning the adjusting screws in the condenser frame until a maximum reading is obtained on the milliammeter. Probably it will be found necessary to adjust each trimmer three or four times to obtain the correct alignment.

Note:—These trimmer condensers are used primarily for adjusting the minimum capacity of the tuned circuits (i.e.), when the variable condensers are set in the all out position, and should not be used for adjusting the capacity at any other condenser setting.

7. Turn the station selector to read 500 on the scale and adjust the oscillator to give a signal in the receiver. Loosen the binding screws and tune each condenser separately by fitting a small knob on each of the three outer condensers. Suitable knobs are available from the Company at 1/- per set of three.
8. Tighten the binding screws and turn the condensers to the "All in" position. The condensers should not vary more than one degree mechanically.
9. Should any condenser be out of line mechanically reset it and return to 500 and line it up by bending the outside plate opposite from the trimmer.
10. A check on the 'Lining up" may be made at other points on the scale by a similar procedure.

MISCELLANEOUS DATA COMMON TO ALL POWER UNITS.

The power units for all the electrically operated Radiolas and Duofortes except the Duoforte Ninety are very similar in design.

The smaller types used with the Radiola Forty and Radiola Seventy may be considered in two sections. The first section is the power transformer waxed in a section of the main container with the rectifying valve mounting adjacent to it. The second section consists of the smoothing unit which fits in the other section of the main container.

This smoothing unit contains smoothing chokes and condensers for the plate current supply of the valves in the Radiola and an output coupling device consisting of an audio choke and condenser to prevent the plate current of the power valve from flowing in the loud speaker windings. On top of these parts is mounted the distribution plate, on one end of which is fitted a rotary switch arm and contacts to enable the set to be operated between 190 and 270 volts from the electric supply. Under the "distribution plate" are mounted mid-tap filament resistors and carborundum plate resistors. These plate resistors serve to decouple the circuits preventing "teed back"; adjust the plate voltage to the required value and provide additional smoothing to the individual circuits.

On the top of the "distribution plate" is mounted the bias resistor for the power valve. The cable from the Radiola chassis fits on this "distribution plate" and is held down with nuts. It can be quickly disconnected by removing the nuts and lifting off.

The large Power Units are very similar to the smaller type. The large container holds three inner sections containing:—(a) the power transformer; (b) the smoothing chokes; (c) the smoothing condensers and output transformer. The distribution plate arrangement is the same as for the smaller unit.

LOUD SPEAKER CIRCUITS IN RADIOLA FORTY-FIVE AND RADIOLA NINETY.

Radiolas Forty-five and Ninety are specially designed to make provision for the alternate use of either a magnetic or an A.W.A. Moving Coil loud speaker.

The power unit contains a moving coil speaker, step down transformer, a magnetic loud speaker coupling condenser, and a moving coil speaker field supply compensating resistor. When using a magnetic speaker, or a dynamic speaker with an independently excited field, connection is made to the loud speaker pin jacks on the Radiola chassis.

All A.W.A. "moving coil" loud speakers are fitted with a 4 pin plug and cable which connects to the power unit by inserting in the UX socket provided on the distribution plate of the unit. The field winding of the loud speaker is connected across the "grid" and "plate" pins and the "Moving coil" of the speaker across the filament pins.

A field compensating resistor is provided in the Power unit which automatically comes into operation when the 4 pin plug is removed from the Power unit. This resistor is equivalent to the resistance of the field winding of the loud speaker and provides artificial loading when a magnetic or dynamic speaker is connected to the loud speaker jacks on the chassis.

In the Duofortes the Moving Coil speaker is operated directly from the power unit.

HUM IN A.C. RADIOLAS.

Loose connections are a frequent cause of hum in A.C. Radiolas. Should the Radiola chassis be disconnected from the power unit, care should be taken to see when reconnecting that all electrical connections depending on nuts and screws are tight, especially those on the distribution plate.

Very often hum is caused by dirty contact on the valve filament prongs of the detector and audio stages. Working the valve up and down in the socket will generally remove this trouble.

Sometimes hum can be reduced by reversing the plug in the power socket.

Replacing the UY224 (or UY227) detector or first audio valves may also eliminate the cause of the hum.

LINE VOLTAGE A.C. RADIOLAS.

The primary of the power transformer of the All Electric Radiolas has four taps to make provision for operating the Radiola on line voltages of 200 volts, 220 volts, 240 and 260 volts. If the Radiola is installed on a supply circuit of 240 volts, and it is found that the operation is not satisfactory, an increase of signals will be obtained by moving the selector arm to the 220 volt contact. **However, agents are warned not to do this, for it has the effect of increasing the voltage on the filaments, which will shorten the life of the valves.** Very often the voltage of a supply system is a good deal lower or higher than that which is accepted as its rated voltage. Therefore, it is good practice to test or have tested the voltage at the point where the Radiola is being installed. Then turn the voltage selector arm to the contact whose marking is the next above the voltmeter reading. Special care should be taken on 40 cycle supply to see that the tapping used is above the line voltage otherwise excessive heating may occur in the power unit.

EARTH CONNECTION.

Permanent earthing conductors should be of stranded copper of cross-section not less than 7/22 covered with 600 megohm grade insulation within 6ft. of the receiving set. In no case should an A.C. Duoforte or Radiola be installed without a permanent earthing conductor, for when an efficient earth is connected, if the insulation in the Power Unit breaks down to frame, the fuse in the circuit will "blow" and automatically cut off the suppiy, thereby safeguarding the operator against shock.

REPAIRS TO POWER UNIT.

Replacement of chassis components is a reasonably straightforward job, but in the case of the Power Unit, apart from wiring faults, it is not advisable to endeavour to carry out repairs. If a fault is definitely located in a transformer, choke or condenser unit, the whole Power Unit should be returned to the Company for repairs.

RETURNING CHASSIS AND POWER UNIT.

When returning either chassis or Power Units to the Company, pack in a case with a solid base. Drill four holes corresponding to those in the bottom of the cabinet, and screw the chassis or the Power Unit rigidly to the bottom of the case with the "holding down" screws provided with the set.

RADIOLA INSTRUMENT NUMBER FOR REFERENCE.

When communicating with the Company in connection with Radiolas, make a point of giving the Radiola Instrument Number. This procedure will simplify investigation by the Company's Service Department.

REMOVING RADIOLAS FROM CABINETS.

After making preliminary tests on a Radiola it is often necessary to remove it from the cabinet. A console Radiola may be dismantled standing in its normal upright position, but a table model must be turned on its side to remove the screws holding the chassis and power unit in position.

REMOVING POWER UNIT FROM CABINET.

Remove lid.

Unscrew nuts from terminals 1 to 13 on power unit terminal assembly.

Lift the bakelite plate attached to the cable from off the top of the terminal plate.

Remove the four screws under the bottom of the cabinet holding the power unit down, and the two or three holding screws passing through the back of the cabinet.

Unscrew the knurled nut from off the power switch and push the switch through the hole.

Lift the power unit out, pulling the adaptor through the hole provided.

REMOVING CHASSIS FROM CABINET.

Remove valves and batteries or power unit.

Pull the knob off the selector drive and unscrew the bakelite switch plate and volume control on the inside of the cabinet at the left hand end.

Remove the five holding down screws from underneath the bottom of the cabinet.

Remove the chassis from the cabinet by sliding back and lifting out.

Radiola Fifty

Model C63 and C63A

GENERAL DESCRIPTION

The A.W.A. Radiola Fifty is a tuned radio frequency battery operated receiver, utilizing a three stage radio frequency amplifier, a detector, and a two stage transformer coupled audio Amplifier.

Models C63 and C63A vary slightly in the aerial circuit.

Model C63 is fitted with a "local distance" switch which operates in the aerial circuit, so that the signal input to the first tuned stage may be reduced when listening to a powerful local "broadcast" station.

Model C63A has been modified by the use of a tighter coupling in the aerial circuit making necessary a change in the first tuning condenser.

The plates of this condenser are specially shaped to compensate for the detuning effect of the aerial on the first tuned circuit. The aerial compensator (a small vernier condenser connected in parallel with the first tuned circuit) takes care of wide variations in aerial capacity and enables the first tuned circuit to be brought into resonance with the other three circuits.

Each radio frequency stage and the detector stage is fitted with an individual bypass condenser unit. The Radio frequency transformers are totally shielded thus minimising feed back, and the grid resistors in the tuned radio frequency stages effectively prevent any tendency to self oscillation.

The volume control regulates the input grid voltage to the detector valve by reducing the amplification in the radio frequency stages. As will be seen from the circuit diagram, this control is in the form of a filament resistance in the radio frequency valves.

The detector is of the orthodox leaky grid type with the grid return connected through the grid leak to +A.

The audio frequency interstage coupling utilizes A.W.A. Ideal Transformers, having high impedance primaries and a flat overall amplification characteristic. The Marconi DEP410 power valve in the last stage still further improves the quality of reproduction.

The valve sequence shown should be adhered to, especially in the case of the first four valves, for if valves of different type are used in these stages, it is quite probable that the inter-electrode capacities will differ and throw the "gang tuning" out of line. The DEP410 valve in the sixth stage should not be substituted by a general purpose valve of the DEL410 standard, for a marked falling off in quality will be noticeable.

In Fig. 3 is shown the theoretical circuit arrangement of Radiola Fifty.

FAULT LOCATION

1. **EQIUPMENT TESTS.** Carry out equipment tests on all valves and batteries. See Equipment Tests in General Information Section. Check very carefully the battery connections.

2. **PRELIMINARY VOLTAGE TEST.** Before removing the chassis from the cabinet make the following voltage tests across the valve sockets with all the valves in position and with the loud speaker connected. No reading points to a fault in the Radiola. Fig. 4 shows the relative positions of the valve contacts, the valves being shown in their correct sequence looking down on the chassis top from the front of the Radiola.

Valve.	Measure across	Approximate Voltage 4 volts with volume control in maximum position
1, 2, & 3 R.F. Amplifiers . .	+F & —F each valve	
	P & —A	90V
	*G & —A	1.5V
No. 4 detector	+F & —F	4V
	P & —A	45V
No. 5 1st Audio	+F & —F	4V
	P & —A	88V
	*G & —A	1.5V
No. 6 2nd Audio	+F & —F	4V
	P & —A	85V
	*G & —A	6V

*Meter should deflect in normal direction when the + lead of the meter is connected to the —A contact.

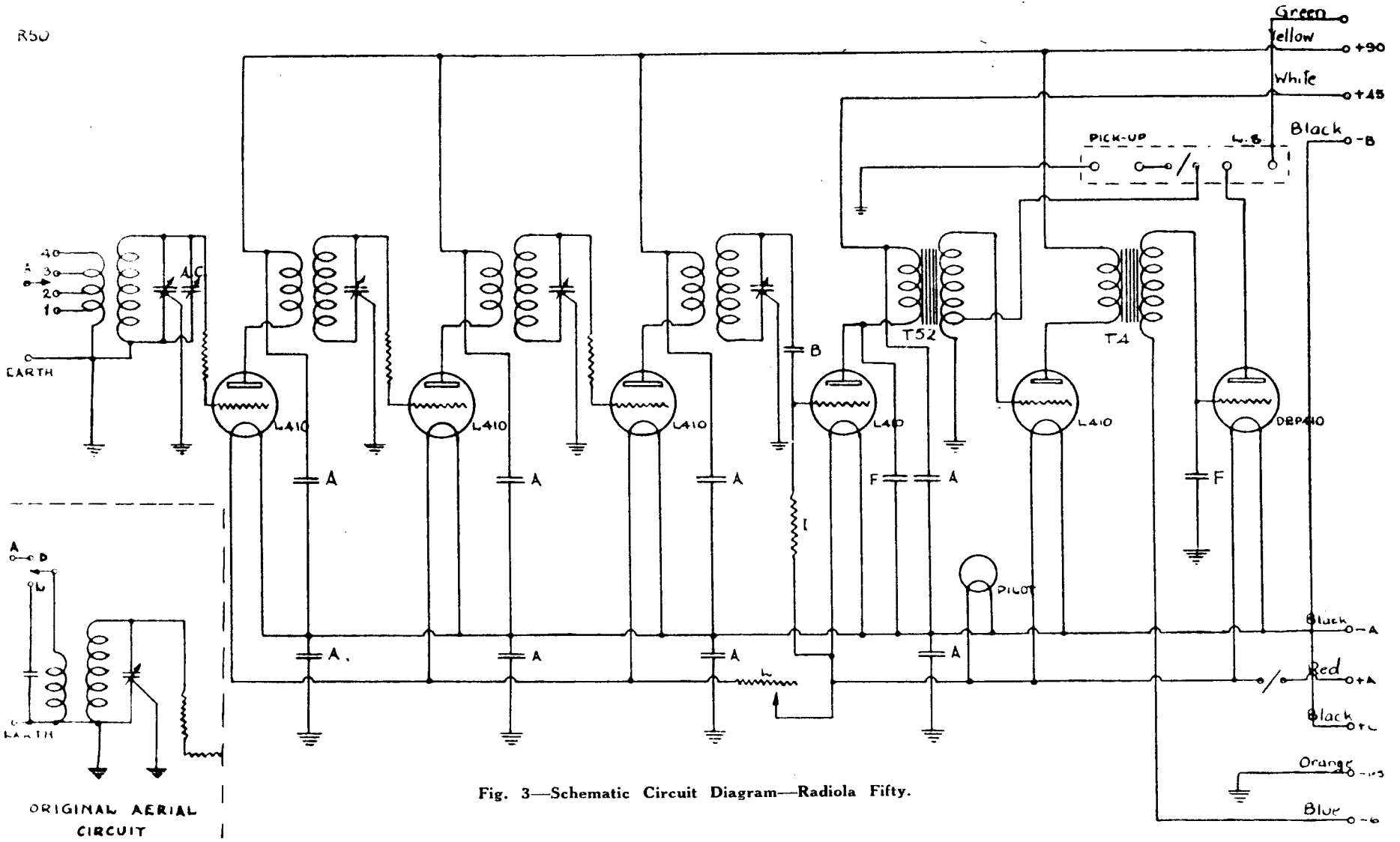

Fig. 3—Schematic Circuit Diagram—Radiola Fifty.

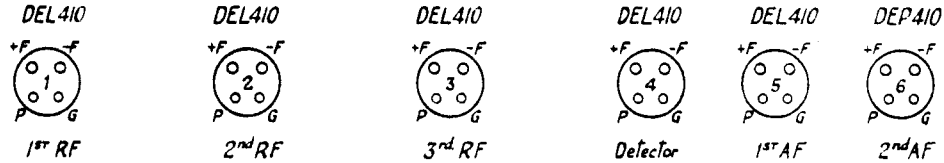

Fig. 4—Valve Sequence and Position of Valve Contacts—Radiola Fifty.

CONTINUITY TESTS.

After making the above tests, if it is found necessary to remove the chassis from the cabinet proceed as outlined in first section under the sub-section on Removing Radiolas from Cabinets.

With the chassis removed, make the following continuity tests with some form of reliable continuity tester. Tests made across the points shown in Column 1 should give the effect shown in Column 2. If this effect is not obtained, Column 3 gives the probable cause of the fault.

Test between	Correct effect.	Incorrect effect caused by
+B90 (yellow) battery lead and P contacts of valves 1, 2 & 3 in turn.	Closed circuit.	Broken lead or open circuit in primary of R.F. transformer.
+B90 battery lead and chassis frame.	Open circuit.	Short to frame in wiring or short to case in primary of 2nd audio transformer, or R F. by-pass condenser unit.
+B90 battery lead and P contact, No. 5 valve.	Closed circuit.	Broken lead or open circuit in primary of 2nd audio transformer.
+B90 (green) battery lead and P contact, No. 6 valve.	Closed circuit.	Broken connection or open circuit in loudspeaker or its connections.
+B45 (white) battery lead and P. contact, No. 4 valve.	Closed circuit.	Broken connection or open circuit in primary 1st audio transformer.
+B45 battery lead and frame of chassis.	Open circuit.	Short to frame in wiring or short to case in primary of 1st audio transformer, or detector by-pass condenser unit.
—A (black) battery lead and —F contact, each valve in turn.	Closed circuit.	Broken connection.
+A (red) battery lead and +F contacts in each valve in turn (battery switch closed).	Closed circuit.	Broken connection or open circuit in volume control in case of valves No. 1, 2 & 3.
—C1.5 (orange) battery lead and G contacts in valves 1, 2 & 3.	circuit. Closed	Broken connection or open circuit in secondary of R.F. transformer or in grid resistor.
—C1.5 battery lead and G contact, valve 5.	circuit. Closed	Broken connection or open circuit in secondary of 1st audio transformer.
—C6 (blue) battery lead and G contact, valve 6.	Closed circuit.	Broken connection or open circuit in secondary of 2nd audio transformer.
Aerial terminal to frame.	Closed circuit.	Open circuit in primary of first R.F. coil.

Radiola Eighty

Models C65 and C65A

GENERAL DESCRIPTION

The A.W.A. Radiola Eighty is a six valve screened grid battery operated receiver, utilizing an efficiently shielded three stage screened grid radio frequency amplifier, a detector and a two stage transformer coupled audio frequency amplifier.

Models C65 and C65A vary slightly in the aerial circuit.

Model C65 is fitted with a "local-distance" switch so that the signal input to the first tuned circuit may be reduced when listening to a strong local station.

Model C65A has a tighter aerial coupling and an aerial compensating condenser similar to the Modified Radiola Fifty Model C63A.

The Radio frequency transformers and condensers are efficiently shielded, thus minimising feed back. Each stage uses a bypass condenser unit allowing the most efficient operation of the screened grid valves.

The volume control regulates the input grid voltage to the detector valve by reducing the amplification in the radio frequency stages. As will be seen from the circuit, this control is in the form of a filament resistance in the radio frequency valves.

As the UX222 screened grid valves require 3.3 volts on the filament for maximum operation a fixed resistor is connected in series with the volume control.

The detector is of the leaky grid type with the grid return connected through the grid leak to + A.

A.W.A. Ideal Transformers are used in the audio frequency amplifier, which, together with the Marconi DEP410 power valve in the last stage, ensures fidelity of reproduction at ample volume.

In the Radiola Eighty a plate voltage for the DEP valve of 135 volts at the correct bias, is provided for as standard equipment. A plate voltage of 135 volts is required for satisfactory operation of UX222 screened grid valves.

With the chassis removed make the following continuity tests with some form of reliable continuity tester. Tests made across the points shown in Column 1 should give the effect shown in Column 2. If this effect is not obtained, Column 3 gives the probable cause of the fault.

The outstanding features of the Radiola Eighty are simplicity of operation, super sensitivity, and high undistorted output.

Fig. 5 shows the schematic circuit diagram of the Radiola Eighty.

FAULT LOCATION

1. **EQUIPMENT TESTS.** Carry out equipment tests on all valves and batteries. See Equipment Tests in General Information Section. Check very carefully the battery connections.

2. **PRELIMINARY VOLTAGE TEST.** Before removing the chassis from the cabinet make the following voltage tests across the valve sockets with all the valves in position and with the loud speaker connected. No reading points to a fault in the Radiola. Fig. 6 shows the relative positions of the valve contacts, the valves being shown in their correct sequence looking down on the chassis top from the front of the Radiola.

Valve	Measure across	Approximate voltage
No. 1, 2 & 3 R.F. Amplifiers	+F & —F	3.2 volts with volume control in maximum position
	P & —A	135 Volts
	S.G. & —A	45 Volts
	*G & —A	1.5 Volts
No. 4 Detector	+F & —F	4 Volts
	P & —A	45 Volts
No. 5 1st Audio	+F & —F	4 Volts
	P & —A	88 Volts
	*G & —A	1.5 Volts
No. 6 2nd Audio	+F & —F	4 Volts
	P & —A	125 Volts
	*G & —A	10.5 Volts

*Meter should deflect in normal direction when the + lead of the meter is connected to the —A contact.

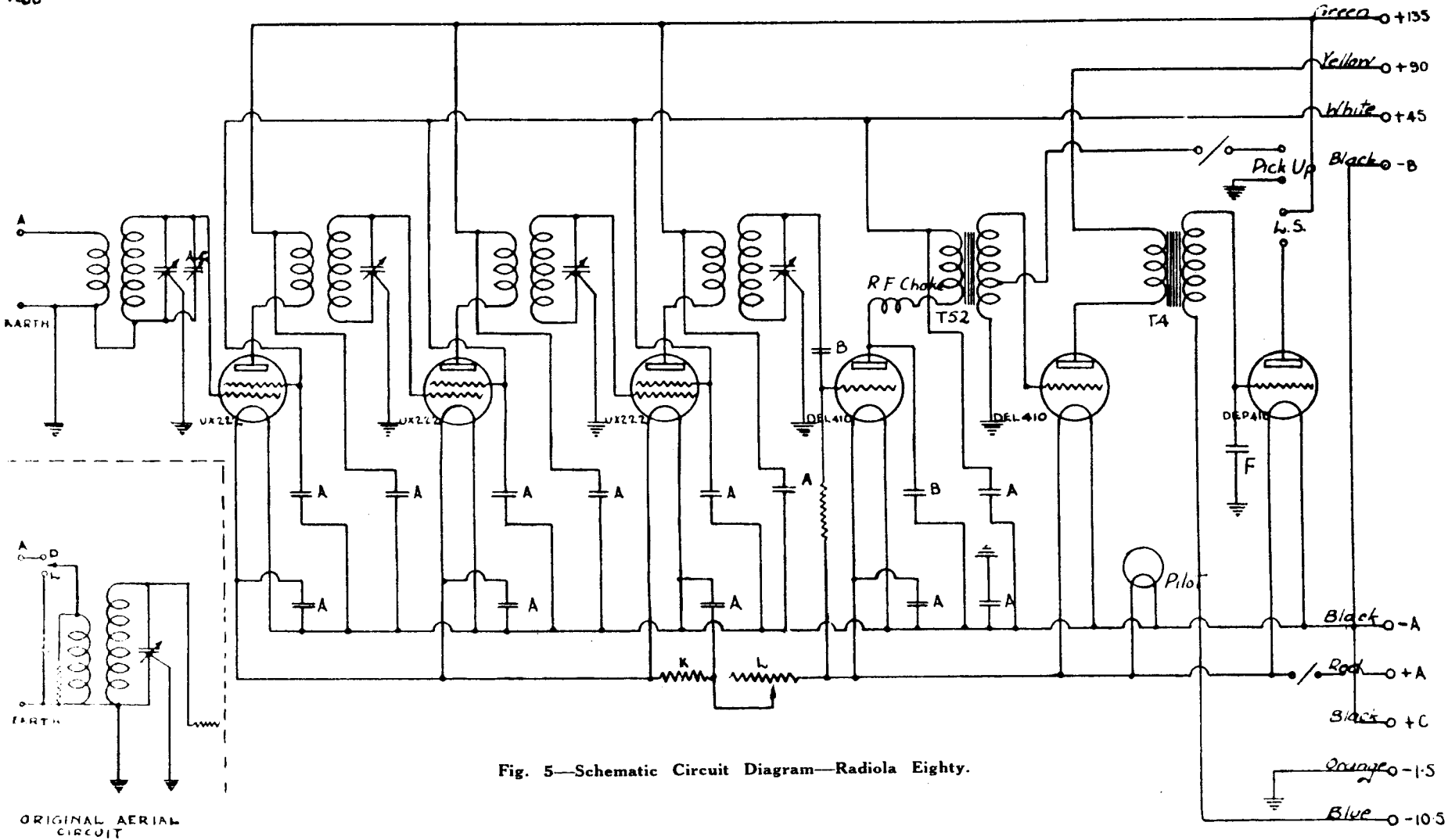

Fig. 5—Schematic Circuit Diagram—Radiola Eighty.

Rad 8c Grid contact of SG valves to valve cap

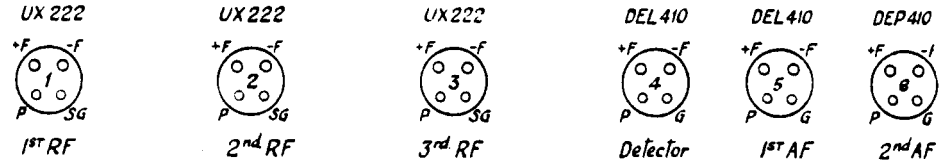

Fig. 6—Valve Sequence and Position of Valve Contacts—Radiola Eighty.

CONTINUITY TESTS.

After making the above tests if it is found necessary to remove the chassis from the cabinet proceed as outlined in the first section under the heading of "Removing Radiolas from Cabinets."

Test between	Correct effect.	Incorrect effect caused by
+B135 (green) battery lead and P contact, valve 6.	Closed circuit.	Broken connection or open circuit in loudspeaker or its connections.
+B135 (green) battery lead and P contacts, valves 1, 2 and 3 in turn.	Closed circuit.	Broken lead or open circuit in primary of R.F. transformer.
+135 battery lead and frame.	Open circuit.	Short to frame in wiring or in a R.F. by-pass condenser unit.
+90 (yellow) battery lead and P contact, No. 5 valve.	Closed circuit.	Broken lead or open circuit in primary of 1st audio transformer.
+B90 battery lead and frame.	Closed circuit.	Short to frame in wiring or short to case in primary of 2nd audio transformer.
+B45 (white) battery lead and P contact, valve4, S.G. contact valves 1, 2, & 3.	Closed circuit.	Broken connection or open circuit in primary of 1st audio transformer, or radio frequency choke coil.
+B45 battery lead and chassis frame.	Closed circuit.	Short to frame in wiring or short to case in primary of 1st audio transformer, or a by-pass condenser unit.
+A (red) battery lead and +F contact, each valve in turn (switch closed).	Closed circuit.	Broken connection or open circuit R.F. filament resistor or volume control.
—A (black) battery lead and —F contact, each valve in turn.	Closed circuit.	Broken connection.
—C1.5 (orange) battery lead and G contacts in valves 1, 2, & 3 in turn.	Open circuit.	Broken connection or open circuit in secondary of R.F. transformer.
—C1.5 battery lead and G contact, valve 5.	Closed circuit.	Broken connection or open circuit in secondary of 1st audio transformer.
—C10.5 (blue) battery lead and G contact, valve 6.	Open circuit.	Broken connection or open circuit in secondary of 2nd audio transformer.
Aerial terminal and frame.	Closed circuit.	Open circuit in primary of first R.F. coil.

Radiola Forty

Models C62 and C62A

Power Unit D16

190-270 volts, 50-60 cycles

190-250 volts, 40 cycles

GENERAL DESCRIPTION

The Radiola Forty is a four valve electrically operated receiver employing one stage of screened grid radio frequency amplification, a screened grid linear power detector, and two stages of transformer coupled audio frequency amplification.

Model C62 was designed primarily as a single control local station receiver.

Model C62A was modified by adding an aerial coupling selector switch and an aerial compensating condenser similar to that used in the Modified Radiola Fifty.

The Radio frequency and Detector stages are efficiently shielded and have individual bypass condenser units thus preventing feed back and self oscillation.

The volume control varies the grid bias on the screened grid radio frequency amplifying valve thus controlling its sensitivity and regulating the input to the detector valve.

The detection is of the linear power type using a screened grid valve. This arrangement gives improved sensitivity, selectivity and fidelity, and eliminates detector overload distortion. A special A.W.A. "Ideal" high inductance primary audio transformer has been designed together with a loading resistance to couple the UY224 screened grid linear power detector to the UY227 first stage audio valve. A standard A.W.A. "Ideal" audio transformer is used to couple the UY227 to the UX171A power valve. The audio amplifier being of high quality retains the fidelity delivered by the linear power detector.

A general outline of the power unit has been given in the first section. The power transformer is of liberal design and is rated at approximately 40 watts. It carries four separate secondary windings.

No. 1 winding lights the UX171A power valve in the Receiver and No. 2 winding supplies the heaters of the three other indirectly heated valves and the 2.5 volt pilot lamp. No. 3 winding lights the UX280 rectifying valve, and the fourth winding supplies the plates of the same valve.

The smoothing circuit as shown in the circuit diagram, Fig. 7, consists of the conventional chokes, condensers and resistors. The plate supply for the UX171A power valve is taken across the maximum smoothed D.C. voltage. The UX171A is biased by means of a resistor connected between the centre of the mid-tapped filament resistor and the negative return to the rectifier.

The UY227 first audio valve is biased by means of a suitable resistor connected between the cathode and frame under the receiver chassis.

The detector valve is similarly biased with a carborundum rod type of resistor.

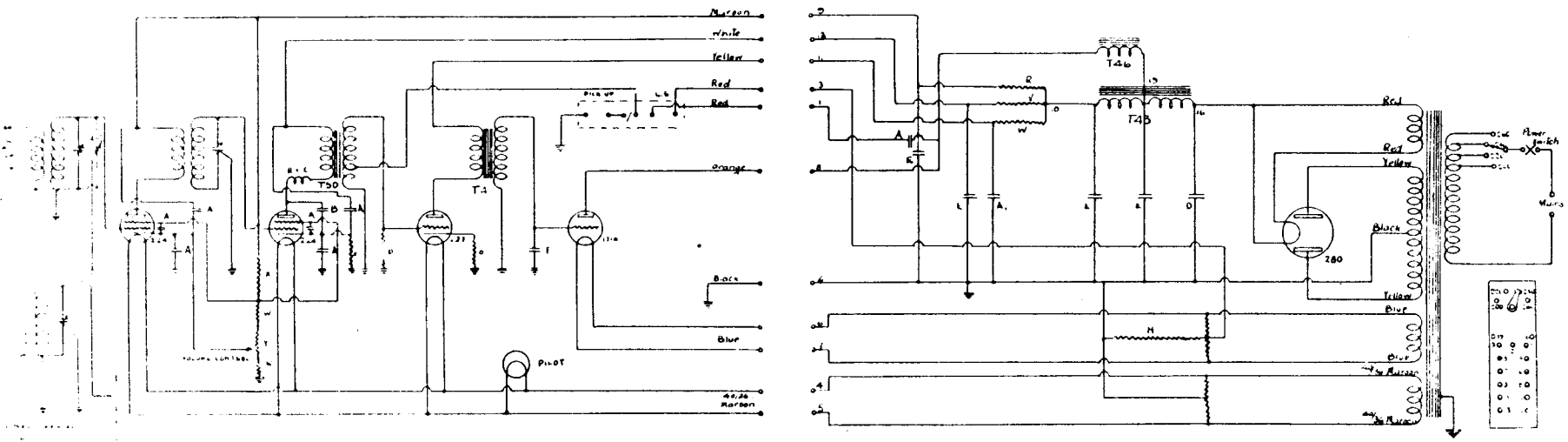

Fig. 7—Schematic Circuit Diagram—Radiola Forty.

Under the receiver chassis current is drawn from the +B supply of the Radio Valve by a path consisting of two carborundum rods in series with an A.W.A. wire wound volume control potentiometer and a bias resistor; returning to the negative side of the rectifier. The purpose of this circuit is as follows:—

The resistors are so chosen that the junction of the two carborundums gives a suitable point of supply to the screening grids of the UY224 valves. There will always be a voltage drop across the volume control potentiometer when the Radiola is in operation, so the cathode of the Radio Frequency Amplifying valve is connected to the movable arm, also the bias voltage on that valve can be adjusted to give the required signal in the loud speaker. For the maximum setting of the volume control the fixed bias resistor gives normal bias to the grid of the valve.

The circuit diagram of the Radiola Forty is given in Fig. 7. Inset at the lower right hand corner is shown a power unit distribution plate assembly with terminals numbered to correspond with the circuit diagram numbers.

FAULT LOCATION

1. **EQUIPMENT TESTS.** Carry out equipment tests on valves. See equipment test in the General Information section.

2. **PRELIMINARY VOLTAGE TEST.** Before removing the chassis from the cabinet make the following voltage tests across the valve sockets with all the valves in position and with the loudspeaker connected. No reading points to a fault in the Radiola and the chassis should then be removed for Continuity Tests. Fig. 8 shows the relative positions of the valve contacts, the valves being shown in their correct sequence looking down on the chassis top from the front of the Radiola.

Valve	Measure across	Approximate voltage Volume control on maximum
No. 1 R.F. Amplifier ..	F1 & F2	2.35V A.C.
	P & C	150V D.C.
	SG & C	65V D.C.
	G & C	1.5V D.C.
No. 2 Detector	F1 & F2	2.35V A.C.
	P & C	140V D.C.
	SG & C	65V D.C.
	G & C	5V D.C.
No. 3 1st Audio	F1 & F2	2.35V A.C.
	P & C	140V D.C.
	G & C	10V D.C.
No. 4 2nd Audio	F1 & F2	4.8V A.C.
	P & F	175V D.C.
	G & F	43V D.C.

A further check can be made on the power unit terminal board. The readings at normal line voltage with all the valves in position should be approximately as follows:

Measure across terminals	Approximate voltage
4—5	2.4V A.C.
6—7	4.8V A.C.
2—3	43V D.C.
3—8	175V D.C.
2—9	150V D.C.
2—11	150V D.C.
2—13	145V D.C.
2—10	210V D.C.

Rad.40 *Grid contact of SG valves to valve cap*

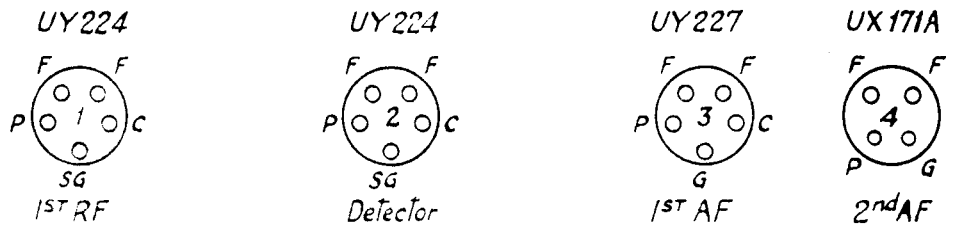

Fig. 8—Valve Sequency and Position of Valve Contacts, Radiola Forty.

CONTINUITY TESTS.

After making the above tests if it is found necessary to remove the chassis and power unit from the cabinet proceed as described in the General Information section.

With the chassis removed make the following continuity tests with some form of reliable continuity tester. Tests made across the points shown in Column 1 should give the effect shown in Column 2. If this effect is not obtained Column 3 gives the probable cause of the fault.

Test between	Correct effect.	Incorrect effect caused by
CHASSIS.		
No. 2 terminal (black lead) & chassis frame.	Closed circuit.	Broken connection.
No. 2 terminal & G contact valves 1 & 2.	Closed circuit.	Open circuit in secondary R.F. coil.
No. 2 terminal & G contact valve 3.	Closed circuit.	Open circuit in secondary 1st audio transformer.
No. 2 terminal and the G contact 4.	Closed circuit.	Open circuit secondary 2nd audio transformer.
No. 9 terminal (maroon lead) & P contacts of valve 1.	Closed circuit.	Open circuit primary R.F. transformer.
Orange terminal 8 and P contacts valve 4.	Closed circuit.	Broken connection.
Terminal 8 and frame.	Closed circuit.	Short circuit in wiring to frame.
White lead terminal 13 and P contact valve 2.	Closed circuit.	Broken lead or open circuit in primary of 1st audio transformer and R.F. choke.
Terminal 13 and chassis frame.	Open circuit.	Short circuit in wiring to frame or broken down by-pass condenser or short to case in primary of 1st audio transformer.
Yellow terminal 11 and P contact valve 3.	Closed circuit.	Broken lead or open circuit in primary of 2nd audio transformer.
Terminal 11 and frame of chassis.	Open circuit.	Short circuit in wiring to frame or short to case in the primary of 2nd audio transformer.
Terminals 1 and 3 (red leads) and loud-speaker jacks.	Closed circuit.	Broken leads.
Terminals 4 and 5 (maroon flex leads) and valves 1, 2 & 3 F contacts.	Closed circuit.	Broken connection.
Terminals 6 and 7 (blue leads) and F contacts, valve 4.	Closed circuit.	Broken connection.
POWER UNIT		
Power leads with switch and voltage tapping arm closed and terminals 200 to 260.	Closed circuit.	Broken lead or connection or open circuit primary power transformer.
Plates of rectifier and frame.	Closed circuit.	Broken connection or open circuit H.T. secondary of power transformer.
Filament of rectifier and terminals 16-19-10.	Closed circuit.	Broken connection or open circuit smoothing choke.
Terminals 19 to 8.	Closed circuit.	Broken connection or open circuit output choke.
Terminals 2 and 3.	Closed circuit.	Broken connection or open circuit bias resistor.
Terminals 200 to 260 and frame.	Open circuit.	Transformer primary or leads to frame.
Terminals 16-19-8-10 and frame.	Open circuit.	Smoothing chokes or output choke to frame or broken down smoothing condenser.
Terminals 1 and 8.	Open circuit.	Broken down output condenser.

Radiola Forty-Five

Model C73

Power Unit D21

190-270 volts, 50-60 cycles

190-250 volts, 40 cycles

GENERAL DESCRIPTION

The Radiola Forty-five is an electrically operated single control screened grid receiver, consisting of two stages of screened grid radio frequency amplification, a screened grid linear power detector, and one stage of audio amplification.

The grid circuits of the screened grid radio frequency stages and detector are tuned by a three gang condenser unit. The circuits are efficiently shielded, and provided with individual bypass condenser units mounted under the chassis.

These features minimise "feed back" and provide an efficient and stable radio frequency amplifier.

The screened grid linear power detector is similar to that of the Radiola Forty.

The audio stage consists of a UX245 power valve choke coupled with a specially designed high inductance "Ideal" choke, together with a coupling condenser and a grid resistor.

As the Radiola Forty-five has only one stage of audio amplification it is necessary to use the detector as an audio frequency amplifier for phonograph reproduction with an electric pickup.

For use as a phonograph the "pick-up" is introduced in the grid circuit of the detector valve and the bias resistor is paralleled with a second resistor to give the correct bias for operation as an audio amplifier.

For Radio reception the pick up jacks are short circuited and the second bias resistor open circuited.

The volume control is an A.W.A. wire wound potentiometer which varies the voltage on the screening grids of the radio frequency amplifying valves and thus controls the radio frequency input to the detector valve.

The Radiola Forty-five is fitted with a Local-Distance switch in the aerial circuit to reduce the input to the receiver when listening to strong local stations.

As mentioned in the general section of these notes the Radiola Forty-five is designed to use either a magnetic or a dynamic speaker as desired. The general circuit arrangement of the power unit is similar to that described in previous sections.

The volume control circuit varies from that of the Radiola Forty. From the −B supply of the Radio Frequency valve the circuit incorporates a carborundum resistor, volume control, and a fixed radio frequency bias resistor with the return to the negative of the rectifier.

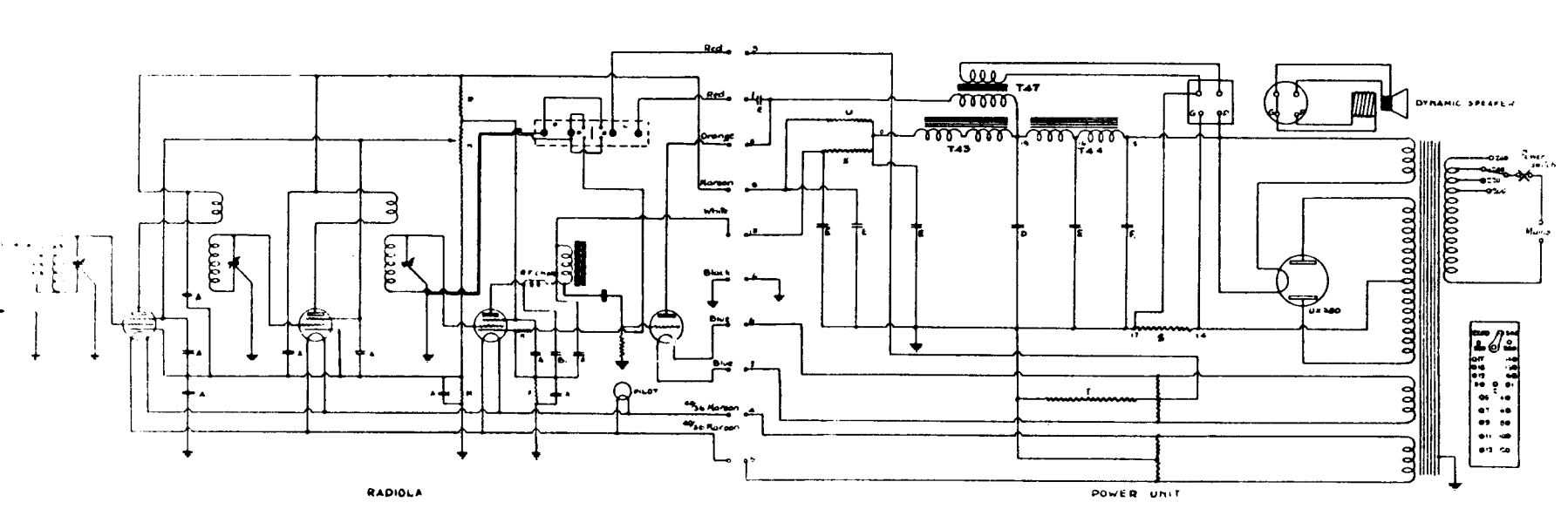

Fig. 9—Schematic Circuit Diagram—Radiola Forty-five.

The screening grid of the Detector is connected to the point joining the carborundum resistor and the Volume control, while the screening grids of the radio frequency amplifiers connect to the variable point on the potentiometer. The cathodes of the radio frequency screen grid valves connect to the junction of the Volume control and the bias resistors. Thus the voltage applied to the screening grids of the radio frequency valves can be controlled as desired.

The power transformer is rated at approximately 75 watts and carries four seperate secondary windings. The first winding lights the filament of the UX245 power valve and the second supplies the heaters of the three UY224 screened grid valves and the 2.5 volt pilot lamp. The No. 3 winding lights the UX280 Rectifying valve and No. 4 winding supplies the plates of the same valve.

The circuit diagram of the Radiola Forty-five is given in Fig. 9. Inset at the lower right hand corner is a diagram of the distribution plate assembly. The terminals are numbered to correspond with numbers in the circuit diagram.

FAULT LOCATION

1. **EQUIPMENT TEST.** Carry out equipment tests on valves. See equipment test in the General Information Section.

2. **PRELIMINARY VOLTAGE TEST.** Before removing the chassis from the cabinet, make the following voltage tests across the valve sockets with all the valves in position and with the loudspeaker connected. No reading points to a fault in the Radiola and the chassis should then be removed for Continuity Tests. Fig. 10 shows the relative positions of the valve contacts, the valves being shown in their correct sequence looking down on the chassis top from the front of the Radiola.

Valve	Measure across.	Approximate voltage Volume control on maximum
No. 1 & 2 R.F. Amplifiers	F1 & F2	2.35V A.C.
	P & C	175V D.C.
	S.G. & C	75V D.C.
	G & C	1.5V D.C.
No. 3 Detector	F1 & F2	2.35V A.C.
	P & C	200V D.C.
	S.G. & C	70V D.C.
	G & C	6V D.C.
No. 4 Audio	F1 & F2	2.4V A.C.
	P & F	230V D.C.
	G & C	* D.C.

*The high value grid resistor makes this reading of no value.

A further check can be made on the power unit terminal board. The readings at normal line voltage with all valves in position should be approximately as follows:—

Measure across	Approximate voltage
4—5	2.4V A.C.
6—7	4.8V A.C.
2—3	45V D.C.
3—8	230V D.C.
2—9	180V D.C.
2—13	205V D.C.
2—10	240V D.C.

Rad. 45 *Grid contact of SG valves to valve cap*

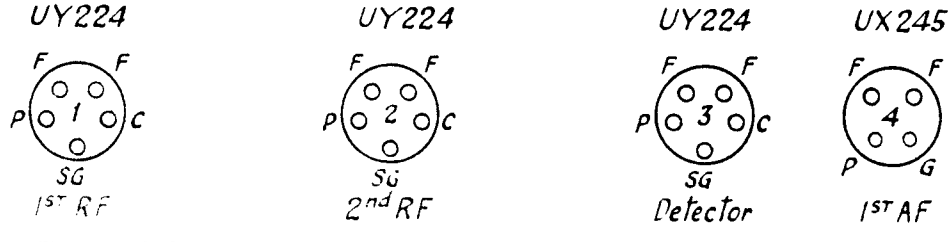

Fig. 10—Valve Sequence and position of Valve Contacts, Radiola Forty-five.

CONTINUITY TESTS.

After making the above tests if it is found necessary to remove the chassis and power unit from the cabinet proceed as described in the General Information Section.

With the chassis removed make the following continuity tests with some form of reliable continuity tester. Tests made across the points shown in Column 1 should give the effect shown in Column 2. If this effect is not obtained Column 3 gives the probable cause of the fault.

Test between	Correct effect.	Incorrect effect caused by
CHASSIS.		
No. 2 terminal (black lead) and chassis frame.	Closed circuit.	Broken connection.
No. 2 terminal and G contact, valves 1, 2 and 3.	Closed circuit.	Open circuit in secondary R.F. coil.
No. 9 terminal (maroon lead) and P contacts of valves 1 and 2.	Closed circuit.	Open circuit primary R.F. transformer.
No. 8 terminal (orange lead) and P contact, valve 4.	Closed circuit.	Broken connection.
Terminal 8 and frame.	Open circuit.	Short circuit in wiring to frame.
No. 13 (white lead) terminal and P of valve 3.	Closed circuit.	Broken lead or open circuit in primary of audio choke or R.F. choke.
Terminal 13 and chassis frame.	Open circuit.	Short circuit in wiring to frame or broken down by-pass condenser or short to case in primary of audio choke.
Terminals 1 and 3 (red lead) and loud speaker jacks.	Closed circuit.	Broken leads.
Terminals 4 and 5 (maroon flex leads) and valves 1, 2 and 3 filaments	Closed circuit.	Broken connection.
Terminals 6 and 7 (blue leads) and valve No. 4 filament contacts.	Closed circuit.	Broken connections.
POWER UNIT		
Power leads with switch and voltage tapping arm closed and terminals 200 to 260.	Closed circuit.	Broken leads or connection or open circuit primary power transformer.
Plates of rectifier and terminal 14.	Closed circuit.	Broken connection or open circuit H.T. secondary of power transformer.
Filament of rectifier and terminals 15, 16, 19, 10.	Closed circuit.	Broken connection or open circuit smoothing chokes.
Terminals 19 and 8.	Closed circuit.	Broken connection or open circuit primary output transformer.
Terminals 2 and 3.	Closed circuit.	Broken connection or open circuit bias resistor.
Terminals 200 to 260 and frame.	Open circuit.	Transformer primary or leads short circuit to frame.
Terminals 15, 16, 19, 8, 10 & frame.	Open circuit.	Smoothing chokes or output chokes to frame or broken down smoothing condenser.
Terminals 17 and 18.	Closed circuit.	Open circuit secondary output transformer.
Terminals 14 and 17.	Closed circuit.	Open circuit loud speaker compensating resistor.
Terminals 1 and 8.	Open circuit.	Broken down output condenser.

Radiola Seventy

Models C 64 and C 64A

Power Unit D15

190-270 volts, 50-60 cycles
190-250 volts, 40 cycles

GENERAL DESCRIPTION

The A.W.A. Radiola Seventy is an electrically operated tuned radio frequency receiver comprising three stages of radio frequency amplification, a detector and two stages of transformer coupled audio amplification.

Model C64A varies from Model C64 by the use of a tighter aerial coupling and is fitted with an aerial compensating condenser similar to the arrangement outlined for the battery receivers.

The grid circuits of the indirectly heated radio frequency amplifying valves and detector valves are tuned by a four condenser gang control. The Radio frequency transformers are totally shielded and each stage has an individual bypass condenser unit. Grid resistors are used in the grid circuits of the Radio frequency valves to prevent self oscillation.

The Volume control is similar to that of the Radiola Forty; providing an adjustment of the grid bias of the Radio Frequency amplifying valves to control the input to the grid of the detector valve.

The detector is of the orthodox leaky grid type utilizing a suitable grid condenser and grid leak with a UY227 valve.

A.W.A. "Ideal" distortionless transformers are used for interstage coupling in the audio frequency amplifier. A UY227 first stage audio and a UX171A power valve in the output stage completes the circuit.

The power transformer is of liberal design and is rated at approximately 55 watts. It carries four separate secondary windings. No. 1 winding lights the filament of the UX171A power valve and No 2 winding the heaters of the five UY227 valves and the 2.5 volt pilot lamp.

The third and fourth windings are for the UX280 rectifier similar to the Radiola Forty and Forty-five Power Units. The smoothing circuit and plate supply circuits to the valves is similar to the power units of the Radiolas already described. The circuit diagram of the Radiola Seventy is given in Fig. 11 together with a layout of the distribution plates with the terminals numbered to correspond to points in the circuit diagram.

FAULT LOCATION

1. **EQUIPMENT TESTS.** Carry out equipment tests on valves. See equipment test in the General Information section.

2. **PRELIMINARY VOLTAGE TEST.** Before removing the chassis from the cabinet make the following voltage tests across the valve sockets with all the valves in position and with the loudspeaker connected. No reading points to a fault in the Radiola and the chassis should then be removed for Continuity Tests. Fig. 12 shows the relative positions of the valve contacts, the valves being shown in their correct sequence looking down on the chassis top from the front of the Radiola.

Valve	Measure across	Approximate voltage
1, 2 & 3 R.F. Amplifiers	F1 & F2	2.35V A.C.
	P & C	150V D.C.
	G & C	11V D.C.
No. 4 Detector	F1 & F2	2.35V A.C.
	P & C	50V D.C.
No. 5 1st Audio	F1 & F2	2.35V A.C.
	P & C	150V D.C.
	G & C	11V D.C.
No. 6 2nd Audio	F1 & F2	4.8V A.C.
	P & F	175V D.C.
	G & F	45V D.C.

A further check can be made on the power unit terminal board. The readings at normal line voltage with all the valves in position should be approximately as follows:

Measure across terminals	Approximate voltage
4—5	2.4V A.C.
6—7	4.8V A.C.
3—8	175V D.C.
2—3	45V D.C.
2—13	50V D.C.
2—11	160V D.C.
2—9	160V D.C.

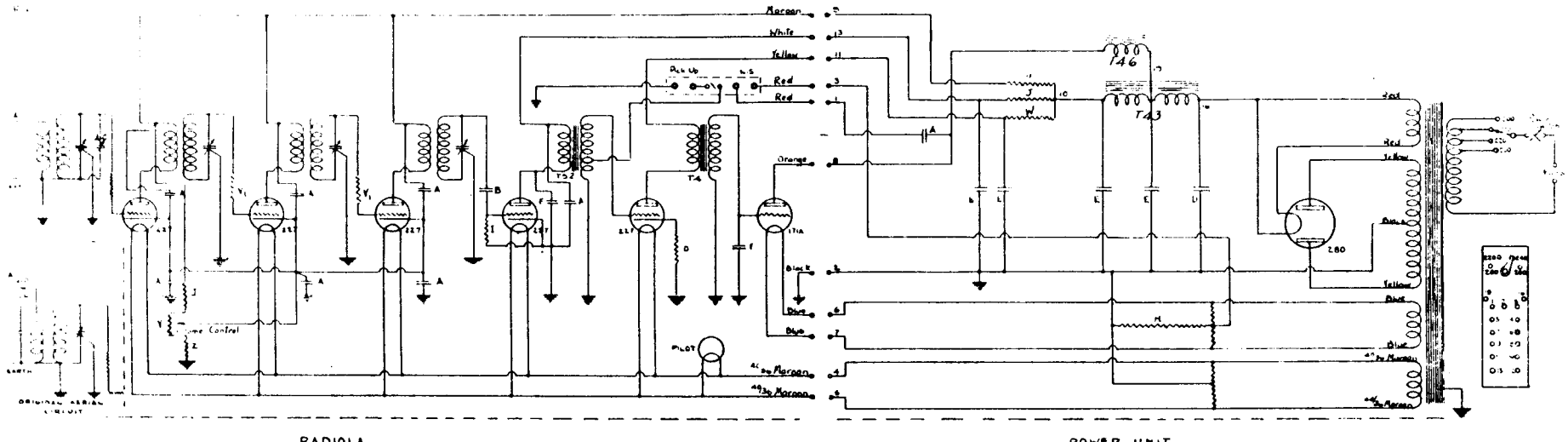

Fig. 11—Schematic Circuit Diagram—Radiola Seventy.

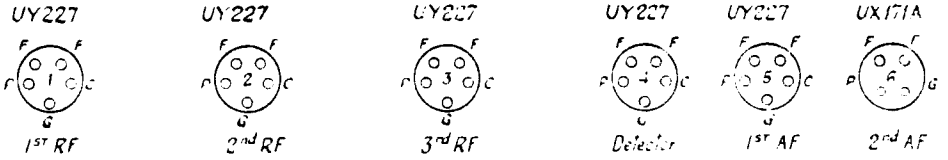

Fig. 12—Valve Sequence and Position of Valve Contacts—Radiola Seventy.

CONTINUITY TESTS.

After making the above tests if it is found necessary to remove the chassis and power unit from the cabinet proceed as described in the General Information Section.

With the chassis removed make the following continuity tests with some form of reliable continuity tester. Tests made across the points shown in Column 1 should give the effect shown. If this effect is not obtained Column 3 gives the probable cause of the fault.

Test between	Correct effect.	Incorrect effect caused by
CHASSIS.		
No. 2 terminal (black lead) and chassis frame.	Closed circuit.	Broken connection.
No. 2 terminal and G contact, valves 1, 2 and 3.	Closed circuit.	Open circuit in secondary R.F. coil or grid resistor.
No. 2 terminal and the fixed plates of the 4th gang condenser.	Closed circuit.	Open circuit in the secondary of the 4th R.F. transformer.
No. 2 terminal and G contact, valve 5.	Closed circuit.	Open circuit in the secondary of the first audio transformer.
No. 2 terminal and G contact, valve 6.	Closed circuit.	Open circuit secondary second audio transformer.
No. 9 terminal (maroon lead) and P contacts of valves 1, 2 and 3.	Closed circuit.	Open circuit primary R.F. transformer.
No. 8 terminal (orange lead) and P contacts, valve 6.	Closed circuit.	Broken connection.
No. 13 terminal (white lead) and P contact, valve 4.	Closed circuit.	Broken lead or open circuit in primary of 1st audio transformer.
Terminal 13 and chassis frame.	Open circuit.	Short circuit in wiring to frame or broken down by-pass condensers or short to case in primary of 1st audio transformer.
No. 11 terminal (yellow) and P contact, valve 5.	Closed circuit.	Broken lead or open circuit in primary of 2nd audio transformer.
Terminal 11 and frame of chassis.	Open circuit.	Short circuit in wiring to frame or short to case in the primary of 2nd audio transformer.
POWER UNITS.		
Power leads with switch and voltage, tapping arm closed to terminals 200 to 260.	Closed circuit.	Broken lead or open circuit primary of power transformer.
Plates of rectifier and frame.	Closed circuit.	Broken connection or open circuit H.T. secondary of power transformer.
Filament of rectifier and terminals 16, 19, 10.	Closed circuit.	Broken connection or open circuit smoothing chokes.
Terminals 19 to 8.	Closed circuit.	Broken connection or open circuit output choke.
Terminals 2 and 3.	Closed circuit.	Broken connection or open circuit resistor.
Terminals 200 to 260 and frame.	Open circuit.	Transformer primary or leads to frame.
Terminals 16, 19, 8, 10.	Open circuit.	Smoothing chokes or output chokes to frame or broken down smoothing condenser.
Terminals 1 and 8.	Open circuit.	Broken down output condenser.

Radiola Ninety

Model C66

Power Unit D17

190-270 volts, 50-60 cycles

190-250 volts, 40 cycles

GENERAL DESCRIPTION

The A.W.A. Radiola Ninety is an electrically operated single control screened grid receiver employing three stages of screened grid radio frequency amplification, a screened grid linear power detector and two stages of audio amplification. The Radiola Ninety is very similar to the Radiola Forty-five but with the addition of one stage of radio and one stage of audio amplification. The arrangement gives maximum sensitivity and selectivity and is suitable for the most exacting requirements. A "Local distance" switch is fitted in the aerial circuit for reducing the pickup from the aerial when listening to a strong local station.

The grid circuits of the three screened grid radio frequency stages and the screened grid detector stage are tuned by a four condenser gang control.

The Radio frequency circuits are efficiently shielded to prevent feed back and any tendency to produce self oscillation.

The Volume control is in the form of a potentiometer arranged to control the voltage on the screening grids of the radio frequency amplifying valves to regulate the input to the detector. The volume control is fitted with a long lead for remote operation, the circuit arrangement being the same as that described for the Radiola Forty-five. The screened grid linear power detector is similar in design to that previously described for the Radiola Forty.

The audio frequency amplifier is similar to that described for the Radiola Forty. The screened grid linear power detector is coupled to the UY227 first stage audio amplifier with a special high inductance primary transformer, and the UX245 power valve coupling is made with a standard A.W.A. Ideal transformer.

Like the Radiola Forty-five the power unit has been designed to operate either an A.W.A. Moving Coil speaker or a magnetic type loud speaker.

The power Transformer is of liberal design and is rated at approximately 90 watts and has four separate secondary windings. The first winding lights the filament UX245 power valve, and the second winding supplies the heaters of the UY224 and UY227 valves and lights the 2.5 volt pilot lamp.

The "B" supply circuits consist of (a) the field supply for the Moving Coil loud-speaker; (b) the UX245 plate supply drawn directly from the full smoothed voltage and which is biassed with a resistor between the mid tap of the filament resistor and the negative return of the rectifier; (c) the "R.F.," detector, and 1st audio, plate supply which is drawn through a second smoothing choke and each provided with decoupling and smoothing resistors. The circuit of the power unit for this Radiola follows the same general principles as those outlined for the preceding types.

The circuit diagram of the Radiola Ninety is given in Fig. 13 together with a distribution plate diagram numbered to correspond with points on the circuit diagram.

FAULT LOCATION

1. **EQUIPMENT TEST.** Carry out equipment tests on valves. See equipment test in the General Information Section.

2. **PRELIMINARY VOLTAGE TEST.** Before removing the chassis from the cabinet, make the following voltage tests across the valve sockets with all the valves in position and with the loudspeaker connected. No reading points to a fault in the Radiola, and the chassis should then be removed for Continuity Tests. Fig. 14 shows the relative positions of the valve contacts, the valves being shown in their correct sequence looking down on the chassis top from the front of the Radiola.

Valve	Measure across	Approximate voltage Volume control at maximum
No. 1, 2 & 3 R.F. Amplifiers	F1 & F2	2.35V A.C.
	P & C	175V D.C.
	S.G. & C	75V D.C.
	G & C	1.5V D.C.
No. 4 Detector	F1 & F2	2.35V A.C.
	P & C	160V D.C.
	S.G. & C	70V D.C.
	G & C	8V D.C.
No. 5 1st Audio	F1 & F2	2.35V A.C.
	P & C	150V D.C.
	G & C	10V D.C.
No. 6 2nd Audio	F1 & F2	2.4V A.C.
	P & F	235V D.C.
	G & F	45V D.C.

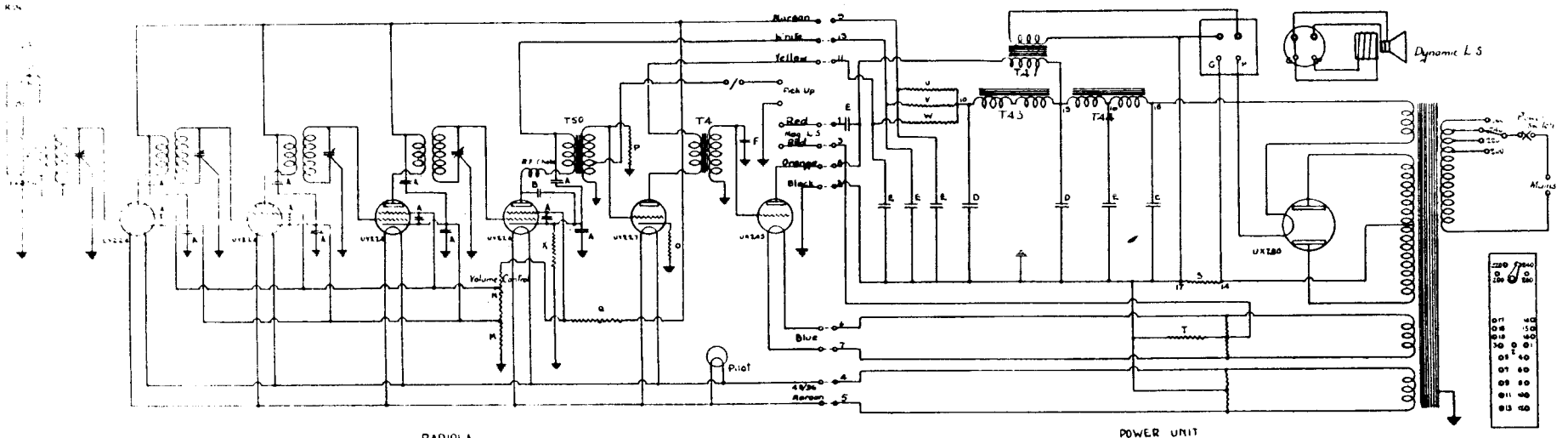

Fig. 13—Schematic Circuit Diagram—Radiola Ninety.

A further test can be made on the power unit terminal boards. The readings at normal line voltage with all valves in position should be as follows:—

Measure across	Approximate voltage
4—5	2.6V A.C.
6—7	2.5V A.C.
2—3	45V D.C.
3—8	235V D.C.
2—9	175V D.C.
2—11	160V D.C.
2—13	160V D.C.
2—10	240V D.C.

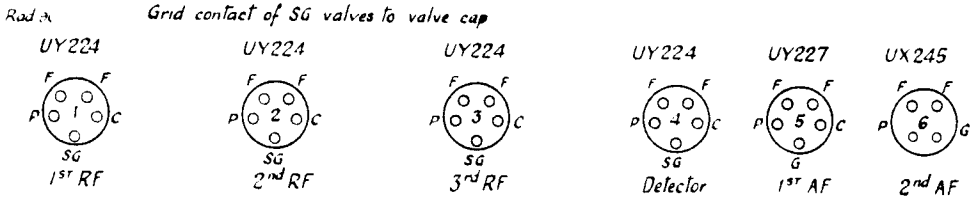

Fig. 14—Valve Sequence and Position of Valve Contact—Radiola Ninety.

CONTINUITY TESTS.

After making the above tests if it is found necessary to remove the chassis and power unit from the cabinet proceed as described in the General Information Section.

With the chassis removed make the following continuity tests with some form of reliable continuity tester. Tests made across the points shown in Column 1 should give the effect shown in Column 2. If this effect is not obtained Column 3 gives the probable cause of the fault.

Test between	Correct effect.	Incorrect effect caused by
No. 2 terminal (black lead) and chassis frame.	Closed circuit.	Broken connection.
No. 2 terminal and G contact, valves 1, 2, 3 and 4.	Closed circuit.	Open circuit in secondary R.F. coil.
No. 2 terminal and G contact, valve 5.	Closed circuit.	Open circuit in the secondary of the first audio transformer.
No. 2 terminal and the G contact, valve 6.	Closed circuit.	Open circuit secondary second audio transformer.
No. 9 terminal (maroon lead) terminal and P contacts of valves 1, 2, 3.	Closed circuit.	Open circuit R.F. transformer.
No 8 terminal (orange lead) and P contacts, valve 6.	Closed circuit.	Broken connection.
No. 13 (white) terminal and P contact, valve 4.	Closed circuit.	Broken lead or open circuit in primary of 1st audio transformer or R.F. choke.
Terminal 13 and chassis frame.	Closed circuit.	Short circuit in wiring to frame or broken down by-pass condenser or short to case in primary of 1st audio transformer.
Terminal 11 (yellow) and P contact, valve 5.	Open circuit.	Broken lead or open circuit in primary of 2nd audio transformer.
Terminal 11 and frame of chassis.	Open circuit.	Short circuit in wiring to frame or short to case in the primary of second audio transformer.
Terminals 1 and 3 (red leads) and loud speaker jacks.	Closed circuit.	Broken leads.
Terminals 4 and 5 (maroon flex leads) and valves 1, 2 3, 4 and 5, filament contacts.	Closed circuit.	Broken connection.
Terminals 6 and 7 (blue leads) and filament contacts No. 6.	Closed circuit.	Broken connection.

POWER UNITS.

For continuity of Power Unit see Radiola Forty-five.

Duoforte Forty

Model C67

Power Unit D 18

190-270 volts, 50-60 cycles

GENERAL DESCRIPTION

The A.W.A. Duoforte Forty is an electrically operated combined Radiola and Phonograph using a Radiola Forty Radiola with a large power unit to supply power to the Moving Coil loud speaker and the UX245 power output valve.

The electric Phonograph consists of a record turntable driven by an induction type motor, a high grade electric "pick up" and pick up transformer together with volume and speed controls.

The change over from Phonograph to Radiola is carried out quickly by a change over switch located on the phonograph motor board. With the switch on the "R" position the circuit is the same as that for the Radiola Forty as described previously. With the switch on the "P" position the secondary of the first audio transformer in the receiver is disconnected from the grid of the UY227 and the secondary of the pick up transformer connected in its place. By this means the phonograph circuit is completed through the audio amplifier of the receiver to the loud speaker.

The power unit is very similar to that used in the Radiola Forty-five. Since a "built in" loud speaker is provided there is no arrangement for a magnetic loud speaker and the windings and resistors are designed to give the particular voltages required by the receiver.

A circuit diagram of the Duoforte Forty is given in Fig. 15.

FAULT LOCATION

1. **EQUIPMENT TEST.** Carry out equipment tests on valves. See equipment test in the General Information Section.

2. **PRELIMINARY VOLTAGE TEST.** Before removing the chassis from the cabinet, make the following voltage tests across the valve sockets with all the valves in position and with the loudspeaker connected. No reading points to a fault in the Radiola and the chassis should then be removed for Continuity Tests. Fig. 16 shows the relative positions of the valve contacts, the valves being shown in their correct sequence looking down on the chassis top from the front of the Radiola.

Valve	Measure across	Approximate voltage Volume control at maximum
No. 1 R.F. Amplifier ..	F1 & F2	2.35V A.C.
	P & C	160V D.C.
	SG & C	70V D.C.
	G & C	1.5V D.C.
No. 2 Detector	F1 & F2	2.35V A.C.
	P & C	160V D.C.
	SG & C	65V D.C.
	G & C	7V D.C.
No. 3 1st Audio	F1 & F2	2.35V A.C.
	P & C	150V D.C.
	G & C	10V D.C.
No. 4 2nd Audio	F1 & F2	2.4V A.C.
	P & F	235V D.C.
	G & F	45V D.C.

Voltages on the top of the power unit should be approximately as follows:—

Measure across	Approximate voltage
4—5	2.5V A.C.
6—7	2.5V A.C.
2—6	45V D.C.
6—8	235V D.C.
2—9	160V D.C.
2—11	160V D.C.
2—13	165V D.C.
2—10	200V D.C.

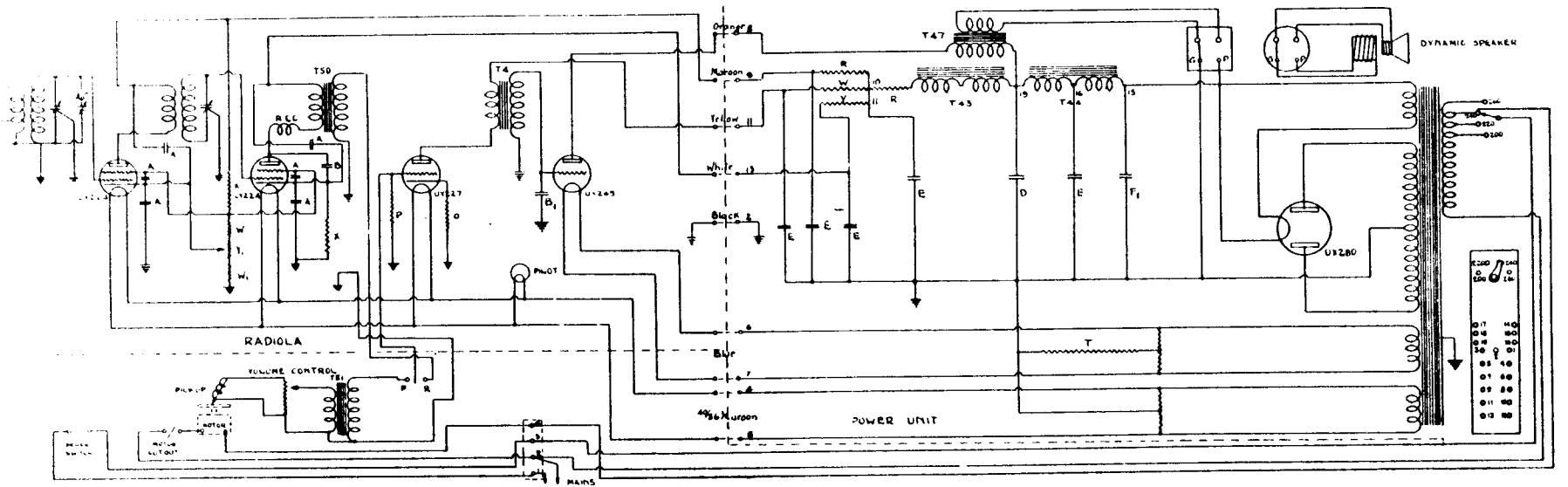

Fig. 15—Schematic Circuit Diagram—Duoforte Forty.

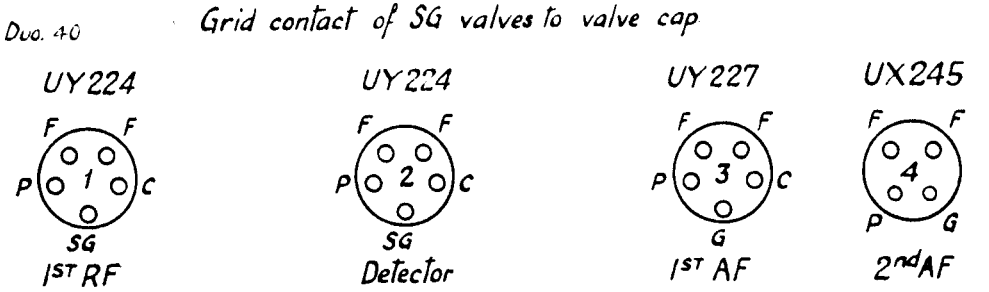

Fig. 16—Valve Sequence and Position of Valve Contacts—Duoforte Forty.

Should it be found necessary to dismantle the Duoforte Forty first remove the motor board by disconnecting the three wire cable from the bracket under the motor board, and the motor power leads from the four point power distribution strip in the back of the loud speaker compartment. Unscrew the hinges on the motor board and lift it out.

To remove the receiver and power unit the procedure is the same as described for Console Model Radiolas.

CONTINUITY TESTS.

CHASSIS.

Owing to the similarity of the Receivers the method of following the continuity of the chassis of the Duoforte Forty is the same as that of the Radiola Forty. The only variation will be in the third item where the circuit is dependent on the position of the Radio Phonograph switch.

POWER UNIT.

The continuity of the Power Unit may be taken from that of the Radiola Forty-five.

MOTOR BOARD.

The most likely faults to occur on the motor board are:—

Broken connection in the wiring.

Open circuit in pick-up.

Open circuit in pick-up leads.

Open circuit in Volume control.

Open circuit in pick-up transformer.

Duoforte Forty-Five

Model C 74

Power Unit D22

190-270 volts, 50-60 cycles

190-250 volts, 40 cycles

GENERAL DESCRIPTION

The A.W.A. Duoforte Forty-five is an electrically operated combined Radiola and Phonograph using a Radiola Forty-five with a power unit very similar to that used with that Radiola.

The Electric Phonograph consists of a record turntable driven by an induction motor, a high grade electric pickup together with volume and speed controls.

The change from Radio to Phonograph is carried out quickly by a change over switch located on the phonograph motor board. This switch is connected to the receiver by a four wire cable which is detachable from a four screw terminal bracket under the motor board.

With the switch on the "R" position the circuit is the same as that described previously for the Radiola Forty-five. The third UY224 screened grid valve is arranged as a linear power detector and the pick-up input is short circuited. With the switch on the "P" position the UY224 functions as an amplifier with the pickup feeding into its grid circuit.

The power unit is the same as that used with the Radiola Forty-five except that there is no direct provision made to use a magnetic loud speaker, that is the output coupling condenser and the field supply compensating resistor are not included in the power unit.

FAULT LOCATION

The complete circuit diagram of the Duoforte Forty-five is given in Fig. 17.

For Equipment Test, Preliminary Voltages Test and Tabulation of approximate Voltages readings refer to procedure and measurements listed for the Radiola Forty-five.

To dismantle the Duoforte Forty-five remove the leads from the power distribution terminal strip in the loud speaker compartment, unscrew the cable connecting the Radiola chassis to the motor board and loosen the cable from the power unit distribution plate.

The motor board, receiver or power unit can now be removed independently by taking out the holding down screws for each unit.

The possible faults to cause trouble on the motor board are:—

Broken connection in wiring.

Open circuit pick-up.

Open circuit pick-up leads.

Open circuit volume control.

Any of these faults can easily be located with a continuity tester.

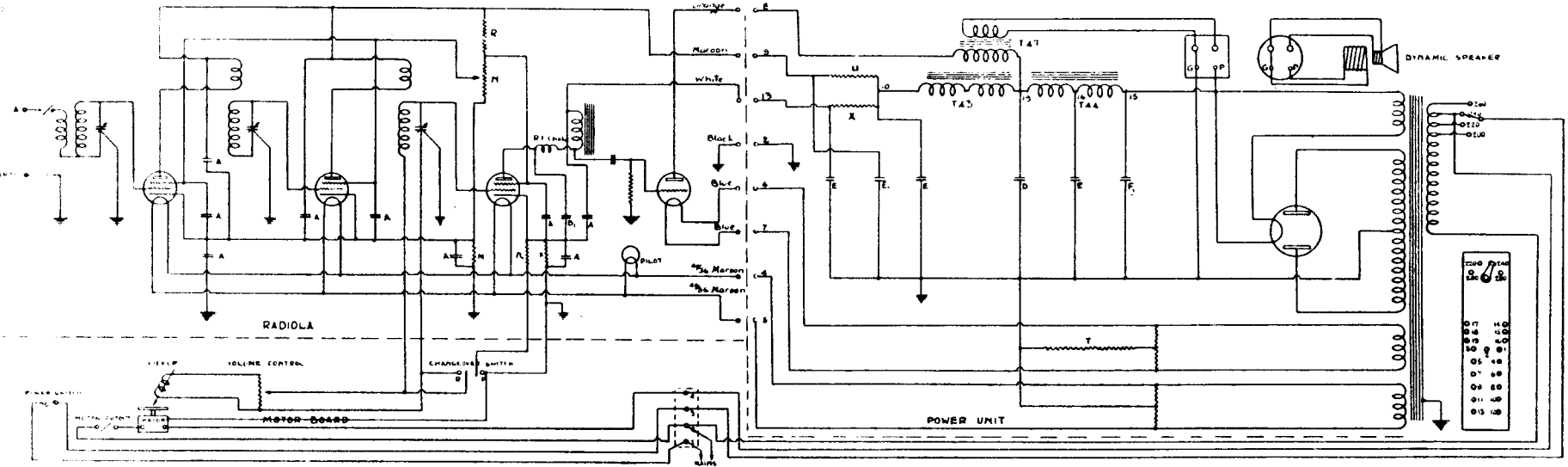

Fig. 17—Schematic Circuit Diagram—Duoforte Forty-five.

Duoforte Ninety

Model C 68

Power Amplifier Unit D19

190-270 volts, 50-60 cycles

190-250 volts, 40 cycles

The change over from Radiola to Phonograph is carried out quickly by a change over switch located on the phonograph motor board. This switch is connected to the receiver by a cable which connects to a bracket under the motor board.

The A.W.A. Duoforte Ninety is an electrically operated combined Radiola and Phonograph using a Radiola Ninety Radio Frequency Amplifier and Detector combined with a specially designed high grade powerful audio amplifier.

The Electric Phonograph consists of a record turntable driven by a noiseless induction motor, a high grade electric pick-up and pick-up transformer together with volume and speed controls.

The Radiola receiver is very similar to that of the Radiola Ninety. The Radiola frequency amplifier and Detector circuit remain unchanged while the UX245 valve is replaced by a UY227 valve to give a first audio amplifying stage of "Push-pull."

The power amplifier housed in the loud speaker compartment consists of a power unit to operate the Radiola and to supply field excitation to the Moving coil loud speaker. It also contains a power output stage—feeding into the loud speaker—consisting of two UX245 valves in push-pull.

The interstage coupling utilizes special Ideal transformers in which have been used a new magnetic material having a very high permeability, thus ensuring a very high impedance primary.

With the switch on the "P" position the instrument is set to reproduce phonograph records by means of the electric Pick-up and the double push-pull audio amplifier. The Duoforte functions similarly to a Radiola Ninety with the switch on the "R" position, with the exception that both stages of the audio amplifier are "push-pull."

On the left hand of the motor board is located the tone control regulator. This control consists of two tuned audio filters and a potentiometer. The purpose of the tone control is to allow the listener to adjust the balance between low and high frequencies to suit the individual taste.

The power transformer in the power amplifier is rated at approximately 130 watts and carries five separate secondary windings. No. 1 winding lights the filaments of the UX245 valves in the power amplifier and No. 2 supplies the heaters of all the valves and the 2.5 volt pilot lamp in the Radiola receiver. The third winding lights the No. 1 UX280 rectifier and the full fourth winding supplies the plates of the same valve. The current supplied by this rectifier is used to operate all the valves in the Duoforte. The fifth winding lights the second UX280 rectifier.

Its plates are supplied by taps on the No. 4 H.T. secondary winding; the rectified current from this valve is used to energise the field of the Moving coil loud speaker.

The smoothing circuit used is very similar to that used in the smaller power units.

The Radio Phonograph switch connects the grids of the UY227 valves to the secondaries of either the Pick-up transformer or the special detector coupling transformer on the Radiola chassis depending on the position of the "P"—"R" switch.

A complete circuit diagram of the Duoforte Ninety is given in Fig. 18.

FAULT LOCATION

1. **EQUIPMENT TEST.** Carry out equipment tests on valves. See equipment test in the General Information Section.

2. **PRELIMINARY VOLTAGE TEST.** Before removing the chassis from the cabinet make the following voltage tests across the valve sockets with all the valves in position and with the loudspeaker connected. No reading points to a fault in the Radiola and the chassis should then be removed for Continuity Tests. Fig. 17 shows the relative positions of the valve contacts in the Duoforte. The valves in the Radiola chassis are shown in their correct sequence looking in on to the chassis from the back of the Duoforte, and the valves in the power amplifier unit are shown in their correct sequence looking down on the unit from the back of the Duoforte.

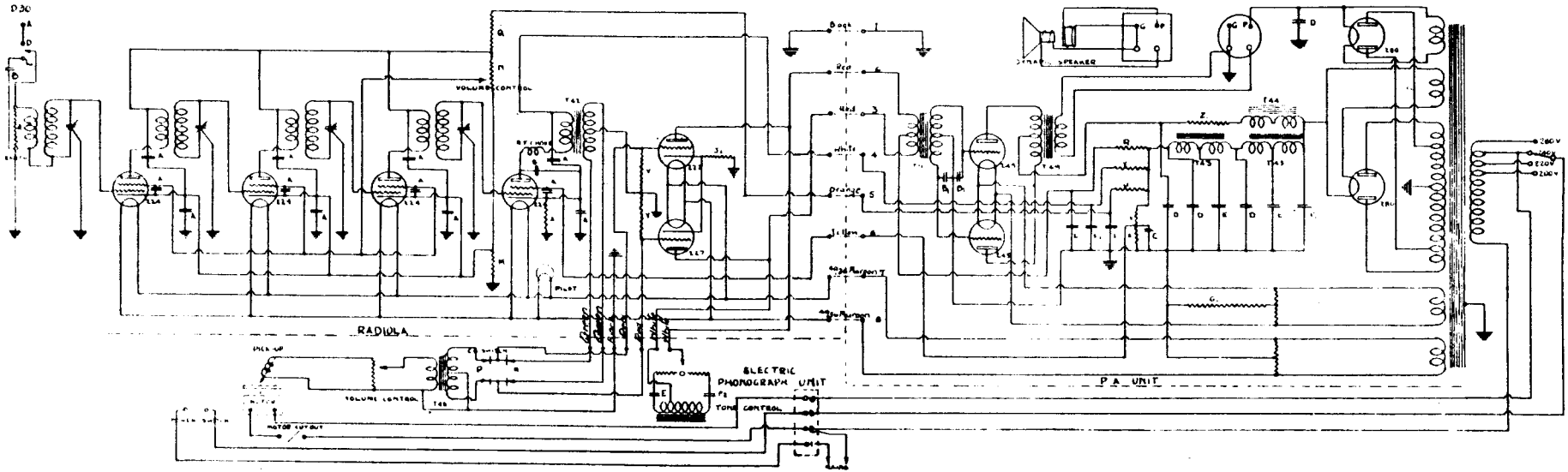

Fig. 18—Schematic Circuit Diagram—Duoforte Ninety.

Valve	Measure across	Approximate voltage
RADIOLA		
1, 2, & 3 R.F. Amplifier ..	F1 & F2	2.35V A.C.
	P & C	170V D.C.
	SG & C	70V D.C.
	G & C	1.5V D.C.
No. 4 Detector	F1 & F2	2.35V A.C.
	P & C	160V D.C.
	SG & C	65V D.C.
	G & C	8V D.C.
Nos. 5 & 6 1st Audio ..	F1 & F2	2.35V A.C.
	P & C	150V D.C.
	G & C	10V D.C.
POWER AMPLIFIER		
Nos. 7 & 8 2nd Audio ..	F1 & F2	2.5V A.C.
	P & F	250V D.C.
	G & F	50V D.C.

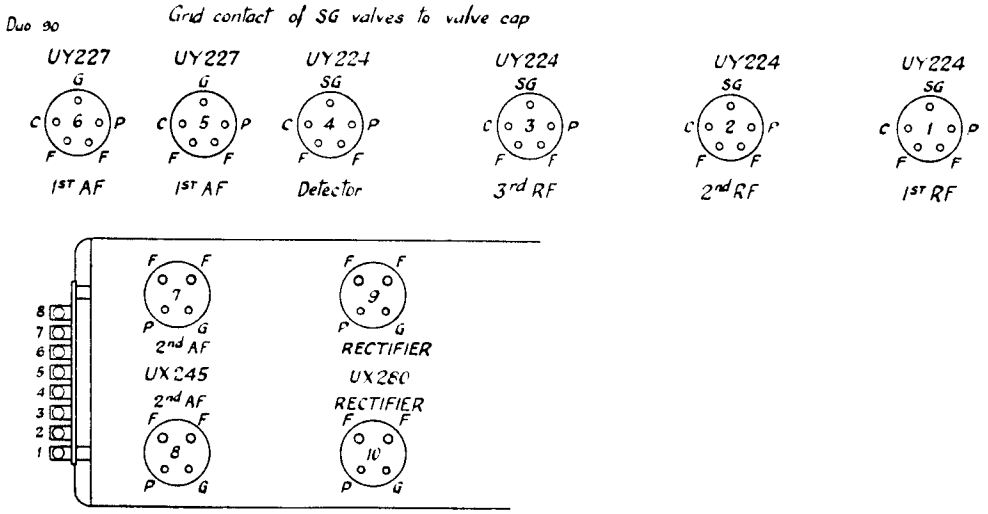

Fig. 19—Valve Sequence and Position of Valve Contacts—Duoforte Ninety.

A further check can be made on the power unit terminal strip. The recordings at normal line voltage with all valves in position should be approximately as follows:—

Measure across	Approximate voltage
7—8	2.75V A.C.
1—2 & 3	160V D.C.
1—4	170V D.C.
1—5	170V D.C.
1—6	70V D.C.

REMOVING DUOFORTE NINETY FROM CABINET.

Should it be found necessary to remove any part of the Duoforte Ninety from the cabinet proceed as follows:—

MOTOR BOARD.

Unscrew lid stay.

Take out wood screws holding down motor board.

Disconnect the seven wire cable from the Receiver to the motor board by loosening the screws in the bracket under the motor board.

Take the motor power supply leads off terminals 2 and 4 of power supply distribution strip in the back of the receiver compartment. Tilt the motor board to lift it out.

RECEIVER.

If necessary the receiver may be taken out of the cabinet by the same method as used with a Console Radiola.

POWER UNIT.

The Power Unit may be removed by the reverse process to installing an amplifier when first received from the works.

CONTINUITY TESTS.

Continuity tests may me made along the lines used for other instruments. A tabulation is given below:—

Test between	Correct effect.	Incorrect effect caused by
RADIOLA CHASSIS.		
No. 1 terminal (black lead) and chassis frame.	Closed circuit.	Broken connection.
No. 1 terminal and grid contacts, valves No. 1, 2, 3 and 4.	Closed circuit.	Open circuit in secondary R.F. transformer.
No. 2 and 3 terminals and plate contacts, valves No. 5 and 6.	Closed circuit.	Broken connection.
No. 4 terminal (white lead) and plate contacts, valve No. 4.	Closed circuit.	Broken connection or open circuit on R.F. choke or primary of audio transformer.
No. 4 terminal and frame.	Open circuit.	Wiring to frame or breakdown audio transformer primary, R F. coil or by-pass condenser.
No. 5 terminal (orange lead) and plate contacts, valves 1, 2 and 3.	Closed circuit.	Broken lead or open circuit primary of R.F. transformers.
No. 5 terminal and frame (volume control disconnected).	Open circuit.	Wiring to frame or breakdown in by-pass condenser.
No. 6 terminal (yellow lead) and S.G. contact valve 4.	Closed circuit.	Broken connection.
No. 7 and No. 8 terminals (40/36 maroon flex leads) and F contacts all valves.	Closed circuit.	Broken connection.
POWER AMPLIFIER.		
Terminals of wire wound resistors.	Closed circuit.	Broken resistor.
Filament contacts loud speaker socket.	Closed circuit.	Broken connection or open circuit secondary winding in output transformer.
Filament UX 280 No. 10 and plates UX 245 Nos. 7 and 8.	Closed circuit.	Open circuit smoothing choke, resistor or output transformer, primary.
Filament UX 280 No. 10, terminals No. 5.	Closed circuit.	Open circuit in smoothing chokes.

MOTOR BOARD.

The causes of trouble on the Motor Board may be:—

Broken connection in wiring.

Open circuit in Pick-up.

Open circuit in pick-up leads.

Open circuit in volume control.

Bad contacts on R.P. switch.

The simplest test on the tone-control is to substitute another control known to be functioning satisfactorily. The Duoforte will function normally with the tone control disconnected if necessary. This may be arranged for by removing the two end leads in the motor board receiver cable from the terminal bracket under the motor board.