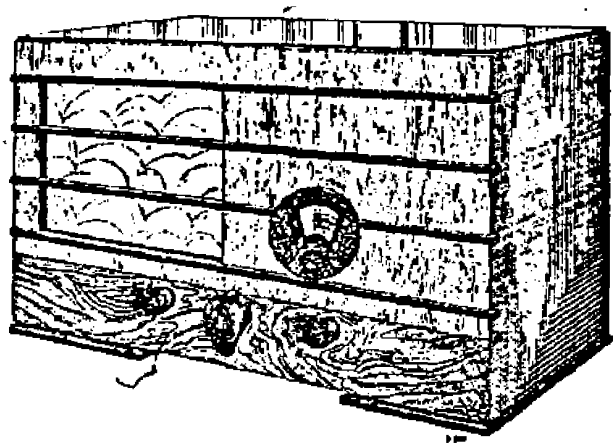
PHILIPS

SERVICE DOCUMENTATION

"SUPERHETERODYNE" RECEIVER FOR A.C. MAINS.

Type 580 A



General Remarks.

This receiver is designed on the superheterodyne principle. There are three knobs on the front of the cabinet. The left hand knob is for the volume control and the right hand knob varies the tuning condenser. The large switch knob which is mounted in the centre of the cabinet is for the following use :— to the extreme left the receiver is switched off, the second position, which is marked with a black staple, is for medium wave and in the third position, which is marked with a red staple, the long wave band can be obtained. A special length of wire is supplied with each receiver wound on a card. The holder for this card is mounted on the back of the rear panel. This lead can be used as an indoor aerial when required and it should be connected to the aerial socket. A mains socket on the back panel (safety switch) is provided which automatically renders the receiver electrically dead when the back is removed.

Description of Circuits.

When describing circuits, etc., the components that serve for one wave-band only, are indicated in brackets.

The octode frequency change valve L1 (FC4) is connected to the aerial by two H.F. tuned circuits namely C9, S6, (S7, C18) C19, C10, S8 (S9, C18), which are trimmed by the trimming condensers C12 and C13 respectively. Both circuits are coupled by the condensers (C18), C19 (direct capacity current coupling) and constitute a band pass filter. The oscillator circuit C11, S10 (S11, C15), C16 is connected to grid 1 and is inductively coupled to S12, (S13). This coil is connected to number 2 grid of the octode valve. The values of the self inductances and capacities in the oscillating circuit are such that a frequency difference can be obtained having a wave length of 115 KC. The octode valve has six grids and an anode. The two grids nearest the cathode namely grid one and grid two form the triode heterodyne oscillator while the third grid (grid 3) acts as a screen between the oscillator and the mixer portions of the valve. The remaining three grids together with the anode form an H.F. pentode with the suppressor (grid 6) which is internally connected to the cathode. The auxiliary grid of the pentode (grid 5) and the screen (grid 3) are also connected together. Between screen (grid 3) and the control grid of the pentode (grid 4) there exists what may be called a "virtual cathode." This is formed by a cloud of electrons which has been accelerated by the high potential screen and repulsed by the negative control grid of the pentode. The heterodyne frequency is superimposed on the electron stream in the oscillating portion and the resultant pulsating electron cloud of

the " virtual cathode " is modulated by the signal frequency applied to the grid of the pentode. The FC4, therefore, acts as an electron coupling frequency changer. This intermediate frequency of 115 K.C. is passed to the circuits C22—S14, C23—S15, C24—S16 and C25–S17. Following the I.F. amplifying stages is the diode, and the super-imposed A.C. potential on the D.C. component across the resistance R14—R15 are transferred via R13—C26—R8 to the control grids of the valves L1 (FC4) and L2 (VP.4A) so that these valves have a varying negative grid bias voltage applied to them. Therefore when a sufficiently powerful signal is received any variation of signal is practically non-existent. Following the diode detector the voltage is applied to the grid of the valve L4 (SP4) via R15 and C29 and this voltage is amplified by a stage of resistance capacity which is passed to the grid of the output pentode valve (PM24M). Finally these signals are passed through an output transformer to the built-in loudspeaker. Circuit S21—C33 is a special aerial filter tuned to the intermediate frequency of 115 K.C.

The valves L1, L2, L4 and L5 receive their negative grid bias due to the voltage drop on resistance R5, R16, R6, R7 respectively and these resistances are decoupled by C5, C32, C6 and C7. C6 and C7 are dry electrolytic condensers and they are polarised. The positive connection is marked red. Gramophone pick-up sockets are provided at the back of the receiver and the manual volume control is resistance R15.
C4 is a high frequency decoupling condenser for the output stage.

Trimming the Receiver.

If the screened tuning or I.F. coils, the 3-gang variable condenser or the trimmers of the receiver are replaced or if the receiver is out of balance so that the selectivity has been reduced the instrument must be rebalanced. It may not be necessary to retrim all circuits. For instance if one of the I.F. transformers is replaced it will be only necessary to retrim this part of the circuit. If other parts of the tuned circuits are changed it may also only be necessary to retrim the part of the receiver affected.

1. The Test apparatus required will be as follows :— A Service oscillator similar to Type 4028C.
2. An output meter. This will have to be substituted for the loudspeaker.
3. A screwdriver which should be insulated except for the extreme end.
4. An insulated spanner (alternatively Fig. 1 screwdriver and spanner, code No. 09.901.050) supplied by Philips.

Fig. 1.

The method of rebalancing the I.F. and Oscillator circuits is as follows :—

Rebalancing I.F. Circuits.

1. Place a signal of 115 K.C. via a condenser of 200 m.m.f. to the grid 4 of the octode valve FC4. (This grid is connected to the top of the valve).
2. Connect the output indicator.
3. Turn the volume control to maximum. If the output is found to be too large the volume control of the oscillator must be reduced and not the volume control of the receiver.
4. Short circuit R1 which will cause L1 (FC4) to cease oscillating.
5. Earth the chassis. Turn the variable condenser to minimum and place the wave band switch to long wave.
6. Short circuit S14 and S17 with a resistance of 10,000 ohms and trim C23 and C24 until the maximum output from the indicator is obtained.
7. Disconnect the resistance from S14 and S17 and place them across S15 and S16 and trim with C22 and C25 until the maximum output is obtained. It will be found that C22 and C23 are fitted on one common insulated plate. C24 and C25 are similarly fitted. C22 and C24 should be adjusted with a spanner and C23 and C25 with a screwdriver.
8. It will only be necessary to adjust the circuit S21 —C23 if any alteration has been made to this part of the circuit and the points mentioned in 9 and 11 give the method of adjusting.
9. A frequency of 115 K.C. should be applied to the aerial socket.
10. Adjust the variable condenser to 1900 metres.
11. Adjust C33 until output indicator shows a minimum.
12. Screws and nuts should be sealed with sealing wax.

Trimming the H.F. and Oscillator Sections.

1. Adjust the receiver to the medium wave band and connect a resistance of 10,000 ohms in parallel with S14 and remove the short circuit on R1. (The 10,000 ohm resistance should be left connected throughout the whole of the operation).
2. Adjust C14 trimming condenser until the vanes have an opening of 1 m.m.
3. Place a weak signal on the grid of L1 (FC4) having a wave length of 225 metres (1333 K.C.).
4. When the variable 3-gang condenser is tuned it will be found that two maximums on the indicator will be obtained. One will have an oscillator frequency at 1333 K.C. plus 115 K.C. (approximately 207 metres) and one at 1333 K.C. minus 115 K.C. (approximately 247 metres).
5. Trim the oscillator circuit until the maximum output is obtained.
6. Leave the variable condenser in this position until point 11.
7. Place the signal of 225 metres to aerial socket.

8. Trim the circuit with condensers C12 and C13 until the maximum output is obtained on the indicator.
9. Short circuit resistance R1 by earthing the grid of L1 (FC4) to the chassis.
10. Place the waveband switch to long wave and pass a signal of 900 metres to the aerial socket. Since the intermediate frequency cannot pass this wave length because the oscillator has been placed out of action by shorting R1 it will be necessary to use a separate receiver. This can be done by connecting a condenser of 25 m.m.f. between the anode of L1 (FC4) and the aerial socket of another receiver which has been accurately tuned to 900 metres. It will be necessary to connect the output meter to this receiver.
11. Tune the receiver accurately to 900 metres.
12. Remove the short circuit from R1 and also connect the output indicator to the receiver which is to be trimmed.
13. Obtain a maximum output by trimming C17.
14. Seal the screws and nuts with sealing wax.
15. Place a wave length of 350 metres to the aerial socket. Tune the receiver and if necessary readjust the dial to the correct reading.

HOW TO TRACE FAULTS.

General Remarks.

1. The following data is as complete as possible but some of the cases may not occur in practice.
2. This list cannot be complete as there may be compound faults.
3. In general it may be said that the majority of faults are due to short circuits in the bare wires or to open or short circuits in one of the component parts. These are indicated as R. or C. shorted or open circuit as the case may be.
4. Always carry out, first of all, test measurements so as to find the cause of the fault.

The method of procedure is as follows :—

I. **Equip the receiver with a set of standard valves (or valves from a receiver that functions satisfactorily) and if necessary try a different loudspeaker.**

If no result is obtained see under II.

II. **Check up to see if gramophone reproduction is possible.**

If it is see under V, if it is not see under III.

III. **Measure the voltage across C1.**

If this voltage is normal see under IV. If it is abnormal then look for the following faults.

1. Fault in the mains or safety switch ; measure the primary voltage to the transformer.
2. Fault in the secondary side of the transformer ; measure secondary voltage.
3. Loose link on the voltage change plate.
4. A bad contact in the valve-holder of L6 or valve L6.
5. C1, C2, C3, C4 short circuited.
6. Disconnection or short circuit in the heater leads or a short circuit across the pilot lamp holder.
7. A short circuit between the primary and secondary winding of the I.F. transformers.
8. Short circuit between the primary and secondary winding of the loudspeaker output transformer.
9. Short circuit on C28.

IV. **Voltage across C1 is normal but no gramophone reproduction.**

A. **If L4 has abnormal current and voltage.**

1. R10, R3 or R6 open circuited ; no anode current.
2. R4 open circuited ; no screen grid voltage.
3. C2, C3, C4 short circuited.
4. C6 short circuited.
5. R9 open circuited.
6. Bad contact in the valve-holder.

B. **If L5 has abnormal current and voltage.**

1. S18 or R7 open circuited.
2. C7 or C27 short circuited ; anode current too high.
3. R11 open circuited.
4. Faulty contact in valve-holder.

C. **If L4 and L5 have normal current and voltages.**

1. R15 open circuited or bad contact.
2. Short circuit in the screen lead between R14, R15 or between R15, C29.
3. C29 open circuited.
4. C30 short circuited.
5. C27 or R12 open circuited.
6. Open circuit in either the loudspeaker output transformer or speech coil winding.

V. **Gramophone reproduction but no radio reception.**

A. **L2 has abnormal currents and voltages.**

1. S16 or R3, R16 open circuited.
2. C2, C4, C32 short circuited.
3. R13, R14, S15 open circuited.
4. C26 short circuited.
5. Faulty contact in valve-holder.

B. **L1 has abnormal voltages and currents.**

1. S14 or R5 open circuited.
2. C2, C4, C5 short circuited.
3. S8 (S9) or R8 open circuited.
4. C11 or C14 short circuited.
5. S12 (S13) open circuited.
6. R1 open circuited.
7. Bad contact in valve-holder.

C. **Both valves have normal voltages and currents.**

Pass a modulated signal via a condenser of 25 u.u.f. to the various points specified below.

A. **No reception when a signal of 115 K.C. is placed on the anode of L2.**

1. C23, C25 short circuited or intermittent.
2. S17 open circuited.
3. C31 short circuited.
4. R14 open circuited.
5. L3 making bad contact in the valve-holder.

B. **No reception with signal placed on the anode of L1 but signal received on the anode of L2.**

1. C22 or C23 short circuited or intermittent.
2. S15 open circuited.

C. **Oscillator out of action.**

This fault can be tested as follows :—
Connect a condenser of about 1,000 u.u.f. from grid one of valve F.C.4 to earth. A rise of current can be measured on grid 2 if L1 is oscillating.

1. C16, S10 (S11, C15) open circuited.
2. C11, C14, C15, C16 or C17 short circuited.
3. C11 or C14 open circuited (oscillating, but not correct frequency).

D. In order to make sure that the oscillator is operating at the correct frequency, tests can be made as follows :—

(a) Connect the anode of L1 (FC4) via condenser of 25 u.u.f. to the aerial socket of a second receiver which is tuned say to 300 metres (1,000 K.C.).

(b) Tune the receiver on test until the oscillator is heard in the speaker at maximum strength. If the receiver (which is to be tested) needs say 339 metres (884 K.C.) the oscillator will have a frequency of 884+115=999 K.C. The difference of one K.C. (i.e., 1,000 less 999) will probably be due to a faulty measurement and therefore the oscillator circuit should be retrimmed. Should, however, the dial read 320 metres (940 K.C. (it is certain that there is a defect (for instance C14 open circuited) because a faulty scale reading (940+115 less 1,000=55 K.C.) is unlikely to occur. It is recommended that these tests should be taken in the neighbourhood of 350 metres because that is the most suitable part of the scale for this test.

E. **The receiver is satisfactory up to this point but no reception is obtained on the aerial.**

1. C19 (C18) open circuited.
2. S6, (S7) open circuited.
3. C8, C33 open circuited.
4. C9, C10, C12, C18, C19 short circuited.

VI. **Reception on one wave length only.**

A. **Reception on short wave length only.**

1. S7, S9, C18, S11, C15, C13 disconnected.
2. C17 short circuited.
3. Defective contact in wave change switch.

B. **Reception on long wave only.**
Defective contact in wave change switch.

VII. **Gramophone reproduction obtained but reception not up to standard quality.**

A. **Weak reproduction.**

1. Voltages and currents are not correct.
2. C8 disconnected or capacity too low.
3. Receiver is out of balance.
4. A defect in the loudspeaker or output transformer (this defect would also probably cause distorted reproduction).
5. C29 or C27 open circuited (very weak).

B. **Distortion—one of the valves has incorrect negative grid bias.**

1. (C6 or C7) short circuited.
2. R9 or R11 open circuited.
3. A defect in the loudspeaker or output transformer.

C. **Receiver hums.**

1. Half wave rectification. (One side of S2 may be open circuited or a fault in the valve-holder of L6).
2. C1 or C2 open circuited.
3. One of the low frequency decoupling condensers open circuited.
4. Loose earth connection to the chassis.

D. **Crackling.**

1. Bad contact in aerial or earth connections.
2. Intermittent short circuit between some of the bare wires.
3. A defective contact or dry joint in one of the connections.
4. Defective contact in one of the switches, valve holders or variable resistances.
5. Defective contact on one of the links of the transformer link plate.

E. **Receiver Oscillates.**

1. C3 or C5 open circuited.
2. S10 open circuited.
3. Intermediate frequency oscillation caused by R13 having an intermittent or open circuit.
4. Metallized coating of one of the valves is not connected to the cathode.

F. **Cabinet resonances.** A defect of this nature may be due to loose parts such as valve screen caps, leads or screws. The vibrating part should be fixed by means of a piece of felt, etc.

REMOVING AND CHANGING OF PARTS.

1. Removing the chassis.

The method of removing the chassis should preferably be done in the following way.

1. Remove the rear panel.
2. Take out the valves.
3. Unsolder the flexible leads connected to the loudspeaker transformer.
4. Remove the control knobs by disconnecting the grub screw.
5. Take out the four base screws on the underside of the cabinet.
6. Take the chassis out of the cabinet.

2. Important points to be noted when repairing.

1. The apparatus is constructed as a precision instrument and should be treated as such.
2. It is advisable to use a support when the chassis is being repaired and attention is drawn to the universal type shown in figure 2 (09.991.000).

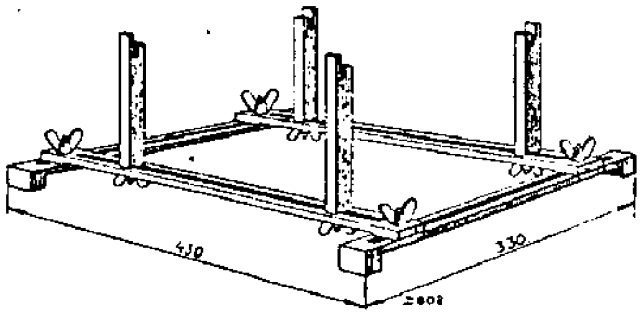


Fig. 2.

3. Do not make any alteration in the wiring or in the position of the screening plates.
4. Refix all earth connections to their original points.
5. Do not place any insulating fabric round the bare wiring of the circuits and see that these wires do not touch the insulating fabric of other conductors.
6. If necessary make a sketch of the wiring or mark the wires with coloured sealing-wax.
7. See that all bare wires are kept clear of each other.
8. Replace spring washers, insulating material etc., in their original places after repair. Rivets may be replaced by screws and nuts, i.e., valve-holders, etc.
9. All moving parts may be greased with a little pure vaseline.
10. As far as possible and if necessary give the contacts a mechanical tension.

Electrolytic condensers C1 and C2.

When changing C1 and C2 use a spanner of the type shown in fig. 3 (Code No. 09.990.760). In order to reach the large nuts some of the condensers and resistances may have to be moved to one side.

Fig. 3.

Electrolytic condensers C6 and C7.

As previously mentioned, it is important to note that when one of these condensers is replaced, the end which is marked red and therefore positive, should be carefully observed, so that it is replaced correctly.

Driving Mechanism.

The friction drive is mounted on the condenser drive and is held in position by the condenser bearing bracket which is secured to the chassis by two screws.

It is only necessary to release these two screws and slightly move the scale on one side and the complete friction drive and spring can be removed for adjustment or renewal.

Wave Length Scale.

This scale is held in position by two grub screws sealed with locking paint to the spindle of the variable condenser and can be easily removed for replacement if necessary.

Care, however, should be taken on reassembly to make sure that the calibration of the scale is reasonably accurate.

Three-gang variable condensers.

Unsolder the connections and uncouple the driving mechanism; release the small fixing plate at the back of the condenser. Further remove the plate which holds the condenser to the chassis; the condenser can now be taken out from the rear and changed.

Mains Transformer.

Special attention should be given to figure 4 below

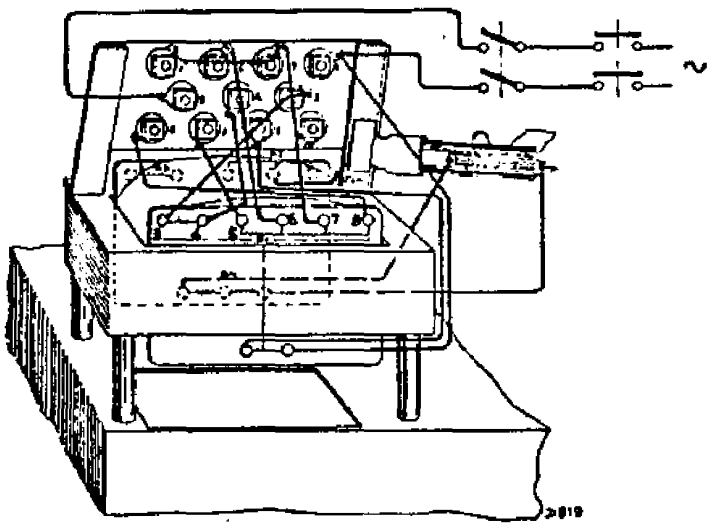


Fig. 4.

and also to paragraph 3 of page 5 under "important points." Adaptation to different mains voltages is effected by fitting the links on the voltage change plate at the positions indicated for the voltage range according to the diagram on the indicator disc. Whenever the voltage is altered it is necessary to turn the indicator disc until the correct range appears at the hole in the removable back.

Mains Switch.

Release the two screws on both ends of the top metal strip and also the grub screws on the spindle. The spindle can now be turned until the connection strip can be removed. Repair can now be more easily effected. If the quick-break is defective the spring and spring holes can be replaced after the small plate with stators and rotors with the wiring has been turned. Make sure that the catch arm is engaging before final assembly.

Wave change switch.

The wave change switch can be replaced by unsoldering all the connections and disconnecting the variable condenser. A flat spanner will be found very helpful in making this repair as it enables the nuts to be easily accessible. Further it may be necessary to remove the first electrolytic condenser.

REMOVING AND REPAIRING THE LOUD SPEAKER.

(Code No. 28.951.210)

Method of removal.

The loudspeaker can be removed by merely loosening the 3 eccentric clamps and unsoldering the leads to the transformer.

Important points to be considered when repairing.

1. See that the repair is carried out with good tools on a table or bench (not an iron one) free from dust or filings.
2. Under no circumstances may the front and back plates be removed from the magnet as this would impair its magnetism (as would also be the case when working on an iron bench).
3. Replace the cover of the loudspeaker immediately after the repair has been carried out.

Centring the cone.

Loosen the centering screw, place 4 distance-pieces of 0.2 mm. thickness through the perforations of the spider into the air-gap. Refix the centring screw and withdraw the distance pieces. No sound should now be heard when the cone is carefully moved up and down (fig. 5).

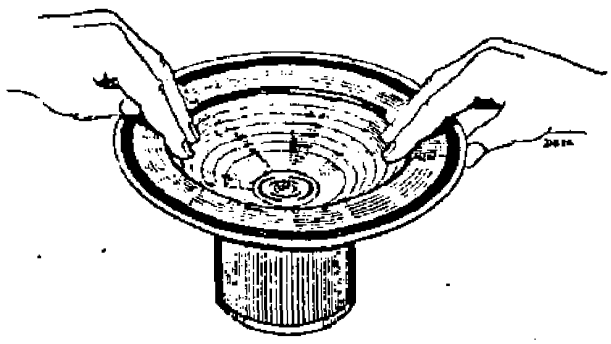


Fig. 5.

Changing the cone.

Unsolder the connections from the transformer, cut through the clamping ring and loosen the centring screw. The air-gap, when dirty, should be cleaned with a piece of strong material, namely Brass, Pertinax, etc., wrapped in wadding that has been moistened with alcohol. Any iron particles should be removed from the air-gap by means of a steel plate-spring. The new cone is to be centred as indicated above and fixed with a special service clamping ring (Code No. 28,445,810). Commence by bending the tags at 4 points positioned at angles of 90° from each other; the distance pieces are not to be taken from the air-gap until all the tags have been bent. The flexible leads of the transformer should be of the correct length (if they are fitted too taut they will impede movement ; if they are too slack they will touch the cone and cause rustling).

Changing the cone holder.

A gauge is required of the type shown in figure 6 (code No. 09.991.020). Remove the cone and place the

Fig. 6.

gauge in the air-gap. Now mark out the internal circumference of the cone-holder as well as possible on the front plate unscrew the nuts of the 3 bolts and stand the loudspeaker on the back plate (bearing in mind paragraph 2). When mounting, do not withdraw the gauge from the air-gap until the 3 draw-bolts have been securely tightened. A gauge will also be required if the cone is no longer accurately centred in the aperture of the front plate.

Faults.

Before commencing a repair, try a different loudspeaker and transformer in order to make sure the fault is not to be found in the receiver.

No sound.

There is an open or short circuit in the speech coil or output transformer. Measure up with an ohm-meter ; the resistances are stated on the folder at the back of the manual.

Sound weak or distorted.

The coil may have become jammed in the air-gap or there is a partial short circuit in the windings of the speech coil or transformer.

Rustling or resonance.

This fault may be caused by loose particles (possibly also from the cabinet) or by some hindrance in the movement of the cone, e.g., connections too taut or too slack, dirt in air-gap or distortion of the speech coil. The glued joint may also be loose in one part or the cone may be torn.

LIST OF SPARE PARTS, TOOLS, GAUGES, etc.

When ordering any of these items please state:

1. Code number.
2. Type and Serial number of receiver.
3. Description.

N.B.—Item numbers are indicated in cases where errors may otherwise occur.

Fig.	Item.	Description.	Code No.
		CABINET.	
		Cabinet with 3 indicating strips	25.867.820
		Indicating strips (separate)	25.013.710
		Escutcheon (colour 026)	23.999.271
		Escutcheon with trade mark	25.866.560
		Window	28.908.050
		Circular knob diameter 30 mm. (Colour 026)	23.950.011
		Circular knob diameter 25 mm. (Colour 026)	23.950.190
		Wavechange knob (Colour 026)	23.950.383
		Rear panel	28.395.042
		Spring for fixing rear panel	25.673.860
		Spring for top of panel	28.750.040
		Mains socket for rear panel	25.742.000
		Voltage indicating disc	25.599.570
		Rubber chassis suspension distance piece	25.655.820
		Earthing spring	25.672.720
		CHASSIS (Top).	
		Mains Transformer	28.517.000
		Voltage Link plate for Mains Transformer	25.787.650
		Interconnecting strip on Link plate	25.258.230
		Socket plate for safety switch	28.864.111
		Lamp holder with 4 contacts	25.161.320
		Lamp holder with 5 contacts	25.161.330
		Lamp holder with 7 contacts	28.225.010
		Holder for pilot lamp	25.160.450
9	3	Coil S6, S7	28.561.022
9	4	Coil S8, S9	28.561.032
9	5	Coil S10, S11, S12, S13	28.561.043
		Socket plate (aerial and earth)	28.864.100
		Socket plate (Gramophone pick-up)	25.787.570
		Socket plate (Extra loud speaker)	25.789.471
		Valve cap for L2 complete	25.771.191
		Small cap for L1	28.906.021
8	1	Coil S21	28.561.271
		Friction coupling	25.747.171
		Spindle for friction coupling	25.000.053
9	6	Roller for link coupling	28.934.000
		Spindle for volume control	28.000.041

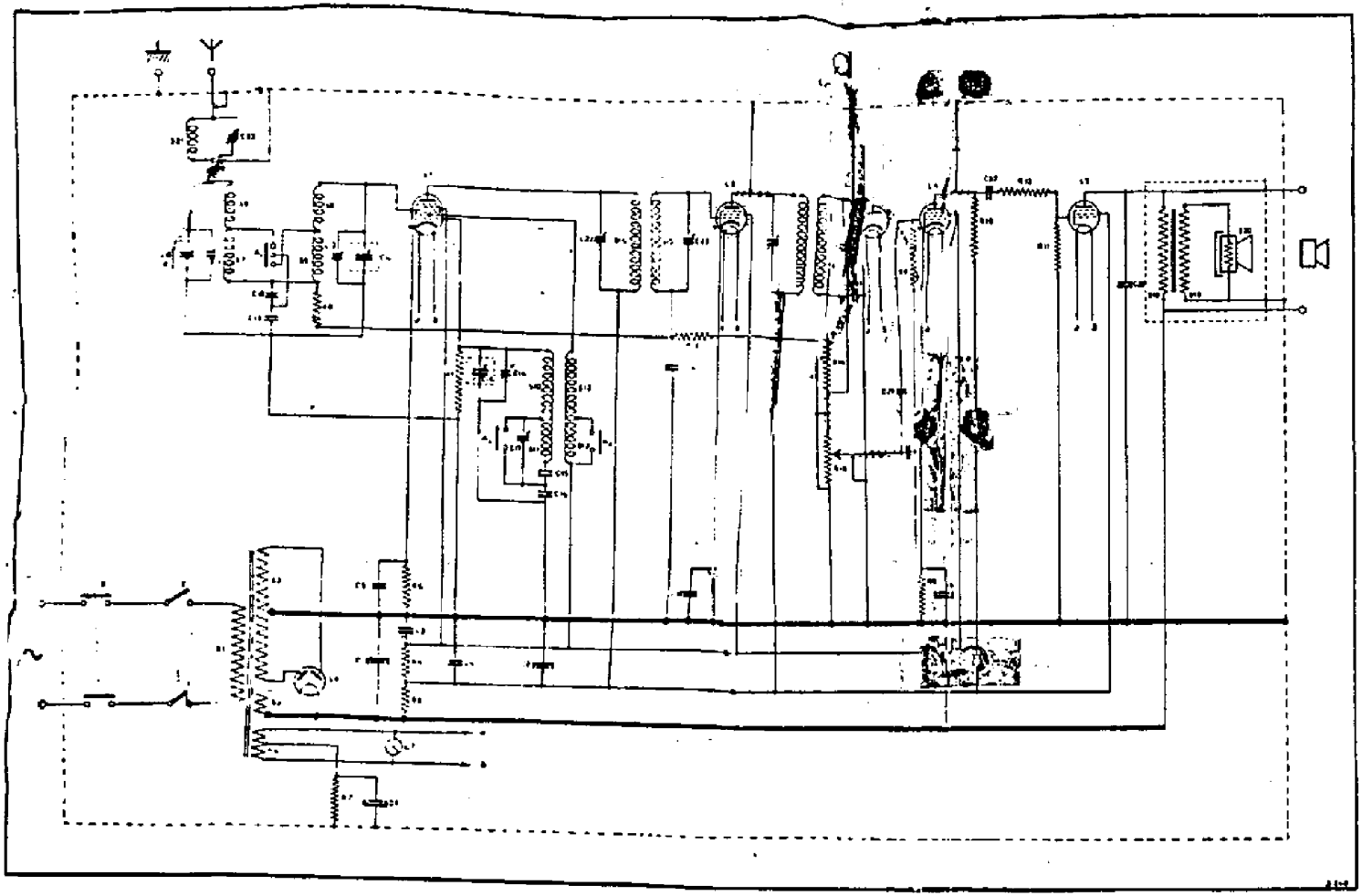


Fig. 7.

VOLTAGES AND CURRENTS

		L2	L4	L5	
Va	5	235	140	230	Volts.
Vg'	5 volts gm2-3	65	65	220	Volts.
-Vg	0 volts on 5	1.15 voltage over R1b	2.5 voltage over Ru	17.0 voltage over R7	Volts.
Ia	0:	2.0	0.3	22.6	mA.
Ig'	Ig=1.15 Ig3=Ig5=2.	1.0	0.12	5	mA.

The voltages were measured with volt-meters taking practically no current. Low values will, of course, be arrived at when measuring with moving-coil volt-meters when resistances are in circuit. The result will then depend upon the internal consumption of the meter. In some cases the currents and voltages may deviate from the above values without, necessarily indicating an error as these figures are mean values on a large number of receivers.

RESISTANCES.

Design-ation	Resistances.	Code No.
R1	50000 Ohm	28.770.420
R3	2500 Ohm	28.770.940
R4	32000 Ohm	2× 28.771.080
R5	200 Ohm	28.770.180
R6	6400 Ohm	28.770.330
R7	640 Ohm	28.770.860
R8	10000 Ohm	28.770.350
R9	1 M. Ohm	28.770.550
R10	0.32 M. Ohm	28.770.500
R11	0.5 M. Ohm	28.770.520
R12	0.64 M. Ohm	28.770.550
R13	1 M. Ohm	28.770.550
R14	50000 Ohm	28.770.420
R15	0.5 M. Ohm	28.808.010
R16	3200 Ohm	28.770.300

CONDENSERS.

C1	32 μF	28.180.011
C2	32 μF	28.180.011
C3	0.5 μF	28.100.211
C4	1.0 μF	
C5	50000 μμF	28.198.170
C6	25 μF	28.180.020
C7	25 μF	28.180.020
C8	25 μμF	28.190.07
C9	0–430 μμF	28.210.4
C10	0–430 μμF	
C11	0–430 μμF	
C12	7–55 μμF	28.210.420
C13	7–55 μμF	28.210.420
C14	7–55 μμF	28.210.440
C17	7–55 μμF	
C15	930 μμF	28.190.291
C16	1810 μμF	28.190.302
C18	25000 μμF	28.198.400
C19	25000 μμF	28.198.400
C22	40–145 μμF	28.210.550
C23	40–145 μμF	
C24	40–145 μμF	28.210.550
C25	40–145 μμF	
C26	0.1 μF	28.198.200
C27	10000 μμF	28.198.100
C28	2000 μμF	28.198.570
C29	10000 μμF	28.198.100
C30	200 μμF	28.190.100
C31	100 μμF	28.190.130
C32	0.1 μF	28.198.200
C33	40–145 μμF	28.210.240
C34	10000 μμF	28.198.100

OHMIC RESISTANCE OF COILS.

Coil	Resistance (Ohms.)	Coil	Resistance (Ohms.)
S6 ; S7	3.9 ; 36.8	S18	680–830
S8 ; S9	3.9 ; 36.8	S19	0.66–0.78
S10 ; S11 ; S12 ; S13	9.75 ; 27.4 ; 4.1 ; 10.7	S20	4.35–5.3
S14 ; S15	135 ; 135	S21	127
S16 ; S17	135 ; 135		

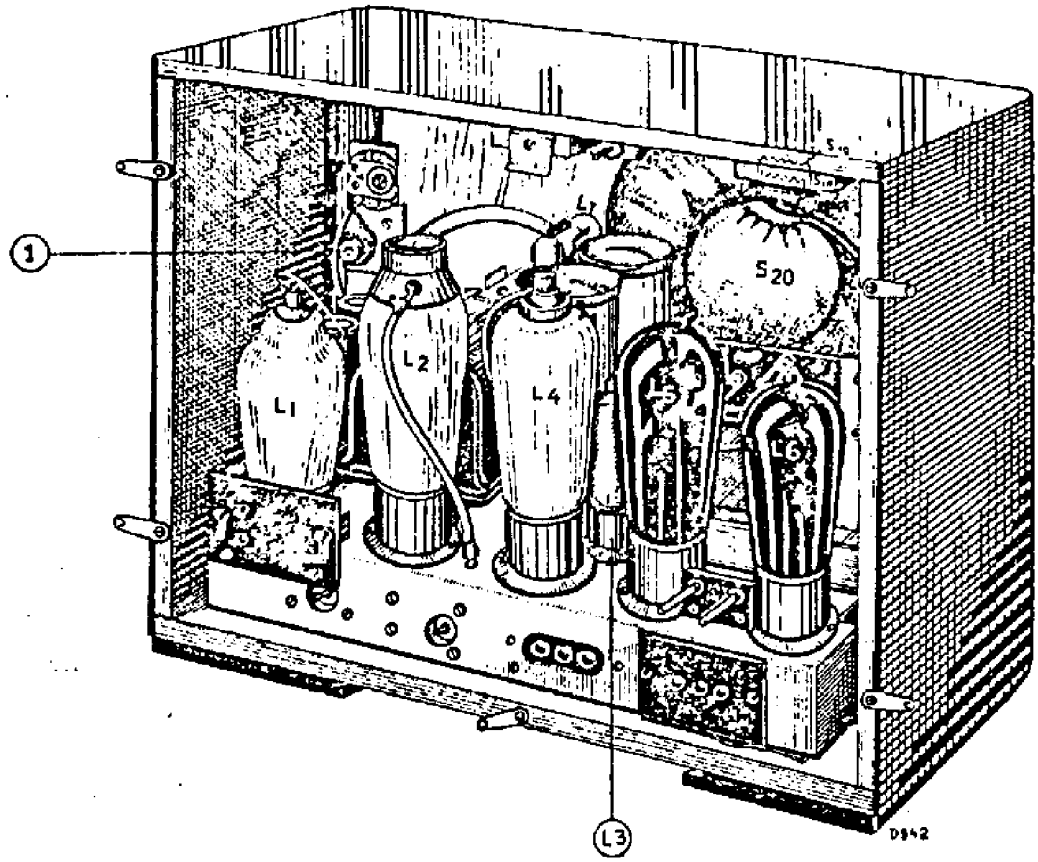

1
L1
L2
L4
L6
S20
L3
D942

Fig. 8.

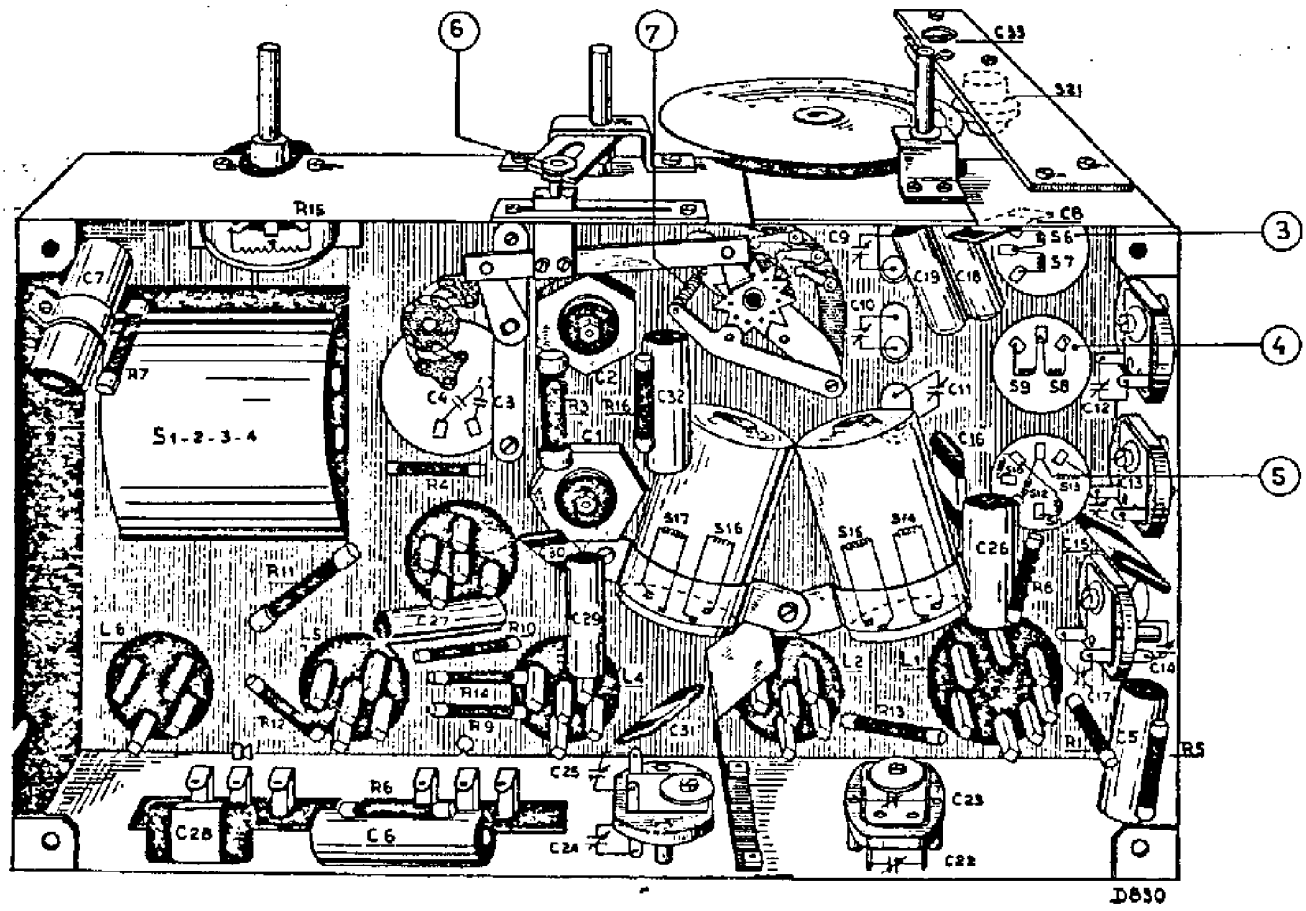

6
7
3
4
5
C33
S21
R15
C8
C9
S6
S7
C7
C19
C18
C10
S9
S8
C12
R7
S1-2-3-4
C4
C3
C2
R3
R16
C32
C1
C11
C16
R4
S17
S16
S15
S14
C26
R11
L6
L5
R10
C29
L4
L2
L1
C14
C17
R14
R9
C31
R13
C5
R5
R12
C25
R6
C28
C6
C24
C23
C22
D830

Fig. 9.