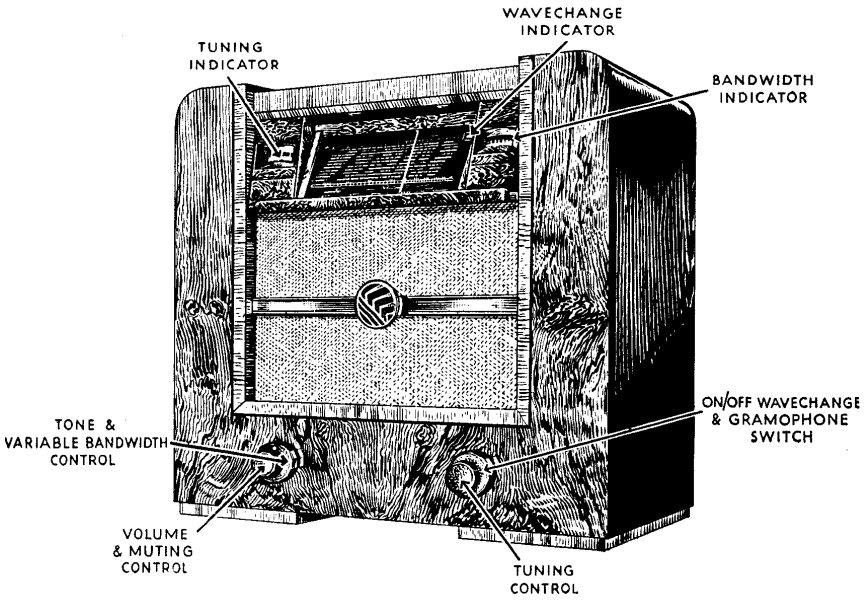
THE Mullard Wireless Service Company LTD.

SERVICE MAS4 MANUAL

GENERAL DESCRIPTION

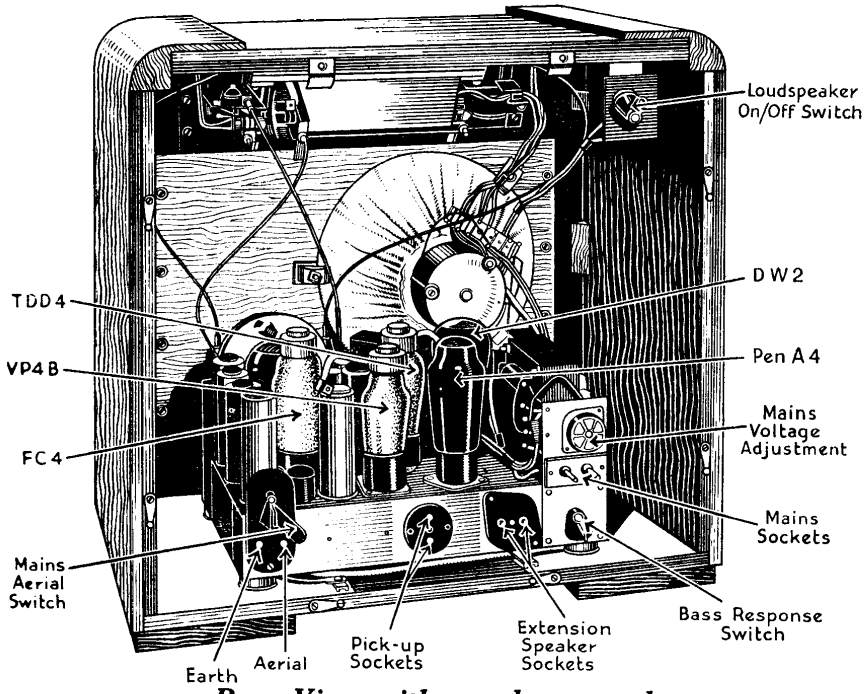
Model M.A.S.4 is a four-valve (plus rectifier) superhet receiver for A.C. mains, receiving on the long, medium and short (16.7 to 51 metres) wave bands. The valve combination comprises Type FC4 octode frequency changer; Type V P 4 B variable-mu screened pentode I.F. amplifier (intermediate frequency 128 kcs.); Type TDD4 double-diode-triode as speech detector, A.V.C. rectifier and L.F. amplifier; Type PENA4 output pentode; and Type DW2 full-wave H.T. rectifier. The receiver incorporates delayed A.V.C. a visual tuning indicator of the meter type, variable selectivity, continuously variable tone control, a separate two position bass control switch, provision for connecting a gramophone pick-up and an extension speaker circuit of approximately 8,000 ohms impedance, and a switch for silencing the built-in speaker. The location of the controls and valves can be seen from Figs 1 and 2.

Fig. 1.



Exterior View

Fig. 2.



Rear View with panel removed

MAINS VOLTAGE ADJUSTMENT

Remove the back panel; pull out the cover-plate marked with various mains voltages (see Fig. 2) and rotate it until the correct voltage is uppermost; push the cover-plate carefully back into position.

Tuning Rotate the tuning knob until the pointer just passes the station required, and then turn it back slowly in the opposite direction. This brings the slow motion drive into operation. The receiver can be "muted" for quiet tuning by pushing the volume control knob inwards.

DESCRIPTION OF CIRCUIT

The following description will be better understood by reference to the circuit diagram at the end of this manual. A description of the method of indicating the switching connections is given under the heading " Wave-change Switch " on page 6.

Input Circuit.

Medium Wave. This consists of the aperiodic winding S7, coupled inductively and also capacitatively via C28 to the first tuned circuit of a band-pass filter, comprising the coil S9, tuning condenser C10 and trimmer C14. This circuit is coupled capacitatively via C30 to the second tuned circuit of the filter, comprising S11 tuned by C11 and the trimmer C15.

Long Wave. The same circuit is used with the addition of the long wave coils S8 (aperiodic), S10 (first band-pass circuit) and S12 (second band-pass circuit), and the additional coupling condenser C29.

Short Wave. For short-wave reception signals are fed from the aerial via C31 to a single tuned circuit comprising the coil S13 tuned by C11. The resistance R32 in the grid circuit of L1 is included for preventing parasitic oscillation on short waves.

Oscillator Circuit.

Medium Wave. The oscillator grid circuit of the frequency changer comprises S14 tuned by C12, the parallel padding condenser C17 and the series padding condensers C20 and C33. S16 is the reaction coil in the oscillator anode circuit (Grid No. 2). R11 is the oscillator grid leak, the grid condenser C34 being short circuited.

Long Wave. The same circuit is used with the addition of the long wave grid coil S15, the additional parallel padding condenser C18, the series padding condensers C19 and C32, and the long wave reaction coil S17.

Short Wave. For short wave reception the oscillator grid circuit comprises the coil S19 tuned by C12 and the parallel padding condenser C16, coupled to S18 in the anode circuit, with the grid condenser C34 and grid leak R11.

Aerial Filter and Image Suppressor. S6 and C13 form an acceptor circuit tuned to the intermediate frequency (128 kcs.), while C46 and C47 suppress signals differing from the signal frequency by twice the intermediate frequency.

Mains Aerial. When the mains aerial switch is in the " on " position the aerial coil is connected to one side of the mains via the condenser C26.

I.F. Amplifier. Coupling between the frequency changer and the I.F. amplifier L2 is by means of the band-pass filter comprising S20 tuned by C22 and S21 tuned by C23. The inductive coupling between S20 and S21 is variable by adjusting the distance between them, thus varying the band-width. The second I.F. transformer comprises S22 tuned by C24 and S23, S24 tuned by C25, the connection to the speech detector anode being taken from the junction of S23 and S24 in order to reduce the circuit damping.

Speech Detector. This circuit comprises the speech diode anode, cathode, R15, R14 and S24, R15 being the manual volume control. Signals are transferred from the slider of R15 to the control grid of L3 via C37 and R16.

L.F. Amplifier. The audio-frequency output of L3 is transferred to the grid circuit of the output valve L4 by a resistance-capacity coupling, R18 being the anode resistance of L3 and C40 the coupling condenser. R28 in the grid circuit and R26 in the auxiliary grid circuit of L4 are H.F. oscillation stoppers. The switch shown close to the resistance R19 is closed when the volume control knob is pushed in, and mutes the receiver by earthing the control grid of L4 via C21. C39 serves to by-pass any I.F. component in the output of L3.

Output Circuit. S26 is the output transformer primary, and S27 the secondary.

Tone Control and Correctors. R22 and C42 in parallel with the grid leak of L4 is the tone control. Tone correction is also applied by C41 which shunts the output transformer primary, and by the Quality Corrector circuit consisting of S29, R21, S25 and R6. The object of this circuit is to inject into the cathode circuit of L3, in anti-phase, any harmonics developed in the L.F. portion of the receiver, thus reducing distortion. A further tone control is provided by the switch at the back of the receiver which operates the contacts marked A and B in the circuit diagram. When these switches are in the positions indicated in the diagram the inclusion of C49 between the volume control slider and the control grid of L3, and the introduction of R27 as a shunt to R6, gives a certain measure of bass attenuation.

A.V.C. Circuit. The anode of the A.V.C. diode is coupled to the primary of the second I.F. transformer via C36, and the diode circuit comprises the diode load R13, the diode anode, cathode, and the bias resistances R6, R7 and R8 which maintain the cathode at the required delay voltage. The voltage developed across the load R13 is transferred as A.V.C. bias to the control grid of L1 via the decoupling resistance R12 by-passed by C35 and the decoupling resistance R10. A.V.C. is also applied to the grid of L2 from the speech diode circuit, the voltage drop across the volume control R15 being utilised via the decoupling resistance R24 by-passed by C43.

Gramophone Reproduction. When the set is switched to the gramophone position the aerial is disconnected, the control grid of L1 is short-circuited, the oscillator anode voltage disconnected and the short-circuit across R31 removed, thus raising the negative bias on L1. At the same time R27 is switched in parallel with R6. The pick-up voltage is applied across R15 and is transferred via the slider and C37 to the control grid of L3, R16 being short-circuited.

RECOMMENDATIONS FOR SERVICE TESTING

PRELIMINARY EXAMINATION. When checking a receiver for alleged faults, first be certain that:

The receiver is adjusted for the correct mains voltage.

Valves are making good contact in their holders.

Loud speaker is in good condition. (Try a speaker known to be satisfactory).

Valves are in good condition. (Substitute valves known to be good).

The tuned circuits are correctly trimmed. (Follow procedure for trimming—see page 7).

QUICK CIRCUIT TESTS.

The nature and approximate location of many faults can often be ascertained by measuring the voltages and currents at various points in the circuit or the resistances of various circuits. The following table gives the approximate values which should be obtained at the points indicated. It should be noted, however, that actual readings may vary somewhat from these values without necessarily indicating a fault.

	L1 (FC4)	L2 (VP4B)	L3 (TDD4)	L4 (PENA4)
Va	260	230	105	245
Vg1	—3	—4	—2.8	—6.0
Vg2	90	155	—	260
Vg3+5	90	—	—	—
Ia (mA)	1.5	5.7	1.1	37
Ig2 (mA)	2.0	1.9	—	4.5
Ig3+5 (mA)	4.7	—	—	—

Total Consumption—60 Watts.

Voltage across C2—260 volts.

Voltage across S2—250/250 A.C.

Note.—All the readings in the above table are actual valves. Allowance must be made when the resistance of the circuit in which a particular measurement is made is comparable with that of the measuring instrument.

A METHOD OF SYSTEMATIC TESTING

The following method of tracing faults by the successive elimination of the various valve stages commencing at the output end of the receiver should enable most faults to be speedily located. It must be remembered, however, that it is not practicable to indicate every possible fault, and the possibility of more than one defect occurring must also be kept in mind.

General Note.—When applying modulated signals to various valves for test purposes the grid connecting cap of the valve under test should be removed, **but this cap must be replaced before proceeding to apply a test signal to a preceding valve.**

1. Test with Gramophone Pick-up. If results are satisfactory, assume low frequency circuits are in order and proceed to Section 2. If receiver is inoperative on gramophone, test in succession the H.T. and L.T. supplies and the circuits of L4 and L3 as follows.

(a) **Check H.T. voltage across C2.**
If reading is abnormal, suspect :
Faulty voltage adjustment of receiver.
Faulty mains on-off switch. (Check voltage across S1).
Faulty winding in mains transformer. (Check voltage across S2).
Short circuit in C1, C2, C5 or C6.
Open circuit in S5.
Short circuit in one of the I.F. transformer circuits.
Short circuit in heater circuit.
Short circuit between primary of output transformer S26 and earth.
Faulty contact in valve-holder.

(b) **Check voltages and currents of L4.**
If readings are abnormal, suspect :
Open circuit in S26, R9 or R26 (no anode current).
Short circuit in C4 or C40 (excessive anode current).
Open circuit in R19, R20 or R28.

(c) **Check voltages and currents of L3.**
If readings are abnormal, suspect :
Open circuit in R3, R6, R7, R8 or R18 (no anode current).
Short circuit in C7 or C39 (no anode current).
Short circuit in C3 (excessive anode current).
Open circuit in R17.

(d) If voltages and currents of L4 and L3 are normal, suspect :
Faulty wave-change switch.
Short circuit to earth in one of the screened wires such as those associated with the grid circuit of L3.
Short circuit between output transformer secondary, S27, and earth.
Open circuit in C37, C40, R15 or R16.

2. Test on Radio. If signals are heard but are weak or distorted, proceed to Section 3. If the receiver is inoperative on radio but operative on gramophone, test the intermediate frequency and radio frequency stages as follows :

(a) **Check voltages and currents of L2.**
If readings are abnormal, suspect :
Open circuit in S22, M1 (tuning indicator), R5 or R25, or short circuit in C6 (no anode current).
Short circuit in C9 (excessive anode current).
Open circuit in R1, R24 or S21.
Short circuit in C5.
If readings are normal, suspect :
Faulty wave-change switch.

(b) **Check voltages and currents of L1.**
If readings are abnormal, suspect :
Open circuit in S20, R4 or R31 (no anode current).
Short circuit in C8 (excessive anode current).
Open circuit in R10, R11 or R32.
L1 not oscillating.

(c) **Apply modulated signal of 128 kcs. to the control grid of L2.**
If the signal is not reproduced, suspect :
Short circuit in C24, C25, or C38.
Open circuit in S22, S23, S24, or R14.

(d) **Apply a modulated signal of 128 kcs. to the control grid of L1.**
If the signal is not reproduced, suspect :
Short circuit in S20, S21, C22 or C23.

(e) **Apply a modulated R.F. signal to the control grid of L1 and tune the receiver to this frequency.**
If the R.F. signal is not reproduced although a modulated I.F. signal applied to this grid is reproduced, suspect :
Open circuit or short circuit in one of the coils, condensers or resistances in the oscillator circuits.

(f) **Apply a modulated R.F. signal to the aerial socket.**
If an R.F. signal is reproduced when applied to the control grid of L1 but not when applied to the aerial socket, suspect :
Open circuit or short circuit in one of the coils or condensers in the aerial or input circuits of the receiver.

3. Radio signals heard but weak, distorted or accompanied by noise.

Weak Reception. Suspect :
Mains voltage low or receiver adjusted for incorrect mains voltage.
Receiver need re-trimming. (See pages 7 and 8).
Open circuit or short circuit in one of the coils or condensers in the R.F. circuits.

Unsatisfactory A.V.C. Suspect :
Open circuit in R10, R12, R13 or C36.
Short circuit in C35 or C43.

The Receiver Oscillates. Suspect :
Open circuit in one of the decoupling condensers, e.g., C8, C9, C5, C6 or C44.
Open circuit in earthing connection between wire screening and chassis.

Hum. Suspect :
Open circuit in C1 or C2.
Short circuit in S5.

Image Frequency Inadequately Suppressed. Suspect :
Coupling between first and second switch sections due to displacement of C30, which should be returned to its original position as indicated in the wiring diagram, at the end of this manual.
Open circuit in C46, C47.
C46 incorrectly trimmed.

Resonance.
Examine cabinet, receiver and speaker to discover loose parts. It may be found that a screw has become loose, or that it is necessary to pack a loose part with a thickness of felt.

DISMANTLING AND REPAIRING THE RECEIVER

It is possible to get at the underside of the chassis by removing the fibre base at the bottom of the cabinet, so that electrical tests and replacements can be carried out without removing the chassis. Should it be necessary, however, to withdraw the chassis from the cabinet, the following hints will be found of service.

To Remove Chassis.

(1) Remove the backplate, valves, knobs, and the four chassis screws on the underside of the cabinet.
(2) Unclip the pilot lamps, and slip the nipples of the wave-change and band-width indicators from their slots. Unscrew the adjusting nuts and withdraw the cables. Release the two securing nuts on the loudspeaker.
(3) The pointer can be released by loosening the small screw and washer securing it to the Bowden wire. Release the two nuts holding the scale bracket in position, and free the bracket from the dial assembly. It is important that the driving cables are handled carefully, otherwise difficulty will be experienced in obtaining a smooth running drive, due to kinks in the wire.
(4) Unsolder the chassis leads to the terminal strip and mark for identification.
(5) Remove the earth lead and bottom fibre plate. The chassis can now be withdrawn.

Note.—When re-securing the pointer the calibration must be carefully checked by the method described on page 9.

General Hints. The efficiency of the M.A.S.4, as of all Mullard receivers, is due largely to careful design and accurate manufacture and assembly. In carrying out repairs therefore, nothing should be done which will materially alter the values of components or the layout of the wiring. For example, when re-making connections, even connections to the chassis, they should be re-connected to the original points, and screening partitions should be reinstated in their former positions.

Adequate insulation is provided where necessary in the wiring, and no additional insulating material should be used such as, for example, on the H.F. wires which are bare when they leave the factory. Care must be taken that none of the wiring is displaced so that bare wires touch the insulation of other wires, as this may introduce serious losses. Where bare wires approach each other there must be a clearance of at least $\frac{1}{8}$-in. between them.
Great care must be taken to reinstate wiring in its original position, and the wiring diagram at the end of this manual should be followed exactly.

Resistances and Fixed Condensers. Soldered connections should be made rapidly, with the joints about half-an-inch from the component to avoid overheating. These components should be suspended clear of the other wiring.

Electrolytic Condensers. These are most easily removed by using the special box spanner, Code No. M.0999154.

Changing Coils. Coils are secured to the chassis by lugs formed on the chassis. The coil connections must first be unsoldered, then the coil can be withdrawn. Should the holding lugs break off, a special repair bracket, Code No. M.2808087, obtainable from the Mullard Receiver Service Department can be used to secure the new coil.

Condenser Drive. Care must be taken in lining up the condenser drive as otherwise the cable may foul the bottom of the groove. The centre of the Bowden wire guide must be adjusted exactly opposite the deepest part of the groove, otherwise the wire will slip off the drum. The method of securing the cord and wires to the drum should be carefully noted so that they can be replaced as originally fitted. New driving cord should be stretched for one minute by attaching a 4-lb. weight to it. The length of the cord must be so adjusted that the tension spring is completely compressed. The cord can be shortened by tying a knot in it.

Bowden Wires. Two sizes are used—the thicker for the variable selectivity and wave-change indicators, and the thinner for the condenser drive. The wire must be carefully handled, as a kink will cause irregular drive and backlash. When fitting new wires, the outside cable may be cut with pliers and the ends trimmed smooth with a fine file. The inner cable should be tinned before being cut to length, using a non-greasy flux.

Muting Switch. This switch is operated by a fibre disc secured to the spindle of the volume control. Should this disc become bent or warped it may close the contacts when the volume control is rotated, thus making the volume control appear intermittent. This is more liable to happen when the contacts are close together ; it can be remedied by bending the contacts so that they close only when the volume control is pushed in.
Care must be taken when replacing the volume control knob that sufficient clearance is left for it to operate the muting switch when pushed inwards.

Mains On/Off Switch. This is operated by the wave-change switch. It is fixed to the front of the chassis, and the chassis must be removed to effect a replacement. See wiring diagram at the end of this manual.

To Fit a New Scale. Place the cabinet upside down on a piece of felt. The aperture between the scale and the escutcheon will disclose two screws, which should be released, together with the brackets, when the scale can be easily pulled out and another one fitted. The receiver should be re-calibrated if necessary by the method described on page 9.

Tuning Condenser. Adjust so that the condenser reaches the limits of its travel before the station pointer in order to avoid the risk of the Bowden wire becoming slack and running off the drum.

Slow Motion Drive. If the drive slips, the fibre bands may have worn smooth, and they should be reversed ; or the spring strips may be too slack and should be carefully bent to restore the necessary pressure.

Wave-change Switch. This is built up of units, together with a ratchet plate, spindle, clips, etc. Each unit comprises a stator, a rotor, contact springs attached to the stator, springs to maintain correct alignment between rotor and stator, and the necessary contacts and connections. The stator has 24 holes, so that it can accommodate a maximum of 12 contact springs on each side. In the circuit diagram the stator contacts are shown as open dots, the contacts fixed to the side

of the stator nearer the ratchet plate being shown in the outer circle, and those fixed to the other side of the stator in the inner circle. A black dot indicates that the hole carries no contact. The rotor carries connection strips the ends of which pass through the holes in the rotor and are then bent over on the other side with smooth pliers. The flattened portion not only keeps the connection strip in position, but is also used as a contact. In the circuit diagram the contact pieces (carried on the rotor), are indicated as small lines between the two circles, and the connection strips are shown as full lines near the outer circle for those strips which are fixed on the side nearer the ratchet plate, and a dotted line near the inner circle for those on the other side. The flat portion of the strips acting as contacts are indicated in the same way as the contact pieces. In view of the different arrangements of contacts in the different units, the following code is used to describe the connections in the list of spare parts. The first figure indicates the number of holes covered by the strip, while the other figures indicate in which holes a projection is located. Thus, " 5.2.3.5 " indicates that five holes are covered, and that there are projections in holes 2, 3 and 5. The stator springs can be fitted by using a small pair of pliers in the same way as the rotor contacts.

Speaker. Repairs should be carried out on a bench free from dust, and **not made of iron.** The front and back plates must **never** be removed from the magnet. The fabric dust-cover should be replaced as soon as repairs are completed.

To centre the speech coil, loosen the spider by undoing the three screws at the back of the cone holder. Centre the coil with a set of small feelers (Code No. 0999084), tighten up the screws holding the spider, and then remove the feelers.

To remove the coil and cone, unsolder the coil leads, and remove the ring holding the cone by cutting across the ring with a pair of pliers or cutters. When replacing the cone, this ring should be replaced by a clamping ring (Code No. M.28445821) which can be secured with a pair of flat pliers. The air gap may be cleaned by passing through it a piece of wadding wound on a flat stick and moistened with methylated spirit.

PROCEDURE FOR TRIMMING THE TUNED CIRCUITS

Equipment. In addition to a service oscillator, output meter and insulated screwdriver (preferably one having very little metal), a 15-degree jig (Code No. M.0999174), is necessary for adjusting the condenser to the standard checking point as described below, and an auxiliary radio receiver (i.e., some form of aperiodic amplifier), is required for determining when a signal on the control grid of the frequency changer L1 reaches a maximum.

General Notes. Before commencing operations, the wax used to seal the trimming condensers should be softened with a warm soldering iron, taking care not to melt it as this may damage the trimmers.

The I.F. circuits should be trimmed first, and afterwards the radio-frequency and oscillator circuits in the following order—medium wave, long wave and short wave.

When tuning the I.F. transformers the band-width adjustment should be set to maximum (i.e., minimum selectivity). When trimming a secondary winding the primary must be damped by a resistance connected in parallel, and when trimming a primary the secondary should be similarly damped, in order to obtain a single-peak response. If the two ends of the circuit to be damped are not accessible, the damping may be connected between the anode or grid side of the circuit and the chassis, but with an 0.1 μF condenser in series with the resistance and on the chassis side of it.

When applying signals to the control grid of a valve for the purpose of trimming, its normal grid circuit must remain connected, (i.e., the top cap must not be removed). Throughout the process of trimming the volume control should be at maximum, and if the reading on the output meter becomes too great, the signal should be reduced by means of the attenuator on the service oscillator. When trimming the radio-frequency circuits the band-width adjustment should be set at minimum (i.e., maximum selectivity) to avoid double peaking.

If the tuning indicator has been removed from the set, it should be temporarily replaced by a resistance of 4,000 ohms.

Note that for the medium and long wave ranges the oscillator frequency is 128 kcs. **higher** than the signal frequency, but for the short wave range it is 128 kcs. **lower** than the signal frequency.

The receiver must be retrimmed if the frequency changer valve, Type FC4, is replaced.

Intermediate Frequency Trimming.

(1) Lay the cabinet on one of its sides to facilitate access to the trimmers.
(2) Connect the output meter to the extension loud speaker sockets.
(3) Adjust the band-width and volume controls to maximum, and switch the set to long waves.
(4) Short circuit R11, and apply a modulated signal of 128 kcs. to the control grid G4 of L1.

(5) Shunt C24 with a 25,000 ohm resistance. Trim C25 for maximum output. Remove damping.
(6) Shunt C23 with a 10,000 ohm resistance and 0.1 μF condenser in series. Trim C22 for maximum output. Remove damping.
(7) Shunt C25 with a 25,000 ohm resistance and trim C24 for maximum output. Remove damping.
(8) Shunt C22 with a 10,000 ohm resistance and 0.1 μF condenser in series. Trim C23 for maximum output. Remove damping and the short circuit across R11.

Radio Frequency and Oscillator Trimming.

Preliminary. Earth the chassis and stand the receiver on its base to facilitate access to the trimmers. Turn C13 so that it is almost entirely " in."

Fit the 15-degree jig by slipping the boss over the locating pin just above the condenser spindle as indicated in Fig. 3. This jig ensures that when the condenser is turned so that it bears upon it the vanes are advanced exactly 15 degrees which is the standard trimming position.

Medium Wave Trimming.

(1) Switch to medium wave and set the selectivity control to minimum band-width (white spot on knob uppermost). Turn the condenser until it bears on the jig.
(2) Apply a modulated signal of 1,442 kcs. (208 metres) to the aerial socket via a standard artificial aerial. Trim C17, C14 and C15 for maximum output.
(3) Short circuit R11.
(4) Connect the anode of L1 to the aerial socket of the auxiliary receiver via a condenser of 25 $\mu\mu$F. Connect the output meter to the output terminals of the auxiliary receiver.
(5) Apply a 550 kcs. (545 metres) signal to the aerial socket of the receiver to be trimmed, and tune the receiver under test for maximum output.
(6) Disconnect the auxiliary receiver ,remove the short circuit across R11 and reconnect the output meter to the receiver to be trimmed.
(7) Apply a 550 kcs. signal to the aerial socket and trim C20 for maximum output.
(8) Repeat (2).

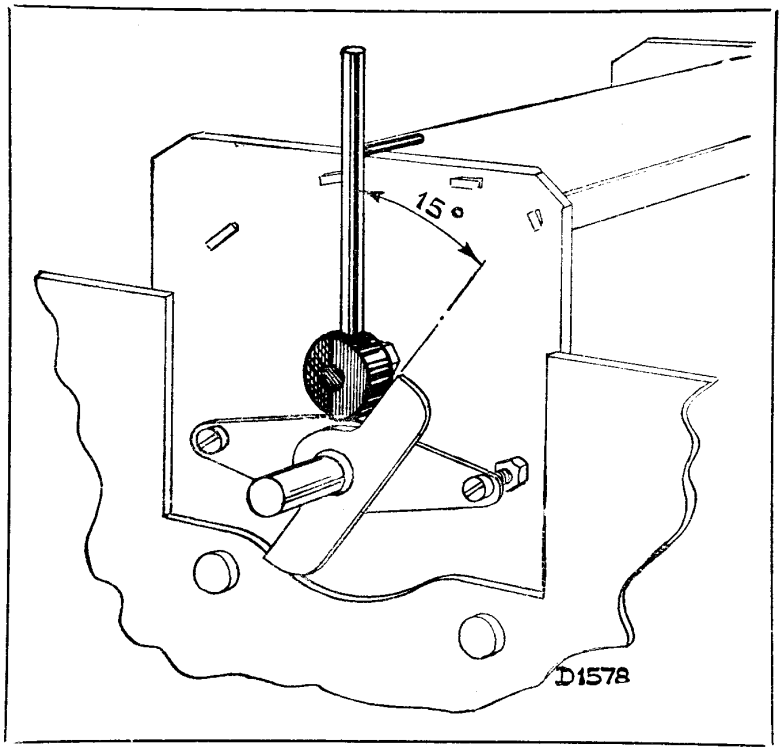


Fig. 3.

Long Wave Trimming.

(1) Switch to long wave.
(2) Apply a modulated signal of 395 kcs. (760 metres) to the aerial socket via a standard artificial aerial.
(3) Short circuit R11.
(4) Connect the anode of L1 to the aerial socket of the auxiliary receiver via a condenser of 25 $\mu\mu$F. Connect the output meter to the output terminals of the auxiliary receiver. Adjust the tuning condenser for maximum output.
(5) Disconnect the auxiliary receiver, remove the short circuit across R11 and re-connect the output meter to the receiver to be trimmed.

(6) Trim C18 for maximum output.
(7) Apply a 160 kcs. (1,875 metres) signal to the aerial socket via a standard artificial aerial.
(8) Short circuit R11.
(9) Connect the anode of L1 to the aerial socket of the auxiliary receiver via a condenser of 25 $\mu\mu$F. Connect the output meter to the output terminals of the auxiliary receiver. Adjust the tuning condenser for maximum output.
(10) Disconnect the auxiliary receiver, remove the short circuit across R11, and re-connect the output meter to the receiver to be trimmed.
(11) Trim C19 for maximum output.

Short Wave Trimming.

(1) Switch receiver to short wave. Turn the condenser until it bears on the jig.
(2) Apply a modulated signal of 17 mcs. (17.6 metres) to the aerial socket via a short-wave artificial aerial. Trim C16 for maximum output. If two tuning positions are found, accept that corresponding to the higher trimmer capacity.

Trimming the I.F. Aerial Filter.

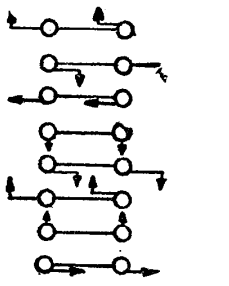
(1) Switch the receiver to long wave and set the tuning condenser to maximum position (2,000 metres).
(2) Apply a strong modulated signal of 128 kcs. and trim C13 for minimum output.

Trimming Image Frequency Suppressor.

(1) Switch to medium wave. Apply a modulated signal of 744 kcs. (403 metres) to the aerial socket and tune it in.
(2) Without altering the tuning of the receiver, apply a strong modulated signal of 1,000 kcs. (300 metres) to the aerial socket, and trim C46 for minimum output.

CALIBRATION OF SCALE

(1) Apply a signal of 1,442 kcs. (208 metres) and tune the receiver for maximum output.
(2) Adjust the position of the pointer to 208 metres on the scale by releasing the screw and washer securing the pointer to the Bowden wire drive.
(3) Check the setting at 350 and 545 metres. If the calibration cannot be satisfactorily adjusted at one or both of these points, correction can be obtained by loosening the large screws at the left and right hand sides of the bracket holding the drive drum to the chassis and then moving the bracket, according to the diagrams in the table below.

Position of pointer at 350 metres	Position of pointer at 545 metres	Adjustment of bracket
Correct	High	
Correct	Low	
High	High	
High	Correct	
High	Low	
Low	High	
Low	Correct	
Low	Low	

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Note.—After effecting an adjustment according to the above table it is necessary to re-check at 208 metres and to re-adjust the position of the pointer if required.

RECEIVER SERVICE DEPARTMENT

Receivers for service, and orders for spare parts should be addressed to :

The Mullard Receiver Service Dept.,
New Road,
Mitcham Junction,
Surrey.

Spare parts should be ordered by stating the Code Number as given on the Part Lists on pages 10 to 12, quoting at the same time the type and serial number of the receiver, and the description of the part required.

COMPONENT AND SPARE PARTS LISTS

In the following tables the various components and parts of the Mullard M.A.S.4 are listed, together with their purpose, electrical values, and the code number under which spares should be ordered. The references in the first column of each table permit the identification of any component on the circuit and wiring diagrams included at the end of this manual.

Important Note. Those code numbers which are marked with an asterisk are for a coil assembly **and** trimmer complete. The component numbers of the coils and trimmers in particular assemblies can be ascertained from the wiring diagrams.

CONDENSERS.

Reference	Purpose	Capacity	Code No.
C1	1st H.T. Smoothing	32 μF	M.2818013
C2	2nd H.T. Smoothing	32 μF	M.2818013
C3	Grid bias decoupling L3	25 μF	M.2818002
C4	Grid bias decoupling L4	25 μF	M.2818002
C5	Screen decoupling L1 and L2	0.1 μF	M.2819909
C6	Anode decoupling L2	0.1 μF	M.2819909
C7	Anode decoupling L3	0.5 μF	M.2819827
C8	Grid bias decoupling L1	50,000 μμF	M.2819906
C9	Grid bias decoupling L2	0.1 μF	M.2819909
C10, C11, C12	Tuning Condenser	10—470 μμF	M.2821142
C13	Aerial Filter	12—170 μμF	M.2857048*
C14	Trimmer	2.5— 30 μμF	M.2857054*
C15	Trimmer	2.5— 30 μμF	M.2857049*
C16	Trimmer	2.5— 30 μμF	M.2821132
C17	Trimmer	2.5— 30 μμF	M.2857050*
C18	Trimmer	2.5— 30 μμF	
C19	Padding	12—170 μμF	M.2821131
C20	Padding	12—170 μμF	M.2821131
C21	Muting	0.1 μF	M.2819909
C22	I.F. Trimming	12—170 μμF	M.2821131
C23	I.F. Trimming	12—170 μμF	M.2857053*
C24	I.F. Trimming	12—170 μμF	M.2821131
C25	I.F. Trimming	12—170 μμF	M.2857072*
C26	Mains Aerial	500 μμF	M.2819020
C28	Aerial Coupling	10 μμF	M.2820634
C29	Band-pass Coupling	16,000 μμF	M.2819901
C30	Band-pass Coupling	25,000 μμF	M.2819903
C31	Aerial Coupling	16 μμF	M.2820636
C32	Padding	650 μμF	M.2819225
C33	Padding	1,375 μμF	M.2819230
C34	Oscillator Grid Coupling	100 μμF	M.2820627
C35	A.V.C. By-pass	0.1 μF	M.2819909
C36	A.V.C. Diode Coupling	10 μμF	M.2820634
C37	L.F. Coupling L3	2,000 μμF	M.2819892
C38	H.F. By-pass L3	100 μμF	M.2820627
C39	I.F. By-pass L3	400 μμF	M.2819019
C40	L.F. Coupling L4	20,000 μμF	M.2819902
C41	Tone Control	4,000 μμF	M.2819971
C42	Tone Control	8,000 μμF	M.2819898
C43	A.V.C. decoupling L2	0.1 μF	M.2819909
C44	Screen decoupling L2	0.1 μF	M.2819909
C45	Oscillator Coupling	2.0 μμF	M.2820588
C46	Image Suppressor	2.5—30 μμF	M.2821132
C47	Image Suppressor	20 μμF	M.2820637
C49	Bass Control	250 μμF	M.2819017

RESISTANCES.

Reference	Purpose	Resistance	Code No.
R1	Voltage Dropping L1 Osc. anode	20,000 ohms	M.2877103
R3	Voltage Dropping L3 anode ...	50,000 ohms	M.2877042
R4	Bias L1	250 ohms	M.2877019
R5	Bias L2	1,250 ohms	M.2877026
R6	Quality Corrector circuit	32 ohms	M.2877010
R7	Bias L3	3,200 ohms	M.2877030
R8	Bias L3	4,000 ohms	M.2877031
R9	Bias L4	160 ohms	M.2877489
R10	A.V.C. decoupling L1	0.1 megohm	M.2877045
R11	Oscillator grid leak	50,000 ohms	M.2877042
R12	A.V.C. decoupling	1.0 megohm	M.2877055
R13	A.V.C. diode load	0.5 megohm	M.2877052
R14	Speech diode load	0.1 megohm	M.2877045
R15	Manual Volume Control	0.5 megohm	M.2881126
R16	H.F. Stopper L3	1.6 megohm	M.2877057
R17	Grid Leak L3	1.6 megohm	M.2877057
R18	Anode Load L3	0.1 megohm	M.2877045
R19	Grid Leak L4	0.8 megohm	M.2877054
R20	H.F. Stopper L4	0.1 megohm	M.2877045
R21	Quality Corrector Circuit ...	500 ohms	M.2877022
R22	Tone Control	0.04+2.5 +0.04 megohm	M.2881127
R24	A.V.C. decoupling L2	1.6 megohm	M.2877057
R25	Voltage Dropping L1 and L2 ...	32,000/2 ohms	M.2877105
R26	H.F. Stopper L4 screen	32 ohms	M.2877010
R27	Bass Control Resistance	32 ohms	M.2877010
R28	H.F. Stopper L4 grid	1,000 ohms	M.2877025
R31	Bias L1	2,500 ohms	M.2877029
R32	H.F. Stopper	50 ohms	M.2877105
R39	Quality Corrector Circuit ...	10 ohms	M.2877005

COILS.

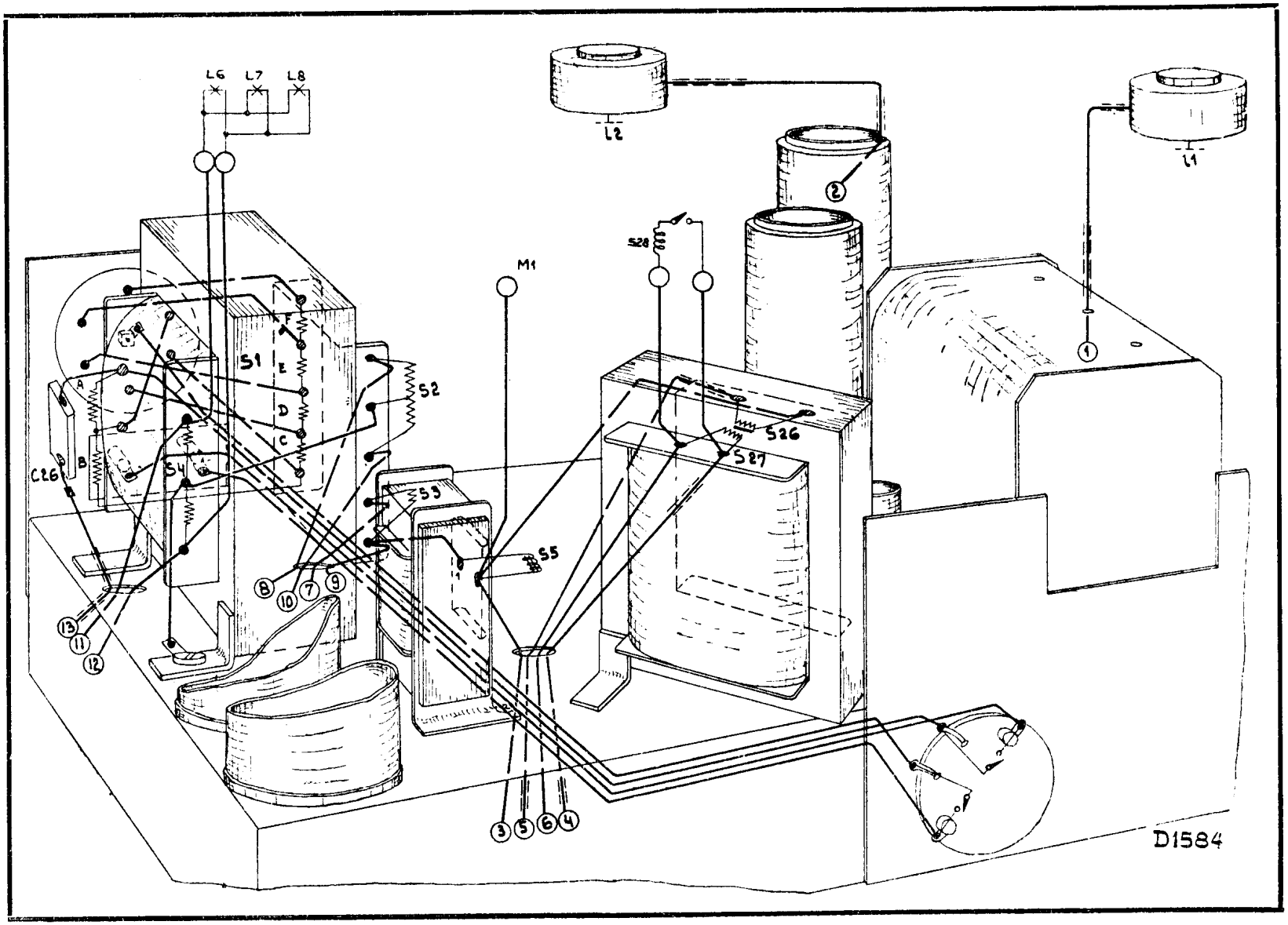
Reference	Purpose	Resistance (Ohms)	Code No.
S1	Mains Transformer Primary	35	M.2852954
S2	Mains Transformer H.T. Secondary ...	360	
S3	Mains Transformer Rectifier Filt. Secondary	0.17	
S4	Mains Transformer Valve Htr. Secondary ...	0.04	
S5	H.T. Smoothing Choke	385	M.2854608
S6	Aerial Filter	140	M.2857048*
S7	Aerial Coils	25	M.2857054*
S8		95	
S9		4	
S10	Band-pass Filter	40	
S11		4	M.2857049*
S12		37	
S13	Short-wave Aerial Coil	0.05	M.2858708
S14	Oscillator Coils	10	M.2857050*
S15		25	
S16		4	
S17		8	
S18	Oscillator Coils—S.W.	30	M.2858709
S19		0.05	
S20	1st I.F. Transformer...	140	M.2857053*
S21		140	
S22	2nd I.F. Transformer	140	M.2857072*
S23		40	
S24		95	
S25	Choke in Quality Corrector Circuit ...	7	M.2854621
S26	Output Transformer	310	M.2852745
S27		0.4	
S28	Loudspeaker Speech Coil	5	M.2858717
S29	Choke in Quality Corrector Circuit ...	150	

SPARE PARTS.

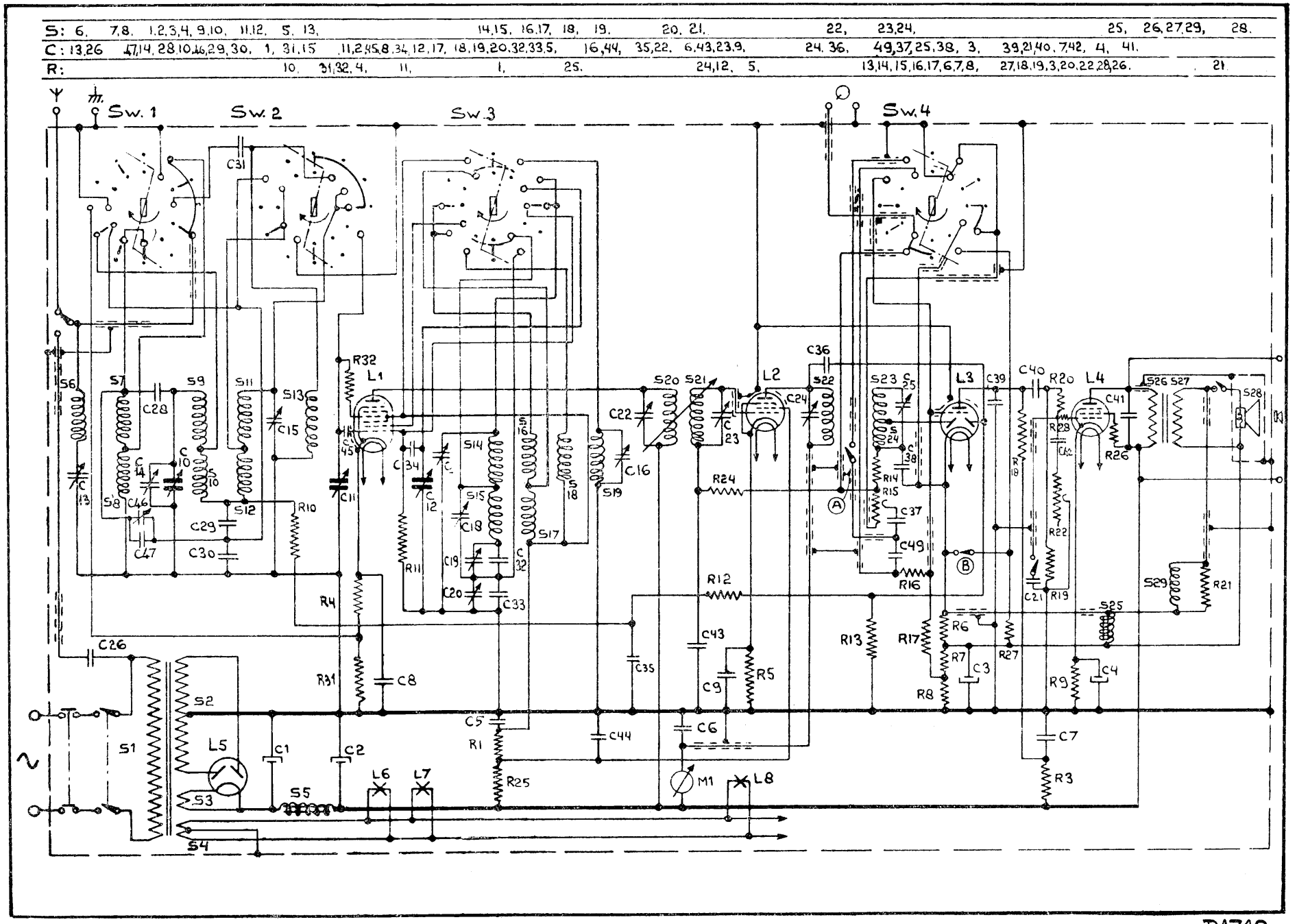
Description of Part	Code No.
Cabinet	M.2824317
Escutcheon Assembly	M.2889482
Station Scale	M.2870354
Large Control Knob	M.2361031
Small Control Knob	M.2395048
Top Clip for Backplate	M.2875004
Rotating Clip for Backplate	M.2875128
Backplate	M.2839877
Mains On/Off Switch	M.0852957
Mains Safety Plug	M.2574200
2-Pin Mains Connector	M.2887075
Speaker Terminal Strip	M.2888902
Mains Aerial Switch	M.2885529
Bass Control Switch	M.0852469
Loudspeaker On/Off Switch	M.0852934
Valve Cap	M.2885531
Metallised Base Plate	M.2836669
Slow Motion Drive	M.2888208
Driving Cord Assembly	M.2882119
Stator without Contacts	M.2893458
Rotor without Contacts	M.2847721
Rotor Contact 1.1	M.2890416
Rotor Contact 2.1	M.2890426
Rotor Contact 2.2	M.2890439
Rotor Contact 3.2	M.2890421
Rotor Contact 4.1.4	M.2890418
Stator Contact	M.2875097
Clip for Stator Contact	M.2807739
Connection Strip	M.2807738
7-Pin Valve Holder	M.2822542
4-Pin Valve Holder	M.2822590
Nut for Electrolytic Condenser	M.0709302
Loudspeaker Silk (240 × 400 mm.)	M.0650084
Grub Screw (4×8 mm.)	M.0785408
Grub Screw (4×5 mm.)	M.0785405
Pilot Lampholder	M.2883796
Pilot Lamp	Type 8042–07
Bowden Control Assembly for Pointer	M.2849822
Bowden Control Assembly for W/C Indicator	M.2849824
Bowden Control Assembly for Selectivity Indicator	M.2849823
Outer Cable. (State for which control required)	M.3363505
Inner Cable (for pointer)	M.3363557
Inner Cable. (State for which indicator required)	M.3363559
Screwed Sleeve	M.0757947
Locknut	M.0710450
Nipple	M.2892738
Plug for Aerial or Earth Socket	M.0826172
Muting Switch	M.2871141
Speaker	M.MK.86012
Clamping Ring for Speaker	M.28445821
Paper Ring for Speaker	M.2844539
Cone Holder	M.2825384
TOOLS	
Chassis Holder	M.0999138
Spanner for Electrolytic Condenser	M.0999154
15° Trimming Jig	M.0999174
Air Gap Gauge	M.0999153
Air Gap Feelers	M.0999084
Combined Screwdriver and Boxspanner for adjusting trimmers	M.0999105
Cleft Screwdriver	M.0999177
Lever for securing coils	M.0999156
Bracket to replace Coil Lugs	M.2808087

WIRING DIAGRAM OF MULLARD M.A.S.4 RECEIVER

TOP OF CHASSIS.



CIRCUIT DIAGRAM OF MULLARD M A S 4 RECEIVER.

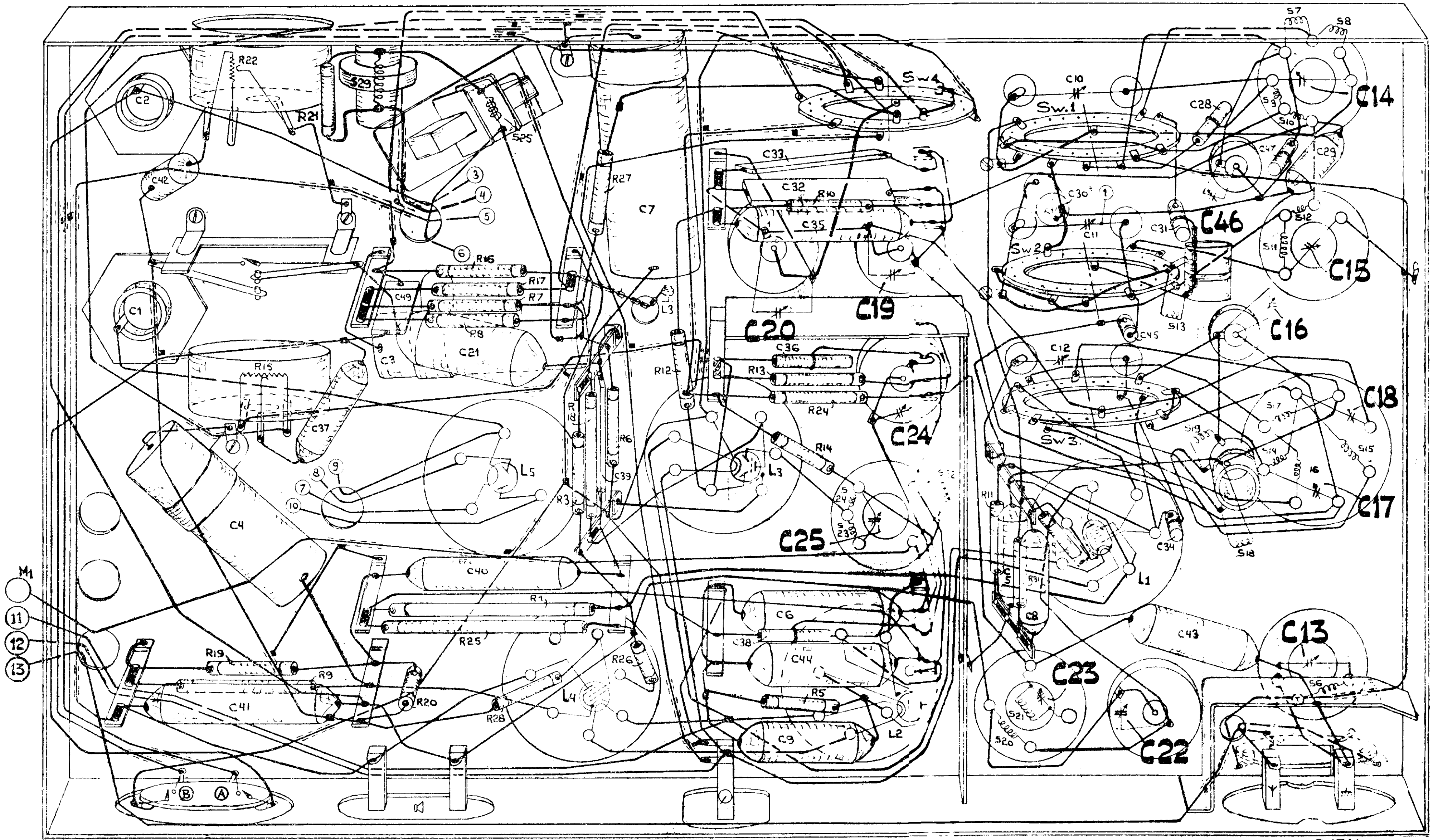


For component values and code numbers see pages 10 to 11

WIRING DIAGRAM OF MULLARD M.A.S.4 RECEIVER

UNDERSIDE OF CHASSIS.

S:	29 25 23, 24, 22, 20, 21 13, 19, 18, 9, 10, 7, 8, 11, 12, 14, 15, 16, 17, 6.
C:	1, 2, 42, 4, 41, 37, 3, 49, 21, 40, 39, 7, 38, 20, 33, 32, 6, 35, 36, 44, 9, 26, 19, 24 25, 5, 8, 23, 12, 30, 11, 10, 22, 45, 31, 34, 43, 28, 46, 47, 14, 29, 15, 16, 17, 18, 13.
R:	19, 15, 22, 9, 21, 20, 20, 16, 8, 25, 7, 28, 17, 1, 3, 18, 6, 26, 27, 12, 13, 24, 14, 10, 5, 11, 31, 31, 4.



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