

SERVICE MANUAL

5-Valve Super-Heterodynes

For A.C. Mains

C O N T E N T S

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THE INFORMATION CONTAINED IN THIS MANUAL APPLIES EQUALLY TO ALL MODELS WITH THE EXCEPTION OF THE SPECIFICATION AND INSTRUCTIONS FOR DISMANTLING RADIOGRAMS WHICH ARE GIVEN SEPARATELY ON PAGE 17.

BRIEF SPECIFICATION. (Table Models only.)

VOLTAGE RANGE.

200 to 250 (A.C.).

FREQUENCY RANGE.

50 to 100 cycles.

This instrument is designed to operate only on the voltages for which it is adjusted. Should any variation be noticed the supply company must be notified immediately.

POWER CONSUMPTION.

65 watts.

FUSES.

This instrument may be connected to any (A.C.) supply point, providing that $2\frac{1}{2}$ -amp. double-pole fuses are used for protection.

SPEECH OUTPUT.

Approx. 2 watts (undistorted).

Anode dissipation of MPT 4 output valve, 8 watts approximately.

WAVELENGTH RANGE.

Medium waves—200 to 550 metres.

Long waves—1,000 to 2,000 metres.

DIMENSIONS.

Height.
 $18\frac{1}{8}$ inches.

Width.
 $15\frac{3}{8}$ inches.

Depth.
 $10\frac{5}{8}$ inches.

WEIGHT.

38 lb. net.

54 lb. gross.

LOUDSPEAKER.

Type No. 10971 L.

Electro-magnetic, the field being in the H.T.— feed. A Hum neutralising coil is fitted and a tapping on the field provides bias for the MPT 4 output valve. Speech and hum neutralising coil (in series) 9 ohms. For other electrical data, see Circuit diagram, Fig. 1, page 8.

CIRCUIT DESCRIPTION. (Both Models.)

AERIAL COUPLING.

The input signals, which are controlled by VR 2 (Volume control), are passed by C 1, L 1, to the constant peak band pass coils L 2, L 3, L 5 and L 6.

Coil L 4 and the micro condenser TC 2 form the image suppressor arrangement which effectively eliminates second channel (interference) whistle.

OSCILLATOR DETECTOR.

Marconi MS4B. (V1.) A screen grid valve with cathode coupling (L 7, L 8).

IFT 1 couples this valve to the IF valve.

When operating on "GRAM" the screen "OSC—DET" is open circuited and oscillations are checked.

I. F. AMPLIFIER.

Marconi VMS 4 met (V2).

VR 1 (which is coupled to VR 2) controls the bias of this variable Mu valve and so regulates input to 2nd Detector.

IFT 2 is coupled by C 7 to power grid :—

2nd DETECTOR.

Marconi MH 4 met (V3).

Biased only on "gram" by R 13.

Pick-up automatically disconnected when instrument is switched to radio.

The coupling between detector and output valve is by condenser C 14 and L.F. coupling unit T 1.

OUTPUT VALVE.

Marconi MPT 4 (V4).

Bias is applied to the grid of this valve from tap on speaker field winding.

C 17 is a tone compensating condenser.

VC 4 is the variable tone control.

RECTIFIER.

Marconi U 12 (V5).

This valve supplies the H.T. current for all valves and also energising current for the loudspeaker.

EXTRA LOUDSPEAKERS.

Switch off the instrument when rearranging speakers. Extra loudspeakers may be connected to this instrument without greatly weakening the output of the parent speaker providing that impedance of extra speech coil is not less than that of the parent speaker.

Always use a heavy gauge wire for low resistance extra speaker leads.

Do not attempt to derive energising current from these Models for the field of an extra Electromagnetic Speaker.

WIRING (EXTRA LOUDSPEAKERS).

Connect speech coil of extra loudspeaker to terminals marked "EXT. LS" on terminal panel of transformer mounted on parent speaker.

If a transformer is incorporated on the extra speaker the leads from receiver must be connected to the speech coil of the speaker and **not** to the primary (high resistance) winding of the transformer.

HIGH-RESISTANCE (MOVING IRON) TYPE.

Connect to "OP. TRANS." terminals (in parallel with transformer primary).

Connect the positive (RED) lead of speaker to the terminal to which the red lead of multiple speaker connector is attached (3rd top terminal from the left "OP.").

Speaker must have covered terminals and the extension wiring between receiver and speaker must be rubber-covered and of good quality as the leads are at high potential.

Alternatively connection can be made through a condenser of not less than 2 microfarads, which will isolate speaker from H.T. voltage. Connect one side of condenser to yellow OP. Trans. terminal, other side of condenser to extra H.R. speaker and return other lead of extra speaker to earth.

It must be noted that the speaker field is in the negative H.T. lead and therefore the speaker field positive (+) terminal is connected to EARTH.

PICK-UP.

(TABLE MODEL ONLY.)

A high resistance pick-up may be permanently connected to the pick-up sockets; the connecting lead must be metal screened and the screening connected to earth. The volume control of the Model does not operate on "GRAM", and consequently an external volume control must be fitted to suit the pick-up used. As an alternative to the pick-up input arrangement shown in Fig. 1 a series resistance of 2,000 ohms, and a 1,000-1,500 ohm volume control may be employed when using the Model 19 pick-up.

PRELIMINARY TESTS.

Before attributing disturbing noises to a fault within the instrument the following simple tests should be made :—

Switch on the receiver and, having tuned to a point where signals are not being received, make and break the aerial lead. If the aerial is picking up disturbances a decrease in noise will be noticed when aerial is disconnected.

On the other hand if no difference is noticed in noise level whether aerial is connected or not, the interference may be due to high frequency (H.F.) brought to the instrument via the current supply, or to a fault in the receiver.

If interfering noises are due to a bad connection in the receiver, a jar will sometimes aggravate the trouble and so assist in locating the source of trouble—see faults table.

Loose or faulty pilot lamps will give rise to severe crackling. If a flickering lamp is noticed and a renewal does not improve matters, suspect a bad connection in the heater circuits of the valves. See that valves are fully inserted and that pilot lamps are tightly screwed in.

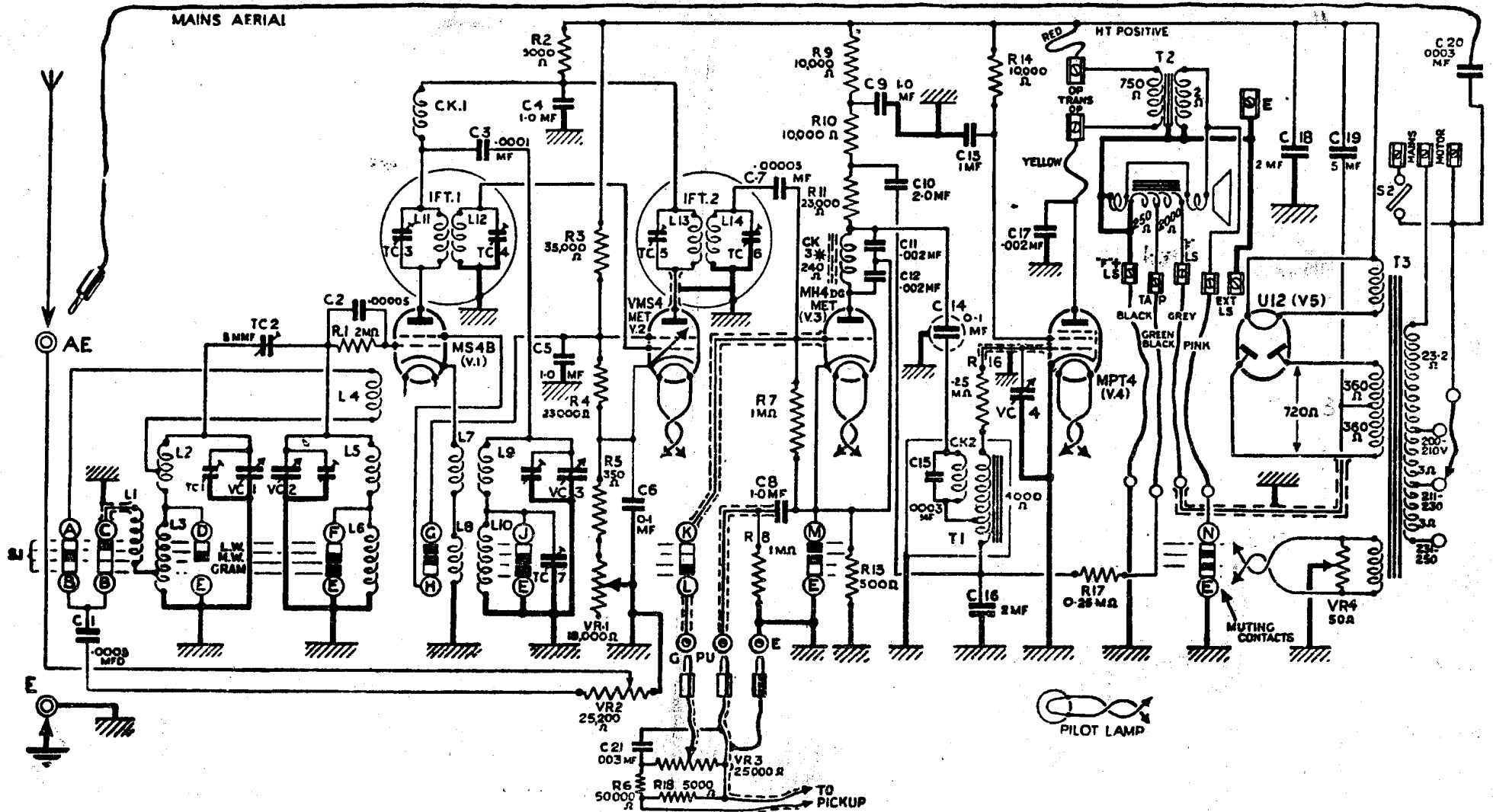
Electrical machinery or flashing signs will invariably give rise to the type of interference known as "H.F." and will cause crackling or "frying" noises in the speaker.

Make sure that the loudspeaker magnet is being energised by applying a screwdriver near the pole-piece. Correct feed for loudspeaker field 50 milliamps. Ascertain that speech circuit is correct by momentarily contacting a $1\frac{1}{2}$ volt battery across extra loudspeaker terminals while the field is energised. This should produce a definite sound in the speaker. See that all connecting leads are securely connected and are continuous.

First test the instrument on gramophone. If "gram" results are good but radio is poor, the fault will be found in that part of the circuit preceding V3. A progressive contacting of the aerial plug on to the following points will assist in locating a fault associated with the tuning coils and connections thereto.

PROGRESSIVE AERIAL TESTS.

Test Point.	Components Eliminated and Tests to Make.	Results which should be Obtained.
Top left-hand tag on Coil L 2. SWITCH TO M.W.	VR 2, C 1 and L 4. Component Tests Nos. 2 & 4.	No minimum volume on local station. Images present.
Top tag on coil L 1. SWITCH TO L.W.	VR 2, C 1 and L 4. Component Test No. 1.	No minimum volume on high power L.W. transmissions. Images present.
Fixed vanes of VC 1.	VR 2, C 1 and L 4 (Medium waves). Component Tests Nos. 1 and 3.	No minimum volume on powerful local stations. Images present. Selectivity will be impaired.
Fixed vanes of VC 2.	VR 2, C 1, L 2 and L 4 (Medium waves). L 1 and L 3 (Long waves). T.C 2 (image condenser). Component Tests Nos. 1 and 3.	No minimum volume on powerful local stations. Images present. Selectivity and calibration will be affected.



* NOTE.—A 10,000-ohm resistance may be found in place of CK 3.

Fig. 1

In certain instruments the "MAINS-MOTOR" panel terminals are marked A, B & C. Where this condition is found the right-hand terminal will be wired to the 231-250 volt tapping of mains transformer primary and not to S2 as shown in the circuit diagram.

CONNECT THE MOTOR (WHERE FITTED) TO THE TERMINALS A AND B IN MODELS WITH LETTERED TERMINALS.

Some radiograms have a simpler pick-up matching circuit consisting of a 2,000 ohm resistor in series with a 1,500 ohm volume control.

VALVE TABLE.

	MS 4B (V 1)	VMS 4 (V 2)	MH 4 (V 3)	MPT 4 (V 4)	U 12 (V 5)	REMARKS.
ANODE FEED	Avo Scale : 0-012. Radio : 4.0 to 2.0 Gram. : —	0-012. Radio } 0.1 to 5.5 Gram. }	0-012. Radio : 2.8† Gram. : 2.8	0-12. 30	0-12. 25 mA each anode	A breakdown of speaker field will be indicated by absence of volts and feed. If screen voltages or feed are abnormal, anode readings will be affected.
ANODE/FRAME VOLTS	Avo Scale : 1,200. Radio : 200 to 180 Gram. : 240	1,200. Radio } 220 to 190 Gram. }	1,200. Radio : 75† Gram. : 75	1,200. 220	— —	
Parts which should be checked if anode voltages and current are abnormal	R 2 CK 1 C 4 L 11 C 18 L 7 C 19 L 8 TC 3	R 2 L 13 C 4 R 5 C 6 VR 1 C 18 Screening on C 19 anode lead TC 5	R 9 R 7 C 7 C 9 R 10 C 18 C 10 R 11 C 19 C 11 R 12 C 12 R 13 (gram. only) C 8	T 2—high side R 16 VC 4 L 17 T 1 C 18 C 16 C 19 C 17	—	
SCREEN FEED	Avo Scale : 0-012. Radio : 1.0 to 0.1 Gram. : —	0-012. Radio } 0.1 to 2.4 Gram. }	— —	0-012. 6.0†	—	A breakdown of speaker field will be indicated by absence of volts and feed. If anode voltages or feed are abnormal, screen readings will be affected.
SCREEN FRAME VOLTS	Avo Scale : 1,200. Radio : 120 to 70 Gram. : —	1,200. Radio } 120 to 70 Gram. }	— —	1,200. 175	—	
Parts which should be checked if screen voltages and current are abnormal	S 1 contacts G and H R 3 C 5 R 4 C 6 R 5 C 18 VR 1 C 19	R 3 C 18 R 4 C 19 R 5 C 5 VR 1 C 6	—	R 14 C 18 C 19 C 13	—	
GRID BIAS	Avo Scale : —	120 v. Radio } 41.0 to 4.0 Gram. } Measured between metal- lising and earth.	12 v. Radio : — Gram. : 1.25 Measured between metal- lising and earth.	12 v. Radio } 9.0 Gram. } Measured between "TAP" on Output Trans. and earth.	—	

† Varies according to signal.

NOTE.—Where two readings are given, the first is for volume control at minimum ; the second when volume control is at maximum.

Total H.T. feeds (including speaker) measured at "F + " on speaker transformer : 50mA.

Total H.T. voltage—measured between main H.T. feeder and earth (chassis) : 240 volts.

Voltage drop across speaker field—measured between "F" and "F + " : 115 volts.

Leakage of HT + to earth when all valves except U 12 are removed should not exceed 7 mA (voltage will rise to 450 v, when valves are removed).

ALL READINGS ARE ± 10 PER CENT.

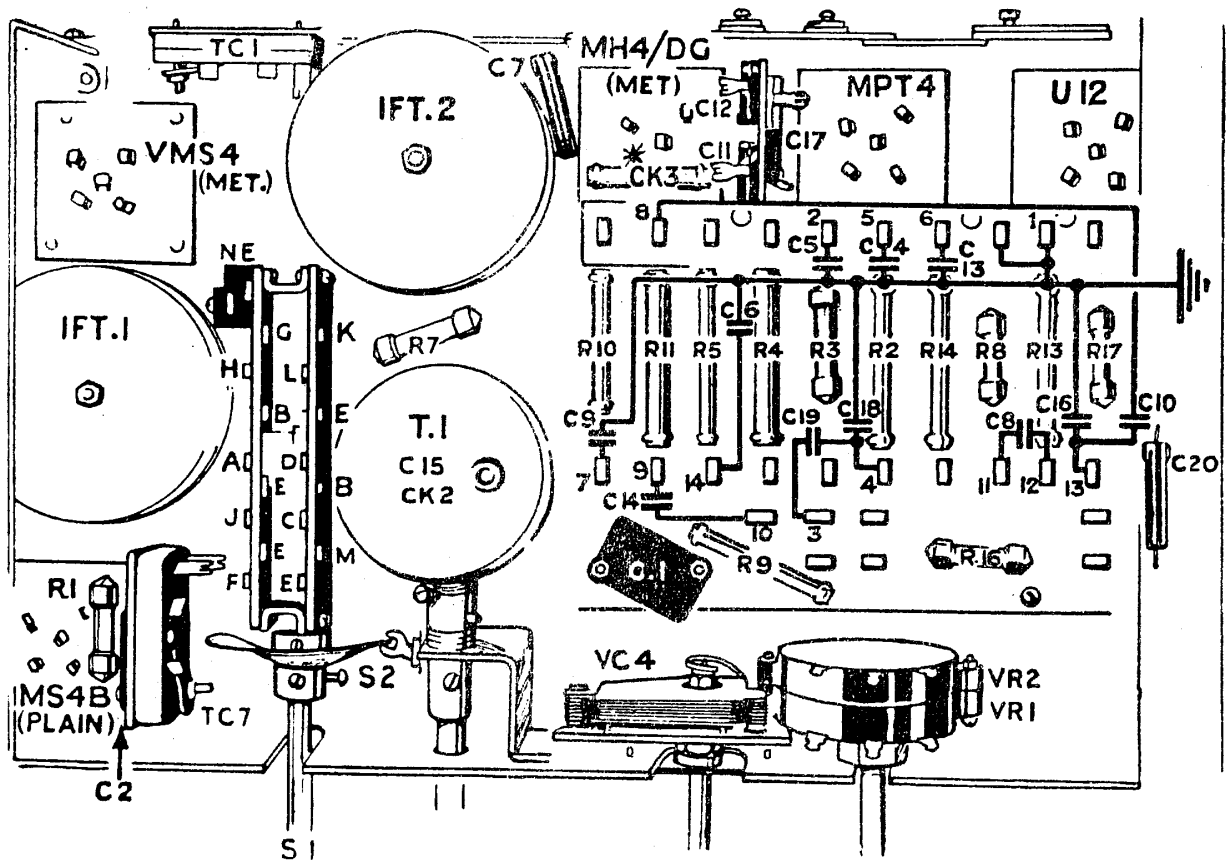


Fig. 2.

NOTE.—In certain instruments a 10,000-ohm resistance may be found in place of CK 3.

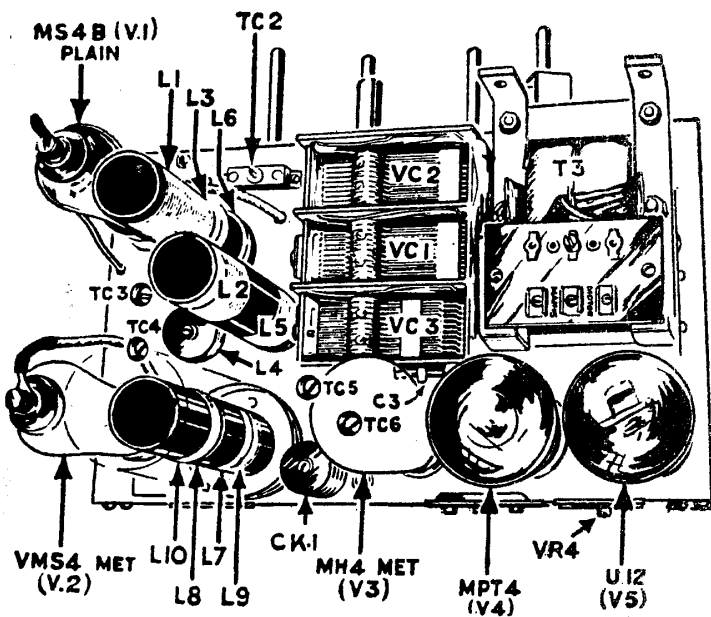


Fig. 3.

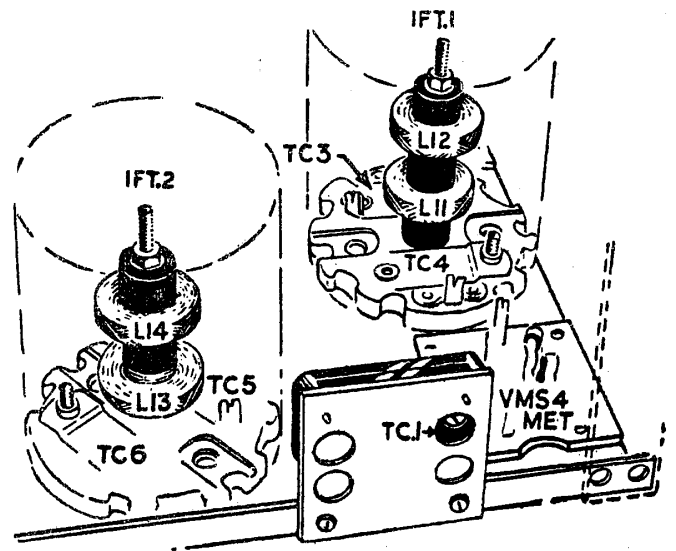


Fig. 4.

COIL CONTINUITY TESTS.

Do not measure resistances with instrument "live," or, with valves in.
ELECTRICAL VALUES ± 10 per cent.

Component Test No.	Component.	Wavechange Switch setting.	D.C. Resistance.	Where to measure.
1	Coil L 1	M.W.	72 ohms	Across ends.
2	Coil L 2	M.W.	3.5 ohms	Between fixed and moving vanes of VC 1.
3	Coil L 2 + L 3 ...	L.W.	16.5 ohms	Between fixed and moving vanes of VC 1.
4	Coil L 4	L.W.	0.1 ohm	End of coil and S 1 (contact A).
5	Coil L 5	M.W.	3.5 ohms	Between fixed and moving vanes of VC 2.
6	Coil L 5 + L 6 ...	L.W.	16.5 ohms	Between fixed and moving vanes of VC 2.
7	Coil L 7	L.W.	0.25 ohm	Ends of coil.
8	Coil L 8	L.W.	0.5 ohm	Ends of coil.
9	Coil L 9	M.W.	5 ohms	Between fixed and moving vanes of VC 3.
10	Coil L 9 + L 10 ...	L.W.	10 ohms	Between fixed and moving vanes of VC 3.
11	Coil L 11 } I.F.T. {	—	100 ohms	Across remote tags of TC 3.
12	Coil L 12 } 1 {	—	100 ohms	Across remote tags of TC 4.
13	Coil L 13 } I.F.T. {	—	100 ohms	Across remote tags of T.C 5.
14	Coil L 14 } 2 {	—	100 ohms	Across remote tags of TC 6.

DISMANTLING.

CHASSIS.

1. Release multiple speaker cord from spring clips on right of cabinet and disconnect tag ends of cords from transformer on speaker.

Refer to circuit diagram when reconnecting speaker cable.

2. Detach aerial-earth panel from left of cabinet by removing **wood screws**.

3. Remove four knobs from front of cabinet.

4. Take out the four screws fixing chassis to underside of cabinet.

SPEAKER.

1. Disconnect tag ends of multiple cable from speaker transformer.

Refer to circuit diagram, Fig. 1. when reconnecting cable.

2. Remove four nuts holding speaker to baffle.

Do not forget to replace the plain washers and the locking washers when reassembling. Do not interfere with the cross-headed screws on front of cabinet

REPLACEMENT OF PILOT LAMPS.

1. Remove the perforated metal plate from the bottom of cabinet.

2. Slack off the round-head screw holding the lamp bracket assembly and slide the bracket to one side and lift over screw-head.

Replacement lamps, which must be of the 6-volt screw-in type, must be screwed in firmly. A spot of wax or a slip of paper should be employed if lamp is slack in the holder.

H.F. TESTS AND ADJUSTMENTS.

Always re-adjust image suppressors after re-ganging H.F. or I.F. circuits.

DO NOT DISTURB THE WIRING ASSOCIATED WITH THE TRIMMER TC 2. THE CAPACITY OF THIS CONDENSER IS VERY SMALL AND DISARRANGEMENT OF WIRING MIGHT MOVE THE CRITICAL ADJUSTMENT POINT OUTSIDE THE SCOPE OF THIS COMPONENT.

TRIMMING OF I.F. TRANSFORMERS.

If a new unit has been fitted to an I.F. transformer, such as L 11, L 12, the circuits must be re-trimmed. An accurately calibrated modulated oscillator is required for this work, which should not be attempted unless adequate facilities are available.

First short the cathode of V 1 to earth (chassis) with a short piece of wire and loosely couple the output of oscillator to grid leads adjacent to TC 2. As an output meter an 0—5 D.C. milliammeter may be employed in the anode circuit of the second detector V 3 or, alternatively, an 0—3 A.C. voltmeter connected across the extra L.S. terminals.

If a D.C. milliammeter is used, the deflection will be downwards and the oscillator need not be modulated. When using an A.C. voltmeter a modulated signal must be employed, when the deflection will be towards maximum.

Trim in the following order, adjusting oscillator to the frequencies indicated.

1. Adjust oscillator to 128 kc.
2. Trim TC 3 and TC 5.
3. Adjust oscillator to 123 kc.
4. Trim TC 4.
5. Adjust oscillator to 125.5 kc.
6. Trim TC 6.

It is advisable to check adjustments, **always working in the above order.**

THESE ADJUSTMENTS CANNOT BE MADE ON BROADCAST SIGNALS.

ALWAYS REGANG H.F. CIRCUITS AFTER TRIMMING I.F. TRANSFORMERS.

RE-GANGING H.F. CIRCUITS.

This adjustment may be done on a broadcast signal, but a modulated oscillator ensures greater accuracy and simplifies the process. Use an output meter as instructed under "Trimming of I.F. Transformers." Couple the oscillator to the aerial lead-in. It is important that an aerial or a dummy aerial is connected to the instrument.

1. Unscrew the image suppressor TC 2 several turns.
2. Set oscillator (or receive station) on 210 metres.
3. Screw trimmer on VC 2 right up.
4. Adjust trimmer on VC 3 for maximum deflection.
5. Adjust aerial trimmer (TC 1) for maximum deflection.
6. Unscrew trimmer on VC 2 until signal is at maximum.

If receiver is "dead" below 240 metres the trimmer of VC 2 has been unscrewed too far.

7. Set oscillator (or receive station) on 1,000 metres.

8. Adjust TC 7 for maximum deflection.

DO NOT DISARRANGE WIRING ROUND THE COILS AND VARIABLE CONDENSER OR THE SET WILL BE THROWN OUT OF GANG.

ADJUSTMENT OF IMAGE SUPPRESSORS.

Powerful local signals may cause an "image" reception at some other part of the scale. This point has a frequency equal to that of the powerful signal minus twice the I.F. frequency; e.g., the "image" on London Regional 356 metres (843 kc.) is $843 - 250 = 593$ kc., or 506 metres.

Receive a powerful local signal and tune the receiver to its "image" point. If "image" is below 350 metres adjust TC 2 with a **non-metallic** screwdriver for minimum signals. If the "image" point is above 350 metres adjust L 4 (the mounting bracket of which has a suitable slotted fixing hole) for minimum signals. When using a modulated oscillator it is convenient to adjust TC 2 on the "image" of a 250-metre signal ("image" point at 315 metres) and L 4 on the "image" of a 350-metre signal ("image" point at 496 metres). Check over these adjustments as they are to a slight degree interdependent.

CORD DRIVES.

Use a superior flax fishing line having a breaking strain of approximately 42 lbs.

Approximate length of both cords (one instrument) 58 inches. In cases where both cords require replacing assemble condenser drive cord first.

REPLACEMENT OF CONDENSER DRIVE CORD (All Models except 438 and 439).

Refer to Fig. 5 and proceed as follows:—

1. Remove station scale from its frame.
2. Cut off approximately 24 inches of cord and splice on to closed end of "S" hook. The cord must now be drawn through a piece of hard wax to ensure freedom from slip.
3. Fully engage the vanes of variable condensers and (looking at the front of chassis) turn the condenser drive spindle fully clockwise.
See that the spring anchor plates on the cord drum are at the **top** of drum when vanes are fully engaged. The hexagon head screw fixes position of drum. Also see that the cheese head screw on the back of the cord drum is in the centre of its radial slot.
4. Hook the cord on to the rear left-hand anchor point of drum and bring the cord once round the wide rear channel of drum, in an anti-clockwise direction, down through aperture in chassis, and on to the right side of drive spindle.
5. Make four complete turns around the undercut portion of "tune" spindle in a clockwise direction.

Make sure that the spindle is kept in its fully clockwise position, and that the condenser vanes are fully engaged.

6. Bring the cord round as for a fifth turn and return the cord through aperture in chassis.
7. The cord must now be passed along the centre (narrow) groove of condenser drum in an anti-clockwise direction—only one turn being necessary.
Splice the end of cord on to the spiral spring so that coils of spring will be slightly opened when spring is hooked on to right-hand (rear) anchor point.

The cord will cross from centre to rear groove before completing one revolution of drum.

REPLACEMENT OF POINTER CORD (Both Models).

Proceed as follows :—

1. Remove station scale from frame, and remove the cursor guide rod and pointer.
2. Take approximately 34 inches of cord and splice on to the closed end of "S" hook. Draw the cord several times through a piece of hard wax to ensure freedom from slip.
3. Pass the cord through the two small holes in the cursor so that hook end of cord is on the right side of pointer and the distance between end of hook and nearest cursor hole is exactly $13\frac{1}{8}$ inches.
4. Replace pointer on guide bar and replace guide bar.
5. Slide pointer fully to the right and fully engage condenser vanes.
6. Slip hook end of cord over front right-hand anchor point and pass the cord clockwise once round the cord drum (front channel), and over the right-hand pulley.
7. Now take the free end of cord under left-hand pulley and pass cord clockwise along the centre (narrow) channel of cord drum—only one turn is necessary.
8. Splice the end of cord on to the spiral spring so that coils of spring will be slightly opened when spring is hooked on to left-hand (nearest) anchor.

The cord will cross from centre to front groove before completing one revolution of drum.

ADJUSTING THE POINTER.

This adjustment may be made without removing chassis from the cabinet :—

Proceed as follows :—

1. Accurately tune in a known station at the top end of the medium waveband.
2. Having switched off again (remove MH 4 valve—Table Model only) slacken off the cheese head screw on the back of the cord drive drum.
3. Carefully hold the moving vanes of variable condensers, and move the tuner knob until the station being received is accurately indicated.
4. Re-tighten the cheese head screw and check over the pointer reading.

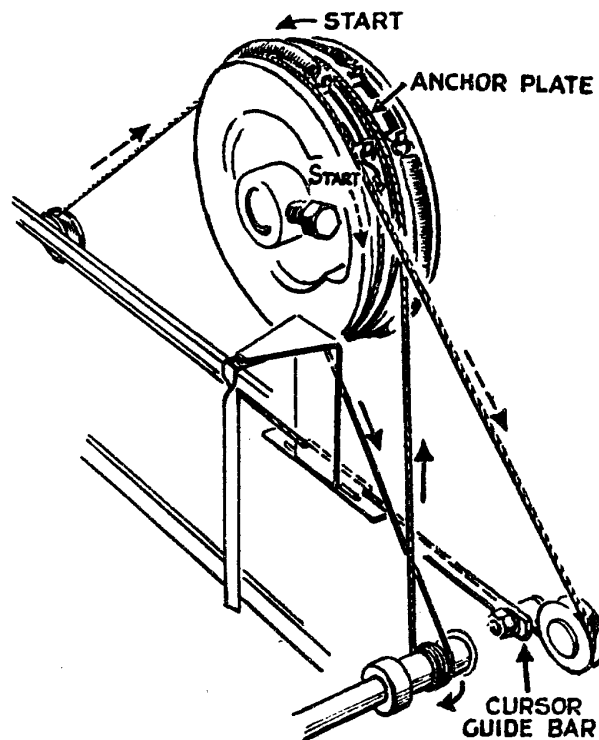


Fig. 5.

MODEL 438 CORD DRIVES. REPLACING THE CONDENSER DRIVE CORD.

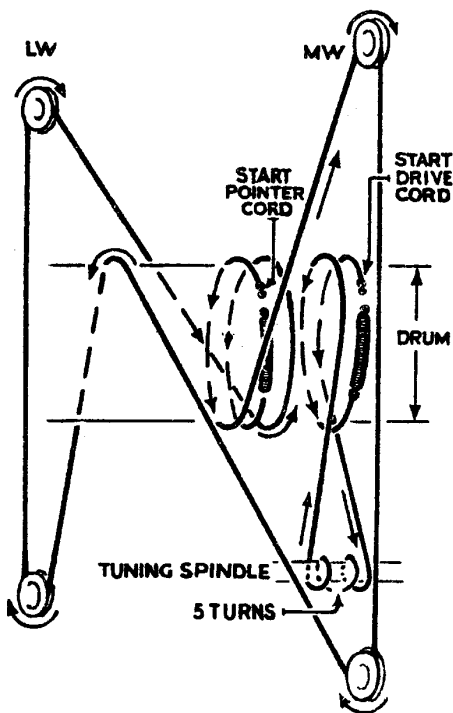
Use a superior flax fishing line having a breaking strain of approximately 42 lb.

Approximate length of both cords (one instrument) 83 inches. In cases where both cords require replacing, the condenser drive cord should be assembled first. Proceed as follows:—

- (1) Cut off approximately 24 inches of cord and splice on to closed end of "S" hook. Draw the cord through a piece of hard wax to ensure freedom from slip.
- (2) Fully engage the vanes of variable condensers and turn the drive spindle to its clockwise stop position. See that the spring anchor plates on the cord drum are at the top of drum when vanes are fully engaged. The hexagon head screw fixes position of drum. Also see that the screw A, Fig. 7. is in the centre of its radial slot.
- (3) Start the condenser drive cord on the back left-hand anchor point, and proceed (as Fig. 6) to wind five complete turns around drive spindle, being careful to keep spindle in its clockwise stop position.
- (4) Bring cord up to drum and wind as shown in Fig. 6 hooking spring between the loop end of cord and the remaining hook on the anchor plate. It is most important that the cord lies in the grooves provided on the drum (see Fig. 7).

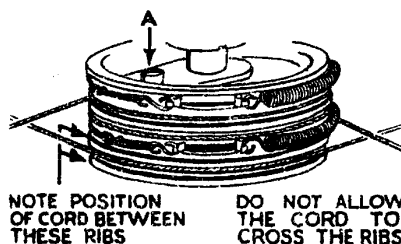
REPLACING THE POINTER CORD. (Fig. 6)

- (1) Take approximately 59 inches of cord and splice on to the closed end of "S" hook. Draw the cord through a piece of hard wax to ensure freedom from slip.
- (2) Remove the cursor guide bars.
- (3) Thread the cursors on the cord as shown in Fig. 9—the distance between the end of hook and the first hole in cursor should be exactly $15\frac{1}{2}$ inches. Adjust the second cursor on the cord so that the distance between the inside holes of the pair of cursors is exactly $18\frac{1}{2}$ inches. Now refer to Fig. 6.



- (4) Set condenser vanes fully in, and hook end of cord on to "S" hook and "S" hook on to anchor plate as shown.
- (5) Pass cord round drum and up over top of M.W. pulley.
- (6) Take cord round lower M.W. pulley, over top of drum, and under lower L.W. pulley.
- (7) Take cord over top L.W. pulley and around drum — one complete turn.
- (8) Assemble coil spring in position as shown.
- (9) Replace pointer guide bars by threading them through the cursors and securing at top and bottom.

ADJUSTING THE POINTER. (See page 12)



PART 2.--INFORMATION RELATING TO RADIOGRAMS ONLY

CURRENT CONSUMPTION.

Radio, 65 watts (approx.).

Gram., 75 watts (approx.).

FREQUENCY RANGE.

50 to 60 cycles.

DIMENSIONS.

Height.	Width.	Depth.
34 inches.	23 inches.	16 inches.

WEIGHT.

87 lb. nett.

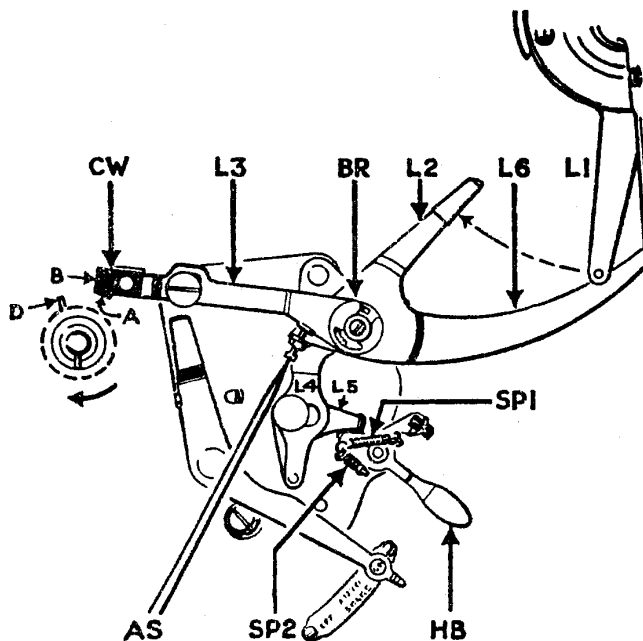


Fig. 8.—Note the correct position of tone arm lever (L 1) in the fork of lever L 2.

DISMANTLING.

ACCESS TO COMPONENTS (underside of chassis).

Remove the 2 wood screws on right of radio control panel (top of instrument).

The side panel of cabinet against which the radio chassis is mounted may now be removed.

HOW TO REMOVE CHASSIS.

1. Remove R.H. side panel as detailed above—"ACCESS TO COMPONENTS."
2. Remove P.U. plugs from back of chassis and disconnect motor and speaker leads.
3. Detach Aerial—Earth panel by removing 4 wood screws in side of cabinet.
4. Remove the 2 remaining screws in the top of radio control panel and remove the knobs. The control panel may now be lifted out.
5. Remove the 4 screws holding chassis to side bearers of cabinet.

REPLACEMENT OF PILOT LAMPS.

Remove radio control knobs and control panel and take out the side panel of the cabinet. Slack off the round-head screw holding the lamp bracket assembly and slide the bracket to one side and lift.

Replacement lamps, which must be of the 6-volt screw-in type, must be screwed in firmly. A spot of wax or a slip of paper may be employed if lamp is slack in the holder.

LOUDSPEAKER.

Type 10955 M.

PICK-UP.

See separate service manual (ready shortly).

MOTOR.

Type 228 B. For service instructions, see separate service manual (already issued).

THE AUTOMATIC BRAKE.

WHAT IT WILL DO.

This brake will automatically stop the turntable revolving and switch off the motor at the end of all 8-inch, 10-inch or 12-inch records having a quick run-in groove.

TO PLAY NON-STANDARD RECORDS.

The auto brake lever must be set to the "OFF" position and the motor stopped by the handbrake H.B. (Fig. 8).

HOW IT WORKS. (Read carefully before attempting adjustments.)

The pick-up arm travels across record until the point is reached when lever L 1 slowly commences to push lever L 2 (rubber covered arm). This slight pressure is transmitted to the brake lever L 3 by the friction bearing BR.

So long as the needle progresses over the record at the normal rate (obtained only by the actual playing of the record), the movement of the pick-up arm is not enough to move L 3 sufficiently for the pawl CW to engage fully with the tooth D on the frictional collar around the turntable bush.

The tooth engages with face A, thus pushing the pawl away at each revolution.

When, however, the end of the record is reached and the spiral "run-in" groove gives the pick-up arm a more rapid movement, the increase in speed of movement is sufficient to cause the pawl CW to move far enough towards the turntable spindle for the tooth D to strike face B, thus actuating the brake and operating switch of the motor.

NOTE.—A faint regular click is normal with this type of brake.

ADJUSTMENT OF BRAKE.

Screw AS is provided to exert a positive movement to lever L 3 and to transmit via L 4 and L 5 the necessary movement to actuate the "MOTOR" switch.

To set screw refer to Fig. 8 and proceed as follows :

1. Slack off locking nut of screw AS, retard the screw and set the switch to the "OFF" position and the "auto-brake" lever to the "ON" position.
2. With the pick-up on the rest, as shown in Fig. 8, adjust screw AS so that there is just a little clearance (about $\frac{1}{16}$ -inch) between lever L 6 and the pin on lever L 1.
3. Tighten up the lock nut, being careful not to alter the adjustment of AS.

If at any time the spring SPI on the hand brake is renewed or replaced, make sure that the axis of the spring lies as far distant as possible from the centre of the pivot of the H.B. lever, otherwise the friction brake may fail to operate in conjunction with the automatic stop.

BRAKE FAULT TABLE.

Symptom.	Suggested Action.
Brake does not operate	See that the tone arm pin is correctly engaged between the brake levers.
Auto brake will not switch on the motor	Adjust screw AS as directed.
Auto brake will not function at end of record	See that auto brake lever is set to "ON" position. Increase friction at BR. To do this slide the flat disc from the groove in boss. A special spring washer will be disclosed, the arms of which should be bent down SLIGHTLY to increase effective thickness.
Brake fails to operate but gives a series of clicks	Increase friction at bearing BR by bending arms of spring washer. NOTE.—Excessive friction at BR will cause undue record wear.
Friction brake does not operate with the auto brake	See that the springs, SP 1 and SP 2, are in position (see also note under 'Adjustment of brake,' above).

MODEL 512 CORD DRIVES (Fig. 9).

Use a superior flax fishing line having a breaking strain of approximately 42 lb.

Approximate length of both cords (one instrument), $63\frac{1}{2}$ inches. In cases where both cords require replacing, the condenser drive cord should be assembled first.

REPLACEMENT OF CONDENSER DRIVE CORD. (See page 11)

REPLACEMENT OF POINTER CORD.

- (1) Remove station scale from frame, and remove the cursor guide rod and pointer assembly.
- (2) Take approximately $39\frac{1}{2}$ inches of cord and splice on to the closed end of "S" hook. The cord must be drawn several times through a piece of hard wax to ensure freedom from slip.
- (3) Thread the free end of cord through the bottom holes in cursors as shown in Fig. 9 and pull through until distance between end of hook and first hole in cursor is exactly $15\frac{1}{2}$ inches.
- (4) Replace cursor guide rod and pointer assembly.
- (5) Slide pointers fully to the right and with the condenser vanes fully engaged, place the hook end of cord on the front (right) anchor point, pass the cord clockwise once round the drum, and then over the right-hand pulley.
- (6) Now take the free end of cord round the left-hand pulley and proceed along the centre (narrow) channel of cord drum.
- (7) Make one turn around drum in a clockwise direction and then splice the cord on to the spiral spring so that coils of spring will be slightly opened when spring is hooked on to the left-hand (front) anchor point.

The cord will cross the centre to front channel before completing one revolution of drum.

ADJUSTING THE POINTERS.

An adjustment affecting **both** pointers may be made without removing the radio control panel.

ADJUSTMENT OF BOTH POINTERS. (See page 12).

INDIVIDUAL ADJUSTMENT OF POINTERS.

If medium band is incorrect and long waveband correct or *vice versa*, the erring scale pointer must be adjusted. To gain access to pointer fixing screws the knobs and the radio control panel must be removed—see dismantling particulars.

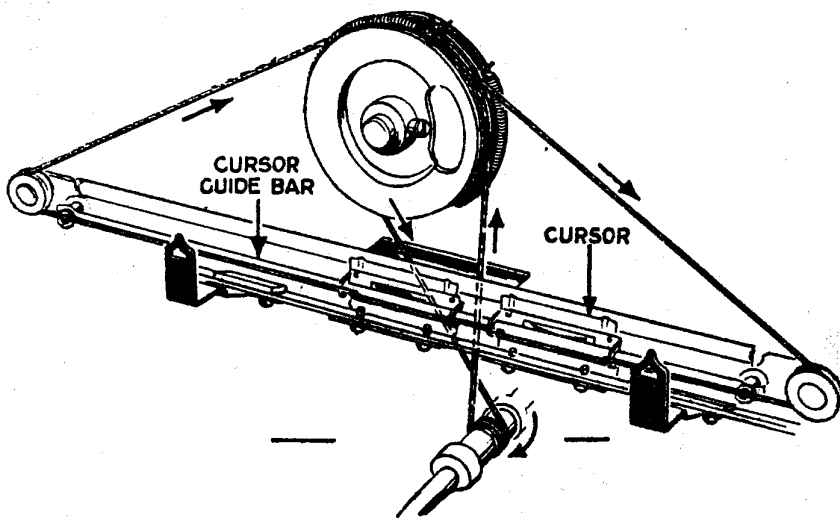


FIG. 9.