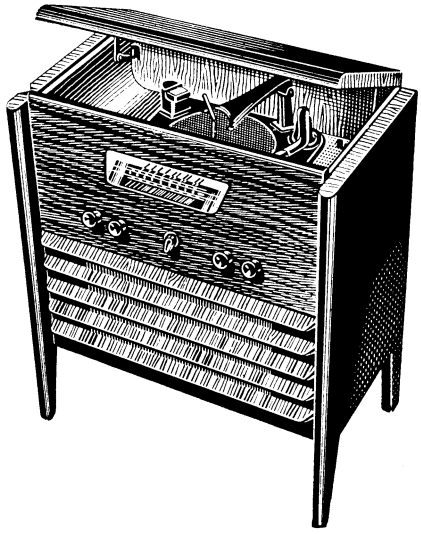
MURPHY SERVICE INSTRUCTIONS

MURPHY RADIO LTD
WELWYN GARDEN CITY · HERTS
PHONE: WELWYN GARDEN 800

THE A138R
RADIO-GRAMOPHONE



(*Control Positions*)

TUNING, WAVERANGE, R/G, VOLUME, TONE ON/OFF

MAINS SUPPLIES:	Home Model: 200–250 volts, a.c., 40–60 c/s. Export Model: 90–250 volts, a.c., 40–60 c/s.
WAVE RANGES:	Short Waves: 16–50 metres Medium Waves: 200–550 metres Long Waves: 900–2000 metres
INTERMEDIATE FREQUENCY:	465 Kc/s.
VALVES:	Mazda: 10C1, 10F9 (two), HL41DD, 10LD11, PEN44 (two), UU8.
SCALE LAMPS:	Two Osram 6·2 volt, 0·3 amp. (m.e.s.)
FUSE:	2 A. PAK type
SPEECH COIL IMPEDANCES:	Each speaker 3 ohms.
EXTENSION LOUDSPEAKER:	See page 5.
CABINET DIMENSIONS:	33½ in. high, by 28½ in. wide, by 17 in. deep.
TOTAL WEIGHT:	60 lb.
CONSUMPTION:	133 watts.
RELEASED:	April 1949.
PRICE:	£64 plus P.T.

CIRCUIT DESCRIPTION

The valves. Eight valves are used in the A138R, V1, V2, V4, and V5 being of the B8A range. V1, V2, and V5 are fed in series from one tap on the mains auto-transformer, and V4 from a separate tap. Four-volt valves are used for the output stage as there are no suitable alternatives in the B8A range, and for the gramophone pre-amplifier to avoid the introduction of hum from the heater supply.

The power supply. An auto-transformer is used for power supplies. The economies effected by this system increase as the anode current of a set becomes larger, and in the A138R with its push-pull connected PEN44 output stage, the saving is about 40 per cent as compared with the cost of a conventional double-wound type. This arises from the fact that the greater part of the a.c. input to the rectifying valve is drawn directly from the mains instead of by electro-magnetic induction, as in a double-wound transformer. Consequently a much smaller iron core can be used, effecting the marked saving referred to.

A mains filter is provided in the usual way. The power rectifying valve is a UU8 connected in a half-wave circuit, each anode having its own anti-sputter resistance. As the heater and cathode of this valve are joined internally, it is necessary to provide an isolated 4-volt secondary winding for supplying its heater.

The aerial and f.c. circuits. The aerial circuit follows the usual Murphy practice, including facilities for fitting local station aerial filters which are mounted inside the cabinet, as described under Aerial Filters on page 12. The frequency changer circuit is also quite conventional except that the valve screen voltage is obtained from a potential divider formed by two resistors, instead of from the more usual series resistor. By thus restricting the rise of screen volts when a.v.c. is applied, the gain reduction for a given negative a.v.c. voltage is increased, resulting in better a.v.c. characteristics. Some reduction in the signal handling capacity of the frequency changer also occurs, but this is not a disadvantage when local station filters are used.

The i.f. and detector stages. The i.f. amplifier valve is a 10F9, and the i.f. transformers are of the pattern which has been standardized in recent Murphy sets. The delayed a.v.c. diode is fed from the primary of the second i.f. transformer and thus provides a less selective form of a.v.c.; the signal diode is fed from the secondary. These diodes are situated in an HL41DD, V3, the triode portion of which is used as the gramophone pre-amplifier. Attention is directed to the tone correction arrangement incorporated in the signal diode circuit which increases the a.f. response at the higher frequencies, thus off-setting the loss in the i.f. stages. This is effected by shunting the top half of the diode load (R16) by a small capacitor (C37). The combined effect of this top lift, and that due to negative feedback is to produce an overall response curve similar to that shown in Fig. 1. The slight rise at about 3 Kc/s is due to the fact that the top lift circuits produce a nearly linear rise with frequency, but the i.f. response decreases only slowly at first and then falls off rapidly.

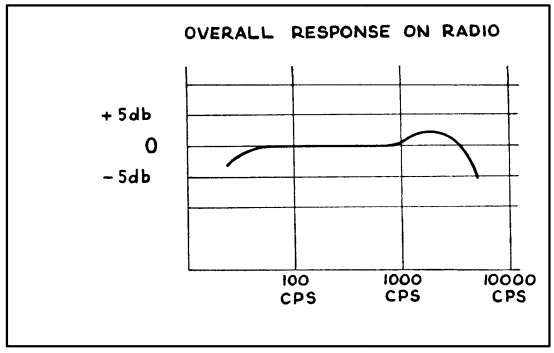


Fig. 1

The a.f. stages. A pentode (10F9) a.f. amplifying stage precedes the phase splitter and as this is a point particularly susceptible to hum, the heater of the valve has a separate tapping on the auto-transformer. This allows the heater to be connected to chassis on one side, and also by a suitable choice of voltage for the tapping, permits the valve to be under run, thus producing a further reduction in the hum level.

Some explanation of this statement is desirable because in normal operation the under-running of a valve heater is just as bad for the valve life as over-running. In this case, however, the valve is designed to be capable of operating with anode currents of 8 mA or more, whereas the operating current is under 1 mA, so that the emission is ample even at slightly reduced heater volts.

After the a.f. stage, a 10LD11 is used as a phase-splitter to feed the push-pull output stage. Anode and cathode loads are used in the triode section of the valve to obtain outputs in opposite phase. The diodes are not used and are connected to the cathode.

The output stage. The output stage incorporates two PEN44 valves in push-pull, delivering an output of about 12 watts with a very low degree of distortion. This freedom from distortion is due to the substantial negative feedback applied via the extra winding on the output transformer and the cathode resistor of the a.f. stage. Damping of the loudspeaker resonances is also a function of this feedback. The equivalent circuit is shown in Fig. 2.

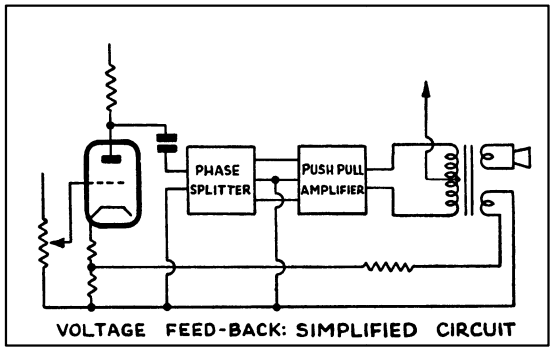


Fig. 2

The feedback circuits. Most radio textbooks quote the basic principles of negative feedback and it will suffice here to state that the overall gain of the amplifier, in respect of the required signals and distortion, is reduced and that with a high degree of feedback the overall gain becomes substantially independent of variations in electrode supply voltages and valve characteristics. An increased undistorted signal input is, however, required.

In the A138R the feedback circuits have been used to give some additional tone correction by making the feedback amplitude dependent on frequency. The switch S7 in the last two positions of clockwise rotation introduces high frequency attenuation in the feedback chain via R51, C62, and R40. The net result is that the overall gain of the amplifier is increased at the higher audio frequencies.

A point which may not be so well appreciated is that transients (sudden pulses with steep sides) can shock-excite the loudspeakers into a momentary damped oscillation, see Fig. 3. A particular case of this is the square waveform or anything approaching it, such as a musical note rich in harmonics. The initial oscillation may have considerable amplitude but this can be reduced by damping the speakers, thus minimizing this tendency.

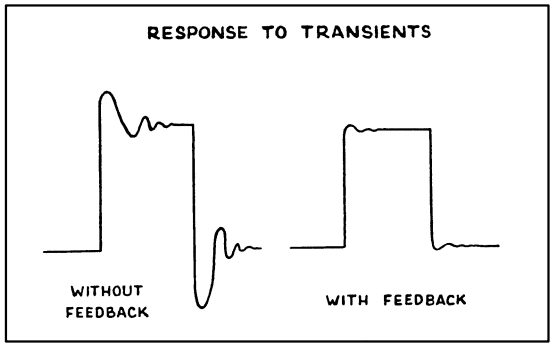


Fig. 3

Negative feedback can reduce the effective output impedance of the amplifier, which in the A138R is reduced by a factor of 5 : 1. The impedance becomes approximately 800 ohms which, after transformation by T3, provides really useful damping for the loudspeakers. As is well known, loudspeaker speech coils have a tendency to overshoot on heavy passages of speech or music, and some means of restricting the speech coil excursions on such occasions is helpful towards preventing overloading and distortion in the output stage. When the speech coil moves in the magnet gap, a back e.m.f. is generated. If the complete circuit including the speech coil is of low impedance then the reverse current caused by the back e.m.f. is of large amplitude and the resultant magnetic field opposes effectively the movement of the speech coil.

The loudspeakers. The two loudspeakers of unequal size call for comment, since they are equally driven by the output transformer T3. To

obviate overloading of the small unit, the magnet has been reduced in dimension and field strength. The junction between the speakers is connected to a centre tap on the transformer secondary winding, thus ensuring that changes of speaker impedance with frequency do not upset the power distribution.

The gramophone circuit. The output from the pick-up is taken via a step-up transformer to the triode portion of an HL41DD (V3) where, after amplification, the signal is bass-corrected for the recording characteristic and passed to V4. The subsequent stages are arranged in a similar fashion to that adopted on radio.

Frequency response on gramophone. The voltage developed across the pick-up terminals when played on a gliding frequency record is constant from above 12 Kc/s down to about 300 c/s; below that the output falls off at the rate of 6dB/octave.

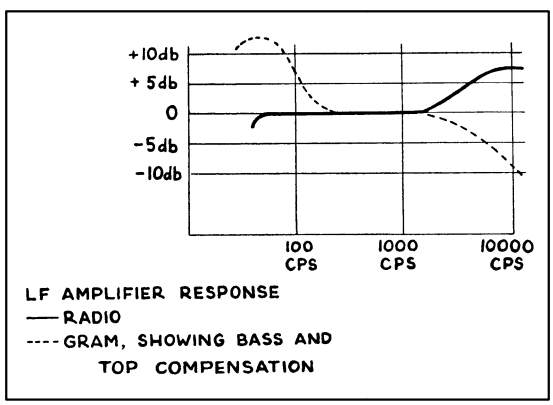


Fig. 4

Prolonged listening tests have shown that it is more desirable to have a drooping high frequency response than one that is flat. Part of the droop is necessary to compensate for a certain amount of pre-emphasis used on modern recordings. In order to arrive at this response in the "138" amplifier it has been arranged that the pick-up transformer step-up falls off slowly above 5 Kc/s. This is done by a capacitive shunt across the transformer secondary winding comprising the screened lead capacitance and the input capacitance of the amplifying stage following it. Valve input capacitance can be many times that indicated in the maker's valve data, due to a phenomenon known as Miller effect. This simply increases the grid to anode capacity by an amount depending on the gain of the valve. For the HL41DD used on the A138R the Cga is 3·5μμF, the valve gain 20, and Cgk is 3·5 μμF. By reason of the Miller effect the input capacity becomes (3·5 + 20 × 3·5) μμF=73·5 μμF, which is very much greater than the value obtained from the maker's data.

Bass Compensation. Compensation for the recording characteristics is achieved by making the gain of the first amplifying stage vary inversely with frequency up to 300 c/s. A simple resistance-capacitance network (R24, R26, C42, C41) in the anode circuit accomplishes this (Fig. 5).

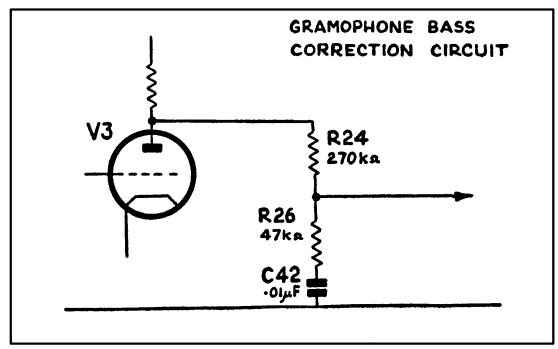


Fig. 5

Hum reduction. The Murphy moving coil pick-up has a voltage output of approximately 200 micro-volts at 50 c/s on a standard record. This is, of course, quite a low output for a pick-up. If a signal-to-noise ratio of 60dB (1000 : 1) is aimed at, the hum voltage developed across the pick-up transformer primary winding must be less than 0·2 micro-volts, hence the elaborate screening required from the

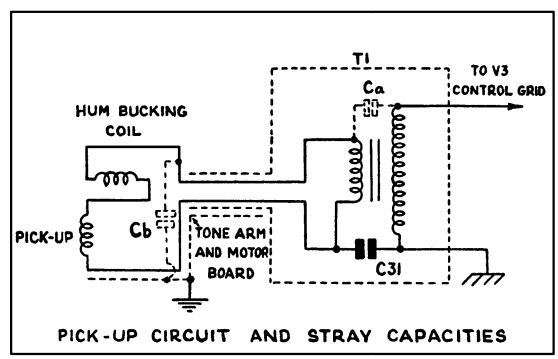


Fig. 6

pick-up to the transformer and to the first amplifying stage. A more detailed explanation of the hum paths may probably be useful. For safety reasons, all accessible metal parts, which include the tone arm and pick-up cover plate, are connected to the earth terminal. When an earth is used on the set there can be a potential difference between the motor-board and receiver chassis equal to the mains voltage.

By reference to the diagram of the pick-up connections (Fig. 6) it can be seen that, as a mains voltage can exist between chassis and the earthed tone-arm, a hum voltage can be developed across the transformer primary winding due to the current through C31, the primary winding and Cb, which is shown dotted. If Cb is removed, this current and hence the hum, would stop. Although Cb cannot be removed completely, it can be made very small by inserting an electro-static screen between the tone-arm and the pick-up leads and connecting it to chassis. To prevent a short circuit of the mains input between the screen and tone-arm a very good p.v.c. insulating sheath is put over it.

The stray capacitance between primary and secondary windings, Ca, can cause hum if Cb is large or C31 very small. This hum has been removed by making C31 very large compared with Ca.

Hum voltages can also be induced in the pick-up itself and the pick-up transformer. The pick-up hum voltage is balanced out by connecting in series opposition with it, a suitable hum-bucking coil; this is fitted to the pick-up magnet assembly. The pick-up transformer has been placed in a heavy steel box which can be oriented to keep the hum voltage induced in the windings, to a minimum.

MECHANICAL NOTES (RADIO)

(*Details of the Record Changer Unit are on Pages 20 to 34*)

General. The receiver circuits are carried on two chassis, one of which is mounted on the hinged front panel of the cabinet. The interconnecting cables are shown in detail in the diagram on page 12.

To lower the front panel. Lift out the three plated caps from the inside front wall of the gramophone compartment and, standing in front of the receiver, remove the three bolts that are uncovered. The front panel can then be lowered until it is supported by the retaining cord (or bracket).

Chassis mounting. The chassis is secured to the cabinet by four slotted bolts. The two rear bolts are fitted with nuts, but the other bolts, including those in the power unit, are fitted with plate nuts let into the cabinet.

Removal of the receiver chassis. First, remove the control knobs and then lower the front panel as described above. Remove the chassis cover and unclip the pointer drive cord from the carrier; disconnect the interconnecting leads associated with this chassis and unclip the dial lights. After removing the chassis bolts the chassis can be lifted away from the cabinet.

Removal of the front panel. The panel must be lowered and, if the chassis is in position, the leads previously mentioned must be disconnected, with the addition of the loudspeaker lead. The panel hinges have the fixing bolts attached, and the nuts (with washers) are underneath the floor of the cabinet; these nuts should be removed. After the supporting cord has been freed, the panel can be lifted away from the cabinet. Care should be taken to avoid damaging the tuning scale when the panel has been removed.

Extension loudspeaker. Sockets are provided at the rear of the instrument for connecting an external loudspeaker, but there is no provision for disconnecting the internal speakers. An impedance of 3 to 7 ohms has been recommended, but if there are negligible losses in the extension leads, or a speaker of low power handling capacity is contemplated, an impedance in the region of 6 to 10 ohms is preferable.

The tuning coils. The aerial coil is secured by a single fish-tail clamping plate, which is screwed directly to the chassis. The l.w. and m.w. oscillator

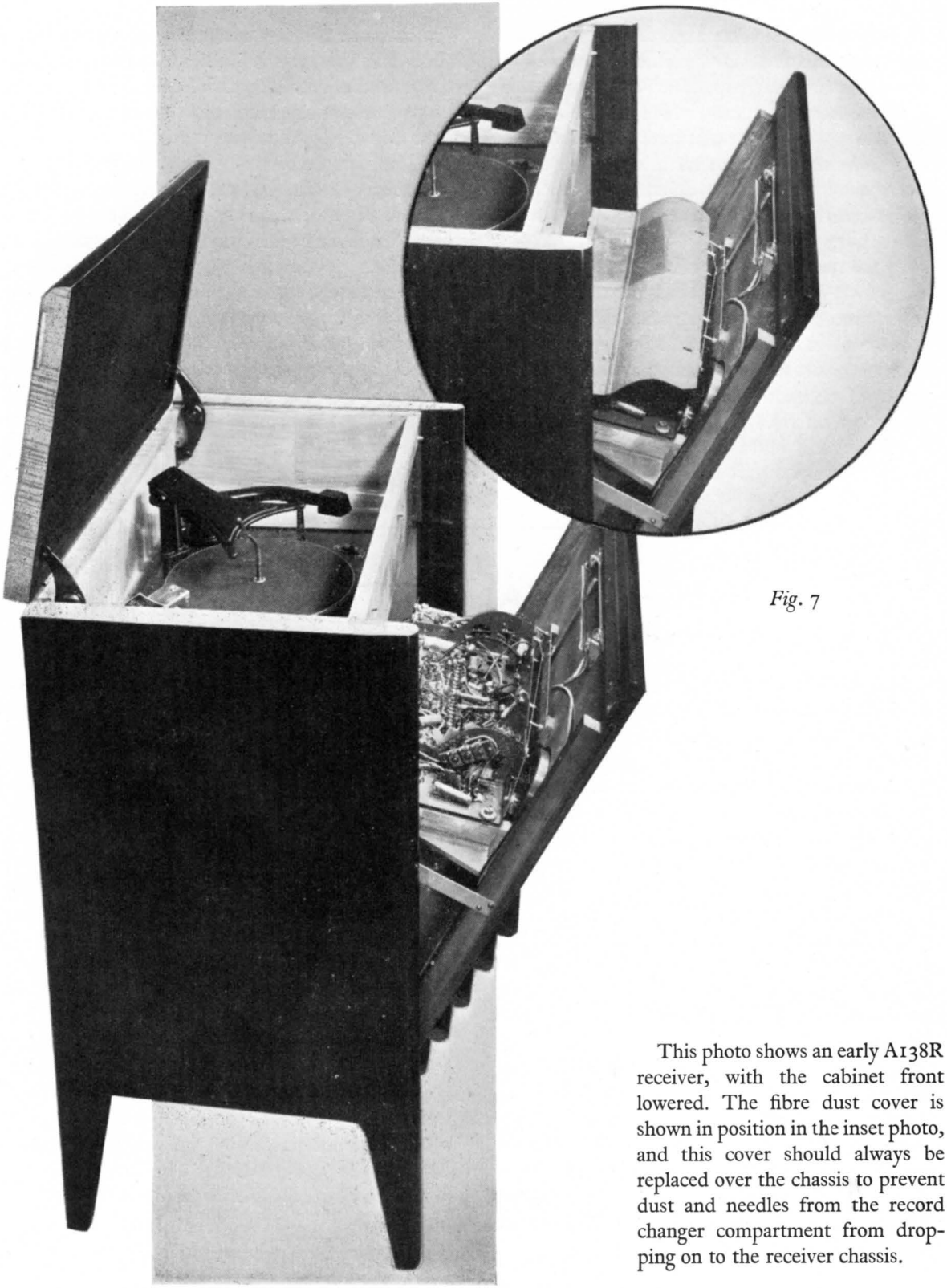


Fig. 7

This photo shows an early A138R receiver, with the cabinet front lowered. The fibre dust cover is shown in position in the inset photo, and this cover should always be replaced over the chassis to prevent dust and needles from the record changer compartment from dropping on to the receiver chassis.

coil former is held in place by two small brass clamps which are passed through holes in the chassis and secured by twisting. The s.w. oscillator coil is soldered to the earth tag and is thus rigidly mounted. When replacing the l.w. oscillator coil, the "nick" in the former must coincide with the position of the black tag shown in the layout diagram on page 11.

Scale fitting details. The "exploded" view in Fig. 8 gives a clear impression of the component parts of the scale fixture and the method of mounting. The mounting plate D is secured by the wood screws E to the front of the cabinet. The scale is then arranged with its front edge projecting through the appropriate slot in the front of the cabinet, and held accurately so that the perforations in the scale are in line with the pressed bushes on the mounting plate. The right-hand side is then secured by the self-tapping screw L and washer J. When fixing the left-hand side, care must be taken to ensure that the self-tapping screw K, passes through the washer J, the two spring washers H, and the spacer G, in turn. These washers, together with the elongated perforation through the scale, are designed to allow for expansion stresses, occasioned by the proximity of the pilot lamps to the Perspex scale, and also to provide tolerance for dimensional variations.

Pointer mechanism. The arrangement of this mechanism is apparent from Fig. 8. Here the holder M is seen to secure the pointer N in a suitable

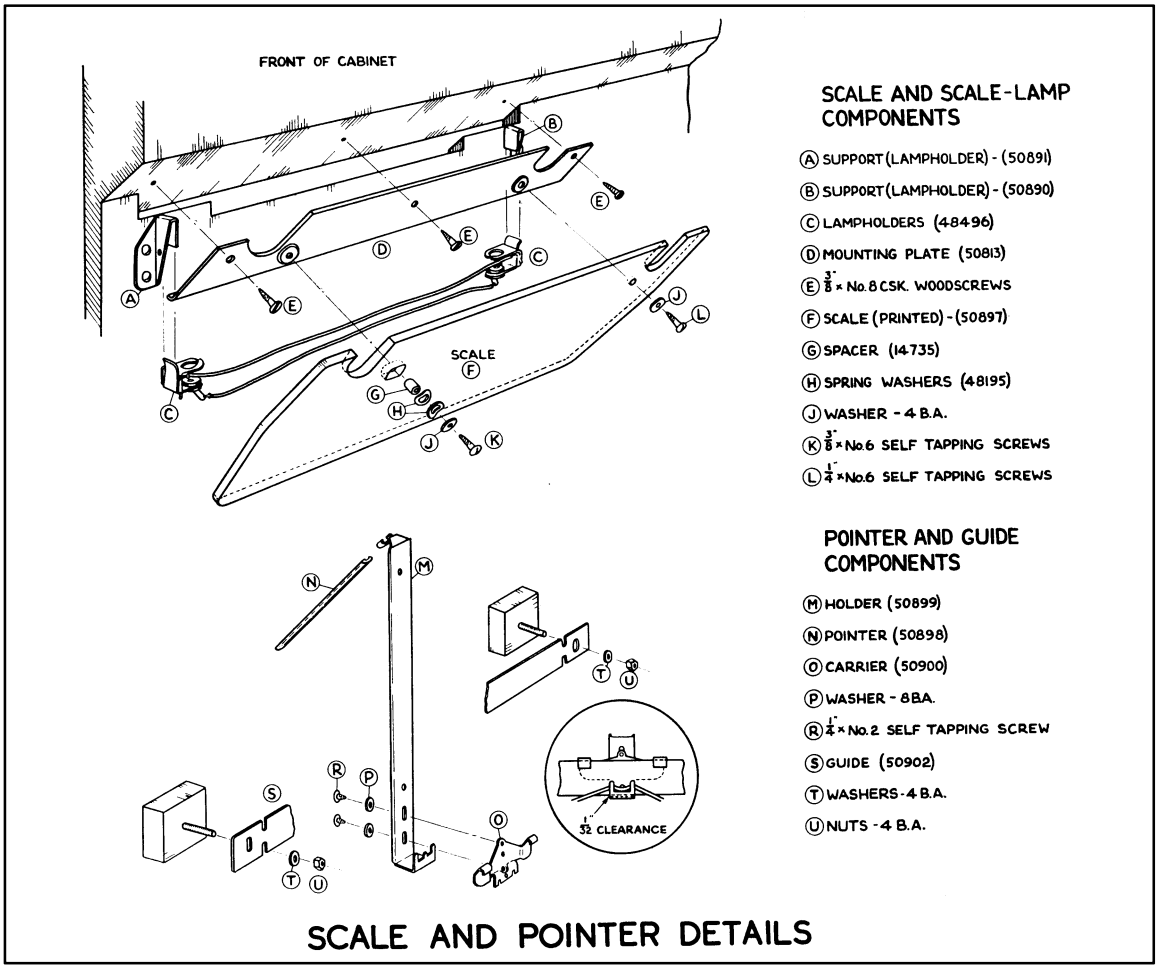


Fig. 8

clip at its top end. This forms a "goose-neck" device and permits the pointer to project through the slot in the cabinet, beneath the Perspex scale, at the same time providing a transmission of drive to the pointer via holder M. The carrier O is fixed to the other end of M by self-tapping screws R and P, and this carrier is designed to ride upon the guide S. The guide S is seen to be secured at either end by washer T and nut U. The drive cord is interlaced between the three projections on the lower tip of holder M; this is illustrated in the inset. It will be observed that the holes on the holder M, through which the screws R and P pass, are elongated, thus permitting the proper clearance of $\frac{1}{32}$ in. to be obtained between the guide and the portion of holder M which passes underneath. This clearance is important; if too great, the drive may cause lateral tilting of holder M, if too little, the carrier O may bind upon the guide.

Adjustment of the pointer is also catered for by the securing nuts for the guide. These permit a degree of up and down movement, ensuring that the pointer does not contact the cabinet or scale. Should this movement prove insufficient and the pointer is still found to rub on the cabinet, further adjustment is provided by the special construction of the guide. This takes the form of slotting at either end, which permits some twisting of the guide, and ought to fulfil all requirements. Hence the holder need not be bent, under any circumstances, but the foregoing adjustment carried out to effect clearance.

Scale lamps. When fitting scale lamps, it is important to ensure that their holders are so placed in the clips that the lamp filaments are aligned with the scale edge. This is important as the illumination is conveyed from the edge, within the Perspex of the scale itself. Two appropriate indentations are cut in the scale to facilitate this adjustment.

See that the wires between the lamps do not interfere with the movement of the tuning pointer.

Replacing the speaker silk. The speaker silk is glued to the front of the baffle, consequently the baffle must first be removed from the cabinet in order to carry out a replacement. Withdrawing this unit also effects removal of the speakers and the receiver chassis, hence it is again necessary to disconnect all leads to the receiver chassis and also the loudspeaker plug. Thereafter the wood screws, three on either side, three along the bottom edge, and four along the top of the baffle are withdrawn.

The unit is not then entirely free, as the speaker silk, which is glued to it, is also glued to the walnut rails across the front of the cabinet. This necessitates the baffle being carefully pulled toward the rear of the cabinet, thus releasing the silk from the rails. The unit may then be lifted out and the silk replaced.

It is important to remember that when replacing the baffle, a little glue must be applied to the backs of the rails to secure the silk. If this glue were omitted the high audio output would cause extreme movement of the silk which, if touching the rails, would cause "buzz".

CORD DRIVE

The pointer drive. Using 45½ in. of cord, thread one end through the tuning spindle bracket and then both ends through the slot in the drive drum. Holding the ends evenly, knot the cord on to the spring, $\frac{5}{8}$ in. from the cord ends. Lay the cord around the pulleys and drive drum as shown in Fig. 9. After checking that the cord lies evenly throughout the system and that no twisting occurs where the two ends approach the spring, hook the spring into the anchoring hole in the drum. The extended spring should measure between 1⅛ in. and 1¼ in.

The primary drive. Unclip the spring which holds the tuning control spindle in position and withdraw the spindle. Using 21 in. of cord, pass the ends through the slot in the drive drum, and knot them evenly on to the spring. Make two loops in the cord as shown in the diagram, and then replace the tuning control spindle, passing it through these loops. Place the cord over the drive drum and hook the spring into position. The extended spring should be between 1⅛ in. and 1¼ in. in length.

Adjustment. After replacing either cord, turn the tuning control through its full travel two or three times to check that the drives operate correctly. Set the drive

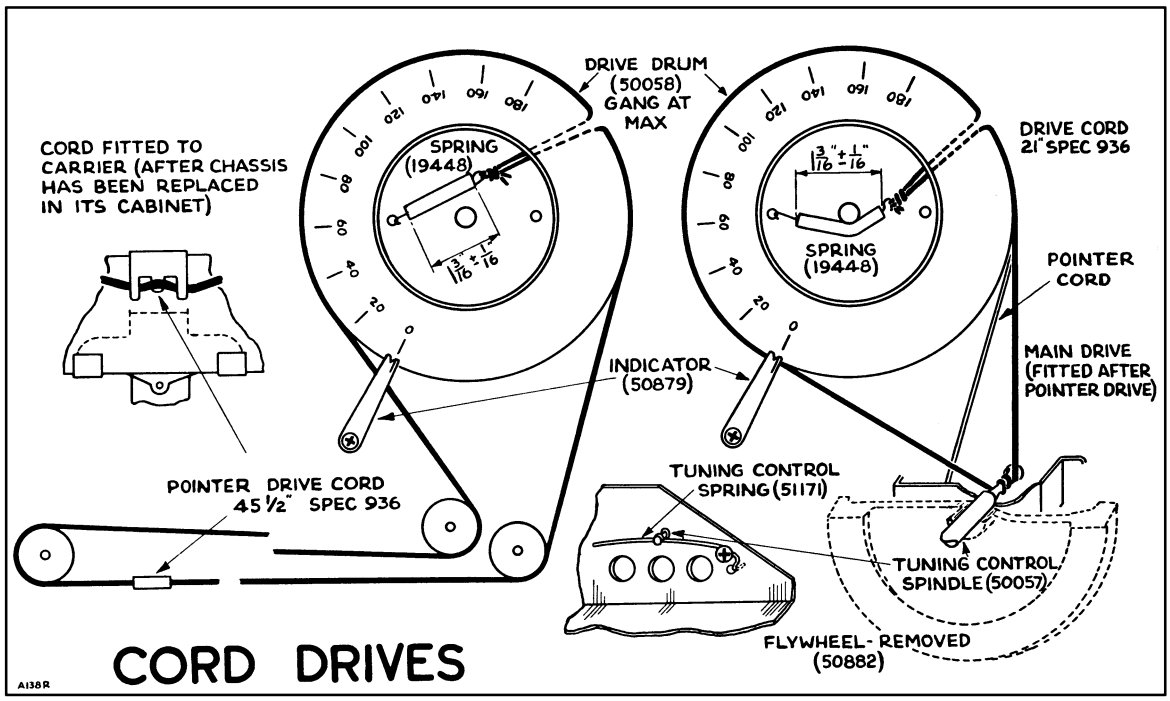


Fig. 9

drum on the gang capacitor spindle so that the zero line on the drum scale coincides with the mark engraved beside the "V" in the indicator, when the gang capacitor vanes are fully in mesh.

When refitting the chassis in the cabinet, the pointer should be attached to the drive cord (as illustrated in Fig. 9) in the 52-metre position on the tuning scale, when the gang capacitor plates are fully in mesh.

CIRCUIT ALIGNMENT

It is possible for the receiver to be completely re-aligned without removing the chassis from the cabinet, as all the trimmers are readily accessible when the front panel is lowered; the long wave oscillator coil, together with the i.f. transformer primaries can be adjusted from the rear of the cabinet. This method is suitable for final adjustments, but as the calibrated drive drum is not visible, it is not desirable for preliminary setting-up, in which case the chassis should be removed.

Before commencing any trimming adjustments, see that the pointer coincides with the 52-metre division on the scale, or, if the chassis has been removed, that the drive drum reading is 0 degrees (using the engraved line on the indicator), when the gang capacitor is at maximum capacitance.

All adjustments are made for maximum reading with an output meter connected to the external l.s. sockets. The output from the service signal generator should be kept as low as possible, and in any case, the receiver output should not exceed 1·5 V, at the l.s. sockets. The volume control and the tone control switch should be turned fully clockwise.

A non-metallic screwdriver should be used for adjusting the iron dust cores in the i.f. transformers, and as these cores are rather fragile, care must be taken to avoid damaging them. It is advisable to unscrew the cores fully, and then to screw in for maximum meter reading.

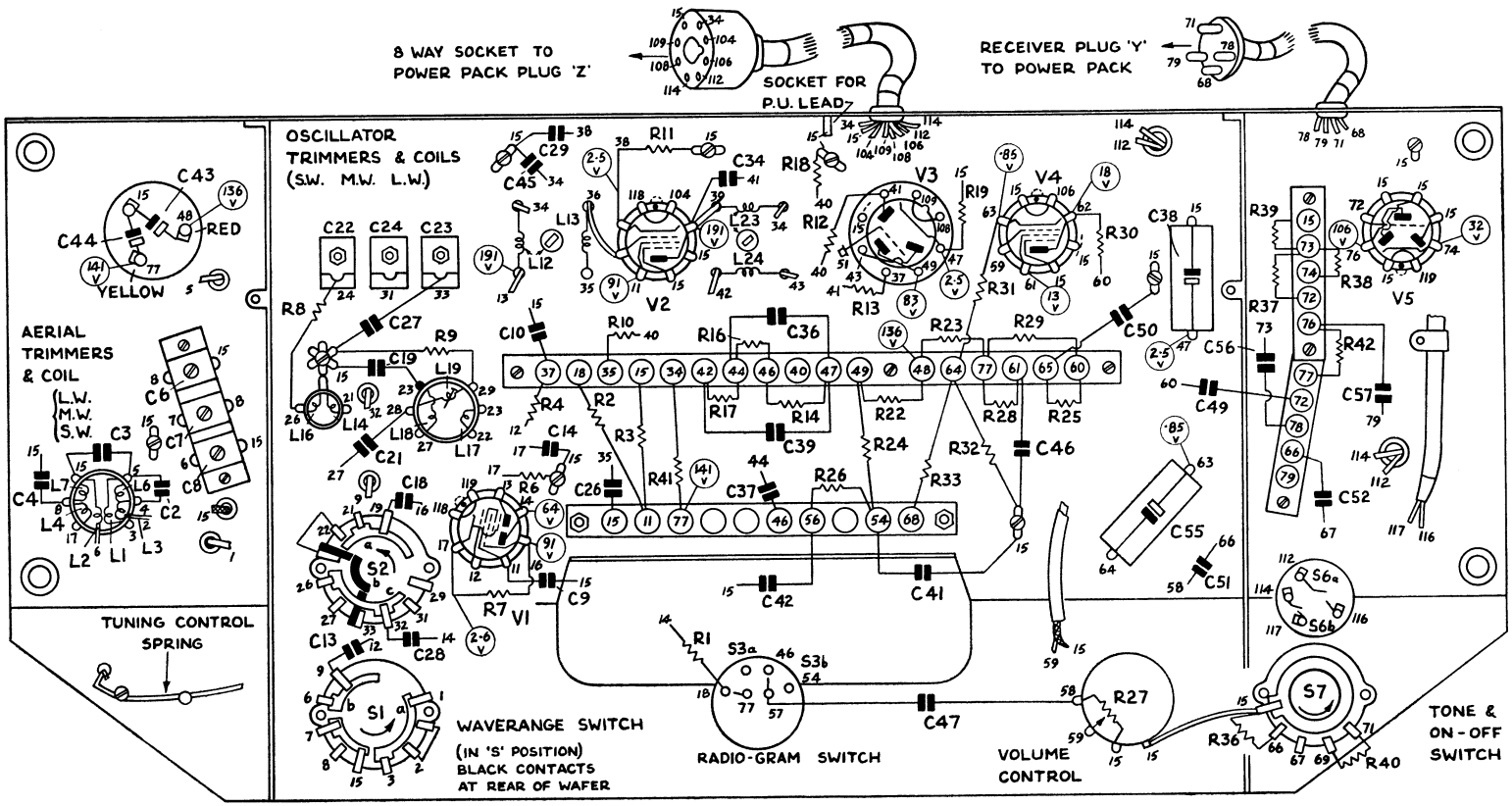
To overcome the effect of "oscillator pulling" on the short wave band, the tuning control should be used to hold the signal whilst adjusting the aerial circuits. The Alignment Table is on page 10.

CIRCUIT ALIGNMENT TABLE

The following table quotes the drive drum degree reading at each calibration point, so that adjustments may be made when the chassis has been removed from its cabinet. The drive drum readings should be taken against the line engraved on the indicator. The oscillator circuit is tuned to a higher frequency than the signal circuit on all bands. For further information, see page 9.

CIRCUIT	NOTES	SIG. GEN. FREQ.	SIG. GEN. TERMINATION	CONNECT SIG. GEN. TO	WAVE RANGE	DRIVE DRUM SETTING	RECEIVER SCALE SETTING	ADJUSTMENTS
2nd i.f.t.	Unscrew pri. and sec. cores to fullest extent	465 Kc/s	Via 0·1μF capacitor	V2 control grid (test point 36)	M	0°	52 metres	L23 (pri.) under chassis L24 (sec.) top of can DO NOT READJUST.
1st i.f.t.	Unscrew pri. and sec. cores to fullest extent	465 Kc/s	Via 0·1 μF capacitor	M.W. ae. trimmer (test point 7)	M	0°	52 metres	L12 (pri.) under chassis L13 (sec.) top of can DO NOT READJUST
L.W.	Unscrew trimmers before adjusting. Repeat these adjustments until there is no further improvement	1000 m. (300 Kc/s)	Dummy aerial	Aerial socket	L	168·5°	1000 metres	l.w. osc. trimmer (C23) l.w. aerial trimmer (C6)
		1900 m. (158 Kc/s)				34°	1900 metres	l.w. osc. coil core (L19)
M.W.	Unscrew trimmers before adjusting. No coil adjustment provided Check calibration at 300 m. and 500 m.	220 m. (1363 Kc/s)	Dummy aerial	Aerial socket	M	158°	220 metres	m.w. osc. trimmer (C24) m.w. aerial trimmer (C7)
		300 m. (1000 Kc/s)				117·5°—119·5°	300 metres	—
		500 m. (600 Kc/s)				29·5°	500 metres	—
S.W.	Unscrew trimmers before adjusting. Lower capacitance setting correct for osc. trimmer. Do not adjust position of s.w. coil turns unless alignment is very poor. Check calibration at 31·25 m. and 41·4 m.	20 m. (15 Mc/s)	Dummy aerial	Aerial socket	S	156·5°	20 metres	s.w. osc. trimmer (C22) s.w. aerial trimmer (C8)
		31·25 m. (9·6 Mc/s)				94·5°—97·5°	31·25 metres	—
		41·4 m. (7·25 Mc/s)				50°	41·4 metres	s.w. osc. coil turns (L16) s.w. aerial coil turns (L2)

C	4 3	44 43 6, 2, 7, 8		22, 27, 24, 19 13, 21, 18	23 28	29 10, 14, 9	26	34	36, 39 42, 37		41, 47	46	50, 55	38 49 51	56 52	57	CAPACITORS
L	4, 2, 1, 3, 6, 7		16	14	18, 19, 17,	12	13		23, 24								INDUCTANCES
R			8		9	7, 6, 4	10 2 3	11 41, 1, 17	18 16, 14,	12 13 26, 24, 22	23, 19, 31 33 32	28, 29, 25	30, 27	36	39, 37	38, 42 40	RESISTORS
				S2 S1	V1		V2	SOCKET 'Z'		V3		V4		PLUG 'Y'		V5 S6a, S6b, S7	MISC.

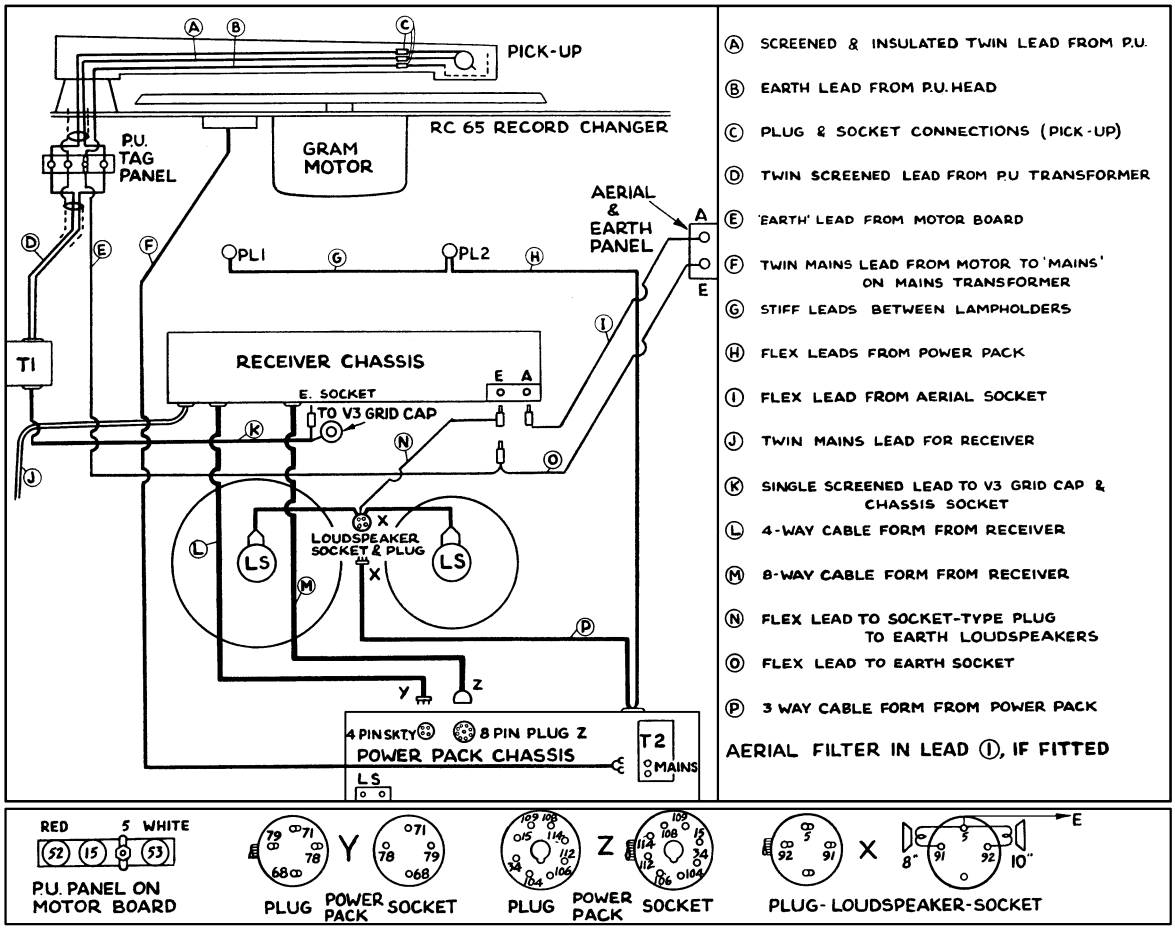


TOP VIEW OF RECEIVER CHASSIS

A138R

Fig. 10

The voltage measurements were made under "no signal" conditions, using a 500 ohm/voltmeter. The black tag on the "m" and "l" oscillator coil corresponds with the locating "nick" in the former.



INTER-UNIT WIRING DIAGRAM, WITH PLUG & SOCKET CONNECTIONS

Fig. 11

AERIAL FILTERS

In areas close to powerful medium wave transmitters, an aerial filter may be required to prevent overloading the frequency changer, causing whistles on other stations. To reduce this form of interference, suitable filters can be supplied by Murphy Radio Ltd, in the form of single or double units according to the station, or stations, causing trouble.

There are three standard filters, covering wavelengths as follows:

A: 200–300 metres (1500–1000 Kc/s)
B: 300–428 metres (1000– 700 Kc/s)
C: 428–600 metres (700– 500 Kc/s)

The double units can be provided in any of the following combinations: AA, BB, CC, AB, AC, BC.

When ordering a filter, please state whether a single or double unit is required, quoting the letter or letters of the units. A **plate, mounting** (49071) should be ordered at the same time.

To fit the filter. The filter is mounted on the outer side of the triangular end wall of the baffle unit, as close as possible to the receiver chassis aerial socket. It is fitted by means of two 4 BA × ¼ in. round headed screws to the plate, mounting (49071) which in turn, is held by two ½ in. No. 6 round headed wood screws. The plate can be most easily fitted when the cabinet front has been lowered.

The lead from the filter is connected to the aerial socket on the chassis, and the lead from the aerial panel is connected to the aerial filter.

To adjust the filter. Connect a voltmeter between the chassis and cathode of V2, and switch it to the 5 or 10 volt d.c. range. Connect the aerial and earth to the receiver and tune in the interfering (local) station; adjust the filter core for maximum voltmeter reading.

NOTE: The filter should be adjusted when the receiver is connected to the aerial and earth with which it will be used.

MODIFICATIONS

The early models differed from the arrangement shown in the circuit and layout diagrams. A change occurred in the a.v.c. circuit to increase the a.v.c. voltage on V1 in order to minimize the possibility of overloading in this stage on strong signals.

The original circuit is shown below:

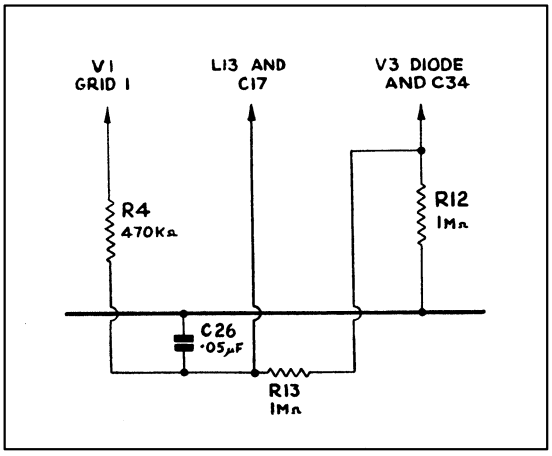


Fig. 12

The second change was introduced in V4 stage to reduce the possibility of a hum voltage being introduced by certain 10F9 specimens. The original circuit is shown in Fig. 13, and in addition, C55 was not fitted across R31.

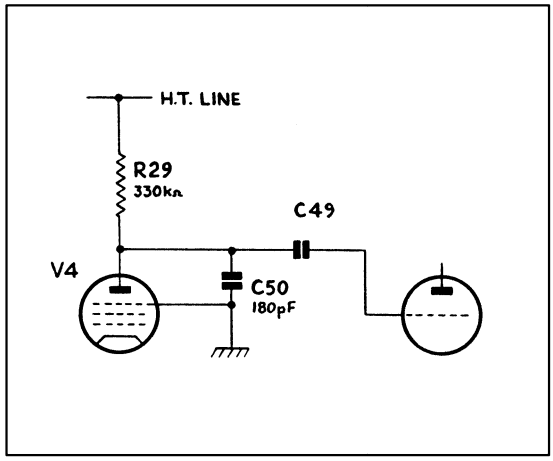


Fig. 13

These diagrams should be compared with the complete circuit on pages 18 and 19.

Two modifications have been introduced in the cabinet. The original bracket (shown on Fig. 7) which prevented the front from being lowered too far is now replaced by a restraining cord.

Later cabinets are veneered in walnut, but early models were veneered in brown sapele, with contrasting sycamore loudspeaker rails, and gramophone compartment.

The Garrard RC65A record changer unit is now fitted in place of the original RC65—see detailed notes on page 20.

THE EXPORT MODEL

In addition to being fully tropicalized, the mains transformer has primary tappings to suit the following 40–60 c/s a.c. supplies:

90–115 V.	120–130 V.	140–160 V.
190–225 V.		230–250 V.

The Gramophone Motor

90–115 V. and 120–130 V. Remove the gramophone turntable and connect the terminals in the junction box as shown in Fig. 14 below. See that the motor leads are connected to the terminals marked "mains" on the mains transformer.

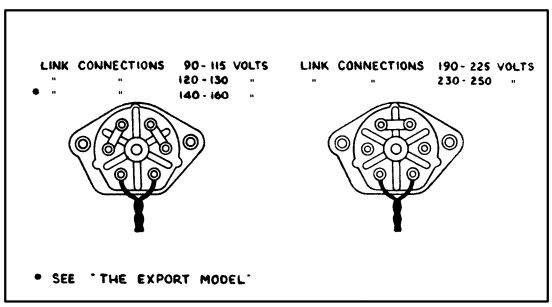


Fig. 14

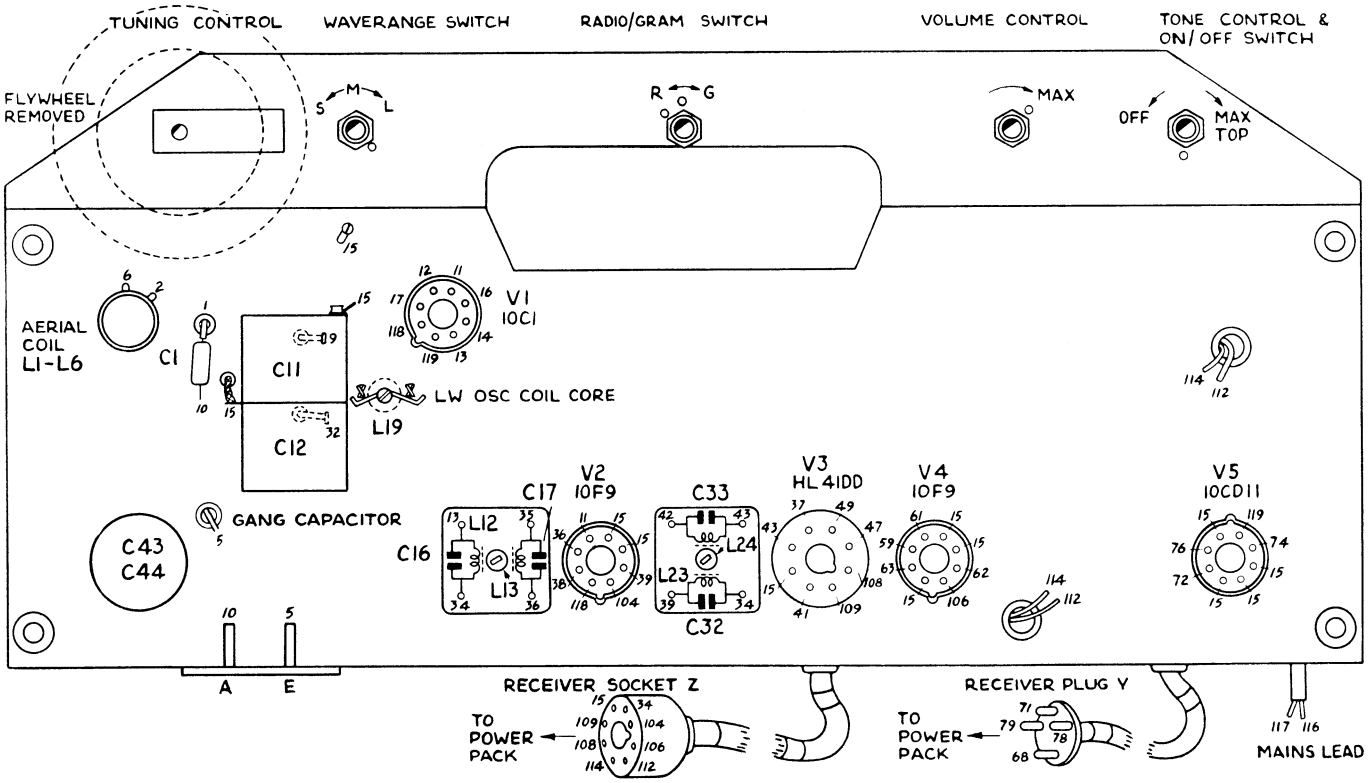
140–160 V. Remove the gramophone turntable and connect the terminals in the junction box as shown in Fig. 14 below. Connect the motor leads between the frame of the mains transformer and the 120–130 V. mains tapping.

190–225 V. and 230–250 V. See that the terminals in the junction box under the gramophone turntable are connected as shown in Fig. 14 below, and that the motor leads are connected to the terminals marked "mains" on the mains transformer.

Gramophone motor speed. If the mains voltage tappings are altered, it will probably be necessary to adjust the motor speed control lever. Full details are given on page 31.

Other components. The fuse is rated at 2 amps as for the standard model, but the mains filter has low resistance windings. Details of the latter component and the mains transformer will be found in the parts list. In all other respects the export model is similar to the standard model.

C	43	44 1	11,12		16	17		33,32							CAPACITORS
L	1-6			19	12	13		23 24							COILS
R															RESISTORS
					V1 IFT,1		V2 SOCKET2	IFT, 2	V3		V4	PLUG Y		V5	MISC.



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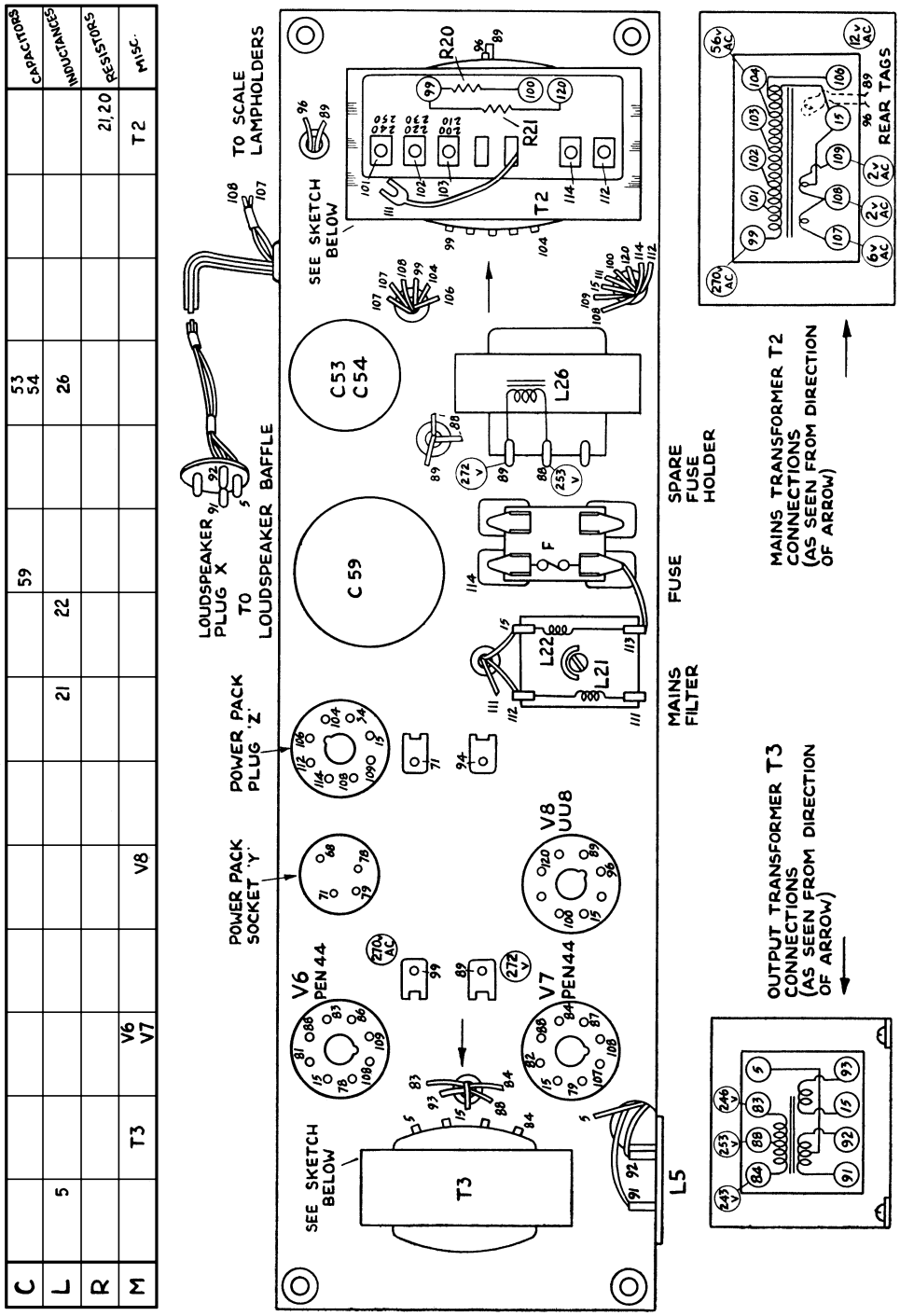
UNDERNEATH VIEW OF RECEIVER CHASSIS

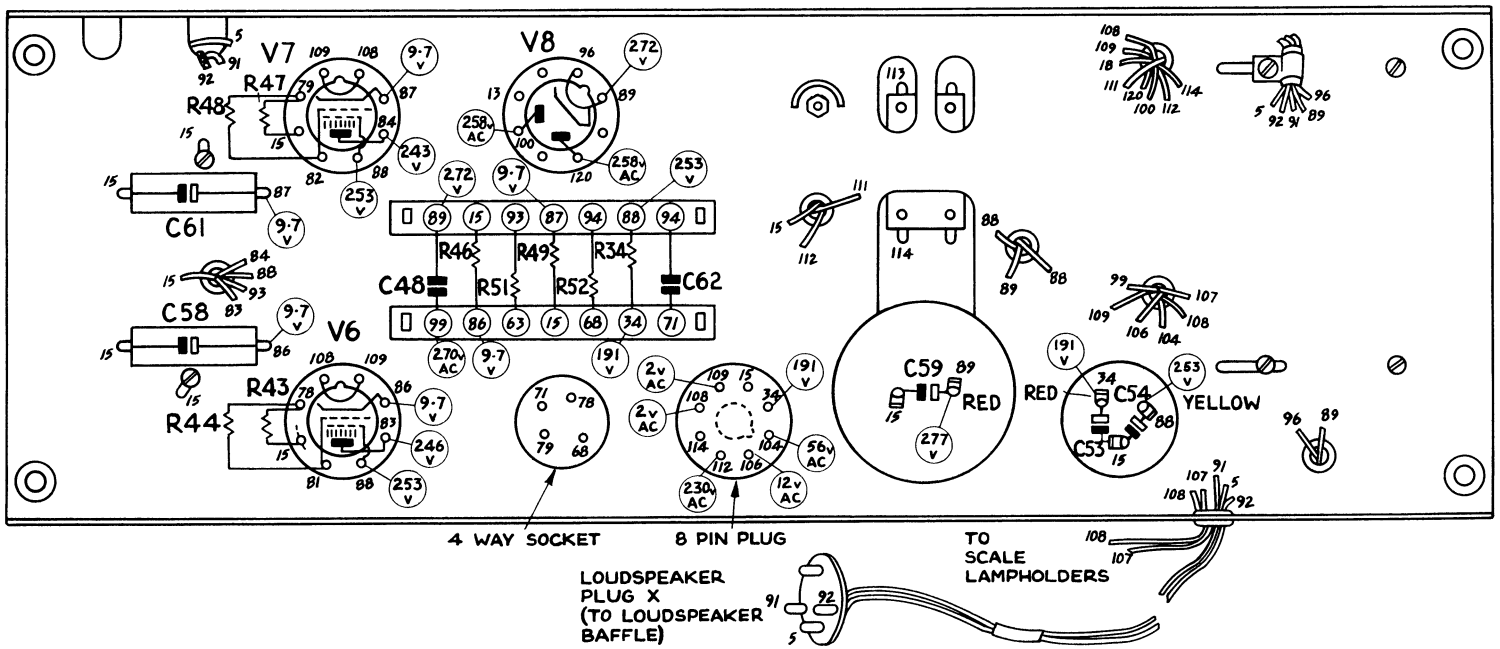
Fig. 15. The top view is given on page 11.



TOP VIEW OF POWER PACK CHASSIS

Fig. 16. The voltage measurements were made under "no signal" conditions using a 500 ohm/voltmeter

C		61 58		48			62			59	53	54			CAPACITORS
L															INDUCTANCES
R		48 44	47 43		46 51	49 52 34									RESISTORS
M															MISC.



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UNDERNEATH VIEW OF POWER PACK CHASSIS

Fig. 17

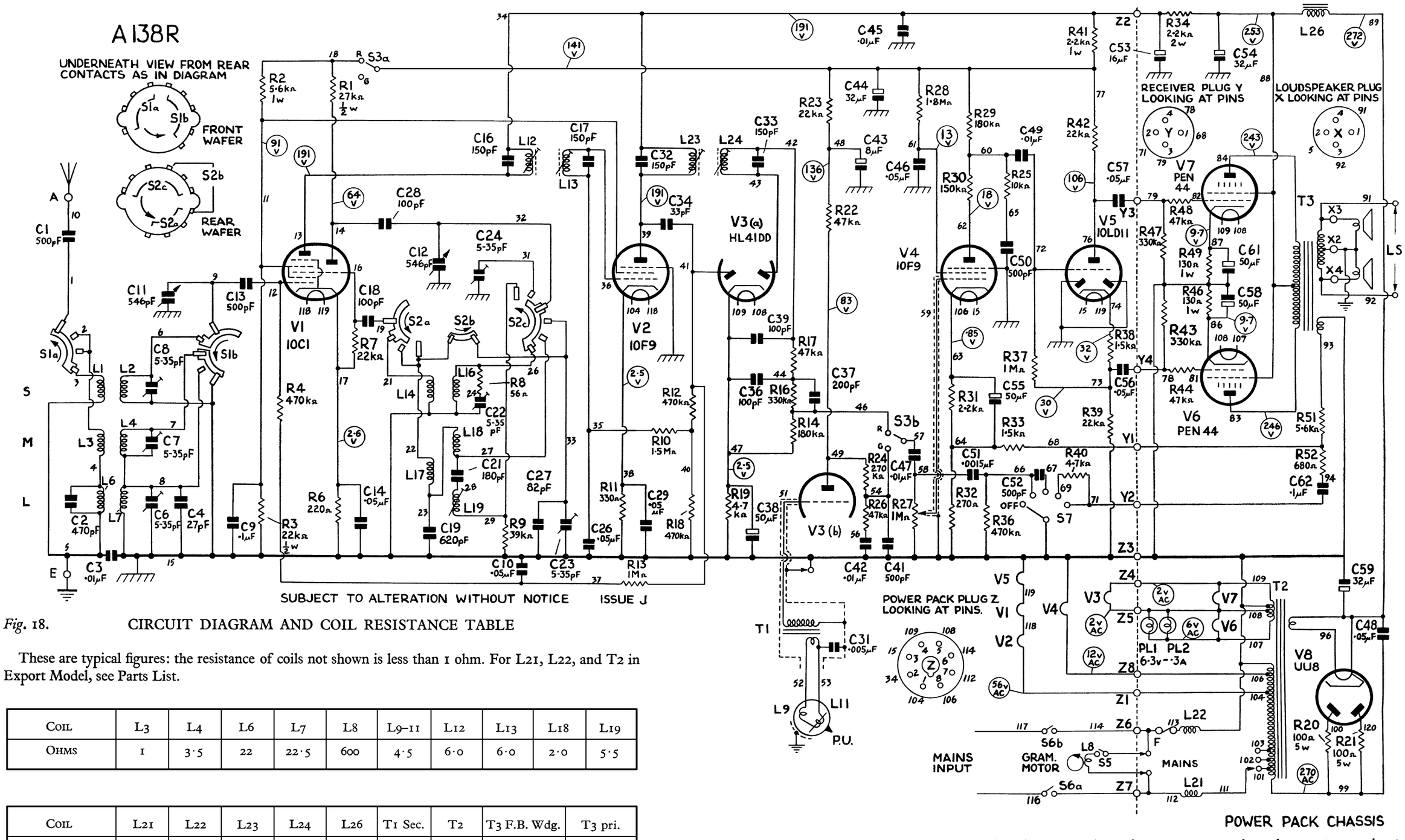

Fig. 18. CIRCUIT DIAGRAM AND COIL RESISTANCE TABLE

These are typical figures: the resistance of coils not shown is less than 1 ohm. For L21, L22, and T2 in Export Model, see Parts List.

Coil	L3	L4	L6	L7	L8	L9–11	L12	L13	L18	L19
Ohms	1	3·5	22	22·5	600	4·5	6·0	6·0	2·0	5·5

Coil	L21	L22	L23	L24	L26	T1 Sec.	T2	T3 F.B. Wdg.	T3 pri.
Ohms	1·5	1·5	6·0	6·0	95	2100	27	14	160 + 130

The voltage measurements were made under "no signal" conditions using a 500 ohm/voltmeter. Layout drawings with valve base diagrams are on pages 11, 15, 16, and 17.

FAULT	ADDITIONAL SYMPTOMS	CAUSE AND CURE
Switches off before the end of the last record.	Will play several records and then switch off.	*Rod 22* depressed too early in the sequence. Turn overarm adjusting screw clockwise so that *rod 22* is depressed only after the last record has dropped.
,, ,, ,,	Tends to switch off after every record.	*Link 21* out of adjustment so that even the slight movement of *lever 24* by *trigger 26* is sufficient to release the *switch lever* (Figs. 26 and 22).
Will not switch off by the "Stop-Start-Reject" knob.		Check *spring 19*, and *stop B loading spring*. Additionally on the RC65A, *lever 33* is not releasing the auto-stop mechanism. Adjust *link 32*.
Motor fails to start.	After "Stop-Start-Reject" knob was moved to stop position just previously (RC65 only). After disconnection of the mains supply (RC65 and RC65A).	Probably the changer mechanism was in the middle of operation when stopped and, in the absence of the fly-wheel action of the turntable, the drive is not sufficient to effect rotation of both the turntable and cam shaft. Turn the turntable round by hand until the pick-up is returned to its rest. Check electrical circuit.
Motor weak.	May fail when pick-up is being lifted from record, prior to being moved back to the rest.	Probably due to motor being oiled with thick oil. Clean motor and bearings, and lubricate with thin oil. Check that motor current is not excessive. (See "Mechanical Notes".) If necessary, replace motor.
Motor rattles.		Probably governor rattle due to sleeve being dry. Lubricate the sleeve with thick oil. Check motor bearings for slackness.
Varying speed.	"Wavy" or "Watery" reproduction.	Dry governor pads, saturate with thin oil.
Movement of record-platform insufficient.		Adjust *link 7*.
Tilt of platform is insufficient.		Adjust *link 5*.
Generally poor performance.	Motor-board damaged or bent.	Transit damage due to transit screws not having been used, or changer not level.

PARTS LIST (ELECTRICAL COMPONENTS)

The following abbreviations are used in the table below: p.s.m., protected silvered mica; m.m., moulded mica; tub., paper tubular; elec., electrolytic; w.w., wire wound; W., wattage rating. All resistors are rated at $\frac{1}{4}$ watt unless otherwise stated.

The d.c. resistances quoted for the coil and transformer windings are average figures and should be taken as a general guide only.

PART NO.	CIRCUIT NO.	VALUE	TOLERANCE AND REMARKS	PART NO.	CIRCUIT NO.	VALUE	TOLERANCE AND REMARKS
28015	C1	500pF	20% m.m., 750V.	48563	C6	5–35pF	Triple trimmer unit
28243	C2	470pF	2% p.s.m.		C7	5–35pF	
41419	C3	0·01μF	25% tub. 1000V.		C8	5–35pF	
23673	C4	27pF	10% p.s.m.	41404	C9	0·1μF	20% tub. 350V.

PART NO.	CIRCUIT NO.	VALUE	TOLERANCE AND REMARKS
41403	C10	0·05μF	20% tub. 350V.
48504	C11	546pF	Gang capacitor
	C12	546pF	
23966	C13	500pF	20% m.m.
41403	C14	0·05μF	20% tub. 350V.
28169	C16	150pF	5% p.s.m.
28169	C17	150pF	5% p.s.m.
23867	C18	100pF	20% m.m.
28241	C19	620pF	1% p.s.m.
28242	C21	180pF	1% p.s.m.
37480	C22	5–35pF	Trimmer
37480	C23	5–35pF	Trimmer
37480	C24	5–35pF	Trimmer
41403	C26	0·05μF	20% tub. 350V.
23676	C27	82pF	10% p.s.m.
23867	C28	100pF	20% m.m.
41403	C29	0·05μF	20% tub. 350 V.
41409	C31	0·005μF	25% tub. 500V.
28169	C32	150pF	5% p.s.m.
28169	C33	150pF	5% p.s.m.
23618	C34	33pF	10% p.s.m.
23867	C36	100pF	20% m.m.
23900	C37	200pF	20% m.m. 350V.
31315	C38	50μF	+50%, −20% elec. 12V.
23867	C39	100pF	20% m.m.
23966	C41	500pF	20% m.m. 350V.
41401	C42	0·01μF	25% tub. 350V.
46530	C43	8μF	+50%, −20% elec.
	C44	32μF	450V.
41401	C45	0·01μF	25% tub. 350V.
41403	C46	0·05μF	20% tub. 350V.
50964	C47	0·01μF	25% tub. 500V.
41421	C48	0·05μF	20% tub. 1000V.
50964	C49	0·01μF	25% tub. 500V.
23966	C50	500pF	20% m.m.
28018	C51	0·0015μF	10% m.m. 350V.
23966	C52	500pF	20% m.m. 350V.
46529	C53	16μF	+50%, −20% elec. 450V.
	C54	32μF	
31315	C55	50μF	+50%, −20% elec. 12V.
50968	C56	0·05μF	25% tub. 500V.
50968	C57	0·05μF	25% tub. 500V.
31315	C58	50μF	+50%, −20% elec. 12V.
46504	C59	32μF	+50%, −20% elec. 500V.
31315	C61	50μF	+50%, −20% elec. 12V.
41404	C62	0·1μF	20% tub. 350V.
25485	R1	27KΩ	10% ½W.
25244	R2	5·6KΩ	10% 1W.
25453	R3	22KΩ	10% ½W.
27397	R4	470KΩ	20%
24677	R6	220Ω	10%
27141	R7	22KΩ	20%
24453	R8	56Ω	10%
25541	R9	39KΩ	10%
27493	R10	1·5MΩ	20%
24701	R11	330Ω	10%
27397	R12	470KΩ	20%
27461	R13	1 MΩ	20%
25797	R14	180KΩ	10%
25893	R16	330KΩ	10%
28544	R17	47KΩ	33%
27397	R18	470KΩ	20%
25189	R19	4·7KΩ	10%
51045	R20	100Ω	5% 5W. w.w.
51045	R21	100Ω	5% 5W. w.w.
25573	R22	47KΩ	10%
27141	R23	22KΩ	20%
25861	R24	270KΩ	10%
25317	R25	10KΩ	10%
25573	R26	47KΩ	10%
49220	R27	1MΩ	Volume control
26181	R28	1·8MΩ	10%
25797	R29	180KΩ	10%
25765	R30	150KΩ	10%
25061	R31	2·2KΩ	10%
24709	R32	270Ω	10%
24997	R33	1·5KΩ	10%
29904	R34	2·2KΩ	10% 2W.
27397	R36	470KΩ	20%
27461	R37	1MΩ	20%
24997	R38	1·5KΩ	10%
25445	R39	22KΩ	10%
25189	R40	4·7KΩ	10%
25084	R41	2·2KΩ	10% 1W.
25445	R42	22KΩ	10%
27365	R43	330KΩ	20%
28544	R44	47KΩ	33%
28558	R46	130Ω	5% 1W.
27365	R47	330KΩ	20%
28544	R48	47KΩ	33%
28558	R49	130Ω	5% 1W.
25221	R51	5·6KΩ	10%
24869	R52	680Ω	10%

PART NO.	CIRCUIT NO.	RESISTANCE (d.c.)	TOLERANCE AND REMARKS
50035	L1	—	s.w. ae. coil
	L2	—	
	L3	1Ω	m.w. ae. coil
	L4	3·5Ω	
	L6	22Ω	l.w. ae. coil
	L7	22·5Ω	
52362	L8	600Ω	Gram. motor
50319	L9	4·5 Ω	p.u. hum bucking coil
	L11		p.u. moving coil
48467	L12	6Ω	1st i.f.t. pri.
	L13	6Ω	1st i.f.t. sec.
50036	L14	—	s.w. osc. coil
	L16	—	
48217	L17	—	m.w. osc. coil
	L18	2Ω	
	L19	5·5Ω	l.w. osc. coil
50874	L21	1·5Ω	mains filter (Home)
	L22	1·5Ω	
52758	L21	—	mains filter (Export)
	L22	—	
48467	L23	6Ω	2nd i.f.t. pri.
	L24	6Ω	2nd i.f.t. sec.
50872	L26	95Ω	smoothing choke
50904	T1	—	pri. p.u. transformer
		2100Ω	sec.
50871	T2	27Ω	mains transfmr (Home)
53437	T2	13·75Ω	mains transfmr (Export)
50873	T3	14Ω	f.b. winding o.t.
		160+130Ω	pri.

PARTS LIST (MECHANICAL COMPONENTS)

This list contains only those parts which are not included in the Electrical Parts list; items such as self-tapping screws, bolts and nuts, etc. may be obtained from Murphy Radio Ltd, Service Department, when required. The components are arranged in alphabetical order, under the title of the section of the equipment with which they are immediately associated. The quantity of items per set is indicated in brackets after the description, unless only one is required.

PART NO.	DESCRIPTION	REMARKS
	Receiver Chassis	
50062	Clamp	For securing aerial coil
46911	Core, iron dust (4)	For i.f.t.
48222	Core, brass	For l.w. oscillator coil
50885	Cover for chassis	
Spec.936	Cord for drives (2)	21 in. for main drive, 45½ in. for pointer drive
50058	Drive drum	Engraved
50882	Flywheel	For tuning control
120	Grid cap (only)	Also requires 477 clip, and 44111, bakelite disc.
50879	Indicator (calibratn)	For use with 50058
50870	Knob (wave range)	
52058	Knob (tuning, volume and tone) (3)	
52059	Knob (radiogram)	
51645	Loudspeaker, 8 in.	
52244	Loudspeaker, 10 in.	
53565	Mains lead	
49229	Panel A and E	For receiver chassis
49301	Plug (4-pin) (X and Y) (2)	For loudspeaker and grid leads
45974	Plug, socket type	On earth lead
43528	Screened lead	For volume control
52265	Socket (Z) (8-pin)	For power plug lead
40135	Spade tag (3)	For motor leads and m.t. panel
19448	Spring (2)	For cord drives
51171	Spring	For tuning control
48228	Spring	For l.w. osc. coil core
50878	Switch, Radio-gram	
50877	Switch, tone control	
52342	Switch, wave range	
50057	Tuning spindle	
3975	Valveholder, British octal	
51451	Valveholder, B8A (4)	
	The Pick-up Components	
50319	Pick - up assembly (moving coil)	Complete pick-up head
50903	Pick-up transformer assembly	Complete with case and leads
50904	Pick-up transformer only	
48655	Plug (earthing)	For pick-up cable form
52362	Record changer unit	Garrard RC65A
51285	Screened lead	To pick-up from p.u. transformer
51161	Screened lead	With grid cap
43531	Screened lead (insulated)	From changer tag panel to p.u. head
	The Power Unit	
52117	Fuse, 2 amp. PAK type	
46671	Fuseholder	
49231	Panel L.S.	For power chassis
51156	Panel, mains tapping	With tags and contacts
52264	Plug, 8-pin (Z)	For power lead connection to power pack
3975	Valveholder, British Octal (3)	
49300	Valveholder 4-pin (Y)	For grid connections
	The Cabinet	
50893	Back for cabinet	
50887	Cabinet	Less fittings
50901	Cover for screw (3)	In gramophone compartment
—	Cord for front of cabinet	To limit opening distance. 20½ in. of $\frac{5}{32}$ in. sash cord
51163	Panel A and E	For cabinet
45974	Plug—socket type	For receiver chassis earth socket from loudspeakers
53582	Terminal eyelet (2)	For ends of cabinet restraining cord
49300	Valveholder 4-pin(X)	For l.s. connections
	The Scale and Associated Mechanism	
50900	Carrier for holder (pointer)	
50902	Guide	For carrier
50899	Holder for pointer	
48496	Lampholder (2)	For scale lamps
50813	Mounting plate	For scale
50898	Pointer	
50897	Scale, Perspex	Printed
14735	Spacer	For scale assembly
50891	Support (left-hand)	For scale lampholder
50890	Support (right-hand)	For scale lampholder
48195	Washer (Spring) (2)	For scale assembly
	Sundries	
37974	Aerial plug (2)	
37975	Earth plug (2)	