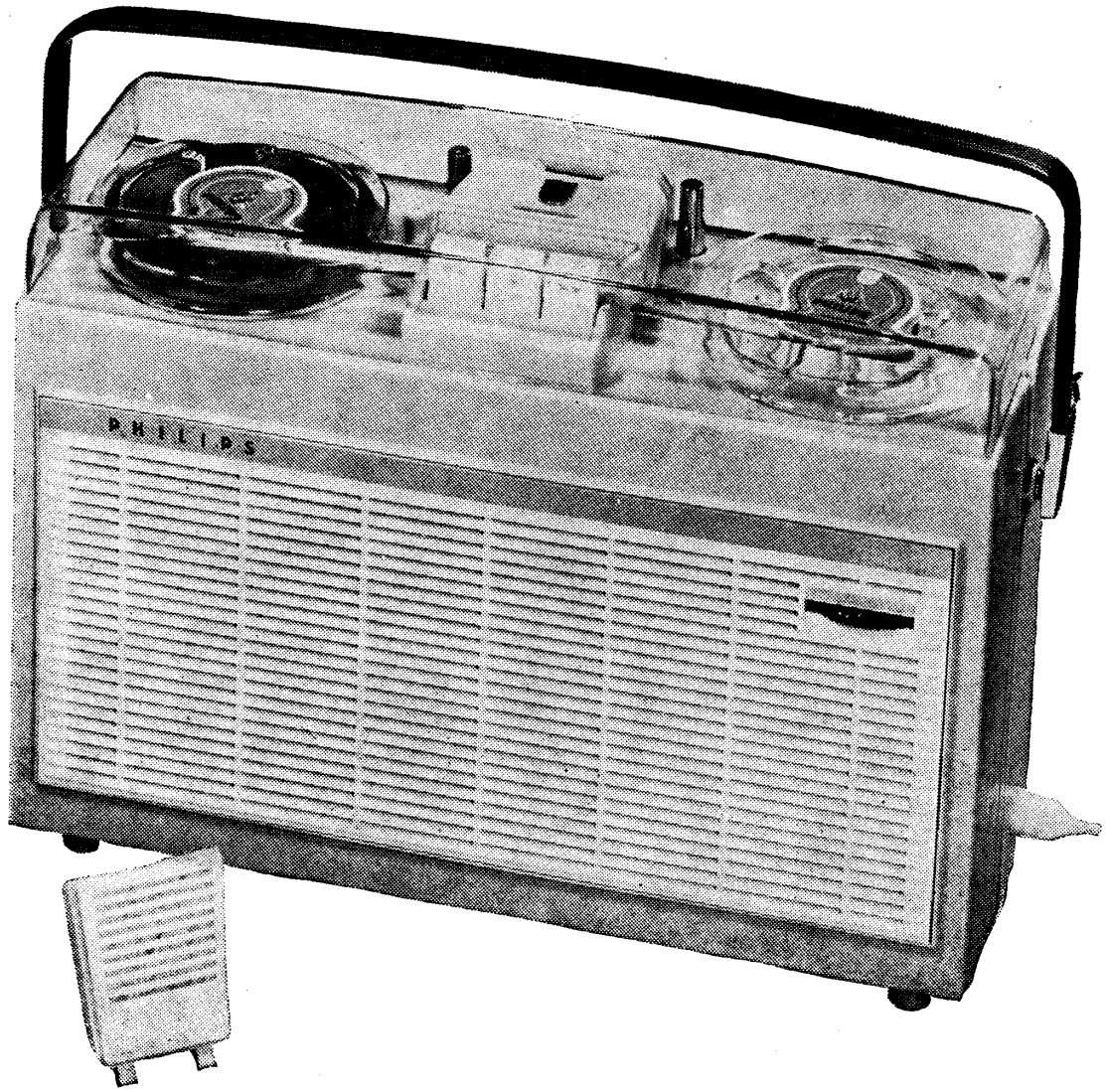
SERVICE INFORMATION FOR THE

PHILIPS

TAPE RECORDER

TYPE EL3514



OFFICIAL SERVICE AGENT :—

AMALGAMATED ELECTRIC SERVICES LTD.

WADDON FACTORY ESTATE CROYDON SURREY

Telephone CROYDON 7722

June, 1962

Form AES 226

PRICE 3s. 6d.

A.—GENERAL DESCRIPTION

The EL.3514/15 is a single speed four track tape recorder, mains operated, providing up to four hours playing time from a single tape.

Recordings may be made from microphone, gramophone and radio (diode).

An internal speaker of 6½" diameter is fitted, also sockets for extension loudspeaker and external amplifier.

B.—OPERATION

Refer to booklet supplied with each machine.

C.—SPECIFICATION

Tape Speed	3¾"/sec.
Max. Reel Diameters	4" with lid fitted, 5" without lid.
Forward Wind/ Rewind Speed	600 ft. of tape in under 130 secs.
Frequency Response	80 c/s to 10 Kc/s.
Mains Voltage Ranges	110–127V and 220–240V A.C. 50 c/s. (adaptable for 60 c/s).
Consumption	Approximately 25 watts.
Output	1.5 watts.
Cabinet demensions	*Width* 14" *Height* 9¾" *Depth* 4¾"
Weight	10½ lbs.
Loudspeaker	6½" diameter.
Transistor and valves	AC107, ECC83, EL95 and DM71.
Signal to Noise Ratio	Better than 40 db.
Wow and Flutter	Less than 1.0%.
Microphone	Type EL3756/00 omni-directional moving coil, 500 Ω impedance.
Inputs	
Microphone	0.2mV, 3K Ω. SKT 1.
Gramophone	130mV, 2.2m Ω. SKT 3 } Connected in
Gramophone	,, ,, SKT 4 } parallel.
Radio (diode)	3.0mV, 50K Ω. SKT 2 (pins 1 and 2).
Radio (diode), via Lead EL3768/01.	100mV, 1.5m Ω. SKT 2. (see Fig. 19)

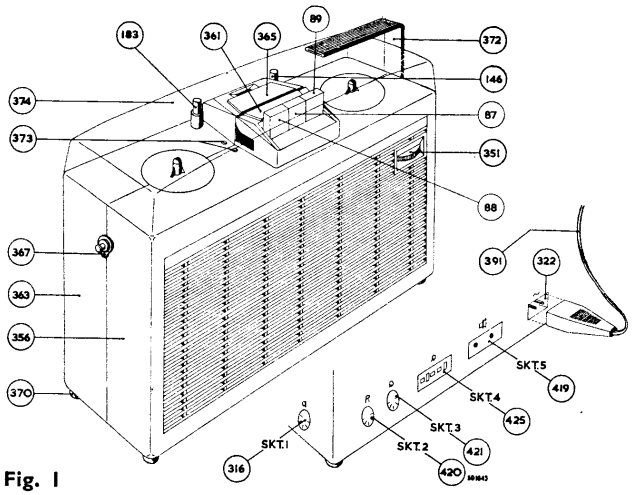


Fig. 1

Outputs	
Extension Loudspeaker	1.5 watts, 3–7 Ω. SKT 5.
External Amplifier	1 volt, 30K Ω. SKT 2 (pins 3 and 5).

Controls (see Fig. 1).

Playback button 87, Rewind button 88, Forward wind button 89, Record button 146 (used in conjunction with playback button).

Track selector button 183, when depressed, locks down for operation on tracks 1 or 4. To use tracks 2 or 3, release button by pressing it again.

Volume Control and mains switch 351.

D.—REMOVAL OF CABINET

This is in two halves and may be separated as follows. Remove the base screws, side circlips 367 and all four screws 373 in top of the cabinet. Front half of cabinet is removed first, due to tongue and groove in respective halves of cabinet.

E.—DESCRIPTION OF MECHANISM (see Fig. 20)

1. Playback

When the playback button 87 is operated, the push bar 84 moves the brake slide 83 to the right, releasing brakes 99, 100 and the R.H. friction pad 120B.

Tape tension is maintained by the L.H. turntable friction pad 120A. Push bar 84 also moves the carriage bracket 57 forward, bringing both pressure pads into contact with the head faces and the pressure roller into contact with the capstan 17. Carriage bracket 57, in turn, moves the slipping clutch assembly 42 into contact with the flywheel and the rubber rim on the R.H. turntable 180.

The flywheel/capstan is driven by belt 18 from pulley 203 on the motor 151.

In addition, push bar 84 operates S 4 and S 5, bringing external amplifier and loudspeaker sockets into circuit.

2. Record

The record button 146 is held down then locked in position by the operation of the playback button 87. The tongue on the locking bracket 65 engaging a slot in the record button 146, which in turn operates S 1 and S 2 via Bowden cable 344.

3. Forward Wind

When forward wind button 89 is operated, both brakes and friction pad are released as described in E1. Push bar 84 moves the winding roller assembly 49 into contact with the flywheel 17 and the rubber rim on the R.H. turntable. Tape tension is again maintained by friction pad 120A.

4. Rewind

When button 88 is operated, brakes and friction pad 120A are released, and winding roller 112 is engaged with the flywheel. The pulley on the winding roller transmits drive via belt 182 to L.H. turntable 179. Tape tension is maintained by friction pad 120B.

F. MECHANICAL CHECKS AND ADJUSTMENTS (see Fig. 20).

1. Motor and Fan Pulley

(i) Motor 151
The Motor may be removed for service by releasing the three screws in the top plate and detaching the drive belt 18.

(ii) Motor bearings
When replacing either of the motor bearings, centering feelers should be used to ensure adequate clearance between rotor and stator. End play in shaft should be adjusted to approximately 0.5 mm. by screw and locknut.

(iii) Fan pulley
To remove pulley loosen grub screw and pull off. Slide replacement on to motor shaft until the end of shaft extends 0.5 mm. beyond pulley. Tighten grub screw.

2. Turntables and Tape Guides

(i) Turntables 179, 180.
The height of each turntable should be adjusted so that the top edge of the turntable is 14 mm. above the top plate. Adjustments are made by rotating the nylon bearing screws 181.

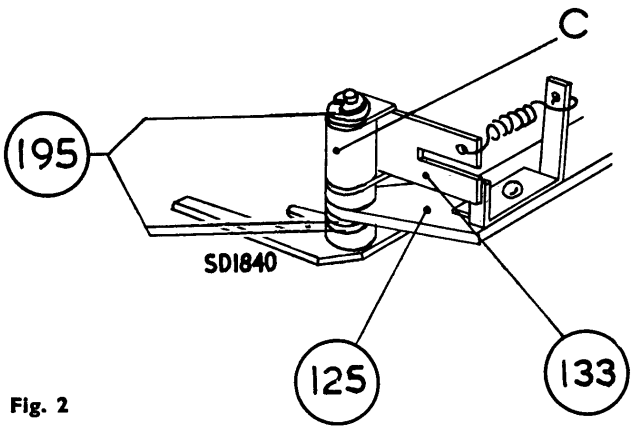


Fig. 2

(ii) Tape guide C (Fig. 2)
With the play button depressed, the flanges of tape guide C should overlap the jaws of tape guide B by an equal amount (when viewed from the back of the recorder).
Adjustment is made by redistributing the spacing washers 195 (see Fig. 3).

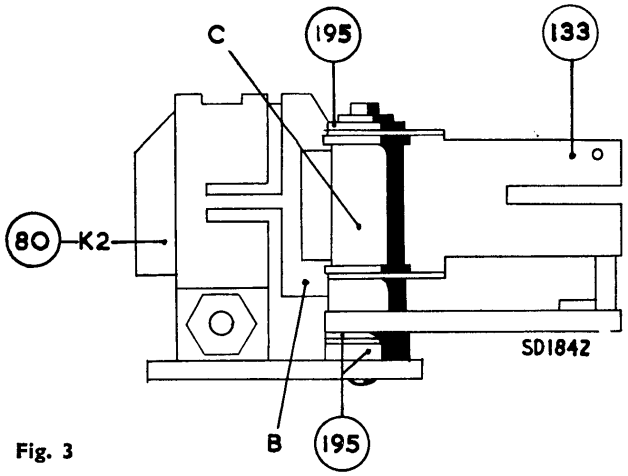


Fig. 3

(iii) Tape guide A.
Adjustment of this tape guide is referred to under electrical adjustments of the record head (see Section J para. 1).
Final adjustment of spool heights should now be made to ensure correct tape feed and take up.

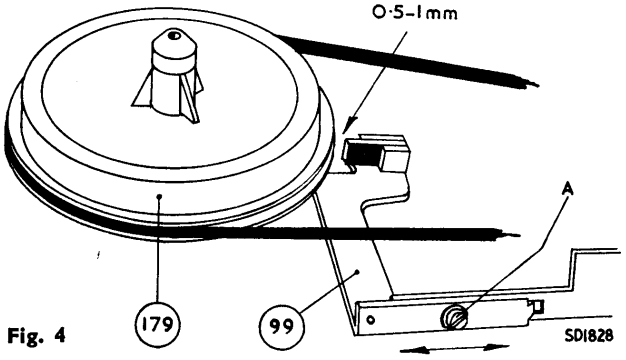


Fig. 4

3. Brakes

(i) Left hand.
With rewind button 88 depressed, the brake block on the L.H. brake bracket 99 should be spaced 0.5 to 1 mm. from the turntable edge. Adjustment is made by slackening locking screw A, repositioning brake bracket and tightening locking screw (see Fig. 4).

(ii) Right hand.
Remove the R.H. turntable and depress rewind button 88. Ascertain that the brake block on the bracket 100 is 26 mm. from the right hand side of the winding shaft. Slacken screw B and move bracket if required (see Fig. 5).

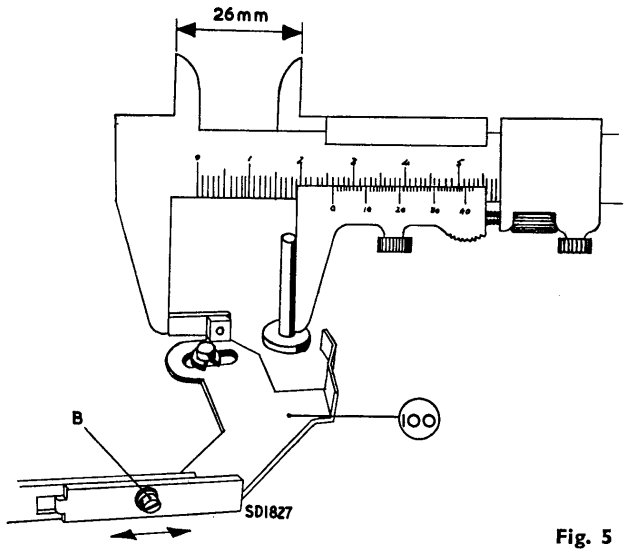


Fig. 5

(iii) Brake tensions.
With a full 5″ spool in position on the L.H. turntable, all buttons disengaged, the force required to move the spool anti-clockwise should exceed 20 grms. Measurement is made with a tension gauge attached to the tape leader (see Fig. 6).
The R.H. brake is tested in a similar manner except that the force is measured clockwise with the tape on the R.H. turntable.

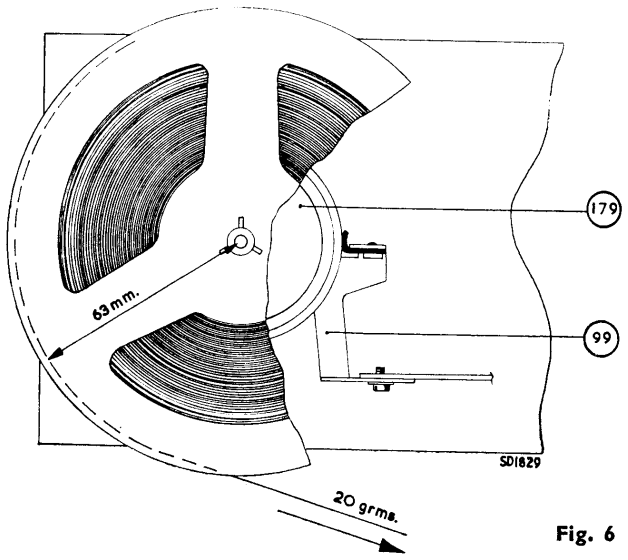


Fig. 6

4. Friction Pads under Turntables (see Fig. 20)

(i) R.H. friction pad 120B.
With the rewind button depressed and a full 5″ spool on the R.H. turntable, the force required to move the spool should be between 6 and 8 grms. (Measured in the same manner as brake tensions.) To increase the friction, bend the outer end of the bracket 118 away from the spring 122.

(ii) L.H. friction pad 120A.
Check in a similar manner but with forward wind button depressed and tape on L.H. turntable. Adjust friction by bending bracket 121.

5. Slipping Clutch Assembly 42 (see Fig. 20)

(i) Measurement.
The " take up " drive measured from the tape leader of a 5″ spool in position on the L.H. turntable, with playback button operated, should be 8–13grms.

(ii) Adjustment of friction.
First remove the assembly as follows. Release spring 55 and the retaining screws holding bracket 39 to leaf spring 33. Depress playback button and remove clutch assembly with bracket 39. To decrease the coupling, clean the felt ring under roller 42A with benzene or alcohol. A further decrease of friction coupling may be made by shortening or replacing spring 42C. To increase the friction drive (or coupling) carefully stretch the pressure spring 42C.

(iii) Positioning.
When the assembly has been replaced in the machine, the rubber clutch wheel 42B should clear the flywheel by at least 0.5 mm., when all buttons are disengaged. Clearance is adjusted by bending the lip on the carriage bracket 57 which is in contact with the bracket 39.
With the playback button depressed the rim of the rubber clutch wheel 42B will be indented by contact with the flywheel. The amount of indentation should not exceed 1 mm. and may be adjusted by stretching or replacing spring 55.

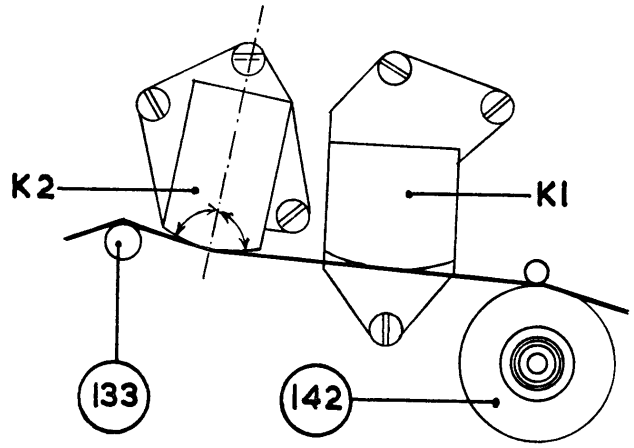


Fig. 7

6. Pressure Arm Assembly

(i) Position (see Fig. 7)
With playback gutton operated, the angles that the tape makes with the centre line of the erase head, should be equal.

(ii) Adjustments (see Fig. 8).
NOTE : To gain access to screws B and C, remove R.H. cabinet fixing bracket 175, release spring 145, push carriage bracket forward and hold pressure arm back. Loosen all three screws.
Depress the playback button and, with tape in position, push the carriage bracket forward at the same time holding the pressure roller against the capstan. When the tape angles are correct mark the position of the carriage bracket on the top plate. Holding the pressure arm back, again move the carriage bracket forward to the marked position, then slide plate 58 against the tongue of lever 20 and tighten screw B. Release playback button, replace spring 145 and check tape angles with button again depressed. Repeat adjustment if necessary.
With the machine in playback position, hold down record button, slide tongue of bracket 65 into it and tighten screws C. Replace bracket 175.

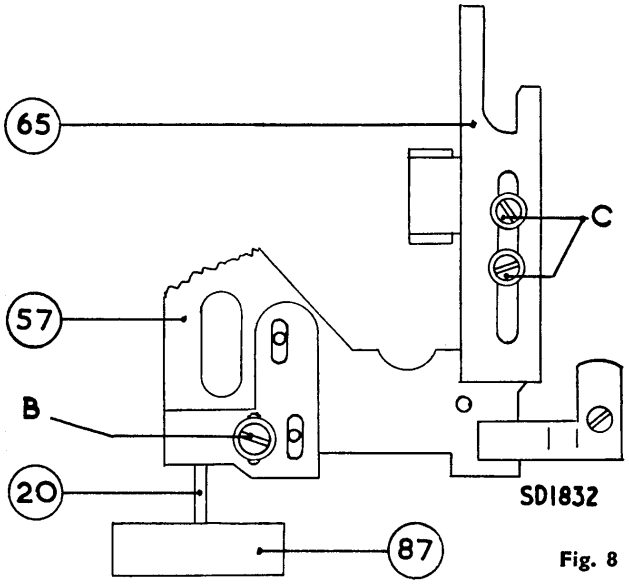


Fig. 8

7. Pressure Roller 142, and Pressure Pads

(i) Positioning.
The clearance between the lip on the carriage bracket 57 and the bent end of pressure arm 125, with machine in playback position, should be 0.3 to 1.5 mm. (see Fig. 9).
Adjust by bending lip on carriage bracket.

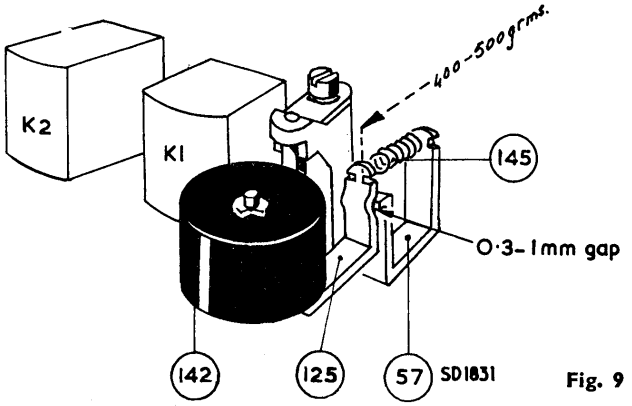


Fig. 9

(ii) Tension.
The force required to overcome that exerted on the pressure arm assembly by spring 145 should be between 400 and 500 grms. Adjustment can be made by bending the spring anchor point on the carriage bracket or replacing the spring 145 (see Fig. 9).

(iii) Pressure pad assemblies 131, 133.
The tension of springs 141 is adjusted (playback position) to between 15 and 25 grms, by bending spring anchor points (see Fig. 10).

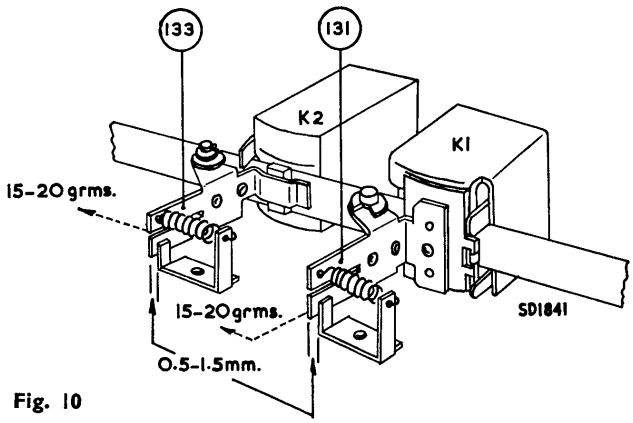


Fig. 10

The clearance between pressure brackets and stops should be adjusted to approximately 1 mm. by bending the stops. (Fig. 10.)

8. Belt Replacement 18 and 182

(i) Drive belt 18 (see Fig. 20).
Remove springs 90, 124, 56 and 117. Remove the top two retaining screws in the printed panel assembly, and loosen the remainer. Now extract the two front screws X that hold plate 19 to mounting pillars 7. Pushing printed panel outwards, loosen the third screw X1 in the plate several turns. Slip the drive belt 18 from motor pulley over the top of fan 203 and, with flywheel and bearing plate separated, underneath the flywheel spindle.
When fitting replacement belt, reverse the above procedure but ensure that both push bar 84 and lever 20 are correctly located (see Fig. 13). Finally check action of S5 and bend contacts if necessary.

(ii) Rewind belt 182.
To remove belt 182 take off the L.H. cabinet fixing bracket 175 and slip belt from rewind pulley.

9. Winding Roller Assembly 49

(i) Removal.
Release springs 55, 56 and the circlip holding bracket 45 to coupling strip 46.
Take out the screws holding bracket 45 to leaf spring 33 and lift out roller with bracket.
To separate roller from bracket, release circlip on top of spindle. To replace the winding roller assembly the procedure is reversed.

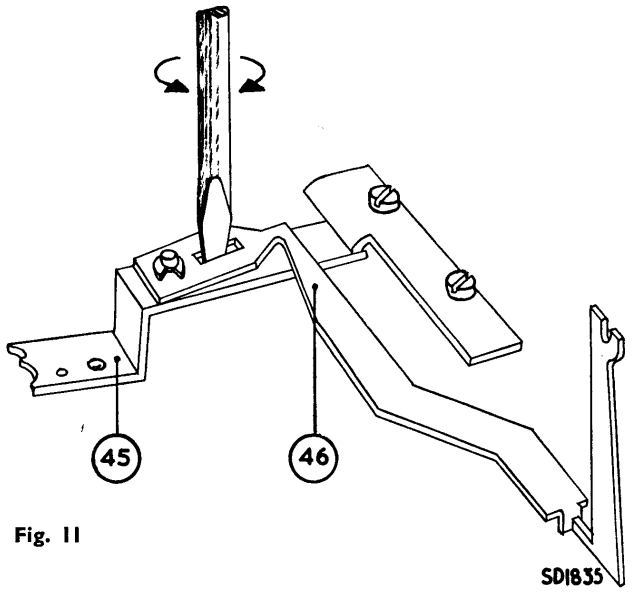


Fig. 11

(ii) Adjustment.
When all push buttons are disengaged, the clearance between rubber wheel of winding roller and the flywheel is 0.5 mm. Also the clearance between the roller and the rubber rim on the R.H. turntable is 0.5 mm. Adjust by bending coupling strip 46 (see Fig. 11). Ensure that, in the forward wind position, coupling strip 46 clears push bar 85 by at least 0.5 mm.

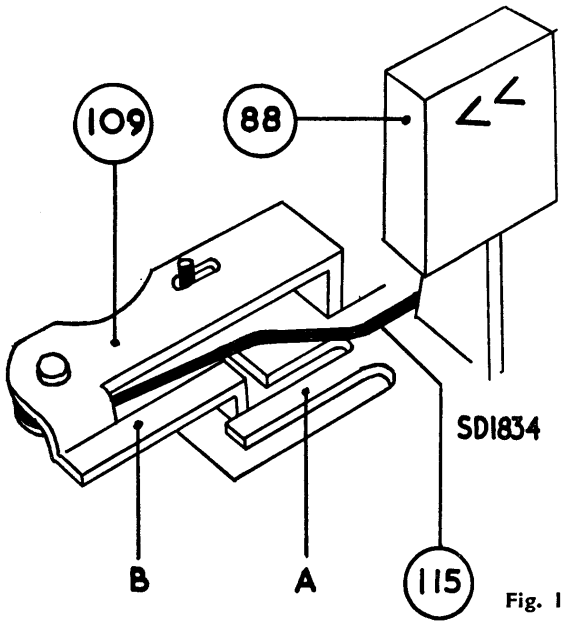


Fig. 12

10. Rewind Pulley Assembly

(i) Removal.
Release rewind belt 182, spring 117 and circlip retaining the bracket 109. Remove pressure arm assembly 125, depress playback button and extract rewind pulley complete with bracket 109.
To separate pulley from the spindle, pull off the brass cap 217 and remove circlip.
Re-assemble in the reverse order.

(ii) Adjustments.
With all buttons disengaged, the clearance between the rubber rim of the rewind pulley assembly and the flywheel 17 should be 0.5 mm. This can be adjusted by bending the lip A in the top plate (see Fig. 12). In the fast rewind position a force of between 35 and 45 grms. should be required to pull the rewind pulley away from the capstan. To adjust, bend torsion spring 115 or replace it.
The clearance between lip B on bracket 109 and the torsion spring should be at least 0.3 mm. in the rewind position. Bend lip B if required (see Fig. 12).

11. Flywheel and Lever 20

(i) Removal.
Extract springs 90, 124 and 56, release spring 117 from bracket 91. Take out the top two retaining screws in the printed panel and loosen the remainder. Remove V3 and screws X, loosen screw X1 several turns. Ease down slightly plate 19 then unscrew insulated pillar from pushbar 84.
Release circlip holding bracket 45 to bracket 46 and separate them. Pull plate 19 down until lower bearing 27 is clear of the flywheel.
Remove belt and flywheel.
To detach lever 20, bend tongue A in plate 19 (Fig. 20).

(ii) Replacement.
Locate lever 20 in plate 19 and hold in position by bending tongue A.

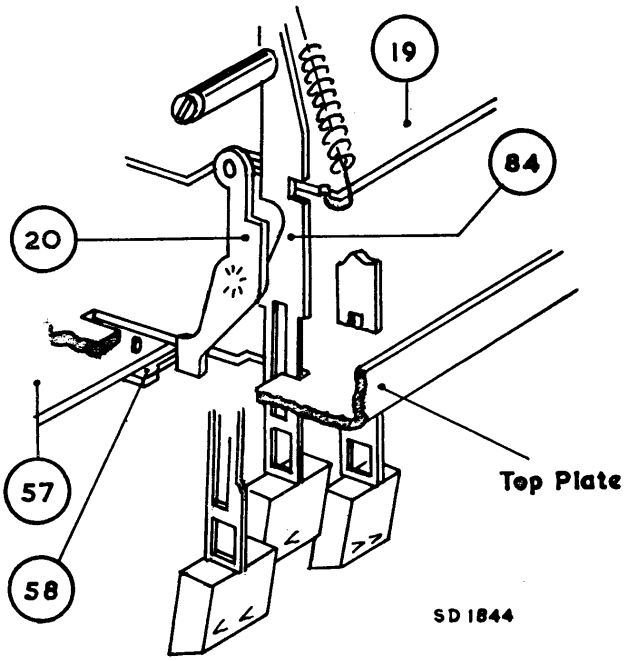


Fig. 13

Position capstan of flywheel in top plate bearing and ensure that roller 49 has not been misplaced.
Fit drive belt and then push plate 19 up towards top plate guiding lever 20 into its slot in top plate (see Fig. 13). At the same time guide flywneel shaft into bearing 27.
Screw insulated pillar back into push bar 84 and tighten with locknut. Prior to pushing plate 19 right home, move carriage bracket forward to allow lever 20 to come up through top plate.
Check position of bracket 45 and then link it back on to bracket 46, replacing spacing spring and circlip. Fasten plate 19 in final position, fit springs 56, 90 and 124, then re-anchor spring 117. Screw back printed panel and replace V3.

(iii) Adjustment.
The screw 78 which limits the vertical movement of the flywheel is adjusted in the following manner. Loosen locknut, and, with the flywheel turning, adjust screw 78 until it just touches the flywheel. Turn the screw back one full turn and tighten locknut.

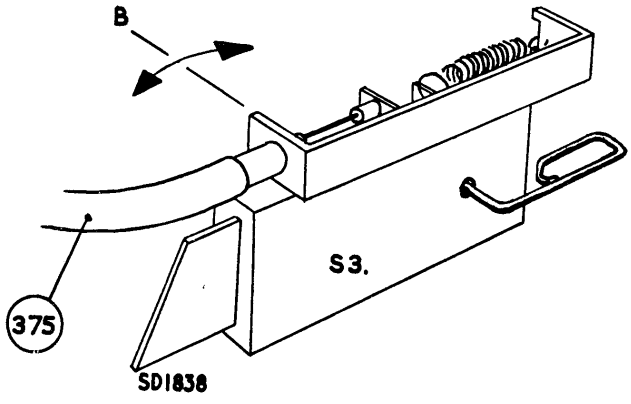


Fig. 14

G.—REPLACEMENT OF BOWDEN CABLES 344 AND 375

1. Bowden Cable 344

The Bowden cable 344 is supplied made up within limits to the correct length, and is easily fitted. Final adjustment of switch slider position is made as follows. With the machine in the record position it should be possible to pass a wire (1.5 mm. dia.) right through both switch assemblies via the locating holes (see Fig. 15). To get the sliders into the correct position the effective length of the inner cable is altered by bending lip A (see Fig. 15).

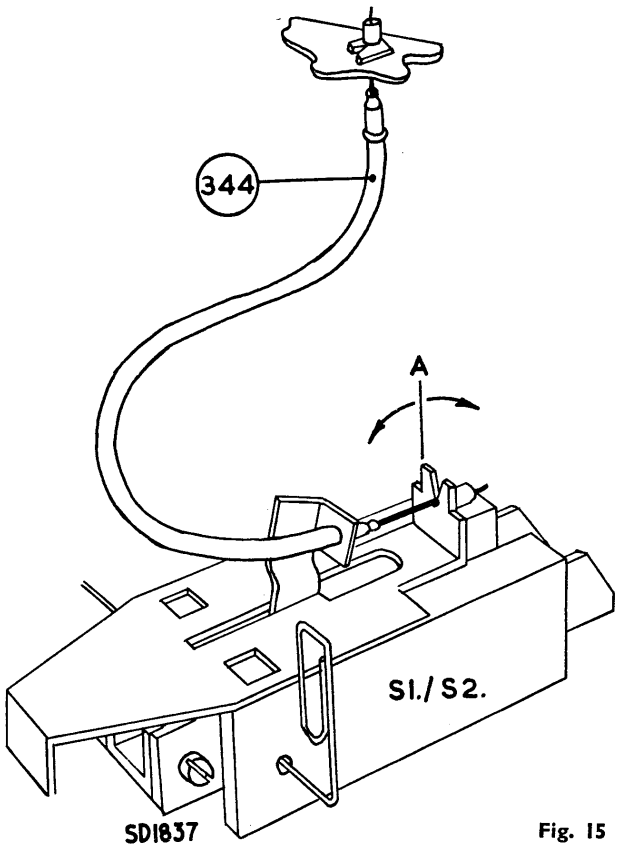


Fig. 15

2. Bowden Cable 375

(i) This cable is checked after replacement in a similar manner. With the track selector switch S3 in position 2–3 (button up), it should be possible to pass the test wire through switch via holes (see Fig. 14).
Adjust position of slider by bending lip B or altering position of the nipple on cable end.

(ii) Some recorders are fitted with a different control system for operating track switch S3 as shown in Fig. 16. Adjustment is made in track 2–3 position, the effective length of control rods being altered by nuts 387 and 388.

H.—MODIFICATION FOR 60 C/S MAINS SUPPLY

Set the voltage carousel to appropriate position and move drive belt to the upper groove in pulley 203. (Lower groove is for use on 50 c/s supply.)

I.—ELECTRICAL DESCRIPTION

(i) Playback.
The signal voltage from the record/playback head K1 is fed via C8 to the base of T1. Bias and stabilization

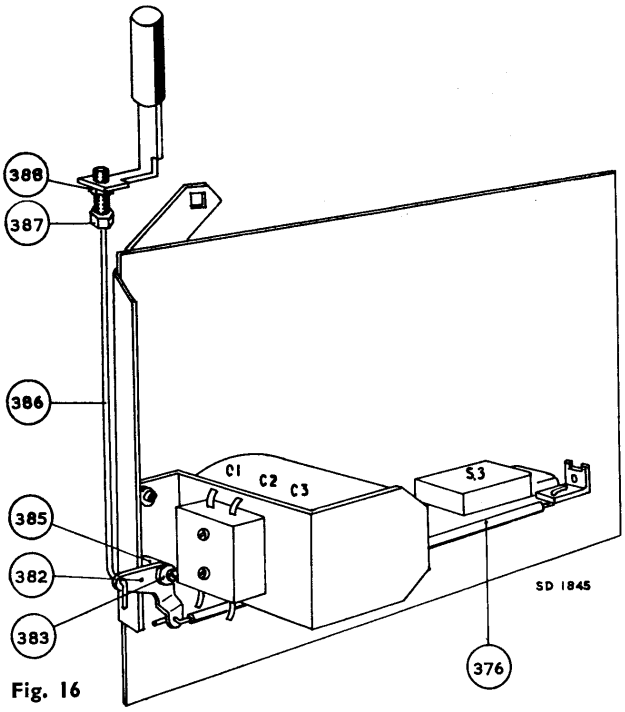


Fig. 16

are provided by R8, R9 and R10. R12 reduces the H.T. voltage to the potential required to operate T1, C10 and C11 provide decoupling for R10 and R12.
Voltage developed across R11 is fed via V/control R13 to the grid of V1A. The frequency response is corrected by the feedback circuit C12, C15, R20, from V1B anode to V1A cathode.

Equalized signals from V1B anode are fed via C18 to output stage V3 and, from tne junction of grid return circuit R23/R24, to the external amplifier socket.

(ii) Record.
The signal source is connected to the appropriate socket from which it is fed via C8 to base of T1. The output from T1 via modulation level control R13, is amplified by V1A and corrected by the feedback circuit C17, R21, C16, R19 and C12 from V1B anode.
C19 feeds signals to modulation level indicator V2 and, via bias rejector L9/C20, to record head K1.
Bias is generated at approximately 46 Kc/s by a Colpitts oscillator comprising V3, C28, C27, C24, C18 and the inductance of erase head K2.

Heater current for V2 is obtained from the voltage developed across V3 cathode resistor R30.

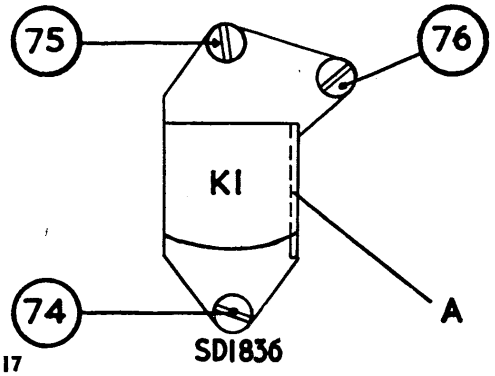


Fig. 17

(iii) Wind and Rewind.
In these positions S5 closes, muting loudspeaker and S4 opens, isolating external amplifier socket.

J.—ELECTRICAL TESTS AND ADJUSTMENTS

1. Record/Playback Head K1

Before commencing head adjustment, check the heights of turntables and tape guides (see Section F2).

(i) Height and cant of head.
Place a tape on the machine, switch to playback and, whilst the tape is moving, switch off mains switch. Release spring 141 from pressure pad assembly 131 and ascertain that the face of the record head is parallel to the tape ; also that the tape is not twisted by tape guide A (Fig. 17).
If necessary alter the cant and height of the head by adjusting screws 74, 75 and 76 (see Fig. 17).
Repeat this test as required.

(ii) Azimuth adjustment.
A suitable test tape is required and can be made on a machine known to be correctly adjusted, by recording a continuous tone of 8 Kc/s.
Position the test tape on the machine and connect a valve voltmeter to extension speaker sockets. Switch to playback and, with volume at maximum, adjust screw 76 for maximum output voltage.
Check that the tape still runs freely through tape guide A, adjusting the height if necessary (see above).
Repeat azimuth test if head neight is altered.

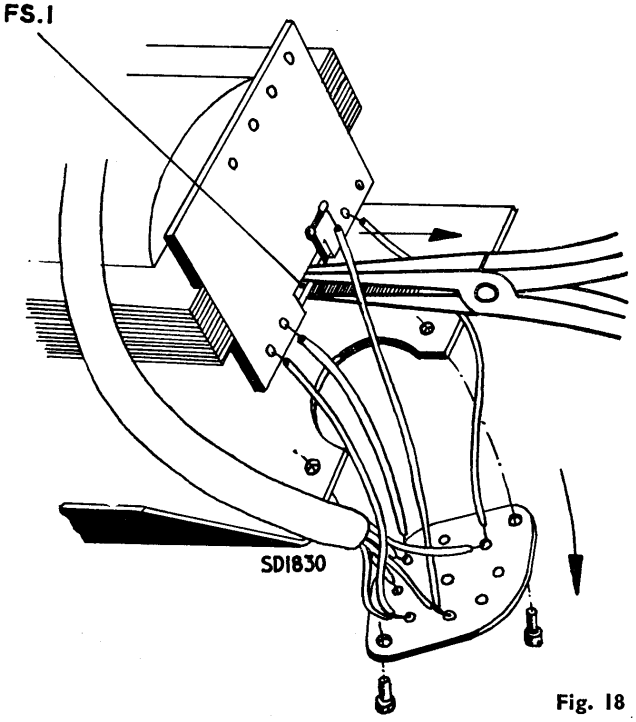


Fig. 18

2. Fuse Replacement

To gain access to tne fuse F.S.1, remove the screws attaching voltage carousel to the chassis and move it aside. Unsolder connections to the fuse and extract it from the transformer (see Fig. 18).

3. Adjustment of Bias Current and Rejector circuit L9/C20

(i) Bias current through the record head can be measured as a voltage across R7. This voltage must not be less than 24 mV A.C. and may be adjusted by altering tne rheostats R34 and R35 for each section of the head. In addition, the bias current should be adjusted to meet

the frequency characteristic requirements of the recorder (see Section K4).

(ii) The rejector circuit L9/C20 is adjusted, in the record position, to reduce the voltage measured between the junction of L9/R22 and earth to a minimum. (At most 7V A.C.). This adjustment should be repeated after each alteration of bias current.

K.—OVERALL FREQUENCY RESPONSE

1. Before checking the response ensure that the head-faces are clean and correctly aligned to tne tape (see Section J1). Also check tne bias current and setting of wave trap L9 (Section J3).

2. Procedure

Replace loudspeaker with a 5Ω resistor, short circuit erase head and switch to track 1.

Connect a valve voltmeter across R7 (between junction of record heads and chassis), turn V/control to maximum and feed a 1000 c/s modulated signal into pick-up socket.

Switch to record and adjust input signal to give a reading of 4mV across R7. Measured input voltage should be 60mV ± 2 db. Remove short circuit from erase head then measure voltage between V/control slider and chassis. Reduce this voltage to a tenth of its value by adjusting V/control.

3. Test

Using a reel of new or good bulk erased tape, record signals at the frequencies listed below, with constant signal voltage input and volume control preset. Play back the recording, measuring the output across the 5Ω resistor (in place of loudspeaker) with a valve voltmeter. The measure voltages should be ± 2 db of these figures.

Freq.	166 c/s	1 Kc/s	6 Kc/s	8 Kc/s	10 Kc/s	13 Kc/s
Vo	1.0v	0.8v	1.0v	1.08v	0.9v	0.57v

4. Adjustment

To correct the frequency response it should only be necessary to alter the bias current (see J3). A decrease in current, increases high frequency response and vice versa.

L.—CLEANING AND LUBRICATION

1. Cleaning

(i) Record and Erase heads.
The magnetic neads capstan and pressure roller must be cleaned at regular intervals.
The heads can be cleaned with a soft cloth wrapped around a wooden stick and moistened with methylated spirits or industrial alcohol. Access for cleaning purposes is provided by the removal of the two small plastic covers in the cabinet.

(ii) General.
After approximately 150 hours of service it is advisable to clean the following parts with methylated spirits or industrial alcohol :
Tape guides.
Erase and record head faces.
Pressure roller and capstan.
Motor pulley and drive belts.
Groove in flywheel and all driving surfaces.
Brake blocks and braking surfaces of turntables.

2. Lubrication

(i) All machines are fully lubricated during manufacture and further attention should normally only be required after a long period of service. If this is the case, or upon replacement of any of the mechanical components lubricant may be applied SPARINGLY to the positions described below. It is emphasised that excessive lubrication will hinder rather than nelp the operation of the instrument, especially if any lubricant gets on to the driving surfaces.

(ii) Oiling points.
A light machine oil (indicated by ● in Fig. 20) may be applied to the following points :—
Bearings of motor, turntables, clutch assembly 42, flywheel, pressure roller, winding roller 49, rewind pulley 112.
Pivot points of pressure arm 125 and pressure pad assemblies 131, 133.

(iii) Greasing.
A light grease preferably containing graphite (indicated by ▲, Fig. 20) may be applied to the following places:—
Contact surfaces of brackets 39, 46, 45, 99 and 100, slide 57, push bars 84, 85 and 86.
Guide pin of record button assembly 11, pivot and roller of lever 20, and guide of track selector knob 183.

D.C. Resistances			
L1	160 Ω	K1	50 Ω + 50 Ω
L2	23 Ω	K2	1.7 Ω + 1.7 Ω
L3	150 Ω		*Motor*
L4	350 Ω	1 }	145 Ω
L5	17.5 Ω	2 }	
L6	1 Ω	2 }	24 Ω
L7	600 Ω	3 }	
L8	0.5 Ω	4 }	150 Ω
L9	110 Ω	5 }	

EL3768/03

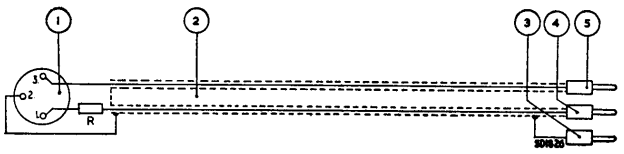
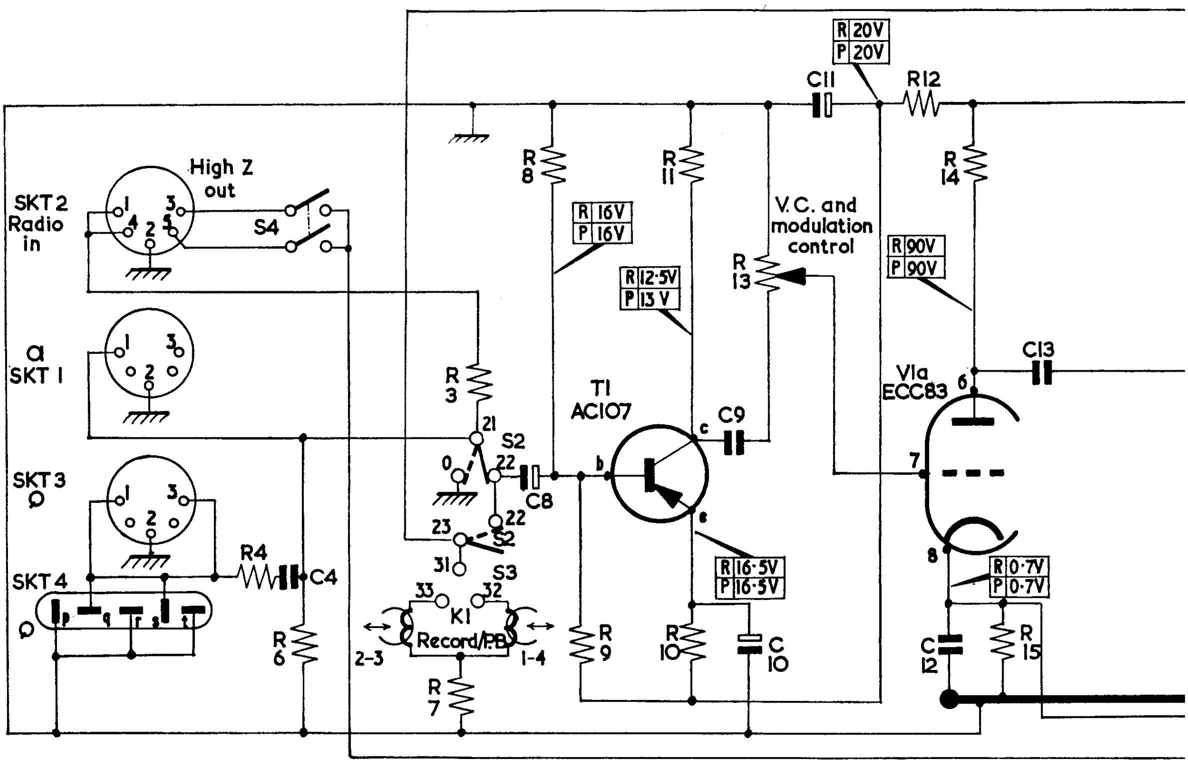


Fig. 19

L	
C	4. 8 9.10. 11. 12. 13.
R	4. 6. 7.3. 8. 9. 11.10. 13. 12. 14. 15.

CAPACITORS

1	50 uF
2	32 uF
3	32 uF
4	4 K7pF
8	10 uF
9	47 KpF
10	25 uF
11	64 uF
12	27 KpF
13	680 pF
14	80 uF
15	3 K9pF
16	270 pF
17	3 K9pF
18	47 KpF
19	47 KpF
20	680 pF
or 20	1 KpF
21	390 pF
24	27 KpF
25	27 KpF
26	50 uF
27	68 KpF
28	1 K5pF



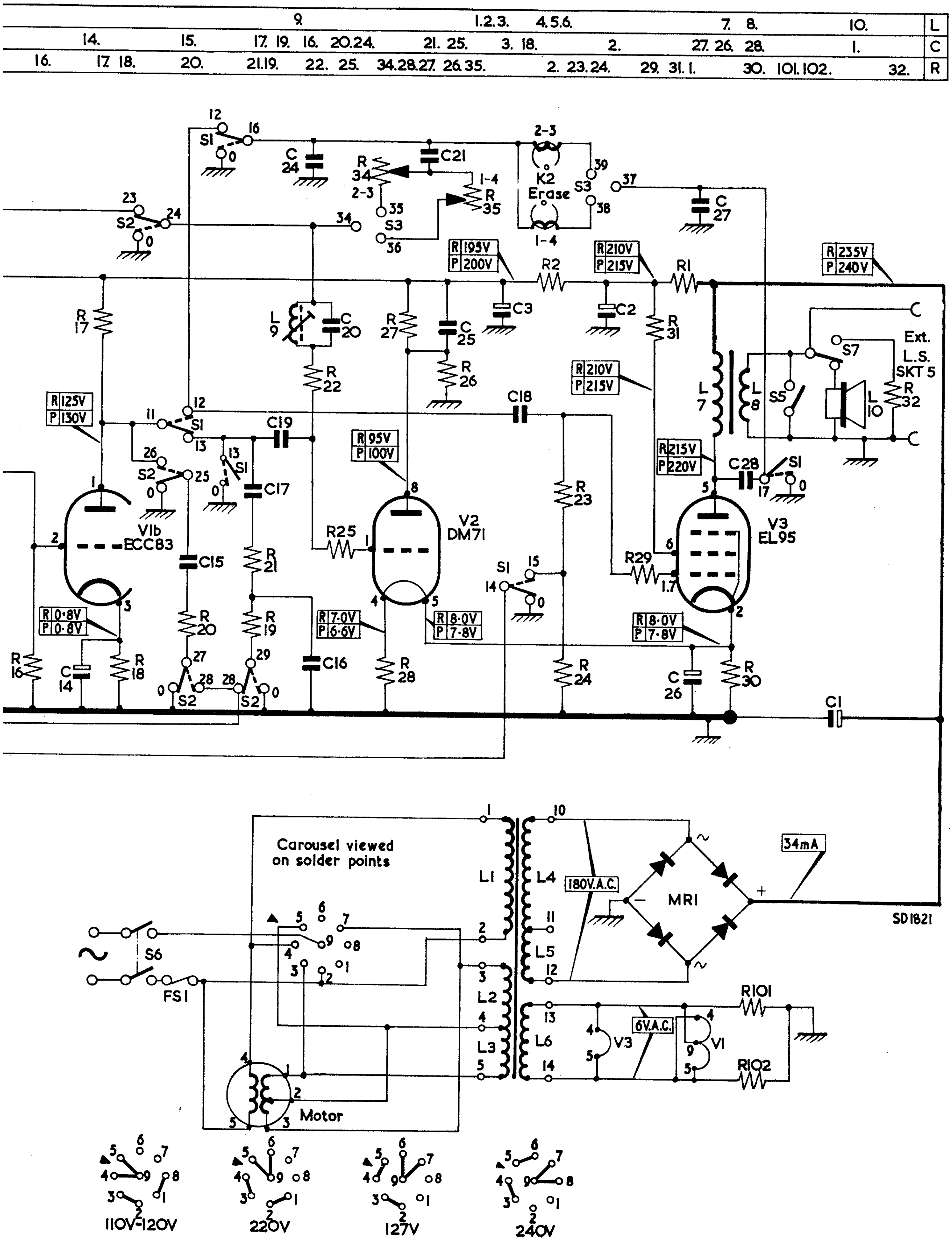
S1						
	Record	16-12	11-13	14-0		
	Playback	11-12	13-0	14-15	16-0	17-0

S2							
	Record	21-22	23-24	25-0	28-29	27-0	
	Playback	21-0	24-0	25-26	29-0	27-28	22-23

S3				
	Track 1 or 4	31-32	34-36	37-38
	Track 2 or 3	31-33	34-35	37-39

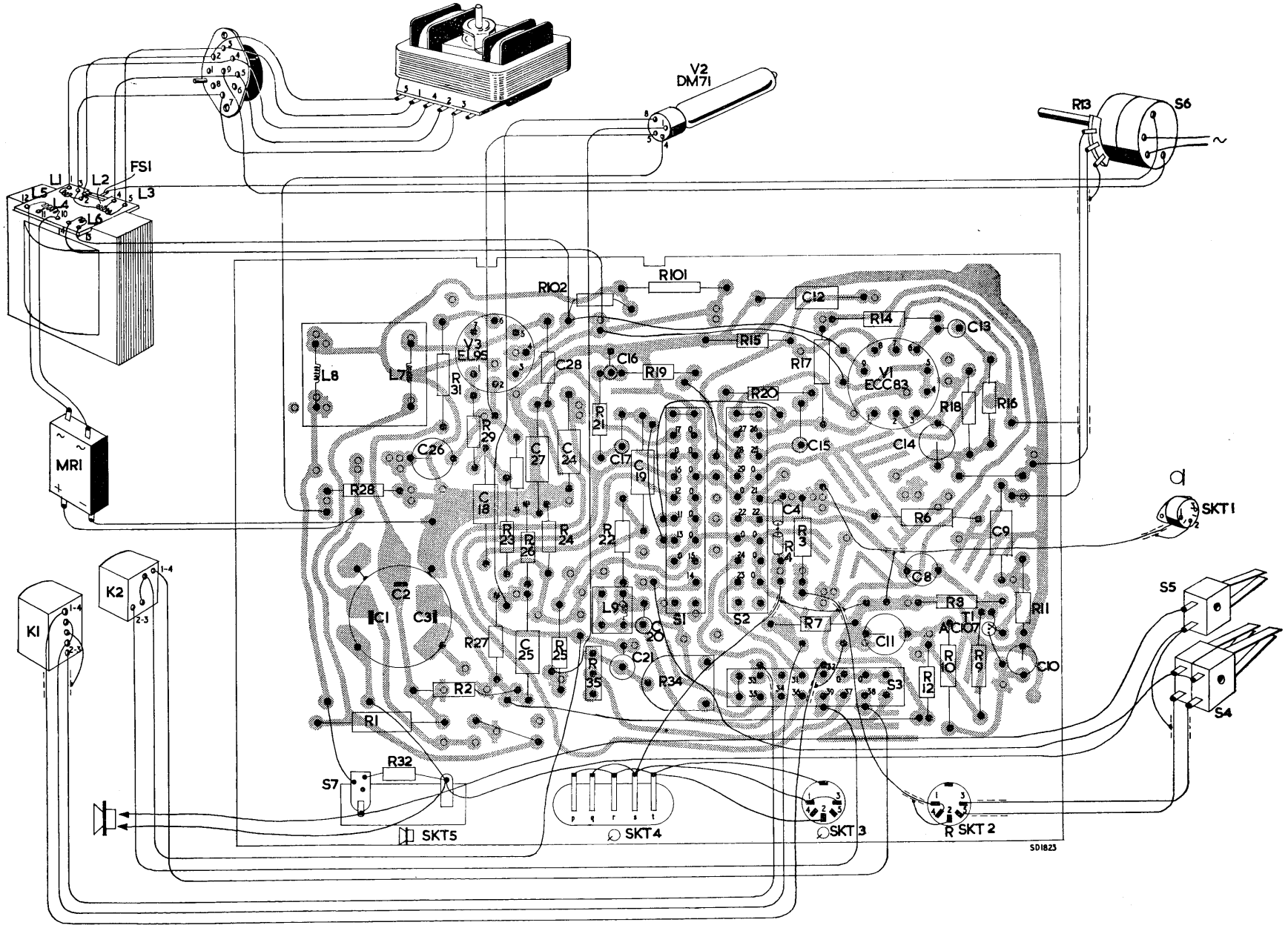
S4 is closed by depressing the Play > button
S5 is opened by depressing the Play > button
S6 On/off ganged to R13
S7 Operated by extension loudspeaker plug

Voltages taken with valve voltmeter of approx. 10MΩ impedance All D.C. voltages taken with −ve prod to chassis. 240V A.C. in on 240V tap. Total consumption 120mA A.C. With no load on MR1 consumption is 90mA A.C.



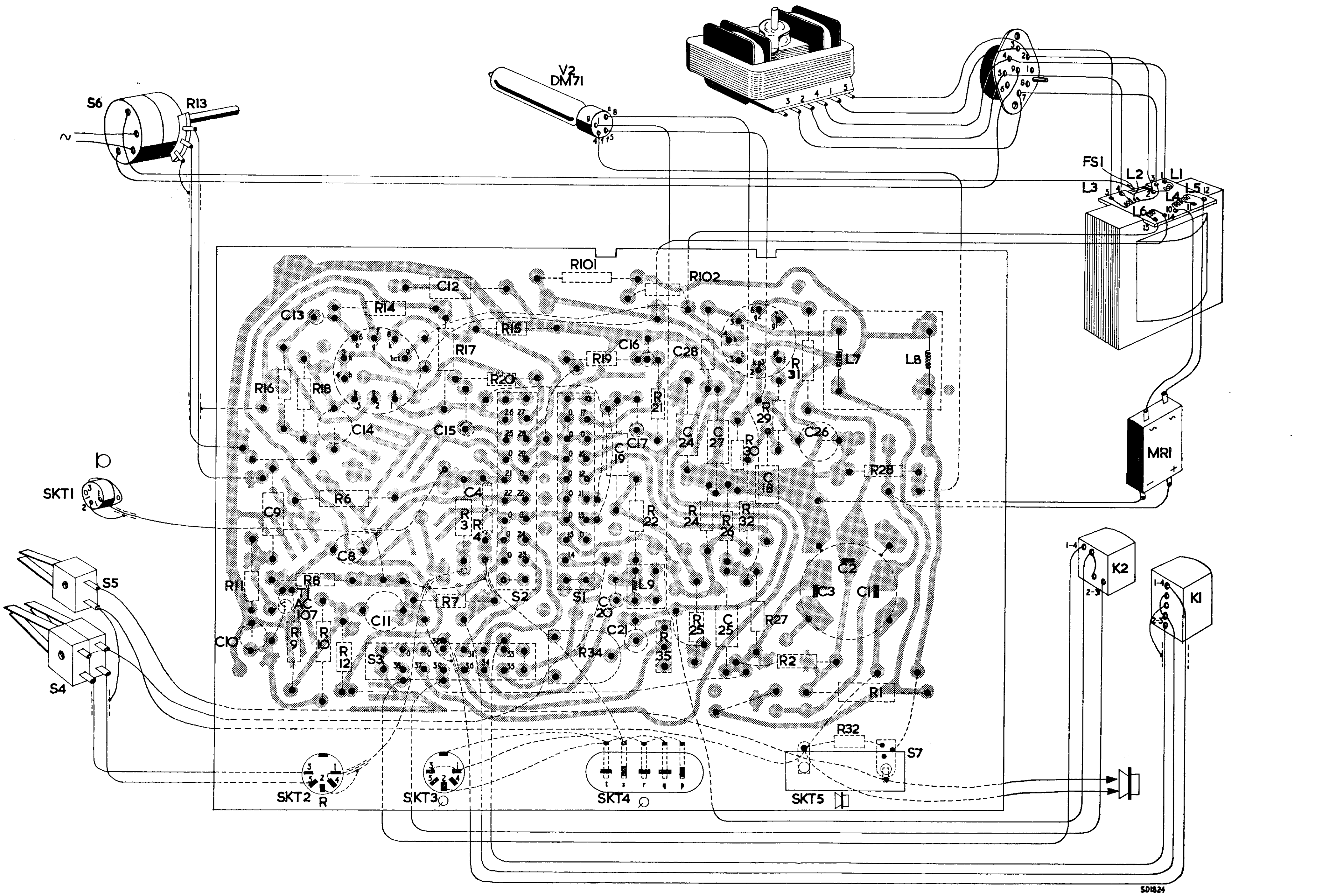
RESISTORS

1	2.7 K
2	6.8 K
3	18 K
4	1.5 M
6	6.8 K
7	22
8	110 K
9	22 K
10	10 K
11	39 K
12	390 K
13	200 K
14	220 K
15	1.5 K
16	470 K
17	68 K
18	820
19	56 K
20	27 K
21	120 K
22	22 K
23	82 K
24	39 K
25	270 K
26	470 K
27	330 K
28	330
29	5.6 K
30	820
31	890
32	15
R34	20 K
R35	20 K
R101	1 K
R102	1 K

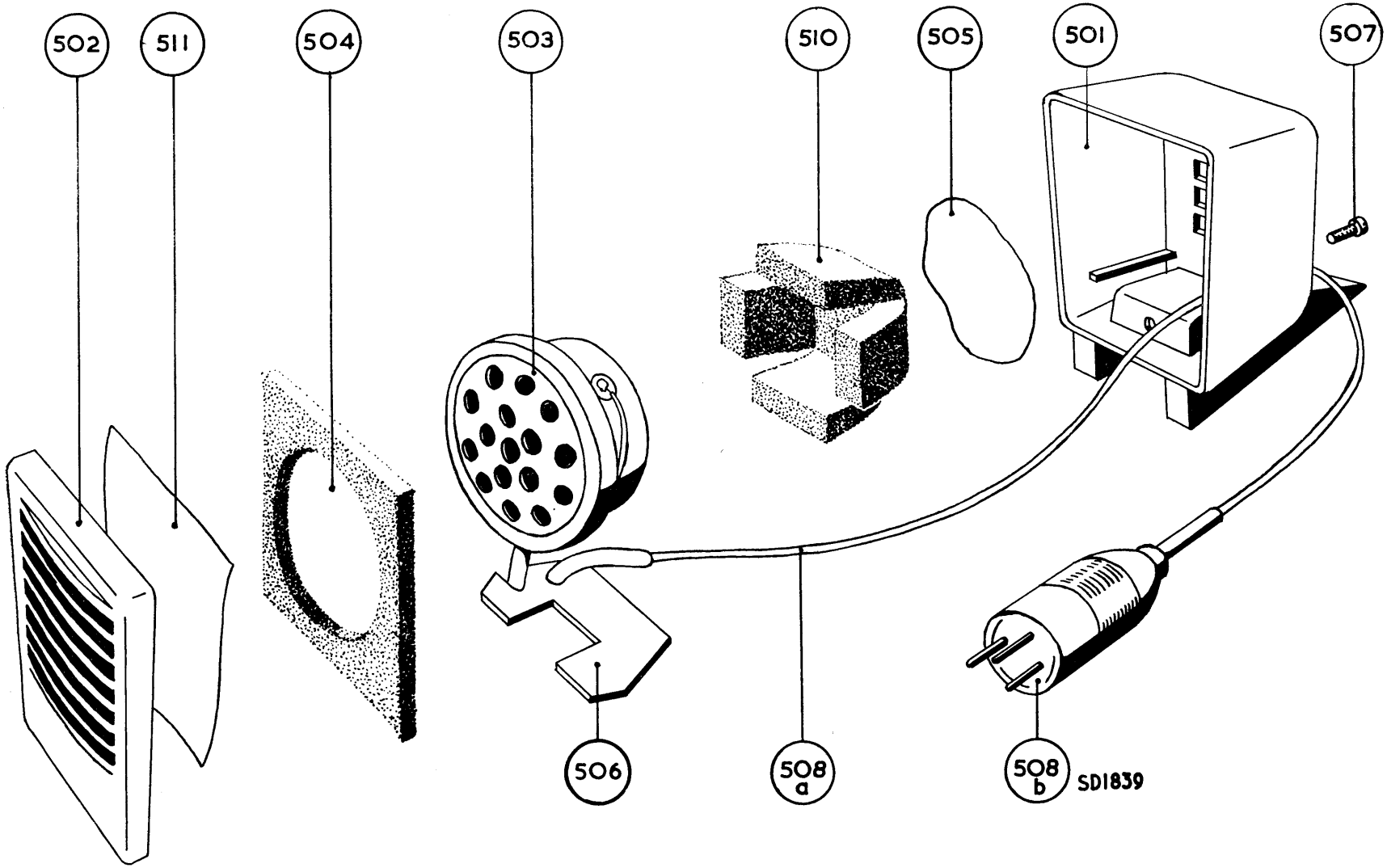


COMPONENT SIDE

PRINT SIDE



S6
R13
V2
DM71
FS1
L1
L2
L3
L4
L5
L6
R101
R102
C12
C13
R14
R15
C16
R17
C28
R16
R18
R19
R20
R21
L7
L8
R31
R29
C14
C15
C17
C19
C24
C27
R30
C26
R28
C18
MR1
SKT1
C4
R6
C9
R3
R4
R22
R24
R26
R32
C8
C2
C3
C1
S5
R11
R8
T1
AC107
R7
S2
S1
L9
C20
K2
K1
R9
R10
C11
C21
R25
C25
R27
C10
R12
S3
R34
R35
R2
R1
S4
R32
S7
SKT2
R
SKT3
SKT4
SKT5
SD1824



CAPSULE D.C. RESISTANCE = 380Ω

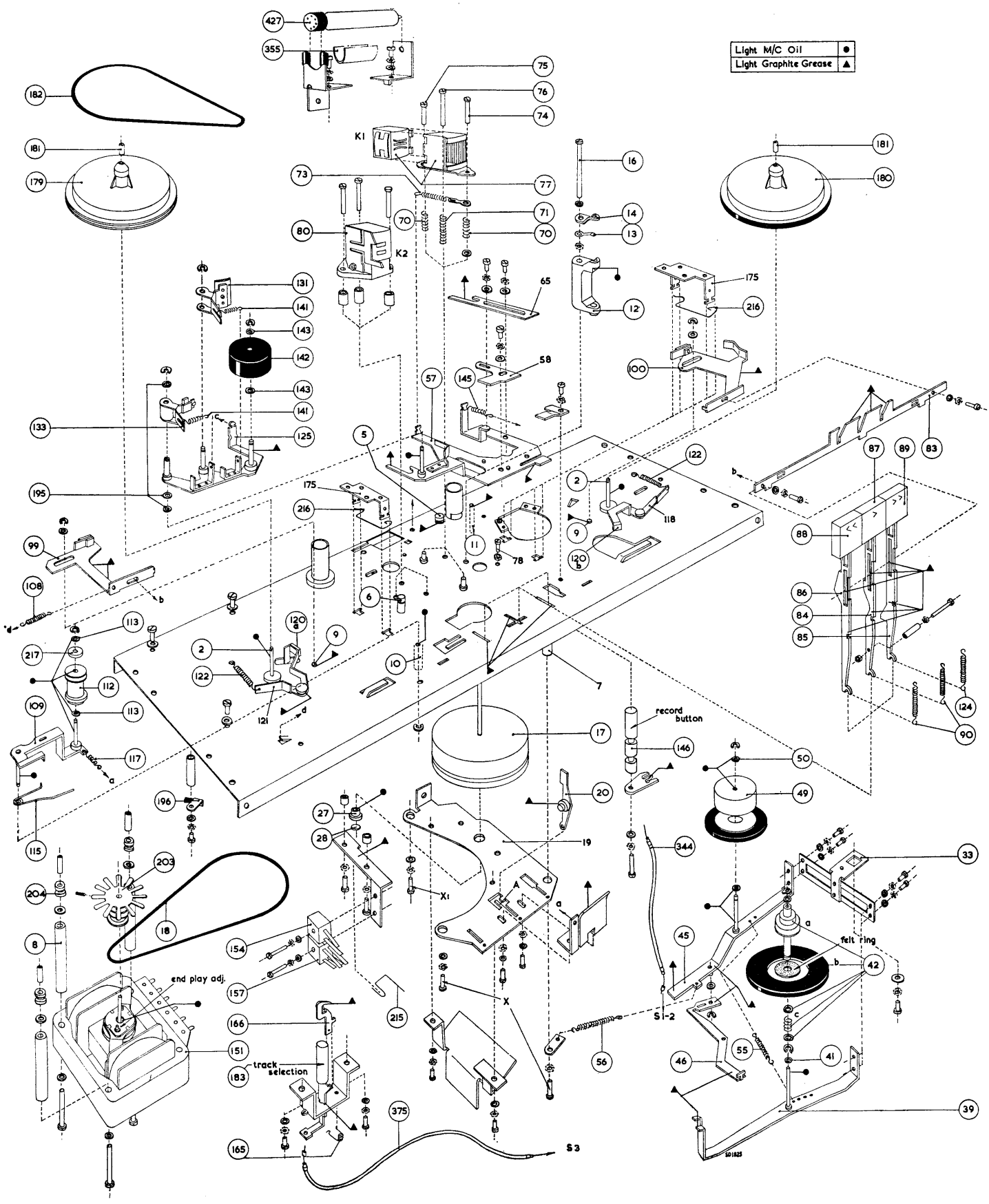

Light M/C Oil ●
Light Graphite Grease ▲
record button
felt ring
end play adj.
track selection
S1-2
S3

Fig. 20

CASE ASSEMBLY

356	Front	AE.606.49
363	Rear	AE.571.40
370	Feet (4)	AE.606.34
	Rubber sleeves for feet	P7 520 48/010
	Screws (4)	B.054.ED/4×20
374	Lid	P5.511.82/423FY
372	Handle	AE.571.57
	Stud for handle (2)	AE.505.83
367	Circlip for above (2)	B.045.BF/13
175	Securing plate for cabinet sections (2)	AE.505.25
	Countersunk screws for above (4)	B.055.ED/2.6×6
216	Spring retainer for securing plate (2)	AE.507.08
361	Record/playback cover—front	AE.606.18
365	Record/playback cover—rear	AE.606.17
	Emblem	V3.341.91
	"Made in Holland" transfer	V3.350.95
	Foam strip for speaker	MK.682.10
	Type label	A3.625.55

CONTROL KNOBS AND PUSHBUTTONS, ETC.

351	Modulation/Volume	AE.571.80
88	Rewind push button	AE.571.04
86	Pushbar for above	AE.504.77
87	Play push button	AE.571.03
84	Pushbar for above	AE.504.75
89	Forward wind push button	AE.571.05
85	Pushbar for above	AE.504.76
90	Springs (2)	AE.504.78
124	Spring	AE.507.10
146	Record button	AE.571.21
183	Track selector button assembly	AE.606.40
†387	Threaded bush	AE.012.22
†	Nut	B.020.EE/4
†386	Rod	AE.507.46
†382	Swivel bracket	AE.507.44
†385	Spacer	AE.507.45
†383	Swivel bush	AE.507.43
†376	Rod	AE.571.91
166	Hook bracket	AE.506.74
344	Bowden cable for SW1/2	AE.571.73
375	Bowden cable for SW3	AE.571.69
165	Torsion spring	AE.503.77
83	Slide bar	AE.506.06
	Insulating roller for SW4/5	HY.139.58
	Insulating washer for above	49.938.15

MAGNETIC HEADS, ETC.

80	Erase head—K2	AE.571.67
77	Record head—K1 with screen	AE.571.63
	Outer screen for record head	AE.507.38
	Mountings screws (3)	B.054.ED/3×12
70	Mounting springs (2)	AE.504.67
71	Mounting spring	AE.504.68

TAPE TRANSPORT ASSEMBLY

125	Pressure arm with spindles	AE.606.15
	Spindle for pressure roller	AE.505.03
145	Spring for pressure arm	AE.505.13
133	Tape guide and pressure pad assembly—erase head	AE.606.39
141	Spring for above	AE.505.12
	Circlip	B.108.AF/1.9
195	Spacing washer	B.050.AD/2.6
131	Pressure pad assembly—record head	AE.606.37
141	Spring for above	AE.505.12
	Circlip	B.108.AF/3.2
†135	Moulded bridge piece	IN.961.54
142	Pressure roller	WT.881.66
143	Washer for roller (2)	P5.515.93/304
	Circlip	B.108.AF/3.2
57	Carriage bracket	AE.606.11
20	Operating bracket assembly for above	AE.606.06
73	Spring for carriage bracket	AE.504.69
65	Locking bracket for record button	AE.504.66

REWIND MECHANISM

179	Left hand turntable	P5.511.99/423
2	Spindle	AE.571.07
181	Nylon bearing screw	P5.511.30/332
182	Drive belt	P7.520.45/000
99	Brake assembly	AE.606.13
108	Tension spring	AE.506.59
109	Sliding pulley bracket with spindle	AE.606.05
	Circlip	B.108.AF/1.9
	Spring washer	B.046.AA/2.6
115	Wire spring for position 109	AE.504.88
117	Tension spring for pulley bracket	AE.504.89
112	Rewind pulley assembly	AE.571.16

† Some sets only.

	Circlip	B.108.AF/1.9
217	Brass cap for pulley	
113	Washer (2)	AE.004.36
122	Tension spring	AE.506.94
120	Brake pad	AE.505.10

FORWARD WIND AND DRIVE MECHANISM

180	Right hand turntable	AE.505.26
2	Spindle	AE.571.07
181	Nylon bearing screw	P5.511.30/332
100	Brake bracket	AE.606.14
	Circlip	B.108.AF/3.2
	Washer	B.050.CD/4
49	Winding roller assembly	AE.571.51
50	Washer (2)	P5.515.93/304
	Circlip	B.108.AF/3.2
45	Bracket with spindle	AE.606.32
56	Tension spring for above	AE.507.02
	Adjusting plate for spring	AE.506.90
46	Coupling strip	AE.504.39
	Spring washer	B.046.AA/2.6
	Circlip	B.108.AF/1.9
42a	Turntable drive pulley	AE.606.09
42b	Rubber clutch wheel	AE.571.71
42c	Clutch spring	AE.504.55
41	Washer (2)	P5.511.75/304
	Circlip	984/2
	Shim washers (2)	A4.452.27
39	Bracket with spindle	AE.606.35
55	Tension spring	AE.507.11
33	Leaf spring and bracket assembly	AE.606.07
122	Tension spring	AE.506.94
120	Brake pad	AE.505.10

FLYWHEEL ASSEMBLY

17	Flywheel	AE.571.08
13	Leaf spring	AE.504.39
14	Bracket	AE.507.01
12	Top bearing	P5.511.98/334
27	Lower bearing	P5.511.95/334
28	Bearing plate	P5.511.93/334
215	Wire spring	AE.507.07
or 215	Leaf spring	AE.507.19

MOTOR ASSEMBLY

151	Motor	JW.412.12
203	50/60 c/s pulley and fan	JW.523.38
	Grubscrew	49.893.40
8	Spacers (3)	AE.506.02
204	Grommets (3)	WRB.905.TU/8×1
18	Drive belt	P7.520.49/000
196	Brush and bracket	WT.832.65

PRINTED PANEL

Panel with components	AE.571.54
Mounting grommets	M.164585
Spacers for above	MK.116.98
Insulation board for panel	AE.506.28
Foam strip for above	MK.682.10
Fish beads	MK.117.66

FUSE AND VALVE HOLDERS, ETC.

Holder for EL95	976/PW7×10
Holder for ECC83	976/PW9×12
Holder for DM71	976/8×6
Mask for DM71	P5.511.91/723GR
Phosphor bronze retainer for DM71	AE.506.12
Retaining spring for valve (2)	A3.811.28
Fuse clips (2)	A3.810.77

SOCKETS, ETC.

316	Microphone socket	WT.888.34
322	Mains socket	AE.571.70
419	Extension speaker socket	AE.571.56
420	Radio socket	WT.888.34
421	Pick up socket—round	WT.888.34
425	Pick up socket—rectangular	979/F5×1
426	Fixing spring for above	A3.647.73
	Plug for position 425	979/M5×1

MISCELLANEOUS

311	Voltage plate	A3.228.39
313	Voltage disc	AE.571.75
	Nut for potentiometer	MK.927.05
	Spring in S1/2	AE.503.77
	Spring in S3	AE.506.79
	Mains lead	P6.493.11
	Carrying pouch for microphone and mains lead	AE.505.93
	Valve position label	AE.506.37

SPARE PARTS LISTS — Continued

SWITCHES

S1	Complete	A3.092.12
S1	Slider	A3.092.11
S2	Complete	A3.092.14
S2	Slider	A3.092.13
S3	Complete	A3.150.38
S3	Slider	A3.150.37
S4		P5.512.26/159
S5		P5.512.18/159

VALVES, ETC.

V1		ECC83
V2		DM 71
V3		EL 95
	Transistors	
T1		AC 107
	Rectifiers	
MR1		B.250.C75
	Fuses	
FS1		A3.425.53
FS2		974/50

TRANSFORMERS AND COILS, ETC.

L1-6	Mains transformer	A3.145.36
L7/8	Output transformer	A3.157.98
L9	Booster coil	A3.910.37
L10	Loudspeaker	940/AD3700X
	Core for L9	K5.120.00

FIXING MATERIAL

SCREWS

Cheesehead

2.6×5 mm.	B.054.ED/2.6×5	3×8 mm.	B.054.ED/3×8
2.6×8 mm.	B.054.ED/2.6×8	3×12 mm.	B.054.ED/3×12
2.6×23 mm.	B.054.ED/2.6×23	3×30 mm.	B.054.ED/3×30
3×5 mm.	B.054.ED/3×5	3×40 mm.	B.054.ED/3×40
4×15 mm.	B.054.ED/4×15	4×20 mm.	B.054.ED/4×20

Countersunk

2.6×6 mm.	B.055.ED/2.6×6

NUTS

3 mm.	B.020.EE/3	2.6 mm.	B.020.AD/2.6

WASHERS

Plain

3 mm. small	B.050.CD/3	2.6 mm.	B.050.CK/2.6
3 mm. large	B.050.ED/3	4 mm.	B.050.CD/4

Lock

2.6 mm.	B.053.VF/6N
3 mm.	B.053.BD/3
4 mm.	B.053.BD/4

Spring—4 mm.	B.046.AA/4
Solder tags—3 mm.	B.201.AF/3
Solder tag—double	B.201.EF/3.6
Distance pieces—general	990/3.5×35

MISCELLANEOUS FIXING MATERIAL

5	Guide for record lever	AE.504.33
6	Guide for pressure arm	AE.504.34
9	Stud for position 99	AE.504.36
10	Stud for position 109	AE.504.37
11	Guide rod for record button	AE.504.38

ACCESSORIES
MICROPHONE ASSEMBLY

	*Microphone complete	EL3756/00
501	Housing	P5.649.31/350
511	Silk for housing	K.300.ZZ/956
502	Grille	V3.131.56
504	Foam ring	P7.630.84/319
503	Capsule	EL6084/10
510	Sponge for capsule	P7.630.73/319
	Foam pad for sponge centre	MK.965.44
505	Cloth for rear grille	V3.449.48.1
506	Cable anchor plate	V3.190.01
507	Retaining screw	B.054.GH/2.6×8
	Washers (2)	B.050.AD/2.6
508A	Lead	R.367.KA/01AA10
508B	Plug	V3.608.19

CONNECTING LEAD ASSEMBLY

*Lead complete	EL3768/01
Plug	WT.888.38
Lead	R.365.KN/04HP10
Single pin plug —black	978/1×4AA
Single pin plug—red	978/1×4AF
Single pin plug—white	AE.012.66
Resistor 1/10 watt 2.2M ohms	B8.305.80B/2M2

TAPES AND SPOOLS

*4" Reel of tape—LP	EL 3908/80
*Empty spool	EL 3909/00

* THESE AND OTHER ACCESSORIES CAN BE ORDERED FROM PHILIPS ELECTRICAL LTD., CENTURY HOUSE, SHAFTESBURY AVE., LONDON, W.C.2

CAPACITORS

		Value	*Working Voltage*	*Tolerance %*	
C1-3	Electrolytic	50+32+32uF	300		A.6027
C4	Polyester	4,700pF	125	10	C.296.AC/A4K7
C8	Electrolytic	10uF	25		C.425.AL/F10
C9	Polyester	47,000pF	125		C.296.AC/A47K
C10	Electrolytic	25uF	25		909/C25
C11	Electrolytic	64uF	40		909/C64
C12	Polyester	27,000pF	125	10	C.296.AC/A27K
C13	Pin up	680 pF		+50-20	904/P680E
C14	Electrolytic	80uF	6.4		C.426.AM/C80
C15	Pin up	3,900pF	500	+50-20	C.301.AA/H3K9
C16	Pin up	270pF		+50-20	904/P270E
C17	Pin up	3,900pF	500	+50-20	C.301.AA/H3K9
C18	Polyester	47,000pF	400	10	C.296.AC/A47K
C19	Polyester	47,000pF	400	10	C.296.AC/A47K
C20	Pin up	680pF		+50-20	904/P680E
or C20	Pin up	1,000pF			C.322.BC/P1K
C21	Pin up	390pF	500	20	904/P390E
C24	Polyester	27,000pF	125	10	C.296.AC/A27K
C25	Polyester	27,000pF	400	10	C.296.AC/A27K
C26	Electrolytic	50uF	25		909/C50
C27	Polyester	68,000pF	125	10	C.296.AC/A68K
C28	Ceramic	1,500pF		+50-20	904/1K5

RESISTORS

		Ohms	*Wattage*	*Tolerance %*	
R1		2,700			E.001.AK/A2K7
R2		6,800			E.001.AK/A6K8
R3		18,000		10	48.426.10/18K
R4		1.5M		10	48.426.10/1M5
R6		6,800		10	48.426.10/6K8
R7		22		5	901/22E
R8		110,000		5	901/110K
R9		22,000		5	901/22K
R10		10,000		5	901/10K
R11		39,000		5	901/39K
R12		390,000		5	901/390K
R13	Volume control	200K	Log Law		E.098.AD/30D11
R14		0.22M	1	10	900/220K
R15		1,500		10	48.426.10/1K5
R16		0.47M		10	48.426.10/470K
R17		68,000	1	10	900/68K
R18		820		10	48.426.10/820E
R19		56,000		10	48.426.10/56K
R20		27,000		10	48.426.10/27K
R21		120,000		10	48.426.10/120K
R22		22,000		10	48.426.10/22K
R23		82,000		10	48.426.10/82K
R24		39,000		10	48.426.10/39K
R25		0.27M		10	48.426.10/270K
R26		0.47M		5	901/470K
R27		0.33M		10	48.426.10/330K
R28		330		5	901/330E
R29		5,600		5	901/5K6
R30		820		10	48.426.10/820E
R31		390	1	10	900/390E
R32		15	1	10	900/15E
R34	Preset	20K			
R35	Preset	20K			
R101		1,000		10	48.426.10/1K
R102		1,000		10	48.426.10/1K