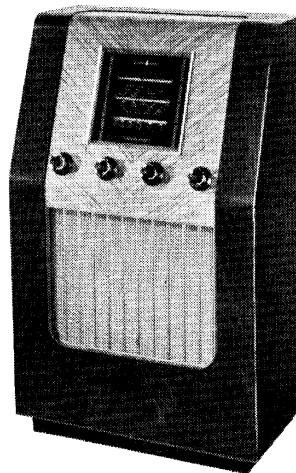


BUSH RADIO

Service Instructions

MODEL SUG. 26.

for A.C. Mains.



FRONT VIEW OF SUG.26

INDEX

Section	Page	Section	Page
Capacitor, Fixed and Variable	2	Resistors, Fixed and Variable	4
Circuit Alignment	3	Specification	1
Circuit Diagram	(Encl)	Valve Data	3
Coils and Transformers	2	<i>Illustrations</i>	
Connections to Main Transformer	8	Under View of Chassis	5
Dismantling	8	Top View of Chassis	6
Fitting Cord Drive	4	Schematic Diagram of Cord Drive	4
Gramophone Pick-up	8	Schematic Diagrams of Coil Deck	7
Part Numbers	8		

SPECIFICATION

BASIC DESIGN

A seven valve (including rectifier), three waverange, superheterodyne receiver, employing Mullard Rimlock Valves in the following sequence :- Frequency Changer ECH.42, I.F. Amplifier EF.41 ; Signal Det' and A.V.C. Rectifier with 1st audio EBC.41, this valve in conjunction with a second EBC.41, operated as a phase inverter, is used to feed a pair of EL.41 valves in push-pull driving a 10 inch P.M. speaker. Negative voltage feedback is used between the secondary of the output transformer and the cathode of 1st EBC.41. A double wound power transformer is used to supply the valve heaters and scale lamps. H.T. supply is from a double path rectifier EZ.40. Adjustable iron dust cored coils are used in the aerial, oscillator, R.F. and I.F. circuits.

VALVES

MULLARD	ECH.42	Heater Volts	6.3,	Amps.	0.225
	EF.41	"	"	6.3,	" 0.2
	EBC.41 (2)	"	"	6.3,	" 0.225
	EL.41 (2)	"	"	6.3,	" 0.7
	EZ.40	"	"	6.3,	" 0.6

VOLTAGE RANGE

100-127, 200-250 Volts. 40-100 cycles. A.C. Supplies.

MAINS CONSUMPTION

60 Watts.

AUDIO OUTPUT

8 Watts.

WAVEBANDS

L.W. 830-2,068 metres (360 -145 Kc/s.)
M.W. 182- 560 metres (1,650-535 Kc/s.)
S.W. 16- 50 metres (18.75- 6 Mc/s.)

CONTROLS (from left to right)

Tone.
On/Off Switch and Volume.
Tuning.
Waveband and Gramophone Switch.

GRAMOPHONE PICK-UP

Pick-up sockets are fitted on the rear of the chassis and are suitable for connecting a high impedance pick-up.

AERIAL AND EARTH

Sockets for aerial and earth connection are provided on the rear of the chassis and when viewed from the rear of the chassis their positions are as follows :-

SENSITIVE POSITION
SELECTIVE POSITION
EARTH POSITION

SCALE LAMP

6.5 Volt, 0.3 Amp.

EXTERNAL SPEAKER

Two sockets to which an extension speaker may be connected are situated on a separate panel on the rear of the cabinet. The extension speaker must be a P.M. type and have a speech coil impedance of approximately 2.5 Ohms, *the extension speaker leads must not be earthed.*

CABINET DIMENSIONS

Height 33½ inches. Depth 11½ inches. Width 20 inches.

WEIGHT

40-lb.

CAPACITORS

Ref.	Value		Type	D.C. Working Voltage	Tolerance ± %	Part No	Description
	mmfd.	mf.					
C1	47	—	Silvered Ceramic	750	20	AP17338	Series aerial capacitor. L.W. Aerial Coupling fixed tuning. S.W. Aerial fixed tuning.
C2	800	—	Moulded Mica	350	20	P3776	
C3	20	—	Silvered Mica	350	10	AP16002	
C4	60	—	Silvered Mica	350	2	AP17054 AP16188 AP17057	L.W. Aerial fixed tuning.
C5	50	—	Moulded Mica	350	20	P3774	
C6	—	.1	Paper Tubular	350	20	P8936 P3771	V1, A.V.C. Grid Isolator. A.V.C. Line Decoupling.
C7	110	—	Silvered Mica	350	2	AP16304 AP17058	1st I.F. Pri. Tuning fixed.
C8	—	.05	Paper Tubular	350	20	P3770	
C9	—	.05	Paper Tubular	350	20	P12775 P3770	V1, Cathode Bypass. V1, Screen Decoupling.
C10	110	—	Silvered Mica	350	2	P12775 AP16304	1st I.F. Sec. Tuning fixed.
C11	45	—	Silvered Mica	350	10	AP17058	
C12	180	—	Silvered Mica	350	2	AP18617 AP18618	Oscillator Grid Capacitor. L.W. Oscillator fixed tuning.
C13	390	—	Silvered Mica	350	1	AP16451 AP17059	L.W. Oscillator Padding.
C14	556	—	Silvered Mica	350	1	AP15735	
C15	—	.05	Paper Tubular	350	20	AP17060 AP15731	M.W. Oscillator Padding.
C16	—	.05	Paper Tubular	350	20	AP17061	
C17	—	.05	Paper Tubular	350	20	P3770	V2, Screen Decoupling.
C18	—	.05	Paper Tubular	350	20	P12775 P3770	2nd I.F. Sec. & A.V.C. Line Bypass.
C19	110	—	Silvered Mica	350	2	P12775	
C20	—	.01	Paper Tubular	1000/350	25	P3770 P12775	V2, Anode Decoupling. V2, Cathode Bypass.
C21	500	—	Moulded Mica	350	10	AP16304 AP17058	2nd I.F. Primary Tuning fixed.
C22	110	—	Silvered Mica	350	2	AP17058	
C23	47	—	Silvered Ceramic	750	20	P3769	Audio Grid Coupling to V3.
C24	100	—	Silvered Ceramic	750	20	P12773	
C25	300	—	Moulded Mica	350	10	P12361	Part of Tone Control Circuit.
C26	33	—	Silvered Ceramic	750	20	AP16304	
C27	500	—	Moulded Mica	350	10	AP17058	2nd I.F. Secondary Tuning fixed.
C28	—	50	Electrolytic	12	—	AP17338	
C29	—	8	Electrolytic	350	—	AP17336	A.V.C. feed to diode.
C30	—	.01	Paper Tubular	1000/350	25	AP12374	R.F. return Signal diode.
C31	—	.01	Paper Tubular	1000/350	25	AP18221	Part of Tone Control circuit.
C32	—	50	Electrolytic	12	—	P12361	Part of Tone Control (top boost.)
C33	—	.001	Paper Tubular	1000	25	AP18622	R.F. Bypass.
C34	—	50	Electrolytic	350	—	AP18622	V3, Cathode Bypass.
C35	—	50	Electrolytic	350	—	AP18620	Low H.T. Line Smoothing.
TC1	3-50	—	Trimmer	—	—	P3769	Coupling to Grid V5.
TC2	3-50	—	Trimmer	—	—	P12773	
TC3	3-50	—	Trimmer	—	—	P3769	Coupling to Grid V6.
VC1	528	—	Tuning	—	—	P12773	
VC2	528	—	Tuning	—	—	AP18622	V5, V6, Cathode Bypass.

COILS, CHOKES AND TRANSFORMERS

Reference	Approximate D.C. Resistance in Ohms	Part No.	Description
L1	Less than .5	S12733	S.W. Aerial Coupling.
L2	Less than .5		S.W. Aerial Tuning.
L3	.6	S12737	M.W. Aerial Coupling.
L4	4.0		M.W. Aerial Tuning.
L5	32.0	S12739	L.W. Aerial Coupling.
L6	16.0		L.W. Aerial Tuning.
L7	Less than .5	S12733	S.W. Oscillator Coupling.
L8	Less than .5		S.W. Oscillator Tuning.
L9	.6	S12738	M.W. Oscillator Coupling.
L10	3.2		M.W. Oscillator Tuning.
L11	1.5	S12740	L.W. Oscillator Coupling.
L12	4.0		L.W. Oscillator Tuning.
—	12.5	ES16447	1st I.F.T. Primary.
—	12.5		1st I.F.T. Secondary.
—	12.5	ES16448	2nd I.F.T. Primary.
—	12.5		2nd I.F.T. Secondary.
T2	Less than .5	DS18641	H.T. Secondary total
—	27		L.T. Secondary total
T1	Less than .5	CS18639	Primary total
			Secondary total
—	145	—	Primary total

Mains Transformer
Output Transformer

ALIGNMENT PROCEDURE

TEST EQUIPMENT REQUIRED

Signal Generator (for R.F. and I.F. Alignment)
 Frequency range 150 Kc/s. to 20 Mc/s., Calibration accuracy $\pm 1\%$, Modulation 400 cycles modulated at 30%.
 Output Wattmeter 50 to 1,000 milliwatts.
 Standard Dummy Aerial 200 mmfd. capacitor for L.W. and M.W. bands and a 400 Ohms non-inductive resistor for the S.W. band.

PRELIMINARY

The receiver and signal generator should be switched on 15 minutes before commencing alignment, use the lowest input from the signal generator consistent with a reasonable output and with the volume control at maximum. Check

the position of the pointer in relation to the tuning condenser, with the plates fully meshed the centre of the pointer should coincide with datum line printed on the main and auxiliary calibration scale.

I.F. ALIGNMENT (465 Kc/s.)

Set the tuning condenser to maximum capacity. Connect the Signal Generator to V2 pin 6. Switch receiver to medium waverange and tune the Secondary and Primary 2nd I.F.T. in that order for maximum output.

Transfer the Signal Generator to V1 pin 6 and tune the Secondary and Primary 1st I.F.T. in that order for maximum output, decrease signal generator output as circuits approach resonance. Peak each circuit once only.

R.F. ALIGNMENT

Operation	Waverange	Signal Generator Frequency	Receiver set to Frequency	Adjust
1	L.W.	150 Kc/s.	150 Kc/s.	Cores of L11/12 Osc. and L5/6 Aer. for maximum output. Trimmer TC3 Osc. for maximum output. Check calibration.
2	L.W.	300 Kc/s.	300 Kc/s.	
3	Repeat operation (1)	—	—	
4	M.W.	600 Kc/s.	600 Kc/s.	Cores of L9/10 Osc. and L3/4 Aer. for maximum output. Trimmer TC2 Osc. for maximum output. Check calibration.
5	M.W.	1,500 Kc/s.	1,500 Kc/s.	
6	Repeat operation (4)	—	—	
7	S.W.	6 Mc/s.	6 Mc/s.	Cores of L7/8 Osc. and L1/2 Aer. for maximum output. Trimmer TC1 Osc. for maximum output. Check calibration.
8	S.W.	12 Mc/s.	12 Mc/s.	
9	Repeat operations (8) and (9)	—	—	

VALVE DATA

Input 230 Volts A.C., 50 cycles. Receiver set to medium waverange with no signal input. All measurements taken on an Avometer, Model 7, with chassis negative; 1,000 Volt range for H.T. and 10 Volt (or appropriate) range for Cathode measurements.

Valve Type	Electrode	Pin No.	Voltage	Current mA.
V1 ECH.42	Hexode anode	2	} 120 55 1.5	6.3
	Oscillator anode	3		
	Screens	5		
	Cathode	7		
V2 EF.41	Anode	2	80	5.7
	Screen	5	60	
	Cathode	3, 4, 7	1.3	
V3 EBC.41	Anode	2	90	.3
	Cathode	7	1.0	
V4 EBC.41	Anode	2	80	1.0
	Cathode	7	0.8	
V5 and V6 EL.41	Anode	2	230	61.0
	Screen	5	220	
	Cathode	3, 7	6.5	
V7 EZ.40	Anodes	2 and 6	242 A.C.	75.0
	Cathode	7	253	

The Total Current Consumption is 220 mA. A.C.

RESISTORS

Reference	Value in Ohms	Rating Watts	Part No.	Description
R1	12	1/4	P13477	Part of Feedback on Gram.
R2	15,000	1/2	P6652	V1, Screen and Oscillator Feed.
R3	470,000	1/4	P7031	V1, Grid A.V.C. Decoupling.
R4	220	1/4	P6191	V1, Cathode Bias.
R5	47,000	1/4	P6779	V1, Oscillator Grid/Cathode Return.
R6	47	1/4	P6023	S.W. Oscillator Stabiliser.
R7	560,000	1/4	P14317	P.U. Isolating Resistance.
R8	1 megohm	1/4	P7115	A.V.C. Decoupling.
R9	220	1/4	P6191	V2, Grid Stabilising.
R10	47,000	1/4	P6779	V2, Screen Feed.
R11	1.5 megohms	1/4	P7157	A.V.C. Decoupling.
R12	10,000	1/4	P6611	V2, Anode Decoupling.
R13	330	1/4	P6233	V2, Cathode Bias.
R14	100,000	1/4	P6863	Signal Filter.
R15	1 megohm	1/4	P7115	Part of Tone Control Circuit.
R16	330,000	1/4	P6989	Signal Diode Load.
R17	68,000	1/4	P6833	V3, Anode Load.
R18	3,300	1/4	P6485	V3, Cathode Bias.
R19	22	1/4	P5945	Part of Feedback Circuit to V3 Cathode.
R20	2,200	1/4	P6455	V4, Cathode Bias.
R21	68,000	1/4	P6833	V4, Anode Load.
R22	1 megohm	1/4	P7115	A.V.C. Diode Load.
R23	10,000	2	P6608	V1, 2, 3 and 4, H.T. Feed Resistor.
R24	470,000	1/4	P7037	V5, Grid/Cathode Return.
R25	33,000	1/4	P6743	Resistor Developing Drive for V4.
R26	470,000	1/4	P7037	V6, Grid/Cathode Return.
R27	47,000	1/4	P6779	V5, Grid Stabilising.
R28	47,000	1/4	P6779	V6, Grid Stabilising.
R29	120	1	P6135	V5, V6, Cathode Bias.
R30	220	1/4	P6197	Part of Feedback Circuit.
R31	1,500	1	P6405	H.T. Smoothing.
VR1	2.2 megohms	—	CP16385	Volume Control with S4 Ganged.
VR2	2.2 megohms	—	CP18616	Tone Control.

A tolerance of $\pm 20\%$ is permissible on all resistors with the exception of R17, R20, R21 and R29 $\pm 5\%$, and R19, R24, R25, R26, R30, and R31 $\pm 10\%$.

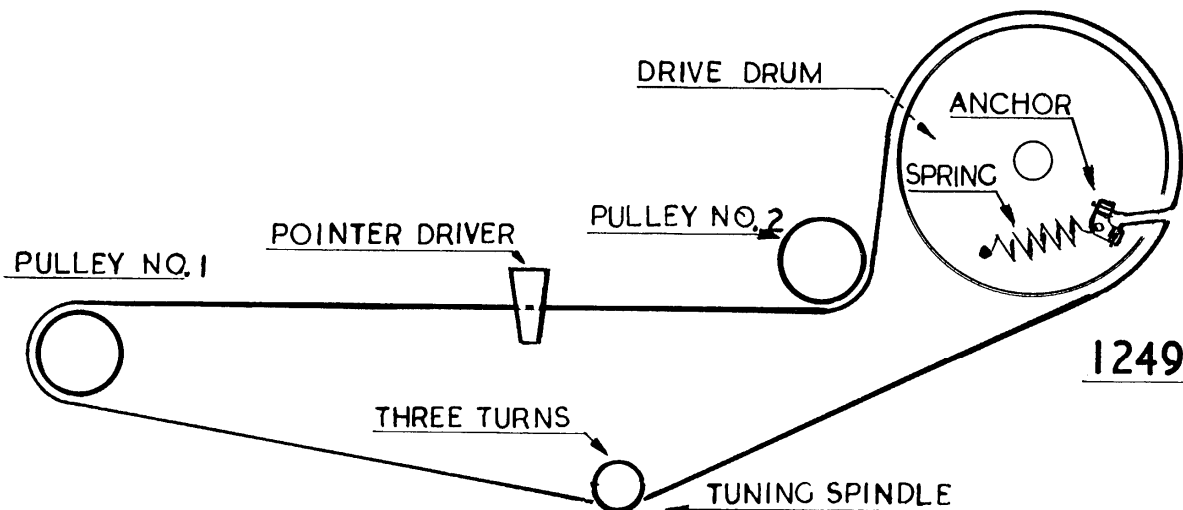
FITTING CORD DRIVE

Part Numbers

- Cord and Anchor for Tuning Drive .. AS16416
- Drive Pressure Spring P1941
- Pointer and Carriage BS16426
- Pointer Driver API6296

With the plates of the tuning condenser fully meshed the drive drum should be set so that the auxiliary pointer coincides with the datum lines on the auxiliary scale attached to the back of the drive drum, the opening on the edge of the drive drum should be in alignment with the figure 25 printed on the auxiliary scale.

The length of the drive cord after clenching in the anchor is $32\frac{1}{2}$ inches. Hook the cord and anchor to the drive pressure spring and attach the opposite end of the spring to the drive drum. Pass the cord through the opening on the edge of the drive drum and take three complete turns round the tuning spindle in a clockwise direction. Pass the cord over pulley No. 1 and under pulley No. 2 and continue for half a turn round the drive drum back to the drive pressure spring. Clip the pointer driver to the cord but do not clench. Replace the chassis in the cabinet, set the pointer to the datum line to be found on the right edge of the L.W. and S.W. scales, drop the pointer driver into the pointer carriage and clench clip tightly on pointer driver.



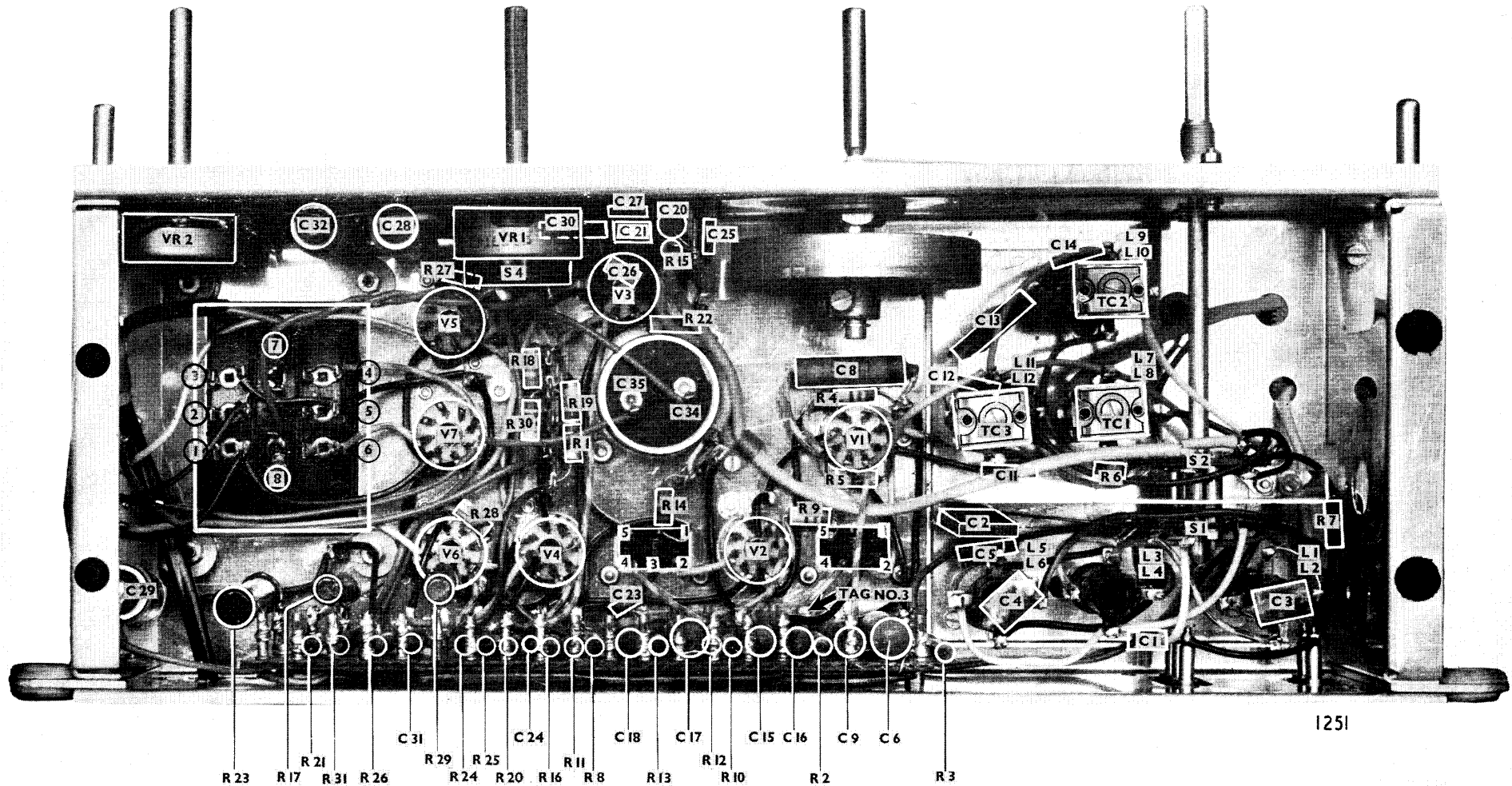


Plate 1

Underchassis View of SUG.26

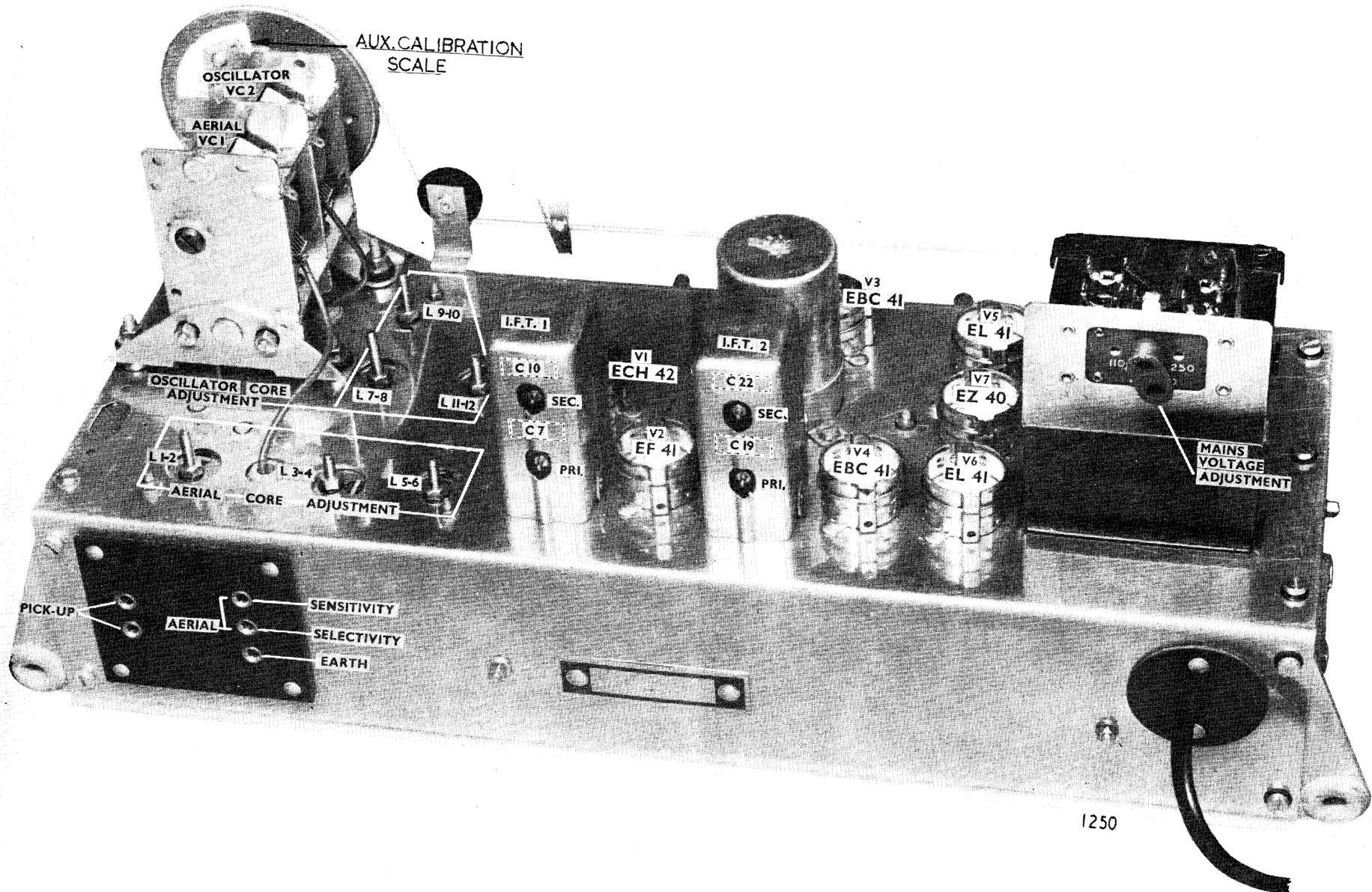


Plate 2

Top View of Chassis SUG.26

COIL DECK CONNECTIONS

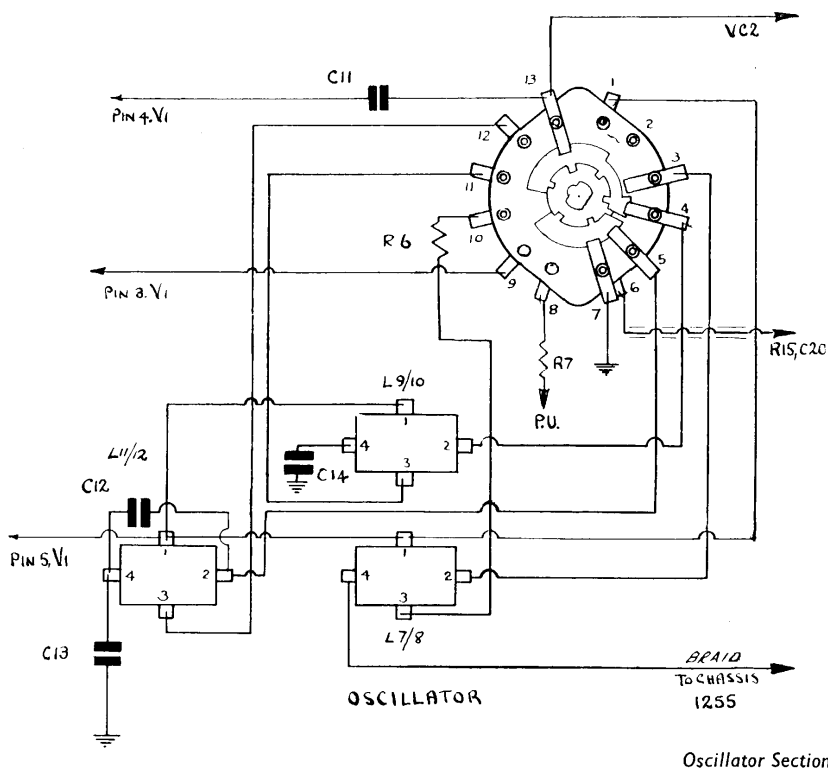
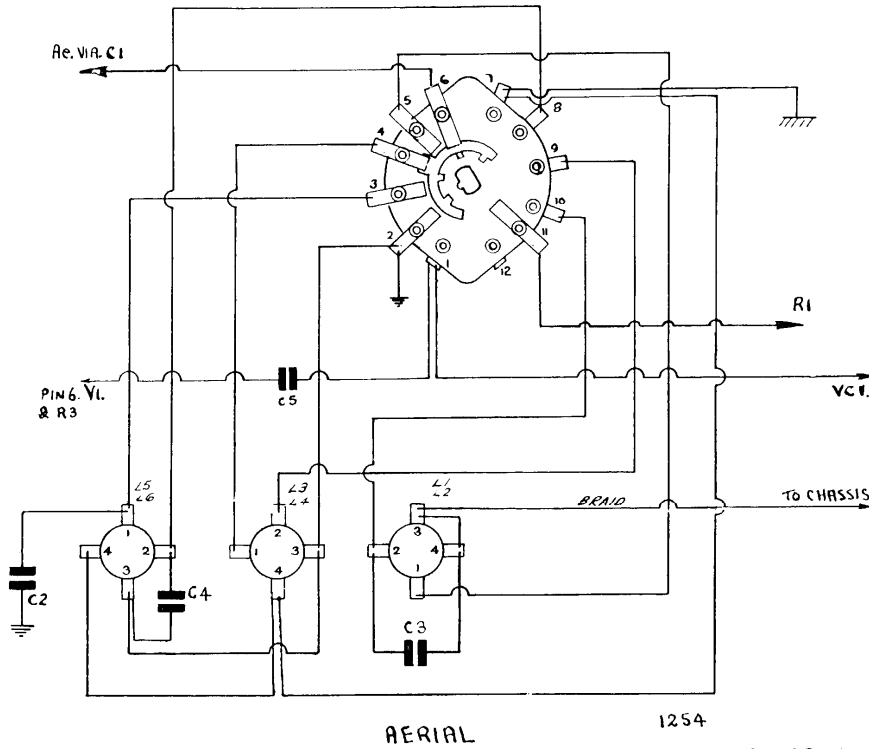
To remove the coil deck from the chassis unscrew the four screws securing the coil deck to the chassis and remove the switch operating bar, the complete assembly may then be removed by unsoldering the following wires :-

Aerial Section

- (1) Switch S1. Tag No. 1 to VCI stator and via C5 to R3 (main R/C panel).
- (2) Switch S1. Tag No. 6 to ' sensitive ' aerial socket.
- (3) Switch S1. Tag No. 7 to chassis.
- (4) Switch S1. Tag No. 11 to R1, on fourway chassis tag strip.
- (5) Coil L1/2. Tag No. 3/4 L1/2 earthing braid to VCI rotor and common chassis earth point.

Oscillator Section

- (6) Switch S2. Tag No. 6 at rear to P.U. socket via R7.
- (7) Switch S2. Tag No. 8 to junction of R15 and C20 (remove at R/C end).
- (8) Switch S2. Tag No. 9 to pin 3, V1.
- (9) Switch S2. Tag No. 13 to VC2 stator and via C11 to pin 4, V1.
- (10) Coil L7/8. Tag No. 4 L7/8 to chassis, earth tag.
- (11) Coil L11/12. Tag No. 1 L11/12 to pin 5, V1.



SUG.26

DISMANTLING

Set the tuning control such that the pointer is approximately in the mid-position on the tuning scale and lift the pointer driver off the carriage. Disconnect the output transformer and pilot light connecting plug **PS1** from the chassis and remove the four control knobs from the front of the receiver. Remove the two chassis securing screws and withdraw the chassis. When replacing the chassis ensure that the locating pins projecting from the front of the chassis are correctly positioned in the cabinet and that each bracket is fitted with its rubber grommet.

SPEAKER

Part Number	CP.17087
Type	Permanent Magnet 10 inches
Impedance at 400 cycles	2.3 ohms

CONNECTIONS TO I.F. TRANSFORMERS

I.F.T. 1 Part No. CS.16447	{	Tag No. 1 to C16 and R11 (main R/C panel).
		Tag No. 2 to pin 2, V1. Tag No. 4 to H.T. + Ve. Tag No. 4 (main R/C panel).
I.F.T. 2 Part No. CS.16448	{	Tag No. 5 to pin 6, V2 via R9. Tag No. 1 to R14 and junction of R16, C24 (main R/C panel).
		Tag No. 2 to pin 2, V2. Tag No. 3 to C23. Tag No. 4 to R12 and C17 (main R/C panel). Tag No. 5 to pin 5, V3.

CONNECTIONS TO OUTPUT TRANSFORMER T1

Reading from top to bottom the tags are numbered 1 to 6 (receiver viewed from rear).

Part No. CS.18639	{	Tag No. 1 to L.H. Ext. Spk. socket and pin 6 PS1.
		Tag No. 2 to R.H. Ext. Spk. socket and pin 7 PS1.
		Tag No. 3 Not used.
		Tag No. 4 to one side of C33 and pin 2 PS1.
		Tag No. 5 to pin 1 PS1.
		Tag No. 6 to one side of C33 and pin 8 PS1.

NOTE :—Eight pin plug and socket **PS1** viewed from underside.

CONNECTIONS TO MAINS TRANSFORMER T2

The external connections to the mains transformer are made to tags situated on the base of the transformer. These tag numbers are shown on Plate 1, the connections are as follows :—

- Tag No. 1 to pin 1 V7 (and all other heaters) and pin 3 of **PS1**.
- Tag No. 2 to *chassis* and pin 4 **PS1**.
- Tag No. 3 to *chassis*.
- Tag No. 4 to pin 6, V6.
- Tag No. 5 to *chassis*.
- Tag No. 6 to pin 2, V7.
- Tag No. 7 to mains supply plug.
- Tag No. 8 to mains supply plug via switch **S4**.

GRAMOPHONE PICK-UP

The waverange switch should be set to the **GRAM.** position when the receiver is being used for record reproduction. A good quality high impedance pick-up either magnetic or crystal, preferable the latter, may be connected direct to the P.U. Sockets. The pick-up must be terminated as recommended by the pick-up manufacturers. It is advisable to use a screened single core cable, of which the screening itself is completely covered with insulating material, for the pick-up connections. The inner conductor of the cable is connected to the upper P.U. socket of the receiver, whilst the screening forming the other conductor is connected to the lower P.U. socket. An input of approximately 0.5 to 1.0 volt R.M.S. is required to fully load the amplifier. A pick-up input circuit suitable for connecting the Cosmocord G.P.19 Std. and G.P.19 L.P. to this receiver is illustrated in diagram A.

COSMOCORD G.P.19. STD. & L.P.

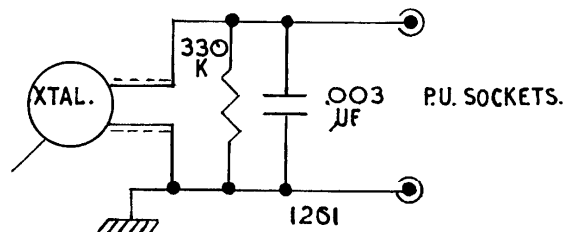


DIAGRAM A.

PART NUMBERS

The following part numbers are not shown elsewhere in these Service Instructions. When ordering replacements or spare parts please quote :—

- (a) Type and serial number of receiver.
- (b) Part number and description of item.
- (c) Quantity required.

Cabinet	FP18816
Cabinet Back (Top)	EP18830
Cabinet Back (Bottom)	EP18831
Coil Deck	ES16459
Iron Core, Adjustable (L1 to L12 inclusive)	AP15378
Knob, Volume, On/Off	CP16419

Knob, Tone	CP16422
Knob, Waveband	CP16421
Knob, Tune	CP16420
Knob, Clip (one each)	AP16423
Knob, Skirt (one each)	BP16418
Scale, Tuning	DP18834
Speaker, 10-inch P.M.	CP17087
Switch, Location Plate	AP16446
Switch, Wafer (Aerial Section)	AP16290
Switch, Wafer (Oscillator Section)	AP16291
Transformer, Mains	DS18641
Transformer, Output	CS18639

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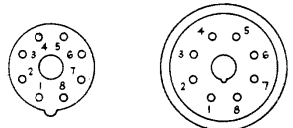
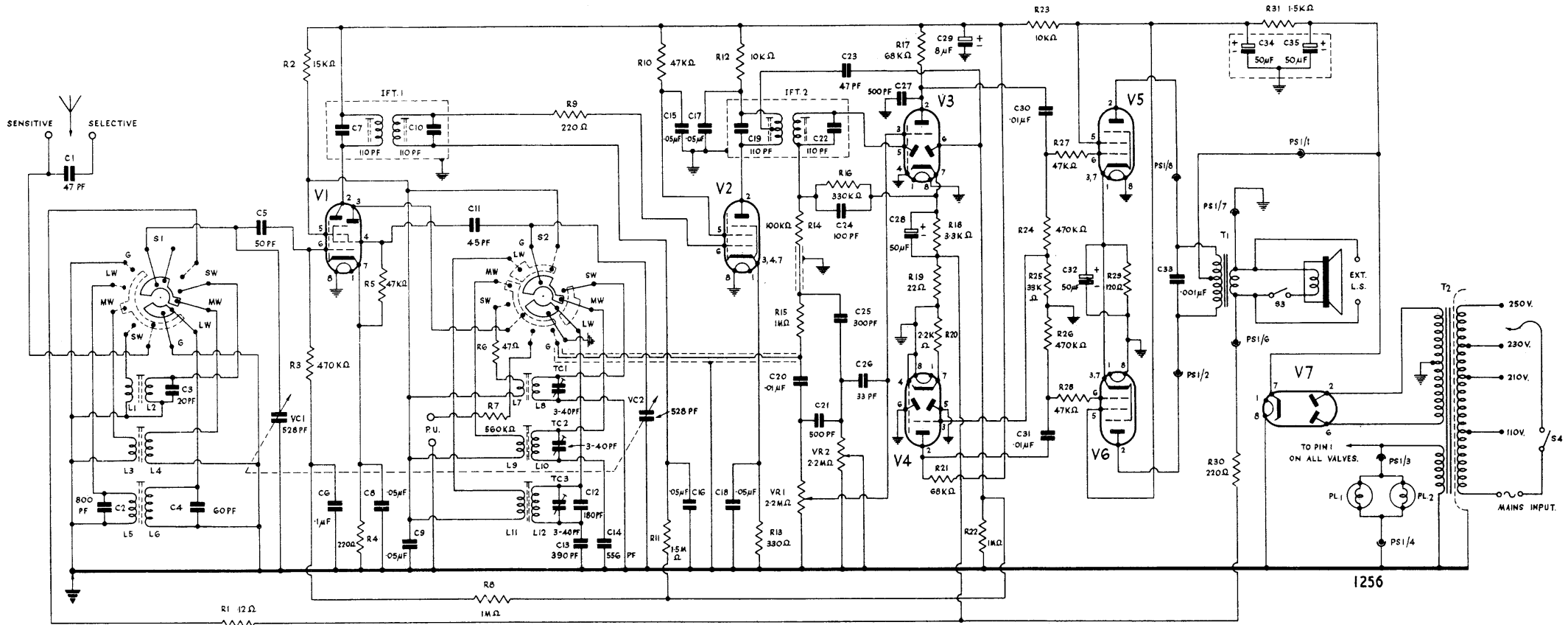
POWER ROAD, LONDON, W.4

Cables : Supasetz, London

Telegrams : Supasetz, Chisk. London

Telephone : Chiswick 6491/9

SUG.26 CIRCUIT DIAGRAM



KEY TO VALVE BASE
VIEWED FROM UNDERSIDE
88A.

8 PIN PLUG & SOCKET
PS1
VIEWED FROM UNDERSIDE.

- NOTES.
- 1 PT. PAPER TUBULAR.
 - M.M. MOULDED MICA.
 - S.M. SILVER MICA.
 - S.C. SILVER CERAMIC.
 - ELECT. ELECTROLYTIC.
 - C. CARBON.

BUSH RADIO LTD., POWER ROAD, LONDON, W.4

June, 1951