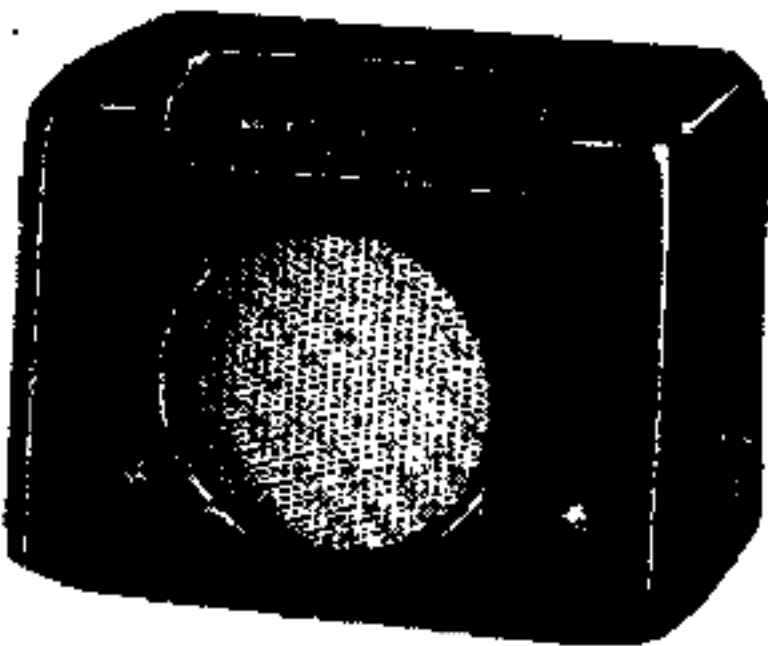


BUSH RADIO

Service Instructions

MODEL EBS3A for A.C. MAINS

MODEL EU3A for A.C./D.C. MAINS



FRONT VIEW of EBS3A

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SPECIFICATION

BASIC CIRCUIT

A five valve, including rectifier, three waverange super-heterodyne receiver using six tuned circuits on each waverange. Mullard Rimlock valves are used in the following order, mixer oscillator (Triode Hexode), I.F. amplifier (Screen Pentode), signal and A.V.C. rectifier, and first audio amplifier (Double Diode Triode), followed by an output pentode feeding a six inch P.M. speaker. Adjustable iron cored coils are used in the aerial, oscillator and I.F. circuits, AC/DC technique is used throughout the receiver.

An auto mains transformer for heater and rectifier A.C. supplies on the EBS3A is replaced by a ballast resistor and Thermistor on the EU3A.

VALVES

MULLARD :-	UCH.42	..	Heater	14.0V
"	UF.41	..	"	12.6V
"	UBC.41	..	"	14.0V
"	UL.41	..	"	45.0V
"	UY.41	..	"	31.0V

VOLTAGE RANGE

EBS3A 100-120, 200-250 volts A.C. 40-100 cycles.
EU3A 100-120, 200-250 volts DC/AC 40-100 cycles.

If a mains electricity supply is not available, either the EBS3A or the EU3A may be operated from a 6-volt accumulator by the addition of a Bush Vibrator Unit Type V7.

MAINS CONSUMPTION

EBS3A 30 watts.
EU3A 50 "
EBS/EU3A 4 amps. at 6 volts., D.C.

AUDIO OUTPUT

2.5 watts.

WAVE RANGE

M.W.	520-1700	Kc/s.	(588 to 167 metres)
S.W.2	3.25-11	Mc/s.	(92 to 27.5 metres)
S.W.1	10.5-26	Mc/s.	(27 to 11.5 metres)

INTERMEDIATE FREQUENCY, 465 Kc/s.

CONTROLS (Front View)

On/off Switch and Volume	Left hand knob.
Tuning	Right hand knob.
Waverange Switch ..	Located on right hand side of cabinet.

AERIAL AND EARTH

Sockets are provided for an external aerial and earth.

SCALE LAMPS

3.5 Volts, 0.15 Amp.

CABINET DIMENSIONS

Height : 9½ ins. Depth : 7½ ins. Width : 12½ ins.

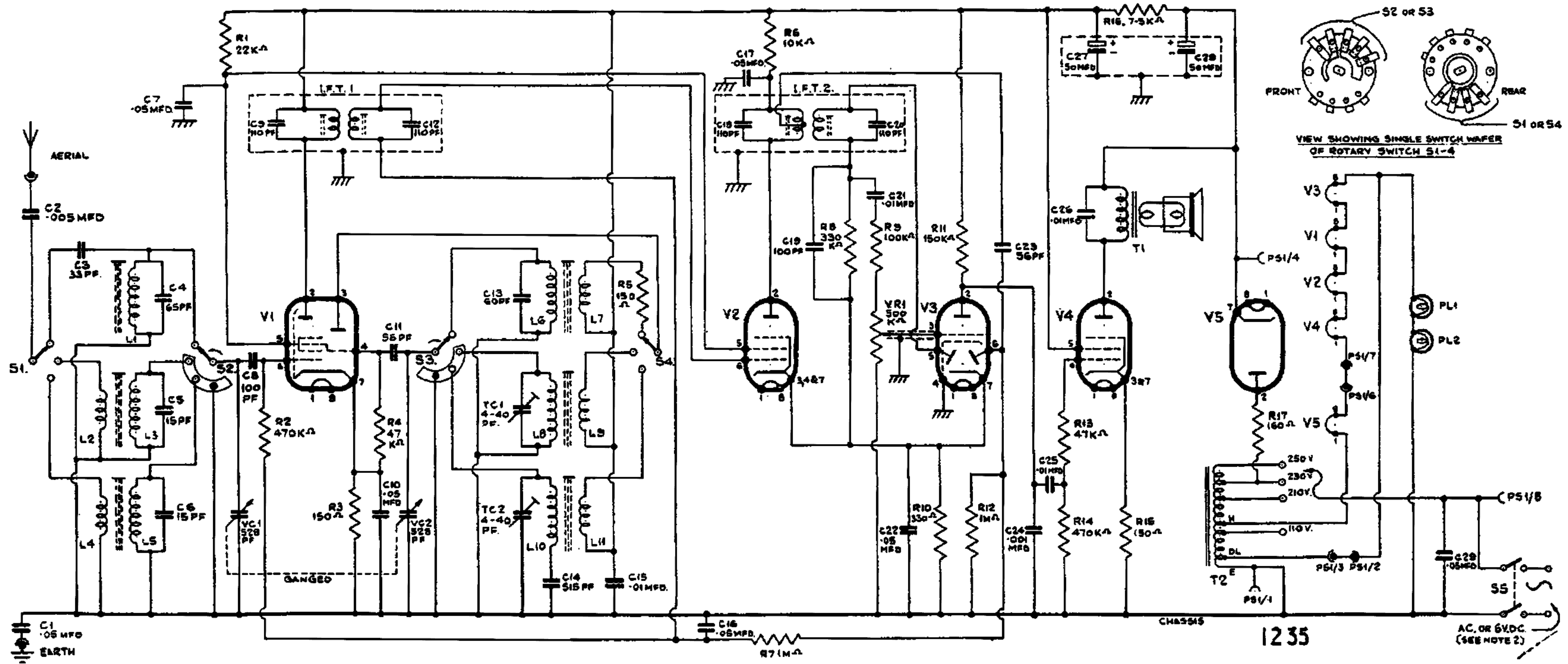
WEIGHT

10 lbs. Approx.

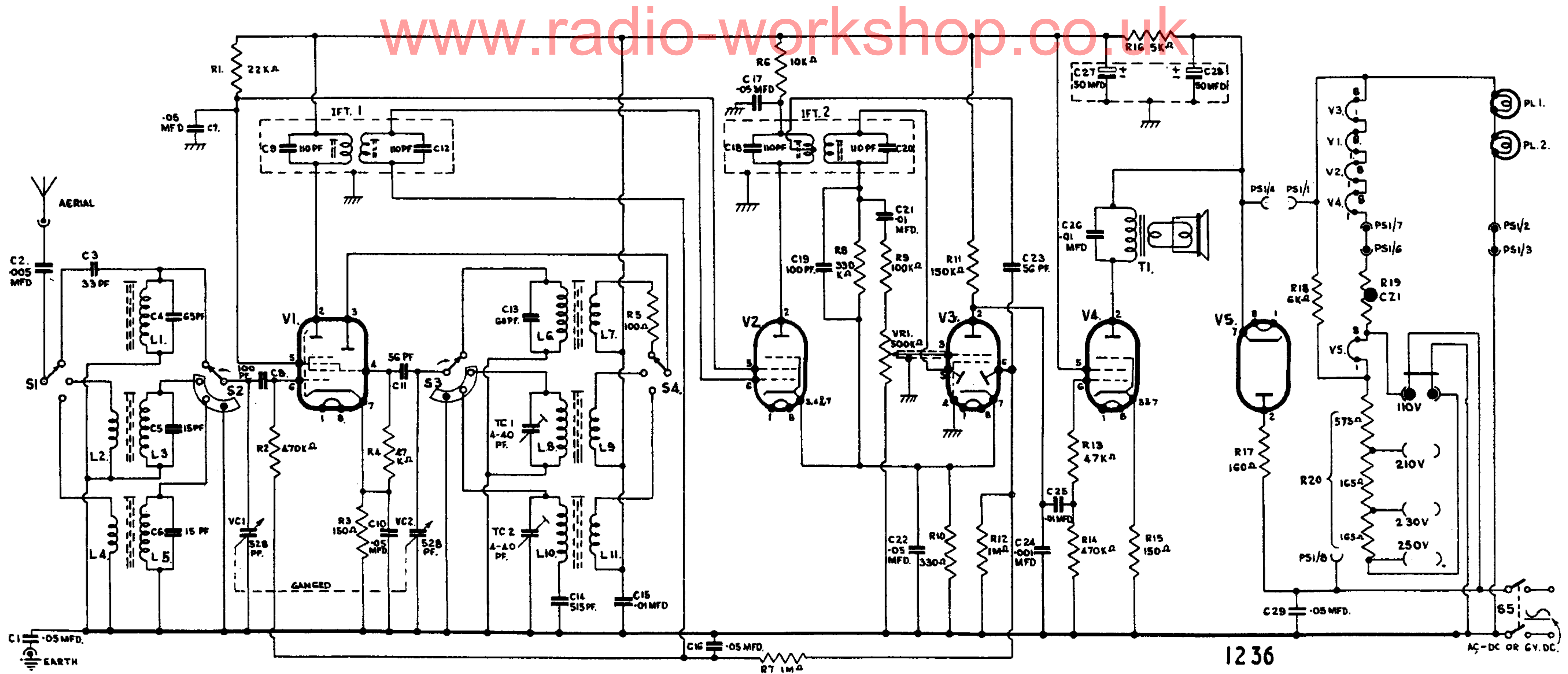
VIBRATOR

The EBS3A and EU3A may be used with Bush Vibrator V7 set to position "A".

CIRCUIT DIAGRAM EBS.3A



CIRCUIT DIAGRAM EU.3A

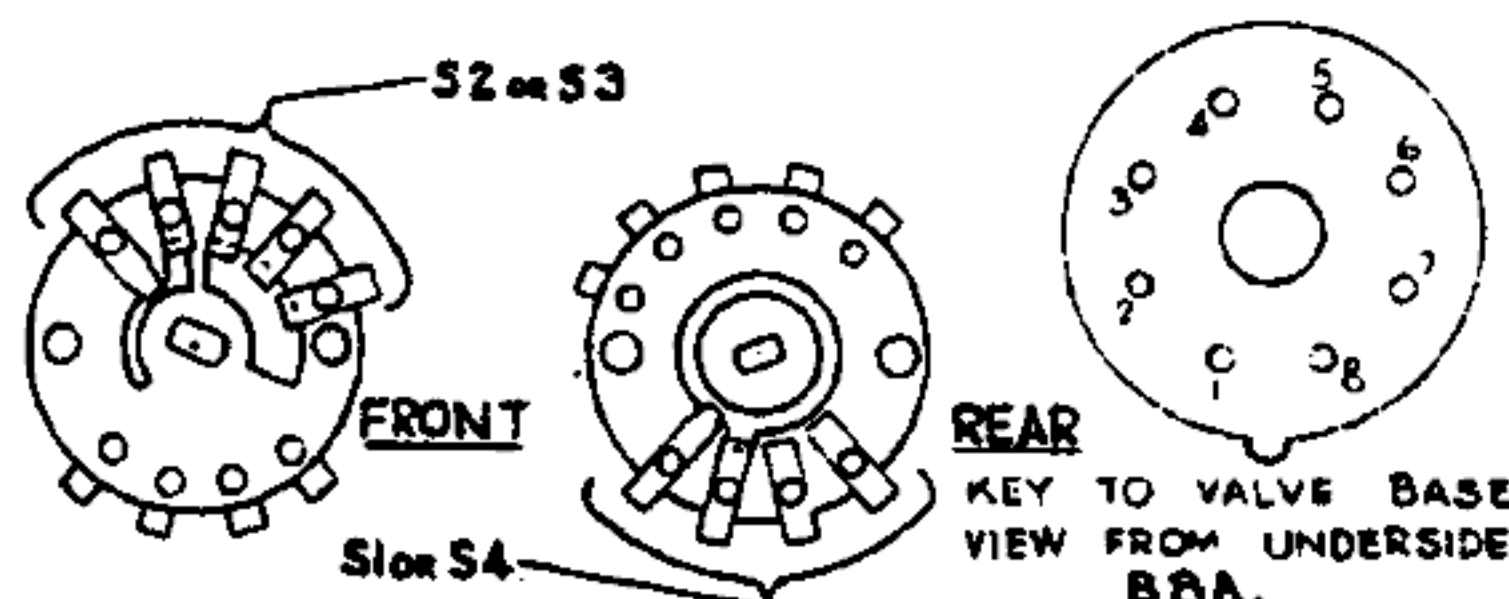


CIRCUIT IS SHOWN FOR OPERATION ON AC-DC SUPPLY. FOR OPERATION ON 6V. BATTERY PLUG FROM VIBRATOR UNIT IS SUBSTITUTED FOR PLUG OF PS1.

INDIVIDUAL PINS INDICATED THUS:- PS1/3



PLUG & SOCKET PS1. VIEW FROM UNDERSIDE.



VIEW SHOWING SINGLE SWITCH WAFER OF ROTARY SWITCH S1-S4.

BUSH RADIO LTD
CHISWICK, LONDON, ENGLAND

CIRCUIT ALIGNMENT

PRELIMINARY

The use of a reputable signal generator with a variable and modulated output is essential for accurate alignment of the R.F. and I.F. circuits. A dummy aerial consisting of a 200 mmfd. fixed capacitor for M.W. and 400 ohms non inductive resistor for S.W. should be connected in series with the output of the signal generator on R.F. alignment. Check the position of the pointer in relation to the tuning condenser, with the plates fully meshed, the pointer should coincide with the "Datum" line, printed on the main and auxiliary calibration scales, the latter scale being situated on the rear of the scale reflector plate; a calibration label is attached. When aligning the receiver the lowest input to

give a reasonable output should be used with the volume control turned to maximum. On S.W. Ranges the tuning control should be rocked when aligning the aerial circuits to overcome oscillator pulling.

I.F. ALIGNMENT 465 Kc/s.

Set the gang to maximum capacity. Connect the signal generator to V2 pin 6. Switch receiver to medium waverange and tune the Sec. and Pri. second I.F.T. in that order for maximum output. Transfer the signal to V1 pin 6 and tune the Sec. and Pri. first I.F.T. in that order for maximum output, decrease signal generator output as circuits come into line.

R.F. ALIGNMENT

Operation	Waverange	Signal Generator Frequency	Recciver Set to--Frequency	Adjustment
1	M.W.	600 Kc/s.	600 Kc/s.	Cores of L10/L11 Osc. and L4/L5 Ae. for maximum output. Timmer TC2, Osc. for maximum output.
2	M.W.	1500 Kc/s.	1500 Kc/s.	
3		Repeat operations 1 and 2 if necessary. (Check calibration).		
4	S.W.2.	4 Mc/s.	4 Mc/s.	Cores of L8/L9. Osc. and L2/L3 Ae. for maximum output. Trimmer TC1, Osc. for maximum output:
5	S.W.2.	8 Mc/s.	8 Mc/s.	
6		Repeat operations 4 and 5 if necessary. (Check calibration).		
7	S.W.1.	12 Mc/s.	12 Mc/s.	Cores of L6/L7, Osc. and L1, Ae. for maximum output. No adjustment required. (Check calibration).
8	S.W.1.	21 Mc/s.	21 Mc/s.	
9		Repeat operation 7 if necessary. (Check calibration).		

NOTE. Realignment of the receiver must be carried out in the above order.

VALVE DATA

EBS3A

Input 230 volts A.C. 50 cycles. 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, with the receiver switched to the medium wave range, no signal input.

Valve	Electrode										Pin No.	Voltage	Current mA
V1 UCH.42	Hexode Anode	..	..	..	..	..	..	..	..	..	2	110	1.4
	Oscillator Anode	..	..	..	..	..	..	..	..	..	3	110	4.0
	Screen	..	..	..	..	..	..	..	..	..	5	50	2.3
	Cathode	..	..	..	..	..	..	..	..	..	7	1.1	
V2 UF.41	Anode	..	..	..	..	..	..	..	..	..	2	88	2.8
	Screen	..	..	..	..	..	..	..	..	..	5	50	2.8
	Cathode	..	..	..	..	..	..	..	..	..	3, 4 and 7	1.1	
V3 UBC.41	Anode	..	..	..	..	..	..	..	..	..	2	55	0.26
	Cathode	..	..	..	..	..	..	..	..	..	7	1.1	
V4 UL.41	Anode	..	..	..	..	..	..	..	..	..	2	215	35
	Screen	..	..	..	..	..	..	..	..	..	5	110	5
	Cathode	..	..	..	..	..	..	..	..	..	3 and 7	6	
V5 UY.41	Anode	..	..	..	..	..	..	..	..	..	2	225 A.C.	52
	Cathode	..	..	..	..	..	..	..	..	..	7	235	

EU3A

The EU.3A valve voltages will be approximately 15 per cent greater than the above on a 230 volt supply with the exception of the following :—

V4. UL.41 anode and V5 UY.41 anode and cathode voltages remain approximately the same.

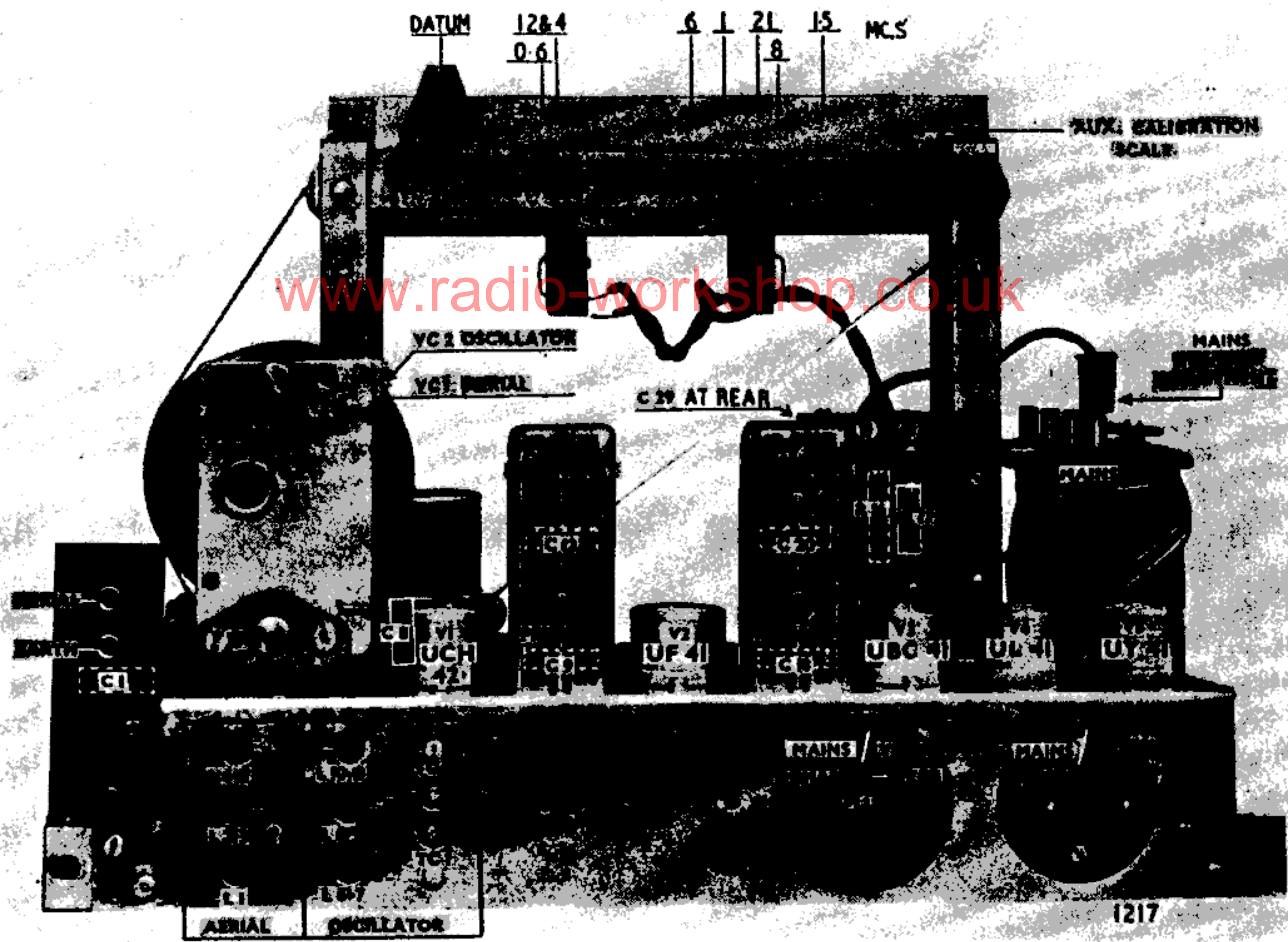


Plate (4)

Rear view of EBS3A

FITTING CORD DRIVE

With the plates of the tuning condenser fully meshed the opening on the edge of the drive drum should be located as on plate 3, page 6 (View of Cord Drive).

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, continue round the drum for half turn in an anti-clockwise direction (view from rear of chassis), take the cord through the aperture in the chassis and completing three turns round the tuning spindle, pass the cord back through the aperture in the chassis, round pulley No. 1 and No. 2, returning cord one half turn round the drive drum "anti-clockwise" and back to the anchor and drive pressure spring. Clip the pointer to the cord and set the pointer to the "datum point" which will be found on the extreme left

hand (back view) of the scale reflector ; clench clip tightly on pointer.

NOTE : When fitting the new cord it will be necessary to detach one end of the crosspiece of the scale assembly adjacent to the drive drum.

Part Numbers :—

Drive Cord 38½ ins.	..	..	..	..	AS18302
Drive Pressure Spring	..	..	..	..	P1941
Carriage and Pointer	..	..	..	..	AP17122 and AP17121
Pulley (2 off)	..	..	..	..	P12416

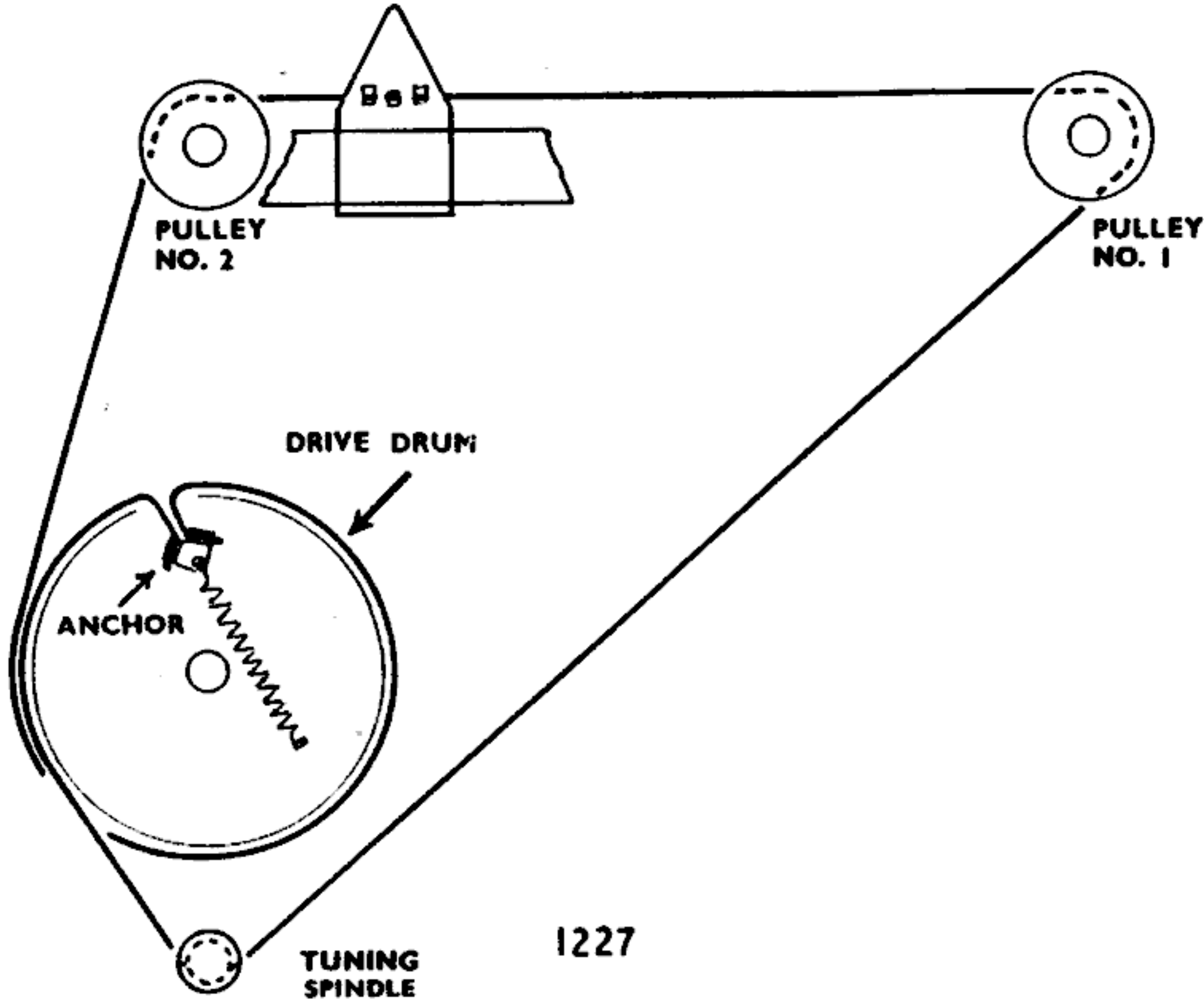
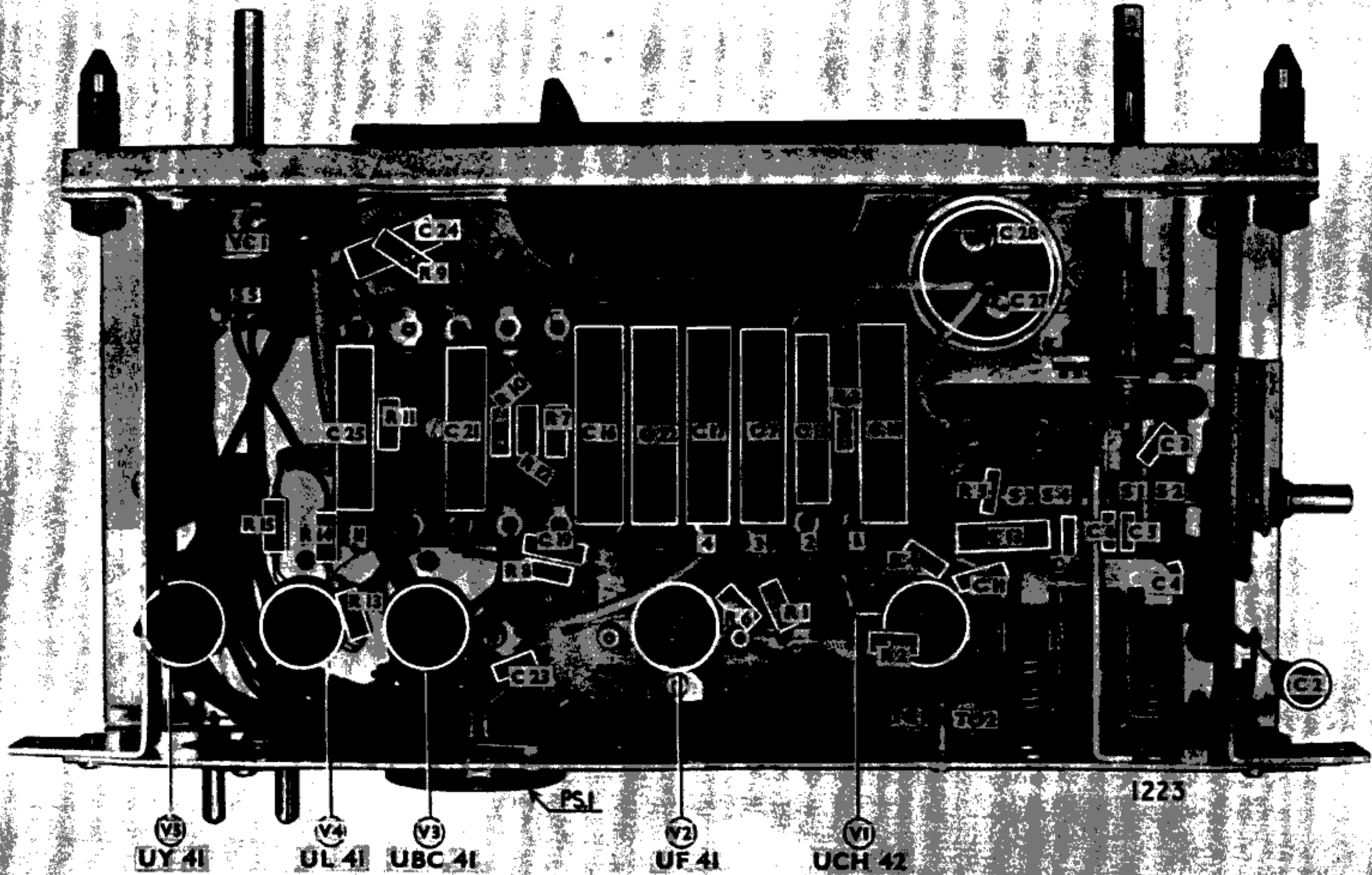


Plate (3)

Cord Drive Schematic EBS/EU3A



CAPACITORS

Ref.	Value		Tolerance ±%	Type	D.C. working voltage	Part No.	Description
	mfd.	mmfd.					
C1	0.05	—	20	P.T.	500	P12941	Earth isolating capacitor.
C2	0.005	—	25	P.T.	500	AP12865	Aerial isolating capacitor.
C3	—	33	20	S.C.	750	AP18221	S.W.1. Aerial coupling.
C4	—	65	2	S.M.	350	AP18219	S.W.1. Aerial fixed tuning.
C5	—	15	5	S.M.	350	or AP18235 AP16510	S.W.2. Aerial fixed tuning.
C6	—	15	5	S.M.	350	or AP18234 AP16510	M.W. Aerial fixed tuning.
C7	0.05	—	20	P.T.	350	AP18234	V1, V2 Screen decoupling capacitor.
C8	—	100	20	S.C.	750	P12514	V1, Grid capacitor (isolating A.V.C.)
C9	—	110	2	S.M.	350	AP17336	1st I.F.T. fixed tuning (Pri.).
C10	0.05	—	20	P.T.	350	AP16304	V1, Cathode decoupling.
C11	—	56	20	S.C.	750	or AP17058	V1, Oscillator grid capacitor.
C12	—	110	2	S.M.	350	P12514	1st I.F.T. fixed tuning (Sec.).
C13	—	60	2	S.M.	350	AP18162	S.W.1. Osc. fixed tuning.
C14	—	515	2	S.M.	350	AP16304	M.W. Osc. fixed padding.
C15	0.01	—	25	P.T.	350	or AP17058	V1, Osc. H.T. feed decoupling.
C16	0.05	—	20	P.T.	350	AP16188	V1, V2, A.V.C. decoupling.
C17	0.05	—	20	P.T.	350	or AP15639	V2, Anode decoupling.
C18	—	110	2	S.M.	350	AP18220	2nd I.F.T. fixed tuning (Pri.).
C19	—	100	20	M.M.	350	or AP18236	Signal diode return and filter.
C20	—	110	2	S.M.	350	P12511	2nd I.F.T. fixed tuning (Sec.).
C21	0.01	—	25	P.T.	350	P12514	V3, Grid coupling capacitor.
C22	0.05	—	20	P.T.	350	AP18162	V2, V3, cathode decoupling.
C23	—	56	20	S.C.	750	P12942	V3, A.V.C. diode coupling capacitor.
C24	0.001	—	25	P.T.	750	P12511	V3, Anode I.F. by-pass.
C25	0.01	—	25	P.T.	350	P12512	V4, Grid coupling capacitor.
C26	0.01	—	25	P.T.	500	AP17168	Pri. T1 tone correction.
C27	50	—	—	Elect.	350	P12941	H.T. line smoothing.
C28	50	—	—	Elect.	350	B17167	H.T. line reservoir.
C29	0.05	—	20	P.T.	500	AP18218	R.F. filter by-pass.
TC1	—	4.40	—	—	—		S.W.2 Osc. trimmer
TC2	—	4.40	—	—	—		M.W. " "
VC1/2	—	528	—	—	—		Aerial and Osc. "trimming"

RESISTORS

Reference	Value in ohms.	Rating in watts.	Part No.	Description
R1	22,000	1/4	P6695	V1, V2 Screen feed.
R2	470,000	1/4	P7031	V1, Grid A.V.C. decoupling.
R3	150	1/4	P6155	V1, Cathode bias.
R4	47,000	1/4	P6779	V1, Osc. section Grid/Cathode, return.
R5	100	1/4	P6107	EU3A Only S.W.1. Osc. Stabilizer.
R5	150	1/4	P6191	EBS3A Only S.W.1. Osc. Stabilizer.
R6	10,000	1/4	P6611	V2, Anode decoupling.
R7	1 Meg.	1/4	P7115	V2, A.V.C. decoupling.
R8	330,000	1/4	P6989	V3, Signal diode load.
R9	100,000	1/4	P6863	V3, Grid I.F. filter.
R10	330	1/4	P6233	V2, V3, Cathode bias.
R11	150,000	1/4	P6905	V3, Anode load.
R12	1 Meg.	1/4	P7114	V3, A.V.C. Diode load.
R13	47,000	1/4	P6779	V4, Grid stopper.
R14	470,000	1/4	P7031	V4, Grid/Cathode return.
R15	150	1/4	P6155	V4, Cathode bias.
R16	5,000	6	AP18224	EU3A Only. H.T. smoothing.
R16	7,500	6	AP18225	EBS3A Only. H.T. smoothing.
R17	160	5	AP17331	V5 Anode surge limiter.
R18	6,000	10	AP18229	Pilot lamp bleeder.
R19	CZ1	—	AP16020	Heater and Pilot protection.
R20	(THERMISTOR) 575 ± 165 ± 165	15	AP18172	Heater ballast resistance.
VR1	0.5 Meg.	—	CP18063	Volume control with switch S.5.

A tolerance of $\pm 20\%$ is permissible on all resistors except R3, R5 $\pm 10\%$ and R16, R17 and R18 $\pm 5\%$.

It may be found that the colour coding of some resistors does not correspond with the value shown in the above table. The measured value of the component fitted will be within the tolerance of the specified resistance.

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	API8197
„ Back EU3A	AS18299
„ „ EBS3A	DP18196
Coil Deck EU3A	DS18292
„ „ EBS3A	DS18291
Knob Wavrange	AP18265
„ Volume, on/off Switch (AP18320 Eng.) or	AP18350
„ Tuning (AP18319 „) or	AP18350

Mains/Vib. Change-over Plug	AS18289
*Mains Tapping Panel EU3A only	BS18298
„ „ Plug „ „	AP16336
Rubber Channel (for Scale)	P12431
Scale Tuning	DP18257
„ Clip, L.H.	P12482
„ „ R.H.	P12483
Wavrange Switch (less wafers)	AP18138
„ „ Wafer (2 off)	AP18137
*Panel complete with Thermistor CZ1, R16, R17 and R18	
Speaker Mounting P.V.C.	BP18246
Slow Motion Drive	AP18127
Speaker Fret	AP17131

SPEAKER

Part No. CP18216
Type Permanent Magnet $6\frac{1}{2}$ ins.
D.C. Resistance 3 ohms.

OUTPUT TRANSFORMER

Part No. AS13240.
D.C. Resistance Primary 500 ohms.
„ „ Secondary 0.75 ohms.
Ratio 40:1
Inductance Primary at 400 cycles 5 volts.
No load on Secondary is 6.4 H. with 26 mA. flowing.

INSTRUCTIONS FOR FITTING VIBRATOR UNIT V7

The voltage panel situated at the top of the Vibrator Unit must be set to *Position A* before the Unit is connected to the receiver. Withdraw the mains supply plug from the receiver, remove the receiver back and withdraw the Mains/Vibrator change over plug from its socket (adjacent to the mains supply socket). Replace the receiver back and insert the Vibrator Unit plug into this socket. Plug in the special accumulator lead supplied with Vibrator Unit into the receiver input supply socket, clipping the other ends to

the terminals of a 6 volt accumulator :—

- Red Lead to " POSITIVE " or "+" Terminal.
Black Lead to " NEGATIVE " or "—" Terminal.

IMPORTANT

It is of the utmost importance that the leads are correctly connected, failure to do so may result in a breakdown of the Vibrator Unit, Fuse or Receiver electrolytic condensers.

DISMANTLING

Remove the wavrange control knob, the grub screw of which is accessible from the back of the cabinet. Place the receiver on its side and remove the " tuning " and " on/off volume control " knobs by inserting a screwdriver through the holes provided in the base of the cabinet to loosen the grub screws. Disconnect the leads to the output transformer and take out the two bolts which pass through the securing lugs at the extreme rear corners of the chassis ; withdraw chassis from cabinet.

WARNING

When servicing the EBS/EU3A receiver, remember that one side of the electricity supply is connected directly to the chassis. Do not connect any earthed equipment or a direct earth to the chassis without first isolating it by a fixed capacitor of approximately 0.005 mfd.; alternatively the receiver should be supplied from an isolating transformer.

MODIFICATIONS

EBS/EU3A

CIRCUIT DIAGRAM (provisional)

Valve voltages EBS3A V5 UY.41 cathode voltage should read 240v.

COILS AND TRANSFORMERS

Reference	Approximate D.C. Resistance in ohms.	Part No.	Description
L1	Less than 0.5	BS17313	S.W.1. Aerial tuning.
L2	2.5	BS17260	S.W.2. Aerial coupling. S.W.2. Aerial tuning.
L3	Less than 0.5		
L4	1.5	BS17257	M.W. Aerial coupling. M.W. Aerial tuning.
L5	6.5		
L6	Less than 0.5	BS18293	S.W.1. Oscillator tuning. S.W.1. Oscillator coupling.
L7	Less than 0.5		
L8	Less than 0.5	BS17310	S.W.2. Oscillator tuning. S.W.2. Oscillator coupling.
L9	Less than 0.5		
L10	4.5	BS17308	M.W. Oscillator tuning. M.W. Oscillator coupling.
L11	1.0		
—	12.5	ES16447	1st I.F.T. Primary 1st I.F.T. Secondary.
—	12.5		
—	12.5	ES16448	2nd I.F.T. Primary. 2nd I.F.T. Secondary.
—	12.5		
—	500 0.75	AS13240	T1 Primary } Output Trans. T1 Secondary }
—	3.5		
—	82	EBS3A only CS17246	T2 Chassis to D.L. Tap T2 Chassis to 110V Tap T2 Chassis to Heater Tap T2 Chassis to 210V Tap T2 Chassis to 230V Tap T2 Chassis to 250V Tap
—	90		
—	160		
—	175		
—	190		
			Mains Auto. Trans.

Iron dust core for coils L1 to L11 AP17109

COIL DECK CONNECTIONS

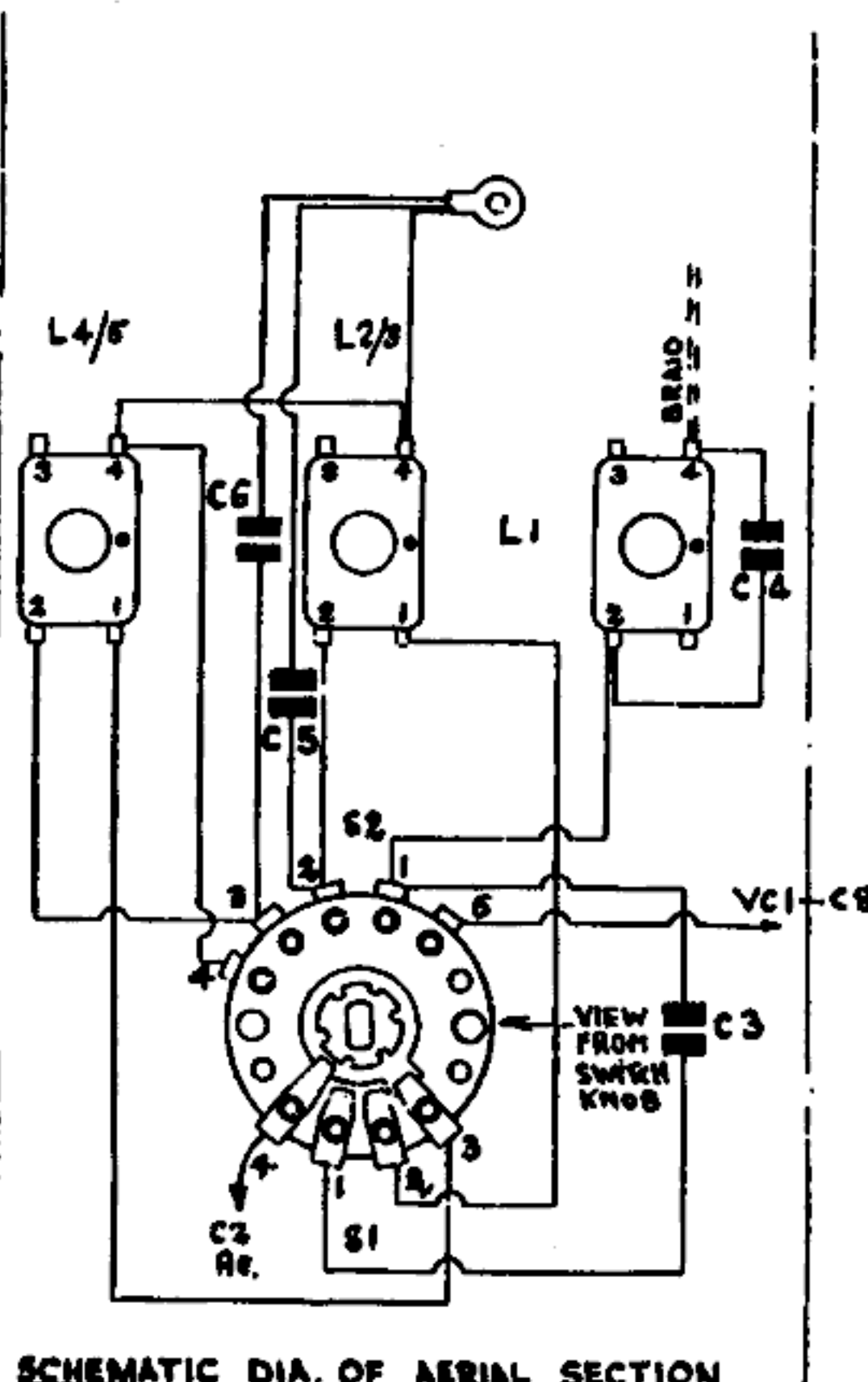
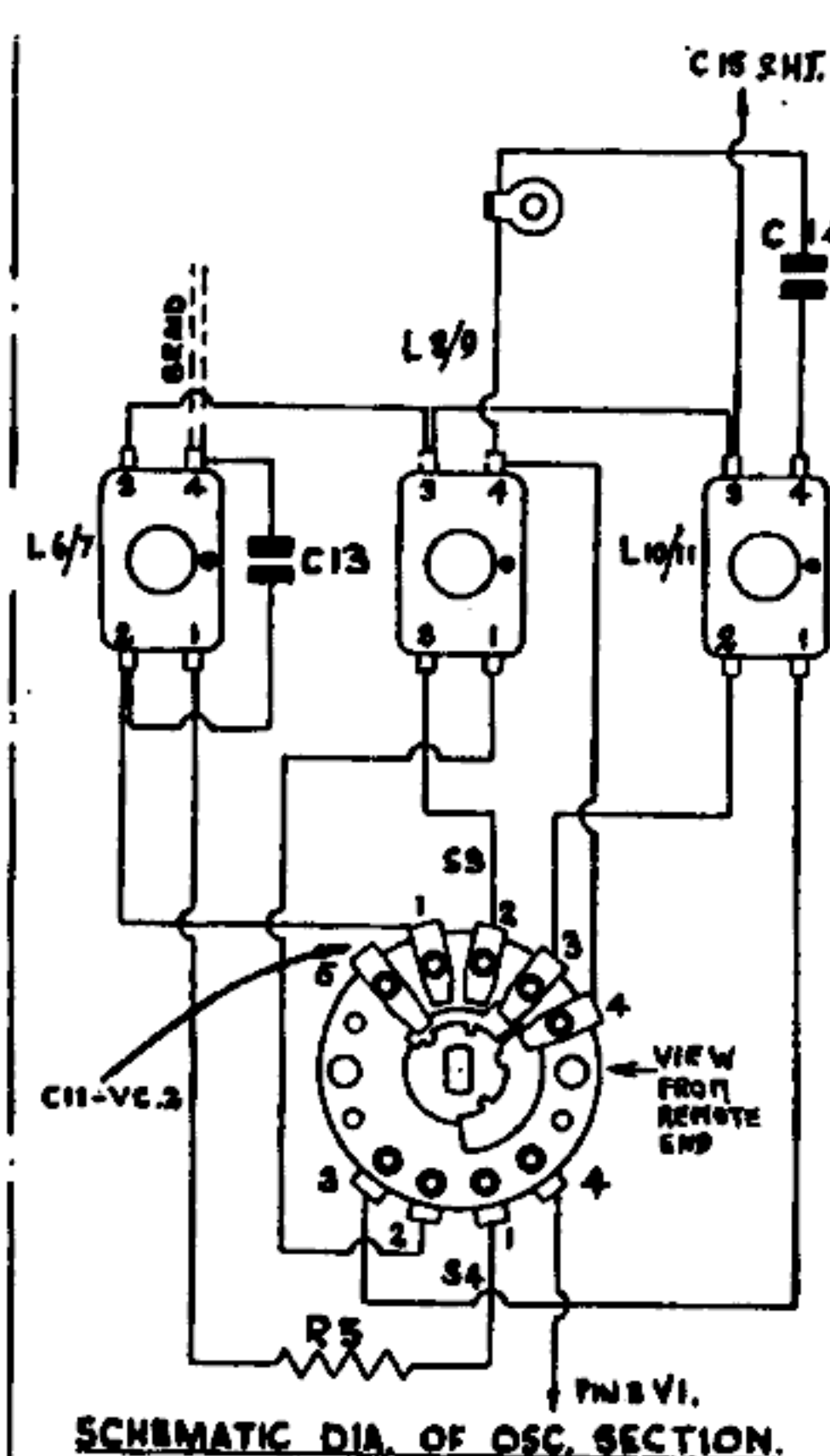
After-removing the three bolts securing the coil deck to the chassis and withdrawing the switch operating bar, (ensuring that the switch wafers are not disturbed), the coil deck may be removed by unsoldering the following wires :—

AERIAL SECTION.

- (1) Lead from C2 to S1. Tag No. 4.
- (2) Lead from VC1 stator to S1. Tag No. 5.
- (3) Lead from VC1/VC2 FRAME to coil deck FRAME.

OSC. SECTION.

- (1) Lead from TC1 & TC2 to L10/11 & L8/9 Tag. No. 2.
- (2) Lead from C11 to V1 pin No. 4.
- (3) Lead from Coil Deck FRAME to CHASSIS TAG.
- (4) Lead from Tag. No. 2 main R/C panel to Tag. No. 3. L10/11. L8/9 & L6/7.
- (5) Lead from VC2 Stator to S3. Tag. No. 5.
- (6) Lead from S4. Tag. No. 4 to V1 pin. No. 3.



1230