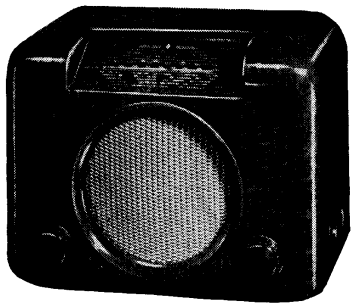
BUSH RADIO

Service Instructions

MAINS PORTABLE
for A.C. or D.C. Supply
MODEL DAC.90A



DAC90A Receiver

INDEX.

SPECIFICATION.

A five valve (including rectifier), two wave range AC/DC, transportable, superheterodyne receiver, incorporating six tuned circuits. The valves employed are of the Mullard Rimlock series, their sequence being, mixer, oscillator, (triode hexode) I.F. amplifier (screen pentode), signal and A.V.C. rectifier and A.F. amplifier (double diode triode), followed by a high slope output pentode (feeding a six inch permanent magnet speaker) and a half wave rectifier.

Adjustable iron dust cored coils are used in the oscillator and I.F. circuits ; a tuned frame aerial is used for signal pre-selection. AC/DC technique is used throughout the receiver.

VALVES.

UCH.42.	...	Heater 14.0 V.
UF.41.	...	„ 12.6 V.
UBC.41.	...	„ 14.0 V.
UL.41.	...	„ 45.0 V.
UY.41.	...	„ 31.0 V.

All valves have British B8A bases.

VOLTAGE RANGE.

AC/DC 200-250 Volts 40-100 Cycles.

MAINS CONSUMPTION.

35 watts approximately.

AUDIO OUTPUT.

2 watts approximately.

WAVE RANGES.

L.W. ... 158 Kc/s.–280 Kc/s. (1900–1070) metres
M.W. ... 1600 Kc/s.–535 Kc/s. (187–560) metres

INTERMEDIATE FREQUENCY.

465 Kc/s.

CONTROLS.

From left to right (front view)
On/Off Switch and Volume.
Tuning.
Wave Range Switch (at side).

SCALE LAMP.

Illumination of the tuning scale is provided by two lamps of the following rating.

3·5 Volts 0·15 Amps.

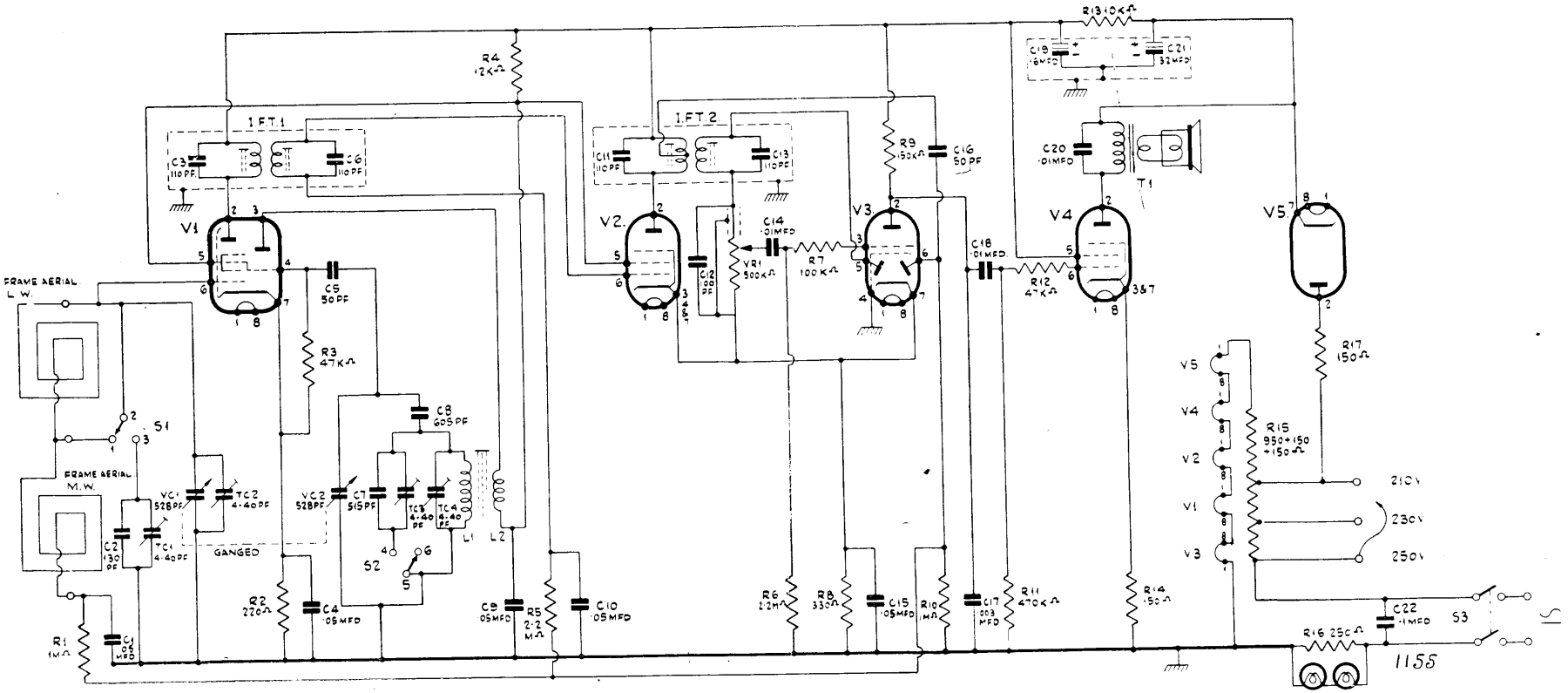
CABINET DIMENSIONS.

Height 9¼ ins. Depth 7⅜ ins. Length 12¾ ins.

WEIGHT.

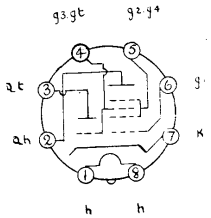
Approximately 10 lbs.

CIRCUIT DIAGRAM DAC.90A

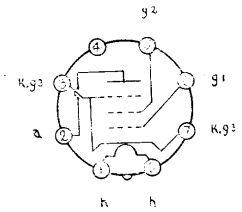


VALVE BASE CONNECTIONS

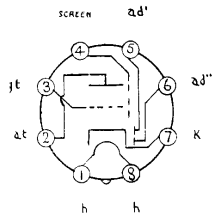
The pin connections are shown as they would appear when the base or its holder is viewed from the underside of the chassis.



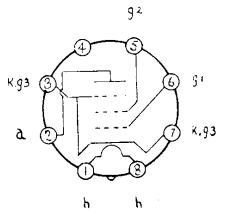
V1
UCH 42



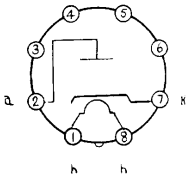
V2
UF 41



V3
UBC 41



V4
UL 41



V5
UY 41

CAPACITORS.

Ref.	Value mfd.	Value mmfd.	Tolerance ± %	Type	D.C. Working Voltage	Part No.	Description.
C 1	·05	—	20	Tubular	350	P3770	V1. A.V.C. decoupling.
C 2	—	130	1	Silvered Mica	350	AP16308 or AP17084	L.W. Frame aerial fixed tuning capacitor.
C 3	—	110	2	,, ,,	350	AP16304 or AP17058	1st I.F.T. primary capacitor.
C 4	·05	—	20	Tubular	350	P3770	V1. Cathode by-pass capacitor.
C 5	—	50	20	Moulded Mica	350	P3774	V1. Oscillator grid capacitor.
C 6	—	110	2	Silvered Mica	350	AP16304 or AP17058	1st I.F.T. secondary capacitor.
C 7	—	515	1	,, ,,	350	AP17015 or AP17175	L.W. Oscillator fixed tuning capacitor.
C 8	—	605	1	,, ,,	350	AP15736 or AP17068	L.W. and M.W. Oscillator padding capacitor.
C 9	·05	—	20	Tubular	350	P3770	Decoupling capacitor V1. Osc. & V1. & V2, G2.
C10	·05	—	20	,,	350	P3770	V2. A.V.C. decoupling.
C11	—	110	2	Silvered Mica	350	AP16304 or AP17058	2nd. I.F.T. primary capacitor.
C12	—	100	20	Moulded Mica	350	P3775	I.F. Filter.
C13	—	110	2	Silvered Mica	350	AP16304 or AP17058	2nd. I.F.T. secondary capacitor.
C14	·01	—	25	Tubular	500	P3769	Coupling to V3.
C15	·05	—	20	,,	350	P3770	V2. and V3. Cathode by-pass.
C16	—	50	20	Moulded Mica	350	P3774	Coupling to A.V.C. diode V3.
C17	·003	—	25	Tubular	500	P3731	I.F. By-pass.
C18	·01	—	25	,,	500	P3769	Coupling to V4.
C19*	16	—	—	Electrolytic	275	AP16476	H.T. Line smoothing.
C20	·01	—	25	Tubular	500	P3769	Fixed tone corrector.
C21*	32	—	—	Electrolytic	275	AP16476	H.T. Line reservoir capacitor.
C22	·1	—	20	Tubular	500	P8998	Mains filter capacitor.

* C19 and C21 are in one container.

RESISTORS.

Ref.	Value in Ohms.	Rating in Watts.	Part No.	Description.
R 1	1 meg.	¼	P7115	V1 A.V.C. decoupling.
R 2	220	¼	P6191	V1 Cathode bias.
R 3	47,000	¼	P6779	V1 Oscillator grid bias.
R 4	12,000	½	P6634	V1 and V2 Screen and V1 Oscillator anode feed.
R 5	2·2 meg.	¼	P7199	V2 A.V.C. decoupling.
R 6	2·2 meg.	¼	P7199	V3 Grid cathode return.
R 7	100,000	¼	P6863	V3 Grid stabiliser.
R 8	330	¼	P6239	V2 and V3 Cathode bias.
R 9	150,000	¼	P6905	V3 Anode load.
R10	1 meg.	¼	P7551	V3 A.V.C. diode load.
R11	470,000	¼	P7031	V4 Grid cathode return.
R12	47,000	¼	P6779	V4 Grid stabiliser.
R13	10,000	2	P6608	H.T. line smoothing.
R14	150	¼	P6155	V4 Cathode bias.
R15	950 + 150 + 150	15	AP16474	V1–V5 Heater circuit ballast.
R16	250	6	AP16632	Scale lamps shunt.
R17 †	150	1	P6147	V5 Surge limiter.
VR1	0·5 meg.	–	CP17206	Volume control with S3. ganged.

A tolerance of ± 20% is permissible on all resistors with the exception of R4, R8, and R14 ± 10% and R16 ± 5%

† On later receivers R17 is 250 ohms ± 20% 4 watt W.W. Part No. AP18039

VARIABLE CAPACITORS.

Ref.	Value.	Type.	Part No.	Description.
TC1 to TC4	4–40 mmfd.	Postage stamp	AP16641	L.W. and M.W. Trimmers.
VC1	528 mmfd.	Ganged Tuning Condenser	BP17132	L.W. and M.W. Frame aerial tuning.
VC2	528 mmfd.			L.W. and M.W. Oscillator tuning.

CIRCUIT ALIGNMENT.

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 single turn loop of wire approximately 10″ by 8″ placed 12″ to 18″ (according to the output of the signal generator) away from and parallel to the frame aerial should be used when aligning the aerial and oscillator circuits. The signal is fed into the single turn loop from the signal generator. A sensitive output meter should be used as a visual indicator. To obtain accurate adjustments of the tuned circuits, use the lowest possible input to the receiver from the signal generator with the volume control of the receiver at maximum.

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.

NOTE—The auxiliary calibration comprises a series of indents on the rear of the scale reflector plate which are arranged in the following order :—(Left to Right) Datum Line, 600Kc/s, 214Kc/s, 1000Kc/s, 250Kc/s, 1500Kc/s, (View from the rear of the chassis.)

INTERMEDIATE FREQUENCY CIRCUITS. 465Kc/s.

Set the receiver to the medium wave range with the tuning control at approximately 300 metres (1000 Kc/s) and away from powerful stations. Sub-harmonics of the I.F. should be avoided. Unscrew all cores fully out.

Set the signal generator to 465 Kc/s and connect it to V2 control grid (pin 6). Adjust the Sec. and Pri. of the 2nd I.F.T. in that order for maximum output.

Transfer the signal to V1 control grid (pin 6) and adjust the Sec. and Pri. of the 1st I.F.T. in that order for maximum output.

Each core should be adjusted once only.

OSCILLATOR AND SIGNAL FREQUENCY CIRCUITS.

Medium Wave Range : 1600 Kc/s–535 Kc/s (185·5–560 metres).

1. Set the signal generator and receiver to 600 Kc/s. (500 metres) and connect the generator to the " single turn loop ".
2. Adjust the core of L1/L2. (oscillator coil) for maximum output.
3. Set the signal generator and receiver to 1500 Kc/s (200 metres) and adjust TC4 (oscillator coil) and TC2 (frame aerial) for maximum output in that order.
4. Repeat operations 1 and 2.
5. Check calibration and repeat operation 3 if required.

Long Wave Range : 280 Kc/s-158 Kc/s. (1070-1900 metres)

1. Set the signal generator and receiver to 214 Kc/s. (1401 metres) connect the generator to the " single turn loop ".
2. Peak TC3 (Oscillator Coil) for maximum output.
3. Peak TC1 (frame aerial) for maximum output.
4. Check calibration.

NOTE.

It is essential that the alignment is carried out in the above order as any adjustment to L1/L2 (oscillator coil) core or trimmer TC4 or TC2 (aerial trimmer) will affect both Medium and Long Wave Ranges. The receiver may be calibrated out of its cabinet by using the auxiliary calibration scale printed on the back of the scale reflector plate.

DISMANTLING.

Remove the waverange 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 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 and frame aerial from cabinet.

SERVICE NOTES.

Before proceeding to locate a fault in the receiver, it is important to ensure all valves are up to standard and are making good contact in their holders.

Valve heaters should be checked for continuity, since failure in one valve will open circuit the whole heater chain.

Voltages on all valves should be checked with the valve data supplied.

A.F. SECTION.

If these preliminary tests give satisfactory results, apply an A.F. signal to the control grid of V3 (Pin 3) to check the stage gain of V3. V4. If there is little or no output check all the components from the anode resistor of V3 to the output stage of V4, including the cathode circuits of both valves.

I.F. SECTION.

To check the I.F. section of the receiver, inject a 465 Kc/s. signal (modulated at 30%) into the control grid of V2 (pin 6).

If the output of the receiver is low, check the 2nd I.F. transformer, the decoupling components, and the detector and input circuits of V3.

Test the 1st I.F. transformer and the hexode section of V1 by transferring the 465 Kc/s. signal to the control grid of V1 (pin 6). If a low figure is obtained, the following components should be checked, 1st I.F. Pri. and Sec. resistance, screen resistor and decoupling condenser, cathode resistor, and input of V2., this test is made with the local oscillator working.

R.F. SECTION.

Apply an R.F. signal (modulated 30%) within the limits of the particular wave range, to the control grid of V.1 (pin 6).

If the signal can be tuned, the local oscillator circuits are functioning and the input circuits of V1 should be checked.

No signal would appear to indicate a fault in the oscillator circuits. A test can be made by injecting into the oscillator grid of V1 (Pin 4) an unmodulated signal which is 465 Kc/s higher than a station known to be transmitting, when normal tuning should be possible. Transfer the R.F. modulated signal to the " single turn loop " as described in " Circuit Alignment " in order to check the frame aerial circuits.

COMPONENTS AFFECTING CALIBRATION.

M.W. ... L1/L2, TC4, C8.

L.W. ... L1/L2, TC4, TC3, C7, C8.

A.V.C. LINE COMPONENTS.

R1, R5, R10, C1, C10, C16.

DECOUPLING AND BIAS COMPONENTS.

V1. Screen and Oscillator anode. R4, C9.

Oscillator grid R3, C5.

Bias R2, C4.

V2. Screen R4, C9.

Bias common with V3, R8, C15.

V3. Anode. R9.

Signal diode VR1, C12.

Grid. R7, R6, C14.

A.V.C. diode C16, R10.

VALVE DATA.

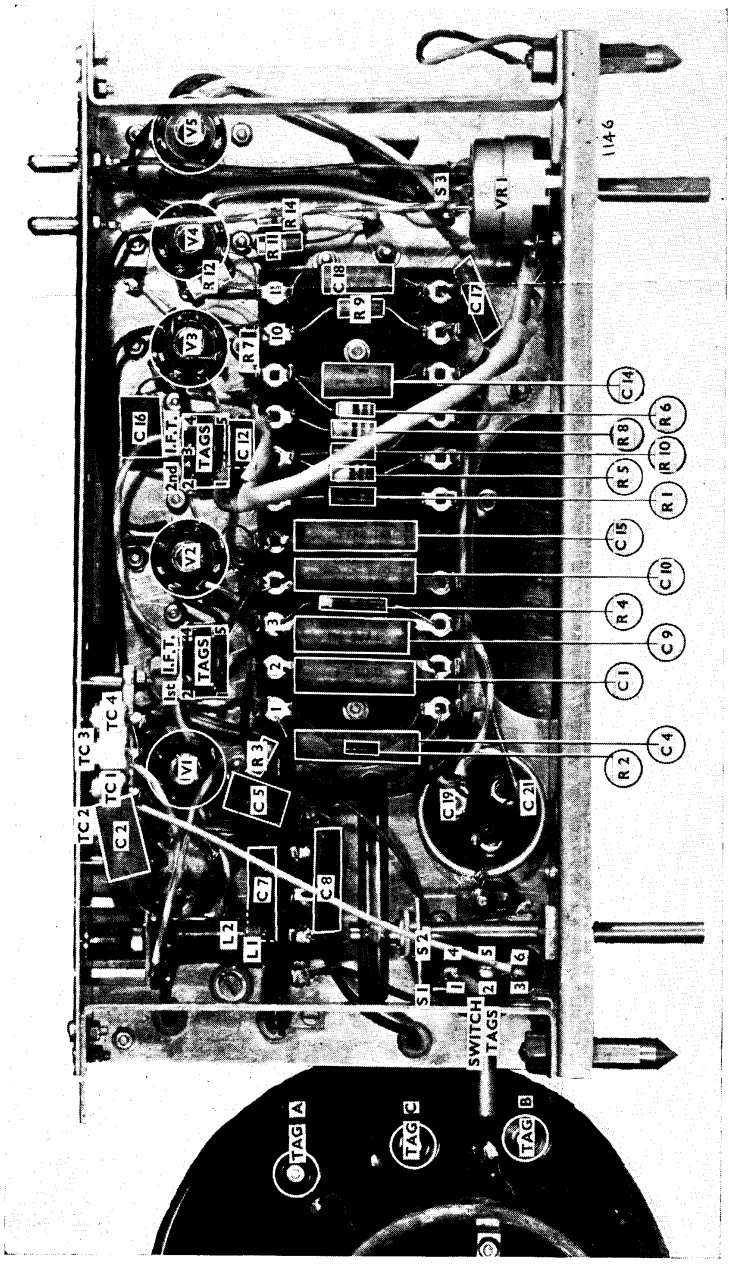
DAC.90A.

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.	Electrode.	Pin No.	Voltage.	Current.
V1 UCH.42	Hexode Anode ... ... Oscillator Anode ... ... Screens ... ... Cathode	2 3 5 7	98 47 47 ·8	1·5 mA. 0·5 mA.
V2 UF.41	Anode ... ... Screen ... ... Cathode	2 5 3, 4 and 7	74 47 1·0	2·5 mA. 0·8 mA.
V3 UBC.41	Triode Anode ... ... Cathode	2 7	74 1·3	0·2 mA.
V4 UL.41	Anode ... ... Screen ... ... Cathode	2 5 3 and 7	190 98 5	27·5 mA. 4·0 mA.
V5 UY.41	Anode ... ... Cathode	2 7	222 A.C. 205	



DAC.90A underneath chassis view

Plate (1)

COILS.

Ref.	Approx. D.C. Resistance in Ohms.	Part No.	Description.
L 1	1·5	BS17273	L.W. and M.W. Oscillator tuning.
L 2	1·0		L.W. and M.W. Oscillator coupling.
L 3	3·25	DS17278	L.W. Aerial tuning (part) frame aerial.
L 4	3·25		M.W. Aerial tuning (part) frame aerial.
L 5	12·5	ES16447	1st I.F.T. Primary.
L 6	12·5		1st I.F.T. Secondary
L 7	12·5	ES16448	2nd I.F.T. Primary.
L 8	12·5		2nd I.F.T. Secondary.

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 (2) 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 a turn in an anti-clockwise direction (view from rear of chassis), take the cord through the aperture in the chassis and completing two 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 drive it will be necessary to remove the frame aerial and associated bracket, and to detach one end of the crosspiece of the scale assembly adjacent to the drive drum. (See plate three).

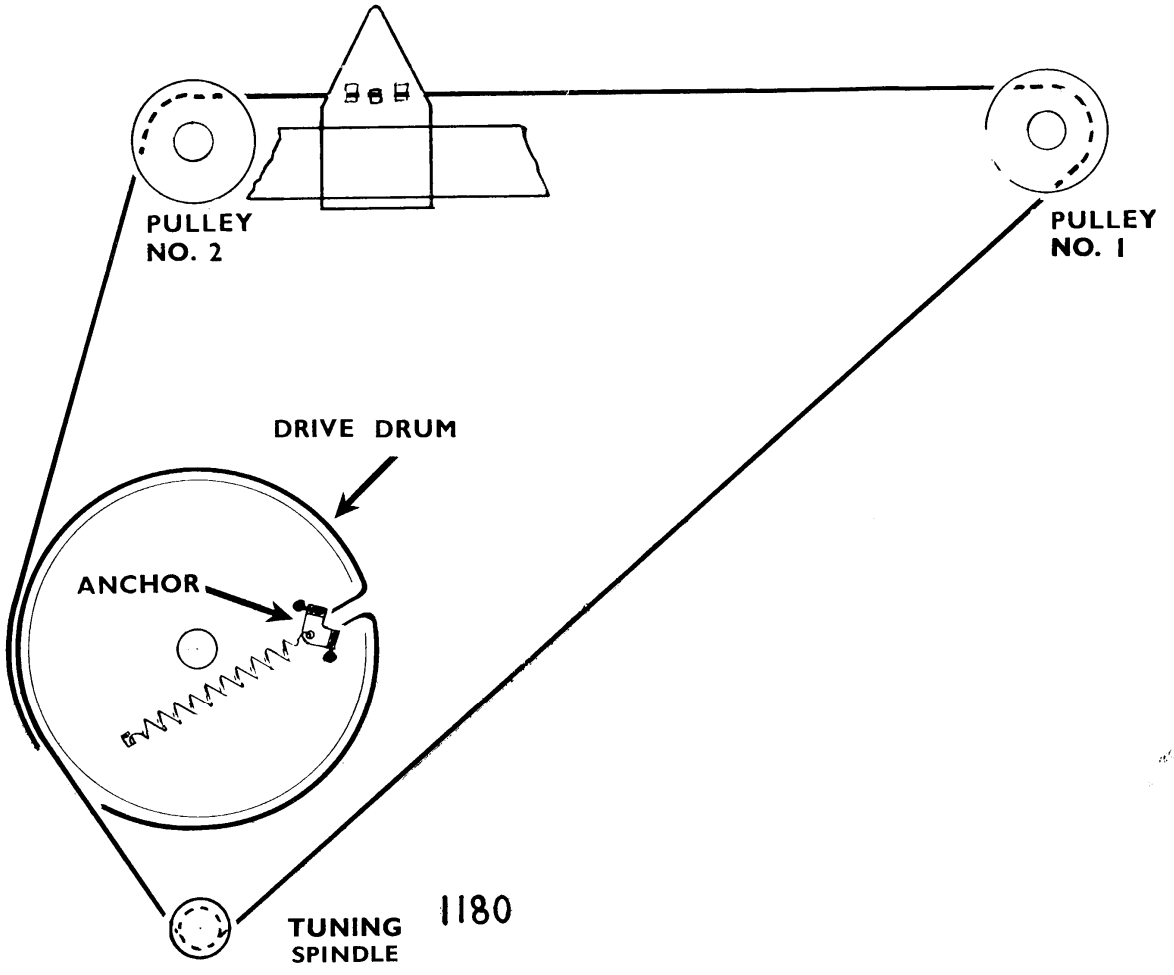


Plate (2) *DAC.90A Cord Drive*

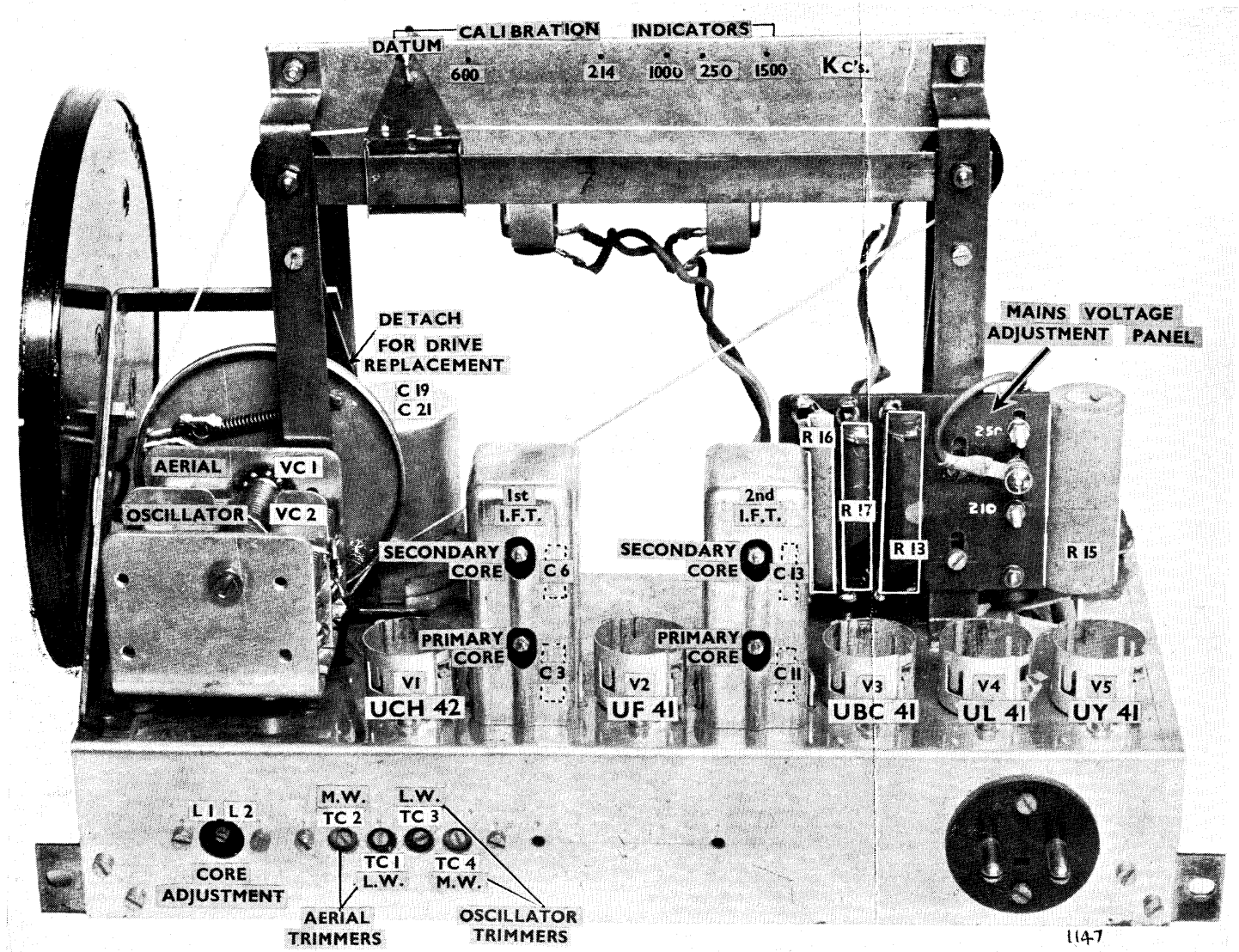


Plate (3)

DAC.90A Top Chassis View

OUTPUT TRANSFORMER.

Part No. S.12706

DC. Resistance.

Primary—500 ohms.
Secondary—0·75 ohms.

Ratio 40:1.

Primary inductance at 400 cycles and 5 Volts no load on secondary is 6·4H. with 26 mA DC. flowing.

SPEAKER.

Part No. CP. 17328.

Type Permanent Magnet 6 ins.

D.C. Resistance 3 ohms.

FRAME AERIAL CONNECTIONS.

Frame Aerial Connections Plate (1)

Tag A. LW. start-to VC1 fixed plates.

Tag B. LW. and M.W. junction-to tag No. 1 switch S.1.

Tag C. M.W. finish-to junction of C1, R1, on tag No. 2 main R/C panel.

WARNING :

When servicing the DAC.90A remember that one side of the electricity supply is connected directly to the chassis via the scale lamps and may, under certain conditions, be " live ".

Do not connect any earthed equipment or a direct earth to the chassis without first isolating it by a fixed capacitor of approximately ·005 mfd.

Care should be taken when handling the chassis.

PART NUMBERS.

The following part numbers are not shown elsewhere in this manual.

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	AP.17113
Cabinet Back	DP.17133
Knob, Volume and On/Off	AP.16206
Knob, Tuning	AP.16206
Knob, Wave Range	AP.17287
Tuning Scale	DP.17981
Tuning Scale—Copenhagen	DP.17179
Wave Range Switch	AP.17277

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