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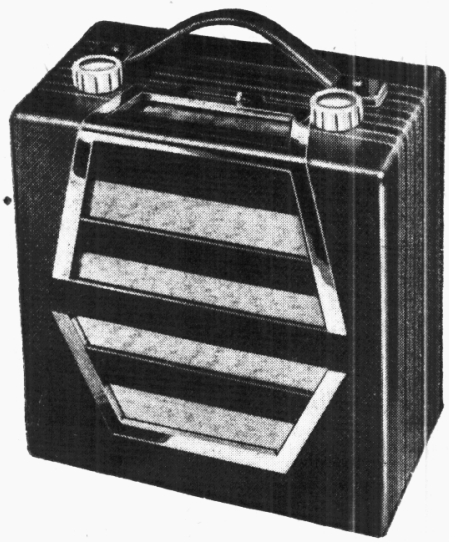
"TRADER" SERVICE SHEET

448

BEETHOVEN 909AC

"LITTLE PRODIGY"



THE Beethoven 909 AC "Little Prodigy" receiver is a 4-valve (plus valve rectifier) AC 2-band superhet mounted in a small portable case, with self-contained frame aerials.

A rectifier and smoothing unit is employed, and this is separate from the main chassis.

The receiver is suitable for 200-250 V, and 100-110 V, 40-100 C/S AC mains.

Release date: October, 1939.

CIRCUIT DESCRIPTION

Tuned frame aerial input **L1** (MW), plus **L2** (LW) tuned by **C14**. Provision is made by a socket at the side of the receiver casing for connection of an external aerial, but no provision is made for an earth connection.

First valve **(V1, Mullard ECH3)** is a triode heptode operating as frequency changer with internal coupling. Triode oscillator grid coils **L3** (MW), plus **L4** (LW) are tuned by **C16**; parallel trimming by **C17** (MW) and **C18** (LW); series tracking by **C19** (MW) and **C20** (LW).

Reaction from anode by coils **L5** (MW) and **L6** (LW).

Second valve **(V2, Mullard EF9)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C21, L7, L8, C22** and **C23, L9, L10, C24.** Iron-dust cores are employed in the first IF transformer.

Intermediate frequency 450·5 KC/S.

Diode second detector is part of double diode triode valve **(V3, Mullard EBC3).** Audio frequency component in rectified output is developed across the manual volume control **R6,** which also operates as load resistance, and passed via AF coupling condenser **C6** and CG resistance **R7** to CG of triode section, which operates as AF amplifier.

IF filtering by **C5** in diode circuit and **C7** in triode anode circuit.

DC potential appearing across **R6** is fed back through decoupling circuit **R5, C3** as GB to FC (via frame aerials) and IF valves, giving automatic volume control. The second diode of **V3** is not used, and is left unconnected.

Resistance-capacity coupling by **R8, C8** and **R9** between **V3** triode and pentode output valve **(V4, Mullard EL3).** The anode circuit stabilising resistance **R11** is fitted to prevent parasitic oscillation. Fixed tone correction in anode circuit by **C9.**

HT current is supplied by full-wave rectifying valve **(V5, Mullard AZ1).** Smoothing is effected by dry electrolytic condensers **C10** and **C11** and HT feed resistance **R12.** Rectifier circuit and mains circuit RF filtering by **C12** and **C13** respectively.

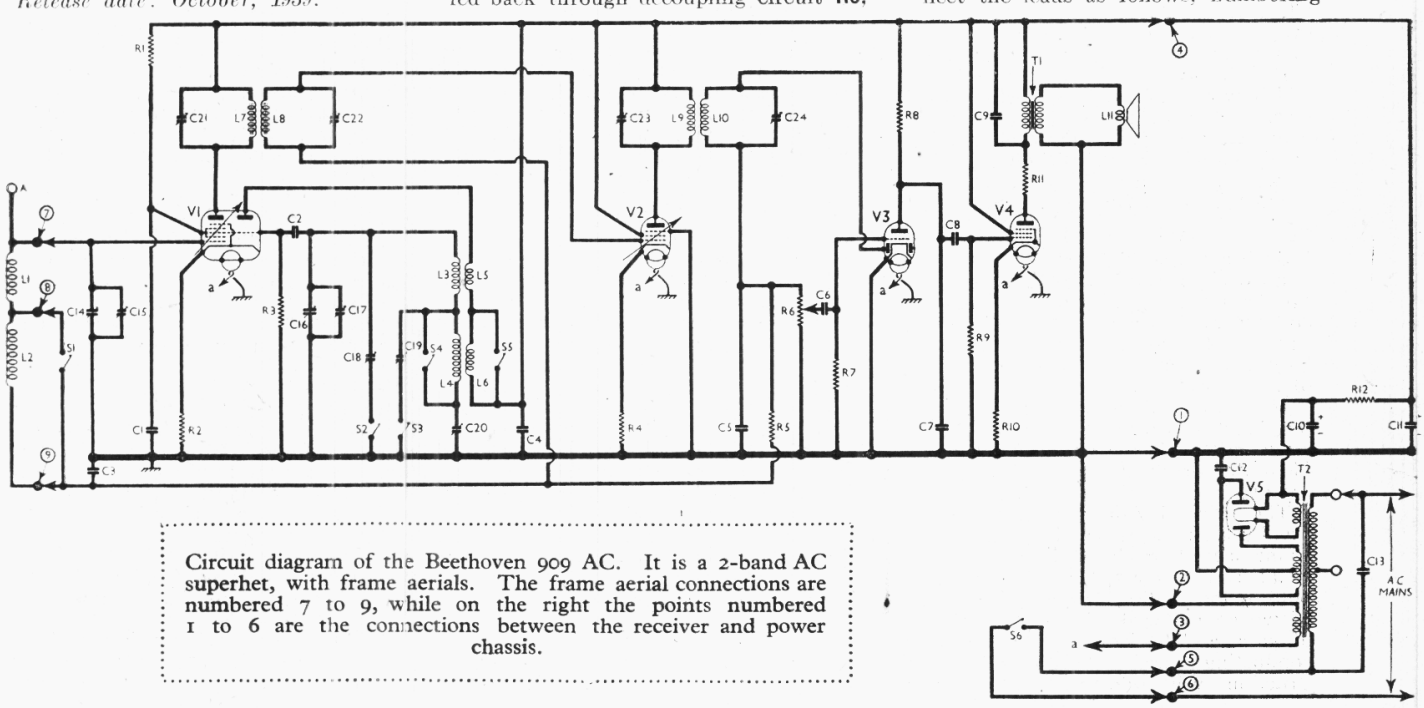
DISMANTLING THE SET

The receiver is constructed in two units: the upper unit, which comprises the main receiver; and the rectifier and power supply unit, which lies on the bottom of the carrying case.

Before access can be gained to the receiver chassis, the power unit must be removed from the case.

Removing Power Unit.—Remove the three counter-sunk head screws (one each side of the case with one blued washer each, and one through the bottom of the case with no washer). The unit may now be withdrawn to the extent of the connecting leads between it and the receiver chassis.

When replacing, insert the unit with the transformer on the right, and connect the leads as follows, numbering



Circuit diagram of the Beethoven 909 AC. It is a 2-band AC superhet, with frame aerials. The frame aerial connections are numbered 7 to 9, while on the right the points numbered 1 to 6 are the connections between the receiver and power chassis.

the tags from left to right, as seen when viewed from the rear of the case.

1 (in red sleeving), from pin 1 of **V3**;
2 (in black sleeving), from pin 2 of **V4**;
3 (in black sleeving), from pin 3 of **V4**;
4 (knotted), from pin 7 of **V4**;
5, 6 (knotted together), from the mains switch **S6**.

The foregoing tag numbers correspond with those indicated in the circuit diagram and chassis illlustrations.

Removing Receiver Chassis.—First remove the power unit as indicated above. The connecting leads need not necessarily be disconnected.

Remove the two control knobs (recessed grub screws);

remove the four counter-sunk head screws (with nuts and lock-washers, and with blued washers under heads) holding the shelf on which the chassis is mounted to the sides of the case;

lower the chassis towards the bottom of the case, when it may be withdrawn to the extent of the frame aerial leads.

To obtain access to the components beneath the chassis the shelf, which is still attached to the chassis by two cheese-head screws (with washers) and one counter-sunk head screw (with lock-washer) must be removed.

When refitting shelf, lay chassis face downwards on the speaker rim;

fit shelf so that the corner screw-hole is at the bottom right-hand corner, as seen when facing the underside of the chassis;

in this hole, fit the counter-sunk head screw;

now fit the two remaining screws.

To free the chassis from the carrying case, unsolder the three frame aerial leads from the tags on the side of the case.

When replacing, connect the leads as follows, numbering the tags from the front of the case backwards towards the rear:

7, lead from tag of upper section of gang condenser;

8, knotted lead from wavechange switch;

9, plain lead from wavechange switch.

The numbers quoted correspond with those in the circuit diagram and chassis plan view.

Removing Speaker.—The wavechange switch and oscillator coil assembly are located behind the speaker, which must be removed before they can be reached or inspected.

Remove the three counter-sunk head screws (with tubular distance-pieces and nuts) holding the speaker frame to the chassis.

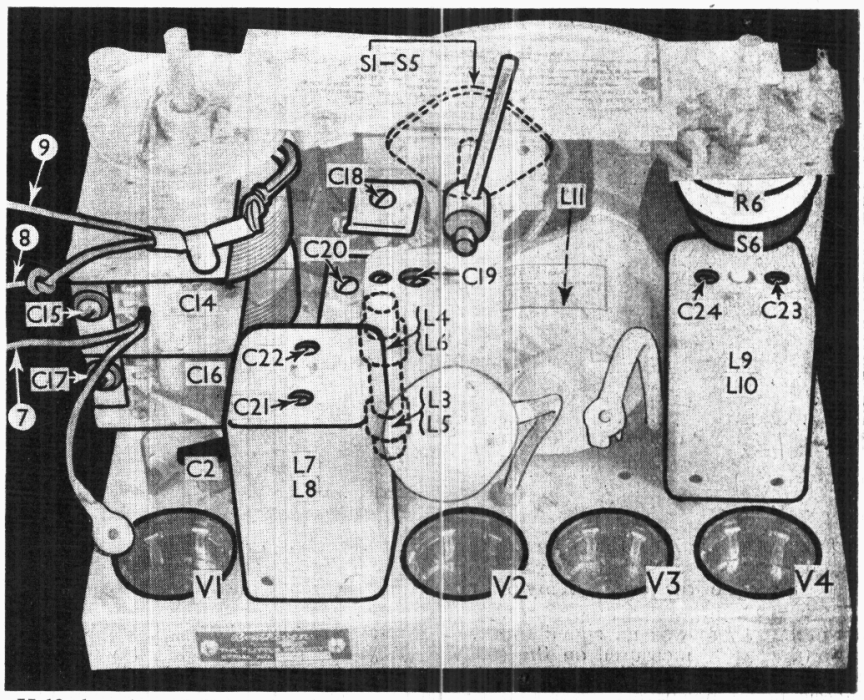
The speaker can now be withdrawn to the extent of the connecting leads, which is sufficient to give access to the forementioned components.

To free speaker entirely, unsolder from the speech coil tags the two leads connecting it to the chassis.

When replacing, the connecting panel should be close to the output transformer;

the red lead (from chassis) should be connected to the upper speech coil tag;

the grey lead (from middle tag on output transformer connecting panel) goes to the lower tag;



Half-plan view of the main chassis. The switch unit **S1-S5** is viewed from the front of the chassis in the diagram in column one overleaf. **L3-L6** is the oscillator coil unit, behind the first IF transformer. The frame aerial connections are numbered.

the longest fixing screw and spacing collar are fitted adjacent to the output transformer.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 SG HT feed	35,000
R2	V1 fixed GB resistance ...	100
R3	V1 osc. CG resistance ...	50,000
R4	V2 fixed GB resistance ...	100
R5	AVC line decoupling ...	2,000,000
R6	Manual volume control; V3 signal diode load ...	500,000
R7	V3 triode CG resistance ...	2,000,000
R8	V3 triode anode load ...	250,000
R9	V4 CG resistance	600,000
R10	V4 GB resistance	190
R11	V4 anode stopper	100
R12	HT feed resistance... ...	1,200

	CONDENSERS	Values (μF)
C1	V1 SG decoupling	0·1
C2	Osc. CG condenser	0·00015
C3	AVC line decoupling ...	0·2
C4	HT circuit RF by-pass ...	0·2
C5	IF by-pass	0·0001
C6	AF coupling to V3 triode ...	0·015
C7	IF by-pass	0·00075
C8	V3 triode to V4 AF coupling	0·0025
C9	Fixed tone corrector ...	0·01
C10*	HT smoothing condensers	16·0
C11*		32·0
C12	V5 anode RF by-pass ...	0·02
C13	Mains RF by-pass	0·1
C14†	Frame aerial tuning ...	—
C15‡	Frame aerial MW trimmer	—
C16†	Oscillator circuit tuning ...	—
C17‡	Osc. circuit MW trimmer...	—
C18‡	Osc. circuit LW trimmer ...	—
C19†	Osc. circuit MW tracker ...	—
C20†	Osc. circuit LW tracker ...	—
C21‡	1st IF trans. pri. tuning ...	—
C22‡	1st IF trans sec. tuning ...	—
C23‡	2nd IF trans. pri. tuning ...	—
C24‡	2nd IF trans. sec. tuning ...	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Frame aerial windings ...	1·5
L2		16·0
L3	Osc. circuit MW tuning coil	5·0
L4	Osc. circuit LW tuning coil	9·0
L5	Oscillator MW reaction ...	4·25
L6	Oscillator LW reaction ...	7·5
L7	1st. IF trans. Pri.	4·0
L8		4·0
L9	2nd. IF trans. Pri.	10·5
L10		10·5
L11	Speaker speech coil	2·5
T1	Output trans. Pri.	240·0
		0·2
T2	Mains trans. Pri., total ...	90·0
	Heater sec. ...	0·2
	Rect. heat. sec.	0·2
	HT sec., total	500·0
S1–S5	Waveband switches... ...	—
S6	Mains switch, ganged R6 ...	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 223 V, using the 230 V tapping on the mains transformer.

The frame aerial leads were joined together, the receiver was tuned to the lowest wavelength on the medium band and the volume control was at maxi-

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH3	118	0·3	58	1·7
	Oscillator 118	4·2		
V2 EF9	118	8·1	118	2·7
V3 EBC3	28	0·4	—	—
V4 EL3	112	16·0	118	1·9
V5 AZ1	164†	—	—	—

† Each anode, AC

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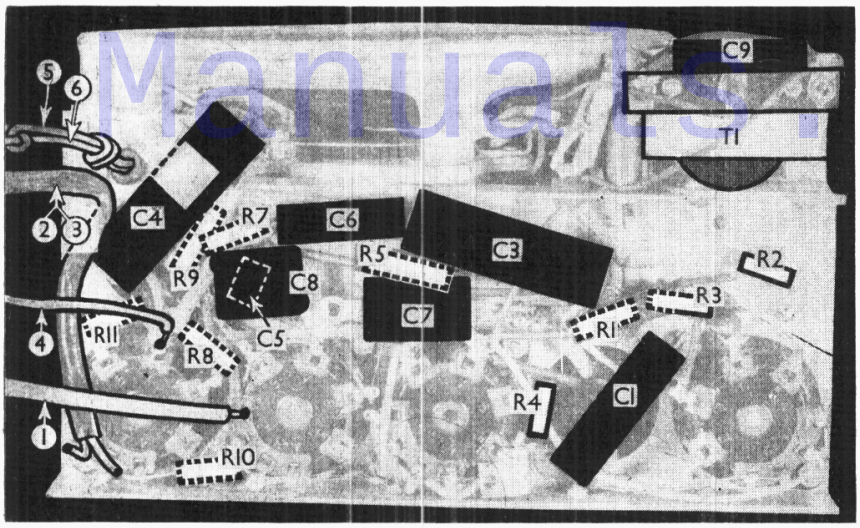


Underneath view of the main chassis. The six leads to the power chassis are numbered to agree with the circuit diagram, and the six tags in the view at the bottom of the page. Many of the resistors are inside insulating sleeving.

mum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 universal Avometer, chassis being negative.

GENERAL NOTES

Switches.—S1-S5 are the waveband switches, in a single lever-operated rotary unit above the main chassis. It is indicated in our plan chassis view, and shown in detail in the diagram below, where it is drawn as seen looking from the front of the chassis. The table below gives the switch positions for the two control settings. The MW position is obtained with the lever towards the lower end of the tuning scale.

S6 is the QMB mains switch, ganged with the volume control **R6.**

SWITCH TABLE

Switch	MW	LW
S1	C	–
S2	–	C
S3	C	–
S4	C	–
S5	C	–

Coils.—L1 and **L2** are the frame aerial windings, terminating in the left hand side of the cabinet, looking from the rear. There are three connecting tags, numbered (in our illustrations) 7, 8 and 9, tag 7 being that nearest to the front of the cabinet.

L3-L6 are in an unscreened unit mounted above the main chassis deck. **L7, L8** and **L9, L10** are in two screened units on the chassis deck, with their associated trimmers.

Trimmers.—Apart from the IF trimmers in the screening cans, there are two trimmers on the gang condenser, two above the **L3-L6** coil unit, and one on a paxolin panel above these two.

Chassis Inter-connections.—Six leads connect the main chassis to the rectifier unit, where they are soldered to a row of tags. These are numbered in our illustration of the unit, and the connections are indicated by arrows and dots, similarly numbered, in the circuit diagram. The leads are coded in the dismantling instructions.

Condensers C10, C11.—These are two dry electrolytics in a single metal can on the deck of the rectifier unit. The can is the common negative. The red coded tag is the positive of **C10** (16μF, 450 V peak) and the green coded tag the positive of **C11** (32μF, 350 V peak). The unit is a Hunts Minipack, List No. 448.

Chassis Divergencies. — In some models, both IF transformers may be air-cored, in which case the resistance of **L7** and **L8** will be 10.5 O. Several divergencies were noticed in the values of components, the figures in our tables being those found in our chassis. In some models **R9** may be 500,000 O; **R11** may not be present; **C2** may be 0.0001 μF; **C3** may be 0.1μF; **C7** may be 0.001 μF; **C8** may be 0.002μF; **C9** may be 0.008μF; **C12** may be 0.01μF.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator, via a 0.1μF condenser, to control grid (top cap) of **V1**, and to chassis. Switch set to MW, feed in a 450.5 KC/S signal, and adjust **C24, C23, C22** and **C21** in turn for maximum output.

RF and Oscillator Stages.—With gang at minimum, pointer should cover 200 m mark on scale. Couple signal generator to external **A** socket.

Switch set to MW and turn gang to minimum. Feed in a 200 m (1,500 KC/S) signal and adjust **C17** for maximum output. Switch set to LW, and with gang still at minimum, feed in an 895 m (335 KC/S) signal and adjust **C18** for maximum output.

Turn gang to maximum, and with set switched to LW, feed in a 2,040 m (147 KC/S) signal and adjust **C20** for maximum output. Re-adjust **C18** at 895 m if necessary. Switch set to MW, and with gang at maximum, feed in a 550 m (543 KC/S) signal and adjust **C19** for maximum output. Re-adjust **C17** at 200 m if necessary.

Remove signal generator, and tune in a weak station near 200 m. Adjust **C15** for maximum output. Next tune in a LW station at about 1,700 m and re-adjust **C20,** while rocking the gang, for maximum output. Finally tune in a MW station at about 450 m, and re-adjust **C19,** while rocking the gang, for maximum output.

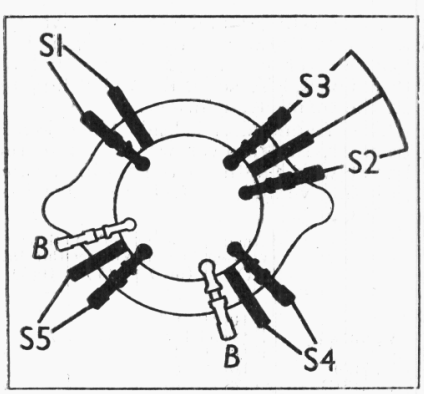
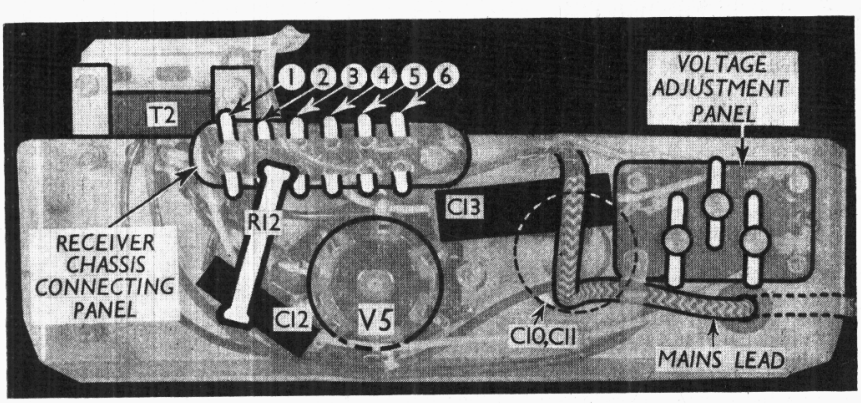


Diagram of the wavechange switch unit, as seen from the front of the chassis, after removal of the loudspeaker.



Underneath view of the power chassis, with the tags on the receiver chassis connecting panel numbered to agree with the circuit diagram and the numbered leads in the view at the top of the page. **C10, C11** are on the deck of this chassis.