'TRADER' SERVICE SHEET 249

BEETHOVEN P202 BATTERY PORTABLE

THE Beethoven P202 Baby Portable is a 4-valve battery operated portable receiver of small dimensions, containing its own frame aerial. Provision is made for the connection of a pair of headphones and an external aerial, while there is a ruby pilot light in the centre of the speaker grille. A turntable is fitted to the bottom of the cabinet.

CIRCUIT DESCRIPTION

Tuned frame aerial input **L1, L2, C13** to R.F. pentode valve (**V1, Mullard metallised VP2**) operating as R. F. amplifier with fixed mean grid potential. Provision for connection of external aerial, if required.

Tuned anode coupling by **L4, L5, C16** between **V1** and triode detector valve (**V2, Mullard metallised PM2HL**) which operates on grid leak system with **C3 and R2, R3.** Reaction is applied from anode by coil **L3** and controlled by **C15**. R.F. filtering in anode circuit by **R6** and **C6.**

Resistance-capacity coupling by **R5, C5, R7** between **V2** and triode A.F. amplifying valve (**V3, Mullard metallised PM2HL**). Fixed tone correction in grid circuit by **C7** and in anode circuit by **C8**.

Auto-transformer coupling by **R8, C9, T1** via R.F. stopper **R9** between **V3** and beam tetrode output valve (**V4, Osram KT2**). Fixed tone correction in anode circuit by **C11.** Provision for connection of headphones across primary of internal speaker input transformer **T2.** G.B. for **V4** is automatically developed across resistor **R10** in H.T. negative lead.

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, first remove the control knobs (recessed grub screws), batteries and valves. Then unsolder the H.T. leads from the tags on the panel at the top of the cabinet, and unsolder the leads from the phone sockets and free them from the two cleats holding them.

Now remove the scale plate (four counter-sunk head wood screws), thus exposing a bolt, which remove. Next remove the two round-head and one countersunk-head wood screws also holding the chassis and remove the nut from the bolt holding the bracket to the speaker. Now turn the receiver upside down.

Then unsolder the leads to the panel now on the left of cabinet carrying the leads for the pilot lamp and L.W. frame winding, and unsolder the red-braided lead to the panel on the right of the cabinet (looking from the back of the cabinet), and the two H.T. battery leads to panel (now at bottom of cabinet). The chassis can now be withdrawn.

When replacing, note that the shorter of the two H.T. leads goes to the left hand tag on the panel (when viewed from the back of the cabinet, with the cabinet upside down), and note that two screened leads go to one of the phone sockets and two unscreened leads to the other. When connecting the leads to the panel for the pilot lamp take the black rubber lead with insulated sleeving covering to the top tag (when viewed with the set upside down) and the screened lead to the second tag from the bottom, connecting the screening to the bottom tag. This is more conveniently done if a piece of wire be connected between the screening and tag.

Removing Speaker.—If it is desired to remove the speaker from the cabinet, remove the chassis and unsolder the earthing lead from the transformer core which passes through the cabinet to the turntable. Free the strap at the top (nut) and remove the nut from the bolt holding the bottom of the speaker to the cabinet. The speaker and transformer can now be withdrawn together.

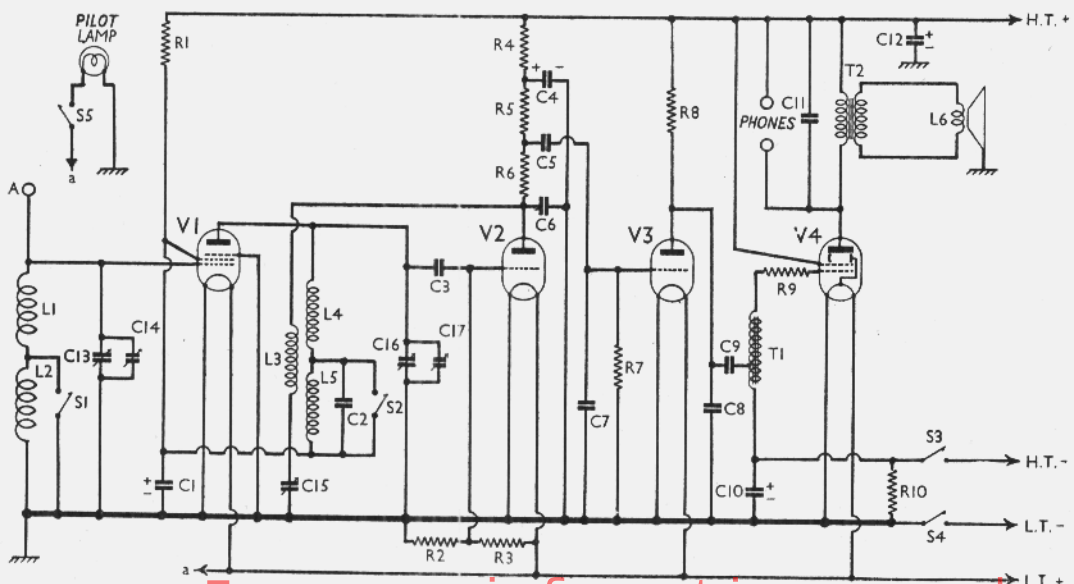
If the transformer is removed from the speaker, disconnect the leads from the speaker terminal panel to the outside tags on the transformer terminal panel, and *when replacing* the speaker see that the terminal panel is at the top (with the set standing normally).

Removing Frame Aerial.—If it should be necessary to service the frame aerial, it will probably be desirable to return the set to the makers, as removal of the frame aerial cannot easily be carried out.

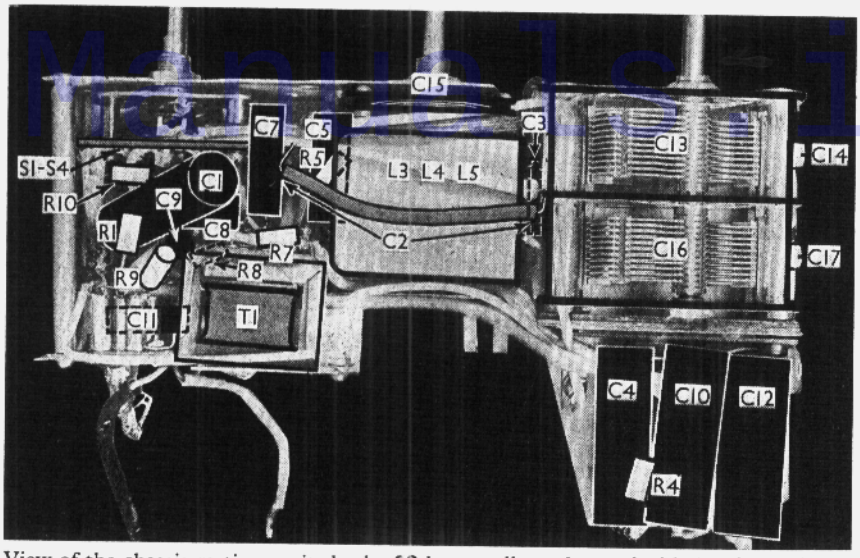
COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1*	V1 S.G. and anode decoupling	2·0
C2	V1 anode circuit L.W. fixed trimmer	Very low
C3	V2 C.G. condenser	0·00015
C4*	V2 anode decoupling	2·0
C5	V2 to V3 A.F. coupling	0·0025
C6	V2 anode R.F. by-pass	0·00005
C7	Fixed tone correctors	0·004
C8	Fixed tone correctors	0·001
C9	A.F. coupling to T1	0·05
C10*	Automatic G.B. by-pass	25·0
C11	Fixed tone corrector	0·004
C12*	H.T. circuit reservoir	4·0
C13†	Frame aerial circuit tuning	—
C14‡	Frame aerial circuit M.W. trimmer	—
C15†	Reaction control	—
C16†	V1 anode circuit tuning	—
C17‡	V1 anode circuit M.W. trimmer	—

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Beethoven P202 Baby Portable battery receiver. **L1** and **L2** are the frame aerial windings. **V4** is a battery output tetrode. All bias is obtained automatically. **S5** is incorporated in the pilot lamp holder.



View of the chassis resting on its back. **C2** is a small condenser inside insulated sleeving

RESISTANCES		Values (ohms)
R1	V1 S.G. and anode H.T. feed	4,000
R2	V2 grid leak and filament pot.	4,000,000
R3	V2 grid leak and filament pot.	4,000,000
R4	V2 anode decoupling	6,000
R5	V2 anode load	30,000
R6	V2 anode R.F. stopper	6,000
R7	V3 C.G. resistance	500,000
R8	V3 anode load	20,000
R9	V4 C.G. R.F. stopper	250,000
R10	Automatic G.B. resistance	300

OTHER COMPONENTS		Approx. Values (ohms)
L1	Frame aerial windings	2·2
L2	Frame aerial windings	12·2
L3	Reaction coil	4·1
L4	V1 anode circuit tuning coils	3·25
L5	V1 anode circuit tuning coils	28·0
L6	Speaker speech coil	3·0
T1	Intervalve auto-trans., total	5,000·0
T2	Speaker input trans. Pri.	590·0
T2	Speaker input trans. Sec.	0·2
S1,S2	Waveband switches	—
S3	H.T. circuit switch	—
S4	L.T. circuit switch	—
S5	Pilot lamp switch	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on an H.T. battery reading 80 V on load. The receiver was tuned to the lowest wavelength on the medium band and the reaction control was at minimum. There was no signal input, the frame aerial connections being shorted.

Voltages were measured on the 1,200 V scale of an Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP2	75	0·6	75	0·2
V2 PM2HL	45	0·7	—	—
V3 PM2HL	60	1·0	—	—
V4 KT2	80	3·0	80	0·7

GENERAL NOTES

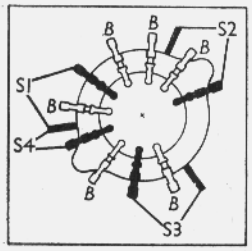
Switches.—**S1, S2** are the wavechange switches, and **S3, S4** the H.T. and L.T. circuit switches, all ganged in a single rotary unit, indicated in our view of the chassis resting on its back, with the control spindles at the top. The switches are shown in detail in the diagram on this page, where they are drawn as seen looking in the direction of the arrow in the chassis illustration.

The table below gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C**, closed.

Switch	M.W.	OFF	L.W.
S1	C	—	—
S2	C	—	—
S3	C	—	C
S4	C	—	C

S5 is the pilot lamp switch, combined with the pilot lamp holder in the centre of the speaker grille. On rotating the holder by the milled disc, **S5** closes or opens, switching the light on or off.

Switch diagram, looking in the direction of the arrow in the chassis view above.



Coils.—Apart from the frame aerial windings, **L1, L2,** which are built into the cabinet, the R.F. anode coils, **L3-L5,** are in a screened unit in the centre of the chassis.

Pilot Lamp.—This can be reached by pulling out the combined holder and switch from the centre of the speaker grille, and then withdrawing the rear portion of the holder, which is sprung into the casing. The lamp is an Osram M.E.S. type, rated at 3.5 V, 0.15 A. It is fitted with a small bulb.

Condenser C2.—This is a small capacity L.W. anode trimmer, formed by a copper wire wound over an insulated wire, the

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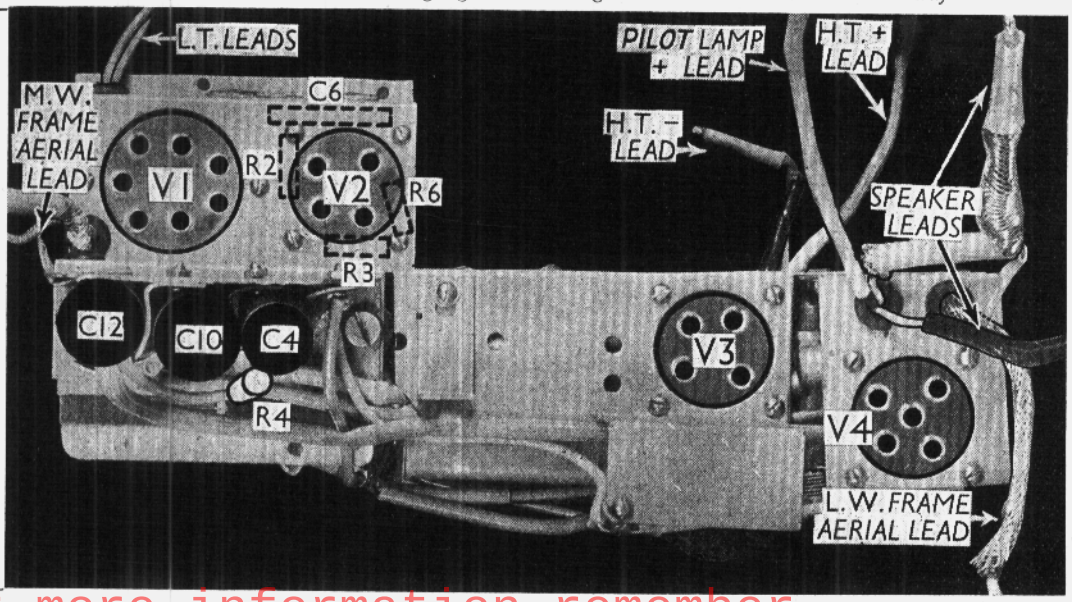

View of the chassis looking down on the valve - holders. The external leads are all marked. **R2, R3, R6** and **C6** are beneath the small panel carrying the **V1** and **V2** valve-holders.

MAINTENANCE PROBLEMS

Hints Contributed by Service Engineers

Unusual Marconi 264 Fault

WE have just completed repairs to a Marconi 264 receiver which had given the customer considerable trouble before he called on us for assistance. Shortly after he got the set he found results poor on all but the local station, but as he used only the mains aerial he put the trouble down to this.

However, the set developed distortion and he finally decided to bring it to us for attention. We found the distortion to be due to low cathode-heater resistance in one of the valves. This was replaced and the set worked quite clearly, but was weak on most stations.

A test of valve voltage revealed the fact that no H.T. was reaching the screen of the I.F. valve. Testing backwards from this point, we found the voltage O.K. at the H.T. side of the resistance forming the upper half of the screen potentiometer. This resistance was replaced, but performance was still poor. Examination of the resistance forming the lower half of the I.F. screen potentiometer showed that instead of a resistance of 23,000 O the reading was zero ohms. This was puzzling, as from the appearance of the resistance one could not expect it to be the cause.

This resistance, as may be known, is mounted in a moulded bed over the condenser bank, and in order to examine the resistance better it was unsoldered complete and taken out. The cause of the short was then apparent, as a straight length of 20 S.W.G. tinned copper wire was lying in the resistance bed and had the appearance of having been there since the set was bought.

The cause of the failure of the upper part of the screen potentiometer was plainly due to the load thrown on it by the shorting out of the lower half, one side of which is at earth potential.—T. ELLIOTT, DUNGANNON.

Faults in a Philco 260

A PHILCO 260 was brought in for service, the complaint being distortion and a bad hum. The main H.T. voltage was low, and upon testing the smoothing condensers I found one was O.C. This was replaced and the receiver tested again.

There was then apparent a very unusual fault. Upon switching from long waves to short or vice versa signals were absent, and only came on when the tuning condenser was rotated.

After some time I found this to be caused by a very poor connection from the condenser moving vanes and frame to chassis.

This receiver was also found to be a little below standard as far as sensitivity was concerned, and a 1 MO resistance connected from the control grid of the frequency changer to chassis vastly improved this, and brought reception quite up to standard.—F.R.E.

Dampness Lowers Efficiency

EVERY now and again we get a receiver in for service with the complaint of low sensitivity. A thorough check through all condensers and resistances of coils, etc. often fails to reveal any fault.

We have found the trouble to be losses in the various coils caused apparently by leakage due to moisture.

When these receivers are placed near a radiator for a couple of hours, and the various circuits are re-aligned, results are generally brought up to standard.—F.R.E.

Shorted Tone Compensator

AN amplifier came in for service, and examination revealed a scorched mains transformer and signs of wax which had run out. Electrolytic condensers tested O.K., so I removed transformer and connected its primary to A.C. mains with no load on the secondary. In a few moments it became quite hot, showing there were shorting turns, so I sent it off for rewind.

Checking through the circuit for the cause of the fault revealed that a tone compensating condenser had been placed from the anode of the output pentode to chassis; in series with this was a 150 mA fuse, evidently to prevent damage in the event of breakdown. This condenser had broken down, but the maximum current obtainable from the rectifier was not enough to blow the fuse. It had, however, imposed such a heavy overload on the mains transformer that this overheated, causing the windings to become partially shorted.—F. R. ELLORY, PAR.

T.I. Produces Instability

OCCASIONALLY a very troublesome high-pitched whistle was experienced in a Pye T10 receiver. Valve replacements and other remedies for instability were tried without success. After correspondence with the makers, the trouble was remedied by replacing the neon tuning indicator.

The black paint used to coat the indicator is a conductor, and forms an inductive loop, which sometimes produces a form of I.F. instability.—A. L. WHEELER, GREAT MISSENDEN.

WE INVITE readers to submit paragraphs based on their own experiences. The kinds of hints required will be gathered from a perusal of this page.

Do not worry if you are not able to put your ideas into a suitable form. Send us the ideas—we will do the rest. The same applies to any sketches or circuits, which need only be roughly drawn. Please write on one side of the paper only, and on alternate lines.

Payment will be made for all ideas and articles used about the 10th of the month following publication. They should be addressed to the Technical Editor, THE WIRELESS & ELECTRICAL TRADER, *Dorset House, Stamford Street, S.E.1.*

BEETHOVEN P202—*Continued*

whole being covered by insulating sleeving. It is shown passing over the coil unit in one of the chassis pictures.

External Phones.—Two sockets are provided at the left-hand side of the cabinet for a pair of high resistance headphones.

External Aerial.—A socket is provided at the right hand side of the cabinet for an external aerial.

Batteries.—L.T., Sterling 2 V 14 AH celluloid-cased jelly acid cell, type 5002. H.T., special Sterling 80 V H.T. battery, with positive and negative strip contacts, type 2002. Grid bias is automatic.

Battery Leads.—The only leads used are for L.T. Red lead, black spade tag, L.T. negative; red lead, red spade tag, L.T. positive 2 V. The H.T. battery makes contact with two flat strips fitted inside the top of the cabinet. The battery should be inserted with its contact strips at the top, with the side from which the strips emerge facing towards the speaker (free ends of the contact strips to the back of the cabinet). Looking from the back of the cabinet, the right hand contact is negative.

Valve V4.—Note that this is a battery tetrode, but the connections are the same as those of the corresponding pentode.

CIRCUIT ALIGNMENT

This must be carried out with the receiver chassis connected up normally in the cabinet. Remove the metal "name" plate at the right-hand side of the cabinet, which will expose the adjusting screws of the two trimmers. Couple a coil to the frame aerial windings (a few turns of wire round the cabinet will suffice), connect the signal generator to the ends of this coil, and feed in a 200 m. (1,500 KC/S) signal. Tune to 200 m. on scale, and adjust **C17,** then **C14** for maximum output. It may be desirable finally to re-adjust **C14** on an actual station of low power, after the temporary coupling coil has been removed.