'TRADER' SERVICE SHEET 233

PHILCO P337

3-BAND BATTERY RECEIVER

OF the 3-band type, the Philco P337 covers a short-wave range of 16·7-51 metres. It is a 3-valve battery-operated model with a pentode R.F. amplifier, a triode detector and a pentode output valve, while provision is made for connecting an extension speaker.

CIRCUIT DESCRIPTION

Aerial input via volume control, potentiometer **R1** and, on M.W. and L.W., coupling coils **L1** (M.W.) and **L3** (L.W.), to inductively coupled band-pass filter. Primary coils **L2, L4** are tuned by **C12**; secondaries **L7, L8** by **C13**; coupling by small inductances **L5** and **L6**. On S.W., potentiometer feeds via coupling coil **L7** to single-tuned circuit **L8, C13.**

First valve (**V1, Philco metallised SP21**) is an R.F. pentode operating as R.F. amplifier.

Tuned secondary R.F. transformer coupling by **L11, L16, C21** (S.W.), **L12, L17, C21** (M.W.) and **L13, L18, C21** (L.W.) between **V1** and triode detector valve (**V2, Philco metallised HL2**) operating on grid leak system with **C5** and **R4.** Reaction is applied from anode by coils **L15** (S.W.) and **L14** (M.W. and L.W.) and controlled by variable condenser **C17.** R.F. filtering by **C4, R5** in anode circuit.

Transformer coupling by **T1** between **V2** and pentode output valve (**V3, Philco OP22**). Tone correction by **C9** in anode circuit. Provision for connection of low impedance external speaker across secondary of internal speaker transformer **T2.**

G.B. voltages are obtained from potentials developed along resistances **R7** and **R8** in negative H.T. line.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	Aerial circuit potentiometer	100,000
R2	V1 anode H.T. feed	10,000
R3	Reaction circuit damping	180
R4	V2 grid leak	1,000,000
R5	V2 anode R.F. stopper	15,000
R6	V2 anode H.T. feed	51,000
R7, R8	Automatic G.B. potentiometer resistances	400, 120

	CONDENSERS	Values (μF)
C1	V1 C.G. decoupling	0·05
C2	V1 S.G. decoupling	0·09
C3	V1 anode decoupling	0·09
C4	V2 anode M.W. and L.W. R.F. by-pass	0·00025
C5	V2 C.G. condenser	0·00003
C6	V2 anode decoupling	0·5
C7*	Automatic G.B. circuit by-pass	35·0
C8	H.T. reservoir	1·0
C9	V3 anode tone corrector	0·003
C10‡	Band-pass primary M.W. trimmer	—
C11‡	Band-pass primary L.W. trimmer	—
C12†	Band-pass primary tuning	—
C13†	Band-pass secondary and S.W. aerial tuning	—
C14‡	Band-pass secondary M.W. trimmer	—
C15‡	Band-pass secondary L.W. trimmer	—
C16‡	Aerial circuit S.W. trimmer	0·00003
C17†	Reaction control	—
C18‡	R.F. trans. sec. S.W. trimmer	0·00003
C19‡	R.F. trans. sec. M.W. trimmer	—
C20‡	R.F. trans. sec. L.W. trimmer	—
C21†	R.F. trans. sec. tuning	—

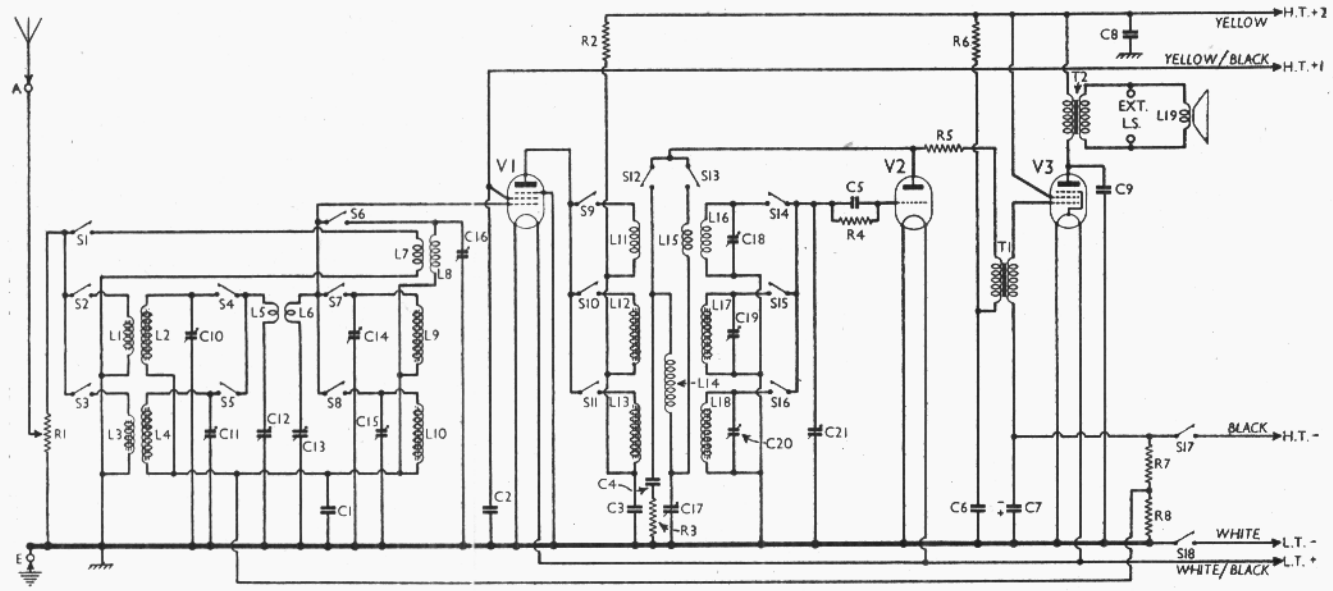
* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial M.W. coupling coil		1·25
L2	Band-pass M.W. primary		1·5
L3	Aerial L.W. coupling coil		17·0
L4	Band-pass L.W. primary		18·5
L5, L6	Band-pass coupling coils		Very low, Very low
L7	Aerial S.W. coupling coil		0·5
L8	Aerial S.W. tuning coil		0·05
L9	Band-pass M.W. secondary		1·5
L10	Band-pass L.W. secondary		20·0
L11	R.F. trans. S.W. primary		0·1
L12	R.F. trans. M.W. primary		5·0
L13	R.F. trans. L.W. primary		15·0
L14	M.W. and L.W. reaction coil		10·0
L15	S.W. reaction coil		0·1
L16	R.F. trans. S.W. secondary		0·05
L17	R.F. trans. M.W. secondary		1·75
L18	R.F. trans. L.W. secondary		18·0
L19	Speaker speech coil		2·25
T1	Intervalve trans.	Pri.	1,250·0
		Sec.	10,000·0
T2	Speaker input trans.	Pri.	725·0
		Sec.	0·3
S1-S16	Waveband switches		—
S17	H.T. circuit switch ganged		—
S18	L.T. circuit switch R1		—

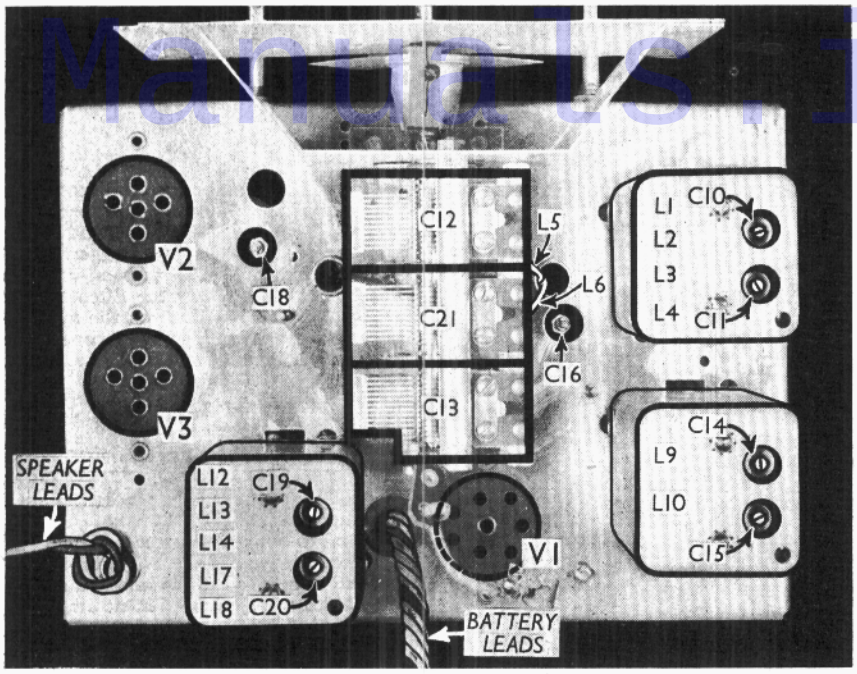
DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, remove the four control knobs (pull off) and the four self-tapping bolts (with washers) holding the chassis to the bottom of the cabinet. The chassis can now be withdrawn to the extent of the speaker leads, which should be sufficient for normal purposes.

When replacing, do not forget the rubber washers between the chassis and the bottom of the cabinet.



Circuit diagram of the Philco P337 3-band battery receiver. **L5** and **L6** are small couplings formed by twisted wires.



Plan view of the chassis. Note the twisted wires passing through the chassis, and forming **L5** and **L6**.

To free the chassis entirely, unsolder the speaker leads.

Removing Speaker.—Should it be necessary to remove the speaker from the cabinet, unsolder the leads and remove the nuts and spring washers from the four ornamentally-headed screws holding the speaker to the front of the cabinet. *When replacing*, see that the transformer is pointing to the bottom right-hand corner of the cabinet.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with an H.T. battery reading 150 V on load. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but the reaction control was at minimum. There was no signal input.

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 SP21	122	1·6	134	0·5
V2 HL2	65	1·0	—	—
V3 OP22	138	5·8	143	1·1

GENERAL NOTES

Switches.—**S1-S16** are the waveband switches, ganged in two rotary units beneath the chassis. The units are indicated in our under-chassis view, and are shown in detail in the diagrams on page IV, where the units are seen looking from the rear of the underside of the chassis.

The table (page IV) gives the switch positions for the three control settings, starting from fully anti-clockwise. O indicates open, and **C** closed.

S17 and **S18** are the H.T. and L.T. circuit switches, of the Q.M.B. type, in a single unit ganged with the volume control (aerial circuit potentiometer) **R1.**

Coils.—**L1-L4**; **L9, L10**; and **L12, L13, L14, L17, L18** are in three screened units on the chassis deck. **L5, L6** are small couplings formed of twisted wires, indicated in our plan chassis view where they pass through a hole in the chassis deck. **L7, L8** and **L11, L15, L16** are in two unscreened tubular units beneath the chassis, indicated in our under-chassis view.

External Speaker.—Two sockets are provided on the internal speaker input transformer terminal panel for a low impedance (2-3 O) external speaker.

Condenser C1.—This is a Philco black moulded unit, of which the two outer tags form the condenser connections. The centre tag is merely a bearer (marked "b" in our under-chassis view).

Condensers C2, C3.—These are in a single black moulded unit, the end tag which is connected to chassis by the fixing bolt being common to both condensers.

Chassis Divergencies.—**C6** may have been 0·01 μF or 0·05 μF in early chassis. It is 0·5 μF in our chassis, and should be increased to this value in early models. **R3** was not included in the makers' diagram, but is in our chassis. **V2** is shown as a T2 triode, but is actually a Philco HL2.

Batteries.—Suggested types are: L.T., 2 V 45 AH accumulator cell, such as the Exide DFG or Ever Ready GS45. H.T., 150 V dry battery, such as the Exide H1081A, Ever Ready Portable 37 or Siemens Full-o'-Power 1317. Grid bias is automatic.

Battery Leads and Voltages.—White lead, spade tag, L.T. negative; black/white lead, spade tag, L.T. positive 2 V; black lead and plug, H.T. negative; yellow/black lead, brown plug, H.T. positive 1, +140V; yellow lead and plug, H.T. positive 2, +150 V.

CIRCUIT ALIGNMENT

With gang condenser at minimum (fully out of mesh), pointer should cover index line just above "M.W." at higher frequency end of scale. Turn volume

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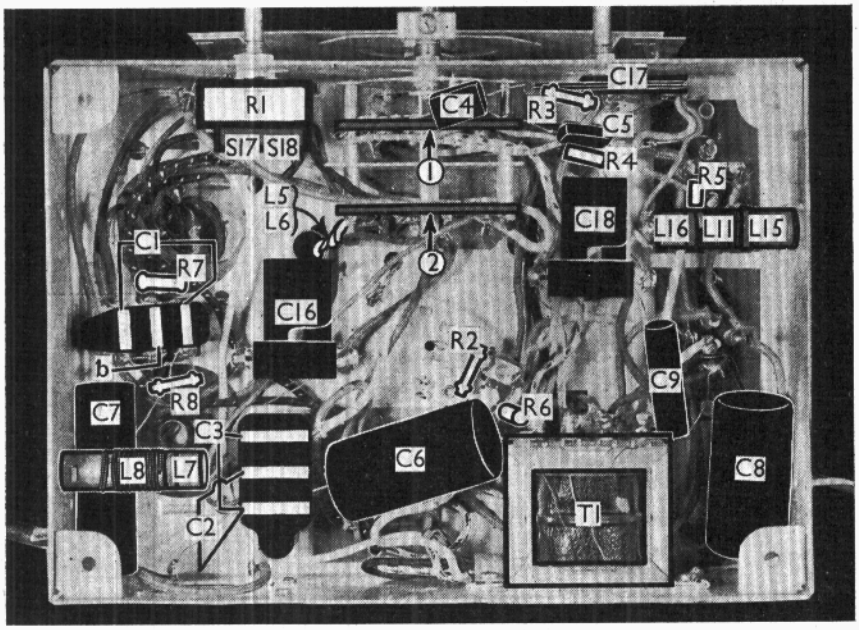


Under-chassis view. Note the **C1** and **C2, C3** condenser units. The centre tag is blank in the first of these. **C16** and **C18** are adjusted through holes in the chassis deck.

MAINTENANCE PROBLEMS

Hints Contributed by Service Engineers

Transformer Breakdowns Again—

W.O.M. (July 3 *Trader*) seems puzzled by output transformer breakdowns in battery sets, but a little thought would soon reveal the trouble. What is there in battery models which is not in mains? Why, an accumulator! It is the acid fumes which work such havoc with copper windings, not the climate.

In this respect, many manufacturers are guilty of placing the accumulator right against the loudspeaker, simply asking for trouble, and in spite of waxing and pitching, breakdowns are frequent, although the method of immersing in pitch seems to be better than paraffin wax.—M. BRITTAIN, EASTBOURNE.

—And Again

I HAVE read with interest the few lines in the July 3 *Trader* re transformer breakdowns. I have also found the trouble to be only in battery sets, not only transformers but also filters, and now and again an odd oscillator coil. The faulty oscillator coils can usually be distinguished by green spots on the windings.

At length I have come to the conclusion that in mains sets, the heat from the receiver and output valves keeps out the damp, or perhaps it brings out any damp that may have been left in due to faulty impregnation.—ROBERT C. BELL, AMBLESIDE.

Obscure Fault in Cossor 363

WEAK signals, broad tuning and no reaction on the medium waves and intermittent reaction on the long waves were the faults in a Cossor 363, which were eventually traced to an obscure cause.

Routine tests were carried out and the aerial, earth, batteries and valves were found to be in order, as were voltages and currents.

During further tests it was noticed that reverse reaction effects occurred on medium waves, although it was not possible to produce oscillation. There was a similar state of affairs on long waves during periods when no oscillation could be obtained.

Tests on anode circuits, R.F. by-pass condensers, reaction coils and condensers, switches, and the grid leak and condenser gave no clue. Then it was noticed that the damping resistance (nominally 200 O) in series with the detector grid coils varied considerably in value between test periods. On replacing this component the set functioned normally on both bands.—R. R. GREEN, MARLOW.

L.W. Trimmer Fault in Ekco AC77

TWO Ekco AC77 receivers I have had recently have been quite O.K. on medium waves, but have failed entirely on long waves. The wave-change switch and the coils were checked and found O.K., so systematic checking of the oscillator stage was commenced, when the oscillator coil long-wave trimmer was found to be shorting, when tested on a megger.

This is a mica dielectric semi-variable condenser marked C5 in the Ekco service manual and is shorted out on the medium waves by S5, thus rendering it inoperative on this band.—COLIN G. WARREN, CROYDON.

Distortion at Normal Volume

WHEN at a reasonable volume level, the reproduction from an Ultra 22 was found to be very distorted. The usual measurements were made and the voltages appeared to be only a little below standard. New valves were tried with no improvement.

After pondering over the circuit diagram, I decided that the fault could be in the A.V.C. circuit. Upon examining it I found that all the resistors were O.K., but the small condenser which feeds the A.V.C. diode from the I.F. valve anode was leaking. When this was replaced the set worked O.K.—F. WADE, SHIPLEY.

Tuning Indicator Trouble

A PHILIPS 797A was in for service with the complaint that every time the volume was turned up to reasonable strength the tuning meter would swing in sympathy with the modulation, while turning the volume down the meter would behave normally. Otherwise the set worked quite well.

Everything associated with the meter circuit was found to be O.K. But it was then noticed there was a little more hum than usual, but not serious enough to make me suspect the smoothing.

However, to make sure a new 32 μF condenser was fitted, and this cured the meter trouble and the hum.—S. MARSH, LEEDS.

Fading In Battery Sets

IN two battery receivers I had the same complaint: when tuned in to a station there was intermittent fading and subdued crackling.

In one receiver this was on every station and was eventually traced to a leak between different windings of the H.F. coil, and was cured by baking and shellac varnishing.

In the other receiver this same thing only happened on the Regional station, and was found to be due to either moisture or corrosion on the variable condenser vanes. Cleaning between the vanes cured the fault.—J. V. LINNELL, ORPINGTON.

PHILCO P337—*Continued*

control to maximum, and reaction to minimum.

L.W.—Switch set to L.W., set pointer to 290 KC/S on scale, feed in a 290 KC/S (1,034·5 m.) signal via a dummy aerial to **A** and **E** sockets. Adjust **C11, C15** and **C20** in that order, for maximum output. Repeat this several times, then increase reaction to a point just short of oscillation and re-adjust **C20,** but do not alter **C11** and **C15.** Check at 160 KC/S.

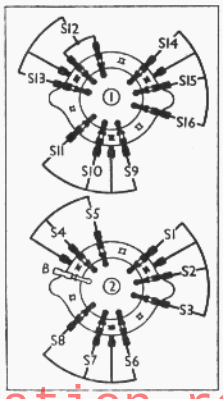
M.W.—Switch set to M.W. and return reaction to minimum. Tune to 1,400 KC/S on scale, and feed in a 1,400 KC/S (214·3 m.) signal. Adjust **C10, C14** and **C19** for maximum output in turn. Repeat several times, then increase reaction to a point just short of oscillation and re-adjust **C19** only. Check at 600 KC/S.

S.W.—Switch set to S.W. and return reaction to minimum. Use a 400 O resistance in place of the dummy aerial, and feed in an 18 MC/S (16·7 m.) signal. Tune to 17.8 MC/S on scale, then adjust **C18** and **C16** for maximum output. Check with the signal that is received at 18 MC/S on scale when reaction is advanced to a point just short of oscillation. Check also at 6 MC/S.

SWITCH TABLE

Switch	L.W.	M.W.	S.W.
S1	O	O	**C**
S2	O	**C**	O
S3	**C**	O	O
S4	O	**C**	O
S5	**C**	O	O
S6	O	O	**C**
S7	O	**C**	O
S8	**C**	O	O
S9	O	O	**C**
S10	O	**C**	O
S11	**C**	O	O
S12	**C**	**C**	O
S13	O	O	**C**
S14	O	O	**C**
S15	O	**C**	O
S16	**C**	O	O

SWITCH DIAGRAM



Switch diagrams of the Philco P337, looking from the rear of the underside of the chassis.