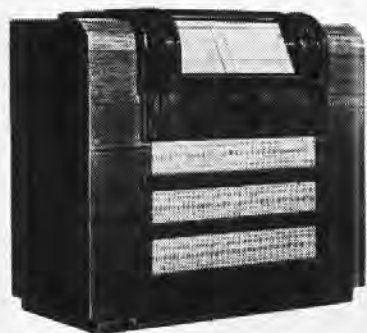


"TRADER" SERVICE SHEET
367

EKCO BAW98

5-VALVE BATTERY SUPERHET



THE 41.5 MC/S television sound channel (referred to below as TS) and a range of 19.50 m (SW) are covered by the Ekco BAW98 5-valve battery superhet, in which the valve arrangement comprises a variable-mu hexode mixer, a triode oscillator, a variable-mu hexode IF amplifier, a double-diode triode and a double pentode output valve in a QPP stage. Provision is made for both a gramophone pick-up and an extension speaker and there is a switch for cutting out the internal speaker.

Release date: August, 1937.

It is regretted that permission to publish the circuit diagrams of Ekco sets is still not available, but the information given is sufficient to enable any competent engineer to effect repairs.

CIRCUIT DESCRIPTION

Aerial input on MW and LW via coupling condenser **C1** to tapping on **L3** (MW) and coupling coil **L2** (LW) to inductively-coupled band-pass filter. Primary coils **L3, L4** are tuned by **C28** via **S8** (MW) or **S9** (LW); secondaries **L9, L10** are tuned by **C34**. IF filter **C2, L1** is connected across **L2** and has an adjustable iron core. On television sound, referred to as TS, and SW bands, input is via **S1** and coupling coil **L5** (TS) or **S2** and **L6** (SW) to single-tuned circuits **L7, C34** (TS) or **L8, C34** (SW). Provision for connection of dipole aerial at socket **A** and unmarked socket immediately below it. Socket **E** should remain connected to earth. Image suppression by condenser **C30** between **L9** and **C1**.

Tuned circuits are connected via switches **S10** (TS), **S11** (SW), **S12** (MW) or **S13** (LW) to CG of first valve (**V1**, Mullard metallised VP2B), a variable-mu RF hexode, which operates as frequency changer with suppressor grid injection in conjunction with triode oscillator valve (**V2**, Cossor metallised 210HF or Mullard PM1HL or Ekco DT21). Oscillator anode coils **L11** (TS and SW), **L12** (MW) and **L13** (LW) are tuned by **C36**; parallel trimming by **C37** (SW), **C38** (MW) and **C39** (LW); series tracking by **C7** (MW) and **C8** (LW), these last two condensers being shunted by resistances **R5** and **R6** to provide a path for HT current to **V2** anode. Reaction by grid coils **L14** (TS and SW), **L15** (MW) and **L16** (LW) connected in series, **S7** short-circuiting

L15 and **L16** on TS and SW, and **S8** short-circuiting **L16** on MW. Coupling between **V1** suppressor grid and **V2** anode is effected by **C6**.

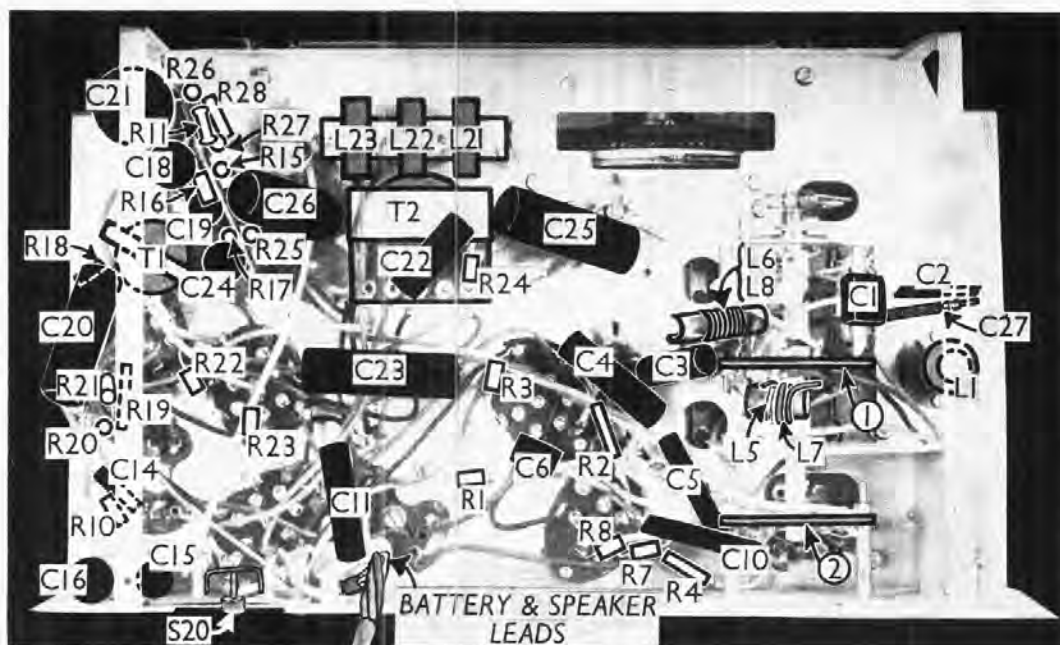
Third valve (**V3**, Mullard metallised VP2B) is a variable-mu RF hexode, with second and fourth grids strapped, operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformers **C40, L17, L18, C41** and **C42, L19, L20, C43**.

Intermediate frequency 126.5 KC/S.

Diode second detector is part of double diode triode valve (**V4**, Mullard metallised TDD2A or Ekco DT21). Audio frequency component in rectified output is developed across load resistance **R10**, the low potential end of which is connected to LT positive line, and passed via AF coupling condenser **C15** and manual volume control **R14** to CG of triode section which operates as AF amplifier, **R13** being shunted across **R14**. Variable tone control by RC filter **C17, R12** also across **R14**. Provision for connection of gramophone pick-up, again across **R14**. IF filtering by **C13, R9, C14**; **R9** being connected between **L20** and **R10**, and **C13, C14** being each connected between one side of **R9** and chassis.

Second diode of **V4**, fed from **V3** anode via **C12**, provides DC potential which is developed across load resistance **R20** and fed back through decoupling circuits as GB to FC and IF valves, giving AVC.

Parallel-fed transformer coupling by **R18, C20** and **T1**, via grid stoppers **R22, R23**, between **V4** triode and quiescent



Under-chassis view. **C27** is a small semi-variable condenser. The core of **L1** is adjustable through a hole in the chassis deck. Diagrams of the switch units are on the back of this sheet. **L5** and **L7** are the aerial coils for the television sound band.

push-pull output valve (V5, Mazda QP230). Fixed tone correction by C22, R24 between anodes.

The output transformer T2 has three windings; a centre-tapped primary connected between the anodes of V5, a secondary from which the speaker is operated and a tertiary which provides negative feed-back. Provision is made for the connection of a low impedance external speaker across part of secondary winding, while the internal speaker is connected across the whole of that winding via a whistle filter circuit C25, L21, L22, L23, C26 and a switch S20 for muting purposes, if desired, when the external speaker is being used. One side of the secondary winding, one side of the speech coil and one side of the tertiary winding are connected to chassis.

The other side of the last goes via C24, R25 and R17 to one side of R15, the other side of which is taken to chassis, so that a fraction of the signal voltage across the tertiary is developed across R15; C24, R25 modifying the frequency response. The response is further modified by C19, R18 connected in series across R15. Switch S19 is also connected across R15. The low potential end of R14 returns to chassis via a decoupling condenser C18 and R15 so that any voltage across R15 is injected into the grid circuit of V4 triode to introduce negative feed-back. On TS and SW bands, S19 closes, connecting C18 directly to chassis, so that no feed-back occurs on these bands. On gramophone, however, negative feed-back can be introduced or dispensed with at will by operating the waveband switch control.

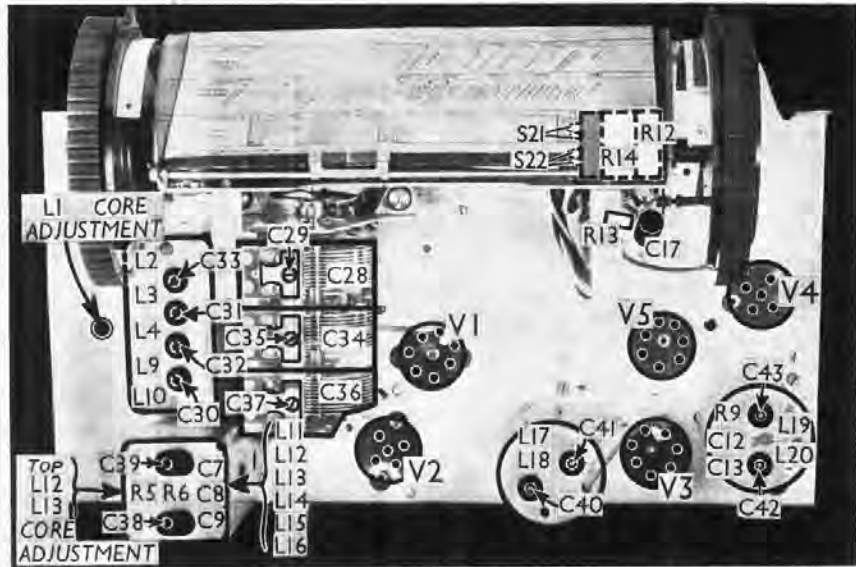
Fixed GB for V1 and V3, GB for V4 triode and V5 and AVC delay potential are obtained automatically from drop along R26 in negative HT lead to chassis, the appropriate potentials being tapped off at the junctions of resistances R11, R27 and R28 which form a potential divider across R26, R11 being connected to chassis. Its junction with R27, at which point is connected one end of R14, provides GB for V4 triode, fixed GB for V1 and V3, and AVC delay; the junction of R27 and R28 provides GB for V5, being connected to the centre-tap of T1 secondary. The further end of R28 is connected to HT negative lead together with one end of R26.

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, remove the two screws (with washers) holding the chassis to the shelf, the two round-head wood screws holding the front of the chassis to the cabinet, and the two screws (with lock washers) holding the brackets on the scale assembly to the top of the cabinet.

Next unsolder the speaker leads and remove the two screws (with lock washers) holding the shelf to the back of the cabinet. Now remove the shelf and let the back of the chassis drop downwards, when the chassis can be withdrawn from the cabinet.

Removing Speaker.—To remove the speaker from the cabinet, slacken the four clamps holding the speaker to the sub-baffle and when replacing, see that the terminal panel is at the bottom.



Plan view of the chassis. The cores of L12 and L13 are adjustable through holes in the side of the can.

COMPONENTS AND VALUES

RESISTANCES		Values (ohms)
R1	V1 CG decoupling	250,000
R2	V1, V3 SG's HT feed	150,000
R3	V1 injector grid resistance	500,000
R4		10,000
R5	V2 anode HT feed resistances	100,000
R6		100,000
R7	V2 CG resistance	100,000
R8	V2 CG stabiliser	150
R9	IF stopper	250,000
R10	V4 signal diode load	250,000
R11	Part of auto GB pot. divider	200,000
R12	Variable tone control	1,500,000
R13	Manual volume control shunt	500,000
R14	Manual volume control	1,000,000
R15	Parts negative feed-back coupling	500
R16		150
R17		9,000
R18	V4 triode anode load	50,000
R19	AVC line decoupling	1,600,000
R20	V4 AVC diode load	750,000
R21	V1, V2, V3 and V4 HT feed	5,000
R22		100,000
R23	V5 grids RF stoppers	100,000
R24	Part of fixed tone corrector	50,000
R25	Part of negative feed-back	20,000
R26	Auto GB resistance	1,280
R27	Parts of auto GB potential divider	3,000,000
R28		500,000

CONDENSERS		Values (µF)
C1	Aerial MW coupling	0.001
C2	Aerial IF filter tuning	0.00015
C3	V1 CG decoupling	0.04
C4	V1, V3 SG's RF by-pass	0.1
C5	V2 anode decoupling	0.02
C6	V1 injector grid coupling	0.00005
C7	Osc. circuit MW tracker	0.002
C8	Osc. circuit LW tracker	0.0008
C9	Osc. circuit LW fixed trimmer	0.00006
C10	V2 CG condenser	0.00004
C11	V3 CG decoupling	0.04
C12	Coupling to V4 AVC diode	0.000015
C13	IF by-pass condensers	0.0002
C14		0.0002
C15	AF coupling to V4 triode	0.01
C16	V1, V4, V3 and V4 HT line decoupling	4.0
C17	Part of variable tone control	0.005
C18	V4 CG decoupling	0.25
C19	Part of neg. feed-back coupling	0.1
C20	AF coupling to T1	0.25
C21	V5 CG's decoupling	2.0
C22	Part of fixed tone corrector	0.0025
C23	HT reservoir condenser	10.0
C24	Part of neg. feed-back circuit	0.2
C25		0.4
C26	Parts of whistle filter	0.1

Continued in next column

CONDENSERS (Continued)		Values (µF)
C27	Band-pass pri. LW trimmer	—
C28	Band-pass primary tuning	—
C29	Band-pass pri. MW trimmer	—
C30	Image suppressor	—
C31	Aerial circuit SW trimmer	—
C32	Band-pass sec. MW trimmer	—
C33	Band-pass sec. LW trimmer	—
C34	Band-pass sec., and SW and TS tuning	—
C35	Aerial circuit TS trimmer	—
C36	Oscillator circuit tuning	—
C37	Osc. circuit SW trimmer	—
C38	Osc. circuit MW trimmer	—
C39	Osc. circuit LW trimmer	—
C40	1st IF trans. pri tuning	—
C41	1st IF trans. sec. tuning	—
C42	2nd IF trans. pri. tuning	—
C43	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial IF filter coil	37.0
L2	Aerial LW coupling coil	180.0
L3		2.5
L4	Band-pass primary coils	27.0
L5	Aerial TS coupling coil	Very low
L6	Aerial SW coupling coil	0.4
L7	Aerial TS tuning coil	Very low
L8	Aerial SW tuning coil	0.05
L9	Band-pass secondary tuning coils	2.5
L10		27.0
L11	Oscillator TS and SW tuning coil	0.05
L12	Oscillator MW tuning coil	3.0
L13	Oscillator LW tuning coil	8.0
L14	Oscillator TS and SW reaction	0.4
L15	Oscillator MW reaction	1.8
L16	Oscillator LW reaction	4.5
L17	1st IF trans. (Pri.)	80.0
L18	(Sec.)	80.0
L19	2nd IF trans. (Pri.)	80.0
L20	(Sec.)	80.0
L21		3.6
L22		2.6
L23	Parts of whistle filter	2.6
L24	Speaker speech coil	24.0
Tr	Intervalve trans. (Pri., total)	475.0
	(Sec., total)	3,500.0
	(Tert., total)	1,350.0
T2	Output trans. (Pri., total)	3.2
	(Sec., total)	—
	(Tert., total)	05.0
Sr-S18	Waveband switches	—
S19	Negative feed-back switch	—
S20	Speaker switch	—
S21	HT circuit switch ganged	—
S22	LT circuit switch R14	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating with an HT 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 there was no signal input.

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

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V ₁ VP2B...	117	0.6	32	0.1
V ₂ 210HF	40	0.6	—	—
V ₃ VP2B...	117	0.5	32	0.2
V ₄ TDD2A	72	0.8	—	—
V ₅ QP230...	132†	2.6†	135	1.5

† Each anode.

GENERAL NOTES

Switches.—S1-S18 are the waveband switches, and S19 the negative feed-back switch, in two rotary units beneath the chassis, indicated in our under-chassis view, and shown in detail in the diagrams below, where they are as seen looking at the rear of the underside of the chassis.

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

Switch	LW	MW	SW	TS
S1	—	—	—	C
S2	—	—	—	—
S3	—	C	—	—
S4	C	C	—	—
S5	—	—	—	C
S6	—	—	C	C
S7	—	C	—	—
S8	—	C	C	—
S9	C	—	—	—
S10	—	—	—	C
S11	—	—	C	—
S12	—	C	—	—
S13	C	—	—	—
S14	—	—	C	C
S15	—	C	—	—
S16	C	—	—	C
S17	—	—	C	C
S18	—	C	—	—
S19	—	—	C	C

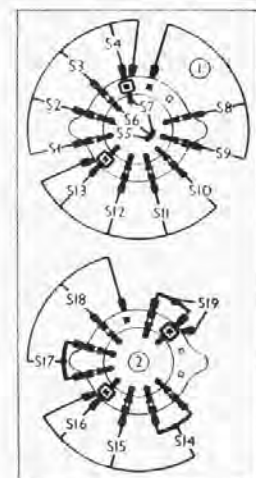


Diagram of the switch units, as seen from the rear of the underside of the chassis.

S20 is the internal speaker switch, which is mounted at the rear of the chassis near the external speaker sockets, and controlled by a small milled knob. When this is unscrewed, the internal speaker

speech coil circuit is broken, thus muting the speaker.

S21 and S22 are the QMB battery circuit switches, ganged with the volume control R14.

Coils.—L1 is mounted beneath the chassis, and has an adjustable iron core, reached through a hole in the chassis deck. L2, L3, L4, L9, L10 and L11-L16 are in two screened units on the chassis deck. The first of these units contains four trimmers reached through holes in the top of the can. The second contains two trimmers (reached through holes in the top of the can) and the three fixed condensers C7-C9, while the cores of L12 and L13 are adjustable through holes in one side of the can. L5, L7 and L6, L8 are on small tubular formers, supported directly on their switch units beneath the chassis.

L17, L18 and L19, L20 are the IF transformers in two further screened units on the chassis deck. They contain their associated trimmers, while the second also includes R9, C12 and C13.

The filter coils L21-L23 are on a single former beneath the chassis, and are unscreened.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (4 Ω) external speaker. The internal speaker can be muted by unscrewing S20.

Condensers C9, C27.—These are small condensers formed of wires spiralled over insulated wires. C9 is inside the oscillator coil unit, while C27 is beneath the chassis near the switch units. The latter is adjustable by sliding the spiralled winding over the straight wire.

Batteries.—LT, 2 V 24 or 30 AH accumulator cell, Pertrix SU30 or SU24; Exide CZK3, LCA3 or RPB3; Dagenite PML9; Ever Ready T284; Hellesens T284. HT, 147 V or 150 V dry battery, Pertrix 114 or 414; Drydex H.1054; Ever Ready W.1183; Hellesens W.B98; Siemens 1344.

Battery Leads and Voltages.—Black lead, spade tag, LT negative; red/white lead, spade tag, LT positive 2 V; white lead and plug, HT negative; red lead and plug, HT positive 147 or 150 V. GB is automatic.

Chassis Divergencies.—R2 and R9 may be 100,000 Ω each. In our chassis they are 150,000 Ω and 250,000 Ω respectively. A 0.00003 μF condenser may be fitted from triode anode of V4 to chassis.

Possible Faults.—The following hints are given by the makers. If the drive slips, this can be caused by excessive load on the drive. Temporarily detach the drive cord from the cursor carrier and check that the latter slides easily on the bar. If necessary, apply a trace of grease. Check that the carrier is clear of the escutcheon. If not, it must be adjusted, after removing the escutcheon. If the cursor will not move to the ends of the scale, the carrier is probably displacing the drive cord so that it does not run in line with the pulleys.

If instability occurs, the metal coating of V3 may be disconnected from pin 5 on the base; alternatively, C11 or C16 may be O/C.

Crackle on the SW band may be due to a defect in C3, or the metal braiding to the gang may be touching chassis at some

point other than the soldered connection.

Boomy MW reproduction may be due to the spring leaf of C38 vibrating in sympathy with the signal. Tune to a weak MW station at about 220 m, remove trimmer nut, insert a hooked piece of thick wire through the hole in the coil can, and lift trimmer leaf to increase its resiliency. Replace trimmer nut, and adjust for maximum output from the selected station to restore MW calibration.

Excessive HT consumption (appreciably greater than 10mA) may be due to C21 or C23 short-circuited, or to R22, R23 or R28 open-circuited. It should be noted that reversal of the HT battery will cause a breakdown of C23, and will burn out R26.

CIRCUIT ALIGNMENT

See that cursor line covers the 550 m mark when gang is at maximum. Volume control should be at maximum.

IF Stages.—Connect signal generator to E socket, and via a 0.02 μF condenser to grid (top cap) of V1, leaving existing clip in position. Switch set to LW, turn gang to indicate 1,950 m on scale, feed in a 126.5 KC/S signal, and adjust C40, C41, C42 and C43 for maximum output.

RF and Oscillator Stages.—Connect signal generator to A and E sockets, and feed in a 15 MC/S signal. Switch set to SW and tune to 15 MC/S on scale. Fully unscrew C37, then screw it in slowly. Two peaks will be obtained, of which the first reached is correct. Adjust to this accurately.

Feed in a 20.75 MC/S signal (its second harmonic being 41.5 MC/S), at full generator output. Then switch to TS, tune to TS mark on scale, and adjust C35 for maximum output.

Switch to SW, feed in a 15 MC/S signal, tune to 15 MC/S on scale, and adjust C31 for maximum output.

Switch set to MW, tune to 250 m on scale, and feed in a 1,200 KC/S signal. Fully unscrew C38 and then screw it in slowly, adjusting accurately to the first peak reached. Now adjust C32 and C29 for maximum output. Tune to 500 m on scale, feed in a 600 KC/S signal, and adjust iron core of L12 for maximum output, while rocking the gang for optimum results. Repeat the adjustments at 250 and 500 m.

Switch set to LW, tune to 1,100 m on scale, feed in a 272.5 KC/S signal, and adjust C39, C33 and C27 for maximum output. C27 is adjusted by sliding the spiralled wire on the insulating sleeve over the straight wire.

Tune to 1,700 m on scale, feed in a 176.5 KC/S signal, and adjust core of L13 for maximum output, while rocking the gang.

Leaving set tuned to 1,700 m, feed in a 126.5 KC/S signal at full generator output, and adjust core of L1 for minimum output. Reduce generator output, and adjust to 272.5 KC/S. Tune to 1,100 m on scale, and repeat LW alignment as above.

Switch set to MW, feed in a 1,000 KC/S signal at full generator output. Tune receiver to image of generator frequency (about 400 m) and adjust C30 for minimum output.

Tune to 250 m, feed in a 1,200 KC/S signal, and re-adjust C32 for maximum output.