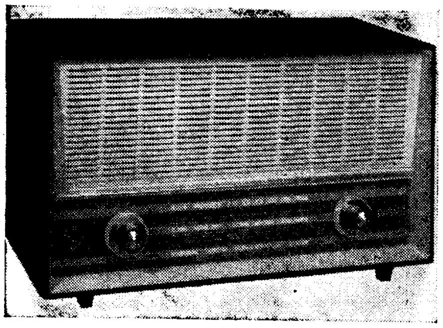
"TRADER" SERVICE SHEET

1496

PHILIPS B3G99U

A.M./F.M. Table Receiver for A.C. or D.C. Mains Operation



Appearance of the Philips B3G99U.

COVERING reception on M.W., L.W. and Band II (V.H.F.) the Philips B3G99U is a mains operated AM./F.M. receiver housed in a moulded plastics cabinet. Using conventional A.C.-D.C. technique, the receiver is designed for operation on mains voltages 200-250V and employs 5 valves (plus rectifier).

The waveband ranges are 188-569m (M.W.), 1,090-2,000m (L.W.) and 87.5 to 100 Mc/s (F.M.) A length of lead on the back cover is provided as an F.M. aerial for reception in high signal strength areas, and an internal loop forms an A.M. aerial. Provision is made for the connection of external A.M. and F.M. aerials. Model B4G0IU employs a similar chassis but is housed in a wooden cabinet.

Release dates and original prices: B3G99U, July 1960, £15 10s; B4G01U, August 1960, £19 17s 5d. Tax extra.

VALVE ANALYSIS

Valve voltages given in the table below are those derived from the manufacturers' information. They were measured on a 20,000 Ω/V meter, chassis being the negative connection in every case.

Valve Table

Valve		Anode (V)	Screen (V)	Cathode (V)
V1a UCC85	*	—	—	—
	†	172	—	1·5
V1b UCC85	*	—	—	—
	†	122	—	—
V2a UCH81	*	104	—	—
	†	—	—	—
V2b UCH81	*	205	57	—
	†	180	63	—
V3 UF89	*	165	79	—
	†	162	76	—
V4d UABC80	*	72	—	—
	†	70	—	—
V5 UL84	*	213	208	17·2
	†	211	193	15·8
V6 UY85	*	—	—	235·0
	†	—	—	230·0

**Receiver switched to A.M.*
†Receiver switched to F.M.

CIRCUIT DESCRIPTION

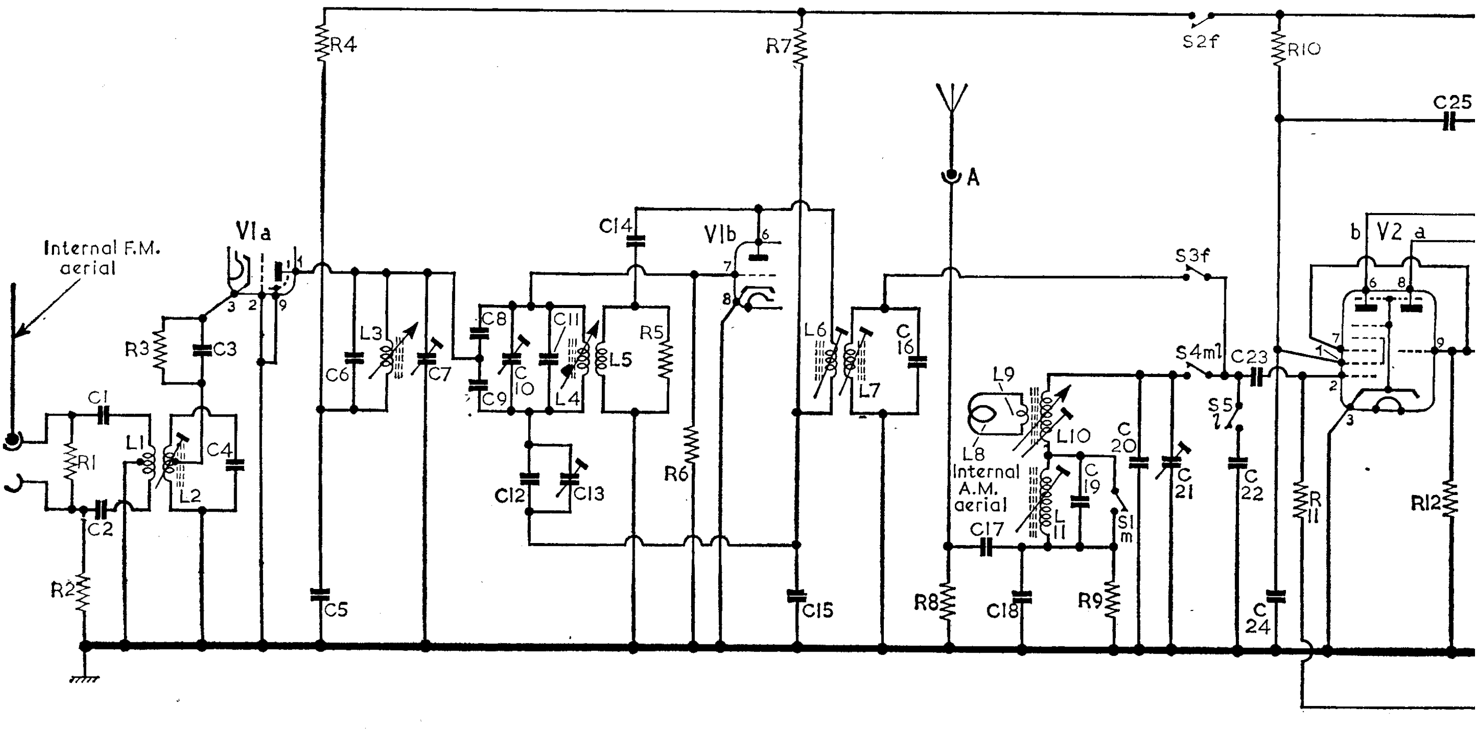
Operation on A.M.—Loop aerial **L8** is coupled to permeability-tuned coil **L10** on both M.W. and L.W. with L.W. loading coil **L11** short-circuited on M.W. External aerial socket is bottom-coupled to aerial tuned circuit. Coupling is made via **C23** to the mixer section of frequency changer **V2.** Parallel-fed local oscillator coil **L12** is permeability tuned and loading coil **L13** is short-circuited on M.W. **S2** is open removing H.T. current supply from the F.M. tuner.

The I.F signal component in **V2b** anode is coupled via tuned transformer **L14, C34** and **L15, C35** to **V3** which operates as intermediate frequency amplifier, and the amplified I.F. output from **V3** is tuned-transformer coupled to detector **V4c** via **L21, C44** and **L22, C45.**

A.M. Intermediate frequency 470kc/s

Rectified output from **V4c**, is filtered by **R21** and **C47** and the audio component appearing across load resistor **R23,** is coupled via **C51** to the volume control **R25,** and passed on to audio frequency amplifier **V4d.**

Amplified audio signals are then fed via **C56** and grid stopper **R30** to the grid of output valve **V5.** Step-down transformer **T1** provides drive to speech coil **L23.** Negative feedback voltage is tapped



*Circuit diagram of the Philips B3G99U. The letter " **m**," " **l** " or " **f** " added to a waveband switch number indicates the waveband on which the on two bands and therefore two letters are used. M.W. is indicated by " **m**," L.W. by " **l**," and F.M. by " **f**." The switch **S131** closes incid round the windings of the output transformer represents a sheet copper screening loop which is fitted round the transformer to prevent its stray Without the screen, undesirable feedback might be caused. The second arrows across coils **L10**, **L12** represent the separate* off at the junction of **R35** and **R36** and applied to **V4d** grid, and A.G.C. bias is derived from the negative potential across **C46** and fed via **R20** to **V2b** and **V3** control grids.

Operation on F.M.—Input via mains isolating network to R.F. transformer **L1, L2** and R.F. amplifier section of **V1. L3** is a tuned R.F. coil in **V1a** anode. The signal is taken from the anode via bridge network coupling, which reduces oscillator radiation, to self-oscillating mixer **V1b. L4** is the oscillator coil, whose core is ganged to that of **L3,** and both are permeability tuned. **L2** is pre-set to cover the entire band. Oscillator feed-back coupling is provided by regenerative winding **L5.**

I.F. output from **V1b** is taken via **S3** to **V2b** which now operates as intermediate frequency amplifier. **S9** is open rendering the A.M. oscillator **V2a** inoperative, and **S10** is open allowing tuned-transformer coupling to I.F. amplifier **V3.** Output from **V3** is fed to **L18** which, together with **L19, L20** and two diodes **V4a** and **V4b** comprise part of a conventional ratio detector circuit.

F.M. intermediate frequency 10.7 Mc/s

Audio frequency appearing across **C43** is passed through de-emphasis network **R22, C50** to volume control **R25. S12** short-circuits the A.G.C. line to chassis and bias for **V2b** is derived from the negative potential due to grid current through **R11. S11** closes, thus red'‚ing **V3** screen voltage, which allows /3 to operate with an A.M. limiting action.

Resistors

R1	10kΩ	H4
R2	4·7MΩ	H4
R3	180Ω	H4
R4	2·2kΩ	H3
R5	2·2kΩ	G3
R6	100kΩ	H4
R7	10kΩ	H3
R8	4·7MΩ	H4
R9	33kΩ	G4
R10	39kΩ	G4
R11	1MΩ	G4
R12	47kΩ	G4
R13	33kΩ	G4
R14	2·2kΩ	G4
R15	1MΩ	F4
R16	33kΩ	F4
R17	47kΩ	F4
R18	4·7kΩ	F4
R19	120Ω	F4
R20	1·2MΩ	F4
R21†	47kΩ	F4
R22	47kΩ	F4
R23	220kΩ	F3
R24	27kΩ	F4
R25	2MΩ	E3
R26	10MΩ	F4
R27	100kΩ	E4
R28	220kΩ	F4
R29	470kΩ	E4
R30	1kΩ	E4
R31	27kΩ	C1
R32	560Ω	E4
R33	560Ω	E4
R34	1,000Ω	C2
R35	3·3kΩ	E3
R36	68Ω	F3
R37	140Ω	D2
R38	235Ω	D2

Capacitors

C1	470pF	H4
C2	470pF	H4
C3	0·001μF	H4
C4	6·8pF	H4
C5	0·001pF	H4
C6	6·8μF	H4
C7	5pF	H4
C8	8·2pF	H3
C9	8·2pF	H3
C10	10pF	G4
C11	15pF	G4
C12	5·6pF	G4
C13	10pF	H4
C14	33pF	H4
C15	130pF	H4
C16	15pF	A2
C17	1,800pF	G4
C18	0·003μF	G4
C19	56pF	G4
C20	33pF	G4
C21	18pF	G4
C22	742pF	G4
C23	100pF	G4
C24	1,200pF	G4
C25	4,700pF	G4
C26	56pF	G4
C27	290pF	G4
C28	15pF	G3
C29	50pF	B2
C30	18pF	G4
C31	470pF	G4
C32	120pF	G3
C33	0·022μF	F4
C34	110pF	B2
C35	195pF	B2
C36	15pF	B2
C37	15pF	B2
C38	100pF	G4
C39	4,700pF	F4
C40	4,700pF	F4
C41	22pF	C2
C42	47pF	C2
C43	330pF	F4
C44	195pF	C2
C45	195pF	C2
C46†	100pF	F4
C47†	100pF	F4
C48	330pF	F4
C49	2μF	F3
C50	330pF	F3
C51	4,700pF	F4
C52	0·001μF	F4
C53	0·01μF	F4
C54	1,500pF	F4
C55	0·22μF	E4
C56	0·01μF	E4
C57	50μF	A2
C58	100μF	A2
C59	0·001μF	C2
C60	25μF	E4
C61	4,700pF	E4
C62	0·001μF	F4
C63	0·001μF	H4
C64	0·001μF	H4
C65	0·001μF	F4

Coils*

L1	—	A2
L2	—	A2
L3	—	A1
L4	—	A1
L5	—	A1
L6	1·8	A2
L7	1·8	B2
L8	—	B1
L9	—	B1
L10	7·0	B1
L11	23·0	G4
L12	23·0	B1
L13	5·5	G3
L14	7·5	B2
L15	4·5	B2
L16	—	B2
L17	1·7	B2
L18	1·4	C2
L19	—	C2
L20	—	C2
L21	4·5	C2
L22	4·5	C2
L23	3·0	—

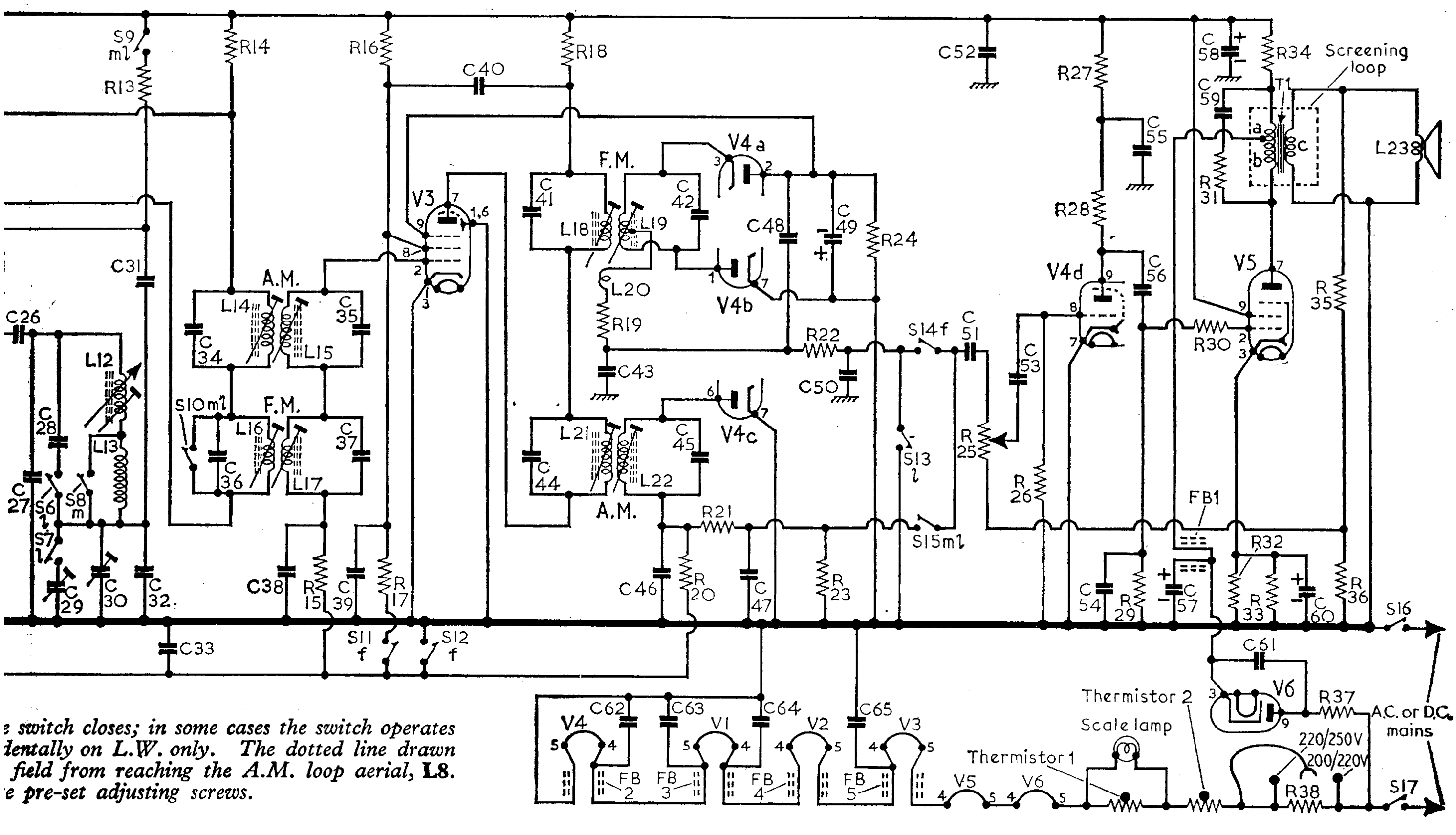
Miscellaneous*

T1 a	12·0	C2
T1 b	350·0	C2
T1 c	—	C2
Therm 1‡		D1
Therm 2‡		D1
FB1	—	E4
FB2	—	F4
FB3	—	H4
FB4	—	G4
FB5	—	F4
S1-S15	—	G4
S16,S17	—	E3

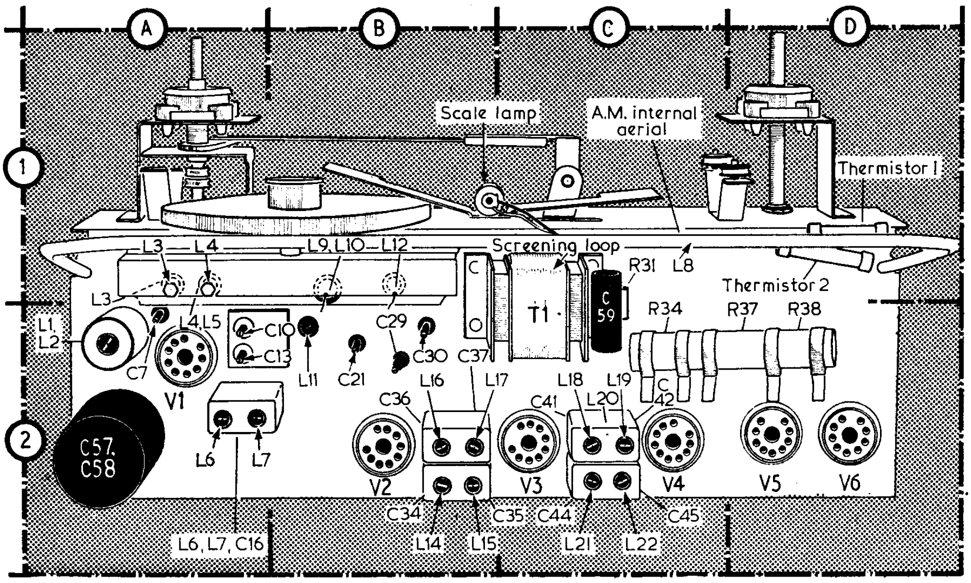
**Approximate D.C. resistance in ohms*

†R21, C46, C47 combined in one component. ‡ Varite

Note: If the component numbers given in these tables are used when ordering spare parts, dealers are requested to mention the fact on the order, as these numbers may differ from the ones used by the manufacturers.



ɜ switch closes; in some cases the switch operates lentally on L.W. only. The dotted line drawn field from reaching the A.M. loop aerial, **L8.** *e pre-set adjusting screws.*



Plan view of the chassis. **L3, L4, L9, L10, L12** *are hidden by the gang structure.*

CIRCUIT ALIGNMENT

In addition to the alignment procedure for A.M. circuits, two alternative F.M. circuit alignment procedures are described. One procedure uses an F.M. method, and the other uses an A.M. method for use where a suitable F.M. generator is not available.

A.M. Circuits

Equipment Required.—An A.M. signal generator modulated 30 per cent at 400c/s; an A.C. voltmeter for use as an output meter; a 5Ω resistor and a 0.05μF capacitor.

1.—Disconnect the speaker, and in its place connect the output meter with the 5Ω resistor in parallel. Connect the signal generator, with the 0.05μF capacitor in its "live" output lead, between chassis and **V2b** control grid, pin 2 (G4).

2.—Switch receiver to M.W. and rotate the tuning knob to the fully anti-clockwise position. Set volume control to maximum.

3.—Feed in a modulated 470 kc/s signal and adjust **L22, L21** (C2), **L15** and **L14** (B2) in that order, for maximum output.

4.—Transfer the signal generator to the A.M. aerial socket via a dummy aerial. Rotate tuning knob to the maximum clockwise position (tuner unit fully closed). Adjust cursor to coincide with the right-hand edge of windows carrying the wavelength scale markings. Now by rotating the tuning knob, bring the cursor in line with 185m mark on scale.

5.—Feed in a modulated 1,620 kc/s signal and adjust **C30** and **C21** (B2) for maximum output.

6.—Switch receiver to L.W. By rotating tuning knob bring cursor in line with the 1,580m mark on scale.

7.—Feed in a modulated 190kc/s signal and adjust **C29** and **L11** (B2) for maximum output.

F.M. Circuits (F.M. method)

Equipment Required.—A sweep-frequency generator with a deviation of 500kc/s at 50 c/s with a built-in A.M. spot frequency generator for marker pip, which can be modulated 30 per cent at 400 c/s; a valve voltmeter; an oscilloscope and a 100kΩ resistor. Also required is an "unbalance to balance pad" for adjustment to the R.F. circuits and a "detector circuit" for adjustment of **C13**. These last two items can be made up as shown in our sketch (Col. 3).

1.—Switch receiver to F.M. and disconnect **C49** (F3) from circuit. Connect the oscilloscope, with the 100kΩ resistor in series, across **R24** (in place of **C49**). Connect the sweep generator between chassis and **V3** control grid (pin 2, ref. F4).

2.—During this operation the voltage across **R24** should not exceed 3V. With the sweep generator set to sweep a range of 500kc/s at 10.7Mc/s and a marker pip at 10.7Mc/s, adjust **L18** (C2) for the best response with the marker at the centre of the response curve.

3.—Adjust **L19** for maximum curve width and symmetry.

4.—Reconnect **C49** and transfer oscilloscope connections across **C43** (F4). Check that the response is straight over approximately 200kc/s.

5.—While maintaining the sweep, switch the marker pip generator to 400 c/s modulation at 10.7 Mc/s, and check that the straight part of the curve remains unchanged. If it changes, readjust **L19**.

6.—Disconnect **C49** and reconnect the oscilloscope across **R24**. Connect the sweep generator to **V2b** control grid (pin 2). Feed in a 10.7Mc/s signal with a deviation of 500kc/s and adjust **L16** (B2) for maximum height, with a 10.7Mc/s marker pip at the centre of the response curve. Adjust **L17** (B2) for maximum height and symmetry consistent with marker position.

7.—Transfer the sweep generator input to **V1a** anode (pin 1, ref. H4) via a 0.005μF capacitor Feed in a 10.7Mc/s signal with a deviation of 500kc/s and adjust **L6** (A2) for maximum height with the marker pip at the centre of the response curve. Adjust **L7** (B2) for maximum height and symmetry consistent with marker position. **L16** may require slight readjustment.

8.—Reconnect **C49.** Feed in an unmodulated 10.7Mc/s signal with the attenuator adjusted to give 8V across **C49.**

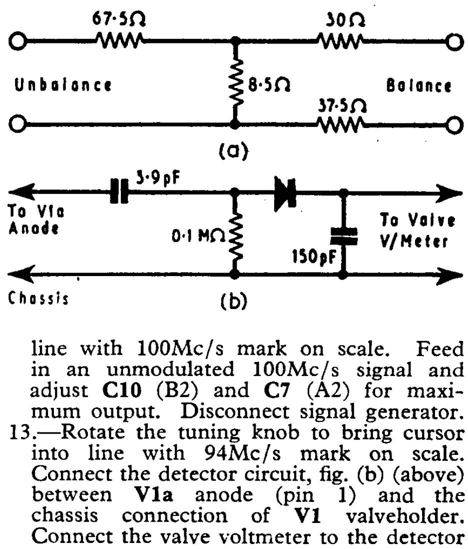
9.—Swing the generator frequency either side of 10.7Mc/s until the output drops to 5V and check that the total frequency change is greater than 200kc/s. Disconnect the generator.

10.—If the A.M. signal generator output is unbalanced, the matching pad, fig. (a), (below), should be connected to its leads and the balanced output connected to the F.M. aerial socket. Connect the valve voltmeter, with the 100kΩ resistor in series, across **C49.** Check the setting of the cursor as described under "A.M. Circuits, operation 4." By rotating the tuning knob bring the cursor into line with the first "E" of R. Eireann.

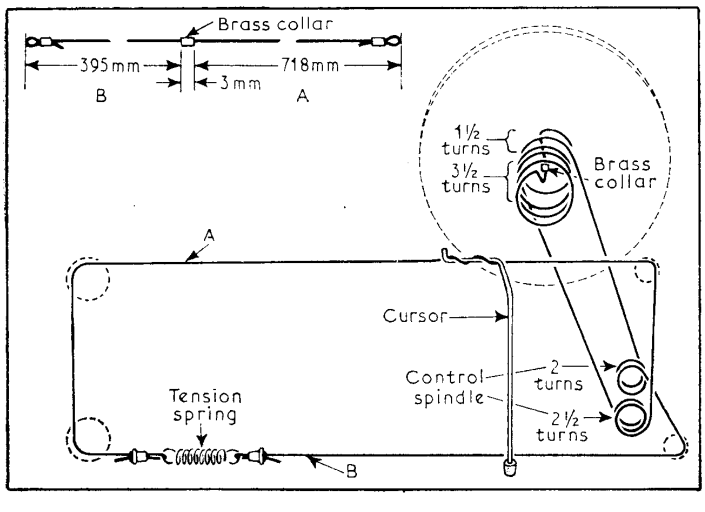
11.—During this operation, the voltage across **C49** should not exceed 8V. Feed in an unmodulated 87.5Mc/s signal and adjust **L4, L3** (A1) for maximum output.

12.—Rotate tuning knob to bring cursor into line with 100Mc/s mark on scale. Feed in an unmodulated 100Mc/s signal and adjust **C10** (B2) and **C7** (A2) for maximum output. Disconnect signal generator.

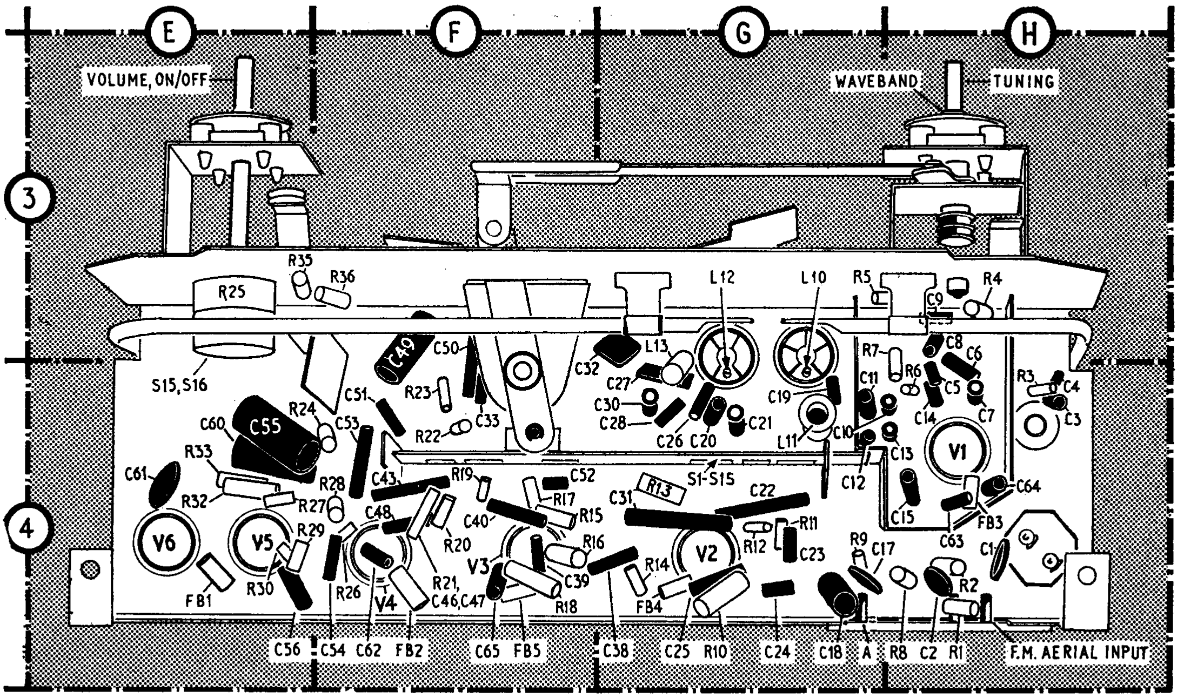
13.—Rotate the tuning knob to bring cursor into line with 94Mc/s mark on scale. Connect the detector circuit, fig. (b) (above) between **V1a** anode (pin 1) and the chassis connection of **V1** valveholder. Connect the valve voltmeter to the detector



Right: *Diagrams of the balun network (a) and the detector circuit (b) referred to in the alignment instructions.*



Left: *Diagram of the tuning drive system drawn as seen from the front of the chassis. At the top is indicated the length of cord required and the position of the brass collar.*



Underside view of the chassis. The screws associated with coils **L10** *and* **L12** *(G3) are the pre-set adjustments mounted alongside the coils*

circuit output. Adjust **C13** (A2) for minimum (oscillator) voltage.

14.—Disconnect the detector circuit and repeat operations 9, 10 and 11 as necessary.

15.—Connect the valve voltmeter with the 100kΩ resistor in series, across **C49,** and the A.M. signal generator to F.M. aerial sockets. Feed in an unmodulated 94Mc/s signal and adjust **L1/L2** (A2) for maximum output.

F.M. Circuits (A.M. Method)

Equipment Required.—An A.M. signal generator; a valve voltmeter; a 100kΩ and a 4.7kΩ resistor; a 0.005μF and 1,500pF ceramic capacitor; an "unbalance to balance pad" and a "detector circuit" (see figs. a and b col. 3).

1.—Connect the valve voltmeter, with the 100kΩ resistor in series, across **C49** (F3). Connect the signal generator between chassis and **V2b** control grid (pin 2) via the 1,500 pF capacitor. Connect a 4.7kΩ damping resistor across **L16** (B2).

2.—Feed in an unmodulated 10.7Mc/s signal and adjust **L17** (B2) for maximum output. Transfer the damping resistor to **L17** and adjust **L16** for maximum output. Remove the damping resistor.

3.—Adjust **L18** (C2) for maximum output and then adjust the signal generator input to give 8V across **C49.** Remove valve voltmeter connections from **C49** and connect meter across **C43** (F4). Adjust **L19** (C2) to give 4V reading on meter.

4.—Re-connect valve voltmeter across **C49** and transfer signal generator to **V1a** anode (pin 1) via the 0.005μF capacitor. Connect the 4.7kΩ damping resistor across **L6** (A2) and adjust **L7** (B2) for maximum output.

5.—Transfer damping resistor to **L7** and adjust **L6** for maximum output. Remove damping resistor.

6.—Proceed from here with operations 8 to 15 described under "F.M. method."

MODEL B4G01U

B4G01U chassis is similar to that of the B3G99U but it includes a modification to the negative feedback circuit to incorporate a variable tone control. Output transformer **T1** is provided with a tertiary winding one end of which is connected to chassis and the other end to **R35. R35** is not connected to winding **c** of **T1** and **L23** is not connected to chassis.

A 470Ω resistor is inserted between **R35** and **R36.** From its junction with **R35,** a 390 pF capacitor and a variable resistor of 2MΩ in series, are taken to the volume control slider end of **C53.** From this same point, a 68kΩ resistor is wired to the volume control slider terminal. **R35** is 2.7kΩ not 3.3.kΩ.

The tone control is mechanically ganged with **R25** using dual concentric control spindles.

GENERAL NOTES

Dismantling.—Remove cabinet back; remove two screws fixing bottom front edge of chassis and two screws at the bottom rear of cabinet; withdraw chassis and unsolder speaker leads.

Drive Cord Replacement.—Slightly more than a total length of 40ins (1,116 mm) of nylon-braided glass yarn is required for a new drive cord. A loop is made at each end by pinching on two brass collars, and the overall length when the loops have been formed should be exactly 40 ins. (1,116 mm). A third brass collar should be pinched on the cord at the position shown in our sketch (col. 1), approximately 15.5 ins. from one end.

Turn the tuner unit drum to its maximum clockwise position.

Insert the third brass collar into the slot in the small diameter section of the drum, the short end of the cord leading. Pass the short end of the cord one turn clockwise around the drum, winding from back to front, and down to the rear section of the spindle pulley. Wind on two turns from back to front in a clockwise direction, and then pass the cord around the bottom right-hand pulley. Fit the tension spring to the cord and anchor it to a convenient point.

Take the longer end of the cord and wind on 3.5 turns from front to back anti-clockwise around the drum. Next pass the cord around the front section of the drive spindle pulley and wind on 2.5 turns in an anti-clockwise direction, winding from back to front. Feed the cord up to the top right-hand pulley, around the two left-hand pulleys, and attach it to the tension spring.

Mains Voltage Adjustment.—Two mains tapping positions only are provided, one for the range 200-220V and other for the range 220-250V. For 220-250V operation, the flying lead should be set to the extreme right-hand tag on dropper resistor **R38,** when viewed from the rear of the chassis shown in location reference D2. For 200-220V operation it should be set to the tag immediately to the left.

Switches.—S1-S15 are the waveband and A.M./F.M. changeover switches, ganged in a single slide-type unit. Our sketch below represents the switch contacts as seen when viewed from the rear of the upturned chassis. The suffix letters "**m**" "**l**" and "**f**" denote that the switch closes on M.W., L.W. or F.M. respectively. **S15** and **S16** are mains on/off switches which comprise a double pole unit ganged with the volume control.

Modifications.—In some earlier receivers, **C65** may be omitted. **C6** may be 4.7pF not 6.8pF and wired from **V1a** anode to chassis, instead of across **L3.**

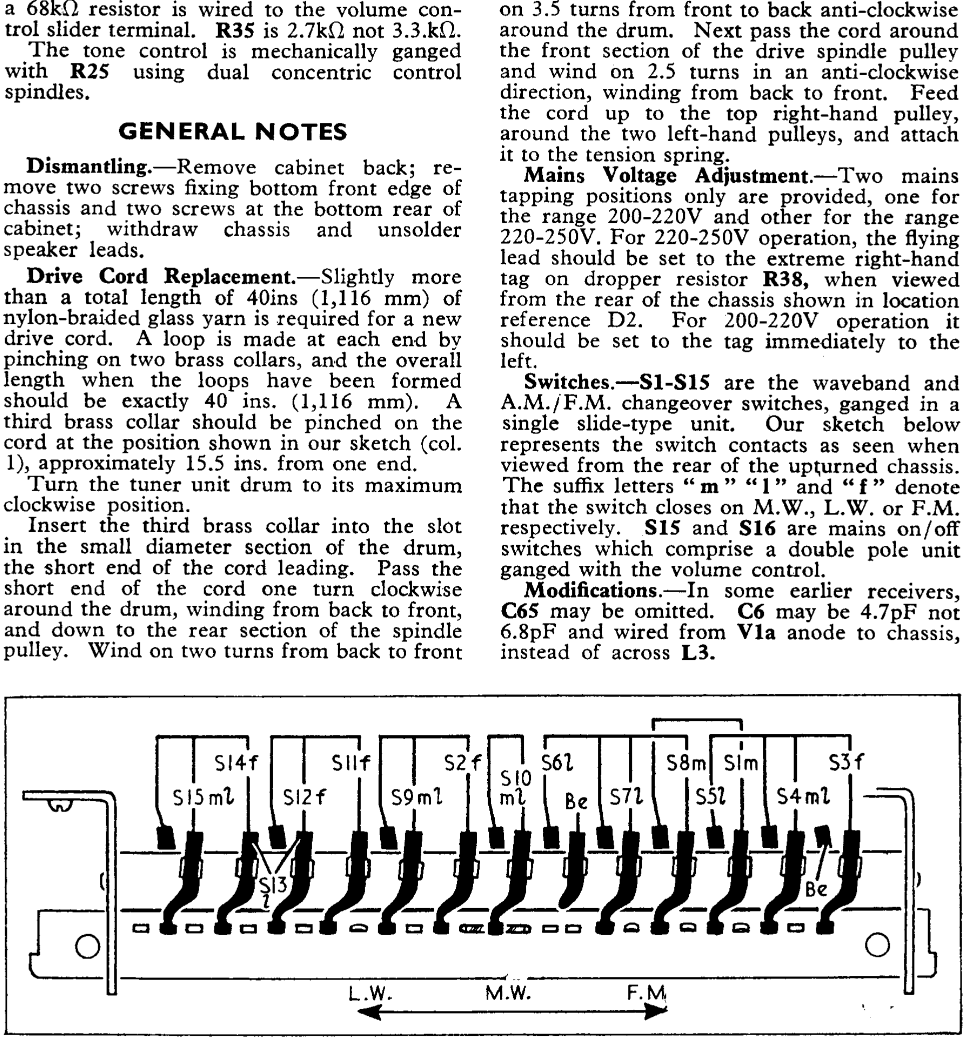


Diagram of the switch unit drawn as seen from the front of an inverted chassis.

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