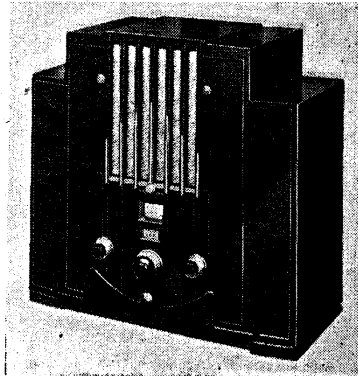


"TRADER" SERVICE SHEET

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REVISED ISSUE OF
SERVICE SHEET No. 23



TWO valves only (plus rectifier) are employed in the GEC BC3520 AC/DC Mains Three, a two-band TRF receiver designed to operate from AC or DC mains of 200-250 V, 40-100 C/S in the case of AC. The BC3521 is similar in nearly every respect, but it is designed for a mains frequency range of 25-100 C/S. The modifications involved are explained in the circuit diagram below and under "25 C/S Model" overleaf. This Service Sheet was prepared from a BC3520 model. Release date, both models: September, 1934.

CIRCUIT DESCRIPTION

Aerial input via differential variable coupling condenser **C10** and selectivity socket 1 or 2 to single tuned circuits **L3**, **C11** (MW) and **L4**, **C11** (LW).

GEC AC/DC MAINS THREE

C10, operating as a series aerial condenser, permits a balance to be obtained between the requirements of selectivity and sensitivity according to local conditions; the "Tuning compensator" plug would then be connected to socket **X**, and adjustment of **C10** would affect the tuning circuit, rendering a subsequent readjustment of **C11** necessary. If the tuning compensator plug is inserted in the (lower) **Y** socket, the third element of **C10** is brought into circuit, and a change in the capacity of the first part of **C10** is then balanced by an opposite change in the capacity of the compensator section, and the tuning of the receiver is reasonably unaffected.

The sockets marked 1 and 2 at the top of **L1** and **L3** in the circuit diagram provide further alternative aerial couplings. These sockets are of the "split" type, having two sections which are short-circuited upon insertion of a plug, each. One half of each socket is connected to **C10**, so that if the plug is inserted in socket 1, the aerial input is fed directly to the tuned circuit; whereas if the plug is inserted in socket 2, the aerial input is fed via coupling coils **L1** (MW) and **L2** (LW) to the tuned circuit, giving greater selectivity. Manipulation of the three devices **C10**, sockets **X** and **Y**, and sockets 1 and 2 provide a very wide range of coupling conditions.

First valve (**V1**, Osram metallised H30) is a triode operating as detector on the grid leak principle with **C1** and **R1**. Reaction is applied from anode via coupling coil **L5** and controlled by a second differential condenser **C12**, while a series resistance **R5** damps the reaction circuit. In the 50 C/S model, the anode circuit is

decoupled by **R2** and **C6**; in the 25 C/S model, **R2** is replaced by **R6**, **R7**, and two electrolytic condensers **C13**, **C14** are added to the decoupling circuit. These modifications are shown in the separate diagram on the right of the complete diagram, where that section of the diagram that is associated with **V1** anode circuit is redrawn as in the 25 C/S model.

Transformer coupling by **T1** follows, between **V1** and "Catkin" pentode output valve (**V2**, Osram N30). Fixed tone correction by **C3** in anode circuit. Provision for connection of low impedance external speaker across **T2** secondary.

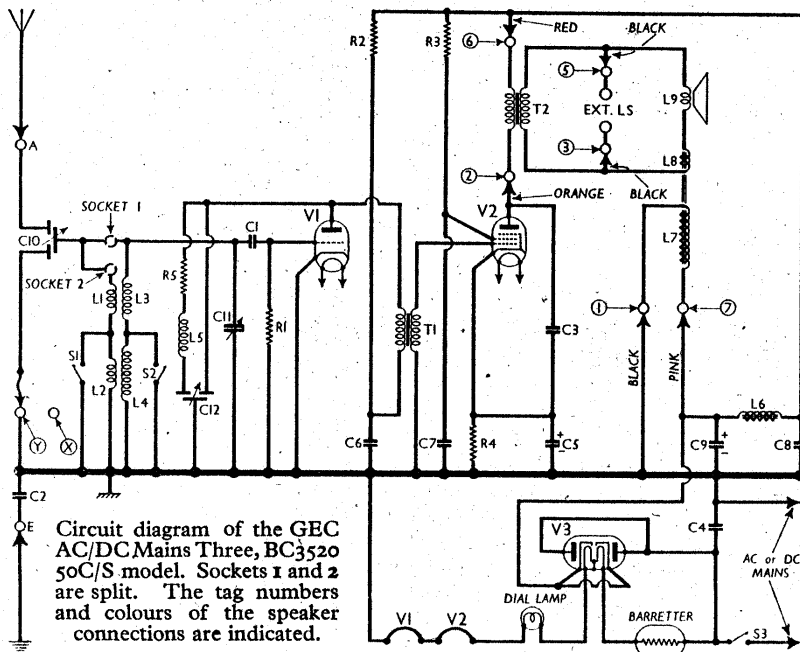
When the receiver is used with AC mains, HT current is supplied by half-wave rectifying valve (**V3**, Osram U30), a voltage-doubler type with the two sections connected in parallel, which behaves on DC mains as a low resistance. Smoothing by iron-cored choke **L6** and electrolytic condensers **C8**, **C9**. Speaker field coil **L7** is connected directly across the rectifier output.

Valve heaters, together with dial lamp and current regulating barretter (Osram 301), are connected in series across the mains input circuit. Mains RF filtering by **C4**.

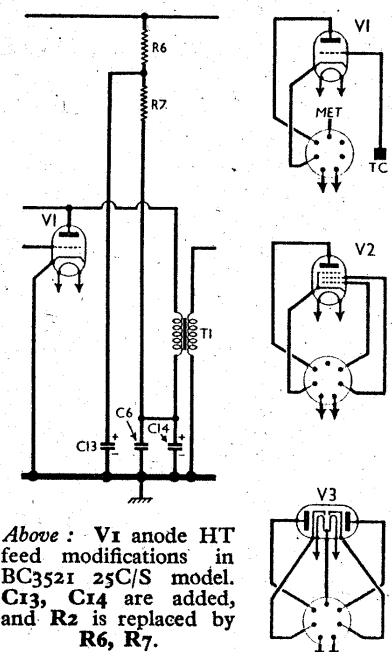
COMPONENTS AND VALUES

RESISTANCES			Values (ohms)
R1	V1 grid leak	...	2,000,000
R2†	V1 anode HT feed	...	77,000
R3	V2 SG HT feed	...	5,500
R4	V2 GB resistance	...	250
R5	Reaction circuit damping	...	300
R6*	V1 anode HT feed resistances	...	33,000
R7*		...	33,000

† In 50 C/S model only. * In 25 C/S model only.



Circuit diagram of the GEC AC/DC Mains Three, BC3520 50C/S model. Sockets 1 and 2 are split. The tag numbers and colours of the speaker connections are indicated.



Above: V1 anode HT feed modifications in BC3521 25C/S model. C13, C14 are added, and R2 is replaced by R6, R7.

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AC/DC 3Supplement to *The Wireless & Electrical Trader*, August 1, 1942

CONDENSERS		Values (μ F)
C1	V1 CG condenser ...	0.0002
C2	Earth isolating condenser ...	0.1
C3	Fixed tone corrector ...	0.0075
C4	Mains RF by-pass ...	0.04
C5*	V2 cathode by-pass ...	20.0
C6	V1 anode decoupling ...	1.0
C7	V2 SG decoupling ...	1.0
C8*	HT smoothing condenser ...	6.0
C9*	HT smoothing condenser ...	6.0
C10†	Aerial coupling control ...	—
C11†	Aerial circuit tuning ...	—
C12†	Reaction control ...	—
C13*	V1 anode decoupling condenser ...	6.0
C14*	V2 anode decoupling condenser ...	6.0

* Electrolytic. † Variable. § In 25 C/S model only.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial coupling coils ...	1.7
L2		22.0
L3		4.7
L4		17.0
L5	Reaction coil ...	2.3
L6		400.0
L7	HT smoothing choke ...	6,750.0
L8	Speaker field coil ...	0.15
L9	Hum neutralising coil ...	3.1
T1	Intervalve trans. { Pri. ...	1,150.0
	Sec. ...	7,500.0
T2	Speaker input { Pri. ...	400.0
	trans. { Sec. ...	0.8
S1, S2	Waveband switches ...	—
S3	Mains switch ...	—

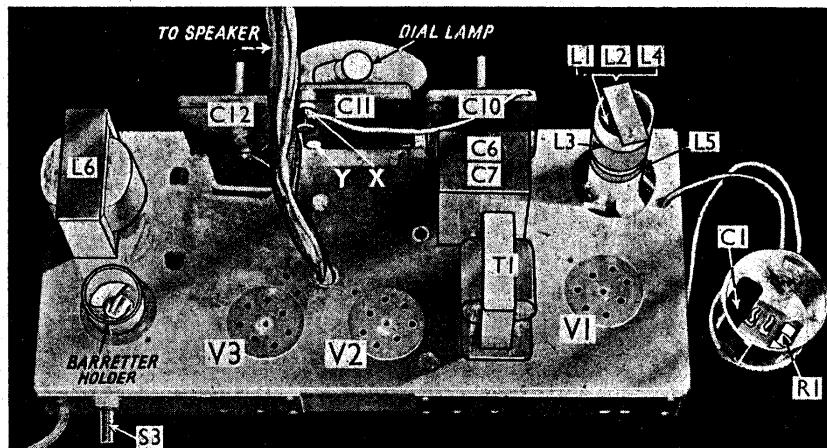
VALVE ANALYSIS

Valve voltages and currents given in the table below are average values computed from those quoted in the makers' manual, where individual readings are given for 200 V and 250 V DC and 50 C/S AC mains. The figures quoted do not necessarily apply in the case of a 25 C/S model.

Measurements were made with the receiver working with no signal input and the reaction control at minimum. Voltages were measured with a 300,000 Ω

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 H30	78	1.8	—	—
V2 N30*	170-225	28.0	150-200	6.0
V3 U30*	190-250†	—	—	—

* Voltage depends upon voltage and nature of mains. † Cathode to chassis, DC.



Plan view of the chassis. Sockets X and Y are indicated on C11.

meter, and the figures in the table assume that the negative lead is connected to chassis.

DISMANTLING THE SET

Removing Chassis.—Remove the mains switch knob (pull-off) at rear, and remove back cover of set; remove the three control knobs (concentric hexagon nuts) and the waveband switch knob (screw-off) from the front of the cabinet; remove the wax covering the heads of the four chassis fixing screws beneath the cabinet, and remove the screws.

The chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free chassis entirely, unsolder from the connecting panel at the top of the speaker assembly the six leads connecting it to chassis.

When replacing, first pull out the waveband switch to the MW position; do not omit finally to rewire the heads of the chassis fixing screws.

The speaker leads should be connected as follows, numbering the tags on the speaker assembly from left to right:

- 1, black lead (from twisted black and pink pair);
- 2, orange lead (from twisted orange and red pair);
- 3 and 5, two leads (black twisted pair from Ext. LS sockets);
- 4, blank;
- 6, red;
- 7, pink.

Removing Speaker.—Remove the three nuts and bolts holding the assembly to the front of the cabinet, when the unit may be withdrawn

to the extent of its leads; or, to free it entirely, unsolder the leads.

When replacing, the transformer should be at the top, and the leads should be connected as previously indicated.

GENERAL NOTES

Switches.—S1, S2 are the waveband switches, in a small push-pull unit at the front of the chassis. Both switches are closed on MW, and open on LW.

S3 is the rotary QMB mains switch, mounted on the rear chassis member.

Coils.—All the tuning and reaction coils are comprised in a single unit, mounted on the chassis deck. L3, L5 are single-layer coils wound on the outside of a cylindrical paxolin former. The remaining coils, L1, L2, L4 are wound on a wooden former, inside the paxolin one.

Dial Lamp.—This is an Osram MES lamp, type S, rated at 6.5 V, 0.3 A. As it is connected in series with the valve heaters, failure of the lamp will render the set inoperative. Any MES type lamp of 0.3 A to 0.5 A rating and up to, say, 20 V, could be used as a replacement or, in emergency, the lamp could be short-circuited to get the set working. A holder for a spare lamp is fitted on the inside of the back cover of the receiver.

External Speaker.—Sockets are provided at the rear of the chassis for a low impedance (4-6 Ω) external speaker.

Selectivity Plug.—Two sockets marked "Socket 1" and "Socket 2" in the circuit diagram and simply "1" and "2" in our under-chassis view are provided for selectivity adjustment. In effect, these sockets, in association with their plug, form a single-pole, two-way switch. Each socket is split, as indicated in the circuit diagram, and upon insertion of the plug, which is unattached to the receiver, the two halves are joined. The electrical purpose is explained under "Circuit Description."

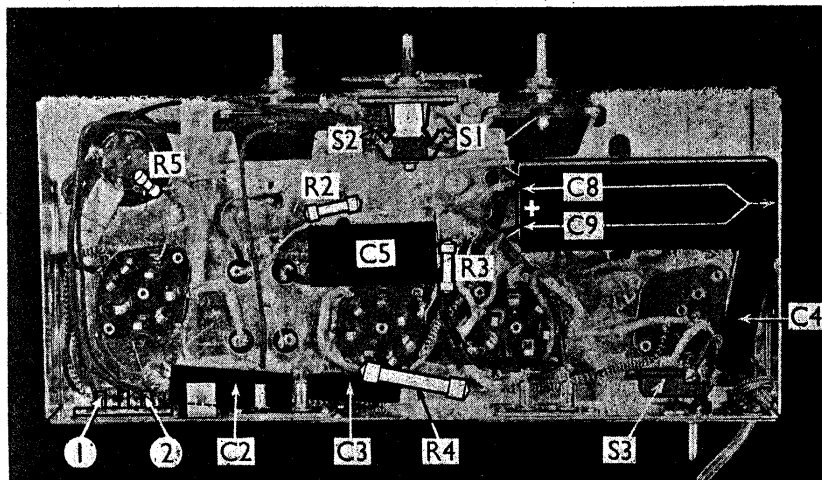
Condensers C6, C7.—These are two 1 μ F sections of a dual unit, mounted on the chassis deck, whose three connecting leads appear beneath the deck. The black lead is common, and is connected to chassis; the orange lead is the outer end of C6, and the blue and white lead is the outer end of C7.

Condensers C8, C9.—These are two dry electrolytics, in a single cardboard container, rated at 6 μ F each. The black lead is the common negative connection, and the two red leads the two positives. In some chassis, the values may be 4.5 μ F each.

25 C/S Model BC3521 Modifications

The main differences in this model, as compared with the 50 C/S model, are in the HT feed circuit to V1, where additional decoupling, or smoothing, measures are introduced. The additional components involved are included in the component tables, where they are annotated with references.

The circuit modifications are shown in the separate diagram section, shown on the right of the complete circuit diagram overleaf. The two electrolytic condensers C13, C14, are rated at 6 μ F each, but they, like C8, C9, may in some cases be 4.5 μ F each. The valve voltages and currents given in our table are not necessarily correct for this model.



Under-chassis view. The split selectivity sockets 1 and 2 are indicated.