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"TRADER" SERVICE SHEET

529

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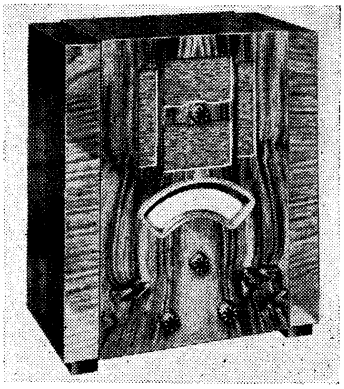
GEC SUPERHET 5

TABLE, CONSOLE & RADIOGRAM



The GEC BC3440 and BC3441.

THE GEC Superhet 5 range of receivers employs a 4-valve (plus rectifier) 2-band chassis, designed to operate from AC mains.

The table models BC3440 and BC3441 are similar to each other, and both have a mains voltage range of 190-250 V; but the frequency range of the former is 40-80 C/S, and the latter, 25-50 C/S.

BC3442 is the 25-50 C/S model, and BC3444 the 40-80 C/S model, in the console version of the range.

The radiogram version BC3448 is similar to the console model, except for the differences described under "Console and Radiogram Modifications," but the mains frequency range is 40-60 C/S.

The meanings of the suffix letters "K" and "L" are explained under "Chassis Divergencies."

Release date: 1933.

CIRCUIT DESCRIPTION

Aerial input via series condenser **C1** and coupling coils **L1** (MW) plus **L2** (LW) to inductively coupled band-pass filter. Primary coils **L3, L4** are tuned by **C25**; secondaries **L6, L7** are tuned by **C28**; coupling by coils **L8, L9.** Image suppression by **L5.**

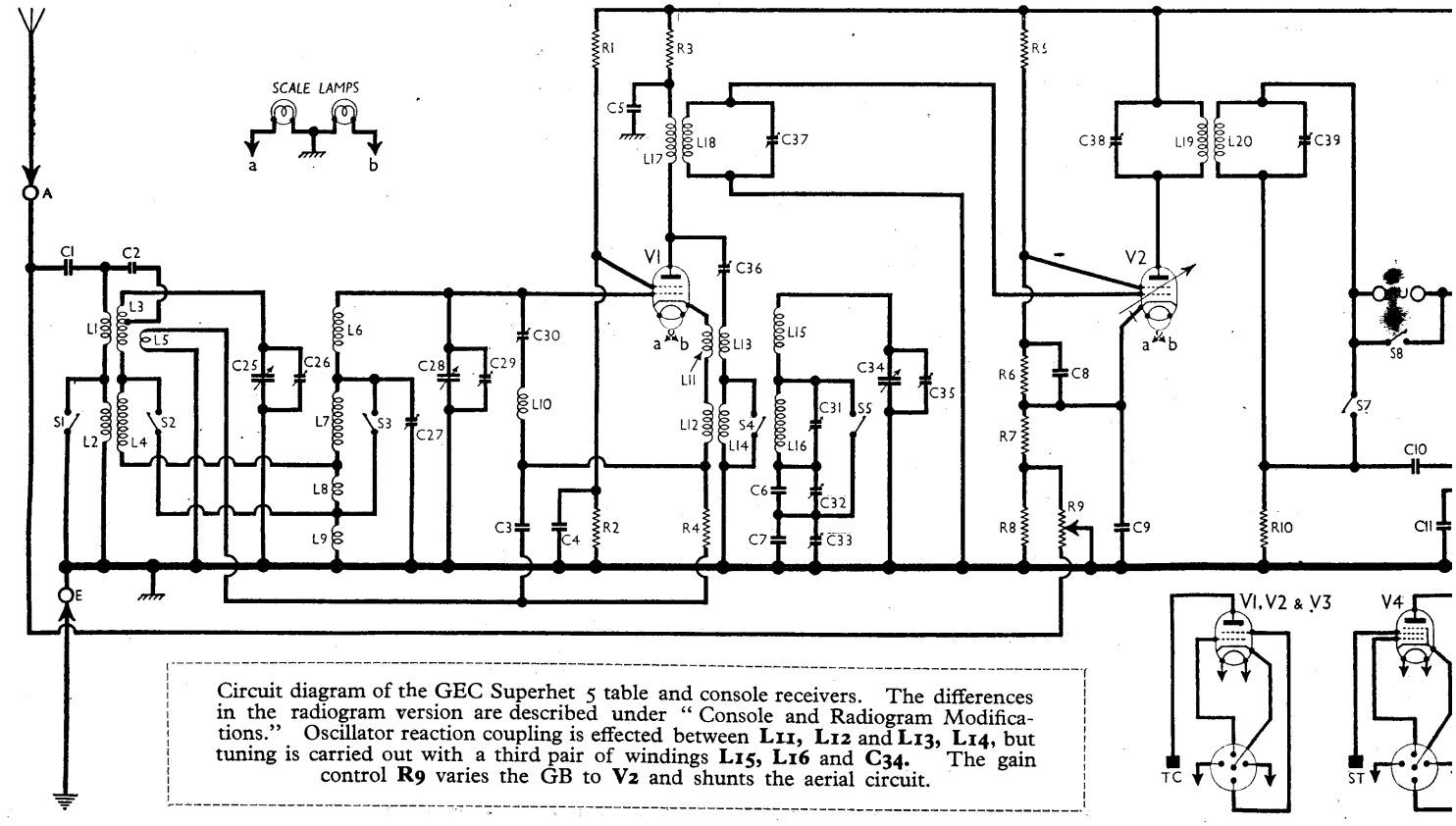
First valve **(V1, Osram MS4B)** is an RF tetrode operating as frequency changer. Oscillator reaction coupling between anode and cathode circuits by coils **L11, L12** and **L13, L14** via the first IF transformer primary tuning condenser **C36,** and oscillator circuit tuning is effected by the tertiary coils **L15** (MW) and **L16** (LW), which are tuned by **C34.** Parallel trimming by **C35** (MW) and **C31** (LW); series tracking by **C7, C33** (MW) and **C6, C32** (LW).

Second valve **(V2, Osram VMS4)** is a variable-mu RF tetrode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C36, L17, L18, C37** and **C38, L19, L20, C39.**

Intermediate frequency 107 KC/S.

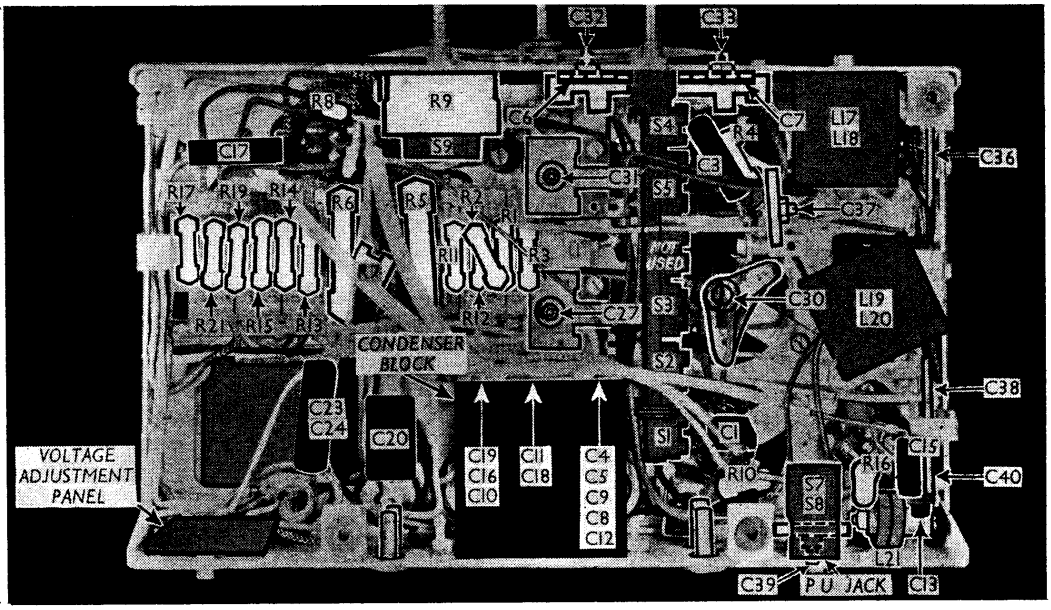
Gain control for the receiver consists of a dual action circuit. The potentiometer **R9** is connected between **V2** cathode and the aerial, and its slider goes to chassis, so that as the control is advanced, the damping it imposes across the aerial circuit and the bias voltage applied to **V2** are reduced. **R7** is included between **R9** and the cathode as a minimum GB limiter.

The output from the IF amplifier is applied via **S8** to the grid circuit of a third RF tetrode valve **(V3, Osram MS4B)** which operates as second detector on the anode bend system. IF filtering by **C13, R16** and **C15** in anode circuit. Second channel whistle suppression by tuned filter **L21, C40,** also in anode circuit. Provision for connection of gramophone pick-up by means of a jack-type socket incorporating switches **S7, S8** which short-circuit **L20** to mute radio or the pick-up jack respectively according to whether the pick-up is plugged in or not.



Circuit diagram of the GEC Superhet 5 table and console receivers. The differences in the radiogram version are described under "Console and Radiogram Modifications." Oscillator reaction coupling is effected between **L11, L12** and **L13, L14**, but tuning is carried out with a third pair of windings **L15, L16** and **C34.** The gain control **R9** varies the GB to **V2** and shunts the aerial circuit.

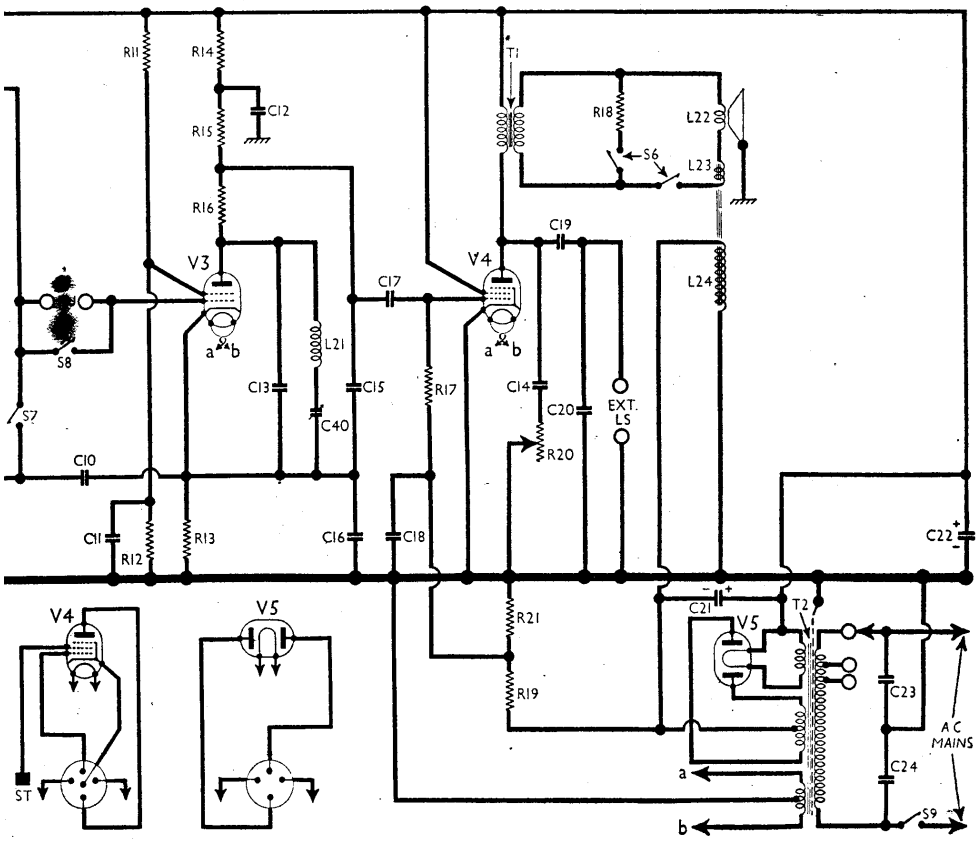
Under - chassis view. All the switches are indicated. **S7, S8** form part of the pick - up jack. The condensers in the condenser block at the bottom of the illustration are listed here, and the diagram in column 5 overleaf shows the internal connections and colour coding of the leads. The positions of all the trimmers, excepting those on the gang, are indicated here. A metal screen has been removed from top right-hand corner.



Resistance-capacity coupling by **R15, C17** and **R17** between **V3** anode and pentode output valve **(V4, Osram MPT4).** Fixed tone correction by **C20** in anode circuit. Variable tone control by **C14, R20,** also in anode circuit. Provision for connection of high-impedance external speaker via **C19** in anode circuit. **S6** in speech coil circuit permits the internal speaker to be muted, and automatically replaces the speech coil with an artificial load in the form of resistance **R18,** when muting, to protect the output valve **V4.**

HT current is supplied by full-wave rectifying valve **(V5, Osram U12).** Smoothing by speaker field **L24,** in negative HT lead to chassis, and dry electrolytic condensers **C21, C22.** Mains input RF filtering by **C23, C24.**

Grid bias potential for **V4** is obtained automatically from drop across the speaker field, a suitable value being selected at the junction of the resistances **R21, R19** which are connected across **L24.**



COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial series condenser ...	0·0001
C2	Aerial "top" coupling ...	0·000025
C3	V1 cathode by-pass ...	0·005
C4	V1 SG decoupling ...	0·1
C5	V1 anode decoupling ...	0·11
C6	Osc. LW fixed tracker ...	0·00125§ / 0·00135
C7	Osc. MW fixed tracker ...	0·00135§ / 0·00145
C8	V2 SG decoupling ...	0·25
C9	V2 cathode by-pass ...	0·25
C10	V3 CG decoupling ...	0·25
C11	V3 SG decoupling ...	0·25
C12	V3 anode decoupling ...	0·11
C13	IF by-pass	0·0001
C14	Part variable tone control	0·04
C15	IF by-pass	0·0001
C16	V3 cathode by-pass ...	0·25
C17	V3 to V4 AF coupling ...	0·01
C18	V4 CG decoupling ...	0·3
C19	Ext. LS isolator	0·25
C20	Fixed tone corrector ...	0·001
C21*	HT smoothing condensers	8·0
C22*	HT smoothing condensers	8·0
C23	Mains RF by-pass condensers	0·01
C24	Mains RF by-pass condensers	0·01
C25†	Band-pass pri. tuning ...	0·00038
C26‡	B-P pri. MW trimmer ...	—
C27‡	B-P sec. LW trimmer ...	—
C28†	Band-pass sec. tuning ...	0·00038
C29‡	B-P sec. MW trimmer ...	—
C30‡	Neutralising trimmer ...	—
C31‡	Osc. circuit LW trimmer...	—
C32‡	Osc. circuit LW tracker...	—
C33‡	Osc. circuit MW tracker...	—
C34†	Oscillator circuit tuning...	0·00038
C35‡	Osc. circuit MW trimmer	—
C36‡	1st IF trans. pri. tuning...	—
C37‡	1st IF trans. sec. tuning...	—
C38‡	2nd IF trans. pri. tuning...	—
C39‡	2nd IF trans. sec. tuning...	—
C40‡	Whistle filter tuning ...	—

* Electrolytic. † Variable. ‡ Pre-set.
§ Between the values given.

	RESISTANCES	Values (ohms)
R1	V1 SG HT feed potential divider	88,000
R2		44,000
R3	V1 anode HT feed... ...	20,000
R4	V1 GB resistance	2,500
R5		24,000
R6	V2 SG and GB potential divider resistances ...	13,000
R7		150
R8		9,900
R9	Gain control	8,000
R10	V3 CG decoupling	33,000
R11	V3 SG HT feed potential divider	88,000
R12		55,000

(*Continued overleaf.*)

	RESISTANCES (*continued*)	Values (ohms)
R13	V3 GB resistance	8,800
R14	V3 anode decoupling ...	33,000
R15	V3 anode load	200,000
R16	IF stopper	33,000
R17	V4 CG resistance	420,000
R18	Artificial output load ...	8
R19	Part V4 GB pot.	420,000
R20	Variable tone control ...	50,000
R21	Part V4 GB pot.	125,000

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial coupling coils ...	17·0
L2		52·5
L3	Band-pass primary coils ..	4·5
L4		25·5
L5	Image suppressor coil ...	—
L6	Band-pass secondary coils	4·5
L7		24·5
L8	Band-pass coupling coils...	1·3
L9		0·3
L10	Neutralising coil	—
L11	V1 cathode oscillator reaction coils	1·85
L12		1·4
L13		4·5
L14		11·0
L15	Osc. MW tuning coil ...	3·9
L16	Osc. LW tuning coil ...	21·3
L17	1st IF trans. Pri. ...	82·0
L18	Sec. ...	82·0
L19	2nd IF trans. Pri. ...	82·0
L20	Sec. ...	82·0
L21	Whistle filter coil... ...	38·5
L22	Speaker speech coil ...	3·1
L23	Hum neutralising coil ...	—
L24	Speaker field coil	1,300·0
T1	Speaker input trans. Pri.	400·0
	Sec.	0·55
T2	Mains trans. Pri., total ...	40·0
	Heater sec. ...	0·15
	Rect. heat. sec....	0·15
	HT sec., total ...	415·0
S1-S5	Waveband switches ...	—
S6	Speaker muting switch ...	—
S7, S8	Radio/gram change switches...	—
S9	Mains switch, ganged R9	—

DISMANTLING THE SET

Removing Chassis.—Remove the three control knobs (pull off);

remove the four bolts holding the chassis to the bottom of the cabinet.

The chassis can 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 on the speaker input transformer the four leads connecting it to the chassis.

When replacing, connect the leads as follows, numbering the tags from left to right, with transformer at the bottom :

1, slate from chassis;
2, red from chassis;
3, green-black from **S6**;
4, red-black from **S6**;
5, black-orange from **S6**;
6, orange from chassis and one end of **C14**;
7, black from chassis and black from tone control **R20.**

Removing Speaker.—Unsolder from the connecting panel on the speaker transformer the four leads connecting it to chassis, the three to **S6** and the two to **C14** and **R20**;

remove the three nuts holding the speaker to the sub-baffle.

When replacing, connect the leads as indicated above.

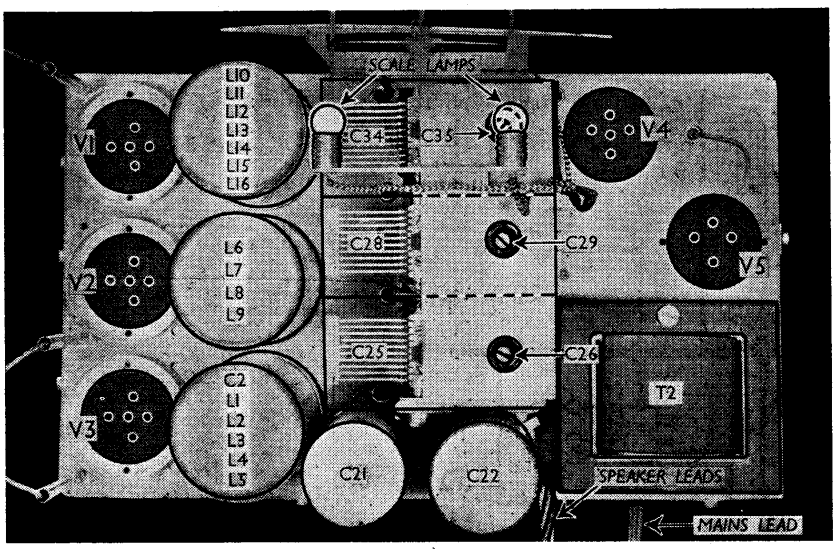
VALVE ANALYSIS

Valve voltages and currents given in the table below have been taken from the makers' manual and are those to be expected from the average receiver when its mains voltage adjustment is correctly set. The receiver should first be switched to MW, and the volume control should be turned to maximum, but there should be no signal input.

Voltages given were measured with a meter scaled 0-300 V, with a resistance of 1,000 ohms per volt. Its negative lead was connected to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 MS4B	220	1·25	80	—
V2 VMS4	250	7·0	80	—
V3 MS4B	100	0·3	80	—
V4 MPT4	235	32·0	250	6·5
V5 U12	310†	—	—	—

† Each anode, AC.



Plain view of the chassis. All the RF and oscillator coils are in the three screening cans.

GENERAL NOTES

Switches.—S1-S5 are the waveband switches in a leaf-type assembly beneath the chassis. This is seen in our under-chassis view, where the individual switches are indicated. All the switches are closed on MW, and open on LW.

S6 is the two-way internal speaker muting switch, mounted on a bracket at the top of the cabinet. It has a push-pull action, and when it is "in," the internal speaker operates. When it is pulled out to mute the speaker, it automatically connects an artificial load resistance **R18** in place of the speech coil. The makers' name for the switch is "Silencing Key."

S7, S8 are the radio/gram change-over switches, and form part of the pick-up jack assembly. Normally, for radio operation, **S8** is closed, and **S7** open, but when the pick-up plug is inserted **S8** opens, and **S7** closes to mute radio.

S9 is the QMB mains switch, ganged with the volume control **R9.**

Coils.—All the RF coils and the oscillator coils are in three screened units on the chassis deck.

The IF transformers **L17, L18** and **L19, L20** are in two unscreened units beneath the chassis.

L21 is the second channel whistle filter coil, seen near its tuning condenser **C40** in the bottom right-hand corner of our under-chassis view.

Gramophone Pick-up.—A jack, with which are incorporated the two radio/gram change-over switches **S7** and **S8,** is fitted at the rear of the chassis for a gramophone pick-up. An external volume control will be required for gramophone operation.

External Speaker.—Two sockets are provided at the rear of the chassis for a high-impedance (7,000-10,000 O) external speaker. The internal speaker may be muted. (See under "Switches.")

Scale Lamps.—These are two Osram MES types, rated at 3.5 V, 0.3 A. They are connected in series across the 4 V heater secondary of **T2,** and their junction with each other is taken to chassis, so that each lamp is across one half of the secondary.

Condensers C21, C22.—These are two 8 μF dry electrolytics, in tubular metal containers; they are Dubilier type 0281, rated at 500 V peak working. When replacements are being fitted, it is necessary first to remove the multi-condenser block to gain access to the fixing nuts. Care should be taken to insulate the case of **C21,** since this should not be connected to chassis. If a double condenser block is used as a replacement, it should have a common positive lead.

Condenser Block.—Condensers **C4, C5, C8, C9, C10, C11, C12, C16, C18** and **C19** are all housed in a single assembly with a metal case. This is indicated in our under-chassis view, and a diagram (col. 5) shows the internal connections and colour coding of the external leads.

Internal Speaker.—This, with its input transformer **T1,** forms an assembly which is mounted on the sub-baffle. Near it are mounted the tone control **R20** and **C14.** The tone control spindle projects through the speaker aperture at the front of the cabinet.

V2.—This is an Osram VMS4 clear valve. When replacements are being

made, it is important that the type should be adhered to, as otherwise the volume control may be rendered ineffective. This will occur even if a VMS4 with a rectangular surround round the type number is used.

Chassis Divergencies.—Since the original issue, several modifications have been made. The control grid lead to **V1** has been broken, and a 0.0001 μF condenser inserted with a 1,000,000 O resistance across it. A 500 O resistance has been similarly inserted in the anode lead of **V1,** directly between the anode and its associated circuits, while in the cathode circuit, **C3** and **R4** have been deleted. These modifications were made to later chassis before they left the factory; but they have also been made to any of the earlier models returned to the makers' service department.

"K" and "L" Models.—In the case of each model covered by this *Service Sheet*, it is available for certain purposes with "Catkin" valves in positions **V2, V3** and **V4,** and to indicate this the suffix "K" is added to the type number of the receiver. It is important that the valves used are the same as those specified originally. In "K" models, **R17** becomes 220,000 O, and **R21** becomes 99,000 O. Both are rated at ½ W.

Each model is also available to special order with the mains transformer **T2** primary wound and tapped for high and low voltage ranges. This is indicated by the addition of the suffix "L" to the type number. The mains voltage range is then 110-130V and 210-230V, instead of 190-250V.

CONSOLE AND RADIOGRAM MODIFICATIONS

The console models BC3442 and BC3444 employ a similar chassis to that used in the table model, but the five-inch speaker assembly No. BCD44683 used in the table models is replaced by an eight-inch assembly No. BCD44899. In the case of the latter assembly, **T1** primary winding has a DC resistance of 300 O instead of 400 O, and the secondary 0.35 O instead of 0.55 O.

The larger assembly is used also in the radiogram model BC3448, but in this model the chassis is slightly modified to accommodate the gramophone pick-up. The pick-up jack and **S7, S8** are discarded and are replaced by two more switches which make their appearance on the **S1-S5** assembly. One of these is inserted in the lead between **L20** and **R10,** and it opens in the gramophone position of the waveband switch. Across it are connected: on one side, the slider of the gramophone volume control, a 5,000 O potentiometer; on the other side, one end of the stator element of the control and one end of the pick-up. The other end of the pick-up goes via a condenser to the top end of the stator of the potentiometer. When the switch closes it short-circuits the pick-up output circuit. The remaining switch is connected across **L12,** and closes on gram.

The arrangement of the switches on the switch assembly is different in the radiogram version from that shown in our under-chassis view. **S4** and **S5** occupy the same positions, but **S3** moves up to a position in the centre of the assembly but on the opposite side of the operating shaft; that is: on the left in our illustration. **S2** and **S1** are moved up to occupy the positions adopted in the table model by **S3** and **S2** respectively, while the two new switches take up the positions marked "Not used" and "**S1**" in our under-chassis view.

The mains frequency range of the radiograms, with or without suffix letters, is restricted to 40-60 C/S.

CIRCUIT ALIGNMENT

It is important that the metal shield on the end of the chassis should be in position before any alignment adjustments are made.

IF Stages.—Switch set to MW, turn gang and volume control to maximum. Short-circuit **C34.** Connect signal generator to the connecting tag of **C28** (centre section of gang) and chassis, feed in a 107 KC/S (2803.74 m) signal, and adjust **C37, C36, C38** and **C39** in turn for maximum output. Remove short-circuit.

RF and Oscillator Stages.—See that the pointer reaches a position equally distant from the two fixing rivets at the lower edge of the scale at the two extreme ends of its travel. Transfer signal generator leads to **A** and **E** sockets via a suitable dummy aerial.

MW.—With the receiver still switched to MW, tune to 214 m on scale, feed in a 214 m (1,400 KC/S) signal, and adjust **C35** for maximum output. If two peaks

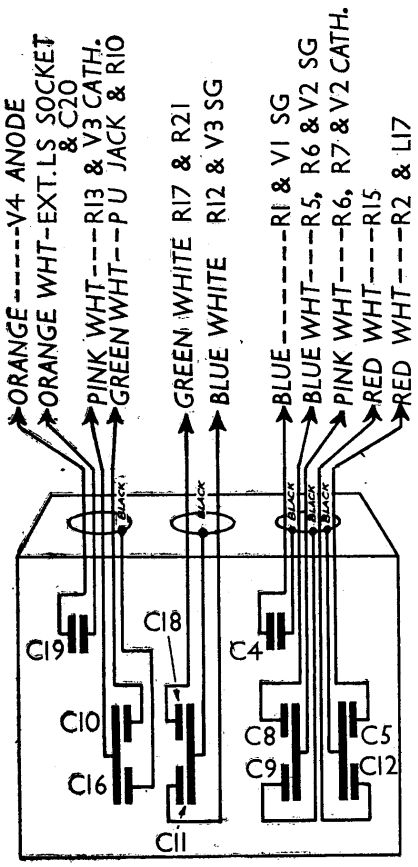


Diagram of the condenser block.

are found, choose the one involving the lesser trimmer capacity. Now adjust **C26** and **C29** for maximum output.

Tune to 500 m on scale and feed in a 500 m (600 KC/S) signal. Disconnect the lead from the tag of **C34,** connect the lead to an external tuning condenser, and tune both the receiver and the external condenser carefully for maximum output. Disconnect the external condenser and reconnect **C34,** taking care not to disturb the position of the gang. Adjust **C33** for maximum output.

Should the calibration of the scale now be incorrect at 500 m, the pointer should be adjusted to correct it, and the whole of the 500 m adjustment must then be repeated. When this is satisfactory, repeat the 214 m adjustments, to compensate for the adjustment of **C33.**

LW.—Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 KC/S) signal, and disconnect lead from **C34,** as in MW alignment. Connect the external tuning condenser, and tune it for maximum output. Now tune the receiver gang for maximum output, and adjust **C27,** while rocking the gang for optimum results. Disconnect external condenser, reconnect **C34,** and adjust **C31** for maximum output.

Tune to 1,818 m on scale, feed in a 1,818 m (165 KC/S) signal, and disconnect **C34** again. Reconnect the external condenser, and tune it and the receiver gang for maximum output. Disconnect the external condenser, reconnect **C34,** and adjust **C32** for maximum output. Repeat the 1,000 m adjustments, except that **C27** need not be disturbed, as the setting of **C31** will have been affected by the adjustment of **C32.**

Whistle Filter.—This adjustment should not be made unless excessive instability is experienced at 1,400 m with the volume control set just short of maximum.

To adjust the filter, disconnect the signal generator leads from the receiver, connect one end of a flexible lead to the aerial socket, and couple this to the anode of **V3** by winding the other end of the lead (about one turn) round the anode lead of the valve. With the volume control at maximum, tune the receiver to 1,400 m, and adjust **C40** for minimum instability. The final setting is very critical; a fraction of a turn either way will restart instability.

FC Neutralising.—**C30** and **L10** form the neutralising coupling; they need adjustment if instability is experienced between 200 m and 250 m, with the volume control set near maximum.

Check for instability at these points, and if it is found, leave the controls set as they are when it occurs. Then adjust, in a clockwise direction, the screw of **C30,** until a point is reached where the instability just ceases—not further. Check at other positions of tuning and volume controls for other points of instability, and repeat the adjustments when they are found. Great care must be exercised, however, not to turn the adjustment too far clockwise, as this will reduce the sensitivity of the receiver unnecessarily.

Since this adjustment affects the ganging, it must be followed by the first part (214 m) of the MW alignment.

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