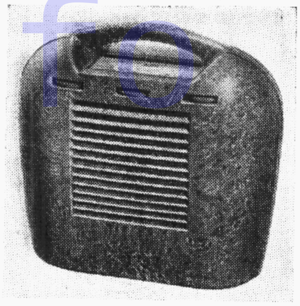
Supplement to The Wireless & Electrical Trader, July 9, 1949

"TRADER" SERVICE SHEET

916

G.E.C. BC4941

All-dry Battery Portable Two-band Superhet



The G.E.C. BC4941.

AN all-dry portable employing Osram 7-pin button-based valves, the G.E.C. BC4941 is a 4-valve 2-band battery superhet covering 192-550 m and 900-2,200 m. An unusual feature of the design is the incorporation of capacitative "top" coupling in the I.F. transformers and I.F. reaction back-coupling.

Release date and original price: April 1948, £15 15s without batteries; reduced June 1948 to £14 14s 6d. Reduced May 1949 to £12 15s including batteries. Purchase tax extra in each case.

CIRCUIT DESCRIPTION

Tuned frame aerial input by **L1**, **C24** on M.W., with the addition of loading coil **L2** on L.W., precedes a heptode valve **(V1, Osram X17)** operating as frequency changer with electron coupling.

Oscillator grid coils **L3** (M.W.) and **L3, L4** (L.W.) are tuned by **C25**, with parallel trimming by **C27** (M.W.), **C8, C29** (L.W.), and series tracking by **C7, C26** (M.W.), **C28** (L.W.). Inductive reaction coupling by **L5** (M.W.) and **L5, L6** (L.W.).

Second valve **(V2, Osram W17)** is a variable mu R.F. pentode operating as intermediate frequency amplifier with tuned-transformer couplings **C3, L7, L8, C4** and **C11, L9, L10, C12** in which the tuning capacitors are fixed and alignment is effected by varying the positions of the iron-dust cores. Additional intervalve coupling is produced by **C5** and **C13**, and reaction coupling by positive I.F. feed-back in **V2** is introduced by capacitative coupling between the signal diode anode and **V2** control grid.

Intermediate frequency 456 kc/s.

Diode second detector is part of single diode pentode valve **(V3, Osram ZD17)**. Audio frequency component in rectified output is developed across the manual volume control **R9**, which is also the diode load resistor, and passed via A.F. coupling capacitor **C15** and grid resistor **R10** to control grid of pentode section, which operates as A.F. amplifier, I.F. filtering by **C14, R8** in diode circuit, and **C17** in pentode anode circuit.

The D.C. potential developed across **R8, R9** in series is tapped off and fed back through a decoupling circuit **R7, C1** as G.B. to F.C. and I.F. valves, giving automatic gain control.

Resistance-capacitance coupling by **R12, C18, R13** between **V3** pentode and pentode output valve **(V4, Osram N17)**, whose twin filament sections are wired in parallel. Fixed tone correction by **C20** in **V4** anode circuit.

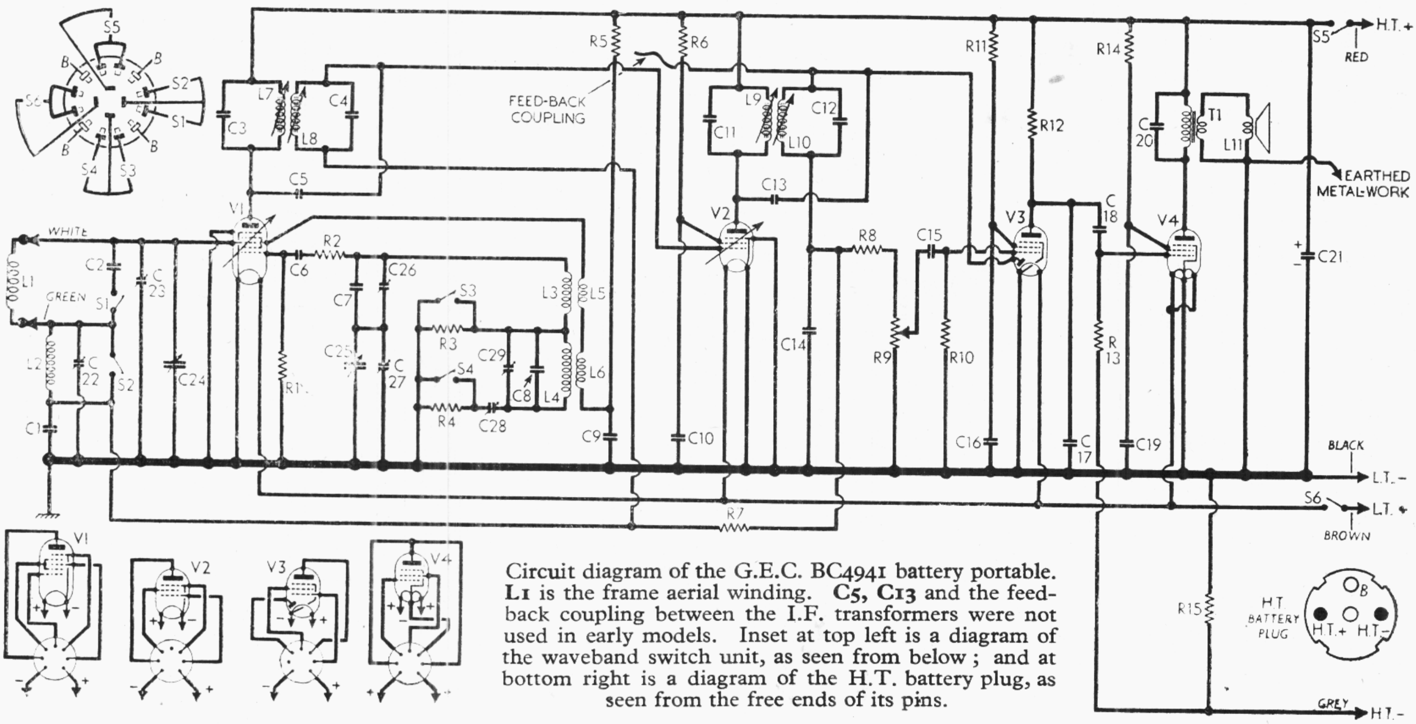
The G.B. potential for **V4** is obtained from the drop across **R15** in the H.T. negative lead to chassis.

COMPONENTS AND VALUES

RESISTORS		Values (ohms)	Locations
R1	V1 osc. C.G. ...	100,000	G4
R2	Osc. stab. resistors	2,700	H4
R3	Osc. stab. resistors	10,000	H3
R4	Osc. stab. resistors	330	J3
R5	Osc. H.T. feed ...	6,800	G3
R6	V2 S.G. H.T. feed ...	68,000	G4
R7	A.G.C. decoup. ...	2,200,000	G3
R8	I.F. stopper ...	68,000	F4
R9	Volume control ...	1,000,000	E2
R10	V3 C.G. resistor ...	6,800,000	F4
R11	V3 S.G. H.T. feed ...	6,800,000	F4
R12	V3 pent. load ...	1,000,000	F4
R13	V4 C.G. resistor ...	2,200,000	E4
R14	V4 S.G. H.T. feed ...	18,000	F3
R15	V4 G.B. resistor ...	820	E3

CAPACITORS		Values (μF)	Locations
C1	A.G.C. decoup. ...	0·1	G3
C2	Aerial L.W. shunt	0·0011	J3
C3	1st I.F. trans. tun.	0·0001	B1
C4	1st I.F. trans. tun.	0·0001	B1
C5	I.F. coupling ...	0·0000017	G4
C6	V1 osc. C.G. ...	0·00005	H4
C7	Osc. M.W. tracker	0·00027	H4
C8	Osc. L.W. trim. ...	0·00014	J3
C9	Osc. H.T. decoup. ...	0·1	G3
C10	V2 S.G. decoup. ...	0·1	G3
C11	2nd I.F. trans. tun.	0·0001	C1
C12	2nd I.F. trans. tun.	0·0001	C1
C13	I.F. coupling ...	0·0000017	F4
C14	I.F. by-pass ...	0·0001	F4
C15	A.F. coupling ...	0·1	F2
C16	V3 S.G. decoup. ...	0·1	F3
C17	I.F. by-pass ...	0·0001	E4
C18	A.F. coupling ...	0·002	E4
C19	V4 S.G. decoup. ...	0·1	F3
C20	Tone Corrector ...	0·002	F3
C21*	H.T. reservoir ...	4·0	E3
C22‡	Aerial L.W. trim. ...	0·00003	A1
C23‡	Aerial M.W. trim.	0·00003	A1
C24†	Aerial tuning ...	0·0005	H3
C25†	Osc. tuning ...	0·0005	J3
C26‡	Osc. M.W. tracker	0·000425	H4
C27‡	Osc. M.W. trim. ...	0·00003	A1
C28‡	Osc. L.W. tracker	0·000425	J4
C29‡	Osc. L.W. trim. ...	0·00003	A1

* Electrolytic † Variable ‡ Pre-set.



Circuit diagram of the G.E.C. BC4941 battery portable. L1 is the frame aerial winding. C5, C13 and the feed-back coupling between the I.F. transformers were not used in early models. Inset at top left is a diagram of the waveband switch unit, as seen from below; and at bottom right is a diagram of the H.T. battery plug, as seen from the free ends of its pins.

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OTHER COMPONENTS		Approx. Values (ohms)	Locations
L1	Frame aerial ...	0·4	B1
L2	L.W. loading coil ...	13·0	H2
L3	Osc. tuning coils ...	1·9	G3
L4		5·0	G3
L5	Osc. reaction coils,		
L6	total ...	4·2	G3
L7	1st I.F. trans. Pri.	12·0	B1
L8	Sec.	12·0	B1
L9	2nd I.F. trans. Pri.	12·0	C1
L10	Sec.	12·0	C1
L11	Speech coil ...	3·5	—
T1	Output trans. Pri.	430·0	E3
	Sec.	0·1	
S1-S4	W/band switches...	—	J2
S5	H.T. circ. switch ...	—	J2
S6	L.T. circ. switch ...	—	J2

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating from a set of new batteries. The receiver was tuned to the lowest wavelength on the M.W. band, with the volume control at maximum, but with no signal input.

Voltages were measured on the 100 V scale of a model 7 Avometer, chassis being the negative connection, and the grid bias voltage drop across **R15** was 8.5 V.

Valve	Anode		Screen	
	(V)	(mA)	(V)	(mA)
V1 X17	83	0.4	53	2·5
V2 W17	83	1·6	29	0·6
V3 ZD17	3·2	0·05	0·5	0·01
V4 N17	80	4·5	57	9·8

DISMANTLING THE SET

Removing Chassis.—Lay the receiver, speaker side downward, on a felt pad on the bench, slacken the two cheese-head captive screws in the base of the carrying case, and slide the rear half of the case forward over the carrying handle.

Remove and unplug the batteries and withdraw the cheese-head screw securing an earthing lead from the speaker to the metal framework supporting the chassis;

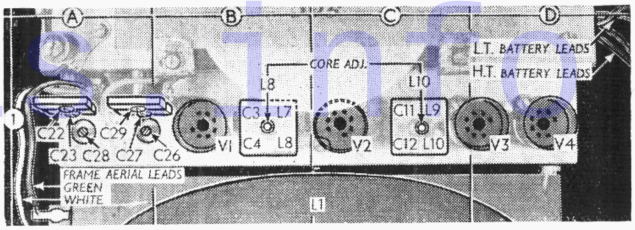
Remove the two screws (with spring and metal washers) securing the front chassis supports to moulded projections on the case;

Remove the two screws (with lock washers) securing the horizontal chassis supporting bar to the brass pillars on each side of the speaker, and lift out the chassis to the extent of the speaker leads, which is sufficient for most purposes.

When replacing, if the speaker leads have been disconnected they should be resoldered to the speech coil tags as follows: black lead (and black earthed metal-work lead) to upper tag, and white to lower tag.

Removing Speaker.—Remove chassis as previously described, slacken the screws of the four speaker retaining clamps, swivel the clamps aside, and lift out the speaker.

Plan view of the valve platform, with the hinged flap carrying the frame aerial attached. All the valves have spring-loaded retaining shields.



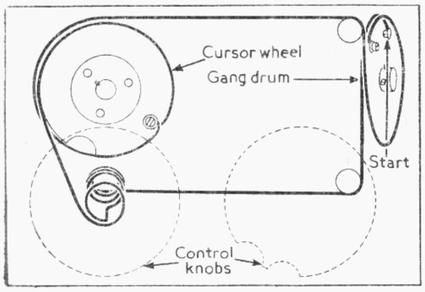
When replacing, the speech coil tags should be on the right and the leads to them must be resoldered as previously described.

TUNING DRIVE REPLACEMENT

The tuning drive cord consists of fine stranded steel wire, and when fitting a new one it is important that the following instructions are carefully obeyed, as replacement is a difficult operation. The length required is 3ft 6in, and supplies can be obtained from G.E.C. Radio Service Depot, 9 Greycoat Street, London, S.W.1.

Remove the scale panel (2 screws and lockwashers) and the cursor plate (3 screws and plain washers) beneath it. Remove the circlip holding the tuning knob to its spindle. Stand the chassis on its base (control knobs uppermost) and face the front of it, when the drive system should appear as shown in our sketch below. Turn the gang to minimum.

Clamp one end of the wire firmly under the anchor screw marked "Start" on the gang



Plan view of the tuning drive system.

drum (at about 2 o'clock when viewed from the front). Set cursor wheel as shown (anchor screw at 4 o'clock). Set tuning control knob so that the slot between the two grooves beneath it faces the front.

Make a quarter-turn anti-clockwise round the gang drum groove, then follow the course in the sketch. Make three turns clockwise (as seen from above, looking "through" the knob) round the lower groove on the tuning control; then, passing through the slot, make 1½ turns round the upper groove in the same direction. Access to these grooves is obtained by raising the knob on its spindle.

Make 1½ turns round the cursor wheel, anchoring the wire on passing at the screw at 4 o'clock, and finish off by clamping wire under the second anchor screw on the gang drum, at 10 o'clock. Then cut off surplus wire. Keep the wire taut during these operations or it will jump out of its grooves. Avoid kinking the wire or it will not run smoothly.

GENERAL NOTES

Switches.—**S1-S4** are the waveband switches, and **S5**, **S6** are the battery circuit switches, ganged in a single rotary 3-position unit mounted on the control panel, directly below its knob. The unit is indicated in our underside view of the chassis, and shown in detail in the diagram inset in the top left-hand corner of the circuit diagram overleaf, as seen in the position shown in our photograph.

In the L.W. position (control knob fully anti-clockwise) **S1**, **S4**, **S5** and **S6** are closed; in the M.W. (central) position, **S2**, **S3**, **S5** and **S6** are closed. In the "Off" position (knob fully clockwise), all switches are open.

Batteries.—The L.T. battery is a G.E.C. type BB396 large-capacity all-dry 1.5 V unit, with a simple 2-pin socket outlet. The H.T. battery is a G.E.C. BB502 90 V layer type unit, with a 3-pin socket outlet of which only two pins are used. A diagram of the plug, viewed from the free ends of its pins, is inset beneath our circuit diagram overleaf.

Chassis Divergency.—In early versions of this receiver, the two I.F. "top" coupling capacitors **C5** and **C13** were not used, nor was the reaction coupling feature between the output and input circuits of **V2**. The frame aerial was different from that in the later types, too, where it is mounted on a hinged flap. **C20**, which is now 0.002 μF, was 0.005 μF.

CIRCUIT ALIGNMENT

Before commencing the following operations the chassis, L.T. battery and frame aerial must be in position in the carrying case, and the H.T. battery leads must be lengthened to enable the battery to be connected outside the case. The reaction coupling tag, which can be rotated on its mounting pillar and is indicated in our under-chassis view (location reference G5) should be in the horizontal position.

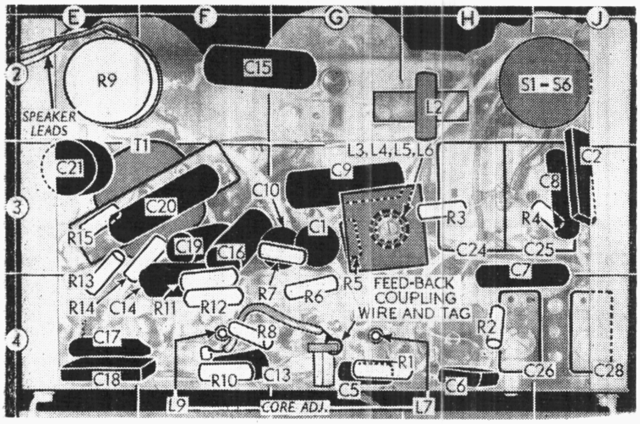
I.F. Stages.—Switch set to L.W., turn gang to minimum capacitance and volume control to maximum; connect signal generator, via an 0.1 μF capacitor in the "live" lead, to the white frame aerial lead and chassis, feed in a 456 kc/s (657.8m) signal, and adjust the cores of **L10**, **L9**, **L8** and **L7** (C1, F4, B1, G4) for maximum output, reducing the feed-back coupling by rotating the tag towards its vertical position if instability is experienced.

R.F. and Oscillator Stages.—With the gang at maximum capacitance the pointer should coincide with the V-shaped marks at the high wavelength ends of the scales. It may be adjusted in position by rotating the drive drum on the gang spindle after slackening its two grub screws. Couple signal generator to the receiver by means of a loop of wire set up in close proximity to the frame aerial.

M.W.—Tune to 214m (spot on scale), feed in a 214m ((1,400 kc/s) signal, and adjust **C27** and **C23** (A1) for maximum output. Tune to 500m on scale, feed in a 500m (600 kc/s) signal, and adjust **C26** (A1) for maximum output. If instability is present move the reaction feed-back tag until it stops.

L.W.—Switch set to L.W., tune to 1,000m on scale, feed in a 1,000m (300 kc/s) signal, and adjust **C29** and **C22** (A1) for maximum output. Tune to 1,875m (spot on scale), feed in a 1,875m (160 kc/s) signal, and adjust **C28** (A1) for maximum output. Repeat these operations, and if any instability is present move the reaction feed-back tag until it stops.

Finally, replace H.T. battery in carrying case, recheck M.W. and L.W. alignment, and adjust the position of the feed-back tag for a compromise between sensitivity and sideband hiss.



Underside view of the chassis. The feed-back coupling wire is attached to an insulated tag which is pushed round on its fixing screw to vary the position of the wire nad so adjust the reaction coupling between the two I.F. transformers. A diagram of the S1-S6 switch unit is inset in the top left-hand corner of the circuit diagram.

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