

# 270

# BUSH SW41 AND RG41 (A.C.)

**S**UITABLE for mains of 200-250 V, 40-100 C/S, the Bush SW41 is a 4-valve (plus rectifier) A.C. 3-band superhet with a short-wave range of 16.5-51 metres and provision for both a gramophone pick-up and an extension speaker.

A similar chassis is fitted in the RG41 (A.C.) radiogram, the differences being explained under "General Notes," but this *Service Sheet* was prepared on an SW41.

### CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (S.W.), **L3** (M.W.), and **L5** (L.W.) to single tuned circuits **L2**, **C24** (S.W.), **L4**, **C24** (M.W.) and **L6**, **C24** (L.W.) which precede triode hexode valve (**V1**, **Cossor metallised 41STH**), which operates as frequency changer with internal coupling. Triode grid coils **L7** (S.W.), **L9** (M.W.) and **L11** (L.W.) are tuned by **C25**; parallel trimming by **C28** (S.W.), **C29** (M.W.) and **C30** (L.W.); series tracking by **C4**, **C26** (M.W.) and **C27** (L.W.). Anode reaction by **L8** (S.W.), **L10** (M.W.) and **L12** (L.W.).

Second valve (**V2**, **Cossor metallised MVS Pen B**), a variable- $\mu$  R.F. pentode, operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C31**, **L13**, **L14**, **C32** and **C33**, **L15**, **L16**, **C34**.

Intermediate frequency 465 KC/S.

Diode second detector is part of double-

diode triode valve (**V3**, **Mullard metallised TDD4**). Audio frequency component in rectified output is developed across load resistance **R12** and passed via A.F. coupling condenser **C12**, manual volume control **R10** and I.F. stopper **R11** to C.G. of triode section, which operates as A.F. amplifier.

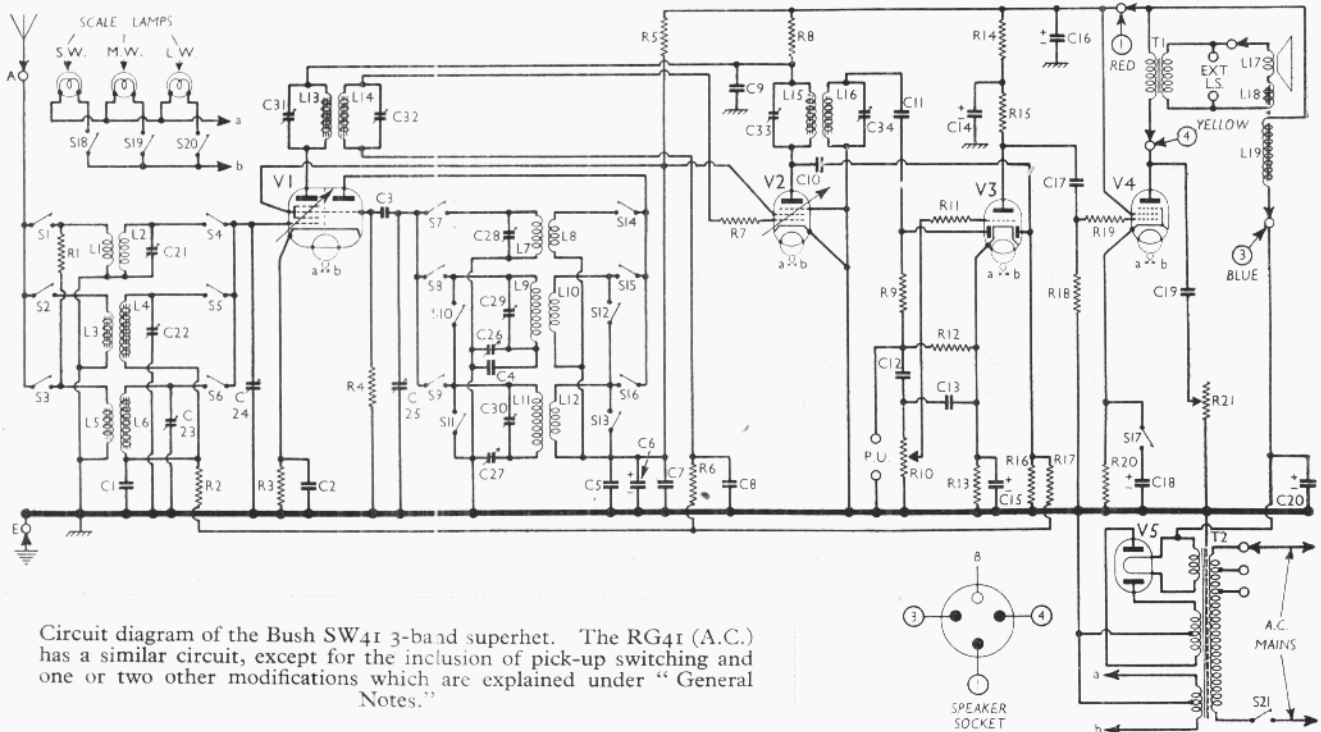
Second diode of **V3**, fed from **V2** anode via **C10**, provides D.C. potential which is developed across load resistance **R16** and fed back through decoupling circuits as G.B. to F.C. (except on S.W.) and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along **R13** in cathode circuit of **V3**.

Resistance-capacity coupling by **R15** **C17** and **R18**, via stopper **R19**, between **V3** triode and pentode output valve (**V4**, **Mullard PenA4**). Variable tone control by R.C. filter **C19**, **R21** in anode circuit. Provision for connection of low impedance external speaker across secondary of speaker transformer **T1**. Removal of plug on flying lead on extension speaker panel mutes internal speaker. Inverse feed-back is introduced on M.W. and L.W. by opening switch **S17**. On S.W. **S17** closes.

H.T. current is supplied by full-wave rectifying valve (**V5**, **Mullard DW4 350**). Smoothing is by speaker field **L19** and two dry electrolytic condensers **C16** and **C20**.

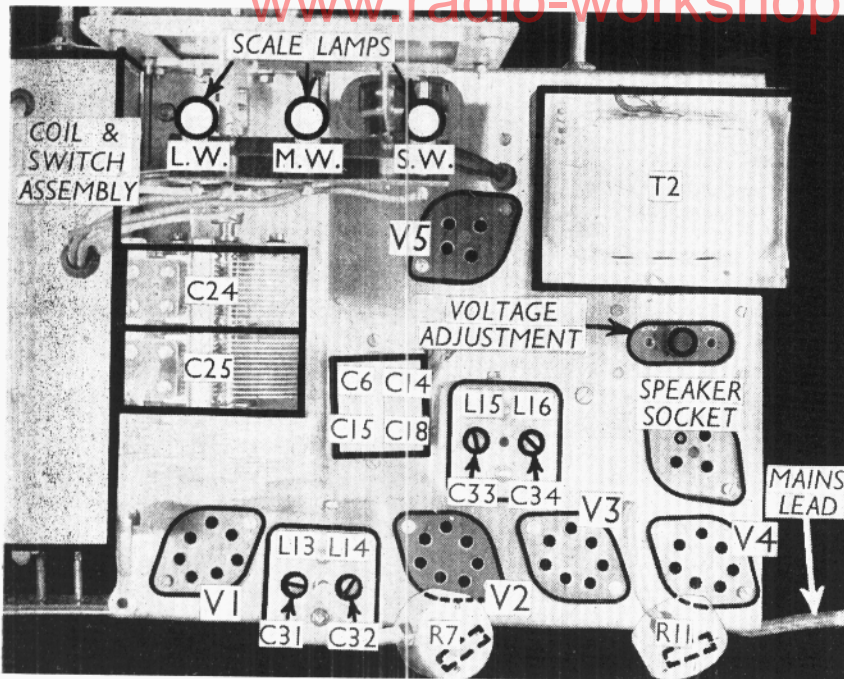
### COMPONENTS AND VALUES

CONDENSERS		Values ( $\mu$ F)
C1	V1 hexode C.G. decoupling ..	0.06
C2	V1 cathode by-pass ..	0.1
C3	V1 osc. C.G. condenser ..	0.00005
C4	Osc. circuit M.W. fixed tracker ..	0.0004
C5	V1, V2 S.G.s and V1 oscillator ..	0.03
C6*	anode decoupling and R.F. ..	2.0
C7	by-pass condensers ..	0.03
C8	V2 C.G. decoupling ..	0.1
C9	V1, V2 anodes R.F. by-pass ..	0.1
C10	Coupling to V3 A.V.C. diode ..	0.0001
C11	Coupling to V3 signal diode ..	0.0001
C12	A.F. coupling to V3 triode ..	0.005
C13	I.F. by-pass ..	0.0001
C14*	V3 triode anode decoupling ..	2.0
C15*	V3 cathode by-pass ..	50.0
C16*	Part H.T. smoothing ..	16.0
C17	V3 triode to V4 A.F. coupling ..	0.03
C18	V4 cathode by-pass (S.W. only) ..	50.0
C19	Part of variable tone control ..	0.02
C20*	Part H.T. smoothing ..	8.0
C21*	Aerial circuit S.W. trimmer ..	0.00004
C22*	Aerial circuit M.W. trimmer ..	0.00007
C23*	Aerial circuit L.W. trimmer ..	0.00007
C24*	Aerial circuit tuning ..	—
C25*	Oscillator circuit tuning ..	—
C26*	Osc. circuit M.W. tracker ..	0.0003
C27*	Osc. circuit L.W. tracker ..	0.0003
C28*	Osc. circuit S.W. trimmer ..	0.00004
C29*	Osc. circuit M.W. trimmer ..	0.00009
C30*	Osc. circuit L.W. trimmer ..	0.000275
C31*	1st I.F. trans. pri. tuning ..	0.0003
C32*	1st I.F. trans. sec. tuning ..	0.0003
C33*	2nd I.F. trans. pri. tuning ..	0.0003
C34*	2nd I.F. trans. sec. tuning ..	0.0003



Circuit diagram of the Bush SW41 3-band superhet. The RG41 (A.C.) has a similar circuit, except for the inclusion of pick-up switching and one or two other modifications which are explained under "General Notes."

www.radio-workshop.co.uk



Plan chassis view. Note R7 and R11 inside the valve top cap connectors.

speaker leads from the socket on the chassis.  
**Removing Speaker.**—The speaker can be removed from the cabinet by unsoldering the leads and then removing the nuts and washers from the four screws holding it to the sub-baffle. When replacing, see that the transformer is on the right and connect the leads from the extension speaker panel to the further terminal strip as follows, numbering the tags from bottom to top:—1, brown; 2, black; 3, green. The leads from the chassis should be connected to the tags on the transformer as follows: 1, red; 2, yellow; 3 and 4, no external connections; 5, blue.

**VALVE ANALYSIS**

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 223 V, using the 230 V tapping on the mains transformer. 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)
V1 41STH	230	1.6	70	3.4
	Oscillator	3.8		
V2 MVS/Pen/B	70	3.8	70	1.2
V3 TDD4	230	3.2	—	—
V4 PenA4	82	2.4	—	—
V5 DW4/350	238	29.0	25.8	4.3
	327†	—	—	—

† Each anode, A.C.

**GENERAL NOTES**

**Switches.**—S1-S17 are the wavelength, and S18-S20 the scale lamp, switches, ganged in three rotary units inside the coil boxes. Their positions are indicated in our under-chassis view, and shown in detail in the diagrams on page VIII.

Continued overleaf

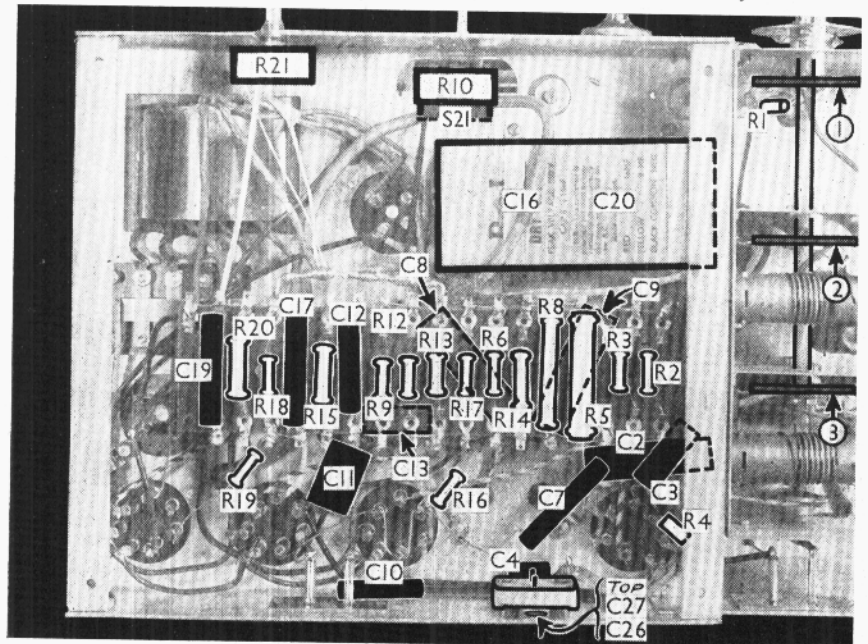
**DISMANTLING THE SET**

**Removing Chassis.**—If it is necessary to remove the chassis from the cabinet, remove the four control knobs (pull off) and the felt washers from the spindles, and then remove the four screws (with washers) holding the chassis to the bottom of the cabinet. Now free the speaker leads from the two cleats on the side of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unplug the

RESISTANCES		Values (ohms)
R1	M.W. coupling coil damping	50,000
R2	V1 hexode C.G. decoupling	1,000,000
R3	V1 fixed G.B. resistance	100
R4	V1 osc. C.G. resistance	30,000
R5	V1, V2 S.G.s and V1 osc. anode H.T. feed	20,000
R6	V2 C.G. decoupling	5,000,000
R7	V2 C.G. stabiliser	250
R8	V1, V2 anodes H.T. feed	5,000
R9	I.F. stopper	250,000
R10	Manual volume control	500,000
R11	V3 triode C.G. I.F. stopper	100,000
R12	V3 signal diode load	1,000,000
R13	V3 G.B. and A.V.C. delay resistance	1,000
R14	V3 triode anode decoupling	10,000
R15	V3 triode anode load	50,000
R16	V3 A.V.C. diode load	1,000,000
R17	A.V.C. line decoupling	1,000,000
R18	V4 C.G. resistance	500,000
R19	V4 C.G. I.F. stopper	100,000
R20	V4 G.B. resistance	200
R21	Variable tone control	50,000

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial S.W. coupling	0.25
L2	Aerial S.W. tuning coil	0.05
L3	Aerial M.W. coupling	0.6
L4	Aerial M.W. tuning coil	1.5
L5	Aerial L.W. coupling	50.0
L6	Aerial L.W. tuning coil	14.0
L7	Oscillator S.W. tuning coil	0.05
L8	Oscillator S.W. reaction	0.3
L9	Oscillator M.W. tuning coil	1.5
L10	Oscillator M.W. reaction	1.3
L11	Oscillator L.W. tuning coil	2.5
L12	Oscillator L.W. reaction	2.0
L13	1st I.F. trans.	Pri. 2.3
L14		Sec. 2.3
L15	2nd I.F. trans.	Pri. 2.3
L16		Sec. 2.3
L17	Speaker speech coil	1.6
L18	Hum neutralising coil	0.15
L19	Speaker held coil	2,000.0
T1	Speaker input trans.	Pri. 650.0
		Sec. 0.3
	Mains trans.	Pri., total 26.5
		Heater sec. 0.1
		Rect. heat. sec. 0.15
		(H.T. sec., total 550.0
S1 S17	Waveband switches	—
S18-20	Scale lamp switches	—
S21	Mains switch, ganged R10	—

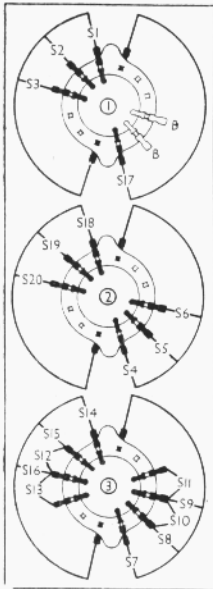


Under-chassis view. The switch units are indicated, but coil and trimmer details are in the side view overleaf.

## BUSH SW41—Continued

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

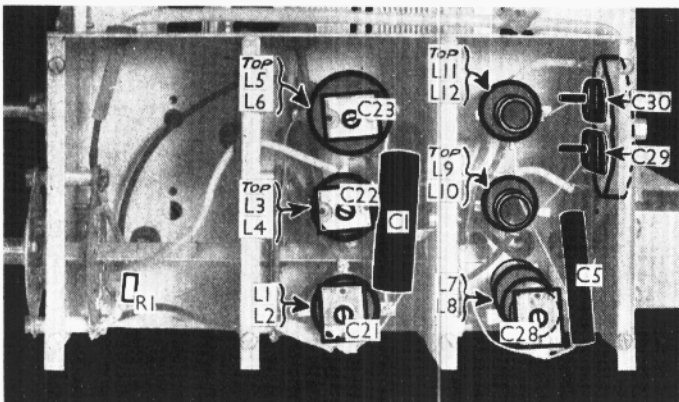
Switch	S.W.	M.W.	L.W.
S <sub>1</sub>	C	—	—
S <sub>2</sub>	—	C	C
S <sub>3</sub>	—	—	—
S <sub>4</sub>	C	C	—
S <sub>5</sub>	—	—	C
S <sub>6</sub>	—	—	—
S <sub>7</sub>	C	—	—
S <sub>8</sub>	—	C	C
S <sub>9</sub>	—	—	—
S <sub>10</sub>	C	C	—
S <sub>11</sub>	—	—	—
S <sub>12</sub>	C	—	—
S <sub>13</sub>	—	C	—
S <sub>14</sub>	—	—	—
S <sub>15</sub>	—	C	—
S <sub>16</sub>	—	—	C
S <sub>17</sub>	C	—	—
S <sub>18</sub>	C	—	—
S <sub>19</sub>	—	—	—
S <sub>20</sub>	—	C	C



Diagrams of the switch units as seen looking from the rear of the underside of the chassis. The radiogram model has an extra unit, as explained under "General Notes."

**S21** is the Q.M.B. mains switch, ganged with the volume control, **R10**.

**Coils.** The signal frequency and oscillator coils are in a partitioned screened unit, with the wavechange switches, and several other components.



Side-chassis view, with the cover plate removed. Each coil unit contains two coils, and four of them have trimmers at their ends.

This unit projects above and below the chassis deck. The coils and trimmers are indicated in detail in our side-chassis view, the metal side plate of the unit having been removed. In all there are six coil formers, each carrying two coils and four of them having trimmers at their ends.

The I.F. transformers **L13**, **L14** and **L15**, **L16** are in two screened units on the chassis deck, with their associated trimmers.

**Scale Lamps.**—These are three Ever Ready M.E.S. types, rated at 6.2 V, 0.3 A. They are switched by **S18-S20**.

**External Speaker.**—Provision is made, by a panel at the top of the back of the cabinet, for the use of a low impedance (20) external speaker. The internal speaker speech coil may be disconnected by a plug and socket device, also on the panel.

**Condensers C6, C14, C15, C18.**—These are two 2  $\mu$ F and two 50  $\mu$ F dry electrolytics in a single carton on the chassis deck. The black lead is the common negative of **C6** and **C14** (2  $\mu$ F) and the brown the common negative of **C15** and **C18**. The red lead to **C7** is the positive of **C6**, and the red lead to the junction of **R15**, **R14** is the positive of **C14**. The yellow lead to the junction of **R12** and **R13** is the positive of **C15**, and the yellow lead to **S17** on the first switch unit is the positive of **C18**.

**Condensers C16, C20.**—These are two dry electrolytics in a single carton beneath the chassis, with a common negative (black) lead. The yellow lead is the positive of **C20** (8  $\mu$ F) and the red positive of **C16** (16  $\mu$ F).

**Condensers C26, C27.**—These two pre-set trackers are mounted at the rear of the chassis, and are adjustable through two holes. **C26** is nearer the chassis deck.

**Speaker Plug and Socket.**—The speaker is connected to the receiver by a 4-pin plug, with a socket on the chassis. Only three of the pins are used. The connections and a diagram of the underside of the socket are included in our circuit diagram. The "grid" pin of the plug is blank. The red wire from the speaker goes to the "anode" pin (pin 1), the blue wire to pin 3, and the yellow wire to pin 4.

**Chassis Divergencies.**—**R1** is not shown in the makers' diagram, while **S21** is shown by the makers as being in the other mains lead. In the makers' diagram the Ext. L.S. sockets are across **L18** and **T1**

secondary, and not across the secondary of **T1** only, as in our chassis.

**Radiogram Modifications.**—In the RG41 (A.C.) a Rola F7 speaker is fitted, instead of the 8ZAP in the SW41, while **T1** has primary and secondary resistances of 700  $\Omega$  and 0.45  $\Omega$ , instead of 650  $\Omega$  and 0.3  $\Omega$  respectively. The external speaker will have the same matching impedance (2  $\Omega$ ).

The gramophone motor is a Garrard AC6, with a Garrard pick-up (700  $\Omega$ ). The two motor coils have resistances of 500  $\Omega$  each, and are connected in series (200-250 V) or in parallel (100-130 V).

The wavechange switch has an extra position for Gram., when the scale lamps are switched off. An extra switch unit is fitted (outside the coil screening box), and this unit contains **S17** on one side, which is transferred from the first unit in our diagram. On the other side is a switch which on radio connects the top of **R10** to **C12**, and on gram. connects the top of **R10** to one side of the pick-up. An additional contact on the second switch unit connects the top of **C24** to chassis on gram. for radio muting.

The pick-up has a 0.05  $\mu$ F shunt, mounted on the extra switch unit. **C12** is mounted on an additional sub-panel, and connected to **R9**, **R12** on the main component panel by a short screened lead.

## CIRCUIT ALIGNMENT

**I.F. Stages.**—When adjusting a primary winding, connect a 15,000  $\Omega$  resistance and a 0.1  $\mu$ F condenser in series between the grid end of the secondary to earth, and when adjusting a secondary connect them from the anode end of the primary to earth.

Switch set to M.W. and tune to about 300 m. Connect signal generator to control grid (top cap) of **V2** and chassis. Feed in a 495 KC/S signal and adjust **C34** and **C33** for maximum output.

Transfer generator to top cap of **V1** and chassis, and adjust **C32** and **C31** for maximum output. Re-check all adjustments.

**R.F. and Oscillator Stages.**—S.W.—Connect generator to **A** and **E** sockets, switch set to S.W., tune to 18 m., on scale, and feed in an 18 m. (16.67 MC/S) signal. Adjust **C28** for maximum output, using the peak which requires the lesser trimmer capacity. Adjust **C21** for maximum output. Check calibration at 50 m.

**M.W.**—Switch set to M.W., tune to 200 m. on scale, feed in a 200 m. (1,500 KC/S) signal, and adjust **C29** for maximum output on the peak requiring the lesser trimmer capacity. Tune to 300 m. on scale, feed in a 300 m. (1,000 KC/S) signal, and adjust **C22** for maximum output.

Feed in a 500 m. (600 KC/S) signal, tune it in, and adjust **C26** for maximum output, rocking the gang for optimum results. Re-check at 300 m.

**L.W.**—Switch set to L.W., tune to 1,300 m. on scale, feed in a 1,300 m. (230.7 KC/S) signal, and adjust **C30** for maximum output. Tune to 1,500 m. on scale, feed in a 1,500 m. (200 KC/S) signal and adjust **C23** for maximum output. Feed in a 1,800 m. (166.7 KC/S) signal, tune it in, and adjust **C27** for maximum output, rocking the gang for optimum results. Re-check at 1,300 m.