

Circuit diagram of the Bush PB53. The SUG52 has an identical circuit, while the RG52 and RG52G radiograms have similar circuits, the modifications being given overleaf. The speaker, and the tone control and mains switch, are connected to the chassis by 4-pin plugs and sockets. The connections of these are indicated by numbers in circles and arrows, and diagrams, looking at the undersides of the plugs, are inset.

COMPONENTS AND VALUES

CONDENSERS		Values (μF)
C1	Aerial SW series condenser ..	0.00005
C2	Aerial LW circuit shunt ..	0.0008
C3	V1 hexode CG decoupling ..	0.5
C4	Aerial SW fixed trimmer ..	0.000005
C5	Aerial LW fixed trimmer ..	0.000005
C6	1st IF trans. pri. trimmer ..	0.00018
C7	1st IF trans. sec. trimmer ..	0.00018
C8	V1 cathode by-pass ..	0.05
C9	V1 osc. CG condenser ..	0.00003
C10	Auto osc. part trimmer (with C11) ..	0.00034
C11	Osc. circuit LW tracker (manual); part osc. circuit trimmer (auto) ..	0.000316
C12	Osc. circuit MW tracker ..	0.000556
C13	Osc. circ. SW fixed trimmer ..	0.000015
C14	Osc. circ. MW fixed trimmer ..	0.00001
C15	Osc. circ. LW fixed trimmer ..	0.000135
C16	V1 osc. anode SW coupling ..	0.00005
C17	V1 SG and osc. decoupling ..	0.05
C18	V2 CG decoupling ..	0.05
C19	V2 SG decoupling ..	0.05
C20	V2 anode decoupling ..	0.05
C21	2nd IF trans. pri. trimmer ..	0.00018
C22	2nd IF trans. sec. trimmer ..	0.00018
C23	Coupling to V3 AVC diode ..	0.0001
C24	Coupling to V3 signal diode ..	0.0001
C25	IF by-pass ..	0.0001
C26	AF coupling to V3 triode ..	0.01
C27	V3 triode anode decoupling ..	2.0
C28	V3 cathode by-pass ..	50.0
C29	V3 triode to V4 AF coupling ..	0.03
C30	V4 cathode by-pass ..	50.0
C31	Fixed tone corrector ..	0.003
C32	Part of variable tone control ..	0.05
C33	HT smoothing ..	16.0
C34	HT smoothing ..	16.0
C35	Aerial circuit SW trimmer ..	0.00001
C36	Aerial circuit MW trimmer ..	0.00001
C37	Aerial circuit LW trimmer ..	0.00001
C38	Aerial circuit tuning ..	—
C39	Oscillator circuit tuning ..	—
C40	Osc. circuit SW trimmer ..	0.00001
C41	Osc. circuit MW trimmer ..	0.00001
C42	Osc. circuit LW trimmer ..	0.00006
C43	1st IF trans. pri. tuning ..	0.00006
C44	1st IF trans. sec. tuning ..	0.00006
C45	2nd IF trans. pri. tuning ..	0.00006
C46	2nd IF trans. sec. tuning ..	0.00006
C47	Aerial circuit LW automatic tuning trimmers ..	0.00045
C48	Aerial circuit LW automatic tuning trimmers ..	0.00045
C49	Aerial circuit MW automatic tuning trimmers ..	0.00015
C50	Aerial circuit MW automatic tuning trimmers ..	0.00015
C51	Aerial circuit MW automatic tuning trimmers ..	0.00015
C52	Aerial circuit MW automatic tuning trimmers ..	0.00015
C53	Aerial circuit MW automatic tuning trimmers ..	0.00015
C54	Aerial circuit MW automatic tuning trimmers ..	0.00015
C55	Aerial circuit MW automatic tuning trimmers ..	0.00015
C56	Aerial circuit MW automatic tuning trimmers ..	0.00015
C57	Oscillator circuit automatic tuning trimmers ..	0.000316
C58	Oscillator circuit automatic tuning trimmers ..	0.000316

* Electrolytic. † Variable. ‡ Pre-set.

RESISTANCES		Values (ohms)
R1	V1 hexode CG decoupling ..	1,000,000
R2	V1 fixed GB resistance ..	100
R3	V1 osc. CG resistance ..	30,000
R4	V1 SG and osc. anode HT feed ..	20,000
R5	V2 CG decoupling ..	2,000,000
R6	V2 grid stabiliser ..	50
R7	V2 SG HT feed ..	100,000
R8	V2 anode HT feed ..	10,000
R9	IF stopper ..	250,000
R10	Manual volume control ..	500,000
R11	V3 triode grid stopper ..	100,000
R12	V3 signal diode load ..	500,000
R13	V3 GB and AVC delay ..	1,000
R14	V3 triode anode decoupling ..	10,000
R15	V3 triode anode load ..	50,000
R16	V3 AVC diode load ..	1,000,000
R17	V4 CG resistance ..	500,000
R18	V4 grid stopper ..	100,000
R19	V4 GB resistance ..	170
R20	Part of variable tone filter ..	2,000
R21	Variable tone control ..	25,000

OTHER COMPONENTS

		Approx. Values (ohms)
L1	Aerial SW coupling coil ..	0.1
L2	Aerial MW coupling coil ..	0.6
L3	Aerial LW coupling coil ..	30.0
L4	Aerial SW tuning coil ..	0.05
L5	Aerial MW tuning coil ..	1.3
L6	Aerial LW tuning coil ..	14.0
L7	Osc. circuit SW tuning coil ..	0.1
L8	Osc. circuit MW tuning coil ..	1.6
L9	Osc. circuit LW tuning coil ..	3.0
L10	Oscillator SW reaction ..	0.2
L11	Oscillator MW reaction ..	1.1
L12	Oscillator LW reaction ..	2.2
L13	1st IF trans. Pri. ..	4.0
L14	1st IF trans. Sec. ..	4.0
L15	2nd IF trans. Pri. ..	4.0
L16	2nd IF trans. Sec. ..	4.0
L17	Oscillator circuit LW automatic tuning coils ..	2.0
L18	Oscillator circuit MW automatic tuning coils ..	2.0
L19	Oscillator circuit SW automatic tuning coils ..	1.4
L20	Oscillator circuit MW automatic tuning coils ..	1.2
L21	Oscillator circuit SW automatic tuning coils ..	1.0
L22	Oscillator circuit MW automatic tuning coils ..	0.7
L23	Oscillator circuit SW automatic tuning coils ..	0.7
L24	Speaker speech coil ..	2.8
L25	Hum neutralising coil ..	0.5
L26	Speaker field coil ..	600.0
T1	Speaker input Pri. trans. ..	250.0
T1	Speaker input Sec. trans. ..	0.8
Continued overleaf		
T2	Mains trans. Pri., total ..	21.0
T2	Mains trans. Rect. heat. sec. ..	0.1
T2	Mains trans. IIT sec., total ..	250.0
S1a, b, x to S3a, b, x	Aerial circ. waveband and manual/auto switches ..	—
S11a, b, x to S13a, b, x	Osc. circuit waveband and manual/auto switches ..	—
S14a, b, x to S16a, b, x	Aerial circuit auto tuning trimmer selector switches ..	—
S17a, b, x to S19a, b, x	Oscillator circuit auto tuning trimmer selector switches ..	—
S20a, b, x to S22a, b, x	Scale lamps switches ..	—
S23	Scale lamps switches ..	—
S24	Mains switch, ganged R21 ..	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230 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.

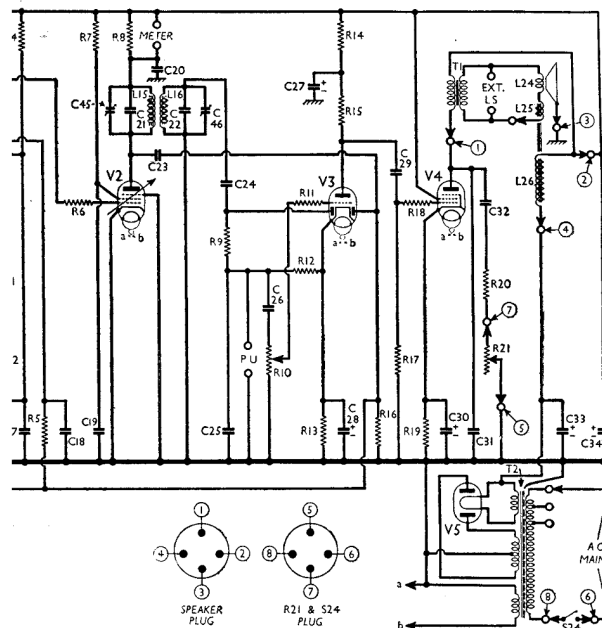
Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH4B	245	2.4	70	5.0
V2 MVS/Pen	178	5.5	76	1.5
V3 TDD4	90	2.3	—	—
V4 PenB4	226	62.0	245	7.4
V5 DW4/350	315†	—	—	—

† Each anode, AC.

GENERAL NOTES

Switches.—There are ten press-buttons, and each one controls six 2-pole shorting switches, three on each side of the unit. In our circuit diagram and other illustrations the switches are grouped in threes, so that in this way each button controls two numbered groups of three, the individual switches in each group being indicated by suffix letters *a*, *b* and *x*, following the group number.

The arrangement and operation of the switches is fully explained near the beginning of the Circuit Description, and it should be noted that when a button



is "out," the associated *a* and *b* switches are *open*, and the *x* switches *closed*. When a button is "in," its *a* and *b* switches are *closed* and its *x* switches are *open*.

Numbering the buttons from left to right looking at the front of the receiver, the first seven buttons control pre-set stations, the eighth is the LW button, the ninth the SW and the tenth on the right, the MW.

The switch groups controlled by the various buttons are: Button 1, **S4** and **S14**; 2, **S5** and **S15**; 3, **S6** and **S16**; 4, **S7** and **S17**; 5, **S8** and **S18**; 6, **S9** and **S19**; 7, **S10** and **S20**; 8, **S3** and **S13**; 9, **S1** and **S11**; 10, **S2** and **S12**.

In addition to the actual press-button switches, there are three scale lamp switches, **S21-S23**, controlled by the three right-hand (wavechange) buttons. These switches are formed by the metal plungers of the three press-buttons (which are earthed) and three spring contacts into which the plungers slide when the buttons are depressed.

S24 is the QMB mains switch, ganged with the tone control **R21**, which is fitted at the left-hand side of the cabinet, and is connected to the chassis by a 4-pin plug and socket.

Coils.—All the coils, with the exception of the IF transformers, are on unscreened tubular formers, built into a unit, together with the press-button switches and the various trimmers. **L1, L4; L7, L10; L8, L11** and **L9, L12** are air-cored. **L2, L5** and **L3, L6** have fixed iron-dust cores, while **L17-L23** have adjustable iron-dust cores for permeability trimming of the oscillator circuits of the seven pre-set station buttons.

The IF transformers **L13**, **L14** and **L15**, **L16** are in two screened units on the chassis deck with their associated trimmers. The variable trimmers are adjusted from beneath the chassis. The first IF transformer **L13**, **L14** also contains **R6**.

Scale and Indicator Lamps.—In all, six lamps are used in this receiver, and they are all Ever Ready MES types, rated at 6.2 V, 0.3 A. Three of them are for illuminating the manual tuning scale, and fit into a holder at the back of the scale. If one of these lamps has to be replaced, see that the holder is replaced the correct way round. The lamps are switched by **S21-S23**, ganged with the waveband press-buttons. The fourth lamp is in a reflector behind the Telefic dial, and is switched by **S21** (on SW only).

The other two lamps are mounted in holders at the front of the chassis.

External Speaker.—Two sockets are provided on a strip at the rear of the cabinet for a low impedance (2.5 Ω) external speaker. A plug and socket device permits the internal speaker to be muted when desired.

Speaker Plug.—A 4-pin plug and socket device connects the speaker to the receiver chassis. An underneath view of the plug, with the pins numbered 1, to 4, is shown beneath the circuit diagram and the connections are indicated by circles and arrows in the diagram itself. The colour coding of the leads to the pins is: 1, yellow; 2, two reds; 3, black; 4, blue.

MODEL RG52 AND RG52G MODIFICATIONS

All the radiogram models use the seventh button from the left for gram switching, so that only six pre-set stations are possible. **L23** and **C56** are therefore omitted, and the switch groups **S10** and **S20** are used for other purposes.

R12 is replaced by two 250,000 Ω resistors in series. One pick-up socket is earthed, and the other goes to the common contact of **S20a**, **b**, **x**. The junction of the two resistances replacing **R12** goes to the other contact of **S20b**. The other contact of **S20a** is blank, while the other contact of **S20x** goes to chassis. Consequently, when the gram button is depressed, the top of the pick-up is connected to the junction of the two resistors and thus to the volume control.

Of the **S10 a**, **b**, **x** switches, the common contact goes to chassis, while the other contact of **S10a** goes to the bottom of **R7**. The other contacts are blank. On pressing the gram button, **V2** SG is earthed, thus muting radio.

In the radiogram models, the volume control is at the right-hand side of the cabinet, and is connected to the chassis by a 4-pin plug and socket. Assuming the same pin numbering as in the speaker plug, pin 1 goes to one end of **R10**, pin 2 goes to the other end of **R10** and its case and screening, pin 3 goes to the slider and pin 4 is blank.

The R52G and R52G auto models have a Rola G12 speaker, instead of the Rola G10-Z in all the other models. In this case, **T1** secondary has a resistance of 6.4 Ω (instead of 0.8 Ω), **L24** becomes 6.2 Ω (instead of 2.8 Ω) and **L25** becomes 0.3 Ω. The external speaker should have a resistance of 10 Ω.

The RG52 and RG52G models are fitted with a Garrard AC7A unit. Pick-up, 2,000 Ω resistance; motor, 800 Ω resistance. The auto models have the Garrard RC4A record changing unit.

BUSH PB53, SUG52, RG52 AND RG52G

ALIGNMENT OF MANUAL CIRCUITS

IF Stages.—Press MW manual tuning button, tune to 300 m on the scale, turn volume control to maximum, and tone control to "low." A damping circuit consisting of a 30,000 Ω resistor in series with a 0.05 μF condenser in series must be used where indicated below.

Connect signal generator between control grid (top cap) of **V2** and chassis, and feed in a 465 KC/S signal. Connect damping circuit between anode of **V2** and chassis, and adjust **C48** for maximum output. Connect damping between **V3** signal diode (pin 1) and chassis, and adjust **C45** for maximum output.

Connect signal generator between control grid (top cap) of **V1** and chassis, connect damping between anode of **V1** and chassis, and adjust **C44** for maximum output. Connect damping circuit between control grid (top cap) of **V2** and chassis, and adjust **C43** for maximum output.

RF and Oscillator Circuits.—With gang at maximum, indicator should coincide with the tops of the wavelength scales. Remove the escutcheon plate from front of cabinet if chassis has not been removed. Turn volume control to maximum, and tone control to "low." Connect signal generator to A and E sockets.

SW.—Press SW button, and tune to 18 m on scale. Feed in an 18 m (16.67 MC/S) signal and adjust **C40** (above SW button) and **C35** (below SW button) for maximum output. Check calibration at 50 m.

MW.—Press MW button, and tune to 300 m on scale. Feed in a 300 m (1,000 KC/S) signal, and adjust **C41** (above MW button) and **C36** (below MW button) for maximum output. Check calibration at 500 m.

LW.—Press LW button, and tune to 1,500 m on scale. Feed in a 1,500 m (200 KC/S) signal, and adjust **C42** (above LW button) and **C37** (below LW button) for maximum output. Check calibration at 1,900 m.

PRE-SET STATION SELECTION

Stations can be selected by buttons 1 to 7, numbering from the left. The wavelength ranges covered by each button are: 1 and 2, 1,200-2,000 m; 3, 450-550 m; 4, 375-475 m; 5, 275-375 m; 6 and 7, 200-300 m.

To select a station accurately, it is advisable to use a DC voltmeter (0-60 V), connected across the two tags on the chassis deck, as an indicator. Adjustments should always be made for *minimum* reading on the meter.

If the chassis is still in the cabinet, remove the escutcheon of the press-button unit (two instrument-head screws).

Connect the aerial and earth to the receiver and press the button to be used for the desired station. Turn the core adjustment for the associated oscillator coil (above the button) until the index mark is at the approximate wavelength on the small calibrated scale. Then carefully turn the adjustment until the loudest output from the desired station (*minimum* voltmeter reading) is obtained.

Adjust the associated aerial circuit trimmer (below the button) for maximum output (*minimum* voltmeter reading).

Re-adjust both trimmers carefully as a final check.

NOTE.—Any adjustment of the manual tuning trimmer **C42** will affect the tuning of the pre-selected stations. After manual circuit alignment, therefore, the cores of **L17** to **L23** must be re-adjusted.

Any adjustment of the MW manual tuning aerial trimmer **C36** will necessitate readjustment of the MW pre-set station trimmers. Similarly any adjustment of the LW manual tuning aerial trimmer **C37** will affect the setting of **C47** and **C48**.

If a new TH4B valve has to be fitted, it may be found necessary to re-adjust the pre-set oscillator circuits. The best way to do this is to use the LW manual trimmer **C42** for correction purposes. Press the sixth or seventh button, which controls a station near the bottom of the MW band, and adjust **C42** until this station is at its maximum volume. When this is so, all the other pre-selected stations will be correct. The slight adjustment of **C42** which is necessary will not affect the LW manual alignment appreciably.