Radio Manuals.info

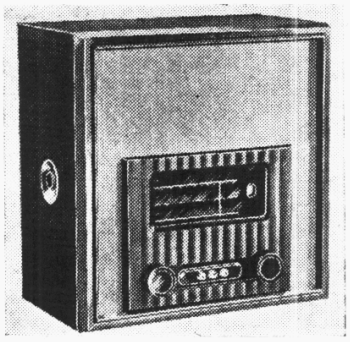
Supplement to The Wireless & Electrical Trader, April 5, 1941

"TRADER" SERVICE SHEET

513

MURPHY A90

A90C & A90RG



THE Murphy A90 is a 4-valve (plus rectifier) 3-band AC table superhet for mains of 200-250 V, 50-100 C/S.

Three press-buttons are used for waveband switching, and provision is made for connection of a gramophone pick-up and an external speaker. An IF rejector is fitted in the aerial circuit, and provision is made for local station rejectors where they are required.

Since the chassis was first produced it has undergone extensive modification. Our chassis was a recent product, and the differences in the earlier models are fully described under "Chassis Divergencies."

The differences in the console and radiogram models are described under "A90C and A90RG Modifications."

Release dates: A90, *February*, 1940; A90C, *July*, 1940; A90RG, *April*, 1940.

CIRCUIT DESCRIPTION

The waveband switches, all of which, together with the scale lamp switches **S1-S3,** are associated with the press-button unit, have been numbered and lettered so that their action is obvious from a study of the circuit diagram.

The numbers 1, 2, 3 indicate that the switches are controlled by the SW, MW and LW buttons respectively, while the letters indicate in the case of **a, b, c, d** and **e** that these switches *close* when their button is pressed, while an **x** indicates that the switch *opens*. When the button is released by pressing another button, the position is reversed, **a, b, c, d** and **e** switches opening, and **x** switches closing.

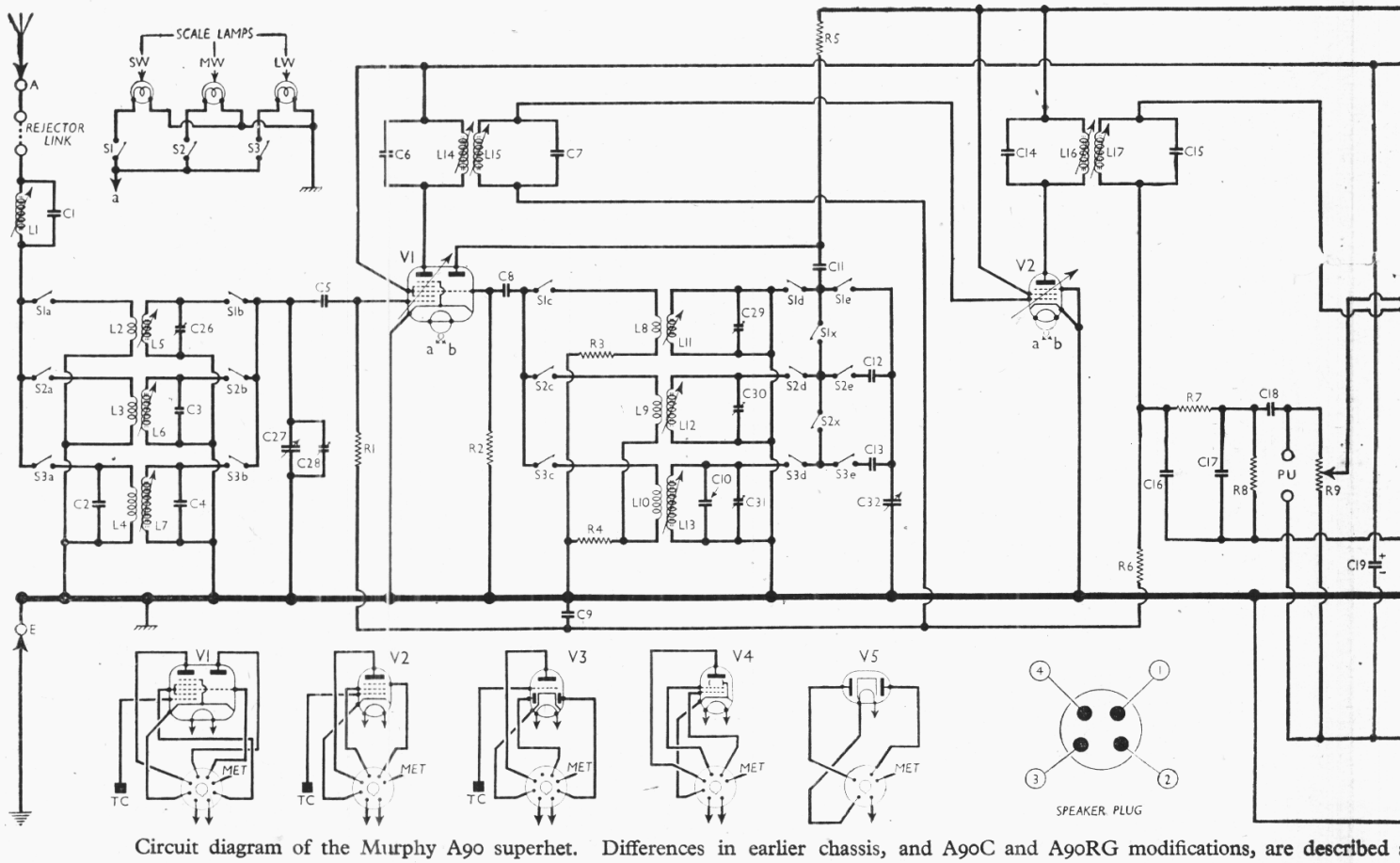
Aerial input is via rejector link, IF rejector circuit **L1, C1** and coupling coils **L2** (SW), **L3** (MW) and **L4** (LW) to single tuned circuits **L5, C27** (SW), **L6, C27** (MW) and **L7, C27** (LW). The rejector link connects two sockets which are wired in series with the aerial lead. In districts served by a powerful local transmitter, a rejector circuit (or two rejectors for twin transmitters) can be plugged into the sockets, after the link has been cut, to prevent interference from the local station.

First valve **(V1, Mazda metallised TH41)** is a triode-heptode operating as frequency changer with internal coupling. Triode oscillator anode coils **L11** (SW), **L12** (MW) and **L13** (LW) are tuned by **C32.** Parallel trimming by **C29** (SW), **C30** (MW) and **C10, C31** (LW); series tracking by **C12** (MW) and **C13** (LW) in high-potential ends of circuits. Tracking adjustments by movable iron-dust cores on all bands. Reaction coupling by grid coils **L8** (SW), **L9** (MW) and **L10** (LW) via stabilising resistances **R3** (SW) and **R4** (MW and LW).

Second valve **(V2, Mazda metallised VP41)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary iron-dust cored transformer couplings **C6, L14, L15, C7** and **C14, L16, L17, C15.**

Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve **(V3, Mazda metallised HL41DD),** the second diode of which is strapped to the cathode and is not used. Audio frequency component in rectified output is developed across load



Circuit diagram of the Murphy A90 superhet. Differences in earlier chassis, and A90C and A90RG modifications, are described

For more information remember www.savoy-hill.co.uk

For more information remember www.savoy-hill.co.uk

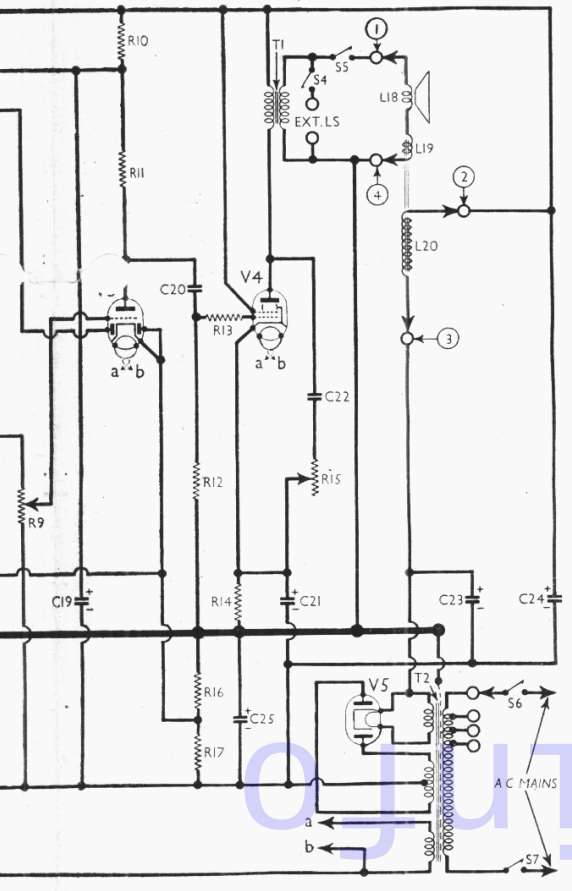
resistance **R8** and passed via AF coupling condenser **C18** and manual volume control **R9** to CG of triode section, which operates as AF amplifier. IF filtering by **C16, R7** and **C17.** Provision for connection of gramophone pick-up across **R9.**

DC potential developed across **R7** and **R8** is tapped off and fed back through decoupling circuit **R6, C9** as GB to FC and IF valves, giving AVC.

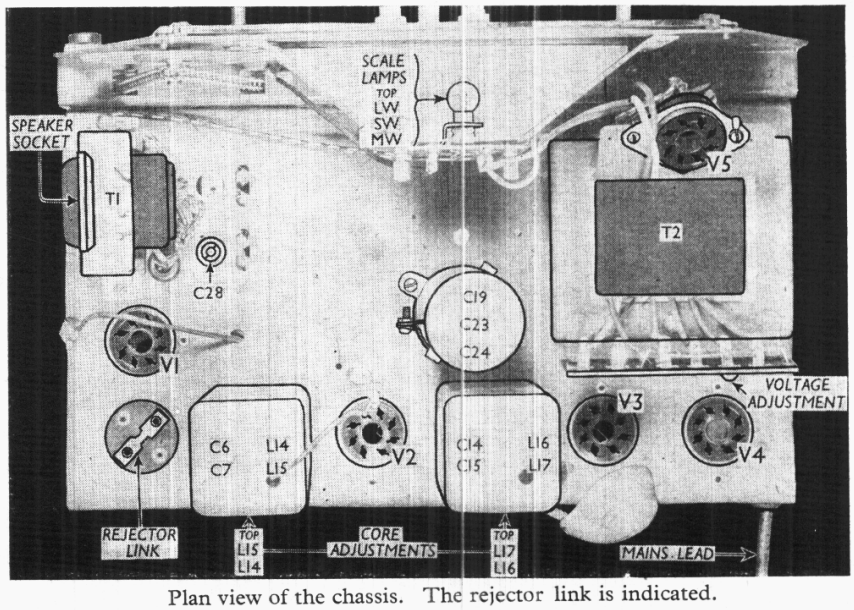
Resistance-capacity coupling by **R11, C20** and **R12** between **V3** triode and beam tetrode output valve **(V4, Mazda PEN45).** Variable tone control by **C22, R15** between anode and cathode. Provision for connection of low impedance external speaker across secondary of output transformer **T1.** Switches **S4, S5** permit either speaker or both speakers to be operated.

HT current is supplied by IHC full-wave rectifying valve **(V5, Mazda metallised UU6)** Smoothing by speaker field **L20** and electrolytic condensers **C23, C24.**

GB potentials for **V1, V2** and **V3** triode obtained automatically from drop along resistances **R16, R17** in negative HT lead to chassis. **V3** control grid circuit is returned to HT negative, but the cathode is taken to the junction of **R16, R17,** so that the GB potential is that developed across **R17.** Since the diode circuit is returned to **V3** cathode, and the AVC line is taken from the diode circuit, DC continuity is established between **V1** and **V2** control grid circuits and the junction of **R16, R17,** and a fixed GB potential, as it appears across **R16,** is thus applied to them via **R8, R7** and **R6.**



described at the end of "General Notes."



Plan view of the chassis. The rejector link is indicated.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 heptode CG resistance	1,500,000
R2	V1 osc. CG resistance ...	22,000
R3	Oscillator reaction stabilising resistances ...	47
R4		470
R5	V1 osc. anode HT feed ...	33,000
R6	AVC line decoupling ...	2,200,000
R7	IF stopper	150,000
R8	V3 diode load resistance...	470,000
R9	Manual volume control ...	1,000,000
R10	V1 SG and heptode anode and V3 triode anode HT feed	8,200
R11	V3 triode anode load ...	47,000
R12	V4 CG resistance ...	470,000
R13	V4 grid stopper	47,000
R14	V4 GB resistance... ...	200*
R15	Variable tone control ...	50,000
R16	Automatic GB resistances	47
R17		27

* Made up of 330 Ω and 500 Ω in parallel.

	CONDENSERS	Values (μF)
C1	Aerial IF rejector tuning	0·0005
C2	Aerial circuit LW shunt...	0·0005
C3	Aerial MW fixed trimmer	0·00001
C4	Aerial LW trimmer ...	0·000085
C5	V1 heptode CG condenser	0·0005
C6	1st IF transformer tuning condensers	0·000139
C7		0·00015
C8	V1 osc. CG condenser ...	0·0002
C9	AVC line decoupling ...	0·05
C10	V1 osc. anode coupling ...	0·0001
C11	Osc. circ. LW fixed trimmer	0·00026
C12	Osc. circuit MW tracker...	0·0007
C13	Osc. circuit LW tracker...	0·000414
C14	2nd IF transformer tuning condensers	0·000139
C15		0·00015
C16	IF by-pass condensers ...	0·0001
C17		0·0001
C18	AF coupling to V3 triode	0·005
C19*	V1 SG and heptode anode and V3 triode anode decoupling	8·0
C20	V3 triode to V4 coupling	0·005
C21*	V4 cathode by-pass ...	50·0
C22	Part variable tone control	0·04
C23*	HT smoothing condensers	16·0
C24*		8·0
C25*	Auto GB circuit by-pass...	50·0
C26‡	Aerial circuit SW trimmer	0·000035
C27†	Aerial circuit tuning ...	—
C28‡	Aerial circuit MW trimmer	0·000035
C29‡	Osc. circuit SW trimmer...	0·000035
C30‡	Osc. circuit MW trimmer	0·000035
C31‡	Osc. circuit LW trimmer	0·000035
C32†	Oscillator circuit tuning...	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial IF filter coil ...	2·5
L2	Aerial SW coupling coil	0·2
L3	Aerial MW coupling coil	0·7
L4	Aerial LW coupling coil	25·0
L5	Aerial SW tuning coil ...	0·05
L6	Aerial MW tuning coil...	2·25
L7	Aerial LW tuning coil ...	15·0
L8	Oscillator SW reaction...	0·2
L9	Oscillator MW reaction...	0·8
L10	Oscillator LW reaction...	0·9
L11	Osc. circ. SW tuning coil	0·05
L12	Osc. circ. MW tuning coil	1·25
L13	Osc. circ. LW tuning coil	1·7
L14	1st IF trans. Pri. ...	5·5
L15	1st IF trans. Sec. ...	5·5
L16	2nd IF trans. Pri. ...	5·5
L17	2nd IF trans. Sec. ...	5·5
L18	Speaker speech coil ...	2·5
L19	Hum neutralising coil ...	0·1
L20	Speaker field coil ...	2,300·0
T1	Output trans. Pri. ...	290·0
	Output trans. Sec. ...	0·6
T2	Mains trans. Pri., total ...	22·0
	Mains trans. Heater sec. ...	0·05
	Mains trans. Rect. heat. sec.	0·15
	Mains trans. HT sec., total...	445·0
S1-S3	Scale lamp switches ...	—
S1a-S3e	Waveband switches ...	—
S4	External speaker switch	—
S5	Internal speaker switch	—
S6, S7	Mains switches, ganged R15	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 240 V, using the 240 V tapping. The receiver was tuned to 300 m, and the volume control was at maximum, but there was no signal input.

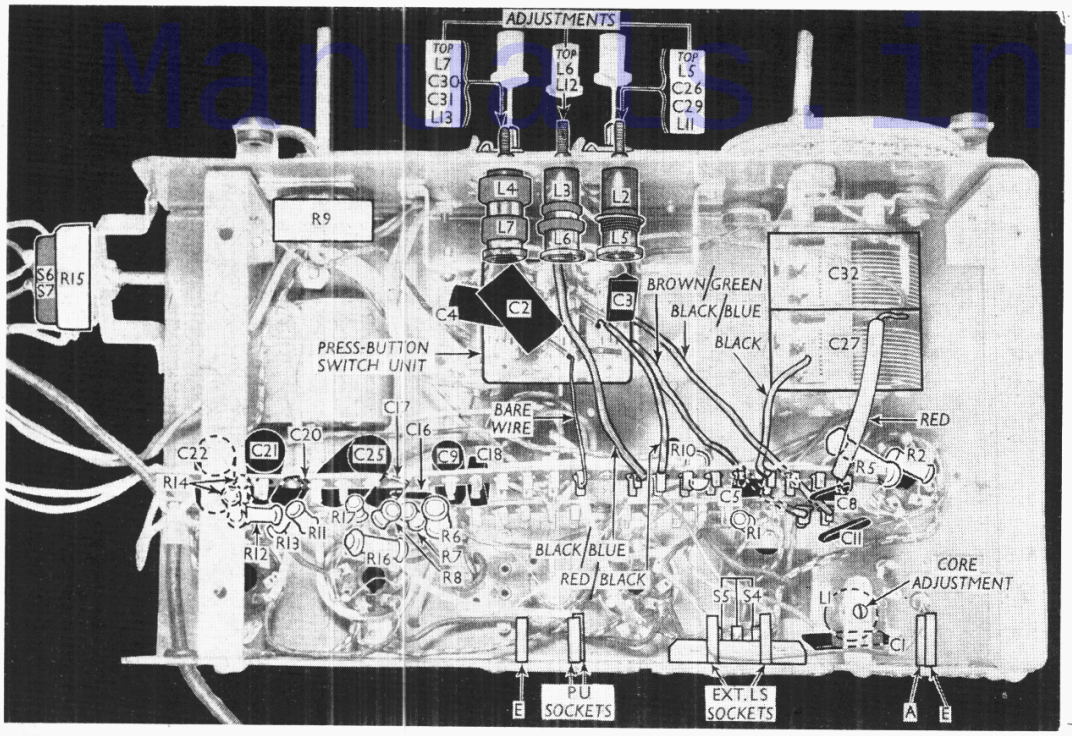
Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH41	116	2·7	116	6·3
	Oscillator			
	65	3·3		
V2 VP41	198	7·6	198	1·7
V3 HL41DD	85	1·9	—	—
V4 Pen 45	188	29·0	198	5·8
V5 UU6	300†	—	—	—

† Each anode, AC.

Manual Junction Radio

Radio Manuals.info



Under-chassis view. A small protective panel has been removed to show the coils **L2-L7**. The underside of the tuning unit, and all its connecting leads, are indicated here, and the points to which the leads are connected are clearly seen. A view of the upper side of the unit, which is normally hidden from view, appears in col. 6 opposite. Diagrams of both sides of the switch unit are given in col. 4.

DISMANTLING THE SET

Removing Chassis.—Remove the two control knobs (recessed grub screws) from the front of the cabinet, and a third from the side;
withdraw the speaker plug from its socket on the output transformer;
remove the tone control bracket (two round-head wood screws) complete with the control, from inside wall of cabinet;
remove the four hexagon set-screws (with metal washers) holding the chassis to the bottom of the cabinet.
When replacing, note that a felt washer is fitted to each of the front control spindles, between the knob and the escutcheon moulding. A small felt washer is also fitted on the knob of each press-button plunger.

Removing Speaker.—Withdraw the connecting plug from its socket on the output transformer;
free the speaker leads from the cleat on the side of the cabinet;
remove the four nuts holding the speaker to the front of the cabinet.
When replacing, the connecting panel should be at the bottom.

Removing the Tuning Assembly.—This is mounted on the front chassis member, and the whole assembly can be removed as a single unit in the following manner:—
unsolder the five flexible leads from tags numbered 1, 4, 8, 9 and 10 on the top row of the pair of connecting strips which run across the width of the underside of the chassis, numbering the tags from right to left when viewed from the rear as seen in our under-chassis view;
unsolder from tags 1 and 2 on the bottom row two further flexibles;
remove from the front of the chassis the four round-head screws holding the front member to the uprights of the cross-members.
When replacing, the leads should be connected as indicated by the colour coding shown in our under-chassis view, where the tags can be clearly seen.

GENERAL NOTES

Switches. — The waveband switches **S1a, b, c, d, e, x** to **S3a, b, c, d, e,** are comprised in a press-button switch unit having three plungers. The switch numbering indicates the functions of the switches, the figures **1, 2** and **3** referring to those operated by the SW, MW and LW buttons respectively, and the letters **a, b, c, d,** and **e** indicating that their switches *close* when their button is depressed, while the **x** switches *open*.

The underside of the unit is indicated in our under-chassis view, and the upper side in a separate view of the tuning unit (col. 6) which is mounted on the front chassis member. Several other components shown are mounted on the switch unit. Diagrams showing both sides of the unit in detail appear in column 4, where the plungers are marked to indicate the wavebands on which they operate.

S4, S5 are the speaker circuit switches, in a three-position unit mounted on the rear member of the chassis. The switch knob has a horizontal motion, and when it is moved to the extreme right **S5** closes, so that the internal speaker only operates; on the extreme left, **S4** closes and only the external speaker operates; in the central position, both speakers operate.

S6, S7 are the QMB mains switches, ganged with the tone control **R15.**

Coils.—**L1** is the aerial IF rejector coil, mounted with **C1** on a bracket near the aerial socket.

All the RF and oscillator coils **L2-L7** and **L8-L13** are wound on six unscreened moulded tubular formers, mounted on the front chassis member. **L2-L7** are seen in the under-chassis view, and **L8-L13** in the small illustration in column 6 showing the upper side of the tuning unit. This side of the unit cannot be seen until the front chassis member has been removed as described under "Dismantling the Set."

The coil units are held in position by speed nuts fitted over the necks which project from the ends of the formers through holes in the chassis member, and are easily demountable.

L14, L15 and **L16, L17** are the IF transformers, mounted in screened units on the chassis deck, with their associated fixed tuning condensers.

All the coils **L1-L17** have adjustable iron-dust cores, the adjustment positions of which are indicated in the chassis illustrations.

Tuning Assembly.—All the components associated with the RF and oscillator tuning circuits, including the gang, switching, scale, scale lamps, trimmers and trackers, are mounted on the front chassis member, which can be detached from the rest of the chassis after seven leads have been unsoldered and four screws removed, as described under "Dismantling the Set." The points to which the leads are soldered are indicated in our under-chassis view.

Scale Lamps.—These are three Osram 6.2V, 0.3A MES types, with large, spherical bulbs. Each lamp illuminates one scale, according to which waveband is in use.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (3-7 Ω) external speaker. A three-position switch unit, mounted just above the sockets, permits either or both speakers to be operated, as described under "Switches—**S4, S5.**" An indicator shows in what position the switch is set.

Condensers C19, C23, C24.—These are three dry electrolytics in a cardboard tubular container mounted vertically on the chassis deck and projecting downwards through a hole in the deck. The red lead is the positive of **C23** (rated at 16 μF, 500 V working), and the yellow leads the positives of **C19** and **C24,** both rated at 8 μF, 450 working. The black lead is the common negative, which, it should be noted, is taken to HT negative, and not to chassis, in the later models.

Condensers C21, C25.—These are two dry electrolytics in separate cardboard tubular formers. They are TCC type FW, rated at 50 μF, 12 V DC working.

Trimmer Adjustments.—All the RF and oscillator trimmer and tracker adjust-

For more information remember www.savoy-hill.co.uk

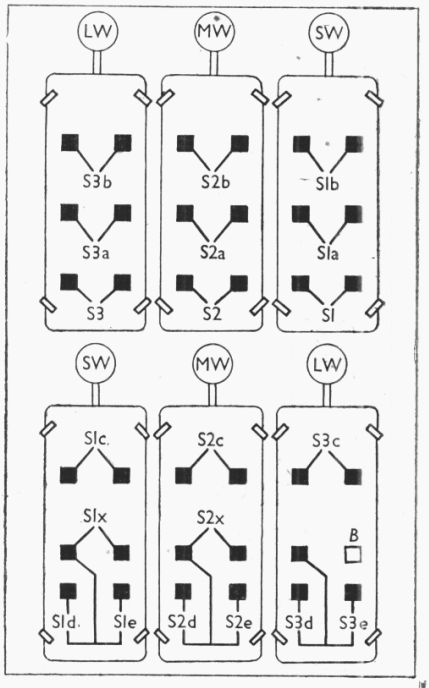
ments, with the exception of **C28** which is mounted on the gang and is reached through a hole in the chassis deck, project from the front of the chassis, and can be reached without removing the chassis from the cabinet if the four screws holding the moulded escutcheon to the front of the cabinet are removed, when the moulding can also be removed, the adjustments being accessible through an aperture behind.

Chassis Divergencies.—Extensive modifications have been made to the 90 chassis since it was introduced. Our chassis was a fairly recent product, and our circuit diagram agrees with our chassis.

In the original version, each valve was independently biased in the conventional manner with a separate cathode resistor and by-pass condenser, as is the case of **V4** in our chassis. The values of these components were as follows : **V1,** 330 O, 0.05 μF ; **V2,** 470 O, 0.025 μF ; **V3,** 680 O, 50 μF electrolytic.

The HT feed arrangements were different in the case of **V1** heptode anode and screen, and **V3** triode anode. **V1** heptode anode and screen were joined together as shown in our diagram, but were fed via an independent 9,100 O resistance, while a 0.05 μF took the junction to **V1** cathode. **V3** anode circuit took the same form as it does in our diagram, but the value of **R10** was 10,000 O.

As a result of the different biasing arrangements, the centre-tap of **T2** HT secondary went directly to chassis, as did also the common negative connection of **C19, C23** and **C24,** which are in a combined unit, and the negative of the separate condenser **C21.** At the same time the capacities of **C18** and **C20** were changed : they were both originally 0.01 μF ; and in some chassis, **R12** may have been changed to 1,000,000 O.



Diagrams of both sides of the press-button unit. *Above :* side seen in under-chassis view. *Below :* upper side, which faces chassis deck.

These changes have been made to meet the contingencies of war. Other divergencies, made no doubt to avoid production delays, were found in our chassis. **R1** was 1,500,000 O instead of 1,000,000 O ; **R7** was 150,000 O instead of 100,000 O ; **R14** was made up of two resistances in parallel, as indicated in our resistance table. The combined value remained sensibly unchanged.

Other modifications, indicated by the makers, are as follows : **C10,** which was originally of the same value as is given in our condenser table, became in later versions 0.000245 μF, and then reverted to the original value, while **C29,** which is now mounted with the other adjustable units on the detachable front chassis member, was originally mounted on the **C32** section of the gang, like **C27;** its adjusting screw was then reached through a hole in the chassis deck, near **C27.**

In very early chassis, **C26** and **C28** were transposed on the chassis, and **C30** occupied the position of **C29.** In chassis in which the SW trimmers **C26** and **C29** are located on the gang, the SW band should be aligned first.

A90C and A90RG Modifications

In the console model A90C, the same chassis is employed as in the table model, but a ten-inch speaker is used.

In the radiogram A90RG, departures from the table model chassis design are made to accommodate pick-up switching and radio muting. A ten-inch speaker is used, as in the console.

The junction between **C18** and **R9** is broken, and the free end of **R9** is then taken to the common tag of one section of a double-pole, double-throw toggle switch, the outer tags of that section going to **C18** and one pick-up lead respectively. The remaining pick-up lead is returned to HT negative. The pick-up is shunted by a 12,000 O resistance, which is located in the chassis.

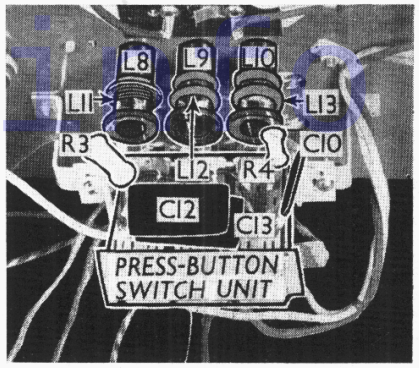
The other section of the switch is interposed between **R5** and the HT positive line in such a manner as to break the circuit on changing over to gram, thus interrupting the oscillator HT supply and muting radio.

Physically, the switch is mounted on the right near the bottom of the rear chassis member, when viewed from the rear, in such a position that its toggle movement is vertical. It is operated by a metal rod which projects through a bush on the motor board and has a push-pull action.

CIRCUIT ALIGNMENT

IF Stages.—Unless an oscilloscope is used as an indicator to obtain a suitable double-humped wave-form, it will be necessary to make up a damping shunt consisting of a resistance of about 30,000 O and a condenser of, say, 0.1 μF in series to damp one half of each transformer as the other is adjusted.

Connect signal generator leads to control grid (top cap) of **V2** and chassis. Connect shunt between **V2** anode and chassis, feed in a 465 KC/S (645.16 m) signal, and adjust **L17** core for maximum output. Connect shunt between **V3** signal diode and chassis, and adjust **L16** core.



Upper side of tuning unit, as seen when front chassis member has been removed as described under "Dismantling the Set."

Transfer signal generator lead to control grid (top cap) of **V1,** the shunt to **V1** heptode anode and chassis, and adjust **L15** core for maximum output. Connect shunt to **V2** control grid and chassis, and adjust **L14** core for maximum output.

Transfer signal generator leads to **A** and **E** sockets, feed in a 465 KC/S signal, and reduce generator output until signal is only just audible in the speaker. The makers suggest that the aural method is better in this instance than using a meter. Now adjust the core of **L1** for *minimum* output.

RF and Oscillator Stage.—With the gang at minimum, the pointer should cover the vertical lines at the left-hand ends of the scales. Insert a suitable dummy aerial in the generator leads. It should be noted that, in chassis in which SW trimmers are mounted on the tuning gang, the SW band should be aligned first. Otherwise the procedure should be as follows, as is most generally the case.

MW.—Press the MW button, tune to 230 m on scale, feed in a 230 m (1,300 KC/S) signal, and adjust **C30,** correcting any calibration inaccuracies, then **C28,** for maximum output. Tune to 500 m on scale, feed in a 500 m (600 KC/S) signal, and adjust the cores of **L12** and **L6** for maximum output. Repeat the 230 m adjustments.

LW.—Press the LW button, tune to 1,000 m on scale, feed in a 1,000 m (300 KC/S) signal, and adjust **C31** to correct any calibration errors. Tune to 1,900 m on scale, feed in a 1,900 m (158 KC/S) signal, and adjust the cores of **L13** and **L7** for maximum output. Repeat the 1,000 m adjustments.

SW.—Press the MW button, tune to 17 m exactly on scale, feed in a 17 m (17.65 MC/S) signal, and adjust **C29,** then **C26,** for maximum output. Tune to 42 m exactly on scale, feed in a 42 m (7.15 MC/S) signal, and adjust the cores of **L11** and **L5** for maximum output. Repeat the 17 m adjustments.

The makers explain in their manual that adjustments are made at the factory with a crystal controlled oscillator, and recommend that, as the adjustments on the SW band are very critical, the performance of the receiver should be carefully checked under broadcast conditions after alignment has been carried out with an ordinary service oscillator.

Printed in Great Britain by The Cornwall Press Ltd., Paris Garden, London, S.E.1

★

For more information remember www.savoy-hill.co.uk