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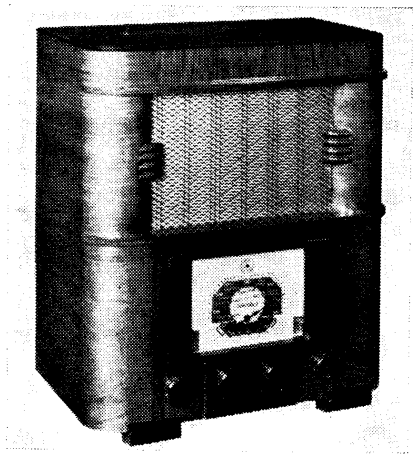
"TRADER" SERVICE SHEET

480

BURNDEPT 318

3-BAND AC SUPERHET



THE Burndept 318 receiver is a 3-band 5-valve (plus valve rectifier and tuning indicator) AC superhet, suitable for use on 200-260V, 50-100 C/S mains. The SW range is 13.5-50m. The wavechange switch has a fourth position for gram, and there is also provision for an external speaker, with internal speaker muting.

Release date : July, 1939.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (SW), **L2** (MW) and **L3** (LW) to single tuned circuits **L4, C36** (SW), **L5, C36** (MW) and **L6, C36** (LW) which precede first valve **(V1, Mullard EF8),** a variable-mu RF hexode operating as signal frequency amplifier.

Tuned-secondary RF transformer coupling by **L7, L10, C40** (SW), **L8, L11, C40** (MW) and **L9, L12, C40** (LW) between **V1** and triode-heptode valve **(V2, Mullard ECH3)** which operates as frequency changer with internal coupling.

Triode oscillator anode coils **L16** (SW), **L17** (MW) and **L18** (LW) are tuned by **C46;** parallel trimming by **C43** (SW), **C44** (MW) and **C11, C45** (LW); series tracking by **C12** (SW), **C13, C41** (MW) and **C14, C42** (LW). Reaction coupling by grid coils **L13,** supplemented by common impedance of tracker **C12** in anode and grid circuits (SW), **L14** (MW) and **L15** (LW), via stabilising resistance **R9** and grid condenser **C10.**

Third valve **(V3, Mullard EF9)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C7, L19, L20, C8** and **C19, L21, L22, C20.**

The transformer coils have iron-dust cores which are adjusted for tuning purposes during the alignment process.

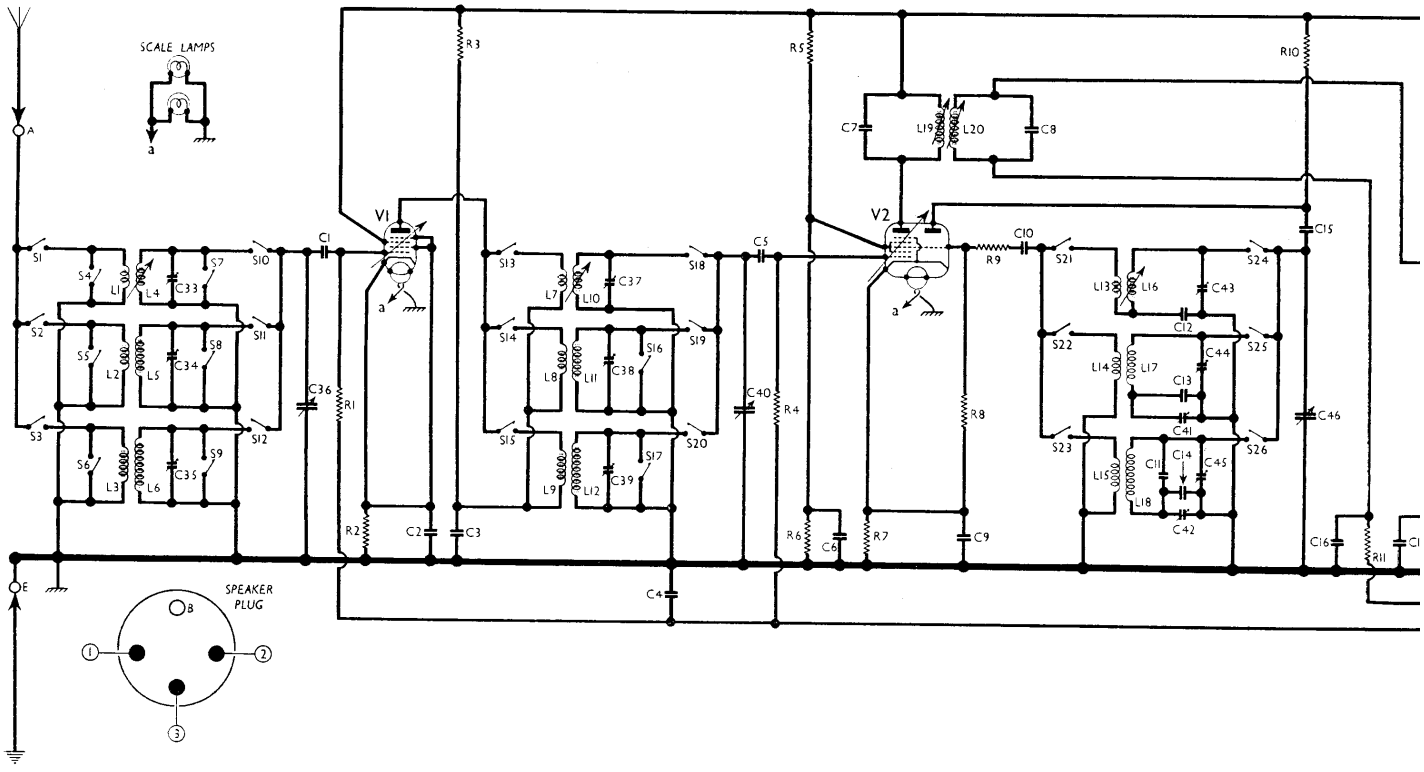
Intermediate frequency 473 KC/S.

Diode second detector is part of separate double diode valve **(V4, Mullard EB4),** which is provided with an independent cathode for each anode and an earthed screen between the two halves of the valve. Audio frequency component in rectified output is developed across AF load resistance **R14** and passed via IF filter circuit **C23, R16, C24,** AF coupling condenser **C25, S27,** manual volume control **R22** and grid stopper **R23** to CG of pentode output valve **(V5, Mullard EL3).**

Provision for connection of gramophone pick-up via switch **S28** across **R22.** When the waveband switch is turned to the "Gram" position **S28** closes, while **S27** opens to mute radio.

DC output from **V4** signal diode is developed across **R14** and **R15,** the voltage appearing across **R15** being fed as control voltage to CG of cathode ray tuning indicator **(T.I., Mullard EM1).** The decoupling condenser **C32** is connected across the grid circuit of **T.I.** and so effectively short-circuits **R15** and prevents it from operating as part of the signal diode AF load.

Second diode of **V4,** fed from **V3** anode

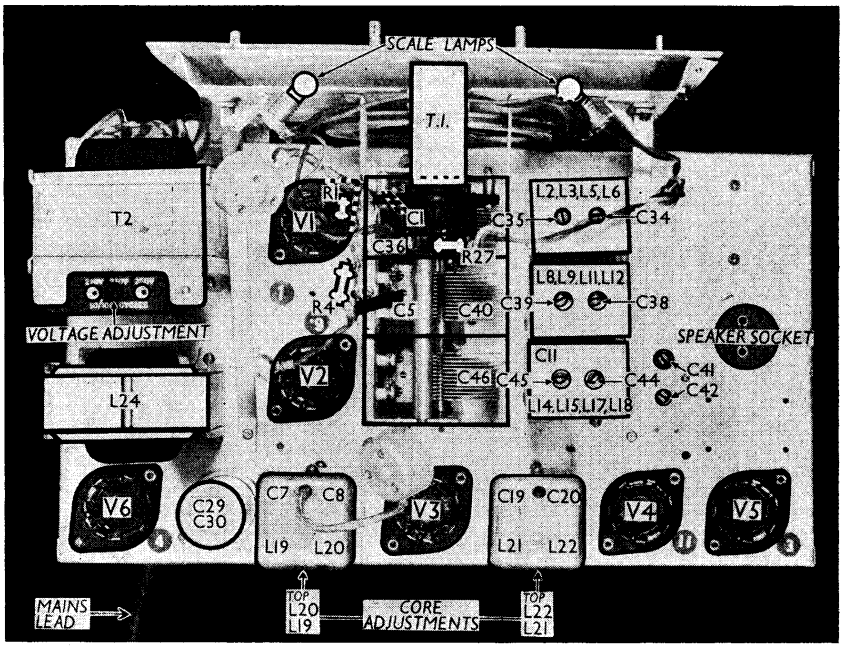


Circuit diagram of the Burndept 318 AC 3-band superhet. A diagram of the speaker plug is inset at the bottom left-hand

via **C22,** provides DC potentials which are developed across load resistances **R19** and **R20** and fed back through decoupling circuits as GB to RF, FC and IF valves, giving automatic volume control. Delay voltage, which is applied to the independent AVC diode cathode, is obtained from the two resistances **R17** and **R18** which form a potential divider across the HT circuit.

Fixed tone correction by **C26** and **R24** in **V5** anode circuit. Variable tone control by **C28** and **R26,** also in **V5** anode circuit. Provision for connection of low impedance external speaker by sockets across internal speaker input transformer secondary winding, while a jack type switch **S29** permits the internal speaker speech coil circuit to be broken for muting purposes if desired when the external speaker plug is inserted in its sockets.

HT current is supplied by IHC full-wave rectifying valve **(V6, Mullard AZ3)** whose cathode is brought out to a contact on the base and connected externally to its associated heater and the HT smoothing circuit, comprising an iron-cored choke **L24** and dry electrolytic condensers **C29** and **C30.** RF filtering by **C17** in HT circuit, and by **C31** in mains input circuit.



Plan view of the chassis. **C1** is beneath the T.I. holder. Many of the trimmers are visible in this illustration.

DISMANTLING THE SET

The cabinet is fitted with a detachable bottom, upon removal of which (four counter-sunk head wood screws) access may be gained to most of the components, including some of the pre-set condensers, beneath the chassis.

Removing Chassis.—Remove the four control knobs (recessed grub screws) from the front of the cabinet;

withdraw the speaker connecting plug from its socket on the chassis deck;

remove the four transit bolts (with lock-washers and claw washers) from the bottom of the cabinet, if still in position;

remove the four fixing bolts (with shaped rubber washers and thin metal washers) holding chassis to the bottom of the cabinet.

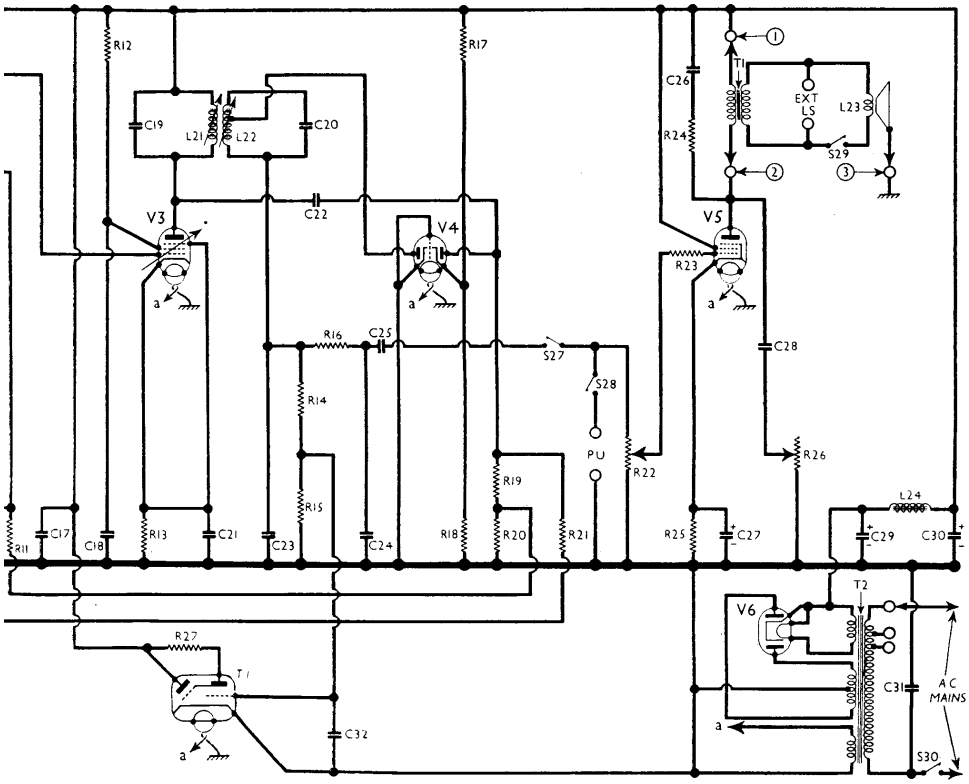
When replacing, the fixing bolts should be inserted through the *outer* set of holes in the bottom of the cabinet; the inner set is for the transit bolts.

Each fixing bolt should be fitted with two shaped rubber washers and two thin metal washers, one of each going either side of the bottom of the cabinet over a brass distance piece.

Removing Speaker.—Remove the two round head wood screws securing the external speaker panel to the top right-hand corner at the rear of the cabinet;

remove the four nuts (with lock-washers) holding the speaker to the sub-baffle.

When replacing, the transformer should be at the bottom.



-hand corner. Note that **V4** is a double-diode with two separate cathodes.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 CG resistance ...	500,000
R2	V1 fixed GB resistance ...	200
R3	V1 anode HT feed ...	1,000
R4	V2 heptode CG resistance	500,000
R5	V2 SG HT potential divider resistances ...	20,000
R6		30,000
R7	V2 fixed GB resistance...	150
R8	V2 osc. CG resistance ...	50,000
R9	Oscillator reaction damping	100
R10	V2 osc. anode HT feed ...	20,000
R11	V3 CG decoupling ...	500,000
R12	V3 SG HT feed resistance	100,000
R13	V3 fixed GB resistance...	250
R14	V4 signal diode load ; T.I. CG feed resistances ...	250,000
R15		100,000
R16	IF stopper	50,000
R17	AVC delay potential divider resistances ...	100,000
R18		5,000
R19	V4 AVC diode load resistances	500,000
R20		500,000
R21	AVC line decoupling ...	500,000
R22	Manual volume control...	1,000,000
R23	V5 grid stopper	100,000
R24	Part of fixed tone corrector	5,000
R25	V5 GB resistance ...	140
R26	Variable tone control ...	50,000
R27	T.I. anode HT feed ...	5,000,000

	CONDENSERS	Values (μF)
C1	V1 CG condenser ...	0·0001
C2	V1 cathode by-pass ...	0·1
C3	V1 anode decoupling ...	0·1
C4	AVC line decoupling ...	0·1
C5	V2 heptode CG condenser	0·0001
C6	V2 SG decoupling ...	0·1
C7	1st IF transformer tuning condensers	0·00015
C8		0·00015
C9	V2 cathode by-pass ...	0·1
C10	V2 osc. CG condenser ...	0·0001
C11	Osc. circuit LW trimmer	0·00005
C12	Osc. circuit SW tracker	0·005
C13	Osc. circ. MW fixed tracker	0·0005
C14	Osc. circ. LW fixed tracker	0·00015
C15	V2 osc. anode coupling ...	0·0001
C16	V3 CG decoupling ...	0·1
C17	HT circuit RF by-pass ...	0·25
C18	V3 SG decoupling ...	0·1
C19	2nd IF transformer tuning condensers	0·00015
C20		0.00017
C21	V3 cathode by-pass ...	0.1
C22	Coupling to V4 AVC diode	0·0001
C23	IF by-pass condensers ...	0·0002
C24		0·0002
C25	AF coupling to V5 ...	0.05
C26	Part of fixed tone corrector	0.01
C27*	V5 cathode by-pass ...	100·0
C28	Part of variable tone control...	0·05
C29*	HT smoothing condensers	16·0
C30*		24·0
C31	Mains RF by-pass ...	0·01
C32	T.I. CG decoupling ...	0·1
C33‡	Aerial circuit SW trimmer	0·00003
C34‡	Aerial circuit MW trimmer	0·00003
C35‡	Aerial circuit LW trimmer	0·00003
C36†	Aerial circuit tuning ...	—
C37‡	RF trans. sec. SW trimmer	0·00003
C38‡	RF trans. sec. MW trimmer	0·00003
C39‡	RF trans. sec. LW trimmer	0·00003
C40†	RF trans. sec. tuning ...	—
C41‡	Osc. circuit MW tracker	0·0001
C42‡	Osc. circuit LW tracker...	0·0001
C43‡	Osc. circuit SW trimmer	0·00003
C44‡	Osc. circuit MW trimmer	0·00003
C45‡	Osc. circuit LW trimmer	0·00003
C46†	Oscillator circuit tuning	—

*Electrolytic. †Variable. ‡Pre-set.

	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial SW coupling coil...		0·5
L2	Aerial MW coupling coil		1·2
L3	Aerial LW coupling coil		100·0
L4	Aerial SW tuning coil ...		Very low
L5	Aerial MW tuning coil ...		2·0
L6	Aerial LW tuning coil ...		10·0
L7	RF trans. SW pri. coil ...		0·7
L8	RF trans. MW pri. coil...		75·0
L9	RF trans. LW pri. coil ...		100·0
L10	RF trans. SW sec. coil ...		0·2
L11	RF trans. MW sec. coil...		2·0
L12	RF trans. LW sec. coil ...		10·0
L13	Oscillator SW reaction...		0·5
L14	Oscillator MW reaction...		70·0
L15	Oscillator LW reaction...		1·5
L16	Osc. circuit SW tuning coil		Very low
L17	Osc. circuit MW tuning coil		6·4
L18	Osc. circuit LW tuning coil		4·9
L19	1st IF trans.	Pri. ...	4·5
L20		Sec. ...	4·5
L21	2nd IF trans.	Pri. ...	4·5
L22		Sec., total	4·5
L23	Speaker speech coil ...		2·5
L24	HT smoothing choke ...		210·0
T1	Speaker input trans.	Pri.	330·0
		Sec.	0·25
T2	Mains trans.	Pri., total ...	25·0
		Heater sec. ...	0·1
		Rect. heat. sec.	0·1
		HT sec., total ...	200·0
S1-S26	Waveband switches ...		—
S27, S28	Radio/ gram. change switches		—
S29	Speaker muting switch...		—
S30	Mains switch, ganged R26		—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on AC mains of 237V, using the 230V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the MW band, and the volume control was at maximum, but there was no signal input.

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

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 EF8	274	10.0	285	0·3
V2 ECH3	285	4·5	115	2·9
	Oscillator			
	133	5·3		
V3 EF9	285	6·0	90	1·8
V4 EB4	—	—	—	—
V5 EL3	270	41·0	285	6·3
V6 AZ3	266†	—	—	—
T.I. EM1	10	0·07	—	—
	Target			
	285	0·5		

† Each anode, AC.

GENERAL NOTES

Switches.—S1-S26 are the wavechange, and **S27, S28** the radio/gram switches ganged together in three rotary units beneath the chassis. These are indicated in our under-chassis view, and shown in detail in the diagrams in col. 3, where they are drawn as seen looking from the rear of the underside of the chassis. The table (below) gives the switch positions for the four control settings, starting from fully anti-clockwise. A dash indicates open, and **C,** closed.

S29 is the speaker muting switch, associated with the external speaker sockets, on a panel at the rear of the cabinet. On inserting the external speaker plug and rotating it anti-clockwise, **S29** opens and mutes the internal speaker.

S30 is the QMB mains switch, ganged with the tone control **R26.**

Coils.—L1, L4; L7, L10 and **L13, L16** are in three unscreened tubular units beneath the chassis. These units have adjustable iron cores, the screw adjustments being indicated in our under-chassis view.

L2, L3, L5, L6; L8, L9, L11, L12; L14, L15, L17, L18; and the IF transformers **L19, L20,** and **L21, L22** are in five screened units on the chassis deck. The first three of these contain two trimmers each, while the third also contains **C11.** The IF transformers have core adjustments at the rear of the cans (indicated in our plan chassis view), and also contain their fixed trimmer condensers.

L24 is the iron-cored smoothing choke, mounted on the chassis deck.

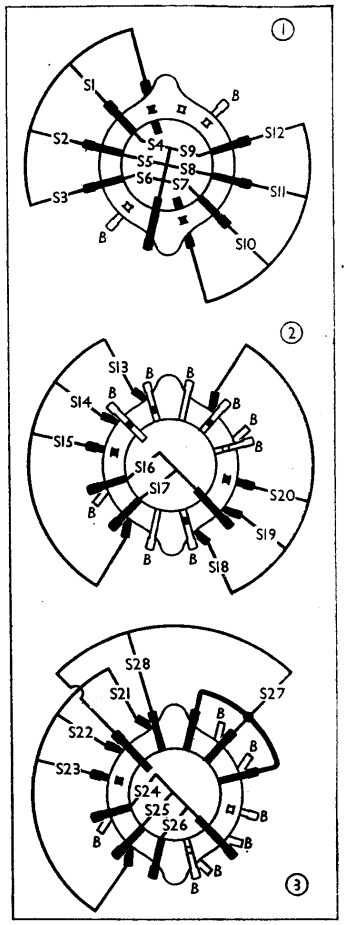
Scale Lamps.—These are two Osram MES types, rated at 6.5V, 0.3A.

External Speaker.—Two sockets are provided on a panel at the rear of the cabinet for a low impedance (about 30) external speaker. On inserting the external speaker plug and rotating it anti-clockwise, **S29** opens and mutes the internal speaker.

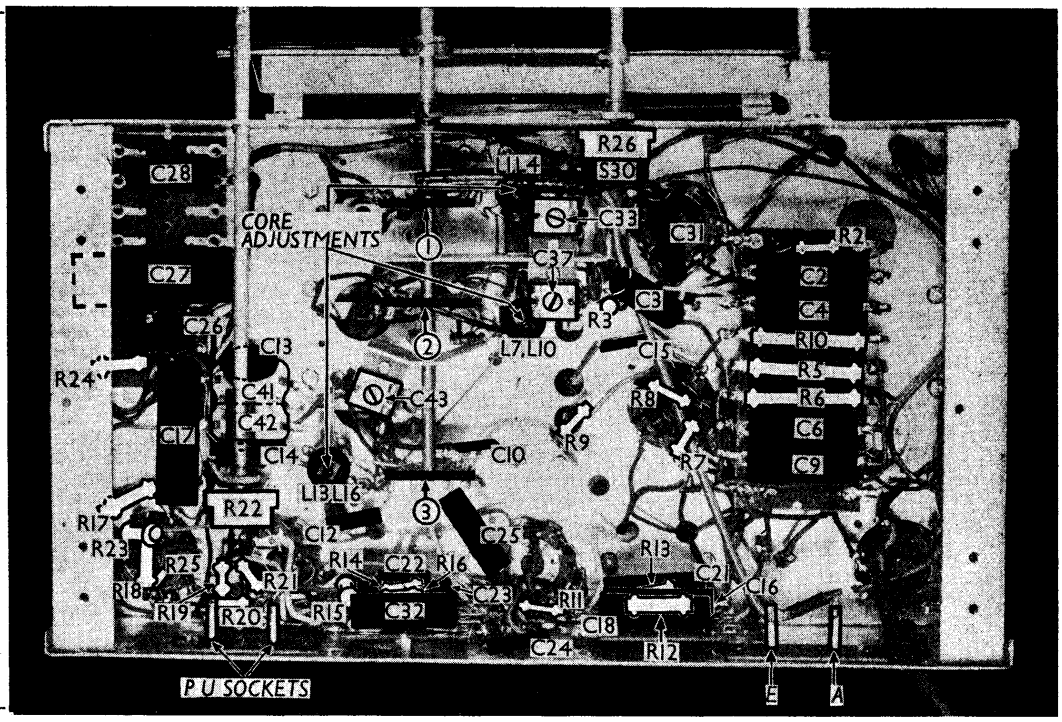
Condensers C29, C30.—These are two dry electrolytics in a single tubular metal unit on the chassis deck, the can being the common negative connection. Beneath the chassis, the tag emerging from the green pillar is the positive of **C29** (16μF) and the tag emerging from the red pillar is the positive of **C30** (24μF). The condensers are rated at 350V peak.

Switch Table

Switch	SW	MW	LW	Gram
S1	C	—	—	—
S2	—	C	—	—
S3	—	—	C	—
S4	—	C	C	C
S5	C	—	C	C
S6	C	C	—	C
S7	—	C	C	C
S8	C	—	C	C
S9	C	C	—	C
S10	C	—	—	—
S11	—	C	—	—
S12	—	—	C	—
S13	C	—	—	—
S14	—	C	—	—
S15	—	—	C	—
S16	C	—	—	—
S17	—	C	—	—
S18	C	—	—	—
S19	—	C	—	—
S20	—	—	C	—
S21	C	—	—	—
S22	—	C	—	—
S23	—	—	C	—
S24	C	—	—	—
S25	—	C	—	—
S26	—	—	C	—
S27	C	C	C	—
S28	—	—	—	C



Diagrams of the three switch units, as seen from the rear of the underside of the chassis.



Under-chassis view. Note the core adjustments for each of the three SW coil units. **C41, C42,** the double tracker unit, has screw adjustments reached through holes in the chassis deck. The three switch units are indicated by numbers in circles and arrows.

Speaker Plug.—The speaker leads terminate in a 4-pin plug (of which three pins are used) and this fits a corresponding socket on the chassis deck. The connections are indicated in the circuit diagram, and a diagram of the plug, looking at the free ends of the pins, is inset beneath the circuit. The colour-coding of the leads to the plug is: 1, blue; 2, black; 3, red.

Pre-Set Trackers.—C41, C42 are in a dual unit beneath the chassis, and their adjusting screws are reached through holes in the chassis deck near the speaker socket.

CIRCUIT ALIGNMENT

IF Stages.—Remove top cap connector of **V2** and connect signal generator to top cap of valve and chassis. Connect a 0.25 MΩ resistance from top cap to chassis. Short circuit **C46,** and turn volume control to maximum. Feed in a 473 KC/S signal, and adjust cores of **L22, L21, L20** and **L19** in turn for maximum output. Repeat these adjustments, then remove the short circuit from **C46** and the 0.25 MΩ resistor, and replace the normal top cap connector of **V2.**

RF and Oscillator Stages.—With gang at maximum, pointer should be horizontal. Connect signal generator to **A** and **E** sockets, via a suitable dummy aerial. (A 30 or 40$\mu\mu$F fixed condenser is suggested for use on the SW band).

LW.—Switch set to LW, tune to 1,000m on scale, feed in a 1,000m (300 KC/S) signal, and adjust **C45,** then **C39** and **C35,** for maximum output. Feed in a 2,000m (150 KC/S) signal, tune it in, and adjust **C42** for maximum output, while rocking the gang for optimum results. Repeat the 1,000m adjustments.

MW.—Switch set to MW, tune to 200m on scale, feed in a 200m (1,500 KC/S) signal, and adjust **C44,** then **C38** and **C34,** for maximum output. Feed in a 500m (600 KC/S) signal, tune it in, and adjust **C41** for maximum output, while rocking the gang for optimum results. Repeat the 200m adjustments.

SW.—Switch set to SW, tune to 13.5m on scale, feed in a 13.5m (22.2MC/S) signal, and adjust **C43,** then **C37** and **C33,** for maximum output. **C43** should be set at the peak involving the lesser trimmer capacity. It is unlikely that tracking adjustments will be necessary, unless a coil has been repaired or replaced. If so, feed in a 50m (6 MC/S) signal, tune it in, and adjust cores of **L16, L10** and **L4** for maximum output, rocking the gang very slightly if necessary. Repeat the 13.5m adjustments.

ECONOMY IN REPLACEMENT RESISTORS

IN the early days of receiver manufacture there used to be a tendency for manufacturers to use resistors which were underrated for the power dissipation requirements of the position they occupied in the circuit. The result of this was that they tended to overheat, and give rise to service troubles.

Such faults are uncommon in modern sets, unless the failure of some other component happens to cause a heavy overload to be applied to the resistor. In fact, in many receivers the opposite tendency is common, and one often finds a 1W resistor used in a position where a ¼W type would be adequate. This, of course, is a good fault, but such a large factor of safety is not at all essential.

Consequently, when the service engineer has to replace such resistors, he can often economise by fitting a new one of lower power rating. The difference in cost between the two is not likely to be great, but every little counts in these days; more important is the fact that while a new resistor of the original power rating may not be readily to hand, one of a lower rating may be in stock. The substitution will then save time and trouble, without affecting the efficiency of the repair.

It is important to use resistors of lower rating only where this is justified, and this involves calculating the power dissipation which will be demanded of the resistor under working conditions.

Resistors dissipate power only when they pass current of any kind. An inspection of the circuit will indicate whether the resistor comes in this category—for instance, an anode feed resistor will have to dissipate power, whereas a grid stopper will not, and an eighth or quarter watt type will be suitable for the latter.

The power in watts can be calculated by multiplying the normal voltage drop across the resistance by the current in ampères flowing through it, or by multiplying the square of the current in ampères by the value of the resistance in ohms, or by dividing the square of the voltage by the value of the resistance in ohms.

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