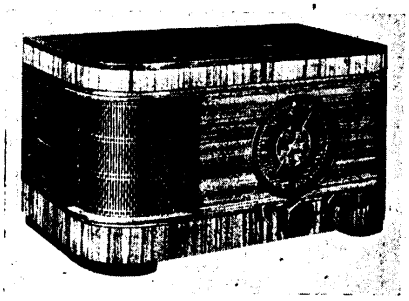
Supplement to The Wireless & Electrical Trader, December 5, 1942

"TRADER" SERVICE SHEET

598

RGD 516 AC

522 Console & 535 Autoradiogram



The RGD 516 superhet.

VARIABLE selectivity, ganged with the mains switch and tone control, a cathode ray tuning indicator and an RF amplifying stage are the predominant features of the RGD 516 superhet, a 4-valve (plus rectifier) 3-band table receiver designed to operate from AC mains of 200-250 V 40-100 C/S. There is provision for the connection of a gramophone pick-up and an external speaker. The SW range is 6.5-50 m.

The 522 is a console employing a similar chassis, but a speaker muting switch is fitted in it. In the 535 Autoradiogram a modified chassis is employed, and the differences, which concern pick-up operation involving the addition of a fifth unit to the switch gang, are described under "535 Modifications." This *Service Sheet* was prepared from a model 516.

Release date, all models : 1937.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (SW), **L2** (MW) and **L3** (LW) to single tuned circuits **L4, C31** (SW), **L5, C31** (MW) and **L6, C31** (LW), which precede variable-mu RF pentode valve **(V1, Mullard metallised VP4B)** operating as signal frequency amplifier.

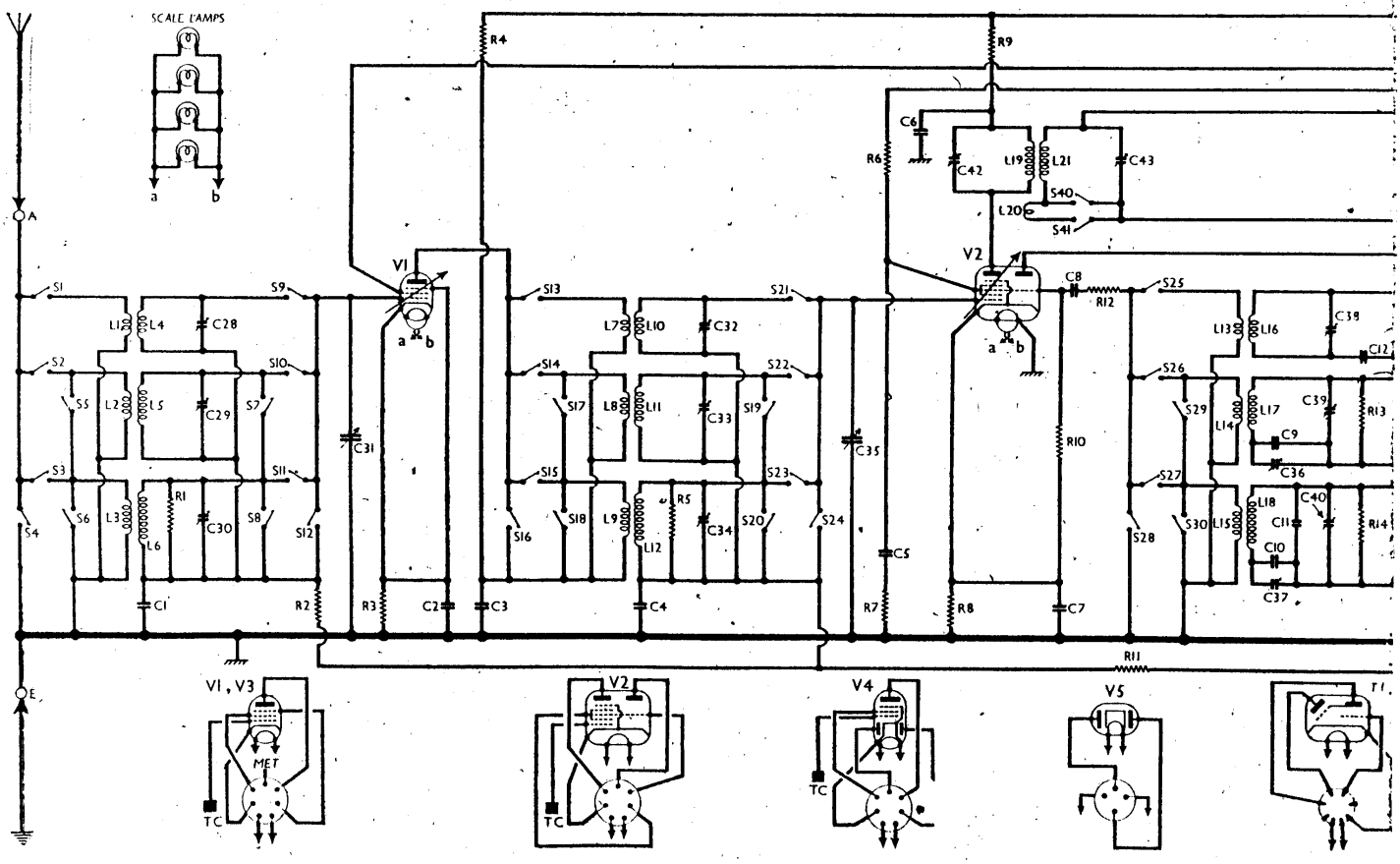
Tuned-secondary RF transformer coupling by **L7, L10, C35** (SW), **L8, L11, C35** (MW) and **L9, L12, C35** (LW) between **V1** and triode heptode valve **(V2, Mazda metallised AC/TH1)**, which operates as frequency changer with internal coupling. Triode oscillator anode coils **L16** (SW), **L17** (MW) and **L18** (LW) are tuned by **C41.** Parallel trimming by **C39** (SW), **C39** (MW) and **C11, C40** (LW); series tracking by **C12** (SW), **C9, C36** (MW), **C10, C37** (LW) and specially shaped vanes of **C41.** Reaction coupling by grid coils **L13** (SW), **L14** (MW) and **L15** (LW) via stabilising resistance **R12.**

All or some of the LW tuning circuits may be damped by resistances **R1, R5** and **R14,** depending upon the stability of the receiver, while **R13** may also be shunted across the oscillator MW tuned circuit.

Third valve **(V3, Mullard metallised VP4B)** is a second variable-mu RF pentode, operating this time as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C42, L19, L20, L21, C43** and **C44, L22, L23, C45.** A variable-selectivity control, ganged with a three-position tone control, operates by including or excluding the coupling coil **L20** in series with the secondary winding **L21,** giving alternative degrees of coupling between primary and secondary circuits.

Intermediate frequency 460 KC/S.

Diode second detector is part of double diode pentode output valve **(V4, Mazda AC/2PenDD).** Audio frequency component in rectified output is developed across the manual volume control **R20,**



which also operates as load resistance, and passed via AF coupling condenser **C22** and CG resistance **R21** to CG of pentode section, which provides the only AF amplification. IF filtering by **C19, R19** and the capacity in the screened lead to **R20.**

Provision for connection of gramophone pick-up via **S39** across **R20.** When the control is turned to the Gram position, **S39** closes to connect the pick-up, while **S38,** together with **S37** in the HT supply circuit to **V2,** open to mute radio. At the same time, all the waveband switch banks are returned to points of low potential, as in the case of **S4** and **S12.**

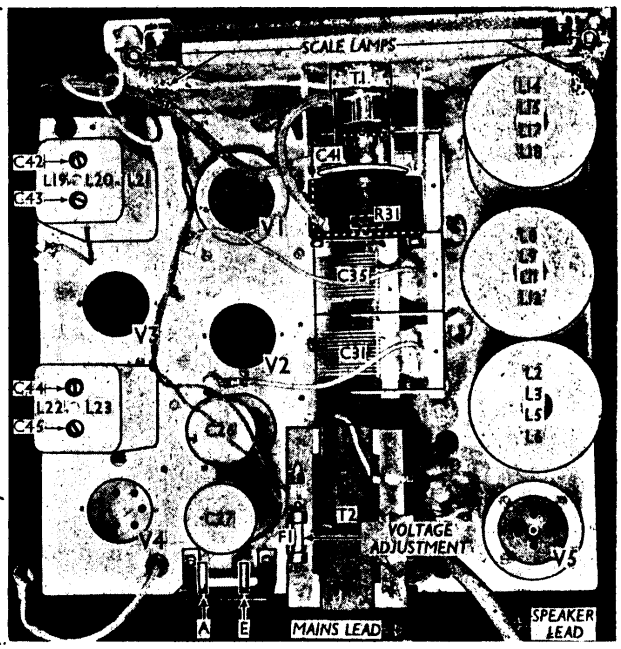
Fixed tone correction by **C25** in **V4** pentode anode circuit. Variable tone control by the resistance-capacity network **R23, R24, C23, C24** in conjunction with switches **S42, S43** and the variable-selectivity device associated with **L20,** the control for all being ganged.

Provision for connection of a low impedance external speaker between sockets **5** and **6** of the speaker connecting adoptor. No provision is made for muting the internal speaker in the model, but a switch could easily be inserted between the lead from socket **4** and chassis.

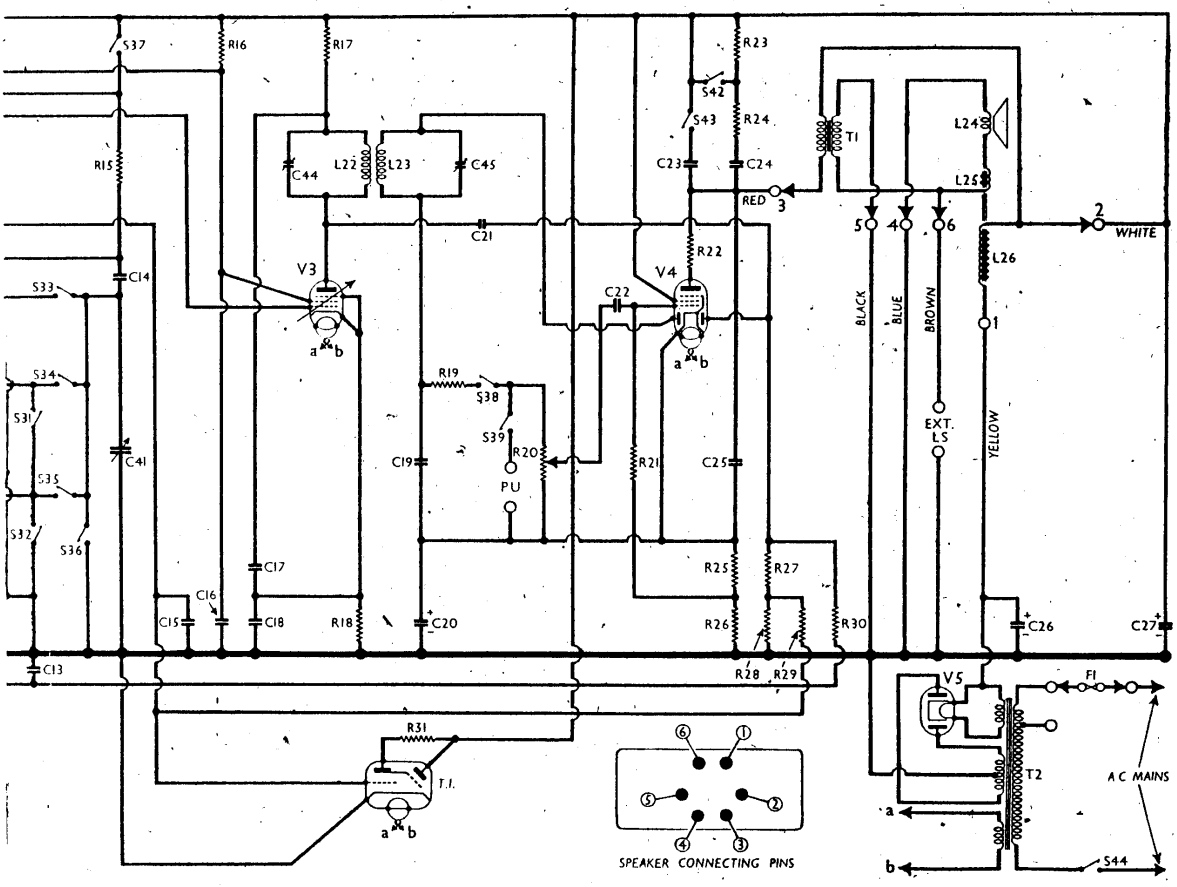
Second diode of **V4,** fed from **V3** anode via **C21,** provides DC potentials which are developed across load resistances **R27, R28** and fed back through decoupling circuits as GB to RF, FC and IF valves, giving automatic volume control. Delay voltage, together with GB for pentode section, is obtained from drop along resistances **R25, R26** in **V4** cathode lead to chassis.

V3 AVC line potential is used also as control voltage to operate the cathode ray tuning indicator **(T.I., Mullard TV4).**

HT current is supplied by IHC full-wave rectifying valve **(V5, Mazda UU4).** Smoothing by speaker field **L26** and electrolytic condensers **C26, C27.** Fuse **F1** protects mains input circuit against accidental short-circuits and also operates as voltage adjustment plug.



Plan view of the chassis. **F1** is a 1-inch mains circuit fuse which also acts as voltage adjustment plug. The speaker lead is terminated at a socket adaptor which fits on five pins mounted on the speaker transformer. **T.I.** is the cathode ray tuning indicator.



Circuit diagram of the RGD 516 table superhet. **R1, R5** and **R14** were not fitted in our chassis. Connections between the speaker unit and chassis are indicated by arrows and circles, and a diagram below shows the connecting pins as seen on the speaker transformer. The only difference in the 522 console is the inclusion of a speaker muting switch in the blue speaker lead. The differences in the 535 autoradiogram are explained overleaf.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 237 V, with the two-position voltage adjustment in the higher voltage position.

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. The selectivity control was at its first position from "Off."

Voltages were measured on the 400 V scale of a model 7 Avometer, chassis being the negative connection, and, owing to the use of valve adaptors for current measurements, it was found necessary to connect a 0.1 μF condenser between **V2** top cap and chassis to stabilise it while taking readings on it.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP4B	245	10·0	210	3·0
V2 AC/TH1	245	2·3	70	6·0
	Oscillator			
	80	3·9		
V3 VP4B	245	10·0	210	2·5
V4 AC/2 PenDD	255	34·0	265	6·5
V5 UU4	305†	—	—	—
T.I. TV4	15	0·1	—	—
	Target			
	265	0·1		

† Each anode, AC.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	V1 CG decoupling ...	0·04
C2	V1 cathode by-pass ...	0·1
C3	V1 anode decoupling ...	0·1
C4	V2 hept. CG decoupling	0·04
C5	V2 SG decoupling ...	0·04
C6	V2 hept. anode decoupling	0·1
C7	V2 cathode by-pass ...	0·1
C8	V2 osc. CG condenser ...	0.0001
C9	Osc. circ. MW fixed tracker	0·000465
C10	Osc. circ. LW fixed tracker	0·00011
C11	Osc. circ. LW fixed trimmer	0·000025
C12	Osc. circ. SW tracker ...	0·003
C13	AVC line decoupling ...	0.002
C14	V2 osc. anode coupling	0·0001
C15	V3 and T.I. CG decoupling	0·04
C16	V1, V3 SG's decoupling...	0·1
C17	V3 anode decoupling ...	0·1
C18	V3 cathode by-pass ...	0·1
C19	IF by-pass	0·0002
C20*	V4 cathode by-pass ...	20·0
C21	Coupling to V4 AVC diode	0·00005
C22	AF coupling to V4 CG ...	0·004
C23, C24	Tone control condensers	0·04, 0·02
C25	Fixed tone corrector ...	0·001
C26*, C27*	HT smoothing condensers	8·0, 16·0
C28‡	Aerial SW trimmer ...	0·000025
C29‡	Aerial MW trimmer ...	0·00005
C30‡	Aerial LW trimmer ...	0·00005
C31†	Aerial circuit tuning ...	—
C32‡	RF trans. SW trimmer ...	0·000014
C33‡	RF trans. MW trimmer...	0·00005
C34‡	RF trans. LW trimmer	0·00005
C35†	RF trans. sec. tuning ...	—
C36‡	Osc. circuit MW tracker	0·00005
C37‡	Osc. circuit LW tracker	0·00005
C38‡	Osc. circuit SW trimmer	0·000014
C39‡	Osc. circuit MW trimmer	0·00005
C40‡	Osc. circuit LW trimmer	0·00005
C41†	Oscillator circuit tuning	—
C42‡	1st IF trans. pri. tuning	—
C43‡	1st IF trans. sec. tuning	—
C44‡	2nd IF trans. pri. tuning	—
C45‡	2nd IF trans. sec. tuning	—

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTANCES	Values (ohms)
R1	Aerial LW damping	250,000
R2	V1 CG decoupling ...	100,000
R3	V1 fixed GB resistance	200
R4	V1 anode HT feed ...	2,000
R5	RF trans LW damping	250,000
R6	V2 SG HT feed ...	25,000
R7	V2 SG stabiliser ...	0·76
R8	V2 heptode fixed GB	160
R9	V2 hept. anode HT feed	5,000
R10	V2 triode CG resistance	50,000
R11	AVC line decoupling	100,000
R12	Osc. reaction stabiliser	100
R13	Osc. circuit MW damping	25,000
R14	Osc. circuit LW damping	50,000
R15	V2 osc. anode HT feed	40,000
R16	V1, V3 SG's HT feed...	10,000
R17	V3 anode HT feed ...	2,000
R18	V3 fixed GB resistance	200
R19	IF stopper	100,000
R20	Manual volume control	500,000
R21	V4 pent. CG resistance	1,000,000
R22	V4 pent. anode stopper	60
R23, R24	Tone control resistances	5,000, 2,000
R25, R26	V4 fixed GB and AVC delay resistances ...	140, 400
R27, R28	V4 AVC diode load resistances ...	500,000, 200,000
R29	V3 and T.I. CG's decoupling	1,000,000
R30	AVC line decoupling	1,000,000
R31	T.I. anode HT feed ...	2,000,000

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial SW coupling ...	2·0
L2	Aerial MW coupling ...	30·0
L3	Aerial LW coupling ...	70·0
L4	Aerial SW tuning ...	Very low
L5	Aerial MW tuning ...	4·5
L6	Aerial LW tuning ...	20·0
L7	RF trans. SW pri. ...	4·0
L8	RF trans. MW pri. ...	1·0
L9	RF trans. LW pri. ...	1·5
L10	RF trans. SW sec. ...	Very low
L11	RF trans. MW sec. ...	5·0
L12	RF trans. LW sec. ...	20·0
L13	Osc. SW reaction ...	0·2
L14	Osc. MW reaction ...	1·0
L15	Osc. LW reaction ...	2·5
L16	Osc. circ. SW tuning ...	Very low
L17	Osc. circ. MW tuning. ...	3·0
L18	Osc. circ. LW tuning ...	9·0
L19, L20, L21	1st IF trans. Pri ... Coupling ... Sec. ...	4·0, 0·2, 8·0
L22, L23	2nd IF trans. Pri. ... Sec. ...	4·0, 4·0
L24	Speaker speech coil ...	2·0
L25	Hum neutralising coil ...	0·3
L26	Speaker field coil ...	1,000·0
T1	Speaker input trans. Pri. ... Sec. ...	230·0, 0·3
T2	Mains trans. Pri., total ... Heater sec. ... Rectheat.sec. ... HT sec., total...	19·0, 0·05, 0·1, 280·0
F1	Mains fuse, 1A	—
S1–S36	Waveband switches ...	—
S37–S39	Radio/gram change switches	—
S40, S41	Variable selectivity switches	—
S42, S43	Tone control switches ...	—
S44	Mains switch, ganged S40–S43	—

DISMANTLING THE SET

The bottom of the cabinet is fitted with a detachable inspection cover, upon removal of which (two wood screws at one end, the other fitting into a slot) access may be gained to many of the components beneath the chassis.

Removing Chassis.—Remove the four control knobs (self-tapping screws) from the front of the cabinet, and the felt washer behind each; withdraw the speaker socket-adaptor from its pins on the speaker transformer; remove the four bolts (with metal washers, rubber washers and distance pieces) holding the chassis to the bottom of the cabinet.

Removing Speaker. — Withdraw the socket-adaptor from its pins on the transformer; slacken the nuts holding the four clamps on the sub-baffle to the speaker rim, swivel the clamps and lift out the speaker.

Where the speaker connections are soldered directly to tags on the transformer, they should be connected as follows, reading from left to right with the transformer beneath the speaker: 1, yellow; 2, white; 3, red; 4, brown; 5, black.

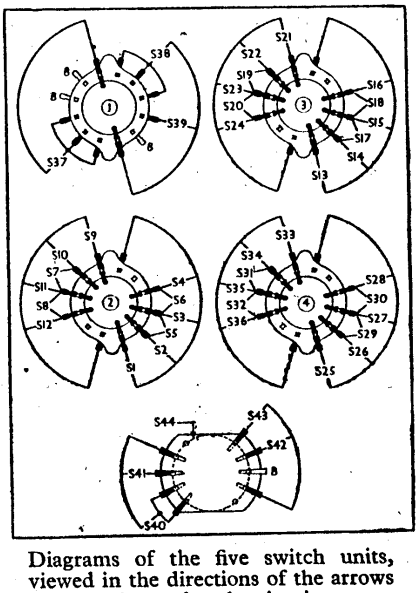
GENERAL NOTES

Switches.—S1-S36 are the waveband switches and **S37-S39** the radio/gram change switches, in four ganged rotary units beneath the chassis. These are indicated in our under-chassis view, where the arrows and numbers in circles identify the units and show in what direction they are viewed in the diagrams below, in which they are shown in detail. The table, col. 4, gives the switch positions for the four control settings, starting from the fully anti-clockwise position of the control. A dash indicates open, and **C**, closed.

S40, S41 are the variable selectivity switches, and **S42, S43** the tone control switches, ganged in a single four-position unit mounted on the front member beneath the chassis. The mains switch **S44** is mounted concentrically with this unit, and obscures the view of the **S40-S43** unit, with which it is ganged. In the fully anti-clockwise position, **S44** is open. In the next position (position 1) it closes, and remains closed in positions 2 and 3. Position 1 is high fidelity, while positions 2 and 3 give two grades of high note attenuation at maximum selectivity. The small switch table in col. 4 gives the switch positions for **S40-S43** at settings 1, 2 and 3; a dash indicates open, and **C**, closed. In the "Off" position all the switches are open. A diagram appears below.

Scale Lamps.—These are four MES-types rated at 6.2 V, 0.3 A.

External Speaker. — Two sockets are provided at the rear of the chassis for the connection of a low impedance (2-4 Ω) external speaker. As one side of transformer **T2** secondary is returned to chassis, and the speech coil **L24** meets it there via socket 4 on the adaptor, it would be a simple matter to insert a muting switch in the blue lead from socket 4 to



Diagrams of the five switch units, viewed in the directions of the arrows in the under-chassis view.

chassis, although care should be taken to see that the transformer will be loaded when the switch is open, otherwise the output valve may be damaged.

Condensers C26, C27.—These are two separate tubular type electrolytics mounted on the chassis deck. **C26** is rated at 8 μF, 500 V; **C27** is rated at 16 μF, 450 V.

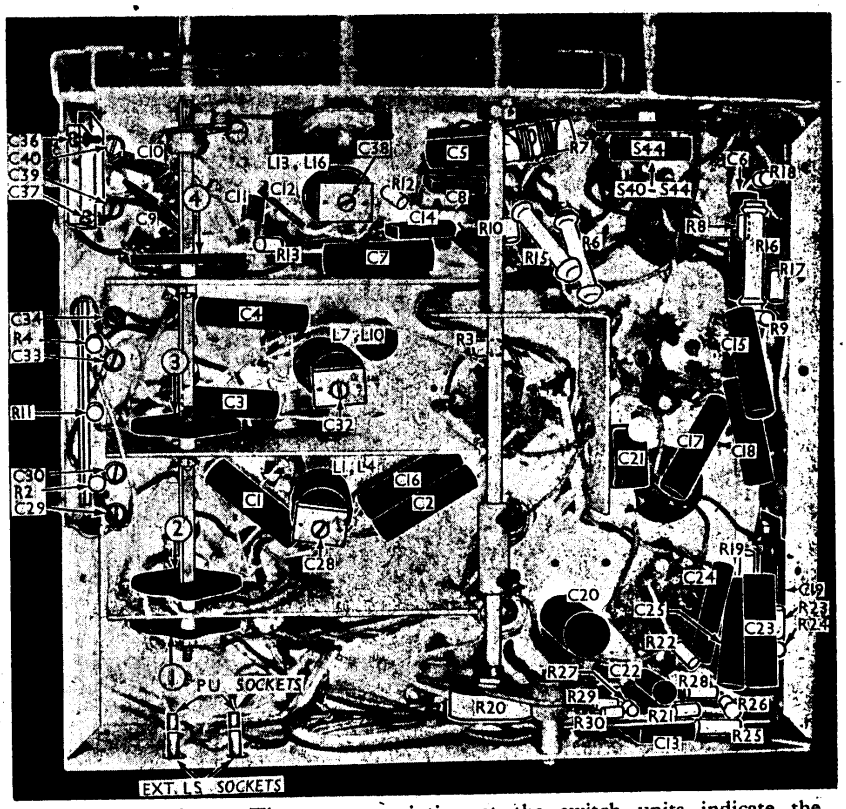
Speaker Connections.—A six-way cable from chassis is terminated in a socketed adaptor, which fits on to six pins mounted on a panel on the speaker input transformer. A diagram of the pins, drawn as seen when viewed from above the transformer, is given beneath the circuit diagram. Points at which connections occur are indicated in the circuit in the usual way and numbered to correspond with pin diagram beneath them. The colours marked are those of the leads in the cable attached to the socket-adaptor.

Chassis Divergencies.—**R1, R5** and **R15** are shown in our diagram, but were not present in our chassis. Presumably they are fitted only where necessary. The makers also show in their diagram a 0.002 μF mica condenser in parallel with **C15,** but this also was absent from our chassis. Switch **S37** was not indicated in the makers' diagram. It will also be observed in our dismantling instructions that some receivers are not provided with a plug-in speaker connecting device. In some models, also, reaction on SW may be increased by returning the bottom of **L13** to the bottom of **L16** instead of to chassis.

Switch Table

Switch	Gram	LW	MW	SW
S1	—	—	—	C
S2	—	—	C	—
S3	—	C	—	—
S4	C	—	—	—
S5	—	—	—	C
S6	—	—	C	—
S7	—	—	—	C
S8	—	—	C	—
S9	—	—	—	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	—	—
S28	C	—	—	—
S29	—	—	—	C
S30	—	—	C	—
S31	—	—	—	C
S32	—	—	C	—
S33	—	—	—	C
S34	—	—	C	—
S35	—	C	—	—
S36	C	—	—	—
S37	—	C	C	C
S38	—	C	C	C
S39	C	—	—	—

Switch	Position 1	Position 2	Position 3
S40	—	C	C
S41	C	—	—
S42	—	C	—
S43	—	—	C



Under-chassis view. The arrows pointing at the switch units indicate the directions in which they are viewed in the detailed diagrams at the foot of col. 3.

535 MODIFICATIONS

In the 535 autoradiogram, the pick-up output is fed into the grid circuit of **V3,** which then operates as an AF amplifier. The screen grid acts as a triode anode, **R16** as the AF load resistance, and **C16** as the AF coupling condenser.

The lead from **S40-S41** is broken before it reaches **C15,** and one bank of an additional switch unit is inserted, closing on the three radio positions of the main control with which it is ganged. In the **gram** position, **S40, S41** lead is switched to the upper pick-up socket, the lower socket being connected directly to chassis. A 100,000 Ω resistance is shunted across the sockets. The pick-up is thus included in **V3** control grid circuit.

The moving contact in the second bank of the new switch unit is connected to the earthy side of **C16,** which is disconnected from chassis. In the three radio positions it is returned via the switch to chassis, but in the radio position it is connected to the outer tag of **S39,** shown connected to the upper pick-up socket in our circuit diagram. Thus it is handed on via **R20** and **C22** to the output valve **V4.** In addition, a 50 μF, 12 V electrolytic condenser is shunted across **V3** cathode by-pass condenser **C18.**

CIRCUIT ALIGNMENT

IF Stages.—Switch set to MW or LW, turn the gang to minimum, the volume control at or near to maximum, and the selectivity (tone) control to maximum selectivity (position 2). This last condition is very important. Connect signal generator leads to control grid (top cap) of **V3,** via LW dummy aerial, and chassis, feed in a 460 KC/S (652 m) signal, and adjust **C45** and **C44** for maximum output.

Transfer signal generator lead from **V3** top cap to control grid (top cap) of **V2,** via the same dummy aerial, and adjust **C43** and **C42** for maximum output. Readjust **C44** and **C45,** and then all four trimmers, until no improvement can be obtained.

RF and Oscillator Stages.—See that the scale fits squarely in its frame. The three alignment dots should lie on a vertical line up the centre of the scale panel, and the centre dot (in the "G" of RGD) should be truly concentric with the pointer fixing screw. The scale can be adjusted after the four clamping screws have been slackened. With the gang at maximum, the pointer should be vertical. Transfer signal generator leads, via a suitable dummy aerial, to **A** and **E** sockets.

LW.—Switch set to LW, tune to 800 m (195 m on MW scale, at last division marked), feed in a strong 800 m (375 KC/S) signal, and adjust **C40** until the signal is indicated in the output. Reduce signal generator output and readjust **C40** carefully. Adjust **C30** and **C34** for maximum output, and then repeat these adjustments until no improvement results.

Tune to 2,000 m on scale, feed in a 2,000 m (150 KC/S) signal, and adjust **C37** for maximum output while rocking the gang for optimum results. Now readjust **C40** at 800 m and **C37** at 2,000 m, checking **C40** finally when no improvement can be obtained.

MW.—Switch set to MW, tune to 220 m on scale, feed in a 220 m (1,360 KC/S) signal, and adjust **C39,** then **C33** and **C29,** for maximum output. Feed in a 550 m (546 KC/S) signal, tune it in, and adjust **C36** for maximum output while rocking the gang for optimum results. Readjust **C39** at 220 m and **C36** at 550 m, finally adjusting **C39** when no improvement can be obtained.

SW.—Switch set to SW, tune to 16.5 m (last point marked on left-hand SW scale), feed in a 16.5 m (18.2 MC/S) signal, and adjust **C38** until two settings are found to give an output indication. It is important to identify these positions and select that involving the lesser trimmer capacity. Adjust **C38** accurately, then **C32** and **C28,** for maximum output. If double-humped tuning is observed when adjusting **C32,** this is due to "pulling," and can be eliminated by setting **C32** at the minimum point between the humps, and then readjusting **C38** slightly for maximum output. It may be necessary to repeat the adjustments several times before the effect disappears. Finally, feed in a strong 16.5 m signal, and check that its image is received at about 17:4 m on the scale. Check calibration at 50 m (6 MC/S), where it should be accurate within ± 1 per cent.

Under no circumstances should the end vanes of the gang sections be adjusted.

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