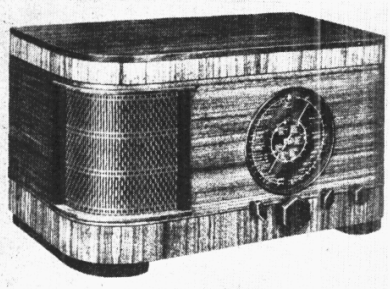


"TRADER" SERVICE SHEET

# 598

# RGD 516 AC

## 522 Console & 535 Autoradiogram



The RGD 516 superhet.

**V**ARIABLE 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 **C38** (SW), **C39** (MW) and **C11**, **C40** (LW); series tracking by **C12** (SW), **C9**, **C36** (MW),

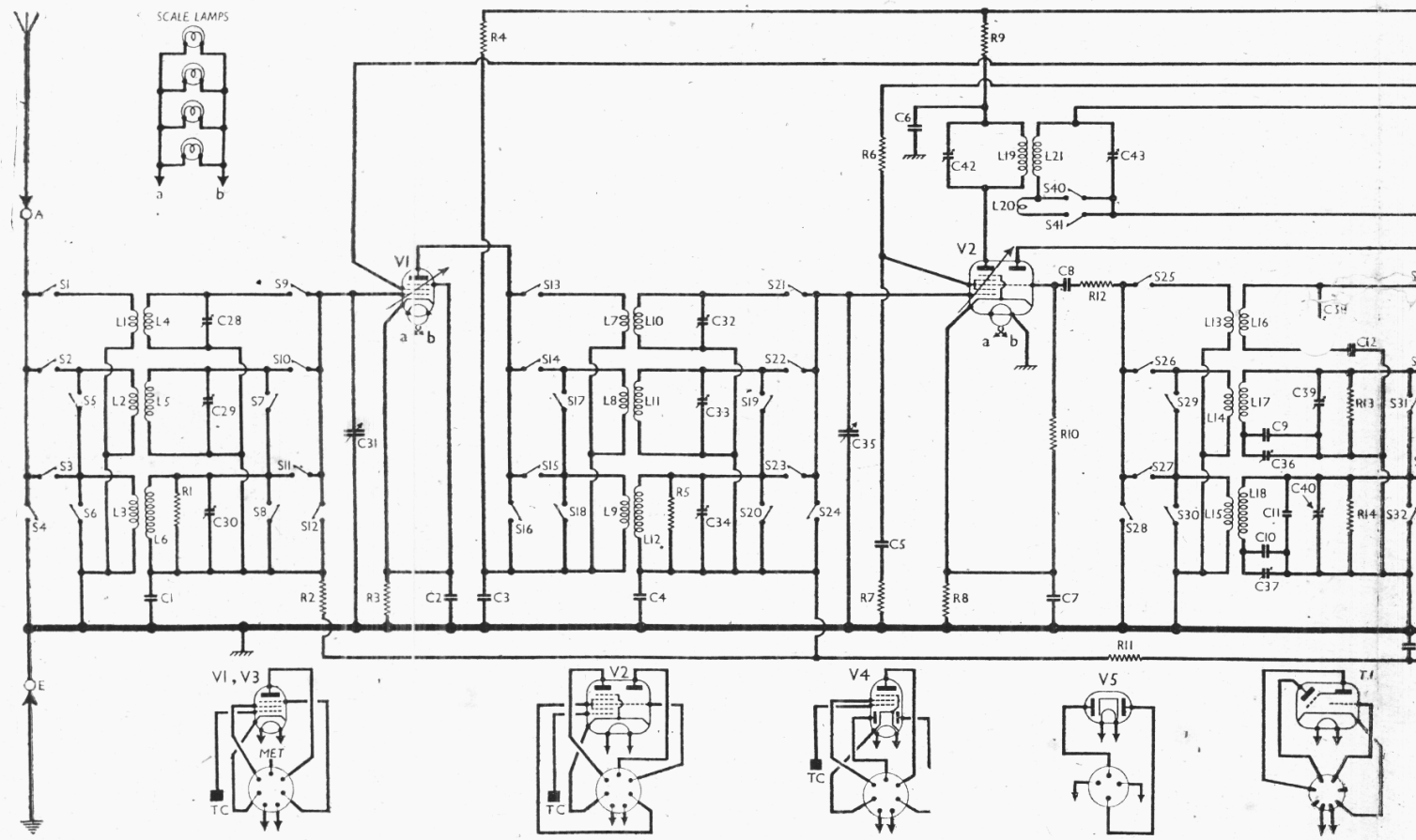
**C10**, **C37** (LW) and specially shaped vanes of **C41**. Reaction coupling by grid coils **L13** (SW), **L14** (MW) and **L15** (LW) via stabilising resistance **R12**.

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**,



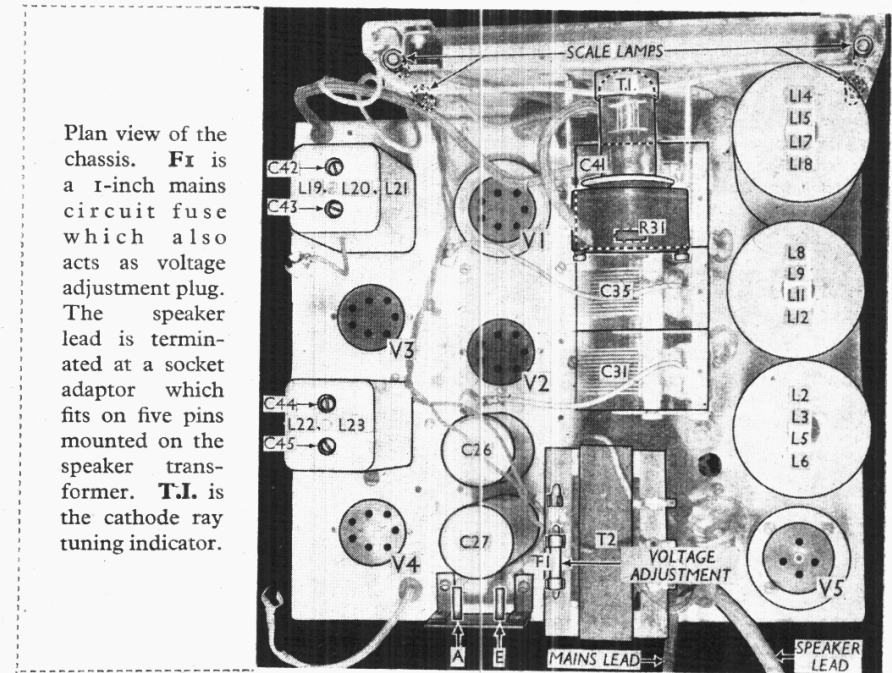
which also operates as load resistance, and passed via AF coupling condenser **C22** and CG resistance **R21** to CG of pentode section, which provides the only AF amplification. IF filtering by **C19, R19** and the capacity in the screened lead to **R20**.

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 adaptor. 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 re-

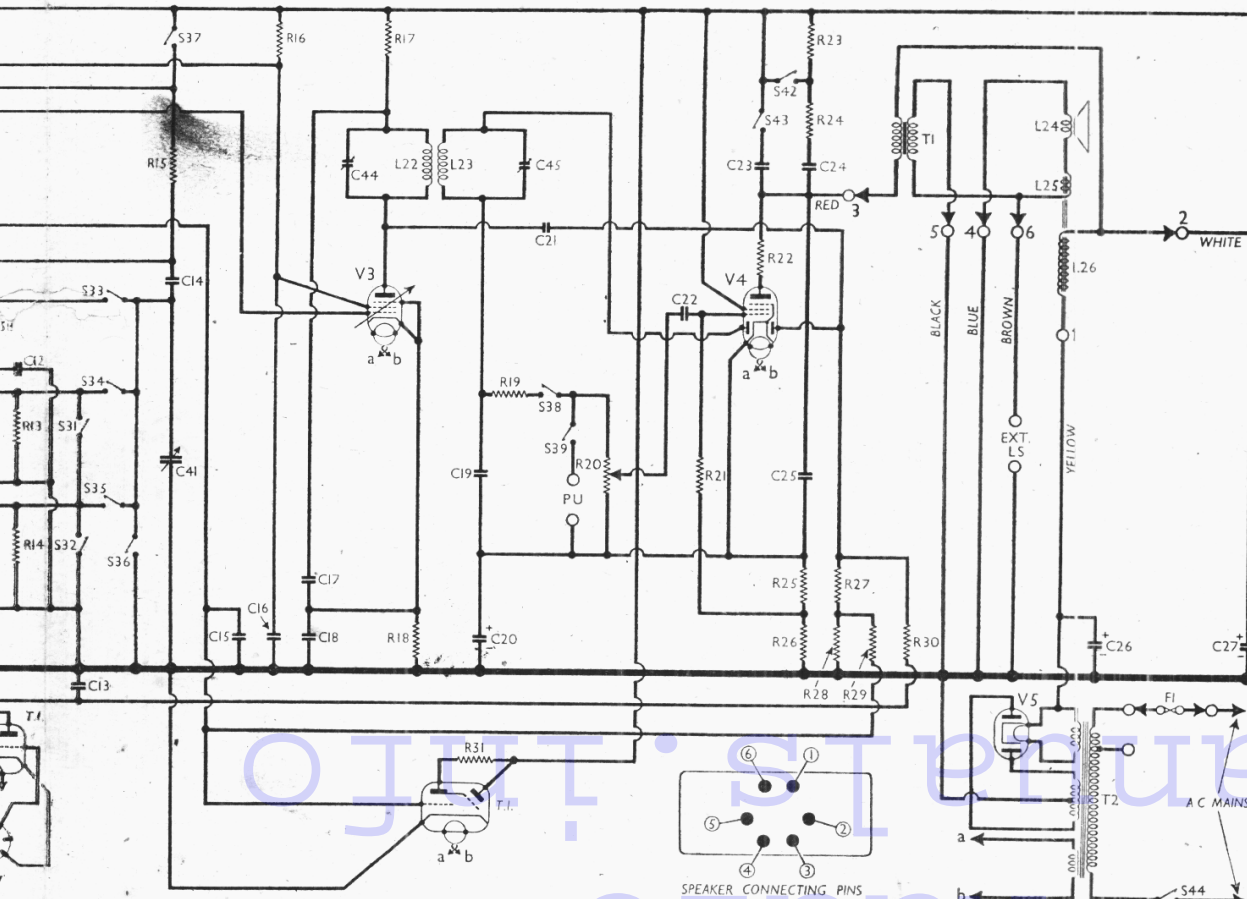


sistances **R25, R26** in **V4** cathode lead to chassis.

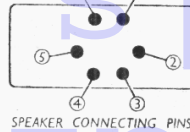
**V3** AVC line potential is used also as control voltage to operate the cathode ray tuning indicator (**T.I., Mullard TV4**).

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.



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 { Oscillator } 80	2.3 3.9	70	6.0
V3 VP4B	245	10.0	210	2.5
V4 AC/2 PenDD	255	34.0	265	6.5
V5 UU4	305†	—	—	—
T.L. TV4	15 { Target } 265	0.1 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	0.0004/5.
C10	Osc. circ. LW fixed tracker	0.00011.
C11	Osc. circ. LW fixed trimmer	0.00002/5
C12	Osc. circ. SW tracker	0.003
C13	AVC line decoupling	0.002
C14	V2 osc. anode coupling	0.0001
C15	V3 and T.L. 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	Tone control condensers	0.04
C24	Fixed tone corrector	0.02
C25	HT smoothing condensers	0.001
C26*	ers	16.0
C27*	ers	8.0
C28†	Aerial SW trimmer	0.00002/5
C29†	Aerial MW trimmer	0.00005
C30†	Aerial LW trimmer	0.00005
C31†	Aerial circuit tuning	—
C32†	RF trans. SW trimmer	0.00004
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	0.00004
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	Tone control resistances	5,000
R24	ances	2,000
R25	V4 fixed GB and AVC delay resistances	140
R26	ances	400
R27	V4 AVC diode load resistances	500,000
R28	ances	200,000
R29	V3 and T.L. CG's decoupling	1,000,000
R30	AVC line decoupling	1,000,000
R31	T.L. 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	Pri	4.0
L20	Coupling	0.2
L21	Sec.	8.0
L22	Pri	4.0
L23	Sec.	4.0
L24	Speaker speech coil	2.0
L25	Hum neutralising coil	0.3
L26	Speaker field coil	1,000.0
T1	Speaker input Pri. trans.	230.0
	Sec.	0.3
	Pri., total	19.0
T2	Mains Heater sec. trans.	0.05
	Rectheat.sec.	0.1
	HT sec., total	230.0
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.

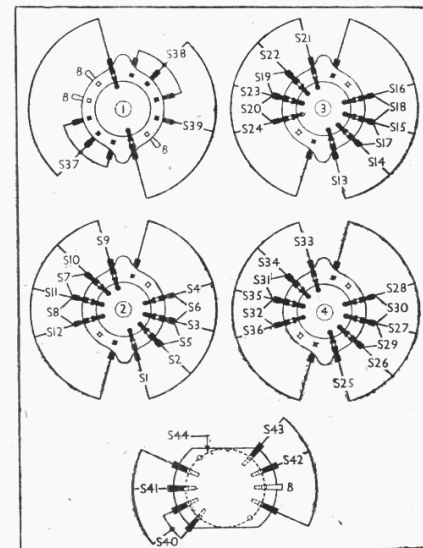
**GENERAL NOTES**

**Switches.**—S1-S36 are the waveband change 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  $\mu$ F, 500 V; C27 is rated at 16  $\mu$ F, 450 V.

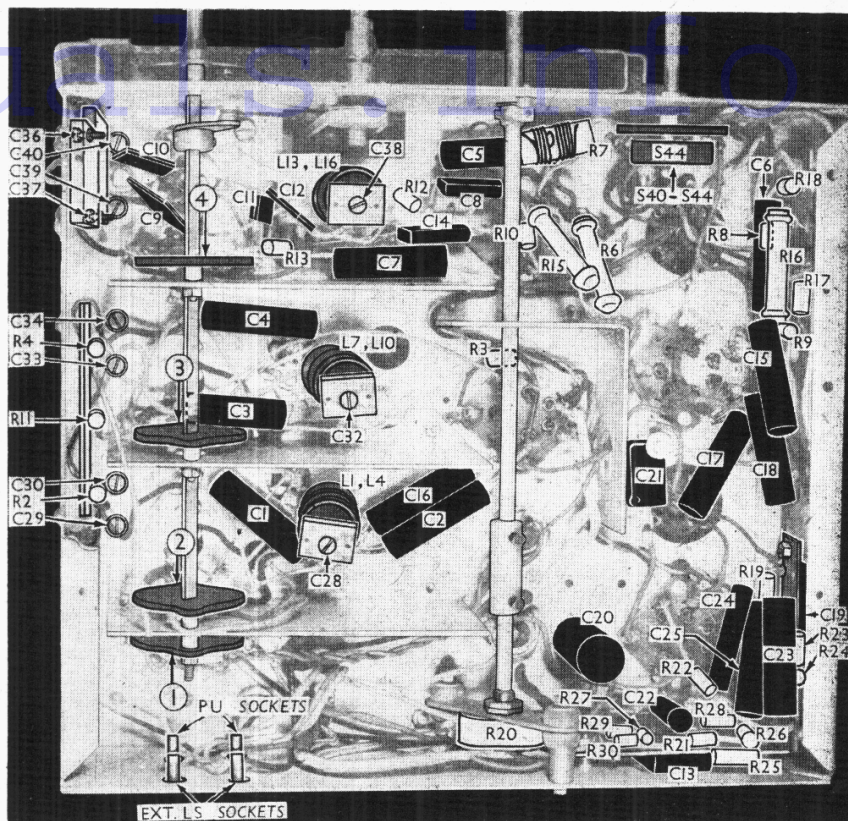
**Speaker Connections.**—A six-way cable from chassis is terminated in a socketed adaptor, which fits on to six pins mounted on a panel on the speaker input transformer. A diagram of the pins, drawn as seen when viewed from above the transformer, is given beneath the circuit diagram. Points at which 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  $\mu$ F 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	—	—
S38	—	—	—	C
S39	C	—	—	—

Switch	Position 1	Position 2	Position 3
S40	—	—	—
S41	C	C	C
S42	—	—	—
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  $\Omega$  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  $\mu$ F, 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  $\pm 1$  per cent.

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