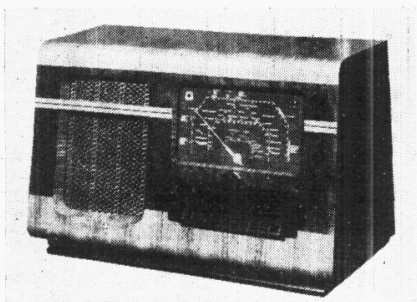
Supplement to The Wireless & Electrical Trader, August 12, 1939

"TRADER" SERVICE SHEET

421

R.G.D. 166

196, 296, 356 (AC)



The R.G.D. 166 table receiver.

THE R.G.D. 166 is a four-valve (plus rectifier) AC 3-band press-button superhet. There are ten press-buttons, including six for permeability tuned pre-set stations, three for manual waveband switching, and one for switching off.

A tuning indicator is fitted, and there is provision for an external speaker and for a pick-up. The SW band covers 16-50 m.

The receiver is for 200-250 V, 50-100 C/S mains.

Models 196 console, 296 radiogram, and 356 auto-radiogram have identical chassis, but the mains frequency is restricted to 50-60 C/S in the case of the radiograms.

This *Service Sheet* was prepared on a model 166.

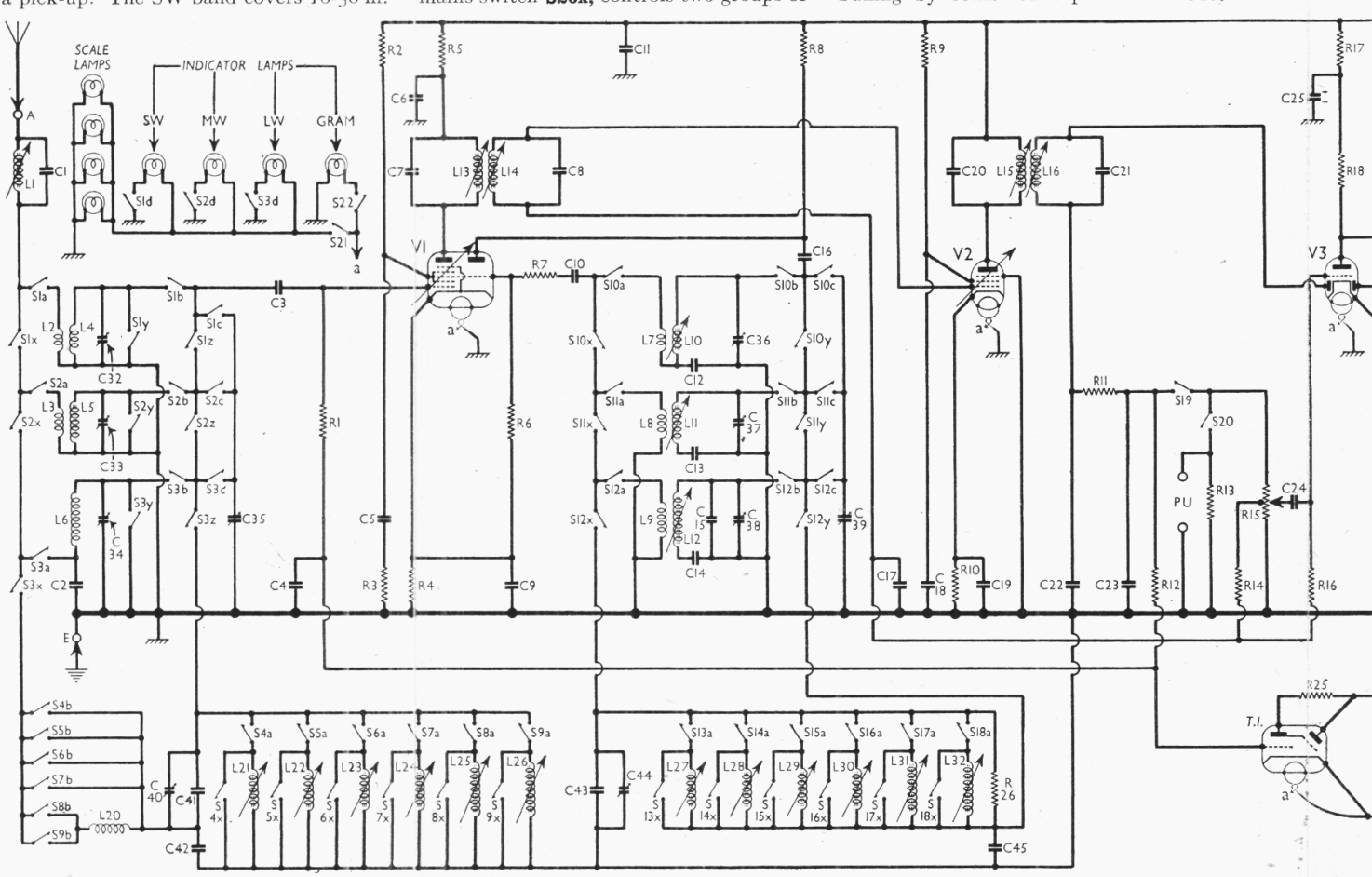
Release dates : all models, June, 1939.

CIRCUIT DESCRIPTION

All the switches associated with the press-button unit, with the exception of **S23,** have been coded so as to indicate their action. Switches bearing the suffix letter **a, b, c** or **d** close when the button with which they are associated is pressed, while those bearing the suffix **x, y** or **z** open ; when the button is released by the depression of another button the proceedure is reversed, the **a, b, c** and **d** switches opening and the **x**'s, **y**'s and **z**'s closing ; all switches bearing the same number belong to the same group and are operated by the same press-button, and each button, except that controlling the mains switch **S26x,** controls two groups of switches : one in the aerial and one in the oscillator circuit.

For manual operation, aerial input is via IF rejector **L1, C1** and coupling coils **L2** (SW) and **L3** (MW), or coupling condenser **C2** (LW), to single tuned circuits **L4, C35** (SW), **L5, C35** (MW) and **L6 C35** (LW) which precede triode pentode valve (**V1, Mazda metallised TH41**) operating as frequency changer with internal coupling. Oscillator anode coils **L10** (SW), **L11** (MW) and **L12** (LW) are tuned by **C39** ; parallel trimming by **C36** (SW), **C37** (MW) and **C15, C38** (LW) ; series tracking by fixed condensers **C12** (SW), **C13** (MW) and **C14** (LW) ; tracking adjustments by movement of the iron cores. Reaction by coils **L7** (SW), **L8** (MW) and **L9** (LW).

For automatic operation, aerial input is via **L1, C1** ; **S1x, S2x** and **S3x** ; one of the switches **S4b** to **S7b** (MW) or **S8b** or **S9b** and coil **L20** (LW) to coupling condenser **C42** and thus to tuning coils **L21** to **L26** via switches **S4a** to **S9a** according to which button is depressed. Tuning by combined capacities of **C40,**



Circuit diagram of the R.G.D. 166. The 196 console and the radiograms 296 and 356 have identical chas

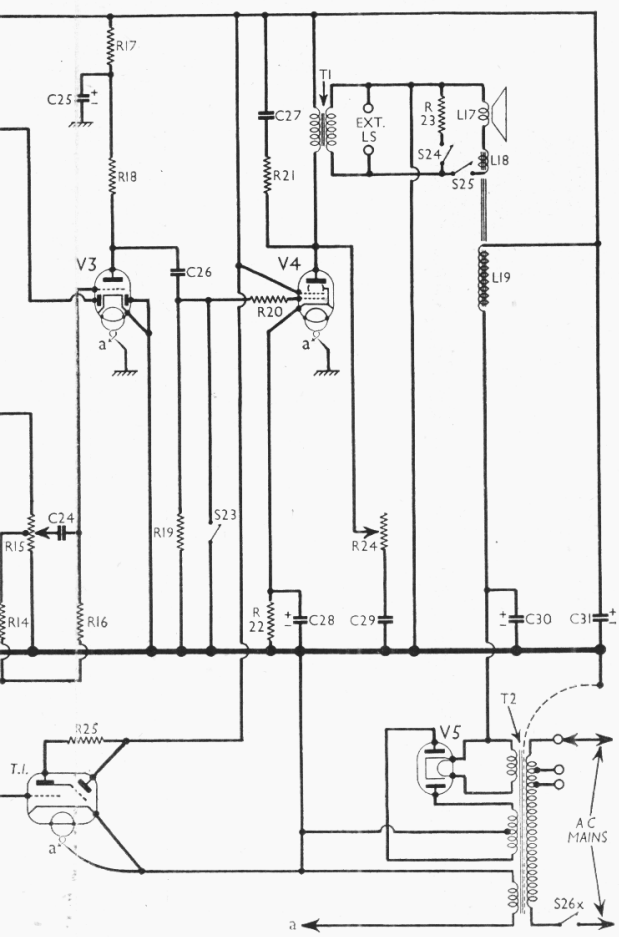
C41 and **C42**. The tuned circuit is connected via switches **S1z, S2z** and **S3z**, which are closed, to **V1** pentode control grid.

The oscillator control grid is connected via **S10x, S11x** and **S12x** to oscillator tuning circuit comprising one of the coils **L27** to **L32** and condensers **C43, C44**, selection being effected by switches **S13a** to **S18a** according to which button is depressed. Reaction coupling is effected by **C45** which is common to grid and anode circuits. Whereas a tuned anode circuit is employed for manual operation, automatic tuning is effected in the grid circuit.

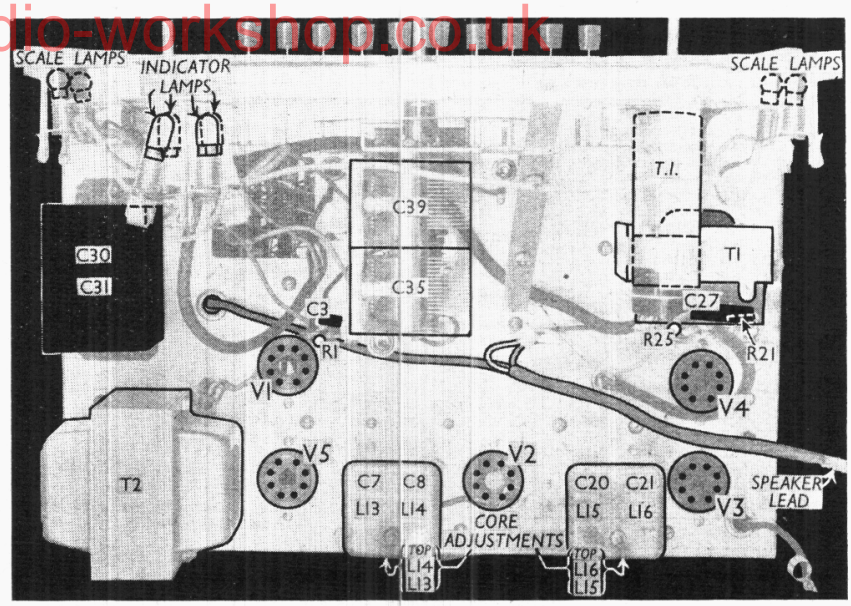
Second valve (**V2, Mazda metallised VP41**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary iron-cored transformer couplings **C7, L13, L14, C8** and **C20, L15, L16, C21**. IF trimming is effected by adjustment of the iron cores.

Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve (**V3, Mazda metallised HL42DD**). Audio frequency component in rectified output is developed across manual volume control **R15**, which also operates as load resistance, and passed via AF coupling condenser **C24** and CG resistance **R16** to CG of triode section, which operates as AF amplifier. IF filtering by **C22, R11, C23**. Provision for connection of pick-up across **R15** via **S20** which closes when the receiver is switched to gram, while **S19** opens to mute radio.



e identical chassis.



Plan view of the chassis. The IF transformer core adjustments, reached from the rear of the chassis, are indicated.

DC potential developed across **R15**, and part of it, obtained at tapping on **R15**, are fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control. The voltage appearing on the higher potential AVC line is applied as control voltage to CG of cathode ray tuning indicator (**T.I., Mazda ME41**).

V3 triode CG is returned via **R16** to the lower potential AVC line, from which it obtains its GB voltage according to the strength of the incoming carrier. On gram, GB is developed across **R16, R14** and part of **R15** by the passage of grid current.

Resistance-capacity coupling by **R18, C26** and **R19** between **V3** triode and beam tetrode output valve (**V4, Mazda Pen45**). Fixed tone correction by **C27, R21,** and variable tone control by **R24, C29,** both in anode circuit. Provision for connection of low impedance external speaker across secondary of output transformer **T1.** Switches **S24, S25** permit internal speaker to be muted, and substitute for it an artificial load resistance, **R23.**

HT current is supplied by IHC full-wave rectifying valve (**V5, Mazda metallised UU6**). Smoothing by speaker field **L19** and electrolytic condensers **C30, C31.**

VALVE ANALYSIS

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 TH41	270 (Oscillator)	7·2	134	5·4
	90	3·8		
V2 VP41 ..	282	9·9	203	3·0
V3 HL42DD	58	3·4	—	—
V4 Pen45 ..	260	43·0	282	8·0
V5 UU6 ..	333†	—	—	—
T.I. ME41..	3	0·3	—	—
	Target†			
	282	0·2		

† Each anode, A.C

Valve voltages and currents given in the table above are those measured in our receiver when it was operating on mains of 228 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.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial IF rejector tuning ..	0·00025
C2	Aerial LW coupling impedance	0·01
C3	V1 pentode CG condenser ..	0·0001
C4	V1 pentode CG decoupling ..	0·04
C5	V1 SG decoupling	0·1
C6	V1 pentode anode decoupling	0·1
C7	1st IF transformer fixed	0·0002
C8	tuning condensers.. ..	0·0002
C9	V1 cathode by-pass	0·04
C10	V1 osc. CG condenser ..	0·0001
C11	HT circuit RF by-pass ..	0·1
C12	Osc. circuit SW tracker ..	0·003
C13	Osc. circuit MW tracker ..	0·00049
C14	Osc. circuit LW tracker ..	0·00016
C15	Osc. circuit LW fixed trimmer	0·00005
C16	V1 osc. anode coupling ..	0·0001
C17	V2 CG decoupling	0·1
C18	V2 SG decoupling	0·1
C19	V2 cathode by-pass	0·04
C20	2nd IF transformer fixed	0·0002
C21	tuning condensers ..	0·0002
C22	IF by-pass condensers ..	0·00015
C23		·0001
C24	AF coupling to V3 triode ..	0·01
C25*	V3 triode anode decoupling..	8·0
C26	V3 triode to V4 AF coupling	0·04
C27	Part of fixed tone corrector..	0·001
C28*	V4 cathode by-pass ..	50·0
C29	Part of variable tone control	0·1
C30*	HT smoothing condensers ..	16·0
C31*		16·0
C32‡	Aerial circuit SW trimmer..	0·00003
C33‡	Aerial circuit MW trimmer..	0·00003
C34‡	Aerial circuit LW trimmer ..	0·00003
C35†	Aerial circuit tuning.. ..	—
C36‡	Osc. circuit SW trimmer ..	0·00003
C37‡	Osc. circuit MW trimmer ..	0·00003
C38‡	Osc. circuit LW trimmer ..	0·00003
C39†	Oscillator circuit tuning ..	—
C40‡	Automatic aerial tuning trimmer	0·00003
C41	Automatic aerial input	0·00025
C42	coupling condensers ..	0·0015
C43	Automatic oscillator circuit	0·00037
C44‡	tuning condensers ..	0·00003
C45	Auto. osc. reaction coupling	0·0008

* Electrolytic. † Variable. ‡ Pre-set.

RESISTANCES		Values (ohms)
R1	V1 pentode CG resistance ..	500,000
R2	V1 SG HT feed	25,000
R3	V1 SG stabiliser	0·7
R4	V1 fixed GB resistance ..	200
R5	V1 pentode anode HT feed..	4,700
R6	V1 osc. CG resistance ..	50,000
R7	V1 osc. CG stabiliser ..	100
R8	V1 osc. anode HT feed ..	40,000
R9	V2 SG HT feed	25,000
R10	V2 fixed GB resistance ..	270
R11	IF stopper	100,000
R12	AVC line decoupling.. ..	2,000,000
R13	Pick-up shunt	50,000
R14	AVC line decoupling.. ..	1,000,000
R15	Manual volume control: V3 signal diode load	500,000*
R16	V3 triode CG resistance ..	2,000,000
R17	V3 triode anode decoupling ..	20,000
R18	V3 triode anode load ..	50,000
R19	V4 CG resistance	500,000
R20	V4 grid stopper	4,700
R21	Part of fixed tone corrector..	4,700
R22	V4 GB resistance	180
R23	T1 sec. artificial load ..	5
R24	Variable tone control ..	25,000
R25	T.I. anode HT feed	1,000,000
R26	Auto. osc. circuit damping ..	20,000

* Centre-tapped.

OTHER COMPONENTS			Approx. Values (ohms)
L1	Aerial IF rejector coil	Manual tuning coils	2·2
L2	Aerial SW coupling coil		1·2
L3	Aerial MW coupling coil		13·3
L4	Aerial SW tuning coil		Very low
L5	Aerial MW tuning coil		1·8
L6	Aerial LW tuning coil		13·0
L7	Oscillator SW reaction		10·5
L8	Oscillator MW reaction		25·0
L9	Oscillator LW reaction		50·0
L10	Osc. circuit SW tuning		Very low
L11	Osc. circuit MW tuning		1·25
L12	Osc. circuit LW tuning		3·4
L13, L14	1st IF trans.	Pri. .. / Sec. ..	3·75
L15, L16	2nd IF trans.	Pri. .. / Sec. ..	3·75
L17	Speaker speech coil ..		2·6
L18	Hum neutralising coil ..		0·1
L19	Speaker field coil		1,200·0

continued in next column

OTHER COMPONENTS (*Continued*)			Approx. Values (ohms)
L20	Auto aerial LW coupling coil		11·0
L21	Aerial circuit MW automatic tuning coils		0·1
L22			0·1
L23			0·15
L24			0·15
L25	Aerial circuit LW automatic tuning coils		0·15
L26			0·2
L27	Oscillator circuit MW automatic tuning coils ..		1·0
L28			1·3
L29			3·0
L30			3·5
L31	Oscillator circuit LW automatic tuning coils ..		5·5
L32			6·4
T1	Output trans.	Pri. .. / Sec. ..	430·0 / 0·5
T2	Mains trans.	Pri., total .. / Heater sec. .. / Rect. heat. sec. / HT sec., total	25·0 / 0·1 / 0·05 / 300·0
S1a, b, c, x, y, z to S3a, b, c, x, y, z	Aerial circuit waveband switches (manual) ..		—
S1d-S3d	Waveband indicator switches		—
S4a, b, x to S9a, b, x	Aerial circuit automatic selector switches ..		—
S10a, b, c, x, y to S12a, b, c, x, y	Oscillator circuit waveband switches (manual) ..		—
S13a, x to S18a, x	Oscillator circuit automatic selector switches ..		—
S19-S22	Radio/gram change switches		—
S23	Receiver muting switch ..		—
S24, S25	Speaker switches		—
S26x	Mains switch		—

DISMANTLING THE SET

The cabinet is fitted with a detachable bottom, upon removal of which access may be gained to most of the components beneath the chassis.

Removing Chassis.—Remove the three control knobs (self-tapping screws), the two knurled screws holding the bakelite escutcheon to the front of the cabinet, and the four hexagon bolts holding the chassis to the bottom of the cabinet, when the chassis may be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unsolder the four chassis leads from the paxolin connecting strip on the speaker. *When replacing*, note that two felt washers are fitted on each control spindle, between the knob and the cabinet. Connect the speaker leads as follows, numbering from left to right: 1, red; 2, blank; 3, two yellow leads: one from chassis and one from speaker switch; 4, white; 5, black from chassis and black (with red tracer) from speaker switch; 6, blue.

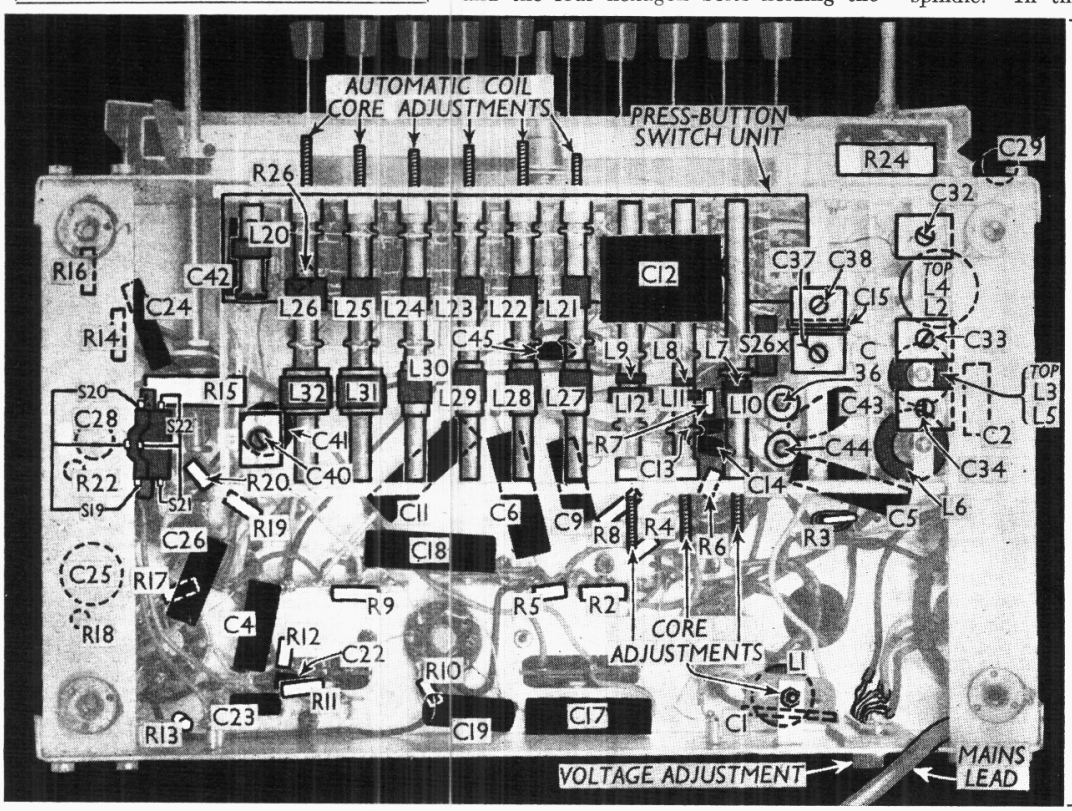
Removing Speaker.—Unsolder the seven leads going to the chassis and speaker switch, and loosen the four clamp nuts holding the speaker to the sub-baffle. If the clamps are now swivelled, the speaker can be withdrawn. *When replacing*, the connecting strip should be at the top and the leads connected as detailed above.

GENERAL NOTES

Switches.—All the switches, except those involved in the radio/gram change-over and the speaker switches, are associated with the press-button unit. **S1a, b, c, d, x, y, z,** to **S18a, x** are of the usual press-button type, those with **a, b, c** or **d** suffixes closing when their button is pressed, and those with **x, y** or **z** opening when their button is pressed.

All these switches are indicated in the diagrams of each side of the press-button unit in cols. 5 and 6. Several components are shown also on one side.

S19-S22 are the radio/gram switches comprising a toggle-type two-way change-over switch, which is mounted on the volume control **R15** and operated by a push-pull movement of the volume control spindle. In the gram position (pulled



Under-chassis view. All the tuning coils and trimmers, except those of the IF transformers, are indicated, as is also the position of the press-button switch unit. **C10** and **C16**, which are shown in the switch diagram, and **R23**, which is mounted across the **S24, S25** unit, are not shown.

out) **S20** is closed and **S19** open. **S22** is closed to light the gram indicator lamp, and **S21** is open, so that all other lamps are extinguished.

S23 is the muting switch, which is normally open, but closes while any press-button is being operated.

S24, S25 are the speaker switches. They form a change-over switch for muting purposes: when **S25** opens, **S24** closes and connects **R23** across **T1** secondary, so that a load is maintained in **V4** anode circuit. The switch unit is mounted at the top of the rear of the cabinet, and **R23** is soldered directly to tags across it.

S26x is the QMB mains switch, operated by the "Off" press-button. It opens when its button is pressed, and closes when any other button is pressed.

Coils.—**L1**, with its condenser, is mounted on the rear member of the chassis; all the RF and oscillator coils are mounted in a single assembly together with the press-button switch unit beneath the chassis. The aerial circuit manual coils **L2-L6** are in three unscreened tubular units, seen on the right in our under-chassis view; the oscillator manual coils **L7-L12** and the six pairs of permeability tuned auto coils **L21-L32** are shown in a row above the switch unit in the same view; **L20** is to the left of this row.

The IF transformers **L13, L14** and **L15 L16** are in two screened units on the chassis deck with their associated trimmers. They are shown in our plan chassis view and the positions of the core adjustments are indicated.

The transformers **T1** and **T2** are also on the chassis deck.

Scale and Indicator Lamps.—These are eight tubular lamps with MES bases, rated at 6·2 V, 0·3 A. The four scale lamps are alight whenever the set is in operation, except on gram, when only the "G" lamp is alight; the remaining three waveband indicator lamps light to indicate the appropriate waveband on manual operation.

External Speaker.—Two sockets are provided at the rear of the chassis for a low impedance (2-4 O) external speaker. The internal speaker may be muted if desired (see under "Switches.")

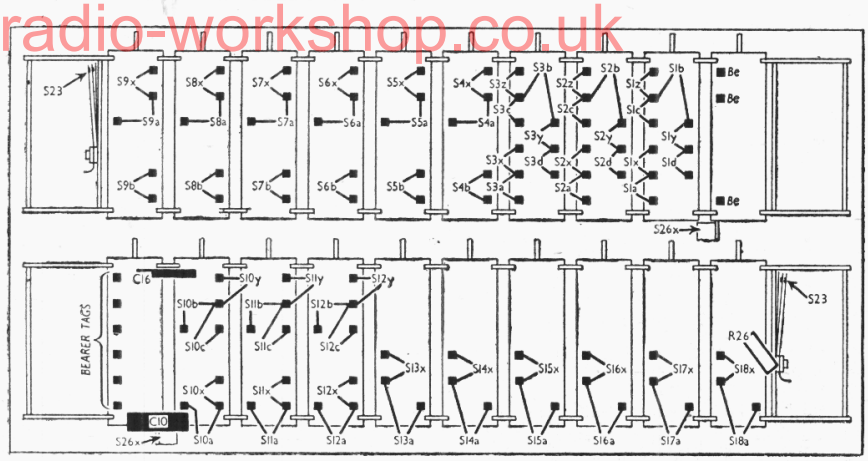
Pick-up Connections.—Two sockets are provided at the rear of the chassis for a magnetic-type pick-up; the sockets are shunted by **R13.**

Condensers C30, C31.—These are two dry electrolytics rated at 16 μF, 550 V peak, in a rectangular cardboard container, situated on the chassis deck.

Pre-set Trimmers.—**C32-C34** are mounted near their appropriate coil units; **C36-C38** are mounted in a row beside the oscillator coils. Near them is **C44,** the oscillator auto tuning capacity trimmer, while its aerial equivalent **C40** is at the opposite end of the coil assembly. All the coil trimmers are shown in our under-chassis view.

R23.—This resistance is not shown in our illustrations; it is mounted on the speaker switch assembly.

Chassis Divergencies.—**R5, R20** and **R21** are shown as 5,000 O in the makers' diagram, but were 4,700 O in our chassis. **R26** is given as 25,000 O, but ours was 20,000 O. The makers' diagram also shows **R12** connected to the top of **R15** instead of the other side of **S19,** as in our chassis; and a 0·000025 μF fixed trimmer is shown connected across **C37.** This condenser may be found in some chassis.



Diagrams of the press-button switch unit. Above, as seen looking at the underside of the chassis; below, side facing chassis deck. **C10, C16** and **R26** are shown.

PRESS-BUTTON RANGES

The wavelength ranges of the six pre-set coil pairs are given in the table below, buttons controlling them being numbered from left to right when looking at the front of the receiver. The setting operation involves only one adjustment, since the aerial and oscillator coils form dual units in which the cores are ganged in pairs.

Button Nos.	Wavelength Ranges
1	1,420-2,100 m
2	1,050-1,540 m
3	315- 545 m
4	268- 455 m
5	254- 422 m
6	190- 328 m

Each trimmer screw protrudes from the front of the chassis, immediately below its associated press-button, and can be reached upon removal of the moulded escutcheon which surrounds the buttons. An anti-clockwise movement *reduces* the wavelength and vice-versa; final adjustment should always be made on the carrier of the desired station.

CIRCUIT ALIGNMENT

IF Stages.—The makers recommend that a special tool should be made up for adjusting the cores of the IF transformers. It should have a tapered blade measuring 2·5 mm by 0·5 mm at the tip and should be made of some hard insulating material, such as bone. On no account should a metal screwdriver be used for trimming.

Switch set to MW or LW, turn gang to minimum, and volume control to maximum.

Connect signal generator to control grid (top cap) of **V1,** and chassis, feed in a 465 KC/S signal, and adjust the cores of **L15, L16** and then **L13, L14** for maximum output, keeping the input as low as possible, to prevent AVC action from influencing the operation.

Transfer signal generator to **A** and **E** sockets, feed in a 465 KC/S signal, and adjust the core of **L1** for *minimum* output.

RF and Oscillator Stages.—With the gang at maximum, the pointer should lie along the high-wavelength ends of the three scale lines. Connect signal generator to **A** and **E** via a suitable dummy aerial.

M W.—Switch set to MW, tune to 220 m on scale, feed in a 220 m (1,362 KC/S) signal, and adjust **C37** and **C33** for maximum output, keeping input low. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust core of **L11** for maximum output, rocking the gang for optimum results. Re-check at 220 m and 500 m until no further improvement can be made.

LW.—Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 KC/S) signal, and adjust **C38** and **C34** for maximum output, keeping input low. Feed in a 2,000 m (150 KC/S) signal, tune it in, and adjust core of **L12** for maximum output, while rocking the gang for optimum results. Re-check at 1,000 m and 2,000 m until no further improvement can be made.

SW.—Switch set to SW, tune to 16·5 m on scale, feed in a 16·5 m (18·2 MC/S) signal, and adjust **C36** and **C32** for maximum output, keeping input low. If two peaks are found when adjusting **C36,** choose that involving the *lesser* trimmer capacity. Feed in a 50 m (6 MC/S) signal, tune it in, and adjust **L10** inductance screw for maximum output, rocking the gang for optimum results. Re-check **C36** at 16·5 m and **L10** screw at 50 m until no further improvement results.

Note.—If a new coil has been fitted, its core should be adjusted at the top of the appropriate waveband before the usual alignment is proceeded with. This should be done at 50 m (SW), 500 m (MW) and 2,000 m (LW).

Press-Button Coils.—Depress the sixth button from the left, with signal generator still connected to **A** and **E** sockets as above. Feed in a 322 m (935 KC/S) signal and screw *in* (clockwise) the core adjustment screw (immediately below the depressed button of **L21, L27** until the signal is received. Then slowly reduce the frequency of the generator and follow it by screwing further in the core adjustment, until the cores reach their maximum position, after which further clockwise movement causes the coil frequency to rise again. From this point, unscrew (anti-clockwise) two turns of the adjusting screw, feed in a 916 KC/S signal and adjust **C44** and **C48** for maximum output.

This completes the alignment procedure, but the disturbed core must be re-set to the desired station.