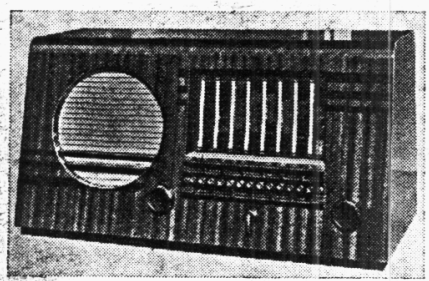
Supplement to The Wireless & Electrical Trader, Oct. 7, 1939.

"TRADER" SERVICE SHEET

430

PYE 906

INTERNATIONAL AC SUPERHET



THE provision of six SW bandspread circuits is the most outstanding feature of the Pye International 906 receiver. In addition, two MW and two LW pre-set stations are provided for, besides the usual manual tuning circuits.

All waveband and station selector switching, together with that for pick-up change-over, is controlled by thirteen press-buttons.

The receiver is a 4-valve (plus rectifier) 8-band superhet, suitable for use with 200-250V, 40-100 C/S mains.

Release date: July, 1939.

CIRCUIT DESCRIPTION

All the switches associated with the press-button unit have, as in previous issues, been coded so as to indicate their functions: all switches bearing the same number belong to the same group and are operated by the same press-button; those bearing the suffix **a, b** or **c** *close* when their button is pressed; those with the suffix **x, y** or **z** *open*. When the button is released by depression of another button, the converse is the case.

Two groups are controlled by each button: one in the aerial circuit, and the corresponding group in the oscillator circuit.

For MW and LW operation, aerial input is via switch **S12Y**, the appropriate group switches and coupling coil **L2** (MW) or condensers **C1, C2** (LW) to single tuned circuits comprising **L3** (MW) or **L4** (LW) tuned by **C43** (manual) or pre-set trimmers **C39** to **C42** (auto).

For SW operation, input is via **S12Y** as before (except on 13m band), appropriate switch group and coupling circuit, to pre-tuned circuits which each cover a given short-wave band, without variable tuning in the aerial circuit. These circuits are peaked near the middle of their bands.

All the **x** switches in the aerial circuit form a series between the frequency changer control grid and the required switch group; on gram, when all tuning buttons are "out," they connect that control grid to the AVC line.

First valve **(V1, Mullard ECH3)** is a triode hexode operating as frequency changer with internal coupling. Triode oscillator anode coils are connected in turn via the **x** series, and in each case are tuned.

For manual tuning, **L27** (MW) and **L28** (LW) are tuned by **C66**; parallel trimming by **C64** (MW) and **C14, C65** (LW); series tracking by **C12, C62** (MW) and **C13, C63** (LW). Reaction by grid coils **L25** (MW) and **L26** (LW) via **S19c** and **S20c** and **L19, L17.**

For automatic tuning, permeability-cored coils **L29, L30** (MW) and **L31, L32** (LW) are connected in turn between oscillator anode and, via **C16,** chassis; the tuning capacity is provided by fixed condenser **C15.** Reaction coupling is effected by the common capacity of **C16,** which is connected in the grid circuit via **L17, L19** and one of the switches **S21b** to **S24b.**

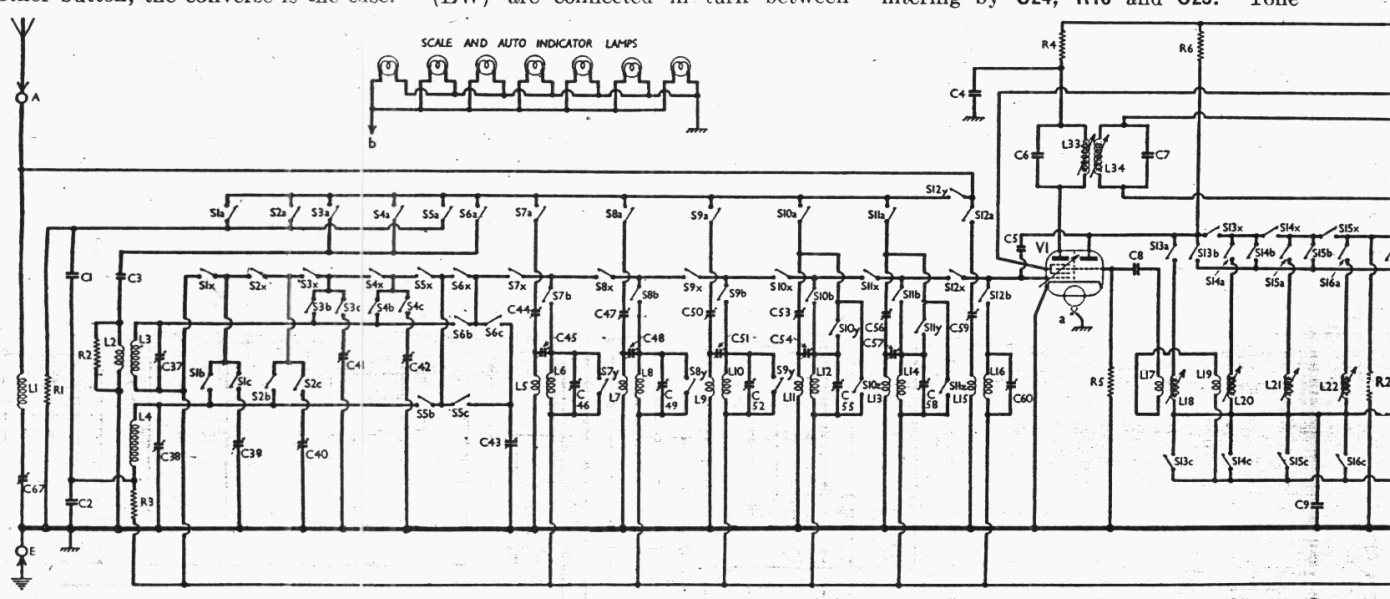
For SW operation, the permeability-cored bandspread coils **L18, L20, L21, L22, L23** and **L24** are connected in turn between the anode and, via **C9,** chassis, and tuned by variable bandspread condenser **C61** in parallel with "tank" capacity **C10.** Reaction coupling is effected by the common capacity of **C9,** which is connected in the grid circuit via **L17, L19** and one of the switches **S13c** to **S18c. L17** (13m band) and **L19** (16m band) provide additional reaction coupling on these two bands.

When any of the SW bands is in operation, the normal oscillator anode resistance value is reduced by the addition of **R7,** in parallel with **R6;** when the 25m, 31m or 49m band is in circuit, **R27** is connected between anode and chassis.

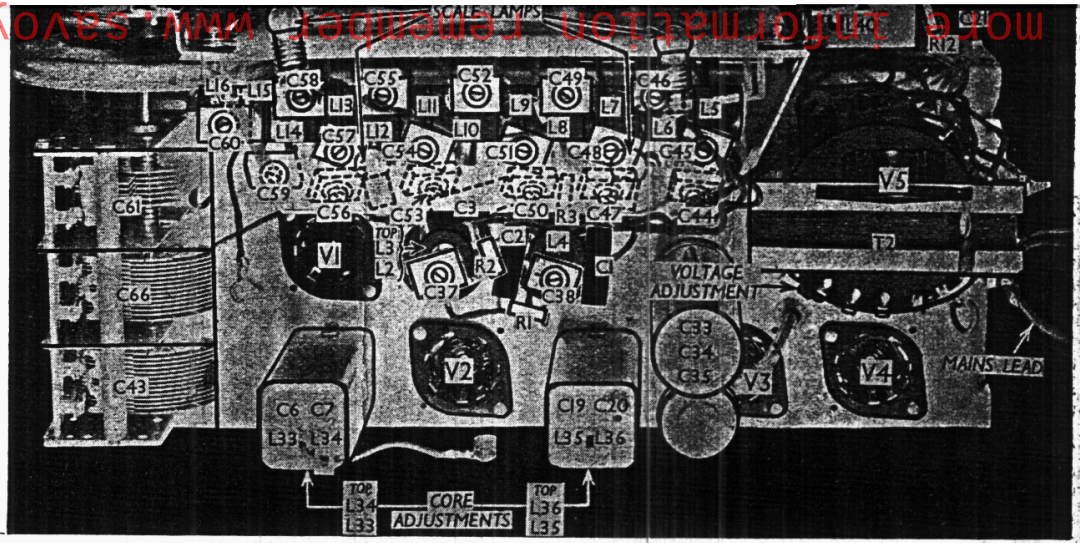
Second valve **(V2, Mullard EF9)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary variable iron cored transformer couplings **C6, L33, L34, C7** and **C19, L35, L36, C20.**

Intermediate frequency 462KC/S.

Diode second detector is part of double diode triode valve **(V3, Mullard EBC3).** Audio frequency component in rectified output is developed across load resistances **R10, R11;** that across **R11** is passed via **S25x, C22** and manual volume control **R13** to CG of triode section. IF filtering by **C24, R10** and **C25.** Tone



Circuit diagram of the Pye International AC superhet. Apart from the RF and oscillator section, th



Plan view of the chassis. The short-wave and some of the other trimmers are indicated. The IF core adjustments are also shown. **L40** is an iron-cored smoothing choke, additional to **L39**, the speaker field.

compensation by **R12, C21** and **S26**. Fixed tone control by **C28**.

Provision for connection of gramophone pick-up via **S25a, C22** across **R13**.

Second diode of V3, fed from **V2** anode via **C23**, provides DC potential which is developed across load resistances **R19, R20** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control. Delay voltage, together with GB for triode section, is obtained from drop along **R14**.

Resistance-capacity coupling by **R17, C29** and **R21** between **V3** triode and pentode output valve **(V4, Mullard EL6)**. Four-position tone control by **C30, R23, C31** and switches **S27, S28** in anode circuit, and **S26, S29**.

When **S29** is closed, some of the output from **T1** is developed across **R24, C32**; that across **C32** is also developed across **R15**, so that negative feed-back coupling is established in **V3** cathode circuit. When **S29** is open, no current flows through **R24, C32**, and the feed-back circuit is inoperative.

Provision for connection of external speaker by socketed plugs connecting internal speaker across **T1**, so that internal, external, or both speakers may be used.

HT current is supplied by full-wave rectifying valve **(V5, Mullard AZ2)**. Smoothing by iron cored choke **L40**, speaker field **L39**, and dry electrolytic condensers **C33, C34, C35**.

Fixed GB voltage for **V1** and **V2**, and GB for **V4**, are obtained from drop along resistances **R25** and **R26** in negative HT lead to chassis.

DISMANTLING THE SET

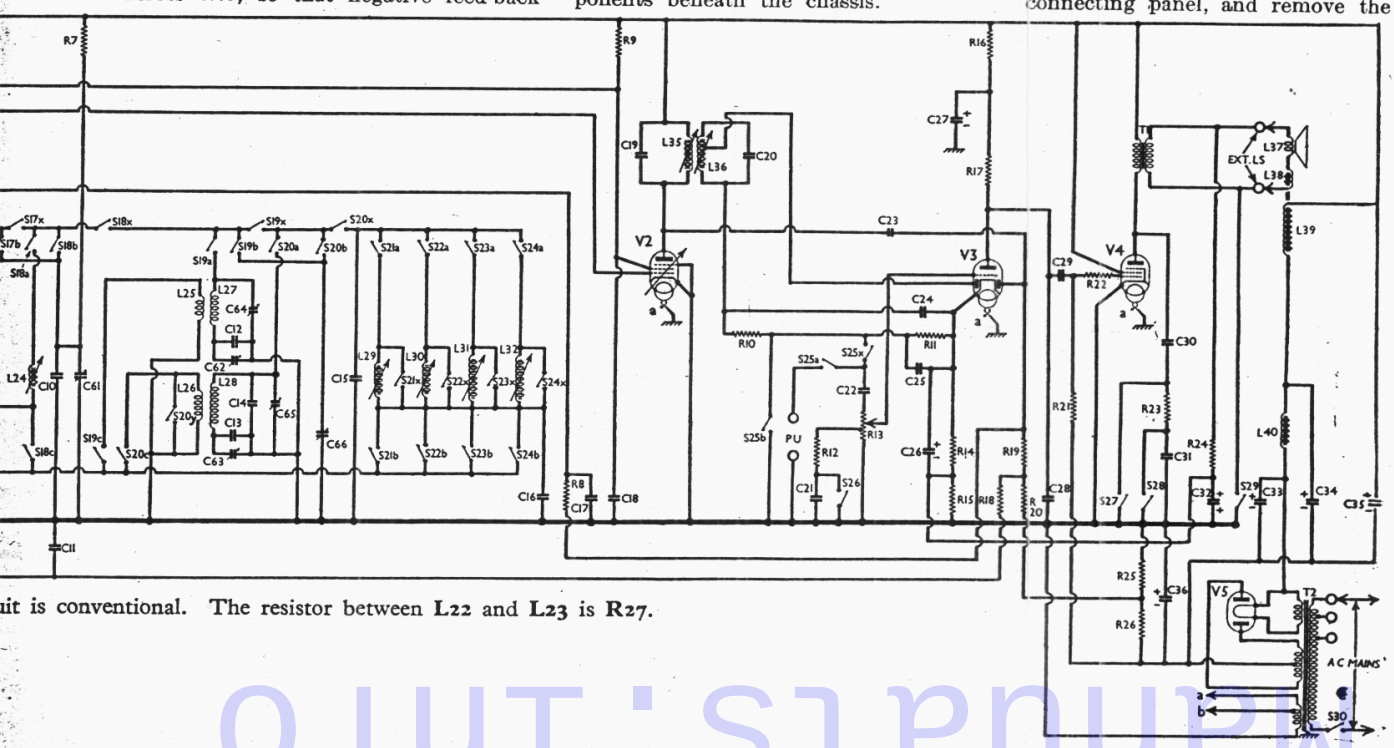
The cabinet is fitted with a detachable bottom, upon removal of which access may be gained to most of the components beneath the chassis.

Removing Chassis.—Remove the three control knobs (pull off) from the front of the cabinet and the four bolts (with metal cup washers) holding the chassis to the bottom of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unplug the speaker leads and remove the two field coil leads from the connecting panel on the speaker.

When replacing, connect the black field coil lead to the left-hand terminal on the speaker connecting panel, and the red lead to the right-hand terminal. A felt washer should be placed between each control knob and the cabinet.

Removing Speaker.—Withdraw the speaker plugs from their sockets on the chassis, disconnect the field coil leads from their terminals on the speaker connecting panel, and remove the four



uit is conventional. The resistor between **L22** and **L23** is **R27**.

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round-head woodscrews holding the speaker to the sub-baffle.

When replacing, see that the speaker connecting panel is at the bottom, and connect the leads as previously indicated.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R 1	LW aerial shunt	10,000
R 2	MW aerial shunt	10,000
R 3	Part aerial coupling	10,000
R 4	V1 hexode anode decoupling	1,000
R 5	V1 osc. CG resistance	50,000
R 6	V1 osc. anode HT feed	30,000
R 7	V1 osc. anode SW HT feed	100,000
R 8	V2 CG decoupling	1,100,000
R 9	V1, V2 SG's HT feed	20,000
R10	V3 signal diode load resistances	110,000
R11		260,000
R12	Part of tone compensator	50,000
R13*	Manual volume control	1,000,000
R14	V3 triode GB; AVC delay	1,000
R15	Negative feed-back coupling	25
R16	V3 triode anode decoupling	15,000
R17	V3 triode anode load	30,000
R18	AVC line decoupling	1,100,000
R19	V3 AVC diode load resistances	510,000
R20		510,000
R21	V4 CG resistance	510,000
R22	V4 grid stopper	25,000
R23	Part of tone control	3,000
R24	Part neg. feed-back feed	200
R25	V1, V2 fixed GB, and V4 GB resistances	25
R26		50
R27	V1 osc. anode shunt	80,000

*Tapped at 250,000 Ω from chassis end.

	CONDENSERS	Values (μF)
C 1	Aerial circuit LW coupling condensers	0·0025
C 2		0·0025
C 3	Aerial MW coupling condenser	0·00007
C 4	V1 hexode anode decoupling	0·1
C 5	Neutralising condenser	Very low
C 6	1st IF transformer fixed tuning condensers	0·00013
C 7		0·00014
C 8	V1 osc. CG condenser	0·0001
C 9	Oscillator reaction coupling	0·0003 §
C10	Bandspread fixed capacity	0·0003
C11	V1 hex. CG decoupling	0·025
C12	Osc. circuit MW tracker	0·00052
C13	Osc. circuit LW tracker	0·0001
C14	Osc. circ. LW fixed trimmer	0·00007
C15	Osc. circuit preset fixed tuning capacity	0·0005
C16	Preset reaction coupling	0·002
C17	V2 CG decoupling	0·025
C18	V1, V2 SG's decoupling	0·1
C19	2nd IF transformer fixed tuning condensers	0·00013
C20		0·00014
C21	Part of tone compensator	0·01
C22	AF coupling to V3 triode	0·005
C23	Coupling to V3 AVC diode	0·00002
C24	IF by-pass condensers	0·0001
C25		0·0001
C26*	V3 cathode by-pass	20·0
C27*	V3 triode anode decoupling	2·0
C28	Fixed tone corrector	0·003
C29	V3 triode to V4 AF coupling	0·01
C30	Parts of tone control filter	0·05
C31		0·01
C32¶	Part negative feed-back feed	4·0
C33*	HT smoothing condensers	8·0
C34*		8·0
C35*		16·0
C36*	Auto GB by-pass	20·0
C37‡	Aerial MW manual trimmer	—
C38‡	Aerial LW manual trimmer	—
C39‡	Aerial circuit LW auto tuning trimmers	—
C40‡		—
C41‡	Aerial circuit MW auto tuning trimmers	—
C42‡		—
C43†	Aerial circ. manual tuning	—
C44‡	49m aerial coupling	—
C45‡	49m image neut. trimmer	—
C46‡	49m aerial circ. trimmer	—
C47‡	31m aerial coupling	—
C48‡	31m image neut. trimmer	—
C49‡	31m aerial circ. trimmer	—
C50‡	25m aerial coupling	—
C51‡	25m image neut. trimmer	—
C52‡	25m aerial circ. trimmer	—
C53‡	19m aerial coupling	—
C54‡	19m image neut. trimmer	—
C55‡	19m aerial circ. trimmer	—
C56‡	16m aerial coupling	—
C57‡	16m image neut. trimmer	—
C58‡	16m aerial circ. trimmer	—
C59‡	13m aerial coupling	—
C60‡	13m aerial circ. trimmer	—
C61†	Bandspread tuning condenser	—
C62‡	Osc. circuit MW tracker	—
C63‡	Osc. circuit LW tracker	—
C64‡	Osc. circuit MW trimmer	—
C65‡	Osc. circuit LW trimmer	—
C66†	Oscillator manual tuning	—
C67‡	Aerial IF filter tuning	—

*Electrolytic. †Variable. ‡Pre-set. §0·0001 μF and 0·0002 μF in parallel. ¶ T.C.C. type F.W. reversible electrolytic.

	OTHER COMPONENTS	Approx. values (ohms)
L1	Aerial IF filter coil	15·0
L2	Aerial MW coupling coil	35·0
L3	Aerial MW manual tuning	2·0
L4	Aerial LW manual tuning	13·5
L5	49m aerial coils	2·4
L6		Very low
L7	31m aerial coils	2·5
L8		Very low
L9	25m aerial coils	1·0
L10		Very low
L11	19m aerial coils	1·0
L12		Very low
L13	16m aerial coils	1·0
L14		Very low
L15	13m aerial coils	0·5
L16		Very low
L17	13m oscillator coils	Very low
L18		Very low
L19	16m oscillator coils	Very low
L20		Very low
L21	19m oscillator coil	Very low
L22	25m oscillator coil	Very low
L23	31m oscillator coil	Very low
L24	49m oscillator coil	Very low
L25	Osc. MW manual reaction	1·9
L26	Osc. LW manual reaction	4·1
L27	Osc. MW manual tuning	1·8
L28	Osc. LW manual tuning	5·9
L29	Osc. circuit MW preset coils	0·5
L30		2·0
L31	Osc. circuit LW preset coils	5·65
L32		5·65
L33	1st IF trans. Pri.	7·5
L34	1st IF trans. Sec.	7·5
L35	2nd IF trans. Pri.	7·5
L36	2nd IF trans. Sec. total	7·5
L37	Speaker speech coil	2·0
L38	Hum neutralising coil	0·1
L39	Speaker field coil	800·0

	OTHER COMPONENTS	Approx. values (ohms)
L40	HT smoothing choke	92·0
T1	Output trans. Pri.	260·0
	Output trans. Sec.	0·2
T2	Mains trans. Pri. total	17·8
	Mains trans. Heater sec.	0·1
	Mains trans. Rect. heat. sec.	0·1
	Mains trans. HT sec., total	310·0
S1a, b, c x to S6a, b, c, x	Aerial circuit wave band and manual/auto change switches	—
S7a, b, x y to S12a, b, x, y	Aerial circuit SW band selector switches	—
S13 a, b, c, x to S18 a, b, c, x	Oscillator circuit SW band selector switches	—
S19 a, b, c, x S20a, b, c, x, y	Oscillator circuit wave-band and manual/auto change switches	—
S21a, b, x to S24a, b, x	Oscillator circuit auto tuning selector switches	—
S25a, b, x	Radio/gram change switches	—
S26–S29	Tone control switches	—
S30	Mains switch ganged R13	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 233 V using the 216-235 V tapping on the mains transformer. The receiver was tuned to the lowest wave-length on the MW band, and the volume control was at maximum, but there was no signal input.

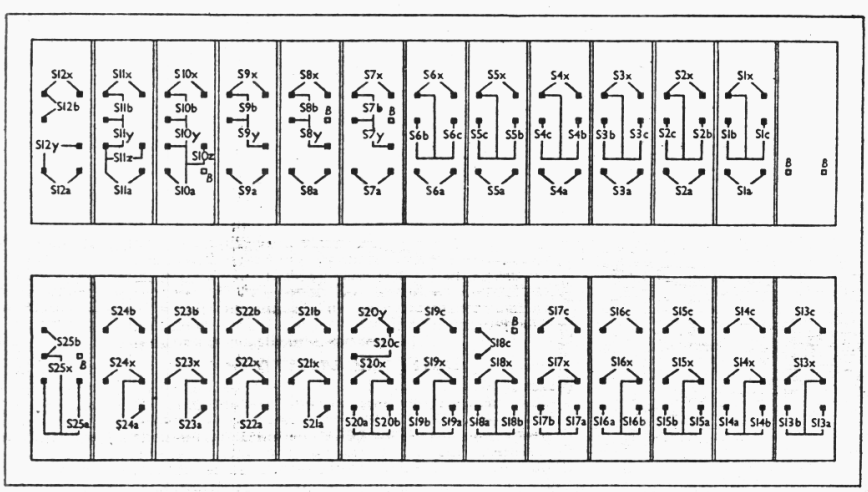
Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 ECH3	235 Oscillator 25	4·5 3·1	114	3·7
V2 EF9	241	11	114	2·8
V3 EBC3	117	2·5	—	—
V4 EL6	222	6·7	241	8·0
V5 AZ2	354†	—	—	—

† Each anode, AC.

GENERAL NOTES

Switches.—All the switches, except the tone control and mains switches, are associated with the press-button unit. Their action is indicated by the coding of their numbers: each button controls two groups of switches: one in the aerial circuit and one in the oscillator circuit; each group is identified with a number; each switch of a group bears that number and a suffix letter. If the suffix letter is **a**, **b** or **c**, the switch *closes* when its button is pressed; if it is **x**, **y** or **z**, the switch *opens*.



Two diagrams of the press-button switch unit. Above, as seen from above the chassis, and below, as seen from beneath the chassis.

one position only, in the following order, starting from fully anti-clockwise: **S27, S28, S26, S29.**

S30. — This is the QMB mains switch, ganged with the volume control **R13.**

Coils.—L1 is the aerial IF filter coil, mounted with its tuning condenser on the rear member of the chassis.

L2, L3, L4.—These are in two half-screened tubular units on the chassis deck, with their associated trimmers and coupling components. The aerial circuit bandspread coils **L5** to **L16** are disposed in numerical order along a horizontal unscreened tubular former, which also carries the seventeen associated trimmers **C44** to **C60**, along the front edge of the chassis deck.

The oscillator bandspread coils **L17** to **L24**, and the four MW and LW pre-set station coils **L29** to **L32** are in ten unscreened tubular units in two groups mounted on the front member of the chassis, beneath the press-button unit. They are indicated, with their core adjustment screws, in our under-chassis view.

Under-chassis view. Trimmers and core adjustments are indicated.

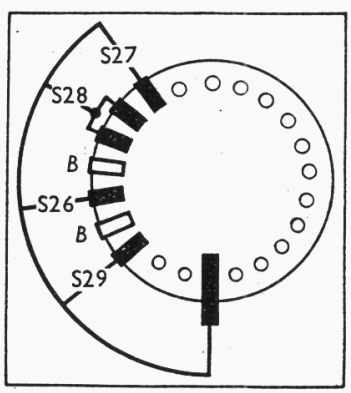
The table below gives the waveband coverage of the four pre-set circuits numbering from left to right, looking at the front of the receiver, and the frequency and wavelength ranges of each of the bandspread circuits.

COIL TABLE

Button	Wavelength range	Frequency range
1	Gram	—
2	1,150–2,000 m	—
3	1,150–2,000 m	—
4	260– 560 m	—
5	195– 395 m	—
6	LW manual	—
7	MW manual	—
8	48·0–50·0 m	6·25– 6·0 MC/S
9	30·6–31·9 m	9·8– 9·4 MC/S
10	24·8–25·8 m	12·1–11·6 MC/S
11	19·3–20·1 m	15·5–14·9 MC/S
12	16·5–17·1 m	18·2–17·5 MC/S
13	13·7–14·2 m	21·9–21·2 MC/S

The manual tuning oscillator coils **L25** to **L28** are on a single unscreened tubular former beneath the chassis.

The IF transformers **L33, L34** and **L35, L36** are in two screened units on the chassis deck with their fixed tuning condensers. They are shown in our plan view, where the core adjustments are also indicated.



The tone-control switch unit, seen from the rear of the underside of the chassis.

Scale and Indicator Lamps.—These are seven Ever Ready MES types with round bulbs, rated at 6V, 0·5 A. They are fed from tapping **b** on **T2** LT secondary.

External Speaker.—This may be connected by inserting its plugs in the sockets in the internal speaker plugs, if both speakers are required. Otherwise, if it is desired to mute the internal speaker, the plugs may be inserted in the speaker sockets at the rear of the chassis, after the internal speaker plugs have been removed. The external speaker should have a low resistance (2-4 O) speech coil.

Condensers C33, C34, C35.—These are three dry electrolytics (500V working) in a single tubular metal case. The common negative is a black rubber lead emerging from the centre of the base, and is connected to the junction of **R21** and **R26.** The red tag is the positive of **C33** (8μF); the yellow tag the positive of **C34** (8μF); and the remaining tag the positive of **C35** (16μF).

Condenser C32.—This is a 4μF T.C.C. type F.W. reversible electrolytic condenser.

Chassis Divergencies.—R6 is given in the makers' circuit as 15,000 O. **R1, R7** and **R27** are not shown in the makers' diagram.

CIRCUIT ALIGNMENT

IF Stages.—Press the LW manual button. Connect signal generator via a 0·01μF condenser between control grid (top cap) of **V1,** leaving existing connection in place, and chassis. Connect a 500,000 O resistance directly across the generator output. Feed in a 462KC/S signal, and adjust the cores of **L33, L34** and **L35, L36.**

Disconnect resistance and condenser, and transfer signal generator to **A** and **E** sockets via a suitable dummy aerial. Feed in a 462 KC/S signal, and adjust **C67** for *minimum* output.

RF and Oscillator Stages.—With the gang at maximum, the line on the pointer should coincide with the marks at the tops of the two end scales. See that the scale panel fits squarely on its clamps. Connect signal generator via a suitable dummy aerial to **A** and **E** sockets, turn volume control to maximum, and tone control fully anti-clockwise.

MW.—Press MW button, tune to 200 m. on scale, feed in a 200 m. (150 KC/S) signal, and adjust **C64,** then **C37,** for maximum output. Feed in a 520 m. (576 KC/S) signal, tune it in, and adjust **C62** for maximum output, while rocking the gang for optimum results.

LW.—Press LW button, tune to 1,000 m. on scale, feed in a 1,000 m. (300 KC/S) signal, and adjust **C65,** then **C38,** for maximum output. Feed in a 1,800 m. (167 KC/S) signal, tune it in, and adjust **C63** for maximum output, while rocking the gang for optimum results.

Bandspread Circuits.—Press the appropriate SW button, tune in the strongest transmission near the middle of the band covered, then move pointer to where that station is marked on the scale, noting whether this requires an increase or a decrease of tuning capacity: if an *increase* is required, turn the appropriate oscillator coil core adjustment screw *in* (clockwise); if a *decrease* is required, screw the core *out* (anti-clockwise). If a large movement of the core is necessary, select the peak with the screw farthest in (highest frequency).

If a new aerial coil unit has been fitted, the following procedure should be followed in conjunction with the table below:

TRIMMING TABLE

Band (metr's)	Osc. coil	Trimmers			Test frequency MC/S
		Aerial	Grid	Image	
13	L18	C59	C60	—	21·56
16	L20	C56	C58	C57	17·8
19	L21	C53	C55	C54	15·2
25	L22	C50	C52	C51	11·8
31	L23	C47	C49	C48	9·6
49	L24	C44	C46	C45	6·07

Set aerial trimmer ¾ turn from maximum; set grid circuit trimmer ½ turn from maximum; set image trimmer to minimum. Then adjust as follows, in the same order:

Tune to test frequency on scale, feed in that frequency to **A** and **E** sockets, and adjust aerial and grid trimmers for maximum output, while rocking the gang for optimum results.

Increase generator frequency by 924 KC/S, and increase output as necessary, adjusting frequency to peak with set.

Adjust image trimmer for *minimum* output, while rocking the gang for optimum results. If this operation requires more than a small movement of the trimmer screw, repeat the whole process until this adjustment requires a negligible movement.

STATION SETTING

To adjust the pre-set station circuits, press the appropriate button and adjust the corresponding oscillator coil core **(L29-L32),** then the aerial trimmer **(C39-C42)** for maximum output, using the signal from the required station or from the signal generator. If the generator is used, final adjustment should always be made on the actual transmission.

Subsequent adjustment of **C37** or **C38** may necessitate readjustment of trimmers **C39-C42.**

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