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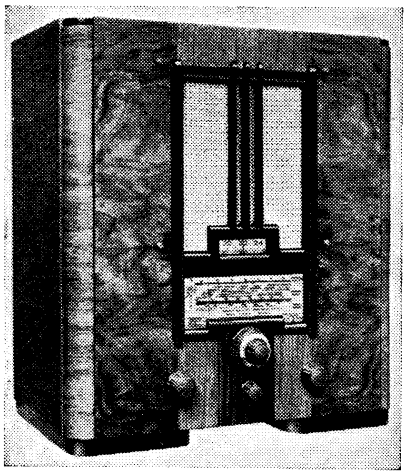
"TRADER" SERVICE SHEET

517

FERRANTI ARCADIA 1936/7

TABLE, CONSOLE & ARCADIAGRAM



The Ferranti Arcadia 1936/7 3-band table receiver.

THE Ferranti 1936/7 Arcadia table model receiver is a 4-valve (plus rectifier) 3-band superhet, designed for use with AC mains of 200-250V, 40-100 C/S. The SW range is 19-51 m.

Variable selectivity, a meter-type tuning indicator, magnascopic tuning, and provision for connecting a gramophone pick-up and an external speaker are features of the receiver.

An identical chassis is used in the console version of the receiver, while in the "Arcadiagram," the radiogram version, there are several modifications which are explained at the end of "General Notes."

No apology is offered for the production of a Trader *Service Sheet* on so old a receiver, since demands for technical information on this range are such as to warrant its publication.

Unfortunately, an actual chassis was unobtainable in this instance, and the information used is that supplied by the makers.

Release date, all models: May, 1936.

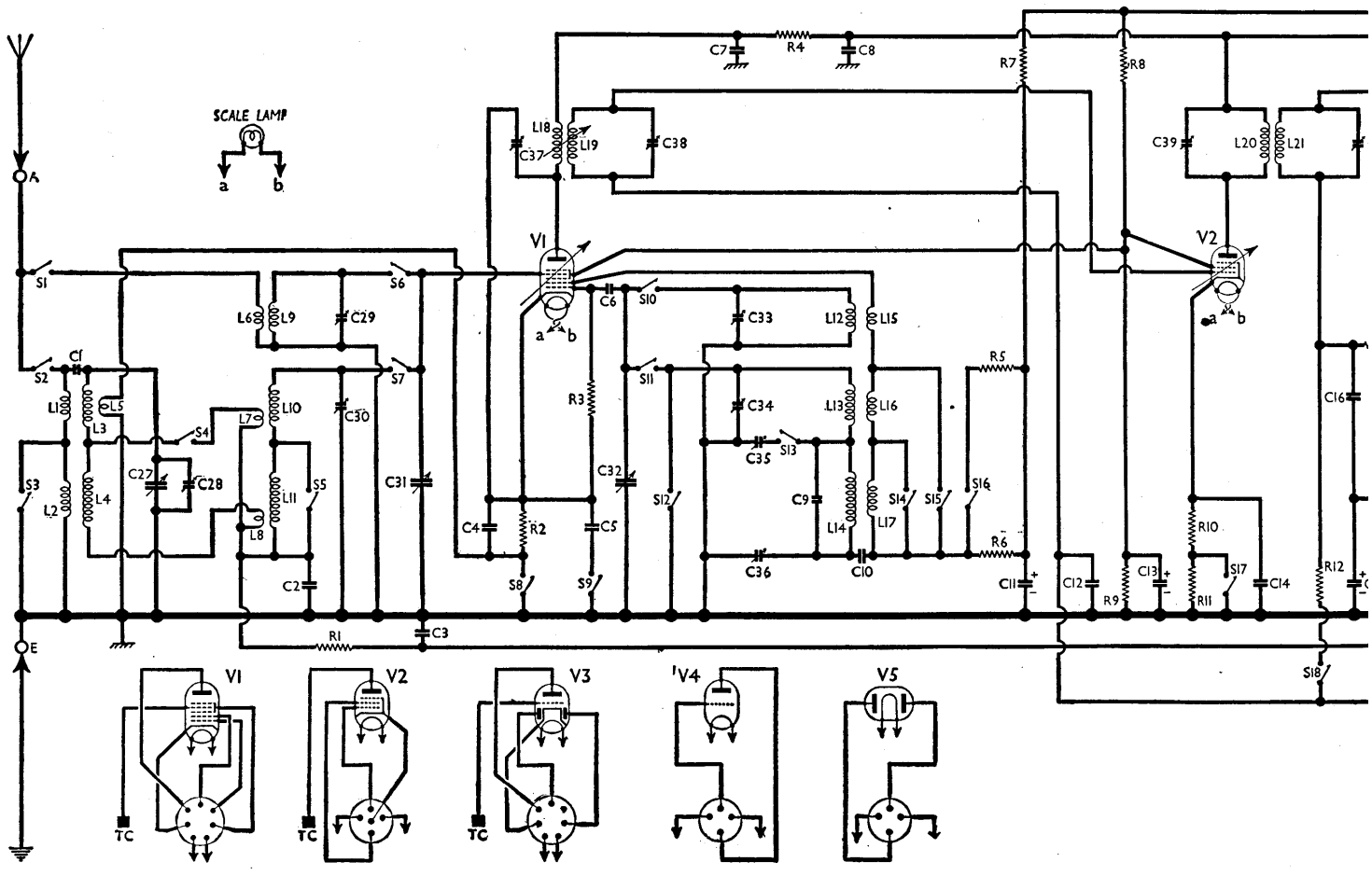
CIRCUIT DESCRIPTION

Aerial input on MW and LW is via coupling coils **L1** (MW), **L2** (LW) and small top coupling condenser **C1** to mixed coupled band-pass filter. Primary coils **L3** (MW) and **L4** (LW) are tuned by **C27**; secondaries **L10** (MW) and **L11** (LW) by **C31.** Coupling by coils **L7** (MW) and **L8,** which is formed by tapping a few turns from the bottom **L11** (LW), and condenser **C2.**

On SW, input is via coupling coil **L6** to single-tuned circuit **L9, C31.**

First valve **(V1, Ferranti metallised VHT4)** is a heptode operating as frequency changer with electron coupling. On MW and LW, its cathode is returned to chassis via the biasing circuit **R2, C4** and the coil **L5,** which is coupled to the band-pass primary, for image suppression. On SW, **S8** and **S9** close and short-circuit **L5,** at the same time adding a special short-wave by-pass condenser **C5.**

V1 oscillator grid coils **L12** (SW), **L13** (MW) and **L14** (LW) are tuned by **C32.**



Parallel trimming by **C33** (SW), **C34** (MW) and **C9** (LW); series tracking by **C35** via **S13,** which then closes, (MW) and **C36** (LW). Reaction coupling from anode via coils **L15** (SW), **L16** (MW) and **L17** (LW), augmented by common coupling between grid and anode circuits across **C36** via **C10.**

Second valve **(V2, Ferranti metallised VPT4)** is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C37, L18, L19, C38** and **C39, L20, L21, C40.**

Intermediate frequency 125 KC/S.

Variable selectivity is introduced by mechanically adjusting the coupling between **L18** and **L19.** This is effected by moving **L19,** whose position is controlled by the tone control spindle.

Diode second detector is part of double diode triode valve **(V3, Ferranti H4D).** Audio frequency component in rectified output is developed across load resistance **R14** and passed via AF coupling condenser **C18,** then tag **X** to one of the pick-up terminals, and manual volume control **R15** to CG of triode section, which operates as AF amplifier.

Provision for connection of gramophone pick-up by terminals across **R15;** tag **X** is then removed to mute radio. IF filtering by **C16, R13, C17** in diode circuit, and **C21** in triode anode circuit.

Second diode of **V3,** fed from **L21** via **C20,** provides DC potentials which are developed across load resistances **R21, R22** and fed back through decoupling circuits as GB to earlier stages, giving automatic volume control. The total voltage across **R21, R22** is applied (on MW and LW only) to the frequency changer stage; and, normally, the voltage at their junction is fed via **S19** to the IF stage.

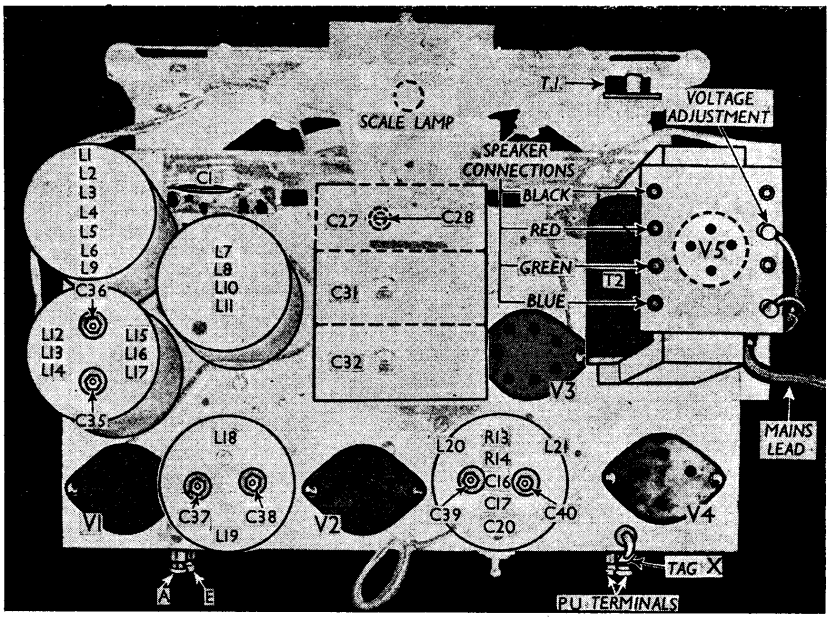
When the noise suppressor is in action, however, **S19** and **S17** are open, and **S18** closed, so that AVC voltage for the IF stage is obtained from the DC potential across **R13, R14,** and the fixed GB resistance in the cathode circuit of **V2** is increased by the addition of **R11.** Delay voltage, together with GB for triode section, is obtained from drop along resistances **R18, R19** in **V3** cathode lead to chassis.

The changing values of **V1** and **V2** anode currents, which are determined by the AVC potentials, are used to operate the meter-type tuning indicator **T.I.** which is included in their common feed circuit.

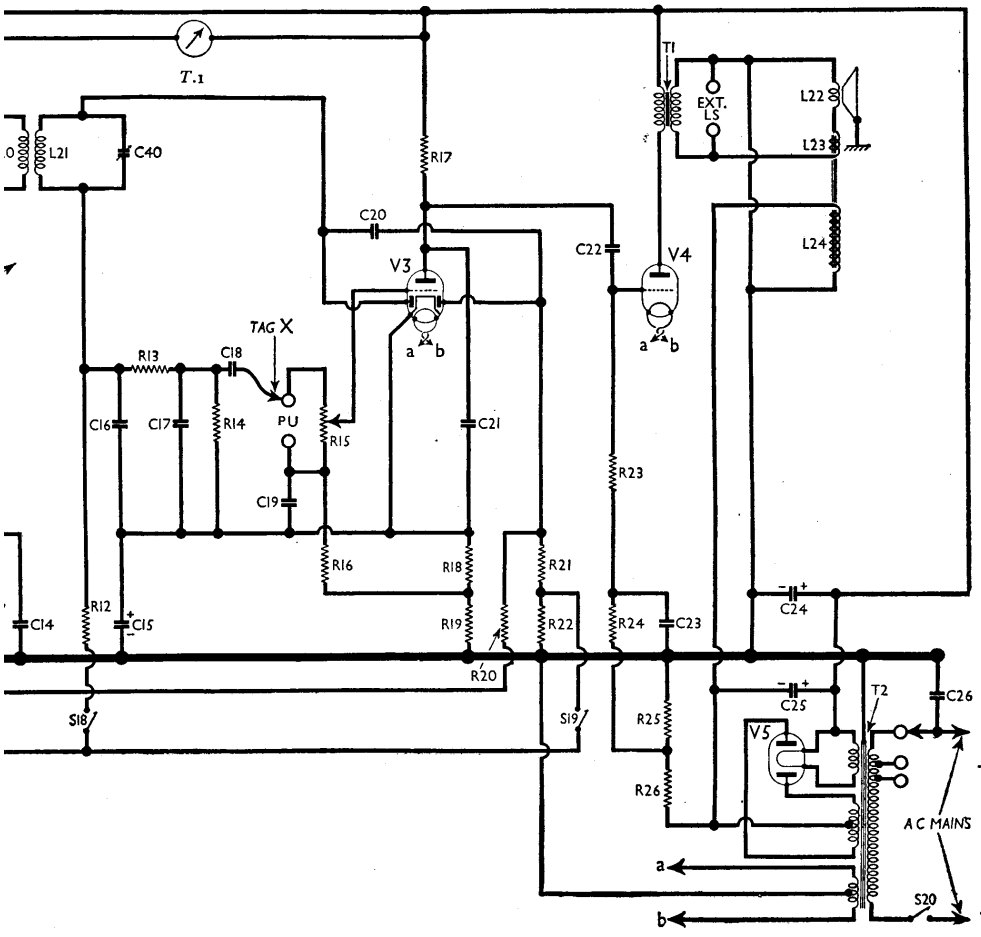
Resistance-capacity coupling by **R17, C22** and **R23** between **V3** triode and directly heated triode power output valve **(V4, Ferranti LP4).** Provision for connection of low impedance external speaker across secondary of internal speaker input transformer **T1.**

HT current is supplied by full-wave rectifying valve **(V5, Ferranti R4).** Smoothing by speaker field **L24** (in negative HT lead to chassis) and dry electrolytic condensers **C24, C25.**

DC voltage across **L24** appears also across the shunt resistances **R25, R26,** and that across **R25** is tapped off and fed via decoupling circuit **R24, C23** as GB voltage to **V4,** whose cathode circuit returns via **T2** heater secondary winding to chassis.



Plan view of the chassis. The colour coding of the speaker connections on the panel on **T2** is indicated. The removal of tag **X** mutes radio for PU operation.



Circuit diagram of the Ferranti Arcadia 1936/7. **R25, R26** are shunted across **L24** in the negative HT lead to chassis.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 pent. CG decoupling...	250,000
R2	V1 fixed GB resistance ...	300
R3	V1 osc. CG resistance ...	100,000
R4	V1 pent. anode HT feed...	1,000
R5	V1 oscillator anode HT feed resistances... ...	1,000
R6		150,000
R7		30,000
R8	V1, V2 SG's HT feed potential divider ...	25,000
R9		50,000
R10	V2 fixed GB resistances ...	450
R11		300
R12	V2 " Q " AVC feed ...	250,000
R13	IF stopper	100,000
R14	V3 signal diode load ...	500,000
R15	Manual volume control ...	1,000,000
R16	V3 triode CG decoupling...	100,000
R17	V3 triode anode load ...	40,000
R18	V3 triode GB and AVC delay resistances ...	1,700
R19		3,500
R20	AVC line decoupling ...	1 000,000
R21	V3 AVC diode load resistances	4,000,000
R22		1,000,000
R23	V4 CG resistance	250,000
R24	V4 CG decoupling ...	60,000
R25	Speaker field shunt; V4 GB pot....	100,000
R26		250,000

	CONDENSERS	Values (μF)
C1	" Top " coupling condenser	0·000016
C2	Band-pass coupling ...	0·05
C3	AVC line decoupling ...	0·05
C4	V1 cathode by-pass condensers	0·05
C5		0·0005
C6	V1 osc. CG condenser ...	0·00005
C7	V1 pent. anode decoupling	0·1
C8	V2 anode decoupling ...	0·1
C9	Osc. circuit LW trimmer...	0·000018
C10	Part reaction coupling ...	0·01
C11*	V1 osc. anode decoupling	30·0
C12	V2 CG decoupling ...	0·05
C13*	V1, V2 SG's decoupling ...	4·0
C14	V2 cathode by-pass ...	0·1
C15*	V3 cathode by-pass ...	6·0
C16	IF by-pass condensers ...	0·00015
C17		0·00015
C18	AF coupling to V3 triode	0·02
C19	V3 triode CG decoupling...	0·25
C20	Coupling to V3 AVC diode	0·00015
C21	IF by-pass	0·0003
C22	V3 triode to V4 AF coupling	0·02
C23	V4 CG decoupling ...	0·25
C24	HT smoothing condenser	8·0
C25		8·0
C26	Mains RF by-pass ...	0·002
C27†	Band-pass pri. tuning ...	—
C28‡	Band-pass pri. MW trimmer	—
C29‡	Aerial circ. SW trimmer...	—
C30‡	Band-pass sec. MW trimmer	—
C31†	Band-pass sec. tuning ...	—
C32†	Oscillator circuit tuning ...	—
C33‡	Osc. circ. SW trimmer ...	—
C34‡	Osc. circ. MW trimmer ...	—
C35‡	Osc. circ. MW tracker ...	—
C36‡	Osc. circ. LW tracker ...	—
C37‡	1st IF trans. pri. tuning...	—
C38‡	1st IF trans. sec. tuning...	—
C39‡	2nd IF trans. pri. tuning...	—
C40‡	2nd IF trans. sec. tuning...	—

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial coupling coils ...	18·0
L2		70·0
L3	Band-pass primary coils	4·5
L4		45·0
L5	Image suppressor coil...	0·25
L6	Aerial SW coupling coil	1·3
L7	Band-pass coupling coils	0·2
L8		(Part L11)
L9	Aerial SW tuning coil...	0·05
L10	Band-pass secondary coils	4·5
L11		40·0*
L12	Osc. circ. SW tuning ...	0·05
L13	Osc. circ. MW tuning ...	8·5
L14	Osc. circ. LW tuning ...	23·0
L15	Oscillator SW reaction	0·8
L16	Oscillator MW reaction	7·2
L17	Oscillator LW reaction	8·0
L18	1st IF trans. Pri. ...	80·0
L19	Sec. ...	80·0
L20	2nd IF trans. Pri. ...	80·0
L21	Sec. ...	80·0
L22	Speaker speech coil ...	3 8
L23	Hum neutralising coil...	0·25
L24	Speaker field coil ...	1,600·0
T1	Speaker input trans. Pri. ...	150·0
	Sec. ...	0·3
T2	Mains trans. Pri., total ...	32·0
	Heater sec. ...	0·05
	Rect. heat. sec.	0·1
	HT sec., total	380·0
T.I.	Tuning indicator winding	1,000·0
S1-S16	Waveband switches ...	—
S17-S19	Noise suppressor switches	—
S20	Mains switch, ganged R15	—

* Total, with L8.

If the speaker has been removed, it should be so positioned when replacing that the transformer is at the top.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those found in the average receiver when its voltage adjustment is set to suit the mains used.

They were measured under no-signal conditions, with the receiver switched to MW, using the 300 V scale of a Ferranti AC/DC circuit tester, which has a resistance of 300,000 O, and the negative lead was connected to chassis.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VHT4	245	2·5	90	4·5
	Oscillator			
	90	0·6		
V2 VPT4	250	4·5	90	2·5
V3 H4D	155	1·7	—	—
V4 LP4	240	47.0	—	—
V5 R4	300†	—	—	—

† Each anode, AC.

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (pull-off);
withdraw from their sockets on the insulating panel on the mains transformer the four speaker connecting plugs;
remove the four screws holding the chassis to the bottom of the cabinet.

When replacing, insert the plugs terminating the speaker leads as follows, numbering the sockets on the connecting panel from front of chassis to rear :

1, black;
2, red;
3, green;
4, blue.

GENERAL NOTES

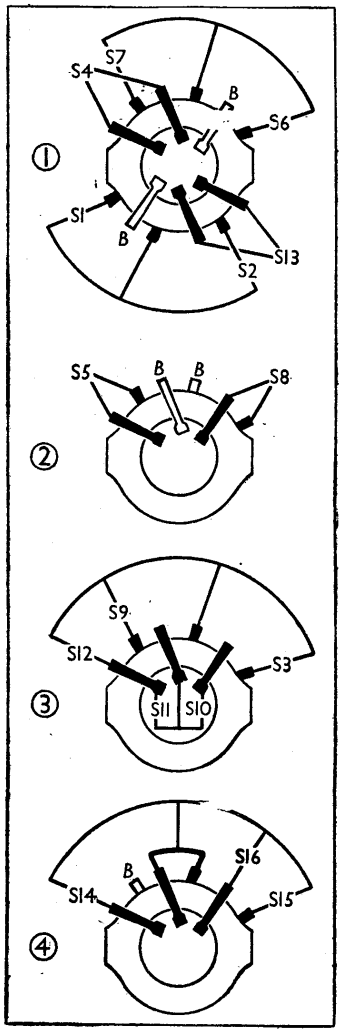
Switches.—S1-S16 are the waveband switches, in four ganged rotary units beneath the chassis. They are indicated by numbers in circles and arrows in our under-chassis view, and shown in detail in the diagrams (next col.), where they are drawn as seen when viewed from the rear of the underside of the chassis. The table (col. 4) gives the switch positions for the three control settings, starting from fully anti-clockwise position of the control. A dash indicates open, and **C**, closed.

S17-S19 are the noise-suppressor switches, in a QMB toggle operated unit mounted on the rear member of the chassis. In the normal position, **S17** and **S19** are closed, and **S18** open, but **S18** closes, while **S17** and **S19** open, when the switch is operated for noise suppression.

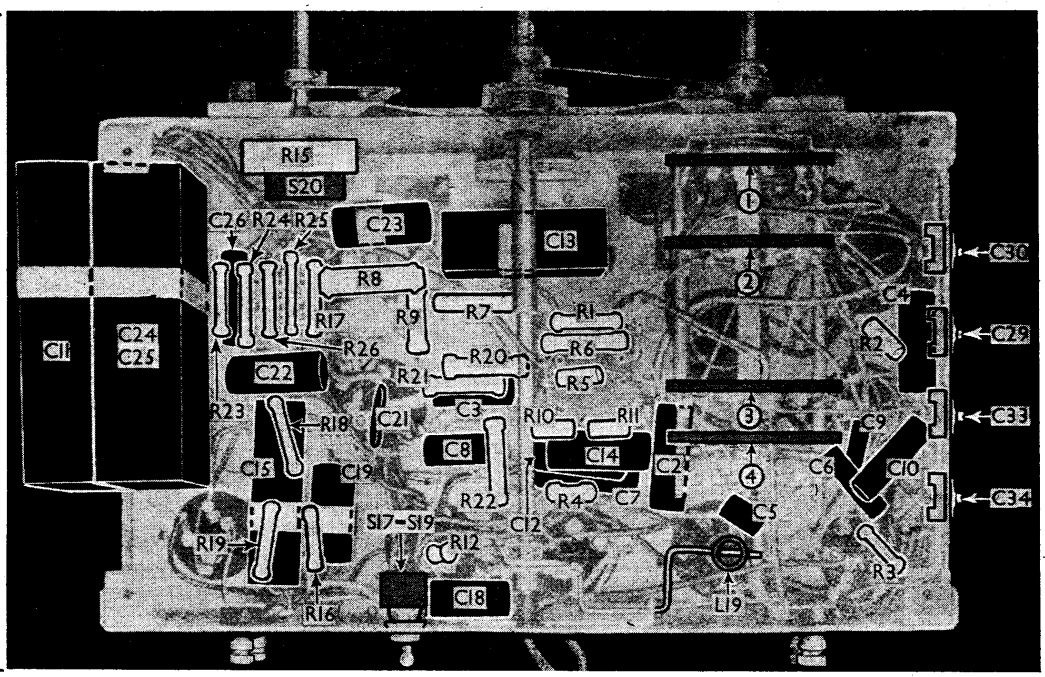
S20 is the QMB mains switch, ganged with the volume control **R15.**

Coils.—L1-L6, L9; L7, L8, L10, L11; and the oscillator coils **L12-L17** are in three screened units on the chassis deck, although the SW coils protrude from their containers downwards into the compartment beneath the chassis. The oscillator circuit trackers are housed in the **L12-L17** unit.

The IF transformers **L18, L19** and **L20, L21** are in two further screened units on the chassis deck with their associated trimmers. In the case of the first transformer, **L19** is movable to vary the selectivity, which is determined by the position of the tone control knob. A lever attached to the coil former and operated by the tone control spindle moves the coil



Diagrams of the four waveband switch units, drawn as seen when viewed from the rear of the underside of the chassis.



Under-chassis view. The four waveband switch units are indicated here, and shown in detail in the diagrams in col. 3 opposite. **L19** is the variable selectivity (tone control) coil and forms part of the first IF transformer. **S17-S19** are the noise suppressor switches.

Switch Table

Switch	SW	MW	LW
S1	C	—	—
S2	—	C	C
S3	—	C	—
S4	—	C	—
S5	—	C	—
S6	C	—	—
S7	—	C	C
S8	C	—	—
S9	C	—	—
S10	C	—	—
S11	—	C	C
S12	C	—	—
S13	—	C	—
S14	C	C	—
S15	C	—	—
S16	C	—	—

up and down in its can, and thus adjusts the coupling between the primary and secondary windings as required.

The second IF transformer unit contains, besides its coils and trimmers, **R13, R14, C16, C17** and **C20.**

Gramophone Pick-up.—Two terminals are provided at the rear of the chassis for the connection of a gramophone pick-up, and, during radio operation, tag **X** is connected to the upper (high-potential) terminal, carrying the AF component from the diode output to the top of the volume control. For gramophone operation, the tag is removed to mute radio.

External Speaker.—Two terminals are provided on the speaker assembly for a low impedance (4-6 O) external speaker.

Scale Lamp.—This is an MES type, with a spherical bulb, rated at 6.2 V, 0.3 A. It is mounted on an easily detachable bracket on the magnascopic indicator assembly. It illuminates both tuning and magnascopic scales.

Magnascopic Scale.—This comprises a large transparent dial and a system of mirrors and lenses which normally should give no trouble. If the scale numbers do not appear centrally in the scale opening, the holder of the top mirror should be bent slightly, either backwards (to raise the numbers) or forwards (to lower the numbers).

Tuning Indicator.—This is virtually a milliammeter registering the magnitude of the combined anode currents of **V1** pentode and **V2.**

Condensers.—C11, C24, C25. These are three dry electrolytics in two rectangular cardboard containers, mounted beneath the chassis by a metal clamp. **C11** is in one container, and **C24, C25** in the other. It should be noted that the **C24, C25** unit has a common *positive* (red) lead.

Condensers C13, C15.—These are two further dry electrolytics beneath the chassis. **C13** is in a rectangular unit, while **C15** is in a tubular unit. Our tables give the value of **C15** as 6 μF, but the makers' information gives it as 2-6 μF.

Alternative Valves. — The following valves are the Mullard equivalents for the Ferranti valves used in this receiver, and may be substituted for them if difficulty is experienced in obtaining replacements of the same type as used originally :—

V1, FC4 (metallised); V2, VP4 (metallised); V3, TDD4 (metallised); V4, ACO44; V5, DW3 or DW4/350.

ARCADIAGRAM MODIFICATIONS

The Arcadiagram is the radiogram version of the table and console models, and except for the following modifications employs a similar chassis.

In the Arcadiagram, the volume control is mounted on the front panel of the cabinet, and its place in the chassis is taken by a three-position switch whose functions are : Radio, "Q" (noise suppression) and Gram. When switched over to Gram, a separate tone control is brought into operation. This comprises a 100,000 O variable resistance in series with a 0.02 μF condenser, the whole being connected between **V3** triode anode and chassis.

The condenser is mounted near the Radio/Gram switch, and the resistance at the rear of the chassis. The spindle of the tone control resistance is linked with that of the radio (variable selectivity) tone control, so that the independent radio and gramophone tone control systems are operated by the same knob.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator to control grid (top cap) of **V1** and chassis, feed in a 125 KC/S (2,400 m) signal, and adjust **C40, C39, C38** and **C37,** in that order, for maximum output, with tone control at low.

RF and Oscillator Stages.—With the gang at minimum the pointer should coincide with the 200 m calibration on the scale. Leave signal generator connected to **V1** control grid, and tone at low.

MW.—Switch set to MW, and tune to 228 m on scale, and screw up **C34** fully (anti-clockwise). Feed in a 228 m (1,315 KC/S) signal, and unscrew **C34** (clockwise) until the *second* peak is reached.

Transfer signal generator leads via a suitable dummy aerial (a 0.0002 μF can be used as the dummy) to **A** and **E** terminals, feed in a signal at the same frequency, and adjust **C28** and **C30** for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust **C35** for maximum output, while rocking the gang for optimum results.

LW.—Switch set to LW, feed in a 1807 m (166 KC/S) signal, and adjust **C36** for maximum output, while rocking the gang for optimum results. There are no LW trimmers.

SW.—Switch set to SW, tune to 19.7 m (black line on scale) and screw up **C33** fully (anti-clockwise). Feed in a 19.7 m (15.23 MC/S) signal, and unscrew **C33** (clockwise) until the *second* peak is reached. To verify the adjustment, turn tuning control to a slightly higher wavelength until the image is received. Then return to original setting, and adjust **C33** for maximum output.

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