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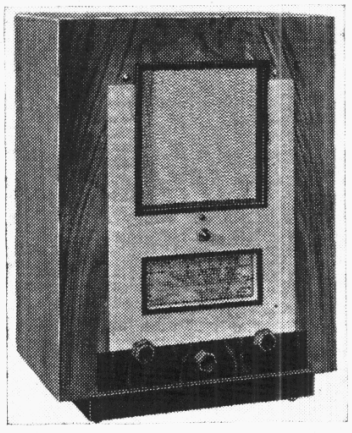
"TRADER" SERVICE SHEET 519

FERRANTI 1934/5 MODELS LANCASTRIA

REVISED ISSUE OF SERVICE SHEET No. 17



The appearance of the Ferranti 1934/5 Lancastria superhet receiver.

THIS *Service Sheet* is a reissue of *Service Sheet* No. 17, which is now right out of print, and for reprints of which a large demand is still experienced. In preparing this reissue, the opportunity has been taken to revise and amplify the information in the original issue and to arrange it in a manner which conforms to our standard method of presentation.

The 1934/5 Lancastria is the original receiver of this series. It is a 3-valve (plus rectifier) 2-band AC table superhet, designed to operate from mains of 200-250 V, 40-100 C/S. Provision is made for mains aerial operation and the connection of a gramophone pick-up and an external speaker. Image suppression, a local/distant control, and a meter-type tuning indicator are included.

Chassis bearing serial numbers between 70,000 and 89,267 use the original circuit; a modified version, with the same title, was produced, however, in which a reflex circuit was employed. The serial numbers of this issue were 100,000 to 111,397, and the differences involved are fully described at the end of this *Service Sheet*.

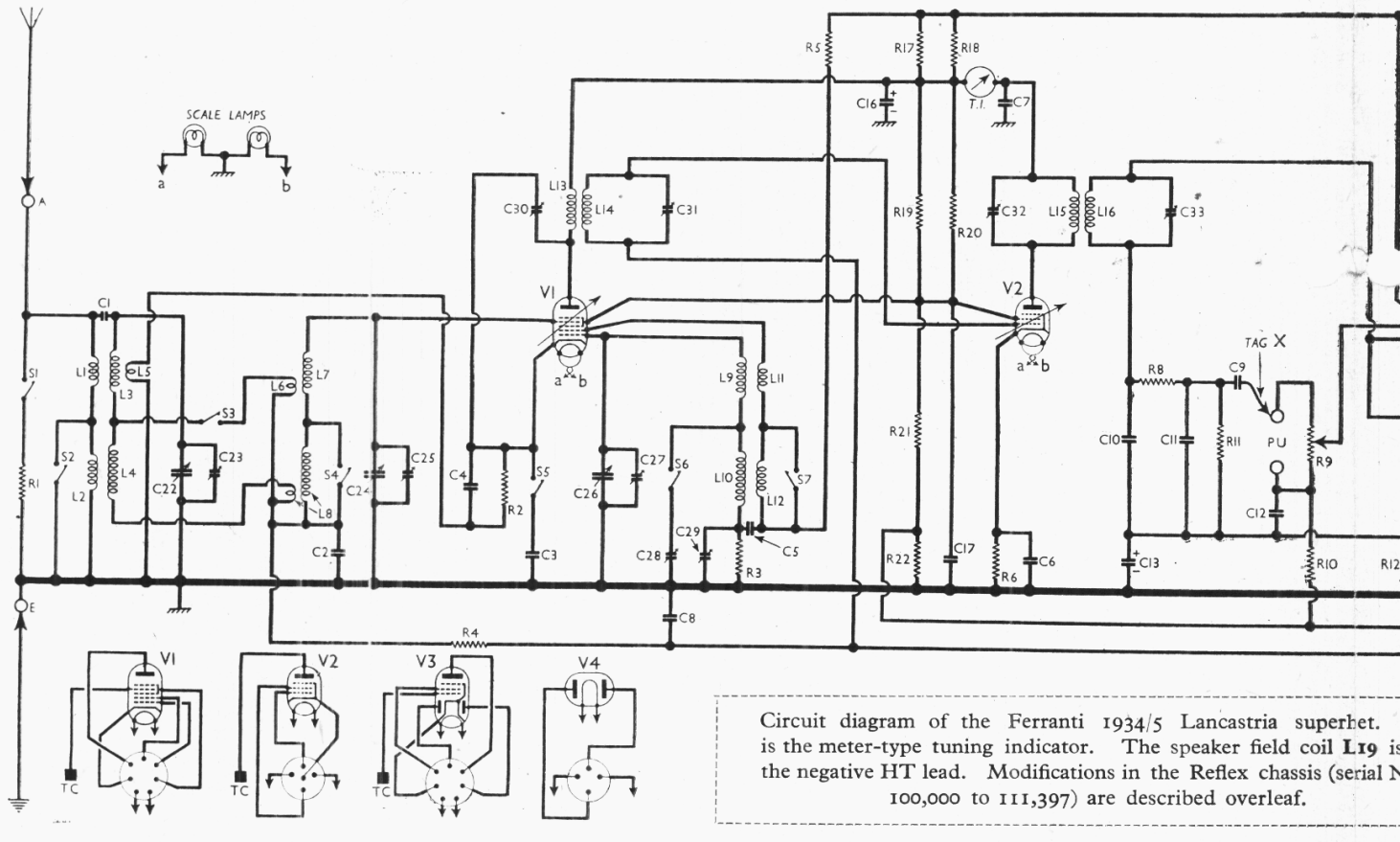
CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (MW) and **L2** (LW) to mixed coupled band-pass filter. Primary coils **L3** (MW) and **L4** (LW) are tuned by **C22;** secondaries **L7** (MW) and **L8** (LW) by **C24;** coupling by **L6** (MW) via **S3,** a few turns at the bottom of **L8** (LW) and common impedance of **C2** on both bands.

Resistance **R1** and switch **S1** form a local/distant control, which is used to prevent overloading when receiving strong local transmissions. Image suppression by coil **L5** in **V1** cathode lead to chassis.

First valve **(V1, Ferranti metallised VHT4)** is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L9** (MW) and **L10** (LW) are tuned by **C26.** Parallel trimming by **C27** (MW); series tracking by **C28** via **S6** (MW) and **C29** (LW). CG resistance **R3** is in low potential end of grid circuit, across **C29.** Reaction by anode coils **L11** (MW) and **L12** (LW), augmented on LW by common impedance of **C29,** via **C5,** in grid and anode circuits.

Second valve **(V2, Ferranti metallised VPT4)** is a variable-mu RF pentode operating as intermediate frequency amplifier



Circuit diagram of the Ferranti 1934/5 Lancastria superhet. is the meter-type tuning indicator. The speaker field coil **L19** is the negative HT lead. Modifications in the Reflex chassis (serial N 100,000 to 111,397) are described overleaf.

with tuned-primary, tuned-secondary transformer couplings **C30, L13, L14, C31** and **C32, L15, L16, C33.**

Intermediate frequency 125 KC/S.

Diode second detector is part of double diode output pentode valve **(V3, Ferranti PTD4 or Mazda AC2/PenDD).** Audio frequency component in rectified output is developed across load resistance **R11** and passed via AF coupling condenser **C9,** tag **X** to one of the pick-up terminals and manual volume control **R9** to CG of pentode section, which provides the sole audio frequency amplification. IF filtering by **C10, R8** and **C11.**

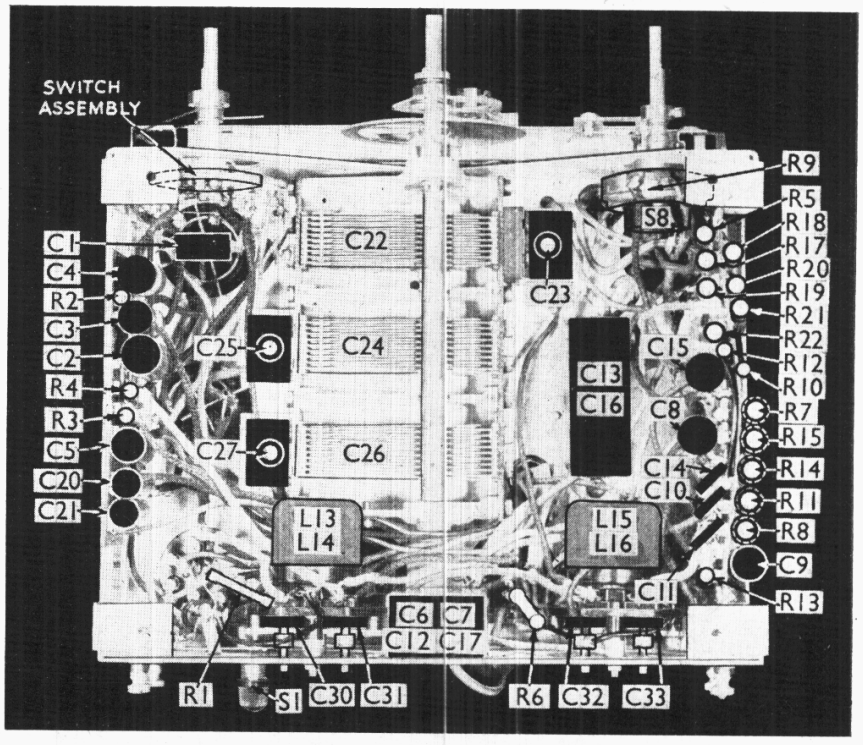
Provision by terminals connected across **R9** for connection of a gramophone pick-up, while the removal of tag **X** from its terminal mutes radio. Provision for connection of low impedance external speaker by terminals connected across the secondary winding of the internal speaker input transformer **T1,** while switch **S9** permits internal speaker to be muted if desired. Variable tone control by **C15, R16** in pentode anode circuit.

Second diode of **V3,** fed from **L16** via **C14,** provides DC potential which is developed across load resistances **R14, R15** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control.

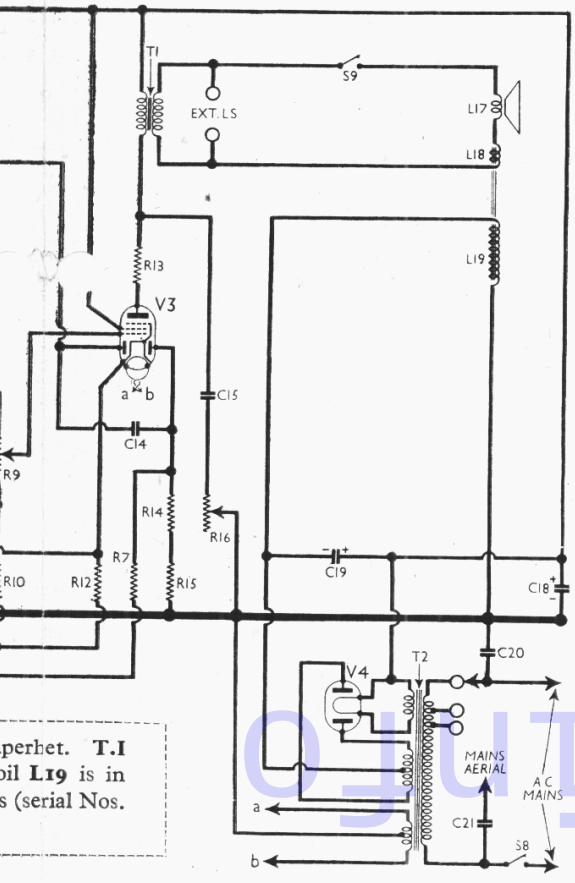
HT voltages for **V1** pentode anode, **V2** anode and **V1, V2** screens is obtained from a potential divider comprising resistances **R17, R18, R19, R20, R21** and **R22. R17** and **R18** are in parallel, and form one limb of the series; **R19** and **R20** similarly form a second limb. The fourth limb of the series, **R22,** carries the cathode current from **V3** in addition to that flowing through the rest of the series. **V3** cathode is fed to it via **R12,** across which is developed the pentode section GB potential. The total voltage developed across **R12** and **R22** provides the AVC delay.

Anode current flowing through **V2** is used to operate a meter-type tuning indicator **T.1.,** whose pointer varies its position in sympathy with changes in the potential of the AVC line.

HT current is supplied by full-wave rectifying valve **(V4, Ferranti R4).** Smoothing by speaker field **L19** in negative HT lead to chassis and electrolytic condensers **C18, C19.** Mains circuit RF filtering by **C20.** Provision for mains aerial connection by **C21** and a tag which can be connected to the aerial terminal.



Under-chassis view. The waveband switch unit is indicated here, and shown in detail in the diagram in column 3 overleaf. The connections of the condenser blocks **C13, C16** and **C6, C7, C12, C17** are described under "General Notes."



...perhet. **T.1** ...oil **L19** is in ...s (serial Nos.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	Aerial circuit shunt ...	1,000
R2	V1 fixed GB resistance ...	300
R3	V1 osc. CG resistance ...	50,000
R4	V1 pentode CG decoupling	250,000
R5	V1 osc. anode HT feed ...	100,000
R6	V2 fixed GB resistance ...	450
R7	AVC line decoupling ...	1,000,000
R8	IF stopper	100,000
R9	Manual volume control ...	1,000,000
R10	V3 pent. CG decoupling...	100,000
R11	V3 signal diode load ...	500,000
R12	V3 pent. GB resistance ...	140
R13	V3 pent. anode stopper ...	140
R14	V3 AVC diode load resistances	2,000,000
R15		2,000,000
R16	Variable tone control ...	50,000
R17	V1 and V2 anode and screen HT feed potential-divider resistances	6,000
R18		6,000
R19		18,000
R20		18,000
R21		12,400
R22		450

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

* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial coupling coils ...	17·5
L2		68·0
L3	Band-pass primary coils ...	5.0
L4		41·0
L5	Image rejector coil ...	1·7
L6	Band-pass MW coupling ...	0·2

(*Continued overleaf*)

	OTHER COMPONENTS (*continued*)		Approx. Values (ohms)
L7	Band-pass secondary coils		5·0
L8			41·0
L9	Osc. circ. MW tuning coil		4·0
L10	Osc. circ. LW tuning coil		24·5
L11	Osc. MW reaction coil		6·5
L12	Osc. LW reaction coil		3·2
L13	1st IF trans.	Pri.	120·0
L14		Sec.	120·0
L15	2nd IF trans.	Pri.	120·0
L16		Sec.	120·0
L17	Speaker speech coil		4·0
L18	Hum neutralising coil		0·5
L19	Speaker field coil		1,500·0
T1	Speaker input trans.	Pri.	250·0
		Sec.	0·3
T2	Mains trans.	Pri., total	40·0
		Heater sec.	0·05
		Rect. heat. sec.	0·1
		HT sec., total	470·0
S1	Local-distant switch		—
S2-S7	Waveband switches		—
S8	Mains switch, ganged R9		—
S9	Speaker muting switch		—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those to be found in an average receiver when its voltage adjustment lead is attached to the appropriate mains voltage adjustment tapping.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VHT4	200	3·0	100	4·0
	Oscillator			
	100	1·5		
V2 VPT4	200	5·0	100	4·5
V3 AC2/Pen. DD	240	28·0	250	8·0
V4 R4	350†	—	—	—

† Each anode, AC.

When making measurements, the receiver should be switched to MW, and the volume control should be turned to maximum, but there should be no signal input.

Voltages were measured on the 1,200 V scale of a Universal Avometer, but similar readings should be obtained on the 400 V scale of the Model 7 Universal Avometer. The negative meter lead should be connected to chassis.

DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (pull-off);

Withdraw the speaker connections from the connecting panel on **T2;**

Remove the four screws holding the chassis to the bottom of the cabinet.

When replacing, small pads of sponge rubber should be fitted between the chassis and the bottom of the cabinet.

The speaker leads should be connected as follows, numbering the pins on the *front* of the connecting panel from left to right when viewed from the rear: 1, blue; 2, green; 3, red; 4, black.

The tone control should be steadied with the free hand while its knob is being pressed home.

Removing Speaker.—Withdraw the connecting leads from their pins;

Remove the four nuts holding the speaker to the sub-baffle.

When replacing, the transformer should be at the top, and the connecting leads replaced as described above.

If the leads to the transformer have been disconnected, they should be replaced as follows, numbering from left to right as seen from rear :—

1, black from **C19** and blue from chassis;
2, green from chassis;
3, red from **C18,** red from **C19** and red from chassis.

The black lead from **C18** goes to the earthing tag on the speaker frame.

GENERAL NOTES

Switches.—**S1** is the local/distant switch, mounted on the rear member of the chassis.

S2-S7 are the waveband switches, in a single rotary unit beneath the chassis. This is indicated in our under-chassis view, and shown in detail in the diagram below, where it is drawn as seen when viewed from the rear of the underside of the chassis. All these switches, except **S5,** close on MW and open on LW. **S5** opens on MW and closes on LW.

S8 is the QMB mains switch, ganged with the volume control **R9.** **S9** is the internal speaker muting switch, and forms part of the speaker assembly.

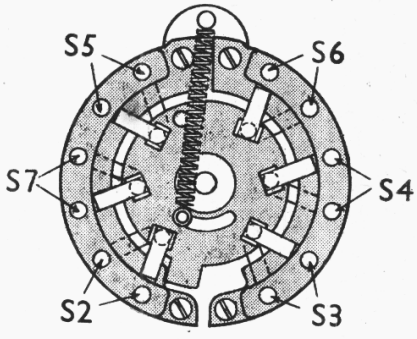


Diagram of the switch unit, as seen when viewed from the rear of the underside of the chassis.

Coils.—**L1-L5; L6-L8;** and **L9-L12** are in three screened units on the chassis deck. The IF transformers **L13, L14** and **L15, L16** are in two units beneath the chassis with their associated tuning condensers, whose adjustments project through the rear member of the chassis.

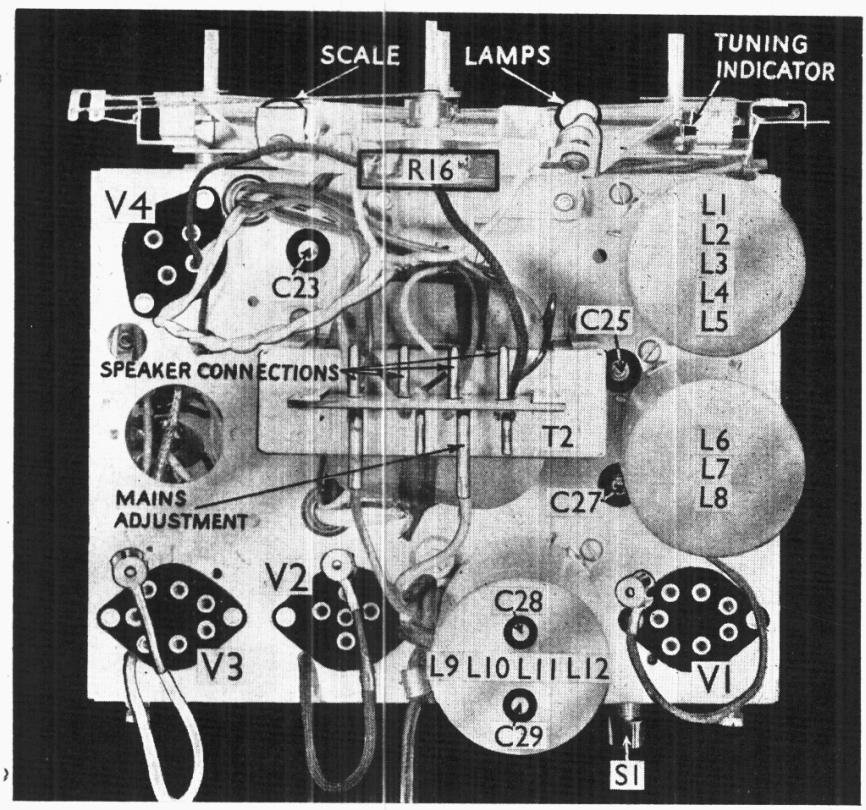
Scale Lamps.—These are two Osram MES types, rated at 2.5 V, 0.3 A. They are connected in series across the LT secondary of **T2,** and their junction is taken to chassis.

External Speaker.—Two terminals are provided on the speaker assembly for a low impedance (4-6 Ω) external speaker. A switch mounted just above the terminals permits the internal speaker to be muted if desired.

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

Condensers C13, C16.—These are two 4 μF electrolytics in a single container. The yellow lead is the positive of **C13,** which is rated at 50V working; the red lead is the positive of **C16,** which is rated at 350V working. The case forms the common negative connection.

Condenser Block C6, C7, C12, C17.—This is a multiple assembly in a metal case



Plan view of the chassis. The colour-coding of the speaker connections, reading from left to right, is: 1, blue; 2, green; 3, red; 4, black.

mounted on the rear member of the chassis; it is indicated in our under-chassis view. The three red leads are from one side each of three 0.1 μF condensers **C6, C7** and **C17**; the other side of each of these is common, and is taken to the case. The two yellow leads come from **C12** (0.25 μF) which is isolated from the case.

Condensers C18, C19.—These are two dry electrolytics in a single container, mounted in a bracket on the right of the speaker assembly. They are both rated at 8 μF, 500V peak working, and their leads are coloured red and black to indicate their polarity.

Resistances R7, R8, R11, R14, R15.—These five resistances are mounted inside insulating tubes, the outsides of which are coated with copper and earthed for screening purposes.

CIRCUIT ALIGNMENT

IF Stages.—Connect signal generator to control grid (top cap) of **V1** and chassis, and turn volume control to maximum and tone control to low. Feed in a 125 KC/S (2,400 m) signal, and adjust **C33, C32, C31** and **C30** for maximum output.

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

MW.—Switch set to MW, tune to 228 m on scale, and screw up **C27** fully (anti-clockwise). Feed in a 228 m (1,315 KC/S) signal, and unscrew **C27** (clockwise) until the *second* peak is reached. A special key should be used to adjust **C27.**

Transfer signal generator leads to **A** and **E** terminals via a suitable dummy aerial or a 0.0002 μF condenser, feed in a signal of the same frequency, and adjust **C23** and **C25.** Feed in a 500 m (600 KC/S) signal, tune it in, and adjust **C28** for maximum output, while rocking the gang for optimum results.

LW.—Switch set to LW, feed in a 1,807 m (166 KC/S) signal, and adjust **C29** for maximum output, while rocking the gang for optimum results. Check calibration at 1,128 m (266 KC/S).

Modifications in the Reflex Model

Receivers bearing serial numbers from 100,000 to 111,397 employ a modified chassis incorporating a reflex circuit, in which **V2** is made to perform the dual function of IF amplifier and AF amplifier. The additional amplification thus obtained is used for both radio and gramophone operation.

The diagram in columns 5 and 6 shows the modified circuit, excepting one or two minor differences which are mentioned below, together with some physical differences in the chassis.

As will be seen from the diagram, the output of the first IF transformer is fed in the usual way to **V2** control grid, amplified and passed on to the diode circuit. The signal diode load resistance is now the manual volume control **R28,** from which the audio-frequency component is tapped off at the slider and passed via the AF coupling condenser **C38** and the CG resistance **R23** to the control grid of **V2.**

The screen of **V2,** which now serves as the anode of a triode AF amplifier, is fed from HT positive via the decoupling resistance **R24** and the AF load resistance **R25. C35** operates as the AF decoupling condenser, while **C36** is the IF screen decoupling condenser and has a fairly high impedance at audio frequencies. The signal developed across **R25** is capacity coupled via **C42** to the control grid of the pentode section of **V3.**

IF filtering by **C34** in **V2** CG circuit, and **C40, R27, C41** in diode circuit. The pick-up terminals are now between the top of **R28** and chassis.

Second diode of **V3,** fed from **L16** via **C43** provides DC potentials which are developed across **R31, R32** and **V2** AF CG resistance **R23.** The total voltage developed is fed back via the AVC line to **V1,** via **R4** in the original diagram overleaf; **R4** becomes 1,000,000 O.

Part of the AVC potential appears across **R23,** since this forms part of the load resistance, and is thus applied as AVC to **V2** CG.

Two electrical differences that are not shown in the modified diagram are the omission of the local/distant control in the reflex chassis, and the separate 50,000 O HT feed resistance and 0.1 μF decoupling condenser to **V1** screen. Also, the tuning indicator **T.I.** is now included in the anode feed circuits of both **V1** pentode and **V2. C30** is connected directly across **L13.**

The HT circuit potential divider **R17-R22** in the original circuit is now discarded; AVC delay and **V3** pentode GB potential is now obtained from the drop across **R30** in **V3** cathode lead to chassis.

Considerable changes have been made in the component values in the modified version. The new values are given in the table (Col. 6). The same valve types are used, although the Ferranti VPT4A is quoted as an alternative to the VPT4, but the voltages and currents are different, as shown in the table (Col. 4).

There are several physical changes in the reflex chassis. The electrolytic block is mounted in a bracket standing off the right-hand side of the chassis (when viewed from the rear). The two rows of small components running along either end of the underside of the chassis are no longer used, the components being distributed over the chassis, and in some cases suspended in the wiring. **S1** is, of course, omitted. All the coils, and the whole of the chassis deck remain undisturbed as in the original chassis.

REFLEX COMPONENT TABLE

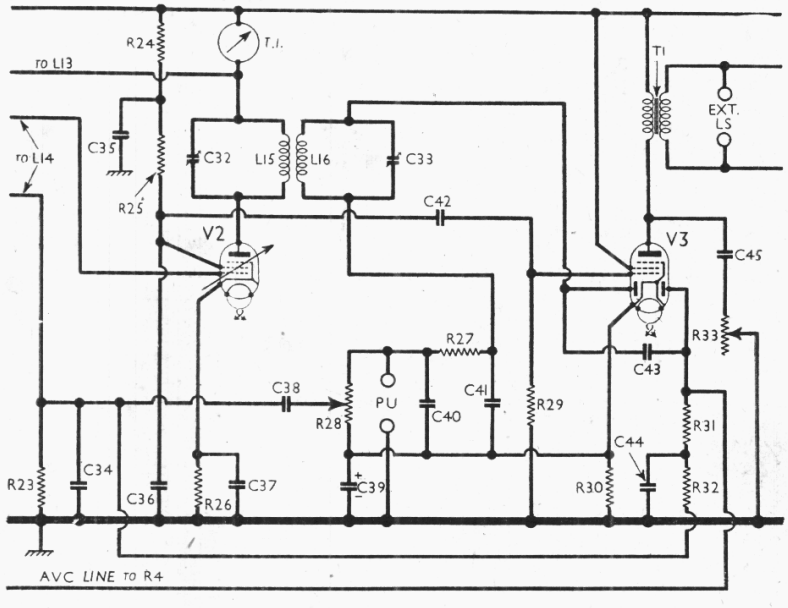
Resistances (ohms)			Condensers (μF)		
R23	...	250,000	C34	...	0·0005
R24	...	15,000	C35	...	1·0
R25	...	50,000	C36	...	0·0016
R26	...	600	C37	...	0·1
R27	...	250,000	C38	...	0·02
R28	...	500,000	C39*	...	50·0
R29	...	500,000	C40	...	0·00015
R30	...	140	C41	...	0·001
R31	...	1,000,000	C42	...	0·01
R32	...	500,000	C43	...	0·0005
R33	...	33,000	C44	...	0·05
			C45	...	0·05

* Electrolytic.

REFLEX VALVE TABLE

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VHT4	250 / Oscillator / 100	1·5	80/100	3·5
V2 VPT4	250	3·5	80/100	3·0
V3 PT4D	260	32·0	265	8·0
V4 R4	380†	—	—	—

† Each anode, AC.



Affected section of the circuit diagram in the Reflex model, showing the principal modifications.

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