G. Marconi

THE REAL THING

MARCONIPHONE

SERVICE MANUAL

PRIVATE AND CONFIDENTIAL
TO THE TRADE ONLY

★

Model 315

3-VALVE ALL-WAVE
BATTERY RECEIVER

Contents

MAR.
1938

PART NO.
20570

MODEL 315
TECHNICAL SPECIFICATION.

WAVELENGTH RANGE.

Short Waves	...	...	...	...	16·5 to 50 metres.
Medium Waves	...	...	...	...	195 to 580 metres.
Long Waves	...	...	...	...	725 to 2,000 metres.

DIMENSIONS.

Height, 13 inches ; Width, 20¾ inches ; Depth, 9¼ inches.

WEIGHT.

19½ lbs. net, 29 lbs. gross (excluding batteries).

BATTERY SPECIFICATION.

High Tension, 120 volts.
Marconiphone Cat. No. B498 or B600.
Low Tension : 2v. 45 Ah Accumulator.
Exide type DFG

CONSUMPTION.

High Tension	...	...	...	...	7·5 milliamps (average).
Low Tension	...	...	...	...	0·6 ampere (approximately).

VALVES.

Marconi W21 or KTW21 (met.)				...	H.F. Amplifier
„ HL2	...	...	...	...	Detector
„ KT21	...	...	...	...	Output valve

SPEECH OUTPUT.

400 milliwatts maximum.

LOUDSPEAKER.

Type No. 24760F.

The latest type of high flux-density permanent magnet is incorporated in this loudspeaker.

D.C. Resistance of speech coil	...	4 ohms.
Impedance at 800 cycles	... ...	5 ohms.

EXTRA LOUDSPEAKER.

If it is desired to connect an extra loudspeaker connexion should be made to the speech coil tags on the receiver loudspeaker. Marconiphone Model 144 adjusted to 5 ohms impedance will give the best results.

CIRCUIT DESCRIPTION

Two aerial tappings are incorporated in this receiver, A being for use under normal conditions, whilst AF includes a Droitwich filter (L4, TC1, C1).

The aerial is coupled to the H.F. amplifier valve V1 (KTW21) via high impedance coupling coils, the grid circuit of this valve being tuned on all bands.

On medium and long waves the coupling coils are litz-wound on iron cores in the interests of selectivity.

Volume is controlled by VR1, which serves as a bias potentiometer for V1, and in conjunction with C14 as an aerial control varying the signal input to the receiver. C17 guards against accidental shorting of the bias supply across the aerial and earth terminals.

The H.F. valve V1 is coupled to the detector V2 (HL2) by a conventional tuned anode capacity-coupled circuit, the tapped medium and long wave coils again being iron-cored. The detector operates on the leaky grid principle and reaction is obtained in the normal manner via L11, L12, L13 and VC3.

The detector is in turn coupled to the output valve V3 (KT21) by an auto-transformer T1, the bias for V3 being taken from the maximum negative point, i.e., the full voltage developed across the resistance R7. On local stations, with V1 fairly heavily biased, the total current consumption of the receiver falls, the grid bias on the output valve is consequently reduced and the power handling capacity of the valve increased, resulting in improved quality of reproduction.

DISMANTLING

REMOVAL OF CHASSIS.

1. Remove back and knobs.
2. Unsolder loudspeaker leads from loudspeaker panel.
3. Remove the four fixing bolts from the underside of the cabinet. The chassis may now be withdrawn.

Note.—The loudspeaker leads are sufficiently long to enable the chassis to be withdrawn for inspection without disconnecting the loudspeaker.

REMOVAL OF LOUDSPEAKER.

1. Disconnect leads from loudspeaker panel.
2. Remove four screws securing loudspeaker and withdraw.

PRELIMINARY TESTS

1. **Battery Voltage.**—The accumulator must read at least 2 volts **on load,** and the H.T. battery should be replaced if its total voltage on load is less than 70 volts. Examine all battery leads and if necessary clean or replace plugs or tags to ensure good contact. Apply vaseline to spade tags to prevent corrosion.

2. **Detector Test.**—Connect the aerial via a small condenser (about 0·0003 mfd.) to the anode (top cap) of V1 (KTW 21). If the output stage is O.K. and the detector is operating correctly signals should be obtained from the medium wave local station with very flat tuning.

3. **H.F. Valve Test.**—Connect the aerial to the fixed vanes of VC1. If signals are now heard on medium and long waves, the fault must lie in the aerial coupling circuits L1, L2, etc.

4. **H.T. Consumption Test.**—The following values were taken with a new H.T. battery. If the battery voltage is low a proportional reduction in consumption should be expected.

Total feed at black lead—Volume at min. 7·6 mA. Volume at max. 8·4 mA.

H.F. TESTS AND ADJUSTMENTS

If coils or other components associated with H.F. section of receiver have been replaced or repaired, or any wiring disarranged, the appropriate circuits must be realigned.

This requires the following apparatus : A screened oscillator or signal generator tuning from 16 to 1,500 metres. (18·75 megacycles to 200 kilocycles), with an attenuator, and an output meter. Alternatively an 0-2 A.C. voltmeter may be used as output meter. The E.M.I. Service equipment is very suitable.

In carrying out the following operations it is important that the receiver input is kept low and progressively reduced so that reading on output meter does not exceed 50 mW. or 0·5 volt. Connect output meter between anode V3 (KT21) and chassis, or the 0-2 voltmeter across the speech coil of loudspeaker.

Note.—Capacity and inductance trimmers are supplied on this model. Inductive trimming on medium waves need only be carried out if the inductance of a tuned circuit has been altered by replacing the coil.

On short waves, however, it is necessary to regang both capacitatively and inductively. If repairs to the receiver affect only one waveband, this waveband only will need realigning.

POSITIONING THE POINTER.

Before realignment is commenced the position of pointer and scale must be checked. If the scale has been replaced it must be fixed in a level position. The pointer should stop at approximately $\frac{1}{8}$ inch below the horizontal position at each end of the scale. The oscillator should be connected to the A and E sockets.

M.W. AND L.W. CONDENSER TRIMMING.

In carrying out all the following ganging operations the receiver reaction control must be kept advanced just short of oscillation and the volume control to maximum.

Medium Waves.

1. Switch receiver to M.W. and set gang condenser to minimum.
2. Tune oscillator to 195 metres (1,538·5 kilocycles) and adjust TC6 and TC3 in that order for maximum output.

Long Waves.

1. Tune oscillator to 725 metres (413·8 kilocycles) and set gang on receiver to 725 metre mark on scale, receiver switched to L.W.
2. Adjust TC5 and TC2 in that order for maximum output.

Adjustment of Droitwich Rejector.

This operation must be performed on the aerial on which the receiver is to be used, using the signal from the Droitwich transmitter.

Connect aerial to AF socket, tune in to Droitwich with reaction control just short of oscillation point, and adjust TC1 for **minimum** output.

Short Waves.

1. Switch receiver to SW and set oscillator and receiver (by scale) to 50 metres (6 megacycles).
2. Adjust inductances of L7 and L10 in that order for maximum output, by moving the loop of wire inside each coil former up and down. A strip of insulating material with a " nick " in it will facilitate this operation.
3. Set oscillator to 16·5 metres (18·18 megacycles) and tune in signal on receiver.
4. Adjust TC4 for maximum output, at the same time " rocking " the gang condenser.
5. Set oscillator to 50 metres, tune in signal and adjust loop in L7 for maximum output.
6. Repeat operations 3 and 4.

Note.—After each waveband has been aligned, check that oscillation is obtainable and controllable throughout the band.

CALIBRATION.

When ganging has been completed the pointer should be adjusted to give the best possible compromise on all bands.

M.W. INDUCTIVE TRIMMING.

This is necessary only if a coil or coils have been replaced.

1. Adjust TC6 and TC3 as shown in " Condenser Trimming."
2. Set oscillator to 530 metres (566 kilocycles) and tune in signal on receiver.
3. Adjust aerial coil iron core by means of hex-headed screw on underside of chassis for maximum output.
4. If calibration is out adjust anode coil core in similar manner, afterwards readjusting aerial coil core.
5. Repeat condenser trimming.

VALVE TABLE

(VOLTAGE, CURRENT AND RESISTANCE TESTS)

Values ± 20 per cent.

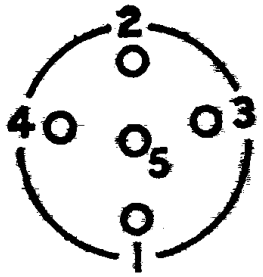
Voltage and current readings taken with an H.T. battery reading 120 volts between maximum and 6 volt sockets, aerial disconnected, receiver switched to M.W. and tuned to point of no reception, sensitivity control at minimum and volume control at maximum.

Resistance readings (in ohms) taken with batteries disconnected ; valves and pilot lamp removed, and switch at S.W.

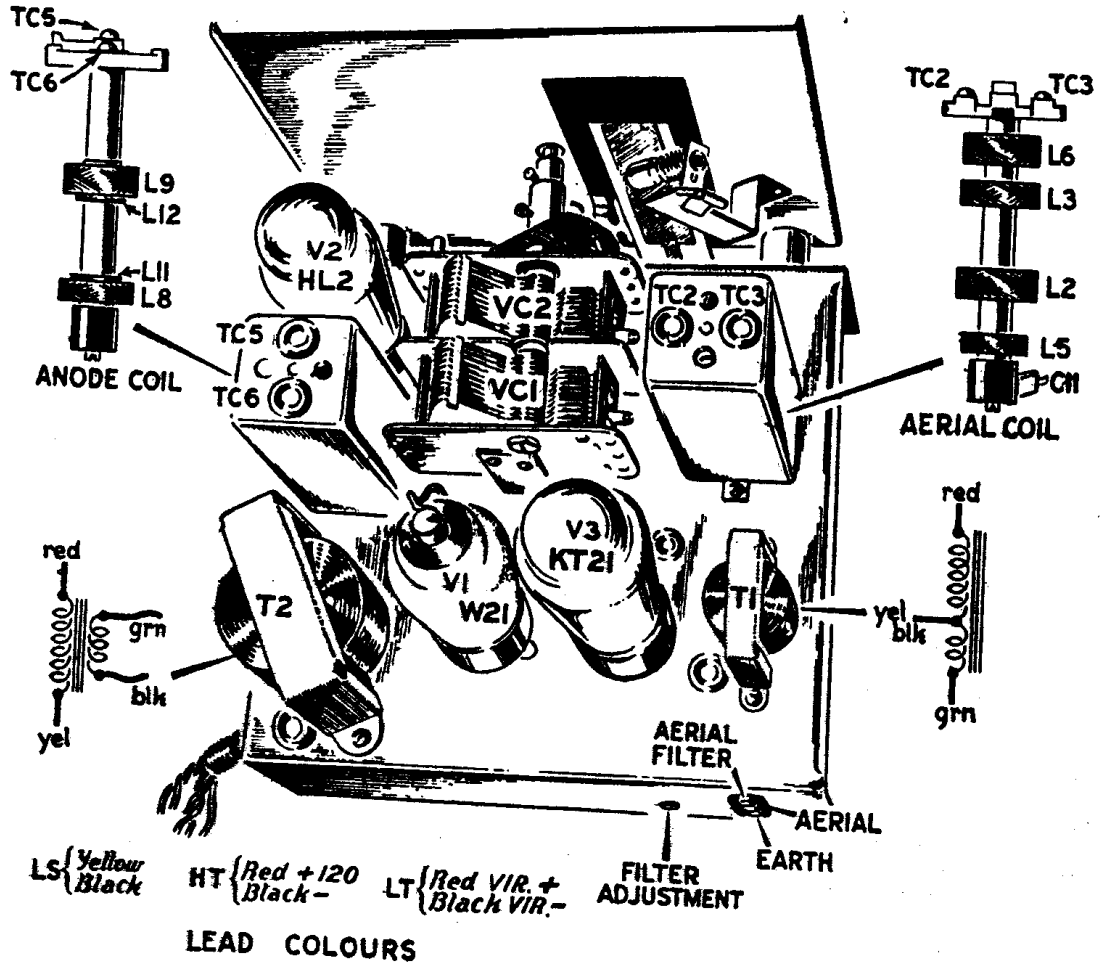
S — Short circuit. ∞ — Open circuit. Socket numbers are given in brackets (see diagram below).

VALVES.		V1 (W21 or KTW21)	V2 (HL2)	V3 (KT21)
ANODE ...	Volts to Chassis	75	50	115
	Current (mA)	2	1	3·5
	Resistance to Chassis	(Cap) ∞	(1) ∞	(1) ∞
SCREEN ...	Volts to Chassis	77	—	120
	Current (mA) ...	0·7	—	1·2
	Resistance to Chassis	(1) ∞	—	(5) ∞
BIAS ...	Voltage ... Measured	2·5 — ∞ Slider VR1 and chassis	— —	2·6 H.T. — (black) and chassis.
CONTROL GRID	Resistance to Chassis ...	(2) 2·9 megohms	(2) ∞	(2) 3630 ohms.
FILAMENT	Volts across sockets ...	2	2	2
	Current (amps) ...	0·1	0·1	0·3
	Resistance to Chassis (3)	S	S	S
	(4)	∞	∞	∞

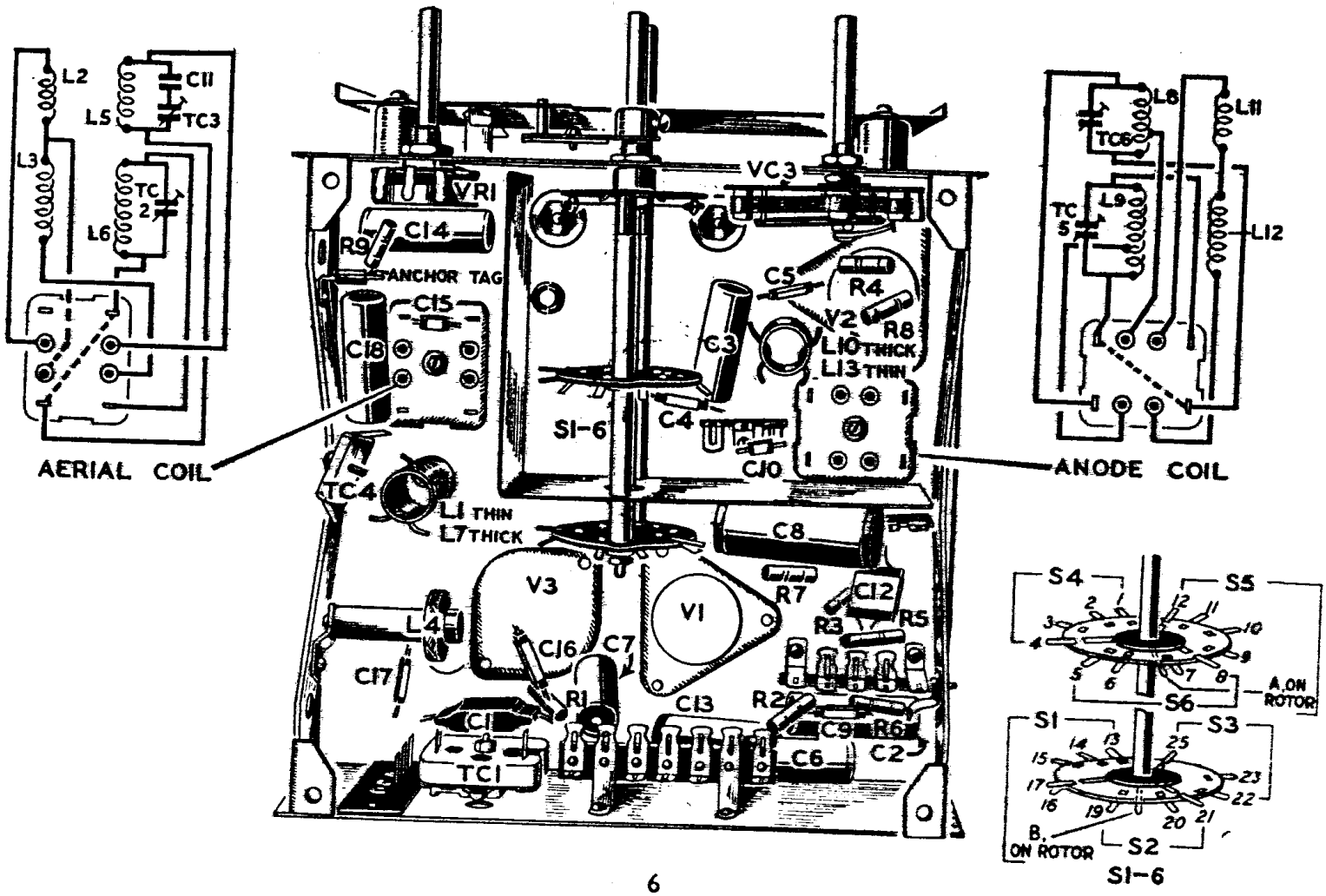
Total H.T. consumption (measured at — 6 volt battery socket) — 7·6 — 8·4 milliamps.
Total L.T. consumption — 0·6 amp.

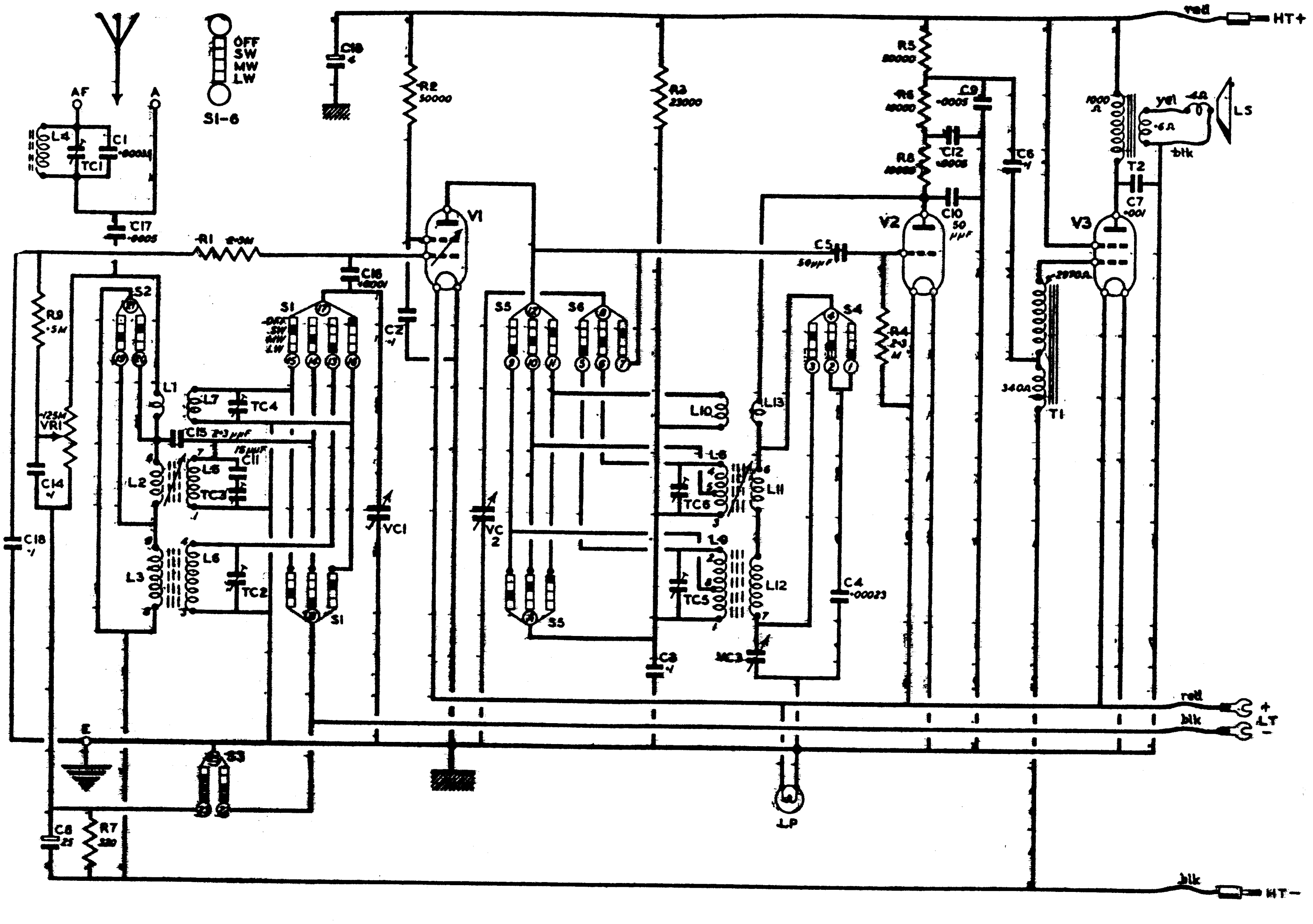


VALVE SOCKET SEEN FROM TOP



LEAD COLOURS




OFF
SW
MW
LW
S1-6
AF
A
L4
C1
TC1
C17
R1
C16
S1
S2
R9
VR1
C14
C18
L1
L7
TC4
C15
L2
L5
C11
TC3
L3
L6
TC2
VC1
C19
R2
50000
R3
23000
V1
C2
S5
S6
VC 2
L10
L8
TC6
L9
TC5
L11
L12
C3
MC3
C5
L13
S4
C4
R4
R5
R6
R8
C9
C12
C10
C6
V2
V3
C7
T2
T1
LS
yel
blk
red
HT+
HT-
LT
S3
C8
R7
LP
E

CONTINUITY CHECKS

Resistance values ± 15 per cent. Remove valves and pilot lamp and disconnect batteries before making any resistance measurements.

Component	Measured	Switch	Resistance
L4	A and AF sockets	—	7·0 ohms.
L1, L2, L3 R7 ...	C17 and E sockets	LW	460 ohms (L1 0·2 ohm) (L2 15·0 ohms) (L3 125·0 ohms)
L5, L6, L7	Fixed vanes VC1 and chassis	SW MW LW	L7 0·1 ohm L5 1·3 ohms L6 12·0 ohms
L10, R3	Anode V1 and H.T. + plug	SW	23,000 ohms (L10 0·1 ohm)
L8, R3	Fixed Vanes VC2 and H.T. + plug	MW	23,000 ohms (L8 1·3 ohms)
L9, R3	Fixed Vanes VC2 and H.T. + plug	LW	23,000 ohms (L9 12·0 ohms)
L11, L12, L13 ...	Anode V2 (HL2) and fixed vanes VC3	SW MW	L13 0·3 ohm L11, L12, L13 5·5 ohms (L11 1·2 ohms)
R1, VR1, R7, R9 ...	Control grid V1 and H.T. — plug	—	2·9 megohms
R4	Grid V2 and filament socket (4)	—	2·3 megohms
T1 Primary ... ... Secondary ...	Across ends ... ... Across ends	— —	340 ohms 2970 ohms
T2 Primary ... ... Secondary ...	Anode V3 and H.T. + plug ... ... Across loudspeaker leads (disconnect speech coil)	— —	1,000 ohms 0·6 ohm
Speech coil	Across ends (disconnect T2 Secondary)	—	4 ohms