Decca Model 919

AC Superhet

Release Date 1935

Circuit diagram and servicing notes

Decca Model 919 AC Superhet

1. General

The Decca model 919 is a two waveband three valve plus rectifier AC superhet, and was released in 1935. All the controls are operated from a single knob (it is actually two concentric controls). The outer knob is tuning. The inner is the volume / mains on-off control, and this pulls in and out to change the wave-band. Provision is made for connecting a gramophone pick-up; this is switched into circuit (and the radio silenced) by turning the tuning control to its minimum wavelength stop, where it operates a switch.

2. Circuit details

The circuit diagram is below. The aerial circuit is tuned by a band-pass arrangement (L2, L3, VC1 and L4, L5, VC2). The mixer stage, V1, is a variable-μ heptode, MX40, using grid tuning for the oscillator (L6, L7, VC3). Tracking is achieved using padder trimmers (Tc3 and Tc4). The intermediate frequency is 130 kHz. A double-tuned IF transformer (IFT1) passes the signal to the IF amplifier V2, a variable-μ pentode, VPM46.

The output from the IF amplifier appears at IFT2, a single tuned IF transformer, and is demodulated by V3, a double-diode output pentode, AC2/PenDD. The AF signal is adjusted by the volume control VR1, and it is further amplified in the pentode section of V3. The output is taken from the anode, using the transformer T1 to couple a mains energised moving coil loudspeaker. R20 and C15 provide tone correction.

An automatic volume control voltage, supplied from the second diode in V3, is applied to V1 and V2. Notice that V1 only receives AVC when the wave-change switch S1 is in the *long wave* position. On medium waves the control is shorted to earth *via* L5 and S1a. This odd feature has been verified on the set used for the information in these notes.

The mains transformer T2 provides heater current to the valves, with the full wave directly heated rectifier V4 having its own heater winding. The reservoir capacitor is C19, and the smoothing capacitor C18; both are electrolytic types. The smoothing inductance L9 is the loudspeaker field winding.

The arrangements for the gramophone pick-up connection are unusual. The pick-up is in the grid circuit of the IF valve V2. At audio frequencies the impedance of the transformer winding in IFT2 is negligible, so the AF signal appears across the anode load resistor R14.
Switch S2 is operated by the main tuning control. In the “radio” position V3 control grid is connected to the diode circuits. In the “gram” position at the extreme end of the tuning range, V3 control grid is disconnected from the diodes and connected to R14.

3. Servicing notes

In order to remove the chassis from the cabinet, the aerial, earth and pick-up connections must be unsoldered from the panel mounted sockets at the back of the cabinet.

The control knobs must also be removed. To do this, pull the large, outer knob (tuning) forward over the inner (volume and wavechange) knob. It is held strongly by a friction spring on to its large diameter hollow shaft. This will reveal the grub screw securing the inner knob to its own spindle. It is not actually necessary to take off the inner knob purely for chassis removal, as it readily passes through the large clearance hole in the cabinet.

The information below is a combination of material taken from a barely legible manufacturer's circuit diagram, and measurements made on a working receiver (serial number 51894). Note that there are some differences between the diagram and the actual receiver investigated. Those which have been discovered are described later.

Table 1 - component values and functions

Capacitors		
C1	V1 AVC decoupling	0.02 µF
C2	V1 cathode resistor by-pass	0.1 µF
C3	V1 oscillator grid isolation	0.0002 µF
C4	VI oscillator anode decoupling	0.1 µF
C5	V2 screen decoupling	0.1 µF
C6	V1 screen decoupling	0.1 µF
C7	V2 anode load bypass	0.001 µF
C8	V2 cathode resistor by-pass	0.1 µF
C9	V2 bias decoupling	0.001 µF
C10	V2 bias decoupling	0.02 µF
C11	V3 control grid isolation	0.02 µF
C12	RF by-pass	0.0001 µF
C13	Diode coupling	0.0001 µF
C14	RF by-pass	0.0002 µF
C15	Tone correction	0.006 µF
C16	V3 cathode resistor by-pass	50 µF
C17	RF by-pass	0.005 µF
C18	HT smoothing	
C19	Reservoir	
C20	Mains RF filter	0.005 µF
Resistors		
R1	V1 AVC decoupling	500 kΩ
R2	V1 cathode resistor	300 Ω
R3	Oscillator grid leak	100 kΩ
R4	Oscillator grid stopper	1000 Ω
R5	Oscillator anode dropper	70 kΩ
R6	V1 screen potential divider	30 kΩ
R7	V1 screen potential divider	30 kΩ
R8	V2 screen potential divider	30 kΩ
R9	V2 screen potential divider	70 kΩ
R10	Pick-up load	50 kΩ
R11	AVC potential divider to V2	500 kΩ
R12	AVC potential divider to V2	500 kΩ
R13	V2 cathode resistor	150 Ω
R14	V2 anode load resistor	2500 Ω
R15	V3 grid coupling	70 kΩ
R16	Diode load	300 kΩ
R17	V3 cathode resistor	140 Ω
R18	V3 cathode resistor	140 Ω
R19	V3 anode stopper	100 Ω
R20	Tone correction	10 kΩ

Others			
L1	Aerial coupling	11 Ω	*DC resistance*
L2	MW tuning (1)	3.3 Ω	*DC resistance*
L3	LW tuning (1)	34 Ω	*DC resistance*
L4	MW tuning (2)	3.2 Ω	*DC resistance*
L5	LW tuning (2)	-	
L6	Oscillator tuning MW	3.1 Ω	*DC resistance*
L7	Oscillator tuning LW	-	
L8	Oscillator coupling	3.0 Ω	*DC resistance*
L9	Loudspeaker field	2650 Ω	*DC resistance*
S1 a,b	Wave-change switch		*Ganged*
S2	Radio / gram switch		*Ganged with VC1 - 3*
S3	Mains on - off switch		*Ganged with VR1*
T1	Output transformer	Pri 810 Ω	*DC resistance*
T2	Mains transformer ‡	Pri 80 Ω Sec 780 Ω	*DC resistance* *DC resistance - whole of HT winding*
Tc1 - 7	Trimmers		*Tracking / alignment*
V1	Frequency changer	MX40	
V2	IF amplifier	VPM46 #	
V3	Demodulation/output	AC2/PenDD	
V4	Mains rectifier	A11D §	
VC1, VC2, VC3	Tuning capacitor		*Ganged with S2*
VR1	Volume control		*Ganged with S3*

Notes: ‡ This is a replacement transformer and figures may differ from original
See comment in Table 2 below
§ Or any similar full wave directly heated mains rectifier

4. Circuit variations

In the set under investigation, there was an additional resistor or 1000 Ω inserted between L8 and pin 1 of V1. Also, resistor R5 was colour coded as 50 kΩ rather than 70 kΩ as shown on the circuit diagram. However, the actual resistance of this component was found to be close to 65 kΩ (it was left in place).

Table 2 - voltages and currents

Please note the following:

(i) an AC/VP1 has been substituted for the VPM46 IF valve in obtaining the readings below;

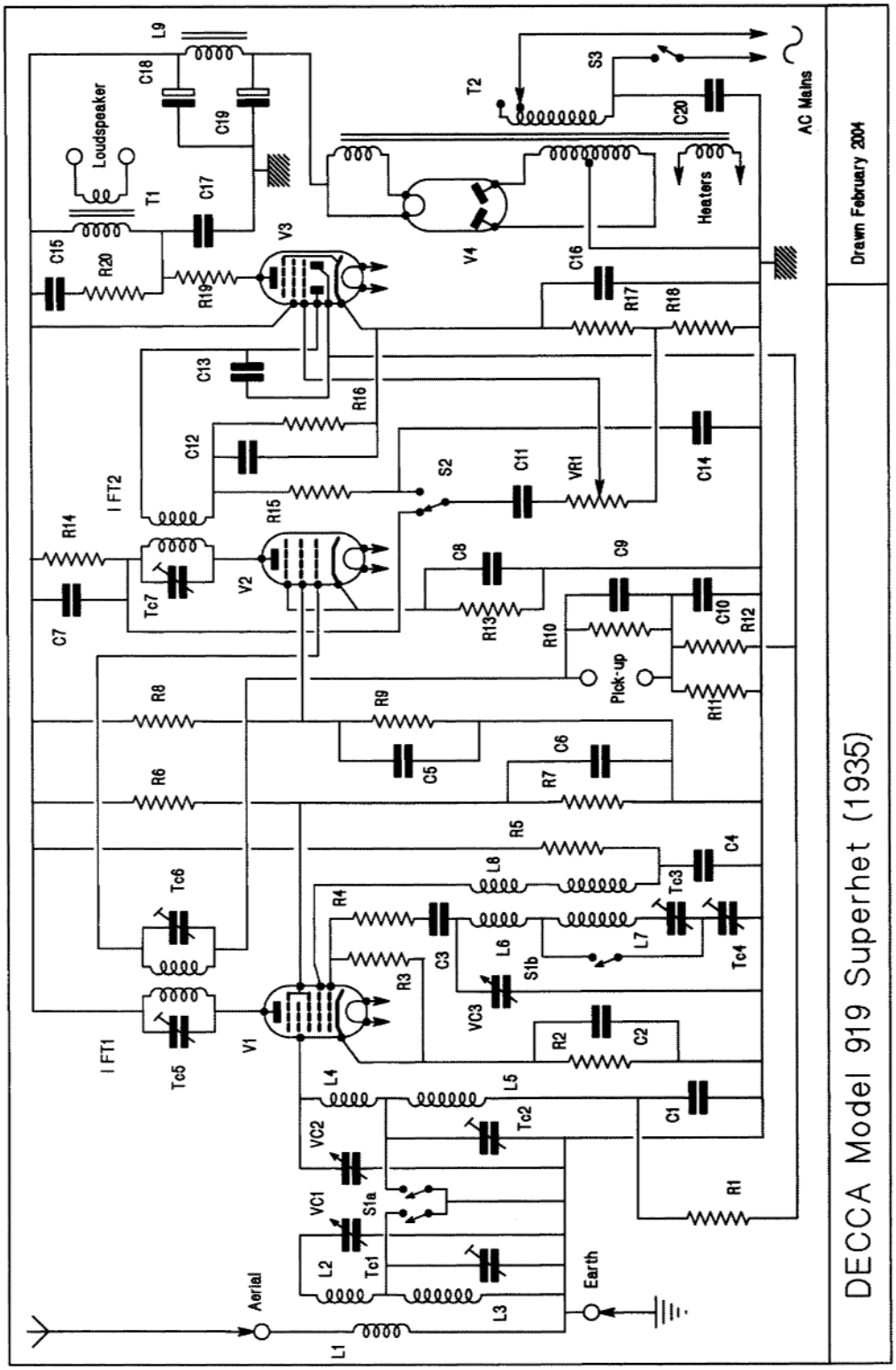
(ii) the mains transformer is a replacement unit;

(iii) the readings below were obtained on a working set, but radios of this type are tolerant of a wide range of operating voltages and currents at the valve electrodes. It is not known whether the set was working to its design specification.

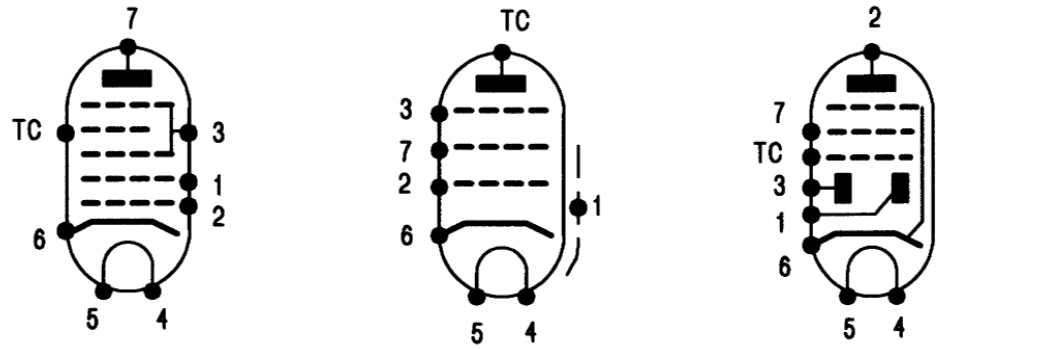
For all these reasons the reported voltages and currents may differ from those originally specified by the manufacturer. All voltages measured with respect to chassis, with the volume at maximum, tuning scale set to a long wavelength (MW) but no strong signal present.

Valve	**V1 (MX40)**	**V2 (AC/VP1)**	**V3 (AC2/PenDD)**	**V4 A11D**
Anode voltage (V)	186 (pin 7)	184 (top cap)	171 (pin 2)	250 (pins 1,4) ***AC***
Screen voltage (V)	68 (pin 3)	96 (pin 7)	193 (pin 7)	-
Oscillator anode (V)	125 (pin 1)	-	-	-
Cathode voltage (V)	1.2 (pin 6)	0.6 (pin 6)	7.6 (pin 6)	293
Cathode current (mA)	4.2	4.3	25	38 (total HT current)

Voltages measured at tags on output transformer T1: (see diagram below)	Tag 1 293 Tag 2 176 Tag 3 193


DECCA Model 919 Superhet (1935)
Drawn February 2004
AC Mains
Loudspeaker
Aerial
Earth
Pick-up
Heaters
L1
L2
L3
L4
L5
L6
L7
L8
L9
T1
T2
V1
V2
V3
V4
S1a
S1b
S2
S3
VC1
VC2
VC3
Tc1
Tc2
Tc3
Tc4
Tc5
Tc6
Tc7
IFT1
IFT2
VR1
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
C16
C17
C18
C19
C20

V1 MX40 V2 AC/VP1 V3 AC2/PenDD



Valve pin diagrams

Transformer T1