

MARCONIPHONE 219 (AND 239 RADIO-GRAMOPHONE)

A SUPERHET chassis with a 5-valve (plus rectifier) circuit is fitted in the Marconiphone 219 receiver, which is for A.C. mains operation. It is suitable for mains of 200-250 V, 50-100 c.p.s. A special feature is the "mechanical Q" noise suppressor.

A similar chassis is fitted in the 239 radio-gramophone, which is suitable for mains of 200-250 V, 50-60 c.p.s.

CIRCUIT DESCRIPTION

Aerial input via pre-set trimmer **C34** and image rejection coil **L1** to tapping on primary of capacity coupled band-pass filter. Primary **L4**, **L5** tuned by **C35**; secondary **L7**, **L8** tuned by **C37**; coupling condensers **C2** and **C3**. Coil **L6** serves to eliminate modulation hum. Coils **L2**, **L3** and condenser **C1** form remainder of image rejection circuit.

First valve (**V1**, Marconi metallised **MX40**) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L9**, **L10** tuned by **C39**, which has shaped vanes for tracking; additional L.W. tracking by **C10**; oscillator anode reaction coils **L11**, **L12**.

Second valve, a variable-mu H.F. pentode (**V2**, Marconi metallised **VMP4G**), operates as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **L13**,

D41). Audio-frequency component in rectified output is developed across **R14** and passed via I.F. stopper **R13**, coupling condenser **C19**, manual volume control **R17**, coupling condenser **C20** and I.F. stopper **R20** to triode L.F. amplifier (**V4**, Marconi metallised **MH4**). Provision for connection of gramophone pick-up across volume control by switch **S6**. On gramophone, switch **S5** breaks **V1** and **V2** S.G.'s H.T. feed circuit and thus prevents radio break-through.

Second diode of **V3**, fed from **V2** anode via **C18**, provides D.C. potential which is developed across **R15** and **R16** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from **V4** cathode resistances **R22**, **R23**.

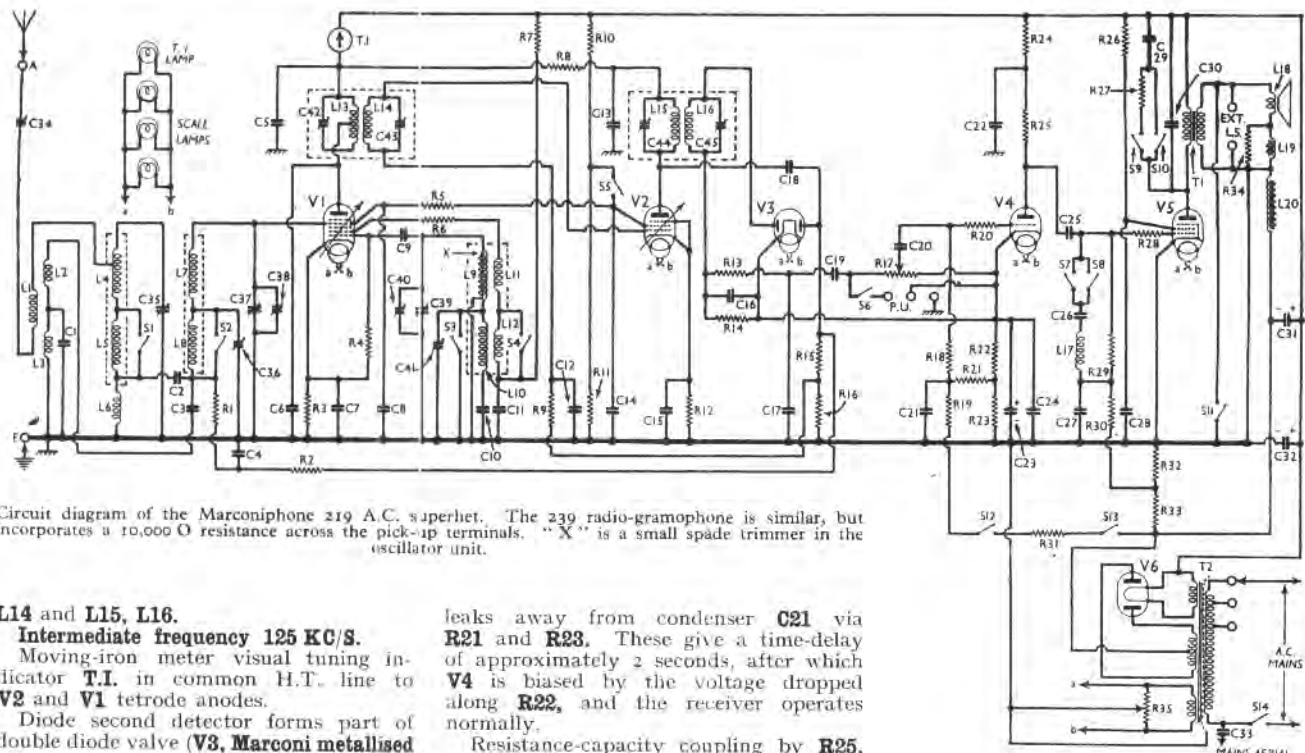
Special electro-mechanical system of silent tuning comprises an oil-drag clutch working in conjunction with the tuning control to close switch **S12** in order to apply a paralysing negative bias potential (obtained from drop along speaker field coil **L20**) to the grid of **V4**, thus muting the L.F. end of the receiver. The switch is closed just as long as the tuning knob is rotated, and the receiver is silent; as soon as rotation ceases the contacts open and the excess bias voltage

C25 and **R29** between **V4** and output pentode (**V5**, Marconi **MPT4**), which obtains its G.B. from potential divider **R32**, **R33** across speaker field coil **L20**. Tone control is effected in grid circuit by tuned filter **L17**, **C26**, which resonates at about 5,000 c.p.s. and gives a sharp cut-off at this frequency. In the anode circuit there is the usual fixed tone corrector **C30**, and also an impedance-limiting network **R27**, **C29**, which gives further control of tone. Switch **S11** mutes speaker while wave-change and gramophone switches are actuated.

H.T. current is derived from full-wave rectifying valve (**V6**, Marconi **U12**). Smoothing by speaker field coil **L20** and dry electrolytic condensers **C31**, **C32**. Hum control by potentiometer **R35**. Mains aerial connection by condenser **C33**.

COMPONENTS AND VALUES

Resistances		Values (ohms)
R1	V1 tetrode C.G. decoupling ..	100,000
R2	V1 A.V.C. line decoupling ..	500,000
R3	V1 fixed G.B. resistance ..	500
R4	V1 oscillator C.G. resistance ..	50,000
R5	V1 S.G.'s H.T. feed ..	15,000
R6	V1 osc. anode circuit stabiliser ..	5,000
R7	V1 osc. anode decoupling ..	50,000
R8	V2 anode decoupling ..	10,000
R9	V2 C.G. decoupling ..	750,000
R10	V1 and V2 S.G.'s H.T. potentiometer ..	23,000
R11	V1 and V2 S.G.'s H.T. potentiometer ..	35,000
R12	V2 fixed G.B. resistance ..	500
R13	I.F. stopper ..	50,000
R14	V3 signal diode load ..	330,000
R15	V2 C.G. decoupling ..	230,000
R16	V3 A.V.C. diode load ..	230,000
R17	Manual volume control ..	500,000
R18	V4 C.G. resistance ..	500,000
R19	Part L.F. muting circuit ..	1,500,000
R20	V4 C.G. I.F. stopper ..	150,000
R21	Part L.F. muting circuit ..	3,500,000



Circuit diagram of the Marconiphone 219 A.C. superhet. The 239 radio-gramophone is similar, but incorporates a 10,000 Ω resistance across the pick-up terminals. "X" is a small spade trimmer in the oscillator unit.

L14 and **L15**, **L16**.

Intermediate frequency 125 KC/S.

Moving-iron meter visual tuning indicator **T.I.** in common H.T. line to **V2** and **V1** tetrode anodes.

Diode second detector forms part of double diode valve (**V3**, Marconi metallised

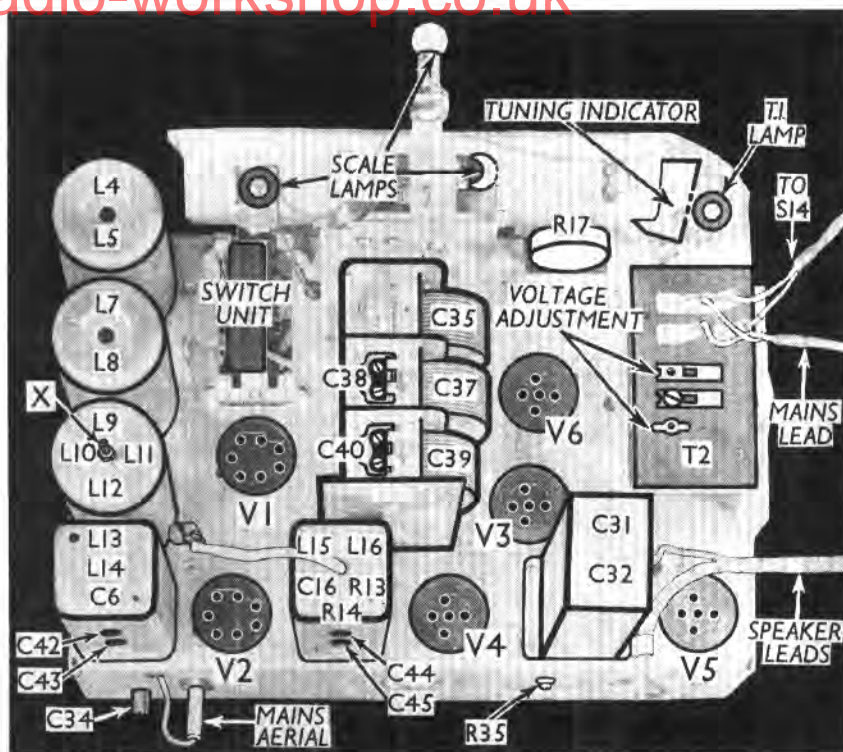
leaks away from condenser **C21** via **R21** and **R23**. These give a time-delay of approximately 2 seconds, after which **V4** is biased by the voltage dropped along **R22**, and the receiver operates normally.

Resistance-capacity coupling by **R25**,

Resistances (contd.)		Values (ohms)
R22	V ₄ normal G.B. and A.V.C. delay voltage resistances	750
R23	V ₄ anode decoupling	1,500
R24	V ₄ anode load	35,000
R25	V ₄ aux. grid H.T. feed	15,000
R26	Part of T.C. circuit	5,000
R27	V ₁ tetrode anode by-pass	23,000
R28	V ₅ C.G. I.F. stopper	5,000
R29	V ₅ C.G. resistance	100,000
R30	V ₅ C.G. decoupling	350,000
R31	Part L.F. muting circuit	1,500,000
R32	V ₅ G.B. potential divider	50,000
R33	Hum neutralising coil shunt	500,000
R34	Hum control	1
R35	Hum control	42

Condensers		Values (μF)
C1	Part image rejection circuit	0.023
C2	Band-pass coupling condensers	0.01
C3	V ₁ A.V.C. line decoupling	0.023
C4	V ₁ tetrode anode decoupling	0.1
C5	V ₁ tetrode anode by-pass	0.1
C6	V ₁ cathode by-pass	0.0001
C7	V ₁ S.G.'s by-pass	0.1
C8	V ₁ oscillator C.G. condenser	0.1
C9	Oscillator L.W. tracker	0.0001
C10	V ₁ osc. anode decoupling	0.0023
C11	V ₂ C.G. decoupling	0.1
C12	V ₂ anode decoupling	0.1
C13	V ₂ S.G. by-pass	0.1
C14	V ₂ cathode by-pass	0.1
C15	I.F. by-passes	0.1
C16	Coupling to V ₃ A.V.C. diode	0.0001
C17	L.F. coupling condensers	0.0002
C18	Part L.F. muting circuit	0.0001
C19	V ₄ anode decoupling	0.1
C20	V ₄ cathode by-passes	25.0
C21	V ₄ to V ₅ L.F. coupling	0.1
C22	Part of T.C. circuit	0.0023
C23	V ₅ C.G. decoupling	0.1
C24	V ₅ aux. grid by-pass	1.0
C25	Part of T.C. circuit	0.01
C26	Fixed tone corrector	0.001
C27	H.T. smoothing	8.0
C28	Mains aerial coupling	4.0
C29	Aerial circuit trimmer	0.0003
C30	Band-pass primary tuning	—
C31	Band-pass sec. L.W. trimmer	—
C32	Band-pass secondary tuning	—
C33	Band-pass sec. main trimmer	—
C34	Oscillator tuning	—
C35	Oscillator main trimmer	—
C36	Oscillator L.W. trimmer	—
C37	1st I.F. trans. pri. tuning	—
C38	1st I.F. trans. sec. tuning	—
C39	2nd I.F. trans. pri. tuning	—
C40	2nd I.F. trans. sec. tuning	—

Other Components		Approx. Values (ohms)
L1	Image rejection coils	0.2
L2	Band-pass primary coils	0.05
L3	Modulation hum suppressor	0.1
L4	Band-pass secondary coils	2.8
L5	Oscillator tuning coils	21.5
L6	Oscillator reaction coils	76.0
L7	1st I.F. trans. Pri.	2.8
L8	1st I.F. trans. Sec.	21.5
L9	2nd I.F. trans. Pri.	7.3
L10	2nd I.F. trans. Sec.	11.5
L11	Tone control choke	4.0
L12	Speaker speech coil	3.5
L13	Hum neutralising coil	40.0
L14	Speaker field coil	90.0
L15	Speaker input trans. Pri.	15.0
L16	Speaker input trans. Sec.	90.0
L17	Mains trans. Pri. total	270.0
L18	Mains trans. Heater sec.	4.0
L19	Mains trans. Rect. fl. sec.	0.5
L20	Mains trans. H.T. sec. total	2,800.0
T1	Tuning indicator meter	300.0
S1-S4	Wave band switches	0.6
S5	Radio muting switch (gram)	29.0
S6	Gram. pick-up switch	0.1
S7-S10	Tone control switches	0.1
S11	Speaker muting switch	520.0
S12	L.F. muting switch	3,000.0
S13	Quiet tuning switch	—
S14	Mains switch	—



Plan view of the chassis. X is the "spade" trimmer in the oscillator unit. Note the trimmers at the sides of the I.F. units.

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, first remove the back (five round-head wood screws), the three large control knobs (recessed self-tapping screws), and the two small knobs (pull off). Now free the mains and speaker leads from the cleats holding them to the cabinet and remove the mains switch from the side of the cabinet. Next remove the four bolts (with washers and lock washers) holding the chassis to the bottom of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads.

When replacing chassis, note that the large control knobs are marked with their purpose and must therefore be placed on the correct spindles. Also, set the wave-change switch in the medium-wave position (see indicator on the tuning dial) and place the knob so that the lettering M.W. is uppermost.

To free the chassis entirely, unsolder the leads from the speaker. The tags are numbered and when replacing the leads, they should be connected as follow:—

2, yellow (and yellow lead to speech coil); 3, black (and one end of the resistance connected to tag 4); 6, yellow/black; 7, red; 8, red/yellow. No external connection is made to tag 4.

Removing Speaker.—To remove the speaker, remove the two long bolts (with washers) holding the speaker cross bar to the cabinet. When replacing see that the transformer is on the left.

Removing Chassis from Radio-Gramophone.—Remove the two wood screws on the right-hand side of the control panel (adjacent to the motor board) and remove the volume control knob. It is now possible to remove the side panel of the cabinet against which the chassis is mounted, when access can be gained to the underside of the chassis.

To remove the chassis, remove the panel and knobs (see above) and slacken the central screw in the pilot lamp cowl which stands above the motor board. The pilot lamp bracket can now be withdrawn through the control board from the inside of the cabinet. Now disconnect the motor and speaker leads (Continued overleaf)



Front view of the lower part of the chassis, showing the tone control, muting and quiet tuning switches.

MARCONIPHONE 219 (Continued)

and remove the pick-up plugs. Remove the four screws holding the chassis, which may now be withdrawn.

Removing Speaker from Radio-Gramophone.—See above.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 225 V, using the 211-230 V tapping. The volume control was at maximum, the inter-station noise suppressor was out of circuit and the receiver was tuned to the lowest wavelength on the M.W. band. There was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 MX40*	225	1.1	63	1.9
V2 VMP4G	180	3.4	90	2.5
V3 D41	—	—	—	—
V4 MH4	90	2.1	—	—
V5 MPT4	232	31.0	210	5.2
V6 U12	358†	—	—	—

* Osc. anode (G2) 82 V, 2.6 mA.
† Each anode, A.C.

GENERAL NOTES

Switches.—S1-S6 and S11 are all ganged together in a single unit partly above and partly below the chassis. They are indicated in our under-chassis view. The table (col. 2) gives the switch position for the various control settings, O indicating open, and C closed.

Switch	M.W.	L.W.	Gram.
S1	C	O	C
S2	C	O	C
S3	C	O	C
S4	C	O	C
S5	C	C	C
S6	O	O	C
S11	O	O	O

It should be noted that S11, the speaker muting switch, is open in all the control positions, but closes between each position, giving silent switching.

S7-S10 are the tone control switches, ganged in a single rotary unit. The unit has three settings, and numbering these 1, 2 and 3 from the fully anti-clockwise position, the table below gives the switch positions.

Switch	Setting		
	1	2	3
S7	O	O	C
S8	O	C	O
S9	O	C	O
S10	O	O	C

S12 is the L.F. muting switch, closed while the tuning knob is being rotated, a friction cam being employed.

S13 is the quiet tuning switch, of the rotary Q.M.B. type. It is closed when the knob is rotated fully clockwise.

S14 is the Q.M.B. mains switch, mounted at the side of the cabinet.

Coils.—L1-L3 are in a single un-screened unit beneath the chassis, near the front. L16 is a small choke, also un-screened and close to the L1-L3 unit. L17 is a choke in a screened can beneath the chassis. The remaining coils are in five screened units on the chassis deck.

Scale and T.I. Lamps.—The three scale lamps and the tuning indicator lamp are all Osram M.E.S. types rated at 6.2 V, 0.3 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a low resistance (4 O) external speaker.

Condensers C31, C32.—These are two dry electrolytics. The red lead is the common positive, the black lead nearest the back of the chassis is the negative of C32, and the other black lead the negative of C31.

Resistance R34.—This is a small wire resistance in insulated sleeving connected across tags 3 and 4 on the speaker unit.

Radiogram Model.—This has a 10,000 O resistance across the pick-up terminals.

CIRCUIT ALIGNMENT

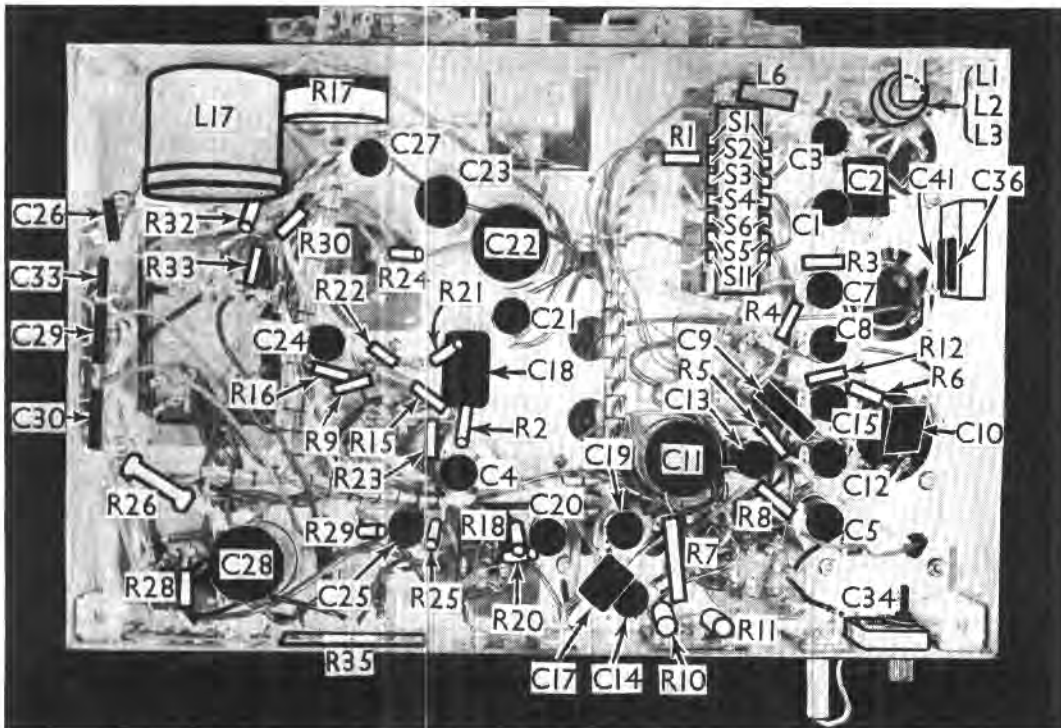
I.F. Alignment.—Connect a suitable output meter to the set, switch to M.W., rotate gang condenser to minimum, advance volume control fully, and see that the cap is on the VMP4G valve. Connect oscillator output leads to control grid of VMP4G valve (V2, pin 2), and earth. Adjust C44 and C45 for maximum output on 125 KC/S. Remove oscillator lead from V2 and connect to control grid of V1 (top cap). Adjust C43 on 127 KC/S for maximum, then adjust C42 on 123 KC/S for maximum. Repeat these operations as a final check, and then check symmetry of I.F. response curve by sweeping the oscillator tuning condenser through the 125 KC/S setting.

Signal Frequency and Oscillator Alignment.—Connect oscillator output to A and E sockets, preferably via a dummy aerial.

Set receiver to 220 m. on the scale, inject a 220 m. signal and adjust C40 for maximum. In trimming a slight "valley" in the resonance curve of C40 may be noted. Leave C40 set to the bottom of this dip. Now adjust C38 and C34 for maximum. Set oscillator and receiver to 525 m., and adjust "spade" trimmer (X) on top of oscillator coil unit for maximum. Repeat adjustments of C40, C38, C34 and X. Again repeat adjustments of C40, C38 and C34. It is essential that these three condensers are adjusted finally, after X.

Switch receiver and oscillator to L.W., and adjust both to 1,000 m. Adjust C41 and C36 for maximum.

Image Rejection.—The two coils L2 and L3 may be varied in relation to L1 to reject image interference. For images of stations above 300 m. (images above 400 m.) adjust L3. For images of stations below 300 m. (images below 400 m.) adjust L2. It may be necessary to re-adjust L2 after L3, as these adjustments are to some extent inter-related.



Under-chassis view. The wavechange and gramophone switches are clearly indicated.