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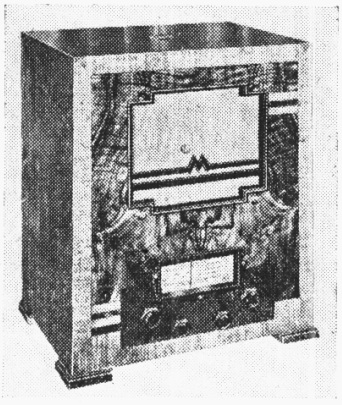
"TRADER" SERVICE SHEET

600

# MARCONIPHONE 262, 278, 280, 286 DC & HMV 404, 440, 505, 540 DC



The Marconiphone 262 DC receiver.

FOR DC mains operation only, the Marconiphone model 262 DC is a 4-valve, 2-band superhet, for operation on mains of 200-250 V. Methods of converting the receiver to AC/DC operation are given under "AC/DC Conversion." Differences in the radiogram version, model 286, are given under "Radiogram Modifications."

Two equivalent receivers in the HMV range are the 440 (table) and 540 (radiogram), while four other models, Marconiphone 278 (table) and 280 (radiogram), and HMV 404 (table) and 505 (radiogram) employ chassis which are similar except for the inclusion of a simple AC/DC conversion device.

*Release dates: Marconiphone* 278, 280 *and HMV* 404, 505, 1933; *Marconiphone* 262, 286 *and HMV* 440, 540, 1934.

## CIRCUIT DESCRIPTION

Aerial input is via isolating condenser **C1,** variable potentiometer **R1,** series coupling condenser **C2** and, on MW, **S1** and image supressor coil **L4** or, on LW, **S2** and coupling coil **L1,** to inductively coupled band-pass filter. Primary coils **L2, L3** are tuned by **C27;** secondaries **L5, L6** are tuned by **C29.** Image suppression by coil **L4** and pre-set condenser **C28.**

First valve **(V1, Marconi DSB)** is an RF tetrode operating as frequency changer with cathode coupling. Oscillator circuit tuning coils **L9** (MW) and **L10** (LW) are tuned by **C32.** Parallel trimming **C33** (MW) and **C31** (LW); tracking by specially shaped vanes of **C32.** Tuned circuit is coupled to anode via **C4** and **L15,** while reaction coupling is obtained via coils **L7, L8** in cathode circuit.

Second valve **(V2, Marconi metallised VDS)** is a variable-mu RF tetrode operating as intermediate frequency amplifier with tuned-primary, tuned-secondary transformer couplings **C34, L11, L12, C35** and **C36, L13, L14, C37.**

**V2** gain is controlled by variable resistance **R6,** which is ganged with **R1,** the two together forming a combined volume control. The positive excursion of **R6** is limited by the inclusion of **R5** in the cathode circuit.

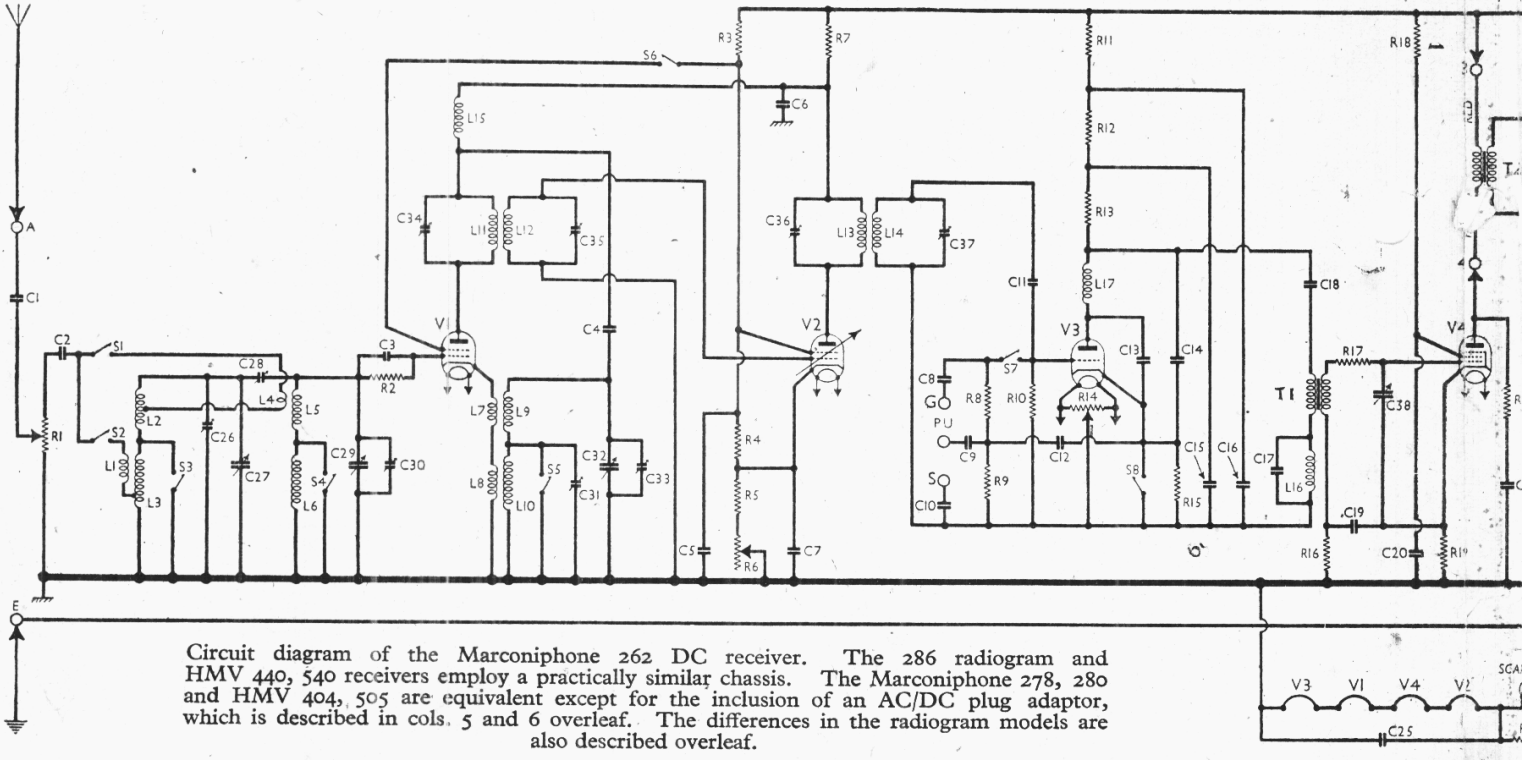
**Intermediate frequency 125 KC/S.**

Third valve **(V3, Marconi metallised DH)** is a triode operating as second detector on the grid leak system with **C11** and **R10. R10** is returned directly to the cathode on radio via switch **S8,** which closes on MW and LW. IF filtering by **C13, L17, C14** in anode circuit.

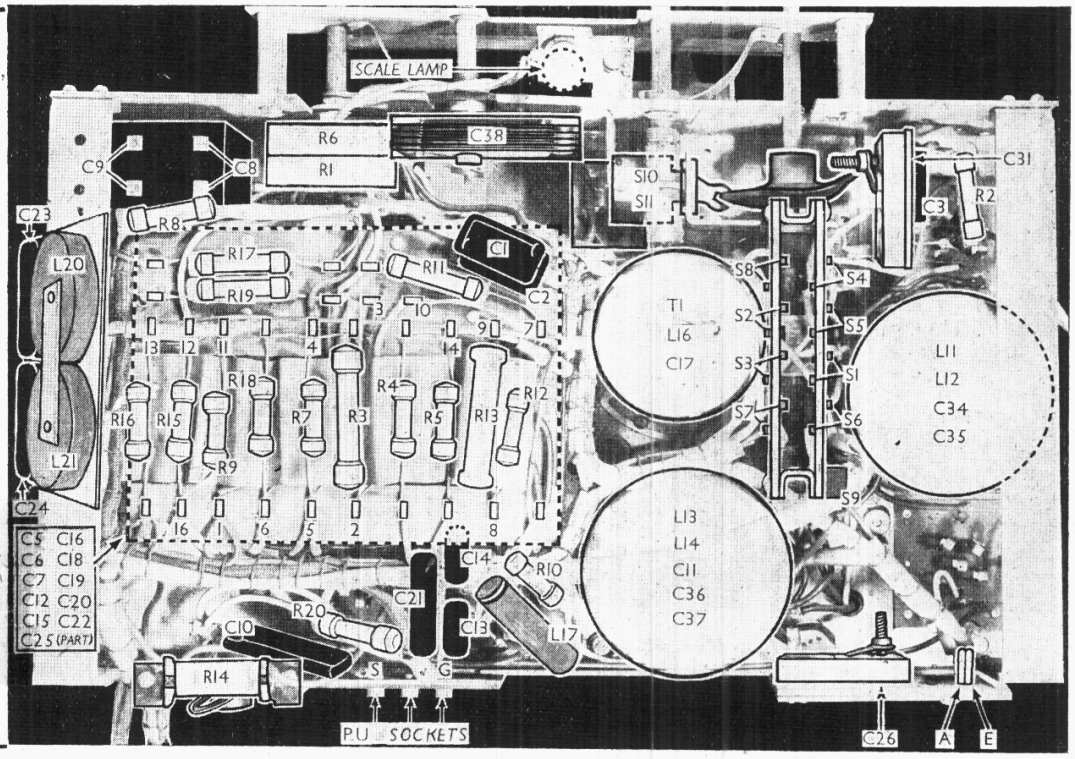
As the detector valve is very susceptible to hum, which may be transmitted via the heater, an adjustable hum control potentiometer **R14** is shunted across **V3** heater, and the earthy ends of all components in **V3** grid and anode circuits are returned to the slider of **R14,** the cathode current flowing via the potentiometer to chassis.

Two sockets are provided for the connection of a gramophone pick-up, and they, together with a third socket **S,** to which the pick-up lead screening should be connected, are isolated from chassis by condensers **C8, C9** and **C10.** On gramophone operation, **S8** opens to apply the necessary grid bias, while **S7** closes to connect the pick-up. At the same time, **S6** opens and disconnects the HT feed to **V1** screen to mute radio.

Parallel-fed transformer coupling by **R13, C18** and **T1,** via tone-correcting circuit **L16, C17** and grid stopper **R17,** between **V3** and pentode output valve **(V4,**



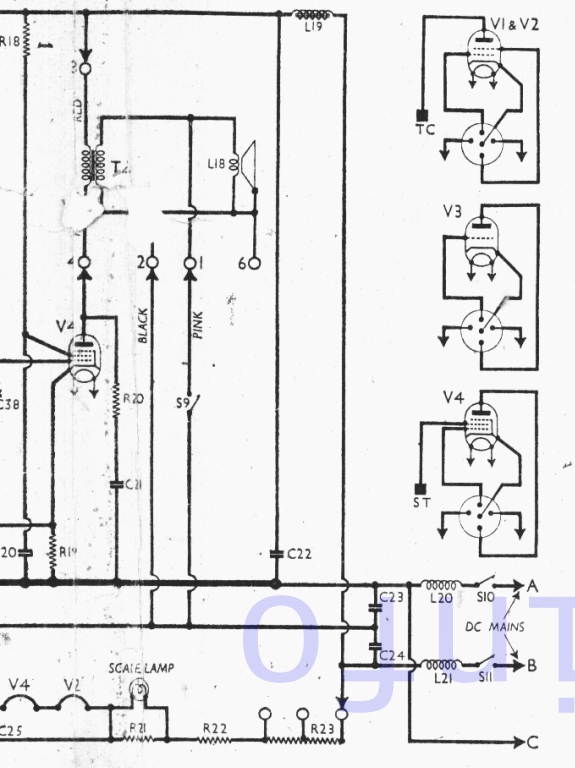

Circuit diagram of the Marconiphone 262 DC receiver. The 286 radiogram and HMV 440, 540 receivers employ a practically similar chassis. The Marconiphone 278, 280 and HMV 404, 505 are equivalent except for the inclusion of an AC/DC plug adaptor, which is described in cols. 5 and 6 overleaf. The differences in the radiogram models are also described overleaf.




Under-chassis view. The switches are indicated individually. The position of the condenser block is indicated by the dotted enclosure, and the tag numbers are marked, but a diagram giving internal connections appears in col. 4 overleaf. The mains filter unit **L20, L21, C23, C24,** has been drawn in as though hinged at or edge, but actually it is hidden beneath a chassis cross member.

**Marconi DPT).** Variable tone control by **R17** and variable condenser **C38** which form a frequency discriminating potential divider in the control grid circuit. Fixed tone correction by RC filter **R20, C21** in anode circuit. Provision for connection of high impedance external speaker in anode circuit at terminals **3** and **4** on the speaker input transformer **T2,** or for a low impedance type at terminals **1** and **2,** across **T1** secondary. The speech coil circuit and the metal frame of the speaker are returned directly to the earth socket of the receiver, and are isolated from chassis by **C23.** A switch **S9,** which is ganged with the main switch control, closes between each of the four settings of the control, muting the speaker during switching operations to eliminate noise.

HT current is supplied directly from the DC mains, and smoothed by iron-cored choke **L19** and **C22,** which consists of two condensers in parallel. Valve heaters, together with scale lamp and ballast resistances **R21, R22, R23,** are connected directly across the mains input. The heaters are by-passed by **C25,** which also consists of two condensers in parallel. Air-cored chokes **L20, L21,** in conjunction with condensers **C23, C24,** suppress mains-borne interference.




## COMPONENTS AND VALUES

| | CONDENSERS | Values (μF) |
|---|---|---|
| C1 | Aerial isolating condenser | 0·001 |
| C2 | Aerial coupling condenser | 0·0005 |
| C3 | V1 CG condenser ... | 0·00005 |
| C4 | V1 osc. anode coupling | 0·0001 |
| C5 | V1, V2 SG decoupling ... | 1·0 |
| C6 | V1, V2 anodes' decoupling | 1·0 |
| C7 | V2 cathode by-pass ... | 0·1 |
| C8 | PU isolating condensers | 0·5 |
| C9 | PU isolating condensers | 0·5 |
| C10 | PU isolating condensers | 0·01 |
| C11 | V3 CG condenser ... | 0·00005 |
| C12 | V3 CG decoupling ... | 1·0 |
| C13 | V3 anode IF by-pass ... | 0·002 |
| C14 | V3 anode IF by-pass condensers | 0·002 |
| C15 | V3 anode decoupling ... | 2·0 |
| C16 | V3 anode decoupling ... | 1·0 |
| C17 | Tone corrector tuning ... | 0·0003 |
| C18 | AF coupling to T1 ... | 0·1 |
| C19 | V4 CG decoupling ... | 2·0 |
| C20 | V4 SG decoupling ... | 1·0 |

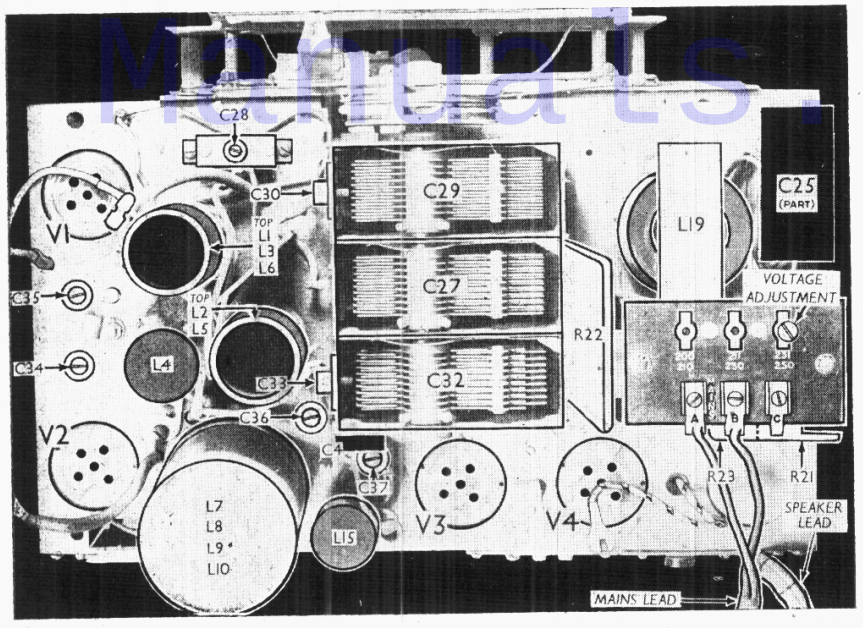
(*Continued next column*)

| | CONDENSERS (*Continued*) | Values (μF) |
|---|---|---|
| C21 | Part fixed tone corrector | 0·004 |
| C22 | HT smoothing condenser | 5·0* |
| C23 | Mains RF by-pass condensers | 0·005 |
| C24 | Mains RF by-pass condensers | 0·005 |
| C25 | Heater circuit by-pass ... | 4·0§ |
| C26‡ | B-P pri. MW trimmer ... | — |
| C27† | Band-pass pri. tuning ... | — |
| C28‡ | Image suppressor ... | — |
| C29† | Band-pass sec. tuning ... | — |
| C30‡ | B-P sec. MW trimmer ... | — |
| C31‡ | Osc. circuit LW trimmer | — |
| C32† | Oscillator circuit tuning | — |
| C33‡ | Osc. circuit MW trimmer | — |
| C34‡ | 1st IF trans. pri. tuning | — |
| C35‡ | 1st IF trans. sec. tuning | — |
| C36‡ | 2nd IF trans. pri. tuning | — |
| C37‡ | 2nd IF trans. sec. tuning | — |
| C38† | Variable tone control ... | 0·00065 |

† Variable. ‡ Pre-set.
* Made up of 2μF and 3μF connected in parallel.
§ Made up of two 2μF condensers in parallel.

| | RESISTANCES | Values (ohms) |
|---|---|---|
| R1 | Aerial input potentiometer | 25,200 |
| R2 | V1 grid leak ... ... | 2,000,000 |
| R3 | V1, V2 SG's potential divider | 35,000 |
| R4 | V1, V2 SG's potential divider | 20,000 |
| R5 | V2 fixed GB resistance ... | 350 |
| R6 | V2 gain control ... ... | 18,000 |
| R7 | V1, V2 anodes HT feed ... | 5,000 |
| R8 | Pick-up shunt ... ... | 10,000 |
| R9 | V3 CG decoupling ... | 100,000 |
| R10 | V3 CG resistance ... | 230,000 |
| R11 | V3 anode decoupling resistances | 10,000 |
| R12 | V3 anode decoupling resistances | 10,000 |
| R13 | V3 anode load ... ... | 23,000 |
| R14 | Hum control ... ... | 3,000 |
| R15 | V3 PU GB resistance ... | 500 |
| R16 | V4 CG decoupling ... | 230,000 |
| R17 | V4 grid stopper ... ... | 230,000 |
| R18 | V4 SG HT feed ... ... | 10,000 |
| R19 | V4 GB resistance ... | 230 |
| R20 | Part fixed tone corrector | 10,000 |
| R21 | Scale lamp shunt ... ... | 100 |
| R22 | Heater circuit ballast ... | 500 |
| R23 | Mains voltage adjustment | 160* |

* Tapped at 0+80+80 ohms.




Plan view of the chassis. **R21, R22, R23** are the heater circuit ballast resistances. **R21** and **R23** are contained in a single unit. The resistance elements are wound on flat formers encased in metal envelopes.

| OTHER COMPONENTS | | Approx. Values (ohms) |
|---|---|---|
| L1 | Aerial LW coupling coil | 72·0 |
| L2 | Band-pass primary coils | 3·5 |
| L3 | | 13·0 |
| L4 | Image suppressor coil ... | 0·1 |
| L5 | Band-pass secondary coils ... ... ... | 3·5 |
| L6 | | 13·0 |
| L7 | Oscillator reaction coils | 0·25 |
| L8 | | 0·5 |
| L9 | Osc. circ. MW tuning coil | 5·0 |
| L10 | Osc. circ. LW tuning coil | 5·0 |
| L11 | 1st IF trans. Pri. ... | 100·0 |
| L12 | 1st IF trans. Sec. ... | 100·0 |
| L13 | 2nd IF trans. Pri. ... | 100·0 |
| L14 | 2nd IF trans. Sec. ... | 100·0 |
| L15 | V1 osc. coupling coil ... | 95·0 |
| L16 | Part of tone filter ... | 1,000·0 |
| L17 | V1 anode IF filter coil ... | 240·0 |
| L18 | Speaker speech coil ... | 9·0 |
| L19 | HT smoothing choke ... | 1,200·0 |
| L20 | Mains filter chokes ... | 2·5 |
| L21 | | 2·5 |
| T1 | Intervalve trans. Pri. | 400·0 |
| | Intervalve trans. Sec. | 2,350·0 |
| T2 | Speaker input trans. Pri. | 750·0 |
| | Speaker input trans. Sec. | 2·0 |
| S1-S5 | Waveband switches | — |
| S6-S8 | Radio/gram. change switches ... .... | — |
| S9 | Wave-change muting switch ... ... | — |
| S10, S11 | Mains circuit switches ... | — |

## VALVE ANALYSIS

Valve voltages and currents given in the table below are those given in the makers' manual for an average receiver when it is operating on mains of 235 V, using the 231-250 V tapping on the voltage adjustment panel.

The receiver should be switched to MW, and the volume control should be at maximum, but there should be no signal input.

Voltages quoted were measured with an Avometer, chassis being the negative connection.

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 DSB | 140 | 1.0 | 60 | 0.25 |
| V2 VDS | 140 | 4.0 | 50 | 0.75 |
| V3 DH | 60 | 2.5 | — | — |
| V4 DPT | 160 | 24.0 | 127 | 4.0 |

## DISMANTLING THE SET

**Removing Chassis.**—Remove the four control knobs (recessed screws);
remove the millboard back cover (three large slotted screws) and the wooden strip below (two large slotted screws);
remove the four bolts holding the chassis to the bottom of the cabinet.
If the speaker leads are now freed from the clips on the walls of the cabinet, the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.
To free chassis entirely, free the speaker leads from the terminals on the speaker connecting panel.
*When replacing*, connect the speaker leads as follows, using the numbers marked on the speaker connecting panel:
Bottom row, left to right: 1, pink; 2, black (in yellow sleeving); 3, red.
Top row, left to right: 4, yellow; 5, no external connection; 6, no external connection.

**Removing Speaker.**—Remove the four hexagon nuts holding the speaker to the sub-baffle, using a screwdriver to hold the cross-headed ornamental screws.

*When replacing*, the transformer should be at the top, and the leads should be connected as indicated above.

## GENERAL NOTES

**Switches.—S1-S5** are the waveband switches, **S6-S8** the pick-up and radio muting switches, and **S9** the speaker muting switch, in a leaf-type unit beneath the chassis. The unit is indicated in our under-chassis view, where the tags of the individual switches are identified. The table below gives the switch positions for three of the four control settings, starting from the "off" position and turning clockwise. The fourth position is "off." A dash indicates open, and **C**, closed. **S9** closes only between the four settings, during the process of operation, and produces a silent wave-change action.

**S10, S11** are the QMB mains circuit switches. They are ganged, and are operated by a cam disc on the **S1-S9** control spindle.

### Switch Table

| Switch | Gram. | MW | LW |
|---|---|---|---|
| S1 | — | C | — |
| S2 | — | — | C |
| S3 | — | C | — |
| S4 | C | C | — |
| S5 | C | C | — |
| S6 | — | C | C |
| S7 | C | — | — |
| S8 | — | C | C |
| S9* | — | — | — |

*Closed between settings only.

**Coils.—L1, L3, L6; L2, L5;** and **L4** are in three unscreened tubular units on the chassis deck, while the oscillator coils **L7-L10** are in a screened unit, also on the chassis deck, with the small choke **L15** beside it. The IF transformers **L11, L12** and **L13, L14** are in two screened units beneath the chassis with their associated tuning condensers, whose adjustments are reached through holes in the chassis deck. **L17** is a small tubular unit in the middle at the rear beneath the chassis, while the tone compensating filter coil **L16,** with its condenser **C15,** is in the same container as **T1** beneath the chassis.

**Pilot Lamp.**—This is an Osram 6.2 V, 0.3 A MES type lamp. It may be replaced without disturbing the chassis if the perforated metal plate in the bottom of the cabinet is removed. Its bracket, which has a slotted fixing hole, may then be removed if the set-screw holding it is loosened. In Marconiphone models 278, 280 and HMV models 404, 505, two scale lamps are used.

**Pick-up Connections.**—Three sockets are provided at the rear of the chassis for a gramophone pick-up, as indicated in our under-chassis view. Two of these take the two plugs from the pick-up itself, while the third, marked **S,** takes a plug connected to the screening of the leads and metal parts of the pick-up. The socket marked **G** is the high potential end of the circuit. All three sockets are isolated from chassis by condensers **C8, C9, C10.**

The pick-up should be one of high impedance, its DC resistance being not less than 900 O, and it may be left permanently connected. Its leads should be screened, but the screening must not be permitted to come into contact with the chassis except via the socket marked **S.**

Since the volume control in the receiver does not operate on gram, an external volume control should be fitted with the pick-up. A circuit somewhat after the style of that described under "Radiogram Modifications" for the radiogram model should be used.

**External Speaker.**—A low impedance (6-12 O) speaker may be connected to the two terminals marked **1** and **2** on the panel on the speaker assembly, or a high impedance speaker may be connected to

those marked **3** and **4**. It should be borne in mind that the latter pair are "live" to the mains, so that well-insulated leads must be used; or, alternatively, they could be connected via a pair of 0.2 $\mu$F isolating condensers. The low impedance connections are quite safe provided that a good earth connection is made to the receiver at socket **E**.

**Condenser Block.**—This is mounted beneath the chassis deck, and is concealed from view in our under-chassis illustration by its connecting panel and an assembly of resistances, but its position is indicated by an arrow. It contains twelve condensers, whose connections are shown in the diagram below, where the numbers of the tags to which they are connected are seen. The diagram is drawn as seen when viewed from the rear of the underside of the chassis.

It should be noted that **C18,** which is the AF coupling condenser, is enclosed in a screened container of its own. Replacements should also be screened, the screen being connected to chassis.

In two cases, also, two condensers are joined in parallel. One of these is **C22,**

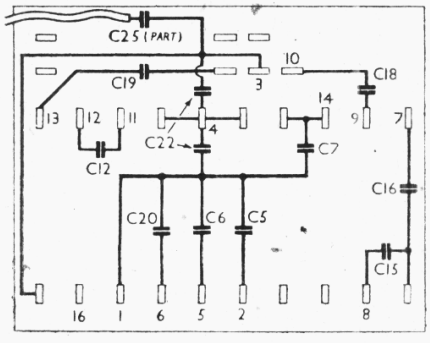



Diagram of the condenser block, as seen from the rear of the underside of the chassis. The tag numbers correspond with those in our under-chassis view.

which consists of two condensers, both in the block, as indicated in the block diagram. The other case is **C25,** for which one 2 $\mu$F in the block is used in parallel with a second 2 $\mu$F condenser on the chassis deck. This is indicated in our chassis illustrations and block diagram by marking each part "C25 (Part)."

**Replacement Electrolytics: Warning.**—When replacement condensers are fitted in such positions as **C22** and **C25,** it is not advisable to use electrolytics, because although the receiver operates like an AC/DC receiver on DC mains, if the mains plug is reversed, reverse polarity will be applied across them, as no rectifier is included in the HT circuit.

Electrolytics may be used only if two are used in each case, each condenser having twice the required capacity and the full voltage rating. They are then used in series, connected with opposed polarity, *i.e.*, back to back. Electrolytics could be used in cathode circuits, such as **C19,** because the valve is in itself a rectifier. No electrolytics at all were used in the original receiver.

**Hum Control R14.**—In later versions of the receiver, according to the makers' manual, improvements in design have made it possible to dispense with **R14.**

## RADIOGRAM MODIFICATIONS

Marconiphone DC Models 280 and 286 and HMV DC Models 505 and 540 are radiograms employing a chassis which, except for small modifications, is similar to that in the 262 DC receiver.

Electrically, the modifications include the addition of a gramophone motor, a pick-up and volume control, and improved smoothing. The motor leads are connected to terminals **B** and **C** on the mains connection panel. The pick-up output is developed across a combination of a variable potentiometer of 1,500 O and a 2,000 O fixed resistance connected in series. The two pick-up leads are joined to the slider and free end of the potentiometer respectively.

An additional smoothing choke and condenser are inserted in the HT positive lead between **L21** and **L19,** the condenser being connected between chassis and the junction of **L19** and the additional choke. The DC resistance of the choke is 230 O, and that of the original choke **L19** becomes 230 O also, instead of 1,200 O. The capacity of the additional condenser is 2$\mu$F.

The changes involve a small rearrangement of components. **L19** is mounted beneath the voltage adjustment panel, and the new choke is just in front of it. The new condenser and the external part of **C25** are combined in a single unit mounted horizontally over the new choke.

## AC/DC CONVERSION

Marconiphone Models 278 and 280, and HMV Models 404, 505, are fitted with a conversion plug and socket for easy conversion to AC/DC operation. The socket, which is an ordinary 4-pin valve holder, is fitted in the position occupied in AC models (*Service Sheet* 518) by the rectifying valve. The diagram in col. 6 shows the electrical connections.

With the normal plug in position, the receiver is suitable only for DC operation, but it can be replaced by a special adaptor which inserts in the positive HT lead, between **L21** and **L19,** a metal rectifier, at the same time connecting an additional smoothing condenser between the mains side of **L19** and chassis, so that the receiver will operate on AC or DC mains.

The conversion can also be made on table receivers not so fitted by mounting a metal rectifier and condenser (which may be electrolytic) somewhere on the chassis and connecting them appropriately. Alternatively, a thermionic rectifier could be used instead of the metal type if proper provision is made to include its heater in the original heater chain, whose current is 0.25 A. A 0.2 A type valve, such as Cossor 40SUA, could be used, provided that its heater were shunted with a suitable resistance to bypass the surplus 0.05 A : 800 O in this particular case. In addition, some adjustment would probably be necessary to the ballast resistance **R22** to compensate for the increased voltage drop across the heaters. The final test should, in any case, be to check that the heater current through **V1-V4** was 0.25 A.

If the conversion is carried out on radiograms, except in the Marconiphone 280 and HMV 505, which have universal gramophone motors, the motor leads must be disconnected and the gramophone left out of use.

## CIRCUIT ALIGNMENT

**IF Stages.**—Short-circuit **L7, L8** by connecting **V1** cathode (centre pin) to chassis, and loosely couple the signal generator output to **V1** control grid circuit via the leads associated with **C28.** Feed in a 128 KC/S (2,340 m) signal, and adjust **C34** and **C36** for maximum output. Feed in a 123 KC/S (2,440 m) signal, and adjust **C35** for maximum output. Feed in a 125.5 KC/S (2,390 m) signal, and adjust **C37** for maximum output. Repeat these adjustments, always in the same order.

**RF and Oscillator Stages.**—Transfer signal generator leads to **A** and **E** sockets via a suitable dummy aerial. If the scale pointer does not register correctly, it may be adjusted after freeing its drive drum (cheese-head screw).

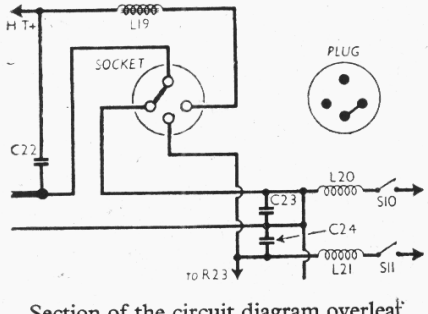
**MW.**—Switch set to MW, tune to 210 m on scale. Unscrew **C28** several turns, and screw up **C30** fully. Feed in a 210 m (1,430 KC/S) signal, and adjust **C33,** then **C26** (near aerial socket), for maximum output. Now adjust **C30** for maximum output, and check whether receiver is "lively" below 240 m. If it is not, **C30** has been unscrewed too far, and must be tightened up a little.

**LW.**—Switch set to LW, tune to 1,000 m on scale, feed in a 1,000 m (300 KC/S) signal, and adjust **C31** for maximum output.

Any subsequent disturbance of the wiring is liable to throw the receiver out of alignment.

**Image Suppressor.**—Switch set to MW, tune to 315 m on scale, feed in a strong 250 m (1,200 KC/S) signal. Find the image point by slight adjustment of the tuning control if necessary, and adjust **C28,** with a non-metallic screwdriver, for *minimum* output. Feed in a 350 m (860 KC/S) signal, tune in its image at about 496 m, and adjust **L4** on its slotted bracket for minimum output.

Care should be exercised with the wiring of **C28,** as its capacity is very small, and disturbance may carry the adjustment beyond the range of the condenser.




Section of the circuit diagram overleaf redrawn to show the inclusion of the AC/DC adaptor in models so fitted. The plug may be replaced by a rectifier and condenser adaptor.

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