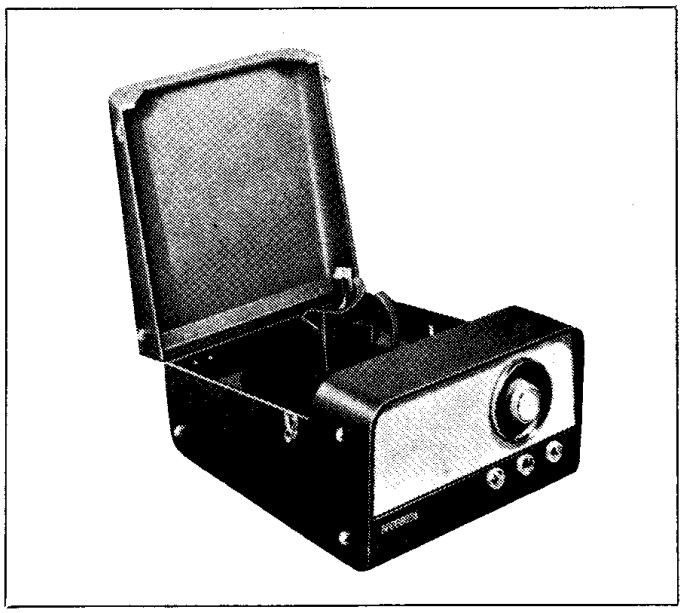
FERGUSON

RADIOGRAMOPHONE MODEL 398RG

SERVICE MANUAL



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FERGUSON RADIO CORPORATION LTD.

Great Cambridge Road · Enfield · Middx.

SERVICE DEPOTS

LONDON

Eley's Estate, Angel Road, Edmonton, N.18
Edmonton 3060

BIRMINGHAM

24 Sheepcote Street, 15. Midland 5291

MANCHESTER

Derby Street, Cheetham, 8. Deansgate 8484

GLASGOW

160/162 Battlefield Road, S.2
Langside 9251/2/3/4

SPECIFICATION

Power Supply

200–250 volts 50 c/s AC.

Waveranges

Medium 185–557 metres.

Long 1090–1920 metres.

Record Changer

BSR UA14 4-speed, with TC8M turnover crystal cartridge.

Aerial

Internal ferrite-rod, with socket provided for external aerial and earth.

Valves

V1	UCH81	Frequency changer.
V2	UBF89	IF amplifier and detector.
V3	UCL83	AF amplifier and output.
V4	UCL83	Phase splitter and output.
V5	UY85	Half wave rectifier.

Loudspeaker

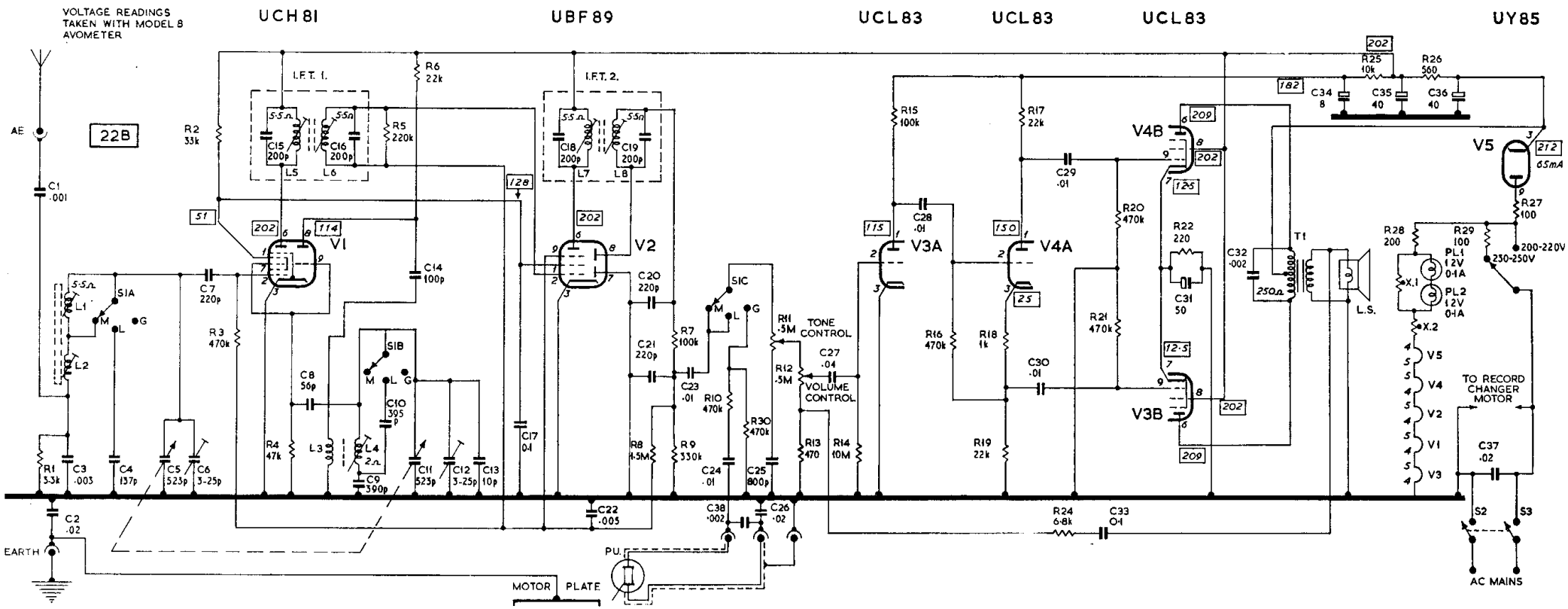
$6\frac{1}{2}$ in. round, twin cone, 3 ohm speech coil.

Power Output

6 watts approximately.

Cabinet Dimensions

$16\frac{1}{2}$ in. wide (including fittings) x 9 in. high x $19\frac{3}{4}$ in. deep.



Circuit Diagram. Figures in rectangles indicate voltages measured with a 20,000 Ω/V meter. DC resistance readings are shown against inductances where these are 1Ω or greater.

CIRCUIT DESCRIPTION

Tuner

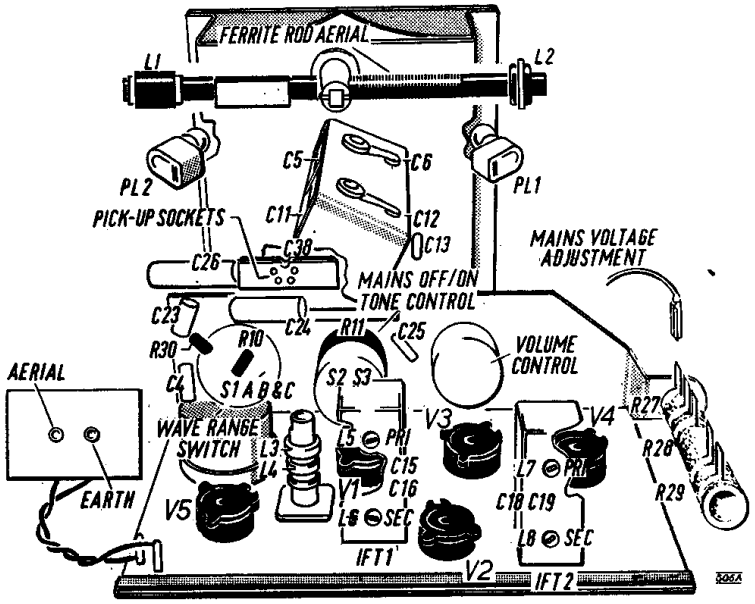
With the receiver switched to MW, **S1A** short-circuits the long wave winding **L1** on the ferrite-rod aerial and the medium wave winding **L2** is tuned by **C5** with trimmer **C6.** To tune the LW band, both aerial windings are series connected and **C4** is connected across the circuit by **S1A. C7** couples the signal to the grid circuit of **V1** (UCH81) the frequency changer. When an external aerial is used, the signal is developed across **C3** which is shunted by **R1** to limit the grid circuit impedance of **V1** at low frequencies. The oscillator is grid tuned, with **L4** the grid coil and **L3** the feedback coupling from the oscillator anode circuit. On MW, **L4** is tuned by **C11** with trimmers **C12** and **C13;** on LW, **C10** is connected across **L4** by **S1B.**

V2 (UBF89) functions as the IF amplifier and sound detector. The DC voltage across **R9** produced by the rectified signal is decoupled by **R8** and **C22** and fed as AGC bias to the grid circuits of **V1** and **V2.**

Audio Amplifier

The pushpull amplifier circuit utilises two triode-pentode valves type UCL83, the pentode sections forming the output stage. One triode section **V4A** functions as the phase inverter and the other, **V3A** as the input voltage amplifier. The tone and volume controls operate in the grid circuit of **V3A** and a negative feedback voltage from the secondary of the output transformer is injected across **R13** in its grid circuit. The effect of **C33** is to reduce the feedback at low frequencies to provide a degree of bass lift. The voltages developed across the anode and cathode loads of **V4A** are applied to the control grids of **V3B** and **V4B** through **C30** and **C29. C32** across the primary of the output transformer provides phase correction.

The tuner unit or gramophone pickup is switched into the amplifier circuit by **S1C.**



CIRCUIT ALIGNMENT

IF

Switch to MW and rotate tuning control fully anti-clockwise. Set volume control to maximum and inject a 470 Kc/s modulated signal, via a 0.1uF capacitor, into V1 grid (pin 2). Adjust L8, L7, L6 and L5 for maximum output; reducing input as necessary to keep receiver output as low as possible.

RF

Note: Signals should be injected via a loop loosely coupled to the ferrite rod aerial, or connected directly to the aerial socket via a 30-100pF capacitor.

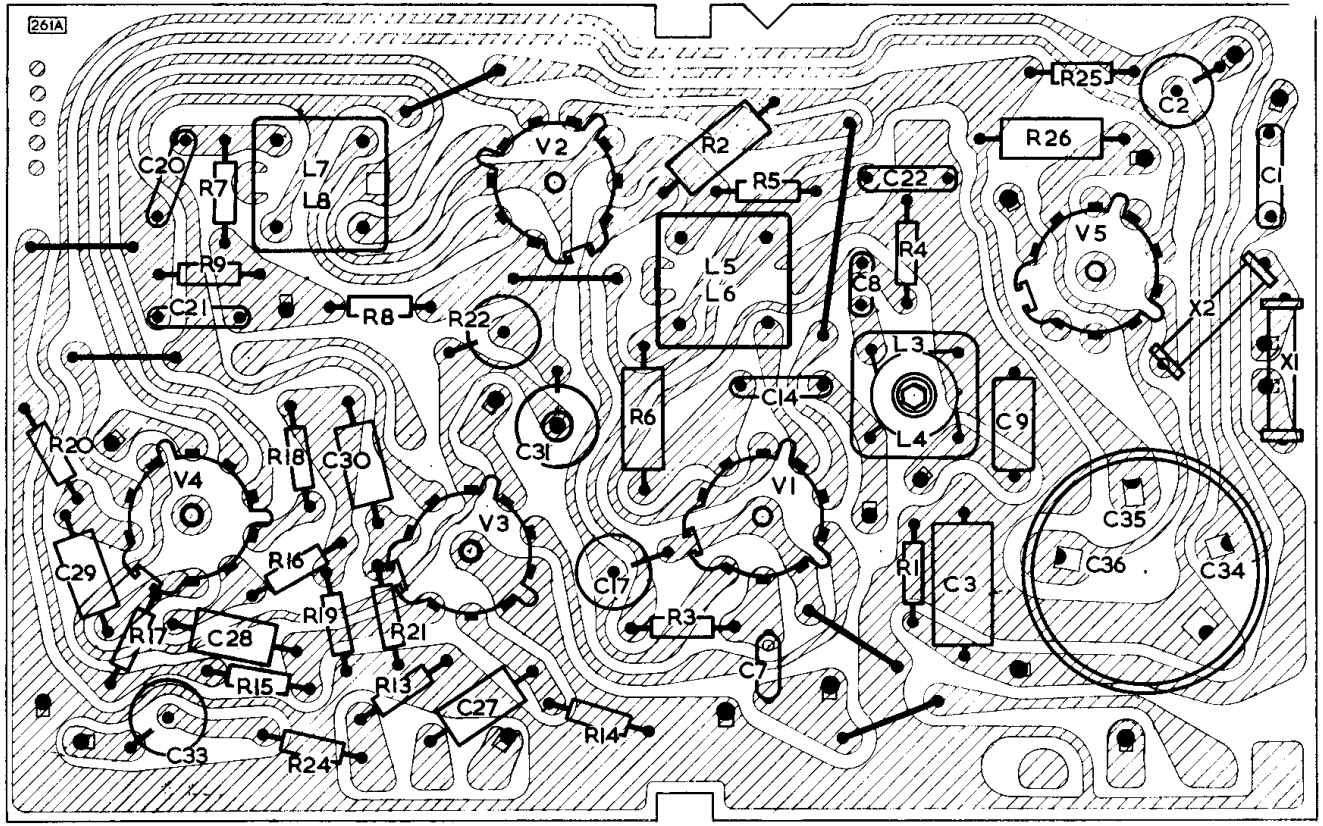
1. With gang fully closed, rotate Cursor assembly clockwise until pointers are horizontal and switch to MW.
2. Rotate tuning control anticlockwise 30° until pointer coincides with white dot marker (500 metres approximately).
3. Inject 580 Kc/s modulated signal and adjust L4 and the rod aerial adjusting ring for maximum output.
4. Rotate tuning control anticlockwise until pointer coincides with white dot marker (200 metres approximately).
5. Inject 1400 Kc/s modulated signal and adjust C12 and C6 for maximum output.
6. Repeat items 2, 3, 4 and 5 until no further improvement can be obtained.
7. Switch to LW and inject 210 Kc/s modulated signal.
8. Rotate tuning control until maximum signal output is obtained (right end of " LIGHT " Programme marker) then adjust the position of L1 on ferrite rod for maximum output.

PRINTED PANEL SERVICING

When servicing is necessary on the printed circuit panel, it must be remembered that excessive heat can loosen the bond between the copper conducting circuits and the insulating board; consequently, particular care is necessary if any connections must be soldered to the 'wiring' side of the panel. For this reason, when replacing a resistor or capacitor, cut out the faulty component so that as much as possible of the original lead-out wires remain for connecting the new component, soldering to the ends of the wires instead of to the printed conductors. Use a small low-consumption iron and do not apply the bit for longer than is necessary to produce a sound joint.

The heavier components are secured on the board by clip lugs which also make electrical connections to the panel. To remove these, use a heavier type iron and apply heat and pressure to the lug—not the printed circuit—so that when the solder melts, the lug is pressed clear of the connecting point. In some cases a small stiff-haired brush will assist in breaking the connection.

If a section of printed conductor is damaged or fused, scrape off the damaged portion and restore the connection with a jumper wire on the component side of the panel. Should it become necessary, however, to solder directly to a printed conductor, use a 60/40 resin-cored solder and with a low-consumption iron, make the joint quickly to avoid overheating. *Do not use a corrosive type flux.*



MECHANICAL DETAILS

Removing Chassis

Remove ventilation panel. Withdraw screws securing the motor board and lift up front end of board. Disconnect mains lead, unplug pickup lead and take out the motor board. The front control knobs should then be removed. The springs fitted to the control knobs ensure a tight fit to eliminate the possibility of live spindles accidentally becoming accessible to the user. The knobs may be removed with the aid of a piece of stout cord placed round the knob boss. Unsolder the output transformer connecting leads or remove the complete loudspeaker assembly (four speaker clamp bolts). Detach internal aerial socket from side of cabinet. Free mains lead from retainer, and remove the two nuts securing the wooden clamp at the rear edge of the printed board together with the two nuts securing the scale backing plate to the cabinet front. The chassis is now free and may be lifted out of the cabinet.

Stylus Replacement

When replacing worn stylii, use the following types:—

LP—TC8R (coloured red).

78-TC8G (coloured green).

Do not remove the screw securing each stylus, one turn is sufficient to slacken and so enable the stylus to be withdrawn. When fitting the new stylus, ensure that it is correctly seated under the screw at one end and fitting over the stylus coupling at the other.

RESISTORS

All carbon types unless otherwise stated. Where no tolerance or power rating is given for fixed resistors, these should be taken as ± 20% and ¼ watt respectively.

Ref.	Value	Rating	Function and Part No.	
R1	3.3KΩ		External aerial shunt	
R2	33KΩ	½ W	V1 SG HT feed	
R3	470KΩ		V1 (heptode) grid leak	
R4	47KΩ		V1 (triode) grid leak	
R5	220KΩ	10%	IFT damping	
R6	22KΩ	½ W	Oscillator HT feed	
R7	100KΩ		IF filter	
R8	1.5MΩ		AGC decoupling	
R9	330KΩ		Detector load	
*R10	470KΩ		Pickup output attenuator	
*R11	500KΩ	lin. pot, with switch	Tone and On/Off controls	Z20203
*R12	500KΩ	log pot.	Volume control	Y13060/2
R13	470Ω	10%	NFB injection resistor	
R14	10MΩ		V3A grid leak	
R15	100KΩ		V3A anode load	
R16	470KΩ		V4A grid leak	
R17	22KΩ	10%	V4A anode load	
R18	1KΩ		V4A cathode bias	
R19	22KΩ	10%	V4A cathode load	
R20	470KΩ		V4B grid leak	
R21	470KΩ		V3B grid leak	
R22	220Ω	10% 1 W	Output cathode bias	
R24	6.8KΩ	10%	NFB Limiter	
R25	10KΩ		HT smoothing	
R26	560Ω	½ W	HT smoothing	
*R27	100Ω		Mains dropper	Z13415
*R28	200Ω			
*R29	100Ω			
*R30	470KΩ		Pickup output attenuator	

* Not attached to printed board.

INDUCTORS AND TRANSFORMERS

Ref.	Description	Part No.
L1	LW } Ferrite rod aerial	Y10782/1
L2	MW }	
L3	Oscillator feedback }	Y18342
L4	Oscillator tuning }	
L5	Primary } IFT 1	Z10900
L6	Secondary }	
L7	Primary } IFT 2	Z10899
L8	Secondary }	
T1	Push-pull output transformer	Y17611

MECHANICAL SPARES

Ref.	Description	Part No.
S1A, S1B, S1C	Waverange/Gram Switch	Z18336
S2, S3	Mains On/Off switch (Part of R11)	Z20203
PL1, PL2	Pilot Lamps 12V 0.1A MES	33774
X1, X2	Thermistors SZ2	Z4558/2
LS	Loudspeaker 6½ in. round	Y16002/13

CAPACITORS

Electrolytics excepted, tolerance ± 20% unless otherwise stated. Where no working voltage is given, this should be taken as 350 volts DC.

Ref.	Value	Rating	Function and Part No.	
C1	.001μF	400V AC	Aerial isolating	
C2	0.02μF	300V AC	Earth isolating	
C3	.003μF	2%	External aerial coupling	Y302R35
*C4	137pF	2%	LW fixed aerial trimmer	45755
*C5	523pF†	Variable	Aerial tuning	Z10851
*C6	3—25pF	Pre-set	MW aerial trimmer	
C7	220pF		V1 grid coupling	
C8	56pF		V1 osc. grid coupling	
C9	390pF	2%	Oscillator padder	Y391R35
*C10	395pF	2%	LW fixed osc. trimmer	45782
*C11	523pF†	Variable	Oscillator tuning	Z10851
*C12	3—25pF	Pre-set	MW oscillator trimmer	
*C13	10pF	5%	MW fixed oscillator trimmer	
C14	100pF		V1 oscillator anode coupling	
*C15	200pF	2.5%	L5 tuning	
*C16	200pF	2·5%	L6 tuning	
C17	0.1μF		V1/V2 SG decoupling	
*C18	200pF	2.5%	L7 tuning	
*C19	200pF	2.5%	L8 tuning	
C20	220pF		Det. reservoir	
C21	220pF		IF filter	
C22	.005μF		AGC decoupling	
*C23	0.01μF		Coupling to tone control	
*C24	0.01μF	300V AC	Pickup isolating	
*C25	800pF		Part tone control	
*C26	0.02μF	300V AC	Pickup isolating	
C27	0.04μF	150V	V3A grid coupling	
C28	0.01μF		V4A grid coupling	
C29	0.01μF		V4B grid coupling	
C30	0.01μF		V3B grid coupling	
C31	50μF	Elec. 25V	V3B/V4B cathode bypass	Y13228/20
*C32	0.002μF		Phase correction	
C33	0.1μF		Bass boost NFB	
C34	8μF	Elec. 275V	HT smoothing }	Y13237/5
C35	40μF	Elec. 275V	HT smoothing }	
C36	40μF	Elec. 275V	HT reservoir }	
*C37	0.02μF	300V AC	Mains RF bypass	
*C38	0.002μF		Pickup phase correction	

* Not attached to printed board

† Swing value

MISCELLANEOUS

Part Description	Part No.
Aerial socket	Z4230/1
Bezel	Y10720
Cabinet	V33560
Indicator panel	Z18123
Knobs:	
Tuning control	X10718/1
(clip)	47409
(ring)	Z10528
Volume, Tone on-off controls	Y25493/18
(clip)	47409
Wavechange switch	Y25493/17
(clip)	47409
Pick-up socket	N16504
Pointer assembly	Z18329
Reflector	Z18347
Scale	Y18339
Scale cover	Z10841
Tag strip	W12295/50
Ventilation panel	X33561

The manufacturers reserve the right to vary specifications or use alternative materials as may be deemed necessary or desirable at any time.