

FERGUSON

Model 658RG

General Description: Ten-valve (plus three crystal diodes and metal rectifier), three-waveband (L.W./M.W./V.H.F.), A.M./F.M. stereo radio-gram with artificial reverberation obtainable on both mono and stereo reproduction. A “phantom push-pull” output stage is fitted, and the F.M. demodulator is a Foster-Seeley discriminator instead of the more usual ratio detector. Garrard Model 210 record unit.

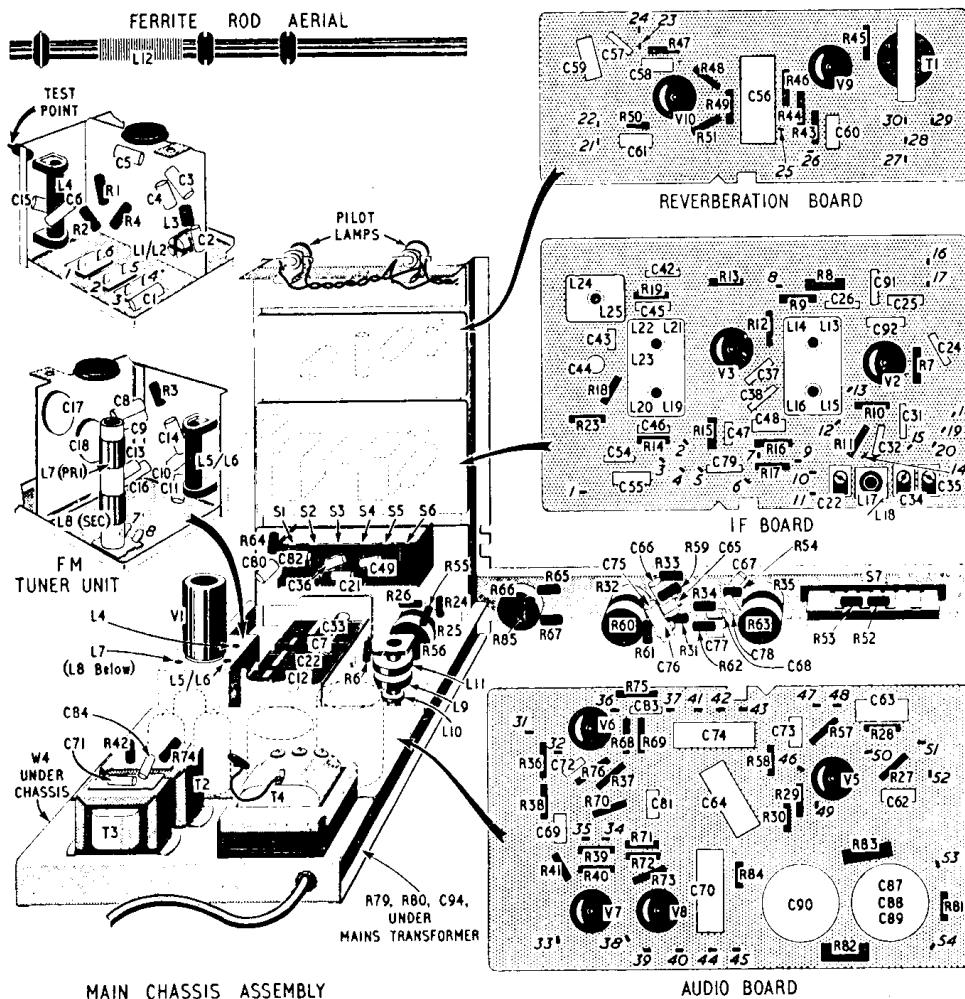
Power Supply: A.C. mains, 200–250 volts, 50 c/s.

Valves: (V₁) ECC85; (V₂) ECH81; (V₃) EBF89; (V₄) EM84; (V₅) ECC83; (V₆) ECC83; (V₇, 8) EL84 (matched pair within 2 mA. anode current of each other). Reverberation unit: (V₉) EF80; (V₁₀) ECF82. Diodes and rectifiers: (W₁) OA70 (I.F. limiter on F.M.); (W₂, 3) OA79 (F.M. discriminator); (W₄) H.T. bridge rectifier (Ferguson Part Number Z33308).

Check of Audio Reverberation: This requires a 1000-c/s. generator, two output meters and a 40-db. attenuator pad comprising a 10-ohm resistor across input, a 220-ohm resistor across output, earthy ends connected together and “live” ends connected via a 220k resistor. (1) Insert 40-db. attenuator in place of reverberator unit, green lead to “input” side. (2) (a) Connect signal generator to gram input tags—black lead and screen located on second and third tags on tag strip beneath chassis angle support adjacent to switch S₁. Switch reverberator to “off”. (b) Switch to “monodic”—both meters should indicate output. (c) Switch to “stereo”—left-hand channel meter only should indicate output. (d) Change output

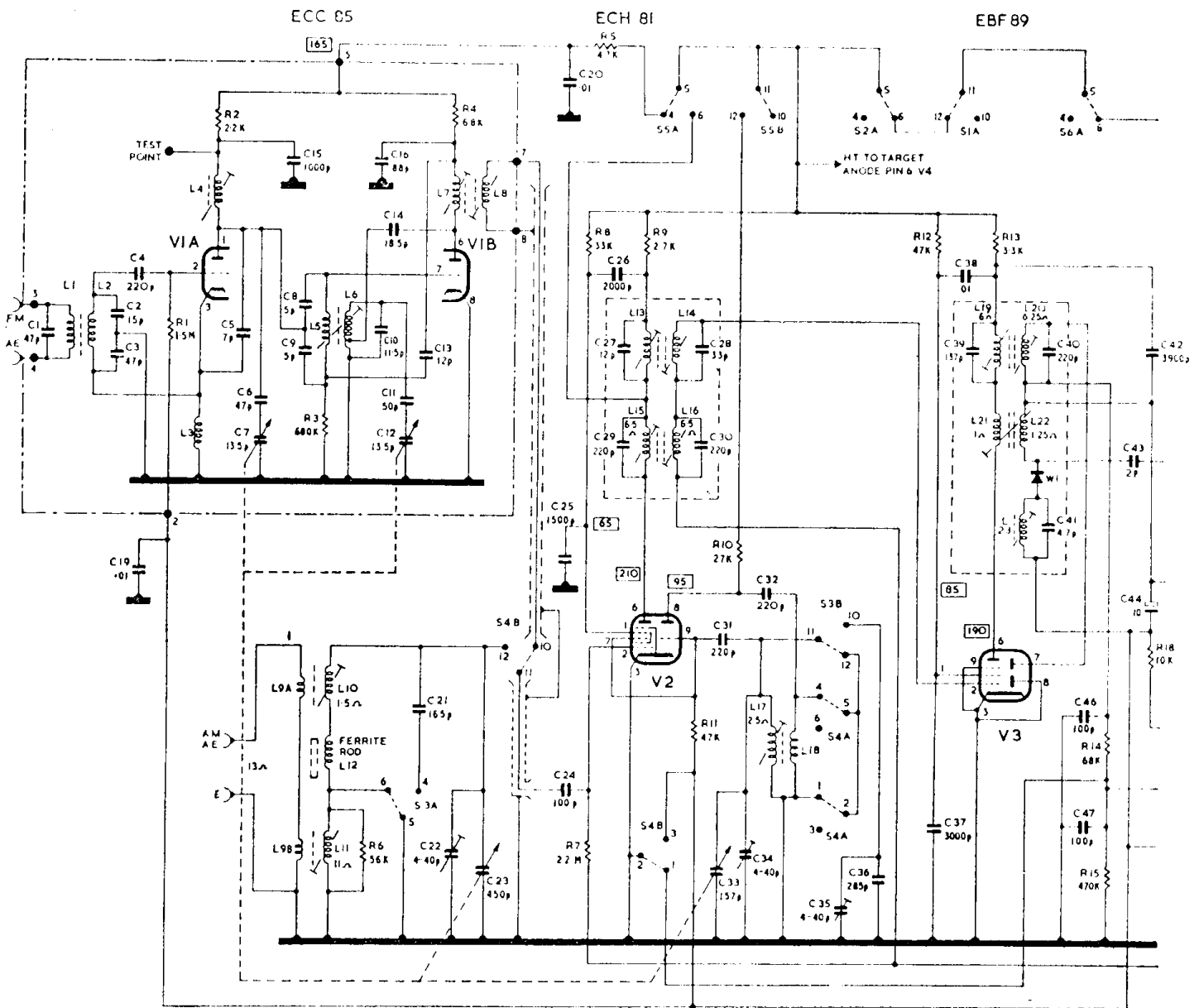
live lead from tag two (black) to tag one (red) and right-hand meter only should indicate output. (3) (a) Connect generator to both channels simultaneously (tags 1 and 2), set balance control for equal readings on both meters with reverberation set to "off". (b) Unsolder yellow lead from tag 43 on audio printed board. Output reading will cease on right-hand meter. (c) Operate reverberation push button ("med"). Output will return on right-hand meter, and should be of similar amplitude to original. (d) Operate reverberation "max." and "min." buttons, these should give readings of 6 db. increase or decrease on the original. Disconnect signal generator, resolder yellow lead, switch reverberation to "off", remove attenuator pad and reconnect reverberator unit.

F.M. Demodulation: As the limiter/demodulator circuit employed here is not in common use, the following description may be of assistance: The 10.7-Mc/s. I.F. signal is developed in anode circuit of V3 and fed to limiter and discriminator stages. The limiter diode W1 is in series with a parallel resistance-capacitance network R18, R19, C44 and C45, the time constant being longer than the lowest audible frequency. Also in series with W1 is the parallel tuned circuit L23/C41, resonant at the third harmonic frequency of the I.F.; the action of this circuit is to modify the shape of current pulses through the diode in such a way that its effective dynamic impedance is



COMPONENT LAY-OUT DETAILS—FERGUSON MODEL 658RQ

reduced. Amplitude changes with a period shorter than the time constant of the RC network are suppressed by variation of the loading of the limiter tuned circuit, and amplitude changes with a period longer than that of the RC time constant are countered by using the diode load voltage for A.G.C. A delay voltage is applied to the diode to improve the A.G.C. characteristic, and hence the suppression of slow amplitude fluctuations. The limiter is coupled to the discriminator by C43 acting as an impedance inverter, which effectively changes the low impedance caused by the presence of the limiter into a high-impedance source for the discriminator. L24, L25 form the discriminator transformer, the insertion of the primary voltage into the secondary circuit with the correct phase relationship being achieved by feeding the junction of C51/C52 with the same signal that is applied to L24. W2,

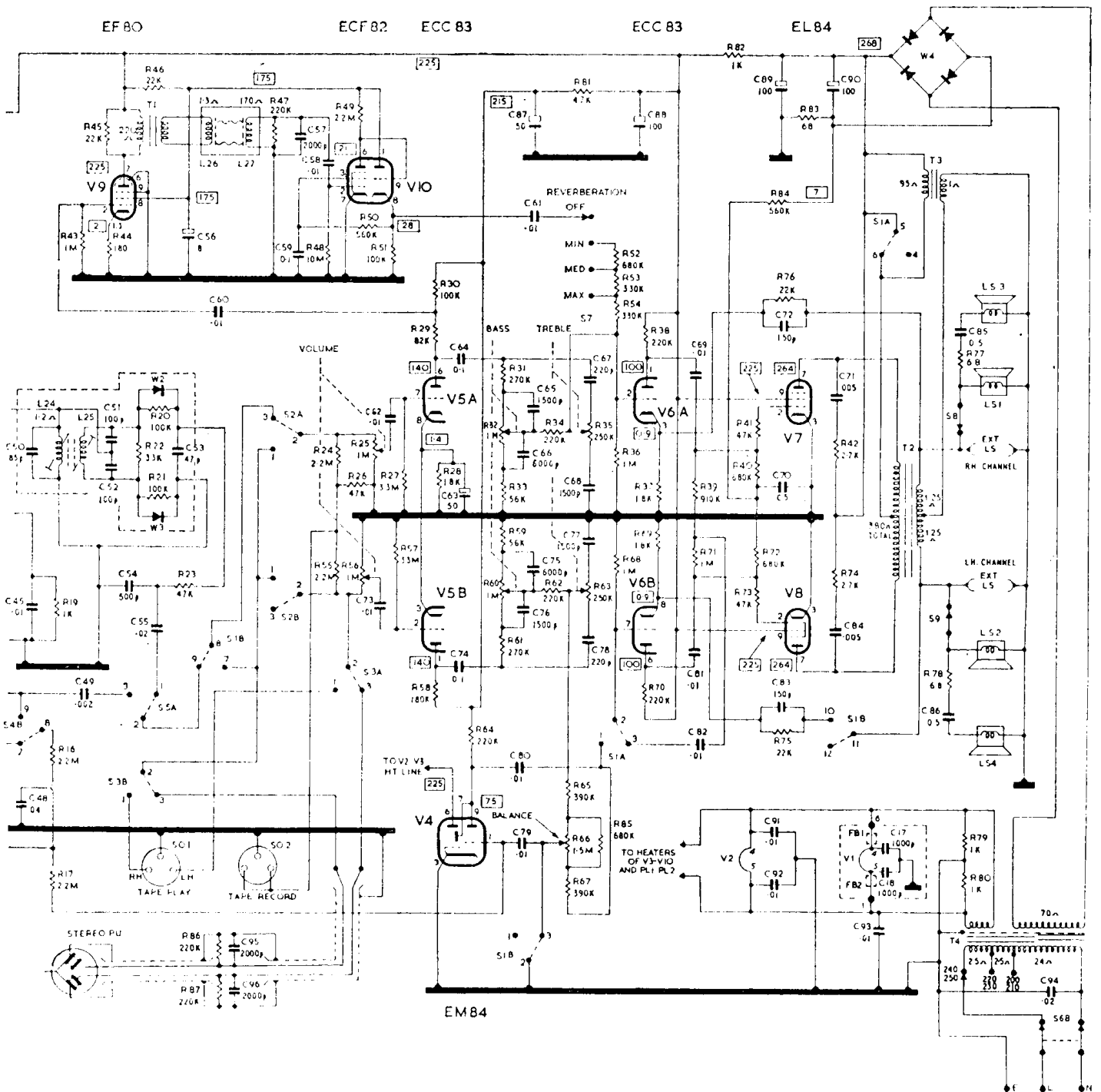


CIRCUIT DIAGRAM—
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W₃ are the discriminator diodes, the A.F. signal being developed across C₅₃ and fed out via R₂₃ and C₅₄, which provide de-emphasis.

Notes: Not shown on circuit diagram are two capacitors and two resistors used for the suppression of noise caused by switch arcing. The pygmy lamp micro-switch operated by the left-hand cabinet door is suppressed by a 0.03-μF. capacitor and a 330-ohm resistor; the gramophone motor switch by a 0.03-μF. capacitor and 100-ohm resistor.

Reverberation Circuits: Reverberation facilities are in the right-hand channel paralleling the tone control network and can be used on both stereo and mono reproduction. Part of the A.F. signal at V_{5A} anode is resistance-capacitance coupled to V₉ grid by R₃₀ and C₆₀, amplified and fed from V₉ anode to the reverberator unit via T₁. The reverberator unit delays and



repeats the signal periodically with diminishing amplitude and feeds V₁₀ (pentode) a second amplifier. V₁₀ (triode) is a cathode follower and is used for matching the reverberating signal back into the audio amplifier at V_{6A} grid, via S₇. The three "on" positions of S₇ select levels of reverberation with differences in level of 6 db. between "min." and "med." and between "med." and "max."

Alignment Summary: *A.M. I.F.:* 470 kc/s. (L₁₅, L₁₆, L₁₉, L₂₀); *M.W.:* 580 kc/s. (L₁₇/L₁₈ and L_{9A}/L₁₀), 1460 kc/s. (C₃₄, C₂₂); *L.W.:* 220 kc/s. (C₃₅, L_{9B}/L₁₁). *F.M. I.F.:* 10.7 Mc/s. (L₁₃, L₁₄, L₂₁, L₂₂, L₂₄, then adjust L₂₃ and L₂₅ for minimum A.M. output, finally peak L₇, L₈). *R.F.:* 91 Mc/s. (L₅/L₆, L₄).

Dismantling: Remove three central cabinet back panels. Pull off five front control knobs. Unsolder pick-up leads from tag strip beneath turntable; disconnect mains connection between chassis and turntable. Dismount ferrite-rod aerial from underside of cabinet top. Remove small clamp on top end of chassis above pilot lights. Dismount tape and external aerial socket panel. Unsolder speaker leads on A.F. transformer, blue one for right-hand speaker and green for left-hand. Unplug co-axial leads from reverberator. Green is input on left, brown is output on right. Remove four main chassis-fixing screws, accessible from underneath main chassis support woodwork, and two nuts located at centre and right-hand end of control panel strip. Remove two pilot lights from flange on top of scale assembly. Dismount and lift up record changer and remove main chassis and control panel carefully. Control panel is mounted on main chassis by two self-tapping screws.