'TRADER' SERVICE SHEET

# 292

# FERRANTI 1137U,

## 1037U, NOVA AND MAGNA

## A.C./D.C. (1936-37)

OF the 3-band type, the Ferranti 1137U is a 4-valve (plus rectifier) A.C./D.C. superhet covering a short-wave range of 19-51 m. The valve arrangement comprises a heptode frequency changer, a variable-mu pentode I.F. amplifier, a double-diode triode and a pentode output valve, while there is provision for an extension speaker.

An identical chassis is fitted in the Nova (1936-1937) and 1037U, A.C./D.C. but both have moulded cabinets, instead of the walnut cabinet of the 1137U. The chassis of the Magna A.C./D.C. (1936-1937) is also very similar, but includes a meter type tuning indicator, this model having a walnut cabinet.

This *Service Sheet* was prepared on an 1137 U and the differences in the Magna are explained under "General Notes."

### CIRCUIT DESCRIPTION

Aerial input on M.W. and L.W. via mains isolating condenser **C1** and coupling coils **L1, L2** to mixed coupled band-pass filter.

Primary coils **L3, L4** are tuned by **C30**; secondaries **L9, L10** by **C34**; coupling by coil **L7** (M.W.), a few turns of **L10** and common impedance of **C4**. On S.W. input is via **C1** and coupling coil **L6** to single tuned circuit **L8, C34.**

First valve (**V1, Ferranti metallised VHTS** or **Osram X30**) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L11** (S.W.), **L12** (M.W.) and **L13** (L.W.) are tuned by **C35**; parallel trimming by **C38** (S.W.), **C36** (M.W.) and **C9** (fixed-L.W.); series tracking by **C37** (M.W.) and **C39** (L.W.). Reaction by coils **L14** (S.W.), **L15** (M.W.) and **L16** (L.W.).

Second valve (**V2, Osram metallised W31** or **Ferranti VPTS**) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C40, L17, L18, C41** and **C42, L19, L20, C43.**

**Intermediate frequency 125 KC/S.**

Diode second detector is part of separate double diode valve (**V3, Osram D41** or **Ferranti SD**). Audio frequency component in rectified output is developed across load resistance **R12** and passed via A.F. coupling condenser **C21** and manual volume control **R18** to C.G. of pentode output valve (**V4, Osram N31**). I.F. filtering by **R11, C19, C20.**

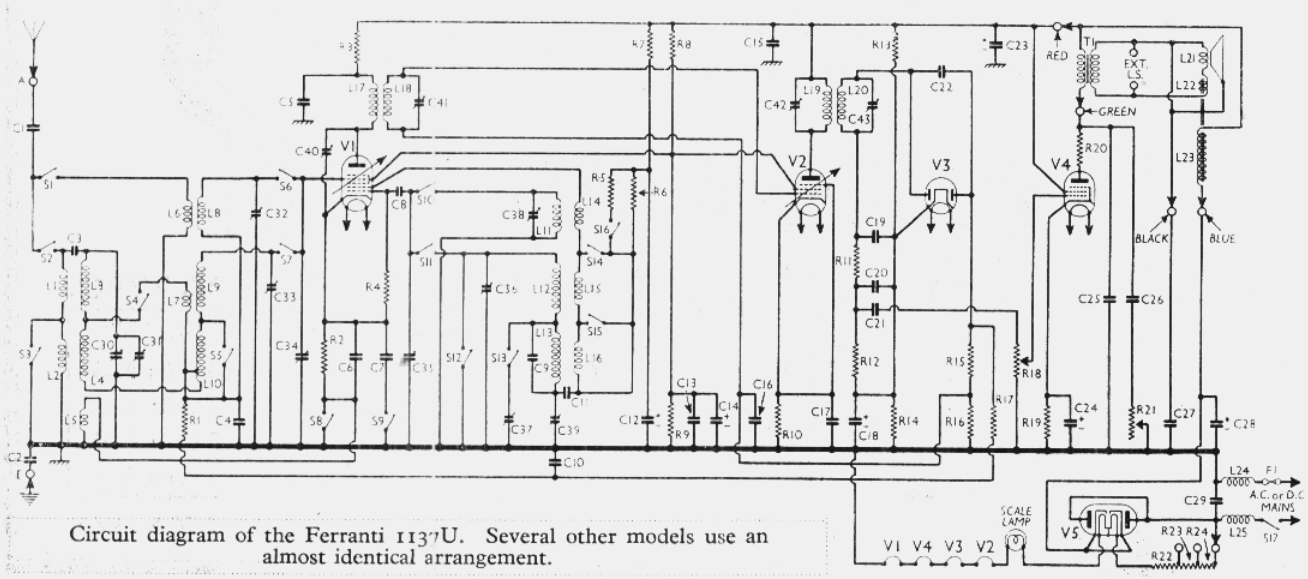
Fixed tone correction by **C25** and variable tone control by R.C. filter **C26, R21,** in **V4** anode circuit. Provision for connection of low impedance external speaker across secondary of internal speaker input transformer **T1.**

When the receiver is used with A.C. mains H.T. current is supplied by I.H.C. rectifying valve (**V5, Osram U30**) with both anodes and both cathodes strapped to operate as half-wave rectifier, which, with D.C. supplies, behaves as a low resistance. Smoothing is effected by speaker field **L23** and dry electrolytic condensers **C23** and **C28.** R.F. filtering in H.T. circuit by **C15.**

Valve heaters are connected in series together with voltage dropping resistance **R22, R23, R24** and scale lamp across mains input. Filter comprising chokes **L24, L25** and condenser **C29** suppresses mains-borne interference.

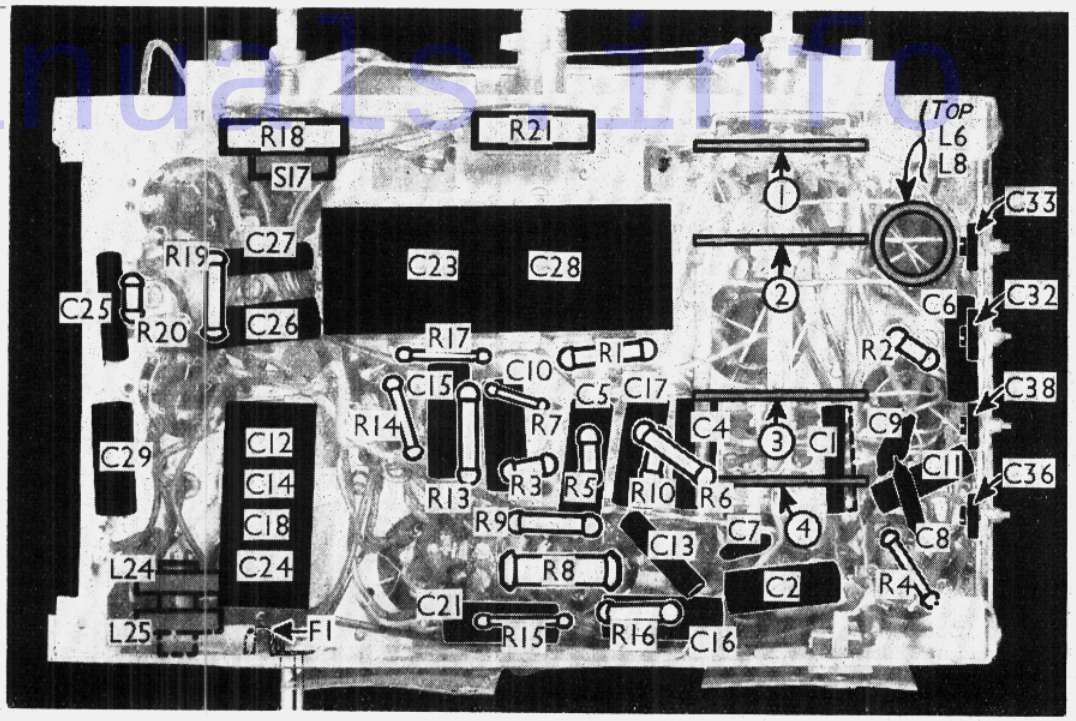
### COMPONENTS AND VALUES

| | CONDENSERS | Values (μF) |
|---|---|---|
| C1 | Aerial isolating condenser | 0·002 |
| C2 | Earth isolating condenser | 0·05 |
| C3 | Aerial coupling condenser | 0·000016 |
| C4 | Band-pass bottom coupling | 0·05 |
| C5 | V1 tet. anode decoupling | 0·1 |
| C6 | V1 cathode by-pass | 0·05 |
| C7 | V1 cathode S.W. by-pass | 0·0005 |
| C8 | V1 osc. C.G. condenser | 0·00005 |
| C9 | Osc. circuit L.W. trimmer | 0·000018 |
| C10 | A.V.C. line decoupling | 0·05 |
| C11 | V1 osc. anode coupling | 0·01 |
| C12* | V1 osc. anode decoupling | 2·0 |
| C13 | V1, V2 S.G.'s R.F. by-pass | 0·002 |
| C14* | V1, V2 S.G.'s decoupling | 4·0 |
| C15 | H.T. circuit R.F. by-pass | 0·1 |
| C16 | V2 C.G. decoupling | 0·05 |
| C17 | V2 cathode by-pass | 0·1 |
| C18* | V3 cathode by-pass | 6·0 |
| C19 | I.F. by-pass condensers | 0·00015 |
| C20 | | 0·00015 |
| C21 | A.F. coupling to V4 | 0·02 |
| C22 | Coupling to V3 A.V.C. diode | 0·00015 |
| C23* | Part H.T. smoothing | 24·0 |
| C24* | V4 cathode by-pass | 50·0 |
| C25 | Fixed tone corrector | 0·002 |
| C26 | Part of variable tone control | 0·05 |
| C27 | Speaker isolating condenser | 0·002 |
| C28* | Part H.T. smoothing | 8·0 |
| C29 | Mains R.F. by-pass | 0·05 |
| C30† | Band-pass primary tuning | — |
| C31‡ | Band-pass pri. M.W. trimmer | — |
| C32‡ | Aerial S.W. trimmer | — |
| C33† | Band-pass sec. M.W. trimmer | — |
| C34† | Band-pass sec. and S.W. aerial tuning | — |
| C35† | Oscillator circuit tuning | — |
| C36‡ | Osc. circuit M.W. trimmer | — |




Circuit diagram of the Ferranti 1137U. Several other models use an almost identical arrangement.

Under - chassis view. Switch details are shown in the diagrams overleaf. **F1** is a small wire fuse, forming an actual connection (see General Notes). Note the trimmers at the side of the chassis.




| CONDENSERS (*Continued*) | | Values (μF) |
|---|---|---|
| C37‡ | Osc. circuit M.W. tracker .. | — |
| C38‡ | Osc. circuit S.W. trimmer .. | — |
| C39‡ | Osc. circuit L.W. tracker .. | — |
| C40‡ | 1st I.F. trans. pri. tuning .. | — |
| C41‡ | 1st I.F. trans. sec. tuning .. | — |
| C42‡ | 2nd I.F. trans. pri. tuning .. | — |
| C43‡ | 2nd I.F. trans. sec. tuning .. | — |

* Electrolytic. † Variable. ‡ Pre-set.

| RESISTANCES | | Values (ohms) |
|---|---|---|
| R1 | V1 tet. C.G. decoupling .. | 250,000 |
| R2 | V1 tet. fixed G.B. .. .. | 300 |
| R3 | V1 tet. anode H.T. feed .. | 1,000 |
| R4 | V1 osc. C.G. resistance .. | 100,000 |
| R5 | V1 osc. anode S.W. stabiliser | 1,000 |
| R6 | V1 osc. anode M.W. and L.W. stabiliser .. .. .. | 150,000 |
| R7 | V1 osc. anode H.T. feed .. | 30,000 |
| R8 | V1, V2 S.G.'s H.T. feed potential divider .. | 25,000 |
| R9 | | 50,000 |
| R10 | V2 fixed G.B. .. .. .. | 300 |
| R11 | I.F. stopper .. .. .. | 100,000 |
| R12 | V3 signal diode load .. .. | 500,000 |
| R13 | V3 A.V.C. delay voltage | 250,000 |
| R14 | potential divider .. | 50,000 |
| R15 | V3 A.V.C. diode load | 1,000,000 |
| R16 | resistances .. | 250,000 |
| R17 | A.V.C. line decoupling .. | 500,000 |
| R18 | Manual volume control .. | 1,000,000 |
| R19 | V4 G.B. resistance .. .. | 140 |
| R20 | V4 anode stopper .. .. | 140 |
| R21 | Variable tone control. . .. | 50,000 |
| R22 | Heater circuit ballast re- | 380 |
| R23 | sistance .. .. | 70 |
| R24 | | 100 |

| OTHER COMPONENTS | | Approx. Values (ohms) |
|---|---|---|
| L1 | Aerial M.W. and L.W. | 18·0 |
| L2 | coupling coils .. | 70·0 |
| L3 | Band-pass primary coils | 4·5 |
| L4 | | 45·0 |
| L5 | Image suppressor coil. . .. | 0·25 |
| L6 | Aerial S.W. coupling coil .. | 1·3 |
| L7 | Band-pass M.W. coupling coil | 0·2 |
| L8 | Aerial S.W. tuning coil .. | 0·05 |
| L9 | Band-pass secondary coils | 4·5 |
| L10 | | 40·0 |
| L11 | Osc. circuit S.W. tuning coil . . | 0·05 |
| L12 | Osc. circuit M.W. tuning coil | 8·5 |
| L13 | Osc. circuit L.W. tuning coil. . | 23·0 |
| L14 | Osc. circuit S.W. reaction .. | 0·8 |
| L15 | Osc. circuit M.W. reaction .. | 7·2 |
| L16 | Osc. circuit L.W. reaction .. | 8·0 |
| L17 | 1st I.F. trans. Pri. .. .. | 80·0 |
| L18 | Sec. .. .. | 80·0 |
| L19 | 2nd I.F. trans. Pri. .. .. | 80·0 |
| L20 | Sec. .. .. | 80·0 |
| L21 | Speaker speech coil .. .. | 3·8 |
| L22 | Hum neutralising coil. . .. | 0·25 |
| L23 | Speaker field coil .. .. | 700·0 |
| L24 | Mains filter chokes .. | 3·0 |
| L25 | | 3·0 |
| T1 | Speaker input trans. Pri. .. | 200·0 |
| | Sec. .. | 0·3 |
| F1 | Mains circuit fuse .. .. | |
| S1-S16 | Waveband switches .. .. | |
| S17 | Mains switch, ganged R18 .. | — |

## DISMANTLING THE SET

**Removing Chassis.**—To remove the chassis from the cabinet, remove the small tuning knob (recessed grub screw covered with sealing wax) and the other four knobs (pull off). Now remove the four bolts (with washers) holding the chassis to the bottom of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads, which will be sufficient for normal purposes if the cabinet is turned upside down. *When replacing*, do not forget to cover the screw in the small tuning knob with wax.

If it is desired to free the chassis entirely, unplug the speaker leads from the panel on the chassis deck. *When replacing*, connect them as follows, numbering the sockets from left to right :—1, blue ; 2, green ; 3, red ; 4, black.

**Removing Speaker.**—To remove the speaker from the cabinet, remove the nuts from the four bolts holding it to the sub-baffle. *When replacing*, see that the transformer is at the top and connect the leads as 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 223 V, using the middle tapping on the mains resistance. The receiver was tuned to the lowest wavelength on the medium band and the volume control was at maximum, but there was no signal input.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 VHTS | 204 | 0·5 | 58 | 2·9 |
| | Oscillator | | | |
| | 43 | 0·8 | | |
| V2 W31 | 204 | 3·2 | 58 | 2·1 |
| V3 D41 | — | — | — | — |
| V4 N31 | 195 | 30·0 | 204 | 7·6 |
| V5 U30† | — | — | — | — |

* Cathode to chassis 242 V, D.C.

*Continued overleaf*

## FERRANTI—*Continued*

### GENERAL NOTES

**Switches.**—**S1-S16** are the waveband switches, in four rotary units beneath the chassis, which are indicated in our under-chassis view, and shown in detail in the diagrams on this page. The table (col. 2) gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C** closed.

**S17** is the Q.M.B. mains switch, ganged with the volume control **R18.**

**Coils.**—**L1-L5 ; L7, L9, L10 ; L11-L16 ; L17-L18 ; L19, L20** are in five units on the chassis deck. The **L11-L16** unit also contains the pre-set trackers **C37** and **C39** and also two extra fixed condensers which are connected in parallel with them. These components, being incorporated in the tracker assemblies, are not indicated separately in our circuit diagram or list of components. The I.F. units contain their associated trimmers, and the second also contains **R11, R12, C19, C20** and **C22.**

**L6** and **L8** are unscreened, and are on a tubular former beneath the chassis, below the **L1-L5** unit. **L8** is the thick wire winding.

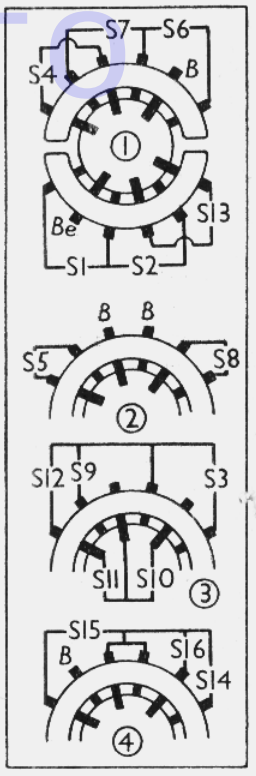
**Scale Lamp.**—This is an Osram M.E.S. type, rated at 6·5 V. 0·3 A, and having a small bulb. It is used for the Magnascopic and main scales.

**External Speaker.**—Two terminals are provided on a bracket at the rear of the internal speaker for a low resistance (about 4 O) external speaker.

**Condensers C23, C28.**—These are two dry electrolytics in a single carton beneath the chassis, with a common negative (black) lead. The yellow lead is the positive of **C23** (24 $\mu$F) while the red lead is the positive of **C28** (8 $\mu$F).

### TABLE AND DIAGRAMS OF THE SWITCH UNITS

| Switch | S.W. | M.W. | L.W. |
|---|---|---|---|
| S1 | C | – | – |
| S2 | – | C | C |
| S3 | – | C | – |
| S4 | – | C | – |
| S5 | – | C | – |
| S6 | C | – | – |
| S7 | – | C | C |
| S8 | C | – | – |
| S9 | C | – | – |
| S10 | C | – | – |
| S11 | – | C | C |
| S12 | C | – | – |
| S13 | – | C | – |
| S14 | C | – | – |
| S15 | C | C | – |
| S16 | C | – | – |



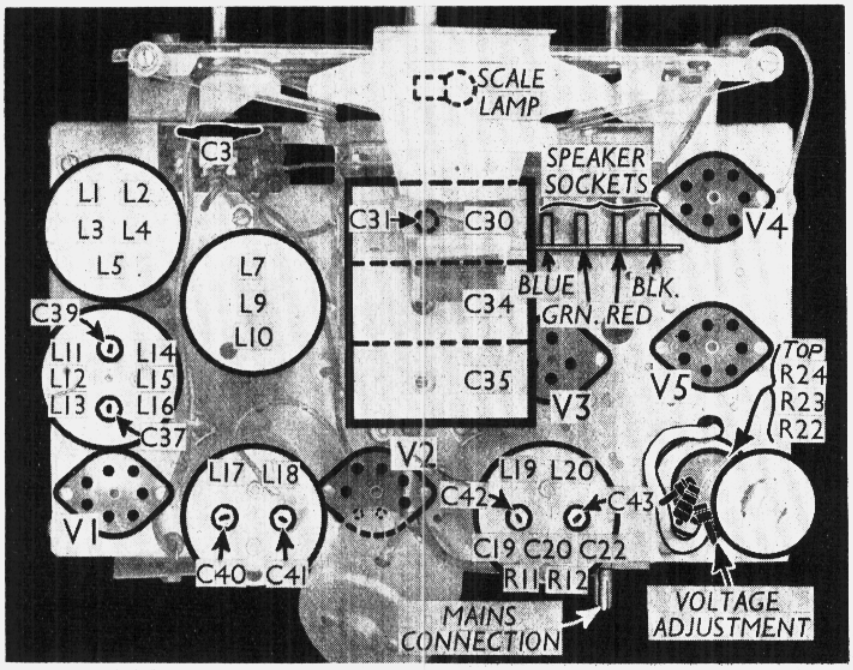

Switch diagrams, as seen looking from the rear of the underside of the chassis.

**Condensers C12, C14, C18, C24.**—These are four dry electrolytics in a single carton beneath the chassis, with common negative (black) lead. The positive leads are : yellow, **C12** (2$\mu$F) ; red, **C14** (4$\mu$F) ; green, **C18** (6$\mu$F) ; blue, **C24** (50 $\mu$F).

**Resistance R22, R23, R24.**—These form the single tapped ballast resistance, mounted on the chassis deck, but insulated from it.

**Fuse F1.**—This consists of a fine connecting wire (40 S.W.G.) between the bottom pin of the mains plug and one end of **L24.** If this blows, there will be an open circuit between the bottom mains pin and chassis ; if it is intact, a resistance of about 3 O will be obtained. Replacement involves removing the chassis from the cabinet.

**Magna Model.**—In the 1936-37 Magna A.C./D.C. model, a meter type tuning indicator is fitted. The top of **R3,** the top of **C15** and the top of **L19, C42** are disconnected from the H.T. positive line, and taken to one side of the tuning indicator, the other side of the indicator going to the H.T. positive line. The meter resistance is about 1,200 O.




Plan view of the chassis. The sockets for the speaker leads are colour-coded. **R22-R24** form the ballast resistance.

### CIRCUIT ALIGNMENT

**I.F. Stages.**—Adjust signal generator to 125 KC/S and feed output between **V1** control grid (top cap) and chassis. Adjust trimmers **C43, C42, C41** and **C40,** in that order, to obtain maximum reading on output meter.

**R.F. and Oscillator Stages.**—Set tuning pointer to 200 m. with the condenser vanes fully out of mesh (anti-clockwise). Set wavechange switch to M.W. and tuning condenser to 228 m. and feed in a 228 m. (1,315 KC/S) signal between **V1** top cap and chassis. Screw oscillator trimmer **C36** to maximum (anti-clockwise) and then slowly clockwise until the second maximum peak output is obtained.

Now apply the 228 m. signal to **A** and **E** terminals via an artificial aerial or 0·0002 $\mu$F condenser and adjust band-pass trimmers **C33, C31** for maximum output. Adjust tuning condenser and signal generator to 500 m. and adjust M.W. tracker **C37** for maximum output while rocking the gang.

Switch to L.W. feed in an 1,807 m. (166 KC/S) signal, tune it in, and adjust **C39** for maximum output while rocking the gang.

Switch to S.W., set tuning condenser to 19·7 m. (marked by black line at top of scale), and feed in a 19·7 m. (15·2 MC/S) signal. Screw oscillator trimmer **C38** to maximum (anti-clockwise) and then slowly clockwise until second maximum peak output is obtained. To verify adjustment, turn tuning condenser slightly to right and the image output should be obtained.

Go back to correct peak, then adjust **C32** for maximum output.

Printed in Great Britain as a supplement to *The Wireless & Electrical Trader* by Sanders Phillips & Co., Ltd., The Baynard Press, Chryssell Road, London, S.W.9