

# TRADER SERVICE SHEETS

NUMBER THIRTY-SEVEN  
(VOLUME TWO)

THE Ferranti 1934/5 Universal A.C./D.C. receiver is a superhet employing 13 V and 26 V, 0.3 A valves, but otherwise it has many features in common with the Lancastria and Arcadia A.C. receivers by the same firm.

# FERRANTI UNIVERSAL AC/DC SUPERHET

### CIRCUIT DESCRIPTION

Aerial input by way of isolating condenser **C34**, coupling condenser **C1** and coupling coils **L1, L2** to "mixed-coupled" band-pass filter. Primary coils **L3, L4** tuned by **C22**; secondary coils **L7, L8** tuned by **C24**; M.W. coupling coil **L6**; coupling condenser **C2**. First valve (**V1, Marconi-Osram X30** or Ferranti **VHTS**) is a heptode operating as frequency-changer with electron coupling. Oscillator grid coils **L9, L10** tuned by **C26**; anode reaction coils **L11, L12**. Coil **L5** in cathode circuit functions as image rejector.

Single variable-mu pentode intermediate frequency amplifier (**V2, Ferranti metallised VPTS**) with tuned-primary tuned-secondary transformer couplings **L13, L14** and **L15, L16**.

#### Intermediate frequency 125 KC/S.

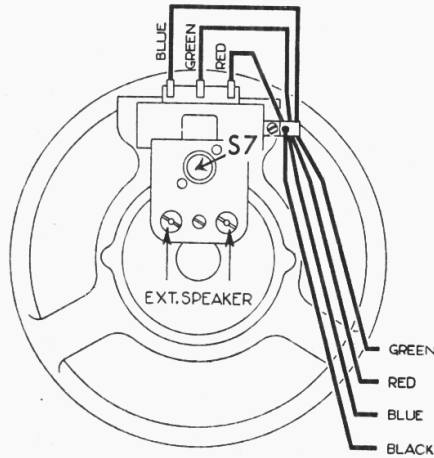
Moving-iron visual tuning indicator meter in common anode feed circuit to **V1** and **V2**.

Diode second detector forming part of double diode triode (**V3, Ferranti metallised HSD**). Second diode provides steady potential which is developed across load resistances **R13** and **R14** and fed back as G.B. through decoupling circuits to frequency-changer and I.F. valves, giving automatic volume control. Delay voltage is obtained from resistances **R9, R10** in **V3** cathode circuit.

Audio-frequency output from rectifier diode is developed across **R7, R8** and in part is fed by way of coupling condenser **C11** and manual volume control

**R6** to grid of triode section of **V3** which operates as L.F. amplifier.

Resistance-capacity coupling to output pentode (**V4, Ferranti PTS**). Variable tone control by means of R.C. filter



Rear view of the speaker chassis, showing the colour-coded leads, S7, and the external speaker terminals.

**R18, C21** in anode circuit. Provision for connection of low-resistance external speaker across secondary of **T1**, the internal speaker input transformer. Switch **S7** cuts out internal speaker.

When the receiver is used with A.C. mains, H.T. current is supplied by a low resistance half-wave rectifier, which takes the form of a full-wave valve (**V5, Marconi-Osram U30**) with its anodes and cathodes strapped. With a D.C. supply the valve behaves as an ordinary resistance of low value.

H.T. current smoothing by capacitor field winding **L17** and large capacity dry electrolytic condensers **C18, C19**.

Heaters of valves are connected in series together with special scale lamp and automatic voltage regulating barretter lamp (**Philips 1941**) across mains supply.

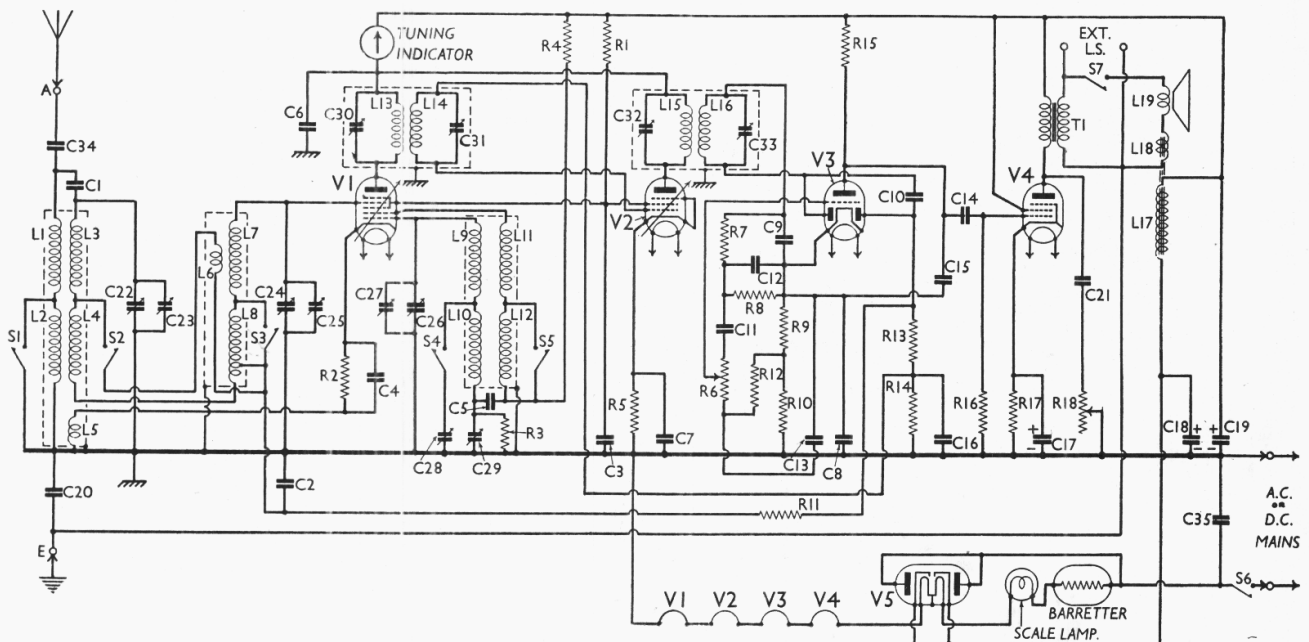
### DISMANTLING THE SET

**Removing Chassis.**—Remove the control knobs at the front of the receiver. There are three of normal size below the scale window, and a smaller one above. All the knobs can be pulled off, and no grub screws are employed. When removing or replacing the small knob belonging to the tone control resistance, it is best to support the resistance in one hand, since this is fairly flexibly mounted.

The four connections to the speaker should now be unplugged from the pins on the paxolin strip mounted on top of the chassis. These are indicated in our plan chassis view. The leads to the pins are coded in the same colours as those from the speaker chassis.

Four screws under the base of the

(Continued overleaf.)



Circuit diagram of the Ferranti Universal Superhet. Note that the valve heaters are all in series, and that a barretter is employed. The rectifier valve **V5** has its cathodes and anodes paralleled to give half-wave rectification on A.C.

For more information remember

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**FERRANTI UNIVERSAL AC/DC SUPERHET—(continued)**

cabinet hold the chassis in position, and when these are removed, the chassis can be withdrawn. *When replacing,* do not forget the small pads of sponge rubber between the chassis and cabinet.

**Removing Speaker.**—Should this be necessary, it is probably simplest to unbolt the speaker from its sub-baffle, leaving the latter in position. There are four nuts and bolts.

**COMPONENTS AND VALUES**

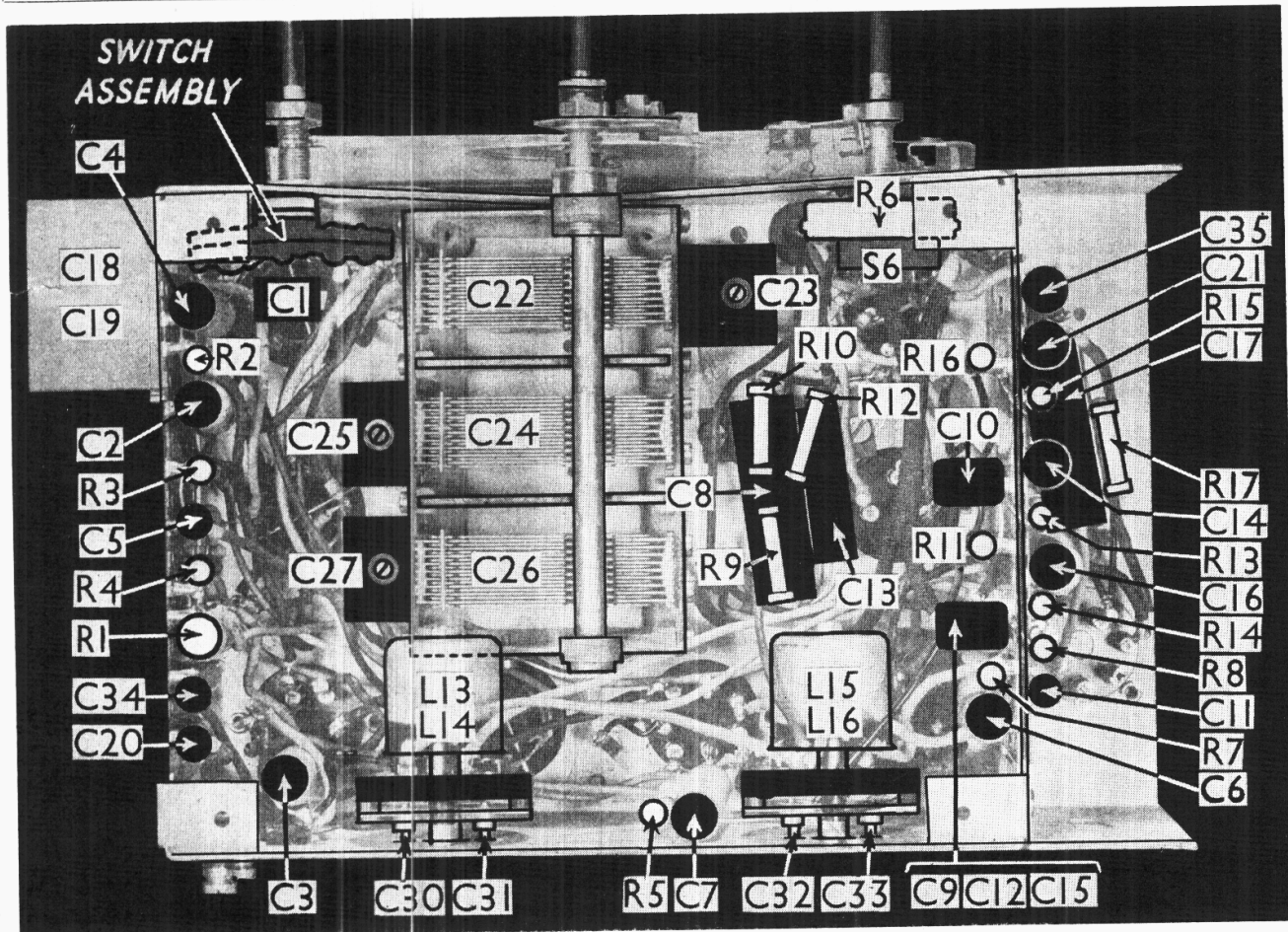
Resistances		Values (ohms)
R1	V1 and V2 S.G. H.T. feed	30,000
R2	V1 fixed G.B. resistance	300
R3	Oscillator tracker shunt	50,000
R4	V1 osc. anode decoupling	100,000
R5	V2 fixed G.B. resistance	450
R6	Manual volume control	1,000,000
R7	Rectifier diode load	100,000
R8		500,000
R9	V3 G.B. and A.V.C. delay	1,000
R10	voltage resistances	2,000
R11	V1 cont. grid decoupling	1,000,000
R12	V3 cont. grid decoupling	100,000
R13	A.V.C. diode load	4,000,000
R14		1,000,000
R15	V3 anode resistance	18,000
R16	V4 grid resistance	500,000
R17	V4 G.B. resistance	320
R18	Tone control resistance	33,000

Condensers		Values ( $\mu$ F)
C1	Top coupling L1, L2 to L3, L4	0.000018
C2	Band-pass coupling	0.05
C3	V1 and V2 S.G.'s by-pass	0.1
C4	V1 cathode by-pass	0.05
C5	V1 osc. anode decoupling	0.01
C6	V1 and V2 anode decoupling	0.05
C7	V2 cathode by-pass	0.1
C8	V3 cathode by-pass	1.0
C9	Rect. diode reservoir	0.00015
C10	A.V.C. diode coupling	0.0005
C11	L.F. coupling to V3 triode	0.01
C12	H.F. by-pass	0.00015
C13	V3 cont. grid decoupling	0.1
C14	L.F. coupling to V4	0.02
C15	V3 anode H.F. by-pass	0.0003
C16	V2 cont. grid decoupling	0.05
C17	V4 cathode by-pass	25.0
C18	H.T. smoothing, electrolytics	16.0
C19		16.0
C20	Earth isolating condenser	0.002
C21	Tone control condenser	0.05
C22	Band-pass primary tuning	—
C23	Band-pass pri. trimmer, pre-set	—
C24	Band-pass secondary tuning	—
C25	Band-pass sec. trimmer, pre-set	—
C26	Oscillator tuning	—
C27	Oscillator trimmer, pre-set	—
C28	Oscillator M.W. tracker, pre-set	—
C29	Oscillator L.W. tracker, pre-set	—
C30	1st I.F. trans. pri. tuning	—
C31	1st I.F. trans. sec. tuning	—
C32	2nd I.F. trans. pri. tuning	—
C33	2nd I.F. trans. sec. tuning	—
C34	Aerial isolating condenser	0.002
C35	Mains by-pass	0.02

Other Components		Values (ohms)
L1	Aerial coupling coils	17.5
L2		68.0
L3		5.0
L4	Band-pass primary coils	41.0
L5		1.7
L6	Band-pass coupling coil	0.2
L7	Band-pass secondary coils	5.0
L8		41.0
L9		4.0
L10	Oscillator tuning coils	24.5
L11		6.5
L12	Oscillator reaction coils	3.2
L13		—
L14	1st I.F. transformer	Pri. ... 120.0
L15		Sec. ... 120.0
L16	2nd I.F. transformer	Pri. ... 120.0
L17		Sec. ... 120.0
L18	Speaker field winding	700.0
L19	Speaker hum neutralising coil	4.5
T1	Speaker speech coil	
T1	Speaker input trans.	Pri. ... 250.0
T1		Sec. ... 0.3
S1-S5	Waveband switches	—
S6	Mains switch (ganged R6)	—
S7	Internal speaker switch	—

**VALVE ANALYSIS**

The voltage and current readings listed in the table are those given by Ferranti for an average chassis working with no aerial or earth connected and with a 220 V A.C. mains supply. All voltages were measured with a high resistance voltmeter, chassis being negative. When measuring anode and screen currents of



The under-chassis view. The wavechange switch assembly is indicated, and is shown diagrammatically in a separate sketch on the next page. C17 is beneath C21, R15 and C14. C9, C12, C15 are in a single waxed unit.



V1 and V2 the usual precautions should be taken to avoid possible instability.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 X30* ..	212	6.5	80	2.5
V2 VPTS ..	212	5.0	80	2.0
V3 HSD ..	160	3.0	—	—
V4 PTS ..	210	43.0	216	6.5
V5 U30 ..	—	70.0	—	—

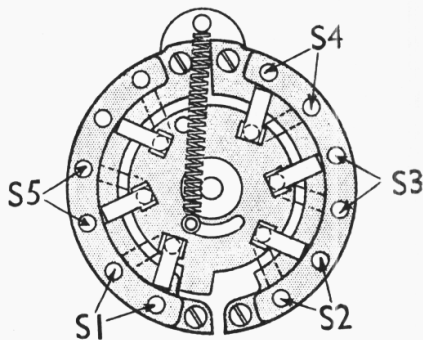
\* Osc. anode (G2) 80 V 1.5 mA.

**GENERAL NOTES**

**Switches.**—S1, S2, S3, S4 and S5 are the waveband switches, mounted in one assembly, which is indicated in the under-chassis view, and is shown diagrammatically in a separate sketch below.

The assembly is of the rotary type, with two positions. Each switch comprises two fixed contacts, which in one position are open, and in the other are shorted by raised studs riveted in the rotating portion of the assembly.

All the waveband switches are open on the L.W. band and closed on the M.W. band.



A sketch of the wavechange switch assembly. The two contacts of each switch are indicated.

S6 is the mains switch, ganged with the volume control R6, and S7 is the internal speaker switch operated by a shaft and knob accessible through a hole in the upper portion of the back of the receiver.

**Trimmers C23, C25, C27.**—These are reached through holes in the top of the chassis.

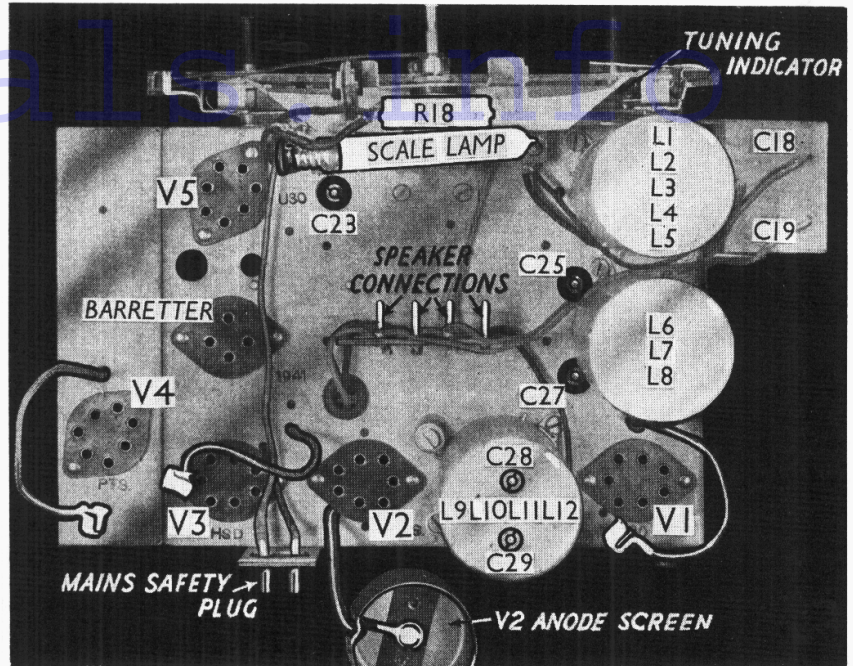
**Trimmers C30, C31, C32, C33.**—The I.F. trimmers project through holes in the back of the chassis.

**Note.**—All trimmers are operated by screwed spindles, with flattened ends, and those for the I.F. circuits are provided with lock-nuts for which a 6 BA box spanner will be required.

**Padders C28, C29.**—These are at the top of the oscillator coil screen. Each comprises a fixed condenser with a small pre-set type in parallel.

**Condenser Block C18, C19.**—This is held to the chassis by a bracket on the left-hand side, and consists of two 16 μF electrolytics. The red leads are positive, and the black one is the common negative.

**Coil Assemblies.**—The coil screens of



Plan view of the chassis. The speaker plugs shown have colour-coded wires running to them. Note the special scale lamp. The condenser block C18, C19, is mounted by a clip to the side of the chassis. The barretter lamp has a 4-pin base, of which only the two "filament" pins are employed. R18 is the variable tone control resistance.

the band-pass and oscillator assemblies, mounted on top of the chassis, are difficult to remove without disturbing the coils. If a coil fault is found, it is probably best to unsolder all the coil connections underneath the chassis, and to remove the screen, with the coil, by taking out the two slotted screws holding it to the chassis. The faulty coil unit can then be returned to the makers.

The I.F. coil screens can be removed by undoing one nut holding each in position.

**Scale Lamp.**—This is a special Ferranti type D.L.S. It has a long filament, rated at 20 V, 0.3 A, and is fitted with an ordinary M.E.S. cap. Since it is wired in series with the valve heaters and the barretter, failure of the lamp will prevent the set from working. The lamp connections may be temporarily shorted, allowing the receiver to be used while a new lamp (price 2s. 6d.) is being obtained.

**Control Indicators.**—The volume control, tone control and waveband switch are each provided with indicating pointers, the ends of which can be seen through the scale window. These pointers are operated by cords wrapped round the spindle of the controls, and they are provided with return springs.

**Visual Tuning Indicator.**—This is of the moving-iron type, and its position is indicated in the plan view of the chassis.

**Earthing Tags.**—Many of the earth connections are made to tags welded to the chassis. Make certain that none of these has broken loose.

**Braided Wires.**—The flexible connecting wires have a braided covering which may

possibly slide back and uncover the wire to some extent. Make certain that no short circuits can occur here.

**Valves.**—V1, V2, V3 have 13 V 0.3 A heaters, while V4 and V5 have 26 V, 0.3 A heaters. Base connections for the heptode V1 were given in Sheet No. 17, Vol. 1, p. 217, col. 3, left-hand diagram. Although our chassis was fitted with an Osram X30, a Ferranti VHTS is an alternative.

Base connections for the rectifier, V5, were given in Sheet No. 23, p. 232, col. 3, left hand diagram.

**Condenser C10.**—This component is screened, the lead from the screen being connected to chassis.

**Condensers C9, C12, C15.**—These are of the mica type, and are mounted in a single waxed unit, with one connection of each common.

**CONDENSER COLOUR CODE**

**Mica Types.**—Capacities are indicated by one or two coloured spots.

- .00005 μF, 1 Black; .00015 μF, 1 Brown; .0002 μF, 1 Red; .0003 μF, 1 Yellow; .0003 μF (2,000 V test), 2 Yellow; .0004 μF, 2 Red; .0005 μF, 1 Yellow, 1 Green; .0006 μF, 1 Green, 1 Red; .001 μF, 1 Green; .0016 μF, 2 Blue; .00175 μF, 1 Blue.

**Paper Types.**—Capacities and test voltages are indicated by one or two coloured bands.

- .002 μF, 1,500 V test, 1 Brown; .01 μF, 750 V, 1 Green; .02 μF, 750 V, 1 Yellow; .05 μF, 750 V, 1 Red; .1 μF, 750 V, 1 Grey; .01 μF, 1,000 V, 2 Green; .05 μF, 1,000 V, 2 Red; .1 μF, 1,000 V, 2 Grey.