Test Report

FERRANTI Model 546

a.c.-d.c. radio receiver

THE Ferranti 546 is a long and medium-wave superhet receiver suitable for use on a.c. or d.c. mains, 210–250 volts. It covers the ranges 200–550 metres and 900–2,000 metres and can be used either with an external aerial or with an internal plate aerial for local station reception.

The Circuit

Aerial input is via primary coil L1, tuned by C1 (which is omitted in some models), to permeability tuned secondary coils L2 (m.w.) and L3 (l.w.) which are tuned by C5, parallel trimming by C6 and thence to the grid of V2 the frequency changer.

The metal back cover is connected to the aerial primary coil and can be used for local station reception. Normal reception is obtained by connecting the aerial lead-in to a socket mounted on the metal back cover.

It should be noted that the back cover must not make contact with the chassis, otherwise the primary coil L1 will be placed across the mains supply and consequently damaged. The low potential end of the aerial coil is connected to the third lead in the three-cored mains cord; this must be earthed.

V1 is a 12K8GT triode-hexode and uses a conventional series-fed oscillator arrangement. This is followed by a 12K7GT i.f. amplifier stage (V2), transformer-coupled to V1 by permeability tuned i.f. transformer IFT1, which are paralleled by fixed tuning condensers C12 and C13.

V2 is transformer-coupled to the signal diode of V3 by IFT2. The a.v.c. diode of V3 is coupled to the anode of V2 by C18 and the rectified negative voltage developed across the a.v.c. diode load resistor R5 is fed back to the signal grids of V1 and V2 via R4 and decoupled by C4. I.f. filtering is carried out by C16, R14 and C27. In some models R14 and C27 are omitted and there are variations in i.f. filtering that may occur in some 546 models, viz.: (a) C16 is fitted in IFT2 coil can, (b) C16, in IFT2 coil can, plus R14 and C27 mounted on the volume control R2, (c) C16, R14 and C27 all mounted inside IFT2 can.

The a.f. component developed across the V3 signal diode load resistor R2 (the manual volume control) is fed via C17 to the signal grid of the triode amplifier portion of V3 and the amplified signal developed across anode load resistor R6 is fed via C20 to the signal grid of the tetrode power amplifier V4 (35L6GT). The V3 anode feed is decoupled by C19.

The output stage V4, which delivers an audio output of 1.5 watts undistorted, is transformer-coupled by T1 to a low impedance mains energised speaker. Fixed tone correction is carried out by C21 and R13 shunted across T1 primary. The output stage cathode bias resistor R8 is decoupled by C22 and R12 is the grid stopper.

H.t. voltage is supplied by the half-wave rectifier V5 (35Z4GT) and smoothing is effected by speaker field coil L14 and by C23, C24 and C25. R9 is an h.t. feed resistor to V1, V2, V4 screen grids and V3 anode.

The mains input is fed via on-off switch S4 to mains resistor R10, the centre section of which is in parallel with the 3.5V 0.3A m.e.s. dial lamp. The anode of V5 is connected to the third tapping on R10. All valve heaters are connected in series with the mains resistor. The total power consumption of the receiver is 60 watts at 230 volts a.c.

SERVICE SNAPS OF THE FERRANTI MODEL 546

Valves: 12K8GT (f.c.), 12K7GT (i.f. amp.), 12Q7GT (2nd det., AVC and a.f.), 35L6GT (o/p), 35Z4GT (half-wave rec.).
Intermediate Frequency: 465 kc/s.
Volume Control: 500,000 ohms with s.p. switch.
Electrolytics: 16μF, 250V peak; 10+10μF and 10+10μF, 150V peak (all in same unit); 12μF, 12V peak.
Pilot Lamp: 3.5 volts, 0.3 amps.
Loudspeaker: Mains energised m.c. field 1,000 ohms; Speech coil 2.5 ohms.
Mains Supply: 210–250 volts d.c.; 210–250 volts, 40–100 c/s a.c. *Live chassis.*

Alignment Procedure

Care must be taken that the metal back cover does not make contact with the metal parts of the receiver chassis, as the chassis may be live, depending on the mains plug connection. For alignment purposes it is necessary to have the chassis at earth potential on a.c. mains supplies to avoid shock and damage to equipment. Correct polarity can be found by a neon lamp or voltmeter.

An output meter should be connected via a 1μF series condenser across the l.s. input terminals LS1 and LS4 and the input signal should be sufficient to provide a reading of 10–20 volts on the output meter.

I.F. Circuits

The factory setting of the iron dust cores in the i.f. transformers is preserved by a soft wax seal, and this may be broken when necessary by a slight turn of the core. It is advisable to use a screwdriver with a blade that fits exactly the slots in the cores to avoid damage, as they are brittle.

The signal generator is connected via a 0.1μF condenser between the top cap of V1 and chassis. Switch the set to l.w. (clockwise rotation of the wavechange switch), adjust the ganged condenser so that the vanes are fully meshed and rotate the volume control for maximum output.

Then inject a 465 kc/s signal and adjust the cores of IFT1 and IFT2 for maximum readings on the output meter. Repeat the operation and seal cores in position with a soft wax seal.

M.W. Alignment

With the ganged condenser vanes fully meshed, check that the pointer is exactly vertical and in line with the cream vertical lines on the scale. If the pointer and scale markings do not coincide, adjust the glass scale. With the set switched to m.w. (wavechange switch anti-clockwise) connect signal generator between the aerial socket on the metal back cover and the receiver *earth lead* in the three-core mains lead) via a 50pF condenser.

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Set the dial pointer to 500 metres (600 kc/s) and inject a 600 kc/s signal. Adjust the cores of L4 and L2 for maximum output. Then set the pointer to 200 metres (1,500 kc/s) and inject a 1,500 kc/s signal; adjust trimmers C8 and C6 for maximum output.

Repeat operations until maximum results obtained. Then inject a 1,316 kc/s signal and tune to 228 metres for maximum response. Adjust trimmer C6. Seal cores of L4 and L2 in position with sealing wax.

L.W. Alignment

Switch to l.w. (wavechange switch clockwise) and connect generator as previously. Set dial pointer to 1,450 metres and inject a 207 kc/s signal. Adjust cores of L3 and L5 for maximum output. At this stage check the set on broadcast transmissions for satisfactory operation, using (a) an external aerial plugged into the aerial socket and (b) the metal back cover only as a local station aerial.

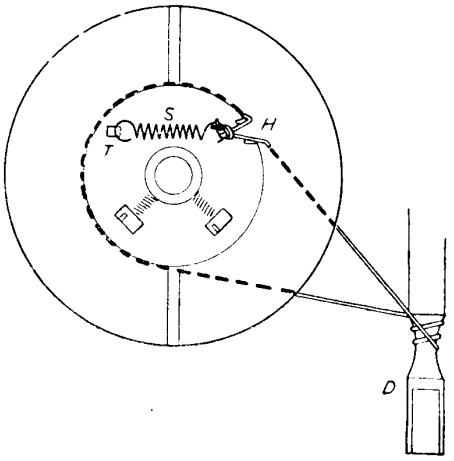
Seal the cores of L3 and L5 with sealing wax.

Drive Cord Replacement

Drive cord length—11in.

To replace the drive cord, first remove the scale (by unscrewing the right-hand scale bracket) and rotate the ganged condenser so that the vanes are fully meshed. Then remove the drive drum by slackening off the two screws which hold the drum in position on the condenser spindle. Knot the ends of the drive cord to the same end of tension spring S and clip the other end of S on to the projecting tag T on the drum.

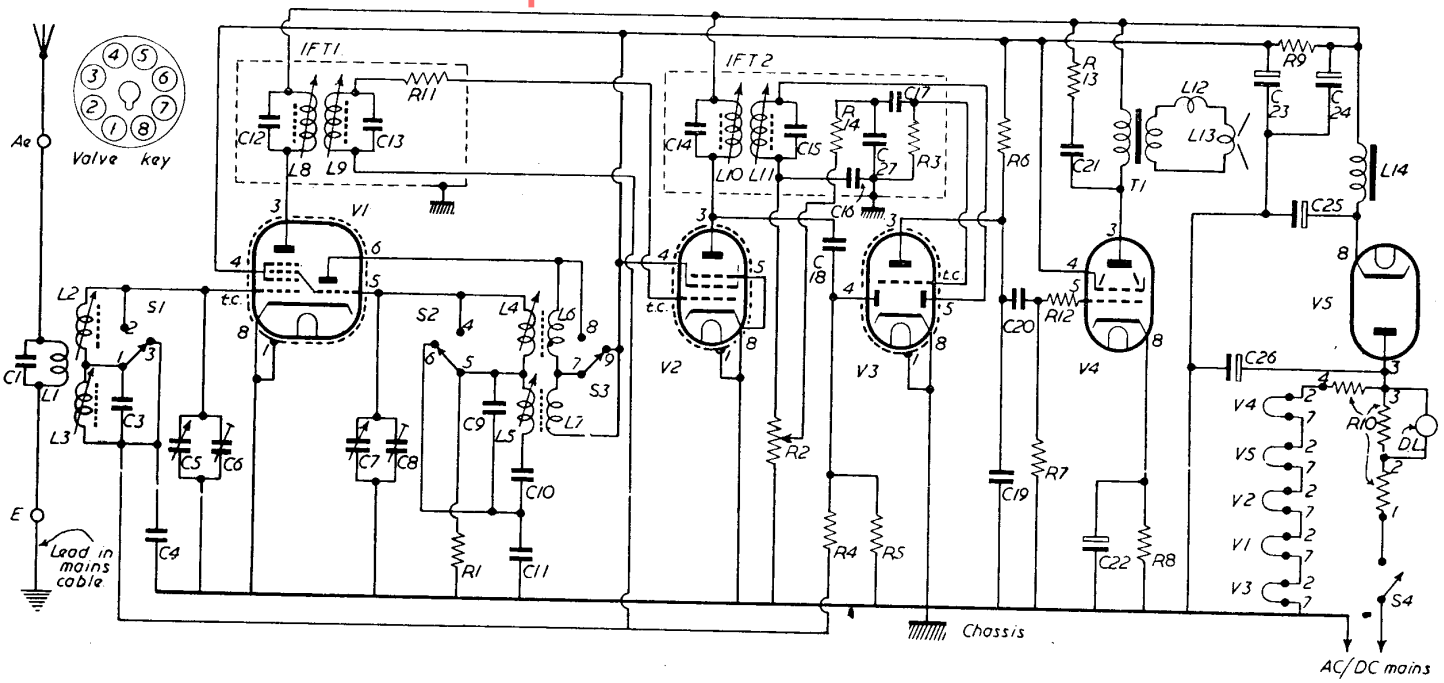
Form the cord into a loop and push it through the lipped hole H so that any slack is taken up. Take the loop over the drive spindle D so that it rests in the groove. Wrap the right-hand side of the loop (as viewed from front of chassis) twice anti-clockwise round the grooved portion of the spindle and then push it on to the drum rim. The left-hand side of the loop should now be pushed on to the drum rim also, but take care that the drive cord, between drum and spindle, does not cross over.



Push the drive drum on to the condenser spindle and adjust the drum on the drive spindle so that the screwheads of its fixing bolts point downwards and the two white lines on the drum are *vertical*, taking note that the condenser vanes are still fully meshed.

Tighten the two drum fixing screws and put some shellac on the knotted ends of the drive cord to prevent slipping or loosening of the knots. The nylon-covered glass fibre cord may be obtained from the Service Dept., Ferranti Ltd.

Circuit of Ferranti 546 Radio Receiver



COMPONENT LIST

Resistors

R1	33kΩ
R2	0.5MΩ
R3	10MΩ
R4	1MΩ
R5	470kΩ
R6	100kΩ
R7	330kΩ
R8	180Ω 10%
R9	2,200Ω ½W
R10	140Ω 10% 0.2A 50Ω 15% 0.2A 625Ω 5% 0.15A
R11	4,700Ω
R12	220kΩ
R13	6,800Ω
R14	100kΩ

Condensers

C1	15pF
C3	35pF
C4	0.05μF
C9	50pF
C10	370pF
C11	450pF
C12	105pF
C13	105pF
C14	90pF
C15	105pF
C16	300pF
C17	4,700pF
C18	50pF
C19	300pF
C20	0.02μF
C21	0.02μF
C22	12.0μF 12v.p.
C23	10+10μF 150v.p.
C24	10+10μF 150v.p.
C25	16μF 250 v.p.
C26	0.05μF, 500 v.w
C27	50pF

Valves

V1	12K8GT
V2	12K7GT
V3	12Q7GT
V4	35L6GT
V5	35Z4GT

N.B.—All resistors 20% tolerance, ¼-watt, unless otherwise stated. R10 has a total resistance of 815 ohms, the three resistors forming one unit.

N.B.—All condensers 350 V.w. unless otherwise stated. C23 and C24 are in one unit.

Dismantling

To remove the chassis and speaker it is necessary first to remove the metal back cover and release the three chassis-holding screws. Two of these will be found at the bottom edge of the chassis, as viewed from the rear, and the third on the front chassis panel between the speaker and volume control. The chassis and speaker assembly may be withdrawn from the cabinet complete with all knobs.

The speaker sub-baffle is held in position by three of the speaker fixing bolts which fit through three corresponding holes in the sub-baffle. It may easily be removed by gently prizing the baffle off these bolts.

Servicing Data

The figures below were obtained from receivers supplied with an a.c. mains input of 230 volts, 50 c/s and tuned to 2,000 metres with no input signal.

H.t. voltage, unsmoothed (V5 cathode)	180–190V
H.t. line volts, smoothed	120–130V
Total h.t. current	62–67mA
Voltage drop across heaters (excl. drop across R10)	105–115V approx.
Valve heater current (heaters are in series)	0.14-0.16 amps, approx.

Oscillator Test

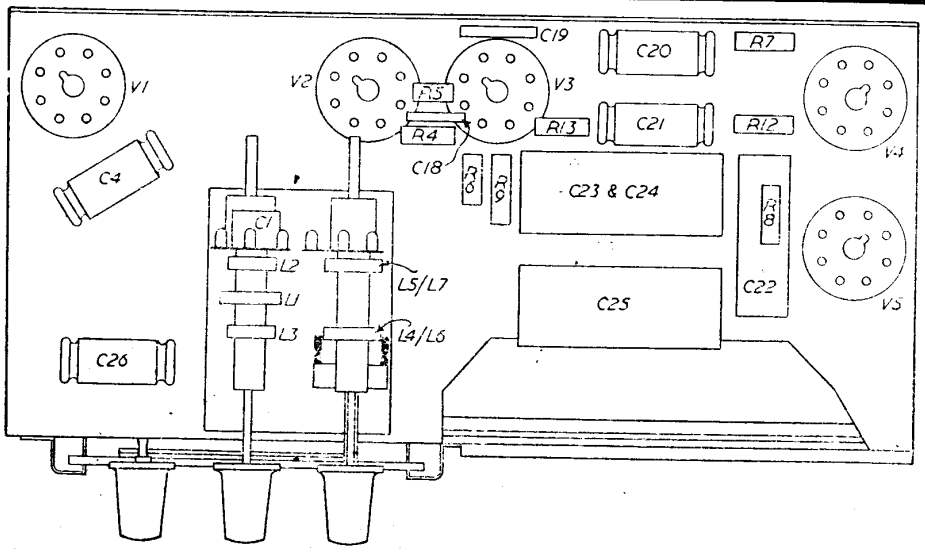
To test if the triode section of the frequency changer V1 is oscillating, insert a milliammeter in the high potential end of the oscillator anode feed and note the reading. Short circuit the oscillator grid (pin 5) to chassis and note the change in current reading. This will increase if the valve is oscillating, but will remain constant at the original value if not.

CONTINUITY

Ref.	Ohms	Ref.	Ohms
L1	25	L9	8
L2	3	L10	8
L3	16.5	L11	8
L4	very low	L12	very low
L5	very low	L13	2.5
L6	2	L14	1,000
L7	6	T1	Primary 330
L8	8		Secondary very low

VALVE DATA

	Va	Vs	Ia	Is
V1	125–135	90–100	2.8–3.3	4.2–5.2
V1 (osc)	90–100		4.5	
V2	125–135	90–100	9.0–12.0	3.0–3.5
V3	35–45		0.35–0.65	
V4	115–120	90–100	36–40	1.9–2.3
V5	230 (RMS)			



Under-chassis layout showing location of major components