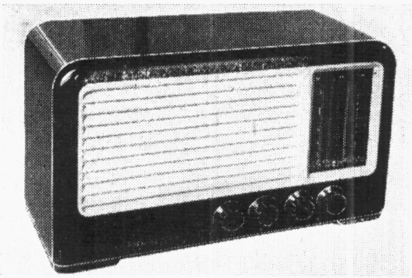
Supplement to Wireless & Electrical Trader, June 6, 1953

"TRADER" SERVICE SHEET 1096

FERRANTI

Models 615 & 648



A BATTERY-OPERATED receiver using 2 V valves and an accumulator, the Ferranti 615 is a 4-valve 3-band table superhet employing a Q.P.P. output stage. A strong metal bracket is fixed to the chassis deck to support the H.T. battery, and it provides a useful support on which to invert the chassis for service work.

The differences in an early receiver of the same type, model 648, are fully described, but this *Service Sheet* was prepared from a model 615.

Release dates and original prices: 615, February 1951, £13 18s; 648, February 1948, £13 11s 10d. Batteries and purchase tax extra.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L2** (S.W.), **L3** (M.W.) or **L4** (L.W.) to single tuned circuits **L5**, **C28** (S.W.), **L6**, **C28** (M.W.) and **L7**, **C28** (L.W.) which precede triode pentode valve **(V1, Mazda TP25)** operating as frequency changer with internal coupling. I.F. rejection by **L1**, **C1**.

Oscillator grid coils **L8** (S.W.), **L9** (M.W.) and **L10** (L.W.) are tuned by **C29**. Parallel trimming by **C30** (S.W.), **C31** (M.W.) and **C9**, **C32** (L.W.); series tracking by **C10** (S.W.), **C11** (M.W.) and **C12** (L.W.). Reaction coupling from anode circuit by **L11** (S.W.), **L12** (M.W.) and **L13** (L.W.).

Second valve **(V2, Mazda VP23)** is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned transformer couplings **C3, L14, L15, C4** and **C15, L16, L17, C16**.

Intermediate frequency 470 kc/s.

Diode signal detector is part of double diode triode valve **(V3, Mazda HL23DD)**. Audio frequency component in rectified output is developed across diode load **R10**, and is passed via **C20** and volume control **R11** to grid of triode section which operates as A.F. amplifier. I.F. filtering by **C18**, **R9**, **C19** and **C21**.

Second diode of **V3** is fed from **V2** anode via **C17** and the resulting D.C. potential developed across **R13** is fed back as bias to **V1** and **V2** giving automatic gain control. On S.W., **V1** control grid circuit is not biased by the A.G.C. voltage, but by the voltage developed across **R3**, which together with **R2** forms the oscillator grid leak.

Series-fed transformer coupling by **T1** between **V3** triode and quiescent push-pull output valve **(V4, Mazda QP25)**. Tone control by **R18**, **C23** and **R17**. G.B. for **V4** is developed across **R14**, **R15** in the H.T. negative lead to chassis. A proportion of this voltage, that across **R14**, is used as bias for **V3** triode section, as delay bias for the A.G.C. diode and as standing bias for **V1** and **V2**.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those derived from the manufacturers' information and were measured with the receiver operating from a new 120 V H.T. battery and a fully charged 2 V L.T. accumulator. The receiver was switched to M.W., with the gang at maximum capacitance, but there was no signal input.

Voltages were measured with a Model 7 Avometer, chassis being the negative connection in each case.

Valve	Anode V	Anode mA	Screen V	Screen mA
V1 TP25	111 / Oscillator 93	0·4 / *	48	0·92
V2 VP23	111	1·4	48	0·92
V3 HL23DD	110	1·45	—	—
V4 QP25	110	4·5†	111	1·0

* No reading quoted. † Total current measured at T2 primary centre tap.

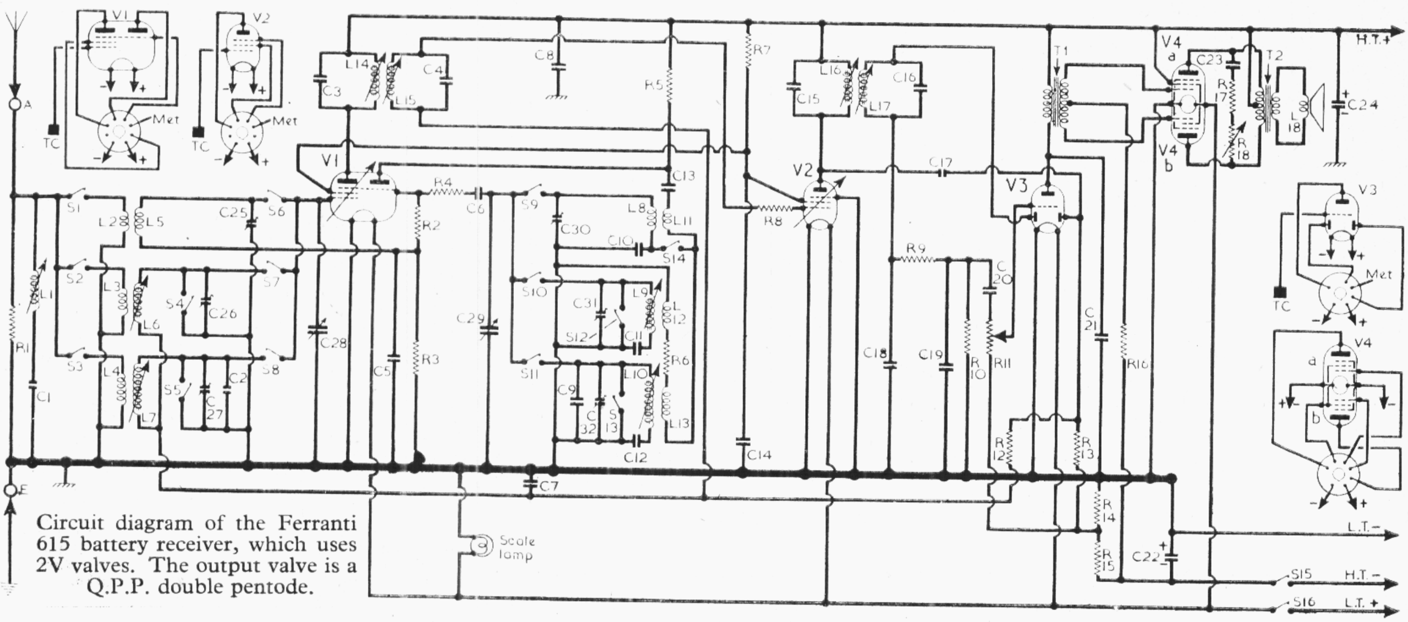
COMPONENTS AND VALUES

	RESISTORS	Values	Locations
R1	Aerial shunt ...	33kΩ	F4
R2	V1 osc. grid leak ...	33kΩ	F3
R3	V1 osc. grid leak ...	15kΩ	F3
R4	Osc. stabilizer ...	47Ω	F3
R5	Osc. anode load ...	4·7kΩ	F4
R6	Osc. stabilizer ...	470Ω	G3
R7	S.G. H.T. feed ...	47kΩ	F4
R8	V2 C.G. stopper ...	2.2kΩ	A2
R9	I.F stopper ...	47kΩ	F4
R10	Signal diode load ...	470kΩ	E4
R11	Volume control ...	1MΩ	E3
R12	A.G.C. decoupling	2·2MΩ	E4
R13	A.G.C. diode load	2·2MΩ	D4
R14	V3, V4, G.B. ...	100Ω	D3
R15	V3, V4, G.B. ...	*650Ω	D3
R16	V4, C.G. ...	47kΩ	D4
R17	Part tone control ...	15kΩ	D3
R18	Tone control ...	500kΩ	D3

* Two resistors, 680Ω and 15kΩ, in parallel.

	CAPACITORS	Values	Locations
C1	Part I.F. rejector ...	30pF	F4
C2	L.W. aerial trim. ...	80pF	G4
C3	1st I.F. trans. tuning ...	105pF	A2
C4	1st I.F. trans. tuning ...	105pF	A2
C5	S.W. G.B. decoup.	0·1μF	E3
C6	V1 osc. C.G. ...	100pF	F3
C7	A.G.C. decoupling	0·1μF	E3
C8	H.T. by-pass ...	0·1μF	F4
C9	L.W. osc. trim. ...	100pF	G3
C10	S.W. osc. tracker ...	0·004μF	F3
C11	M.W. osc. tracker	470pF	G3
C12	L.W. osc. tracker	130pF	G3
C13	Osc. anode coup ...	0·001μF	F3
C14	S.G. decoupling ...	0·1μF	E3
C15	2nd I.F. trans. tuning ...	105pF	B2
C16	2nd I.F. trans. tuning ...	180pF	B2
C17	A.G.C. coupling ...	50pF	E4
C18	I.F. by-passes ...	130pF	E4
C19	I.F. by-passes ...	130pF	E4
C20	A.F. coupling ...	0·02μF	E3
C21	I.F. by-pass ...	400pF	D4
C22*	G.B. by-pass ...	25μF	D4
C23	Part tone control ...	0·02μF	D4
C24*	H.T. reservoir ...	8μF	E3
C25‡	S.W. aerial trim. ...	50pF	A2
C26‡	M.W. aerial trim.	50pF	A2
C27‡	L.W. aerial trim. ...	50pF	A2
C28†	Aerial tuning ...	—	B1
C29†	Oscillator tuning ...	—	B1
C30‡	S.W. osc. trim. ...	50pF	A1
C31‡	M.W. osc trim ...	50pF	A1
C32‡	L.W. osc. trim. ...	50pF	A1

* Electrolytic † Variable. ‡ Pre-set.



Circuit diagram of the Ferranti 615 battery receiver, which uses 2V valves. The output valve is a Q.P.P. double pentode.

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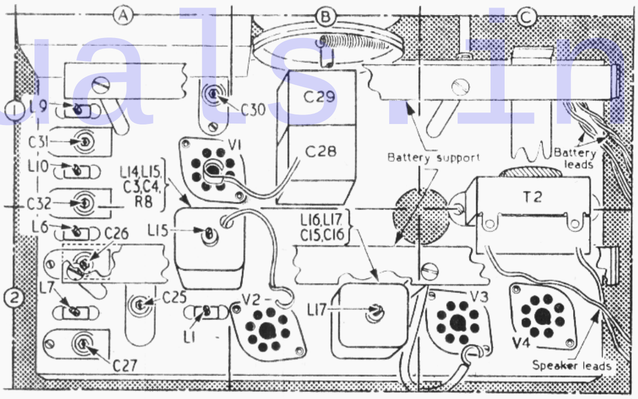
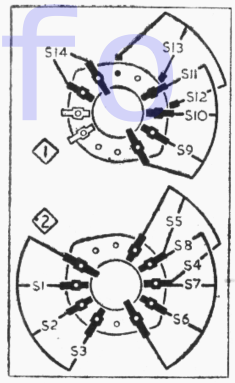
	OTHER COMPONENTS	Approx. Values (Ohms)	Locations
L1	I.F. rejector ...	18·0	F4
L2	Aerial coupling coils	—	G4
L3		29·0	G4
L4		45·0	G4
L5	Aerial tuning coils	—	G4
L6		3·5	G4
L7		17·0	G4
L8	Oscillator tuning coils	—	F3
L9		3·5	G3
L10		12·0	G3
L11	Oscillator reaction coils	—	F3
L12		1·0	G3
L13		3·0	G3
L14	1st I.F. trans. Pri.	7·0	A2
L15	Sec.	7·0	A2
L16	2nd I.F. Trans. Pri.	7·0	B2
L17	Sec.	7·0	B2
L18	Speech coil ...	2·5	—
T1	Intervalve trans. Pri. ...	900·0	D4
	Sec., total	10,000.0	
T2	O.P. trans. Pri., total	420·0	C2
	Sec. ...	—	
S1-S14	Waveband switches	—	G3
S15, S16	Batt. sw., g'd R18	—	D3



Plan view of the chassis. **V1, V2, V3** have top cap connectors.



Waveband switch units, with table (below).

Switches	S.W.	M.W.	L.W.
S1	C	—	—
S2	—	C	—
S3	—	—	C
S4	C	—	—
S5	C	C	—
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—
S10	—	C	—
S11	—	—	C
S12	C	—	—
S13	C	C	—
S14	C	—	—

GENERAL NOTES

Switches.—**S1-S14** are the waveband switches, ganged in two rotary units beneath the chassis. These are indicated in our underside view of the chassis, and shown in detail in the diagrams inset beside our plan view illustration, where they are drawn as seen from the rear of an inverted chassis. The table below them gives the switch positions for the three control settings, starting from the fully anti-clockwise position of the control knob. A dash indicates open, and **C**, closed.

S15, S16 are the Q.M.B. battery switches, ganged with the tone control **R18.**

Scale Lamp.—Any low-consumption 2.5 V lamp with an M.E.S. base can be used. The original lamp was rated at 2.5 V, 0.15 A.

External Speaker.—No provision is made for this, but if one is used its impedance should be about 3-4 Ω. The makers say in their instruction book that an external speaker should not be used.

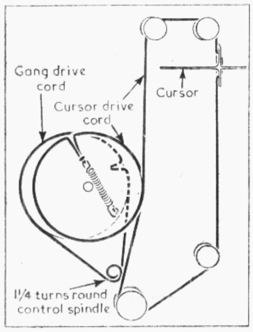
Batteries.—A 2 V accumulator is required for L.T., and a capacity of 40 AH or more is recommended. Space is available for it in the cabinet. A substantial steel shelf support is mounted on the chassis deck to hold the H.T. battery, which should be of the "super-power" type rated at 120 V. Sizes up to 12in × 6in × 3¼in can be accommodated on the shelf.

Model 648.—This was the predecessor of the model 615, and basically both designs were alike. Detailed differences in the 648 as compared with our information here, which was all based on our sample 615, are as follows:—

L1 is fixed, and **C1** is 70 pF pre-set. An image rejector of similar design to this is shunted across **L4.** It should be adjusted by feeding in a strong 247 m (1,214 kc/s) signal, tuning in the image at about 1,056 m, and adjusting the trimmer for minimum output. (It was originally intended for 261 m, with the image at 1,370 m.)

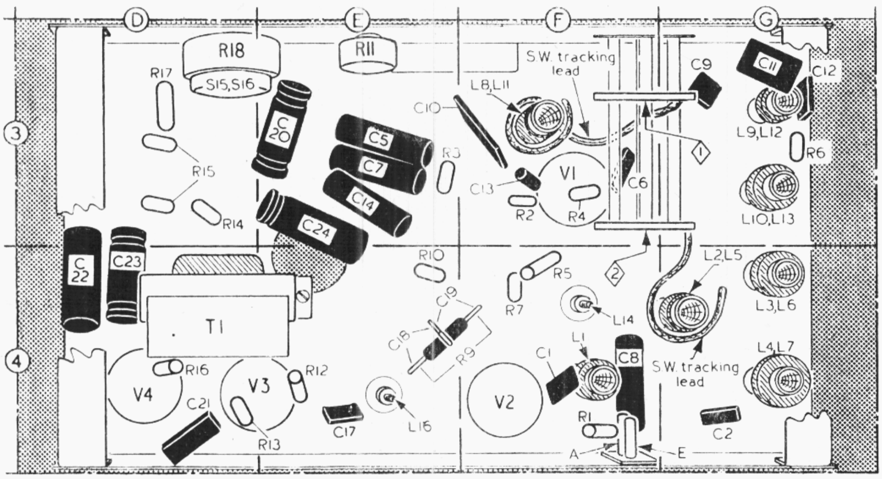
L6 core is not adjustable, and **L7, L9, L10** are air-cored. Pre-set trackers of 200 pF (plus 400 pF fixed) and 70 pF (plus 150 pF fixed) replace **C11** and **C12. R6** is omitted, and the three reaction coils are switched independently like the tuning coils. **L11** and **L12** return to chassis via the trackers.

Three scale lamps are provided, one for each waveband, and only the appropriate lamp lights. **R9, C18, C19** are housed in the I.F. can, and their values are 100 kΩ and 150 pF. **C2** is 50 pF; **C15** is 90 pF; **C16** is 105 pF; **C22** is 50 μF; **R8** is 2.7 kΩ; and the intermediate frequency is 465 kc/s. Coil resistances are generally lower.



Sketch of the tuning drive system, seen from the front. The gang and cursor have separate drive drums.

Drive Cord Replacement.—The gang drive and cursor drive are separate cords with separate drums on the gang spindle. The gang cord requires about 15in of nylon braided glass yarn, and the cursor drive 36in. They should be run as shown in the sketch above.



Underside view of the chassis. Tracking lead adjustments are provided for the S.W. band.

CIRCUIT ALIGNMENT

I.F. Stages.—Switch receiver to L.W. and turn gang to maximum capacitance. Connect signal generator output, via an 0.1 μF capacitor in the "live" lead, to control grid (top cap) of **V1** and chassis. Feed in a 470 kc/s (638.3 m) signal and adjust the cores of **L17** (location reference B2) **L16** (E4), **L15** (A2) and **L14** (F4) for maximum output. Repeat these adjustments until no further improvement results.

R.F. and Oscillator Stages.—Transfer signal generator leads, via a standard dummy aerial, to **A** and **E** sockets. Check that with the gang at maximum capacitance, the cursor coincides with the marks at the high wavelength ends of the tuning scales.

M.W.—Switch receiver to M.W., tune to 200 m, feed in a 200 m (1,500 kc/s) signal and adjust **C31** (A1) for maximum output. Feed in a 228 m (1,316 kc/s) signal and tune receiver to it. Adjust **C26** (A2) for maximum output. Tune receiver to 500 m, feed in a 500 m (600 kc/s) signal, and adjust the cores of **L9** (A1) and **L6** (A2) for maximum output, rocking the gang while adjusting **L9** for optimum results. Repeat these adjustments until no further improvement results.

I.F. Rejector.—With the receiver switched to M.W., turn gang to maximum capacitance. Feed in a 470 kc/s (638.3 m) signal and adjust the core of **L1** (A2) for minimum output.

L.W.—Switch receiver to L.W., tune to 1,128 m, feed in an 1,128 m (266 kc/s) signal and adjust **C32** (A2) and **C27** (A2) for maximum output. Tune receiver to 1,800 m, feed in an 1,800 m (167 kc/s) signal and adjust the cores of **L10** (A1) and **L7** (A2) for maximum output, rocking the gang while adjusting **L10** for optimum results. Repeat these adjustments until no further improvement results.

S.W.—Switch receiver to S.W., tune to 16.7 m, feed in a 16.67 m (18 Mc/s) signal and adjust **C30** (A1) for maximum output. Two peaks will be found when making this adjustment, the correct one being that which involves the lesser capacitance. Tune receiver to 20 m, feed in a 20 m (15 Mc/s) signal, and adjust **C25** (A2) for maximum output, rocking the gang for optimum results. Tune receiver to 45 m, feed in a 45 m (6.67 Mc/s) signal and adjust the position of the thick yellow tracking lead, which is looped round **L5** (G4) from the waveband switch, for maximum output, while rocking the gang for optimum results. Repeat these adjustments until no further improvement results. **Another tracking lead, round L8, is set at the works.**

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