Supplement to The Wireless & Electrical Trader, Oct. 14, 1939

"TRADER" SERVICE SHEET

431

FERRANTI 139 (AND 239) AC SUPERHETS

The Ferranti 139 table receiver. The 239 is similar, but has a wooden cabinet.

A SHORT-WAVE range of 16·7—52m is provided in the Ferranti model 139 AC 3-band 4-valve (plus rectifier) superhet, which is suitable for mains of 200-270V, 40-100 C/S.

A nearly identical chassis is fitted in the model 239, but is housed in a walnut, instead of a bakelite, cabinet. This *Service Sheet*, however, was prepared on a model 139.

Release dates: 139, July, 1939; 239, August, 1939.

CIRCUIT DESCRIPTION

Aerial input is via coupling coils **L3** (SW), **L4** (MW) and **L5** (LW) to single-tuned circuits **L6, C31** (SW), **L7, C31** (MW) and **L8, C31** (LW). IF filtering is effected by **L1, C26** across aerial circuit, while a 261 m filter **L2, C33** across LW aerial circuit prevents break-through on that band.

First valve (**V1. Ferranti 6A8G** or **Osram X63**) is a heptode operating as frequency changer with electron coupling. Oscillator grid coils **L9** (SW), **L10** (MW) and **L11** (LW) are tuned by **C32**; parallel trimming by **C35** (SW), **C33** (MW) and **C7, C34** (LW); series tracking by **C6** (SW), **C8, C36** (MW) and **C9, C37** (LW). Reaction by coils **L12** (SW), **L13** (MW) and **L14** (LW).

Second valve (**V2, Ferranti 6K7G** or **Osram KTW63**) is a variable-mu RF pentode or tetrode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C38, L15, L16, C39** and **C40, L17, L18, C41.**

Intermediate frequency 450KC/S.

Diode second detector is part of double-diode triode valve (**V3, Ferranti 6Q7G** or **Osram DH63**). Audio frequency component in rectified output is developed across load resistance **R5** and passed via the AF coupling condenser **C16** and manual volume control **R6** to CG of triode section, which operates as AF amplifier. IF filtering by **C12, R4** and **C13** in diode circuit. Provision for connection of gramophone pick-up between signal diode and chassis, so that the gramophone input is fed via **L18, R4, C16** and **R6**, and the diode is biased by the AVC delay potential to mute radio.

Second diode of **V3**, fed from **V2** anode via **C15**, provides DC potential which is developed across load resistance **R12**, and fed back through decoupling circuit as GB to FC and IF valves, giving automatic volume control. Delay voltage is obtained from drop along **R9** in cathode lead to chassis.

Resistance-capacity coupling by **R10, C17** and **R13** between **V3** triode and pentode or tetrode output valve (**V4. Ferranti 6F6G** or **Osram KT63**). Variable tone control by **R13, C19** in grid circuit. Further IF filtering by **C18** in grid circuit. Fixed tone correction by **R14, C20** in anode circuit. Provision for connection of low impedance external speaker across secondary of internal speaker input transformer **T1.**

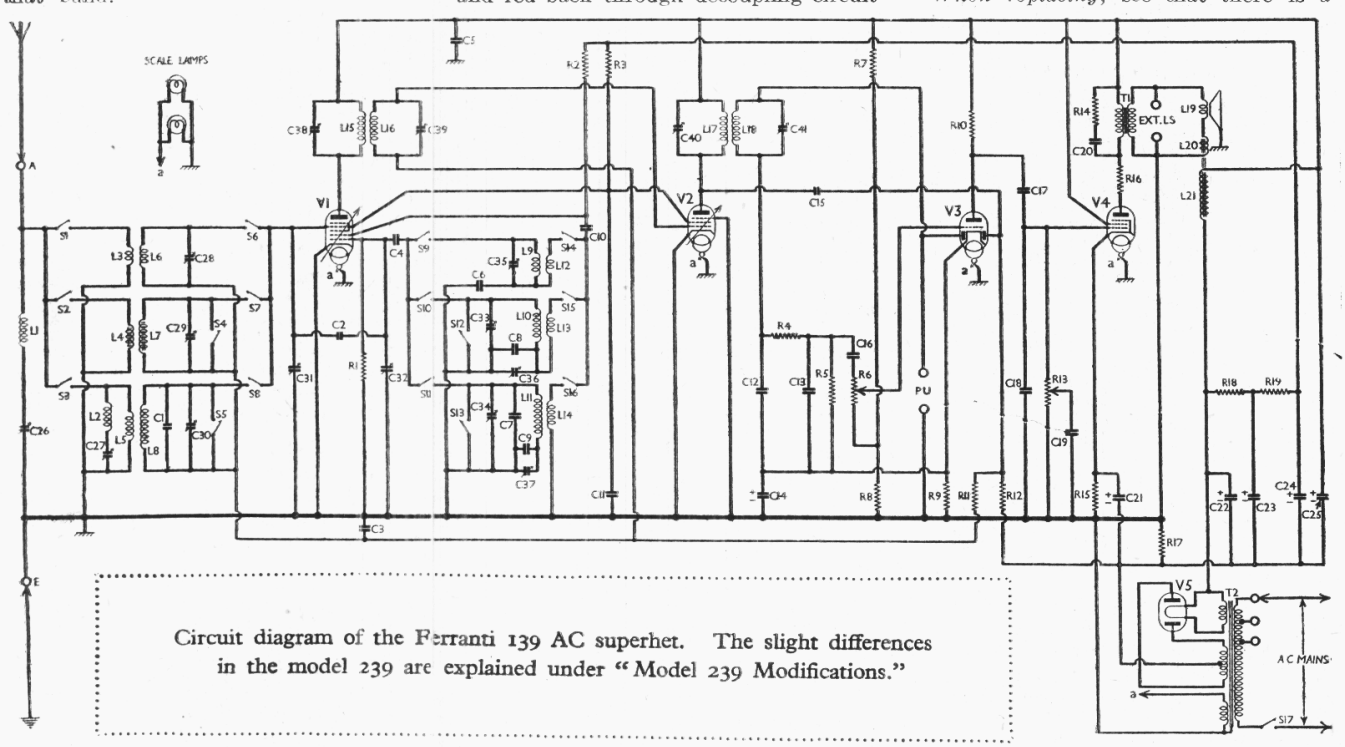
HT current is supplied by full-wave rectifying valve (**V5 Brimar R4**). Smoothing by speaker field **L21** and dry electrolytic condensers **C22, C23, C24** and **C25.**

Fixed GB potential for **V1** and **V2** is obtained from drop along **R17** in negative HT lead to chassis, and is fed via **R12** and **R11.** This potential also provides further AVC delay in addition to that derived from the drop across **R9.**

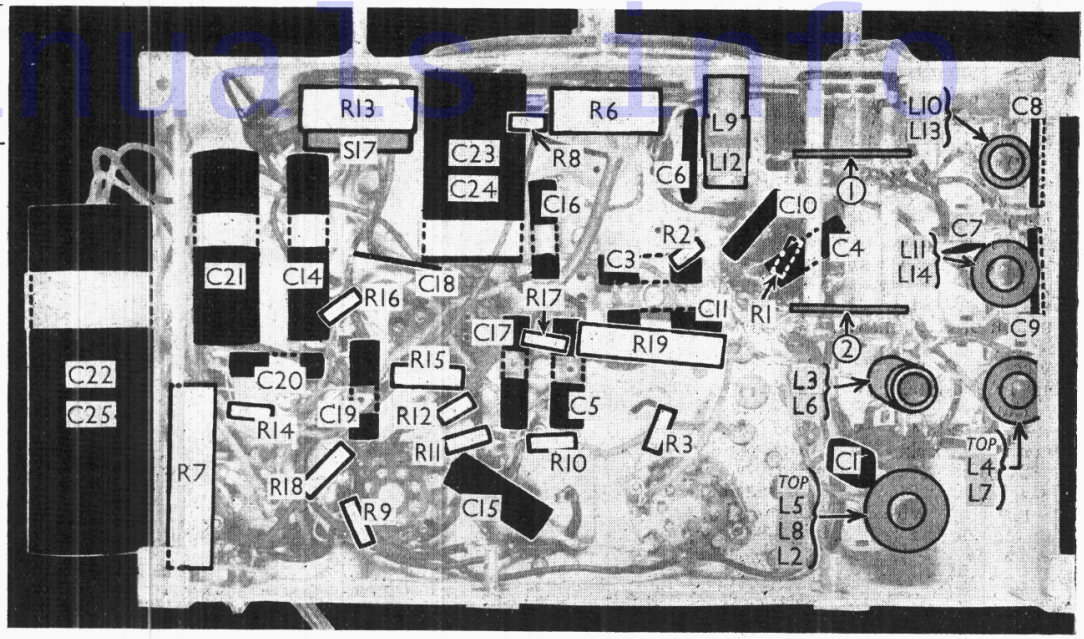
DISMANTLING THE SET

Removing Chassis.—Remove the four control knobs (pull off) and the four bolts holding the chassis to the bottom of the cabinet. The chassis may now be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

When replacing, see that there is a



Circuit diagram of the Ferranti 139 AC superhet. The slight differences in the model 239 are explained under "Model 239 Modifications."



Under-chassis view. Diagrams of the switch units are shown overleaf.

distance piece and rubber washer on each of the lower three control spindles, noting that the shortest distance piece goes on the tone control, and make sure that there is a rubber washer on each of the fixing bolts, between the chassis and the bottom of the cabinet. Do not forget to replace the felt washer on the spindle of the tuning control.

To free the chassis entirely, unsolder the speaker leads, and *when replacing*, connect them as follows, numbering the tags from left to right: 1, blue; 2, green; 3, black; 4, red.

Removing Speaker.—The speaker can be removed from the cabinet by unsoldering the leads and removing the nuts and spring washers from the four screws holding it to the sub-baffle.

When replacing, see that the transformer is at the bottom and connect the leads as previously indicated.

COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial LW fixed trimmer ...	0·00005
C2	Small coupling	Very low
C3	AVC line decoupling	0·05
C4	V1 osc. CG condenser ...	0·0001
C5	HT circuit RF by-pass ...	0·1
C6	Osc. circuit SW tracker ...	0·004
C7	Osc. circuit LW fixed trimmer	0·0001
C8	Osc. circuit MW fixed tracker	0·0004
C9	Osc. circuit LW fixed tracker	0·00015
C10	V1 osc. anode coupling ...	0·001
C11	V1, V2 SG's decoupling ...	0·1
C12	IF by-pass condensers ...	0·00015
C13		0·00015
C14*	V3 cathode by-pass	6·0
C15	Coupling to V3 AVC diode ...	0·00005
C16	AF coupling to V3 triode ...	0·02
C17	V3 triode to V4 AF coupling	0·05
C18	V4 CG IF by-pass	0·0004
C19	Part of variable tone control	0·005
C20	Part of fixed tone corrector...	0·01
C21*	V4 cathode by-pass	50·0
C22*	HT smoothing condensers ...	12·0
C23*		4·0
C24*		4·0
C25*		12·0
C26‡	Aerial IF filter tuning ...	—
C27‡	Aerial 261 m filter tuning ...	—
C28‡	Aerial circuit SW trimmer ...	—
C29‡	Aerial circuit MW trimmer ...	—
C30‡	Aerial circuit LW trimmer ...	—
C31†	Aerial circuit tuning	—
C32†	Oscillator circuit tuning ...	—
C33‡	Osc. circuit MW trimmer ...	—
C34‡	Osc. circuit LW trimmer ...	—
C35‡	Osc. circuit SW trimmer ...	—
C36‡	Osc. circuit MW tracker ...	0·0002
C37‡	Osc. circuit LW tracker ...	0·00007
C38‡	1st IF trans. pri. tuning ...	0·0002
C39‡	1st IF trans. sec. tuning ...	0·0002
C40‡	2nd IF trans. pri. tuning ...	0·0002
C41‡	2nd IF trans. sec. tuning ...	0·0002

* Electrolytic. † Variable. ‡ Pre-set.

	RESISTANCES	Values (ohms)
R1	V1 osc. CG resistance ...	50,000
R2	V1 osc. anode HT feed ...	10,000
R3	V1, V2 SG's HT feed ...	40,000
R4	IF stopper	100,000
R5	V3 signal diode load ...	500,000
R6	Manual volume control ...	1,000,000
R7	V3 triode GB potential divider resistances ...	20,000
R8		250
R9	AVC delay resistance ...	10,000
R10	V3 triode anode load ...	250,000
R11	AVC line decoupling ...	2,000,000
R12	V3 AVC diode load	2,000,000
R13	Variable tone control ...	500,000
R14	Part of fixed tone corrector	20,000
R15	V4 GB resistance	450
R16	V4 anode stabiliser	100
R17	V1, V2 fixed GB	50
R18	V1 osc. anode and V1, V2 SG HT feed resistances ...	10,000
R19		10,000

	OTHER COMPONENTS	Approx. Values (ohms)
L1	MW aerial IF filter coil ...	35·0
L2	LW aerial 261 m filter coil ...	5·0
L3	Aerial SW coupling coil ...	0·25
L4	Aerial MW coupling coil ...	35·0
L5	Aerial LW coupling coil ...	65·0
L6	Aerial SW tuning coil ...	Very low
L7	Aerial MW tuning coil ...	2·5
L8	Aerial LW tuning coil ...	25·0
L9	Osc. circuit SW tuning coil ...	0·05
L10	Osc. circuit MW tuning coil...	5·0
L11	Osc. circuit LW tuning coil...	12·0
L12	Oscillator SW reaction ...	Very low
L13	Oscillator MW reaction ...	1·5
L14	Oscillator LW reaction ...	3·0
L15	1st IF trans. Pri.	9·5
L16	1st IF trans. Sec.	9·5
L17	2nd IF trans. Pri.	9·5
L18	2nd IF trans. Sec.	9·5
L19	Speaker speech coil	2·0
L20	Hum neutralising coil ...	0·25
L21	Speaker field coil	1,000·0
T1	Speaker input. trans. Pri. ...	220·0
	Sec. ...	0·4
T2	Mains trans. Pri., total	45·0
	Heater sec....	0·2
	Rect. heater sec. ...	0·2
	HT sec., total ...	450·0
S1-S16	Waveband switches	—
S17	Mains switch, ganged R13 ...	—

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230V, using the 230V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the MW 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 6A8G	295	1·2	67	2·4
	Oscillator			
	138	5·1		
V2 6K7G	295	2·7	67	3·1
V3 6Q7G	86	0·6	—	—
V4 6F6G	280	38	295	7·4
V5 R4	357†	—	—	—

† Each anode, AC.

GENERAL NOTES

Switches.—**S1-S16** are the waveband switches, ganged in two rotary units beneath the chassis. These are indicated in our underchassis view, and shown in detail in the diagrams overleaf. The table overleaf gives the switch positions for the four control settings, starting from fully anti-clockwise. A dash indicates open, and **C** closed.

S17 is the QMB mains switch, ganged with the tone control **R13.**

Coils.—**L1** is on the chassis deck, and the remainder of the RF and oscillator coils are beneath the chassis. The IF transformers **L15, L16** and **L17, L18** are in two screened units on the chassis deck. Each contains a number of additional components.

Scale Lamps.—These are two Osram MES type bulbs, rated at 6·5V, 0·3A. They have small bulbs (type S).

External Speaker.—Two sockets are provided on the internal speaker con-

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nection panel for a low impedance (2 to 3 Ω) external speaker.

Condensers C22, C25.—These are two 12 μF dry electrolytic types, in a large tubular unit fitted to one side of the chassis. The black lead is the common negative, the red lead to **V5** holder is the positive of **C22**, and the other red lead the positive of **C25**.

Condensers C23, C24.—These are two 4 μF dry electrolytic types, in a carton beneath the chassis having a common negative (black) lead. The red lead to the junction of **R18** and **R19** is the positive of **C23**, and the red lead to the junction of **R19** and **R2, R3** is the positive of **C24**.

Pre-Set Condensers.—Apart from the four IF trimmers, reached through holes in the IF cans, there are ten other trimmers, all reached through holes in the chassis deck. Note that one of these **(C35)** is close to the gang condenser.

Condenser C2.—This is formed by an insulated wire twisted round one of the tags of the rear section of the gang condenser **(C31)**.

MODEL 239 MODIFICATIONS

An almost identical chassis is employed in the model 239 receiver, in which the differences are as follows: a single-speed drive is used, instead of a two-ratio drive; a plug and socket device permits the internal speaker to be muted; the tuning scale pointer has a rotary travel instead of a horizontal one; the cabinet is made of wood, and is of vertical design, instead of bakelite and horizontal respectively; and the four controls are arranged in a single horizontal line, in the following order, numbering from left to right, and looking at the front of the cabinet: 1, mains switch and tone; 2, volume; 3, tuning; 4, wavechange.

CIRCUIT ALIGNMENT

IF Stages.—Turn volume control to maximum, gang condenser to maximum, and switch set to LW. Connect signal generator to control grid (top cap) of **V1** (via a 0.05 μF fixed condenser) and chassis and screw **C39** down tightly. Feed in a 450 KC/S signal, and adjust **C38, C40** and **C41** for maximum output. Then adjust **C39** for maximum output.

RF and Oscillator Stages.—Connect signal generator via a suitable dummy aerial to **A** and **E** sockets.

SW.—Switch set to SW, and use a SW dummy aerial. Turn gang to minimum, feed in a 16.67 m (18 MC/S) signal, and adjust **C35** for maximum output. The peak requiring the lesser trimmer capacity is the correct one. Now tune to 20 m on the scale, feed in a 20 m (15 MC/S) signal, and adjust **C28** for maximum output.

MW.—Switch set to MW and, with gang still at a minimum, feed in a 200 m (1,500 KC/S) signal, and adjust **C33** for maximum output. Feed in a 228 m (1,316 KC/S) signal, tune it in, and adjust **C29** for maximum output.

Feed in a 500 m (600 KC/S) signal, tune it in, and adjust **C36** for maximum output, rocking the gang for optimum results.

Turn gang to maximum, feed in a 450 KC/S signal, and adjust **C26** for *minimum* output.

Repeat the 200, 228 and 500 m adjustments.

LW.—Switch set to LW, tune to 1,128 m on scale, feed in a 1,128 m (266 KC/S) signal, and adjust **C34**, then **C30**, for maximum output.

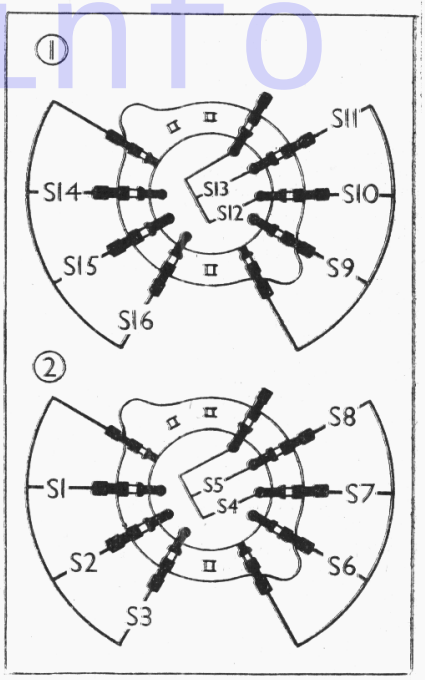
Feed in a 1,800 m (166.5 KC/S) signal, tune it in, and adjust **C37** for maximum output, while rocking the gang for optimum results.

Tune to 1,200 m on scale, feed in a *strong* 261 m (1,149 KC/S) signal, and adjust **C27** for *minimum* output.

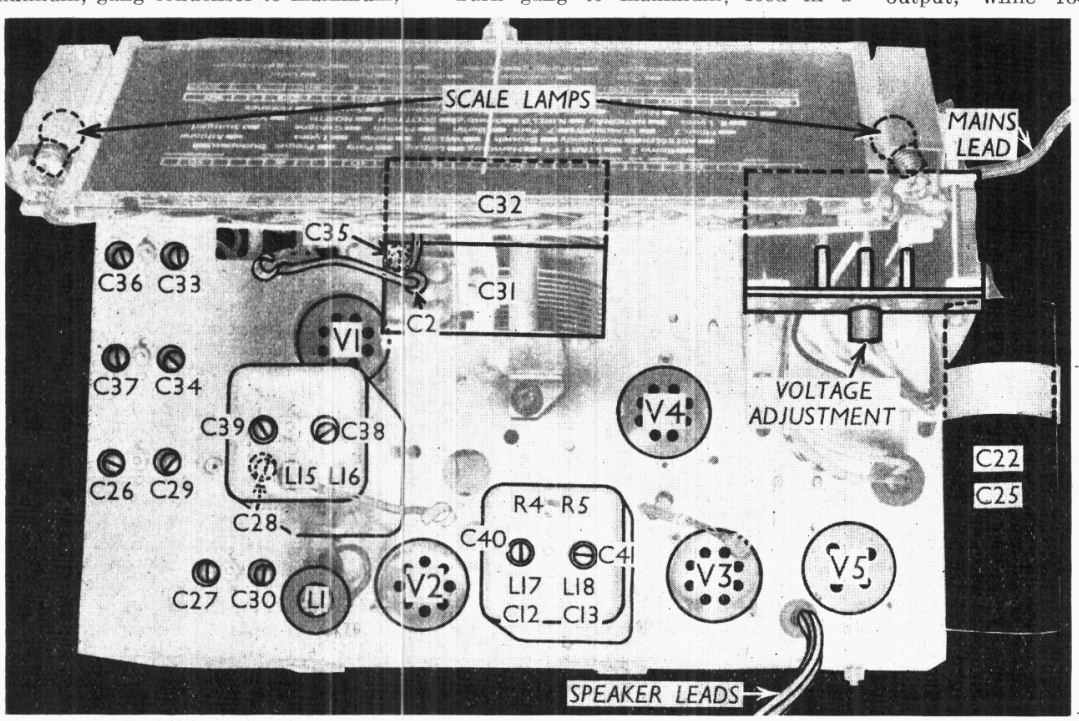
Return to 1,128 m and readjust **C34** and **C30**, then re-adjust **C37** at 1,800 m. Repeat until no further improvement results.

TABLE AND DIAGRAMS OF SWITCH UNITS

Switch	SW	MW	LW
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	—	—
S15	—	C	—
S16	—	—	C



Diagrams of the switch units, as seen from the rear of the underside of the chassis.



Plan view of the chassis. Note the positions of the various trimmers, ten of which are reached through holes in the chassis deck.

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