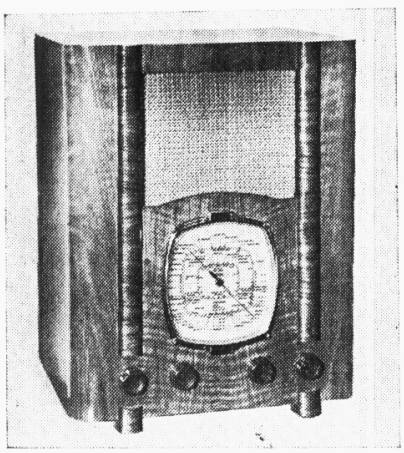
Supplement to The Wireless & Electrical Trader, July 15, 1939

"TRADER" SERVICE SHEET

415

LISSEN 8521

AC/DC SUPERHET



THE Lissen 8521 is a 4-valve (plus rectifier) AC/DC 3-band superhet, with a short-wave range of 19-50 m. It is suitable for use on mains of 200-250 V DC or AC (40-100 C/S).

There are two alternative aerial sockets, but no provision is made for a pick-up or external speaker. A variable tone control is provided.

Release date : September, 1938.

CIRCUIT DESCRIPTION

Two alternative aerial input sockets **A1, A2.** Input from **A1** on MW and LW is via aerial isolating condenser **C1** and coupling coil **L1** to inductively coupled band-pass filter. Primary coils **L2, L3** are tuned by **C25 ;** secondaries **L5, L6** by **C29.** On SW, input from **A1** is via **C1** and coupling condenser **C3** to single-tuned circuit **L4, C29.** From **A2** socket, input is fed into same circuits via potential divider **R1, R2** for the reception of local transmissions. **R1** also forms a DC path between **A1** and **E** sockets to prevent **C1** from developing a charge.

First valve (**V1, Ever Ready metallised C36C**) is a triode pentode operating as frequency changer with internal coupling. Triode oscillator grid coils **L7** (SW), **L8** (MW) and **L9** (LW) are tuned by **C30 ;** parallel trimming by **C31** (SW), **C32** (MW) and **C33** (LW) ; series tracking by **C34** (MW) and **C35** (LW). Reaction by coils **L10** (SW), **L11** (MW) and **L12** (LW).

Second valve (**V2, Ever Ready metallised C50N** or **Mullard VP13C**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C36, L13, L14, C37,** and **C38, L15, L16, C39.**

Intermediate frequency 455 KC/S.

Diode second detector is part of separate double diode valve (**V3, Ever Ready metallised C20C**). Audio frequency component in rectified output is developed across load resistance **R16** and passed via IF stopper **R15,** AF coupling condenser **C13,** manual volume control **R20** to CG of pentode output valve (**V4, Mazda Pen3520**). Fixed tone correction is obtained by condenser **C18** in anode circuit, and variable tone control by **C19** and **R22,** also in anode circuit.

Second diode of **V3,** fed from **L16** via **C16,** provides DC potential which is developed across load resistances **R18** and **R19,** that across **R19** being fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control. Delay voltage is obtained from drop along resistance **R21** in **V4** cathode circuit.

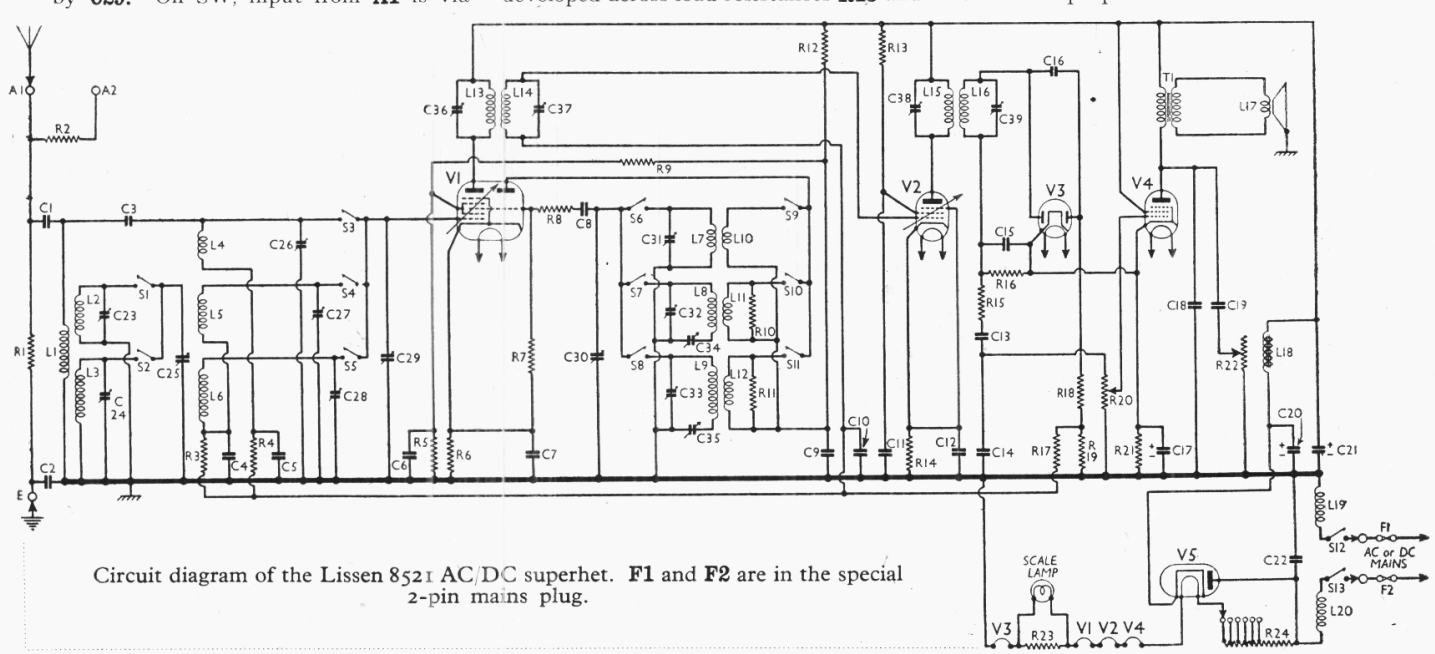
When the receiver is used with AC mains, HT current is supplied by IHC half-wave rectifying valve (**V5, Mazda U4020**) which, with DC supplies, behaves as a low resistance. Smoothing is effected by iron-cored choke **L18** and dry electrolytic condensers **C20** and **C21.**

Alternative valves for **V4** and **V5** are **V4, Ever Ready C70D** and **V5, Ever Ready C10B.** These alternative pairs are, however, not directly interchangeable with each other, the value of **R24** being governed by the pair in use.

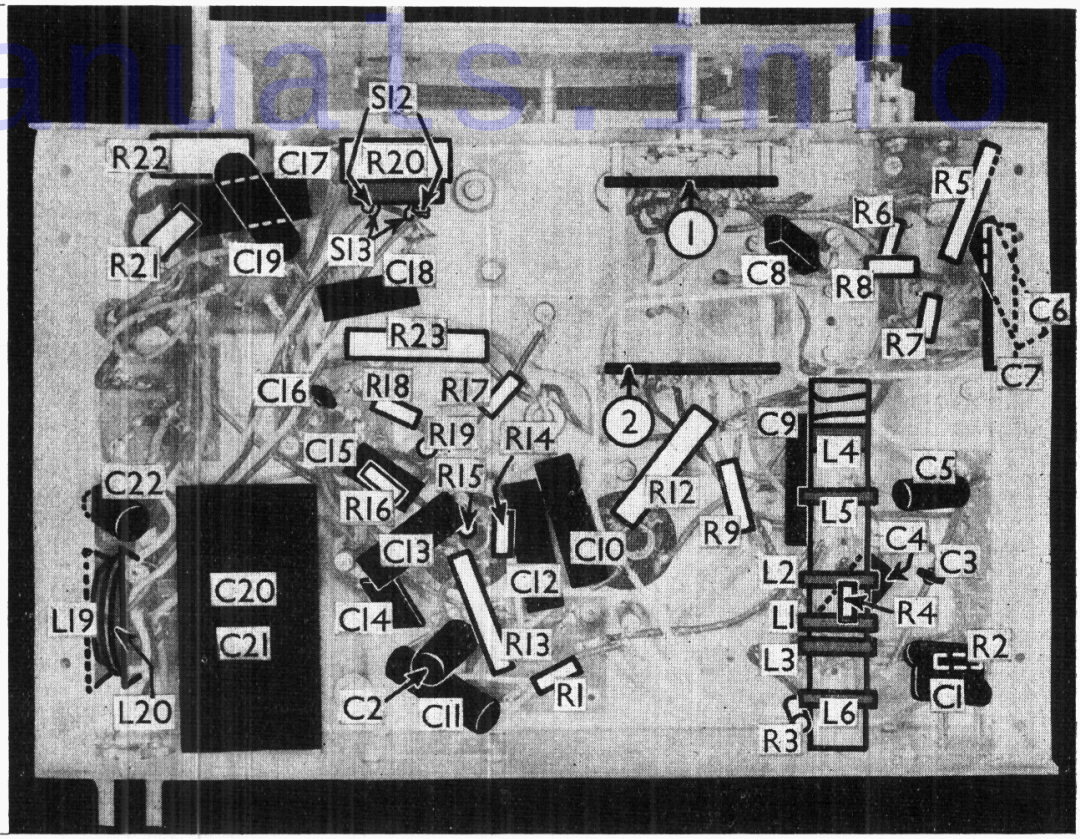
Valve heaters are connected in series, together with ballast resistance **R24** and scale lamp with shunt resistance **R23,** across mains input. Filter comprising chokes **L19, L20** and condenser **C22** suppresses mains-borne interference. Fuses **F1, F2,** located in mains plug, afford protection in case of accidental short-circuit.

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, remove the four knobs (pull-off) and the four bolts (with washers) holding the chassis to the bottom of the cabinet when, if the leads are freed from the cleat on the side of the cabinet, the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.



Circuit diagram of the Lissen 8521 AC/DC superhet. **F1** and **F2** are in the special 2-pin mains plug.



Under-chassis view. The two rotary switch units are indicated, and are shown in detail in the diagrams overleaf. The contacts of **S12, S13** are indicated by arrows. Note the coil unit towards the right. The end turn of **L4** can be adjusted in position for tracking at the upper wavelength end of the SW range.

To free the chassis entirely, unsolder the two speaker leads from the tags on the paxolin connecting panel, which is mounted on the smoothing choke **L18** at the rear right-hand corner of the chassis, and the black lead from the tag under the bottom right-hand speaker fixing nut.

When replacing, connect the brown lead from the speaker to the front right-hand tag on **L18,** together with two red leads from the chassis, and the green lead from the speaker to the rear left-hand tag on **L18,** together with a blue lead from the chassis. The black lead from the chassis goes to the tag under the bottom right-hand speaker fixing nut on the sub-baffle.

Removing Speaker.—To remove the speaker from the cabinet, unsolder the two connecting leads from the paxolin panel on **L18** and remove the four nuts holding the rim of the speaker frame to the sub-baffle. The tag to which the black lead is soldered will be freed when the nut under which it is situated is removed.

When replacing, the transformer should be on the right and the leads connected as indicated above.

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 2) are those measured in our receiver when it was operating on AC mains of 230 V, using the 230 V tapping on the mains resistance. The receiver was tuned to the lowest wavelength on the medium wave 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 Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 C36C ..	227 (Oscillator)	1·2	60	2·6
	88	7·5		
V2 C50N ..	227	8·3	153	2·9
V3 C20C ..	—	—	—	—
V4 Pen3520	210	50·0	227	8·6
V5 U4020†	—	—	—	—

† Cathode to chassis, 250 V. DC.

COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1, R2	A2 aerial feed potentiometer	11,000, 110,000
R3	V1 pentode CG decoupling (MW and LW)	110,000
R4	V1 pent. CG decoupling (SW)	110,000
R5	Part V1 SG HT pot	20,000
R6	V1 fixed GB resistance	150
R7	V1 osc. CG resistance	26,000
R8	V1 osc. CG stabiliser	200
R9	Part V1 SG HT pot	5,000
R10	Osc. reaction MW damping	1,000
R11	Osc. reaction LW damping	2,100
R12	V1 SG and osc. anode HT feed	10,000
R13	V2 SG HT feed	25,000
R14	V2 fixed GB resistance	100
R15	IF stopper	110,000
R16	V3 signal diode load	510,000
R17	AVC line decoupling	110,000
R18, R19	V3 AVC diode load resistances	510,000, 510,000
R20	Manual volume control	500,000
R21	V4 GB resistance	150
R22	Variable tone control	50,000
R23	Scale lamp shunt	35
R24	Heater circuit ballast	617*

* Tapped at 45 O + 55 O + 60 O + 55 O + 45 O + 357 O approx. from V5 heater. See also under "General Notes."

	CONDENSERS	Values (μF)
C1	Aerial isolating condenser	0·001
C2	Earth isolating condenser	0·01
C3	Aerial SW coupling	0·00001
C4	V1 pentode CG decoupling (MW and LW)	0·1
C5	Aerial circuit SW tracker	0·01
C6	V1 SG decoupling	0·1
C7	V1 cathode by-pass	0·1
C8	V1 osc. CG condenser	0·0001
C9	V1 osc. anode decoupling	0·1
C10	V2 CG decoupling	0·1
C11	V2 SG decoupling	0·1
C12	V2 cathode by-pass	0·1
C13	AF coupling to V4	0·05
C14, C15	IF by-pass condensers	0·0001, 0·0002
C16	Coupling to V3 AVC diode	0·00001
C17*	V4 cathode by-pass	50·0
C18	Fixed tone corrector	0·005
C19	Part of variable tone control	0·04
C20*, C21*	HT smoothing condensers	8·0, 16·0
C22	Mains RF by-pass	0·01
C23‡	Band-pass pri. MW trimmer	0·00004
C24‡	Band-pass pri. LW trimmer	0·00009
C25†	Band-pass primary tuning	0·00054
C26‡	Aerial circuit SW trimmer	0·00004
C27‡	Band-pass sec. MW trimmer	0·00004
C28‡	Band-pass sec. LW trimmer	0·00009
C29†	Band-pass secondary and SW aerial tuning	0·00054
C30†	Oscillator circuit tuning	0·00054
C31‡	Osc. circuit SW trimmer	0·00004
C32‡	Osc. circuit MW trimmer	0·00004
C33‡	Osc. circuit LW trimmer	0·00009
C34‡	Osc. circuit MW tracker	0·0006
C35‡	Osc. circuit LW tracker	0·0004
C36‡	1st IF trans. pri. tuning	0·0003
C37‡	1st IF trans. sec. tuning	0·0003
C38‡	2nd IF trans. pri. tuning	0·0003
C39‡	2nd IF trans. sec. tuning	0·0003

* Electrolytic. † Variable. ‡ Pre-set.

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	OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial MW and LW coupling		11·0
L2	Band-pass primary coils		2·6
L3			11·0
L4	Aerial SW tuning coil		Very low
L5	Band-pass secondary coils		2·5
L6			11·0
L7	Osc. circuit SW tuning coil		Very low
L8	Osc. circuit MW tuning coil		1·8
L9	Osc. circuit LW tuning coil		5·0
L10	Oscillator SW reaction		0·3
L11	Oscillator MW reaction		6·25
L12	Oscillator LW reaction		8·3
L13	1st IF trans.	Pri.	6·5
L14		Sec.	6·5
L15	2nd IF trans.	Pri.	6·5
L16		Sec.	6·5
L17	Speaker speech coil		1·7
L18	HT smoothing choke		250·0
L19	Mains RF filter chokes		0·1
L20			0·1
T1	Speaker input trans	Pri.	270·0
		Sec.	0·25
F1,F2	Mains circuit fuses		—
S1-S11	Waveband switches		—
S12	Mains switches, ganged R20		—
S13			—

GENERAL NOTES

Switches.—**S1-S11** are the wavechange switches, ganged in two rotary units beneath the chassis. The units are indicated in our under-chassis view, and shown in detail in the diagrams (col. 3). 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*.

S12, S13 are the QMB mains switches, ganged with the volume control **R20.**

Coils.—**L1-L6** are in a tubular unscreened unit beneath the chassis. **L7-L12** and the IF transformers **L13, L14** and **L15, L16** are in three screened units on the chassis deck. Note that the **L7-L12** unit also contains the resistances **R10** and **R11. L18** is mounted on the chassis deck, while **L19, L20** are in a single unit beneath the chassis.

Scale Lamp.—This is an Ever Ready MES type, rated at 2·5 V, 0·2 A.

External Speaker.—No provision is made for this, but a low impedance (2O) type could be connected across the tags of the secondary of **T1.**

Condensers C20, C21.—These are two dry electrolytics, in a single carton beneath the chassis. The black lead is the common negative. The yellow lead is the positive of **C20** (8μF) and the red lead the positive of **C21** (16 μF).

Trimmers.—All the trimmers except those of the IF transformers are adjusted through holes in the chassis deck.

Alternative Valves.—**V4** and **V5** may be Ever Ready C70D and C10B types respectively. In this case instead of **R24** being 617 O total (Part No. 89,601) it becomes 677 O total (Part No. 89,600). This is necessary because the C10B has a 20 V heater, while the Mazda U4020 has a 40 V heater.

Fuses F1, F2.—These are incorporated in the special Lissen 2-pin mains plug. They are 0·5 A glass tubular types, § in. long.

CIRCUIT ALIGNMENT

IF Stages.—Short circuit the oscillator tuning coils by a wire across **C30.** Feed in a 455 KC/S signal between control grid (top cap) of **V1** and chassis, and adjust **C39, C38, C37** and **C36** in turn for maximum output, in the order given. Re-check adjustments, then remove the short on **C30.**

RF and Oscillator Stages.—With gang at maximum, pointer should cover the horizontal lines across the centre of the scale. Set **C34** approximately two-thirds in.

Switch set to MW, tune to 214 m on scale, feed a 214 m (1,400 KC/S) signal into the **A1** and **E** sockets, and adjust **C32, C27** and **C23** for maximum output.

Tune to 500 m on scale, feed in a 500 m (600 KC/S) signal and adjust **C34** for maximum output.

Return to 214 m and re-adjust **C32, C27** and **C23,** then return to 500 m, and if the pointer does not indicate 500 m when the signal is accurately tuned, re-adjust **C34** until it does. Check calibration at 214, 300 and 500 m.

Switch set to LW and set **C35** about one-third in. Tune to 1,200m on scale, feed in a 1,200 m (250 KC/S) signal, and adjust **C33,** then **C28** and **C24,** for maximum output. Tune to 1,700 m on scale, feed in a 1,700 m (176·5 KC/S) signal, and adjust **C35** for maximum output. Return to 1,200 m and re-adjust **C33, C28** and **C24,** then re-adjust **C35** until the 1,700 m signal is accurately tuned at 1,700 m on the scale.

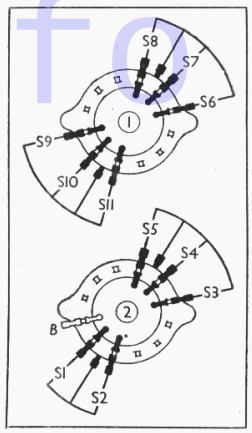
Switch set to SW and tune to 15 MC/S on scale. Screw **C31** right in, feed in a 15 MC/S (20 m) signal, and slowly unscrew **C31** until the *first* output peak is reached. It is important that the second peak is *not* used. Next adjust **C26** for maximum output.

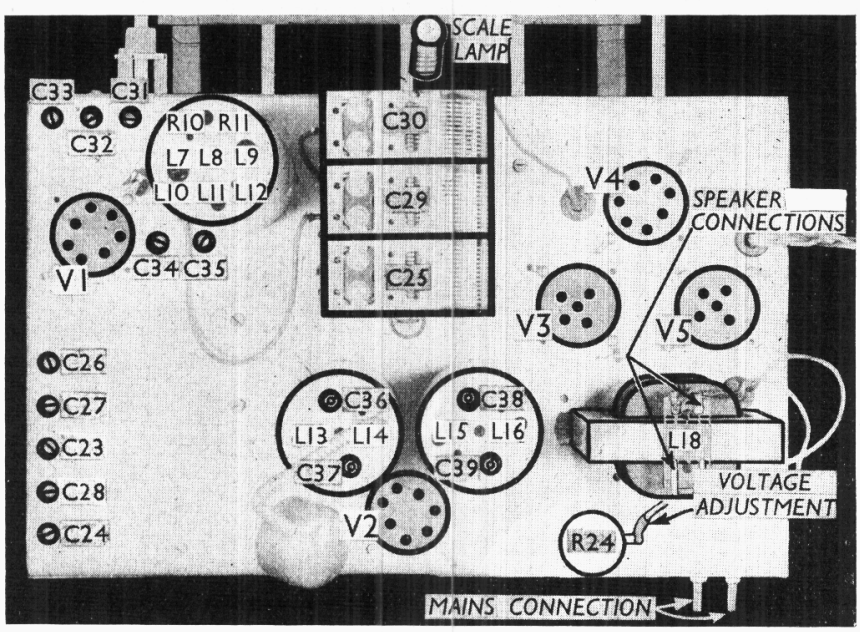
Feed in a 7·5 MC/S (40 m) signal, tune it in, and adjust the end turn of **L4** (nearest the end of the coil former) for maximum output. Return to 15 MC/S, and re-adjust **C31** and **C26.**

TABLE AND DIAGRAMS OF THE SWITCH UNITS

Switch	SW	MW	LW
S1	—	C	—
S2	—	—	C
S3	C	—	—
S4	—	C	—
S5	—	—	C
S6	C	—	—
S7	—	C	—
S8	—	—	C
S9	C	—	—
S10	—	C	—
S11	—	—	C

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





Plan view of the chassis. Note the various trimmers adjustable through holes in the chassis deck. **R24** is the tapped heater circuit ballast resistor.

Service Hints Wanted

Service engineers are invited to submit hints regarding the maintenance of all kinds of domestic electrical, radio and television apparatus—based on their own personal experiences.

Payment will be made at usual lineage rates for all ideas and paragraphs used—about the 10th of the month following the month of publication. Material should be addressed to the Technical Editor, "The Wireless and Electrical Trader," Dorset House, Stamford Street, London, S.E.1.

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