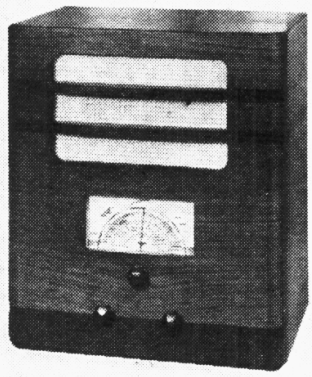
'TRADER' SERVICE SHEET 327

LISSEN 8321

3-BAND AC/DC SUPERHET



THE Lissen 8321 is a 4-valve (plus rectifier) AC/DC 3-band superhet with a short-wave range of 19-50 m, and suitable for mains of 200-250 V (40-100 C/S in the case of AC). Two alternative aerial sockets are provided, one of which is for use when the set is near a powerful station.

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 **C23**; secondaries **L5, L6** by **C27.** On SW, input from **A1** is via **C1** and coupling condenser **C3** to single-tuned circuit **L4, C27.** 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** developing a charge.

First valve (**V1, Ever Ready metallised C36B**) is a triode hexode operating as frequency changer with internal coupling. Triode oscillator grid coils **L7** (SW), **L8** (MW) and **L9** (LW) are tuned by **C28**; parallel trimming by **C29** (SW), **C30** (MW) and **C31** (LW); series tracking by **C32** (MW) and **C33** (LW). Reaction by coils **L10** (SW), **L11** (MW) and **L12** (LW).

Second valve (**V2, Mullard metallised VP13C** or **Ever Ready C50N**) is a variable-mu RF pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C34, L13, L14, C35,** and **C36, L15, L16 C37.**

Intermediate frequency 455 KC/S.

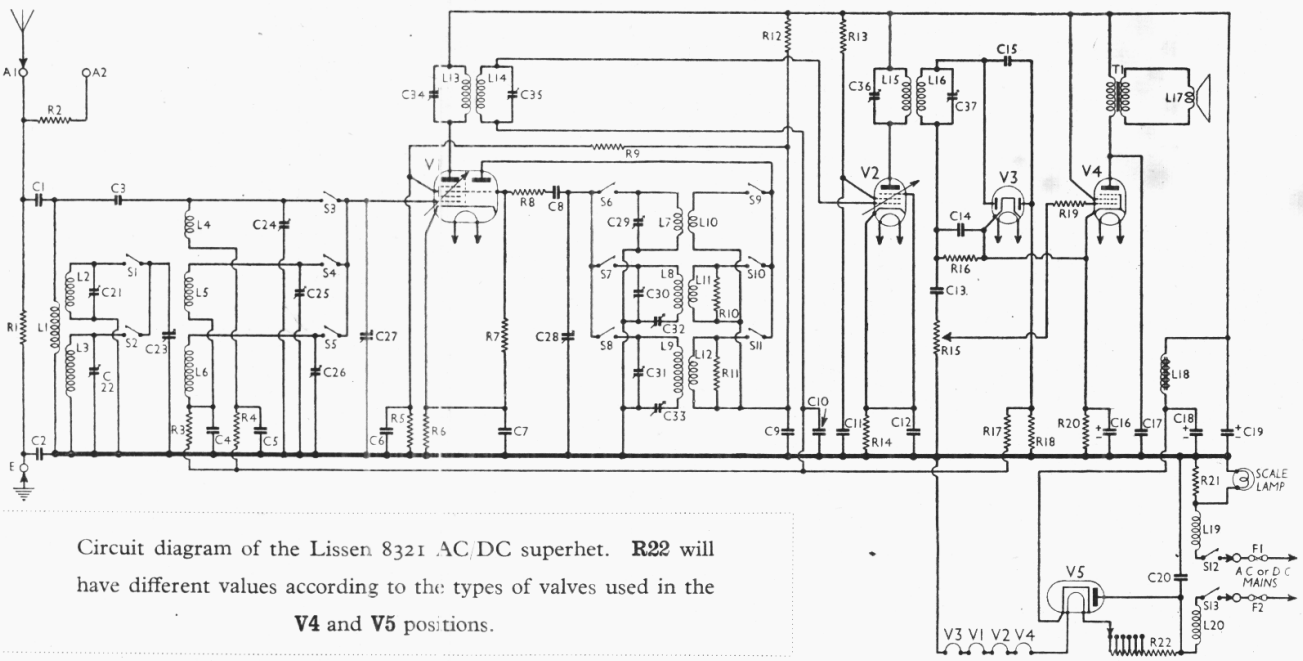
Diode second detector is part of separate double diode valve (**V3, Ever Ready metallised C20C**). Audio frequency component in rectified output is developed across load resistance **R16** and passed via AF coupling condenser **C13,** manual volume control **R15** and grid stopper **R19** to CG of pentode output valve (**V4, Mazda Pen3520**). Fixed tone correction is obtained by condenser **C17** in anode circuit.

Second diode of **V3,** fed from **L16** via **C15,** provides DC potential which is developed across load resistance **R18** and fed back through decoupling circuits as GB to FC and IF valves, giving automatic volume control. Delay voltage is obtained from drop along resistance **R20** 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 **C18, C19.**

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 **R22** being governed by the pair in use.

Valve heaters are connected in series, together with ballast resistance **R22** and, via chassis, scale lamp with shunt resistance **R21,** across mains input. Filter comprising chokes **L19, L20** and condenser **C20** suppresses mains-borne interference. Fuses **F1, F2,** located in mains plug, afford protection in case of accidental short-circuit.



Circuit diagram of the Lissen 8321 AC/DC superhet. **R22** will have different values according to the types of valves used in the **V4** and **V5** positions.

COMPONENTS AND VALUES

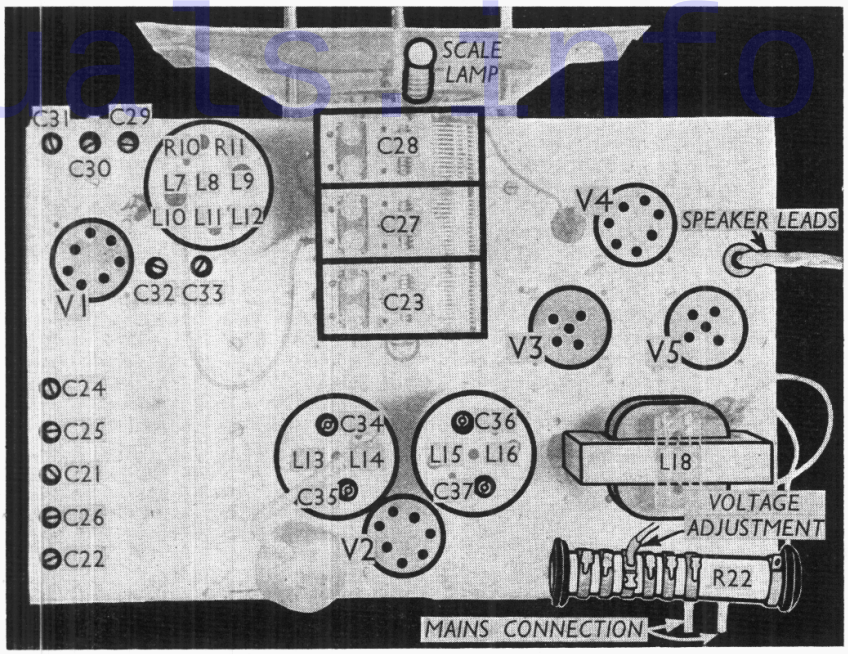
	RESISTANCES	Values (ohms)
R1	A2 aerial feed potentiometer	11,000
R2	A2 aerial feed potentiometer	110,000
R3	V1 hexode CG decoupling (MW and LW)	110,000
R4	V1 hex. CG decoupling (SW)	110,000
R5	Part V1 SG HT pot.	20,000
R6	V1 fixed GB resistance	150
R7	V1 osc. CG resistance	26,000
R8	V1 osc. CG stabiliser	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	Manual volume control	500,000
R16	V3 signal diode load	510,000
R17	AVC line decoupling	110,000
R18	V3 AVC diode load	510,000
R19	V4 grid stopper	21,000
R20	V4 GB resistance	150
R21	Scale lamp shunt	40
R22	Heater circuit ballast	*617

* Tapped at 45 Ω + 55 Ω + 60 Ω + 55 Ω + 45 Ω + 357 Ω 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 hexode 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	IF by-pass	0·0002
C15	Coupling to V3 AVC diode	0·00001
C16*	V4 cathode by-pass	50·0
C17	Fixed tone corrector	0·01
C18*	HT smoothing	8·0
C19*	HT smoothing	16·0
C20	Mains RF by-pass	0·01
C21‡	Band-pass pri. MW trimmer	0·00004
C22‡	Band-pass pri. LW trimmer	0·0001
C23†	Band-pass primary tuning	0·00054
C24‡	Aerial circuit SW trimmer	0·00004
C25‡	Band-pass sec. MW trimmer	0·00004
C26‡	Band-pass sec. LW trimmer	0·0001
C27†	Band-pass secondary and SW aerial tuning	0·00054
C28†	Oscillator circuit tuning	0·00054
C29‡	Osc. circuit SW trimmer	0·00004
C30‡	Osc. circuit MW trimmer	0·00004
C31‡	Osc. circuit LW trimmer	0·0001
C32‡	Osc. circuit MW tracker	0·0006
C33‡	Osc. circuit LW tracker	0·0004
C34‡	1st IF trans. pri. tuning	—
C35‡	1st IF trans. sec. tuning	—
C36‡	2nd IF trans. pri. tuning	—
C37‡	2nd IF trans. sec. tuning	—

*Electrolytic. †Variable. ‡Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial MW and LW coupling	11·0
L2	Band-pass primary coils	2·6
L3	Band-pass primary coils	11·0
L4	Aerial SW tuning coil	Very low
L5	Band-pass secondary coils	2·5
L6	Band-pass secondary coils	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	1st IF trans. Sec.	6·5
L15	2nd IF trans. Pri.	6·5
L16	2nd IF trans. Sec.	6·5
L17	Speaker speech coil	1·7
L18	HT smoothing choke	230·0
L19	Mains RF filter chokes	0·1
L20	Mains RF filter chokes	0·1
T1	Speaker input trans. Pri.	300·0
T1	Speaker input trans. Sec.	0·25
F1, F2	Mains circuit fuses	—
S1-S11	Waveband switches	—
S12	Mains switches, ganged R15	—
S13	Mains switches, ganged R15	—



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

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, remove the three knobs (pull off) and the four bolts (with washers), holding the chassis to the bottom of the cabinet. By tilting the back upwards the chassis can then be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

When replacing, see that there is a metal washer on each of the fixing bolts, between the chassis and the rubber washers mounted in the bottom of the cabinet.

To free the chassis entirely unsolder the speaker leads and *when replacing*, connect them as follows, numbering the outer row of tags from bottom to top:—1, no external connection; 2, red; 3, blue; 4, no external connection. The black lead goes to the soldering tag on the bottom left-hand screw.

Removing Speaker.—To remove the speaker from the cabinet, unsolder the leads and remove the nuts, lock washers and washers from the four screws holding it to the sub-baffle. *When replacing*, see that the transformer is on the right, do not forget to fit the earthing tag on the bottom right-hand screw and connect the leads as above.

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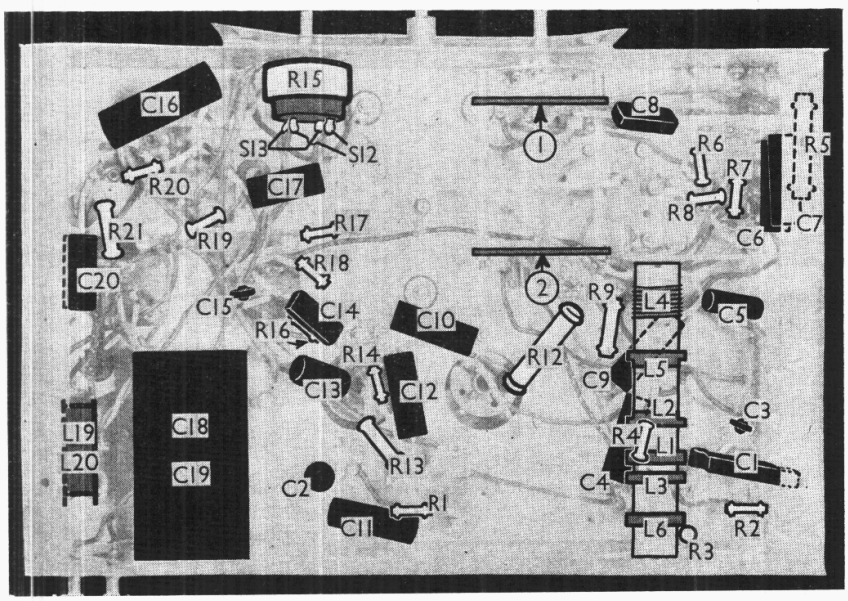


Under-chassis view. **L1-L6** are in a single unscreened unit, using a tubular former.

LISSEN 8321—*Continued*

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on AC mains of 225 V, using the 230 V tapping on the mains resistance. The receiver was tuned to the lowest wavelength on the medium 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 C36B ..	215 / Oscillator / 86	0·9 / 7·2	61	1·9
V2 VP13C	215	6·4	153	2·2
V3 C20C ..	—	—	—	—
V4 Pen3520	200	42·0	215	7·4
V5 U4020†	—	—	—	—

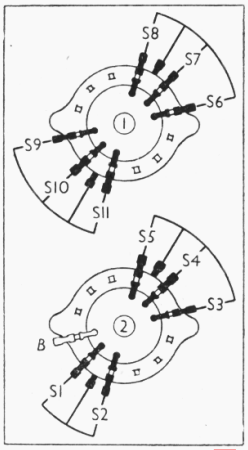
† Cathode to chassis 230 V, DC.

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 below. The table below 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 **R15.**

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



Switch diagrams, looking from the rear of the underside of the chassis.

Coils.—**L1-L6** are in a tabular 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 5·5 V 0·3 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 C18, C19.—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 **C18** (8μF) and the red lead the positive of **C19** (16μF).

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 **R22** 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 1A glass tubular types, $\frac{5}{8}$ in. long.

Chassis Divergency.—The makers' diagrams show a 0·0005 μF tone correction condenser across the manual volume control **R15,** but it was not included in our chassis.

CIRCUIT ALIGNMENT

IF Stages.—Short circuit the oscillator tuning coils by a wire across **C28.** Feed in a 455 KC/S signal between control grid (top cap) of **V1** and chassis, and adjust **C37, C36, C35** and **C34** in turn for maximum output, in the order given. Re-check adjustments, then remove the short on **C28.**

RF and Oscillator Stages.—With gang at maximum, pointer should cover the horizontal lines at the bottoms of the scales. Set **C32** 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 **C30, C25** and **C21** for maximum output.

Tune to 500 m on scale, feed in a 500 m (600 KC/S) signal and adjust **C32** for maximum output.

Return to 214 m and re-adjust **C30, C25** and **C21,** then return to 500 m, and if the pointer does not indicate 500 m when the signal is accurately tuned, re-adjust **C32** until it does. Check calibration at 214, 300 and 500 m.

Switch set to LW and set **C33** about one-third in. Tune to 1,200 m on scale, feed in a 1,200 m (250 KC/S) signal, and adjust **C31,** then **C26** and **C22,** for maximum output. Tune to 1,700 m on scale, feed in a 1,700 m (176·5 KC/S) signal, and adjust **C33** for maximum output. Return to 1,200 m and re-adjust **C31, C26** and **C22,** then re-adjust **C33** 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 **C29** right in, feed in a 15 MC/S (20 m) signal, and slowly unscrew **C29** until the *first* output peak is reached. It is important that the second peak is *not* used. Next adjust **C24** 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 **C29** and **C24.**

MAINTENANCE PROBLEMS

Speaker Lead Shorts HT

AN Ever Ready 5039 came back with a complaint of complete failure. Upon testing between one transformer tag and chassis only a 15 V reading could be obtained, and when testing between the remaining tag and chassis no reading at all.

The speaker was taken out and inspected, when it was found that one of the transformer input leads (which are made of uncovered wire braid) was bent into such a shape that it was enabled to touch the transformer casing. As the speaker frame is earthed to the chassis, only the resistance of the transformer primary saved the HT battery from a direct s/c.—V.A.F.

Replacement Condenser Faulty

AN Alba 57 (AC/DC) was unstable and gave excessive hum, which would sometimes suddenly cease. The 32 μF section of the smoothing pack was found to be o/c and the 8 μF section was first o/c and then s/c, so the pack was taken apart carefully and it was then noted that the common negative lead was adrift, but had been making intermittent contact with its associated electrode.

A new condenser was ordered and fitted. The set was then put on test and, after about half an hour, the wattmeter on the test board showed an increased reading and the fuses suddenly blew. All condensers between HT line and chassis were tested and found O.K., as were all other points which might cause excessive consumption. It was, therefore, decided to test the new electrolytic pack and, much to our surprise, the 8 μF section had developed a s/c.

It would, therefore, seem that it does not do to take for granted that a new condenser is perfectly O.K.—V. A. FRISBEE, LONDON.

Celluloid Dials in Cossor Sets

WHEN some Cossor receivers with a celluloid dial have been in use for a time in a warm room, or near a fire, the dial warps and consequently the pointer rubs it and eventually obliterates the station names.

It is quite easy to put this right. Remove the dial and place it for a few moments in a saucer of warm (not boiling) water. This will soften the celluloid, which can then be bent back to its original position, when it should be kept under cold water for a minute to harden and set.—F. R. ELLORY, PAR.