TRADER' SERVICE SHEET 227

LISSEN 8302

3-BAND A.C. SUPERHET

COVERING a short-wave range of 19-50 metres, the Lissen 8302 receiver is a 4-valve (plus rectifier) A.C. 3-band superhet suitable for mains of 200-250 V, 40-60 C/S. Provision is made for both an extension speaker and a gramophone pick-up and there are two alternative aerial sockets.

CIRCUIT DESCRIPTION

Two alternative aerial input sockets, **A1** via coupling coil **L1,** to inductively coupled band-pass filter. Primary coils **L2** (M.W.) and **L3** (L.W.) are tuned by **C23**; secondary coils **L5** (M.W.) and **L6** (L.W.) are tuned by **C27.** On S.W. coupling is via condenser **C1** to single-tuned circuit **L4, C27.** From **A2** socket input is fed into the same circuits via a potentiometer **R1, R2** for the reception of powerful transmissions.

First valve (**V1, Ever Ready metallised A36B**) is a triode hexode operating as frequency changer with internal coupling. Oscillator grid coils **L7** (S.W.), **L9** (M.W.) and **L11** (L.W.) are tuned by **C28**; parallel trimming by **C29** (S.W.), **C30** (M.W.) and **C31** (L.W.); series tracking by **C32** (M.W.) and **C33** (L.W.). Anode reaction coils **L8** (S.W.), **L10** (M.W.) and **L12** (L.W.).

Second valve (**V2, Ever Ready metallised A50P**), a variable-mu R.F. pentode, operates 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 double diode triode valve (**V3, Ever Ready metallised A23A**). Audio frequency component in rectified output is developed across load resistance **R16** and fed via I.F. filter **R15, C11,** A.F. coupling condenser **C12** and manual volume control **R17** to C.G. of triode section. Provision for connection of gramophone pick-up across **R17.**

Second diode of **V3,** fed from **L16** via coupling condenser **C15,** provides D.C. potential which is developed across load resistance **R21** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control.

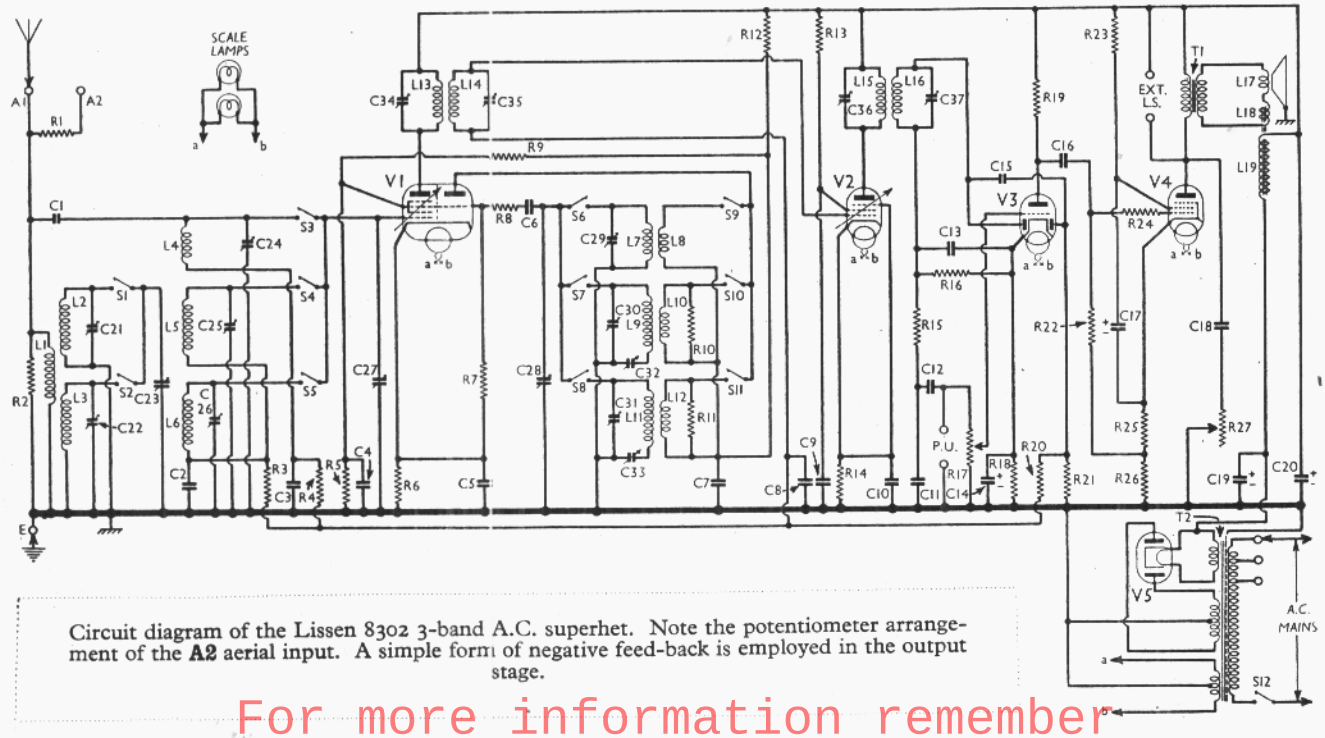
Resistance-capacity coupling by **R19, C16** and **R22,** via stopper resistance **R24,** between **V3** triode and pentode output valve (**V4, Ever Ready A70D**). A.F. voltages developed across resistances **R25** and **R26** in cathode circuit are returned to C.G. thus providing a negative feed-back circuit. Provision for connection of high impedance external speaker across leads feeding primary of internal speaker input transformer **T1.** Variable tone control by R.C. filter in anode circuit.

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V5, Ever Ready A11D**). Smoothing by dry electrolitic condensers **C19, C20** and speaker field coil **L19.**

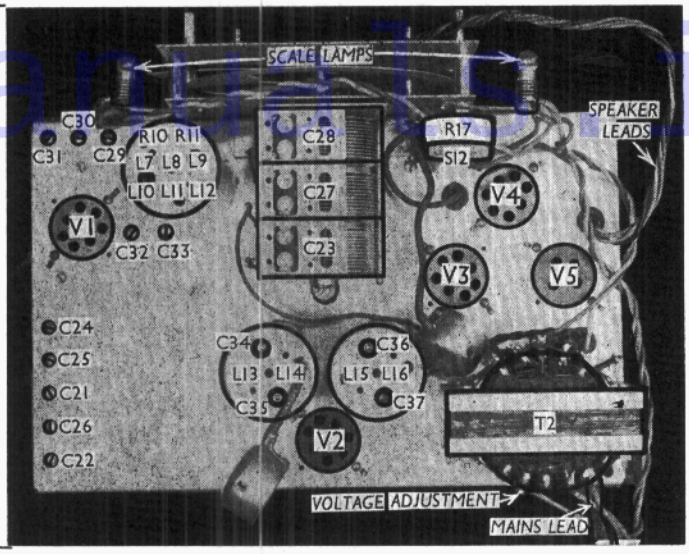
COMPONENTS AND VALUES

	CONDENSERS	Values (μF)
C1	Aerial S.W. coupling ..	0·00001
C2	V1 hex. C.G. decoupling (M.W. and L.W.)	0·1
C3	Aerial circuit S.W. tracker ..	0·01
C4	V1 S.G. decoupling	0·1
C5	V1 cathode by-pass	0·1
C6	V1 osc. C.G. condenser ..	0·0001
C7	V1 osc. anode decoupling ..	0·1
C8	V2 C.G. decoupling	0·1
C9	V2 S.G. decoupling	0·1
C10	V2 cathode by-pass	0·1
C11	I.F. by-pass	0·0002
C12	A.F. coupling to V3 triode ..	0·05
C13	I.F. by-pass	0·0002
C14*	V3 cathode by-pass ..	50·0
C15	V3 A.V.C. diode coupling ..	0·00001
C16	V3 triode to V4 A.F. coupling	0·05
C17*	V4 S.G. decoupling	8·0
C18	Part of T.C. filter	0·05
C19*	H.T. smoothing ..	8·0
C20*		8·0
C21‡	Band-pass pri. M.W. trimmer	0·00004
C22‡	Band-pass pri. L.W. trimmer	0·0001
C23†	Band-pass pri. tuning.. ..	0·00054
C24‡	Aerial S.W. trimmer ..	0·00004
C25‡	Band-pass sec. M.W. trimmer	0·00004
C26‡	Band-pass sec. L.W. trimmer	0·0001
C27†	Band-pass sec. and S.W. tuning	0·00054
C28†	Oscillator circuit tuning ..	0·00054
C29‡	Osc. circuit S.W. trimmer ..	0·00004
C30‡	Osc. circuit M.W. trimmer ..	0·00004
C31‡	Osc. circuit L.W. trimmer ..	0·0001
C32‡	Osc. circuit M.W. tracker ..	0·0006
C33‡	Osc. circuit L.W. tracker ..	0·0006
C34‡	1st I.F. trans. pri. tuning ..	—
C35‡	1st I.F. trans. sec. tuning ..	—
C36‡	2nd I.F. trans. pri. tuning ..	—
C37‡	2nd I.F. trans. sec. tuning ..	—

* Electrolytic. † Variable. ‡ Pre-set.



Circuit diagram of the Lissen 8302 3-band A.C. superhet. Note the potentiometer arrangement of the **A2** aerial input. A simple form of negative feed-back is employed in the output stage.



Plan view of the chassis. Note the various trimmers, which are adjusted through holes in the chassis deck. **R10** and **R11** are inside the **L7-L12** coil unit.

	RESISTANCES	Values (ohms)
R1	A2 aerial feed potentiometer	110,000
R2	A2 aerial feed potentiometer	10,000
R3	V1 hex. C.G. decoupling (M.W. and L.W.)	100,000
R4	V1 hex. C.G. decoupling (S.W.)	100,000
R5	Part V1 S.G. H.T. potentiometer	20,000
R6	V1 fixed G.B. resistance	150
R7	V1 osc. C.G. resistance	26,000
R8	V1 osc. C.G. stabiliser	200
R9	Part V1 S.G. H.T. potentiometer	5,000
R10	Osc. circuit M.W. stabiliser	1,000
R11	Osc. circuit L.W. stabiliser	2,000
R12	V1 osc. anode and S.G. H.T. feed	10,000
R13	V2 S.G. H.T. feed	25,000
R14	V2 fixed G.B. resistance	100
R15	I.F. stopper	100,000
R16	V3 signal diode load	500,000
R17	Manual volume control	500,000
R18	V3 G.B. resistance	300
R19	V3 triode anode load	20,000
R20	A.V.C. line decoupling	100,000
R21	V3 A.V.C. diode load	510,000
R22	V4 C.G. resistance	260,000
R23	V4 S.G. H.T. feed	2,500
R24	V4 C.G. I.F. stopper	20,000
R25	V4 G.B.; part neg. feed-back pot.	150
R26	Part negative feed-back pot.	250
R27	Variable tone control	50,000

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial M.W. and L.W. coupling	11·0
L2	Band-pass primary coils	2·6
L3	Band-pass primary coils	11·0
L4	Aerial S.W. tuning coil	Very low
L5	Band-pass secondary coils	2·4
L6	Band-pass secondary coils	11·5
L7	Osc. circuit S.W. tuning coil	Very low
L8	Oscillator anode S.W. reaction	0·2
L9	Osc. circuit M.W. tuning coil	1·75
L10	Oscillator anode M.W. reaction	6·5
L11	Osc. circuit L.W. tuning coil	5·0
L12	Oscillator anode L.W. reaction	8·3
L13	1st I.F. trans. Pri.	7·0
L14	1st I.F. trans. Sec.	7·0
L15	2nd I.F. trans. Pri.	7·0
L16	2nd I.F. trans. Sec.	7·0
L17	Speaker speech coil	1·75
L18	Hum neutralising coil	0·1
L19	Speaker field coil	2,000·0
T1	Speaker input trans. Pri.	800·0
	Speaker input trans. Sec.	0·1
T2	Mains trans. Pri. total	46·0
	Mains trans. Heat. sec. total	0·1
	Mains trans. Rect. heat. sec.	0·2
	Mains trans. H.T. sec. total	380·0
S1-S11	Waveband switches	—
S12	Mains switch, ganged R17	—

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, first remove the four control knobs (pull off) and then the four bolts (with washers and distance pieces) holding the chassis to the bottom of the cabinet. Now free the speaker leads from the cleat on the side of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

To free the chassis entirely, unsolder the speaker leads and *when replacing*, connect them as follows, numbering the tags from left to right:—1, brown; 2, blue; 3 and 4 joined together, red. The black lead goes to the tag on one of the speaker fixing screws.

Removing Speaker.—To remove the speaker from the cabinet, remove the four screws (with washers and lock washers) holding it to the sub-baffle. *When replacing*, see that the transformer is at the top and do not forget to replace the earthing tag on the top left-hand screw.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 230 V, using the 216-235 V tapping on the mains transformer. 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 1,200 V scale of an Avometer, chassis being negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 A36B*	255	1·9	70	3·8
V2 A50P	255	9·2	160	3·3
V3 A23A	125	6·0	—	—
V4 A70D	225	33·0	235	5·4
V5 A11D	350†	—	—	—

* Oscillator anode 100 V, 7·4 mA.
† Each anode, A.C.

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 diagram on page IV. The table (p. IV) gives the switch positions for the three control settings, starting from fully anti-clockwise. O indicates open, and **C** closed.

S12 is the Q.M.B. mains switch, ganged with the volume control **R17.**

Coils.—**L1-L6** are in a tubular unscreened unit beneath the chassis. **L7-L12** and the I.F. transformers **L13, L14** and **L15, L16** are in three screened units on the chassis deck. Note that the **L7-L12** unit also contains **R10** and **R11.**

Scale Lamps.—These are two Ever Ready M.E.S. types, rated at 6·2 V 0·3 A.

External Speaker.—Two sockets are provided at the rear of the chassis for a high impedance (7,000 O) external speaker.

Condensers C17, C19, C20.—These are three 8 μF dry electrolytics, in a single

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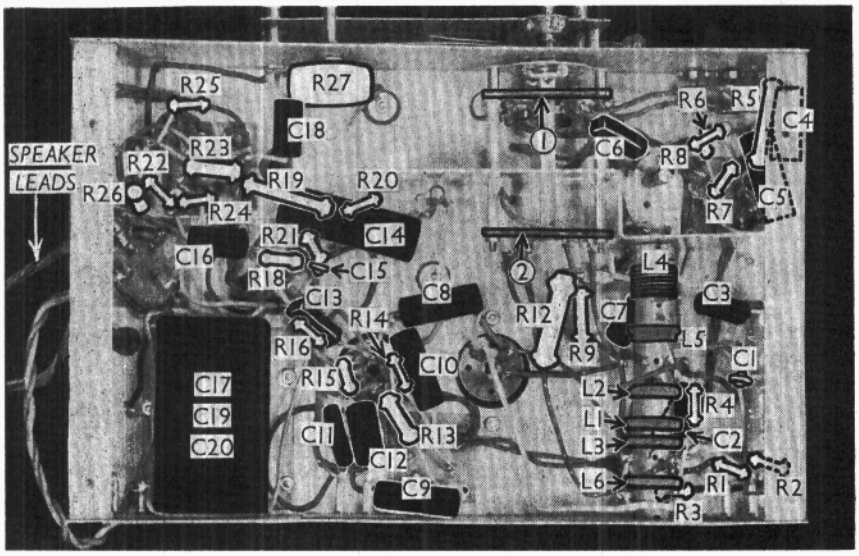


Under-chassis view. The trimmers are not shown here, but are all identified in the plan view. The end turn of **L4** is adjustable for S.W. tracking.

LISSEN 8302—*Continued*

carton beneath the chassis. The yellow and blue leads are the positive and negative connections respectively of **C17.** The black lead is the common negative of **C19** and **C20.** The red lead to **V5** valve holder is the positive of **C19,** and the red lead to one of the Ext.L.S. sockets is the positive of **C20.**

Trimmers.—All the trimmers except those of the I.F. transformers are adjusted through holes in the chassis deck, and are indicated in our plan chassis view.

Resistance Values.—Seven of the resistors indicated by the makers as having values of 110,000 O, 510,000 O, 21,000 O, and 11,000O, in our chassis were 100,000 O. 500,000 O, 20,000 O and 10,000 O types. This makes no appreciable difference to the working of the set, and either value can be used for replacement.

CIRCUIT ALIGNMENT

I.F. 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, then remove the short on **C28.**

R.F. and Oscillator Stages.—With gang at maximum, pointer should cover the horizontal lines on the scale. Set **C32** approximately two-thirds in.

Switch set to M.W., 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.

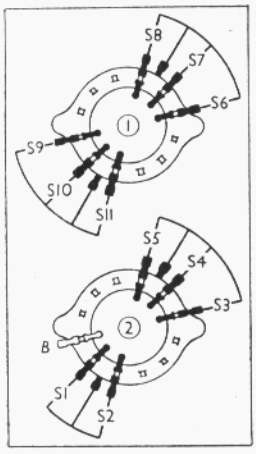
Switch set to L.W., and set **C33** about one-third in. Tune to 1,200 m. on scale, feed in a 1,200 m. (250 KC/S) signal, and adjust **C31,** then **C26** and **C22,** for maximum output. Tune to 1,700 m. on scale, feed in a 1,700 m. (176·5 KC/S) signal, and adjust **C33** for maximum output. Return to 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 S.W., and tune to 15 MC/S on scale. Screw **C29** right in, feed in a 15 M/CS (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** if necessary.

SWITCH TABLE AND DIAGRAM

Switch	S.W.	M.W.	L.W.
S1	O	**C**	O
S2	O	O	**C**
S3	**C**	O	O
S4	O	**C**	O
S5	O	O	**C**
S6	**C**	O	O
S7	O	**C**	O
S8	O	O	**C**
S9	**C**	O	O
S10	O	**C**	O
S11	O	O	**C**



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

MAINTENANCE PROBLEMS

Faulty Heater Return Circuit

BROUGHT in to have the speaker re-centred, an Invicta AW57 receiver was connected up, when it was noticed that the scale lamp was only just alight. The voltage on the valve heaters was then measured and was found to be only 1·2 V. The chassis was taken out and the voltage measured at the heater winding tags on the mains transformer, where it was the full 4 V.

The wiring was then traced out and it was noticed that only one wire went to each of the valves, the other side of each valve-heater being taken to the nearest earthing point. Going back to the mains transformer it was found that the other side of the heater winding was soldered to a tag which in turn was bolted to the frame of the transformer by means of a bolt used to clamp up the laminations.

Voltage readings were then taken and found to be only 1·2 V from the bolt head to the other tag. There was then found a small resistance of about 1 O at this point which was sufficient to drop the voltage to a useless value. The trouble was cured by soldering a short piece of wire from that point to chassis, but had a wire been carried to all the valves this fault could not have occurred.—E. SWARBRICK, FLEETWOOD.

Shorted Turns in Field Coil

AN Ekco CTA87 console was found to be humming very loudly. The electrolytic smoothing condensers were naturally suspect, but they were found to be in order. All voltages and currents were then taken, when it was found that all seemed slightly on the high side, and the voltage drop across the speaker field winding was less than usual.

This gave a clue, and upon measuring the D.C. resistance of the winding, it was found to be less than 1,000 O, whereas the correct value is 2,500 O. Evidently the winding had developed "shorted turns" thus lowering its smoothing action, and allowing "ripple" to get through. A new field coil soon righted matters.—R.A.C.

Portable Wouldn't Work

ONE of the old-fashioned Pye portables was recently brought in for repair, and the owner said that it had been accidently knocked off a table and had not functioned since. For a while the receiver presented a problem, as everything seemed in order, judging from meter tests.

Accordingly an aerial was connected to the grid of V1 to find if any signals could be forced through. The condenser was then rotated, when signals suddenly burst through at the minimum capacity end. Close scrutiny revealed that the outer moving vane of the tuning condenser, was bent slightly inwards and was touching the fixed vanes throughout the full rotation, barring a few degrees at the minimum position. Upon straightening it, the set worked perfectly. It seemed that our customer had been investigating for any possible signs of damage after the fall, had poked his hand inside the receiver, and accidently bent the vane, thus in effect cutting out everything received on the frame aerial.—R. A. COATES, WHITBY.

Faults in Philips 472A

SOME Philips 427A receivers have by now developed two troubles which can be awkward to locate on first acquaintance.

Uncertain earthing of the tuning condenser rotor provokes instability which can be cured by securing one leg of a hairpin spring under a convenient bolt head and allowing the other leg to press against the rear end of the condenser spindle.

Flickering dial bulbs in this model are usually caused by varying heater consumption of the 2D4A valve. The performance is sometimes not impaired and although this irregularity often escapes observation on the bench, the owner is very sensitive to such visible evidence.—R. D. PRITCHARD, GLASGOW.

I.F. Transformers in McMichael 435

A CERTAIN fault in McMichael 435 receivers has caused me a considerable amount of trouble and I have no doubt that my experience will save other service engineers a lot of time.

The symptom is poor reception of foreign stations and I have found that this is due to both the I.F. transformers having become faulty. If an oscillator is used it will be found impossible to obtain a definite point of resonance on the trimmers.

The trouble is due to chemical action on the windings, which are not impregnated with wax, and on examination, the windings will be found discoloured. All replacement coils are now soaked in wax.—A COBDEN, WEYBRIDGE.