'TRADER' SERVICE SHEET NUMBER 160

AERODYNE 54

3-BAND A.C. SUPERHET

OF the all-wave type, the Aerodyne 54 is a 5-valve (plus rectifier) A.C. superhet with a short-wave range of 16·5-50 metres. It is suitable for mains of 200-250 V, 50 c.p.s., and has provision for an extension speaker, a gramophone pick-up and for using the mains as an aerial.

CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (S.W.), **L3** (M.W.) and **L5** (L.W.) to tuned circuits comprising **C27** and **L2** (S.W.), **L4** (M.W.) and **L6** (L.W.) which precede variable-mu pentode H.F. amplifier (**V1, Mullard metallised VP4B**). Variable resistance **R3** in cathode circuit varies fixed G.B. applied and forms noise suppression control.

Tuned-secondary transformer couplings by **C31** and **L7, L8** (S.W.), **L9, L10** (M.W.), and **L11, L12** (L.W.) between **V1** and triode-hexode frequency changer (**V2, Mullard metallised TH4**) which operates with internal coupling. Oscillator grid coils **L13** (S.W.), **L15** (M.W.) and **L17** (L.W.) are tuned by **C33**; trimming by **C34** (M.W.) and **C35** (L.W.); tracking by series condensers **C8** (S.W.), **C36** (M.W.) and **C37** (L.W.); oscillator anode reaction coils **L14** (S.W.), **L16** (M.W.) and **L18** (L.W.).

Single variable-mu H.F. pentode intermediate frequency amplifier (**V3, Mullard metallised VP4B**) operating with tuned-primary tuned-secondary iron-dust-cored transformer couplings **C38, L19, L20, C39** and **C40, L21, L22, C41.**

Intermediate frequency 465 KC/S.

Diode second detector is part of double diode triode valve (**V4, Mullard metallised TDD4**). Audio-frequency component in rectified output is developed across manual volume control **R14** and passed via coupling condenser **C15** to C.G. of triode section which operates as L.F. amplifier. Provision for connection of gramophone pick-up across C.G. resistance **R15.** I.F. filtering by **R13, C13, C14** and anode by-pass **C18.**

Second diode of **V4,** coupled by **C17,** provides D.C. potential which is developed across load **R19** and fed back through decoupling circuits as G.B. to H.F., F.C. and I.F. valves, giving automatic volume control. Delay voltage is obtained from drop along **V4** cathode resistance **R17.**

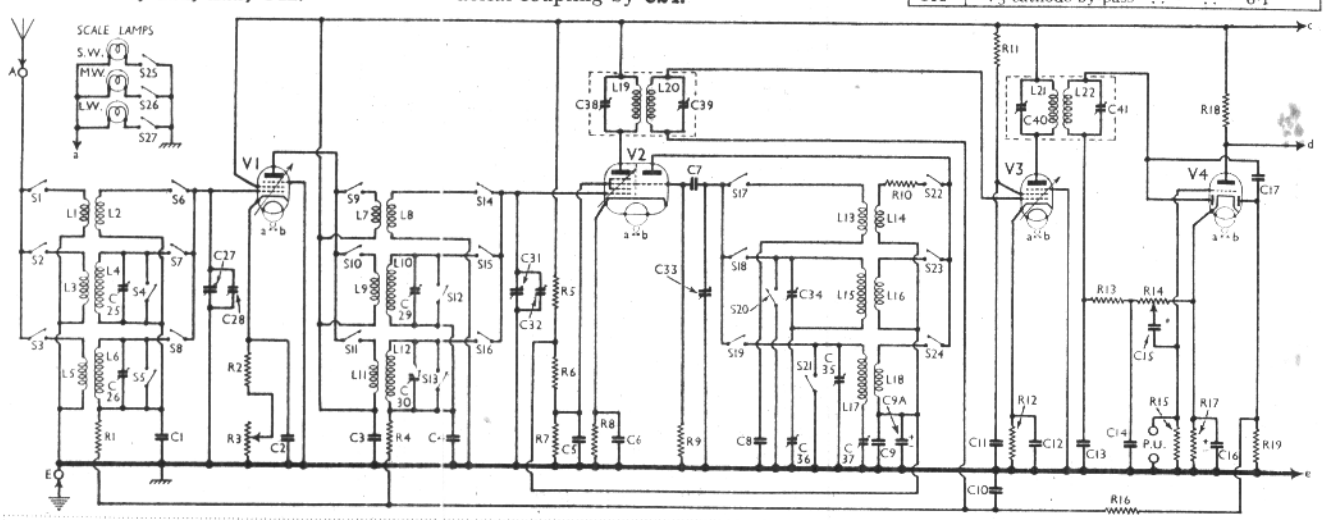
Resistance-capacity coupling by **R18, C19** and **R22** between **V4** and pentode output valve (**V5, Mullard Pen4VA**). G.B. is obtained from potential divider **R24, R25,** connected across speaker field coil **L25** and ballast resistance **R27** which are in H.T. negative line. Variable tone control in anode circuit by R.C. filter **R26, C21.** Provision for connection of low-impedance external speaker across secondary of internal speaker transformer **T1.**

H.T. current is supplied by I.H.C. full-wave rectifying valve (**V6, Mullard IW3**). Smoothing by speaker field coil **L25,** ballast resistance **R27,** and dry electrolytic condensers **C22, C23.** Mains aerial coupling by **C24.**

COMPONENTS AND VALUES

	RESISTANCES	VALUES (ohms)
R1	V1 C.G. decoupling	100,000
R2	V1 fixed G.B. resistance	300
R3	Noise suppression control	3,000
R4	V2 hexode C.G. decoupling	100,000
R5	V2 S.G.'s and oscillator anode H.T. potential divider	10,000
R6		20,000
R7		20,000
R8	V2 fixed G.B. resistance	340
R9	V2 osc. C.G. resistance	30,000
R10	Osc. S.W. reaction stabiliser	100
R11	V3 S.G. H.T. feed	10,000
R12	V3 fixed G.B. resistance	100
R13	I.F. stopper	50,000
R14	Manual volume control	500,000
R15	V4 C.G. resistance	1,000,000
R16	A.V.C. line decoupling	1,000,000
R17	V4 G.B. resistance	500
R18	V4 triode anode load	20,000
R19	V4 A.V.C diode load	1,000,000
R20	V5 C.G. I.F. stoppers	250,000
R21		100,000
R22	V5 C.G. resistance	500,000
R23	V5 C.G. decoupling	100,000
R24	V5 G.B. potential divider	250,000
R25		40,000
R26	Variable tone control	50,000
R27	H.T. circuit ballast	630

	CONDENSERS	VALUES (μF)
C1	V1 C.G. decoupling	0·02
C2	V1 cathode by-pass	0·1
C3	V1 anode decoupling	0·1
C4	V2 hexode C.G. decoupling	0·02
C5	V2 hexode S.G.'s by-pass	0·1
C6	V2 cathode by-pass	0·1
C7	V2 osc. C.G. condenser	0·0001
C8	Oscillator S.W. series tracker	0·008
C9	V2 osc. anode decoupling	0·1
C9A*		4·0
C10	A.V.C. line decoupling	0·05
C11	V3 S.G. by-pass	0·1
C12	V3 cathode by-pass	0·1

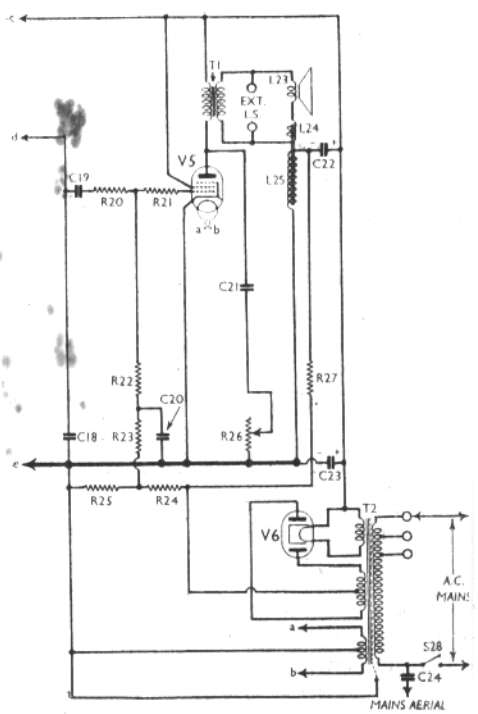


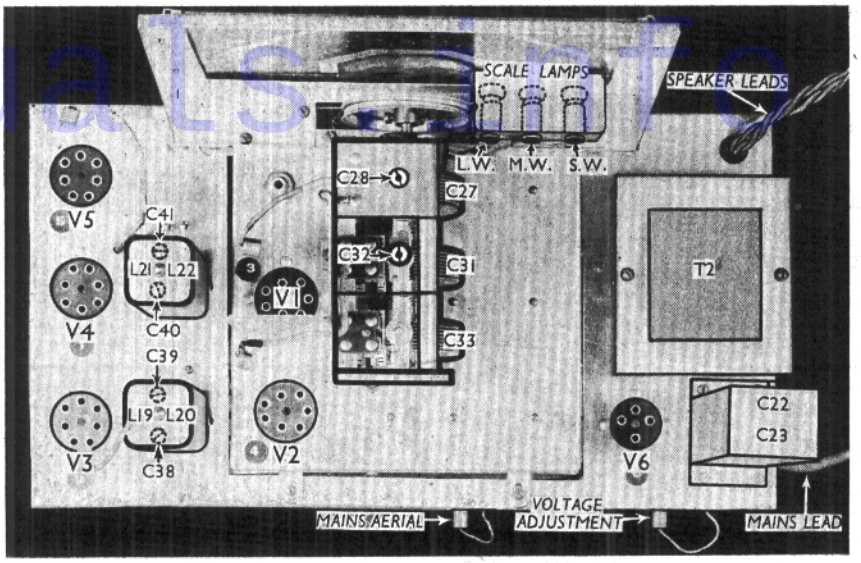
Circuit diagram of the Aerodyne 54 A.C. superhet, which includes one S.W. band. The diagram extends to the opposite page. The H.F. and oscillator coils are in nine units of two, and separate switching is employed. The I.F. transformers are iron-cored. There are one or two minor modifications in our chassis as compared with the makers' diagram, which presumably referred to early models only. The above diagram is drawn in accordance with our chassis.

CONDENSERS (Continued)		Values (μF)
C13	} I.F. by-passes ..	* 0·0001
C14	}	* 0·0001
C15	L.F. coupling to V4 triode ..	0·01
C16*	V4 cathode by-pass	25·0
C17	Coupling to V4 A.V.C. diode ..	0·0003
C18	V4 triode anode I.F. by-pass	0·0005
C19	V4 to V5 L.F. coupling ..	0·02
C20	V5 C.G. decoupling	1·0
C21	Part of T.C. filter	0·02
C22*	} H.T. smoothing ..	* 8·0
C23*	}	* 8·0
C24	Mains aerial coupling ..	0·0002
C25‡	Aerial circuit M.W. trimmer	0·000035
C26‡	Aerial circuit L.W. trimmer ..	0·000035
C27†	Aerial circuit tuning	0·00035
C28‡	Aerial circuit S.W. trimmer	—
C29‡	H.F. trans. M.W. trimmer ..	0·000035
C30‡	H.F. trans. L.W. trimmer ..	0·000035
C31†	H.F. trans. tuning	0·00035
C32‡	H.F. trans. S.W. trimmer ..	—
C33†	Oscillator circuit tuning ..	0·00035
C34‡	Osc. circuit M.W. trimmer ..	0·000035
C35‡	Osc. circuit L.W. trimmer ..	0·00011
C36‡	Osc. M.W. series tracker ..	0·0004
C37‡	Osc. L.W. series tracker ..	0·00014
C38‡	1st I.F. trans. pri. tuning ..	0·00022
C39‡	1st I.F. trans sec. tuning ..	0·00022
C40‡	2nd I.F. trans. pri. tuning ..	0·00022
C41‡	2nd I.F. trans. sec. tuning ..	0·00022

* Electrolytic. † Variable. ‡ Pre-set.

OTHER COMPONENTS		Approx. Values (ohms)
L1	Aerial S.W. coupling coil ..	0·4
L2	Aerial S.W. tuning coil ..	0·05
L3	Aerial M.W. coupling coil ..	21·0
L4	Aerial M.W. tuning coil ..	2·2
L5	Aerial L.W. coupling coil ..	75·0
L6	Aerial L.W. tuning coil ..	33·0
L7	H.F. trans S.W. primary ..	0·6
L8	H.F. trans. S.W. sec.	0·05
L9	H.F. trans. M.W. primary ..	0·4
L10	H.F. trans. M.W. sec.	2·2
L11	H.F. trans. L.W. primary ..	9·5
L12	H.F. trans. L.W. sec. ..	33·0
L13	Osc. S.W. tuning coil ..	0·05
L14	Osc. S.W. reaction coil ..	0·7
L15	Osc. M.W. tuning coil ..	2·8
L16	Osc. M.W. reaction coil ..	2·0
L17	Osc. L.W. tuning coil ..	6·0
L18	Osc. L.W. reaction coil ..	2·5
L19	} 1st I.F. trans. { Pri. ..	3·2
L20	} { Sec. ..	3·2
L21	} 2nd I.F. trans. { Pri. ..	3·2
L22	} { Sec. ..	3·2
L23	Speaker speech coil	1·6
L24	Hum neutralising coil. . ..	0·15





Plan view of the chassis. Note the three scale lamps, which are separately switched, and rotate behind the tuning scale.

OTHER COMPONENTS (Continued)		Approx. Values (ohms)
L25	Speaker field coil	1,500·0
T1	Speaker input trans. { Pri.	750·0
	{ Sec..	0·3
T2	Mains Trans. { Pri. total ..	18·0
	{ Heater sec. ..	0·05
	{ React. heat. sec.	0·1
	{ H.T. sec. total	325·0
S1-S24	Waveband switches	—
S25-27	Scale lamp switches	—
S28	Mains circuit switch, ganged R26	—

DISMANTLING THE SET

Removing Chassis.—If it is desired to remove the chassis from the cabinet, first remove the five knobs (pull off), free the speaker leads from the cleat on the sub-baffle and remove the four bolts (with washers and rubber washers) holding the chassis to the bottom of the cabinet. By tilting the back of the chassis upwards so that the tuning dial clears the sub-baffle, the chassis can now be withdrawn to the extent of the speaker, which is sufficient for normal purposes.

When replacing, do not forget the rubber washers between the chassis and the bottom of the cabinet. Also note that the knob for the wave-change switch is marked "S," "M" and "L," and as there is no flat on the spindle, care must be taken to see that it is replaced correctly.

Removing Speaker.—To remove the speaker from the cabinet, first unsolder the leads from the transformer and slacken the four clamps (with nuts and lock nuts). Now remove the two round-head wood screws and unsolder the leads going to the panel for the extension speaker.

When replacing, see that the transformer is on the right and connect the extension speaker leads to the bottom two tags on the panel carrying the speech coil leads. Connect the leads to the transformer as follows, numbering the tags from bottom to top :—1, black ; 2, blue ; 3, blue ; 4, red.

VALVE ANALYSIS

Valve voltages and currents given in the table below are those measured in our receiver when it was operating on mains of 220 V, using the 230 V tapping on the mains transformer. The volume control was at maximum and the receiver was tuned to the lowest wavelength on the medium band, but there was no signal input.

Voltages were measured on the 1,200 V scale of an Avometer, with chassis as negative.

Valve	Anode Voltage (V)	Anode Current (mA)	Screen Voltage (V)	Screen Current (mA)
V1 VP4B*	212	2·7	212	1·0
V2 TH4 ..	212	0·9	45	1·6
V3 VP4B ..	212	9·8	168	3·7
V4 TDD4 ..	120	4·0	—	—
V5 Pen4VA	190	27·0	212	2·3
V6 IW3 ..	270†	—	—	—

* Oscillator anode 80 V, 5·5mA.
† Each anode; A.C.

GENERAL NOTES

Switches.—S1-S24 are the waveband switches, in three rotary units, ganged together beneath the chassis. **S25-S27** are the scale lamp switches, in a further rotary unit, of a different type, ganged with the others, and situated just behind the front of the chassis. The units are indicated by numbers in circles and arrows in our under-chassis view, and separate diagrams are also given, showing the individual switches in each unit, as seen from the underside of the chassis in the direction of the arrows in the under-chassis view.

Note the extra moving contact in the centre of each unit which provides two extra switches in each unit. This contact is in each case connected by a flexible wire.

(*Continued overleaf*)

AERODYNE 54 — *Continued*

The table below gives the switch positions for the various control settings, O indicating open, and C, closed.

Switch	S.W.	M.W.	L.W.
S1	C	O	O
S2	O	C	O
S3	O	O	C
S4	C	O	O
S5	O	C	O
S6	C	O	O
S7	O	C	O
S8	O	O	C
S9	C	O	O
S10	O	C	O
S11	O	O	C
S12	C	O	O
S13	O	C	O
S14	C	O	O
S15	O	C	O
S16	O	O	C
S17	C	O	O
S18	O	C	O
S19	O	O	C
S20	C	O	O
S21	O	C	O
S22	C	O	O
S23	O	C	O
S24	O	O	C
S25	C	O	O
S26	O	C	O
S27	O	O	C

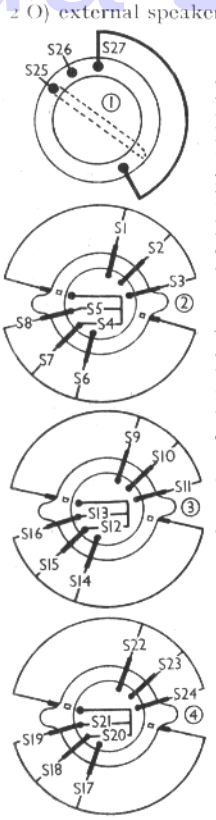
S28 is the Q.M.B. mains switch, ganged with the tone control **R26.**

Coils.—All the signal frequency and oscillator coils are in nine unscreened units beneath the chassis, each unit comprising two coils. All the M.W. and L.W. units have single trimmers mounted above them, as seen in the under-chassis view. In these units, the upper coil in each case is indicated by the word "Top." In the case of the **L1, L2**; **L7, L8** and **L13, L14** units, the thick enamelled wire windings are **L2, L8** and **L13** respectively.

The I.F. transformers, **L19, L20** and **L21, L22** are in two screened units on the chassis deck.

Scale Lamps.—These are three Osram M.E.S. types, rated at 3.5 V, 0·3 A. They are run from one half of the 4 V heater winding, and are switched by **S25, S26,** and **S27.** They are enclosed in a box which rotates with the gang condenser.

External Speaker.—Two sockets are provided on a panel attached to the rear of the cabinet for a low resistance (about 2 O) external speaker.



Diagrams of the four switch units, numbered as in the under-chassis view, and as seen looking in the directions of the arrows in that view.

Condensers C22, C23.—These are two 8 μF dry electrolytics, with separate leads. The red and yellow leads are joined together and form the positive connections. The black lead is the negative of **C22** and the blue the negative of **C23.**

Trimmers C36, C37.—These are adjustable through holes in the rear of the rubber mounted section of the chassis, **C36** being on the right, looking at the rear of the chassis.

Condenser C9A.—This is a 4μF dry electrolytic, connected in parallel with **C9.**

Chassis Divergencies.—Apart from **C9A,** there are one or two other differences in our chassis as compared with earlier models. The speaker field has a resistance of 1,500 O in our model, not 2,000 O. **R27** is an additional resistance for ballast purposes. **R25** is 40,000 O, not 60,000 O as in early models. **R21** is an additional **V5** grid stopper, of 100,000 O, not shown in the original diagram, while **R20** is 250,000 O, not 100,000 O.

CIRCUIT ALIGNMENT

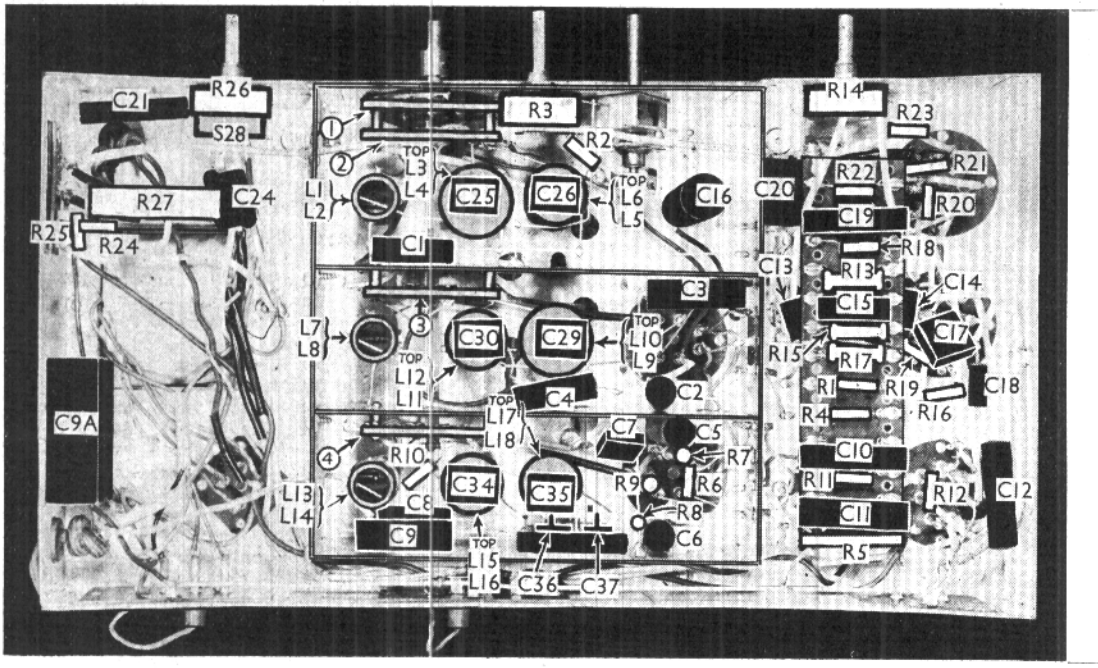
I.F. Stages.—The intermediate frequency is 465 KC/S. At the actory the I.F. transformers are aligned with a cathode ray oscilloscope to give a true band-pass response, but if they are found to be seriously out of alignment they may be dealt with in the usual way.

Feed in a 465 kC/S signal to the control grid of the hexode section of **V2**, and adjust **C41, C40, C39** and **C38** in that order for maximum output. If any attempt is made to secure a better band-pass effect this should be done very carefully, making only slight alterations to the trimmers. The oscillator should be swung through the range of about 461 to 469 KC/S, to see whether the output remains fairly constant.

H.F. and Oscillator Stages.—S.W.: Feed a 17 or 18 m. signal into the aerial and earth sockets, set scale indicator to this wavelength and adjust **C28** and **C32** for maximum output. Next tune to 31 m. and check alignment. If calibration is correct, but signal strength poor, adjust loose (top) turn on **L2** and **L8** until maximum output is secured. The receiver should then also be correct at 50 m.

M.W.: Feed in a 250 m. signal, tune to 250 m. on scale, and adjust **C34** for maximum output. Then adjust **C25** and **C29** similarly. Tune to 500 m., feed in a 500 m. signal, and adjust **C36** for maximum output, meanwhile rocking the gang slightly for optimum results.

L.W.: Feed in a 1,300 m. signal, tune to 1,300 m. on scale, and adjust **C35** for maximum output. Then adjust **C26** and **C30** similarly. Then tune to 1,900 m., feed in a 1,900 m. signal and adjust **C37** for maximum output. Return to 1,300 m., and readjust **C26** and **C30**.



Under-chassis view. Note the nine coil units, six having trimmers mounted above them. In these six units, the upper coil is indicated by the word "top." In the other three units, the thick enamelled wire windings are L2, L8 and L13respectively. C9A, R20 and R27 may not occur in early chassis.

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