'TRADER' SERVICE SHEETS

RECEIVER SERIES (NUMBER FOURTEEN)

AERODYNE "SWALLOW"

A.C. SUPERHET

THE Aerodyne "Swallow" is a 4-valve (plus rectifier) A.C. superhet fitted in a modern table consolette cabinet. It employs an octode frequency changer, while a double-diode triode gives A.V.C., and also a neat form of inter-station noise suppression. There is a band-pass input circuit to the frequency changer, and a single I.F. stage with tuned transformer couplings. The output valve is a large pentode. A variable control is provided for the image suppression coil.

CIRCUIT DESCRIPTION

Aerial input to coils **L1, L2,** which are coupled to capacity-coupled band-pass filter preceding octode frequency changer (**V1, Mullard metallised FC4**). Band-pass primary coils **L3, L4,** tuned by **C1**; secondary coils **L5, L6,** tuned by **C2**; coupling condensers, **C4, C35.** Image suppression by **L7** in **V1** cathode circuit. Oscillator grid coils **L8, L9,** tuned by **C3**; anode coil, **L10.** Electron coupling. One variable-mu pentode intermediate frequency amplifier (**V2, Mullard metallised VP4**) with tuned-primary, tuned secondary transformer couplings **L11, L12** and **L13, L14. I.F. 125 KC/S.** Diode second detector forming part of double diode triode (**V3, Mullard metallised TDD4**) with diode anodes in parallel. Rectified voltage developed across manual volume control **R11** is tapped off and fed to triode section by way of grid coupling condenser **C17.** Mean D.C. voltage fed back as G.B. to **V1** and **V2,** thus giving automatic volume control Diode anode biased slightly negatively in order to obtain a degree of inter-station noise suppression. R.C. coupling between **V3** and I.H.C. output pentode (**V4, Mullard Pen4VA**).

H.T. current supplied by I.H.C. full-wave rectifier (**V5, Mullard IW3**). Smoothing by speaker field **L15** and dry electrolytic condensers **C25, C26.**

DISMANTLING THE SET

Removing Chassis.—Pull off the three control knobs, which are held by internal springs pressing on flats on the spindles. *When replacing,* note that the knob marked "Volume" is at the bottom left, the one marked "M.W.—L.W." is at the bottom right, and the plain one at the top right.

Remove two wood screws and washers holding scale plate to the inside of the front of cabinet. Remove clip holding speaker leads to cabinet (one wood screw). Unsolder earth wire from tag on speaker transformer.

Remove four screws at underside of base of cabinet holding chassis. These screws have large metal and rubber washers. Chassis can now be withdrawn to extent of speaker leads. There is a loose metal shielding plate below the chassis, and between this and the cabinet are strips of sponge rubber.

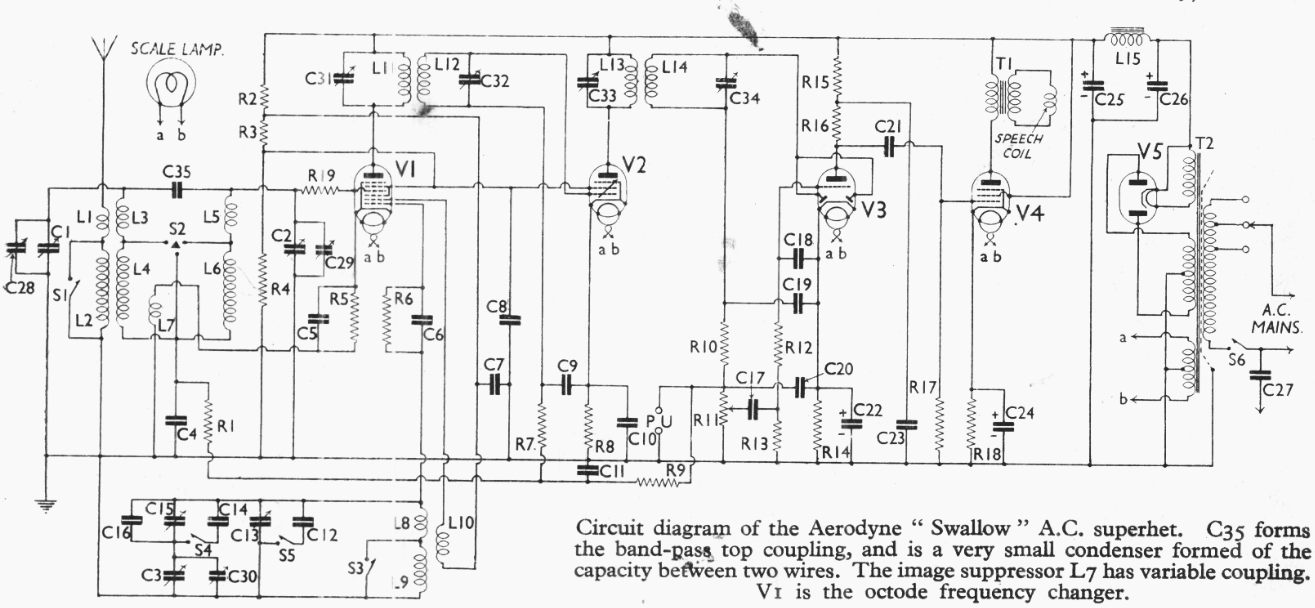
For normal service work the loud-speaker leads will not have to be removed, but where the chassis has to be taken right out it will be necessary to unsolder the three leads at the speaker terminal board. Note that the leads consist of a pair twisted, and a single one. The single lead goes to top tag on the board. The wires in the twisted pair are not coded externally, but have red and black rubber insulation under the braiding. In our sample the red lead was connected to the bottom tag, and the black lead to the middle one. Further identification is that the lead on the middle tag is that going to one of the rectifier valve heater sockets. Do not forget the speaker earth lead when replacing chassis.

Removing Speaker.—This is fixed to the front of the cabinet by four metal clamps, held by bolts with nuts and lock-nuts.

COMPONENTS AND VALUES

	Condensers	Values (μF)
C1	Band-pass pri. tuning	0·0005
C2	Band-pass sec. tuning	0·0005
C3	Oscillator tuning	0·0005
C4	Band-pass coupling	0·05
C5	V1 cathode by-pass	0·25
C6	Oscillator grid condenser ..	0·001
C7	Oscillator anode decoupling ..	0·1
C8	V1 and V2 S.G.'s by-pass ..	0·1
C9	V2 cont. grid decoupling ..	0·01
C10	V2 cathode by-pass	0·1
C11	A.V.C. circuit decoupling ..	0·01
C12	Osc. L.W. trimmer, fixed ..	0·00004
C13	Osc. M.W. trimmer, pre-set ..	0·00005
C14	Osc. tracking condensers, fixed	0·0012
C15	Osc. tracking condensers, pre-set	0·0003
C16	Osc. tracking condensers, fixed	0·0005
C17	V3 grid L.F. coupling	0·05
C18	V3 grid H.F. by-pass	0·0001
C19	Diode reservoir	0·0003
C20	H.F. by-pass	0·0001
C21	V4 grid L.F. coupling	0·1
C22	V3 cath. by-pass, electrolytic ..	25·0
C23	V3 anode decoupling	1·0
C24	V4 cath. by-pass, electrolytic ..	25·0
C25	H.T. smoothing, electrolytics	8·0
C26	H.T. smoothing, electrolytics	8·0
C27	Mains aerial condenser	0·0001
C28	Band-pass pri. trimmer, pre-set	—
C29	Band-pass sec. trimmer, pre-set ..	—
C30	Oscillator trimmer, pre-set ..	—
C31	1st I.F. trans. pri. tuning, pre-set	—
C32	1st I.F. trans. sec. tuning, pre-set	—
C33	2nd I.F. trans. pri. tuning, pre-set	—
C34	2nd I.F. trans. sec. tuning, pre-set	—
C35	Band-pass top-end coupling ..	Very low

(*Continued overleaf*)



Circuit diagram of the Aerodyne "Swallow" A.C. superhet. C35 forms the band-pass top coupling, and is a very small condenser formed of the capacity between two wires. The image suppressor L7 has variable coupling. V1 is the octode frequency changer.

C I C I

AERODYNE "SWALLOW" (cont'd)

	Resistances	Values (ohms)
R1	V1 cont. grid decoupling	500,000
R2	V1 and V2 S.G.'s pot. div.	10,000
R3		10,000
R4		30,000
R5	V1 fixed G.B. resistance ..	250
R6	Oscillator grid resistance ..	20,000
R7	V2 cont. grid decoupling ..	500,000
R8	V2 fixed G.B. resistance ..	200
R9	A.V.C. circuit decoupling ..	500,000
R10	Part of diode load	50,000
R11	Manual volume control ..	500,000
R12	V3 grid H.F. stopper	50,000
R13	V3 grid resistance	1,000,000
R14	V3 G.B. resistance	1,000
R15	V3 anode decoupling	10,000
R16	V3 anode resistance	75,000
R17	V4 grid resistance	500,000
R18	V4 G.B. resistance	500
R19	V1 grid circuit stabiliser ..	750

	Other Components		Values (ohms)
L1	Aerial coupling coils ..		0·7
L2			13·0
L3	Band-pass pri. coils ..		3·7
L4			14·0
L5	Band-pass sec. coils ..		3·7
L6			14·0
L7	Image rejection coil		Very Low
L8	Osc. tuning coils ..		3·0
L9			7·0
L10	Osc. reaction coil		0·7
L11	1st I.F. transformer ..	Pri.	118·0
L12		Sec.	118·0
L13	2nd I.F. transformer ..	Pri.	118·0
L14		Sec.	118·0
L15	Speaker field		2500·0
T1	Speaker input trans. ..	Pri.	1000·0
		Sec.	0·3
T2	Mains transformer	Pri. total	16·0
		Heater sec.	0·04
		Rect. fil. sec.	0·05
		H.T. sec.	315·0
S1-S5	Waveband switches, ganged ..		—
S6	Mains switch (ganged R11) ..		—

VALVE ANALYSIS

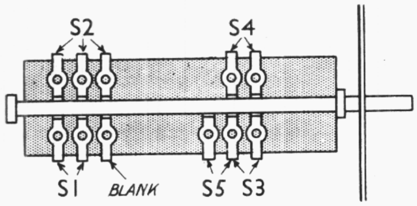
The values in the table below are average ones, measured with no signal input to the receiver. In the case of voltage measurements, these were taken with a high resistance meter connected between anode or screen, and chassis. Note that **V2** may be a Mullard VP4A, having a shorter grid base than the VP4. In this case the readings may be a little different from those given.

Valve	Anode Volts	Anode Current (mA)	Screen Volts	Screen Current (mA)
V1 FC4* ..	210	3·6	60	2·0
V2 VP4† ..	210	3·8	60	1·5
V3 TDD4	40	1·6	—	—
V4 Pen4VA	200	35·0	210	5·5
V5 IW3 ..	350‡	—	—	—

* Osc. anode (G2), 130 V. † Or VP4A.
‡ Each anode, A.C.

GENERAL NOTES

Switches.—S1—S5 are the ganged wavechange switches, mounted on the switch panel outlined in the under-chassis view, and also illustrated diagrammatically. **S1** and **S4** are of the two-point shorting type. **S2** is a 3-point



A diagrammatic sketch of the switch panel, showing the contacts. Note that S2 is a 3-point shorting type, while S3 and S5 are 2-point shorting types, having one common contact, the central one of the three.

shorting type. **S5** and **S6** are also of the single pole shorting type, but are arranged with the earth connection of each common, as shown in the diagram.

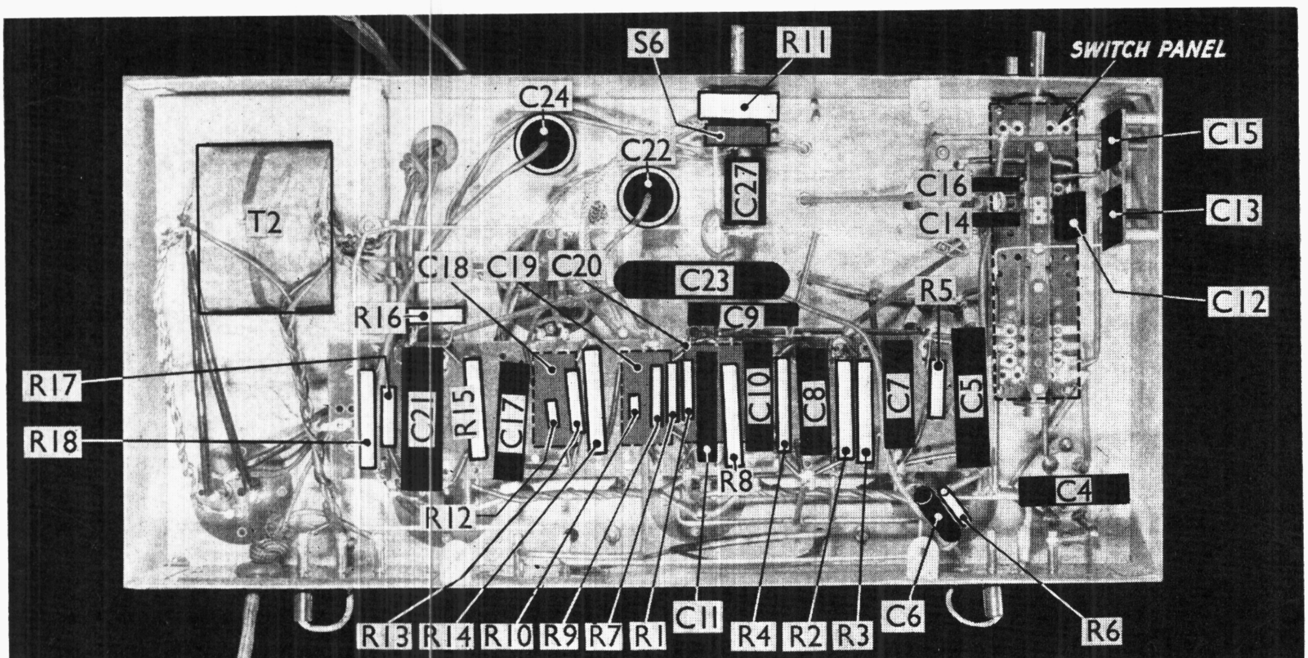
The switch positions on the M.W. and L.W. bands are given in the table below.

S6 is the Q.M.B. mains switch, ganged with the volume control **R11.**

Switch	M.W.	L.W.
S1	Closed	Open
S2	Closed	Open
S3	Closed	Open
S4	Closed	Open
S5	Open	Closed

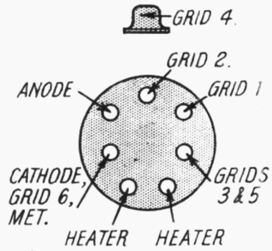
Frequency Changer Valve, V1.—This is the Mullard FC4, an indirectly heated octode, which acts as a combined 1st detector and oscillator. In many respects it is similar to a heptode, but in place of the tetrode 1st detector section, the octode includes a variable-mu H.F. pentode 1st detector section. The octode frequency changer differs from the triode-pentode in that, like the heptode, it employs electron coupling between the two sections, whereas the triode pentode requires external coupling coils.

The octode has the usual heater-cathode assembly, together with six grids and an anode. Starting from the innermost grid, Grid 1, this is the oscillator control grid, while Grid 2, the next in order, is the oscillator anode. The two (with the cathode) thus form a triode oscillator. Grid 3 acts as a screen between the oscillator and mixer portions of the valve. Grids 4, 5, 6 and the anode form a variable-mu H.F. pentode, with the suppressor grid (Grid 6) connected internally to the cathode. The



Under-chassis view. C18, C19, C20 are beneath the resistance-condenser panel. C13 and C15 are adjustable through holes in the side of the chassis. The switch panel is outlined in dotted lines, and is illustrated separately in diagrammatic form on this page. The metal base-plate of the chassis has, of course, been removed.

auxiliary grid (Grid 5) is connected internally to Grid 3. Between the screen (Grid 3) and the control grid of the pentode (Grid 4) exists the "virtual cathode" formed by a cloud of electrons which have been accelerated by Grid 3, at positive potential, and repelled by Grid 4, which is negative. The oscillator frequency is superimposed on the electron



Connections of the FC4 frequency changer (V1) looking at the underside of the base, or valve-holder. The functions of the various grids are explained in the text.

stream in the oscillator section, and the resulting pulsating cloud of electrons between Grid 3 and Grid 4 acts as a cathode for the pentode section. The signal input to Grid 4 modulates the electron stream in the pentode section, and thus the "mixing" is carried out.

The connections of the octode are given in the diagram. Note that the top cap, in the form of a metal thimble, is the control grid of the H.F. pentode section (signal input grid).

Condenser Drive.—This comprises an arrangement of pulleys and cord to give a slow-motion drive, and a vertical movement of the scale pointer. It can be seen fairly clearly in the plan view of the chassis. The device is simple and not likely to get out of order. If the cord stretches beyond the limit of the spiral springs inside condenser pulley, the cord can be shortened by tying another knot close to the existing one. Take care not to alter the position of the pointer, otherwise the calibration will be incorrect.

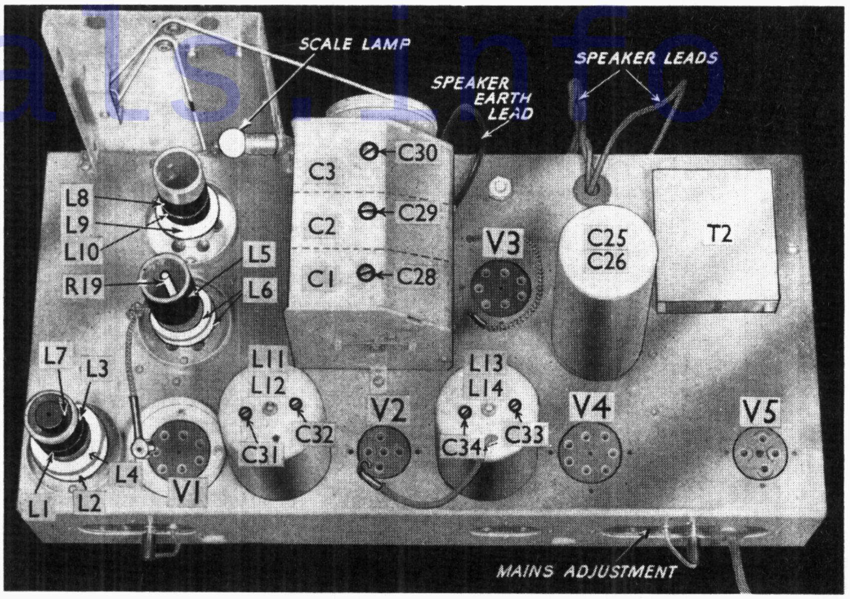
Image Suppressor, L7.—This is inside the first band-pass coil unit, and is operated by a screwed rod projecting through the top of the can. It comprises a single turn coil on a flat circular ebonite former, arranged to move up and down inside the main coil former. This varies the coupling between **L7** and **L3.**

Coil Screens.—Some of these are difficult to remove. In the case of the first band-pass coil, **L1, L2, L3, L4, L7,** it is held by one nut at the top, but it cannot be entirely freed until the leads to **L7** are unsoldered.

The second band-pass and the oscillator coil cans, containing **L5, L6, R19,** and **L8, L9, L10** respectively, are merely held by a single domed nut at the top of each.

The two I.F. coil cans are each held by a central domed nut, and two screwed studs at their bases projecting through the chassis, and fitted with nuts.

Grid Resistance, R19.—This is inside the former of the second band-pass coil, **L5, L6,** one end being connected to the



Plan view of the chassis. The valves, the screen of V1 and three of the coil screens have been removed. Note the image suppressor L7 shown *in situ*, though actually it is removed with the coil screen. R19 is inside the former of L5, L6. The form of the condenser drive will also be clear from the illustration.

flexible lead which emerges and goes to the top cap (control grid) of **V1.**

Electrolytic Condensers, C25, C26.—These two 8 μF units are fitted into a single large cylindrical can, mounted on top of the chassis. The can forms the common negative connection, and is in contact with the chassis.

C18, C19, C20.—These three mica condensers are mounted beneath the resistance-condenser panel, looking at the underside of the chassis.

Electrolytic Condensers C22 and C24.—These are two bias resistance by-pass condensers with capacities of 25 μF and peak working voltages of 25 V D.C. They are in small aluminium cans, mounted in an inverted position under the surface of the chassis. The cans are negative and the rubber covered wires emerging from the tops are positive.

Scale Lamp.—This is an Osram M.E.S. type, rated at 6.2 V, 0.3A. It screws into a holder behind the tuning scale.

Condenser C35.—This is a very small condenser, providing top coupling between the band-pass coils **L3, L4** and **L5, L6.** In our sample it is formed by the capacity between the two high H.F. potential leads to the tuning condensers **C1** and **C2,** these wires being drawn together to the requisite distance by an insulated wire clip. The condenser may also be formed by twisted insulated wires in some cases.

CIRCUIT ALIGNMENT

Owing to the condensers **C13** and **C15** being at the side of the chassis, this must be removed from the cabinet when trimming the set. First of all, set the signal generator to the intermediate frequency of 125 KC/S, and connect its output to the aerial and earth terminals of the chassis. Switch the set on to the L.W. range. Connect an output meter to the output of the set (across the speaker transformer primary or secondary, according to its voltage range).

Now adjust the trimmers of the I.F. transformers, **C31-C34,** until maximum output is shown by the output meter. It is probably best to adjust the trimmers in the order **C34, C33, C32, C31.**

After the I.F. transformers have been adjusted, switch the chassis to the M.W. range, set the signal generator to 200 metres, and tune the chassis so that the scale indicator points exactly to 200 m. Screw up **C28** and **C29** nearly to their maximum, and unscrew **C30** to its minimum. Screw **C15** (at the side of the chassis) almost to its maximum, and unscrew **C13.**

Now adjust **C28** and **C29** for maximum output, and screw in **C13** until maximum output is again indicated.

Now set the signal generator to 2,000 metres, switch the chassis to the L.W. range, and adjust the chassis tuning until 2,000 m. is exactly indicated on the scale.

Adjust **C15** to give maximum output.

Go back to the 200 m. setting, and attempt to improve the output by slight adjustments of **C28, C29,** and **C13.**

The ganging should now hold for both wavebands, and the sensitivity and scale reading should be checked at several other points on each waveband.

For second channel adjustment, set the signal generator at 350 m., and with a large signal input the second channel whistle will be found at about 500 m. on the scale.

The image suppressor **L7** should now be adjusted by the screwed rod projecting through the screen of the first band-pass coil until the note is at the minimum.

Important.—All the above operations should be carried out with the metal base plate of the chassis in position.