'TRADER' SERVICE SHEET

250 AERODYNE 73

BATTERY SUPERHET

THE Aerodyne 73 is a 5-valve battery superhet with a double triode Class B output valve. Provision is made for both a gramophone pick-up and an extension speaker, and there are two alternative aerial sockets.

CIRCUIT DESCRIPTION

Aerial input via **A1** (or **A2** with fixed series condenser **C1**) and coupling coils **L1, L2** to capacity-coupled band-pass filter. Primary coils **L3, L4** are tuned by **C22**; secondaries **L5, L6** by **C24.** Coupling by common capacity **C2** and small top couplings **C3, C4,** formed by twisted wires.

First valve (**V1, Mullard metallised FC2A**) is an octode operating as frequency changer with electron coupling. Oscillator grid coils **L7** (M.W.) and **L8** (L.W.) are tuned by **C26**; parallel trimming by **C27** (M.W.); series tracking by **C6** (fixed, M.W.) and **C8, C28, C29** (L.W.); anode reaction by coils **L9** (M.W.) and **L10** (L.W.).

Second valve (**V2, Mullard metallised VP2**) is a variable-mu R.F. pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C30, L11, L12, C31,** and **C32, L13, L14, C33.**

Intermediate frequency 125 KC/S.

Diode second detector is part of separate I.H.C. double diode valve (**V3, Cossor 220 DD or Mullard 2D2**). Audio frequency component in rectified output is developed across manual volume control **R6** and passed via coupling condenser **C14** and I.F. stopper **R15** to C.G. of triode driver valve (**V4, Cossor 220 PA**). Provision for connection of gramophone pick-up in grid circuit. Variable tone control by R.C. filter **R16, C17** in anode circuit.

Second diode of **V3**, fed from **L14** via condenser **C16**, provides D.C. potentials which are developed across load resistances **R9, R10, R11,** and fed back through decoupling circuits as G.B. to F.C. and I.F. valves, giving automatic volume control. Delay voltages are obtained from potentiometer **R7, R8** via **V3** cathode. Potentiometer **R12, R13** across G.B. battery provides a fixed minimum grid bias for **V2.**

Transformer coupling by **T1** between **V4** and positive drive Class B valve (**V5, Mullard PM2B**). Fixed tone correction in anode circuits by condensers **C19** and **C20** and R.C. filter **R17, C21** between anodes. Provision for connection of external speaker across secondary of internal speaker input transformer **T2.**

Dry electrolytic reservoir condenser **C15** is connected across H.T. supply but, with potentiometer **R7, R8,** is disconnected by switch **S6** when receiver is out of use.

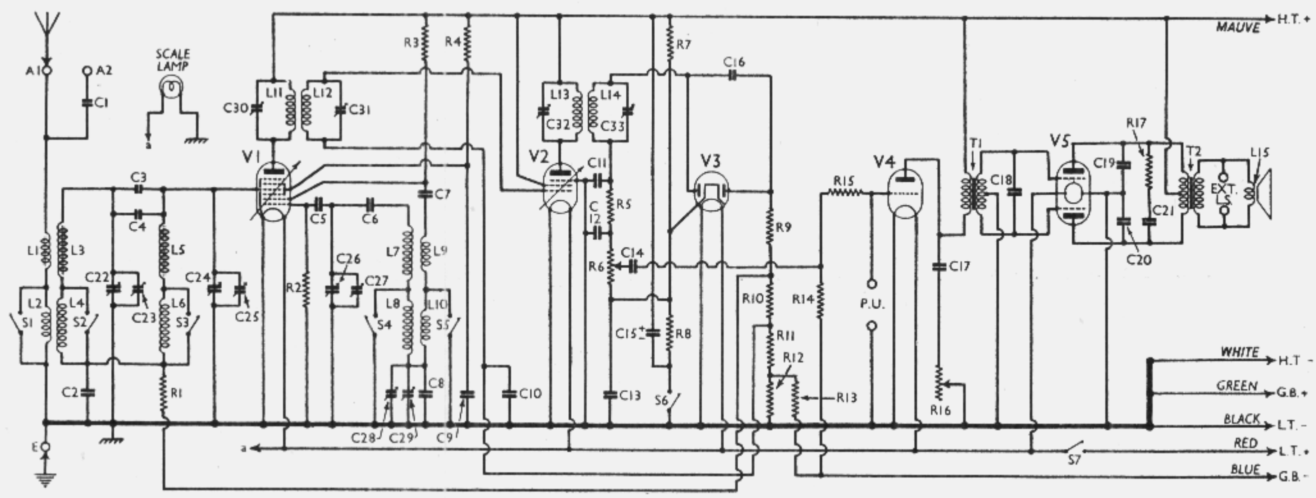
COMPONENTS AND VALUES

	RESISTANCES	Values (ohms)
R1	V1 pentode C.G. decoupling ..	500,000
R2	V1 oscillator C.G. resistance ..	50,000
R3	V1 osc. anode H.T. feed ..	40,000
R4	V1 S.G. H.T. feed	30,000
R5	I.F. stopper	50,000
R6	V3 signal diode load; manual volume control	500,000
R7	V3 cathode A.V.C. delay voltage potentiometer	1,000,000
R8		100,000
R9	V3 A.V.C. diode load resistances	500,000
R10		500,000
R11		100,000
R12	V2 fixed G.B. potentiometer	100,000
R13		1,000,000
R14	V4 C.G. resistance	1,000,000
R15	V4 C.G. I.F. stopper	100,000
R16	Variable tone control ..	50,000
R17	Fixed tone corrector	20,000

	CONDENSERS	Values (μF)
C1	A2 series aerial condenser ..	0·00005
C2	Band-pass bottom coupling ..	0·02
C3	Band-pass top coupling	Very low
C4		Very low
C5	V1 osc. C.G. condenser ..	0·0003
C6	Osc. circuit M.W. fixed tracker	0·0019
C7	V1 osc. anode coupling condenser	0·05
C8	Osc. circuit L.W. fixed tracker	0·0002
C9	V1 S.G. decoupling	0·1
C10	V2 C.G. decoupling	0·05
C11	I.F. by-passes ..	0·0003
C12		0·0001
C13	V4 C.G. decoupling	0·1
C14	A.F. coupling to V4	0·01
C15*	H.T. reservoir condenser ..	8·0
C16	V3 A.V.C. diode coupling ..	0·00005
C17	Part of T.C. circuit	0·05
C18	V5 C.G.'s circuit stabiliser ..	0·0005
C19	V5 anodes fixed tone correctors	0·002
C20		0·002
C21	Part of fixed R.C. tone filter	0·01
C22†	Band-pass pri. tuning.. ..	0·0005
C23‡	Band-pass pri. M.W. trimmer	—
C24†	Band-pass sec. tuning ..	0·0005
C25‡	Band-pass sec. M.W. trimmer	—
C26†	Oscillator circuit tuning ..	0·0005
C27‡	Osc. circuit M.W. trimmer ..	—
C28‡	Osc. circuit L.W. trackers	—
C29‡		—
C30‡	1st I.F. trans. pri. tuning ..	0·00014
C31‡	1st I.F. trans. sec. tuning ..	0·00007
C32‡	2nd I.F. trans. pri. tuning ..	0·00007
C33‡	2nd I.F. trans. sec. tuning ..	0·00014

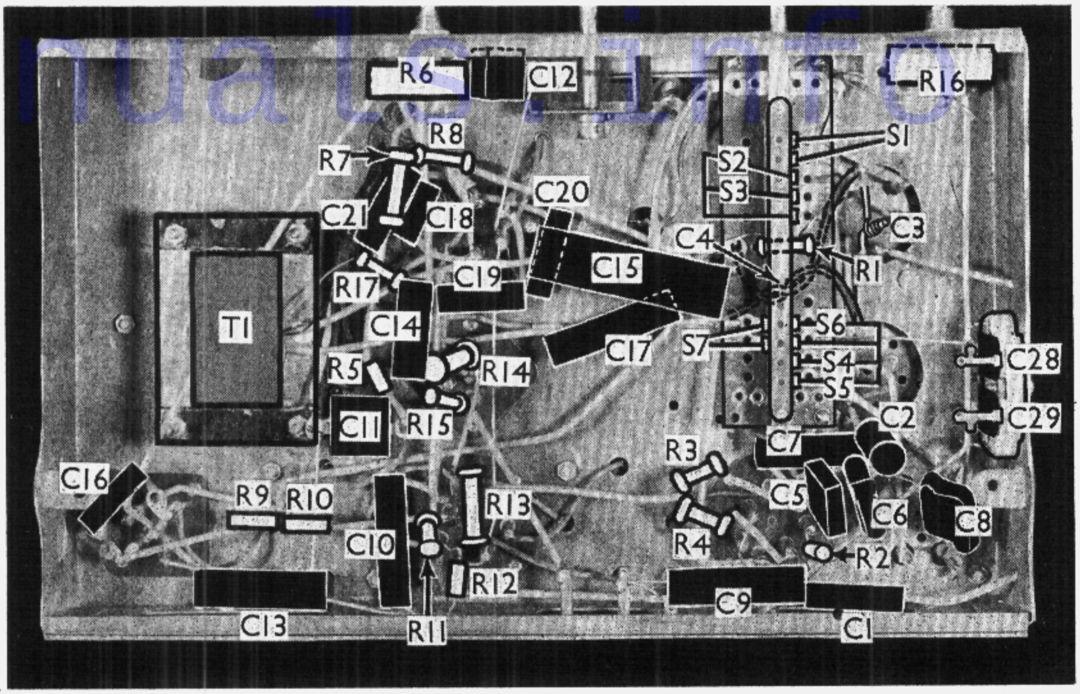
* Electrolytic. † Variable. ‡ Pre-set.

	OTHER COMPONENTS	Approx. Values (ohms)
L1	Aerial coupling coils ..	0·3
L2		16·0
L3	Band-pass primary coils	1·2
L4		13·5
L5	Band-pass secondary coils	1·2
L6		13·5
L7	Oscillator grid tuning coils	4·0
L8		15·5
L9	Oscillator anode reaction coils	9·5
L10		8·0



Circuit diagram of the Aerodyne 73 5-valve battery superhet. **C3** and **C4** are very small condensers, and only **C3** may occur in some chassis. Where **V1** is an FC2 (not FC2A) there will be an extra small condenser between oscillator grid and pentode control grid of **V1.**

Under-chassis view. All the switches are identified. Note that certain contacts are common to two or three switches. **C3** and **C4** are very small condensers formed of twisted wires. **C28** and **C29** are in parallel, and are adjusted through the side of the chassis.



OTHER COMPONENTS (*Continued*)		Approx. Values (ohms)
L11	1st I.F. trans. Pri. ..	75·0
L12	1st I.F. trans. Sec. ..	110·0
L13	2nd I.F. trans. Pri. ..	110·0
L14	2nd I.F. trans. Sec. ..	75·0
L15	Speaker speech coil	2·0
T1	Intervalve trans. Pri. ..	1,000·0
	Intervalve trans. Sec., total	230·0
T2	Speaker input trans. Pri., total	525·0
	Speaker input trans. Sec. ..	0·12
S1-S5	Waveband switches	—
S6	V3 cathode pot. and H.T. reservoir switch	—
S7	L.T. circuit switch	—

DISMANTLING THE SET

Removing Chassis.—To remove the chassis from the cabinet, remove the four knobs (pull off) and the four screws (with washers and rubber washers) holding the chassis to the bottom of the cabinet.

Next remove the two round-head wood screws holding the top of the tuning scale to the front of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads, which should be sufficient for normal purposes. *When replacing*, note that some of the knobs are marked with their purpose so that they must be placed on the correct spindles.

To free entirely, unsolder the speaker leads and, *when replacing*, connect them as follows, numbering the tags from bottom to top: 1 and 2, no external connection; 3, red; 4, white; 5, black.

Removing Speaker.—To remove the speaker from the cabinet, slacken the four clamps (nuts and lock nuts) holding it to the sub-baffle. *When replacing*, see that the transformer is on the right.

VALVE ANALYSIS

Valve voltages and currents given in the table (col. 2) are those measured in our receiver when it was operating with an H.T. battery reading 130 V on load and with 6 V G.B. 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 FC2A*	130	0·4	60	2·3
V2 VP2	130	1·8	130	0·6
V3 220DD	—	—	—	—
V4 220PA	130	1·8	—	—
V5 PM2B	130†	1·5†	—	—

* Oscillator anode (G2) 70 V, 1·4 mA.
† Each anode.

GENERAL NOTES

Switches.—**S1-S7** are the wavechange and battery switches, ganged in a single unit beneath the chassis. They are all indicated in our under-chassis view, certain contacts being common to two or more switches.

The table below gives the switch positions for the M.W. and L.W. control settings. A dash indicates open, and **C**, closed. In the "off" position all switches are open.

Switch	M.W.	L.W.
S1	C	—
S2	C	—
S3	C	—
S4	C	—
S5	C	—
S6	C	C
S7	C	C

Coils.—**L1-L4**; **L5, L6**; **L7-L10** and the I.F. transformers **L11, L12** and **L13, L14** are in five screened units. The I.F. transformer units contain their associated trimmers.

Scale Lamp.—This is an Osram M.E.S. type, rated at 3.5 V, 0.15 A.

External Speaker.—Two sockets are provided on the internal speaker terminal panel for a low resistance (2 O) external speaker.

Batteries.—L.T., 2 V, 50 AH accumulator cell; H.T., 130 V or 150 V medium power H.T. battery; G.B., 9 V G.B. battery.

Battery Leads and Voltages.—Black lead, spade tag, L.T. negative; red lead, spade tag, L.T. positive 2 V; white lead, black plug, H.T. negative; mauve lead and plug, H.T. positive, 130 V or 150 V; green lead and plug, G.B. positive; blue lead, yellow plug, G.B. negative 6 V (130 V H.T.) or 9 V (150 V H.T.).

Alternative Valves.—Early models may have a Mullard FC2 for **V1**, instead of an FC2A; a Mullard 2D2 for **V3**, instead of a Cossor 220 DD; and a Cossor 220 B for **V5**, instead of a Mullard PM2B.

Condensers C3, C4.—**C3** consists of a few turns of wire round another insulated wire, and has a very small capacity. **C4**, found in our chassis, consists of the flexible wires from the stator connections of **C22** and **C24** twisted together, and is a small extra capacity in parallel with **C3**. It may not occur in all chassis.

Chassis Divergencies.—The makers show a small condenser between **V1** pentode and oscillator control grids, formed by twisted wires. This is only used where **V1** is an FC2; it is not necessary with an FC2A, and is not shown in our circuit or chassis illustrations.

The bias potentiometer **R12, R13** may not be included in early models, **R11** being then returned direct to chassis.

The L.W. trackers **C8, C28** and **C29**, all in parallel, are shown as a single condenser of 0.0008μF capacity in the makers' diagram. In our case, **C8** is 0.0002μF fixed, and **C28** and **C29** are in a

Continued overleaf

MAINTENANCE PROBLEMS

Ganging Difficulties

ON quite a few occasions I have come across difficulty in ganging some of the Cossor straight sets, and after testing coils, etc., the trouble has been found to be due to the moving vanes of the condenser shifting towards the fixed vanes. The same trouble has also been experienced with a Pye Twin-triple and also with a K.B. 666.

It may at first be thought that this would make no difference, as the capacity lost on one side of the plates would be made up on the other, or what is lost on the swings is gained on the roundabouts. Actually this is not the case, as the roundabouts gain more than the swings lose.

The capacity of a condenser is inversely proportional to the distance between the plates. Take for example three of the plates of the condenser, two fixed and the other the moving, and assume that the distance is 1 mm. between each plate.

As stated, the capacity is proportional to $\frac{1}{d}$ or 1, since d is 1.

As there are two sides the total will be proportional to $1 + 1 = 2$.

Supposing now that the centre vane moves so that it is now only ½ mm. from one outer and 1½ mm. from the other. The capacity on one side is proportional to $\frac{1}{1\frac{1}{2}} = \frac{2}{3}$, and on the other side $\frac{1}{\frac{1}{2}} = 2$.

The total capacity is now proportional to $\frac{2}{3} + 2, = 2\frac{2}{3}$, or an increase of $33\frac{1}{3}\%$ in capacity.

This means that if the original capacity of the condenser was 0.0005 μF it would now be 0·00067 μF.

Centring the moving vanes between the fixed ones and adjusting the bearings so that shifting cannot take place will be found to cure the trouble.—W. A. DAVIES, NEWCASTLE-ON-TYNE.

Crackle Due to Loose Wire

A FERRANTI Lancastria came in for adjustment, with the complaint of fading out after a few minutes' working I located a faulty electrolytic screen by-pass condenser, and replaced it with a new one.

I had the set on test with the chassis removed and standing on its end—the leads from speaker to chassis make this set very awkward to handle as they are too short—and tuned to dance music. Subconsciously, with a screw-driver and a pair of pliers, I was lightly tapping the bench more or less in rhythm with the music, when a crackle from the speaker started to keep beat with my taps.

Here was more trouble, and completely unsuspected. The first suspects were valves with loose electrodes. Careful tapping with my finger showed the trouble to be in the valve regions, but valve replacements did not cure the trouble.

I then switched the set off and had a look round, but could not see anything wrong. With the set switched on again, I was almost certain the trouble was inside a coil can, proved by careful tapping.

With the set switched off, valves removed, chassis bottom uppermost, I shone a light inside the cans and eventually located a short end of tinned copper wire embedded in the wax of a small condenser at the top of the coil. This apparently was making contact with one of the condenser tags, and I was able to remove this wire with a wire hook.

The offending piece proved to be about one and a half inches long, and had evidently been cut off after soldering. —C. H. MERRETT, PLYMOUTH.

AERODYNE 73—*Continued*

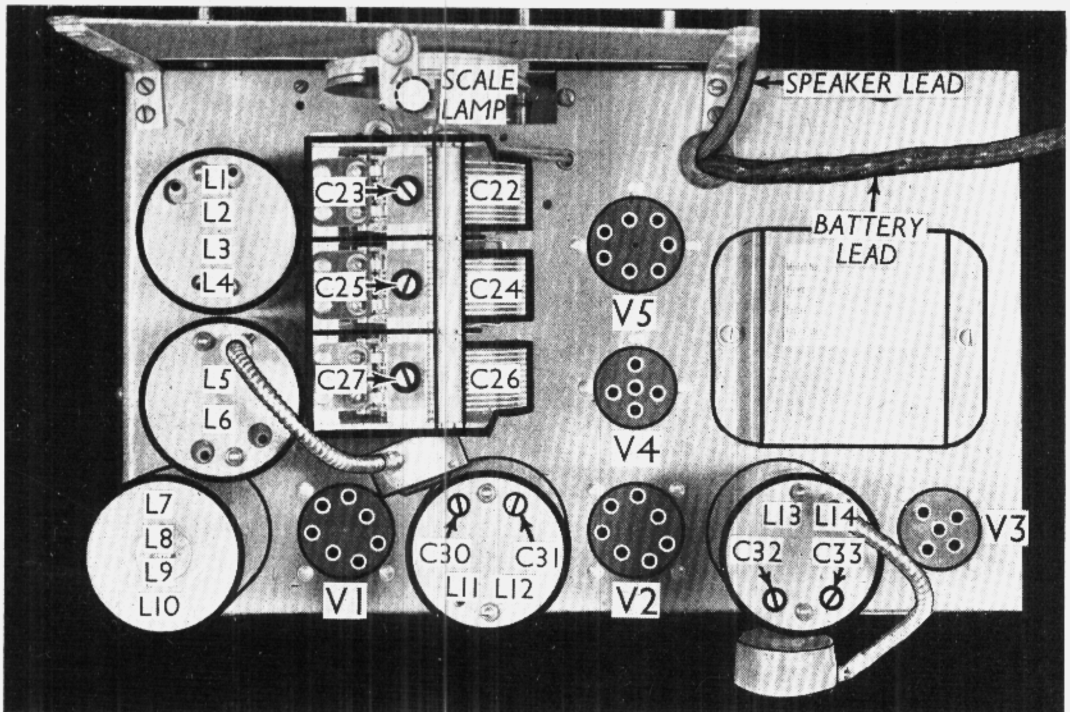
dual unit at the side of the chassis, and are parallelled to make up the requisite capacity.

CIRCUIT ALIGNMENT

I.F. Stages.—Connect signal generator to control grid (top cap) of **V1** and chassis, feed in a 125 KC/S signal, and adjust **C33, C32, C31** and **C30** in turn for maximum output.

R.F. and Oscillator Stages.—Switch set to M.W., and tune to 214 m. on scale. Connect signal generator to **A1** and **E** sockets, inject a 214 m. (1,400 KC/S) signal, and adjust **C27**, then **C25** and **C23** for maximum output.

Switch set to L.W., inject a 2,000 m. (150 KC/S) signal, tune it in, and adjust **C28** and **C29** for maximum output, rocking the gang for optimum results. **C28** and **C29** are in parallel, and it may be best to screw one of them up to maximum, making the tracking adjustment with the other. There is no point in adjusting both if the peak can be obtained on one of them.



Plan view of the Aerodyne 73 chassis. The layout is quite conventional. Most of the pre-set condensers can be seen in this view, the only others being the two parallelled trackers, which are reached through holes in the side of the chassis near the **L7-L10** coil unit.

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