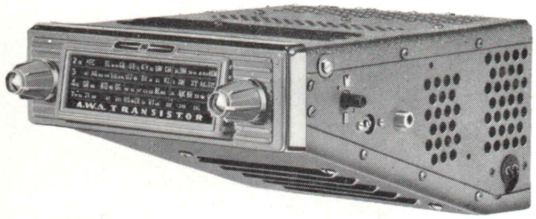
TECHNICAL INFORMATION AND SERVICE DATA

MANUFACTURERS AWA SUPERVISED SERVICE



A.W.A. Transistor Car Radios

MODELS 936 AND 937 SERIES

ISSUED BY
AMALGAMATED WIRELESS (AUSTRALASIA) LTD.

GENERAL DESCRIPTION

These models are five valve and one transistor, permeability tuned superheterodyne car radios designed for the reception of the Medium Wave Band. These receivers operate directly from a 12 volt battery without a vibrator high voltage supply, plugs being provided for either positive or negative earth operation.

Features of design include:

High gain I.F. transformers; permeability — tuning unit with high degree of electrical and mechanical stability; low drift oscillator circuit; transistor output stage; provision for external speaker.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

Frequency Range ..... 530-1650 Kc/s (566-182 Metres)

Intermediate Frequency ..... 455 Kc/s

Battery Voltage ..... 12 volts

Battery Consumption ..... 1.3/4 amps.

Loudspeaker

Model No.	Designed for	Speaker Size	Speaker Replacement Part No.
936A	Universal	5" built in	21606
937A	Universal	7"x5" External	21157
937B	Holden	9"x6" External	21158

Loudspeaker Choke 38198A

V.C. Impedance ..... 15 ohms at 400 c.p.s.

Undistorted Power Output ..... 2 watts

Controls: Manual Tuning, Volume, Tone, Power Switch.

Valve Complement:

Radiotron 12BL6	R.F. Amplifier
Radiotron 12AD6	Converter
Radiotron 12BL6	I.F. Amplifier
Radiotron 12F8	Detector, A.V.C., A.F. Amplifier
Radiotron 12K5	Audio Amplifier
AWV 2N301	Audio Output Power Transistor

The aerial assemblies designed for use with these models are as follows:—

No. 38218—Top Cowl/Fender (4')
No. 27649—Top Cowl/Fender (6')
No. 34860—Side Cowl

TWO SPEAKER OPERATION

The common practice of connecting a second speaker in parallel with the existing one can be tolerated in a receiver having a valve output stage.

Impedance matching is more important in a receiver having a transistor output stage and, in this case, any reduction in the correct loading of 15 ohms will result in considerable distortion.

If a second speaker is desired, it can be connected as shown in fig. 1, utilising a fader control.

For this purpose a special kit No. 34787 is available comprising a 6 inch 15 ohm speaker, baffle and fader control unit.

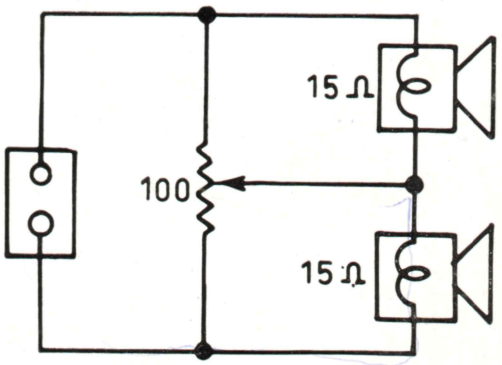


FIG. 1

SERVICE NOTES FOR TRANSISTOR RECEIVERS

1. General:

Whilst transistors, when used within the manufacturer's ratings, should give considerably longer life in service than vacuum tubes, the following precautions should be observed when servicing.

Transistors can be damaged when checking circuit continuity by the D.C. voltage present in an ohmmeter. To avoid damaging a transistor or getting a misleading resistance reading, the base and emitter leads to the power transistor should be disconnected. However, an ohmmeter may be used with care to test a power transistor as described later.

The use of screwdrivers as a means of checking high tension is not only a waste of time but can permanently damage the transistors. Similarly the indiscriminate shorting to ground of the valve grids and particularly the output transistor base as a means of checking whether certain stages are operating will almost certainly have drastic results.

Get in the habit of using a good quality voltmeter and a signal tracer or generator with a series capacitor for all fault finding.

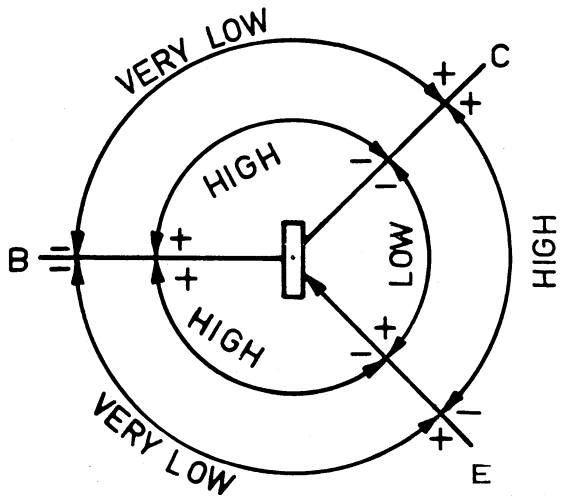
In general the power transistor should be the last component to be suspected in a faulty receiver. However, if a receiver is faulty due to an open circuit speaker voice coil, then the transistor should be checked for possible damage.

2. Power Transistor Test:

Power transistors can be readily checked for short or open circuit by carefully applying an ohmmeter check to determine the forward and reverse resistance of each junction as a diode.

An ohmmeter, either multimeter or vacuum tube type, having a small battery voltage of say 1.5 volts applied on the XI range must be used. Check this with a voltmeter before using, as a higher voltage will cause damage. Also check the polarity of the meter leads in the ohmmeter position. Often this is the reverse of the polarity when used as a voltmeter or ammeter.

Fig. 2 shows the correct resistance readings between the junctions of the 2N301 power transistor with the + and — signs indicating the correct polarity of the applied ohmmeter leads. The base and emitter leads should be disconnected from a mounted transistor.



RESISTANCE DIAGRAM
FIG 2

3. Bias Adjustment:

A variable control (R21) is provided to enable adjustment of the base — emitter bias voltage. This is set at the factory and should not need resetting unless a replacement transistor has been fitted. To set the bias, proceed as follows:

(a) Connect a voltmeter capable of accurately measuring 0.4 volts across the emitter resistance choke (R24).

(b) Adjust the battery input voltage to exactly 12.0 volts with the receiver operating. Adjust the bias control until the voltmeter reads exactly 0.4 volts.

or

(a) Connect an ammeter capable of accurately measuring 400 mA in the supply lead to the primary of the Output choke (L7).

(b) Adjust the battery input voltage to exactly 12.0 volts with the receiver operating.

(c) Adjust the bias control until the ammeter reads exactly 400 mA. In either case this will set the transistor collector current at 400 mA.

4. Transistor Mounting:

The transistor is thermally connected to, but electrically insulated from a heat sink mounted across the rear of the receiver.

If a transistor is removed from the heat sink or replaced for any reason, it is essential that the following method of mounting be carefully adopted.

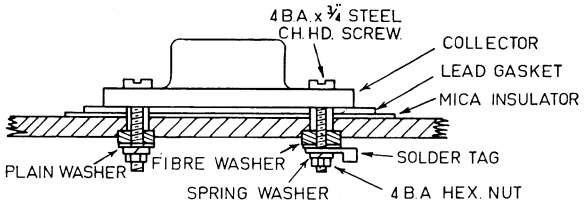


FIG 3

On no account must the old lead gasket and mica insulator be used again.

To mount the transistor, first liberally smear the relevant surfaces of the heat sink and the transistor, and both sides of the lead gasket and mica insulator with silicone grease. (MS4 silicone compound available in handy 8oz. tubes.)

Fit the fibre washers into the counter bored holes, place the mica insulator in position on the finned side followed by the lead gasket and finally the transistor.

Assemble the screws, plain washers, spring washers, solder tag and nuts as shown in fig. 3 and tighten the nuts progressively one at a time until the set is taken out of the spring washers.

Warning. Excessive tightening of these screws can distort the transistor base with the danger of rupture to the mica insulator.

Finally check with an ohmmeter the insulation between the collector (mounting flange) of the transistor and the heat sink (greater than 1 megohm).

ALIGNMENT PROCEDURE

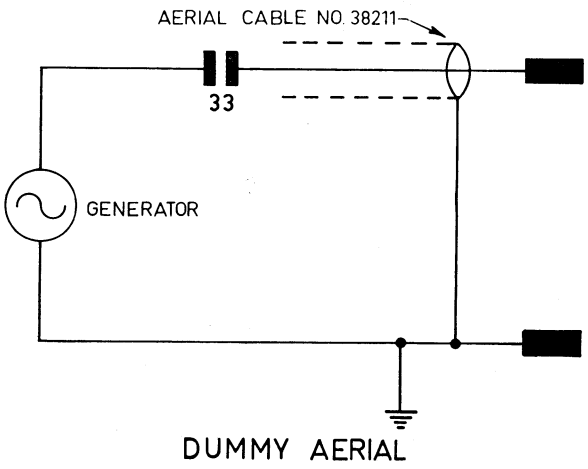
Manufacturer's Setting of Adjustments:

The receiver is tested by the manufacturer with precision instruments and all adjusting screws, except the aerial trimmer, are sealed. Re-alignment should be necessary only when components in tuned circuits are repaired or replaced, or when it is found that the seals over the adjusting screws have been broken.

It is especially important that the adjustments should not be altered unless in association with the correct testing instruments listed below.

For all alignment operations connect the "low" side of the signal generator to the receiver chassis, and keep the generator output as low as possible to avoid A.V.C. action.

When the generator is connected to the aerial terminal, use the dummy aerial as shown in the diagram.



Testing Instruments:

(1) A.W.A. Junior Signal Generator, Type 2R7003, or
(2) A.W.A. Modulated Oscillator, Series J6726.

If the modulated oscillator is used, connect a 0.25 megohm non-inductive resistor across the output terminals.

(3) A.W.A. Output Meter, type 2M8832 or
(4) Marconi Receiver Tester, type TF888/3 (combined Signal Generator and Output Meter).

ALIGNMENT TABLE

NOTE: The replacement of any valve in the receiver will not affect the alignment of the tuned circuits in any way providing the recommended Radiotron type is used.

A General:

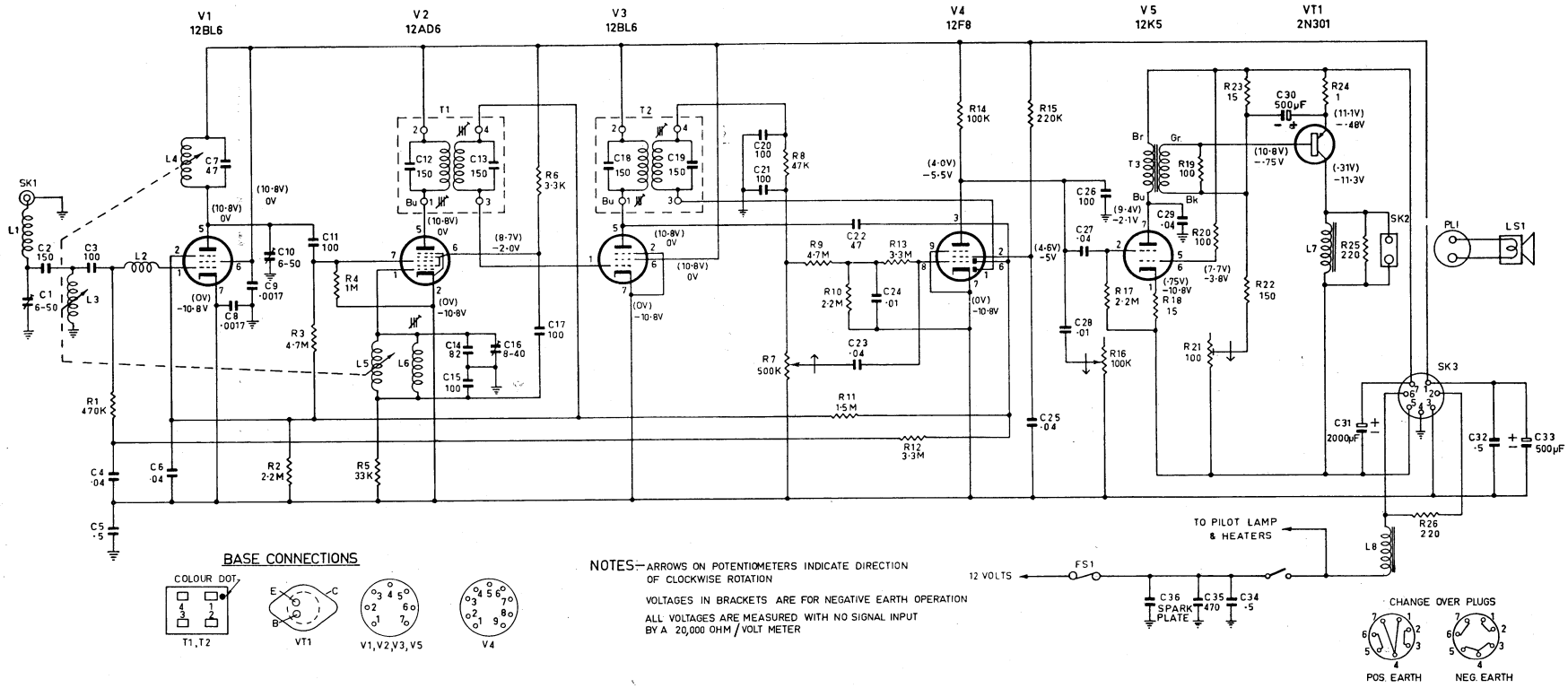
Alignment Order	Connect "High" side of Generator to:	Tune Generator to:	Tune Receiver to:	Adjust for maximum Peak Output:
1	12AD6 Pin 7*	455 Kc/s.	L.F. Limit	T2 Sec. Core (Top)
2	12AD6 Pin 7*	455 Kc/s.	L.F. Limit	T2 Prim. Core (Bottom)
3	12AD6 Pin 7*	455 Kc/s.	L.F. Limit	T1 Sec. Core (Top)
4	12AD6 Pin 7*	455 Kc/s.	L.F. Limit	T1 Prim. Core (Bottom)
	Repeat the above adjustments until maximum output is obtained.			
5	Aerial Terminal via Dummy Aerial.	1650 Kc/s. (accurate)	H.F. Limit	H.F. Osc. Adj. (C16)
6	Aerial Terminal via Dummy Aerial.	1500 Kc/s.	1500 Kc/s.	H.F. R.F. Adj. (C10)
7	Aerial Terminal via Dummy Aerial.	1500 Kc/s.	1500 Kc/s.	H.F. Aer. Adj. (C1)
8	Aerial Terminal via Dummy Aerial.	600 Kc/s.	600 Kc/s.	L.F. Osc. Padder Adj. (L6)§
	Repeat adjustments 5, 6, 7 and 8 until no further adjustment is possible.			
9	**Calibration Alignment:** With the receiver connected to an aerial, the dial scale calibration should now be checked and corrected if necessary. The pointer can be moved relative to the dial scale by turning the eccentric stud located underneath the rear end of the pointer arm.			

* A 0.01 μF capacitor should be connected in series with the high side of the test instrument.
§ Rock the tuning control back and forth through the signal.

B. Tuner Alignment:

The adjustment of the three tuning cores will be necessary only if a tuning core or coil has been replaced. To make this adjustment proceed as follows:

(1) Adjust the manual drive control until a 0.560" gauge can be slipped into the left rear slot in front of the carriage lug. Use the 0.560" gauge in the manner of a feeler gauge.
(2) Tune the signal generator accurately to 1000 Kc/s. and connect it to the aerial terminal via the dummy aerial.
(3) Adjust the oscillator core, then the aerial and R.F. cores until the maximum output is obtained.
(4) Proceed with adjustments 5, 6 and 7 in Table "A" and then repeat adjustment 3 above, if necessary.
(5) Seal the tuning core studs.


V1 12BL6
V2 12AD6
V3 12BL6
V4 12F8
V5 12K5
VT1 2N301
SK1
L1
L2
L3
L4
L5
L6
L7
L8
T1
T2
T3
C1 6-50
C2 150
C3 100
C4 .04
C5 .5
C6 .04
C7 47
C8 .0017
C9 .0017
C10 6-50
C11 100
C12 150
C13 150
C14 82
C15 100
C16 8-40
C17 100
C18 150
C19 150
C20 100
C21 100
C22 47
C23 .04
C24 .01
C25 .04
C26 100
C27 .04
C28 .01
C29 .04
C30 500µF
C31 2000µF
C32 .5
C33 500µF
C34 .5
C35 470
C36 SPARK PLATE
R1 470K
R2 2·2M
R3 4·7M
R4 1M
R5 33K
R6 3·3K
R7 500K
R8 47K
R9 4·7M
R10 2·2M
R11 1·5M
R12 3·3M
R13 3·3M
R14 100K
R15 220K
R16 100K
R17 2·2M
R18 15
R19 100
R20 100
R21 100
R22 150
R23 15
R24 1
R25 220
R26 220
SK2
SK3
PL1
LS1
FS1
12 VOLTS
TO PILOT LAMP & HEATERS
(10·8V) 0V
(OV) −10·8V
(8·7V) −2·0V
(4·0V) −5·5V
(4·6V) −5V
(9·4V) −2·1V
(7·7V) −3·8V
(−75V) −10·8V
(11·1V) −·48V
(10·8V) −·75V
(−31V) −11·3V
BASE CONNECTIONS
COLOUR DOT
T1, T2
VT1
V1, V2, V3, V5
V4
NOTES:— ARROWS ON POTENTIOMETERS INDICATE DIRECTION OF CLOCKWISE ROTATION
VOLTAGES IN BRACKETS ARE FOR NEGATIVE EARTH OPERATION
ALL VOLTAGES ARE MEASURED WITH NO SIGNAL INPUT BY A 20,000 OHM / VOLT METER
CHANGE OVER PLUGS
POS. EARTH
NEG. EARTH

CIRCUIT CODE — RADIOLA 936 - 937 SERIES

Code No.	Description	Part No.	Fig. No.	Location
	RESISTORS			
	All Resistors ± 10% Carbon unless otherwise stated			
R1	470K ohms ½ watt	601840	5	C10
R2	2.2 Megohms ½ watt	601940	5	L6
R3	4.7 Megohms ½ watt	618936	5	K9
R4	1 Megohm ½ watt	601890	5	K9
R5	33K ohms ½ watt	614455	5	H6
R6	3.3K ohms ½ watt	601290	5	K7
R7	500K ohms Log Carbon Volume W/S	620572	5	M15
R8	47K ohms ½ watt	614956	5	M8
R9	4.7 Megohms ½ watt	618936	5	M13
R10	2.2 Megohms ½ watt	601940	5	M11
R11	1.5 Megohms ½ watt	618258	5	M8
R12	3.3 Megohms ± 20% ½ watt	618710	5	M9
R13	3.3 Megohms ± 20% ½ watt	618710	5	N12
R14	100K ohms ± 20% ½ watt	616009	5	E6
R15	220K ohms ± 20% ½ watt	616719	5	E6
R16	100K ohms Log Carbon Tone	620419	5	B13
R17	2.2 Megohms ½ watt	601940	5	D7
R18	15 ohms ½ watt W.W.	602008	5	D7
R19	100 ohms ½ watt	601070	4	E14
R20	100 ohms ½ watt	601070	4	H14
R21	100 ohms Bias Adjustment	38583	5	G4
R22	150 ohms 1 watt	604673	5	F3
R23	15 ohms ½ watt	602008	4	F14
R24	1 ohms ± 5% W.W.	206234	4	H15
R25	220 ohms ½ watt	601091	4	B15
R26	220 ohms ½ watt	601091	4	K12
	CAPACITORS			
C1	6-50 pF trimmer (Aerial)	31954	4	A6
C2	150 pF ± 5% 500 volt working mica	222696	4	B8
C3	100 pF ± 20% 600V working Styroseal	222225	4	B8
C4	0.04 μF ± 20% 200 VW AEE W99	228750	5	L10
C5	0.5 μF ± 20% 200 VW Hunts W48	229116	4	L7
C6	0.04 μF ± 20% 200 VW AEE W99	228750	5	L5
C7	47 pF ± 5% N750 tubular	220554	5	D8
C8	0.0017 μF Hi-k Disc.	222259	5	B7
C9	0.0017 μF Hi-k Disc.			
C10	6-50 pF trimmer (R.F.)	31954	4	H8
C11	100 pF ± 20% 600 VW Styroseal	222225	5	J9
C12	150 pF ± 5% silvered mica (in 1st I.F.)	226618	5	K6
C13	150 pF ± 5% silvered mica (in 1st I.F.)	226618	5	K7
C14	82 pF ± 5% N750 tubular	222128	5	J9
C15	100 pF ± 5% NPO tubular	221603	5	F7

Code No.	Description	Part No.	Fig. No.	Location
	CAPACITORS			
C16	8-40 pF trimmer (Osc.)	231185	5	G7
C17	100 pF ± 20% 600 VW Styroseal	222225	5	J8
C18	150 pF ± 5% silvered mica (in 2nd I.F.)	226618	5	M8
C19	150 pF ± 5% silvered mica (in 2nd I.F.)	226618	5	M9
C20	100 pF + 100%-0% K5000 bead	221605	5	N9
C21	100 pF + 100%-0% K5000 bead	221605	5	M8
C22	47 pF ± 5% N750 tubular	220554	5	N8
C23	0.04 μF ± 20% 200 VW AEE W99	228750	5	M13
C24	0.01 μF ± 20% 200 VW AEE W99	228609	5	M11
C25	0.04 μF ± 20% 200 VW AEE W99	228750	5	H6
C26	100 pF + 100% - 0% K5000 bead	221605	5	N11
C27	0.04 μF ± 20% 200 VW AEE W99	228750	5	E6
C28	0.01 μF ± 20% 200 VW AEE W99	228609	5	N12
C29	0.04 μF ± 20% 200 VW AEE W99	228750	5	B6
C30	500 μF 3 VW Electrolytic	229854	4	F15
C31	2000 μF 18 VW Electrolytic	229923	4	K15
C32	0.5 μF ± 20% VW Hunts W48	229116	4	K15
C33	500 μF 18 VW Electrolytic	229853	4	K14
C34	0.5 μF ± 20% 200 VW Hunts W48	229116	4	L7
C35	470 pF + 100 % - 0% K5000 disc	224201	4	L12
C36	Spark Plate	35988	4	M10
	INDUCTORS			
L1	Aerial Choke	34336	4	B8
L2	R.F. Choke	206234	5	B9
L3	Tuning Coil, Aerial		4	E7
L4	Tuning Coil, R.F. } Assembly	35005	4	H7
L5	Tuning Coil, Osc.		4	F7
L6	Oscillator Padder Coil	35471	5	J7
L7	Output Choke	38198A	4	C14
L8	Choke	38133A	4	J13
	TRANSFORMERS			
T1	1st I.F. Transformer	35458	5	K6
T2	2nd I.F. Transformer	35458	5	M8
T3	Coupling Transformer	38130A	5	C4
	VALVES			
V1	Radiotron 12BL6		5	C8
V2	Radiotron 12AD6		5	K8
V3	Radiotron 12BL6		5	M6
V4	Radiotron 12F8		5	M10
V5	Radiotron 12K5		5	C6
VT1	AWV 2N301 Transistor		5	G2

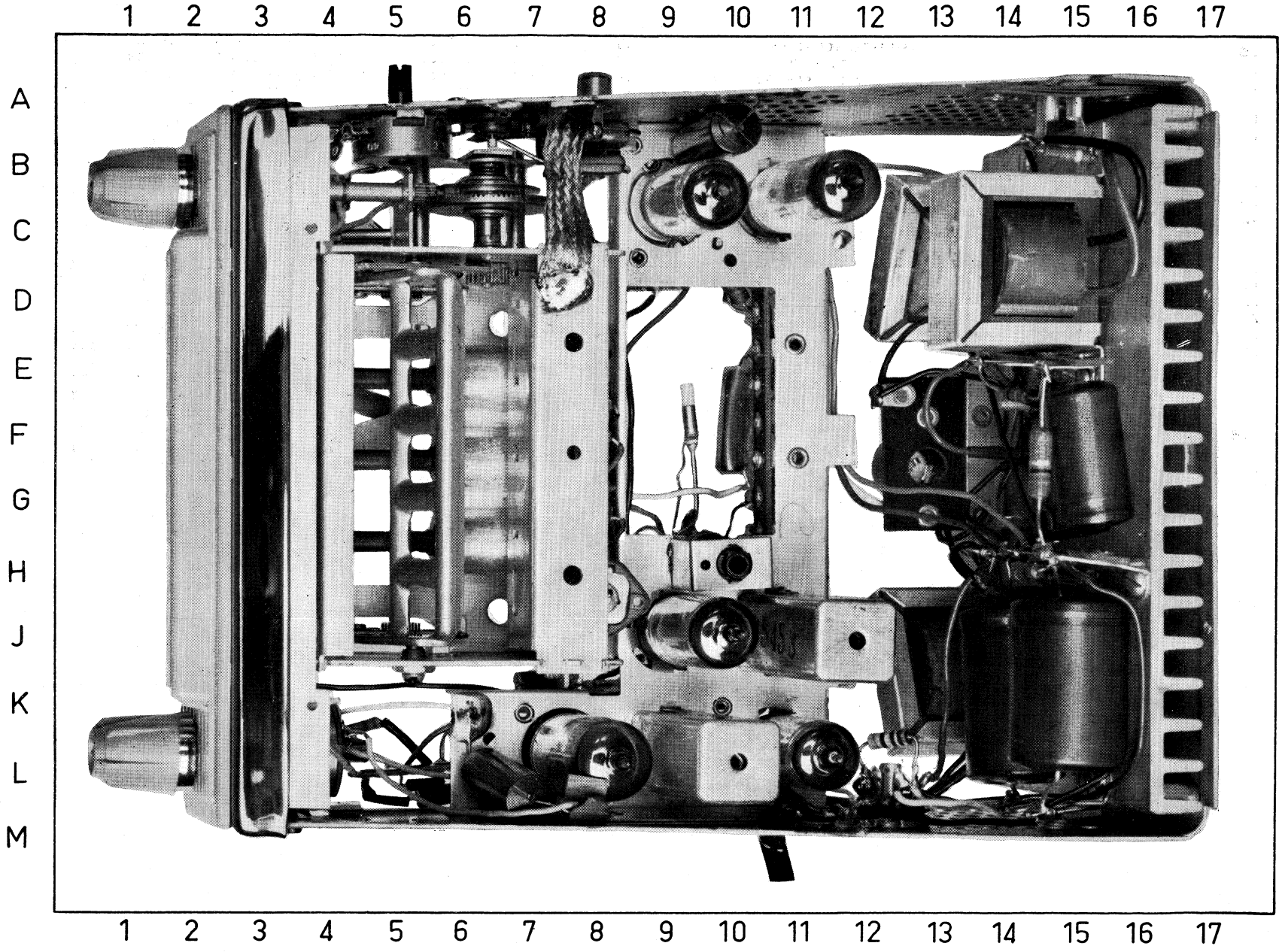


FIG. 4

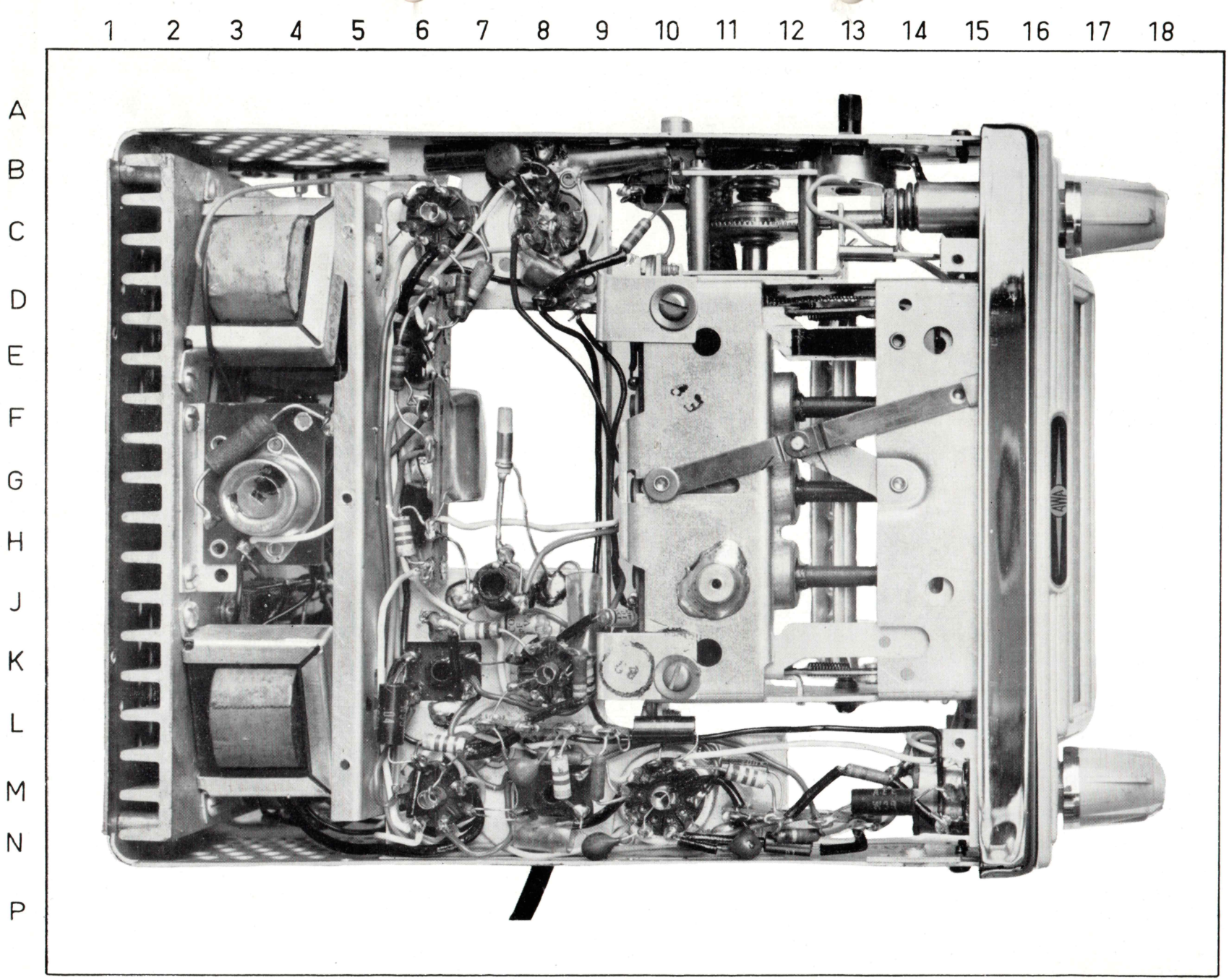


FIG. 5

D.C. RESISTANCE OF WINDINGS

Winding	D.C. Resistance in ohms
Aerial Choke L1	1
R.F. Choke L2	1
Tuning Coils L3, L4 and L5	9
Oscillator Padder Coil L6	19
Output Choke L7	1.3
Choke L8	*
I.F. Transformer Winding T1 and T2	16
Coupling Transformer T3:	
Primary	170
Secondary	10

* Less than 1 ohm.

The above readings were taken on a standard chassis, but substitution of materials during manufacture may cause variations and it should not be assumed that a component is faulty if slightly different reading is obtained.

MECHANICAL REPLACEMENT PARTS

Item	Part No.	Code
Tuning Unit:		
Crown Gear Bush Assembly	38579	
Drive Shaft Bushing	35973	
Drive Spindle Assembly	35799	
Manual Drive Bracket	35961	
Pointer Assembly	35969	
Tuning Unit Assembly	38578	
Slug, Tuning	35102	
Chassis:		
Gasket, Transistor Mounting	38569	
Insulator, Transistor	38568	
Label, Valve Replacement	37689	
Lamp Holder	32804	
Power Cable, Female	38701	
Power Cable, Male	38700	
Socket Aerial		793249
Socket 9 Pin		794568
Socket 7 Pin		794579
Socket Speaker		793051
Miscellaneous:		
Cable Assembly Aerial	38211	
Escutcheon Assembly Eastern	38564A	
Escutcheon Assembly Western	38564B	
Knob Assembly	38565	
Strap, Mounting	24571	
Aerial, Top Cowl:		
Bush Insulator	27660	
Earth Connector	27674	
Gasket, Shallow	24584	
Gasket, Steep	25335	
Insulator, Stand-off	25338	
Stud Assembly	27695	
Telescopic Section Assembly, 4'	38219	
Telescopic Section Assembly, 6'	27650	
Washer, Bakelite	27699	
Aerial, Side Cowl:		
Bush, Threaded	34862	
Clamp	24582	
Contact Screw	34861	
Gasket, Flat	24591	
Gasket, Tapered	24584	
Insulator, Bottom Stand-off	24581	
Insulator, Top Stand-off	24582	
Telescopic Section Assembly	25242	
Washer, Bakelite	24583	