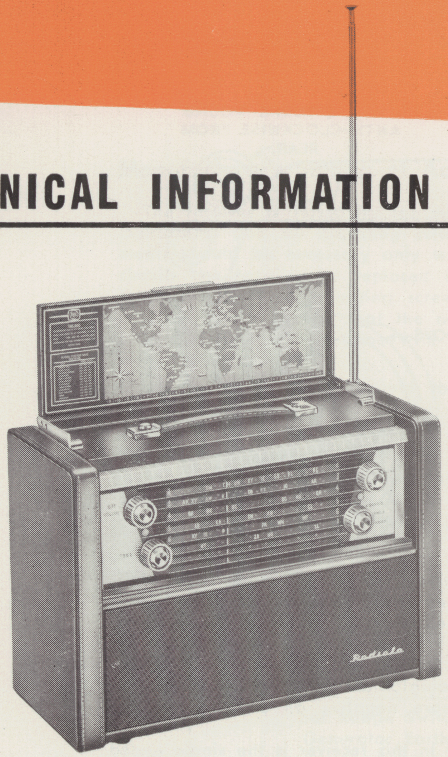
TECHNICAL INFORMATION AND SERVICE DATA

MANUFACTURERS AWA SUPERVISED SERVICE



Radiola
3 Band Transistor Portable
Model 893-P

ISSUED BY
AMALGAMATED WIRELESS (AUSTRALASIA) LTD.

GENERAL DESCRIPTION

Model 893-P is an eight transistor, battery operated, three-band superheterodyne portable receiver designed for reception of Medium and Short Wave Bands.

Features of design include:

Ferrite Rod Aerial; Telescopic Aerial, provision for switching to external aerial; R.F. stage; high gain I.F. transformers; Autodyne converter; provision for Phono use; single ended push-pull output stage incorporating feedback; high sensitivity 7" x 5" elliptical speaker; long economical battery life.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

Frequency Ranges .... 530-1710 Kc/s (566-175 Metres)
1.9-6.1 Mc/s (158-49 Metres)
5.9-18 Mc/s (51-16 Metres)

Intermediate Frequency .... 455 Kc/s
Battery Complement ...... 2 x 6V Batteries Eveready 509 or Diamond 3509

Battery Consumption .... Zero Output = 12 mA
Full Output = 65 mA

Transistor Complement:

AWV 2N370	R.F. Amplifier
AWV 2N370	Converter
AWV 2N218	1st I.F. Amplifier
AWV 2N218	2nd I.F. Amplifier
AWV 2N218	1st Audio Amplifier
AWV 2N408	Driver
AWV 2N270	Output
AWV 2N270	Output

Four GEX 34 Crystal Diodes are also used as (1) 2 Overload Diodes, (2) Converter Clamp, (3) Detector.

Loudspeaker:
7" x 5" Permanent Magnet No. 21601.
V.C. Impedance, 45 ohms at 400 c.p.s.

Undistorted Power Output .... 400 mW

Controls:

Tuning Control (incl. Fine Tuning); ON/OFF Volume; Tone; Range Switch; Aerial Switch; Phono-Radio Switch; (the last two being located at the rear of the cabinet).

Chassis Removal:

Remove the cabinet back.

Remove the screw holding the battery pack and remove the pack.

The chassis is held in position by three screws, two at the base and one above the Aerial and Phono-Radio switches at the rear of the cabinet. Latter chassis will have an additional mounting screw near the centre of the front plate. Remove these screws.

Disconnect the telescopic aerial.

Slide the chassis out of the cabinet, taking care that the ferrite rod does not foul on the cabinet back retaining bracket.

Installation of the chassis is the reverse of the above procedure.

Service Notes for Transistor Receivers:

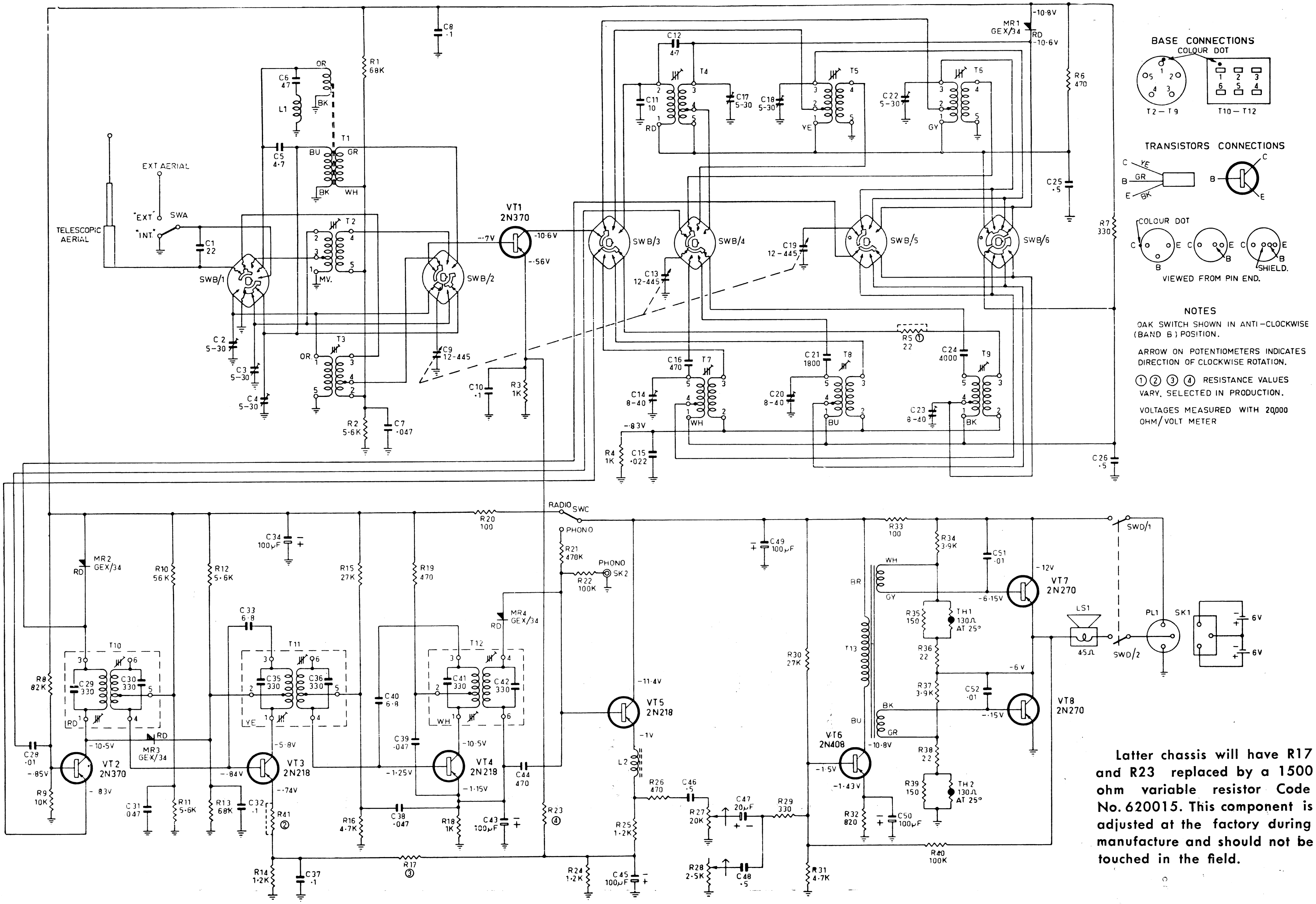
Whilst transistors, when used within the manufacturer's ratings, should give considerably longer life in service than vacuum tubes, the following precautions should be observed when servicing receivers to prevent damage to transistors.

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 transistors must be disconnected from the circuit.

The use of screwdrivers as a means of checking high tension, as is commonly done in mains operated receivers, is not only a waste of time but can permanently damage the transistors. Similarly, the indiscriminate shorting out of bias resistors as a means of checking whether certain stages are operating will almost certainly have drastic results, particularly in the output stages.

Transistors are extremely sensitive to heat, temperatures in excess of 90° C. can cause permanent damage. Great care should therefore be exercised when soldering transistor leads, keeping the soldering iron as far away from the transistor body as practicable and applying heat for as short a time as possible.

It should be noted that all electrolytic capacitors have their positive terminal going to earth or the earthy part of the circuit.



Latter chassis will have R17 and R23 replaced by a 1500 ohm variable resistor Code No. 620015. This component is adjusted at the factory during manufacture and should not be touched in the field.

CIRCUIT CODE — RADIOLA 893 P

Code No.	Description	Part No.	Fig No.	Location
	RESISTORS			
	All Resistors ± 10% unless otherwise stated			
R1	68K ohms ± 5% ½ watt	614593	1	K12
R2	5.6K ohms ± 5% ½ watt	611291	1	K13
R3	1K ohm ± 5% ½ watt	608022	2	D5
R4	1K ohm ± 5% ½ watt	608022	1	G18
R5	22 ohms ½ watt	602320	1	H17
R6	470 ohms ½ watt	601180	1	J14
R7	330 ohms ½ watt	601130	1	H14
R8	82K ohms ± 5% ½ watt	615791	1	G13
R9	10K ohms ± 5% ½ watt	612019	1	G13
R10	56K ohms ± 5% ½ watt	601618	2	D9
R11	5.6K ohms ± 5% ½ watt	611291	2	D10
R12	5.6K ohms ± 5% ½ watt	611291	2	F9
R13	68K ohms ½ watt	601632	2	F8
R14	1.2K ohms ± 5% ½ watt	608310	2	D12
R15	27K ohms ± 5% ½ watt	614133	2	F8
R16	4.7K ohms ± 5% ½ watt	610951	2	G8
R17	1.2K, 1K, 820, 680, 470, 220 ohms ± 5% ½ watt	Selected	2	D12
R18	1K ohms ± 5% ½ watt	608022	2	D10
R19	470 ohms ½ watt	601180	2	G10
R20	100 ohms ½ watt	601070	2	C10
R21	470K ohms ½ watt	601840	2	F11
R22	100K ohms ½ watt	601680	2	F12
R23	220, 470, 680, 820, 1K, 1.2K ohms ± 5% ½ watt	Selected	2	D12
R24	1.2K ohms ± 5% ½ watt	608310	2	E11
R25	1.2K ohms ± 5% ½ watt	608310	2	E12
R26	470 ohms ½ watt	601180	2	F11
R27	20K ohms Volume Control W/S	620252	2	C14
R28	2.5K ohms Tone Control	620030	2	C16
R29	330 ohms ½ watt	601130	2	D16
R30	27K ohms ½ watt	601520	2	D15
R31	4.7K ohms ½ watt	601340	2	C16
R32	820 ohms ½ watt	601202	2	D17
R33	100 ohms ½ watt	601070	2	G14
R34	3.9K ohms ½ watt	601310	2	G14
R35	150 ohms ± 5% ½ watt	604676	2	G15
R36	22 ohms ½ watt	602320	2	G16
R37	3.9K ohms ½ watt	601310	2	F16
R38	22 ohms ½ watt	602320	2	F17
R39	150 ohms ± 5% ½ watt	604676	2	F17
R40	100K ohms ½ watt	601680	2	E16
R41	0, 22, 47, 100 ohms ½ watt	Selected	2	E10
	CAPACITORS			
C1	22 pF ± 10% NPO tubular	220889	2	C4
C2	5-30 pF trimmer Aerial (Band B)	231136	2	D8
C3	5-30 pF trimmer Aerial (Band A)	231136	2	C2
C4	5-30 pF trimmer Aerial (B/C)	231136	2	D2
C5	4.7 pF ± 10% NPO disc	220217	2	C5
C6	47 pF ± 5% 500 volt silvered mica	226808	2	D2
C7	0.047 µF 200 volt working paper	226834	2	D6
C8	0.1 µF 200 volt working paper	227022	1	K13
C9	12-445 pF tuning Aerial	18635	1	C15
C10	0.1 µF 200 volt working paper	227022	2	D5
C11	10 pF ± 10% NPO disc	220456	1	L16
C12	4.7 pF ± 5% NPO tubular	220219	1	K17
C13	12-445 pF tuning R.F.	18635	1	C15
C14	8-40 pF trimmer Oscillator (B/C)	231185	1	G13
C15	0.022 µF 200 volt working paper	226641	1	G17
C16	470 pF ± 2½% padder	224487	1	G14
C17	5-30 pF trimmer R.F. (B/C)	231136	1	J18
C18	5-30 pF trimmer R.F. (Band A)	231136	1	L17
C19	12-445 pF tuning Oscillator	18635	1	C15
C20	8-40 pF trimmer Oscillator (Band A)	231185	1	F14
C21	1800 pF ± 2½% padder (Band A)	225480	1	G15
C22	5-30 pF trimmer R.F. (Band B)	231136	1	L14
C23	8-40 pF trimmer Oscillator (Band B)	231185	1	H18
C24	4000 pF ± 2½% padder (Band B)	224594	1	G16
C25	0.5 µF 200 volt working Hunts W48	229116	1	K14
C26	0.5 µF 200 volt working Hunts W48	229116	1	F17
C27	Not used			
C28	0.01 µF + 100%—0% K5000 tubular	222300	1	H14
C29	330 pF ± 5% silvered mica (in 1st I.F.)	223709	2	C8
C30	330 pF ± 5% silvered mica (in 1st I.F.)	223709	2	D8
C31	0.047 µF 200 volt working paper	226834	2	E11
C32	0.1 µF +100%—0% K5000 disc	227038	2	D9
C33	6.8 pF ± 10% NPO disc	220380	2	E9
C34	100 µF 18 volt working Electrolytic	229708	2	B9
C35	330 pF ± 5% silvered mica (in 2nd I.F.)	223709	2	E8
C36	330 pF ± 5% silvered mica (in 2nd I.F.)	223709	2	F8
C37	0.1 µF 200 volt working paper	227022	2	C12
C38	0.047 µF 200 volt working paper	226834	2	F8
C39	0.047 µF 200 volt working paper	226834	2	F10
C40	6.8 pF ± 10% NPO disc	220380	2	F9
C41	330 pF ± 5% silvered mica (in 3rd I.F.)	223709	2	F10
C42	330 pF ± 5% silvered mica (in 3rd I.F.)	223709	2	F11
C43	100 µF 3 volt working Electrolytic	229706	2	G10
C44	470 pF ± 10% 500 volt working mica	224205	2	F12
C45	100 µF 18 volt working Electrolytic	229708	2	C11
C46	0.5 µF 200 volt working Hunts W48	229116	2	E13
C47	20 µF 12 volt working Electrolytic	229307	2	D15
C48	0.5 µF 200 volt working Hunts W48	229116	2	D17
C49	100 µF 18 volt working Electrolytic	229708	2	C11
C50	100 µF 3 volt working Electrolytic	229706	2	D17
C51	0.01 µF 200 volt working paper	226311	2	G15
C52	0.01 µF 200 volt working paper	226311	2	F16
	TRANSFORMERS			
T1	Ferrite Rod Aerial	38068	2	C10
T2	Aerial Transformer (Band A)	36979	2	C2
T3	Aerial Transformer (Band B)	36982	2	C5
T4	R.F. Transformer (B/C)	36986	1	K17
T5	R.F. Transformer (Band A)	36980	1	K15
T6	R.F. Transformer (Band B)	36983	1	K14
T7	Oscillator Transformer (B/C)	36978	1	G14
T8	Oscillator Transformer (Band A)	36981	1	G15
T9	Oscillator Transformer (Band B)	36979	1	G17
T10	1st I.F. Transformer	36911	1	F11
T11	2nd I.F. Transformer	36913	1	F11
T12	3rd I.F. Transformer	36993	1	F9
T13	Driver Transformer	38116	1	G7
	INDUCTORS			
L1	I.F. Filter (incl. C6)	9382	2	D2
L2	R.F. Filter Choke	38719	2	G12
	SWITCHES			
SWA	Aerial Switch	22778	1	L10
SWB	Wave Change Switch	37646	1	J16
SWC	Phono — Radio Switch	22778	1	L8
SWD	ON/OFF Switch (on R27)		2	C14
	TRANSISTORS			
VT1	AWV 2N370	906488	1	L15
VT2	AWV 2N370	906488	1	H13
VT3	AWV 2N218	906480	2	E8
VT4	AWV 2N218	906480	2	F9
VT5	AWV 2N218	906480	2	F13
VT6	AWV 2N408	906492	2	C16
VT7	AWV 2N270	906485	2	F14
VT8	AWV 2N270	906485	2	E15
	MISCELLANEOUS			
MR1	Converter Clamp, GEX 34	597049	1	J15
MR2	Overload Diode, GEX 34	597049	1	H14
MR3	Overload Diode, GEX 34	597049	2	D9
MR4	Detector, GEX34	597049	2	F11
TH1	Thermistor, 130 ohms at 25° C. N.T.C.	893703	2	G15
TH2	Thermistor, 130 ohms at 25° C. N.T.C.	893703	2	F17
LS1	7" x 5" P.M. Loudspeaker 45 Ω V/C.	21601		
PL1	3 Pin Battery Plug	36425	1	L6

ALIGNMENT PROCEDURE

Manufacturer's Setting of Adjustments:

The receiver is tested by the manufacturer with precision instruments and all adjusting screws are sealed. Re-alignments 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.

Under no circumstances should the plates of the ganged tuning capacitor be bent, as the unit is accurately aligned during manufacture and can only be re-adjusted by skilled operators using special equipment.

For all alignment operations, keep the generator output as low as possible to avoid A.V.C. action and set the volume control in the maximum clockwise position.

Testing Instruments:

(1) A.W.A. Junior Signal Generator, type 2R7003; or

(2) A.W.A. Modulated Oscillator, series J6726.

(3) The output impedance is 45 ohms (speaker voice coil). If an indication only is required then Output Meter 2M8832, switched to 200 ohms should be adequate. If other types of output meters are used the impedance across the speaker should not be less than 200 ohms, otherwise the transistors may be overloaded. If a meter with the correct impedance, 40-50 ohms, is used it should replace the speaker and also provide a D.C. path. A resistor of 40-50 ohms could also be used instead of the speaker and the voltage measured across it.

ALIGNMENT TABLE

Alignment Order	Connect "high" side of Generator to:	Tune Generator to:	Tune Receiver to:	Adjust for maximum output
Set Range Switch to "Broadcast"; Aerial Switch to "Ext."; Phono-Radio Switch to "Radio"; connect Generator Earth to chassis.				
1	R.F. (rear) Section of Gang	455 Kc/s	Gang fully closed	Top and bottom Cores in T12, T11 and T10
Repeat adjustment until maximum output is obtained.				
2	External Aerial Terminal	600 Kc/s	600 Kc/s	Oscillator Core Adjustment (T7) *
3	External Aerial Terminal	600 Kc/s	600 Kc/s	R.F. Core Adjustment (T4)
4	External Aerial Terminal	1710 Kc/s	Gang fully open	Oscillator Trimmer Adjustment (C14) °
5	External Aerial Terminal	1500 Kc/s	1500 Kc/s	R.F. Trimmer Adjustment (C17)
6	External Aerial Terminal	1500 Kc/s	1500 Kc/s	Aerial Trimmer Adjustment (C4)
Repeat adjustments 2 to 6 and check the pointer calibration. Set Range Switch to "Band A"; Fully erect Telescopic Aerial.				
7	External Aerial Terminal	2 Mc/s	2 Mc/s	Oscillator Core Adjustment (T8) †
8	External Aerial Terminal	6.1 Mc/s	Gang fully open	Oscillator Trimmer Adjustment (C20) °†
Repeat adjustments 7 and 8				
9	External Aerial Terminal	2.2 Mc/s	2.2 Mc/s	R.F. Core Adjustment (T5)
10	External Aerial Terminal	2.2 Mc/s	2.2 Mc/s	Aerial Core Adjustment (T2)
11	External Aerial Terminal	5.5 Mc/s	5.5 Mc/s	R.F. Trimmer Adjustment (C18)
12	External Aerial Terminal	5.5 Mc/s	5.5 Mc/s	Aerial Trimmer Adjustment (C3)
Repeat adjustments 9 to 12. Set Range Switch to "Band B"				
13	External Aerial Terminal	7 Mc/s	7 Mc/s	Oscillator Core Adjustment (T9) †
14	External Aerial Terminal	18 Mc/s	Gang fully open	Oscillator Trimmer Adjustment (C23) °†
Repeat adjustments 13 and 14				
15	External Aerial Terminal	7 Mc/s	7 Mc/s	R.F. Core Adjustment (T6)
16	External Aerial Terminal	7 Mc/s	7 Mc/s	Aerial Core Adjustment (T3)
17	External Aerial Terminal	16 Mc/s	16 Mc/s	R.F. Trimmer Adjustment (C22) *
18	External Aerial Terminal	16 Mc/s	16 Mc/s	Aerial Trimmer Adjustment (C2) *
Repeat adjustments 15 to 18.				

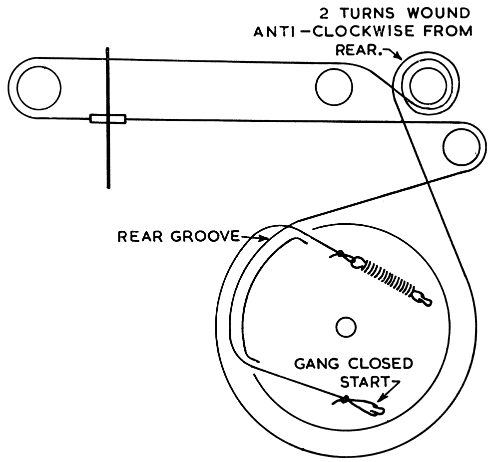
* Rock the tuning control back and forth through the signal.

° Do not cut off the excess wire from these spiral trimmers until final adjustments have been made.

† Check that the image frequency should be 910 Kc/s higher (on the generator) than the tuned frequency of the receiver.

Tuning Drive Cord Replacement:

The accompanying diagram shows the route of the cord and the method of attachment. Whilst fitting the cord, keep it taut and adjust the length so that the tension spring (1741) measures approximately 2 inches long when fitted. The length of black cord required will be not less than 54 inches. Make sure the spring does not rattle against the dial drum.



Fault Finding:

The first thing to check when the receiver is inoperative, is the battery. With the receiver switched on a new battery should measure 12 volts, although a receiver will still operate satisfactorily at 8 volts.

Voltmeters used for test purposes must be at least 20,000 ohms per volt. The use of low impedance meters will only give misleading results as serious shunting effects will occur.

When checking for a circuit fault causing excessive battery drain, an overall current measurement and supplementary voltage measurements should be made. For reasons stated above continuity measurements can be misleading.

Signal tracing by injection of a signal from a signal generator is carried out on transistor radios in exactly the same manner as has been done for many years with conventional vacuum tube radios. The signal generator should be connected (as in past practice) in series with a capacitor to avoid shorting out bias voltages. With the transistors used in this receiver, the BASE is the signal input terminal (corresponding to the signal grid of vacuum tubes), the COLLECTOR is the signal output terminal (corresponding to plate) and the EMITTER is the common terminal (corresponding to the cathode). The exception to the above is in the 1st Audio stage (VT5) where the output is taken from the EMITTER instead of the COLLECTOR.

If the receiver is inoperative make the normal tests (audio, I.F. and R.F.) with the generator. If the converter is suspect, the oscillator can be checked with crystal probe of a Voltohmyst connected to the tap of the oscillator coils (last bottom portion of the switch). If no reading is indicated the converter does not oscillate. If no Voltohmyst is available a check can be made by connecting a 20,000 ohm/volt meter between the base and emitter. The reading obtained should, if the converter is oscillating, become more negative on shorting out the oscillator coil.

The output circuit used in this receiver is the single ended "Class B" type; this type of output circuit has seldom been used in commercial radios. It should, therefore, be noted that in this output stage the battery current increases greatly with increased signal input to the base as in normal "Class B" but each transistor is biased separately and the load (45 ohm speaker) is between -6 volts and the transistors, no output transformer being needed.

MECHANICAL REPLACEMENT PARTS

Item	Part No.
Chassis Assembly:	
Clip I.F. Mounting	27780
Dial Backing	37616
Dial Scale	37913
Dial Drum	20130B
Knob Assembly, Band Selector	37588
Knob Assembly, Power/Volume	38547
Knob Assembly, Tuning, Tone	37589
Pointer Assembly	37644
Socket, Transistor	794562
Vernier Drive Assembly	37626
Cabinet Assembly:	
Battery Clamp Assembly	37617
Cabinet Back	37766/2
Cabinet Body	37766/1
Cabinet Lid	37606
Card, World Map	38509
Label, Component Layout	37688
Pivot	37608
Pivot Arm, L.H.	37625
Pivot Arm, R.H.	37624
Screw, Cabinet Back	37637
Telescopic Aerial Assembly	38475

D.C. RESISTANCE OF WINDINGS

Winding	D.C. Resistance in ohms
I.F. Filter L1	28
Ferrite Rod Aerial T1:	
External Aerial Winding	7.5
Other Windings	*
Aerial Coil Band B T2:	
Primary 1-3	1
Secondary 4-5	*
Aerial Coil Band A T3:	
Primary 1-5	*
Secondary 2-3	*
R.F. Coil Broadcast T4:	
Primary 1-2	100
Secondary 3-5	4
R.F. Coil Band B T5:	
Primary 1-3	1
Secondary 4-5	*
R.F. Coil Band A T6:	
Primary 1-3	*
Secondary 4-5	*
Oscillator Coil Broadcast T7:	
Primary 1-5	3.6
Secondary 2-3	*
Oscillator Coil Band B T8:	
Primary 1-5	2.2
Secondary 2-3	*
Oscillator Coil Band A T9:	
Primary 1-5	*
Secondary 2-3	*
I.F. Transformer Windings T10, T11, T12	10
Driver Transformer T13:	
Primary	325
Secondary	70
Secondary	95

* 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 a slightly different reading is obtained.

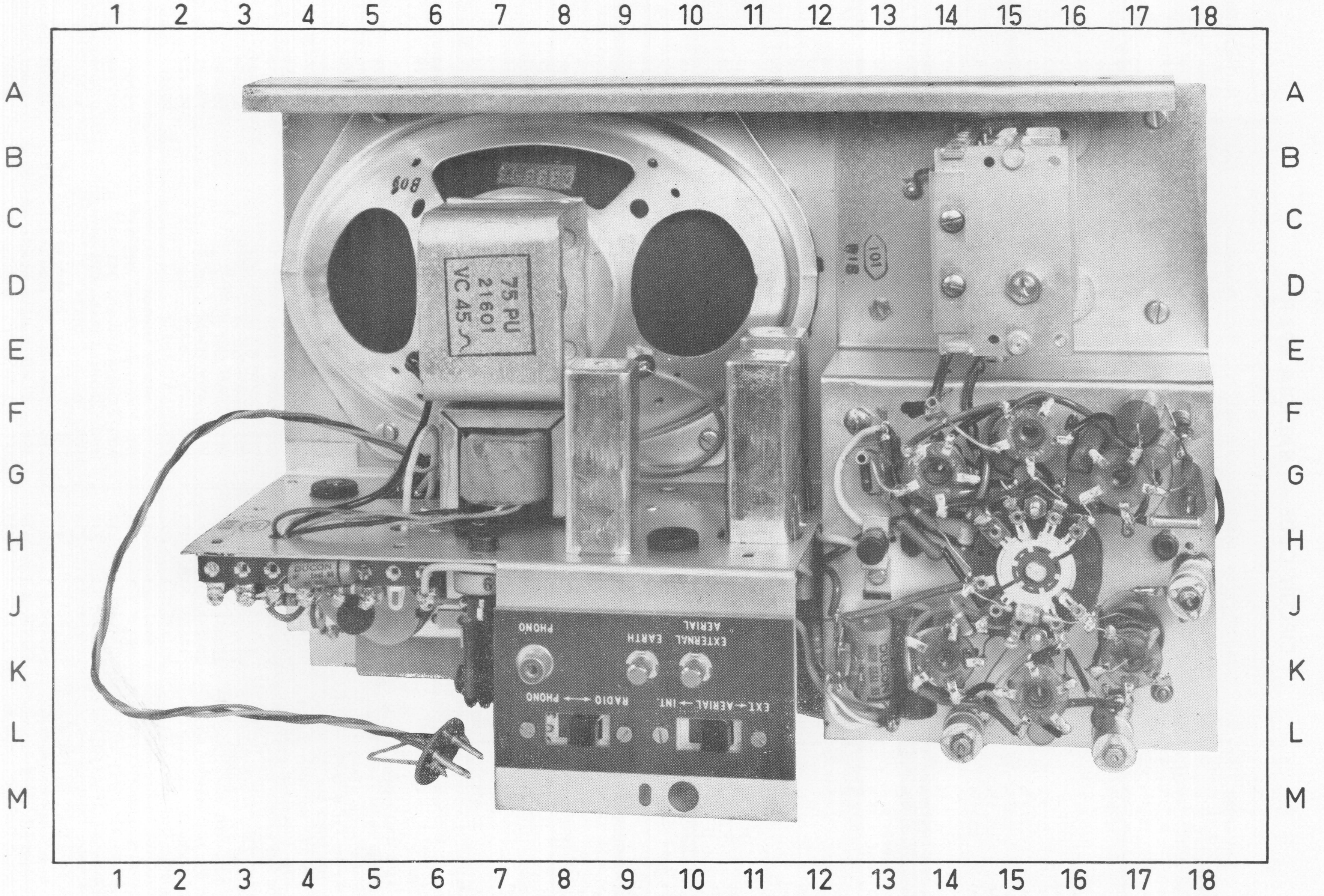

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
A B C D E F G H J K L M
75 PU
21601
VC 45 ~
PHONO
EARTH
EXTERNAL
AERIAL
RADIO ⟷ PHONO
EXT ← AERIAL → INT.
DUCON

FIG. 1

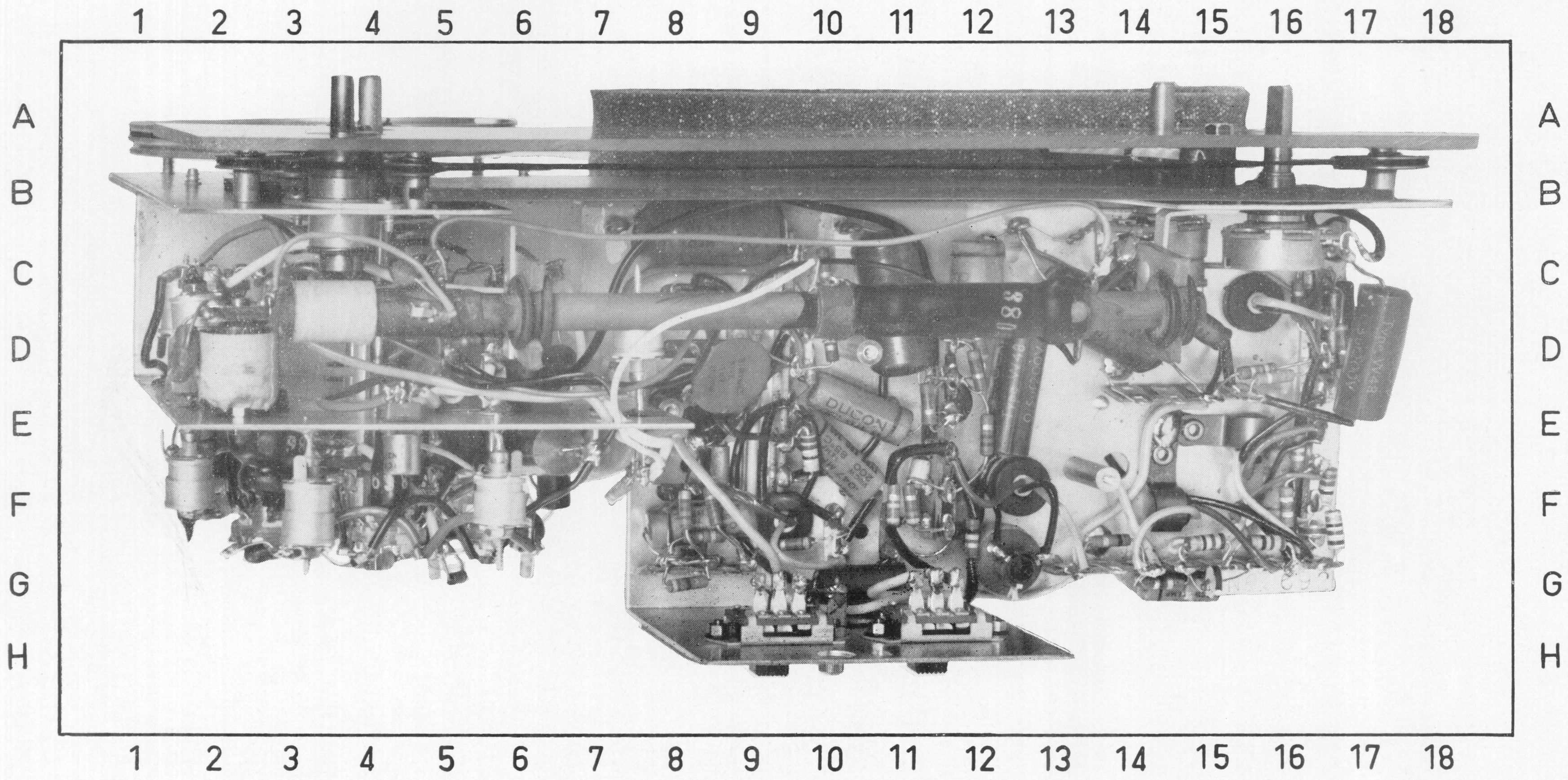


FIG. 2