WESTINGHOUSE SERVICE MANUAL FOR MODEL W831

WESTINGHOUSE
Factory Supervised
Service

RADIO

The Model W831 is an eight transistor, battery operated superheterodyne portable receiver designed for the reception of the Medium Wave Band.

Features of design include:—

Ferrite rod aerial, with provision for car aerial or external aerial and earth systems; high gain i.f. transformers; audodyne converter; high sensitivity; tuning meter; provision for auxiliary power supply Type PS9Z.

ISSUED BY
EMAIL LIMITED
CONSUMER PRODUCTS DIVISION (SYDNEY)
Joynton Avenue, Waterloo. 69-0411

ELECTRICAL AND MECHANICAL SPECIFICATIONS

Frequency Range .... 525-1620 Kc/s (571-1855 Metres)
Intermediate Frequency .... 455 Kc/s
Battery Complement .. 9 volt battery Eveready type 2761

Battery Consumption:
- Zero Output .... 15 mA
- 50 mW Output .... 40 mA
- Full Output .... 100 mA

Loudspeaker:
- 6″ x 4″—50257.
- V.C. Impedance .... 80 ohms centre tapped at 400 cps.
- Undistorted Power Output .... 400 mW

Controls:
- Tuning—the top right hand control.
- On/Off-Volume—the centre right hand control.
- Tone—the bottom right hand control.

Dimensions:
- Height .... $8\frac{1}{4}$″; Width .... $12\frac{7}{8}$″; Depth .... $3\frac{7}{8}$″
- Weight (with battery) .... 8 lbs. 4 ozs.

Transistor Complement:

AWV 2N1637	R.F. Amplifier
AWV 2N1639	Converter
AWV 2N1638	1st I.F. Transformer
AWV 2N1638	2nd I.F. Transformer
AWV 2N408	Audio Amplifier
AWV 2N408	Driver
AWV 2N217S (2)	P-P Output
1N87A or OA90	Detector Diode
1N87A or OA90	AGC Diode
1N87A or OA90	Overload Diode
AS2	Compensation Diode

NOV. '64

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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 to the earthy part of the circuit.

Fault Finding:

The first thing to check when the receiver is inoperative is the battery. With the receiver switched on a new battery should read 9 volts, although a receiver will still operate satisfactorily at 6 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.

If the receiver is inoperative to r.f. and the converter is suspect, the oscillator can be checked by measuring the voltage between base and emitter of the converter. If the base is negative with respect to the emitter by more than 0.12 volts then the converter is not oscillating.

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 the plate) and the EMITTER is the common terminal (corresponding to the cathode).

The output circuit used in this receiver is of the "Class B" type and it should be noted that the battery current increases greatly with increased signal input to the base.

Chassis Removal:

Remove the control knobs by pulling them straight off their spindles.

Remove the Philip's head screw holding the small escutcheon on the left hand side of the cabinet.

Open the cabinet back and remove the battery.

The chassis assembly is held in the cabinet by six self tapping screws. Remove these and lift the chassis to give access to the speaker leads.

Unsolder the speaker leads and the chassis will be free to lift clear of the cabinet.

Component Removal and Replacement:

Remove the orange lead from the tuning gang.

Remove the printed board by unsoldering the six mounting studs.

When removing any component from the printed circuit board always use a soldering iron which is very clean and just hot enough to achieve a quick soldering operation, as prolonged application of heat will damage the printed wiring.

To remove an i.f. r.f. or oscillator transformer it is desirable to have a suitable tip on the soldering iron as shown in fig. 1. All seven connections on the transformer

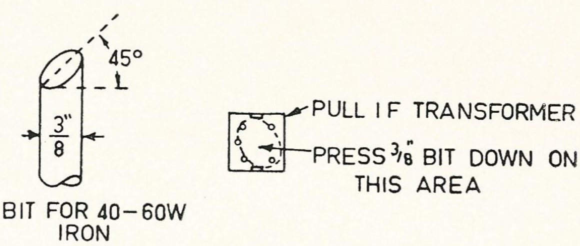


Fig. 1

may be freed simultaneously and the transformer pulled from the board. This is the only satisfactory method; any other method using smaller irons will generally result in damage to either the board or the transformer or to both.

Transistors may be removed in a similar manner using a 3/16" bit on an ORYX iron.

All other components may be removed by disconnecting one lead at a time.

Before installing a replacement component it is advisable to clear the contact hole by heating the contact area and pushing a tapered stainless steel wire into the hole. Small screw driver kits are available on the market containing a suitable spiked bit.

Tuning Meter:

The tuning meter is situated in the collector circuit of the r.f. transistor and performs two functions.

1. It indicates battery voltage by indicating collector current with no signal applied to the receiver. Since collector current is dependent only on base bias under these conditions, which is dependent on battery voltage, the latter may be clearly indicated. The meter range is from 9 volts (the thickest part of the red range) to 6 volts (the point of the red range).

2. It serves as a tuning indicator by indicating the drop in collector current due to a.g.c. voltage applied to the r.f. emitter. The indicator is quite sensitive so that the meter can be used to tune quite weak stations. The extent to which the needle falls at minimum position is a function of a.g.c. voltage and this may be used as an indicator of station strength.

Dial Cord Replacement

At least 44 inches of dial cord will be necessary for replacement purposes. Commence with the gang closed and the anchor bobbin on the drive spindle as indicated in Fig. 2. Make sure that the cord is fully tensioned before connecting it to the tension spring which is then anchored to the pin remote from the drive spindle. The pointer may now be attached without decreasing the cord tension.

If the drive spindle or gears have been removed for any reason reassembly must conform to that shown in Fig. 2. The flat on the drive spindle is the important item as this determines the position of the anchor bobbin. The split gears may be 180° out to that shown but the hole in each gear must be in line to provide the correct tension to the anti-backlash spring.

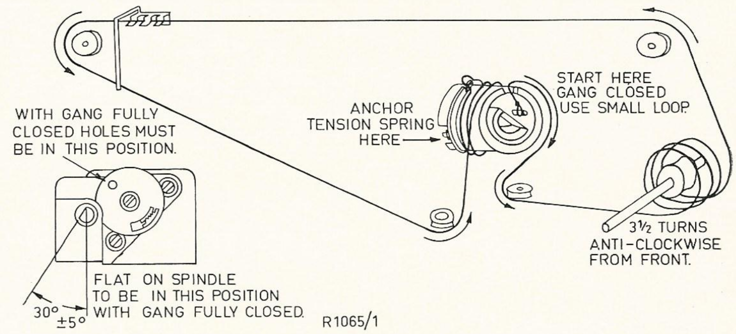


Fig. 2

ALIGNMENT PROCEDURE

Manufacturer's Setting of Adjustments:

The receiver is tested by the manufacturer with precision instruments and all adjusting screws 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.

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.g.c. action and set the volume control in the maximum position.

Testing Instruments:

Signal Generator—modulated 400 c.p.s. or modulated oscillator.

If the modulated oscillator is used, connect a 0.22 megohms non-inductive resistor across the output terminals.

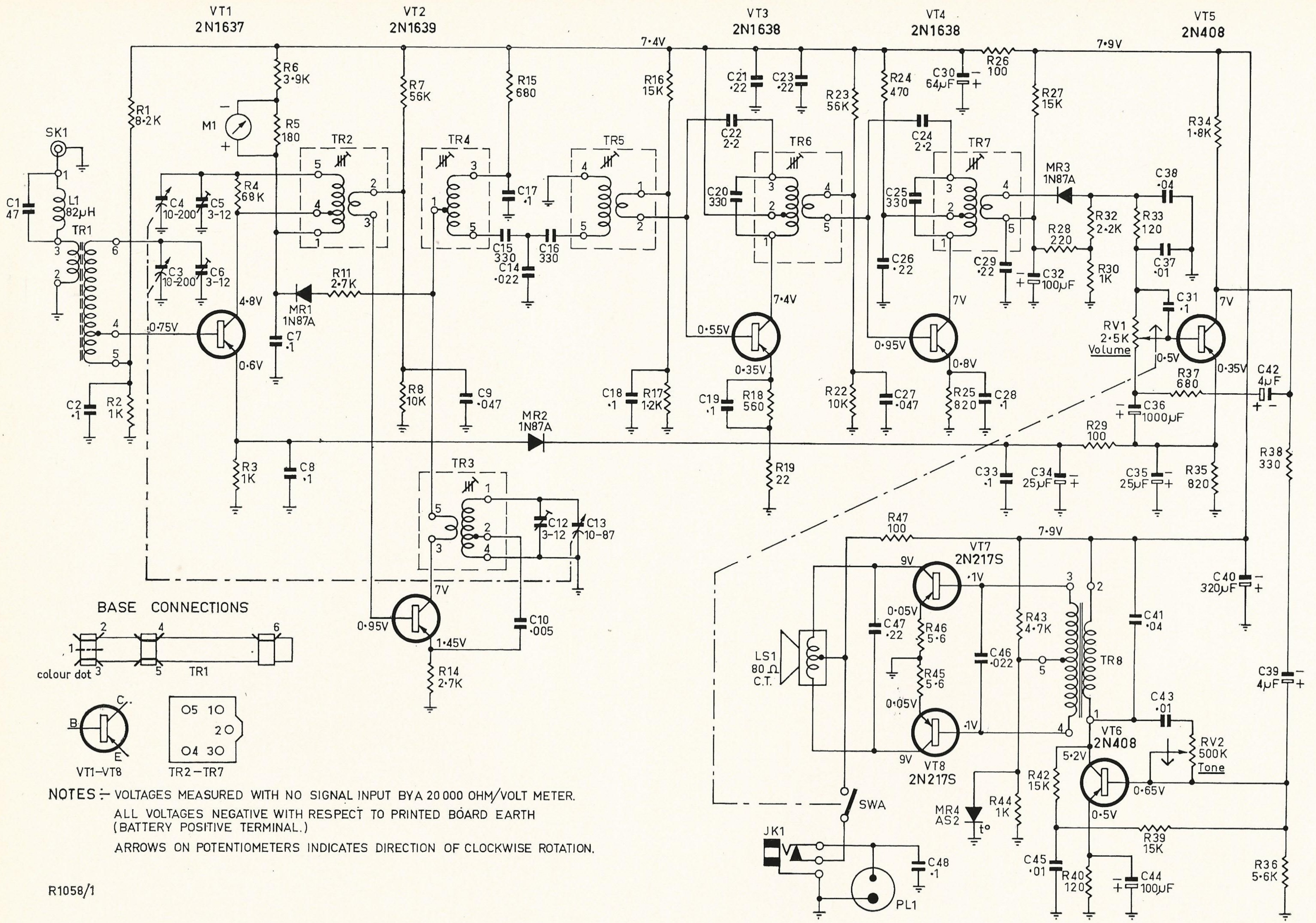
No output transformer is used in this receiver since the speaker has a centre tapped 80 ohms voice coil and is connected directly to the collectors of the output transistors. For output measurement, if an indication only is required, Output Meter type 2M8832 switched to 5000 ohms and connected across the output collectors, should be adequate. For correct reading of power output an a.c. meter, with neither probes earthed, connected across the output collectors will measure the voltage across the 80 ohms load. The normal alignment level of 50mW occurs when 2 volts is indicated on the a.c. voltmeter.

ALIGNMENT TABLE

ORDER	CONNECT "HIGH" SIDE OF GENERATOR TO:	TUNE GENERATOR TO:	TUNE RECEIVER TO:	ADJUST FOR MAX. PEAK OUTPUT
1	R.F. Section of Gang	455 Kc/s	Gang fully closed	Cores in TR7, TR6, TR5 and TR4
	Repeat adjustment until maximum output is obtained.			
2	Inductively coupled to Rod Aerial*	1,620 Kc/s	Gang fully open	H.F. Osc. Adj. (C12)
	Shunt R.F. section of gang with a 2.2K ohms resistor in series with a 0.1μf capacitor.			
3	Inductively coupled to Rod Aerial*	1,500 Kc/s	1,500 Kc/s	H.F. Aerial Adj. (C6)
4	Inductively coupled to Rod Aerial*	600 Kc/s	600 Kc/s	L.F. Osc. Core. Adj. (TR3)†
	Repeat adjustments 3 and 4 as required and then remove shunt network.			
5	Inductively coupled to Rod Aerial*	600 Kc/s	600 Kc/s	L.F. R.F. Core Adj. (TR2)
6	Inductively coupled to Rod Aerial*	1,500 Kc/s	1,500 Kc/s	H.F. R.F. Adj. (C5)
	Repeat adjustments 5 and 6 as required.			

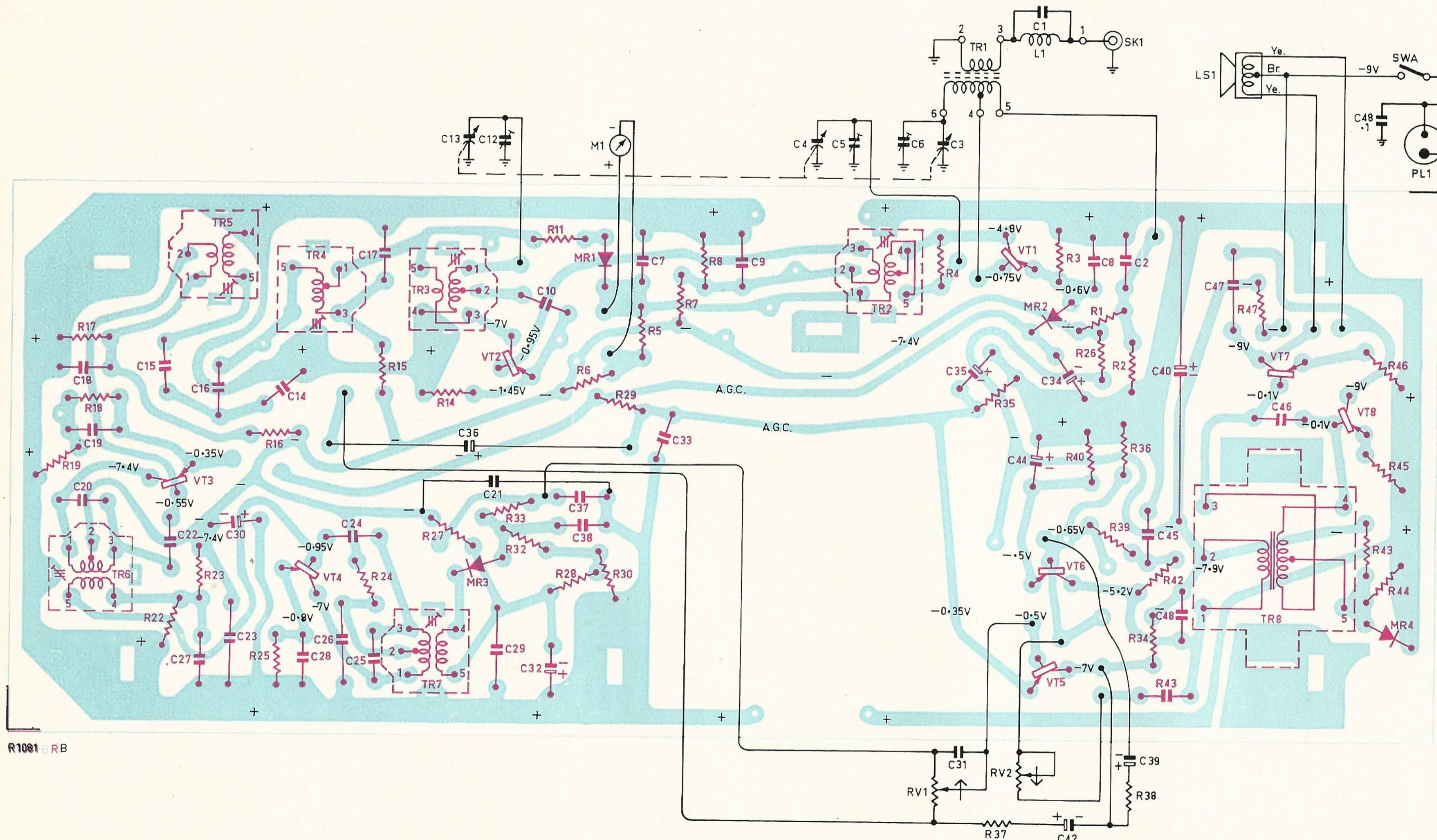
* A coil comprising 3 turns of 16 gauge D.C.C. wire, about 12″ in diameter should be connected between the output terminals of the test instrument, placed concentric with the rod aerial and distant not less than 1 foot from it.

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



Changes since circuit was drawn:

R20 a 1K ohms ± 10% ½ watt resistor, 608025, has been added from the emitter of VT3 to the junction of MR2 and C33.
C22 is now a 4.7pf ± 10% NPO bead capacitor, 220220.



Notes: The diagram represents the view from the wiring side of the printed board.
Blue indicates the printed wiring.
Red indicates components and leads mounted on the remote side of the board.
Black indicates those components and leads mounted on the wiring side or completely removed from the board.
All voltages shown are negative with respect to the board earth (positive terminal of the battery) and measured with no signal input and volume maximum clockwise using a 20,000 ohm/volt meter.

CIRCUIT CODE

CODE No.	DESCRIPTION	PART No.
	RESISTORS	
	All Resistors composition type unless otherwise stated.	
R1	8.2K ohms ± 5% ½ watt	611847
R2	1K ohms ± 5% ½ watt	608029
R3	1K ohms ± 5% ½ watt	608029
R4	68K ohms ± 10% ½ watt	615509
R5	180 ohms ± 5% ½ watt	604916
R6	3.9K ohms ± 5% ½ watt	610560
R7	56K ohms ± 5% ½ watt	615163
R8	10K ohms ± 5% ½ watt	612031
R9, R10	Not used	
R11	2.7K ohms ± 10% ½ watt	609862
R12, R13	Not used	
R14	2.7K ohms ± 10% ½ watt	609862
R15	680 ohms ± 10% ½ watt	607281
R16	15K ohms ± 10% ½ watt	612922
R17	1.2K ohms ± 10% ½ watt	608312
R18	560 ohms ± 10% ½ watt	606844
R19	22 ohms ± 10% ½ watt	602320
R20, R21	Not used	
R22	10K ohms ± 10% ½ watt	612025
R23	56K ohms ± 10% ½ watt	615161
R24	470 ohms ± 10% ½ watt	606588
R25	820 ohms ± 10% ½ watt	607665
R26	100 ohms ± 10% ½ watt	604031
R27	15K ohms ± 10% ½ watt	612922
R28	220 ohms ± 10% ½ watt	605253
R29	100 ohms ± 10% ½ watt	604031
R30	1K ohms ± 10% ½ watt	608025
R31	Not used	
R32	2.2K ohms ± 10% ½ watt	609442
R33	120 ohms ± 10% ½ watt	601077
R34	1.8K ohms ± 10% ½ watt	609077
R35	820 ohms ± 10% ½ watt	607665
R36	5.6K ohms ± 10% ½ watt	611293
R37	680 ohms ± 10% ½ watt	607281
R38	330 ohms ± 10% ½ watt	605959
R39	15K ohms ± 10% ½ watt	612922
R40	120 ohms ± 10% ½ watt	601077
R41	Not used	
R42	15K ohms ± 10% ½ watt	612922
R43	4.7K ohms ± 10% ½ watt	610932
R44	1K ohms ± 10% ½ watt	608025
R45	5.6 ohms ± 10% ½ watt	600724
R46	5.6 ohms ± 10% ½ watt	600724
R47	100 ohms ± 10% ½ watt	604031
RV1	2.5K ohms curve S16, Volume W/S	620035
RV2	500K ohms curve C, Tone	620504

CODE No.	DESCRIPTION	PART No.
	CAPACITORS	
C1	47pf ± 5% N750 tubular	220554
C2	0.1μf + 80% — 20% 25VW Hi-K disc	227074
C3	10-200pf tuning aerial (Assembly)	64550
C4	10-200pf tuning R.F. (Assembly)	64550
C5	3-12pf trimmer R.F. (Assembly)	64550
C6	3-12pf trimmer Aerial (Assembly)	64550
C7	0.1μf + 80% — 20% 25VW Hi-K disc	227074
C8	0.1μf + 80% — 20% 25VW Hi-K disc	227074
C9	0.047μf + 80% — 20% 25VW Hi-K disc	226823
C10	0.005μf ± 20% 200VW AEE W99	226005
C11	Not used	
C12	3-12pf trimmer Osc. (linked with C3-C6)	
C13	10-87pf tuning Osc. (linked with C3-C6)	
C14	0.022μf ± 20% 200VW AEE W99	226658
C15	330pf ± 5% N750 disc	223726
C16	330pf ± 5% N750 disc	223726
C17	0.1μf + 80% — 20% 25VW Hi-K disc	227074
C18	0.1μf + 80% — 20% 25VW Hi-K disc	227074
C19	0.1μf + 80% — 20% 25VW Hi-K disc	227074
C20	330pf ± 5% N750 disc	223726
C21	0.22μf + 80% — 20% 25VW Hi-K disc	227338
C22	2.2pf ± .5pf NPO bead	221494
C23	0.22μf + 80% — 20% 25VW Hi-K disc	227338
C24	2.2pf ± .5pf NPO bead	221494
C25	330pf ± 5% N750 disc	223726
C26	0.22μf + 80% — 20% 25VW Hi-K disc	227338
C27	0.047μf + 80% — 20% 25VW Hi-K disc	226823
C28	0.1μf + 80% — 20% 25VW Hi-K disc	227074
C29	0.22μf +80% — 20% 25VW Hi-K disc	227338
C30	64μf 10VW Electrolytic	229675
C31	0.1μf ±20% 200VW AEE W49	228931
C32	100μf 3VW Electrolytic	229706
C33	0.1μf + 80% — 20% 25VW Hi-K disc	227074
C34	25μf 3VW Electrolytic	229428
C35	25μf 3VW Electrolytic	229428
C36	1000μf 3VW Electrolytic	229912
C37	0.01μf± 20% 200VW AEE W99	228609
C38	0.04μf ± 20% 200VW AEE W99	228750
C39	4μf 10VW Electrolytic	228193
C40	320μf 10VW Electrolytic	229776
C41	0.04μf ± 20% 200VW AEE W99	228750
C42	4μf 10VW Electrolytic	228193
C43	0.01μf ± 20% 200VW AEE W99	228609
C44	100μf 3VW Electrolytic	229706
C45	0.01μf ± 20% 200VW AEE W99	228609
C46	0.022μf ± 20% 200VW AEE W99	226658
C47	0.22μf + 80% — 20% 25VW Hi-K disc	227338
C48	0.1μf + 80% — 20% 25VW Hi-K disc	227074

CODE No.	DESCRIPTION	PART No.
	TRANSFORMERS	
TR1	Ferrite Rod Aerial (incl. C1 & L1)	52111
TR2	R.F. Transformer	52135
TR3	Oscillator Transformer	52133
TR4	1st I.F. Transformer	52106
TR5	2nd I.F. Transformer	52180
TR6	3rd I.F. Transformer	52100
TR7	4th I.F. Transformer	52102
TR8	Driver Transformer	52440A
	INDUCTOR	
L1	R.F. Choke (on TR1)	52167
	TRANSISTORS AND DIODES	
VT1	AWV 2N1637	
VT2	AWV 2N1639	
VT3	AWV 2N1638	
VT4	AWV 2N1638	
VT5	AWV 2N408	
VT6	AWV 2N408	
VT7	AWV 2N217S	
VT8	AWV 2N217S	
MR1	1N87A or OA90	
MR2	1N87A or OA90	
MR3	1N87A or OA90	
MR4	AS2 (Compensating Diode)	
	MISCELLANEOUS	
LS1	6″ x 4″ Speaker	50257
SK1	Ext. Aerial Socket	
SK2	Ext. Power Supply Socket	
M1	Tuning Meter	454606

MECHANICAL REPLACEMENT PARTS

ITEM	PART No.	ITEM	PART No.
Bracket Tuning Spindle	64478	Printed Board	64467
Circlip Tuning Bracket Assembly	2537	Pulley (4 off)	17716
Circlip (4 off)	4885	Spacer (4 off)	35923
Chassis Assembly	64443	Spring, Tension, Drive Cord	1741
Dial Backing Assembly	64445	Support, Aerial, Moulded (2 off)	64459
Dial Scale	65001	Variable Capacitor and Gear Assembly	64553
Drive Spindle	64462	This includes the following:	
Escutcheon Moulded	64560	Bracket Drive Spindle Support	64485
Front Panel Assembly	64985	Drive Drum Assembly	64453
This includes the following:		Circlip, Drive Spindle Retaining Salter	5103-25
		Drive Spindle Assembly	64557
Badge	65659	Gear, Anti-backlash, Front	64555
Fret	64476	Gear, Anti-backlash, Rear	64412
Front Panel	64456	Screw, 4BA x ¼″ Ch/Hd, Bracket Mounting	714006
Name Plate	65657	Screw, 6BA x ¼″ Ch/Hd, Gear Retaining	716008
Knob Assembly (2 off)	64987	Spring, Gear Tensioning	44152
Knob Assembly, Tuning	64986	Washer, Plain, 4BA	15727
Plug, Aerial	51250	Washer, 4BA I.T.L.	921204
Pointer Assembly	64461	Washer, 6BA I.T.L.	921226

NOTE: When ordering spares, always quote the above Part Numbers, and in the case of coloured parts such as knobs, etc., also quote the colour.

D.C. RESISTANCE OF WINDINGS

WINDING	D.C. RESISTANCE IN OHMS	WINDING	D.C. RESISTANCE IN OHMS
Ferrite Rod Assembly (TR1)	*	3rd I.F. Transformer (TR6):	
R.F. Transformer (TR2):		Primary	7
Primary	1	Secondary	*
Secondary	*	4th I.F. Transformer (TR7):	
Oscillator Transformer (TR3):		Primary	7
Primary	4	Secondary	*
Secondary	*	Coupling Transformer (TR8):	
1st I.F. Transformer (TR4)	7	Primary	540
2nd I.F. Transformer (TR5):		Secondary	540
Primary	7		
Secondary	*	Aerial Choke (L1)	4

* 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.