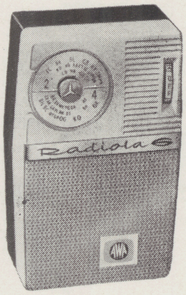


RADIOLA TRANSISTOR SIX PORTABLE

MODELS B11 and B11X

Issued by

AMALGAMATED WIRELESS (AUSTRALASIA) LTD.

GENERAL DESCRIPTION

Model B11 is a compact, lightweight battery-operated portable containing six transistors and two crystal diodes. It is a superheterodyne receiver designed for the reception of the Medium Wave Band.

Model B11X is identical with the B11, with only the i.f. transformers changed. These transformers are direct replacements, with no associated circuit changes.

Features of design include: Ferrite Rod Aerial; high-gain I.F. transformers; Autodyne converter; high-sensitivity 2-in. permanent magnet speaker; printed circuit giving compact size.

ELECTRICAL AND MECHANICAL SPECIFICATIONS

Frequency Range .... 540-1,600 Kc/s (555-187.5 metres)

Intermediate Frequency .... 455 Kc/s

Battery Complement ...... 9 volt Eveready type 216P

Battery Consumption:

For zero audio output .... 4.5 mA

For 50 mW audio output .... 17 mA

Transistor Complement:

AWV 2N412 .... Converter

AWV 2N410 .... 1st I.F. Amplifier

AWV 2N410 .... 2nd I.F. Amplifier

AWV 2N408 or 2N406S .... Driver

AWV 2N408 .... Output

AWV 2N408 .... Output

Two IN295 or OA90 crystal diodes are also used as:

(1) Audio Detector and A.V.C.,

(2) Overload Diode.

LOUDSPEAKER:

2″ Permanent Magnet No. 50041.

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

Undistorted Power Output .... 70 mW

CONTROLS:

Tuning Control—front left hand of cabinet.

On/Off Volume Control—front right hand of cabinet.

DIMENSIONS:

Height .... 4¼″; Width .. 2⅝″; Depth .... 1½″

Weight with Battery .... 10 ozs.

June, 1963. 2nd Edition.

CONTENTS

PRINTED BOARD REMOVAL

Remove the tuning knob by unscrewing the centre locking screw and easing the knob off the gang spindle.

Remove the cabinet back by inserting a small coin or screwdriver into the opening on the bottom of the case and twisting until the back cover is free.

Remove the two screws holding the printed board and lift the board clear of the case.

If necessary, the output transformer leads may be disconnected at the earphone jack.

Installation of the printed board is the reverse of the above procedure.

D.C. RESISTANCE OF WINDINGS

WINDING		D.C. RESISTANCE IN OHMS	WINDING	D.C. RESISTANCE IN OHMS
Ferrite Rod T1:			Driver Transformer T6:	
Primary A-C		4.5	Primary Bu-Br	720
Secondary B-D		*	Secondary Gr-Bk	410
Oscillator Transformer T2:			Output Transformer T7:	
Primary 1-4		1.5	Primary Bu-Br	120
Secondary 2-5		*	Secondary Gr-Bk	1.8
I.F. Transformers T3, T4 and T5:				
Primary	(B11)	1		
	(B11X)	2.5		
Secondary		*		

The above readings were taken on a standard board, 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.
*Indicates less than 1 ohm.

MECHANICAL REPLACEMENT PARTS

ITEM	PART No.	ITEM	PART No.
Badge, A.W.A.	39816	Earphone	307005
Board, Printed	39810	Earphone Jack and Nut	417019
Cabinet, Back	37796	Fret, Speaker	39814
Cabinet, Front	37795	Fret, Backing	39853
Cable, Battery	50652	Knob, Tuning	39811
Case, Receiver Carrying	39822	Knob, Volume	39801
Clamp, Speaker Mounting	39800	Nameplate, Radiola	39815
		Pouch, Earphone Carrying	39823
DIAL SCALES:		Screw, Gang Mounting	39825
Eastern (N.S.W. and Q'ld.)	39818	Screw, No. 2 x ¼" Self Tapping	760167
Southern (Vic. and Tas.)	39819	Screw, Tuning Knob Retaining	39806
Western (S.A. and W.A.)	39820	Spacer, Speaker Mounting Clamp	39840

When ordering, always quote the above Part Numbers and in the case of coloured parts such as cabinets, knobs, etc., the colour plus the Part Number.

ALIGNMENT TABLE

ORDER	CONNECT HIGH SIDE OF GENERATOR TO:	TUNE GENERATOR TO:	TUNE RECEIVER TO:	ADJUST FOR MAXIMUM PEAK OUTPUT:
1	Aerial Sect. of Gang	455 Kc/s	H.F. Limit	Core T5
2	Aerial Sect. of Gang	455 Kc/s	H.F. Limit	Core T4
3	Aerial Sect. of Gang	455 Kc/s	H.F. Limit	Core T3
	Repeat steps 1, 2 and 3 until maximum output is obtained‡			
4	Inductively coupled* to Rod Aerial	600 Kc/s	600 Kc/s	L.F. Osc. Core Adj. (T2)†
5	Inductively coupled* to Rod Aerial	1,650 Kc/s	Gang fully open	H.F. Osc. Adj. (C4)
6	Inductively coupled* to Rod Aerial	1,500 Kc/s	1,500 Kc/s	H.F. Aerial Adj. (C2)°
	Repeat steps 4, 5 and 6			

* A coil comprising 3 turns of 16 gauge D.C.C. wire about 12 inches in diameter should be connected across the output terminals to the generator, 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.

° Rock generator back and forth through the signal as there is some pulling effect on this adjustment.

‡ These transformers are a very high Q miniature type, the construction of which is shown in Fig. 5. It should be appreciated then that the amount of travel for the tuning core to cover its tuning range is much smaller than on normal i.f. transformers. Tuning the i.f. thus becomes more critical and the following hints will prove useful.

(a) The tuning tool used should be a small metal screwdriver whose tip fits cleanly into the tuning core.

(b) When turning the core do not use any downward pressure as the threaded boss has enough resilience to detune the i.f. after the pressure has been relieved.

(c) The threads on the boss may be damaged if the core is wound in and forced against the winding bobbin. This should never happen as only a light torque is needed to turn the tuning core normally.

SERVICING NOTES

INTRODUCTION

This publication is intended to help servicemen understand the operation of this receiver, and, by giving detailed step by step service procedure, enable them to satisfy their customers with a minimum of work.

The material has been arranged under headings such as "dead", weak", etc., corresponding to the customer's usual description when requesting service.

The many "service hints" listed in this manual should not be regarded as indicative of the amount of trouble to be expected. Many of the hints given are similar to everyday "run-of-the-mill" troubles found in vacuum-tube radios and would not be mentioned except for the fact that miniature transistor radios are a new experience for many servicemen.

By using an organised test procedure, transistor radio servicing can be made easy for the serviceman and satisfying for the customer.

Test Equipment.

The servicing of transistor receivers generally does not involve much additional specialised test equipment beyond that normally used on vacuum tube circuits. It is essential, however, that the voltmeter used for all measurements be a comparatively high impedance type, i.e., 20,000 ohms per volt or better. There are several multimeters on the market which are suitable, e.g. the A.W.A. Voltohmyst which is a VTVM type and the Model 8 A.V.O. Whatever meter is used a low d.c. voltage range is essential, preferably 2.5 volts full scale or less. Probably the simplest way to check the impedance of a multimeter is to set it on the 10 VDC range and connect across its terminal a 9 volt battery, in series with a 100,000 ohms resistor. A reading of 6 volts or better indicates that the meter is at least 20,000 ohms per volt. The cheaper and generally used multimeters are 1,000 ohms per volt and under the above conditions these would read 0.9 volts.

A Cathode Ray Oscilloscope can be of great assistance in transistor servicing, both on audio and r.f. testing. The main requirements for the C.R.O. are high sensitivity on the Y amplifier and good high frequency response. Generally any CRO used for TV servicing is adequate, e.g. A.W.A. Type 1A 56031.

There are several transistor testers available on the market but the majority of these are expensive and the amount of usage by the serviceman does not generally justify the cost. A simple transistor tester may be constructed in accordance with the circuit below and will provide adequate service information.

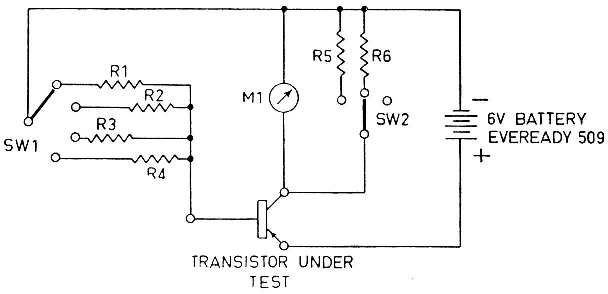


FIG. 1—SIMPLE TRANSISTOR TESTER.

PARTS.

M1—1mA F.S.D. ammeter.
SW1—1 pole, 4 position switch.
SW2—1 pole, 3 position switch.
R1—1.2 Megohms : β 0-200
R2—680 K ohms : β 0-100
R3—330 K ohms : β 0-50
R4—39K ohms : Match 2N408 or 2N270 Output
R5—Adjust for 20 mA full scale.
R6—0.1 ohms or 1 foot of 5 amp. fuse wire.

Switch SW1 selects the range of β and SW2 selects the current range on the collector current meter.

The mid position of SW2 is a safety precaution; if the transistor is faulty it could draw excessive current and damage the meter if switched to the 1mA or 20 mA F.S.D. position. Hence if the meter deflects in the mid position the transistor is faulty.

A battery polarity change over switch for NPN transistors could also be incorporated if desired.

To avoid damaging components and the printed wiring due to excessive heat, special soldering irons are recommended. For all general work an ORYX 12 watts iron is most useful, while for removal of i.f. and audio transformers a heavier 40-60 watts type with a $\frac{3}{8}$" bit filed flat at 45° will provide the best results (see Fig. 9). Care should be taken that the soldering iron frame is earthed as 50c/s leakage to the iron tip can damage transistors during soldering.

As the primary impedence of the output transformer is in the order of 600 ohms any output meter, such as A.W.A. Output Meter M8832, capable of working into such an impedance may be used for output measurements. Probably the easiest indication of audio output is to connect an A.C. meter, e.g. Voltohmyst or AVO Model 8, across the speaker terminals. A reading of 0.86 volts across the 15 ohms speaker indicates 50 mW audio output.

TEST METHODS

The procedure to be used in servicing transistor radios is much the same as used with vacuum tube radios. They both employ the superheterodyne circuit, they both pick up a minute signal voltage on an antenna, amplify it and apply it to a loudspeaker.

The test procedure differs only because of the low impedances and the low voltages which are found in transistor radios and in the case of this particular model because of the small size and the use of printed circuit.

TEST THE BATTERY FIRST. Do not perform any service work when using a weak battery to operate the receiver. Do not accept any performance deficiency as being due to a weak battery unless it has been proven by comparison when using a new battery.

1. Signal Tracing.

Signal tracing is a method of servicing that is applicable to any communication circuit. Either signal tracing or the similar method of signal injection is well adapted to the servicing of transistor radios. Signal level indication can be had by listening to the sound at the loudspeaker or by the methods outlined in the section on "Test Equipment".

2. Voltage Measurement.

Measurement of d.c. voltages is even more important in the servicing of miniature transistorised radios than with vacuum tube receivers. The most important difference is in the magnitude of the voltage to be measured. The maximum voltage encountered is 9 volts, and the bias voltages are in the order of 0.05 to 0.2 volt.

3. Resistance Measurement.

Although servicing by resistance measurement is one of the most common methods used for testing vacuum tube radios, this method has severe limitations when applied to the testing of circuits which contain transistors. Transistors will conduct an electric current when the terminal voltage is supplied from an ohmmeter just as readily as when the voltage is supplied from the radio battery. Because of this transistor conductivity misleading indication will be obtained and the transistors themselves can be permanently damaged by using resistance measurement.

If resistance measurements are to be made in a transistor radio, the transistors should be removed from the circuit to be tested. Generally, in the case of printed boards, it is easier to disconnect one lead of the suspect component than to remove the associated transistors when measurements are being made.

4. Current Measurement.

Individual current measurements are seldom made in servicing printed circuit receivers because of the difficulty of making such measurements. However, an overall current measurement is easily taken and should be made to assist in diagnosing trouble.

5. Preliminary Tests.

Regardless of what the stated complaint may be the following overall conditions should be checked:

(a) Condition of the battery (voltage with the set turned on).

(b) Overall current drain with no signal input (should be in the range 4-5 mA).

(c) Soldered connections. Turn the radio on with maximum volume. While listening to the loudspeaker gently wiggle all visible components and leads with an insulated tool such as an alignment tool.

(d) Sensitivity as determined by a listening test.

(e) Distortion as determined by a listening test.

CIRCUIT CONDITIONS AND THEIR EFFECT ON SERVICE PROCEDURE.

Circuit Impedances.

In vacuum tube receivers, both the input (grid) and output (plate) circuits are high impedances. A common practice to determine whether or not a circuit is alive is either touch a finger or short to chassis with a screwdriver various points and listen for possible effects through the loudspeaker.

In transistor radios the input (base) circuit has very low impedance 500Ω-1000Ω and the output (collector) circuit has medium impedance 20K-50KΩ. The "finger-test" method described above will provide no indication in a transistor radio and the "screwdriver method" could easily result in permanent damage to the transistor.

Figure 2 is an illustrated comparison of the circuit impedances.

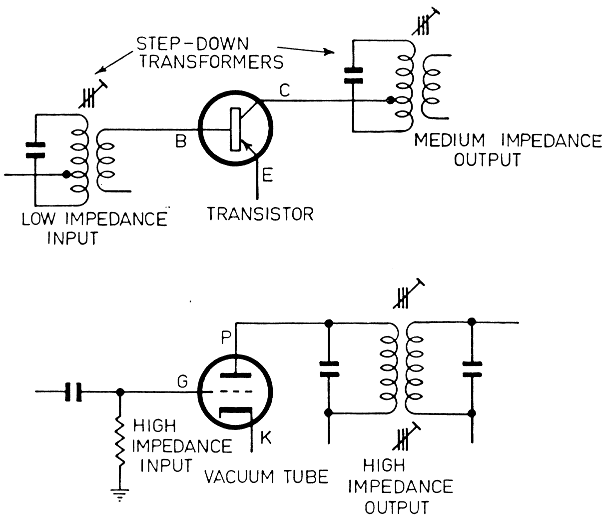


FIG 2—COMPARISON OF IMPEDANCES IN TRANSISTOR VS. VACUUM TUBE RADIOS.

Since generally the circuits in a transistor radio are not high impedance, it is not necessary to use low capacity probes in conjunction with oscilloscopes.

As impedance matching is important in any transistor radio, both audio and i.f. transformers have a step-down ratio, and when signal tracing, a pronounced signal voltage loss will be encountered between primary and secondary.

DC Voltages at Transistor Terminals.

The maximum terminal voltage encountered in this receiver is 9 volts, and as all the transistors are P-N-P types the collector and base voltage are negative with respect to the emitter. Just as with vacuum tubes a small voltage at the input of a transistor is used to control the output current, but this voltage, the base-emitter bias voltage, is of the order of 0.1 to 0.2 volt. Excluding the converter transistor, bias voltages outside these limits will result in distortion.

A.V.C. System.

In this model an "overload diode" is used to reduce the sensitivity on strong signals. The A.V.C. voltage changes the current in the 1st i.f. transistor T2 and thus reduces the d.c. voltage across the overload diode. This causes the diode to conduct and reduce the gain of the converter i.f. transformer.

Fig. 3 shows the relevant part of the circuit.

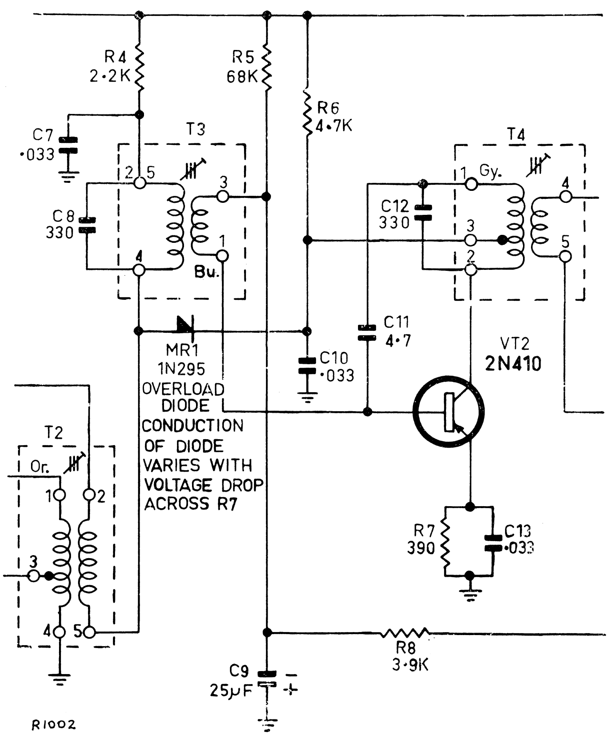


FIG. 3—OVERLOAD DIODE SYSTEM AND A.V.C.

Transistor Currents and Bias Voltages.

In a vacuum tube as the negative bias voltage is increased the plate current decreases. In a transistor the reverse occurs; as the base-emitter bias is increased the collector current increases.

The Audio output stage is Class B push-pull, which causes the battery current to increase rapidly with signal. Under no signal conditions the total receiver current is 4 mA approximately and with 50 mW audio output the current rises to approximately 17 mA.

PROCEDURE WHEN RECEIVER IS DEAD.

1. Turn the receiver on and check battery voltage. Under usual conditions the receiver should continue to operate at least until the battery has dropped to two-thirds of its rated voltage when new, i.e. six volts. If there is any doubt about the battery use a new one for test purposes. Carry out Section 5 of Test Methods, preliminary tests (a), (b) and (c).

2. Having ascertained that the battery being used is satisfactory, hold the set up to your ear and switch the receiver on and off. Clicks should be heard through the speaker. No clicks could mean an open circuit speaker voice coil, a faulty switch, an open circuit associated with the earphone jack or output transformer.

3. If a gentle hiss is heard through the loudspeaker with the volume control at maximum then it is almost certain that the audio stages are working satisfactorily and that the fault lies in the detector or r.f. end of the receiver. At this stage remove the board from the cabinet.

4. Use a voltmeter to check all voltages shown in the circuit diagram, (positive side of meter to positive of battery) allowing a tolerance of ±15% on all emitter and base voltages. If there is a discrepancy between any measured and quoted voltage check the associated circuitry. Open circuit resistors, improperly soldered connections (dry joints) and shorted capacitors are the most likely causes.

In general the component to be suspected last is the transistor. No potential difference between base and emitter, measured either directly in the case of a normal multimeter or by subtracting emitter from base potential when using a VTVM with one side earthed, usually signifies a short cricuit external to the transistor, but in the odd case can signify breakdown of the base-emitter junction in the transistor itself.

Note that in the converter due to self bias when oscillating, the potential between base and emitter will vary between +0.05 and −0.05 volt. A voltage greater than −0.1 volt signifies that the converter is not oscillating.

5. If no hiss is heard in the loadspeaker with the volume control at maximum and the speaker, output transformer secondary winding and the earphone jack are operating correctly (this may be checked with an ohmmeter). and all voltages are normal in the audio stages, the fault will be an open circuit coupling capacitor.

6. If the fault has been found to be in the r.f. end of the receiver first check whether the oscillator circuit is operative. If there is any doubt after the voltage check has been made, either check with an oscilloscope at the converter emitter or close the gang and pick up the oscillation on another receiver tuned across the range between 2UE and 2KY (950-1050 Kc/s.). This will appear as an unmodulated carrier.

7. If the oscillator is working, (a) connect the ground lead of a signal generator to the +ve side of the battery (board earth), (b) set generator to 455 Kc with audio modulation, (c) connect a capacitor (say 0.01 to 0.1μF) in series with the high-side signal generator lead and (d) set the generator to give almost maximum output. Then touch the free end of the capacitor to transformer side of the diode detector, thence to the bases of 2nd and 1st i.f. stages and the converter. The faulty stage should be apparent. If the signal is heard at each of these points the fault lies in the aerial circuit.

8. To make a circuit isolation of a component without removal of either terminal, with a sharp knife cut through the printed wiring to that component as shown in Fig. 4. This wiring break is then easily bridged with a soldering iron. However this method should only be used where absolutely necessary.

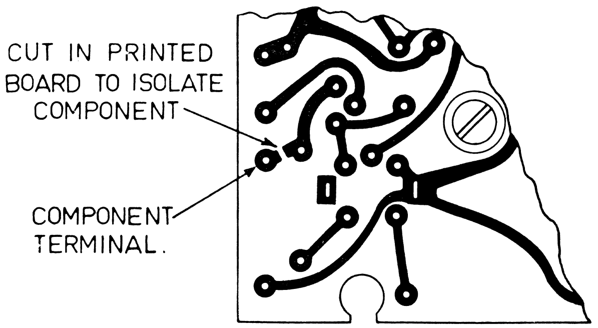


FIG. 4—COMPONENT ISOLATION ON PRINTED CIRCUIT BOARD.

PROCEDURE WHEN THE RECEIVER IS "WEAK".

Use a new battery and give the receiver a listening test to determine whether the fault is in the audio section or in the i.f. section.

If the receiver has low i.f. sensitivity it may provide full volume on local stations and distant stations will be weak or not heard at all. If the receiver has low audio sensitivity then even local stations will not give full volume, but distant stations will probably be received.

PROCEDURE WHEN RECEIVER HAS LOW AUDIO GAIN.

1. Measure all voltages around the audio section and compare against the quoted values. If there is a marked discrepancy remove the associated transistor and check all components which could be at fault.

2. If the voltages are satisfactory check all electrolytic capacitors by shunting with another capacitor (connected in the correct polarity) of approximately the same value. This applies to the emitter bypass capacitors as well as the interstage coupling capacitors.

3. Measure the d.c. resistance of the audio transformer windings. Low audio gain can easily be caused by the internally shorted turns in either the driver or the output transformers and often signal tracing by means of an audio generator may not readily disclose the trouble. Before making resistance measurements disconnect the transformer leads. Note that due to variations in the wire used, the resistance can vary appreciably and the transformer still be satisfactory. As a general rule the expected resistance variation is ± 20%.

4. If an audio generator is available the audio sensitivity may be checked. The input at 1000 c/s to the top of the volume control required for 50 mW output is approximately 4 mV.

PROCEDURE WHEN RECEIVER HAS LOW I.F. GAIN.

1. Check the i.f. alignment (see page 3). Connect the generator to the aerial section of the gang and peak the i.f. transformers. These transformers are very high Q miniature types, whose constructions are shown in the following cross-sectional diagrams. It will be seen that the i.f. transformer, used in the Model B11X, which is the only major difference from the Model B11, is of a simpler, more rugged construction, and is not so critical of adjustment as its counterpart in the B11. The following hints for tuning the i.f. will prove useful:—

(a) The tuning tool used should be a small metal screw-driver whose tip fits cleanly into the tuning core. A tuning tool, Part No. 39462, is available from the Service Department.

(b) When tuning the core, do not use any downward pressure.

(c) In Model B11, the threads on the boss may be damaged if the core is wound in and forced against the winding bobbin. This should never happen as only a light torque is needed to turn the tuning core normally.

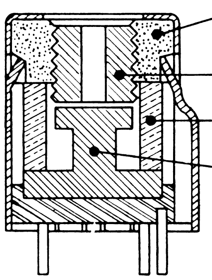


FIG. 5A.—I.F. TRANSFORMER CONSTRUCTION (B11).

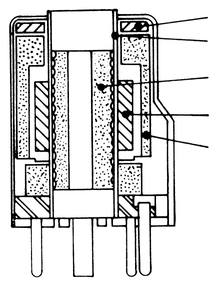


FIG. 5B.—I.F. TRANSFORMER CONSTRUCTION (B11X).

2. When a resonance peak is reached, there should be a very definite decrease in the output with only one eighth of a turn in either direction. A transformer having a broadly resonant peak should be replaced.

3. If a transformer can not be peaked at 455 Kc/s the trouble can be due to a defective transformer, 330 pf tuning capacitor or transistor. Always check the soldering of the transformer and transistor before replacing these components as a high resistance connection may cause the trouble.

4. Incorrect bias across the overload diode will cause loss of gain in the converter stage. The bias should be between 1 volt and 2.5 volts and may be measured directly with a multimeter or by subtraction with a VTVM with one side earthed. This should be checked if VT2 has been replaced, and if the bias is outside of tolerance, R5 (68K ohms) should be altered slightly to ensure correct operation of the overload diode.

5. The fault may be isolated readily to one particular stage by means of the signal generator. Tune the generator to 455 Kc/s with audio modulation and always work with the volume control at maximum and a fairly low audio output. Using the generator output applied to the collector of VT3 as a reference to give a measured audio output then, for the same audio output, the required output from the generator should be

(i) at base VT3 : 1/50 of reference (—33db)

(ii) at base VT2 : 1/1,500 of reference (—63db)

(iii) at base VT1 : 1/30,000 of reference (—90db)

(iv) at aerial section of gang : 1/1,500 of ref. (—63db)

If all these figures are satisfactory check the diode detector and associated components.

The diode may be checked with an ohmmeter with an internal voltage not greater than 9 volts, the forward resistance being in the order of 1,000 ohms and the back resistance in the order of 100,000 ohms.

6. If the fault has not yet been isolated, check the oscillator alignment. This may be done by setting the tuning close to 600 Kc/s and away from any station and adjusting the core of the oscillator coil for maximum noise. This is very effective when near a fluorescent light. If this adjustment gives much improvement, proceed with the complete alignment as detailed in the alignment table page 3.

7. Where a transistor stage shows low gain, shunt each bypass capacitor in that stage with another capacitor to detect an open circuit bypass.

PROCEDURE WHEN RECEIVER IS DISTORTED

1. For accurate determination of the existence and origin of distortion in any radio receiver there is no substitute for a signal generator and an oscilloscope. After finding where the distortion originates a voltage check (especially bias voltage) will assist in pin-pointing the trouble.

2. If there is complete lack of bass frequencies the fault could be in the A.V.C. bypass capacitor C9.

3. The base to emitter voltage on the Class B output transistor should be 0.1 to 0.17 volts. Low voltage will give what is termed "Crossover Distortion" and is most noticeable on low volume (see Fig. 6). If the bias voltage cannot be measured accurately check the collector currents in the output stage. These should be between 0.5 and 1 mA for each transistor. Note that the thermistor is temperature sensitive and if heated should be allowed to cool to room temperature before making bias measurements.

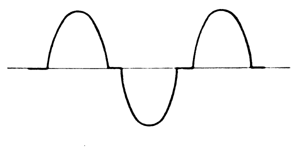


FIG. 6—CROSSOVER DISTORTION.

4. For minimum distortion the output transistors should be matched for push-pull operation. This is achieved when on high output levels the waveform is evenly clipped as in Fig. 7.

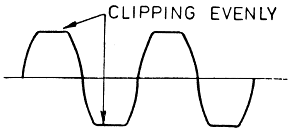


FIG 7—CORRECTLY MATCHED OUTPUT TRANSISTORS.

The waveforms obtained with a mismatched pair at low output and high output are shown in Figs 8 (a) and (b). A waveform similar to 8 (c) indicates one transistor inoperative.

5. Distortion can occur on local stations if there is excessive bias on the overload diode. If the bias, with no signal input to the receiver, is greater than 2.5 volts the point at which the overload diode conducts will be altered and the first transistor may overload before the diode starts its limiting action. (Refer to section 4 Low I.F. Gain.)

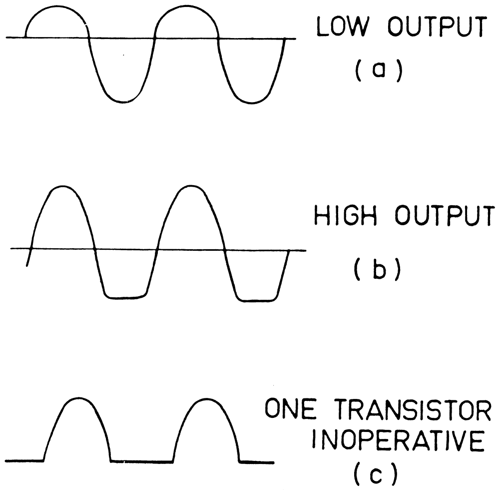


FIG. 8—MIS-MATCHED OUTPUT TRANSISTORS.

PROCEDURE WHEN RECEIVER IS UNSTABLE..

1. Check the battery. Instability can occur due to the high internal resistance of a flat battery resulting in low frequency "motorboating".

2. Open circuit high tension bypass capacitors will result in either i.f. or audio instability dependant on the position in the circuit. This also applies to C17 the 0.033 uf filter capacitor across the volume control.

3. Poor earthing of the tuning capacitor may result in i.f. instability.

4. Faulty neutralising capacitors will cause instability in the i.f. stages. The nominal value of these is 4.7 pf and it has been found in isolated cases on other models that the value has risen in service and caused heterodyne whistles on all stations. This is best checked by substitution.

5. A faulty converter clamp diode will cause excessive oscillator voltage and render the converter stage unstable (most noticeable at the high frequency end of the band).

PROCEDURE WHEN RECEIVER IS INTERMITTENT.

1. The most likely cause is an incorrectly soldered connection. Resolder any suspected connections.

2. Look for excess solder that will make contact only when the receiver is placed in its case, particularly on the area of the board directly over the speaker.

3. If physical examination does not enable the trouble to be localised, it will be necessary to use signal tracing or signal injection to localise the fault.

COMPONENT REMOVAL AND REPLACEMENT.

1. 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.

2. 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 screwdriver kits are available on the market containing a suitable spiked bit.

3. To remove an i.f. transformer or oscillator coil it is desirable to have a suitable tip on the soldering iron as shown in Fig. 9. All seven connections on the transformer 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. The construction of the transformer is shown in Fig 5.

4. Transistors may be removed in a similar manner to the i.f. transformers using the $\frac{3}{16}$" bit on the ORYX iron.

5. The volume control may be removed readily by cutting the wires to the three terminals and removing the nuts from the mounting screws.

6. The audio transformers may be removed by first disconnecting the five leads and then moving each mounting lug by approximately $\frac{1}{32}$" at a time until both lugs are free.

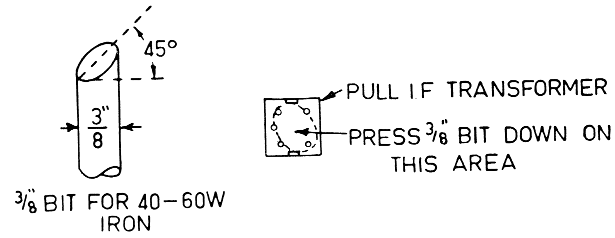
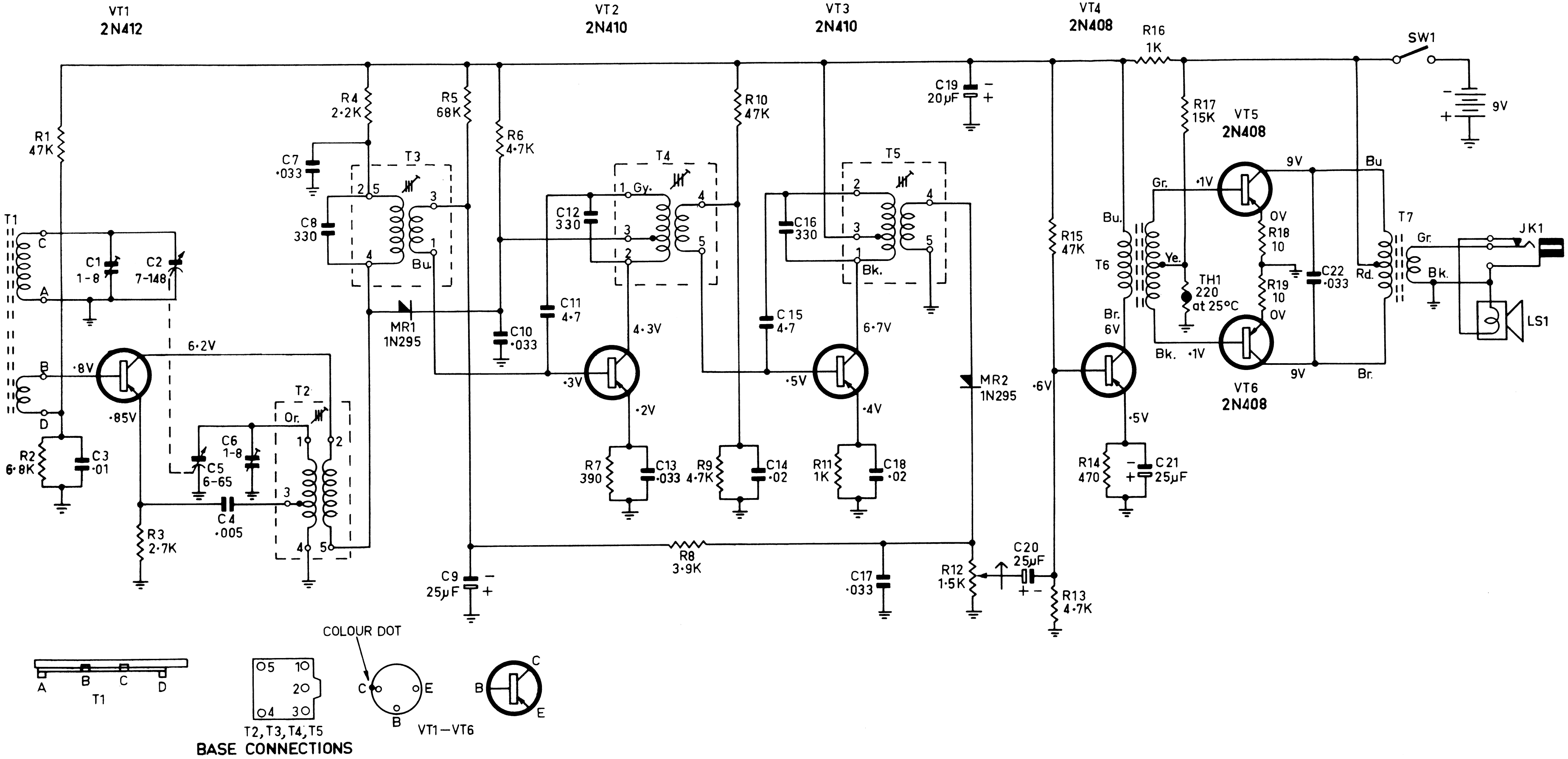


FIG. 9—SOLDERING BIT AND I.F. REMOVAL.


VT1
2N412
VT2
2N410
VT3
2N410
VT4
2N408
R16
1K
SW1
9V
R1
47K
R4
2·2K
R5
68K
R6
4·7K
R10
47K
C19
20μF
R17
15K
VT5
2N408
C7
·033
T3
T4
T5
C8
330
C12
330
C16
330
Gy.
Bu.
Bk.
T1
C1
1-8
C2
7-148
MR1
1N295
C10
·033
C11
4·7
C15
4·7
R15
47K
T6
Gr.
·1V
9V
Bu
0V
R18
10
T7
Gr.
JK1
Bk.
Ye.
TH1
220
at 25°C
R19
10
C22
·033
Rd.
LS1
Br.
6V
Bk.
·1V
9V
Br.
VT6
2N408
6·2V
·8V
·85V
4·3V
6·7V
·3V
·5V
·6V
·2V
·4V
·5V
MR2
1N295
T2
Or.
C6
1-8
R2
6·8K
C3
·01
C5
6-65
R7
390
C13
·033
R9
4·7K
C14
·02
R11
1K
C18
·02
R14
470
C21
25μF
C4
·005
R3
2·7K
R8
3·9K
C17
·033
R12
1·5K
C20
25μF
R13
4·7K
C9
25μF
COLOUR DOT
T1
T2, T3, T4, T5
VT1 – VT6
BASE CONNECTIONS
(VIEWED FROM WIRING SIDE)

R1001

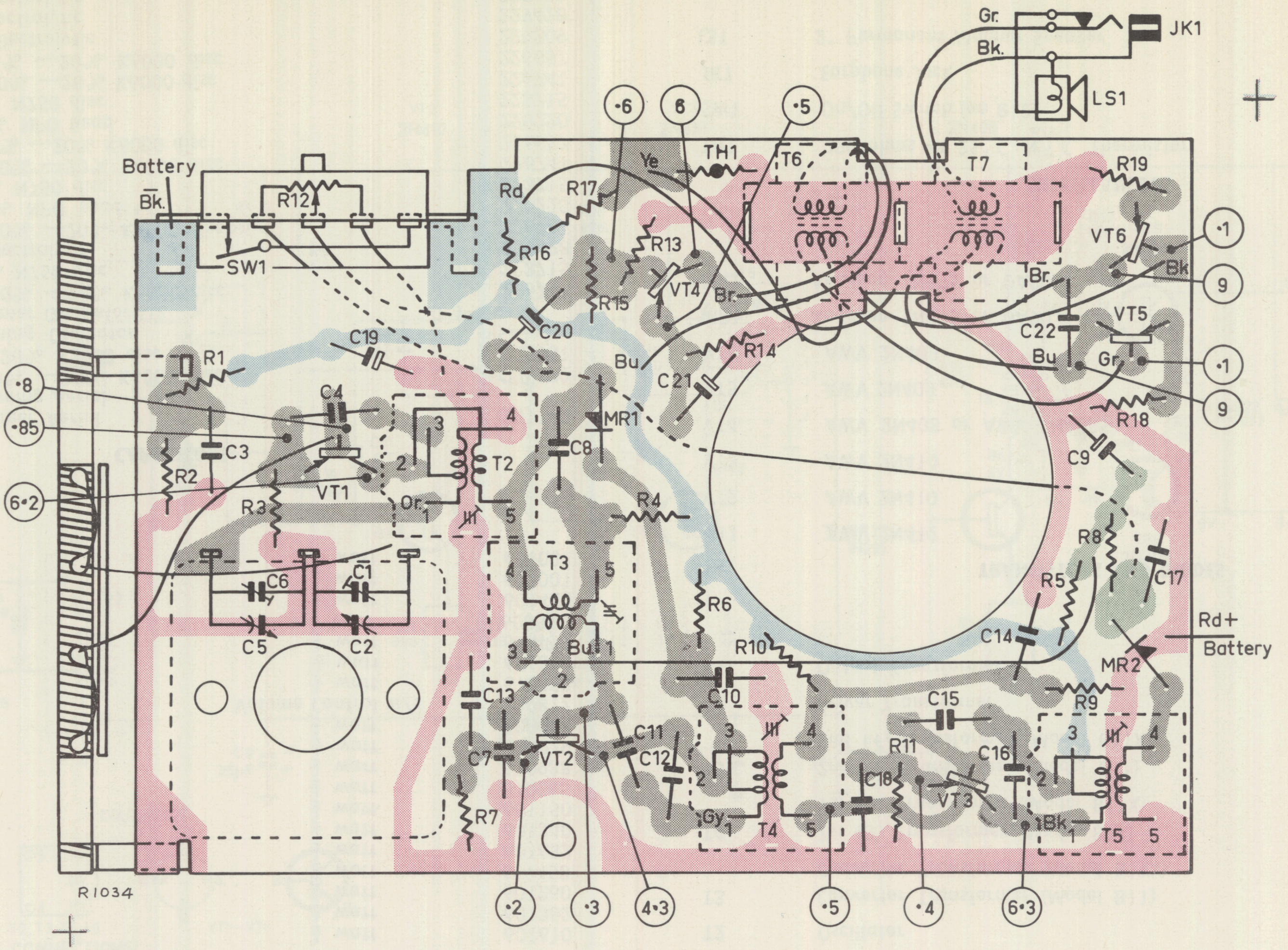
CIRCUIT CODE

CODE No.	DESCRIPTION		PART No.
	RESISTORS		
	All Resistors ± 10% Carbon unless otherwise stated.		
R1	47K ohms	½ watt	601610
R2	6.8K ohms	½ watt	601362
R3	2.7K ohms	½ watt	601260
R4	2.2K ohms	½ watt	609453
R5	68K ohms	½ watt	601632
R6	4.7K ohms	½ watt	601340
R7	390 ohms	½ watt	601150
R8	3.9K ohms	½ watt	610565
R9	4.7K ohms	½ watt	610938
R10	47K ohms	½ watt	614979
R11	1K ohms	½ watt	608044
R12	1.5K ohms	Volume Control w/s	39817
R13	4.7K ohms	½ watt	610938
R14	470 ohms	½ watt	606598
R15	47K ohms	½ watt	614979
R16	1K ohms	½ watt	608044
R17	15K ohms	½ watt	601450
R18	10 ohms	½ watt	601001
R19	10 ohms	½ watt	601001
	CAPACITORS		
C1	1—8pf trimmer Aerial		231143
C2	7—148pf tuning Aerial		
C3	0.01uf +80% —20% K6000 disc		226372
C4	0.0047uf ±20% K2000 disc		225951
C5	6—65pf tuning Oscillator		
C6	1—8pf trimmer Oscillator		
C7	0.033uf +80% —20% K6000 disc		226741
C8	330pf ±5% N750 disc		223715
C9	25uf 3vw Electrolytic		229428
C10	0.033uf +80% —20% K6000 disc		226741
C11	4.7pf ±10% NPO bead		220220
C12	330pf ±5% N750 disc		223715
C13	0.033uf +80% —20% K6000 disc		226741
C14	0.02uf +80% —20% K6000 disc		226657
C15	4.7pf ±10% NPO bead		220220
C16	330pf ±5% N750 disc		223715
C17	0.033uf +80% —20% K6000 disc		226741
C18	0.02uf +80% —20% K6000 disc		226657
C19	20uf 10vw Electrolytic		229309
C20	25uf 3vw Electrolytic		229428
C21	25uf 3vw Electrolytic		229428
C22	0.033uf +80% —20% K6000 disc		226741

CODE No.	DESCRIPTION	PART No.
	TRANSFORMERS	
T1	Ferrite Rod	50651
T2	Oscillator	50647
T3	Converter Transformer (Model B11)	50649
	Converter Transformer (Model B11X)	51626
T4	1st I.F. Transformer (Model B11)	50643
	1st I.F. Transformer (Model B11X)	51622
T5	2nd I.F. Transformer (Model B11)	50645
	2nd I.F. Transformer (Model B11X)	51624
T6	Driver Transformer	50451
T7	Output Transformer	50454
	TRANSISTORS AND DIODES	
VT1	AWV 2N412	
VT2	AWV 2N410	
VT3	AWV 2N410	
VT4	AWV 2N408 or AWV 2N4065	
VT5	AWV 2N408	
VT6	AWV 2N408	
MR1	Anodeon 1N295 or OA90	
MR2	Anodeon 1N295 or OA90	
	MISCELLANEOUS	
TH1	220 ohms at 25° C. N.T.C. Thermistor	893709
SW1	On/Off Switch (on R12)	
JK1	Earphone Jack	41701
LS1	2" Permanent Magnet Speaker	50041

VOLTAGE CHART AND COMPONENT LOCATION

All voltages negative with respect to printed board earth (positive terminal of battery).



The assembly represented above is viewed from the wiring side of the board.

The printed wiring, on the near side of the board, is presented in phantom view superimposed on the component layout of the reverse side.

Red indicates earth line (battery positive terminal).

Blue indicates H.T. line (battery negative terminal).

Green indicates A.G.C.