

## REPORT ON REFURBISHMENT OF R1155 RECEIVER TO WORKING CONDITION

Item received: 19 May 2018

Work completed: 11 June 2018

### Power Supply and Audio Amplifier

An order for the work having been agreed earlier, power supply and audio amplifier construction commenced prior to the above date.

The power supply unit was constructed to enable operation from 230V AC domestic mains supply, and housed inside a vented aluminium project box (see image below). The box also contains a low voltage power supply to operate an integrated circuit audio amplifier driving a 4-inch speaker mounted on the front face. At customer request, a 0.25 inch jack socket was added to the front panel to enable use of low impedance headphones. Insertion of the phones jack isolates the internal speaker. An additional volume control is provided because the R1155 amplifier is designed such that, when the Master Switch is set to AVC, the audio output cannot be reduced to zero.

A hand-drawn circuit diagram of the power supply and audio unit is shown on the next page. The power supply delivers 220v DC HT and 6.3v AC LT supplies for the valves and connects to the right-hand Jones socket on the front of the R1155. Audio output from the R1155 and the aerial connection are routed back via the Jones plug and bundled inside the power lead to the power supply and audio unit. The aerial wire plugs into a socket at the rear of the power supply and audio unit. The unit contains 2 fuses (20mm glass type):

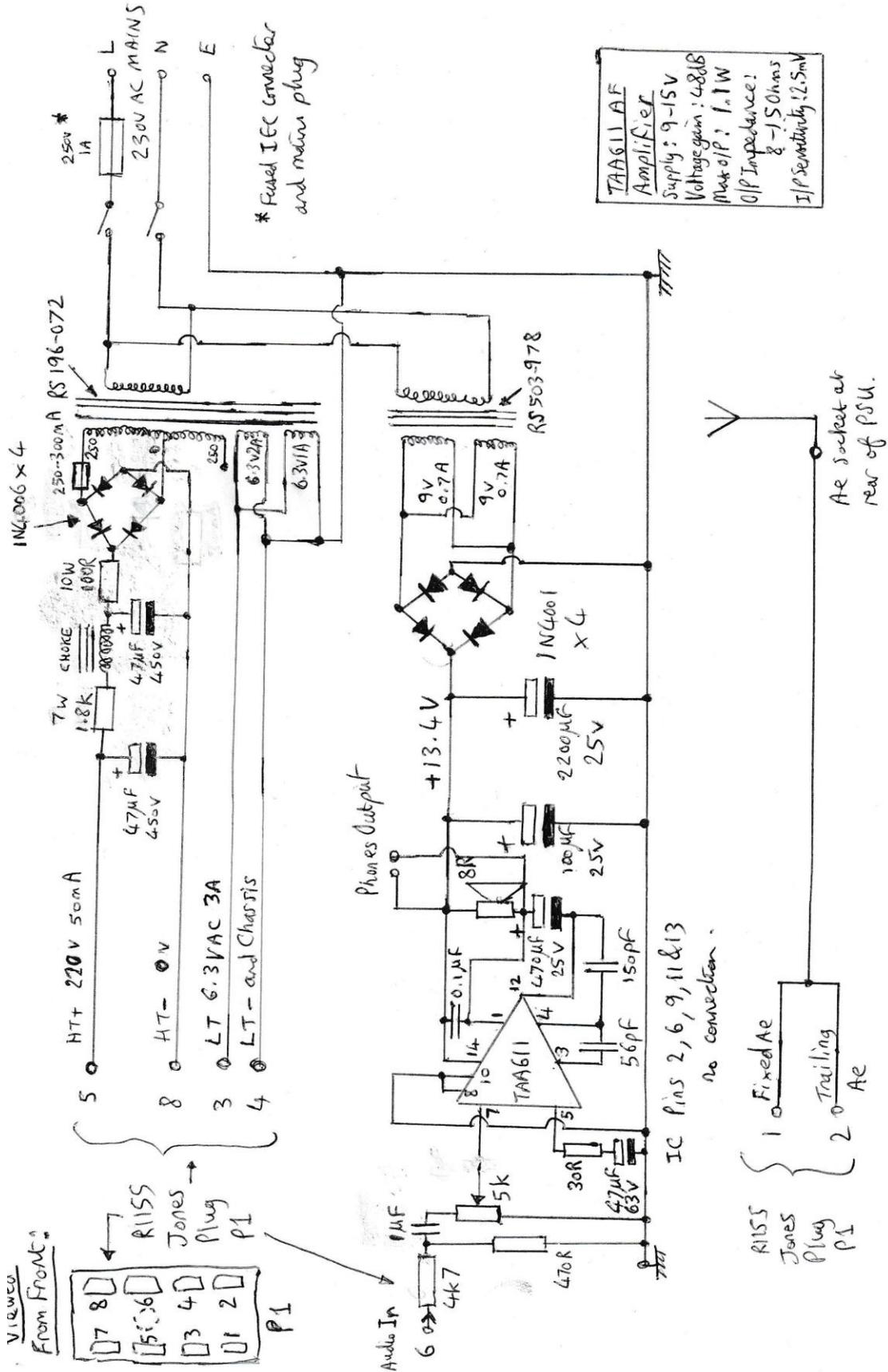
1. Mains fuse 1A, located inside the power socket receptacle. Spare fuse supplied, also inside receptacle.
2. HT fuse 250 - 300mA. Steady state HT current is well below this but, at power-up, there is a high in-rush current to initially charge the smoothing capacitors. Use of lower fuse ratings might therefore cause nuisance fuse-blowing.



Project box 270mm x 200mm x 110mm. Needs to be this large to accommodate the main power supply parts, amplifier power supply, board and speaker.

### R1155 Initial Inspection

Initial examination revealed that V1 and V2 (visual switching) had been removed, along with associated circuitry. This will not affect normal use of the receiver. Also V9, similarly redundant, had been removed and crudely replaced with a 6F6 audio pentode and some components including a small audio output transformer, intended to function as an internal audio amplifier. For economy of power consumption, and because the external integrated circuit audio amplifier had already been built, this modification has mostly been left in-situ but disconnected and the valve removed to conserve heater current. The small transformer has been removed because it was fouling the fittings inside the case when attempts were made to re-insert the chassis into the case. Inside the Beat Frequency Oscillator (BFO) box, an OM-4 valve was found fitted in lieu of VR101/MHLD6. This is not a direct equivalent, but works acceptably, and so was left as-is. The VI103/Y63 magic eye tuning indicator worked dimly so was replaced with a brighter Y65 that has higher sensitivity and will therefore show deflection on weaker signals for ease of tuning.



TAA611 AF Amplifier  
 Supply: 9-15V  
 Voltage gain: 48dB  
 Max. o/p: 1.1W  
 O/P Impedance: 8-15 Ohms  
 I/P Sensitivity: 2.5mV

## Valve Tests

Valves were tested as follows, using an Avo VCM163 valve characteristics meter: test values for a brand new valve are shown in brackets for comparison. Civilian equivalent valve numbers are given as well as valve function:

Valve	Function	Anode Current (mA)	Gain (mA/v)	Comments
V1, V2	Visual switching	-	-	Both found to have been removed prior to receipt.
V3: VR100/KTW62	RF amplifier	15 (8)	3.6 (2.8)	Excellent.
V4: VR99/X66 (triode part)	Oscillator	12 (8)	1.6 (2.5)	Excellent.
V4: VR99/X66 (hexode part)	Mixer	4 (4)	0.9 (1.2)	Excellent.
V5: VR100/KTW62	1 <sup>st</sup> IF amplifier	13 (8)	3.5 (2.8)	Excellent.
V6: VR100/KTW62	2 <sup>nd</sup> IF amplifier	15.5 (8)	3.5 (2.8)	Excellent.
V7: VR101/MHLD6 (triode part)	AVC and BFO <sup>1</sup>	(11.5) (OM-4) 4.1 (5.5)	(3) (OM-4) 1.3 (2.2)	OM-4 found fitted. This is not equivalent to MHLD6, but works acceptably. Tests good.
V7: VR101/MHLD6 (diodes part)	AVC and BFO	(OM-4) a <sup>1</sup> d: 83%, a <sup>2</sup> d: 82%		OM-4 as above. Tests good.
V8: VR101/MHLD6 (triode part)	AF amplifier	13 (11.5)	3.5 (3)	Excellent.
V8: VR101/MHLD6 (diodes part)	Detector	a <sup>1</sup> d: 97%, a <sup>2</sup> d: 95%		Excellent.
V9	Visual switching	-	-	Found to have been removed prior to receipt.
V10: VI103/Y63	Tuning indicator	(0.2)	-	The VI103/Y63 magic eye tuning indicator worked dimly. Replaced with a brighter Y65 that gives greater deflection for ease of tuning.

## Capacitor Replacement

The following paper capacitors were found leaky when tested and replaced with new polyester types. Most paper capacitors of this age are prone to leakage through moisture ingress and would otherwise have prevented correct functioning of the radio. Many of the metal can paper capacitors were triple 0.1uF units whose protruding rubber-insulated cables had perished and deteriorated beyond recovery. The cables were snipped off leaving the cans in place for appearance's sake, and replacements soldered discreetly beneath the chassis.

ID	Value	Function
C37	0.1uF	V4 AGC <sup>2</sup> decoupler
C32	0.1uF	V4 mixer anode decoupler
C33	0.1uF	V5 AGC decoupler
C34	0.1uF	V4 oscillator anode decoupler
C36	0.1uF	V4 g2/g4 decoupler
C40	0.1uF	V3 AGC decoupler
C39	0.1uF	V3 g2 decoupler
C2	0.2uF	AGC line decoupler
C105	0.1uF	AF volume control return to V8 cathode

<sup>1</sup> AVC – automatic volume control; BFO – beat frequency oscillator

<sup>2</sup> AGC – automatic gain control (same as AVC)

ID	Value	Function
C28	0.1uF	V6 g2 decoupler
C27	0.1uF	V6 anode decoupler
C12	0.1uF	Assoc. V7
C16	0.5uF	V7 cathode decoupler
C29	0.1uF	V5 anode decoupler
C30	0.1uF	V6 AGC decoupler
C31	0.1uF	V5 g2 decoupler
C10	0.004uF	AF filter
C96	0.02uF	AF filter

### Realignment of RF and Oscillator Circuits

The RF amplifier and oscillator circuits were checked using an Avo No.1 Signal Generator and a Racal 836 Digital Frequency Counter. The oscillator circuits were found to be close to calibration except for Range 2 (7.5/3.0 MHz) which was about 500 kHz off-tune. Range 2 oscillator trimmer was adjusted. RF trimmers and some dust cores were adjusted to peak sensitivity on all ranges. IF alignment appeared normal and was left alone.

### Cost Breakdown

Item	£
Project Box	40.00
Mains transformer for HT and valve heaters	10.00
Mains transformer for IC audio amp	5.00
HT Choke	4.00
4 x 1N4006 diodes, 2 x 47uF electrolytic capacitors, HT Fuse holder and fuse	5.00
Switched and fused IEC mains connector	2.00
Mains lead (2 metres) with 13A plug and IEC connector	2.00
Replacement of 18 paper capacitors	11.00
Labour, sundry parts from spares box inc. IC audio amp and speaker	20.00
Replacement Y65 magic eye tuning indicator	11.00
8-pin Jones plug for front panel	10.50
Replacement slow-motion tuning knob (original found cracked)	3.00
<b>Total:</b>	<b>123.50</b>

### Appendices:

1. General safety guidance on use of vintage valve equipment.
2. Guidance notes on operating R1155.

## **Appendix 1: General safety guidance on use of vintage valve equipment**

Very old radio sets (i.e. those made before 1975) were not made to the current very high standards of electrical safety that we take for granted nowadays.

Consequently, they are more prone to fail in an unsafe way than modern equipment. For example, they may overheat, even catch fire (in rare cases) and exposed metal parts may become electrically "live".

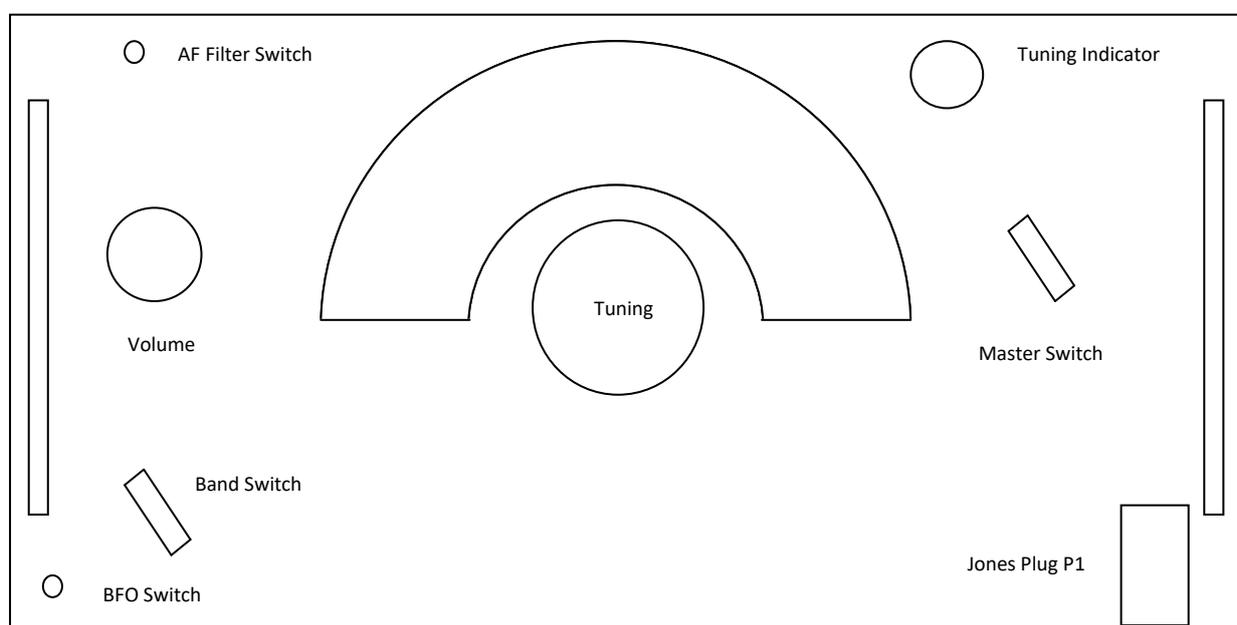
The equipment to which this notice is attached has been carefully electrically refurbished and then tested, to ensure it is at least as safe as it was originally designed to be. Where possible, modern components have been used which enhance the safety of this equipment.

However, to avoid problems, the following points should always be observed:

1. Never leave unattended any equipment that is switched on.
2. Always switch off and unplug the equipment (at the wall socket) when not in use.
3. If the equipment behaves in an abnormal way, try tuning into another programme. If this is also abnormal, the equipment may be defective and should immediately be switched off and unplugged from the mains supply outlet.
4. If any of the fuses fails, it must be replaced with a fuse of the same type and current rating. If the fuse fails a second time, seek repairs and do not fit a higher rated fuse.
5. Ensure adequate ventilation is provided underneath and at the rear of the equipment.
6. Only persons suitably trained and competent should remove any covers or undertake repairs to electrical equipment.
7. Never attempt to make any electrical connections to the inside of the set (e.g. for connecting turntable or iPod, etc.).
8. Never operate this radio or its power supply and audio unit with the covers removed, and always remove the mains plug from the wall outlet before removing the covers.

## Appendix 2: Guidance notes on operating R1155.

1. Plug the Jones plug into the right-hand socket on the front of the R1155. Ensure that the “Top” marker is at the top before inserting the plug, otherwise the locating pin will not engage. Pin protectors have been inserted into the centre Jones socket. Never remove these as, although none of the pins on the centre socket carry lethal voltages, metal objects falling against them could cause short circuits and damage the equipment. There should never be any need to connect anything to the centre or left-hand sockets.
2. The mains on-off switch is on the power supply and audio unit rear-right (part of the IEC fused connector). Ensure that an aerial is plugged into the aerial socket at the same location. Turn on the mains switch. The green pilot lamp on the front of the power supply and audio box should illuminate. Once the R1155 valves have warmed up, the magic eye tuning indicator on the front of the R1155 should glow green. The R1155 controls are explained below; in the diagram, only the functioning controls are shown as the remaining knobs and switches don't do anything.



**AF Filter Switch:** In upper position audio is normal. Down position gives bass cut.

**Volume:** With Master Switch at 'Omni' (for single sideband reception with BFO on) the volume control needs turning clockwise 50%-75%. At AVC (for broadcast AM reception with BFO off) the volume control needs to be set near to minimum. Use in conjunction with the volume control on the power supply and audio unit for comfortable listening level.

**Band Switch:**

Band 1: 18/7.5 MHz

Band 2: 7.5/3.0 MHz

Band 3: 1500/600 kHz

Band 4: 500/200 kHz

Band 5: 200/75 kHz

See notes below on broadcast and amateur bands

### BFO Switch

The Beat Frequency Oscillator switch needs to be turned on to receive single sideband (SSB) signals. With BFO on (and using the "Omni" setting of the Master Switch), adjusting the tuning using the slow-motion knob will alter the note of the received signal enabling the voice transmission to be discerned correctly. Use the lowest audible volume control setting to aid correct reception. Practice is needed.

### Tuning Indicator

As a strong station is tuned in, green shutters in the lower half of the tuning indicator move progressively closer together.

### Master Switch

Only the 2 most anti-clockwise switch positions are functional: Position 1 "Omni" turns off the automatic volume control (AVC) function and is most suited to reception of single sideband (SSB) radio amateur reception. Position 2 "AVC" is most suited to broadcast transmission. Switching from "Omni" to "AVC" without reducing the volume control can cause blasting of sound!

### Jones Plug P1

The R1155 cannot be operated without first inserting the Jones Plug P1 that supplies power to the R1155.

### Amateur Bands

The R1155 is capable of receiving the following Amateur Bands:

Band	Frequency	R1155 Band
80m	3.5 – 4.0 MHz	7.5/3.0 (Band 2)
40m	7.0 – 7.1 MHz	7.5/3.0 (Band 2)
20m	14.0 – 14.3 MHz	18/7.5 (Band 1)

### Broadcast Bands

The R1155 is capable of receiving the following Broadcast Bands:

Band	Frequency	Notes	R1155 Band
Long Wave	200 - 500 kHz	BBC R4 198 kHz	500/200 (Band 4/5)
Medium Wave	600 – 1500 kHz	Various	1500/600 (Band 3)
90m	3.2 – 3.4 MHz	Night time	7.5/3.0 (Band 2)
75m	3.9 – 4.0 MHz	Night time	7.5/3.0 (Band 2)
60m	4.75 – 5.06 MHz	Night time	7.5/3.0 (Band 2)
49m	5.8 – 6.2 MHz	Dusk and night	7.5/3.0 (Band 2)
41m	7.2 – 7.45 MHz	Dusk and night	7.5/3.0 (Band 2)
31m	9.4 – 9.9 MHz	Afternoon & night	18/7.5 (Band 1)
25m	11.6 – 12.1 MHz	Day and night	18/7.5 (Band 1)
22m	13.6 – 13.9 MHz	Day	18/7.5 (Band 1)
19m	15.1 – 15.8 MHz	Day	18/7.5 (Band 1)
16m	17.5 – 17.9 MHz	Day	18/7.5 (Band 1)