

RANK RADIO INTERNATIONAL  
HI FI PRODUCT GROUP BRADFORD  
LEAK 2100 AMPLIFIER SERVICE MANUAL

Introduction:

The servicing instructions in the manual are divided into two levels:-

- 1) Servicing to module level, where the fault is located to a module or major component which can then be replaced.
- 2) Complete servicing, where circuit description, circuit diagrams and test point voltages are provided to assist the qualified Service Engineer.

If further assistance is required, please contact:-

Service Department,  
Rank Radio International,  
Bradford Road,  
Idle,  
Bradford.  
Yorkshire. BD10 8SF

Telephone: BRADFORD (STD - 0274) 611131

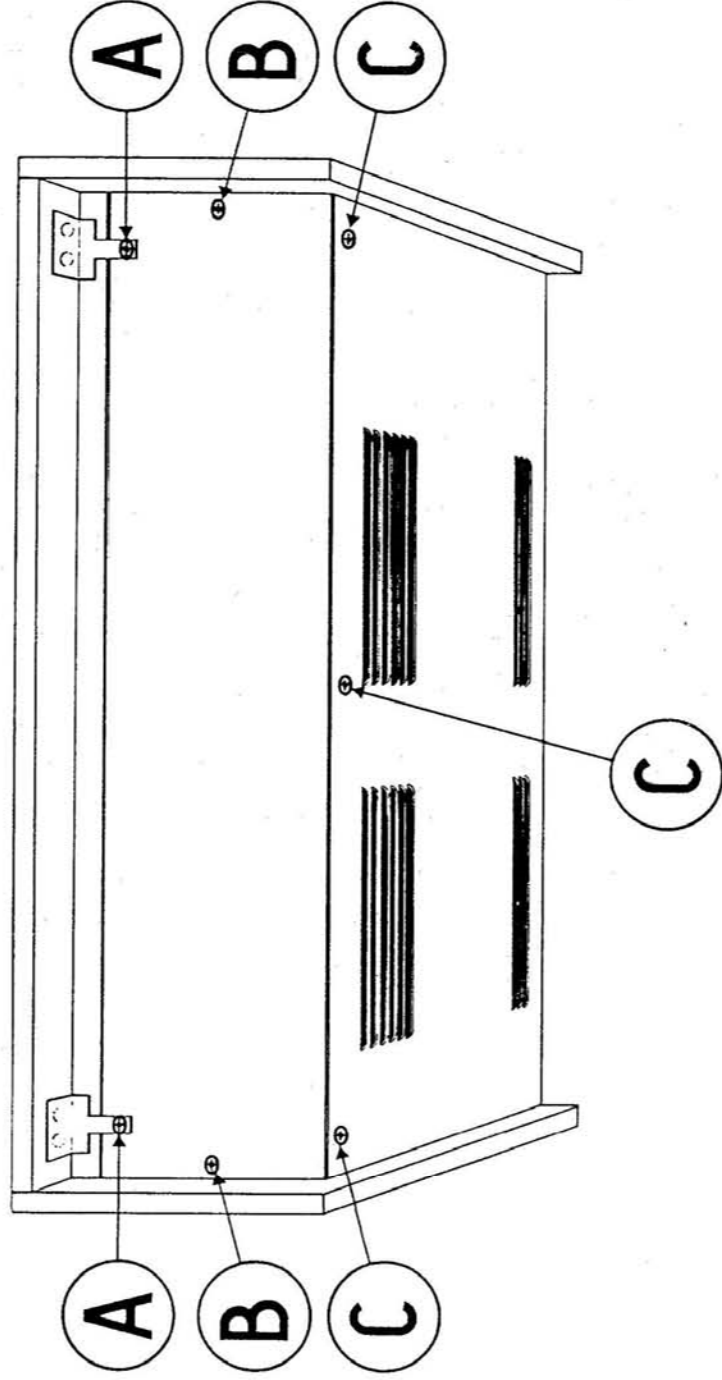
Contents:

1. Dismantling the Case
2. Key to Major Components
3. Faultfinding to Module Level
4. Access to the Main Amplifier Module
5. Access to Front Panel Components
6. Detailed Servicing

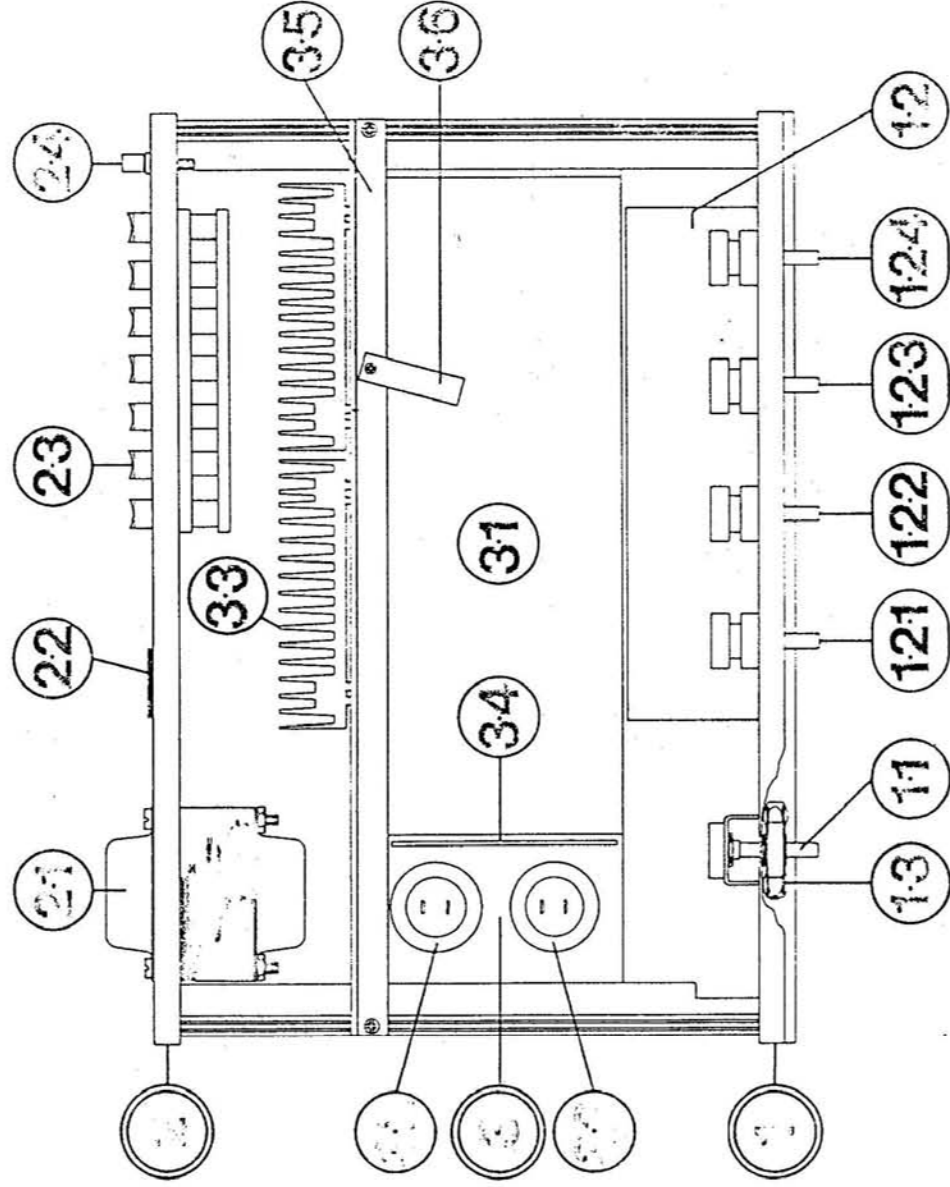
## 1 DISMANTLING THE CASE

- 1a To remove the top panel:-  
Remove the two fixing screws "A" from the back panel. Lift slightly and remove to rear.
- 1b To remove the side panels:-  
Remove the single fixing screw "B" from the back panel, pull the side panel forward approximately 1 inch and remove to side.  
Repeat for the other side.
- 1c To remove the bottom plate:-  
Remove the fixing screws "C" as indicated from the three positions at rear of bottom plate, remove bottom plate to rear.

Re-assembly is a direct reversal of these sequences.



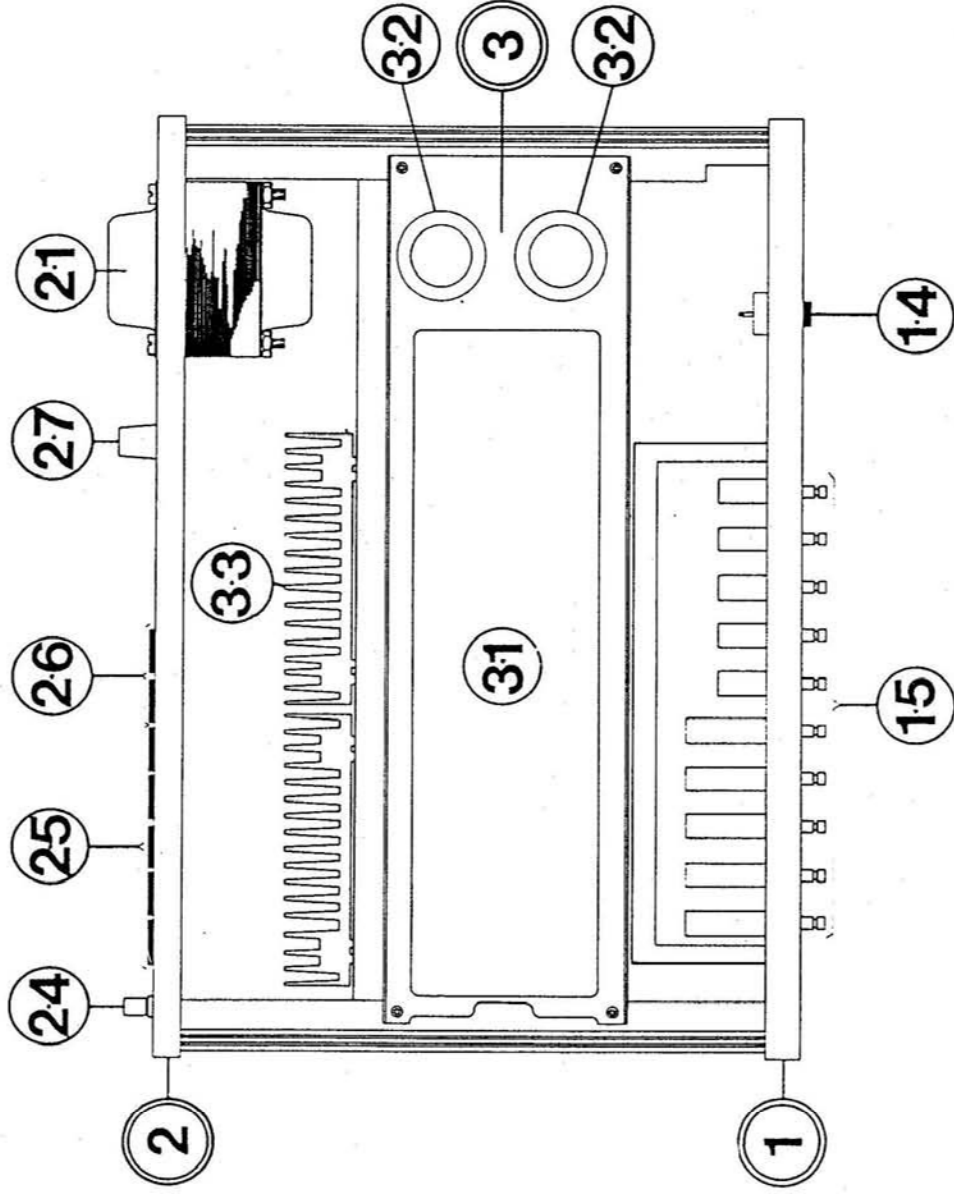
## 2 KEY TO MAJOR COMPONENTS



2a Top View of Unit

- |       |   |       |                            |
|-------|---|-------|----------------------------|
| 1.    | Front Panel Module:-                                | 3.    | Amplifier Module:-         |
| 1.1   | Mains on/off switch                                 | 3.1   | Amplifier Board Assembly   |
| 1.2   | Control Amplifier Assembly                          | 3.1.1 | Power Supplies             |
| 1.2.1 | Volume Control                                      | 3.1.2 | Main Amplifier             |
| 1.2.2 | Balance Control                                     | 3.1.3 | Disc Preamplifier          |
| 1.2.3 | Bass Control  | 3.2   | Capacitor 6,800µF          |
| 1.2.4 | Treble Control                                      | 3.3   | Heatsink                   |
| 1.3   | Power Indicator Bulb and Holder<br>24 Volt, 3 Watt. | 3.4   | Speaker Protection Circuit |
| 2.    | Rear Panel Module:-                                 | 3.5   | Heatsink Support Strap     |
| 2.1   | Transformer   | 3.6   | Screening Contact Clip     |
| 2.2   | Mains Outlet Socket                                 |       |                            |
| 2.3   | Switch Bank - 7 way                                 |       |                            |
| 2.4   | Earth Terminal                                      |       |                            |

2 KEY TO MAJOR COMPONENTS



2b Bottom View of Unit

- |     |                              |     |                          |
|-----|------------------------------|-----|--------------------------|
| 1.  | Front Panel Module:-         | 3.  | Amplifier Module:-       |
| 1.4 | Phones Socket                | 3.1 | Amplifier Board Assembly |
| 1.5 | Switch Bank - 10 way         | 3.2 | Capacitor 6,800uF        |
| 2.  | Rear Panel Module:-          | 3.3 | Heatsink                 |
| 2.1 | Transformer                  |     |                          |
| 2.4 | Earth Terminal               |     |                          |
| 2.5 | Input Sockets - 5 pin DIN    |     |                          |
| 2.6 | Speaker Sockets - 2 pin DIN  |     |                          |
|     | 2.6.1 Speaker 1 R & L        |     |                          |
|     | 2.6.2 Speaker 2 R & L        |     |                          |
| 2.7 | Mains Supply Fuse and Holder |     |                          |

The amplifier comprises:-

- a) AMPLIFIER MODULE ASSEMBLY:- containing disc preamplifiers (3.1.3), main power amplifiers (3.1.2), stabilised power supplies (3.1.1) and the speaker protection circuitry (3.4).
  - b) FRONT PANEL MODULE ASSEMBLY:- containing function selection switch bank (1.5), control amplifier circuitry (1.2) and power supply on/off switch (1.1).
  - c) REAR PANEL MODULE ASSEMBLY:- containing signal input and output sockets (2.5), speaker outlet sockets (2.6) mains supply fuse (2.7) and mains transformer (2.1).
- The control amplifier circuitry obtains its power supply from the main amplifier module.
- The following "check" procedures are a guide to help faultfinding the amplifier to a level whereby either the module, or part of the module can be replaced. For more detailed servicing see Section (6).

### 3.1 INITIAL PROCEDURE:-

- Set up the amplifier as follows:-
- Plug the amplifier into the mains supply
- Plug the speakers into the speaker 1 sockets
- Depress the speaker 1 button, set all other buttons into the out position.
- Set the balance, bass and treble controls into the centre position.
- Turn the volume control full anti-clockwise, adjust to the required level during testing.

### 3.2 CHECK LIST:-

Checks	Yes	No
3.2.1 <u>Initial Check</u> : Switch on the amplifier. Does the "power" legend illuminate.	Proceed to 3.2.2	Read section 3.3.1
3.2.2 <u>Main Amplifier Check</u> : Press the NORMAL/ SEPARATE switch in. Feed a signal (500mV 1kHz) into the PRE/MAIN socket. Check for left and right channel outputs.	Proceed to 3.2.3	Main amp. module or associated wiring suspect. Read Section 3.3.2
3.2.3 <u>CONTROL AMPLIFIER &amp; FUNCTION SWITCH CHECK</u> : Release PRE/MAIN switch. Select TUNER function. Feed a signal (100mV 1kHz) into the TUNER input socket. Adjust volume and check for left and right channel outputs. Repeat for cassette and tape functions.	Proceed to 3.2.4	Control amplifier or associate wiring suspect. Read section 3.3.3 and 3.3.4

/continued.....

### 3 FAULTFINDING TO MODULE LEVEL

#### 3.2 CHECK LIST (cont.....)

Checks	Yes	No
<p>3.2.4 <u>DISC PREAMP CHECK:-</u>                      Select DISC function. Feed a signal (5mV 1kHz) into the DISC input socket. Adjust volume and check for left and right channel outputs.</p>	<input type="checkbox"/>	<p>Disc preamplifier or associated wiring suspect.                      Read section 3.3.5</p>

#### 3.3

##### DETAIL CHECK PROCEDURES:-

##### 3.3.1 Procedure:

- a) Check mains supply voltage
- b) Check transformer primary voltage
- c) Check transformer secondary voltage
- d) Check D.C. voltage across main smoothing capacitors (on amplifier module).

If have a) and not b) investigate mains fuse, on/off switch and associated wiring.

If have b) and not c) transformer is faulty.

If have c) and not d) investigate secondary fuses (on amplifier P.C.B.).

If blown replace. If they fail on switch-on, then fault on amplifier module. To replace module see section 4.

##### 3.3.2 Procedure:

Inject a signal at the input pin of both power amplifiers in turn.

- a) Check for signal on left channel speaker socket.
- b) Check for signal on right channel speaker socket.

If have not a) or b) check continuity of wiring from speaker sockets to the amplifier module.

If wiring O.K. then fault on amplifier module. To replace module see section 4.

##### 3.3.3 Procedure:

Inject a signal at the input pin of both control amplifiers in turn. Turn volume control clockwise approximately 30°.

- a) Check for signal on left channel speaker socket.
- b) Check for signal on right channel speaker socket.

If have not a) or b) check continuity of wiring from control amplifier output to main amplifier input. If O.K. check supply voltage on control amplifier. If O.K. then fault on control amplifier. To replace see section 5.

/Continued.....

### 3 FAULTFINDING TO MODULE LEVEL

#### 3.3 DETAIL CHECK PROCEDURES: (cont....)

##### 3.3.4 Procedure:

Feed a signal into the TUNER, CASSETTE, TAPE input sockets respectively.

Select functions TUNER, CASSETTE, TAPE accordingly.

- a) Check for signal on left channel Speaker Socket.
- b) Check for signal on right channel Speaker Socket.

If have not a) or b) check wiring from appropriate input socket to function selection switch. If O.K. check wiring from function selection switch to control amplifier input. If O.K. then fault on function selection switch or interconnect P.C.B. To remove see section 5.

##### 3.3.5 Procedure:

Select DISC function.

Inject a signal (5mV 1kHz) into the DISC input socket.

- a) Check for signal at input to disc preamp,
- b) Check for signal at output from disc preamp.
- c) Check for input to function selection switch.
- d) Check for output from function selection switch.

If have a) and not b) fault on amplifier module.  
To replace amplifier module see section 4.

If have b) and not c) check interconnect wiring.  
To remove switch see section 5.

#### 4 ACCESS TO MAIN AMPLIFIER MODULE

To service the Main Amplifier Module remove the Top Panel and Bottom Plate.

To remove the main amplifier module, disconnect the amplifier from the mains supply. Unplug all connections to the Amplifier Module, noting the position of the groups of leads. Remove the four "Module fixing screws" which fasten the heatsinks to the heatsink support rail, and the four "Module fixing screws" from the side rails. The amplifier module then lifts out. To replace the module reverse the procedure.

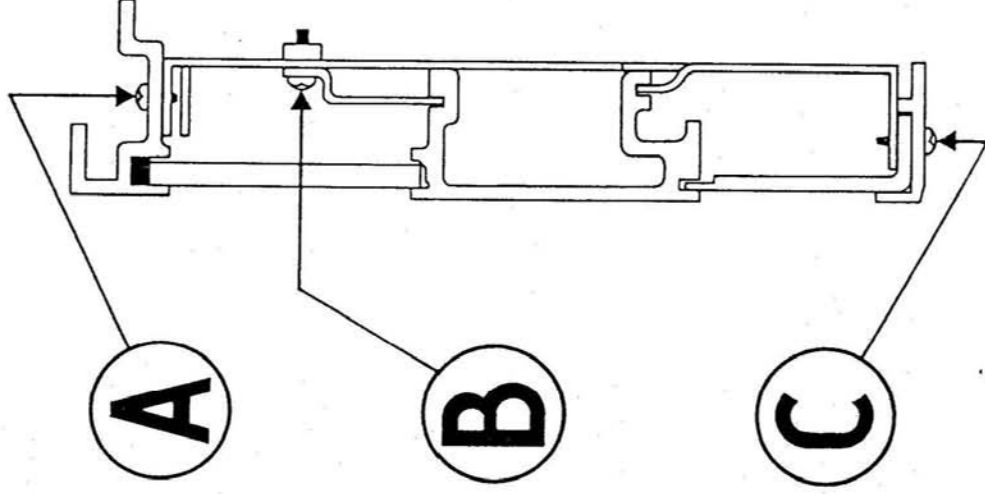
## 5 ACCESS TO FRONT PANEL COMPONENTS

To service the Function Switch and Phones Socket, the bottom appearance parts only need removing. See Section 5.1.5. By unscrewing and moving the Function Switch away from the front panel, access can be gained to the underside of the Control Amplifier.

To remove the Control Amplifier and the on/off switch, it is necessary to remove the top appearance parts. See sections 5.1.1 to 5.1.4. Unplug all connections and unscrew the hexagon fixing nuts.

### 5.1 REMOVAL OF APPEARANCE PARTS:-

- 5.1.1.1 Remove four screws (A) and lift off. TOP FASCIA STRIP as indicated.
- 5.1.1.2 Remove FASCIA SCALE INSERT.
- 5.1.1.3 Remove Control Knobs from their shafts by firmly and carefully pulling.
- 5.1.1.4 Remove the two fascia fixing screws and clips (B). Lift MAIN FASCIA STRIP and remove over Control Knob Shafts.
- 5.1.1.5 Remove four screws (C) and remove BOTTOM FASCIA STRIP and FASCIA INSERTS. Remove the PUSH BUTTONS from their shafts by firmly and carefully pulling.





## 6 DETAILED SERVICING

### 6.1 AMPLIFIER SPECIFICATION:

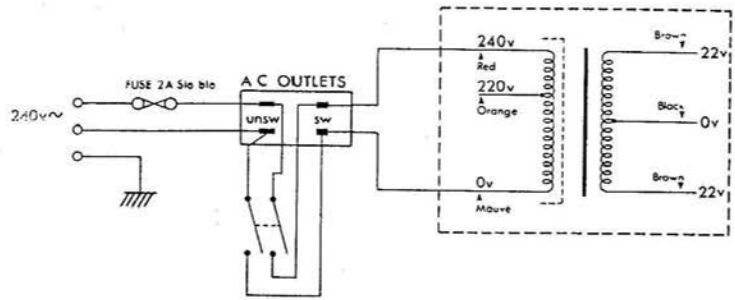
Unless otherwise stated, all specifications apply for 6 ohm loudspeakers, and values are typical. Noise measurement bandwidth 20Hz-20kHz.

Distortion Limited Output Power:	
4 ohm speakers	: greater than 40 + 40 watts
6 ohm speakers	: greater than 35 + 35 watts
8 ohm speakers	: greater than 30 + 30 watts
(both channels sinewave driven at 1kHz, 0.5% THD).	
Total Harmonic Distortion:	
All powers up to 30 watts, 1kHz	: less than 0.1%
at 1 watt, 1kHz	: 0.01%
at 30 watts, 10kHz	: 0.1%
Intermodulation Distortion	: 0.1%
(70Hz and 5kHz in ratio 4 to 1).	
Power Bandwidth:	
2dB down, relative to 35 watts	: 10Hz to 40kHz
(0.5% THD both channels driven).	
Damping Factor:	
Measured at 80Hz	: 40
Input Sensitivity for 35 watts	: 830mV
Input impedance	: 47k ohms
Frequency Response (-2dB)	: 20Hz - 50kHz
Hum and Noise	: -90dB
Crosstalk at 10kHz	: -50dB
Input Function Sensitivity:	
Disc Input:	
Sensitivity at 1kHz for 35 watts	: 2.2mV or 6mV
Input impedance	: 47k ohms
Frequency response	: Compensated to IEC 98 fine groove characteristic
Hum and Noise	: -65dB
Input overload margin	: 35dB
Crosstalk at 10kHz	: -35dB
Tape/Cassette/Tuner Inputs:	
Sensitivity for 35 watts	: 140mV
Input impedance	: 100k ohms
Frequency response ( $\pm$ 1.5dB)	: 25Hz - 40kHz
Hum and Noise	: better than -80dB
Crosstalk at 10kHz	: - 40dB
Alternative tuner sensitivity	: 550mV
Tape/Cassette Output:	
Output high	: 140mV
Output low (DIN standard)	: 1.4mV/k ohm (based on above input sensitivity)
Residual Hum and Noise:	
Volume control minimum	: 1.0mV maximum

## 6 DETAILED SERVICING

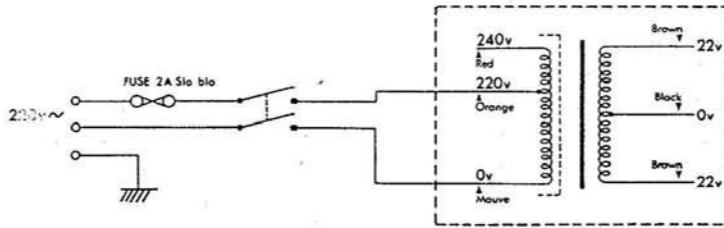
### 6.2 POWER SUPPLIES:-

U.K. Model (240V)

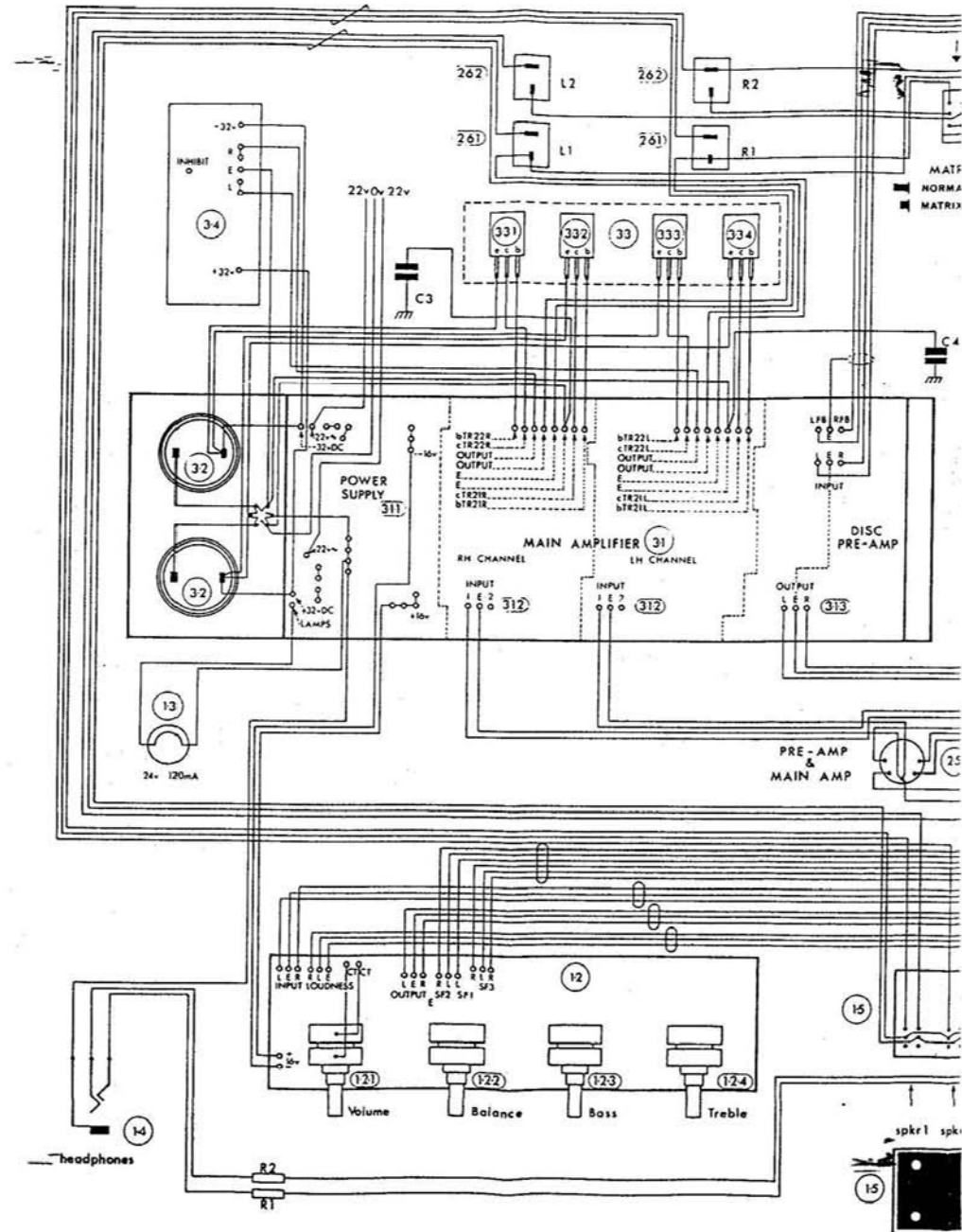
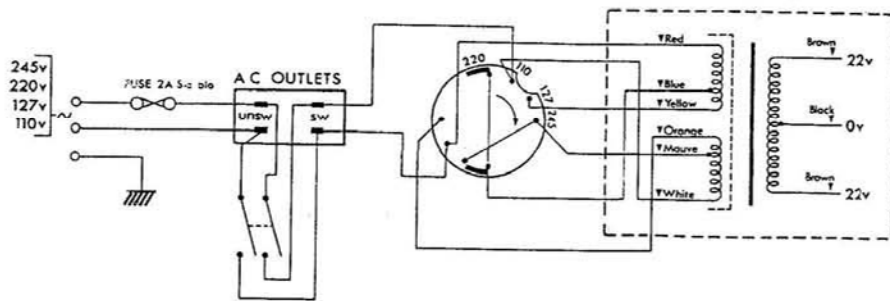


European Model (220V)

Scandinavian Model:-

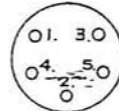


Voltage Selector Model:-



## 6 DETAILED SERVICING

### 6.2 Power Supplies



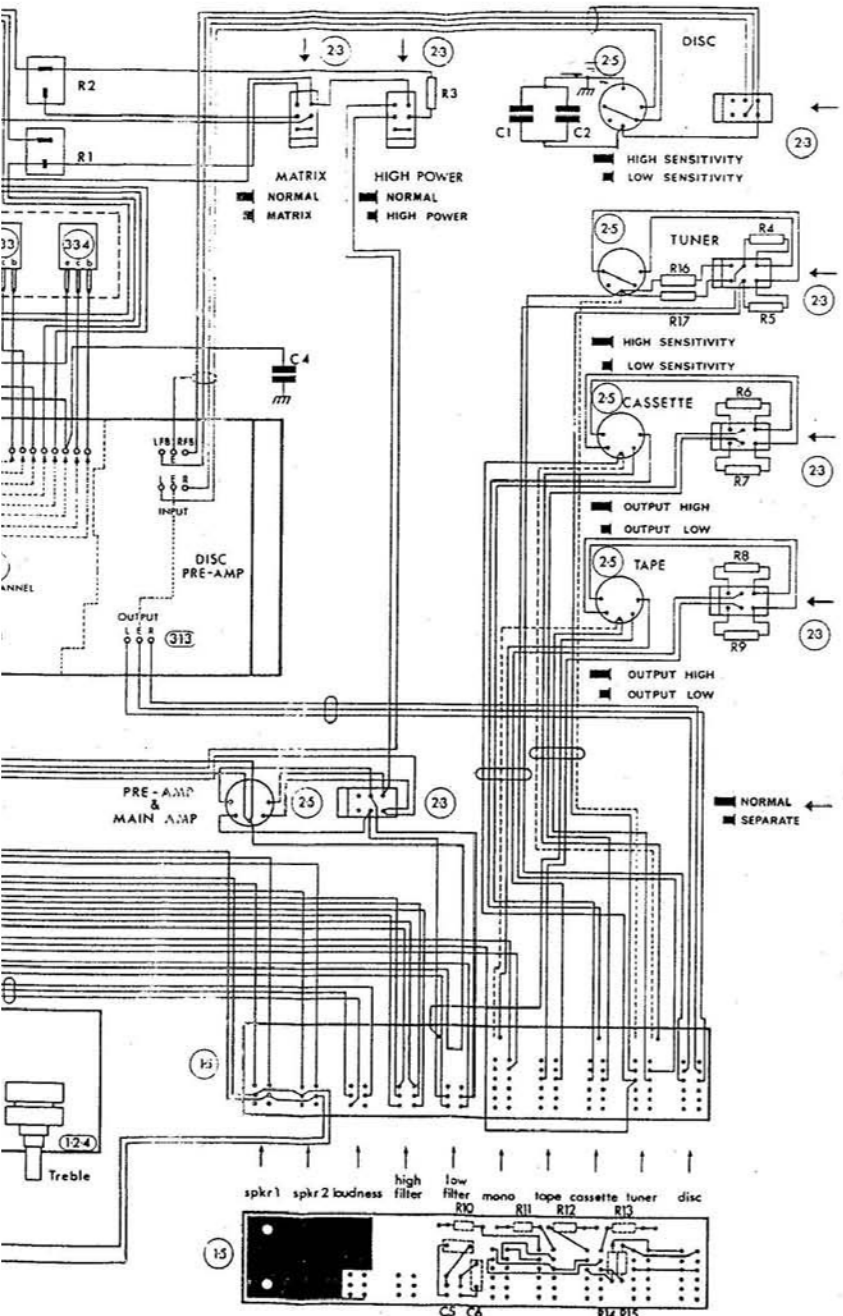
DIN Socket Connections (Rear View)

1. Left Output
2. Earth
3. Left Input
4. Right Output
5. Right Input

#### Component Values:

R1	100 ohms
R2	100 ohms
R3	820k ohms
R4	68k ohms
R5	68k ohms
R6	100k ohms
R7	100k ohms
R8	100k ohms
R9	100k ohms
R10	10k ohms
R11	10k ohms
R12	10k ohms
R13	10k ohms
R14	10k ohms
R15	10k ohms
R16	33k ohms
R17	33k ohms
C1	0.01uF
C2	0.01uF
C3	0.01uF
C4	0.01uF
C5	0.033uF
C6	0.033uF

Component Ref.	Parts No's.
1.2	162.02
1.3	482.24
1.8	523.19
1.9	536.06
2.3	523.18
2.5	536.18
2.6	536.17
3.1	153.02
3.2	396.02
3.3	509.16
3.4	152.09



### 6.3 AUDIO INTERCONNECT DIAGRAM

#### 6.4 AMPLIFIER MODULE CIRCUIT DESCRIPTIONS:-

##### 6.4.1 Power Supply Circuit:-

The centre tapped secondary of the mains transformers (2.1) is connected via the fuses F1, F2 and then via D2, D3, D4 and D5 to the two 6800 $\mu$ F electrolytic capacitors producing a positive and negative supply rail. These rails supply the two main amplifiers directly, and the remaining circuitry via two series stabilisers. The positive stabiliser (the negative one being complementary) consists of an emitter coupled transistor pair TR1, TR4 which compares a fixed proportion (via R5, R6) of the 16 volt output, with a 12 volt reference from Z1. A decrease in output voltage causes the current in TR1 to fall, hence increasing the collector current in TR4 consequently providing increased output current from TR3 which serves to correct the original error. Under short circuit conditions, the output current is limited by the action of R11 and R9 which both serve to limit the base current in TR3. Since the Zener Z1 is supplied from the regulated output via R13 and D6, R2 is added to guarantee starting up of the regulator.

##### 6.4.2 Power Amplifier Circuit Description:-

The input signal is coupled via R16 and C6 to the input point at the base of TR7. The D.C. coupled amplifier comprises TR7, TR8 an emitter coupled input pair, TR10 a PNP inverter and TR12, an emitter follower, driving the fully complementary output comprising TR19, 20, 21 and 22. The system is inverting and negative feedback is thus provided by R30, C10, R18, C7 and R17. TR13 and its associated components control quiescent current in the output pair. The quiescent current setting is 90mA with the amplifier cold and is adjusted by means of VR1 and monitored in the supply rail feeding the emitter of TR21. Of the remaining transistors in the amplifier, TR9 monitors the current in TR12 by means of R23 shunted by C9 and provides current limiting by clamping the input to TR10 under fault conditions. In a similar way TR14 is controlled by TR11 to provide a constant current i.e. high impedance collector load for the pre-drivers TR10, TR12. The complementary transistor pairs TR15, TR16 and TR17, TR18 provide output current limiting. The output current is controlled by comparing the voltage across the low value emitter resistor R36, R37 with the base-emitter voltage of the appropriate sensing transistors TR16 or TR17. As soon as either of these transistors conductors sufficiently to turn on the other one of it pair, they both conduct together and remain locked in this condition until the polarity of the audio signal reverses. This "snap" action at a fixed output current provides ideal protection even under complete short circuit conditions since the drive to both the driver (TR19) or TR20) and the output transistor (TR21 or TR22) is removed until normal conditions prevail. The input to the main amplifier is clamped to earth for a period of approximately 3 seconds by TR26 and associated components D8, C27, R52, R53 to suppress any transient pulses which may occur during switch on.

## 6 DETAILED SERVICING

### 6.3 AMPLIFIER MODULE CIRCUIT DESCRIPTIONS: (cont.....)

#### 6.4.3 Disc Preamplifier Circuit:-

The circuit consists of an emitter coupled transistor pair TR23, TR24 coupled to the grounded emitter PNP transistor giving an overall non-inverting system.

The input is directly coupled from the magnetic cartridge to TR23 to minimise low frequency flicker noise. Negative feedback to TR24 is provided by R45, C16, C15, R44 with R42, R43, C14 providing the lower limb of the potential divider network. The R.I.A.A. playback characteristic is provided by the feedback components listed above with R34 acting to reduce the gain with the "DISC" function switch (2.3) in the "LOW SENSITIVITY" position.

#### 6.4.4 Speaker Protection Circuit:-

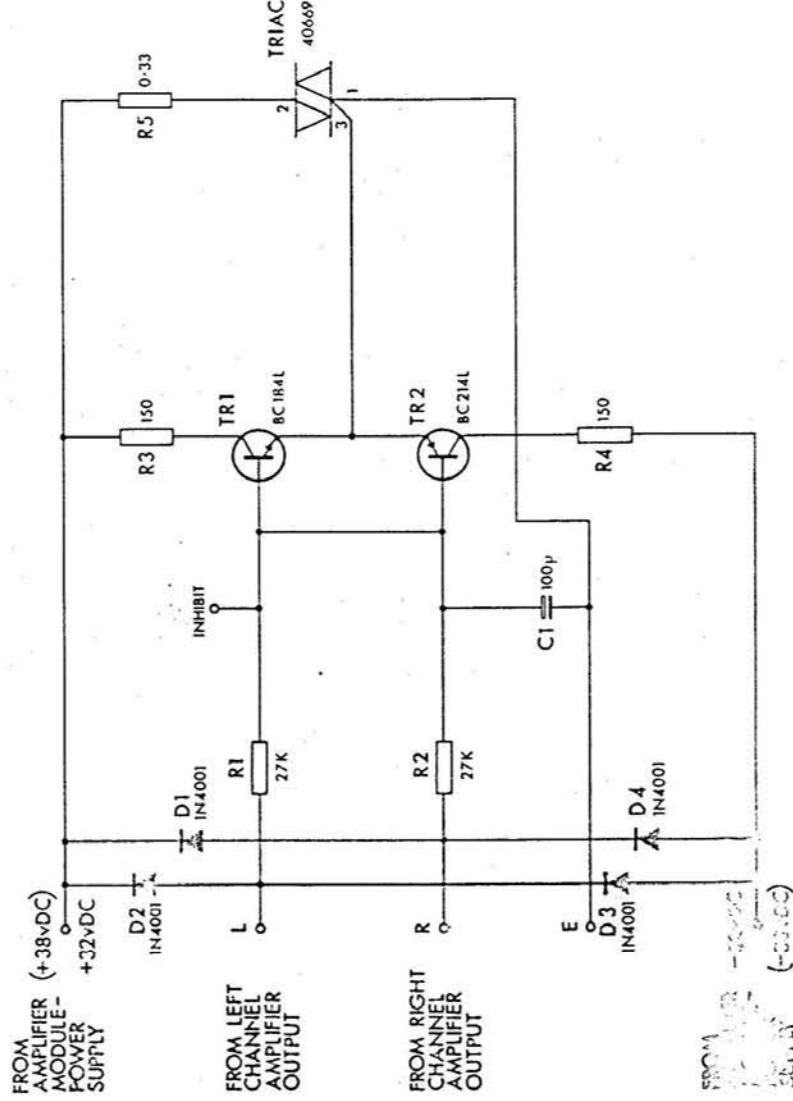
The speaker protection circuit is designed to blow the A. C. fuses, if for any reason the output from the amplifier swings to either of the supply voltages and stays there for more than 0.5 seconds. This eliminates the risk of prolonged D.C. current flowing through the speaker voice coil causing permanent damage.

The circuit operates as follows:-

The inputs to TR1 and TR2 are connected to the outputs of the main amplifiers via R1 and R2. Under normal operating conditions TR1 and TR2 are in the off state due to the filtering action of C1. If the amplifier outputs swing up to a D.C. level and remain there, either TR1 or TR2 depending on the polarity of the amplifier output voltage will trigger the triac, which in turn will blow the main A.C. fuses.

To avoid premature triggering of the protection circuit when servicing the main amplifier, connect the INHIBIT pin on the speaker protection

P.C.B. to earth potential. N.B. DISCONNECT on completion of work.



## 6 DETAILED SERVICING

### 6.4 AMPLIFIER MODULE CIRCUIT DESCRIPTIONS: (cont.....)

#### 6.4.5 Test Point Voltage Chart:-

All measurements taken with respect to earth potential using an AVO model 8 or equivalent. The voltages shown in the chart are nominal values intended as a guide to faultfinding, and were measured with the amplifier inputs connected to signal earth.

#### Power Amplifier Test Point Voltage Chart:-

Test Point	Voltage	Test Point	Voltage
Pin 22V	22 a.c.	TR6 Emitter	31-
Pin 22V	22 a.c.	TR6 Collector	16-
Pin e TR21R	32±	TR7 Base	0
Pin e TR22L	32-	TR8 Base	0
TR1 Base	12+	TR8 Emitter	0.6-
TR1 Emitter	11.3+	TR8 Collector	31+
TR2 Base	12.0-	TR13 Emitter	1.5-
TR3 Emitter	26+	TR13 Collector	1.2+
TR3 Collector	16+	TR26 Base	2.5-
TR4 Base	12+	TR26 Emitter	0
TR5 Base	12-	Pin OUTPUT	0
TR5 Emitter	11.3-		

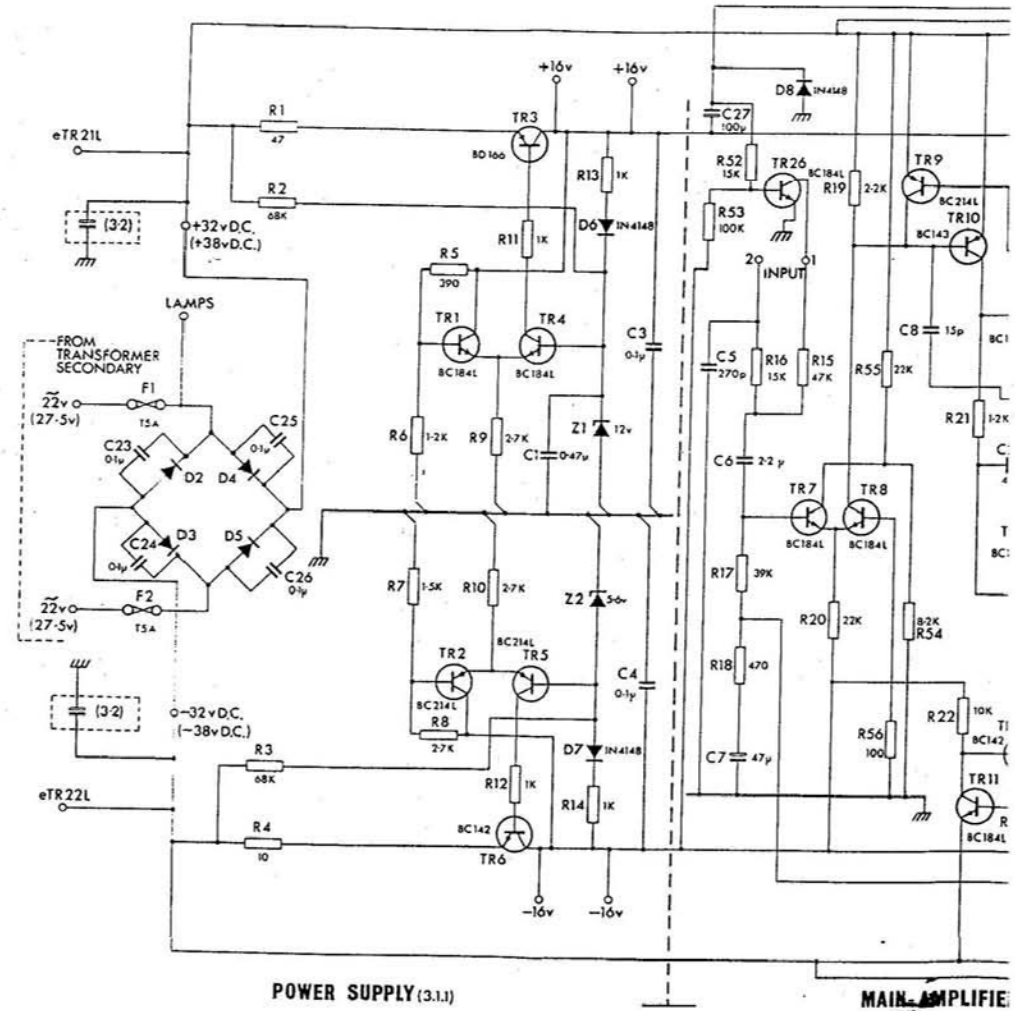
Quiescent current setting 90mA, see section 6.4.2.

#### Pre-Amplifier Test Point Voltage Chart:-

Test Point	Voltage	Test Point	Voltage
TR25 Emitter	15+	TR23 Base	0
TR25 Collector	5+	TR23 Emitter	0.6-
R47-R49 Junction	13-	TR24 Base	0

#### 6.4.6 Parts List:-

Component Ref.		Part No's.
Amplifier Module Assembly Complete	3	153.00
6800uF Electrolytic Capacitor	3.2	396.02
Printed Circuit Board Assembly	3.1	153.02
Rectifiers (D2, D3, D4, D5)		501.18
R36, R37		200.03
TR21 Power Transistor PNP		505.03
TR22 Power Transistor NPN		504.09

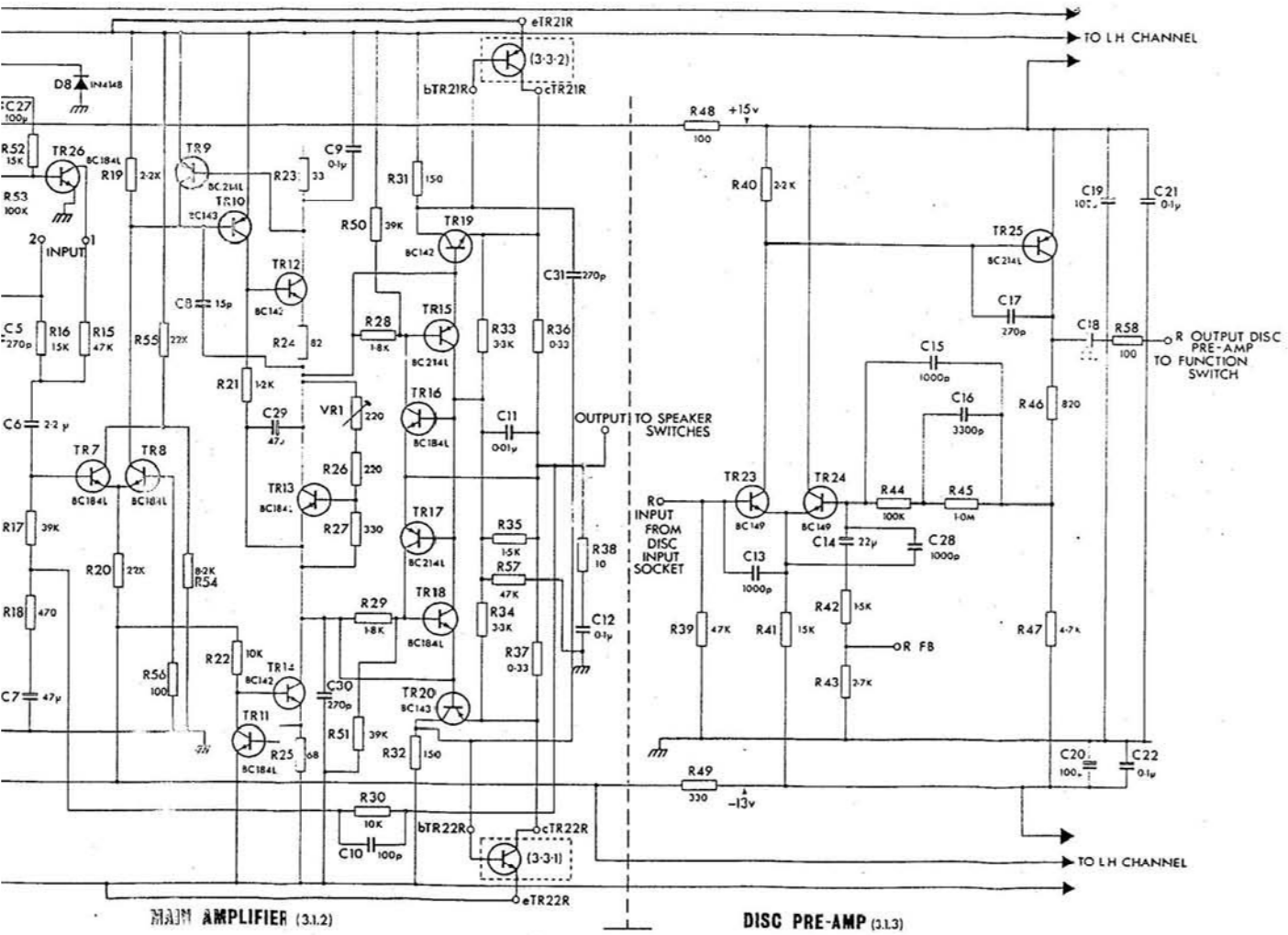


6 DETAILED SERVICING

6.4 AMPLIFIER MODULE CIRCUIT DESCRIPTIONS:

6.4.5 Test Point Voltage Chart

6.4.6 Parts List



6.4.7 Amplifier Module Circuit Diagram

## 6.5 FRONT PANEL MODULE CIRCUIT DESCRIPTION:

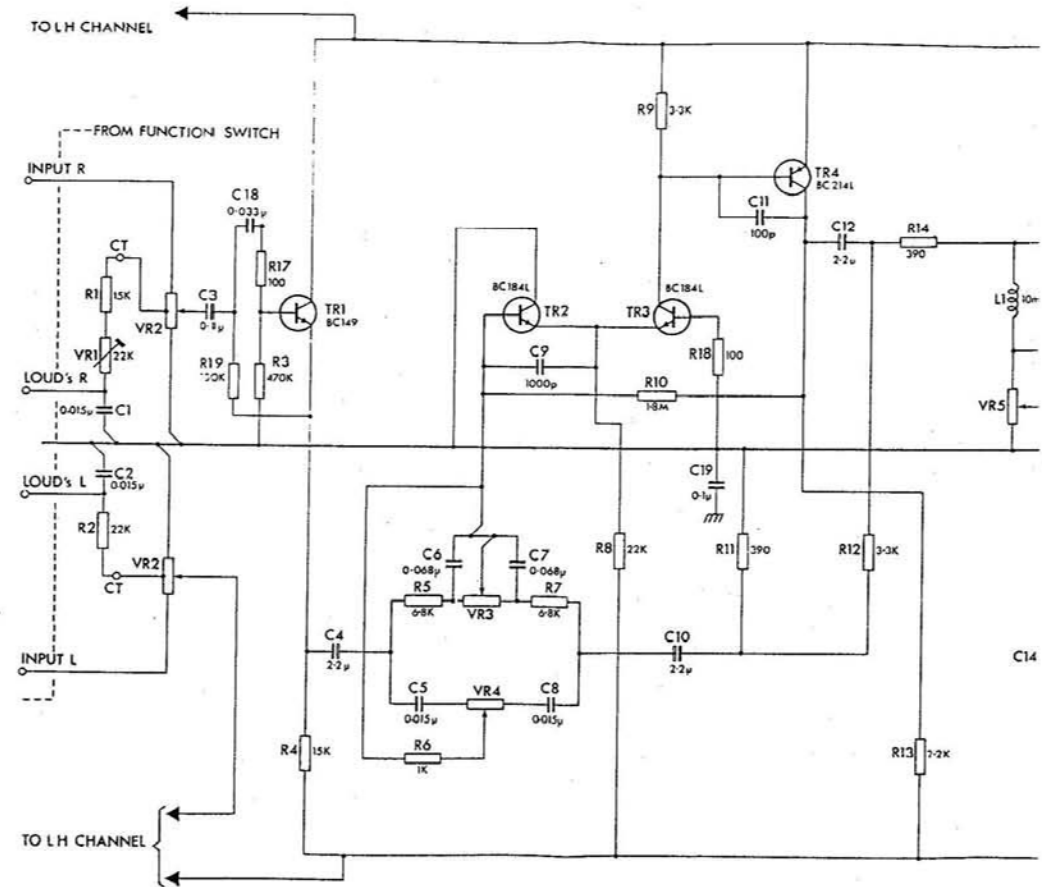
## 6.5.1 Control Amplifier Circuit:-

The appropriate audio signal selected by the Function Selection Switch (1.5) is connected to the volume control VR2. The linear control is centre-tapped and loaded by R1 and VR1 on the right channel and R2 on the left channel. These resistors give the control a logarithmic law and VR2 allows balancing of the channels at half rotation of the volume control. When "loudness" is selected at switch bank 1.5, C1 and C2 are added into circuit to provide bass boost at low volume settings. TR1 in conjunction with C18, R3 and R19 provides impedance transformation and fixed low frequency roll-off (-1dB at 20Hz, -10dB at 10Hz) after which the signal is fed to the normal Baxendall type feedback tone control. The amplifier section consists of TR2 and TR3, an emitter coupled NPN pair connected to TR4 a PNP inverter.

L1, C15 and R14 form a 12dB per octave scratch filter selected by "high-filter" at switch bank (1.5). The output from the balance control VR5 goes to C5, right channel and C6 left channel on the switch bank (1.5) which provides a 6dB per octave rumble filter selected by "low-filter" on the switch bank (1.5).

## 6.5.2 Control Amplifier Specification:-

Frequency Response ( $\pm 1.5$ dB)	:	25Hz - 40kHz
Treble Control	:	$\pm 13$ dB at 15kHz
Bass Control	:	$\pm 13$ dB at 50Hz
High-Filter	:	-3dB at 5kHz -10dB at 10kHz
Low-Filter	:	-3dB at 70Hz -10dB at 20Hz
Loudness	:	+10dB at 50Hz (-40dB volume setting)
Output Impedance	:	10k ohms nominal





## 6 DETAILED SERVICING

### 6.5.1 Control Amplifier Circuit:

### 6.5.2 Control Amplifier Specification:

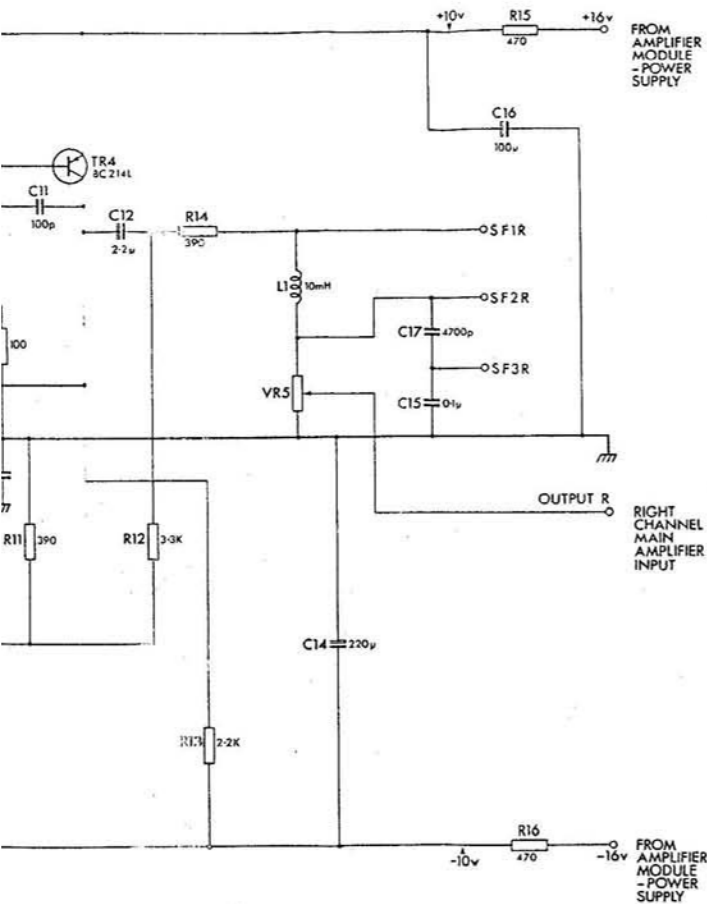
### 6.5.3 Test Point Voltage Chart:-

All measurements taken with respect to earth potential using an AVO model 8 or equivalent. The voltage shown in the chart are nominal values intended as a guide to faultfinding and were measured with the input connected to signal earth.

Test Point	Voltage
TR1 Base	0.8-
TR1 Emitter	1.4-
TR1 Collector	10+
TR2 Base	0
TR2 Emitter	0.6-
TR3 Base	0
TR3 Collector	9.4+
TR4 Collector	1.3+
TR13-T16 Junction	10-

### 6.5.4 Parts List:-

Components Ref.	Part No's.
Complete Assembly	162.02
VR1 22k ohm Linear	237.04
VR2 200k + 200k ohm Linear CT	248.17
VR3 50k + 50k ohm Linear	248.19
VR4 25k + 25k ohm Linear	248.20
VR5 50k log + 50k reverse log	248.18
L1 10mH	403.30
Printed Circuit Board	450.40



6.5.5 CONTROL AMPLIFIER CIRCUIT DIAGRAM.

## 6 DETAILED SERVICING

### 6.6 REAR PANEL MODULE FUNCTION DESCRIPTION:

The input and output sockets (2.15) are mounted on the rear panel below a bank of seven switches (2.3). The switches are used to perform the following functions:-

DISC function, input sensitivity "high sensitivity" (2.2mV), "low sensitivity" (6.0mV) for full power output.

TUNER function, tuner input sensitivity "high sensitivity" 140mV. "Low sensitivity" 550mV for full power output.

CASSETTE function, output impedance "output high" (10k) or "output low" (100k).

TAPE function, output impedances "output high" (10k) or "output low" (100k).

PRE-AMP AND MAIN AMP, "normal" or "separate", separates Control Amplifier outputs and Main Amplifier inputs and connects the input pins of the PRE-MAIN socket to the Main Amplifier inputs.

N.B. The PRE-MAIN SOCKET provides access to the Control Amplifier outputs (pins 1 and 4) and the Main Amplifier inputs (pins 3 and 5).

The two remaining switches are associated with the speaker 2 output sockets (2.6.2) mounted on the back panel. These and speaker 1 output sockets (2.6.1) are of the two pin DIN type. The switch functions are:-

"NORMAL" or "MATRIX" in the matrix position, the left and right channels are connected to give (R-L and L-R) signals which can be fed into two rear channel speakers.

"NORMAL" or "HIGH POWER", in the high power mode the output of the right channel main amplifier is connected to the input of the left channel main amplifier via a resistor. The signal is fed into the right channel input socket. With a speaker connected across the two output sockets the system operates in a "High Power Mono Mode".