# Assembly Instructions

PASSION

AUDIO KIT

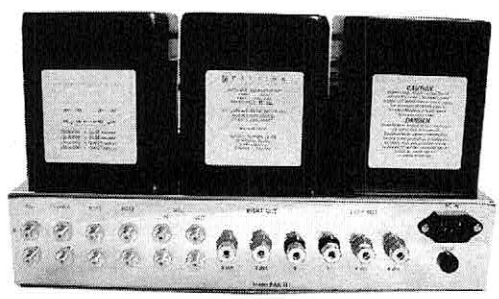
**PAK-i11**

**Integrated Amplifier**

# COPYRIGHT©

# Table of contents





**PAK-i11**

# Introduction

The PAK-i11 is a high quality integrated stereo amplifier. Its tube engineered amplifying circuitry delivers a most pleasant musical performance. Just as a CD player, the PAK-i11 provides a high-level 4 source selection. It has no tone adjustment, which accounts for an exeptional linearity and a mimimum phase distortion. The output tubes bias adjustment is done without opening the case, so as to facilitate the checking of the ouput tubes.

The PASSION AUDIO KIT components are offered as non-assembled modules. The assembly, however, requires a certain dexterity; the ability to perform good soldering is also an essential requirement. Take the time to execute the assembly operations to perfection. You will thereafter have a reliable and performing equipment.

## PAK-i11 Integrated amplifier: specifications

| | |
|---|---|
| Output RMS 2 simultaneous chanels at 1 Khz : | 2 X 30 Watts RMS <0.5 % |
| Output 30 hz at 15 hz <1.5 % TDH : | 20 Watts |
| Frequency response at 1 Watt : | 10 Hz at 25 Khz - 2 db |
| Harmonic distortion at 1 Khz at 30 W : | < 0.5 % |
| Signal to noise ratio : | - 80 db |
| Polarity : | negative |
| Sensitivity for total power : | 0.3 VRMS |
| Input impedance : | 100 KOHM |
| Output impedance : | 4 & 8 OHM (16 OHM) |
| Input : | 4 (RCA)pr |
| Tape loop : | 2 (RCA)pr |
| Output : | Banana, fork or direct strand |
| Control : | Volume, selector, power switch and pilot |
| Bias adjustment : | External access. Voltmeter required. |
| Tube assembly : | 4 X 12AU7 (ECC82) 4 X EL34 |
| Power requirement : | 117V 60hz 280W max, separate cord |
| Dimension : | L 384mm D 276mm H 216mm |
| Weight : | 17.6Kg |

# WARRANTY AND CONDITIONS

PLEASE REFER TO USER'S GUIDE

**Passion Audio Kit**
**ROTAC ELECTRONIQUE INC**
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**Sainte-Foy, Québec**
**G1N 2E6**

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# Safety precautions

**DANGER:**

**A tube equipment operates under very high voltage. Its manipulation involves a danger of deadly electric shock. The greatest care is therefore recommended when assembling, checking and calibrating the unit. We assume no liability for any accident or manipulation error resulting from the construction or calibration of this assembly kit.**

Never align, adjust or take measurements with testing equipments when the component is near a grounded object such as a radiator, a water pipe, a heating or ventilation duct, a kitchen appliance or any non insulated electrical conduct.

Work on a dry surface and an isolated floor.

Use a single hand when you align or adjust the components. Keep the other one in your pocket. This will reduce the risk of dangerous electric shocks.

While setting up the wiring and also after assembling or before plugging the component into an electrical outlet, carefully check for the presence of stripped wire pieces left into the cabinet which might provide a contact with the cabinet, especially near the 117 volt electrical inlet terminals, the fuse box or the terminal connecting the transformer wires.

Never make any soldering with the unit plugged into the electrical outlet, especially when making corrections. Putting the switch in the OFF position is not enough.

If you are tired, postpone the assembly of your unit. Be careful.

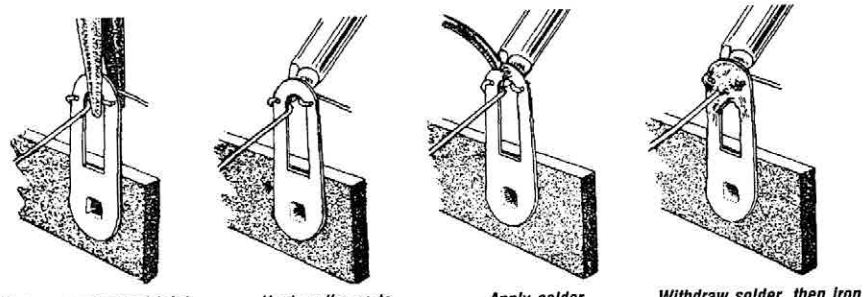
# List of required or useful tools

-Soldering iron or gun, 40 to 60 Watts, and support
-Damp sponge to clean the tip of the soldering iron
-Unsoldering pump
-Precision long nose plier
-Small cutting plier
-Wire stripper
-File
-Philips screwdriver (star shape) # 1 & 2
-Flat blade screwdriver (slot type) 1/8 & 1/4
-Electric drill and bits
-Multimeter (Voltmeter/Ohmmeter)
-Magnifying glass
-Locking adhesive: nail lacker or LocTite®
-Piece of carpet for the work table
-Epoxy 5 minute® glue
-Silicon type glue

# Use the adequate soldering technique

It is essential that you perform soldering correctly, so as to get the best performance and to respect the technical engineering of this high fidelity equipment.
If you are a beginner and have no experience of the soldering technique, one hour of practice with a few pieces of scrap wire may prove to be a highly profitable investment.
For most electronic parts to assemble, a 40 to 60 Watts soldering iron or gun will be adequate. Keep the tip of the iron clean at all times. A sponge dipped in lukewarm water is very useful to clean the tip of your soldering iron. Wipe it often with the damp sponge.
**It is very important to use some ROSIN CORE 60:40 or 50:50 solder, therefore a 60/40 lead/tin alloy with a rosin core.**

**IMPORTANT:**
**All warranty will be void and we will not repair nor provide service on a unit asembled using an acid core solder or a soldering paste. This would cause definitive damage. Buy your solder from an electronic parts distributor.**

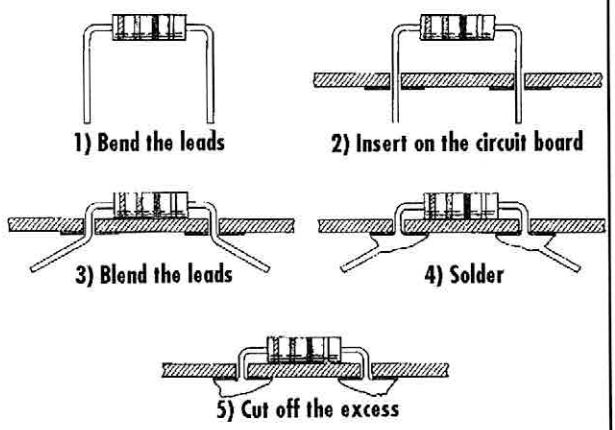


*Make a mechanical joint* *Heat up the parts* *Apply solder* *Withdraw solder, then iron*

To solder a wire on a terminal or to join 2 wires, one must always create a strong mechanical joint first before soldering the parts. Use a long nose plier to assist you.
The basic principle to achieve good soldering is to heat up both parts to a high degree, so that their temperatures be identical and they allow the solder to melt uniformly on the parts and not on the iron.
Apply the tip of the iron on the parts to solder. Heat up and check that the temperature is high enough to melt the solder, applying the solder on the parts, not on the tip of the iron. The solder must flow evenly over the joint. Don't apply too much. Withdraw the solder, then the iron from the completed joint, being careful not to move the parts until the soldered joint is completely hardened. Avoid inhaling the fumes of lead and tin, as they are harmful.
A poor or "cold" soldered joint (poor soldering) will look crystalline, with a grainy texture. Parts that have not been heated enough will not allow the solder to flow smoothly. You must clean up corroded or greasy parts, for it will otherwise be very difficult to perform a reliable soldering. Use a fine grain sand paper or a file to prepare those parts.

## Soldering on a printed circuit board (PCB)

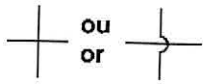
It is essential not to overheat when soldering on a printed circuit board. The foil (or track) of a printed circuit are made of a thin coat of copper which may peel off when heated for too long. Heat up the lead of the component first, applying a little solder, then slide the iron toward the circuit. As the iron touches the pcb track, add a small amount of solder and withdraw the iron. Try not to keep the iron in contact with the board for more than 2 or 3 seconds. If you are unable to do it within that short time, let the parts cool down for 10 to 15 seconds and try again. This will reduce the risk of damaging the circuit board. Finish by cutting off the excess lead length.



# Components and their schematics

**Filages qui se croisent en faisant contact**
**Wires crossing and connected**

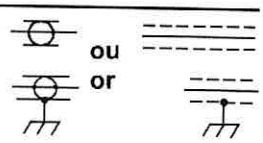

**Filages qui se croisent sans faire contact**
**Wires crossing and not connected**




**Masse (au boitier)**
**Ground (to chassis)**

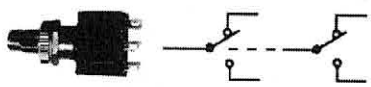
**Masse (a la terre)**
**Ground (to earth)**

**Câble coaxial (avec blindage à la masse)**
**Coaxial cable (grounded shield)**

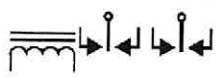



**Commutateur (SPST)**
**Switch (simple pole simple throw)**

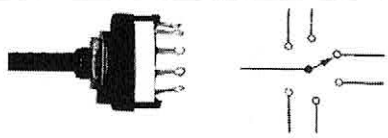
**Commutateur (DPDT)**
**Switch (double pole double throw)**



**Relais (DPDT)**
**Relay (double pole double throw)**

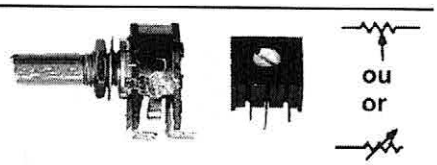


**Sélecteur rotatif**
**Rotary switch (1 pole 6 positions)**



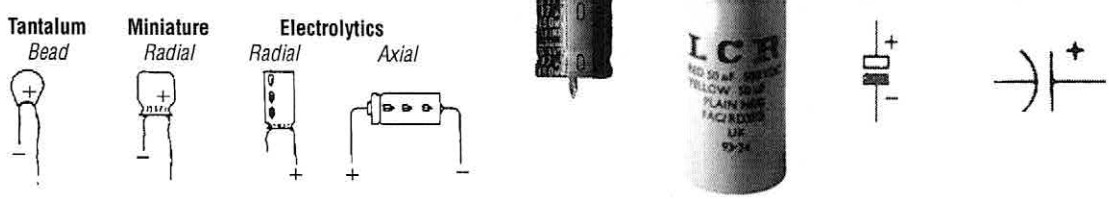
**Résistance à valeur fixe**
**Resistor, fixed value**


**Potentiomètre, résistance variable**
**Potentiometer, variable resistor (trim pot)**



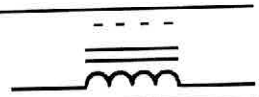

**Condensateur non polarisé**
**Capacitor, nonpolarized**

**Condensateur polarisé**
**Capacitor, polarized**

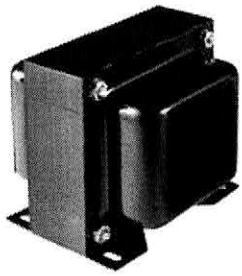


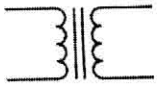
**Inductance (noyau d'air)**
**Inductor (air-core)**

**Inductance (noyau de fer)**
**Inductor (iron-core)**

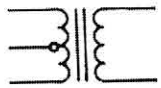


**Transformateur (noyau de fer)**
**Transformer (iron-core)**

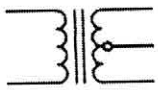




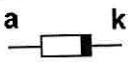
**Transformateur (prise médiane au primaire)**
**Transformer (tapped-primary)**

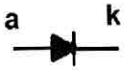


**Transformateur (prise médiane au secondaire)**
**Transformer (tapped-secondary)**

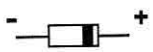


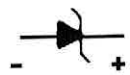
**Diode (générale)**
**Diode (general)**



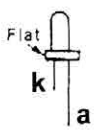



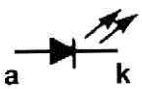

**Diode (zener)**



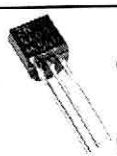



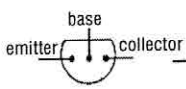

**Diode électro-luminescente(DEL)**
**Light-emitting diode (LED)**



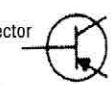




**Transistor (npn ou pnp)**
**Transistor (bipolar, npn or pnp)**






**Vue de dessous**
*Viewed from below*



**pnp**

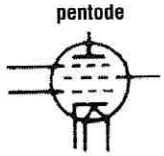
**npn**

**Tube**

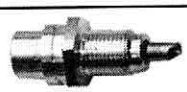
**diode**

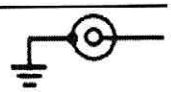
**triode**

**pentode**

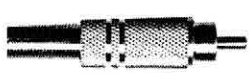


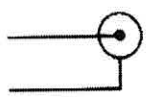
**Fiche RCA femelle**
**RCA phono jack**



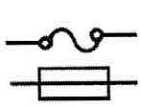


**Fiche RCA mâle**
**RCA phono plug**

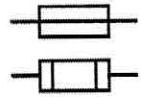




**Fusible**
**Fuse**



**Porte fusible**
**Fuse block**



# How to identify the resistors

You will notice that there are many colour bands on a resistor. Each colour band around a resistor indicates a specific value. There is therefore a colour code for the resistors. The value of a resistor is expressed in OHM (Ω). 1Kohm is equivalent to 1 000 Ohm and 1MegOhm is equivalent to 1 000 000 Ohm.

-The first band represents the first significant number of the value.

-The second band indicates the second significant number.

-The third band represents the multiplier.

-The fourth band indicates the precision of the component in %.

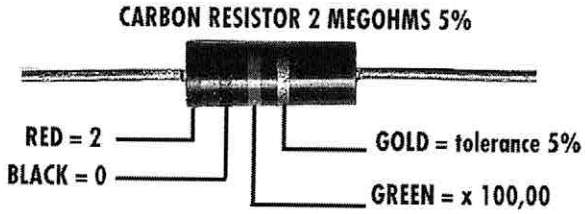



**FIGURE 1**

**Resistor coding:**

| Colour | Band 1 | Band 2 | Band 3 Multiplier | Band 4 Tolerance |
|---|---|---|---|---|
| Black | 0 | 0 | X1 | |
| Brown | 1 | 1 | X10 | 1% |
| Red | 2 | 2 | X100 | 2% |
| Orange | 3 | 3 | X1000 | |
| Yellow | 4 | 4 | X10,000 | |
| Green | 5 | 5 | X100,000 | 0.5% |
| Blue | 6 | 6 | X1,000,000 | 0.25% |
| Violet | 7 | 7 | X10,000,000 | 0.1% |
| Grey | 8 | 8 | | |
| White | 9 | 9 | | |
| Gold | | | X 0.1 | 5% |
| Silver | | | X 0.01 | 10% |
| None | | | | 20% |

There is, however, a new standard for the coding of high precision resistors, which has 5 bands.

- The third band is then used as third significant figure.
- The fourth band is the multiplier.
- The fifth band indicates the tolerance.

**Resistor coding:**

| Colour | Band 1 | Band 2 | Band 3 | Band 4 Multiplier | Band 5 Tolerance |
|---|---|---|---|---|---|
| Black | 0 | 0 | 0 | X1 | 20% |
| Brown | 1 | 1 | 1 | X10 | 1% |
| Red | 2 | 2 | 2 | X100 | 2% |
| Orange | 3 | 3 | 3 | X1000 | 3% |
| Yellow | 4 | 4 | 4 | X10,000 | 4% |
| Green | 5 | 5 | 5 | X100,000 | 0.5% |
| Blue | 6 | 6 | 6 | X1,000,000 | 0.25% |
| Violet | 7 | 7 | 7 | X10,000,000 | 0.1% |
| Grey | 8 | 8 | 8 | | |
| White | 9 | 9 | 9 | | |
| Gold | | | | X 0.1 | 5% |
| Silver | | | | X 0.01 | 10% |

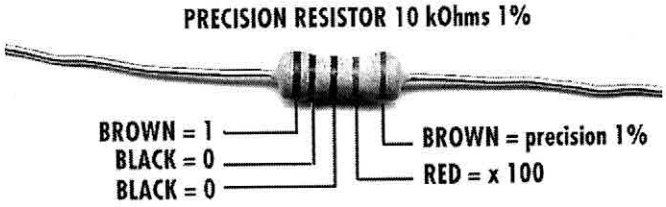



**FIGURE 2**

It is sometimes difficult to determine the value of a resistor. Checking with an ohmmeter is a way to be sure. The physical size of a resistor is proportional to its power expressed in Watts. The power circulating through the resistor and the voltage at its terminals will determine the power dissipated by that resistor. P = VI

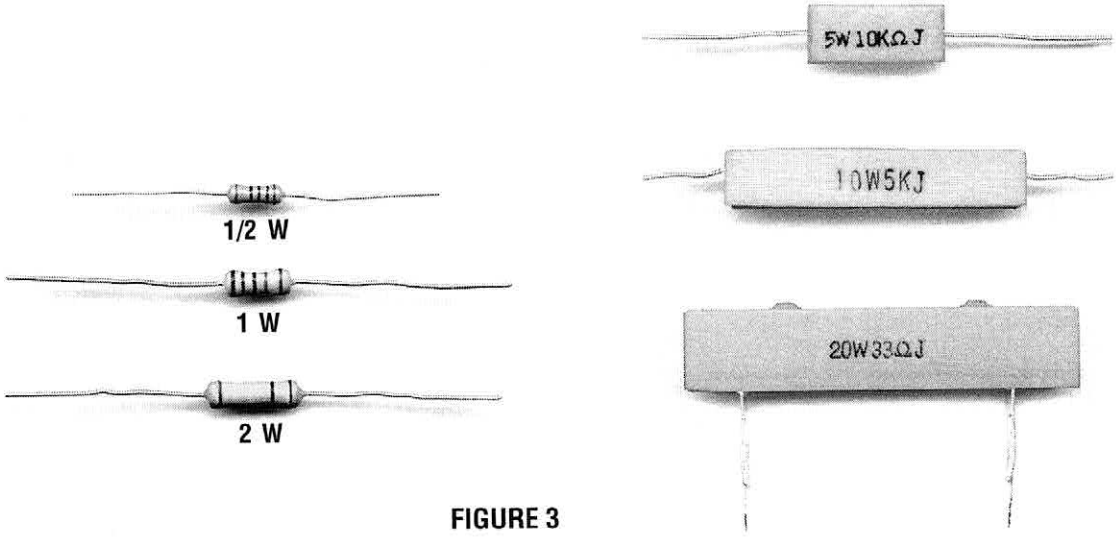
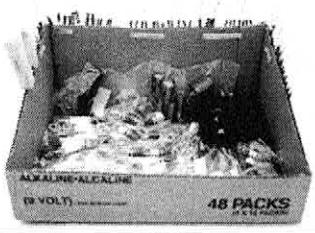



**FIGURE 3**

# Contents and list of parts

Use an old cardboard box to spreadout the parts.
Resistors may be pinned out all around and identified on the box.




## CABLE:

| Description | Quantity |
|---|---|
| Coaxial (shielded) cable | 180cm |
| Single wire 600V, black | 170cm |
| Single wire 600V, blue | 150cm |
| Single wire 600V,green | 225cm |
| Single wire 600V, red | 145cm |
| Single wire 600V, violet | 90cm |
| Single wire 600V, orange | 95cm |
| Single wire rigid blue | 25cm |
| Single wire rigid red | 30cm |
| Single wire rigid | 10cm |
| Bare wire | 15cm |
| Heatshrink tube | |
| Tie wraps | |

## HARDWARE:

| Description | Quantity |
|---|---|
| Screw T/M 3mm x 8mm | 17 |
| Screw T/M 5mm x 10mm | 4 |
| Screw B/M 5mm x 10mm | 12 |
| Nut, hexagonal 3mm | 4 |
| Nut, hexagonal 5mm | 20 |
| Flat washer M5 | 36 |
| Threaded stud spacer | 13 |
| With screw T/M 3X8mm | 13 |
| With nut, hexagonal 3mm | 17 |
| Terminal lug | 2 |
| Allen key 1.5mm | 1 |
| Toggle switch for tape loop | 1 |

Snap-in bushing 25mm 3
Snap-in bushing 8mm 4

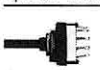
Metal rod 6mm x 220mm 1
Machanical connector 1
Mechanical support for selector 1

Button 28mm 2
Button 22mm 1

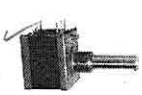
## VARIOUS PARTS:

| Description | Quantity |
|---|---|
| Switch | 1 |
| AC socket | 1 |
| Fuse holder | 1 |
| RCA female jack red | 6 |
| RCA female jack black | 6 |

Speaker binding post red 4
Speaker binding post black 2



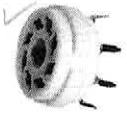
Rotary switch for source selection 1
Rotary switch for bias selection 1



Volume control 2 x 100 Kohm 1

Banana jack 1

Luminescent diode (LED)
assembled (D11)(D10)(R56) 1



8 pin tube socket 4

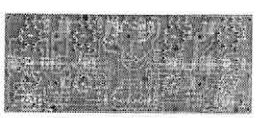
9 pin tube socket 4

Tubes 12 AU7/ECC82 4

Tubes EL34/6CA7 4

Power cord 1

Rubber feet 4
With screw T/M 3X8mm 4
With flat washer M5 8
With nut, hexagonal 3mm 4

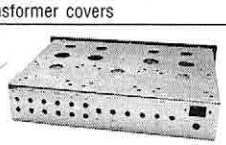


Printed circuit board PCB-AMP
(125mm x 320mm) 1

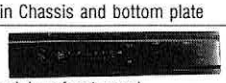
Printed circuit board PCB-BIAS
(50mm x 120mm) 1

Power transformer 1
Cover 1

Output transformers 2
Transformer covers 2



Main Chassis and bottom plate 1



Aluminium front panel 1

## RESISTORS:

| Description | Quantity |
|---|---|
| **1/2 Watt** | |
| 100 ohm (R18-R19-R38-R39) | 4 |
| 220 ohm (R65) | 1 |
| 470 ohm (R6-R26) | 2 |
| 1 Kohm (R4-R14-R15-R24-R34-R35) | 6 |
| 1.2 Kohm (R2-R22) | 2 |
| 2.2Kohm (R55) | 1 |
| 3.3 Kohm ( R20-R40) | 2 |
| 10 Kohm (R49-R50) | 2 |
| 20 Kohm (R57-R58-R59-R60) | 4 |
| 47 Kohm (R56) | 1 |
| 100 Kohm (R1-R21-R51-R52-R53-R54-R61-R62-R63-R64) | 10 |
| 470 Kohm (R5-R12-R13-R25-R32-R33) | 6 |
| 1 Meg ohm (R8-R28) | 2 |
| **1 Watt** | |
| 10 ohm (R16-R17-R36-R37) | 4 |
| 33 Kohm (R7-R10-R11-R27-R30-R31) | 6 |
| 100 Kohm (R3-R23) | 2 |
| **2 Watts** | |
| 24 Kohm (R9-R29) | 2 |
| 220 Kohm (R44) | 1 |
| **Others** | |
| 10 Kohm 5 Watts (R41) | 1 |
| 5 Kohm 10 Watts (R42) | 1 |
| 33 ohm 20 Watts (R43) | 1 |

Variable resistor 20 Kohm
(VR2-VR3-VR4-VR5-VR6) 5

## CAPACITORS:

| Description | Quantity |
|---|---|
| 100 picoFARAD 50volts (C2-C6-C8-C12) | 4 |
| 0.047 microFARAD 250 volts AC (C19) | 1 |
| 0.22 microFARAD 250 volts AC 400 volts DC (C1-C4-C5-C7-C10-C11) | 6 |
| 0.47 microFARAD 250 volts AC 400 volts DC (C3-C9) | 2 |
| 47 microFARAD 450 volts DC (C14-C15-C16) | 3 |
| 100 microFARAD 160 volts DC (C17-C18) | 2 |
| 220 microFARAD 450 volts DC (C13) | 1 |

## DIODES :

| Description | Quantity |
|---|---|
| 1N4007 (D1-D2-D3-D4-D5-D6-D7-D8) | 8 |
| 1N4761A (D9) Zener 75V | 1 |

## TRANSISTORS :

| Description | Quantity |
|---|---|
| 2N5401 (Q1-Q2-Q3-Q4-Q5) | 5 |

# STEP BY STEP ASSEMBLY PROCEDURE

The instructions are presented step by step according to a logical sequence, so that the assembly of this kit may be performed easily and efficiently.

Read the instructions pertaining to each step carefully. Check each completed step in the space provided. This is particularly important to prevent errors or omissions.

## PRINTED CIRCUIT BOARD / AMPLIFICATION STAGES (PCB-AMP)

#1 ( ✓ ) *Install and solder the 4 octal (8 pin) tube sockets VB3,VB4,VB1,VB2.*
Identify the pin numbers by looking at the pins of the socket facing you (figure 4). The pins are usually numbered clockwise from 1 to 8, from the pin located to the right of the notch. Prong 1 is identified by a dot on the PCB-AMP.

Install one socket at a time on the pc board. It must be on the side opposite to the parts (the side of the copper foil of the PCB). See figure 12 on page 19.

**CAUTION :** Make sure that the socket is resting firmly on on the pc board and that the numbers of the pins are well at their place.

*Solder the pins one by one to the printed circuit board.*
Solder each pin to its rivet, first on the side of the PCB-AMP parts, then on the other side of the board, *taking care* to solder each rivet to the copper foil of the printed circuit.
**VERY IMPORTANT** : **Make sure each rivet is well soldered.**

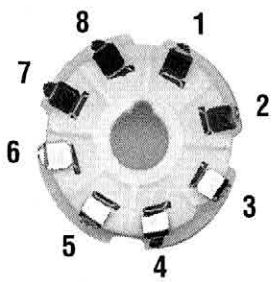



**FIGURE 4**
8 pin socket

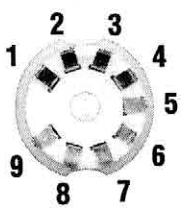



**FIGURE 5**
9 pin socket

#2 ( ✓ ) *Install and solder the 4 tube sockets VB8,VB7,VB5 and VB6 with 9 pins.*

Identify the pin numbers by looking at the pins of the socket facing you. There is a space between pins 1 and 9. Count clockwise from pin 1 (figure 5).

Install one socket at a time on the board. It must be on the side opposite to the parts (the side of the copper foil of the PCB). Make sure the soket is resting firmly on the printed circuit and solder the pins one by one to the printed circuit.

#3 ( ✓ ) *Solder each rivet perfectly:*

Those rivets are the links with the circuit board's copper foil (conductive layer). It is strongly advisable **to rub some sand paper** on the surface of the rivet and the copper foil. Secure each of the 52 rivets by applying solder on it. Heat up sufficiently to allow solder to run smoothly beteween the 2 parts. **This is very important to avoid any defective contact** between the rivet and the copper foil of the board.

## Resistors

*Insert the resistors at their location.*

Install each resistor at the assigned location. Resistors don't have to respect a polarity, therefore you may install them in either orientation. Fold the leads to 45 degrees and solder. Afterwards, cut off the excess lead lengths. **Use an Ohmmeter to verify the value of each resistor.** Note: The resistors in this kit may use the 5-band code instead of the usual 4-band one. Ex: 4.7K Ohm 1 % (yellow - violet - black - brown - brown) compared to 4.7 K Ohm 5 % (yellow - violet - red - gold).

**The 1watt and 2 watt dissipation power resistors produce more heat. Keep those resistors a few milimeters apart from the PCB.**

#4 (✓) R5 : 470 Kohm 1/2W
(yellow-violet-black-orange-green)

#5 (✓) R4 : 1Kohm 1/2W
(brown-black-black-brown-brown)

#6 (✓) R20 : 3.3Kohm 1/2W
(orange-orange-red-gold)

#7 (✓) R6 : 470ohm 1/2W
(yellow-violet-black-black-green)

#8 (✓) R3 : 100Kohm 1W*
(brown-black-black-orange-green)

#9 (✓) R11 : 33Kohm 1W*
(orange-orange-black-red-brown)

#10 (✓) R49 :10Kohm 1/2W
(brown-black-black-red-green)

#11 (✓) R7 : 33Kohm 1W*
(orange-orange-black-red-brown)

#12 (✓) R10 : 33Kohm 1W
(orange-orange-black-red-brown)

#13 (✓) R8 : 1MEGohm 1/2W
(brown-black-black-yellow-brown)

#14 (✓) R42 : 5Kohm 10W
*** keep that resistor away 5mm from the circuit because it produces heat**

#15 (✓) R41 : 10Kohm 5W
*** keep that resistor away 5mm from the circuit because it produces heat**

#16 (✓) R28:1MEGohm 1/2W
(brown-black-black-yellow-brown)

#17 (✓) R31 : 33Kohm 1W*
(orange-orange-black-red-brown)

#18 (✓) R51 : 100Kohm 1/2W
(brown-black-black-orange-green)

#19 (✓) Make sure that all resistors are soldered and the extra lead lengths have been cut off.

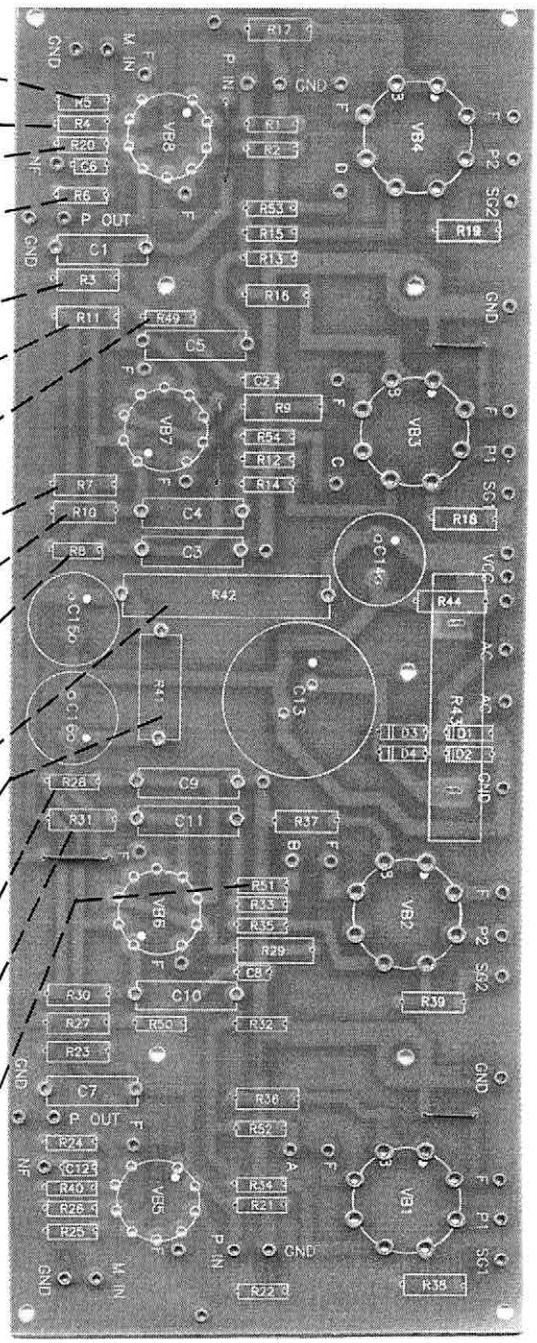



**FIGURE 6**
*PCB-AMP*

#20 ( ) R17 : 10ohm 1W*
(brown-black-black-gold-green)

#21 ( ) R1 : 100Kohm 1/2W
(brown-black-black-orange-green)

#22 ( ) R2 : 1.2Kohm 1/2W
(brown-red-red-gold)

#23 ( ) R53 : 100Kohm 1/2W
(brown-black-black-orange-green)

#24 ( ) R15 : 1Kohm 1/2W
(brown-black-black-brown-brown)

#25 ( ) R13 : 470Kohm 1/2W
(yellow-violet-black-orange-green)

#26 ( ) R19:100ohm 1/2W
(brun-noir-noir-noir-brun)

#27 ( ) R33 : 470Kohm 1/2W
(yellow-violet-black-orange-green)

#28 ( ) R35 : 1Kohm 1/2W
(brown-black-black-brown-brown)

#29 ( ) R30 : 33Kohm 1W*
(orange-orange-black-red-brown)

#30 ( ) R27 : 33Kohm 1W*
(orange-orange-black-red-brown)

#31 ( ) R23 : 100Kohm 1W*
(brown-black-black-orange-green)

#32 ( ) R50 : 10Kohm 1/2W
(brown-black-black-red-green)

#33 ( ) R24 : 1Kohm 1/2W
(brown-black-black-brown-brown)

#34 ( ) R40 : 3.3Kohm 1/2W
(orange-orange-red-gold)

#35 ( ) R26 : 470ohm 1/2W
(yellow-violet-black-black-green)

#36 ( ) R25 : 470Kohm 1/2W
(yellow-violet-black-orange-green)

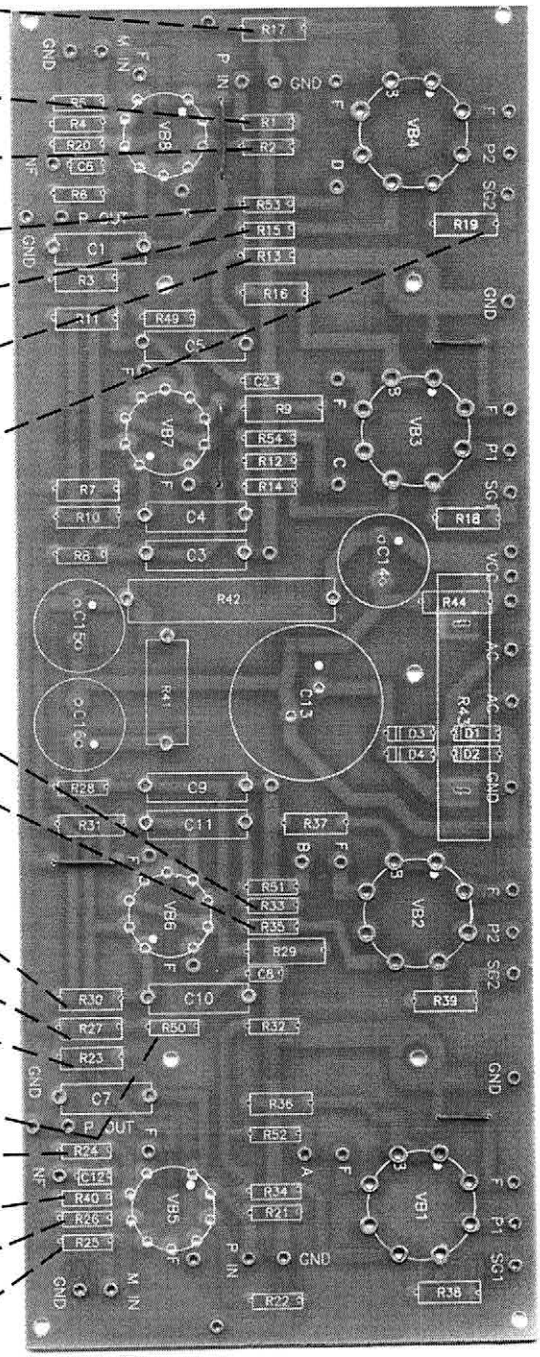



**FIGURE 7**
*PCB-AMP*

#37 ( ) Make sure that all resistors are soldered and the extra lead lengths have been cut off.

#38 ( ) R16 : 10 ohm 1W*
(brown-black-black-gold-green)

#39 ( ) R9 : 24Kohm 2W*
(red-yellow-black red-green)

#40 ( ) R54 : 100Kohm 1/2W
(brown-black-black-orange-green)

#41 ( ) R12 : 470Kohm 1/2W
(yellow-violet-black-orange-green)

#42 ( ) R14 : 1Kohm 1/2W
(brown-black-black-brown-brown)

#43 ( ) R18 : 100 ohm 1/2W
(brown-black-black-black-brown)

#44 ( ) R44 : 220Kohm 2W*
(red-red-black-orange-brown)

#45 ( ) R37 : 10 ohm 1W*
(brown-black-black-gold-green)

#46 ( ) R29 : 24Kohm 2W*
(red-yellow-black-red-green)

#47 ( ) R39 : 100 ohm 1/2W
(brown-black-black-black-brown)

#48 ( ) R32 : 470Kohm 1/2W
(yellow-violet-black-orange-green)

#49 ( ) R36 : 10 ohm 1W*
(brown-black-black-gold-green)

#50 ( ) R52 : 100Kohm 1/2W
(brown-black-black-orange-green)

#51 ( ) R34 : 1Kohm 1/2W
(brown-black-black-brown-brown)

#52 ( ) R21 : 100Kohm 1/2W
(brown-black-black-orange-green)

#53 ( ) R22 : 1.2Kohm 1/2W
(brown-red-red-gold)

#54 ( ) R38 : 100 ohm 1/2W
(brown-black-black-black-brown)

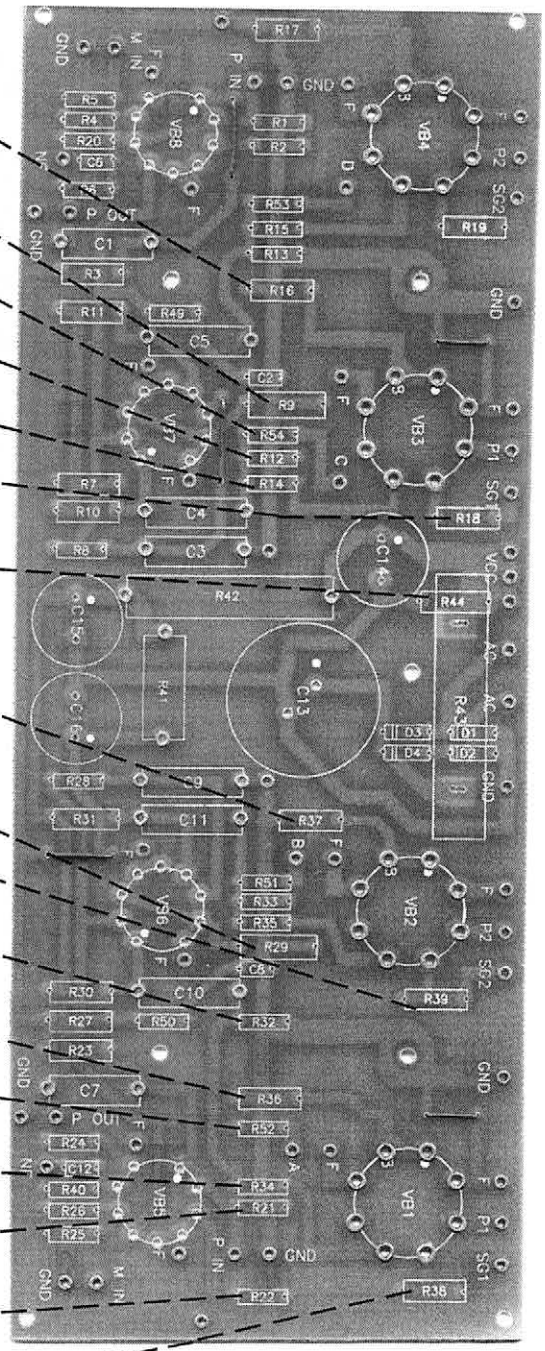
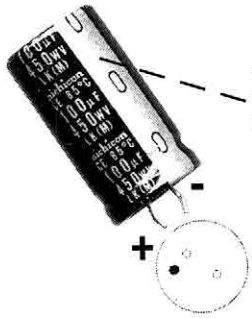



**FIGURE 8**
*PCB-AMP*

#55 ( ) Make sure that all resistors are soldered and the extra lead lengths have been cut off.

## CAPACITORS

Small size capacitors are designated in picofarads (PFD), whereas larger ones are designated in microfarads (MFD or mfd). Capacitors have a maximum operationg voltage expressed in Volts.




Insert the capacitors in their specific location, but be careful to respect the **polarity**, because they have a positive and a negative lead. The negative lead of a capacitor is well identified(- - - -). On the printed circuit board, however, the positive one is often identified. **Caution: a capacitor installed with inverted polarity may blow up and cause injury when powered on.**

Once the capacitor is inserted into the board, bend the leads and solder them.

#56 (✓) C6 : 100 PFD (pico farad) 50Vdc (non polarized)

#57 (✓) C1 : 0.22 MFD 250Vac 400Vdc (non polarized)

#58 (✓) *Install a jumper wire:* Cut a 30mm length of stripped wire. Link the 2 points between white line. Solder and cut off extra material.

#59 (✓) C5 : 0.22MFD 250Vac 400Vdc (non polarized)

#60 (✓) C2 : 100 PFD (pico farad) 50Vdc (non polarized)

#61 (✓) *Install a jumper wire:* Cut a 30mm length of stripped wire. Link the 2 points between white line. Solder and cut off extra material.

#62 (✓) C4 : 0.22MFD 250Vac 400Vdc (non polarized)

#63 (✓) C3 : 0.47MFD 250Vac 400Vdc (non polarized)

#64 (✓) C15 : 47MFD 450Vdc **(polarized)**

#65 (✓) C16 : 47MFD 450Vdc **(polarized)**

#66 (✓) C13 : 220MFD 450Vdc **(polarized)**

#67 (✓) C14 : 47MFD 450Vdc **(polarized)**

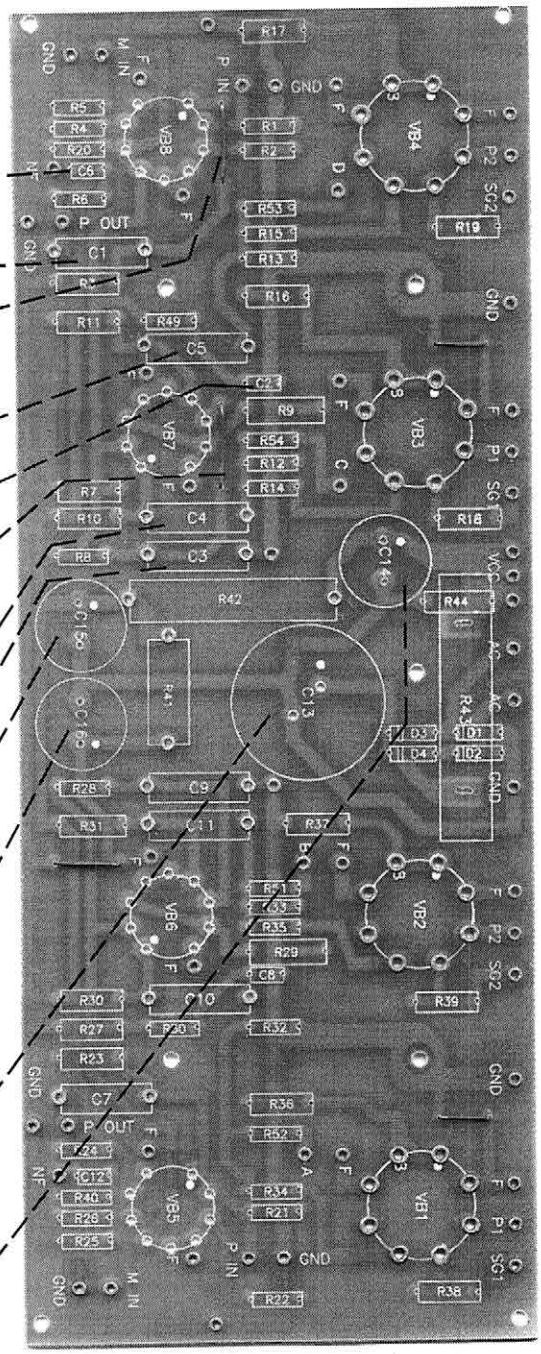



**FIGURE 9**
*PCB-AMP*

Make sure that all components are soldered and the extra material has been cut off.

**Rectifier diode**

A diode is a semiconductor used to rectify the alternate current so as to obtain a continuous current ready for filtering. A diode has a **polarity**. The two leads are identified as the anode and the cathode. The cathode is identified by a band at one end of the diode. **Caution: it is important to respect the polarity of the diode, because an inverted polarity power would be applied to the capacitors.**

Install the diodes with care. Bend the leads at 45 degrees and solder them in place, being careful not to overheat them, semiconductors are very sensitive to heat. Cut off the excess of material.

#68 ( ✓ ) *Install a jumper wire:*
Cut a 27mm length of stripped wire. Link the 2 points between white line. Solder and cut off extra material.

#69 ( ✓ ) D1 D2 D3 D4 : Diodes 1N4007(**polarized**)

#70 ( ✓ ) R43 : 33 ohm 20W

#71 ( ✓ ) C9 : 0.47MFD 250Vac 400Vdc (non polarisé)

#72 ( ✓ ) C11 : 0.22MFD 250Vac 400Vdc (non polarized)

#73 ( ✓ ) C8 : 100 PFD (pico farad) 50Vdc (non polarized)

#74 ( ✓ ) C10 : 0.22MFD 250Vac 400Vdc non polarized)

#75 ( ✓ ) C7 : 0.22MFD 250Vac 400Vdc (non polarized)

#76 ( ✓ ) C12 : 100 PFD (pico farad) 50Vdc (non polarized)

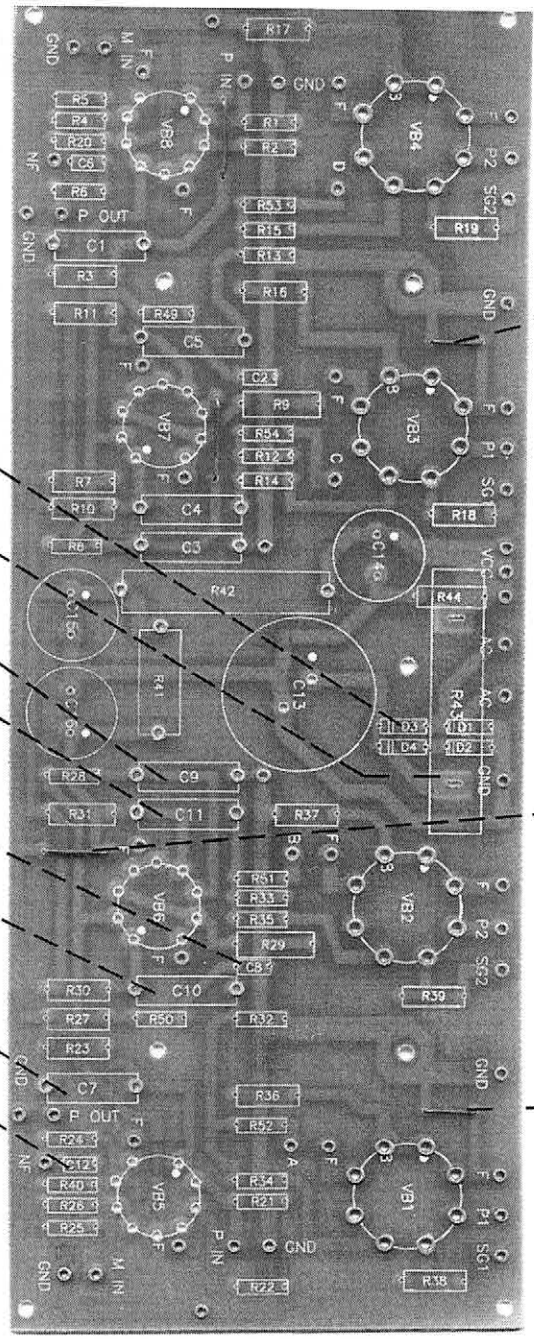



**FIGURE 10**
*PCB-AMP*

Make sure that all components are soldered and the extra material has been cut off.

## Wire the vacuum tube filaments

The filaments are interlinked (in parallel), on the side of the tube sockets, that is on the side of the copper foil of the printed circuit (PCB-AMP).They are divided in two groups, that is VB5-VB6-VB1-VB2 and VB8-VB7-VB3-VB4.

To do the wiring, you will prepare a given length of blue and green wire that you will twist together at the rate of 3 turns per 2.5cm (1 inch) of length (figure 12). This is for a maximum reduction of the alternate current (60hz) induction to the whole circuit. TAKE CARE ,as you solder the wire to the pin of the socket, that it doesn't make contact with the next pin.

**Caution : Make sure you identify the pin number correctly.** Count counterclockwise, looking at the socket from the top.

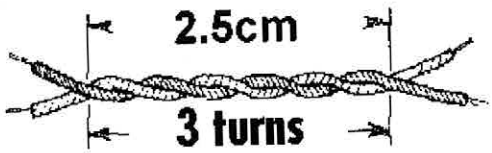



**FIGURE 11**

### VB2-VB6-VB5-VB1 :

#77
- A( ) Cut a 95mm length of blue wire.
- B( ) Cut a 105mm length of green wire.
- C( ) Strip 3mm at the extremities. Solder up (apply a small amount of solder to) each extremity.
- D( ) Solder the green wire directly on no. 2 pin of VB2 socket.
- E( ) Solder the blue wire directly on no. 7 pin of VB2 socket.
- F( ) Twist the green and blue wires together (3 turns/2.5cm).
- G( ) Solder the other extremity of the green wire directly on pins no. 4 and 5 of VB6 socket
- H( ) Solder the other extremity of the blue wire directly on pin no. 9 of VB6 socket.

#78
- A( ) Cut a 105mm length of blue wire.
- B( ) Cut a 125mm length of green wire.
- C( ) Strip 3mm at the extremities. Solder up (apply a small amount of solder to) each extremity.
- D( ) Solder the green wire on «F» rivet next to no. 4 and 5 pins of VB6 socket.
- E( ) Solder the blue wire on «F» rivet next to no. 9 pin of VB6 socket.
- F( ) Twist the green and blue wires together (3 turns/2.5cm).
- G( ) Solder the other extremity of the green wire directly on pins no. 4 and 5 of VB5 socket.
- H( ) Solder the other extremity of the blue wire directly on pins no. 9 of VB5 socket.

#79
- A( ) Cut a 90mm length of blue wire.
- B( ) Cut a 120mm length of green wire.
- C( ) Strip 3mm at the extremities. Solder up (apply a small amount of solder to) each extremity.
- D( ) Solder the green wire on «F» rivet next to no. 4 and 5 pins of VB5 socket.
- E( ) Solder the blue wire on «F» rivet next to no. 9 pin of VB5 socket.
- F( ) Twist the green and blue wires together (3 turns/2.5cm).
- G( ) Solder the other extremity of the blue wire on «F» rivet next to ping no. 7 of VB1 socket.
- H( ) Solder the other extremity of the green wire on "F" rivet next to pin no. 2 of VB1 socket.

The «F» rivets of VB2 will later be used to link the circuit of VB2-VB6-VB5-VB1 filaments to the power transformer.

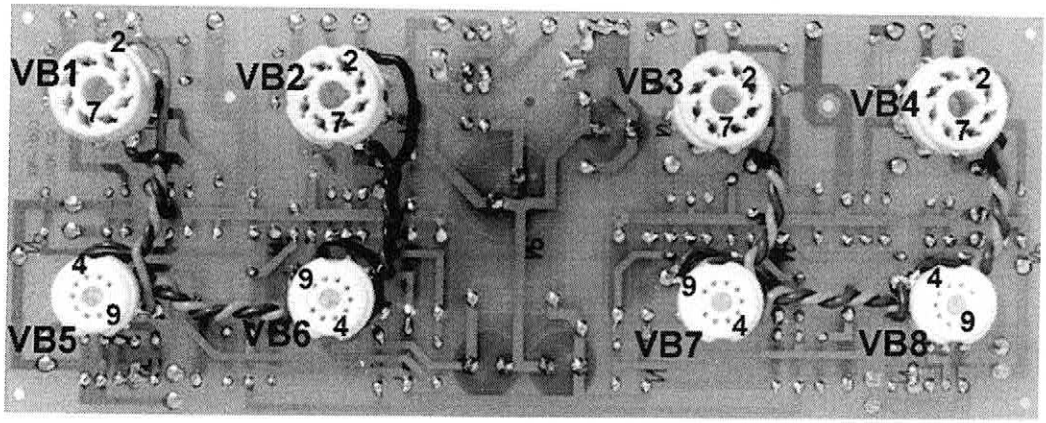



**FIGURE 12**

## VB3-VB7-VB8-VB4 :

#80

A( ) Cut a 95mm length of blue wire.
B( ) Cut a 105mm length of green wire.
C( ) Strip 3mm at the extremities. Solder up (apply a small amount of solder to) each extremity.
D( ) Solder the green wire directly on no. 2 pin of VB3 socket.
E( ) Solder the blue wire directly on no. 7 pin of VB3 socket.
F( ) Twist the green and blue wires together (3 turns/2.5cm).
G( ) Solder the other extremity of the green wire directly on pins no. 4 and 5 of VB7 socket.
H( ) Solder the other extremity of the blue wire directly on pin no. 9 of VB7 socket.

#81

A( ) Cut a 120mm length of blue wire.
B( ) Cut a 100mm length of green wire.
C( ) Strip 3mm at the extremities. Solder up (apply a small amount of solder to) each extremity.
D( ) Solder the green wire on «F» rivet next to no. 4 and 5 pins of VB7 socket.
E( ) Solder the blue wire on «F» rivet next to no. 9 pin of VB7 socket.
F( ) Twist the green and blue wires together (3 turns/2.5cm).
G( ) Solder the other extremity of the green wire directly on pins no. 4 and 5 of VB8 socket.
H( ) Solder the other extremity of the blue wire directly on pin no. 9 of VB8 socket.

#82

A( ) Cut a 95mm length of blue wire.
B( ) Cut a 120mm length of green wire.
C( ) Strip 3mm at the extremities. Solder up (apply a small amount of solder to) each extremity.
D( ) Solder the green wire on «F» rivet next to no. 4 and 5 pins of VB8 socket.
E( ) Solder the blue wire on «F» rivet next to no. 9 pin of VB8 socket.
F( ) Twist the green and blue wires together (3 turns/2.5cm).
G( ) Solder the other extremity of the blue wire on «F» rivet next to pin no. 7 of VB4 socket.
H( ) Solder the other extremity of the green wire on «F» rivet next to pin no. 2 of VB4 socket.

The «F» rivets of VB3 will later be used to link the circuit of VB3-VB7-VB8-VB4 filaments to the power transformer.

# PCB-AMP check with an ohmmeter

For more security, check every rivet's conductivity with your ohmmeter by applying the positive probe on the rivet and the negative one on one of the parts in contact with the same copper foil on the printed circuit.

Example : Apply the negative probe of the ohmmeter on the «GND» rivet near R43 and the positive probe on the anode of the «D1» or «D2» diode. You should be reading "0" Ohm, as if you had short-circuited both probes together. If you are not getting "0" value, do your solderings again.

## Here are some important verifications :

VB4

*Positive probe* on pin 5 of VB4.
*Negative probe* on «D» rivet.
Expected reading : about 100 kohms.

*Positive probe* on pin 8 of VB4.
*Negative probe* on «GND» near R5.
Expected reading :10 ohms.

VB3

*Positive probe* on pin 5 of VB3.
*Negative probe*on «C» rivet.
Expected reading : about 100 kohms.

*Positive probe* on pin 8 of VB3.
*Negativeprobe* on «GND» near R1.
Expected reading :10 ohms.

VB2

*Positive probe* on pin 5 of VB2.
*Negative probe* on "B" rivet.
Expected reading : about 100 kohms.

*Positive probe* on pin 8 of VB2.
*Negative probe* on «GND» near R22.
Expected reading :10 ohms.

VB1

*Positive probe* on pin 5 of VB1.
*Negative probe* on «A» rivet.
Expected reading : about 100 kohms.

*Positive probe* on pin 8 of VB1.
*Negative probe* on «GND» near R25.
Expected reading :10 ohms.

## Verification of the filaments powering set up on the PCB-AMP

Still using the ohmmeter, on a 100 ohm scale, check wiring continuity :

a) -Negative probe on «F», near pin 2 of VB2
-Positive probe on «F», near pin 7 of VB2

Reading : infinite value

b) -Negative probe on pin 2 of VB2 and always leave in place

-Positive probe on pin 4 or 5 of VB6 : reading 0 ohm
-Positive probe on pin 4 or 5 of VB5 : reading 0 ohm
-Positive probe on pin 2 of VB1 : reading 0 ohm

c) -Negative probe on pin 7 of VB2 and always leave in place

-Positive probe on pin 9 of VB6 : reading 0 ohm
-Positive probe on pin 9 of VB5 : reading 0 ohm
-Positive probe on pin 7 of VB1 : reading 0 ohm

d) -Negative probe on «F», near pin 2 of VB3
-Positive probe on «F», near pin 7 of VB3
Reading : infinite value

e) -Negative probe on pin 2 of VB3 and always leave in place

-Positive probe on pin 4 or 5 of VB7 : reading 0 ohm
-Positive probe on pin 4 or 5 of VB8 : reading 0 ohm
-Positive probe on pin 2 of VB4 : reading 0 ohm

f) -Negative probe on pin 7 of VB3 and always leave in place

-Positive probe on pin 9 of VB7 : reading 0 ohm
-Positive probe on pin 9 of VB8 : reading 0 ohm
-Positive probe on pin 7 of VB4 : reading 0 ohm

**Correct immediately if required, before continuing.**

# Printed circuit board/ Bias circuit (PCB-BIAS)

#83 ( ) *Solder each rivet perfectly:*

Those rivets are the links with the copper foil of the printed circuit. Apply solder on each one of the 7 rivets. Give enough heat to allow the solder to flow smoothly between the 2 parts. **This is very important to avoid any defective contact between the rivet and the printed circuit.**

*Insert the resistors in their proper place.*

#84 ( ) R64 : 100K ohm 1/2W
(brown-black-black-orange-green)

#85 ( ) R60 : 20K ohm 1/2W
(red-black-black-red-green)

#86 ( ) R63 : 100K ohm 1/2W
(brown-black-black-orange-green)

#87 ( ) R59 : 20K ohm 1/2W
(red-black-black-red-greent)

#88 ( ) R62 : 100K ohm 1/2W
(brown-black-black-orange-green)

#89 ( ) R58 : 20K ohm 1/2W
(red-black-black-red-green)

#90 ( ) R61 : 100K ohm 1/2W
(brown-black-black-orange-green)

#91 ( ) R57 : 20K ohm 1/2W
(red-black-black-red-green)

#92 ( ) R56 : 47K ohm 1/2W
(yellow-violet-black-red-green)

#93 ( ) R55 : 2.2K ohm 1/2W
(red-red-black-brown-green)

#94 ( ) *Install a jumper wire :*

Cut a 25mm length of stripped wire. Link the 2 points between white line. Solder and cut off extra material.

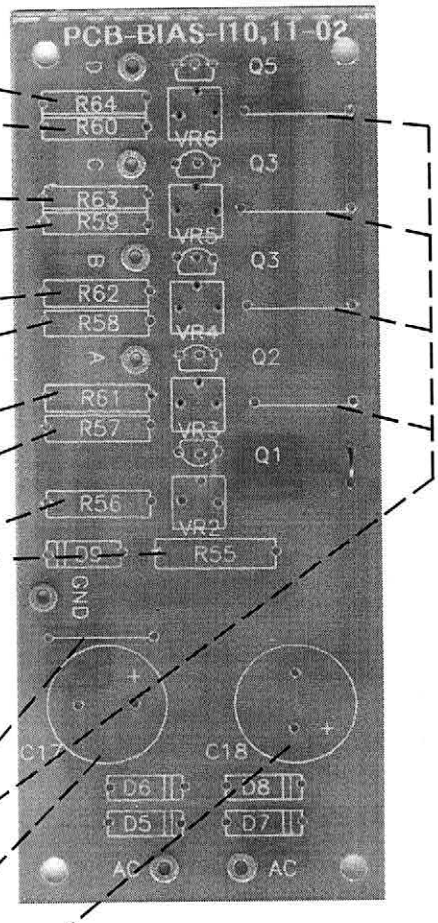



**FIGURE 13**
***PCB-BIAS***

## Capacitors:

#95( ) C17 : 100MFD 160V **(polarized)**

#96( ) C18 : 100MFD 160V **(polarized)**

Make sure that all components are soldered and the extra material has been cut off.

## Transistor :

#97(✓) Q1-Q2-Q3-Q4-Q5 :
*Install transistors 2N5401.*

Align the flat side of the transistor as shown on the printed circuit. Insert the 3 leads into their respective holes : emitter, base, collector. **Solder them taking care not to overheat, for semiconductors are very sensitive to heat.** Cut off extra material.

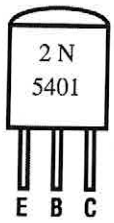



**FIGURE 15**

**E = EMITTER**
**B = BASE**
**C = COLLECTOR**

## Zener diode (regulator)

#98 (✓) D9 : Zener diode 1N4761A (75V 1W).
*Install regulator diode:*

**Respect polarity**.(cathode identified by band).
Install the diodes with care. Bend the leads at 45 degrees and solder them in place, **being careful not to overheat them, semiconductors are very sensitive to heat.** Cut off the excess of material.

## Diode rectifier:

#99 (✓) D5-D6-D7-D8: Diode rectifier 1N
*Install rectifier diode :*

**Respect polarity.** (cathode iden

Make sure th

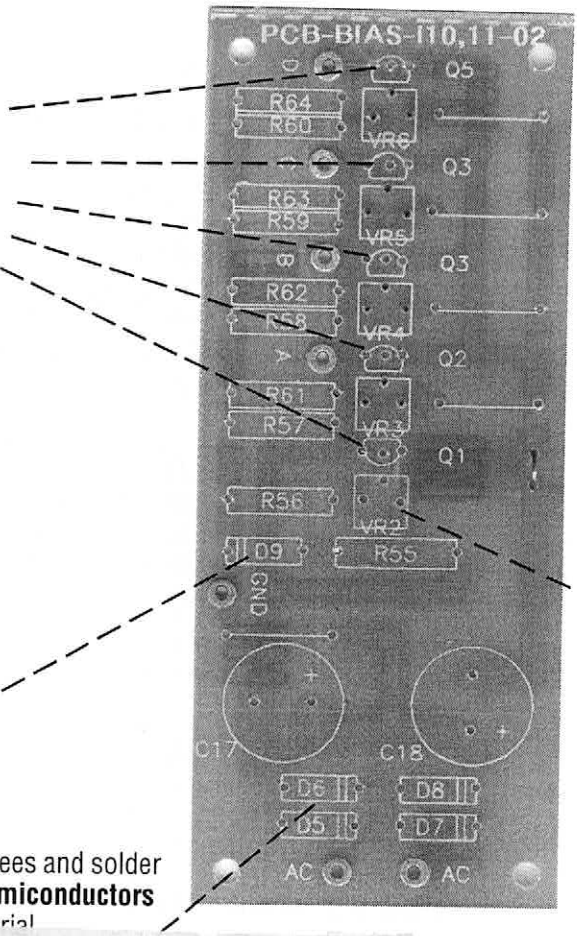
## VARIABLE RESISTORS :

*Install the variable resistors*

#100(✓) VR2 : Variable resistor (on the s
(trim pot) 20Kohm

#101(✓) VR3-VR4-VR5-VR6 : Variable r
(trim pot) 20Kohm

IMPORTANT : The 4 variable
**on the side opposite to the pa**
(PCB-BIAS), that is on the side
close as possible to the surface of the PCB and correctly aligned, for they must be accessible from the outside of the chassis for adjustment. Solder each lead of trim pots.



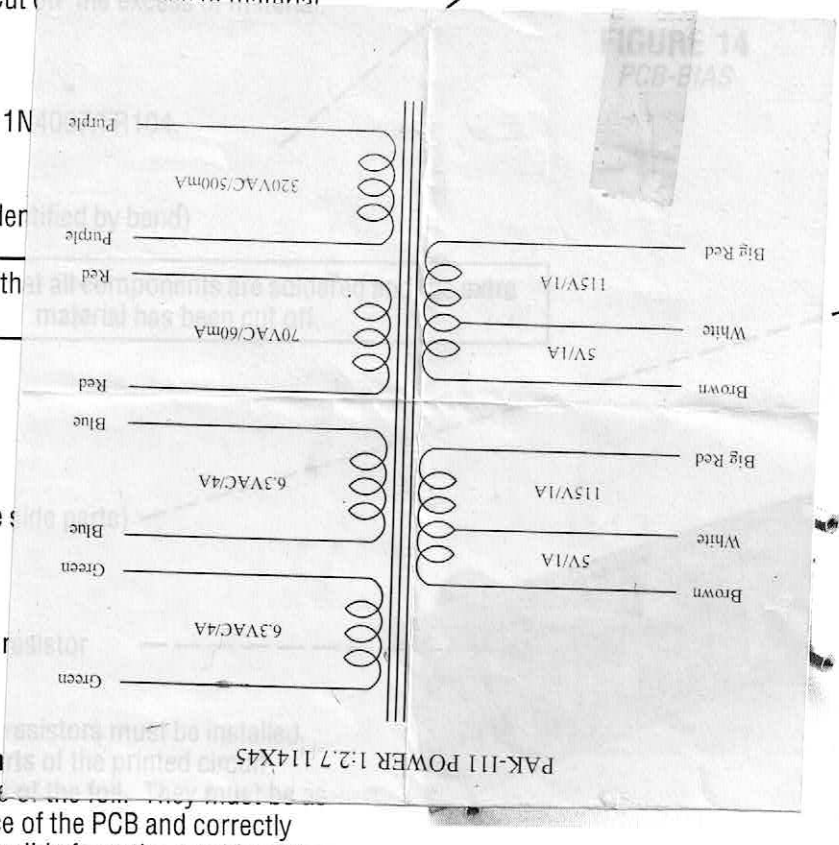
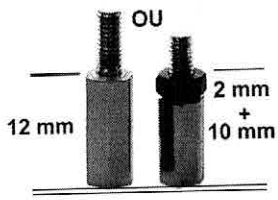




**FIGURE 16**

# Mechanical components set up

#102(✓) Install the 9 threaded stud spacers (12mm) on the PCB-AMP, in the hole provided (figure 18). The spacers must be on the side of the PCB's foil. If threaded stud are 10mm longer , you must use 2 nuts, one on each side of the PCB (figure 17). On the central threaded stud spacer, **install one solder lug (on the parts side)** before putting on the nut. Il would be advisable to secure the nuts with some locking adhesive.



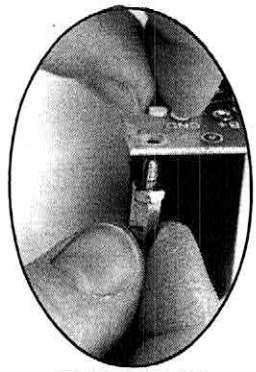



FIGURE 17

**Locking adhesive**

It is advisable to lock the screws and nuts with some adhesive. Apply a small amount of lacker on the screw or nut to be locked. Nail polish does a good job as a locking adhesive.

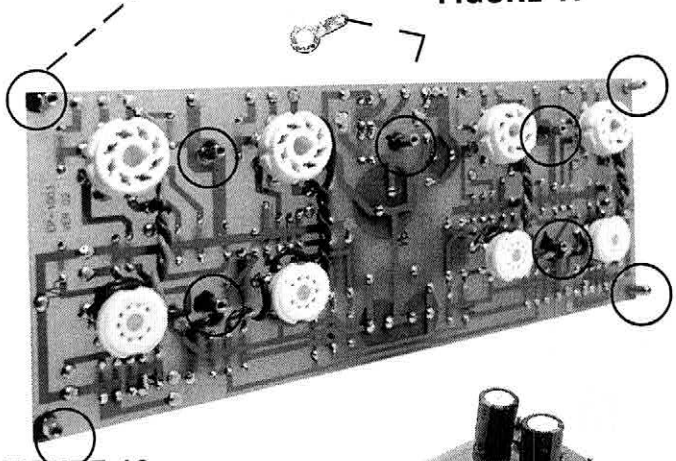


FIGURE 18
*PCB-AMP*

#103(✓) Install the 4 threaded stud spacers (12mm) on the PCB-BIAS, in the recess provided at the four corners of the board (figure 19). The spacers must be on the side of the PCB's threadways. If threaded stud are 10mm longer, you must use 2 nuts, one on each side of the PCB (figure 17). Il would be advisable to secure the nuts with some locking adhesive.

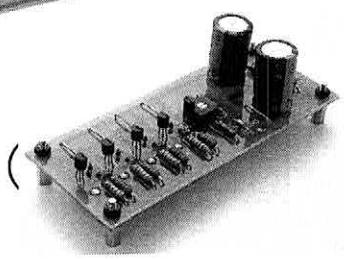


FIGURE 19
*PCB-BIAS*

**To avoid damaging the finish of the cabinet, use an old piece of carpet or a towel on your working table.**

#104(✓) Install the four 8mm snap-in bushings into the 4 holes on the side of the chassis marked VB8/VB2/VB3/VB4.

#105(✓) Install the banana jack into the the hole located at the rear of the chassis, on the side (figure 20). It is advisable to lock the screws and nuts with some adhesive.

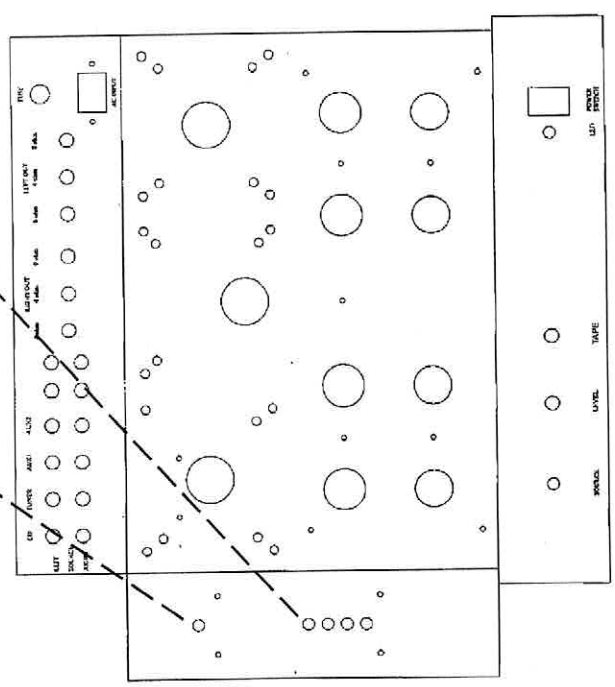
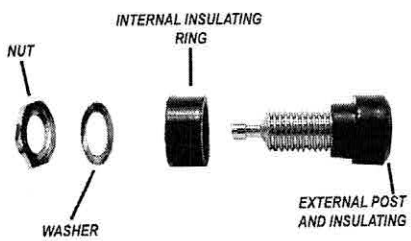


FIGURE 20



#106( ✓ ) *Make sure that there is no paint around the 2 ground connecting holes.* Use a file. This will ensure the contact between the terminal and the chassis (grounds).

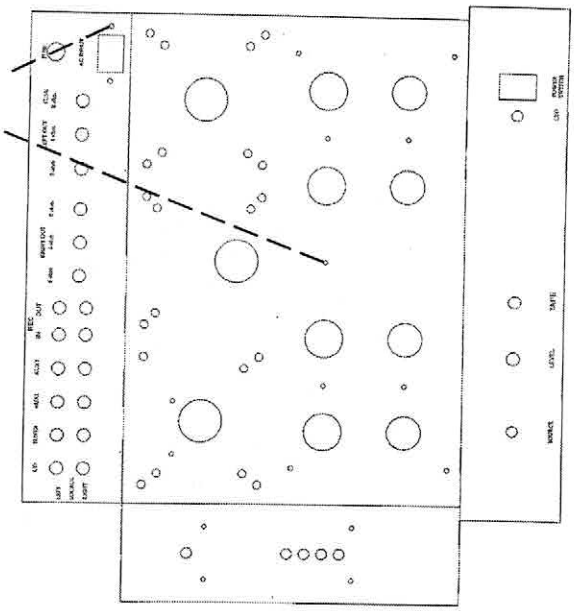


**FIGURE 21**

#107( ✓ ) *Set the amplification stages printed circuit (PCB-AMP) into the chassis.* Align the tube sockets well with their individual recess. Use nine 3mm x 8mm screws.

#108( ✓ ) *Set the bias printed circuit (PCB-BIAS) into the chassis.* Use four 3mm x 8mm screws.

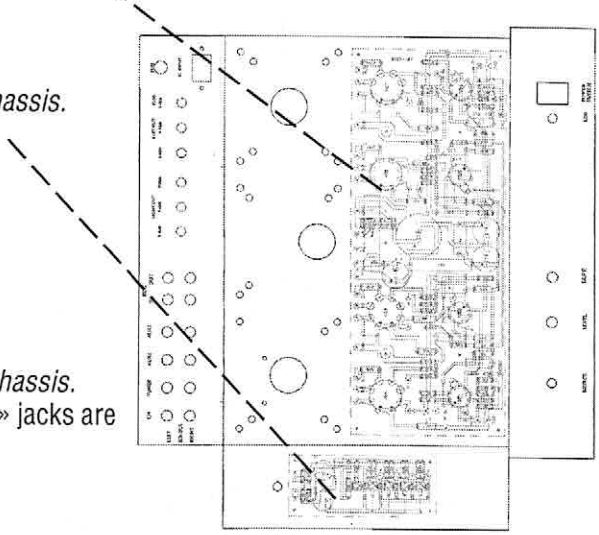


**FIGURE 22**

#109( ✓ ) *Set the RCA female jacks at the rear of the main chassis.* The «black» jacks are the left inputs and the «red» jacks are the right inputs .

Install the 6 pairs as follows:

First install plastic insulators. If they don't fit easily into their holes, give them a light file stroke or use a 3/8" bit. Follow the sequence of figure 23. Turn the terminal toward its twin soket. Bend the blade of the terminal so as to keep it away from the chassis. Tighten the jacks temporarily, taking care to align the right and left terminals together.

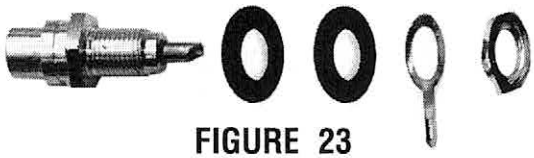


**FIGURE 23**

#110( ) *Solder the terminals:*
Solder the terminal of each pair together. Now, solder a piece of bare wire on the terminals in order to connect them together. Cut off excess wire strand.

#111( ) *Tighten the screws on each RCA jack.* Lock each screw with some locking adhesive.

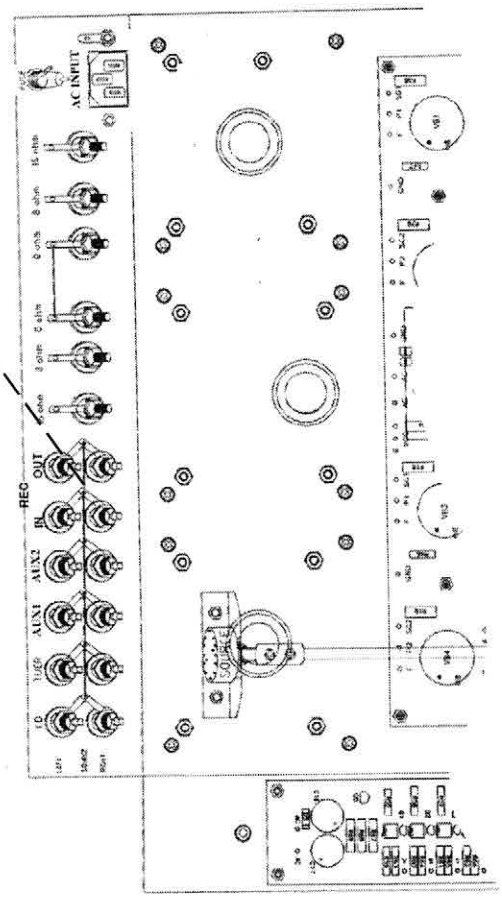



**FIGURE 24**

#112( ) *Set the female speaker binding posts:*
Use the two black binding post for the negative outputs identified «O».
Use the four red binding post for the positive outputs identified «8 OHM and 4 OHM».

-Unassemble each speaker binding post by removing the nut, the lock washer, the terminal lug, the internal and the external insulating rings. (figure 25)

-Unscrew the wire grip part of the binding post to see the insertion hole of the speaker wire.

-Set the external insulator on the binding post in position so as to put the thru holes in vertical position (the insertion hole of the wire is top to bottom).

-Set the internal insulator plus the terminal lug turned outward of the case.

-Put in the lock washer and the nut.

-Tighten reasonably with an 8mm (5/16) nut driver.

-Lock with some locking adhesive.

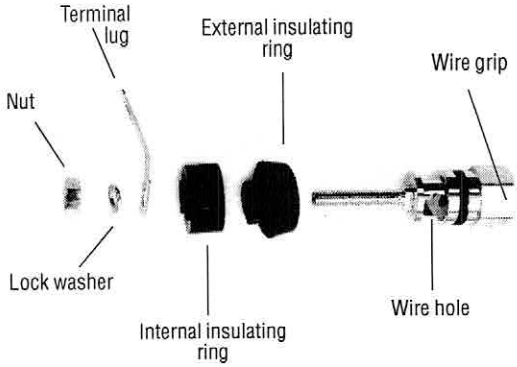



**FIGURE 25**

#113( ✓ ) *Install a piece of bare wire between the 2 binding posts identifed «0».*
Cut the wire 4.5cm long and bend the tips 5mm. Insert each end of the wire into each hole and solder.

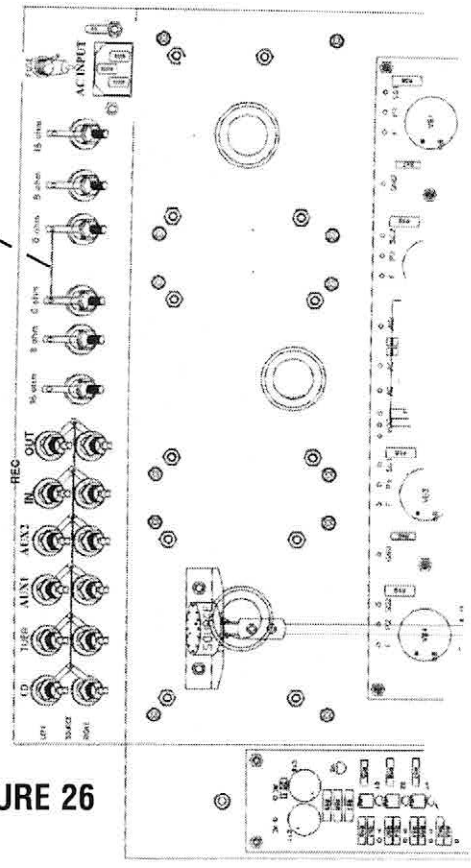



**FIGURE 26**

#114( ✓ ) *Insert the AC socket into its proper hole .*

You may have to file the hole to facilitate installation. Set with 3mm x 8mm screws and 3mm nuts. Don't forget to install **the terminal lug**. Lock the nuts with some locking adhesive.

#115( ✓ ) *Install the fuse holder (FUSE).*

Be sure to tighten the screw. Use a long nose plier. Lock the screw with some locking adhesive.

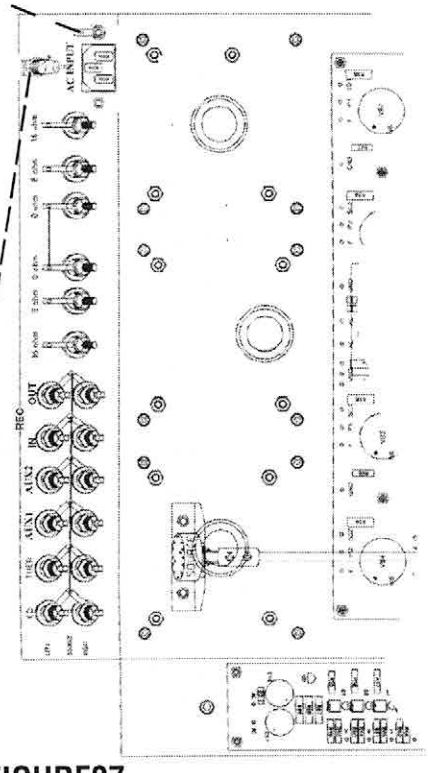



**FIGURE27**

# «Alpha» sources selector

The ALPHA selector makes it possible to adjust the choice of selections between 2 and 6 stereo sources. Two ALPHA selectors are required for the PAK-i11 assembly. One for the sources selection (4 positions: CD-Tuner-Aux1-Aux2) and the other for the selection of the output tubes when adjusting bias (5 positions : OFF-VB8-VB2-VB/-VB4).

## How to adjust an ALPHA selector

FIGURE 28

- Remove the nut and the control lock washer.
- Remove the special ring made of a 90 degrees bent lug or pin.The small holes under the ring are numbered 2 to11.The choice of numbered hole determines selector's positions .
- Turn the selector's shaft counterclockwise and full course.
- Now, reset the ring, being careful to insert the lug into the hole identified to number of selection you need.

#116( ) *Install the bias selector:*

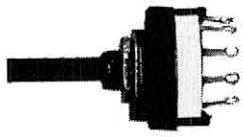


FIGURE 29

Take the selector with the 8mm shaft and adjust it for 5 positions. Install the selector into the hole provided on the side of the cabinet. With the selector in first position (fully counterclockwise), turn the flat side of the selector's shaft to the position corresponding to 4 o'clock on the face of a watch. Set with the lock washer and nut.

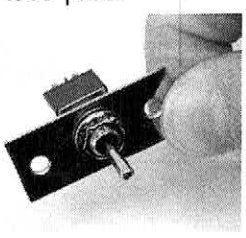
#117( ) *Install the black aluminum front panel.* Use three 3 x 8 K/T screws and apply to the chassis.

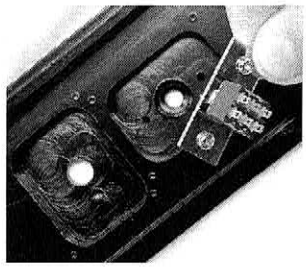
#118a( ) *Install the power switch on the front panel.*

The power switch is set tight into its hole. Position 1 of the switch should point to the top of the chassis.

#118a( ) *Install the tape switch on the front panel.*

Start by fixing switch on the provided plate and fix the plate with the 2 screws on the interior face plate.





#119( ) *Install the volume control (100Kohm potentiometer):*

Use the flat washer and the hexagonal nut to set the volume control in position. Tighten the nut temporarily.

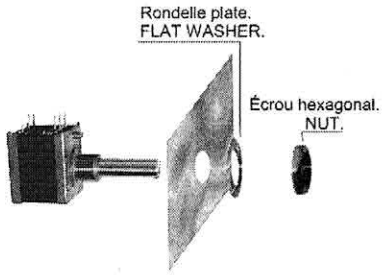



FIGURE 30

#120( ) *Install the sources selector.*

Take the ALPHA selector with the 2cm shaft and adjust it for 4 positions. Install the selector on the metal support provided. Align the small hole with the locking lug of the selector. Set with the lock washer and nut.

DO NOT SET THE SUPPORT TO THE CHASSIS IMMEDIATELY.

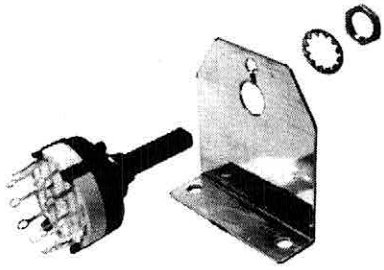


FIGURE 31

## Preparation of wires:

### Single (hookup) wires

Prepare the single coloured wires to required lengths as per table below:

- Cut the coloured wire to the total length.
- Strip each end to 5mm.
- Solder up each tip.

### Coaxial (shielded) wires

#### 1st extremity:

- Remove 2.5cm of the outer insulation at one end only.
- Twist the strands of the shield lead together.
- Cut the inner insulation to a 1.5cm length.
- Strip the inner lead 0.5cm.

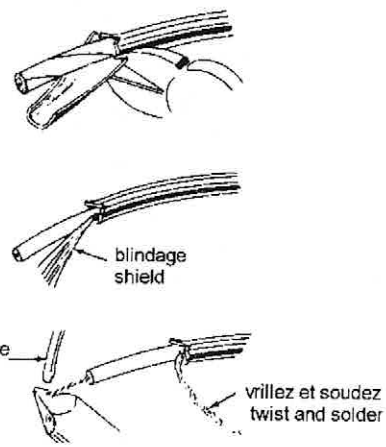



FIGURE 32

#### 2nd extremity:

- Remove 1.5cm of the outer insulation at one end only.
- Cut off the shield that exceeds the insulation.
- Strip the inner insulation 0.5cm.
- Cut 1.5cm of heatshrink tube and install it at the outside end of the coaxial wire. The heatshrink tube must be shrink-heated with the tip of your soldering iron, a match or ideally a heatgun.
- Solder up (apply a small amount of solder to) all extremities.

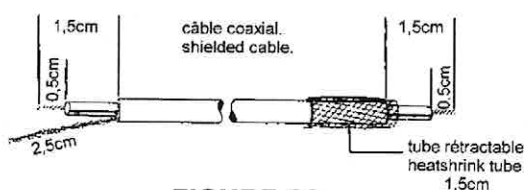



FIGURE 33

### Cable direction:

We now offer shielded wire of «silver» type. However this wire are not directional contrary to old version. Please do not take account of the arrows of directivities like l'illustration 34.

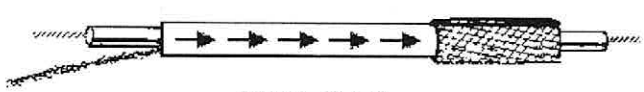
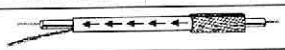
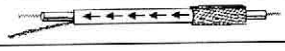


FIGURE 34

The following table gives you the exact lengths of wire to prepare, along with their proper location. Note the position of the 1st extremity of the wire, which differs from the 2nd extremity by the connection of its shield to the grounds. Each wire is identified by a number corresponding to its location according to figure 37a & 37b entitled «**Wire layout guide**» on page 31 & 32..

## Wiring the source selector :

The wires must be soldered to the selector before it is set to the chassis with its support.

| Step | Prepare a wire Type and colour | length | Direction of shielded wire 1st extremity 2nd extremity | Wire assigned as per figure 37 (p.31/32) | Connect | | |
|---|---|---|---|---|---|---|---|
| #121 ( ) | coaxial | 350mm |  | 2 | 2nd extremity | to | selector lug c |
| #122 ( ) | coaxial | 350mm |  | 1 | 2nd extremity | to | selector lug A |
| #123 ( ) | single red | 80mm | | 8 | one end | to | selector lug 7 |
| #124 ( ) | single red | 60mm | | 10 | one end | to | selector lug 8 |
| #125 ( ) | single red | 60mm | | 12 | one end | to | selector lug 9 |
| #126 ( ) | single red | 50mm | | 13 | one end | to | selector lug 10 |
| #127 ( ) | single red | 100mm | | 77 | one end | to | selector lug C with wire #2 |
| #128 ( ) | single blue | 50mm | | 7 | one end | to | selector lug 1 |
| #129 ( ) | single blue | 50mm | | 9 | one end | to | selector lug 2 |
| #130 ( ) | single blue | 50mm | | 11 | one end | to | selector lug 3 |
| #131 ( ) | single blue | 80mm | | 14 | one end | to | selector lug 4 |
| #132 ( ) | single blue | 100mm | | 76 | one end | to | selector lug A with wire #1 |

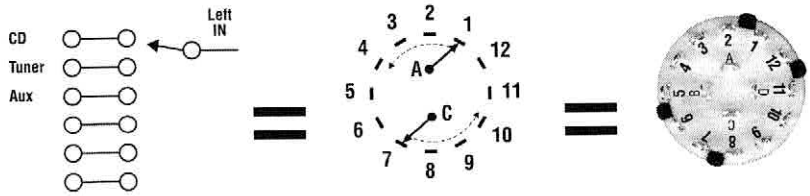



**FIGURE 35**

#133( ) *Install the source selector support in its assigned location, near the RCA input jacks (figure 37).* Use two 3 x 8 K/T screws with 2 flat washers and two M3 nuts. Lock with locking adhesive.

#134( ) *Install the long rod and connect to selector.* Use the sleeve connector to link the long metallic rod to the selector's shaft.

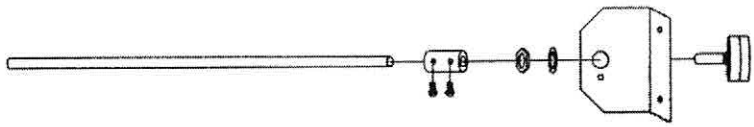


**FIGURE 36**

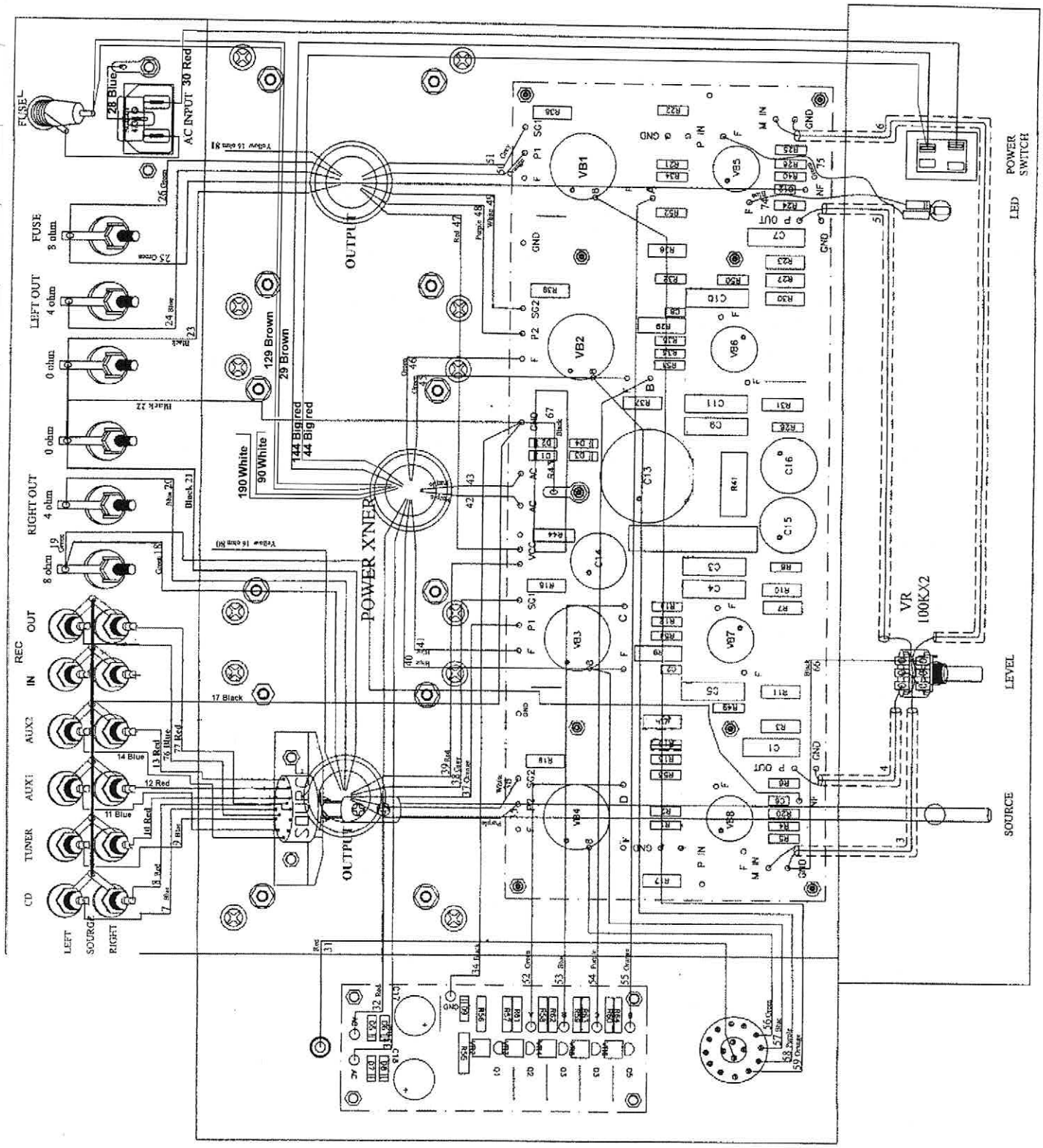



**FIGURE 37a**
*WIRING GUIDE*

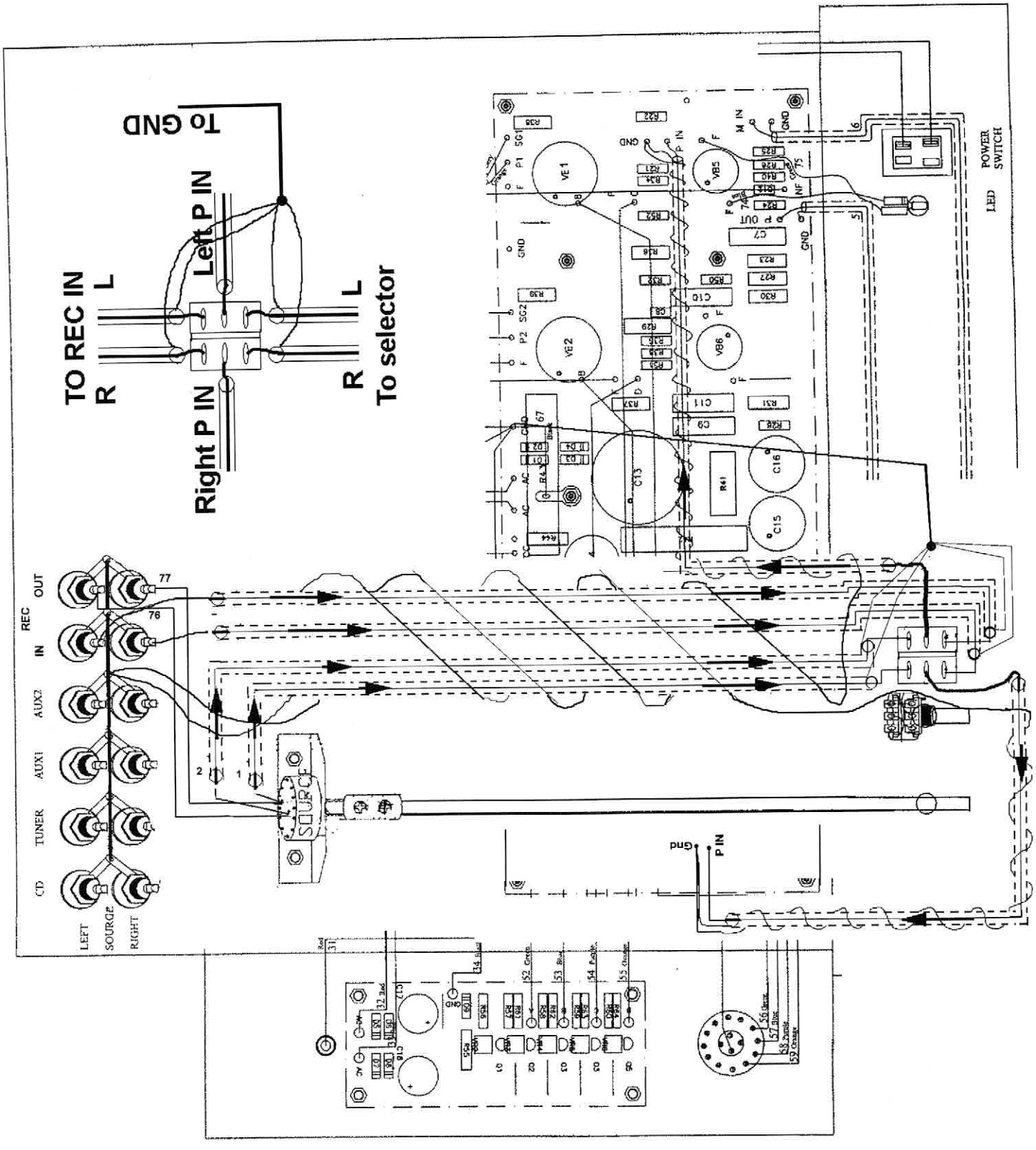



**FIGURE 37b**
*WIRING GUIDE*

## Wiring the selector to the RCA input jacks

| Step | Solder wire Type and colour | Origin of wire | Assigned as per figure 37(p.31/32) | Connect |
|---|---|---|---|---|
| #135 ( ) | single red | selector lug 7 | 8 | RCA jack « CD RIGHT» |
| #136 ( ) | single red | selector lug 8 | 10 | RCA jack «TUNER RIGHT» |
| #137 ( ) | single red | selector lug 9 | 12 | RCA jack « AUX 1 RIGHT» |
| #138 ( ) | single red | selector lug 10 | 13 | RCA jack « AUX 2 RIGHT» |
| #139 ( ) | single bleue | selector lug 1 | 7 | RCA jack « CD LEFT» |
| #140 ( ) | single bleue | selector lug 2 | 9 | RCA jack « TUNER LEFT» |
| #141 ( ) | single bleue | selector lug 3 | 11 | RCA jack « AUX 1 LEFT» |
| #142 ( ) | single bleue | selector lug 4 | 14 | RCA jack « AUX 2 LEFT» |

#143( )
Unassemble the volume control from the front panel temporarily to solder the cables. It will be reassembled at step 149.

(Photo)
Drawing un clear!

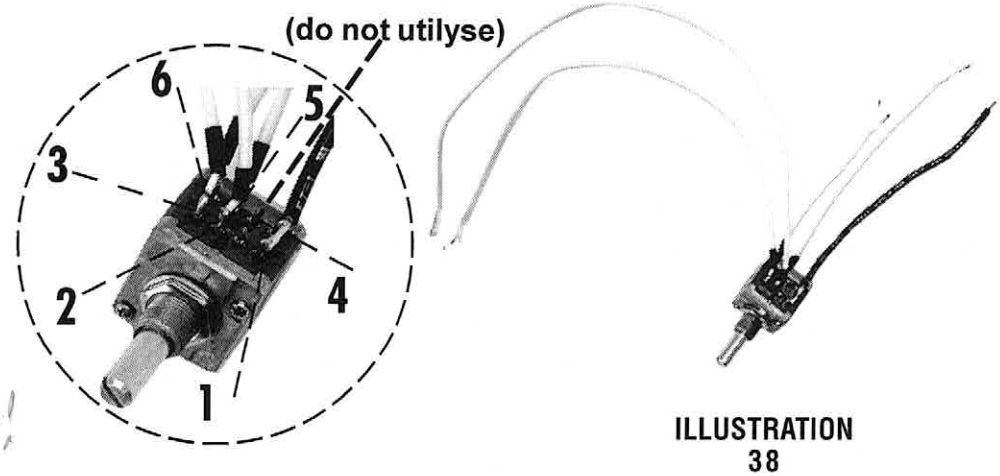



**ILLUSTRATION 38**

## Wiring the volume control

| Step | Prepare a wire Type and colour | length | Direction of shielded wire 1st extremity 2nd extremity | Wire assigned as per figure 37(p.31/32) | Connect | | |
|---|---|---|---|---|---|---|---|
| #144 ( ) | coaxiale | 110mm | | 3 | 2nd extremity | to | volume lug 5 |
| #145 ( ) | coaxiale | 70mm | | 4 | 2nd extremity | to | volume lug 6 |
| #146 ( ) | coaxiale | 240mm | | 5 | 2nd extremity | to | volume lug 3 |
| #147 ( ) | coaxiale | 290mm | | 6 | 2nd extremity | to | volume lug 2 |
| #148 ( ) | single black | 110mm | STRIP ONE END 15mm AND THE OTHER 5mm | 66 | volume lug 1 and 4 | | |

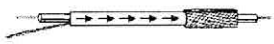
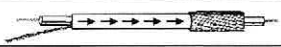
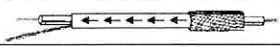
#149( ) *Reinstall volume control on the chassis.* Tighten screw firmly. Make sure cables have no contact between one another nor with the chassis.

## Wiring the volume control (continued)

| Step | Solder wire Type and colour | Origin of wire | Assigned as per figure 37(p.31/32) | Connect |
|---|---|---|---|---|
| #150( ) | single black | volume lugs 1 and 4 | 66 | to GND on the PCB-AMP near VB8 |
| #151( ) | coaxial | volume lug 5 | 3 | the white conductor to «M IN» and the shield to «GND» (with cable #66) on the PCB-AMP near VB8 |
| #152( ) | coaxial | volume lug 6 | 4 | the white conductor to «P OUT» and the shield to «GND» on the PCB-AMP near VB8 |
| #153( ) | coaxial | volume lug 3 | 5 | the white conductor to «P OUT» and the shield to «GND» on the PCB-AMP near VB5 |
| #154( ) | coaxial | volume lug 2 | 6 | the white conductor to «M IN» and the shield to «GND» on the PCB-AMP near VB5 |

#155( ) Prepare black single wire at 170mm of lengths identified #84 on figure 37b. Strip each end 7mm. Solder up (apply a small amount of solder to) each end. Connect one extremity at «GND» on PCB-AMP near R43. Insert a 5mm X 12mm heatshrink tube for installation at step168.

| Step | Solder wire Type and colour | Origin of wire | Assigned as per figure 37(p.31/32) | Connect |
|---|---|---|---|---|
| #156( ) | coaxial | selector lug C | 1 | the white conductor to tape switch. The shield will be soldered later. |
| #157( ) | coaxial | selector lug A | 2 | the white conductor to tape switch. The shield will be soldered later. |
| #158( ) | single red | selector lug C | 77 | RCA jack «REC OUT RIGHT» |
| #159( ) | single blue | selector lug A | 76 | RCA jack «REC OUT LEFT» |

| Step | Prepare a wire Type and colour | length | Direction of shielded wire 1st extremity 2nd extremity | Wire assigned as per figure 37(p.31/32) | Connect | | |
|---|---|---|---|---|---|---|---|
| #160 ( ) | coaxiale | 290mm |  | 86 | 2nd extremity | to | RCA jack «REC IN LEFT» |
| #161 ( ) | coaxiale | 290mm |  | 87 | 2nd extremity | to | RCA jack «REC IN RIGHT» |
| #162 ( ) | coaxiale | 200mm |  | 83 | 2nd extremity | to | tape switch |
| #163 ( ) | coaxiale | 165mm |  | 82 | 2nd extremity | to | tape switch |

| Step | Solder wire Type and colour | Origin of wire as per figure 37(p.31/32) | Assigned | Connect |
|---|---|---|---|---|
| #164( ) | coaxial | tape switch | 82 | the white conductor to PCB-AMP «P IN» The shield to GND between VB8 and VB4. |
| #165( ) | coaxial | tape switch | 83 | the white conductor to PCB-AMP «P IN» The shield to GND between VB5 and VB1. |
| #166( ) | coaxial | RCA jack «REC IN» right | 87 | the white conductor to tape switch. The shield will be soldered later. |
| #167( ) | coaxial | RCA jack «REC IN» left | 86 | the white conductor to tape switch. The shield will be soldered later. |

#168( ) Install a 2mm X 20mm heatshrink on each shield of #1,#2,#86 and #87 wires. Twist 4 ends shield together and solder with black single wire #84. Insulate with heatshrink who have been inserted rather.

## INSTALLING THE REMAINING WIRES

Prepare single wires in specified lengths. Strip each end 7mm. Solder up (apply a small amount of solder) each end. Install a heatshrink tube when specified in table.

| Step colour | Prepare a wire length per figure 37 | | Wire assigned as (p.31/32) | Additional steps from | Connect to | |
|---|---|---|---|---|---|---|
| #169 | black | 580mm | 15 | Turn single black wire around coaxial wires | rigid bare wire from RCA jack | with shield of assigned wire #83 to «GND» on PCB-AMP between VB5 and VB1 |
| #170 | black | 600mm | 16 | Turn single black wire around coaxial wires | rigid bare wire from RCA jack | with shield of assigned wire #82 to «GND» on PCB-AMP between VB8 and VB4 |
| #171 | black | 350mm | 17 | strip one end 5mm on which you will solder the other cables on PCB-AMP | «GND»RCA jack | PCB-AMP «GND» near R43 (let the stripped end protrude) |
| #172 | green | 430mm | 19 | | terminal at h-p RIGHT OUT 8 ohms(red) | PCB-AMP «NF» near VB8 |
| #173 | black | 230mm | 22 | | from centre of bare wire between terminals at h-p negative (black) | PCB-AMP «GND» near R43 (use stripped end of cable #17 to solder grounds) |
| #174 | green | 480mm | 25 | | terminal at h-p PCB-AMP LEFT OUT 8 ohm(red) | PCB-AMP «NF» near VB5 |
| #175 | red | 60mm | 27 | Install a heatshrink tube 8mm X 15mm on each end | fuse holder | AC socket |
| #176 | blue | 60mm | 28 | Install a heatshrink tube 8mm X 15mm on each end | AC socket | GND terminal near AC socket |
| #177 | Install a 0.047MFD 250Vac «surge capacitor» (identified «473K») | | | Install a heatshrink tube 2mmX15mm | AC socket do not solder immediately | AC socket do not solder immediately |
| #178 | red | 490mm | 30 | Install a heatshrink tube 8mm X 15mm on each end | AC socket | power switch |
| #179 | red | 300mm | 31 | | bias selector lug « A » | male DC plug on middle connection |
| #180 | black | 300mm | 34 | | PCB-BIAS « GND » | PCB-AMP « GND » |
| #181 | green | 210mm | 52 | | PCB-BIAS « A » | PCB-AMP « D » |
| #182 | bleue | 260mm | 53 | | PCB-BIAS « B » | PCB-AMP « C » |
| #183 | violet | 370mm | 54 | | PCB-BIAS « C » | PCB-AMP « B » |
| #184 | orange | 400mm | 55 | | PCB-BIAS « D » | PCB-AMP « A » |
| #185 | green | 270mm | 56 | | bias selector lug 5 | PCB-AMP VB4 lug 8 (solder directly on lug) |
| #186 | blue | 350mm | 57 | | bias selector lug 4 | PCB-AMP VB3 lug 8 (solder directly on lug) |
| #187 | violet | 450mm | 58 | | bias selector lug3 | PCB-AMP VB2 lug8 (solder directlyon lug) |
| #188 | orange | 520mm | 59 | | bias selector lug 2 | PCB-AMP VB1lug 8 (solder directly on lug) |
| #189 | black | 60mm | 67 | | PCB-AMP on terminal lug | PCB-AMP « GND » |

#190 (✓) *Install emitting diode (LED):*

Insert diode into hole just beside the switch.
Solder blue wire No 74 to « F» rivet near VB5.
Solder green wire No 75 to« F» rivet near VB5.
Set diode with some silicon type glue.

#191 (✓) *Insert the 3 snap-in bushings*
into the three 30mm holes through which the transformer wires will run.

#192 (✓) *Set the power transformer (the largest of the three).*

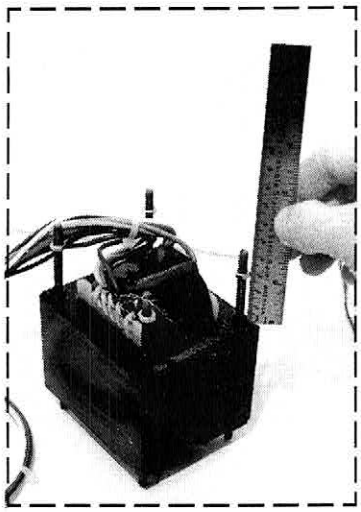
Run all wires through their holes. Use the four 5 x 10 TM screws and put a flat washer M5 on either side. Use M5 nuts and tighten reasonably. The transformer will be firmly secured later.

Twist pairs before running through hole.
as per next page

#193 (✓) *Set the two audio transformers.*

On rod screws of each transformer, adjust nuts for a space of 30mm between face body of transformer and nut s(See figure).

Put a flat washer M5 on each rod screws and run all wires through their holes. Use the four M5 nuts with M5 flat washer. **Tighten reasonably at the moment. The transformers will be firmly secured later.**



**Do not install the covers on the transformers immediately.**

## Cabling the transformers

| Step | Prepare a wire colour | length | Wire assigned as per figure 37 (p.31/32) | Additional steps | Connect from | to |
|---|---|---|---|---|---|---|
| #194 ( ) | green | 200mm | 18 | | secondary audio transformer 8ohm connection | h-p terminal « RIGHT » 8ohm |
| #195 ( ) | blue | 180mm | 20 | | secondary audio transformer 8ohm connection | h-p terminal « RIGHT » 4ohm |
| #196 ( ) | black | 200mm | 21 | | secondary audio transformer 0ohm connection | h-p terminal « RIGHT » 0ohm |
| #197 ( ) | black | 200mm | 23 | | secondary audio transformer 0ohm connection | h-p terminal « LEFT » 0ohm |
| #198 ( ) | blue | 180mm | 24 | | secondary audio transformer 4ohm connection | h-p terminal « LEFT » 4ohm |
| #199 ( ) | green | 200mm | 26 | | secondary audio transformer 8ohm connection | h-p terminal « LEFT » 8ohm |
| #200 ( ) | yellow | 200mm | 80 | Cut cable to 200mm. Do not strip. Fold up and insulate with a piece of heatshrink tube. | secondary audio transformer 16ohm connection but insulated for future use with a 16ohm impedance speaker. | |
| #201 ( ) | yellow | 200mm | 81 | Cut cable to 200mm. Do not strip. Fold up and insulate with a piece of heatshrink tube. (figure 39). | secondary audio transformer 16 ohm connection but insulated for future use with a 16ohm impedance speaker. | |
| #202 ( ) | violet | 120mm | 35 | | primary audio transformer «plate 2» connection | PCB-AMP at « P2 » near VB4 |
| #203 ( ) | white | 130mm | 36 | | primary audio transformer «screen grid 2» connection | PCB-AMP at« SG2 » near VB4 |
| #204 ( ) | orange | 170mm | 37 | | primary audio transformer «plate 1» connection | PCB-AMP à « P1 » near VB3 |
| #205 ( ) | grey | 150mm | 38 | | primary audio transformer «screen grid 1» connection | PCB-AMP à « SG1 » near VB3 |
| #206 ( ) | red | 180mm | 39 | | primary audio transformer «B+» connection | PCB-AMP at « Vcc » |
| #207 ( ) | blue pair | 200mm et 150mm | 40 41 | twist the blue wires together, 3 turns/2.5cm | secondary power transformer filament connection | PCB-AMP « F »andt « F » near VB3 |
| #208 ( ) | red pair, 280mm each | (*small) | 32 33 | twist both red wires together, ( 3 turns/2.5cm). ***smallest pair of red wires** | secondary power transformer 70Vac connection | PCB-BIAS at rivet « AC » |
| #209 ( ) | violet pair | 90mm et 90mm | 42 43 | twist both violet wires together, (3turns/2.5cm). | secondary, power transformer 320Vac connection | PCB-AMP « AC » and « AC » |
| #210 ( ) | green pair | 160mm et 120mm | 45 46 | twist both green wires together, (3turns/2.5cm). | secondary power transformer filament connection | PCB-AMP « F » and « F » near VB2 |

**FIGURE 39**

| Step | Prepare a wire colour | length | Wire assigned as per figure 37 (p.31/32) | Additional steps | Connect from | to |
|---|---|---|---|---|---|---|
| #211 ( ) | «BIG» red | 210mm | 44&144 | twist both red wires together, the 144 with 44. Run them along the power transformer 0 Vac connection edge of the case. Install a heatshrink tube 8mm X 15mm on power switch lug. | primary | power switch |
| #212 ( ) | Brown | 210mm | 29&129 | Twist both brown wires together, the 29 with 129. Install a heatshrink tube power transformer 120 Vac connection of 8mm X 15mm on fuse holder lug. | primary | fuse holder |
| #213 ( ) | White | 210mm | 90&190 | Cut two wires at 210mm, Do not strip. Fold up and insulate each wire with a piece of heatshrink. | primary power transformer 115 Vac connection | |
| #214 ( ) | red | 240mm | 47 | | primary audio transformer «B+» connection | PCB-AMP at « Vcc » |
| #215 ( ) | violet | 160mm | 48 | | primary audio transformer «plate 2» connection | PCB-AMP at « P2 » near VB2 |
| #216 ( ) | white | 150mm | 49 | | primary audio transformer «screen grid 2» connection | PCB-AMP at «SG2» near VB2 |
| #217 ( ) | orange | 120mm | 50 | | primary audio transformer «plate 1» connection | PCB-AMP at «P1» near VB1 |
| #218 ( ) | grey | 120mm | 51 | | primary audio transformer «screen grid 1» connection | PCB-AMP at «SG1» near VB1 |

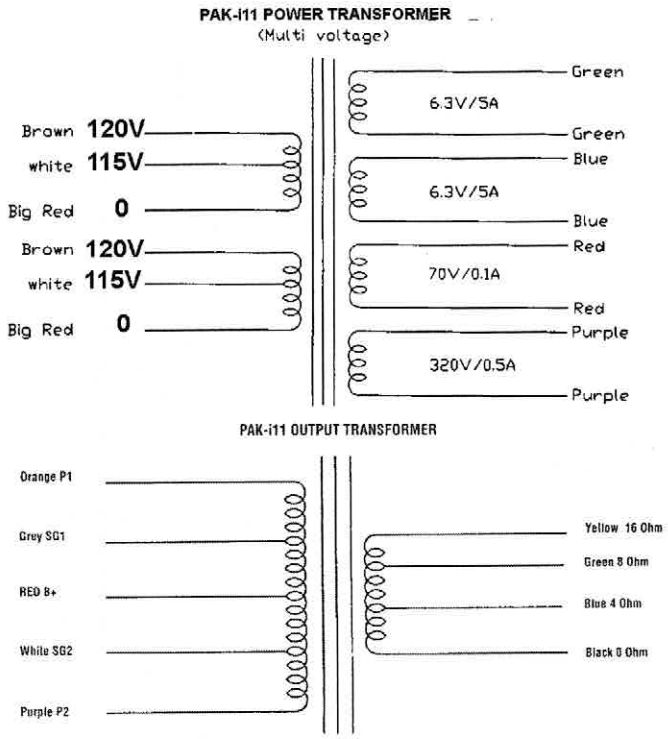



**FIGURE 40**

#219 ( ) *Bunch up the wires following figure 41.* Tie them together with tie-wraps.

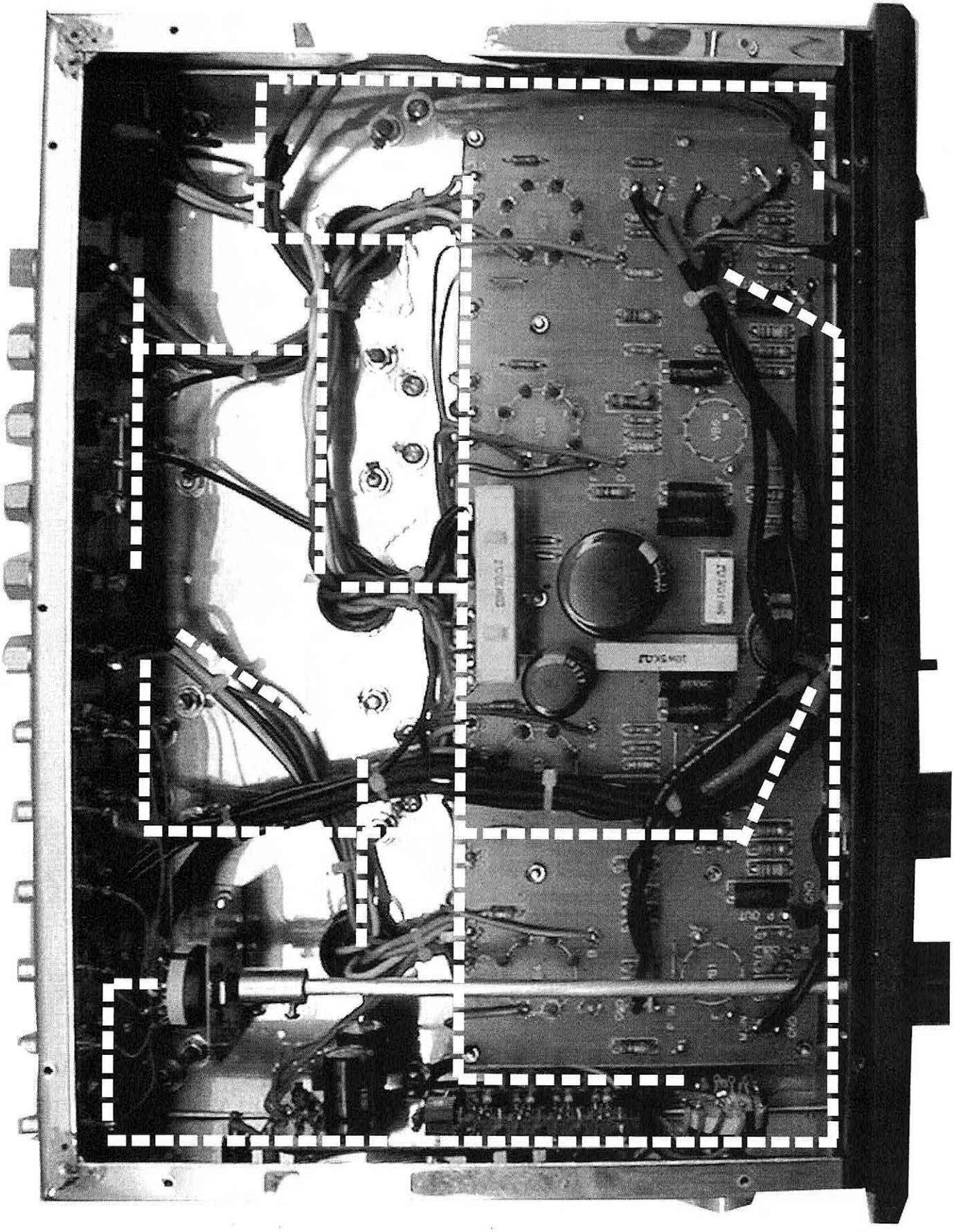


**FIGURE 41**
**Running the wires**

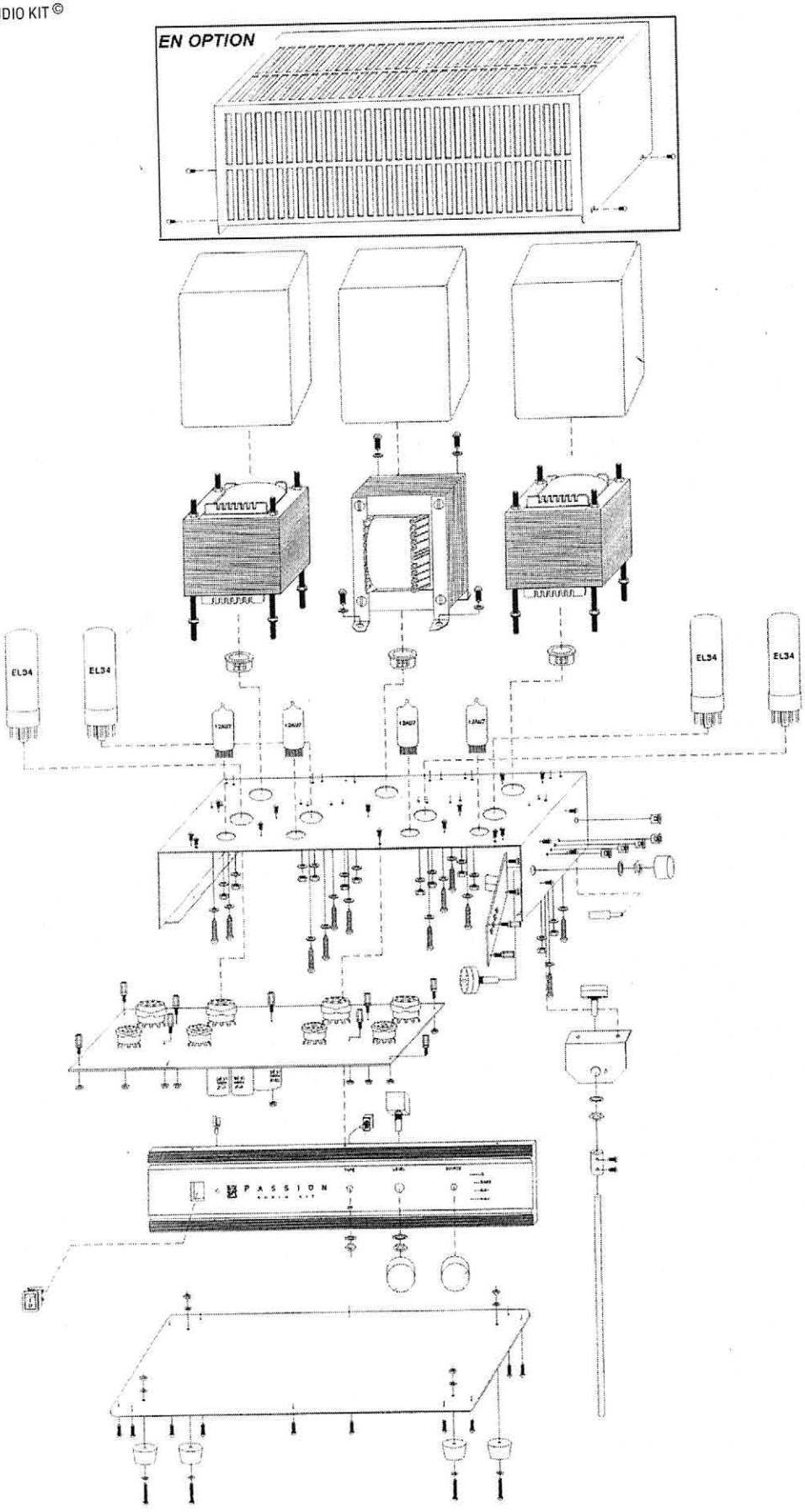
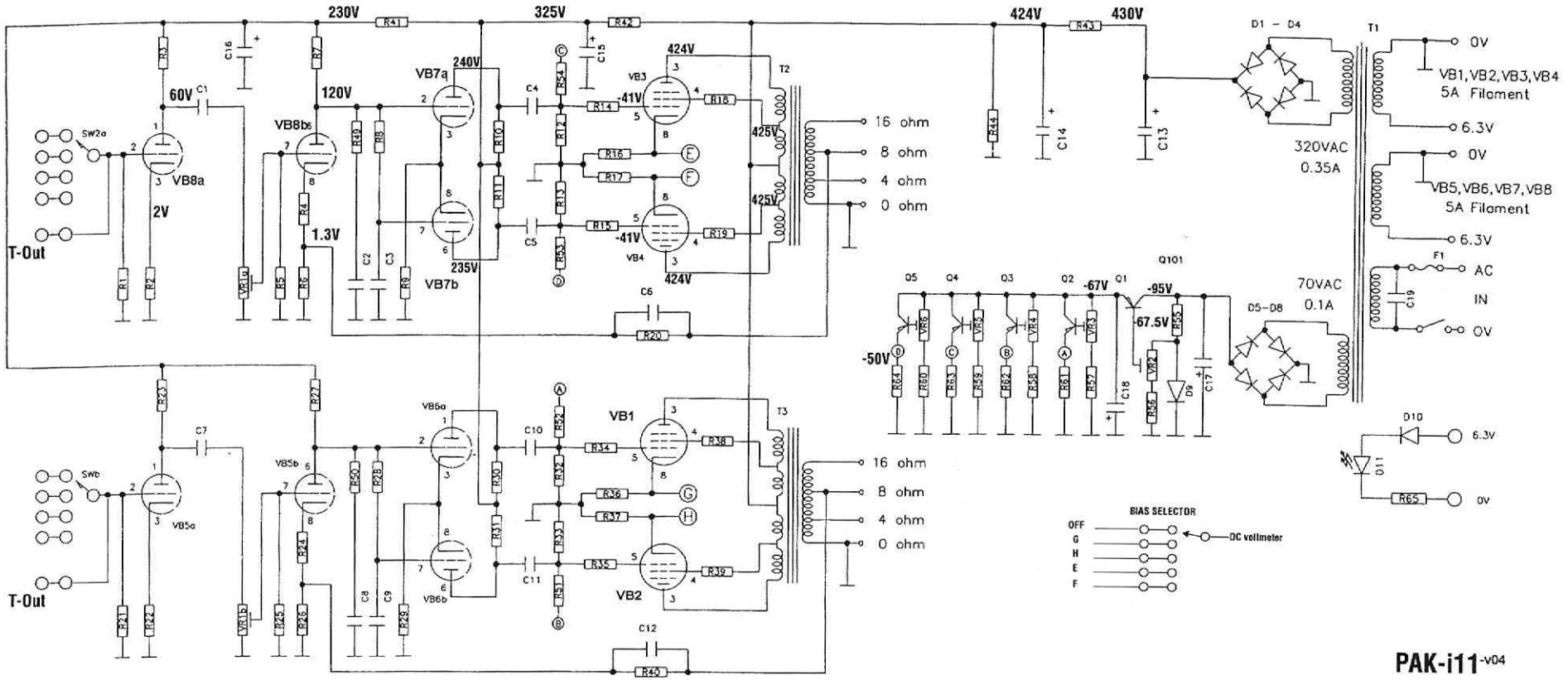



FIGURE42
**Exploded view of the parts**




**PAK-i11**-v04

| | |
|---|---|
| R1,21 | 100K 1/2W |
| R2,22 | 1.2K 1/2W |
| R3,23 | 100K 1W |
| R4,14,15,24,34,35 | 1K 1/2W |
| R5,12,13,25,32,33 | 470K 1/2W |
| R6,26 | 470 1/2W |
| R7,10,11,27,30,31 | 3.3K 1W |
| R8,28 | 1M 1/2W |
| R9,29 | 24K 2W |
| R16,17,36,37 | 10 1W |
| R18,19,38,39 | 100 1/2W |
| R20,40 | 3.3K 1/2W |

| | |
|---|---|
| R41 | 10K 5W |
| R42 | 5K .10W |
| R43 | 33 20W |
| R44 | 220K 2W |
| R49,50 | 10K 1/2W |
| R51-54 | 100K 1/2W |
| R55 | 2.2K 1/2W |
| R56 | 47K 1/2W |
| R57-60 | 20K 1/2W |
| R61-64 | 100K 1/2W |
| R65 | 220 1/2W |

| | |
|---|---|
| C1,4,5,7,10,11 | 0.22UF400V |
| C2,6,8,12 | 100PF50V |
| C3,9 | 0.47UF400V |
| C13 | 220UF450V |
| C14.15,16 | 47UF450V |
| C17,18 | 100UF160V |
| C19 | 0.047UF250VAC |
| D1-4 | IN4007 |
| D5-8,10 | IN4004 |
| D9 **Zener** | **75V** |
| D11 | LED |

| | |
|---|---|
| VR1 | 100KX2 |
| VR2-6 | 20K |
| Q1-5 | 2N5401 |
| VB1,2,5,6 | 12AU7 |
| VB3,4,7,8 | EL34 |
| SW2 | 3P4T |
| FUSE | 3A |

**Installing transformer covers**

#220 ( ) *Temporarily unassemble the PCB-BIAS* by removing the 4 screws accessible from outside the chassis. It will be reinstalled at step 212.

#221 ( ) *To set the cover to its location:* x 4

- take care to position the transformer wires so as they won't interfere with the cover alignment;
- check the alignment of the cover's 4 fixation holes; you may have to re-align the transformer;
- tighten the 4 transformer screws strongly now;
- use four 5 x 12 B/M metal screws and four flat M5 rings for each cover;
- repeat for each transformer.

#222 ( ) *Re-install the PCB-BIAS with its 4 screws.*

#223 ( ) *With locking adhesive, lock the 12 screws and the 12 nuts* used to set the transformers and covers.

#224 ( ) *Install the 4 rubber feet on the chassis cover.* Use four 3 x 18 T/M screws and eight M3 flat rings, and four M3 nuts. See figure 42 (detail of parts).

#225 ( ) *Install the 28mm button on the shaft of the sources selector.*

#226 ( ) *Install the 28mm button on the shaft of the volume control.*

#227 ( ) *Install the 22mm button on the bias selector shaft.*

**The assembly is now completed. Congratulation.**

# Checking and powering:

**1** Do not install the tubes immediately. The power circuit will be checked first.

**2** Make sure the fuse is well inserted into its holder. It must be european type (2cm x 0.5cm), 3amps 250Volt and type F (fast).

**3** Install the amplifier on the work table which must be covered with a piece of carpet or a towel to protect the finish of your equipment. Rest the unit on its side (opposite to the bias selector). Remove cover completely. Do not plug the power cord to the outlet immediately.

**4** Carefully examine the inside of the chassis for solder or metal wire residues, in order to prevent a short-circuit. Be particularly alert near the AC jack, the fuse holder and the switch. Examine the printed circuit for the same reasons.

**5** Test with an ohmmeter:

Apply the *negative* (black) *probe* and the *positive* (red) *probe* to the specified locations :

**a)** *Negative probe* : metallic case , on the ground terminal located on the screw near the AC socket.
*Positive probe* : on the PCB-AMP at GND near R43 (33ohm 20W).

Expected reading: 0 ohm.**(as when the two probesare short-circuited with each other).**
*Reading incorrect :*
*Put the positive probe directly on the terminal grounds located at the center of the « PCB-AMP» and the negative probe on the terminal grounds which is located on the screw of the AC receptacle . The reading must be of 0 ohm.*

*Apply the positive probe on the anode of D1 or D2, near R43 on the PCB-AMP and the negative probe on the terminal grounds located on the screw of the AC receptacle. The reading must be 0 ohm. If the reading is incorrect, the GND rivet near R43 is not making good contact with the printed circuit.*

**b)** *Negative probe :* on the bare wire between the output black binding posts, identified «0 ohm».
*Positive probe :* on the PCB-AMP at GND near R43 (33ohm 20W).

Expected reading : 0 ohm.
*Reading incorrect :*
*Check the solder of the GND rivet near R43 on PCB-AMP.*

**c)** *Negative probe :* on the bare wire between the output black binding posts, identified «0 ohm».
*Positive probe :* on the PCB-AMP at GND near R5.

Expected reading : 0ohm.
*Reading incorrect :*
*Check the contact of the two GND rivets near C1 and GND near R5 on PCB-AMP.*

**d)** *Negative probe* : on the bare wire between the output black binding posts, identified «0 ohm».
*Positive probe* : on the PCB-AMP at GND near R25.

Expected reading : 0ohm.
*Reading incorrect :*
*Check the contact of the three GND rivets near C7, R25 and R22 on the PCB-AMP.*

**e)** *Negative probe* : on the bare wire between the output black binding posts, identified «0 ohm».
*Positive probe* : on the PCB-BIAS at GND near R59.

Expected reading : 0ohm.
*Reading incorrect :*
*Check the contact of the GND rivet near R59 on PCB-BIAS.*

**f)** *Negative probe :* at PCB-AMP on pin 5 of VB3.
*Positive probe :* at PCB-AMP on "C" rivet.

✓ Expected reading : between 86 and 100Kohms. 86.4
*Reading incorrect :*
*Check the contact between pin 5 of VB3 tube and PCB foil or the contact between "C" rivet and the foil of the PCB.*

**g)** *Negative probe :* at PCB-AMP on pin 5 of VB4.
*Positive probe :* at PCB-AMP on "D" rivet.

✓ Expected reading : between 86 and 100Kohms. 86.3
*Reading incorrect : check the contact between pin 5 of VB4 tube and PCB foil or the contact between "D" rivet and the foil of the PCB.*

**h)** *Negative probe :* at PCB-AMP on pin 5 of VB1.
*Positive probe :* at PCB-AMP on «A» rivet.

✓ Expected reading : between 86 and 100Kohms. 86.0
*Reading incorrect : check the contact between pin 5 of VB1 tube and PCB foil or the contact between «A» rivet and the foil of the PCB.*

**i)** *Negative probe :* at PCB-AMP on pin 5 of VB2.
*Positive probe :* at PCB-AMP on «B» rivet.

✓ Expected reading : between 86 and 100Kohms. 85.9
*Reading incorrect : check the contact between pin 5 of VB6 tube and PCB foil or the contact between «B» rivet and the foil of the PCB.*

**j)** *Positive probe :* at PCB-AMP on pin 8 of VB3.
*Negative probe :* on the bare wire between the speaker binding posts (black).

✓ Expected reading : 10ohms. 10.1
*Reading incorrect : check the contact between pin 8 of VB3 tube and PCB foil or check the value of R16 resistor and the solderings at its terminals.*

**k)** *Positive probe :* at PCB-AMP on pin 8 of VB4.
*Negative probe :* on the bare wire between the speaker binding posts (black).

✓ Expected reading : 10ohms. 10.2
*Reading incorrect : check the contact between pin 8 of VB4 tube and PCB foil or check the value of R17 resistor and the solderings at its terminals.*

**l)** *Positive probe :* at PCB-AMP on pin 8 of VB1.
*Negative probe :* on the bare wire between the speaker binding posts (black).

✓ Expected reading : 10ohms. 10.2
*Reading incorrect : check the contact between pin 8 of VB1 tube and PCB foil or check the value of R36 resistor and the solderings at its terminals.*

**m)** *Positive probe :* at PCB-AMP on pin 8 of VB2.
*Negative probe :* on the bare wire between the speaker binding posts (black).

✓ Expected reading : 10ohms. 10.2
*Reading incorrect : check the contact between pin 8 of VB2 tube and PCB foil or check the value of R37 resistor and the solderings at its terminals.*

**6** Voltage check: (always with no tube)

**a)** Set the volume control in the OFF position, that is fully counterclockwise.

**b)** Do not connect the speakers immediately.

**c)** Plug the power cord and flick the switch to the ON position.

**Be alert : if a smell of burning or smoke comes from a component, put the switch to OFF and disconnect the power cord. Have the circuits checked by a competent technician.**

**d)** Select the voltmeter in DC mode on a 500Volt scale or greater.

**e)** Connect the negative probe of the voltmeter to the body, that is the bare wire connecting the black speaker binding posts.

**f)** Connect the positive probe of the voltmeter to point Vcc on the PCB-AMP near R43 (33ohm 20W). Expected reading: about +455Volt DC. 445V

**g)** Connect the positive probe to point V (on the anode of D5 diode on the PCB-BIAS). ANALOG VOLTMETER: invert the probes.
Expected reading: about -91Volt DC. -93.6

**h)** Select the voltmeter in AC mode on a scale of 10Volt or more.

**i)** Check the voltage input on the filaments of the warming tubes.
Connect the probes to point F and F on the PCB-AMP near VB3.
Expected reading: about 6.7Volt AC. 6.7 Vac

**j)** Connect the probes to point F and F on the PCB-AMP near VB2.
Expected reading: about 6.7Volt AC. 6.7 Vac

**7** Verify and pre-adjust bias trim pot :

**a)** Adjust the voltmeter on a 100Volt DC scale or more.

**b)** Connect the negative probe of the digital voltmeter (positive probe for an analog voltmeter) on the bare wire connecting the black speaker binding posts,hat is identified «0 ohm».

**c)** Find the 4 variable bias adjustment resistors located on the side of the cabinet. Turn the 4 variable resistors fully clockwise.

**d)** Connect the digital voltmeter's positive probe (negative probe for an analog voltmeter) on one or the other following points on the PCB-AMP: «A orange» «B violet»«C blue«, or« D green» (wires from the PCB-BIAS).

**e)** Adjust VR2 on the PCB-BIAS to obtain -58Volt.

**f)** Set the switch to OFF and disconnect the power cord.

**g)** Install the cover with all its screws.

**h)** Install the tubes as specified in the User's Manual and proceed with the the bias adjustment of the tubes.