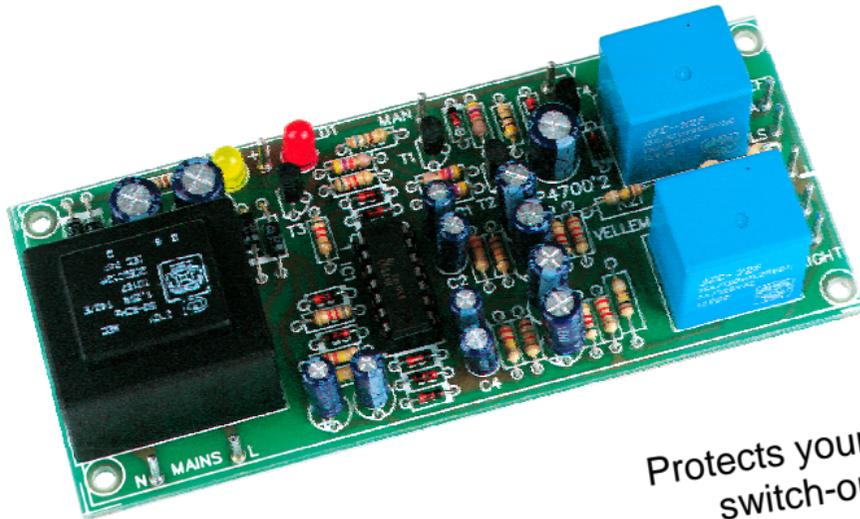


## SPEAKER PROTECTION KIT



# K4700

Protects your precious speakers against  
switch-on clicks and DC current.



## Features

This stereo loudspeaker protection will protect the loudspeakers against the switch-impulsions and the direct current component on the output of the connected amplifier.

- Suitable for:
- \* Amplifiers with symmetrical power supply
  - \* Amplifiers with asymmetrical power supply.

## Specifications :

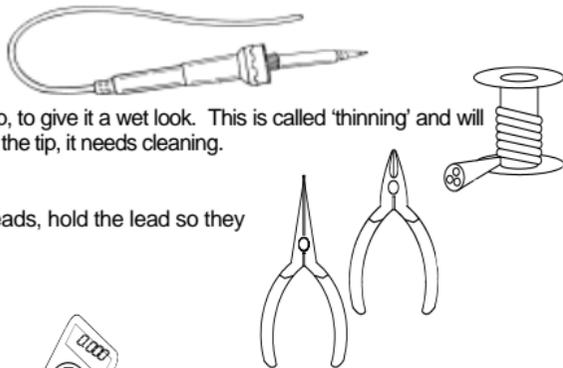
- Switch-delay:  $\pm 6$  seconds
- DC protection: +1V/-1V
- Max. input voltage: 200Vpp + DC
- Max. switching current: 10A
- LED indication for: WAIT (switch-on delay) and ERROR (DC on speaker output)
- Supply voltage: 220VAC
- PCB dimensions: 55 x 125mm (2.2" x 4.9")

### 1. Assembly (Skipping this can lead to troubles !)

Ok, so we have your attention. These hints will help you to make this project successful. Read them carefully.

#### 1.1 Make sure you have the right tools:

- A good quality soldering iron (25-40W) with a small tip.
- Wipe it often on a wet sponge or cloth, to keep it clean; then apply solder to the tip, to give it a wet look. This is called 'thinning' and will protect the tip, and enables you to make good connections. When solder rolls off the tip, it needs cleaning.
- Thin rosin-core solder. Do not use any flux or grease.
- A diagonal cutter to trim excess wires. To avoid injury when cutting excess leads, hold the lead so they cannot fly towards the eyes.
- Needle nose pliers, for bending leads, or to hold components in place.
- Small blade and Phillips screwdrivers. A basic range is fine.



**For some projects, a basic multi-meter is required, or might be handy**

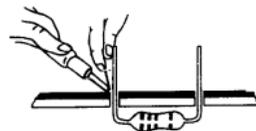


#### 1.2 Assembly Hints :

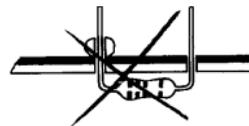
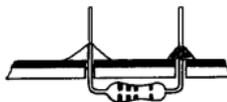
- ⇒ Make sure the skill level matches your experience, to avoid disappointments.
  - ⇒ Follow the instructions carefully. Read and understand the entire step before you perform each operation.
  - ⇒ Perform the assembly in the correct order as stated in this manual
  - ⇒ Position all parts on the PCB (Printed Circuit Board) as shown on the drawings.
  - ⇒ Values on the circuit diagram are subject to changes.
  - ⇒ Values in this assembly guide are correct\*
  - ⇒ Use the check-boxes to mark your progress.
  - ⇒ Please read the included information on safety and customer service
- \* Typographical inaccuracies excluded. Always look for possible last minute manual updates, indicated as 'NOTE' on a separate leaflet.

### 1.3 Soldering Hints :

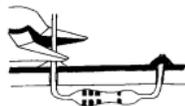
1- Mount the component against the PCB surface and carefully solder the leads



2- Make sure the solder joints are cone-shaped and shiny

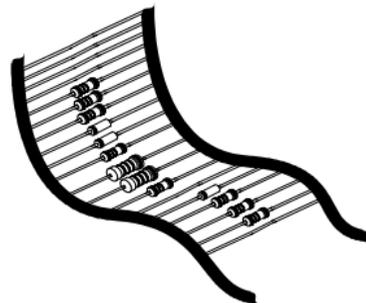


3- Trim excess leads as close as possible to the solder joint



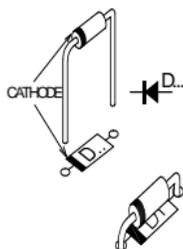
**AXIAL COMPONENTS ARE TAPED IN THE CORRECT MOUNTING SEQUENCE !**

**REMOVE THEM FROM THE TAPE ONE AT A TIME !**



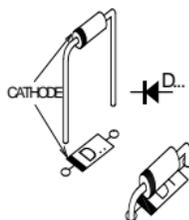
### 1. Diodes. Watch the polarity !

- D1 : 1N4148
- D2 : 1N4148
- D3 : 1N4148
- D4 : 1N4148
- D5 : 1N4148
- D6 : 1N4148
- D7 : 1N4148
- D8 : 1N4148
- D9 : 1N4148
- D10 : 1N4148



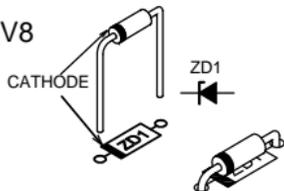
### 3. Diodes. Watch the polarity !

- D11 : 1N4007
- D12 : 1N4007
- D13 : 1N4007
- D14 : 1N4007

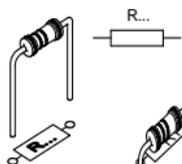


### 2. Zenerdiode. Watch the polarity !

- ZD1 : 6V8



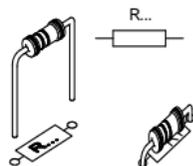
### 4. Resistor



- R1 : 3K3 (3 - 3 - 2 - B)
- R2 : 3K3 (3 - 3 - 2 - B)
- R3 : 8K2 (8 - 2 - 2 - B)
- R4 : 8K2 (8 - 2 - 2 - B)
- R5 : 8K2 (8 - 2 - 2 - B)
- R6 : 8K2 (8 - 2 - 2 - B)
- R7 : 8K2 (8 - 2 - 2 - B)

- R8 : 330K (3 - 3 - 4 - B)
- R9 : 330K (3 - 3 - 4 - B)
- R10 : 330K (3 - 3 - 4 - B)
- R11 : 330K (3 - 3 - 4 - B)
- R12 : 18K (1 - 8 - 3 - B)
- R13 : 18K (1 - 8 - 3 - B)
- R14 : 47K (4 - 7 - 3 - B)
- R15 : 47K (4 - 7 - 3 - B)
- R16 : 47K (4 - 7 - 3 - B)
- R17 : 47K (4 - 7 - 3 - B)
- R18 : 47 (4 - 7 - 0 - B)
- R19 : 680 (6 - 8 - 1 - B)
- R20 : 680 (6 - 8 - 1 - B)

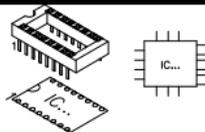
### 5. Metal film resistor



- R21 : 100K (1 - 0 - 4 - B - 9)
- R22 : 100K (1 - 0 - 4 - B - 9)

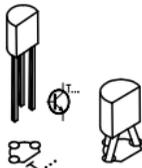
### 6. IC socket, Watch the position of the notch !

- IC1 : 14P



### 7. Transistors

- T1 : BC547B
- T2 : BC547B
- T3 : BC547B
- T4 : BC517



### 8. PCB tabs.

- MAINS (N - L)
- +V
- MAN
- V
- GND

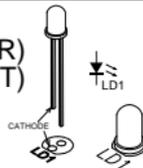


- PA } LEFT
- LS }
- PA } RIGHT
- LS }



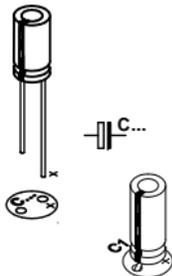
### 9. Leds. Watch the polarity!

- LD1 : Red (ERROR)
- LD2 : Yellow (WAIT)

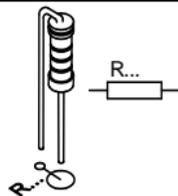


### 10. Electrolytic Capacitor. Watch the polarity !

- C1 : 1µF
- C2 : 1µF
- C3 : 1µF
- C4 : 1µF
- C5 : 1µF
- C6 : 1µF
- C7 : 100µF
- C8 : 100µF
- C9 : 100µF
- C10 : 100µF
- C11 : 220µF
- C12 : 470µF
- C13 : 470µF



### 11. 1W vertical resistors

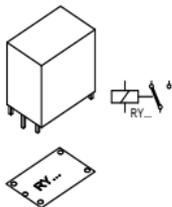


If the amplifier to which the module is to be connected has a simple power supply (asymmetrical supply), i.e. an amplifier with output-elcos, the following resistances has to be mounted:

- R23 : 1K2 (1 - 2 - 2 - B)
- R24 : 1K2 (1 - 2 - 2 - B)
- R25 : 1K2 (1 - 2 - 2 - B)
- R26 : 1K2 (1 - 2 - 2 - B)

**ATTENTION:** if the involved amplifier has a symmetrical power supply, those resistances may NOT be mounted!

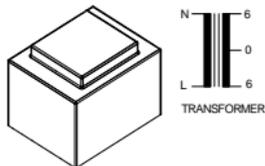
## 12. Relays



- RY1 : VR15M121C (12VDC - 15A - 1C)
- RY2 : VR15M121C (12VDC - 15A - 1C)

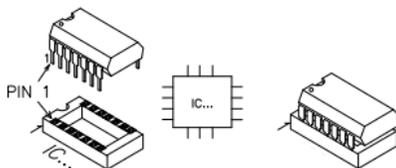
 **Cover the wide connecting broad leads with solder.**

## 13. Transformer



- Transfo (1,2VA - 2 x 6V / 2 x 0,1A)

## 14. IC. Watch the position of the notch!



- IC1 : LM324

 **CHECK THE ENTIRE MODULE PROFOUNDLY ONCE AGAIN.**

 **CHECK IF ALL SOLDERINGS ARE CORRECT AND THAT THERE ARE NO SHORT-CIRCUITS!**

## 15. Testing

Connect a net-cord to the MAINS, connect the module to the net and check if after approx. +/-6 sec. the yellow LED 'WAIT' extinguishes; at the very same moment the LED is extinguishing, one should hear the clack of the relais switching.

### Testing the Left channel :

- Connect the point PA of the left channel to the point -V (figure 1.0); the red LED 'ERROR' should now be lightening together with the yellow LED 'WAIT'.
- When the connection is interrupted again (figure 2.0), the red LED should extinguish and after approx. +/- 6 sec. the yellow LED as well.

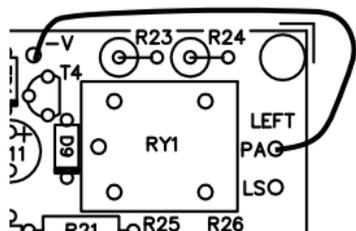


Fig. 1.0

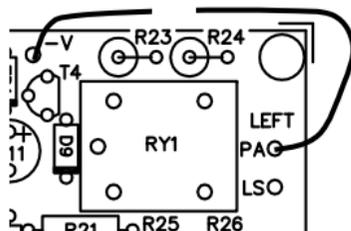


Fig. 2.0

Repeat this testing procedure by connecting the point PA to the point +V.

**Testing the right channel :**

- ❑ Connect the point PA of the right channel to the point -V (figure 3.0); the red LED 'ERROR' should now be lightening together with the yellow LED 'WAIT'.
- ❑ When the connection is interrupted again (figure 4.0), the red LED should extinguish and after approx. +/- 6 sec. the yellow LED as well.

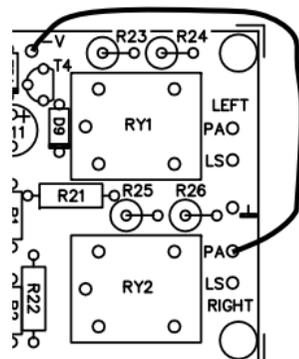


Fig. 3.0

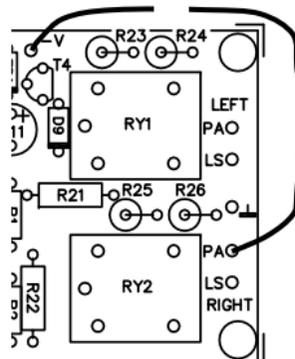


Fig. 4.0

Repeat this testing procedure by connecting the point PA to the point +V.



**The module is now ready for being connected definitively to the amplifier.**

## 16. Connection

First find a proper place to install the protection module (f.i. against the back-side of the housing).

### **Realise the following connections:**

**MAINS:** this connection has to be linked to the NET-connection of the transformer in the amplifier, i.e. AFTER the net-switch!

**PA:** connect this point to the speaker-output of the amplifier, respectively for the left and the right signal (fig 5.0). In case a bridge-amplifier (fig 6.0) is being used, there ought to be two "hot" connections here.

**MASS:** this point has to be connected to the mass of the amplifier.

**LS:** to this point the left resp. right loud speaker is to be connected.

### **To disconnect the loudspeakers manually, realise the following connections:**

Install a switch between the points -V and MAN; when the switch is shut the speakers will be disconnected permanently, when opening the switch again after approx. +/-6 sec the speakers will be reconnected as well.

**REMARK.** In case of amplifiers with asymmetrical power supply (i.e. having output-elcos and the resistances R23 to R26) of more than 300W/4 Ohm or 150W/8 Ohm, it is not recommandable to disconnect the speakers at full power during a longer period, because the just mentioned resistances could burn. In case the protection module is being used on a bridge-amplifier with asymmetrical power supply, the diodes D7 and D8 should not be mounted; in this case the DC-protection should not be functioning anymore because the voltage-reference of the protection-module is now opposed to the mass.

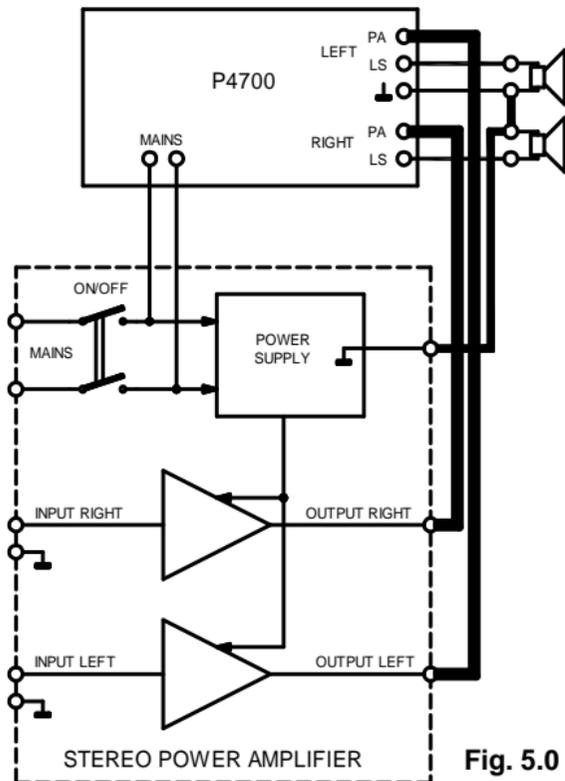


Fig. 5.0

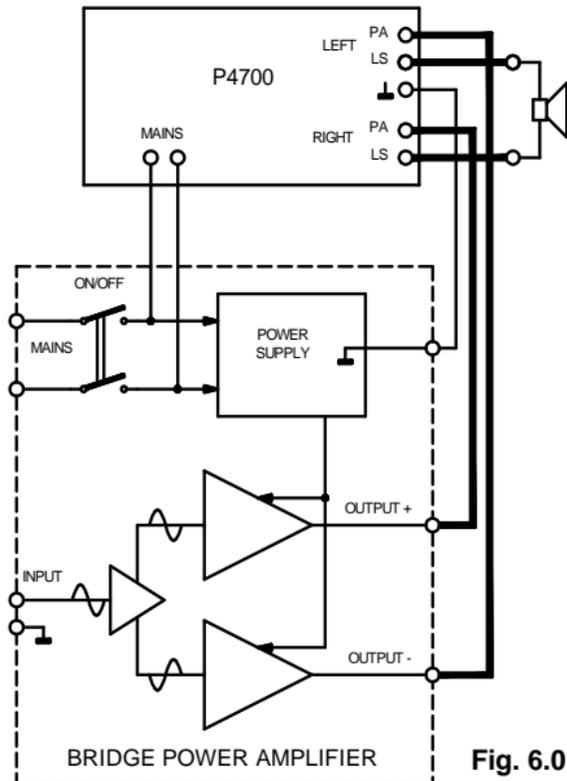
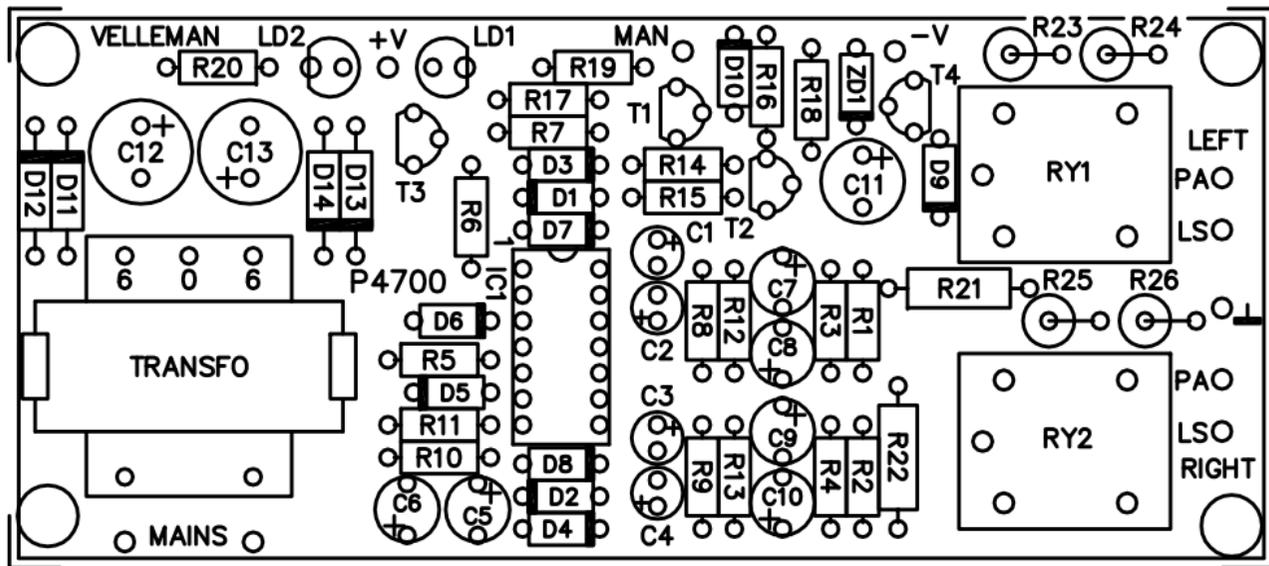
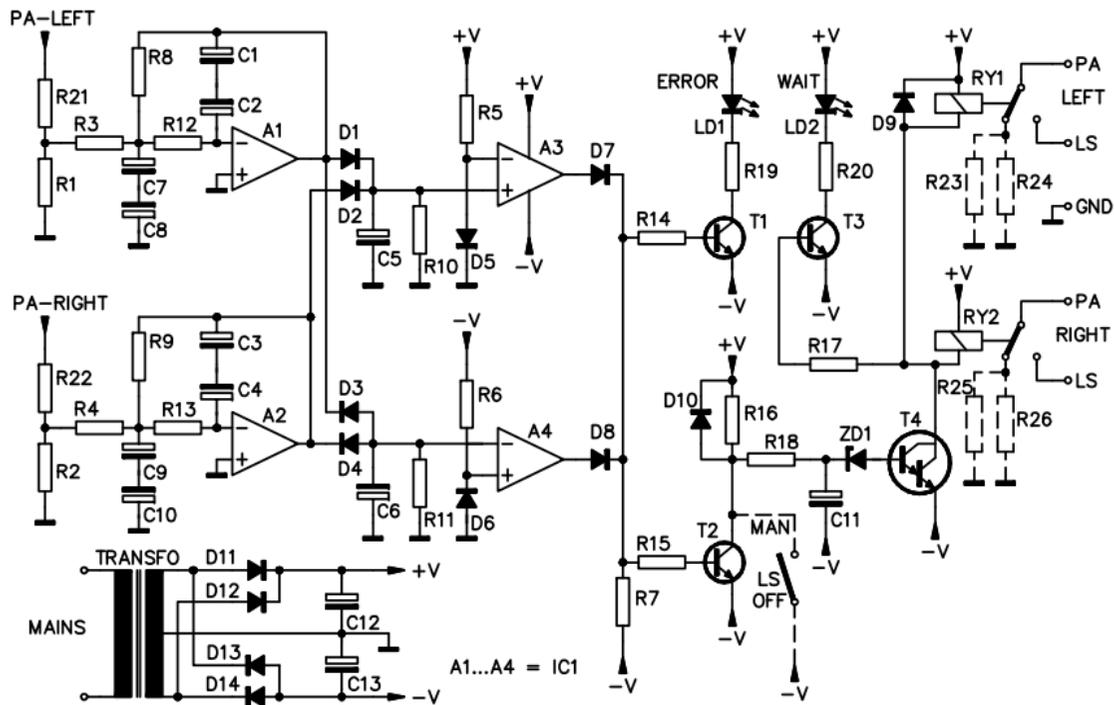


Fig. 6.0

17. PCB layout.



## 18. Diagram







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