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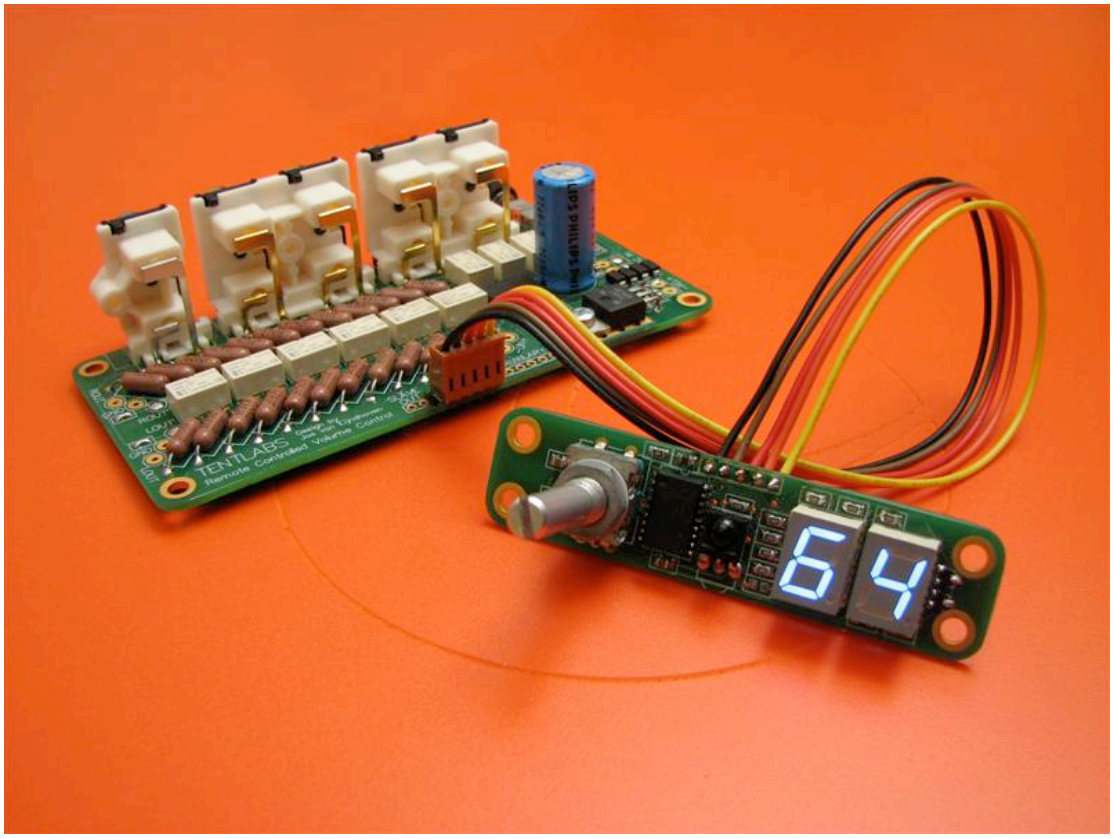
Tentlabs Application Note AN.07

Volume Control



Introduction

This Note applies to the Tentlabs Volume Control module. It shows how to connect the module as:

- Stand alone control
- Volume control in existing equipment

An FAQ is added to help trouble shooting, and the specifications are listed for reference.

Purpose

The Tentlabs volume control serves as a masetr volume control. It can replace existing controls or can be used in new equipment.

Electrical safety

Within electronic equipment, during building and surely when finished, AC mains voltages and high DC voltages exist. Care should be taken as long as the cabinet is not closed and the equipment has been connected to the mains. The user remains responsible for his own and others‘ safety and damage of the equipment. Following the instructions however will avoid hazard and electrical shock.

Liability

Tentlabs accepts no liability at all from any potential damage or injury that may occur when assembling, connecting or using the negative bias supply or any of its sub parts and assemblies.

Warrantee

The warrantee on the Tentlabs module is 5 years, assumed they are applied and used according the instructions in this Application Note.

Introduction

64 steps of attenuation are achieved with 6 Omron G6K relays, controlling 12 Dale RN6 resistors in parallel configuration. This is a fundamental difference compared to other attenuators, which usually have more contacts or resistors in their signal way. A micro controller controls the relays. A second micro controller on the display section takes care of remote control and decoding, and communicates with the other micro to achieve correct volume and input settings. It also displays these settings.

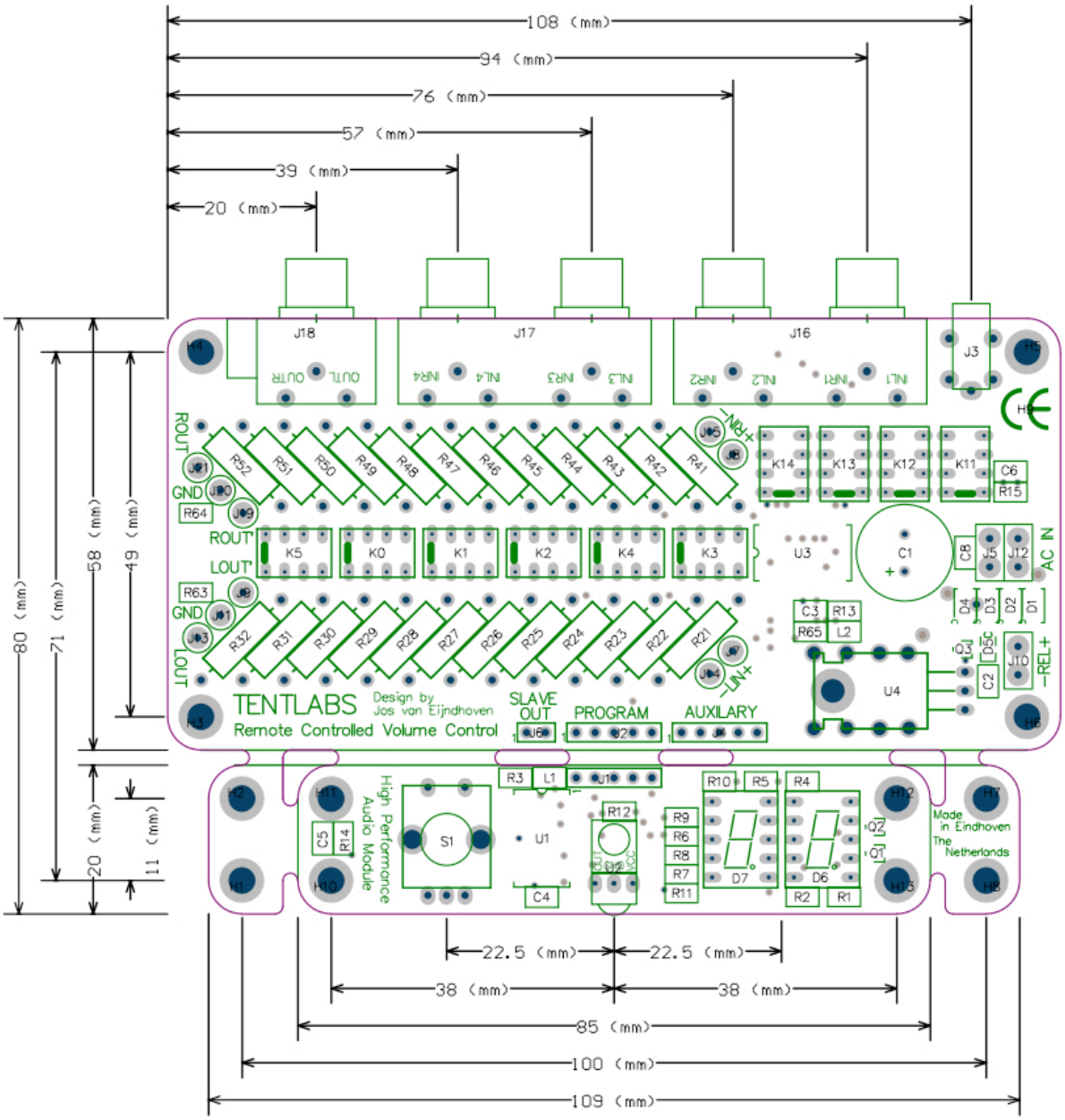
Power supply consists of a low drop 5V regulator. On board rectifiers and decoupling capacitors assure proper functioning of the whole unit, being powered by either AC or DC. Additionally, a power on/off signal is present to directly drive an external relay, which in turn can switch a power amplifier, or fulfill other functions. In power off mode, the controller of the volume control remains active, with a very low standby power.

General Notes

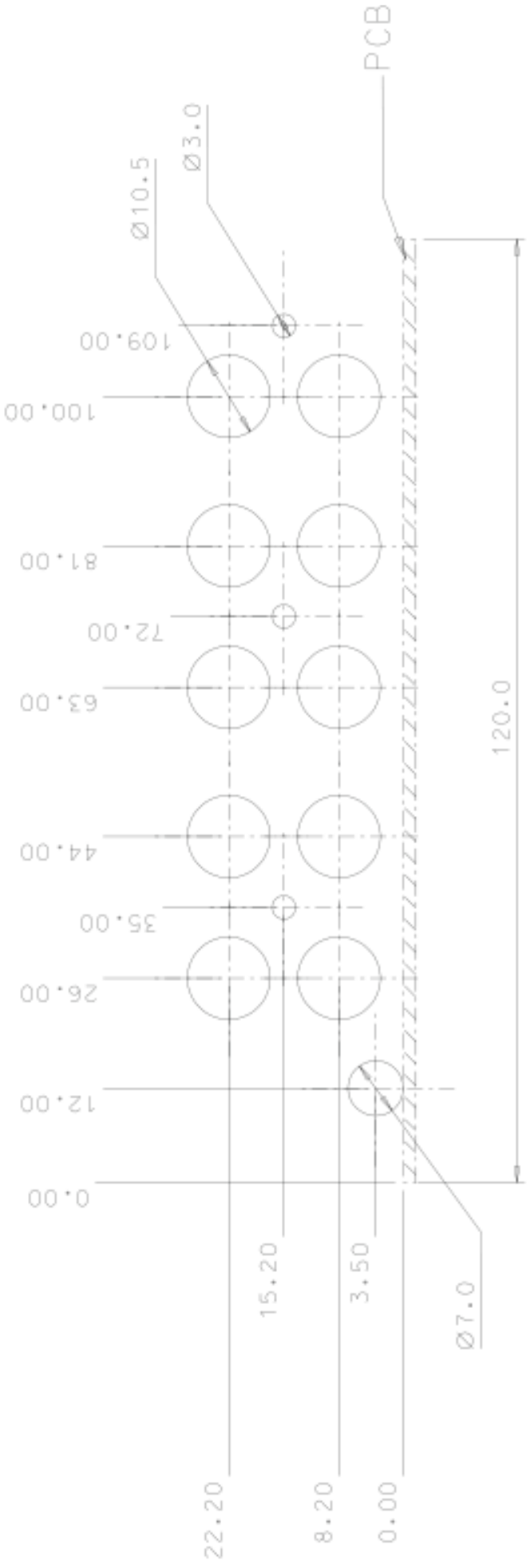
This Application Note describes how to set up systems using Tentlabs modules. Enthousiastic hobbyists may want to fully build their own surrounding electronics. For those, technical information is available on the Tentlabs website. Some important notes for the CDpro however are:

Installing the module - Mechanical

The drawing below facilitates the mounting process



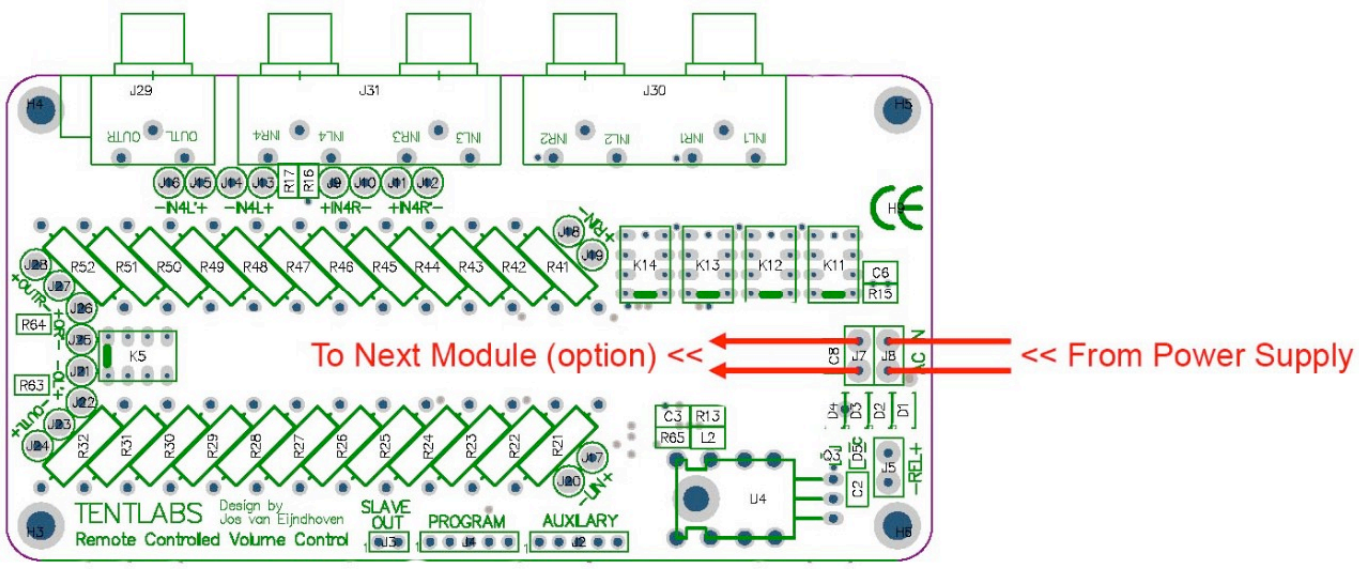
The back plane drawing is shown here



Volume controle backpanel layout

1. Connecting the volume control

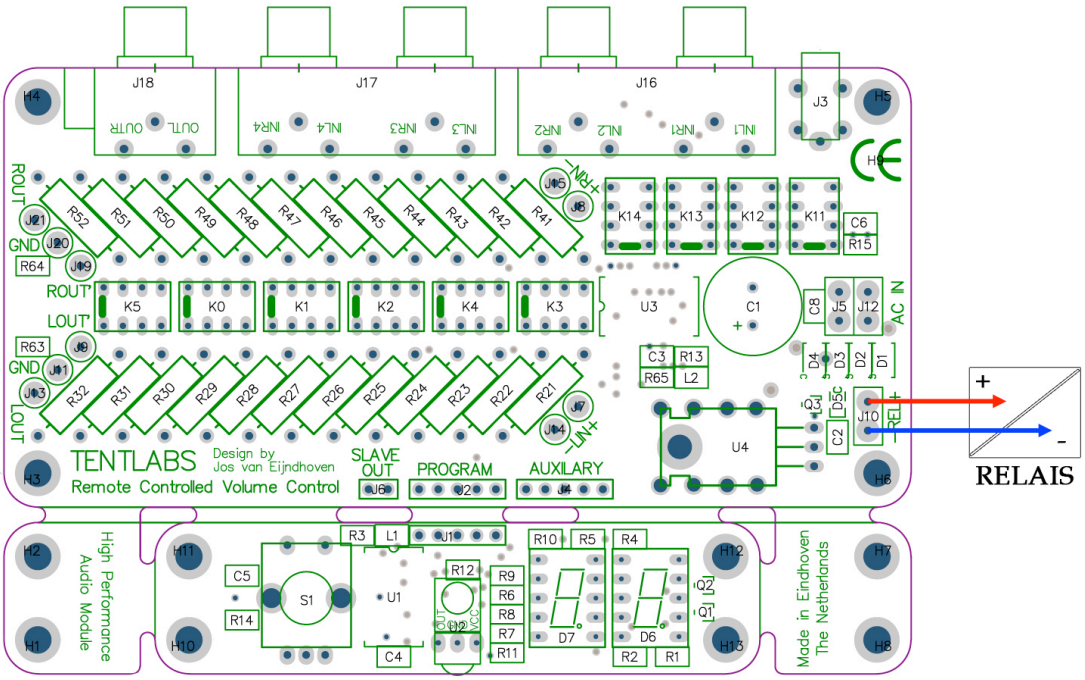
Power supply. Any AC or DC voltage between 6 and 10V can be connected as shown below. A second unit can be powered using the parallel connectors. In that case the current consumption doubles.



The power supply is connected to the audio ground using a parallel network of of 10kΩ and 1uF.

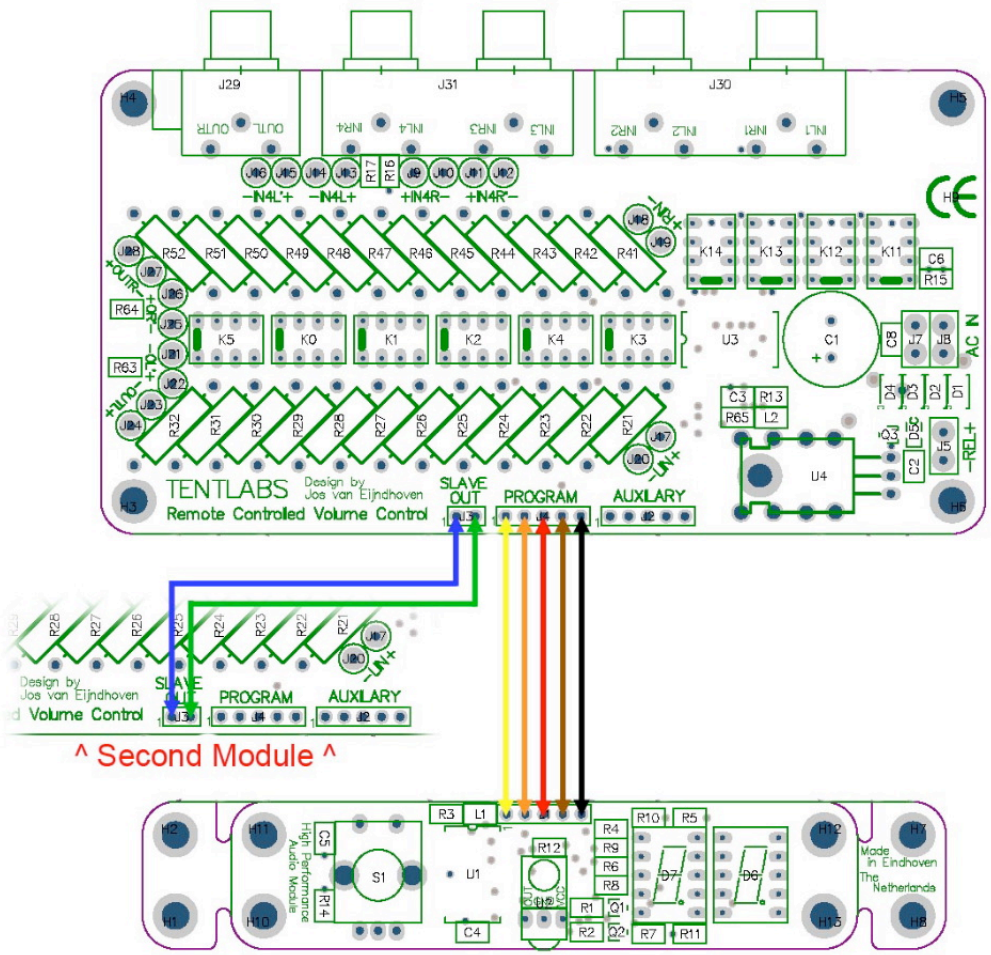
Connecting a stand-by relay

A relay can be connected as shown below. This relay can be used to switch a (pre)amplifier into standby, using the remote control.



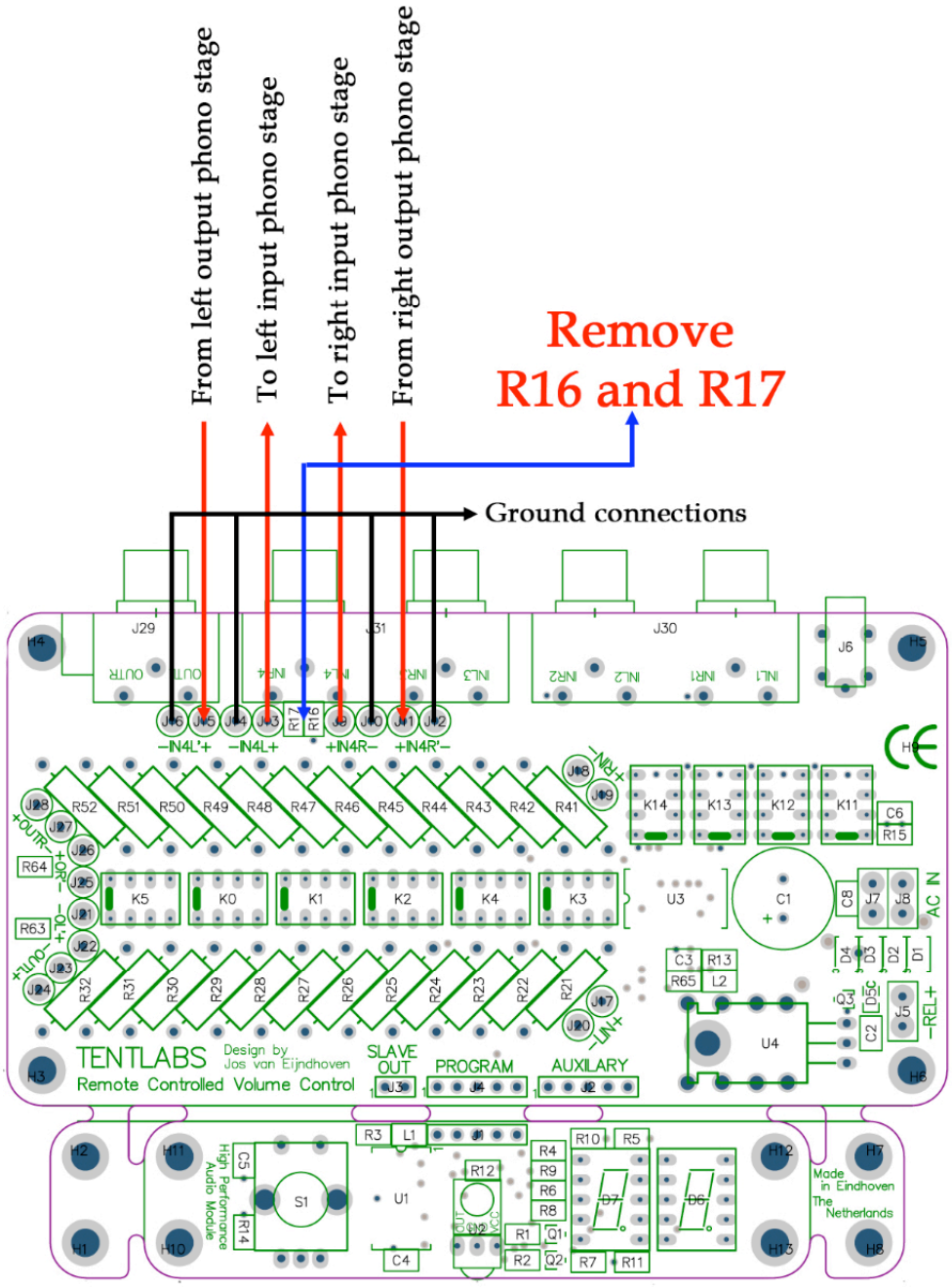
2. Connecting the volume control

The front panel PCB is connected using the 5-wire coloured cable and a connector. A second relay module can be controlled using the same front panel PCB. A 2–wire interface (blue-green) does the job. This option is required if balanced use of the volume control is needed. See also section



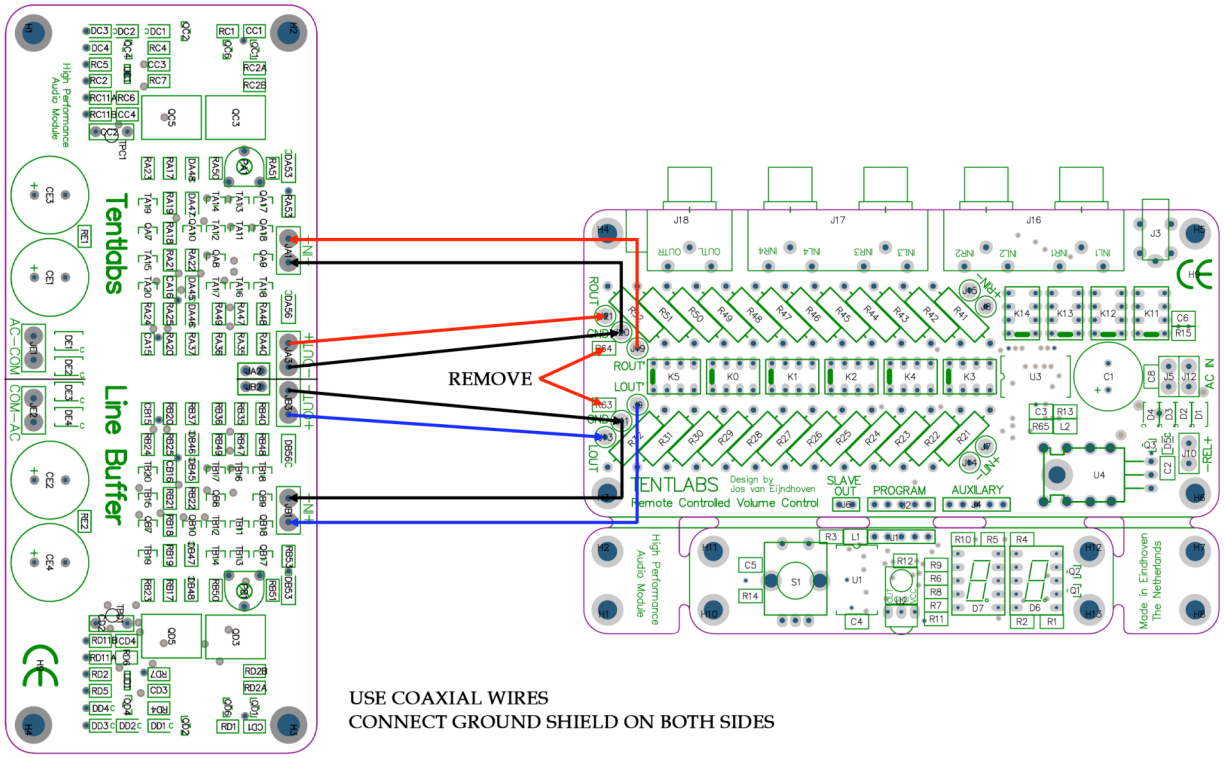
3. Connecting the volume control

Inserting a phono pre amplifier. Input 4 can be transformed to a phono input. Remove resistors R16 and R17, and connect a phono pre-amp as shown below. Use screened (oaxial) wiring, and connect the screen to ground on both sides.



4. Connecting the volume control

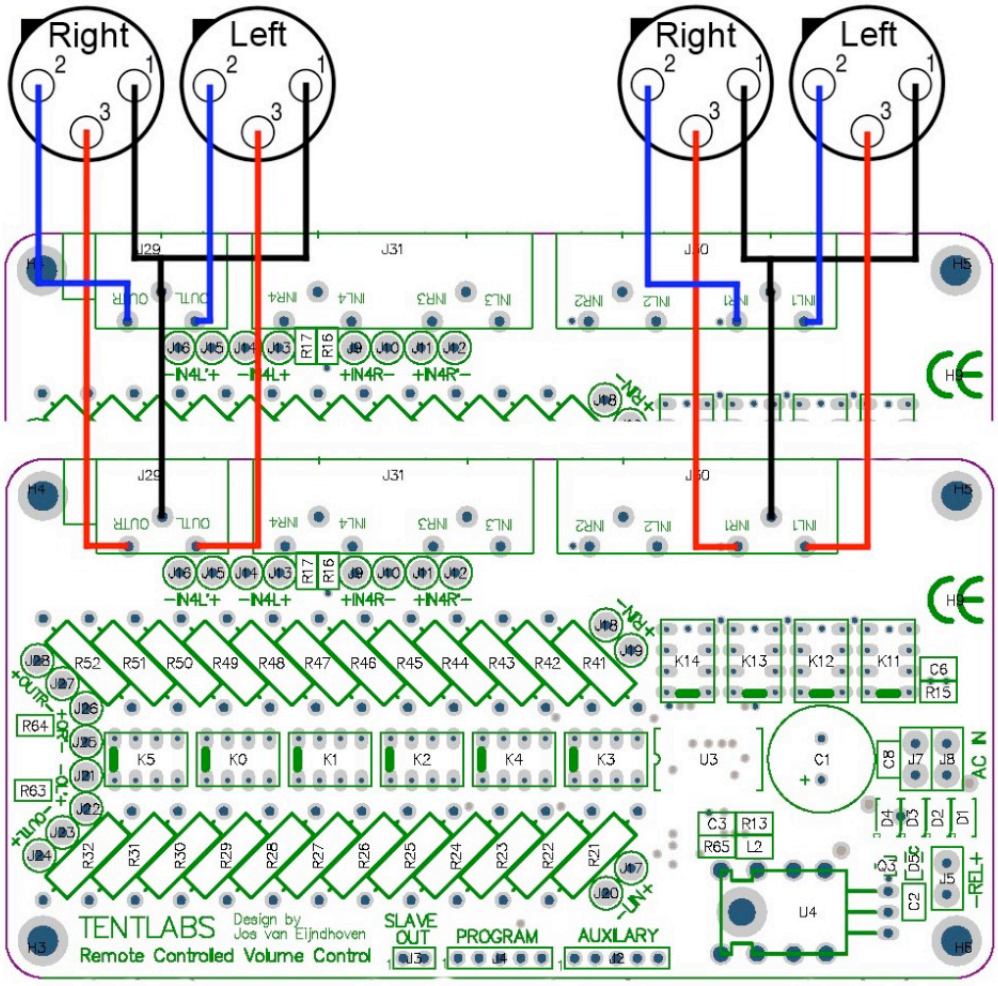
Inserting a line output buffer to create an active output can be done as shown below



5. Connecting the volume control

Balanced use. A second module is reuired. The controller conecton (cascade mode) is shown in chapter 2.

The XLR conections are shown below. For the sake of transparency, only channel 1 is wired. Succesive channels are wired in a similar way.



Programming the volume control

In order to use a remote control, the volume control has to "learn" the sent codes from the remote. This chapter is a step-by-step tutorial on how to do this.

1. Turn the volume control (or the device in which it is built) off. (Do not use the stand-by function, really turn of the power supply).

2. Choose a button on the remote, which you do not want to use for any of the volume control functions (so do not choose buttons which you would like to assign to any of the functions in step 4). This button is from here on referred to as the program button.

3. When the volume control is turned on the display will show the letter P. This means that the volume control is now in program mode and it is now possible to program the volume control. After a short while this indication will disappear and the volume control will proceed to its normal mode. Now turn on the volume control.

4. By pressing the program button in the program mode, a number will appear next to the letter P. By repeatedly pressing the program button the number will increase in a loop. After number 9 the loop returns to 1. The number corresponds to a function of the volume control:

   P1: Volume up
   P2: Volume down
   P3: Mute On/Off
   P4: Channel up
   P5: Channel down
   P6: Directly select channel 1
   P7: Directly select channel 4
   P8: On/Standby
   P9: Display remains on / go's dark after a few seconds

5. When the desired function is selected, press a button, which you want to assign to this function. To indicate that the function has been programmed, the display shows the number of the function without the letter P. If desired, you can program other functions by pressing the program button again.

6. If you finished programming the functions, wait for a few seconds. The volume control will automatically turn to the normal mode, and the display will show the current volume setting.

Short manual:

1. Turn vol. ctrl. Off.
2. Choose the programming button
3. Turn vol. ctrl. On.
4. Push the programming button
5. Choose a function you want to program
6. Assign a button to the chosen function (repeat step 4 until 6 if desired)
7. Wait for a few seconds until the display shows the current volume setting

Good to know:

- Carefully consider which button you would like to assign as programming button. It is only possible to make this choice once. After that, it cannot be changed.

- In some cases, the display will show - - . This indicates that the transmitted code cannot be used by the volume control. In this case a different remote control has to be used.

- In programming mode, the volume control will automatically proceed to the normal mode if no action is performed for a short amount of time. Because of this behaviour it is necessary to push the required buttons relatively fast after each other. You can experience the timing interval by pressing the programming button and then wait. It is always possible to return to the programming mode by switching the volume control off and then back on.

Het programmeren van de volumeregeling

Om een afstandsbediening te kunnen gebruiken moet de volume regeling de codes van die afstandsbediening leren. Het volgende stappenplan geeft aan hoe dit in zijn werk gaat:

1. Zet de volumeregeling (of het apparaat waar de volumeregeling is ingebouwd) uit. (gebruik niet de stand-by functie, maar zorg er voor dat de voeding uit is).

2. kies een knop op de afstandsbediening die u niet wilt gebruiken voor een functie van de volume regeling (kies dus geen knop die u wilt toewijzen aan een van de functies in stap 4). Deze knop heet vanaf nu de programmeerknop.

3. Bij het aanzetten van de volumeregeling verschijnt de letter P in beeld. Dat betekent dat u op dat moment de volume regeling kunt programmeren. Deze verdwijnt na een korte tijd om daarna naar de normale toestand te gaan. Zet de volume regeling nu aan.

4. Door nu op de programmeerknop te drukken ziet u achter de P een nummer verschijnen. Door herhaaldelijk op deze knop te drukken zal het nummer steeds 1 stap verder gaan, en na 9 zal deze weer bij 1 beginnen. Het nummer achter de P komt overeen met een functie van de volumeregeling:

   P1: Volume omhoog
   P2: Volume omlaag
   P3: Mute Aan/Uit
   P4: Kanaal verder
   P5: Kanaal terug
   P6: Direct kanaal 1 selectie
   P7: Direct kanaal 4 selectie
   P8: Aan/Stand-by
   P9: Display blijft aan / gaat uit na enkele seconden

5. Wanneer de gewenste te programmeren functie in beeld is drukt u op de knop die u aan die functie toe wilt wijzen. Op dat moment verdwijnt de P een korte tijd om aan te geven dat die functie nu geprogrammeerd is. Wanneer gewenst kunt u weer op de programmeerknop drukken om andere functie te programmeren.

6. Als u klaar bent met programmeren wacht u enkele seconden tot het display weer naar de normale mode terug gaat. Op dat moment zal het display de huidige volumestand aangeven.

In het kort:

8. Zet de volume regeling uit
9. Kies de programmeerknop
10. Zet de volume regeling aan
11. druk op de programmeerknop
12. Kies een te programmeren functie
13. Ken een knop toe aan de gekozen functie (herhaal stap 4 tot 6 indien gewenst)
14. Wacht enkele seconden tot het volume in beeld is

Goed om te weten:

- Denk goed na welke knop u wil toewijzen als programmeerknop. Deze keuze is eenmalig mogelijk en daarna niet meer te veranderen.

- In enkele gevallen geeft het display - - weer. De uitgezonden code kan dan niet worden gebruikt. Dit betekent dat u een andere afstandsbediening moet gebruiken.

- De tijd dat u kunt programmeren is relatief kort. Experimenteer eerst met de programmeerknop hoeveel tijd u per functie heeft om te programmeren. U kunt altijd opnieuw in de programmeermode komen door de volume regeling uit en weer aan te zetten.

Specifications Electrical

Input impedance:	> 40 kΩ (value depends on volume setting)
Output impedance:	< 8 kΩ (value depends on volume setting)
Input voltage:	6 to 10V max (AC or DC)
	This input is connected to audio ground by a parallel circuit of 10kΩ and 1uF
Current consumption:	150mA DC, 225mA AC (max values)
Volume setting:	64 steps of 1.0 dB
Channel imbalance:	< 0.15 dB
Inputs:	4
Connectors:	Cinch / RCA
Remote control:	Can be programmed to Philips / Marantz models and most Sony types
Standby output:	Open collector, 5V, max 100mA (this current is not included in the current consumption spec)

Specifications Mechanical

Main PCB size:	120*58*28 mm (W*L*H)(excludes connectors)
Hole pitch:	111*49 mm (symmetrical)
Display PCB size:	120*20*8 mm (W*L*H) (excludes control shaft)
Hole pitch:	111*11 mm (symmetrical)
Display PCB small size:	80*20*8 mm (W*L*H) (excludes control shaft)
Hole pitch:	71*11 mm (symmetrical)

All mounting hole diameters are 3.2 mm

All specs and parameters subject to change without prior notice