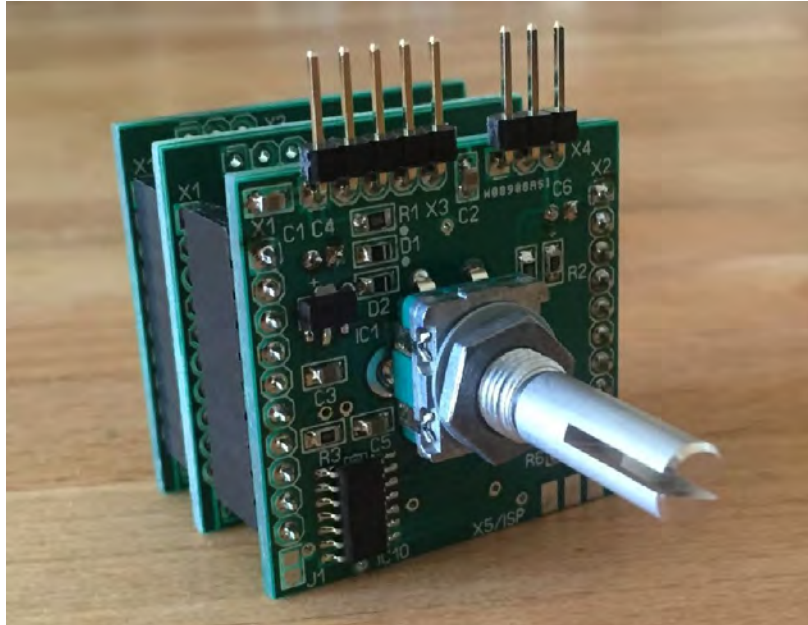


Muses Volume Control

20160207

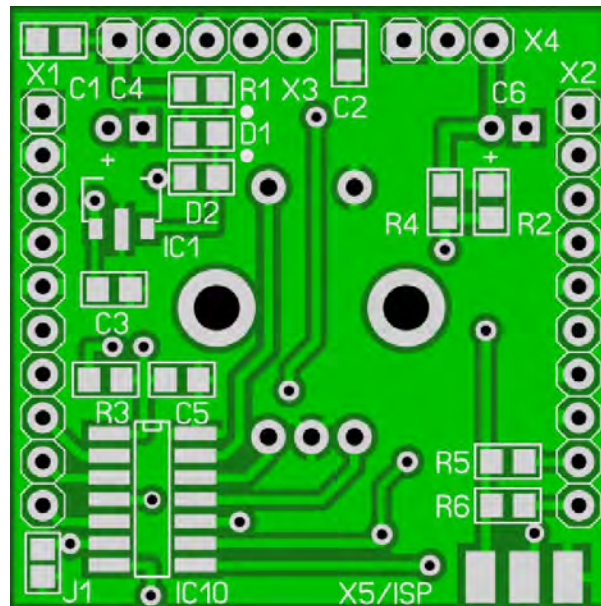


Features:

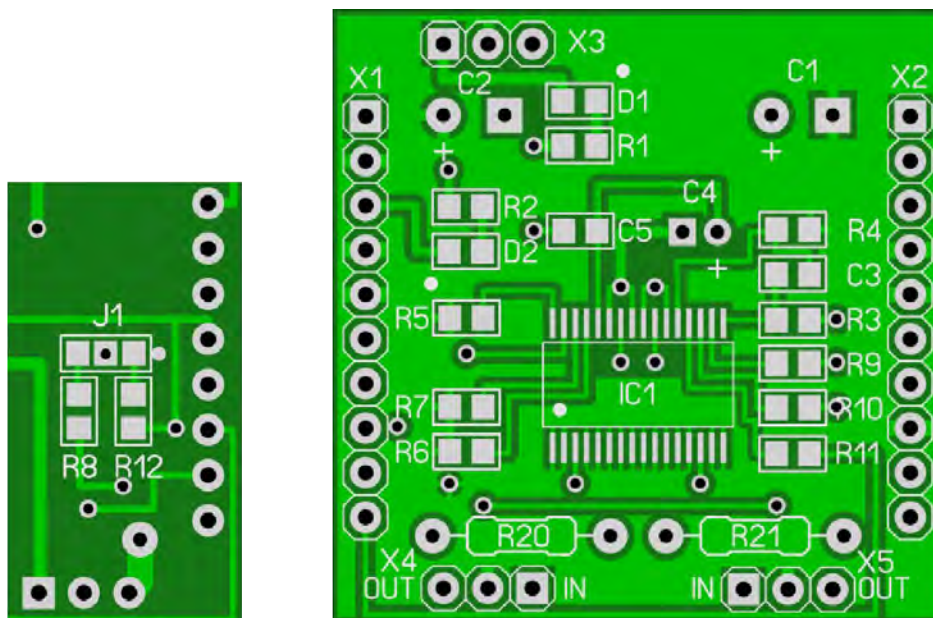
- 35mmx35mm
- 2,4,6,8 channels possible because volume boards can be cascaded
- 0dB to -111.5dB/0.25dB and mute function
- 20kOhm input impedance
- Operation / mounting on rotary encoder with switch function
- Save current volume as startup volume
- +/- 15 V voltage supply
- Controller is in "no operation" state out of function, all clocks are off in order to avoid disturbances of the audio signal
- Volume +/- and Mute remote control (RC5, RC6, NEC, Apple ...) incl. learning function

Layout

Controller Board:

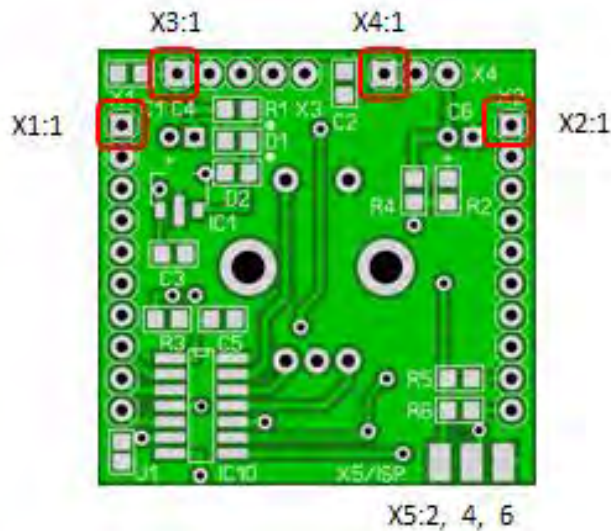


Volume Board:



populating
bottom side

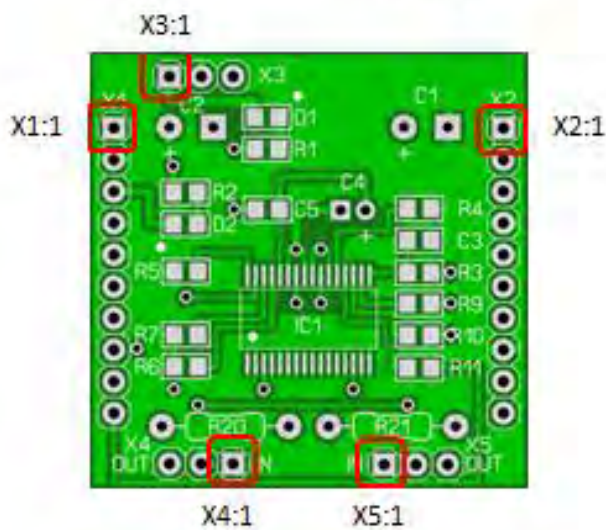
Pin-, Electrolytes- Jumper- and Diodes -Orientation



Pins:

The counting of the terminal pins starts always at the rectangular pin!

X5 is done on both pcb sides. Pin 1, on the bottom side is marked with a dot.

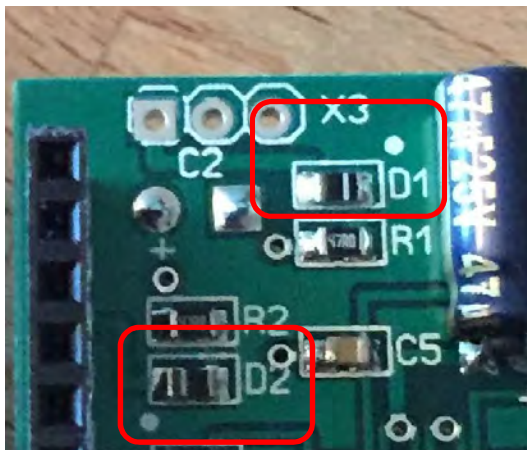


Electrolytes

The polarity of the electrolytic capacitors is marked with a +. In addition the negative terminal is the rectangular pad. The capacitors are installed in horizontal position!

Jumpers:

J2 (controller board) and J1 (Volume Board) are located on the bottom side. Each Pin 1 is marked with a point

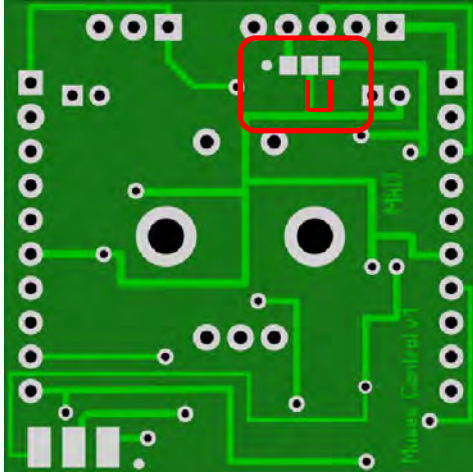


Diodes:

Here the cathode is represented by a dot on the PCB layout.

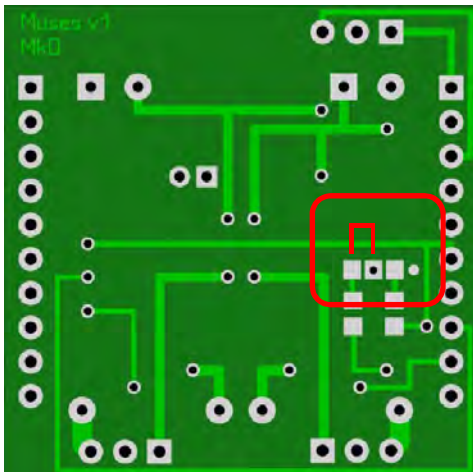
Jumpers

Controller Board



J2: Depending on the jumper position the 5 VDC supply for the digital section is provided by an external source or internal by the onboard voltage regulators fed by the + 15VDC power supply voltage (shown in the picture / 2-3). Details see wiring diagram.

Volume Board



J1: This jumper is used to address the Muses72320 and **MUST** be set from pin 2 to 3!

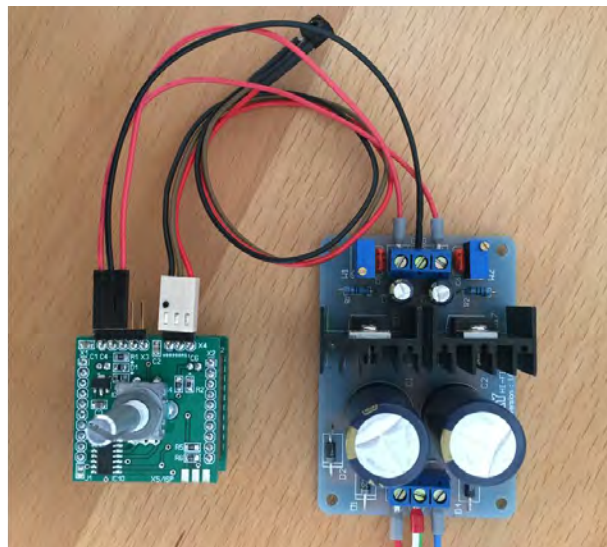
Installation and Connections

The volume boards can be cascaded. Depending on the number of volume boards 2,4,6 ... channel solutions are possible. For stacking stackable socket connectors are necessary for the central boards

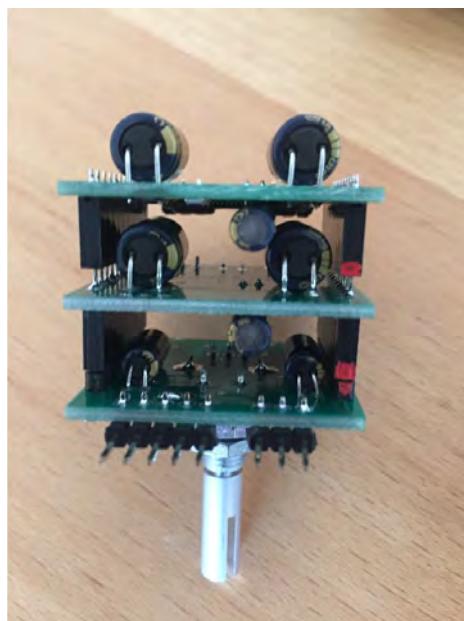
In the simplest case, the controller board is supplied via X3 with +/- 15 V DC and the jumper J2 is set from 2 to 3

If necessary, an infrared receiver is connected to X4

The audio signal can now be connected to the Muses Board (s)



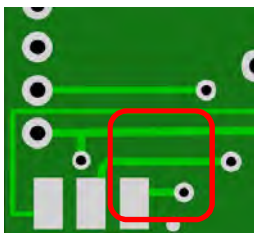
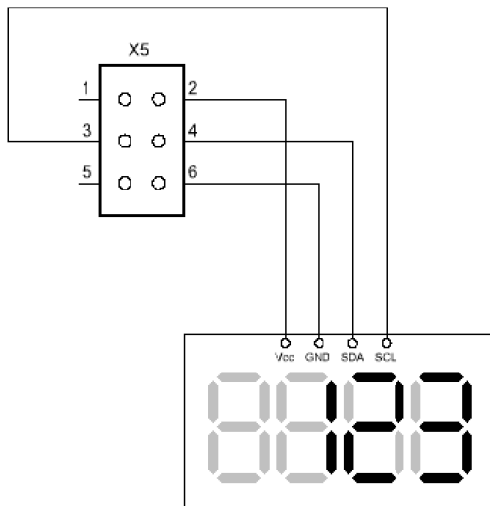
Power supply and IR receiver



4- channel construction

Optional Display

Optionally, a 7-segment display can be connected. An Adafruit 4x7 0.56 "is used (see parts list). For this purpose, a 2 row male connector on the controller board is soldered to X5.



Pin 1

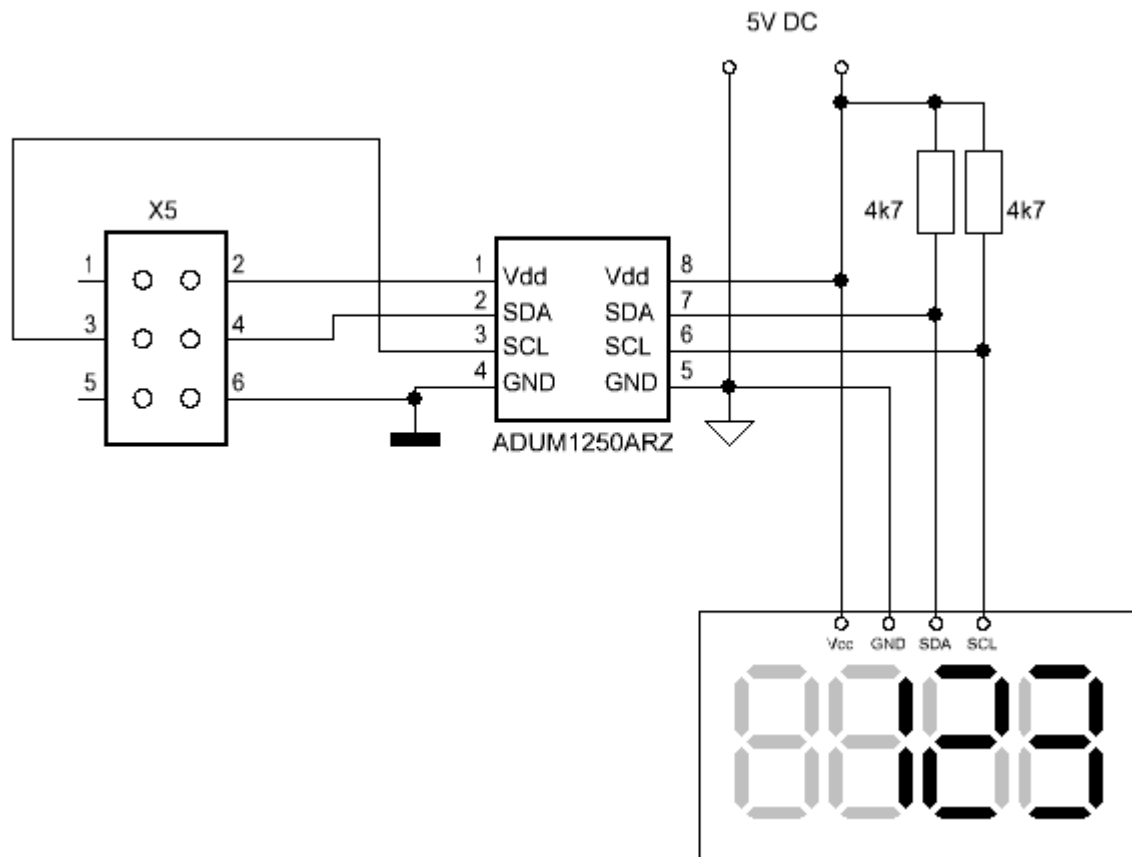
The display shows the following operating states

- The status of the infrared teach mode (see section "Teach IR Codes")
- The current volume level as a numerical value 0-224 / -115,5dB - 0dB (see chart)
- Mute (blinking of the current volume shown)

Example how the current volume is displayed



Using the display there might be interference to the signal path. To avoid this a galvanic separation of the display and a supplementary 5V DC source is recommended.



Learning IR Codes

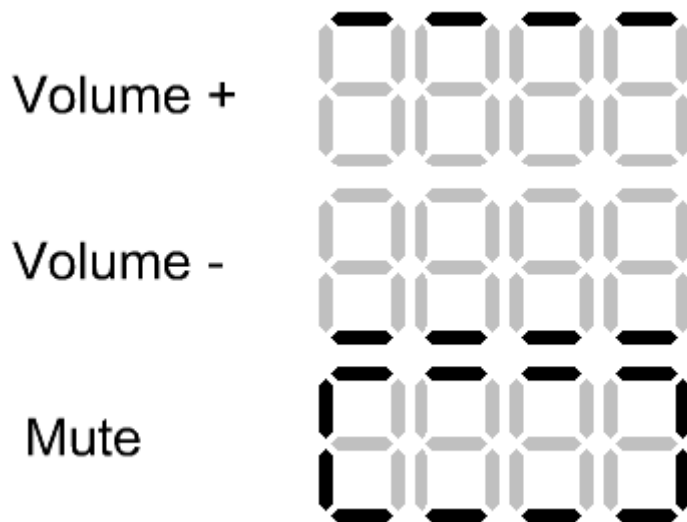
The controller can be taught to many common IR codes. Below the setup is described

1. Turn on supply voltage by pressing the encoder button
2. Release encoder button
3. Press button for "volume up" shortly on the remote control
4. Briefly press "volume down" button on the remote control
5. Briefly press the "mute" button on the remote control

In the case the 3 keys have been successfully detected, the controller will start as usual with the starting volume. The read codes will be stored permanently in the EEPROM.

The setup can be canceled by pressing the encoder button or switching off the supply voltage .

Indication in the optional display

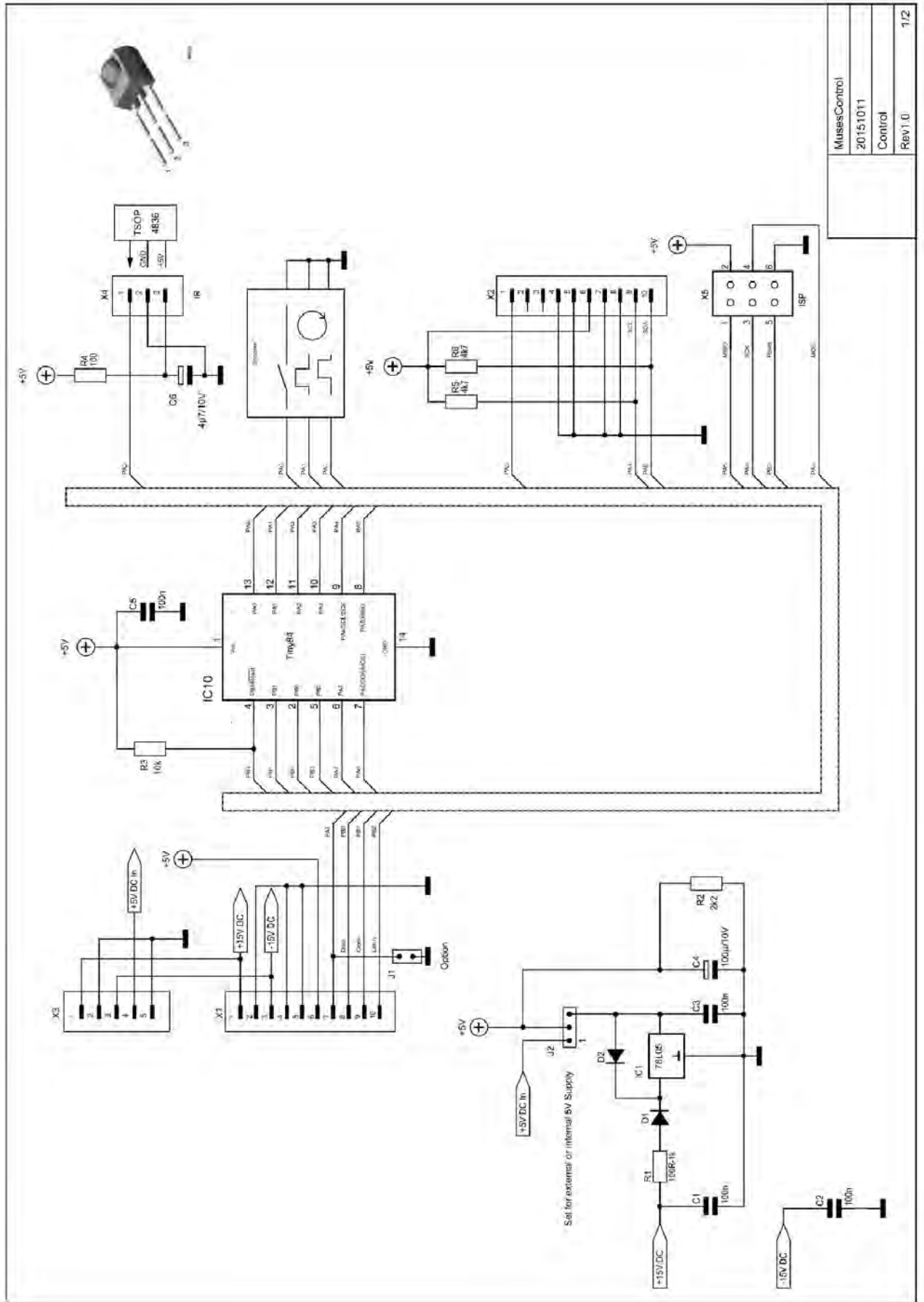


Saving the start volume

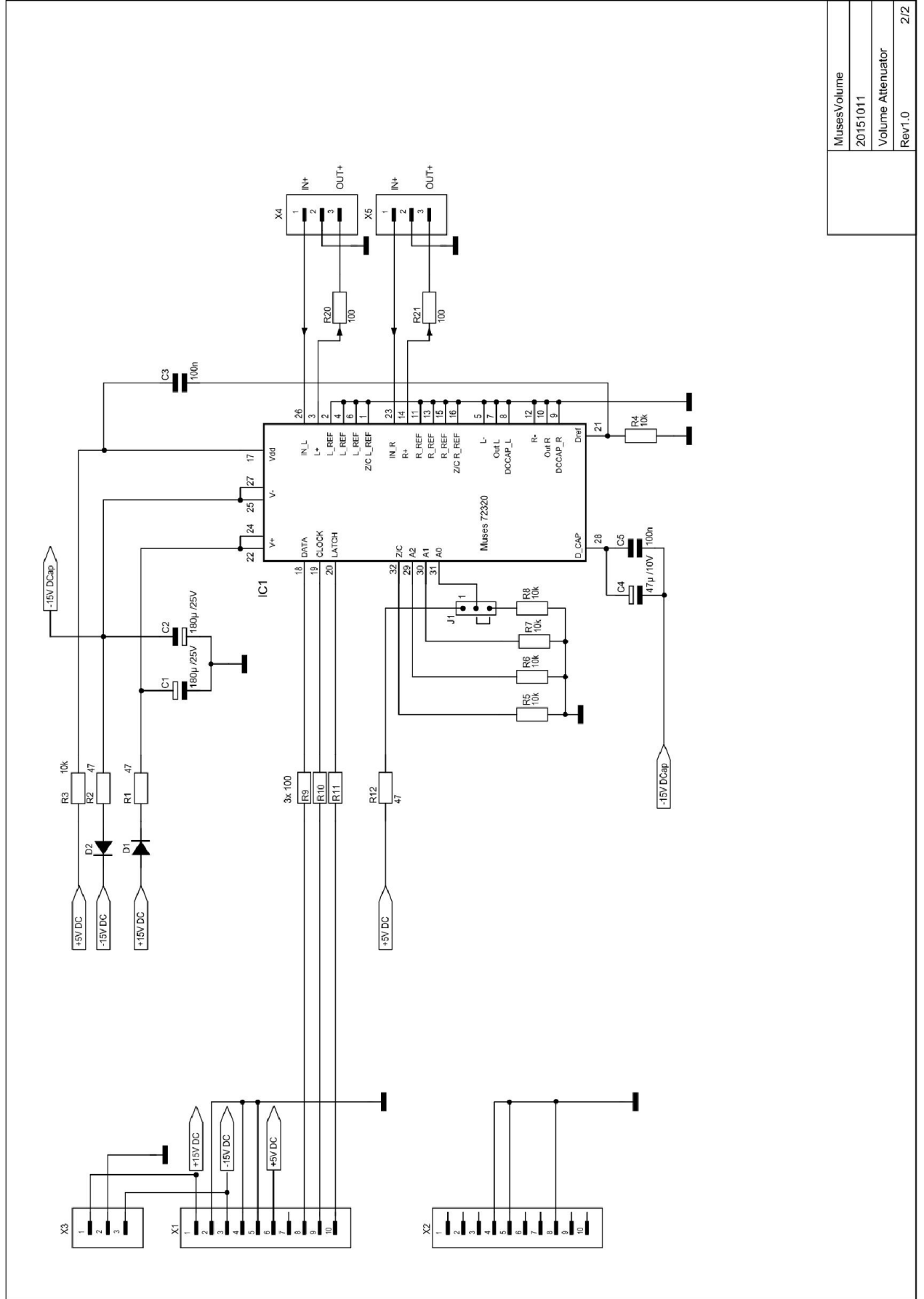
The initial volume level is the value that is displayed after switching on the controller.

When the encoder button is pressed down for 3 seconds during operation , the current volume level is stored as starting volume. A successful save is confirmed by a short mute sequence.

Only values corresponding to less than 80% of maximum volume can be saved



MusesControl
20151011
Control
Rev1.0
1/2



MusesVolume
20151011
Volume Attenuator
Rev1.0
2/2

BOM

Controller Board

Resistors

Component	Number	Value	Remark
R1	1	100R-1k*	Metal film resistor/ 0805 SMD
R2	1	2k2	Metal film resistor / 0805 SMD
R3	1	10k	Metal film resistor / 0805 SMD
R4	1	100R	Metal film resistor / 0805 SMD
R5,6	2	4k7	Metal film resistor / 0805 SMD Optional

Component	Number	Value	Remark
C1,2,3,5	4	100nF	SMD 0805
C4	1	100µ/10V	Pitch 2-2,5mm; dmax= 5mm
C6	1	10µ/50V	Pitch 2-2,5mm; dmax= 5mm

Semiconductors

Component	Number	Value	Remark
D1,2	2	1N4148	Diode SMD0805
IC1	1	LP2950 ACZ5,0	Voltage regulator 5V SOT89
IC10	1	Tiny84	Atmel Mikrocontroller SO-14 / programmed
	1	TSOP4838	Infrared receiver / alternative TSOP4836

Other Parts

Component	Number	Value	Remark
Encoder	1	ALPS STEC11B	Rotary Encoder, 15/30, vert., with button
X1,2	1	10pol. 2,54mm	Pin header, straight, pitch 2,54mm
X3,4	1	5pol./3pol. 2,54mm	Pin header, angled, ptch 2,54mm
X5	1	2x3pol. 2,54mm	Pin header, angled, pitch 2,54 mm
	1		Programming
	1		Adafruit 0.56 "4-digit 7-segment display + I2C Backpack - Green / yellow / red / white

*100R with optional display / 100R-1k without display

Volume Board

Resistors:

Component	Number	Value	Remark
R1,2,12	2	47R	Metal film resistor/ 0805 SMD
R3,4,5,6,7,8	6	10k	Metal film resistor/ 0805 SMD
R9,10,11	3	100R	Metal film resistor/ 0805 SMD
R20,21	2	100R	1/4W Metal film resistor

Capacitors

Component	Number	Value	Remark
C1,2	2	180µF/25V	Pitch 3,5mm; dmax= 8mm
C3,5	2	100nF	SMD 0805
C4	1	47µ/10V	Pitch 2-2,5mm; dmax= 5mm

Semiconductors:

Component	Number	Value	Remark
D1,2	2	1N4148	Diode SMD0805
IC1	1	Muses72320	Volume Attenuator SSOP32

Other parts:

Component	Number	Value	Remark
X1,2*	1	10pol. 2,54mm	Stackable Receptacle / Arduino header - 1 x 10-pin
X1,2*	2	10pol. 2,54mm	10-pin socket terminal strip, straight, RM 2.54
X4,5	1	10pol. 2,54mm	10-pin socket terminal strip, straight, RM 2.54

* depending whether multiple Muse Volume boards to be stacked