

curryman DAC PSU

Assembly Guide V1.01



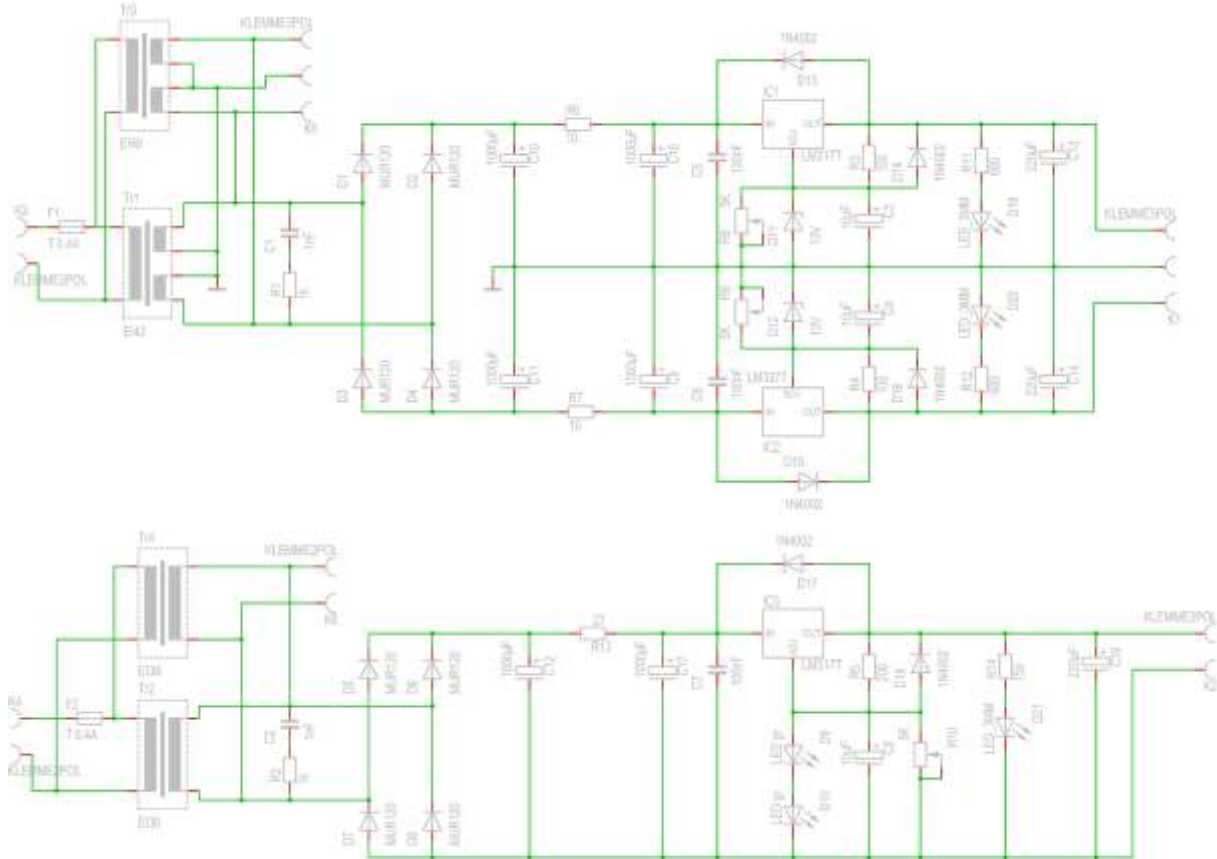
This guide roughly describes the assembly of the curryman DAC PSU and its different build options, though it cannot cover all possible configurations or pitfalls. The complete PSU delivers up to three voltages, in the standard setup approximately +5V and +/-15V, on a quite compact board (100mm x 100mm) including two separate transformers e.g. for the analog and the digital part of a DAC. It uses the good old LM317/337 voltage regulators with a carefully designed schematic and optimized board layout to squeeze out maximum performance at a reasonable price and a good availability of all parts (e.g. all parts are available from Reichelt).

This assembly guide will first describe the standard configuration of the PSU for the curryman DAC. Later several other configurations will be mentioned.

ATTENTION: During the build and the operation of the PSU you will be dealing with AC mains voltages. It is assumed that you know what you are doing and that the applicable safety regulations are taken into account. If you are not careful you can injure yourself, or worse! Keep a clean bench and ***PAY ATTENTION*** to what you are doing! Neither curryman nor the organizer of the group buy (Ronald) can be made responsible for any injury or damage caused by the build or operation of this PSU.

Schematic:

The following picture shows the complete schematic of the PSU. Please note that some parts are optional and represent alternative configurations (e.g. TR1/TR3, R8/D11,...). The exact parts needed for each of the several configurations will be listed below.



Standard fixed voltage configuration for the curryman DAC

The curryman DAC requires two power supplies:

- a (regulated or unregulated) DC power supply for the DAC and XO in the range from 4.5V to 12V (max. 65mA) and
- a regulated bipolar DC power supply between +/-10V and +/-18V (max. 35mA per rail).

In the standard configuration the PSU delivers fixed and regulated output voltages of approximately 5.25V and +/-14.25V with maximum currents of ~300mA and ~200mA per rail which is fine for up to four curryman DACs.

BOM for the standard fixed voltage configuration:

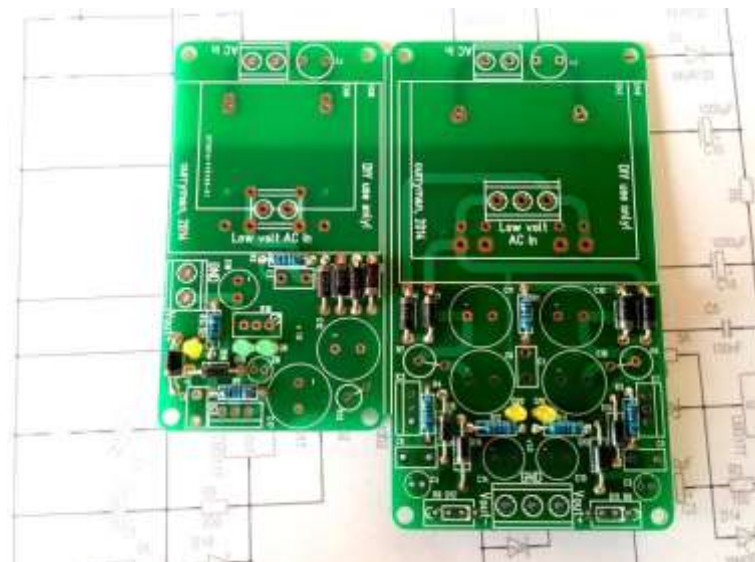
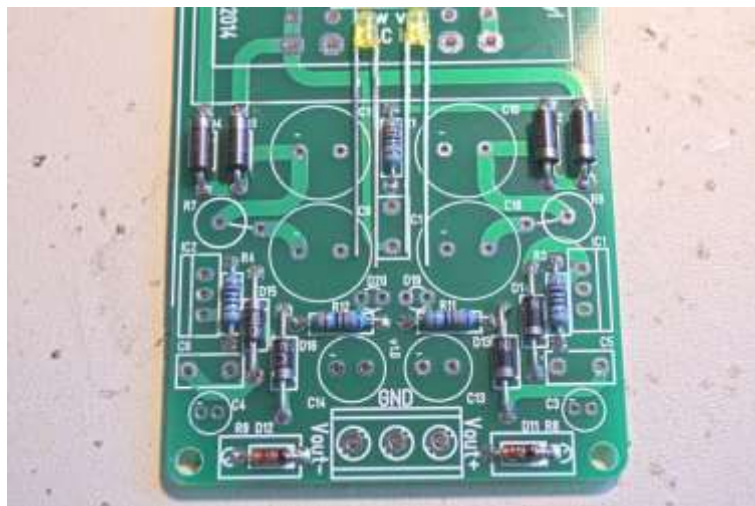
Count per PCB	Part No	Description	Reichelt order number	Comment
2	IC1, IC3	LM317T	LM 317-220	
1	IC2	LM337T	LM 337-220	
3	D19, D20, D21	LED yellow	LED 3MM ST GE	Optional
2	R11, R12	680Ohm, ½ W	METALL 680	Optional, should be adapted for other output voltages
1	R14	150Ohm, ½ W	METALL 150	Optional, should be adapted for other output voltages
2	C1, C2	1,0nF Foilcap	FKP-2 1,0N	LS 5mm, Wima FKP-2
2	R1, R2	1kOhm, ½ W	METALL 1,00K	
8	C1-C8	MUR 110 ultrafast diode	MUR 110	
6	C10-C12, C9, C16, C17	Elcap 1000µF/35V	RAD FR 1.000/35	Panasonic FR, LS 5mm, Diameter 12,5mm
3	R6, R7, R13	Wirewound 2W 10Ohm	2W DRAHT 10	Can be 27 Ohm if only one DAC is used
3	C5-C7	100nF Foilcap	MKS-2 100N	LS 5mm, Wima MKS-2
2	D11, D12	low noise Zener 13V	ZF 13	Fixed output voltage 14.25V
2	D9, D10	Low current LED green	LED 3MM 2MA GN	Fixed output voltage 5,05-5,65V (depending on forward voltage of individual LEDs)
3	C3, C4, C8	Elcap 22µF/50V	RAD FR 22/50	Panasonic FR, LS 2mm, Diameter 5mm
6	D13-D18	1N4002	1N 4002	
2	R3, R4	100Ohm, ½ W	METALL 100	
1	R5	200Ohm, ½ W	METALL 200	
3	C13, C14, C15	Elcap 220µF/35V	RAD FC 220/35	Panasonic FC, LS 3.5mm, Diameter 8mm
1	TR1	Transformer Block 2x18V 10VA	EI 48/16,8 218	Alternative for one DAC: EI 42/14,8 218 (5VA transformer)
1	TR2	Transformer Block 9V 3,2VA	EI 38/13,5 109	Alternative for one DAC: EI 30/18 109 (2.3 VA transformer)
2	F1, F2	Miniature Fuse, 0,1A slow	MIK-TRÄGE 0,1A	
1	K1	Screw type connector, 3 pole, Lift	AKL 094-03	LS 5mm
3	K2, K3, K4	Screw type connector, 2 pole, Lift	AKL 094-02	LS 5mm

Resistors/Trimmers R8, R9 and R10 are not used for fixed output version.

Assembly

Boards can be separated into two parts (single voltage part and dual voltage part) for easier installation in certain situations (see first picture). Obviously this should be done before soldering the first components to the board.

As usual start soldering small, low height parts like resistors and diodes and continue soldering higher and higher parts like connectors, capacitors etc. and finally the transformer. No need to say that the builder has to take care for the orientation of parts like diodes and electrolytic caps as per the schematic and the silk screen. The following pictures may also help.





Variable output voltage configuration

For variable output voltages the voltage setting zener diodes (D11/12) or LEDs (D9/10) can be replaced by 5k Trimpots (R8/9/10, Reichelt order number: 64W-5,0K). Maximum achievable output voltage depends on the actual transformer voltage and the current need of the load in combination with the filter resistors (R6/7/13).

Other fixed output voltages

Other fixed voltages than +/- 14.25V and 5V can be set within the limits given by the transformer secondary voltages and voltage drops at filter resistors and regulators using standard ¼W resistors at positions R8/9 and 10. Output voltages of the regulators can be calculated as per the LM317/337 datasheet formula:

$$V_{out} = 1,25V \times \left(1 + \frac{[R8,9,10]}{[R3,4,5]} \right) + 0.005mA \times [R8,9,10]$$

Configuration for higher currents

Maximum currents are mainly limited by the onboard transformers and power dissipation of the regulators. If higher currents are needed, external transformers can be used. The secondaries can be easily wired to the boards using screw-type terminals. Corresponding two pole (Reichelt order number: AKL 094-02) and three pole (Reichelt order number: AKL 094-03) terminals can be soldered to the board close to "Low volt AC in" print.

Power on indicator LEDs

The LEDs D19-D21 are used to indicate power on state and as such are optional. However they are recommended since they also will ensure a minimum load current and enables to check output voltage even without any external load connected (LM317/337 regulators need a minimum amount of load current to actually regulate).

The values given in the above BOM will lead to approximately 18-20mA of current through the LEDs, however exact values are not critical.

Calculation (yellow LED $V_{forward_LED} \sim 2.1V$):

$R_{LED} \sim (V_{out} - V_{forward_LED}) / I_{LED}$, e.g. $R_{LED} \sim (14.25V - 2.1V) / 18mA = 675\Omega$ -> choose 680 Ohms

Power dissipation / heatsinking

The LM317/337 regulators in TO220 case are capable of dissipating up to approximately 1W without heatsinking. Therefore when powering one or two Curryman DAC boards heatsinks are not really necessary (but obviously do no harm). If higher power is needed it is necessary to choose adequate heatsinks for the regulators!

Besides the regulators also the filter resistors R6/7/13 need some attention. Depending on the load current and the actual resistor value they will need to dissipate up to several watts of power. Therefore resistors with appropriate power rating must be used.

Curryman PSU calculator

DIYaudio user Ray (nautibuoy) made a nice Excel Spreadsheet that helps to calculate resistor values and power dissipations for various configurations. The spreadsheet has already been [posted at DIYaudio](#) and is available upon request (PN to curryman or nautibuoy at DIYaudio)